User Manual

Allen-Bradley

PowerFlex 70 Adjustable Frequency AC Drives

Standard Control Firmware, Revision 2.*xxx*
Enhanced Control Firmware, Revision 2.*xxx* . . . 4.*xxx*

Allen-Bradley • Rockwell Software

Rockwell Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

The information below summarizes the changes to this PowerFlex® 70 Adjustable Frequency AC Drives User Manual since the May 2009 release.

Parameter Updates

The following parameters have been added or updated.

Description of New or Updated Parameters	Page
Parameter 007 [Output Power]	22
Parameter 054 [Maximum Voltage]	25
Parameter 427 [Torque Ref A Sel]	28
Parameter 090 [Speed Ref A Sel]	33
Parameter 096 [TB Man Ref Sel]	34
Parameter 175 [Auto Rstrt Delay]	46
Parameter 213 [Speed Ref Source]	54
Parameter 238 [Fault Config 1]	58
Parameters 361…366 [Digital In*x* Sel]	68

Additional Manual Updates

The following information has been added, removed, or updated.

Description of New or Updated Information	Page
Removed Chapter 1, Installation/Wiring. All installation and wiring information is now in the PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009.	–
Removed Chapter 2, Startup Information. All startup information is now in the PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009.	–
Updated the Catalog Number Explanation options	11
Updates and additions to fault descriptions:	
Cntl Bd Overtemp (55)	79
DB Resistance (69)	79
Encoder Quad Err (90)	79
Hardware Fault (93)	79
Fatal Faults (900…930)	80
Ground Fault (13)	80
Heatsink LowTemp (10)	80
Output PhaseLoss (21)	80
Power Down Csum (112)	81
Power Unit (70)	81
Fault Cross Reference	82
Updated EPRI/SEMIF 47 certification	89
Added information for Korean KC Registration certification	89
Added information for Drive to motor power ratio	91
Updated information for Motor overload protection	92
Added footnote 2 for information regarding watts loss with certain drives	93
Removed dimensions and fuse/breaker information. All dimensions and fuse/breaker information is now in the PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009.	–

Notes:

Appendix C

The purpose of this manual is to provide you with the basic information needed to program and troubleshoot the PowerFlex 70 Adjustable Frequency AC Drive.

About This Publication

This manual is intended for qualified pJulyersonnel. 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 Publication

This manual provides basic start-up, programming, and troubleshooting information; it does not include information for mounting, wiring, and installing the drive. For installation instructions, refer to the PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009. For detailed drive information, refer to the PowerFlex Reference Manuals, publications PFLEX-RM001 and PFLEX-RM004.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009	Provides the five basic steps needed to install and perform a basic startup of the PowerFlex 70 drive.
PowerFlex 70 and 700 Reference Manual - Vol. 1, publication PFLEX-RM001	Provides detailed information for specifications and dimensions, operation, and dynamic brake selection for the drive.
PowerFlex 70 Enhanced Control and 700 Vector Control Reference Manual, publication PFLEX-RM004	Provides detailed drive information including operation, parameter descriptions, and programming.
DriveGuard Safe-Off Option (Series B) for PowerFlex 40P and PowerFlex 70 AC Drives, publication PFLEX-UM003	Provides information for the installation and operation of the DriveGuard Safe Torque Off option.
PowerFlex Comm Adapter Manuals, publication 20COMM-UM	Provides information for the installation and operation of the various communication protocol adapters available for the drive.
PowerFlex Dynamic Braking Resistor Calculator Application Technique, publication PFLEX-AT001	Provided information for determining dynamic braking requirements and evaluating resistors for dynamic braking.
Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001	Provides the basic information needed to properly wire and ground Pulse Width Modulated (PWM) AC drives.

Resource	Description
Industry Installation Guidelines for Pulse Width Modulated (PWM) AC Drives Application Technique, publication DRIVES-AT003	Provides basic information for enclosure systems and environmental/location considerations (to help protect against environmental contaminants), and power and grounding considerations needed to properly install AC drives.
Preventive Maintenance of Industrial Control and Drive System Equipment, publication DRIVES-TD001	Provides a checklist to use as a guide for performing preventive maintenance on industrial control and drive systems.
Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls, publication SGI-1.1	Describes some important differences between solid-state equipment and hard-wired electromechanical devices
A Global Reference Guide for Reading Schematic Diagrams, publication 100-2.10	Provides a simple cross-reference of common schematic/wiring diagram symbols that are used in various parts of the world.
Guarding Against Electrostatic Damage, publication 8000-4.5.2	This data sheet explains the causes of electrostatic damage (ESD), and how you can guard against its effects.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http:/www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

For Allen-Bradley® drives technical support, see Rockwell Automation Support on the back cover of this manual.

Manual Conventions

In this manual we refer to the PowerFlex 70 Adjustable Frequency AC Drive as; drive, PowerFlex 70 or PowerFlex 70 Drive.

To help differentiate parameter names and Liquid Crystal Display (LCD) text from other text, the following conventions are used:

- Parameter Names appear in [brackets].
  For example: [DC Bus Voltage].
- Display Text appears in “quotes.” For example: “Enabled.”

Drive Frame Sizes

Similar PowerFlex 70 drive sizes are grouped into frame sizes to simplify spare parts ordering, dimensioning, and so on. A cross reference of drive catalog numbers and their respective frame size is provided in Appendix A.

General Precautions

Qualified Personnel

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

Personal Safety

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 terminal of the Power Terminal Block and the -DC test point (refer to PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009 for locations). 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: 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.

Product Safety

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 can result in malfunction of the system.

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

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 to start and stop the motor. If an input device is used, operation must not exceed one cycle per minute or drive damage can occur.

ATTENTION: Nuisance tripping can occur in Standard Control firmware revision 1.011 and earlier due to unstable currents. When using a motor that is connected for a voltage that is different from the drive (for example, by using a 230V connected motor with a 460V drive) the following adjustment must be made to "Stability Gain" by using DriveExplorer software and a personal computer.

$$\frac{\text{Motor Nameplate Voltage}}{\text{Drive Rated Voltage}} \times 128$$

Any adjustment made to "Stability Gain" must be manually restored if the drive is reset to defaults or is replaced.

If unstable currents are still present after making the adjustment, contact the factory for assistance.

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 can cause a fault; however, it can also cause either of the following two conditions to occur.

- Fast positive changes in input voltage (more than a 10% increase within 6 minutes) can cause uncommanded positive speed changes; however an F25 "OverSpeed Limit" fault occurs if the speed reaches P82 [Max Speed] + P83 [Overspeed Limit]. If this condition is unacceptable. Take action 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 [Bus Reg Mode A] and 162 [Bus Reg Mode B]).
- 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 [Bus Reg Mode A] and 162 [Bus Reg Mode B]). In addition, installing a properly sized dynamic brake resistor provides equal or better performance in most cases.
  Note: These faults are not instantaneous and have shown test results that take between 2 and 12 seconds to occur.

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 can 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 is removed from the respective motor, but the drive continues 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 can cause the drive to fault. If any of these conditions are determined to be undesirable or unsafe, wire an auxiliary contact on the output contactor to a drive digital input that is programmed as "Enable." This causes the drive to execute a coast-to-stop (cease output) whenever an output contactor is opened.

Catalog Number Explanation

Position Number

1-3	4	5-7	8	9	10	11	12	13	14	15	16
20A	B	2P2	A	3	A	Y	Y	N	N	C	0
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*

a

Drive	
Code	Type
20A	PowerFlex 70

b

Voltage Rating		
Code	Voltage	Ph.
B	240V AC	3
C	400V AC	3
D	480V AC	3
E	600V AC	3

c1

ND Rating			
208V, 60 Hz Input			
Code	Amps	kW (Hp)	Frame
2P2	2.5	0.37 (0.5)	A
4P2	4.8	0.75 (1.0)	A
6P8	7.8	1.5 (2.0)	B
9P6	11	2.2 (3.0)	B
015	17.5	4.0 (5.0)	C
022	25.3	5.5 (7.5)	D
028	32.2	7.5 (10)	D
042	43	11 (15)	D
054	62.1	15 (20)	E
070	78.2	18.5 (25)	E

c2

ND Rating			
240V, 60 Hz Input			
Code	Amps	kW (Hp)	Frame
2P2	2.2	0.37 (0.5)	A
4P2	4.2	0.75 (1.0)	A
6P8	6.8	1.5 (2.0)	B
9P6	9.6	2.2 (3.0)	B
015	15.3	4.0 (5.0)	C
022	22	5.5 (7.5)	D
028	28	7.5 (10)	D
042	42	11 (15)	D
054	54	15 (20)	E
070	70	18.5 (25)	E

c3

ND Rating			
400V, 50 Hz Input			
Code	Amps	kW (Hp)	Frame
1P3	1.3	0.37 (0.5)	A
2P1	2.1	0.75 (1.0)	A
3P5	3.5	1.5 (2.0)	A
5P0	5.0	2.2 (3.0)	B
8P7	8.7	4.0 (5.0)	B
011	11.5	5.5 (7.5)	C
015	15.4	7.5 (10)	C
022	22	11 (15)	D
030	30	15 (20)	D
037	37	18.5 (25)	D
043	43	22 (30)	D
060	60	30 (40)	E
072	72	37 (50)	E

c4

ND Rating			
480V, 60 Hz Input			
Code	Amps	kW (Hp)	Frame
1P1	1.1	0.37 (0.5)	A
2P1	2.1	0.75 (1.0)	A
3P4	3.4	1.5 (2.0)	A
5P0	5.0	2.2 (3.0)	B
8P0	8.0	3.7 (5.0)	B
011	11	5.5 (7.5)	C
014	14	7.5 (10)	C
022	22	11 (15)	D
027	27	15 (20)	D
034	34	18.5 (25)	D
040	40	22 (30)	D
052	52	30 (40)	E
065	65	37 (50)	E

c5

ND Rating			
600V, 60 Hz Input ✶			
Code	Amps	kW (Hp)	Frame
0P9	0.9	0.37 (0.5)	A
1P7	1.7	0.75 (1.0)	A
2P7	2.7	1.5 (2.0)	A
3P9	3.9	2.2 (3.0)	B
6P1	6.1	4.0 (5.0)	B
9P0	9.0	5.5 (7.5)	C
011	11	7.5 (10)	C
017	17	11 (15)	D
022	22	15 (20)	D
027	27	18.5 (25)	D
032	32	22 (30)	D
041	41	30 (40)	E
052	52	37 (50)	E

✶ CE certification testing has not been performed on 600V class drives.

d

Enclosure	
Code	Enclosure
A	Panel Mount - IP 20, NEMA/UL Type 1
C	Wall/Machine Mount = IP66, NEMA/UL Type 4X/12 for indoor use only
F	Flange Mount - Front Chassis = IP 20, NEMA/UL Type 1; Rear Heatsink = IP66, NEMA/UL Type 4X/12 for indoor/outdoor use
G	Wall/Machine Mount - IP54, NEMA/UL Type 12 ✶

✶ Only available on Frame E.

e

HIM	
Code	Interface Module
0	Blank Cover
3	Full Numeric LCD
5	Prog. Only LCD ❄

❄ Only available with NEMA 4X, option C.

See Catalog Number Explanation (continued) on page 12 for additional catalog number descriptions.

Catalog Number Explanation (continued)

Position Number

1-3	4	5-7	8	9	10	11	12	13	14	15	16
20A	B	2P2	A	3	A	Y	Y	N	N	C	0
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*

f

Documentation	
Code	Type
A	Manual
N	No Manual

g

Brake IGBT	
Code	w/Brake IGBT
Y	Yes

h

Internal Brake Resistor	
Code	w/Resistor
Y	Yes
N	No

i

Emission Class	
Code	Rating
A	Filtered∗ A❄ & B Frames (Optional) C, D, & E Frames (Standard)
N	Not Filtered∗ A & B Frames (Optional) C, D, & E Frames

∗ 600V Frames A through D available only without filter (Cat. Code N). 600V Frame E available only with filter (Cat. Code A).

❄ Increases size to Frame B.

j

Comm Slot	
Code	Network Type
C	ControlNet (Coax)
D	DeviceNet
E	EtherNet/IP
N	None

k

Control & I/O		
Code	Control	Safe-Off
N❄	Standard	N/A
C	Enhanced	No
G∗	Enhanced	Yes

❄ No longer available for sale.

∗ Not available as factory installed option for 600V ratings.

l

Feedback	
Code	Feedback
0	No Feedback - Enhanced Control
1	5V/12V Encoder w/Enhanced Control

Programming and Parameters

This chapter provides a complete list and descriptions of the PowerFlex 70 drive parameters. The parameters are programmed (viewed/edited) by using a Light-emitting Diode (LED) or LCD Human Interface Module (HIM).

You can also use DriveExplorer™ or DriveExecutive™ software and a personal computer to program the drive. Refer to Appendix B for brief descriptions of the LED and LCD HIMs.

About Parameters

To configure a drive to operate in a specific way, you set the drive parameters. The drive uses these three types of parameters:

- **ENUM Parameters**

  ENUM parameters have selections from two or more items. The LCD HIM displays a text message for each item. The LED HIM Displays a number for each item.

- **Bit Parameters**

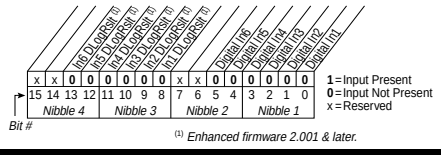
  Bit parameters have individual bits associated with features or conditions. If the bit is 0 the feature is off, or the condition is false. If the bit is 1 the feature is on, or the condition is true.

- **Numeric Parameters**

  These parameters have a single numerical value (for example 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 and Description	Values	Related
UTILITY (file E)	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
	Diagnostics	216	**[Dig In Status]** Status of the digital inputs.  (1) Enhanced firmware 2.001 & later.	
MOTOR . . .	Torq . . .	059	EC **[SV Boost Filter]** Sets the amount of filtering used to boost voltage during Sensorless Vector operation.	Default: 500 Min/Max: 0/32767 Units: 1	

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

How Parameters are Organized

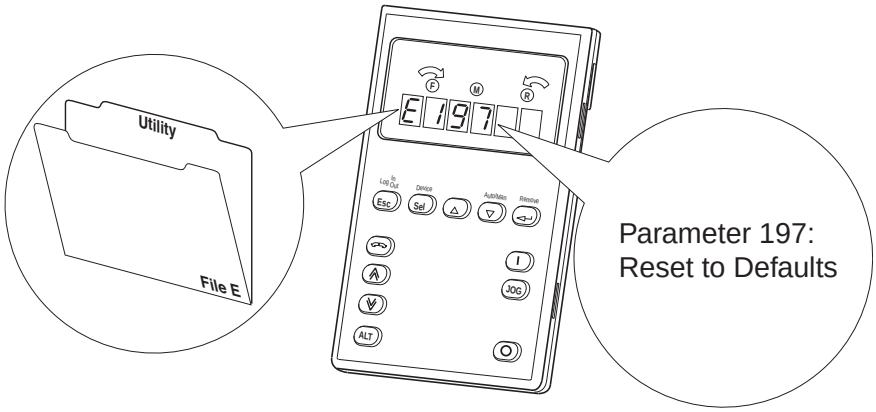
LED HIM (human interface module)

The LED HIM displays parameters in numbered list order. Parameters are accessed by first selecting the file letter, then a parameter number.

IMPORTANT The PowerFlex 70 Enhanced Control drive does not support the LED HIM.

File Letter Designations

The LED HIM identifies each parameter by file letter and parameter number.



LCD HIM (human interface module)

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 the cursor is on the parameter selection. In addition, when you use parameter 196 [Param Access Lvl], you have the option to display all parameters, commonly used parameters, or diagnostic parameters.

Control Options

Two different control options are available for the PowerFlex 70, standard and enhanced.

- Standard control drives provide volts per hertz and sensorless vector operation.
- Enhanced control drives support the addition of FVC vector control, the DriveGuard Safe Off option, and more.

File-Group-Parameter View

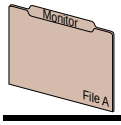
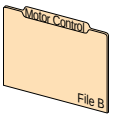
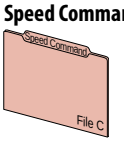
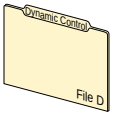
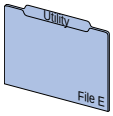
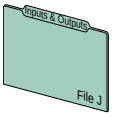
This simplifies programming by grouping parameters that are used for similar functions. The parameters are organized into six files in basic parameter view, or seven files in advanced parameter view. Each file is divided into groups, and each parameter is an element in a group. By default, the LCD HIM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

Numbered List View

All parameters are in numerical order.

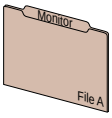
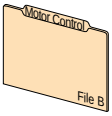
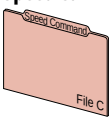
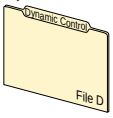
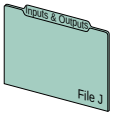
Basic Parameter View – Standard Control

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

File	Group	Parameters					
Monitor 	Metering	Output Freq	001				
		Commanded Freq	002				
		Output Current	003				
		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 NP Hertz	043	Mtr NP Pwr Units	046		
	Torq Attributes	Torque Perf Mode	053	Maximum Freq	055		
		Maximum Voltage	054	Autotune	061		
Speed Command 	Spd Mode and Limits	Minimum Speed	081				
		Maximum Speed	082				
	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				
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 	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				
Inputs and Outputs 	Analog Inputs	Anlg In Config	320	Analog In1 Hi	322	Analog In2 Hi	325
				Analog In1 Lo	323	Analog In2 Lo	326
	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	Digital Out2 Sel	384		
		Dig Out1 Level	381	Dig Out2 Level	385		

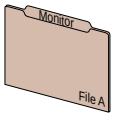
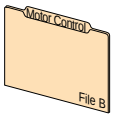
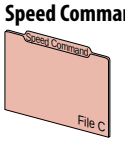
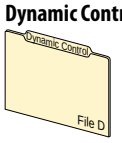
Basic Parameter View – Enhanced Control

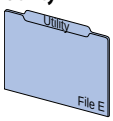
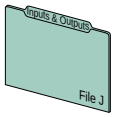
Parameter 196 [Param Access Lvl] set to option 0 "Basic."

File	Group	Parameters					
Monitor 	Metering	Output Freq	001				
		Commanded Freq	002				
		Output Current	003				
		Torque Current	004				
		DC Bus Voltage	012				
		Commanded Torque**	024				
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	061	Torque Ref A Sel**	427
		Maximum Voltage	054	Autotune Torque**	066	Torque Ref A Hi**	428
		Maximum Freq	055	Inertia Autotune**	067	Torque Ref A Lo**	429
						Pos Torque Limit**	436
						Neg Torque Limit**	437
	Speed Feedback	Motor Fdbk Type**	412				
		Encoder PPR**	413				
Speed Command 	Spd Mode and Limits	Feedback Select	080	Minimum Speed	081		
				Maximum Speed	082		
	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 1	100	Preset Speed 1…7	101…107	Jog Speed 2	108
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 Brake 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		
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				
Inputs and Outputs 	Analog Inputs	Anlg In Config	320	Analog In 1 Hi	322	Analog In 1 Lo	323
				Analog In 2 Hi	325	Analog In 2 Lo	326
	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		

Advanced Parameter View – Standard Control

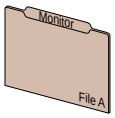
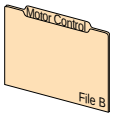
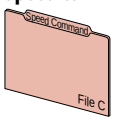
Parameter 196 [Param Access Lvl] set to option 1 "Advanced."

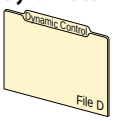
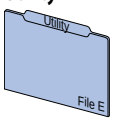
File	Group	Parameters					
Monitor 	Metering	Output Freq	001	Output Voltage	006	MOP Frequency	011
		Commanded Freq	002	Output Power	007	DC Bus Voltage	012
		Output Current	003	Output Powr Fctr	008	DC Bus Memory	013
		Torque Current	004	Elapsed MWh	009	Analog In1 Value	016
		Flux Current	005	Elapsed Run 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	Compensation	056	Autotune	061
		Maximum Voltage	054	Flux Up Mode	057	IR Voltage Drop	062
		Maximum Freq	055	Flux Up Time	058	Flux Current Ref	063
	Volts per Hertz	StAcc Boost	069	Break Voltage	071		
		Run Boost	070	Break Frequency	072		
Speed Command 	Spd Mode and 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 Level	158	Bus Reg Mode A	161
		Stop Mode B	156	DC Brake Time	159	Bus Reg Mode B	162
		DC Brake Lvl Sel	157	Bus Reg Gain	160	DB Resistor Type	163
	Restart Modes	Start At PowerUp	168	Flying StartGain	170	Auto Rstrt Delay	175
		Flying Start En	169	Auto Rstrt Tries	174		
	Power Loss	Power Loss Mode	184				
		Power Loss Time	185				

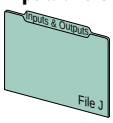
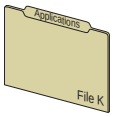
File	Group	Parameters					
Utility 	Direction Config	Direction Mode	190				
	HIM Ref Config	Save HIM Ref	192				
		Man Ref Preload	193				
	MOP Config	Save MOP Ref	194				
		MOP Rate	195				
	Drive Memory	Param Access Lvl	196	Save To User Set	199	Voltage Class	202
		Reset To Defalts	197	Reset Meters	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 Frequency	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…4 Code	243…249
		Fault Clear	240	Power Up Marker	242	Fault 1…4 Time	244…250
	Alarms	Alarm Config 1	259				
Communication 	Comm Control	DPI Data Rate	270	Drive Ref Rslt	272		
		Drive Logic Rslt	271	Drive Ramp Rslt	273		
	Masks and 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 and Outputs 	Analog Inputs	Anlg In Config	320	Analog In 1 Hi	322	Analog In 2 Hi	325
		Anlg In Sqr Root	321	Analog In 1 Lo	323	Analog In 2 Lo	326
				Anlg In 1 Loss	324	Anlg In 2 Loss	327
	Analog Outputs	Anlg Out Absolut	341	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	Digital Out2 Sel	384		
		Dig Out1 Level	381	Dig Out2 Level	385		
		Dig Out1 OnTime	382	Dig Out2 OnTime	386		
		Dig Out1 OffTime	383	Dig Out2 OffTime	387		

Advanced Parameter View – Enhanced Control

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

File	Group	Parameters					
Monitor 	Metering	Output Freq	001	Output Powr Fctr	008	Torque Estimate	015[3.x]
		Commanded Freq	002	Elapsed MWh	009	Analog In1 Value	016
		Output Current	003	Elapsed Run Time	010	Analog In2 Value	017
		Torque Current	004	MOP Frequency	011	Ramped Speed	022
		Flux Current	005	DC Bus Voltage	012	Speed Reference	023
		Output Voltage	006	DC Bus Memory	013	Commanded Torque**	024
		Output Power	007	Elapsed kWh	014	Speed Feedback	025
	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 OL Mode	050[3.x]
		Motor NP Hertz	043	Motor OL Hertz	047		
	Torq Attributes	Motor Cntl Sel	053	Autotune	061	Torque Ref A Hi**	428
		Maximum Voltage	054	IR Voltage Drop	062	Torque Ref A Lo**	429
		Maximum Freq	055	Flux Current Ref	063	Torque Setpoint1**	435
		Compensation	056	Ixo Voltage Drop	064	Pos Torque Limit**	436
		Flux Up Mode	057	Autotune Torque**	066	Neg Torque Limit**	437
		Flux Up Time	058	Inertia Autotune**	067	Control Status**	440
		SV Boost Filter	059	Torque Ref A Sel**	427	Torq Current Ref**	441
	Volts per Hertz	StAcc Boost*	069	Break Voltage*	071		
		Run Boost*	070	Break Frequency*	072		
	Speed Feedback	Motor Fdbk Type	412	Enc Pos Feedback	414	Fdbk Filter Sel**	416
		Encoder PPR	413	Encoder Speed	415	Notch FilterFreq**	419
						Notch Filter K**	420
Speed Command 	Spd Mode and Limits	Feedback Select	080	Skip Frequency 1	084	Skip Freq Band	087
		Minimum Speed	081	Skip Frequency 2	085	Speed/Torque Mod**	088
		Maximum Speed	082	Skip Frequency 3	086	Rev Speed Limit	454
		Overspeed Limit	083				
	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 1	100	Preset Speed 1…7 101…107		Jog Speed 2	108
	Speed Trim	Trim % Setpoint	116	Trim In Select	117	Trim Hi	119
				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 BW Filter	139
		PI Reference Sel	126	PI Preload	133	PI Deriv Time	459
		PI Setpoint	127	PI Status	134	PI Reference Hi	460
		PI Feedback Sel	128	PI Ref Meter	135	PI Reference Lo	461
		PI Integral Time	129	PI Fdback Meter	136	PI Feedback Hi	462
		PI Prop Gain	130	PI Error Meter	137	PI Feedback Lo	463
	Speed Regulator	Ki Speed Loop**	445	Spd Err Filt BW	448[3.x]	Total Inertia**	450
		Kp Speed Loop**	446	Speed Desired BW**	449	Speed Loop Meter**	451
		Kf Speed Loop**	447				

File	Group	Parameters					
Dynamic Control 	Restart Modes	Powerup Delay	167	Auto Rstrt Tries	174	Wake Level	180
		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
	Power Loss	Gnd Warn Level	177	Power Loss Time	185	Load loss Time	188
		Power Loss Mode	184	Load Loss Level	187		
	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	Regen Power Lim**	153
		Current Lmt Val	148	PWM Frequency	151	Current Rate Lim**	154
		Current Lmt Gain	149	Droop RPM@FLA	152	Shear Pin Time*	189
	Stop/Brake Modes	DB While Stopped	145	DC Brake Time	159	Bus Reg Kp*	164
		Stop/Brk Mode A	155	Bus Reg Ki*	160	Bus Reg Kd*	165
		Stop/Brk Mode B	156	Bus Reg Mode A	161	Flux Braking	166
		DC Brake Lvl Sel	157	Bus Reg Mode B	162		
		DC Brake Level	158	DB Resistor Type	163		
Utility 	Direction Config	Direction Mode	190				
	HIM Ref Config	AutoMan Cnfg	192				
	MOP Config	Save MOP Ref	194	MOP Rate	195		
	Drive Memory	Param Access Lvl	196	Reset Meters	200	Dyn UsrSet Cnfg	204
		Reset To Defalts	197	Language	201	Dyn UserSet Sel	205
		Load Frm Usr Set	198	Voltage Class	202	Dyn UserSet Actv	206
		Save To User Set	199	Drive Checksum	203		
	Diagnostics	Drive Status 1	209	Drive Temp	218	Status 1 @ Fault	227
		Drive Status 2	210	Drive OL Count	219	Status 2 @ Fault	228
		Drive Alarm 1	211	Motor OL Count	220	Alarm 1 @ Fault	229
		Drive Alarm 2	212	Mtr OL Trip Time	221[3.x]	Alarm 2 @ Fault	230
		Speed Ref Source	213	Drive Status 3	222[3.x]	Testpoint 1 Sel	234
		Start Inhibits	214	Status 3 @ Fault	223[3.x]	Testpoint 1 Data	235
		Last Stop Source	215	Fault Frequency	224	Testpoint 2 Sel	236
		Dig In Status	216	Fault Amps	225	Testpoint 2 Data	237
		Dig Out Status	217	Fault Bus Volts	226		
	Faults	Fault Config 1	238	Fault Clear Mode	241	Fault 1…4 Code	243…249
		Fault Clear	240	Power Up Marker	242	Fault 1…4 Time	244…250
	Alarms	Alarm Config 1	259				
	Scaled Blocks	Scale1 In Value	476	Scale2 In Value	482		
		Scale1 In Hi	477	Scale2 In Hi	483		
		Scale1 In Lo	478	Scale2 In Lo	484		
Communication 	Comm Control	DPI Data Rate	270	Drive Ramp Rslt	273	DPI Ref Select	298
		Drive Logic Rslt	271	DPI Port Select	274		
		Drive Ref Rslt	272	DPI Port Value	275		
	Masks and 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	HighRes Ref	308	Data Out A1…D2	310…317
	Security	PortMask Act	595	Write Mask Act	597	Logic Mask Act	598
		Write Mask Cfg	596	Logic Mask	276		

File	Group	Parameters					
Inputs and Outputs 	Analog Inputs	Anlg In Config	320	Analog In 1 Lo	323	Analog In 2 Lo	326
		Anlg In Sqr Root	321	Analog In 1 Loss	324	Analog In 2 Loss	327
		Analog In 1 Hi	322	Analog In 2 Hi	325		
	Analog Outputs	Anlg Out Config	340	Analog Out1 Hi	343	Anlg Out1 Setpt	377
		Anlg Out Absolut	341	Analog Out1 Lo	344		
		Analog Out1 Sel	342	Anlg Out Scale	354		
	Digital Inputs	Digital In1…6 Sel	361…366	DigIn DataLogic	411		
	Digital Outputs	Dig Out Setpt	379	Dig Out1 OnTime	382	Dig Out2 Level	385
		Digital Out1 Sel	380	Dig Out1 OffTime	383	Dig Out2 OnTime	386
		Dig Out1 Level	381	Digital Out2 Sel	384	Dig Out2 OffTime	387
Applications [3.x] 	Fiber Functions [3.x]	Fiber Control	620 [3.x]	Traverse Inc	623 [3.x]	P Jump	626 [3.x]
		Fiber Status	621 [3.x]	Traverse Dec	624 [3.x]		
		Sync Time	622 [3.x]	Max Traverse	625 [3.x]		

* These parameters are available only when parameter 053 [Motor Cntl Sel] is set to option 2 or 3.

** These parameters are available only when parameter 053 [Motor Cntl Sel] is set to option 4.

[3.x] Firmware revision 3.002 and later.

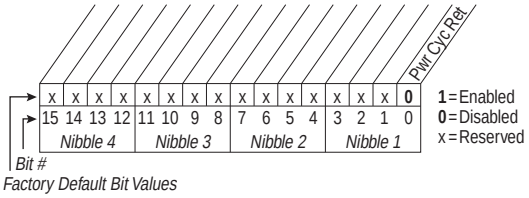
Monitor File (file A)

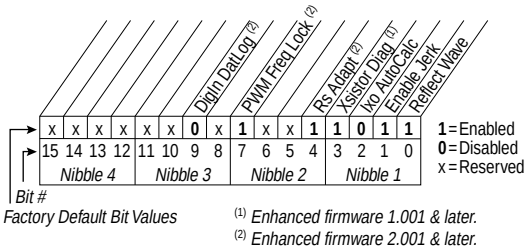
File A	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values		Related
MONITOR (file A)	Metering	001	**[Output Freq]** Output frequency present at T1, T2, and T3 (U, V, and W)	Default: Min/Max: Units:	Read Only ±[Maximum Freq] 0.1 Hz	
		002	**[Commanded Freq]** Value of the active frequency command.	Default: Min/Max: Units:	Read Only ±[Maximum Speed] 0.1 Hz	213
		003 EC 32	**[Output Current]** The total output current present at T1, T2, and T3 (U, V, and W).	Default: Min/Max: Units:	Read Only 0.0/Drive Rated Amps × 2 0.1 Amps 0.01 Amps EC	
		004 EC 32	**[Torque Current]** The amount of current that is in phase with the fundamental voltage component.	Default: Min/Max: Units:	Read Only Drive Rating × –2/+2 0.1 Amps 0.01 Amps EC	
		005 EC 32	**[Flux Current]** The amount of current that is out of phase with the fundamental voltage component.	Default: Min/Max: Units:	Read Only Drive Rating × –2/+2 0.1 Amps 0.01 Amps EC	063
		006	**[Output Voltage]** Output voltage present at terminals T1, T2, and T3 (U, V, and W).	Default: Min/Max: Units:	Read Only 0.0/Drive Rated Volts 0.1 VAC	054 202
		007 EC 32	**[Output Power]** Output power present at T1, T2, and T3 (U, V, and W). The output power is a calculated value, dependent on autotune values.		Read Only 0.0/Drive Rated kW × 2 0.1 kW 0.01 kW EC	
		008	**[Output Powr Fctr]** Output power factor.	Default: Min/Max: Units:	Read Only 0.00/1.00 0.01	
		009 32	**[Elapsed MWh]** Accumulated output energy of the drive.	Default: Min/Max: Units:	Read Only 0.0/429496729.5 MWh 0.1 MWh	

File A	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
MONITOR (file A)		010 32	**[Elapsed Run Time]** Accumulated time drive is outputting power.	Default: Read Only Min/Max: 0.0/429496729.5 Hrs Units: 0.1 Hrs	
		011	**[MOP Frequency]** Value of the signal at MOP (Motor Operated Potentiometer).	Default: Read Only Min/Max: ±[Maximum Frequency] Units: 0.1 Hz	194 195
		012	**[DC Bus Voltage]** Present DC bus voltage level.	Default: Read Only Min/Max: 0.0/Drive Rating Based Units: 0.1 VDC	
		013	**[DC Bus Memory]** 6 minute average of DC bus voltage level.	Default: Read Only Min/Max: 0.0/Drive Rating Based Units: 0.1 VDC	
	Metering	014 32	E C **[Elapsed kWh]** Accumulated output energy of the drive.	Default: Read Only Min/Max: 0.0/429496729.5 kWh Units: 0.1 kWh	
		015	E C v3 **[Torque Estimate]** Estimated motor torque output as percent of motor rated torque.	Default: Read Only Min/Max: ±800.0% Units: 0.1%	
		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	320 ... 327
		022	E C **[Ramped Speed]** The value shown is the value after the accel/decel ramp but prior to any corrections supplied by slip comp, PI, and so on	Default: Read Only Min/Max: ±500.0 Hz Units: 0.1 Hz	
		023	E C **[Speed Reference]** Summed value of ramped speed and Process PI.	Default: Read Only Min/Max: ±500.0 Hz Units: 0.1 Hz	053 138 152
		024 FV	E C v2 **[Commanded Torque]** Final torque reference value after limits and filtering are applied. % motor rated torque.	Default: Read Only Min/Max: ±800.0% Units: 0.1%	053
		025	E C v2 **[Speed Feedback]** Value of actual motor speed, measured by encoder feedback or estimated.	Default: Read Only Min/Max: ±500.0 Hz Units: 0.1 Hz	053
	Drive Data	026 32	**[Rated kW]** Drive power rating.	Default: Read Only Min/Max: 0.37/15.0 kW 0.00/300.00 kW E C Units: 0.01 kW	
		027	**[Rated Volts]** The drive input voltage class (208, 240, 400, and so on.).	Default: Read Only Min/Max: 208/600 Volt 0.0/6553.5 Volt E C Units: 0.1 VAC	
		028	**[Rated Amps]** The drive rated output current.	Default: Read Only Min/Max: 1.1/32.2 Amps 0.0/6553.5 Amps E C Units: 0.1 Amps	
		029	**[Control SW Ver]** Main Control Board software version/firmware revision.	Default: Read Only Min/Max: 0.000/65.256 0.0/65.535 E C Units: 0.001	196

Motor Control File (file B)

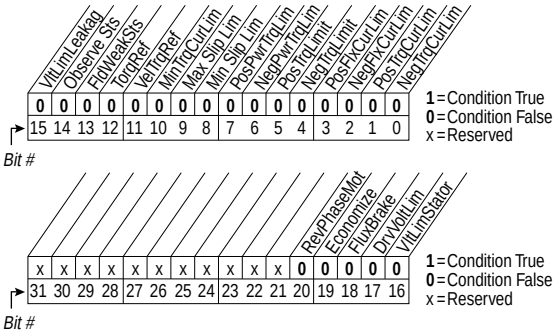
File B	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values			Related
MOTOR CONTROL (file B)	Motor Data	040	**[Motor Type]** Set to match the type of motor connected. (1) **Important:** Selecting option 1 or 2 also requires selection of "Custom V/Hz," option 2 in parameter 53.	Default: Options:	0 0 1 2	"Induction" "Induction" "Synchr Reluc" (1) "Synchr PM" (1)	053
		041	**[Motor NP Volts]** Set to the motor nameplate rated volts.	Default: Min/Max: Units:	Drive Rating Based 0.0/[Rated Volts] 0.1 VAC		
		042	**[Motor NP FLA]** Set to the motor nameplate rated full load amps.	Default: Min/Max: Units:	Drive Rating Based 0.0/[Rated Amps] × 2 0.1 Amps		047 048 148
		043	**[Motor NP Hertz]** Set to the motor nameplate rated frequency.	Default: Min/Max: Units:	Drive Rating Based 5.0/400.0 Hz 5.0/500.0 Hz EC 0.1 Hz		
		044	**[Motor NP RPM]** Set to the motor nameplate rated rpm.	Default: Min/Max: Units:	Drive Rating Based 60/30000 rpm 1 rpm		049 080 121
		045	**[Motor NP Power]** Set to the motor nameplate rated power. (1) See [Mtr NP Pwr Units].	Default: Min/Max: Units:	Drive Rating Based 0.00/100.00 0.00/412.48 EC 0.01 kW/Hp (1)		046
		046	**[Mtr NP Pwr Units]** Selects the motor power units to be used.	Default: Options:	Drive Rating Based 0 1	"Horsepower" "kiloWatts"	045
		047	**[Motor OL Hertz]** Selects the output frequency below where the motor operating current is derated. The motor thermal overload generates a fault at lower levels of current.	Default: Min/Max: Units:	Motor NP Hz/3 0.0/500.0 Hz 0.1 Hz		042 220
		048	**[Motor OL Factor]** Sets operating level for motor overload service factor. **P42 [Motor NP FLA] x P48 [Motor OL Factor] = Operating Level**	Default: Min/Max: Units:	1.00 0.20/2.00 0.01		042 220
		049	EC **[Motor Poles]** Defines the number of poles in the motor. Number of Poles = (120 x P43 [Motor NP Hertz]) / P44 [Motor NP RPM]	Default: Min/Max: Units:	4 2/40 2 Pole		043 044

File B	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values			Related
MOTOR CONTROL (file B)	Motor Data	050	E C v3 **[Motor OL Mode]** If "0," [Motor OL Count], P220 is reset to zero by a drive reset or a power cycle. If "1," the value is maintained. A "1" to "0" transition resets [Motor OL Count], P220 to zero.  *Factory Default Bit Values*				220
	Torq Attributes	053	Standard **[Torque Perf Mode]** Sets the method of motor torque production.	Default: Options:	0 0 1 2 3	"Sensrls Vect" "Sensrls Vect" "SV Economize" "Custom V/Hz" "Fan/Pmp V/Hz"	062 063 069 070
			E C **[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. (1) Enhanced firmware revision 2.001 and later.	Default: Options:	0 0 1 2 3 4	"Sensrls Vect" "Sensrls Vect" "SV Economize" "Custom V/Hz" "Fan/Pmp V/Hz" "FVC Vector"(1)	
		054	**[Maximum Voltage]** Sets the highest voltage the drive can output.	Default: Min/Max: Units:	Drive Rated Volts Rated Volts × 0.25/Rated Volts based on high voltage rating, for example: • 208/240 ≥ 240.0V • 400/480 ≥ 480.0V • 600/600 ≥ 600.0V 0.1 VAC		197
		055	**[Maximum Freq]** Sets the highest frequency the drive can output. Refer to parameter 083 [Overspeed Limit].	Default: Min/Max: Units:	110.0 or 130.0 Hz 5.0/400.0 Hz 5.0/500.0 Hz E C 0.1 Hz		082 083 202 298

File B	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
MOTOR CONTROL (file B)	Torq Attributes	056	**[Compensation]** Enables/disables correction options.  *Factory Default Bit Values* (1) *Enhanced firmware 1.001 & later.* (2) *Enhanced firmware 2.001 & later.* Option Descriptions: • Reflect Wave – Provides 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 – Power transistor power diagnostic tests run at each start command. • Rs Adapt – only FVC w/Encoder – Disabling can improve torque regulation at lower speeds (typically not needed). • PWM Freq Lock – Keeps the PWM frequency from decreasing to 2 kHz at low operating frequencies in FVC Vector mode without encoder. • DigIn DatLog – Enables logic functions that can be applied to parameter 411 [DigIn DataLogic] and the specified digital input.		140… 143 411
		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 uses 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 Min/Max: 0.00/5.00 Secs Units: 0.01 Secs	053 058
		059	E C **[SV Boost Filter]** Sets the amount of filtering used to boost voltage during Sensorless Vector operation.	Default: 500 Min/Max: 0/32767 Units: 1	

File B	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values			Related
MOTOR CONTROL (file B)	Torq Attributes	061	**[Autotune]** Provides a manual or automatic method for setting P62 [IR Voltage Drop] and P63 [Flux Current Ref] to affect sensorless vector performance. Valid only when P53 is set to "Sensrls Vect", "SV Economize", or "FVC Vector."	Default: Options:	3 0 1 2 3	"Calculate" "Ready" "Static Tune" "Rotate Tune" "Calculate"	053 062
			"Ready" (0) = Parameter returns to this setting following a "Static Tune" or "Rotate Tune." It also permits manually setting P62 [IR Voltage Drop], P64 [Ixo Voltage Drop] and P63 [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 P62 [IR Voltage Drop] in all valid modes and a non-rotational motor leakage inductance test for the best possible automatic setting of P64 [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, and then another start transition is required to operate the drive in normal mode. This is used when the 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 P63 [Flux Current Ref]. In "FVC Vector" mode, with encoder feedback, a test for the best possible automatic setting of P121 [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, and then another start transition is required to operate the drive in normal mode. **Important:** If you are using rotate tune for "Sensrls Vect" mode, uncouple the motor from the load or results can be invalid. With "FVC Vector," either a coupled or uncoupled load produces a valid result. **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 P62 [IR Voltage Drop], P64 [Ixo Voltage Drop], P63 [Flux Current Ref] and P121 [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: Min/Max: Units:	Drive Rating Based 0.0/[Motor NP Volts]×0.5 0.1 VAC		053 061
		063	**[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: Min/Max: Units:	Drive Rating Based [Motor NP FLA] × 0.05/[Motor NP FLA] × 0.9 0.01 Amps		053 061

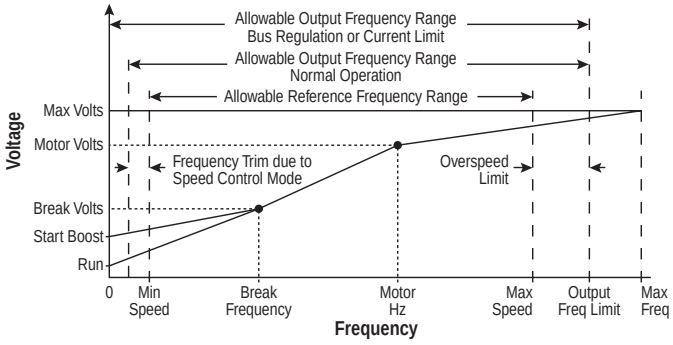
File B	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
MOTOR CONTROL (file B)	Torq Attributes	064	E C v2 **[IXo Voltage Drop]** Value of voltage drop across the leakage inductance of the motor at rated motor current. Used only when parameter 53 is set to "FVC Vector."	Default: Based on Drive Rating Min/Max: 0.0/Motor NP Volts Units: 0.1 VAC	053 061
		066	E C v2 **[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	E C v2 **[Inertia Autotune]** Provides an automatic method of setting [Total Inertia]. This test is automatically run during Start-Up motor tests. **Important:** Use this when the motor is coupled to the load. Results can be invalid 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 ramps up and down, while the drive measures the amount of inertia.	Default: 0 "Ready" Options: 0 "Ready" 1 "Inertia Tune"	053 066 445 446 449 450
		427	E C v2 **[Torque Ref A Sel]** Selects the source of the external torque reference to the drive. How this reference is used is dependent upon P88 [Speed/Torque Mod]. (1) See Appendix B for DPI port locations.	Default: 0 "Torque Setpt" Options: 0 "Torque Setpt" 1 "Analog In 1" 2 "Analog In 2" 3…17 "Reserved" 18…22 "DPI Port 1…5" (1) 23 "Reserved" 24 "Disabled" 25 "Scale Block1" 26 "Scale Block2"	053 088 320… 327 428… 437
		428	E C v2 **[Torque Ref A Hi]** Scales the upper value of the [Torque Ref A Sel] selection when the source is an analog input.	Default: 100.0% Min/Max: ±800.0% Units: 0.1%	053 427
		429	E C v2 **[Torque Ref A Lo]** Scales the lower value of the [Torque Ref A Sel] selection when the source is an analog input.	Default: 0.0% Min/Max: ±800.0% Units: 0.1%	053 427
		435	E C v2 **[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%	053 427

File B	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values		Related
MOTOR CONTROL (file B)	Torq Attributes	436	E C v2 **[Pos Torque Limit]** FV Defines the torque limit for the positive torque reference value. The reference cannot exceed this value.	Default: Min/Max: Units:	200.0% 0.0/800.0% 0.1%	053
		437	E C v2 **[Neg Torque Limit]** FV Defines the torque limit for the negative torque reference value. The reference cannot exceed this value.	Default: Min/Max: Units:	–200.0% –800.0/0.0% 0.1%	053
		440	E C v2 **[Control Status]** FV Displays a summary status of any condition that can be limiting either the current or the torque reference. 	Read Only		053
		441	E C v2 **[Torq Current Ref]** FV Displays the torque current reference value that is present at the output of the current rate limiter (parameter 154).	Default: Min/Max: Units:	Read Only ±3276.7 Amps 0.1 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: Min/Max: Units:	Drive Rating Based 0.0/[Motor NP Volts] × 0.25 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. Refer to the diagram at parameter 083.	Default: Min/Max: Units:	Drive Rating Based 0.0/[Motor NP Volts] × 0.25 0.1 VAC	053 069
		071	**[Break Voltage]** Sets the [Break Frequency] output voltage of the drive. Refer to parameter 083 [Overspeed Limit].	Default: Min/Max: Units:	[Motor NP Volts] × 0.25 0.0/[Motor NP Volts] 0.1 VAC	053 072

File B	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
MOTOR CONTROL (file B)	Volts per Hertz	072	**[Break Frequency]** Sets the [Break Voltage] output frequency of the drive. Refer to parameter 083 [Overspeed Limit].	Default: [Motor NP Hertz] × 0.25 Min/Max: 0.0/[Maximum Freq] Units: 0.1 Hz	053 071
	Speed Feedback	412	E C v2 **[Motor Fdbk Type]** Selects the encoder type; single channel or quadrature. Options 1 and 3 detect a loss of encoder signal (when you are 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"	080 088
		413	E C v2 **[Encoder PPR]** Contains the encoder pulses per revolution. For improved operation in FVC Vector mode, PPR can be ≥ (64 x motor poles).	Default: 1024 PPR Min/Max: 1/20000 PPR Units: 1 PPR	080
		414	E C v2 **[Enc Pos Feedback]** Displays raw encoder pulse count. For single channel encoders, this count increases (per rev.) by the amount in [Encoder PPR]. For quadrature encoders this count increases by 4 times the amount defined in [Encoder PPR].	Default: Read Only Min/Max: ±2147483647 Units: 1	
		415	E C v2 **[Encoder Speed]** Provides a monitoring point that reflects speed as seen from the feedback device.	Default: Read Only Min/Max: ±500.0 Hz Units: 0.1 Hz	
		416	E C v2 **[Fdbk Filter Sel]** FV 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	E C v2 **[Notch FilterFreq]** FV 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
		420	E C v2 **[Notch Filter K]** FV Sets the width for the 2-pole notch filter.	Default: 0.3 Min/Max: 0.1/0.9 Units: 0.1	053

Speed Command File (file C)

File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
SPEED COMMAND (file C)	Spd Mode and 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"	121… 138 125 412
			E C **[Feedback Select]** Selects the source for motor speed feedback. Note that all selections are available when you are 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 and interface check.	Default: 0 "Open Loop" Options: 0 "Open Loop" 1 "Slip Comp" 2 "Reserved" 3 "Encoder" 4 "Reserved" 5 "Simulator"	413
		081	**[Minimum Speed]** Sets the low limit for speed reference after scaling is applied. Refer to parameter 083 [Overspeed Limit].	Default: 0.0 Hz Min/Max: 0.0/[Maximum Speed] Units: 0.1 Hz	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 (Dependent on voltage class) 5.0/400.0 Hz Min/Max: 5.0/500.0 Hz E C 0.1 Hz Units:	055 083 091 094 202 298
		083	**[Overspeed Limit]** Sets the incremental amount of the output frequency (above [Maximum Speed]) for functions such as slip compensation. P82 [Maximum Speed] + P83 [Overspeed Limit] must be ≤ P55 [Maximum Freq]	Default: 10.0 Hz Min/Max: 0.0/20.0 Hz Units: 0.1 Hz	055 082



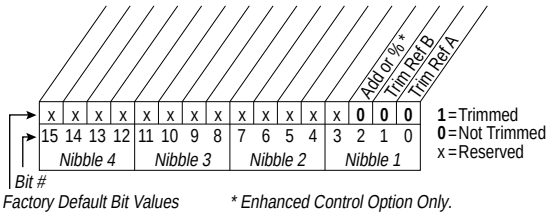
File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
SPEED COMMAND (file C)	Spd Mode and Limits	084 085 086	**[Skip Frequency 1]** **[Skip Frequency 2]** **[Skip Frequency 3]** Sets a frequency where the drive does not operate.	Default: 0.0 Hz Default: 0.0 Hz Default: 0.0 Hz Min/Max: ±500.0 Hz Units: 0.1 Hz	087
		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
		088 FV	E C v2 **[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. **ATTENTION:** The speed of the drive could reach P82 [Maximum Speed] + P83 [Overspeed Limit] to meet required torque when any of the torque modes have been selected. Equipment damage and/or personal injury can result.	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"	053 361... 366
		454	E C **[Rev Speed Limit]** Sets a limit on speed in the negative direction. A value of zero disables this parameter and uses [Min Speed] for minimum speed.	Default: 0.0 Hz Min/Max: –[Max Speed]/0.0 Hz Units: 0.1 Hz	

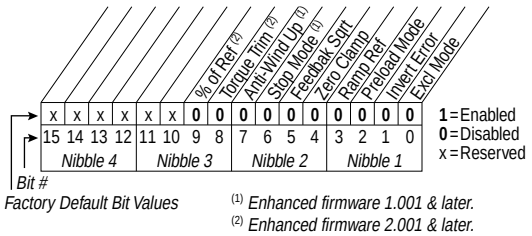
File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values			Related
SPEED COMMAND (file C)	Speed References	090	**[Speed Ref A Sel]** Selects the source of the speed reference to the drive unless [Speed Ref B Sel] or [Preset Speed 1…7] is selected. For more information on selecting a speed reference source, see Speed Reference Control on page 116. (1) See External and Internal Connections on page 99 for DPI port locations. (2) Only Enhanced Control Drives.	Default: Options:	2 1 2 3…7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23, 24 25 26 27…29 30	"Analog In 2" "Analog In 1" "Analog In 2" "Reserved" "Encoder" "MOP Level" "Reserved" "Preset Spd1" "Preset Spd2" "Preset Spd3" "Preset Spd4" "Preset Spd5" "Preset Spd6" "Preset Spd7" "DPI Port 1"(1) "DPI Port 2"(1) "DPI Port 3"(1) "Reserved" "DPI Port 5"(1) "Reserved" "Scale Block1" "Scale Block2" "Reserved" "HighRes Ref"(2)	002 091… 093 101… 107 117… 120 192… 194 213 272 273 320 361… 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: Min/Max: Units:	[Maximum Speed] ±[Maximum Speed] 0.1 Hz		082 090
		092	**[Speed Ref A Lo]** Scales the lower value of the [Speed Ref A Sel] selection when the source is an analog input.	Default: Min/Max: Units:	0.0 Hz ±[Maximum Speed] 0.1 Hz		081 090
		093	**[Speed Ref B Sel]** See [Speed Ref A Sel].	Default: Options:	11 See [Speed Ref A Sel]	"Preset Spd1"	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: Min/Max: Units:	[Maximum Speed] ±[Maximum Speed] 0.1 Hz		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: Min/Max: Units:	0.0 Hz ±[Maximum Speed] 0.1 Hz		090 093

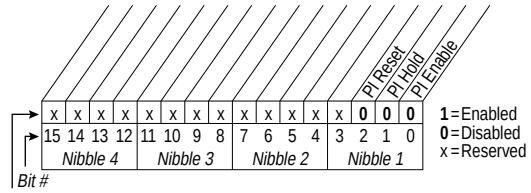
File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values			Related
SPEED COMMAND	Speed References	096	**[TB Man Ref Sel]** Sets the manual speed reference source when a digital input (parameter 361…366) is configured for "Auto/Manual." • (1)"Analog In 2" is not a valid selection if it was selected for any of the following: - P117 [Trim In Select] - P128 [PI Feedback Sel] - P126 [PI Reference Sel] - P147 [Current Lmt Sel] - P179 [Sleep Wake Ref]	Default: Options:	1 1 2 3…8 9 10…17 18 19 20	"Analog In 1" "Analog In 1" "Analog In 2" (1) "Reserved" "MOP Level" "Reserved" "DPI Port 1" (2) "DPI Port 2" (2) "DPI Port 3" (2)	097 098
			(2)Requires a Series B HIM with firmware revision v5.004.01 or later. Selects the HIM to provide the manual speed reference when a digital input is configured for "Auto/Manual." Additionally, if [Man Ref Preload], parameter 193 is set to "Enabled," the automatic speed reference is preloaded into the HIM when the drive switches to Manual mode from Automatic mode. • Set [Save HIM Ref], parameter 192, bit 1 (Manual Mode) as desired. • Set [TB Man Ref Sel] to the desired drive reference when in Manual Mode. If set to one of the DPI Ports, then [Man Ref Preload] must be set to enable or disable reference preload of the current speed. Connect a HIM to the DPI Port selected. • When Manual mode is requested through the terminal block digital input, the drive evaluates if Manual mode can be granted. • If [TB Man Ref Sel] is set to a DPI Port and [Man Ref Preload] is enabled, the drive transfers the last value of the automatic speed reference to the HIM. The HIM is now the speed reference source. The terminal block has exclusive control based on [Save HIM Ref], bit 1 (Manual Mode). If [Man Ref Preload] is disabled, the HIM is now the speed reference source. The terminal block has exclusive control based on [Save HIM Ref], bit 1 (Manual Mode). **Important:** the HIM does not enter Manual mode, it is only the reference source for the terminal block. When Auto mode is requested through the terminal block, the drive changes to Auto mode and returns control and reference to the previous state before Manual mode was requested.				
		097	**[TB Man Ref Hi]** Scales the upper value of the [TB Man Ref Sel] selection when the source is an analog input.	Default: Min/Max: Units:	[Maximum Speed] ±[Maximum Speed] 0.1 Hz		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: Min/Max: Units:	0.0 Hz ±[Maximum Speed] 0.1 Hz		096

File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
SPEED COMMAND (file C)	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	361…366
			E C **[Jog Speed 1]** Sets the output frequency when Jog Speed 1 is selected.	Default: 10.0 Hz Min/Max: ±[Maximum Speed] Units: 0.1 Hz	
		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 10.0 Hz 20.0 Hz 30.0 Hz 40.0 Hz 50.0 Hz 60.0 Hz Min/Max: ±[Maximum Speed] Units: 0.1 Hz	090 093 213 361…366
		108	E C **[Jog Speed 2]** Sets the output frequency when Jog Speed 2 is selected.	Default: 10.0 Hz Min/Max: ±[Maximum Speed] Units: 0.1 Hz	361…366
	Speed Trim	116	E C **[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: 0.00% Min/Max: ±200.00% Units: 0.01%	090 093 117
		117	**[Trim In Select]** Specifies the analog input signal to use as a trim input. (1) See External and Internal Connections on page 99 for DPI port locations.	Default: 2 "Analog In 2" Options: 1 "Analog In 1" 2 "Analog In 2" 3…7 "Reserved" 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 "Reserved" 22 "DPI Port 5"(1) 23 "Reserved" 24 "Reserved" 25 "Scale Block1" 26 "Scale Block2"	090 093 116

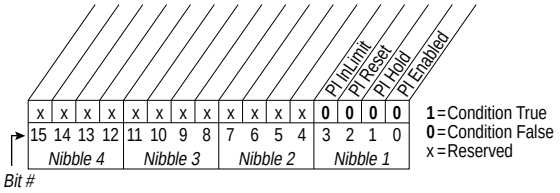
File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
SPEED COMMAND (file C)	Speed Trim	118	**[Trim Out Select]** Specifies the speed references to be trimmed. To apply negative trim, P190 [Direction Mode] must be set to 1 "Bipolar."		117 119 120 190
		119	**[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 % EC	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 % EC	117
	Slip Comp		**Important:** Parameters in the Slip Comp Group are used to enable and tune the Slip Compensation Regulator. For the Slip Compensation Regulator to control drive operation, set parameter 080 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 are not accepted.	Default: Based on [Motor NP RPM] Min/Max: 0.0/1200.0 rpm Units: 0.1 rpm	044 061 080 122 123
		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: 0.0/300.0 rpm ±300.0 rpm EC Units: 0.1 rpm	080 121 122
	Process PI		**Important:** Parameters in the Process PI Group are used to enable and tune the PI Loop. Standard For the PI Loop to control drive operation, set parameter 080 to 2 "Process PI".		
		124	**[PI Configuration]** Sets configuration of the PI regulator.		124… 138 140… 143





File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
SPEED COMMAND (file C)	Process PI	125	**[PI Control]** Controls the PI regulator.  *Factory Default Bit Values*		080 361… 366
		126	**[PI Reference Sel]** Selects the source of the PI reference. (1) Only Enhanced Control Drives.	Default: 0 "PI Setpoint" Options: See Table	124… 138 460
		127	**[PI Setpoint]** Provides an internal fixed value for process setpoint when [PI Reference Sel] is set to "PI Setpoint."	Default: 50.00% Min/Max: ±100.00% of Maximum Process Value Units: 0.01%	124… 138
		128	**[PI Feedback Sel]** Selects the source of the PI reference.	Default: 2 "Analog In 2" Options: See P126 [PI Reference Sel].	124… 138 462 463
		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). A value of zero disables this parameter	Default: 2.00 Secs Min/Max: 0.00/100.00 Secs Units: 0.01 Secs	124… 138
		130	**[PI Prop Gain]** Sets the value for the PI proportional component. PI Error × PI Prop Gain = PI Output	Default: 1.00 Min/Max: 0.00/100.00 Units: 0.01	124… 138
		131	**[PI Lower Limit]** Sets the lower limit of the PI output.	Default: –[Maximum Freq] –100% EC Min/Max: ±400.0 Hz ±800% EC Units: 0.1 Hz 0.1% EC	124… 138

Options		P462 [PI Feedback Hi]	P463 [PI Feedback Lo]
0	"Setpoint"	+100	-100
1	"Analog In 1"	P322 [Analog In1 Hi]	P323 [Analog In1 Lo]
2	"Analog In 2"	P325 [Analog In2 Hi]	P326 [Analog In2 Lo]
3…7	"Reserved"		
8	"Encoder"	+P55 [Maximum Freq]	-P55 [Maximum Freq]
9	"MOP Level"	+P55 [Maximum Freq]	-P55 [Maximum Freq]
10	"Master Ref"	+P55 [Maximum Freq]	-P55 [Maximum Freq]
11…17	"Preset Spd1…7"	+P55 [Maximum Freq]	-P55 [Maximum Freq]
18…20	"DPI Port 1…3"	+32767	-32676
21	"Reserved"		
22	"DPI Port 5"	+32767	-32676
23, 24	"Reserved"		
25	"Scale Block1"	P477 [Scale1 In Hi]	P478 [Scale1 In Lo]
26	"Scale Block2"	P483 [Scale2 In Hi]	P484 [Scale2 In Lo]
27…29	"Reserved"		
30	"HighRes Ref" (1)	$+32767 \times 2^{16}$	-32767×2^{16}
31	"CommandedTrq" (2)	P436 [Pos Torque Limit]	P437 [Neg Torque Limit]
32	"Torque Est" (2)	P436 [Pos Torque Limit]	P437 [Neg Torque Limit]
33	"Torque Amps" (2)	+P28 [Rated Amps]	-P28 [Rated Amps]

File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
SPEED COMMAND (file C)	Process PI	132	**[PI Upper Limit]** Sets the upper limit of the PI output.	Default: +[Maximum Freq] 100% EC Min/Max: ±400.0 Hz ±800.0% EC Units: 0.1 Hz 0.1% EC	124… 138
		133	**[PI Preload]** Sets the value used to preload the integral component on start or enable.	Default: 0.0 Hz 100.0% EC Min/Max: [PI Lower Limit]/ [PI Upper Limit Units: 0.1 Hz 0.1% EC	124… 138
		134	**[PI Status]** Status of the Process PI regulator. 	Read Only	124… 138
		135	**[PI Ref Meter]** Present value of the PI reference signal.	Default: Read Only Min/Max: ±100.00% Units: 0.01%	124… 138
		136	**[PI Fdback Meter]** Present value of the PI feedback signal.	Default: Read Only Min/Max: ±100.00% Units: 0.01%	124… 138
		137	**[PI Error Meter]** Present value of the PI error.	Default: Read Only Min/Max: ±100.00% Units: 0.01%	124… 138
		138	**[PI Output Meter]** Present value of the PI output.	Default: Read Only Min/Max: ±100.0 Hz ±800.0% EC Units: 0.1 Hz 0.1% EC	124… 138
		139	EC v2 **[PI BW Filter]** Firmware revision 2.001 and later – Provides filter for Process PI error signal. The output of this filter is displayed in [PI Error Meter]. Zero disables the filter.	Default: 0.0 R/s Min/Max: 0.0/240.0 R/s Units: 0.1 R/s	137
		459	EC v2 **[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	

File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
SPEED COMMAND (file C)	Process PI	460	E C **[PI Reference Hi]** Scales the upper value of [PI Reference Sel] of the source.	Default: 100.0% Min/Max: ±100.0% Units: 0.1%	126
		461	E C **[PI Reference Lo]** **Scales the lower value of [PI Reference Sel] of the source.**	Default: –100.0% Min/Max: ±100.0% Units: 0.1%	126
		462	E C **[PI Feedback Hi]** **Scales the upper value of [PI Feedback] of the source.**	Default: 100.0% Min/Max: ±100.0% Units: 0.1%	128
		463	E C **[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	E C v2 **[Ki Speed Loop]** FV Controls the integral error gain of the speed regulator. The drive automatically adjusts P445 [Ki Speed Loop] when a non-zero value is entered for P449 [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. P449 [Speed Desired BW] is set to "0" when a manual adjustment is made to this parameter.	Default: 7.8 Min/Max: 0.0/4000.0 Units: 0.1	053 449 450
		446	E C v2 **[Kp Speed Loop]** FV Controls the proportional error gain of the speed regulator. The drive automatically adjusts P446 [Kp Speed Loop] when a non-zero value is entered for P449 [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. P449 [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	053 449 450
		447	E C v2 **[Kf Speed Loop]** FV 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
		448	E C v3 **[Spd Err Filt BW]** FV Sets the bandwidth of a speed error filter used in FVC Vector mode. A setting of 0.0 disables the filter.	Default: 200.0 R/s Min/Max: 0.0/2000.0 R/s Units: 0.1 R/s	053

File C	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
SPEED COMMAND (file C)	Speed Regulator	449 FV	E C v2 **[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 causes the drive to calculate and change P445 [Ki Speed Loop] and P446 [Kp Speed Loop] gains.	Default: 0.0 Radians/Sec Min/Max: 0.0/250.0 Radians/Sec Units: 0.1 Radians/Sec	053 067 445 446
		450 FV	E C v2 **[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 causes the drive to calculate and change P445 [Ki Speed Loop] and P446 [Kp Speed Loop] gains.	Default: 0.10 Secs Min/Max: 0.01/600.0 Secs Units: 0.01 Secs	053 067 445 446 449
		451 FV	E C v2 **[Speed Loop Meter]** Value of the speed regulator output. When in FVC mode, units are in percent.	Default: Read Only Min/Max: ±800.0%/Hz Units: 0.1%/Hz	053 121

Dynamic Control File (file D)

File D	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (file D)	Ramp Rates	140 141	**[Accel Time 1]** **[Accel Time 2]** Sets the rate of accel for all speed increases. $\frac{\text{Max Speed}}{\text{Accel Time}}$ = Accel Rate	Default: 10.0 Secs 10.0 Secs Min/Max: 0.0/3600.0 Secs Units: 0.1 Secs	142 143 146 361...366
		142 143	**[Decel Time 1]** **[Decel Time 2]** Sets the rate of decel for all speed decreases. $\frac{\text{Max Speed}}{\text{Decel Time}}$ = Decel Rate	Default: 10.0 Secs 10.0 Secs Min/Max: 0.0/3600.0 Secs Units: 0.1 Secs	140 141 146 361...366
		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: 0.0% Min/Max: 0.0/100.0% Units: 0.1%	056 140...143
	Load Limits	147	**[Current Lmt Sel]** Selects the source for the adjustment of current limit (for example, parameter, analog input, and so on).	Default: 0 "Cur Lim Val" Options: 0 "Cur Lim Val" 1 "Analog In 1" 2 "Analog In 2"	146 148 149
		148	**[Current Lmt Val]** Defines the current limit value when [Current Lmt Sel] = "Cur Lim Val."	Default: [Rated Amps] × 1.5 (Equation approximates default value.) Min/Max: Drive Rating Based Units: 0.1 Amps	028 147 149
		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 can occur at higher carrier frequencies. For derating information, refer to the PowerFlex Reference Manual, publication PFLEX-RM001.	Default: 4 kHz Min/Max: 2, 3, 4, 5, 6, 7, 8, 9, 10 kHz 2, 4, 8, 12 kHz (1) EC Units: 1 kHz (1) Only Frames A...D.	

File D	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (file D)	Load Limits	152	E C v2 **[Droop RPM @ FLA]** Selects amount of droop that the speed reference is reduced when at full load torque. Zero disables the droop function. Setting parameter 080 to 0 is recommended when you are using the Droop function.	Default: 0.0 rpm Min/Max: 0.0/200.0 rpm Units: 0.1 rpm	
		153	E C v2 **[Regen Power Lim]** FV Sets the maximum power limit transfer from the motor to the DC bus. When you are using an external dynamic brake, set this parameter to its minimum (–800.0%) value. Overvoltage trips can occur if set too negative and the connected brake is unable to dissipate the energy.	Default: –50.0% Min/Max: –800.0/0.0% Units: 0.1%	053 161 162 163
		154	E C v2 **[Current Rate Lim]** FV Sets the largest 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
		189	E C **[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	
	Stop/Brake Modes	145	E C **[DB While Stopped]** Enables/disables dynamic brake operation. Disabled = DB operates only when the drive is running. Enable = DB operates whenever the drive is energized.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	
		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 digital inputs programmed for "Stop Mode B." (1) When you are 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"	157 158 159 161 163 168 361... 366
			E C v2 **[Stop/Brk Mode A]** E C v2 **[Stop/Brk Mode B]** See description above.	Default: 1 "Ramp" Default: 0 "Coast" Options: 0 "Coast" 1 "Ramp"(1) 2 "Ramp to Hold"(1) 3 "DC Brake" 4 "Fast Brake" E C v3	

File D	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values		Related
DYNAMIC CONTROL (file D)	Stop/Brake Modes	157	**[DC Brake Lvl Sel]** Selects the source for [DC Brake Level].	Default: Options:	0 "DC Brake Lvl" 0 "DC Brake Lvl" 1 "Analog In 1" 2 "Analog In 2"	155 156 158 159
		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 that is used in this function is created by a PWM algorithm and can fail to generate the smooth holding force needed for some applications. Refer to the PowerFlex 70 and 700 Adjustable Frequency AC Drive Reference Manual, publication PFLEX-RM001. **Important:** Frame E drives can be limited to less than 150% depending on the setting of parameter 151 [PWM Frequency]. **ATTENTION:** If a hazard of injury due to movement of equipment or material exists, an auxiliary mechanical braking device must be used. **ATTENTION:** Do not use this feature with synchronous or permanent magnet motors. Motors can be demagnetized during braking.	Default: Min/Max: Units:	[Rated Amps] 0/[Rated Amps] × 1.5 (Equation yields approximate maximum value.) 0.1 Amps	155 156 157
		159	**[DC Brake Time]** Sets the amount of time DC brake current is "injected" into the motor.	Default: Min/Max: Units:	0.0 Secs 0.0/90.0 Secs 0.1 Secs	155... 158
		160	Standard **[Bus Reg Gain]** E C **[Bus Reg Ki]** Sets the responsiveness of the bus regulator.	Default: Min/Max: Units:	450 0/5000 1	161 162

File D	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (file D)	Stop/Brake Modes	161 162	**[Bus Reg Mode A]** **[Bus Reg Mode B]** Active bus regulation mode. Choices are dynamic brake, frequency adjust or both. Sequence is determined by programmed value or digital input programmed for "Bus Reg Md B." Dynamic Brake Setup If a dynamic brake resistor is connected to the drive, both these parameters must be set to either option 2, 3 or 4. Refer to the Attention statement on page 10 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 1 on page 106 (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"	155 156 160 163 361... 366
		163	**[DB Resistor Type]** Selects whether the internal or an external DB resistor used. If a dynamic brake resistor is connected to the drive, P161/162 [Bus Reg Mode x], A, B or Both (if used), must be set to either option 2, 3 or 4. **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 1 on page 106, or equivalent, must be supplied. **ATTENTION:** Equipment damage can result if a drive mounted (internal) resistor is installed and this parameter is set to "External Res." Thermal protection for the internal resistor is disabled, resulting in possible device damage.	Default: 0 "Internal Res" 2 "None" E C Options: 0 "Internal Res" 1 "External Res" 2 "None"	161 162 166
		164	E C **[Bus Reg Kp]** Proportional gain for the bus regulator. Used to adjust regulator response.	Default: 1500 Min/Max: 0/10000 Units: 1	
		165	E C **[Bus Reg Kd]** Derivative gain for the bus regulator. Used to control regulator overshoot.	Default: 1000 Min/Max: 0/10000 Units: 1	

File D	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (file D)	Stop/Brake Modes	166	E C v2 **[Flux Braking]** Set to use an increase in the motor flux current to increase the motor losses, and enables a faster deceleration time when a chopper brake or regenerative capability is not available. Can be used as a stopping or fast deceleration method. For more information about applying this mode of operation, see Stop Modes on page 109.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	
	Restart Modes	167	E C **[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. **ATTENTION:** Equipment damage and/or personal injury can 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.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	167 169 174 361... 366

File D	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (file D)	Restart Modes	169	**[Flying Start En]** Enables/disables the function that reconnects to a spinning motor at actual rpm when a start command is issued.	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	170
		170	**[Flying StartGain]** Sets the response of the flying start function.	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. Refer to the PowerFlex Reference Manual, publication PFLEX-RM004 for additional information. **ATTENTION:** Equipment damage and/or personal injury can 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.	Default: 0 Min/Max: 0/9 Units: 1	175
		175	**[Auto Rstrt Delay]** Sets the time between restart attempts when [Auto Rstrt Tries] is set to a value other than zero. The HIM display shows AutoRst X,YY during the restart delay. Where X is the number of restarts left and YY is the time left before restart. For delay times of 99 seconds or less, YY displays the seconds remaining before restart. For delay times greater than 99 seconds, YY changes to the percent of delay time remaining before restart. **Description**: Restarts Remaining = 8; Delay Time = 93 seconds **Example Screen**: F-> AutoRst 8,93 Auto F2 Auxiliary Input Time Since Fault 00000:00:31	Default: 1.0 Secs Min/Max: 0.5/6000.0 Secs Units: 0.1 Secs	174

File D	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (file D)	Restart Modes	178	E C v2 **[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] and [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)	179…183

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 and international codes, standards, regulations or industry guidelines must be considered.

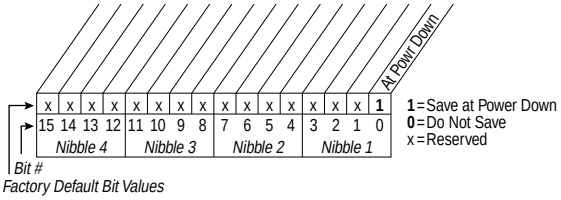
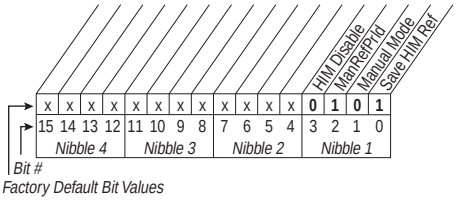
Conditions Required to Start Drive (1)(2)(3)

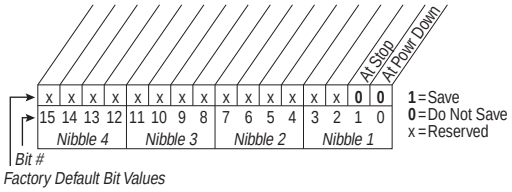
Input	After Powerup	After a Drive Fault		After a Stop Command
		Reset by Stop-CF, HIM or TB	Reset by Clear Faults (TB)	HIM or TB
Stop	Stop Closed Wake Signal	Stop Closed Wake Signal New Start or Run Cmd. (4)	Stop Closed Wake Signal	Stop Closed Direct Mode Analog Sig. > Sleep Level (6) Invert Mode Analog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

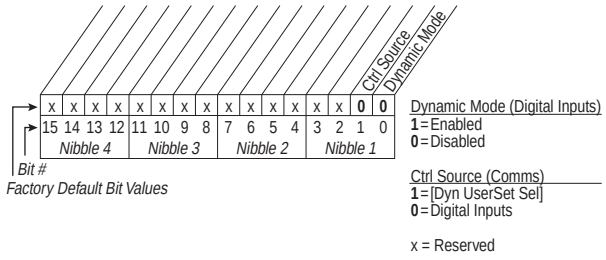
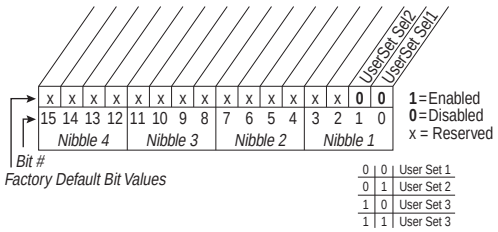
(1) When power is cycled, if all of the above conditions are present after power is restored, a restart occurs.
(2) If all of the above conditions are present when [Sleep-Wake Mode] is "enabled," the drive starts.
(3) The active speed reference is determined as explained in Speed Reference Control on page 116. The Sleep/Wake function and the speed reference can 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) Enhanced firmware revision 2.001 and later. For Invert function, refer to [Analog In x Loss].

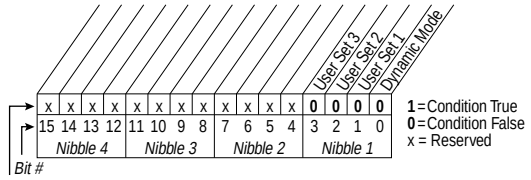
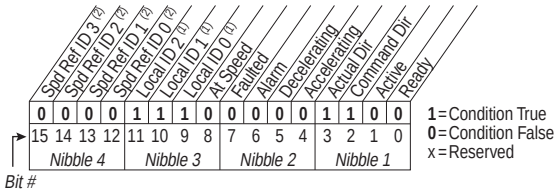
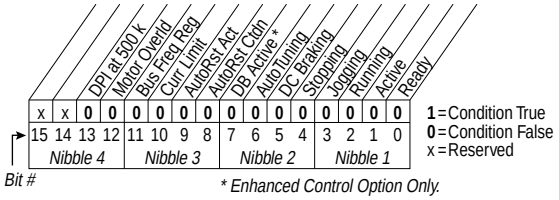
File D	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
DYNAMIC CONTROL (file D)	Restart Modes	179	E C v2 **[Sleep Wake Ref]** Selects the source of the input controlling the Sleep-Wake function.	Default: 2 "Analog In 2" Options: 1 "Analog In 1" 2 "Analog In 2"	178 180 183 320…327
		180	E C v2 **[Wake Level]** Defines the analog input level that starts the drive.	Default: 6.000 mA, 6.000 Volts Min/Max: [Sleep Level]/20.000 mA [Sleep Level]/10.000 Volts Units: 0.001 mA 0.001 Volts	178 179 181 183
		181	E C v2 **[Wake Time]** Defines the amount of time at or above [Wake Level] before a Start is issued.	Default: 1.0 Secs Min/Max: 0.0/1000.0 Secs Units: 0.1 Secs	178 180
		182	E C v2 **[Sleep Level]** Defines the analog input level that stops 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	178 180 183
		183	E C v2 **[Sleep Time]** Defines the amount of time at or below [Sleep Level] before a Stop is issued.	Default: 1.0 Secs Min/Max: 0.0/1000.0 Secs Units: 0.1 Secs	182
		177	E C v2 **[Gnd Warn Level]** Sets the level where a ground warning fault occurs. Configure with [Alarm Config 1].	Default: 3.0 Amps Min/Max: 1.0/5.0 Amps Units: 0.1 Amps	259
	Power Loss	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". "Coast" = Disable drive and enable the motor to coast. "Decel" = Decelerate the motor at a rate that regulates the DC Bus until the load's Kinetic Energy can no longer power the drive. "Continue" = Enable the drive to power the motor down to 50% of the nominal DC Bus voltage. Refer to the PowerFlex 70EC/700VC Reference Manual, publication PFLEX-RM004, for additional information. **ATTENTION:** To guard against drive damage, a minimum line impedance must be provided to limit inrush current when the power line recovers. Provide an input impedance equal or greater than the equivalent of a 5% transformer with a VA rating 6 times the drive's input VA rating.	Default: 0 "Coast" Options: 0 "Coast" 1 "Decel" 2 "Continue" E C 3 "Reserved" 4 "Reserved" 5 "Decel 2 Stop" E C v4	013 185 361…366
		185	**[Power Loss Time]** Sets the time that the drive remains 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
		187	E C v2 **[Load Loss Level]** Sets the percentage of motor nameplate torque where a load loss alarm occurs.	Default: 200.0% Min/Max: 0.0/800.0% Units: 0.1%	211 259
		188	E C v2 **[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: 0.0/300.0 Secs Units: 0.1 Secs	187

Utility File (file E)

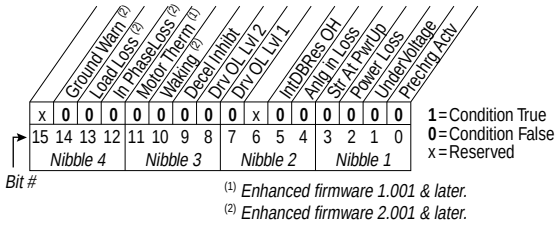
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	Direction Config	190	**[Direction Mode]** Selects the method for changing drive direction. **Mode** / **Direction Change** Unipolar / Drive Logic Bipolar / Sign of Reference Reverse Dis / Not Changable	Default: 0 "Unipolar" Options: 0 "Unipolar" 1 "Bipolar" 2 "Reverse Dis"	320…327 361…366
	HIM Ref Config	192	Standard **[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.  *Factory Default Bit Values* E C **[AutoMan Cnfg]** Enables HIM to control only the Speed Reference, or Reference, Start, and Jog in Manual mode including two-wire control. Also enables a feature to save the preset frequency reference value issued by the HIM to drive memory on power loss. Value is restored to the HIM on power up.  *Factory Default Bit Values* Manual Mode **1** = HIM has exclusive Start & Jog control in Manual mode. **0** = Disabled HIM Disable **1** = HIM does not start drive. **0** = HIM starts drive x = Reserved Save HIM Ref 1 = Saves HIM reference, Reloads HIM reference at power-up. **0** = Disabled ManRefPrld **1** = Preloads auto reference into HIM upon Auto to Manual transition. **0** = Disabled		
		193	Standard **[Man Ref Preload]** Enables/disables a feature to automatically load the present "Auto" frequency reference value into the HIM when "Manual" is selected. Enables smooth speed transition from "Auto" to "Manual."	Default: 0 "Disabled" Options: 0 "Disabled" 1 "Enabled"	

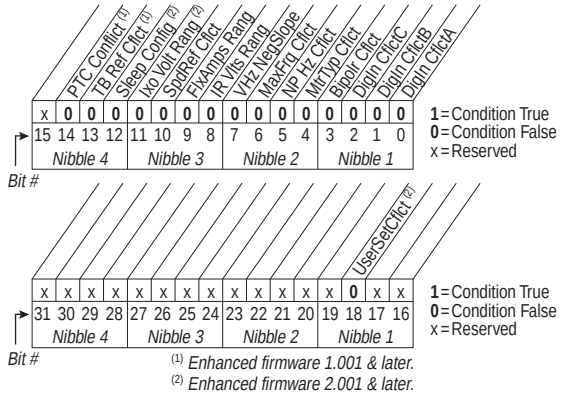
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	MOP Config	194	**[Save MOP Ref]** Enables/disables the feature that saves the present MOP frequency reference at power down or at stop.  *Factory Default Bit Values*		090 093 096 361… 366
		195	**[MOP Rate]** Sets rate of change of the MOP reference in response to a digital input.	Default: 1.0 Hz/s Min/Max: 0.2/[Maximum Freq] Units: 0.1 Hz/s	090 093 096 361… 366
	Drive Memory	196	**[Param Access Lvl]** Selects the parameter display level viewable on the HIM. Basic = Reduced param. set Advanced = Full param. set Reserved = Full param. set and Engineering params.	Default: 0 "Basic" Options: 0 "Basic" 1 "Advanced" 2 "Reserved" EC	
		197	**[Reset To Defalts]** Resets all parameter values (except parameters 196, 201, and 202) to defaults. Option 1 resets drive to factory settings. Options 2 and 3 reset the drive to alternate voltage and current rating.	Default: 0 "Ready" Options: 0 "Ready" 1 "Factory" 2 "Low Voltage" 3 "High Voltage"	
		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. To maintain control consistency when you are using the drive inputs (P361…P366), verify that the input settings are identical in each of the user sets.	Default: 0 "Ready" Options: 0 "Ready" 1 "User Set 1" 2 "User Set 2" 3 "User Set 3"	198 361… 366
		200	**[Reset Meters]** Resets selected meters to zero.	Default: 0 "Ready" Options: 0 "Ready" 1 "MWh" 2 "Elapsed Time"	

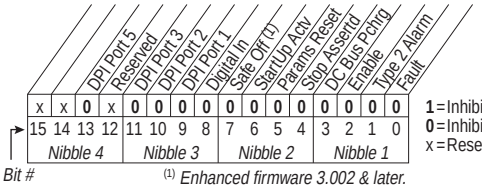
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	Drive Memory	201	**[Language]** Selects the display language when you are using an LCD HIM. This parameter is not functional with an LED HIM.	Default: 0 "Not Selected" Options: 0 "Not Selected" 1 "English" 2 "Français" 3 "Español" 4 "Italiano" 5 "Deutsch" 6 "Reserved" 7 "Português" 8, 9 "Reserved" 10 "Nederlands"	
		202	**[Voltage Class]** Configures the drive current rating and associates it with the selected voltage (for example, 400 or 480V). This parameter is normally used when downloading parameter sets.	Default: Based on Drive Cat. No. "Low Voltage" Options: 2 "High Voltage" 3	
		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	
		204	E C v2 **[Dyn UsrSet Cnfg]** Enables/Disables dynamic selection of user parameter sets. **Important:** In dynamic mode, changes to the parameters are not saved to nonvolatile storage. Switching user sets restores the values last saved before enabling dynamic mode.  	198 199 361... 366
		205	E C v2 **[Dyn UsrSet Sel]** Selects user set if [Dyn UsrSet Cnfg] = xxx xx11.  	204

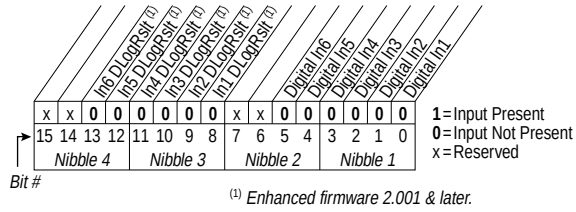
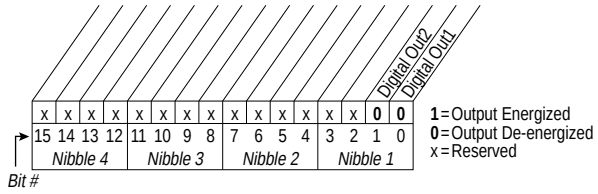
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	Drive Memory	206	E C v2 **[Dyn UserSet Actv]** Indicates the active user set and if the operation is dynamic or normal.  *Factory Default Bit Values*	Read Only	198 199 361… 366
	Diagnostics	209	**[Drive Status 1]** Present operating condition of the drive.  Bits (2) / Description 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) / Description 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	Read Only	210 213
		210	**[Drive Status 2]** Present operating condition of the drive.  	Read Only	209

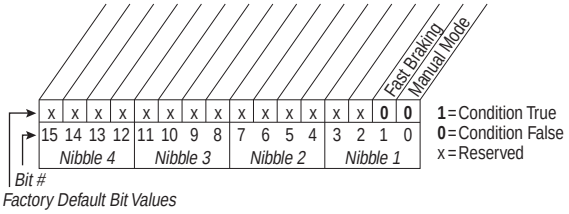
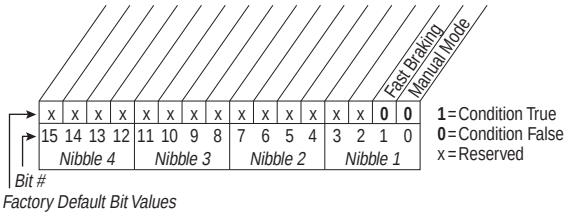
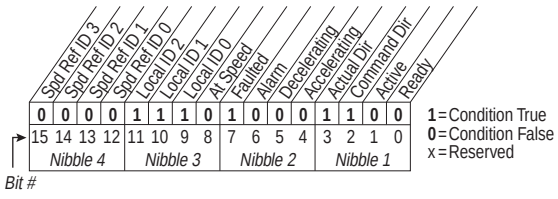
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	Diagnostics	211	**[Drive Alarm 1]** Alarm conditions that currently exist in the drive. See Chapter 2 for information on Type 1 alarms.	Read Only	212
		212	**[Drive Alarm 2]** Alarm conditions that currently exist in the drive. See Chapter 2 for information on Type 2 alarms.	Read Only	211



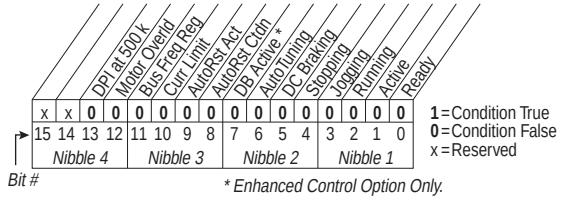


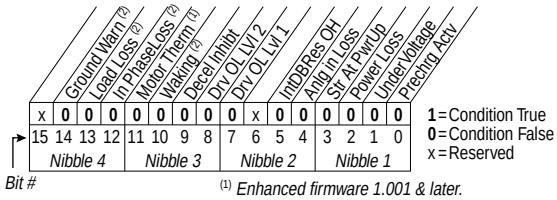
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values			Related
UTILITY (file E)	Diagnostics	213	**[Speed Ref Source]** Displays the source of the speed reference to the drive. (1) Displays after Start is pressed. (2)Only Enhanced Control Drives.	Default: Options:	0 1 2 3…7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23,24 25 26 27…29 30	Read Only "PI Output"(1) "Analog In 1" "Analog In 2" "Reserved" "Encoder" "MOP Level" "Reserved" "Preset Spd1" "Preset Spd2" "Preset Spd3" "Preset Spd4" "Preset Spd5" "Preset Spd6" "Preset Spd7" "DPI Port 1" "DPI Port 2" "DPI Port 3" "Reserved" "DPI Port 5" "Reserved" "Scale Block1" "Scale Block2" "Reserved" "HighRes Ref"(2)	002 090 093 096 101
		214	**[Start Inhibits]** Displays the inputs currently preventing the drive from starting.  (1) Enhanced firmware 3.002 & later.	Read Only			243 361…366
		215	**[Last Stop Source]** Displays the source that initiated the most recent stop sequence. The display is cleared (set to 0) during the next start sequence.	Default: Options:	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14	Read Only "Pwr Removed" "DPI Port 1" "DPI Port 2" "DPI Port 3" "Reserved" "DPI Port 5" "Reserved" "Digital In" "Fault" "Not Enabled" "Sleep" "Jog" "Autotune" EC "Precharge" EC "Safe Off" EC v3	361…366

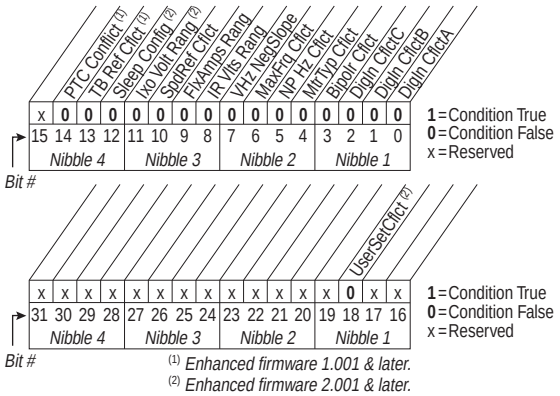
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	Diagnostics	216	**[Dig In Status]** Status of the digital inputs.  (1) *Enhanced firmware 2.001 & later.*	Read Only	361… 366 411
		217	**[Dig Out Status]** Status of the digital outputs.  	Read Only	380… 384
		218	**[Drive Temp]** Present operating temperature of the drive power section. For heatsink temperature, refer to P234 [Testpoint 1 Sel].	Default: Read Only Min/Max: ±100 degC 0.0/100.0% EC Units: 1.0 degC 0.1% EC	
		219	**[Drive OL Count]** Accumulated percentage of drive overload. Continuously operating the drive over 100% of its rating increases 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
		220	**[Motor OL Count]** Accumulated percentage of motor overload. Continuously operating the motor over 100% of the motor overload setting increases this value to 100% and cause a drive fault.	Default: Read Only Min/Max: 0.0/100.0% Units: 0.1%	047 048
		221	EC v3 **[Mtr OL Trip Time]** Amount of time before a drive Overload fault(f64) occurs if the load condition remains constant. A value of 99999 means that the drive is operating under the overload level.	Default: Read Only Min/Max: 0/99999 Units: 1	220

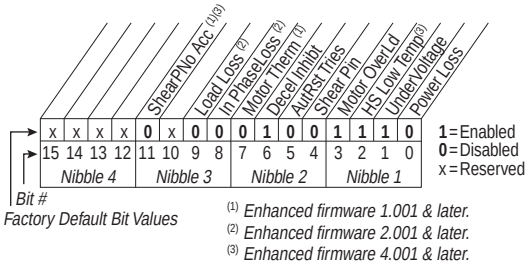
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	Diagnostics	222	E C v3 **[Drive Status 3]** Present operating condition of the drive. Manual Mode - See "Manual" Speed Sources on page 117. Fast Braking - Fast Braking is active, see [Stop/Brk Mode A] [Stop/Brk Mode B] on page 42. 	Read Only	
		223	E C v3 **[Status 3 @ Fault]** Captures and displays [Drive Status 3] bit pattern at the time of the last fault. 	Read Only	
		224	**[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…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…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…230
		227	**[Status 1 @ Fault]** Captures and displays [Drive Status 1] bit pattern at the time of the last fault. 	Read Only	209 224…230

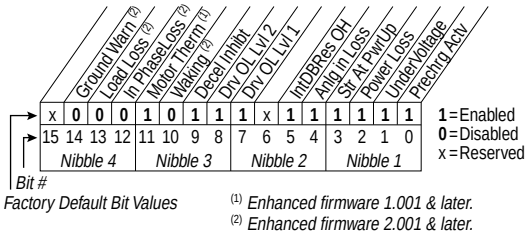
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	Diagnostics	228	**[Status 2 @ Fault]** Captures and displays [Drive Status 2] bit pattern at the time of the last fault.	Read Only	210 224… 230
		229	**[Alarm 1 @ Fault]** Captures and displays [Drive Alarm 1] at the time of the last fault.	Read Only	211 224… 230
		230	**[Alarm 2 @ Fault]** Captures and displays [Drive Alarm 2] at the time of the last fault.	Read Only	212 224… 230





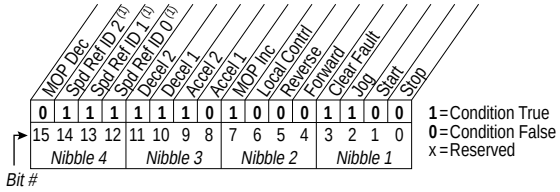


File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	Diagnostics	234 236	**[Testpoint 1 Sel]** **[Testpoint 2 Sel]** Selects the function whose value is displayed value in [Testpoint x Data]. These are internal values that are not accessible through parameters. See Testpoint Codes and Functions on page 85 for a listing of available codes and functions.	Default: 499 Min/Max: 0/999 0/65535 EC Units: 1	235 237
		235 237 EC 32	**[Testpoint 1 Data]** **[Testpoint 2 Data]** The present value of the function selected in [Testpoint x Sel].	Default: Read Only Min/Max: 0/65535 ±2147483647 EC Units: 1	234 236
	Faults	238	**[Fault Config 1]** Enables/disables annunciation of the listed faults.  (1) *Enhanced firmware 1.001 & later.* (2) *Enhanced firmware 2.001 & later.* (3) *Enhanced firmware 4.001 & later.* (4) Bit 11 enables the shear pin fault to be ignored during acceleration and deceleration. If you use Bit 11 with Bit 4 set to "0", Bit 11 will have no effect.	189
		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 that are cleared indirectly via other actions.	Default: 1 "Enabled" Options: 0 "Disabled" 1 "Enabled"	
		242 32	**[Power Up Marker]** Elapsed hours from the initial drive powerup. This value rolls over to 0 after the drive has been powered on for more than the max value shown. The parameter value only updates at powerup. For relevance to most recent power up see [Fault *x* Time] on page 59.	Default: Read Only Min/Max: 0.0000/429496.7295 Hrs Units: 0.0001 Hrs	246

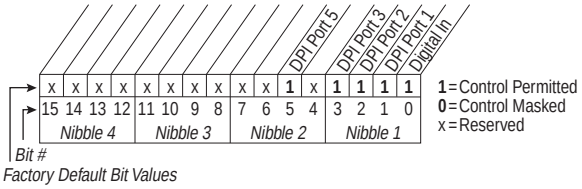
File E	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
UTILITY (file E)	Faults	243 245 247 249	**[Fault 1 Code]** **[Fault 2 Code]** **[Fault 3 Code]** **[Fault 4 Code]** A code that represents the fault that tripped the drive. The codes appears in these parameters in the order they occur ([Fault 1 Code] = the most recent fault).	Default: Read Only Min/Max: 0/9999 0/65535 EC Units: 0	214 238
		244 246 248 250 32	**[Fault 1 Time]** **[Fault 2 Time]** **[Fault 3 Time]** **[Fault 4 Time]** 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. To convert this value to the number of days, hours, minutes and seconds, use the following formulas: • Fault x Time / 24 hours = (# of days).(remaining time) • Remaining Time x 24 hours = (# of hours).(remaining time) • Remaining Time x 60 minutes = (# of minutes).(remaining seconds) • Remaining Time x 60 seconds = (# of seconds) • Result = (# of days).(# of hours).(# of minutes).(# of seconds) Example: • 1909.2390 Hrs / 1 Day/24 Hrs = 79.551625 Days • 0.551625 Days x 24 Hrs/Day = 13.239 Hrs • 0.239 Hrs x 60 Min/Hr = 14.34 Min • 0.34 Min x 60 Sec/Min = 20.4 Secs	Default: Read Only Min/Max: 0.0000/429496.7295 Hrs Units: 0.0001 Hrs	242
	Alarms	259	**[Alarm Config 1]** Enables/disables alarm conditions that initiate an active drive alarm.  *Factory Default Bit Values* (1) *Enhanced firmware 1.001 & later.* (2) *Enhanced firmware 2.001 & later.*		
	Scaled Blocks	476 482	EC v4 **[Scale1 In Value]** EC v4 **[Scale2 In Value]** Displays the value of the signal being sent to [Scale*X* In Value] by using a datalink.	Default: 0.0 Min/Max: -3276.8/+3276.7 Units: 0.1	090 093 117 126 127 427
		477 483	EC v4 **[Scale1 In Hi]** EC v4 **[Scale2 In Hi]** Scales the upper value of [Scale*X* In Value].	Default: 0.0 Min/Max: -3276.8/+3276.7 Units: 0.1	091 094 119 428 460 462
		478 484	EC v4 **[Scale1 In Lo]** EC v4 **[Scale2 In Lo]** Scales the lower value of [Scale*X* In Value].	Default: 0.0 Min/Max: -3276.8/+3276.7 Units: 0.1	092 095 120 429 461 463

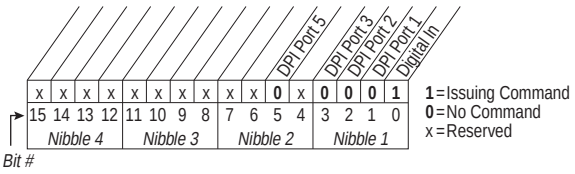
Communication File (file H)

File H	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
COMMUNICATION (file H)	Comm Control	270	**[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"	
		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	
		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 any corrections supplied by slip comp, PI, and so on.	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, and so on.	Default: Read Only Min/Max: ±32767 Units: 1	

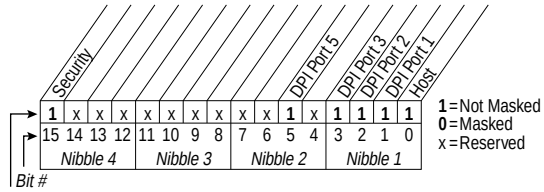
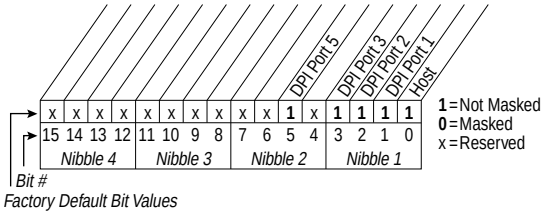
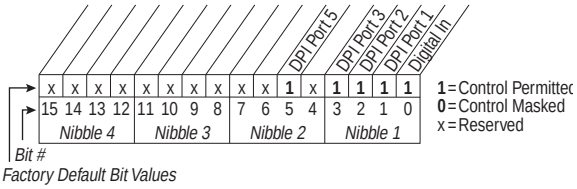


Bits(1)			
14	13	12	Description
0	0	0	No Command - Man. Mode
0	0	1	Ref A Auto
0	1	0	Ref B Auto
0	1	1	Preset 3 Auto
1	0	0	Preset 4 Auto
1	0	1	Preset 5 Auto
1	1	0	Preset 6 Auto
1	1	1	Preset 7 Auto

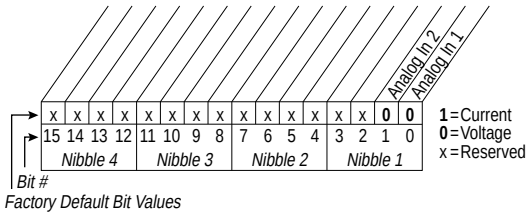
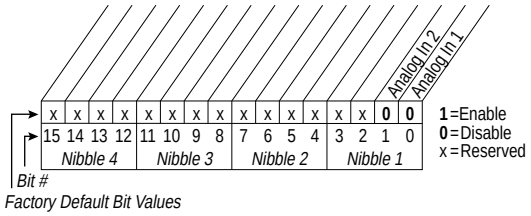
File H	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
COMMUNICATION (file H)	Comm Control	274	E C **[DPI Port Select]** Selects the port reference value that appears in [DPI Port Value].	Default: 0 "Not Used" Options: 0 "Not Used" 1 "DPI Port 1" 2 "DPI Port 2" 3 "DPI Port 3" 4 "Reserved" 5 "DPI Port 5"	
		275	E C **[DPI Port Value]** Value of the DPI reference selected in [DPI Port Sel].	Default: Read Only Min/Max: ±32767 Units: 1	
		298	E C **[DPI Ref Select]** Scales DPI on [Maximum Freq] or [Maximum Speed]. This adjusts the resolution of the DPI reference.	Default: 0 "Max Freq" Options: 0 "Max Freq" 1 "Max Speed"	055 082
	Masks and Owners	276	**[Logic Mask]** Determines the adapters that can control the drive when 598, bit 15 is set to "1." If the bit for an adapter is "0," the adapter has no control functions except for stop.  	288…297
		277	**[Start Mask]** Controls the adapters that can issue start commands.	See P276 [Logic Mask].	288…297
		278	**[Jog Mask]** Controls the adapters that can issue jog commands.	See P276 [Logic Mask].	288…297
		279	**[Direction Mask]** Controls the adapters that can issue forward/reverse direction commands.	See P276 [Logic Mask].	288…297
		280	**[Reference Mask]** Controls the adapters that can select an alternate reference; [Speed Ref A, B Sel] or [Preset Speed 1…7].	See P276 [Logic Mask].	288…297
		281	**[Accel Mask]** Controls the adapters that can select [Accel Time 1, 2].	See P276 [Logic Mask].	288…297
		282	**[Decel Mask]** Controls the adapters that can select [Decel Time 1, 2].	See P276 [Logic Mask].	288…297
		283	**[Fault Clr Mask]** Controls the adapters that can clear a fault.	See P276 [Logic Mask].	288…297

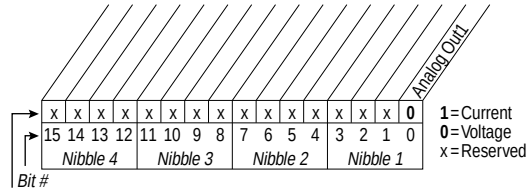
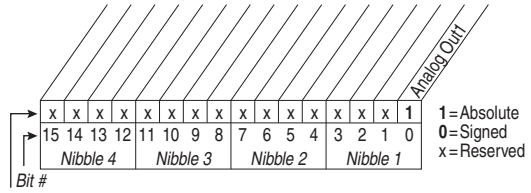
File H	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
COMMUNICATION (file H)	Masks and Owners	284	**[MOP Mask]** Controls the adapters that can issue MOP commands to the drive.	See P276 [Logic Mask].	288…297
		285	**[Local Mask]** Controls the adapters that take exclusive control of drive logic commands (except stop). Exclusive "local" control can only be taken while the drive is stopped.	See P276 [Logic Mask].	288…297
		288	**[Stop Owner]** Adapters that are presently issuing a valid stop command.  	Read Only	276…285
		289	**[Start Owner]** Adapters that are presently issuing a valid start command.	See P288 [Stop Owner].	276…285
		290	**[Jog Owner]** Adapters that are presently issuing a valid jog command.	See P288 [Stop Owner].	276…285
		291	**[Direction Owner]** Adapter that currently has exclusive control of direction changes.	See P288 [Stop Owner].	276…285
		292	**[Reference Owner]** Adapter that has the exclusive control of the command frequency source selection.	See P288 [Stop Owner].	276…285
		293	**[Accel Owner]** Adapter that has exclusive control of selecting [Accel Time 1, 2].	See P288 [Stop Owner].	140 276…285
		294	**[Decel Owner]** Adapter that has exclusive control of selecting [Decel Time 1, 2].	See P288 [Stop Owner].	142 276…285
		295	**[Fault Clr Owner]** Adapter that is presently clearing a fault.	See P288 [Stop Owner].	276…285
		296	**[MOP Owner]** Adapters that are currently issuing increases or decreases in MOP command frequency.	See P288 [Stop Owner].	276…285

File H	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
COMMUNICATION (file H)	Masks and Owners	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 P288 [Stop Owner].	276…285
	Datalinks	300 301 ◯	**[Data In A1] - Link A Word 1** **[Data In A2] - Link A Word 2** Parameter number whose value is written from a communications device data table. Parameters that can be changed only while drive is stopped cannot be used as Datalink inputs. Entering a parameter of this type disables the link. Refer to your communications option manual for datalink information.	Default: 0 (0 = "Disabled") Min/Max: 0/387 0/545 EC 0/598 EC v2 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.	
		304 305 ◯	**[Data In C1] - Link C Word 1** **[Data In C2] - Link C Word 2**	See [Data In A1] - Link A Word 1.	
		306 307 ◯	**[Data In D1] - Link D Word 1** **[Data In D2] - Link D Word 2**	See [Data In A1] - Link A Word 1.	
		310 311	**[Data Out A1] - Link A Word 1** **[Data Out A2] - Link A Word 2** Parameter number whose value is written to a communications device data table.	Default: 0 (0 = "Disabled") Min/Max: 0/387 0/545 EC 0/598 EC v2 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.	
		314 315	**[Data Out C1] - Link C Word 1** **[Data Out C2] - Link C Word 2**	See [Data Out A1] - Link A Word 1.	
		316 317	**[Data Out D1] - Link D Word 1** **[Data Out D2] - Link D Word 2**	See [Data Out A1] - Link A Word 1.	
		308 32	EC **[HighRes Ref]** Used as a high resolution, 32 bit reference with Datalinks. ±[Maximum Freq] or ±[Maximum Speed] = 2147418112	Default: 0 Min/Max: ±2147483647 Units: 1	090 093 126 128 213 298

File H	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
COMMUNICATION (file H)	Security	595	E C v2 **[Port Mask Act]** Active status for port communication. 		
		596	E C v2 **[Write Mask Cfg]** Enables/disables write access (parameters, and so on) for ports. Changes to this parameter are affective after a power cycle, drive reset or when 597, bit 15 transitions from “1” to “0.” 		
		597	E C v2 **[Write Mask Act]** Active status of write access for ports. Bit 15 determines if network security is controlling the write mask instead of 596.	See [Port Mask Act].	
		276	**[Logic Mask]** Determines the adapters that can control the drive when 597, bit 15 is set to “1”. If the bit for a port is set to “0,” the port has no control functions except for stop. 		288…297
		598	E C v2 **[Logic Mask Act]** Active status of logic mask for ports. Bit 15 determines if network security is controlling the logic mask instead of 276.	See [Port Mask Act].	

Inputs and Outputs File (file J)

File J	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
INPUTS and OUTPUTS (file J)	Analog Inputs	320	**[Anlg In Config]** Selects the mode for the analog inputs.  *Factory Default Bit Values*		322 323
		321	**[Anlg In Sqr Root]** **Enables/disables the square root function for each input.**  *Factory Default Bit Values*		
		322 325	**[Analog In 1 Hi]** **[Analog In 2 Hi]** Sets the highest input value to the analog input x scaling block.	Default: 10.000 Volt 10.000 Volt Min/Max: 4.000/20.000 mA Standard, 0.000/20.000 mA E C , ±10.000V, Units: 0.000/10.000V 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.	Default: 0.000 Volt 0.000 Volt Min/Max: 4.000/20.000 mA, 0.000/10.000V (No. 323), ±10.000V (No. 326) Units: 0.000/10.000V, 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

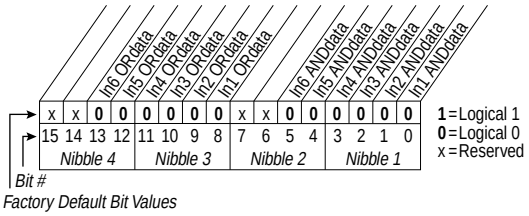
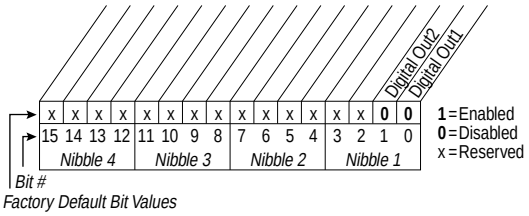
File J	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
INPUTS and OUTPUTS (file J)	Analog Outputs	340	EC **[Anlg Out Config]** Selects the mode for the analog outputs.  *Factory Default Bit Values*		
		341	**[Anlg Out Absolut]** Selects whether the signed value or absolute value of a parameter is used before being scaled to drive the analog output.  *Factory Default Bit Values*		342
		342	**[Analog Out1 Sel]** Selects the source of the value that drives the analog output.	Default: 0 "Output Freq" Options: See Table	001 002 003 004 005 007 006 012 135 136 137 138 220 219 024 441 023 025 015 377

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]
2	"Output Amps"	0 Amps	0 Amps	200% Drive Rated
3	"Torque Amps"	–200%	0 Amps	200% Drive Rated
4	"Flux Amps"	0 Amps	0 Amps	200% Drive Rated
5	"Output Power"	0 kW	0 kW	200% Drive Rated
6	"Output Volts"	0 Volts	0 Volts	120% Drive Rated
7	"DC Bus Volts"	0 Volts	0 Volts	200% Drive Rated
8	"PI Reference" (1)	–100%	0%	100%
9	"PI Feedback"	–100%	0%	100%
10	"PI Error"	–100%	0%	100%
11	"PI Output"	–800%	0%	800%
12	"%Motor OL"	0%	0%	100%
13	"%Drive OL"	0%	0%	100%
14	"CommandedTrq:" (3)	–800%	0%	800% Motor Rated
15	"MtrTrqCurRef" (1)(3)	–200%	0 Amps	200% Motor Rated
16	"Speed Ref" (3)	–[Maximum Speed]	0 Hz	[Maximum Speed]
17	"Speed Fdbk" (3)	–[Maximum Speed]	0 Hz	[Maximum Speed]
19	"Torque Est" (1)(3)	–800%	0%	800% Motor Rated
24	"Param Cntl" (1)(2)			
25	"SpdFdBk NoFilt" (1)	–[Maximum Speed]	0 Hz	[Maximum Speed]

(1) Refer to Option Definitions on page 71.
(2) Enhanced firmware revision 1.001 and later.
(3) Enhanced firmware revision 2.002 and later.

File J	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values		Related
INPUTS and OUTPUTS (file J)	Analog Outputs	343	**[Analog Out1 Hi]** Sets the analog output value when the source value is at maximum.	Default: Min/Max: Units: 	10.00 Volts 0.00/10.00 Volts 0.00/20.00 mA E C 0.01 Volt 0.01 mA E C	340 342
		344	**[Analog Out1 Lo]** Sets the analog output value when the source value is at minimum.	Default: Min/Max: Units: 	0.00 Volts 0.00/10.00 Volts 0.00/20.00 mA E C 0.01 Volt 0.01 mA E C	340 342
		354	E C **[Anlg Out1 Scale]** Sets the high value for the range of analog out scale. Entering 0.0 disables this scale and max scale is used. Example: If [Analog Out Sel] = "Commanded Trq," a value of 150 = 150% scale in place of the default 800%.	Default: Min/Max: Units:	0.0 [Analog Out1 Sel] 0.01	341 342
		377	E C **[Anlg Out1 Setpt]** Controls the analog output value from a communication device. Example Set [Data In A1] to "377" as the value from the communication device.	Default: Min/Max: Units: 	0.00 Volts 0.00/10.00 Volts 0.00/20.00 mA E C 0.01 Volt 0.01 mA E C	340

File J	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values			Related
INPUTS and OUTPUTS (file J)	Digital Inputs	361 362 363 364 365 366	**[Digital In1 Sel]** **[Digital In2 Sel]** **[Digital In3 Sel]** **[Digital In4 Sel]** **[Digital In5 Sel]** **[Digital In6 Sel](7)** Selects the function for the digital inputs. **Important**: Digital inputs are not designed to work with a pulsed source. (1) When [Digital Inx Sel] is set to option 2 "Clear Faults" the Stop button cannot be used to clear a fault condition. (2) 3 2 1 <– "Speed Sel 1…3" 0 0 0 Reference A - P90 0 0 1 Reference B - P93 0 1 0 Preset Speed 2 - P102 0 1 1 Preset Speed 3 - P103 1 0 0 Preset Speed 4 - P104 1 0 1 Preset Speed 5 - P105 1 1 0 Preset Speed 6 - P106 1 1 1 Preset Speed 7 - P107 To access Preset Speed 1, set [Speed Ref A Sel] or [Speed Ref B Sel] to "Preset Speed 1". (3) 3 2 1 <– "Spd/Trq Sel1…3" 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) Only Enhanced Control Drives. (5) Enhanced firmware revision V2.001 and later. (6) Opening an "Enable" input causes the motor to coast-to-stop, ignoring any programmed Stop modes. (7) A dedicated hardware enable input is available via a jumper selection. Refer to I/O Wiring Examples in the PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009. (8) Configures the input to command a transition between the Manual/Auto or Auto/Manual speed references. Refer to "Auto" Speed Sources on page 116 and "Manual" Speed Sources on page 117 for details. "Manual/Auto" (68) is similar to "Auto/Manual" (18) except that the polarity is opposite. Input State / "Auto/Manual" (18) / "Manual/Auto" (68) Lo / Auto / Manual Hi / Manual / Auto	Default:	4	"Stop – CF"(1)	
				Default:	5	"Start"	
				Default:	18	"Auto/ Manual"	
				Default:	15	"Speed Sel 1"	
				Default:	16	"Speed Sel 2"	
				Default:	17	"Speed Sel 3"	
				Options:	0	"Not Used"	
					1	"Enable"(6)	
					2	"Clear Faults"(1)	
					3	"Aux Fault"	
					4	"Stop – CF"(1)	
					5	"Start"(9)(11)	
					6	"Fwd/ Reverse"(9)	
					7	"Run"(10)	
					8	"Run Forward"(10)	
					9	"Run Reverse"(10)	
					10	"Jog"(9) "Jog1"(4)	100
					11	"Jog Forward"	
					12	"Jog Reverse"	
					13	"Stop Mode B"	156
					14	"Bus Reg Md B"	162
					15…17	"Speed Sel 1-3"(2)	
					18	"Auto/ Manual"(8)	096
					19	"Local"	
					20	"Acc2 and Dec2"	140
					21	"Accel 2"	
					22	"Decel 2"	
					23	"MOP Inc"(12)	194
					24	"MOP Dec"(12)	
					25	"Excl Link"(12)	380
					26	"PI Enable"	125
					27	"PI Hold"	
					28	"PI Reset"	
					29	"Reserved"	
					30	"Precharge En"(4)(12)	
					31…33	"Spd/Trq Sel1-3"(3)(13)	088
					34	"Jog 2"(4)	108
					35	"PI Invert"(4)	124
					36…40	"Reserved"	
					41,42	"UserSet Sel1-2"(5)	205
					43	"Run Level"(5)(12)	
					44	"RunFwd Level"(5)(12)	
					45	"RunRev Level"(5)(12)	
					46	"Run w/Comm"(5)(12)	
					47…57	"Reserved"	
					58	"Sync Enable"(13)	620
					59	"Traverse Ena"(13)	
					60	"Manual/Auto"(8)(14)	

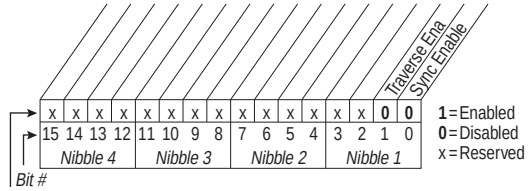
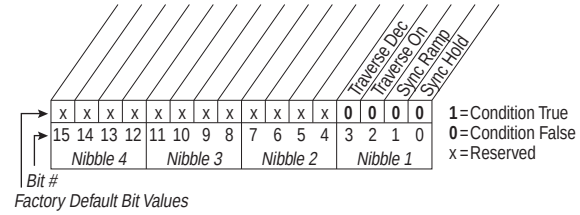
File J	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
INPUTS and OUTPUTS (file J)	Digital Inputs		(9) Typical 3-Wire Inputs - Requires that only 3-wire functions are chosen. Including 2-wire selections causes a type 2 alarm. (10) Typical 2-Wire Inputs - Requires that only 2-wire functions are chosen. Including 3-wire selections causes a type 2 alarm. (11) A "Dig In ConflictB" alarm occurs if a "Start" input is programmed without a "Stop" input. Type 2 Alarms - Some digital input programming can cause conflicts that 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. Refer to Alarm Descriptions on page 83 for information on resolving this type of conflict. (12) Refer to Option Definitions on page 71. (13) Enhanced firmware revision V3.002 and later. (14) Enhanced firmware revision V5.001 and later.		
		411	E C **[DigIn DataLogic]** Provides data to the logical operations that are done with the digital inputs when parameter 056 option 9 "DigIn DatLog" is set to 1.  *Factory Default Bit Values*		056
	Digital Outputs	379	E C **[Dig Out Setpt]** Controls output relays (CRx) when parameter 380 or 384 is set to option 30 "Param Cntl".  *Factory Default Bit Values*		

File J	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values		Related
INPUTS and OUTPUTS (file J)	Digital Outputs	380 384	**[Digital Out1 Sel]** **[Digital Out2 Sel]** Selects the drive status that energizes a (CRx) output relay. (1) Any relay programmed as Fault or Alarm energizes (pick up) when power is applied to drive and deenergize (drop out) when a fault or alarm exists. Relays selected for other functions energizes when that condition exists and deenergize when condition is removed. Refer to I/O Wiring Examples in the PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009. (2) Activation level is defined in [Dig Outx Level] below. (3) Only Enhanced Control Drives. (4) Enhanced firmware revision V3.002 and later. (5) Enhanced firmware revision V4.001 and later.	Default: Options: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31...57 58 59 60 61	1 "Fault" 4 "Run" "Fault"(1) "Alarm"(1) "Ready" "Run" "Forward Run" "Reverse Run" "Auto Restart" "Powerup Run" "At Speed" "At Freq"(2) "At Current"(2) "At Torque"(2) "At Temp"(2) "At Bus Volts"(2) "At PI Error"(2) "DC Braking" "Curr Limit" "Economize" "Motor Overld" "Power Loss" "Input 1 Link" "Input 2 Link" "Input 3 Link" "Input 4 Link" "Input 5 Link" "Input 6 Link" "PI Enabled"(3) "PI Hold"(3) "Drive Overld"(3) "Param Cntl"(3) "Reserved" "Manual Mode"(4) "Fast Braking"(4) "Reserved" "Speed Fdbk"(2)(5)	381 382 383 002 001 003 004 218 012 137 157 147 053 048 184
		381 385	**[Dig Out1 Level]** **[Dig Out2 Level]** Sets the relay activation level for options 10 – 15 in [Digital Outx Sel]. Units are assumed to match the above selection (for example, "At Freq" = Hz, "At Torque" = Amps).	Default: Min/Max: Units:	0.0 0.0 0.0/819.2 0.1	380
		382 386	**[Dig Out1 OnTime]** **[Dig Out2 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:	0.0 Secs 0.0 Secs 0.0/600.0 Secs 0.1 Secs	380
		383 387	**[Dig Out1 OffTime]** **[Dig Out2 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:	0.0 Secs 0.0 Secs 0.0/600.0 Secs 0.1 Secs	380

Selected Option Definitions – [Analog Out*x* Sel], [Digital In*x* Sel], and [Digital Out*x* Sel]

Option	Description	Related
At Speed	Relay changes state when drive has reached commanded speed.	380
Excl Link	Links digital input to a digital output if the output is set to "Input 1-6 Link."	361
Input 1…6 Link	When Digital Output 1 is set to of these (for example, 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
Manual Mode	Either the HIM or I/O Terminal Block (analog input) has control of the speed reference.	380
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 enables PLC to control analog outputs through data links. Set in [AnlgX Out Setpt], parameters 377 and 378.	342
Param Cntl	Parameter controlled digital output enables PLC to control digital outputs through data links. Set in [Dig Out Setpt], parameter 379.	342
PI Reference	Reference for PI block (see Process PI for Standard Control on page 119).	342
Precharge En	Forces drive into precharge state. Typically controlled by auxiliary contact on the disconnect at the DC input to the drive.	361
Run Level	Provides a run level input. They do not require a transition for enable or fault, but a transition is still required for a stop.	
RunFwd Level		
RunRev Level		
Run w/Comm	Enables the comms start bit to operate like a run with the run input on the terminal block. Ownership rules apply.	
SpdFdBk NoFilt	Provides an unfiltered value to an analog output. The filtered version "Speed Fdbk" includes a 125 ms filter.	342
Sync Enable	The fiber feature Synchronized Speed Change has been enabled. Enables a coordinated change in drive speeds to change machine speed.	622
Torque Est	Calculated percentage of rated motor torque.	342
Traverse Enable	The Traverse function has been enabled. This adds a triangle wave and square wave modulation to the speed reference.	623 624 625 626

Applications File (file K)

File K	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
APPLICATIONS (file K)	Fiber Functions	620	E C v3 **[Fiber Control]** Controls the Sync and Traverse functions. 		
		621	E C v3 **[Fiber Status]** Status of Sync and Traverse functions. 	Read Only	
		622	E C v3 **[Sync Time]** The time to ramp from the "held speed reference" to the current speed reference, after the Sync input is de-energized.	Default: 0.0 Secs Min/Max: 0.0/3600.0 Secs Units: 0.1 Secs	
		623	E C v3 **[Traverse Inc]** Sets the time period of increasing frequency.	Default: 0.00 Secs Min/Max: 0.00/30.00 Secs Units: 0.01 Secs	
		624	E C v3 **[Traverse Dec]** Sets the time period of decreasing frequency.	Default: 0.00 Secs Min/Max: 0.00/30.00 Secs Units: 0.01 Secs	
		625	E C v3 **[Max Traverse]** Sets the amplitude of the triangle wave speed modulation.	Default: 0.00 Hz Min/Max: 0.00/Maximum Speed Units: 0.01 Hz	
		626	E C v3 **[P Jump]** Sets the amplitude of the square wave speed modulation.	Default: 0.00 Hz Min/Max: 0.00/Maximum Speed Units: 0.01 Hz	

Parameter Cross Reference – by Name

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Break Frequency	72	Volts per Hertz	30
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Notes:

Troubleshooting

This chapter provides information for troubleshooting the PowerFlex 70 drive. It includes a list and descriptions of drive faults (with possible solutions, when applicable) and alarms.

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 46) is set to a value greater than "0," a user-configurable timer, [Auto Rstrt Delay] (see page 46) 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 is reset and the drive is restarted. Drive must remain in Run state. If Stop is initiated, Restart function is aborted.
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 is reset on powerup 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, can stop the drive. There are two alarm types.

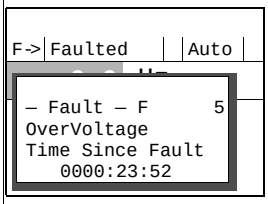
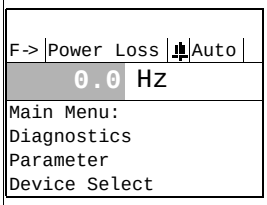
Type	Alarm Description	
1	User configurable	These alarms can be enabled or disabled by using [Alarm Config 1] on page 59.
2	Non-configurable	These alarms are always enabled.

Drive Status

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

HIM Indication

The LCD and LED HIMs also provide visual notification of a fault or alarm condition.

Condition	Display
Drive is indicating a fault. The LCD HIM immediately reports the fault condition by displaying the following information: • "Faulted" appears in the status line • Fault number • Fault name • Time that has passed since the fault occurred Press Esc to regain HIM control. The LED HIM reports the fault condition by displaying the specific fault code.	LCD HIM  LED HIM 
Drive is indicating an alarm. The LCD HIM immediately reports the alarm condition by displaying the following information: • Alarm name (Type 2 alarms only) • Alarm bell graphic	LCD HIM  LED HIM No indication.

Manually Clearing Faults

Step	Keys
1. Press Esc to acknowledge the fault. The fault information is removed so that you can use the HIM. 2. Address the condition that caused the fault. The cause must be corrected before the fault can be cleared. 3. After corrective action has been taken, clear the fault by one of these methods: • Press Stop. • Cycle power to the drive. • Set parameter 240 [Fault Clear] to "1." • "Clear Faults" on the HIM Diagnostic menu.	 

Fault Descriptions

Table 1 provides a list of fault messages, descriptions of the cause of the fault, and corrective action to fix the fault.

Table 1 - 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 *X* Loss] on page 65.	1. Check the 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 the 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 58.	Correct the cause of the fault and manually clear.
AutoTune Aborted	80		Autotune function was canceled by the user or a fault occurred.	Restart the procedure.
Cntl Bd Overtemp	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.
Auxiliary Input	2	1	Auxiliary input interlock is open.	Check remote wiring.
DB Resistance	69		The resistance of the internal DB unit is out of range.	Replace the resistor.
Decel Inhibit	24	3	The drive is not following a commanded acceleration or 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.
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 EC v2	49		No fault displayed. Used as a Power Up Marker in the Fault Queue indicating that the drive power has been cycled.	
Enable Hardware EC	111		Safe-Off board is not installed and pins 3 and 4 of the Safe-Off Connector are not jumpered.	Install Safe-Off board or jumper pins 3 and 4.
			If Safe-Off board is installed, verify the hardware enable jumper is removed.	Locate and remove the enable jumper on the main control board. Refer to DriveGuard Safe-Off Option (Series B) for PowerFlex 40P and PowerFlex 70 AC Drives, publication PFLEX-UM003, for instructions and location.
			Safe-Off board has failed.	Replace Safe-Off board.
			Hardware enable circuitry failed.	Replace control board.
Encoder Loss EC v2	91		One or both 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.
Hardware Fault	93		Hardware enable is disabled (jumpered high) but logic pin is still low.	1. Check jumper. 2. Replace Main Control Board.
Excessive Load	79		Motor did not come up to speed in the allotted time during autotune.	1. Uncouple load from motor. 2. Repeat Autotune.
Faults Cleared EC v2	52		No fault displayed. Used as a marker in the Fault Queue indicating that the fault clear function was performed.	

Table 1 - Fault Types, Descriptions and Actions (Continued)

Fault	No.	Type[1]	Description	Action
Fatal Faults	900…930	2	Diagnostic code indicating a drive malfunction.	1. Cycle power. 2. Replace Main Control Board. 3. Contact Tech Support.
Flt QueueCleared E C v2	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.
Heatsink LowTemp	10	1	Annunciates a too low temperature case or an open NTC (heatsink temperature sensing device) circuit.	1. Verify ambient temperature. 2. In cold ambient temperatures, add space heaters. 3. Check connections to NTC.
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.
HW OverCurrent	12	1	The drive output current has exceeded the hardware current limit.	1. Check output of drive or motor for shorts. 2. Check programming. 3. 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.
Input Phase Loss E C v2	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 E C v2	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 can be required.
Load Loss E C v2	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 58.	An excessive motor load exists. Reduce load so drive output current does not exceed the current set by [Motor NP FLA]. If enabled, check level of flux braking in parameter P549 [Flux Braking %].
Motor Thermistor E C	16		Thermistor output is out of range.	1. Verify that thermistor is connected. 2. Motor is overheated. Reduce load.
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.

Table 1 - Fault Types, Descriptions and Actions (Continued)

Fault	No.	Type(1)	Description	Action
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		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 occurs. 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.	Check DPI device event queue and corresponding fault information for the device.
Power Loss	3	1 3	DC bus voltage remained below trigger of nominal for longer than [Power Loss Time]. Enable/Disable with [Fault Config 1] on page 58.	Monitor the incoming AC line for low voltage or line power interruption.
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.
Power Down Csum	112		EEPROM data is corrupt on drive power up.	Clear the fault or cycle power to the drive.
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.
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 58.	Check load requirements and [Current Lmt Val] setting.

Table 1 - Fault Types, Descriptions and Actions (Continued)

Fault	No.	Type(1)	Description	Action
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. If enabled, check level of flux braking in parameter P549 [Flux Braking %].
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 excessive load.
UnderVoltage	4	1 3	DC bus voltage fell below the minimum value. Standard Control: • 509V DC at 600V input • 407V DC at 400/480V input • 204V DC at 200/240V input Enhanced Control: • 375V DC at 600V input • 300V DC at 400/480 input • 160V DC at 200/240V input Enable/Disable with [Fault Config 1] on page 58.	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 77 for a description of fault types.

Table 2 - 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
10	Heatsink LowTemp
12	HW OverCurrent
13	Ground Fault
15	Load Loss
16	Motor Thermistor
17	Input Phase Loss
21	Output PhaseLoss
24	Decel Inhibit
25	OverSpeed Limit
29	Analog In Loss
33	Auto Rstrt Tries
36	SW OverCurrent

No.(1)	Fault
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

No.(1)	Fault
80	AutoTune Aborted
81…86	Port 1…6 DPI Loss
87	IXo VoltageRange
90	Encoder Quad Error
91	Encoder Loss
93	Hardware Fault
100	Parameter Chksum
101	UserSet1 Chksum
102	UserSet2 Chksum
103	UserSet3 Chksum
104	Pwr Brd Chksum1
105	Pwr Brd Chksum2
106	Incompat MCB-PB
107	Replaced MCB-PB
108	Anlg Cal Chksum
111	Enable Hardware
112	Power Down Csum
900…930	Fatal Faults

(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 3 provides a list of alarm messages and descriptions of the cause of the alarm.

Table 3 - Alarm Descriptions and Actions

<table>
<tr><th>Alarm</th><th>No.</th><th>Type(1)</th><th>Description</th></tr>
<tr><td>Analog in Loss</td><td>5</td><td>1</td><td>An analog input is configured for “Alarm” on signal loss and signal loss has occurred.</td></tr>
<tr><td>Bipolar Conflict</td><td>20</td><td>2</td><td>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”.</td></tr>
<tr><td>Decel Inhibit</td><td>10</td><td>1</td><td>Drive is being inhibited from decelerating.</td></tr>
<tr><td>Dig In ConflictA</td><td>17</td><td>2</td><td>Digital input functions are in conflict. Combinations marked with an “X” will cause an alarm.
<table>
<tr><th></th><th>Acc2/Dec2</th><th>Accel 2</th><th>Decel 2</th><th>Jog</th><th>Jog Fwd</th><th>Jog Rev</th><th>Fwd/Rev</th></tr>
<tr><td>Acc2 / Dec2</td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Accel 2</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Decel 2</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Jog</td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td></td></tr>
<tr><td>Jog Fwd</td><td></td><td></td><td></td><td>X</td><td></td><td></td><td>X</td></tr>
<tr><td>Jog Rev</td><td></td><td></td><td></td><td>X</td><td></td><td></td><td>X</td></tr>
<tr><td>Fwd / Rev</td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td></td></tr>
</table></td></tr>
<tr><td>Dig In ConflictB</td><td>18</td><td>2</td><td>A digital Start input has been configured without a Stop input or other functions are in conflict. Combinations that conflict are marked with an “X” and will cause an alarm.
<table>
<tr><th></th><th>Start</th><th>Stop–CF</th><th>Run</th><th>Run Fwd</th><th>Run Rev</th><th>Jog</th><th>Jog Fwd</th><th>Jog Rev</th><th>Fwd/Rev</th></tr>
<tr><td>Start</td><td></td><td></td><td>X</td><td>X</td><td>X</td><td></td><td>X</td><td>X</td><td></td></tr>
<tr><td>Stop–CF</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Run</td><td>X</td><td></td><td></td><td>X</td><td>X</td><td></td><td>X</td><td>X</td><td></td></tr>
<tr><td>Run Fwd</td><td>X</td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td></tr>
<tr><td>Run Rev</td><td>X</td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td>X</td></tr>
<tr><td>Jog</td><td></td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Jog Fwd</td><td>X</td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Jog Rev</td><td>X</td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Fwd / Rev</td><td></td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Dig In ConflictC</td><td>19</td><td>2</td><td>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</td></tr>
<tr><td>Drive OL Level 1</td><td>8</td><td>1</td><td>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 eventually occur.</td></tr>
<tr><td>Drive OL Level 2</td><td>9</td><td>1</td><td>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 eventually occur.</td></tr>
<tr><td>FluxAmpsRef Rang</td><td>26</td><td>2</td><td>The calculated or measured Flux Amps value is not within the expected range. Verify motor data and rerun motor tests.</td></tr>
<tr><td>Ground Warn
E C v2</td><td>15</td><td>1</td><td>Ground current has exceeded the level set in [Gnd Warn Level].</td></tr>
<tr><td>In Phase Loss
E C v2</td><td>13</td><td>1</td><td>The DC bus ripple has exceeded the level in [Phase Loss Level].</td></tr>
<tr><td>IntDBRes OvrHeat</td><td>6</td><td>1</td><td>The drive has temporarily disabled the DB regulator because the resistor temperature has exceeded a predetermined value.</td></tr>
</table>

Table 3 - Alarm Descriptions and Actions (Continued)

Alarm	No.	Type(1)	Description
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 clears when all motor nameplate data is properly entered.
IXo VoltageRange E C v2	28	2	Motor leakage inductance is out of range.
Load Loss E C v2	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 E C	12		[Fault Config 1] or [Alarm Config 1] Bit 7 "Motor Therm" is enabled and the analog Input voltage is <0.2 Volts or >5.0 Volts.
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 E C	31		[Fault Config 1] or [Alarm Config 1] Bit 7 "Motor Therm" is enabled and Analog In 1 is set to milliamperes.
Sleep Config E C v2	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. The drive can start at any time within 10 seconds of drive powerup.
TB Man Ref Cflct E C	30		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 can 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 reprogrammed (such as parameters 90, 117, 128, and 179). See also Auto/Manual Examples on page 118. To correct: • Verify/reprogram the parameters that reference an analog input *or* • Reprogram [Digital In3] to another function or "Unused."
UnderVoltage	2	1	The bus voltage has dropped below a predetermined value.
UserSet Conflict E C v2	51	2	[Digital Inx Sel] values differ in different user sets.
VHz Neg Slope	24	2	[Torq Perf Mode] = "Custom V/Hz" and the V/Hz slope is negative.
Waking E C v2	11	1	The Wake timer is counting toward a value that will start the drive.

(1) See page 77 for a description of alarm types.

Table 4 - Alarm Cross Reference

No.(1)	Alarm	No.(1)	Alarm	No.(1)	Alarm
1	Precharge Active	12	Motor Thermistor	23	MaxFreq Conflict
2	UnderVoltage	13	In Phase Loss	24	VHz Neg Slope
3	Power Loss	14	Load Loss	25	IR Volts Range
4	Start At PowerUp	15	Ground Warn	26	FluxAmpsRef Rang
5	Analog in Loss	17	Dig In ConflictA	27	Speed Ref Cflct
6	IntDBRes OvrHeat	18	Dig In ConflictB	28	Ixo Vlt Rang
8	Drive OL Level 1	19	Dig In ConflictC	29	Sleep Config
9	Drive OL Level 2	20	Bipolar Conflict	30	TB Man Ref Cflct
10	Decel Inhibit	21	Motor Type Cflct	31	PTC Conflict
11	Waking	22	NP Hz Conflict	51	UserSet Conflict

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

Testpoint Codes and Functions

Table 5 - Testpoint Codes and Functions

Code Selected in [Testpoint *x* Sel]	Function Whose Value is Displayed in [Testpoint *x* Data]
1	DPI Error Status
2	Heatsink Temperature
3	Active Current Limit
4	Active PWM Frequency
5	Lifetime MegaWatt Hours(1)
6	Lifetime Run Time
7	Lifetime Powered Up Time
8	Lifetime Power Cycles
9	Life MegaWatt Hours Fraction(1)
10	Life MegaWatt Hours Fraction Units(1)
11…99	Reserved for Factory Use

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

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

Common Symptoms and Corrective Actions

Table 6 through Table 12 describe the cause, status indication (if applicable), and corrective action of common problem symptoms.

Table 6 - Drive Does Not Start From Start or Run Inputs Wired to the Terminal Block

Causes	Indication	Corrective Action
Drive is faulted	Flashing red status light	Clear fault: 1. Press Stop. 2. Cycle the power. 3. Set [Fault Clear] to 1 (see page 58). 4. "Clear Faults" on the HIM Diagnostic menu.
Incorrect input wiring. Refer to PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009, 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 7 to 8 is required.	None	Wire inputs correctly and/or install jumper.
Incorrect digital input programming. • Mutually exclusive choices have been made (for example, Jog and Jog Forward). • 2-wire and 3-wire programming can be conflicting. • Exclusive functions (for example, direction control) can have multiple inputs configured. • Stop is factory default and is not wired.	None	Program [Digital In*x* Sel] for correct inputs (see page 68). Start or Run programming can be missing.
	Flashing yellow status light and "DigIn CflctB" indication on LCD HIM. [Drive Status 2] shows type 2 alarm(s).	Program [Digital In*x* Sel] to resolve conflicts (see page 68). Remove multiple selections for the same function. Install stop button to apply a signal at stop terminal.

Table 7 - Drive Does Not Start From HIM

Cause	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 is necessary. If 3-wire control is required, program [Digital In*x* Sel] for correct inputs (see page 68.)

Table 8 - Drive Does Not Respond to Changes in Speed Command

Causes	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 22).
Incorrect reference source has been programmed.	None	1. Check [Speed Ref Source] for the source of the speed reference (see page 54). 2. Reprogram [Speed Ref A Sel] for correct source (see page 33).
Incorrect reference source is being selected via remote device or digital inputs.	None	1. Check [Drive Status 1], bits 12 and 13 for unexpected source selections (see page 52). 2. Check [Dig In Status] to see if inputs are selecting an alternate source (see page 55). 3. Reprogram digital inputs to the correct "Speed Sel *x*" option in the [Digital In*x* Sel] parameter (see page 68).

Table 9 - Motor and/or Drive Does Not Accelerate to Commanded Speed

Causes	Indication	Corrective Action
Acceleration time is excessive.	None	Reprogram [Accel Time *x*] (see page 41).
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 52). Remove excess load or reprogram [Accel Time *x*] (see page 41).
Speed command source or value is not as expected.	None	Check for the proper Speed Command by using the steps in Table 8 on page 86.
Programming is preventing the drive output from exceeding limiting values.	None	Check [Maximum Speed] page 31 and [Maximum Freq] page 25 to assure that speed is not limited by programming.

Table 10 - Motor Operation is Unstable

Cause	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" procedures in the Autotune parameter (see page 27).

Table 11 - Drive Does Not Reverse Motor Direction

Causes	Indication	Corrective Action
Digital input is not selected for reversing control.	None	Check [Digital In*x* Sel] (see page 68). Choose correct input and program for reversing mode.
Digital input is incorrectly wired.	None	Check input wiring. Refer to PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009.
Direction mode parameter is incorrectly programmed.	None	Reprogram the analog "Bipolar" or digital "Unipolar" control in the [Direction Mode] parameter (see page 49).
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. Refer to PowerFlex 70 Adjustable Frequency AC Drive Installation Instructions, publication 20A-IN009. Positive voltage commands forward direction. Negative voltage commands reverse direction.

Table 12 - Stopping the Drive Results in a Decel Inhibit Fault

Causes	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 10. 2. Reprogram bus regulation (parameters 161 and 162) to eliminate any "Adjust Freq" selection. 3. Disable bus regulation (parameters 161 and 162) and add a dynamic brake. 4. Correct AC input line instability or add an isolation transformer. 5. Reset drive.

Notes:

Supplemental Drive Information

This appendix provides certification, specification, and communication information.

Certifications and Specifications

Table 13 through Table 17 provide certification and technical specifications.

Table 13 - Certifications

Certifications[1]	Description	Frames	
		A...E 240...480V	A...E 600V
ABS	American Bureau of Shipping MA Certificate 08-HS303172A/1-PDA for auxiliary services on AB Classed vessels and offshore platforms	X	X
C-Tick	Certified by Rockwell Automation to be in conformity with the requirements of the applicable Australian legislation and standards referenced below: IEC 61800-3	X	
c-UL-us	Listed to UL508C and CAN/CSA C22.2 No. 14-05 Configured drives can be listed to UL508A	X	X
EN	Certified by Rockwell Automation to be in conformity with the essential requirements of the applicable European Directives and the standards referenced below have been applied: **2006/95/EC (Low Voltage Directive)** EN 50178 Electronic Equipment for Use in Power Installations	X	X
	2004/108/EC (EMC Directive) EN 61800-3 Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods	X	
EPRI/SEMIF 47	EPRI Quality Star Certificates SEMIF47.115, SEMIF47.116, and SEMIF47.127 for SEMI F47 compliance, 480V units tested	X	
IEC 61800-2	Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency AC power drive systems	X	X
Korean KC Registration	**KCC-REM-RAA-20A** Refer to the certificate of registration for specific drive catalog numbers that have this certification.[1]	X	X
Lloyd's Register	Lloyd's Register Type Approval Certificate 08 / 60014 (marine certification)	X	
NEMA ICS 7.1	Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems	X	X
NFPA 70	US National Electric Code	X	X
NSF	Type 4X enclosure NSF Listed to meet Criteria C2 for splash and non-food zones	X	X
Trentec	Tested by Trentec to be compliant with AC156 Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components and 2003 International Building Code for worst-case seismic level for USA excluding site class F	X	X

Table 13 - Certifications (continued)

Certifications[1]	Description	Frames	
		A...E 240...480V	**A...E** 600V
TÜV	TÜV Rheinland Certificate T72041027 01 tested to EN 50178	X	X
	TÜV Rheinland Certificate of a Competent Body AV 72061059 0001 for compliance with EMC Directive (89/336/EEC)	X	
	TÜV Rheinland Certificate 968/EZ 166.01/06 Safe Off Option satisfies requirements for Category 3 safety function according to EN 954-1	X	

(1) See the product certifications website, http://www.rockwellautomation.com/products/certification/ for declarations of conformity, certificates, and other certification details.

Table 14 - Specifications

Category	Specification						
Protection	**Drive**	**200... 208V**	**240V**	**380/400**	**480V**	**600V**	**690V**
	AC input overvoltage trip	247V AC	285V AC	475V AC	570V AC	690V AC	
	AC input undervoltage trip	120V AC	138V AC	233V AC	280V AC	345V AC	
	Bus overvoltage trip	405V DC	405V DC	810V DC	810V DC	1013V DC	
	Bus undervoltage output shutoff	300V DC	300V DC	407V DC	407V DC	508V DC	
	Bus undervoltage fault level	160V DC	160V DC	300V DC	300V DC	375V DC	
	Nominal bus voltage	281V DC	324V DC	540V DC	648V DC	810V DC	
	All Drives						
	Heat sink thermistor	Monitored by microprocessor overtemp trip					
	Drive overcurrent trip Software current limit Hardware current limit Instantaneous current limit	 20...160% of rated current 200% of rated current (typical) 220...300% of rated current (dependent on drive rating)					
	Line transients	Up to 6000 volts peak per IEEE C62.41-1991					
	Control logic noise immunity	Showering arc transients up to 1500V peak					
	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/UL Type 1 flange mount IP66 NEMA/UL Type 4X/12 (for indoor use only)	 0...50 °C (32...122 °F) 0...50 °C (32...122 °F) 0...40 °C (32...104 °F)					
	Cooling fan operation Frames A and C Frames B, D, and E	 Fan operates when power is applied. Fan operates when power is applied and in Run condition.					
	Storage temperature (all const.)	–40...70 °C (–40...158 °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, store the drive where it is not exposed to a corrosive atmosphere.					
	Relative humidity	5...95% non-condensing					
	Shock	15 g peak for 11 ms duration (±1.0 ms)					
	Vibration	0.152 mm (0.006 in.) displacement, 1 g peak					
	Surrounding environment Pollution degree: Pollution degree 1 and 2 Pollution degree 3 and 4 See Table 15 on page 91 for descriptions of pollution degree rating.	 All enclosures are acceptable for pollution degree 1 and 2. An enclosure that meets or exceeds IP54, NEMA/UL Type 12, is required for pollution degree 3 and 4.					

Table 15 - Pollution Degree Ratings According to EN 61800-5-1

Pollution Degree	Description
1	No pollution or only dry non-conductive pollution occurs. The pollution has no influence.
2	Normally only non-conductive pollution occurs. Occasionally a temporary conductivity, caused by condensation, is expected when the drive is out of operation.
3	Conductive pollution or dry non-conductive pollution occurs, which becomes conductive due to condensation, and is expected.
4	The pollution generates persistent conductivity caused, for example, by conductive dust, rain, or snow.

Table 16 - Specifications (continued)

Category	Specification	
Electrical	Voltage tolerance	–10% of minimum, +10% of maximum. See page 121 for Full Power and Operating Range.
	Input 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 (all drives)	0.98 across speed range.
	Efficiency	97.5% at rated amps, nominal line volts.
	Maximum short circuit rating	200,000 amps symmetrical.
	Max short circuit current rating (by using the recommended fuse or circuit breaker type)	Maximum short circuit current rating to match specified fuse/circuit breaker capability.
	Drive to motor power ratio Minimum Maximum	 Recommended not less than 1:2 ratio Recommended not greater than 2:1 ratio
Control	Method	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives.
	Carrier frequency	2, 3, 4, 5, 6, 7, 8, 9, and 10 kHz Standard. 2, 4, 8, and 12 kHz EC. Drive rating based on 4 kHz.
	Output voltage range	0 to rated motor voltage
	Output frequency range	0…400 Hz Standard. 0…500 Hz EC.
	Frequency accuracy Digital input Analog input	 Within ±0.01% of set output frequency. Within ±0.4% of maximum output frequency.
	Frequency control - speed regulation	with slip compensation (V/Hz mode) 0.5% of base speed across 40:1 speed range 40:1 operating range 10 rad/sec bandwidth
		with slip compensation (Sensorless Vector mode) 0.5% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth
		with feedback (Sensorless Vector mode) EC 0.001% of base speed across 40:1 speed range 0.1% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth

Table 16 - Specifications (continued)

Category	Specification	
Control (continued)	Speed control - speed regulation	without feedback (Vector Control mode) EC 0.1% of base speed across 120:1 speed range 120:1 operating range 30 rad/sec bandwidth
		with feedback (Vector Control mode) EC 0.001% of base speed across 120:1 speed range 1000:1 operating range 125 rad/sec bandwidth
	Torque regulation	without feedback +/-10% EC
		with feedback +/-5% EC
	Selectable motor control	Sensorless Vector with full tuning. Standard V/Hz with full custom capability and vector control.
	Stop modes	Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Fast Brake, Ramp-to-Hold and S-curve.
	Accel/Decel	Two independently programmable accel and decel times. Each time can 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…160% of rated output current. Independently programmable proportional and integral gain.
	Motor overload protection	Class 10 motor overload protection according to NEC article 430 and motor over-temperature protection according to NEC article 430.126 (A)(2). UL 508C File E59272.
Encoder	Type	Incremental, dual channel
	Supply	5V/12V Configurable ±5%
	Quadrature	90° ±27°
	Duty cycle	50% +10%
	Requirements	Encoders must be line driver type, quadrature (dual-channel) or pulse (single-channel), single-ended or differential and capable of supplying a minimum of 10 mA per channel. The encoder interface board accepts 5V or 12V DC square-wave with a minimum high state voltage of 3.5V DC (5V mode) and 7.0V DC (12V mode). Maximum low state voltage is 1V DC (for both 5V and 12V modes). Maximum input frequency is 250 kHz.

Table 17 - IP20, NEMA/UL Type 1 Watts Loss (Rated Load, Speed, and PWM)[1]

Voltage	ND Hp	External Watts	Internal Watts	Total Watts Loss
208V	0.5	12.2	19.2	31.4
	1.0	30.7	20.5	51.2
	2.0	44.6	22.6	67.2
	3.0	67.3	25.4	92.7
	5.0	141.3	33.2	174.5
	7.5	205.7	34.2	239.9
	10	270.4	48.1	318.5
	15	385.6	40.3	425.9
	20	494.6	44.9	539.5
	25	650.7	51.6	702.3
240V	0.5	12.2	19.2	31.4
	1.0	30.7	20.5	51.2
	2.0	44.6	22.6	67.2
	3.0	67.3	25.4	92.7
	5.0	141.3	33.2	174.5
	7.5	205.7	34.2	239.9
	10	270.4	48.1	318.5
	15	385.6	40.3	425.9
	20	494.6	44.9	539.5
	25	650.7	51.6	702.3
400V	0.37	11.5	17.9	29.4
	0.75	27.8	19.5	47.3
	1.5	43.6	21.6	65.2
	2.2	64.6	24	88.6
	4.0	99.5	28.2	127.7
	5.5	140	27.8	167.8
	7.5	193.3	32	225.3
	11	305.4	34.2	339.6
	15	432.9	42.9	475.8
	18.5	363.8	40.5	404.3[2]
	22	396.8	41.5	438.3[2]
	30	500.8	50	550.8
	37	632	57.7	689.7
480V	0.5	11.5	17.9	29.4
	1.0	27.8	19.5	47.3
	2.0	43.6	21.6	65.2
	3.0	64.6	24	88.6
	5.0	99.5	28.2	127.7
	7.5	140	27.8	167.8
	10	193.3	32	225.3
	15	305.4	34.2	339.6
	20	432.9	42.9	475.8
	25	363.8	40.5	404.3[2]
	30	396.8	41.5	438.3[2]
	40	500.8	50	550.8
	50	632	57.7	689.7

Table 17 - IP20, NEMA/UL Type 1 Watts Loss (Rated Load, Speed, and PWM)[1] (continued)

Voltage	ND Hp	External Watts	Internal Watts	Total Watts Loss
600V	0.5	11.5	17.9	29.4
	1.0	27.8	19.5	47.3
	2.0	43.6	21.6	65.2
	3.0	64.6	24	88.6
	5.0	99.5	28.2	127.7
	7.5	140	27.8	167.8
	10	193.3	32	225.3
	15	305.4	34.2	339.6
	20	432.9	42.9	475.8
	25	281.4	42.4	323.8[2]
	30	311.9	43.4	355.3[2]
	40	389.9	51.8	441.7
	50	501.4	59.9	561.3

(1) Worst case condition including the HIM and the communication module.

(2) The 25/30 Hp and 18.5/22 kW drives contain different components and have a lower watts loss that then 20 Hp and 15 kW drive ratings, respectively.

Communication Configurations

Typical Programmable Controller Configurations

This section provides information for programmable controller configurations and bit settings for logic command word and logic status word.

IMPORTANT If block transfers are programmed to continuously write information to the drive, be sure to properly format the block transfer.

If attribute 10 is selected for the block transfer, values are written only to RAM and are not saved by the drive. This is the preferred attribute for continuous transfers.

If attribute 9 is selected, each program scan completes a write to the non-volatile Electrically Erasable Programmable Read-Only Memory (EEPROM) of the drive. Because the EEPROM has a fixed number of writes, continuous block transfers can quickly damage the EEPROM.

Do not assign attribute 9 to continuous block transfers. Refer to the individual communications adapter user manual for additional details.

For a description of logic command word bit settings, see Table 18 on page 96.

For a description of logic status word bit settings, see Table 19 on page 97.

Logic Command Word/ Logic Status Word

Table 18 and Table 19 provide bit settings for logic command word and logic status word.

Table 18 - 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 starts the drive. The Start command acts as a momentary Start command. A "1" starts the drive, but returning to "0" **does not** stop the drive.

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

(3) This Reference Select does not function if a digital input (parameters 361-366) is programmed for "Speed Sel 1, 2, or 3" (option 15, 16, or 17). When using the Logic Command Word for the speed reference selection, always set Bit 12, 13, or 14. Note that reference selection is "Exclusive Ownership" see [Reference Owner] on page 62.

Table 19 - 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 = Port 6 111 = 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 = DPI 6 Manual 1111 = Jog Ref

(1) See Owners parameters [Stop Owner] on page 62 through [Local Owner] on page 63 for further information.

Output Devices

For information on output devices such as output contactors, cable terminators, and output reactors, refer to the PowerFlex Reference Manual, publication PFLEX-RM001.

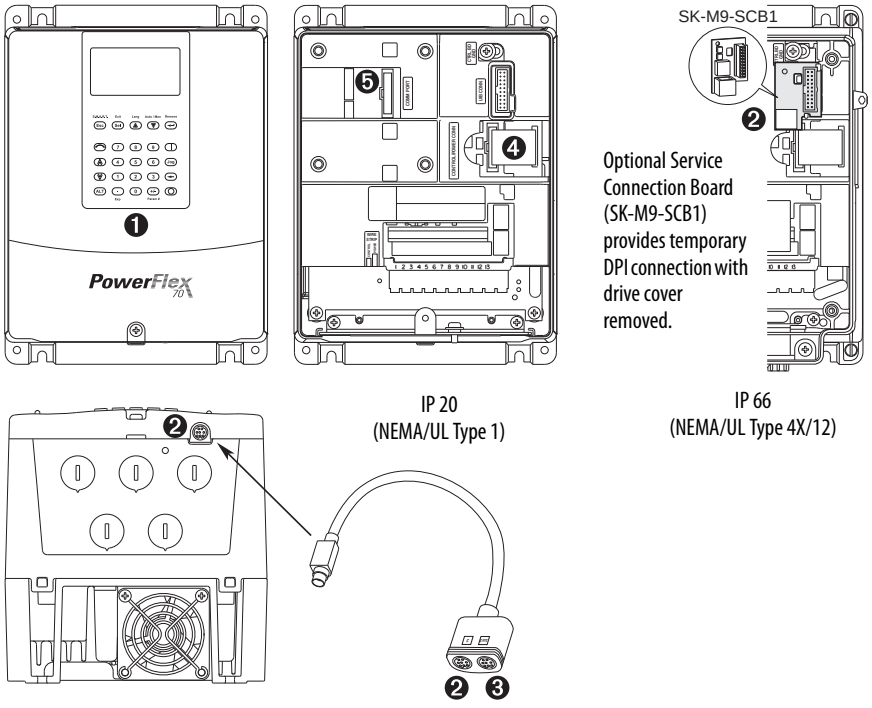
Notes:

HIM Overview

This appendix provides information for connecting the HIM, and using the HIM to view and program the drive parameters.

External and Internal Connections

The PowerFlex 70 drive provides a number of cable connection points (B frame shown).



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	Splitter cable connected to DPI Port 2 provides additional port.
❹	Control / Power Connection	Connection between control and power boards.
❺	DPI Port 5	Cable connection for communications adapter.

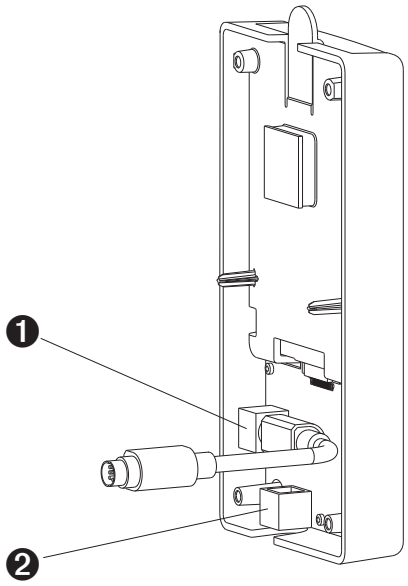
Using the HIM With a 20-HIM-B1 Bezel Kit

The 20-HIM-B1 bezel kit enables remote HIM or Wireless Interface Module (WIM) operation and provides an additional remote DPI port for accessories.

Use the bezel cradle connection to mount the NEMA/UL 1 HIM or NEMA/UL 1 WIM (port 3).

Use the accessory port on the bottom of the bezel for standard DPI peripherals such as 1203-SSS, 1203-USB, or another handheld HIM (port 2, just like the accessory port on the drive).

Use the internal connection on the back side of the bezel to connect the bezel to the host drive with a standard DPI cable. The 20-HIM-B1 bezel kit cannot be used with a 1203-S03 two-way splitter cable, or a 1203-SG2 two-way or 1203-SG4 four-way splitter module.

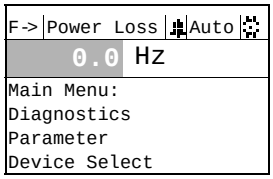


No.	Connector	Description
	Upper DPI port	Connects the 20-HIM-B1 bezel to the drive.
	Lower DPI port	Connects a 1203-SSS or 1203-USB converter to the drive.

IMPORTANT The bezel's lower DPI port is always port 2, and the cradle connection port is always port 3.

- If you are using the HIM in the bezel, set parameter 90 [Speed Ref A Sel] or parameter 93 [Speed Ref B Sel] (depending on your application requirements) to option 20 "DPI Port 3."
- If you are using a remote 20-HIM-C* HIM connected directly into Port 2 on the bottom of the drive, set parameter 90 [Speed Ref A Sel] or parameter 93 [Speed Ref B Sel] to option 19 "DPI Port 2."

LCD Display Elements

Display	Description
	Direction | Drive Status | Alarm | Auto/Man | Information Commanded or Output Frequency Programming / Monitoring / Troubleshooting

ALT Functions

To use an ALT function, start at the Main Menu and press the ALT key, release it, then press the programming key associated with one of the functions listed in the table below.

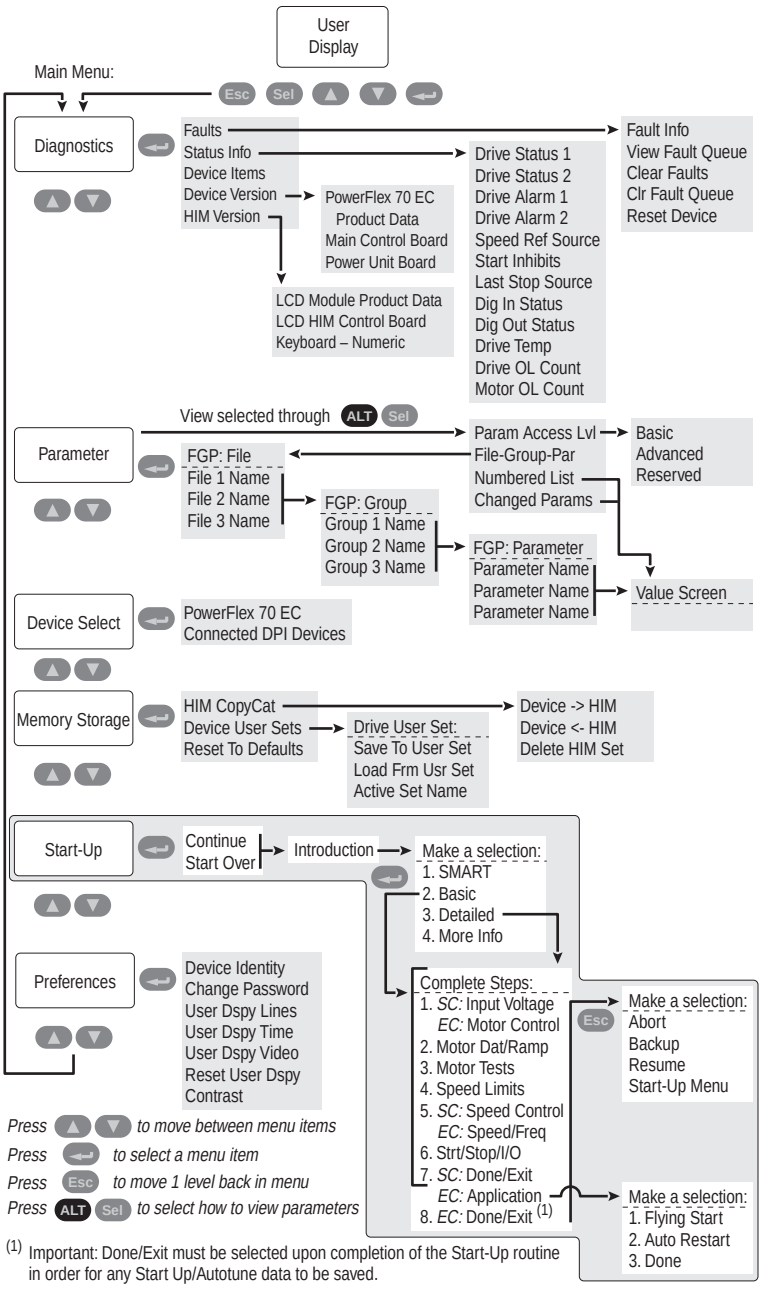
ALT Key and then …			Performs this function …	HIM Type
ALT	Esc	S.M.A.R.T.	Displays the S.M.A.R.T. screen.	LCD
	Esc	Log In/Out	Log in to change parameter settings. Log out to protect parameter settings. Change a password.	LED
	Sel	View	Enables the selection of how parameters are viewed, or detailed information about a parameter or component.	LCD
	Sel	Device	Select a connected adapter for editing.	LED
	▲	Lang	Displays the language selection screen.	LCD
	▼	Auto / Man	Switches between Auto and Manual Modes.	LCD and LED
	↵	Remove	Enables HIM removal without causing a fault if the HIM is not the last controlling device and does not have Manual control of the drive.	LCD and LED
	.	Exp	Enables value to be entered as an exponent. (Not available on PowerFlex 70.)	LCD
	+/–	Param #	Enables entry of a parameter number for viewing/ editing.	LCD

Removing the HIM

The HIM can be removed while the drive is powered. Normally, the drive issues a fault when the HIM is removed because it detects that a device is missing.

IMPORTANT HIM removal is permissible only in Auto mode. If the HIM is removed while in Manual mode, or the HIM is the only remaining control device, a fault occurs.

Menu Structure



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 revision and hardware series of components.
HIM Version	View the firmware revision and hardware series of the HIM.

Parameter Menu

Refer to Viewing and Editing Parameters on page 103.

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.

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.

Viewing and Editing Parameters

The PowerFlex 70 drive is initially set to the basic parameter view. Parameter 196 [Param Access Lvl] controls the parameter views that you can see. The list below describes the different settings and view options for Parameter 196 [Param Access Lvl]:

- **View basic parameters** – To view the basic parameters, set parameter 196 [Param Access Lvl] to option 0 “Basic”.
- **View all parameters** – To view all parameters, set parameter 196 [Param Access Lvl] to option 1 “Advanced”.
- **View engineering parameters** – To view engineering parameters, set parameter 196 [Param Access Lvl] to option 2 “Reserved”.

Refer to the PowerFlex 70/700 Reference Manual, publication PFLEX-RM004 for descriptions of these parameters. Parameter 196 is not affected by the Reset to Defaults function.

LCD HIM

Step	Keys	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 Speed Command
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 Volts per Hertz
5. Repeat steps 3 and 4 to select a group and then a parameter. The parameter value screen appears.		FGP: Parameter Maximum Voltage Compensation
6. Press Enter to edit the parameter.	↵	
7. Press the up arrow or down arrow to scroll through the parameters. Press Sel to move the curser down 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 is highlighted.	▲ or ▼ Sel	FGP: Par 55 Maximum Freq Hz [ALT] [VIEW] -> Limits
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 90.00 Hz [ALT] [VIEW] -> Limits

Numeric Keypad Shortcut

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

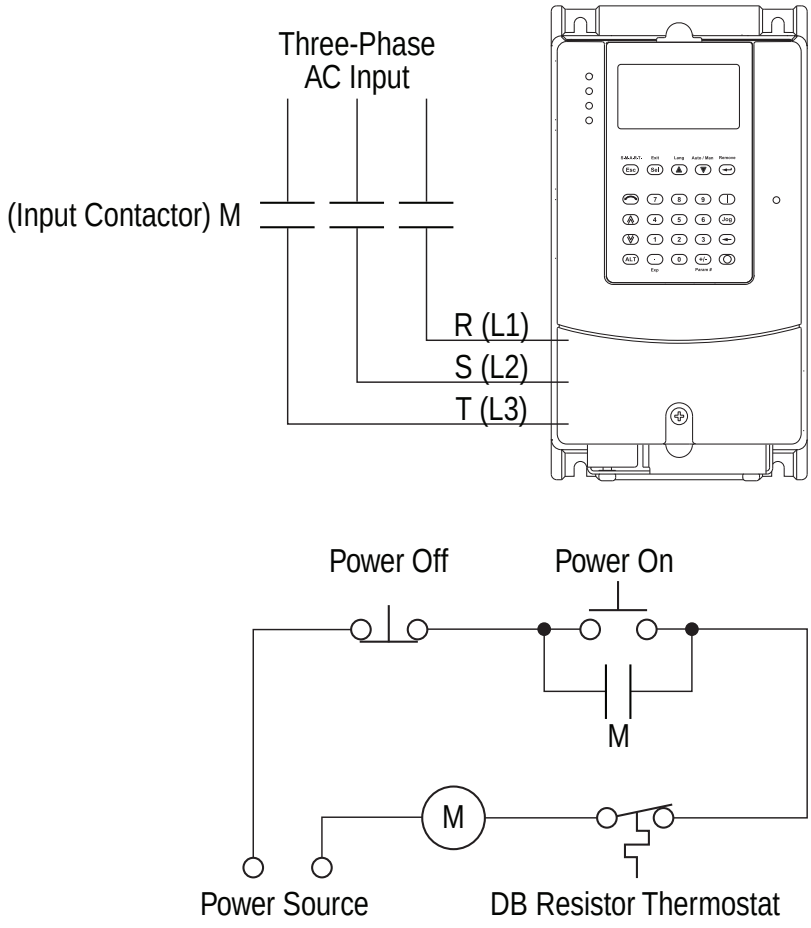
Application Notes

This appendix provides operational application notes.

External Brake Resistor

Figure 1 shows the external brake resistor circuitry.

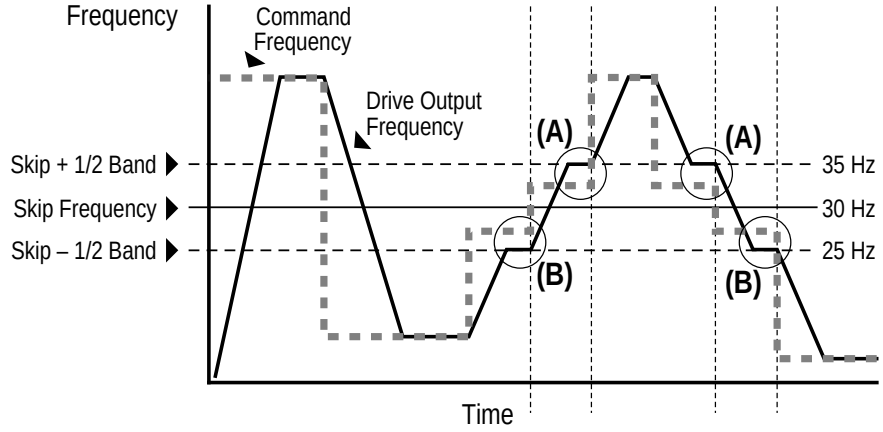
Figure 1 - External Brake Resistor Circuitry



Skip Frequency

Figure 2 shows the skip frequency band parameters.

Figure 2 - Skip Frequency



Some machinery can 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.

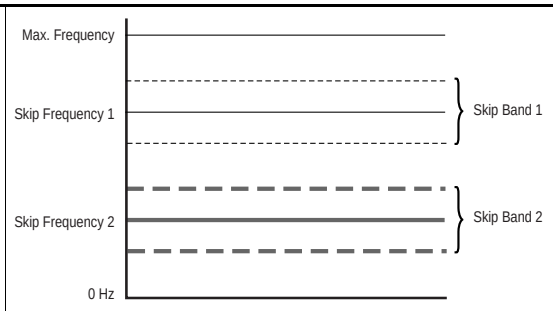
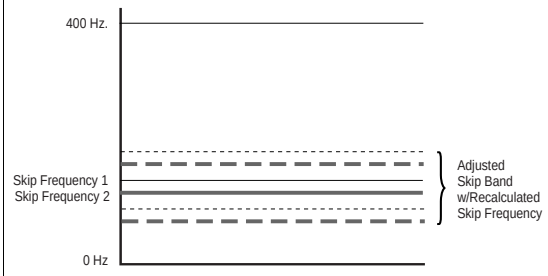
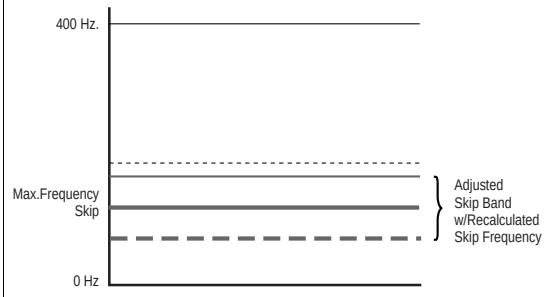
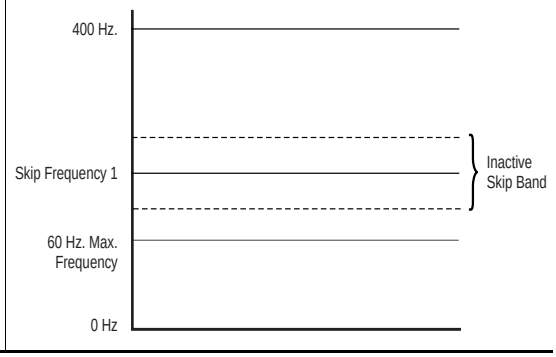
The value programmed into the skip frequency parameters sets the center point for an entire skip band of frequencies. The width of the band (range of frequency around the center point) is determined by parameter 87, [Skip Freq Band]. The range is split, half above and half below the skip frequency parameter.

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 sets the output frequency to the high value of the band. See (A) in Figure 2.

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 sets the output frequency to the low value of the band. See (B) in Figure 2.

Acceleration and deceleration are not affected by the skip frequencies. Normal accel/decel proceeds through the band once the commanded frequency is greater than the skip frequency. See (A) and (B) in Figure 2. This function affects only continuous operation within the band.

Table 20 - Skip Frequency Examples

Skip Frequency Examples	
The skip frequency has 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.	
If skip bands overlap or touch, the center frequency is recalculated based on the highest and lowest band values.	
If a skip band(s) extend beyond the max frequency limits, the highest band value is clamped at the max frequency limit. The center frequency is recalculated based on the highest and lowest band values.	
If the band is outside the limits, the skip band is inactive.	

Stop Modes

Several methods are available for braking or stopping a load as described in the table below.

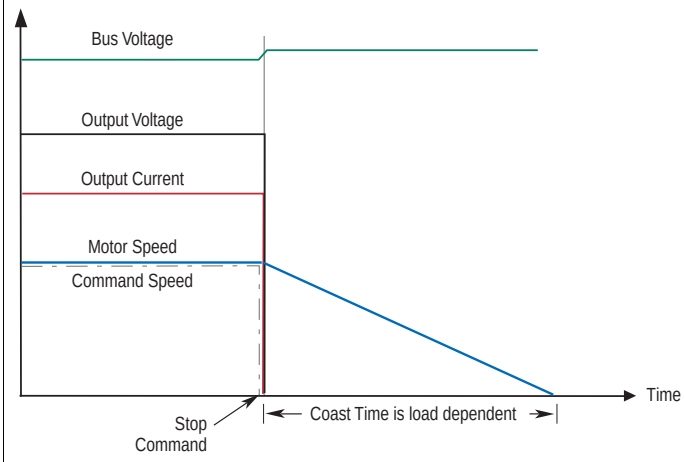
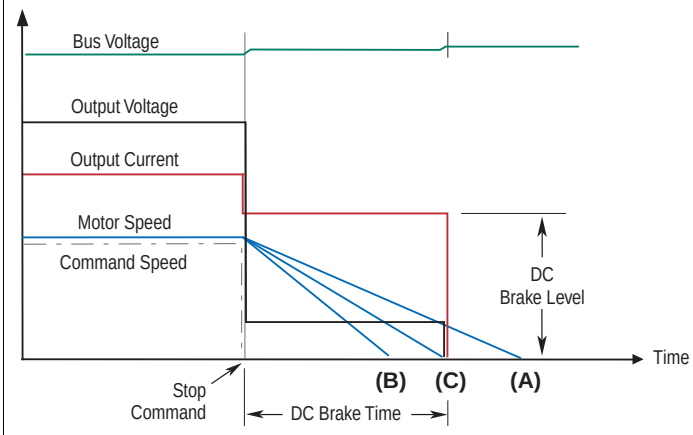
Method	Use When Application Requires . . .	Braking Power
Ramp	• The fastest stopping time or fastest ramp time for speed changes (external brake resistor or regenerative capability required for ramp times faster than the methods below). • High duty cycles, frequent stops or speed changes. (The other methods can result in excessive motor heating).	Most, if an external resistor or regenerative device is connected.
Fast brake	• Additional braking capability without the use of an external brake resistor or regenerative unit. Fast brake is effective during stop events, but not during speed changes. **Important:** For this feature to function properly the active Bus Reg Mode A or B must be set to Adjust "Freq" and **not** be "Disabled".	More than flux braking or DC brake.
Flux braking	In some applications, Flux Braking can provide a method for fast speed changes or stops. It is not suitable for high inertia loads or high duty cycle operation for applications greater than 1 cycle per minute. This feature supplies additional flux current to the motor and can cause motor thermistor or overvoltage faults in the drive. • Fast speed changes and fast stopping time. • Typical stop from speeds below 50% of base speed ("Flux Braking" typically stops the load faster than "Fast Brake" in this case). **Important:** This can be used in conjunction with "Ramp" or "Ramp to Hold" for additional braking power or with "Fast Brake" or "DC Brake" for speed changes. **Important:** For this feature to function properly the active Bus Reg Mode A or B must be set to Adjust "Freq" and **not** be "Disabled".	More than DC brake.
DC brake	• Additional braking capability without use of external brake resistor or regenerative units.	Less than the methods above.

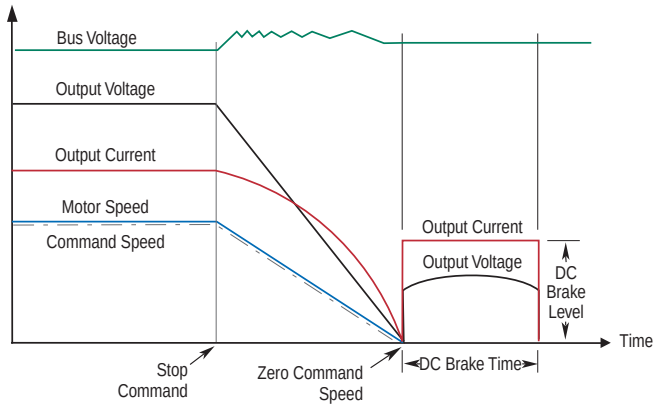
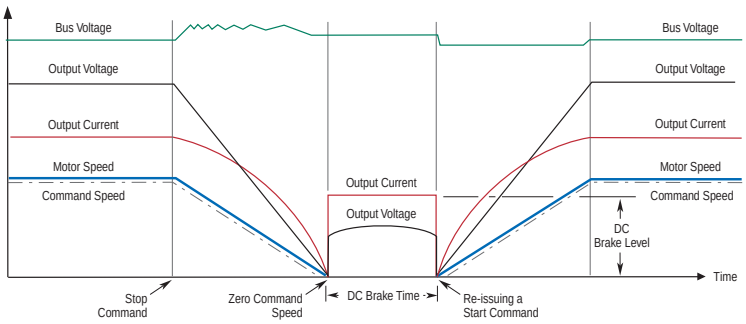
In addition to these modes the drive can be programmed for "Coast" and "Ramp to Hold," and are described in further detail in Detailed Operation on page 111.

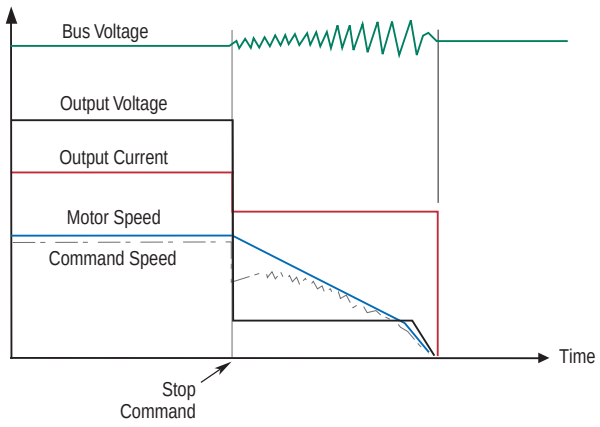
Configuration

- [Stop/Brk Mode A], parameter 155
- [Stop/Brk Mode B], parameter 156
  - 0 = Coast
  - 1 = Ramp
  - 2 = Ramp to Hold
  - 3 = DC Brake
  - 4 = Fast Brake
- [DC Brk Lvl Sel], parameter 157
  - 0 = “DC Brake Lvl” – selects parameter 158 as the source for the DC brake level
  - 1 = “Analog in 1”
  - 2 = “Analog in 2”
- [DC Brake Level], parameter 158 – sets the DC brake level in amps, when parameter 157 = “DC Brake Lvl”
- [DC Brake Time], parameter 159 – sets the amount of time that DC braking is applied after the ramp (if any).
- [Flux Braking], parameter 166 – may need to adjust parameter 549
  - 0 = Disabled
  - 1 = Enabled
- [Digital InX Sel], parameters 361...366
  - 13 = “Stop Mode B” – setting a digital input to this function enables the use of a digital input to switch between Stop Mode A (open input) and Stop Mode B (closed input).

Detailed Operation

Mode	Description
Coast to Stop	 **Coast** is selected by setting [Stop Mode A/B] to a value of "0." When in Coast to Stop, the drive acknowledges the Stop command by shutting off the drive output and releasing control of the motor. The load and motor coasts until the kinetic energy is dissipated.
DC Brake to Stop	 This method uses DC injection of the motor to Stop and/or hold the load. **DC Brake** is selected by setting [Stop Mode A/B] to a value of "3." The amount of time that braking is applied is programmed in [DC Brake Time] and the magnitude of the current used for braking is programmed in and [DC Brake Level]. This mode of braking generates up to 40% of rated motor torque for braking and is typically used for low inertia loads with infrequent Stop cycles. 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], parameter 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 is used to attempt to hold the motor at zero speed (decel profile "B" on the diagram above). 3. DC voltage to the motor continues for the amount of time programmed in [DC Brake Time], parameter 159. Braking ceases after this time expires. 4. After the DC Braking ceases, no further power is supplied to the motor. The motor/load may or may not be stopped. The drive has released control of the motor/load (decel profile "A" on the diagram above). 5. The motor, if rotating, coasts from its present speed for a time that is dependent on the remaining kinetic energy and the mechanics of the system (inertia, friction, and so on). 6. Excess motor current and/or applied duration, could cause motor damage. The user is also cautioned that motor voltage can exist long after the Stop command is issued. The right combination of Brake Level and Brake Time must be determined to provide the safest, most efficient stop (decel profile "C" on the diagram above).

Mode	Description
Ramp	 This method uses drive output reduction to stop the load. **Ramp** is selected by setting [Stop Mode A/B] to a value of "1". The drive ramps the frequency to zero based on the deceleration time programmed into [Decel Time 1/2]. The "normal" mode of machine operation can utilize [Decel Time 1]. If the machine "stop" requires a faster deceleration than desired for normal deceleration, [Decel Time 2] can be activated with a faster rate selected. When in Ramp mode, the drive acknowledges the stop command by decreasing or "ramping" the output voltage and frequency to zero in a programmed period (Decel Time), maintaining control of the motor until the drive output reaches zero. The drive output is then shut off. The load and motor follow the decel ramp. Other factors such as bus regulation and current limit can alter the actual decal rate. Ramp mode can also include a "timed" hold brake. Once the drive has reached zero output hertz on a Ramp-to-Stop and both parameters [DC Brake Time] and [DC Brake Level] are not zero, the drive applies DC to the motor producing current at the DC Brake Level for the DC Brake Time. 1. On Stop, drive output decreases according to the programmed pattern from its present value to zero. The pattern can be linear or squared. The output decreases 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 the output is shut off. 4. The motor, if rotating, coasts from its present speed for a time that is dependent on the mechanics of the system (inertia, friction, and so on).
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 decreases according to the programmed pattern from its present value to zero. The pattern can be linear or squared. The output decreases 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], parameter 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 the drive returns to normal AC operation. If an Enable command is removed, the drive enters a "not ready" state until the enable is restored.

Mode	Description
Fast Brake	 This method takes advantage of the characteristic of the induction motor whereby frequencies greater than zero (DC braking) can be applied to a spinning motor that provides more braking torque without causing the drive to regenerate. 1. On Stop, the drive output decreases based on the motor speed, keeping the motor out of the regen region. This is accomplished by lowering the output frequency below the motor speed where regeneration does not occur. This causes excess energy to be lost in the motor. 2. The method uses a PI based bus regulator to regulate the bus voltage to a reference (for example 750V) by automatically decreasing output frequency at the proper rate. 3. When the frequency is decreased to a point where the motor no longer causes the bus voltage to increase, the frequency is forced to zero. DC brake is used to complete the stop if the DC Braking Time is non-zero, then the output is shut off. 4. Use of the current regulator ensures that over current trips don't occur and enable an easily adjustable and controllable level of braking torque. 5. Use of the bus voltage regulator results in a smooth, continuous control of the frequency and forces the maximum allowable braking torque to be utilized at all times. 6. **Important:** For this feature to function properly the active Bus Reg Mode A or B must be set to Adjust "Freq" and NOT be "Disabled".

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 these three parameters:

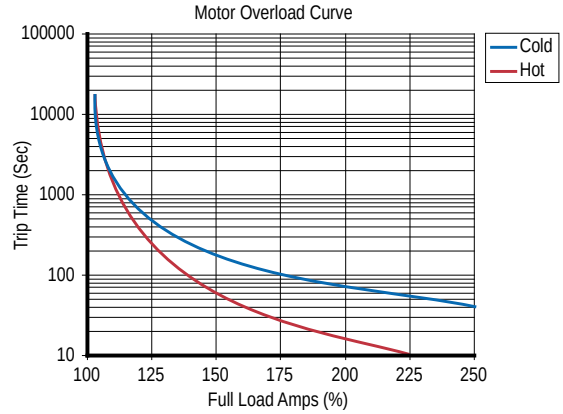
- 042 [Motor NP FLA]
- 047 [Motor OL Hertz]
- 048 [Motor OL Factor]

[Motor NP FLA] is multiplied by [Motor OL Factor] to let you define the continuous level of current allowed by the motor thermal overload.

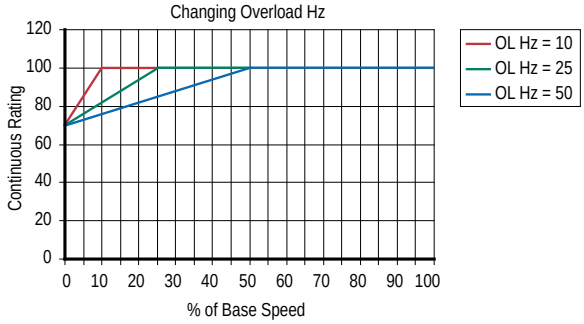
[Motor OL Hertz] is used to adjust the frequency below where the motor overload is derated.

The motor can operate up to 102% of FLA continuously. If the drive had just been activated, it runs at 150% of FLA for 180 seconds. If the motor had been operating at 100% for over 30 minutes, the drive runs 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.

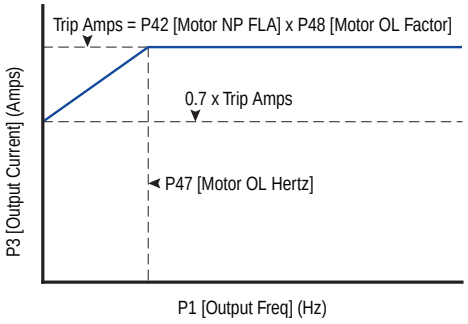
Operation below 100% current causes the temperature calculation to account for motor cooling.



[Motor OL Hertz] defines the frequency where motor overload capacity derate begins. 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 causes the motor thermal overload to trip. The effective overload factor is a combination of [Motor OL Hertz] and [Motor OL Factor].



The motor overload, if enabled, enables continuous operation at or below the line. Above the line, the overload trips after a time delay. The further above the line, the shorter the trip time.

Motor Overload Memory Retention Per 2005 NEC

The PowerFlex 70 EC (firmware revision 3.002 or later) has the ability to retain the motor overload count at power down per the 2005 NEC motor overtemp requirement. A parameter has been added to provide this functionality. To enable/disable this feature, refer to the information below.

File B	Group	No.	Parameter Name and Description *See page 14 for symbol descriptions*	Values	Related
MOTOR CONTROL (File B)	Motor Data	050	E C v3 **[Motor OL Mode]** If "0," [Motor OL Count], P220 is reset to zero by a drive reset or a power cycle. If "1," the value is maintained. A "1" to "0" transition resets [Motor OL Count], P220 to zero. Pwr Cyc Rst 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 *Nibble 4* *Nibble 3* *Nibble 2* *Nibble 1* *Bit #* *Factory Default Bit Values*	**1** = Enabled **0** = Disabled x = Reserved	

Start At Powerup

When Start At PowerUp in 2-wire control is configured, the drive starts if all start permissive conditions are met (within 10 seconds of drive power being applied), and the terminal block start input (Run, Run Forward or Run Reverse for 2-wire) is closed. An alarm is annunciated from application of power until the drive actually starts, indicating the powerup start attempt is in progress.

The powerup start attempt is aborted if any of the following occurs anytime during the 10-second start interval:

- A fault condition occurs
- A Type 2 alarm condition occurs
- The terminal block programmed enable input is opened
- All terminal block run, run forward, or run reverse, inputs are canceled
- A Stop request (from any source) is received

If the drive has not started within the 10 second interval, the powerup start attempt is terminated.

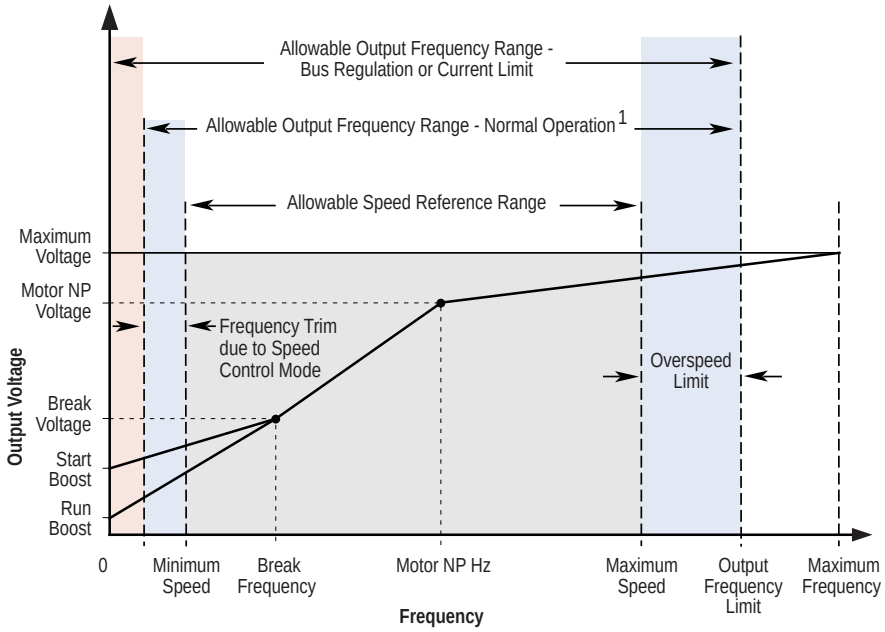
Overspeed

Overspeed Limit is a user programmable value that enables operation at maximum speed, but also provides an overspeed band that enables a speed regulator, such as encoder feedback or slip compensation, to increase the output frequency above maximum speed 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 limit only the speed reference, 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 that prevents operation if the Speed Limit exceeds Maximum Frequency.



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

Speed 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 input 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 P90 [Speed Ref A Sel]. If any of the speed select inputs are closed, the drive uses other parameters as the speed command source.

If a communication device is the source of the speed reference, refer to the appropriate communications manual for additional information.

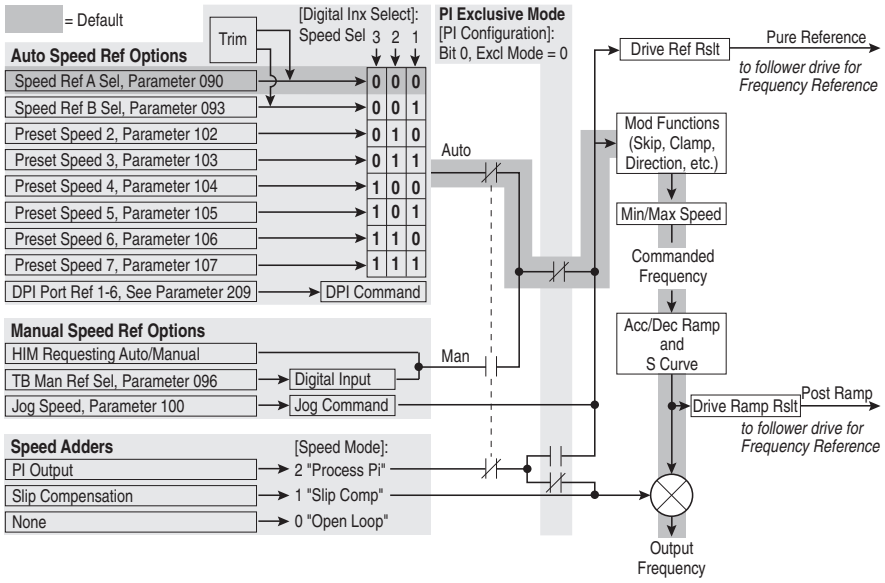
"Manual" Speed Sources

The manual source for speed command to the drive is either the HIM requesting manual control (see ALT Functions on page 101) or the control terminal block (analog input 1, 2, or MOP based on P96 [TB Man Ref Sel]) 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 3 - Speed Reference Selection Chart (1)



(1) To access Preset Speed 1, set [Speed Ref A Sel] or [Speed Ref B Sel] 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 setup. The auto speed reference is issued by the PLC through a communications module installed in the drive. Because the internal communications is designated as port 5, P90 [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.

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. Because the internal communications is designated as port 5, P90 [Speed Ref A Sel] is set to "DPI Port 5" with the drive running from the Auto source. Because the Manual speed reference is issued by an analog input ("Analog In 1 or 2"), P96 [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 digital input 4.
  With the input closed, the speed command comes from the potentiometer.

Release to Auto Control

- Open digital input 4.
  With the input open, the speed command returns to the PLC.

Auto/Manual Notes

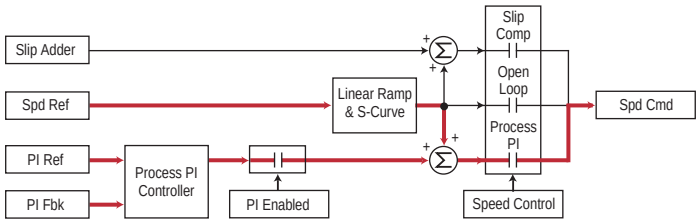
1. Manual control is exclusive. If a HIM or terminal block takes manual control, no other device can take manual control until the controlling device releases manual control.
2. If a HIM has manual control and power is removed from the drive, the drive returns to Auto mode when power is reapplied.

Process PI for Standard Control

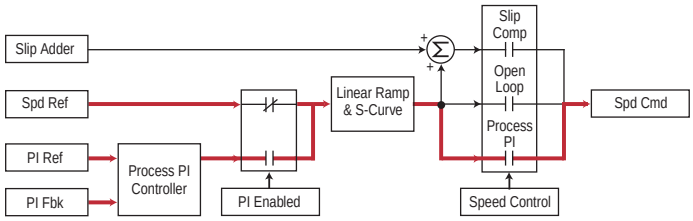
The internal PI function of the PowerFlex 70 provides closed loop process control with proportional and integral control action. The function is designed for use in applications that require simple control of a process without external control devices. The PI function enables the microprocessor of the 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 then adjusts 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.

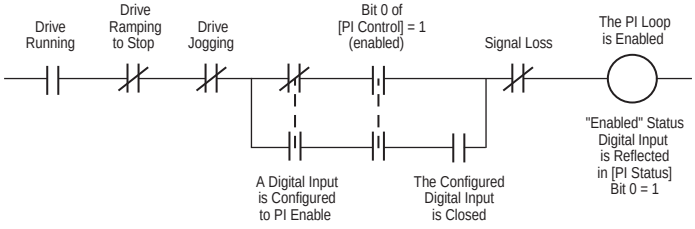


Or, it can operate as control mode by supplying the entire speed reference. This method is identified as Exclusive mode.



PI Enable

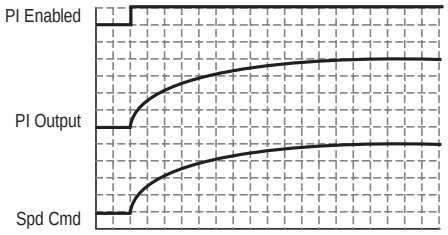
The output of the PI loop can be turned on (enabled) or turned off (disabled). This control enables the user to determine when the PI loop is providing part or all of the commanded speed. The logic for enabling the PI loop is shown in below.



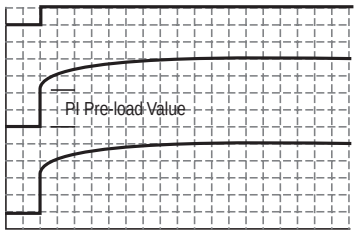
The drive must be running for the PI loop to be enabled. The loop is disabled when the drive is ramping to a stop, jogging, or the signal loss protection for the analog input or inputs is sensing a loss of signal.

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.

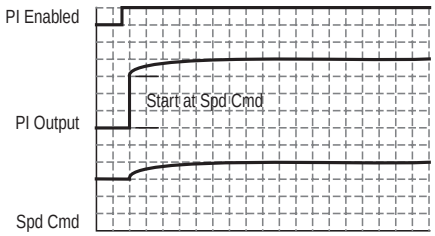
If no digital input is configured to “PI Enable,” the Bit 0 = 1 condition must be met. If the bit is permanently set to “1”, the loop is enabled as soon as the drive goes into “run”.



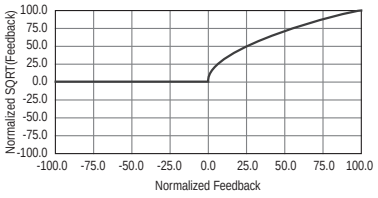
PI Pre-load Value = 0

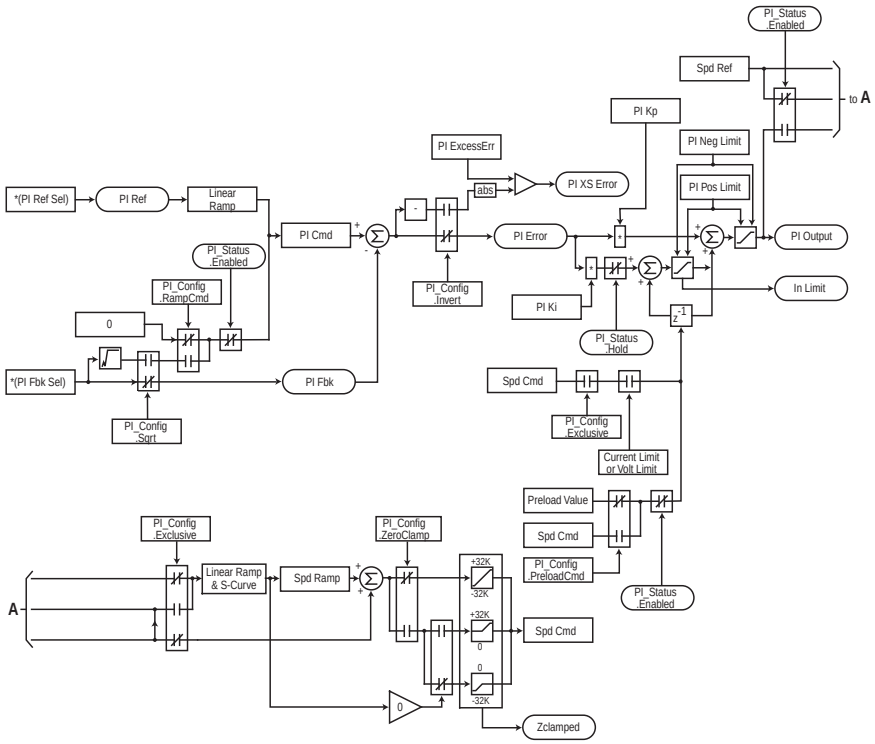


PI Pre-load Value > 0



Pre-load to Command Speed



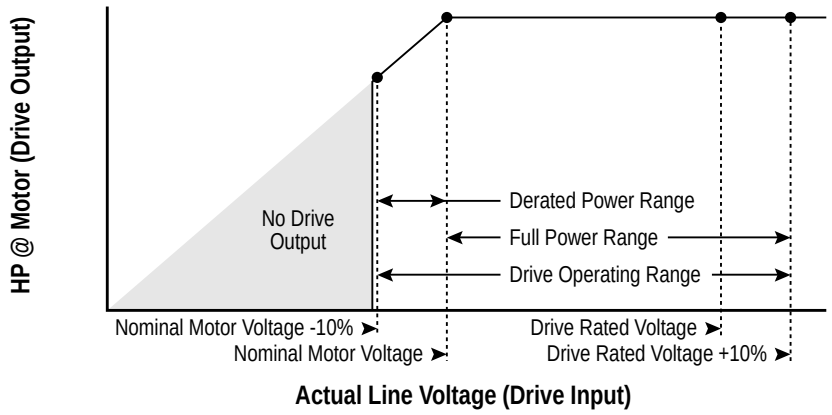


Voltage Tolerance

This section describes voltage tolerances for the different drive ratings.

Drive Rating	Nominal Line Voltage	Nominal Motor Voltage	Drive Full Power Range	Drive Operating Range
200…40	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	600	575†	575…660	432…660

Drive full power range =	Nominal motor voltage to drive rated voltage + 10%. Rated current 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 the actual line voltage is less than the nominal motor voltage.

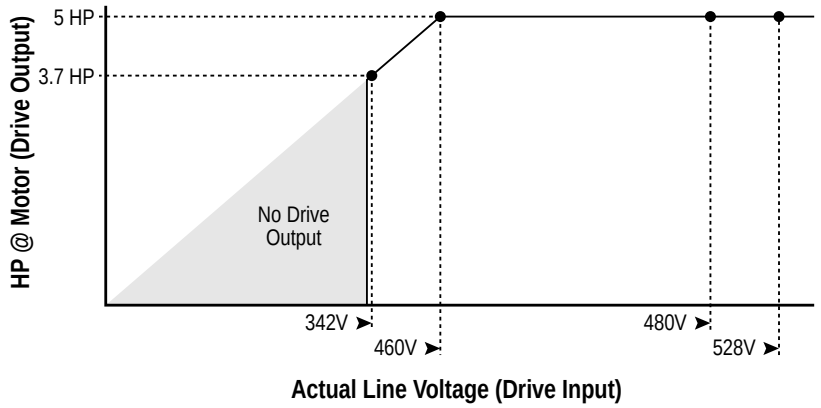


Example:

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:

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

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Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at https://rockwellautomation.custhelp.com/ for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

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