PowerFlex® 700S Drive

Introduction

This document is designed to guide you through the basic steps needed to install, start-up and program the PowerFlex 700S Drive. **The information provided does not replace the user manual and is intended for qualified personnel only.** For detailed PowerFlex 700S information refer to the following:

Title	Publication	Available...
PowerFlex 700S User Manual	20D-UM001	www.theautomationbookstore.com
PowerFlex 700S Reference Manual, Vol. 2	PFlex-RM-002	
PowerFlex 700S Firmware Release Notes	20D-RN004	

Precautions

Class 1 LED Product

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber optic cable connectors.

General Precautions

ATTENTION: This drive contains **ESD** (Electrostatic Discharge) 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, reference A-B publication 8000-4.5.2, “Guarding Against Electrostatic Damage” 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 under sizing the motor, incorrect or inadequate AC supply, or excessive surrounding air temperatures may result in malfunction of the system.

ATTENTION: Only **qualified personnel** familiar with the PowerFlex 700S Drive 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 before performing any work on the drive. Measure the DC bus voltage at the +DC & –DC terminals of the Power Terminal Block (refer to Chapter 1 in the *PowerFlex 700S User Manual* for location). The voltage must be zero.

ATTENTION: Risk of injury or equipment damage exists. DPI or SCANport 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.

ATTENTION: Risk of injury or equipment damage exists. Parameters 365 [Encdr0 Loss Cnfg] - 394 [VoltFdbkLossCnfg] let you determine the action of the drive in response to operating anomalies. Precautions should be taken to ensure that the settings of these parameters do not create hazards of injury or equipment damage

ATTENTION: Risk of injury or equipment damage exists. Parameters 383 [SL CommLoss Data] - 392 [NetLoss DPI Cnfg] let you determine the action of the drive if communications are disrupted. You can set these parameters so the drive continues to run. Precautions should be taken to ensure the settings of these parameters do not create hazards of injury or equipment damage.

EMC Instructions

CE Conformity

Conformity with the Low Voltage (LV) Directive and Electromagnetic Compatibility (EMC) Directive has been demonstrated using harmonized European Norm (EN) standards published in the Official Journal of the European Communities. PowerFlex Drives comply with the EN standards listed below when installed according to the User and Reference Manual.

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

Low Voltage Directive (73/23/EEC)

- EN50178 Electronic equipment for use in power installations.

EMC Directive (89/336/EEC)

- EN61800-3 Adjustable speed electrical power drive systems Part 3: EMC product standard including specific test methods.

General Notes

- If the adhesive label is removed from the top of the drive, the drive must be installed in an enclosure with side openings less than 12.5 mm (0.5 in.) and top openings less than 1.0 mm (0.04 in.) to maintain compliance with the LV Directive.
- The motor cable should be kept as short as possible in order to avoid electromagnetic emission as well as capacitive currents.
- Use of line filters in ungrounded systems is not recommended.
- PowerFlex drives may cause radio frequency interference if used in a residential or domestic environment. The user is required to take measures to prevent interference, in addition to the essential requirements for CE compliance listed below, if necessary.
- 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.
- PowerFlex drives can generate conducted low frequency disturbances (harmonic emissions) on the AC supply system. More information regarding harmonic emissions can be found in the *PowerFlex Reference Manual, Vol. 2*.

Essential Requirements for CE Compliance

Conditions 1-6 listed below must be satisfied for PowerFlex drives to meet the requirements of EN61800-3.

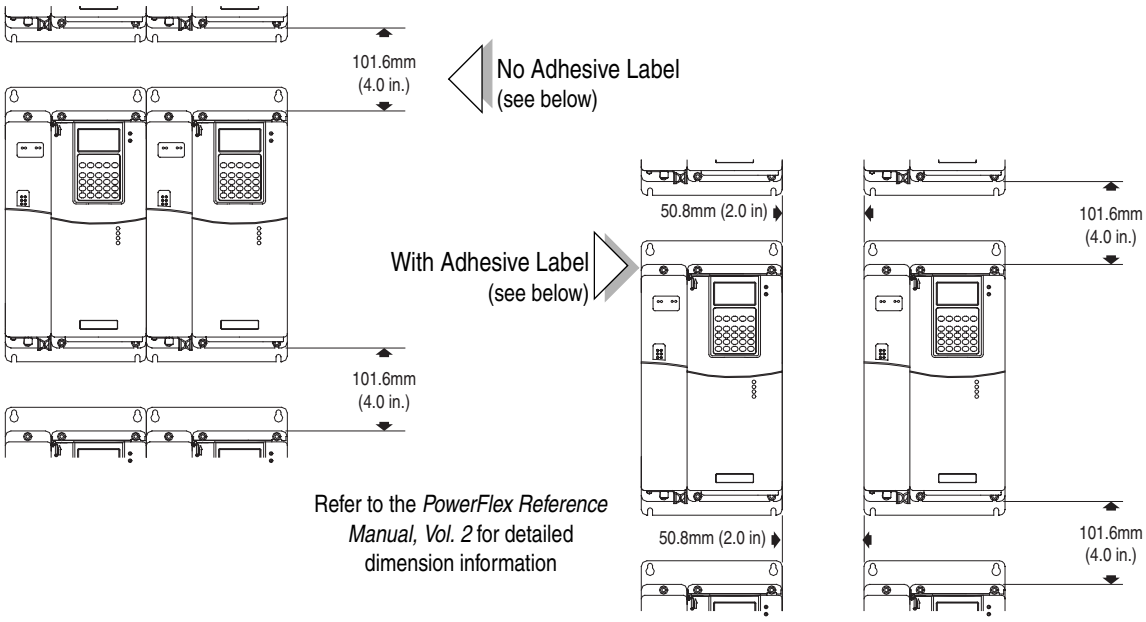
1. Standard PowerFlex 700S CE compatible Drive.
2. Review important precautions/attentions statements throughout this document before installing drive.
3. Grounding as described on page 1-4 of the user manual.
4. Output power, control (I/O) and signal wiring must be braided, shield cable with a coverage of 75% or better, metal conduit or equivalent attenuation.
5. All shielded cables should terminate with proper shielded connector.
6. Conditions in Table A.

Table A PowerFlex 700S EN61800-3 EMC Compatibility

Frame	**Second Environment** *Restrict Motor Cable to 30 m (98 ft.)*	**First Environment Restricted Distribution**
	Any Drive and Option	
1	✔	*Refer to PowerFlex Reference Manual, Vol. 2*
2	✔	
3	✔	
4	✔	
5	✔	
6	✔	

Mounting Clearances

Figure 1 Minimum Mounting Clearance Requirements



Operating Temperatures

PowerFlex 700S drives are designed to operate in a surrounding air temperature range of 0° to 40° C. To operate the drive in installations with surrounding air temperature between 41° and 50° C, remove the adhesive label affixed to the top of the drive enclosure.

Important: Removing the adhesive label from the drive changes the NEMA enclosure rating from Type 1 to Open type.

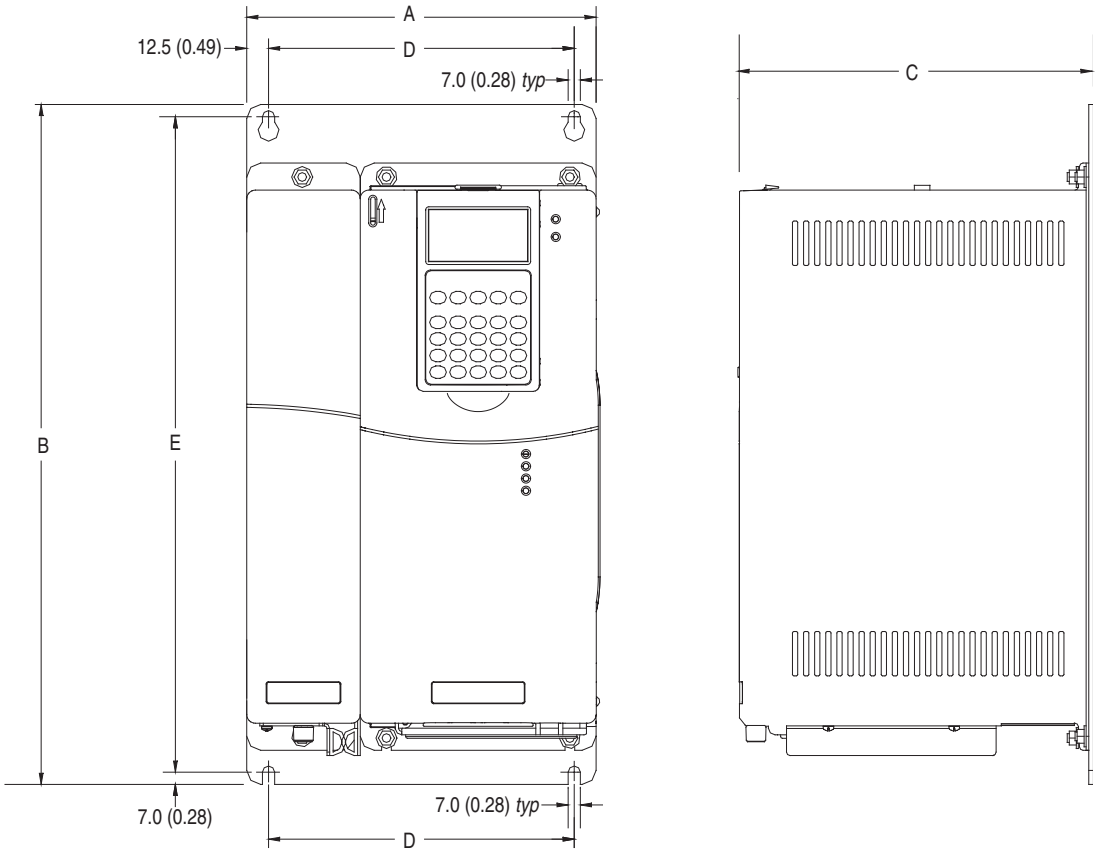
Dimensions

The following are the PowerFlex 700S dimensions.

Table B PowerFlex 700S Frames

Frame	AC Input								DC Input			
	208/240		400V		480V		600V		540V		650V	
	ND HP	HD HP	ND kW	HD kW	ND HP	HD HP	ND HP	HD HP	ND HP	HD HP	ND HP	HD HP
1	2	1.5	7.5	5.5	10	7.5	10	7.5	7.5	5.5	10	7.5
	3	2	11	7.5	15	10	15	10	11	7.5	15	10
	5	3	–	–	–	–	–	–	–	–	–	–
	7.5	5	–	–	–	–	–	–	–	–	–	–
2	10	7.5	15	11	20	15	20	15	15	11	20	15
	–	–	18.5	15	25	20	25	20	18.5	15	25	20
3	15	10	22	18.5	30	25	30	25	22	18.5	30	25
	20	15	30	22	40	30	40	30	30	22	40	30
	–	–	37	30	50	40	50	40	37	30	50	40
4	25	20	45	37	60	50	60	50	45	37	60	50
	30	25	–	–	–	–	–	–	–	–	–	–
5	40	30	55	45	75	60	75	60	55	45	75	60
	50	40	–	–	100	75	100	75	–	–	100	75
6	60	50	75	55	125	100	–	–	75	55	125	100
	75	60	90	75	150	125	–	–	90	75	150	125
	–	–	110	90	–	–	–	–	110	90	–	–

Figure 2 PowerFlex 700S Frame 1-3 *(Frame 1 Shown)*



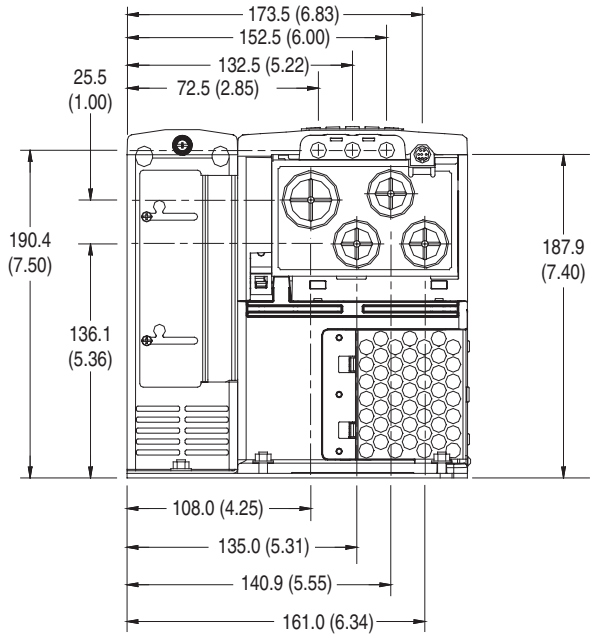
Dimensions are in millimeters and (inches)

Frame	A	B	C	D	E	Weight ❶ kg (lbs.) Drive
1	200.0 (7.87)	389.0 (15.31)	202.8 (7.98)	175.0 (6.89)	375.0 (14.76)	11.3 (24.92)
2	285.0 (11.22)	389.0 (15.31)	202.7 (7.98)	250.0 (9.84)	375.0 (14.76)	18.4 (40.57)
3	285.0 (11.22)	564.0 (22.20)	202.7 (7.98)	250.0 (9.84)	550.0 (21.65)	26.6 (58.65)

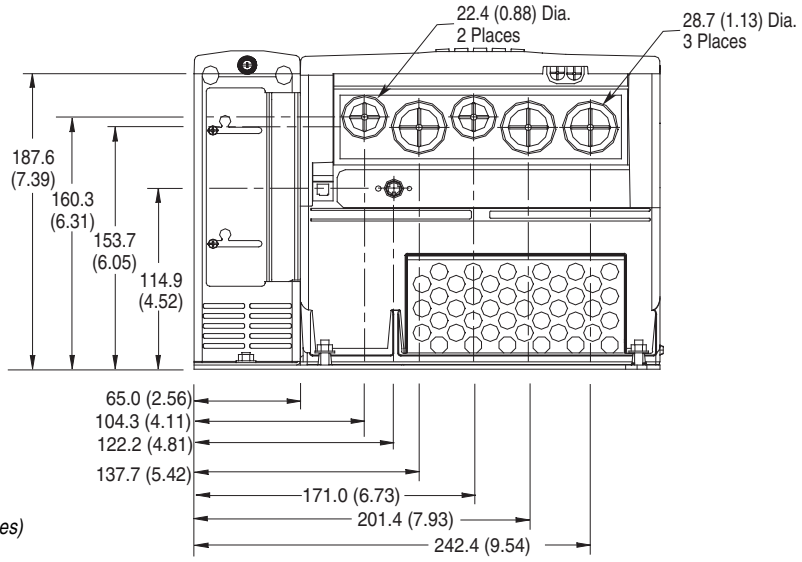
❶ Weights include HIM, DriveLogix controller with ControlNet daughtercard, Hi-Resolution Encoder Option, and 20-COMM-C ControlNet adapter

Figure 3 PowerFlex 700S Bottom View Dimensions, Frame1 & 2

Frame 1



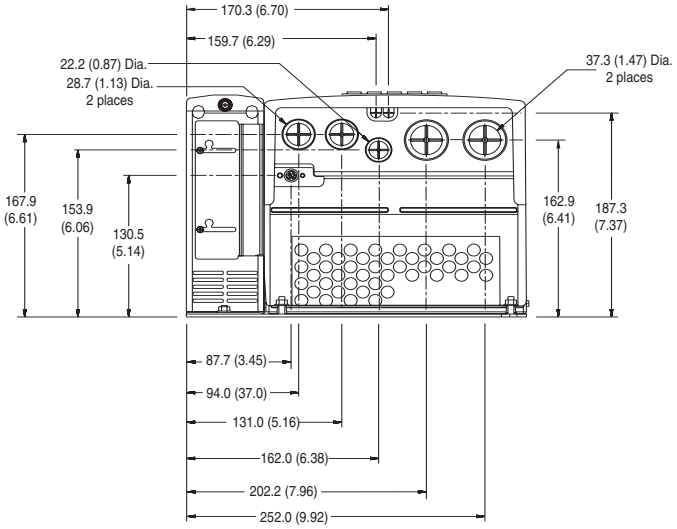
Frame 2



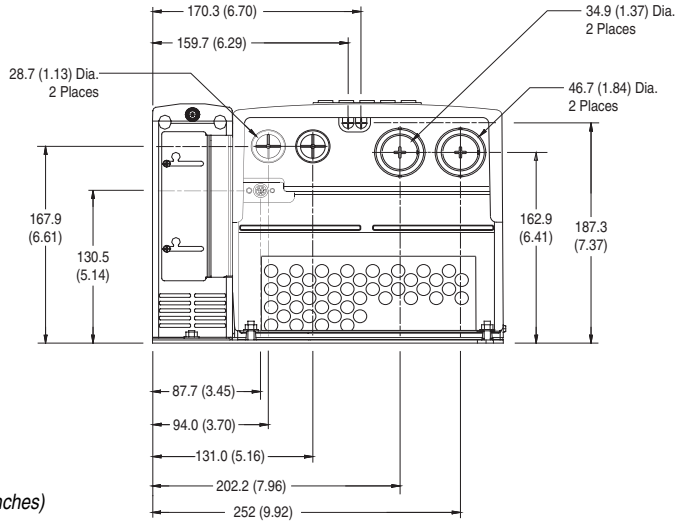
Dimensions are in millimeters and (inches)

Figure 4 PowerFlex 700S Frame 3 Bottom View Dimensions

Frame 3 - All Drives, except 50 HP, 480 V (37 kW, 400V)

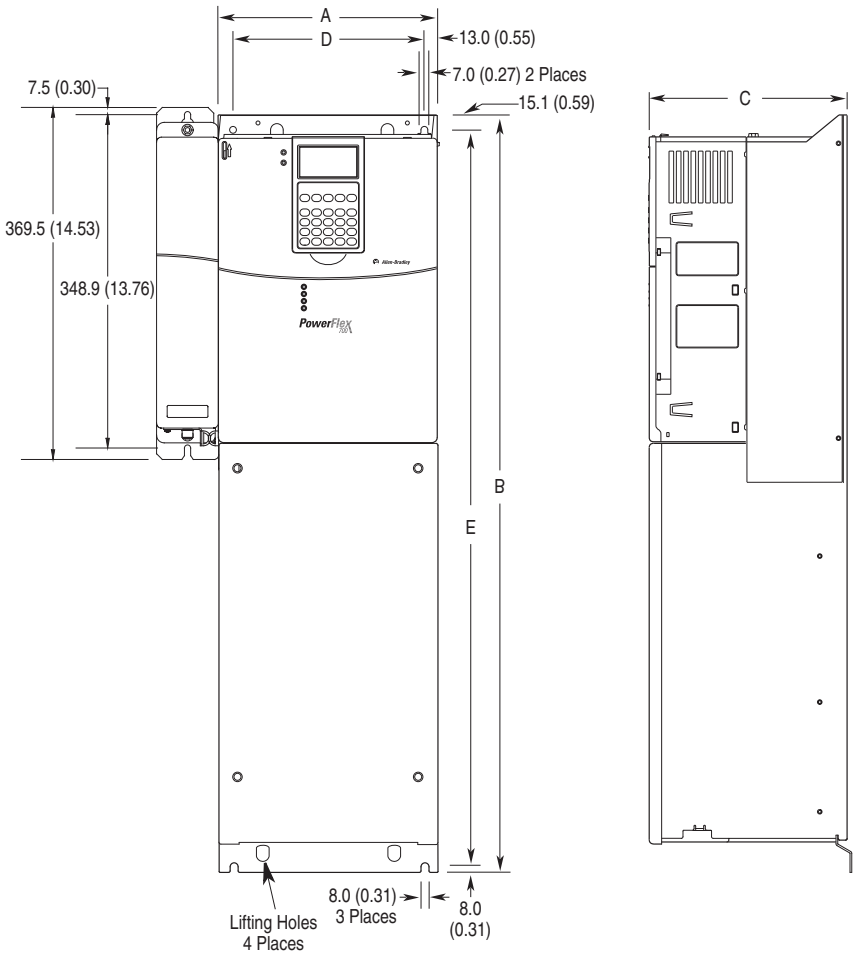


Frame 3 - 50 HP, 480V (37 kW, 400V) Normal Duty Drive



Dimensions are in millimeters and (inches)

Figure 5 PowerFlex 700S Frame 4 Dimensions

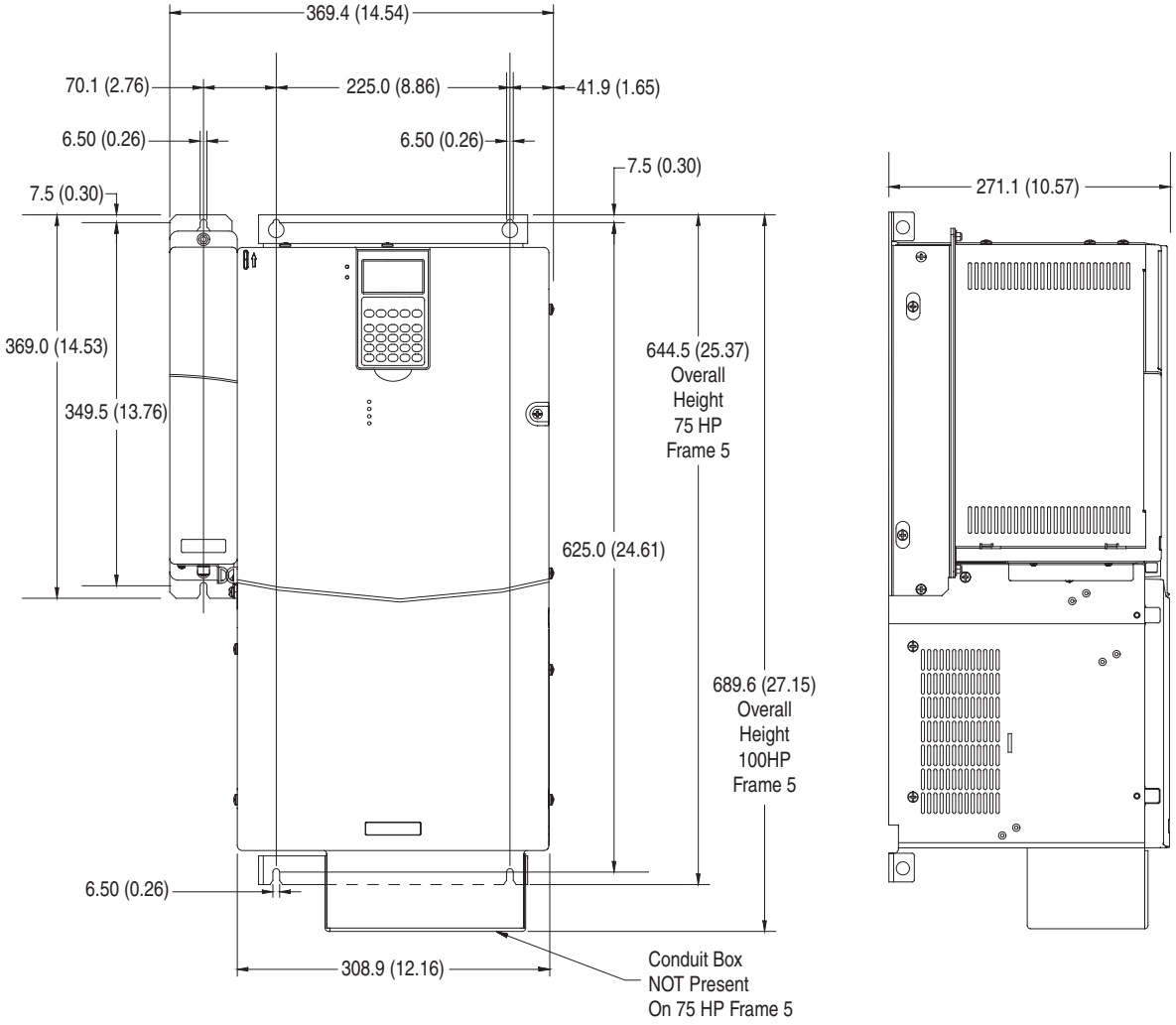


Dimensions are in millimeters and (inches)

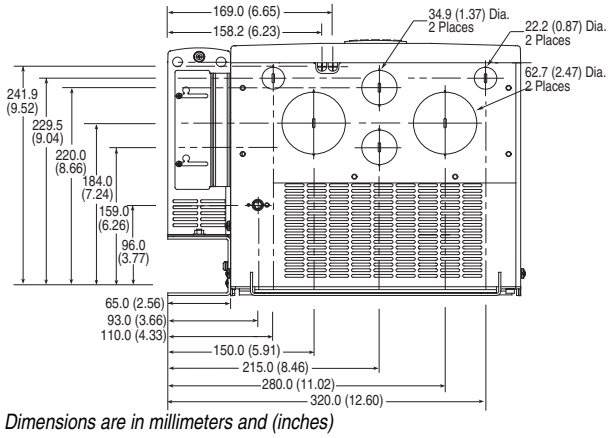
Frame	A *(Max.)*	B	C *(Max.)*	D	E	Approx. Weight ❶ *kg (lbs.)*	
						Drive	Drive & Packaging
4	220.8 (8.69)	758.8 (29.9)	201.8 (7.94)	192.0 (7.56)	741.7 (29.2)	28.4 (62.5)	29.03 (63.9)

❶ Weights include HIM and Standard I/O.

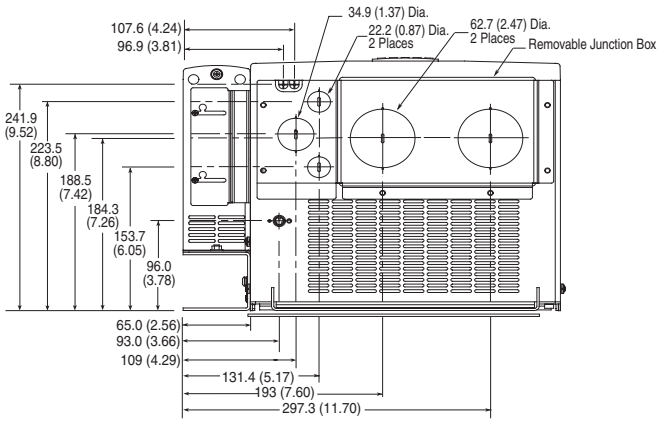
Figure 6 PowerFlex 700S Frame 5 Dimensions



Frame 5 - 75 HP, 480 V (55kW, 400V)



Frame 5 - 100 HP, 480 V (55kW, 400V)

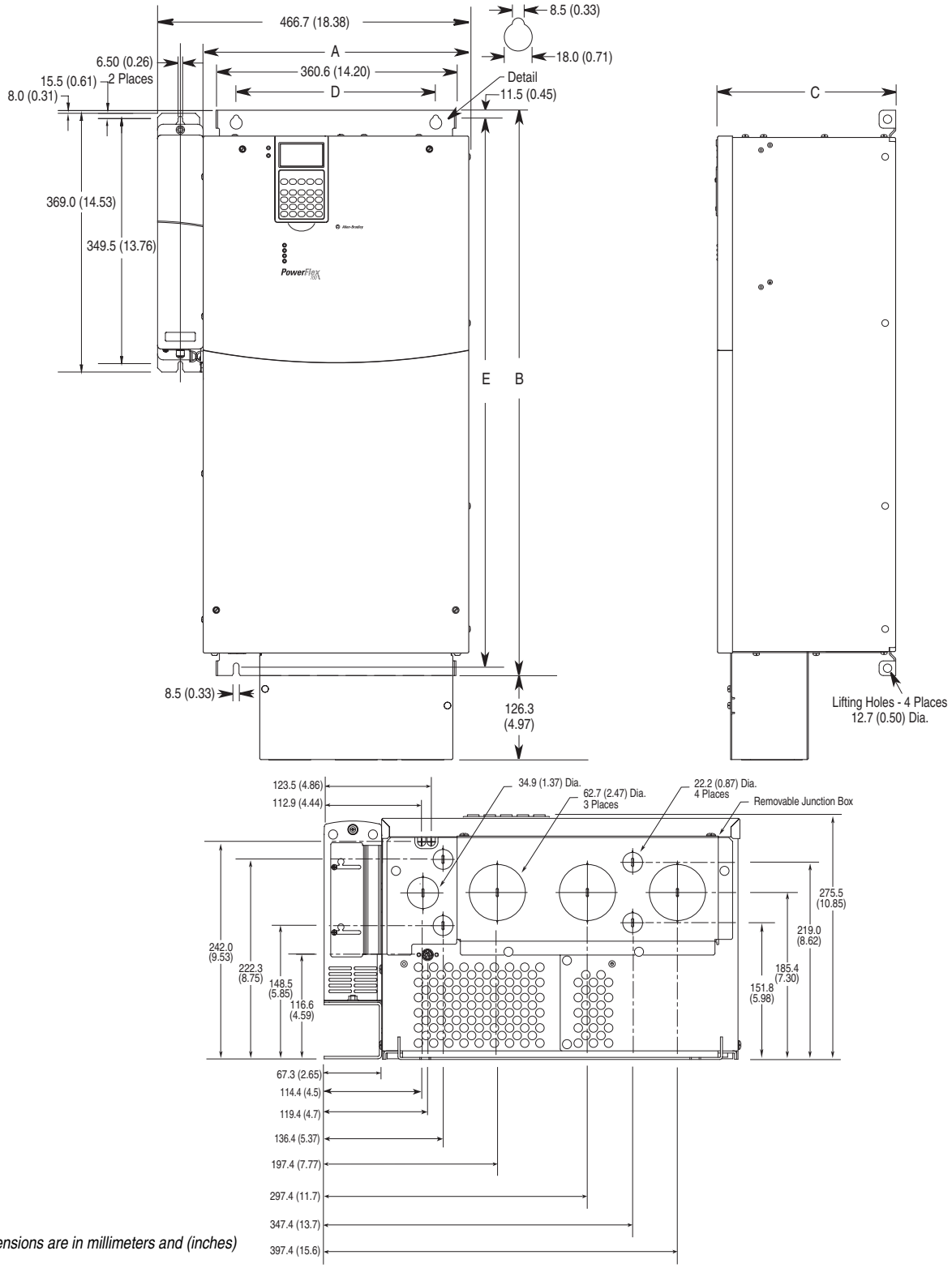


Dimensions are in millimeters and (inches)

Frame	A	B	C	D	E	Approx Weight ❶ *kg (lbs.)*
5	308.9(12.16)	644.5(25.37)	275.4(10.84)	225.0(8.86)	625.0(24.61)	37.19 (82)

❶ Weights include HIM and Standard I/O.

Figure 7 PowerFlex 700S Frame 6 Dimensions



Dimensions are in millimeters and (inches)

Frame	A *(Max.)*	B	C *(Max.)*	D	E	Approx. Weight ❶ *kg (lbs.)*	
						Drive	Drive and Packaging
6	403.90 (15.90)	850.00 (33.46)	275.50 (10.85)	300.00 (11.81)	825.00 (32.48)	11.3 (24.92)	92.85 (202.50)

❶ Weights include HIM and Standard I/O.

Wiring Recommendations

Since most start-up difficulties are the result of incorrect wiring, take every precaution to assure 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. The Allen-Bradley Company cannot assume responsibility for the compliance or the 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.

Power Cable Types Acceptable for 200-600 Volt Installations

ATTENTION: National Codes and standards (NEC, VDE, BSI etc.) 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.

General

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.). See Table C on page 12.

Unshielded

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

Shielded/Armored 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 communications/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. Refer to Reflected Wave in *Wiring and Grounding Guidelines for 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. In addition, a braided shield should be included and specified by the cable manufacturer as having coverage of at least 75%. An additional foil shield can be greatly improve noise containment.

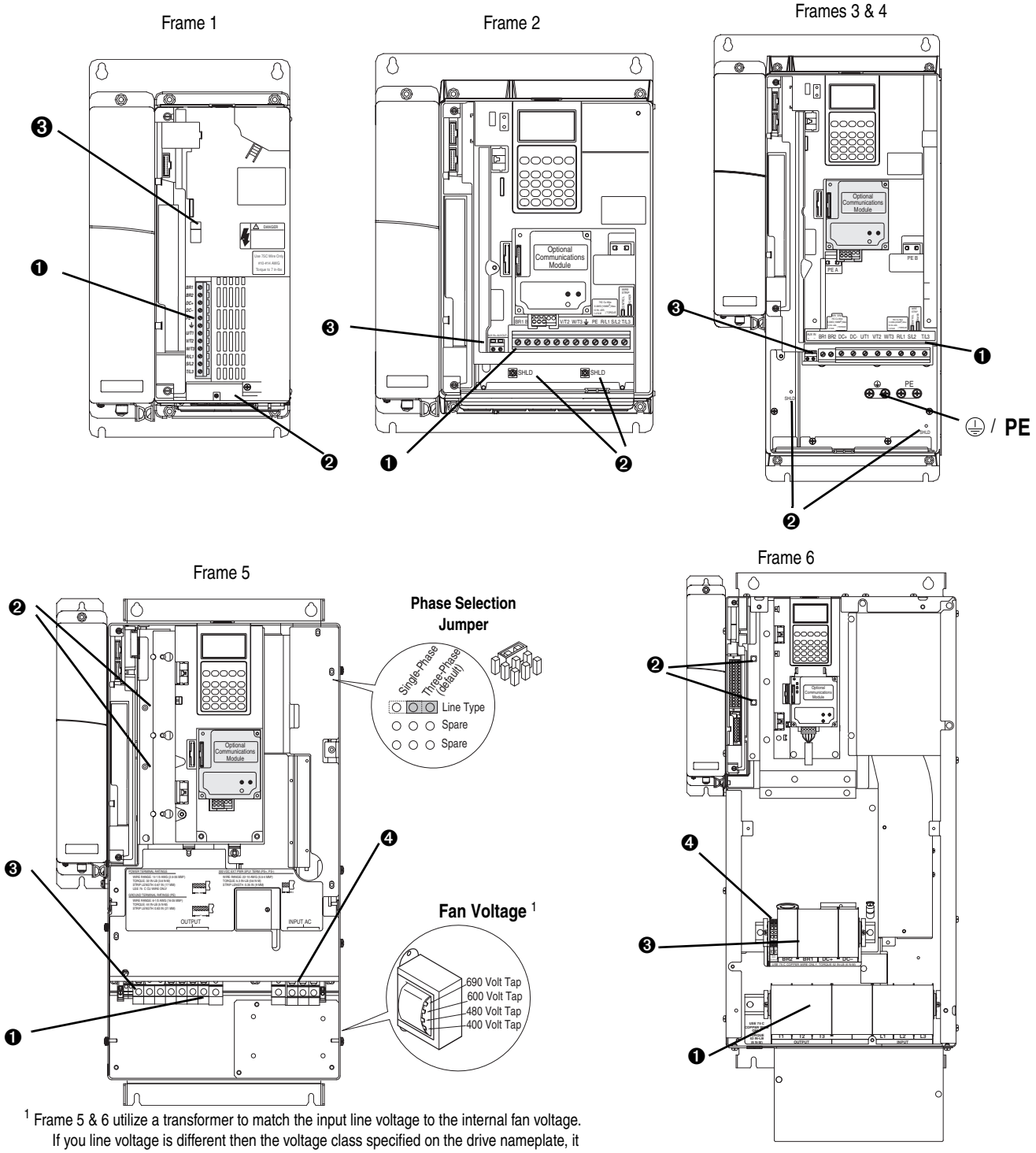
A good example of recommended cable is Belden® 295xx (xx determines gauge). This cable has 4 XLPE insulated conductors with a 100% coverage foil and an 85% coverage copper braided shield (with drain wire) surrounded by a PVC jacket.

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. Unless specified in the individual distance tables as tested with the drive, these cables are not recommended and their performance against the lead length limits supplied is not known.

Table C Recommended Shielded Wire

Location	Rating/Type	Description
Standard (Option 1)	600V, 90° C (194° F) XHHW2/RHW-2 Anixter B209500-B209507, Belden® 29501-29507, 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 600V, 90° C (194° F) RHH/ RHW-2 Anixter OLF-7xxxxx or equivalent	Three tinned copper conductors with XLPE insulation. 5 mil single helical copper tape (25% overlap min.) with three bare copper grounds in contact with shield. PVC jacket.
Class I & II; Division I & II	Tray rated 600V, 90° C (194° F) RHH/ RHW-2 Anixter 7V-7xxxx-3G 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 on #10 AWG and smaller.

Figure 8 Power Terminal Block Location



[1] Frame 5 & 6 utilize a transformer to match the input line voltage to the internal fan voltage. If you line voltage is different then the voltage class specified on the drive nameplate, it may be necessary to change the transformer taps. The taps are shown in the inserts of frames 5 & 6.

Common Bus drives require user supplied 120V or 240V to power the cooling fans. Power source is connected between "0V AC" and the terminal corresponding to your source voltage (see common bus terminal blocks, page 15).

Fan VA Rating - Common Bus Only

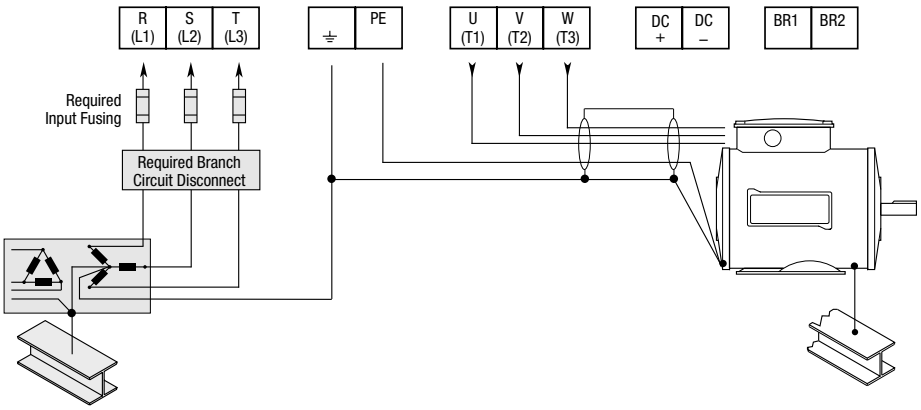
Frame	Fan Voltage*(120V or 240V)*
5	100 VA
6	138 VA

Table D Power Terminal Block Specifications

No.	Name	Frame	Description	Wire Size Range[1]		Torque	
				Maximum	Minimum	Maximum	Recommended
❶	Power Terminal Block	1	All power terminals	4.0 mm² (10 AWG)	0.5 mm² (22 AWG)	1.7 N-m (15 lb.-in.)	0.8 N-m (7 lb.-in.)
		2	All power terminals	10.0 mm² (6 AWG)	0.8 mm² (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)
		3	All power terminals	25.0 mm² (3 AWG)	2.5 mm² (14 AWG)	3.6 N-m (32 lb.-in.)	1.8 N-m (16 lb.-in.)
			All power terminals	10.0 mm² (6 AWG)	0.8 mm² (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)
		4	All power terminals	35.0 mm² (1/0 AWG)	10 mm² (8 AWG)	4.0 N-m (24 lb.-in.)	4.0 N-m (24 lb.-in.)
		5 (75 HP)[2]	R, S, T, BR1, 2, DC+, DC-, U, V and W	35.0 mm² (1/0 AWG)	2.5 mm² (14 AWG)	3.6 N-m (32 lb.-in.)	3.6 N-m (32 lb.-in.)
			PE	35.0 mm² (1/0 AWG)	16.0 mm² (6 AWG)	5 N-m (44 lb.-in.)	5 N-m (44 lb.-in.)
		5 (100 HP)[2]	R, S, T, DC+, DC-, U, V and W	70.0 mm² (3/0 AWG)	16.0 mm² (4 AWG)	15 N-m (133 lb.-in.)	15 N-m (133 lb.-in.)
			BR1, 2,	35.0 mm² (1/0 AWG)	2.5 mm² (14 AWG)	3.6 N-m (32 lb.-in.)	3.6 N-m (32 lb.-in.)
			PE	35.0 mm² (1/0 AWG)	16.0 mm² (6 AWG)	5 N-m (44 lb.-in.)	5 N-m (44 lb.-in.)
		6	All power terminals	70.0 mm² (250 MCM)	2.5 mm² (14 AWG)	6 N-m (52 lb.-in.)	6 N-m (52 lb.-in.)
❷	SHLD Terminal	1-6	Terminating point for wiring shields	—	—	1.6 N-m (14 lb.-in.)	1.6 N-m (14 lb.-in.)
❸	AUX Terminal Block	1-4	Auxiliary Control Voltage[3] PS+, PS-	1.3 mm² (16 AWG)	0.2 mm² (24 AWG)	—	—
		5-6		4.0 mm² (10 AWG)	0.5 mm² (22 AWG)	0.6 N-m (5.3 lb.-in.)	0.6 N-m (5.3 lb.-in.)
❹	Fan Terminal Block (Common Bus Only)	5-6	User Supplied Fan Voltage 0V AC, 240V AC, 120V AC	4.0 mm² (10 AWG)	0.5 mm² (22 AWG)	0.6 N-m (5.3 lb.-in.)	0.6 N-m (5.3 lb.-in.)

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.
(2) Not all terminals present on all drives.
(3) External control power:
UL Installation - 300V DC, ±10%, Non UL Installation - 270-600V DC, ±10%.
Frame 1-6, 100 W

Figure 9 Power and Ground Wiring



Important Common Bus (DC Input) Application Notes

1. If drives without internal precharge are used (Frames 5 & 6 only), then:

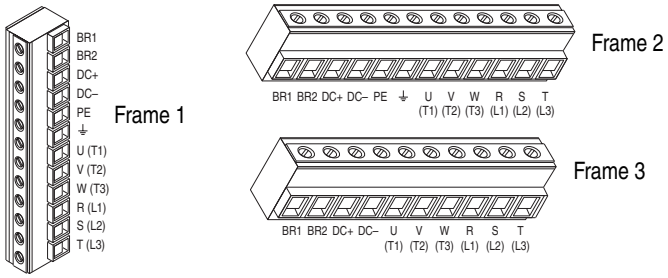
a) precharge capability must be provided in the system to guard against possible damage, and

b) disconnect switches Must Not be used between the input of the drive and a common DC bus without the use of an external precharge device.

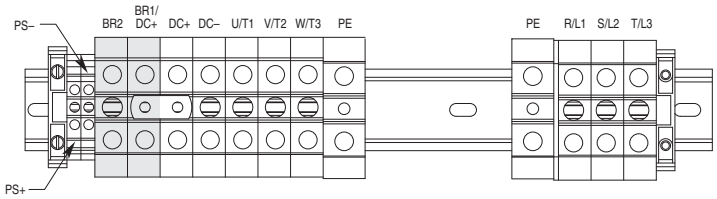
2. If drives with internal precharge (Frames 0-6) are used with a disconnect switch to the common bus, then:

a) an auxiliary contact on the disconnect must be connected to a digital input of the drive. The corresponding input (parameter 361-366) must be set to option 30, “Precharge Enable.” This provides the proper precharge interlock, guarding against possible damage to the drive when connected to a common DC bus.the drive must have firmware version 2.002 or above (Standard & Vector Control).

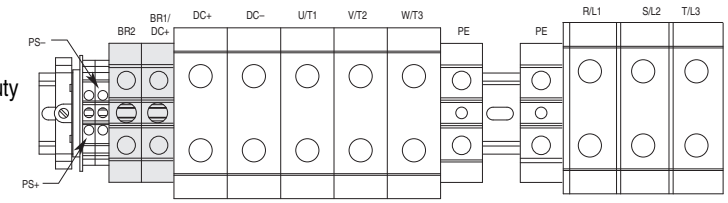
Figure 10 Power Terminal Block



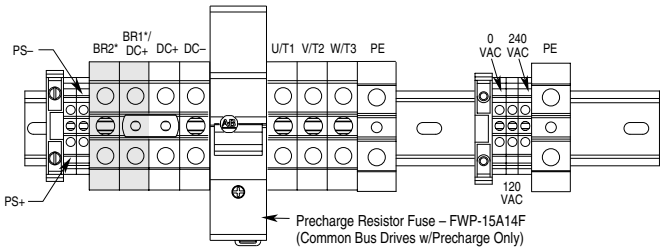
Frame 5 - 75 HP, Normal Duty AC Input



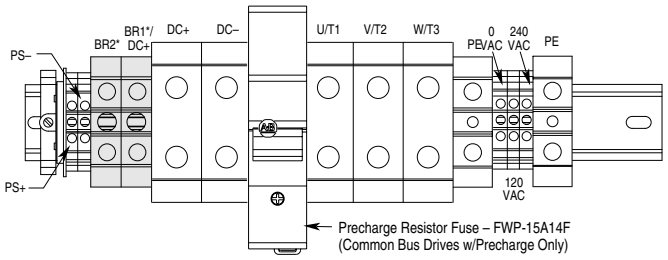
Frame 5 - 100 HP, Normal Duty AC Input

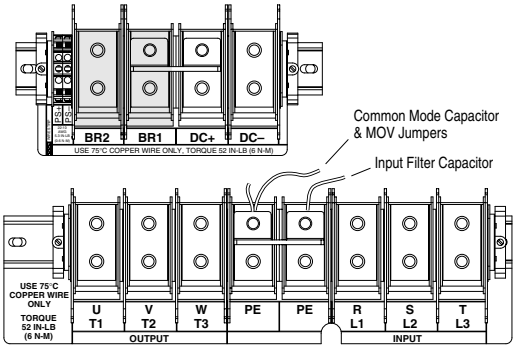


Frame 5 - 75 HP, Normal Duty 650V DC Iput

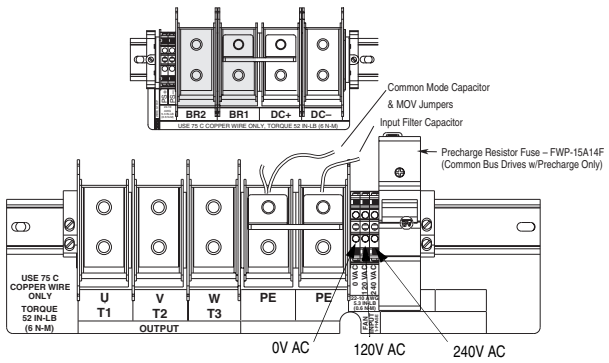


Frame 5 - 100 HP, Normal Duty 650V DC Input





Frame 6 - 150 HP, Normal Duty 480V AC Input



Frame 6 - 150 HP, Normal Duty 650V DC Input

Shaded terminals (BR1 & BR2) will only be present on drives ordered with the Brake Option.

Table E Terminal Block Designations

Terminal	Description	Notes
BR1	DC Brake (+)	Dynamic Brake Resistor Connection (+)
BR2	DC Brake (–)	Dynamic Brake Resistor Connection (–)
DC+	DC Bus (+)	DC Input Power or Dynamic Brake Chopper
DC–	DC Bus (–)	DC Input Power or Dynamic Brake Chopper
PE	PE Ground	Refer to Figure 9 on page 14 for location on 3 Frame drives
⏚	Motor Ground	Refer to Figure 8 on page 13 for location on 3 Frame drives
U	U (T1)	To motor
V	V (T2)	To motor
W	W (T3)	To motor
R	R (L1)	AC Line Input Power
S	S (L2)	AC Line Input Power
T	T (L3)	AC Line Input Power

Control Wiring

Important points to remember about I/O wiring:

- Always use copper wire.
- Wire with an insulation rating of 600V or greater is recommended.
- Control and signal wires should be separated from power wires by at least 0.3 meters (1 foot).

Important: I/O terminals labeled "(–)" or "Common" are not referenced to earth ground and are designed to greatly reduce common mode interference. Grounding these terminals can cause signal noise.

Recommended Control Wire

Type		Wire Type(s)	Description	Insulation Rating
Signal	Analog I/O	Belden 8760/9460 (or equiv.)	0.750 mm^2 (18 AWG), twisted pair, 100% shield with drain (1).	300V, 75-90° C (167-194° F), Minimum
		Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 cond., shielded for remote pot only.	
	Encoder/ Pulse I/O	Less than or equal to 30 m (98 ft.) – Belden 9728 (or equiv.)	0.196 mm^2 (24 AWG), individually shielded.	
		Greater than 30 m (98 ft.) – Belden 9773 (or equiv.)	0.750 mm^2 (18 AWG), twisted pair, shielded.	
Digital I/O	Unshielded	Per US NEC or applicable national or local code	–	300V, 60° C (140° F), Minimum
	Shielded	Multi-conductor shielded cable such as Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 conductor, shielded.	
EMC Compliance	Refer to EMC Instructions for details.			

(1) If the wires are short and contained within a cabinet which has no sensitive circuits, the use of shielded wire may not be necessary, but is always recommended.

Wiring the Main Control Board I/O Terminals

Terminal blocks TB1 and TB2 contain connection points for all inputs, outputs and standard encoder connections. Both terminal blocks reside on the Main Control Board.

Remove the terminal block plug from the socket, and make connections.

TIP: Remember to route wires through the sliding access panel at the bottom Control Assembly.

Reinstall the plug, when wiring is complete. The terminal blocks have keys, which make it difficult to insert a terminal plug into the wrong socket.

Table F Control & Encoder Terminal Block Specifications

			Wires Size Range(1)		Torque	
Name	**Frame**	**Description**	Maximum	Minimum	Maximum	Recommended
I/O & Encoder Blocks	1, 2, 3, 5	Signal & Encoder power connections	1.5 mm^2 (16 AWG)	.14 mm^2 (28 AWG)	.25 N-m (2.2 lb.-in.)	.22 N-m (1.9 lb.-in.)

(1) Maximum/minimum sizes the terminal block will accept - these are not recommendations.

Figure 1 Main Control Board I/O Terminal Locations

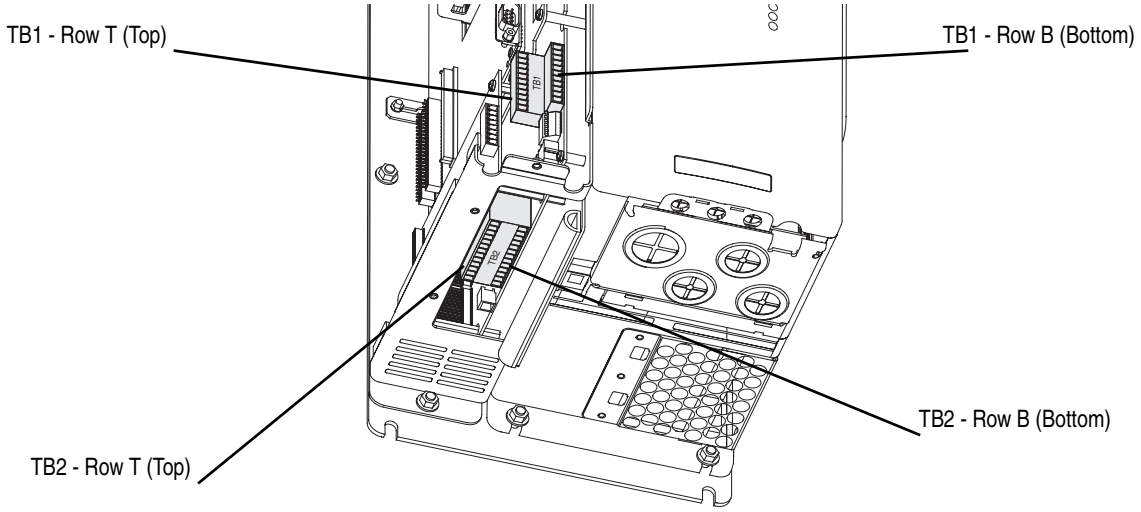
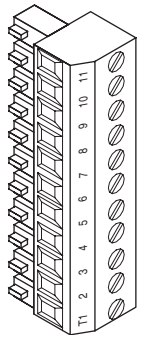


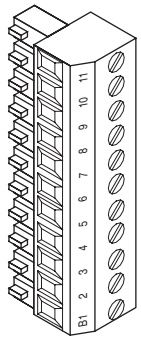
Table G TB1 - Row T (Top) Terminals



Terminal	Signal	Description	Related Parameter
T11	Power Supply 24V DC Return (-)	Power and common for pre charge and enable inputs.(1) Inputs may sink or source.(2) Rating: 100 mA maximum.	
T10	Power Supply 24V DC (+)		
T9	Logic Common		
T8	Digital Input #1 Default = Precharge	For common DC bus drives. Must be high, for drive to complete the pre charge cycle. Load: 20 mA at 24V DC.	824, 838, 829, 826, 827, 828
T7	Enable Input	Must be high for drive to run. Load: 20 mA at 24V DC.	824, 825
T6	Digital Output #1	24V DC open collector (sinking logic) output. Rating: 25 mA maximum.	843, 844, 824
T5	Digital Output #2	24V DC open collector (sinking logic) output. Rating: 25 mA maximum.	845, 846, 824
T4	Digital Output Return	Return for Digital outputs 1 and 2.	
T3	Thermistor Input	Used only in FOC2 mode with approved motor for temperature adaptation.	485
T2	Thermistor Input Return		
T1	Thermistor Shield		

(1) The drive's 24V DC power supply supports only on-board digital inputs. Do not use it to power circuits outside of the drive.
(2) Refer to wiring examples of sinking and sourcing outputs.

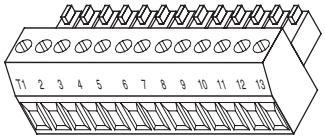
Table H TB1 - Row B (Bottom) Terminals



Terminal	Signal	Description	Related Parameter
B11	Analog Input #1 (-)	+/-10.0V DC or +/-1.0V DC bipolar, differential input. (1), 13 bit + sign, 20k ohm input impedance	800, 801, 802, 803, 804, 805
B10	Analog Input #1 (+)		
B9	Analog Input Shield	Optional connection point for analog input shield. (2)	
B8	Analog Input #2 (-)	+/-10.0V DC or +/-1.0V DC bipolar, differential input. (1), 13 bit + sign, 20k ohm input impedance	806, 807, 808, 809, 810, 811
B7	Analog Input #2 (+)		
B6	Analog Output #1 (+)	+/-10.0V DC bipolar, differential output, 11 bit + sign, 2k ohm minimum load	814, 815, 816, 817, 812, 818
B5	Analog Output #1 Return (-)		
B4	Analog Output Shield	Optional connection point for analog output shield. (2)	
B3	Analog Output #2 (+)	+/-10.0V DC bipolar, differential output, 11 bit + sign, 2k ohm minimum load	819, 820, 821, 822, 813, 823
B2	Analog Output #2 Return (-)		
B1	Analog Output Shield	Optional connection point for analog shields.	

(1) Refer to Analog Input Settings in the *PowerFlex 700S User Manual* for necessary dip switch settings.
(2) Analog shields should connect to common at the signal source, if possible. Shields for signals from ungrounded devices, such as analog tachometers, should connect to an analog shield terminal point at the drive.

Table I TB2 - Row T (Top) Terminals

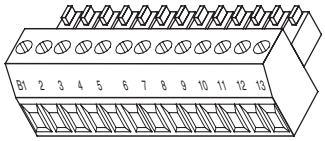


Terminal	Signal	Description	Related Parameter
T13	Encoder Signal A	Primary encoder interface. 5 or 12V DC switch selectable (1), Nominal current draw per channel @ 12V DC 45 mA, @5V DC 32 mA	222, 232, 233, 234, 231, 230, 236, 237. 238, 235
T12	Encoder Signal Not A		
T11	Encoder Signal B		
T10	Encoder Signal Not B		
T9	Encoder Signal Z		
T8	Encoder Signal Not Z		
T7	Shield	Connection point for encoder shield.	
T6	Digital Input #2	High speed 12-24V DC sinking digital input.	824, 839, 833, 830, 831, 832
T5	Digital Input #2 Return		
T4	Digital Input #3	High speed 12-24V DC sinking digital input.	824, 840, 837, 834, 835, 836
T3	Digital Input #3 Return		
T2	Power Supply +12V DC (A) (+)	12V DC power supply for primary encoder interface and high speed inputs. Rating 300 mA(2)	
T1	Power Supply +12V DC Return (A) (-)		

(1) Refer to Encoder Input Settings in the *PowerFlex 700S User Manual* for necessary dip switch settings.

(2) This power supply supports only the primary encoder interface and digital inputs. Do not use it to power circuits outside of the drive.

Table J TB2 - Row B (Bottom) Terminals



Terminal	Signal	Description	Related Parameter
B13	Encoder Signal A	Secondary encoder interface. 5 or 12V DC switch selectable (1), Nominal current draw per channel @ 12V DC 45 mA, @5V DC 32 mA	222, 243, 244, 242, 241, 240, 246, 247, 248, 245
B12	Encoder Signal Not A		
B11	Encoder Signal B		
B10	Encoder Signal Not B		
B9	Encoder Signal Z		
B8	Encoder Signal Not Z		
B7	Shield	Connection point for encoder shield.	
B6	Unused		
B5	Relay Output	Relay contact output. Rating: 5A @ 24V DC Resistive, 2A 24V DC Inductive	824, 841, 842
B4	Relay Output Return		
B3	Unused		
B2	Power Supply +12V DCDC (B) (+)	12V DC power supply for secondary encoder interface. Rating 300 mA(2)	
B1	Power Supply +12V DC Return (B) (-)		

(1) Refer to Encoder Input Setting in the *PowerFlex 700S User Manual* for necessary dip switch settings.

(2) This power supply supports only the secondary encoder interface. Do not use it to power circuits outside of the drive

SynchLink

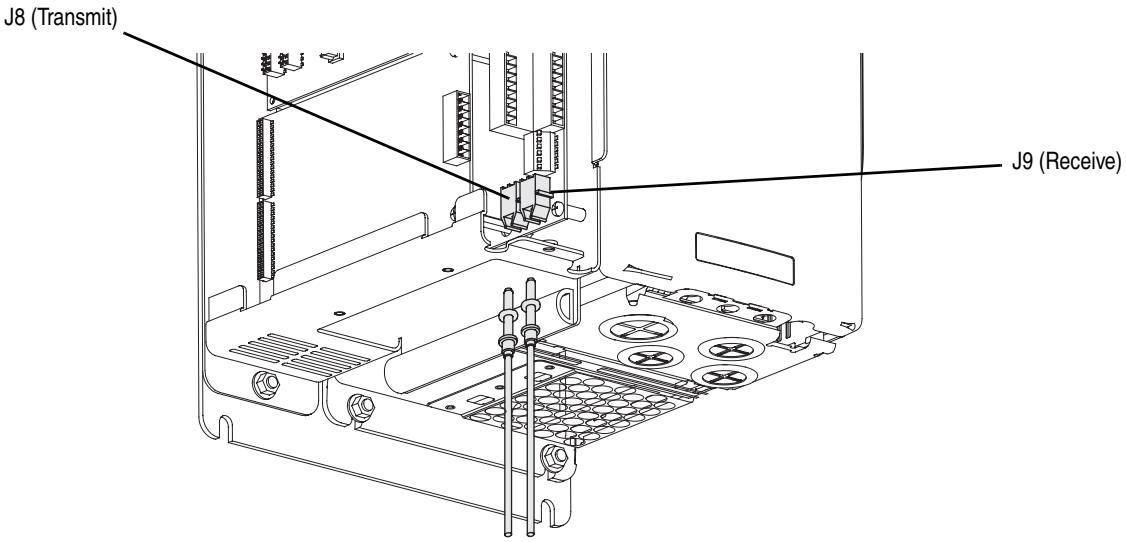
SynchLink provides high-speed synchronization and communication between multiple PowerFlex 700S drives (or other products with SynchLink capability).

Refer to the *SynchLink Design Guide* (1756-TD008) when planning and connecting the SynchLink network.

Class 1 LED Product

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber optic cable connectors.

Figure 11 SynchLink Connections



Connect cables J8 (transmit) and J9 (receive) connectors on the bottom of the Main Control Board. Push the plug into the socket until it produces an audible click.

Important: Do not overtighten tie-wraps.

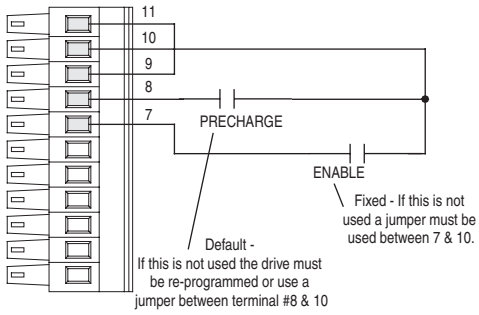
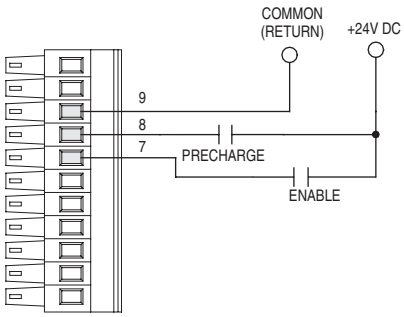
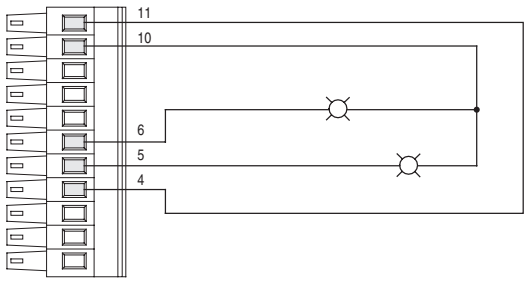
I/O Wiring Examples

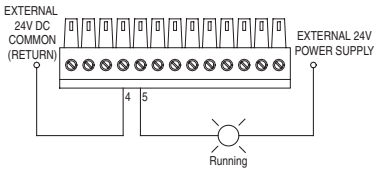
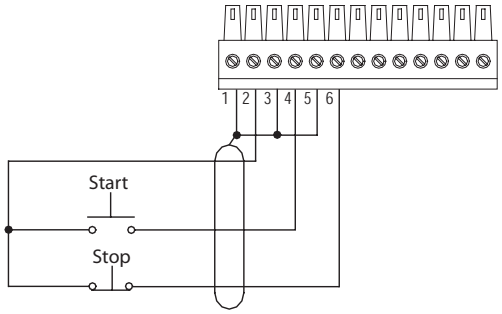
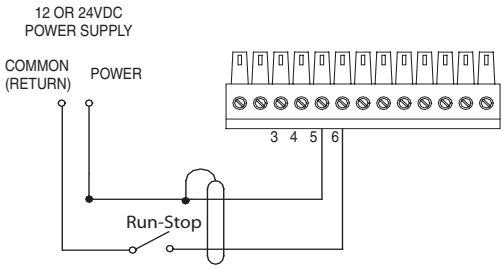
This section provides basic information to wire the PowerFlex 700S.

Table K Digital Wiring Examples
The following definitions are used throughout this section:

Source
- Apply positive voltage through the device to the input or output.
- Connect the input or output common (return) directly to the power supply common.

Sink
- Apply the positive voltage directly to the input or output common (return).
- Connect the input or output to the power supply common through the device

Input/Output	Connection Example	
Digital Inputs used for enable and precharge control. *Note:* **24V DC Supply** - supports only on-board digital inputs. Do not use for circuits outside the drive.	Sourcing Input - using internal power supply **TB1 - Row T (Top)**  	**Required Parameter Changes** **Enable** - In sinking configuration, this circuit must connect to 24V DC power for drive to run. **Precharge** Precharge control is used in common bus configurations and is not required for AC fed drives. If precharge control is not required, reprogram *Par 838* [DigIn 1 Sel] to a value of zero or replace the contact shown with a jumper from Terminal 8 to Terminal 10. If precharge is needed, in sinking configuration, this circuit must connect to 24V DC power for drive to complete the precharge cycle.
	Sourcing Input - using external power supply **TB1 - Row T (Top)**  	**Enable** - In sourcing configuration, must connect to 24V DC common for drive to run. **Precharge** Precharge control is used in common bus configurations and is not required for AC fed drives. If precharge control is not required, reprogram *Par 838* [DigIn 1 Sel] to a value of zero If precharge is needed, in sourcing configuration, must connect to 24V DC common for drive to enter pre charge cycle.
Auxiliary Outputs - 24V DC outputs 25 mA maximum per output	Digital Output 1 Indicating Alarm and Digital Output 2 Indicating Fault - in sourcing configuration **TB1 - Row T (Top)**  	**Using DigOut 1 to annunciate an alarm:** • Link the status word to the output control *Par 843* [DigOut 1 Data] (the destination) linked to *Par 155* [Logic Status] (the source) • Select which bit activated the output *Par 844* [DigOut] / 1 Bit = 8 “alarm”

Input/Output	Connection Example	
Auxiliary Output - Relay contact output	Auxiliary Output - sourcing configuration **TB2 - Row B (Bottom)** 	**Using Relay Out to annunciate "drive running:"** • Link the status word to the relay control *Par 841* [Relay Out Data] (the destination) linked to *Par 155* [Logic Status] (the source) • Set *Par* 842 [Relay Out Bit] to a value of one, so that *Par* 155 [Logic Status] / bit 1 "Running" will control the output.
12 - 24V DC Inputs Digital Inputs used for Start/Stop 3-Wire Control	3-Wire Control, Non-Reversing - using internal power supply **TB2 - Row T (Top)** 	• *Par 839* Digital Input 2 Select = 1 "Normal Stop" • *Par 840* Digital Input 3 Select = 2 "Start" • *Par 153* [Control Option] / bit 8 (3WireControl) = 1 "3- wire control" Use Digital Input 2 & 3 for 3-wire Start/Stop Control
Digital Inputs used for Run/Stop 2-Wire Control **Note:** +12V and +24V are also available from TB1 Top 10 & 11.	2 -Wire Control, Non-Reversing - using external power supply (1) **TB2 - Row T (Top)** 	• *Par 839* Digital Input 2 Select = 3 (Run) • *Par 153* [Control Option] / bit 8 (3WireControl) = 0 "2-wire control" **AND** • *Par 153* [Control Option] / bit 9 (2W CoastStop) = 0 "ramp stop" **or** • *Par 153* [Control Option] / bit 9 (2W CoastStop) = 1 "coast stop" Use Digital Input 2 for 2-wire Run/Stop Control

(1) See "Important" statement about the HIM on page 27.

Table L Analog Wiring Examples

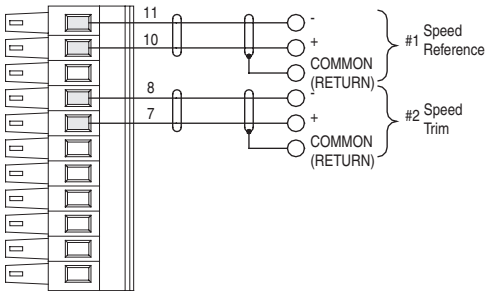
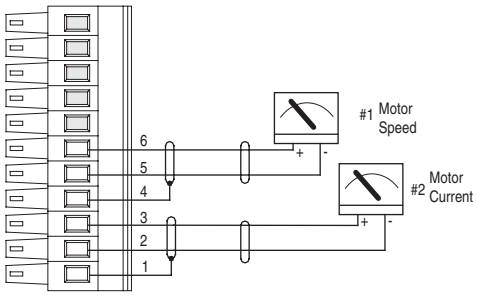
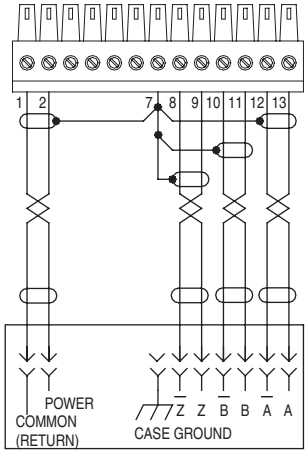
Analog I/O	Connection Example	Required Parameter Changes
Analog Inputs - +/-10V DC or +/-1.0V DC (DIP switch setable) Terminate shields at the analog source if analog common is available Used for Speed Reference and Speed Trim	Analog Inputs - shield terminated at source **TB1 - Row B (Bottom)** 	**Using Analog In1 as 0 - 10 V speed reference:** • Scale the Input to 1 V *Par 802* [Anlg In1 Scale] =.1 • Send the data to the Speed Reference parameter *Par 10* [Speed Ref1] (the destination) linked to *Par 800* [Anlg In1 Data] (the source) • Select Ref 1 as the active speed ref *Par 16* [Speed Ref Sel] = 1 • *Par 153* [Control Option]\bit 0 = 0 (Unipolar Speed Reference) **Using Analog In2 as -10 to +10V speed trim @ 10%:** • Scale the input to .1V - 10% *Par 808* [Anlg In2 Scale]=.01 • Send the data to the speed Reference parameter *Par 13* [Speed Ref2] (the destination) linked to *Par 806* [Anlg In2 Data] (the source) • Select Ref 1 as the active speed ref and Ref2 as trim [Speed Ref Sel] = 3
Analog Outputs - +/-10V DC Used to drive analog meters displaying speed and current	**TB1 - Row B (Bottom)** 	**Using Analog Out 1, -10V to + 10V to meter Motor RPM and direction:** • Send the data to the Analog Output *Par 815* [Anlg Out1 Real] (the destination) linked to *Par 300* [Motor Spd Fdbk] (the source) • Scale the Output to the source parameter *Par 817* [Anlg Out1 Scale] = 175 (1750 *Par 4* [Motor NP RPM] / 10V) **Using Analog Out 2, -10V to + 10V to meter Motor Current:** • Send the data to the Analog Output *Par 820* [Anlg Out2 Real] (the destination) linked to *Par 308* [Output Current] (the source) • Scale the Output to the source parameter *Par 822* [Anlg Out2 Scale] = xx (*Par 2* [Motor NP FLA] / 10 V Output)

Table M Encoder Wiring Example

Input/Output	Connection Example	Required Parameter Changes
Primary Encoder Interface - Supports 12V DC differential encoders with internal power supply. 5V DC differential encoders require external power supply and special jumper settings. Used as primary closed loop speed feedback	Primary Encoder - using internal power supply **TB2 - Row T (Top)** 	**Using Encoder 0 as speed feedback:** • *Par 222* [Motor Fdkbk Sel] = 0 (Encoder 0 = default) • *Par 232* [Encoder 0 PPR] = Pulses/Rev for installed encoder

Start-Up Check List

This section describes how you start-up the PowerFlex 700S.

ATTENTION: Power must be applied to the drive to perform the following start-up procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, **Do Not Proceed**. **Remove Power** including user supplied control voltages. User supplied voltages may exist even when main AC power is not applied to then drive. Correct the malfunction before continuing.

Before Applying Power to the Drive

❑ **1.** Confirm that motor wires are connected to the correct terminals and are secure.

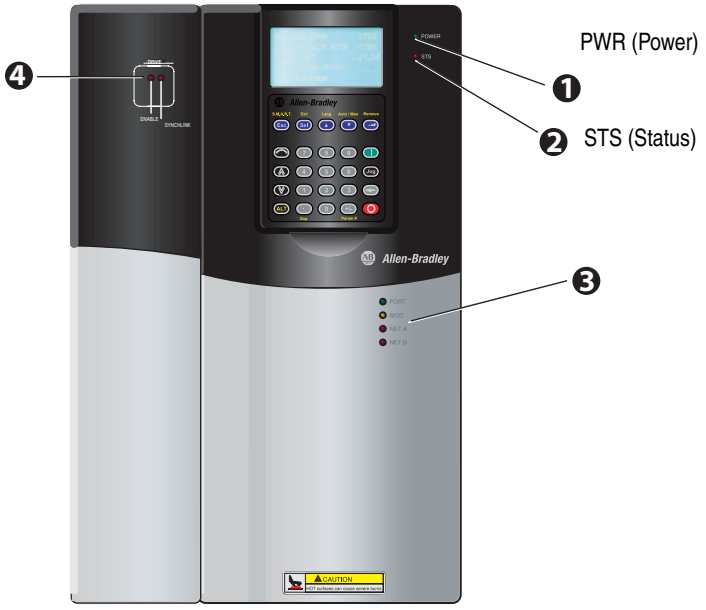
❑ **2.** Confirm that encoder wires are connected to the correct terminals and are secure.

❑ **3.** Confirm that all control inputs are connected to the correct terminals and are secure.

❑ **4.** Verify that AC line power at the disconnect device is within the rated value of the drive.

❑ **5.** Verify that control power voltage is correct.

The remainder of this procedure requires a HIM (Human Interface Module) be installed. If an operator interface is not available, remote devices should be used to start-up the drive.



Applying Power to the Drive

❑ **6.** Apply AC power and control voltages to the drive. Examine the *Power (PWR)* LED.

Steady Green
Power has been applied to the drive and no faults are present.

❑ **7.** Examine the *Status (STS)* LED. Verify that it is flashing green. If it is not in this state, check the following possible causes and take the necessary corrective action.

Flashing Yellow
A run inhibit exists in the drive. Refer to Table N to correct the problem.

Table N Common Causes of a Pre-Start Alarm

Examine *Par 156* - Run Inhibit Status			
bit	**Description**		**Action**
1	No power is present at the Enable Terminal TB1 - T7		Apply the enable
2, 3, 4	A stop command is being issued		Close all stop inputs
5	Power loss event is in progress, indicating a loss of the AC input voltage		Restore AC power
6	Data supplied by the power structure EEprom is invalid or corrupt.		Cycle power. If problem persists, replace the power structure.
7	Flash Update in Progress		Complete Flash Procedures
8	Drive is expecting a Start Edge and is receiving a continuous signal.		Open all start buttons and remove all start commands
9	Drive is expecting a Jog Edge and is receiving a continuous signal.		Open all jog buttons and remove all jog commands
10	A conflict exists between the Encoder PPR programming (*Par 232 or 242*) and the encoder configuration for edge counts (*Par 233 or 243,* bits 4 & 5).		Verify encoder data and reprogram
11	The drive cannot precharge because a precharge input is programmed and no signal is present.		Reprogram the input or close the precharge control contact.
12	Digital Configuration	Start input configured but stop not configured	Program *Par 838-840* to include a stop button, rewire the drive
		Run input configured but control options do not match	Program *Par 153*, Bit 8 to “0” (2 wire control)
		Start input configured but control options do not match	Program *Par 153*, Bit 8 to “1” (3 wire control)
		Multiple inputs configured as Start or Run	Reprogram *Par 838-840* so multiple starts, multiple runs or any combination do not exist
		Multiple inputs configured as Jog1	Reprogram *Par 838-840* so only (1) is set to Jog1
		Multiple inputs configured as Jog2	Reprogram *Par 838-840* so only (1) is set to Jog2
		Multiple inputs configured as Fwd/Rev	Reprogram *Par 838-840* so only (1) is set to Fwd/Rev
14	Invalid Feedback Device for Permanent Magnet Motor Control		Set *Par 222* to Value 5 (FB Opt Port0)

Flashing Red
A fault has occurred. Refer to Table O on page 26 for common start-up faults and actions to correct the problem.

Table O Common Start-Up Faults

Fault	Description	Action
Encoder Loss	One of the following has occurred on an encoder: • missing encoder (broken wire) • quadrature error • phase loss	Reconnect encoder or replace encoder.
Motor Overload	A motor overload is pending.	Enter correct motor nameplate full load amps. *Par 2* [Motor NP FLA] or reduce excess load.
Motor Poles Fault	The poles of the motor do not match its rating.	Enter correct motor nameplate RPM. *Par 4* [Motor NP RPM]

Steady Red
A fault has occurred. Cycle the power. If the light continues to be steady red, replace the drive.

Alternately Flashing Red/Yellow
A non-resettable, terminal fault has occurred. The drive needs to be replaced.

If any digital input is configured to Stop - CF (CF=Clear Faults) verify the signal is present or the drive will not start. Refer to Chapter 4 in the *PowerFlex 700S User Manual* for a list of potential digital input conflicts.

If a fault code appears, refer to Chapter 4 in the *PowerFlex 700S User Manua*l.

The STS LED should be flashing green at this point.

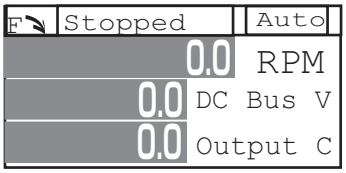
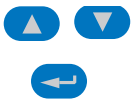
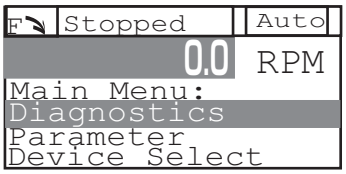
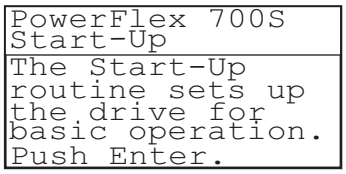
❑ **8.** Proceed to Start-Up Routine.

Assisted Start-Up

This routine prompts you for information that is needed to start-up a drive for most applications, such as line and motor data, commonly adjusted parameters and I/O.

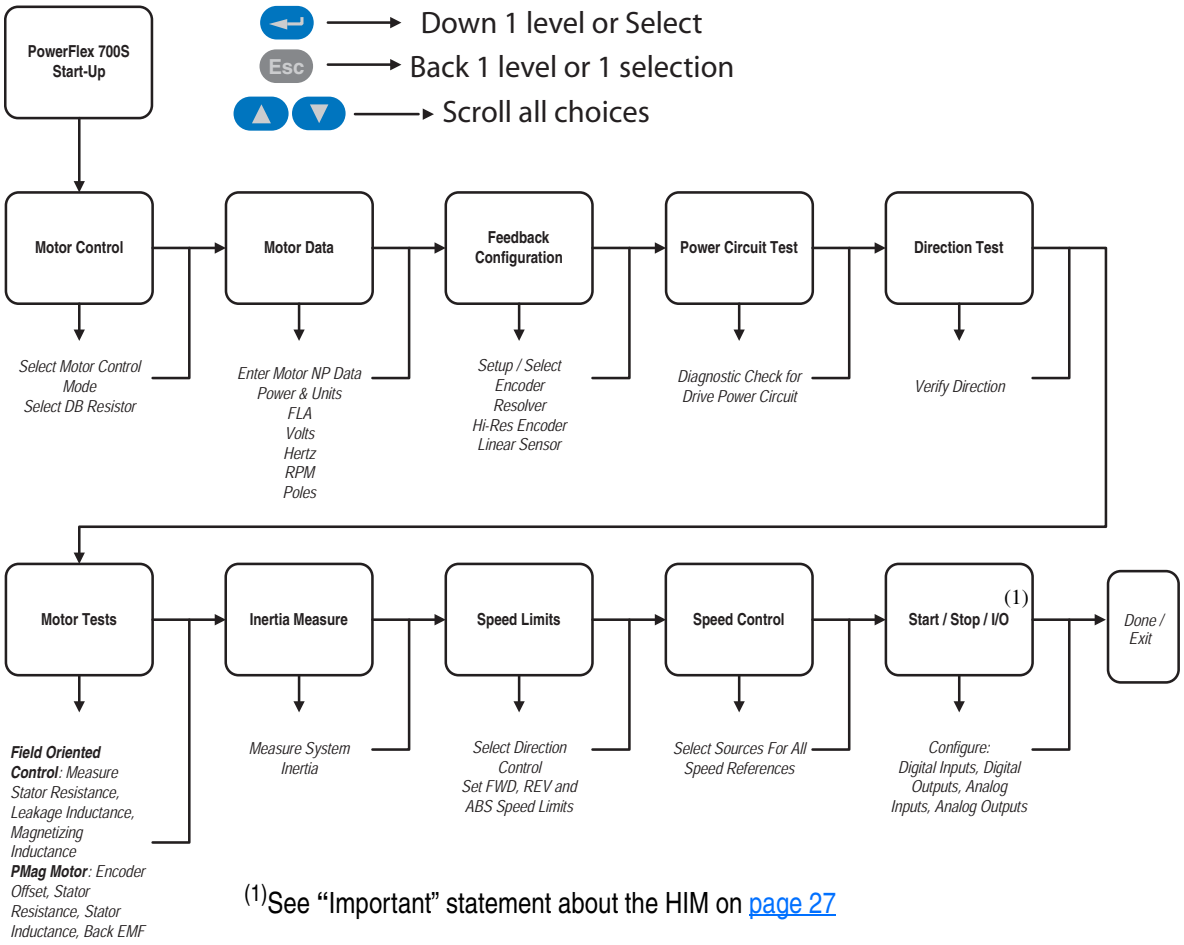
Important: This start-up routine requires a HIM. If the drive is configured for 2-wire control, the HIM installed on the drive will also act as a 2-wire device. In 2-wire mode, the drive will start when the HIM "Start" is pressed and stop when the HIM "Start" is released. The recommended mode of use for a Start-Up Routine is 3-wire control, Parameter 153 [Control Options], Bit 8 set to "1".

The assisted start-up routine asks simple yes or no questions and prompts you to input required information. Access Assisted Start-Up by selecting "Start-Up" from the Main Menu.

1. To exit the User Display screen Press Esc.		
1. In the Main Menu, use the Down Arrow to scroll to "Start Up". 2. Press Enter. **TIP:** Throughout the Start-Up Routine many screens have more selections than shown. Use the arrow keys to scroll through all the menu options.		
1. Follow the instructions on the screen to complete the Start-Up.		

TIP: If using a HIM the following functions are not available.

- Alt-Man
- Alt-Lang
- Alt-SMART



(1) See "Important" statement about the HIM on page 27

Note: In 2-wire mode, the drive will start when the HIM "Start" is pressed and stop when the HIM "Start" is released. The recommended mode of use for the Start-Up Rountine is 3-wire control, Parameter 153 [Control Options], Bit 8 set to "1".

Status Indicators

Table P Drive Status Indicator Descriptions

			#	Name	Color	State	Description
DRIVE	Power Structure		❶	PWR (Power)	Green	Steady	Illuminates when power is applied to the drive.
			❷	STS (Status)	Green	Flashing	Drive ready, but not running & no faults are present.
						Steady	Drive running, no faults are present.
					Yellow	Flashing	A type 2 (non-configurable) alarm condition exists, drive continues to run.
						Steady	A type 1 (user configurable) alarm condition exists, but drive continues to run.
					Red	Flashing	A fault has occurred.
						Steady	A non-resettable fault has occurred.
					Red / Yellow	Flashing Alternately	The drive is in flash recovery mode. The only operation permitted is flash upgrade.
	Control Assembly	Communications	❸	PORT	Refer to the *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).
		Control	❹	SYNCHLINK	Green	Steady	• The module is configured as the time keeper. or • The module is configured as a follower and synchronization is complete.
					Green	Flashing	The follower(s) are not synchronized with the time keeper.
					Red	Flashing	The module is configured as a time master on SynchLink and has received time information from another time master on SynchLink.
				ENABLE	Green	On	The drive's enable input is high.
					Green	Off	The drive's enable input is low.

Troubleshooting

See Table O on page 26 for typical start up faults.

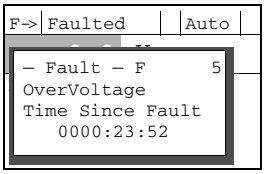
For a complete listing of Faults and Alarms, refer to the *PowerFlex 700S User Manual*.

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

Type	Fault Description	
①	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
②	User Configurable	Programming and commissioning personnel can configure the drive's response to these exception events. Responses include: • Ignore • Alarm • Fault Coast Stop • Fault Ramp Stop • Fault Current Limit Stop

HIM Indication

The 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: • "Faulted" appears in the status line • Fault number • Fault name • Time that has passed since fault occurred Press Esc to regain HIM control.	

Manually Clearing Faults

This section illustrates a table showing the HIM keystrokes necessary to clear faults.

Step	Key(s)
1. Press Esc to acknowledge the fault. The fault information will be removed so that you can use the HIM.	Esc
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 one of these methods. • Press Stop • Cycle drive power • Select "Clear Faults" from Diagnostic - Faults menu	

Technical Support Available

Online

You can access the complete *PowerFlex™ 700S User Manual* online at:

http://www.theautomationbookstore.com/

PowerFlex™ 700S and DriveLogix™ Technical Support is available online

Important: You are encouraged to navigate our **free** website as part of your installation and start-up process.

You will have complete access to the following information:

- Firmware Updates
- Tech Tips
- Application Guides
- Knowledgbase Documents
- Product Specifications
- Technical Publications

You will find the information on the website to be useful, as well as important in the application, installation and troubleshooting of a PowerFlex 700S and DriveLogix System.

These simple steps will guide you to our website so you can obtain the information needed to help solve your most difficult problems.
Here's how...

1. Open your Internet Browser, this may be: Microsoft® Internet Explorer, Netscape®, or Opera®.
2. With your browser open, type in the following URL address in your path bar.

   http://www.ab.com/support/abdrives/powerflex700s/

3. Press the *Ente*r key or click the *Go* button. This will take you to our website.

Drives Technical Forum

Remember that we currently offer a *Drives Technical Forum* for all Allen-Bradley® drive products. The forum can also help you solve issues in areas such as *Application*s, *Communication*s, *Hardware* and *Software*. You can visit us at the following URL address...

http://www.ab.com/support/abdrives/registered.html

Telephone

Drives Technical Support Hotline

Monday through Friday, 7:00a.m. to 7:00p.m. Central STD time
Call **1-262-512-8176**

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