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ALTIVAR™ 66

Adjustable Speed Drive Controllers For Asynchronous Motors

User's Manual

Constant and Variable Torque
1 to 400 hp, 460 V and 1 to 50 hp, 230 V
Level 1 & 2 Configuration

Telemecanique

SQUARE D

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this bulletin in its entirety before installing or operating ALTIVAR 66 drive controllers. Installation, adjustment, repair and maintenance of these drive controllers must be performed by qualified personnel.
- Disconnect all power before servicing drive controller. WAIT ONE MINUTE until DC bus capacitors discharge, then measure DC bus capacitor voltage between PA and (-) terminals to verify DC voltage is less than 45 V. The DC bus LED is not an accurate indication of the absence of DC bus voltage.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Install all covers and close door before applying power or starting and stopping the drive controller.
- User is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Before servicing drive controller:

- Disconnect all power.
- Place a “DO NOT TURN ON” label on drive controller disconnect.
- Lock disconnect in open position.

Failure to follow these instructions will result in death or serious injury.

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Electrical equipment should be serviced only by qualified electrical maintenance personnel. No responsibility is assumed by Schneider S.A. for any consequences arising out of the use of this material.

CONTENTS

INTRODUCTION 1
ALTIVAR 66 Family 1
Scope of Manual 1
Documentation List 1
Revision Level 1
KEYPAD DISPLAY 2
LCD Display 2
ENT Key 2
ESC Key 2
Arrow (▲ ▼) Keys 3
Numeric Keys 3
Function Keys 3
Key Cover 4
STOP Key 4
RUN Key 4
Keypad Display Connections 5
MENU OVERVIEW 6
Selecting the Language 6
Drive Configuration 6
Drive Identification 6
Display Mode 6
Main Menu 7
DISPLAY MODE 8
Drive Controller Running 8
Drive Controller in Fault State 8
ACCESS LEVELS 10
Access Locking Switch Locked 10
Total Lock 10
Access Locking Switch Unlocked 11
Partial Unlock 11
Total Unlock 11
MENU SUMMARY: USING THIS MANUAL 12
1→PARAMETER SETTING MENU 13
Low Speed 15
High Speed 15
Acceleration Time 15
Deceleration Time 16
Acceleration 2 and Deceleration 2 16
Slip Compensation 16
IR Compensation 17

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Damping 19
Profile 20
Bandwidth 21
Voltage Boost 21
Motor Overload 23
2→I/O MAP 24
3→FAULT HISTORY 25
Troubleshooting 25
4→DISPLAY CONFIGURATION MENU 26
4.1→One Bar Graph 27
4.2→Two Bar Graphs 28
4.3→Scroll 28
5→KEYPAD CONFIGURATION MENU 29
5.1→Program Function Keys 30
Using Keypad Command Mode 31
6→DRIVE CONFIGURATION MENU 33
6.1→Torque Type 34
6.2→Command Type 34
6.3→Motor Power (ATV66U41 only) 34
2-Wire Command 35
3-Wire Command 36
7→GENERAL CONFIGURATION MENU 37
7.1→Drive Parameters 37
7.11 (7.14, 7.17)→Motor Parameters 38
7.12 (7.15, 7.18)→Control Parameters 54
7.13 (7.16, 7.19)→Control Type 61
7.2→Application Functions 63
7.3→Output Assignments 100
7.4→Fault Management 107
8→DIAGNOSTIC MODE 121
Autodiagnostic 122
Logic Input Test 123
Analog Input Test 123
Logic Output Test 123
Analog Output Test 124
9→DRIVE INITIALIZATION MENU 125
Total Factory Settings 125
Partial Factory Settings 126
Store User Settings 126
Recall User Settings 127
10→ACCESS LOCK MENU 128

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APPENDIX A: PARAMETER SUMMARY 129
1→Parameter Setting Menu 129
2→I/O Map. 130
6→Drive Configuration Menu. 131
7→General Configuration Menu 131
APPENDIX B: MENU SUMMARY 139
INDEX 143

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INTRODUCTION

ALTIVAR 66 Family

ALTIVAR 66 is a family of 1 to 400 hp, 2.2 to 250 kW, 460 V and 1 to 50 hp, 2.2 to 37 kW, 230 V adjustable frequency AC drive controllers. Capable of controlling either constant or variable torque loads and designed to handle simple or complex applications, ALTIVAR 66 drive controllers can function as stand-alone drive controllers or as part of complex drive systems.

Scope of Manual

This manual covers the configuration, commissioning and diagnostic functions of ALTIVAR 66 drive controllers. This manual is intended for use with V3.0 software or greater. Consult the addendum for information specific to that software version.

For receiving, installation, and start-up of the drive controller, refer to the Receiving, Installation and Start-Up manual, document number VD0C06S304_.

ALTIVAR 66 drive controllers have a wide variety of hardware and software options for extended capability. For a description of the options, refer to the catalog. A separate manual or instruction sheet is provided with each option.

Documentation List

The following ALTIVAR 66 drive controller documents are available:

- Receiving, Installation and Start-Up: VD0C06S304_
- Level 1 and 2 Configuration: VD0C06S305_
- Catalog: VD0C06S201_

Additional documentation is provided with the optional peripherals.

Revision Level

This document, Revision C dated February 1997, replaces VD0C06S305B dated July 1996 (supporting V1.6, V2.0, V2.1, and V3.0 software). Additions to this document include:

- Errata
- PI Regulator information
- Motor Select Switch information

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KEYPAD DISPLAY

The ALTIVAR 66 drive controller includes a keypad display mounted on front for:

- Identification of the drive controller
- Display of parameters and faults
- Recall and adjustment of drive controller parameters
- Local command of the drive controller

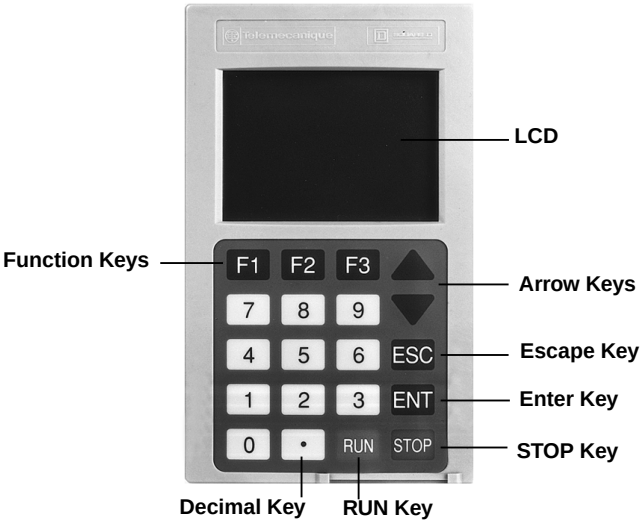

Figure 1: Keypad Layout

LCD Display

The LCD display is a 128 x 64 point graphic screen consisting of six 21-character lines. The display can be programmed to show text lines and bar graphs, and has reverse video capability for enhancement of text or numbers on the screen.

ENT Key

Use the ENT (Enter) key to:

- Confirm a menu selection
- Go to the next menu

ESC Key

Use the ESC (Escape) key to:

- Reset an adjustment to its original value
- Leave the present menu and go back to the previous menu

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Arrow (▲ ▼) Keys

Use the arrow keys to:

- Scroll through the screens and menus
- Select an item or function
- Increase or decrease numeric parameters (i.e. from 12.5 A to 12.6 A). The arrow keys adjust the portion of the parameter value highlighted on the display. To increase the scrolling speed, press and hold the arrow key for two seconds.

Numeric Keys

Use the numeric and decimal point keys to enter numeric values for parameter adjustments. The format and limits of values entered are checked by the control software according to the nature of the parameter.

Function Keys

Use the function keys to program the drive controller or issue commands. Operation of the function keys depends on whether the drive controller is in Terminal Command or Keypad Command mode.

In Terminal Command (drive controller receives its Run, Stop, and Reference Frequency signals from the drive controller terminal strip) the function keys operate as follows:

- F1 calls up the Help menu
- F2 returns to the Display Mode screen (page 6 and page 8), unless set for Terminal / Keypad switching in the 5→Keypad Configuration menu
- F3 functions as a jump key

To jump directly to a menu, press F3. A window will appear. Enter the menu's index number and press ENT. The display will jump directly to that menu. Index numbers are found in the upper left corner of the display for each menu, and are also listed in Table 3 on page 12. Throughout this manual, menu names are preceded by their index numbers. For example, in a reference such as "1→Parameter Setting", "1" is the index number for the Parameter Setting menu.

In Keypad Command (drive controller receives its Run, Stop and Reference Frequency signals from the keypad display), each function key can be programmed to perform a function such as Jog, Reset Fault, or Meter Scroll. See the 5.1→Program Function Keys menu for programming procedure (page 30). The factory preset functions of the keys are:

- F1 switches between forward and reverse direction rotation
- F2 switches between Terminal and Keypad Command
- F3 commands Jog

Terminal Command and Keypad Command are described further in the 5→Keypad Configuration menu section (page 29).

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Key Cover

A plastic cover is factory-installed over the RUN and STOP keys. For access to RUN and STOP keys and local command of drive controller, this cover must be removed. See Figure 5 on page 5. The key cover can be re-installed to cover RUN and STOP keys.

STOP Key

The STOP key, active in Terminal and Keypad Command modes, commands normal stop of the motor. The motor follows ramp as determined by selected deceleration time.

⚠ WARNING

INABILITY TO INITIATE STOP

- With the key cover removed, the STOP key is enabled and active in both Terminal Command and Keypad Command modes.
- When the key cover is installed, the STOP key is not accessible. Verify that appropriate system STOP functions are in place when the STOP key is not accessible.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

RUN Key

The RUN key commands the motor to run when the drive controller is in Keypad Command mode. The motor follows the ramp determined by the selected acceleration time. Rotation direction can be changed with a function key programmed to change direction. If Change Direction is not assigned to a function key, forward is the default direction. LI1 (Run Enable) on J12 must be high for the RUN key to command the motor. *Note: When running the drive controller in Keypad Command after having been in another command mode, the drive controller will run in the same direction in which it was running in the other command mode, even if the drive controller power has been cycled. This will occur whether or not a function key is programmed for direction.*

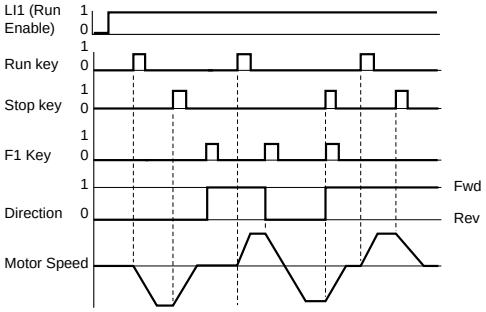

Figure 2: Run Timing Diagram

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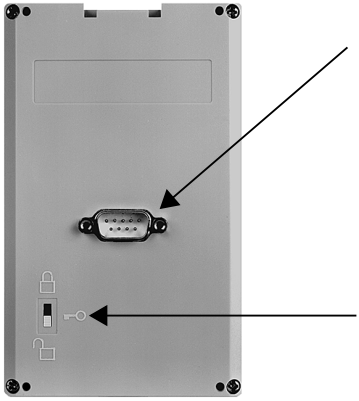
Keypad Display Connections



Sub D 9-pin connector for connection to the drive controller.

- For remote handheld use, connect terminal with a 3-meter cable (part # VW3-A66311) or 2-meter cable (part # VW3-A66312).
- For mounting in an enclosure door, use kit # VW3-A66101 (3-meter cable) or VW3-A66100 (2-meter cable).

Switch for access locking to prohibit or authorize changes to the configuration.

Figure 3: Rear View of Keypad Display

Figure 4: Removing Keypad

NOTE: Keypad supplied with this drive controller has been matched with the software revision level. Do not install keypad on another drive controller.

Installation of an incompatible keypad may result in non-recognition of the keypad by the drive controller at power-up.

Figure 5: Access to RUN and STOP Keys

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⚠CAUTION

UNINTENDED EQUIPMENT ACTION

If Voltage Boost is set too high, the motor may slowly rotate in a direction opposite to that commanded when starting.

- Adjust only when necessary.
- Read the following instructions before adjusting.
- For critical applications which cannot be rotated in the reverse direction such as extruders or pumps equipped with anti-rotation ratchets, uncouple the motor from the load after adjusting Voltage Boost and check the motor for the proper rotation direction when starting.

Failure to follow these instructions can result in equipment damage.

Set Voltage Boost so that sufficient break-away torque is developed below 5 Hz for the motor to begin rotating. Increasing Voltage Boost increases available break-away torque.

Before adjusting Voltage Boost, adjust IR Compensation if required. Always set the motor Current Limit in the 7.11 (7.14, 7.17)→Motor Parameters menu to greater than the motor nameplate rated current.

If Voltage Boost is set too low, the motor may remain stalled instead of accelerating to Low Speed when starting or it may not begin rotating until the speed reference is increased to 20 to 30% of motor nominal frequency. If Voltage Boost is set too high, the motor may not turn, or it may slowly rotate in the reverse direction when commanded to start. Current limit is active at this time. For critical loads which cannot be rotated in the reverse direction, always uncouple the motor from the load after adjusting Voltage Boost and check the motor for the proper direction of rotation.

When a satisfactory value of Voltage Boost has been found, operate the drive controller throughout its speed range with the expected motor load. The steady-state motor current (in the 4→Display Configuration menu) should not exceed the motor nameplate current rating.

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Motor Overload

⚠ CAUTION

MOTOR OVERHEATING

This drive controller does not provide direct thermal protection for the motor. Use of a thermal sensor in the motor may be required for protection at all speeds or loading conditions. Consult motor manufacturer for thermal capability of motor when operated over desired speed range.

Failure to follow these instructions can result in injury or equipment damage.

Motor Overload enables the drive controller to protect a standard induction motor from overload. This function can replace a conventional thermal overload relay for single motor applications; however, multi-motor applications require individual external thermal overload motor protection.

This function is more effective in protecting a motor operated from a drive controller because it considers motor speed as well as time and current in its protection algorithm. This is important since most motors applied on drive controllers are self-cooled, and their cooling effectiveness declines at lower speeds. The drive controller's protection algorithm integrates motor current over time, taking into account factors such as stop time and idle time. Four types of motor overload protection can be selected from the 7.4→Fault Management menu (page 107 for details):

1. For Self-Cooled Motor (factory setting)
2. For Force-Ventilated Motor
3. Manual Tuning
4. No thermal protection

Motor Overload can be adjusted from 0.45 to 1.15 times the nominal drive controller current, as displayed on the Drive Identification screen. Factory preset is 0.9. Adjust Motor Overload value to nominal motor current (see page 40).

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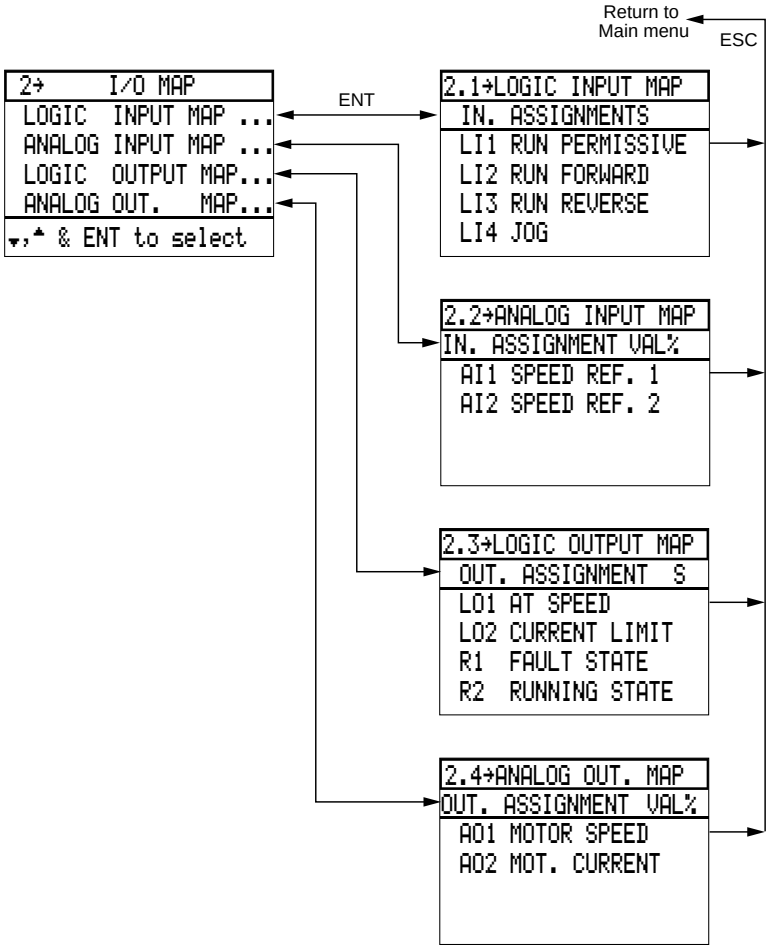
2→I/O MAP



The I/O map is a series of display-only screens that show the analog and logic input/output terminal assignments. I/O Map is helpful for determining which input/output terminals are assigned to which software functions, and for displaying the state of the inputs/outputs while operating the drive controller.

The I/O Map consists of four three-column, display-only screens.The left column of each lists the inputs/outputs, the middle column shows the input/output functions, and the right column displays states or values. I/O states are given as 0 (low logic state) or 1 (high logic state). Refer to VD0C06S304_ for definitions of logic 1 and logic 0 for applicable logic I/O. Analog I/O values are given in percentages. See page 105 for base of percentage displayed.

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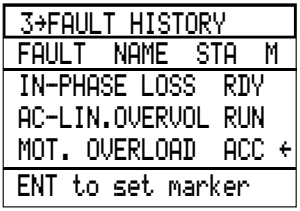
3→FAULT HISTORY



The Fault History screen displays the last eight faults stored by the drive controller, and run status at time of fault. The most recent fault is displayed first in the list. The arrow (←) under the "M" column is used to mark a fault so that it can be followed for future observation.

Table 5 lists drive controller run status codes. Table 2 on page 9 lists the faults that can be displayed on the Fault History Screen.

Table 5: Fault History Screen Run Status Codes

Code	Code Definition
ACC	Accelerating
DEC	Decelerating
RUN	Drive controller running (at speed)
BRK	Braking (dynamic or regenerative)
RDY	Drive controller stopped and ready
DCB	DC injection braking
CLI	Current limit active
JOG	Jogging
FLT	Faulted

Troubleshooting

Refer to document VD0C06S304_, Receiving Installation and Start-Up, for troubleshooting procedure when a fault is displayed. In the case of an internal drive controller fault, autodiagnostics can be run to locate the failed component. See the 8→Diagnostic Mode menu on page 121.

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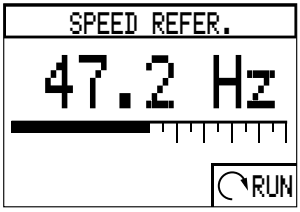
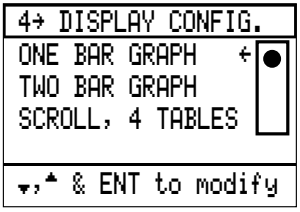
4→DISPLAY CONFIGURATION MENU

By default, the Display screen shows reference frequency in bar graph form.



The type and number of functions shown can be modified from the 4→Display Configuration menu. Modification is possible while the drive controller is running.



Three display options are available from the 4→Display Configuration screen. An arrow (←) indicates the active display option.

- One function displayed in bar graph form
- Two functions displayed in bar graph form
- Eleven functions displayed in three tables

The One Bar Graph and Two Bar Graph choices have sub-menus from which you select the functions to be displayed from a list of 9 items. The list of functions is the same for both display choices, and is illustrated in the 4.1→One Bar Graph menu on page 27.

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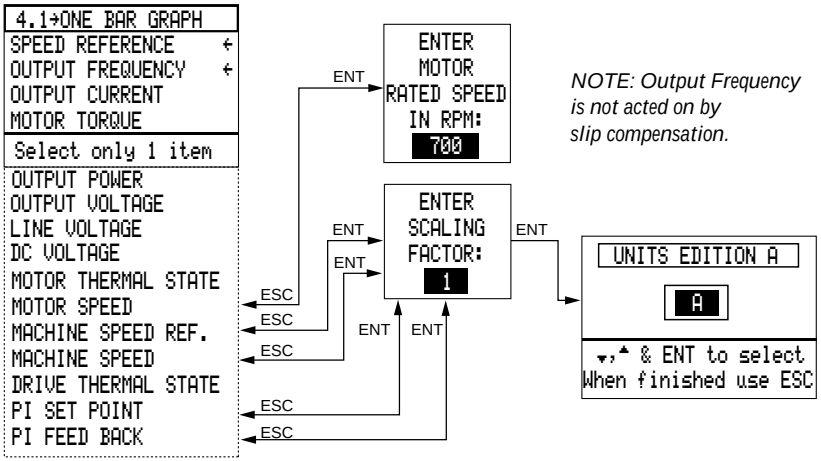
4.1→One Bar Graph



Use the ▲ and ▼ keys to select a function from the 4.1→One Bar Graph menu and press ENT.

Five functions on the menu have associated screens for entering actual values. For motor RPM, enter the motor rated speed. The controller will automatically select the closest standard motor speed: 700, 900, 1200, 1800, or 3600 RPM.

For Machine Speed Reference, Machine Speed, PI Set Point, and PI Feed Back, first enter the scale factor that multiplies motor rated speed in Hz to determine the application units. The scale factor is programmable from 1 to 100, factory preset at 1.

NOTE: There is only one scaling factor entry available for Machine Speed Reference, Machine Speed, PI Set Point, and PI Feed Back. The scaling factor chosen for Machine Speed, for example, will be the same scaling factor used for PI Set Point.

Second, enter a 4-character label for the application (“ft / s”, for example) in the Units Edition screen. Using the ▲ (moves up) and ▼ (moves down) keys, scroll among the alphabetical characters and press ENT to select a character. Each selected character will appear in the upper band of the screen. Press ESC when finished defining the label.

When one bar graph is displayed, the ▲ and ▼ keys can be used to display other functions.

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4.2→Two Bar Graphs

The 4.2→Two Bar Graphs menu is the same as the 4.1→One Bar Graph menu (page 27); however, two selections can be made.

Figure 13 shows the display screen configured for Two Bar Graphs. When the▲ and ▼ keys are used to scroll, the first bar graph remains fixed, while the other parameters are displayed successively on the second bar graph.

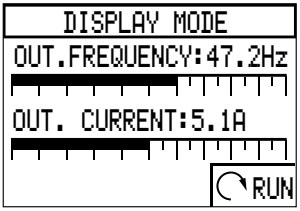

Figure 13: Display Screen Configured for Two Bar Graphs

4.3→Scroll

The Scroll format displays 11 functions in three tables (12 functions for ATV66D16 to ATV66C31 drive controllers). See Figure 14.

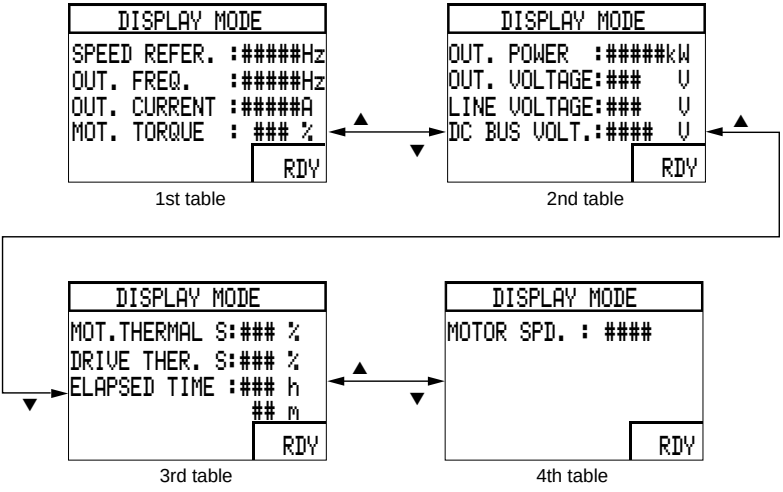

Figure 14: Display Screen Configured for Four Table Scroll

NOTE: For Motor Thermal State (see first line of third table in Figure 14), if Motor Overload is set to No Thermal Overload in the 7.4→Fault Management menu, ntH will be displayed instead of a percentage. Drive Thermal State (second line of third table) appears only for ATV66D16 to ATV66C31 drive controllers.

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5→KEYPAD CONFIGURATION MENU

Use the 5→Keypad Configuration menu to configure the drive controller for Terminal or Keypad Command, and to program the function keys.

In Terminal Command (factory setting), the drive controller takes reference frequency, stop, and run commands from its terminal strip connections.

Keypad Command allows the drive controller to run and receive its reference frequency from the keypad display.

If keypad is removed from drive controller while in keypad command mode, then the controller will stop and may trip on serial link fault.

Command mode can be set in one of three ways.

1. Select TERMINAL COMMAND or KEYPAD COMMAND from the menu. The drive controller will operate in the selected command mode.
2. Select TER/KEY by LI from the menu and assign a logic input, LI3 or LI4. This enables switching between command modes by logic input. When the assigned logic input is low (state 0), Terminal Command will be active. When the assigned logic input is high (state 1), Keypad Command will be active. To reassign a logic input, follow the instructions on the screen.
3. Select TER/KEY by F2. The F2 key can now be used to toggle between Terminal Command and Keypad Command.

NOTE: Keypad Command is only accessible when in Total Lock or Partial Lock if KEYPAD COMMAND, TER/KEY by LI, or TER/KEY by F2 has been selected before locking. Also, Keypad Command cannot be used with PI Regulator enabled.

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5.1→Program Function Keys

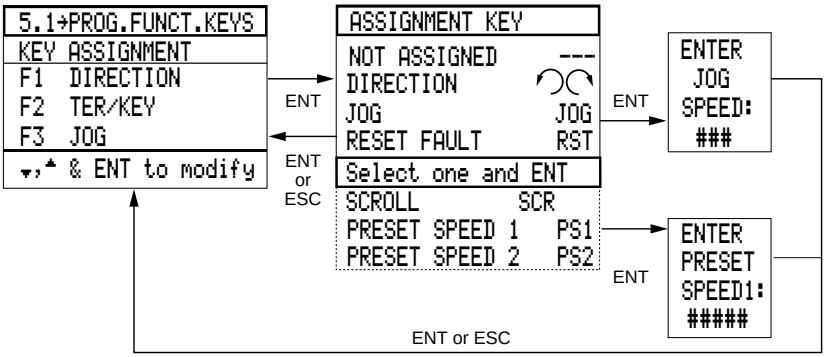

Figure 15: Program Function Keys

The 5.1→Program Function Keys menu shows the assignment of the F1, F2 and F3 function keys when the drive controller is in Keypad Command mode.

In Keypad Command, the factory preset assignments of the function keys are:

- F1: Direction Rotation
- F2: Terminal / Keypad Command
- F3: Jog

To modify the function key assignments, select the function key to be reassigned and press ENT.

The Assignment Key menu will appear with a list of assignable functions. If TER / KEY by F2 has been selected from the 5→Keypad Configuration menu, F2 cannot be reassigned. Scroll with the ▲ and ▼ keys to the desired function and press ENT. The Jog and Preset Speed parameters have additional screens for entering speeds.

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Using Keypad Command Mode

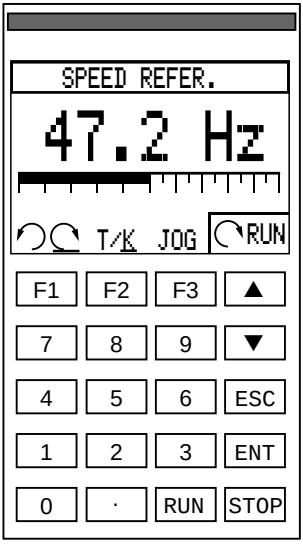

Figure 16: Display Mode Screen in Keypad Command Mode

Keypad Command allows the drive controller to run independently of its logic and analog inputs. To start the drive controller in Keypad Command, momentarily press the RUN key. The drive controller will start, following the acceleration ramp.

NOTE: When running the drive controller in Keypad Command after having been in another command mode, the drive controller will run in the same direction in which it was running in the other command mode, even if the drive controller power has been cycled. This will occur whether or not a function key is programmed for direction.

To stop the drive controller, momentarily press the STOP key and the drive controller will stop, following the deceleration ramp. **The LI1 input remains active for an override stop in Keypad Command mode**.

In Keypad Command mode, the ▲ key is used to increase reference frequency and the ▼ key is used to decrease reference frequency. Note that pressing the ENT key is not necessary—frequency changes automatically upon pressing the ▲ or ▼ keys.

A reference frequency can also be entered by pressing the decimal point key, entering a frequency, and pressing the ENT key.

The assignment of each function key is displayed on the last line of the Display Mode screen above the corresponding function key. Table 6 on page 32 describes the operation of the function keys in keypad command.

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While in Keypad Command mode, 0 Hz reference is treated as a speed. Once the RUN key is pressed, the drive controller is in a “run state”. After pressing RUN, you may select any speed reference (including 0 Hz) and the drive controller will run at that speed. Pressing the STOP key causes the drive controller to ramp to zero output even though the reference remains at a non-zero frequency. Cycling power resets the reference to zero and causes the drive to be in the “stop state”.

Table 6: Operation of Function Keys in Keypad Command

Label/ Icon	Indication	Action Achieved by Pressing Associated Function Key
	Direction rotation is assigned to the associated function key. Forward direction is selected.	Press assigned function key (F1 is default) to select reverse direction.
	Direction rotation is assigned to the associated function key. Reverse direction is selected.	Press assigned function key (F1 is default) to select forward direction.
JOG	Jog function is assigned to the associated function key.	Motor jogs while assigned function key is pressed. F3 is default.
T / K	Terminal/Keypad Command selection is assigned to associated function key and Keypad Command is active.	Press assigned function key (F2 is default) to activate Terminal Command.
T / K	Terminal/Keypad Command selection is assigned to associated function key and Terminal Command is active.	Press assigned function key (F2 key is default) to activate Keypad Command.
RST	Reset fault is assigned to associated function key.	Press function key to reset drive controller after a fault.
SCR	Scroll function is assigned to associated function key.	Press function key to scroll through display screens. ▲ and ▼ keys are used for this function in Terminal Command mode.
PS1	Preset Speed 1 is assigned to associated function key.	Press function key to run at Preset Speed 1. Drive controller will run at Preset Speed 1 until PS2 or JOG function key is pressed, speed reference is changed, or STOP key is pressed.
PS2	Preset Speed 2 is assigned to associated function key.	Press function key to run at Preset Speed 2. Drive controller will run at Preset Speed 2 until PS1 or JOG function key is pressed, speed reference is changed, or STOP key is pressed.

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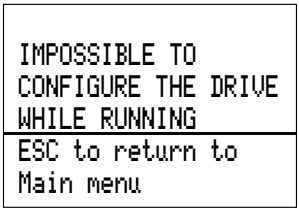
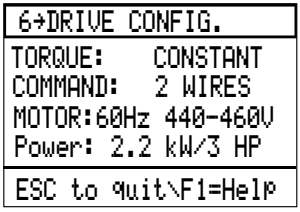
6→DRIVE CONFIGURATION MENU

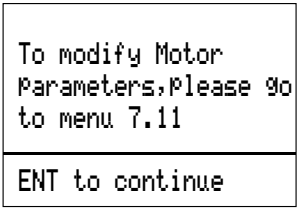
The 6→Drive Configuration menu can be accessed only if the drive controller is stopped. If the drive controller is running, a message appears:



Press ESC to return to the Main menu.



The 6→Drive Configuration menu contains three selections: Torque Type, Command Type, and Motor. “Motor” is a valid selection for the ATV66U41N4 drive controller only since this drive controller can be used with a 1, 2, or 3 hp motor. Otherwise, selecting “Motor” calls up a message screen:



To access Motor Parameters, go to the 7.11→Motor Parameters menu (page 38).

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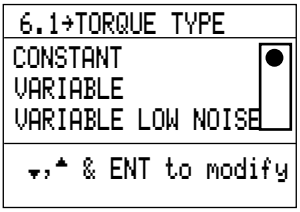
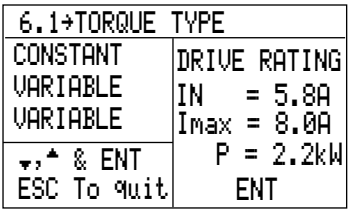
6.1→Torque Type





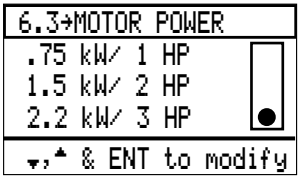
Select type of torque according to the application and press ENT. Note that Variable Low Noise does not appear as a menu selection for the ATV66C10 to ATV66C31 drive controllers. A window will appear showing the current and power rating of the drive controller. Confirm by pressing ENT. Display returns to the 6→Drive Configuration menu.

NOTE: Changing Torque Type or Control Type (in the 7.13→ Control Type menu) resets the motor parameters in the 7.11 (7.14, 7.17)→Motor Parameters menu to the factory settings.

6.2→Command Type

Select 2-wire or 3-wire command. The selection affects the operation of LI1 and the forward (LI2) and reverse (LI3, if assigned) inputs. Factory setting is 2-wire command. See pages 35 and 36 for descriptions of 2-wire and 3-wire command.

6.3→Motor Power (ATV66U41 only)



For the ATV66U41 drive controller with a motor rated less than 3 hp (or 4 hp variable torque), the 6.3→Motor Power screen can be accessed to select the power of the motor. This screen is only available on the ATV66U41 drive controller.

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2-Wire Command

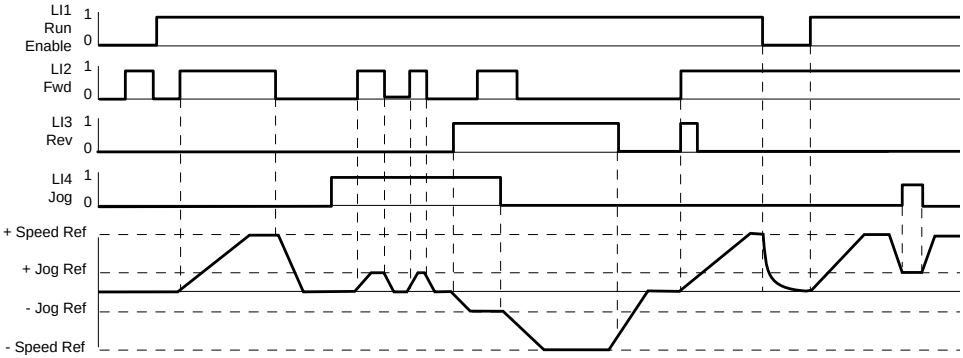

Figure 17: Timing Diagram for 2-Wire Command

The use of 2-wire command will allow for the restarting of the drive controller without operator intervention after fault reset or restoration of power provided that a run command is present. For applications where automatic restarting may pose a hazard to personnel, the use of 2-wire command is not recommended.

If 2-wire command is selected, LI1 is Run Enable and must always be high for the drive controller to run. If drive controller is running and LI1 goes low, the drive controller will freewheel stop.

The forward or reverse input must also be maintained for the drive controller to run at the speed reference. If both forward and reverse inputs go high at the same time, the forward direction takes priority. If a second direction input goes high after the first, the second is ignored. If the drive controller is running and the forward and reverse inputs go low, the drive controller will stop, following the normal ramp. If the drive controller is running and the keypad STOP key is pressed, regardless of whether the drive is in Keypad or Terminal mode, the drive controller will stop, following the normal ramp.

To restart the drive controller, the Run command (forward or reverse) must be set to low state. Then the drive controller will restart on the next command to run.

Jog is accomplished by setting the logic input assigned to Jog high and toggling the forward or reverse input high. For wiring diagram, refer to manual VD0C06S304_, Receiving, Installation, and Start-Up.

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3-Wire Command

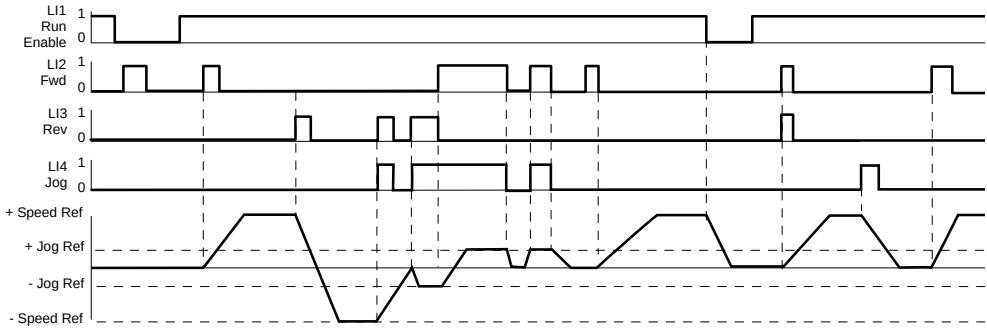

Figure 18: Timing Diagram for 3-Wire Command

The use of 3-wire command requires operator intervention after fault reset or restoration of power to restart the drive controller.

If 3-wire command is selected, LI1 is Stop, normally-closed. LI1 must be closed for the drive controller to run. The forward (LI2) or reverse (LI3, if assigned) input must momentarily transition to active to start the drive controller. If the drive controller is running and LI1 goes low, the drive controller will stop, following the normal ramp. If the drive controller is running and the keypad STOP key is pressed, regardless of whether the drive is in Keypad or Terminal mode, the drive controller will stop, following the normal ramp.

To restart the drive controller, the Run command (forward or reverse) must be set to low state. Then the drive controller will restart on the next Run command.

Jog is accomplished by pressing the Jog forward or Jog reverse push-button, with the input assigned to Jog wired into the forward and reverse inputs. Refer to manual VD0C06S304_, Receiving, Installation and Start-Up, for wiring diagram. The drive controller will jog as long as the Jog forward or Jog reverse push-button is held in.

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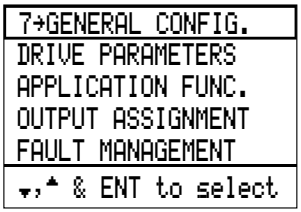
7→GENERAL CONFIGURATION MENU



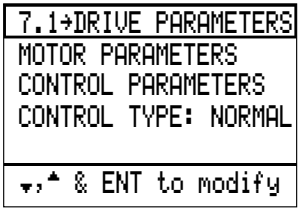
NOTE: This screen is modified when Mot. Select Switch is activated in the 7.2→Application Functions menu. See pages 83 to 89 for details.

The 7→General Configuration menu allows access to four sub-menus:

- 7.1→Drive Controller Parameters
- 7.2→Application Functions (including input assignments)
- 7.3→Output Assignments
- 7.4→Fault Management.

These menus can be accessed only if the drive controller is stopped.

7.1→Drive Parameters



NOTE: This screen is modified when Mot. Select Switch is activated in the 7.2→Application Functions menu. See pages 83 to 89 for details.

The 7.1→Drive Parameters menu allows access to basic motor and control parameters, and control type. The menu is accessible only if the drive controller is stopped and in **Terminal Command mode** (page 29). To verify adjustments, return to the Display screen by pressing F2, then start the motor. To readjust, stop the motor and return to the desired menu.

The parameter choices available on the sub-menus vary depending on the torque type selected from the 6.1→Torque Type menu, and the control type selected from the 7.13 (7.16, 7.19)→Control Type menu. See Table 7 on page 39.

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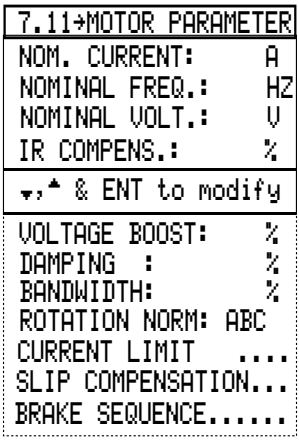
7.11 (7.14, 7.17) →Motor Parameters



NOTE: Menus 7.14 and 7.17 are available only when 2 Motors or 3 Motors is selected in Mot. Select Switch. Menu 7.11 is used for motor 1, menu 7.14 is used for motor 2, and menu 7.17 is used for motor 3. See pages 83 to 89 for instructions on configuring the drive controller for use with multiple motors.

Use the 7.11 (7.14, 7.17)→Motor Parameters menu to adjust basic motor parameters. The functions available from this menu vary depending on whether the drive controller is configured for constant or variable torque (page 34) and the type of control selected (page 61). Table 7 shows the functions available from the menu under the various types of control.

Adjustments to motor parameters are made either to sub-menus or directly on the 7.11 (7.14, 7.17)→Motor Parameters menu itself. To select a parameter, scroll with the ▲ and ▼ keys and press ENT. Adjust the parameter value to the desired setting, then press ENT to confirm.

Some motor parameters are also accessible from the 1→Parameter Setting menu. Any adjustments made to these parameters from the 7.11 (7.14, 7.17)→Motor Parameters menu are also automatically displayed in the Parameter Setting menu.

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Table 7 shows the selections available from the 7.11 (7.14, 7.17)→Motor Parameters menu under the various drive controller configurations.

Table 7: 7.11 (7.14, 7.17)→Motor Parameters Menu

	Constant Torque		Variable Torque
Normal Control	Nominal Current Nominal Frequency Nominal Voltage IR Compensation Damping Rotation Normalization Current Limit Slip Compensation Brake Sequence	**Normal Control**	Nominal Current Nominal Frequency Nominal Voltage Profile Damping Rotation Normalization Current Limit
High Torque (SVC) Control	Nominal Current Nominal Frequency Nominal Voltage IR Compensation Voltage Boost Damping Bandwidth Rotation Normalization Torque Limit Motor Torque Limit Generator Current Limit Slip Compensation Brake Sequence	**NOLD Control**	Nominal Current Nominal Frequency Nominal Voltage Damping Rotation Normalization Current Limit
Special Control (V/Hz)	Nominal Current Nominal Frequency Nominal Voltage IR Compensation Voltage Boost Damping Rotation Normalization Current Limit Slip Compensation Brake Sequence		

NOTE: Menus 7.14 and 7.17 are available only when 2 Motors or 3 Motors is selected in Mot. Select Switch. Menu 7.11 is used for motor 1, menu 7.14 is used for motor 2, and menu 7.17 is used for motor 3. See pages 83 to 89 for instructions on configuring the drive controller for use with multiple motors.

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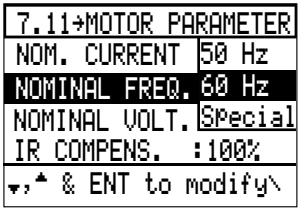
Nominal Current

Nominal Current is the motor nameplate value for full load current. Adjustable from 45% to 105% of the drive controller's current rating, the factory preset value is 90%. Set Nominal Current to equal the motor full load current. The Nominal Current parameter does not affect the maximum current that the drive controller can produce, i.e. Current Limit. However, changing the nominal current parameter can change the value of motor overload current in menu 1. Check and adjust, if necessary, the value of motor overload if nominal current is changed.

Nominal Frequency



Nominal Frequency corresponds to the point on the V / Hz curve beyond which voltage remains virtually constant and only frequency increases. Nominal Frequency often corresponds to the base frequency of the motor, which is usually the same as the line frequency of the connected power system. With special motors or applications, Nominal Frequency may be different than the connected power system line frequency.

Upon first power-up, the drive controller senses the connected power system frequency. If this value is 50 Hz, Nominal Frequency is set to 50 Hz. If it is 60 Hz, Nominal Frequency is set to 60 Hz. For Special motors and / or applications, select Special and enter a value between 25 and 400 Hz (ATV66U41 to ATV66C13, constant torque); 25 and 200 Hz (ATV66C15 to ATV66C31, constant torque); or 25 and 90Hz (variable torque).

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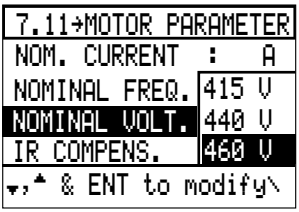
Nominal Voltage



Nominal Voltage corresponds to the point on the V / Hz curve beyond which voltage remains virtually constant and only frequency increases. Nominal Voltage is used with Nominal Frequency to determine the V / Hz baseline. Nominal Voltage often corresponds to the base voltage of the motor, which is usually the same as the line voltage of the connected power system. With special motors or applications, Nominal Voltage may be different than the connected power system line voltage.

On 460 V units, select the value of the motor supply voltage from the following: 380-400-415-440-460. Upon first power-up, if the input line is 50 Hz, the drive controller is configured for 400 V Nominal Voltage. If the input line is 60 Hz, the drive controller is configured for 460 V Nominal Voltage.

On 230 V units, select the value of the motor supply voltage from the following: 208-220-230-240. Upon first power-up, the drive controller is configured for 230 V for 50 Hz and 60 Hz input lines.

IR Compensation

IR Compensation is only available when the drive controller is configured for constant torque (page 34), with any of the control types (page 61). IR Compensation is used to adjust low speed torque for optimal performance. IR Compensation range is:

- 0 to 100% for Normal control type, factory preset to 100%
- 0 to 150% for High Torque control type, factory preset to 100%
- 0 to 800% for Special control type, preset to 100%

IR Compensation attempts to adjust or compensate for the resistive voltage drops of the motor stator windings and the conductors connecting the motor to the drive controller. This ensures good torque performance throughout the speed range of the drive controller. At every power-up, the drive controller attempts to measure the value of motor winding and feeder conductor resistance. See chapter 3 of VD0C06S304_, Receiving, Installation, and Start-Up, for further information. If the resistance cannot be measured (for instance in the case of an output contactor), default values stored in the drive controller for the particular motor horsepower selected are used.

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⚠ CAUTION

UNINTENDED EQUIPMENT ACTION

If the IR Compensation parameter is set too high, the motor may slowly rotate in a direction opposite to that commanded when starting.

- Adjust only when necessary.
- Read the following instructions before adjusting.
- For critical applications which cannot be rotated in the reverse direction such as extruders or pumps equipped with anti-rotation ratchets, uncouple the motor from the load after adjusting IR Compensation and check the motor for the proper rotation direction when starting.

Failure to follow these instructions can result in equipment damage.

Normally, if the drive controller is allowed to self-tune at least once with the selected motor, no adjustment of IR Compensation is required. However, if the drive controller cannot self-tune at least once during start up with the selected motor, adjustment of IR Compensation may be required. With the motor operating at rated torque, a properly adjusted IR Compensation will maintain the motor voltage (refer to the 4→Display Configuration menu) at a value equal to or slightly greater than the estimated value computed from the following formula over the frequency range of 30 to 90% of the motor nominal frequency as set in the 7.11 (7.14, 7.17)→Motor Parameters menu.

$$\text{Estimated Voltage} = \text{Drive Controller Output Frequency} \times \frac{\text{Motor Nameplate Voltage}}{\text{Motor Nameplate Frequency}}$$

If IR Compensation is set too high, the motor may not turn or it may slowly rotate in the reverse direction when commanded to start. Current limit will be active at this time. For critical loads which cannot be rotated in the reverse direction, always uncouple the motor from the load after making an adjustment to IR compensation and check the motor for the proper direction of rotation. If the IR Compensation is set too low, the available (peak) motor torque will be reduced.

When adjusting IR Compensation, the Current Limit parameter in the 7.11 (7.14, 7.17)→Motor Parameters menu should always be set to a value greater than the motor nameplate rated current, and Voltage Boost, also in the 7.11 (7.14, 7.17)→Motor Parameters menu should be set to zero. When a satisfactory value of IR Compensation has been found, operate the drive controller throughout its speed range with the expected motor load. The steady-state motor current (in the 4→Display Configuration menu) should not exceed motor nameplate current rating.

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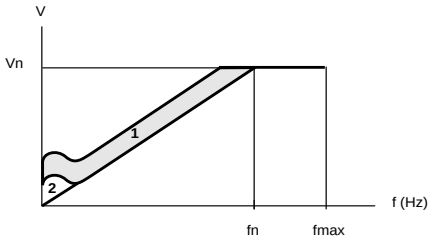
Voltage Boost



1 Zone within which the drive controller functions depending on the load and adjustments (IR Compensation)
2 Adjustment zone for voltage boost

Figure 19: Voltage Boost

Voltage Boost is available when the drive controller is configured for constant torque (page 34), with High Torque and Special control types (page 61). Voltage Boost allows for optimal voltage and torque boost during starting. This value corresponds to a voltage level at 0 Hz, and can be set between 0 and 100% of nominal voltage. Factory setting is 20%.

Normally, the factory setting of Voltage Boost is adequate for most applications. For loads which require moderate to high break-away torque to achieve initial rotation, adjustment of Voltage Boost may be required.

⚠ CAUTION

UNINTENDED EQUIPMENT ACTION

If Voltage Boost is set too high, the motor may slowly rotate in a direction opposite to that commanded when starting.

- Adjust only when necessary.
- Read the following instructions before adjusting.
- For critical applications which cannot be rotated in the reverse direction such as extruders or pumps equipped with anti-rotation ratchets, uncouple the motor from the load after adjusting Voltage Boost and check the motor for the proper rotation direction when starting.

Failure to follow these instructions can result in equipment damage.

Set Voltage Boost so that sufficient break-away torque is developed below 5 Hz for the motor to begin rotating. Increasing Voltage Boost increases available break-away torque. Before adjusting Voltage Boost, adjust IR Compensation if required. Always set the motor Current Limit in the 7.11 (7.14, 7.17)→Motor Parameters menu to greater than the motor nameplate rated current.

If Voltage Boost is set too low, the motor may remain stalled instead of accelerating to Low Speed when starting or it may not begin rotating until the speed reference is increased to 20 to 30% of motor nominal frequency. If Voltage Boost is set too high, the motor may not turn, or it may slowly rotate in the

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reverse direction when commanded to start. Current limit is active at this time. For critical loads which cannot be rotated in the reverse direction, always uncouple the motor from the load after adjusting Voltage Boost and check the motor for the proper direction of rotation.

When a satisfactory value of Voltage Boost has been found, operate the drive controller throughout its speed range with the expected motor load. The steady-state motor current (in the 4→Display Configuration menu) should not exceed the motor nameplate current rating.

Profile

Profile is used only when the drive controller is configured for variable torque (page 34), with Normal control type. This parameter shapes the V / Hz profile of the output. Profile can be set to a value between 0 and 100, factory preset to 20. Enter the Profile value directly onto the 7.11 (7.14, 7.17)→Motor Parameters menu.

During changes in speed command, the V / Hz profile becomes linear, intersecting the Vn and fn points of Figure 20. As a result, there is no reduction in available motor torque during speed changes.

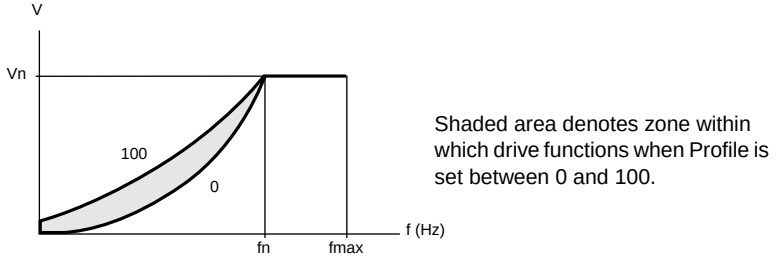

Figure 20: Profile

Profile is not available when NOLD control type is selected.

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Damping

Damping is available with any drive controller configuration (page 34). This parameter adjusts the integral gain of the frequency loop to match the inertial response of the load to the frequency response of the drive controller.

The adjustable range varies with the drive controller configuration:

- 1 to 100% for Normal and High Torque control with constant torque configuration
- 1 to 100% for NOLD control with either variable torque configuration
- 1 to 800% for Special control with constant torque configuration
- 1 to 800% for Normal control with either variable torque configuration

When Damping is properly adjusted and the drive controller is not in current limit or ramp modification, the motor speed should follow the speed reference ramp without oscillation and with little overshoot. During steady-state operation with constant load, the motor speed should remain constant with no oscillation. If the motor load changes, the drive controller should correct the motor speed disturbance rapidly with little or no oscillation.

The factory preset value of Damping is 20% which corresponds to 1.5 times the factory set motor inertia for the selected motor power rating. For most applications, no adjustment of Damping should be required. However, for some high inertia applications (centrifuges, grinders, traction control, etc.) Damping may require adjustment.

If the motor speed oscillates or overshoots the desired speed during changes in the motor speed reference or during steady-state operation with constant load, Damping is set too low and should be increased. If the motor speed varies excessively or oscillates during motor load changes, Bandwidth may also require adjustment (if the controller is set for constant torque with high torque control type). If the motor speed follows the speed reference ramp sluggishly or tends to vary during steady-state operation with constant load, Damping is set too high and should be decreased.

Bandwidth

A second frequency loop gain called Bandwidth is available with Damping when the drive controller is configured for constant torque (page 34) with High Torque control type (page 61). Bandwidth increases speed response, causing the drive controller to react faster to a change in speed or a load impact.

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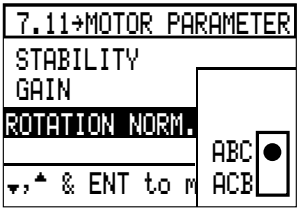
Bandwidth can be set to a value between 0 and 100%. Factory setting is 20%. For most applications, no adjustment of Bandwidth should be required. For applications where motor speed or load changes occur rapidly, the Bandwidth setting can be adjusted to optimize the drive controller response to these changes. Increasing the Bandwidth setting will allow the drive controller to respond to rapid variations in speed or load. Decreasing the Bandwidth setting lessens the drive controller's ability to respond. If set too high for a given application, the drive controller output frequency can exhibit instability or excessive sensitivity to load disturbances at the commanded speed.

To optimize dynamic performance of the drive controller in response to rapid changes in speed reference, always adjust the Damping parameter first with the Bandwidth parameter set at factory preset value. Once Damping is adjusted for minimum speed overshoot, then adjust Bandwidth for rapid speed response and minimum disturbance from load changes.

Rotation Normalization



Rewiring the input terminals L1, L2, and L3 will not change the direction of motor shaft rotation; therefore with the Rotation Normalization parameter, direction of rotation can be inverted from ABC to ACB in order for the motor shaft rotation to agree with the forward and reverse logic inputs. Neither the drive controller nor the motor has to be rewired. Select desired phase rotation and press ENT. Factory setting is ABC, corresponding to U / T1, V / T2, W / T3.

Torque Limit Motor and Torque Limit Generator

These two parameters allow the limitation of torque, independent of current limit, with separate adjustment for the motor and generator (drive controller with dynamic braking) quadrants. Both parameters can be set to a value between 0 and 200% of nominal motor torque, factory preset at 200%.

When using generator torque limit, the overspeed function is active. If the action of the generator torque limit causes the actual motor frequency to be greater than the desired motor frequency by≈10 Hz, then an overspeed trip will occur.

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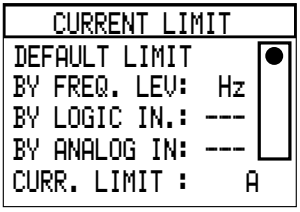
Current Limit



Current Limit can be set to a value between 40 and 150% of drive controller output current if the drive controller is configured for constant torque, or from 40 to 110% of drive controller output current for variable torque configurations. Default value for constant torque configuration is 150% of drive controller output current if input frequency is 60 Hz, or 136% if input frequency is 50 Hz. Default value for variable torque configuration is 110% of drive controller output current. Note that the Current Limit value is not affected by the Nominal Current parameter set in the 7.11→Motor Parameters menu.

⚠ CAUTION

UNINTENDED EQUIPMENT ACTION

If Current Limit is set to less than the no-load current of the motor, unstable operation of the drive controller may result. The setting of Current Limit may also affect the performance of IR Compensation and Voltage Boost.

After adjusting Current Limit, operate the drive controller throughout its speed range with expected motor load. Ensure that:

- The motor rotates in the correct direction.
- Rotation occurs even with small (2-3 Hz) values of speed reference.
- The steady-state motor current does not exceed the motor nameplate current rating.

For critical applications which cannot be rotated in the reverse direction such as extruders or pumps equipped with anti-rotation ratchets, uncouple the motor from the load after adjusting Current Limit and check the motor for the proper rotation direction when starting.

Failure to follow these instructions can result in equipment damage.

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The value of Current Limit can affect the operation of other drive controller functions. If Current Limit is set to less than the motor no-load current, then unstable operation of the motor may result. In addition, the setting of Current Limit may affect performance of IR Compensation and Voltage Boost. After adjusting Current Limit, operate the drive controller throughout its speed range. The motor should always start in the correct direction and should rotate even with low (2-3 Hz) values of speed reference. The steady-state motor current should not exceed the motor nameplate current rating. For critical loads which cannot be rotated in the reverse direction, always uncouple the motor from the load after adjusting Current Limit and check the motor for the proper direction of rotation.

Set Current Limit to Default Limit, or enter a reduced value and select one of the activation methods:

- Frequency Level: when the drive controller exceeds the programmed frequency level the reduced Current Limit value is activated. To keep the reduced Current Limit value active at all times, set frequency level to 0.
- Logic Input: assign a logic input to Current Limit (see Figure 23 for procedure). When the assigned logic input is low (state 0), the Current Limit value is the default setting. When it is high (state 1), the Current Limit is the reduced value.
- Analog Input: assign an analog input to Current Limit (see Figure 22 for procedure). The set current limit is ignored and the analog input is scaled so that the adjustment range of current limit is 40% to 150% of the drive controller current for constant torque configurations and 40% to 110% of the drive controller current for variable torque type configurations. This function could be used as a drive current reference for motor torque control.

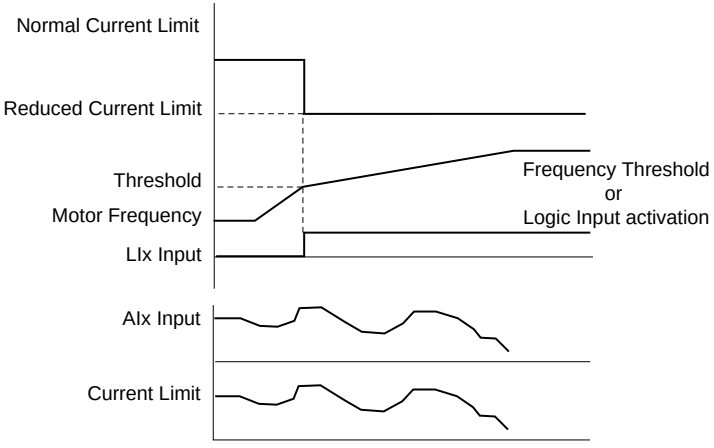

Figure 21: Current Limit Timing

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Reassigning Analog and Logic Inputs

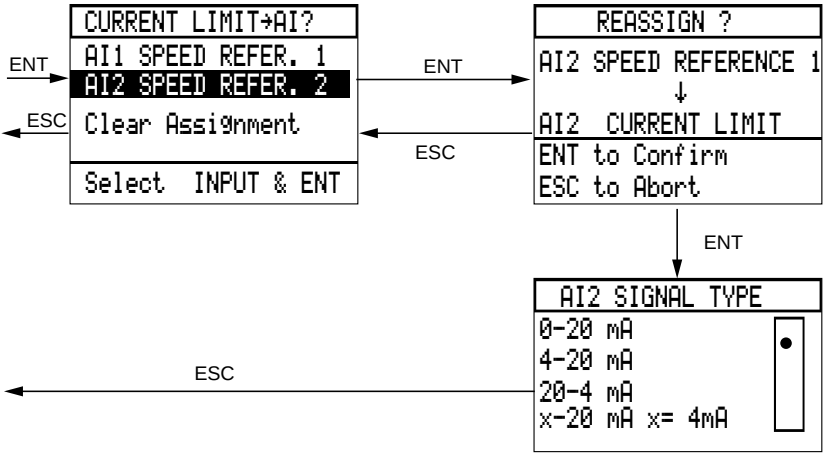

Figure 22: Reassigning Analog Inputs

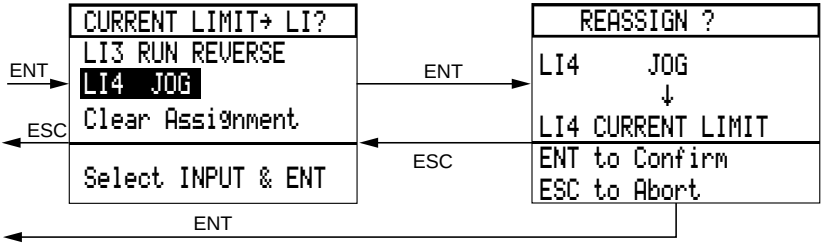

Figure 23: Reassigning Logic Inputs

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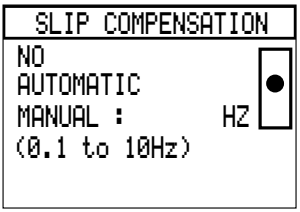
Slip Compensation



Slip compensation is available only when the drive controller is configured for constant torque (page 34), with any of the control types (page 61). Slip Compensation improves steady state speed regulation by controlling output frequency based on motor slip. For applications such as synchronous reluctance motors that do not require slip compensation, the function can be disabled by selecting No.

If Slip Compensation is activated, two choices are available: Automatic and Manual. Automatic is the factory setting for Slip Compensation and requires no further adjustments. The amount of frequency added to the output is dependent on the reference frequency. With Manual Slip Compensation, enter a value between 0.1 and 10 Hz (factory setting is 3 Hz). This constant value is scaled according to motor load and added to output frequency throughout the speed range. If Manual is selected, this value also appears in the 1→Parameter Setting menu.

To estimate the setting for Slip Compensation, use the following formula:

$$\text{Slip Frequency} = \text{Motor Nameplate Frequency} - \frac{\text{Motor Nameplate rpm} \times \text{Number of Poles}}{120}$$

For example, for a 4-pole motor with 60 Hz nameplate frequency and 1750 rpm, the estimated setting of the slip frequency would be:

$$\text{Slip Frequency} = 60 - \frac{1750 \times 4}{120} = 1.7 \text{ Hz}$$

Although the Slip Compensation setting is active over the entire operating frequency and load range of the drive controller, actual operation is best observed when the speed reference value is greater than 20 Hz but less than the motor nameplate frequency. When properly adjusted, the actual motor speed at full load should approximately equal the motor no-load speed. If the no-load speed is greater than the full-load speed, increase the slip frequency value. If the no-load speed is less than the full-load speed, reduce the slip frequency value.

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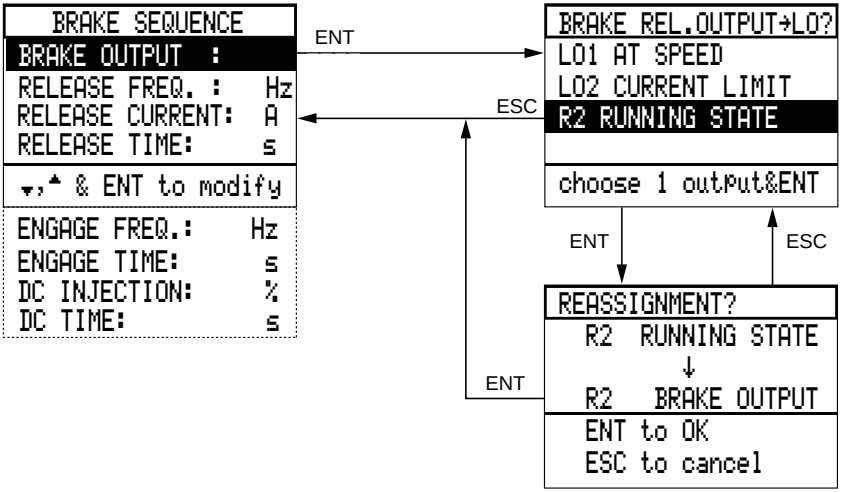
Brake Sequence



Brake Sequence, available with constant torque configuration only (page 34), is used to activate and coordinate a mechanical brake actuator. It allows you to coordinate the sequencing of drive controller output, mechanical brake actuation, and DC injection for smooth starting and stopping. To use Brake Sequence, reassign a logic output for brake output command as shown above, then enter values for the parameters specific to the application. Brake Sequence parameters are described in Table 8.

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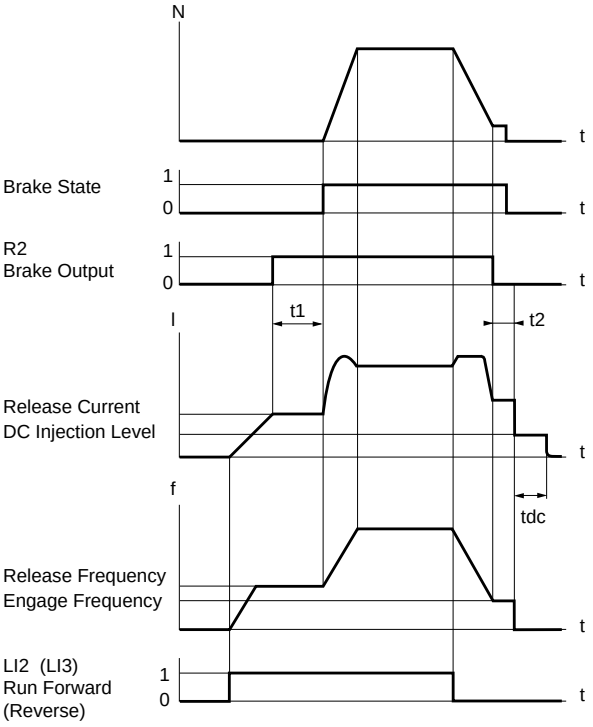

Figure 24: Timing Diagram for Brake Sequence

Table 8: Brake Sequence Parameters

Parameter	Description	Range	Default
Brake Output	Can be assigned to any available logic or relay output. Brake Output changes state when both Release Frequency and Release Current reach their programmed values.	—	—
Release Frequency	Programmable frequency level.	0-Low Speed	0 Hz
Release Current	Programmable current level.	0-100% Motor Nominal Current	0%
Release Time (t1)	The delay between the points when both Release Frequency and Release Current are reached, and when the drive controller begins its acceleration ramp.	0-5 s	0 s

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Table 8: Brake Sequence Parameters (Continued)

Parameter	Description	Range	Default
Engage Frequency	When drive controller receives a Stop command, it follows active deceleration ramp until it reaches the programmed Engage Frequency. At this point, the Brake Output changes state and a delay of Engage Time begins.	0-Low Speed	0 Hz
Engage Time (t2)	Delay between when the Engage Frequency is reached and DC is injected.	0-5 s	0 s
DC Injection Level	Sets the DC current level used for injection braking. Braking torque depends on motor characteristics.	50-150% of motor nominal current	70%
DC Brake Time	Time for which DC is injected.	0-30.1 s	2 s

⚠ WARNING

NO HOLDING TORQUE

- DC injection braking does not provide holding torque at zero speed.
- DC injection braking does not function during loss of power or drive controller fault.
- When required, use separate brake function for holding torque.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ CAUTION

MOTOR OVERHEATING AND DAMAGE

Application of DC injection braking for long periods of time can cause motor overheating and damage. Protect motor from extended periods of DC injection braking.

Failure to follow these instructions can result in injury or equipment damage.

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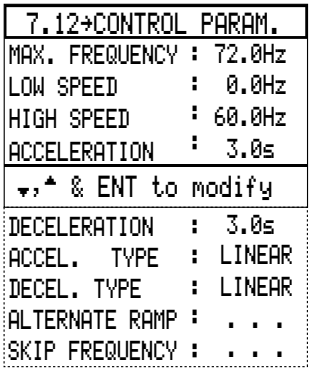
7.12 (7.15, 7.18)→Control Parameters



NOTE: Menus 7.15 and 7.18 are available only when 2 Motors, 3 Motors, 2 Parameters, or 3 Parameters is selected in Mot. Select Switch. Menu 7.12 is used for motor 1 or control parameters 1, menu 7.15 is used for motor 2 or control parameters 2, menu 7.18 is used for motor 3 or control parameters 3. See pages 83 to 89 for instructions on configuring the drive controller for use with multiple motors or multiple control parameter sets.

The 7.12 (7.15, 7.18)→Control Parameters menu allows access to basic drive controller parameters. The default or previously programmed values for each parameter appear in the right column of the menu.

Adjustments to control parameters are made either to submenus or directly on the 7.12 (7.15, 7.18)→Control Parameter menu. To select a parameter, scroll with the ▲ and ▼ keys and press ENT. Adjust the parameter to the desired setting, then press ENT to confirm.

The Control Parameters are discussed in detail in the following pages. Some parameters are also accessible from the 1→Parameter Setting menu. Any adjustments made to these parameters from the 7.12 (7.15, 7.18)→Control Parameters menu are also displayed in the 1→Parameter Setting menu.

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Maximum Frequency

⚠ CAUTION

MACHINERY OVERSPEED

- Some motors and/or loads may not be suited for operation above nameplate motor speed and frequency. Consult motor manufacturer before operating motor above rated speed.
- Under certain steady-state and transient conditions, the output frequency may reach 120% of Maximum Frequency setting. Adjust Maximum Frequency parameter accordingly.

Failure to follow these instructions can result in injury or equipment damage.

Maximum Frequency clamps the High Speed setting. Adjustable ranges for Maximum Frequency are:

- Constant torque:
  - — ATV66U41 to ATV66D79: Nominal Frequency, set in the 7.11 (7.14, 7.17)→Motor Parameters menu, to 400 Hz
  - — ATV66C10 to ATV66C31: Nominal Frequency to 200 Hz
- Variable torque: Nominal Frequency to 90 Hz

Factory setting is 60 Hz if the input line frequency is 50 Hz, or 72 Hz for an input line frequency of 60 Hz.

Low Speed

Low Speed corresponds to the lower limit of the speed reference at AI1 or AI2 (see Figure 25) and limits the minimum commanded running frequency to a value between 0 and High Speed. It does not affect the starting frequency. If the drive controller is commanded to run below the programmed Low Speed, the output will be limited to the Low Speed value. Factory setting is 0 Hz.

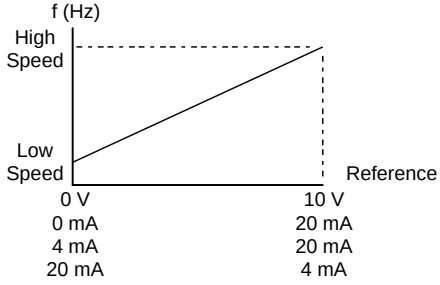

Figure 25: Speed Reference

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High Speed

High Speed corresponds to the upper limit of the speed reference at AI1 or AI2 (see Figure 25) and limits the maximum commanded running frequency to a value between Low Speed and Maximum Frequency. If the drive controller is commanded to run above the programmed High Speed, the output will be limited to the High Speed value. Factory setting is 50 Hz if input frequency is 50 Hz, or 60 Hz for an input frequency of 60 Hz.

Acceleration Time

Acceleration Time is adjustable between 0.1 and 999.9 seconds and represents the time the drive controller will take to accelerate between 0 Hz and Nominal Frequency, set in the 7.11 (7.14, 7.17)→Motor Parameters menu (page 40). Acceleration Time determines the base line slope used by the drive controller to accelerate between frequencies. Factory setting is 3 seconds.

If the acceleration slope is too steep for the motor to accelerate the connected load, the acceleration slope will be modified to minimize the possibility of a nuisance trip.

Deceleration Time

Deceleration Time is adjustable between 0.1 and 999.9 seconds and represents the time the drive controller will take to decelerate between Nominal Frequency, set in the 7.11 (7.14, 7.17)→Motor Parameters menu (page 40), and 0 Hz. Deceleration Time determines the base line slope used by the drive controller to decelerate between frequencies. Factory setting is 3 seconds.

If the deceleration slope is too steep for the motor to decelerate the connected load, the deceleration slope will be modified to minimize the possibility of a nuisance trip.

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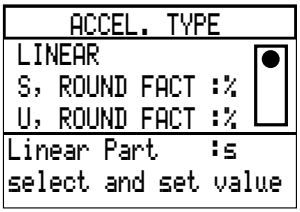
Acceleration Type



This parameter determines the type of acceleration ramp the drive controller will follow when a Run command is issued. The ramp type applies to Acceleration Time only. If Alternate Ramps is active (page 59), both acceleration ramps will be linear, overriding the previously set acceleration ramp type. The three Acceleration Ramp Types are:

- Linear Acceleration (factory setting)
- “S” Curve Acceleration
- “U” Curve Acceleration

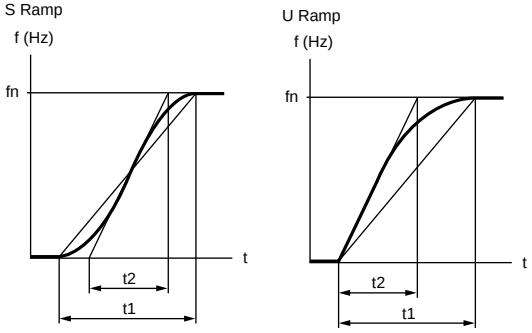


Figure 26: “S” and “U” Acceleration Ramps

“S” Curve Acceleration optimizes smoothness and reduces consequent shock as the drive controller accelerates from current speed to setpoint speed. Adjust the “S” Curve ramp to a percentage of total acceleration time (t1) between 0 and 100%. Factory setting is 20%. This scaling factor adjusts the degree of curvature of the acceleration profile, affecting the linear part (t2) of the total acceleration time. When Percentage S is set, the linear acceleration time (t2) is displayed.

“U” Curve Acceleration is characterized by an initial steep rate of acceleration followed by a decreasing acceleration rate. This gets variable torque load types started fast at low speed where there is limited load. Adjust the “U” Curve ramp to a percentage of total acceleration time (t1) between 0 and 100%. Factory setting is 50%. This scaling factor adjusts the degree of curvature of the acceleration profile, affecting the linear part (t2) of the total acceleration time. When Percentage U is set, the linear acceleration time (t2) is displayed.

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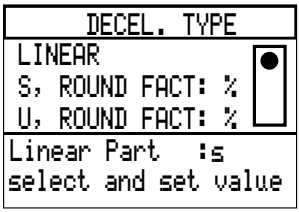
Deceleration Type



This parameter determines the type of deceleration ramp the drive controller will follow when a Stop command is issued. The ramp type specified here applies to Deceleration Time only. If Alternate Ramps is active (page 59), both deceleration ramps will be linear, overriding the previously set deceleration ramp type. The possible settings for Deceleration Ramp Type are:

- Linear Deceleration (factory setting)
- “S” Curve Deceleration
- “U” Curve Deceleration

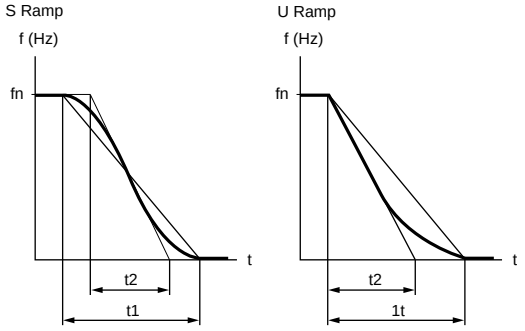


Figure 27: “S” and “U” Deceleration Ramps

“S” Curve deceleration optimizes smoothness and reduces consequent shock as the drive controller decelerates from current speed to setpoint speed. Adjust the “S” Curve ramp to a percentage of total deceleration time (t1) between 0 and 100%. Factory setting is 20%. This scaling factor adjusts the degree of curvature of the deceleration profile, affecting the linear part (t2) of the total deceleration time. When Percentage S is set, the linear deceleration time (t2) is displayed

“U” Curve Deceleration is characterized by an initial steep rate of deceleration followed by a decreasing deceleration rate. Adjust the “U” Curve ramp to a percentage of total deceleration time (t1) between 0 and 100%. Factory setting is 50%. The Percentage U scaling factor adjusts the degree of curvature of the deceleration profile affecting the linear part (t2) of the total deceleration time. When Percentage U is set, the linear deceleration time (t2) is displayed.

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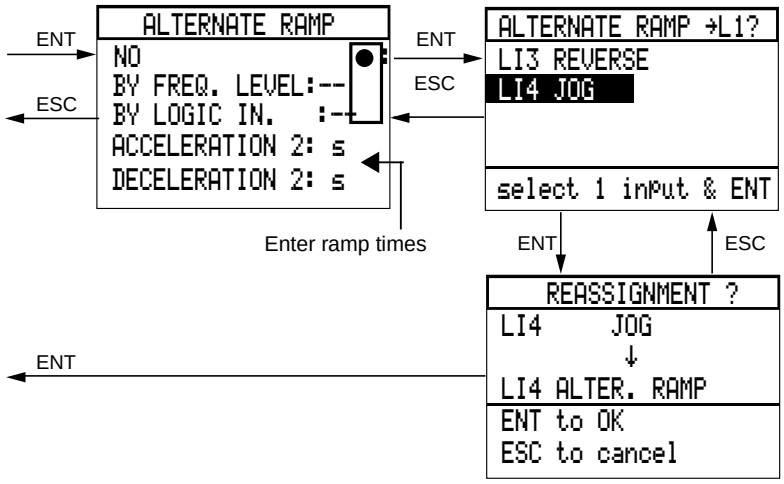
Alternate Ramps



Alternate acceleration and deceleration ramps can be programmed to times between 0.1 and 999.9 seconds with the Acceleration 2 and Deceleration 2 parameters which appear in this menu and in the 1→Parameter Setting menu. The alternate ramps are linear, and can only be activated together. Two methods of activation are possible. **Frequency Level**: when the drive controller exceeds the programmed frequency level, the alternate ramps are activated. As the drive controller decelerates below the frequency level, the primary ramps become active again. **Logic Input**: a logic input can be assigned to activate the alternate ramps. To enable Alternate Ramps, choose the activation method and set the ramp times. Assign a logic input or specify a frequency level. When Alternate Ramps are used, ramp types can only be set for Linear.

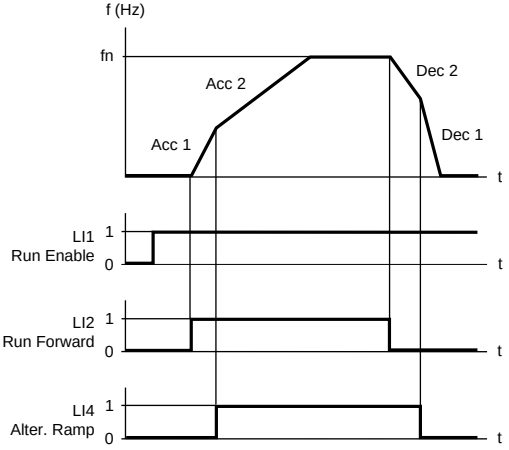


Figure 28: Alternate Ramp Activation

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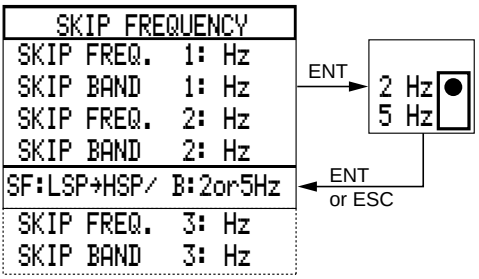
Skip Frequencies



Skip Frequencies 1, 2 and 3 are used to avoid mechanical resonance. The adjustable range for skip frequencies is:

- From 0 Hz (page 15) to 400 Hz (ATV66U41 to ATV66D79, constant torque)
- From 0 Hz to 200 Hz (ATV66C10 to ATV66C31, constant torque)
- From 0 Hz to 90 Hz (variable torque)

The three skip points may overlap each other. Skip Bands of 2 or 5 Hz can be selected. If a reference is set in a skip frequency band, the drive controller will not run in that band. Ramps are not modified in the skip frequency bands.

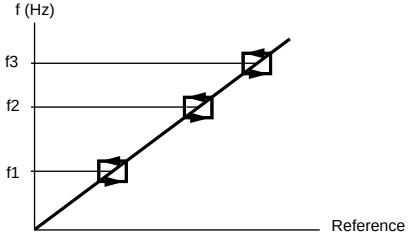


Figure 29: Skip Frequency

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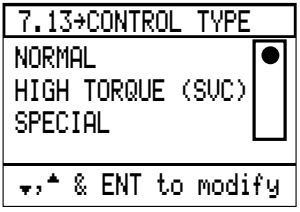
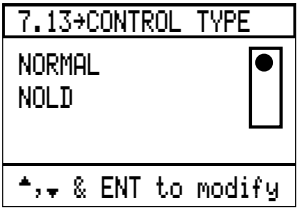
7.13 (7.16, 7.19)→Control Type

Constant torque



Variable torque



NOTE: Changing Control Type or Torque Type (in the 6.1→Torque Type menu) resets the motor parameters in menu 7.11 (7.14, 7.17) to factory settings.

NOTE: Menus 7.16 and 7.19 are available only when 2 Motors or 3 Motors is selected in Mot. Select Switch. Menu 7.13 is used for motor 1, menu 7.16 is used for motor 2, and menu 7.19 is used for motor 3. High Torque is not available in menus 7.16 and 7.19. See pages 83 to 89 for instructions on configuring the drive controller for use with multiple motors.

The selections available from the 7.13 (7.16, 7.19)→Control Type menu depend on whether the drive controller is configured for constant or variable torque.

Normal

Normal control is the factory setting for both constant and variable torque configurations. Normal is a sensorless flux vector control. In order to create high torque at low speeds, the drive controller maintains a 90° phase relationship between the rotor and stator electromagnetic fields by continuously calculating the position of the rotor in relation to the electrical position of the stator. It is generally applicable on asynchronous motors and provides good torque performance. Because there are fewer parameters than with the High Torque control type, less tuning is required. When using Normal control, the motor horsepower must be equal to or one horsepower size less than the drive controller horsepower.

When Normal control type is used on a constant torque configuration, self-tuning is active. When the drive controller is powered up, a pulse of direct current equal to motor rated current is injected into the motor, allowing the drive controller to determine the resistance of the motor to set the motor parameters.

High Torque

High torque control is also a sensorless flux vector control, available when the drive controller is configured for constant torque. In order to create high torque at low speeds, the drive controller maintains a 90° phase relationship between the rotor and stator electromagnetic fields by continuously calculating the

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position of the rotor in relation to the electrical position of the stator. High Torque provides more flexible setup and optimized parameters than the Normal control type, therefore offering better torque performance. Select this control type when controlling only one motor in constant torque configuration. When using High Torque control, the motor horsepower must be equal to or one horsepower size less than the drive controller horsepower.

When High Torque control type is used, self-tuning is active. When the drive controller is powered up, a pulse of direct current equal to motor rated current is injected into the motor, allowing the drive controller to determine the resistance of the motor to set the motor parameters.

High Torque control type is not available in menus 7.16 and 7.19 when using the Mot. Select Switch feature.

Special

The Special control type, available when the drive controller is configured for constant torque, maintains a constant volts / frequency ratio throughout the speed range. For example, if the voltage to the motor is 460 V at 60 Hz, it will be 230 V at 30 Hz, functioning as a current limited power supply.

Use Special control when controlling synchronous permanent magnet motors, synchronous wound-field motors, and synchronous reluctance motors.

NOLD (No Load)

NOLD control is only available when the drive controller is configured for variable torque. For the NOLD control type, the V / Hz profile is linear, intersecting the Vn and fn points of Figure 11 on page 20 during changes in speed command or changes in motor load. During steady-state operation, the slope of the V / Hz line is automatically adjusted to reduce the voltage on the motor, depending on load, at any given speed. If a motor speed change is commanded or the motor load changes, the initial V / Hz profile is immediately reestablished.

The NOLD control type differs from the Normal control type in the following way:

- Motor voltage reduction can occur even at motor nominal frequency for applications where the motor load varies.

Operation with NOLD control type generally results in reduced audible motor noise without reducing motor RPM. In some cases (particularly with motors whose horsepower rating is less than 10 hp), improved motor efficiency may result. NOLD control should not be used with motors in parallel.

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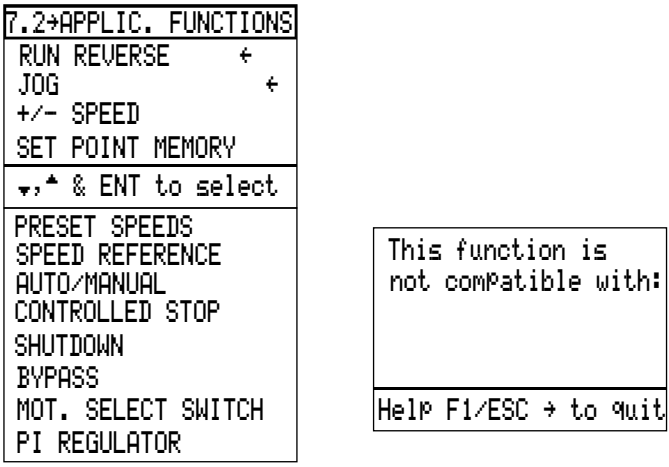
7.2→Application Functions



Use the 7.2→Application Functions menu to assign functions to the logic inputs and outputs. Arrows indicate functions which have been assigned. Factory settings are Run Reverse (assigned to the LI3 input) and Jog (assigned to the LI4 input).

The number of functions assignable is limited by the number of inputs / outputs required by a function (see Table 9), the number of inputs / outputs on the drive controller available to be reassigned, and by compatibility of the selected functions (see Figure 30). The selection of a function which is not compatible with one already selected causes the message illustrated above to appear on the terminal screen.

The drive controller has two logic inputs that can be reassigned. If more inputs / outputs are required, an I / O Extension module can be ordered. Refer to the catalog (document number VD0C06S201_) for more information.

Table 9: Logic I/O Required by Application Functions

Application Function	No. of LI Inputs Used [1]	No. of AI Inputs Used	No. of LO or R2 Outputs Used
Run Reverse	1	0	0
Jog	1	0	0 or 1
+Speed/-Speed	2	0	0
Setpoint Memory	1	0	0
Preset Speeds	1 or 2	0	0

[1] The only LI inputs which can be reprogrammed are LI3 and LI4. LI1 is fixed as Run Enable, and LI2 is fixed as Run Forward. If more inputs are required, the I/O Extension Module can be ordered. See catalog (document VD0C06S201_) for more information.

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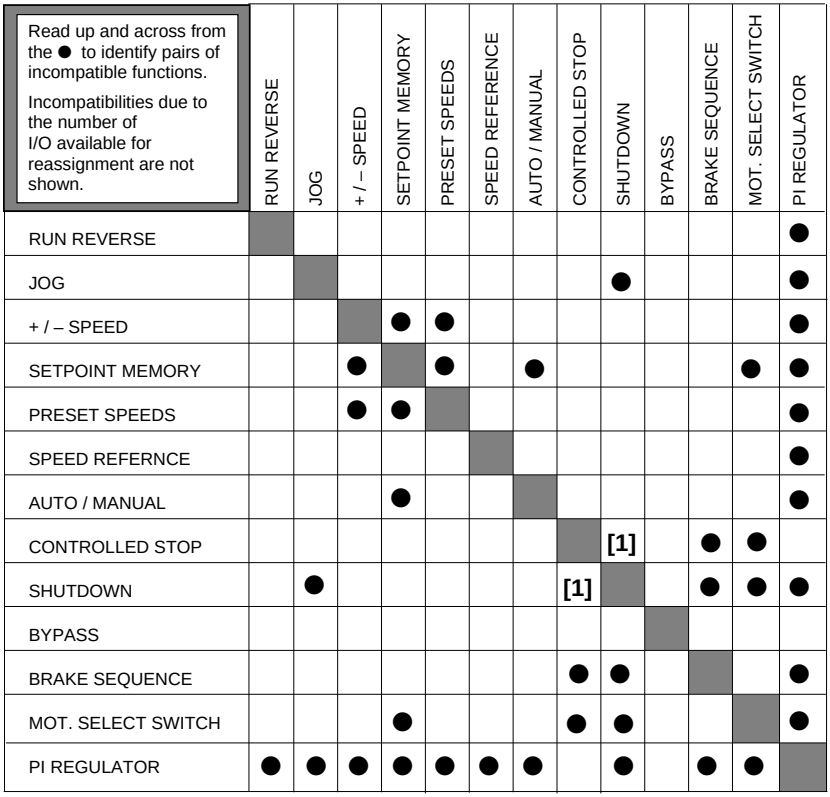
Table 9: Logic I/O Required by Application Functions (Continued)

Application Function	No. of LI Inputs Used [1]	No. of AI Inputs Used	No. of LO or R2 Outputs Used
Speed Reference	0	1 or 2	0
Auto/Manual	1 or 2	0	0
Controlled Stop	0 or 1	0	0
Shutdown	0	0	0 or 1
Bypass	2	0	1
Mot. Select Switch	0, 1, or 2	0	0
PI Regulator	0, 1, or 2	0, 1, 2, or 3	0, 1, 2, or 3

[1] The only LI inputs which can be reprogrammed are LI3 and LI4. LI1 is fixed as Run Enable, and LI2 is fixed as Run Forward. If more inputs are required, the I/O Extension Module can be ordered. See catalog (document VD0C06S201_) for more information.



[1] Shutdown is incompatible with Controlled Stop by Frequency Threshold and Controlled Stop by Frequency Threshold/Logic Input.

Figure 30: Application Function Incompatibilities

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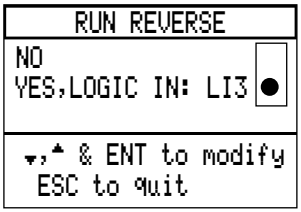
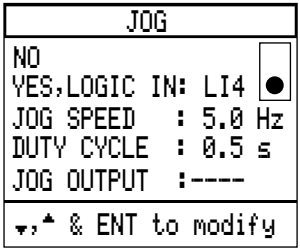
Run Reverse



The drive controller runs in reverse when the assigned input is high. The input will be a maintained signal if 2-wire control is selected, or edge-triggered with 3-wire control. Select control type on the 6.2→Command Type menu. If forward and reverse inputs occur simultaneously, the forward command has priority.

Input LI3 is factory assigned to Run Reverse. If the motor only rotates in forward direction, the LI3 input can be reassigned.

Jog



To enable the Jog function, select yes, set Jog speed to a value from 0.2 to 10 Hz, and adjust Duty Cycle from 0.2 to 10 seconds. Factory preset Jog speed is 5 Hz, and factory preset Duty Cycle is 0.5 seconds.

In 2-wire command, when Run Enable (LI1) and a direction input are high, the drive controller runs at the programmed jog speed for as long as the jog input is high. In 3-wire command, when Run Enable (LI1) is high, the drive controller runs at the programmed jog speed for as long as the jog forward or jog reverse push button is held high (for wiring refer to VD0C06S304_, Receiving, Installation, and Start-Up). Time between jog pulses is determined by the programmed Duty Cycle. Acceleration and deceleration ramps are automatically calculated to allow speed changes as quickly as possible without overcurrent trip.

LI4 is factory assigned to Jog input. If the application does not require the Jog function, the input can be reassigned.

An output can be assigned to indicate that the drive controller has been commanded to jog.

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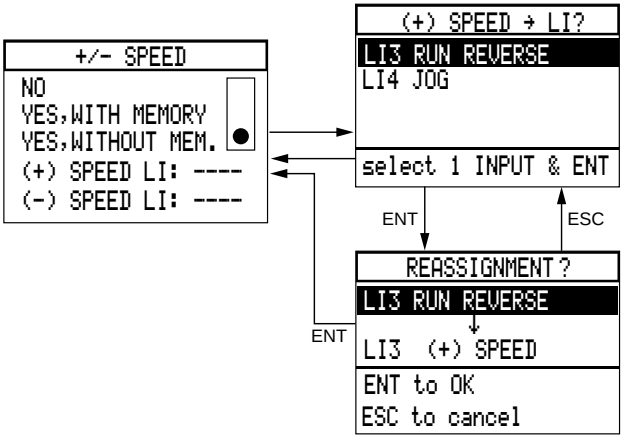
+Speed/-Speed



This function allows the assigned logic inputs to increase (+Speed) or decrease (-Speed) output frequency. If the logic input assigned to +Speed is high, the drive controller increases output frequency to a value limited by the reference frequency at a rate determined by the active acceleration ramp. When the input goes low, speed is maintained.

If the logic input assigned to -Speed is high, the drive controller decreases output frequency to a value limited by low speed at a rate determined by the active deceleration ramp. When the input goes low, speed is maintained.

If both logic inputs are high simultaneously, the -Speed input has priority and output frequency decreases.

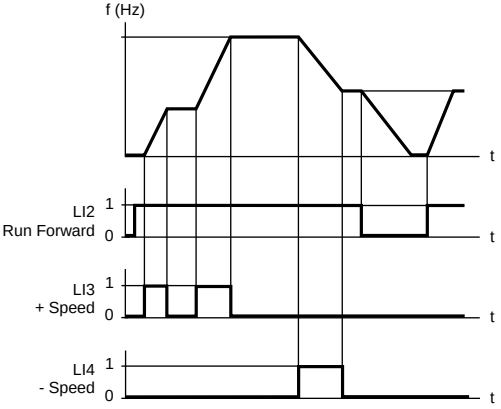


Figure 31: +Speed/-Speed Timing Diagram

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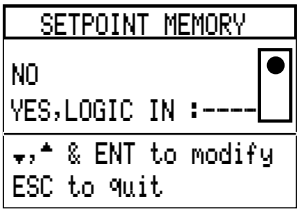
+Speed / -Speed can be selected with or without memory. With memory, the drive controller stores its last speed. In this mode, if the drive controller is stopped and then started again, it accelerates to its last speed. Memory remains even if power cycled. If +Speed / -Speed is enabled without memory, the beginning speed will be zero when a Run command occurs. Figure 31 illustrates timing sequence with memory.

Setpoint Memory



Setpoint memory allows a PLC or similar device to control the speed of several drive controllers with a single analog reference (current or voltage) and one logic input per drive controller.

If the programmed logic input assigned to a given drive controller goes high for 0.1 seconds or longer, that drive controller will read and store the analog reference available at that time. This value is stored until the next time the logic input goes high, or until the direction command is removed.

To enable the function, select Yes and assign a logic input.

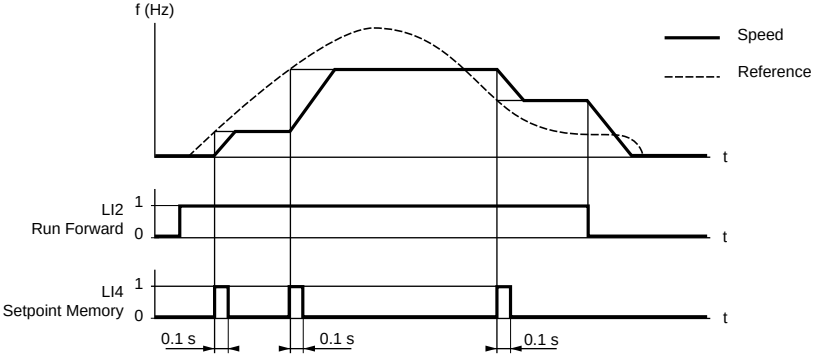


Figure 32: Setpoint Memory Timing Diagram

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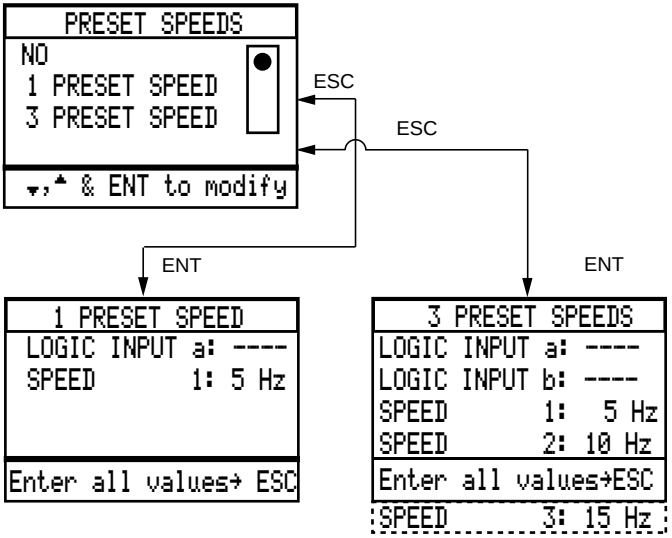
Preset Speeds



This function allows you to program up to three preset speeds. If one preset speed is required, one logic input must be assigned. Two logic inputs must be assigned if three preset speeds are required.

The preset speeds are adjustable from 0.1 to 400 Hz (ATV66U41 to ATV66D79, constant torque); 0.1 to 200 Hz (ATV66C10 to ATV66C31, constant torque), or 0.1 to 90 Hz (variable torque). The actual running speed is limited to the setting of High Speed. The programmed values must increase consecutively from speeds 1, 2, and 3. If both logic inputs are low, the speed will be the speed reference, if present, or low speed. The factory preset value for one Preset Speed is 5 Hz, for three Preset Speeds 5, 10 and 15 Hz.

Table 10 gives input states for activation of 3 Preset Speeds. If 1 Preset Speed has been selected, the speed is active when the assigned input is high.

Table 10: Logic Input States for 3 Preset Speeds

	Input a	Input b
Low Speed or Reference	0	0
Preset Speed 1	1	0
Preset Speed 2	0	1
Preset Speed 3	1	1

Seven preset speeds can be obtained with the I/O Extension Module. For more information refer to the catalog (document number VD0C06S201_).

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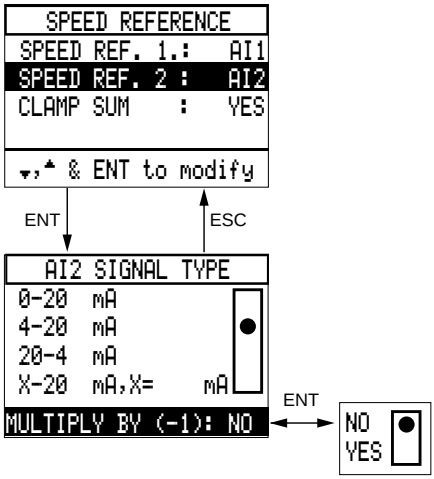
Speed Reference



Speed Reference allows the assignment of the AI1 and AI2 inputs as Speed Reference 1 or Speed Reference 2.

Speed Reference also allows you to modify the analog current input, AI2, for type of signal. The adjustment range is 0-20 mA, 4-20 mA, 20-4 mA, or x-20 mA where x can be programmed from 0 to 20 mA in increments of 0.1 mA. Factory setting for AI2 is 4-20 mA. When Speed Reference is set to x-20 mA, the frequency at which the drive controller will run is determined as follows:

$$f = (\text{High Speed} - \text{Low Speed})(\text{Input mA} / 20\text{ mA}) + \text{Low Speed}$$

When the value of A12 is below x mA, the drive will run at the Low Speed setting.

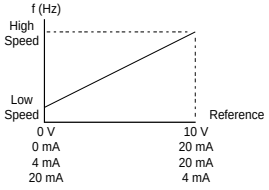


Figure 33: Speed Reference and Drive Controller Frequency

If the switch on the control board is set to voltage, AI2 will be a 0-5 V voltage input. Refer to the Receiving Installation and Start-Up manual (document number VD0C06S304_) for location of switch. AI2 in this case must be set on the keypad display for 0-20 mA. The voltage reference input, AI1, cannot be modified. It is fixed as a 0 to 10 VDC input.

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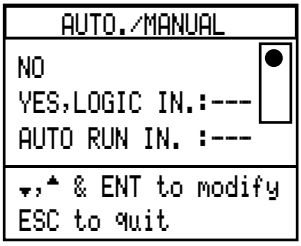
The two inputs, AI1 and AI2, are summed as a factory default, limited to High Speed. However, when Auto / Manual is active the inputs function independently and only one is active at a time. It is possible to multiply AI2 by (-1) by selecting Yes. In this case, AI2 is subtracted from AI1. If Clamp Sum is set to Yes (factory setting) and (AI1-AI2) is zero or negative, the drive controller will run at Low Speed. If Clamp Sum is set to No and (AI1-AI2) is negative, the drive controller will change direction.

The directional change will affect both the forward and reverse input, as well as the JOG function.

NOTE: If 20-4 mA is selected, user should consider effects of broken wire. If broken wire occurs when 20-4 mA is selected, drive controller will run at high speed.

Auto/Manual



Auto / Manual allows switching between Speed Reference 1 and Speed Reference 2 by using a logic input. Speed Reference 1 and Speed Reference 2 can be programmed to AI1 or AI2 in the Speed Reference screen (see page 56). The Auto / Manual function eliminates the need for mechanical switching of the low level analog inputs, and allows the Speed References to act independently instead of being summed.

Manual command is defined as Speed Reference 1; Automatic command as Speed Reference 2. When assigned input is high, Auto is active. When it is low, Manual is active.

Auto Run Input is optional. If assigned, it allows the use of a second logic input for an additional 2-wire remote control run command, only active when the drive controller is in Auto mode. Local control can be used as either 2-wire or 3-wire control. See Figure 63 and Figure 64 in Appendix A for interaction of Auto / Manual and Controlled Stop in 2-wire and 3-wire control.

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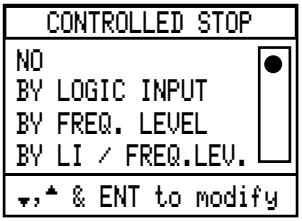
Controlled Stop



Controlled Stop customizes the stopping process. Controlled stop is commanded by one of the following:

- Logic Input
- Frequency Threshold
- Frequency Threshold and Logic Input

When Controlled Stop is activated, the drive controller stops according to one of the following methods: Freewheel Stop, Fast Stop, or DC Injection Braking. To enable Controlled Stop, select a command and stop method as explained below. The command methods are explained on pages 72 and 73. The stop methods are explained on pages 74 to 76. See Figure 63 and Figure 64 in Appendix A for interaction of Auto / Manual and Controlled Stop in 2-wire and 3-wire control.

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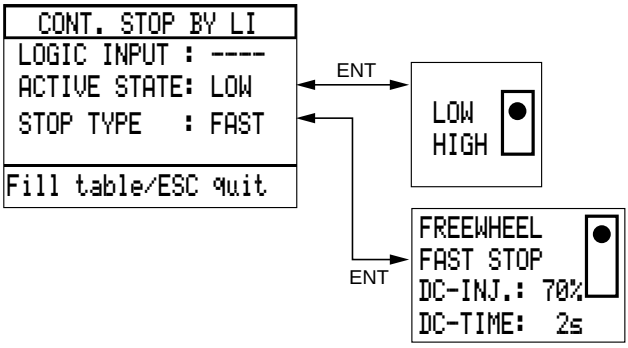
Controlled Stop Command Methods

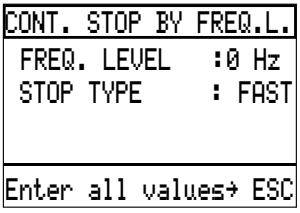
Logic Input



When Controlled Stop by Logic Input is selected, the activation of the assigned logic input causes the drive controller to stop, following the selected controlled stop method (Freewheel Stop, Fast Stop or DC Injection Braking). **The controlled stop logic input is only active in Terminal Command mode and is disabled in the Keypad Command mode.**

To enable Controlled Stop by Logic Input, assign a logic input, define its active state as logic low (0) or logic high (1), and choose the stop method.

Frequency Threshold



With Controlled Stop by Frequency Threshold enabled, if a Stop command is initiated, the drive controller follows the active deceleration ramp until the programmed Frequency Threshold is reached. At this point, the drive controller automatically begins the programmed controlled stop method. **Controlled Stop by Frequency Threshold is active in both Terminal Command and Keypad Command modes.**

To enable Controlled Stop by Frequency Threshold, set Frequency Threshold and select a stopping method (Freewheel Stop, Fast Stop, or DC Injection Braking).

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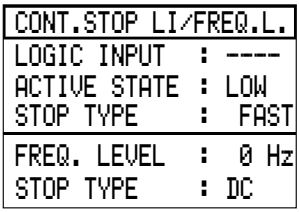
Controlled Stop Command Methods

Frequency Threshold / Logic Input



To enable Controlled Stop by Frequency Threshold / Logic Input, assign a logic input and define its active state. Set the Frequency Threshold and select stopping methods for both commands.

If both Logic Input and Frequency Threshold commands are selected and active, the stop type for the Logic Input command has priority; however, both commands can be used in the same stopping sequence.

When Frequency Threshold / Logic Input is selected and the drive controller is in Terminal Command mode, controlled stopping is active both at the frequency threshold and with the logic input. When the drive controller is in Keypad Command mode, controlled stopping by frequency threshold is active, but controlled stopping by logic input is disabled.

At the first command to stop, the drive controller stops following the selected controlled stop method (Freewheel Stop, Fast Stop or DC Injection Braking). If the other command to stop is given, the drive controller will only stop following the controlled stop method corresponding to the second command if the method has priority as compared to the first method. The order of priority is: Freewheel Stop, Fast Stop, DC Injection Braking.

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Controlled Stop Methods

Freewheel Stop

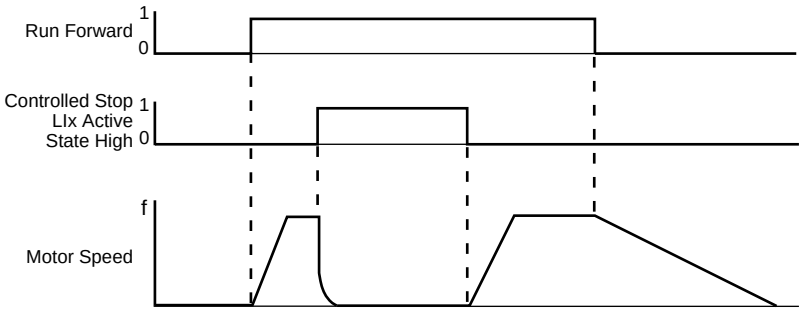

Figure 34: Freewheel Stop Timing Diagram (2-Wire Command)

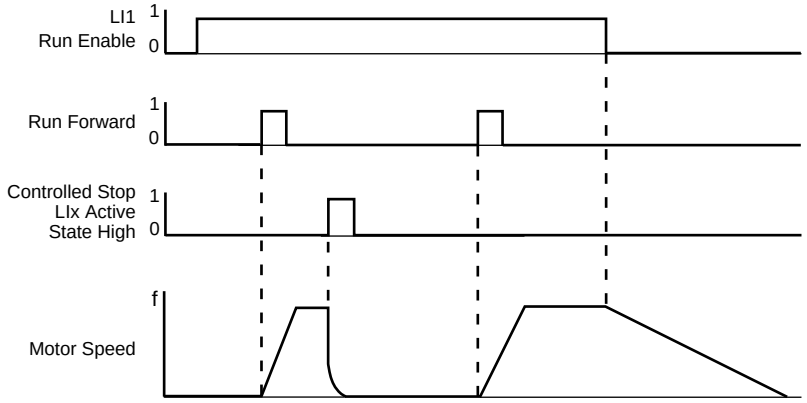

Figure 35: Freewheel Stop Timing Diagram (3-Wire Command)

With Freewheel Stop, the drive controller output is turned off and the motor coasts to a stop. Figure 34 and Figure illustrate timing sequence for Freewheel Stop.

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Controlled Stop Methods, cont.

Fast Stop

⚠ WARNING

EXTENDED STOPPING TIME

Deceleration time during fast stop may be automatically extended depending on braking ability of drive controller. A dynamic brake or mechanical stopping/holding brake may be required for consistent stopping times independent of motor load conditions. Fast Stop does not function during loss of power or drive controller fault.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

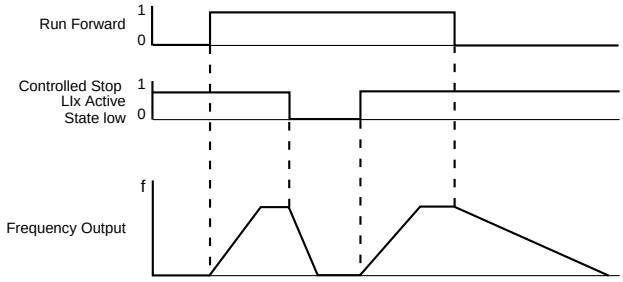

Figure 36: Fast Stop Timing Diagram (2-Wire Command)

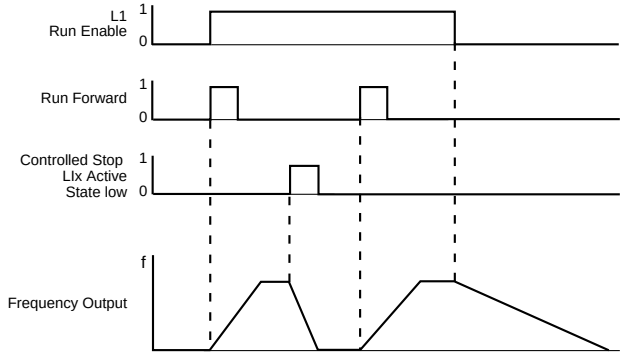

Figure 37: Fast Stop Timing Diagram (3-Wire Command)

With fast stop, the drive controller decelerates as quickly as possible without causing a nuisance trip. Figure 36 and Figure 37 illustrate timing sequence for Fast Stop.

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Controlled Stop Methods. cont.

DC Injection Braking

⚠ WARNING

NO HOLDING TORQUE

- DC injection braking does not provide holding torque at zero speed.
- DC injection braking does not function during loss of power or drive controller fault.
- When required, use separate brake function for holding torque.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ CAUTION

MOTOR OVERHEATING AND DAMAGE

Application of DC injection braking for long periods of time can cause motor overheating and damage. Protect motor from extended periods of DC injection braking.

Failure to follow these instructions can result in injury or equipment damage.

With DC Injection Braking, DC current is injected in the stator creating a stationary magnetic pole which brakes the rotor. This method of braking produces maximum torque at low frequencies.

Two adjustable parameters, DC Injection Level and DC Brake Time, control the operation of DC Injection Braking. DC Injection Level sets the current level used for injection braking. The level is programmable between 50 and 110% (variable torque configuration) or 150% (constant torque configuration) of motor nominal current. Factory setting is 70%. Actual braking torque depends on the motor characteristics. DC Brake Time can be set between 0 and 30 seconds, preset at 2 seconds. If 30.1 seconds is selected, the drive controller brakes for 30 seconds at the adjusted level and then continuously at 50% of rated current.

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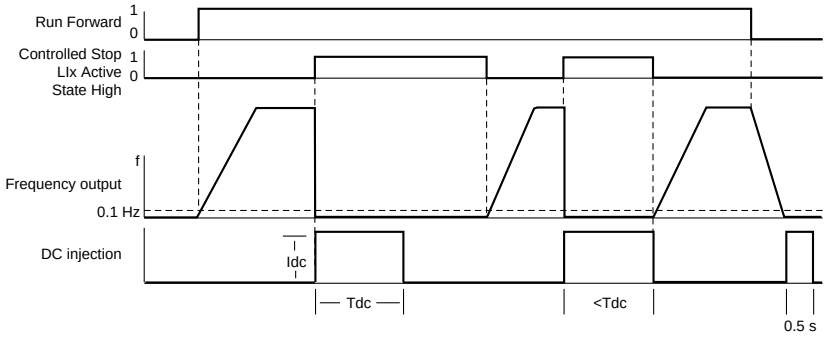

Figure 38: DC Injection Timing Sequence (2-Wire Command)

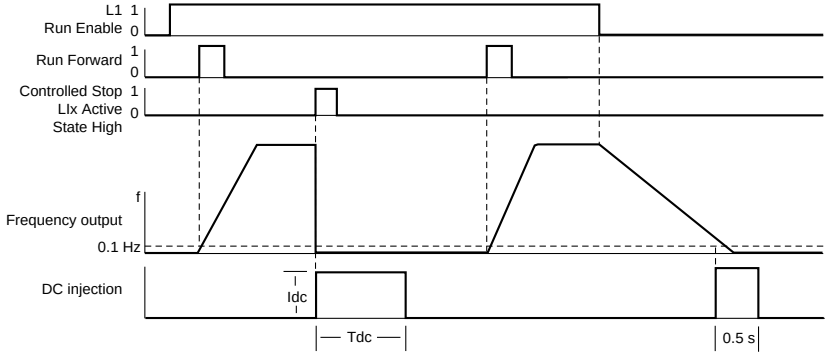

Figure 39: DC Injection Timing Sequence (3-Wire Command)

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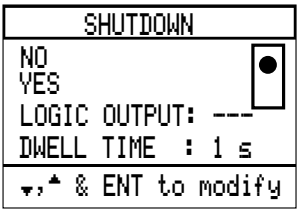
Shutdown



Shutdown allows the drive controller to dwell at Low Speed for a time period adjustable from 0.1 to 60 seconds before completely stopping. This function is useful in applications such as pumping stations where the dwell time controls the closing of a check valve before the pump is stopped.

To use Shutdown, activate the function by selecting Yes and set dwell time to a value between 0.1 and 60 seconds. The timer begins when the drive controller deceleration ramp reaches Low Speed. Factory setting of dwell time is 1 second.

If the application requires it, a logic output can be assigned to the Shutdown function. When dwell time has expired, the drive controller activates the logic output to indicate end of functioning at Low Speed.

Note that if a Run command is issued during the dwell time, it is not taken into account until the end of the dwell time.

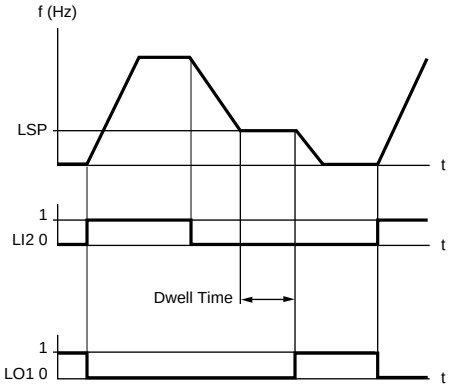


Figure 40: Shutdown Timing Diagram (2-Wire Command)

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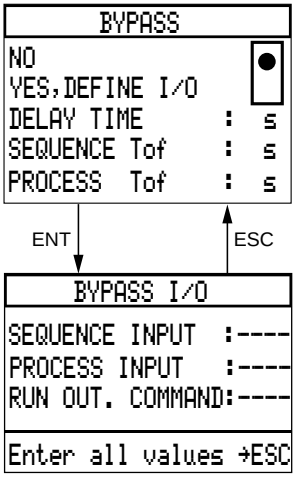
Bypass



Bypass is used to sequence an output isolation contactor. The output isolation contactor is commonly used in conjunction with a bypass contactor. The bypass contactor and associated power circuit components permit starting, running and stopping of the motor directly from line power. Bypass operation requires the wiring scheme illustrated in Figure 42 on page 82.

To use Bypass, assign a logic input (LI3 for example) to Sequence Input and relay output R2 to Run Output Command. Set time values for Delay Time and Sequence Tof (Time Out Fault). If desired, logic input LI4 can be assigned to Process Input and a time value for Process Tof (Time-out Fault) can be set to verify an optional user-defined event. These parameters are described in Table 11.

Table 11: Bypass Parameters

Parameter	Description	Range	Default
Delay Time	Programmable delay time to allow for decay of residual motor voltage before restarting the drive controller after operating directly from line power.	0.2-10 s	2 s
Run Output Command	This output is active if the drive controller receives a Run command and Delay Time has expired. Assign relay R2 to Run Output Command.	—	—
Sequence Input	Used to initiate the acceleration ramp. If this input does not go high within the time for which Sequence Time-out Fault is set, the drive controller will not start and displays a Sequence Time-out Fault. If the Sequence Input goes low while the drive controller is operating, the drive controller will fault and freewheel stop.	—	—

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Table 11: Bypass Parameters (Continued)

Parameter	Description	Range	Default
Sequence Time-out Fault	The time period after a run command is received during which the Sequence Input must go high to prevent a sequence time-out fault.	0.2-300 s	5 s
Process Input	Verifies the occurrence of a user-defined event after the acceleration ramp has begun. If this input does not go high within the time for which the Process Time-out Fault is set, the drive controller will trip on Process Time-out Fault.	—	—
Process Time-out Fault	The time period after the acceleration ramp has begun during which the Process Input must go high to prevent a Process Time-out fault.	0.2-300 s	60 s

Example Bypass Circuit Description

The bypass scheme shown in Figure 42 on page 82 is an example of integrating electromechanical devices with the Bypass function and agrees with the operation described in Table 11 and Figure 41 on page 81. Depending upon the application, modifications to this circuit may be required to achieve the desired performance. Command Type must be set in the 6→Drive Configuration to "2-wire" for our example circuit to operate correctly.

NOTE: When using the Bypass function, an external overload relay should be present for motor overload protection. The overload relay is required for protection of the motor against overload/phase loss when operating from either the line (BYP) or drive controller (AS).

Selector switch SW controls the circuit.

- With the switch in the AS (Adjustable Speed) position, the motor is run from the drive controller.
- With the switch in the OFF position, no power is applied to the motor.
- With the switch in the BYP (Bypass) position, the motor is run directly from the input line.

The operation at each transition of SW is as follows:

1. **OFF to AS**: SW contact C closes, causing LI2 (Run Forward) to go high which starts the Delay Time. If the motor had previously been running in Bypass, then the delay time allows the residual motor voltage to decay. After the Delay Time, the R2 relay (Run Output Command) closes, energizing the I (Isolation) contactor, allowing power to the motor. The I contactor interlock connected to LI 3 (Sequence Input) allows the drive controller to start accelerating. The I contactor interlock must close within the Sequence ToF time or a Sequence Time-out Fault will occur. If the pressure switch contactor connected to LI4 (Process Input) does not close within the Process ToF time, a Process Time-out Fault will occur.

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2. **AS to OFF**: SW contact C opens, causing LI2 to go low and the drive controller to decelerate and stop the motor. Then R2 (Run Output Command) opens, de-energizing the I contactor.
3. **OFF to BYP**: SW contact A closes, energizing the B (Bypass) contactor. Motor overload protection is provided by OL (thermal overload relay) during running in Bypass. SW contact B opens, disabling the I contactor control circuit. SW contact D opens. Since LI3 (Sequence Input) goes low as a result, the drive controller cannot start. If the drive controller was still in the process of decelerating the motor when previously in “AS”, the drive controller will initiate a Sequence Time-out Fault, signalling that an incorrect SW sequence has occurred. If incorrect SW sequence indication is not desired, the Controlled Stop function can be used along with the Bypass function. To use Controlled Stop, SW contact D must be connected directly into the LI assigned to Controlled Stop and the I contactor interlock is wired to +24. Use of the Controlled Stop function along with the Bypass function requires the addition of an I/O Extension module if a Process Input is used.
4. **BYP to OFF**: SW contact A opens, de-energizing the I contactor. The motor stops.

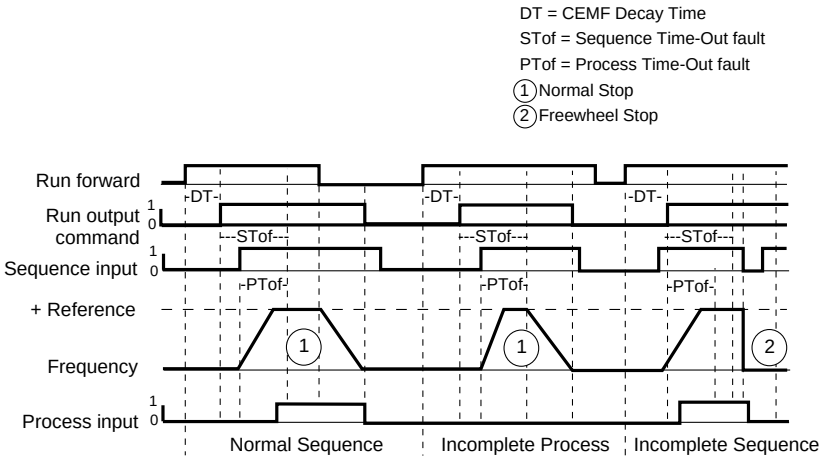

Figure 41: Bypass Timing Diagram

If Bypass is used with Normal or High Torque control, the drive controller will be unable to measure the motor electrical characteristics at power up since the isolation contactor will remain open until the drive controller is commanded to run. For optimal performance when either Normal or High Torque control is used with Bypass, follow the procedure below during initial commissioning and any time the motor is changed. **This procedure applies to the circuit shown in Figure 42**. If the circuit of Figure 42 has been modified, the procedure may also need to be modified.

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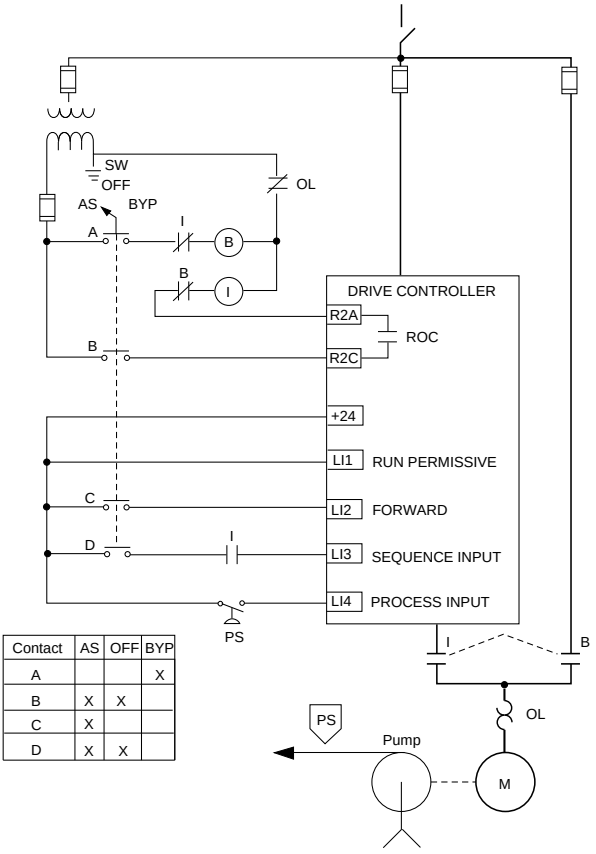
1. Read and follow the precautions listed on the inside front cover of this manual.
2. Open the disconnect and verify that all power is removed from the drive controller and auxiliary circuits associated with the Isolation and Bypass contactors.
3. Wait one minute to allow the DC bus to discharge.
4. Open enclosure. Verify that no voltages are present, then place a jumper across the ROC contact of the drive controller.
5. Close enclosure, then close disconnect for approximately one minute.
6. Repeat steps 2 and 3.
7. Open enclosure. Verify that no voltages are present, then remove the jumper across the ROC contact of the drive controller.
8. Close enclosure. Close disconnect if appropriate.



Contact	AS	OFF	BYP
A			X
B	X	X	
C	X		
D	X	X	

Figure 42: Bypass Circuit Diagram

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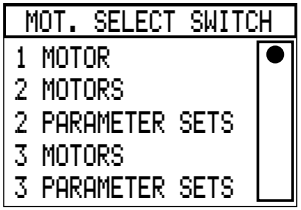
Motor Select Switch



Motor Select Switch provides the capability to program the drive controller with multiple sets of drive and / or control parameters for use with 1, 2, or 3 motors. Motor Select Switch is useful for applications in which a single drive controller is used to control multiple motors individually, or for applications in which multiple control parameter sets are required for a single motor.

If multiple motors with different power, enclosure type, or speed ratings are used with a single controller, separate motor contactors, thermal protection, and short circuit protection will be required for each motor.

The menu items available from Motor Select Switch are described in Table 12. See Figure 43 for a block diagram for 2 Motors and 3 Motors, and Figure 44 for a block diagram for 2 Parameter Sets and 3 Parameter Sets. The menus in the Motor Select Switch section show factory settings.

Table 12: Motor Select Switch Menu Items

Menu Item	Description
1 MOTOR	Disables the Motor Select Switch feature. Controller is configurable for only one set of drive parameters.
2 MOTORS	Enables Motor Select Switch. Provides the capability to program the controller with two sets of drive parameters for use with two motors.
2 PARAMETER SETS	Enables Motor Select Switch. Provides the capability to program the drive controller with two sets of control parameters.
3 MOTORS	Enables Motor Select Switch. Provides the capability to program the drive controller with three sets of drive parameters for use with three motors.
3 PARAMETER SETS	Enables Motor Select Switch. Provides the capability to program the controller with three sets of control parameters.

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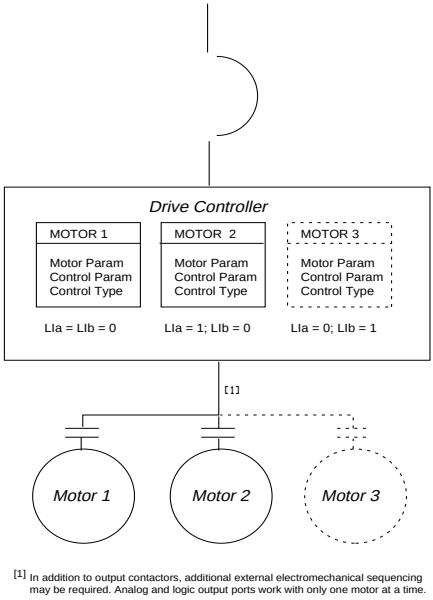

[1] In addition to output contactors, additional external electromechanical sequencing may be required. Analog and logic output ports work with only one motor at a time.

Figure 43: Block Diagram for 2 Motors and 3 Motors

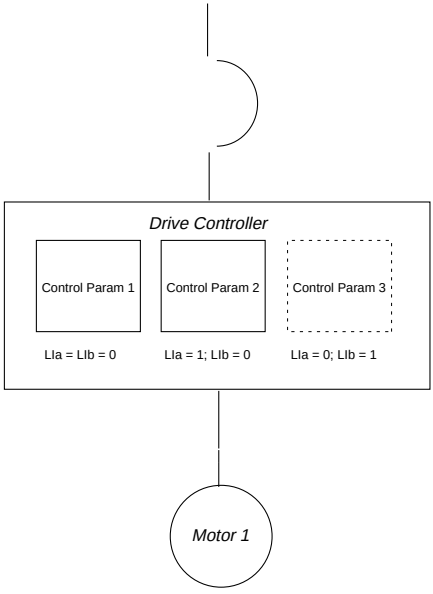

Figure 44: Block Diagram for 2 Parameter Sets and 3 Parameter Sets

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2 Motors and 3 Motors

The 2 Motors and 3 Motors selections provide the capability to program a single drive controller with either two or three different sets of drive parameters. One logic input is required for 2 Motors, and two logic inputs are required for 3 Motors. The logic inputs select the motor and parameters to be used.

NOTE: Always stop the drive controller before switching to another motor. Stop the drive controller such that the controller is in the ready (RDY) state.

When 2 Motors or 3 Motors is selected, logic input port(s) must be selected for receiving motor switching logic inputs.

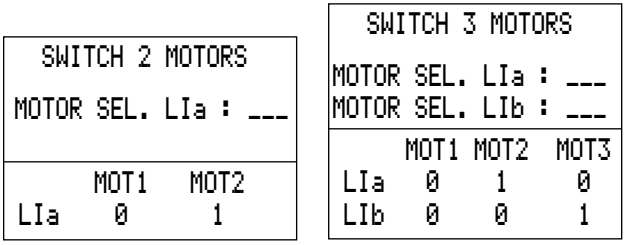

Figure 45: 2 Motors and 3 Motors Logic Input Screens

Configure one logic input port for 2 Motors and two logic input ports for 3 Motors. See Table 13 for determining the drive parameter set selected for the logic input states.

Table 13: Drive Parameter Selection

Logic Input State		Drive Parameter Set Selected
LIa	LIb	
0	0	Drive parameters 1
1	0	Drive parameters 2
0	1	Drive parameters 3
1	1	Unchanged. Uses drive parameters already in use.

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Once logic inputs are selected for motor switching, a set of drive parameters must be programmed for each motor. The 7→General Configuration menu is illustrated in Figure 46. Select Drive Parameters to program motor parameters, control parameters, and control type. Upon selecting Drive Parameters, a motor selection screen appears (see Figure 46). Use the arrow keys and the ENT button to select the set of motor parameters to be programmed.

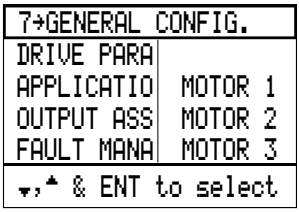

Figure 46: General Configuration Menu

NOTE: The drive controller can only take auto tuning measurements from and make a math model of motor 1. Motor 1 should be used for the motor which will be required to produce the best speed/torque characteristics. Also, High Torque control type is selectable only for motor 1.

A unique Drive Parameters screen will appear for each motor selected (Figure 47). An indicator "(M_)" will appear in the upper right hand corner of each Drive Parameters screen to indicate the motor for which the parameters are being programmed.

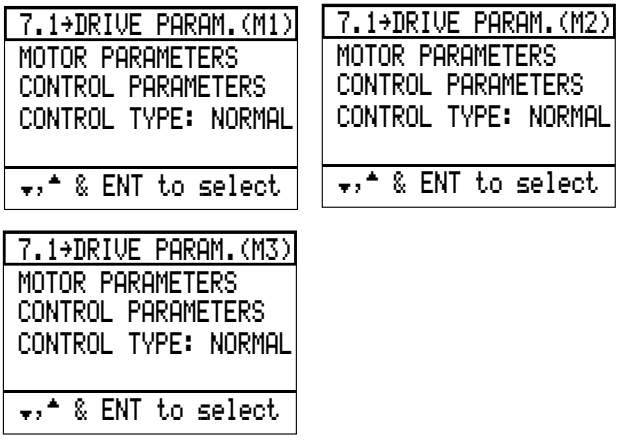

Figure 47: Drive Parameters Screens

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Program the motor parameters, control parameters, and control type for each motor (High Torque is not available on motor 2 and motor 3). See pages 37 to 62 for descriptions of the parameter settings.

When running the drive controller with either 2 Motors or 3 Motors selected, the display screen indicates the set of drive parameters selected.

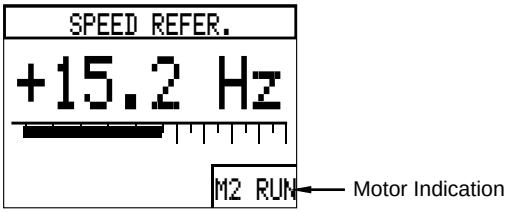

Figure 48: Display Screen

Using 2 Motors and 3 Motors with Other Controller Application Functions

Table 14 contains notes about how 2 Motors and 3 Motors interact with other controller application functions.

Table 14: 2 Motors & 3 Motors Operation Notes

Application Function	Operation Notes
Motor Overload Fault	Works with motor 1 only. Motors 2 & 3 require separate external overload protection.
High Torque	High torque control type available with motor 1 only.
Foldback	Works with motor 1 only.
Tach. Feedback	Works with motor 1 only.
Brake Sequence	Works with all motors but uses only one logic output from the controller. Care should be taken in brake sequencing so that brakes will not unintentionally engage or disengage when switching motors.

2 Parameter Sets and 3 Parameter Sets

The 2 Parameter Sets and 3 Parameter Sets selections provide the capability to program a single drive controller with either two or three different sets of control parameters. 2 Parameter Sets and 3 Parameter Sets are to be used when multiple sets of control parameters are required for an application with one motor. Unlike the 2 Motors and 3 Motors functions, 2 Parameter Sets and 3 Parameter Sets do not provide the capability to program multiple sets of motor parameters or control types in the 7.1→Drive Parameter menu.

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Configure one logic input port for 2 Parameter Sets and two logic input ports for 3 Parameter Sets. Figure 49 illustrates the Logic Input Selection Screens. See Table 15 for determining the control parameter set selected for the logic input states.

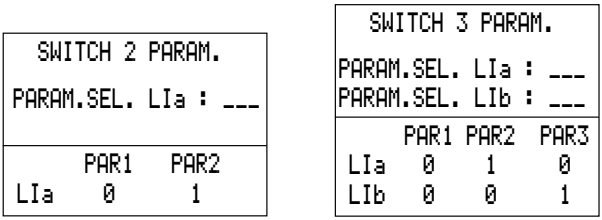

Figure 49: 2 Parameter Sets & 3 Parameter Sets Logic Input Selection Screens

Table 15: Control Parameter Selection

Logic Input State		Control Parameter Set Selected
LIa	LIb	
0	0	Control parameters 1
1	0	Control parameters 2
0	1	Control parameters 3
1	1	Unchanged. Uses control parameters already in use.

Once logic inputs are selected for control parameter switching, a set of control parameters must be programmed for each set of control parameters. The 7.1→Drive Parameters menu is illustrated in Figure 50. Program motor parameters, and then program each set of control parameters.

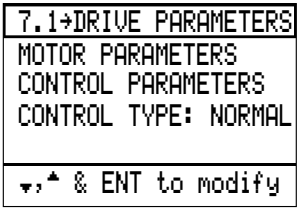

Figure 50: 7.1→Drive Parameters Menu

NOTE: When using Brake Sequence with 2 Parameter Sets or 3 Parameter Sets, the lowest LSP setting will be used when switching the brake at a frequency.

When running the drive controller with either 2 Parameter Sets or 3 Parameter Sets selected, the display screen (Figure 51) indicates the set of control parameters selected.

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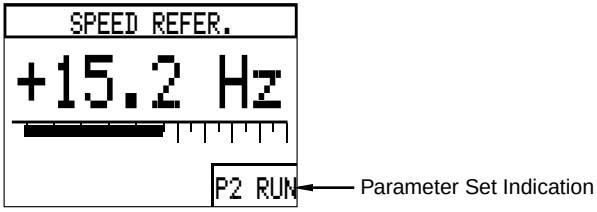
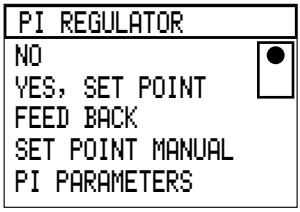


Figure 51: Display Screen

PI Regulator



PI Regulator makes it possible to control a process by adjusting motor speed using a setpoint input and a feedback input. For example, PI Regulator can be used to control the flow or pressure in a pumping system or the liquid level in a reservoir. PI Regulator requires, at minimum, two analog input ports. Additional analog and logic input ports are required for other optional PI Regulator functions. Table 16 describes the items available from the PI Regulator menu. See Figure 52 on page 90 for a block diagram of the PI Regulator function. The menus in this section show factory settings.

Table 16: PI Regulator Menu Items

Menu Item	Description
NO	PI Regulator function is off.
YES, SET POINT	PI Regulator function is on. Selecting this brings up the SET POINT configuration menu. The settings under SET POINT must be defined for PI Regulator to operate. See page 91.
FEED BACK	Feedback configuration menu. The settings under FEED BACK must be defined for PI Regulator to operate. See page 93.
SET POINT MANUAL	Manual speed reference/automatic setpoint configuration menu. The settings under SET POINT MANUAL may be configured to allow switching between an automatic setpoint reference and a manual speed reference. See page 97.
PI PARAMETERS	Miscellaneous PI Regulator configuration parameters menu. The settings under PI PARAMETERS may be configured to fine tune the operation of PI Regulator, or to provide analog and logic reference and status outputs. See page 98.

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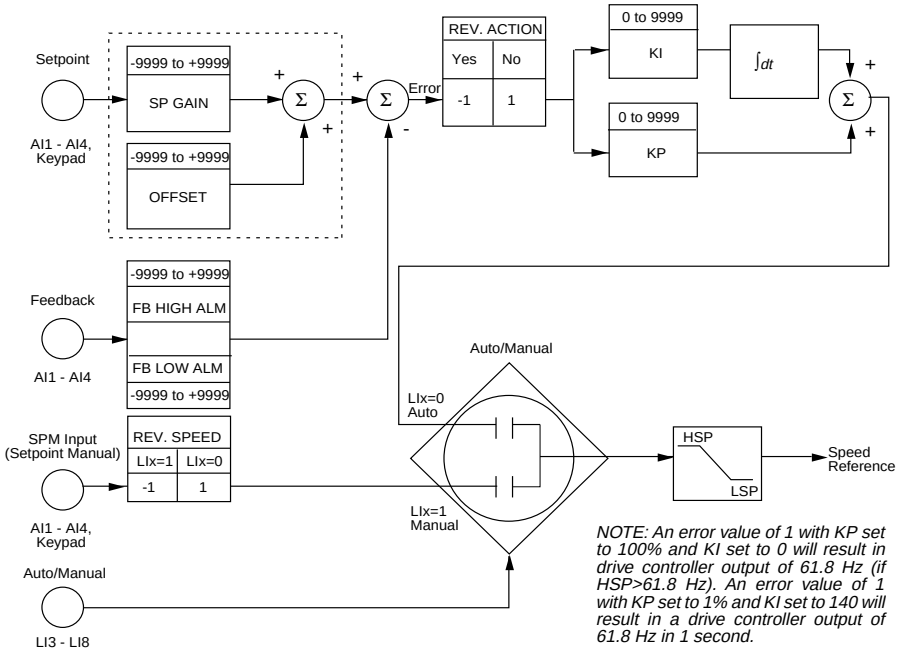

Figure 52: PI Regulator Block Diagram

Function Compatibility

PI Regulator function can only be used when the drive controller is configured for 2-wire control. Table 17 lists the functions which are incompatible with the PI Regulator function.

Table 17: Functions Incompatible with PI Regulator

Function	Menu No.	Function	Menu No.
Keypad Configuration Menu	5	Preset Speeds	7.2
Command Type: 3-wire	6.2	Auto/Manual	7.2
Brake Sequence	7.11	Shutdown	7.2
Run Reverse	7.2	Mot. Select Switch	7.2
Jog	7.2	Orient	7.2
+/- Speed	7.2	Process Cycles	7.2
Setpoint Memory	7.2	Tach. Feedback	7.2
Speed Reference	7.2		

NOTE: Functions in shaded area are only available when an I/O Extension module is present.

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Using PI Regulator

To activate the PI Regulator function, choose “YES, SET POINT” from the PI Regulator menu. The SET POINT menu appears.

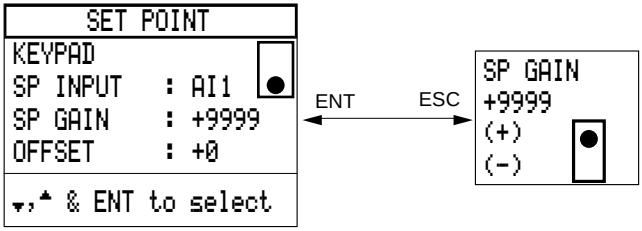

Table 18: SETPOINT Menu Items

Menu Item	Description	Range
KEYPAD	Selects the keypad as the means for entering the setpoint. Enter the setpoint with PI SET POINT in the 1→Parameter Setting menu.	—
SP INPUT	Selects an analog input port as the means for entering the setpoint.	AI1, AI2, AI3, AI4
SP GAIN	Setpoint scaling adjustment. Range corresponds to %. For example: 9999 = 99.99%.	-9999 to +9999
OFFSET	Setpoint offset adjustment. Range corresponds to %. For example: 9999 = 99.99%.	-9999 to +9999

First, select the means for setpoint entry. Choose KEYPAD for entering the setpoint through the keypad, or SP INPUT for entering the setpoint through an analog input port.

If KEYPAD is chosen for setpoint entry, enter the setpoint value in PI SET POINT under the 1→Parameter Setting menu. The setpoint value ranges from 0 to 9999 and is a percentage of the setpoint range (where 9999 represents 99.99%). 0 is setpoint minimum, 9999 is setpoint maximum, and 5000 is the middle (50%) of the setpoint range. Calculate the PI SET POINT value percentage as follows:

$$\text{PI SET POINT} = \left(\frac{\text{Setpoint} - \text{Min. Process Level}}{\text{Max. Process Level} - \text{Min. Process Level}}\right) \times 9999$$

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If setpoint is to be entered through an analog input port, chose the analog input port based on the type of setpoint signal used (see Table 19).

Table 19: Analog Input Port Ranges

Analog Input Port	Input Range
AI1	0 to 10 V
AI2	0 to 20 mA; 4 to 20 mA
AI3	-10 V to 10 V [1]
AI4	0 to 20 mA; 4 to 20 mA

[1] **AI3 acts as an absolute value when used for PI Regulator.**

NOTE: The shaded analog inputs are available only when an I/O extension module is present.

Next, calculate the system gain and offset values. System gain and offset are determined by the setpoint minimum and maximum process values and the feedback minimum and maximum process values. Use the formulas below to calculate system gain and offset, and then enter the values into the drive controller with the SP GAIN and OFFSET entries on the SET POINT menu.

$$\text{SP GAIN} = \left(\frac{\text{Setpoint Max.} - \text{Setpoint Min.}}{\text{Feedback Max.} - \text{Feedback Min.}}\right) \times 9999$$

$$\text{OFFSET} = \left(\frac{\text{Setpoint Min.} - \text{Feedback Min.}}{\text{Feedback Max.} - \text{Feedback Min.}}\right) \times 9999$$

Setpoint Min.	Process value corresponding to the minimum setpoint signal. Setpoint Min. may either be the maximum process level or the minimum process level, depending on the type of application. Controller will run at low speed at setpoint minimum.
Setpoint Max.	Process value corresponding to the maximum setpoint signal. Setpoint Max. may either be the maximum process level or the minimum process level, depending on the type of application. Controller will run at high speed at setpoint maximum.
Feedback Min.	Process value at which feedback is minimum.
Feedback Max.	Process value at which feedback is maximum.
9999	Process resolution factor. 9999 corresponds to 99.99%.

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Feedback

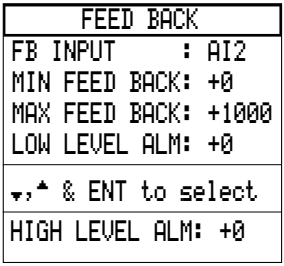

Table 20: Feedback Menu Items

Menu Item	Description	Range
FB INPUT	Selects an analog input port for receiving the feedback signal.	AI1,AI2,AI3,AI4
MIN FEED BACK	Minimum process value for the process feedback sensor.	-9999 to 9999
MAX FEED BACK	Maximum process value for the process feedback sensor.	-9999 to 9999
LOW LEVEL ALM	Process value below which the FB LOW ALARM logic output activates.	-9999 to 9999
HIGH LEVEL ALM	Process value above which the FB HIGH ALARM logic output activates.	-9999 to 9999

NOTE: LOW LEVEL ALM must be set greater than MIN FEED BACK and HIGH LEVEL ALM must be set less than MAX FEED BACK.

Select an analog input port for receiving the process feedback signal based on the type of signal used. See Table 19 on page 92 for specifications of analog input ports. Enter the minimum process value for the process feedback sensor in MIN FEED BACK and enter the maximum process value for the process feedback sensor in MAX FEED BACK.

LOW LEVEL ALM may be configured in conjunction with FB LOW ALARM to annunciate when the process is below an acceptable level. Enter a process value between -9999 and 9999 corresponding to the level in which the feedback low alarm (FB LOW ALARM) should turn on. Configure the logic output which will annunciate the fault minimum with FB LOW ALARM in the PI Parameters menu (see page 98).

HIGH LEVEL ALM may be configured in conjunction with FB HIGH ALARM to annunciate when the process is above an acceptable level. Enter a process value between -9999 and 9999 corresponding to the level in which the feedback high alarm (FB HIGH ALARM) should turn on. Configure the logic output which will annunciate the fault maximum with FB HIGH ALARM in the PI Parameters menu (see page 98).

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PI Regulator Application Examples

Example 1

The drive controller will be used to regulate the level of water in a wet well. The pump will be pumping water out of the wet well to maintain the level between 8 feet and 17 feet. The feedback signal is 0 to 20 mA. At 5 feet the feedback signal is 0 mA, and at 20 feet the feedback signal is 20 mA. A 0 to 10 V signal is used for the setpoint. At 0 V the wet well level is 8 feet, and at 10 V the wet well level is 17 feet.

1. Select YES, SET POINT in the PI Regulator menu.
2. Select SP INPUT.
3. Select AI1 for setpoint input.
4. Calculate SP GAIN and OFFSET and enter the values.

Setpoint Signal Input on AI1	Corresponding Process Value
0 V	8 feet. Setpoint Min. *Process value at low speed.*
10 V	17 feet. Setpoint Max. *Process value at high speed.*

Feedback Signal Input on AI2	Corresponding Process Value
0 mA	5 feet. Feedback Min. *Process value at minimum feedback.*
20 mA	20 feet. Feedback Max. *Process value at maximum feedback.*

$$\text{SP GAIN} = \left(\frac{17-8}{20-5}\right) \times 9999 = 6000$$

$$\text{OFFSET} = \left(\frac{8-5}{20-5}\right) \times 9999 = 2000$$

5. Select FEED BACK in the PI Regulator screen.
6. Select FB INPUT.
7. Select AI2 for feedback input.
8. Select MIN FEED BACK.
9. Enter 5 for the minimum process level.
10. Select MAX FEED BACK.

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11. Enter 20 for the maximum process level.
12. If desired, enter optional LOW LEVEL ALM and HIGH LEVEL ALM values.
13. Select YES for REV. ACTION in PI PARAMETERS menu.
14. Adjust KP and KI to achieve the best system response.

Example 2

This example is the same as Example 1, except it uses the keypad as the means for setpoint entry. The desired setpoint is 12.5 feet.

1. Select YES, SET POINT in the PI Regulator menu.
2. Select KEYPAD as means for setpoint entry.
3. Calculate SP GAIN and OFFSET as illustrated in Example 1 and enter the value.
4. Select FEED BACK in the PI Regulator screen.
5. Select FB INPUT.
6. Select AI2 for feedback input.
7. Select MIN FEED BACK.
8. Enter 8 for the minimum process level.
9. Select MAX FEED BACK.
10. Enter 17 for the maximum process level.
11. If desired, enter optional LOW LEVEL ALM and HIGH LEVEL ALM values.
12. Calculate PI SET POINT and enter the value in the 1→Parameter Setting menu.

$$\text{PI SET POINT} = \left(\frac{12.5 - 8}{17 - 8}\right) \times 9999 = 5000$$

13. Select YES for REV. ACTION in PI PARAMETERS menu.
14. Adjust KP and KI to achieve the best system response.

Example 3

In this example, the drive controller will be used to regulate the volume of water in a vat. The pump will be pumping water into the vat to maintain the level between 100 m^3 and 10 m^3. The feedback signal is 0 to 20 mA. At 5 m^3 the feedback signal is 0 mA, and at 100 m^3 the feedback signal is 20 mA. A 0 to 10 V signal is used for the setpoint. At 0 V the process level is 100 m^3, and at 10 V the process level is 10 m^3.

1. Select YES, SET POINT in the PI Regulator menu.
2. Select SP INPUT.

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3. Select AI1 for setpoint input.
4. Calculate SP GAIN and OFFSET and enter the values.

Setpoint Signal Input on AI1	Corresponding Process Value
0 V	100 m^3. Setpoint Min. *Process value at low speed.*
10 V	10 m^3. Setpoint Max. *Process value at high speed.*

Feedback Signal Input on AI2	Corresponding Process Value
0 mA	5 m^3. Feedback Min. *Process value at minimum feedback.*
20 mA	10 m^3. Feedback Max. *Process value at maximum feedback.*

$$\text{SP GAIN} = \left(\frac{10-100}{200-5}\right) \times 9999 = -4615$$

$$\text{OFFSET} = \left(\frac{100-5}{200-5}\right) \times 9999 = 4871$$

5. Select FEED BACK in the PI Regulator screen.
6. Select FB INPUT.
7. Select AI2 for feedback input.
8. Select MIN FEED BACK.
9. Enter 10 for the minimum process level.
10. Select MAX FEED BACK.
11. Enter 100 for the maximum process level.
12. If desired, enter optional LOW LEVEL ALM and HIGH LEVEL ALM values.
13. Adjust KP and KI to achieve the best system response.

Example 4

This example is the same as Example 3 except it uses the keypad as the means for setpoint entry. The desired setpoint point is 55 m^3.

1. Select YES, SET POINT in the PI Regulator menu.
2. Select KEYPAD as means for setpoint entry.
3. Calculate SP GAIN and OFFSET as in Example 3 and enter the value.

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4. Select FEED BACK in the PI Regulator screen.
5. Select FB INPUT.
6. Select AI2 for feedback input.
7. Select MIN FEED BACK.
8. Enter 10 for the minimum process level.
9. Select MAX FEED BACK.
10. Enter 100 for the maximum process level.
11. If desired, enter optional LOW LEVEL ALM and HIGH LEVEL ALM values.
12. Calculate PI SET POINT and enter the value in the 1→Parameter Setting menu.

$$\text{PI SET POINT} = \left(\frac{55-10}{100-10}\right) \times 9999 = 5000$$

13. Adjust KP and KI to achieve the best system response.

Setpoint Manual

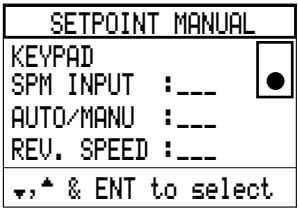

Table 21: SETPOINT MANUAL Menu Items

Menu Item	Description	Range
KEYPAD	Selects the keypad as the means for entering the manual speed reference. Enter the speed reference with PI SP MANUAL in the 1→Parameter Setting menu when KEYPAD is selected.	-
SPM INPUT	Analog input port used for manual speed reference entry.	AI1,AI2,AI3,AI4
AUTO/MANU	Logic input for switching between automatic speed reference and manual speed reference. When the logic input is high, Manual is selected. When the logic input is low, Auto is selected.	LI3 to LI8
REV. SPEED	Logic input for switching between forward and reverse speed. When the logic input is high, the speed reference will be reversed. When the logic input is low, the speed reference will not be reversed.	LI3 to LI8

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Setpoint Manual provides the capability to manually control the controller speed. This function is useful for slowly bringing the system up to the desired setpoint, and then switching the setpoint to automatic control.

If KEYPAD is chosen as the means for manual speed reference entry, enter the speed reference value in the PI SP MANUAL menu item in the 1→Parameter Setting menu. The PI SP MANUAL range is from low speed to high speed and is expressed as Hz.

SPM INPUT is the analog input port which will receive the manual setpoint signal. Select the SPM INPUT based on the type of signal used. See Table 19 on page 92 for specifications on the analog input ports.

AUTO / MANU configures the logic input port which controls whether the manual speed reference or the automatic setpoint is used for setpoint entry. If the logic input is low, the automatic setpoint will be used. If the logic input is high, the manual speed reference will be used.

REVERSE SPEED configures the logic input port which controls the direction in which the drive controller runs in manual. If the logic input is high, the drive controller will run in the reverse direction from the direction commanded by the manual speed reference.

PI Parameters

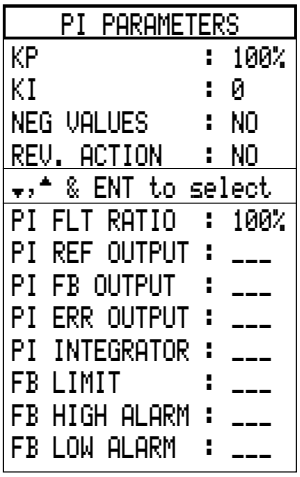

Table 22 describes the various PI adjustment parameters available with PI Regulator.

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Table 22: PI Parameters Menu Items

Menu Item	Description	Range
KP	Proportional gain. Adjusts the speed of the reaction to the feedback loop. Range corresponds to %. 9999 corresponds to 99.99%.	0 to 9999%
KI	Integral gain. Adjusts the accuracy of PI regulation. Range corresponds to per second units.	0 to 9999
NEG. VALUES	Determines if the drive controller will be able to run in both directions or in only one direction. **Yes**: The controller can run in both directions. **No**: The controller can run in only one direction.	Yes, No
REV. ACTION	Determines the response to error (E) between setpoint and feedback signals. E = Setpoint - Feedback **Selection** / E / **Speed Response** Yes / + / Speed decrease Yes / - / Speed increase No / + / Speed increase No / - / Speed decrease	Yes, No
PI FLT RATIO	User defined error limit between desired setpoint and actual process feedback. Expressed as a percentage of [MAX FEED BACK - MIN FEED BACK]. If the real error exceeds the PI FLT RATIO, the FB LIMIT logic output activates.	0-100%
PI REF OUTPUT	Analog output reference proportional to PI setpoint.	AO1,AO2,AO3
PI FB OUTPUT	Analog output reference proportional to feedback	AO1,AO2,AO3
PI ERR OUTPUT	Analog output reference proportional to PI error. PI error is the percentage difference between desired setpoint and actual feedback compared to the feedback range. The analog output is scaled such that 0 (or 4 mA) is proportional to -5%, and 20 mA is proportional to 5%.	AO1,AO2,AO3
PI INTEGRATOR	Analog output reference proportional to PI integral error.	AO1,AO2,AO3
FB LIMIT	Logic output indicating that PI FLT RATIO has been exceeded. See description of PI FLT RATIO.	LO1 to LO4 RO1 to RO4
FB HIGH ALARM	Logic output indicating that HIGH LEVEL ALM has been exceeded. See description of HIGH LEVEL ALM on page 93.	LO1 to LO4 RO1 to RO4
FB LOW ALARM	Logic output indicating that the feedback is less than LOW LEVEL ALM. See description of LOW LEVEL ALM on page 93.	LO1 to LO4 RO1 to RO4

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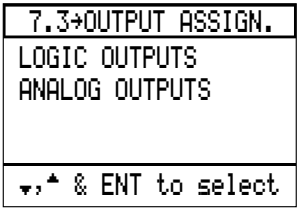
PI Regulator Settings Configurable from the 1→Parameter Setting Menu

The following PI Regulator Settings are also configurable in the 1→Parameter Setting menu. (PI SET POINT and PI SP MANUAL are *only* configurable in the 1→Parameter Setting menu.) See descriptions of these settings in the "Using PI Regulator" on pages 91 to 92.

- SP GAIN
- OFFSET
- KP
- KI
- PI FLT RATIO
- PI SET POINT (present in the 1→Parameter Setting menu only when KEYPAD is chosen for setpoint entry.)
- PI SP MANUAL (present in the 1→Parameter Setting menu only when KEYPAD is chosen for manual speed reference entry.)

7.3→Output Assignments



The Output Assignment menu allows:

- Display of the logic and analog output assignments
- Assignment of functions to available outputs (i.e., outputs not previously assigned from the 7→General Configuration menu).

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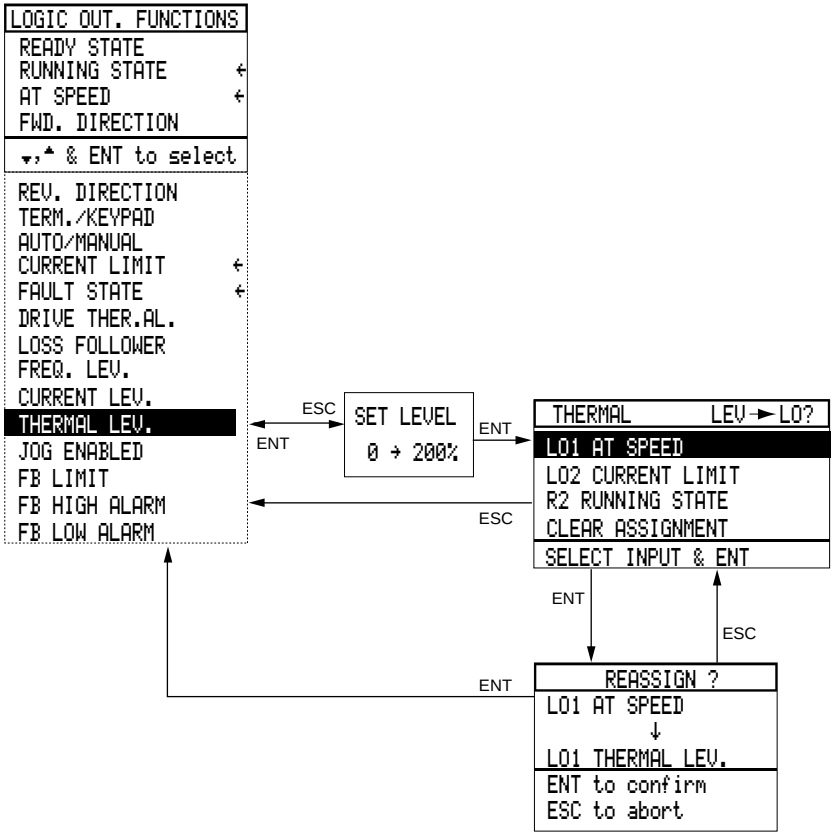
Logic Output Functions



This menu displays all functions that can be assigned to the logic outputs and allows reassignment where possible. Only the outputs not previously assigned from the 7.2→Application Function menu can be reassigned here. An arrow indicates a function that is already assigned. Output functions can be assigned to more than one output.

The R1 relay is assigned to the Fault State function and cannot be reassigned. Also, the Drive Thermal Alarm function is only available on drive controllers ATV66D16 to ATV66C31. The menus illustrated above show the procedure for reassigning the logic outputs. The logic output functions are described in the following sections.

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Ready State

If drive controller is waiting for a Run command and is not in fault state, logic output is high or relay is energized.

Running State

When a Run command is present, DC injection is not enabled, and there is no fault on the drive controller, logic output is high or relay is energized. If Bypass is enabled, the Sequence Input must also be present for Running State to be high or energized.

At Speed

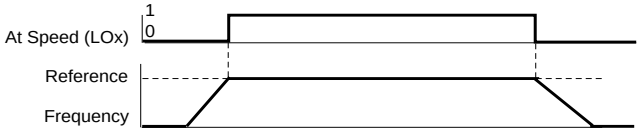

Figure 53: At Speed

When drive controller is commanded to run above zero speed and Output Frequency is equal to Frequency Reference input signal, logic output is high or relay is energized.

Forward Direction

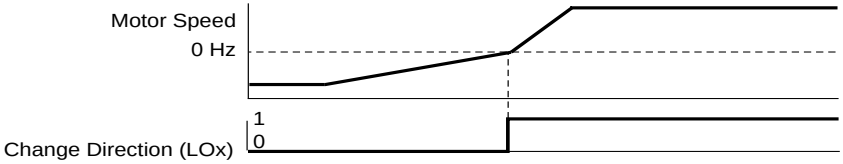

Figure 54: Forward Direction

When the drive controller is running the motor above zero speed, DC injection is not enabled, and the drive controller output phase sequence is in forward rotation, logic output is high or relay is energized.

Reverse Direction

When the drive controller is running the motor above zero speed, DC injection is not enabled, and the drive controller output phase sequence is in reverse direction, logic output is high or relay is energized.

Terminal/Keypad

When drive controller is in Keypad Command, logic output is high or relay is energized; in Terminal Command, logic output is low or relay is not energized.

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Auto/Manual

When drive controller is in Auto mode of operation, logic output is high or relay is energized. When in Manual mode of operation, logic output is low or relay is not energized.

Current Limit

When drive controller reaches current limit value (depending on setting in 7.11→Motor Parameters), logic output is high or relay is energized.

Fault State

If drive controller is in fault state, logic output is high or relay is energized. The R1 relay, already assigned to Fault State, deenergizes upon fault.

Drive Thermal Alarm

When the drive controller has reached the thermal alarm, activated a minimum of 60 seconds before a drive controller thermal fault is reached, logic output is high or relay is energized. Available only on drive controllers ATV66D16 to ATV66C31.

Loss of Follower

If current reference at AI2 falls below 3 mA, logic output is high or relay is energized. Can be used only if AI2 is set for 4-20 mA or 20-4 mA.

Frequency Level

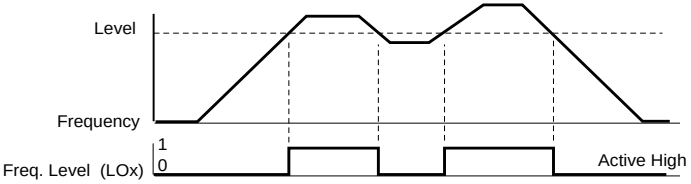

Figure 55: Frequency Level

When output frequency exceeds the programmed frequency level, logic output is high or relay is energized and remains high (or energized) until output frequency falls below the programmed frequency level. Frequency level is adjustable from 0 to 400 Hz (ATV66U41•• to ATV66D79•• or N4, constant torque); 0 to 200 Hz (ATV66C10N4 to ATV66C31N4, constant torque); or 0 to 90 Hz (variable torque).

To indicate with a low logic level, assign a relay output and wire to the correct contacts.

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Current Level

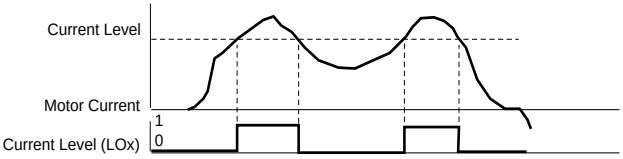

Figure 56: Current Level

When drive controller exceeds programmed current level (adjustable from 10 to 150% of nominal drive controller current for constant torque configuration, and 10 to 110% of nominal drive controller current for variable torque configuration) logic output is high or relay is energized and remains high (or energized) until drive controller falls below the programmed current level.

Thermal Level

When thermal motor overload value reaches programmed thermal level (adjustable from 0 to 200% of nominal motor thermal state) logic output is high or relay is energized and remains high (or energized) until thermal motor overload value falls below thermal level.

Jog Enabled

When drive controller has been commanded to jog, logic output is high or relay is energized. Available only if a logic input is assigned to Jog.

FB Limit

See description in Table 22 on page 99.

FB High Alarm

See description in Table 22 on page 99.

FB Low Alarm

See description in Table 22 on page 99.

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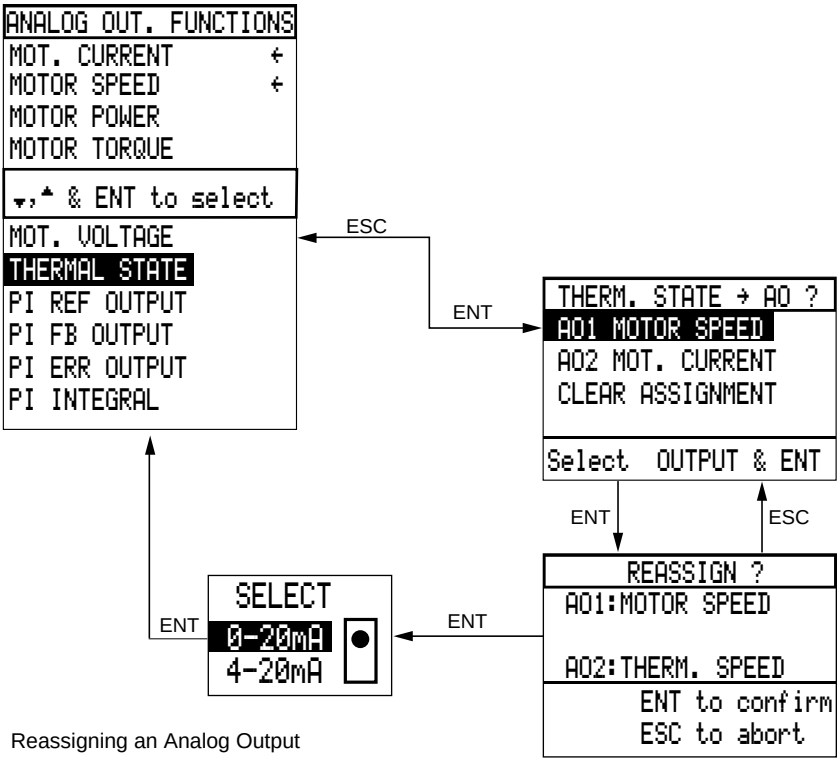
Analog Output Functions



Reassigning an Analog Output

The Analog Output Functions menu displays all functions that can be assigned to the analog outputs and allows reassignment where possible. Only the outputs not previously assigned from the 7→General Configuration menu can be reassigned here. Each function that is already assigned (either by factory default or reassignment) is indicated by an arrow.

The menu illustrated above shows the procedure for reassigning the analog outputs. Note that the output signal scaling factor (factory default 0-20 mA) can be changed from the Analog Output Functions menu.

Motor Current

20 mA equals 200% of the motor nominal current rating.

Motor Speed

20 mA equals High Speed. 0 mA or 4 mA equals 0 speed. Slip compensation does not act on this output.

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Motor Thermal State

20 mA equals 200% of the nominal motor thermal state.

Motor Power

20 mA equals 200% of the motor nameplate power in constant torque configuration.

Motor Torque

20 mA equals 200% of nominal motor torque.

PI Ref Output

See description in Table 22 on page 99.

PI FB Output

See description in Table 22 on page 99.

PI Err Output

See description in Table 22 on page 99.

PI Integral

See description in Table 22 on page 99.

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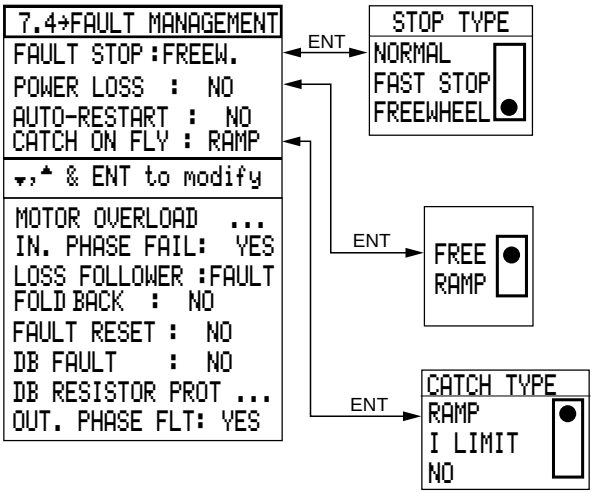
7.4→Fault Management



The 7.4→Fault Management menu allows you to program the drive controller for detecting certain fault states and to specify fault stop methods.

NOTE: The user must evaluate the effects of a drive controller fault on the process being controlled and select an appropriate fault management strategy. If a drive controller fault occurs, applications such as those involving safety-critical aspects of a process (continuity of service under unusual service conditions, emergency braking, etc.) may require additional apparatus or control to achieve an appropriate response or level of redundancy.

Fault Stop

Fault Stop determines how the drive controller will stop upon occurrence of a fault. To protect internal circuitry, certain faults always cause a freewheel stop (see Table 23 on page 108). One of the following stop methods can be programmed for all other drive controller faults:

- Normal Stop: drive controller follows the active deceleration ramp and any controlled stop by frequency settings set in menu 7.2.
- Fast Stop: the drive controller stops as quickly as possible without causing a trip, regardless of the ramp setting.
- Freewheel Stop (factory setting): the drive controller output is turned off, allowing the motor to coast to a stop according to inertia and resistant torque.

Select Fault Stop by scrolling with the ▲ and ▼ keys and press ENT. A window will appear from which you can specify the type of stop.

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Drive Controller Restart Methods

There are three methods for resetting the drive controller after a fault:

- Automatic restart (2-wire command only). See page 111.
- Manual reset: removal of all power for longer than 1.0 second, then reapplication of power.

  NOTE: If input phase failure detection is enabled, an input phase failure lasting longer than 1.0 second may also initiate a manual reset.

- Fault reset by logic input (see page 119) or function key (see page 30).

In all cases, fault reset cannot occur unless the cause of the fault is no longer present. Certain faults do not allow an automatic restart. These are described in Table 23 on page 108.

Table 23: Fault Stop and Restart Methods

	Resettable Only By Manual Reset (Removal Of Power)	Fault Reset by LI, Function Key, or Manual Reset	Can be Automatically Reset	Non-Latching Faults [1]
Faults Causing Freewheel Stop	Short circuit Ground fault Precharge failure Internal fault Memory failure Dynamic brake fault Dynamic brake resistor fault Auto-test failure Transistor short circuit Open transistor Link Fault	AC line overvoltage DC bus overvoltage Sequence time-out fault Overspeed Output phase loss	AC line overvoltage DC bus overvoltage Sequence time-out fault Overspeed Output phase loss	Undervoltage
Programmable Fault Stop		Drive overtemperature Motor overload Loss of follower Process time-out fault Serial link fault	Drive overtemperature Motor overload Loss of follower Process time-out fault Serial link fault	Input phase failure

[1] When the fault condition is no longer present, the drive controller will automatically restart the motor if the Command Type is set for 2-wire and the Run Enable and direction inputs are maintained, regardless of the setting of Automatic Restart.

The following sections describe the faults programmable from the 7.4→Fault Management menu.

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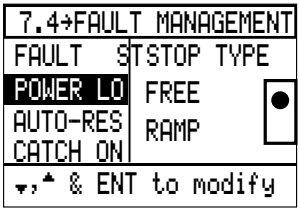
Power Loss



During loss of input power, certain actions are taken by the drive controller to enable recovery once power is restored. This is possible since the drive controller logic remains active for a least one second after power is lost. The actions taken depend on the settings of Power Loss and Input Phase Failure (see page 118).

With Power Loss set to FREE (factory setting), the following sequence occurs when power is lost or there is a phase failure while the drive controller is running:

- The drive controller freewheel stops (independent of the setting of Input Phase Failure).
- The control logic remains active for at least one second by using the power stored on the drive controller DC bus.
- If input power is restored while the control logic is still active, the drive controller automatically restarts independent of the Command type (in the 6→Drive Configuration menu) selected. If input power is restored when the control logic is no longer active, the drive controller will follow a normal power-up sequence. Restart of the drive controller requires a run command and the absence of faults.

With power loss set to RAMP, the following sequence occurs when power is lost or there is a phase failure while the drive controller is running:

- When the DC bus voltage reaches 80% of its initial value, the drive controller is commanded to decelerate following a ramp. The deceleration attempts to recover inertial energy stored in the load to enable the drive controller to operate the motor for as long as possible during loss of power.
- The control logic remains active for at least one second by using the power stored on the drive controller DC bus.
- Once the DC bus voltage becomes too low to allow motor operation, the drive controller freewheel stops.

If input power is restored while the control logic is still active, the drive controller will automatically restart independent of the Command type (in the 6→Drive Configuration menu) selected. If input power is restored when the control logic is no longer active, the drive controller will follow a normal power-up sequence. Restart of the drive controller requires a run command and the absence of faults.

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To use the RAMP mode of Power Loss, Input Phase Failure must be set to NO. Otherwise, the drive controller will operate as if Power Loss were set to FREE.

The selection of FREE or RAMP depends on the amount and type of disturbance that the load can tolerate during a power loss. Setting Power Loss to FREE allows a longer deceleration time but requires the drive controller to resynchronize to the motor once power returns. FREE is generally best suited for installations which experience long periods of power loss. Setting power Loss to RAMP decelerates the motor more rapidly during power loss and does not require the drive controller to resynchronize to the motor. If power is restored while the motor is still running, recovery to commanded speed occurs rapidly. RAMP is generally best suited for installations which experience short periods of power loss.

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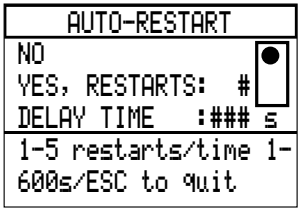
Automatic Restart



⚠ WARNING

UNINTENDED EQUIPMENT ACTION

- Automatic restart can only be used for machines or installations that present no danger for personnel or equipment in the event of automatic restarting.
- Equipment operation must conform with national and local safety regulations.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Enabling Automatic Restart allows up to five restart attempts after the drive controller has tripped on a fault. The time between restart attempts is programmable from 1 to 600 seconds. The power supply and control commands must be maintained for an Automatic restart.

To enable Automatic Restart, select Yes, specify the number of restart attempts (1-5) and set time between restart attempts (1-600 s).

If the drive controller trips on a fault that is automatically resettable and Automatic Restart is enabled, the drive controller is locked for the programmed time period, then resets the drive controller if the fault condition has disappeared. Then, if commanded to run, the drive controller restarts the motor. If the fault condition remains during the reset attempt, the drive controller locks for the programmed period of time, and the restart command is repeated at the programmed delay time for the programmed number of restarts (maximum of 5 times) before the drive controller trips. See Table 23 for the faults which can be automatically reset.

Note that only if the drive controller is configured for 2-wire command will it automatically restart the motor. If the drive controller is configured for 3-wire command, Automatic Restart is not available. For 2-wire and 3-wire command, see pages 35 and 36.

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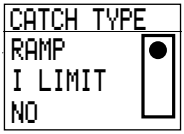
Catch On Fly



Catch on Fly is used to regain control of a spinning load after an event such as loss of power or freewheel stop. For proper operation of this function, the drive controller should be configured for 2-wire control. Also, the rotation direction of the freewheeling load must be the same as the rotation direction of the drive controller.

Three possible selections appear for the catch on fly function. These selections are Ilimit, Ramp, and NO. NO is the default setting.

Catch On Fly Set to NO (Refer to Figure 57)

When commanded to start into a spinning load, the drive controller will reset its output frequency to zero and begin to ramp at the set acceleration ramp rate to the commanded speed. As the frequency increases, the output current increases until the drive controller current limit is reached. The torque produced by the motor current will reduce the speed of the spinning motor to a point where the motor rotational speed matches the drive controller output frequency. Once this occurs, the currents decrease and the drive controller can then accelerate the load to the commanded speed.

The advantage to this control method is that is does not require any user sequencing of the drive controller power or control. In addition, it does not require the presence of any residual voltage at the motor for proper operation. This method does have the disadvantage that the change in motor speed during resynchronization may be unacceptable to some applications since the motor could be forced to near-zero speed before re-acceleration can occur.

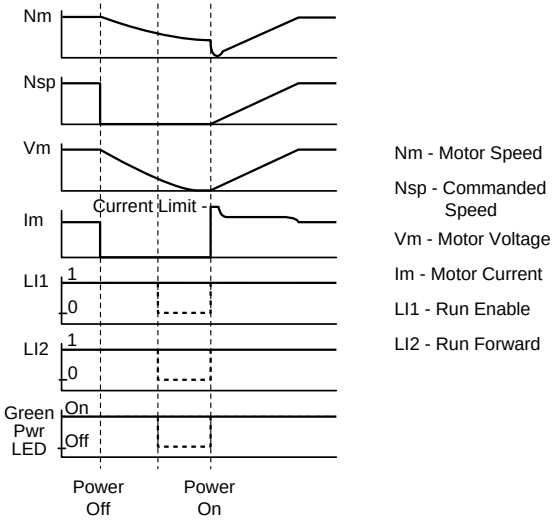


Figure 57: Catch On Fly Set to NO

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Catch On Fly Set to RAMP (Refer to Figure 58)

When commanded to start into a spinning load, the drive controller will use the residual voltage present at the motor terminals to estimate motor speed. If no residual voltage is present, then the control method reverts to that described in “Catch On Fly Set to NO”. If residual voltage is present, then the drive controller initial output frequency is set to the estimated speed value allowing the motor to rapidly synchronize to the drive controller output frequency. The drive controller then increases the motor speed at the set acceleration ramp rate to the commanded speed. If a run command is present, the drive controller will start in this mode when the LI1 input is cycled from logic 1 to logic 0 and back to logic 1 or, following a brief power outage for which the control logic remains active (Green LED on drive controller remains lit). If the control logic becomes inactive during the power outage (Green LED on drive controller goes out), the restart control method reverts to that described in “Catch On Fly Set to NO”.

The advantage to this control method is that it produces the least additional speed disturbance of the three Catch o Fly selections while the motor is synchronizing to the drive controller output. This method does have the disadvantage that residual motor voltage must be present for speed estimation to occur.

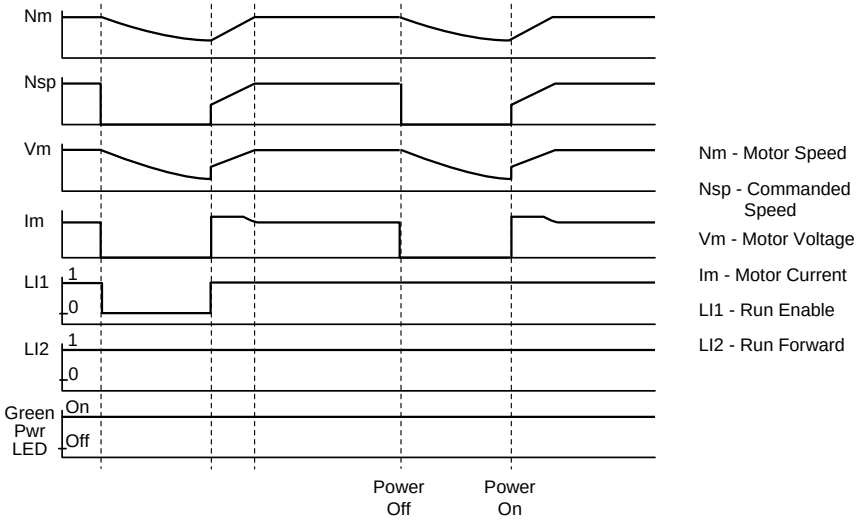

Figure 58: Catch On Fly Set to RAMP

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Catch On Fly Set to ILIMIT (Refer to Figure 59)

When commanded to start into a spinning load, the drive controller output voltage is reduced and the drive controller output frequency is set to the commanded frequency. While the voltage is being reduced, the drive controller output voltage is synchronized to the motor. If synchronization is not possible, the restart control method reverts to that described in “Catch On Fly Set to NO”. If synchronization is possible, the drive controller output voltage is then raised causing the motor to rapidly accelerate to commanded speed. Acceleration generally occurs with the drive controller at current limit. Provided that a run command is present, the drive controller will start following an extended power outage where the control logic is no longer active (Green LED on drive controller is out). The run command must be activated prior to or during the drive controller power-up sequence for this mode to be active.

The advantage to this control method is that it can resynchronize to command speed in the least amount of time of the three Catch on Fly selections, since re-acceleration generally occurs with the controller at current limit. Also, the method does not require the presence of residual motor voltage. This is useful when regaining control of high inertia loads after extended power outages. If the command speed matches the motor speed, little if any motor disturbance is seen during restarting. This is useful when restarting a single motor on a moving process line. This method does have the disadvantage that the motor torque disturbance during resynchronization may be unacceptable to some applications, since the motor attempts to accelerate to the commanded speed at the current limit setting of the controller.

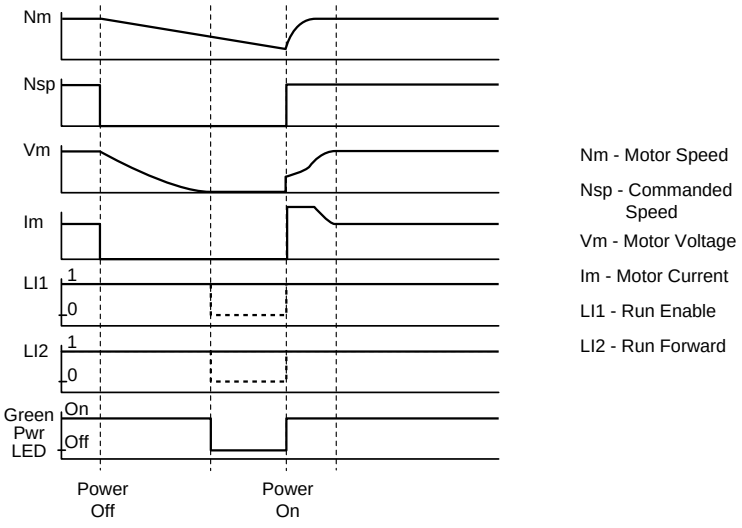

Figure 59: Catch On Fly Set to ILIMIT

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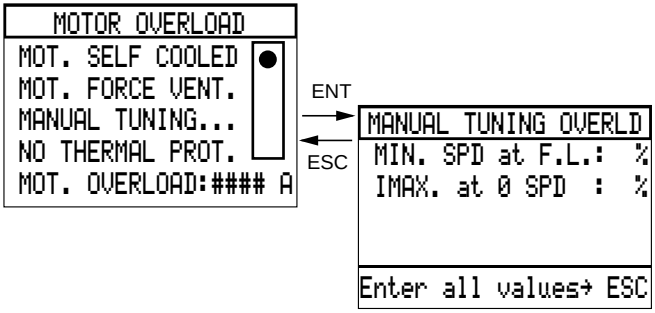
Motor Overload

⚠ WARNING

MOTOR OVERHEATING

This drive controller does not provide direct thermal protection for the motor. Use of a thermal sensor in the motor may be required for protection at all speeds or loading conditions. Consult motor manufacturer for thermal capability of motor when operated over desired speed range.

Failure to follow these instructions can result in death, serious injury, or equipment damage.



Motor Overload enables the drive controller to protect a standard asynchronous induction motor from overload. This function can replace a conventional class 10 thermal overload relay for single motor applications; however, multi-motor applications require individual external thermal overload motor protection.

This function is more effective in protecting a motor operated from a drive controller because it considers motor speed as well as time and current in its protection algorithm. This is important since most motors applied on drive controllers are self-cooled, and their cooling effectiveness declines at lower speeds. The drive controller's protection algorithm integrates motor current over time, taking into account factors such as stop time and idle time.

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Adjustment of Motor Overload

To adjust Motor Overload, first select the type of protection in the 7.4→ Fault Management menu. Four types of protection are available from the Motor Overload screen:

1. For Self-Cooled Motor
2. For Force-Ventilated Motor
3. Manual Tuning
4. No thermal protection

Factory setting is Self-Cooled Motor. Once the type of protection is selected, the Motor Overload current can be set in either the 1→Parameter Setting menu or in this screen. Motor Overload can be adjusted from 0.45 to 1.15 times the nominal drive controller current (see page 7), factory preset is 0.9 times nominal drive controller current (see page 40). Adjust Motor Overload value to nominal motor current. The types of protection are discussed in the following section.

Types of Protection

Self-Cooled Motor

With this type of motor overload protection, the motor base frequency is assumed to be the same as the nominal rated frequency. Enter the motor full load amps for Motor Overload current value.

The overload time–current characteristic is set to allow operation at motor rated current above 50% of motor base speed. Below 50% of motor base speed, the time-current characteristic is linearly tapered so that at zero speed, the drive will trip on overload at continuous operation above 25% of the motor overload setting.

The I^2t curve, which is used to determine when to trip on a motor overheat condition, emulates a class 10 thermal overload curve if nominal rated frequency is 60 Hz. If nominal rated frequency is 50 Hz, it emulates the European standard curve.

Force-Ventilated Motor

This type of motor overload protection is the same as that for a Self-Cooled Motor except that the overload time-current characteristic is set to allow operation at motor rated current throughout the speed range. The drive will trip on overload if the motor current exceeds the set level.

Manual Tuning

Manual Tuning works in the same way as the Self-Cooled Motor except for minimum speed at full load (MIN. SPD at F.L.), which was 50% in the case of Self-Cooled Motor, and maximum current at zero speed (1MAX at 0 SPD), which was 25% in the case of Self-Cooled Motor, are both programmable, as is the Motor Overload current value.

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No Thermal Protection

External thermal overload relays are required when more than one motor is connected to the output or when the motor connected to the drive controller is less than half the drive controller rating, or with a permanent magnet or wound field synchronous motor. When external overload protection is provided, select "No Thermal Protection".

NOTE: When "No Thermal Protection" is selected for the ATV66C23 to ATV66C31 drive controllers, the thermal protection is set to a level which limits the maximum continuous current to prevent drive controller damage.

⚠ CAUTION

LOSS OF MOTOR OVERLOAD PROTECTION

When using external overload relays connected to drive controller output, the overload relays must be capable of operation over the expected range of drive controller output frequencies (including direct current). When DC injection braking is used:

- The overload relay must be suitable for operation with direct current flowing in the motor.
- Do not use overload relays equipped with current transformers for sensing the motor current.

Failure to follow these instructions can result in equipment damage.

The thermal state of the drive controller is not automatically reset when power is removed.

⚠ CAUTION

MOTOR OVERHEATING

Repeated reset of the thermal state after a thermal overload can result in thermal stress to the motor.

When faults occur, promptly inspect motor and driven equipment for problems (locked shaft, mechanical overload, etc.) prior to restarting. Also check power supplied to motor for abnormal conditions (phase loss, phase imbalance, etc.).

Failure to follow these instructions can result in damage to the motor.

When a thermal overload fault occurs, a screen appears which asks "Do you want to clear the thermal state?"

If **NO** is selected, the motor overload fault cannot be reset until the thermal state of the motor, as calculated by the motor overload algorithm in the drive controller, is less than 100%.

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If **YES** is selected, the motor overload fault is restrained. The motor overload fault can be reset and the drive controller restarted. The restraint of the motor overload trip will last for approximately one minute. At the end of one minute, the restraint will clear and a motor overload trip will occur. This function can be used to allow maintenance personnel to perform an orderly shut-down of a process in the event of a motor overload fault. Subsequent restraint is possible, if required. However, repeated use of the restraint function can ultimately lead to motor damage.

Input Phase Failure

Input Phase Failure is used to detect loss of one or all input phases. When set to Yes, if one input phase is lost, the drive controller will trip. If the phase is restored and the drive controller is in 2-wire command with the Run Enable and direction inputs high, the drive controller will automatically restart the motor, regardless of the setting of Automatic Restart. If the phase is restored and the drive controller is in 3-wire command, the drive controller will be reset, but the motor will not start. If more than one phase is lost, the drive will trip on undervoltage.

Input phase failure can be inhibited by selecting No when a line contactor is used with the drive controller and control power is supplied separately to CL1-CL2, or in special applications when a common DC bus tie is used. When set to No, input phase loss will be ignored, however undervoltage will be displayed if the DC bus voltage is less than the undervoltage level but sufficient to maintain the drive controller power supply. The Fault State relay R1 will remain energized whenever voltage is present on CL1 and CL2, as long as there are no other faults. The undervoltage condition must be cleared prior to the drive controller recognizing a run command.

Loss of Follower

Loss of follower is used with the AI2 input and occurs when the 4-20 mA or 20-4 mA reference input is less than 3 mA. The drive controller can be programmed to fault, to run at a preset speed (programmable from Low Speed to High Speed), or to ignore the fault condition (factory preset) when loss of follower is detected.

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When “Go to ### Hz” is selected, AI2 must be the only assigned speed reference. All other speed references must be de-selected (see “Speed Reference” on page 69). The adjustment range of “Go to ### Hz” is 0.1 to 400 Hz for ATV66U41 to ATV66D79, CT; 0.1 to 200 Hz for ATV66C10N4 to ATV66C31N4, CT; and 0.1 to 90 Hz, VT.

Fold Back

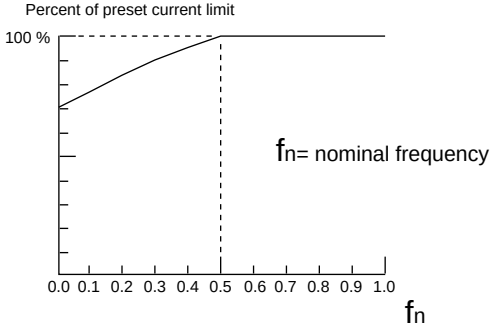
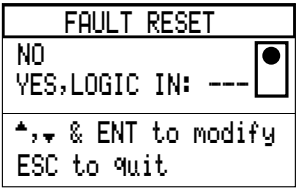


Figure 60: Fold Back

Fold Back is displayed only if the drive controller is configured for variable torque (page 34). Fold Back tapers the current limit curve as shown in Figure 60. Fold Back can be activated or deactivated from the keypad display.

Fault Reset



Enabling Fault Reset allows the drive controller to be reset when in Terminal Command mode after tripping on certain faults when an assigned logic input is high. To enable Fault Reset, select Yes and assign a logic input. The faults resettable with this function are: Overvoltage, DC-Bus Overvoltage, Output Phase Loss, Drive Overtemperature, Motor Overload, Loss of Follower, Sequence time-out fault, and Process time-out fault. When in Keypad Command mode (page 31) a function key can be programmed for Fault Reset.

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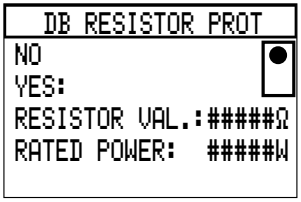
Dynamic Brake Fault

DB Fault is available on drive controllers with dynamic braking. Enabling the function allows the drive controller to protect the resistor and connection by generating a fault if the DB resistor connection is open.

DB Resistor Protection



DB Resistor Protection calculates the expected power dissipated by a dynamic braking resistor connected to the drive controller and issues a fault if the calculation exceeds the rating of the resistor. The range of resistor values is adjustable from at least 1 to 8 times the minimum recommended dynamic braking resistor value found in VD0C06S304_. The range of resistor power ratings is adjustable from at least 0.02 to 1.0 times the power rating of the drive controller. Enable by selecting Yes, and program the resistor value and power rating for the braking application. Because the calculation does not use current sensing, it is very important to enter the correct values of resistance and rated power for the resistors used. This protection function does not provide overtemperature protection for the resistor and its enclosure. Separate thermal protection may be required.

Output Phase Fault

Output Phase Fault is used to detect a loss of output phase. The fault can be inhibited by setting to No for troubleshooting or when the motor connected to the drive controller is less than 45% of drive controller power. Output Phase Fault is automatically inhibited when the Bypass function is used or the drive controller is operated in a variable torque mode at less than 33% of nominal frequency.

NOTE: If Output Phase Fault is inhibited for normal running (either manually or by the selection of the Bypass function), always supply an external motor overload relay. Operation with the presence of an Output Phase Fault can affect the calibration of the Motor Overload Protection function of the drive controller.

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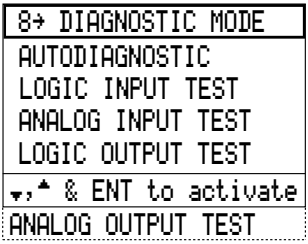
8→DIAGNOSTIC MODE



The 8→Diagnostic Mode menu allows access to various tests for locating failed components in case of an internal drive controller fault. This menu is accessible only when:

- The drive controller is stopped
- Supply line power (L1, L2 and L3) is disconnected
- Control power supply (CL1, CL2) is connected

If any of these conditions are not met, an error message appears and access to the Diagnostic Mode is denied. Exit the error message screen and return to the Main menu by pressing ESC.

The motor should be connected when performing tests. The following sections cover the functions available from the Diagnostic Mode menu.

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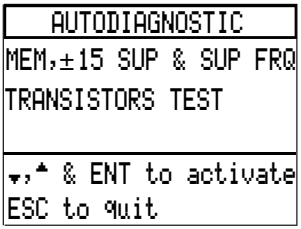
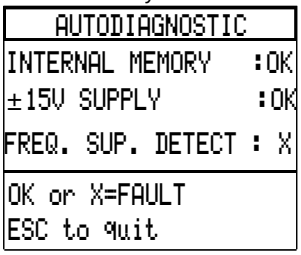
Autodiagnostic



Two tests are available from the Autodiagnostic Screen. Select either or both of the tests by scrolling with the ▲ and ▼ keys and pressing ENT.

1. Memory, ±15 V Supply, and Supply Frequency initiates a test on the ROM memory, a confirmation of the presence of ± 15 V, and a confirmation of the presence of supply frequency.
2. Transistors Tests initiates a test sequence on the drive controller transistor bridge. Note that the length of time required for this test varies with product size and the number of transistors in the bridge. While the test is in progress the Result display (see Figure 61) will report “In Process” on line 2.

Memory Test



Transistor Test

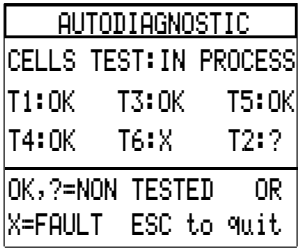


Figure 61: Tests Results

There are three possible responses for each element of a test:

- “OK” indicates that the tested element is good.
- “X” indicates that the tested element is defective.
- “?” (transistor test only) indicates that the transistor could not be tested.

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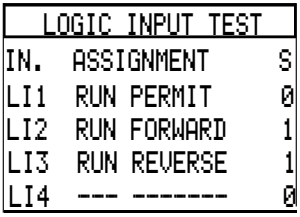
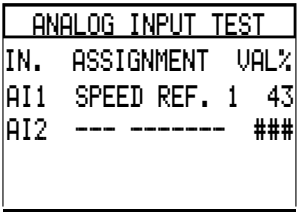
Logic Input Test



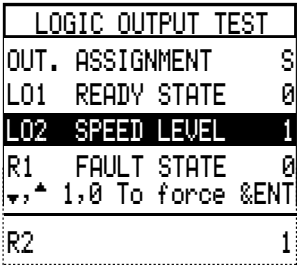
This menu allows you to change the state of the logic inputs to check for good wiring connections. When the Logic Input Test screen is active, changes made to the inputs will change input bit status without affecting the state of the drive controller.

Analog Input Test



Analog Input Test is similar to Logic Input Test. When this screen is active, you can change the state of the analog inputs to check for good wiring connections without affecting the state of the drive controller.

Logic Output Test



This menu allows you to change the state of the logic outputs to check for good wiring connections without affecting drive controller operation.

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When the Logic Output Test screen is active, all outputs are forced to low (0) state regardless of actual drive controller settings. Changes then made to the outputs will alter bit status without affecting the state of the drive controller. When you leave the Diagnostic Mode and return to Main menu, the logic outputs resume the programmed settings in place before the test sequence.

⚠ WARNING

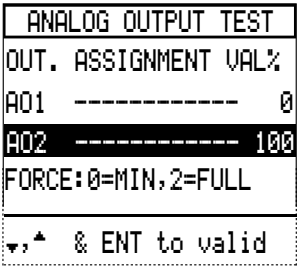
UNINTENDED EQUIPMENT ACTION

Forcing drive controller logic and analog outputs may cause undesired activation of connected equipment.

Set the connected equipment to ignore the change of state.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Analog Output Test



This menu allows you to change the value of the analog outputs to check for good wiring connections without affecting drive controller operation.

When the Analog Output Test screen is active, all output values are forced to 0 regardless of actual drive controller settings. Changes then made to the outputs will alter the setting without affecting the state of the drive controller. When you leave the Diagnostic Mode and return to Main menu, the analog outputs resume the programmed settings in place before the test sequence.

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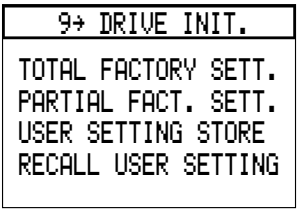
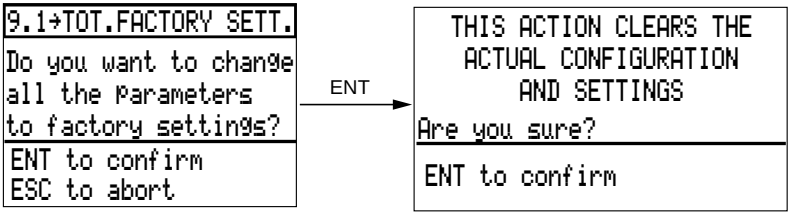
9→DRIVE INITIALIZATION MENU



This menu is only accessible when the drive controller is stopped. It allows the original factory default parameter settings to be restored to the drive controller, or the user configuration and adjustment settings to be saved to or recalled from a memory card (VW3A66901T).

Total Factory Settings

This selection returns all of the drive controller adjustment and configuration parameters to the original factory default settings.



⚠ WARNING

UNINTENDED EQUIPMENT ACTION

- Factory default settings will be substituted for present settings when Total Factory Settings is selected and confirmed.
- Factory default settings may not be compatible with the application. After returning to total factory settings, verify that default settings are compatible with application requirements.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

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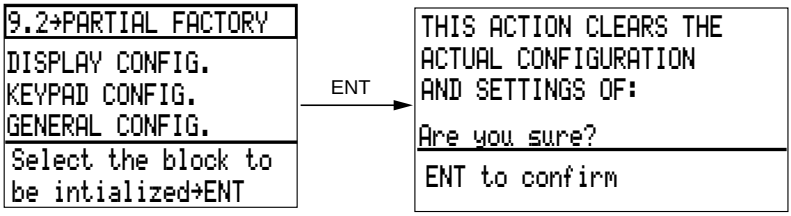
Partial Factory Settings

This selection allows you to restore factory settings of the Display Configuration menu, Keypad Configuration menu and General Configuration menu.



Store User Settings

NOTE: The PCMCIA Memory Card cannot transfer files between drive controllers of different power ratings or between drive controllers which contain different versions of software. See page 7 for determining controller power rating and software version.

Up to 16 configurations can be saved in a PCMCIA memory card (catalog number VW3A66901T). After selecting Store User Settings, a message will appear prompting you to insert a memory card:

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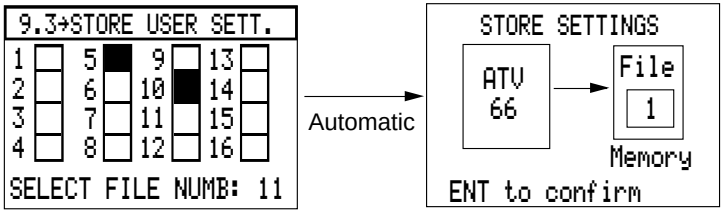
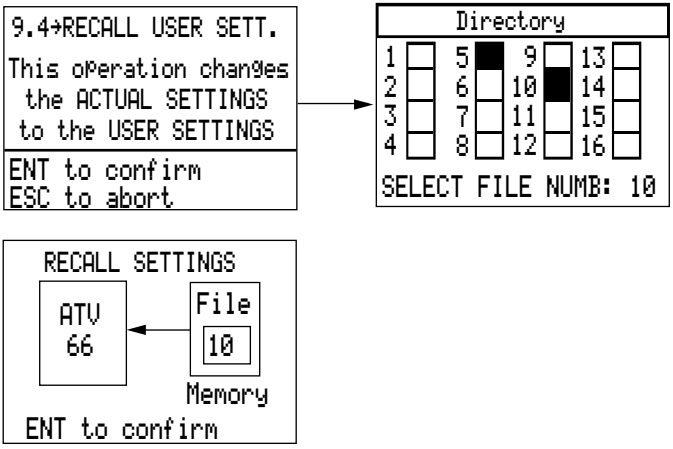
The Store User Settings menu is illustrated below. The black boxes correspond to configurations already stored in the card. Select an empty box. In the example shown, 1 is selected. To store, press ENT. When the configuration has been saved, a message will appear indicating whether or not the save operation was successful.



Recall User Settings

To download a configuration from a PCMCIA memory card to the drive controller, select Recall User Settings. Install the memory card. A message will appear:



Select one black box. In the example shown above, “10” is selected. Press ENT to download. When the configuration has been downloaded, a message will appear indicating whether or not the transfer was successful. If an error was made in selecting a box (file) number, a message will indicate an incompatible or empty file.

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10→ACCESS LOCK MENU

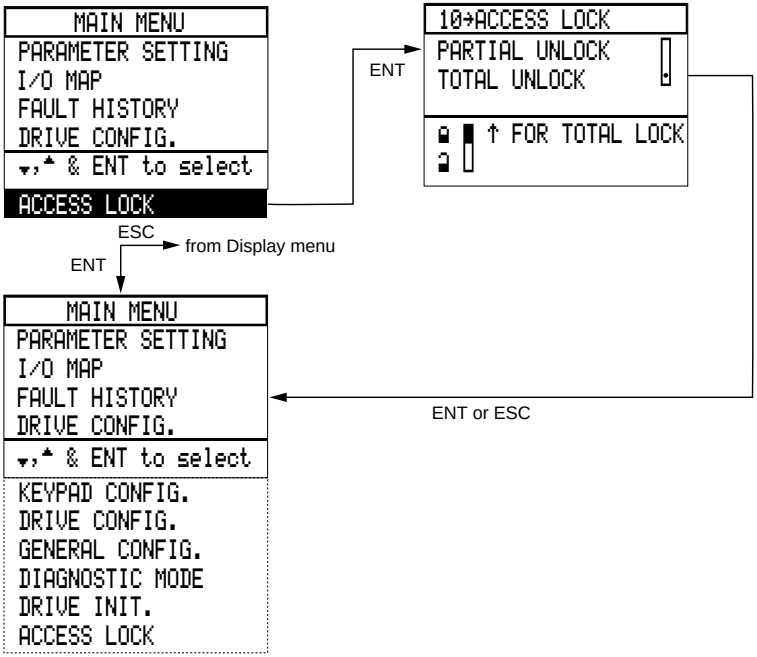

Figure 62: Setting Access Level to Total Unlock from Partial Unlock

The 10→Access Lock menu is used to move between Partial Unlock and Total Unlock when the access locking switch on the back of the keypad display is set to unlock (down).

To return to Total Lock, disconnect the keypad display and set the access locking switch to lock (up). If command is from the keypad display, the drive controller must be stopped before disconnecting the keypad. If command is from the terminal strip, it is not necessary to stop the drive controller.

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APPENDIX A: PARAMETER SUMMARY

This Appendix contains a general summary and description of parameters. Refer to previous sections of the manual for complete explanations of the parameters and applicable precautions.

1→PARAMETER SETTING MENU

Parameter	Range	Factory Setting	Description
Low Speed	0–High Speed	0 Hz	Low speed setting.
High Speed	Low Speed to Maximum Frequency	50 Hz if input freq. is 50 Hz; 60 Hz if input freq. is 60 Hz	High speed setting.
Acceleration	0.1–999.9 s	3 s	Length of time to accelerate from zero speed to nominal frequency.
Deceleration	0.1–999.9 s	3 s	Length of time to decelerate from nominal frequency to zero speed.
Acceleration 2	0.1–999.9 s	5 s	Second acceleration ramp rate, used when alternate ramp is selected (7.12→Control Parameters menu).
Deceleration 2	0.1–999.9 s	5 s	Second deceleration ramp rate, used when alternate ramp is selected (7.12→Control Parameters menu).
Slip Compensation	0.1–10 Hz	Depends on drive controller horsepower	Improves steady state speed regulation by controlling output frequency based on motor slip. Only available with constant torque configuration and when set to Manual in the 7.11→Motor Parameters menu.
IR Compensation	Normal: 0–100% High Torque: 0–150% Special: 0–800%	100%	Used to adjust low speed torque for optimal performance. For constant torque only.
Damping	Normal, High Torque (CT), & NOLD (VT): 1–100%; Special (CT) and Normal (VT): 1–800%	20%	Matches the response of the load to the frequency response of the drive controller by adjusting the integral gain of the frequency loop.
Profile	0–100	20	Shapes the V/Hz profile of the output for variable torque applications in normal control type.
Bandwidth	0–100%	20%	Second frequency loop gain when drive controller is set for constant torque, high torque control type.
Voltage Boost	0–100% of nominal voltage	20%	Corresponds to a voltage level at 0 Hz, allowing for optimal voltage and torque boost during starting in special and high torque control types.
Motor Overload	0.45–1.15 times nominal drive controller current	0.9 x nominal drive controller current	Accounts for speed, time and current when calculating thermal overload state.
SP Gain	-9999 to +9999	+9999	System gain in PI Regulator

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1→PARAMETER SETTING MENU(cont'd)

Parameter	Range	Factory Setting	Description
Offset	-9999 to +9999	+0	System offset in PI Regulator
KP	0–9999	100%	Proportional gain in PI Regulator
KI	0–9999	0	Integral gain in PI Regulator
PI FLT Ratio	0–100%	100%	Limitation of error between desired setpoint and actual process feedback
PI Set Point	-9999 to +9999	0	Setpoint in PI Regulator
PI SP Manual	0–High Speed	0 Hz	Manual speed reference in PI Regulator

2→I/O MAP

2.1→Logic Input Map

Logic Input	Factory Setting	Reassignable
LI1	Run permissive	No
LI2	Run forward	No
LI3	Run reverse	Yes
LI4	Jog	Yes

2.2→Analog Input Map

Analog Input	Factory Setting	Reconfigurable
AI1	Speed reference1	No
AI2	Speed reference 2	Yes

2.3→Logic Output Map

Logic Input	Factory Setting	Reassignable
LO1	At speed	Yes
LO2	Current limit	Yes
R1	Fault	No
R2	Running state	Yes

2.4→Analog Output Map

Analog Output	Factory Setting	Reassignable
AO1	Motor speed	Yes
AO2	Motor current	Yes

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6→DRIVE CONFIGURATION MENU

Parameter	Range	Factory Setting	Description
Torque Type	Constant Variable Variable Low Noise	Constant	Type of Torque.
Command Type	2-wire (maintained) 3-wire (impulse)	2-wire	Type of control circuit which is wired into the drive controller, affecting operation of the Forward and Reverse inputs.
Motor Power (ATV66U41 only)	.75 kW / 1 hp 1.5 kW / 2 hp 2.2 kW / 3 hp	2.2 kW / 3 hp	Used to select motor power for ATV66U41 drive controller.

7→GENERAL CONFIGURATION MENU

7.11 (7.14, 7.17)→Motor Parameters [1]

Parameter	Range	Factory Setting	Description
Nominal Current	45–105% of drive controller current rating	90%	Motor nameplate value for full load current.
Nominal Frequency	50 Hz, 60 Hz Special: ATV66U41–D79, CT: 25–400 Hz; ATV66C10–C31, CT: 25–200 Hz ; VT: 25–90 Hz	60 Hz if input freq. at 1st power up = 60 Hz 50 Hz if input freq. at 1st power up = 50 Hz	Point on the V/Hz curve beyond which voltage remains virtually constant and only frequency increases.
Nominal Voltage	ATV66•••N4: 380- 400- 415- 440- 460 V ATV66•••M2: 208- 220- 230- 240 V	ATV66•••N4: 400 V if input freq. at 1st power up = 50 Hz; 460 V if input freq. at 1st power up = 60 Hz ATV66•••M2: 230 V	Point on the V/Hz curve beyond which voltage remains virtually constant and only frequency increases.
IR Compensation	Normal: 0–100% High Torque: 0–150% Special: 0–800%	100%	Used to adjust low speed torque for optimal performance. For constant torque only.
Voltage Boost	0–100% of nominal voltage	20%	Corresponds to a voltage level at 0 Hz, allowing for optimal voltage and torque boost during starting in special and high torque control type.
Profile	0–100	20	Shapes the V/Hz profile of the output for variable torque applications in normal control type.
Damping	Normal, High Torque (CT) and NOLD (VT): 1–100%; Special (CT) and Normal (VT): 1–800%	20%	Matches the response of the load to the frequency response of the drive controller by adjusting the integral gain of the frequency loop.

[1] Menus 7.14 and 7.17 only available with 2 Motors or 3 Motors enabled in Mot. Select Switch.

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7.11 (7.14, 7.17)→Motor Parameters(cont'd) [1]

Parameter	Range	Factory Setting	Description
Bandwidth	0–100%	20%	Second frequency loop gain when drive controller is set for constant torque, high torque control type.
Rotation Normalization	ABC, ACB	ABC	Inverts direction of motor rotation without rewiring.
Torque Limit Generator	0–200% of nominal motor torque	150%	Allows the limitation of torque, independent of current limit, in the generator quadrant (drive controller with dynamic braking).
Torque Limit Motor	0–200% of nominal motor torque	150%	Allows the limitation of torque, independent of current limit, in the motor quadrant.
Current Limit	Default limit, Alternate value, CT: 40–150% of nominal drive controller current if input freq. = 60 Hz, 40–150% of nominal controller current if input freq. = 50 Hz VT: 40–110% of nominal drive controller current By frequency level CT, ATV66U41–D79 : 0.1–400 Hz CT, ATV66C10–C31: 0.1–200 Hz VT: 0.1–90 Hz	CT: 150% if input freq. = 60 Hz; 136% if input freq. = 50 Hz VT: 110%	Allows alternate current limit value by frequency level, logic input or analog input.
Slip Compensation	No, Automatic, Manual: 0.1–10 Hz	Automatic	Improves steady state speed regulation by controlling output frequency based on motor slip. Only available with constant torque configuration.
Brake Sequence			Allows sequencing of drive controller output, mechanical brake actuation, and DC injection for smooth starting and stopping.
Release Frequency	0 Hz–Low Speed	0 Hz	Release frequency and release current must be reached before the brake output changes state.
Release Current	0–100% of motor nominal current	0%	Release current and release frequency must be reached before the brake output changes state.
Release Time	0–5 s	0 s	Delay between when brake output changes state and drive controller begins its acceleration ramp.
Engage Frequency	0 Hz–Low Speed	0 Hz	Frequency at which, after a stop command is received and the drive controller decelerates, DC injection braking is activated.

[1] Menus 7.14 and 7.17 only available with 2 Motors or 3 Motors enabled in Mot. Select Switch.

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7.11 (7.14, 7.17)→Motor Parameters(cont'd) [1]

Parameter	Range	Factory Setting	Description
Brake Sequence (cont'd)			
Engage Time	0 to 5 s	0 s	Delay between when Engage frequency is reached and DC is injected, and when brake output changes state initiating brake actuation.
DC Injection Level	50–150% of motor nominal current	70%	Level of DC injection braking current.
DC Brake Time	0–30.1 s	2 s	Amount of time for which DC is injected.

[1] Menus 7.14 and 7.17 only available with 2 Motors or 3 Motors enabled in Mot. Select Switch.

7.12 (7.15, 7.18)→Control Parameters [2]

Parameter	Range	Factory Setting	Description
Maximum Frequency	CT, ATV66U41–D79: Nominal Freq.–400 Hz CT, ATV66C10–C31: Nominal Freq. –200 Hz VT: Nominal Freq.–90 Hz	60 Hz if input line freq. = 50 Hz; 72 Hz if input line freq. = 60 Hz	Maximum output frequency.
Low Speed	0–High Speed	0 Hz	Low speed setting.
High Speed	Low Speed to Maximum Frequency	50 Hz if input freq. = 50 Hz; 60 Hz if input freq. = 60 Hz	High speed setting.
Acceleration	0.1– 999.9 s	3 s	Length of time to accelerate from zero speed to nominal frequency.
Deceleration	0.1– 999.9 s	3 s	Length of time to decelerate from nominal frequency to zero.
Acceleration Type	Linear, S, U	Linear	Type of acceleration ramp the drive controller follows.
Deceleration Type	Linear, S, U	Linear	Type of deceleration ramp the drive controller follows.
Alternate Ramps	No, By Frequency level, CT, ATV66U41–D79: 0.1–400 Hz CT, ATV66C10–C31: 0.1–200 Hz VT: 0.1–90 Hz By Logic input Acceleration 2: 0.1– 999.9 s Deceleration 2: 0.1–999.9 s	No 5 s 5 s	Alternate acceleration and deceleration ramps activated by either a frequency level or logic input.

[2] Menus 7.15 and 7.18 only available with Motor Select Switch enabled.

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7.12 (7.15, 7.18)→Control Parameters(cont'd) [2]

Parameter	Range	Factory Setting	Description
Skip Frequencies	Low speed to: CT, ATV66U41–D79: 400 Hz CT, ATV66C10–C31: 200 Hz VT: 90 Hz Skip bands: 2 or 5 Hz	None	Drive controller reference will not stop on the skip frequency which causes mechanical resonance. Up to 3 can be programmed.

[2] Menus 7.15 and 7.18 only available with Motor Select Switch enabled.

7.13 (7.16, 7.19)→Control Type [3]

Control Type	Range	Factory Setting
Constant Torque	Normal, Special motors, High torque (SVC) [4]	Normal
Variable Torque	Normal, NOLD	Normal

[3] Menus 7.16 and 7.19 only available when 2 Motors or 3 Motors is enabled in Motor Select Switch.

[4] High Torque (SVC) not available in menus 7.16 and 7.19.

7.2→Application Functions

Parameter	Range	Factory Setting	Description
Run Reverse	No Yes, Logic input	Yes, Logic Input LI3	Drive controller runs in reverse when assigned input is high.
Jog	No Yes, Logic input Jog speed: 0.2–10 Hz Duty time: 0.2–10 s	Yes, Logic Input LI4 5 Hz 0.5 s	Drive controller jogs at programmed jog speed when assigned input is high.
+/- Speed	No Yes, with memory Yes, without memory	No	Increase or decrease of the speed by using two logic inputs, similar to a motorized potentiometer. When input assigned to + speed is high, frequency increases according to acceleration ramp, limited by the reference frequency. When input goes low, speed is maintained. When input assigned to -speed is high, frequency decreases according to deceleration ramp, limited by low speed. When input goes low, speed is maintained. With memory: Drive controller stores speed. Without memory: Last speed is not stored.
Set Point Memory	No Yes, logic input	No	When the assigned logic input goes high for longer than 0.1 s, the analog speed reference is stored and the drive controller runs at that speed until the next time the input goes high.

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7.2→Application Functions (cont'd)

Parameter	Range	Factory Setting	Description
Preset Speeds	No 1 Preset speed 3 Preset speeds Range: 0.1 Hz to: CT, ATV66U41–D79: 400 Hz CT, ATV66C10–C31: 200 Hz; VT: 90 Hz	No (When preset speeds are selected, factory settings are 5, 10, and 15 Hz)	Input 1 / Input 2 0 / 0 Low or reference speed 1 / 0 Preset Speed 1 0 / 1 Preset Speed 2 1 / 0 Preset Speed 3
Reference Speed	0–20 mA 4–20 mA 20–4 mA x–20 mA	4–20 mA	Modification of AI2 for the type of signal.
Auto/Manual	No Yes, Logic input	No	Allows switching between AI1 and AI2 by logic command. AI1 is manual reference. AI2 is automatic. See Figures 63 and 64.
Controlled Stop	No By Logic input By Frequency level or by LI /Frequency level CT, ATV66U41–D79: 0.1–400 Hz CT, ATV66C10–C31: 0.1–200 Hz VT: 0.1–90 Hz Stopping Methods: Freewheel stop Fast stop DC injection	No Freewheel stop	Allows frequency threshold and Logic Input to work together to tailor the stopping process.
Shutdown	No Yes Dwell time: 0.1–60 s	No 1 s	Allows drive controller to dwell at low speed before completely stopping. Time adjustable between 1 and 30 s
Bypass	No Yes, Define I/O Delay time: 0.2–10 s Sequence Time-out Fault: 0.2–300 s Process Time-out Fault: 0.2–300 s	No 2 s 5 s 5 s	Used to run machine at full speed when the drive must be taken off line for service or repair. Allows for isolation of the motor by means of a contactor installed between the drive and the motor with a special command sequence.
Mot. Select Switch	1 Motor 2 Motors 2 Parameters 3 Motors 3 Parameters	1 Motor	2 Motors and 3 Motors used to toggle between sets of motor and control parameters for using two or three motors with a single controller. 2 Parameters and 3 Parameters only toggle control parameters, and are for use with one motor.

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7.2→Application Functions (cont'd)

Parameter	Range	Factory Setting	Description
PI Regulator	No Yes, Set Point Feed Back Set Point Manual PI Parameters	No	Used for controlling level or flow of a process with setpoint and feedback inputs.

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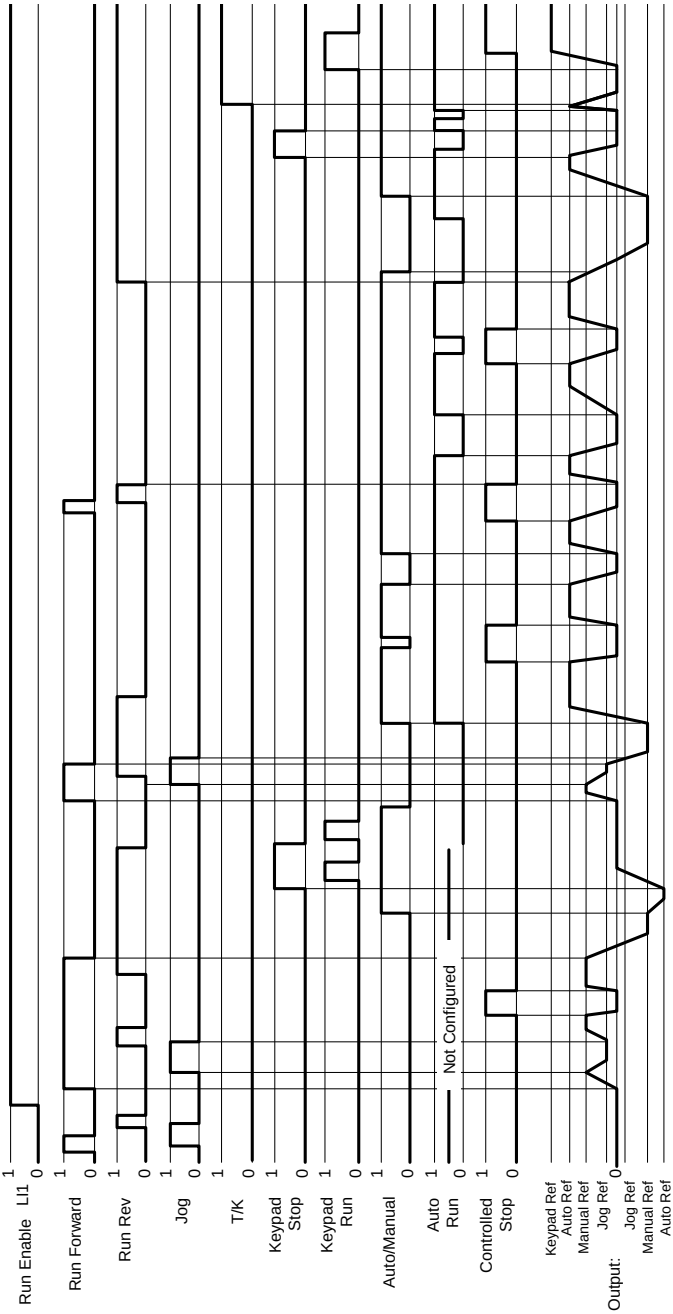

Figure 63: Auto/Manual in 2-Wire Command with Controlled Stop Active High

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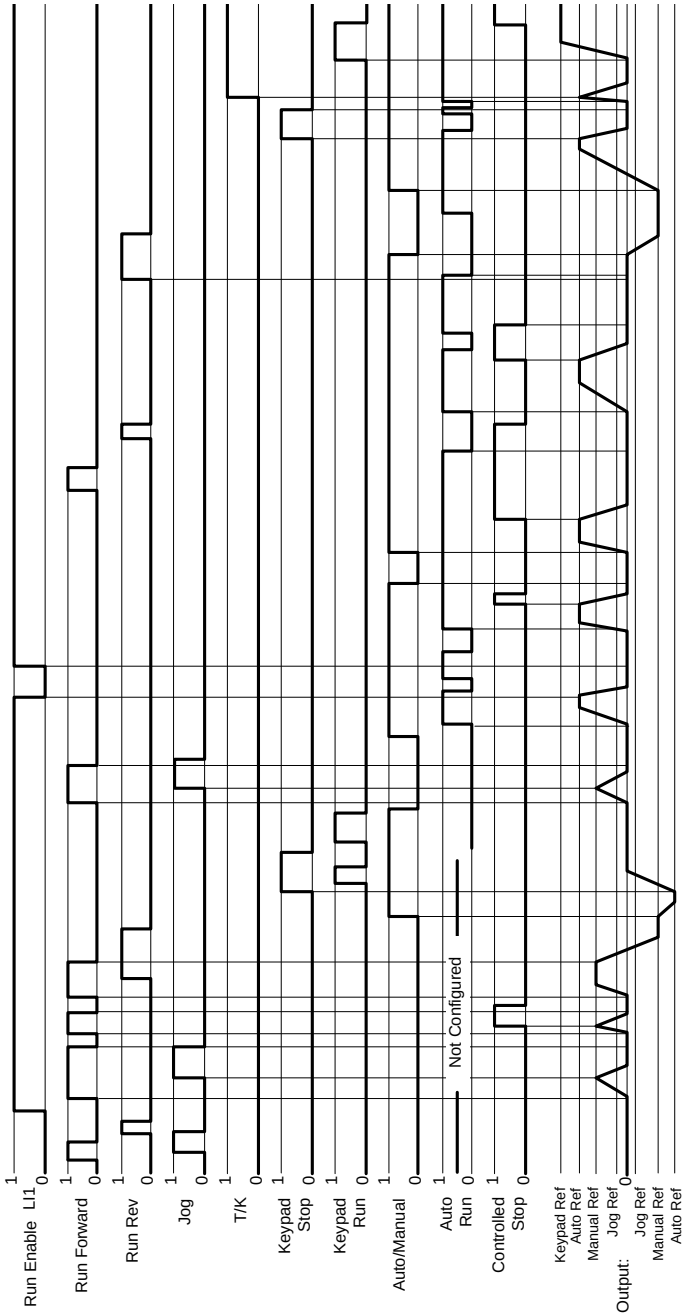

Figure 64: Auto/Manual in 3-Wire Command with Controlled Stop Active High

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Appendix B: Menu Summary

This Appendix contains a summary of Level 1 and 2 Configuration Software menus. Use it as a quick reference for menu flow and contents. The page numbers refer back to sections of this manual where complete explanations of the menus can be found.

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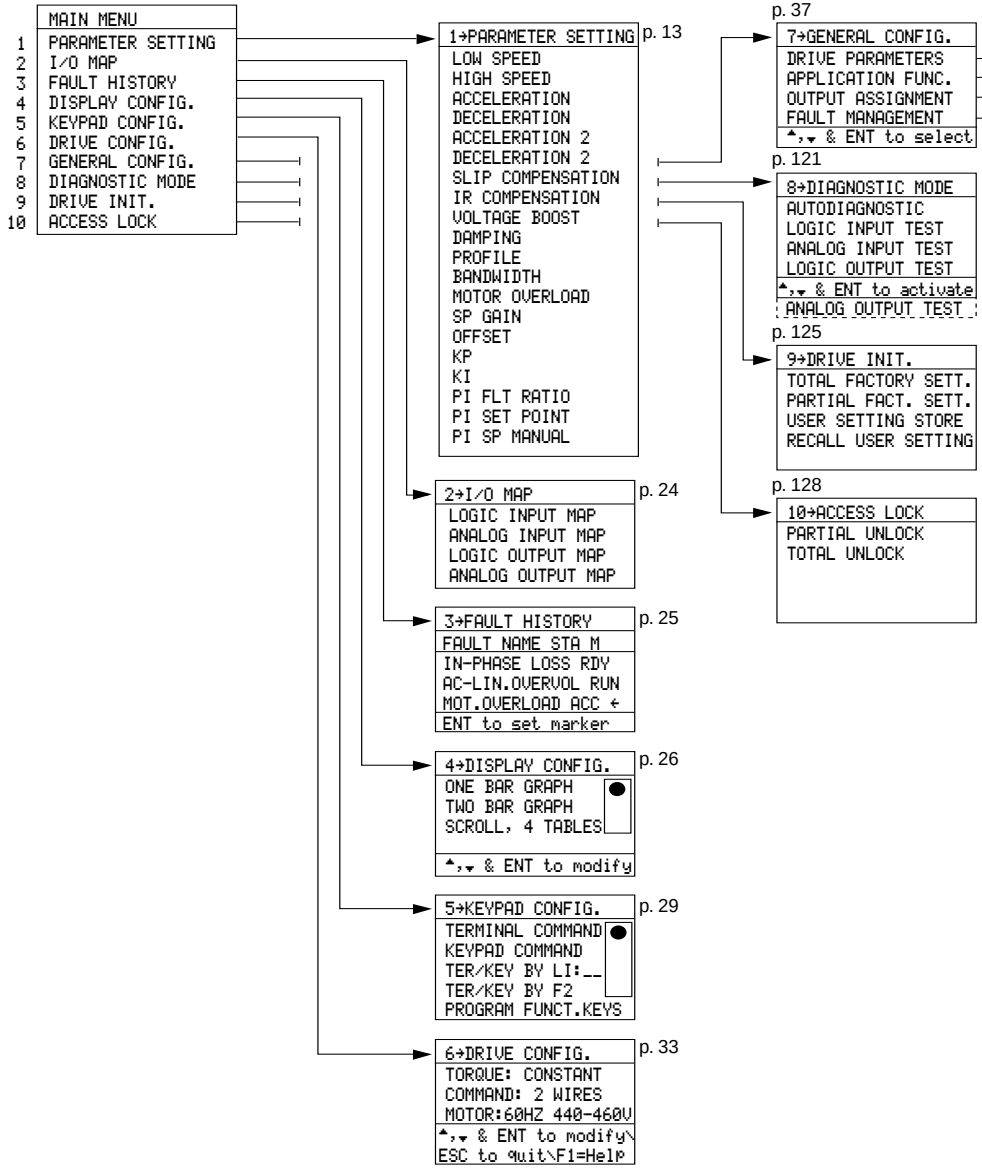

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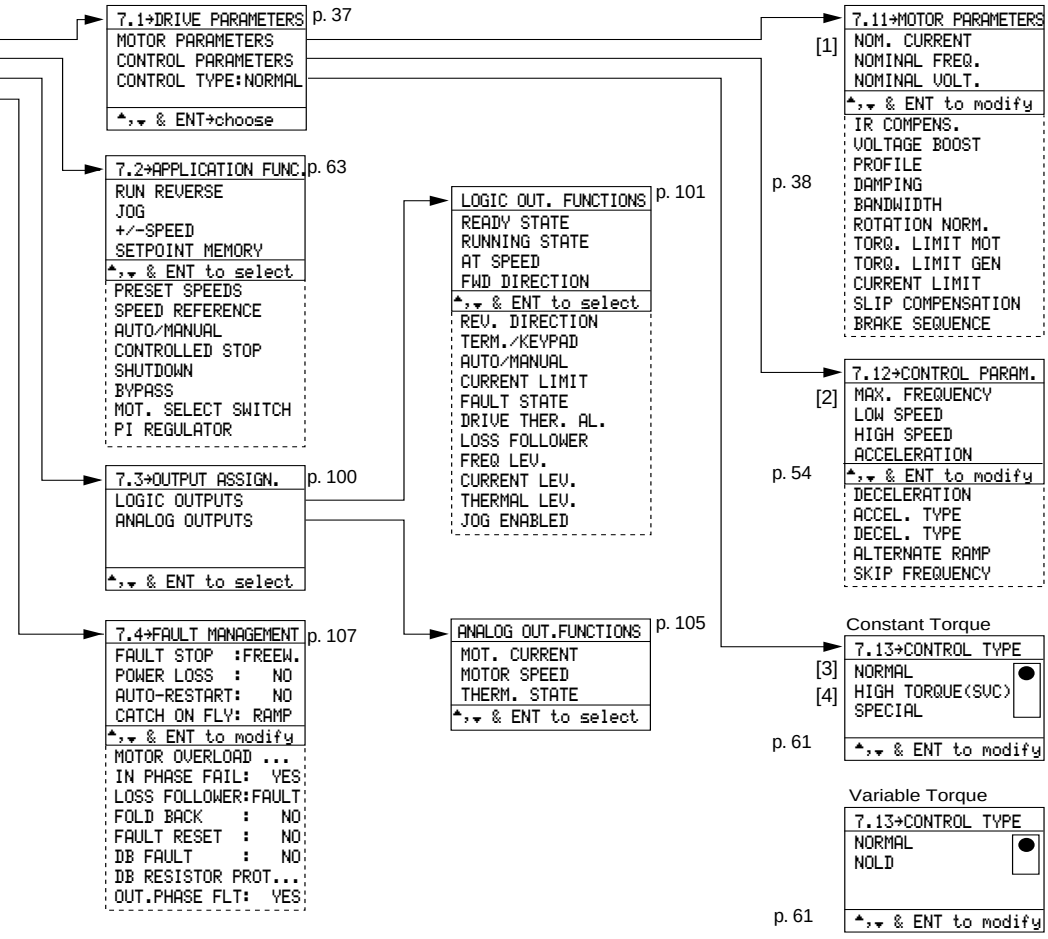

[1] Motor parameters also available in menus 7.14 and 7.17 when 2 Motors or 3 Motors is enabled.
[2] Control parameters also available in menus 7.15 and 7.18 when 2 Motors, 3 Motors, 2 Parameters, or 3 Parameters is enabled.
[3] Control type also available in menus 7.16 and 7.19 when 2 Motors or 3 Motors is enabled.
[4] High torque not available in menus 7.16 and 7.19.

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Symbols

+speed/-speed 63, 66
“S” curve acceleration 57
“S” curve deceleration 58
“U” curve acceleration 57
“U” curve deceleration 58

Numerics

1 motor 83
2 motors 83, 85, 87
2 parameter sets 83, 87
2-wire command 35
3 motors 83, 85, 87
3 parameter sets 83, 87
3-wire command 36

A

AC line overvoltage 9
ACC 8, 25
acceleration 14
acceleration "2" 14, 16, 59
acceleration ramp type 57
acceleration time 15, 56
access levels 10
  partial unlock 11
  total lock 10
  total unlock 11
access lock menu 128
access locking switch 5, 10–11, 128
AI2
  modifying signal type 69
alternate ramps 59
Altivar 66 1
analog input test 123
analog inputs/outputs
  displaying 24
analog output test 124
analog outputs
  assigning functions to 105
application functions menu 63
at speed 102
auto/manu 97–98
auto/manual 64, 70, 103
autodiagnostics 122
automatic restart 111
auto-test failure 9

B

bandwidth 21, 39, 45
bar graphs
  displaying 26–28
brake output 52, 105
brake sequence 39, 51
BRK 8, 25
bypass 64, 79, 82

C

catch on Fly 112
CLI 8, 25
command type
  selecting 34
command type menu 34
component failure
  locating 121
control parameter menu 54
control type menu 61
controlled stop 64, 71
  by frequency threshold 72
  by frequency threshold and logic input 73
  by logic input 72
current level 1 104
current limit 39, 47, 103

D

damping 14, 19, 21, 39, 45
DB resistor protection 120
DC brake time 53, 76
DC bus overvoltage 9
DC injection braking 76
DC injection level 53, 76
DCB 8, 25
DEC 8, 25
deceleration 14
deceleration "2" 14, 16, 59
deceleration ramp type 58
deceleration time 16, 56
delay time 79
diagnostic mode menu 121
direction rotation 30, 32
display configuration menu 26
display screen 6, 8
displaying faults 25
documentation 1
drive configuration 33
  downloading 127
  storing 126
drive configuration menu 6
drive controller
  parameters 54
  status 8
drive functions
  displaying 26
drive identification menu 6
drive initialization menu 125
drive nameplate information
  displaying 6
drive overtemperature 9
drive parameters menu 37
drive status codes 8, 25
drive thermal alarm 103

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dynamic brake 9
dynamic brake fault 120
dynamic brake resistor 9

E

engage frequency 53
engage time 53

F

factory default settings
  restoring 125–126
fast stop 75, 107
fault
  descriptions 9
  displaying 25
  displaying type 8
  programming 107
  reset methods 108
  troubleshooting 25
fault history menu 25
fault management menu 107
fault reset 119
fault state 103
fault stop methods
  specifying 107
FB high alarm 99, 104
FB input 93
FB limit 99, 104
FB low alarm 99, 104
feedback menu 93
FLT 8, 25
flux vector control 61
fold back 119
freewheel stop 74, 107
frequency level 1 103
frequency loop gain 19, 21, 45
function keys
  in keypad command 32
  programming 29–30
FWD direction 102

G

general configuration menu 37
ground fault 9

H

help menu 3
high level alarm 93
high speed 14–15, 56
high torque control 61

I

I/O extension module 63, 68
I/O map 24
index number menu 3
index numbers 12
input phase failure 118
input phase loss 9
input/output extension 63
internal fault 9
IR compensation 14, 17, 39, 41

J

JOG 8, 25
jog 30, 32, 63, 65
jog function 32
jump to menu 3

K

keypad
  selecting 91, 97
keypad command 3, 10
  function keys in 30
  selecting 29
  using 31
keypad configuration menu 29
keypad display 2
  connection 5
  locking 10
  mounting 5
  remote handheld use 5
  removal 5
keys
  arrow 3
  ENT 2
  ESC 2
  F1 3
  F2 3
  F3 3
  function 3
  numeric 3
  RUN 4
  STOP 4
  STOP/RUN key cover 4
KI 14, 99
KP 14, 99

L

language
  selecting 6
language menu 6
LCD 2
local command 10
logic input test 123
logic inputs
  assigning functions to 63

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logic inputs/output
displaying 24
logic output test 123
logic outputs
assigning functions to 101
loss of follower 9, 103, 118
low level alarm 93
low speed 14–15, 55

M

machine speed 27
machine speed reference 27
main menu 7
max. feed back 93
maximum frequency 55
mechanical resonance 60
memory failure 9
menus
access lock 128
application functions 63
command type 34
control parameters 54
control type 61
diagnostic mode 121
display configuration 26
display screen 6, 8
drive configuration 6
drive Identification 6
drive initialization 125
drive parameters 37
fault history 25
fault management 107
general configuration 37
help 3
I/O Map 24
index number 3
index numbers 12
jump to 3
keypad configuration 29
language 6
main 7
motor parameters 38
motor power 34
one bar graph 27
output assignment 100
overview 12
parameter setting 13
program function keys 30
torque type 34
two bar graph 28
min. feed back 93
motor current 105
motor overload 9, 14
adjustment 116
motor overload protection 23, 115
force-ventilated motor 116
manual tuning 116
self-cooled Motor 116
motor parameters
adjusting 38
motor parameters menu 38
motor power
selecting 34
motor power menu 34
motor select switch 15, 64, 83
motor speed 27, 105
motor thermal state 106

N

neg. values 99
NLP 8
NOLD control 62
nominal current 39–40
nominal frequency 39–40
nominal voltage 39, 41
normal control 61
normal stop 107
NRP 8

O

offset 14, 91
calculating 92
one bar graph menu 27
open transistor 9
output assignment menu 100
output phase fault 120
output phase loss 9
overload relays 117
overspeed 9

P

parameter setting menu 13
partial factory settings 126
PCMCIA card
downloading from 127
storing to 126
phase rotation 46
PI err output 99, 106
PI FB output 99, 106
PI feed back 27, 89, 93
PI FLT ratio 14, 99
PI integral 106
PI integrator 99
PI parameters 98
PI ref output 99, 106
PI regulator 64, 89
application examples 94–96
function compatibility 90
using the function 91
PI set point 14, 27, 89, 91
PI SP manual 14, 89, 97–98
power loss fault 109
precharge failure 9
preset speeds 30, 63, 68
process input 80

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process time out 9
process time-out fault 80
profile 14, 20, 39, 44
program function keys menu 30
PS1 32
PS2 32

R

RDY 8, 25
ready state 102
reference storage 63
release current 52
release frequency 52
release time 52
reset after fault 108
reset fault 32
rev. action 99
rev. speed 97–98
reverse direction 105
ROM memory
  testing 122
rotation normalization 39, 46
RST 32
RUN 8, 25
run output command 79
run reverse 63, 65
running state 102

S

SCR 32
scroll function 32
sequence input 79
sequence time out 9
sequence time-out fault 80
serial link fault 9
set point menu 91
setpoint
  automatic 97
  manual 97
setpoint manual menu 97
setpoint memory 67
short circuit 9
shutdown 64, 78
skip frequencies 60
SLC 8
slip compensation 14, 16, 39, 50
SP gain 14, 91
  calculating 92
SP input 91
special control 62
speed reference 64, 69
speed regulation 50
speed response
  increasing 45
SPM input 97–98
store user settings 126
supply frequency
  testing for 122
switching between AI1 and AI2 70

T

T / K 32
terminal command 3
  selecting 29
terminal/keypad 102
terminal/keypad command
  selection 32
thermal level 1 104
thermal overload fault 117
thermal protection 23, 115
torque boost 21
torque limit
  generator 46
  motor 46
torque type
  selecting 34
torque type menu 34
total factory setting 125
transistor bridge
  testing 122
two bar graph menu 28

U

undervoltage 9

V

V/Hz profile 20, 44
voltage
  setting 6
voltage boost 14, 21, 39, 43
voltage reference input 69

W

wiring connections
  checking 123

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Replaces Bulletin No. VD0C06S305B dated 7/96
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Addendum V3.2 to Instruction Bulletin VD0C06S305C

for Software Versions:
V2.0, V2.1, V3.0, V3.1, V3.1S238, V3.2, & V3.2S238

INTRODUCTION

This document is for ALTIVAR® 66 drive controllers with V2.0 through V3.2 software. It is an addendum to the Level 1 & 2 Configuration Manual, bulletin VD0C06S305C (dated November, 1996).

To determine if this addendum is applicable to your drive controller and, if so, which part of the addendum to use, first identify the version of software installed in your ALTIVAR 66 drive controller.

IDENTIFYING THE SOFTWARE VERSION

⚠ DANGER

HAZARDOUS VOLTAGE

- Read, understand, and perform "Procedure 1: Bus Voltage Measurement" in Chapter 4 of VD0C06S304C before identifying the software version. Measurement of DC bus capacitor voltage must be performed by qualified personnel.
- The DC bus LED is not an accurate indication of absence of DC bus voltage.
- DO NOT short across capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Failure to follow these instructions will result in death or serious injury.

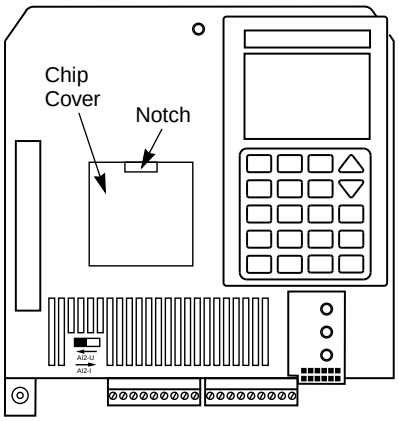

Figure 1: Main Control Board – Location of Chip Cover

1. Disconnect and verify that all power is removed from the drive controller (including any power present on J22, J23 & J24 terminals of the I/O Extension module, if installed).
2. Wait 1 minute to allow the DC bus to discharge.
3. Perform the Bus Voltage Measurement Procedure (refer to Chapter 4 of the Receiving, Installation & Start-Up Manual, VD0C06S304C).
4. Insert a small, electrically insulated screw driver in the notch of the software chip cover. Apply slight upward pressure and pull out to remove the cover. See Figure 1.
   NOTE: If drive controller is equipped with I/O Extension or Communication Carrier module, first remove module by loosening the two mounting screws. (On I/O extension module, also unplug the separable connectors — J22, J23 & J24 — from the bottom of the module.)
5. Record the software revision number from the chip.
6. Select the portion of the addendum that matches the software version of your drive controller and review the material prior to configuration.
7. Replace the plastic cover over the software chip.
8. Reinstall the module (as required, see note in Step 4).
9. Close the drive controller cover.

If your drive controller contains a software version between V1.1 IE07 and V1.6 IE19B, contact your local field sales office for software upgrade information.

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Replaces Addendum V3.1 IE33 dated 12/96

CONTROLLED STOP AND FAULT STOP

Table 2 lists the differences between **V1.6 through V3.2** software and the functionality described in bulletin VD0C06S305C, which you received with the drive controller.

Table 1: Incompatible Functions

Menu	Function	Description
7.2→Application Functions and 7.4→Fault Management	Controlled Stop Fault Stop	**⚠ WARNING** **UNINTENDED EQUIPMENT ACTION** • When set for DC Injection, Controlled Stop by Logic Input (Menu 7.2→Application Functions) is not compatible with Fault Stop (Menu 7.4→Fault Management) • If Controlled Stop by Logic Input is set for DC Injection, Fault Stop type must be set to Fast or Freewheel. **Failure to follow this instruction can result in death, serious injury, or equipment damage.**

SOFTWARE VERSION 3.2

Table 2 lists the differences between **V3.2 and V3.2S238** software and the functionality described in bulletin VD0C06S305C, which you received with the drive controller.

Table 2: Software V3.2 and V3.2S238 Exceptions

Menu	Function	Description
4→Display Config.	Motor Speed	Motor rated speed in rpm is configured in Menu 7.11 as Nominal RPM. Motor rated speed in rpm cannot be assigned to the Motor Speed function in Menu 4.
7.11→Motor Parameters	Torque Limit	Torq. Limit Gen. and Torq. Limit Mot. (in Torque Limit menu) can be activated by frequency, logic input, or analog input. These activation methods function like those in Current Limit (see page 48 of VD0C06S305C). **⚠ WARNING** **UNINTENDED EQUIPMENT ACTION** If Torq. Limit Gen. adjustment is set to less than the continuous required regeneration torque for the application, controller will not stop when commanded. **Failure to follow this instruction can result in death, serious injury, or equipment damage.**
	Brake Sequence	Brake Sequence and Controlled Stop (Menu 7.2) are compatible.
	Nominal Freq.	Max. Frequency setting (Menu 7.12) will automatically increase if the Nominal Frequency setting is increased to a value that exceeds the initial Max. Frequency setting.
7.2→Application Functions	Mot. Select Switch	• Only use terminal command mode with Mot. Select Switch. Do not use Mot. Select Switch on 250 to 400 hp controllers. • Lowest HSP setting is used for 2 Motors and 3 Motors.
	PI Regulator	The drive controller can run in reverse when the PI Regulator function is used. For applications where reverse operation is not permitted, select NO for NEG. VALUES under the PI Parameters screen.
7.4→Fault Management	Loss of Follower	"Go to ### Hz" does not work for Loss of Follower function.
	Prot. Devir.	Checks the error between speed reference and estimated speed. This function should be left On (Yes selected).
	Auto-Restart	Auto-Restart and Orient functions are not compatible. Do not enable these functions at the same time.
7.2→Application Functions and 7.4→Fault Management	Controlled Stop Fault Stop	Controlled Stop by LI and Fault Stop may not be used simultaneously. See "Controlled Stop and Fault Stop" above.
8→Diagnostic Mode	Auto-Diagnostic	For best performance, remove motor leads before using Auto-Diagnostic function.

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SOFTWARE VERSION 3.1

Table 3 lists the differences between **V3.1 and V3.1S238** software and the functionality described in bulletin VD0C06S305C, which you received with the drive controller.

Table 3: Software V3.1 and V3.1S238 Exceptions

Menu	Function	Description
7.2→Application Functions	Mot. Select Switch	• Only use terminal command mode with Mot. Select Switch. Do not use Mot. Select Switch on 250 to 400 hp controllers. • Lowest HSP setting is used for 2 Motors and 3 Motors.
	PI Regulator	The drive controller can run in reverse when the PI Regulator function is used. For applications where reverse operation is not permitted, select NO for NEG. VALUES under the PI Parameters screen.
7.4→Fault Management	Loss of Follower	"Go to ### Hz" does not work for Loss of Follower function.
	Auto-Restart	Auto-Restart and Orient functions are not compatible. Do not enable these functions at the same time.
7.2→Application Functions and 7.4→Fault Management	Controlled Stop Fault Stop	Controlled Stop by LI and Fault Stop may not be used simultaneously. See "Controlled Stop and Fault Stop" on page 2.
8→Diagnostic Mode	Auto-Diagnostic	For best performance, remove motor leads before using Auto-Diagnostic function.

SOFTWARE VERSION 3.0

Table 4 lists the differences between **V3.0** software and the functionality described in bulletin VD0C06S305C, which you received with the drive controller.

Table 4: Software V3.0 Exceptions

Menu	Function	Description
4.1→One Bar Graph	Machine Speed Machine Speed Ref.	Scaling factor is 1→10.
7.2→Application Functions	PI Regulator Mot. Select Switch	Not available.
7.4→Fault Management	Auto-Restart	Auto-Restart and Orient functions are not compatible. Do not enable these functions at the same time.
7.2→Application Functions and 7.4→Fault Management	Controlled Stop Fault Stop	Controlled Stop by LI and Fault Stop may not be used simultaneously. See "Controlled Stop and Fault Stop" on page 2.
8→Diagnostic Mode	Auto-Diagnostic	The internal memory check incorrectly reports a fault.

SOFTWARE VERSION 2.1

Table 5 lists the differences between **V2.1** software and the functionality described in bulletin VD0C06S305C, which you received with the drive controller.

Table 5: Software V2.1 Exceptions

Menu	Function	Description
4→Display Configuration	Motor RPM	Not available.
	Machine Speed Ref.	Not available.
	Machine Speed	Not available.
6.2→Command Type	3-Wire	When the drive controller is running with the functions listed below enabled, the drive controller will not restart after a momentary loss of power: • 3-Wire enabled • Auto/Manual enabled • Auto/Run enabled Restarting the drive controller requires cycling Auto Run Input low, and then back high.
7.13→Control Type	Special	When configured for constant torque, use of the Special control type is not recommended.
7.2→Application Functions	PI Regulator Mot. Select Switch	Not available.
7.4→Fault Management	Auto-Restart	Auto-Restart and Orient functions are not compatible. Do not enable these functions at the same time.
7.2→Application Functions and 7.4→Fault Management	Controlled Stop Fault Stop	Controlled Stop by LI and Fault Stop may not be used simultaneously. See "Controlled Stop and Fault Stop" on page 2.
8→Diagnostic Mode	Auto-Diagnostic	The internal memory check incorrectly reports a fault.
9→Drive Initialization	Partial Factory Settings	Not available.

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SOFTWARE VERSION 2.0 IE23

Table 6 lists the differences between **V2.0** software and the functionality described in bulletin VD0C06S305C, which you received with the drive controller.

Table 6: Software V2.0 Exceptions

Menu	Function	Description
4→Display Configuration	Motor RPM	Not available.
	Machine Speed Reference	Not available.
	Machine Speed	Not available.
6.2→Command Type	3-Wire	When the drive controller is running with the functions listed below enabled, the drive controller will not restart after a momentary loss of power: • 3-Wire enabled • Auto/Manual enabled • Auto/Run enabled Restarting the drive controller requires cycling Auto Run Input low, and then back high.
7.11→Motor Parameters	Current Limit	Current Limit for the ATV66U41N4 drive controller is not managed automatically when a different rating is selected (1 hp to 2 hp instead of 3 hp) or when VT is selected instead of CT. To properly set the Current Limit when a different rating is selected: • After changing the rating, select Current Limit by Freq. from menu 7.11. • Set the frequency value to 0 hz. • Set the Current Limit level to the proper value as given in the Receiving, Installation, and Start-Up manual (VD0C06S304C).
7.13→Control Type	Special	When configured for constant torque, use of the Special control type is not recommended.
7.2→Application Functions	Controlled Stop	In Controlled Stop by Logic Input, with 3-wire control, the DC Injection Braking stop type requires that the logic input be maintained until the DC Injection Braking is completed. In the Fast and Freewheel stop types, the logic input does not have to be maintained.
	PI Regulator Mot. Select Switch	Not available.
7.4→Fault Management	Auto-Restart	Auto-Restart and Orient functions are not compatible. Do not enable these functions at the same time.
7.2→Application Functions and 7.4→Fault Management	Controlled Stop Fault Stop	Controlled Stop by LI and Fault Stop may not be used simultaneously. See “Controlled Stop and Fault Stop” on page 2.
8→Diagnostic Mode	Auto-Diagnostic	The internal memory check incorrectly reports a fault.
9→Drive Initialization	Partial Factory Settings	Not available.

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