



## PowerFlex 700 Drive w/Vector Control Option (Revision 6.002)

These release notes correspond to the firmware version 6.002 for PowerFlex<sup>®</sup> 700 drives with the Vector Control option. Refer to publications 20B-RN001 through 20B-RN005 for a description of the changes implemented in previous firmware versions.

### Determining Firmware Revision Level

To determine the firmware version for a PowerFlex 700 Drive, view parameter 29 [Control SW Ver].

### Firmware Upgrade Procedure

This section describes procedures to flash upgrade your drive firmware. Downloads are provided on the Allen-Bradley Web Updates site located at <http://www.ab.com/support/abdrives/webupdate>. For a detailed explanation of the flash procedure, refer to <http://www.ab.com/support/abdrives/powerflex700vc/phase1/firmware/index.html>.



**ATTENTION:** Risk of drive damage exists if drive power is removed during the Boot Flash segment of the upgrade/download. To guard against damage, Do Not Remove Power to the drive until the download is complete and the drive has been reset.

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**Important:** Once a flash update has been started, do not remove drive power until the download is complete and the drive has been reset. If power is removed during Boot Flash, the drive may be permanently damaged. A drive that has been damaged in this way cannot be repaired. If power is removed during Application Flash, the drive will remain in Boot and can be reflashed.

1. Remove/disconnect any HIMs before proceeding.
2. Install the “v6.002 Flash Kit” from the Allen-Bradley Web Updates site. This automatically installs the latest version of the ControlFLASH utility on your computer. ControlFLASH, DriveExplorer or DriveExecutive can now be used to update the drive using the following instructions.

Using ControlFLASH

**Important:** This method requires RSLinx.

1. Launch ControlFLASH (if it is not already running).
2. Follow the screen prompts until the flash procedure is completed and the new firmware version is displayed.

Using DriveExplorer Lite/Full

1. Exit the ControlFLASH program (if it is running) and launch DriveExplorer. Make a connection to the drive.
2. In the DriveExplorer treeview, select the appropriate drive. Then select the Information icon.
3. On the Properties screen, select the “Details” tab.
4. Select “Flash Update” and follow the screen prompts until the procedure is completed and the new firmware version is displayed.

Using DriveExecutive

**Important:** This method requires RSLinx.

1. Exit the ControlFLASH program (if it is running) and launch DriveExecutive. Make a connection to the drive.
2. In the DriveExecutive treeview, select the appropriate drive. Then select the Information icon.
3. On the Properties screen, select “Component Details.”
4. Select “Flash Update” and follow the screen prompts until the procedure is completed and the new firmware version is displayed.

**New Features/  
Enhancements**

The following parameters have been added or updated in v6.002. Detailed descriptions are available on the pages that follow.

New Parameters

File	Group	No.	Name	Units
Motor Control	Motor Data	50	Motor OL Mode	
Utility	Diagnostics	222	Drive Status 3	
Utility	Diagnostics	223	Status 3 @ Fault	
Communications	Datalinks	308	HighRes Ref	
Inputs & Outputs	Digital Inputs	411	DigIn DataLogic	
Speed Command	Speed Regulator	448	Spd Err Filt BW	R/s
Utility	Diag Motor Cntl	552	Dead Time Comp	%
Utility	Diag Motor Cntl	553	Flux Down Rate	mSec
Applications	Torque Proving	613	Brake Test Torq	%
Pos/Spd Profile	ProfSetup/Status	702	Home Position	Unit

New Diagnostics

No.	Name	Units
38	Junction Temp	degC
39	Gnd Warn Level	Amps
40	In Phase LossLvl	

## New Bits

Parameter	Bit	Description		
50	Motor OL Mode	0 Pwr Cyc Ret		
56	Compensation	9 DigIn DatLog		
		10 NoSyncPWM		
211	Drive Alarm 1	20 Active Cnvtr		
214	Start Inhibits	7 Fast Stop		
216	Dig In Status	8 In1 DLogRslt		
		9 In2 DLogRslt		
		10 In3 DLogRslt		
		11 In4 DLogRslt		
		12 In5 DLogRslt		
		13 In6 DLogRslt		
222	Drive Status 3	0 Manual Mode		
		1 Fast Braking		
223	Status 3 @ Fault	0 Manual Mode		
		1 Fast Braking		
229	Alarm 1 @ Fault	20 Active Cnvtr		
238	Fault Config 1	2 HS Low Temp		
259	Alarm Config 1	20 Active Cnvtr		
276	Logic Mask	6 DPI Port 6		
277	Start Mask	6 DPI Port 6		
278	Jog Mask	6 DPI Port 6		
279	Direction Mask	6 DPI Port 6		
280	Reference Mask	6 DPI Port 6		
281	Accel Mask	6 DPI Port 6		
282	Decel Mask	6 DPI Port 6		
283	Fault Clr Mask	6 DPI Port 6		
284	MOP Mask	6 DPI Port 6		
285	Local Mask	6 DPI Port 6		
411	DigIn DataLogic	0 In1 ANDdata		
		1 In2 ANDdata		
		2 In3 ANDdata		
		3 In4 ANDdata		
		4 In5 ANDdata		
		5 In6 ANDdata		
		8 In1 ORdata		
		9 In2 ORdata		
		10 In3 ORdata		
		11 In4 ORdata		
		12 In5 ORdata		
		13 In6 ORdata		
		595	Port Mask Act	6 DPI Port 6
		596	Write Mask Cfg	6 DPI Port 6
597	Write Mask Act	6 DPI Port 6		
598	Logic Mask Act	6 DPI Port 6		
600	TorqProve Cnfg	6 StoppedBkSlp		
		7 Brake Test		
		8 Fast Stop Bk		
		9 BkSlp SpdLmt		
705	Pos/Spd Prof Cmd	12 Hold At Home		
		13 Abort Step		
		14 Abort Prof		

## Default Value Change

No.	Name	Default Value
549	Flux Braking % <sup>(1)</sup>	125% (previous 175%)

<sup>(1)</sup> Refer to the PowerFlex 70EC/700VC Reference Manual, publication PFLEX-RM004 for parameter details.

**New Enum Parameter Selections**

Parameter	No.	Description
90	Speed Ref A Sel	30 HighRes Ref
93	Speed Ref B Sel	30 HighRes Ref
184	Power Loss Mode	5 Decel 2 Stop
213	Speed Ref Source	43 HighRes Ref
361-366	Digital In1-6 Sel	60 AdjV Sel 1 61 AdjV Sel 2 62 AdjV Sel 3 63 AdjV/Hz Sel1 64 AdjV/Hz Sel2 65 AdjV/Hz Sel3 66 Abort Step 67 Abort Prof
380-388	Digital Out1-3 Sel	58 Manual Mode 59 Fast Braking 60 TrqPrv Brake

**New Alarms and Faults**

No.	Fault	No.	Alarm
10	Heatsink LowTemp	16	Brake Slipping
75	Port 6 Adapter		
85	Port 6 DPI Loss		
111	Power Down Csum		

**Linkable Parameters**

The following parameter was added to the “linkable” list:

- [153 Regen Power Lim]

**Pos/Spd Profile Enhancements**

**Hold after Home**

Bit 12, “Hold At Home” was added to [705 Pos/Spd Prof Cmd]. At the completion of a “Find Home” command, the drive will remain enabled and will remain at the home position (holding position, not necessarily just holding zero speed) when the “Hold At Home” bit is set. This function is similar to the “End Hold Pos” step type except the hold can continue indefinitely.

A “Hold At Home” is terminated by a Start command to initiate a profile or by a Stop command.

<b>POS/SPD PROFILE</b>	<b>ProfSetup/Status</b>	705	<b>[Pos/Spd Prof Cmd]</b>
		<p>Control word for the profile/indexer. The control functions are the same as those in the digital input section. If a digital input is configured to provide the starting step (bits 0-4), then its starting step value takes priority over [Pos/Spd Prof Cmd]. If a digital input is configured for any of bits 8-12, the corresponding functions will respond to the digital input status or the status of [Pos/Spd Prof Cmd].</p>	
		<p>Bit # <span style="float: right;">(1) Firmware 6.002 and later.</span></p> <p>Factory Default Bit Values <span style="float: right;">1 = Enabled 0 = Disabled x = Reserved</span></p>	



### Fast Stop Enhancement

Added the option to set the mechanical brake (Digital Output 1 for torque prove applications) and Ramp to Zero Speed at the same time during a Fast Stop. Added configuration bit 8, “Fast Stop Bk” to [TorqProve Cnfg], parameter 600. When “8, Fast Stop Bk” is set to “1” and Fast Stop is initiated (either from [Digital Inx Sel] = “38, Fast Stop” or [601 TorqProve Setup] = “0, Fast Stop” the mechanical brake is set immediately instead of waiting for the drive to reach zero speed.

The affect of this function will be more apparent in sensorless vector (SVC) mode (no encoder). In SVC the brake is set when the actual frequency reaches the float tolerance, thus there may be some benefit to setting the brake immediately when fast stop is initiated. In flux vector mode (FVC) the drive ramps down to float tolerance at a 0.1 ramp rate and sets the brake, so enabling this configuration effectively means the brake is set 100 ms sooner than it is in v4.x.

### Brake Slip Detection when Drive is Stopped

Added configuration bit 6, “StoppedBkSlp” to [600 TorqProve Cnfg] to enable brake slip detection while drive is powered but not enabled (stopped). If a brake slip condition is detected, the drive would be enabled and would begin the brake slip routine. This option is only available with encoder operation.

**Important:** After power-up an initial move has to be made to arm this function.



**ATTENTION:** To guard against personal injury and/or equipment damage, note the following condition:

When torque proving is enabled and Brake Slip Detection is enabled when the drive is stopped (“StoppedBkSlp” bit 6 is set to a value of “1”), the drive will turn on and execute the brake slip routine if a brake slip condition is detected. This will cause the connected load to be in motion.

If this condition is considered unacceptable by the user Do Not Enable the “Brake Slip Detection While Drive is Stopped” function.

### Test Brake at Start Before Opening

Added configuration bit 7, “Brake Test” to [600 TorqProve Cnfg]. Also added parameter 613 [Brake Test Torq] to enable a brake test at start. When “7, Brake Test” is set/toggled, the drive will output torque at the level specified by [Brake Test Torq] with the brake closed to verify no movement is present. For completeness, this test may need to be done in both directions. If motion is detected, initiate the Brake Slip Alarm procedure.

	613	v6 [Brake Test Torq]	Default: 50.0%	<a href="#">600</a>
		Sets test torque to use when [Brake Test] is enabled in [TorqProv Cnfg].	Min/Max: 0.0/150.0% Units: 0.1%	

### Response Options to Brake Test Results

Allows the user to select the action resulting from a brake malfunction. This would be determined at the end of a lifting operation (existing feature), while drive is stopped (new feature), or during test at start (new feature). The user selectable actions would be:

- Lower the load using brake slip procedure (existing function)
- Operator override (existing function)
- Brake slip procedure performed at [101 Preset Speed 1] (new function) and selected by [600 TorqProv Cnfg] “9, BkSlp SpdLmt.”

### Digital Output Selection Added for TrqPrv Brake

In firmware version 4.xxx, when Torque Proving is enabled, the drive automatically assigns the “Digital Out 1” relay for electromechanical brake control.

In version 6.xxx, while Torque Proving is enabled, [380 Digital Out1 Sel] is set to “60, TrqPrv Brake.” This is similar to removing the Hardware Enable jumper ([366 Digital In6 Sel] is set to “1, Enable.”

**Important:** To maintain strict functional compatibility: [382 Dig Out1 OnTime], [383 Dig Out1 OffTime], and [392 Digital Out Invert] have no effect on Digital Out 1 with torque proving enabled, but OnTime, OffTime and Invert do affect Digital Out 2 and 3 (Digital Out 1 has access to both N.O. and N.C. contacts, Digital Out 2 is N.C. only and Digital Out 3 is N.O. only).

**Important:** Both [612 TorqProv Status] “4, Brake Set” and [217 Dig Out Status] “0, Digital Out1” indicate brake status (through with opposite logic).

With Torque Proving enabled, [380 Digital Out1 Sel] is set to “60, TrqPrv Brake” but [381 Digital Out2 Sel] and [382 Digital Out3 Sel] may be set to “60, TrqPrv Brake” by the user.

### Assisted Start Up for Encoderless Operation

The HIM Start-Up routines were enhanced for setting up the Torque Prove function when using encoderless control.

### Brake Slipping Alarm

This alarm is annunciated while the brake slip procedure is in progress.

## Digital Output Selections Added

Digital Output Selections Added for Speed Feedback, Encoder Speed, At Zero Speed

Added “61, Speed Fdbk” to [Digital Outx Sel], parameters 380, 384, 388. Speed feedback is compared against [Dig Outx Level], parameters 381, 385 and 389 to set the relay state.

**Important:** When [80 Feedback Select] = “3, Encoder” speed feedback is the encoder.

INPUTS & OUTPUTS Digital Outputs	380	[Digital Out1 Sel] <sup>(4)</sup>	Default: 1	“Fault”	<a href="#">381</a>
	384	[Digital Out2 Sel]	4	“Run”	<a href="#">385</a>
	388	[Digital Out3 Sel]	4	“Run”	<a href="#">389</a>
		Selects the drive status that will energize a (CRx) output relay.	Options: 1	“Fault” <sup>(1)</sup>	<a href="#">382</a>
		(1) Any relay programmed as Fault or Alarm will energize (pick up) when power is applied to drive and deenergize (drop out) when a fault or alarm exists. Relays selected for other functions will energize only when that condition exists and will deenergize when condition is removed. Refer to pages 19.	2	“Alarm” <sup>(1)</sup>	<a href="#">386</a>
		(2) Refer to Option Definitions.	3	“Ready”	<a href="#">390</a>
		(3) Activation level is defined in [Dig Outx Level] below.	4	“Run”	<a href="#">383</a>
		(4) When [TorqProve Cnfg] is set to “Enable,” [Digital Out1 Sel] becomes the brake control and any other selection will be ignored.	5	“Forward Run”	
		(5) Firmware 6.002 & Later.	6	“Reverse Run”	
			7	“Auto Restart”	
			8	“Powerup Run”	
			9	“At Speed” <sup>(2)</sup>	
			10	“At Freq” <sup>(3)</sup>	<a href="#">002</a>
			11	“At Current” <sup>(3)</sup>	<a href="#">001</a>
			12	“At Torque” <sup>(3)</sup>	<a href="#">003</a>
			13	“At Temp” <sup>(3)</sup>	<a href="#">004</a>
			14	“At Bus Volts” <sup>(3)</sup>	<a href="#">218</a>
			15	“At PI Error” <sup>(3)</sup>	<a href="#">012</a>
			16	“DC Braking”	<a href="#">137</a>
			17	“Curr Limit”	<a href="#">157</a>
			18	“Economize”	<a href="#">147</a>
		19	“Motor Overld”	<a href="#">053</a>	
		20	“Power Loss”	<a href="#">048</a>	
		21-26	“Input 1-6 Link”	<a href="#">184</a>	
		27	“PI Enable”		
		28	“PI Hold”		
		29	“Drive Overload”		
		30	“Param Cntl” <sup>(2)</sup>		
		31	“Mask 1 AND”	<a href="#">379</a>	
		32	“Mask 1 OR”		
		33	“Prof At Pos”		
		34	“Prof Enabled”		
		35	“Prof Running”		
		36	“Prof Holding”		
		37	“Prof At Home”		
		38	“ProfComplete”		
		39	“Prof Homing”		
		40	“Prof Dwell”		
		41	“Prof Batch”		
		42-57	“Prof @ Step1-16”	<a href="#">222</a>	
		58	“Manual Mode” <sup>(5)</sup>	<a href="#">222</a>	
		59	“Fast Braking” <sup>(5)</sup>	<a href="#">600</a>	
		60	“TrqPrv Brake” <sup>(5)</sup>		
		61	“Speed Fdbk” <sup>(5)</sup>		

### Digital Input Selections Added

Digital Input Selections for Preset Voltage Added

[53 Motor Cntl Sel] = “5, Adj Voltage” allows frequency and voltage to be controlled independently.

In firmware version 4.xxx a speed (frequency) reference can be selected via digital inputs, but the voltage reference cannot.

In v6.xxx the following selections were added to [Digital Inx Sel], parameters 361-366.

“60, AdjV Sel 1,” “61, AdjV Sel 2” and/or “62, AdjV Sel 3” allow selection of a voltage reference

“63, AdvV/Hz Sel1,” “64, AdvV/Hz Sel2” and/or “65, AdvV/Hz Sel3” allow selection of both speed (frequency) and voltage references from minimum number of digital inputs.

**Important:** Mixing selections from “63-65, AdvV/Hz Sel1-3” with “60-62, AdjV Sel 1-3” or with “15-17, Speed Sel 1 3” causes a type 2 alarm.

INPUTS & OUTPUTS Digital Inputs	(10) A dedicated hardware enable input is available via a jumper selection. Refer to <a href="#">page 21</a> for further information.			58-59	“Reserved”
	(11) Only available when “Torque Proving” function is selected.			60-62	“AdjV Sel 1-3” <sup>(14,15)</sup>
	(12) Refer to Option Definitions.			63-65	“AdvV/Hz Sel1-3” <sup>(14,16)</sup>
	(13) Refer to [Dyn UsrSet Sel] for selection information.			66	“Abort Step” <sup>(14)</sup>
	(14) Firmware v6.002 and later.			67	“Abort Prof” <sup>(14)</sup>
	(15) Adjust Voltage Select Inputs				
	3	2	1	AdjV Sel	
	0	0	0	Adj Volt Sel	
	0	0	1	Adj Volt Preset1	
	0	1	0	Adj Volt Preset2	
0	1	1	Adj Volt Preset3		
1	0	0	Adj Volt Preset4		
1	0	1	Adj Volt Preset5		
1	1	0	Adj Volt Preset6		
1	1	1	Adj Volt Preset7		
(16)					
3	2	1	AdjV Sel		
0	0	0	Adj Volt Sel & Speed ref A Sel		
0	0	1	Adj Volt Preset1 & Speed Ref B Sel		
0	1	0	Adj Volt Preset2 \$ Speed Preset 2		
0	1	1	Adj Volt Preset3 \$ Speed Preset 3		
1	0	0	Adj Volt Preset4 \$ Speed Preset 4		
1	0	1	Adj Volt Preset5 \$ Speed Preset 5		
1	1	0	Adj Volt Preset6 \$ Speed Preset 6		
1	1	1	Adj Volt Preset7 \$ Speed Preset 7		
Mixing selections 63-65 with 60-62 or 15-17 will cause a type 2 alarm.					

### “Manual Mode” and “Fast Braking” Status

Digital output selections and status bits have been added to indicate that a device has “Manual” control of the speed reference and/or that a “Fast Braking” stop is in progress.

Added “58, Manual Mode” and “59, Fast Braking” to [Digital Outx Sel], parameters 380, 384, 388.

Added [Drive Status 3] and [Status 3 @ Fault], parameters 222 and 223.

Refer to “Reference Control” and “Auto/Manual Examples” in the User Manual for an explanation of “Manual” control.

UTILITY	Diagnostics	222	<b>v6 [Drive Status 3]</b>	Read Only	
		Indicates if a device has manual control of the speed reference or if a “Fast Brake” is in progress.			
		<p>Bit #</p> <p>Option Descriptions</p> <p>Manual Mode Refer to “Manual” Speed Sources in Chapter 1 of the User Manual.</p> <p>Fast Braking Fast braking active, see [Stop/Brk Mode A].</p>			<p>1 = Condition True</p> <p>0 = Condition False</p> <p>x = Reserved</p>
		223	<b>v6 [Status 3 @ Fault]</b>	Read Only	<a href="#">222</a>
		Captures and displays [Drive Status 3] bit pattern at the time of the last fault.			
		<p>Bit #</p>			<p>1 = Condition True</p> <p>0 = Condition False</p> <p>x = Reserved</p>

### Motor Overload Memory

When bit 0 of [Motor OL Mode], parameter 50 is set to “1,” the value of [Motor OL Count], parameter 220 is maintained through a power cycle or drive reset. This is an enhanced version of the v4.002 Motor Overload Memory function.

In v4.002, the ability to preserve the value of [Motor OL Count], parameter 220 through a power cycle was added and enabled through testpoint (#629).

If [234 Testpoint 1 Sel] = 629, then [235 Testpoint 1 Data] = the value of [220 Motor OL Count] *or*

If [236 Testpoint 2 Sel] = 629 then [237 Testpoint 2 Data] = the value of [220 Motor OL Count].

In earlier software versions the value of [Motor OL Count] was NOT maintained through a drive reset. That enhancement is now offered. The testpoint method will still work, but the preferred method is to set [Motor OL Mode], parameter 50.

MOTOR CONTROL	Motor Data	050	<b>v6 [Motor OL Mode]</b>
		<p>Provides the ability to preserve the [Motor OL Count] value through a power cycle or drive reset.</p> <p style="text-align: right;">1=Enabled 0=Disabled x=Reserved</p>	
		<p>Factory Default Bit Values</p> <p>Option Descriptions</p> <p><b>Pwr Cyc Ret</b> If bit 0 is set to "0" (Disabled) the value of [Motor OL Count], parameter 220 is reset to zero by a drive reset or power cycle. A "1" (Enabled) will maintain the value. A transition from "1" to "0" resets [Motor OL Count] to zero.</p>	

### **New Power Loss Mode**

A new mode "5, Decel 2 Stop" has been added to [184 Power Loss Mode].

- If [DC Bus Voltage] drops to = ([DC Bus Memory] - 120), set [Drive Alarm 1], "Power Loss" = "1" and [Last Stop Source] = "Pwr Removed".
- The logic sequencing treats this similar to a "Ramp To Stop" except it forces the ramp to use [Decel Time 2] with no s-curve to set the ramp and any [DC Brake Time] is ignored.
- [Decel Time 2] must be set short enough to keep the drive regenerating power from the load for the duration of the stop.
- If [DC Bus Voltage] drops to or is equal to ([DC Bus Memory] - 180), the drive switches to a coast stop and the precharge relay opens.
- If [Bus Reg Mode] is set to "Adjust Freq" the actual decel time may be increased to limit [DC Bus Voltage].
- If [Fault Config 1], "Power Loss" is set (NOT the default), the drive will fault after [Power Loss Time].
- [Drive Alarm 1], "Power Loss" is cleared once the drive is stopped AND [DC Bus Voltage] = ([DC Bus Memory] - 60). The drive can then accept a re-start command.
- If [Power Loss Level] is active, it sets the [DC Bus Voltage] setpoints.

For [Power Loss Mode] 0-4, if power is restored before loss of control board power and run is maintained, the response to restored power is to do a flying start and return to the commanded speed.

This new [Power Loss Mode] is intended for cases where a power loss causes a process disruption and the desired drive response is to stop as quickly as possible and not to restart until commanded (and power is restored).

[Decel Time 2] is automatically selected to allow for cases where the normal operation decel is not fast enough to keep the drive regenerating power all the way to zero speed. If [Decel Time 2] is not short enough to keep the bus up, the drive switches to a coast stop.

**Important:** This is essentially a ramp to stop, while active it over-rides [155 Stop/Brk Mode A].

### Additional Alarms and Configuration Bits

Diagnostic parameters have been added:

[D38 Junction Temp] IGBT junction temperature in deg C.

[D39 Gnd Warn Level] is the measured ground current compared against the setpoint [177 Gnd Warn Level] for the ground warning test.

[D40 In Phase LossLvl] is the measured bus voltage ripple compared against the setpoint [545 In Phase LossLvl] for the input phase loss test.

### Speed Error Filter Bandwidth Parameter

A separate adjustment for the speed error filter bandwidth was added ([448 SPd Err Filt BW] to aid in configuring high inertia systems. The filter is disabled when set to “0.”

<b>SPEED COMMAND</b>	<b>Speed Regulator</b>	448	<b>v6</b>	<b>[Spd Err Filt BW]</b>	Default: 200.0 R/s	<a href="#">053</a>
	<b>FV</b>	Sets the bandwidth of a speed error filter used in FVC Vector mode. Setting 0.0 disables the filter.			Min/Max: 0.0/2000.0 R/s Units: 0.1 R/s	

### DigIn DataLogic Parameter

Added parameter 411 [DigIn DataLogic], which is enabled with bit 9 “DigInDatLog” of [Compensation], parameter 56. Bits 8-13 added to parameter 216 [Dig In Status].

<b>MOTOR CONTROL</b>	<b>Torq Attributes</b>	056	<b>[Compensation]</b>
		Enables/disables correction options.	
<p>Bit #</p> <p>Factory Default Bit Values</p> <p>(1) For current limit (except FVC Vector mode). (2) Firmware 6.002 and later.</p> <p>1 = Enabled 0 = Disabled x = Reserved</p>			
<b>Option Descriptions</b>			
Reflect Wave		Disables reflected wave overvoltage protection for long cable lengths. (typically enabled).	
Enable Jerk		In non-FVC Vector modes, disabling jerk removes a short S-curve at the start of the accel/decel ramp.	
Ixo AutoCalc		Not functional – reserved for future enhancements.	
Xsistor Diag		“0” disables power transistor power diagnostic tests which run at each start command. “1” enables transistor diagnostic tests.	
Rs Adapt		FVC w/Encoder Only - Disabling may improve torque regulation at lower speeds (typically not needed).	
Mtr Lead Rev		Reverses the phase rotation of the applied voltage, effectively reversing the motor leads. Note: This bit is reset to “0” when parameters are reset to factory defaults.	
PWM Freq Lock		Keeps the PWM frequency from decreasing to 2 kHz at low operating frequencies in FVC Vector mode without encoder.	
DigIn DatLog		Enable [DigIn DataLogic], parameter 411.	
NoSyncPWM		Disables synchronous PWM.	

INPUTS & OUTPUTS	Digital Inputs	411	<p><b>v6 [DigIn DataLogic]</b></p> <p>Provides data to the logical operations that will be done with the digital inputs when parameter 056 is set to option 9, "DigIn DatLog".</p> <p style="text-align: right;">1 = Input Present 0 = Input Not Present x = Reserved</p> <p style="text-align: center;">(1) Firmware 6.002 and later.</p>	056

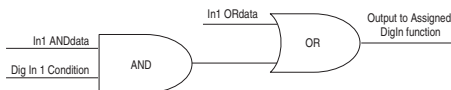
UTILITY	Diagnostics	216	<p><b>[Dig In Status]</b> <span style="float: right;">Read Only</span></p> <p>Status of the digital inputs.</p> <p style="text-align: right;">1 = Input Present 0 = Input Not Present x = Reserved</p>	<p>361 thru 366 411</p>

### Digital Input Data Logic

Digital Input Data Logic performs logical operations on the condition of digital inputs with that of data contained in a parameter. The output of the logical operation performs the function (start, stop, preset speed, etc.) that is “assigned” to the digital input. An example of an appropriate application for this function is the temporary override of a conveyor sensor that is wired directly to a digital input. In such a case, a controller could write the data to the drive over a network to start a drive, and then reset the data after the conveyor load clears the sensor, thus allowing the sensor to stop the next load.

When this feature is enabled through bit 9, “DigIn DatLog” of [Compensation], parameter 56, the operation is performed. If the feature is disabled, the functions assigned to the digital inputs will operate directly, regardless of the data in the “Digital Input Data Logic” parameter.

The following diagram shows the logical operation. The condition of each digital input is “ANDed” with the “ANDdata” from [DigIn DataLogic], parameter 411, then “ORed” with the “ORdata” from [DigIn DataLogic]. The result is fed to the assigned digital input function.



The logical result (output) for each string of operations for a digital input can be viewed in the upper half of parameter 216 [Dig In Status].

When the feature is enabled, and the Input 6 Dedicated Enable Jumper is pulled, the Data Logic function will still be performed on input 6, but will not interfere with the dedicated hardware path to the gate drive circuit.

## **High Resolution Reference**

[308 HighRes Ref] was added to allow milliHertz frequency resolution.

A new selection, “30, HighRes Ref” has been added to [90 Speed Ref A Sel] and [93 Speed Ref B Sel]. “43, HighRes Ref” has been added to [213 Speed Ref Source].

**Important:** Scale Blocks and Parameter Linking features can also be used to create high resolution references.

<b>COMMUNICATIONS</b>	Datalinks	308	<b>v6 [HighRes Ref]</b>	Default: 0	090
			Used as a high resolution, 32 bit reference with Datalinks. -/+[Maximum Freq] or -/+[Maximum Speed] = 32767 x 65536	Min/Max: -/+2147418112 Units: 1	093 126 128 213 298

## **Disable Synchronous PWM**

At high output frequencies (if [Motor Cntl Sel] is NOT set to “4, FVC Vector”) the drive switches to synchronous PWM (PWM frequency (actual, not [151 PWM Frequency]) is set to an integer multiple of the output frequency. Synchronous PWM eliminates output subharmonics that may otherwise occur.

PWM Frequency/Output Frequency = 24, 21, 18, 15, 12, 9 or 6

Synchronous PWM starts at 74, 148, 296, or 370 Hz output frequency for 2, 4, 8, and 10 kHz PWM frequencies.

Setting [56 Compensation], “10, NoSyncPWM” = 1 forces the drive to stay in asynchronous pwm.

## **Fault - F10 “Heatsink LowTemp”**

A new, maskable fault F10, “Heatsink LowTemp” is now used to annunciate a too low temperature case. This fault also appears for an open NTC (heatsink temperature sensing device) circuit.

In firmware version 4.xxx, F8 “Heatsink OvrTemp” is annunciated for a too high temperature condition as well as a too low temperature condition.

**Important:** NTCs are used to detect heatsink temperature. At a very low temperature (high resistance) it is difficult to differentiate between low temperature and an open NTC circuit.

## **Flux Down Rate Parameter Added for Frames 9 and 10**

Frames 9 and 10 use a flux down procedure that has an associated tuning parameter. [553 Flux Down Rate] was added to allow adjustment of the time to ramp from full flux to zero before initiating a DC Brake or a Fast Brake stop. This adjustment is only effective for frames 9 and 10 (600 HP, 730A and 700 HP, 875A).

### **Adjustable Dead Time Compensation**

In unusual applications (such as driving a step up transformer), a DC offset current due to the voltage added to the output by dead time compensation has prevented desired operation. The parameter [552 Dead Time Comp] has been added to allow dead time compensation to be reduced.

### **Logix Centric Automatic Device Replacement**

Changes have been added to support RSLogix 5000 v17 Premier integration features such as ADR.

Also called; Auto Device Replacement, Automatic Data Recovery or Auto Data Recovery

### **Merge PF700L 5.003 Code with the PF700**

The PowerFlex 700 Vector Control Board and firmware can be used in a PowerFlex700L liquid-cooled drive. The functionality of PowerFlex 700L v5.003 has been incorporated into the PowerFlex 700 firmware version 6.002.

**Corrected Anomalies**

This section describes the anomalies corrected in this revision.

Function	Anomaly	Correction
Parameter 539 and 540 text	Incorrect text.	Exchange text strings for parameters [539 Freq Reg Kp] and [540 Freq Reg Ki].
Parameter 299 text	Incorrect text for [299 DPI Fdbk Select].	Selection "19, Param Cnt" changed to "19, Reserved."
Flux Up Time	[Flux Up Time] was not recalculated when [Motor NP Power], [Mtr NP Pwr Units], or [Flux Current Ref] changed.	When Flux Up Mode = "Automatic," the drive will re-calculate [58 Flux Up Time] when [45 Motor NP Power], [46 Motor NP Pwr Units] or [63 Flux Current Ref] are changed.
Save data at power down	If EEPROM data is corrupted at power down, the drive resets some parameters to default and there is no indication. In some cases, [61 Autotune] is set to its default value "Calculate".	In version 6.xxx on power up, if EEPROM data is corrupt, a F112 "Power Down Csum" fault is generated.
Dynamic User Set Parameters	In version 4.xxx, parameters [204 Dyn UserSet Cnfg], [205 Dyn UserSet Sel], and [206 Dyn UserSet Actv] are not accessible from a HIM in File-Group-Parameter mode at any access level.	In version 6.xxx they are visible from a HIM in the Utility -> Drive Memory menu if [196 Param Access Lvl] = "1, Advanced."
Visibility of parameters 392-394	In version 4.xxx, parameters [392 Dig Out Invert], [393 Dig Out Param], and [394 Dig Out Mask] are not accessible from any device in File-Group-Parameter mode.	In version 6.xxx they are visible with a HIM in the Inputs & Outputs -> Digital Outputs menu if [196 Param Access Lvl] = "1, Advanced". Visible to Drive Explorer, Drive Executive, etc. at any access level.
Output Current Display	In version 4.xxx, the displayed output current is the average of 50ms worth of 2ms samples. At certain operating points, particularly with large drives, the displayed output current could be 5% high.	In version 6.xxx the displayed output current is now the average of 50ms worth of 256µs samples.
Parameter 214 text	Text description missing.	Bit 7 was implemented in v4 but the description (Fast Stop) was missing. This is fixed in v6.
Voltage Class	In v4 if [202 Voltage Class] is set to "4, Reserved" or "5, Reserved," and power is cycled, the drive immediately faults with F9 "Trnsistr OvrTemp". If that fault is cleared, the drive immediately faults with F8 "Heatsink OvrTemp".	In v6 setting [202 Voltage Class] to "4, Reserved" reset the parameter to "2, Low Voltage" and setting [202 Voltage Class] to "5, Reserved" resets it to "3, High Voltage".
PWM Frequency	Frame 5 & 6 10 Mhz maximum frequency was incorrect.	Changed frame 5 and 6 maximum value of [151 PWM Frequency] to 8 kHz.
Hardware Enable	If the Hardware Enable goes low for more than 0.5 ms but less than 6 ms, the drive (PWM) output will be disabled, but the rest of the drive will think it is still running.	With v6, a loss of enable recognized by either the PWM or I/O processor is always detected and will show up in [215 Last Stop Source] as "9, Not Enabled".
Voltage Limits	In v4.xxx Motor NP Volts is limited to rated volts.	Expand the maximum value of Motor NP Volts. With v6: The [041 Motor NP Volts] online maximum is now the drive's high voltage rating: <ul style="list-style-type: none"> <li>• 208/240 = 240.0V</li> <li>• 400/480 = 480.0V</li> <li>• 600/600 = 600.0V</li> <li>• 600/690 = 690.0V</li> </ul> With v4 software, [41 Motor NP Volts] is limited to [27 Rated Volts]. You can now enter 415V and 50Hz into a 400V drive and get the correct V/Hz ratio. Note: The [54 Maximum Voltage] online maximum is still rated volts and "VoltageLimit" software limits commanded voltage to that value or to what it calculates is the maximum possible for a given bus voltage (and [523 Bus Utilization]). Note: The online limit for [71 Break Voltage] and [64 IXo Voltage Drop] is the same as [41 Motor NP Volts]. The limit is one-half that for [62 IR Voltage Drop] and [541 Encdls Ang Comp] and one-fourth for [69 Start/Acc Boost] and [70 Run Boost]. These limits also increase in the low voltage case.
Synchronous Motor	Synchronous Motor Operation	Eliminate the small rotation at the motor shaft that could occur with permanent magnet synchronous motor applications when the drive transitions from ramp to hold or when reversing. This change is in effect when [40 Motor Type] = "1, Synchr Reluc" or "2, Synchr PM" in v6.

Function	Anomaly	Correction
Offline Default Changes	<p>For versions prior to v6, the online and offline default values for [62 IR Voltage Drop], [63 Flux Current Ref], and [542 EncdLss Vlt Comp], are based on IrVolts and FluxAmps values from the power board.</p> <p>If [61 Autotune] is "3, Calculate" (default), values for [62 IR Voltage Drop], [63 Flux Current Ref], [64 IXo Voltage Drop], and [542 EncdLss Vlt Comp] are calculated based on the Motor NP parameters and [53 Motor Cntl Sel].</p> <p>Thus a reset to defaults command writes the default values but they are immediately overwritten by Autotune Calculate and a "compare to defaults" flags them.</p>	<p>For v6, the offline and online values are set to what Autotune Calculate would calculate given default Motor NP values.</p> <p>In v6 if you open a new offline file in Drive Executive and compare it to an online drive that has been reset to shipping defaults, there will be no differences for any "editable/changeable" parameters and drive rated values in the offline file are correct (instead of zero).</p>

## Offline Default Changes

The DPI (Drive Peripheral Specification) specifies that each drive parameter has both offline and online minimum, maximum, and default values. In earlier versions of PowerFlex drives, this meant that online values dynamically change based on the current state of the drive but offline values are constants and the same for all ratings.

PowerFlex 700 drives now return offline default values, for selected parameters, that depend on the particular drive rating. That includes returning different values depending on the setting of [202 Voltage Class].

Parameter	Fixed Offline		v6 Offline Defaults	
26	Rated kW	0.00	kW	LvWatts HvWatts
27	Rated Volts	0.0	VAC	LvVolts HvVolts
28	Rated Amps	0.0	Amps	LvAmps HvAmps
41	Motor NP Volts	460.0	VAC	LvNpVolts HvNpVolts
42	Motor NP FLA	8.0	Amps	LvNpAmps HvNpAmps
43	Motor NP Hertz	60.0	Hz	LvNpHertz HvNpHertz
44	Motor NP RPM	1750	RPM	LvNpRPM HvNpRPM
45	Motor NP Power	0.00		LvNpPower HvNpPower
46	Mtr NP Pwr Units	Horsepower		LvNpUnits HvNpUnits
47	Motor OL Hertz	0.0	Hz	LvNpHertz ÷ 3 HvNpHertz ÷ 3
54	Maximum Voltage	460.0	VAC	LvNpVolts HvNpVolts
55	Maximum Freq	130.0	Hz	2 · LvNpHertz + 10 2 · HvNpHertz + 10
62	IR Voltage Drop	20.0	VAC	Autotune Calculate Autotune Calculate
63	Flux Current Ref	26.00	Amps	Autotune Calculate Autotune Calculate
69	Start/Acc Boost	5.0	VAC	LvIrVolts HvIrVolts
70	Run Boost	5.0	VAC	LvIrVolts HvIrVolts
71	Break Voltage	115.0	VAC	LvNpVolts ÷ 4 HvNpVolts ÷ 4
72	Break Frequency	15.0	Hz	LvNpHertz ÷ 4 HvNpHertz ÷ 4
82	Maximum Speed	60.0		LvNpHertz HvNpHertz
91	Speed Ref A Hi	60.0		LvNpHertz HvNpHertz
94	Speed Ref B Hi	60.0		LvNpHertz HvNpHertz
97	TB Man Ref Hi	60.0		LvNpHertz HvNpHertz
107	Preset Speed 7	60.0		LvNpHertz HvNpHertz
119	Trim Hi	60.0		LvNpHertz HvNpHertz
121	Slip RPM @ FLA	30.0	RPM	30 · LvNpHertz- LvNpRPM 30 · HvNpHertz- HvNpRPM
148	Current Lmt Val	1.2	Amps	Lv3SecAmps Hv3SecAmps
151	PWM Frequency	4	kHz	DefPwmHz DefPwmHz
158	DC Brake Level	0.0	Amps	LvAmps HvAmps
202	Voltage Class	Low Voltage		Low Voltage High Voltage
238	Fault Config 1	0x000004E		Frame 8-10 only: {8 In Phase Loss} = 1
542	EncdLss Vlt Comp	20.0	VAC	Autotune Calculate Autotune Calculate
545	In Phase LossLvl	325		Frame 8-10 only: 255
713	Find Home Speed	10.0		LvNpHertz ÷ 10 HvNpHertz ÷ 10

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