PowerFlex 70 Adjustable Frequency AC Drive

When reading this document, look for this symbol " **Step x** " to guide you through the **5 BASIC STEPS needed to install, start-up and program the PowerFlex 70**. **The information provided Does Not replace the User Manual and is intended for qualified drive service personnel only.** For detailed PowerFlex 70 information including application considerations and related precautions refer to the following:

Title	Publication	Available...
PowerFlex 70 User Manual	20A-UM001x	on the CD supplied with the drive or at **www.ab.com/manuals/dr**
PowerFlex Reference Manual	PFLEX-RM001x	

Step 1 Read the General Precautions

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

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

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

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the +DC terminal of the Power Terminal Block and the -DC test point (refer to the User Manual for location). The voltage must be zero.

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

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

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

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

Note: These faults are not instantaneous and have shown test results that take between 2 and 12 seconds to occur.

EMC Instructions

CE Conformity

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

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

Low Voltage Directive (73/23/EEC)

- EN50178 Electronic equipment for use in power installations.

EMC Directive (89/336/EEC)

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

General Notes

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

Essential Requirements for CE Compliance

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

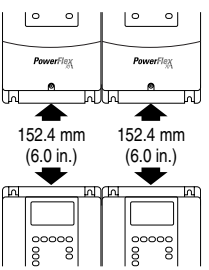
1. Standard PowerFlex CE compatible Drive.
2. Review all important precautions/attention statements throughout this manual prior to drive installation.
3. Grounding as described on page 1-4 of the User Manual.
4. Output power, control (I/O) and signal wiring must be braided, shielded cable with a coverage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

Table A PowerFlex 70 EN61800-3 EMC Compatibility

Frame	Drive Description	Second Environment				First Environment Restricted Distribution
		Restrict Motor Cable to 40 m (131 ft.)	Internal Filter Option	External Filter	Input Ferrite (1)	
A	Drive Only	✔		✔		
	with any Comm Option	✔		✔		
	with ControlNet	✔		✔	✔	
B	Drive Only	✔	✔			
	with any Comm Option	✔	✔			
	with ControlNet	✔	✔		✔	See *PowerFlex Reference Manual*
C	Drive Only	✔				
	with any Comm Option	✔				
	with ControlNet	✔			✔	
D	Drive Only	✔				
	with any Comm Option	✔				
	with ControlNet	✔			✔	

(1) Input cables through a Ferrite Core (Frames A, B and C Fair-Rite #2643102002 or equivalent, Frame D Fair-Rite #2643251002 or equivalent).

Step 2 Mount the Drive – Minimum Requirements



Maximum Surrounding Air Temperature

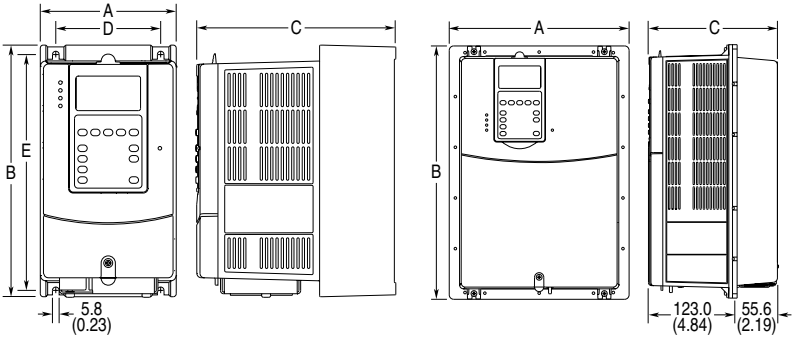
PowerFlex 70 drives are designed to operate at 0° to 50°C (32° to 122°F) surrounding air temperature.

Important: Some drives are equipped with an adhesive label on the top of the chassis. Removing the adhesive label from the drive changes the NEMA enclosure rating from Type 1 Enclosed to Open Type.

Dimensions

Figure 1 PowerFlex 70 Frames A-D

IP20 / NEMA Type 1 **Flange Mount**



Dimensions are in millimeters and (inches).

Frame *(see Table B)*	A	B	C	D	E	Weight (1) *kg (lbs.)*	
						Drive	Drive & Packaging
IP20 / NEMA Type 1							
A	122.4 (4.82)	225.7 (8.89)	179.8 (7.08)	94.2 (3.71)	211.6 (8.33)	5.22 (11.5)	3.65 (7.85)
B	171.7 (6.76)	234.6 (9.24)	179.8 (7.08)	122.7 (4.83)	220.2 (8.67)	7.03 (15.5)	4.9 (9.9)
C	185.0 (7.28)	300.0 (11.81)	179.8 (7.08)	137.6 (5.42)	285.6 (11.25)	12.52 (27.6)	7.6 (16.75)
D	219.9 (8.66)	350.0 (13.78)	179.8 (7.08)	169.0 (6.65)	335.6 (13.21)	18.55 (40.9)	9.75 (21.5)
Flange Mount							
A	156.0 (6.14)	225.8 (8.89)	178.6 (7.03)	–	–	5.22 (11.5)	3.65 (7.85)
B	205.2 (8.08)	234.6 (9.24)	178.6 (7.03)	–	–	7.03 (15.5)	4.9 (9.9)
C	219.0 (8.62)	300.0 (11.81)	178.6 (7.03)	–	–	12.52 (27.6)	7.6 (16.75)
D	248.4 (9.78)	350.0 (13.78)	178.6 (7.03)	–	–	18.55 (40.9)	9.75 (21.5)

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

Table B PowerFlex 70 Frames

Output Power		Frame Size					
		208-240V AC Input		400-480V AC Input		600V AC Input	
kW ND (HD)	HP ND (HD)	Not Filtered	Filtered	Not Filtered	Filtered	Not Filtered	Filtered
0.37 (0.25)	0.5 (0.33)	A	B	A	B	A	–
0.75 (0.55)	1 (0.75)	A	B	A	B	A	–
1.5 (1.1)	2 (1.5)	B	B	A	B	A	–
2.2 (1.5)	3 (2)	B	B	B	B	B	–
4 (3)	5 (3)	–	C	B	B	B	–
5.5 (4)	7.5 (5)	–	D	–	C	C	–
7.5 (5.5)	10 (7.5)	–	D	–	C	C	–
11 (7.5)	15 (10)	–	–	–	D	D	–
15 (11)	20 (15)	–	–	–	D	D	–

Step 3 Wire the Drive – Wire Recommendations

Type		Wire Type(s)	Description	Min. Insulation Rating
Power (1)	Standard	600V, 90°C (194°F) XHHW2/RHW-2 Anixter B209500-B209507, Belden 29501-29507, or equivalent	• Four tinned copper conductors with XLP insulation. • Copper braid/aluminum foil combination shield and tinned copper drain wire. • PVC jacket.	
	Standard (Euro)			
Signal (1)(2) (3)	Standard Analog I/O	Belden 8760/9460 (or equiv.)	0.750 mm^2 (18 AWG), twisted pair, 100% shield with drain.	300V, 75-90 degrees C (167-194 degrees F)
		Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 cond., shielded for remote pot only.	
	Standard (Euro)			
Digital I/O (1)(2)(3)	Shielded	Multi-conductor shielded cable such as Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 conductor, shielded.	300V, 60 degrees C (140 degrees F)

(1) Control and signal wires should be separated from power wires by at least 0.3 meters (1 foot).

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

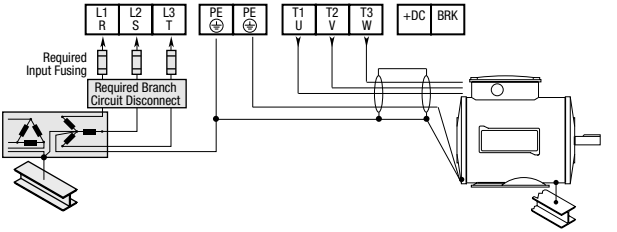
(3) I/O terminals labeled "(–)" or "Common" are not referenced to earth ground and are designed to greatly reduce common mode interference. Grounding these terminals can cause signal noise.

Terminal Block Specifications

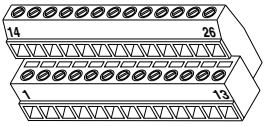
Name	Frame	Description	Wire Size Range(1)		Torque	
			Maximum	Minimum	Maximum	Recommended
Power Terminal Block	A, B & C	Input power and motor connections	3.5 mm^2 (12 AWG)	0.3 mm^2 (22 AWG)	0.66 N-m (5.5 lb.-in.)	0.6 N-m (5 lb.-in.)
	D	Input power and motor connections	8.4 mm^2 (8 AWG)	0.8 mm^2 (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)
I/O Terminal Block		Signal & control connections	1.5 mm^2 (16 AWG)	0.05 mm^2 (30 AWG)	0.55 N-m (4.9 lb.-in.)	0.5 N-m (4.4 lb.-in.)
SHLD Terminal	All	Terminating point for wiring shields	—	—	1.6 N-m (14 lb.-in.)	1.6 N-m (14 lb.-in.)

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

Power & Ground Wiring



Standard I/O Terminal Blocks



No.	Signal	Factory Default	Description	Related Param.
1	Digital In1 Sel	Stop – CF (CF = Clear Fault)	11.2 mA @ 24V DC 19.2V minimum on state 3.2V maximum off state Important: Use only 24V DC, not suitable for 115V AC circuitry. Inputs can be wired as sink or source. See page 8.	361 - 366
2	Digital In2 Sel	Start		
3	Digital In3 Sel	Auto/Man		
4	Digital In4 Sel	Speed Sel 1		
5	Digital In5 Sel	Speed Sel 2		
6	Digital In6 Sel	Speed Sel 3		
7	24V Common	–	Drive supplied power for Digital In1-6 inputs. See examples on page 8. 150mA maximum load.	
8	Digital In Common	–		
9	+24V DC	–		
10	+10V Pot Reference	–	2 k ohm minimum load.	
11	Digital Out 1 – N.O.(1)	NOT Fault	Max Resistive Load: 250V AC / 30V DC, 50 VA / 60 Watts Max Inductive Load: 250V AC / 30V DC, 25 VA / 30 Watts Minimum DC Load: 10 µA, 10 mV DC	380 - 387
12	Digital Out 1 Common			
13	Digital Out 1 – N.C.(1)	Fault		
14	Analog In 1 (– Volts)	(2) Voltage – Reads value at 14 & 15	Non-isolated, 0 to +10V, 10 bit, 100k ohm input impedance.(3)	320 - 327
15	Analog In 1 (+ Volts)			
16	Analog In 1 (– Current)		Non-isolated, 4-20mA, 10 bit, 100 ohm input impedance.(3)	
17	Analog In 1 (+ Current)			
18	Analog In 2 (– Volts)	(2) Voltage – Reads value at 18 & 19	Isolated, bipolar, differential, 0 to +10V unipolar (10 bit) or ±10V bipolar (10 bit & sign), 100k ohm input impedance.(4)	
19	Analog In 2 (+ Volts)			
20	Analog In 2 (– Current)		Isolated, 4-20mA, 10 bit & sign, 100 ohm input impedance.(4)	
21	Analog In 2 (+ Current)			
22	Analog Out (– Volts) 10V Pot Common	(2) Output Freq	0 to +10V, 10 bit, 10k ohm (2k ohm minimum) load. Referenced to chassis ground. Common if internal 10V supply (terminal 10) is used.	341 - 344
23	Analog Out (+ Volts)			
24	Digital Out 2 – N.O.	Run	See description at No.s 11-13.	380 - 387
25	Digital Out 2 Common			
26	Digital Out 2 – N.C.			

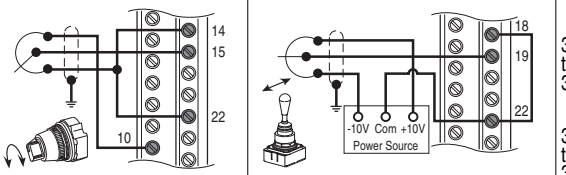
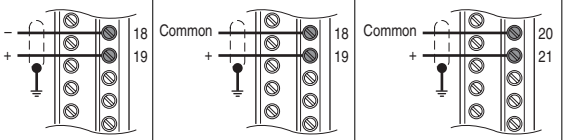
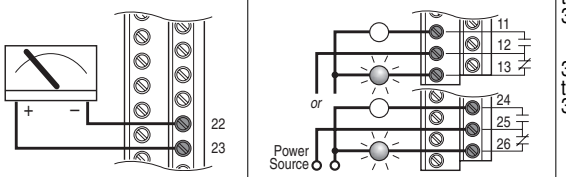
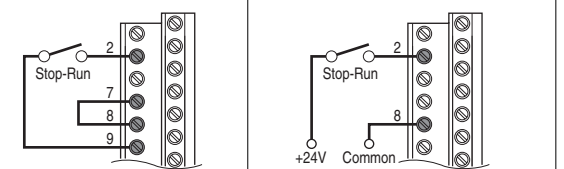
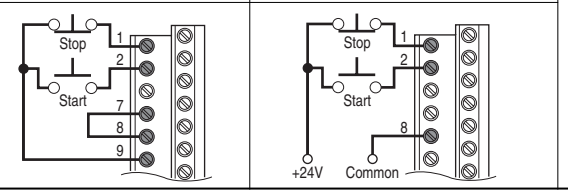
(1) Contacts shown in unpowered state. Relays change state when drive is powered.

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

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

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

I/O Wiring Examples

Input/Output	Connection Example[3]	Related Param.
Potentiometer[1] 10k Ohm Pot. Recommended (2k Ohm minimum) **Joystick[1]** ±10V Input - 100k ohm input impedance	[Speed Ref A Sel] = "Analog In 1" Potentiometer / Joystick 	090 to 095 320 to 327 361 to 366
Analog Input Bipolar: ±10V Unipolar: 0 to +10V, 100k ohm impedance 4-20 mA, 100 ohm impedance	[Speed Ref A Sel] = "Analog In 2" Bipolar[1] / Unipolar (Voltage) / Unipolar (Current) 	
Analog/Digital Output 0 to +10V Output - Can drive a 2k Ohm load (25 mA short circuit current limit)	Analog Output / Digital N.O. / N.C. Output 	341 to 344 380 to 387
2 Wire Control[2] - Non-Reversing Requires 2-wire functions only ([Digital In1 Sel]). Using 3-wire selections will cause a type 2 alarm.	24V DC Input[4]: [Digital In2 Sel] = "Run" Internal Supply / External Supply 	361 to 366
3 Wire Control Requires 3-wire functions only ([Digital In1 Sel]). Using 2-wire selections will cause a type 2 alarm.	24V DC Input[4]: [Digital In1 Sel] = "Stop – CF", [Digital In2 Sel] = "Start" Internal Supply / External Supply 	

(1) Refer to the Attention statement on page 2 for important bipolar wiring information.

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

(3) Examples show hardware wiring only. Refer to page 7 for parameters that must be adjusted.

(4) If desired, a User Supplied 24V DC power source can be used. Refer to the "External" example.

Step 4 Start-Up Check List

❑ **1.** Verify input supply voltage.

❑ **2.** Check output wiring.

❑ **3.** Check control wiring.

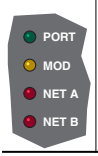
❑ **4.** Apply AC power and control voltages to the drive.

If any of the six digital inputs are configured to Stop – CF (CF = Clear Fault) or Enable, verify that signals are present or the drive will not start. Refer to Troubleshooting – Abbreviated Fault & Alarm Listing on page 16 for a list of potential digital input conflicts.

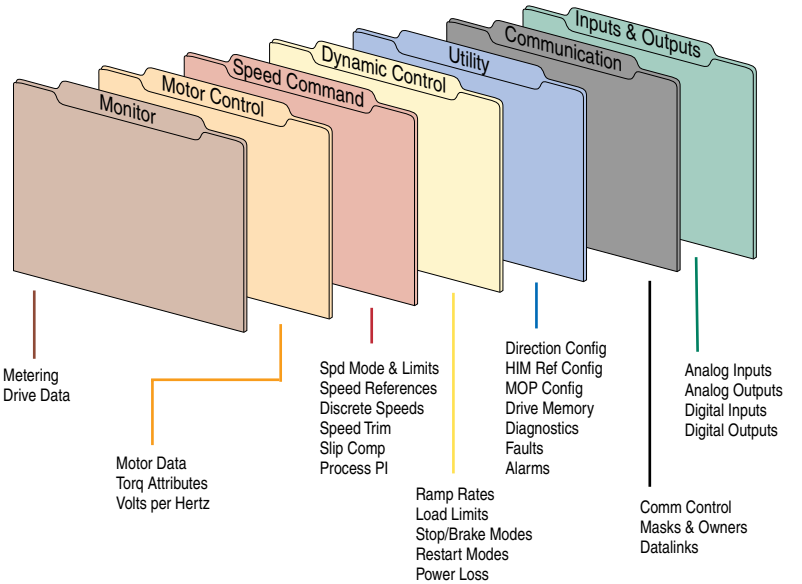
If the STS LED is not flashing green at this point, refer to Status Indicators on page 9.

❑ **5.** Select Start-Up method: SMART Start or Assisted Start-Up.

Status Indicators

Name	Color	State	Description
	Green	Flashing	Drive ready, but not running and no faults are present.
		Steady	Drive running, no faults are present.
	Yellow	Flashing, Drive Stopped	A type 2 alarm condition exists, the drive cannot be started. Check parameter 212 [Drive Alarm 2].
		Flashing, Drive Running	An intermittent type 1 alarm condition is occurring. Check parameter 211 [Drive Alarm 1].
		Steady, Drive Running	A continuous type 1 alarm condition exists. Check parameter 211 [Drive Alarm 1].
	Red	Flashing	A fault has occurred.
		Steady	A non-resettable fault has occurred.
	Refer to the Communication Adapter User Manual.		Status of DPI port internal communications (if present).
			Status of communications module (when installed).
			Status of network (if connected).
			Status of secondary network (if connected).

Step 5 Program the Drive – Parameter Files & Groups



Frequently Used Parameters

MOTOR CONTROL (File B) — Motor Data

041	**[Motor NP Volts]** Set to the motor nameplate rated volts.	Default: Based on Drive Rating Min/Max: 0.0/[Rated Volts] Display: 0.1 VAC		
042	**[Motor NP FLA]** Set to the motor nameplate rated full load amps.	Default: Based on Drive Rating Min/Max: 0.0/[Rated Amps] × 2 Display: 0.1 Amps	047 048	
045	**[Motor NP Power]** Set to the motor nameplate rated power.	Default: Based on Drive Rating Min/Max: 0.00/100.00 Display: See [Mtr NP Pwr Units]	046	
046	**[Mtr NP Pwr Units]** The power units shown on the motor nameplate.	Default: Based on Drive Rating Options: 0 "Horsepower" 1 "kiloWatts"		
047	**[Motor OL Hertz]** Selects the output frequency below which the motor operating current is derated. The motor thermal overload will generate a fault at lower levels of current.	Default: Motor NP Hz/3 Min/Max: 0.0/Motor NP Hz Display: 0.1 Hz	042 220	

MOTOR CONTROL (File B)	Torq Attributes	053	**[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
		061	**[Autotune]** Provides a manual or automatic method for setting [IR Voltage Drop] and [Flux Current Ref], which affect sensorless vector performance. Valid only when [Torque Perf Mode] is set to "Sensrls Vect" or "SV Economize." "Ready" (0) = Parameter returns to this setting following a "Static Tune" or "Rotate Tune." It also permits manually setting [IR Voltage Drop] and [Flux Current Ref]. "Static Tune" (1) = A temporary command that initiates a non-rotational motor stator resistance test for the best possible automatic setting of [IR Voltage Drop]. A start command is required following initiation of this setting. The parameter returns to "Ready" (0) following the test, at which time another start transition is required to operate the drive in normal mode. Used when motor cannot be uncoupled from the load. "Rotate Tune" (2) = A temporary command that initiates a "Static Tune" followed by a rotational test for the best possible automatic setting of [Flux Current Ref]. A start command is required following initiation of this setting. The parameter returns to "Ready" (0) following the test, at which time another start transition is required to operate the drive in normal mode. **Important:** Used when motor is uncoupled from the load. Results may not be valid if a load is coupled to the motor during this procedure. **ATTENTION:** Rotation of the motor in an undesired direction can occur during this procedure. To guard against possible injury and/or equipment damage, it is recommended that the motor be disconnected from the load before proceeding. "Calculate" (3) = This setting uses motor nameplate data to automatically set [IR Voltage Drop] and [Flux Current Ref].	Default: Options:	3 0 1 2 3	"Calculate" "Ready" "Static Tune" "Rotate Tune" "Calculate"	053 062
SPEED COMMAND (File C)	Spd Mode & Limits	080	**[Speed Mode]** Sets the method of speed regulation.	Default: Options:	0 0 1 2	"Open Loop" "Open Loop" "Slip Comp" "Process PI"	121 thru 138
		081	**[Minimum Speed]** Sets the low limit for speed reference after scaling is applied. Refer to parameter 083 [Overspeed Limit].	Default: Min/Max: Display:	0.0 Hz 0.0/[Maximum Speed] 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: Min/Max: Display:	50.0 or 60.0 Hz (Dependent on voltage class) 5.0/400.0 Hz 0.0 Hz		055 083 091 094 202

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. (1) See Appendix B of the User Manual for DPI port locations.	Default: 2 "Analog In 2" Options: 1 "Analog In 1" 2 "Analog In 2" 3-8 "Reserved" 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"	002 091 thru 093 101 thru 107 117 thru 120 192 thru 194 213 272 273 320 361 thru 366
		091	**[Speed Ref A Hi]** Scales the upper value of the [Speed Ref A Sel] selection when the source is an analog input.	Default: [Maximum Speed] Min/Max: –/+[Maximum Speed] Display: 0.1 Hz		082
		092	**[Speed Ref A Lo]** Scales the lower value of the [Speed Ref A Sel] selection when the source is an analog input.	Default: 0.0 Hz Min/Max: –/+[Maximum Speed] Display: 0.1 Hz		081
	Discrete Speeds	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] Display: 0.1 Hz		090 093
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: 0.1/3600.0 Secs Display: 0.1 Secs		142 143 146 361 thru 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: 0.1/3600.0 Secs Display: 0.1 Secs		140 141 146 361 thru 366

DYNAMIC CONTROL (File D)	Load Limits	148	**[Current Lmt Val]** Defines the current limit value when [Current Lmt Sel] = "Cur Lim Val."	Default: Min/Max: Display:	[Rated Amps] × 1.5 (Equation yields approximate default value.) Based on Drive Rating 0.1 Amps	147 149
		151	**[PWM Frequency]** Sets the carrier frequency for the PWM output. Drive derating may occur at higher carrier frequencies. For derating information, refer to the *PowerFlex Reference Manual*.	Default: Min/Max: Display:	4 kHz 2/10 kHz 1 kHz	
	Stop/Brake Modes	155 156	**[Stop Mode A]** **[Stop Mode B]** Active stop mode. [Stop Mode A] is active unless [Stop Mode B] is selected by inputs. (1) When using options 1 or 2, refer to the Attention statement below. **ATTENTION:** If a hazard of injury due to movement of equipment or material exists, an auxiliary mechanical braking device must be used.	Default: Default: Options:	1 "Ramp" 0 "Coast" 0 "Coast" 1 "Ramp"(1) 2 "Ramp to Hold"(1) 3 "DC Brake"	157 158 159
		161 162	**[Bus Reg Mode A]** **[Bus Reg Mode B]** Sets the method and sequence of the DC bus regulator voltage. Choices are dynamic brake, frequency adjust or both. Sequence is determined by programming or digital input to the terminal block. 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 2 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 a protective circuit must be supplied. See the *PowerFlex 70 User Manual* for more information.	Default: Options:	1 "Adjust Freq" 4 "Both-Frq 1st" 0 "Disabled" 1 "Adjust Freq" 2 "Dynamic Brak" 3 "Both-DB 1st" 4 "Both-Frq 1st"	160 163

DYNAMIC CONTROL (File D)	Stop/Brake Modes	163	**[DB Resistor Type]** Selects whether the internal or an external DB resistor will be used.	Default: Options:	0 0 1 2	"Internal Res" "Internal Res" "External Res" "None"	161 162
			ATTENTION: Equipment damage may result if a drive mounted (internal) resistor is installed and this parameter is set to "External Res." Thermal protection for the internal resistor will be disabled, resulting in possible device damage. Also see Attention at [Bus Reg Mode x].				
	Restart Modes	169	**[Flying Start En]** Enables/disables the function which reconnects to a spinning motor at actual RPM when a start command is issued.	Default: Options:	0 0 1	"Disabled" "Disabled" "Enabled"	170
UTILITY (File E)	Drive Memory	201	**[Language]** Selects the display language when using an LCD HIM. This parameter is not functional with an LED HIM.	Default: Options:	0 0 1 2 3 4 5 6 7 8-9 10	"Not Selected" "Not Selected" "English" "Français" "Español" "Italiano" "Deutsch" "Reserved" "Português" "Reserved" "Nederlands"	
INPUTS & OUTPUTS (File J)	Analog Inputs	322 325	**[Analog In 1 Hi]** **[Analog In 2 Hi]** Sets the highest input value to the analog input x scaling block.	Default: Min/Max: Display:	10.000 Volt 10.000 Volt 4.000/20.000mA –/+10.000V 0.000/10.000V 0.001 mA or 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: Min/Max: Display:	0.000 Volt 0.000 Volt 4.000/20.000mA 0.000/10.000V (No. 323) –/+10.000V (No. 326) 0.000/10.000V 0.001 mA or 0.001 Volt		091 092

INPUTS & OUTPUTS (File J) — Digital Inputs

361 **[Digital In1 Sel]**
362 **[Digital In2 Sel]**
363 **[Digital In3 Sel]**
364 **[Digital In4 Sel]**
365 **[Digital In5 Sel]**
366 **[Digital In6 Sel]**

Selects the function for the digital inputs.

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

(2) Typical 3-Wire Inputs. Requires that only 3-wire functions are chosen. Including 2-wire selections will cause a type 2 alarm.

(3) Typical 2-Wire Inputs. Requires that only 2-wire functions are chosen. Including 3-wire selections will cause a type 2 alarm.

(4) Speed Select Inputs.

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

To access Preset Speed 1, set [Speed Ref A Sel] or [Speed Ref B Sel] to "Preset Speed 1".

Type 2 Alarms
Some digital input programming may cause conflicts that will result in a Type 2 alarm. Example: [Digital In1 Sel] set to 5 "Start" in 3-wire control and [Digital In2 Sel] set to 7 "Run" in2-wire.

Refer to Troubleshooting – Abbreviated Fault & Alarm Listing on page 16 for information on resolving this type of conflict.

(5) Auto/Manual - Refer to Figure 1.6 in the User Manual for details.

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

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

Default:	4	"Stop – CF" (CF = Clear Fault)	
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"(2)	
	5	"Start"(2)(7)	
	6	"Fwd/ Reverse"(2)	
	7	"Run"(3)	
	8	"Run Forward"(3)	
	9	"Run Reverse"(3)	
	10	"Jog"(2)	100
	11	"Jog Forward"	
	12	"Jog Reverse"	
	13	"Stop Mode B"	156
	14	"Bus Reg Md B"	162
	15	"Speed Sel 1"(4)	
	16	"Speed Sel 2"(4)	
	17	"Speed Sel 3"(4)	
	18	"Auto/ Manual"(5)	096
	19	"Local"	
	20	"Acc2 & Dec2"	140
	21	"Accel 2"	
	22	"Decel 2"	
	23	"MOP Inc"	194
	24	"MOP Dec"	
	25	"Excl Link"	380
	26	"PI Enable"	124
	27	"PI Hold"	
	28	"PI Reset"	

Troubleshooting – Abbreviated Fault & Alarm Listing

For a complete listing of Faults and Alarms, refer to the PowerFlex 70 User Manual.

Fault	No.	Type(1)	Description	Action
Auxiliary Input	2	①	Auxiliary input interlock is open.	Check remote wiring.
Motor Overload	7	① ③	Internal electronic overload trip. Enable/Disable with [Fault Config 1].	An excessive motor load exists. Reduce load so drive output current does not exceed the current set by [Motor NP FLA].
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].
SW OverCurrent	36	①	The drive output current has exceeded the hardware current.	Check for excess load, improper DC boost setting. DC brake volts set too high.
IR Volts Range	77		The drive auto tuning default is "Calculate" and the value calculated for IR Drop Volts is not in the range of acceptable values.	Re-enter motor nameplate data.
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.

(1) See the User Manual for a description of fault types.

Alarm	Type(1)	Description
Dig In ConflictA	②	Digital input functions are in conflict. Combinations marked with a "●" will cause an alarm.

	Acc2/Dec2	Accel 2	Decel 2	Jog	Jog Fwd	Jog Rev	Fwd/Rev
Acc2 / Dec2		●	●				
Accel 2	●						
Decel 2	●						
Jog					●	●	
Jog Fwd				●			●
Jog Rev				●			●
Fwd / Rev					●	●	

<table>
<tr><th>Alarm</th><th>Type(1)</th><th>Description</th></tr>
<tr><td>Dig In ConflictB</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 a “■” 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>■</td><td>■</td><td>■</td><td></td><td>■</td><td>■</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>■</td><td></td><td></td><td>■</td><td>■</td><td></td><td>■</td><td>■</td><td></td></tr>
<tr><td>Run Fwd</td><td>■</td><td></td><td>■</td><td></td><td></td><td>■</td><td></td><td></td><td>■</td></tr>
<tr><td>Run Rev</td><td>■</td><td></td><td>■</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>■</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Jog Fwd</td><td>■</td><td></td><td>■</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Jog Rev</td><td>■</td><td></td><td>■</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>■</td><td>■</td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>Dig In ConflictC</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>
</table>

(1) See User Manual for a description of alarm types.

Manually Clearing Faults

Step	Key(s)
1. Press Esc to acknowledge the fault. The fault information will be removed so that you can use the HIM.	Esc
2. Address the condition that caused the fault. The cause must be corrected before the fault can be cleared.	
3. After corrective action has been taken, clear the fault by one of these methods: • Press Stop • Cycle drive power • Set parameter 240 [Fault Clear] to “1.”	

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