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Allen-Bradley

PowerFlex® 700

Adjustable Frequency AC Drive
Series A

Standard and Vector Control

Firmware Versions
Standard Control: xxx.x - 3.001
Vector Control: xxx.x - 3.002

User Manual

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 **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.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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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.

Important: Identifies information that is critical for successful application and understanding of the product.

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 the hazard
- recognize the consequences

Shock Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

Burn Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

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DeviceNet is a trademark of the Open DeviceNet Vendor Association.

Document Update

PowerFlex 700 User Manual Update

This document provides important information for the following PowerFlex 700 User Manuals:

- Series A - publication 20B-UM001x-xx-x
- Series B - publication 20B-UM002x-xx-x

Included is new information about using the PowerFlex 700 drive with an Auxiliary Control Power Supply (such as the 20-24V-AUX1). Place this document with your User Manual for future reference.

Auxiliary Control Power Supply

An Auxiliary Control Power Supply can provide control power for certain PowerFlex 700 drives. See details below.

ATTENTION: The Auxiliary Control Power Supply **Must Not** be used with any PowerFlex 700 Standard Control drive or 200/240 Volt Vector Control drive. Using the power supply with these drives will cause equipment/component damage.

The Auxiliary Control Power Supply **Must Not be used** with…

- Any Standard Control drive (15th position of the catalog number string equals “A,” “B,” or “N”).
- Any 200/240V PowerFlex 700 drive, Standard or Vector Control (4th position of the catalog number string equals “B”).

The Auxiliary Control Power Supply **Can be used** with…

- 400/480 and 600/690 Volt drives with Vector Control (15th position of the catalog number string equals “C,” or “D”). Consult the factory when using an auxiliary power supply in these instances.

  Use of an auxiliary power supply to keep the drive control logic up when the main AC power is removed requires the use of some type of AC line monitoring as well as control of the Precharge Enable signal. Consult the factory for additional guidance.

Summary of Changes

The information below summarizes the changes to the PowerFlex 700 User Manual, publication 20B-UM001 since the last release.

Manual Updates

Change	Page
Bypass Attention statement added	P-3
Catalog Number Explanation updated	P-4
Mounting section updated	1-2
Shield Termination description updated	1-4
Power Terminal Block Specifications updated	1-9
Recommended Signal Wire table updated	1-15
CE General Notes & Table 1.I updated	1-25
"Flashing, Drive Stopped" Status Indicator updated	2-2 & 4-2
[Dig Out Setpt] description updated	3-58
"Decel Inhibit" Action #3 updated	4-5
Sound Pressure specification added	A-2
Motor Starter catalog numbers updated	A-8 through A-12

Notes:

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Overview

The purpose of this manual is to provide you with the basic information needed to install, start-up and troubleshoot the PowerFlex 700 Adjustable Frequency AC Drive.

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Who Should Use this Manual?

This manual is intended for qualified personnel. You must be able to program 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

The *PowerFlex 700 User Manual* is designed to provide only basic start-up information. For detailed drive information, please refer to the *PowerFlex Reference Manual*. The reference manual is included on the CD supplied with your drive or is also available online at **http://www.rockwellautomation.com/literature.**

Reference Materials

The following manuals are recommended for general drive information:

Title	Publication	Available Online at . . .
Wiring and Grounding Guidelines for PWM AC Drives	DRIVES-IN001…	**www.rockwellautomation.com/literature**
Preventive Maintenance of Industrial Control and Drive System Equipment	DRIVES-TD001…	
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	

For detailed PowerFlex 700 information:

Title	Publication	Available . . .
PowerFlex Reference Manual	PFLEX-RM001…	on the CD supplied with the drive or **www.rockwellautomation.com/literature**

For Allen-Bradley Drives Technical Support:

Title	Online at . . .
Allen-Bradley Drives Technical Support	**www.ab.com/support/abdrives**

Manual Conventions

- In this manual we refer to the PowerFlex 700 Adjustable Frequency AC Drive as; drive, PowerFlex 700 or PowerFlex 700 Drive.
- To help differentiate parameter names and LCD display text from other text, the following conventions will be used:
  - Parameter Names will appear in [brackets].
    For example: [DC Bus Voltage].
  - Display Text will appear in “quotes.” For example: “Enabled.”
- The following words are used throughout 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

Drive Frame Sizes

Similar PowerFlex 700 drive sizes are grouped into frame sizes to simplify spare parts ordering, dimensioning, etc. A cross reference of drive catalog numbers and their respective frame size is provided in Appendix A.

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, 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 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 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: An incorrectly applied or installed bypass system can result in component damage or reduction in product life. The most common causes are:

- Wiring AC line to drive output or control terminals.
- Improper bypass or output circuits not approved by Allen-Bradley.
- Output circuits which do not connect directly to the motor.

Contact Allen-Bradley for assistance with application or wiring.

ATTENTION: The “adjust freq” portion of the bus regulator function is extremely useful for preventing nuisance overvoltage faults resulting from aggressive decelerations, overhauling loads, and eccentric loads. It forces the output frequency to be greater than commanded frequency while the drive's bus voltage is increasing towards levels that would otherwise cause a fault. However, it can also cause either of the following two conditions to occur.

1. Fast positive changes in input voltage (more than a 10% increase within 6 minutes) can cause uncommanded positive speed changes. However an “OverSpeed Limit” fault will occur if the speed reaches [Max Speed] + [Overspeed Limit]. If this condition is unacceptable, action should be taken to 1) limit supply voltages within the specification of the drive and, 2) limit fast positive input voltage changes to less than 10%. Without taking such actions, if this operation is unacceptable, the “adjust freq” portion of the bus regulator function must be disabled (see parameters 161 and 162).
2. Actual deceleration times can be longer than commanded deceleration times. However, a “Decel Inhibit” fault is generated if the drive stops decelerating altogether. If this condition is unacceptable, the “adjust freq” portion of the bus regulator must be disabled (see parameters 161 and 162). In addition, installing a properly sized dynamic brake resistor will provide equal or better performance in most cases.

   Important: These faults are not instantaneous. Test results have shown that they can take between 2-12 seconds to occur.

ATTENTION: Loss of control in suspended load applications can cause personal injury and/or equipment damage. Loads must always be controlled by the drive or a mechanical brake. Parameters 600-611 are designed for lifting/torque proving applications. It is the responsibility of the engineer and/or end user to configure drive parameters, test any lifting functionality and meet safety requirements in accordance with all applicable codes and standards.

Catalog Number Explanation

The PowerFlex 700 catalog numbering scheme is shown on page P-5.

Position

1-3	*4*	*5-7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*❼	*17-18*❼	*19-20*❼
20B	**D**	**2P1**	**A**	**3**	**A**	**Y**	**N**	**A**	**R**	**C**	**0**	**NN**	**AD**
Drive	Voltage Rating	Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback	Future Use	Custom Firmware

Code	**Type**
20B	700

Code	**Voltage**	**Ph.**	**Prechg.**
B	240V AC	3	–
C	400V AC	3	–
D	480V AC	3	–
E	600V AC❸	3	–
F	690V AC	3	–
H	540V DC❹	–	N
J	650V DC❹	–	N
P	540V DC❹	–	Y
R	650V DC❹	–	Y

208/240V 60Hz Input

	208V	**240V**	
Code	**Amps**	**Amps**	**HP**
2P2	2.5	2.2	0.5
4P2	4.8	4.2	1.0
6P8	7.8	6.8	2.0
9P6	11	9.6	3.0
015	17.5	15.3	5.0
022	25.3	22	7.5
028	32.2	28	10
042	48.3	42	15
052	56	52	20
070	78.2	70	25
080	92	80	30
104	120	104	40
130	130	130	50
154	177	154	60
192	221	192	75

400V 60Hz Input

	400V	
Code	**Amps**	**kW**
1P3	1.3	0.37
2P1	2.1	0.75
3P5	3.5	1.5
5P0	5.0	2.2
8P7	8.7	4.0
011	11.5	5.5
015	15.4	7.5
022	22	11
030	30	15
037	37	18.5
043	43	22
056	56	30
072	72	37
085	85	45
105	105	55
125	125	55
140	140	75
170	170	90
205	205	110
260	260	132

480V 60Hz Input

	480V	
Code	**Amps**	**HP)**
1P1	1.1	0.5
2P1	2.1	1.0
3P4	3.4	2.0
5P0	5.0	3.0
8P0	8.0	5.0
011	11	7.5
014	14	10
022	22	15
027	27	20
034	34	25
040	40	30
052	52	40
065	65	50
077	77	60
096	96	75
125	125	100
156	156	125
180	180	150
248	248	200

600V 60Hz Input❸

	600V	
Code	**Amps**	**HP**
1P7	1.7	1.0
2P7	2.7	2.0
3P9	3.9	3.0
6P1	6.1	5.0
9P0	9.0	7.5
011	11	10
017	17	15
022	22	20
027	27	25
032	32	30
041	41	40
052	52	50
062	62	60
077	77	75
099	99	100
125	125	125
144	144	150

690V 60Hz Input

	690V	
Code	**Amps**	**kW**
052	52	45
060	60	55
082	82	75
098	98	90
119	119	110
142	142	132

Code	**Enclosure**
A	IP 20, NEMA Type 1
N	Open

Code	**Operator Interface**
0	Blank Cover
2	Digital LCD
3	Full Numeric LCD
4	Analog LCD
5	Prog. Only LCD

Code	**Type**
A	User Manual
N	No Manual

Code	**w/Brake IGBT**❷
Y	Yes
N	No

Code	**w/Resistor**
Y	Yes❶
N	No

Code	**CE Filter**	**CM Choke**
A	Yes	Yes
B	Yes	No

Code	**Version**
C	ControlNet (Coax)
D	DeviceNet
E	EtherNet/IP
R	RIO
S	RS-485
N	None

Code	**Control**	**I/O Volts**
A	Std.	24V DC/AC
B	Std.	115V AC
C	Vector❺	24V DC/AC
D	Vector❺	115V AC
N	Std.	None

Code	**Type**
0	None
1	Encoder, 12V

Code	**Type**
AD❻	60Hz Maximum

❶ Not available for Frame 3 drives or larger.

❷ Brake IGBT is standard on Frames 0-3 and optional on Frames 4-6.

❸ Note: CE Certification testing has not been performed on 600V class drives.

❹ Frames 5 & 6 Only.

❺ Vector Control Option utilizes DPI Only.

❻ Must be used with Vector Control option C or D (position 15). Positions 17-20 are only required when custom firmware is supplied.

❼ Positions 16-20 of the catalog number are not applicable for Canada. These options (positions 16-20) are only available as User Installed in Canada

Notes:

Chapter 1

Installation/Wiring

This chapter provides information on mounting and wiring the PowerFlex 700 Drive.

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Mounting Considerations	1-2
AC Supply Source Considerations	1-2
General Grounding Requirements	1-4
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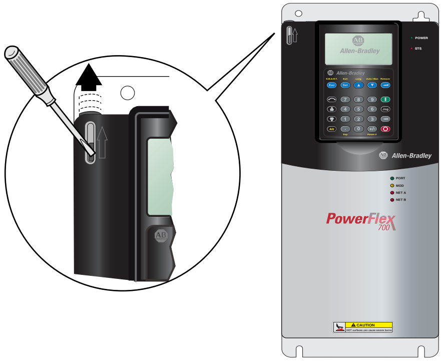
Most start-up difficulties are the result of incorrect wiring. Every precaution must be taken to assure that the wiring is done as instructed. All items must be read and understood before the actual installation begins.

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.

Opening the Cover



Frames 0-4
Locate the slot in the upper left corner. Slide the locking tab up and swing the cover open. Special hinges allow cover to move away from drive and lay on top of adjacent drive (if present). See page 1-7 for frame 4 access panel removal.

Frame 5
Slide the locking tab up, loosen the right-hand cover screw and remove. See page 1-7 for access panel removal.

Frame 6
Loosen 2 screws at bottom of drive cover. Carefully slide bottom cover down & out. Loosen the 2 screws at top of cover and remove.

Mounting Considerations

Operating Temperatures

PowerFlex 700 drives are designed to operate at 0° to 40° C ambient. To operate the drive in installations between 41° and 50° C, see below.

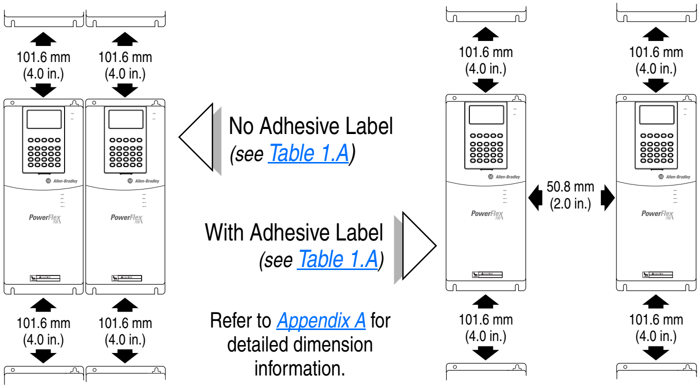
Table 1.A Acceptable Surrounding Air Temperature & Required Actions

Drive Catalog Number	Required Action . . .		
	IP 20, NEMA Type 1(1)	**IP 20, NEMA Type Open**	**IP 00, NEMA Type Open**
	No Action Required	*Remove Top Label*(2)	*Remove Top Label & Vent Plate*(3)
All *Except* 20BC072	40° C	50° C	NA
20BC072	40° C	45° C	50° C

(1) IP20 (NEMA Type 1) general purpose enclosures are intended for indoor use primarily to provide a degree of protection against contact with enclosed equipment. These enclosures offer no protection against airborne contaminants such as dust or water.

(2) Removing the adhesive top label from the drive changes the NEMA enclosure rating from Type 1 to Open type.

(3) To remove vent plate (see page A-20 for location), lift top edge of plate from the chassis. Rotate the plate out from the back plate.


101.6 mm (4.0 in.)
101.6 mm (4.0 in.)
101.6 mm (4.0 in.)
101.6 mm (4.0 in.)
No Adhesive Label
(see Table 1.A)
With Adhesive Label
(see Table 1.A)
Refer to Appendix A for detailed dimension information.
101.6 mm (4.0 in.)
101.6 mm (4.0 in.)
50.8 mm (2.0 in.)
101.6 mm (4.0 in.)
101.6 mm (4.0 in.)
101.6 mm (4.0 in.)
101.6 mm (4.0 in.)

Minimum Mounting Clearances

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

AC Supply Source Considerations

PowerFlex 700 drives are suitable for use on a circuit capable of delivering up to a maximum of 200,000 rms symmetrical amperes, and a maximum of 600 volts.

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

If a system ground fault monitor (RCD) is to be used, only Type B (adjustable) devices should be used to avoid nuisance tripping.

Unbalanced or Ungrounded Distribution Systems

If phase to ground voltage will exceed 125% of normal line to line voltage or the supply system is ungrounded, refer to the *Wiring and Grounding Guidelines for PWM AC Drives* (publication DRIVES-IN001).

ATTENTION: PowerFlex 700 drives contain protective MOVs and common mode capacitors that are referenced to ground. These devices should be disconnected if the drive is installed on an ungrounded distribution system. See page 1-13 for jumper locations.

Input Power Conditioning

Certain events on the power system supplying a drive can cause component damage or shortened product life. These conditions are divided into 2 basic categories:

1. **All drives**
   - 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.
2. **5 HP or Less Drives (in addition to "1" above)**
   - The nearest supply transformer is larger than 100kVA or the available short circuit (fault) current is greater than 100,000A.
   - The impedance in front of the drive is less than 0.5%.

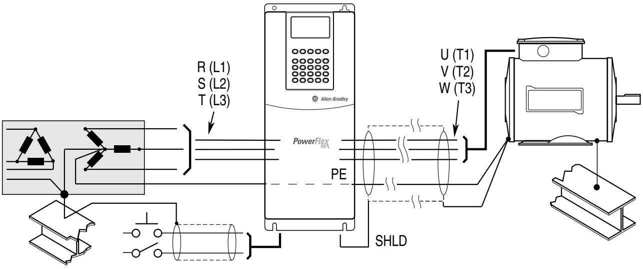
If any or all of these conditions exist, it is recommended that the user install a minimum amount of impedance between the drive and the source. This impedance could come from the supply transformer itself, the cable between the transformer and drive or an additional transformer or reactor. The impedance can be calculated using the information supplied in *Wiring and Grounding Guidelines for PWM AC Drives*, publication DRIVES-IN001.

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 point/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, joist), a floor ground rod or bus bar (see above). Grounding points must comply with national and local industrial safety regulations and/or electrical codes.

Shield Termination - SHLD

The Shield terminal (see Figure 1.3 on page 1-10) provides a grounding point for the motor cable shield. The **motor cable** shield should be connected to this terminal on the drive (drive end) and the motor frame (motor end). A shield terminating cable gland may also be used.

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.

RFI Filter Grounding

Using an optional RFI filter may result in relatively high ground leakage currents. Therefore, the **filter must only be used in installations with grounded AC supply systems and be permanently installed and solidly grounded** (bonded) to the building power distribution ground. Ensure that the incoming supply neutral is solidly connected (bonded) to the same building power distribution ground. Grounding must not rely on flexible cables and should not include any form of plug or socket that would permit inadvertent disconnection. Some local codes may require redundant ground connections. The integrity of all connections should be periodically checked. Refer to the instructions supplied with the filter.

Fuses and Circuit Breakers

The PowerFlex 700 can be installed with either input fuses or an input circuit breaker. National and local industrial safety regulations and/or electrical codes may determine additional requirements for these installations. Refer to Appendix A for recommended fuses/circuit breakers.

ATTENTION: The PowerFlex 700 does not provide branch short circuit protection. Specifications for the recommended fuse or circuit breaker to provide protection against short circuits are provided in Appendix A.

Power Wiring

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.

Cable Types Acceptable for 200-600 Volt Installations

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 (0.4mm/0.015 in.). Use Copper wire only. Wire gauge requirements and recommendations are based on 75 degrees C. Do not reduce wire gauge when using higher temperature wire.

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 that 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-IN001A-EN-P.

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 be 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® 295xx (xx determines gauge). This cable has four (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.

See Table 1.B.

Table 1.B 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.

Location	Rating/Type	Description
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.

EMC Compliance

Refer to EMC Instructions on page 1-25 for details.

Cable Trays and Conduit

If cable trays or large conduits are to be used, refer to the guidelines presented in the *Wiring and Grounding Guidelines for 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 will help minimize the possible shock hazard from "cross coupled" motor leads.

Motor Cable Lengths

Typically, motor lead lengths less than 91 meters (300 feet) are acceptable. However, if your application dictates longer lengths, refer to the *Wiring and Grounding Guidelines for PWM AC Drives*, publication DRIVES-IN001.

Cable Entry Plate Removal

If additional wiring access is needed, the Cable Entry Plate on 0-3 Frame drives can be removed. Simply loosen the screws securing the plate to the chassis. The slotted mounting holes assure easy removal.

Important: Removing the Cable Entry Plate limits the maximum ambient temperature to 40 degrees C (104 degrees F).

Power Wiring Access Panel Removal

Frame	**Removal Procedure** *(Replace when wiring is complete)*
0, 1, 2 & 6	Part of front cover, see page 1-1.
3	Open front cover and gently tap/slide cover down and out.
4	Loosen the 4 screws and remove.
5	Remove front cover (see page 1-1), gently tap/slide panel up and out.

AC Input Phase Selection (Frames 5 & 6 Only)

ATTENTION: To avoid a shock hazard, ensure that all power to the drive has been removed before performing the following.

Moving the “Line Type” jumper shown in Figure 1.2 will allow single or three-phase operation.

Important: When selecting single-phase operation, input power must be applied to the R (L1) and S (L2) terminals only.

Selecting/Verifying Fan Voltage (Frames 5 & 6 Only)

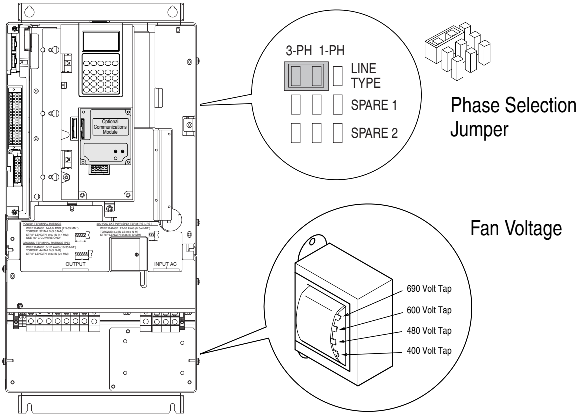
Important: **Read Attention** statement above!

Frames 5 & 6 utilize a transformer to match the input line voltage to the internal fan 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 shown below. Common Bus (DC input) drives require user supplied 120 or 240V AC to power the cooling fans. The power source is connected between “0 VAC” and the terminal corresponding to your source voltage (see Figure 1.4).

Table A Fan VA ratings (DC Input Only)

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

Figure 1.2 Typical Locations - Phase Select Jumper & Transformer (Frame 5 shown)


Optional Communications Module
OUTPUT
INPUT AC
3-PH 1-PH
LINE TYPE
SPARE 1
SPARE 2
Phase Selection Jumper
Fan Voltage
690 Volt Tap
600 Volt Tap
480 Volt Tap
400 Volt Tap

Frame 6 Transformer Tap Access

The transformer is located behind the Power Terminal Block in the area shown in Figure 1.2. Access is gained by releasing the terminal block from the rail. To release terminal block and change tap:

1. Locate the small metal tab at the bottom of the end block.
2. Press the tab in and pull the top of the block out. Repeat for next block if desired.
3. Select appropriate transformer tap.
4. Replace block(s) in reverse order.

Power Terminal Block

Refer to Figure 1.3 for typical locations.

Table 1.C Power Terminal Block Specifications

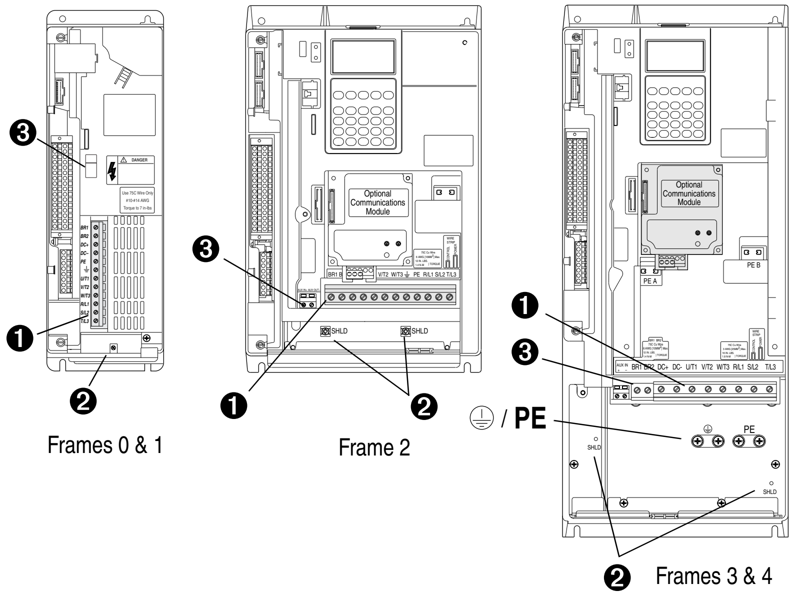
				Wire Size Range (1)		**Torque**	
No.	**Name**	**Frame**	**Description**	Maximum	Minimum	Maximum	Recommended
❶	Power Terminal Block	0 & 1	Input power and motor connections	4.0 mm^2 (10 AWG)	0.5 mm^2 (22 AWG)	1.7 N-m (15 lb.-in.)	0.8 N-m (7 lb.-in.)
		2	Input power and motor connections	10.0 mm^2 (6 AWG)	0.8 mm^2 (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)
		3	Input power and motor connections	25.0 mm^2 (3 AWG)	2.5 mm^2 (14 AWG)	3.6 N-m (32 lb.-in.)	1.8 N-m (16 lb.-in.)
			BR1, 2 terminals	10.0 mm^2 (6 AWG)	0.8 mm^2 (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)
		4	Input power and motor connections	35.0 mm^2 (1/0 AWG)	10 mm^2 (8 AWG)	4.0 N-m (35 lb.-in.)	4.0 N-m (35 lb.-in.)
		5 (75 HP)	Input power, BR1, 2, DC+, DC– and motor connections	50.0 mm^2 (1/0 AWG)	2.5 mm^2 (14 AWG)	See Note (2)	
			PE	50.0 mm^2 (1/0 AWG)	16.0 mm^2 (6 AWG)		
		5 (100 HP)	Input power, DC+, DC– and motor	70.0 mm^2 (2/0 AWG)	25.0 mm^2 (4 AWG)		
			BR1, 2, terminals	50.0 mm^2 (1/0 AWG)	2.5 mm^2 (14 AWG)		
			PE	50.0 mm^2 (1/0 AWG)	16.0 mm^2 (6 AWG)		
		6	Input power, DC+, DC–, BR1, 2, PE, motor connections	120.0 mm^2 (4/0 AWG)	2.5 mm^2 (14 AWG)	6 N-m (52 lb.-in.)	6 N-m (52 lb.-in.)
❷	SHLD Terminal	0-6	Terminating point for wiring shields	—	—	1.6 N-m (14 lb.-in.)	1.6 N-m (14 lb.-in.)
❸	AUX Terminal Block	0-4	Auxiliary Control Voltage PS+, PS– (3)	1.5 mm^2 (16 AWG)	0.2 mm^2 (24 AWG)	—	—
		5-6		4.0 mm^2 (12 AWG)	0.5 mm^2 (22 AWG)	0.6 N-m (5.3 lb.-in.)	0.6 N-m (5.3 lb.-in.)
❹	Fan Terminal Block (CB Only)	5-6	User Supplied Fan Voltage (page 1-8)	4.0 mm^2 (12 AWG)	0.5 mm^2 (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) Refer to the terminal block label inside the drive.

(3) External control power: UL Installation-300V DC, ±10%, Non UL Installation-270-600V DC, ±10%
0-3 Frame - 40 W, 165 mA, 5 Frame - 80 W, 90 mA.

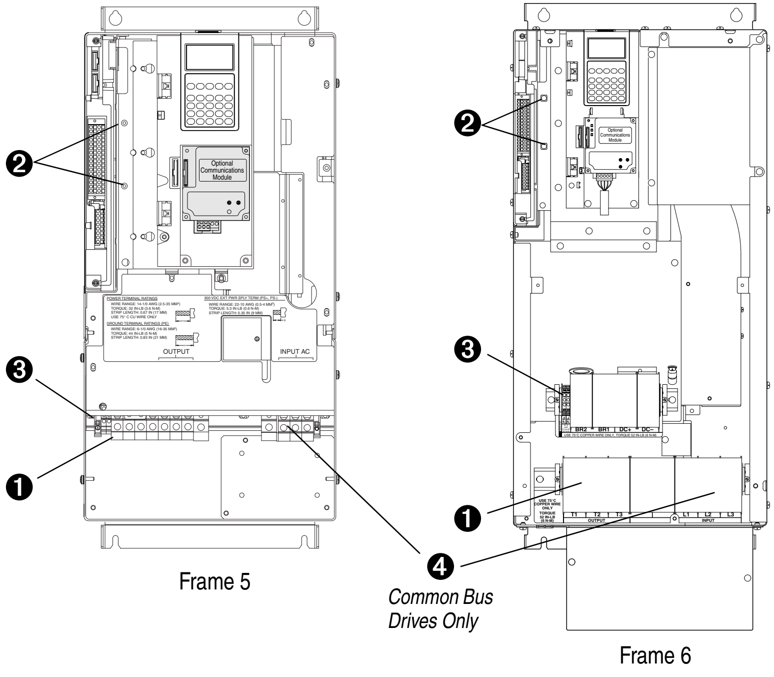
Figure 1.3 Typical Power Terminal Block Location


❸
DANGER
Use 75C Wire Only
#10-#14 AWG
Torque to 7 in-lbs
BR1
BR2
DC+
DC–
PE
U/T1
V/T2
W/T3
R/L1
S/L2
T/L3
❶
❷
Optional Communications Module
BR1 B
V/T2 W/T3 PE R/L1 S/L2 T/L3
AUX IN+ AUX OUT–
SHLD
SHLD
❸
❶
❷
Optional Communications Module
PE A
PE B
❶
❸
AUX IN
BR1 BR2 DC+ DC- U/T1 V/T2 W/T3 R/L1 S/L2 T/L3
/ PE
PE
SHLD
SHLD
❷

Frames 0 & 1

Frame 2

Frames 3 & 4


❷
Optional Communications Module
POWER TERMINAL RATINGS
300 VDC EXT PWR SPLY TERM (PS+, PS-)
GROUND TERMINAL RATINGS (PE)
OUTPUT
INPUT AC
❸
❶
❹
❷
Optional Communications Module
❸
BR2 BR1 DC+ DC–
USE 75°C COPPER WIRE ONLY TORQUE 52 IN-LB (6 N-M)
USE 75°C COPPER WIRE ONLY TORQUE 52 IN-LB (6 N-M)
T1 T2 T3
OUTPUT
L1 L2 L3
INPUT
❶

Frame 5

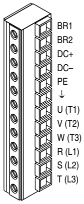
Common Bus Drives Only

Frame 6

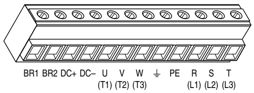
Figure 1.4 Power Terminal Block

Frame **Terminal Block**

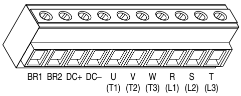
0 + 1


BR1
BR2
DC+
DC–
PE
⏚
U (T1)
V (T2)
W (T3)
R (L1)
S (L2)
T (L3)

2


BR1 BR2 DC+ DC– U (T1) V (T2) W (T3) ⏚ PE R (L1) S (L2) T (L3)

3 + 4


BR1 BR2 DC+ DC– U (T1) V (T2) W (T3) R (L1) S (L2) T (L3)

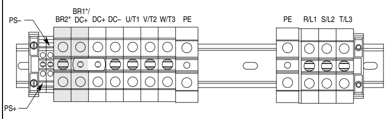
*** Note:**
Shaded BR1 & BR2 Terminals will only be present on drives ordered with the Brake Option.

480V AC Input

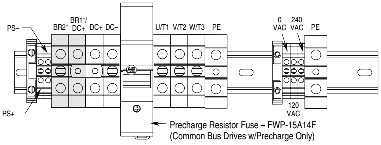
650V DC Input

5

75 HP, Normal Duty

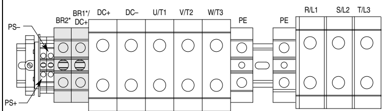

PS–
BR2*
BR1*/ DC+
DC+
DC–
U/T1
V/T2
W/T3
PE
PE
R/L1
S/L2
T/L3
PS+

75 HP, Normal Duty

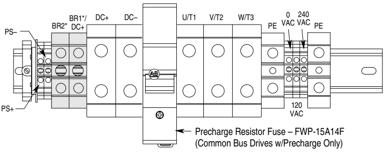

PS–
BR2*
BR1*/ DC+
DC+
DC–
U/T1
V/T2
W/T3
PE
0 VAC
240 VAC
PE
120 VAC
PS+

Precharge Resistor Fuse – FWP-15A14F
(Common Bus Drives w/Precharge Only)

100 HP, Normal Duty


PS–
BR2*
BR1*/ DC+
DC+
DC–
U/T1
V/T2
W/T3
PE
PE
R/L1
S/L2
T/L3
PS+

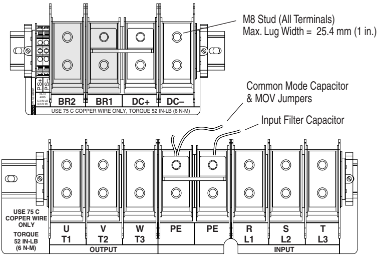
100 HP, Normal Duty


PS–
BR2*
BR1*/ DC+
DC+
DC–
U/T1
V/T2
W/T3
PE
0 VAC
240 VAC
PE
120 VAC
PS+

Precharge Resistor Fuse – FWP-15A14F
(Common Bus Drives w/Precharge Only)

6

125-200 HP, Normal Duty

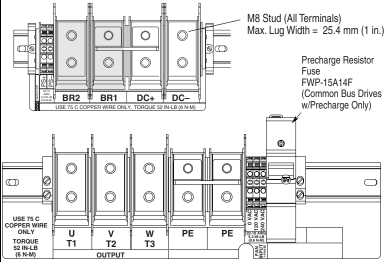

PS+
PS–
BR2
BR1
DC+
DC–
USE 75 C COPPER WIRE ONLY, TORQUE 52 IN-LB (6 N-M)
USE 75 C COPPER WIRE ONLY
TORQUE 52 IN-LB (6 N-M)
U T1
V T2
W T3
PE
PE
R L1
S L2
T L3
OUTPUT
INPUT

M8 Stud (All Terminals)
Max. Lug Width = 25.4 mm (1 in.)

Common Mode Capacitor & MOV Jumpers

Input Filter Capacitor

125-200 HP, Normal Duty


PS+
PS–
BR2
BR1
DC+
DC–
USE 75 C COPPER WIRE ONLY, TORQUE 52 IN-LB (6 N-M)
USE 75 C COPPER WIRE ONLY
TORQUE 52 IN-LB (6 N-M)
U T1
V T2
W T3
PE
PE
OUTPUT
0 VAC
120 VAC
240 VAC
FAN INPUT

M8 Stud (All Terminals)
Max. Lug Width = 25.4 mm (1 in.)

Precharge Resistor Fuse
FWP-15A14F
(Common Bus Drives w/Precharge Only)

Terminal	Description	Notes
BR1	DC Brake (+)	DB Resistor Connection - **Important:** Only one DB resistor can be used with Frames 0-3. Connecting an internal & external resistor could cause damage.
BR2	DC Brake (–)	
DC+	DC Bus (+)	
DC–	DC Bus (–)	
PE	PE Ground	Refer to Figure 1.3 for location on 3 Frame drives
⏚	Motor Ground	Refer to Figure 1.3 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 Three-Phase = R, S & T Single-Phase = R & S Only
S	S (L2)	
T	T (L3)	
PS+	AUX (+)	Auxiliary Control Voltage (see Table 1.C)
PS–	AUX (–)	Auxiliary Control Voltage (see Table 1.C)

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 hardwired 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.

Bypass Contactor Precaution

ATTENTION: An incorrectly applied or installed bypass system can result in component damage or reduction in product life. The most common causes are:

- Wiring AC line to drive output or control terminals.
- Improper bypass or output circuits not approved by Allen-Bradley.
- Output circuits which do not connect directly to the motor.

Contact Allen-Bradley for assistance with application or wiring.

Disconnecting MOVs and Common Mode Capacitors

PowerFlex 700 drives contain protective MOVs and common mode capacitors that are referenced to ground. To guard against drive damage, these devices should be disconnected if the drive is installed on an ungrounded distribution system where the line-to-ground voltages on any phase could exceed 125% of the nominal line-to-line voltage. To disconnect these devices, remove the jumper(s) listed in Table 1.D. Jumpers can be removed by carefully pulling the jumper straight out. See *Wiring and Grounding Guidelines for PWM AC Drives*, publication DRIVES-IN001 for more information on ungrounded systems.

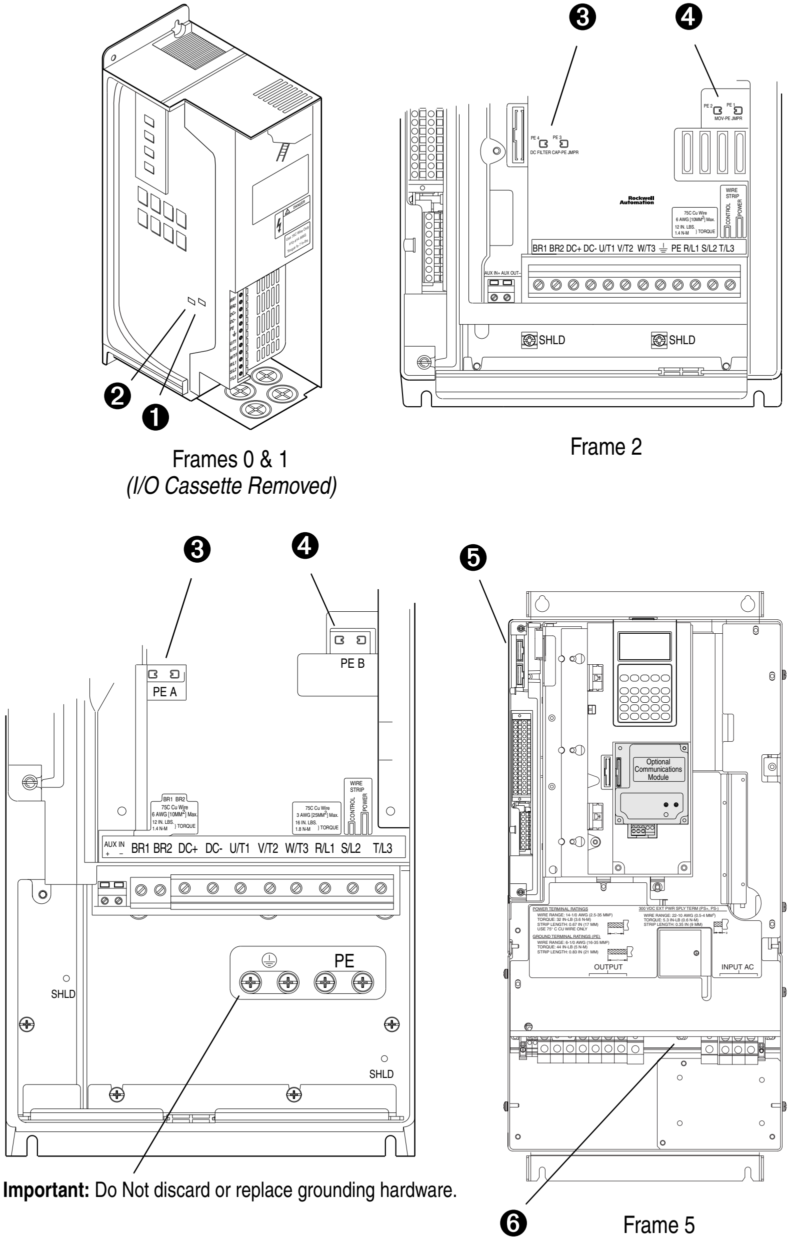
ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before removing/installing jumpers. Measure the DC bus voltage at the +DC & –DC terminals of the Power Terminal Block. The voltage must be zero.

Table 1.D Jumper Removal (1)

Frames	Jumper	Component	Jumper Location	No.
0, 1	PEA	Common Mode Capacitors	Remove the I/O Cassette (page 1-16). Jumpers located on the Power Board (Figure 1.5).	❶
	PEB	MOV's		❷
2-4	PEA	Common Mode Capacitors	Jumpers are located above the Power Terminal Block (see Figure 1.5).	❸
	PEB	MOV's		❹
5	Wire	Common Mode Capacitors	Remove the I/O Cassette as described on page 1-16. The green/yellow jumper is located on the back of chassis (see Figure 1.5 for location). Disconnect, insulate and secure the wire to guard against unintentional contact with chassis or components.	❺
		MOV's	Note location of the two green/yellow jumper wires next to the Power Terminal Block (Figure 1.5). Disconnect, insulate and secure the wires to guard against unintentional contact with chassis or components.	❻
		Input Filter Capacitors		
6	Wire	Common Mode Capacitors	Remove the wire guard from the Power Terminal Block. Disconnect the three green/yellow wires from the two "PE" terminals shown in Figure 1.4. Insulate/secure the wires to guard against unintentional contact with chassis or components.	
		MOV's		
		Input Filter Capacitors		

(1) **Important:** Do Not remove jumpers if the distribution system is grounded.

Figure 1.5 Typical Jumper Locations (see Table 1.D for description)


❸
❹
PE 4
PE 3
DC FILTER CAP-PE JMPR
PE 2
PE 1
MOV-PE JMPR
Rockwell Automation
WIRE STRIP
CONTROL
POWER
75C Cu Wire
6 AWG [10MM²] Max.
12 IN. LBS.
1.4 N-M
} TORQUE
BR1 BR2 DC+ DC- U/T1 V/T2 W/T3 PE R/L1 S/L2 T/L3
AUX IN+ AUX OUT–
SHLD
SHLD
❷
❶
❸
❹
❺
PE A
PE B
BR1 BR2
75C Cu Wire
6 AWG [10MM²] Max.
12 IN. LBS.
1.4 N-M
} TORQUE
75C Cu Wire
3 AWG [25MM²] Max.
16 IN. LBS.
1.8 N-M
} TORQUE
WIRE STRIP
CONTROL
POWER
AUX IN + –
BR1 BR2 DC+ DC- U/T1 V/T2 W/T3 R/L1 S/L2 T/L3
PE
SHLD
SHLD
Optional Communications Module
POWER TERMINAL RATINGS
300 VDC EXT PWR SPLY TERM (PS+, PS-)
GROUND TERMINAL RATINGS (PE)
OUTPUT
INPUT AC
❻

Frames 0 & 1
(I/O Cassette Removed)

Frame 2

Important: Do Not discard or replace grounding hardware.

Frames 3 & 4

Frame 5

I/O Wiring

Important points to remember about I/O wiring:

- Use Copper wire only. Wire gauge requirements and recommendations are based on 75 degrees C. Do not reduce wire gauge when using higher temperature 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.

ATTENTION: Configuring an analog input for 0-20mA operation and driving it from a voltage source could cause component damage. Verify proper configuration prior to applying input signals.

ATTENTION: Hazard of personal injury or equipment damage exists when using bipolar input sources. Noise and drift in sensitive input circuits can cause unpredictable changes in motor speed and direction. Use speed command parameters to help reduce input source sensitivity.

Signal and Control Wire Types

Table 1.E Recommended Signal Wire

Signal Type/ Where Used	Belden Wire Type(s) *(or equivalent)*		Description	Min. Insulation Rating
Analog I/O & PTC	8760/9460		0.750 mm^2 (18 AWG), twisted pair, 100% shield with drain (5)	300V, 75-90° C (167-194° F)
Remote Pot	8770		0.750 mm^2 (18 AWG), 3 cond., shielded	
Encoder/Pulse I/O <30 m (100 ft.)	Combined:	9730 (1)	0.196 mm^2 (24 AWG), individually shielded	
Encoder/Pulse I/O 30 to 152 m (100 to 500 ft.)	Signal:	9730/9728 (1)	0.196 mm^2 (24 AWG), indiv. shielded	
	Power:	8790 (2)	0.750 mm^2 (18 AWG)	
	Combined:	9892 (3)	0.330 mm^2 or 0.500 mm^2 (3)	
Encoder/Pulse I/O 152 to 259 m (500 to 850 ft.)	Signal:	9730/9728 (1)	0.196 mm^2 (24 AWG), indiv. shielded	
	Power:	8790 (2)	0.750 mm^2 (18 AWG)	
	Combined:	9773/9774 (4)	0.750 mm^2 (18 AWG), indiv. shielded pair	

(1) 9730 is 3 individually shielded pairs (2 channel + power). If 3 channel is required, use 9728.

(2) 8790 is 1 shielded pair.

(3) 9892 is 3 individually shielded pairs (3 channel), 0.33 mm^2 (22 AWG) + 1 shielded pair 0.5 mm^2 (20 AWG) for power.

(4) 9773 is 3 individually shielded pairs (2 channel + power). If 3 channel is required, use 9774.

(5) 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.

Table 1.F Recommended Control Wire for Digital I/O

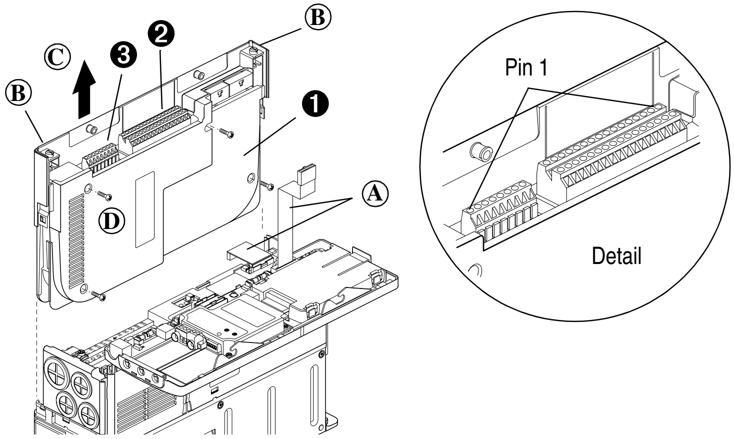
Type	Wire Type(s)	Description	Min. Insulation Rating
Unshielded	Per US NEC or applicable national or local code	–	300V, 60° C (140° F)
Shielded	Multi-conductor shielded cable such as Belden 8770(or equiv.)	0.750 mm^2(18AWG), 3 conductor, shielded.	

The I/O Control Cassette

Figure 1.6 shows the I/O Control Cassette and terminal block locations. The cassette provides a mounting point for the various PowerFlex 700 I/O options. To remove the cassette, follow the steps below. Cassette removal will be similar for all frames (0 Frame drive shown).

Step	Description
Ⓐ	Disconnect the two cable connectors shown in Figure 1.6.
Ⓑ	Loosen the two screw latches shown in Figure 1.6.
Ⓒ	Slide the cassette out.
Ⓓ	Remove screws securing cassette cover to gain access to the boards.

Figure 1.6 PowerFlex 700 Typical Cassette & I/O Terminal Blocks



I/O Terminal Blocks

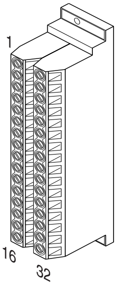
Table 1.G I/O Terminal Block Specifications

No.	Name	Description	Wire Size Range[2]		Torque	
			Maximum	Minimum	Maximum	Recommended
❶	I/O Cassette	Removable I/O Cassette				
❷	I/O Terminal Block	Signal & control connections	2.1 mm^2 (14 AWG)	0.30 mm^2 (22 AWG)	0.6 N-m (5.2 lb.-in.)	0.6 N-m (5.2 lb.-in.)
❸	Encoder Terminal Block[1]	Encoder power & signal connections	0.75 mm^2 (18 AWG)	0.196 mm^2 (24 AWG)	0.6 N-m (5.2 lb.-in.)	0.6 N-m (5.2 lb.-in.)

(1) Not available with Standard Control option.

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

Figure 1.7 Standard Control Option I/O Terminal Designations

Standard Control Option	No.	Signal	Factory Default	Description	Related Param.
	1	Anlg Volts In 1 (–)	(2)	Isolated (3), bipolar, differential, ±10V, 11 bit & sign, 88k ohm input impedance.	320 - 327
	2	Anlg Volts In 1 (+)			
	3	Anlg Volts In 2 (–)	(2)	Isolated (4), bipolar, differential, ±10V, 11 bit & sign, 88k ohm input impedance.	
	4	Anlg Volts In 2 (+)			
	5	Pot Common	–	For (+) and (–) 10V pot references.	
	6	Anlg Volts Out 1 (–)	(2)	Bipolar, ±10V, 11 bit & sign, 2k ohm minimum load.	340 - 344
	7	Anlg Volts Out 1 (+)			
	8	Anlg Current Out 1 (–)	(2)	4-20mA, 11 bit & sign, 400 ohm maximum load.	
	9	Anlg Current Out 1 (+)			
	10	Reserved for Future Use			
	11	Digital Out 1 – N.C. (1)	Fault	Max. Resistive Load: 240V AC/30V DC – 1200VA, 150W Max. Current: 5A, Min. Load: 10mA Max. Inductive Load: 240V AC/30V DC – 840VA, 105W Max. Current: 3.5A, Min. Load: 10mA	380 - 387
	12	Digital Out 1 Common			
	13	Digital Out 1 – N.O. (1)	NOT Fault		
	14	Digital Out 2 – N.C. (1)	NOT Run		
	15	Digital Out 2 Common			
	16	Digital Out 2 – N.O. (1)	Run		
	17	Anlg Current In 1 (–)	(2)	Isolated (3), 4-20mA, 11 bit & sign, 124 ohm input impedance.	320 - 327
	18	Anlg Current In 1 (+)			
	19	Anlg Current In 2 (–)	(2)	Isolated (4), 4-20mA, 11 bit & sign, 124 ohm input impedance.	
	20	Anlg Current In 2 (+)			
	21	–10V Pot Reference	–	2k ohm minimum.	
	22	+10V Pot Reference	–		
	23	Reserved for Future Use			
	24	+24V DC (5)	–	Drive supplied logic input power. (5)	
	25	Digital In Common	–		
	26	24V Common (5)	–	Common for internal power supply.	
	27	Digital In 1	Stop - CF	115V AC, 50/60 Hz - Opto isolated Low State: less than 30V AC High State: greater than 100V AC 24V AC/DC, 50/60 Hz - Opto isolated Low State: less than 5V AC/DC High State: greater than 20V AC/DC 11.2 mA DC	361 - 366
	28	Digital In 2	Start		
	29	Digital In 3	Auto/Man.		
	30	Digital In 4	Speed Sel 1		
	31	Digital In 5	Speed Sel 2		
	32	Digital In 6	Speed Sel 3		

(1) Contacts in unpowered state. Any relay programmed as Fault or Alarm will energize (pick up) when power is applied to drive and deenergize (drop out) when a fault or alarm exists. Relays selected for other functions will energize only when that condition exists and will deenergize when condition is removed.

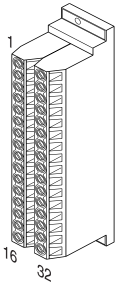
(2) These inputs/outputs are dependant on a number of parameters. See “Related Parameters.”

(3) Differential Isolation - External source must be maintained at less than 160V with respect to PE. Input provides high common mode immunity.

(4) Differential Isolation - External source must be less than 10V with respect to PE.

(5) 150mA maximum Load. Not present on 115V versions.

Figure 1.8 Vector Control Option I/O Terminal Designations

Vector Control Option	No.	Signal	Factory Default	Description	Related Param.
	1	Analog In 1 (–)(1)	(2)	Isolated(3), bipolar, differential, ±10V/4-20mA, 11 bit & sign, 88k ohm input impedance. For 4-20mA, a jumper must be installed at terminals 17 & 18 (or 19 & 20).	320 - 327
	2	Analog In 1 (+)(1)			
	3	Analog In 2 (–)(1)			
	4	Analog In 2 (+)(1)			
	5	Pot Common	–	For (+) and (–) 10V pot references.	
	6	Analog Out 1 (–)	(2)	Bipolar (current output is not bipolar), ±10V/4-20mA, 11 bit & sign, voltage mode - limit current to 5 mA. Current mode - max. load resistance is 400 ohms.	340 - 347
	7	Analog Out 1 (+)			
	8	Analog Out 2 (–)			
	9	Analog Out 2 (+)			
	10	Reserved for Future Use			
	11	Digital Out 1 – N.C.(4)	Fault	Max. Resistive Load: 240V AC/30V DC – 1200VA, 150W Max. Current: 5A, Min. Load: 10mA Max. Inductive Load: 240V AC/30V DC – 840VA, 105W Max. Current: 3.5A, Min. Load: 10mA	380 - 391
	12	Digital Out 1 Common			
	13	Digital Out 1 – N.O.(4)	NOT Fault		
	14	Digital Out 2 – N.C.(4)	NOT Run		
	15	Digital Out 2/3 Com.			
	16	Digital Out 3 – N.O.(4)	Run		
	17	Current In Jumper(1) – Analog In 1		Placing a jumper across terminals 17 & 18 (or 19 & 20) will configure that analog input for current.	
	18				
	19	Current In Jumper(1) – Analog In 2			
	20				
	21	–10V Pot Reference	–	2k ohm minimum load.	
	22	+10V Pot Reference	–		
	23	Reserved for Future Use			
	24	+24V DC(5)	–	Drive supplied logic input power. (5)	
	25	Digital In Common	–		
	26	24V Common(5)	–	Common for internal power supply.	
	27	Digital In 1	Stop - CF	115V AC, 50/60 Hz - Opto isolated Low State: less than 30V AC High State: greater than 100V AC 24V DC - Opto isolated Low State: less than 5V DC High State: greater than 20V DC 11.2 mA DC	361 - 366
	28	Digital In 2	Start		
	29	Digital In 3	Auto/Man.		
	30	Digital In 4	Speed Sel 1		
	31	Digital In 5	Speed Sel 2		
	32	Digital In 6/Hardware Enable, see pg. 1-19	Speed Sel 3		

---

(1) **Important:** 4-20mA operation requires a jumper at terminals 17 & 18 (or 19 & 20). Drive damage may occur if jumper is not installed.

(2) These inputs/outputs are dependant on a number of parameters (see “Related Parameters”).

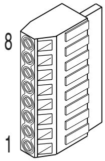
(3) Differential Isolation - External source must be maintained at less than 160V with respect to PE. Input provides high common mode immunity.

(4) Contacts in unpowered state. Any relay programmed as Fault or Alarm will energize (pick up) when power is applied to drive and deenergize (drop out) when a fault or alarm exists. Relays selected for other functions will energize only when that condition exists and will deenergize when condition is removed.

(5) 150mA maximum Load. Not present on 115V versions.

Encoder Terminal Block (Vector Control Option Only)

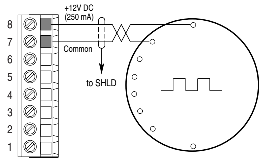
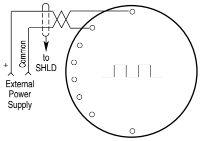
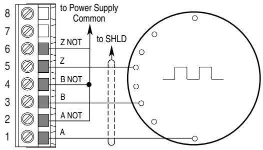
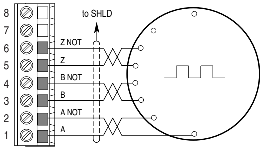
Table 1.H Encoder Terminal Designations

	No.	Description (refer to page A-3 for encoder specifications)	
See "Detail" in Figure 1.6 	8	+12V(1) DC Power	Internal power source 250 mA.
	7	+12V(1) DC Return (Common)	
	6	Encoder Z (NOT)	Pulse, marker or registration input.(2)
	5	Encoder Z	
	4	Encoder B (NOT)	Quadrature B input.
	3	Encoder B	
	2	Encoder A (NOT)	Single channel or quadrature A input.
	1	Encoder A	

(1) Jumper selectable +5/12V is available on 20B-ENC-2 Encoder Boards only.

(2) Z channel can be used as a pulse input while A & B are used for encoder.

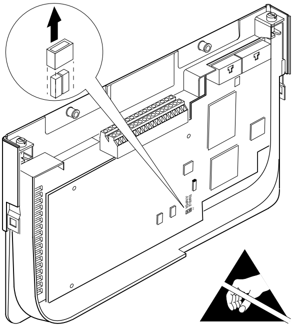
Figure 1.9 Sample Encoder Wiring

I/O	Connection Example	I/O	Connection Example
Encoder Power – Internal Drive Power Internal (drive) 12V DC, 250mA	 8 7 6 5 4 3 2 1 +12V DC (250 mA) Common to SHLD	**Encoder Power – External Power Source**	 Common + to SHLD External Power Supply
Encoder Signal – Single-Ended, Dual Channel	 8 7 6 5 4 3 2 1 to Power Supply Common Z NOT to SHLD Z B NOT B A NOT A	**Encoder Signal – Differential, Dual Channel**	 8 7 6 5 4 3 2 1 to SHLD Z NOT Z B NOT B A NOT A

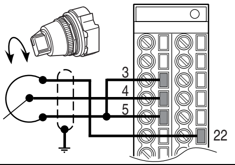
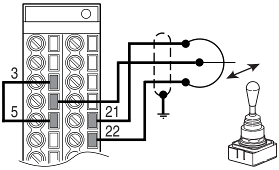
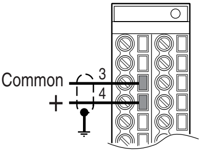
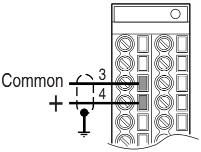
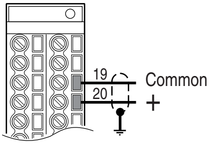
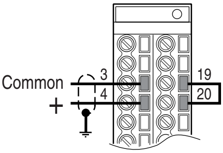
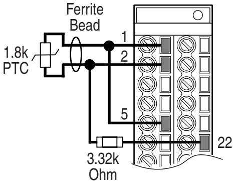
Hardware Enable Circuitry (Vector Control Option Only)

By default, the user can program a digital input as an Enable input. The status of this input is *interpreted by drive software*. If the application requires the drive to be disabled *without* software interpretation, a "dedicated" hardware enable configuration can be utilized. This is done by removing a jumper and wiring the enable input to "Digital In 6" (see below).

1. Remove the I/O Control Cassette & cover as described on page 1-16.
2. Locate & remove Jumper J10 on the Main Control Board (see diagram).
3. Re-assemble cassette.
4. Wire Enable to "Digital In 6" (see Figure 1.8).
5. Verify that [Digital In6 Sel], parameter 366 is set to "1, Enable."

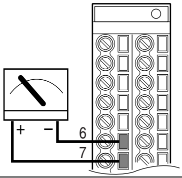
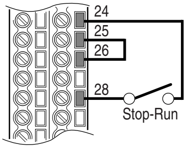
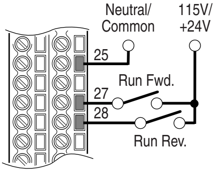
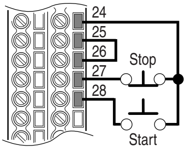
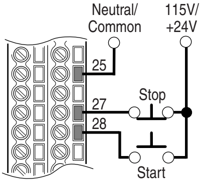
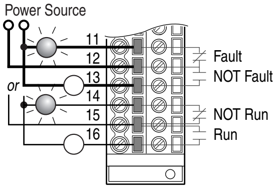
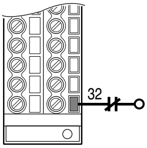


I/O Wiring Examples – Standard & Vector Control Options

Input/Output	Connection Example	Required Parameter Changes
Potentiometer Unipolar Speed Reference (1) 10k Ohm Pot. Recommended (2k Ohm Minimum)		- Adjust Scaling: Parameters 91/92 and 325/326 - View Results: Parameter 002
Joystick Bipolar Speed Reference (1) ±10V Input		- Set Direction Mode: Parameter 190 = “1, Bipolar” - Adjust Scaling: Parameters 91/92 and 325/326 - View Results: Parameter 002
Analog Input Bipolar Speed Reference ±10V Input		- Set Direction Mode: Parameter 190 = “1, Bipolar” - Adjust Scaling: Parameters 91/92 and 325/326 - View Results: Parameter 002
Analog Voltage Input Unipolar Speed Reference 0 to +10V Input		- Configure Input with parameter 320 - Adjust Scaling: Parameters 91/92 and 325/326 - View results: Parameter 002
Analog Current Input Unipolar Speed Reference **Standard** 4-20 mA Input		- Configure Input for Current: Parameter 320, Bit 1 = “1, Current” - Adjust Scaling: Parameters 91/92 and 325/326 - View Results: Parameter 002
Analog Current Input Unipolar Speed Reference **Vector** 4-20 mA Input		- Configure Input for Current: Parameter 320 and add jumper at appropriate terminals - Adjust Scaling: Parameters 91/92 and 325/326 - View results: Parameter 002
Analog Input, PTC **Vector** PTC OT set > 5V PTC OT cleared < 4V PTC Short < 0.2V		- Set Drive Alarm 1: Parameter 211, bit 11 = “True” - Set Fault Config 1: Parameter 238, bit 7 = “Enabled” - Set Alarm Config 1: Parameter 259, bit 11 = “Enabled”

(1) Refer to the Attention statement on page 1-15 for important bipolar wiring information.

I/O Wiring Examples (continued)

Input/Output	Connection Example	Required Parameter Changes
Analog Output ±10V, 4-20 mA Bipolar +10V Unipolar *(shown)* Standard Control 4-20 mA Unipolar *(use term. 8 & 9)*		- Configure with Parameter 340 - Select Source Value: Parameter 384, [Digital Out1 Sel] - Adjust Scaling: Parameters 343/344
2-Wire Control Non-Reversing(1) 24V DC internal supply	 24 25 26 28 Stop-Run	- Disable Digital Input:#1: Parameter 361 = "0, Unused" - Set Digital Input #2: Parameter 362 = "7, Run" - Set Direction Mode: Parameter 190 = "0, Unipolar"
2-Wire Control Reversing(1) External supply (I/O Board dependent)	 Neutral/ Common 115V/ +24V 25 Run Fwd. 27 28 Run Rev.	- Set Digital Input:#1: Parameter 361 = "8, Run Forward" - Set Digital Input #2: Parameter 362 = "9, Run Reverse"
3-Wire Control Internal supply	 24 25 26 27 28 Stop Start	- No Changes Required
3-Wire Control External supply (I/O Board dependent). Requires 3-wire functions only ([Digital In1 Sel]). Using 2-wire selections will cause a type 2 alarm (page 4-10).	 Neutral/ Common 115V/ +24V 25 Stop 27 28 Start	- No Changes Required
Digital Output Relays shown in powered state with drive faulted. See pages 1-18 & 1-17. Standard Control 1 relay at terminals 14-16. Vector Control 2 relays at terminals 14-16.	 Power Source or 11 12 13 14 15 16 Fault NOT Fault NOT Run Run	- Select Source to Activate: Parameters 380/384
Enable Input		- Standard Control Configure with parameter 366 - Vector Control Configure with parameter 366 For dedicated hardware Enable: Remove Jumper J10 (see 1-19)

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(1) **Important:** Programming inputs for 2 wire control deactivates all HIM Start buttons.

Reference Control

"Auto" Speed Sources

The drive speed command can be obtained from a number of different sources. The source is determined by drive programming and the condition of the Speed Select digital inputs, Auto/Manual digital inputs or reference select bits of a command word.

The default source for a command reference (all speed select inputs open or not programmed) is the selection programmed in [Speed Ref A Sel]. If any of the speed select inputs are closed, the drive will use other parameters as the speed command source.

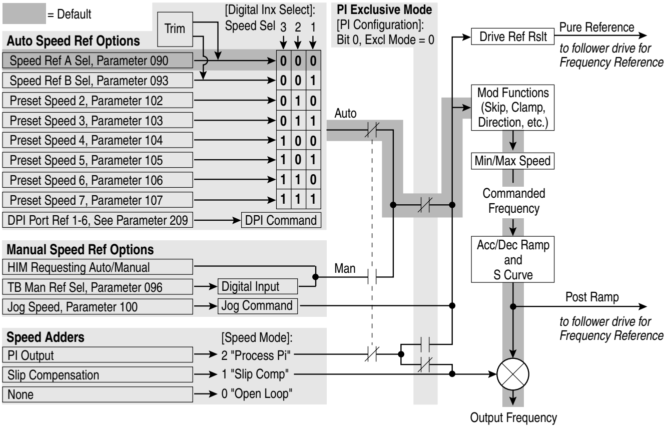
"Manual" Speed Sources

The manual source for speed command to the drive is either the HIM requesting manual control (see ALT Functions on page B-2) or the control terminal block (analog input) if a digital input is programmed to "Auto/Manual."

Changing Speed Sources

The selection of the active Speed Reference can be made through digital inputs, DPI command, jog button or Auto/Manual HIM operation.

Figure 1.10 Speed Reference Selection Chart(1)


= Default
Auto Speed Ref Options
Trim
[Digital Inx Select]:
Speed Sel 3 2 1
Speed Ref A Sel, Parameter 090
Speed Ref B Sel, Parameter 093
Preset Speed 2, Parameter 102
Preset Speed 3, Parameter 103
Preset Speed 4, Parameter 104
Preset Speed 5, Parameter 105
Preset Speed 6, Parameter 106
Preset Speed 7, Parameter 107
DPI Port Ref 1-6, See Parameter 209
0 0 0
0 0 1
0 1 0
0 1 1
1 0 0
1 0 1
1 1 0
1 1 1
DPI Command
Manual Speed Ref Options
HIM Requesting Auto/Manual
TB Man Ref Sel, Parameter 096
Jog Speed, Parameter 100
Digital Input
Jog Command
Speed Adders
PI Output
Slip Compensation
None
[Speed Mode]:
2 "Process Pi"
1 "Slip Comp"
0 "Open Loop"
PI Exclusive Mode
[PI Configuration]:
Bit 0, Excl Mode = 0
Auto
Man
Drive Ref Rslt
Pure Reference
to follower drive for Frequency Reference
Mod Functions (Skip, Clamp, Direction, etc.)
Min/Max Speed
Commanded Frequency
Acc/Dec Ramp and S Curve
Post Ramp
to follower drive for Frequency Reference
Output Frequency

Torque Reference Source (Vector Control Option Only)

The torque reference is normally supplied by an analog input or network reference. Switching between available sources while the drive is running is not available. Digital inputs programmed as "Speed Sel 1,2,3" and the HIM Auto/Manual function (see above) do not affect the active torque reference when the drive is in Vector Control Mode.

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(1) To access Preset Speed 1, set parameter 090 or 093 to "Preset Speed 1."

Auto/Manual Examples

PLC = Auto, HIM = Manual

A process is run by a PLC when in Auto mode and requires manual control from the HIM during set-up. The Auto speed reference is issued by the PLC through a communications module installed in the drive. Since the internal communications is designated as Port 5, [Speed Ref A Sel] is set to “DPI Port 5” with the drive running from the Auto source.

Attain Manual Control

- Press ALT then Auto/Man on the HIM.
  When the HIM attains manual control, the drive speed command comes from the HIM speed control keys or analog potentiometer.

Release to Auto Control

- Press ALT then Auto/Man on the HIM again.
  When the HIM releases manual control, the drive speed command returns to the PLC.

PLC = Auto, Terminal Block = Manual

A process is run by a PLC when in Auto mode and requires manual control from an analog potentiometer wired to the drive terminal block. The auto speed reference is issued by the PLC through a communications module installed in the drive. Since the internal communications is designated as Port 5, [Speed Ref A Sel] is set to “DPI Port 5” with the drive running from the Auto source. Since the Manual speed reference is issued by an analog input (“Analog In 1 or 2”), [TB Man Ref Sel] is set to the same input. To switch between Auto and Manual, [Digital In4 Sel] is set to “Auto/ Manual”.

Attain Manual Control

- Close the digital input.
  With the input closed, the speed command comes from the pot.

Release to Auto Control

- Open the digital input.
  With the input open, the speed command returns to the PLC.

Auto/Manual Notes

1. Manual control is exclusive. If a HIM or Terminal Block takes manual control, no other device can take manual control until the controlling device releases manual control.

2. If a HIM has manual control and power is removed from the drive, the drive will return to Auto mode when power is reapplied.

Lifting/Torque Proving

For Lifting/Torque Proving details, refer to page C-2.

Common Bus/Precharge Notes

The following notes must be read and understood. Also refer to pages 1-8 through 1-11 for additional common bus information.

Important 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.

   b) the drive must have firmware version 2.002 or above (Standard & Vector Control).

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(1) comply with the EN standards listed below when installed according to the User and Reference Manual.

CE 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 installer is required to take measures to prevent interference, in addition to the essential requirements for CE compliance provided in this section, 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 generate conducted low frequency disturbances (harmonic emissions) on the AC supply system.

(1) CE Certification testing has not been performed on 600V class drives.

General Notes (continued)

- 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 ensure, by consultation with the distribution network operator and Rockwell Automation, if necessary, that applicable requirements have been met.

Essential Requirements for CE Compliance

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

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

Table 1.I PowerFlex 700 EN61800-3 EMC Compatibility

Frame	**Second Environment (Industrial)** (1)(2) *External filter Not Required if motor cables are restricted to design shown*	**First Environment Restricted Distribution**
	Any Drive and Option	
0-6	Restrict Motor Cable to 30 m (98 ft.)	(2)

(1) Motor cable limited to 30 m (98 ft.) for installations in the second (industrial) environment without additional external line filters.

(2) Refer to the PowerFlex 70/700 Reference Manual for installations in the first (residential) environment and installations in the second environment with motor cables longer than 30 m (98 ft.).

Start Up

This chapter describes how you start up the PowerFlex 700 Drive. Refer to Appendix B for a brief description of the LCD HIM (Human Interface Module).

For information on . . .	See page . . .
Prepare For Drive Start-Up	2-1
Status Indicators	2-2
Start-Up Routines	2-3
Running S.M.A.R.T. Start	2-4
Running an Assisted Start Up	2-4

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.

Prepare For Drive Start-Up

Before Applying Power to the Drive

☐ **1.** Confirm that all inputs are connected to the correct terminals and are secure.

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

☐ **3.** Verify that control power voltage is correct.

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

Applying Power to the Drive

☐ **4.** Apply AC power and control voltages to the drive.

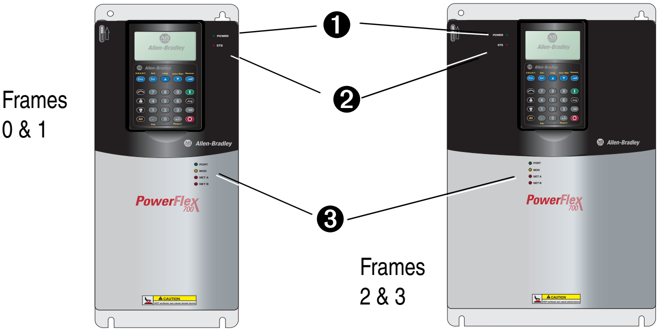
If any of the six digital inputs are configured to "Stop – CF" (CF = Clear Fault) or "Enable," verify that signals are present or reconfigure [Digital Inx Sel]. If an I/O option is not installed (i.e. no I/O terminal block), verify that [Digital Inx Sel] is not configured to "Stop – CF" or "Enable." If this is not done, the drive will not start. Refer to Alarm Descriptions on page 4-10 for a list of potential digital input conflicts. If a fault code appears, refer to Chapter 4.

If the STS LED is not flashing green at this point, refer to Status Indicators below.

☐ **5.** Proceed to Start-Up Routines.

Status Indicators

Figure 2.1 Drive Status Indicators



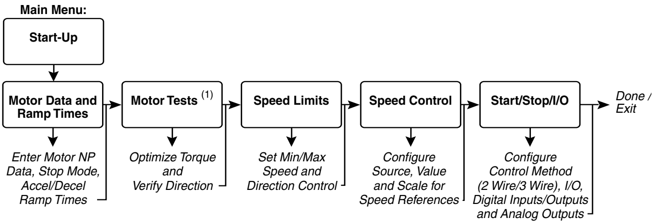
#	Name	Color	State	Description
❶	PWR (Power)	Green	Steady	Illuminates when power is applied to the drive.
❷	STS (Status)	Green	Flashing	Drive ready, but not running and no faults are present.
			Steady	Drive running, no faults are present.
		Yellow See page 4-10	Flashing, Drive Stopped	A start inhibit condition exists, the drive cannot be started. Check parameter 214 [Start Inhibits].
			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.
		See page 4-4	Steady	A non-resettable fault has occurred.
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).

Start-Up Routines

The PowerFlex 700 is designed so that start up is simple and efficient. If you have an LCD HIM, three methods are provided, allowing the user to select the desired level needed for the application.

- **S.M.A.R.T. Start**
  This routine allows you to quickly set up the drive by programming values for the most commonly used functions (below and page 2-4).
- **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. The Vector Control option provides two levels of Assisted Start Up; Basic and Detailed. See page 2-4.
- **Lifting/Torque Proving Start Up**
  Torque Proving applications can use the Assisted Start Up to tune the motor. However, it is recommended that the motor be disconnected from the hoist/crane equipment during the routine. If this is not possible, refer to the manual tuning procedure on page C-2.

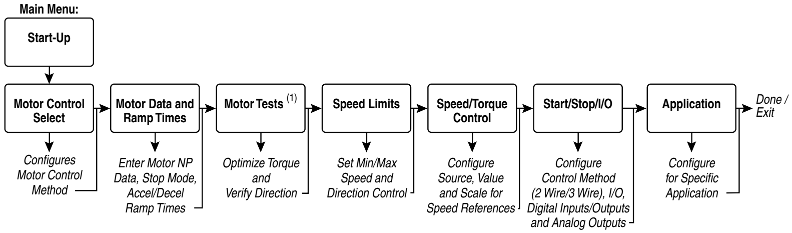
Figure 2.2 Standard Control Option Start Up Menu


Main Menu:
Start-Up
Motor Data and Ramp Times
Enter Motor NP Data, Stop Mode, Accel/Decel Ramp Times
Motor Tests (1)
Optimize Torque and Verify Direction
Speed Limits
Set Min/Max Speed and Direction Control
Speed Control
Configure Source, Value and Scale for Speed References
Start/Stop/I/O
Configure Control Method (2 Wire/3 Wire), I/O, Digital Inputs/Outputs and Analog Outputs
Done / Exit

Important Information

Power must be applied to the drive when viewing or changing parameters. Previous programming may affect the drive status and operation when power is applied. If the I/O Cassette has been changed, a Reset Defaults operation must be performed.

Figure 2.3 Vector Control Option Start Up Menu


Main Menu:
Start-Up
Motor Control Select
Configures Motor Control Method
Motor Data and Ramp Times
Enter Motor NP Data, Stop Mode, Accel/Decel Ramp Times
Motor Tests (1)
Optimize Torque and Verify Direction
Speed Limits
Set Min/Max Speed and Direction Control
Speed/Torque Control
Configure Source, Value and Scale for Speed References
Start/Stop/I/O
Configure Control Method (2 Wire/3 Wire), I/O, Digital Inputs/Outputs and Analog Outputs
Application
Configure for Specific Application
Done / Exit

(1) See page 2-4.

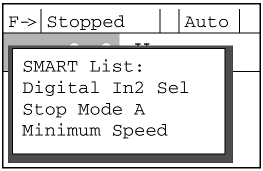
(1) During Motor Tests and tuning procedures, the drive may modify certain parameter values for proper Start Up operation. These values are then reset to their original values when Start Up is complete. The affected parameters are: 053, 080, 276, 278 and 361-366. If power is removed from the drive during the tests without aborting the auto-tune procedure, these parameters may not be reset to their original value. If this situation occurs, reset the drive to factory defaults and repeat the Start Up procedure.

Running S.M.A.R.T. Start

During a Start Up, the majority of applications require changes to only a few parameters. The LCD HIM on a PowerFlex 700 drive offers S.M.A.R.T. start, which displays the most commonly changed parameters. With these parameters, you can set the following functions:

S - Start Mode and Stop Mode
M - Minimum and Maximum Speed
A - Accel Time 1 and Decel Time 1
R - Reference Source
T - Thermal Motor Overload

To run a S.M.A.R.T. start routine:

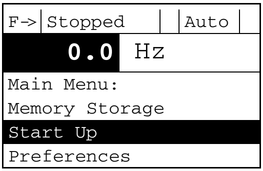
Step	Key(s)	Example LCD Displays
1. Press ALT and then Esc (S.M.A.R.T). The S.M.A.R.T. start screen appears.	ALT Esc	 F-> Stopped Auto SMART List: Digital In2 Sel Stop Mode A Minimum Speed
2. View and change parameter values as desired. For HIM information, see Appendix B.		
3. Press Esc to exit the S.M.A.R.T. start.	Esc	

Running an Assisted Start Up

Important: This start-up routine requires an LCD HIM.

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.

To perform an Assisted Start-Up

Step	Key(s)	Example LCD Displays
1. In the Main Menu, press the Up Arrow or Down Arrow to scroll to “Start Up”.	▲ ▼	 F-> Stopped Auto 0.0 Hz Main Menu: Memory Storage Start Up Preferences
2. Press Enter.	↵	

Chapter 3

Programming and Parameters

Chapter 3 provides a complete listing and description of the PowerFlex 700 parameters. The parameters can be programmed (viewed/edited) using an LCD HIM (Human Interface Module). As an alternative, programming can also be performed using DriveExplorer™ or DriveExecutive™ software and a personal computer. Refer to Appendix B for a brief description of the LCD HIM.

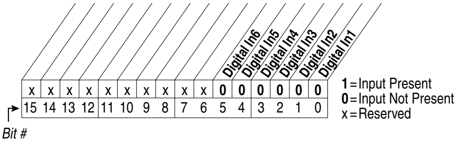
For information on . . .	See page . . .
About Parameters	3-1
How Parameters are Organized	3-3
Monitor File	3-12
Motor Control File	3-14
Speed Command File	3-21
Dynamic Control File	3-31
Utility File	3-38
Communication File	3-49
Inputs & Outputs File	3-53
Applications File	3-59
Parameter Cross Reference – by Name	3-61
Parameter Cross Reference – by Number	3-64

About Parameters

To configure a drive to operate in a specific way, drive parameters may have to be set. Three types of parameters exist:

- **ENUM Parameters**
  ENUM parameters allow a selection from 2 or more items. The LCD HIM will display a text message for each item.
- **Bit Parameters**
  Bit parameters have individual bits associated with features or conditions. If the bit is 0, the feature is off or the condition is false. If the bit is 1, the feature is on or the condition is true.
- **Numeric Parameters**
  These parameters have a single numerical value (i.e. 0.1 Volts).

The example on the following page shows how each parameter type is presented in this manual.

❶	❷	❸	❹	❺	❻
File	**Group**	**No.**	**Parameter Name & Description**	**Values**	**Related**
UTILITY	Drive . . .	198 ⬭	**[Load Frm Usr Set]** Loads a previously saved set of parameter values from a selected user set location in drive nonvolatile memory to active drive memory.	Default: 0 "Ready" Options: 0 "Ready" 1 "User Set 1" 2 "User Set 2" 3 "User Set 3"	199 ℹ
UTILITY	Diagnostics	216	**[Dig In Status]** Status of the digital inputs.	 Digital In6 Digital In5 Digital In4 Digital In3 Digital In2 Digital In1 x x x x x x x x x x 0 0 0 0 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Bit # 1 = Input Present 0 = Input Not Present x = Reserved	
MOTOR . . .	Torq . . .	434 FV	Vector **[Torque Ref B Mult]** Defines the value of the multiplier for the [Torque Ref B Sel] selection.	Default: 1.0 Min/Max: –/+32767.0 Units: 0.1	

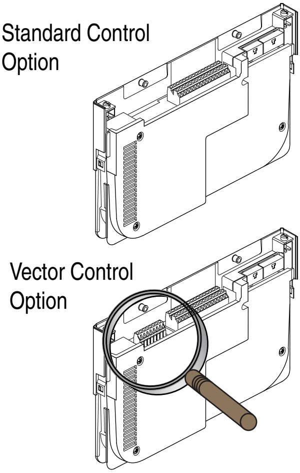
<table>
<tr><th>No.</th><th colspan="3">Description</th></tr>
<tr><td>❶</td><td colspan="3">File – Lists the major parameter file category.</td></tr>
<tr><td>❷</td><td colspan="3">Group – Lists the parameter group within a file.</td></tr>
<tr><td>❸</td><td colspan="3">No. – Parameter number. ⬭ = Parameter value can not be changed until drive is stopped.
▽32 = 32 bit parameter in the Standard Control option. All parameters in the Vector Control option are 32 bit.
FV = Parameter only displayed when [Motor Cntl Sel] is set to "4."</td></tr>
<tr><td>❹</td><td colspan="3">Parameter Name & Description – Parameter name as it appears on an LCD HIM, with a brief description of the parameters function.
Standard = This parameter is specific to the Standard Control Option.
Vector = This parameter will only be available with the Vector Control option.
Vector v3 = Only available with Vector Control option firmware version 3.xxx & later.</td></tr>
<tr><td rowspan="6">❺</td><td colspan="3">Values – Defines the various operating characteristics of the parameter. Three types exist.</td></tr>
<tr><td>ENUM</td><td>Default:
Options:</td><td>Lists the value assigned at the factory. "Read Only" = no default.
Displays the programming selections available.</td></tr>
<tr><td>Bit</td><td>Bit:</td><td>Lists the bit place holder and definition for each bit.</td></tr>
<tr><td rowspan="3">Numeric</td><td>Default:
Min/Max:
Units:</td><td>Lists the value assigned at the factory. "Read Only" = no default.
The range (lowest and highest setting) possible for the parameter.
Unit of measure and resolution as shown on the LCD HIM.</td></tr>
<tr><td colspan="2">Important: Some parameters will have two unit values:
• Analog inputs can be set for current or voltage with [Anlg In Config], param. 320.
• Setting [Speed Units], parameter 79 on Vector Control drives selects Hz or RPM.
• Values that pertain to Vector Control drives only will be indicated by " Vector " or " v3 " for Vector firmware 3.xxx and later.</td></tr>
<tr><td colspan="2">Important: When sending values through DPI ports, simply remove the decimal point to arrive at the correct value (i.e. to send "5.00 Hz," use "500").</td></tr>
<tr><td>❻</td><td colspan="3">Related – Lists parameters (if any) that interact with the selected parameter. The symbol "ℹ" indicates that additional parameter information is available in Appendix C.</td></tr>
</table>

How Parameters are Organized

The LCD HIM displays parameters in a **File-Group-Parameter** or **Numbered List** view order. To switch display mode, access the Main Menu, press ALT, then Sel while cursor is on the parameter selection. In addition, using [Param Access Lvl], the user has the option to display *all* parameters, commonly used parameters or diagnostic parameters.

Control Options

Two different control options are available for the PowerFlex 700; Standard and Vector. The Standard Control option provides typical Volts per Hertz and Sensorless Vector operation. The Vector Control option provides the added capability of FVC Vector control. The cassette determines the type of control you have available (see diagram).



To simplify programming with the Vector Control option, the displayed parameters will change according to the selection made with [Motor Cntl Sel]. For example, if "FVC Vector" is selected, the parameters associated solely with other operations such as Volts per Hertz or Sensorless Vector will be hidden. Refer to pages 3-4 through 3-8.

File-Group-Parameter Order

This simplifies programming by grouping parameters that are used for similar functions. The parameters are organized into files. Each file is divided into groups, and each parameter is an element in a group. By default, the LCD HIM displays parameters by File-Group-Parameter view.

Numbered List View

All parameters are in numerical order.

Basic Parameter View – Standard Control Option

Parameter 196 [Param Access Lvl] set to option 0 "Basic."

File	Group	Parameters					
Monitor Monitor	Metering	Output Freq	001				
		Commanded Freq	002				
		Output Current	003				
		DC Bus Voltage	012				
Motor Control Motor Control	Motor Data	Motor NP Volts	041	Motor NP RPM	044	Motor OL Hertz	047
		Motor NP FLA	042	Motor NP Power	045		
		Motor NP Hertz	043	Mtr NP Pwr Units	046		
	Torq Attributes	Torque Perf Mode	053	Maximum Freq	055		
		Maximum Voltage	054	Autotune	061		
Speed Command Speed Command	Spd Mode & Limits	Minimum Speed	081				
		Maximum Speed	082				
	Speed References	Speed Ref A Sel	090	Speed Ref B Hi	094	TB Man Ref Sel	096
		Speed Ref B Sel	093	Speed Ref A Lo	092	TB Man Ref Hi	097
		Speed Ref A Hi	091	Speed Ref B Lo	095	TB Man Ref Lo	098
	Discrete Speeds	Jog Speed	100				
		Preset Speed 1-7	101-107				
Dynamic Control Dynamic Control	Ramp Rates	Accel Time 1	140	Decel Time 1	142	S-Curve %	146
		Accel Time 2	141	Decel Time 2	143		
	Load Limits	Current Lmt Sel	147				
		Current Lmt Val	148				
	Stop/Brake Modes	Stop Mode A	155	DC Brk Lvl Sel	157	Bus Reg Mode A	161
		Stop Mode B	156	DC Brake Level	158	Bus Reg Mode B	162
				DC Brake Time	159	DB Resistor Type	163
	Restart Modes	Start At PowerUp	168	Auto Rstrt Tries	174	Auto Rstrt Delay	175
	Power Loss	Power Loss Mode	184	Power Loss Time	185		
Utility Utility	Direction Config	Direction Mode	190				
	Drive Memory	Param Access Lvl	196	Save To User Set	199		
		Reset To Defalts	197	Language	201		
		Load Frm Usr Set	198				
	Faults	Fault Config 1	238				
Inputs & Outputs Inputs & Outputs	Analog Inputs	Anlg In Config	320	Analog In1 Lo	323		
		Analog In1 Hi	322	Analog In2 Lo	326		
		Analog In2 Hi	325				
	Analog Outputs	Analog Out1 Sel	342				
		Analog Out1 Hi	343				
		Analog Out1 Lo	344				
	Digital Inputs	Digital In1-6 Sel	361-366				
	Digital Outputs	Digital Out1 Sel	380	Dig Out1 Level	381		
		Digital Out2 Sel	384	Dig Out2 Level	385		

Basic Parameter View – Vector Control Option

Parameter 196 [Param Access Lvl] set to option 0 “Basic.”

File	Group	Parameters					
Monitor	Metering	Output Freq	001				
		Commanded Speed	002				
		Commanded Torque**	024				
		Output Current	003				
		Torque Current	004				
		DC Bus Voltage	012				
Motor Control	Motor Data	Motor NP Volts	041	Motor NP RPM	044	Motor OL Hertz	047
		Motor NP FLA	042	Motor NP Power	045	Motor Poles	049
		Motor NP Hertz	043	Mtr NP Pwr Units	046		
	Torq Attributes	Motor Cntl Sel	053	Autotune Torque**	066	Torque Ref A Lo**	429
		Maximum Voltage	054	Inertia Autotune**	067	Pos Torque Limit**	436
		Maximum Freq	055	Torque Ref A Sel**	427	Neg Torque Limit**	437
		Autotune	061	Torque Ref A Hi**	428		
	Speed Feedback	Motor Fdbk Type	412	Encoder PPR	413		
Speed Command	Spd Mode & Limits	Speed Units	079	Minimum Speed	081	Rev Speed Limit**	454
		Feedback Select	080	Maximum Speed	082		
	Speed References	Speed Ref A Sel	090	Speed Ref B Hi	094	TB Man Ref Lo	098
		Speed Ref A Hi	091	Speed Ref B Lo	095	Pulse Input Ref	099
		Speed Ref A Lo	092	TB Man Ref Sel	096		
		Speed Ref B Sel	093	TB Man Ref Hi	097		
	Discrete Speeds	Jog Speed 1	100	Jog Speed 2	108		
		Preset Speed 1-7	101-107				
Dynamic Control	Ramp Rates	Accel Time 1	140	Decel Time 1	142	S-Curve %	146
		Accel Time 2	141	Decel Time 2	143		
	Load Limits	Current Lmt Sel	147	Current Lmt Val	148		
	Stop/Brake Modes	Stop/Brk Mode A	155	DC Brk Lvl Sel	157	Bus Reg Mode A	161
		Stop/Brk Mode B	156	DC Brake Level	158	Bus Reg Mode B	162
				DC Brake Time	159	DB Resistor Type	163
	Restart Modes	Start At PowerUp	168	Auto Rstrt Tries	174	Auto Rstrt Delay	175
	Power Loss	Power Loss Mode	184	Power Loss Time	185	Power Loss Level	186
Utility	Direction Config	Direction Mode	190				
	Drive Memory	Param Access Lvl	196	Load Frm Usr Set	198	Language	201
		Reset To Defalts	197	Save To User Set	199		
	Diagnostics	Start Inhibits	214	Dig In Status	216	Dig Out Status	217
	Faults	Fault Config 1	238				
	Alarms	Alarm Config 1	259				
Inputs & Outputs	Analog Inputs	Anlg In Config	320	Analog In2 Hi	325		
		Analog In1 Hi	322	Analog In2 Lo	326		
		Analog In1 Lo	323				
	Analog Outputs	Analog Out1, 2 Sel	342	Analog Out1, 2 Lo	344	Analog Out2 Hi	346
		Analog Out1 Hi	343	Analog Out1, 2 Sel	345	Analog Out1, 2 Lo	347
	Digital Inputs	Digital In1-6 Sel	361-366				
	Digital Outputs	Digital Out1-3 Sel	380-388	Dig Out1-3 Level	381-389		

** These parameters will only be displayed when parameter 053 [Motor Cntl Sel] is set to option “4.”

Advanced Parameter View – Standard Control Option

Parameter 196 [Param Access Lvl] set to option 1 “Advanced.”

File	Group	Parameters					
Monitor	Metering	Output Freq	001	Output Voltage	006	MOP Frequency	011
		Commanded Freq	002	Output Power	007	DC Bus Voltage	012
		Output Current	003	Output Powr Fctr	008	DC Bus Memory	013
		Torque Current	004	Elapsed MWh	009	Analog In1 Value	016
		Flux Current	005	Elapsed Run Time	010	Analog In2 Value	017
	Drive Data	Rated kW	026	Rated Amps	028		
		Rated Volts	027	Control SW Ver	029		
Motor Control	Motor Data	Motor Type	040	Motor NP RPM	044	Motor OL Factor	048
		Motor NP Volts	041	Motor NP Power	045		
		Motor NP FLA	042	Mtr NP Pwr Units	046		
		Motor NP Hertz	043	Motor OL Hertz	047		
	Torq Attributes	Torque Perf Mode	053	Flux Up Mode	057	IR Voltage Drop	062
		Maximum Voltage	054	Flux Up Time	058	Flux Current Ref	063
		Maximum Freq	055	SV Boost Filter	059	IXo Voltage Drop	064
		Compensation	056	Autotune	061		
	Volts per Hertz	Start/Acc Boost	069	Break Voltage	071		
		Run Boost	070	Break Frequency	072		
Speed Command	Spd Mode & Limits	Speed Mode	080	Overspeed Limit	083	Skip Frequency 3	086
		Minimum Speed	081	Skip Frequency 1	084	Skip Freq Band	087
		Maximum Speed	082	Skip Frequency 2	085		
	Speed References	Speed Ref A Sel	090	Speed Ref B Sel	093	TB Man Ref Sel	096
		Speed Ref A Hi	091	Speed Ref B Hi	094	TB Man Ref Hi	097
		Speed Ref A Lo	092	Speed Ref B Lo	095	TB Man Ref Lo	098
	Discrete Speeds	Jog Speed	100				
		Preset Speed 1-7	101-107				
	Speed Trim	Trim In Select	117	Trim Hi	119		
		Trim Out Select	118	Trim Lo	120		
	Slip Comp	Slip RPM @ FLA	121	Slip RPM Meter	123		
		Slip Comp Gain	122				
	Process PI	PI Configuration	124	PI Integral Time	129	PI Status	134
		PI Control	125	PI Prop Gain	130	PI Ref Meter	135
		PI Reference Sel	126	PI Lower Limit	131	PI Fdback Meter	136
		PI Setpoint	127	PI Upper Limit	132	PI Error Meter	137
		PI Feedback Sel	128	PI Preload	133	PI Output Meter	138
Dynamic Control	Ramp Rates	Accel Time 1	140	Decel Time 1	142	S Curve %	146
		Accel Time 2	141	Decel Time 2	143		
	Load Limits	Current Lmt Sel	147	Drive OL Mode	150		
		Current Lmt Val	148	PWM Frequency	151		
		Current Lmt Gain	149				
	Stop/Brake Modes	Stop Mode A	155	DC Brake Time	159	DB Resistor Type	163
		Stop Mode B	156	Bus Reg Ki	160	Bus Reg Kp	164
		DC Brake Lvl Sel	157	Bus Reg Mode A	161	Bus Reg Kd	165
		DC Brake Level	158	Bus Reg Mode B	162		
	Restart Modes	Start At PowerUp	168	Auto Rstrt Delay	175	Wake Time	181
		Flying Start En	169	Sleep Wake-Mode	178	Sleep Level	182
		Flying StartGain	170	Sleep-Wake Ref	179	Sleep Time	183
		Auto Rstrt Tries	174	Wake Level	180		
	Power Loss	Power Loss Mode	184				
		Power Loss Time	185				
		Power Loss Level	186				

File	Group	Parameters					
Utility	Direction Config	Direction Mode	190				
	HIM Ref Config	Save HIM Ref	192				
		Man Ref Preload	193				
	MOP Config	Save MOP Ref	194				
		MOP Rate	195				
	Drive Memory	Param Access Lvl	196	Save To User Set	199	Voltage Class	202
		Reset To Defalts	197	Reset Meters	200	Drive Checksum	203
		Load Frm Usr Set	198	Language	201		
	Diagnostics	Drive Status 1	209	Dig Out Status	217	Status 2 @ Fault	228
		Drive Status 2	210	Drive Temp	218	Alarm 1 @ Fault	229
		Drive Alarm 1	211	Drive OL Count	219	Alarm 2 @ Fault	230
		Drive Alarm 2	212	Motor OL Count	220	Testpoint 1 Sel	234
		Speed Ref Source	213	Fault Speed	224	Testpoint 1 Data	235
		Start Inhibits	214	Fault Amps	225	Testpoint 2 Sel	236
		Last Stop Source	215	Fault Bus Volts	226	Testpoint 2 Data	237
		Dig In Status	216	Status 1 @ Fault	227		
	Faults	Fault Config 1	238	Fault Clear Mode	241	Fault 1-8 Code	243-257
		Fault Clear	240	Power Up Marker	242	Fault 1-8 Time	244-258
	Alarms	Alarm Config 1	259	Alarm1-8 Code	262-269		
		Alarm Clear	261				
Communication	Comm Control	DPI Baud Rate	270	Drive Ref Rslt	272		
		Drive Logic Rslt	271	Drive Ramp Rslt	273		
	Masks & Owners	Logic Mask	276	Fault Clr Mask	283	Reference Owner	292
		Start Mask	277	MOP Mask	284	Accel Owner	293
		Jog Mask	278	Local Mask	285	Decel Owner	294
		Direction Mask	279	Stop Owner	288	Fault Clr Owner	295
		Reference Mask	280	Start Owner	289	MOP Owner	296
		Accel Mask	281	Jog Owner	290	Local Owner	297
		Decel Mask	282	Direction Owner	291		
	Datalinks	Data In A1-D2	300-307				
		Data Out A1-D2	310-317				
Inputs & Outputs	Analog Inputs	Anlg In Config	320	Analog In 2 Hi	325	Anlg In 1 Loss	324
		Anlg In Sqr Root	321	Analog In 1 Lo	323	Anlg In 2 Loss	327
		Analog In 1 Hi	322	Analog In 2 Lo	326		
	Analog Outputs	Anlg Out Config	340	Analog Out1 Hi	343		
		Anlg Out Absolut	341	Analog Out1 Lo	344		
		Analog Out1 Sel	342				
	Digital Inputs	Digital In1-6 Sel	361-366				
	Digital Outputs	Digital Out1 Sel	380	Dig Out2 Level	385	Dig Out1 OffTime	383
		Digital Out2 Sel	384	Dig Out1 OnTime	382	Dig Out2 OffTime	387
		Dig Out1 Level	381	Dig Out2 OnTime	386		

Advanced Parameter View – Vector Control Option

Parameter 196 [Param Access Lvl] set to option 1 “Advanced.”

File	Group	Parameters					
Monitor	Metering	Output Freq	001	Torque Current	004	MOP Reference	011
		Commanded Speed	002	Flux Current	005	DC Bus Voltage	012
		Ramped Speed	022	Output Voltage	006	DC Bus Memory	013
		Speed Reference	023	Output Power	007	Analog In1 Value	016
		Commanded Torque**	024	Output Powr Fctr	008	Analog In2 Value	017
		Speed Feedback	025	Elapsed MWh	009	Elapsed kWh	014$^{3.x}$
		Output Current	003	Elapsed Run Time	010		
	Drive Data	Rated kW	026	Rated Amps	028		
		Rated Volts	027	Control SW Ver	029		
Motor Control	Motor Data	Motor Type	040	Motor NP RPM	044	Motor OL Factor	048
		Motor NP Volts	041	Motor NP Power	045	Motor Poles	049
		Motor NP FLA	042	Mtr NP Pwr Units	046		
		Motor NP Hertz	043	Motor OL Hertz	047		
	Torq Attributes	Motor Cntl Sel	053	Flux Current Ref	063	Torque Ref B Hi**	432
		Maximum Voltage	054	IXo Voltage Drop	064	Torque Ref B Lo**	433
		Maximum Freq	055	Autotune Torque**	066	Torq Ref B Mult**	434
		Compensation	056	Inertia Autotune**	067	Torque Setpoint**	435
		Flux Up Mode	057	Torque Ref A Sel**	427	Torque Setpoint 2**	438$^{3.x}$
		Flux Up Time	058	Torque Ref A Hi**	428	Pos Torque Limit**	436
		SV Boost Filter	059	Torque Ref A Lo**	429	Neg Torque Limit**	437
		Autotune	061	Torq Ref A Div**	430	Control Status**	440
		IR Voltage Drop	062	Torque Ref B**	431	Mtr Tor Cur Ref**	441
	Volts per Hertz	Start/Acc Boost	069	Break Voltage*	071		
		Run Boost*	070	Break Frequency*	072		
	Speed Feedback	Motor Fdbk Type	412	Fdbk Filter Sel	416	Marker Pulse	421
		Encoder PPR	413	Notch Filter Freq**	419	Pulse In Scale	422
		Enc Position Fdbk	414	Notch Filter K**	420	Encoder Z Chan	423
		Encoder Speed	415				
Speed Command	Spd Mode & Limits	Speed Units	079	Overspeed Limit	083	Skip Freq Band*	087
		Feedback Select	080	Skip Frequency 1*	084	Speed/Torque Mod**	088
		Minimum Speed	081	Skip Frequency 2*	085	Rev Speed Limit**	454
		Maximum Speed	082	Skip Frequency 3*	086		
	Speed References	Speed Ref A Sel	090	Speed Ref B Hi	094	TB Man Ref Hi	097
		Speed Ref A Hi	091	Speed Ref B Lo	095	TB Man Ref Lo	098
		Speed Ref A Lo	092	TB Man Ref Sel	096	Pulse Input Ref	099
		Speed Ref B Sel	093				
	Discrete Speeds	Jog Speed 1	100	Preset Speed 1-7	101-107	Jog Speed 2	108
	Speed Trim	Trim In Select	117	Trim Hi	119	Trim % Setpoint	116$^{3.x}$
		Trim Out Select	118	Trim Lo	120		
	Slip Comp	Slip RPM @ FLA	121	Slip Comp Gain*	122	Slip RPM Meter	123
	Process PI	PI Configuration	124	PI Lower Limit	131	PI Output Meter	138
		PI Control	125	PI Upper Limit	132	PI Reference Hi	460
		PI Reference Sel	126	PI Preload	133	PI Reference Lo	461
		PI Setpoint	127	PI Status	134	PI Feedback Hi	462
		PI Feedback Sel	128	PI Ref Meter	135	PI Feedback Lo	463
		PI Integral Time	129	PI Fdback Meter	136	PI BW Filter	139$^{2.x}$
		PI Prop Gain	130	PI Error Meter	137	PI Deriv Time	459$^{3.x}$
	Speed Regulator	Ki Speed Loop**	445	Kf Speed Loop**	447	Total Inertia**	450
		Kp Speed Loop**	446	Speed Desired BW**	449	Speed Loop Meter**	451$^{3.x}$
Dynamic Control	Ramp Rates	Accel Time 1, 2	140,141	Decel Time 1, 2	142,143	S Curve %	146
	Load Limits	Current Lmt Sel	147	Drive OL Mode	150	Regen Power Limit**	153
		Current Lmt Val	148	PWM Frequency	151	Current Rate Limit **	154
		Current Lmt Gain	149	Droop RPM @ FLA	152		

File	Group	Parameters					
Dynamic Control *continued*	Stop/Brake Modes	Stop/Brk Mode	155,156	Bus Reg Ki*	160	Bus Reg Kd*	165
		DC Brk Lvl Sel	157	Bus Reg Mode	161,162	Flux Braking	166
		DC Brake Level	158	DB Resistor Type	163	DB While Stopped	145[3.x]
		DC Brake Time	159	Bus Reg Kp*	164		
	Restart Modes	Start At PowerUp	168	Auto Rstrt Delay	175	Wake Time	181
		Flying Start En	169	Sleep-Wake Mode	178	Sleep Level	182
		Flying StartGain	170	Sleep-Wake Ref	179	Sleep Time	183
		Auto Rstrt Tries	174	Wake Level	180	Powerup Delay	167
	Power Loss	Power Loss Mode	184	Load Loss Level	187[3.x]	Gnd Warn Level	177[3.x]
		Power Loss Time	185	Load Loss Time	188[3.x]		
		Power Loss Level	186	Shear Pin Time	189[3.x]		
Utility	Direction Config	Direction Mode	190				
	HIM Ref Config	Save HIM Ref	192	Man Ref Preload	193		
	MOP Config	Save MOP Ref	194	MOP Rate	195		
	Drive Memory	Param Access Lvl	196	Save To User Set	199	Voltage Class	202
		Reset To Defalts	197	Reset Meters	200	Drive Checksum	203
		Load Frm Usr Set	198	Language	201		
	Diagnostics	Drive Status 1, 2	209,210	Dig Out Status	217	Fault Bus Volts	226
		Drive Alarm 1, 2	211,212	Drive Temp	218	Status 1,2 @ Fault	227,228
		Speed Ref Source	213	Drive OL Count	219	Alarm 1,2 @ Fault	229,230
		Start Inhibits	214	Motor OL Count	220	Testpoint 1,2 Sel	234,236
		Last Stop Source	215	Fault Speed	224	Testpoint 1,2 Data	235,237
		Dig In Status	216	Fault Amps	225		
	Faults	Fault Config 1	238	Fault Clear Mode	241	Fault 1-8 Code	243-257
		Fault Clear	240	Power Up Marker	242	Fault 1-8 Time	244-258
	Alarms	Alarm Config 1	259	Alarm Clear	261	Alarm1-8 Code	262-269
	Scaled Blocks	Scale1, 2 In Val	476,482	Scale1, 2 In Lo	478,484	Scale1,2 Out Lo	480,486
		Scale3, 4 In Val	488,494[3.x]	Scale3, 4 In Lo	490,496[3.x]	Scale3,4 Out Lo	492,488[3.x]
		Scale1, 2 In Hi	477,483	Scale1, 2 Out Hi	479,485	Scale1,2 Out Val	481,487
		Scale3, 4 In Hi	489,495[3.x]	Scale3, 4 Out Hi	491,497[3.x]	Scale3,4 Out Val	493,499[3.x]
Communication	Comm Control	DPI Baud Rate	270	Drive Ref Rslt	272	DPI Port Sel	274
		Drive Logic Rslt	271	Drive Ramp Rslt	273	DPI Port Value	275
	Masks & Owners	Logic Mask	276	MOP Mask	284	Decel Owner	294
		Start Mask	277	Local Mask	285	Fault Clr Owner	295
		Jog Mask	278	Stop Owner	288	MOP Owner	296
		Direction Mask	279	Start Owner	289	Local Owner	297
		Reference Mask	280	Jog Owner	290	DPI Ref Select	298[3.x]
		Accel Mask	281	Direction Owner	291	DPI Fdbk Select	299[3.x]
		Decel Mask	282	Reference Owner	292		
		Fault Clr Mask	283	Accel Owner	293		
	Datalinks	Data In A1-D2	300-307	Data Out A1-D2	310-317		
Inputs & Outputs	Analog Inputs	Anlg In Config	320	Analog In1, 2 Hi	322,325	Analog In1, 2 Loss	324,327
		Anlg In Sqr Root	321	Analog In1, 2 Lo	323,326		
	Analog Outputs	Anlg Out Config	340	Analog Out1, 2 Hi	343,346	Anlg Out1,2 Scal	354,355[3.x]
		Anlg Out Absolut	341	Analog Out1, 2 Lo	344,347	Anlg1 Out Setpt	377,378[3.x]
		Analog Out1, 2 Sel	342,345				
	Digital Inputs	Digital In1-6 Sel	361-366				
	Digital Outputs	Digital Out Sel	380,384,388	Dig Out OnTime	382,386,390	Dig Out Setpt	379[3.x]
		Dig Out Level	381,385,389	Dig Out OffTime	383,387,391		
Applications[3.x]	Torq Proving[3.x]	TorqProve Cnfg	600[3.x]	Brk Release Time	604[3.x]	TorqLim SlewRate	608[3.x]
		TorqProve Setup	601[3.x]	ZeroSpdFloatTime	605[3.x]	BrkSlip Count	609[3.x]
		Spd Dev Band	602[3.x]	Float Tolerance	606[3.x]	Brk Alarm Travel	610[3.x]
		SpdBand Integrat	603[3.x]	Brk Set Time	607[3.x]	MicroPos Scale%	611[3.x]

* These parameters will only be displayed when parameter 053 [Motor Cntl Sel] is set to option "2 or 3."

** These parameters will only be displayed when parameter 053 [Motor Cntl Sel] is set to option "4."

[2.x] Firmware 2.001 & later only. [3.x] Firmware 3.001 & later only.

Basic Fan/Pump Parameter View[1] – Standard Control Option

Parameter 196 [Param Access Lvl] set to option 3 "Fan/Pump."

File	Group	Parameters			
Monitor	Metering	Output Freq	001	Elapsed MWh	009
		Commanded Freq	002	Elapsed Run Time	010
		Output Current	003	DC Bus Voltage	012
		Output Power	007	Analog In1 Value	016
Motor Control	Motor Data	Motor NP Volts	041	Motor NP RPM	044
		Motor NP FLA	042	Motor NP Power	045
		Motor NP Hertz	043	Mtr NP Pwr Units	046
	Torq Attributes	Maximum Voltage	054		
		Maximum Freq	055		
	Volts per Hertz	Start/Acc Boost	069	Break Voltage	071
		Run Boost	070	Break Frequency	072
Speed Command	Spd Mode & Limits	Speed Mode	080	Overspeed Limit	083
		Minimum Speed	081	Skip Frequency 1	084
		Maximum Speed	082	Skip Freq Band	087
	Speed References	Speed Ref A Sel	090		
		Speed Ref A Hi	091		
		Speed Ref A Lo	092		
	Discrete Speeds	Preset Speed 2	102		
Dynamic Control	Ramp Rates	Accel Time 1	140		
		Decel Time 1	142		
	Load Limits	Current Lmt Val	148		
	Stop/Brake Modes	Stop Mode A	155		
	Restart Modes	Start At PowerUp	168		
		Auto Rstrt Tries	174		
		Auto Rstrt Delay	175		
Utility	Drive Memory	Param Access Lvl	196		
		Reset To Defalts	197		
		Language	201		
	Diagnostics	Start Inhibits	214		
		Dig In Status	216		
		Dig Out Status	217		
Inputs & Outputs	Analog Inputs	Anlg In Config	320	Analog In 1 Lo	323
		Anlg In Sqr Root	321	Anlg In 1 Loss	324
		Analog In 1 Hi	322		
	Analog Outputs	Anlg Out Config	340	Analog Out1 Hi	343
		Analog Out1 Sel	342	Analog Out1 Lo	344
	Digital Inputs	Digital In1-6 Sel	361-366		
	Digital Outputs	Digital Out1 Sel	380	Dig Out2 Level	385
		Digital Out2 Sel	384		
		Dig Out1 Level	381		

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(1) Only available on Standard Control drives with firmware version 3.001 or above.

Advanced Fan/Pump Parameter View(1) – Standard Control Option

Parameter 196 [Param Access Lvl] set to option 4 “Adv Fan/Pump.”

File	Group	Parameters					
Monitor	Metering	Output Freq	001	Elapsed Run Time	010		
		Commanded Freq	002	DC Bus Voltage	012		
		Output Current	003	Analog In1 Value	016		
		Output Power	007	Analog In2 Value	017		
		Elapsed MWh	009				
Motor Control	Motor Data	Motor NP Volts	041	Motor NP Hertz	043	Motor NP Power	045
		Motor NP FLA	042	Motor NP RPM	044	Mtr NP Pwr Units	046
	Torq Attributes	Torque Perf Mode	053	Maximum Freq	055		
		Maximum Voltage	054				
	Volts per Hertz	Start/Acc Boost	069	Break Voltage	071		
		Run Boost	070	Break Frequency	072		
Speed Command	Spd Mode & Limits	Speed Mode	080	Overspeed Limit	083	Skip Frequency 3	086
		Minimum Speed	081	Skip Frequency 1	084	Skip Freq Band	087
		Maximum Speed	082	Skip Frequency 2	085		
	Speed References	Speed Ref A Sel	090	Speed Ref A Lo	092	Speed Ref B Hi	094
		Speed Ref A Hi	091	Speed Ref B Sel	093	Speed Ref B Lo	095
	Discrete Speeds	Preset Speed 2-4	102-104				
	Process PI	PI Configuration	124	PI Integral Time	129	PI Status	134
		PI Control	125	PI Prop Gain	130	PI Ref Meter	135
		PI Reference Sel	126	PI Lower Limit	131	PI Fdback Meter	136
		PI Setpoint	127	PI Upper Limit	132	PI Error Meter	137
		PI Feedback Sel	128	PI Preload	133	PI Output Meter	138
Dynamic Control	Ramp Rates	Accel Time 1	140	Decel Time 1	142	S Curve %	146
		Accel Time 2	141	Decel Time 2	143		
	Load Limits	Current Lmt Val	148	PWM Frequency	151		
	Stop/Brake Modes	Stop Mode A	155				
	Restart Modes	Start At PowerUp	168	Auto Rstrt Delay	175	Wake Time	181
		Flying Start En	169	Sleep Wake-Mode	178	Sleep Level	182
		Flying StartGain	170	Sleep-Wake Ref	179	Sleep Time	183
		Auto Rstrt Tries	174	Wake Level	180		
	Power Loss	Power Loss Mode	184	Power Loss Time	185		
Utility	Direction Config	Direction Mode	190				
	HIM Ref Config	Save HIM Ref	192	Man Ref Preload	193		
	Drive Memory	Param Access Lvl	196	Reset To Defalts	197	Language	201
	Diagnostics	Start Inhibits	214	Dig Out Status	217		
		Dig In Status	216				
Inputs & Outputs	Analog Inputs	Anlg In Config	320	Analog In 2 Hi	325	Anlg In 1 Loss	324
		Anlg In Sqr Root	321	Analog In 1 Lo	323	Anlg In 2 Loss	327
		Analog In 1 Hi	322	Analog In 2 Lo	326		
	Analog Outputs	Anlg Out Config	340	Analog Out1 Hi	343		
		Analog Out1 Sel	342	Analog Out1 Lo	344		
	Digital Inputs	Digital In1-6 Sel	361-366				
	Digital Outputs	Digital Out1 Sel	380	Dig Out2 Level	385	Dig Out1 OffTime	383
		Digital Out2 Sel	384	Dig Out1 OnTime	382	Dig Out2 OffTime	387
		Dig Out1 Level	381	Dig Out2 OnTime	386		

(1) Only available on Standard Control drives with firmware version 3.001 or above.

Monitor File

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
MONITOR	Metering	001	**[Output Freq]** Output frequency present at T1, T2 & T3 (U, V & W)	Default: Read Only Min/Max: –/+[Maximum Freq] Units: 0.1 Hz	
		002	**Standard** **[Commanded Freq]** Value of the active frequency command.	Default: Read Only Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	
			Vector **[Commanded Speed]** Value of the active Speed/Frequency Reference. Displayed in Hz or RPM, depending on value of [Speed Units].	Default: Read Only Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 0.1 RPM	079
		003	**[Output Current]** The total output current present at T1, T2 & T3 (U, V & W).	Default: Read Only Min/Max: 0.0/Drive Rated Amps × 2 Units: 0.1 Amps	
		004	**[Torque Current]** Based on the motor, the amount of current that is in phase with the fundamental voltage component.	Default: Read Only Min/Max: Drive Rating × –2/+2 Units: 0.1 Amps	
		005	**[Flux Current]** Amount of current that is out of phase with the fundamental voltage component.	Default: Read Only Min/Max: Drive Rating × –2/+2 Units: 0.1 Amps	
		006	**[Output Voltage]** Output voltage present at terminals T1, T2 & T3 (U, V & W).	Default: Read Only Min/Max: 0.0/Drive Rated Volts Units: 0.1 VAC	
		007	**[Output Power]** Output power present at T1, T2 & T3 (U, V & W).	Default: Read Only Min/Max: 0.0/Drive Rated kW × 2 Units: 0.1 kW	
		008	**[Output Powr Fctr]** Output power factor.	Default: Read Only Min/Max: 0.00/1.00 Units: 0.01	
		009 ▽32	**[Elapsed MWh]** Accumulated output energy of the drive.	Default: Read Only Min/Max: 0.0/214748352.0 MWh Units: 0.1 MWh	
		010 ▽32	**[Elapsed Run Time]** Accumulated time drive is outputting power.	Default: Read Only Min/Max: 0.0/214748352.0 Hrs Units: 0.1 Hrs	

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
MONITOR	Metering	011	Standard **[MOP Frequency]** Value of the signal at MOP (Motor Operated Potentiometer).	Default: Read Only Min/Max: –/+[Maximum Freq] Units: 0.1 Hz	079
			Vector **[MOP Reference]** See description above.	Default: Read Only Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 0.1 RPM	
		012	**[DC Bus Voltage]** Present DC bus voltage level.	Default: Read Only Min/Max: 0.0/Based on Drive Rating Units: 0.1 VDC	
		013	**[DC Bus Memory]** 6 minute average of DC bus voltage level.	Default: Read Only Min/Max: 0.0/Based on Drive Rating Units: 0.1 VDC	
		014	Vector v3 **[Elapsed kWh]** Accumulated output energy of the drive.	Default: Read Only Min/Max: 0.0/429496729.5 kWh Units: 0.1 kWh	
		016 017	**[Analog In1 Value]** **[Analog In2 Value]** Value of the signal at the analog inputs.	Default: Read Only Min/Max: 0.000/20.000 mA –/+10.000V Units: 0.001 mA 0.001 Volt	
		022	Vector **[Ramped Speed]** Value of commanded speed after Accel/Decel, and S-Curve are applied.	Default: Read Only Min/Max: –/+400.0 Hz –/+24000.0 RPM Units: 0.1 Hz 0.1 RPM	079
		023	Vector **[Speed Reference]** Summed value of ramped speed, process PI and droop. When FVC Vector mode is selected, droop will not be added.	Default: Read Only Min/Max: –/+400.0 Hz –/+24000.0 RPM Units: 0.1 Hz 0.1 RPM	079
		024 FV	Vector **[Commanded Torque]** Final torque reference value after limits and filtering are applied. Percent of motor rated torque.	Default: Read Only Min/Max: –/+800.0% Units: 0.1%	053
		025	Vector **[Speed Feedback]** This parameter displays the value of actual motor speed, whether measured by encoder feedback, or estimated.	Default: Read Only Min/Max: –/+400.0 Hz –/+24000.0 RPM Units: 0.1 Hz 0.1 RPM	

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
MONITOR	Drive Data	026 ▽32	**[Rated kW]** Drive power rating.	Default: Read Only Min/Max: 0.00/3000.00 kW Units: 0.01 kW	
		027	**[Rated Volts]** The drive input voltage class (208, 240, 400 etc.).	Default: Read Only Min/Max: 0.0/6553.5 VAC 0.0/65535.0 VAC Vector Units: 0.1 VAC	
		028	**[Rated Amps]** The drive rated output current.	Default: Read Only Min/Max: 0.0/6553.5 Amps 0.0/65535.0 Amps Vector Units: 0.1 Amps	
		029	**[Control SW Ver]** Main Control Board software version.	Default: Read Only Min/Max: 0.000/256.256 0.000/65535.000 Vector Units: 0.001	196

Motor Control File

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
MOTOR CONTROL	Motor Data	040 ⭘	**[Motor Type]** Set to match the type of motor connected. (1) **Important:** Selecting option 1 or 2 also requires selection of "Custom V/Hz," option 2 in parameter 53.	Default: 0 "Induction" Options: 0 "Induction" 1 "Synchr Reluc" (1) 2 "Synchr PM" (1)	053
		041 ⭘	**[Motor NP Volts]** Set to the motor nameplate rated volts.	Default: Based on Drive Rating Min/Max: 0.0/[Rated Volts] Units: 0.1 VAC	
		042 ⭘	**[Motor NP FLA]** Set to the motor nameplate rated full load amps.	Default: Based on Drive Rating Min/Max: 0.0/[Rated Amps] × 2 Units: 0.1 Amps	047 048
		043 ⭘	**[Motor NP Hertz]** Set to the motor nameplate rated frequency.	Default: Based on Drive Cat. No. Min/Max: 5.0/400.0 Hz Units: 0.1 Hz	
		044 ⭘	**[Motor NP RPM]** Set to the motor nameplate rated RPM.	Default: 1750 RPM 1750.0 RPM Vector Min/Max: 60/2400 RPM 60.0/24000.0 RPM Vector Units: 1 RPM 1.0 RPM Vector	

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL	Motor Data	045 ○ ▽32	**[Motor NP Power]** Set to the motor nameplate rated power.	Default: Based on Drive Rating Min/Max: 0.00/100.00 Units: 0.00/1000.00 **Vector** 0.01 kW/HP See [Mtr NP Pwr Units]	046
		046 ○	**Standard** **[Mtr NP Pwr Units]** Selects the motor power units to be used.	Default: Drive Rating Based 0 “Horsepower” Options: 1 “kiloWatts”	
			Vector **[Mtr NP Pwr Units]** Selects the motor power units to be used. “Convert HP” = converts all power units to Horsepower. “Convert kW” = converts all power units to kilowatts.	Default: Drive Rating Based 0 “Horsepower” Options: 1 “kiloWatts” 2 “Convert HP” 3 “Convert kW”	
		047 ○	**[Motor OL Hertz]** Selects the output frequency below which the motor operating current is derated. The motor thermal overload will generate a fault at lower levels of current.	Default: Motor NP Hz/3 Min/Max: 0.0/Motor NP Hz Units: 0.1 Hz	042 220 ℹ
		048 ○	**[Motor OL Factor]** Sets the operating level for the motor overload. Motor FLA x OL Factor = Operating Level	Default: 1.00 Min/Max: 0.20/2.00 Units: 0.01	042 220 ℹ
		049 ○	**Vector** **[Motor Poles]** Defines the number of poles in the motor.	Default: 4 Min/Max: 2/40 Units: 1 Pole	
	Torq Attributes	053 ○	**Standard** **[Torque Perf Mode]** Sets the method of motor torque production.	Default: 0 “Sensrls Vect” Options: 0 “Sensrls Vect” 1 “SV Economize” 2 “Custom V/Hz” 3 “Fan/Pmp V/Hz”	ℹ
			Vector **[Motor Cntl Sel]** Sets the method of motor control used in the drive. **Important:** “FVC Vector” mode requires autotuning of the motor, both coupled and uncoupled to the load.	Default: 0 “Sensrls Vect” Options: 0 “Sensrls Vect” 1 “SV Economize” 2 “Custom V/Hz” 3 “Fan/Pmp V/Hz” 4 “FVC Vector”	
		054	**[Maximum Voltage]** Sets the highest voltage the drive will output.	Default: Drive Rated Volts Min/Max: Rated Volts x 0.25/Rated Volts Units: 0.1 VAC	

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL	Torq Attributes	055 ○	**[Maximum Freq]** Sets the highest frequency the drive will output. Refer to [Overspeed Limit], 083.	Default: 110.0 or 130.0 Hz Min/Max: 5.0/420.0 Hz Units: 0.1 Hz	083
		056	**[Compensation]** Enables/disables correction options.		

Bit #	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
									PWM FreqLock (5)		Mtr Lead Rev (4)	Rs Adapt	Xsistor Diag (3)	Ixo AutoCalc (2)	Enable Jerk (1)	Reflect Wave
Factory Default Bit Values	x	x	x	x	x	x	x	x	1	x	0	1	1	0	1	1

1 = Enabled
0 = Disabled
x = Reserved

(1) *For current limit (except FVC Vector mode).*
(2) *Standard Control Option Only.*
(3) *Vector Control Option Only.*
(4) *Vector firmware 2.003 & later.*
(5) *Vector firmware 3.001 & later.*

Option Descriptions

Reflect Wave	Disables reflected wave overvoltage protection for long cable lengths. (typically enabled).
Enable Jerk	In non-FVC Vector modes, disabling jerk removes a short S-curve at the start of the accel/decel ramp.
Ixo AutoCalc	Not functional – reserved for future enhancements.
Xsistor Diag	Disables power transistor power diagnostic tests which run at each start command.
Rs Adapt	FVC w/Encoder Only - Disabling may improve torque regulation at lower speeds (typically not needed).
Mtr Lead Rev	Reverses the phase rotation of the applied voltage, effectively reversing the motor leads.
PWM Freq Lock	Keeps the PWM frequency from decreasing to 2 kHz at low operating frequencies in FVC Vector mode without encoder.

File	Group	No.	Parameter Name & Description	Values	Related
MOTOR CONTROL	Torq Attributes	057	**[Flux Up Mode]** Auto = Flux is established for a calculated time period based on motor nameplate data. [Flux Up Time] is not used. Manual = Flux is established for [Flux Up Time] before acceleration.	Default: 0 “Manual” Options: 0 “Manual” 1 “Automatic”	053 058
		058	**[Flux Up Time]** Sets the amount of time the drive will use to try and achieve full motor stator flux. When a Start command is issued, DC current at current limit level is used to build stator flux before accelerating.	Default: 0.00 Secs 0.0 Secs Vector Min/Max: 0.00/5.00 Secs 0.0/5.0 Secs Vector 0.000/5.000 Secs v3 Units: 0.01 Secs 0.1 Secs Vector 0.001 Secs v3	053 058
		059	**[SV Boost Filter]** Sets the amount of filtering used to boost voltage during Sensorless Vector and FVC Vector (encoderless) operation.	Default: 500 Min/Max: 0/32767 Units: 1	

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL	Torq Attributes	061 ○	**[Autotune]** Provides a manual or automatic method for setting [IR Voltage Drop], [Flux Current Ref] and [Ixo Voltage Drop]. Valid only when parameter 53 is set to "Sensrls Vect," "SV Economize" or "FVC Vector."	Default: 3 "Calculate" Options: 0 "Ready" 1 "Static Tune" 2 "Rotate Tune" 3 "Calculate"	053 062
			"Ready" (0) = Parameter returns to this setting following a "Static Tune" or "Rotate Tune." It also permits manually setting [IR Voltage Drop], [Ixo Voltage Drop] and [Flux Current Ref]. "Static Tune" (1) = A temporary command that initiates a non-rotational motor stator resistance test for the best possible automatic setting of [IR Voltage Drop] in all valid modes and a non-rotational motor leakage inductance test for the best possible automatic setting of [Ixo Voltage Drop] in "FVC Vector" mode. A start command is required following initiation of this setting. The parameter returns to "Ready" (0) following the test, at which time another start transition is required to operate the drive in normal mode. Used when motor cannot be rotated. "Rotate Tune" (2) = A temporary command that initiates a "Static Tune" followed by a rotational test for the best possible automatic setting of [Flux Current Ref]. In "FVC Vector" mode, with encoder feedback, a test for the best possible automatic setting of [Slip RPM @ FLA] is also run. A start command is required following initiation of this setting. The parameter returns to "Ready" (0) following the test, at which time another start transition is required to operate the drive in normal mode. **Important:** Used when motor is uncoupled from the load. Results may not be valid if a load is coupled to the motor during this procedure. ⚠ **ATTENTION:** Rotation of the motor in an undesired direction can occur during this procedure. To guard against possible injury and/or equipment damage, it is recommended that the motor be disconnected from the load before proceeding. "Calculate" (3) = This setting uses motor nameplate data to automatically set [IR Voltage Drop], [Ixo Voltage Drop], [Flux Current Ref] and [Slip RPM @ FLA].		
		062	**[IR Voltage Drop]** Value of voltage drop across the resistance of the motor stator at rated motor current. Used only when parameter 53 is set to "Sensrls Vect," "SV Economize" or "FVC Vector."	Default: Based on Drive Rating Min/Max: 0.0/[Motor NP Volts]×0.25 Units: 0.1 VAC	053 061
		063 ▽32	**[Flux Current Ref]** Value of amps for full motor flux. Used only when parameter 53 is set to "Sensrls Vect," "SV Economize or "FVC Vector."	Default: Based on Drive Rating Min/Max: 0.00/[Motor NP FLA] Units: 0.01 Amps	053 061
		064 ○	**[Ixo Voltage Drop]** Value of voltage drop across the leakage inductance of the motor at rated motor current. Used only when parameter 53 is set to "Sensrls Vect," "SV Economize or "FVC Vector."	Default: Based on Drive Rating Min/Max: 0.0/230.0, 480.0, 575 VAC Units: 0.1 VAC	

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL	Torq Attributes	066 ○ FV	Vector **[Autotune Torque]** Specifies motor torque applied to the motor during the flux current and inertia tests performed during an autotune.	Default: 50.0% Min/Max: 0.0/150.0% Units: 0.1%	053
		067 ○ FV	Vector **[Inertia Autotune]** Provides an automatic method of setting [Total Inertia]. This test is automatically run during Start-Up motor tests. **Important:** Use when motor is coupled to the load. Results may not be valid if the load is not coupled to the motor during this procedure. “Ready” = Parameter returns to this setting following a completed inertia tune. “Inertia Tune” = A temporary command that initiates an inertia test of the motor/ load combination. The motor will ramp up and down, while the drive measures the amount of inertia.	Default: 0 “Ready” Options: 0 “Ready” 1 “Inertia Tune”	053 450
		427 431 ○ FV	Vector **[Torque Ref A Sel]** Vector **[Torque Ref B Sel]** Selects the source of the external torque reference to the drive. How this reference is used is dependent upon [Speed/ Torque Mod]. (1) See *Appendix B* for DPI port locations. (2) Vector firmware 3.001 and later.	Default: 1 “Torque Setpt” 24 “Disabled” Options: 0 “Torque Setpt” “Torque Stpt1”(2) 1 “Analog In 1” 2 “Analog In 2” 3-17 “Reserved” 18-22 “DPI Port 1-5”(1) 23 “Reserved” 24 “Disabled” 25-28 “Scale Block1-4”(2) 29 “Torque Stpt2”(2)	053
		428 432 FV	Vector **[Torque Ref A Hi]** Vector **[Torque Ref B Hi]** Scales the upper value of the [Torque Ref A Sel] selection when the source is an analog input.	Default: 100.0% 100.0% Min/Max: –/+800.0% Units: 0.1%	053
		429 433 FV	Vector **[Torque Ref A Lo]** Vector **[Torque Ref B Lo]** Scales the lower value of the [Torque Ref A Sel] selection when the source is an analog input.	Default: 0.0% 0.0% Min/Max: –/+800.0% Units: 0.1%	053
		430 FV	Vector **[Torq Ref A Div]** Defines the value of the divisor for the [Torque Ref A Sel] selection.	Default: 1.0 Min/Max: 0.1/3276.7 Units: 0.1	053
		434 FV	Vector **[Torque Ref B Mult]** Defines the value of the multiplier for the [Torque Ref B Sel] selection.	Default: 1.0 Min/Max: –/+32767.0 Units: 0.1	053

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
MOTOR CONTROL	Torq Attributes	435 FV	**Vector** **[Torque Setpoint]** **Vector v3** **[Torque Setpoint1]** Provides an internal fixed value for Torque Setpoint when [Torque Ref Sel] is set to "Torque Setpt."	Default: 0.0% Min/Max: –/+800.0% Units: 0.1%	053
		436 ○ FV	**Vector** **[Pos Torque Limit]** Defines the torque limit for the positive torque reference value. The reference will not be allowed to exceed this value.	Default: 200.0% Min/Max: 0.0/800.0% Units: 0.1%	053
		437 ○ FV	**Vector** **[Neg Torque Limit]** Defines the torque limit for the negative torque reference value. The reference will not be allowed to exceed this value.	Default: –200.0% Min/Max: –800.0/0.0% Units: 0.1%	053
		438 FV	**Vector v3** **[Torque Setpoint2]** Provides an internal fixed value for Torque Setpoint when [Torque Ref Sel] is set to "Torque Setpt 2."	Default: 0.0% Min/Max: –/+800.0% Units: 0.1%	
		440 FV	**Vector** **[Control Status]** Displays a summary status of any condition that may be limiting either the current or the torque reference.	Read Only	053

	VltLimLeakag	Observe Sts	FldWeakSts	TorqRef	VelTrqRef	MinTrqCurLim	Max Slip Lim	Min Slip Lim	PosPwrTrqLim	NegPwrTrqLim	PosTrqLimit	NegTrqLimit	PosFlxCurLim	NegFlxCurLim	PosTrqCurLim	NegTrqCurLim
	0	0	0	0	0	0	0	0	0	0	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

												RevPhaseMot	Economize	FluxBrake	DrvVoltLim	VltLimStator
	x	x	x	x	x	x	x	x	x	x	x	0	0	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

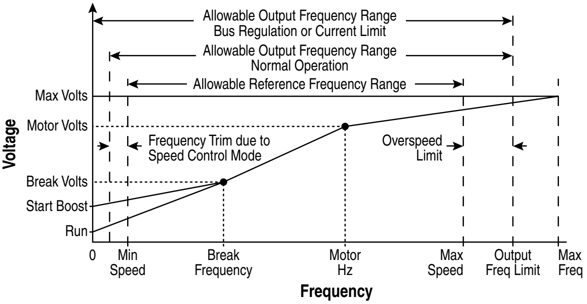
File	Group	No.	Parameter Name & Description	Values	Related
MOTOR CONTROL	Torq Attributes	441 FV	**Vector** **[Mtr Tor Cur Ref]** Displays the torque current reference value that is present at the output of the current rate limiter (parameter 154).	Default: Read Only Min/Max: –/+32767.0 Amps Units: 0.01 Amps	053
	Volts per Hertz	069	**[Start/Acc Boost]** Sets the voltage boost level for starting and acceleration when "Custom V/Hz" mode is selected. Refer to parameter 083 [Overspeed Limit].	Default: Based on Drive Rating Min/Max: 0.0/[Motor NP Volts] x 0.25 Units: 0.1 VAC	053 070
		070	**[Run Boost]** Sets the boost level for steady state or deceleration when "Fan/Pmp V/Hz" or "Custom V/Hz" modes are selected. See parameter 083 [Overspeed Limit].	Default: Based on Drive Rating Min/Max: 0.0/[Motor NP Volts] x 0.25 Units: 0.1 VAC	053 069

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
MOTOR CONTROL	Volts per Hertz	071	**[Break Voltage]** Sets the voltage the drive will output at [Break Frequency]. Refer to parameter 083 [Overspeed Limit].	Default: [Motor NP Volts] × 0.25 Min/Max: 0.0/[Motor NP Volts] Units: 0.1 VAC	053 072
		072	**[Break Frequency]** Sets the frequency the drive will output at [Break Voltage]. Refer to parameter 083.	Default: [Motor NP Hz] × 0.25 Min/Max: 0.0/[Maximum Freq] Units: 0.1 Hz	053 071
	Speed Feedback	412	**Vector** **[Motor Fdbk Type]** Selects the encoder type; single channel or quadrature. Options 1 & 3 detect a loss of encoder signal (when using differential inputs) regardless of the [Feedback Select], param. 080 setting. For FVC Vector mode, use a quadrature encoder only (option 0/1). If a single channel encoder is used (option 2/3) in sensorless vector or V/Hz mode, select “Reverse Dis” (option 2) in param. 190.	Default: 0 “Quadrature” Options: 0 “Quadrature” 1 “Quad Check” 2 “Single Chan” 3 “Single Check”	
		413 ○	**Vector** **[Encoder PPR]** Contains the encoder pulses per revolution. For improved operation in FVC Vector mode, PPR should be ≥ (64 x motor poles).	Default: 1024 PPR Min/Max: 2/20000 PPR Units: 1 PPR	
		414	**Vector** **[Enc Position Fdbk]** Displays raw encoder pulse count. For single channel encoders, this count will increase (per rev.) by the amount in [Encoder PPR]. For quadrature encoders this count will increase by 4 times the amount defined in [Encoder PPR].	Default: Read Only Min/Max: –/+2147483647 Units: 1	
		415	**Vector** **[Encoder Speed]** Provides a monitoring point that reflects speed as seen from the feedback device.	Default: Read Only Min/Max: –/+420.0 Hz –/+25200.0 RPM Units: 0.1 Hz 0.1 RPM	079
		416	**Vector** **[Fdbk Filter Sel]** Selects the type of feedback filter desired. “Light” uses a 35/49 radian feedback filter. “Heavy” uses a 20/40 radian feedback filter.	Default: 0 “None” Options: 0 “None” 1 “Light” 2 “Heavy”	
		419 FV	**Vector** **[Notch Filter Freq]** Sets the center frequency for an optional 2-pole notch filter. Filter is applied to the torque command. “0” disables this filter.	Default: 0.0 Hz Min/Max: 0.0/500.0 Hz Units: 0.1 Hz	053

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
MOTOR CONTROL	Speed Feedback	420 FV	**Vector** **[Notch Filter K]** Sets the gain for the 2-pole notch filter.	Default: 0.3 Hz Min/Max: 0.1/0.9 Hz Units: 0.1 Hz	053
		421 ◯	**Vector** **[Marker Pulse]** Latches the raw encoder count at each marker pulse.	Default: Read Only Min/Max: –/+2147483647 Units: 1	
		422 ◯	**Vector** **[Pulse In Scale]** Sets the scale factor/gain for the Pulse Input when P423 is set to "Pulse Input." Calculate for the desired speed command as follows: for Hz, [Pulse In Scale] = $\frac{\text{Input Pulse Rate (Hz)}}{\text{Desired Cmd. (Hz)}}$ for RPM, [Pulse In Scale] = $\frac{\text{Input Pulse Rate (Hz)}}{\text{Desired Cmd. (RPM)}} \times \frac{120}{\text{[Motor Poles]}}$	Default: 64 Min/Max: 2/20000 Units: 1	
		423 ◯	**Vector** **[Encoder Z Chan]** Defines if the input wired to terminals 5 & 6 of the Encoder Terminal Block will be used as a Pulse or Marker input. Options 1 & 3 detect a loss of signal (when using differential inputs) regardless of the [Feedback Select], param. 080 setting.	Default: 0 "Pulse Input" Options: 0 "Pulse Input" 1 "Pulse Check" 2 "Marker Input" 3 "Marker Check"	

Speed Command File

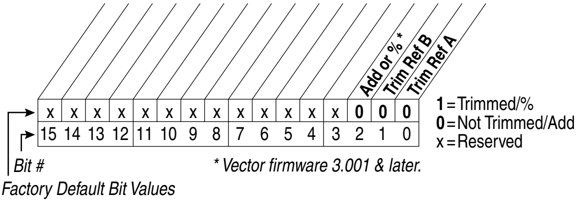
File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
SPEED COMMAND	Spd Mode & Limits	079 ◯	**Vector** **[Speed Units]** Selects the units to be used for all speed related parameters. Options 0 & 1 indicate status only. Options 2 & 3 will convert/configure the drive for that selection. "Convert Hz" (2) - converts all speed based parameters to Hz, and changes the value proportionately (i.e. 1800 RPM = 60 Hz). "Convert RPM" (3) - converts all speed based parameters to RPM, and changes the value proportionately.	Default: 0 "Hz" Options: 0 "Hz" 1 "RPM" 2 "Convert Hz" 3 "Convert RPM"	

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND	Spd Mode & Limits	080 ○	**Standard** **[Speed Mode]** Sets the method of speed regulation.	Default: 0 "Open Loop" Options: 0 "Open Loop" 1 "Slip Comp" 2 "Process PI"	412 152
			Vector **[Feedback Select]** Selects the source for motor speed feedback. Note that all selections are available when using Process PI. "Open Loop" (0) - no encoder is present, and slip compensation is not needed. "Slip Comp" (1) - tight speed control is needed, and encoder is not present. "Encoder" (3) - an encoder is present. "Simulator" (5) - Simulates a motor for testing drive operation & interface check.	Default: 0 "Open Loop" Options: 0 "Open Loop" 1 "Slip Comp" 2 "Reserved" 3 "Encoder" 4 "Reserved" 5 "Simulator"	
		081 ○	**[Minimum Speed]** Sets the low limit for speed reference after scaling is applied. Refer to parameter 083 [Overspeed Limit].	Default: 0.0 Min/Max: 0.0/[Maximum Speed] Units: 0.1 Hz 0.1 RPM Vector	079 083 092 095
		082 ○	**[Maximum Speed]** Sets the high limit for speed reference after scaling is applied. Refer to parameter 083 [Overspeed Limit].	Default: 50.0 or 60.0 Hz (volt class) [Motor NP RPM] Min/Max: 5.0/400.0 Hz 75.0/24000.0 RPM Vector Units: 0.1 Hz 0.1 RPM Vector	055 079 083 091 094 202
		083 ○	**[Overspeed Limit]** Sets the incremental amount of the output frequency (above [Maximum Speed]) allowable for functions such as slip compensation. [Maximum Speed] + [Overspeed Limit] must be ≤ [Maximum Freq]  Allowable Output Frequency Range Bus Regulation or Current Limit Allowable Output Frequency Range Normal Operation Allowable Reference Frequency Range Max Volts Motor Volts Voltage Frequency Trim due to Speed Control Mode Overspeed Limit Break Volts Start Boost Run 0 Min Speed Break Frequency Motor Hz Max Speed Output Freq Limit Max Freq Frequency	Default: 10.0 Hz 300.0 RPM Vector Min/Max: 0.0/20.0 Hz 0.0/600.0 RPM Vector Units: 0.1 Hz 0.1 RPM Vector	055 079 082 ℹ

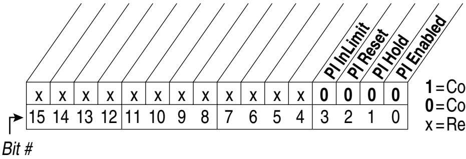
File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
SPEED COMMAND	Spd Mode & Limits	084 085 086	**[Skip Frequency 1]** **[Skip Frequency 2]** **[Skip Frequency 3]** Sets a frequency at which the drive will not operate. [Skip Frequency 1-3] and [Skip Frequency Band] must not equal 0.	Default: 0.0 Hz Default: 0.0 Hz Default: 0.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	087 ℹ
		087	**[Skip Freq Band]** Determines the bandwidth around a skip frequency. [Skip Freq Band] is split, applying 1/2 above and 1/2 below the actual skip frequency. The same bandwidth applies to all skip frequencies.	Default: 0.0 Hz Min/Max: 0.0/30.0 Hz Units: 0.1 Hz	084 085 086
		088 FV	**Vector** **[Speed/Torque Mod]** Selects the torque reference source. "Zero Torque" (0) - torque command = 0. "Speed Reg" (1) - drive operates as a speed regulator. "Torque Reg" (2) - an external torque reference is used for the torque command. "Min Torq/Spd" (3) - selects the smallest algebraic value to regulate to when the torque reference and torque generated from the speed regulator are compared. "Max Torq/Spd" (4) - selects the largest algebraic value when the torque reference and the torque generated from the speed regulator are compared. "Sum Torq/Spd" (5) - selects the sum of the torque reference and the torque generated from the speed regulator. "Absolute" (6) - selects the smallest absolute algebraic value to regulate to when the torque reference and torque generated from the speed regulator are compared.	Default: 1 "Speed Reg" Options: 0 "Zero Torque" 1 "Speed Reg" 2 "Torque Reg" 3 "Min Torq/Spd" 4 "Max Torq/Spd" 5 "Sum Torq/Spd" 6 "Absolute Min"	053
		454 FV	**Vector** **[Rev Speed Limit]** Sets a limit on speed in the negative direction, when in FVC Vector mode. Used in bipolar mode only. A value of zero disables this parameter and uses [Maximum Speed] for reverse speed limit.	Default: 0.0 RPM Min/Max: –[Max Speed]/0.0 Hz –[Max Speed]/0.0 RPM Units: 0.0 Hz 0.0 RPM	ℹ

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	**Related**
SPEED COMMAND	**Speed Reference**	090 ○	**[Speed Ref A Sel]** Selects the source of the speed reference to the drive unless [Speed Ref B Sel] or [Preset Speed 1-7] is selected. (1) See Appendix B for DPI port locations. (2) Vector firmware 3.001 and later.	Default: 2 "Analog In 2" Options: 1 "Analog In 1" 2 "Analog In 2" 3-6 "Reserved" 7 "Pulse In" 8 "Encoder" 9 "MOP Level" 10 "Reserved" 11 "Preset Spd1" 12 "Preset Spd2" 13 "Preset Spd3" 14 "Preset Spd4" 15 "Preset Spd5" 16 "Preset Spd6" 17 "Preset Spd7" 18 "DPI Port 1"(1) 19 "DPI Port 2"(1) 20 "DPI Port 3"(1) 21 "DPI Port 4"(1) 22 "DPI Port 5"(1) 23-24 "Reserved" 25 "Scale Block1"(2) 26 "Scale Block2"(2) 27 "Scale Block3"(2) 28 "Scale Block4"(2)	002 091 thru 093 101 thru 107 117 thru 120 192 thru 194 213 272 273 320 361 thru 366
		091	**[Speed Ref A Hi]** Scales the upper value of the [Speed Ref A Sel] selection when the source is an analog input.	Default: [Maximum Speed] Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 0.01 RPM Vector	079 082
		092	**[Speed Ref A Lo]** Scales the lower value of the [Speed Ref A Sel] selection when the source is an analog input.	Default: 0.0 Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 0.01 RPM Vector	079 081
		093 ○	**[Speed Ref B Sel]** See [Speed Ref A Sel].	Default: 11 "Preset Spd1" Options: See [Speed Ref A Sel]	See 090
		094	**[Speed Ref B Hi]** Scales the upper value of the [Speed Ref B Sel] selection when the source is an analog input.	Default: [Maximum Speed] Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 0.01 RPM Vector	079 093
		095	**[Speed Ref B Lo]** Scales the lower value of the [Speed Ref B Sel] selection when the source is an analog input.	Default: 0.0 Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 0.01 RPM Vector	079 090 093

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
SPEED COMMAND	Speed Reference	096 ○	**[TB Man Ref Sel]** Sets the manual speed reference source when a digital input is configured for "Auto/Manual." (1) "Analog In 2" is not a valid selection if it was selected for any of the following: - [Trim In Select] - [PI Feedback Sel] - [PI Reference Sel] - [Current Lmt Sel] - [Sleep-Wake Ref]	Default: 1 "Analog In 1" Options: 1 "Analog In 1" 2 "Analog In 2"(1) 3-8 "Reserved" 9 "MOP Level"	097 098
		097	**[TB Man Ref Hi]** Scales the upper value of the [TB Man Ref Sel] selection when the source is an analog input.	Default: [Maximum Speed] Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 0.01 RPM Vector	079 096
		098	**[TB Man Ref Lo]** Scales the lower value of the [TB Man Ref Sel] selection when the source is an analog input.	Default: 0.0 Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 0.01 RPM Vector	079 096
		099	**Vector [Pulse Input Ref]** Displays the pulse input value as seen at terminals 5 and 6 of the Encoder Terminal Block, if [Encoder Z Chan], parameter 423 is set to "Pulse Input."	Default: Read Only Min/Max: –/+420.0 Hz –/+25200.0 RPM Units: 0.1 Hz 0.1 RPM	
	Discrete Speeds	100	**Standard [Jog Speed]** Sets the output frequency when a jog command is issued.	Default: 10.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz	079
			Vector [Jog Speed 1] Sets the output frequency when Jog Speed 1 is selected.	Default: 10.0 Hz 300.0 RPM Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 1 RPM	
		101 102 103 104 105 106 107	**[Preset Speed 1]** **[Preset Speed 2]** **[Preset Speed 3]** **[Preset Speed 4]** **[Preset Speed 5]** **[Preset Speed 6]** **[Preset Speed 7]** Provides an internal fixed speed command value. In bipolar mode direction is commanded by the sign of the reference.	Default: 5.0 Hz/150 RPM Vector 10.0 Hz/300 RPM Vector 20.0 Hz/600 RPM Vector 30.0 Hz/900 RPM Vector 40.0 Hz/1200 RPM Vector 50.0 Hz/1500 RPM Vector 60.0 Hz/1800 RPM Vector Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 1 RPM Vector	079 090 093
		108	**Vector [Jog Speed 2]** Sets the output frequency when Jog Speed 2 is selected.	Default: 10.0 Hz 300.0 RPM Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 1 RPM	

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	**Related**
SPEED COMMAND	**Speed Trim**	116 ○	**Vector v3** **[Trim % Setpoint]** Adds or subtracts a percentage of the speed reference or maximum speed. Dependent on the setting of [Trim Out Select], parameter 118.	Default: 0.0% Min/Max: –/+200.0% Units: 0.1%	118
		117 ○	**[Trim In Select]** Specifies which analog input signal is being used as a trim input.	Default: 2 "Analog In 2" Options: See [Speed Ref A Sel]	090 093
		118 ○	**[Trim Out Select]** Specifies which speed references are to be trimmed.  Add or % * Trim Ref B Trim Ref A x x x x x x x x x x x x x 0 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Trimmed/% 0 = Not Trimmed/Add x = Reserved Bit # Factory Default Bit Values * Vector firmware 3.001 & later.		117 119 120
		119	**[Trim Hi]** Scales the upper value of the [Trim In Select] selection when the source is an analog input.	Default: 60.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 1 RPM/% **Vector**	079 082 117
		120	**[Trim Lo]** Scales the lower value of the [Trim In Select] selection when the source is an analog input.	Default: 0.0 Hz Min/Max: –/+[Maximum Speed] Units: 0.1 Hz 1 RPM/% **Vector**	079 117
	Slip Comp		**Important:** Parameters in the Slip Comp Group are used to enable and tune the Slip Compensation Regulator. In order to allow the regulator to control drive operation, parameter 080 [Speed Mode] must be set to 1 "Slip Comp".		
		121	**[Slip RPM @ FLA]** Sets the amount of compensation to drive output at motor FLA. If the value of parameter 061 [Autotune] = 3 "Calculate" changes made to this parameter will not be accepted. Value may be changed by [Autotune] when "Encoder" is selected in [Feedback Select], parameter 080.	Default: Based on [Motor NP RPM] Min/Max: 0.0/1200.0 RPM Units: 0.1 RPM	061 080 122 123
		122	**[Slip Comp Gain]** Sets the response time of slip compensation.	Default: 40.0 Min/Max: 1.0/100.0 Units: 0.1	080 121 122
		123	**[Slip RPM Meter]** Displays the present amount of adjustment being applied as slip compensation.	Default: Read Only Min/Max: –/+300.0 RPM Units: 0.1 RPM	080 121 122

<table>
<tr><th>File</th><th>Group</th><th>No.</th><th>Parameter Name & Description
<i>See page 3-2 for symbol descriptions</i></th><th>Values</th><th>Related</th></tr>
<tr><td>SPEED COMMAND</td><td>Process PI</td><td></td><td colspan="2">Important: Parameters in the Process PI Group are used to enable and tune the PI Loop. In order to allow the PI Loop to control drive operation, program the following:
Standard Control Option – Parameter 080 [Speed Mode] must be set to 2 “Process PI” and parameter 125, bit 0 must be set to “1, Enabled.”.
Vector Control Option – Only requires setting parameter 125, bit 0 to “1, Enabled.”</td><td></td></tr>
<tr><td></td><td></td><td>124
○</td><td colspan="2">[PI Configuration]
Sets configuration of the PI regulator.
<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td><i>% of Ref **</i></td><td><i>Torque Trim *</i></td><td><i>Anti-Wind Up</i></td><td><i>Stop Mode</i></td><td><i>Feedbak Sqrt</i></td><td><i>Zero Clamp</i></td><td><i>Ramp Ref</i></td><td><i>Preload Mode</i></td><td><i>Invert Error</i></td><td><i>Excl Mode</i></td></tr>
<tr><td><i>Factory Default Bit Values</i></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td><i>Bit #</i></td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
</table>
1 = Enabled
0 = Disabled
x = Reserved
<i>* Vector Control Option Only</i>
<i>** Vector firmware 3.001 & later</i></td><td>124
thru
138
ℹ</td></tr>
<tr><td></td><td></td><td>125</td><td colspan="2">[PI Control]
Controls the PI regulator.
<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td><i>PI Reset</i></td><td><i>PI Hold</i></td><td><i>PI Enable</i></td></tr>
<tr><td><i>Factory Default Bit Values</i></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td><i>Bit #</i></td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
</table>
1 = Enabled
0 = Disabled
x = Reserved</td><td>080
ℹ</td></tr>
<tr><td></td><td></td><td>126
○</td><td>[PI Reference Sel]
Selects the source of the PI reference.
(1) Vector firmware 3.001 and later.</td><td>Default: 0 “PI Setpoint”
Options: 0 “PI Setpoint”
1 “Analog In 1”
2 “Analog In 2”
3-6 “Reserved”
7 “Pulse In”
8 “Encoder”
9 “MOP Level”
10 “Master Ref”
11-17 “Preset Spd1-7”
18-22 “DPI Port 1-5”
23-24 “Reserved”
25 “Scale Block 1”(1)
26 “Scale Block 2”(1)
27 “Scale Block 3”(1)
28 “Scale Block 4”(1)</td><td>024
124
thru
138
ℹ</td></tr>
<tr><td></td><td></td><td>127</td><td>[PI Setpoint]
Provides an internal fixed value for process setpoint when [PI Reference Sel] is set to “PI Setpoint.”</td><td>Default: 50.00%
Min/Max: –/+100.00% of Maximum Process Value
Units: 0.01%</td><td>124
thru
138</td></tr>
</table>

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
SPEED COMMAND	Process PI	128 ○	**[PI Feedback Sel]** Selects the source of the PI feedback.	Default: 2 "Analog In 2" Options: See [PI Reference Sel].	124 thru 138
		129	**[PI Integral Time]** Time required for the integral component to reach 100% of [PI Error Meter]. Not functional when the PI Hold bit of [PI Control] = "1" (enabled).	Default: 2.00 Secs Min/Max: 0.00/100.00 Secs Units: 0.01 Secs	124 thru 138
		130	**[PI Prop Gain]** Sets the value for the PI proportional component. PI Error x PI Prop Gain = PI Output	Default: 1.0 Min/Max: 0.00/100.00 Units: 0.01	124 thru 138
		131	**[PI Lower Limit]** Sets the lower limit of the PI output.	Default: –[Maximum Freq] –100% Vector Min/Max: –/+400.0 Hz –/+800.0% Vector Units: 0.1 Hz 0.1% Vector	079 124 thru 138
		132	**[PI Upper Limit]** Sets the upper limit of the PI output.	Default: +[Maximum Freq] 100% Vector Min/Max: –/+400.0 Hz –/+800.0% Vector Units: 0.1 Hz 0.1% Vector	079 124 thru 138
		133	**[PI Preload]** Sets the value used to preload the integral component on start or enable.	Default: 0.0 Hz 100.0% Vector Min/Max: [PI Lower Limit]/ [PI Upper Limit] Units: 0.1 Hz 0.1% Vector	079 124 thru 138
		134	**[PI Status]** Status of the Process PI regulator.  PI InLimit PI Reset PI Hold PI Enabled x x x x x x x x x x x x 0 0 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Bit #	Read Only **1** =Condition True **0** =Condition False x =Reserved	124 thru 138
		135	**[PI Ref Meter]** Present value of the PI reference signal.	Default: Read Only Min/Max: –/+100.0% Units: 0.1%	124 thru 138
		136	**[PI Fdback Meter]** Present value of the PI feedback signal.	Default: Read Only Min/Max: –/+100.0% Units: 0.1%	124 thru 138

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
SPEED COMMAND	Process PI	137	**[PI Error Meter]** Present value of the PI error.	Default: Read Only Min/Max: –/+100.0% –/+200.0% v3 Units: 0.1%	124 thru 138
		138	**[PI Output Meter]** Present value of the PI output.	Default: Read Only Min/Max: –/+100.0 Hz –/+100.0% Vector –/+800.0% v3 Units: 0.1 Hz 0.1% Vector	124 thru 138
		139	**Vector** **[PI BW Filter]** *Firmware 2.001 & later* – Provides filter for Process PI error signal. The output of this filter is displayed in [PI Error Meter]. Zero will disable the filter.	Default: 0.0 Radians Min/Max: 0.0/240.0 Radians Units: 0.1 Radians	137
		459 ○	**Vector v3** **[PI Deriv Time]** Refer to formula below: $PI_{Out} = KD\ (Sec) \times \frac{d_{PI\ Error}\ (\%)}{d_t\ (Sec)}$	Default: 0.00 Secs Min/Max: 0.00/100.00 Secs Units: 0.01 Secs	
		460	**Vector** **[PI Reference Hi]** Scales the upper value of [PI Reference Sel] of the source.	Default: 100.0% Min/Max: –/+100.0% Units: 0.1%	
		461	**Vector** **[PI Reference Lo]** Scales the lower value of [PI Reference Sel] of the source.	Default: –100.0% Min/Max: –/+100.0% Units: 0.1%	
		462	**Vector** **[PI Feedback Hi]** Scales the upper value of [PI Feedback] of the source.	Default: 100.0% Min/Max: –/+100.0% Units: 0.1%	
		463	**Vector** **[PI Feedback Lo]** Scales the lower value of [PI Feedback] of the source.	Default: 0.0% Min/Max: –/+100.0% Units: 0.1%	
	Speed Regulator	445 FV	**Vector** **[Ki Speed Loop]** Controls the integral error gain of the speed regulator. The drive automatically adjusts [Ki Speed Loop] when a non-zero value is entered for [Speed Desired BW] or an autotune is performed. Typically, manual adjustment of this parameter is needed only if system inertia cannot be determined through an autotune. [Speed Desired BW] is set to "0" when a manual adjustment is made to this parameter.	Default: 7.0 Min/Max: 0.0/4000.0 Units: 0.1	053

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
SPEED COMMAND	Speed Regulator	446 FV	**Vector** **[Kp Speed Loop]** Controls the proportional error gain of the speed regulator. The drive automatically adjusts [Kp Speed Loop] when a non-zero value is entered for [Speed Desired BW] or an auto-tune is performed. Typically, manual adjustment of this parameter is needed only if system inertia cannot be determined through an autotune. [Speed Desired BW] is set to “0” when a manual adjustment is made to this parameter.	Default: 6.3 Min/Max: 0.0/200.0 Units: 0.1	053
		447 FV	**Vector** **[Kf Speed Loop]** Controls the feed forward gain of the speed regulator. Setting the Kf gain greater than zero reduces speed feedback overshoot in response to a step change in speed reference.	Default: 0.0 Min/Max: 0.0/0.5 Units: 0.1	053
		449 FV	**Vector** **[Speed Desired BW]** Sets the speed loop bandwidth and determines the dynamic behavior of the speed loop. As bandwidth increases, the speed loop becomes more responsive and can track a faster changing speed reference. Adjusting this parameter will cause the drive to calculate and change [Ki Speed Loop] and [Kp Speed Loop] gains.	Default: 0.0 Radians/Sec Min/Max: 0.0/250.0 Radians/Sec Units: 0.1 Radians/Sec	053
		450 FV	**Vector** **[Total Inertia]** Represents the time in seconds, for a motor coupled to a load to accelerate from zero to base speed, at rated motor torque. The drive calculates Total Inertia during the autotune inertia procedure. Adjusting this parameter will cause the drive to calculate and change [Ki Speed Loop] and [Kp Speed Loop] gains.	Default: 1.25 Secs 0.10 Secs v3 Min/Max: 0.1/600.0 Secs 0.01/600.00 v3 Units: 0.1 Secs 0.01 Secs v3	053
		451 FV	**Vector v3** **[Speed Loop Meter]** Value of the speed regulator output.	Default: Read Only Min/Max: –/+800.0%/Hz/RPM Units: 0.1%/Hz/RPM	053 121 079

Dynamic Control File

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL	Ramp Rates	140 141	**[Accel Time 1]** **[Accel Time 2]** Sets the rate of accel for all speed increases. $\frac{\text{Max Speed}}{\text{Accel Time}} = \text{Accel Rate}$	Default: 10.0 Secs 10.0 Secs Min/Max: 0.1/3600.0 Secs 0.0/3600.0 Secs v3 Units: 0.1 Secs	142 143 146 361
		142 143	**[Decel Time 1]** **[Decel Time 2]** Sets the rate of decel for all speed decreases. $\frac{\text{Max Speed}}{\text{Decel Time}} = \text{Decel Rate}$	Default: 10.0 Secs 10.0 Secs Min/Max: 0.1/3600.0 Secs 0.0/3600.0 Secs v3 Units: 0.1 Secs	140 141 146 361
		146	**[S Curve %]** Sets the percentage of accel or decel time that is applied to the ramp as S Curve. Time is added, 1/2 at the beginning and 1/2 at the end of the ramp.	Default: 0% Min/Max: 0/100% Units: 1%	140 thru 143
	Load Limits	147 ○	**[Current Lmt Sel]** Selects the source for the adjustment of current limit (i.e. parameter, analog input, etc.).	Default: 0 "Cur Lim Val" Options: 0 "Cur Lim Val" 1 "Analog In 1" 2 "Analog In 2"	146 149
		148	**[Current Lmt Val]** Defines the current limit value when [Current Lmt Sel] = "Cur Lim Val."	Default: [Rated Amps] × 1.5 (Equation yields approximate default value.) Min/Max: Based on Drive Rating Units: 0.1 Amps	147 149
		149	**[Current Lmt Gain]** Sets the responsiveness of the current limit.	Default: 250 Min/Max: 0/5000 Units: 1	147 148
		150	**[Drive OL Mode]** Selects the drive's response to increasing drive temperature.	Default: 3 "Both–PWM 1st" Options: 0 "Disabled" 1 "Reduce CLim" 2 "Reduce PWM" 3 "Both–PWM 1st"	219
		151	**[PWM Frequency]** Sets the carrier frequency for the PWM output. Drive derating may occur at higher carrier frequencies. For derating information, refer to the *PowerFlex Reference Manual*. **Important:** If parameter 053 [Motor Cntl Sel] is set to "FVC Vector," the drive will run at 2 kHz when operating below 6 Hz.	Default: 4 kHz 2 kHz (Frames 4-6, 600/690VAC) Min/Max: 2/10 kHz Units: 2/4/8/10 kHz	

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	**Related**
DYNAMIC CONTROL	**Load Limits**	152	**Vector** **[Droop RPM @ FLA]** Selects amount of droop that the speed reference is reduced when at full load torque. Zero disables the droop function. **Important:** Selecting “Slip Comp” with parameter 080 in conjunction with parameter 152, may produce undesirable results.	Default: 0.0 RPM Min/Max: 0.0/200.0 RPM Units: 0.1 RPM	
		153 FV	**Vector** **[Regen Power Limit]** Sets the maximum power limit allowed to transfer from the motor to the DC bus. When using an external dynamic brake, set this parameter to its maximum value.	Default: –50.0% Min/Max: –800.0/0.0% Units: 0.1%	053
		154 FV	**Vector** **[Current Rate Limit]** Sets the largest allowable rate of change for the current reference signal. This number is scaled in percent of maximum motor current every 250 microseconds.	Default: 400.0% Min/Max: 1.0/800.0% Units: 0.1%	053
	Stop/Brake Modes	145 ○	**Vector v3** **[DB While Stopped]** Enables/disables dynamic brake operation when drive is stopped. DB may operate if input voltage becomes too high. Disabled = DB will only operate when drive is running. Enable = DB may operate whenever drive is energized.	Default: 0 “Disabled” Options: 0 “Disabled” 1 “Enabled”	161 162
		155 156	**Standard** **[Stop Mode A]** **Standard** **[Stop Mode B]** Active stop mode. [Stop Mode A] is active unless [Stop Mode B] is selected by inputs. (1) When using options 1 or 2, refer to the Attention statements at [DC Brake Level].	Default: 1 “Ramp” Default: 0 “Coast” Options: 0 “Coast” 1 “Ramp”(1) 2 “Ramp to Hold”(1) 3 “DC Brake”	157 158 159 ℹ
			Vector **[Stop/Brk Mode A]** **Vector** **[Stop/Brk Mode B]** See description above.		
		157	**[DC Brake Lvl Sel]** Selects the source for [DC Brake Level].	Default: 0 “DC Brake Lvl” Options: 0 “DC Brake Lvl” 1 “Analog In 1” 2 “Analog In 2”	155 156 158 159

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL	Stop/Brake Modes	158	**[DC Brake Level]** Defines the DC brake current level injected into the motor when "DC Brake" is selected as a stop mode. The DC braking voltage used in this function is created by a PWM algorithm and may not generate the smooth holding force needed for some applications. Refer to the *PowerFlex Reference Manual*. **ATTENTION:** If a hazard of injury due to movement of equipment or material exists, an auxiliary mechanical braking device must be used. **ATTENTION:** This feature should not be used with synchronous or permanent magnet motors. Motors may be demagnetized during braking.	Default: [Rated Amps] Min/Max: 0/[Rated Amps] × 1.5 (Equation yields approximate maximum value.) Units: 0.1 Amps	
		159	**[DC Brake Time]** Sets the amount of time DC brake current is "injected" into the motor.	Default: 0.0 Secs Min/Max: 0.0/90.0 Secs Units: 0.1 Secs	155 thru 158 ℹ
		160	**[Bus Reg Ki]** Sets the responsiveness of the bus regulator.	Default: 450 Min/Max: 0/5000 Units: 1	161 162
		161 162 ○	**[Bus Reg Mode A]** **[Bus Reg Mode B]** Sets the method and sequence of the DC bus regulator voltage. Choices are dynamic brake, frequency adjust or both. Sequence is determined by programming or digital input to the terminal block. Dynamic Brake Setup If a dynamic brake resistor is connected to the drive, both of these parameters must be set to either option 2, 3 or 4. Refer to the Attention statement on page P-4 for important information on bus regulation. **ATTENTION:** The drive does not offer protection for externally mounted brake resistors. A risk of fire exists if external braking resistors are not protected. External resistor packages must be self-protected from over temperature or the protective circuit shown in Figure C.1 on page C-1 (or equivalent) must be supplied.	Default: 1 "Adjust Freq" 4 "Both-Frq 1st" Options: 0 "Disabled" 1 "Adjust Freq" 2 "Dynamic Brak" 3 "Both-DB 1st" 4 "Both-Frq 1st"	160 163 ℹ

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL	Stop/Brake Modes	163	**[DB Resistor Type]** Selects whether the internal or an external DB resistor will be used. **Important:** In 0-3 Frame drives, only one DB resistor can be connected to the drive. Connecting both an internal & external resistor could cause damage. If a dynamic brake resistor is connected to the drive, [Bus Reg Mode A & B] must be set to either option 2, 3 or 4.	Default: 0 "Internal Res" 2 "None" Vector Options: 0 "Internal Res" 1 "External Res" 2 "None"	161 162
			ATTENTION: Equipment damage may result if a drive mounted (internal) resistor is installed and this parameter is set to "External Res" or "None." Thermal protection for the internal resistor will be disabled, resulting in possible device damage. Also see ATTENTION above.		
		164	**[Bus Reg Kp]** Proportional gain for the bus regulator. Used to adjust regulator response.	Default: 1500 Min/Max: 0/10000 Units: 1	
		165	**[Bus Reg Kd]** Derivative gain for the bus regulator. Used to control regulator overshoot.	Default: 1000 Min/Max: 0/10000 Units: 1	
		166	Vector **[Flux Braking]** Set to use an increase in the motor flux current to increase the motor losses, and allow a faster deceleration time when a chopper brake or regenerative capability is not available. Can be used as a stopping or fast deceleration method.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	
	Restart Modes	167	Vector **[Powerup Delay]** Defines the programmed delay time, in seconds, before a start command is accepted after a power up.	Default: 0.0 Secs Min/Max: 0.0/30.0 Secs Units: 0.1 Secs	
		168	**[Start At PowerUp]** Enables/disables a feature to issue a Start or Run command and automatically resume running at commanded speed after drive input power is restored. Requires a digital input configured for Run or Start and a valid start contact.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	ℹ
			ATTENTION: Equipment damage and/or personal injury may result if this parameter is used in an inappropriate application. Do not use this function without considering applicable local, national and international codes, standards, regulations or industry guidelines.		

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
DYNAMIC CONTROL	Restart Modes	169	**[Flying Start En]** Enables/disables the function which reconnects to a spinning motor at actual RPM when a start command is issued. Not required in FVC Vector mode when using an encoder.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	170
		170	**[Flying StartGain]** Sets the response of the flying start function. **Important:** Lower gain may be required for permanent magnet motors.	Default: 4000 Min/Max: 20/32767 Units: 1	169
		174	**[Auto Rstrt Tries]** Sets the maximum number of times the drive attempts to reset a fault and restart.	Default: 0 Min/Max: 0/9 Units: 1	175
			⚠ **ATTENTION:** Equipment damage and/or personal injury may result if this parameter is used in an inappropriate application. Do Not use this function without considering applicable local, national and international codes, standards, regulations or industry guidelines.		
		175	**[Auto Rstrt Delay]** Sets the time between restart attempts when [Auto Rstrt Tries] is set to a value other than zero.	Default: 1.0 Secs Min/Max: 0.5/30.0 Secs Units: 0.1 Secs	174

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
DYNAMIC CONTROL	Restart Modes	178	**[Sleep-Wake Mode]** Enables/disables the Sleep/Wake function. **Important:** When enabled, the following conditions must be met: • A proper value must be programmed for [Sleep Level] & [Wake Level]. • A speed reference must be selected in [Speed Ref A Sel]. • At least one of the following must be programmed (and input closed) in [Digital Inx Sel]; "Enable," "Stop=CF," "Run," "Run Forward," "Run Reverse."	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Direct" (Enabled) 2 "Invert" (Enabled) (7)	

ATTENTION: Enabling the Sleep-Wake function can cause unexpected machine operation during the Wake mode. Equipment damage and/or personal injury can result if this parameter is used in an inappropriate application. Do Not use this function without considering the information below and in Appendix C. In addition, all applicable local, national & international codes, standards, regulations or industry guidelines must be considered

Conditions Required to Start Drive (1)(2)(3)

Input	After Power-Up	After a Drive Fault		After a Stop Command
		Reset by Stop-CF, HIM or TB	*Reset by Clear Faults (TB)*	*HIM or TB*
Stop	Stop Closed Wake Signal	Stop Closed Wake Signal New Start or Run Cmd.(4)	Stop Closed Wake Signal	Stop Closed Direct Mode Analog Sig. > Sleep Level (6) Invert Mode Analog Sig. < Sleep Level (6) New Start or Run Cmd.(4)
Enable	Enable Closed Wake Signal (4)	Enable Closed Wake Signal New Start or Run Cmd.(4)	Enable Closed Wake Signal	Enable Closed Direct Mode Analog Sig. > Sleep Level (6) Invert Mode Analog Sig. < Sleep Level (6) New Start or Run Cmd.(4)
Run Run For. Run Rev.	Run Closed Wake Signal	New Run Cmd.(5) Wake Signal	Run Closed Wake Signal	New Run Cmd.(5) Wake Signal

(1) When power is cycled, if all of the above conditions are present after power is restored, restart will occur.

(2) If all of the above conditions are present when [Sleep-Wake Mode] is "enabled," the drive will start.

(3) The active speed reference is determined as explained in Reference Control on page 1-22. The Sleep/Wake function and the speed reference may be assigned to the same input.

(4) Command must be issued from HIM, TB or network.

(5) Run Command must be cycled.

(6) Signal does not need to be greater than wake level.

(7) Vector firmware 3.xxx & later. For Invert function, refer to [Analog In x Loss].

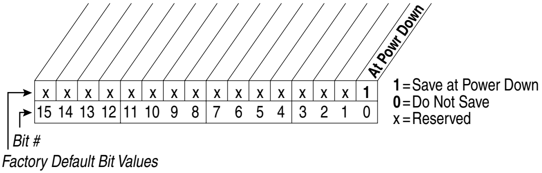
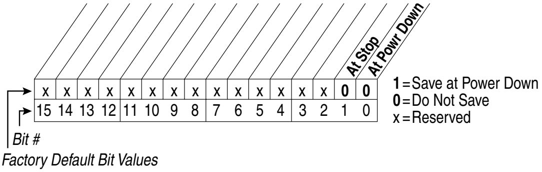
File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
DYNAMIC CONTROL	Restart Modes	179 ○	**[Sleep-Wake Ref]** Selects the source of the input controlling the Sleep-Wake function.	Default: 2 “Analog In 2” Options: 1 “Analog In 1” 2 “Analog In 2”	
		180	**[Wake Level]** Defines the analog input level that will start the drive.	Default: 6.000 mA, 6.000 Volts Min/Max: [Sleep Level]/20.000 mA 10.000 Volts Units: 0.001 mA 0.001 Volts	181
		181	**[Wake Time]** Defines the amount of time at or above [Wake Level] before a Start is issued.	Default: 1.0 Secs 0.0 Secs Vector Min/Max: 0.0/30.0 Secs Units: 0.0/1000.0 Secs Vector 0.1 Secs	180
		182	**[Sleep Level]** Defines the analog input level that will stop the drive.	Default: 5.000 mA, 5.000 Volts Min/Max: 4.000 mA/[Wake Level] 0.000 Volts/[Wake Level] Units: 0.001 mA 0.001 Volts	183
		183	**[Sleep Time]** Defines the amount of time at or below [Sleep Level] before a Stop is issued.	Default: 1.0 Secs 0.0 Secs Vector Min/Max: 0.0/30.0 Secs Units: 0.0/1000.0 Secs Vector 0.1 Secs	182
	Power Loss	177 ○	Vector v3 **[Gnd Warn Level]** Sets the level at which a ground warning fault will occur. Configure with [Alarm Config 1].	Default: 3.0 Amps Min/Max: 1.0/5.0 Amps Units: 0.1 Amps	259
		184	**[Power Loss Mode]** Sets the reaction to a loss of input power. Power loss is recognized when: • DC bus voltage is ≤ 73% of [DC Bus Memory] and [Power Loss Mode] is set to “Coast”. • DC bus voltage is ≤ 82% of [DC Bus Memory] and [Power Loss Mode] is set to “Decel”.	Default: 0 “Coast” Options: 0 “Coast” 1 “Decel” 2 “Continue” 3 “Coast Input” 4 “Decel Input”	013 185
		185	**[Power Loss Time]** Sets the time that the drive will remain in power loss mode before a fault is issued.	Default: 0.5 Secs Min/Max: 0.0/60.0 Secs Units: 0.1 Secs	184

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
DYNAMIC CONTROL	Power Loss	186	**[Power Loss Level]** Sets the level at which the [Power Loss Mode] selection will occur. The drive can use the percentages referenced in [Power Loss Mode] or a trigger point can be set for line loss detection as follows: $V_{trigger}$ = [DC Bus Memory] – [Power Loss Level] A digital input (programmed to "29, Pwr Loss Lvl") is used to toggle between fixed percentages and the detection level. ⚠ **ATTENTION:** Drive damage can occur if proper input impedance is not provided as explained below. If the value for [Power Loss Level] is greater than 18% of [DC Bus Memory], the user must provide a minimum line impedance to limit inrush current when the power line recovers. The input impedance should be equal to or greater than the equivalent of a 5% transformer with a VA rating 5 times the drives input VA rating.	Default: Drive Rated Volts Min/Max: 0.0/999.9 VDC Units: 0.1 VDC	ℹ
		187	**Vector v3** **[Load Loss Level]** Sets the percentage of motor nameplate torque at which a load loss alarm will occur.	Default: 200.0% Min/Max: 0.0/800.0% Units: 0.1%	211 259
		188	**Vector v3** **[Load Loss Time]** Sets the time that current is below the level set in [Load Loss Level] before a fault occurs.	Default: 0.0 Secs Min/Max: 0.0/30.0 Secs Units: 0.1 Secs	187
		189	**Vector v3** **[Shear Pin Time]** Sets the time that the drive is at or above current limit before a fault occurs. Zero disables this feature.	Default: 0.0 Secs Min/Max: 0.0/30.0 Secs Units: 0.1 Secs	238

Utility File

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY	Direction Config	190 ⬭	**[Direction Mode]** Selects method for changing direction.	Default: 0 "Unipolar" Options: 0 "Unipolar" 1 "Bipolar" 2 "Reverse Dis"	320 thru 327 361 thru 366

Mode	Direction Change
Unipolar	Drive Logic
Bipolar	Sign of Reference
Reverse Dis	Not Changeable

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY	HIM Ref Config	192	**[Save HIM Ref]** Enables a feature to save the present frequency reference value issued by the HIM to Drive memory on power loss. Value is restored to the HIM on power up.  At Powr Down x x x x x x x x x x x x x x x 1 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Bit # Factory Default Bit Values 1 = Save at Power Down 0 = Do Not Save x = Reserved		
		193	**[Man Ref Preload]** Enables/disables a feature to automatically load the present "Auto" frequency reference value into the HIM when "Manual" is selected. Allows smooth speed transition from "Auto" to "Manual."	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	
	MOP Config	194	**[Save MOP Ref]** Enables/disables the feature that saves the present MOP frequency reference at power down or at stop.  At Stop At Powr Down x x x x x x x x x x x x x x 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Bit # Factory Default Bit Values 1 = Save at Power Down 0 = Do Not Save x = Reserved		
		195	**[MOP Rate]** Sets rate of change of the MOP reference in response to a digital input.	Default: 1.0 Hz/s 30.0 RPM/s **Vector** Min/Max: 0.2/[Maximum Freq] 6.0/[Maximum Freq] **Vector** Units: 0.1 Hz/s 0.1 RPM/s **Vector**	
	Drive Memory	196	**[Param Access Lvl]** Selects the parameter display level. Basic = Reduced param. set Advanced = Full param. set Fan/Pump = Reduced fan/pump set Adv Fan/Pump = Full fan/pump set (1) Standard Control drives v3.001 & up.	Default: 0 "Basic" Options: 0 "Basic" 1 "Advanced" 2 "Reserved" 3 "Fan/Pump" (1) 4 "Adv Fan/Pump" (1)	

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY	Drive Memory	197 ○	**[Reset To Defalts]** Resets parameters to factory defaults except [Language], [Param Access Lvl], [Voltage Class] & [TorqProve Cnfg] (params 196, 201, 202 & 600). • Option 1 resets parameters to factory defaults based on [Voltage Class]. • Options 2 & 3 will reset parameters to factory defaults and set [Voltage Class] to low or high voltage settings. **Important:** Frames 5 & 6 - the internal fan voltage may have to be changed when using Option 2 or 3. See “Selecting /Verifying Fan Voltage” on page 1-8.	Default: 0 “Ready” Options: 0 “Ready” 1 “Factory” 2 “Low Voltage” 3 “High Voltage”	041 thru 047 054 055 062 063 069 thru 072 082 148 158
		198 ○	**[Load Frm Usr Set]** Loads a previously saved set of parameter values from a selected user set location in drive nonvolatile memory to active drive memory.	Default: 0 “Ready” Options: 0 “Ready” 1 “User Set 1” 2 “User Set 2” 3 “User Set 3”	199
		199	**[Save To User Set]** Saves the parameter values in active drive memory to a user set in drive nonvolatile memory.	Default: 0 “Ready” Options: 0 “Ready” 1 “User Set 1” 2 “User Set 2” 3 “User Set 3”	198
		200	**[Reset Meters]** Resets selected meters to zero.	Default: 0 “Ready” Options: 0 “Ready” 1 “MWh” 2 “Elapsed Time”	
		201	**[Language]** Selects the display language when using an LCD HIM. This parameter is not functional with an LED HIM. Options 6, 8 and 9 are “Reserved.”	Default: 0 “Not Selected” Options: 0 “Not Selected” 1 “English” 2 “Francais” 3 “Español” 4 “Italiano” 5 “Deutsch” 7 “Português” 10 “Nederlands”	
		202 ○	**[Voltage Class]** Configures the drive current rating and associates it with the selected voltage (i.e. 400 or 480V). Normally used when downloading parameter sets. Options 2 & 3 indicate status only. Selecting Option 4 or 5 will covert/configure the drive. Min/Max & Default values will be changed for parameters; 41-47, 54, 55, 62, 63, 69, 70-72, 82, 148, 158. **Important:** Frames 5 & 6 - the internal fan voltage may have to be changed when using Option 4 or 5. See page 1-8.	Default: Based on Drive Cat. No. Options: 2 “Low Voltage” 3 “High Voltage” 4 “Reserved”(1) “Convert Lo V” Vector 5 “Reserved”(1) “Convert Hi V” Vector (1) Vector firmware v3.001 & up.	041 thru 047 054 055 062 063 069 thru 072 082 148 158

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY	Drive Memory	203	**[Drive Checksum]** Provides a checksum value that indicates whether or not a change in drive programming has occurred.	Default: Read Only Min/Max: 0/65535 Units: 1	
	Diagnostics	209	**[Drive Status 1]** Present operating condition of the drive.	Read Only	210

Bit #	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	Spd Ref ID 3 (2)	Spd Ref ID 2 (2)	Spd Ref ID 1 (2)	Spd Ref ID 0 (2)	Local ID 2 (1)	Local ID 1 (1)	Local ID 0 (1)	At Speed	Faulted	Alarm	Decelerating	Accelerating	Actual Dir	Command Dir	Active	Ready
	0	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**

1 = Condition True
0 = Condition False
x = Reserved

Bit #

Bits (2) 15	14	13	12	Description
0	0	0	0	Ref A Auto
0	0	0	1	Ref B Auto
0	0	1	0	Preset 2 Auto
0	0	1	1	Preset 3 Auto
0	1	0	0	Preset 4 Auto
0	1	0	1	Preset 5 Auto
0	1	1	0	Preset 6 Auto
0	1	1	1	Preset 7 Auto
1	0	0	0	TB Manual
1	0	0	1	Port 1 Manual
1	0	1	0	Port 2 Manual
1	0	1	1	Port 3 Manual
1	1	0	0	Port 4 Manual
1	1	0	1	Port 5 Manual
1	1	1	0	Port 6 Manual
1	1	1	1	Jog Ref

Bits (1) 11	10	9	Description
0	0	0	Port 0 (TB)
0	0	1	Port 1
0	1	0	Port 2
0	1	1	Port 3
1	0	0	Port 4
1	0	1	Port 5
1	1	0	Port 6
1	1	1	No Local Control

File	Group	No.	Parameter Name & Description	Values	Related
UTILITY	Diagnostics	210	**[Drive Status 2]** Present operating condition of the drive.	Read Only	209

Bit #	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
			DPI at 500 k	Motor Overld	Bus Freq Reg	Curr Limit	AutoRst Act	AutoRst Ctdn	DB Active *	AutoTuning	DC Braking	Stopping	Jogging	Running	Active	Ready
	x	x	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

1 = Condition True
0 = Condition False
x = Reserved

Bit #

** Vector firmware 3.001 & later*

File	Group	No.	Parameter Name & Description	Values	Related
UTILITY	Diagnostics	211	**[Drive Alarm 1]** Alarm conditions that currently exist in the drive.	Read Only	212

Bit #	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		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
	x	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	x	**0**	**0**	**0**	**0**	**0**	**0**

1 = Condition True
0 = Condition False
x = Reserved

Bit #

** Vector firmware 3.001 & later*

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY	Diagnostics	212	**[Drive Alarm 2]** Alarm conditions that currently exist in the drive.	Read Only	211
		213	**[Speed Ref Source]** Displays the source of the speed reference to the drive. (1) Vector firmware 3.001 and later.	Default: Read Only Options: see below	090 093 096 101
		214	**[Start Inhibits]** Displays the inputs currently preventing the drive from starting.	Read Only	

Brk Slipped *	PTC Conflict *	TB Ref Cflct	Sleep Config	Ixo Vlt Rang	SpdRef Cflct	FlxAmps Rang	IR Vlts Rang	VHz NegSlope	MaxFrq Cflct	NP Hz Cflct	MtrTyp Cflct	Bipolr Cflct	DigIn CflctC	DigIn CflctB	DigIn CflctA
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Bit #

1 = Condition True
0 = Condition False
x = Reserved

															TrqPrv Cflct *
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Bit #

1 = Condition True
0 = Condition False
x = Reserved

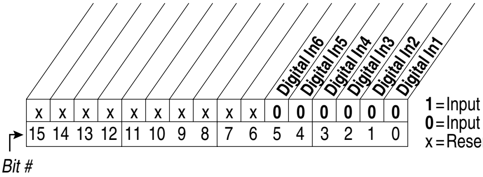
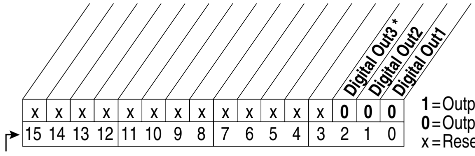
** Vector firmware 3.001 & later*

Default:		Read Only
Options:	0	"PI Output"
	1	"Analog In 1"
	2	"Analog In 2"
	3-6	"Reserved"
	7	"Pulse In"
	8	"Encoder"
	9	"MOP Level"
	10	"Jog Speed 1"
	11-17	"Preset Spd1-7"
	18	"DPI Port 1"
	19	"DPI Port 2"
	20	"DPI Port 3"
	21	"DPI Port 4"
	22	"DPI Port 5"
	23	"Reserved"
	24	"Auto Tune" Vector
	25	"Jog Speed 2" Vector
	26	"Scale Block 1"(1)
	27	"Scale Block 2"(1)
	28	"Scale Block 3"(1)
	29	"Scale Block 4"(1)

		DPI Port 5	DPI Port 4	DPI Port 3	DPI Port 2	DPI Port 1	Digital In		Startup Actv	Params Reset	Stop Assertd	DC Bus Pchrg	Enable	Type 2 Alarm	Fault
x	x	0	0	0	0	0	1	x	0	0	1	0	0	0	0
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Bit #

1 = Inhibit True
0 = Inhibit False
x = Reserved

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	**Related**
UTILITY	Diagnostics	215	**[Last Stop Source]** Displays the source that initiated the most recent stop sequence. It will be cleared (set to 0) during the next start sequence.	Default: Read Only Options: 0 "Pwr Removed" 1-5 "DPI Port 1-5" 6 "Reserved" 7 "Digital In" 8 "Fault" 9 "Not Enabled" 10 "Sleep" 11 "Jog" 12 "Autotune" Vector 13 "Precharge" Vector	361 362 363 364 365 366
		216	**[Dig In Status]** Status of the digital inputs.  Digital In6 Digital In5 Digital In4 Digital In3 Digital In2 Digital In1 x x x x x x x x x x 0 0 0 0 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Bit #	Read Only **1** = Input Present **0** = Input Not Present x = Reserved	361 thru 366
		217	**[Dig Out Status]** Status of the digital outputs.  Digital Out3 * Digital Out2 Digital Out1 x x x x x x x x x x x x x 0 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Bit # ** Vector Control Option Only*	Read Only **1** = Output Energized **0** = Output De-energized x = Reserved	380 thru 384
		218	**[Drive Temp]** Present operating temperature of the drive power section.	Default: Read Only Min/Max: 0.0/100.0% Units: 0.1%	
		219	**[Drive OL Count]** Accumulated percentage of drive overload. Continuously operating the drive over 100% of its rating will increase this value to 100% and cause a drive fault or foldback depending on the setting of [Drive OL Mode].	Default: Read Only Min/Max: 0.0/100.0% Units: 0.1%	150

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY	Diagnostics	220	**[Motor OL Count]** Accumulated percentage of motor overload. Continuously operating the motor over 100% of the motor overload setting will increase this value to 100% and cause a drive fault.	Default: Read Only Min/Max: 0.0/100.0% Units: 0.1%	047 048
		224	**Standard** **[Fault Frequency]** Captures and displays the output speed of the drive at the time of the last fault.	Default: Read Only Min/Max: 0.0/+[Maximum Freq] Units: 0.1 Hz	225 thru 230
			Vector **[Fault Speed]** See description above.	Default: Read Only Min/Max: 0.0/+[Maximum Freq] 0.0/+[Maximum Speed] Units: 0.1 Hz 0.1 RPM	079 225 thru 230
		225	**[Fault Amps]** Captures and displays motor amps at the time of the last fault.	Default: Read Only Min/Max: 0.0/[Rated Amps] × 2 Units: 0.1 Amps	224 thru 230
		226	**[Fault Bus Volts]** Captures and displays the DC bus voltage of the drive at the time of the last fault.	Default: Read Only Min/Max: 0.0/Max Bus Volts Units: 0.1 VDC	224 thru 230
		227	**[Status 1 @ Fault]** Captures and displays [Drive Status 1] bit pattern at the time of the last fault.	Read Only	209 224 thru 230

	Spd Ref ID 3	Spd Ref ID 2	Spd Ref ID 1	Spd Ref ID 0	Local ID 2	Local ID 1	Local ID 0	At Speed	Faulted	Alarm	Decelerating	Accelerating	Actual Dir	Command Dir	Active	Ready
	0	0	0	0	1	1	1	0	1	0	0	0	1	1	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

		228	**[Status 2 @ Fault]** Captures and displays [Drive Status 2] bit pattern at the time of the last fault.	Read Only	210 224 thru 230

			DPI at 500 k	Motor Overld	Bus Freq Reg	Curr Limit	AutoRst Act	AutoRst Ctdn	DB Active *	AutoTuning	DC Braking	Stopping	Jogging	Running	Active	Ready
	x	x	0	0	0	0	0	0	0	0	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

** Vector firmware 3.001 & later*

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY	Diagnostics	229	**[Alarm 1 @ Fault]** Captures and displays [Drive Alarm 1] at the time of the last fault.	Read Only	211 224 thru 230

	Reserved	Ground Warn *	Load Loss *	In PhaseLoss *	Motor Therm *	Waking	Decel Inhibt	Drv OL Lvl 2	Drv OL Lvl 1	Reserved	IntDBRes OH	Anlg in Loss	Str At PwrUp	Power Loss	UnderVoltage	Prechrg Actv
	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

** Vector firmware 3.001 & later*

File	Group	No.	Parameter Name & Description	Values	Related
UTILITY	Diagnostics	230	**[Alarm 2 @ Fault]** Captures and displays [Drive Alarm 2] at the time of the last fault.	Read Only	212 224 thru 230

	Brk Slipped *	PTC Conflict *	TB Ref Cflct	Sleep Config	Ixo Vlt Rang	SpdRef Cflct	FlxAmps Rang	IR Vlts Rang	VHz NegSlope	MaxFrq Cflct	NP Hz Cflct	MtrTyp Cflct	Bipolr Cflct	DigIn CflctC	DigIn CflctB	DigIn CflctA
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bit #	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

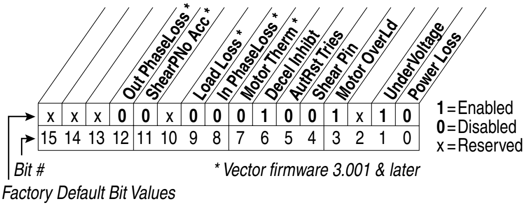
1 = Condition True
0 = Condition False
x = Reserved

																TrqPrv Cflct *
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	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

** Vector firmware 3.001 & later*

File	Group	No.	Parameter Name & Description	Values	Related
UTILITY	Diagnostics	234 236	**[Testpoint 1 Sel]** **[Testpoint 2 Sel]** Selects the function whose value is displayed value in [Testpoint x Data]. These are internal values that are not accessible through parameters. See Testpoint Codes and Functions on page 4-16 for a listing of available codes and functions.	Default: 499 Min/Max: 0/65535 Units: 1	
		235 237 32	**[Testpoint 1 Data]** **[Testpoint 2 Data]** The present value of the function selected in [Testpoint x Sel].	Default: Read Only Min/Max: 0/4294967295 –/+2147483648 Vector Units: 1	

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY	Faults	238	**[Fault Config 1]** Enables/disables annunciation of the listed faults.  Out PhaseLoss * ShearPNo Acc * Load Loss * In PhaseLoss * Motor Therm * Decel Inhibt AutRst Tries Shear Pin Motor OverLd UnderVoltage Power Loss x x x 0 0 x 0 0 0 1 0 0 1 x 1 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Enabled 0 = Disabled x = Reserved Bit # Factory Default Bit Values * Vector firmware 3.001 & later		
		240	**[Fault Clear]** Resets a fault and clears the fault queue.	Default: 0 "Ready" Options: 0 "Ready" 1 "Clear Faults" 2 "Clr Flt Que"	
		241	**[Fault Clear Mode]** Enables/disables a fault reset (clear faults) attempt from any source. This does not apply to fault codes which are cleared indirectly via other actions.	Default: 1 "Enabled" Options: 0 "Disabled" 1 "Enabled"	
		242 32	**[Power Up Marker]** Elapsed hours since initial drive power up. This value will rollover to 0 after the drive has been powered on for more than the max value shown. For relevance to most recent power up see [Fault x Time].	Default: Read Only Min/Max: 0.0000/429496.7295 Hr 0.0/429496.7 Hr **Vector** 0.0000/214748.3647 Hr **v3** Units: 0.0001 Hr 0.1 Hr **Vector**	244 246 248 250 252 254 256 258
		243 245 247 249 251 253 255 257	**[Fault 1 Code]** **[Fault 2 Code]** **[Fault 3 Code]** **[Fault 4 Code]** **[Fault 5 Code]** **[Fault 6 Code]** **[Fault 7 Code]** **[Fault 8 Code]** A code that represents the fault that tripped the drive. The codes will appear in these parameters in the order they occur ([Fault 1 Code] = the most recent fault).	Default: Read Only Min/Max: 0/65535 Units: 0	

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
UTILITY	Faults	244 246 248 250 252 254 256 258	**[Fault 1 Time]** **[Fault 2 Time]** **[Fault 3 Time]** **[Fault 4 Time]** **[Fault 5 Time]** **[Fault 6 Time]** **[Fault 7 Time]** **[Fault 8 Time]**	Default: Read Only Min/Max: 0.0000/429496.7295 Hr 0.0000/214748.3647 Hr v3 Units: 0.0001 Hr	242
		32	The time between **initial** drive power up and the occurrence of the associated trip fault. Can be compared to [Power Up Marker] for the time from the most recent power up. [Fault x Time] – [Power Up Marker] = Time difference to the most recent power up. A negative value indicates fault occurred before most recent power up. A positive value indicates fault occurred after most recent power up.		
	Alarms	259	**[Alarm Config 1]** Enables/disables alarm conditions that will initiate an active drive alarm.		

		Ground Warn *	Load Loss *	In Phase Loss *	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
Factory Default Bit Values	x	0	0	0	0	1	1	1	1	x	1	1	1	1	1	1
Bit #	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

1 = Enabled
0 = Disabled
x = Reserved

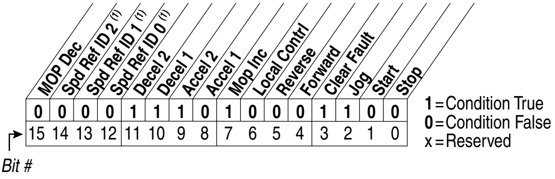
** Vector firmware 3.001 & later*

File	Group	No.	Parameter Name & Description	Values	Related
UTILITY	Alarms	261	**[Alarm Clear]** Resets all [Alarm 1-8 Code] parameters to zero.	Default: 0 "Ready" Options: 0 "Ready" 1 "Clr Alrm Que"	262 263 264 265 266 267 268 269
		262 263 264 265 266 267 268 269	**[Alarm 1 Code]** **[Alarm 2 Code]** **[Alarm 3 Code]** **[Alarm 4 Code]** **[Alarm 5 Code]** **[Alarm 6 Code]** **[Alarm 7 Code]** **[Alarm 8 Code]** A code that represents a drive alarm. The codes will appear in the order they occur (first 4 alarms in – first 4 out alarm queue). A time stamp is not available with alarms.	Default: Read Only Min/Max: 0/65535 Units: 1	261

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
UTILITY	Scaled Blocks	476 482 488 494	Vector **[Scale1 In Value]** Vector **[Scale2 In Value]** Vector v3 **[Scale3 In Value]** Vector v3 **[Scale4 In Value]** Displays the value of the signal being sent to [ScaleX In Value] using a link. (1) Blocks 3 & 4 only.	Default: 0.0 Min/Max: –/+32000.0 –/+32767.0 (v2.xxx) –/+32767.000 v3 (1) Units: 0.1 0.001 v3	
		477 483 489 495	Vector **[Scale1 In Hi]** Vector **[Scale2 In Hi]** Vector v3 **[Scale3 In Hi]** Vector v3 **[Scale4 In Hi]** Scales the upper value of [ScaleX In Value]. (1) Blocks 3 & 4 only.	Default: 0.0 Min/Max: –/+32000.0 –/+32767.0 (v2.xxx) –/+32767.000 v3 (1) Units: 0.1 0.001 v3	
		478 484 490 496	Vector **[Scale1 In Lo]** Vector **[Scale2 In Lo]** Vector v3 **[Scale3 In Lo]** Vector v3 **[Scale4 In Lo]** Scales the lower value of [ScaleX In Value]. (1) Blocks 3 & 4 only.	Default: 0.0 Min/Max: –/+32000.0 –/+32767.0 (v2.xxx) –/+32767.000 v3 (1) Units: 0.1 0.001 v3	
		479 485 491 497	Vector **[Scale1 Out Hi]** Vector **[Scale2 Out Hi]** Vector v3 **[Scale3 Out Hi]** Vector v3 **[Scale4 Out Hi]** Scales the upper value of [ScaleX Out Value]. (1) Blocks 3 & 4 only.	Default: 0.0 Min/Max: –/+32000.0 –/+32767.0 (v2.xxx) –/+32767.000 v3 (1) Units: 0.1 0.001 v3	
		480 486 492 498	Vector **[Scale1 Out Lo]** Vector **[Scale2 Out Lo]** Vector v3 **[Scale3 Out Lo]** Vector v3 **[Scale4 Out Lo]** Scales the lower value of [ScaleX Out Value]. (1) Blocks 3 & 4 only.	Default: 0.0 Min/Max: –/+32000.0 –/+32767.0 (v2.xxx) –/+32767.000 v3 (1) Units: 0.1 0.001 v3	
		481 487 493 499	Vector **[Scale1 Out Value]** Vector **[Scale2 Out Value]** Vector v3 **[Scale3 Out Value]** Vector v3 **[Scale4 Out Value]** Value of the signal being sent out of the Universal Scale block. Typically this value is used as the source of information and will be linked to another parameter. (1) Blocks 3 & 4 only.	Default: Read Only Min/Max: –/+32000.0 –/+32767.0 (v2.xxx) –/+32767.000 v3 (1) Units: 0.1 0.001 v3	

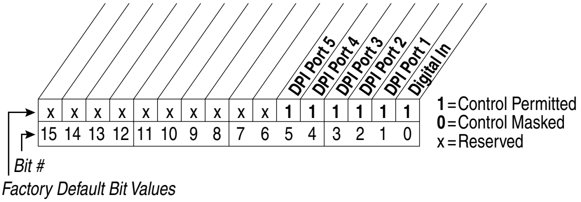
Communication File

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
COMMUNICATION	Comm Control	270 ○	**Standard** **[DPI Data Rate]** Sets the baud rate for attached drive peripherals. When changing this value the drive must be reset for the change to take affect.	Default: 0 “125 kbps” Options: 0 “125 kbps” 1 “500 kbps”	
			Vector **[DPI Baud Rate]** See description above.	Default: 1 “500 kbps”	
		271	**[Drive Logic Rslt]** The final logic command resulting from the combination of all DPI and discrete inputs. This parameter has the same structure as the product-specific logic command received via DPI and is used in peer to peer communications.	Read Only	


MOP Dec
Spd Ref ID 2 (1)
Spd Ref ID 1 (1)
Spd Ref ID 0 (1)
Decel 2
Decel 1
Accel 2
Accel 1
Mop Inc
Local Contrl
Reverse
Forward
Clear Fault
Jog
Start
Stop
0 0 0 0 1 1 1 0 1 0 0 0 1 1 0 0
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Bit #
1 = Condition True
0 = Condition False
x = Reserved

Bits(1)			
14	13	12	Description
0	0	0	No Command - Man. Mode
0	0	1	Ref A Auto
0	1	0	Ref B Auto
0	1	1	Preset 3 Auto
1	0	0	Preset 4 Auto
1	0	1	Preset 5 Auto
1	1	0	Preset 6 Auto
1	1	1	Preset 7 Auto

File	Group	No.	Parameter Name & Description	Values	Related
COMMUNICATION	Comm Control	272	**[Drive Ref Rslt]** Present frequency reference scaled as a DPI reference for peer to peer communications. The value shown is the value prior to the accel/decel ramp and the corrections supplied by slip comp, PI, etc.	Default: Read Only Min/Max: –/+32767 Units: 1	
		273	**[Drive Ramp Rslt]** Present frequency reference scaled as a DPI reference for peer to peer communications. The value shown is the value after the accel/decel ramp, but prior to any corrections supplied by slip comp, PI, etc.	Default: Read Only Min/Max: –/+32767 Units: 1	

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	**Related**
COMMUNICATION	Comm Control	274	**Vector** **[DPI Port Sel]** Selects which DPI port reference value will appear in [DPI Port Value].	Default: “DPI Port 1” Options: 1-5 “DPI Port 1-5”	
		275	**Vector** **[DPI Port Value]** Value of the DPI reference selected in [DPI Port Sel].	Default: Read Only Min/Max: –/+32767 Units: 1	
		298 ⬭	**Vector v3** **[DPI Ref Select]** Scales DPI on maximum frequency or maximum speed.	Default: 0 “Max Freq” Options: 0 “Max Freq” 1 “Max Speed”	
		299	**Vector v3** **[DPI Fdbk Select]** Selects DPI units displayed on the “Fdbk” line of the HIM. (1) Vector firmware 3.001 and later. (2) Refer to Input/Output Definitions on page 3-56.	Default: 17 “Speed Fdbk” Options: 0 “Output Freq” 1 “Command Freq” 1 * “Command Spd” 2 “Output Amps” 3 “Torque Amps” 4 “Flux Amps” 5 “Output Power” 6 “Output Volts” 7 “DC Bus Volts” 8 “PI Reference”(2) 9 “PI Feedback” 10 “PI Error” 11 “PI Output” 12 “%Motor OL” 13 “%Drive OL” 14 “CommandedTrq” 15 “MtrTrqCurRef”(2) 16 “Speed Ref” 17 “Speed Fdbk” 18 “Pulse In Ref”(2) 19 “Reserved” 20-23 “Scale Block1-4(1)(2)	
	Masks & Owners	276 ⬭	**[Logic Mask]** Determines which adapters can control the drive. If the bit for an adapter is set to “0,” the adapter will have no control functions except for stop.  DPI Port 5 DPI Port 4 DPI Port 3 DPI Port 2 DPI Port 1 Digital In x x x x x x x x x x 1 1 1 1 1 1 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Control Permitted 0 = Control Masked x = Reserved Bit # Factory Default Bit Values		288 thru 297
		277 ⬭	**[Start Mask]** Controls which adapters can issue start commands.	See [Logic Mask].	288 thru 297

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	Values	Related
COMMUNICATIONS	**Masks & Owners**	278 ○	**[Jog Mask]** Controls which adapters can issue jog commands.	See [Logic Mask].	288 thru 297
		279 ○	**[Direction Mask]** Controls which adapters can issue forward/reverse direction commands.	See [Logic Mask].	288 thru 297
		280 ○	**[Reference Mask]** Controls which adapters can select an alternate reference; [Speed Ref A, B Sel] or [Preset Speed 1-7].	See [Logic Mask].	288 thru 297
		281 ○	**[Accel Mask]** Controls which adapters can select [Accel Time 1, 2].	See [Logic Mask].	288 thru 297
		282 ○	**[Decel Mask]** Controls which adapters can select [Decel Time 1, 2].	See [Logic Mask].	288 thru 297
		283 ○	**[Fault Clr Mask]** Controls which adapters can clear a fault.	See [Logic Mask].	288 thru 297
		284 ○	**[MOP Mask]** Controls which adapters can issue MOP commands to the drive.	See [Logic Mask].	288 thru 297
		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 thru 297
		288	**[Stop Owner]** Adapters that are presently issuing a valid stop command.	Read Only	276 thru 285

										DPI Port 5	DPI Port 4	DPI Port 3	DPI Port 2	DPI Port 1	Digital In
x	x	x	x	x	x	x	x	x	x	**0**	**0**	**0**	**0**	**0**	**1**
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Bit #

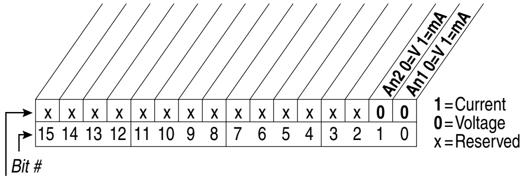
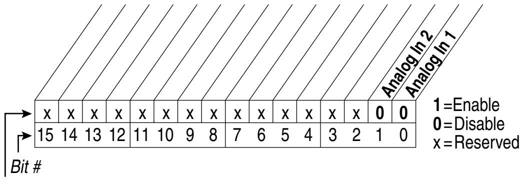
1 = Issuing Command
0 = No Command
x = Reserved

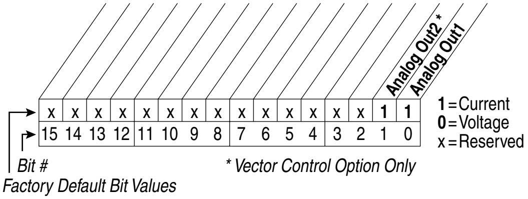
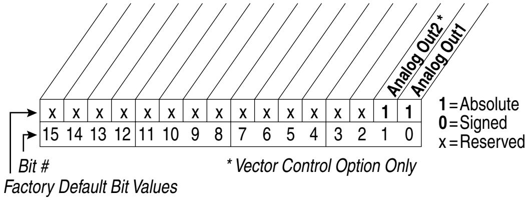
File	Group	No.	Parameter Name & Description	Values	Related
COMMUNICATIONS	**Masks & Owners**	289	**[Start Owner]** Adapters that are presently issuing a valid start command.	See [Stop Owner].	276 thru 285
		290	**[Jog Owner]** Adapters that are presently issuing a valid jog command.	See [Stop Owner].	276 thru 285

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	Related
COMMUNICATIONS	Masks & Owners	291	**[Direction Owner]** Adapter that currently has exclusive control of direction changes.	See [Stop Owner].	276 thru 285
		292	**[Reference Owner]** Adapter that has the exclusive control of the command frequency source selection.	See [Stop Owner].	276 thru 285
		293	**[Accel Owner]** Adapter that has exclusive control of selecting [Accel Time 1, 2].	See [Stop Owner].	140 276 thru 285
		294	**[Decel Owner]** Adapter that has exclusive control of selecting [Decel Time 1, 2].	See [Stop Owner].	142 276 thru 285
		295	**[Fault Clr Owner]** Adapter that is presently clearing a fault.	See [Stop Owner].	276 thru 285
		296	**[MOP Owner]** Adapters that are currently issuing increases or decreases in MOP command frequency.	See [Stop Owner].	276 thru 285
		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].	276 thru 285
	Datalinks	300 301 ○	**[Data In A1] - Link A Word 1** **[Data In A2] - Link A Word 2** Parameter number whose value will be written from a communications device data table. Standard Control – Parameters that can only be changed while drive is stopped cannot be used as Datalink inputs. Entering a parameter of this type will "Disable" the link. Vector Control – Will not be updated until drive is stopped. Refer to your communications option manual for datalink information.	Default: 0 (0 = "Disabled") Min/Max: 0/387 0/544 Vector 0/611 v3 Units: 1	
		302 303 ○	**[Data In B1] - Link B Word 1** **[Data In B2] - Link B Word 2**	See [Data In A1] - Link A Word 1 [Data In A2] - Link A Word 2.	

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
COMMUNICATIONS	Datalinks	304 305 ○	**[Data In C1] - Link C Word 1** **[Data In C2] - Link C Word 2**	See [Data In A1] - Link A Word 1 [Data In A2] - Link A Word 2.	
		306 307 ○	**[Data In D1] - Link D Word 1** **[Data In D2] - Link D Word 2**	See [Data In A1] - Link A Word 1 [Data In A2] - Link A Word 2.	
		310 311	**[Data Out A1] - Link A Word 1** **[Data Out A2] - Link A Word 2** Parameter number whose value will be written to a communications device data table.	Default: 0 (0 = "Disabled") Min/Max: 0/387 0/544 Vector 0/611 v3 Units: 1	
		312 313	**[Data Out B1] - Link B Word 1** **[Data Out B2] - Link B Word 2**	See [Data Out A1] - Link A Word 1 [Data Out A2] - Link A Word 2.	
		314 315	**[Data Out C1] - Link C Word 1** **[Data Out C2] - Link C Word 2**	See [Data Out A1] - Link A Word 1 [Data Out A2] - Link A Word 2.	
		316 317	**[Data Out D1] - Link D Word 1** **[Data Out D2] - Link D Word 2**	See [Data Out A1] - Link A Word 1 [Data Out A2] - Link A Word 2.	

Inputs & Outputs File

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS	Analog Inputs	320 ○	**[Anlg In Config]** Selects the mode for the analog inputs.  An2 0=V 1=mA An1 0=V 1=mA x x x x x x x x x x x x x x 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Current 0 = Voltage x = Reserved Bit # *Factory Default Bit Values*		322 325 323 326
		321	**[Anlg In Sqr Root]** Enables/disables the square root function for each input.  Analog In 2 Analog In 1 x x x x x x x x x x x x x x 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Enable 0 = Disable x = Reserved Bit # *Factory Default Bit Values*		

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS	Analog Inputs	322 325	**[Analog In 1 Hi]** **[Analog In 2 Hi]** Sets the highest input value to the analog input x scaling block. [Anlg In Config], parameter 320 defines if this input will be –/+10V or 4-20 mA (0-20 mA with Vector firmware 3.xxx & later).	Default: 10.000 Volt 10.000 Volt Min/Max: 4.000/20.000mA 0.000/20.000mA v3 –/+10.000V 0.000/10.000V Units: 0.001 mA 0.001 Volt	091 092
		323 326	**[Analog In 1 Lo]** **[Analog In 2 Lo]** Sets the lowest input value to the analog input x scaling block. [Anlg In Config], parameter 320 defines if this input will be –/+10V or 4-20 mA (0-20 mA with Vector firmware 3.xxx & later). If set below 4 mA, [Analog In x Loss] should be “Disabled.”	Default: 0.000 Volt 0.000 Volt Min/Max: 4.000/20.000mA 0.000/20.000mA v3 –/+10.000V 0.000/10.000V Units: 0.001 mA 0.001 Volt	091 092
		324 327	**[Analog In 1 Loss]** **[Analog In 2 Loss]** Selects drive action when an analog signal loss is detected. Signal loss is defined as an analog signal less than 1V or 2mA. The signal loss event ends and normal operation resumes when the input signal level is greater than or equal to 1.5V or 3mA.	Default: 0 “Disabled” 0 “Disabled” Options: 0 “Disabled” 1 “Fault” 2 “Hold Input” 3 “Set Input Lo” 4 “Set Input Hi” 5 “Goto Preset1” 6 “Hold OutFreq”	091 092
	Analog Outputs	340	**[Anlg Out Config]** Selects the mode for the analog outputs. .  Analog Out2 * Analog Out1 x x x x x x x x x x x x x x 1 1 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Current 0 = Voltage x = Reserved Bit # Factory Default Bit Values * Vector Control Option Only		
		341	**[Anlg Out Absolut]** Selects whether the signed value or absolute value of a parameter is used before being scaled to drive the analog output.  Analog Out2 * Analog Out1 x x x x x x x x x x x x x x 1 1 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Absolute 0 = Signed x = Reserved Bit # Factory Default Bit Values * Vector Control Option Only		

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	**Related**
INPUTS & OUTPUTS	**Analog Outputs**	342 345	**[Analog Out1 Sel]** Vector **[Analog Out2 Sel]** Selects the source of the value that drives the analog output.	Default: 0 "Output Freq" Options: See Table	001 002 003 004 005 007 006 012 135 136 137 138 220 219 377 378

Options		**[Analog Out1 Lo] Value**		**[Analog Out1 Hi] Value**
		Param. 341 = Signed	*Param. 341 = Absolute*	
0	"Output Freq"	–[Maximum Speed]	0 Hz	+[Maximum Speed]
1	"Command Freq"	–[Maximum Speed]	0 Hz	+[Maximum Speed]
1 *	"Command Spd"	–[Maximum Speed]	0 Hz/RPM	+[Maximum Speed]
2	"Output Amps"	0 Amps	0 Amps	200% Rated
3	"Torque Amps"	–200% Rated	0 Amps	200% Rated
4	"Flux Amps"	0 Amps	0 Amps	200% Rated
5	"Output Power"	0 kW	0 kW	200% Rated
6	"Output Volts"	0 Volts	0 Volts	120% Rated Input Volts
7	"DC Bus Volts"	0 Volts	0 Volts	200% Rated Input Volts
8	"PI Reference" (1)	–100%	0%	100%
9	"PI Feedback"	–100%	0%	100%
10	"PI Error"	–100%	0%	100%
11	"PI Output"	–100%	0%	100%
12	"%Motor OL"	0%	0%	100%
13	"%Drive OL"	0%	0%	100%
14 *	"CommandedTrq"	–800% Rated	0%	800% Rated
15 *	"MtrTrqCurRef" (1)	–200% Rated	0%	200% Rated
16 *	"Speed Ref"	–[Maximum Speed]	0 Hz/RPM	+[Maximum Speed]
17 *	"Speed Fdbk"	–[Maximum Speed]	0 Hz/RPM	+[Maximum Speed]
18 *	"Pulse In Ref" (1)	–25200.0 RPM	0 Hz/RPM	+[Maximum Speed]
19*	"Torque Est" (1)	–800%	0%	+800%
20-23**	"Scale Block1-4" (1)			
24**	"Param Cntl" (1)			

* Vector Control Option Only **Vector firmware 3.001 & later

(1) Refer to Option Definitions on page 3-56.

File	Group	No.	**Parameter Name & Description**	**Values**	**Related**
INPUTS & OUTPUTS	**Analog Outputs**	343 346	**[Analog Out1 Hi]** Vector **[Analog Out2 Hi]** Sets the analog output value when the source value is at maximum.	Default: 20.000 mA, 10.000 Volts Min/Max: 4.000/20.000mA 0.000/20.000mA v3 –/+10.000V Units: 0.001 mA 0.001 Volt	340 342
		344 347	**[Analog Out1 Lo]** Vector **[Analog Out2 Lo]** Sets the analog output value when the source value is at minimum.	Default: 0.000 mA, 0.000 Volts Min/Max: 4.000/20.000mA 0.000/20.000mA v3 –/+10.000V Units: 0.001 mA 0.001 Volt	340 342

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS	Analog Outputs	354 355	**Vector v3** **[Anlg Out1 Scale]** **Vector v3** **[Anlg Out2 Scale]** Sets the high value for the range of analog out scale. Entering 0.0 will disable this scale and max scale will be used. Example: If [Analog Out Sel] = “Commanded Trq,” a value of 150 = 150% scale in place of the default 800%.	Default: 0.0 Min/Max: [Analog Out1 Sel] Units: 0.01	
		377 378	**Vector v3** **[Anlg1 Out Setpt]** **Vector v3** **[Anlg2 Out Setpt]** Sets the analog output value from a communication device. Example: Set [Data In Ax] to “377” (value from communication device). Then set [Analog Outx Sel] to “Param Cntl.”	Default: 20.000 mA, 10.000 Volts Min/Max: 0.000/20.000mA –/+10.000V Units: 0.001 mA 0.001 Volt	

Selected Option Definitions – [Analog Outx Sel], [Digital Inx Sel], [Digital Outx Sel]

Option	Description	Related
At Speed	Relay changes state when drive has reached commanded speed.	380
Fast Stop	When closed, the drive will stop with a 0.1 second decel time. (If Torque Proving is being used, float will be ignored at end of ramp and the mechanical brake will be set).	361
Excl Link	Links digital input to a digital output if the output is set to “Input 1-6 Link.” This does not need to be selected in the Vector option.	361
Input 1-6 Link	When Digital Output 1 is set to one of these (i.e. Input 3 Link) in conjunction with Digital Input 3 set to “Excl Link,” the Digital Input 3 state (on/off) is echoed in the Digital Output 1.	380
Micro Pos	Micropostion input. When closed, the command frequency is set to a percentage speed reference as defined in [MicroPos Scale%], parameter 611.	361
MOP Dec	Decrements speed reference as long as input is closed.	361
MOP Inc	Increments speed reference as long as input is closed.	361
MtrTrqCurRef	Torque producing current reference.	342
Param Cntl	Parameter controlled analog output allows PLC to control analog outputs through data links. Set in [AnlgX Out Setpt], parameters 377-378.	342
Param Cntl	Parameter controlled digital output allows PLC to control digital outputs through data links. Set in [Dig Out Setpt], parameter 379.	380
PI Reference	Reference for PI block (see Process PI for Standard Control on page C-13).	342
Precharge En	Forces drive into precharge state. Typically controlled by auxiliary contact on the disconnect at the DC input to the drive.	361
Pulse In Ref	Reference of the pulse input (Z channel of encoder - can be used while A & B channels are encoder inputs).	342
Scale Block 1-4	Output of scale blocks, parameters 354-355.	342
Torque Est	Calculated percentage of rated motor torque.	342
Torque Setpt 1	Selects “Torque Stpt1” for [Torque Ref A Sel] when set, otherwise uses value selected in [Torque Ref A Sel].	361

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**			Related
INPUTS & OUTPUTS	**Digital Inputs**	361	**[Digital In1 Sel]**	Default:	4	"Stop – CF"	
		362	**[Digital In2 Sel]**	Default:	5	"Start"	
		363	**[Digital In3 Sel]**	Default:	18	"Auto/ Manual"	
		364	**[Digital In4 Sel]**	Default:	15	"Speed Sel 1"	
		365	**[Digital In5 Sel]**	Default:	16	"Speed Sel 2"	
		366	**[Digital In6 Sel]** (11)	Default:	17	"Speed Sel 3"	

○ Selects the function for the digital inputs.

(1) Speed Select Inputs.

3	2	1	Auto Reference Source
0	0	0	Reference A
0	0	1	Reference B
0	1	0	Preset Speed 2
0	1	1	Preset Speed 3
1	0	0	Preset Speed 4
1	0	1	Preset Speed 5
1	1	0	Preset Speed 6
1	1	1	Preset Speed 7

To access Preset Speed 1, set [Speed Ref x Sel] to "Preset Speed 1".

Type 2 Alarms - Some digital input programming may cause conflicts that will result in a Type 2 alarm. Example: [Digital In1 Sel] set to "5, Start" in 3-wire control and [Digital In2 Sel] set to 7 "Run" in 2-wire. See Table 4.C for info on resolving this type of conflict.

(2) Vector Control Option Only.

(3)

3	2	1	Spd/Trq Mode
0	0	0	Zero Torque
0	0	1	Spd Reg
0	1	0	Torque Reg
0	1	1	Min Spd/Trq
1	0	0	Max Spd/Trq
1	0	1	Sum Spd/Trq
1	1	0	Absolute
1	1	1	Zero Trq

(4) When [Digital Inx Sel] is set to option 2 "Clear Faults" the Stop button cannot be used to clear a fault condition.

(5) Typical 3-Wire Inputs - Only 3-wire functions are allowed. Including 2-wire selections will cause a type 2 alarm.

Values			Related
Options:	0	"Not Used"	
	1	"Enable" (8,10)	
	2	"Clear Faults"(CF) (4)	
	3	"Aux Fault"	
	4	"Stop – CF" (10)	
	5	"Start" (5, 9)	
	6	"Fwd/ Reverse" (5)	
	7	"Run" (6, 10)	
	8	"Run Forward" (6)	
	9	"Run Reverse" (6)	
	10	"Jog" (5) "Jog1" (2)	100
	11	"Jog Forward" (6)	
	12	"Jog Reverse" (6)	
	13	"Stop Mode B"	156
	14	"Bus Reg Md B"	162
	15-17	"Speed Sel 1-3" (1)	
	18	"Auto/ Manual" (7)	096
	19	"Local"	
	20	"Acc2 & Dec2"	
	21	"Accel 2"	141
	22	"Decel 2"	143
	23	"MOP Inc" (14)	195
	24	"MOP Dec" (14)	
	25	"Excl Link" (14)	
	26	"PI Enable"	194
	27	"PI Hold"	
	28	"PI Reset"	380
	29	"Pwr Loss Lvl"	124
	30	"Precharge En" (14)	
	31-33	"Spd/Trq Sel1-3" (2,3)	
	34	"Jog 2" (2)	
	35	"PI Invert" (12)	
	36	"Torque Setpt 1" (12,14)	
	37	"Micro Pos" (12, 13, 14)	
	38	"Fast Stop" (12, 14)	

(6) Typical 2-Wire Inputs - Requires that only 2-wire functions are chosen. Including 3-wire selections will cause a type 2 alarm. See Table 4.C for conflicts.

(7) Auto/Manual - Refer to Figure 1.10 on page 1-22 for details.

(8) Opening an "Enable" input will cause the motor to coast-to-stop, ignoring any programmed Stop modes.

(9) "Dig In ConflictB" alarm will occur if a "Start" input is programmed without a "Stop" input.

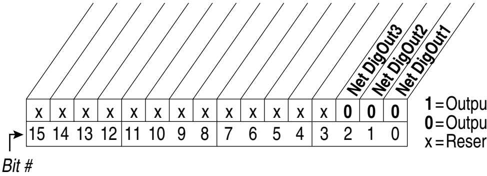
(10) Refer to the Sleep-Wake Mode Attention statement on page 3-36.

(11) A dedicated hardware enable input is available via a jumper selection. Refer to page 1-19 for further information.

(12) Vector firmware 3.001 and later.

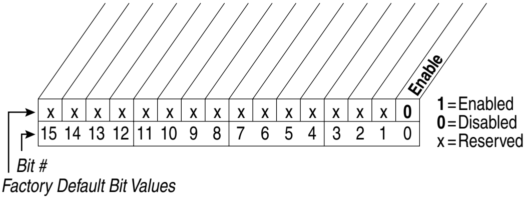
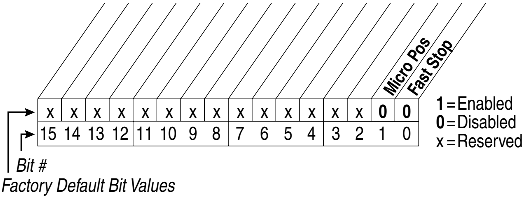
(13) Only available when "Torque Proving" function is selected.

(14) Refer to Option Definitions on page 3-56.

File	Group	No.	Parameter Name & Description *See page 3-2 for symbol descriptions*	Values	Related
INPUTS & OUTPUTS	Digital Outputs	379	**Vector v3** **[Dig Out Setpt]** Sets the digital output value from a communication device. Example Set [Data In B1] to "379." The first three bits of this value will determine the setting of [Digital Outx Sel] which should be set to "30, Param Cntl."  Net DigOut3 Net DigOut2 Net DigOut1 x x x x x x x x x x x x x 0 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Bit # **1** = Output Energized **0** = Output De-energized x = Reserved		380
		380 384 388	**[Digital Out1 Sel]** (5) **[Digital Out2 Sel]** **Vector** **[Digital Out3 Sel]** Selects the drive status that will energize a (CRx) output relay. (1) Any relay programmed as Fault or Alarm will energize (pick up) when power is applied to drive and deenergize (drop out) when a fault or alarm exists. Relays selected for other functions will energize only when that condition exists and will deenergize when condition is removed. Refer to pages 1-18 & 1-17. (2) Vector Control Option Only. (3) Activation level is defined in [Dig Outx Level] below. (4) Vector firmware 3.001 and later. (5) When [TorqProve Cnfg] is set to "Enable," [Digital Out1 Sel] becomes the brake control and any other selection will be ignored. (6) Refer to Option Definitions on page 3-56.	Default: 1 "Fault" 4 "Run" 4 "Run" Options: 1 "Fault" (1) 2 "Alarm" (1) 3 "Ready" 4 "Run" 5 "Forward Run" 6 "Reverse Run" 7 "Auto Restart" 8 "Powerup Run" 9 "At Speed" (6) 10 "At Freq" (3) 11 "At Current" (3) 12 "At Torque" (3) 13 "At Temp" (3) 14 "At Bus Volts" (3) 15 "At PI Error" (3) 16 "DC Braking" 17 "Curr Limit" 18 "Economize" 19 "Motor Overld" 20 "Power Loss" 21-26 "Input 1-6 Link" (6) 27 "PI Enable" (2) 28 "PI Hold" (2) 29 "Drive Overload" (2) 30 "Param Cntl" (4, 6)	381 385 389 382 386 390 383 002 001 003 004 218 012 137 157 147 053 048 184 379
		381 385 389	**[Dig Out1 Level]** **[Dig Out2 Level]** **Vector** **[Dig Out3 Level]** Sets the relay activation level for options 10-15 in [Digital Outx Sel]. Units are assumed to match the above selection (i.e. "At Freq" = Hz, "At Torque" = Amps).	Default: 0.0 0.0 Min/Max: 0.0/819.2 Units: 0.1	380

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**		**Related**
INPUTS & OUTPUTS	**Digital Outputs**	382 386 390	**[Dig Out1 OnTime]** **[Dig Out2 OnTime]** **Vector** **[Dig Out3 OnTime]** Sets the "ON Delay" time for the digital outputs. This is the time between the occurrence of a condition and activation of the relay.	Default: Min/Max: Units:	0.00 Secs 0.00 Secs 0.00/600.00 Secs 0.01 Secs	380
		383 387 391	**[Dig Out1 OffTime]** **[Dig Out2 OffTime]** **Vector** **[Dig Out3 OffTime]** Sets the "OFF Delay" time for the digital outputs. This is the time between the disappearance of a condition and de-activation of the relay.	Default: Min/Max: Units:	0.00 Secs 0.00 Secs 0.00/600.00 Secs 0.01 Secs	380

Applications File

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	**Related**
Applications	**Torque Proving**	600 ◯	**Vector v3** **[TorqProve Cnfg]** Enables/disables torque/brake proving feature. When "Enabled," [Digital Out1 Sel] becomes the brake control. Note: this value is not changed when parameters are reset to factory defaults (page 3-40).  Enable x x x x x x x x x x x x x x x 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Enabled 0 = Disabled x = Reserved Bit # Factory Default Bit Values		ℹ
		601	**Vector v3** **[TorqProve Setup]** Allows control of specific torque proving functions through a communication device.  Micro Pos Fast Stop x x x x x x x x x x x x x x 0 0 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 = Enabled 0 = Disabled x = Reserved Bit # Factory Default Bit Values		

File	Group	No.	**Parameter Name & Description** *See page 3-2 for symbol descriptions*	**Values**	**Related**
Applications	**Torque Proving**	602	**Vector v3** **[Spd Dev Band]** Defines the allowable difference between the commanded frequency and encoder feedback value. A fault will occur when the difference exceeds this value for a period of time.	Default: 2.0 Hz 60.0 RPM Min/Max: 0.1/15.0 Hz 3.0/450.0 RPM Units: 0.1 Hz 0.1 RPM	603
		603	**Vector v3** **[SpdBand Integrat]** Sets the amount of time before a fault is issued when [Spd Dev Band] is outside its threshold.	Default: 60 mSec Min/Max: 1/200 mSec Units: 1 mSec	602
		604	**Vector v3** **[Brk Release Time]** Sets the amount of time between commanding the brake to release and the start of frequency acceleration.	Default: 0.10 Secs Min/Max: 0.00/10.00 Secs Units: 0.01 Secs	
		605	**Vector v3** **[ZeroSpdFloatTime]** Sets the amount of time the drive is below [Float Tolerance] before the brake is set.	Default: 5.0 Secs Min/Max: 0.1/500.0 Secs Units: 0.1 Secs	
		606	**Vector v3** **[Float Tolerance]** Sets the frequency level where the float timer starts.	Default: 0.2 Hz 6.0 RPM Min/Max: 0.1/5.0 Hz 3.0/150.0 RPM Units: 0.1 Hz 0.1 RPM	
		607	**Vector v3** **[Brk Set Time]** Defines the amount of delay time between commanding the brake to be set and the start of brake proving.	Default: 0.10 Secs Min/Max: 0.00/10.00 Secs Units: 0.01 Secs	
		608	**Vector v3** **[TorqLim SlewRate]** Sets the rate to ramp the torque limits to zero during brake proving.	Default: 10.0 Secs Min/Max: 0.5/300.0 Secs Units: 0.1 Secs	
		609	**Vector v3** **[BrkSlip Count]** Sets the number of encoder counts to define a brake slippage condition.	Default: 250 Min/Max: 0/65535 Units: 1	
		610	**Vector v3** **[Brk Alarm Travel]** Sets the number of motor shaft revolutions allowed during the brake slippage test. Drive torque is reduced to check for brake slippage. When slippage occurs, the drive allows this number of motor shaft revolutions before regaining control.	Default: 1.0 Revs Min/Max: 0.0/1000.0 Revs Units: 0.1 Revs	
		611	**Vector v3** **[MicroPos Scale%]** Sets the percent of speed reference to be used when micropositioning has been selected. Motor must come to a stop before this setting will take effect.	Default: 10.0% Min/Max: 0.1/100.0% Units: 0.1%	361 thru 366

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Troubleshooting

Chapter 4 provides information to guide you in troubleshooting the PowerFlex 700. Included is a listing and description of drive faults (with possible solutions, when applicable) and alarms.

For information on...	See page...
Faults and Alarms	4-1
Drive Status	4-2
Manually Clearing Faults	4-4
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Clearing Alarms	4-9
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Common Symptoms and Corrective Actions	4-13
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Faults and Alarms

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

Type	Fault Description	
①	Auto-Reset Run	When this type of fault occurs, and [Auto Rstrt Tries] (see page 3-35) is set to a value greater than "0," a user-configurable timer, [Auto Rstrt Delay] (see page 3-35) begins. When the timer reaches zero, the drive attempts to automatically reset the fault. If the condition that caused the fault is no longer present, the fault will be reset and the drive will be restarted.
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.

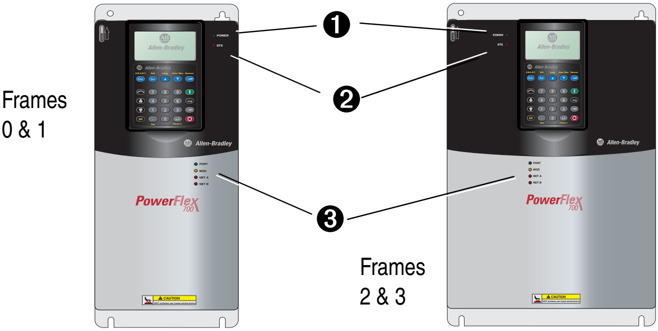
Type	Alarm Description	
①	User Configurable	These alarms can be enabled or disabled through [Alarm Config 1] on page 3-47.
②	Non-Configurable	These alarms are always enabled.

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).

Front Panel LED Indications

Figure 4.1 Typical Drive Status Indicators



#	Name	Color	State	Description
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 See page 4-10	Flashing, Drive Stopped	A start inhibit condition exists, the drive cannot be started. Check parameter 214 [Start Inhibits].
			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 See page 4-4	Flashing	Fault has occurred. Check [Fault x Code] or Fault Queue.
			Steady	A non-resettable fault has occurred.
❸	PORT	Green	–	Status of DPI port internal communications (if present).
	MOD	Yellow	–	Status of communications module (when installed).
	NET A	Red	–	Status of network (if connected).
	NET B	Red	–	Status of secondary network (if connected).

Precharge Board LED Indications

Precharge Board LED indicators are found on Frame 5 & 6 drives. The LEDs are located above the "Line Type" jumper shown in Figure 1.2.

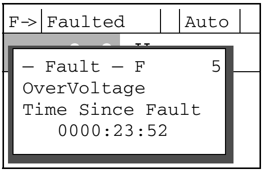
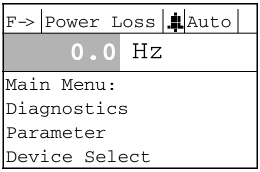
Name	Color	State	Description
Power	Green	Steady	Indicates when precharge board power supply is operational
Alarm	Yellow	Flashing	Number in "[ ]" indicates flashes and associated alarm(1):
		[1]	Low line voltage (<90%).
		[2]	Very low line voltage (<50%).
		[3]	Low phase (one phase <80% of line voltage).
		[4]	Frequency out of range or asymmetry (line sync failed).
		[5]	Low DC bus voltage (triggers ride-through operation).
		[6]	Input frequency momentarily out of range (40-65 Hz).
		[7]	DC bus short circuit detection active.
Fault	Red	Flashing	Number in "[ ]" indicates flashes and associated fault(2):
		[2]	DC bus short (Udc <2% after 20 ms).
		[4]	Line sync failed or low line (Uac <50% Unom).

(1) An alarm condition automatically resets when the condition no longer exists

(2) A fault indicates a malfunction that must be corrected and can only be reset after cycling power.

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. • "Faulted" appears in the status line • Fault number • Fault name • Time that has passed since fault occurred Press Esc to regain HIM control.	 F-> Faulted Auto — Fault — F 5 OverVoltage Time Since Fault 0000:23:52
Drive is indicating an alarm. The LCD HIM immediately reports the alarm condition by displaying the following. • Alarm name (Type 2 alarms only) • Alarm bell graphic	 F-> Power Loss Auto 0.0 Hz Main Menu: Diagnostics Parameter Device Select

Manually Clearing 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 • Set parameter 240 [Fault Clear] to "1." • "Clear Faults" on the HIM Diagnostic menu.	○

Fault Descriptions

Table 4.A Fault Types, Descriptions and Actions

Fault	No.	Type(1)	Description	Action
Analog In Loss	29	① ③	An analog input is configured to fault on signal loss. A signal loss has occurred. Configure with [Anlg In 1, 2 Loss] on page 3-54.	1. Check parameters. 2. Check for broken/loose connections at inputs.
Anlg Cal Chksum	108		The checksum read from the analog calibration data does not match the checksum calculated.	Replace drive.
Auto Rstrt Tries	33	③	Drive unsuccessfully attempted to reset a fault and resume running for the programmed number of [Flt RstRun Tries]. Enable/Disable with [Fault Config 1] on page 3-46.	Correct the cause of the fault and manually clear.
AutoTune Aborted	80		Autotune function was canceled by the user or a fault occurred.	Restart procedure.
Auxiliary Input	2	①	Auxiliary input interlock is open.	Check remote wiring.
Cntl Bd Overtemp **Vector**	55		The temperature sensor on the Main Control Board detected excessive heat.	1. Check Main Control Board fan. 2. Check surrounding air temperature. 3. Verify proper mounting/cooling.
DB Resistance	69		Resistance of the internal DB resistor is out of range.	Replace resistor.

Fault	No.	Type[1]	Description	Action
Decel Inhibit	24	③	The drive is not following a commanded deceleration because it is attempting to limit bus voltage.	1. Verify input voltage is within drive specified limits. 2. Verify system ground impedance follows proper grounding techniques. 3. Disable bus regulation and/or add dynamic brake resistor and/or extend deceleration time. Refer to the Attention statement on page P-4
Drive OverLoad	64		Drive rating of 110% for 1 minute or 150% for 3 seconds has been exceeded.	Reduce load or extend Accel Time.
Drive Powerup	49		No fault displayed. Used as a Power Up Marker in the Fault Queue indicating that the drive power has been cycled.	
Excessive Load	79		Motor did not come up to speed in the allotted time during autotune.	1. Uncouple load from motor. 2. Repeat Autotune.
Encoder Loss	91		Requires differential encoder. One of the 2 encoder channel signals is missing.	1. Check Wiring. 2. Replace encoder.
Encoder Quad Err	90		Both encoder channels changed state within one clock cycle.	1. Check for externally induced noise. 2. Replace encoder.
Faults Cleared	52		No fault displayed. Used as a marker in the Fault Queue indicating that the fault clear function was performed.	
Flt QueueCleared	51		No fault displayed. Used as a marker in the Fault Queue indicating that the clear queue function was performed.	
FluxAmpsRef Rang	78		The value for flux amps determined by the Autotune procedure exceeds the programmed [Motor NP FLA].	1. Reprogram [Motor NP FLA] with the correct motor nameplate value. 2. Repeat Autotune.
Ground Fault	13	①	A current path to earth ground greater than 25% of drive rating.	Check the motor and external wiring to the drive output terminals for a grounded condition.
Hardware Fault	93		Hardware enable is disabled (jumpered high) but logic pin is still low.	1. Check jumper. 2. Replace Main Control Board.
Hardware Fault	130		Gate array load error.	1. Cycle power. 2. Replace Main Control Board.
Hardware Fault	131		Dual port failure.	1. Cycle power. 2. Replace Main Control Board.
Heatsink OvrTemp	8	①	Heatsink temperature exceeds 100% of [Drive Temp].	1. Verify that maximum ambient temperature has not been exceeded. 2. Check fan. 3. Check for excess load.

Fault	No.	Type[1]	Description	Action
HW OverCurrent	12	①	The drive output current has exceeded the hardware current limit.	Check programming. Check for excess load, improper DC boost setting, DC brake volts set too high or other causes of excess current.
Incompat MCB-PB	106	②	Drive rating information stored on the power board is incompatible with the main control board.	Load compatible version files into drive.
I/O Comm Loss	121		I/O Board lost communications with the Main Control Board.	Check connector. Check for induced noise. Replace I/O board or Main Control Board.
I/O Failure	122		I/O was detected, but failed the powerup sequence. I/O Board is separate in Standard & integral in Vector Control.	Replace I/O Board (Standard Control) or Main Control Board (Vector Control).
I/O Mismatch Standard	120		I/O board configuration not the same from last time drive was powered up.	Verify configuration.
Input Phase Loss	17		The DC bus ripple has exceeded a preset level.	Check incoming power for a missing phase/blown fuse.
IR Volts Range	77		"Calculate" is the autotune default and the value determined by the autotune procedure for IR Drop Volts is not in the range of acceptable values.	Re-enter motor nameplate data.
IXo VoltageRange	87		Voltage calculated for motor inductive impedance exceeds 25% of [Motor NP Volts].	1. Check for proper motor sizing. 2. Check for correct programming of [Motor NP Volts], parameter 41. 3. Additional output impedance may be required.
Load Loss	15		Drive output torque current is below [Load Loss Level] for a time period greater than [Load Loss time].	1. Verify connections between motor and load. 2. Verify level and time requirements.
Motor Overload	7	① ③	Internal electronic overload trip. Enable/Disable with [Fault Config 1] on page 3-46.	An excessive motor load exists. Reduce load so drive output current does not exceed the current set by [Motor NP FLA].
Motor Thermistor	16		Thermistor output is out of range.	1. Verify that thermistor is connected. 2. Motor is overheated. Reduce load.
NVS I/O Checksum	109		EEprom checksum error.	1. Cycle power and repeat function. 2. Replace Main Control Board.
NVS I/O Failure	110		EEprom I/O error.	1. Cycle power and repeat function. 2. Replace Main Control Board.

Fault	No.	Type[1]	Description	Action
Output PhaseLoss	21		Current in one or more phases has been lost or remains below a preset level.	Check the drive and motor wiring. Check for phase-to-phase continuity at the motor terminals. Check for disconnected motor leads.
OverSpeed Limit	25	①	Functions such as Slip Compensation or Bus Regulation have attempted to add an output frequency adjustment greater than that programmed in [Overspeed Limit].	Remove excessive load or overhauling conditions or increase [Overspeed Limit].
OverVoltage	5	①	DC bus voltage exceeded maximum value.	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install dynamic brake option.
Parameter Chksum	100	②	The checksum read from the board does not match the checksum calculated.	1. Restore defaults. 2. Reload User Set if used.
Params Defaulted	48		The drive was commanded to write default values to EEPROM.	1. Clear the fault or cycle power to the drive. 2. Program the drive parameters as needed.
Phase U to Grnd	38		A phase to ground fault has been detected between the drive and motor in this phase.	1. Check the wiring between the drive and motor. 2. Check motor for grounded phase. 3. Replace drive.
Phase V to Grnd	39			
Phase W to Grnd	40			
Phase UV Short	41		Excessive current has been detected between these two output terminals.	1. Check the motor and drive output terminal wiring for a shorted condition. 2. Replace drive.
Phase VW Short	42			
Phase UW Short	43			
Port 1-5 DPI Loss	81-85	②	DPI port stopped communicating. A SCANport device was connected to a drive operating DPI devices at 500k baud.	1. If adapter was not intentionally disconnected, check wiring to the port. Replace wiring, port expander, adapters, Main Control Board or complete drive as required. 2. Check HIM connection. 3. If an adapter was intentionally disconnected and the [Logic Mask] bit for that adapter is set to "1", this fault will occur. To disable this fault, set the [Logic Mask] bit for the adapter to "0."
Port 1-5 Adapter	71-75		The communications card has a fault.	1. Check DPI device event queue and corresponding fault information for the device.

Fault	**No.**	**Type**[1]	**Description**	**Action**
Power Loss	3	① ③	DC bus voltage remained below 85% of nominal for longer than [Power Loss Time]. Enable/ Disable with [Fault Config 1] on page 3-46.	Monitor the incoming AC line for low voltage or line power interruption.
Power Unit	70		One or more of the output transistors were operating in the active region instead of desaturation. This can be caused by excessive transistor current or insufficient base drive voltage.	1. Check for damaged output transistors. 2. Replace drive.
Pulse In Loss	92		Z Channel is selected as a pulse input and no signal is present.	1. Check wiring. 2. Replace pulse generator.
Pwr Brd Chksum1	104		The checksum read from the EEPROM does not match the checksum calculated from the EEPROM data.	Clear the fault or cycle power to the drive.
Pwr Brd Chksum2	105	②	The checksum read from the board does not match the checksum calculated.	1. Cycle power to the drive. 2. If problem persists, replace drive.
Replaced MCB-PB	107	②	Main Control Board was replaced and parameters were not programmed.	1. Restore defaults. 2. Reprogram parameters.
Shear Pin	63	③	Programmed [Current Lmt Val] has been exceeded. Enable/ Disable with [Fault Config 1] on page 3-46.	Check load requirements and [Current Lmt Val] setting.
Software Fault	88		Microprocessor handshake error.	Replace Main Control Board.
Software Fault	89		Microprocessor handshake error.	Replace Main Control Board.
SW OverCurrent	36	①	Drive output current has exceeded the 1ms current rating. This rating is greater than the 3 second current rating and less than the hardware overcurrent fault level. It is typically 200- 250% of the drive continuous rating	Check for excess load, improper DC boost setting. DC brake volts set too high.
TorqPrv Spd Band	20		Difference between [Commanded Speed] and [Encoder Speed] has exceeded the level set in [Spd Dev Band] for a time period greater than [Spd Band Integrat].	1. Check wiring between drive and motor. 2. Check release of mechanical brake.
Trnsistr OvrTemp	9	①	Output transistors have exceeded their maximum operating temperature.	1. Verify that maximum ambient temperature has not been exceeded. 2. Check fan. 3. Check for excess load.

Fault	No.	Type(1)	Description	Action
UnderVoltage	4	① ③	DC bus voltage fell below the minimum value of 407V DC at 400/480V input or 204V DC at 200/240V input. Enable/Disable with [Fault Config 1] (page 3-46).	Monitor the incoming AC line for low voltage or power interruption.
UserSet1 Chksum	101	②	The checksum read from the user set does not match the checksum calculated.	Re-save user set.
UserSet2 Chksum	102	②		
UserSet3 Chksum	103	②		

(1) See page 4-1 for a description of fault types.

Table 4.B Fault Cross Reference

No.(1)	Fault
2	Auxiliary Input
3	Power Loss
4	UnderVoltage
5	OverVoltage
7	Motor Overload
8	Heatsink OvrTemp
9	Trnsistr OvrTemp
12	HW OverCurrent
13	Ground Fault
15	Load Loss
16	Motor Thermistor
17	Input Phase Loss
20	TorqPrv Spd Band
21	Output PhaseLoss
24	Decel Inhibit
25	OverSpeed Limit
29	Analog In Loss
33	Auto Rstrt Tries
36	SW OverCurrent
38	Phase U to Grnd
39	Phase V to Grnd
40	Phase W to Grnd
41	Phase UV Short
42	Phase VW Short
43	Phase UW Short
48	Params Defaulted
49	Drive Powerup
51	Flt QueueCleared
52	Faults Cleared
55	Cntl Bd Overtemp
63	Shear Pin
64	Drive OverLoad
69	DB Resistance
70	Power Unit
71- 75	Port 1-5 Adapter
77	IR Volts Range
78	FluxAmpsRef Rang
79	Excessive Load
80	AutoTune Aborted
81- 85	Port 1-5 DPI Loss
87	IXo VoltageRange
88	Software Fault
89	Software Fault
90	Encoder Quad Err
91	Encoder Loss
92	Pulse In Loss
93	Hardware Fault
100	Parameter Chksum
101-103	UserSet Chksum
104	Pwr Brd Chksum1
105	Pwr Brd Chksum2
106	Incompat MCB-PB
107	Replaced MCB-PB
108	Anlg Cal Chksum
120	I/O Mismatch
121	I/O Comm Loss
122	I/O Failure
130	Hardware Fault
131	Hardware Fault

(1) Fault numbers not listed are reserved for future use.

Clearing Alarms

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

Alarm Descriptions

Table 4.C Alarm Descriptions and Actions

Alarm	No.	Type(1)	Description
Analog In Loss	5	①	An analog input is configured for “Alarm” on signal loss and signal loss has occurred.
Bipolar Conflict	20	②	Parameter 190 [Direction Mode] is set to “Bipolar” or “Reverse Dis” and one or more of the following digital input functions is configured: “Fwd/Reverse,” “Run Forward,” “Run Reverse,” “Jog Forward” or “Jog Reverse.”
Brake Slipped	32	②	Encoder movement has exceeded the level in [BrkSlipCount] after the brake was set.
Decel Inhibt	10	①	Drive is being inhibited from decelerating.
Dig In ConflictA	17	②	Digital input functions are in conflict. Combinations marked with a “🔔” will cause an alarm. ** Jog 1 and Jog 2 with Vector Control Option*

	Acc2/Dec2	Accel 2	Decel 2	Jog*	Jog Fwd	Jog Rev	Fwd/Rev
Acc2 / Dec2		🔔	🔔				
Accel 2	🔔						
Decel 2	🔔						
Jog*					🔔	🔔	
Jog Fwd				🔔			🔔
Jog Rev				🔔			🔔
Fwd/Rev					🔔	🔔	

Alarm	No.	Type(1)	Description
Dig In ConflictB	18	②	A digital Start input has been configured without a Stop input or other functions are in conflict. Combinations that conflict are marked with a “🔔” and will cause an alarm. ** Jog 1 and Jog 2 with Vector Control Option*

	Start	Stop-CF	Run	Run Fwd	Run Rev	Jog*	Jog Fwd	Jog Rev	Fwd/ Rev
Start			🔔	🔔	🔔		🔔	🔔	
Stop-CF									
Run	🔔			🔔	🔔		🔔	🔔	
Run Fwd	🔔		🔔			🔔			🔔
Run Rev	🔔		🔔			🔔			🔔
Jog*				🔔	🔔				
Jog Fwd	🔔		🔔						
Jog Rev	🔔		🔔						
Fwd/Rev				🔔	🔔				

Alarm	No.	Type(1)	Description
Dig In ConflictC	19	②	More than one physical input has been configured to the same input function. Multiple configurations are not allowed for the following input functions. Forward/Reverse Speed Select 1 Speed Select 2 Speed Select 3 Run Forward Run Reverse Jog Forward Jog Reverse Run Stop Mode B Bus Regulation Mode B Acc2 / Dec2 Accel 2 Decel 2
Drive OL Level 1	8	①	The calculated IGBT temperature requires a reduction in PWM frequency. If [Drive OL Mode] is disabled and the load is not reduced, an overload fault will eventually occur.

Alarm	**No.**	**Type**[1]	**Description**
Drive OL Level 2	9	①	The calculated IGBT temperature requires a reduction in Current Limit. If [Drive OL Mode] is disabled and the load is not reduced, an overload fault will eventually occur.
FluxAmpsRef Rang	26	②	The calculated or measured Flux Amps value is not within the expected range. Verify motor data and rerun motor tests.
Ground Warn	15	①	Ground current has exceeded the level set in [Gnd Warn Level].
In Phase Loss	13	①	The DC bus ripple has exceeded the level in [Phase Loss Level].
IntDBRes OvrHeat	6	①	The drive has temporarily disabled the DB regulator because the resistor temperature has exceeded a predetermined value.
IR Volts Range	25	②	The drive auto tuning default is “Calculate” and the value calculated for IR Drop Volts is not in the range of acceptable values. This alarm should clear when all motor nameplate data is properly entered.
Ixo Vlt Rang	28	②	Motor leakage inductance is out of range.
Load Loss	14		Output torque current is below [Load Loss Level] for a time period greater than [Load Loss time].
MaxFreq Conflict	23	②	The sum of [Maximum Speed] and [Overspeed Limit] exceeds [Maximum Freq]. Raise [Maximum Freq] or lower [Maximum Speed] and/or [Overspeed Limit] so that the sum is less than or equal to [Maximum Freq].
Motor Thermistor	12		The value at the thermistor terminals has been exceeded.
Motor Type Cflct	21	②	[Motor Type] has been set to “Synchr Reluc” or “Synchr PM” and one or more of the following exist: • [Torque Perf Mode] = “Sensrls Vect,” “SV Economize” or “Fan/Pmp V/Hz.” • [Flux Up Time] is greater than 0.0 Secs. • [Speed Mode] is set to “Slip Comp.” • [Autotune] = “Static Tune” or “Rotate Tune.”
NP Hz Conflict	22	②	Fan/pump mode is selected in [Torq Perf Mode] and the ratio of [Motor NP Hertz] to [Maximum Freq] is greater than 26.
Power Loss	3	①	Drive has sensed a power line loss.
Precharge Active	1	①	Drive is in the initial DC bus precharge state.
PTC Conflict	31	②	PTC is enabled for Analog In 1, which is configured as a 0-20 mA current source in [Anlg In Config].
Sleep Config	29	②	Sleep/Wake configuration error. With [Sleep-Wake Mode] = “Direct,” possible causes include: drive is stopped and [Wake Level] < [Sleep Level]. “Stop=CF,” “Run,” “Run Forward,” or “Run Reverse.” is not configured in [Digital Inx Sel].
Speed Ref Cflct	27	②	[Speed Ref x Sel] or [PI Reference Sel] is set to “Reserved”.
Start At PowerUp	4	①	[Start At PowerUp] is enabled. Drive may start at any time within 10 seconds of drive powerup.

Alarm	No.	Type[1]	Description
TB Man Ref Cflct **Vector**	30	②	Occurs when: • "Auto/Manual" is selected (default) for [Digital In3 Sel], parameter 363 *and* • [TB Man Ref Sel], parameter 96 has been reprogrammed. No other use for the selected analog input may be programmed. Example: If [TB Man Ref Sel] is reprogrammed to "Analog In 2," all of the factory default uses for "Analog In 2" must be reprogramed (such as parameters 90, 117, 128 and 179). See also Auto/Manual Examples on page 1-23. To correct: • Verify/reprogram the parameters that reference an analog input *or* • Reprogram [Digital In3] to another function or "Unused."
TorqProve Cflct	49	②	When [TorqProve Cnfg] is enabled, [Motor Cntl Sel], [Feedback Select] and [Motor Fdbk Type] must be properly set (refer to page C-4).
UnderVoltage	2	①	The bus voltage has dropped below a predetermined value.
VHz Neg Slope	24	②	[Torq Perf Mode] = "Custom V/Hz" & the V/Hz slope is negative.
Waking	11	①	The Wake timer is counting toward a value that will start the drive.

[1] See page 4-1 for a description of alarm types.

Table 4.D Alarm Cross Reference

No.[1]	Alarm	No.[1]	Alarm	No.[1]	Alarm
1	Precharge Active	13	In Phase Loss	25	IR Volts Range
2	UnderVoltage	14	Load Loss	26	FluxAmpsRef Rang
3	Power Loss	15	Ground Warn	27	Speed Ref Cflct
4	Start At PowerUp	17	Dig In ConflictA	28	Ixo Vlt Rang
5	Analog in Loss	18	Dig In ConflictB	29	Sleep Config
6	IntDBRes OvrHeat	19	Dig In ConflictC	30	TB Man Ref Cflct
8	Drive OL Level 1	20	Bipolar Conflict	31	PTC Conflict
9	Drive OL Level 2	21	Motor Type Cflct	32	Brake Slipped
10	Decel Inhibt	22	NP Hz Conflict	49	Torq Prove Cflct
11	Waking	23	MaxFreq Conflict		
12	Motor Thermistor	24	VHz Neg Slope		

[1] Alarm numbers not listed are reserved for future use.

Common Symptoms and Corrective Actions

Drive does not Start from Start or Run Inputs wired to the terminal block.

Cause(s)	Indication	Corrective Action
Drive is Faulted	Flashing red status light	Clear fault. • Press Stop • Cycle power • Set [Fault Clear] to 1 (See page 3-46) • "Clear Faults" on the HIM Diagnostic menu.
Incorrect input wiring. See pages 1-20 & 1-21 for wiring examples. • 2 wire control requires Run, Run Forward, Run Reverse or Jog input. • 3 wire control requires Start and Stop inputs. • Jumper from terminal 25 to 26 is required.	None	Wire inputs correctly and/or install jumper.
Incorrect digital input programming. • Mutually exclusive choices have been made (i.e., Jog and Jog Forward). • 2 wire and 3 wire programming may be conflicting. • Exclusive functions (i.e, direction control) may have multiple inputs configured. • Stop is factory default and is not wired.	None	Program [Digital Inx Sel] for correct inputs. (See page 3-57) Start or Run programming may be missing.
	Flashing yellow status light and "DigIn CflctB" indication on LCD HIM. [Drive Status 2] shows type 2 alarm(s).	Program [Digital Inx Sel] to resolve conflicts. (See page 3-57) Remove multiple selections for the same function. Install stop button to apply a signal at stop terminal.

Drive does not Start from HIM.

Cause(s)	Indication	Corrective Action
Drive is programmed for 2 wire control. HIM Start button is disabled for 2 wire control.	None	If 2 wire control is required, no action needed. If 3 wire control is required, program [Digital Inx Sel] for correct inputs. (See page 3-57)

Drive does not respond to changes in speed command.

Cause(s)	Indication	Corrective Action
No value is coming from the source of the command.	LCD HIM Status Line indicates "At Speed" and output is 0 Hz.	1. If the source is an analog input, check wiring and use a meter to check for presence of signal. 2. Check [Commanded Freq] for correct source. (See page 3-12)

Cause(s)	Indication	Corrective Action
Incorrect reference source has been programmed.	None	3. Check [Speed Ref Source] for the source of the speed reference. (See page 3-42) 4. Reprogram [Speed Ref A Sel] for correct source. (See page 3-24)
Incorrect Reference source is being selected via remote device or digital inputs.	None	5. Check [Drive Status 1], page 3-41, bits 12 and 13 for unexpected source selections. 6. Check [Dig In Status], page 3-43 to see if inputs are selecting an alternate source. 7. Reprogram digital inputs to correct "Speed Sel x" option. (See page 3-57)

Motor and/or drive will not accelerate to commanded speed.

Cause(s)	Indication	Corrective Action
Acceleration time is excessive.	None	Reprogram [Accel Time x]. (See page 3-31)
Excess load or short acceleration times force the drive into current limit, slowing or stopping acceleration.	None	Check [Drive Status 2], bit 10 to see if the drive is in Current Limit. (See page 3-41) Remove excess load or reprogram [Accel Time x].(See page 3-31)
Speed command source or value is not as expected.	None	Check for the proper Speed Command using Steps 1 through 7 above.
Programming is preventing the drive output from exceeding limiting values.	None	Check [Maximum Speed] (See page 3-22) and [Maximum Freq] (See page 3-16) to assure that speed is not limited by programming.

Motor operation is unstable.

Cause(s)	Indication	Corrective Action
Motor data was incorrectly entered or Autotune was not performed.	None	1. Correctly enter motor nameplate data. 2. Perform "Static" or "Rotate" Autotune procedure. (Param #061, page 3-17)

Drive will not reverse motor direction.

Cause(s)	Indication	Corrective Action
Digital input is not selected for reversing control.	None	Check [Digital Inx Sel], page 3-57. Choose correct input and program for reversing mode.
Digital input is incorrectly wired.	None	Check input wiring. (See page 1-15)
Direction mode parameter is incorrectly programmed.	None	Reprogram [Direction Mode], page 3-38 for analog "Bipolar" or digital "Unipolar" control.
Motor wiring is improperly phased for reverse.	None	Switch two motor leads.
A bipolar analog speed command input is incorrectly wired or signal is absent.	None	1. Use meter to check that an analog input voltage is present. 2. Check wiring. (See page 1-15) Positive voltage commands forward direction. Negative voltage commands reverse direction.

Stopping the drive results in a Decel Inhibit fault.

Cause(s)	Indication	Corrective Action
The bus regulation feature is enabled and is halting deceleration due to excessive bus voltage. Excess bus voltage is normally due to excessive regenerated energy or unstable AC line input voltages. Internal timer has halted drive operation.	Decel Inhibit fault screen. LCD Status Line indicates "Faulted".	1. See Attention statement on page P-4. 2. Reprogram parameters 161/162 to eliminate any "Adjust Freq" selection. 3. Disable bus regulation (parameters 161 & 162) and add a dynamic brake. 4. Correct AC input line instability or add an isolation transformer. 5. Reset drive.

Testpoint Codes and Functions

Select testpoint with [Testpoint x Sel], parameters 234/236. Values can be viewed with [Testpoint x Data], parameters 235/237.

			Values		
No.(1)	**Description**	**Units**	**Minimum**	**Maximum**	**Default**
01	DPI Error Status	1	0	255	0
02	Heatsink Temp	0.1 degC	–100.0	100.0	0
03	Active Cur Limit	1	0	32767	0
04	Active PWM Freq	1 Hz	2	10	4
05	Life MegaWatt Hr(2)	0.0001 MWh	0	214748.3647	0
06	Life Run Time	0.0001 Hrs	0	214748.3647	0
07	Life Pwr Up Time	0.0001 Hrs	0	214748.3647	0
08	Life Pwr Cycles	1	0	4294967295	0
09	Life MW-HR Fract(2)	1	0	4294967295	0
10	MW-HR Frac Unit(2)	1	0	4294967295	0
11	MCB Life Time	0.0001 Hrs	0	214748.3647	0
12	Raw Analog In 1	1	0		0
13	Raw Analog In 2	1	0		0
16	CS Msg Rx Cnt	1	0	65535	0
17	CS Msg Tx Cnt	1	0	65535	0
18	CS Timeout Cnt	1	0	255	0
19	CS Msg Bad Cnt	1	0	255	0
22	PC Msg Rx Cnt	1	0	65535	0
23	PC Msg Tx Cnt	1	0	65535	0
24-29	PC1-6 Timeout Cnt	1	0	255	0
30	CAN BusOff Cnt	1	0	65535	0
31	No. of Analog Inputs	1	0	x	0
32	Raw Temperature	1	0	65535	0
33	MTO Norm Mtr Amp	0.1 Amps	0	65535	0
34	DTO-Cmd Frequency	1	0	420	0
35	DTO-Cmd Cur Lim	0.1	0		0
36	DTO-Cmd DC Hold	1	0	32767	0
37	Control Bd Temp	0.1	0.0	60.0	0.0

(1) Enter in [Testpoint x Sel].

(2) Use the equation below to calculate total Lifetime MegaWatt Hours.

$$\left(\frac{\text{Value of Code 9}}{\text{Value of Code 10}} \times 0.1\right) + \text{Value of Code 5} = \text{Total Lifetime MegaWatt Hours}$$

Supplemental Drive Information

For information on . .	See page . .
Specifications	A-1
Communication Configurations	A-4
Output Devices	A-7
Drive, Fuse & Circuit Breaker Ratings	A-7
Dimensions	A-15
Frame Cross Reference	A-22

Specifications

Category	Specification	
Agency Certification	c UL us	Listed to UL508C and CAN/CSA-C2.2 No. 14-M91.
	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.
	The drive is 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.	

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

Category	Specification						
Protection	**Drive**	200-208V	240V	380/400	480V	600V	690V
	AC Input Overvoltage Trip:	247VAC	285VAC	475VAC	570VAC	690VAC	
	AC Input Undervoltage Trip:	120VAC	138VAC	233VAC	280VAC	345VAC	
	Bus Overvoltage Trip:	405VDC	405VDC	810VDC	810VDC	1013VDC	
	Bus Undervoltage Shutoff/Fault:	153VDC	153VDC	305VDC	305VDC	381VDC	
	Nominal Bus Voltage:	281VDC	324VDC	540VDC	648VDC	810VDC	
	All Drives						
	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					

Category	**Specification**				
Protection *(continued)*	Control Logic Noise Immunity:	Showering arc transients up to 1500V peak			
	Power Ride-Thru:	15 milliseconds at full load			
	Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical			
	Ground Fault Trip:	Phase-to-ground on drive output			
	Short Circuit Trip:	Phase-to-phase on drive output			
Environment	Altitude:	1000 m (3300 ft) max. without derating			
	Maximum Surrounding Air Temperature without Derating: IP20, NEMA Type 1:	0 to 50 degrees C (32 to 122 degrees F), typical. See pages A-8 through A-13 for exceptions.			
	Storage Temperature (all const.):	–40 to 70 degrees C (–40 to 158 degrees 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 to 95% non-condensing			
	Shock:	15G peak for 11ms duration (±1.0 ms)			
	Vibration:	0.152 mm (0.006 in.) displacement, 1G peak			
	Sound:	Frame	Fan Speed	Sound Level	Note: Sound pressure level is measured at 2 meters.
		0	30 CFM	58 dB	
		1	30 CFM	59 dB	
		2	50 CFM	57 dB	
		3	120 CFM	61 dB	
		4	190 CFM	59 dB	
		5	200 CFM	71 dB	
		6	300 CFM	72 dB	
Electrical	Voltage Tolerance:	See page C-24 for full power and operating range.			
	Frequency Tolerance:	47-63 Hz.			
	Input Phases:	Three-phase input provides full rating for all drives. Single-phase operation provides 50% of rated current.			
	Displacement Power Factor:	0.98 across entire speed range.			
	Efficiency:	97.5% at rated amps, nominal line volts.			
	Maximum Short Circuit Rating:	200,000 Amps symmetrical.			
	Actual Short Circuit Rating:	Determined by AIC rating of installed fuse/circuit breaker.			
Control	Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives (refer to the *Derating Guidelines* in the PowerFlex Reference Manual). The drive can be supplied as 6 pulse or 12 pulse in a configured package.			
	Carrier Frequency:	2, 4, 8 & 10 kHz. Drive rating based on 4 kHz (see pages A-8 through A-13 for exceptions).			
	Output Voltage Range:	0 to rated motor voltage			
	Output Frequency Range:	Standard Control – 0 to 400 Hz., Vector Control – 0 to 420 Hz			
	Frequency Accuracy Digital Input: Analog Input:	Within ±0.01% of set output frequency. Within ±0.4% of maximum output frequency.			

Category	Specification		
Control *(continued)*	Frequency Control:	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	**Standard** **Vector**
		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	**Standard** **Vector**
		Speed Regulation - w/Feedback (Sensorless Vector Mode) 0.1% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth	**Vector**
	Speed Control:	Speed Regulation - w/o Feedback (Vector Control Mode) 0.1% of base speed across 120:1 speed range 120:1 operating range 50 rad/sec bandwidth	**Vector**
		Speed Regulation - w/Feedback (Vector Control Mode) 0.001% of base speed across 120:1 speed range 1000:1 operating range 250 rad/sec bandwidth	**Vector**
	Torque Regulation:	Torque Regulation - w/o Feedback ±10%, 600 rad/sec bandwidth	**Vector**
		Torque Regulation - w/Feedback ±5%, 2500 rad/sec bandwidth	**Vector**
	Selectable Motor Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability. PF700 adds Vector Control.	
	Stop Modes:	Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Ramp-to-Hold and S-curve.	
	Accel/Decel:	Two independently programmable accel and decel times. Each time may be programmed from 0 - 3600 seconds in 0.1 second increments.	
	Intermittent Overload:	110% Overload capability for up to 1 minute 150% Overload capability for up to 3 seconds	
	Current Limit Capability:	Proactive Current Limit programmable from 20 to 160% of rated output current. Independently programmable proportional and integral gain.	
	Electronic Motor Overload Protection:	Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 12.	
Encoder	Type:	Incremental, dual channel	
	Supply:	12V, 250 mA. 12V, 10 mA minimum inputs isolated with differential transmitter, 250 kHz maximum.	
	Quadrature:	90°, ±27 degrees at 25 degrees C.	
	Duty Cycle:	50%, +10%	
	Requirements:	Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), 8-15V DC output, 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 square-wave with a minimum high state voltage of 7.0V DC (12 volt encoder). Maximum low state voltage is 0.4V DC.	

Communication Configurations

Typical Programmable Controller Configurations

Important: If block transfers are programmed to continuously write information to the drive, care must be taken to properly format the block transfer. If attribute 10 is selected for the block transfer, values will be written only to RAM and will not be saved by the drive. This is the preferred attribute for continuous transfers. If attribute 9 is selected, each program scan will complete a write to the drives non-volatile memory (EEprom). Since the EEprom has a fixed number of allowed writes, continuous block transfers will quickly damage the EEprom. Do Not assign attribute 9 to continuous block transfers. Refer to the individual communications adapter User Manual for additional details.

Logic Command/Status Words

Figure A.1 Logic Command Word

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Command**	**Description**
															x	Stop(1)	0 = Not Stop 1 = Stop
														x		Start(1)(2)	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Present Direction
									x							Local Control	0 = No Local Control 1 = Local Control
								x								MOP Increment	0 = Not Increment 1 = Increment
						x	x									Accel Rate	00 = No Command 01 = Use Accel Time 1 10 = Use Accel Time 2 11 = Use Present Time
				x	x											Decel Rate	00 = No Command 01 = Use Decel Time 1 10 = Use Decel Time 2 11 = Use Present Time
	x	x	x													Reference Select(3)	000 = No Command 001 = Ref. 1 (Ref A Select) 010 = Ref. 2 (Ref B Select) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
x																MOP Decrement	0 = Not Decrement 1 = Decrement

(1) A “0 = Not Stop” condition (logic 0) must first be present before a “1 = Start” condition will start the drive. The Start command acts as a momentary Start command. A “1” will start the drive, but returning to “0” will not stop the drive.

(2) This Start will not function if a digital input (parameters 361-366) is programmed for 2-Wire Control (option 7, 8 or 9).

(3) This Reference Select will not function if a digital input (parameters 361-366) is programmed for “Speed Sel 1, 2 or 3” (option 15, 16 or 17). Note that Reference Selection is “Exclusive Ownership” see [Reference Owner] on page 3-52.

Figure A.2 Logic Status Word

Logic Bits																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Status**	**Description**
															x	Ready	0 = Not Ready 1 = Ready
														x		Active	0 = Not Active 1 = Active
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm 1 = Alarm
								x								Fault	0 = No Fault 1 = Fault
							x									At Speed	0 = Not At Reference 1 = At Reference
				x	x	x										Local Control (1)	000 = Port 0 (TB) 001 = Port 1 010 = Port 2 011 = Port 3 100 = Port 4 101 = Port 5 110 = Reserved 111 = No Local
x	x	x	x													Reference Source	0000 = Ref A Auto 0001 = Ref B Auto 0010 = Preset 2 Auto 0011 = Preset 3 Auto 0100 = Preset 4 Auto 0101 = Preset 5 Auto 0110 = Preset 6 Auto 0111 = Preset 7 Auto 1000 = Term Blk Manual 1001 = DPI 1 Manual 1010 = DPI 2 Manual 1011 = DPI 3 Manual 1100 = DPI 4 Manual 1101 = DPI 5 Manual 1110 = Reserved 1111 = Jog Ref

(1) See “Owners” on page 3-50 for further information.

Output Devices

Common mode cores are internal to the drive. For information on output devices such as output contactors, cable terminators and output reactors refer to the *PowerFlex Reference Manual*.

Drive, Fuse & Circuit Breaker Ratings

The tables on the following pages provide drive ratings (including continuous, 1 minute and 3 second) and recommended AC line input fuse and circuit breaker information. Both types of short circuit protection are acceptable for UL and IEC requirements. Sizes listed are the recommended sizes based on 40 degree C and the U.S. N.E.C. Other country, state or local codes may require different ratings.

Fusing

If fuses are chosen as the desired protection method, refer to the recommended types listed below. If available amp ratings do not match the tables provided, the closest fuse rating that exceeds the drive rating should be chosen.

- IEC – BS88 (British Standard) Parts 1 & 2(1), EN60269-1, Parts 1 & 2, type gG or equivalent should be used.
- UL – UL Class CC, T, RK1 or J must be used.

Circuit Breakers

The “non-fuse” listings in the following tables include both circuit breakers (inverse time or instantaneous trip) and 140M Self-Protecting Motor Starters. **If one of these is chosen as the desired protection method**, the following requirements apply.

- IEC and UL – Both types of devices are acceptable for IEC and UL installations.

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(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.

Table A.A 208 Volt AC Input Protection Devices (See page A-13 for Notes)

Drive Catalog Number	Frame	HP Rating		PWM Freq.	Temp.	Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)	140M Motor Starter with Adjustable Current Range (5)(6)			
		ND	*HD*	*kHz*	*°C*	*Amps*	*kVA*	*Cont.*	*1 Min.*	*3 Sec.*	*Min. (1)*	*Max. (2)*	*Min. (1)*	*Max. (2)*	*Max. (8)*	*Max. (8)*	*Available Catalog Numbers - 140 . . . (7)*			
208 Volt AC Input																				
20BB2P2	0	0.5	0.33	4	50	1.9	0.7	2.5	2.8	3.8	3	6	3	10	15	3	M-C2E-B25	M-D8E-B25	–	–
20BB4P2	0	1	0.75	4	50	3.7	1.3	4.8	5.6	7.0	6	10	6	17.5	15	7	M-C2E-B63	M-D8E-B63	–	–
20BB6P8	1	2	1.5	4	50	6.8	2.4	7.8	10.4	13.8	10	15	10	30	30	15	M-C2E-C10	M-D8E-C10	M-F8E-C10	–
20BB9P6	1	3	2	4	50	9.5	3.4	11	12.1	17	12	20	12	40	40	15	M-C2E-C16	M-D8E-C16	M-F8E-C16	–
20BB015	1	5	3	4	50	15.7	5.7	17.5	19.3	26.3	20	35	20	70	70	30	M-C2E-C20	M-D8E-C20	M-F8E-C20	–
20BB022	1	7.5	5	4	50	23.0	8.3	25.3	27.8	38	30	50	30	100	100	30	M-C2E-C25	M-D8E-C25	M-F8E-C25	-CMN-2500
20BB028	2	10	7.5	4	50	29.6	10.7	32.2	38	50.6	40	70	40	125	125	50	–	–	M-F8E-C32	-CMN-4000
20BB042	3	15	10	4	50	44.5	16.0	48.3	53.1	72.5	60	100	60	175	175	70	–	–	M-F8E-C45	-CMN-6300
20BB052	3	20	15	4	50	51.5	17.1	56	64	86	80	125	80	200	200	100	–	–	–	-CMN-6300
20BB070	4	25	20	4	50	72	25.9	78.2	93	124	90	175	90	300	300	100	–	–	–	-CMN-9000
20BB080	4	30	25	4	50	84.7	30.5	92	117	156	110	200	110	350	350	150	–	–	–	-CMN-9000
20BB104	5	40	–	4	50	113	40.7	120	132	175	150	250	150	475	350	150	–	–	–	–
		–	30	4	50	84.7	30.5	92	138	175	125	200	125	350	300	150	–	–	–	-CMN-9000
20BB130	5	50	–	4	50	122	44.1	130	143	175	175	275	175	500	375	250	–	–	–	–
		–	40	4	50	98	35.3	104	156	175	125	225	125	400	300	150	–	–	–	–
20BB154	6	60	–	4	50	167	60.1	177	195	266	225	350	225	500	500	250	–	–	–	–
		–	50	4	50	141	50.9	150	225	300	200	300	200	500	450	250	–	–	–	–
20BB192	6	75	–	4	50	208	75.0	221	243	308	300	450	300	600	600	400	–	–	–	–
		–	60	4	50	167	60.1	177	266	308	225	350	225	500	500	250	–	–	–	–

Table A.B 240 Volt AC Input Protection Devices (See page A-13 for Notes)

Drive Catalog Number	Frame	HP Rating		PWM Freq.	Temp.	Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)	140M Motor Starter with Adjustable Current Range (5)(6)			
		ND	*HD*	*kHz*	*°C*	*Amps*	*kVA*	*Cont.*	*1 Min.*	*3 Sec.*	*Min.* (1)	*Max.* (2)	*Min.* (1)	*Max.* (2)	*Max.* (8)	*Max.* (8)	*Available Catalog Numbers - 140 . . .* (7)			
240 Volt AC Input																				
20BB2P2	0	0.5	0.33	4	50	1.7	0.7	2.2	2.4	3.3	3	6	3	10	15	3	M-C2E-B25	M-D8E-B25	–	–
20BB4P2	0	1	0.75	4	50	3.3	1.4	4.2	4.8	6.4	5	8	5	15	15	7	M-C2E-B63	M-D8E-B63	–	–
20BB6P8	1	2	1.5	4	50	5.9	2.4	6.8	9	12	10	15	10	25	25	15	M-C2E-C10	M-D8E-C10	M-F8E-C10	–
20BB9P6	1	3	2	4	50	8.3	3.4	9.6	10.6	14.4	12	20	12	35	35	15	M-C2E-C10	M-D8E-C10	M-F8E-C10	–
20BB015	1	5	3	4	50	13.7	5.7	15.3	16.8	23	20	30	20	60	60	30	M-C2E-C16	M-D8E-C16	M-F8E-C16	–
20BB022	1	7.5	5	4	50	19.9	8.3	22	24.2	33	25	50	25	80	80	30	M-C2E-C25	M-D8E-C25	M-F8E-C25	-CMN-2500
20BB028	2	10	7.5	4	50	25.7	10.7	28	33	44	35	60	35	100	100	50	–	–	M-F8E-C32	-CMN-4000
20BB042	3	15	10	4	50	38.5	16.0	42	46.2	63	50	90	50	150	150	50	–	–	M-F8E-C45	-CMN-6300
20BB052	3	20	15	4	50	47.7	19.8	52	63	80	60	100	60	200	200	100	–	–	–	-CMN-6300
20BB070	4	25	20	4	50	64.2	26.7	70	78	105	90	150	90	275	275	100	–	–	–	-CMN-9000
20BB080	4	30	25	4	50	73.2	30.5	80	105	140	100	180	100	300	300	100	–	–	–	-CMN-9000
20BB104	5	40	–	4	50	98	40.6	104	115	175	125	225	125	400	300	150	–	–	–	–
		–	30	4	50	73	30.5	80	120	160	100	175	100	300	300	100	–	–	–	-CMN-9000
20BB130	5	50	–	4	50	122	50.7	130	143	175	175	275	175	500	375	250	–	–	–	–
		–	40	4	50	98	40.6	104	156	175	125	225	125	400	300	150	–	–	–	–
20BB154	6	60	–	4	50	145	60.1	154	169	231	200	300	200	600	450	250	–	–	–	–
		–	50	4	50	122	50.7	130	195	260	175	275	175	500	375	250	–	–	–	–
20BB192	6	75	–	4	50	180	74.9	192	211	288	225	400	225	600	575	250	–	–	–	–
		–	60	4	50	145	60.1	154	231	308	200	300	200	600	450	250	–	–	–	–

Table A.C 400 Volt AC Input Protection Devices (See page A-13 for Notes)

Drive Catalog Number	Frame	kW Rating		PWM Freq.	Temp.	Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)	140M Motor Starter with Adjustable Current Range (5)(6)			
		ND	*HD*	*kHz*	*°C*	*Amps*	*kVA*	*Cont.*	*1 Min.*	*3 Sec.*	*Min.(1)*	*Max.(2)*	*Min.(1)*	*Max.(2)*	*Max.(8)*	*Max.(8)*	*Available Catalog Numbers - 140 . . .(7)*			
400 Volt AC Input																				
20BC1P3	0	0.37	0.25	4	50	1.1	0.77	1.3	1.4	1.9	3	3	3	6	15	3	M-C2E-B16	–	–	–
20BC2P1	0	0.75	0.55	4	50	1.8	1.3	2.1	2.4	3.2	3	6	3	8	15	3	M-C2E-B25	M-D8E-B25	–	–
20BC3P5	0	1.5	0.75	4	50	3.2	2.2	3.5	4.5	6.0	6	7	6	12	15	7	M-C2E-B40	M-D8E-B40	–	–
20BC5P0	0	2.2	1.5	4	50	4.6	3.2	5.0	5.5	7.5	6	10	6	20	20	7	M-C2E-B63	M-D8E-B63	–	–
20BC8P7	0	4	2.2	4	50	7.9	5.5	8.7	9.9	13.2	15	17.5	15	30	30	15	M-C2E-C10	M-D8E-C10	M-F8E-C10	–
20BC011	0	5.5	4	4	50	10.8	7.5	11.5	13	17.4	15	25	15	45	45	15	M-C2E-C16	M-D8E-C16	M-F8E-C16	–
20BC015	1	7.5	5.5	4	50	14.4	10.0	15.4	17.2	23.1	20	30	20	60	60	20	M-C2E-C20	M-D8E-C20	M-F8E-C20	–
20BC022	1	11	7.5	4	50	20.6	14.3	22	24.2	33	30	45	30	80	80	30	M-C2E-C25	M-D8E-C25	M-F8E-C25	–
20BC030	2	15	11	4	50	28.4	19.7	30	33	45	35	60	35	120	120	50	–	–	M-F8E-C32	–
20BC037	2	18.5	15	4	50	35.0	24.3	37	45	60	45	80	45	125	125	50	–	–	M-F8E-C45	–
20BC043	3	22	18.5	4	50	40.7	28.2	43	56	74	60	90	60	150	150	60	–	–	–	–
20BC056	3	30	22	4	50	53	36.7	56	64	86	70	125	70	200	200	100	–	–	–	–
20BC072	3	37	30	4	50	68.9	47.8	72	84	112	90	150	90	250	250	100	–	–	–	–
20BC085	4	45	–	4	45	81.4	56.4	85	94	128	110	200	110	300	300	150	–	–	–	–
		–	37	4	45	68.9	47.8	72	108	144	90	175	90	275	300	100	–	–	–	–
20BC105	5	55	–	4	50	100.5	69.6	105	116	158	125	225	125	400	300	150	–	–	–	–
		–	45	4	50	81.4	56.4	85	128	170	110	175	110	300	300	150	–	–	–	–
20BC125	5	55	–	4	50	121.1	83.9	125	138	163	150	275	150	500	375	250	–	–	–	–
		–	45	4	50	91.9	63.7	96	144	168	125	200	125	375	375	150	–	–	–	–
20BC140	5	75	–	4	40	136	93.9	140	154	190	200	300	200	400	400	250	–	–	–	–
		–	55	4	40	101	69.6	105	157	190	150	225	150	300	300	150	–	–	–	–
20BC170	6	90	–	4	50	164	126	170	187	255	250	375	250	600	500	250	–	–	–	–
		–	75	4	50	136	103	140	210	280	200	300	200	550	400	250	–	–	–	–
20BC205	6	110	–	4	40	199	148	205	220	289	250	450	250	600	600	400	–	–	–	–
		–	90	4	40	164	126	170	255	313	250	375	250	600	500	250	–	–	–	–
20BC260	6	132	–	2	40	255	177	260	286	390	350	550	350	750	750	400	–	–	–	–
		–	110	2	50	199	138	205	308	410	250	450	250	600	600	400	–	–	–	–

Table A.D 480 Volt AC Input Protection Devices (See page A-13 for Notes)

Drive Catalog Number	Frame	HP Rating		PWM Freq.	Temp.	Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)	140M Motor Starter with Adjustable Current Range (5)(6)			
		ND	*HD*	*kHz*	*°C*	*Amps*	*kVA*	*Cont.*	*1 Min.*	*3 Sec.*	*Min.* (1)	*Max.* (2)	*Min.* (1)	*Max.* (2)	*Max.* (8)	*Max.* (8)	*Available Catalog Numbers - 140 . . .* (7)			
480 Volt AC Input																				
20BD1P1	0	0.5	0.33	4	50	0.9	0.7	1.1	1.2	1.6	3	3	3	6	15	3	M-C2E-B16	–	–	–
20BD2P1	0	1	0.75	4	50	1.6	1.4	2.1	2.4	3.2	3	6	3	8	15	3	M-C2E-B25	–	–	–
20BD3P4	0	2	1.5	4	50	2.6	2.2	3.4	4.5	6.0	4	8	4	12	15	7	M-C2E-B40	M-D8E-B40	–	–
20BD5P0	0	3	2	4	50	3.9	3.2	5.0	5.5	7.5	6	10	6	20	20	7	M-C2E-B63	M-D8E-B63	–	–
20BD8P0	0	5	3	4	50	6.9	5.7	8.0	8.8	12	10	15	10	30	30	15	M-C2E-C10	M-D8E-C10	M-F8E-C10	–
20BD011	0	7.5	5	4	50	9.5	7.9	11	12.1	16.5	15	20	15	40	40	15	M-C2E-C16	M-D8E-C16	M-F8E-C16	–
20BD014	1	10	7.5	4	50	12.5	10.4	14	16.5	22	17.5	30	17.5	50	50	20	M-C2E-C16	M-D8E-C16	M-F8E-C16	–
20BD022	1	15	10	4	50	19.9	16.6	22	24.2	33	25	50	25	80	80	30	M-C2E-C25	M-D8E-C25	M-F8E-C25	-CMN-2500
20BD027	2	20	15	4	50	24.8	20.6	27	33	44	35	60	35	100	100	50	–	–	M-F8E-C32	-CMN-4000
20BD034	2	25	20	4	50	31.2	25.9	34	40.5	54	40	70	40	125	125	50	–	–	M-F8E-C45	-CMN-4000
20BD040	3	30	25	4	50	36.7	30.5	40	51	68	50	90	50	150	150	50	–	–	M-F8E-C45	-CMN-4000
20BD052	3	40	30	4	50	47.7	39.7	52	60	80	60	110	60	200	200	70	–	–	–	-CMN-6300
20BD065	3	50	40	4	50	59.6	49.6	65	78	104	80	125	80	250	250	100	–	–	–	-CMN-9000
20BD077	4	60	–	4	50	72.3	60.1	77	85	116	100	170	100	300	300	100	–	–	–	-CMN-9000
		–	50	4	50	59.6	49.6	65	98	130	80	125	80	250	250	100	–	–	–	-CMN-9000
20BD096	5	75	–	4	50	90.1	74.9	96	106	144	125	200	125	350	350	125	–	–	–	–
		–	60	4	50	72.3	60.1	77	116	154	100	170	100	300	300	100	–	–	–	-CMN-9000
20BD125	5	100	–	4	50	117	97.6	125	138	163	150	250	150	500	375	150	–	–	–	–
		–	75	4	50	90.1	74.9	96	144	168	125	200	125	350	350	125	–	–	–	–
20BD156	6	125	–	4	50	147	122	156	172	234	200	350	200	600	450	250	–	–	–	–
		–	100	4	50	131	109	125	188	250	175	250	175	500	375	250	–	–	–	–
20BD180	6	150	–	4	50	169	141	180	198	270	225	400	225	600	500	250	–	–	–	–
		–	125	4	50	147	122	156	234	312	200	350	200	600	450	250	–	–	–	–
20BD248	6	200	–	2	40	233	194	248	273	372	300	550	300	700	700	400	–	–	–	–
		–	150	2	50	169	141	180	270	360	225	400	225	600	500	250	–	–	–	–

Table A.E 600 Volt AC Input Protection Devices (See page A-13 for Notes)

Drive Catalog Number	Frame	HP Rating		PWM Freq.	Temp.	Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker(3)	Motor Circuit Protector(4)	140M Motor Starter with Adjustable Current Range(5)(6)			
		ND	*HD*	*kHz*	*°C*	*Amps*	*kVA*	*Cont.*	*1 Min.*	*3 Sec.*	*Min.(1)*	*Max.(2)*	*Min.(1)*	*Max.(2)*	*Max.(8)*	*Max.(8)*	*Available Catalog Numbers - 140 . . .(7)*			
600 Volt AC Input																				
20BE1P7	0	1	0.5	4	50	1.3	1.4	1.7	2	2.6	2	4	2	6	15	3	M-C2E-B16	–	–	–
20BE2P7	0	2	1	4	50	2.1	2.1	2.7	3.6	4.8	3	6	3	10	15	3	M-C2E-B25	–	–	–
20BE3P9	0	3	2	4	50	3.0	3.1	3.9	4.3	5.9	6	9	6	15	15	7	M-C2E-B40	M-D8E-B40	–	–
20BE6P1	0	5	3	4	50	5.3	5.5	6.1	6.7	9.2	9	12	9	20	20	15	M-C2E-B63	M-D8E-B63	–	–
20BE9P0	0	7.5	5	4	50	7.8	8.1	9	9.9	13.5	10	20	10	35	30	15	M-C2E-C10	M-D8E-C10	M-F8E-C10	–
20BE011	1	10	7.5	4	50	9.9	10.2	11	13.5	18	15	25	15	40	40	15	M-C2E-C10	M-D8E-C10	M-F8E-C10	–
20BE017	1	15	10	4	50	15.4	16.0	17	18.7	25.5	20	40	20	60	50	20	M-C2E-C16	M-D8E-C16	M-F8E-C16	–
20BE022	2	20	15	4	50	20.2	21.0	22	25.5	34	30	50	30	80	80	30	M-C2E-C25	M-D8E-C25	M-F8E-C25	-CMN-2500
20BE027	2	25	20	4	50	24.8	25.7	27	33	44	35	60	35	100	100	50	–	–	M-F8E-C25	-CMN-2500
20BE032	3	30	25	4	50	29.4	30.5	32	40.5	54	40	70	40	125	125	50	–	–	M-F8E-C32	-CMN-4000
20BE041	3	40	30	4	50	37.6	39.1	41	48	64	50	90	50	150	150	100	–	–	M-F8E-C45	-CMN-4000
20BE052	3	50	40	4	50	47.7	49.6	52	61.5	82	60	110	60	200	200	100	–	–	–	-CMN-6300
20BE062	4	60	50	2	50	58.2	60.5	62	78	104	80	125	80	225	225	100	–	–	–	-CMN-6300
20BE077	5	75	–	2	50	72.3	75.1	77	85	116	90	150	90	300	300	100	–	–	–	-CMN-9000
		–	60	2	50	58.2	60.5	63	94	126	90	125	90	250	250	100	–	–	–	-CMN-6300
20BE099	5	100	–	2	40	92.9	96.6	99	109	126	125	200	125	375	375	150	–	–	–	–
		–	75	2	40	72.3	75.1	77	116	138	100	175	100	300	300	100	–	–	–	-CMN-9000
20BE125	6	125	–	2	50	117	122	125	138	188	150	250	150	375	375	250	–	–	–	–
		–	100	2	50	93	96.6	99	149	198	125	200	125	375	375	150	–	–	–	–
20BE144	6	150	–	2	50	135	141	144	158	216	175	300	175	400	400	250	–	–	–	–
		–	125	2	50	117	122	125	188	250	150	275	150	375	375	250	–	–	–	–

Table A.F 690 Volt AC Input Protection Devices

Drive Catalog Number	Frame	kW Rating		PWM Freq.	Temp.	Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)
		ND	HD	kHz	°C	Amps	kVA	Cont.	1 Min.	3 Sec.	Min. (1)	Max. (2)	Min. (1)	Max. (2)	Max. (8)	Max. (8)
690 Volt AC Input																
20BF052	5	45	–	4	50	46.9	56.1	52	57	78	60	110	60	175	175	–
		–	37.5	4	50	40.1	48.0	46	69	92	50	90	50	150	150	–
20BF060	5	55	–	4	50	57.7	68.9	60	66	90	80	125	80	225	225	–
		–	45	4	50	46.9	56.1	52	78	104	60	110	60	175	175	–
20BF082	5	75	–	2	50	79.0	94.4	82	90	123	100	200	100	375	375	–
		–	55	2	50	57.7	68.9	60	90	120	80	125	80	225	225	–
20BF098	5	90	–	2	40	94.7	113	98	108	127	125	200	125	375	375	–
		–	75	2	40	79.0	94.4	82	123	140	100	200	100	375	375	–
20BF119	6	110	–	2	50	115	137	119	131	179	150	250	150	400	–	–
		–	90	2	50	94.7	113	98	147	196	125	200	125	375	–	–
20BF142	6	132	–	2	50	138	165	142	156	213	175	300	175	450	–	–
		–	110	2	50	115	137	119	179	238	150	250	150	400	–	–

Notes:

(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) Motor Circuit Protector - instantaneous trip circuit breaker. For US NEC minimum size is 125% of motor FLA. Ratings shown are maximum.
(5) Bulletin 140M with adjustable current range should have the current trip set to the minimum range that the device will not trip.
(6) Manual Self-Protected (Type E) Combination Motor Controller, UL listed for 208 Wye or Delta, 240 Wye or Delta, 480Y/277 or 600Y/ 347. Not UL listed for use on 480V or 600V Delta/Delta systems.
(7) The AIC ratings of the Bulletin 140M Motor Protector may vary. See publication 140M-SG001B-EN-P.
(8) Maximum allowable rating by US NEC. Exact size must be chosen for each installation.

Table A.G 540 Volt DC Input Protection Devices

Drive Catalog Number	**Frame**	**kW Rating**		**DC Input Ratings**		**Output Amps**			**Fuse**	**Bussmann Style Fuse**
		ND	*HD*	*Amps*	*kW*	*Cont.*	*1 Min.*	*3 Sec.*		
540 Volt DC Input										
20BC1P3	1	0.37	0.25	1.3	0.7	1.3	1.4	1.9	3	BUSSMANN_JKS-3
20BC2P1	1	0.75	0.55	2.1	1.1	2.1	2.4	3.2	6	BUSSMANN_JKS-6
20BC3P5	1	1.5	0.75	3.7	2.0	3.5	4.5	6.0	8	BUSSMANN_JKS-8
20BC5P0	1	2.2	1.5	5.3	2.9	5.0	5.5	7.5	10	BUSSMANN_JKS-10
20BC8P7	1	4	3.0	9.3	5.0	8.7	9.9	13.2	20	BUSSMANN_JKS-20
20BC011	1	5.5	4	12.6	6.8	11.5	13	17.4	25	BUSSMANN_JKS-25
20BC015	1	7.5	5.5	16.8	9.1	15.4	17.2	23.1	30	BUSSMANN_JKS-30
20BC022	1	11	7.5	24	13	22	24.2	33	45	BUSSMANN_JKS-45
20BC030	2	15	11	33.2	17.9	30	33	45	60	BUSSMANN_JKS-60
20BC037	2	18.5	15	40.9	22.1	37	45	60	80	BUSSMANN_JKS-80
20BC043	3	22	18.5	47.5	25.7	43	56	74	90	BUSSMANN_JKS-90
20BC056	3	30	22	61.9	33.4	56	64	86	110	BUSSMANN_JKS-110
20BC072	3	37	30	80.5	43.5	72	84	112	150	BUSSMANN_JKS-150
20BC085	4	–	37	80.5	43.5	72	108	144	150	BUSSMANN_JKS-150
		45	–	95.1	51.3	85	94	128	200	BUSSMANN_JKS-200
20BH105 (1)	5	–	45	95.1	51.3	85	128	170	200	BUSSMANN_JKS-200
		55	–	117.4	63.4	105	116	158	200	BUSSMANN_JKS-200
20BH125 (1)	5	–	45	91.9	63.7	96	144	168	150	
		55	–	139.8	75.5	125	138	163	225	BUSSMANN_JKS-225
20BH140 (1)	6	–	55	117.4	63.4	105	158	210	200	BUSSMANN_JKS-200
		75	–	158.4	85.6	140	154	210	300	BUSSMANN_JKS-300
20BH170 (1)	6	–	75	158.4	85.6	140	210	280	300	BUSSMANN_JKS-300
		90	–	192.4	103.9	170	187	255	350	BUSSMANN_JKS-350
20BH205 (1)	6	–	90	192.4	103.9	170	255	313	350	BUSSMANN_JKS-350
		110	–	232	125.3	205	220	289	400	BUSSMANN_JKS-400

(1) Also applies to “P” voltage class.

Table A.H 650 Volt DC Input Protection Devices

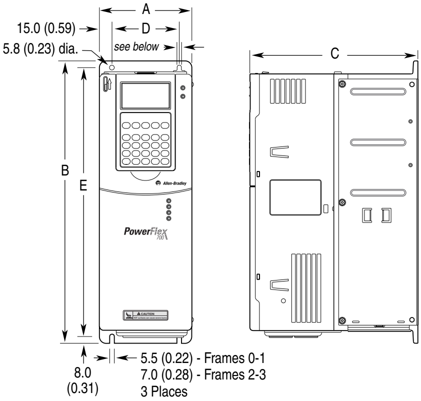
Drive Catalog Number	**Frame**	**kW Rating**		**DC Input Ratings**		**Output Amps**			**Fuse**	**Bussmann Style Fuse**
		ND	*HD*	*Amps*	*kW*	*Cont.*	*1 Min.*	*3 Sec.*		
650 Volt DC Input										
20BD1P1	0	0.5	0.33	1.0	0.6	1.1	1.2	1.6	6	BUSSMANN_JKS-6
20BD2P1	0	1	0.75	1.9	1.2	2.1	2.4	3.2	6	BUSSMANN_JKS-6
20BD3P4	0	2	1.5	3.0	2.0	3.4	4.5	6.0	6	BUSSMANN_JKS-6
20BD5P0	0	3	2	4.5	2.9	5.0	5.5	7.5	10	BUSSMANN_JKS-10
20BD8P0	0	5	3	8.1	5.2	8.0	8.8	12	15	BUSSMANN_JKS-15
20BD011	0	7.5	5	11.1	7.2	11	12.1	16.5	20	BUSSMANN_JKS-20
20BD014	1	10	7.5	14.7	9.5	14	16.5	22	30	BUSSMANN_JKS-30
20BD022	1	15	10	23.3	15.1	22	24.2	33	45	BUSSMANN_JKS-45
20BD027	2	20	15	28.9	18.8	27	33	44	60	BUSSMANN_JKS-60
20BD034	2	25	20	36.4	23.6	34	40.5	54	70	BUSSMANN_JKS-70
20BD040	3	30	25	42.9	27.8	40	51	68	80	BUSSMANN_JKS-80
20BD052	3	40	30	55.7	36.1	52	60	80	100	BUSSMANN_JKS-100
20BD065	3	50	40	69.7	45.4	65	78	104	150	BUSSMANN_JKS-150
20BR077 (1)	4	–	50	67.9	45.4	65	98	130	150	BUSSMANN_JKS-150
	4	60	–	84.5	54.7	77	85	116	150	BUSSMANN_JKS-150

Drive Catalog Number	Frame	kW Rating		DC Input Ratings		Output Amps			Fuse	Bussmann Style Fuse
		ND	*HD*	*Amps*	*kW*	*Cont.*	*1 Min.*	*3 Sec.*		
20BR096 [1]	5	–	60	84.5	54.7	77	116	154	150	BUSSMANN_JKS-150
		75	–	105.3	68.3	96	106	144	200	BUSSMANN_JKS-200
20BR125 [1]	5	–	75	105.3	68.3	96	144	168	200	BUSSMANN_JKS-200
		100	–	137.1	88.9	125	138	163	250	BUSSMANN_JKS-250
20BR156 [1]	6	–	100	137.1	88.9	125	188	250	250	BUSSMANN_JKS-250
		125	–	171.2	110.9	156	172	234	300	BUSSMANN_JKS-300
20BR180 [1]	6	–	125	171.2	110.9	156	234	312	300	BUSSMANN_JKS-300
		150	–	204.1	132.2	180	198	270	400	BUSSMANN_JKS-400

[1] Also applies to "J" voltage class.

Dimensions

Figure A.3 PowerFlex 700 Frames 0-3 *(0 Frame Shown)*



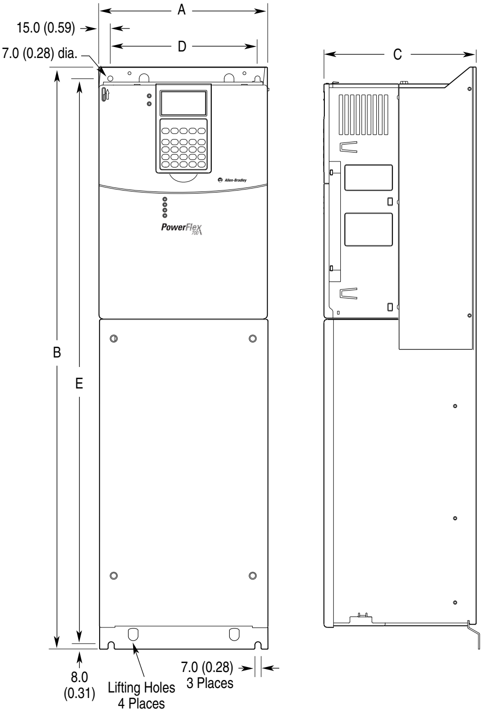
Dimensions are in millimeters and (inches).

Frame [1]	A	B	C	D	E	Weight [2] *kg (lbs.)*	
						Drive	Drive & Packaging
0	110.0 (4.33)	336.0 (13.23)	200.0 (7.87)	80.0 (3.15)	320.0 (12.60)	5.22 (11.5)	8.16 (18)
1	135.0 (5.31)	336.0 (13.23)	200.0 (7.87)	105.0 (4.13)	320.0 (12.60)	7.03 (15.5)	9.98 (22)
2	222.0 (8.74)	342.5 (13.48)	200.0 (7.87)	192.0 (7.56)	320.0 (12.60)	12.52 (27.6)	15.20 (33.5)
3	222.0 (8.74)	517.5 (20.37)	200.0 (7.87)	192.0 (7.56)	500.0 (19.69)	18.55 (40.9)	22.68 (50)

[1] Refer to Table A.I for frame information.

[2] Weights include HIM and Standard I/O.

Figure A.4 PowerFlex 700 Frame 4


A
15.0 (0.59)
D
7.0 (0.28) dia.
C
B
E
Allen-Bradley
PowerFlex 700
8.0
(0.31)
Lifting Holes
4 Places
7.0 (0.28)
3 Places

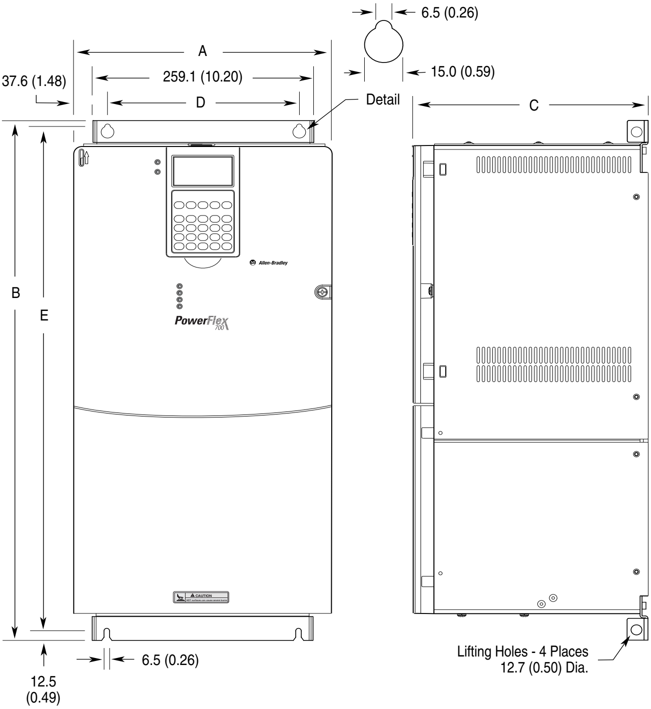
Dimensions are in millimeters and (inches)

Frame[1]	**A** *(Max.)*	**B**	**C** *(Max.)*	**D**	**E**	**Approx. Weight**[2] *kg (lbs.)* **Drive**	**Approx. Weight**[2] *kg (lbs.)* **Drive & Packaging**
4	220.0 (8.66)	758.8 (29.87)	201.7 (7.94)	192.0 (7.56)	738.2 (29.06)	24.49 (54.0)	29.03 (64.0)

[1] Refer to Table A.I for frame information.

[2] Weights include HIM and Standard I/O.

Figure A.5 PowerFlex 700 Frame 5


6.5 (0.26)
A
37.6 (1.48)
259.1 (10.20)
15.0 (0.59)
D
Detail
C
B
E
Allen-Bradley
PowerFlex 700
CAUTION
6.5 (0.26)
12.5
(0.49)
Lifting Holes - 4 Places
12.7 (0.50) Dia.

Dimensions are in millimeters and (inches).

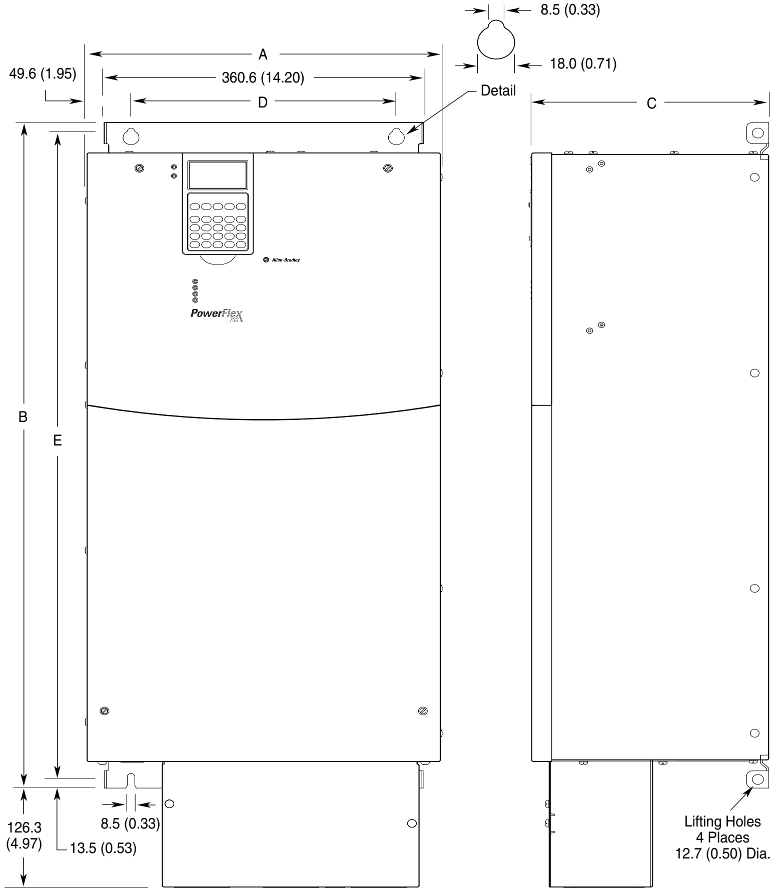
Frame (1)	**A** *(Max.)*	**B**	**C** *(Max.)*	**D**	**E**	**Approx. Weight** (2) *kg (lbs.)*	
						Drive	**Drive & Packaging**
5	308.9 (12.16)	644.5 (25.37) (3)	275.4 (10.84)	225.0 (8.86)	625.0 (24.61)	37.19 (82.0)	42.18 (93.0)

(1) Refer to Table A.I for frame information.

(2) Weights include HIM and Standard I/O.

(3) When using the supplied junction box (100 HP drives Only), add an additional 45.1 mm (1.78 in.) to this dimension.

Figure A.6 PowerFlex 700 Frame 6


8.5 (0.33)
18.0 (0.71)
Detail
A
49.6 (1.95)
360.6 (14.20)
D
C
B
E
Allen-Bradley
PowerFlex 700
126.3
(4.97)
8.5 (0.33)
13.5 (0.53)
Lifting Holes
4 Places
12.7 (0.50) Dia.

Dimensions are in millimeters and (inches)

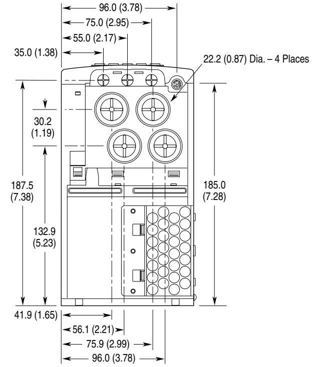
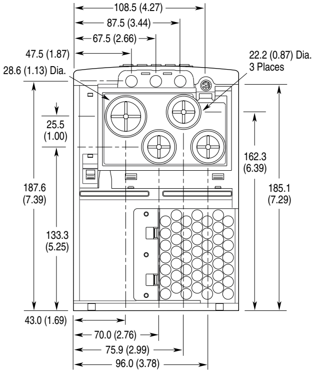
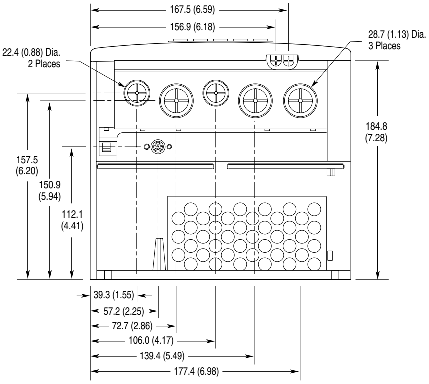
Frame[1]	A *(Max.)*	B	C *(Max.)*	D	E	Approx. Weight[2] *kg (lbs.)* Drive	Approx. Weight[2] *kg (lbs.)* Drive & Packaging
6	403.9 (15.90)	850.0 (33.46)	275.5 (10.85)	300.0 (11.81)	825.0 (32.48)	71.44 (157.5)[3]	91.85 (202.5)[3]

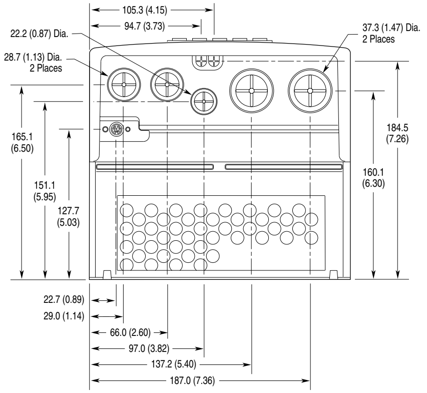
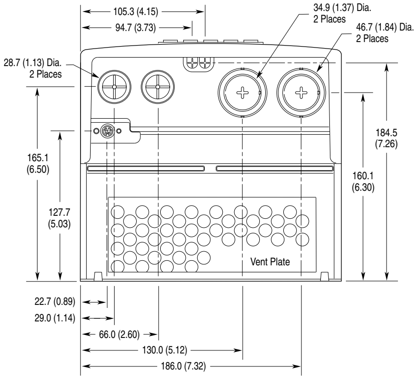
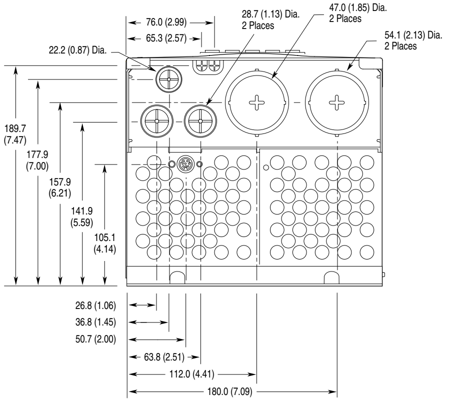
[1] Refer to Table A.I for frame information.

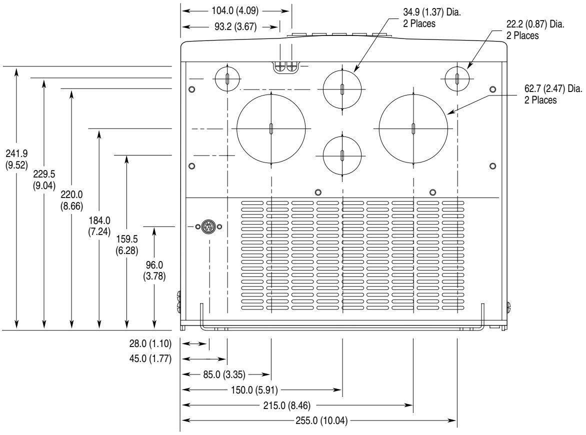
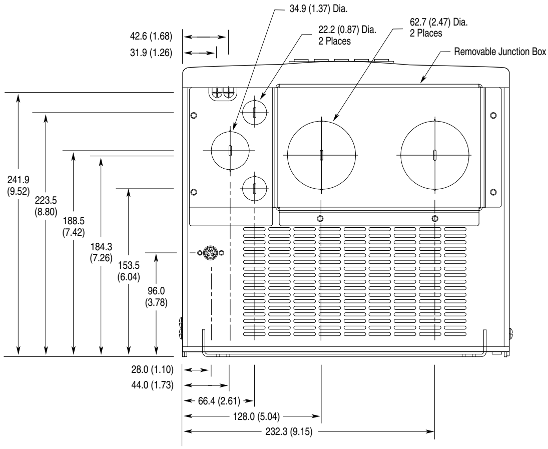
[2] Weights include HIM and Standard I/O.

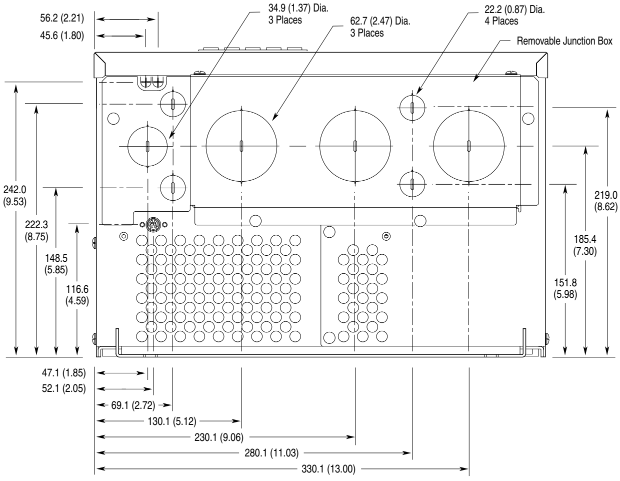
[3] Add an additional 3.6 kg (8.00 lbs.) for 200 HP drives.

Figure A.7 PowerFlex 700 Bottom View Dimensions

Frame	Rating	Dimensions
0	All	 96.0 (3.78) 75.0 (2.95) 55.0 (2.17) 35.0 (1.38) 22.2 (0.87) Dia. – 4 Places 30.2 (1.19) 187.5 (7.38) 185.0 (7.28) 132.9 (5.23) 41.9 (1.65) 56.1 (2.21) 75.9 (2.99) 96.0 (3.78)
1	All	 108.5 (4.27) 87.5 (3.44) 67.5 (2.66) 47.5 (1.87) 28.6 (1.13) Dia. 22.2 (0.87) Dia. 3 Places 25.5 (1.00) 162.3 (6.39) 187.6 (7.39) 185.1 (7.29) 133.3 (5.25) 43.0 (1.69) 70.0 (2.76) 75.9 (2.99) 96.0 (3.78)
2	All	 167.5 (6.59) 156.9 (6.18) 22.4 (0.88) Dia. 2 Places 28.7 (1.13) Dia. 3 Places 184.8 (7.28) 157.5 (6.20) 150.9 (5.94) 112.1 (4.41) 39.3 (1.55) 57.2 (2.25) 72.7 (2.86) 106.0 (4.17) 139.4 (5.49) 177.4 (6.98)

Frame	Rating	Dimensions
3	All *except* 50 HP, 480V (37 kW, 400V)	 105.3 (4.15) 94.7 (3.73) 22.2 (0.87) Dia. 28.7 (1.13) Dia. 2 Places 37.3 (1.47) Dia. 2 Places 165.1 (6.50) 151.1 (5.95) 127.7 (5.03) 184.5 (7.26) 160.1 (6.30) 22.7 (0.89) 29.0 (1.14) 66.0 (2.60) 97.0 (3.82) 137.2 (5.40) 187.0 (7.36)
	50 HP, 480V (37 kW, 400V) Normal Duty Drive	 105.3 (4.15) 94.7 (3.73) 34.9 (1.37) Dia. 2 Places 46.7 (1.84) Dia. 2 Places 28.7 (1.13) Dia. 2 Places 165.1 (6.50) 127.7 (5.03) 184.5 (7.26) 160.1 (6.30) Vent Plate 22.7 (0.89) 29.0 (1.14) 66.0 (2.60) 130.0 (5.12) 186.0 (7.32)
4	All	 76.0 (2.99) 65.3 (2.57) 28.7 (1.13) Dia. 2 Places 47.0 (1.85) Dia. 2 Places 54.1 (2.13) Dia. 2 Places 22.2 (0.87) Dia. 189.7 (7.47) 177.9 (7.00) 157.9 (6.21) 141.9 (5.59) 105.1 (4.14) 26.8 (1.06) 36.8 (1.45) 50.7 (2.00) 63.8 (2.51) 112.0 (4.41) 180.0 (7.09)

Frame	Rating	Dimensions
5	75 HP, 480V (55kW, 400V) Normal Duty Drive	 104.0 (4.09) 93.2 (3.67) 34.9 (1.37) Dia. 2 Places 22.2 (0.87) Dia. 2 Places 62.7 (2.47) Dia. 2 Places 241.9 (9.52) 229.5 (9.04) 220.0 (8.66) 184.0 (7.24) 159.5 (6.28) 96.0 (3.78) 28.0 (1.10) 45.0 (1.77) 85.0 (3.35) 150.0 (5.91) 215.0 (8.46) 255.0 (10.04)
	100 HP, 480V Normal Duty Drive	 34.9 (1.37) Dia. 42.6 (1.68) 31.9 (1.26) 22.2 (0.87) Dia. 2 Places 62.7 (2.47) Dia. 2 Places Removable Junction Box 241.9 (9.52) 223.5 (8.80) 188.5 (7.42) 184.3 (7.26) 153.5 (6.04) 96.0 (3.78) 28.0 (1.10) 44.0 (1.73) 66.4 (2.61) 128.0 (5.04) 232.3 (9.15)

Frame	Rating	Dimensions
6	All	

34.9 (1.37) Dia.
3 Places
62.7 (2.47) Dia.
3 Places
22.2 (0.87) Dia.
4 Places
Removable Junction Box
56.2 (2.21)
45.6 (1.80)
242.0
(9.53)
222.3
(8.75)
148.5
(5.85)
116.6
(4.59)
219.0
(8.62)
185.4
(7.30)
151.8
(5.98)
47.1 (1.85)
52.1 (2.05)
69.1 (2.72)
130.1 (5.12)
230.1 (9.06)
280.1 (11.03)
330.1 (13.00)

Frame Cross Reference

Table A.I PowerFlex 700 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
0	0.5	0.33	0.37	0.25	0.5	0.33	–	–	0.37	0.25	0.5	0.33
	1	0.75	0.75	0.55	1	0.75	–	–	0.75	0.55	1	0.75
	–	–	1.5	0.75	2	1.5	–	–	1.5	0.75	2	1.5
	–	–	2.2	1.5	3	2	–	–	2.2	1.5	3	2
	–	–	4	2.2	5	3	–	–	4	2.2	5	3
	–	–	5.5	4	7.5	5	–	–	5.5	4	7.5	5
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	–	–

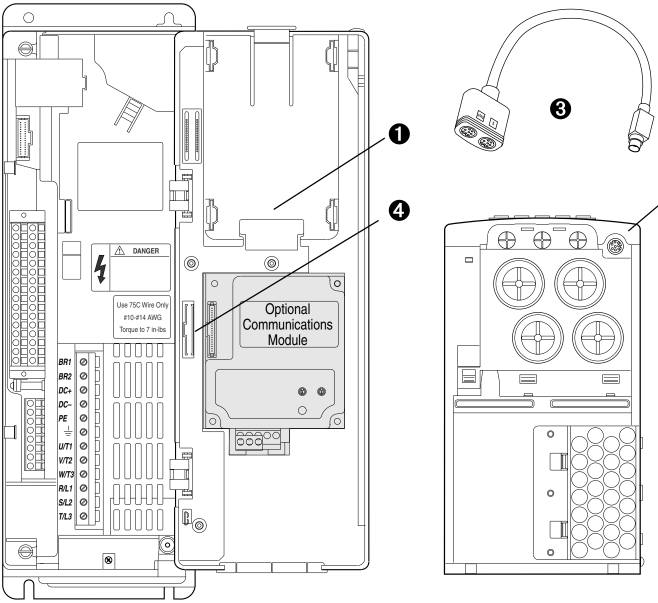
Appendix B

HIM Overview

For information on . .	See page . .	For information on . .	See page . .
External and Internal Connections	B-1	Menu Structure	B-3
LCD Display Elements	B-2	Viewing and Editing Parameters	B-5
ALT Functions	B-2	Removing/Installing the HIM	B-8

External and Internal Connections

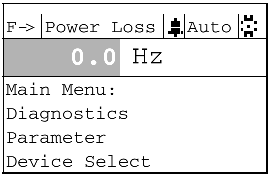
The PowerFlex 700 provides a number of cable connection points (0 Frame shown).



❶
❹
❸
❷
DANGER
Use 75C Wire Only
#10-#14 AWG
Torque to 7 in-lbs
BR1
BR2
DC+
DC–
PE
U/T1
V/T2
W/T3
R/L1
S/L2
T/L3
Optional Communications Module

No.	Connector	Description
❶	DPI Port 1	HIM connection when installed in cover.
❷	DPI Port 2	Cable connection for handheld and remote options.
❸	DPI Port 3 or 2	Splitter cable connected to DPI Port 2 provides additional port.
❹	DPI Port 5	Cable connection for communications adapter.

LCD Display Elements

Display	Description
 F-> Power Loss Auto	Direction | Drive Status | Alarm | Auto/Man | Information
0.0 Hz	Commanded or Output Frequency
Main Menu: Diagnostics Parameter Device Select	Programming / Monitoring / Troubleshooting

The top line of the HIM display can be configured with [DPI Fdbk Select], parameter 299 (Vector firmware 3.xxx and later).

ALT Functions

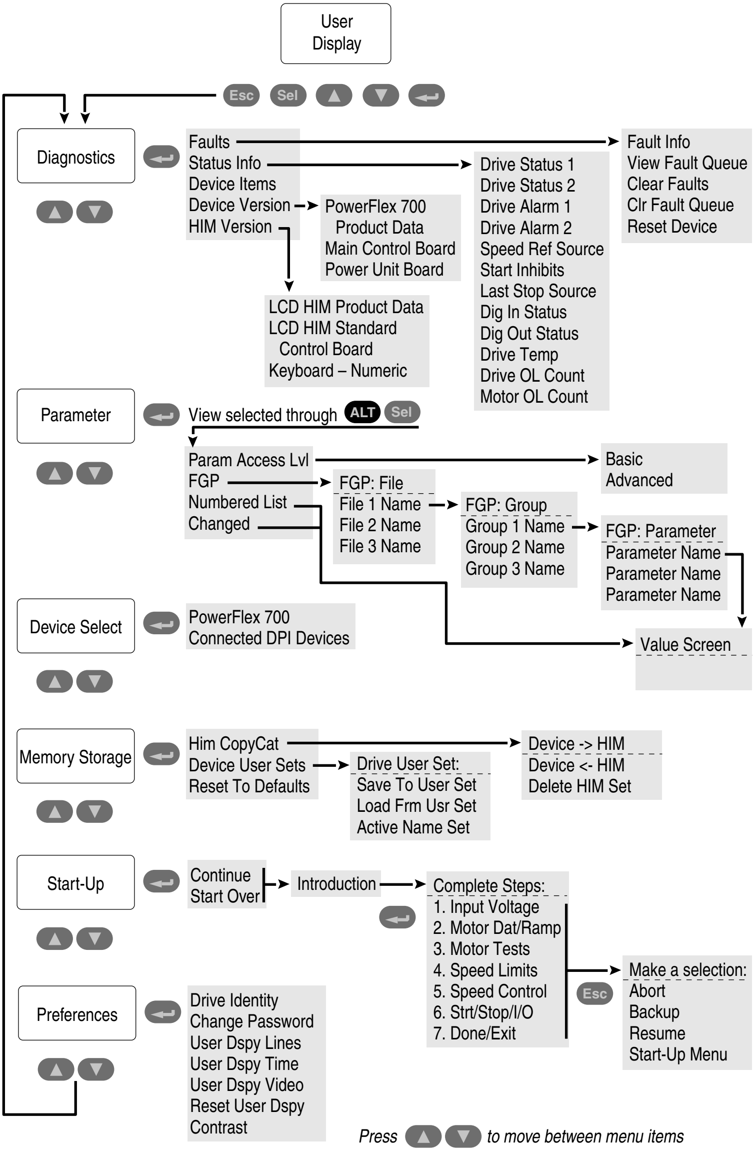
To use an ALT function, press the ALT key, release it, then press the programming key associated with one of the following functions:

Table B.A ALT Key Functions

ALT Key and then ...			Performs this function ...
ALT	Esc	S.M.A.R.T.	Displays the S.M.A.R.T. screen.
	Sel	View	Allows the selection of how parameters will be viewed or detailed information about a parameter or component.
	▲	Lang	Displays the language selection screen.
	▼	Auto / Man	Switches between Auto and Manual Modes.
	↵	Remove	Allows HIM removal without causing a fault if the HIM is not the last controlling device and does not have Manual control of the drive.
	.	Exp	Allows value to be entered as an exponent (Not available on PowerFlex 700).
	+/–	Param #	Allows entry of a parameter number for viewing/ editing.

Menu Structure

Figure B.1 HIM Menu Structure


User Display
Esc
Sel
▲
▼
↵
Diagnostics
Faults
Status Info
Device Items
Device Version
HIM Version
Fault Info
View Fault Queue
Clear Faults
Clr Fault Queue
Reset Device
Drive Status 1
Drive Status 2
Drive Alarm 1
Drive Alarm 2
Speed Ref Source
Start Inhibits
Last Stop Source
Dig In Status
Dig Out Status
Drive Temp
Drive OL Count
Motor OL Count
PowerFlex 700
Product Data
Main Control Board
Power Unit Board
LCD HIM Product Data
LCD HIM Standard
Control Board
Keyboard – Numeric
Parameter
View selected through ALT Sel
Param Access Lvl
FGP
Numbered List
Changed
Basic
Advanced
FGP: File
File 1 Name
File 2 Name
File 3 Name
FGP: Group
Group 1 Name
Group 2 Name
Group 3 Name
FGP: Parameter
Parameter Name
Parameter Name
Parameter Name
Value Screen
Device Select
PowerFlex 700
Connected DPI Devices
Memory Storage
Him CopyCat
Device User Sets
Reset To Defaults
Device -> HIM
Device <- HIM
Delete HIM Set
Drive User Set:
Save To User Set
Load Frm Usr Set
Active Name Set
Start-Up
Continue
Start Over
Introduction
Complete Steps:
1. Input Voltage
2. Motor Dat/Ramp
3. Motor Tests
4. Speed Limits
5. Speed Control
6. Strt/Stop/I/O
7. Done/Exit
Esc
Make a selection:
Abort
Backup
Resume
Start-Up Menu
Preferences
Drive Identity
Change Password
User Dspy Lines
User Dspy Time
User Dspy Video
Reset User Dspy
Contrast

Press ▲ ▼ *to move between menu items*

Press ↵ *to select a menu item*

Press Esc *to move 1 level back in the menu structure*

Press ALT Sel *to select how to view parameters*

Diagnostics Menu

When a fault trips the drive, use this menu to access detailed data about the drive.

Option	Description
Faults	View fault queue or fault information, clear faults or reset drive.
Status Info	View parameters that display status information about the drive.
Device Version	View the firmware version and hardware series of components.
HIM Version	View the firmware version and hardware series of the HIM.

Parameter Menu

Refer to Viewing and Editing Parameters on page B-5.

Device Select Menu

Use this menu to access parameters in connected peripheral devices.

Memory Storage Menu

Drive data can be saved to, or recalled from, User and HIM sets.
User sets are files stored in permanent nonvolatile drive memory.
HIM sets are files stored in permanent nonvolatile HIM memory.

Option	Description
HIM Copycat Device -> HIM Device <- HIM	Save data to a HIM set, load data from a HIM set to active drive memory or delete a HIM set.
Device User Sets	Save data to a User set, load data from a User set to active drive memory or name a User set.
Reset To Defaults	Restore the drive to its factory-default settings.

Start Up Menu

See Chapter 2.

Preferences Menu

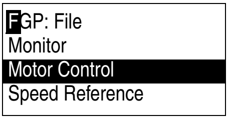
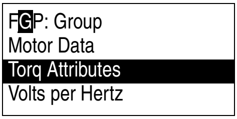
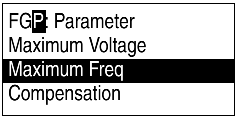
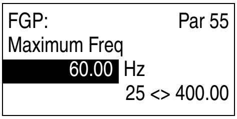
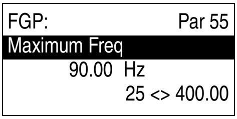
The HIM and drive have features that you can customize.

Option	Description
Drive Identity	Add text to identify the drive.
Change Password	Enable/disable or modify the password.
User Dspy Lines	Select the display, parameter, scale and text for the User Display. The User Display is two lines of user-defined data that appears when the HIM is not being used for programming.
User Dspy Time	Set the wait time for the User Display or enable/disable it.
User Dspy Video	Select Reverse or Normal video for the Frequency and User Display lines.
Reset User Dspy	Return all the options for the User Display to factory default values.

The PowerFlex 700 drive is initially set to Basic Parameter View. To view all parameters, set parameter 196 [Param Access Lvl] to option 1 "Advanced". Parameter 196 is not affected by the Reset to Defaults function.

Viewing and Editing Parameters

LCD HIM

Step	Key(s)	Example Displays
1. In the Main Menu, press the Up Arrow or Down Arrow to scroll to "Parameter."	▲ or ▼	
2. Press Enter. "FGP File" appears on the top line and the first three files appear below it.	↵	 FGP: File Monitor Motor Control Speed Reference
3. Press the Up Arrow or Down Arrow to scroll through the files.	▲ or ▼	
4. Press Enter to select a file. The groups in the file are displayed under it.	↵	 FGP: Group Motor Data Torq Attributes Volts per Hertz
5. Repeat steps 3 and 4 to select a group and then a parameter. The parameter value screen will appear.		 FGP: Parameter Maximum Voltage Maximum Freq Compensation
6. Press Enter to edit the parameter.	↵	
7. Press the Up Arrow or Down Arrow to change the value. If desired, press Sel to move from digit to digit, letter to letter, or bit to bit. The digit or bit that you can change will be highlighted.	▲ or ▼ Sel	 FGP: Par 55 Maximum Freq 60.00 Hz 25 <> 400.00
8. Press Enter to save the value. If you want to cancel a change, press Esc.	↵	
9. Press the Up Arrow or Down Arrow to scroll through the parameters in the group, or press Esc to return to the group list.	▲ or ▼ Esc	 FGP: Par 55 Maximum Freq 90.00 Hz 25 <> 400.00

Numeric Keypad Shortcut

If using a HIM with a numeric keypad, press the ALT key and the +/– key to access the parameter by typing its number.

Linking Parameters (Vector Control Option Only)

Most parameter values are entered directly by the user. However, certain parameters can be “linked,” so the value of one parameter becomes the value of another. For Example: the value of an analog input can be linked to [Accel Time 2]. Rather than entering an acceleration time directly (via HIM), the link allows the value to change by varying the analog signal. This can provide additional flexibility for advanced applications.

Each link has 2 components:

- Source parameter – sender of information.
- Destination parameter – receiver of information.

Most parameters can be a source of data for a link, except parameter values that contain an integer representing an ENUM (text choice). These are not allowed, since the integer is not actual data (it represents a value). Table B.B lists the parameters that can be destinations. All links must be established between equal data types (parameter value formatted in floating point can only source data to a destination parameter value that is also floating point).

Establishing A Link

Step	Key(s)	Example Displays
1. Select a valid destination parameter (see Table B.B) to be linked (refer to page B-5). The parameter value screen will appear.		FGP: Parameter Accel Time 1 Accel Time 2 Decel Time 1
2. Press Enter to edit the parameter. The cursor will move to the value line.	↵	Min: 0.1 Secs Max: 3600.0 Secs Dflt: 10.0 Secs Present Value
3. Press ALT and then View (Sel). Next, press the Up or Down Arrow to change “Present Value” to “Define Link.” Press Enter.	ALT + Sel ▲ or ▼ ↵	. . . Define Link
4. Enter the Source Parameter Number and press Enter. The linked parameter can now be viewed two different ways by repeating steps 1-4 and selecting “Present Value” or “Define Link.” If an attempt is made to edit the value of a linked parameter, “Parameter is Linked!” will be displayed, indicating that the value is coming from a source parameter and can not be edited.	↵	Parameter: #141 Accel Time 2 Link: 017 Analog In1 Value
5. To remove a link, repeat steps 1-5 and change the source parameter number to zero (0).		
6. Press Esc to return to the group list.	Esc	

Table B.B Linkable Parameters

Number	Parameter
54	Maximum Voltage
56	Compensation
57	Flux Up Mode
58	Flux Up Time
59	SV Boost Filter
62	IR Voltage Drop
63	Flux Current Ref
69	Start/Acc Boost
70	Run Boost
71	Break Voltage
72	Break Frequency
84	Skip Frequency 1
85	Skip Frequency 2
86	Skip Frequency 3
87	Skip Freq Band
91	Speed Ref A Hi
92	Speed Ref A Lo
94	Speed Ref B Hi
95	Speed Ref B Lo
97	TB Man Ref Hi
98	TB Man Ref Lo
100	Jog Speed
101	Preset Speed 1
102	Preset Speed 2
103	Preset Speed 3
104	Preset Speed 4
105	Preset Speed 5
106	Preset Speed 6
107	Preset Speed 7
119	Trim Hi
120	Trim Lo
121	Slip RPM @ FLA
122	Slip Comp Gain
123	Slip RPM Meter
127	PI Setpoint
129	PI Integral Time
130	PI Prop Gain
131	PI Lower Limit
132	PI Upper Limit
133	PI Preload
140	Accel Time 1
141	Accel Time 2
142	Decel Time 1
143	Decel Time 2
146	S-Curve %
148	Current Lmt Val
149	Current Lmt Gain
151	PWM Frequency
152	Droop RPM @ FLA
153	Regen Power Limit
154	Current Rate Limit
158	DC Brake Level
159	DC Brake Time
160	Bus Reg Ki
164	Bus Reg Kp
165	Bus Reg Kd
170	Flying StartGain
175	Auto Rstrt Delay
180	Wake Level
181	Wake Time
182	Sleep Level
183	Sleep Time
185	Power Loss Time
186	Power Loss Level
321	Anlg In Sqr Root
322	Analog In1 Hi
323	Analog In1 Lo
324	Analog In1 Loss
325	Analog In2 Hi
326	Analog In2 Lo
327	Analog In2 Loss
343	Analog Out1 Hi
344	Analog Out1 Lo
346	Analog Out2 Hi
347	Analog Out2 Lo
381	Dig Out1 Level
382	Dig Out1 OnTime
383	Dig Out1 OffTime
385	Dig Out2 Level
386	Dig Out2 OnTime
387	Dig Out2 OffTime
389	Dig Out3 Level
390	Dig Out3 OnTime
391	Dig Out3 OffTime
416	Fdbk Filter Sel
419	Notch Filter Freq
420	Notch Filter K
428	Torque Ref A Hi
429	Torque Ref A Lo
430	Torq Ref A Div
432	Torque Ref B Hi
433	Torque Ref B Lo
434	Torq Ref B Mult
435	Torque Setpoint
436	Pos Torque Limit
437	Neg Torque Limit
445	Ki Speed Loop
446	Kp Speed Loop
447	Kf Speed Loop
449	Speed Desired BW
450	Total Inertia
454	Rev Speed Limit
460	PI Reference Hi
461	PI Reference Lo
462	PI Feedback Hi
463	PI Feedback Lo
476-494	ScaleX In Value
477-495	ScaleX In Hi
478-496	ScaleX In Lo
479-497	ScaleX Out Hi
480-498	ScaleX Out Lo
602	Spd Dev Band
603	SpdBand Integrat
604	Brk Release Time
605	ZeroSpdFloatTime
606	Float Tolerance
607	Brk Set Time
608	TorqLim SlewRate
609	BrkSlip Count
610	Brk Alarm Travel
611	MicroPos Scale%

Removing/Installing the HIM

The HIM can be removed or installed while the drive is powered.

Important: HIM removal is only permissible in Auto mode. If the HIM is removed while in Manual mode or the HIM is the only remaining control device, a fault will occur.

Step	Key(s)	Example Displays
To remove the HIM . . .		
1. Press ALT and then Enter (Remove). The Remove HIM confirmation screen appears.	ALT + ↵	Remove Op Intrfc: Press Enter to Disconnect Op Intrfc? (Port 1 Control)
2. Press Enter to confirm that you want to remove the HIM.		
3. Remove the HIM from the drive.		
To install HIM . . .		
1. Insert into drive or connect cable.		

Appendix C

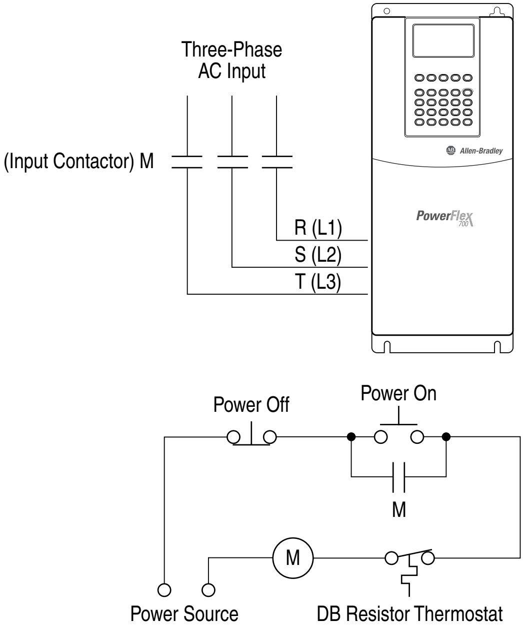
Application Notes

For information on . .	See page . .
External Brake Resistor	C-1
Lifting/Torque Proving	C-2
Minimum Speed	C-7
Motor Control Technology	C-8
Motor Overload	C-10
Overspeed	C-11
Power Loss Ride Through	C-12

For information on . .	See page . .
Process PI for Standard Control	C-13
Reverse Speed Limit	C-16
Skip Frequency	C-17
Sleep Wake Mode	C-19
Start At PowerUp	C-21
Stop Mode	C-22
Voltage Tolerance	C-24

External Brake Resistor

Figure C.1 External Brake Resistor Circuitry


Three-Phase
AC Input
(Input Contactor) M
R (L1)
S (L2)
T (L3)
Allen-Bradley
PowerFlex 700
Power Off
Power On
M
M
Power Source
DB Resistor Thermostat

Lifting/Torque Proving

The lifting/torque proving feature of the PowerFlex 700 is intended for applications where proper coordination between motor control and a mechanical brake is required. Prior to releasing a mechanical brake, the drive will check motor output phase continuity and verify proper motor control (torque proving). The drive will also verify that the mechanical brake has control of the load prior to releasing drive control (brake proving). After the drive sets the brake, motor movement is monitored to ensure the brakes ability to hold the load.

Lifting Application functionality includes:

- Torque Proving (includes flux up and last torque measurement).
- Brake Proving (includes mode to slowly lower load if brake slips/fails).
- Float Capability
- Micro-Positioning
- Fast Stop
- Speed Deviation Fault, Output Phase Loss Fault, Encoder Loss Fault.

The Lifting/Torque Proving feature is only available in Vector firmware versions 3.xxx and later. It is intended to operate in the FVC Vector Control mode (see [Motor Cntl Sel], parameter 053) with an encoder. Motor movement is monitored through the encoder feedback which excludes the other feedback modes from being used.

ATTENTION: Loss of control in suspended load applications can cause personal injury and/or equipment damage. Loads must always be controlled by the drive or a mechanical brake. Parameters 600-611 are designed for lifting/torque proving applications. It is the responsibility of the engineer and/or end user to configure drive parameters, test any lifting functionality and meet safety requirements in accordance with all applicable codes and standards.

Lifting/Torque Proving Manual Start Up

It is possible to use the Assisted Start Up (see page 2-3) to tune the motor. However, it is recommended that the motor be disconnected from the hoist/crane equipment during the routine. If this is not possible, refer to steps 1 through 12 on the following pages.

ATTENTION: To guard against personal injury and/or equipment damage caused by unexpected brake release, verify Digital Out 1 brake connections and/or programming. The default drive configuration energizes the Digital Out 1 relay when power is applied to the drive. If the brake is connected to this relay, it could be released. If necessary, disconnect the relay output until wiring/programming can be verified.

Initial Static Auto Tune Test

1. Set the following parameters as shown.

No.	Name	Value	Notes
380	[Digital Out1 Sel]	"9, At Speed"	keeps brake engaged during test
041-045	[Motor NP . . .]	per nameplate	enter motor nameplate data
053	[Motor Cntl Sel]	"4, FVC Vector"	
080	[Feedback Select]	"3, Encoder"	
061	[Autotune]	"1, Static Tune"	

2. Press the Start key on the HIM. Parameters 062-064 will be updated.

Motor Rotation/Encoder Direction Test

3. Set the following parameters as shown.

No.	Name	Value	Notes
053	[Motor Cntl Sel]	"0, Sensrls Vect"	
080	[Feedback Select]	"0, Open Loop"	
090	[Digital Out1 Sel]	"11, Preset Spd1"	
238	[Fault Config 1]	Bit 8, "In PhaseLoss" = 1 Bit 12, "OutPhaseLoss" = 1	
380	[Digital Out1 Sel]	"4, Run"	releases brake

Important: If the direction of travel is critical at this point, perform short jogs to determine which run direction (RUNFWD or RUNREV) should be used in the next steps.

4. Press Start and run the drive in the desired direction. Observe the direction of motor rotation.

If rotation is not in the desired direction:

- remove drive power and reverse the two motor leads, or . . .
- set bit 5 of [Compensation], parameter 56 to "Mtr Lead Rev."

5. With the drive running, observe [Encoder Speed], parameter 415. If the sign of the encoder is not the same as the displayed frequency, remove drive power and reverse encoder leads A and A NOT.

6. With the drive running, verify correct motor rotation and encoder direction. Set [Motor Fdbk Type], parameter 412 to "1, Quad Check." Stop the drive.

Rotate AutoTune Test

ATTENTION: In this test the following conditions will occur:

- The motor will be run for 12 seconds at base frequency (60 Hz). Note that equipment travel during this 12 second interval may exceed equipment limits. However, travel distance can be reduced by setting [Maximum Speed], parameter 82 to a value less than 45 Hz (i.e. 22.5 Hz = 12 seconds at 30 Hz).
- The brake will be released without torque provided by the drive for 15 seconds.

To guard against personal injury and/or equipment damage, this test should not be performed if either of the above conditions are considered unacceptable by the user.

7. Set the following parameters as shown.

No.	Name	Value	Notes
053	[Motor Cntl Sel]	"4, FVC Vector"	
080	[Feedback Select]	"3, Encoder"	
061	[Autotune]	"2, Rotate Tune"	

8. Start the drive and run the motor in the desired direction. Parameters 062, 063, 064 & 121 will be updated.

Inertia AutoTune Test

9. Set [Inertia Autotune], parameter 067 to "1, Inertia Tune."

10. Press Start and run the motor in the direction desired. Parameters 445, 446 and 450 will be updated.

11. Set [Speed Desired BW], parameter 449 to desired setting.

12. Set up is complete - check for proper operation.

Drive Setup

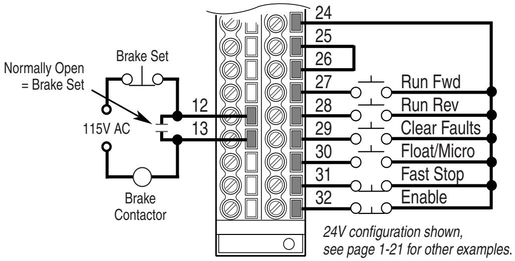
[TorqProve Cnfg], parameter 600 must be set to "Enabled." Once this is set, a Type 2 alarm will be active until the following three parameter settings are entered:

No.	Name	Value	Notes
053	[Motor Cntl Sel]	"4, FVC Vector"	
080	[Feedback Select]	"3, Encoder"	
412	[Motor Fdbk Type]	"1, Quad Check"	

Installation/Wiring

When [TorqProve Cnfg] is set to “Enable,” the Digital Out 1 relay is used to control the external brake contactor. The normally open (N.O.) contact, when closed, is intended to energize the contactor. This provides the mechanical brake with voltage, causing the brake to release. Any interruption of power to the contactor will set the mechanical brake. Programming [Digital Out1 Sel], parameter 380 will be ignored when [TorqProve Cnfg] is set to “Enable.”

Figure C.2 Typical Torque Proving Configuration

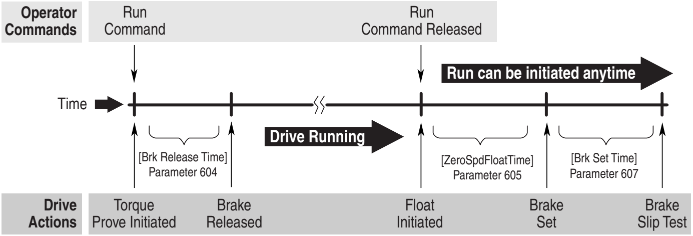

Normally Open
= Brake Set
Brake Set
115V AC
Brake
Contactor
12
13
24
25
26
27
28
29
30
31
32
Run Fwd
Run Rev
Clear Faults
Float/Micro
Fast Stop
Enable

24V configuration shown, see page 1-21 for other examples.

Lifting/Torque Proving Application Programming

The PowerFlex 700 lifting application is mainly influenced by parameters 600 through 611 in the Torque Proving group of the Application file. Figure C.3 and the paragraphs that follow describe programming.

Figure C.3 Torque Proving Flow Diagram


Operator Commands
Run Command
Run Command Released
Run can be initiated anytime
Time
Drive Running
[Brk Release Time] Parameter 604
[ZeroSpdFloatTime] Parameter 605
[Brk Set Time] Parameter 607
Drive Actions
Torque Prove Initiated
Brake Released
Float Initiated
Brake Set
Brake Slip Test

All times between Drive Actions are programmable and can be made very small (i.e. Brake Release Time can be 0.1 seconds)

Torque Proving

When the drive receives a start command to begin a lifting operation, the following actions occur:

1. The drive first performs a transistor diagnostic test to check for phase-to-phase and phase-to-ground shorts. A failure status from either of these tests will result in a drive fault and the brake relay will NOT be energized (brake remains set).
2. The drive will then provide the motor with flux as well as perform a check for current flow through all three motor phases. This ensures that torque will be delivered to the load when the mechanical brake is released. When torque proving is enabled, open phase loss detection is performed regardless of the setting of Bit 12 of [Fault Config 1], parameter 238.
3. If the drive passes all tests, the brake will be released and the drive will take control of the load after the programmed time in [Brk Release Time], parameter 604 which is the typical mechanical release time of the brake.

Brake Proving

When the drive receives a stop command to end a lifting operation, the following actions occur:

1. The brake is commanded closed when the speed of the motor reaches zero.
2. After the time period programmed in [Brk Set Time], parameter 607, the drive will verify if the brake is capable of holding torque. It will do this by ramping the torque down at a rate set in [TorqLim SlewRate], parameter 608. Note that the drive can be started again at any time without waiting for either of the above timers to finish.
3. While the torque is ramping down, the drive will perform a brake slip test. If movement exceeds the limit set in [BrkSlip Count], parameter 609, then an alarm is set and the drive will start a brake slip procedure. The drive will allow the motor to travel the distance programmed [Brk Alarm Travel], parameter 610. Another slip test will be performed and will repeat continuously until; A) the load stops slipping, or B) the load reaches the ground. This feature keeps control of the load and returns it to the ground in a controlled manner in the event of a mechanical brake failure.

Speed Monitoring / Speed Band Limit

This routine is intended to fault the drive if the difference between the speed reference and the encoder feedback is larger than the value set in [Spd Dev Band], parameter 602 and the drive is NOT making any progress toward the reference. [SpdBand Integrat], parameter 603 sets the time that the speed difference can be greater than the deviation band before causing a fault and setting the brake.

Float

Float is defined as the condition when the drive is holding the load at zero hertz while holding off the mechanical brake. The float condition starts when the frequency drops below the speed set in [Float Tolerance], parameter 606. Float will stay active for a period of time set by [ZeroSpdFloatTime], parameter 605. If a digital input (parameters 361-366) is set to "Micro Pos" (also Float) and it is closed, the Float condition will stay active and will disregard the timer. This signal is also available through a communication device, see [TorqProve Setup], parameter 601.

Micro Position

Micro Position refers to rescaling of the commanded frequency by a percentage entered in [MicroPos Scale %], parameter 611. This allows for slower operation of a lift which provides an operator with better resolution when positioning a load. Micro Position is activated only when the drive is running at or near zero speed. This can be initiated by a digital input configured as Micro Pos or through a communication device ([TorqProve Setup]) which is the same digital input which signals the float condition.

Fast Stop

Fast Stop is intended to stop the load as fast as possible then set the mechanical brake. The Fast Stop can be initiated from a digital input or through a communication device through [TorqProve Setup]. The difference from a normal stop is that the decel time is forced to be 0.1 seconds. When the Torque Proving function is enabled, the Float time is ignored at the end of the ramp. This feature can be used without enabling the Torque Proving function.

Minimum Speed

Refer to Reverse Speed Limit on page C-16

Motor Control Technology

Within the PowerFlex family there are several motor control technologies:

- Torque Producers
- Torque Controllers
- Speed Regulators

Torque Producers

Volts/Hertz

This technology follows a specific pattern of voltage and frequency output to the motor, regardless of the motor being used. The shape of the V/Hz curve can be controlled a limited amount, but once the shape is determined, the drive output is fixed to those values. Given the fixed values, each motor will react based on its own speed/torque characteristics.

This technology is good for basic centrifugal fan/pump operation and for most multi-motor applications. Torque production is generally good.

Sensorless Vector

This technology combines the basic Volts/Hertz concept with known motor parameters such as Rated FLA, HP, Voltage, stator resistance and flux producing current. Knowledge of the individual motor attached to the drive allows the drive to adjust the output pattern to the motor and load conditions. By identifying motor parameters, the drive can maximize the torque produced in the motor and extend the speed range at which that torque can be produced.

This technology is excellent for applications that require a wider speed range and applications that need maximum possible torque for breakaway, acceleration or overload. Centrifuges, extruders, conveyors and others are candidates.

Torque Controllers

Vector

This technology differs from the two above, because it actually controls or regulates torque. Rather than allowing the motor and load to actually determine the amount of torque produced, Vector technology allows the drive to regulate the torque to a defined value. By independently identifying and controlling both flux and torque currents in the motor, true control of torque is achieved. High bandwidth current regulators remain active with or without encoder feedback to produce outstanding results.

This technology is excellent for those applications where torque control, rather than mere torque production, is key to the success of the process. These include web handling, demanding extruders and lifting applications such as hoists or material handling.

Vector Control can operate in one of two configurations:

1. Encoderless

   Not to be confused with Sensorless Vector above, Encoderless Vector based on Allen-Bradley’s patented Field Oriented Control technology means that a feedback device is not required. Torque control can be achieved across a significant speed range without feedback.

2. Closed Loop (with Encoder)

   Vector Control with encoder feedback utilizes Allen-Bradley’s Force Technology™. This industry leading technology allows the drive to control torque over the entire speed range, including zero speed. For those applications that require smooth torque regulation at very low speeds or full torque at zero speed, Closed Loop Vector Control is the answer.

Speed Regulators

Any of the PowerFlex drives, regardless of their motor control technology (Volts/Hz, Sensorless Vector or Vector) can be set up to regulate speed. Speed regulation and torque regulation must be separated to understand drive operation.

The PowerFlex 70 and PowerFlex 700 with Standard Control can be programmed to regulate speed using the slip compensation feature. Slip compensation reacts to load changes by adjusting the drive output frequency to maintain motor speed. Torque production operates independently. This feature produces speed regulation of about 0.5% of base speed over a specified speed range (40:1 for V/Hz and 80:1 for Sensorless Vector). These two drives do not have the capability to extend the speed range or tighten the speed regulation below 0.5% because they do not have connections for a feedback device.

The PowerFlex 700 with the Vector Control option can offer better speed regulation by adding speed feedback. Using a speed feedback device (encoder) tightens speed regulation to 0.001% of base speed and extends the speed range to zero speed.

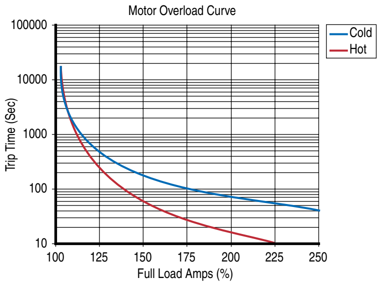
Motor Overload

For single motor applications the drive can be programmed to protect the motor from overload conditions. An electronic thermal overload I^2T function emulates a thermal overload relay. This operation is based on three parameters; [Motor NP FLA], [Motor OL Factor] and [Motor OL Hertz] (parameters 042, 048 and 047, respectively).

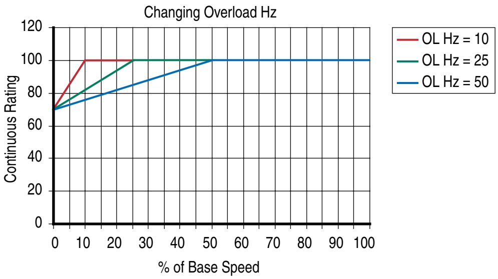
[Motor NP FLA] is multiplied by [Motor OL Factor] to allow the user to define the continuous level of current allowed by the motor thermal overload. [Motor OL Hertz] is used to allow the user to adjust the frequency below which the motor overload is derated.

The motor can operate up to 102% of FLA continuously. If the drive had just been activated, it will run at 150% of FLA for 180 seconds. If the motor had been operating at 100% for over 30 minutes, the drive will run at 150% of FLA for 60 seconds. These values assume the drive is operating above [Motor OL Hertz], and that [Motor OL Factor] is set to 1.00.

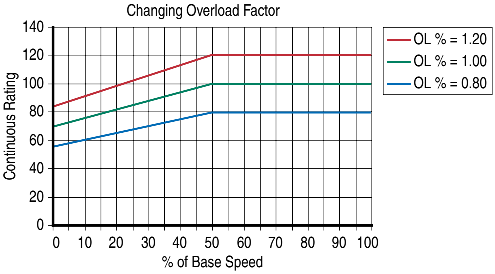
Operation below 100% current causes the temperature calculation to account for motor cooling.



[Motor OL Hertz] defines the frequency where motor overload capacity derate should begin. The motor overload capacity is reduced when operating below [Motor OL Hertz]. For all settings of [Motor OL Hertz] other than zero, the overload capacity is reduced to 70% at an output frequency of zero.



[Motor NP FLA] is multiplied by [Motor OL Factor] to select the rated current for the motor thermal overload. This can be used to raise or lower the level of current that will cause the motor thermal overload to trip. The effective overload factor is a combination of [Motor OL Hertz] and [Motor OL Factor].



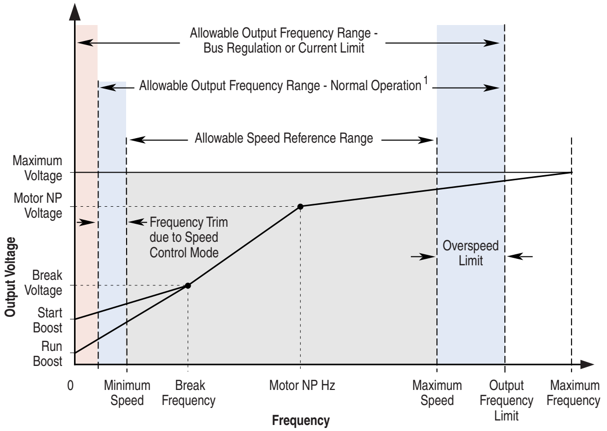
Overspeed

Overspeed Limit is a user programmable value that allows operation at maximum speed, but also provides an “overspeed band” that will allow a speed regulator such as encoder feedback or slip compensation to increase the output frequency above maximum speed in order to maintain maximum motor speed.

The figure below illustrates a typical Custom V/Hz profile. Minimum Speed is entered in Hertz and determines the lower speed reference limit during normal operation. Maximum Speed is entered in Hertz and determines the upper speed reference limit. The two “Speed” parameters only limit the speed reference and not the output frequency.

The actual output frequency at maximum speed reference is the sum of the speed reference plus “speed adder” components from functions such as slip compensation.

The Overspeed Limit is entered in Hertz and added to Maximum Speed and the sum of the two (Speed Limit) limit the output frequency. This sum (Speed Limit) must is compared to Maximum Frequency and an alarm is initiated which prevents operation if the Speed Limit exceeds Maximum Frequency.


Allowable Output Frequency Range - Bus Regulation or Current Limit
Allowable Output Frequency Range - Normal Operation 1
Allowable Speed Reference Range
Maximum Voltage
Motor NP Voltage
Frequency Trim due to Speed Control Mode
Overspeed Limit
Output Voltage
Break Voltage
Start Boost
Run Boost
0
Minimum Speed
Break Frequency
Motor NP Hz
Maximum Speed
Output Frequency Limit
Maximum Frequency
Frequency

Note 1: The lower limit on this range can be 0 depending on the value of Speed Adder

Power Loss Ride Through

When AC input power is lost, energy is being supplied to the motor from the DC bus capacitors. The energy from the capacitors is not being replaced (via the AC line), thus, the DC bus voltage will fall rapidly. The drive must detect this fall and react according to the way it is programmed. Two parameters display DC bus voltage:

- [DC Bus Voltage] - displays the instantaneous value
- [DC Bus Memory] - displays a 6 minute running average of the voltage.

All drive reactions to power loss are based on [DC Bus Memory]. This averages low and high line conditions and sets the drive to react to the average rather than assumed values. For example, a 480V installation would have a 480V AC line and produce a nominal 648V DC bus. If the drive were to react to a fixed voltage for line loss detect, (i.e. 533V DC), then normal operation would occur for nominal line installations. However, if a lower nominal line voltage of 440V AC was used, then nominal DC bus voltage would be only 594V DC. If the drive were to react to the fixed 533V level (only –10%) for line loss detect, any anomaly might trigger a false line loss detection. Line loss, therefore always uses the 6 minute average for DC bus voltage and detects line loss based on a fixed percentage of that memory. In the same example, the average would be 594V DC instead of 650V DC and the fixed percentage, 27% for “Coast to Stop” and 18% for all others, would allow identical operation regardless of line voltage.

The PowerFlex 70 uses only these fixed percentages. The PowerFlex 700 can selectively use the same percentages or the user can set a trigger point for line loss detect. The adjustable trigger level is set using [Power Loss Level] (see [Power Loss Level] on page 3-38).

Figure C.4 Power Loss Mode = Coast

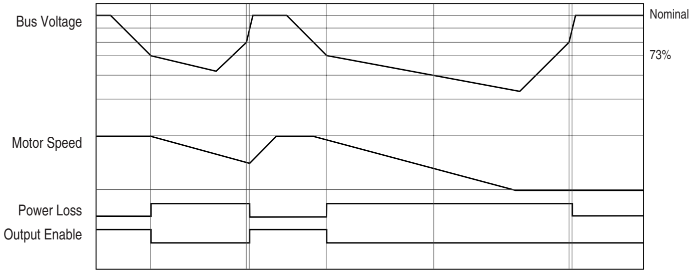
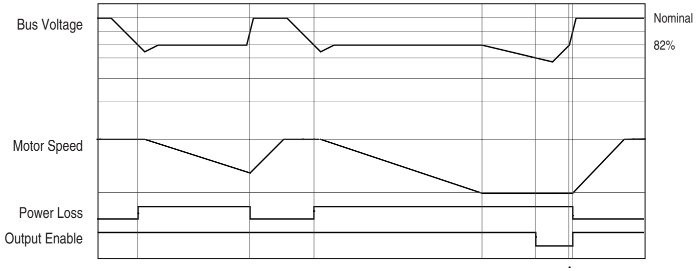


Figure C.5 Power Loss Mode = Decel

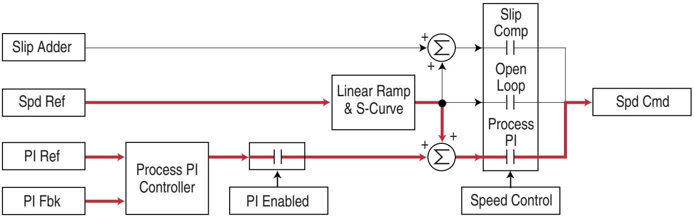


Process PI for Standard Control

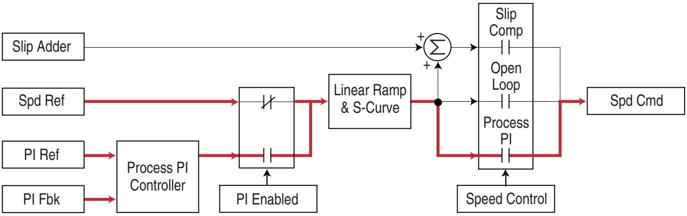
The internal PI function of the PowerFlex 700 provides closed loop process control with proportional and integral control action. The function is designed for use in applications that require simple control of a process without external control devices. The PI function allows the microprocessor of the drive to follow a single process control loop.

The PI function reads a process variable input to the drive and compares it to a desired setpoint stored in the drive. The algorithm will then adjust the output of the PI regulator, changing drive output frequency to try and make the process variable equal the setpoint.

It can operate as trim mode by summing the PI loop output with a master speed reference.

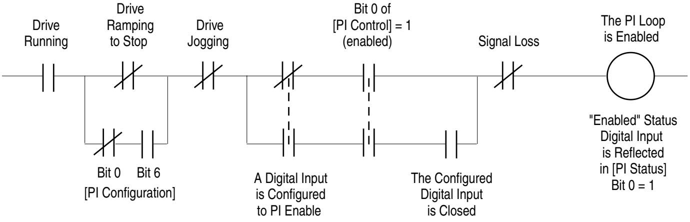

Slip Adder
Spd Ref
PI Ref
PI Fbk
Process PI Controller
PI Enabled
Linear Ramp & S-Curve
Slip Comp
Open Loop
Process PI
Speed Control
Spd Cmd
+
+
+
+

Or, it can operate as control mode by supplying the entire speed reference. This method is identified as "exclusive mode"


Slip Adder
Spd Ref
PI Ref
PI Fbk
Process PI Controller
PI Enabled
Linear Ramp & S-Curve
Slip Comp
Open Loop
Process PI
Speed Control
Spd Cmd
+
+

PI Enable

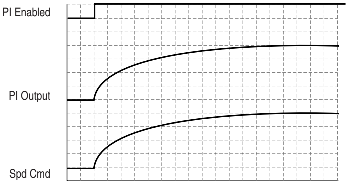
The output of the PI loop can be turned on (enabled) or turned off (disabled). This control allows the user to determine when the PI loop is providing part or all of the commanded speed. The logic for enabling the PI loop is shown below.


Drive Running
Drive Ramping to Stop
Drive Jogging
Bit 0 of [PI Control] = 1 (enabled)
Signal Loss
The PI Loop is Enabled
Bit 0
Bit 6
[PI Configuration]
A Digital Input is Configured to PI Enable
The Configured Digital Input is Closed
"Enabled" Status Digital Input is Reflected in [PI Status] Bit 0 = 1

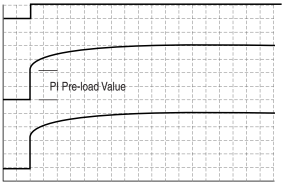
The drive must be running for the PI loop to be enabled. The loop will be disabled when the drive is ramping to a stop (unless "Stop Mode" is configured in [PI Configuration]), jogging or the signal loss protection for the analog input(s) is sensing a loss of signal.

If a digital input has been configured to "PI Enable," two events are required to enable the loop: the digital input must be closed AND bit 0 of the PI Control parameter must be = 1.

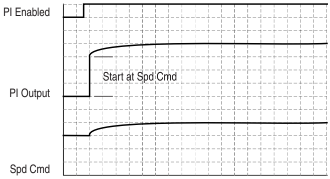
If no digital input is configured to “PI Enable,” then only the Bit 0 = 1 condition must be met. If the bit is permanently set to a “1”, then the loop will become enabled as soon as the drive goes into “run”.



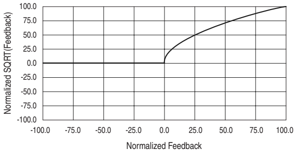
PI Pre-load Value = 0

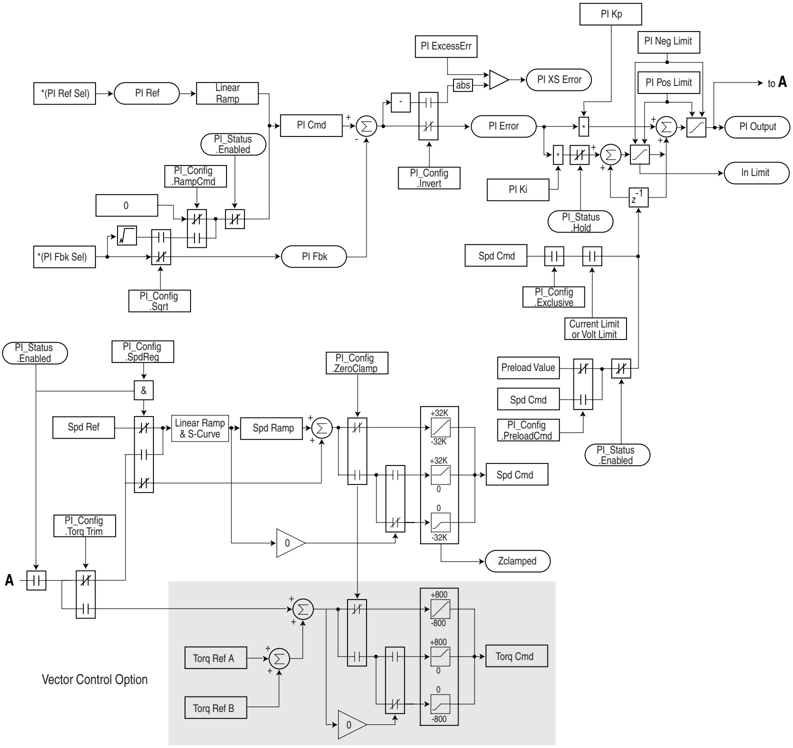


PI Pre-load Value > 0



Pre-load to Command Speed




PI Kp
PI ExcessErr
PI Neg Limit
PI XS Error
abs
PI Pos Limit
to A
*(PI Ref Sel)
PI Ref
Linear Ramp
PI Cmd
PI Error
PI Output
PI_Status .Enabled
In Limit
PI_Config .RampCmd
PI_Config .Invert
PI Ki
0
z-1
PI_Status .Hold
*(PI Fbk Sel)
PI Fbk
Spd Cmd
PI_Config .Sqrt
PI_Config .Exclusive
Current Limit or Volt Limit
PI_Status .Enabled
PI_Config .SpdReg
PI_Config .ZeroClamp
Preload Value
&
Spd Cmd
Spd Ref
Linear Ramp & S-Curve
Spd Ramp
+32K
-32K
PI_Config .PreloadCmd
PI_Status .Enabled
+32K
0
Spd Cmd
PI_Config .Torq Trim
0
0
-32K
Zclamped
A
+800
-800
Torq Ref A
+800
0
Torq Cmd
Vector Control Option
Torq Ref B
0
0
-800

Reverse Speed Limit

Figure C.6 [Rev Speed Limit], parameter 454 set to zero

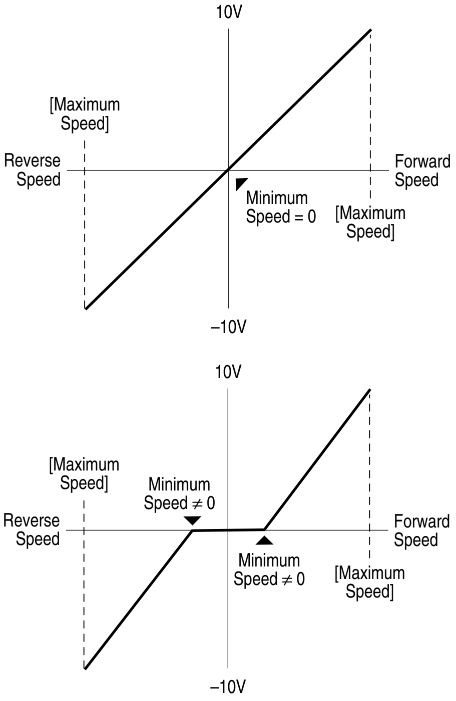
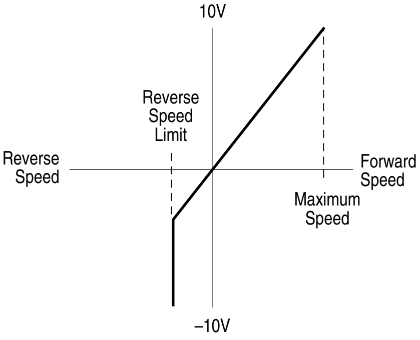
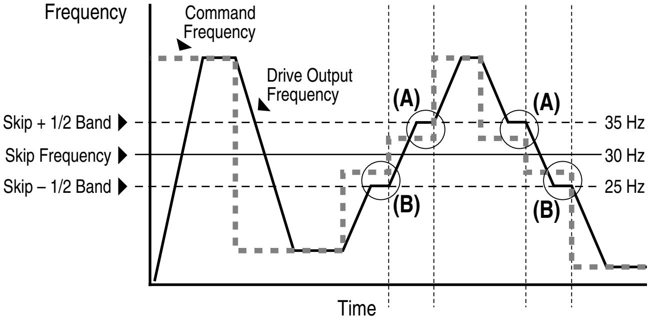


Figure C.7 [Rev Speed Limit], parameter 454 set to a non-zero Value



Skip Frequency

Figure C.8 Skip Frequency



Some machinery may have a resonant operating frequency that must be avoided to minimize the risk of equipment damage. To assure that the motor cannot continuously operate at one or more of the points, skip frequencies are used. Parameters 084-086, ([Skip Frequency 1-3]) are available to set the frequencies to be avoided.

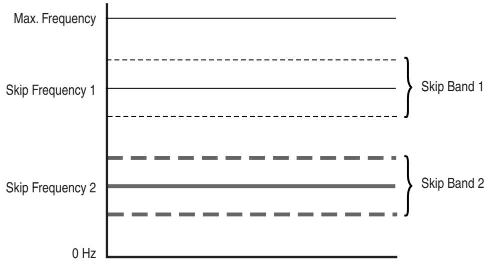
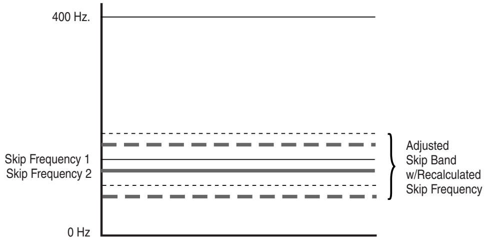
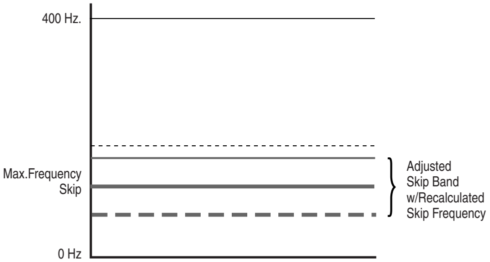
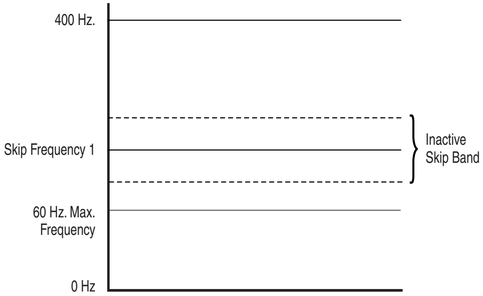
The value programmed into the skip frequency parameters sets the center point for an entire “skip band” of frequencies. The width of the band (range of frequency around the center point) is determined by parameter 87, [Skip Freq Band]. The range is split, half above and half below the skip frequency parameter.

If the commanded frequency of the drive is greater than or equal to the skip (center) frequency and less than or equal to the high value of the band (skip plus 1/2 band), the drive will set the output frequency to the high value of the band. See (A) in Figure C.8.

If the commanded frequency is less than the skip (center) frequency and greater than or equal to the low value of the band (skip minus 1/2 band), the drive will set the output frequency to the low value of the band. See (B) in Figure C.8.

Acceleration and deceleration are not affected by the skip frequencies. Normal accel/decel will proceed through the band once the commanded frequency is greater than the skip frequency. See (A) & (B) in Figure C.8. This function affects only continuous operation within the band.

Skip Frequency Examples

The skip frequency will have hysteresis so the output does not toggle between high and low values. Three distinct bands can be programmed. If none of the skip bands touch or overlap, each band has its own high/low limit.	 Max. Frequency Skip Frequency 1 Skip Band 1 Skip Frequency 2 Skip Band 2 0 Hz
If skip bands overlap or touch, the center frequency is recalculated based on the highest and lowest band values.	 400 Hz. Skip Frequency 1 Skip Frequency 2 Adjusted Skip Band w/Recalculated Skip Frequency 0 Hz
If a skip band(s) extend beyond the max frequency limits, the highest band value will be clamped at the max frequency limit. The center frequency is recalculated based on the highest and lowest band values.	 400 Hz. Max.Frequency Skip Adjusted Skip Band w/Recalculated Skip Frequency 0 Hz
If the band is outside the limits, the skip band is inactive.	 400 Hz. Skip Frequency 1 Inactive Skip Band 60 Hz. Max. Frequency 0 Hz

Sleep Wake Mode

This function stops (sleep) and starts (wake) the drive based on separately configurable analog input levels rather than discrete start and stop signals. When enabled in "Direct" mode, the drive will start (wake) when an analog signal is greater than or equal to the user specified [Wake Level], and stop the drive when an analog signal is less than or equal to the user specified [Sleep Level]. When Sleep Wake is enabled for "Invert" mode(1), the drive will start (wake) when an analog signal is less than or equal to the user specified [Wake Level], and stop the drive when an analog signal is greater than or equal to the user specified [Sleep Level].

Definitions

- Wake - A start command generated when the analog input value remains above [Wake Level] (or below when Invert mode is active) for a time greater than [Wake Time].
- Sleep - A Stop command generated when the analog input value remains below [Sleep Level] (or above when Invert mode is active) for a time greater than [Sleep Time].
- Speed Reference – The active speed command to the drive as selected by drive logic and [Speed Ref x Sel].
- Start Command - A command generated by pressing the Start button on the HIM, closing a digital input programmed for Start, Run, Run Forward or Run Reverse.

Refer to Figure C.9.

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(1) Invert mode is only available with Vector firmware 3.xxx and later.

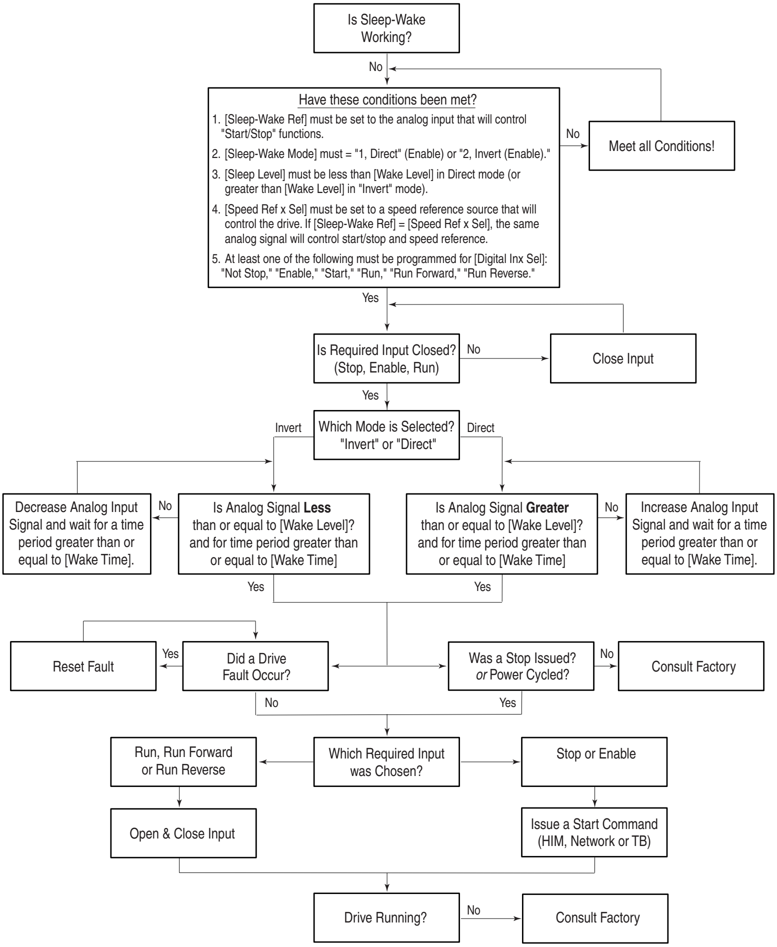


Figure C.9 Sleep Wake Mode

Have these conditions been met?

1. [Sleep-Wake Ref] must be set to the analog input that will control "Start/Stop" functions.
2. [Sleep-Wake Mode] must = "1, Direct" (Enable) or "2, Invert (Enable)."
3. [Sleep Level] must be less than [Wake Level] in Direct mode (or greater than [Wake Level] in "Invert" mode).
4. [Speed Ref x Sel] must be set to a speed reference source that will control the drive. If [Sleep-Wake Ref] = [Speed Ref x Sel], the same analog signal will control start/stop and speed reference.
5. At least one of the following must be programmed for [Digital Inx Sel]: "Not Stop," "Enable," "Start," "Run," "Run Forward," "Run Reverse."

Is Sleep-Wake Working?
No
No
Meet all Conditions!
Yes
Is Required Input Closed? (Stop, Enable, Run)
No
Close Input
Yes
Which Mode is Selected? "Invert" or "Direct"
Invert
Direct
Decrease Analog Input Signal and wait for a time period greater than or equal to [Wake Time].
No
Is Analog Signal **Less** than or equal to [Wake Level]? and for time period greater than or equal to [Wake Time]
Is Analog Signal **Greater** than or equal to [Wake Level]? and for time period greater than or equal to [Wake Time]
No
Increase Analog Input Signal and wait for a time period greater than or equal to [Wake Time].
Yes
Yes
Reset Fault
Yes
Did a Drive Fault Occur?
Was a Stop Issued? *or* Power Cycled?
No
Consult Factory
No
Yes
Run, Run Forward or Run Reverse
Which Required Input was Chosen?
Stop or Enable
Open & Close Input
Issue a Start Command (HIM, Network or TB)
Drive Running?
No
Consult Factory

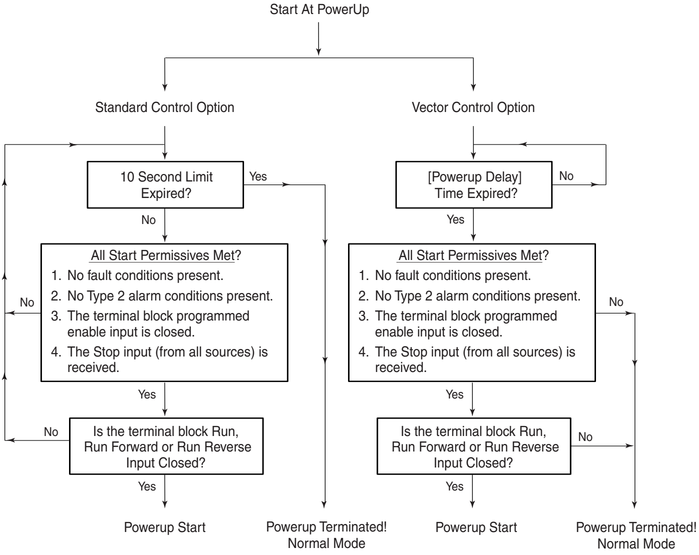
Start At PowerUp

Standard Control Option

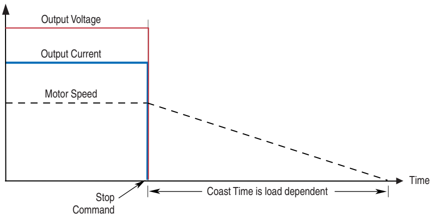
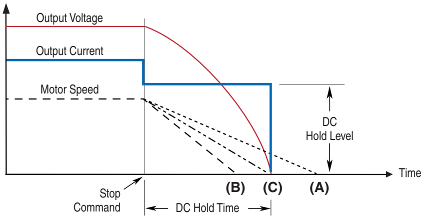
When Start At Powerup in 2 wire control is configured, the drive will start if the start permissive conditions are met within 10 seconds of drive power being applied. An alarm will be annunciated from application of power until the drive actually starts, indicating the powerup start attempt is in progress. If the drive has not started within the 10 second interval, the powerup start attempt will be terminated.

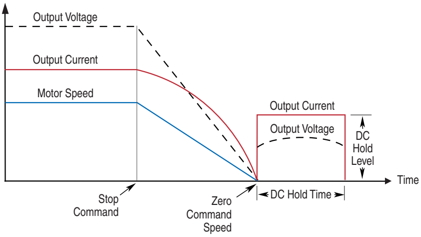
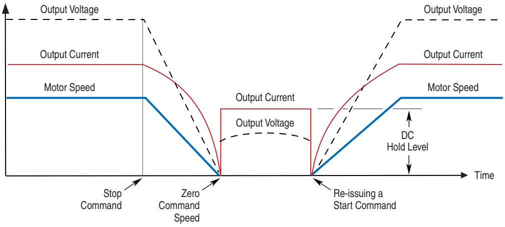
Vector Control Option

A powerup delay time of up to 30 seconds can be programmed through [Powerup Delay], parameter 167. After the time expires, the drive will start if all of the start permissive conditions are met. Before that time, restart is not possible.


Start At PowerUp
Standard Control Option
Vector Control Option
10 Second Limit Expired?
Yes
No
[Powerup Delay] Time Expired?
No
Yes
All Start Permissives Met?
1. No fault conditions present.
2. No Type 2 alarm conditions present.
3. The terminal block programmed enable input is closed.
4. The Stop input (from all sources) is received.
No
Yes
Is the terminal block Run, Run Forward or Run Reverse Input Closed?
No
Yes
Powerup Start
Powerup Terminated! Normal Mode
All Start Permissives Met?
1. No fault conditions present.
2. No Type 2 alarm conditions present.
3. The terminal block programmed enable input is closed.
4. The Stop input (from all sources) is received.
No
Yes
Is the terminal block Run, Run Forward or Run Reverse Input Closed?
No
Yes
Powerup Start
Powerup Terminated! Normal Mode

Stop Mode

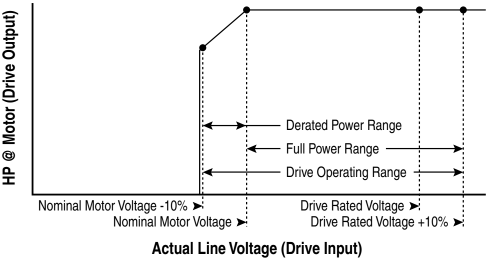
Mode	Description
Coast to Stop	 This method releases the motor and allows the load to stop by friction. 1. On Stop, the drive output goes immediately to zero (off). 2. No further power is supplied to the motor. The drive has released control. 3. The motor will coast for a time that is dependent on the mechanics of the system (inertia, friction, etc).
Brake to Stop	 This method uses DC injection of the motor to Stop and/or hold the load. 1. On Stop, 3 phase drive output goes to zero (off) 2. Drive outputs DC voltage on the last used phase at the level programmed in [DC Brake Level] Par 158. This voltage causes a “stopping” brake torque. If the voltage is applied for a time that is longer than the actual possible stopping time, the remaining time will be used to attempt to hold the motor at zero speed. 3. DC voltage to the motor continues for the amount of time programmed in [DC Brake Time] Par 159. Braking ceases after this time expires. 4. After the DC Braking ceases, no further power is supplied to the motor. The motor may or may not be stopped. The drive has released control. 5. The motor, if rotating, will coast from its present speed for a time that is dependent on the mechanics of the system (inertia, friction, etc).

Mode	Description
Ramp to Stop	 This method uses drive output reduction to stop the load. 1. On Stop, drive output will decrease according to the programmed pattern from its present value to zero. The pattern may be linear or squared. The output will decrease to zero at the rate determined by the programmed [Maximum Freq] and the programmed active [Decel Time x]. 2. The reduction in output can be limited by other drive factors such as such as bus or current regulation. 3. When the output reaches zero the output is shut off. 4. The motor, if rotating, will coast from its present speed for a time that is dependent on the mechanics of the system (inertia, friction, etc).
Ramp to Hold	 This method combines two of the methods above. It uses drive output reduction to stop the load and DC injection to hold the load at zero speed once it has stopped. 1. On Stop, drive output will decrease according to the programmed pattern from its present value to zero. The pattern may be linear or squared. The output will decrease to zero at the rate determined by the programmed [Maximum Freq] and the programmed active [Decel Time x] 2. The reduction in output can be limited by other drive factors such as bus or current regulation. 3. When the output reaches zero 3 phase drive output goes to zero (off) and the drive outputs DC voltage on the last used phase at the level programmed in [DC Brake Level] Par 158. This voltage causes a “holding” brake torque. 4. DC voltage to the motor continues until a Start command is reissued or the drive is disabled. 5. If a Start command is reissued, DC Braking ceases and he drive returns to normal AC operation. If an Enable command is removed, the drive enters a “not ready” state until the enable is restored.

Voltage Tolerance

Drive Rating	Nominal Line Voltage	Nominal Motor Voltage	Drive Full Power Range	Drive Operating Range
200-240	200	200*	200-264	180-264
	208	208	208-264	
	240	230	230-264	
380-400	380	380*	380-528	342-528
	400	400	400-528	
	480	460	460-528	
500-600 *(Frames 0-4 Only)*	600	575*	575-660	432-660
500-690 *(Frames 5-6 Only)*	600	575*	575-660	475-759
	690	690	690-759	475-759

Drive Full Power Range =	Nominal Motor Voltage to Drive Rated Voltage +10%. Rated power is available across the entire Drive Full Power Range.
Drive Operating Range =	Lowest (*) Nominal Motor Voltage –10% to Drive Rated Voltage +10%. Drive Output is linearly derated when Actual Line Voltage is less than the Nominal Motor Voltage.

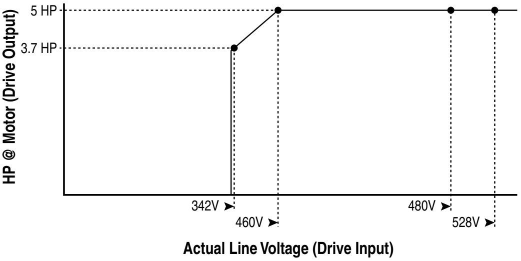


Example:

Calculate the maximum power of a 5 HP, 460V motor connected to a 480V rated drive supplied with 342V Actual Line Voltage input.

- Actual Line Voltage / Nominal Motor Voltage = 74.3%
- 74.3% × 5 HP = 3.7 HP
- 74.3% × 60 Hz = 44.6 Hz

At 342V Actual Line Voltage, the maximum power the 5 HP, 460V motor can produce is 3.7 HP at 44.6 Hz.



Notes:

Notes:

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