Parameter Settings for PowerFlex Drives Using Sine Wave Filters, dv/dt Filters, and Adjustable Voltage

PowerFlex 750-Series, 700, and 700VC AC Drives

About This Document

This information applies to PowerFlex 750-Series, PowerFlex 700, and PowerFlex 700VC AC Drives.

This document provides information about key parameters that can be adjusted when applying the Adjustable Voltage or V/Hz control methods through a sine wave filter at the output of a variable frequency drive (VFD).

The drive parameter settings that are described in this document modify the stability gains, modulation mode, and prevents over reaction to the charging current into the capacitor branch of a sine wave filter.
This section describes the required parameter settings for using a PowerFlex 753 or 755 drive with sine wave filters and the operation theory behind each setting.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name / Bit</th>
<th>Required Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P035</td>
<td>Motor Ctrl Mode</td>
<td>0 “InductionVHz”</td>
</tr>
<tr>
<td>P038</td>
<td>PWM Frequency</td>
<td>2 kHz or 4 kHz</td>
</tr>
<tr>
<td>P040</td>
<td>Mtr Options Cfg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 5 “Reflect Wave”</td>
<td>0 “Disabled”</td>
</tr>
<tr>
<td></td>
<td>Bit 7 “PWM Type Sel”</td>
<td>1 “Full-time three-phase”</td>
</tr>
<tr>
<td></td>
<td>Bit 8 “AsyncPWMLock”</td>
<td>1 “Enabled”</td>
</tr>
<tr>
<td></td>
<td>Bit 11 “Elect Stab”</td>
<td>0 “Disabled”</td>
</tr>
<tr>
<td></td>
<td>Bit 12 “Xsistor Diag”</td>
<td>0 “Disabled”</td>
</tr>
<tr>
<td>P043</td>
<td>Flux Up Enable</td>
<td>0 “Manual”</td>
</tr>
<tr>
<td>P044</td>
<td>Flux Up Time</td>
<td>0.000 Secs</td>
</tr>
<tr>
<td>P420</td>
<td>Drive OL Mode</td>
<td>1 “Reduce Clmt”</td>
</tr>
<tr>
<td>P1153</td>
<td>Dead Time Comp</td>
<td>Vary from 100% to 0% (755 Only)</td>
</tr>
<tr>
<td>P1154</td>
<td>DC Offset Ctrl</td>
<td>1 “Enable” (755 Only)</td>
</tr>
</tbody>
</table>

**P035 [Motor Ctrl Mode]**
The motor control mode is set to V/Hz. The sine wave filter, with its LRC (inductive, resistive, and capacitive) components between the drive and motor, the load no longer looks like an equivalent motor circuit to the drive for purposes of Flux Vector (FV) or Sensorless Vector control. Therefore, the drive is operated in a simple V/Hz mode.

**IMPORTANT** Do not autotune. An autotune function is likely to fail to complete when a V/Hz setting is applied.

**P038 [PWM Frequency]**
See the filter instructions to set the pulse width modulation (PWM) frequency. The setting is based on the drive rating.

**P040 [Mtr Options Cfg]**

*Bit 5 "Reflect Wave”*
The reflected wave bit is turned off so that there are no missing pulses in the output voltage waveform and to minimize any offsets that could appear.

*Bit 7 “PWM Type Sel”*
The PWM type select bit is set to its default value of full-time three-phase modulation with no switch over to two-phase modulation. Two-phase modulation degrades filter performance.

*Bit 8 “AsyncPWMLock”*
The asynchronous PWM lock bit is turned on because the filter is tuned to the carrier frequency. If the carrier frequency changes, the filter does not work, so the carrier frequency must be fixed. The PWM frequency is set for whatever the filter is tuned to: either 2 kHz or 4 kHz.
Bit 11 “Elect Stab”
This bit affects angle and voltage stability. When electrical stability is set to 0 “Disabled,” angle stability gain and voltage stability gain are set automatically. There is no compensation for the current going into the filter caps.

Bit 12 “Xistor Diag”
The transistor diagnostics bit is turned off because the sequence that turns the transistors on and off charges the capacitors in the filter and can cause an F12 “HW OverCurrent” fault.

P043 [Flux Up Mode]
Set P043 to 0 “Manual” to accommodate motor control because it looks less like an equivalent motor circuit to the drive.

P044 [Flux Up Time]
Flux up time is set to zero because the output load looks less like an equivalent motor circuit to the drive. Building stator flux independently before accelerating is less effective.

P420 [Drive OL Mode]
Drive overload mode is set for reduce current limit, and not the PWM frequency, for the same reason as P040 [Mtr Options Cfg] Bit 8 “AsyncPWMLock.”

P1153 [Dead Time Comp]
Dead time compensation is best set to 0% when the output of the sine wave filter is fed into a transformer.

P1154 [DC Offset Ctrl]
DC offset control is enabled when the PWM inverter output is used for non-motor loads. When enabled, P1153 [Dead Time Comp] is disabled.
This section describes the required parameter settings for using a PowerFlex 753 or 755 drive in an adjustable voltage application and the operation theory behind each setting.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name / Bit</th>
<th>Required Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P035</td>
<td>Motor Ctrl Mode</td>
<td>9 “Adj VltgMode”</td>
</tr>
<tr>
<td>P038</td>
<td>PWM Frequency</td>
<td>2 kHz or 4 kHz</td>
</tr>
<tr>
<td>P040</td>
<td>Mtr Options Cfg</td>
<td></td>
</tr>
<tr>
<td>Bit 5 “Reflect Wave”</td>
<td>0 “Disabled”</td>
<td></td>
</tr>
<tr>
<td>Bit 7 “PWM Type Sel”</td>
<td>1 “Full-time three-phase”</td>
<td></td>
</tr>
<tr>
<td>Bit 8 “AsyncPWMLock”</td>
<td>1 “Enabled”</td>
<td></td>
</tr>
<tr>
<td>Bit 11 “Elect Stab”</td>
<td>0 “Disabled”</td>
<td></td>
</tr>
<tr>
<td>Bit 12 “Xsistor Diag”</td>
<td>0 “Disabled”</td>
<td></td>
</tr>
<tr>
<td>Bit 15 “Jerk Select”</td>
<td>0 “Disabled”</td>
<td></td>
</tr>
<tr>
<td>P043</td>
<td>Flux Up Enable</td>
<td>0 “Manual”</td>
</tr>
<tr>
<td>P044</td>
<td>Flux Up Time</td>
<td>0.000 Secs</td>
</tr>
<tr>
<td>P060</td>
<td>Start Acc Boost</td>
<td>0.00</td>
</tr>
<tr>
<td>P061</td>
<td>Run Boost</td>
<td>0.00</td>
</tr>
<tr>
<td>P062</td>
<td>Break Voltage</td>
<td>0.00</td>
</tr>
<tr>
<td>P420</td>
<td>Drive OL Mode</td>
<td>1 “Reduce CLmt”</td>
</tr>
</tbody>
</table>

**Basic Adjustable Voltage Control Parameters**

| P1131 | Adj Vltg Config | Bit 0 “PhaseSetting” 0 “3-Phase” or 1 “1-Phase” |
| P1133 | Adj Vltg Select | Preset 1 (1142) |
| P1134 | Adj Vltg Ref Hi | 100.0% |
| P1140 | Adj Vltg Acc Time | Required number of Secs |
| P1141 | Adj Vltg Dec Time | Required number of Secs |
| P1142 | Adj Vltg Preset1 | Required VAC |
| P1153 | Dead Time Comp | Vary from 100% to 0% (755 Only) |
| P1154 | DC Offset Ctrl | 1 “Enable” (755 Only) |

**P035 [Motor Ctrl Mode]**
The adjustable voltage control mode is typically a non-motor load control function. This mode provides an independent output voltage with an independent output frequency.

**IMPORTANT** Do not autotune. An autotune function is likely to fail to complete when the Adjustable Voltage mode is applied.

**P038 [PWM Frequency]**
See the filter instructions to set the PWM frequency. The setting is based on the drive rating.

**P040 [Mtr Options Cfg]**
**Bit 5 “Reflect Wave”**
The reflected wave bit is turned off so that there are no missing pulses in the output voltage waveform and to minimize any offsets that could appear.
Bit 7 “PWM Type Sel”
The PWM type select bit is set to its default value of full-time three-phase modulation with no switch over to two-phase modulation. Two-phase modulation degrades filter performance.

Bit 8 “AsyncPWMLock”
The asynchronous PWM lock bit is turned on because the filter is tuned to the carrier frequency. If the carrier frequency changes, the filter does not work, so the carrier frequency must be fixed. The PWM frequency is set for whatever the filter is tuned to: either 2 kHz or 4 kHz.

Bit 11 “Elect Stab”
This bit affects angle and voltage stability. When electrical stability is set to 0 “Disabled,” angle stability gain and voltage stability gain are set automatically. There is no compensation for the current going into the filter caps.

Bit 12 “Xistor Diag”
The transistor diagnostics bit is turned off because the sequence that turns the transistors on and off charges the capacitors in the filter and can cause an F12 “HW OverCurrent” fault.

Bit 15 “Jerk Select”
Used when PowerFlex 753/755 sine wave filters are used with linear induction motors (LIMs) with a short acceleration rate. Disable this bit to allow acceleration rates of 0.1 Secs in the frequency channel to be smooth and not be limited at some lower frequency value.

P043 [Flux Up Mode]
Set P043 to 0 “Manual” to accommodate motor control because it looks less like an equivalent motor circuit to the drive.

P044 [Flux Up Time]
Flux up time is set to zero because the output load looks less like an equivalent motor circuit to the drive. Building stator flux independently before accelerating is less effective.

P060 [Start Acc Boost]
P061 [Run Boost]
P062 [Break Voltage]
P063 [Break Frequency]
These parameters can cause DC offsets in Adjustable Voltage mode.

P420 [Drive OL Mode]
Drive overload mode is set for reduce current limit, and not the PWM frequency, for the same reason as P040 [Mtr Options Cfg] Bit 8 “AsyncPWMLock.”
P1131 [Adj Vltg Config]
P1133 [Adj Vltg Select]
P1134 [Adj Vltg Ref Hi]
P1140 [Adj Vltg AccTime]
P1141 [Adj Vltg DecTime]
P1142 [Adj Vltg Preset1]
These essential parameters are configured when P035 [Motor Ctrl Mode] is set to 9 “Adj VltgMode.”

P1153 [Dead Time Comp]
Dead time compensation is best set to 0% when the output of the sine wave filter is fed into a transformer.

P1154 [DC Offset Ctrl]
DC offset control is enabled when the PWM inverter output is used for non-motor loads. When enabled, P1153 [Dead Time Comp] is disabled.
PowerFlex 753/755 Parameter Settings for Use with LRC dv/dt Filters

This section describes the required parameter settings for using a PowerFlex 753 or 755 drive with LRC dv/dt filters and the operation theory behind each setting.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name / Bit</th>
<th>Required Setting</th>
</tr>
</thead>
</table>
| P035 | Motor Ctrl Mode | 0 “Induction VHz”  
1 “Induction SV” or  
3 “Induction FV” |
| P038 | PWM Frequency | 2 kHz or 4 kHz |
| P040 | Mtr Options Cfg |  
Bit 5 “Reflect Wave” 0 “Disabled”  
Bit 7 “PWM Type Sel” 1 “Full-time three-phase”  
Bit 8 “AsyncPWMLock” 1 “Enabled”  
Bit 11 “Elect Stab” 0 “Disabled”  
Bit 12 “Xsistor Diag” 0 “Disabled” |
| P043 | Flux Up Enable | 0 “Manual” |
| P044 | Flux Up Time | 0.000 Sacs |
| P420 | Drive OL Mode | 1 “Reduce CLmt” |

Excessive motor lead lengths generally create an impedance mismatch with the motor impedance. This mismatch can damage high voltage at the motor terminals due to the reflective wave phenomenon. When mitigation calls for a dv/dt filter to be installed between the drive and the motor, the parameter changes listed here are not needed. A dv/dt filter typically consists of LR (inductive and resistive) components and no capacitive components.

The exception is when dv/dt filter topologies include capacitance, the lower spectrum of current capacity rated drives are prone to nuisance F12 “HW Over Current” faults. If frequent IOC faults occur, the parameter changes listed here are recommended.

Likewise, dv/dt topologies that include rectification and connections to the drive DC bus are prone to IOC faults and damage to the drive due to voltage ring up.

**IMPORTANT** Perform the autotune routine with caution. If FVC Autotune fails, the combination of the LR dv/dt or LRC dv/dt filter, long lead lengths, and the motor have distorted the “equivalent motor electrical circuit” characteristics. FVC torque control and performance can become dangerously ineffective and should not be used.

**P035 [Motor Ctrl Mode]**

P035 can be operated in V/Hz, SVC, or FVC control mode. An Autotune routine can be performed as normally needed and intended. However, be cautious because with the additional LRC (inductive, resistive, and capacitive components) capacitance, the load does not effectively represent an equivalent motor circuit to the drive for purposes of higher performance current control that is expected of Sensorless Vector (SV) and Flux Vector (FV) control in demanding applications. The more capacitance the more it affects current feedback and current regulator control. The Autotune function can also fail to complete with an LRC type dv/dt.
P038 [PWM Frequency]
See the filter instructions to set the PWM frequency. The setting is based on the drive rating.

P040 [Mtr Options Cfg]
Bit 5 “Reflect Wave”
The reflected wave bit is turned off so that there are no missing pulses in the output voltage waveform and to minimize any offsets that could appear.

Bit 7 “PWM Type Sel”
The PWM type select bit is set to its default value of full-time three-phase modulation with no switch over to two-phase modulation. Two-phase modulation degrades filter performance.

Bit 8 “AsyncPWMLock”
The asynchronous PWM lock bit is turned on because the filter is tuned to the carrier frequency. If the carrier frequency changes, the filter does not work, so the carrier frequency must be fixed. The PWM frequency is set for whatever the filter is tuned to: either 2 kHz or 4 kHz.

Bit 11 “Elect Stab”
This bit affects angle and voltage stability. When electrical stability is set to 0 “Disabled,” angle stability gain and voltage stability gain are set automatically. There is no compensation for the current going into the filter caps.

Bit 12 “Xsistor Diag”
The transistor diagnostics bit is turned off because the sequence that turns the transistors on and off charges the capacitors in the filter and can cause an F12 “HW OverCurrent” fault.

P043 [Flux Up Enable]
Set P043 to 0 “Manual,” to accommodate motor control because it looks less like an equivalent motor circuit to the drive.

P044 [Flux Up Time]
Flux up time is set to zero because the output load looks less like an equivalent motor circuit to the drive. Building stator flux independently before accelerating is less effective.

P420 [Drive OL Mode]
Drive overload mode is set for reduce current limit, and not the PWM frequency, for the same reason as P040 [Mtr Options Cfg] Bit 8 “AsyncPWMLock.”
This section describes the required parameter settings for using a PowerFlex 700 drive with sine wave filters and the operation theory behind each setting.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name / Bit</th>
<th>Required Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P053</td>
<td>Motor Cntl Sel</td>
<td>2 “Custom V/Hz”</td>
</tr>
<tr>
<td>P056</td>
<td>Compensation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bit 0 “Reflect Wave”</td>
<td>0 “Disabled”</td>
</tr>
<tr>
<td></td>
<td>Bit 3 “Xistor Diag”</td>
<td>0 “Disabled”</td>
</tr>
<tr>
<td></td>
<td>Bit 7 “PWM FreqLock”</td>
<td>1 “Enabled”</td>
</tr>
<tr>
<td>P057</td>
<td>Flux Up Mode</td>
<td>0 “Manual”</td>
</tr>
<tr>
<td>P058</td>
<td>Flux Up Time</td>
<td>0.000 Secs</td>
</tr>
<tr>
<td>P150</td>
<td>Drive OL Mode</td>
<td>1 “Reduce CLim”</td>
</tr>
<tr>
<td>P151</td>
<td>PWM Frequency</td>
<td>2 kHz or 4 kHz</td>
</tr>
<tr>
<td>P069</td>
<td>Start/Acc Boost</td>
<td>Start with low values and increase until effective.</td>
</tr>
<tr>
<td>P070</td>
<td>Run Boost</td>
<td>Per motor</td>
</tr>
<tr>
<td>P071</td>
<td>Break Voltage</td>
<td>Per need</td>
</tr>
<tr>
<td>P072</td>
<td>Break Frequency</td>
<td>Per need</td>
</tr>
</tbody>
</table>

**Reserved Parameters**

These parameters can only be viewed when P196 [Param Access Lvl] is set to 2 “Reserved.”

- P506 Angle Stability Gain 0
- P507 Volt Stability Gain 10
- P524 Modulation Mode 1 “Space Vector” only
- P552 Dead Time Comp 0%

**P053 [Motor Cntl Sel]**

The motor control select is set to V/Hz. The sine wave filter, with its LRC (inductive, resistive, and capacitive) components between the drive and motor, the load no longer looks like an equivalent motor circuit to the drive for purposes of Flux Vector (FV) or Sensorless Vector control. Therefore, the drive is operated in a simple V/Hz mode.

**IMPORTANT** Do not autotune. An autotune function is likely to fail to complete when a V/Hz setting is applied.

**P056 [Compensation]**

*Bit 0 “Reflect Wave”*

The reflected wave bit is turned off so that there are no missing pulses in the output voltage waveform and to minimize any offsets that could appear.

*Bit 3 “Xistor Diag”*

The transistor diagnostics bit is turned off because the sequence that turns the transistors on and off charges the capacitors in the filter and can cause an F12 “HW OverCurrent” fault.

*Bit 7 “PWM FreqLock”*

The PWM frequency lock bit is turned on because the filter is tuned to the carrier frequency. If the carrier frequency changes, the filter does not work, so the carrier frequency must be fixed. The PWM frequency is set for whatever the filter is tuned to: either 2 kHz or 4 kHz.
P057 [Flux Up Mode]
Set P057 to 0 “Manual” to accommodate motor control because it looks less like an equivalent motor circuit to the drive.

P058 [Flux Up Time]
Flux up time is set to zero because the output load looks less like an equivalent motor circuit to the drive. Building stator flux independently before accelerating is less effective.

P150 [Drive OL Mode]
Drive overload mode is set for reduce current limit, and not the PWM frequency, for the same reason as P056 [Compensation] Bit 7 “PWM FreqLock.”

P151 [PWM Frequency]
See the filter instructions to set the PWM frequency. The setting is based on the drive rating.

P069 [Start/Acc Boost]
P070 [Run Boost]
P071 [Break Voltage]
P072 [Break Frequency]
These parameters can cause DC offsets in Adjustable Voltage mode.

P506 [Angle Stability Gain]
Angle stability gain is set to 0 so it does not try to compensate for the current going into the filter capacitors.

P507 [Volt Stability Gain]
Voltage stability gain is set to 10 for the same reason as angle stability gain.

P524 [PWM Type Sel]
PWM type select is set to 1 “Space Vector only,” because two-phase modulation degrades filter performance.

Avoid transformer saturation potential by minimizing long acceleration ramp times from start to approximately 5 Hz command speed. Program the drive to skip to 3 or up to 5 Hz at the fastest (0.1 sec) acceleration rate. Then switch to the desired acceleration ramp rate the remainder increase to desired speed command.

P552 [Dead Time Comp]
Dead time compensation is best set to 0% when output of the sine wave filter is fed into a transformer.

Parameters 506, 507, 524, and 552 are only active in Sensorless Vector and Custom V/Hz modes of operation, therefore these parameters require modification when in Sensorless Vector control mode.
Find Reserved Engineering Parameters

For the drive current regulator to tolerate the surge of current into the capacitors of the sine wave filter branch circuit, it is necessary to modify some parameters that affect the vector algorithm and sensitivity of the current regulator.

Some of the drive parameters necessary to access and change from default values are “Reserved” from view, because they are rarely changed or are preferred not to be changed. In rare cases, such as for use with a sine wave filter, access to some of the “Reserved” parameters is necessary. Access can only be gained via the HIM and software tools such as DriveExecutive (shown here) or DriveExplorer or CCW Connected Components Workshop through the drive DPI ports or Ethernet. The “Reserved” parameters are part of the “500” group of parameters under the first menu folder.

**IMPORTANT** All other “Reserved” parameters must not be altered.

To access the reserved engineering parameters via the drive HIM, set parameter 196 [Param Access Lvl] to 2 “Reserved.”
## Linear Parameter List

<table>
<thead>
<tr>
<th>File Group</th>
<th>No.</th>
<th>Parameter Name and Description</th>
<th>Values</th>
<th>PF 70</th>
<th>PF 700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diag-Motor Ctrl</td>
<td>506</td>
<td>[Angl Stbly Gain] Angle Stability Gain adjusts the electrical angle to maintain stable motor operation. An increase in the value increases the angle adjustment.</td>
<td>Default: 51 Min/Max: 0/32767 Units: 1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Diag-Motor Ctrl</td>
<td>507</td>
<td>[Volt Stbly Gain] Adjusts the output voltage to maintain stable motor operation. An increase in the value increases the output voltage adjustment.</td>
<td>Default: 93 Min/Max: 0/32767 Units: 1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Diag-DACs</td>
<td>524</td>
<td>[PWM Type Sel] Allows selection of the active PWM type. A value of 0 is default, and results in a change of PWM method at approximately 2/3 of rated motor frequency. If unacceptable for harmonic or audible reasons, a value of 1 disables the change.</td>
<td>Default: 0 Min/Max: 0/1 Units: 1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Diag-Vector Ctrl</td>
<td>552</td>
<td>[Dead Time Comp] Voltage compensation for off time between PWM switching events.</td>
<td>Default: 75 Min/Max: 50/100 Units: %</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
PowerFlex 700VC Parameter Settings for Use with Adjustable Voltage Application with a Sine Wave Filter

This section describes the required parameter settings for using a PowerFlex 700VC drive in an adjustable voltage application with a sine wave filter and the operation theory behind each setting. Many but not all adjustable voltage applications require a sine wave filter.

### No. Name / Bit Required Setting

<table>
<thead>
<tr>
<th>No.</th>
<th>Name / Bit</th>
<th>Required Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P196</td>
<td>Param Access Lvl</td>
<td>2 “Reserved”</td>
</tr>
<tr>
<td>P053</td>
<td>Motor Cntl Sel</td>
<td>5 “Adj Voltage”</td>
</tr>
<tr>
<td>P056</td>
<td>Compensation</td>
<td></td>
</tr>
<tr>
<td>Bit 0 “Reflect Wave”</td>
<td>0 “Disabled”</td>
<td></td>
</tr>
<tr>
<td>Bit 3 “Xistor Diag”</td>
<td>0 “Disabled”</td>
<td></td>
</tr>
<tr>
<td>Bit 7 “PWM FreqLock”</td>
<td>1 “Enabled”</td>
<td></td>
</tr>
<tr>
<td>P057</td>
<td>Flux Up Mode</td>
<td>0 “Manual”</td>
</tr>
<tr>
<td>P058</td>
<td>Flux Up Time</td>
<td>0.000 Secs</td>
</tr>
</tbody>
</table>

Set the next group of parameters when P053 [Motor Cntl Sel] = 5 “Adj Voltage”

<table>
<thead>
<tr>
<th>No.</th>
<th>Name / Bit</th>
<th>Required Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P069</td>
<td>Start/Acc Boost</td>
<td>0</td>
</tr>
<tr>
<td>P070</td>
<td>Run Boost</td>
<td>0</td>
</tr>
<tr>
<td>P071</td>
<td>Break Voltage</td>
<td>0</td>
</tr>
<tr>
<td>P072</td>
<td>Break Frequency</td>
<td>0</td>
</tr>
<tr>
<td>P150</td>
<td>Drive OL Mode</td>
<td>1 “Reduce CLim”</td>
</tr>
<tr>
<td>P151</td>
<td>PWM Frequency</td>
<td>2 kHz or 4 kHz</td>
</tr>
</tbody>
</table>

### Reserved Parameters

These parameters can only be viewed when P196 [Param Access Lvl] is set to 2 “Reserved.”

<table>
<thead>
<tr>
<th>No.</th>
<th>Name / Bit</th>
<th>Required Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P066</td>
<td>Angl Stbility Gain</td>
<td>0</td>
</tr>
<tr>
<td>P067</td>
<td>Volt Stbility Gain</td>
<td>10</td>
</tr>
<tr>
<td>P524</td>
<td>PWM Type Sel</td>
<td>1 “Space Vector” only</td>
</tr>
<tr>
<td>P552</td>
<td>Dead Time Comp</td>
<td>0%</td>
</tr>
</tbody>
</table>

### P196 [Param Access Lvl]

The parameter access level is set to 2 “Reserved” to enable access to the reserved engineering parameters. See Find Reserved Engineering Parameters on page 11.

### P053 [Motor Cntl Sel]

Motor control select is set to adjustable voltage for applications that involve nontraditional/non-motor type of loads. Generally a sine wave filter (SWF) is used for optimal control and performance, however not all adjustable voltage applications require a SWF. If the recommended parameter value changes listed are not made, nuisance instantaneous over current (IOC) trips are likely to occur when the SWF capacitor is being charged.

**IMPORTANT** Do not autotune. An autotune function is likely to fail to complete when the adjustable voltage setting is applied.
P056 [Compensation]

Bit 0 “Reflect Wave”
The reflected wave bit is turned off so that there are no missing pulses in the output voltage waveform and to minimize any offsets that could appear.

Bit 3 “Xistor Diag”
The transistor diagnostics bit is turned off because the sequence that turns the transistors on and off charges the capacitors in the filter and can cause an F12 “HW OverCurrent” fault.

Bit 7 “PWM FreqLock”
The PWM frequency lock bit is turned on because the filter is tuned to the carrier frequency. If the carrier frequency changes, the filter does not work, so the carrier frequency must be fixed. The PWM frequency is set for whatever the filter is tuned to: either 2 kHz or 4 kHz.

P057 [Flux Up Mode]
Set P057 to 0 “Manual” to accommodate motor control because it looks less like an equivalent motor circuit to the drive.

P058 [Flux Up Time]
Flux up time is set to zero because the output load looks less like an equivalent motor circuit to the drive. Building stator flux independently before accelerating is less effective.

P069 [Start/Acc Boost]
P070 [Run Boost]
P071 [Break Voltage]
P072 [Break Frequency]
These parameters can cause DC offsets in Adjustable Voltage mode.

P150 [Drive OL Mode]
Drive overload mode is set for reduce current limit, and not the PWM frequency, for the same reason as P056 [Compensation] Bit 7 “PWM FreqLock.”

P151 [PWM Frequency]
See the filter instructions to set the PWM frequency. The setting is based on the drive rating.

P506 [Angle Stability Gain]
Angle stability gain is set to 0 so it does not try to compensate for the current going into the filter capacitors.

P507 [Volt Stability Gain]
Voltage stability gain is set to 10 for the same reason as angle stability gain.
P524 [PWM Type Sel]
PWM type select is set to 1 “Space Vector” only, because two-phase modulation degrades filter performance.

Avoid transformer saturation potential by minimizing long acceleration ramp times from start to approximately 5 Hz command speed. Program the drive to skip to 3 or up to 5 Hz at the fastest (0.1 sec) acceleration rate. Then switch to the desired acceleration ramp rate the remainder increase to desired speed command.

P552 [Dead Time Comp]
Dead time compensation is best set to 0% when output of the sine wave filter is fed into a transformer.

Parameters 506, 507, 524, and 552 are only active in Sensorless Vector, Custom V/Hz, and Adjustable Voltage modes of operation, therefore these parameters require modification when in Adjustable Voltage control mode (which is a form of V/Hz).
PowerFlex 700 Parameter Settings for Use with LRC dv/dt Filters

This section describes the required parameter settings for using a PowerFlex 700 drive with LRC dv/dt filters and the operation theory behind each setting.

Excessive motor lead lengths generally create an impedance mismatch with the motor impedance. This mismatch can damage high voltage at the motor terminals due to the reflective wave phenomenon. When mitigation calls for a dv/dt filter to be installed between the drive and the motor, the parameter changes listed here are not needed. A dv/dt filter typically consists of LR (inductive and resistive) components and no capacitive components.

The exception is when dv/dt filter topologies include capacitance, the lower spectrum of current capacity rated drives are prone to nuisance F12 “HW Over Current” faults. If frequent IOC faults occur, the parameter changes listed here are recommended.

Likewise, dv/dt topologies that include rectification and connections to the drive DC bus are prone to IOC faults and damage to the drive due to voltage ring up.

**IMPORTANT** Perform the autotune routine with caution. If FVC Autotune fails, the combination of the LR dv/dt or LRC dv/dt filter, long lead lengths, and the motor have distorted the “equivalent motor electrical circuit” characteristics. FVC torque control and performance can become dangerously ineffective and should not be used.

**P053 [Motor Cntl Sel]**
Motor control select can be set to V/Hz, SVC, or FVC control mode. An Autotune routine can be performed as normally needed and intended. However, be cautious because with the additional LRC (inductive, resistive, and capacitive components) capacitance, does not effectively represent an equivalent motor circuit to the drive for purposes of higher performance current control that is expected of Sensorless Vector (SV) and Flux Vector (FV) control in demanding applications. The more capacitance the more it affects current feedback and current regulator control. The Autotune function can also fail to complete with an LRC type dv/dt.
**P056 [Compensation]**

*Bit 0 "Reflect Wave"*

The reflected wave bit is turned off so that there are no missing pulses in the output voltage waveform and to minimize any offsets that could appear.

*Bit 3 "Transistor Diag"*

The transistor diagnostics bit is turned off because the sequence that turns the transistors on and off charges the capacitors in the filter and can cause an F12 “HW OverCurrent” fault.

*Bit 7 "PWM FreqLock"*

The PWM frequency lock bit is turned on because the filter is tuned to the carrier frequency. If the carrier frequency changes, the filter does not work, so the carrier frequency must be fixed. The PWM frequency is set for whatever the filter is tuned to: either 2 kHz or 4 kHz.

**P057 [Flux Up Mode]**

Set P057 to 0 “Manual” to accommodate motor control because it looks less like an equivalent motor circuit to the drive.

**P058 [Flux Up Time]**

Flux up time is set to zero because the output load looks less like an equivalent motor circuit to the drive. Building stator flux independently before accelerating is less effective.

**P150 [Drive OL Mode]**

Drive overload mode is set for reduce current limit, and not the PWM frequency, for the same reason as P056 [Compensation] Bit 7 “PWM FreqLock.”

**P151 [PWM Frequency]**

See the filter instructions to set the PWM frequency. The setting is based on the drive rating.

**P506 [Angle Stability Gain]**

Angle stability gain is set to 0 so it does not try to compensate for the current going into the filter capacitors.

**P507 [Volt Stability Gain]**

Voltage stability gain is set to 10 for the same reason as angle stability gain.

**P524 [PWM Type Sel]**

PWM type select is set to 1 “Space Vector” only, because two-phase modulation degrades filter performance.
# Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At [http://www.rockwellautomation.com/support](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/](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](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.

<table>
<thead>
<tr>
<th>Region</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States or Canada</td>
<td>1.440.646.3434</td>
</tr>
<tr>
<td>Outside United States or Canada</td>
<td>Use the Worldwide Locator at <a href="http://www.rockwellautomation.com/rockwellautomation/support/overview.page">http://www.rockwellautomation.com/rockwellautomation/support/overview.page</a>, or contact your local Rockwell Automation representative.</td>
</tr>
</tbody>
</table>

## 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.

<table>
<thead>
<tr>
<th>Region</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>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.</td>
</tr>
<tr>
<td>Outside United States</td>
<td>Please contact your local Rockwell Automation representative for the return procedure.</td>
</tr>
</tbody>
</table>

## 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/](http://www.rockwellautomation.com/literature/).


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