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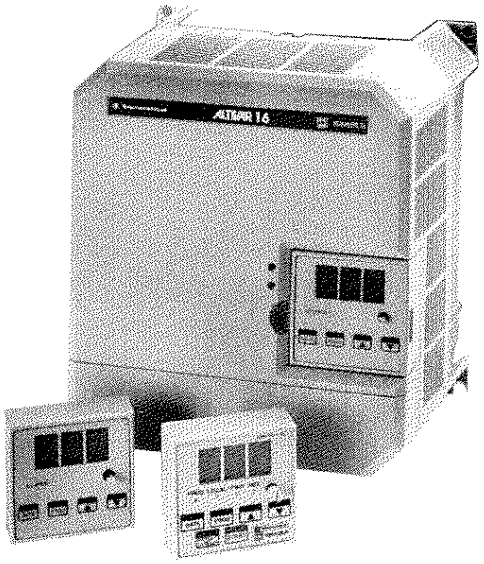
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Instruction Bulletin
50006-360-02B
May, 1995
Replaces 50006-360-02A dated 1/94

ALTIVAR™ 16

Display / Adjustment Options

VW3-A16101, VW3-A16102, VW3-A16103

for ALTIVAR 16 Drive Controllers

Telemecanique

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NOTE

On earlier models, the DC bus terminals, designated J8- and J9+ in the Bus Voltage Measurement Procedure, are designated as follows:

Catalog No.	J8-	J9+
ATV16U09M2 ATV16U18M2	J211	J212
ATV16U29M2 ATV16U18N4 ATV16U29N4	J104	J105
ATV16U41M2 ATV16U41N4 ATV16U54N4 ATV16U72N4	J110	J112

Revision Notice

Display/Adjustment Options manufactured after March, 1994 (date code 9414) have the addition of the LFr parameter as described in this manual.

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Introduction 1
VW3-A16101 1
VW3-A16102 2
VW3-A16103 2

Mounting 3
Local 3
Remote 4

Parameter Summary 5

Switch Settings 6
Switch 1 (VW3-A16102 Only) 6
Switch 2 (VW3-A16101 and VW3-A16102) 6

Operation of the Push Buttons 8
Set-up Mode 9
Adjustment Lockout Mode 10

Configuration Parameters 10
UnS: Nominal Motor Voltage 10
FrS: Nominal Motor Frequency 10
tFr: Maximum Drive Output Frequency 11
UFt: Type of Volts/Frequency Ratio 11
brA: Deceleration Ramp Adaptation 12
SLP: Automatic Slip Compensation 12
StE: Start/Stop in Adjustment Lockout Mode 13
StS: Start/Stop in Set-up Mode 13
rES: Reset Fault 13

Adjustment Parameters 14
Acc: Acceleration Ramp Time 14
dEc: Deceleration Ramp Time 14
LSP: Low Speed 15
HSP: High Speed 15
UFr: Volts/Frequency Ratio 15
FLG: Frequency Loop Gain 16
ItH: Motor Thermal Protection 16
LFr: Reference Frequency in Hz 17

Display Parameters 17

Additional Parameters 18
VW3-A16201 Option Card set for General Use 18
VW3-A16201 Option Card Set for Material Handling 19
VW3-A16202 Variable Torque Option Card 21
VW3-A16203 High Speed Motor Option Card 22
VW3-A16204 General Use / 3-Wire Control Option Card 23

Operation Assistance 24
Procedure 1: Checking Supply Voltage 24
Bus Voltage Measurement Procedure 25
Procedure 2: Checking the Peripheral Equipment 26
Fault Codes 27

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List of Figures

Figure 1 Display/Adjustment Option VW3-A16101 1
Figure 2 Display/Adjustment/Local Control Option VW3-A16102 2
Figure 3 Mounting Option VW3-A16101 or VW3-A16102 3
Figure 4 Remote Mounting with Kit VW3-A16103 4
Figure 5 Parameter Summary 5
Figure 6 Set-up Mode 9
Figure 7 Adjustment Lockout Mode 10
Figure 8 Voltage/Frequency Operation 11
Figure 9 Deceleration Ramp Adaptation 12
Figure 10 Automatic Slip Compensation 12
Figure 11 Acceleration Ramp 14
Figure 12 Deceleration Ramp 14
Figure 13 Low Speed/High Speed 15
Figure 14 Volts/Frequency Ratio 15
Figure 15 Preset Speeds 19
Figure 16 Brake Control Logic 20
Figure 17 Measuring Bus Capacitor Voltage 25

List of Tables

Table 1 Set-Up Mode 7
Table 2 Adjustment Lockout Mode 7
Table 3 Key Operation 8
Table 4 Nominal Motor Voltage Settings 10
Table 5 Fault Codes 27

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INTRODUCTION

This instruction bulletin covers installation and operation of the three Display/Adjustment options available for use with the Altivar 16 family of drive controllers:

- VW3-A16101: Display/Adjustment Option
- VW3-A16102: Display/Adjustment/Local Control Option
- VW3-A16103: Remote Mounting Kit

It also describes the various parameters and fault codes accessible with the options. Each option is described in the following sections.

VW3-A16101

Option VW3-A16101 mounts on the front of the drive controller. It includes three seven-segment displays, one program LED, and four push buttons for programming the drive controller. Its features are illustrated in Figure 1.

For a summary of the parameters accessible with this and the other two display options, see Figure 5 on page 5. The codes displayed in the event of a fault are listed in Table 5 on page 27.

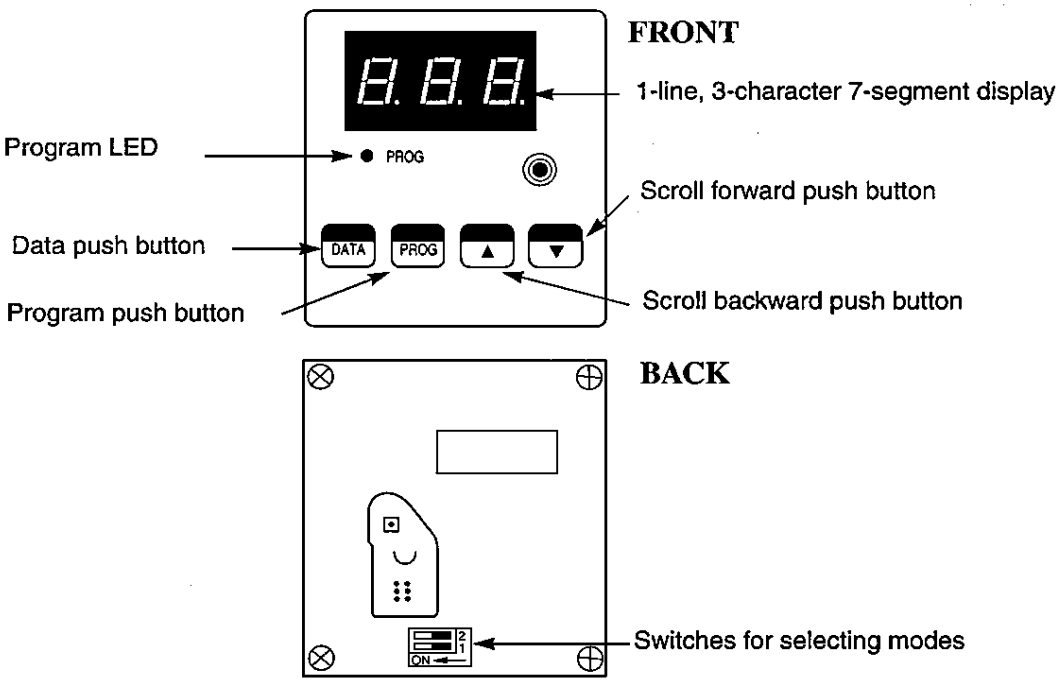


Figure 1 Display/Adjustment Option VW3-A16101

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VW3-A16102

Option VW3-A16102 also mounts on the front of the drive controller. It provides the same features as option VW3-A16101, but adds the ability to start and stop the drive controller from the option if a direction command (FW/RV) is present, and the ability to adjust the speed of the drive controller and to reset the drive controller from the option. LEDs indicate when the drive is in local control and whether the motor has been commanded to rotate in forward or reverse. Option VW3-A16102 is illustrated in Figure 2.

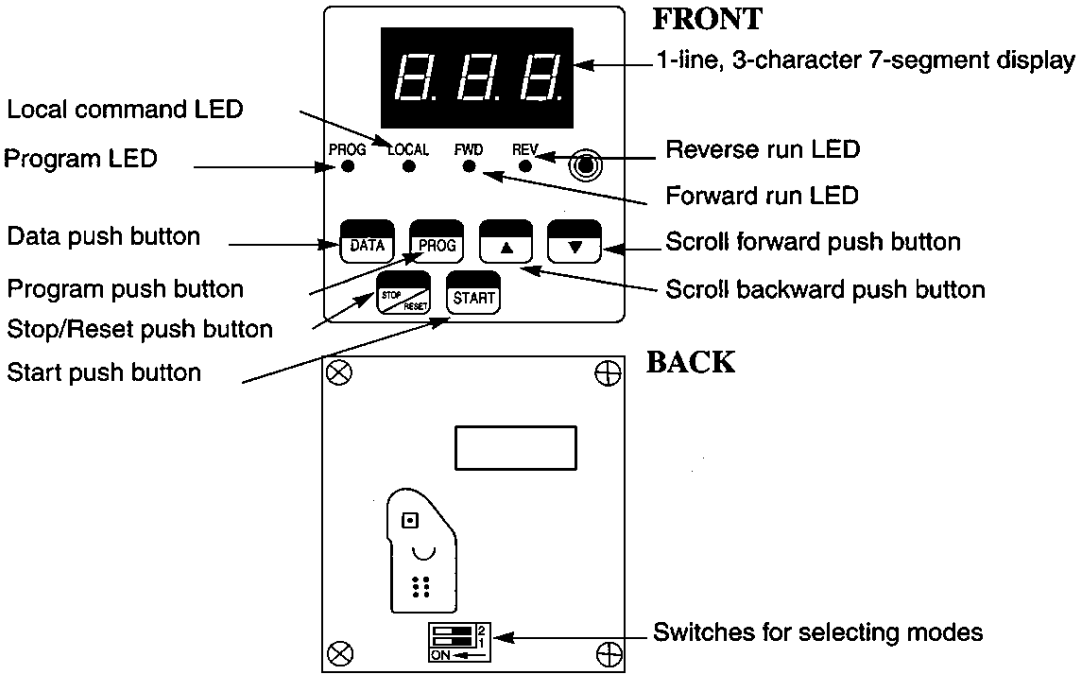


Figure 2 Display/Adjustment/Local Control Option VW3-A16102

VW3-A16103

Option VW3-A16103 is a kit for remote mounting of option VW3-A16101 or VW3-A16102 to a NEMA Type 1, 4 or 12 enclosure. The kit consists of an interface box which mounts on the front of the drive controller, a 3-meter connection cable and a plastic keypad cover.

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MOUNTING

Local

Options VW3-A16101 and VW3-A16102 can be connected while the drive controller is powered up. To mount either option (refer to Figure 3):

1. Using a screwdriver, remove programming cover plate from front of drive controller as shown. Do not remove any other cover.

⚠ WARNING

HAZARDOUS VOLTAGE.

Do not remove any other cover besides programming cover plate when installing the option.

Failure to observe this precaution can cause shock or burn, resulting in severe personal injury or death.

2. Plug option into drive controller. Use screwdriver to secure option.

Note: *Removal of option VW3-A16102 when it is set to local mode (Switch 1 set to On, see page 6) and when the drive controller is powered up (with or without the motor running) will cause the drive controller to fault.*

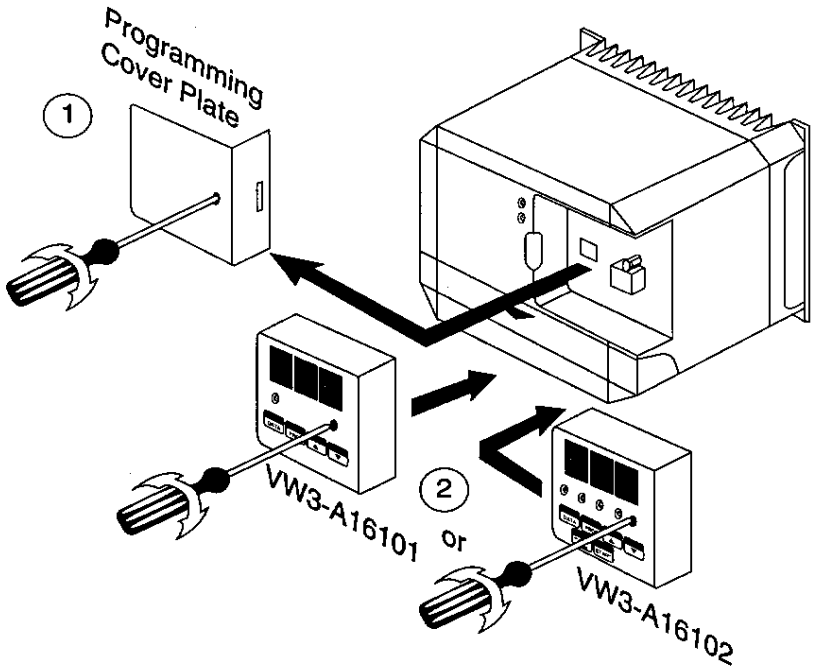


Figure 3 Mounting Option VW3-A16101 or VW3-A16102

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Remote

When mounted with kit VW3-A16103 on a NEMA Type 1, 4 or 12 enclosure, options VW3-A16101 and VW3-A16102 have a protection rating of IP65. To remotely mount the options (refer to Figure 4):

1. Using a screwdriver, remove programming cover plate from front of drive controller. Do not remove other covers.

⚠ WARNING

HAZARDOUS VOLTAGE.

Do not remove any other cover besides programming cover plate when installing the option.

Failure to observe this precaution can cause shock or burn, resulting in severe personal injury or death.

2. Plug interface box provided with kit into front of drive controller. Use screwdriver to secure interface box.
3. Connect display unit (VW3-A16101 or VW3-A16102) to interface box with cable provided in kit.
4. Mount display unit on front of enclosure. Information concerning cut-out size is found in the instruction guide which accompanies option VW3-A16103.

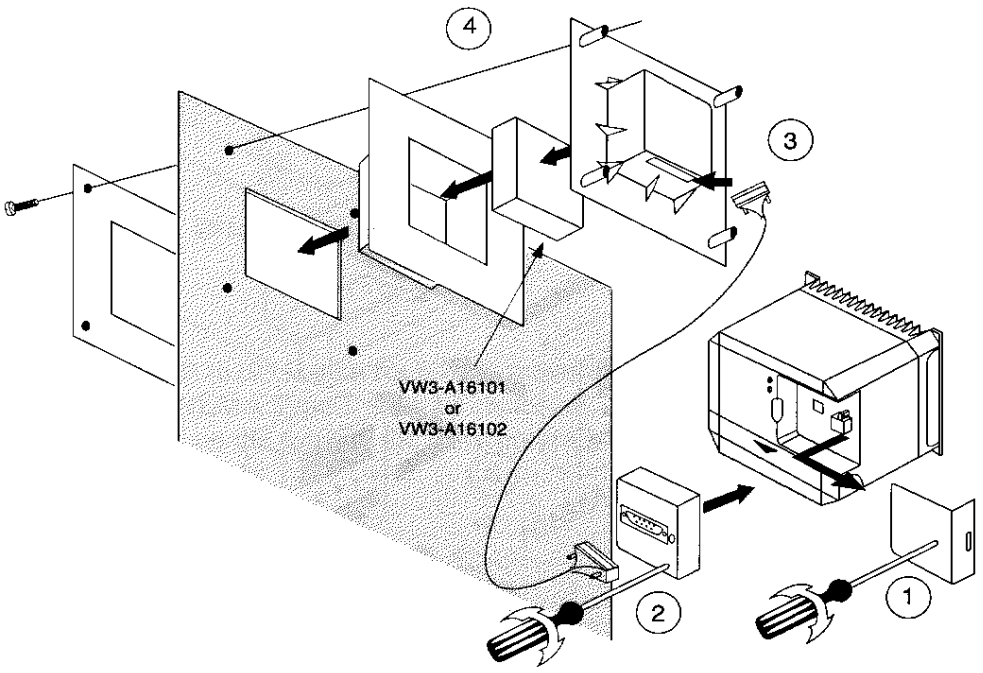


Figure 4 Remote Mounting with Kit VW3-A16103

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PARAMETER SUMMARY

Figure 5 lists the parameters accessible through the Display/Adjustment options along with their valid ranges.

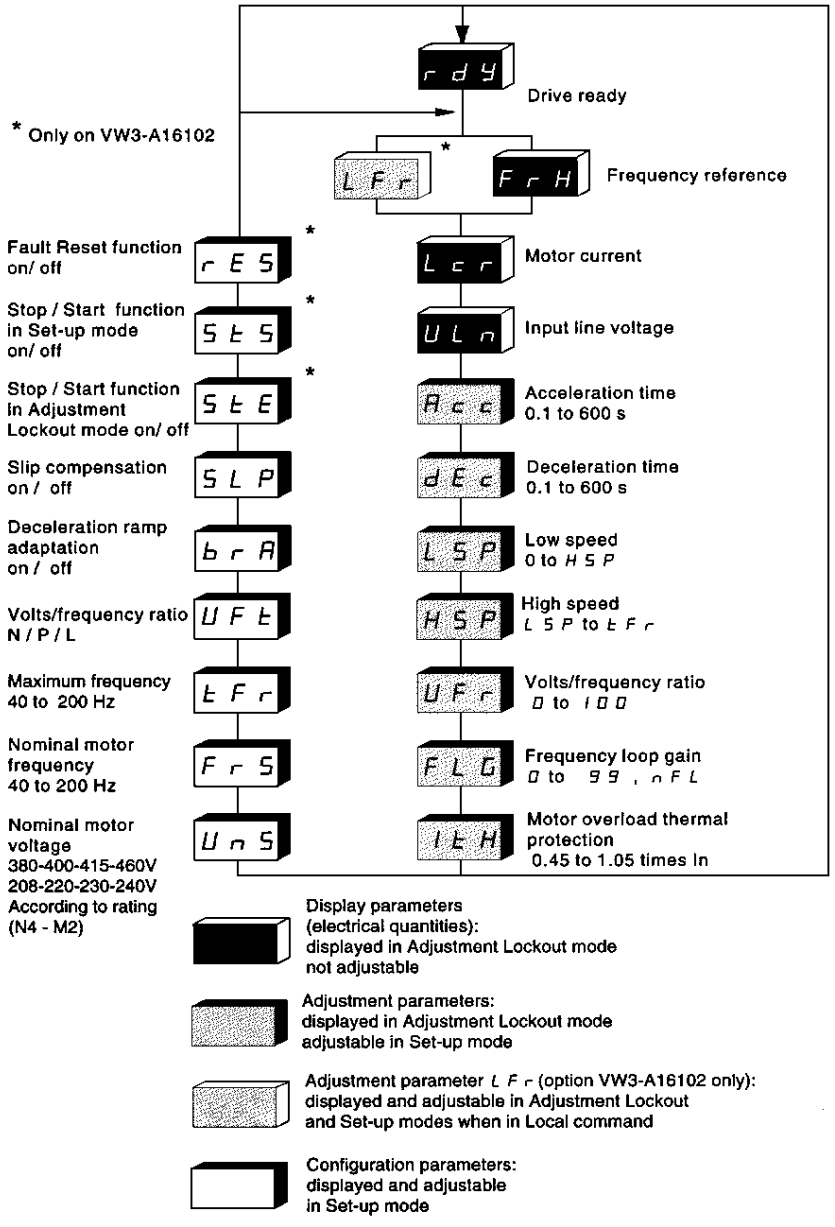


Figure 5 Parameter Summary

Note: *Value of input line voltage,* **ULn**, *is valid only when the drive controller is in ready mode (***rdY***). In addition, the value displayed may be incorrect if the input line voltage is subject to waveform distortion.*

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SWITCH SETTINGS

Use the switches on back of the Display/Adjustment options as described in the following sections. Refer to Tables 1 and 2 for a summary of switch settings.

For location of the switches on option VW3-A16101, see Figure 1 on page 1. For location of switches on option VW3-A16102, see Figure 2 on page 2.

Note: In Table 1 and Table 2, Drive Ready indicates that power is applied to the drive controller, but no Run command is present.

Switch 1 (VW3-A16102 Only)

Switch 1, used on option VW3-A16102 **only**, selects local control. When Switch 1 is set to On, the drive controller is in Local mode. With the presence of a direction command (FW/RV) and reference frequency set with the **LFr** parameter, the drive controller may be started, stopped and reset from the Display/Adjustment option, depending on settings of the **rES**, **StS** and **StE** parameters (see page 13).

When Switch 1 is set to Off, the drive controller is run only with the presence of a direction command (FW/RV) and reference signal at AIV or AIC.

Switch 2 (VW3-A16101 and VW3-A16102)

Switch 2 is used on both options to determine the mode of the Display/Adjustment option. When Switch 2 is set to On, the option is in **Set-up mode**. Set-up mode permits modification of parameters when the drive controller is ready or the motor is running. See Table 1 for further explanation.

When Switch 2 is set to Off, the option is in **Adjustment Lockout mode**. No modification of parameters is possible in this mode. See Table 2 for further explanation.

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Table 1 Set-Up Mode

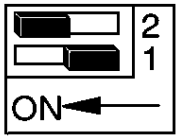
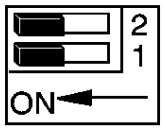
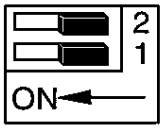
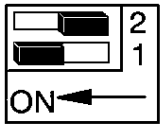
Switch Position	Option	Drive Ready	Motor Running
	VW3-A16101 VW3-A16102	• Drive controller can be started and stopped with presence of direction command (FW/RV) and reference signal at AIV or AIC. • Display of display parameters • Display and modification of adjustment parameters • Display and modification of configuration parameters • Display of fault codes • Prog LED lit	• Display of display parameters • Display and modification of adjustment parameters • Display of configuration parameters; no modification of configuration parameters
	VW3-A16102 only	• Display of display parameters • Display and modification of adjustment parameters • Display and modification of configuration parameters • Display of fault codes • Prog LED lit • Enables local command push buttons: **Reset** if rES is set to On. **Start/Stop** if StS is set to On and with presence of a direction command (FW/RV) and reference frequency set with LFr parameter. • Local LED lit (flashes if rES, StS and StE are set to Off).	• Same as above • Enables local command push buttons: **Reset** if rES is set to On. **Start/Stop** if StS is set to On and with presence of a direction command (FW/RV) and reference frequency set with LFr parameter. • Local LED lit.

Table 2 Adjustment Lockout Mode

Switch Position	Option	Drive Ready or Motor Running
	VW3-A16101 VW3-A16102	• Drive controller can be started and stopped with presence of direction command (FW/RV) and a reference signal at AIV or AIC. • Display of display parameters • Display of adjustment parameters • Display of fault codes • Configuration parameters not displayed • No modifications possible
	VW3-A16102 only	• Display of display parameters • Display of adjustment parameters • Display of fault codes • Configuration parameters not displayed • No modifications possible • Enables local command push buttons: **Reset** if rES was set to On in Set-up mode. **Start/Stop** if StE was set to On in Set-up mode and with presence of a direction command (FW/RV) and a reference frequency set with LFr parameter. • Local LED lit (flashes if rES, StS and StE are set to Off).

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OPERATION OF THE PUSH BUTTONS

Figures 6 and 7 illustrate operation of the Display/Adjustment option push buttons. Refer to Table 3 for key operation. For key operation with the LFr parameter, refer to page 17.

Table 3 Key Operation

Key	Operation	
	When parameter name is displayed	When parameter value is displayed
	Steps forward through list of parameters	Increases parameter value
	Steps back through list of parameters	Decreases parameter value
	Displays parameter value	Displays parameter name or cancels change to parameter value
		Saves change to parameter value

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Set-up Mode

Figure 6 illustrates how to change and save adjustment and configuration parameter values in Set-up mode (Switch 2 set to On).

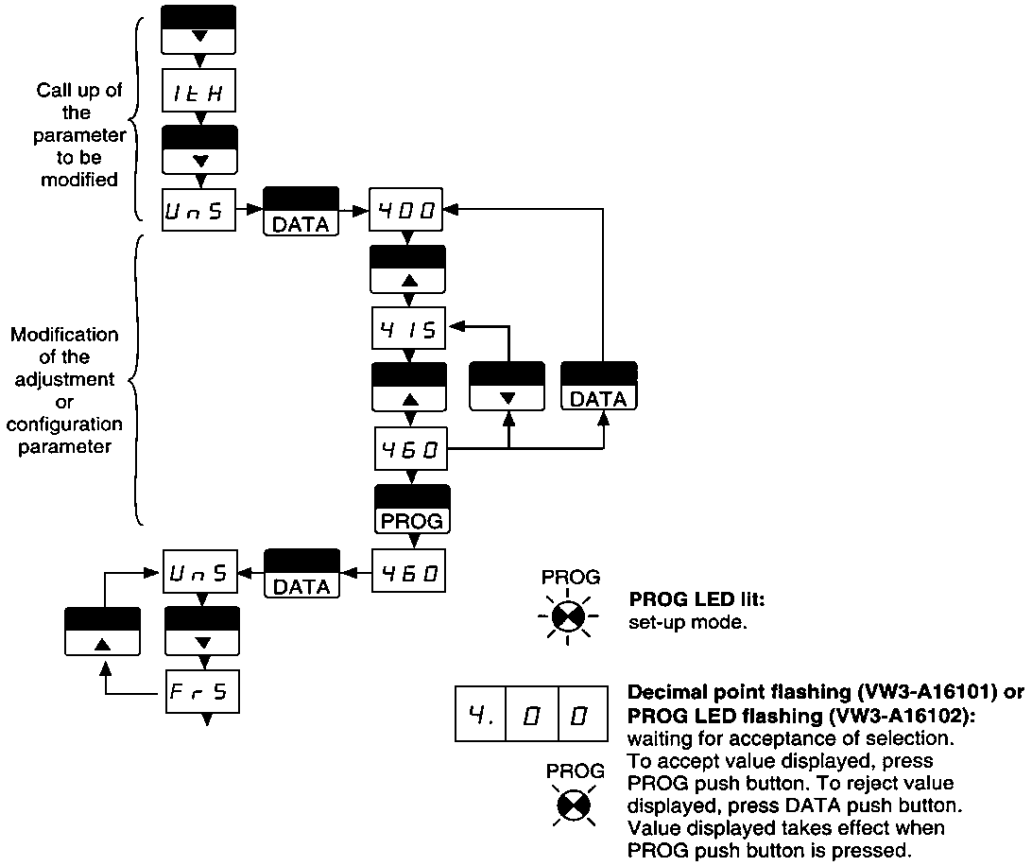


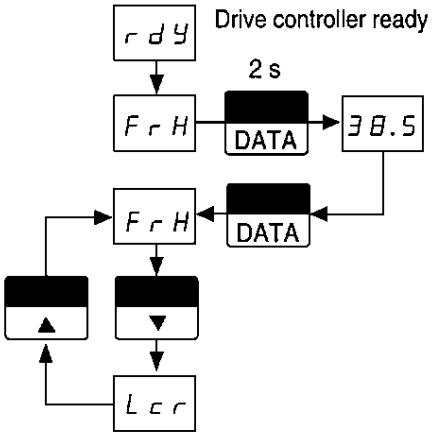
Figure 6 Set-up Mode

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Adjustment Lockout Mode

Figure 7 illustrates how to scroll through the available parameters and display their values in Adjustment Lockout mode.



2 seconds after the parameter name appears, the parameter value is displayed.
The parameter value can also be displayed by pressing the DATA push button.

Figure 7 Adjustment Lockout Mode

CONFIGURATION PARAMETERS

The following sections describe the configuration parameters available on options VW3-A16101 and VW3-A16102.

UnS: Nominal Motor Voltage

Nominal motor voltage is based on the motor nameplate. Refer to Table 4 for appropriate settings.

Table 4 Nominal Motor Voltage Settings

Choice of Nominal Voltage at 50 or 60 Hz:	Factory Setting:
ATV16...M2: 208, 220, 230, 240 V	230 V
ATV16...N4: 380, 400, 415, 460 V	400 or 460 V depending on position of Switch 1 on drive controller

FrS: Nominal Motor Frequency

Selection of nominal motor frequency is based on nominal motor voltage and is indicated on the motor nameplate. Setting this parameter from the display overrides setting of the volts/frequency ratio switch on the drive controller. Factory setting is 50 or 60 Hz depending on the position of Switch 1 on the drive controller. Range is 40 to 200 Hz. Note that with the variable torque option card VW3-A16202 installed, the range of FrS is 40 to 70/80 Hz. With the high speed option card VW3-A16203 installed, the range of FrS is 40 to 400 Hz.

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Note: For drive controllers containing V2.1, IE07 or later software, the position of switch 1 on the control board determines whether the drive controller is 2-wire control (Switch 1 set for 50 Hz) or 2-wire transitional control (Switch 1 set for 60 Hz). The setting of the FrS parameter does not affect the type of control. For more information, see the drive controller instruction bulletin 50006-360-01.

tFr: Maximum Drive Output Frequency

Overspeed operation at constant power above nominal motor frequency follows the characteristics shown in Figure 8. Factory setting is 50 Hz if FrS=50, or 60 Hz if FrS=60. Maximum drive output frequency can range from 40 to 200 Hz. Note that with the variable torque option card VW3-A16202 installed, the range of tFr is 40 to 70/80 Hz. With the high speed option card VW3-A16203 installed, the range of tFr is 40 to 400 Hz.

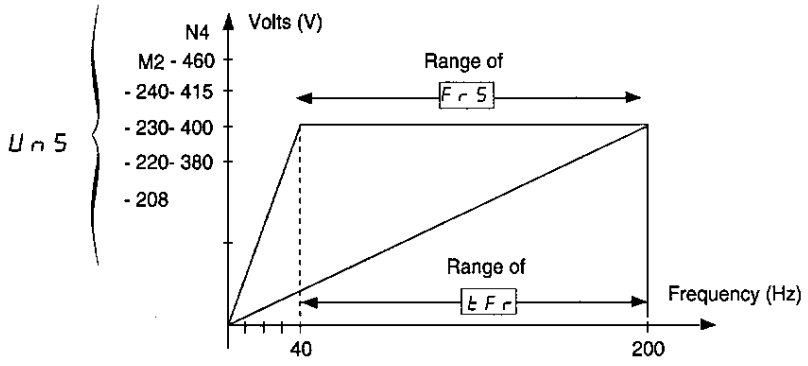


Figure 8 Voltage/Frequency Operation

UFt: Type of Volts/Frequency Ratio

UFt is used along with UFr to give voltage boost. Refer to Figure 14 on page 15 for the V/f curves. Possible settings are n, L or P.

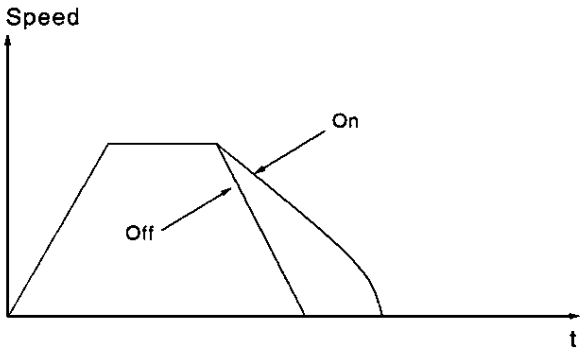
- **n**: Volts/frequency ratio adjusted for constant torque applications (machines with average loads) not requiring high voltage boost.
- **L**: Volts/frequency ratio adjusted for constant torque applications for special motors (tapered rotor motors, pole change motors, high torque motors) used in fast cycle applications.
- **P**: Volts/frequency ratio adjusted for quadratic torque applications such as fans or centrifugal pumps.

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brA: Deceleration Ramp Adaptation

Possible settings are On and Off.



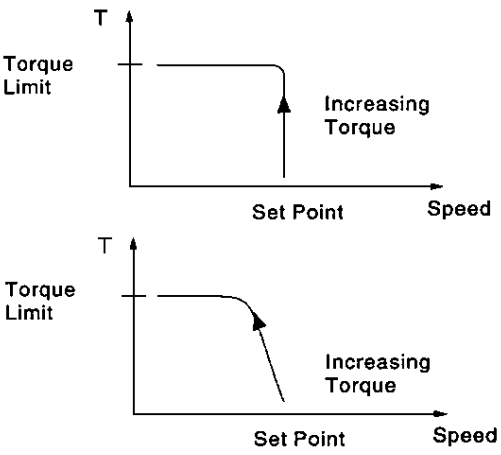
On: Deceleration ramp time (dEc) is automatically adjusted to compensate for load inertia and to avoid overbraking fault (ObF).

Off: Deceleration ramp time (dEc) is not automatically adjusted. If the motor is unable to follow deceleration ramp, drive controller will trip on overbraking fault (ObF).

Figure 9 Deceleration Ramp Adaptation

SLP: Automatic Slip Compensation

Possible settings are On and Off.



On: Automatic slip compensation enabled. Use this setting for running at constant speed as the load changes.

Off: Automatic slip compensation disabled. Use this setting for applications with high inertia, variable torque or external speed regulation.

Figure 10 Automatic Slip Compensation

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StE, StS, rES

Three additional configuration parameters are available with option VW3-A16102. These are used to start, stop and reset the drive controller from the display option when in Local mode (Switch 1 set to On) and when a direction command (FW/RV) and reference frequency set with LFr are present. When not in Local mode (Switch 1 set to Off), these parameters are not used and the drive controller is run with the presence of a direction command and reference signal at AIV or AIC.

StE: Start/Stop in Adjustment Lockout Mode

When StE is set to On and the display is in Adjustment Lockout mode, with the presence of a direction command (FW/RV) and a reference frequency set with LFr, the drive controller is started and stopped from the display option. When a direction command is present, the FWD or REV LED will flash to indicate that the drive controller can be started from the display option. When started, the FWD or REV LED will be lit. If the direction command is removed while the drive controller is running, the drive controller will stop. If a direction command (FW or RV) is restored, the drive controller will restart. When StE is set to Off and the display is in Adjustment Lockout mode, the drive controller cannot be started even if a direction command and reference frequency are present.

StS: Start/Stop in Set-up Mode

When StS is set to On and the display is in Set-up mode, with the presence of a direction command (FW/RV) and reference frequency set with LFr, the drive controller is started and stopped from the display option. When a direction command is present, the FWD or REV LED will flash to indicate that the drive controller can be started from the display option. When started, the FWD or REV LED will be lit. If the direction command is removed while the drive controller is running, the drive controller will stop. If a direction command (FW or RV) is restored, the drive controller will restart. When StS is set to Off and the display is in Set-up mode, the drive controller cannot be started, even if a direction command and reference frequency are present.

rES: Reset Fault

The reset fault function is not dependent on whether the display option is in Adjustment Lockout or Set-up mode. When rES is set to On, the drive controller can be reset after the OSF, OLF, OBF, OBF., SPF, SPF. or SLF faults (see pages 23 and 24) by pressing the Stop/Reset push button, if the cause of the fault has been corrected. When rES is set to Off, after these faults the drive controller must be reset by removing power. If the cause of the PhF, USF or OPt faults is corrected, the drive controller automatically resets.

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ADJUSTMENT PARAMETERS

The following sections describe the adjustment parameters available on both options VW3-A16101 and VW3-A16102.

ACC: Acceleration Ramp Time

Acceleration ramp time can range from 0.1 to 600 s. The factory setting is 3 s. Acceleration ramp time is automatically extended when the maximum transient output current of the drive controller is reached.

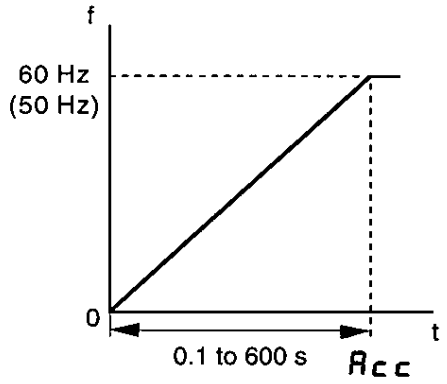


Figure 11 Acceleration Ramp

dEC: Deceleration Ramp Time

Deceleration ramp time can range from 0.1 to 600 s. The factory setting is 3 s. If deceleration ramp adaptation (brA) is set to On, the deceleration time is automatically extended to avoid overbraking fault (ObF).

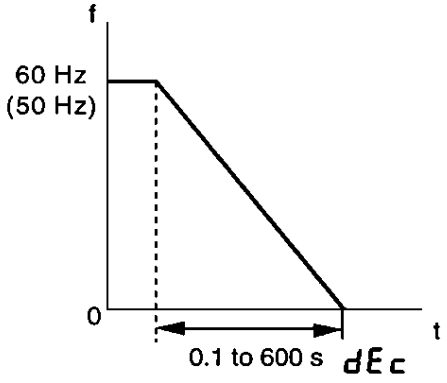


Figure 12 Deceleration Ramp

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LSP: Low Speed
HSP: High Speed

The factory settings for low speed (LSP) and high speed (HSP) are 0 Hz and 50 Hz respectively. When LSP is 0, the drive stays ready as long as reference speed is less than 0.1 Hz. HSP is limited by the value of maximum drive output frequency (tFr).

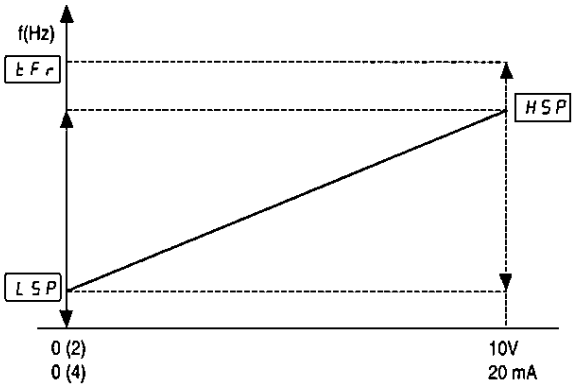


Figure 13 Low Speed/High Speed

UFr: Volts/Frequency Ratio

UFr is factory set to n20, L20 or P20, depending on the setting of UFt (i.e, n, P or L). The factory settings are suitable for most applications; however, if the torque is insufficient, increase the setting gradually from 00 to 100.

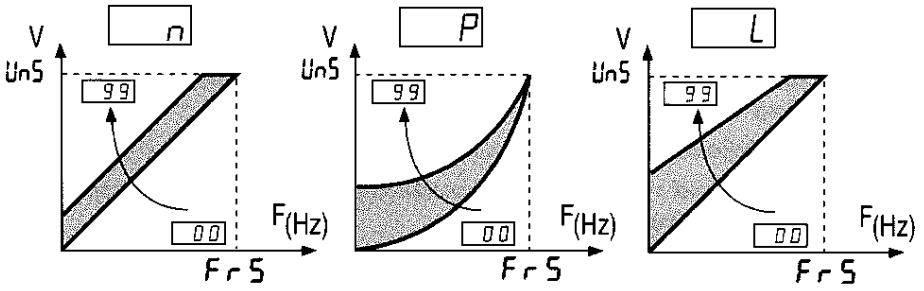


Figure 14 Volts/Frequency Ratio

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FLG: Frequency Loop Gain

Frequency loop gain can range from 00 to 99 or nFL. The factory setting is 33. For machines with high resistant torque or high inertia, reduce the gain gradually to a value between 33 and 00. For machines with fast cycles, low resistant torque or low inertia, increase the gain gradually from 33 to 99. Note that too much gain can cause instability. A value of nFL suppresses frequency loop gain. This can cause the motor to stall if the required torque is too high.

⚠ CAUTION

MOTOR MAY STALL.

Inhibiting this function can cause motor to stall if required torque is too high.

Failure to observe this precaution can result in equipment damage.

ItH: Motor Thermal Protection

Motor thermal protection can range from 0.45 to 1.05 times the nominal drive controller rated output current. Factory setting is 0.9 times the drive controller rated output current. Adjust ItH to the current value shown on the motor nameplate. To suppress motor thermal protection, increase the value of ItH to the maximum and provide external thermal protection.

⚠ CAUTION

LOSS OF MOTOR OVERLOAD PROTECTION.

When using external overload relays connected to the drive controller output, the overload relay 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 observe this precaution can result in equipment damage.

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> **⚠ 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 and loading conditions. Consult motor manufacturer for thermal capability of motor when operated over desired speed range.**
>
> Failure to observe this precaution can result in equipment damage.

LFr: Reference Frequency in Hz

When the display/adjustment keypad is in local command mode (Switch 1 On), this parameter appears in place of Frh and is used to adjust the reference frequency. In Set-up mode, StS must be set to On and in Adjustment Lockout mode, StE must be set to On for this parameter to take effect. To change the value of LFr, press PROG and ▲ or ▼ simultaneously. If the motor is running, the change is immediately taken into account.

DISPLAY PARAMETERS

The values of the Display parameters, available on both option VW3-A16101 and VW3-A16102, are obtained by pressing the DATA push button.

- rdY: Drive ready (no run command)
- Frh: Reference frequency in Hz. If the displayed value flashes, it is because the drive is adjusting its acceleration or deceleration ramp, or because the drive is at current limit.
- LCr: Motor current in Amps
- ULn: Input line voltage in volts

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ADDITIONAL PARAMETERS

Additional parameters appear on the display with the option cards. These are described in the following sections.

VW3-A16201 Option Card set for General Use

Adjustable Parameter

JoG: Jog operation. The LI3 input on the VW3-A16201 option card is factory set for Jog operation when the option card is configured for general use. With LI3 at state 1, the direction command (FW/RV) input is used to jog the drive controller at the frequency set by the Jog parameter. Factory set for 5 Hz, it can be adjusted between 0.1 and 10 Hz. When jogging, the acceleration and deceleration ramp rates are 0.1 s.

Configurable Parameters

AtR: Automatic restart. Enables the drive controller to automatically restart following an overvoltage (**OSF**), overload (**OLF**) or overbraking (**ObF**) fault. For the **OSF** and **ObF** faults, the drive controller remains disabled for 1 minute after the fault appears causing the fault relay of the drive controller to engage, then it restarts automatically if the fault has disappeared. If the cause of the fault is present at the end of 1 minute. the drive controller must be manually reset. The drive controller will attempt five automatic restarts (one every minute) before it must be manually reset. For the **OLF** fault, the restart is effective as soon as the thermal state drops below 100%, usually about seven minutes after the fault occurs. Factory set to **Off**, can be configured to **On**.

⚠ WARNING

UNINTENDED EQUIPMENT ACTION.

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

Failure to observe these precautions can result in equipment damage or severe personal injury.

FLr: Catching a spinning load. Allows smooth restarting of motor after a brief input line undervoltage. If the reference signal and a direction command are maintained, the motor accelerates back up to speed without starting at zero. Factory set to **Off**, can be configured to **On**.

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VW3-A16201 Option Card Set for Material Handling

Configurable Parameter

StP: Controlled stop on loss of input power. Factory set to **Off**, can be configured to **On**. When set to On, deceleration follows a self-adjusting ramp which is a function of the regenerated energy. When set to Off, motor coasts to a stop at loss of input power.

Adjustable Functions

Preset speeds: Preset Speed 1 is Low Speed (**LSP**) or the value of the reference signal. Preset Speed 2 is High Speed (**HSP**). The display allows adjustment of Preset Speeds 3 and 4.

3SP: Preset Speed 3. Input LI2 is factory set for Preset Speed 3. The drive controller will run at Preset Speed 3 when LI2 is at state 1 and a direction command is present (FWD or REV). Factory set at 5 Hz, Preset Speed 3 can be adjusted between **LSP** and **HSP**.

4SP: Preset Speed 4. Input LI3 is factory set for Preset Speed 4. The drive controller will run at Preset Speed 4 when LI3 is at state 1 and a direction command (FWD or REV) is present. Factory set at 25 Hz, Preset Speed 4 can be adjusted to a value between **LSP** and **HSP**.

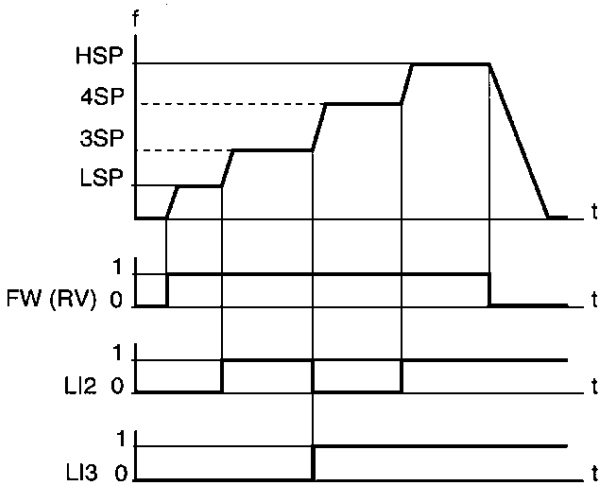


Figure 15 Preset Speeds

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Brake control: The S2A-S2B relay on the VW3-A16201 option card is set for brake control. The release and engaging of the mechanical brake follows the graph below. When the brake release frequency threshold and the brake release current threshold (**Ibr**) are reached, the S2A-S2B relay closes. During a time delay of t1, the acceleration ramp is inhibited. This ensures that the motor develops the necessary torque before the actual release of the brake. For the brake to engage, when the deceleration ramp reaches the brake engage frequency threshold, the S2A-S2B relay opens. The brake engages after a time delay of t1.

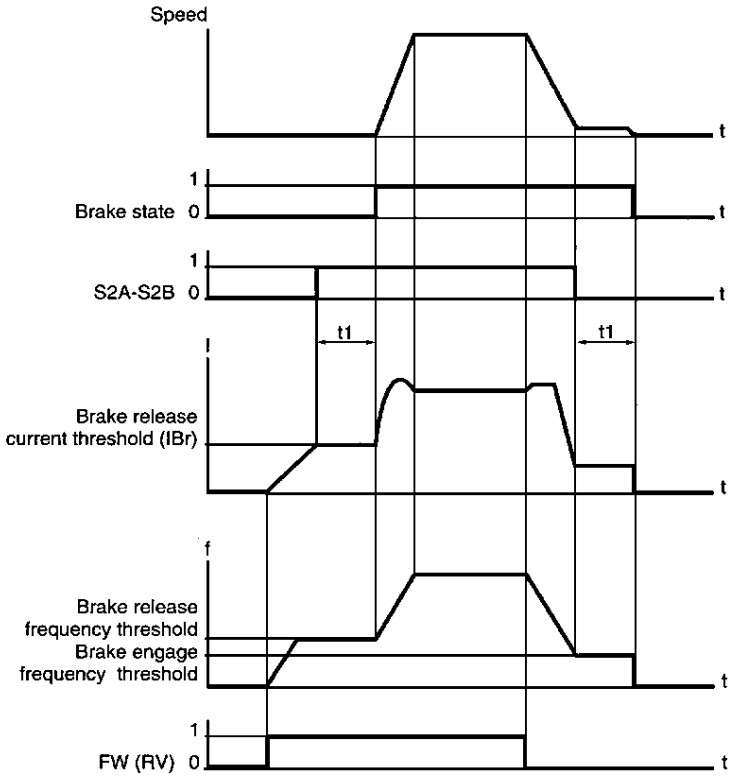


Figure 16 Brake Control Logic

Factory settings:
Brake release frequency threshold = Low speed setting (**LSP**)
Brake release current threshold (**Ibr**) = 0. See **Ibr** below.
Brake release time delay = 0 s
Brake engage frequency threshold = Low speed setting (**LSP**)

Ibr: Brake release current threshold. Current threshold initiates closing of S2A-S2B brake control relay activating the brake release. Factory set to 0, brake release current threshold can be adjusted from 0 to 1.05 drive controller rated output current.

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VW3-A16202 Variable Torque Option Card

Adjustable Parameters

JF 1: Jump (skip) frequency 1 with bandwidth of 2 Hz. Factory set at 0 Hz (not used); can be adjusted to a value between **LSP** and **HSP**.

JF2: Jump (skip) frequency 2 with bandwidth of 2 Hz. Factory set at 0 Hz (not used), can be adjusted to a value between **LSP** and **HSP**.

Configurable Parameters

Atr: Automatic restart. Enables the drive controller to automatically restart following an overvoltage (**OSF**), overload (**OLF**) or overbraking (**ObF**) fault. For the **OSF** and **ObF** faults, the drive controller remains disabled for 1 minute after the fault appears, causing the fault relay of the drive controller to engage, then it restarts automatically if the cause of the fault has disappeared. If the cause of the fault has not disappeared at the end of 1 minute, the drive controller must be manually reset. The drive controller will attempt 5 automatic restarts (one every minute) before it must be manually reset. For the **OLF** fault, the restart is effective as soon as the thermal state drops below 100%, usually about 7 minutes after the fault occurs. Factory set to **Off**, can be configured to **On**.

⚠ WARNING

UNINTENDED EQUIPMENT ACTION.

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

Failure to observe these precautions can result in equipment damage or severe personal injury.

FLr: Catching a spinning load. Allows smooth restarting of the motor after a brief input line undervoltage. If the reference signal and a direction command are maintained, the motor accelerates back up to speed without starting at zero. Factory set to **Off**, can be configured to **On**.

StP: Controlled stop on loss of input power. Factory set to **Off**, can be configured to **On**.When set to On, deceleration follows a self-adjusting ramp which is a function of the regenerated energy. When set to Off, motor coasts to a stop at loss of input power.

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VW3-A16203 High Speed Motor Option Card

Adjustable Parameters

Ac2: Acceleration ramp 2. LI2 is factory set as Switch to Ramp 2. When this input is at state 1, drive controller will accelerate according to **Ac2**. Factory set to 12 s, it can be adjusted between 0.1 and 600 s.

dE2: Deceleration ramp 2. LI2 is factory set as Switch to Ramp 2. When this input is at state 1, drive controller will decelerate according to **dE2**. Factory set to 12 s, it can be adjusted between 0.1 and 600 s.

Idc: DC current level. DC injection occurs when frequency drops to a value less than 0.1 Hz. Factory set to 0.7 times **ItH**, it can be adjusted between 0.5 and 1.5 times **ItH**.

tdc: DC current time. Amount of time for which DC is injected when frequency drops to a value less than 0.1 Hz. Factory set at 0.5 s, it can be adjusted from 0 to 5 s or to be permanently injected (setting is **dcb**).

⚠ 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 observe this precaution can result in equipment damage, severe personal injury or death.

⚠ CAUTION

MOTOR OVERHEATING.

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 observe this precaution can result in equipment damage or personal injury.

FLr: Catching a spinning load. Allows smooth restarting of the motor after a brief input line undervoltage. If the reference signal and a direction command are maintained, the motor accelerates back up to speed without starting at zero. Factory set to **Off**, can be configured to **On**.

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VW3-A16204 General Use / 3-Wire Control Option Card

Adjustable Functions

JoG: Jog operation. The LI3 input on the VW3-A16204 option card is factory set for Jog operation. Jog is factory set for 5 Hz and can be adjusted between 0.1 and 10 Hz. When jogging, the acceleration and deceleration ramp rates are 0.1 s. For information on wiring the Jog input, refer to the instruction manual for the VW3-A16204 option card.

Idc: DC current level. DC injection occurs when frequency drops to a value less than 0.1 Hz. Factory set to 0.7 times **ItH**, it can be adjusted between 0.5 and 1.5 times **ItH**.

tdc: DC current time. Amount of time for which DC is injected when frequency drops to a value less than 0.1 Hz. Factory set at 0.5 s, it can be adjusted from 0 to 5 s or to be permanently injected (setting is **dcb**).

⚠ 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 observe this precaution can result in equipment damage, severe personal injury or death.

⚠ CAUTION

MOTOR OVERHEATING.

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 observe this precaution can result in equipment damage or personal injury.

FLr: Catching a spinning load. Allows smooth restarting of the motor after a brief input line undervoltage. If the reference signal and a direction command are maintained, the motor accelerates back up to speed without starting at zero. Factory set to **Off**, can be configured to **On**.

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OPERATION ASSISTANCE

Table 5 on page 27 lists the fault codes accessible on the Display/Adjustment options, the probable causes of the faults and associated corrective action. When taking corrective action, follow the two procedures outlined on pages 24-26.

⚠ DANGER

HAZARDOUS VOLTAGE.

- **Read and understand these procedures before servicing AC drive controllers. Installation, adjustment, repair and maintenance of these drive controllers must be performed by qualified personnel.**
- **Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools while making adjustments.**

Failure to observe these precautions will cause shock or burn, resulting in severe personal injury or death.

The following procedures are intended for use by qualified electrical maintenance personnel and should not be viewed as sufficient instruction for those who are not otherwise qualified to operate, service or maintain the equipment discussed.

Procedure 1: Checking Supply Voltage

Before checking supply voltage, disconnect all power and measure DC bus capacitor voltage by following the procedure below.

DC bus capacitor voltage is measured between the J9+ and J8- terminals of the drive controller. The DC bus capacitors are discharged when input power is removed from the drive controller. To ensure the capacitors are fully discharged, always disconnect all power, wait 1 minute, then test with a DC voltmeter (1000 VDC scale) before wiring, troubleshooting or working inside the drive controller. If no reading is shown on the voltmeter, reduce scale and test again.

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⚠ DANGER

HAZARDOUS VOLTAGE.

- **Read and understand Bus Voltage Measurement Procedure before performing procedure. Measurement of bus capacitor voltage must be performed by qualified personnel.**
- **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 observe these precautions will cause shock or burn, resulting in severe personal injury or death.

The J9+ and J8- terminals are located on the power board, in the general area shown in Figure 17. To measure the bus capacitor voltage, follow the Bus Voltage Measurement Procedure below.

Bus Voltage Measurement Procedure

1. Disconnect all power from drive controller.
2. Wait 1 minute to allow the DC bus to discharge.
3. Remove all covers.
4. Set the voltmeter to the 1000 VDC scale. Measure the bus capacitor voltage between the J9+ and J8- terminals to verify the DC voltage is less than 45 V. **Do not short across capacitor terminals with voltage present!**
5. If the bus capacitors are not fully discharged, contact your local Square D representative – **do not operate the drive controller**.
6. Replace all covers.

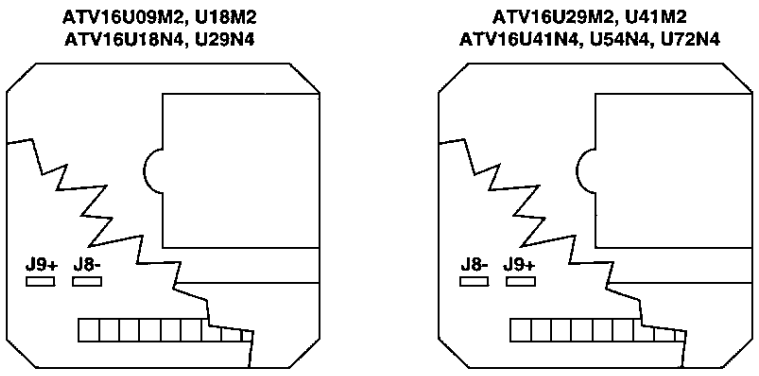


Figure 17 Measuring Bus Capacitor Voltage

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After measuring DC bus capacitor voltage, check supply voltage by following the procedure below:

1. Attach meter leads to L1 and L2. Set voltmeter to the 600V AC scale.
2. Reapply power. Voltage should be as follows:
   ATV16U••M2: 187.2 VAC<V<264 VAC
   ATV16U••N4: 340.0 VAC<V<529 VAC
3. Remove power and repeat procedure for L2 and L3, and L1 and L3 if wired for three phase.
4. When all phases have been measured, remove power. Remove leads, reinstall covers.

Procedure 2: Checking the Peripheral Equipment

The following equipment may need to be checked. Follow the manufacturers' procedures when checking this equipment.

1. A protective device such as fuses or circuit breaker may have tripped.
2. A switching device such as a contactor may not be closing at the correct time.
3. Conductors may require repair or replacement.
4. Connection cables to the motor or high resistance connections to ground may need to be checked. Follow NEMA standard procedure WC-53.
5. Motor insulation may need to be checked. Follow NEMA standard procedure MG-1. Do not apply high voltage to U, V or W. Do not connect the high potential dielectric test equipment or insulation resistance tester to the drive controller since the test voltages used may damage the drive controller. Always disconnect the drive controller from the conductors or motor while performing such tests.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD.

- **Do not perform high potential dielectric tests on circuits while the circuits are connected to the drive controller.**
- **Any circuit requiring high potential dielectric tests must be disconnected from the drive controller prior to performing the test.**

Failure to observe this precaution can result in equipment damage.

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Table 5 Fault Codes

Fault	Probable Causes	Corrective Actions
Display Off or Partial Display	• No voltage • Voltage too low	Check: • Supply Voltage (Procedure 1 on page 24) • Supply fuses or circuit breaker (Procedure 2 on page 26)
PhF	**Phase failure** • No supply to terminals L1, L2, (L3) • Power fuses blown • Brief input line failure (t≥200 ms)	Check: • Supply Voltage (Procedure 1 on page 24) • Supply fuses or circuit breaker (Procedure 2 on page 26)
USF	**Undervoltage** • Supply voltage too low • For ATV16...M2, V≤187 V • For ATV16...N4, V≤340 V • Temporary voltage drop (t≥200 ms)	Check: • Supply voltage (Procedure 1 on page 24) • Connections
OSF	**Overvoltage** • Supply voltage too high • For ATV16...M2, V≥264 V • For ATV16...N4, V≥529 V	Check: • Supply voltage (Procedure 1 on page 24)
OLF	**Overload** Thermal trip due to prolonged motor overload	Check: • ItH setting and compare with motor rated current • Load base speed and power rating and compare with operating speed and drive controller/motor power rating • Motor connections (possibility of single phase operation) Wait approximately 7 minutes before resetting.
ObF ObF.	**Overbraking** due to overvoltage or overcurrent due to excessive braking or an overhauling load, even with braking option.	Increase deceleration time, optimize gain by decreasing value of FLG, and optimize UFr. Add braking option if necessary. Refer to Instruction Bulletin 50006-360-04.
drF	**Transient overcurrent** • Short circuit or phase to ground on the output of the drive controller • Overheating of IPM • Power supplies to IPM are too low • Current too high during transient duty • Internal short circuit	Switch drive off. Disconnect drive controller from motor at U/T1, V/T2 and W/T3. Check connection cables and motor insulation (Procedure 2 on page 26). Increase acceleration or deceleration time. Check the ambient temperature of the drive controller.
crF	**Capacitor charge relay fault** Failure of command for capacitor charge relay to close	Replace drive controller.
InF	**Internal connection fault** Drive does not recognize rating	Disconnect power and wait one minute for capacitors to discharge. Check internal connections in the drive. If fault persists, replace drive controller.
EEF	**EEPROM memory fault**	Replace drive controller.

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Table 5 Fault Codes (Continued)

Fault	Probable Causes	Corrective Actions
SLF	**Communication fault** Communication loss between options	Check display option connection. Reset drive controller.
OPt	**Option Card Fault.** Switch 2 on option card was moved to On in order to reconfigure the I/O.	Reconfigure the I/O with the PC connection option (refer to Instruction Bulletin 50006-360-03) or return Switch 2 to Off.
SPF SPF.	**Option card fault (VW3-A16201 only)** **Speed feedback fault** Incorrect adjustment of tachogenerator feedback, or machine overload. No tachogenerator signal.	Check: • Feedback signal • Load base speed and power rating and compare with operating speed and drive controller/motor power rating • Tachogenerator connection

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