User Manual

Allen-Bradley

PowerFlex 700L Liquid-Cooled Adjustable Frequency AC Drive

Frames 2, 3A, and 3B

Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

The information below summarizes the changes made to this manual since its last release (August 2008).

Description of Changes	Page
Revised and re-organized information in Chapter 4.	4-1…4-11
Revised information for Electronic Motor Overload Protection in the “Control” section of the specification.	A-3
Revised information in the section “Fuse and Circuit Breaker Ratings.”	A-6

Notes:

Chapter 4 Cooling Loop Installation

Overview

This manual provides the basic information needed to install, start-up, and troubleshoot the PowerFlex 700L Liquid-Cooled AC Drive.

Who Should Use this Manual?

This manual is intended for qualified personnel. You must be able to install, wire, and operate Adjustable Frequency AC Drive devices. In addition, you must have an understanding of the parameter settings and functions.

What Is Not in this Manual

This manual is designed to provide only basic installation and start-up information. The following information is **not included**:

PowerFlex 700L Active Converter Power Module Information

Regenerative PowerFlex 700L drives are equipped with a PowerFlex 700L Active Converter Power Module. For details on active converter I/O wiring, start-up, programming, and other related information, see the PowerFlex 700L Active Converter Power Module User Manual, publication PFLEX-UM002.

PowerFlex 700 Vector Control Information (standard)

For PowerFlex 700L drives equipped with Standard Vector Control, see the PowerFlex 700 Adjustable Frequency AC Drive User Manual - Series B, publication 20B-UM002, which provides I/O wiring, start-up, programming, and vector control encoder information.

PowerFlex 700S Phase II Control Information (optional)

For PowerFlex 700L drives equipped with Optional 700S Phase II Control, see the PowerFlex 700S High Performance AC Drive - Phase II Control User Manual, publication 20D-UM006, which provides I/O wiring, start-up, programming, and other related information.

HIM (Human Interface Module) Information

For an overview of the HIM operation, see the PowerFlex 700 Adjustable Frequency AC Drive User Manual - Series B, publication 20B-UM002, or the PowerFlex 700S High Performance AC Drive - Phase II Control User Manual, publication 20D-UM006.

PowerFlex 7-Class Network Communication Adapter Information

For PowerFlex 700L drives equipped with a network communication adapter, see the adapter User Manual, publication 20COMM-UMxxx, for information on configuring and using I/O and explicit messaging over the network.

PowerFlex 700L Service Information

For Frame 2 drive service information, see the PowerFlex 700L Liquid-Cooled Adjustable Frequency AC Drive Frame 2 Hardware Service Manual, publication 20L-TG002.

For Frame 3A and 3B drive service information, see the PowerFlex 700L Liquid-Cooled Adjustable Frequency AC Drive Frames 3A and 3B Hardware Service Manual, publication 20L-TG001.

Additional Resources

Documentation can be obtained online at http://literature.rockwellautomation.com. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

To find your local Rockwell Automation distributor or sales representative, visit http://www.rockwellautomation.com/locations.

For information such as firmware updates or answers to drive-related questions, go to the Drives Service & Support website at http://www.ab.com/support/abdrives and click on the Downloads or Knowledgebase link.

The following publications provide general drive information.

Title	Publication
Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives	DRIVES-IN001
Preventive Maintenance of Industrial Control and Drive System Equipment	DRIVES-TD001
PowerFlex 70EC/700VC Reference Manual	PFLEX-RM004
Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control	SGI-1.1
A Global Reference Guide for Reading Schematic Diagrams	100-2.10
Guarding Against Electrostatic Damage	8000-4.5.2

The following publications provide specific feedback card information for PowerFlex 700L drives with Optional 700S Phase II Control.

Title	Publication
Hi-Resolution (Stegmann) Feedback Option Card Installation Instructions for PowerFlex 700S Drives	20D-IN001
Resolver Feedback Option Card Installation Instructions for PowerFlex 700S Drives	20D-IN002
Multi-Device Interface Option Card Installation Instructions for PowerFlex 700S Drives	20D-IN004
Second Encoder Option Card for PowerFlex 700S Drives with Phase II Control	20D-IN009
DriveGuard Safe Torque Off Option for PowerFlex 700S Phase II and PowerFlex 700L Drives	20D-UM007

The following publication provides information that is necessary when applying the 700S Phase II Control DriveLogix™ 5730 Controller.

Title	Publication
DriveLogix 5730 Controller User Manual	20D-UM003

The following publications provide information that is useful when planning and installing communication networks.

Title	Publication
ControlNet Coax Tap Installation Instructions	1786-IN007
ControlNet Coax Media Planning and Installation Manual	1786-6.2.1
ControlNet Fiber Media Planning and Installation Guide	CNET-IN001
DeviceNet Product Overview	DNET-SO002
DeviceNet Media Design and Installation Guide	DNET-UM072
DeviceNet Starter Kit User Manual	DNET-UM003
EtherNet/IP Media Planning and Installation Manual (1)	ODVA Pub. 148
EtherNet/IP Network Infrastructure Guidelines (1)	ODVA Pub. 35
EtherNet/IP Performance Application Solution	ENET-AP001
SynchLink™ Design Guide	1756-TD008

(1) Use this link to the ODVA EtherNet/IP library for these publications: http://odva.org/Home/ODVATECHNOLOGIES/EtherNetIP/EtherNetIPLibrary/tabid/76/Default.aspx

Manual Conventions

- In this manual, we also refer to the PowerFlex 700L Liquid-Cooled AC Drive as drive, PowerFlex 700L, or PowerFlex Drive.
- To help differentiate parameter names and LCD display text from other text, the following conventions are used:
  - Parameter Names appear in [brackets] – example: [DC Bus Voltage].
  - Display Text appears in “quotes” – example: “Enabled.”
- The following words may be used in the manual to describe an action.

Word	Meaning
Can	Possible, able to do something
Cannot	Not possible, not able to do something
May	Permitted, allowed
Must	Unavoidable, you must do this
Shall	Required and necessary
Should	Recommended
Should Not	Not recommended

General Precautions

ATTENTION: This drive contains electrostatic discharge (ESD) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, see Guarding Against Electrostatic Damage, publication 8000-4.5.2, or any other applicable ESD protection handbook.

ATTENTION: An incorrectly applied or installed drive can result in component damage or a reduction in product life. Wiring or application errors, such as undersizing the motor, incorrect or inadequate AC supply, or excessive ambient temperatures may result in malfunction of the system.

ATTENTION: Only qualified personnel familiar with adjustable frequency AC drives and associated machinery should plan or implement the installation, start-up, and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. After removing power to the drive, wait 5 minutes for the bus capacitors to discharge. Measure the DC bus voltage at the DC+ and DC- TESTPOINT sockets on the drive or power module. See Figure 2.15 for Frame 2, Figure 3.25 for Frame 3A, or Figure 3.27 for Frame 3B. The voltage must be zero.

ATTENTION: Risk of injury or equipment damage exists. DPI host products must not be directly connected together via 1202 cables. Unpredictable behavior can result if two or more devices are connected in this manner.

Catalog Number Explanation

Position	1-3	4	5-7	8	9	10	11	12	13	14	15	16	17	18
	20L	E	800	A	0	E	N	N	A	N	1	0	W	A
	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*

a

Drive

Code	Type
20L	PowerFlex 700L

b

Voltage Rating

Code	Voltage	Ph.
C	400V AC	3
D	480V AC	3
E	600V AC	3
F	690V AC	3

c1

ND Rating

400V, 60 Hz Input

Code	Amps	Hp (KW)	Frame
360	360	268 (200)	2
650	650	500 (370)	3A
1K2	1250	960 (715)	3B

c2

ND Rating

480V, 60 Hz Input

Code	Amps	Hp (KW)	Frame
360	360	300 (224)	2
650	650	600 (445)	3A
1K2	1250	1150 (860)	3B

c3

ND Rating

600V, 60 Hz Input

Code	Amps	Hp (KW)	Frame
425	425	465 (345)	3A
800	800	870 (650)	3B
1K1	1175	1275 (950)	3B ♣

♣ Must operate at 2 kHZ PWM only, and only as a stand-alone inverter module ("K" in position 13).

c4

ND Rating

690V, 60 Hz Input

Code	Amps	Hp (KW)	Frame
380	380	475 (355)	3A
705	705	881 (657)	3B
1K0	1050	1310 (980)	3B ♣

♣ Must operate at 2 kHZ PWM only, and only as a stand-alone inverter module ("K" in position 13).

d

Enclosure

Code	Type	Conformal Coating
A	NEMA/UL Type 1, IP20 †	No
N	Open-Chassis Style/IP00 ❖	No

† Frame 3 complete drive.

❖ Frame 2 drive and Frame 3 input filter and power modules.

e

HIM

Code	Operator Interface
0	No HIM/Blank Cover
3	Full Numeric LCD ♠
C	Door-Mounted Full Numeric LCD †

♠ Frame 2 and Frame 3 power modules.

† Frame 3 complete drive only.

f

Documentation

Code	Documents	Ship Carton
E	English Doc Set	Yes
N	No Documentation	Yes
Q	No Documentation	No

g

Brake

Code	w/Brake IGBT
N	No

h

Brake Resistor

Code	w/Resistor
N	No

i

Equipment Type

Code	Description	Frame
A	Complete Regenerative Drive - Std. Interrupt Rating	2, 3A, and 3B
C	Input Filter	3A and 3B
E	Combined Active Converter/ Inverter Power Module	3A only
G	Active Converter Power Module	3B only
J	Inverter Power Module - Coupled Version	3B only
K	Inverter Power Module - Common DC Bus Version	3B only
L	Dual Inverter Power Module	3A only
P	Active Converter Power Module - Stand Alone Version	3B only
X	Spare Power Module ◆	3A and 3B

◆ No control cassettes.

j

Comm Slot

Code	Communication Option	DPI User-Installed Kit Cat. No. ✧
N	None	N
C	ControlNet (Coax) - DPI ‡	20-COMM-C
D	DeviceNet - DPI ‡	20-COMM-D
E	EtherNet/IP - DPI ‡	20-COMM-E
1	DriveLogix Comm Option, ControlNet (Coax) ✻	—
2	DriveLogix Comm Option, ControlNet Redundant (Coax) ✻	—
3	DriveLogix Comm Option, ControlNet (Fiber) ✻	—
4	DriveLogix Comm Option, ControlNet Redundant (Fiber) ✻	—
5	DriveLogix Comm Option, DeviceNet (Open Connection) ✻	—
6	DriveLogix Comm Option, DeviceNet (Twisted Pair) ✻	—

✧ For 700S Phase II Control with DriveLogix5730, comm. slot option selections are mutually exclusive. For two communication adapters, (DPI and DriveLogix), select the DriveLogix comm. slot option and order the DPI user installed kit catalog number separately.

‡ 700 Vector Control uses DPI comm. slot options only.

✻ DriveLogix comm. slot options require 700S Phase II Control with DriveLogix5730.

Position	1-3	4	5-7	8	9	10	11	12	13	14	15	16	17	18
	20L	E	800	A	0	E	N	N	A	N	1	0	W	A
	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*

k

Control Option

Code	Control	Cassette	Logic Expansion	Synch Link
1	700VC 24V I/O	Base	N/A	N/A
2	700VC 115V I/O	Base	N/A	N/A
A	700S Ph. II	Expanded	No	No
B	700S Ph. II	Expanded	No	Yes
C	700S Ph. II	Expanded	Yes	No ▲
D	700S Ph. II	Expanded	Yes	Yes ▲
W	None ❖	N/A	N/A	N/A

❖ Frame 3 input filter, Active Converter Power Modules, and spare power modules.

▲ Requires DriveLogix5730.

l

Feedback

Code	Control Option	Type
0	All	None
1	700VC	Encoder 5V/12V
A	700S Ph. II	Resolver ❤
B	700S Ph. II	Hi-Res. Stegmann Encoder ❤
C	700S Ph. II	Multi-Device Interface ❤ ✠
E	700S Ph. II	2nd Encoder ❤
S	700S Ph. II	Safe-Off (w/2nd Encoder) ❤

❤ Requires expanded cassette.

✠ Multi-Device Interface allows the connection of the Stegmann and Temposonics linear sensors. The Temposonics sensor cannot be used to close motor control or speed loops.

m

Additional 700S Configuration

Code	Logix Option	Embedded Comm.
W	None	—
E	Phase II Control	No
K	Phase II Control with DriveLogix5730	No
L	Phase II Control with DriveLogix5730	EtherNet/IP

n

Coolant Type

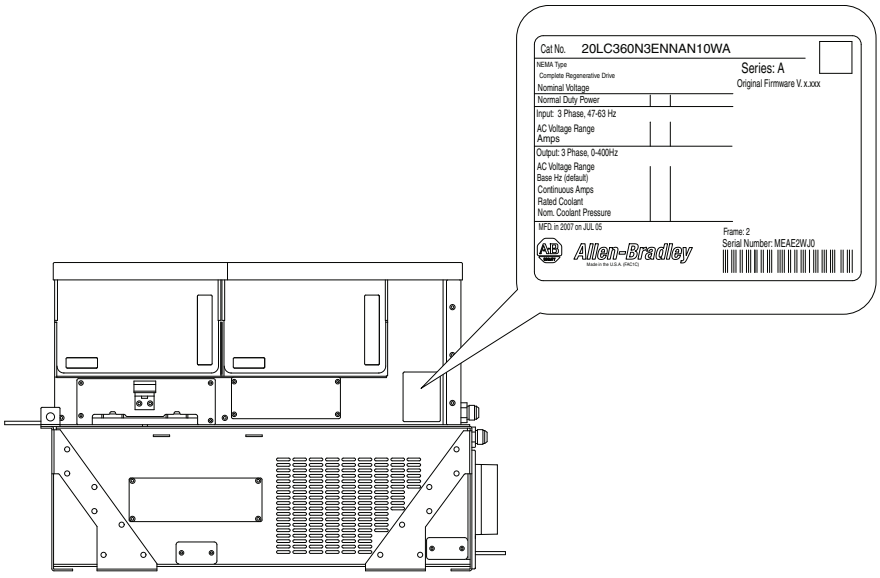
Code	Coolant	Frame
N	None	3 Input Filter only
A	Water	All

Complete Drive Data Nameplate Locations

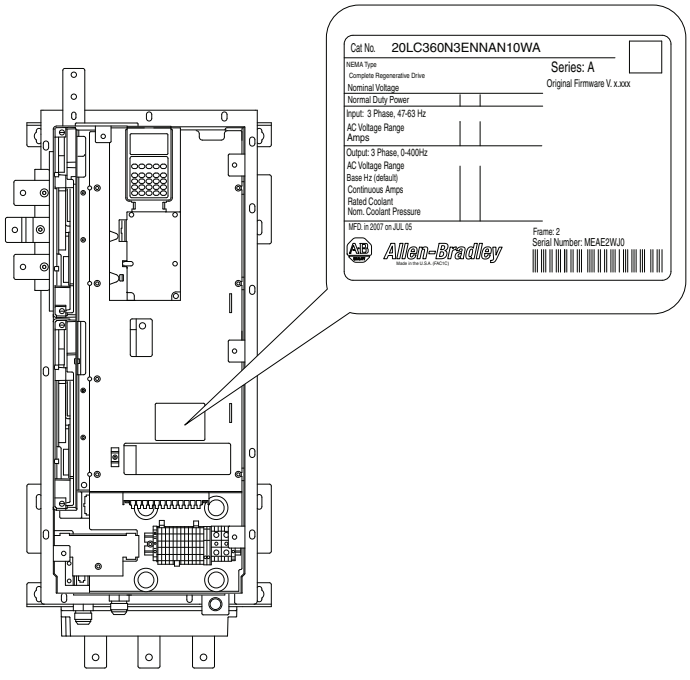
Frame 2 Drives

Figure P.1 shows multiple data nameplate locations for Frame 2 drives. The data and agency markings are different for equipment type. For example, the complete drive is UL listed component; and the Power Modules are UL recognized.

Figure P.1 Frame 2 Drive Data Nameplate Locations



SIDE VIEW



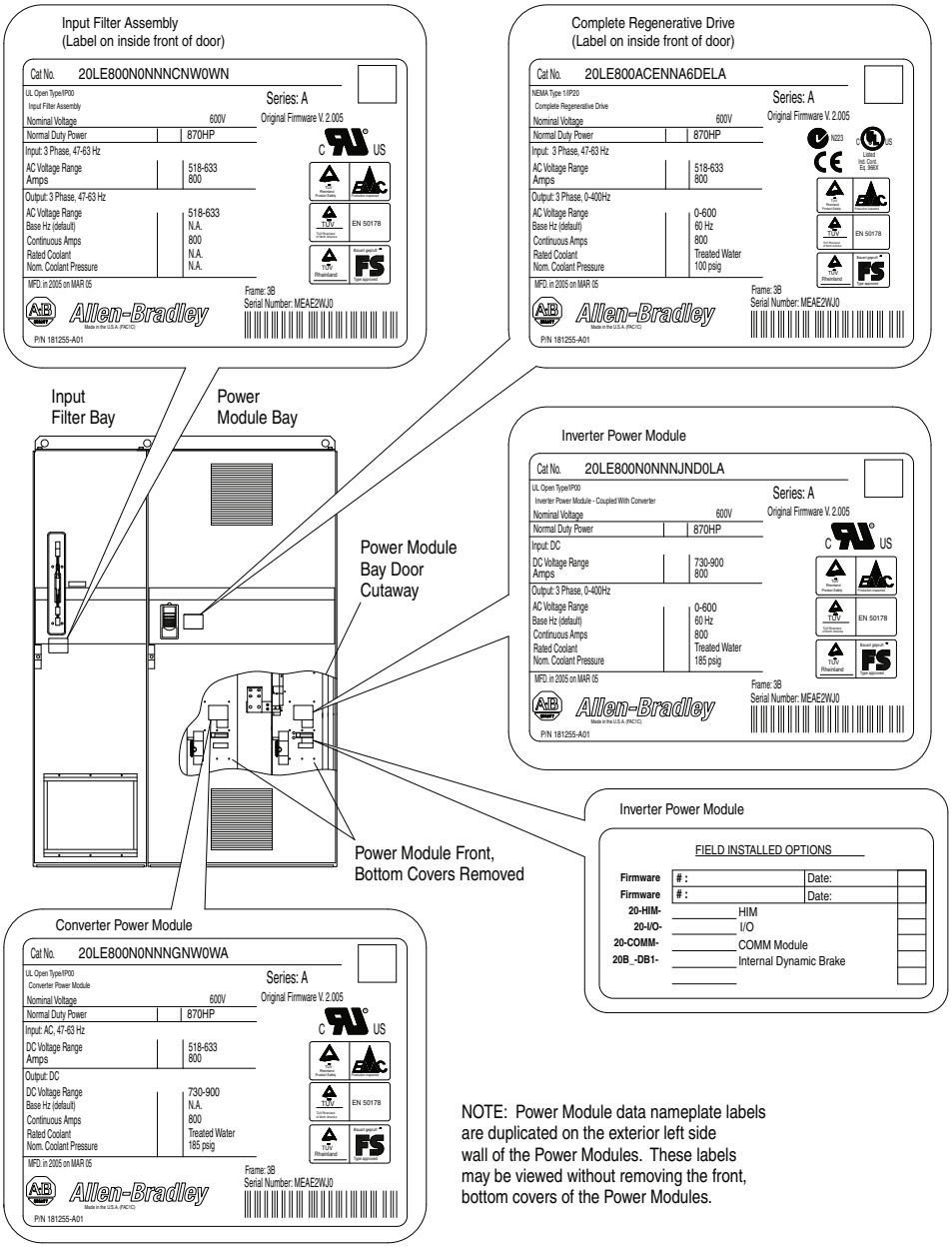
FRONT VIEW (Cover Removed)

Frames 3A and 3B Drives

Figure P.2 shows multiple data nameplate locations for complete Frame 3A/ 3B drives. The data and agency markings are different for equipment type. For example, except for 690V AC input, the complete drive is UL listed component; and the Input Filter and Power Modules are UL recognized.

Base Power Module catalog numbers do not reflect the position 14 and position 16 options actually installed inside the Inverter Power Module. When ordering a replacement Inverter Power Module for use in a complete drive, inform Rockwell Customer Service of both the Inverter Power Module catalog string, and the position 14 and position 16 factory-installed options shown on the Factory Installed Options label.

Figure P.2 Complete Frame 3A and 3B Drive Data Nameplate Locations



NOTE: Power Module data nameplate labels are duplicated on the exterior left side wall of the Power Modules. These labels may be viewed without removing the front, bottom covers of the Power Modules.

General Installation Information

This chapter provides general information on mounting and wiring PowerFlex 700L Liquid-Cooled AC Drives.

Enclosure Ratings

PowerFlex 700L Liquid-Cooled AC drives have the following enclosure ratings:

- Open-Chassis Style (IP00) - Frame 2: Intended to be installed in an enclosure. Frame 3: Input filter and power modules, when purchased individually, are intended to be mounted in an enclosure.
- Type 1 (IP20) - Frame 3: Drive is mounted in a separate NEMA/UL Type 1 enclosure to obtain this rating.

PowerFlex 700L Liquid-Cooled AC drives must be placed in an enclosure. See the catalog string on page P-5 for fully assembled NEMA/UL Type 1 drive options.

AC Supply Source Considerations

PowerFlex 700L Liquid-Cooled AC drives are suitable for use on a circuit capable of delivering up to a maximum of 200,000 rms symmetrical amperes. For the PowerFlex 700L Frame 3A or 3B complete drive, a circuit breaker with shunt trip with the appropriate kAIC rating must always be used upstream of the power module. See Table 1.A for details.

PowerFlex 700L Liquid Cooled AC drives should not be used on undersized or high-impedance supply systems. The supply system kVA should be equal to or greater than the drive-rated kW, and the system impedance should be less than 10%. Operation outside these limits could cause instability resulting in drive shutdown.

System Impedance = (PowerFlex 700L kVA ÷ Transformer kVA) x Transformer % Impedance

The kVA of all PowerFlex 700L drives on the distribution system and the system impedance of upstream transformers should be taken into account.

ATTENTION: To guard against personal injury and/or equipment damage caused by improper circuit breaker selection, use only the recommended circuit breakers specified in Table 1.A.

Unbalanced, Ungrounded or Resistive Grounded Distribution Systems

If phase-to-ground voltage will exceed 125% of normal or the supply system is ungrounded, see Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001, for more information.

ATTENTION: PowerFlex 700L Liquid Cooled Frame 2, 3A, and 3B drives contain protective MOVs and a common mode capacitor that are referenced to ground. (The protective MOVs and common mode capacitor in Frame 3A and 3B drives are mounted in the Input Filter Bay.) These devices must be disconnected if the drive is installed on a resistive grounded distribution system or an ungrounded distribution system.

Drive Frame Size	See Ungrounded or Resistive Grounded Installations on...
2	Page 2-11
3A or 3B	Page 3-22

Input Power Conditioning

Certain events on the power system supplying a drive can cause component damage or shortened product life. These events include the following:

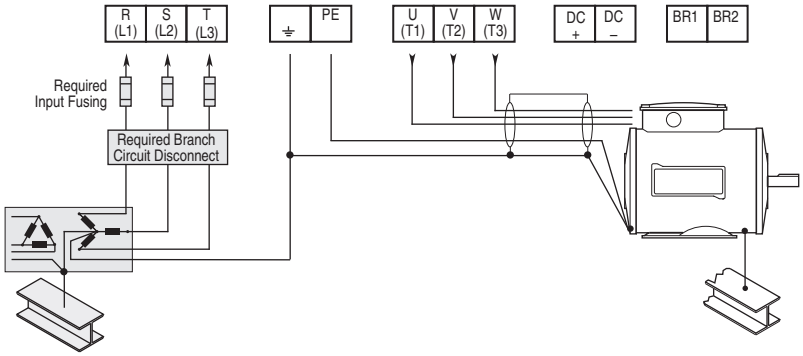
- The power system has power factor correction capacitors switched in and out of the system, either by the user or by the power company.
- The power source has intermittent voltage spikes in excess of 6000 volts. These spikes could be caused by other equipment on the line or by events such as lightning strikes.
- The power source has frequent interruptions.

General Grounding Requirements

The drive Safety Ground - PE must be connected to system ground. Ground impedance must conform to the requirements of national and local industrial safety regulations and/or electrical codes. The integrity of all ground connections should be periodically checked.

For installations within a cabinet, a single safety ground point or ground bus bar connected directly to building steel should be used. All circuits including the AC input ground conductor should be grounded independently and directly to this ground point or ground bus bar.

Figure 1.1 Typical Grounding



Safety Ground - PE

This is the safety ground for the drive that is required by code. This point must be connected to adjacent building steel (girder or joist), a floor ground rod, or bus bar (Figure 1.1). Grounding points must comply with national and local industrial safety regulations and/or electrical codes.

Shield Termination - SHLD

The Shield terminal provides a grounding point for the motor cable shield. It must be connected to an earth ground by a separate continuous lead. The **motor cable** shield should be connected to this terminal on the drive (drive end) and the motor frame (motor end). Use a shield terminating or EMI clamp to connect shield to this terminal.

When shielded cable is used for **control and signal wiring**, the shield should be grounded at the source end only, not at the drive end.

Wiring Requirements for the Drive

Certain drive requirements should be checked before continuing with the drive installation. Wire sizes, branch circuit protection, encoder feedback (for FVC regulation), and wiring to disable the drive are all areas that need to be evaluated.

Operation of the drive can be disabled in two locations. The Gate Enable terminal block on the front of the power structure can be used to disable the firing of inverter IGBTs. When the Gate Enable signal is opened, inverter IGBTs are disabled independent of any software control. This action also generates fault 207 in the Inverter Power Module to enunciate this condition. As a result of this fault, the Active Converter Power Module is also turned off, but this is done via software operation. The firing of IGBTs in the Active Converter Power Module can be disabled independently of any software control by opening the connection between terminals 13 and 14 on

the Active Converter Power Module control cassette PCB assembly terminal block P1. This action also generates a fault in the Inverter Power Module to enunciate this condition.

Input Line Branch Circuit Protection

ATTENTION: Most codes require that upstream branch circuit protection be provided to protect input power wiring.

The PowerFlex 700L Frame 2 drive does not provide input power short circuit protection. Specifications for the recommended fuse or circuit breaker to provide Frame 2 drive input power protection against short circuits are provided in Table A.F and Table A.G.

Frame 3A and 3B complete drives include an input power circuit breaker. The value of the circuit breaker provided with the drive is listed in Table 1.A.

Table 1.A AC Input Circuit Breaker Values for Frame 3A and 3B Complete Drives

Frame Size	Input Voltage	Circuit Breaker Provided	Shunt Trip Rating
3A	400...480V AC	800 A	65 kAIC
	575...690V AC	800 A	35 kAIC
3B	400...480V AC	1500 A	100 kAIC
	575...690V AC	1500 A	35 kAIC

Power Wiring

Because most start-up difficulties are the result of incorrect wiring, take every precaution to verify that the wiring is correct. Read and understand all items in this section before beginning installation.

ATTENTION: The following information is merely a guide for proper installation. Rockwell Automation cannot assume responsibility for the compliance or noncompliance to any code, national, local, or otherwise for the proper installation of this drive or associated equipment. A risk of personal injury and/or equipment damage exists if codes are ignored during installation.

Cable Types Acceptable for 400-690 Volt Installations

ATTENTION: National Codes and standards (NEC, VDE, BSI, and so forth) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection, and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 foot) for every 10 meters (32.8 feet) of length. In all cases, long parallel runs must be avoided. Do not use cable with an insulation thickness less than or equal to 15 mils (0.4 mm/0.015 in.). **Use Copper wire only**. Wire gauge requirements and recommendations are based on 75 °C (167 °F). Do not reduce wire gauge when using higher temperature wire.

Unshielded Cable

THHN, THWN, or similar wire is acceptable for drive installation in dry environments provided adequate free air space and/or conduit fill rate limits are used. **Do not use THHN or similarly coated wire in wet areas**. Any wire chosen must have a minimum insulation thickness of 15 mils (0.4 mm/ 0.015 in.) and should not have large variations in insulation concentricity.

Shielded Cable

Shielded cable contains all of the general benefits of multi-conductor cable with the added benefit of a copper braided shield that can contain much of the noise generated by a typical AC Drive. Strong consideration for shielded cable should be given in installations with sensitive equipment such as weigh scales, capacitive proximity switches, and other devices that may be affected by electrical noise in the distribution system. Applications with large numbers of drives in a similar location, imposed EMC regulations, or a high degree of communication/networking are also good candidates for shielded cable.

Shielded cable may also help reduce shaft voltage and induced bearing currents for some applications. In addition, the increased impedance of shielded cable may help extend the distance the motor can be located from the drive without the addition of motor protective devices such as terminator networks. See Chapter 5, “Reflected Wave” in Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001.

Consideration should be given to all of the general specifications dictated by the environment of the installation, including temperature, flexibility, moisture characteristics, and chemical resistance. Additionally, a braided shield should be included and specified by the cable manufacturer as having coverage of at least 75%. An additional foil shield can greatly improve noise containment.

A good example of recommended cable is Belden® 29528 - 29532 (AWG-1 through AWG-410). This cable has three XLPE insulated conductors plus ground with a spiral copper shield surrounded by a PVC jacket.

Other types of shielded cable are available, but the selection of these types may limit the allowable cable length. Particularly, some of the newer cables twist 4 conductors of THHN wire and wrap them tightly with a foil shield. This construction can greatly increase the cable charging current required,

and reduce the overall drive performance. These cables are not recommended.

Armored Cable

Cable with continuous aluminum armor is often recommended in drive system applications or specific industries. It offers most of the advantages of standard shielded cable and also combines considerable mechanical strength and resistance to moisture. It can be installed in concealed and exposed manners and removes the requirement for conduit (EMT) in the installation. It can also be directly buried or embedded in concrete.

Because noise containment can be affected by incidental grounding of the armor to building steel when the cable is mounted, we recommend that the armor cable have an overall PVC jacket. For details, see Chapter 2, "Wire Types" in Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001.

Interlocked armor is acceptable for shorter cable runs, but continuous welded armor is preferred.

Best performance is achieved with three spaced ground conductors, but acceptable performance for drives below 200 HP is provided by way of a single ground conductor.

Table 1.B Recommended Shielded or Armored Wire

Location	Rating/Type	Description
Standard (Option 1)	1000V, 90 °C (194 °F) XHHW2/RHW-2 Anixter B29528-B29532, Belden 29528-29532, or equivalent	• Four tinned copper conductors with XLPE insulation. • Copper braid/aluminum foil combination shield and tinned copper drain wire. • PVC jacket.
Standard (Option 2)	Tray rated 1000V, 90 °C (194 °F) RHH/RHW-2 Anixter OLFLEX-76xxx03 or equivalent	• Three tinned copper conductors with XLPE insulation. • corrugated copper tape with three bare copper grounds in contact with shield. • PVC jacket.
Class I & II; Division I & II	Tray rated 1000V, 90 °C (194 °F) RHH/RHW-2 Anixter 7VFD-xxxx or equivalent	• Three bare copper conductors with XLPE insulation and impervious corrugated continuously welded aluminum armor. • Black sunlight resistant PVC jacket overall. • Three copper grounds.

Cable Trays and Conduit

If cable trays or large conduits are to be used, see the guidelines in Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001.

ATTENTION: To avoid a possible shock hazard caused by induced voltages, unused wires in the conduit must be grounded at both ends. For the same reason, if a drive sharing a conduit is being serviced or installed, all drives using this conduit should be disabled. This helps to minimize the possible shock hazard from "cross coupled" motor leads.

CE Conformity

Compliance with the Low Voltage (LV) Directive and Electromagnetic Compatibility Directive (EMC) has been demonstrated using harmonized European Norm (EN) standards published in the Official Journal of the European Communities. PowerFlex 700L Liquid-Cooled AC drives comply with the EN standards listed below when installed according to this PowerFlex 700L Liquid-Cooled AC Drive User Manual, PowerFlex 700 Active Converter User Manual, PowerFlex 70/700 Reference Manual and, depending on the equipped drive control option, either the PowerFlex 700 - Series B User Manual or PowerFlex 700S Phase II Control User Manual.

CE Declarations of Conformity are available online at www.ab.com/certification/ce/docs.

Low Voltage Directive (2006/95/EC)

EN50178 Electronic equipment for use in power installations.

EMC Directive (2004/108/EC)

EN61800-3 Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods.

General Notes

- Without additional external filtering, PowerFlex 700L Liquid-Cooled AC drives satisfy the 2nd Environment high-frequency emission limits of EN61800-3. Without external mitigation, PowerFlex 700L Liquid-Cooled drives are not intended to be used on a low-voltage public network which supplies residential or office premises; radio frequency interference is expected if used in such an environment.
- The drive motor cabling should be kept as short as possible to minimize electromagnetic emission and capacitive currents.

- Use of line filters in ungrounded systems is not recommended.
- Conformity of the drive with CE EMC requirements does not guarantee an entire machine or installation complies with CE EMC requirements. Many factors can influence total machine/installation compliance.
- Non-regenerative PowerFlex 700L Liquid-Cooled AC drives generate conducted low frequency disturbances (harmonic emissions) on the AC supply system which may require mitigation in some applications. More information regarding harmonic emissions can be found in the PowerFlex 70/700 Reference Manual, publication PFLEX-RM001.
- When operated on a public supply system, it is the responsibility of the installer or user to make sure, by consultation with the distribution network operator and Rockwell Automation, if necessary, that applicable requirements have been met.

Essential Requirements for CE Compliance

Conditions 1 through 6 listed below **must be accomplished** for a PowerFlex 700L drive installation to meet the requirements of EN61800-3.

1. Use a standard PowerFlex 700L Liquid-Cooled CE-compliant drive. For the Frame 2 drive, kit Catalog Number SK-L1-CHK2-F2, which includes common mode chokes and shielded cable clamps, must be installed according to its included instructions, publication 20L-IN011. For Frame 3A and 3B, the drive must be installed in a suitable enclosure which attenuates radio frequency emissions (Rittal TS 8 or equivalent).
2. System grounding as described on page 1-2.
3. Output power wiring to the motor, control (I/O) and signal wiring must use cable with a braided shield with coverage of 75% or greater, or cables must be contained in metal conduit, or equivalent shielding must be provided.
4. All control (I/O) and signal wiring to the drive must use cable with a braided shield providing 75% or greater coverage, or the cables be housed in a metal conduit, or equivalent shielding must be provided. When shielded cable is used, only the drive end of the cable shield should be terminated with a low-impedance connection to earth.
5. The shields of all shielded cables must be terminated with the proper shielded connectors to chassis/earth.
6. Motor cables must not exceed 20 meters (65.6 feet) in length.
7. Motor cabling must be separated from control and signal wiring wherever possible.
8. Review important precautions and attention statements throughout this manual before installing the drive.

C-Tick Conformity

Compliance of PowerFlex 700L Liquid-Cooled AC drives with the Australian Radiocommunications Act of 1992 has been demonstrated through compliance with EN61800-3. Both the General Notes and the Essential Requirements for CE Compliance provided above apply to C-Tick compliance for PowerFlex 700L Liquid-Cooled AC drives.

C-Tick Declarations of Compliance are available online at www.ab.com/certification/c-tick/index.html.

Using Input/Output Contactors

Input Contactor Precautions

ATTENTION: A contactor or other device that routinely disconnects and reapplies the AC line to the drive to start and stop the motor can cause drive hardware damage. The drive is designed to use control input signals that will start and stop the motor. If an input device is used, operation must not exceed one cycle per minute or drive damage will occur.

ATTENTION: The drive start/stop/enable control circuitry includes solid-state components. If hazards due to accidental contact with moving machinery, or unintentional flow of liquid, gas, or solids exist, an additional hard-wired stop circuit may be required to remove the AC line to the drive. An auxiliary braking method may be required.

Output Contactor Precaution

ATTENTION: To guard against drive damage when using output contactors, the following information must be read and understood. One or more output contactors may be installed between the drive and motor(s) for the purpose of disconnecting or isolating certain motors/loads. If a contactor is opened while the drive is operating, power will be removed from the respective motor, but the drive will continue to produce voltage at the output terminals. In addition, reconnecting a motor to an active drive (by closing the contactor) could produce excessive current that may cause the drive to fault. If any of these conditions are determined to be undesirable or unsafe, an auxiliary contact on the output contactor should be wired to a drive digital input that is programmed as “Enable.” This will cause the drive to execute a coast-to-stop (cease output) whenever an output contactor is opened.

Notes:

Frame 2 Installation

Because most start-up difficulties are the result of incorrect wiring, take every precaution to verify that the wiring is completed as instructed. Read and understand all items before starting actual installation.

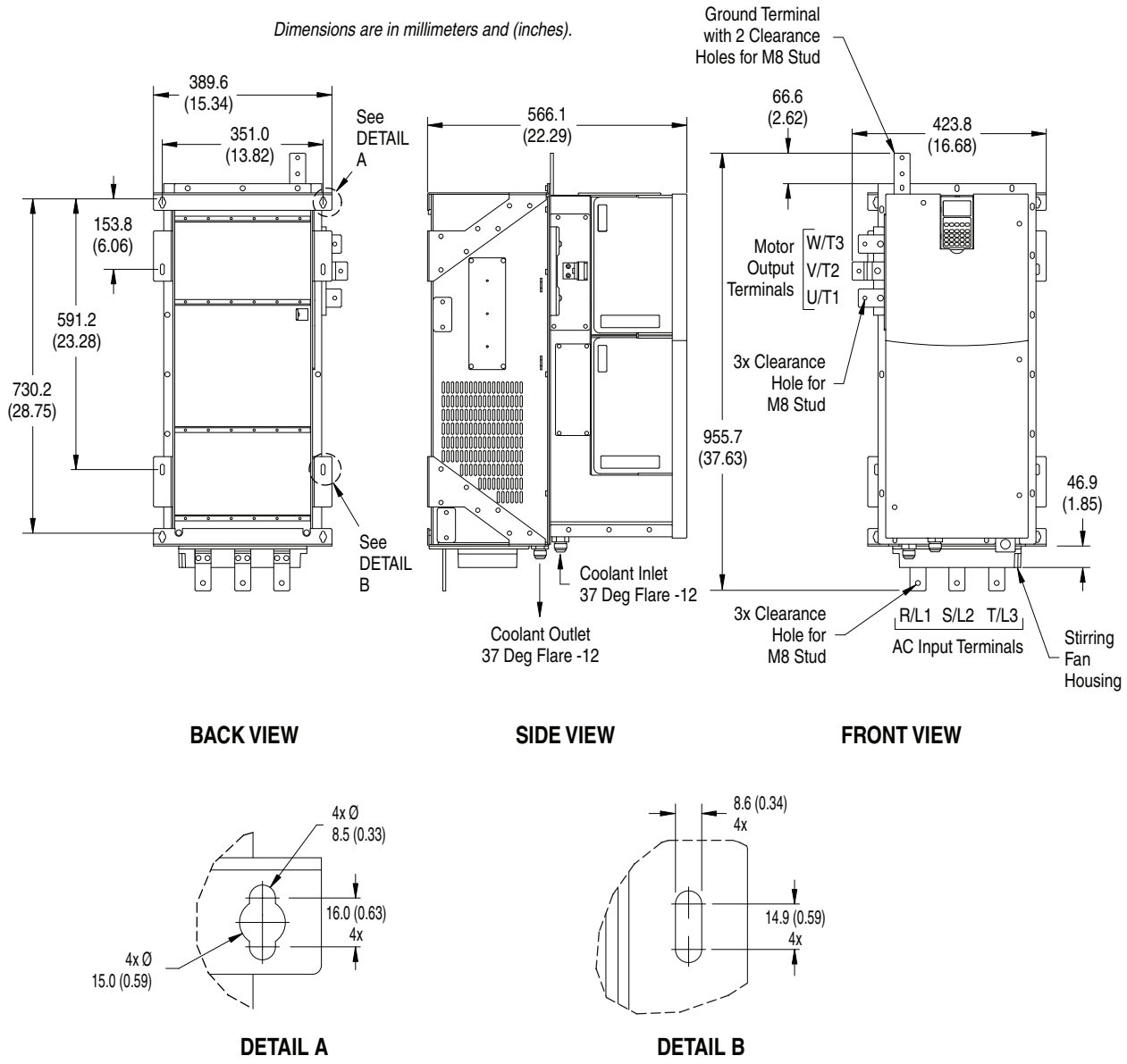
ATTENTION: The following information is merely a guide for proper installation. Rockwell Automation does not assume responsibility or liability for the compliance or noncompliance to any code, national, local or otherwise for the proper installation of this drive or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during installation.

Mounting Considerations

Total Area Required for Drive Installation

Overall drive dimensions are shown in Figure 2.1 as an aid in calculating the total area required for installing Frame 2 drives.

Figure 2.1 Frame 2 Drive Installation Dimensions

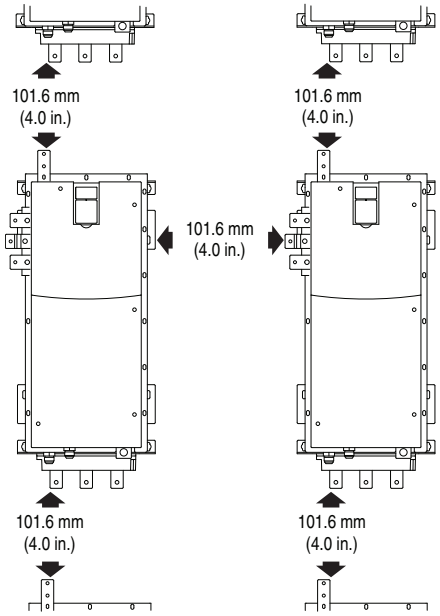


Approximate Weight
186 kg (410 lb)

Recommended Mounting Clearances

Specified vertical clearance requirements (Figure 2.2) are intended to be from drive to drive. Other objects can occupy this space; however, reduced air flow may cause protection circuits to fault the drive. In addition, inlet air temperature must not exceed the product specification.

Figure 2.2 Frame 2 Drive Minimum Mounting Clearances



Verifying Drive Input Ratings Match Supplied Power

It is important to verify that plant power meets the input power requirements of the PowerFlex 700L Frame 2 drive circuitry. See Appendix A for input power rating specifications. Be sure input power to the drive corresponds to the drive nameplate voltage and frequency.

Equipment Lifting

This section explains how to lift the drive.

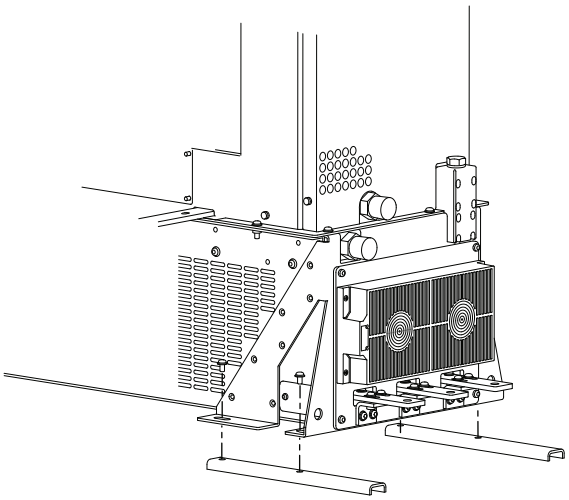
ATTENTION: To guard against possible personal injury and/or equipment damage, observe the following:

- Do not allow any part of the drive or lifting mechanism to make contact with electrically charged conductors or components.
- At no time should a person or their limbs be directly underneath the items being lifted.
- Do not subject the load to high rates of acceleration or deceleration.
- Inspect all lifting hardware for proper attachment before lifting any drive unit.

Attaching the Lifting Feet to the Drive

1. Remove the four shipping bolts that hold the drive to the skid.
2. Attach the two lifting feet provided with the drive to the bottom drive mounting holes as shown in Figure 2.3.

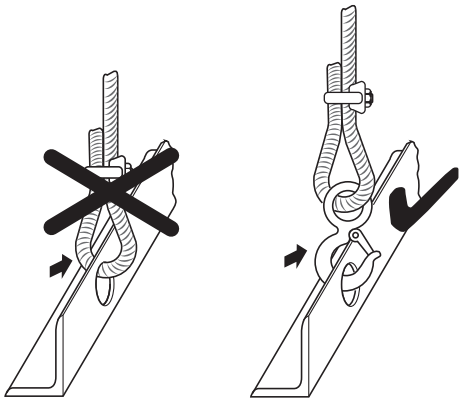
Figure 2.3 Attaching Lifting Feet to the Drive



Attaching the Lifting Hardware to the Drive

Apply lifting hooks (see Figure 2.4). Take precautions to verify that there are lifting hooks secured in all four locations (Figure 2.5) on the drive.

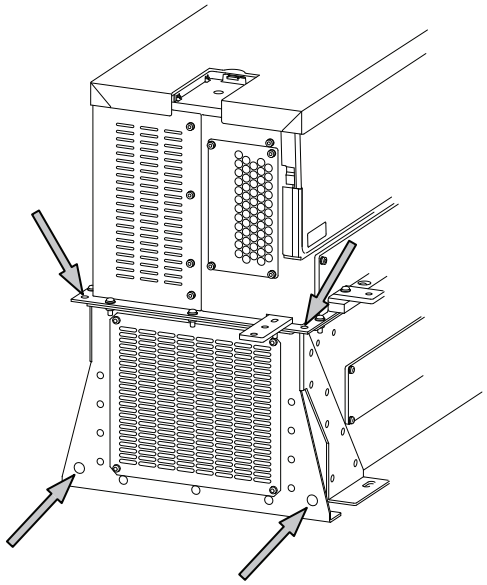
Figure 2.4 Attaching Lifting Hardware to the Frame 2 Drive



Connecting Lifting Hooks to Proper Locations

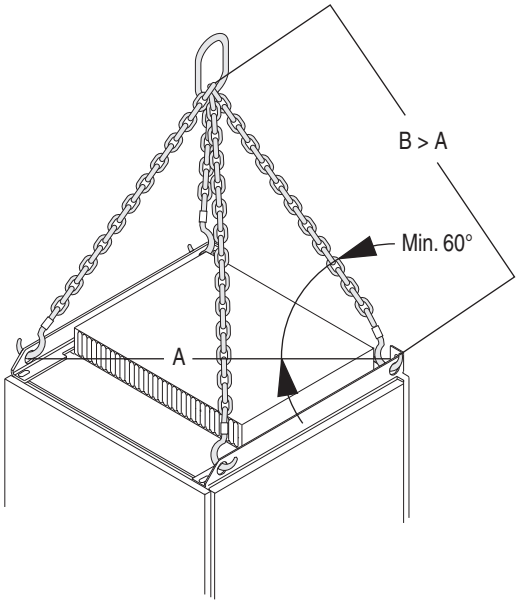
Locate all four lifting features on the drive (see Figure 2.5). All four locations must be used to maintain the drive center of gravity when lifting.

Figure 2.5 Lifting Locations on the Frame 2 Drive



Applying Strap Angles

TIP: To ensure that this angle is greater than 60°, make the length of chain or cable between the center and the corners (B) longer than the distance between the opposite corners (A).

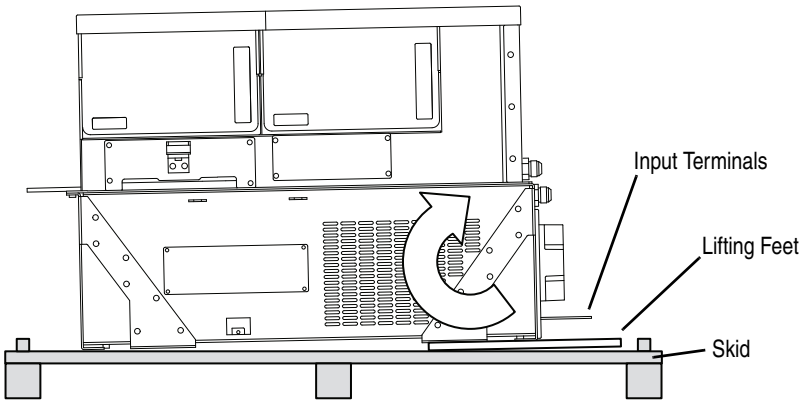


Rotating the Drive About the Board

Figure 2.6 shows the drive, with the lifting feet attached, on a skid. To avoid damage to the drive input terminals when lifting the drive to a vertical position, do the following.

1. After the straps are in place (see Applying Strap Angles on page 2-5), carefully lift the drive to rotate it 90° to a vertical position.
2. Remove the lifting feet before installing the drive into the enclosure.

Figure 2.6 Frame 2 Drive on Skid



Mounting Requirements

The PowerFlex700L Frame 2 drive is a single integrated assembly consisting of a filter section and a power section. The filter section provides the mounting feet and represents greater than 50% of the approximate 186 kg (410 lb) total weight. Follow these mounting requirement guidelines.

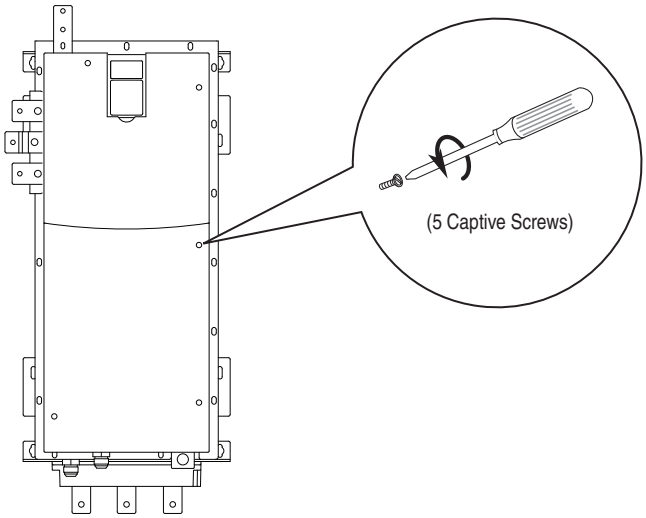
1. Mount the Frame 2 drive into an enclosure that is designed according to Electrical Equipment Pollution Degree 2 requirements.
2. Size and fasten any enclosure mounting panel appropriately to accommodate for the weight of the drive.
3. The Frame 2 drive is designed to use eight M8 x 1.25 fasteners in mounting slots shown in Detail A and Detail B of Figure 2.1.
4. The M8 x 1.25 fasteners must be class 5.8 or greater.
5. Use a lock washer or similar mechanism to prevent the fasteners from loosening after mounting.
6. All M8 x 1.25 fastener threads must engage a steel panel with 6 to 7 full threads or a permanent backing nut such as a weld nut or a self-clinching PEM® (1) nut with 4 full threads.
7. Tighten the M8 x 1.25 fasteners to 11.3 ± 2.8 N•m (100 ± 25 lb•in) unless the lock washer mechanism requires a different torque. If this is the case, the holding force must be equivalent.

(1) PEM is a registered trademark of PennEngineering.

Verifying the Drive's Watts Loss Rating

When mounting the drive inside of an enclosure, determine the watts loss rating of the drive from Table A.E on page A-6. This table lists the typical full load power loss watts value at 4 kHz (rated carrier frequency). Make sure that the enclosure is adequately ventilated with 0…50 °C (32…122 °F) ambient air based on the drive's watts loss rating.

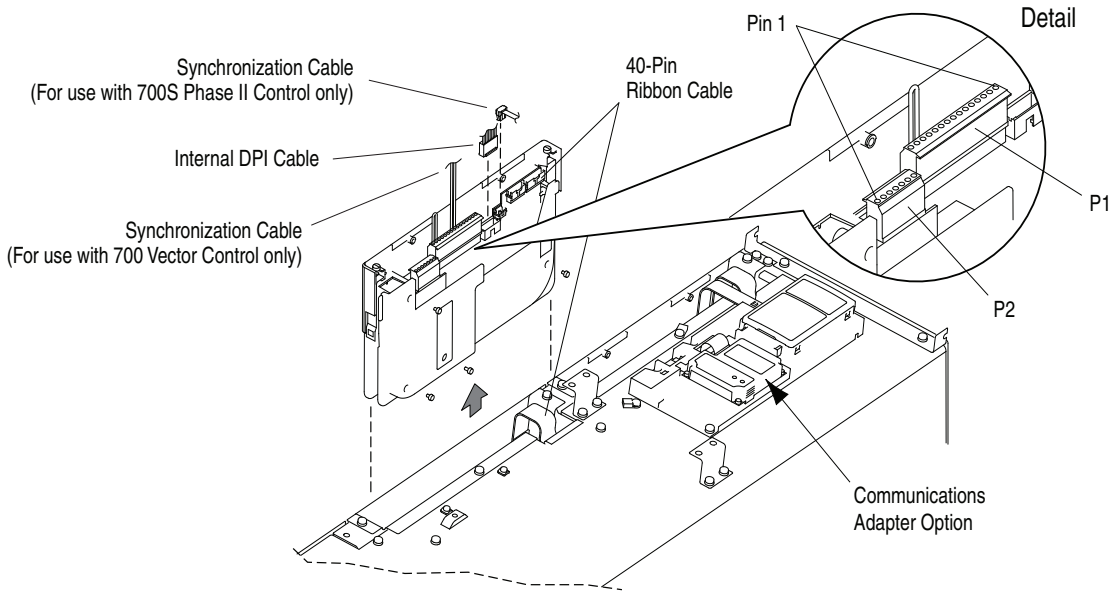
Removing the Drive Cover



Removing the Active Converter Control Cassette

The Frame 2 regenerative-type drive is equipped with an Active Converter control cassette. Figure 2.7 shows the location and removal of this cassette to access its terminal blocks for control wiring. See the PowerFlex 700 Active Converter Power Module User Manual, publication PFLEX-UM002, for control wiring details.

Figure 2.7 Removing the Frame 2 Active Converter Control Cassette



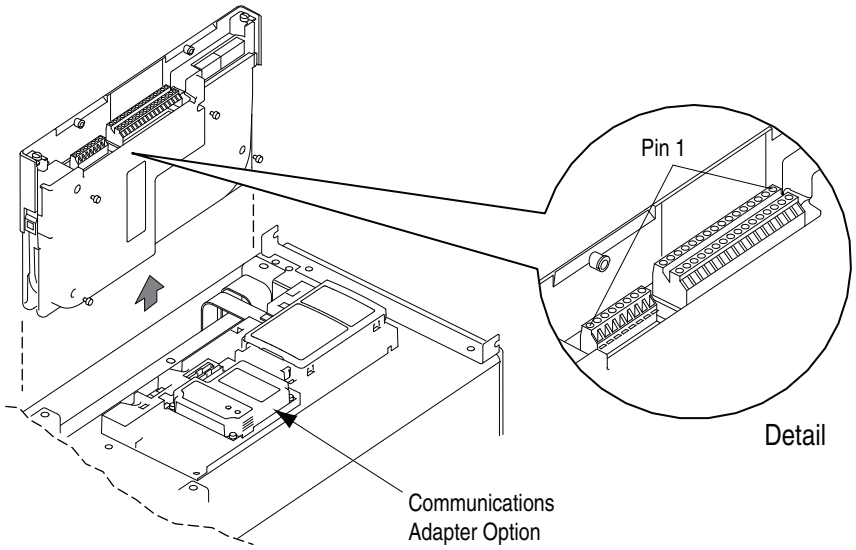
Removing the Inverter Control Cassette

For Frame 2 drives, the Inverter is equipped with either the standard PowerFlex 700 Vector Control cassette or an optional PowerFlex 700S Phase II Control cassette. In either case, the cassette is removed in the same way.

PowerFlex 700 Vector Control Cassette (standard)

Figure 2.8 shows the location and removal of the drive's standard PowerFlex 700 Vector Control cassette to access its terminal blocks for control wiring. See the PowerFlex 700 Adjustable Frequency AC Drive User Manual - Series B, publication 20B-UM002, for control wiring details.

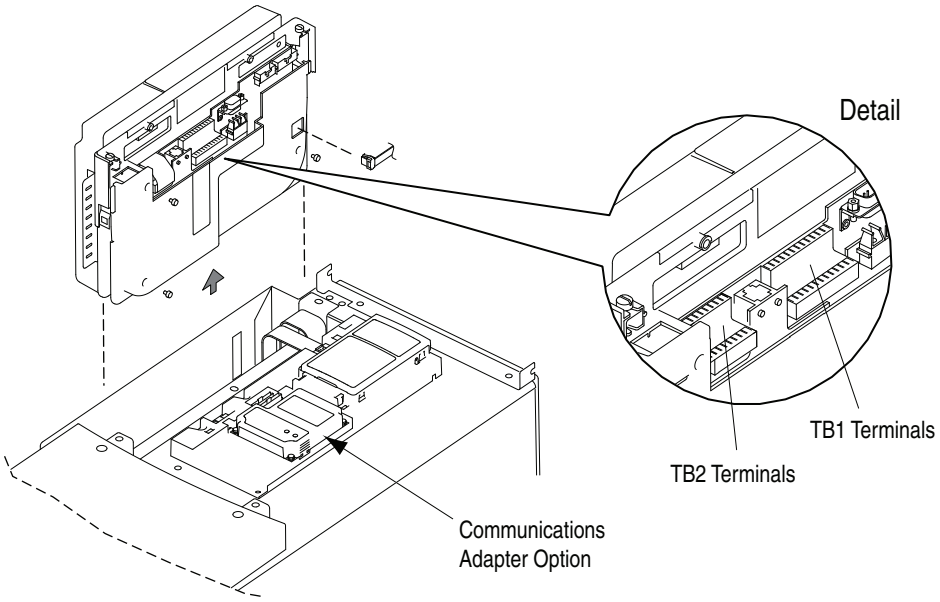
Figure 2.8 Removing the Standard PowerFlex 700 Vector Control Cassette



PowerFlex 700S Phase II Control Cassette (optional)

Figure 2.9 shows the location and removal of the drive's optional PowerFlex 700S Phase II Control cassette to access its terminal blocks for control wiring. See the PowerFlex 700S High Performance AC Drive - Phase II Control User Manual, publication 20D-UM006, for control wiring details.

Figure 2.9 Removing the Optional PowerFlex 700S Phase II Control Cassette



Determining Wire Routing for Control, Ground, Drive Input, and Motor Output

All wiring should be installed in conformance with the applicable local, national, and international codes (for example, NEC/CEC). Signal wiring, control wiring, and power wiring must be routed in separate conduits to prevent interference with drive operation. When hubs are not provided, use grommets to guard against wire chafing.

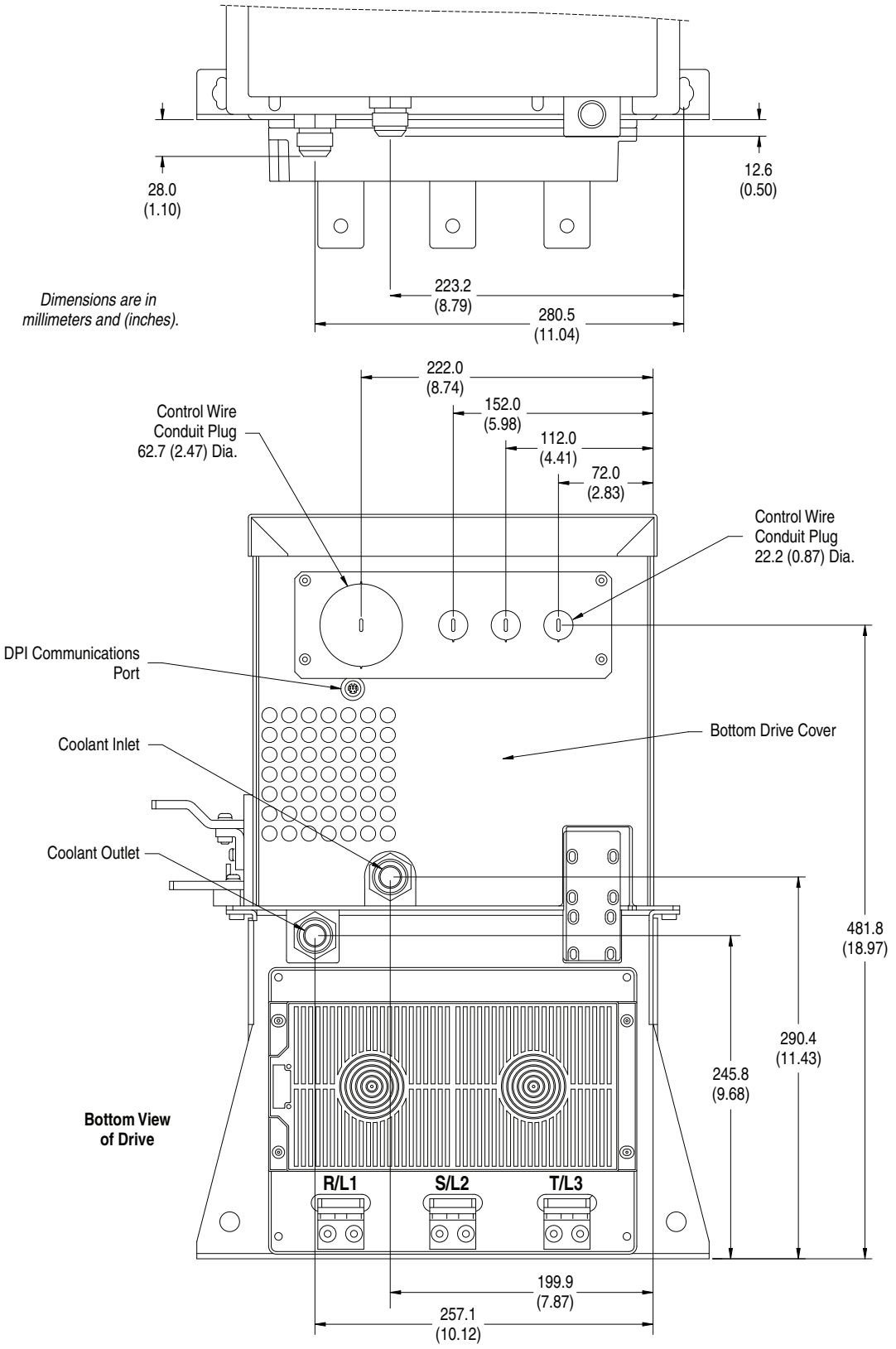
ATTENTION: Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe this precaution can result in damage to, or destruction of, the equipment.

Do not route more than three sets of motor leads through a single conduit. This minimizes cross-talk that can reduce the effectiveness of noise reduction methods. If more than three drive/motor connections per conduit are required, shielded cable must be used. If possible, each conduit should contain only one set of motor leads.

ATTENTION: Unused wires in conduit must be grounded at both ends to avoid a possible shock hazard caused by induced voltages. Also, if a drive sharing a conduit is being serviced or installed, disable all drives using this conduit to eliminate the possible shock hazard from cross-coupled motor leads. Failure to observe these precautions can result in bodily injury.

Figure 2.10 shows locations for Frame 2 control wire routing, ground, drive input, motor output, DPI communication ports/cable routing, and coolant connections.

Figure 2.10 Frame 2 Drive Locations for Control Wire Routing, DPI Communication Port, and Coolant Connections



Grounding the Drive

ATTENTION: The user is responsible for conforming with all applicable local, national, and international codes. Failure to observe this precaution can result in damage to, or destruction of, the equipment.

The customer must supply a grounding conductor between the ground lug of the drive and the ground lug in the cabinet. For PE ground terminal location, see Figure 2.15. Tighten the ground connection to the recommended torque shown in Table 2.B.

Ungrounded or Resistive Grounded Installations

PowerFlex 700L Frame 2 drives are equipped with a common mode input filter capacitor and MOV that are referenced to ground. If the drive is installed on a resistive ground or ungrounded distribution system, disconnect this capacitor and MOV to prevent drive damage.

Disconnecting the Common Mode Capacitor

To disconnect the 1 µF common mode capacitor from the circuit, see Figure 2.11 and perform the following steps.

1. Disconnect the Faston wire from the 1 µF common mode capacitor.
2. Insulate the wire end by applying a wire nut or electrical tape.
3. Tie wrap the disconnected wire to keep it away from any electrical connections.

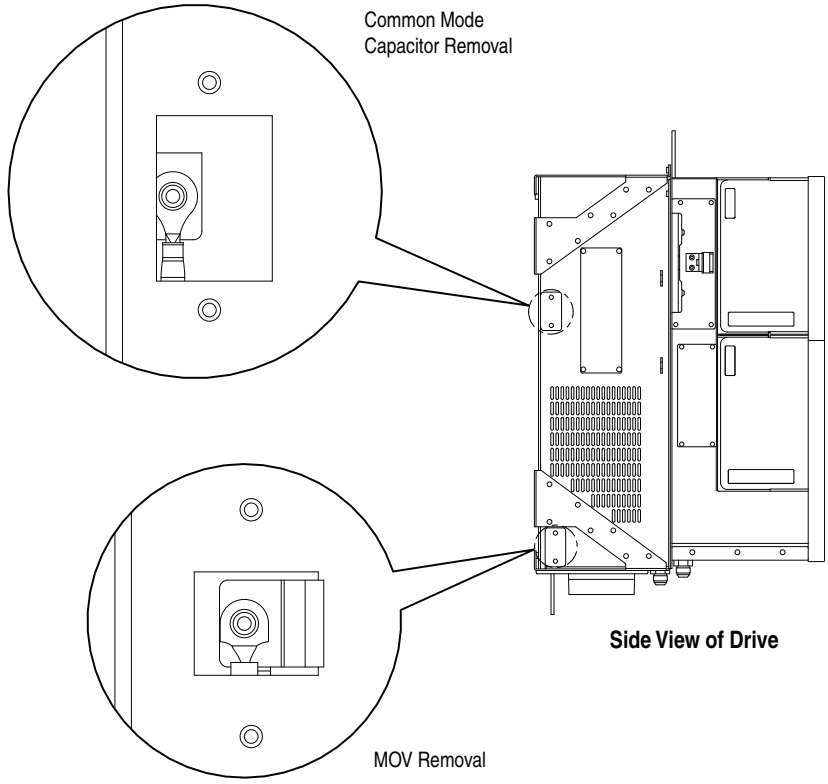
Disconnecting the MOV from Ground

To disconnect the MOV from ground, see Figure 2.11 and perform the following steps.

1. Unbolt the ground wire lug from the MOV's ground connection point.
2. Screw the bolt back into the panel.
3. Cut the lug off the disconnected ground wire and apply a wire nut to its end.
4. Tie wrap the disconnected ground wire to keep it away from any electrical connections.

For more information on ungrounded distribution systems, see Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001. **Note:** Removing the Common Mode capacitor and input MOVs makes the drive more vulnerable to high voltage line spikes.

Figure 2.11 Removing Common Mode Capacitor and MOV



Power Wiring

This section describes incoming line components and how to install them, and provides instructions on wiring input power, output contactors, motor overload protection, and output wiring to the motor.

Installing Transformers and Reactors (Not Recommended)

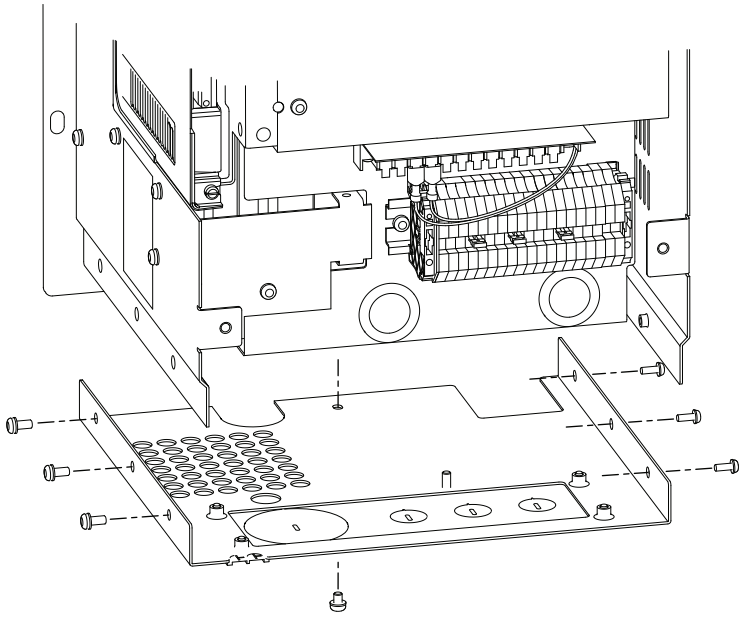
Frame 2 drives may be used on distribution systems with 200,000 amps or less symmetrical fault current capacity. The drive input components consist of a 3% line reactor and a harmonic line filter. Additional input inductance is not recommended.

Selecting and Verifying Control Transformer Voltage

A control transformer is used to match the input line voltage of the drive to the 115V control voltage. If your line voltage is different than the voltage class specified on the drive nameplate, it may be necessary to change transformer taps as described in the following steps.

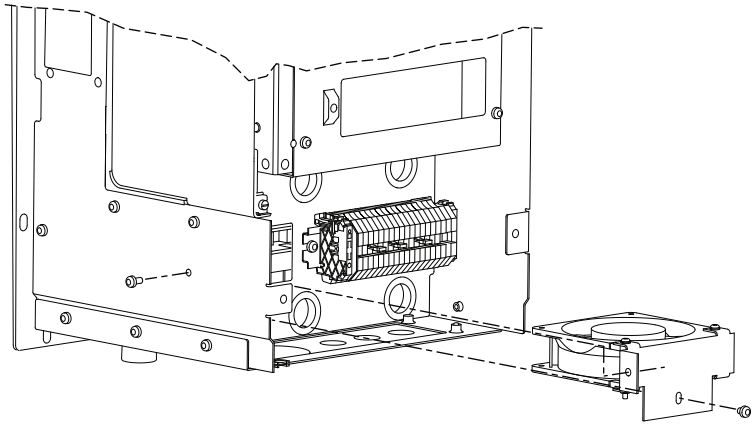
1. Unfasten seven screws and remove the bottom drive cover (Figure 2.12).

Figure 2.12 Removing the Bottom Drive Cover



2. Remove the power section stirring fan.
   a. Unfasten two bracket screws.
   b. Disconnect the fan power leads (two fastons).
   c. Lift the fan from the drive (Figure 2.13).

Figure 2.13 Removing the Power Section Stirring Fan



3. Depending on the supplied AC line voltage used to power the drive, see Table 2.A to determine which transformer tap to use.

Table 2.A Control Transformer Tap Usage

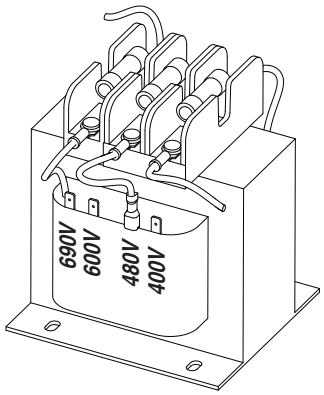
AC Line Voltage	Transformer Tap To Use
380V AC	400V
400V AC	
440V AC	
460V AC	480V
480V AC	

4. Pull the faston from the present tap and push it onto the appropriate tap.

   Verify that the faston is fully seated on the tap.

TIP: Do not bend the faston. A straight blade screwdriver helps to remove the faston by carefully prying on the bottom edge of the faston.

Figure 2.14 Control Transformer Voltage Taps



5. Reinstall the power section stirring fan.
6. Before fastening the two bracket screws, connect power to the fan power leads.
7. Reinstall the bottom drive cover by fastening the six screws.

Installing Input Power Wiring to the Drive

Use the following steps to connect AC input power to the drive.

ATTENTION: Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe this precaution can result in damage to, or destruction of, the equipment.

1. Connect the three-phase AC input power leads (three-wire 380-480V AC) to the R/L1, S/L2, and T/L3 input power terminals on the Frame 2 drive.

   For terminal locations, see Figure 2.15.

2. Tighten the AC input power terminal connections to the recommended torque as shown in Table 2.B.

Table 2.B Frame 2 Drive Power Terminal Specifications

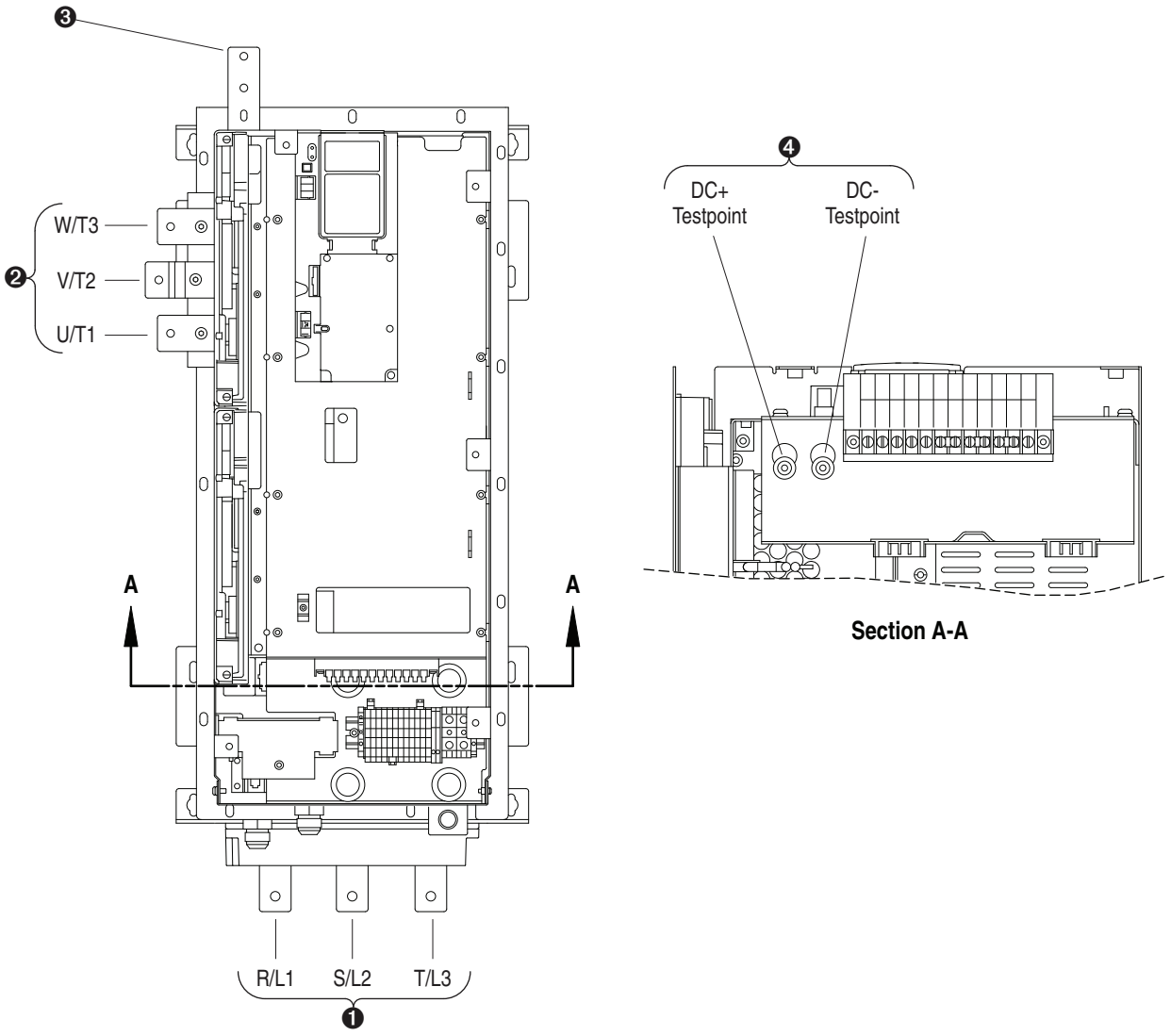
Item	Name	Description	Recommended Tightening Torque (±10%)	Terminal Bolt Size (1)
❶	Input Power Bus Bar (2) R/L1, S/L2, T/L3	Input power	40 N•m (354 lb•in)	M8
❷	Output Power Bus Bar (2) U/T1, V/T2, W/T3	Motor connections	40 N•m (354 lb•in)	M8
❸	PE, Motor Ground Bus Bar (2)	Terminating point for wiring shields and grounds	40 N•m (354 lb•in)	M8
❹	DC Bus Test Point Socket (3) (2 Terminals; DC+, DC-)	4 mm socket for DC bus voltage measurement only	—	—

(1) Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt to avoid damage to the terminal.

(2) These connections are bus bar type terminations and require the use of lug connectors.

(3) Use only to verify that DC bus capacitors are discharged before servicing the Power Module. No other external use is permitted.

Figure 2.15 Frame 2 Drive Power Terminal Locations



Installing Mechanical Motor Overload Protection (Optional)

To provide the motor with overload protection, local, national, and international codes (for example, NEC/CEC) may require one of the following items:

- A motor thermostat be installed internal to the motor.
- A mechanical thermal motor overload relay, sized to protect the motor, be installed between the motor and the drive's output terminals.

In multiple motor applications (only V/Hz regulation), each motor must have its own user-supplied overload and branch circuit protection.

Installing Output Wiring from the Drive Output Terminals to the Motor

Important: See the PowerFlex 700L Technical Data, publication 20L-TD001, for motor lead length restrictions.

Follow these steps to connect the AC output power wiring from the drive to the motor.

1. Route the three-phase AC output power motor leads to the drive power module.

   Do not route more than three sets of motor leads through a single conduit. This minimizes cross-talk that can reduce the effectiveness of noise reduction methods. If more than three drive/motor connections per conduit are required, shielded cable must be used. If possible, each conduit should contain only one set of motor leads.

ATTENTION: Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe these precautions can result in damage to, or destruction of, the equipment

ATTENTION: Unused wires in conduit must be grounded at both ends to avoid a possible shock hazard caused by induced voltages. Also, if a drive sharing a conduit is being serviced or installed, disable all drives using this conduit to eliminate the possible shock hazard from cross-coupled motor leads. Failure to observe these precautions can result in bodily injury.

2. Connect the three-phase AC power motor leads to the U/T1, V/T2, and W/T3 output power terminals.

   For terminal locations, see Figure 2.15.

3. Tighten the AC output power terminal connections to the proper torque as shown in Table 2.B.

Control Wiring

This section provides details on control wiring to the drive.

ATTENTION: Risk of equipment damage exists. Do not use drive terminal blocks TB5-1 and TB5-3 to connect any type of power wiring for auxiliary equipment. These terminals are only for low amperage control wiring.

ATTENTION: Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe this precaution can result in damage to, or destruction of, the equipment.

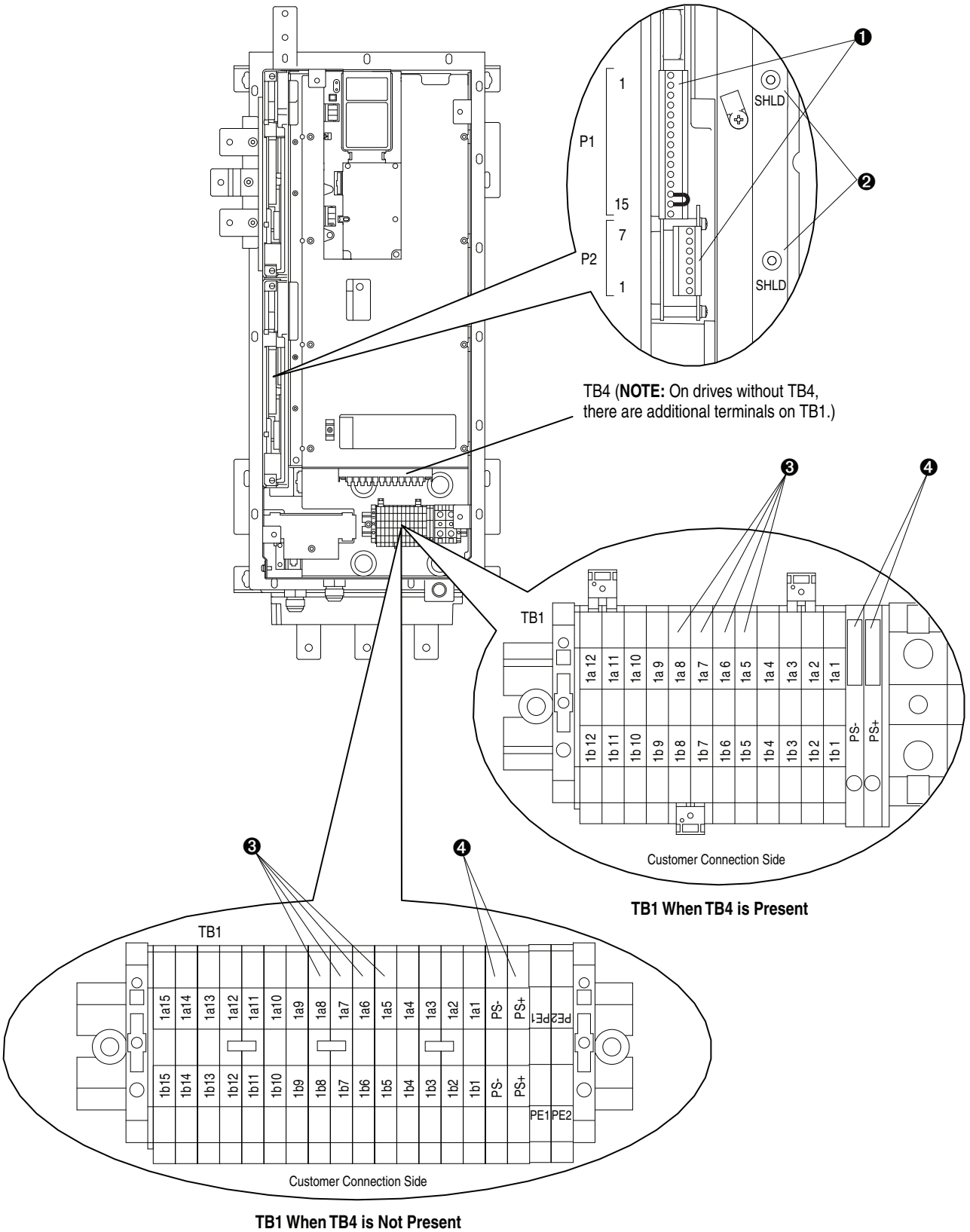
Connect wiring to terminals in accordance with Table 2.C, Figure 2.16, and the Frame 2 drive schematic on page B-2.

Table 2.C Frame 2 Drive Control Wiring Terminal Specifications

Item	Name	Description	Wire Size Range[1]		Recommended Tightening Torque (±10%)	Wire Strip Length
			Maximum	Minimum		
❶	Active Converter Cassette Terminal Blocks—P1 and P2	Active Converter AC power and control wiring	3.3 mm^2 (#12 AWG)	0.3 mm^2 (#22 AWG)	0.8 N•m (7 lb•in)	8 mm (0.31 in.)
❷	SHLD Terminal	Terminating point for control wiring shields on the drive	2.1 mm^2 (#14 AWG)	0.3 mm^2 (#22 AWG)	1.4 N•m (12 lb•in)	10 mm (0.39 in.)
❸	Terminal Block—TB1 1b 5: +12/+24V Cooling Loop 1b 6: Cooling Loop Return	Drive control wiring: Output dry contact (12V DC/24V DC, 2 Amps max.) indicating the drive is powered and has completed precharge.	4.0 mm^2 (#10 AWG)	0.2 mm^2 (#24 AWG)	0.9 N•m (8 lb•in)	8 mm (0.31 in.)
	1b 7: +24V (digin)	Drive-supplied +24V DC				
	1b 8: Gate Enable	Enables the firing of the IGBTs. Factory-installed jumper from terminal 1b 7 to terminal 1b 8 allows firing of the IGBTs.				
❹	PS- Terminal PS+ Terminal	300V DC Auxiliary Control voltage	4.0 mm^2 (#12 AWG)	0.5 mm^2 (#22 AWG)	0.6 N•m (5.3 lb•in)	10 mm (0.39 in.)

[1] Maximum/minimum sizes that the terminals will accept - these are not recommendations.

Figure 2.16 Frame 2 Drive Control Wiring Terminal Locations



Synchronization Connections

Coupled Power Modules

Frame 2 combined Converter/Inverter Power Modules are configured only as coupled power modules. Coupling the Converter and Inverter is achieved by using two factory-installed cables: a control synchronization cable and an inverter-to-converter DPI communication cable. The two cables are described in the next two subsections.

Control Synchronization Cable

To enable synchronization between the Inverter control board and the Converter control board, a factory-installed control synchronization cable connects each board. No user connection is required. However, the connection method is different for PowerFlex 700L drives with 700 Vector Control than for 700S Phase II Control. The 700 Vector Control synchronization cable connection is shown in Figure 2.17. The 700S Phase II Control synchronization cable connection is shown in Figure 2.18.

Figure 2.17 Frame 2 700 Vector Control Synchronization Cable Connection

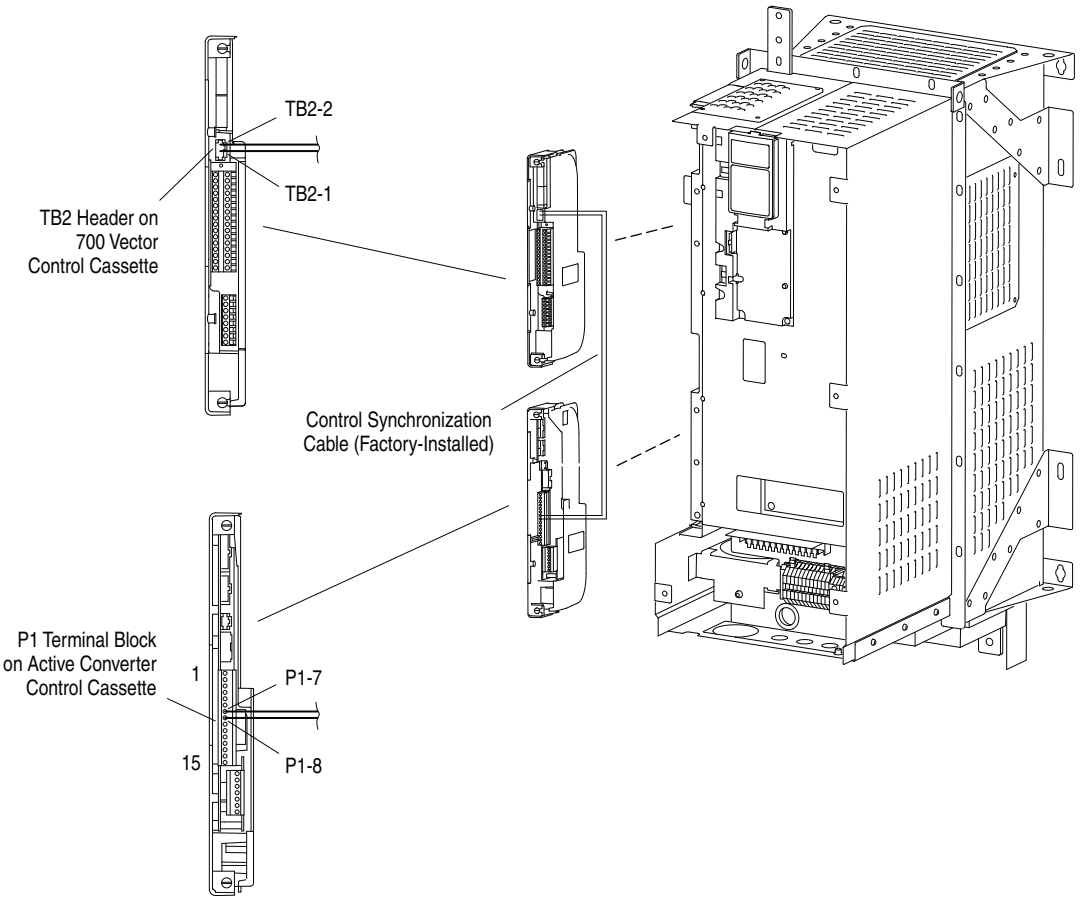
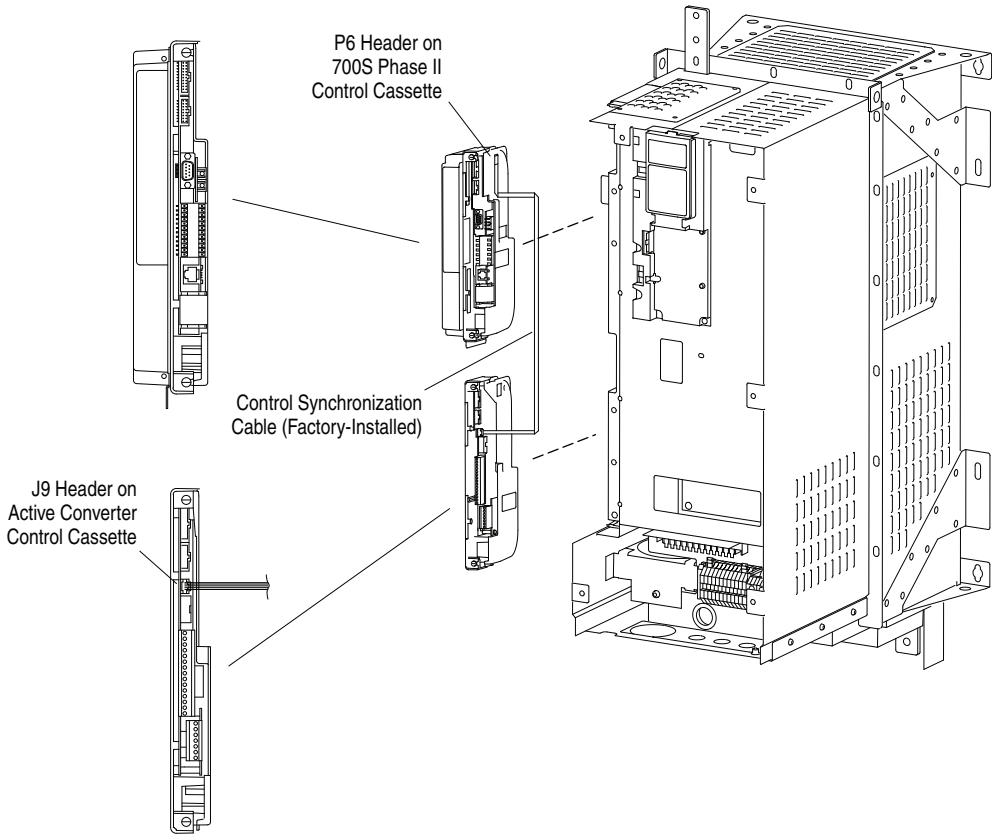


Figure 2.18 Frame 2 700S Phase II Control Synchronization Cable Connection



Inverter-to-Converter DPI Communication Cable

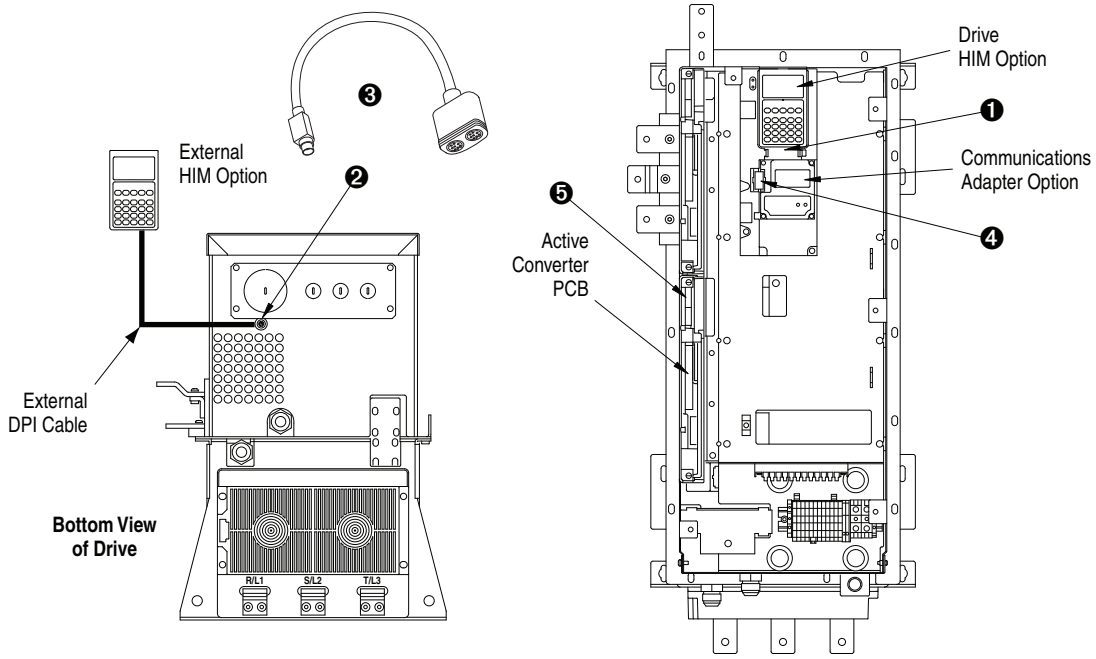
To enable the Inverter and Converter section of the Frame 2 drive to communicate with each other, a factory-installed DPI communication cable is used. No user connection is required.

DPI Connections for Frame 2 Drives

Drive Connection Points

The PowerFlex 700L Frame 2 drive provides a number of cable connection points as shown in Figure 2.19. If an additional external HIM is required for the application, the HIM can be connected to the DPI port on the bottom of the drive. Only one additional external HIM device may be connected. The use of two external HIM devices is not supported. If multiple external HIM devices are required, then install a user-supplied splitter cable or splitter box.

Figure 2.19 Frame 2 Drive DPI Connection Points



Item	Connector	Description
❶	DPI Port 1	HIM connection when installed in the drive.
❷	DPI Port 2	Cable connection for handheld and remote options.
❸	DPI Port 3 or 2	Splitter cable connection to DPI Port 2 provides additional port.
❹	DPI Port 5	Cable connection for communications adapter.
❺	DPI Port 6	Internal DPI connection to Active Converter pcb.

External Door-Mounted HIM Connection (optional)

For a Frame 2 drive installed in a user-supplied enclosure, an optional external door-mounted HIM may be connected as an alternative to the external HIM option. The cable supplied with the door-mount HIM option kit connects to the DPI port on the bottom of the drive (see Figure 2.19). For additional installation information, see the instructions provided with the door-mount HIM option kit.

Coolant Loop Connections

See Chapter 4, Cooling Loop Installation for details.

Frame 3A and 3B Installation

Because most start-up difficulties are the result of incorrect wiring, take every precaution to verify that the wiring is completed as instructed. Read and understand all items before beginning actual installation.

ATTENTION: The following information is merely a guide for proper installation. Rockwell Automation does not assume responsibility or liability for the compliance or noncompliance to any code, national, local or otherwise for the proper installation of this drive or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during installation.

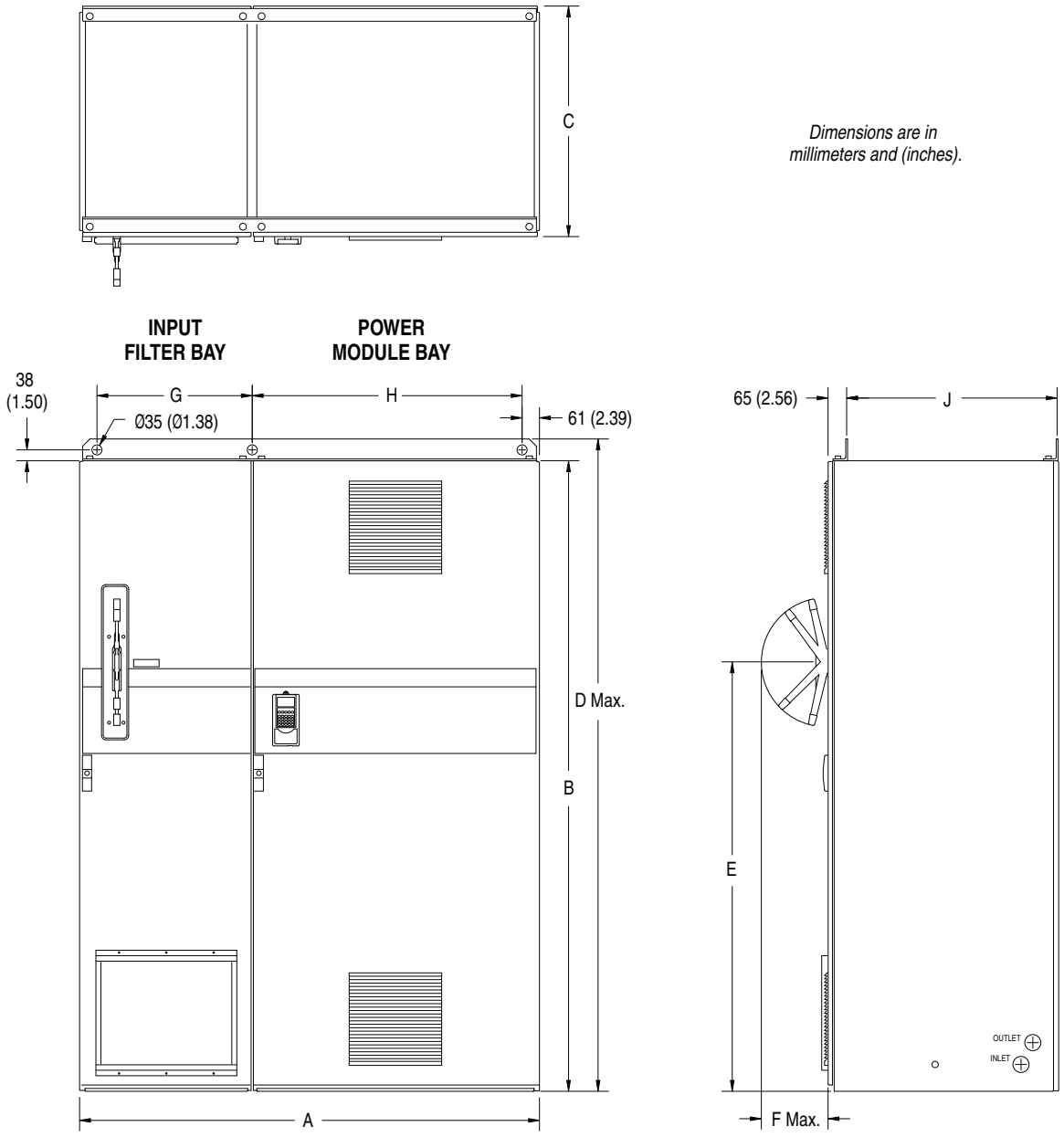
Drive Components

Frame 3A and 3B complete drives are comprised of an Input Filter Bay and a Power Module Bay. For Frame 3A drives, the Power Module Bay contains a combined Converter/Inverter Power Module. For Frame 3B drives, the Power Module Bay contains separate Converter and Inverter Power Modules.

Total Area Required for Drive Installation

Overall drive dimensions are shown in Figure 3.1 as an aid in calculating the total area required for installing Frame 3A and 3B drives.

Figure 3.1 Frame 3 Complete Drive Installation Dimensions



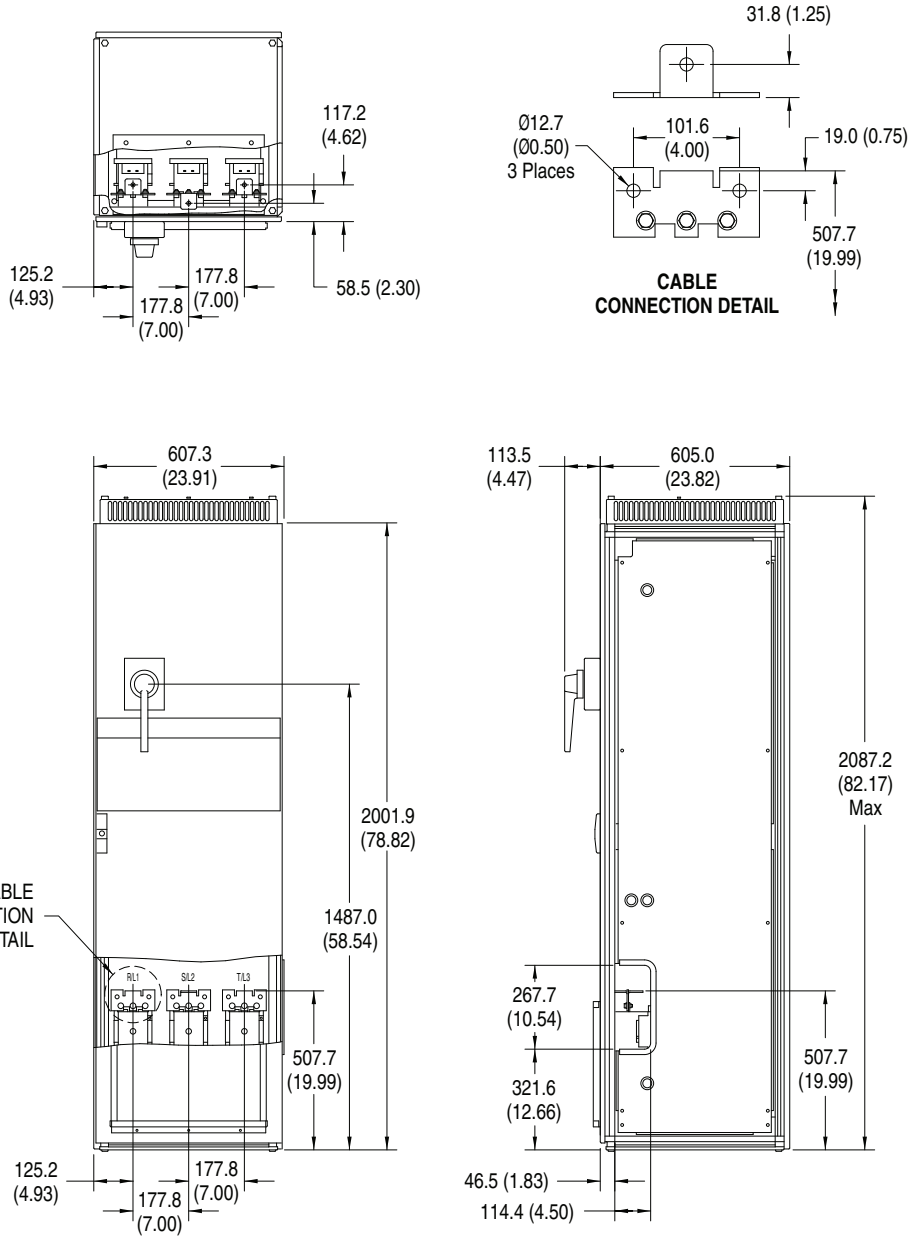
Frame Size	Dimensions mm (in.)									Approximate Weight of Complete Drive
	A	B	C	D	E	F	G	H	J	
3A	1200 (47.2)	2000 (78.7)	600 (23.6)	2078 (81.9)	1500 (59.1)	233 (9.2)	542 (21.3)	542 (21.3)	535 (21.1)	950 kg (2090 lb)
3B	1600 (63.0)	2200 (86.6)	800 (31.5)	2278 (89.8)	1500 (59.1)	233 (9.2)	542 (21.3)	942 (37.1)	735 (28.9)	1361 kg (3000 lb)

Recommended Air Flow Clearances for Complete Drive

Verify that there is adequate clearance for air circulation around the drive enclosures. A 15 cm (6 in.) minimum clearance is required wherever vents in the cabinet are located.

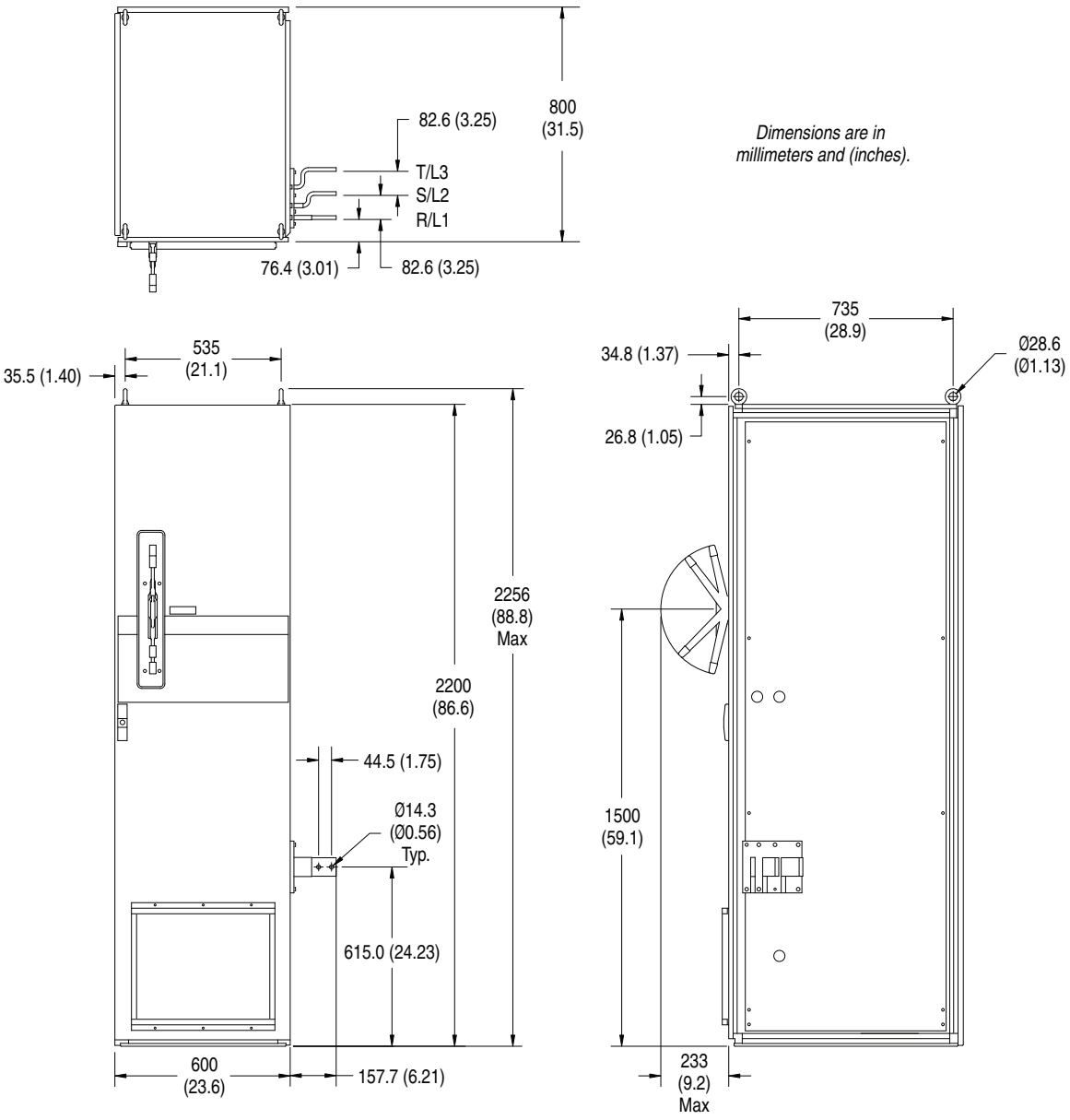
Figure 3.2 Frame 3A Input Filter Bay Power Wiring and Installation Dimensions

Dimensions are in millimeters and (inches).



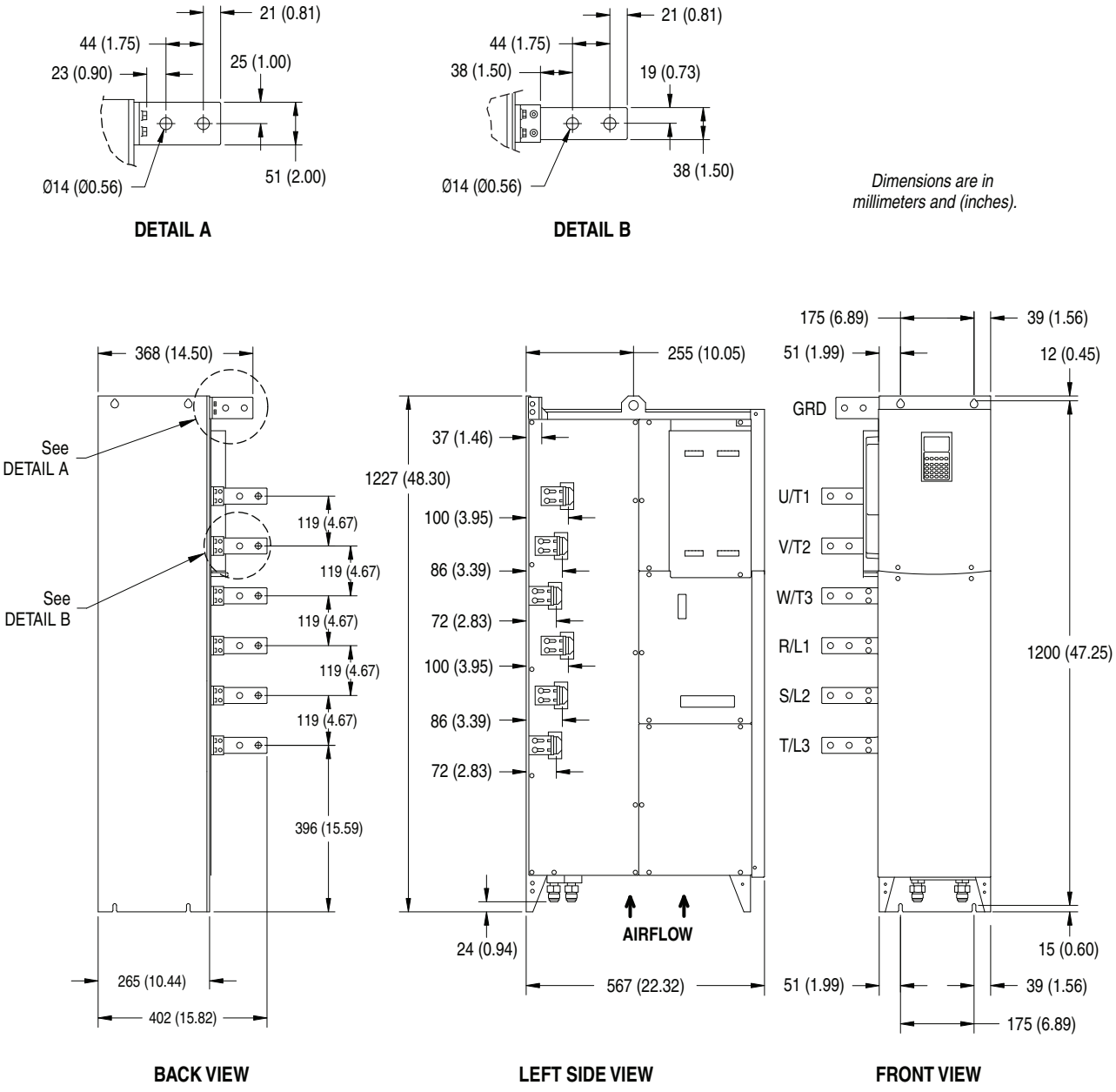
Approximate Weight of Frame 3A Input Filter Assembly
695 kg (1530 lb)

Figure 3.3 Frame 3B Input Filter Bay Power Wiring and Installation Dimensions



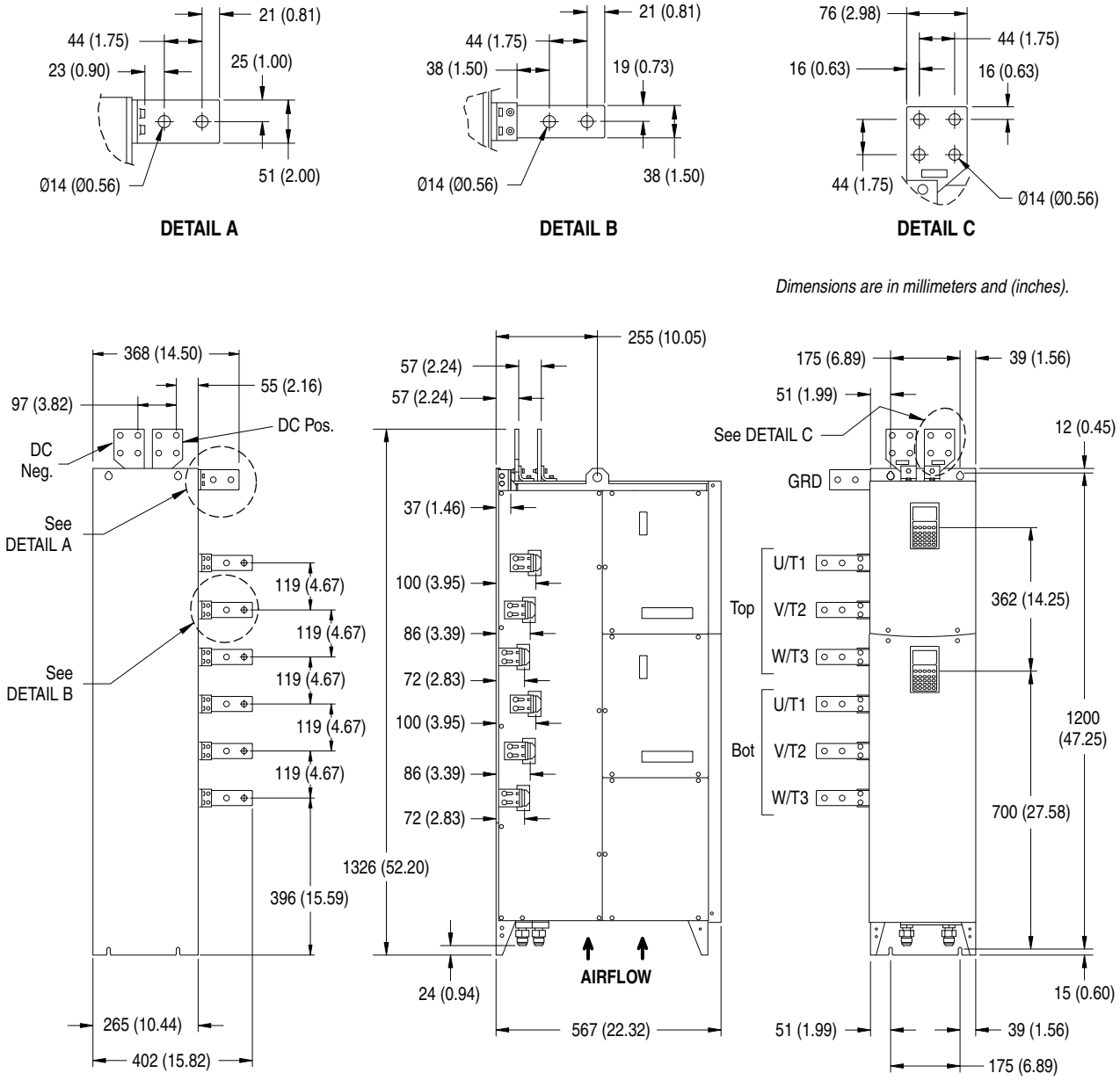
Approximate Weight of Frame 3B Input Filter Assembly
861.8 kg (1900 lb)

Figure 3.4 Frame 3A Converter/Inverter Power Module Installation Dimensions



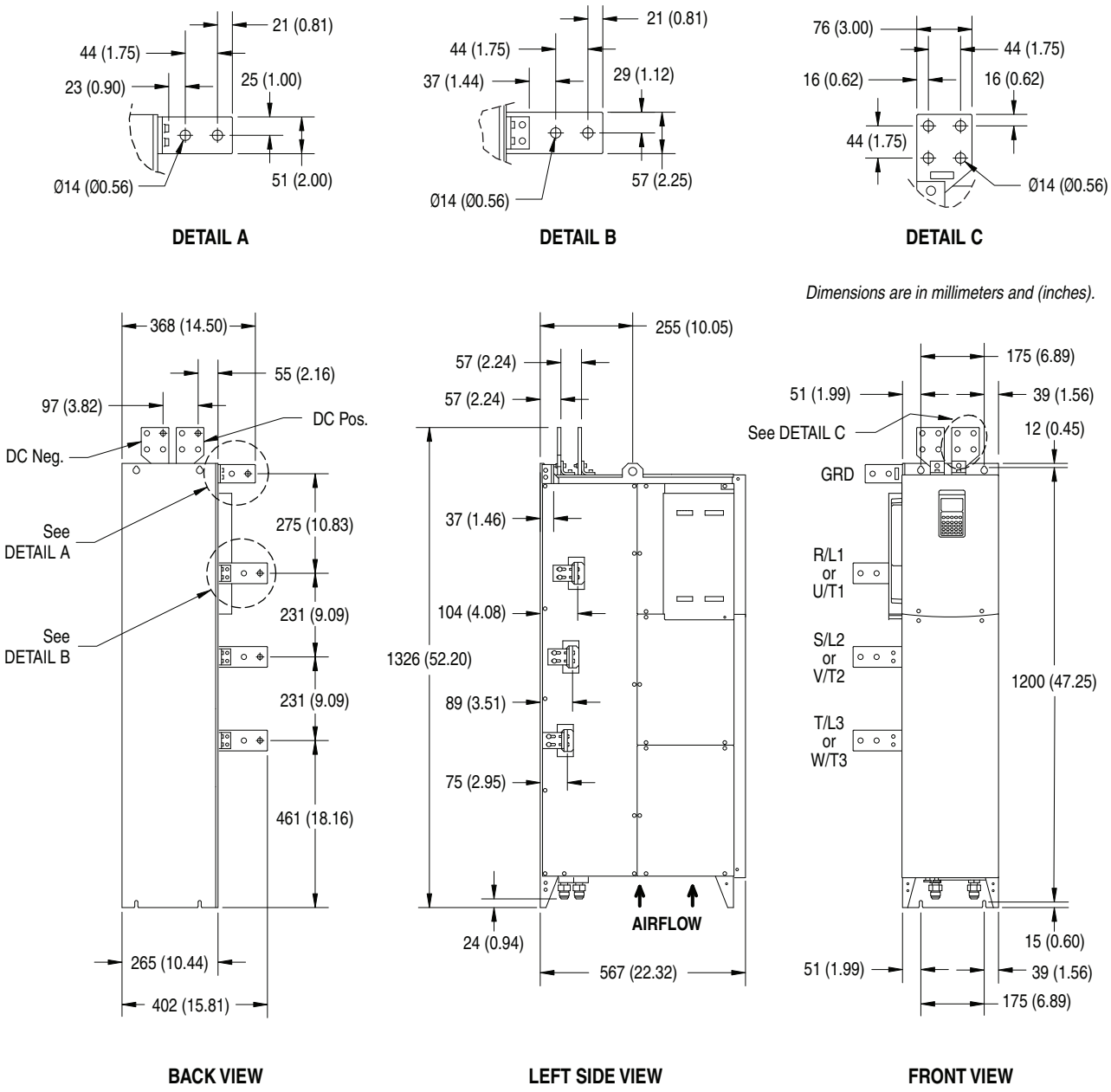
Approximate Weight	
Power Module	**Power Module and Packaging**
112 kg (247 lb)	144 kg (317 lb)

Figure 3.5 Frame 3A Dual Inverter Power Module Installation Dimensions



Approximate Weight	
Power Module	**Power Module and Packaging**
113.9 kg (251 lb)	145.6 kg (321 lb)

Figure 3.6 Frame 3B Power Module Installation Dimensions

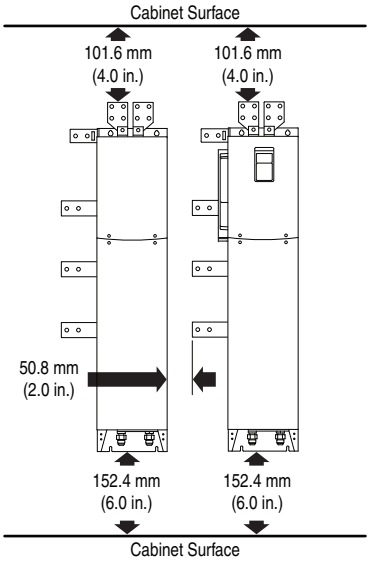


Approximate Weight	
Power Module	**Power Module and Packaging**
132 kg (290 lb)	166 kg (365 lb)

Recommended Mounting Clearances for Power Modules

Specified vertical clearance requirements (Figure 3.7) are intended to be from power module to cabinet surface. Other objects can occupy this space; however, reduced air flow can cause protection circuits to fault the module. In addition, inlet air temperature must not exceed the product specification.

Figure 3.7 Frame 3A and 3B Power Module Minimum Mounting Clearances



Verifying Power Module Input Ratings Match Supplied Power

It is important to verify that plant power will meet the input power requirements of the PowerFlex 700L drive's Power Module circuitry. See Appendix A for input power rating specifications. Make sure input power to the drive corresponds to the drive nameplate voltage and frequency.

Equipment Lifting

This section explains how to lift the equipment.

ATTENTION: To guard against possible personal injury and/or equipment damage, observe the following:

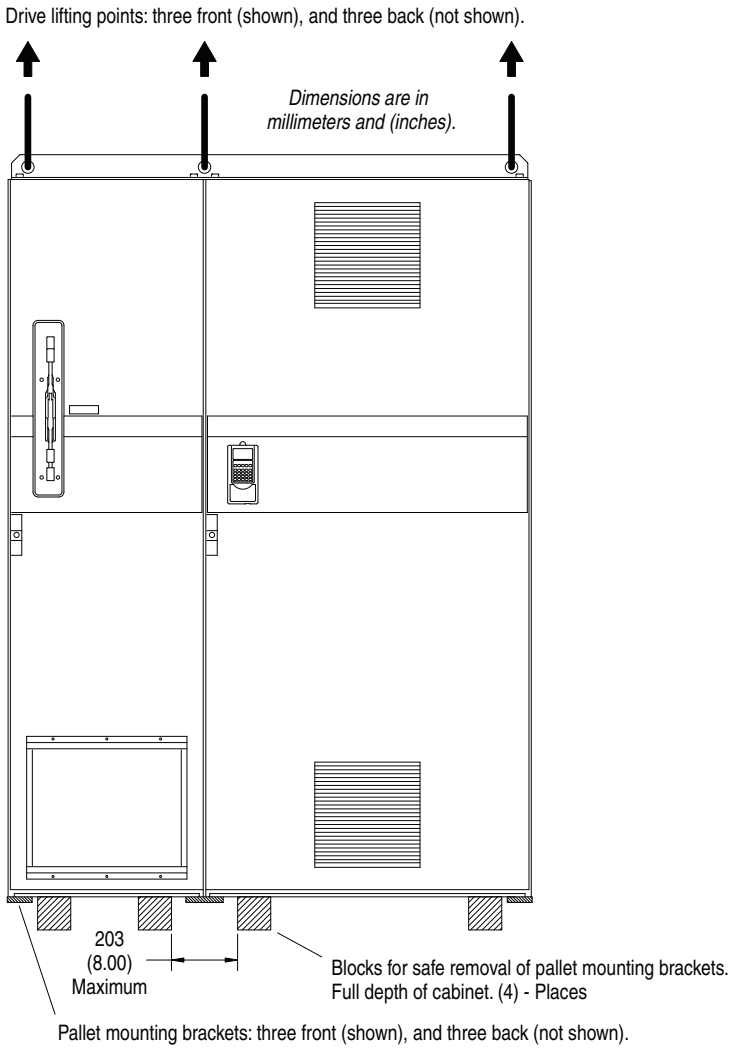
- Do not allow any part of the drive or lifting mechanism to make contact with electrically charged conductors or components.
- At no time should a person or their limbs be directly underneath the items being lifted.
- Do not subject the load to high rates of acceleration or deceleration.
- Inspect all lifting hardware for proper attachment before lifting any drive unit.

Lifting the Complete Drive

For the complete drive equipment, always hoist the cabinet using the lifting angles provided with the equipment (see Figure 3.8). Prior to placing the complete drive equipment at its installation site, remove both the pallet and

the pallet mounting brackets. For safety when removing the pallet mounting brackets, place blocks under the hoisted cabinet (Figure 3.9). The blocks provide a measure of safety while the six M12 screws are unfastened under the cabinet to remove the pallet mounting brackets. After the complete drive equipment is placed at its installation position, remove the lifting angles to permit the installation of the vented top cover over the input filter bay. Assembly instructions are provided with the vented top cover. If the complete drive equipment must be moved for any reason, remove the vented top cover, and then reinstall the lifting angles to hoist the cabinet.

Figure 3.8 Frame 3 Complete Drive Lifting Instructions

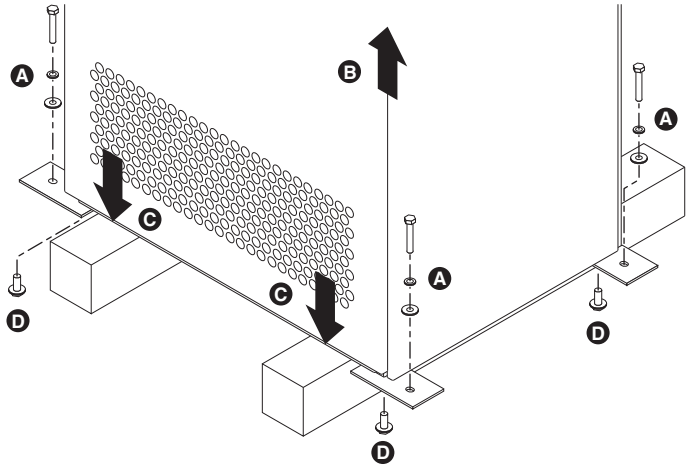


ATTENTION: To guard against possible personal injury and/or equipment damage, block the cabinet while removing the pallet mounting brackets.

Removing the Pallet and Pallet Mounting Brackets

ATTENTION: To guard against personal injury and equipment damage, do not work under the drive unless the drive is securely mounted on appropriate blocks.

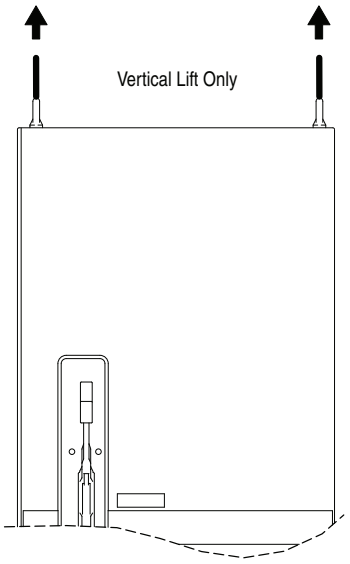
Figure 3.9 Frame 3 Complete Drive Pallet/Mounting Bracket Removal Instructions



Task	Description
A	Using a 15 mm wrench, remove the hardware which secures the drive to the pallet.
B	Lift the drive off the pallet.
C	Place the drive on proper blocks on a hard, level surface. The blocks should be approximately 10 cm (4 inches) high.
D	Using a 17 mm wrench, remove the hardware which secures the pallet mounting brackets to the drive and remove the brackets.

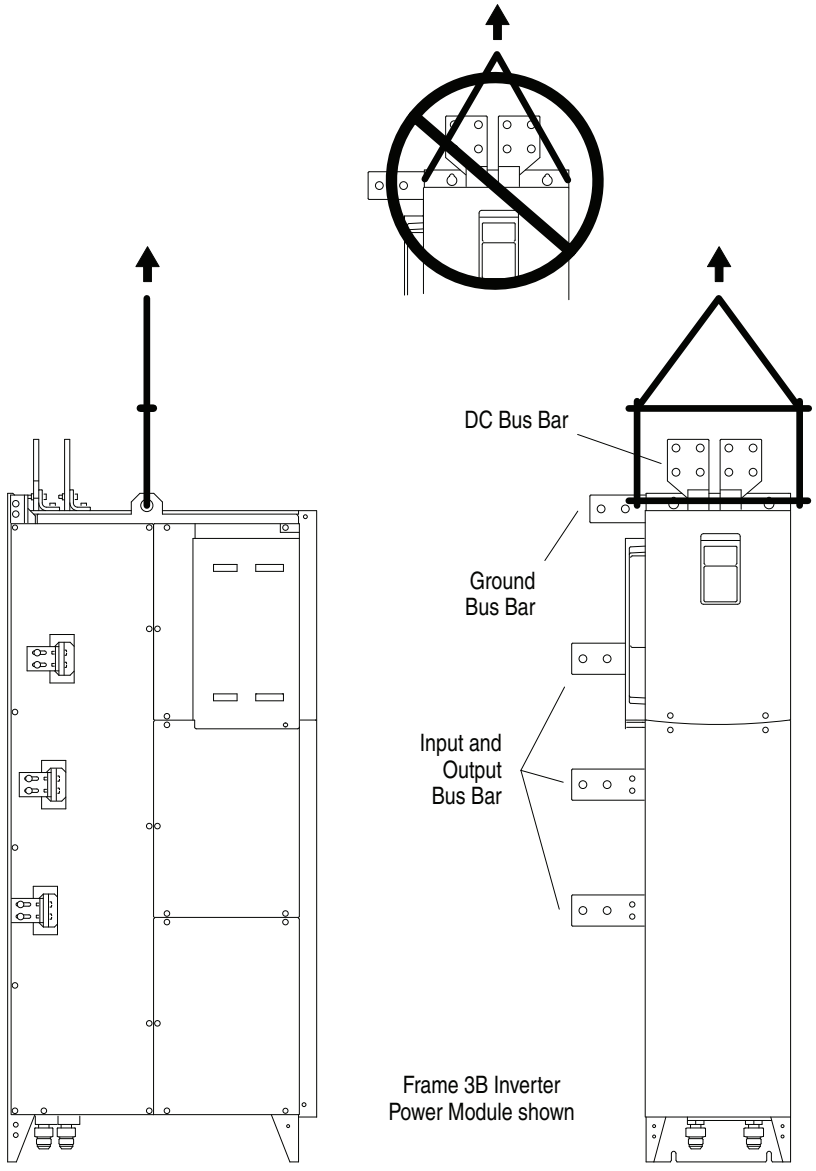
Lifting the Input Filter Bay

Figure 3.10 Frame 3 Input Filter Bay Lifting Instructions



Lifting the Power Module

Figure 3.11 Frame 3 Power Module Lifting Instructions



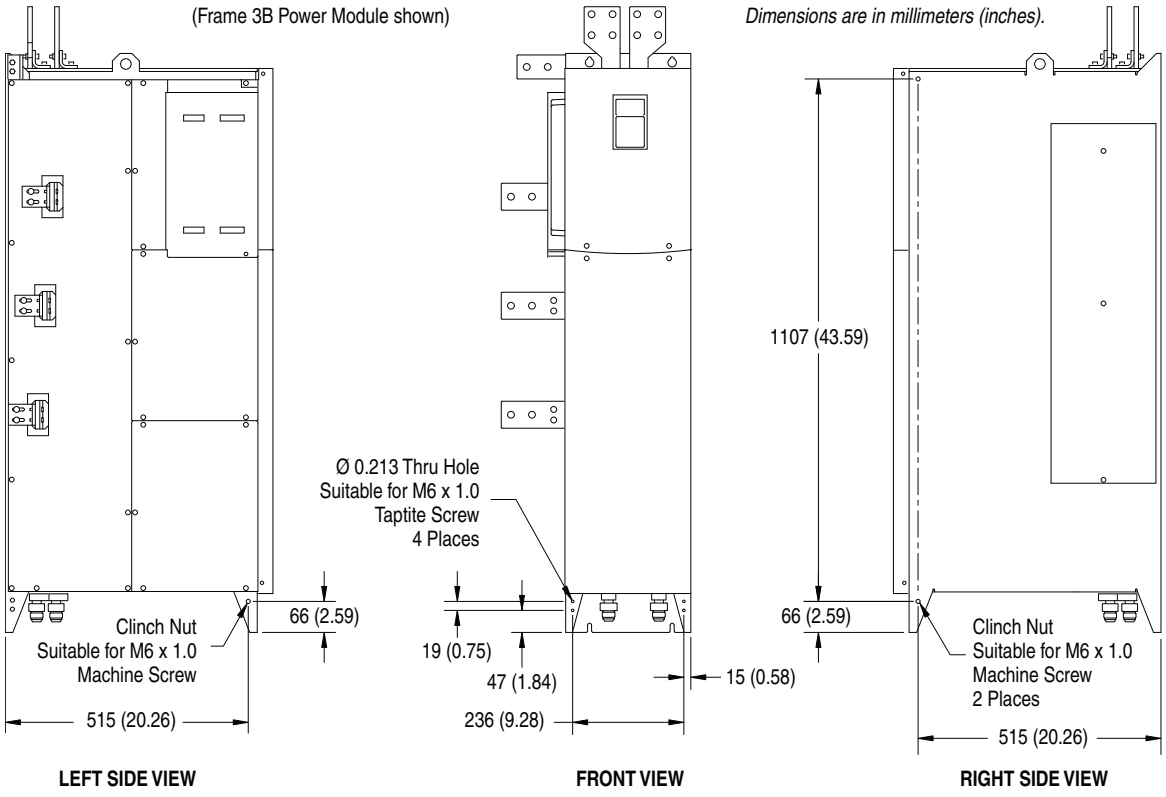
ATTENTION: Risk of equipment damage exists. Do not use input, output, ground, or DC bus bars for lifting or handling.

Mechanically support conductors to minimize mechanical load on the input and output bus bars.

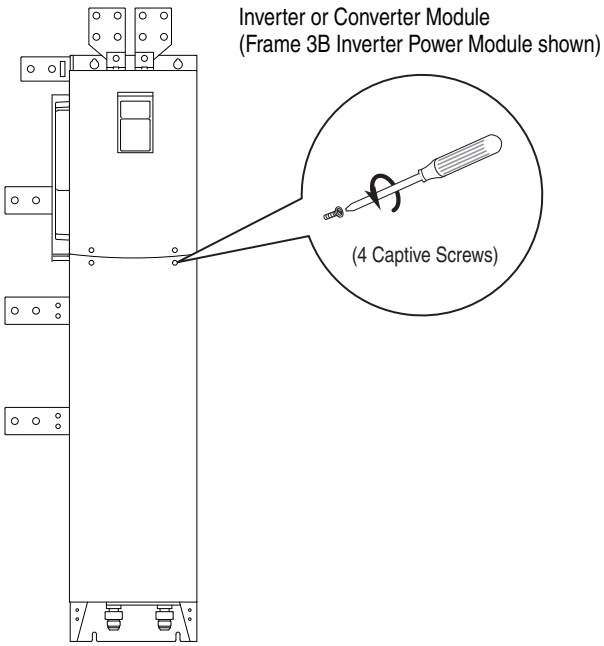
Supporting the Power Module

The Frame 3 power module has features for attaching support brackets with screws. The support brackets are required to prevent mechanical damage to the AC input, DC, and AC output bus bars. The feature locations, feature size, and screw type are shown in Figure 3.12.

Figure 3.12 Frame 3 Power Module Support Locations



Removing the Power Module Covers

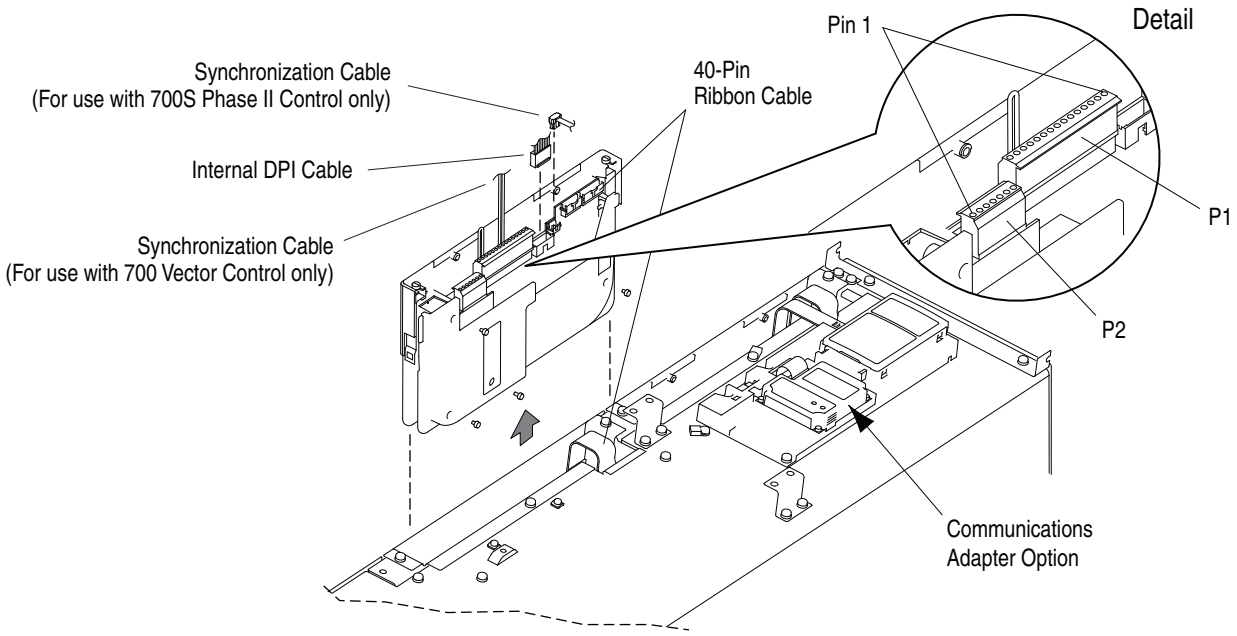


Removing the Active Converter Power Module Control Cassette

Frame 3A Drives

For Frame 3A regenerative-type drives, the combined Active Converter/ Inverter Power Module is equipped with an Active Converter control cassette. Figure 3.13 shows the location and removal of this cassette to access its terminal blocks for control wiring. See the PowerFlex 700 Active Converter Power Module User Manual, publication PFLEX-UM002, for control wiring details.

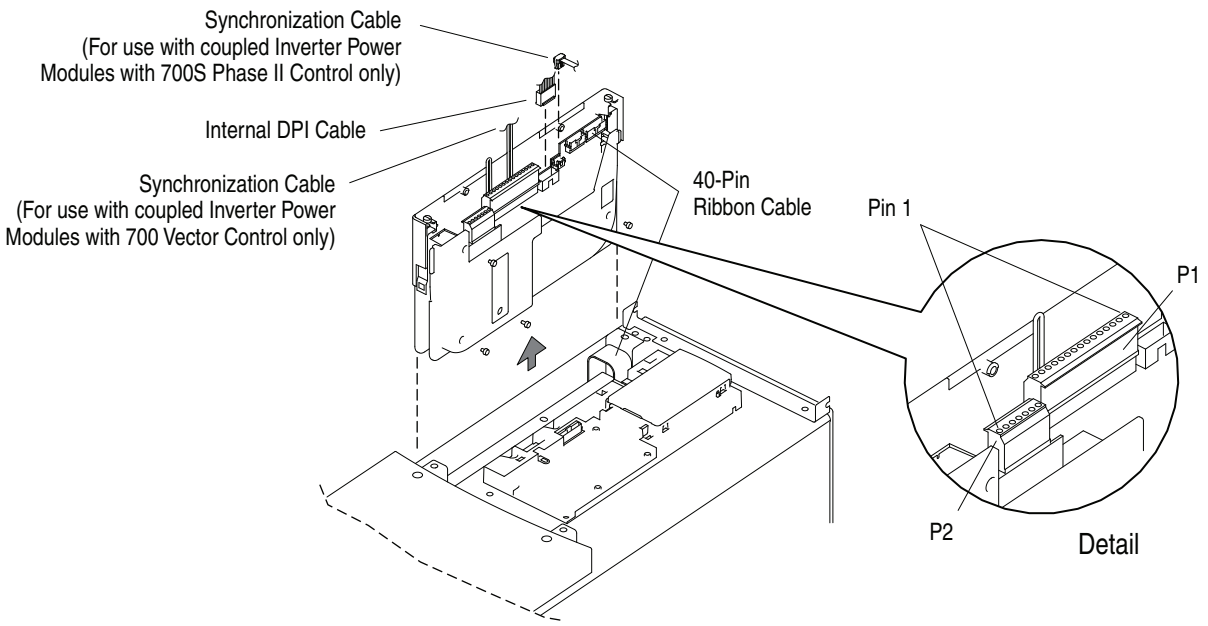
Figure 3.13 Removing the Frame 3A Active Converter Control Cassette



Frame 3B Drives

For Frame 3B regenerative-type drives, the separate Active Converter Power Module is equipped with a control cassette. Figure 3.14 shows the location and removal of this cassette to access its terminal blocks for control wiring. See the PowerFlex 700 Active Converter Power Module User Manual, publication PFLEX-UM002, for control wiring details.

Figure 3.14 Removing the Frame 3B Active Converter Control Cassette



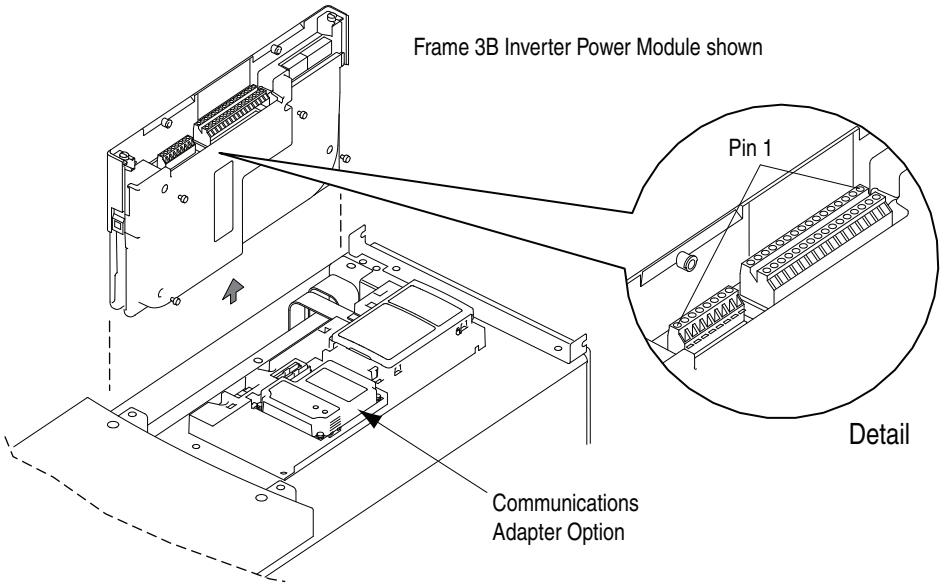
Removing the Inverter Power Module Control Cassette

For Frame 3A drives (with a combined Active Converter/Inverter Power Module) or Frame 3B drives (with a separate Inverter Power Module), the Inverter is equipped with either the standard PowerFlex 700 Vector Control cassette or an optional PowerFlex 700S Phase II Control cassette. In either case, the cassette is removed in the same way.

PowerFlex 700 Vector Control Cassette (standard)

Figure 3.15 shows the location and removal of the Inverter Power Module's standard PowerFlex 700 Vector Control cassette to access its terminal blocks for control wiring. See the PowerFlex 700 Adjustable Frequency AC Drive User Manual - Series B, publication 20B-UM002, for control wiring details.

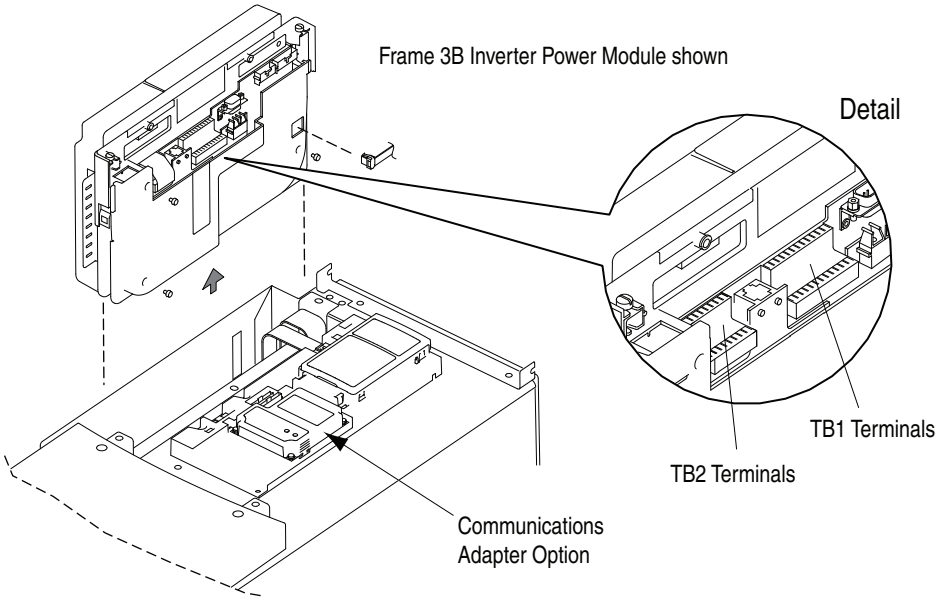
Figure 3.15 Removing the Standard PowerFlex 700 Vector Control Cassette



PowerFlex 700S Phase II Control Cassette (optional)

Figure 3.16 shows the location and removal of the Inverter Power Module's optional PowerFlex 700S Phase II Control cassette to access its terminal blocks for control wiring. See the PowerFlex 700S High Performance AC Drive - Phase II Control User Manual, publication 20D-UM006, for control wiring details.

Figure 3.16 Removing the Optional PowerFlex 700S Phase II Control Cassette



Verifying the Drive's Watts Loss Rating

When mounting the drive inside of an enclosure, determine the watts loss rating of the drive from Table A.E on page A-6. This table lists the typical full load power loss watts value at 4 kHz (rated carrier frequency). Make sure that the enclosure is adequately ventilated with 0…40 °C (32…105 °F) ambient air based on the drive's watts loss rating.

Installing the Vented Top Cover

Important: Install the vented top cover for PowerFlex 700L Frame 3A and 3B complete drives before routing input wiring. See the vented top cover installation instructions, publication 20L-IN002, for more information.

Determining Wire Routing for Control, Ground, Drive Input, and Motor Output

All wiring should be installed in conformance with the applicable local, national, and international codes (for example, NEC/CEC). Signal wiring, control wiring, and power wiring must be routed in separate conduits to prevent interference with drive operation. When hubs are not provided, use grommets to guard against wire chafing.

ATTENTION: Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe this precaution can result in damage to, or destruction of, the equipment.

Do not route more than three sets of motor leads through a single conduit. This minimizes cross-talk that can reduce the effectiveness of noise reduction methods. If more than three drive/motor connections per conduit are required, shielded cable must be used. If possible, each conduit should contain only one set of motor leads.

ATTENTION: Unused wires in conduit must be grounded at both ends to avoid a possible shock hazard caused by induced voltages. Also, if a drive sharing a conduit is being serviced or installed, disable all drives using this conduit to eliminate the possible shock hazard from cross-coupled motor leads. Failure to observe these precautions can result in bodily injury.

Frame 3A Drives

Figure 3.17 shows the location of Frame 3A Input Filter Bay wire routing. Figure 3.20 shows locations for Frame 3A Power Module control wire routing, DPI communication ports/cable routing, and coolant connections. Figure 3.18 shows locations of Frame 3A complete drive control, ground, drive input, motor output, and coolant connections.

Frame 3B Drives

Figure 3.19 shows the location of Frame 3B Input Filter Bay wire routing. Figure 3.20 shows locations for Frame 3B Power Module control wire routing, DPI communication ports/cable routing, and coolant connections. Figure 3.21 shows locations of Frame 3B complete drive control, ground, drive input, motor output, and coolant connections.

Figure 3.17 Location of Frame 3A Input Filter Bay Wire Routing

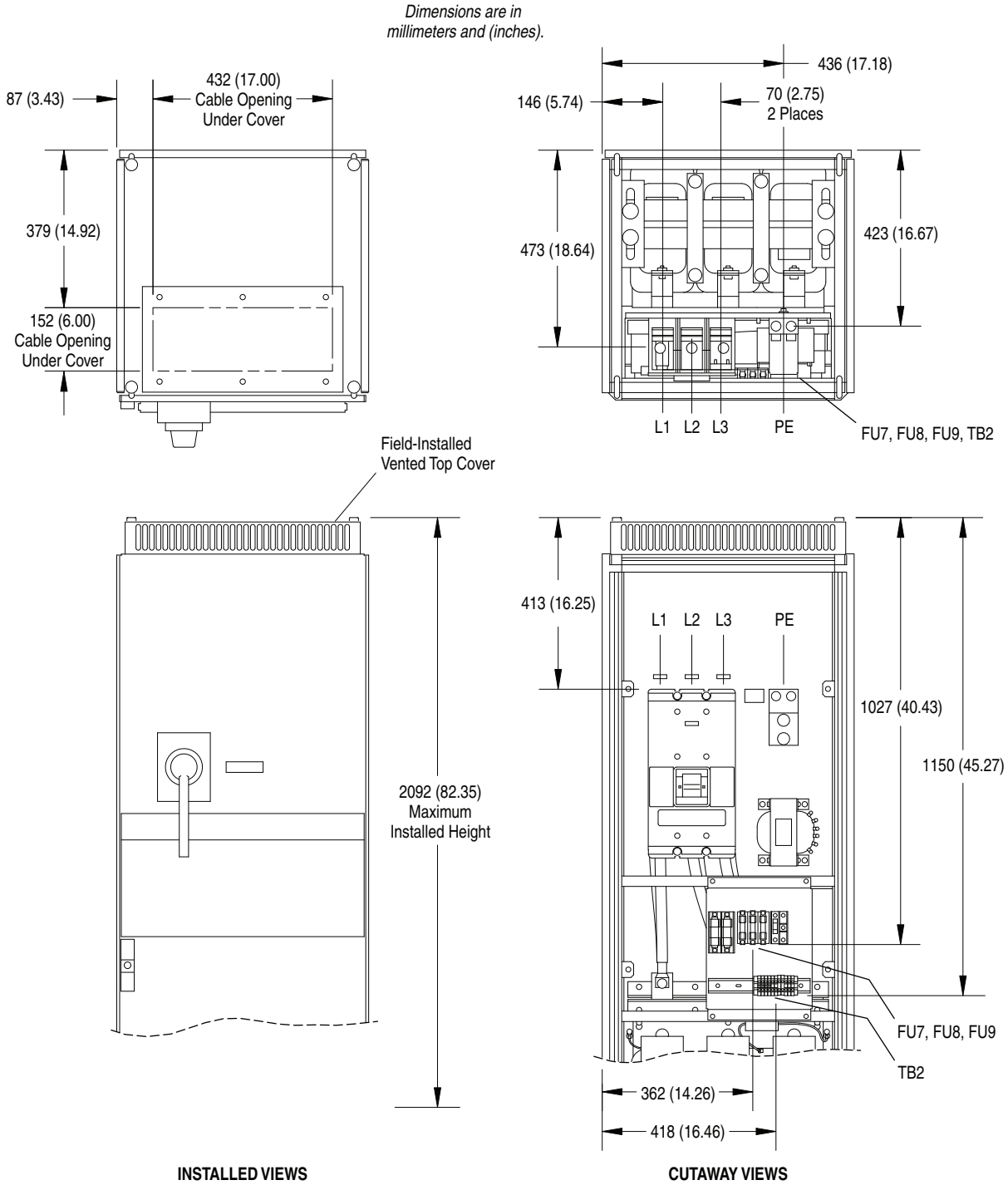


Figure 3.18 Locations for Frame 3A Complete Drive Power Module Bay Control, Ground, Motor Output, and Coolant Connections

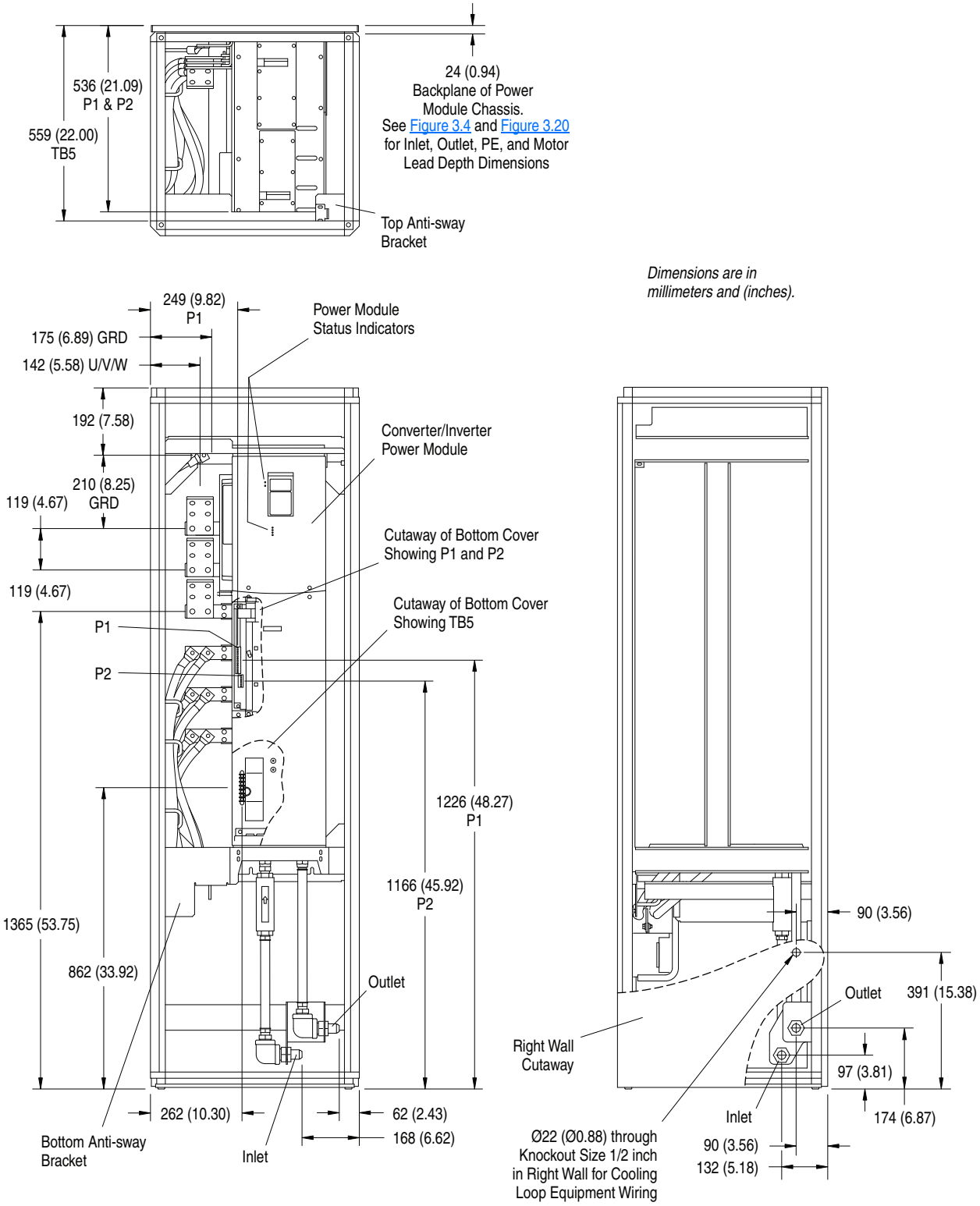


Figure 3.19 Location of Frame 3B Input Filter Bay Wire Routing

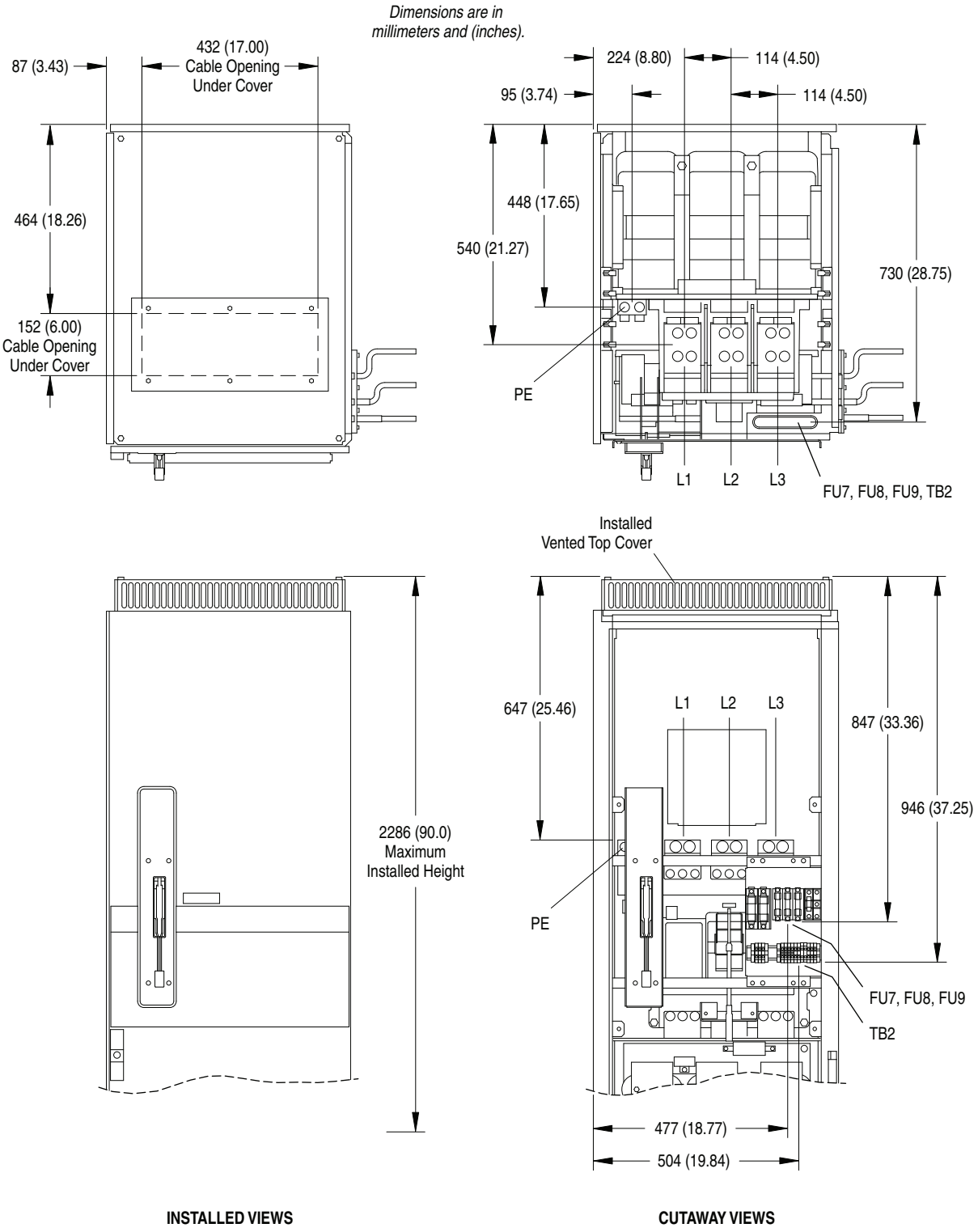
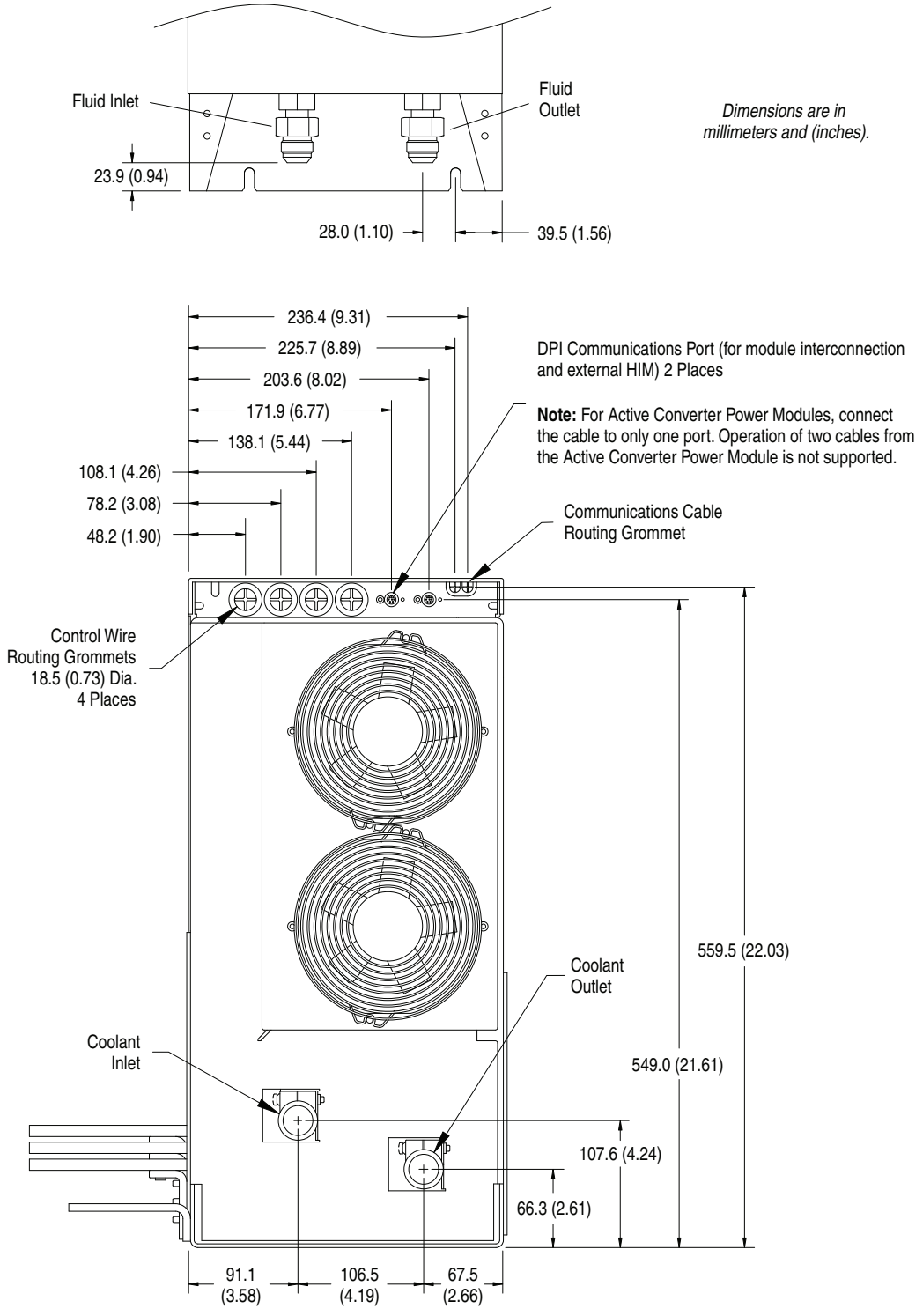
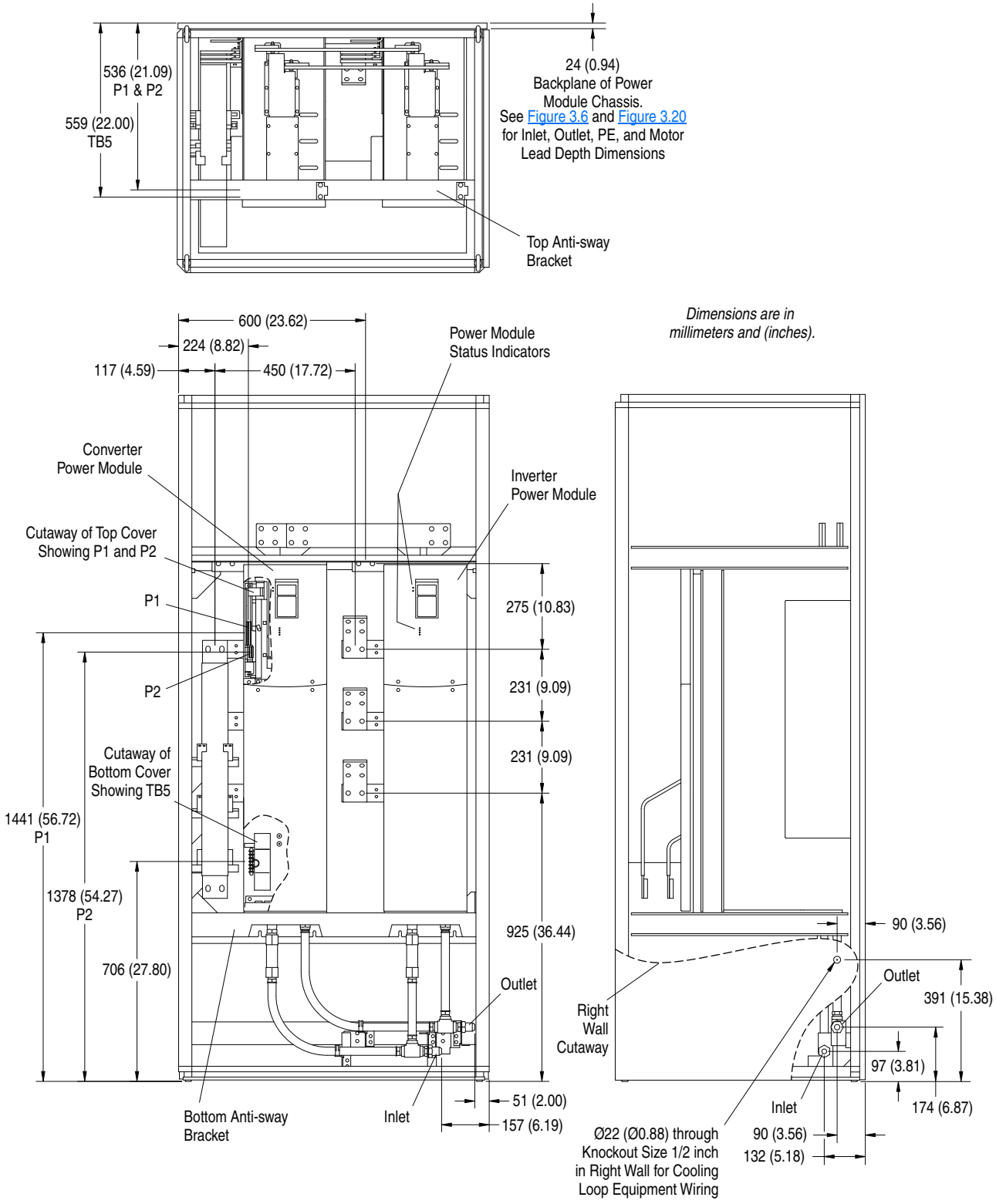


Figure 3.20 Frame 3A and 3B Power Module Locations for Control Wire Routing, DPI Communication Ports/Cable Routing, and Coolant Connections



Bottom View of Power Module

Figure 3.21 Locations for Frame 3B Complete Drive Control, Ground, Drive Input, Motor Output, and Coolant Connections



Grounding the Power Module

ATTENTION: The user is responsible for conforming with all applicable local, national, and international codes. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

Complete drives consist of an Input Filter Bay and a Power Module Bay (see Figure 3.1). Complete drives purchased from Rockwell Automation are furnished with a grounding conductor between the ground lug of the Inverter Power Module and the ground lug in the Input Filter Bay. However, when power modules are purchased separately and mounted in a customer's cabinet, the customer must supply a grounding conductor as follows:

- Frame 3A—between the ground lug of the combined Converter/Inverter Power Module (or the ground lug of the Dual Inverter Power Module) and the ground lug in the Input Filter Bay (see Figure 3.23).
- Frame 3B—between the ground lugs of each separate Power Module and the ground lug in the Input Filter Bay (see Figure 3.24).

Ungrounded or Resistive Grounded Installations

PowerFlex 700L Frame 3A and 3B drives are equipped with a common mode capacitor and MOV that are referenced to ground. If the drive is installed on a resistive ground or ungrounded distribution system, disconnect this capacitor and MOV to guard against drive damage.

ATTENTION: The PowerFlex 700L Liquid-Cooled AC Drive has not been designed to be used on IT (insulated tera) or corner-grounded power networks above 600V (phase-to-phase voltage). Operation on such a network can cause a hazardous failure of the insulation system of the drive.

Disconnecting the Input Filter Common Mode Capacitor

To disconnect the 1 µF common mode capacitor from the circuit, see Figure 3.22 and perform the following steps.

1. Disconnect the Faston wire from the 1 µF common mode capacitor.
2. Insulate the wire end by applying a wire nut or electrical tape.
3. Tie wrap the disconnected wire to keep it away from any electrical connections.

Disconnecting the MOV from Ground

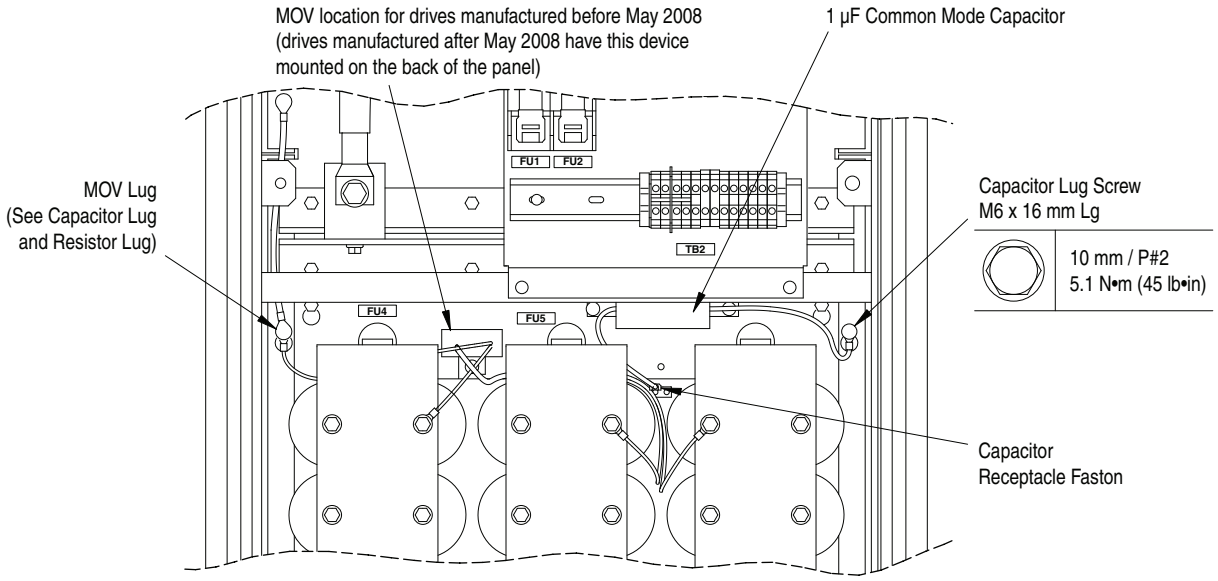
To disconnect the MOV from ground, see Figure 3.22 and perform the following steps.

1. Unbolt the ground wire lug from the MOV's ground connection point.

2. Screw the bolt back into the panel.
3. Cut the lug off the disconnected ground wire and apply a wire nut to its end.
4. Tie wrap the disconnected ground wire to keep it away from any electrical connections.

For more information on ungrounded distribution systems, see Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001. **Note:** Removing the Common Mode capacitor and input MOVs makes the drive more vulnerable to high voltage line spikes.

Figure 3.22 Removing Common Mode Capacitor and MOV



Installing Input Power Wiring

This section describes incoming line components and how to install them.

Installing Transformers and Reactors (Not Recommended)

Frame 3A and 3B drives may be used on distribution systems with 200,000 amps or less symmetrical fault current capacity. The Drive Input components consist of a 3% line reactor and a harmonic line filter. Additional input inductance is not recommended.

Selecting and Verifying Control Transformer Voltage

A control transformer in the input filter bay of the drive is used to match the input line voltage of the drive to the 115V control voltage. If your line voltage is different than the voltage class specified on the drive nameplate, it may be necessary to change transformer taps as described below.

Depending on the supplied AC line voltage used to power the drive, connect FU1 and FU2 to TB1 in accordance with Table 3.A. See Figure 3.29 or Figure 3.30 for fuse and terminal block locations.

Table 3.A Input Voltage Setting for Control Transformer

Supplied Input Voltage	From	To
For all input voltages	FU1	TB1-1
380/415V AC	FU2	TB1-2
440/480V AC	FU2	TB1-3
575/600V AC	FU2	TB1-4
690V AC	FU2	TB1-5

Figure 3.23 Frame 3A Regenerative Drive Input Power and PE Wiring

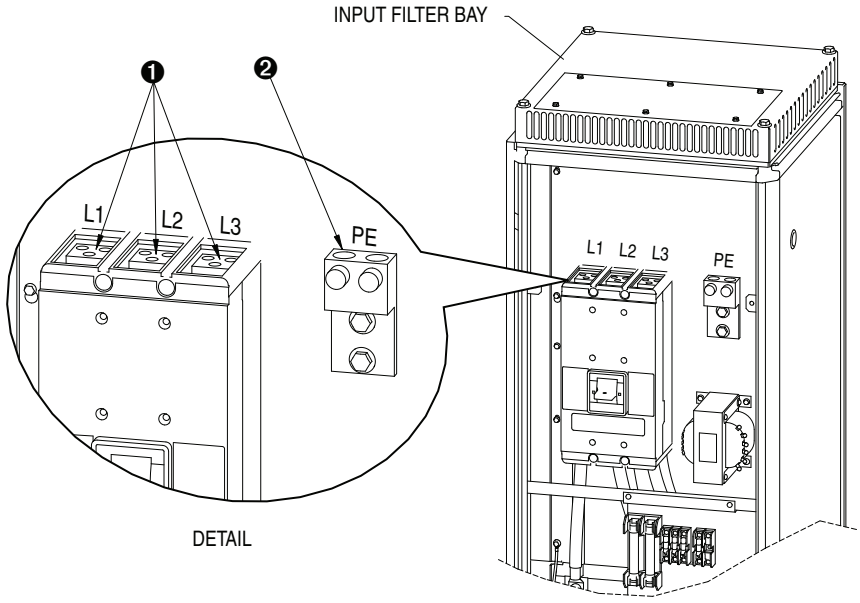


Figure 3.24 Frame 3B Regenerative Drive Input Power and PE Wiring

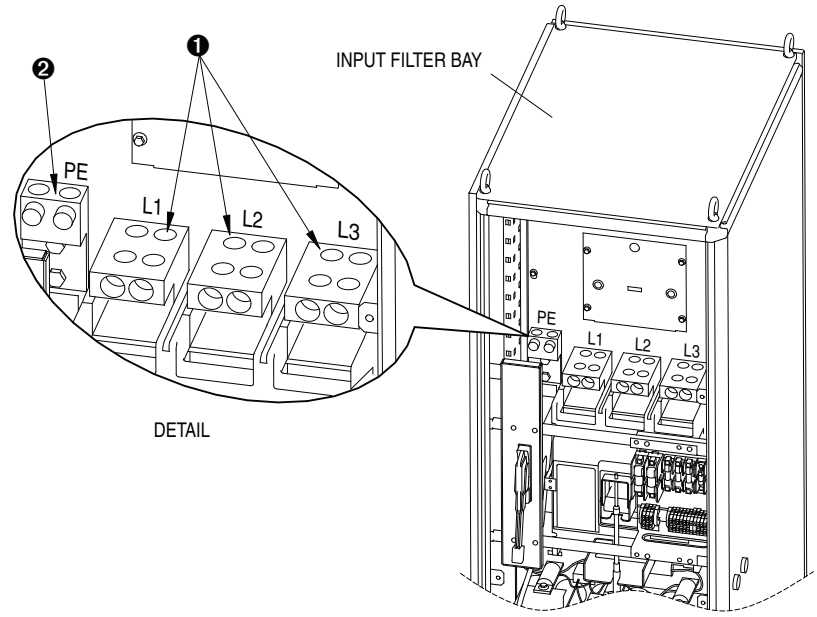


Table 3.B Frame 3 Power Terminal Specifications

Item	Name	Description	Frame Size	Wire Size Range[1]		Recommended Tightening Torque (±10%)
				Maximum	Minimum	
❶	Input Power Wire Lugs R/L1, S/L2, T/L3	Input power connections on drive	3A	400 MCM	3/0	42 N•m (375 lb•in)
			3B	1000 MCM	500 MCM	62 N•m (550 lb•in)
❷	PE Wire Lug	Terminating point for ground wires	3A or 3B	600 MCM	#2 AWG	34 N•m (300 lb•in)

[1] Maximum/minimum sizes that the terminals will accept - these are not recommendations.

Installing an External/Separate Input Disconnect

An input disconnect can be installed in the line before the drive input terminals in accordance with local, national, and international codes (for example, NEC/CEC). Size the disconnect according to the in-rush current as well as any additional loads the disconnect might supply. Coordinate the trip rating for the inrush current (10-12 times full load current) with that of the input isolation transformer, if used. See Installing Transformers and Reactors (Not Recommended) on page 3-23 for additional information.

Installing Power Wiring from Input Filter Bay to the Power Module Bay

Use the following steps to connect AC input power to the drive.

ATTENTION: Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe this precaution can result in damage to, or destruction of, the equipment.

1. Connect the three-phase AC input power leads (three-wire 380-480V AC or three-wire 600-690V AC, depending on drive nameplate voltage rating) to the R/L1, S/L2, and T/L3 input power terminals on the drive:
   - Frame 3A Combined Converter/Inverter Power Module (for terminal locations, see Figure 3.2, Figure 3.18, and Figure 3.25).
   - Frame 3A Dual Inverter Power Module (for terminal locations, see Figure 3.2, Figure 3.18, and Figure 3.26).
   - Frame 3B Separate Converter Power Module (for terminal locations, see Figure 3.3, Figure 3.21, and Figure 3.27).
2. Tighten the AC input power terminal connections to the recommended torque as shown in Table 3.C.

Table 3.C Power Module Terminal Specifications

Item	Name	Description	Recommended Tightening Torque (±10%)	Terminal Bolt Size (1)
❶	Input Power Bus Bar (2) R/L1, S/L2, T/L3	Input power	62 N•m (550 lb•in)	M12
❷	Output Power Bus Bar (2) U/T1, V/T2, W/T3	Motor connections	62 N•m (550 lb•in)	M12
❸	PE, Motor Ground Bus Bar (2)	Terminating point for wiring shields	11 N•m (100 lb•in)	M8
❹	DC Bus Test Point Socket (3) (2 Terminals; DC+, DC-)	4 mm socket for DC bus voltage measurement only	—	—
❺	DC Power Bus Bar (2) (4) (2 Terminals; DC+, DC-)	DC power from Converter Power Module to Inverter Power Module (Frame 3B only)	62 N•m (550 lb•in)	M12

(1) Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt to avoid damage to the terminal.
(2) These connections are bus bar type terminations and require the use of lug connectors.
(3) Use only to verify that DC bus capacitors are discharged before servicing the Power Module. No other external use is permitted.
(4) Size DC power conductors for current carrying capacity as follows: 400/480V, 1000 Amps; 600/690V, 800 Amps.

Figure 3.25 Frame 3A Converter/Inverter Power Module Terminal Locations

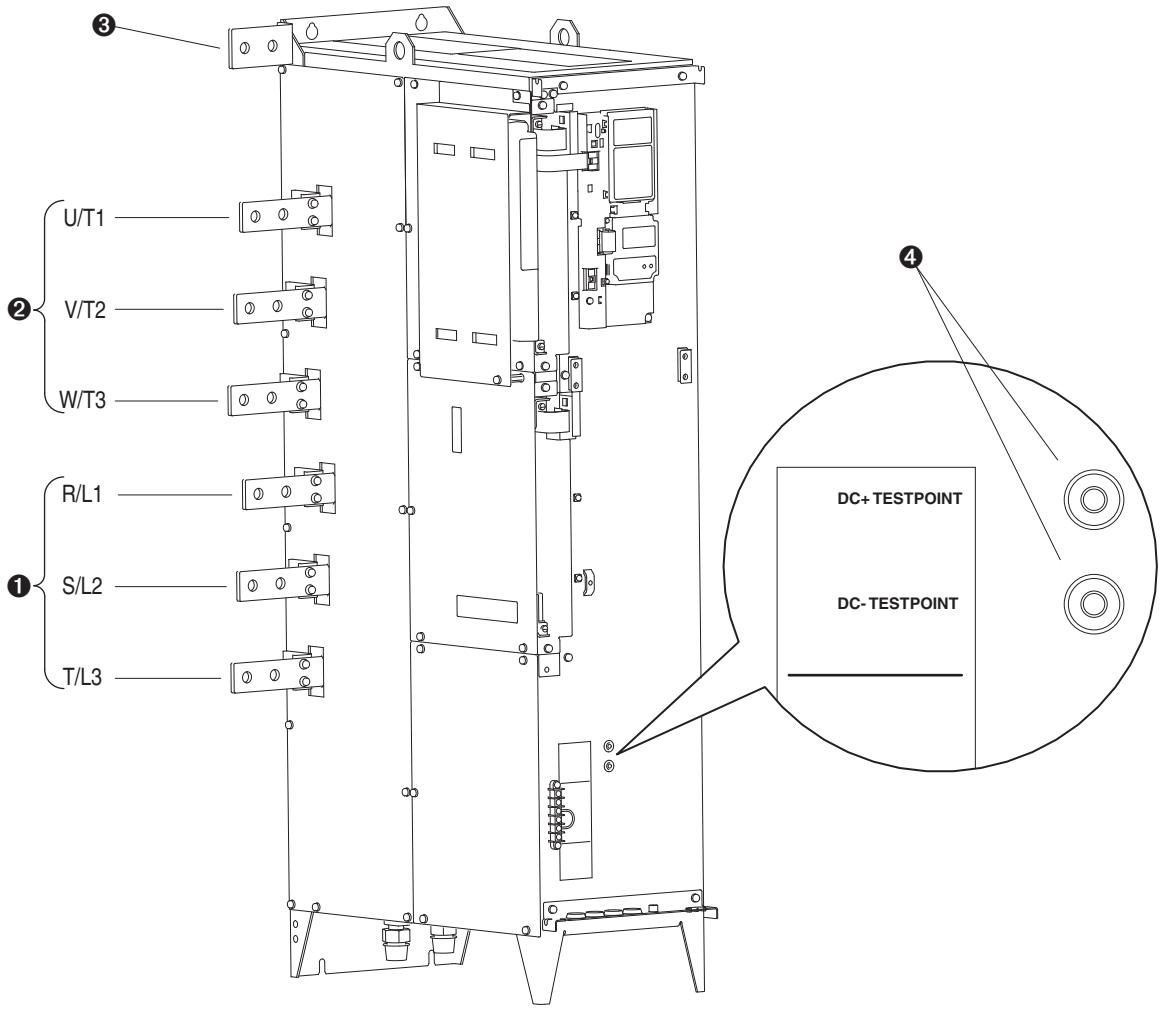


Figure 3.26 Frame 3A Dual Inverter Power Module Terminal Locations

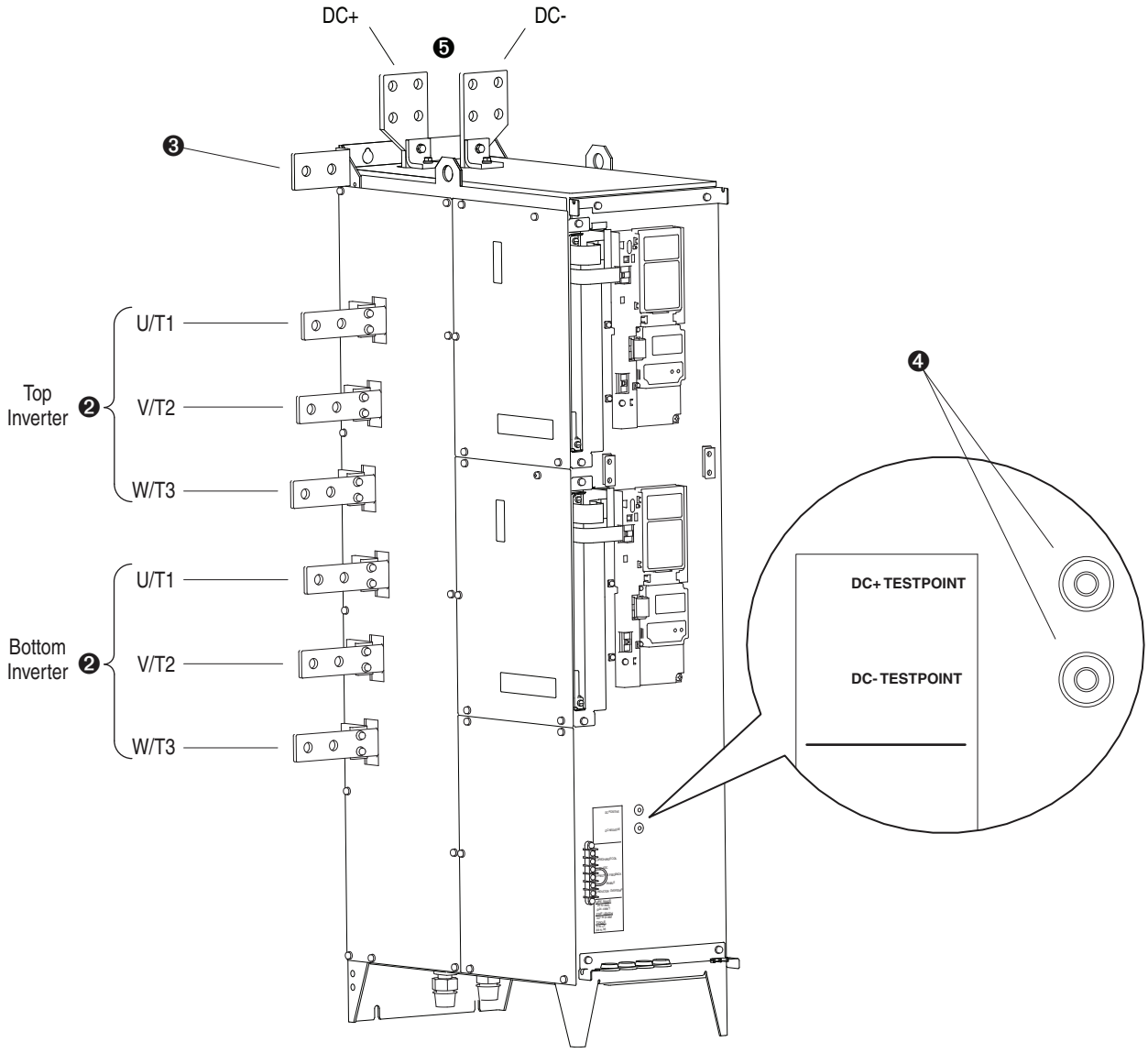


Figure 3.27 Frame 3B Active Converter Power Module Terminal Locations

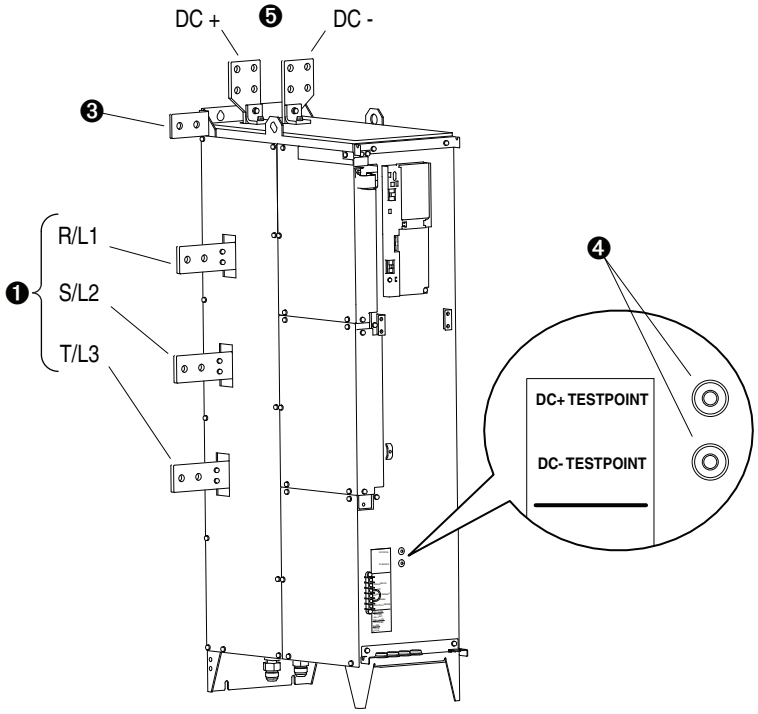
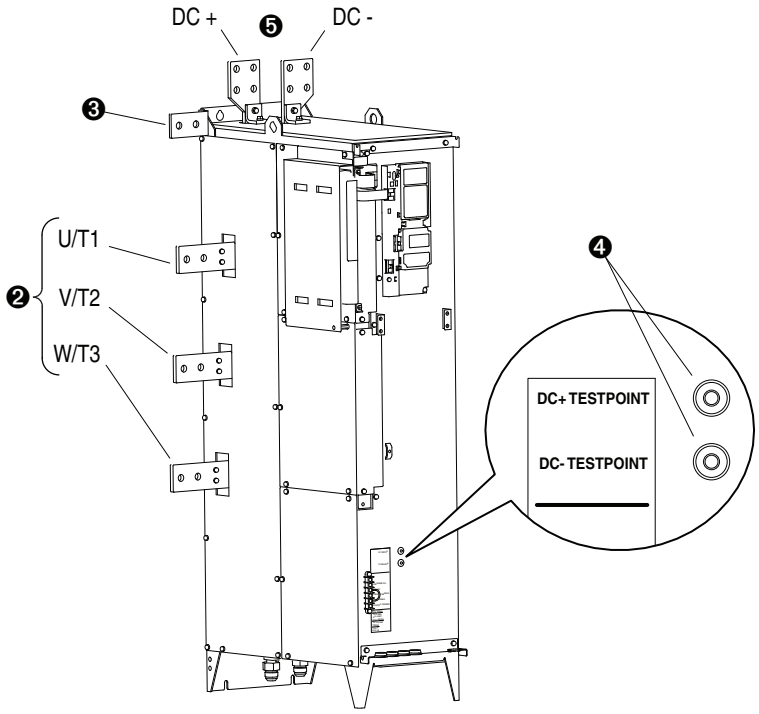


Figure 3.28 Frame 3B Inverter Power Module Terminal Locations



Installing Output Power Wiring

This section provides instructions on wiring output contactors, motor overload protection, and output wiring to the motor.

Installing Mechanical Motor Overload Protection (Optional)

To provide the motor with overload protection, local, national, and international codes (for example, NEC/CEC) may require one of the following items:

- A motor thermostat be installed internal to the motor.
- A mechanical thermal motor overload relay, sized to protect the motor, be installed between the motor and the drive's output terminals.

In multiple motor applications (V/Hz regulation only), each motor must have its own user-supplied overload and branch circuit protection.

Installing Output Wiring from the Drive Output Terminals to the Motor

Important: See the PowerFlex 700L Technical Data, publication 20L-TD001, for motor lead length restrictions.

Follow these steps to connect the AC output power wiring from the drive to the motor.

1. Route the three-phase AC output power motor leads to the drive power module.

   Do not route more than three sets of motor leads through a single conduit. This minimizes cross-talk that can reduce the effectiveness of noise reduction methods. If more than three drive/motor connections per conduit are required, shielded cable must be used. If possible, each conduit should contain only one set of motor leads.

ATTENTION: Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe these precautions can result in damage to, or destruction of, the equipment.

ATTENTION: Unused wires in conduit must be grounded at both ends to avoid a possible shock hazard caused by induced voltages. Also, if a drive sharing a conduit is being serviced or installed, disable all drives using this conduit to eliminate the possible shock hazard from cross-coupled motor leads. Failure to observe these precautions can result in bodily injury.

2. Connect the three-phase AC power motor leads to the U/T1, V/T2, and W/T3 output power terminals on the drive:
   - Frame 3A Combined Converter/Inverter Power Module (for terminal locations, see Figure 3.18 and Figure 3.25).
   - Frame 3A Dual Inverter Power Module (for terminal locations, see Figure 3.18 and Figure 3.26).
   - Frame 3B Separate Converter Power Module (for terminal locations, see Figure 3.21 and Figure 3.27).
3. Tighten the AC output power terminal connections to the proper torque as shown in Table 3.C.

Installing Control Wiring from the Input Filter Bay to the Power Module Bay

This section provides details on control wiring between the Input Filter Bay and the Power Module Bay. When a Frame 3A or 3B Complete Drive is ordered, wiring from the Input Filter Bay to the Power Module Bay is completed at the factory. In this case, this section can be used as verification or reference for installation or maintenance.

ATTENTION: Risk of equipment damage exists. Do not use power module terminal blocks TB5-1 and TB5-3 to connect any type of power wiring for auxiliary equipment. These terminals are for only low amperage control wiring.

ATTENTION: Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe this precaution can result in damage to, or destruction of, the equipment.

Frame 3A Drives

Connect wiring to terminals in accordance with Table 3.D, Table 3.A, Table 3.E, Figure 3.29, and the Frame 3A drive schematic on page C-2 or page C-4.

Frame 3B Drives

Connect wiring to terminals in accordance with Table 3.D, Table 3.A, Table 3.E, Figure 3.30, and the Frame 3B drive schematic on page C-10 or page C-12.

Table 3.D Power Module Control Wiring Terminal Specifications

Item	Name	Description	Wire Size Range[1]		Recommended Tightening Torque (±10%)	Wire Strip Length	Wire Terminal
			Maximum	Minimum			
❶	400/480V Line Voltage Fuses FU7, FU8, and FU9	Input filter AC power	21.1 mm^2 (#4 AWG)	2.1 mm^2 (#14 AWG)	4 N•m (35 lb•in)	[2]	[2]
	600/690V Line Voltage Fuses FU7, FU8, and FU9		21.1 mm^2 (#4 AWG)	2.1 mm^2 (#14 AWG)	4 N•m (35 lb•in)	6 mm (0.25 in.)	not applicable
❷	Terminal Blocks—TB2	Input filter control signals	3.3 mm^2 (#12 AWG)	0.3 mm^2 (#22 AWG)	1.5 N•m (13 lb•in)	13 mm (0.51 in.)	not applicable
❸	Active Converter Cassette Terminal Blocks—P1 and P2	Active Converter AC power and control wiring	3.3 mm^2 (#12 AWG)	0.3 mm^2 (#22 AWG)	0.8 N•m (7 lb•in)	8 mm (0.31 in.)	not applicable
❹	SHLD Terminal	Terminating point for control wiring shields on Power Module	2.1 mm^2 (#14 AWG)	0.3 mm^2 (#22 AWG)	1.4 N•m (12 lb•in)	10 mm (0.39 in.)	not applicable
❺	Terminal Blocks—TB5 and TB6	Power Module control wiring	4.0 mm^2 (#10 AWG)	0.2 mm^2 (#24 AWG)	1.4 N•m (12 lb•in)	8 mm (0.31 in.)	not applicable
❻	Fan—M6	Power Module Bay cooling fan	4.0 mm^2 (#10 AWG)	0.3 mm^2 (#22 AWG)	0.8 N•m (7 lb•in)	8 mm (0.31 in.)	not applicable

[1] Maximum/minimum sizes that the terminals will accept - these are not recommendations.

[2] For 400/480V applications, terminate wires with #10 spade tongue terminal. Maximum terminal width is 11 mm (0.43 in.). Wire strip length per terminal manufacture's recommendation.

Wire the Input Filter Bay to the Power Module Bay in accordance with Table 3.E and drive schematics in Appendix C.

Table 3.E Input Filter-to-Power Module Bay Wiring

From	To	Comments
FU7	PMC P2-1	PMC = Power Module, Converter
FU8	PMC P2-4	
FU9	PMC P2-7	
TB2-1	PMC P1-9	
TB2-1	PMC TB5-1	
TB2-3	M6-N	M6 = Power Module Bay Door Fan
TB2-4	PMC TB5-3	
TB2-5	PMC P1-10	
TB2-6	PMC TB5-2	
TB2-6	M6-L1	
TB2-7	M6-PE	
TB2-9	PMC TB5-4	
TB2-10	PMC TB5-7	
TB2-11	PMC TB5-5	
PMC TB5-4	PMC TB5-6	Factory-installed jumper

Figure 3.29 Frame 3A Complete Drive Control Wiring Terminal Locations

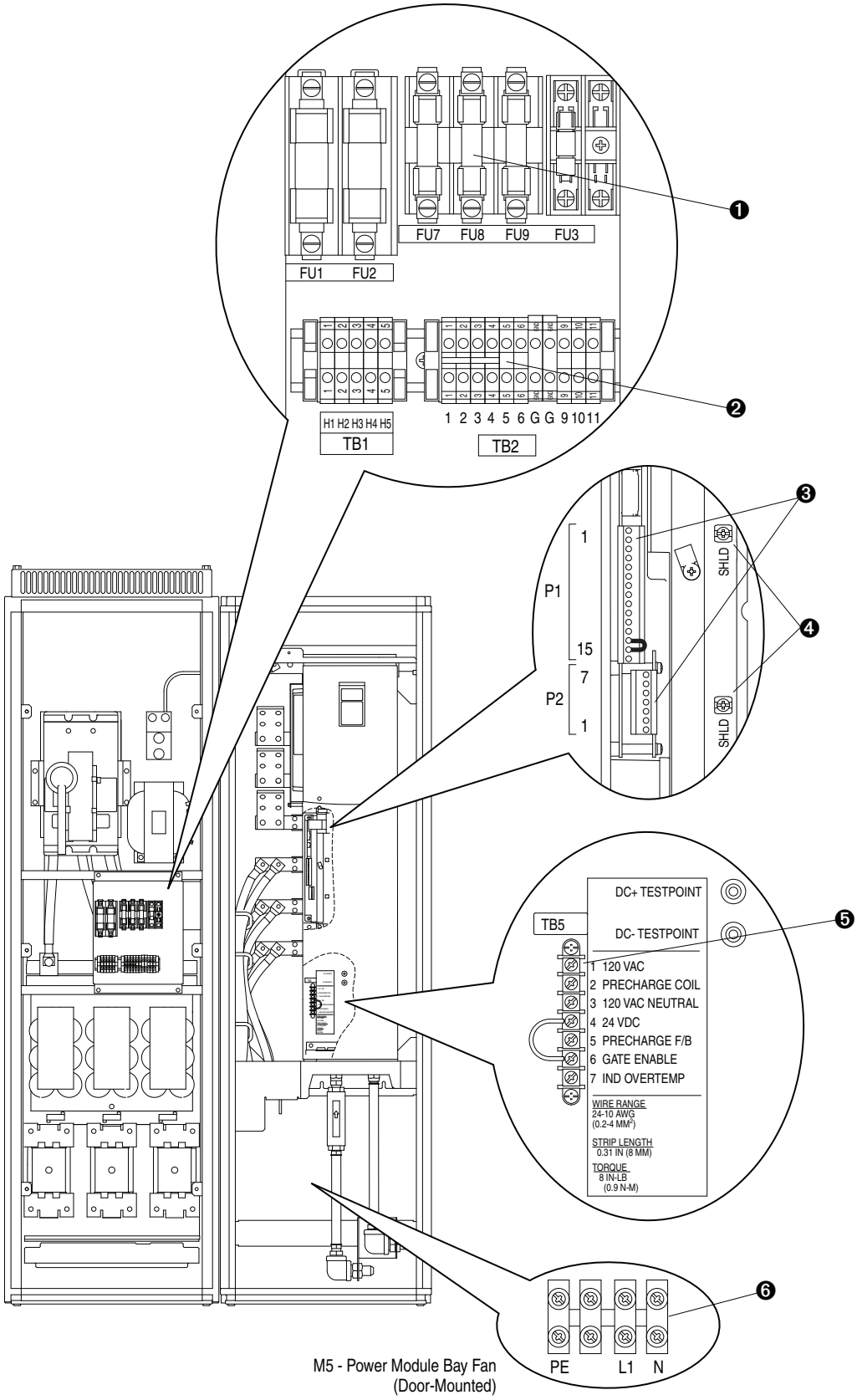
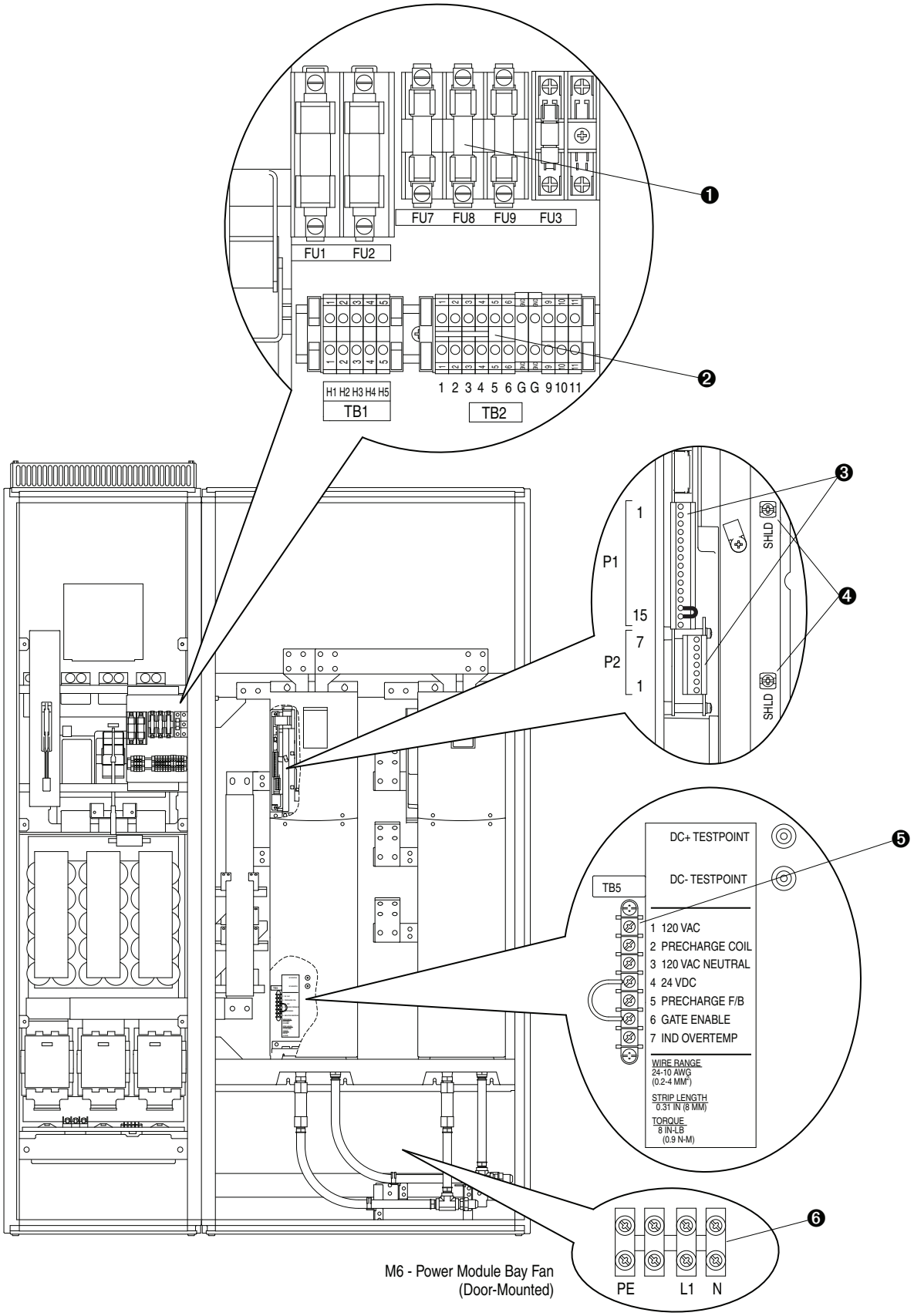


Figure 3.30 Frame 3B Complete Drive Control Wiring Terminal Locations



Synchronization Connections for Frame 3A

Coupled Power Modules

Frame 3A combined Converter/Inverter Power Modules are configured only as coupled power modules. Coupling the Converter and Inverter is achieved by using two factory-installed cables: a control synchronization cable and an inverter-to-converter DPI communication cable. The two cables are described in the next two subsections.

Control Synchronization Cable

To enable synchronization between the Inverter control board and the Converter control board, a factory-installed control synchronization cable connects each board. No user connection is required. However, the connection method is different for PowerFlex 700L drives with 700 Vector Control than for 700S Phase II Control. The 700 Vector Control synchronization cable connection is shown in Figure 3.31. The 700S Phase II Control synchronization cable connection is shown in Figure 3.32.

Figure 3.31 Frame 3A 700 Vector Control Synchronization Cable Connection

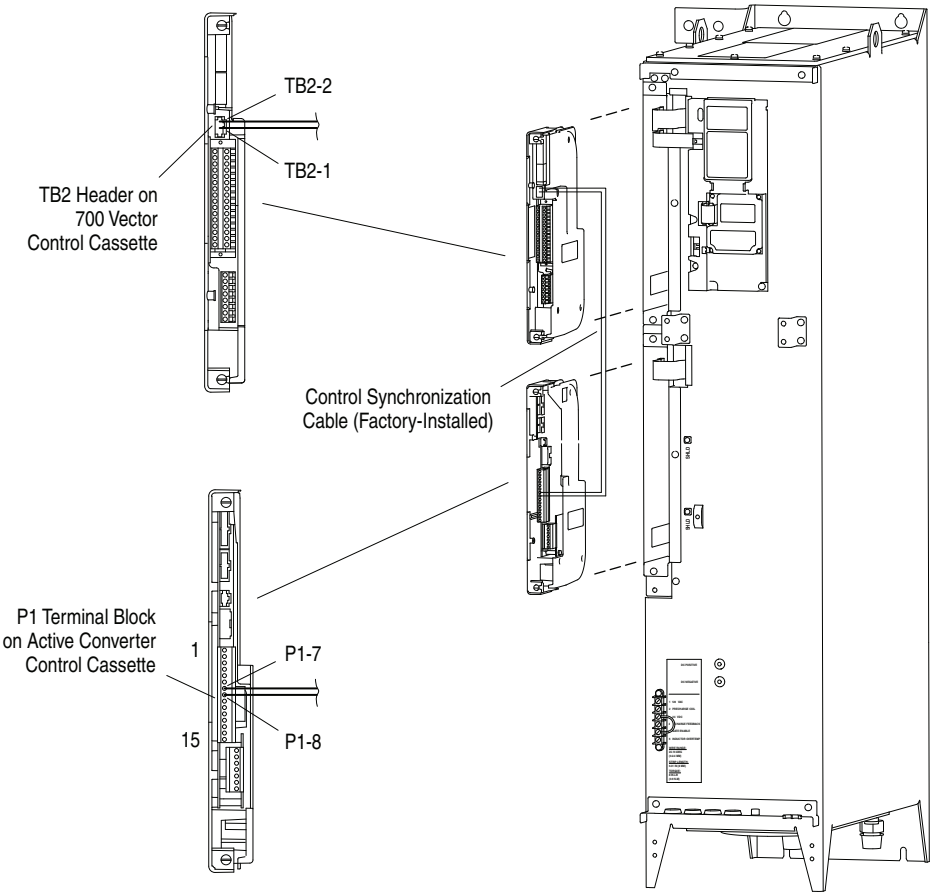
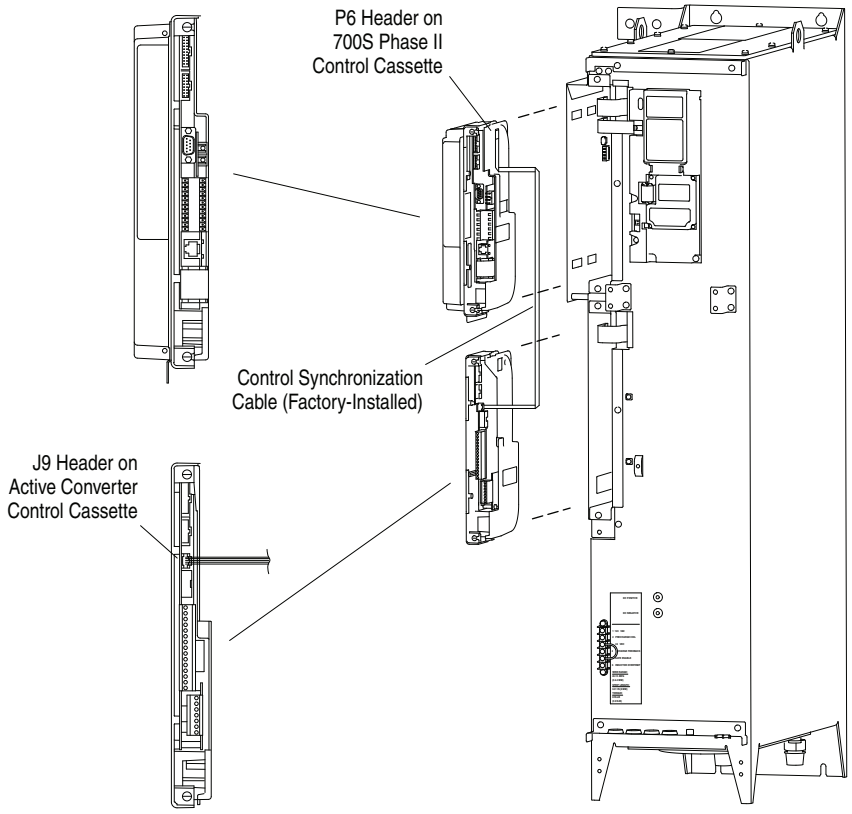


Figure 3.32 Frame 3A 700S Phase II Control Synchronization Cable Connection



Inverter-to-Converter DPI Communication Cable

To enable the Inverter and Converter section of the Frame 3A Power Module to communicate with each other, a factory-installed DPI communication cable is used. No user connection is required.

Synchronization Connections for Frame 3B

Coupled or Stand-Alone Inverter Power Modules

Frame 3B Inverter Power Modules may be configured in two ways. One way is an Inverter Power Module coupled with a Converter Power Module. The coupling is achieved by using two cables: a control synchronization cable and an inverter-to-converter DPI connection cable. The other way is a stand-alone Inverter Power Module. In this case, synchronization and DPI connection cables are not needed to connect the Inverter Power Module to the Converter Power Module. The two cables for coupling are described in the next two subsections.

Control Synchronization Cable

To enable synchronization between the Inverter control board and the Converter control board, you must connect a synchronization cable to each board. The connection method is different for PowerFlex 700L drives with 700 Vector Control than for 700S Phase II Control. The 700 Vector Control synchronization cable connection is shown in Figure 3.33. The 700S Phase II Control synchronization cable connection is shown in Figure 3.34. The appropriate version of the cable is provided in a plastic bag with each Inverter Power Module. Only one Inverter Power Module may be coupled to a Converter Power Module.

Figure 3.33 Frame 3B 700 Vector Control Synchronization Cable Connection

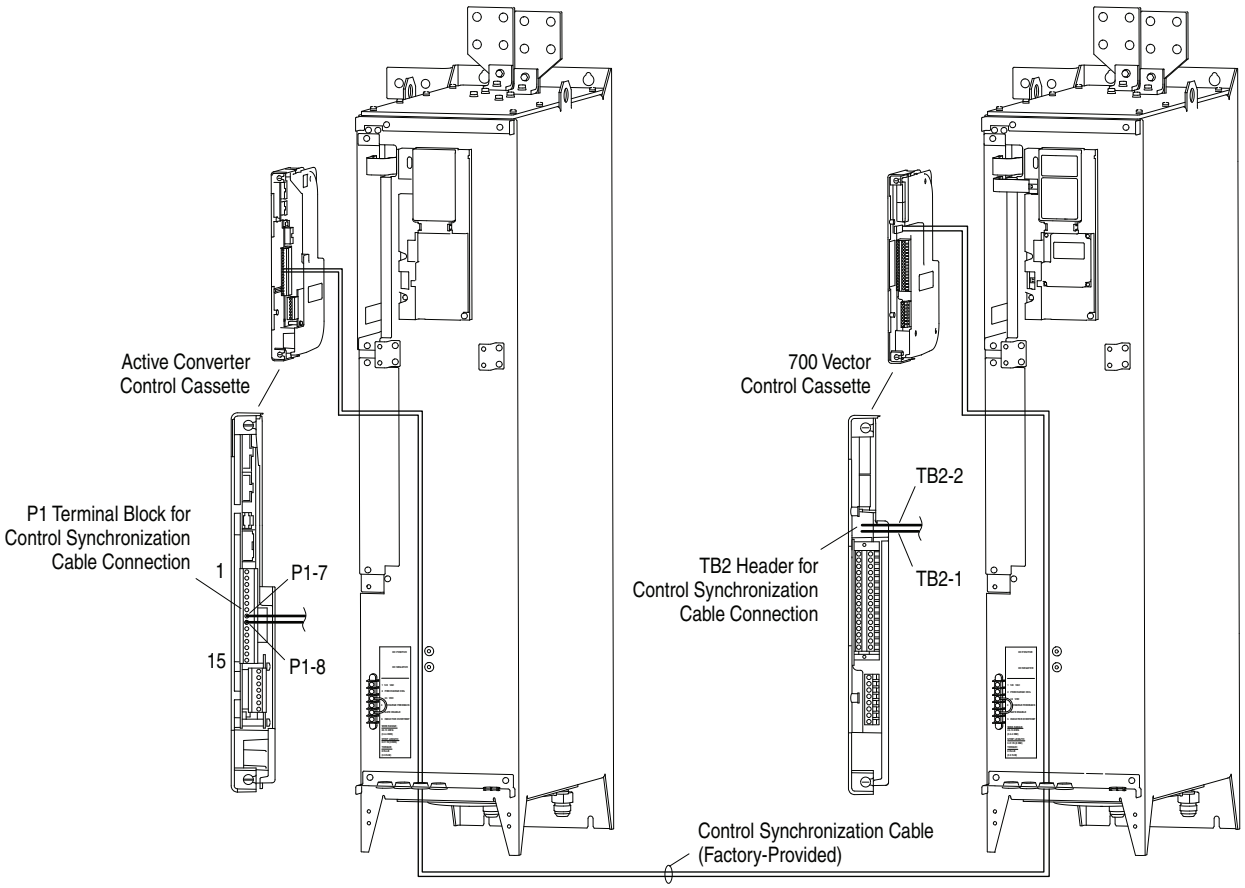
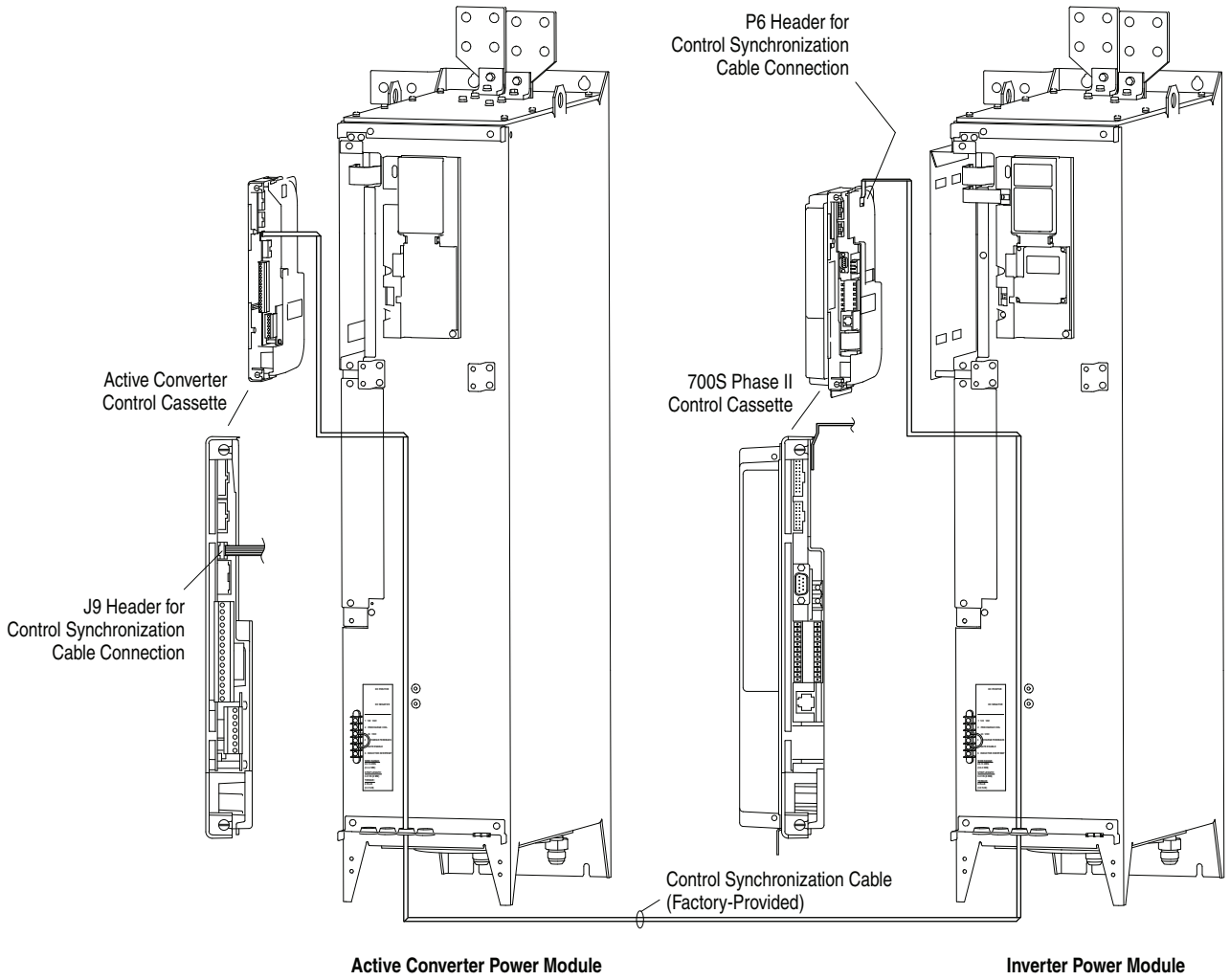


Figure 3.34 Frame 3B 700S Phase II Control Synchronization Cable Connection



Inverter-to-Converter DPI Communication Cable

To enable the Frame 3B Inverter and Converter Power Modules to communicate with each other, you must connect one DPI port on the bottom of the Converter to a DPI port on the bottom of the Inverter with a DPI communication cable (see Figure 3.36).

DPI Connections for Frame 3A and 3B Drives

Drive Connection Points

The PowerFlex 700L provides a number of cable connection points as shown in Figure 3.35 and Figure 3.36. If an additional external HIM is required for the application, the HIM can be connected to the DPI port on the bottom of the Power Module. Only one additional external HIM device may be connected. The use of two external HIM devices is not supported. If multiple external HIM devices are required, then install a user-supplied splitter cable or splitter box.

Figure 3.35 Frame 3A DPI Connection Points

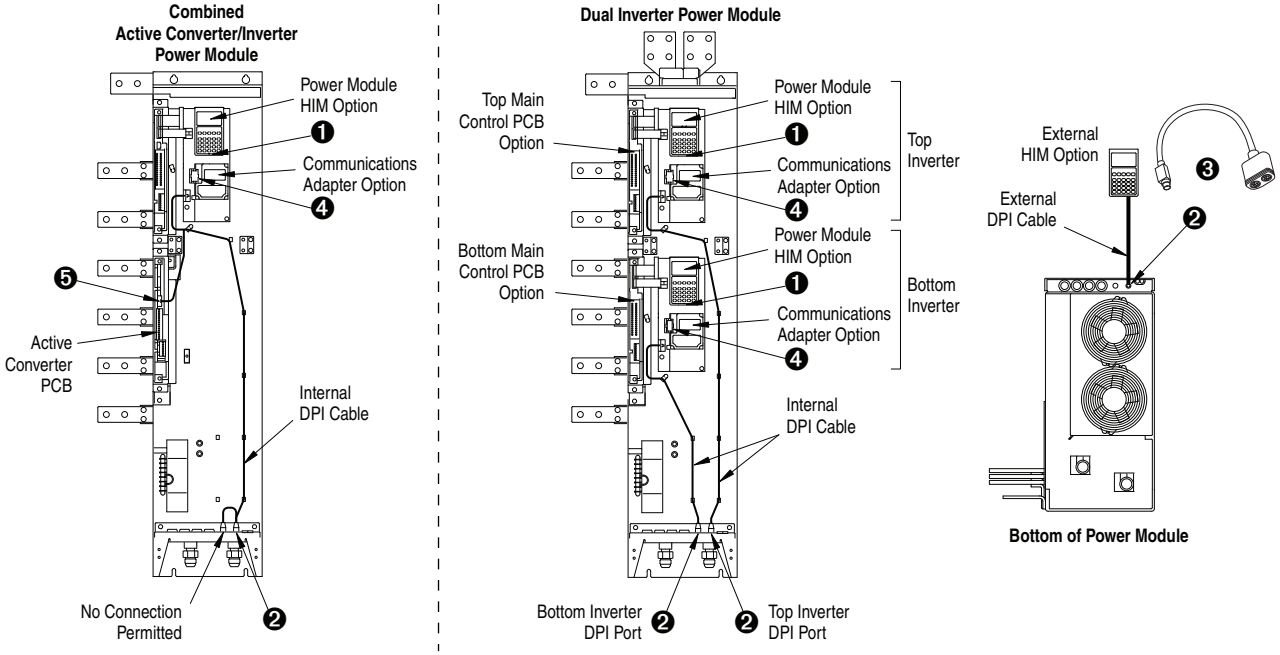
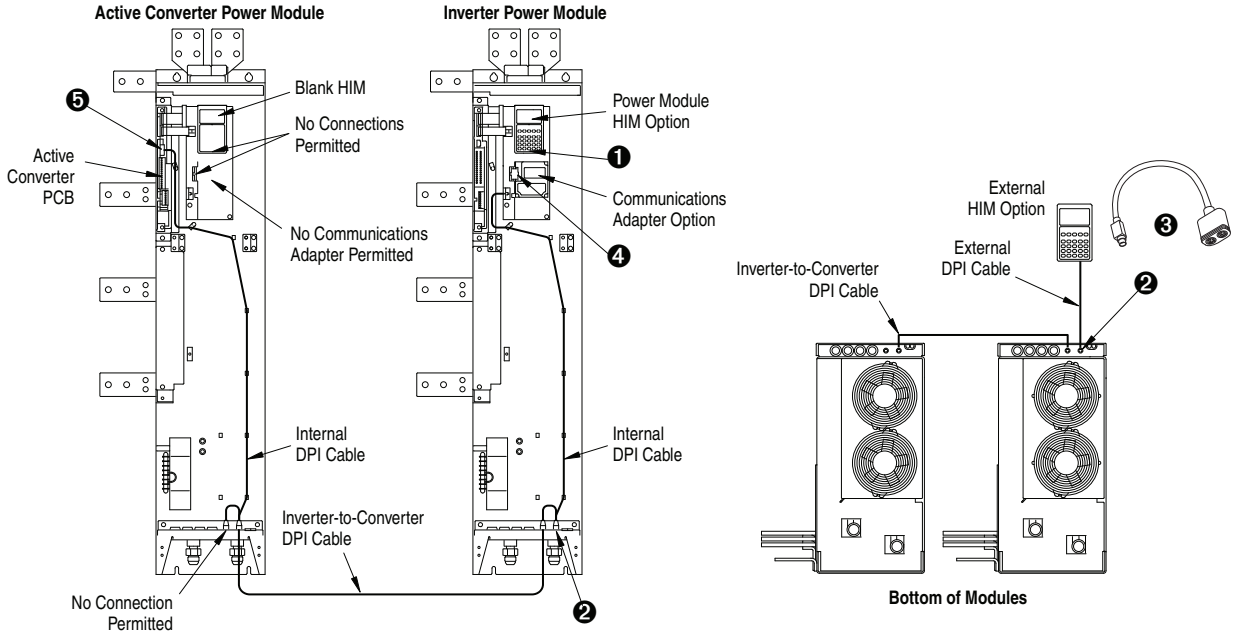


Figure 3.36 Frame 3B DPI Connection Points



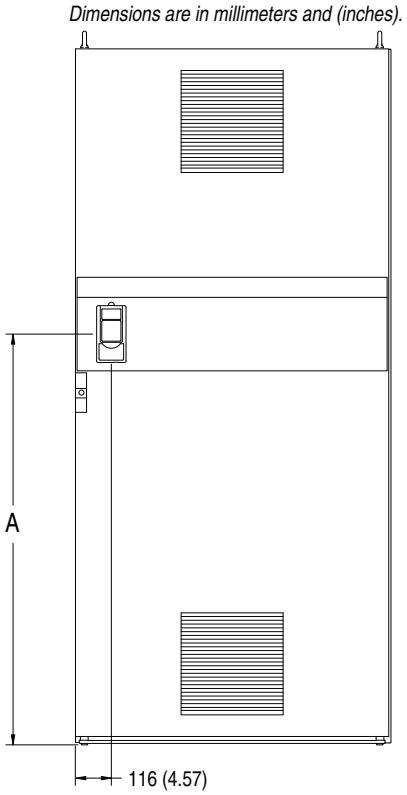
Item	Connector	Description
1	DPI Port 1	HIM connection when installed in Power Module.
2	DPI Port 2	Cable connection for handheld and remote options.
3	DPI Port 3 or 2	Splitter cable connected to DPI Port 2 provides an additional port.
4	DPI Port 5	Cable connection for communications adapter.
5	DPI Port 6	Internal DPI connection to Active Converter PCB.

External Door-Mounted HIM Connection (optional)

For complete drives, the door-mounted HIM is standard equipment. Figure 3.37 shows the location for the door mount bezel in the door of the Power Module Bay.

For power modules installed in user-supplied enclosures, an optional external door-mounted HIM may be connected as an alternative to the external HIM option. The cable supplied with the door-mount HIM option kit connects to the DPI port on the bottom of the Power Module (see Figure 3.35 for Frame 3A or Figure 3.36 for Frame 3B). For additional installation information, see the instructions provided with the door-mount HIM option kit.

Figure 3.37 Complete Drive External Door-Mounted HIM Location



Frame Size	Dimensions mm (in.)
	A
3A	1206 (47.49)
3B	1301 (51.21)

Coolant Loop Connections

See Chapter 4, Cooling Loop Installation for details.

Notes:

Cooling Loop Installation

Proper liquid cooling is critical to drive operation and reliability. This chapter provides information about the types of drive cooling loops, drive coolant requirements, and cooling loop connections for the PowerFlex 700L Liquid-Cooled drive power structure.

Explanation of Cooling Loop Types

Liquid-to-Liquid Heat Exchanger

The liquid-to-liquid heat exchanger uses a heat transfer plate to transfer heat from one liquid to another. This method requires a stable water supply from the user.

Figure 4.1 Drive and Liquid-to-Liquid Heat Exchanger Plumbing Arrangement

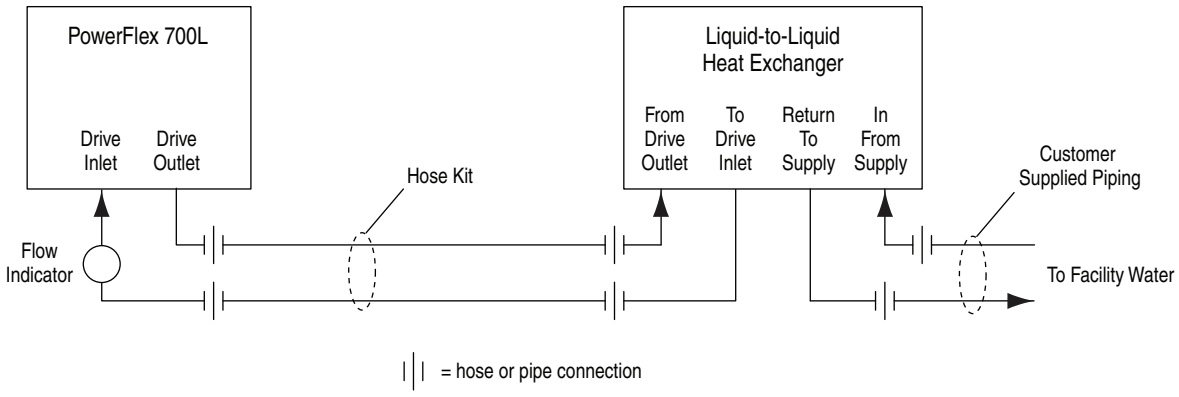
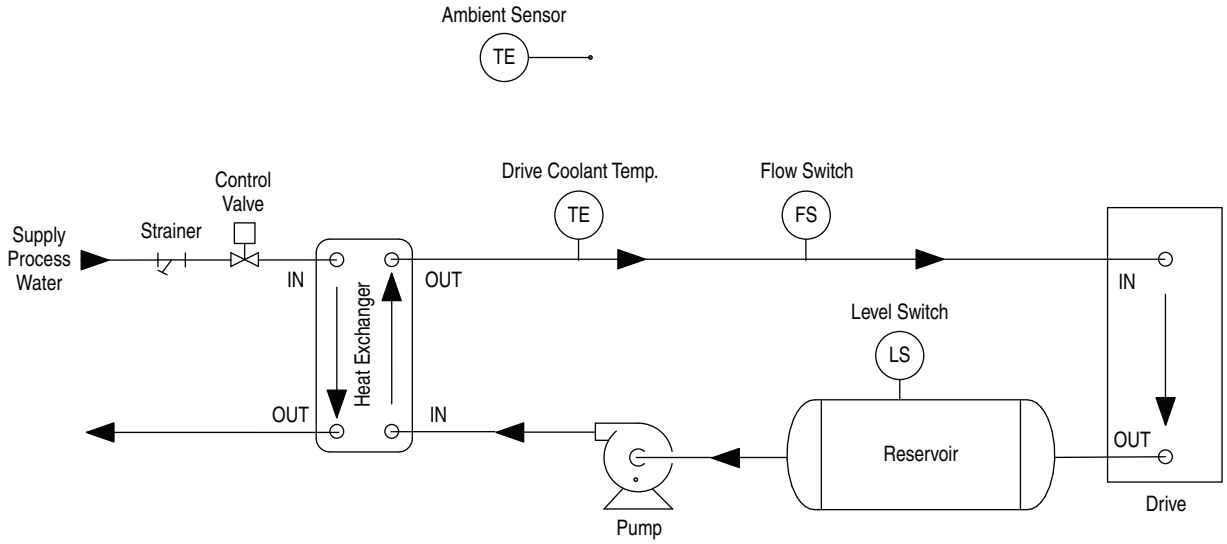


Figure 4.2 shows a cooling loop diagram for a typical liquid-to-liquid heat exchanger.

Figure 4.2 Liquid-to-Liquid Heat Exchanger Plumbing Diagram



The main components of the liquid-to-liquid heat exchanger cooling loop are listed below.

Part	Description
Strainer	Filters particles from the supply water.
Control Valve	Controls the supply loop water flow.
Heat Exchanger Plate	Transfers heat from the drive loop to the supply loop.
Ambient Sensor	Senses the ambient temperature used for the dew point control.
Drive Coolant Temperature Sensor	Senses the drive coolant temperature used for the dew point control.
Drive Coolant Flow Switch	Measures the drive coolant flow rate.
Level Switch	Senses the level of coolant in the reservoir.
Reservoir	Stores drive coolant.
Pump and Motor	Circulates drive coolant.

Liquid-to-Air Heat Exchanger

The liquid-to-air heat exchanger uses radiator technology to transfer heat from a liquid to surrounding air. This is a simple closed loop system—it does not require a water supply from the user. However, this system requires surrounding air that is 5-10 °C below the maximum operating temperature of the drive.

Figure 4.3 Drive and Liquid-to-Air Heat Exchanger Plumbing Arrangement

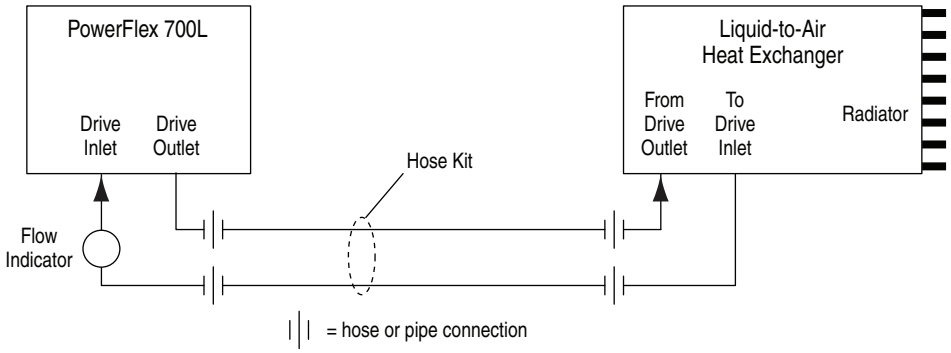
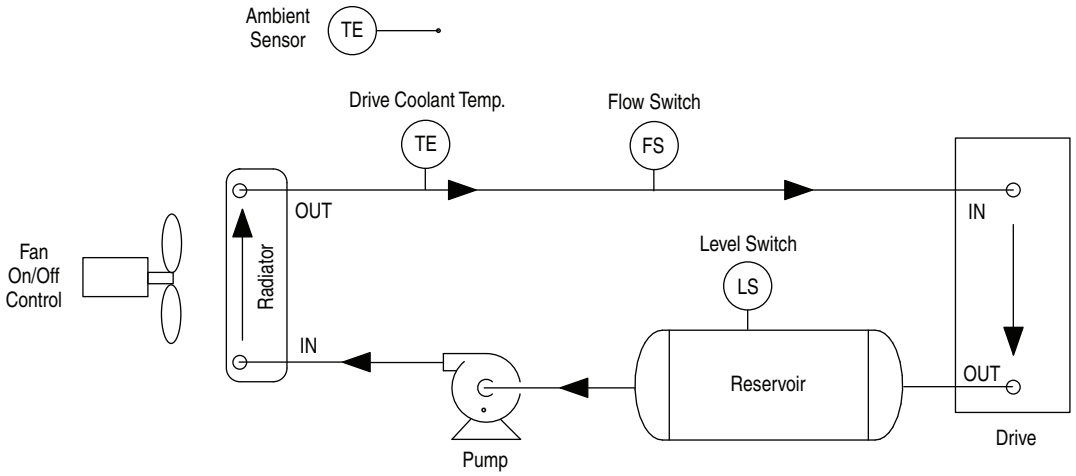


Figure 4.4 shows a cooling loop diagram for a typical liquid-to-air heat exchanger.

Figure 4.4 Liquid-to-Air Heat Exchanger Plumbing Diagram



The main components of the liquid-to-air heat exchanger cooling loop are listed below.

Part	Description
Fan	Blows air across the radiator.
Radiator	Transfers heat from liquid to air.
Ambient Sensor	Senses the ambient temperature used for the dew point control.
Drive Coolant Temperature Sensor	Senses the drive coolant temperature used for the dew point control.
Drive Coolant Flow Switch	Measures the drive coolant flow rate.
Level Switch	Senses the level of coolant in the reservoir.
Reservoir	Allows for expansion of coolant.
Pump and Motor	Circulates drive coolant.

Chiller

The chiller uses refrigerant to transfer heat from a liquid to air. This is a simple closed loop system—it does not require a water supply from the user. A chiller can achieve almost any coolant temperature required. Coolant temperature should be at or above ambient temperature to avoid condensation on drive components.

Figure 4.5 Drive and Chiller Plumbing Arrangement

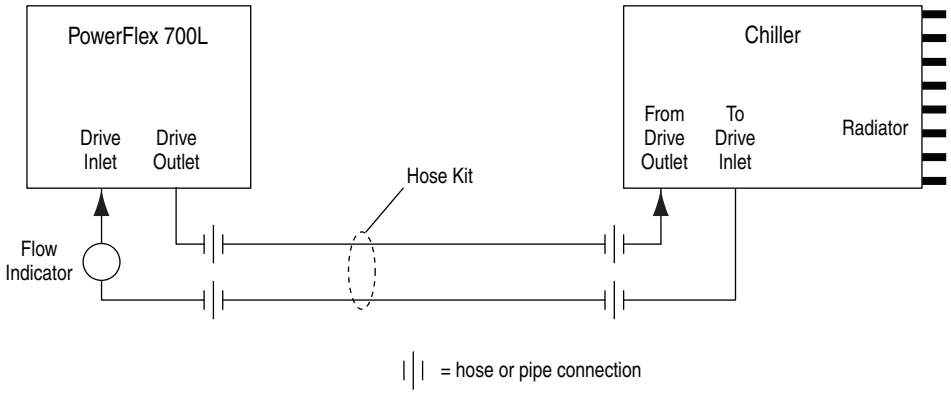
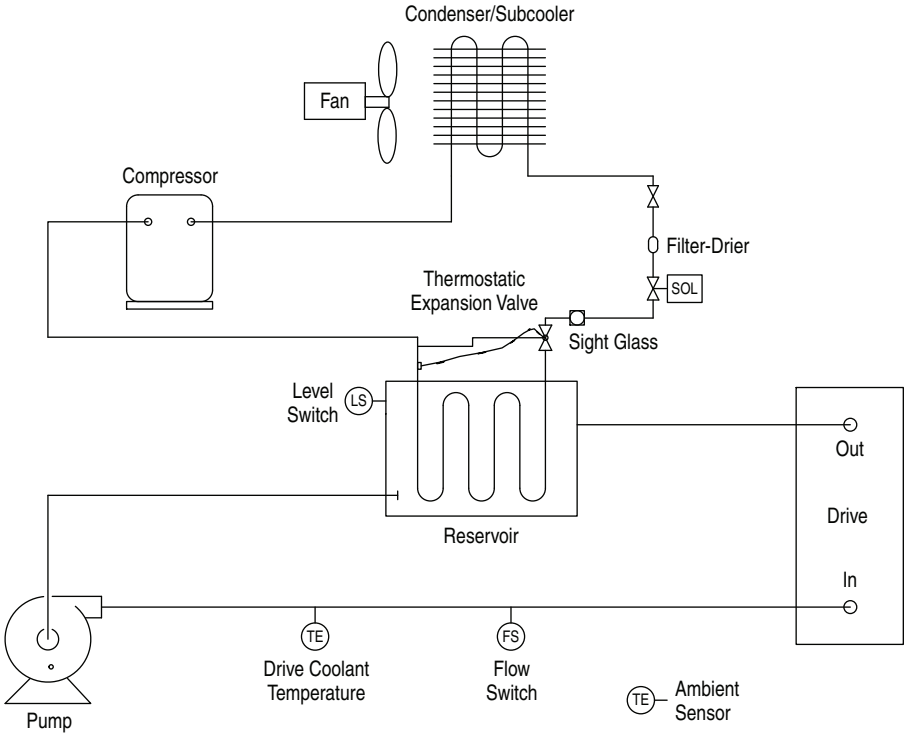


Figure 4.6 shows a cooling loop diagram for a typical chiller.

Figure 4.6 Chiller Plumbing Diagram



The main components of the chiller cooling loop are listed below.

Part	Description
Compressor	Forces the refrigerant into a smaller space.
Fan	Blows air across the condenser/subcooler.
Condenser/Subcooler	Cools the refrigerant.
Filter-Drier	Filters the refrigerant.
Sight Glass	Allows viewing of the level of drive coolant in the reservoir.
Thermostatic Expansion Valve	Allows for expansion of the refrigerant.
Level Switch	Senses the level of coolant in the reservoir.
Reservoir	Allows for expansion of coolant.
Pump and Motor	Circulates drive coolant.
Drive Coolant Temperature Sensor	Senses the drive coolant temperature used for the dew point control.
Drive Coolant Flow Switch	Measures the drive coolant flow rate.
Ambient Sensor	Senses the ambient temperature used for the dew point control.

Cooling Loop Resources

Cooling loops are available from many suppliers, such as Dimplex Thermal Solutions, which can be contacted as follows:

USA and Canada: 1-800-968-5665
Elsewhere: 1-269-349-6800

Cooling Loop Application Guidelines

ATTENTION: Risk of equipment damage exists. Do not use ferrous and plated-ferrous materials for pipe-treated water to the power modules and drive. Use of ferrous materials degrades the performance of the power module chillplate.

This section is intended to provide guidelines for applying the cooling loops.

1. The allowable drive coolant temperature range is listed below:
   - Frame 2 Drives: 0…50 °C (32…122 °F)
   - Frame 3A and 3B Drives: 0…40 °C (32…105 °F)

   When using coolant at a temperature below the dew point of the surrounding air, condensation can accumulate on the drive heatsink and/or circuit boards, which can damage the drive. In this situation, install a coolant flow regulating device and tube/hose insulation. A flow regulating device modulates the coolant flow rate to a level that permits the drive heatsink temperature to rise above the dew point. Insulation for customer side tube or hose can be closed-cell foam insulation with a minimum 12.7 mm (0.50 in.) wall thickness.

2. Include a flow switch in the cooling loop on the connection to the drive inlet to turn off the drive if coolant flow drops below the minimum flow required by the drive (see Table 4.C).

3. Circulate coolant through the drive only when the drive is also powered. Failure to do this can result in condensation accumulating on the drive heatsink and/or circuit boards, which could damage the drive.

4. Use an interlock from the cooling loop to stop the drive when the cooling loop is faulted.

5. For applications requiring a closed loop coolant system, vent the system to remove air that can otherwise degrade the performance of the drive heatsink.

6. Install a flow measuring device at the inlet of each Converter and each Inverter Power Module. Note that flow measuring devices are included in the PF700L Frame 3A and 3B Complete Drive cabinets (13th position in catalog number = A). The coolant flow rate (GPM) must meet the requirements in Table 4.C.

7. We recommend the following types of pipe for cooling loop connections:
   - Copper tubing, type L
   - Brass pipe
   - Stainless steel, 300 series

   Important: Do not use galvanized pipe.

8. Provide a method in the cooling loop for draining and replacing the coolant.

Drive Coolant Connections

Frame 2 Drive or Frame 3A or 3B Power Module

For locations of the coolant inlet and outlet connections on PowerFlex 700L Frame 2 drives, see Figure 2.10. For locations on Frame 3A and 3B Power Modules, see Figure 3.20.

The rated working pressure of the Frame 2 drive is 6.89 bar (100 psi). Size coolant supply and return lines for 76 LPM (20 gpm) / 6.89 bar (100 psi) service with a maximum operating temperature of 50 °C (122 °F). The required operating flow rate and pressure drop is specified in Table 4.C.

The rated working pressure of the Frame 3A or 3B Power Module is 12.76 bar (185 psi). Size coolant supply and return lines for 38 LPM (10 gpm) / 12.76 bar (185 psi) service with a maximum operating temperature of 40 °C (105 °F). The required operating flow rate and pressure drop is specified in Table 4.C.

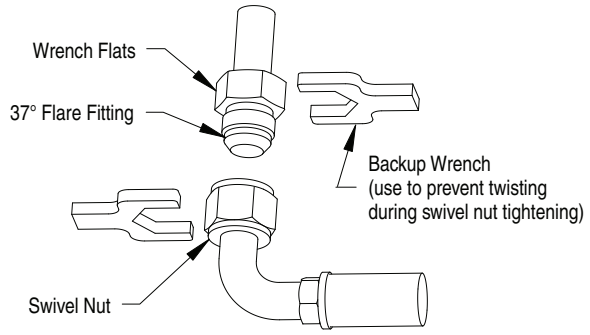
Coolant connections for Frame 2 drives and Frame 3A and 3B Power Modules are made using 37 degree flare fittings which have a:

- 3/4-inch nominal size
- "-12" SAE dash size
- 1-1/16-12 UN/UNF-2B external thread size

The mating connection is shown in Figure 4.7. To make the mating coolant connection, follow these steps.

1. Assemble the mating version of the fitting (with swivel nut) to each fluid fitting, and tighten to a wrench resistance of approximately 3.4 N•m (30 lb•in).
2. Using a backup wrench on the Power Module fitting, tighten the swivel nut fitting by either of the following two methods:
   - Hex flats from wrench resistance method (recommended): one and one-quarter (1-¼) hex flat from wrench resistance.
   - Torque method: 69…77 N•m (51…57 lb•ft).

Figure 4.7 Power Module Mating Coolant Connection



Frame 3A or 3B Complete Drive

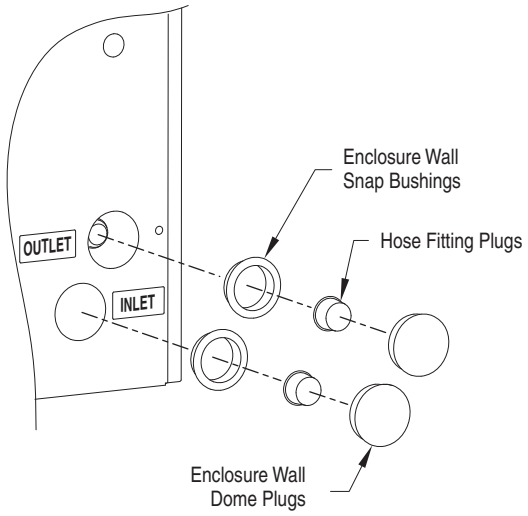
For locations of the coolant inlet and outlet connections on PowerFlex 700L Frame 3A Complete Drives, see Figure 3.18 (front and side views). For locations on Frame 3B Complete Drives, see Figure 3.21 (front and side views).

The rated working pressure of the Frame 3A and 3B Complete Drive is 6.89 bar (100 psi). Size coolant supply and return lines for 76 LPM (20 gpm) / 6.89 bar (100 psi) service with a maximum operating temperature of 40 °C (105 °F). The required operating flow rate is specified in Table 4.C.

Before connecting the coolant hoses to the Complete Drive hose fittings located at the lower-right back corner of the drive enclosure, see Figure 4.8 and perform these steps.

1. Remove the factory-installed hose fitting plugs and the enclosure wall dome plugs.
2. Install the factory-supplied snap bushings to the enclosure wall.

Figure 4.8 Frame 3A and 3B Complete Drive Coolant Connection Components



Frame 3A and Frame 3B Complete Drive coolant connections are made using 37 degree flare fittings which have a:

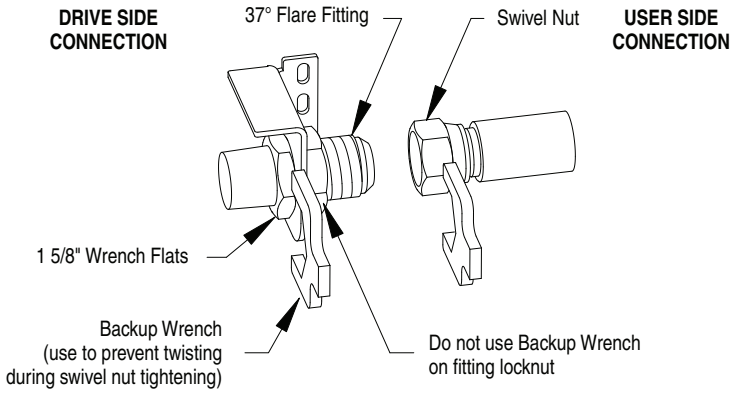
- 1-inch nominal size
- “-16” SAE dash size
- 1-5/16-12 UN/UNF-2B external thread size

The mating connection is shown in Figure 4.9. To make the mating coolant connection, follow these steps.

1. Assemble the mating version of the fitting (with swivel nut) to each fluid fitting, and tighten to a wrench resistance of approximately 3.4 N•m (30 lb•in).

2. Using a backup wrench on the Complete Drive fitting, tighten the swivel nut fitting by either of the following two methods:
   - Hex flats from wrench resistance method (recommended): one (1) hex flat from wrench resistance.
   - Torque method: 103…109 N•m (76…81 lb•ft).

Figure 4.9 Frame 3A and 3B Complete Drive Mating Coolant Connection



Depending on the location of the heat exchanger or chiller relative to the drive, the following drive cooling loop hose kits are available.

Table 4.A Drive Cooling Loop Hose Kits

Hose Length	Hoses in Kit	Drive Side (1) Coupling Size	Heat Exchanger Side Coupling Size	Used With	Hose Kit (2) Catalog Number
3 m (10 ft)	2	0.75 inch	0.75 inch	Frame 2	20L-GH10-B1
9.1 m (30 ft)	2	0.75 inch	0.75 inch	Frame 2	20L-GH30-B1
3 m (10 ft)	2	1 inch	1 inch with 90° elbow	Frame 3A	20L-GH10-A2
9.1 m (30 ft)	2	1 inch	1 inch with 90° elbow	Frame 3A	20L-GH30-A2
3 m (10 ft)	2	1 inch	1 inch	Frame 3B	20L-GH10-A1
9.1 m (30 ft)	2	1 inch	1 inch	Frame 3B	20L-GH30-A1

(1) All drive side hose kit fittings are 37 degree flare.

(2) Each hose kit contains two (2) hoses and the appropriate connectors.

Drive Coolant Requirements

Recommended Coolants

Table 4.B lists approved sources and recommended coolants with appropriate corrosion inhibitors for the drive loop.

Table 4.B Recommended Drive Loop Coolants

Source	Coolant
Interstate Chemical http://www.interstatechemical.com/contact.htm	• NFP-50 (1); a 50/50 premix of propylene glycol and distilled water • NFE-50 (1); a 50/50 premix of ethylene glycol and distilled water
Koolant Koolers/Dimplex Thermal Solutions http://www.koolantkoolers.com/index.php/nic=contact	• K-Kool-E (1); ethylene glycol (available premixed with distilled water) • Propylene glycol (1) also available
Dow Chemical http://www.dow.com	• Dowtherm® SR-1 (2); ethylene glycol • Dowfrost® (2); propylene glycol Dowtherm and Dowfrost are registered trademarks of the Dow Chemical Company

(1) Available in 5 gallon pails.
(2) Not premixed with distilled water, and may not be available in 5 gallon quantities.

Non-premixed coolants require a coolant-to-water mix ratio of 50% by volume.

Important: Since coolant performance slowly degrades over time, we recommend replacing the drive loop coolant every two years and/or whenever the loop is drained for servicing.

Corrosion Inhibitor

If an approved coolant is not used, the drive coolant must consist of clean water **with a corrosion inhibitor**. An approved corrosion inhibitor is Chemtool, Inc. (www.chemtool.com) part number Watertool 4435-C. The recommended concentration of the inhibitor is 8-10% by volume. **Deionized water is prohibited**. Use distilled water or water with less than 50 ppm concentrations of these chemical compounds:

- Sulfate and chloride
- Hard water ions such as Mg++ and Ca++

ATTENTION: Ethylene and propylene glycols must be inhibited and silicate free. **Use of common silicate-containing, automotive-type ethylene glycol solutions is prohibited as they can damage the heat exchanger and/or drive and cooling module equipment.**

The drive coolant must be compatible with the following materials:

- Copper
- Brass
- Aluminum
- Arimid fiber gasket with nitrile binder (Garlock, Inc. Blue-Gard 3000®)

  Blue-Gard 3000 is a registered trademark of Garlock, Inc.
- Synthetic rubber hose (Parker Hannifan Corp 801 General Purpose Hose)
- Viton seal (only Complete Drive)

Biocide

A biocide may be needed to control biological growth. Use of a biocide is permitted. For specific recommendations, consult a reputable water treatment company.

Drive Cooling Loop Specifications

Table 4.C Coolant Requirements for One Frame 2, 3A or 3B Drive

Drive Frame Size	Coolant Temperature Range	Minimum Coolant Flow Rate	Pressure Drop (2) From Drive Inlet to Drive Outlet at Minimum Coolant Flow Rate	Coolant Type
2	0…50 °C (32…122 °F)	30.3 LPM (8 gpm)	1.58 bar (23 psi)	WEG50 (3) or WPG50 (4)
3A	0…40 °C (32…104 °F)	30.3 LPM (8 gpm)	0.35 bar (5 psi)	
3B	0…40 °C (32…104 °F)	56.8 LPM (15 gpm) (1)	0.48 bar (7 psi) (1)	

(1) Frame 3B includes separate converter and inverter power modules. A single inverter or converter power module requires a minimum flow rate of 30.3 LPM (8 gpm) at 0.35 bar (5 psi).

(2) Pressure drop does not include any system connections such as hoses or piping. Cooling systems must be sized to provide minimum flow considering entire system pressure drop.

(3) WEG50 equals good quality or distilled water with approved, **inhibited*** ethylene glycol, 50% glycol by volume.

(4) WPG50 equals good quality or distilled water with approved, **inhibited*** propylene glycol, 50% glycol by volume.

* Inhibited ethylene glycol or propylene gylcol must contain a corrosion inhibitor. See Corrosion Inhibitor on page 4-10 for an approved source.

Table 4.D lists the estimated amount of coolant needed for the drive loop based on the drive frame size. For recommended drive loop coolants, see Table 4.B.

Table 4.D Estimated Coolant Amount for the Drive Loop

Drive Size	Estimated Amount of Coolant (1)
Frame 2	15.1 liters (4 gal)
Frame 3A	19 liters (5 gal)
Frame 3B	19 liters (5 gal)

(1) The estimated amount of coolant is based on the heat exchanger using 1.2 m (4 ft) hoses. Longer hoses require more coolant. The maximum hose length of 9.1 m (30 ft) would require up to an additional 2.8 liters (3/4 gal).

Notes:

Programming and Parameters

This chapter provides information about specific 700 Vector Control parameters and specific 700S Phase II Control parameters that are affected when used in a PowerFlex 700L Liquid-Cooled drive power structure.

Affected 700 Vector Control Parameters

Utility File

For the following Utility file parameters, Bit 20 is set when there is an alarm present in the Active Converter.

File	Group	No.	Parameter Name & Description	Values
UTILITY	Diagnostic	211	**[Drive Alarm 1]** Displays alarm conditions that presently exist in the drive. "Prof SetHome" will be set if the alarm is configured in [Alarm Config 1], "Prof/Indexer" is configured in [Speed/Torque Mod] and the homing routine has not been successfully completed.	Read Only

Bit Definition		Ground Warn	Load Loss	In PhaseLoss	Motor Therm	Waking	Decel Inhibt	Drv OL Lvl 2	Drv OL Lvl 1		IntDBRes OH	Anlg in Loss	Str At PwrUp	Power Loss	UnderVoltage	Prechrg Actv
Default	x	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

1 = Condition True
0 = Condition False
x = Reserved

Bit Definition												Active Cnvtr		PTC HW	Prof SetHome	Adj Volt Ref
Default	x	x	x	x	x	x	x	x	x	x	x	0	x	0	0	0
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

1 = Condition True
0 = Condition False
x = Reserved

File	Group	No.	Parameter Name & Description	Values
UTILITY	Diagnostic	229	**[Alarm 1 @ Fault]** Captures and displays [Drive Alarm 1] at the time of the last fault.	Read Only

Bit Definition		Ground Warn	Load Loss	In PhaseLoss	Motor Therm	Waking	Decel Inhibt	Drv OL Lvl 2	Drv OL Lvl 1		IntDBRes OH	Anlg in Loss	Str At PwrUp	Power Loss	UnderVoltage	Prechrg Actv
Default	x	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

1 = Condition True
0 = Condition False
x = Reserved

Bit Definition												Active Cnvtr		PTC HW	Prof SetHome	Adj Volt Ref
Default	x	x	x	x	x	x	x	x	x	x	x	0	x	0	0	0
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

1 = Condition True
0 = Condition False
x = Reserved

File	Group	No.	Parameter Name & Description	Values
	Alarms	259	**[Alarm Config 1]** Enables/disables alarm conditions that will initiate an active drive alarm.	

Bit Definition		Ground Warn	Load Loss	In PhaseLoss	Motor Therm	Waking	Decel Inhibt	Drv OL Lvl 2	Drv OL Lvl 1		IntDBRes OH	Anlg in Loss	Str At PwrUp	Power Loss	UnderVoltage	Prechrg Actv
Default	x	0	0	0	0	0	0	0	0	x	0	0	0	0	0	0
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

1 = Condition True
0 = Condition False
x = Reserved

Bit Definition												Active Cnvtr		PTC HW	Prof SetHome	Adj Volt Ref
Default	x	x	x	x	x	x	x	x	x	x	x	0	x	0	0	0
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

1 = Condition True
0 = Condition False
x = Reserved

Communication File

For the following Communication file parameters, Bit 6 is available and is set when DPI port 6 is indicated.

File	Group	No.	Parameter Name & Description	Values
COMMUNICATION	Comm Control	274	**[DPI Port Sel]** Selects which DPI port reference value will appear in [DPI Port Value].	Default: 1 "DPI Port 1" Options: 1 - 6 "DPI Port 1 - 6"
	Masks & Owners	276	**[Logic Mask]** Determines which ports can control the drive when [Write Mask Act], bit 15 is set to "1." If the bit for a port is set to "0," the port will have no control functions except for stop. Bit Definition: DPI Port 6, DPI Port 5, DPI Port 4, DPI Port 3, DPI Port 2, DPI Port 1, Digital In Default: x x x x x x x x x 1 1 1 1 1 1 1 Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Control Permitted 0 = Control Masked x = Reserved	
		277	**[Start Mask]** Controls which adapters can issue start commands.	See [Logic Mask]
		278	**[Jog Mask]** Controls which adapters can issue jog commands.	See [Logic Mask]
		279	**[Direction Mask]** Controls which adapters can issue forward/reverse commands.	See [Logic Mask]
		280	**[Reference Mask]** Controls which adapters can select an alternate reference; [Speed Ref A, B Sel] or [Preset Speed 1-7].	See [Logic Mask]
		281	**[Accel Mask]** Controls which adapters can select [Accel Time 1, 2].	See [Logic Mask]
		282	**[Decel Mask]** Controls which adapters can select [Decel Time 1, 2].	See [Logic Mask]
		283	**[Fault Clr Mask]** Controls which adapters can clear a fault.	See [Logic Mask]
		284	**[MOP Mask]** Controls which adapters can issue MOP commands to the drive.	See [Logic Mask]
		285	**[Local Mask]** Controls which adapters are allowed to take exclusive control of drive logic commands (except stop). Exclusive "local" control can only be taken while the drive is stopped.	See [Logic Mask]
		288	**[Stop Owner]** Adapters that are presently issuing a valid stop command. Bit Definition: DPI Port 6, DPI Port 5, DPI Port 4, DPI Port 3, DPI Port 2, DPI Port 1, Digital In Default: x x x x x x x x x 1 1 1 1 1 1 1 Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Issuing Command 0 = No Command x = Reserved	Read Only
		289	**[Start Owner]** Adapters that are presently issuing a valid start command.	See [Stop Owner]
		290	**[Jog Owner]** Adapters that are presently issuing a valid jog command.	See [Stop Owner]

File	Group	No.	Parameter Name & Description	Values
COMMUNICATION	Masks & Owners	291	**[Direction Owner]** Adapter that presently has exclusive control of direction changes.	See [Stop Owner]
		292	**[Reference Owner]** Adapter that has the exclusive control of the command frequency source selection.	See [Stop Owner]
		293	**[Accel Owner]** Adapter that has exclusive control selecting [Accel Time 1, 2].	See [Stop Owner]
		294	**[Decel Owner]** Adapter that has exclusive control selecting [Decel Time 1, 2].	See [Stop Owner]
		295	**[Fault Clr Owner]** Adapter that is presently clearing a fault.	See [Stop Owner]
		296	**[MOP Owner]** Adapters that are presently issuing increases or decreases in MOP command frequency.	See [Stop Owner]
		297	**[Local Owner]** Adapter that has requested exclusive control of all drive logic functions. If an adapter is in local lockout, all other functions (except stop) on all other adapters are locked out and non-functional. Local control can only be obtained when the drive is not running.	See [Stop Owner]
	Security	595	**[Port Mask Act]** Bits 0-6 indicate status for DPI port communications. Bit 15 indicates when security software is controlling the parameter. Bit Definition: Security, x, x, x, x, x, x, x, DPI Port 6, DPI Port 5, DPI Port 4, DPI Port 3, DPI Port 2, DPI Port 1, Host Default: 0 x x x x x x x x 1 1 1 1 1 1 1 Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Active 0 = Not Active x = Reserved	Read Only
		596	**[Write Mask Cfg]** Enables/disables write access (parameters, links, etc.) for DPI ports. Changes to this parameter only become effective when power is cycled, the drive is reset, or bit 15 of [Write Mask Actv] transitions from “1” to “0.” Bit Definition: x, x, x, x, x, x, x, x, DPI Port 6, DPI Port 5, DPI Port 4, DPI Port 3, DPI Port 2, DPI Port 1, x Default: x x x x x x x x 1 1 1 1 1 1 1 x Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Write Permitted 0 = Read Only x = Reserved	
		597	**[Write Mask Act]** Status of write access for DPI ports. When bit 15 is set, network security is controlling the write mask instead of [Write Mask Cfg]. Bit Definition: Security, x, x, x, x, x, x, x, DPI Port 6, DPI Port 5, DPI Port 4, DPI Port 3, DPI Port 2, DPI Port 1, x Default: 0 x x x x x x x x 1 1 1 1 1 1 1 x Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Write Permitted 0 = Read Only x = Reserved	Read Only
		598	**[Logic Mask Act]** Indicates status of the logic mask for DPI ports. When bit 15 is set, network security is controlling the logic mask instead of [Logic Mask]. Bit Definition: Security, x, x, x, x, x, x, x, DPI Port 6, DPI Port 5, DPI Port 4, DPI Port 3, DPI Port 2, DPI Port 1, Digital In Default: 0 x x x x x x x x 1 1 1 1 1 1 1 1 Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Control Permitted 0 = Control Masked x = Reserved	Read Only

Affected 700S Phase II Control Parameters

When a PowerFlex 700L Liquid-Cooled drive is present, the following 700S Phase II Control functions are affected:

- Supports DPI communication ports 1 through 6.
- Supports DPI Type III communication with an active converter.
- Supports the power structure fault latch and multiple NTCs.
- Supports IT (Junction Temperature Calculation) mode.
- Bus regulator mode is disabled when an active converter is present.
- Fast Flux-up current is limited to 40% of motor nameplate current instead of 70% (PowerFlex 700S).

Utility File

In the Utility file - Diagnostics group, the following parameters are available when a PowerFlex 700L Liquid-Cooled AC drive is present.

No.	Name Description	Values
332	**700L EventStatus** Indicates the presence of certain drive anomalies for the PowerFlex 700L Liquid-Cooled drive. Bit 0 [Dsat Phs U1] indicates that the primary structure detected a Dsat on phase U. Bit 1 [Dsat Phs V1] indicates that the primary structure detected a Dsat on phase V. Bit 2 [Dsat Phs W] indicates that the primary structure detected a Dsat on phase W. Bit 3 [Ovr Current1] indicates that the primary structure detected an over current. Bit 4 [Ovr Volt1] indicates that the primary structure detected an over voltage. Bit 5 [Asym DcLink1] indicates that the primary structure detected an unbalanced DC Link. Bit 6 [Pwr Suply1]indicates that the primary structure detected a power supply failure. Bit 7 [HW Disable1] indicates that the primary structure detected a hardware disable. Bit 8 [Latch Err1] indicates that the primary structure fault was generated but no indicating bit was set. Bit 9 [Fan Fail1] indicates Bit 12 [NonCnfgAlarm] indicates Bit 13 [Cnv Faulted] indicates Bit 14 [Cnv NotLogin] indicates the converter was expected but none logged in. Bit 15 [Cnv NotStart] indicates the converter was commanded to start but did not become active. Bit 16 [Dsat Phs U2] indicates the second structure detected a Dsat on phase U. Bit 17 [Dsat Phs V2] indicates the second structure detected a Dsat on phase V. Bit 18 [Dsat Phs W2] indicates the second structure detected a Dsat on phase W. Bit 19 [Ovr Current2] indicates the second structure detected an over current. Bit 20 [Ovr Volt2] indicates the second structure detected an over voltage. Bit 21 [Asym DcLink2] indicates the second structure detected an unbalanced DC Link. Bit 22 [Pwr Suply2] indicates the second structure detected a power supply failure. Bit 23 [HW Disable2] indicates the second structure detected a hardware disable. Bit 24 [Latch Err2] indicates the second structure fault was generated but no indicating bit was set. Bit 25 [Fan Fail2] indicates Note: This parameter was added for firmware version 2.03.	

Bit Definition	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Fan Fail2	Latch Err2	HW Disable2	Pwr Suply2	Asym DcLink2	Ovr Volt2	Ovr Current2	Dsat Phs W2	Dsat Phs V2	Dsat Phs U2	Cnv NotStart	Cnv NotLogin	Cnv Faulted	NonCnfgAlarm	Reserved	Reserved	Fan Fail1	Latch Err1	HW Disable1	Pwr Suply1	Asym DcLink1	Ovr Volt1	Ovr Current1	Dsat Phs W1	Dsat Phs V1	Dsat Phs U1	
Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 = False
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	1 = True

No.	Name Description	Values
333	**700L FaultStatus** Indicates the occurrence of exception events that have been configured as fault conditions for the PowerFlex 700L Liquid-Cooled drive. Bit 0 [Dsat Phs U1] indicates that the primary structure detected a Dsat on phase U. Bit 1 [Dsat Phs V1] indicates that the primary structure detected a Dsat on phase V. Bit 2 [Dsat Phs W1] indicates that the primary structure detected a Dsat on phase W. Bit 3 [Ovr Current1] indicates that the primary structure detected an over current. Bit 4 [Ovr Volt1] indicates that the primary structure detected an over voltage. Bit 5 [Asym DcLink1] indicates that the primary structure detected an unbalanced DC Link. Bit 6 [Pwr Suply1] indicates that the primary structure detected a power supply failure. Bit 7 [HW Disable1] indicates that the primary structure detected a hardware disable. Bit 8 [Latch Err1] indicates that the primary structure fault was generated but no indicating bit was set. Bit 9 [Fan Fail1] indicates Bit 12 [NonCnfgAlarm] indicates Bit 13 [Cnv Faulted] indicates Bit 14 [Cnv NotLogin] indicates that the converter expected but none logged in. Bit 15 [Cnv NotStart] indicates that the converter commanded to start but did not become active. Bit 16 [Dsat Phs U2] indicates that the second structure detected a Dsat on phase U. Bit 17 [Dsat Phs V2] indicates that the second structure detected a Dsat on phase V. Bit 18 [Dsat Phs W2] indicates that the second structure detected a Dsat on phase W. Bit 19 [Ovr Current2] indicates that the second structure detected an over current. Bit 20 [Ovr Volt2] indicates that the second structure detected an over voltage. Bit 21 [Asym DcLink2] indicates that the second structure detected an unbalanced DC Link. Bit 22 [Pwr Suply2] indicates that the second structure detected a power supply failure. Bit 23 [HW Disable2] indicates that the second structure detected a hardware disable. Bit 24 [Latch Err2] indicates that the second structure fault was generated but no indicating bit was set. Bit 25 [Fan Fail2] indicates Note: This parameter was added for firmware version 2.03.	

Bit Definition	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Fan Fail2	Latch Err2	HW Disable2	Pwr Suply2	Asym DcLink2	Ovr Volt2	Ovr Current2	Dsat Phs W2	Dsat Phs V2	Dsat Phs U2	Cnv NotStart	Cnv NotLogin	Cnv Faulted	NonCnfgAlarm	Reserved	Reserved	Fan Fail1	Latch Err1	HW Disable1	Pwr Suply1	Asym DcLink1	Ovr Volt1	Ovr Current1	Dsat Phs W1	Dsat Phs V1	Dsat Phs U1	
Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 = False
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	1 = True

No.	Name Description	Values
334	**700L AlarmStatus** Indicates the occurrence of exception events that have been configured as alarm conditions for the PowerFlex 700L Liquid-Cooled drive. Bit 0 [NonCnfgFault] Not configured as alarm. Bit 1 [NonCnfgFault] Not configured as alarm. Bit 2 [NonCnfgFault] Not configured as alarm. Bit 3 [NonCnfgFault] Not configured as alarm. Bit 4 [NonCnfgFault] Not configured as alarm. Bit 5 [NonCnfgFault] Not configured as alarm. Bit 6 [NonCnfgFault] Not configured as alarm. Bit 7 [NonCnfgFault] Not configured as alarm. Bit 8 [NonCnfgFault] Not configured as alarm. Bit 9 [NonCnfgFault] Not configured as alarm. Bit 10 [NonCnfgFault] Not configured as alarm. Bit 11 [NonCnfgFault] Not configured as alarm. Bit 12 [Cnv Alarm] Bit 13 [NonCnfgFault] Not configured as alarm. Bit 14 [Cnv NotLogin] Bit 15 [NonCnfgFault] Not configured as alarm. Bit 16 [NonCnfgFault] Not configured as alarm. Bit 17 [NonCnfgFault] Not configured as alarm. Bit 18 [NonCnfgFault] Not configured as alarm. Bit 19 [NonCnfgFault] Not configured as alarm. Bit 20 [NonCnfgFault] Not configured as alarm. Bit 21 [NonCnfgFault] Not configured as alarm. Bit 22 [NonCnfgFault] Not configured as alarm. Bit 23 [NonCnfgFault] Not configured as alarm. Bit 24 [NonCnfgFault] Not configured as alarm. Bit 25 [NonCnfgFault] Not configured as alarm. Bit 26 [NonCnfgFault] Not configured as alarm. Bit 27 [NonCnfgFault] Not configured as alarm. Bit 28 [NonCnfgFault] Not configured as alarm. Bit 29 [NonCnfgFault] Not configured as alarm. Bit 30 [NonCnfgFault] Not configured as alarm. Bit 31 [NonCnfgFault] Not configured as alarm. Note: This parameter was added for firmware version 2.03.	

Bit Definition	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	Cnv Alarm	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	NonCnfgFault	
Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 = False
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	1 = True

No.	Name Description	Values
420	**Pwr Strct Mode** Displays the power structure used in the drive. This is an identifier to the firmware for power structure control. Bit 0 = PowerFlex 700S Frame 1 to 6 (Lo Pwr Strct) Bit 1 = PowerFlex 700S above Frame 6 (Hi Pwr Strct) Bit 2 = PowerFlex 700L Bit 3 = PowerFlex 700S Frame 12 **NOTE:** Bit 3 [Parallel Drv] was added for firmware version 3.01.	

Bit Definition	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Parallel Drv	PF 700L	Hi Pwr Strct	Lo PwrStrct	
Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 = False
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	1 = True

Notes:

Troubleshooting

This chapter provides information to guide you in troubleshooting the PowerFlex 700L Liquid-Cooled AC drive. Included is a listing and description of faults (with possible solutions, when applicable) and alarms.

Faults and Alarms

A fault is a condition that stops the drive. There are two fault types.

Type	Fault Description	
①	Reserved for future.	
②	Non-Resettable	This type of fault normally requires drive or motor repair. The cause of the fault must be corrected before the fault can be cleared. The fault will be reset on power up after repair.
③	User Configurable	These faults can be enabled/disabled to annunciate or ignore a fault condition.

An alarm is a condition that, if left untreated, may stop the drive. There are two alarm types.

Type	Fault Description	
①	User Configurable	These alarms can be enabled/disabled through [Alarm Config 1].
②	Non-Configurable	These alarms are always enabled.

Drive Status

The condition or state of your drive is constantly monitored. Any changes will be indicated through the LEDs and/or the HIM (if present).

Frame 2 Drive LED Indicators

Status indicators for Frame 2 drives are located near the top and front of the drive (see Figure 2.1). For drive status indications, see Table 6.A.

Accessing Status Indicators of Powered Frame 3A and 3B Complete Drives

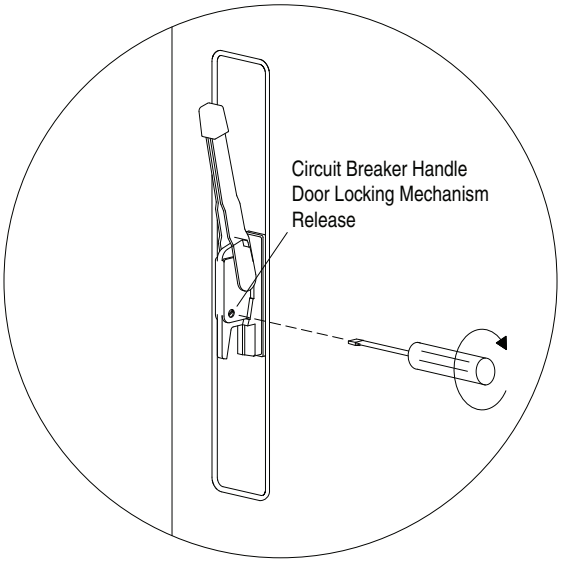
Status indicators (shown in Table 6.A) for Frame 3A and 3B complete drives are inside the power module bay. To access the status indicators, follow the instructions below.

ATTENTION: Risk of injury or death exists. Only qualified electricians should use this procedure. Bypassing the interlock mechanism exposes the user to dangerous high voltage live components. Failure to comply can result in personal injury and/or death.

To Open:

1. Unlock the input filter bay door and the power module bay door by using the key provided with the drive.
2. Turn the circuit breaker handle door locking mechanism release with a flat head screwdriver (Figure 6.1) to unlatch the input filter bay door.

Figure 6.1 Releasing Door Locking Mechanism



3. Swing open the input filter bay several inches until the door interlock mechanism unlatches from the power module bay door.
4. Swing open the power module bay door to view the status indicators on the power module(s).

To Close:

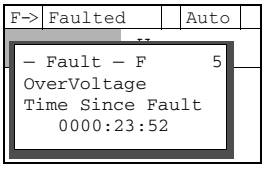
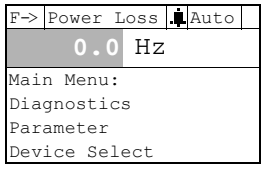
1. Close and lock the power module bay door.
2. Close and lock the input filter bay door.

Table 6.A Status Indications

Item	Name	Color	State	Description
❶	POWER	Green	Steady	Illuminates when power is applied to the drive.
❷	STS (Status)	Green	Flashing	Drive ready, but not running and no faults are present.
			Steady	Drive running, no faults are present.
		Yellow	Flashing, Drive Stopped	A type 2 alarm condition exists, the drive cannot be started. Check parameter 211 [Drive Alarm 2].
			Flashing, Drive Running	An intermittent type 1 alarm condition is occurring. Check parameter 211 [Drive Alarm 1].
			Steady, Drive Running	A continuous type 1 alarm condition exists. Check parameter 211 [Drive Alarm 1].
		Red	Flashing	Fault has occurred. Check [Fault x Code] or Fault Queue.
			Steady	A non-resettable fault has occurred.
❸	PORT	See the 20-COMM-x Communication Adapter User Manual.		Status of DPI port internal communications (if present).
	MOD			Status of communications module (when installed).
	NET A			Status of network (if connected).
	NET B			Status of secondary network (if connected).

HIM Indication

The LCD HIM also provides visual notification of a fault or alarm condition.

Condition	Display
Drive is indicating a fault. The LCD HIM immediately reports the fault condition by displaying the following information: • "Faulted" appears in the status line • Fault number • Fault name • Time that has passed since fault occurred Press Esc to regain HIM control.	
Drive is indicating an alarm. The LCD HIM immediately reports the alarm condition by displaying the following information: • Alarm name (Type 2 alarms only) • Alarm bell graphic	

Manually Clearing Faults

To manually clear faults, follow these steps.

1. Press the Esc (Escape) key to acknowledge the fault.

   The fault information is removed so that you can use the HIM.

2. Address the condition that caused the fault.

   The cause must be corrected before the fault can be cleared.

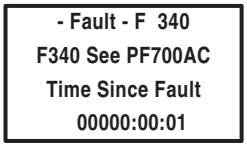
3. After corrective action has been taken, clear the fault by using **one** of these methods:

   - Press the (Stop) key.
   - Cycle drive power.
   - Set parameter 239 - [Fault Clear] to "1" (Clear Faults).
   - "Clear Faults" on the HIM Diagnostic menu.

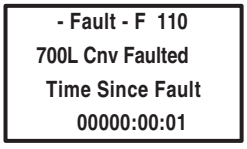
Converter Faults

When a fault is generated in the Converter, that fault is passed to the Inverter so all the faults are recorded in the Inverter fault queue. Faults in the converter are numbered 1 to 99.

When using PowerFlex 700 Vector Control, the fault from the Converter is added to a base number of 300, so all the Converter faults are numbered 301 to 399. The pop-up window on the HIM alerts the user to look at the fault log in the PF700AC to get the specific fault text.



When using PowerFlex 700S Phase II Control, the faults from the Converter are all combined into one fault code (F110) in the Inverter. The pop-up window on the HIM alerts the user to look at the fault log in the PF700AC to get the specific fault text.



For a complete listing of Converter faults, descriptions, and actions, see the PowerFlex 700L Active Converter User Manual, publication PFLEX-UM002.

700 Vector Control Fault Descriptions

Table 6.B 700 Vector Control Fault Types, Descriptions, and Actions

Fault	No.	Type (1)	Description	Action
Port 6 Adapter	F76		Communication adapter on DPI port 6 reported a fault.	Check communication cable and check adapter fault queue for information about the fault.
Port 6 DPI Loss	F86		DPI Communications to port 6 was lost.	If adapter was not intentionally disconnected, check wiring. Replace wiring, port expander, or Main Control Board as needed. Check HIM connection.
700L Dsat U	F170		Phase U Dsat fault on 700L power structure.	Contact Technical Support.
700L Dsat V	F171		Phase V Dsat fault on 700L power structure.	Contact Technical Support.
700L Dsat W	F172		Phase W Dsat fault on 700L power structure.	Contact Technical Support.
700L OvrCurnt	F173		Over current on 700L power structure.	Check programming. Check for cause of excessive current.
700L OvrVolt	F174		Over voltage on 700L power structure.	Check programming. Check for cause of excessive voltage.
700L Asym Vdc	F175		Asymmetrical voltage on the 700L power structure dc link.	Verify load balance resistors.
700L PwrSply	F176		Power supply failed on 700L power structure.	Replace power supply if problem persists.
700L HW Disable	F177		Hardware disable asserted on 700L power structure.	Verify drive enable is present.
700L Latch Err	F178		Fault reporting failure on 700L power structure.	Contact Technical Support.
700L Fan Loss	F179		Fan failure on 700L power structure.	Verify internal circulating fans are turning.
700L Dsat U	F180		Phase U Dsat fault on secondary 700L power structure.	Contact Technical Support.
700L Dsat V	F181		Phase V Dsat fault on secondary 700L power structure.	Contact Technical Support.
700L Dsat W	F182		Phase W Dsat fault on secondary 700L power structure.	Contact Technical Support.
700L OvrCurnt	F183		Over current on secondary 700L power structure.	Check programming. Check for cause of excessive current.
700L OvrVolt	F184		Over voltage on secondary 700L power structure.	Check programming. Check for cause of excessive voltage.
700L Asym Vdc	F185		Asymmetrical voltage on secondary 700L power structure dc link.	Verify load balance resistors.
700L PwrSply	F186		Power supply failed on secondary 700L power structure.	Replace power supply if problem persists.
700L HW Disable	F187		Hardware disable asserted on secondary 700L power structure.	Verify drive enable is present.
700L Latch Err	F188		Fault reporting failure on secondary 700L power structure.	Contact Technical Support.
700L Fan Loss	F189		Fan failure on secondary 700L power structure.	Verify internal circulating fans are turning.
Cnvtr Not Login	F190		Active converter did not begin communication.	Check DPI connection. Check for proper versions.
Cnvtr Not Start	F191		Active converter did not start when requested.	Check start inhibits. Check parameter 214 - [Start Inhibit].
700L NTC Open	F192		Thermal sensor failed on 700L power structure.	Contact Technical Support.

(1) See page 6-1 for a description of fault types.

700S Phase II Control Fault Descriptions

Table 6.C 700S Phase II Control Fault Types, Descriptions, and Actions

Fault	No.	Type (1)	Description	Action
700L Dsat Phs U1	F097		Phase U Dsat fault on 700L power structure.	Contact Technical Support.
700L Dsat Phs V1	F098		Phase V Dsat fault on 700L power structure.	Contact Technical Support.
700L Dsat Phs W1	F099		Phase W Dsat fault on 700L power structure.	Contact Technical Support.
700L Ovr Current1	F100		Over current on 700L power structure.	Check programming. Check for cause of excessive current.
700L Ovr Volt1	F101		Over voltage on 700L power structure.	Check programming. Check for cause of excessive voltage.
700L AsymDcLink1	F102		Asymmetrical voltage on the 700L power structure dc link.	Verify load balance resistors.
700L Pwr Suply1	F103		Power supply failed on 700L power structure.	Replace power supply if problem persists.
700L HW Disable1	F104		Hardware disable asserted on 700L power structure.	Verify drive enable is present.
700L Latch Err1	F105		Fault reporting failure on 700L power structure.	Contact Technical Support.
700L Fan Fail1	F106		Fan failure on 700L power structure.	Verify internal circulating fans are turning.
700L Cnv Faulted	F110		Active converter has faulted.	Check active converter fault log.
Cnv NotLogin	F111		Active converter did not begin communication.	Check DPI connection. Check for proper versions.
Cnv NotStart	F112		Active converter did not start when requested.	Check start inhibits. Check parameter 214 - [Start Inhibits].
700L Dsat Phs U2	F113		Phase U Dsat fault on secondary 700L power structure.	Contact Technical Support.
700L Dsat Phs V2	F114		Phase V Dsat fault on secondary 700L power structure.	Contact Technical Support.
700L Dsat Phs W2	F115		Phase W Dsat fault on secondary 700L power structure.	Contact Technical Support.
700L Ovr Current2	F116		Over current on secondary 700L power structure.	Check programming. Check for cause of excessive current.
700L Ovr Volt2	F117		Over voltage on secondary 700L power structure.	Check programming. Check for cause of excessive voltage.
700L AsymDcLink2	F118		Asymmetrical voltage on secondary 700L power structure dc link.	Verify load balance resistors.
700L Pwr Suply2	F119		Power supply failed on secondary 700L power structure.	Replace power supply if problem persists.
700L HW Disable2	F120		Hardware disable asserted on secondary 700L power structure.	Verify drive enable is present.
700L Latch Err2	F121		Fault reporting failure on secondary 700L power structure.	Contact Technical Support.
700L Fan Fail2	F122		Fan failure on secondary 700L power structure.	Verify internal circulating fans are turning.

(1) See page 6-1 for a description of fault types.

Clearing Alarms

Alarms are automatically cleared when the condition that caused the alarm is no longer present.

Alarm Descriptions (only 700S Phase II Control)

The following alarm can occur when the PowerFlex 700L Liquid-Cooled AC drive is equipped with the optional 700S Phase II Control cassette.

Table 6.D 700S Phase II Control Alarm Descriptions

Alarm	No.	Type [1]	Description
700L Cnv Alarm	A109	②	Indicates an alarm in the Active Converter control has occurred. See the Active Converter User Manual for alarm descriptions.

[1] See page 6-1 for a description of alarm types.

Replacement of Door Filter of the Input Filter Cabinet (Frames 3A and 3B)

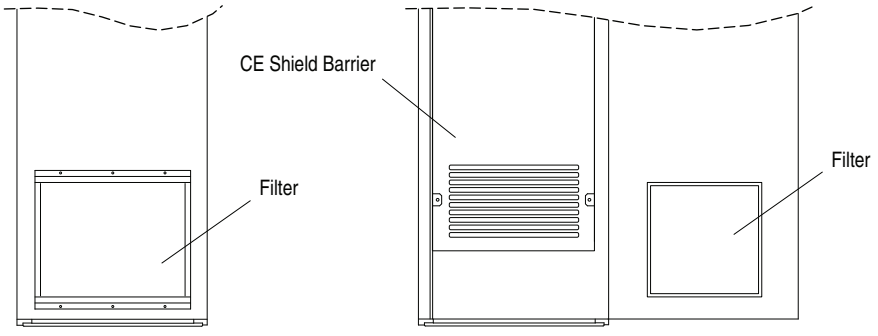
ATTENTION: Only qualified personnel familiar with adjustable frequency AC drives and associated machinery should plan or implement the installation, start-up, and subsequent maintenance of the system. Failure to comply can result in personal injury and/or equipment damage.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged completely before servicing. After removing power to the drive, wait 5 minutes for the bus capacitors to discharge. Measure the DC bus voltage at the DC+ and DC- TESTPOINT sockets on the front of the power module (Figure 3.14 or Figure 3.27). The voltage must be zero.

When the door filter of the Input Filter Cabinet requires replacement, remove the dirty filter and replace it with an equivalent clean filter.

Important: If the CE Shield Barrier has been removed for servicing, it must be reinstalled to restore the casual touch protection this barrier provides.

Figure 6.2 Input Filter Cabinet Door Filter Replacement



Input Filter Cabinet (Door Closed)

Input Filter Cabinet (Door Open)

Notes:

Supplemental Drive Information

Specifications

Category	Specification		
		Frame 2	Frames 3A and 3B
Agency Certification	c UL us	Listed to UL508C and CAN/CSA-C2.2 No. 14-05. UL Listing for Frame 2 is applicable up to 480V AC. UL Listing for Frame 3A and 3B is applicable up to 600V AC.	
	CE	Marked for all applicable European Directives(1) EMC Directive (89/336/EEC) EN 61800-3 Adjustable Speed electrical power drive systems Low Voltage Directive (73/23/EEC) EN 50178 Electronic Equipment for use in Power Installations	
	N223	Certified to AS/NZS, 1997 Group 1, Class A.	
	These drives are also designed to meet the following specifications: NFPA 70 - US National Electrical Code NEMA ICS 3.1 - Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems. IEC 146 - International Electrical Code. CMAA Specification #70 (Crane Manufacturers of America Association)		

(1) Applied noise impulses may be counted in addition to the standard pulse train causing erroneously high [Pulse Freq] readings.

Unless otherwise noted, the following specifications pertain to drives equipped with 700 Vector Control or 700S Phase II Control.

Category	Specification						
		Frame 2		Frames 3A and 3B			
Protection		400V	480V	400V	480V	600V	690V
	AC Input Overvoltage Trip:	528V AC	528V AC	528V AC	528V AC	760V AC	760V AC
	AC Input Undervoltage Trip:	340V AC	340V AC	340V AC	340V AC	340V AC	340V AC
	Bus Overvoltage Trip:	815V DC	815V DC	815V DC	815V DC	1168V DC	1168V DC
	Bus Undervoltage Shutoff/Fault:	300V DC	300V DC	300V DC	300V DC	300V DC	300V DC
	Nominal Bus Voltage:	600V DC	700V DC	600V DC	700V DC	900V DC	1000V DC
	Heat Sink Thermistor:	Monitored by microprocessor overtemp trip					
	Drive Overcurrent Trip Software Overcurrent Trip: Hardware Overcurrent Trip:	 200% of rated current (typical) 220…300% of rated current (dependent on drive rating)					
	Line Transients:	Up to 6000 volts peak per IEEE C62.41-1991					
	Control Logic Noise Immunity:	Showering arc transients up to 1500V peak					

Category	Specification			
		Frame 2	Frames 3A and 3B	
Protection *(continued)*	Logic Control Ride-Thru Vector Control: 700S Phase II Control:	 0.5 seconds minimum, 2 seconds typical 0.25 seconds, drive not running		
	Ground Fault Trip:	Phase-to-ground on drive output		
	Short Circuit Trip:	Phase-to-phase on drive output		
Environment	Altitude:	1000 m (3280 ft) at rated current. See Derating Guidelines on page A-4 for operation above 1000 m (3280 ft).		
	Maximum Surrounding Air Temperature w/o Derating: IP20, NEMA/UL Type 1:	 0…50 °C (32…122 °F)	 0…40 °C (32…104 °F)	
	Storage Temperature (all constructions):	–40…85 °C (–40…185 °F)		
	Atmosphere:	**Important:** Drive **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the drive is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.		
	Relative Humidity:	5…95% non-condensing		
	Shock:	10G peak for 11 milliseconds duration (± 1.0 ms)		
	Vibration:	0.152 mm (0.006 in.) displacement, 1G peak, 5.5 Hz		
	Sound:	Frame 2: Not available at time of publication. Note: Sound pressure level is measured at 1 meter.	Frame 3A: 78 dB	Frame 3B: 76 dB
Electrical	Voltage Tolerance Vector Control: 700S Phase II Control:	 For full power and operating range, see the PowerFlex 700 Adjustable Frequency AC Drive—Series B User Manual, publication 20B-UM002, Appendix C. For full power and operating range, see the PowerFlex 700S High Performance AC Drive—Phase II Control User Manual, publication 20D-UM006, Appendix C.		
	Input Frequency Tolerance:	27…93 Hz.		
	Input Phases:	Three-phase input provides full rating for all drives.		
	Displacement Power Factor:	0.98 across entire speed range.		
	Efficiency:	96.2% at rated amps, nominal line volts.	97.5% at rated amps, nominal line volts.	
	Maximum Short Circuit Current Rating:	To match specified circuit breaker capability, ≤ 200,000 Amps		
	Actual Short Circuit Rating:	Determined by AIC rating of installed circuit breaker.		
	Motor Lead Lengths:	76 meters (250 feet) total		
Control	Method:	Sine coded PWM with programmable carrier frequency.		
	Carrier Frequency:	2, 4, or 8 kHz. Drive rating based on 4 kHz. Derating Guidelines on page A-4 for more information.	2 or 4 kHz. Drive rating based on 4 kHz.	
	Output Voltage Range:	0 to rated motor voltage		
	Output Frequency Range Vector Control: 700S Phase II Control:	 0…420 Hz 0…350 Hz		
	Frequency Accuracy (Vector Control only) Digital Input: Analog Input:	 Within ± 0.01% of set output frequency. Within ± 0.4% of maximum output frequency		

Category	Specification		
		Frame 2	**Frames 3A and 3B**
Control *(continued)*	Frequency Control (Vector Control only):	Speed Regulation - w/Slip Compensation (Volts per Hertz Mode) 0.5% of base speed across 40:1 speed range 40:1 operating range 10 rad/sec bandwidth Speed Regulation - w/Slip Compensation (Sensorless Vector Mode) 0.5% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth	
	Speed Control Vector Control:	Speed Regulation - without feedback (Vector Control Mode) 0.1% of base speed across 120:1 speed range 120:1 operating range 50 rad/sec bandwidth Speed Regulation - with feedback (Vector Control Mode) 0.001% of base speed across 120:1 speed range 1000:1 operating range 250 rad/sec bandwidth	
	700S Phase II Control:	Speed Regulation - without feedback 0.1% of base speed across 120:1 speed range 120:1 operating range 50 rad/sec bandwidth Speed Regulation - with feedback 0.001% of base speed across 120:1 speed range 1000:1 operating range 740 rad/sec bandwidth	
	Torque Regulation Vector Control:	Torque regulation without Feedback; ± 5%, 600 rad/sec bandwidth Torque regulation with Feedback; ± 2%, 2500 rad/sec bandwidth	
	700S Phase II Control:	Torque regulation without Feedback; ± 10%, 600 rad/sec bandwidth Torque regulation with Feedback; ± 5%, 4400 rad/sec bandwidth	
	Selectable Motor Control Vector Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability and Vector Control with Force Technology (with and without feedback).	
	700S Phase II Control:	Vector Control with Force Technology (with and without feedback), V/Hz Control, and permanent magnet motor control.	
	Stop Modes Vector Control:	Multiple programmable stop modes including Ramp, Coast, DC-Brake, Ramp-to-Hold, and S-curve.	
	700S Ph. II Control:	Multiple programmable stop modes including Ramp, Coast, and Current Limit.	
	Accel/Decel Vector Control:	Two independently programmable accel and decel times. Each time may be programmed from 0…3600 seconds in 0.1 second increments.	
	700S Phase II Control:	Independently programmable accel and decel times, adjustable from 0…6553.5 seconds in 0.01 second increments.	
	Intermittent Overload:	110% Overload capability for up to 1 minute 150% Overload capability for up to 3 seconds	
	Current Limit Capability Vector Control:	Proactive Current Limit programmable from 20 to 160% of rated output current. Independently programmable proportional and integral gain.	
	700S Phase II Control:	Independent Motoring and Regenerative Power Limits programmable to 800% of rated output current.	
	Electronic Motor Overload Protection:	Class 10 motor overload protection according to NEC article 430 and motor over-temperature protection according to NEC article 430.126 (A)(2). UL File E59272.	

Category	Specification		
		Frame 2	Frames 3A and 3B
Encoder (Vector Control only)	Type:	Incremental, dual channel	
	Supply:	12V or 5V, 250 mA. 12V or 5V, 10 mA minimum inputs isolated with differential transmitter, 250 kHz maximum.	
	Quadrature:	90°, ± 27° at 25 °C	
	Duty Cycle:	50%, ± 10%	
	Requirements:	Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), 8…15V DC output (3.5…6V DC for 5V encoder), single-ended or differential, and capable of supplying a minimum of 10 mA per channel. Maximum input frequency is 250 kHz. The Encoder Interface Board accepts 12V DC or 5V DC square-wave with a minimum high state of 7.0V DC (12 volt encoder) or 3.1V DC (5 volt encoder). Maximum low state voltage is 0.4V DC.	
Feedback (700S Phase II Control only)	Encoder Input: Encoder Voltage Supply: Maximum Input Freq:	Dual Channel Plus Marker, Isolated with differential transmitter Output (Line Drive) Incremental, Dual Channel Quadrature type 5V DC or 12V DC (5V DC requires an external power supply), 320 mA/channel 400 kHz	
	Stegmann Hi-Resolution Option Encoder Voltage Supply: Hi-Resolution Feedback: Maximum Cable Length: RS-485 Interface: Customer-I/O Plug (P1) - Hi Res:	 11.5V DC @ 130 mA Sine/Cosine 1V P-P Offset 2.5 182 m (600 ft.) Hi-Resolution Feedback Option card obtains the following information via the Hiperface RS-485 interface shortly after power-up: Address, Command Number, Mode, Number of Turns, Number of Sine/Cos cycles, and Checksum. Allen-Bradley PN: S94262912 Weidmuller PN: BL3.50/90/12BK	
	Resolver Option Excitation Frequency: Excitation Voltage: Operating Freq. Range: Resolver Fdbk. Voltage: Maximum Cable Length:	 2400 Hz 4.25…26V rms 1…10 kHz 2V ± 300 mV 304.8 m (1000 ft)	
DriveLogix (700S Phase II Control only)	User Available Memory Base:	1.5 megabytes	
	Battery:	1756-BA1 (Allen-Bradley P/N 94194801) 0.59g lithium	
	Serial Cable:	1761-CBLPM02 to 1761-NET-AIC 1761-CBLPA00 to 1761-NET-AIC 1756-CP3 directly to controller 1747-CP3 directly to controller Category 3 (2)	
	Compact I/O Connection:	Up to (30) modules	
	Cable:	20D-DL2-CL3 or 20D-DL2-CR3	

Derating Guidelines

Altitude

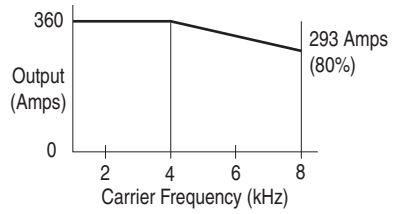
Above 1000 m (3280 ft), derate the output current by 1% for every 100 additional meters (328 additional feet). This is applicable to filters and power modules. PowerFlex 700L 600/690V drives cannot be used in altitudes above 2000 m (6562 ft) due to voltage spacing requirements.

Ambient

Frame 2 drives have a maximum ambient of 50 °C (122 °F). Frame 3A and 3B drives have a maximum ambient of 40 °C (104 °F). PowerFlex 700L drives cannot be derated to operate at higher temperatures.

Carrier Frequency

For Frame 2 drives, see the carrier frequency derating table below. PowerFlex 700L Frame 3A and 3B drives cannot be run above 4 kHz.



Horsepower/Current Ratings

The following tables provide normal duty and heavy duty drive ratings (including continuous, 1 minute, and 3 second).

Table A.A 400V AC Ratings (AC Input/AC Output)

Drive Catalog Number	Frame	PWM Freq. (kHz)	Output Power		Output Current (with 400V AC Induction Motor) (1)					
			HP (kW)		Cont.	110% 1 min.	150% 3 secs.	Cont.	150% 1 min.	200% 3 secs.
			ND	HD	ND	ND	ND	HD	HD	HD
20LC360	2	4	**268 (200)**	**200 (150)**	360	396	540	264	396	540
20LC650	3A	4	**500 (370)**	**365 (270)**	650	715	975	475	715	975
20LC1K2	3B	4	**960 (715)**	**700 (525)**	1250	1375	1875	915	1375	1875

(1) Frame 2 ratings are based on 50 °C ambient and 50 °C coolant.
Frame 3A and 3B ratings are based on 40 °C ambient and 40 °C coolant.

Table A.B 480V AC Ratings (AC Input/AC Output)

Drive Catalog Number	Frame	PWM Freq. (kHz)	Output Power		Output Current (with 480V AC Induction Motor) (1)					
			HP (kW)		Cont.	110% 1 min.	150% 3 secs.	Cont.	150% 1 min.	200% 3 secs.
			ND	HD	ND	ND	ND	HD	HD	HD
20LD360	2	4	**300 (224)**	**235 (175)**	360	396	540	264	396	540
20LD650	3A	4	**600 (445)**	**440 (325)**	650	715	975	475	715	975
20LD1K2	3B	4	**1150 (860)**	**845 (630)**	1250	1375	1875	915	1375	1875

(1) Frame 2 ratings are based on 50 °C ambient and 50 °C coolant.
Frame 3A and 3B ratings are based on 40 °C ambient and 40 °C coolant.

Table A.C 600V AC Ratings (AC Input/AC Output)

Drive Catalog Number	Frame	PWM Freq. (kHz)	Output Power		Output Current (with 600V AC Induction Motor) (1)					
			HP (kW)		Cont.	110% 1 min.	150% 3 secs.	Cont.	150% 1 min.	200% 3 secs.
			ND	HD	ND	ND	ND	HD	HD	HD
20LE425	3A	4	**465 (345)**	**345 (255)**	425	470	640	315	470	640
20LE800	3B	4	**870 (650)**	**640 (480)**	800	885	1200	590	885	1200
20LE1K1	3B	2 (2)	**1275 (955)**	**935 (695)**	1175	1295	1765	860	1295	1765

(1) Frame 3A and 3B ratings are based on 40 °C ambient and 40 °C coolant.
(2) Must operate at only 2 kHz PWM, and only as a stand-alone inverter module ("K" in catalog string position 13).

Table A.D 690V AC Ratings (AC Input/AC Output)

Drive Catalog Number	Frame	PWM Freq. (kHz)	Output Power		Output Current (with 690V AC Induction Motor) (1)					
			HP (kW)		Cont.	110% 1 min.	150% 3 secs.	Cont.	150% 1 min.	200% 3 secs.
			ND	HD	ND	ND	ND	HD	HD	HD
20LF380	3A	4	**475 (355)**	**350 (260)**	380	420	570	280	420	570
20LF705	3B	4	**881 (657)**	**650 (485)**	705	780	1060	520	780	1060
20LF1K0	3B	2 (2)	**1315 (980)**	**965 (720)**	1050	1155	1575	770	1155	1575

(1) Frame 3A and 3B ratings are based on 40 °C ambient and 40 °C coolant.

(2) Must operate at only 2 kHz PWM, and only as a stand-alone inverter module ("K" in catalog string position 13).

Watts Loss

Table A.E Watts Loss @ Rated Load, Speed, and PWM Carrier Frequency

Frame Size	Voltage	PWM Freq.	Watts Loss					
			Filter Section	Power Section			Complete Drive	
			Into Air	Into Air	Into Liquid	Total	Total Air	Total Liquid
2	400V	4 kHz	Not Applicable				1500	7900
	480V	4 kHz	Not Applicable				1500	7900
3A	400V	4 kHz	4000	1000	10,500	11,500	5000	10,500
	480V	4 kHz	4000	1000	11,500	12,500	5000	11,500
	600V	4 kHz	4000	1200	10,500	11,700	5200	10,500
	690V	4 kHz	4000	1200	12,000	13,200	5200	12,000
3B (1)	400V	4 kHz	7800	2000	21,000	23,000	9800	21,000
	480V	4 kHz	7800	2000	23,000	25,000	9800	23,000
	600V	4 kHz	7800	2400	21,000	23,400	10,200	21,000
	690V	4 kHz	7800	2400	24,000	26,400	10,200	24,000

(1) Frame 3B power section consists of two power modules. Each module dissipates half (½) of the watts shown in this table.

Fuse and Circuit Breaker Ratings

The tables on the following pages provide recommended AC line input fuse and circuit breaker information. See below for UL and IEC requirements. Sizes listed are the recommended sizes based on 40 °C (104 °F) and the U.S. NEC. Other country, state or local codes may require different ratings. Tables with DC link fuse recommendations for DC input drives are also provided.

Fusing

The recommend fuse types are listed below. If available current ratings do not match the tables provided, the next higher fuse rating should be chosen.

- IEC – BS88 (British Standard) Parts 1 & 2, EN60269-1, Parts 1 & 2(1), type gG fuses or equivalent should be used.
- UL – UL Class T, J or L fuses should be used.

(1) Typical designations include, but may not be limited to the following; Parts 1 & 2: AC, AD, BC, BD, CD, DD, ED, EFS, EF, FF, FG, GF, GG, GH.

Circuit Breakers

The "non-fuse" listings in the following tables include inverse time circuit breakers, instantaneous trip circuit breakers (motor circuit protectors), and 140M self-protected combination motor controllers. If one of these is chosen as the desired protection method, the following requirements apply.

- IEC – Both types of circuit breakers and 140M self-protected combination motor controllers are acceptable for IEC installations.
- UL – Only inverse time circuit breakers and the specified 140M self-protected combination motor controllers are acceptable for UL installations.

Table A.F 400 Volt AC Input Protection Devices

Drive Catalog Number	Frame	HP (kW) Rating		Input Rating	Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (5)
		ND	HD	Amps	Min. (1)	Max. (2)	Min.	Max.	Max. (4)	Max.
20LC360	2	268 (200)	—	360	500	750	500	900	900	600
		—	200 (150)	264	400	650	450	900	900	400

(1) Minimum protection device size is the lowest rated device that supplies maximum protection without nuisance tripping.

(2) Maximum protection device size is the highest rated device that supplies drive protection. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.

(3) Circuit Breaker - inverse time breaker. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum

(4) Maximum allowable rating by US NEC. Exact size must be chosen for each installation.

(5) Motor Circuit Protector - instantaneous trip circuit breaker. For US NEC minimum size is 125% of motor FLA. Ratings shown are maximum

Table A.G 480 Volt AC Input Protection Devices

Drive Catalog Number	Frame	HP (kW) Rating		Input Rating	Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (5)
		ND	HD	Amps	Min. (1)	Max. (2)	Min.	Max.	Max. (4)	Max.
20LD360	2	300 (224)	—	360	500	750	500	900	900	600
		—	235 (175)	264	400	650	450	900	900	400

(1) Minimum protection device size is the lowest rated device that supplies maximum protection without nuisance tripping.

(2) Maximum protection device size is the highest rated device that supplies drive protection. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.

(3) Circuit Breaker - inverse time breaker. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum

(4) Maximum allowable rating by US NEC. Exact size must be chosen for each installation.

(5) Motor Circuit Protector - instantaneous trip circuit breaker. For US NEC minimum size is 125% of motor FLA. Ratings shown are maximum

Table A.H 540 Volt DC Input Fusing

Drive Catalog Number	Frame	HP (kW) Rating		DC Input Rating	Bussmann Fuse	
		ND	HD	Amps	Amps	Catalog No.
20LC650	3A	500 (370)	365 (270)	1250 (1)	2000	170M6621 (2)
20LC1K2	3B	960 (715)	700 (525)	1250	2000	170M6621 (2)

(1) Only the Dual Inverter for PowerFlex 700L Frame 3A is available as a DC input inverter.

(2) Two 1000A Bussmann 170M6614 fuses per phase can also be used.

Table A.I 650 Volt DC Input Fusing

Drive Catalog Number	Frame	HP (kW) Rating		DC Input Rating	Bussmann Fuse	
		ND	HD	Amps	Amps	Catalog No.
20LD650	3A	600 (445)	440 (325)	1250 (1)	2000	170M6621 (2)
20LD1K2	3B	1150 (860)	845 (630)	1250	2000	170M6621 (2)

(1) Only the Dual Inverter for PowerFlex 700L Frame 3A is available as a DC input inverter.
(2) Two 1000A Bussmann 170M6614 fuses per phase can also be used.

Table A.J 810 Volt DC Input Fusing

Drive Catalog Number	Frame	HP (kW) Rating		DC Input Rating	Bussmann Fuse	
		ND	HD	Amps	Amps	Catalog No.
20LE425	3A	465 (345)	345 (255)	850 (1)	1400	170M6701 (2)
20LE800	3B	870 (650)	640 (480)	800	1250	170M6700 (3)
20LE1K1	3B	1275 (955)	935 (695)	1175	900 (2 per phase)	170M6697

(1) Only the Dual Inverter for PowerFlex 700L Frame 3A is available as a DC input inverter.
(2) Two 700A Bussmann 170M6695 fuses per phase can also be used.
(3) Two 630A Bussmann 170M6694 fuses per phase can also be used.

Table A.K 932 Volt DC Input Fusing

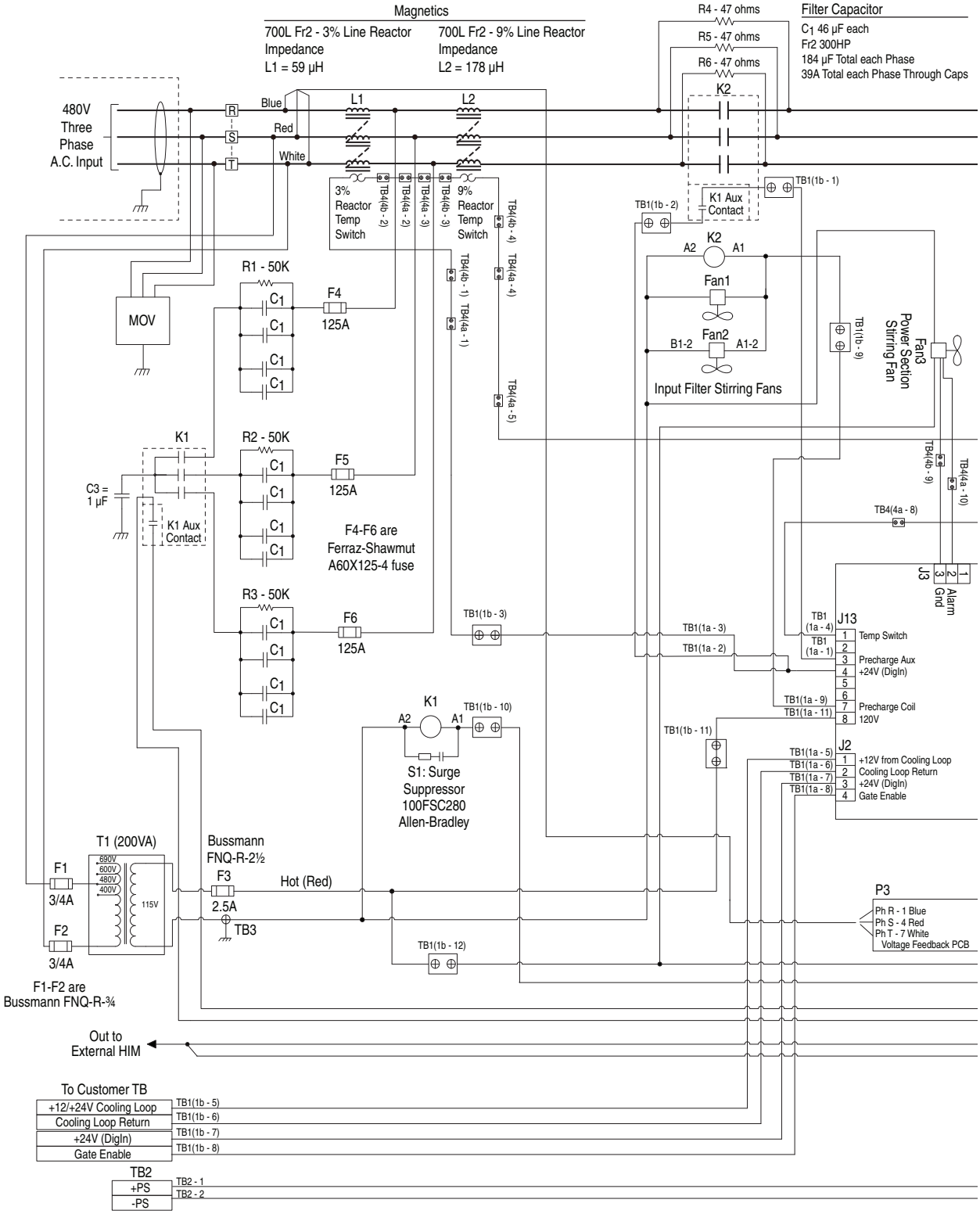
Drive Catalog Number	Frame	HP (kW) Rating		DC Input Rating	Bussmann Fuse	
		ND	HD	Amps	Amps	Catalog No.
20LF380	3A	475 (355)	350 (260)	760 (1)	1250	170M6700 (2)
20LF705	3B	881 (657)	650 (485)	705	1100	170M6699 (3)
20LF1K0	3B	1315 (980)	965 (720)	1050	800 (2 per phase)	170M6696

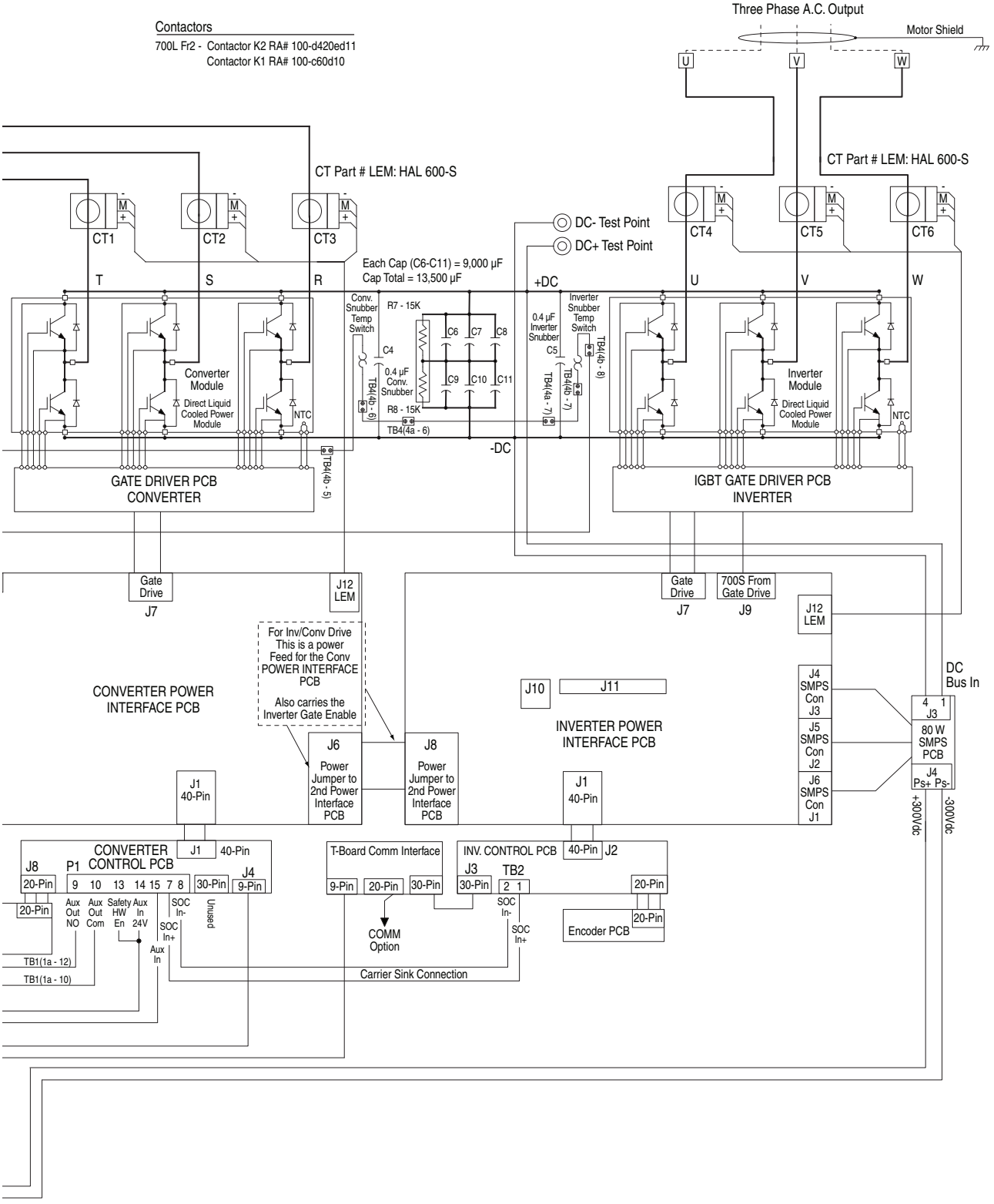
(1) Only the Dual Inverter for PowerFlex 700L Frame 3A is available as a DC input inverter.
(2) Two 630A Bussmann 170M6694 fuses per phase can also be used.
(3) Two 550A Bussmann 170M6693 fuses per phase can also be used.

Frame 2 Schematics

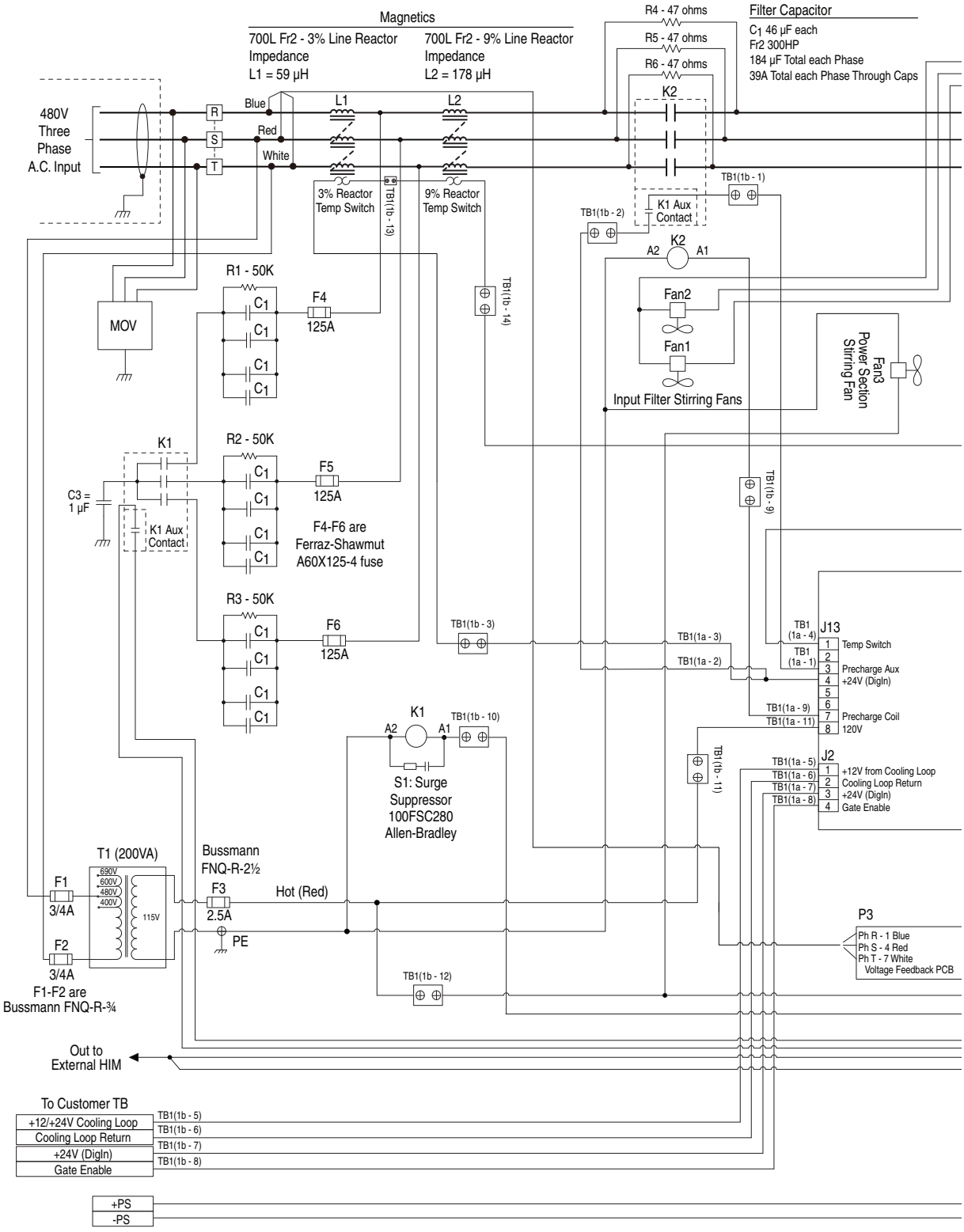
The schematics on the following pages illustrate the PowerFlex 700L Frame 2 Liquid-Cooled drives.

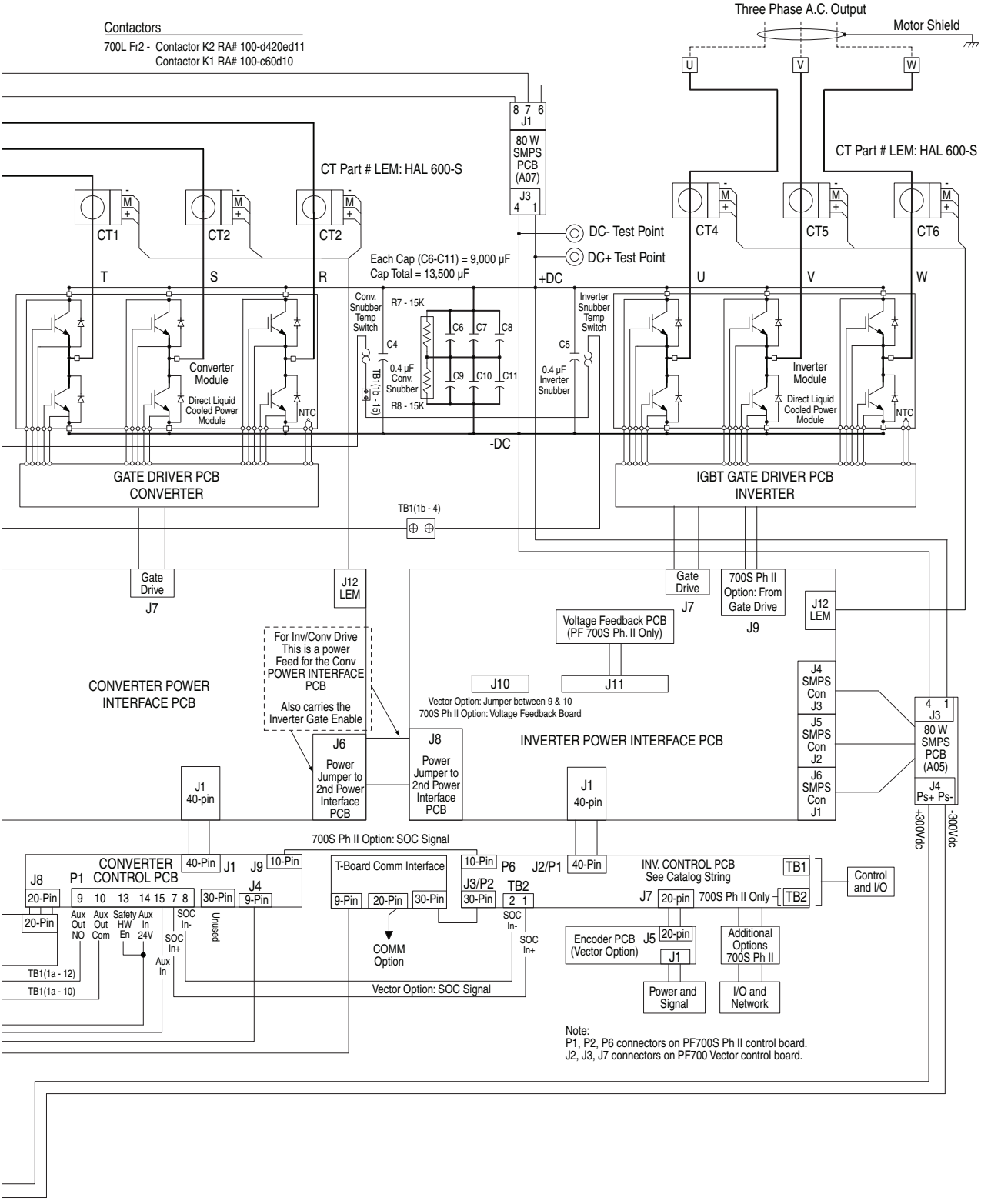
Regenerative Drive Wiring Diagram with TB4 Connections – 400/480V, 3 Phase




Contactors
700L Fr2 - Contactor K2 RA# 100-d420ed11
Contactor K1 RA# 100-c60d10
Three Phase A.C. Output
Motor Shield
U
V
W
CT Part # LEM: HAL 600-S
CT1
CT2
CT3
CT4
CT5
CT6
DC- Test Point
DC+ Test Point
Each Cap (C6-C11) = 9,000 µF
Cap Total = 13,500 µF
T
S
R
+DC
-DC
Converter Module
Direct Liquid Cooled Power Module
NTC
Conv. Snubber Temp Switch
R7 - 15K
R8 - 15K
C4
C5
C6
C7
C8
C9
C10
C11
0.4 µF Conv. Snubber
0.4 µF Inverter Snubber
Inverter Snubber Temp Switch
TB4(4b - 6)
TB4(4b - 7)
TB4(4b - 8)
TB4(4a - 6)
TB4(4a - 7)
TB4(4b - 5)
Inverter Module
GATE DRIVER PCB CONVERTER
IGBT GATE DRIVER PCB INVERTER
Gate Drive
J7
J12 LEM
700S From Gate Drive
J9
For Inv/Conv Drive This is a power Feed for the Conv POWER INTERFACE PCB
Also carries the Inverter Gate Enable
CONVERTER POWER INTERFACE PCB
INVERTER POWER INTERFACE PCB
J10
J11
J6
Power Jumper to 2nd Power Interface PCB
J8
J1
40-Pin
J4 SMPS Con J3
J5 SMPS Con J2
J6 SMPS Con J1
DC Bus In
80 W SMPS PCB
J4 Ps+ Ps-
+300Vdc
-300Vdc
CONVERTER CONTROL PCB
P1
20-Pin
9 10 13 14 15 7 8
30-Pin
9-Pin
J4
Aux Out NO
Aux Out Com
Safety HW En
Aux In 24V
SOC In-
SOC In+
Unused
Aux In
TB1(1a - 12)
TB1(1a - 10)
T-Board Comm Interface
COMM Option
INV. CONTROL PCB
J3
TB2
2 1
Encoder PCB
Carrier Sink Connection

Regenerative Drive Wiring Diagram without TB4 Connections – 400/480V, 3 Phase



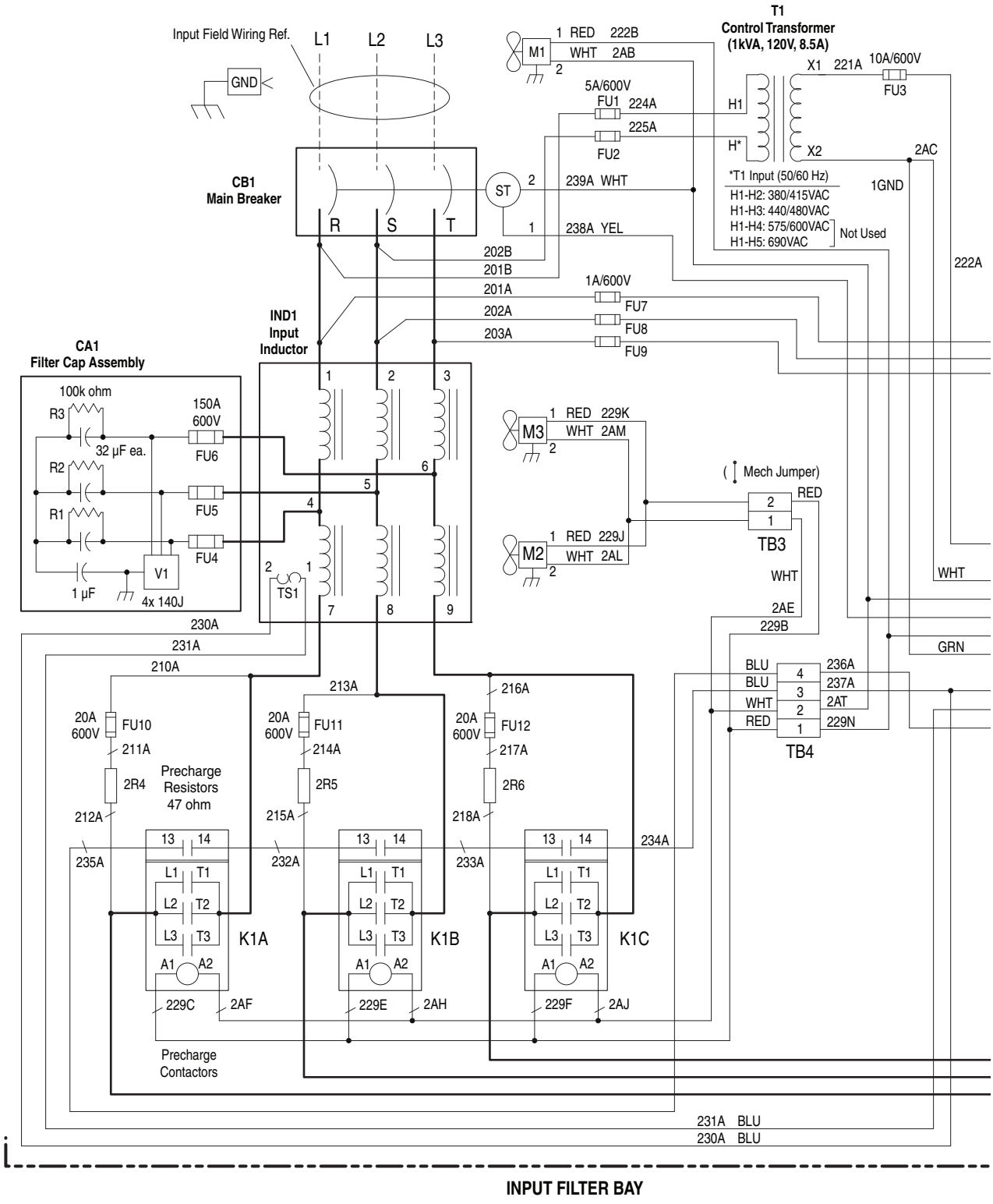

Contactors
700L Fr2 - Contactor K2 RA# 100-d420ed11
Contactor K1 RA# 100-c60d10
Three Phase A.C. Output
Motor Shield
U
V
W
8 7 6
J1
80 W SMPS PCB (A07)
J3
4 1
CT Part # LEM: HAL 600-S
CT1
CT2
CT2
CT4
CT5
CT6
DC- Test Point
DC+ Test Point
Each Cap (C6-C11) = 9,000 µF
Cap Total = 13,500 µF
T
S
R
+DC
-DC
Conv. Snubber Temp Switch
R7 - 15K
C4
0.4 µF Conv. Snubber
R8 - 15K
C6
C7
C8
C9
C10
C11
C5
0.4 µF Inverter Snubber
Inverter Snubber Temp Switch
Converter Module
Direct Liquid Cooled Power Module
NTC
Inverter Module
GATE DRIVER PCB CONVERTER
IGBT GATE DRIVER PCB INVERTER
TB1(1b - 4)
TB1(1b - 15)
Gate Drive
J7
J12 LEM
700S Ph II Option: From Gate Drive
J9
Voltage Feedback PCB (PF 700S Ph. II Only)
J10
J11
Vector Option: Jumper between 9 & 10
700S Ph II Option: Voltage Feedback Board
For Inv/Conv Drive This is a power Feed for the Conv POWER INTERFACE PCB
Also carries the Inverter Gate Enable
CONVERTER POWER INTERFACE PCB
INVERTER POWER INTERFACE PCB
J6
Power Jumper to 2nd Power Interface PCB
J8
Power Jumper to 2nd Power Interface PCB
J4 SMPS Con J3
J5 SMPS Con J2
J6 SMPS Con J1
4 1
J3
80 W SMPS PCB (A05)
J4
Ps+ Ps-
+300Vdc
-300Vdc
J1
40-pin
700S Ph II Option: SOC Signal
CONVERTER CONTROL PCB
40-Pin
J1
J9
10-Pin
J8
20-Pin
P1
9 10 13 14 15 7 8
30-Pin
J4
9-Pin
Aux Out NO
Aux Out Com
Safety HW En
Aux In 24V
SOC In-
SOC In+
Aux In
Unused
TB1(1a - 12)
TB1(1a - 10)
T-Board Comm Interface
9-Pin
20-Pin
30-Pin
COMM Option
10-Pin
P6
J2/P1
40-Pin
J3/P2
30-Pin
TB2
2 1
Vector Option: SOC Signal
INV. CONTROL PCB
See Catalog String
TB1
TB2
J7
20-pin
700S Ph II Only
Control and I/O
Encoder PCB (Vector Option)
J5
20-pin
J1
Additional Options 700S Ph II
Power and Signal
I/O and Network
Note:
P1, P2, P6 connectors on PF700S Ph II control board.
J2, J3, J7 connectors on PF700 Vector control board.

Notes:

Frame 3A and 3B Schematics

Schematics on the following pages illustrate the PowerFlex 700L Frame 3A and Frame 3B Liquid-Cooled drives and power modules.

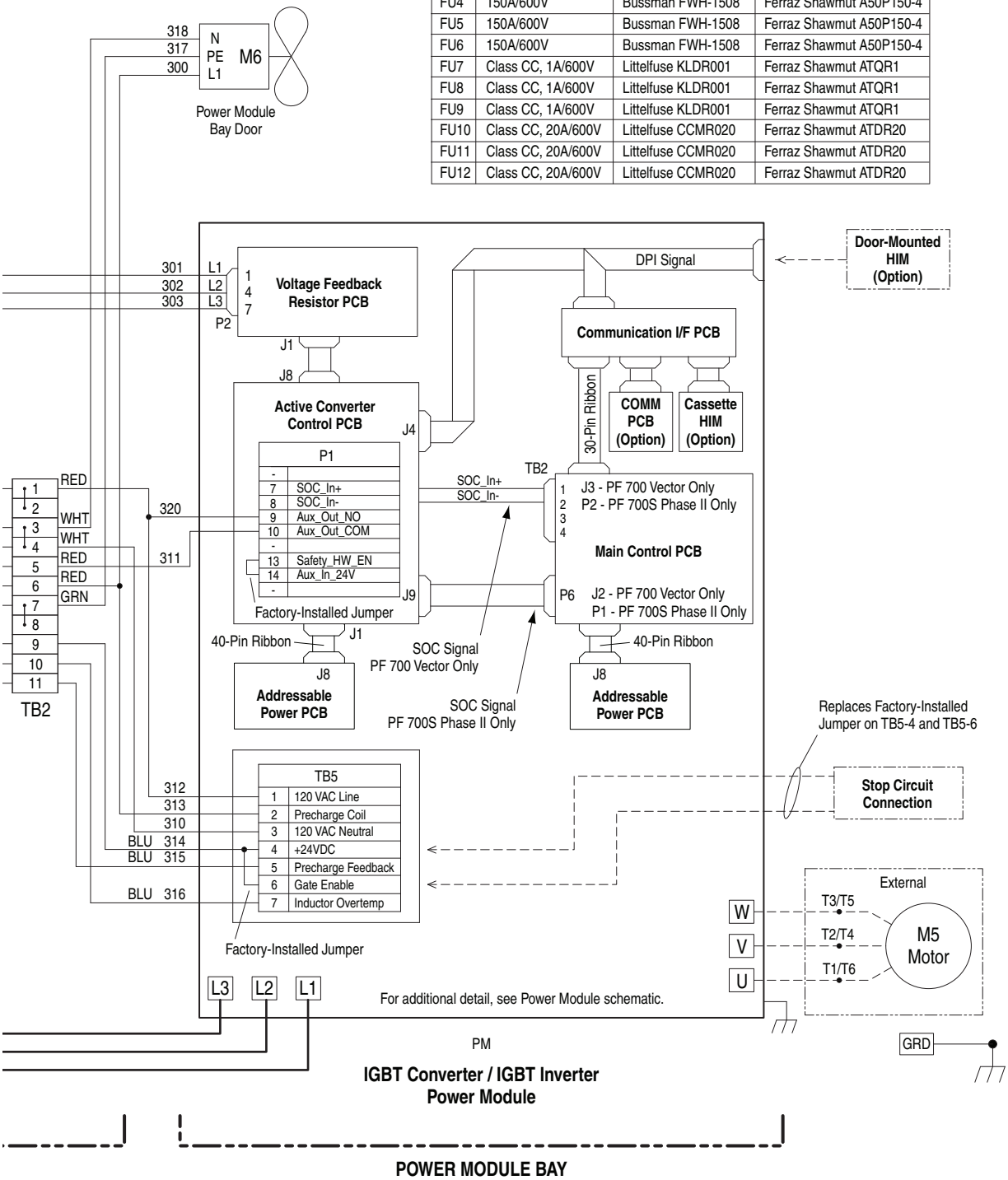
Frame 3A Regenerative Drive Wiring Diagram – 400/480V, 3 Phase



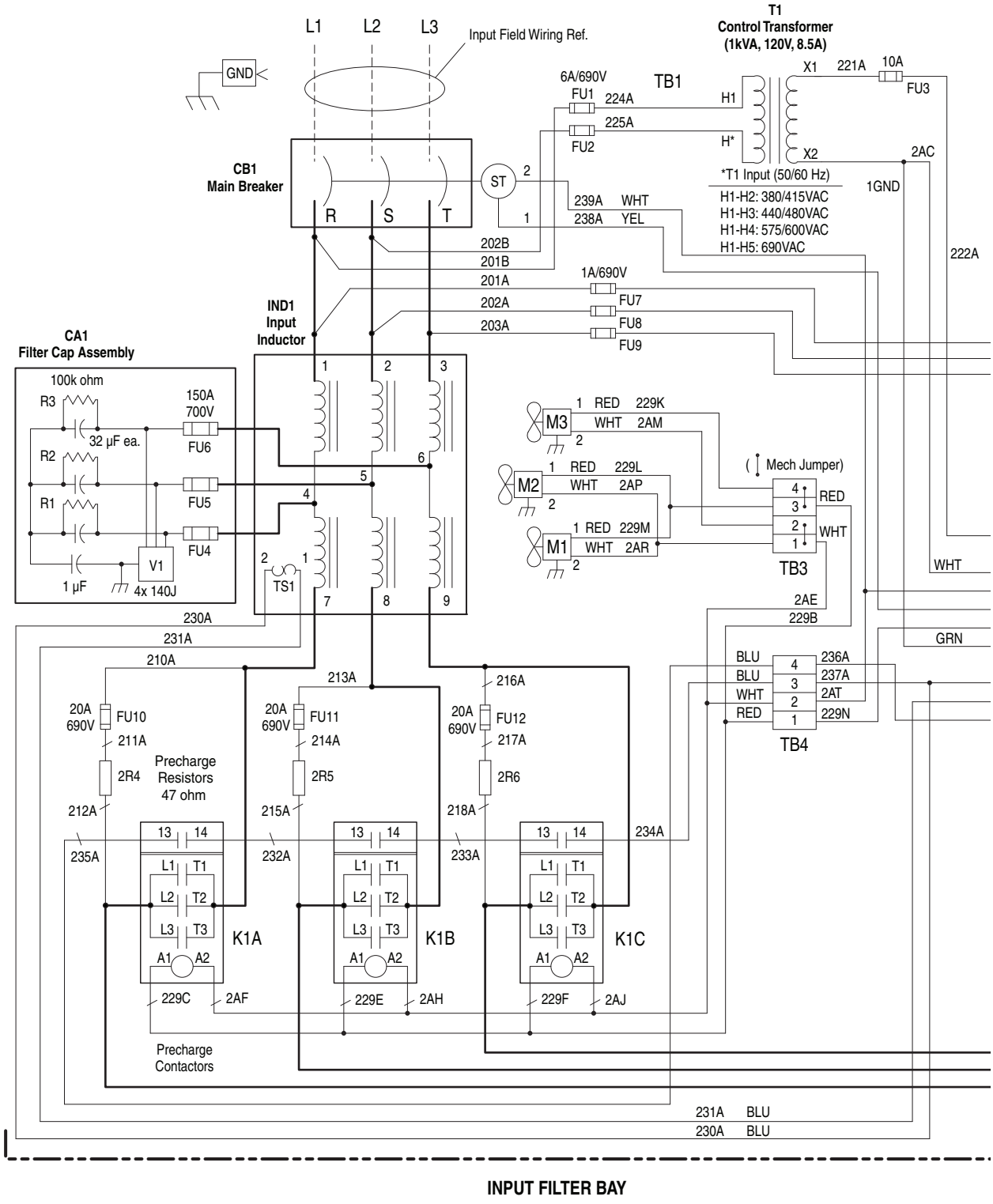
NOTES:

1.) Dashed lines indicate external components and wiring by others.

FUSE TABLE - DRIVE INPUT			
Ref.	**Fuse Description**	**Supplier "A" and P/N**	**Supplier "B" and P/N**
FU1	Class RK-5, 5A/600V	Bussman FRS-R-5	Ferraz Shawmut TRS5R
FU2	Class RK-5, 5A/600V	Bussman FRS-R-5	Ferraz Shawmut TRS5R
FU3	Class CC, 10A/600V	Littelfuse KLDR010	Ferraz Shawmut ATQR10
FU4	150A/600V	Bussman FWH-1508	Ferraz Shawmut A50P150-4
FU5	150A/600V	Bussman FWH-1508	Ferraz Shawmut A50P150-4
FU6	150A/600V	Bussman FWH-1508	Ferraz Shawmut A50P150-4
FU7	Class CC, 1A/600V	Littelfuse KLDR001	Ferraz Shawmut ATQR1
FU8	Class CC, 1A/600V	Littelfuse KLDR001	Ferraz Shawmut ATQR1
FU9	Class CC, 1A/600V	Littelfuse KLDR001	Ferraz Shawmut ATQR1
FU10	Class CC, 20A/600V	Littelfuse CCMR020	Ferraz Shawmut ATDR20
FU11	Class CC, 20A/600V	Littelfuse CCMR020	Ferraz Shawmut ATDR20
FU12	Class CC, 20A/600V	Littelfuse CCMR020	Ferraz Shawmut ATDR20



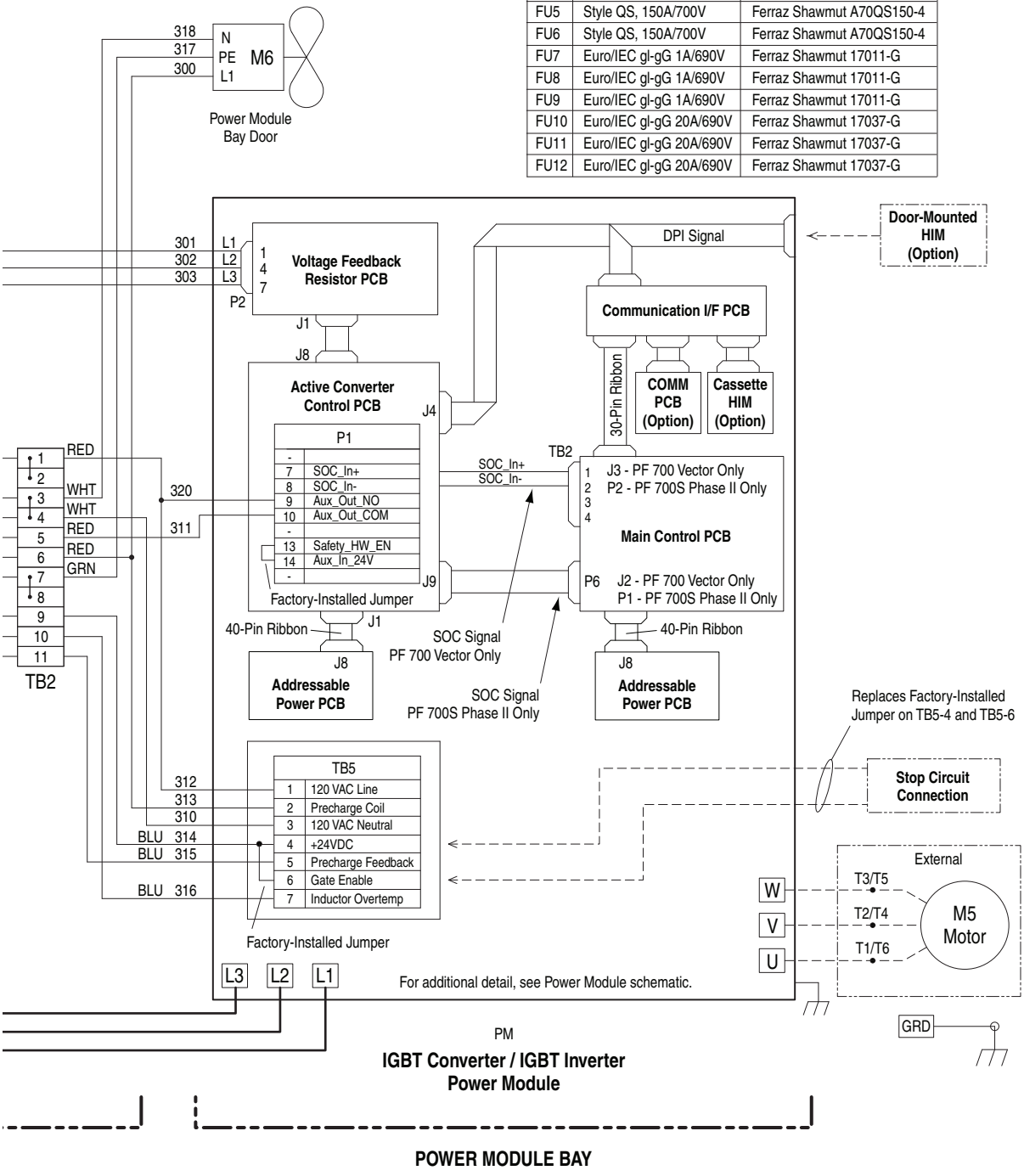
Frame 3A Regenerative Drive Wiring Diagram – 600/690V, 3 Phase



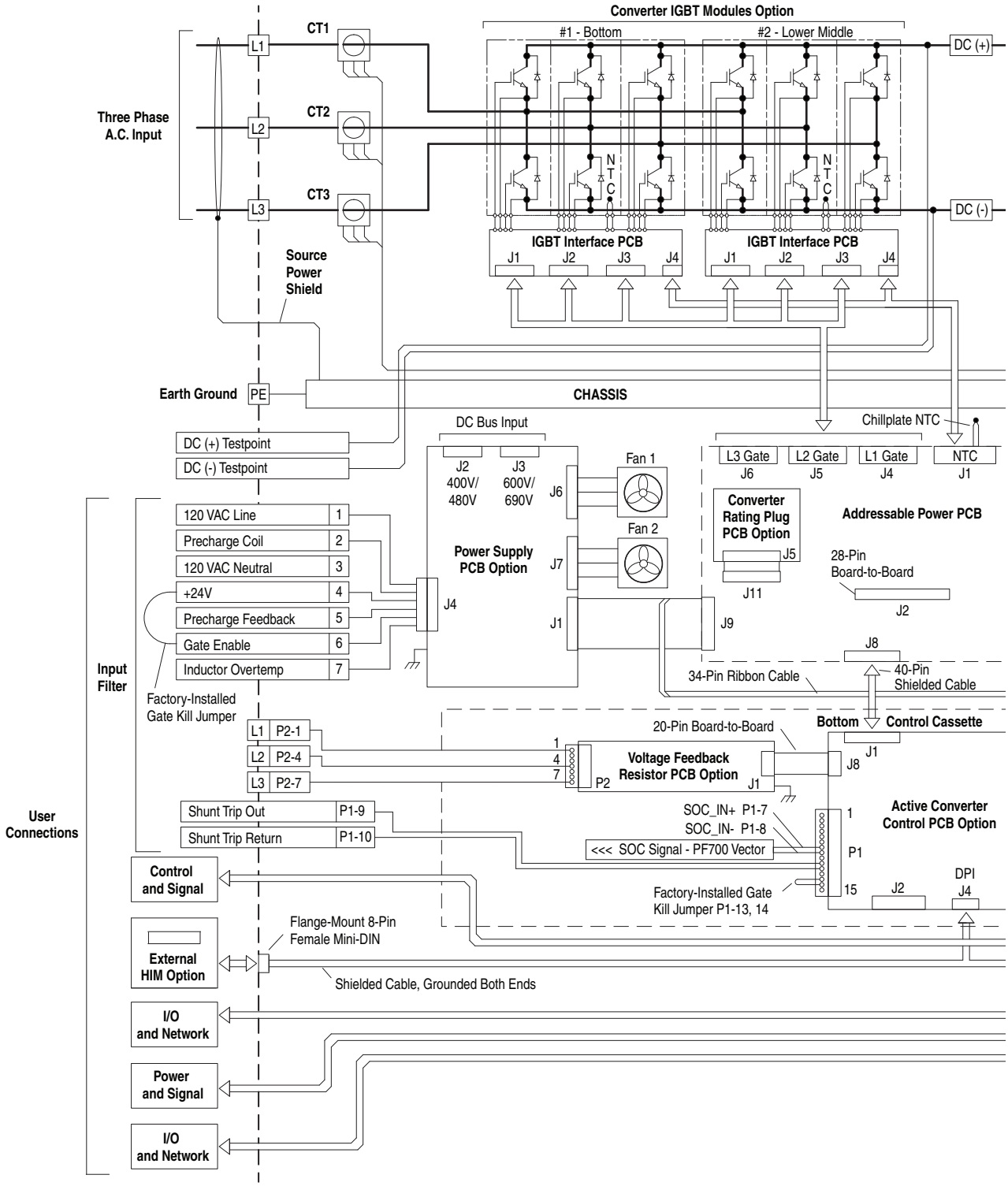
NOTES:

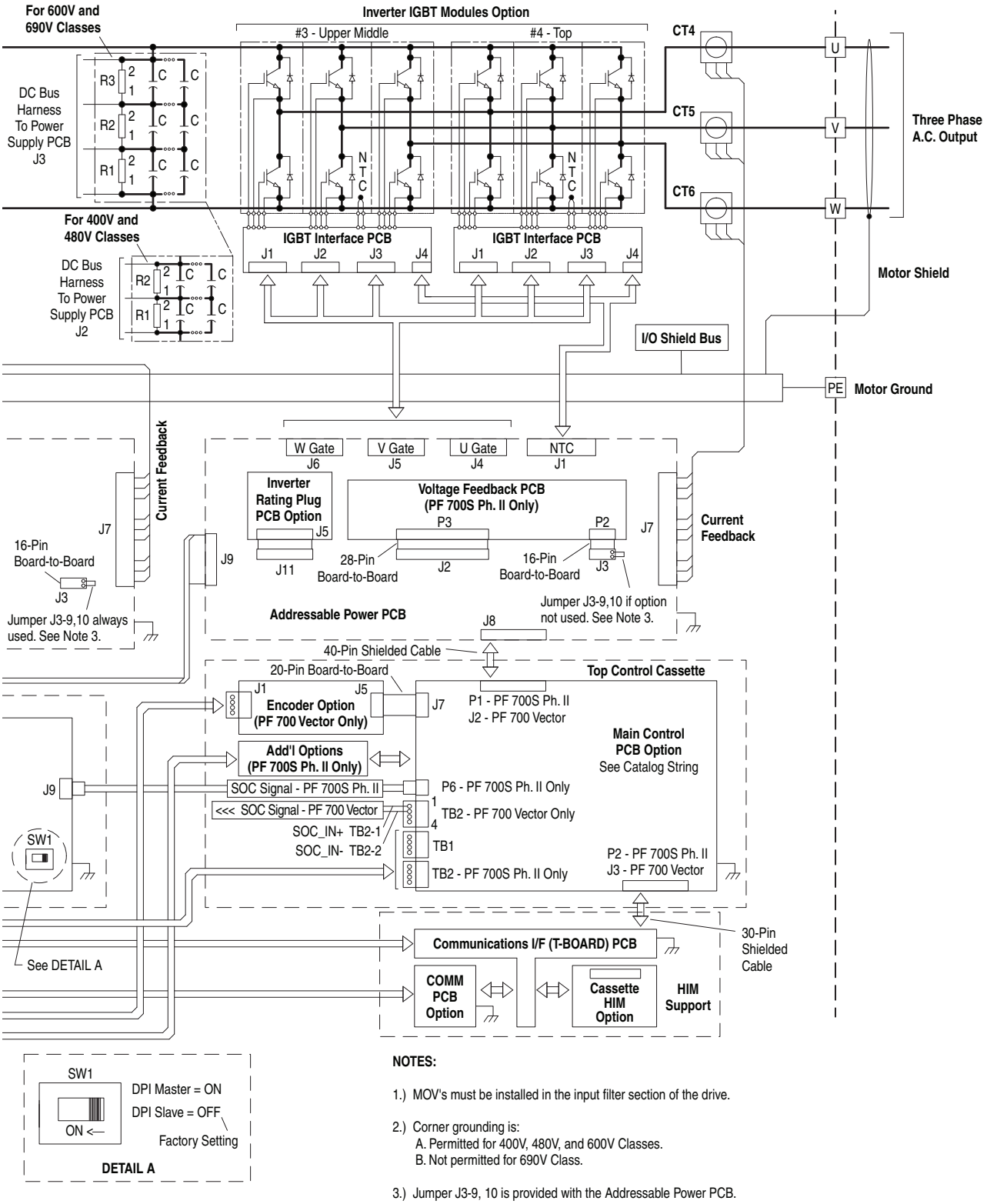
1.) Dashed lines indicate external components and wiring by others.

FUSE TABLE - INPUT FILTER BAY		
Ref.	**Fuse Description**	**Supplier and P/N**
FU1	Euro/IEC gl-gG 6A/690V	Ferraz Shawmut 18023-G
FU2	Euro/IEC gl-gG 6A/690V	Ferraz Shawmut 18023-G
FU3	Class CC, 10A/600V	Ferraz Shawmut ATQR10
FU4	Style QS, 150A/700V	Ferraz Shawmut A70QS150-4
FU5	Style QS, 150A/700V	Ferraz Shawmut A70QS150-4
FU6	Style QS, 150A/700V	Ferraz Shawmut A70QS150-4
FU7	Euro/IEC gl-gG 1A/690V	Ferraz Shawmut 17011-G
FU8	Euro/IEC gl-gG 1A/690V	Ferraz Shawmut 17011-G
FU9	Euro/IEC gl-gG 1A/690V	Ferraz Shawmut 17011-G
FU10	Euro/IEC gl-gG 20A/690V	Ferraz Shawmut 17037-G
FU11	Euro/IEC gl-gG 20A/690V	Ferraz Shawmut 17037-G
FU12	Euro/IEC gl-gG 20A/690V	Ferraz Shawmut 17037-G



Frame 3A Converter/Inverter Power Module Wiring Diagram – 400/690V, 3 Phase





NOTES:

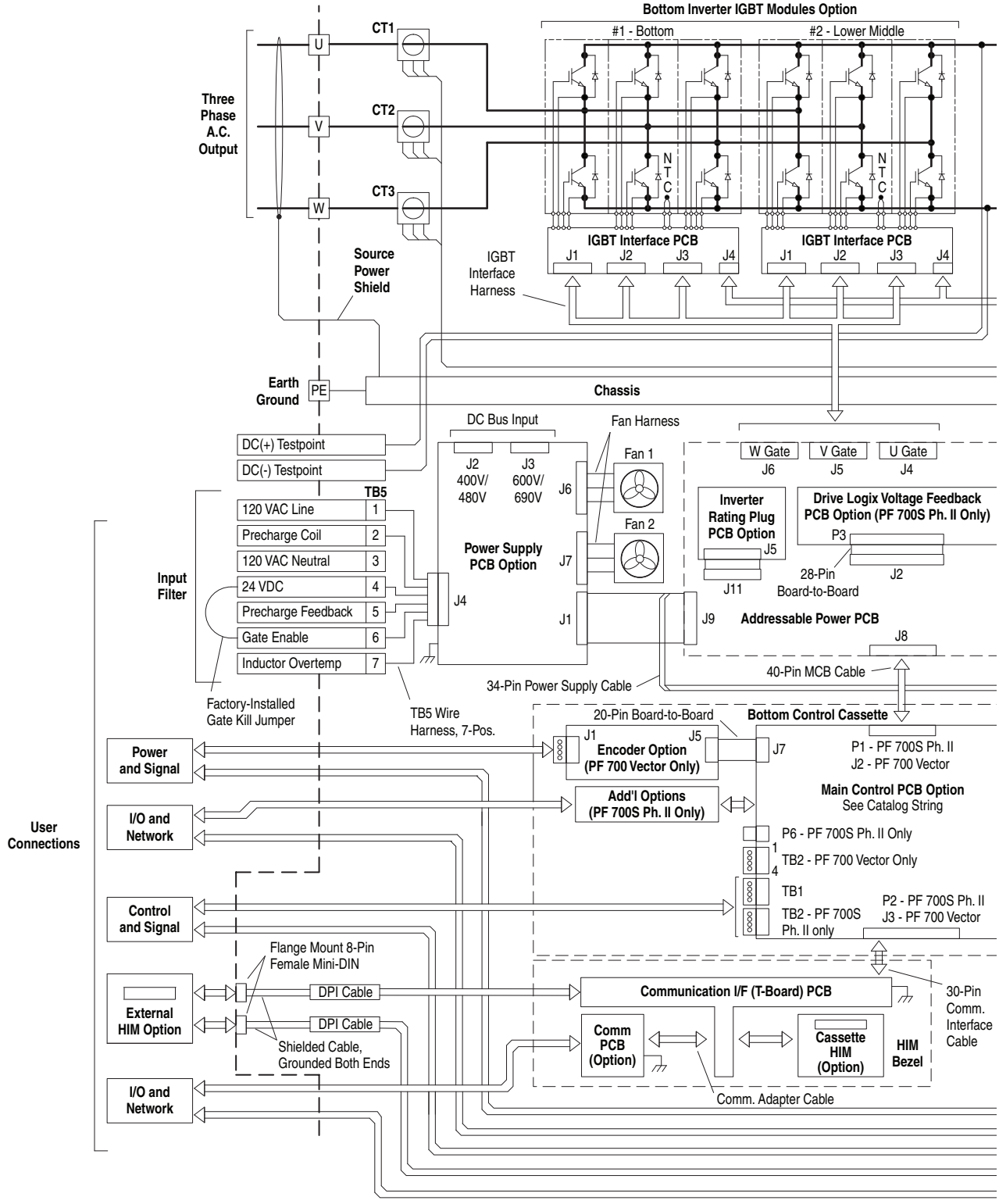
1.) MOV's must be installed in the input filter section of the drive.

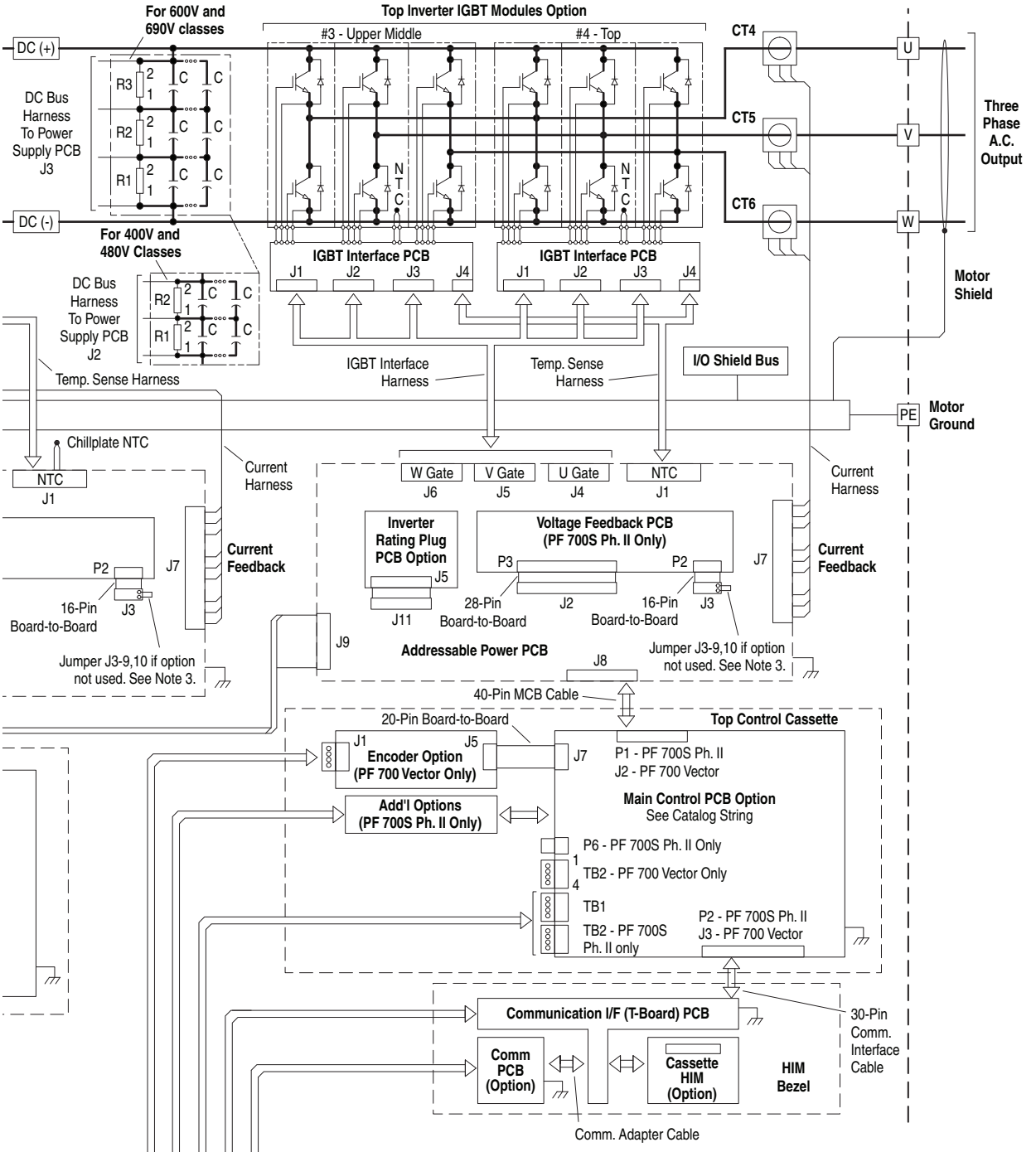
2.) Corner grounding is:
A. Permitted for 400V, 480V, and 600V Classes.
B. Not permitted for 690V Class.

3.) Jumper J3-9, 10 is provided with the Addressable Power PCB.

4.) Product software supports only one external HIM.
A splitter box is required for multiple external HIM devices.

Frame 3A Dual Inverter Power Module Wiring Diagram – 400/690V, 3 Phase





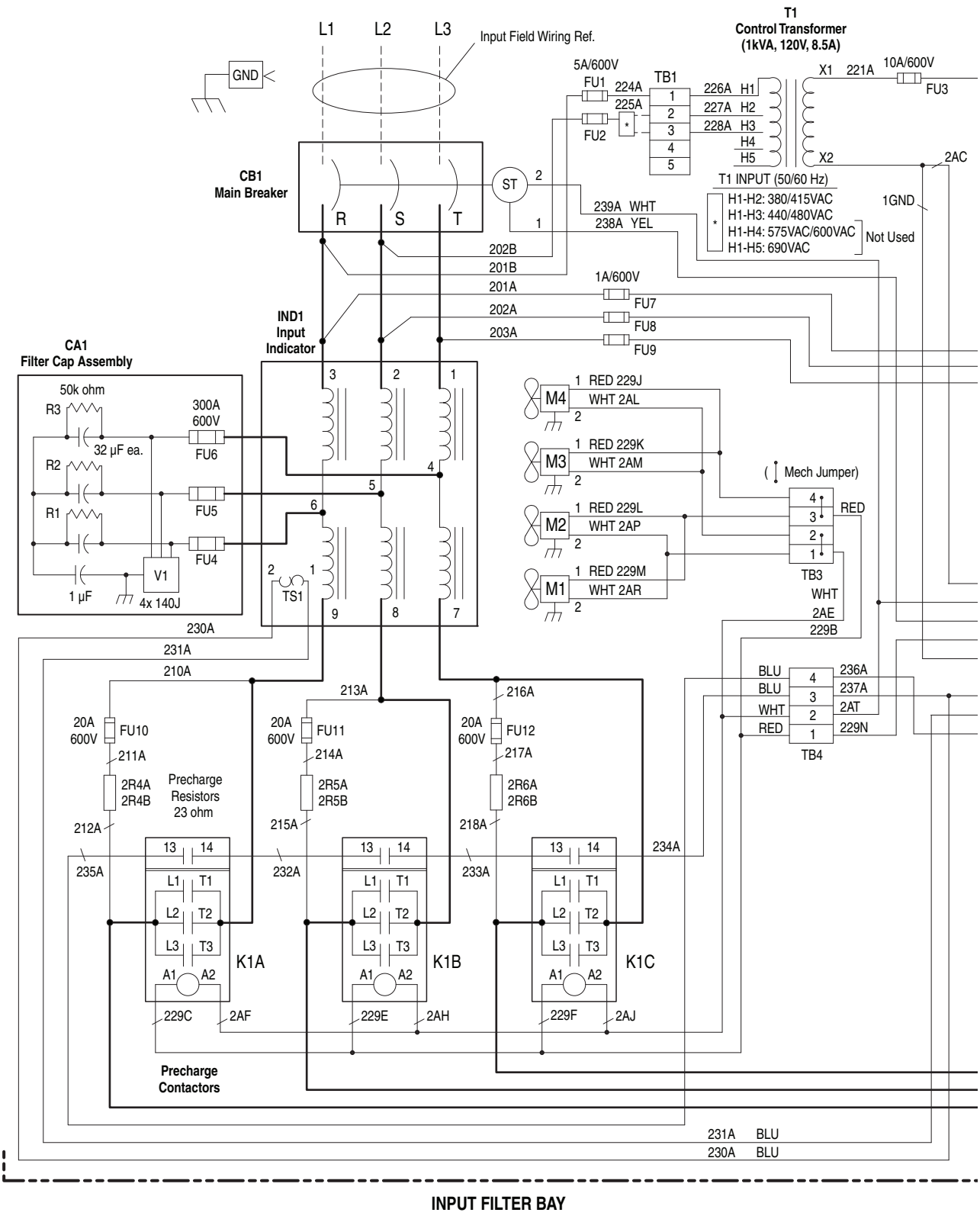
Notes:

1.) MOV's must be installed in the Input Filter section of the drive.

2.) Corner grounding is:
A. Permitted for 400V, 480V, and 600V Classes.
B. Not permitted for 690V Class.

3.) Jumper J3-9, 10 is provided with the Addressable Power PCB.

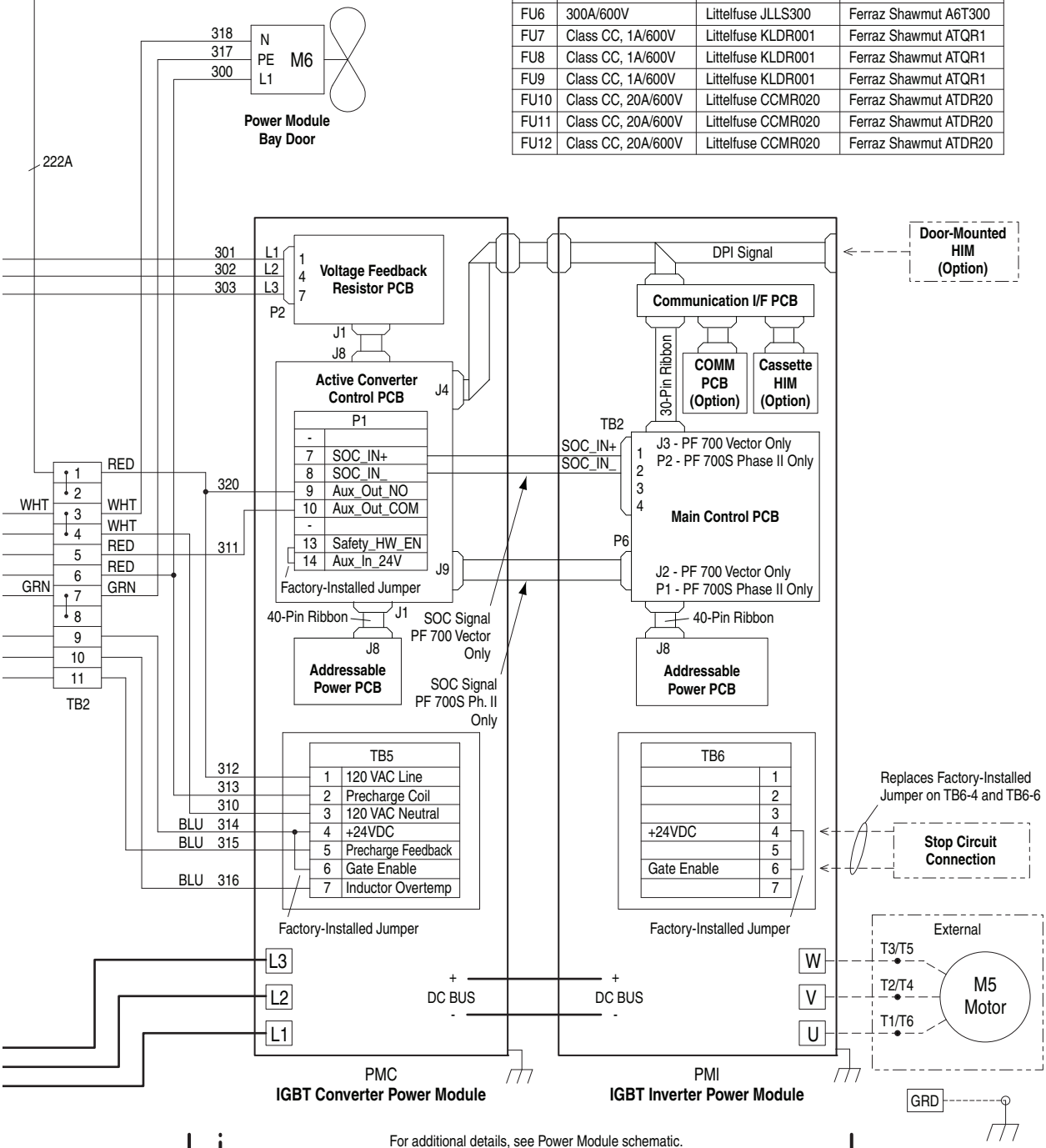
Frame 3B Regenerative Drive Wiring Diagram – 400/480V, 3 Phase



FUSE TABLE - DRIVE INPUT			
Ref.	**Fuse Description**	**Supplier "A" and P/N**	**Supplier "B" and P/N**
FU1	Class RK-5, 5A/600V	Bussman FRS-R-5	Ferraz Shawmut TRS5R
FU2	Class RK-5, 5A/600V	Bussman FRS-R-5	Ferraz Shawmut TRS5R
FU3	Class CC, 10A/600V	Littelfuse KLDR010	Ferraz Shawmut ATQR10
FU4	300A/600V	Littelfuse JLLS300	Ferraz Shawmut A6T300
FU5	300A/600V	Littelfuse JLLS300	Ferraz Shawmut A6T300
FU6	300A/600V	Littelfuse JLLS300	Ferraz Shawmut A6T300
FU7	Class CC, 1A/600V	Littelfuse KLDR001	Ferraz Shawmut ATQR1
FU8	Class CC, 1A/600V	Littelfuse KLDR001	Ferraz Shawmut ATQR1
FU9	Class CC, 1A/600V	Littelfuse KLDR001	Ferraz Shawmut ATQR1
FU10	Class CC, 20A/600V	Littelfuse CCMR020	Ferraz Shawmut ATDR20
FU11	Class CC, 20A/600V	Littelfuse CCMR020	Ferraz Shawmut ATDR20
FU12	Class CC, 20A/600V	Littelfuse CCMR020	Ferraz Shawmut ATDR20

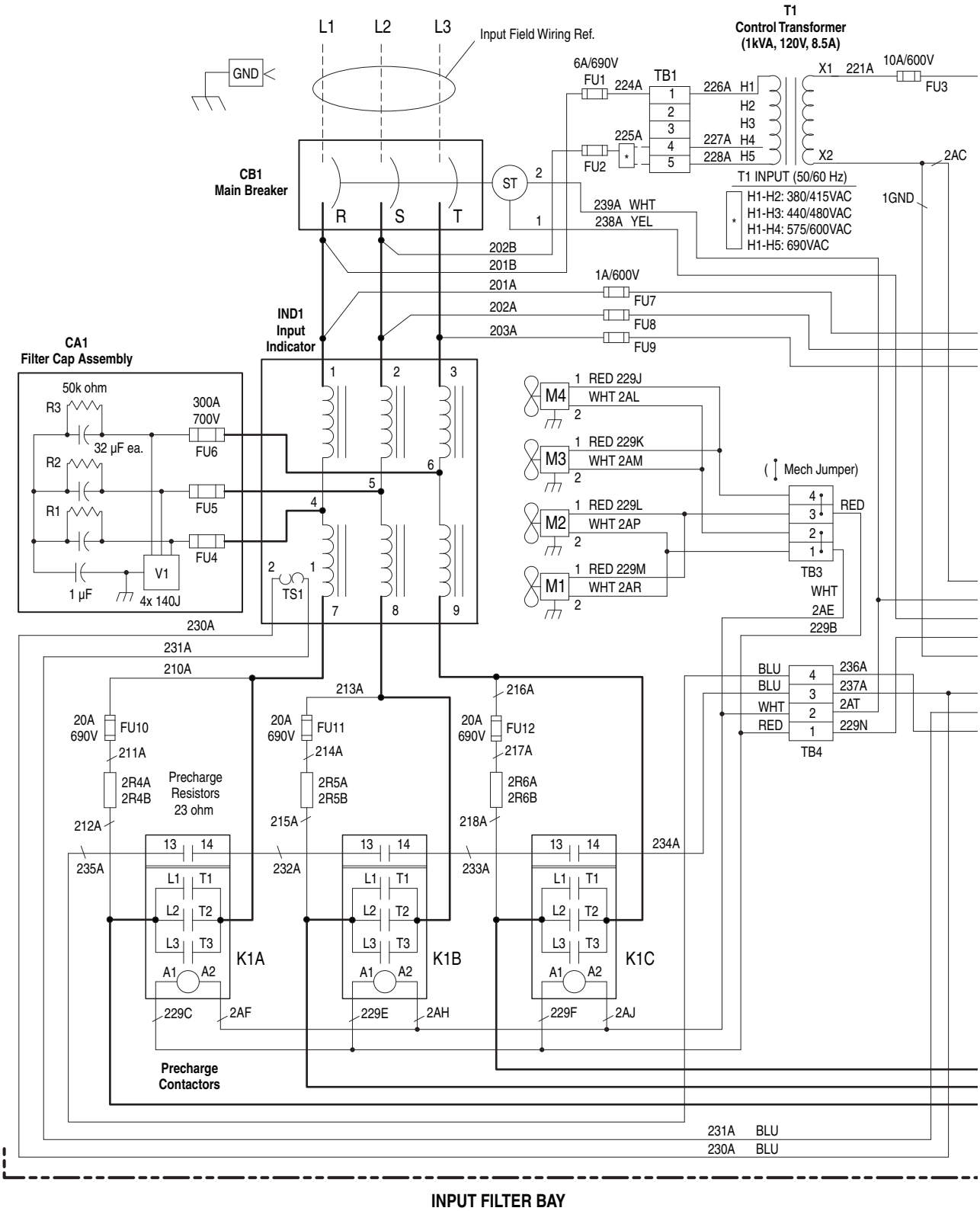
NOTES:

1.) Dashed lines indicate external components and wiring by others.



POWER MODULE BAY

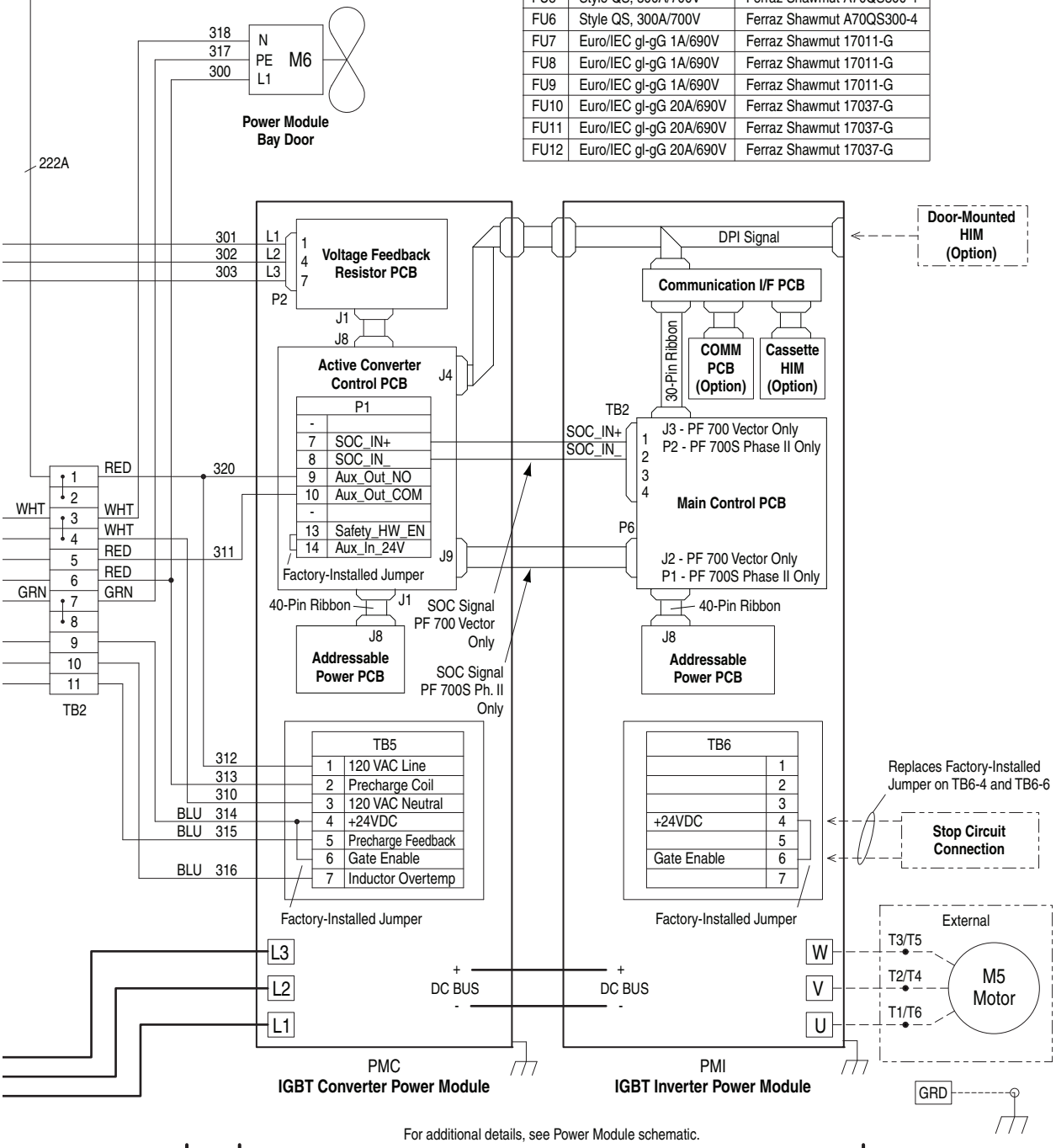
Frame 3B Regenerative Drive Wiring Diagram – 600/690V, 3 Phase



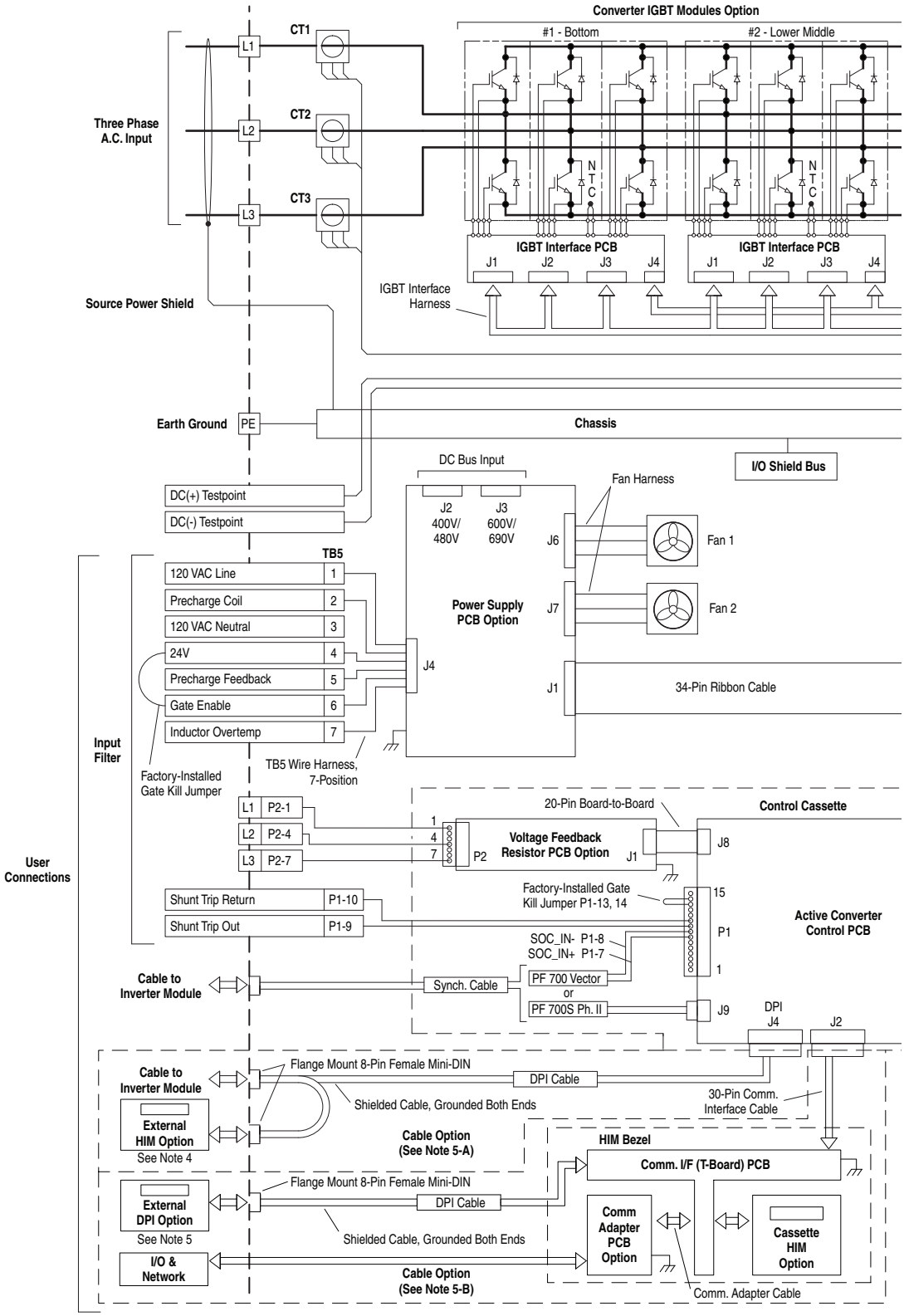
FUSE TABLE - INPUT FILTER BAY		
Ref.	**Fuse Description**	**Supplier and P/N**
FU1	Euro/IEC gl-gG 6A/690V	Ferraz Shawmut 18023-G
FU2	Euro/IEC gl-gG 6A/690V	Ferraz Shawmut 18023-G
FU3	Class CC, 10A/600V	Ferraz Shawmut ATQR10
FU4	Style QS, 300A/700V	Ferraz Shawmut A70QS300-4
FU5	Style QS, 300A/700V	Ferraz Shawmut A70QS300-4
FU6	Style QS, 300A/700V	Ferraz Shawmut A70QS300-4
FU7	Euro/IEC gl-gG 1A/690V	Ferraz Shawmut 17011-G
FU8	Euro/IEC gl-gG 1A/690V	Ferraz Shawmut 17011-G
FU9	Euro/IEC gl-gG 1A/690V	Ferraz Shawmut 17011-G
FU10	Euro/IEC gl-gG 20A/690V	Ferraz Shawmut 17037-G
FU11	Euro/IEC gl-gG 20A/690V	Ferraz Shawmut 17037-G
FU12	Euro/IEC gl-gG 20A/690V	Ferraz Shawmut 17037-G

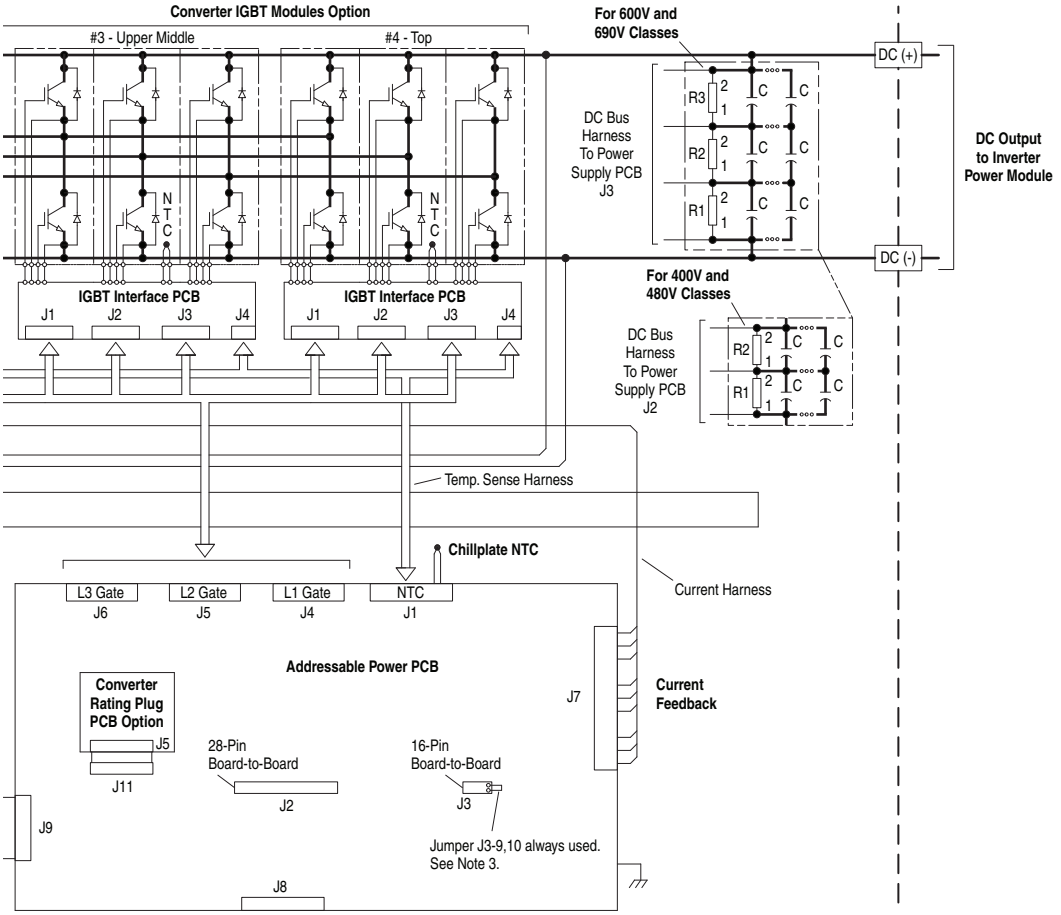
NOTES:

1.) Dashed lines indicate external components and wiring by others.



Frame 3B Active Converter Power Module Schematic – 400/690V, 3 Phase





NOTES:

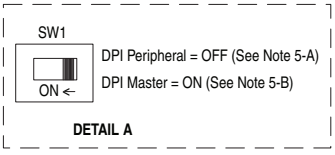
1.) MOV's must be installed in the input filter section of the drive.

2.) Corner grounding is:
A. Permitted for 400V, 480V, and 600V Classes.
B. Not permitted for 690V Class.

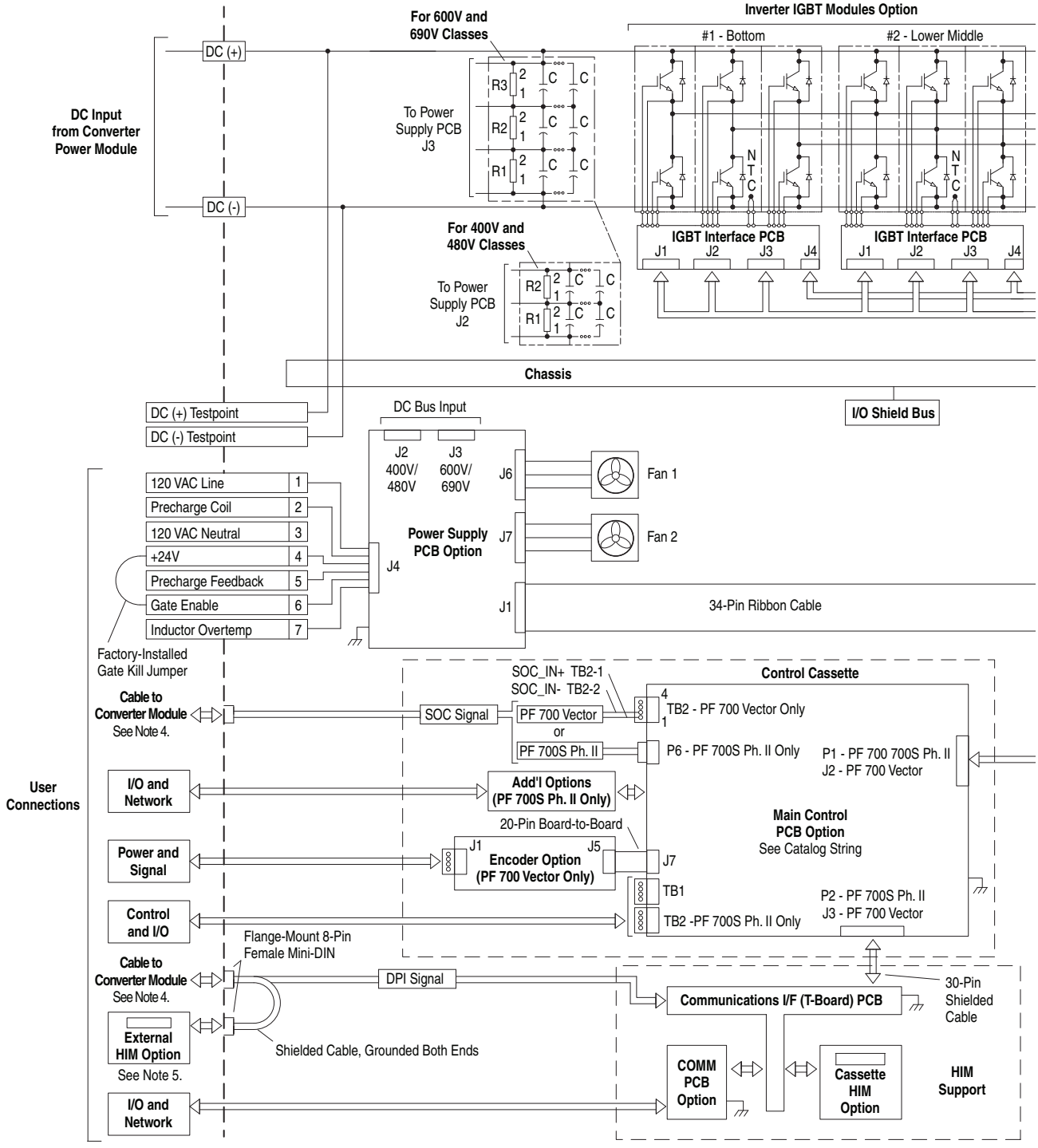
3.) Jumper J3-9, 10 is provided with Addressable Power PCB.

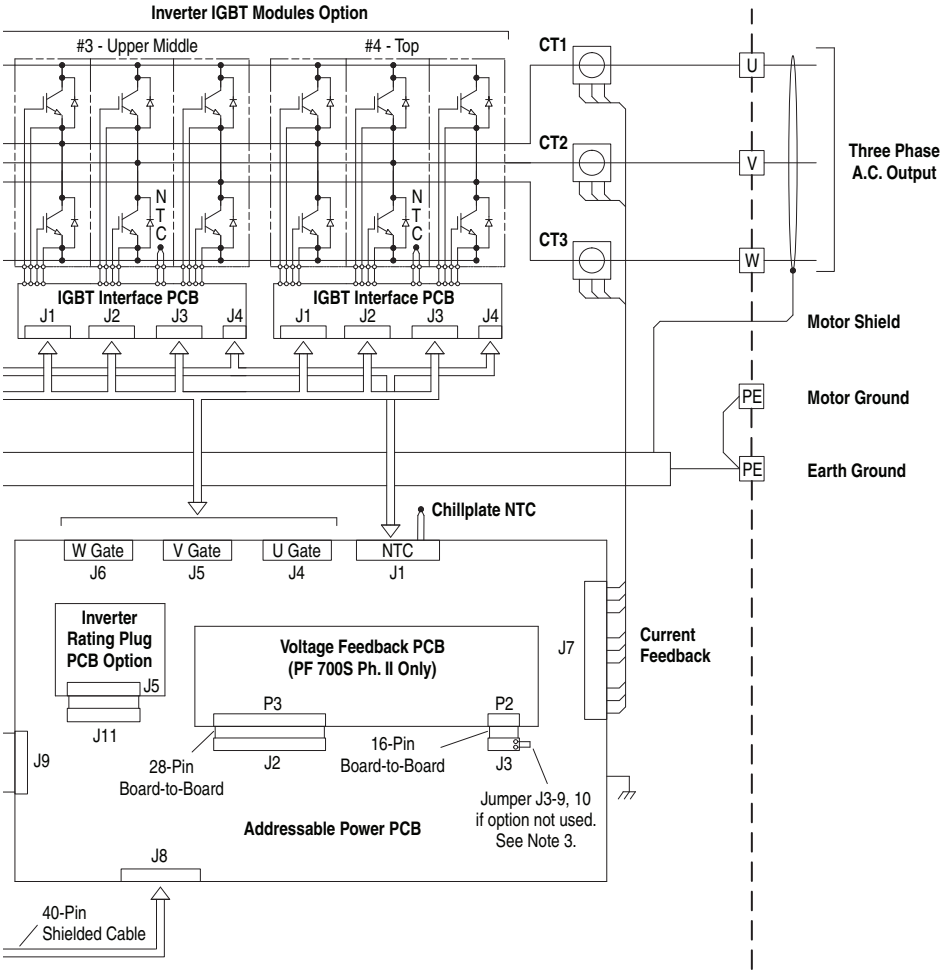
4.) Product software supports only one external HIM. Do not connect external HIM if one is also connected to the Inverter Power Module. A splitter box is required for multiple external HIM devices.

5.) DPI Cable and SW1 Options:
A. Use with Active Converter Power Module (Catalog String position 13 = G).
B. Use with Active Converter Power Module - Stand Alone (Catalog String position 13 = P).



Frame 3B Inverter Power Module Schematic – 400/690V, 3 Phase





NOTES:

1.) MOV's must be installed in the input filter section of the drive.

2.) Corner grounding is:
A. Permitted for 400V, 480V, and 600V Classes.
B. Not permitted for 690V Class.

3.) Jumper J3-9, 10 is provided with the Addressable Power PCB.

4.) SOC cable and DPI cable are used only with Inverter Power Modules coupled to Converter Power Modules. These cables are not used with stand-alone Inverter Modules.

5.) Product software supports only one external HIM. Do not connect external HIM if one is also connected to the Converter Power Module. A splitter box is required for multiple external HIM devices.

Notes:

Numerics

A

B

C

D

E

F

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W

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Publication 20L-UM001E-EN-P – May, 2013
Supersedes 20L-UM001D-EN-P – August, 2008

P/N-203462