VS1SM
Single Phase AC Drive

10/07 **Installation & Operating Manual** MN761

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Important:

Be sure to check **www.baldor.com** for the latest software, firmware and drivers for your VS1 product. Also, you can download the latest version of this manual in Adobe Acrobat PDF format.

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Chapter 1
Introduction

This manual is intended for qualified electrical personnel familiar with installing, programming, and maintaining AC Drives. This manual contains information on:

- Installing and wiring the VS1SM drive
- Programming the drive
- Troubleshooting the drive

1.1 Getting Assistance from Baldor

For technical assistance, contact your Baldor District Office. Before calling, please review the troubleshooting section of this manual and you will be asked for the drive model number or catalog number that is located on the Nameplate.

1.2 Safety Notice

This equipment contains voltages that may be as high as 1000 volts! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

This equipment may be connected to other machines that have rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

Precautions: Classifications of cautionary statements

WARNING: Do not touch any circuit board, power device or electrical connection before you first ensure that power has been disconnected and there is no high voltage present from this equipment or other equipment to which it is connected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

WARNING: Be sure that you are completely familiar with the safe operation of this equipment. This equipment may be connected to other machines that have rotating parts or parts that are controlled by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

WARNING: Do not use motor overload relays with an automatic reset feature. These are dangerous since the process may injure someone if a sudden or unexpected automatic restart occurs. If manual reset relays are not available, disable the automatic restart feature using external control wiring.

WARNING: This unit has an automatic restart feature that will start the motor whenever input power is applied and a RUN (FWD or REV) command is issued. If an automatic restart of the motor could cause injury to personnel, the automatic restart feature of the VS1MSD should be disabled.

WARNING: Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury.

WARNING: Do not remove cover for at least five (5) minutes after AC power is disconnected to allow capacitors to discharge. Dangerous voltages are present inside the equipment. Electrical shock can cause serious or fatal injury.

WARNING: Motor circuit may have high voltage present whenever AC power is applied, even when motor is not rotating. Electrical shock can cause serious or fatal injury.

Continued on next page

WARNING: **Improper operation of control may cause violent motion of the motor shaft and driven equipment. Be certain that unexpected motor shaft movement will not cause injury to personnel or damage to equipment. Certain failure modes of the control can produce peak torque of several times the rated motor torque.**

WARNING: **Dynamic brake resistors may generate enough heat to ignite combustible materials. Keep all combustible materials and flammable vapors away from brake resistors.**

WARNING: **The motor shaft will rotate during the autotune procedure. Be certain that unexpected motor shaft movement will not cause injury to personnel or damage to equipment.**

Caution: **Disconnect motor leads (U, V and W) from control before you perform a "Dielectric Withstand" test on the motor. Failure to disconnect motor from the control will result in extensive damage to the control. The control is tested at the factory for high voltage / leakage resistance as part of Underwriter Laboratory requirements.**

Caution: **Suitable for use on a circuit capable of delivering not more than the RMS symmetrical short circuit amperes listed here at rated voltage.**

Horsepower	RMS Symmetrical Amperes
1-50	5,000
51-200	10,000
201-400	18,000
401-600	30,000
601-900	42,000

Caution: **Do not connect AC power to the Motor terminals U, V and W. Connecting AC power to these terminals may result in damage to the control.**

Caution: **Baldor recommends not to use "Grounded Leg Delta" transformer power leads that may create ground loops. Instead, we recommend using a four wire Wye.**

Caution: **If the DB hardware mounting is in any position other than vertical, the DB hardware must be derated by 35% of its rated capacity.**

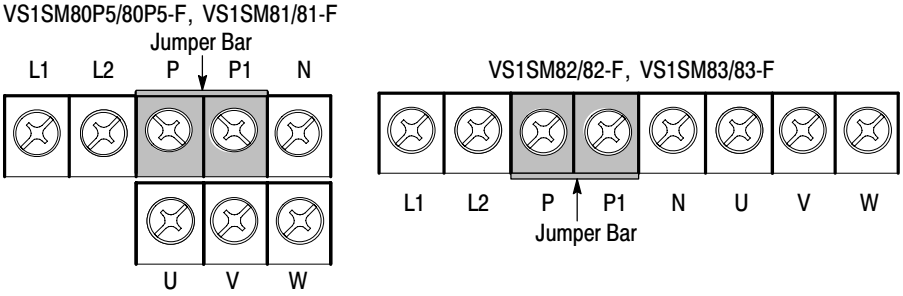
Caution: **Only Baldor cables should be used to connect the keypad and control. These are special twisted pair cables to protect the control and keypad. Damage associated with other cable types are not covered by the Baldor warranty.**

Caution: **If an M-Contactor is installed, the control must be disabled for at least 200msec before the M-Contactor is opened. If the M-Contactor is opened while the control is supplying voltage and current to the motor, the control may be damaged. Before the control is enabled, the M-Contactor must be closed for at least 200msec.**

Caution: **Use of power correction capacitors on the output of the drive can result in erratic operation of the motor, nuisance tripping, and/or permanent damage to the drive. Remove power correction capacitors before proceeding. Failure to observe this precaution could result in damage to, or destruction of, the equipment.**

1.3 Quick Start Quick Start Guide is also available separately, see MS760.

Figure 1-1 Power & Motor Terminal Locations



Powerup Procedure Refer to Chapter 3, 4 and 5 for additional details.

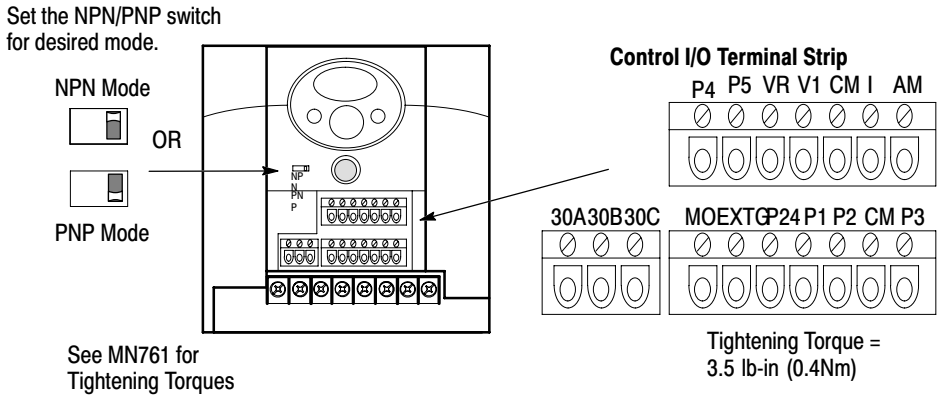
1. Remove all power from the control.
2. Connect Power & Motor, See Figure 1-1.
3. Connect input control wires and output wires, See Figure 1-2.
4. Disconnect the motor from the load (including coupling or inertia wheels).
5. Turn power on. Be sure there are no faults.
6. Set the following parameters for the values displayed on the motor nameplate:
   P30 Motor HP Select
   P32 Motor Rated Current
   P33 Pole Number
   P34 Base Frequency
7. If external dynamic brake hardware is used, set the Level 2 Brake Adjust block "Resistor Ohms" and "Resistor Watts" parameters.

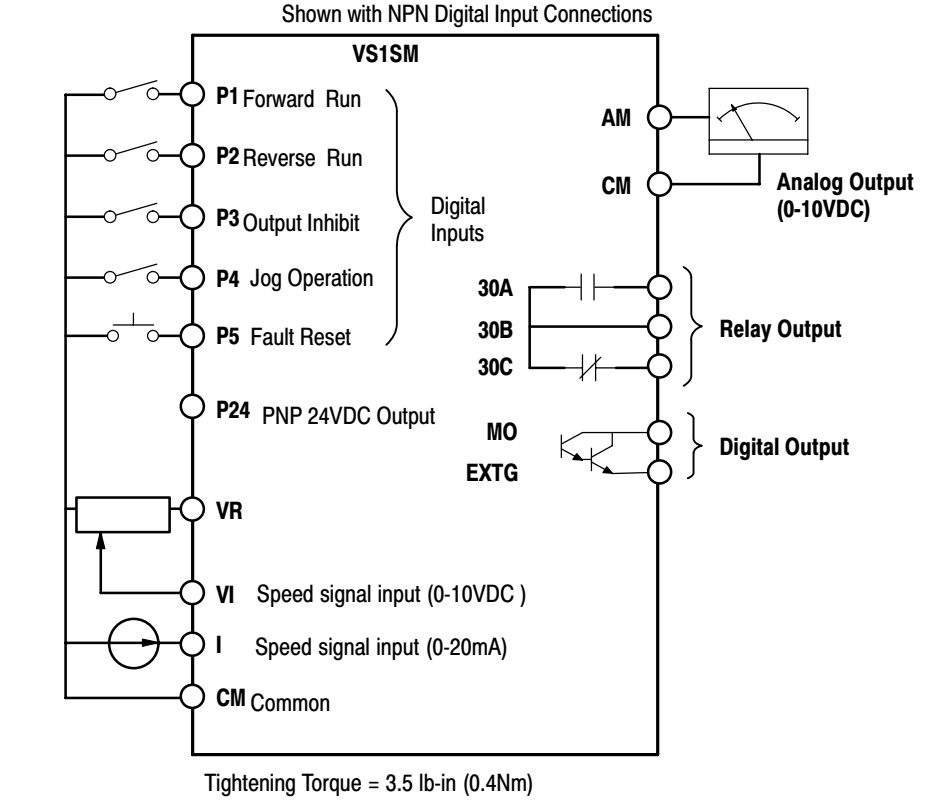
WARNING: The motor shaft will rotate during this procedure. Be certain that unexpected motor shaft movement will not cause injury to personnel or damage to equipment.

8. Set H41 =1 from using the Keypad. Perform each step including auto tune.
9. Remove all power from the control.
10. Couple the motor to its load.
11. Verify freedom of motion of motor shaft.
12. Verify the motor coupling is tight without backlash.
13. Verify the holding brakes if any, are properly adjusted to fully release and set to the desired torque.
14. Turn power on. Be sure no errors are displayed.
15. Run the drive from the keypad.
16. Select and program additional parameters to suit your application, see Chapter 8.

The control is now ready for use the in keypad mode. If a different operating mode is desired, refer to Chapter 7 Parameter Descriptions and Chapter 8 Customizing for your Application.

Figure 1-2 Input/Output Connections





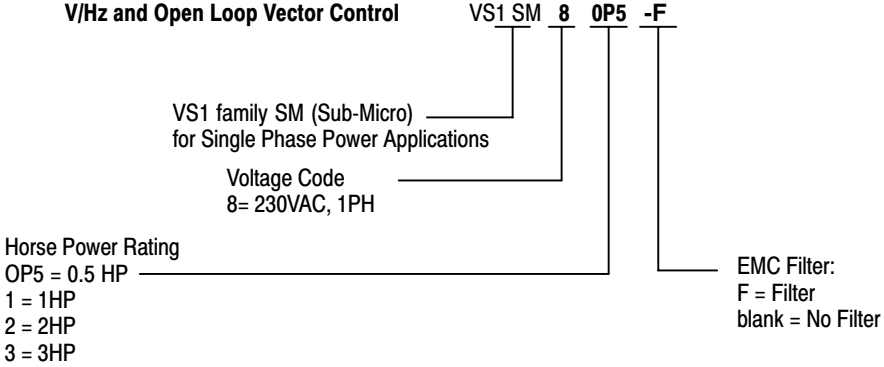
Chapter 2
General Information and Ratings

The VS1SM is a variable frequency PWM drive capable of operating in open- loop, V/Hz (volts per hertz) mode and in a sensorless vector control (SVC) mode. This chapter contains information about the VS1SM drive, including how to identify the drive.

2.1 Identify the Drive by Model Number

Each drive can be identified by its model number, as shown in Figure 2-1. The model number is on the shipping label and the drive nameplate. The model number includes the drive and any options.

Figure 2-1 Drive Identification



2.2 Storage Guidelines

If you need to store the drive, follow these recommendations to prolong drive life and performance:

1. Storage ambient temperature is -20°C to 65°C.
2. Storage Humidity range 10% to 90% RH non-condensing.
3. Do not expose to corrosive atmosphere.

2.3 VS1SM Ratings, Model Numbers and Frame Sizes

Table 2-1 has drive ratings for each VS1SM Model.

Table 2-1

Catalog No.	Input Volt	Frame Size	Output			Watts Loss
			HP	KW	Amps	Watts
VS1SM80P5	230	A	0.5	0.4	2.5	7
VS1SM81	230	A	1	0.75	5.0	25
VS1SM82	230	B	2	1.5	8.0	48
VS1SM83	230	B	3	2.2	12.0	73

Chapter 3
Installing the Drive

This chapter provides information that must be considered when planning a VS1SM drive installation and provides drive mounting information and installation site requirements.

3.1 Receiving & Inspection

When you receive your control, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your control.
2. Remove the control from the shipping container and remove all packing materials from the control. The container and packing materials may be retained for future shipment.
3. Verify that the part number of the control you received is the same as the part number listed on your purchase order.
4. Inspect the control for external physical damage that may have been sustained during shipment and report any damage immediately to the commercial carrier that delivered your control.
5. If the control is to be stored for several weeks before use, be sure that it is stored in a location that conforms to published storage humidity and temperature specifications stated in this manual.

3.2 General Requirements for the Installation Site

It is important to ensure that the drives environment and operating conditions are satisfactory.

The area behind the drive must be kept clear of all control and power wiring. Power connections may create electromagnetic fields that may interfere with control wiring or components when run in close proximity to the drive.

Read the recommendations in the following sections before continuing with the drive installation.

3.2.1 Operating Conditions

Before deciding on an installation site, consider the following guidelines:

- Protect the cooling fan by avoiding dust or metallic particles.
- Do not expose the drive to a corrosive atmosphere.
- Protect the drive from moisture and direct sunlight.
- Verify that the drive location will meet the environmental conditions specified in Table 3-1.

Table 3-1 - Ambient Temperatures and Mounting Clearances

Ambient Temperature		Enclosure Rating	Minimum Mounting Clearances
Minimum	Maximum		
14°F (-10°C)	104°F (40 °C)	IP20/Open Type	2 in (50mm)
	104°F (40 °C)	IP20/NEMA 1	2 in (50mm)
	104°F (40 °C)	Side-by-Side	2 in (50mm)

3.2.2 Minimum Mounting Clearances

Be sure to provide proper top, bottom and side clearance (2" minimum each side).

3.3 Mounting the Drive

Mount the drive upright on a flat, vertical, non combustible and level surface.
Refer to Figure 3-3 for mounting hole locations.

3.3.1 Protecting the Drive from Debris

The drive must be protected from debris falling through the drive vents during installation and operation. The drive is designed to operate in IP20/NEMA1 Type installations.

3.3.2 Watts Loss Data

Refer to Table 2-1 for watts loss data.

3.3 Cover Removal

To connect power and signal wires, the cover must be removed.
Remove the cover as shown in Figure 3-2.

1. Gently press in the area labeled Cover Release shown in Figure 3-2.
2. Slide the cover downward about 3/8 in (10mm) and lift off the Main Cover.
3. The Power Terminal Cover can then be removed by lifting it from the control.

Figure 3-2 Cover Removal

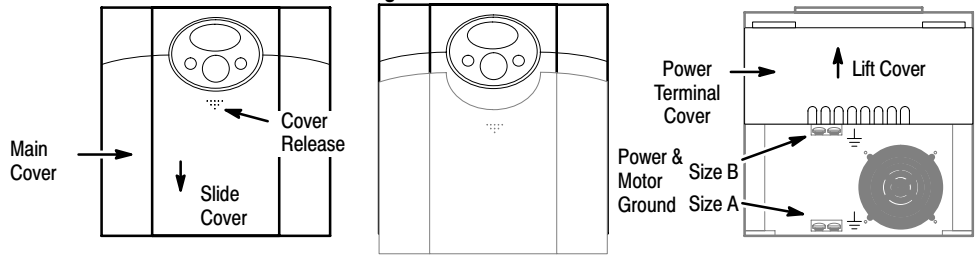


Figure 3-3 Mounting Hole Locations

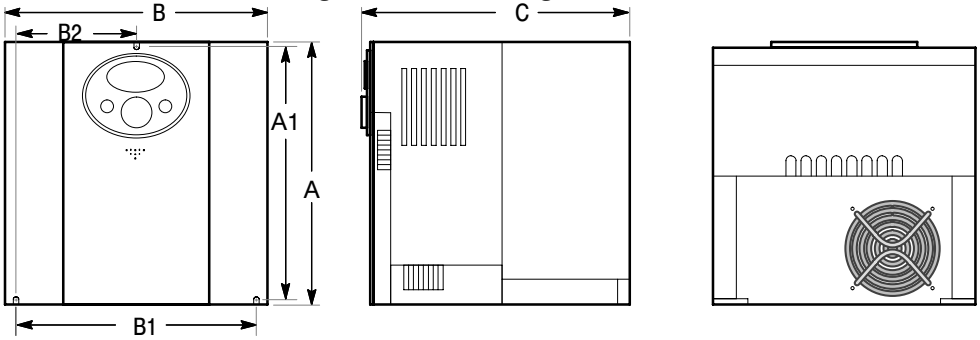


Table 3-2 Drive Dimensions and Weights

Size	Catalog Number	Dimensions inches(mm)						Weight
		Outside			Mounting			
		Height (A)	Width (B)	Depth (C)	Height (A1)	Width (B1)	Width (B2)	lb (kg)
A	VS1SM80P5	5.63 (143)	3.11 (79)	5.64 (143)	2.66 (67.5)	5.35(135.9)	N/A	1.92 (0.87)
A	VS1SM80P5- F	5.63 (143)	3.11 (79)	5.64 (143)	2.66 (67.5)	5.35(135.9)	N/A	2.09(0.95)
A	VS1SM81	5.63 (143)	3.11 (79)	5.64 (143)	2.66 (67.5)	5.35(135.9)	N/A	1.96 (0.89)
A	VS1SM81-F	5.63 (143)	3.11 (79)	5.64 (143)	2.66 (67.5)	5.35(135.9)	N/A	2.14(0.97)
B	VS1SM82	5.63 (143)	6.14 (156)	5.64 (143)	5.34 (135)	5.43 (138)	2.71 (68.8)	3.95 (1.79)
B	VS1SM82-F	5.63 (143)	6.14 (156)	5.64 (143)	5.34 (135)	5.43 (138)	2.71 (68.8)	4.28(1.94)
B	VS1SM83	5.63 (143)	6.14 (156)	5.64 (143)	5.34 (135)	5.43 (138)	2.71 (68.8)	4.08 (1.85)
B	VS1SM83-F	5.63 (143)	6.14 (156)	5.64 (143)	5.34 (135)	5.43 (138)	2.71 (68.8)	4.41(2.0)

Chapter 4
Power Wiring

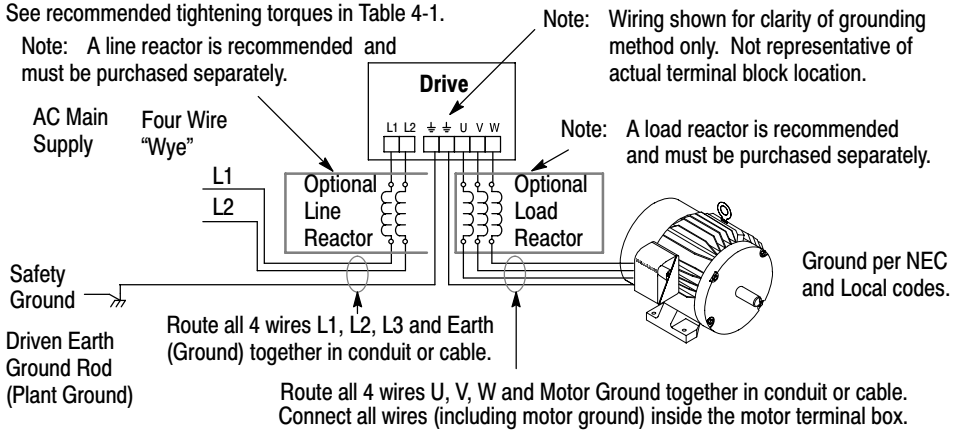
4.1 Overview of Power Connections

The recommended grounding method is shown in Figure 4-1.

Safety Ground - (G) ⏚

This is the safety ground for the drive that is required by code. One of these points must be connected to adjacent building steel (girder, joist), a floor ground rod, or bus bar. Grounding points must comply with national and local industrial safety regulations and/or electrical codes.

Figure 4-1 Recommended System Grounding



Motor Ground

The motor ground must be connected to one of the ground terminals on the drive.

Shield Termination

Either of the safety ground terminals located on the power terminal block provides a grounding point for the motor cable shield. The motor cable shield connected to one of these terminals (drive end) should also be connected to the motor frame (motor end). Use a shield terminating or EMI clamp to connect the shield to the safety ground terminal. The NEMA 1/IP30 Kit may be used with a cable clamp for a grounding point for the cable shield.

When shielded cable is used for control and signal wiring, the shield should be grounded at the drive end only, never at both ends.

RFI Filter Grounding

Using single-phase drives with integral filter, or an external filter with any drive rating, may result in relatively high ground leakage currents. Therefore, the filter must only be used in installations with grounded AC supply systems and be permanently installed and solidly grounded (bonded) to the building power distribution ground.

Ensure that the incoming supply neutral is solidly connected (bonded) to the same building power distribution ground. Grounding must not rely on flexible cables and should not include any form of plug or socket that would permit inadvertent disconnection. Some local codes may require redundant ground connections. The integrity of all connections should be checked periodically.

4.2 Power Disconnect

A power disconnect should be installed between the input power service and the drive for a fail safe method to disconnect power. The drive will remain in a powered-up condition until all input power is removed from the drive and the internal bus voltage is depleted.

4.3 Protective Devices

Recommended fuse sizes are based on the following:
115% of maximum continuous current for time delay.
150% of maximum continuous current for Fast or Very Fast action.

Note: These recommendations do not consider harmonic currents or ambient temperatures greater than 45°C.

Be sure a suitable input power protection device is installed. Use the recommended fuses and wire sizes shown in Table 4-1 is based on the use of copper conductor wire rated at 75 °C. The table is specified for NEMA B motors.

Fast Action Fuses:	240VAC, Buss® KTN; 460VAC, Buss® KTS
Very Fast Action:	240VAC, Buss® JJN; 460VAC, Buss® JJS
Semiconductor	240VAC, Ferraz Shawmut A50QS

Buss® is a trademark of Cooper Industries, Inc.

4.4 Electrical Installation

All interconnection wires between the drive, AC power source, motor, host control and any operator interface stations should be in metal conduits or shielded cable must be used. Use listed closed loop connectors that are of appropriate size for wire gauge being used. Connectors are to be installed using crimp tool specified by the manufacturer of the connector. Only class 1 wiring should be used.

Table 4-1 Fuse & Wire Size and Terminal Tightening Torque Specifications

Catalog Number	Input Fuse (Amps)	Wire Gauge		Tightening Torque	
	Fast Acting (UL)	AWG	mm^2	lb-in	Nm
VS1SM80PF, VS1SM80P5-F	10A	14	2.5	9	4.5
VS1SM81, VS1SM81-F	20A	14	2.5	9	4.5
VS1SM82, VS1SM82-F	30A	12	4.0	15	1.7
VS1SM83, VS1SM83-F	40A	12	4.0	15	1.7

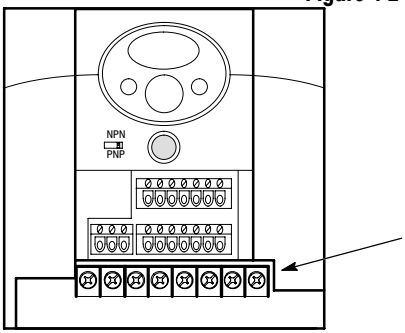
Note: Wire sizes based on 75°C copper wire. Fuses based on 45°C ambient, max continuous output and no harmonic current.

4.4.1 Input Power Connections

All cables must be shielded and the shields must be grounded at the enclosure cable entrance.

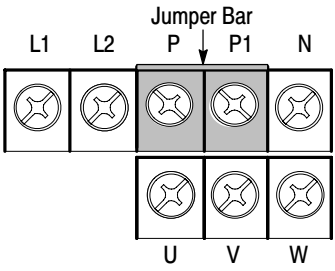
1. Connect the line L1, L2 to the Power Terminal Strip, Figure 4-3.
2. Connect the motor leads to U, V and W terminals, Figure 4-2.
3. Connect motor ground to the ground terminal ⏚ located in the opening at the rear of the drive by the fan (see Figure 3-2 for location).

Figure 4-2 Power Terminal Locations

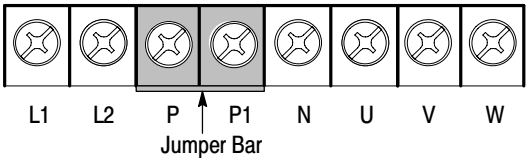


Power Terminal Strip

VS1SM80P5/80P5-F, VS1SM81/81-F



VS1SM82/82-F, VS1SM83/83-F



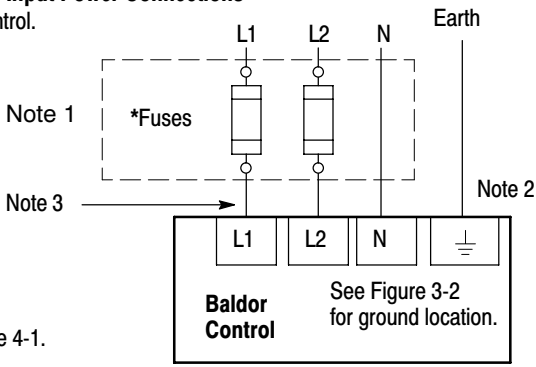
See Recommended Tightening Torques in table 4-1.

Figure 4-3 Input Power Connections

***** Optional components not provided with control.

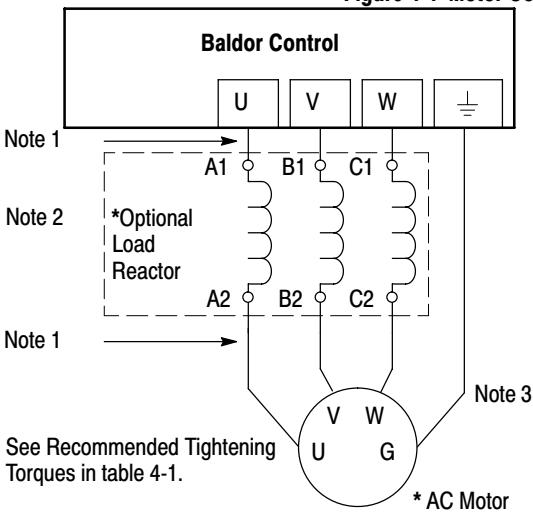
Notes:

1. See “Protective Devices” described previously in this section.
2. Use same gauge wire for Earth ground as is used for L1 and L2.
3. Metal conduit should be used. Connect conduits so the use of a Reactor or RC Device does not interrupt EMI/RFI shielding.



See Recommended Tightening Torques in table 4-1.

Figure 4-4 Motor Connections



See Figure 3-2 for ground location.

Notes:

1. Metal conduit should be used. Connect conduits so the use of Load Reactor or RC Device does not interrupt EMI/RFI shielding.
2. See Line/Load Reactors described previously in this section.
3. Use same gauge wire for ground as for U, V and W.

* Optional components not provided with control.

4.4.1 Grounding Procedure

1. Remove covers. Cover removal is described in Chapter 3 of this manual.
2. Connect the power ground wire to the ground terminal G (see Figure 3-2).
3. Connect the motor ground wire to the ground terminal G (see Figure 3-2).

4.4.2 Motor Connections

All cables must be shielded and the shields must be grounded at the enclosure cable entrance.

1. Remove covers. Cover removal is described in Chapter 3 of this manual.
2. Connect the Motor leads to terminals U, V and W (see Figure 4-2 for location).

Long Motor Leads

The wire leads that connect the motor to the control are critical in terms of sizing, shielding and the cable characteristics. Short cable runs are usually trouble free but fault-monitoring circuitry can produce numerous faults when long cables (over 100 feet) are used.

100+ ft (30m). Baldor recommends adding an optional load reactor to the output of the control.

250+ ft (75m). Baldor recommends adding an optional load reactor and common mode choke to the control.

The load reactor and/or common mode choke should be placed in close physical proximity to the control. Unexpected faults may occur due to excessive charging current required for motor cable capacitance.

If you use long motor leads and experience unexpected trips due to current overload conditions and are not sure how to correctly size and connect the optional load reactors, please contact your Baldor representative. Baldor is always glad to assist.

4.5 Optional Dynamic Brake Hardware

Refer to MN763DB for DB resistor connections.

Dynamic Brake (DB) Hardware must be installed on a flat, non-flammable, vertical surface for effective cooling and operation.

Chapter 5
Control Wiring

5.1 Control Wiring Overview

Analog and digital inputs and output terminals are shown in Figure 5-1 and described in Table 5-1.

Figure 5-1 Control Wiring Terminal Identification

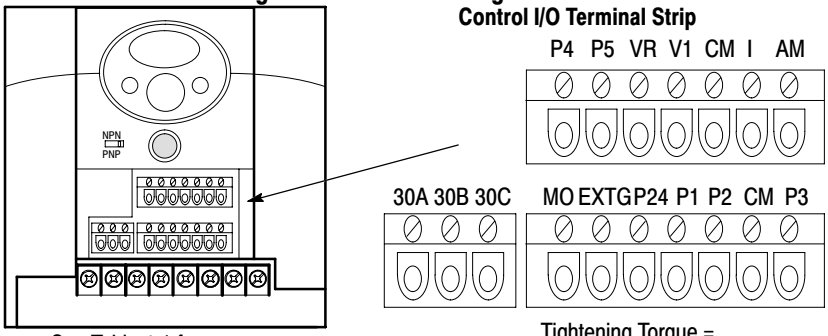


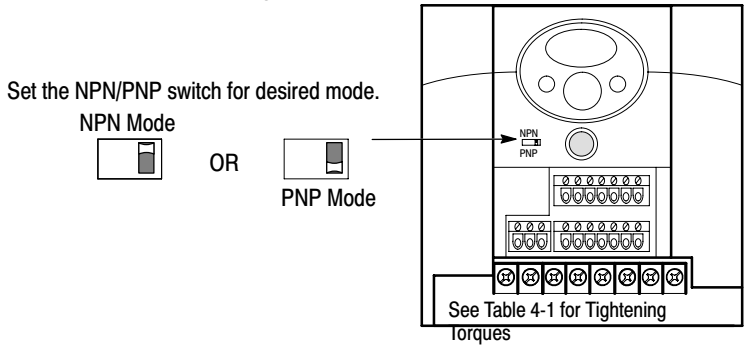
Table 5-1 I/O Connection Description

Connector Terminal	Signal Description
P1	Forward Run
P2	Reverse Run
P3	Output Inhibit
P4	Fault Reset
P5	Jog Operation
P24	Internal 24VDC power (powers P1-P5 inputs)
VR	12V power supply for speed reference potentiometer
V1	0-10VDC Analog Input Terminal
I	0-20mA Analog Input Terminal
CM	Internal 24V common (return for P1-P5 and AM inputs)
AM	0-10VDC Analog Output Terminal
CM	Common for Analog Output
MO	Digital Output (Open Collector)
EXTG	Digital Common for MO
30A	Relay Output - A Contact
30B	Relay Output - B Contact
30C	Common - 30A, 30B Contacts

5.2 Control Input Connections

Determine if you will use NPN (factory setting) or PNP connections. NPN/PNP settings are shown in Figure 5-2. For NPN, CM (Common or ground) is used to switch the input signals. For PNP, P24 (+24VDC output) is used to switch the input signals.

Figure 5-2 NPN/PNP Mode



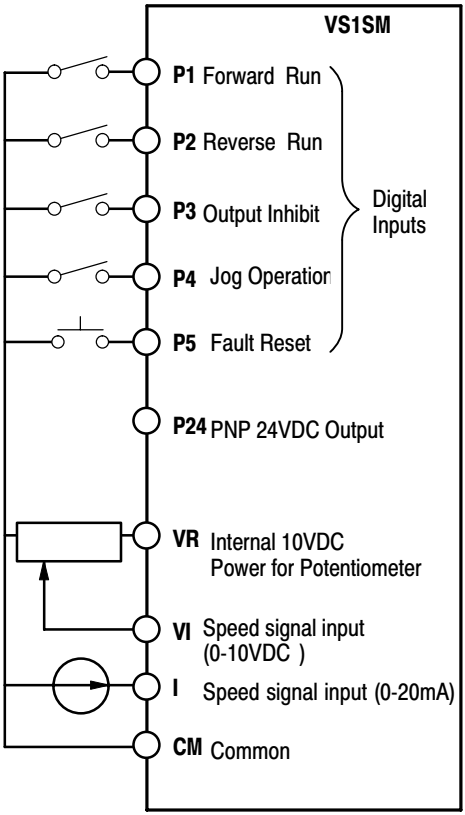
Input connections are shown in Figure 5-3

1. **For NPN Connections** Connect the Digital Inputs to one pole of a switch and the other switch pole to CM. An active low at P1 - P5 will activate the inputs.
   For PNP Connections1 Connect the Digital Inputs to one pole of a switch and the other switch pole to P24. An active High at P1 - P5 will activate the inputs.
2. The speed Command input can be wither a Voltage (0-10VDC) or a Current (0-20mA) input.
   For Voltage input, either an external potentiometer or an external voltage reference can be used.
   a. For an External reference voltage input, connect the 0-10VDC input to the VI terminal. Connect the reference from the external source to the CM terminal.
   b. For an external potentiometer, connect the pot as shown, one end to VR terminal, the wiper to VI terminal and the other end to CM terminal.

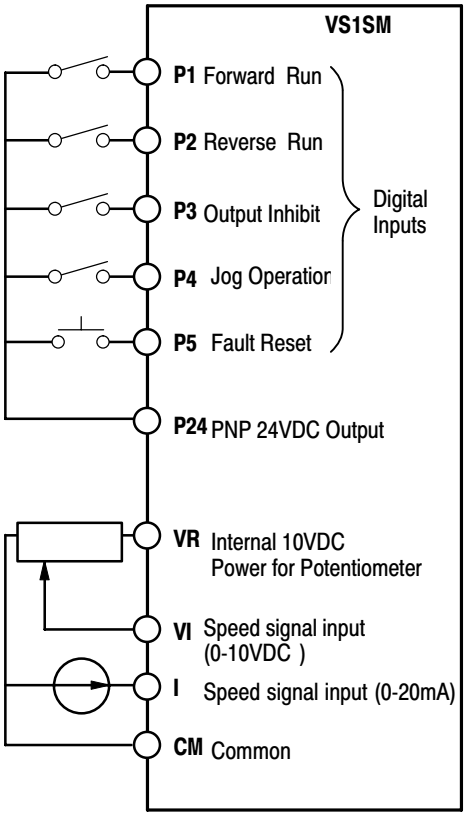
   For Current input, connect the 0-20mA source to the I terminal, the reference to CM terminal.

Figure 5-3 Input Connections

Shown with NPN Digital Input Connections



Shown with PNP Digital Input Connections



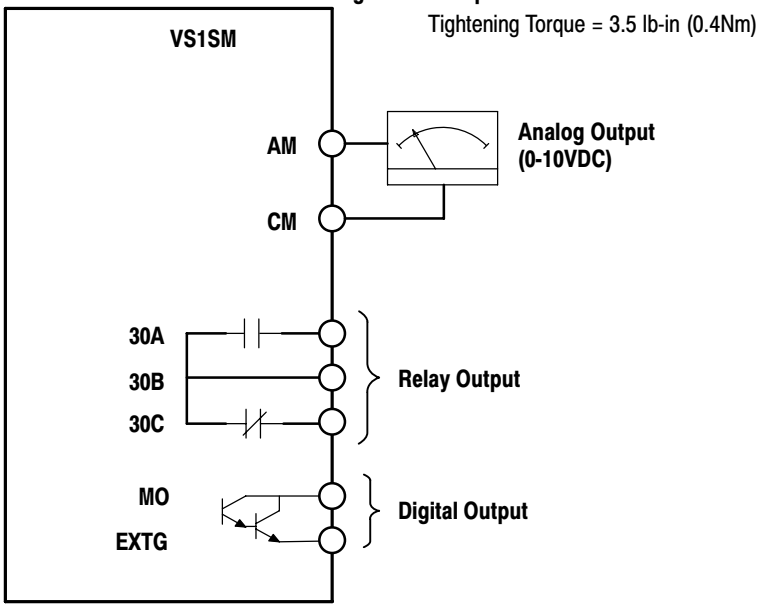
Tightening Torque = 3.5 lb-in (0.4Nm)

5.3 Control Output Connections

The Analog and Digital outputs are shown in Figure 5-4.

1. Connect an external analog output device to AM terminal and it's reference to CM.
2. The normally Open and Closed relay outputs can be connected to an external device, terminal 30B is the common terminal.
3. A multi-function open collector output can drive a digital load, connect to MO and EXTG.

Figure 5-4 Output Connections



Chapter 6
Using the Keypad

6.1 Keypad Overview

Operator controls are shown in Figure 6-1 and described in Table 6-1.
The 5 Way Button that is used for parameter setting is only accessible when the cover is removed.

Figure 6-1 Operator Controls

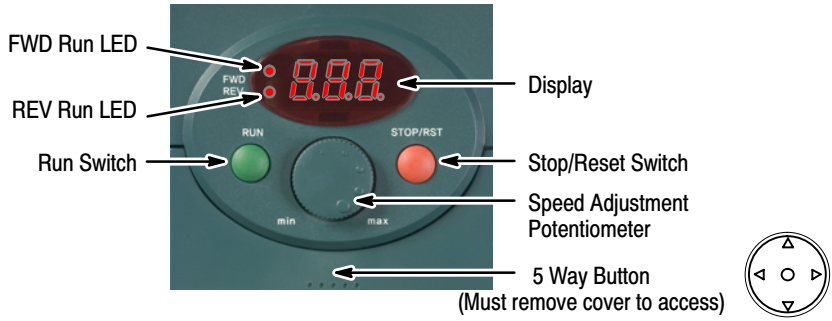


Table 6-1 Key Descriptions

Item	Description
FWD	**FWD Run LED:** On during Forward Run.
REV	**REV Run LED:** On during Reverse Run.
DISPLAY	**7 Segment LED Display:** Displays operation status and parameter information.
RUN	**Run Switch:** Press to issue a run command.
STOP/RST	**Stop / Reset Switch:** STOP: Stop the operation RST: Reset faults
POTENTIO-METER	**Speed Adjustment Potentiometer:** Adjusts the value of run frequency.
5 WAY BUTTON	**5 Way Button:** (Not visible with cover on.) ▲ Navigate parameter lists or increase parameter value. ▼ Navigate parameter lists or decrease parameter value. ▶ Navigate parameter groups or move cursor to the right to change the parameter value. ◀ Navigate parameter groups or move a cursor to the left to change the parameter value. ● Set the parameter value or save the changed parameter value (Enter).

Figure 6-2 Alpha-numeric LED Characters

0	0	A	A	K	K	U	U
1	1	b	B	L	L	v	V
2	2	C	C	M	M	W	W
3	3	d	D	n	N	X	X
4	4	E	E	O	O	Y	Y
5	5	F	F	P	P	Z	Z
6	6	G	G	q	Q		
7	7	H	H	r	R		
8	8	I	I	S	S		
9	9	J	J	t	T		

6.2 Parameter Groups

To access the parameter groups the cover must be removed to allow access to the 5 Way Button. The 5 Way Button is used to navigate the parameters and examine or change values.

There are 4 parameter groups in VS1SM shown in Figure 6-3.

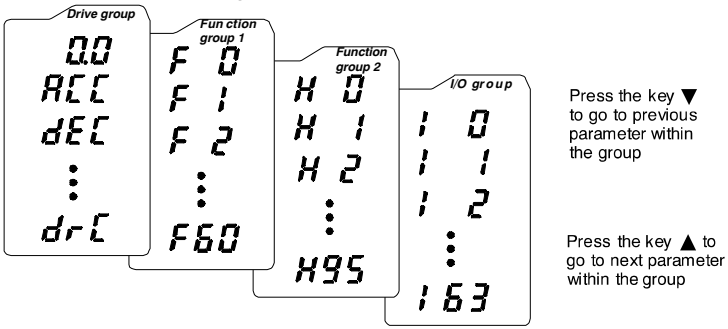
Drive Group Basic start up parameters necessary to run the drive.

Function Group1 Basic function parameters to adjust output speed/voltage, minimum/maximum speeds and braking.

Function Group2 Advanced function parameters.

I/O Group Parameters to configure the digital and analog I/O and to set preset speeds.

Figure 6-3



Press the ▶ key to navigate to the next group. Press the ◀ key to navigate to the previous group.

View the Drive Group Parameters: When power is applied, the first Drive Group parameter is viewed.

Action	Description	Display	Comments
Apply Power	Power on display shows drive status. Speed Reference is 0.0Hz		This is the first display within the Drive Group
Press the ▲ key	The next parameter is displayed.		Acceleration time. Press enter to view or change setting.
Press the ▲ key	The next parameter is displayed.		Deceleration time. Press enter to view or change setting.
Press the ▲ key	The next parameter is displayed.		Start/Stop Source. Press enter to view or change setting.
Press the ▲ key	The next parameter is displayed.		Speed Reference Source. Press enter to view or change setting.
Press the ▲ key	The next parameter is displayed.		Preset Speed 1. Press enter to view or change setting.
Press the ▲ key	The next parameter is displayed.		Preset Speed 2. Press enter to view or change setting.
Press either the ◀ or the ▶ key returns to the first parameter in the group.	Return to top level of present group.		Pressing either key will immediately return to the first parameter in the group.
Press the ▶ key to go to the next parameter group.	The first parameter in the Function Group 1		
Press the ▶ key to go to the next parameter group.	The first parameter in the Function Group 2		
Press the ▶ key to go to the next parameter group.	The first parameter in the I/O Group		
Press the ▶ key returns to the drive group.			

Change Accel time from 5.0 to 16.0 seconds: Factory setting is 5.0 seconds.

Action	Description	Display	Comments
Apply Power			
Press the ▲ key	Accel parameter is displayed.		Acceleration time. Press enter to view or change setting.
Press Enter to view/edit	The right most digit is bright indicating the cursor position.		Press Enter to exit without changing the value.
Press the ◀ key to move one digit to the left	The present value is 5 and we want it to be 6.		
Press the ▲ key to increase the value to 6.			
Press the ◀ key to move one digit to the left	The present value is 0 and we want it to be 1.		
Press the ▲ key to increase the value to 1			Accel time has been changed to 16.0 sec. Press Enter to exit and save changed value.
Press either the ◀ or the ▶ key returns to the first parameter in the group.			
			

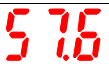
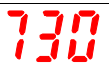
Change Speed Reference from 0.0 to 30.0Hz: Factory setting for keypad speed reference is 0.0Hz.

Action	Description	Display	Comments
Apply Power			
Press the ◀ key twice to move 2 digits to the left	The present value is 5 and we want it to be 6.		
Press the ▲ key to increase the value to 3.			Press Enter to exit and save changed value.
After the value change, the display will flash for a few seconds indicating the new value.			The new Speed Reference is 30.0Hz.

View parameter F27: Use the jump code to quickly get to F27.

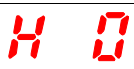
Action	Description	Display	Comments
Apply Power			
Press the ▶ key to go to the next parameter group.	The jump code in Function Group 1		Press Enter to change the value to 27.
Press the ▲ key 26 times or use the next steps.			
or			
Press the ▲ key 6 times to increment to 7.			
Press the ◀ key to move 1 digits to the left			
Press the ▲ key 2 times to increment to 2.			Jump code is now 27. Press Enter to view to F27.
Press Enter to go to F27.			Press enter to view or change setting.

View the motor RPM on a 3 digit display: Motor RPM in this example is 1730RPM

Action	Description	Display	Comments
Apply Power			Speed reference is displayed 57.6Hz
Press the ▲ key until the RPM is displayed	The next parameter is displayed.		Press enter to view or change setting.
Press Enter to view the value (motor RPM)			The right most 3 digits are displayed.
Press the ◀ key to view digits to the left			Now the left most 3 digits are displayed. The value is 1730 RPM. Press Enter to exit.
Press Enter to exit.			
Press the ◀ key to return to Speed Reference display.			

Motor current and other parameter values are viewed in a similar manner.

Reset all parameters to factory settings: Restoring factory settings (H93) will overwrite all parameter values.

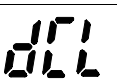
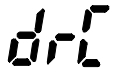
Action	Description	Display	Comments
Apply Power			
Press the ▶ key to go to Function Group 2.	The jump code in Function Group 2		
Press Enter to edit the jump code.	Change the code from 1 to 93.		
Press the ▲ key 2 times to increment to 3.			
Press the ◀ key to move 1 digits to the left			
Press the ▲ key 9 times to increment to 9.			Jump code is now 93. Press Enter to view to F93.
Press Enter to jump to H93			
Press Enter to edit to change the setting			
Press the ▲ key to change value to 1 (reset all parameter values).			Press Enter to restore all factory settings.
Press Enter to rest values. The display will flash for a few seconds until the values are reset to factory settings.			

Chapter 7
Parameter Descriptions

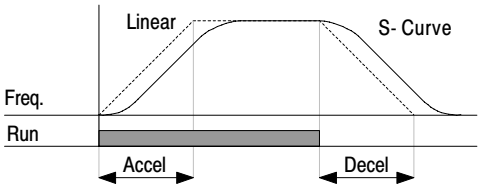
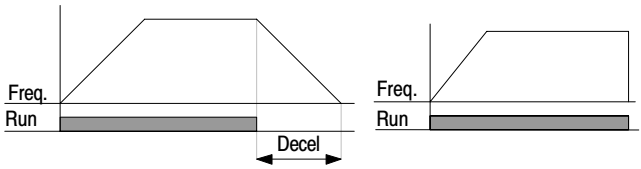
7.1 Drive Group

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
0.0	RW	**Speed Reference** (Range: 0.00 to 400.00 Hz) Must be less than F21. The value of the speed reference command. The commanded speed (frequency) is displayed even if the drive is not running. Preset Value: 0.00
ACC	RW	**Acceleration Time** (Range: 0-6000seconds) Sets acceleration time. During Preset Speed operation, serves as acceleration time 0. Preset Value: 0
dEC	RW	**Deceleration Time** (Range: 0-6000seconds) Sets deceleration time. During Preset Speed operation, serves as deceleration time 0. Preset Value: 0
drv	RW	**Start/Stop Source** (Range: 0- Run/Stop by Run/Stop key on the keypad. 1- 2 or 3 wire control from the terminal strip. 2- 2 wire with direction control from the terminal strip. 3- Operation by Communication Option) Sets the control mode to keypad, terminal strip, communication network. Preset Value: 0.0
Fr9	RW	**Speed Reference Source** (Range: 0- Digital, by Keypad 1 1- Digital, by Keypad 2 2- Analog, by Keypad Potentiometer (V0) 3- Analog, by V1 Terminal 4- Analog, by I Terminal 5- Analog, by Keypad Potentiometer and I Terminal 6- Analog, by V1 Terminal and I Terminal 7- Analog, by Keypad Potentiometer and V1 Terminal 8- Analog, by Modbus-RTU Communication Sets the speed reference source of the drive to be from the drive keypad or a remote analog reference. Preset Value: 0.00
SS1	RW	**Preset Speed 1** (Range: 0-400 Hz) Must be less than F21. Sets Preset Speed 1 during operation. See also I30-I33. Preset Value: 10.00
SS2	RW	**Preset Speed 2** (Range: 0-400 Hz) Must be less than F21. Sets Preset Speed 2 during operation. See also I30-I33. Preset Value: 20.00

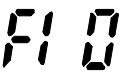
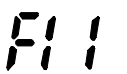
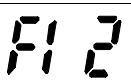
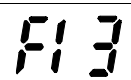
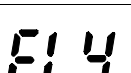
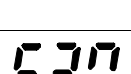
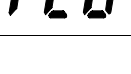
7.1 Drive Group Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Preset Speed 3** (Range: 0-400 Hz) Must be less than F21. Sets Preset Speed 3 during operation. See also I30-I33. Preset Value: 30.00
	RO	**Output Current** (Range: N/A) Displays the output current to the motor. Preset Value: N/A
	RO	**Motor RPM** (Range: N/A) When H40=0 or 1 motor speed is calculated and displayed in RPM. Motor slip is not considered. Preset Value: N/A
	RO	**DC Link Voltage** (Range: N/A) Displays the DC link voltage (Bus). Preset Value: N/A
	RO	**User Display Selection** (Range: vOL- Output Voltage POr- Output Power tOr- Output Torque) Displays the item selected in parameter H73. Enter motor efficiency in H36 (motor nameplate) for correct torque. Preset Value: N/A
	RO	**Fault Display** (Range: N/A) Displays, most recent fault, frequency and drive status at the time of the fault. When reset the fault information is moved to H1. Preset Value: N/A
	RW	**Motor Rotation Direction** (Range: F=Forward, R=Reverse) Sets the motor rotation direction. Only applicable when drV=0 or 1. Preset Value: F

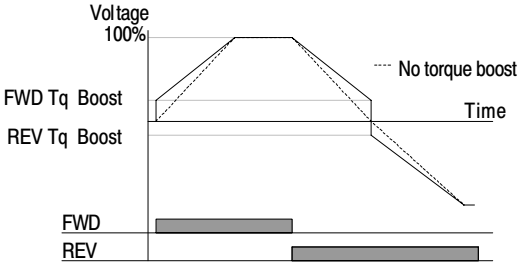
7.2 Function Group1

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
F00	RW	**Jump Code** (Range: 0-60) Sets the parameter number to jump to within Function Group1. Allows quick access to a desired parameter. Preset Value: 1
F01	RW	**Forward/Reverse Run Disable** (Range: 0- Forward and reverse run enabled 1- Forward run disabled 2- Reverse run disabled) Enables or disables the ability to run the drive in forward or reverse. Preset Value: 0
F02 F03	RW	**Accel Pattern** F02, **Decel Pattern** F03 (Range: 0- Linear. A general pattern for constant torque applications. 1- S-Curve. Allows the motor to accelerate and decelerate smoothly.) If set to S-Curve, the actual accel time will take longer than the time set by the user, as illustrated here. If H70 is set to maximum speed and target speed is set to less than maximum speed, the shape of S-curve may be distorted. Preset Value: F02=0, F03=0 
F04	RW	**Stop Mode** (Range: 0- Decelerate to stop. Decels to 0Hz for the preset time. 1- DC Brake to stop. See Chapter 8 for information. 2- Free run to stop. Motor output is disabled and motor coasts to stop.) Preset Value: 0 

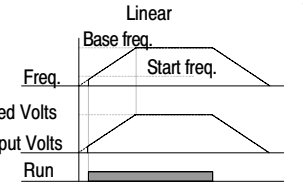
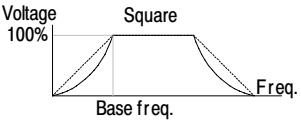
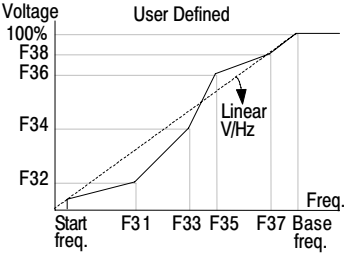
7.2 Function Group1 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**DC Brake Trigger** (Range: 0.0-60 Hz) Sets the frequency at which DC braking begins. Cannot be less than F23. Preset Value: 5.00 Parameter is only displayed when F4 =1.
	RW	**DC Brake Wait Time** (Range: 0-60 sec) Sets the delay before DC braking after F8 has been reached. Preset Value: 0.1 Parameter is only displayed when F4 =1.
	RW	**DC Brake Voltage** (Range: 0-200%) Sets DC Brake voltage. Preset Value: 50 Parameter is only displayed when F4 =1.
	RW	**DC Brake Time** (Range: 0-60 sec) Sets the time DC brake current is applied after the motor has stopped. Preset Value: 1.0 Parameter is only displayed when F4 =1.
	RW	**DC Brake Start Voltage** (Range: 0-200%) Sets the amount of DC brake voltage applied during brake before start. Preset Value: 50
	RW	**DC Brake Start Time** (Range: 0-60 sec) Sets the time DC braking is applied during brake before start. Preset Value: 0
	RW	**Time for Motor Magnetization** (Range: 0-60 sec) Sets the time current is applied to the motor before the motor begins acceleration during Sensorless Vector control. Preset Value: 1.0
	RW	**Jog Speed** (Range: 0-400Hz) Sets the frequency for jog operation. Cannot be greater than F21. Preset Value: 10.0
	RW	**Maximum Speed** (Range: 40-400Hz) Sets the maximum motor speed the drive will output. Acts as the speed reference for accel/decel. Note: If H40 =3, the range is decreased to 40-300Hz. See also: H70 Preset Value: 60.00
	RW	**Base Speed** (Range: 30-400Hz) Sets the motor base speed, at which the rated output voltage is applied. For a 60Hz motor, the base speed is 60Hz. Preset Value: 60.00

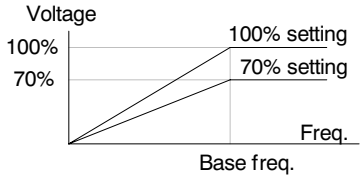
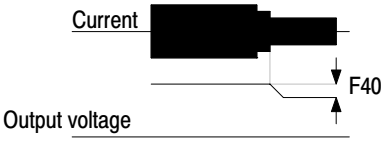
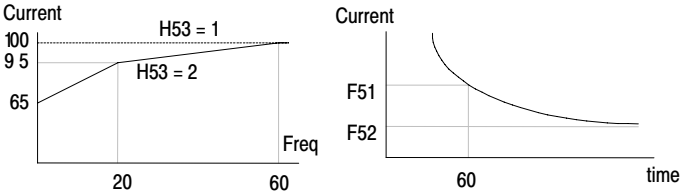
7.2 Function Group1 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
F23	RW	**Start Speed** (Range: 0.1-10Hz) Sets initial speed of the inverter. Preset Value: 0.50
F24	RW	**Speed High/Low Limit Selection** (Range: 0=No, 1=Yes) Sets whether the high/low limits (F25 and F26) are used. Preset Value: 0
F25	RW	**Speed High Limit** (Range: 0-400Hz) Sets the upper speed limit. Cannot be greater than F21. Preset Value: 60.00 Parameter is only displayed when F24 =1.
F26	RW	**Speed Low Limit** (Range: 0.1-400Hz) Sets the lower speed limit. Cannot be greater than F25 or less than F23. Preset Value: 0.50 Parameter is only displayed when F24 =1.
F27	RW	**Torque Boost** (Range: 0- Manual. Torque levels set in F28 and F29 are used. 1- Auto. Automatically boosts the output voltage by calculated torque boost value using motor parameters. Sets how Torque Boost is applied. Preset Value: 0
F28	RW	**Forward Torque Boost** (Range: 0-15%) Sets the torque boost level during forward run. Excess boost may cause motor overheating. Preset Value: 5 
F29	RW	**Reverse Torque Boost** (Range: 0-15%) Sets the torque boost level during reverse run. Excess boost may cause motor overheating. Preset Value: 5

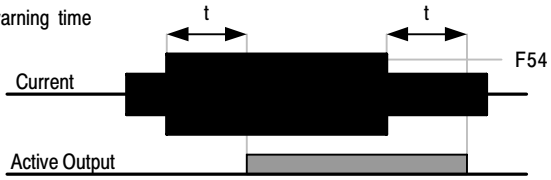
7.2 Function Group1 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
F30	RW	**Volts/Hz Pattern** (Range: 0- Linear. Maintains a linear Volts/Hz ratio from F23 to F22. 1- Square. Maintains a squared Volts/Hz ratio. 2- User Defined. Volts/Hz ratio adjusted for specialized motors and load characteristics. When User Volts/Hz pattern is active, F28 and F29 are deactivated. Preset Value: 0   
F31	RW	**User V/F Frequency 1** (Range: 0-400Hz) Sets Frequency 1 in User Defined V/F Pattern. See also F32. Cannot be greater than F21, F33, F35 or F37. Preset Value: 15.00 Parameter is only displayed when F30=2.
F32	RW	**User V/F Volts 1** (Range: 0-100%) Sets Voltage 1 in User Defined V/F Pattern as a % of ?? See also F31. Cannot be greater than F34, F36 or F38. Preset Value: 25 Parameter is only displayed when F30=2.
F33	RW	**User V/F Frequency 2** (Range: 0-400Hz) Sets Frequency 2 in User Defined V/F Pattern. See also F34. Cannot be greater than F21, F35 or F37. Preset Value: 30.00 Parameter is only displayed when F30=2.
F34	RW	**User V/F Volts 2** (Range: 0-100%) Sets Voltage 2 in User Defined V/F Pattern as a % of ?? See also F33. Cannot be greater than F36 or F38. Preset Value: 50 Parameter is only displayed when F30=2.
F35	RW	**User V/F Frequency 3** (Range: 0-400Hz) Sets Frequency 3 in User Defined V/F Pattern. See also F36 Cannot be greater than F21 or F37. Preset Value: Parameter is only displayed when F30=2.
F36	RW	**User V/F Volts 3** (Range: 0-100%) Sets Voltage 3 in User Defined V/F Pattern as a % of ?? See also F35. Cannot be greater than F38. Preset Value: 45.00 Parameter is only displayed when F30=2.

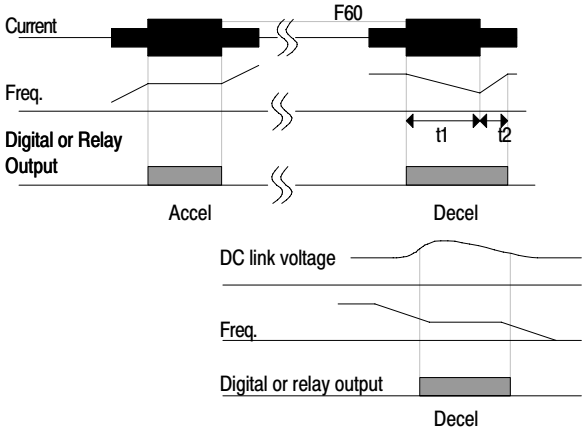
7.2 Function Group1 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
F37	RW	**User V/F Frequency 4** (Range: 0-400Hz) Sets Frequency 4 in User Defined V/F Pattern. See also F38. Cannot be greater than F21. Preset Value: 60.00 Parameter is only displayed when F30=2.
F38	RW	**User V/F Volts 4** (Range: 0-100%) Sets Voltage 4 in User Defined V/F Pattern as a % of ?? See also F37. Preset Value: 100 Parameter is only displayed when F30=2.
F39	RW	**Output Voltage Scale** (Range: 40-110%) Adjusts the output voltage as a percentage of Input Voltage. Useful for a motor that has a rated voltage less than the line voltage. Preset Value: 100 
F40	RW	**Energy Saving Level** (Range: 0-30%) Sets the amount of output voltage decrease when light load is detected. For fan or pump applications, energy savings can be significant. Preset Value: 0 
F50	RW	**Electronic Thermal** (Range: 0=Off, 1=On) If motor current exceeds F51 for 1 minute the output is turned off and the motor coasts to stop (Trip). Preset Value: 0 

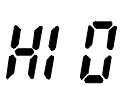
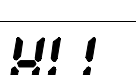
7.2 Function Group1 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
F51	RW	**Electronic Thermal Level for 1 Minute** (Range: 50-150%) Sets the maximum continuous motor current allowed for 1 minute as a % of H33. Cannot be less than F52. Preset Value: 150 Parameter is only displayed when F50=1.
F52	RW	**Electronic Thermal Level for Continuous** (Range: 50-150%) Sets maximum continuous motor current allowed as a % of H33. Cannot exceed F51. Preset Value: 100 Parameter is only displayed when F30=2.
F53	RW	**Motor Cooling Method** (Range: 0- Cooled by fan connected directly to the shaft of the motor. 1- Cooled by fan powered by a separate motor.) Sets the motor cooling method used. Preset Value: 0 Parameter is only displayed when F30=2.
F54	RW	**Overload Warning Level** (Range: 30-150%) Sets the alarm current level that activates a relay or digital output terminal as a percentage of H33. Select one output terminal for this function (MO or 30AC). For digital output, set I54=5. For relay output, set I55=5. See also: I54 and I55 Preset Value: 150 t=Overload warning time 
F55	RW	**Overload Warning Time** (Range: 0-30sec) Sets the amount of time motor current greater than F54 is tolerated. After this time an alarm is issued if the Overload continues. Preset Value: 10
F56	RW	**Overload Trip Selection** (Range: 0- Off. Output is NOT turned off for overload. 1- On. Output is disabled (trip) and motor coasts to stop for overload. Sets if the motor output is turned off when motor overload is detected. Preset Value: 1
F57	RW	**Overload Trip Level** (Range: 30-200%) Sets the motor current required to trigger an overload trip as a % of H33. Preset Value: 180 Parameter is only displayed when F56=1.
F58	RW	**Overload Trip Time** (Range: 0-60sec) Sets the amount of time motor current greater than F57 is tolerated. After this time an overload trip is issued if the Overload continues. Preset Value: 60 Parameter is only displayed when F56=1.

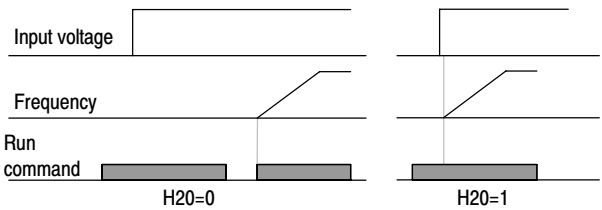
7.2 Function Group1 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
F59	RW	**Stall Prevent** (Range: 0- No stall prevention. 1- During acceleration. Accel is stopped when motor current > F60. 2- During constant run: Motor decels when motor current > F60. 3- During both accel and Constant run. 4- During deceleration. Decel is stopped when link volts > preset. 5- During both accel and decel. 6- During both decel and Constant run. 7- During accel, decel and Constant run.) Sets when stall prevention is active. Preset Value: 0 
F60	RW	**Stall Prevention Level** (Range: 30-150%) Sets the motor current level required to activate stall prevention. Set as a % of H33. Preset Value: 150

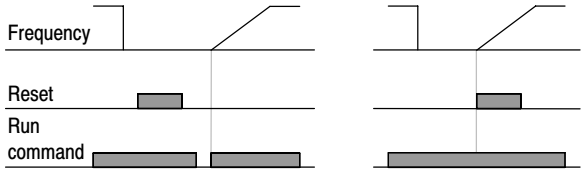
7.3 Function Group2

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Jump Code** (Range: 1-95) Sets the parameter number to jump to within Function Group2. Allows quick access to a desired parameter. Preset Value: 1
	RO	**Fault History 1** (Range: N/A) Fault information for frequency, current and accel/decel at the fault time. When a fault occurs during operation, it can be viewed with nOn in the Drive Group. When the fault is reset it is moved to H1. Fault information stored in H1 is moved to H2, H2 info is moved to H3 etc. H5 has the oldest fault information. Preset Value: N/A
	RW	**Fault History 2** (Range: N/A) See H1. Preset Value: N/A
	RW	**Fault History 3** (Range: N/A) See H1. Preset Value: N/A
	RW	**Fault History 4** (Range: N/A) See H1. Preset Value: N/A
	RW	**Fault History 5** (Range: N/A) See H1. Preset Value: N/A
	RW	**Reset Fault History** (Range: 0-1) 1- Clears H1, H2, H3, H4 and H5 fault history locations. Preset Value: 0
	RW	**Dwell Speed** (Range: F23 to 400Hz) When a run command is issued, dwell frequency is applied to the motor for H8 time. Then normal accel to speed setpoint will occur. H8 must be set to a value between F21 and F23. Preset Value: 5.00
	RW	**Dwell Time** (Range: 0-10sec) Sets the duration of the dwell operation (0.0=no dwell operation). Preset Value: 0.0
	RW	**Skip Frequency** (Range: 0=Off, 1=On) Sets whether or not certain frequencies will be skipped to help prevent undesirable resonance and vibration on the structure of the machine. Preset Value: 0
	RW	**Skip Frequency Low Limit 1** (Range: 0-400Hz) Sets the lower limit of frequency range 1 to skip. Preset Value: 10.00 Parameter is only displayed when H10=1.

7.3 Function Group2 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
H12	RW	**Skip Frequency High Limit 1** (Range: 0-400Hz) Sets the upper limit of frequency range 1 to skip. Preset Value: 15.00 Parameter is only displayed when H10=1.
H13	RW	**Skip Frequency Low Limit 2** (Range: 0-400Hz) Sets the lower limit of frequency range 2 to skip. Preset Value: 20.00 Parameter is only displayed when H10=1.
H14	RW	**Skip Frequency High Limit 2** (Range: 0-400Hz) Sets the upper limit of frequency range 2 to skip. Preset Value: 25.00 Parameter is only displayed when H10=1.
H15	RW	**Skip Frequency Low Limit 3** (Range: 0-400Hz) Sets the lower limit of frequency range 3 to skip. Preset Value: 30.00 Parameter is only displayed when H10=1.
H16	RW	**Skip Frequency High Limit 3** (Range: 0-400Hz) Sets the upper limit of frequency range 3 to skip. Preset Value: 35.00 Parameter is only displayed when H10=1.
H17	RW	**S-Curve Accel/Decel Start** (Range: 1-100%) Sets the speed reference value to form a curve at the start of the accel/decel cycle. Larger value decreases the linear zone. Preset Value: 40
H18	RW	**S-Curve Accel/Decel Stop** (Range: 1-100%) Sets the speed reference value to form a curve at the end of the accel/decel cycle. Larger value decreases the linear zone. Preset Value: 40
H19	RW	**Output Phase Loss Detect** (Range: 0=Disabled, 1=Output Protection) Sets whether or not the motor output is disabled when more than one output phase (U,V,W) is not properly connected. Preset Value: 0
H20	RW	**Power On Start** (Range: 0- Off. Motor will not start when power is applied. 1- On. Motor will accel to speed when power is applied.) Sets whether the motor will automatically start when power is applied and a run command is present. When AC input power is applied to the inverter with drV=1 or 2 and either Forward Run or Reverse Run input is active, the motor will start immediately. Preset Value: 0 

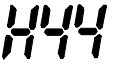
7.3 Function Group2 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
H21	RW	**Auto Restart** (Range: 0- Off. Motor will not start immediately when fault condition is reset. 1- On. Motor will start acceleration when fault condition is reset) Sets whether the motor will automatically start after a fault condition is reset and a Run command is present. After the fault is reset, with drV=1 or 2 and either Forward Run or Reverse Run input is active, the motor will start immediately. Preset Value: 0 
H22	RW	**Speed Search** (Range: 0- No speed search. 1- Normal search. 2- After Fault. 3- Normal search, After Fault, 4- After Fault, After Power Failure, 5- Normal search, After Fault, After Power Failure, 6- After Fault, After Power Failure, 7- Normal search, After Fault, After Power Failure, 8- Power on start. 9- Normal search, After Fault, Power on start. 10- After Fault, Power on start. 11- Normal search, After Fault, Power on start. 12- After Fault, After Power Failure, Power on start. 13- Normal search, After Power Failure, Power on start. 14- After Fault, After Power Failure, Power on start. 15- Normal search, After Fault, After Power Failure, Power on start. Note: On power start if H20=1) Note: Normal search done is first even when others are also selected. Helps prevent faults when attempting to start a running motor. (After power outage while motor is coasting). Preset Value: 0
H23	RW	**Current Level During Speed Search** (Range: 80-200%) Sets the motor current during speed search as a % of H33. Preset Value: 100
H24	RW	**P Gain During Speed Search** (Range: 0-9999) Sets the PI Controller Proportional Gain used during Speed Search. Preset Value: 100

7.3 Function Group2 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
H25	RW	**I Gain During Speed Search** (Range: 0-9999) Sets the PI Controller Integral Gain used during Speed Search. Preset Value: 1000
H26	RW	**Restart Attempts** (Range: 0-10) Sets the number of Auto-Restarts allowed after faults occur. Helps prevent the system from going down due to internal protection function activated by causes such as noise. Preset Value: 0
H27	RW	**Auto-Restart Time** (Range: 0-60sec) Sets the time between Auto-Restart attempts Preset Value: 1.0
H30	RW	**Motor Type Selection** (Range: 0.2= 0.2kW 0.4= 0.4kW 0.75= 0.75kW 1.5= 1.5kW 2.2= 2.2kW) Sets the type of motor. Preset Value: CALC
H31	RW	**Motor Poles** (Range: 2-12) Sets the number of motor poles. Preset Value: CALC
H32	RW	**Slip Frequency** (Range: 0-10Hz) Sets the motor Slip Frequency (f_s) based on Rated frequency (f_r), RPM and motor poles (P). Preset Value: CALC $f_s = f_r - \frac{RPM \times P}{120}$
H33	RW	**Motor Rated Current** (Range: 0.5-50A) Sets the rated motor current. See the motor nameplate. Preset Value: CALC
H34	RW	**No Load Motor Current** (Range: 0.1-20A) Sets the motor current as measured when the motor is rotating at rated RPM with no load (approximately 50% of the motor rated current). Preset Value: 11
H36	RW	**Motor Efficiency** (Range: 50-100%) Sets the motor efficiency. See the motor nameplate. Preset Value: 87

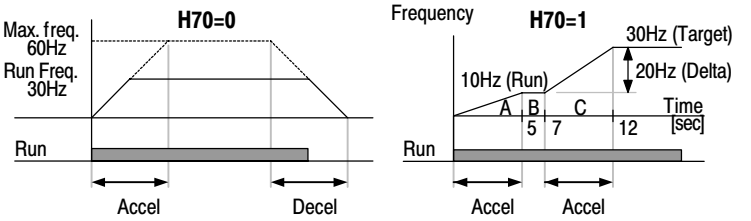
7.3 Function Group2 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Load Inertia Rate** (Range: 0- Load inertia rate is less than 10 times that of motor inertia 1- Load inertia rate is approximately 10 times the motor inertia. 2- Load inertia rate is more than 10 times that of motor inertia.) Sets the load inertia rate. Preset Value: 0
	RW	**PWM Frequency** (Range: 1-15kHz) Sets the PWM for the PWM output. Preset Value: 3
	RW	**Control Mode** (Range: 0- Volts/Frequency 1- Slip Compensation 2- PID Feedback 3- Sensorless Vector) Sets the control mode for the drive Preset Value: 0
	RW	**Auto Tuning** (Range: 0- Off. Auto tune will not. 1- On. Parameters H42 and H44 are automatically measured and adjusted. Specifies whether or not H42 and H44 will be measured automatically. Preset Value: 0
	RW	**Stator Resistance** (Range: 0-14ohms) Sets the stator resistance value of the motor. If H41=1 this value is measured and automatically adjusted. Preset Value: CALC
	RW	**Leakage Inductance** (Range: 0-300.0mH) Sets the leakage inductance value of the stator and rotor of the motor. If H41=1 this value is measured and automatically adjusted. Preset Value:
	RW	**Sensorless P Gain** (Range: 0-32767) Sets the P Gain for Sensorless Vector Control of the motor. Preset Value: 1000 Parameter is only displayed when H40=2 or 3.
	RW	**Sensorless I Gain** (Range: 0-32767) Set the I Gain for the motor during Sensorless Vector Control. Preset Value: 100 Parameter is only displayed when H40=2 or 3.
	RW	**PID Feedback** (Range: 0- Terminal I Input (0-20 mA) 1- Terminal V1 Input (0-10V)) Sets the feedback type of PID controller. Preset Value: 0 Parameter is only displayed when H40=2 or 3.

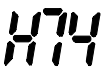
7.3 Function Group2 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Proportional (P) Gain for PID** (Range: 0-999.9%) Sets the P Gain for the PID Controller. If P Gain is set to 50%, 50% of the error value will be output. Preset Value: 300 Parameter is only displayed when H40=2 or 3.
	RW	**Integral Time (I) Gain for PID** (Range: 0.1-32.0sec) Sets the I Gain for the PID Controller, the time needed to output the accumulated error value. Set the time required to output 100% when the error value is 100%. For example, if H52=1 sec, 100% is output in 1 second. Preset Value: 1.0 Parameter is only displayed when H40=2 or 3.
	RW	**Differential Time (D) Gain for PID** (Range: 0-30.0sec) Sets the D Gain for the PID Controller. This is the output value corresponding to the variation of the error. Preset Value: 0.0 Parameter is only displayed when H40=2 or 3.
	RW	**Feed Forward (F) Gain for PID** (Range: 0-999.9%) Sets the F Gain for the PID Controller. This is the gain to add the target value to the PID controller output. Preset Value: 0.0 Parameter is only displayed when H40=2 or 3.
	RW	**PID Output Frequency Limit** (Range: 0.1-400Hz) Sets the output frequency limit through the PID Controller. Must be set within the limits of F21and F23. Preset Value: 60.00 Parameter is only displayed when H40=2 or 3.

7.3 Function Group2 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
H70	RW	**Speed Reference for Accel/Decel** (Range: 0- F21 (max speed). Accel/Decel time is the time to reach Max speed from 0 Hz or 0Hz from Max speed. 1- Delta speed. Accel/Decel time is the time that it takes to reach a target speed from run speed.) Sets the speed reference for accel/decel. Set the desired Accel/Decel time at ACC and dEC in Drive Group. If necessary, a more precise time scale can be set in H71. Preset Value: 0 
H71	RW	**Accel/Decel Time Scale** (Range: 0- Scaled in increments of 0.01 second. 1- Scaled in increments of 0.1 second. 2- Scaled in increments of 1 second.) Sets the scale unit for Acceleration/Deceleration time. Preset Value: 1
H72	RW	**Power-On Display** (Range: 0- Speed Command 1- Acceleration Time 2- Deceleration Time 3- =Drive Mode 4- Speed Reference Source 5- Preset Speed 1 6- Preset Speed 2 7- Preset Speed 3 8- Output Current 9- Motor RPM 10- Inverter DC Link Voltage 11- User Selected Display [H73] 12- Fault Display 13 Motor Rotation Direction Selection) Sets the parameter to be displayed when power is first applied to the drive. Preset Value: 0

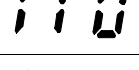
7.3 Function Group2 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Monitoring Item** (Range: 0- Output Voltage [V] 1- Output Power [kW] 2- Torque [kgf-m]) Selects the item to be monitored/displayed in vOL parameter. Preset Value: 0
	RW	**Gain for Motor RPM** (Range: 1-1000%) Sets the display units motor speed (r/min) to mechanical speed (m/min). Preset Value: 100
	RW	**Software Version** (Range: 0-10.0) Displays the inverter software version. Preset Value: X.X
	RW	**Second Motor Accel Time** (Range: 0-6000sec) Sets the acceleration time for the second motor. Preset Value: 5.0 Parameter is only displayed when a Digital Input (I20-I24)=12.
	RW	**Second Motor Decel Time** (Range: 0-6000sec) Sets the deceleration time for the second motor. Preset Value: 10.0 Parameter is only displayed when a Digital Input (I20-I24)=12.
	RW	**Second Motor Base Speed** (Range: 30-400Hz) Sets the rated frequency of the second motor. See motor nameplate. Preset Value: 60.00 Parameter is only displayed when a Digital Input (I20-I24)=12
	RW	**Second Motor Volts/Hz Pattern** (Range: 0- Linear 1- Square 2- User Defined Volts/Hz Pattern) Sets the Volts/Hz pattern for the second motor. (See F30 description). Preset Value: 0 Parameter is only displayed when a Digital Input (I20-I24)=12
	RW	**Second Motor Forward Torque Boost** (Range: 0-15%) Sets the of torque boost level for the second motor during forward run. Set as a percentage of maximum Output Voltage. Preset Value: 5 Parameter is only displayed when a Digital Input (I20-I24)=12
	RW	**Second Motor Reverse Torque Boost** (Range: 0-15%) Sets the of torque boost level for the second motor during reverse run. Set as a percentage of maximum Output Voltage. Preset Value: 5 Parameter is only displayed when a Digital Input (I20-I24)=12

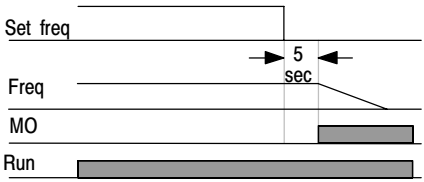
7.3 Function Group2 Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Second Motor Stall Prevention Level** (Range: 30-150%) Sets the current level that activates stall prevention for the second motor during Accel, Constant, or Decel. Set as a percentage of H90. Preset Value: 150 Parameter is only displayed when a Digital Input (I20-I24)=12
	RW	**Second Motor 1 Minute Overload** (Range: 50-200%) Sets the maximum current level the motor can tolerate for 1 minute set as a percentage of H90. Cannot be less than H89. Preset Value: 150 Parameter is only displayed when a Digital Input (I20-I24)=12
	RW	**Second Motor Continuous Overload** (Range: 50-150%) Sets the maximum current level the motor can tolerate for continuous operation set as a percentage of H90. Cannot be greater than H88. Preset Value: 100 Parameter is only displayed when a Digital Input (I20-I24)=12
	RW	**Second Motor Rated Current** (Range: 0.1-20A) Sets the rated current for the second. See motor nameplate. Preset Value: 1.8 Parameter is only displayed when a Digital Input (I20-I24)=12
	RW	**Factory Settings** (Range: 0- None. 1- All parameter values are restored to factory settings. 2- Only Drive Group parameter values are restored to factory settings. 3- Only Function Group 1 parameter values are restored to factory settings. 4- Only Function Group 2 parameter values are restored to factory settings. 5- Only I/O Group parameter values are restored to factory settings.) Initializes parameter values to factory settings. Preset Value: 0
	RW	**Password Registration** (Range: 0-FFF) Set password for H95. Valid password is 3 hexadecimal characters (0-9, A, B, C, D, E, F). Preset Value: 0
	RW	**Parameter Lock and Unlock** (Range:) 0- Unlocked Parameter changes allowed. 1- Locked Parameter changes NOT allowed. Locks or Unlocks parameters by entering the password registered in H94. Preset Value: 0

7.4 I/O Group

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Jump Code** (Range: 0-63) Sets the parameter number to jump to within I/O Group. Allows quick access to a desired parameter. Preset Value: 1
	RW	**Filter Time Constant for V0 Input** (Range: 0-9999) Adjusts the analog voltage input signal by keypad potentiometer. Preset Value: 10
	RW	**V0 Input Minimum Voltage** (Range: 0-10V) Sets the minimum voltage of the V0 input. Preset Value: 0
	RW	**Speed Corresponding to I2** (Range: 0-400Hz) Sets the output frequency at minimum V0 input voltage set in I2. Preset Value: 0.00
	RW	**V0 Input Maximum Voltage** (Range: 0-10V) Sets the maximum voltage of the V0 input. Preset Value: 10.00
	RW	**Speed Corresponding to I4** (Range: 0-400Hz) Sets the output frequency at maximum V0 input voltage as set in I4. Preset Value: 60.00
	RW	**Filter Time Constant for V1** (Range: 0-9999) Sets the responsiveness of V1 Input (0-10V). Preset Value: 10
	RW	**V1 Input Minimum Voltage** (Range: 0-10V) Sets the minimum voltage of the V1 Input. Preset Value: 0
	RW	**Speed Corresponding to I7** (Range: 0-400Hz) Sets the output frequency at minimum V1 input voltage as set in I7. Preset Value: 0.00
	RW	**V1 Input Maximum Voltage** (Range: 0-10V) Sets the maximum voltage of the V1 input. Preset Value: 10.00
	RW	**Speed Corresponding to I9** (Range: 0-400Hz) Sets the maximum frequency at maximum V1 input voltage as set in I10. Preset Value: 60.00
	RW	**Filter Time Constant for I Input** (Range: 0-9999) Sets the internal filter constant of the input section for I input. Preset Value: 10

7.4 I/O Group Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
I12	RW	**I Input Minimum Current** (Range: 0-20mA) Sets the minimum current of the I Input. Preset Value: 4.00
I13	RW	**Speed Corresponding to I12** (Range: 0-400Hz) Sets the minimum frequency at minimum I input current as set in I12. Preset Value: 0.00
I14	RW	**I Input Maximum Current** (Range: 0-20mA) Sets the maximum current of the I input. Preset Value: 20.00
I15	RW	**Speed Corresponding to I14** (Range: 0-400Hz) Sets the maximum frequency at maximum I input current as set in I14. Preset Value: 60.00
I16	RW	**Criteria for Analog Input Signal Loss** (Range: 0- Disabled (Does not check the analog input signal loss) 1- Activated when drops below 50% of set value 2- Activated when drops below set value) Sets the level at which the analog input signal is considered lost. Preset Value: 0 Example: I62=2, I63=5.0 sec and I54=11. 

7.4 I/O Group Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
I20	RW	**Programmable Digital Input Terminal P1-P5 Definition** (Range: 0- Forward Run. 1- Reverse Run. 2- Output Inhibit. 3- Fault Reset. 4- Jog. 5- Speed Select1. 6- Speed Select2. 7- Speed Select3. 8- Ramp Select1. 9- Ramp Select2. 10- Ramp Select3. 11- DC Brake During Stop. 12- Second Motor Selection. 13- N/A 14- N/A 15- Speed Increase. 16- Speed Decrease. 17- 3-Wire Operation. 18- External Trip: A Contact. 19- External Trip: B Contact. 20- N/A 21- PID or Volts/Hz Operation. 22- Option or Inverter. 23- Analog Hold. 24- Accel/Decel Disable. Sets the operation mode of each Digital Input Preset Value: I20=0, I21=1, I22=2, I23=3, I24=4
I21	RW	
I22	RW	
I23	RW	
I24	RW	

0 = **Forward Run Command**: Defines a digital input as a forward run command in 2-Wire or 3-Wire control. For both 2-Wire and 3-Wire control, P38 - Drive Mode should be set to a 1 for normal operation. For 3-Wire control an additional terminal must be defined as 17 = 3-Wire operation.

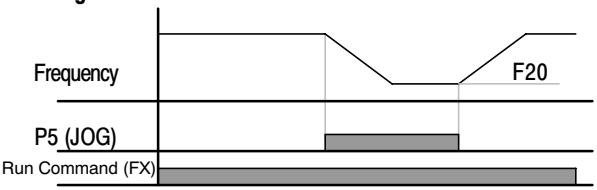
1 = **Reverse Run Command**: Defines a digital input as a reverse run command in 2-Wire or 3-Wire control. For both 2-Wire and 3-Wire control, P38 - Drive Mode should be set to a 1 for normal operation. For 3-Wire control an additional terminal must be defined as 17 = 3-Wire operation.

2 = **Output Inhibit**: Defines a digital input as a drive Output Inhibit. As soon as this input is closed, the drive output is instantly turned off and the motor will free wheel (coast to a rest). As soon as the input is opened, the drive will resume previous operation (if in run, the drive will immediately accelerate to the set speed). While the input is closed the drive display will show ESt [Instant Cut Off].

3 = **Fault Reset** : Active input resets the fault and resets the drive.

4 = **Jog**: When active, the drive ramps to the value set in Jog Frequency (F20). Jog operation overrides all other operations except Dwell operation. If Jog Speed Command is entered during a Preset Speed, Up-Down or 2-Wire control; operation is executed at Jog frequency, see Figure 7-4. A valid start command is required separate from the dedicated jog input. The jog function is only available for 2-Wire control.

Figure 7-4



5 = **Speed Select 1** - (see Figure NO TAG)

6 = **Speed Select 2** - (see Figure NO TAG)

7 = **Speed Select 3** - (see Figure NO TAG)
Used to select Preset Speed 1 - 7 combinations, see P43-P45 and t10-t13, and Figure NO TAG.

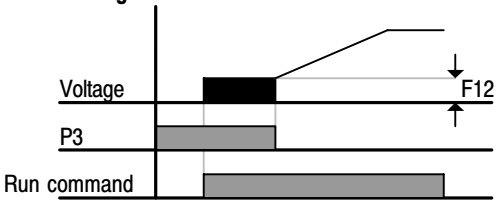
8 = **Ramp Select1** - (see Figure NO TAG)

9 = **Ramp Select2** - (see Figure NO TAG)

10 = **Ramp Select3** - (see Figure NO TAG)
Used to define accel/decel ramp combinations for preset speeds, see (t14-t27).

11 = **DC brake during Stop:** DC voltage will be applied to the motor windings at a level set by DC Brake Start Voltage (F12) for as long as the digital input is closed. See also F12 and F13 - Starting DC brake parameters. See Figure 7-5.

Figure 7-5



12 = **2nd motor select:** When input is present, the drive configures itself for a second set of motor settings defined in 2nd motor operation parameters (H81 to H90).

13 = Reserved: Reserved

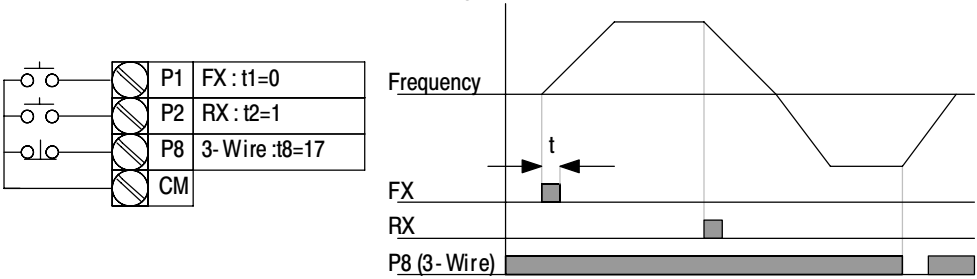
14 = Reserved: Reserved

15 = **Speed increase (UP)**: Increases the speed reference to the drive after a run command. Frequency is saved to parameter F64 on a stop command if F63 = 1 'save up/down frequency'.

16 = **Speed decrease (DOWN)**: decreases the speed reference to the drive after a run command. Frequency is saved to parameter F64 on a stop command if F63 = 1 'save up/down frequency'.

17 = **3-W ire operation**: Select to define a digital input for 3-Wire control. Inputs defined as forward (FX) and reverse (RX) are momentary inputs and opening the input defined as 3-Wire operation will stop the drive. For both 2-Wire and 3-Wire control, P38 - Drive Mode should be set to a 1 for normal operation. See Figure 7-6.

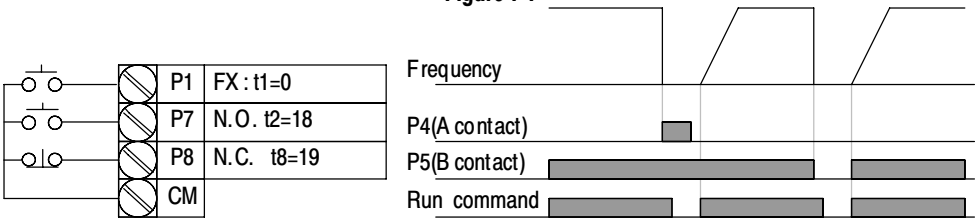
Figure 7-6



18 = **External trip - A (N.O.)**: Normally open contact input. When a digital input is set to "Ext trip-A" is ON (Closed), the drive displays the fault and turns off its output power. See Figure 7-7.

19 = **External trip - B (N.C.)**: Normally closed contact input. When a digital input is set to "Ext trip-B" is OFF (Open), the drive displays the fault and turns off its output power. See Figure 7-7.

Figure 7-7



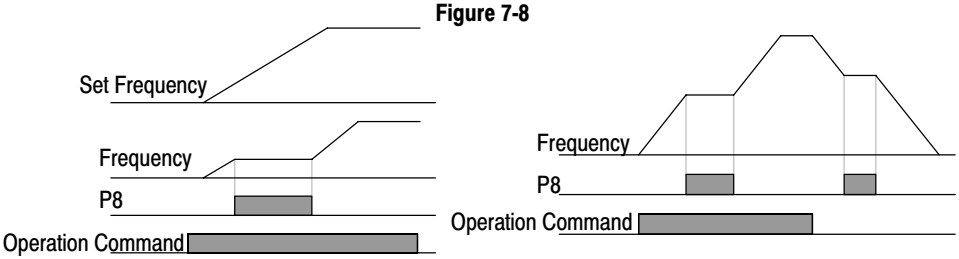
20 = **Self-Diagnostic function**: Defines a digital input to initiate the self-diagnostic function capability of the drive unit. Parameter H60 = Self-Diagnostic function is used to define the test to conduct; IGBT fault and ground fault, Output phase short/open circuit/ground fault or ground fault (IGBT fault/output phase short/open circuit). See Chapter 8 - Customizing Your Application for advanced drive function description.

21 = **Change from PID to V/Hz Operation**: Selects a digital input to bypass the PID Feedback controller and selects the default V/Hz control settings. See Chapter 8 Customizing your application for advanced drive function.

22 = **Exchange between second source and drive**: When the defined input is turned ON, setting values in P46 and P47 are used for control and reference to the drive. Settings for P46 and P47 can not be changed while the digital input is closed.

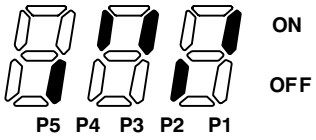
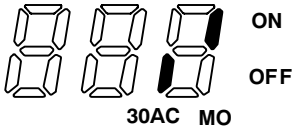
23 = **Analog Hold**: Locks the analog speed reference at the last value when the input was closed. Available when P40 = Frequency setting method is set in the range of 2-7.

Figure 7-8

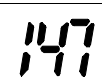


24 = **Accel/Decel Disable**: Disables the acceleration or deceleration ramp while the digital input is closed, holding the reference at its last value. See Figure 7-8.

7.4 I/O Group Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
125	RW	**Input Terminal Status Display** (Range: N/A) Displays the On/Off status of each digital input. Preset Value: N/A Example: P1, P3, P4 are ON and P2, P5 are OFF. 
126	RW	**Output Terminal Status Display** (Range: N/A) Displays the On/Off status of each digital output. Preset Value: N/A Example: Digital Output MO=On Relay output 30AC=Off. 
127	RW	**Filtering Time Constant for Digital Inputs** (Range: 2-50) Adjusts the noise immunity of the Inputs. Increased values result in slower response times. Preset Value: 15
130	RW	**Preset Speed 4** (Range: 0-400Hz) Sets Frequency for Preset Speed 4. Can not be greater than F21. Preset Value: 30.00
131	RW	**Preset Speed 5** (Range: 0-400Hz) Sets Frequency for Preset Speed 5. Can not be greater than F21. Preset Value: 25.00
132	RW	**Preset Speed 6** (Range: 0-400Hz) Sets Frequency for Preset Speed 6. Can not be greater than F21. Preset Value: 20.00
133	RW	**Preset Speed 7** (Range: 0-400Hz) Sets Frequency for Preset Speed 7. Can not be greater than F21. Preset Value: 15.00
134	RW	**Accel Time 1** (Range: 0-6000sec) Sets the Acceleration time for Preset Speed 1. Preset Value: 3.0
135	RW	**Decel Time 1** (Range: 0-6000sec) Sets the Deceleration time for Preset Speed 1. Preset Value: 3.0

7.4 I/O Group Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Accel Time 2** (Range: 0-6000sec) Sets the Acceleration time for Preset Speed 2. Preset Value: 4.0
	RW	**Decel Time 2** (Range: 0-6000sec) Sets the Deceleration time for Preset Speed 2. Preset Value: 4.0
	RW	**Accel Time 3** (Range: 0-6000sec) Sets the Acceleration time for Preset Speed 3. Preset Value: 5.0
	RW	**Decel Time 3** (Range: 0-6000sec) Sets the Deceleration time for Preset Speed 3. Preset Value: 5.0
	RW	**Accel Time 4** (Range: 0-6000sec) Sets the Acceleration time for Preset Speed 4. Preset Value: 6.0
	RW	**Decel Time 4** (Range: 0-6000sec) Sets the Deceleration time for Preset Speed 4. Preset Value: 6.0
	RW	**Accel Time 5** (Range: 0-6000sec) Sets the Acceleration time for Preset Speed 5. Preset Value: 7.0
	RW	**Decel Time 5** (Range: 0-6000sec) Sets the Deceleration time for Preset Speed 5. Preset Value: 7.0
	RW	**Accel Time 6** (Range: 0-6000sec) Sets the Acceleration time for Preset Speed 6. Preset Value: 8.0
	RW	**Decel Time 6** (Range: 0-6000sec) Sets the Deceleration time for Preset Speed 6. Preset Value: 8.0
	RW	**Accel Time 7** (Range: 0-6000sec) Sets the Acceleration time for Preset Speed 7. Preset Value: 9.0
	RW	**Decel Time 7** (Range: 0-6000sec) Sets the Deceleration time for Preset Speed 7. Preset Value: 9.0

7.4 I/O Group Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Analog Output Function** (Range: 0-3) 0- Output Frequency. (Range=Min to Max frequency). 1- Output Current. (Range 0- 150%). 2- Output Voltage. (Range 0-282VAC). 3- DC Link Voltage. (Range 0-400VDC). Sets the parameter value represented by the 0-10VDC Analog output. Preset Value: 0
	RW	**Analog Output Level** (Range: 10-200%) Adjusts the gain for the parameter range can be adjusted to be within the 0-10VDC output level. Preset Value: 100
	RW	**Frequency Detection Level** (Range: 0-400Hz) Used when I54=0-4 or I55=0-4. Preset Value: 30.00
	RW	**Frequency Detection Bandwidth** (Range: 0-400Hz) Used when I54=0-4 or I55=0-4. Preset Value: 10.00
	RW	**Digital Output Function** (Range: 0- FDT-1. 1- FDT-2. 2- FDT-3. 3- FDT-4. 4- FDT-5. 5- Overload (OLt). 6- Inverter Overload (IOL). 7- Motor Stall (STALL). 8- Over Voltage Trip (OV). 9- Low Voltage Trip (LV). 10- Inverter Overheat (OH). 11- Command Loss. 12- During Run. 13- During Stop. 14- During Constant Run. 15- During Speed Searching. 16- Wait Time for Run Signal Input. 17- Fault Relay Output.) Sets the parameter value represented by the digital and relay outputs. If I54=17, the outputs are active by the condition set in I56. Preset Value: I54=12, I55=17
		

7.4 I/O Group Continued

Parameter #	Access	Parameter Name, Value Range, Description and Preset Value
	RW	**Fault Relay Output** (Range: 0- None 1- At Low Voltage Trip. 2- All trips other than Low Voltage. 3- All trips. 4- When setting H26 [Number of Auto-Restart Tries] 5- H26 and Low Voltage Trips. 6- H26 and All trips. 7- H26 and All trips.) Sets the item that will be output by digital and relay outputs. Preset Value: 2
	RW	**Inverter Station ID** (Range: 1-32) Sets Inverter ID for RS485 Communication. Preset Value: 1
	RW	**Baud Rate** (Range: 0- 1200 bps 1- 2400 bps 2- 4800 bps 3- 9600 bps 4- 19200 bps) Sets the Baud Rate of RS485 Communication. Preset Value: 3
	RW	**Drive Mode After Loss of Speed Command** (Range: 0- Continue operation at last frequency before command was lost. 1- Coast to stop. 2- Deceleration to stop.) Sets the action during loss of speed reference command. Speed reference command by V1 or I terminal or by communication option. Preset Value:
	RW	**Wait Time after Loss of Speed Command** (Range: 0.1-120sec) Sets the delay after loss of speed reference before I62 is active. If the Speed Reference command is still lost after this delay, I62 mode occurs. Preset Value: 1.0

Chapter 8
Customizing for Your Application

Chapter 9
Troubleshooting

The VS1PF constantly monitors operating status and provides the following means to determine drive status and to troubleshoot problems that may occur:

- LEDs on the drive
- Fault Codes displayed on LCD display
- Drive monitor and status parameters
- Entries in the fault queue

9.1 Periodic Maintenance

Check the cooling fan, the fan should be unobstructed and free.
Clean all dirt and debris from the cover and fan (air inlet) area.

9.2 Reviewing Fault Status of the Drive

Table 9-1 Fault Code Descriptions

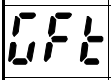
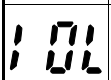
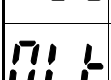
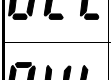
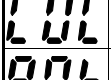
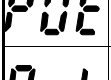
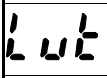
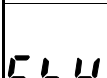
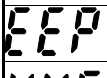
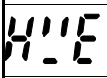
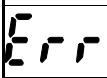
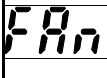
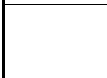
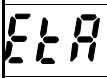
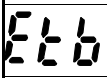
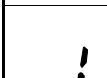
Display	Function	Description / Cause.	Cause	Remedy
	Overcurrent	Output turns off when output current exceeds 200% of rated current.	Accel/Decel too short. Load exceeds inverter rating Inverter started when the motor is free running. Output short circuit or ground fault occurred. Mechanical brake is operating too fast.	Increase Accel/Decel time or decrease load. Resume only after stopping the motor or use H22 Check output wiring. Check the mechanical brake.
	Ground fault	Output turns off when ground current exceeds the internal value.	Ground fault has occurred or motor insulation is damaged.	Check the output wiring. Replace the motor.
	Overload	Output turns off when output current exceeds 150% of rated current for 1 minute.	Load exceeds inverter rating. Torque boost scale set too large.	Decrease load or use correctly sized inverter. Reduce torque boost scale.
	Overload trip	Output turns off when output current exceeds 150% of rated current for 1 minute.		
	Heat sink overtemp	Output turns off when heat sink temperature exceeds its limit.	Cooling fan fault. Poor air circulation. Ambient temperature too high.	Replace fan. Remove air flow restriction. Ambient must be < 40°C.
	DC link capacitor overload	Output turns off when		
	Output Phase loss	Output turns off when one or more output phases (U, V, W) is open.	Faulty output wiring. Damaged motor.	Verify output connections Replace motor.
	Over voltage	Output turns off when the DC link voltage exceeds 400 V (during motor deceleration).	Decel time is too short. Regenerative load is overhauling. Line voltage is too high.	Increase Decel time. Use Dynamic Brake Unit. Reduce line voltage.

Table 9-1 Fault Code Description Continued

Display	Function	Description / Cause.	Cause	Remedy
	Low voltage	Output turns off when the DC link voltage is less than 180V.	Line voltage is low. Insufficient line capacity.	Increase line voltage. Check the AC line voltage at full rated current.
	Electronic Thermal	Output turns off when the inverter calculates that the motor is overheating. Protection is not provided when driving multiple motors or a motor having more than 4 poles.	Motor has overheated. Load is greater than inverter rating. ETH set too low. Inverter has been operated at low speed for too long.	Reduce load weight and operating duty. Install larger inverter. Adjust ETH level. Install an external cooling fan.
	Parameter save error	Parameter values cannot be written to memory.	Contact your local Baldor District Office.	Contact your local Baldor District Office.
	Inverter hardware fault	An error occurs in the control circuitry of the inverter.		
	Communication Error	Inverter cannot communicate with the keypad.		
	Cooling fan fault	Fault condition occurs in the cooling fan.	Obstructed air flow. Damaged cooling fan.	Clean the ventilating slot. Replace the cooling fan.
	Output Inhibit	Output turns off when a digital input (set to 2, Output Inhibit) is closed. The drive output is instantly turned off and the motor coasts to stop. As soon as the input is opened, the drive will resume previous operation (if in run, the drive will immediately accelerate to the set speed).	The digital input is active (Closed).	Eliminate the cause of fault at external terminal.
	External fault A contact input	Output turns off when a digital input (set to 18, Ext Trip: A Contact) is closed.	The digital input is active (Closed).	Eliminate the cause of fault at external terminal.
	External fault B contact input	Output turns off when a digital input (set to 19, Ext Trip: B Contact) is closed.		
	Speed reference input is lost	Speed Reference is Lost (when set to Analog input 0-10V or 0-20mA or RS485). Operation continues by the method set in I62.	No speed command is applied to V1, I or RS485 inputs.	Check wiring of inputs V1, I and RS485 and the speed reference level.

Appendix A
Technical Specifications

All specifications are subject to change without notice.

Input Ratings	Voltage	230
	Voltage range	190-253
	Phase	Single Phase
	Frequency	50/60Hz ±5%
	Impedance	1% minimum from mains connection

Output Ratings	Horsepower	0.5-3 HP @ 230VAC
	Overload Capacity	150% for 1 minute
	Frequency	0-400Hz
	Voltage	0 to maximum input voltage (RMS)

Protective Features	Trip	Over Voltage, Low Voltage, Over Current, Ground Fault, Inverter Overheat, Motor Overheat, Output Phase Open, Overload Protection, External Faults, Communication Error, Loss of Speed Command, Hardware Fault, Option Fault.
	Stall Prevention	Over voltage suppression, over current suppression
	External Output	LED trip condition indicators, 5 assignable logic outputs, 2 assignable analog outputs
	Short Circuit	Phase to phase, phase to ground
	Electronic Motor Overload	Meets UL508C (I^2T)

Environmental Conditions	Temperature	-10 to 40 °C Derate 3% per degree C above 40 to 50 °C maximum ambient temperature
	Cooling	Forced air
	Enclosure	IP20, NEMA 1 (optional)
	Altitude	Sea level to 3300 Feet (1000 Meters) Derate 2% per 1000 Feet (303 Meters) above 3300 Feet
	Humidity	10 to 90% RH Non-Condensing
	Shock	1G
	Vibration	0.5G at 10Hz to 60Hz
	Storage Temperature	-20 to +65 °C
	Duty Cycle	1.0

Keypad Display	Display	2 line by 15 character LCD
	Keys	9 key membrane with tactile response
	Functions	Output status monitoring Digital speed control Parameter setting and display Diagnostic and Fault log display Motor run and jog Local/Remote toggle
	LED Indicators	Forward run command Reverse run command Stop command Jog active
	Remote Mount	200 feet (60.6m) maximum from control
	Trip	Separate message for each trip, last 5 trips retained in memory

Control Specifications	Control Method	V/Hz inverter, Sensorless vector
	PWM Frequency	Adjustable 1.0-15kHz
	Speed Setting	±10 VDC, 0-10 VDC, 4-20 mA, external Pot, digital (keypad),
	Accel/Decel	0-6000 seconds
	Velocity Loop Bandwidth	Adjustable to 180 Hz (Control only)
	Current Loop Bandwidth	Adjustable to 1200 Hz (Control only)

Appendix B
Parameter Tables

Refer to Chapter 7.

Appendix C
CE Guidelines

C.1 CE Declaration of Conformity

Baldor indicates that the products are only components and not ready for immediate or instant use within the meaning of “Safety law of appliance”, “EMC Law” or “Machine directive”.

The final mode of operation is defined only after installation into the user’s equipment. It is the responsibility of the user to verify compliance.

C.2 EMC - Conformity and CE - Marking

The information contained herein is for your guidance only and does not guarantee that the installation will meet the requirements of the council directive 89/336/EEC.

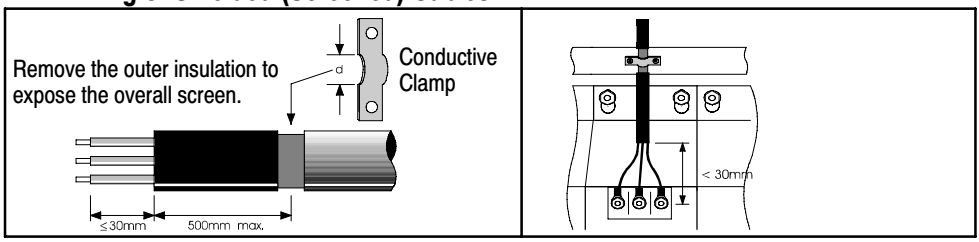
The purpose of the EEC directives is to state a minimum technical requirement common to all the member states within the European Union. In turn, these minimum technical requirements are intended to enhance the levels of safety both directly and indirectly.

Council directive 89/336/EEC relating to Electro Magnetic Compliance (EMC) indicates that it is the responsibility of the system integrator to ensure that the entire system complies with all relative directives at the time of installing into service.

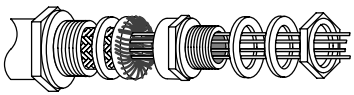
Motors and controls are used as components of a system, per the EMC directive. Hence all components, installation of the components, interconnection between components, and shielding and grounding of the system as a whole determines EMC compliance.

The CE mark does not inform the purchaser which directive the product complies with. It rests upon the manufacturer or his authorized representative to ensure the item in question complies fully with all the relative directives in force at the time of installing into service, in the same way as the system integrator previously mentioned. Remember, it is the instructions of installation and use, coupled with the product, that comply with the directive.

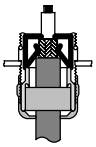
Wiring of Shielded (Screened) Cables



Shielded Couplings



360 Degree Coupling



360 Degree Coupling

Conductive 360 degree Clamp

EMC Installation Options

When installed for Class A or Class B operation, the control is compliant with EN55011 (1991)/ EN55022 (1994) for radiated emissions as described.

Grounding for Wall Mounting (Class A) also see Chapters 4 and 5.

Top cover must be installed.

- A single-star point (earth) is required.
- The protective earth connection (PE) to the motor must be run inside the screened cable or conduit between the motor and control and be connected to the protective earth terminal at the control.
- The internal/external AC supply filter must be permanently earthed.
- The signal/control cables must be screened.

Grounding for Enclosure Mounting (Class B) also see Chapters 4 and 5.

- The unit is installed for Class B operation when mounted inside an enclosure that has 10dB attenuation from 30 to 100MHz (typically the attenuation provided by a metal cabinet with no opening greater than 0.15m), using the recommended AC supply filter and having met all cable requirements.

Note: Radiated magnetic and electric fields inside the cubicle will be high and components installed inside must be sufficiently immune.

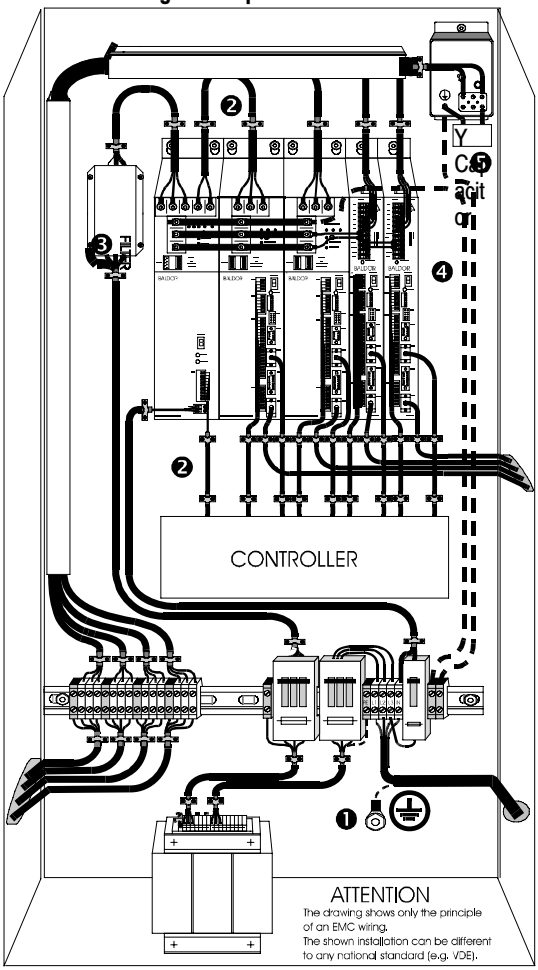
- The control, external filter and associated equipment are mounted onto a conducting, metal panel. Do not use enclosures that use insulating mounting panels or undefined mounting structures. Cables between the control and motor must be screened or in conduit and terminated at the control.

Using CE approved components will not guarantee a CE compliant system!

1. The components used in the drive, installation methods used, materials selected for interconnection of components are important.
2. The installation methods, interconnection materials, shielding, filtering and grounding of the system as a whole will determine CE compliance.
3. The responsibility of CE mark compliance rests entirely with the party who offers the end system for sale (such as an OEM or system integrator).

Baldor products which meet the EMC directive requirements are indicated with a “CE” mark. A signed CE declaration of conformity is provided in this section.

EMC Wiring Technique



1 **CABINET**
The drawing shows an electroplated zinc coated enclosure, which is connected to ground.
This enclosure has the following advantages:
- All parts mounted on the back plane are connected to ground.
- All shield (screen) connections are connected to ground.
Within the cabinet there should be a spatial separation between power wiring (motor and AC power cables) and control wiring.

2 **SCREEN CONNECTIONS**
All connections between components must use shielded cables. The cable shields must be connected to the enclosure. Use conductive clamps to ensure good ground connection. With this technique, a good ground shield can be achieved.

3 **EMC - FILTER**
The EMI or main filter should be mounted next to the power supply (here BPS). For the connection to and from the main filter screened cables should be used. The cable screens should be connected to screen clamps on both sides. (Exception: Analog Command Signal).

4 **Grounding (Earth)**
For safety reasons (VDE0160), all BALDOR components must be connected to ground with a separate wire. The diameter of the wire must be at minimum AWG#6 (10mm^2). Ground connections (dashed lines) must be made from the central ground to the regen resistor enclosure and from the central ground to the Shared Power Supply.

5 **Y-CAPACITOR**
The connection of the regeneration resistor can cause RFI (radio frequency interference) to be very high. To minimize RFI, a Y-capacitor is used. The capacitor should only be connected between the dynamic brake resistor housing and terminal pin R1 (lead from Lin).

C.3 EMC Installation Instructions

To ensure electromagnetic compatibility (EMC), the following installation instructions should be completed. These steps help to reduce interference.
Consider the following:

- Grounding of all system elements to a central ground point
- Shielding of all cables and signal wires
- Filtering of power lines

A proper enclosure should have the following characteristics:

A) All metal conducting parts of the enclosure must be electrically connected to the back plane. These connections should be made with a grounding strap from each element to a central grounding point. [1]

B) Keep the power wiring (motor and power cable) and control wiring separated. If these wires must cross, be sure they cross at 90 degrees to minimize noise due to induction.

C) The shield connections of the signal and power cables should be connected to the screen rails or clamps. The screen rails or clamps should be conductive clamps fastened to the cabinet. [2]

D) The cable to the regeneration resistor must be shielded. The shield must be connected to ground at both ends.

E) The location of the AC mains filter has to be situated close to the drive so the AC power wires are as short as possible.

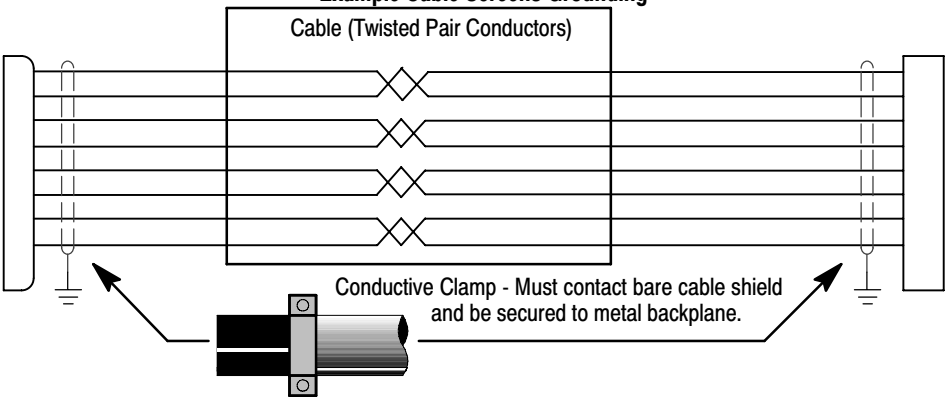
F) Wires inside the enclosure should be placed as close as possible to conducting metal, cabinet walls and plates. It is advised to terminate unused wires to chassis ground. [1]

G) To reduce ground current, use at least a 10mm^2 (6 AWG) solid wire for ground connections.

[1] Grounding in general describes all metal parts which can be connected to a protective conductor, e.g. housing of cabinet, motor housing, etc. to a central ground point. This central ground point is then connected to the main plant (or building) ground.

[2] Or run as twisted pair at minimum.

Example Cable Screens Grounding



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