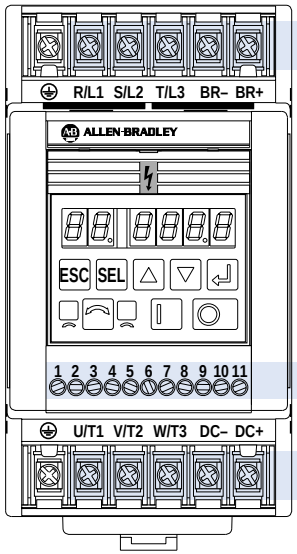
## Power Wiring – TB1, TB2



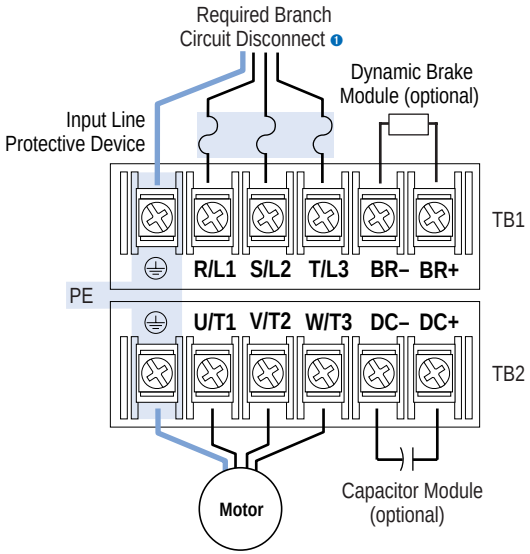

**TB1** Line Power & Dynamic Brake Module Wiring

**TB3** Control Wiring

**TB2** Motor & Capacitor Module Wiring

### Wire Size and Torque Ranges

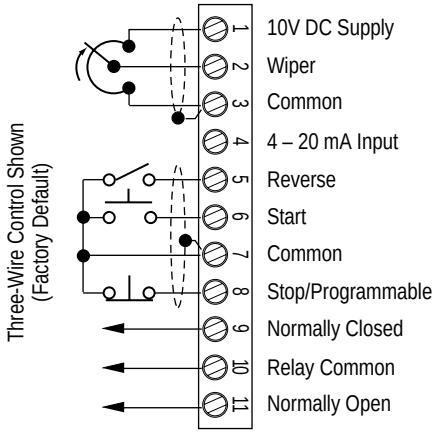
| Model | Terminal | Min./Max. Wire Size *mm² (AWG)* | Min./Max. Torque *Nm (lb.-in.)* |
|---|---|---|---|
| 4.0 kW (5 HP) Three Phase | TB1, TB2 | 5.26-3.31 (10-12) | 1.35-0.90 (12-8) |
| | TB3 | 2.50-0.50 (14-22) | 0.80-0.40 (8-4) |
| 1.5 kW (2 HP) Single Phase | TB1, TB2 | 5.26-3.31 (10-12) | 1.35-0.90 (12-8) |
| | TB3 | 2.50-0.50 (14-22) | 0.80-0.40 (8-4) |
| All Other Ratings | TB1, TB2 | 3.31-0.82 (12-18) | 1.35-0.90 (12-8) |
| | TB3 | 2.50-0.50 (14-22) | 0.80-0.40 (8-4) |



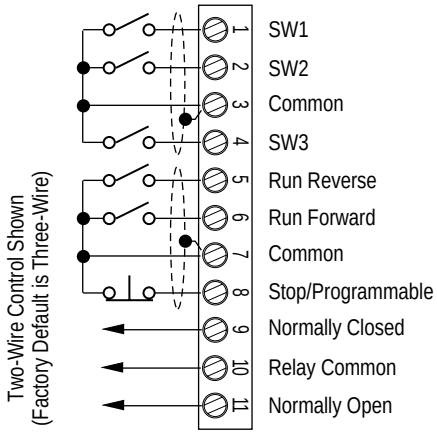

❶ For single phase input applications, connect the AC input line to input terminals S (L2) and T (L3).

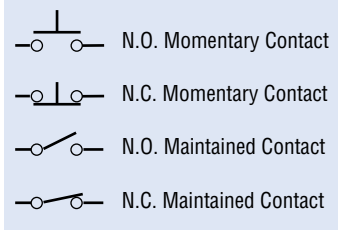
## Control Wiring – TB3

### Analog Signal Follower Model




### Preset Speed Model



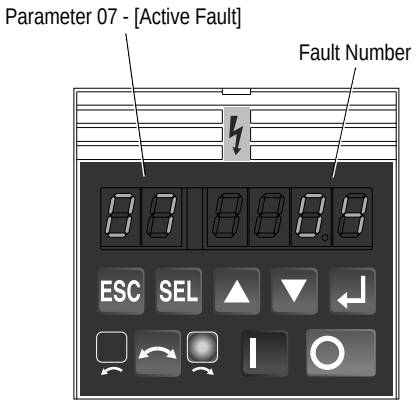




Wires must be shielded.

## Troubleshooting

- **Motor Does Not Start** *(No output voltage to motor)*
  1. Check power circuit.
     - Check supply voltage.
     - Check all fuses and disconnects.
  2. Check the motor – Verify that it is connected properly.
  3. Check control input signals.
     - Verify that START signal is present.
     - Verify that the contact closure signal is present at **TB3-8**.
     - Verify that either the RUN FORWARD or RUN REVERSE signal is active, but NOT both.
  4. Check P46 - [Input Mode].
     - If P46 - [Input Mode] is set to 2, only the program keypad module Start button will start the motor.
  5. Cycle power or use P56 - [Reset Functions] if you changed P46 - [Input Mode].
- **Drive Started but Motor NOT Rotating** *(P01 - [Output Frequency] displays "0.0")*
  1. Check the motor – Verify that it is connected properly.
  2. Check frequency source P06 - [Frequency Command].
     - Verify that a frequency signal is present at terminal block TB3. Either a –10 to +10V or 4-20 mA signal.
     - Verify that Preset Frequencies are set properly.
  3. Check control input signals.
     - Verify that SW1, SW2 and SW3 are correct. (Refer to the chart in the User Manual at the end of Chapter 5).
  4. Check parameter settings.
     - Verify that P59 - [Frequency Select] is showing the desired frequency source.
     - Verify that P58 - [Internal Frequency] is the desired value.
  5. Cycle power or use P56 - [Reset Functions] if you changed P46 - [Input Mode].
- **Motor Not Accelerating Properly**
  1. Check the motor – Verify that it is connected properly and that no mechanical problems exist.
  2. Check parameter settings.
     - Verify that P30 - [Accel Time 1] or P69 - [Accel Time 2] (whichever is current used) is set properly.
     - Verify that P43 - [Current Limit] is set properly.
     - Verify that P38 - [Boost Select] is set properly.
- **Can Not Operate in "RUN FWD/RUN REV" Mode**
  1. Verify that P46 - [Input Mode] is set to 1.
  2. Verify that the contact closure signal is present at **TB3-8**.
  3. Verify that P73 - [Reverse Disable] and P74 - [Analog Select] are not set to 1.
  4. Verify that power has been cycled for above change to take effect.
  5. Verify that both RUN FORWARD and RUN REVERSE switches are NOT closed simultaneously.
  6. Cycle power or use P56 - [Reset Functions] if you changed P46 - [Input Mode].

## Fault Codes

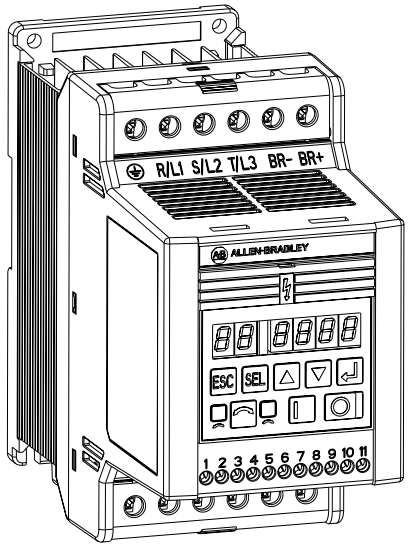



| Fault No. | Fault Indication and Corrective Action |
|---|---|
| 03 | **Power Loss Fault**<br>Monitor incoming AC line for low voltage or line power interruption. |
| 04 ⓘ | **UnderVoltage Fault**<br>Monitor incoming AC line for low voltage or line power interruption. |
| 05 ⓘ | **OverVoltage Fault**<br>Bus overvoltage caused by motor regeneration. Monitor incoming AC line for excessive voltage. Extend the decel time or install dynamic brake module or external capacitor module. |
| 06 ⓘ | **Motor Stall Fault**<br>Longer acceleration time or a reduced load required. |
| 07 ⓘ | **Motor Overload Fault**<br>Reduce motor load until drive output current does not exceed the current set by P42 - [Motor Overload Current]. Reduce P38 - [Boost Select]. |
| 08 ⓘ | **Over Temperature Fault**<br>Clear blocked or dirty heat sink fins. Check ambient temperature. Check for blocked or non-operating fan. |
| 11 | **Operator Error**<br>Clear fault. Do not remove keypad under power. |
| 12 ⓘ | **Overcurrent Fault**<br>Check short circuit at the drive output or excessive load conditions at the motor. |
| 13 ⓘ | **Software Overcurrent Fault**<br>A longer acceleration time, reduced load, or removal of motor shaft blockage is required. |
| 20 ⓘ | **Drive Overload Fault**<br>Clear blocked or dirty heat sink fins. Check ambient temperature. Check for blocked or non-operating fan. Reduce motor load current. |
| 32 | **EEPROM Fault**<br>Reset EEPROM using P56 - [Reset Functions]. Set to 1. Cycle Power |
| 33 | **Max Retries Fault**<br>Repair system fault. |
| 36 | **Incompatible Fault**<br>Check the wiring between the drive and the motor. Check the motor for a grounded phase. |
| 38 | **Phase U Fault**<br>Check the wiring between the drive and motor. Check motor for grounded phase. |
| 39 | **Phase V Fault**<br>Check the wiring between the drive and motor. Check motor for grounded phase. |
| 40 | **Phase W Fault**<br>Check the wiring between the drive and motor. Check motor for grounded phase. |
| 41 | **UV Short Fault**<br>Check the motor and external wiring to the drive output terminals for a shorted condition. |
| 42 | **UW Short Fault**<br>Check the motor and external wiring to the drive output terminals for a shorted condition. |
| 43 | **VW Short Fault**<br>Check the motor and external wiring to the drive output terminals for a shorted condition. |
| 46 | **Intermittent Power Output Fault**<br>Check the wiring between the drive and motor. Check the motor for more than one shorted output. |
| 48 | **Reprogram Fault**<br>Clear fault. |

ⓘ These faults have an auto reset feature. This feature automatically clears overvoltage, undervoltage and overtemperature faults 1 second after the fault condition is removed. Refer to P51 - [Restart Time].

# 160 SSC™ Variable Speed Drive

Quick Reference
Series C, FRN 7.xx




**IMPORTANT:** This publication is designed as a reference tool. The 160 SSC User Manual (publication 0160-5.15) must be consulted for more detailed information about parameters, faults and hazards of personal injury.

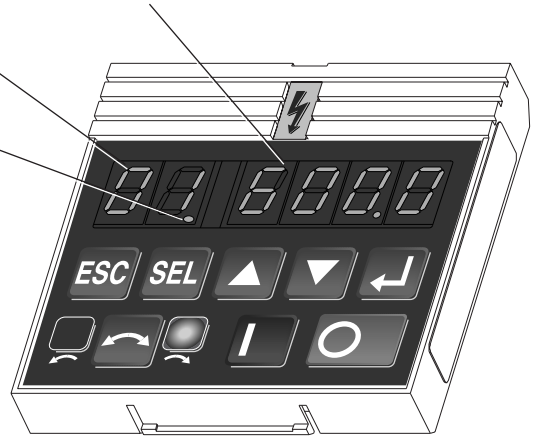
Publication 0160-5.16 – June, 2000
Supersedes October, 1998
P/N 189339 (02)

## Keypad Module Description

**Parameter Number Display**
These two digits display the active parameter number for both Display and Program Group parameters.

**Program Mode Indicator**
When the Program Mode Indicator flashes, you can edit the parameter value. When the Display Mode is active, the indicator will not be lit.

**Parameter Value/Fault Number**
These four digits display the parameter value or fault code number.




**Escape**
The ESCape key allows you to toggle between the Display and Program modes. When the Program mode is active, this key will disable the editing of a parameter value.

**Select**
The SELect key enables editing of a parameter value when the Program mode is active. When you press this key the Program Mode Indicator flashes.

**Up/Down Arrow Keys**
Use the Up/Down Arrow keys to scroll through a list of parameters, or increase and decrease parameter values. Press and hold either key to increase scrolling speed.

Real time frequency adjustment can be achieved when using P58 - [Internal Frequency]. Refer to the User Manual for further information.

**Enter**
Pressing this key causes the current value displayed to be entered into memory (only while in the Program mode). When you press this key the Program Mode Indicator remains on, but stops flashing.

**Direction LEDs (Indicators)**
The appropriate LED will illuminate continuously to indicate the commanded direction of rotation. If the second LED is flashing, the drive has been commanded to change direction, but is still decelerating.

**Important:** Actual motor rotation could be different if motor leads are not connected properly. See Chapter 4 of the User Manual for details on verifying correct rotation.

**Reverse (Change Direction)**
This function is only active when P46 - [Input Mode] is set to 2. When active, pressing this key causes the motor to ramp down to 0 Hz and then ramp up to its set speed in the opposite direction. When the motor is running, pressing this key causes the (currently illuminated) LED to flash, indicating motor rotation while decelerating to zero. The other LED will illuminate indicating the commanded direction.

**Start**
This function is only active when P46 - [Input Mode] is set to 2. When active, pressing this key initiates a start command.

**Stop**
Pressing the Stop key will cause the motor to stop, using the selected stop mode. Refer to the P34 - [Stop Mode] parameter.

If the drive has stopped due to a fault, pressing this key will clear the fault.

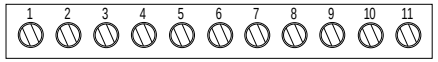
## Programming Steps

| Action | Description |
|---|---|
| ESC | 1. To program the value of a Program Group parameter, enter the Program Group by pressing the ESCape key. The Program Mode Indicator will illuminate. |
| ▲ ▼ | 2. Press the Up/Down Arrow keys until the desired parameter number is displayed. |
| SEL | 3. Press the SELect key. The Program Mode Indicator flashes, indicating that you can use the Up/Down Arrow keys to change the parameter value. |
| ▲ ▼ | 4. Press the arrow keys until the desired value is shown.<br>**Important:** Continuously holding the Up or Down key will cause the value to increase or decrease as long as the key is pressed. |
| ↵ | 5. When the desired value is displayed, press the Enter key. This writes the new value to memory. The Program Mode Indicator will stop flashing and the display will flash once indicating that the new value has been accepted. |
| ESC | **Important:** If at any time (while in the Program mode) you wish to abort the editing process, press the ESCape key. The original value of the parameter will remain unchanged and you will be exited from the Program mode. |

# Display Group Parameter List

**Display Group Parameters**

| No. | Parameter Name | Min/Max Range | Units/Settings |
|---|---|---|---|
| 01 | [Output Frequency] | 0-240 Hz | 0.1 Hz |
| 02 | [Output Voltage] | 0-Max Voltage | 1 Volt |
| 03 | [Output Current] | 0-2 x Rtd. Out. Curr. | 0.01Amps |
| 04 | [Output Power] | 0-2 x Rtd. Out. Power | 0.01 kW |
| 05 | [Bus Voltage] | 0-400 (230V)<br>0-800 (460V) | 1 Volt |
| 06 | [Frequency Command] | 0-240 | 0.1 Hz |
| 07 | [Active Fault] | 0-48 | Numeric Value |
| 08 | [Heatsink Temperature] | 69-150 | 1 Degree C |
| 09 | [Controller Status] | 0000 to 1011 | Bit 3 Decel, Bit 2 Accel, Bit 1 Forward, Bit 0 Running |
| 10 | [Controller Type] | Numeric Value | Numeric Value |
| 11 | [Control Version] | Fixed Value | Numeric Value |
| 12 | [Input Status] ❺ | 0000 to 1111 | See Below |




| P46 Input Mode | Description | Bit 3 | TB3-6 Bit 2 | TB3-8 Bit 1 | TB3-5 Bit 0 |
|---|---|---|---|---|---|
| 0 | 3-Wire | 0 = Positive Analog Input | Start | Stop | Reverse |
| 1 | 2-Wire | | Run Forward | Stop | Run Reverse |
| 2 | Keypad | | N/A | Stop | N/A |
| 3 | Mom. Run Fwd/Rev | 1 = Negative Analog Input | Run Forward | Stop | Run Reverse |
| 4 | Accel/Decel | | Run Forward | 0=Accel 2/Decel 2<br>1=Accel1/Decel 1 | Run Reverse |
| 5 | Coast to Rest | | Run Forward | Coast to Rest Stop | Run Reverse |
| 6 | TB3/Keypad or Comm. | | Run Forward | 0=TB3 Control<br>1=Keypad or Comm. | Run Reverse |
| 7 | Frequency Select | | Run Forward | 0=Analog Freq. Select<br>1=Internal Freq. Select | Run Reverse |
| 8 | SF1 Preset Speed ❶ | | Run Forward | 0=Open<br>1=Closed | Run Reverse |
| 9 | 2-Wire PI Control | | Run Forward | 0=PI<br>1=Internal Freq. Select | Run Reverse |

| | | | |
|---|---|---|---|
| 13 | [Power Factor Angle] | 0.0-180.0 | 0.1 Degrees |
| 14 | [Memory Probe Display] | Numeric Value | Numeric Value |
| 15 | [Preset Status] | 0000 to 0111 | Bit 3 Not Used, Bit 2 SW3❷, Bit 1 SW2, Bit 0 SW1 |
| 16 | [Analog Input] ❸ | –150 to +150 | 0.1% |
| 17 | [Fault Buffer 0] | 0-48 | Numeric Value |
| 18 | [Fault Buffer 1] | 0-48 | Numeric Value |
| 19 | [Fault Buffer 2] | 0-48 | Numeric Value |

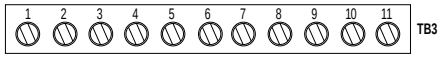
# Program Group Parameter List

**Program Group Parameters**

| No. | Parameter Name | Min/Max Range | Units/Settings | Default |
|---|---|---|---|---|
| 30 | [Accel Time 1] | 0.0-600 | 0.1 Sec | 10.0 |
| 31 | [Decel Time 1] ❺ | 0.1-600 | 0.1 Sec | 10.0 |
| 32 | [Min. Freq.] | 0-240 | 1 Hz | 0 |
| 33 | [Max. Freq.] | 0-240 | 1 Hz | 60 |
| 34 | [Stop Mode Select] | 0-3 | 0 = Ramp<br>1 = Coast<br>2 = DC Brake<br>3 = DC Brake Auto-Off | 0 |
| 35 | [Base Freq.] | 10-240 | 1 Hz | 60 |
| 36 | [Base Voltage] | 20-230/460 | 1 Volt | 230/460 |
| 37 | [Max. Voltage] | 20-255/510 | 1 Volt | 230/460 |
| 38 | [Boost Select] | 0-12 | Start Volts (%): 0 = 0, 1 = 2.5, 2 = 5.0, 3 = 7.5, 4 = 10.0, 5 = 12.5, 6 = 15.0, 7 = 17.5, 8 = 20.0<br>Midpoint (%): 9 = 45.0, 10 = 40.0, 11 = 35.0, 12 = 30.0 | 2 |
| 39 | [Skip Freq.] | 0-240 | 1 Hz | 240 |
| 40 | [Skip Freq. Band] | 0-30 | 1 Hz | 0 |
| 41 | [Motor Overload Select] | 0-2 | 0 = No Derating<br>1 = Min. Derating<br>2 = Max. Derating | 0 |
| 42 | [Motor Overload Current] | 0.1-200% of Drive Rating | 0.01 Amps | 115% of Rating |
| 43 | [Current Limit] | 1-180% of Drive rating | 1% | 150% |
| 44 | [DC Hold Time] | 0-25 | 0.1 Sec | 0 |
| 45 | [DC Hold Voltage] | 0-115 | 1 Volt | 0 |
| 46 | [Input Mode] ❻ | 0-9 | 0 = 3-wire control<br>1 = 2-wire control<br>2 = Keypad control<br>3 = Momentary FWD/REV control<br>4 = 2-wire "Accel/Decel" control<br>5 = 2-wire Coast to Rest control<br>6 = 2-wire TB3/Keypad-Comm control<br>7 = 2-wire P59-[Frequency Select] control<br>8 = 2-wire Preset Speed control<br>9 = 2-wire PI control | 0 |
| 47 | [Output Configure] | 0-10 | 0 = Drive Ready/Faulted<br>1 = At Frequency<br>2 = Motor Running<br>3 = Reverse<br>4 = Motor Overload<br>5 = Ramp Regulated<br>6 = Above Frequency<br>7 = Above Current<br>8 = Above DC Bus Voltage<br>9 = Retries Exhausted<br>10 = Above Power Factor Angle | 0 |
| 48 | [Output Threshold] | 0-815 | **P47** - 6 = 0-240 Hz Range<br>**P47** - 7 = 0-180% Range<br>**P47** - 8 = 0-815 V Range<br>**P47** - 10 = 0-180° | 0 |
| 49 | [PWM Freq.] | 2.0-8.0 | 0.1 kHz | 4.0 |
| 50 | [Restart Tries] | 0-9 | Numeric Value | 0 |
| 51 | [Restart Time] | 0.5-300 | 0.1 Sec | 10.0 |
| 52 | [DB Enable] | 0-100 | 0 = Disable, > 0 = % of dB | 0 |
| 53 | [S-Curve] | 0-10 | 0, 1...10 @ 10% Increments | 0 |
| 54 | [Clear Fault] | 0-1 | 1 = Reset fault | 0 |
| 55 | [Memory Probe Address] | Numeric Value | Numeric Value | Numeric |
| 56 | [Reset Functions] | 0-2 | 0 = Idle State<br>1 = Reset Defaults<br>2 = Update Input Mode | 0 |

**Program Group Parameters** *(continued)*

| No. | Parameter Name | Min/Max Range | Units/Settings | Default |
|---|---|---|---|---|
| 57 | [Program Lock] | 0-1 | 0 = Unlock<br>1 = Lock | 0 |
| 58 | [Internal Freq.] | 0-240 | 0.1 Hz | 60 |
| 59 | [Freq. Select] | 0-1 | 0 = TB3<br>1 = Internal Freq. | 0 |
| 60 | [Zero Offset] ❸ | –50.0 to +50.0 | 0.1% | 0 |
| 61-68 | [Preset Freq.0 – 7] ❷ | 0-240 | 0.1 Hz | See Below |




| | | | Preset Speed Model | | | Signal Follower Model | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | TB3-4 | TB3-2 | TB3-1 | TB3-8 | TB3-2 | | |
| No. | Name | Default | (SW3) | (SW2) | (SW1) | (SW2) | (SW1) | Accel ❹ | Decel ❹ |
| 61 | [Preset 0] | 3 Hz | 0 | 0 | 0 | 0 | 0 | Parameter 30, [Accel Time 1] | Parameter 31, [Decel Time 1] |
| 62 | [Preset 1] | 20 Hz | 0 | 0 | 1 | 0 | 1 | | |
| 63 | [Preset 2] | 30 Hz | 0 | 1 | 0 | N/A | N/A | | |
| 64 | [Preset 3] | 40 Hz | 0 | 1 | 1 | N/A | N/A | | |
| 65 | [Preset 4] | 45 Hz | 1 | 0 | 0 | 1 | 0 | Parameter 69, [Accel Time 2] | Parameter 70, [Decel Time 2] |
| 66 | [Preset 5] | 50 Hz | 1 | 0 | 1 | 1 | 1 | | |
| 67 | [Preset 6] | 55 Hz | 1 | 1 | 0 | N/A | N/A | | |
| 68 | [Preset 7] | 60 Hz | 1 | 1 | 1 | N/A | N/A | | |

| | | | |
|---|---|---|---|
| 69 | [Accel Time 2] | 0.0-600 | 0.1 Sec. | 20.0 |
| 70 | [Decel Time 2] ❺ | 0.1-600 | 0.1 Sec. | 20.0 |
| 71 | [IR Compensation] | 0-150 | 1% | 50% |
| 72 | [Slip Compensation] | 0.0-5.0 | 0.1 Hz | 2.0 Hz |
| 73 | [Reverse Disable] | 0-1 | 0 = Enable<br>1 = Disable | 0 |
| 74 | [Analog Select] ❸ | 0-1 | 0 = Unipolar<br>1 = Bipolar | 0 |
| 75 | [Analog Input Min.] ❸ | 0.0-150.0 | 0.1% | 0.0% |
| 76 | [Analog Input Max.] ❸ | 0.0-150.0 | 0.1% | 100% |
| 78 | [Compensation] | 0-2 | Numeric Value | 0 |
| 79 | [Software Current Trip] | 0-50% | 1% | 0 |
| 80 | [Stall Fault Time] | 0-5 | 0 = Normal (Appx. 60 sec)<br>1 = 2 x Normal<br>2 = 4 x Normal<br>3 = 6 x Normal<br>4 = 8 x Normal<br>5 = Disable | 0 |
| 81 | [PI Proportional Gain] ❸ | 0-10.00 | Numeric Value | 0.01 |
| 82 | [PI Integral Gain] ❸ | 0-10.00 | Numeric Value | 0.01 |
| 83 | [PI Process Reference] ❸ | 0-100.0% | 0.1% | 0.0% |
| 84 | [PI Dead Band] ❸ | 0-10.0% | 0.1% | 0.0% |

❶ Status of Bit 3 for P46 - [Input Mode] setting 8 (TB3-2) is 0 = Open, 1 = Closed.

❷ Parameters 63, 64, 67 & 68 apply to the Preset Speed model only.

❸ This parameter setting applies to the Analog Signal Follower model only.

❹ When using P46 - [Input Mode] setting 4, the Accel and Decel times are selected by providing an input to TB3-8.

❺ In firmware 7.05, there are minimum decel settings based on horsepower. 1 HP and less remain 0.1 seconds, 2 HP is 0.2 seconds, 3 HP is 0.6 seconds, and 5 HP is 0.7 seconds.

❻ In firmware 7.06, all Input Modes of parameter 46 allow PI control except Input Mode 8.