



User Manual for the
HE300IBS100

**Interbus-S™ Option Card
for GE Drives AF-300E\$™
Variable Frequency Drives**

Fifth Edition
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MAN0019-05

PREFACE

This manual explains how to use the Horner APG HE300IBS100 Module.

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ABOUT PROGRAMMING EXAMPLES

Any example programs and program segments in this manual or provided on accompanying diskettes are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner APG cannot assume responsibility or liability for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilizing HE300IBS100 Module to appropriately design the end system, to appropriately integrate the HE300IBS100 Module and to make safety provisions for the end equipment as is usual and customary in industrial applications as defined in any codes or standards which apply.

Note: The programming examples shown in this manual are for illustrative purposes only. Proper machine operation is the sole responsibility of the system integrator.

Revisions to This Manual

This version (MAN0019-05) of the **Interbus-S™ Option Card for GE Drives AF-300E\$™ Variable Frequency Drives User Manual** contains the following revisions, additions, and deletions.

1. Replaced Section 1.2 with *Option Card Jumper Settings*. Moved *Installation Procedures for Drives Under 40 Horsepower* to Section 1.3 and re-numbered subsequent sections accordingly.
2. Deleted item 6 in Section 1.3, *Installation Procedures for Drives Under 40 Horsepower*, and re-numbered steps accordingly.
3. Revised Figure 1.5.
4. Revised Sections 2.1, 2.4, and added Section 2.7.
5. Revised Section 3.5, item #2.
6. Revised Section 3.5, item #3, steps 1, 3, 4, and 5.

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CHAPTER 1: INSTALLING THE OPTION CARD

1.1 Installation Hardware

Included in the packaging with the AF-300E\$ option card should be the following:

- a. The option card.
- b. One HE300KIT399 (consisting of one 0.5 inch plastic standoff, one M3 x 5 screw and one lock washer) for drives under 40 hp,
- c. One HE300KIT401 (consisting of one 0.63 inch metal standoff, one metal bracket, two plastic fasteners, four M3 x 5 screws and four lock washers) for drives 40 hp and larger, and
- d. This document.

1.2 Option Card Jumper Settings

There are 3 jumper locations on the option card; JP1, JP2, and JP3. The following is a description of the jumpers and how they need to be set.

JP1 – Write Enable

Always open. Do not install a jumper (factory default).

JP2 – Remote/Local setting upon power-up.

- a. Installed – Drive has control upon power-up
- b. Not Installed – Option Card has control upon power-up (normal operating condition).

JP3 – Debug Header

Must have jumper across pins 9-10. Do not remove/change jumper (factory default)

Note: The only jumper setting that can change is JP2; the other two jumpers must remain in factory default position.

1.3 The Installation Procedure for Drives Under 40 Horsepower

The AF-300E\$ Communications Option Cards have been designed to integrate seamlessly with the AF-300E\$ drive. The option card is installed within the drive cover, so that the NEMA rating of the drive is maintained after installation of the option card.

1. Power down the drive.
2. Remove the cover the AF-300E\$ drive as shown in the diagram below.
3. Install the supplied plastic 1/2" standoff (A') in hole (A).

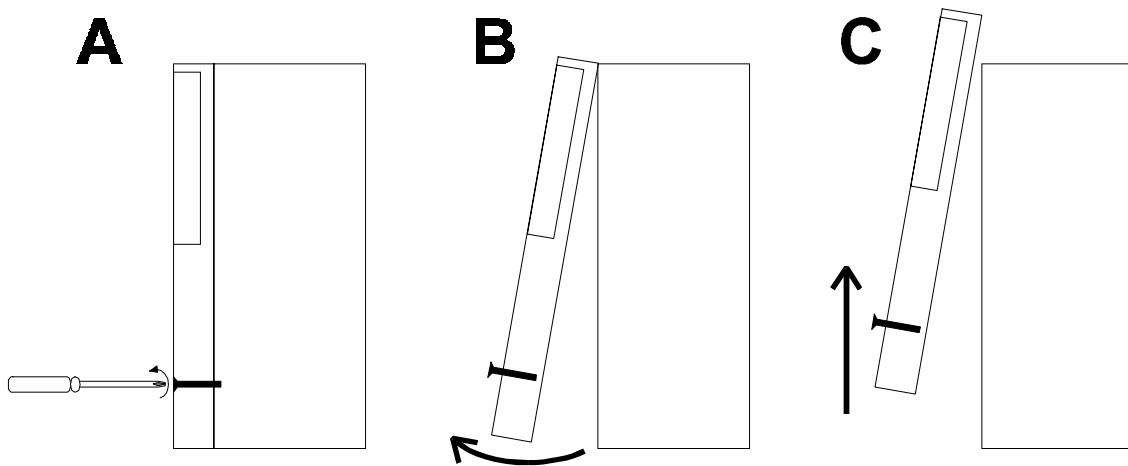


Figure 1.1 - Drive Front Cover Removal Procedure

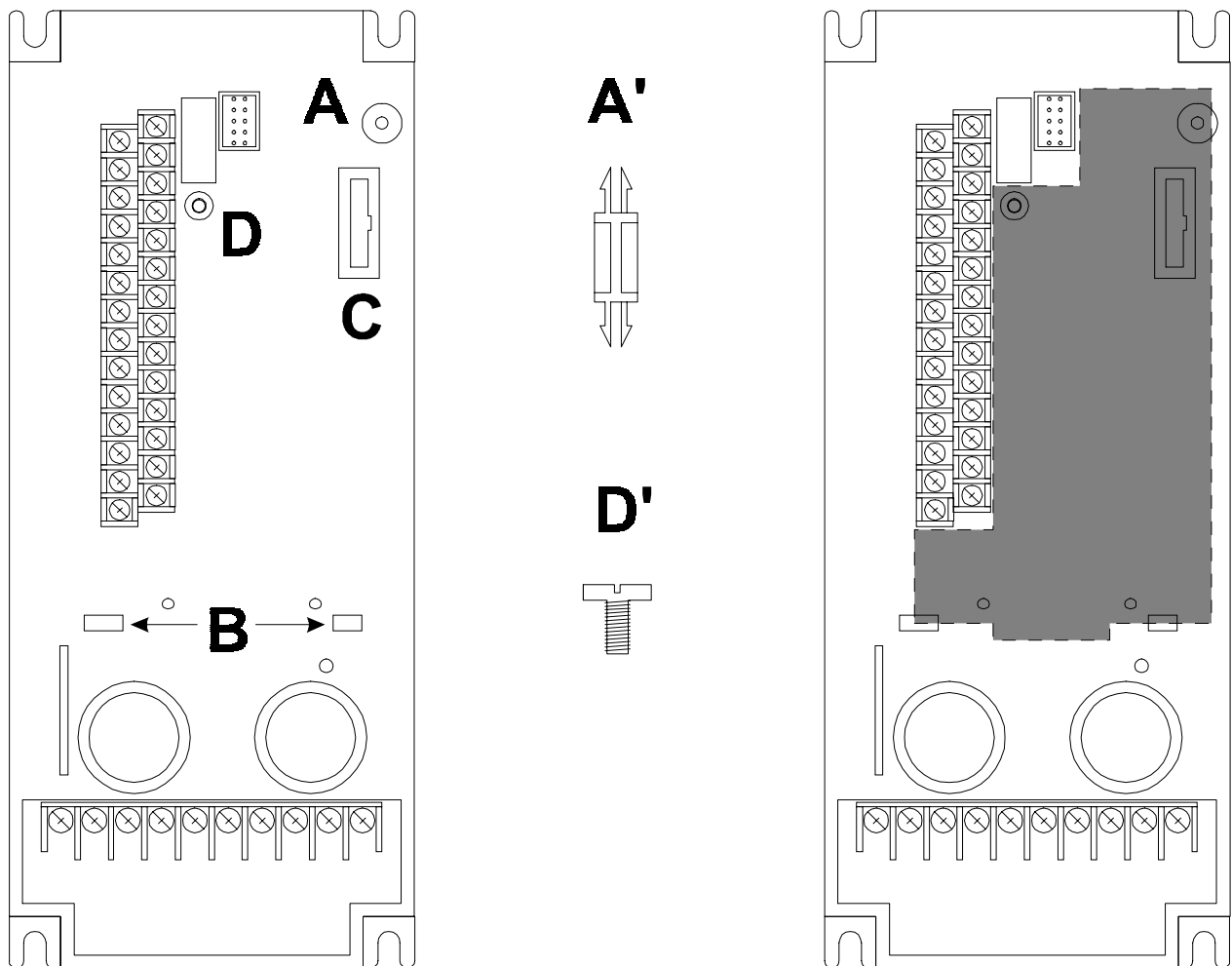


Figure 1.2 - Drive Mounting Holes and Connectors (left), Mounting Hardware (center, not to scale), and Option Card Location (right). Drive shown is 1/2HP AF-300E\$ viewed from the front.

4. Install the HE300 option board. Use the plastic guides (B) to properly align the bottom of the option board. Snap the option board into the standoff (A') and option connector (C).
5. Install the supplied M3 x 5 screw (D') with washer in hole D to secure the option board.
6. After completing field wiring to the removable terminal strip(s), replace the front cover.
7. Power up the drive as needed.

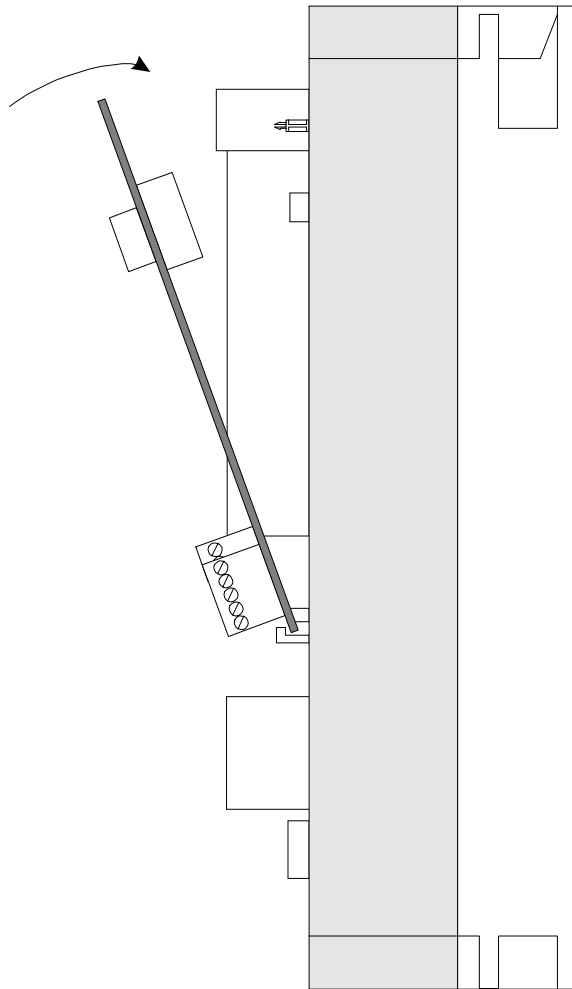


Figure 1.3 - Installing Option Board (Side View of AF-300E\$ 1/2HP shown)

1.4 The Installation Procedure for Drives 40 Horsepower and Larger

The AF-300E\$ Communications Option Cards have been designed to integrate seamlessly with the AF-300E\$ drive. The option card is installed within the drive cover, so that the NEMA rating of the drive is maintained after installation of the option card.

1. Power down the drive.
2. Remove the cover from the AF-300E\$ using the 11 screws on the front panel.
3. Remove the keypad and the keypad mounting plastic (4 screws) shown below.

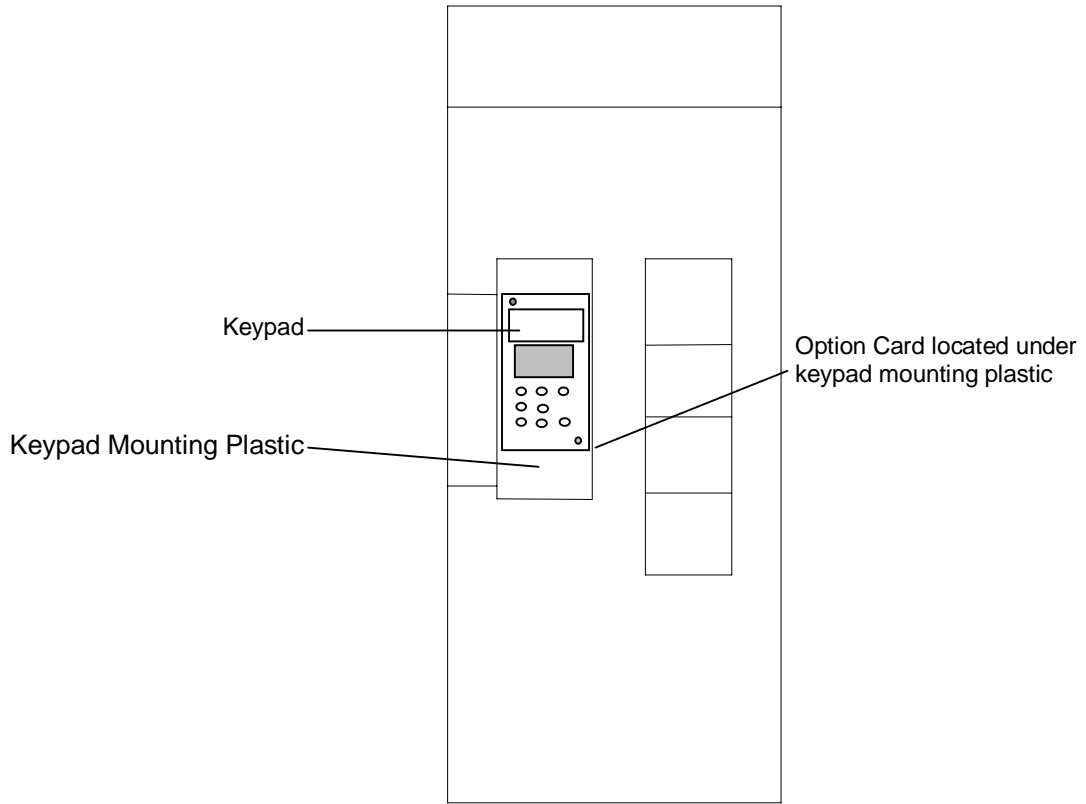


Figure 1.4 - Drive Keypad, Keypad Mounting Plastic and Option Card Location.
Drive shown is a 40HP AF-300E\$ viewed from the front.

- 4. Install corner brackets (A') on bottom corners of interface board (A).
- 5. Install corner brackets (A') on metal bracket (B') using the supplied M3 x 5 screws and lock washers in the corner bracket mounting holes (C).

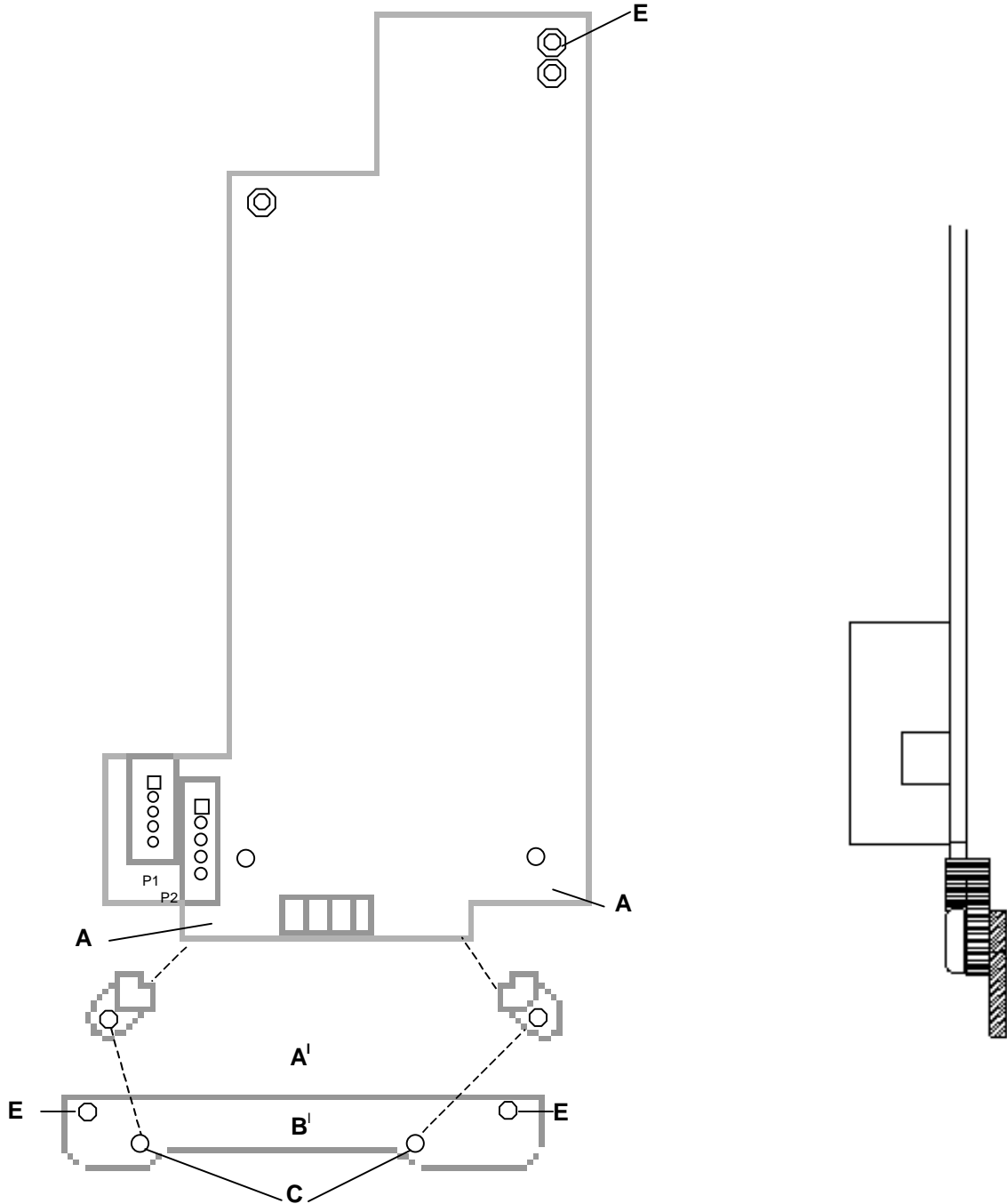


Figure 1.5 - Option Card Assembly Front and Side View (Right)

6. Install the assembled board into the drive using the M3 x 5 screws and lock washers in the mounting holes (E). If you used the plastic standoff in the upper right hand corner of the board you may need to use one of the M3 x 5 screws from the HE300KIT399.
7. Replace the keypad mounting plastic and the keypad.
8. After completing field wiring to the terminal strip(s), replace the front cover.
9. Power up the drive as needed.

Note:

The metal standoff included with the HE300KIT401 can be used in place of the plastic standoff that comes with the drive. The plastic standoff is the preferred method of installation, but if the metal standoff is to be used the steps below should be followed.

1. Once the keypad and keypad mounting plastic is removed, remove the plastic standoff in the upper right corner of the drive board by holding the screw under the standoff with your finger, while unscrewing the plastic standoff.
2. Once the standoff is removed, screw on the metal standoff that is supplied with the HE300KIT401.
3. Instead press the interface board down onto the metal standoff until it snaps into place.
4. To remove the board you may need to use a pair of fine tipped pliers to squeeze the tip of the metal standoff together in order for the board to snap off of the standoff.

NOTES

CHAPTER 2: COMMUNICATIONS PROTOCOL

2.1 Accessing Drive Parameters

The Option card consumes 2 input words and produces 2 output words according to its relative position on an Interbus-S network. Through these network words, the Interbus-S master can both send and receive data to the associated drive. The drive's terminal, speed reference and configuration parameters, which are typically accessed through the drive's terminal and keypad, are also accessible over the Interbus-S network. Most of the parameters are writeable (with certain limitation) while all the parameters are readable.

To access a drive parameter, the Interbus-S master must set a command, parameter number and data (if a write operation) in the outgoing words. The incoming words reflect the command success and return data (if a read operation). Handshake bits are also transferred in the outgoing and incoming words to synchronize the send and receive transfer. The handshake sequence is covered in section 2.4.

All parameters whether terminal, speed reference or configuration are assigned a parameter number (listed in chapter 4) which must be supplied as part of the read or write sequence. However, an exception to this process is the forward and reverse bits contained in the terminal command parameter. These bits are directly writable in an outgoing word and do not require a parameter number or handshake sequence. These bits are called quick commands and are covered in section 2.7. Likewise, the drive's run and fault status are also directly available in an incoming word.

2.2 Output Words(Data sent out from the Master)

IB-OUT BYTE NUMBER	DEFINITION	VALUE	
0	Parameter Number	0-7Ah or FFh	
1	Status/Command Bits		
2	Low Byte of data to the drive	Depends on Valid Value for Parameter Number (See Chapter 3)	
3	High Byte of data to the drive	Depends on Valid Value for Parameter Number (See Chapter 3)	
* FORWARD and REVERSE can NOT be 1 at the same time.			

2.3 Input Words(Data sent out by the Drive)

Table 2.2 – Input Words			
IB-IN BYTE NUMBER	DEFINITION	VALUE	
0	Parameter Number	0-7Ah or FFh	
1	Status/Command Bits		
2	Low Byte of data from the drive	Depends on Valid Value for Parameter Number (See Chapter 3)	
3	High Byte of data from the drive	Depends on Valid Value for Parameter Number (See Chapter 3)	

2.4 Parameter Transfer with Handshake Description

Both read and write operations to the drive require the drive parameter number in IB-OUT BYTE 0. The specific operation (Read or Write) is specified in the 'Read/Write' bit in IB-OUT BYTE 1. The option card is then commanded to process the request by toggling the 'Master Handshake Send' bit in IB-OUT BYTE 1. When performing a read operation, the option card indicates that valid data from the 'read' command is ready in IB-IN BYTES 2-3 by toggling the 'Drive Handshake Send' bit in the IB-IN BYTE 1.

The option card actually looks for inequalities in the 'Master Send/Drive Receive' handshake pair to trigger a command. That is, if the 'Master Handshake Sent' bit is not equal to the 'Drive Handshake Receive', the option card processes the contents of the IB-OUT BYTES as a command and toggles the 'Drive Handshake Receive' bit. The handshake bits are now set equal indicating that it is ready for a new command.

If the command is a read, the option card sets the 'Drive Handshake Send' bit opposite to that of the 'Master Handshake Receive' bit such to indicate that the requested data is now present in IB-IN BYTES 2-3. The master should then toggle the 'Master Handshake Receive' bit to be ready for the next operation. Should the master not toggle the 'Master Handshake Receive' bit or at any time this bit becomes unequal to the 'Drive Handshake Send' bit, a one-second timer is started. Should the timer time-out, the option card sets the 'Drive Handshake Send' bit to match the 'Master Handshake Receive' bit. This timeout guarantees a toggle action should the master lose synchronization with the option card.

2.5 State of Handshake Bits for a Command Send

This example shows the state of the handshake bits for a command send. Note that the state of the handshake bits are not based on a high or low state.

MASTER SEND BIT	DRIVE RECEIVE BIT	DESCRIPTION
0	0	Start up
0	0	Bits equal, master loads command data
1	0	Master toggles send bit to send command
1	0	Slave recognizes inequality of bits & reads command information
1	0	Slave performs command
1	1	Slave toggles receive bit
1	1	Bits equal, master can send another command

2.6 Handshake Bits Status For A Command Receive

This example shows the state of the handshake bits for a command receive. This would happen after a read parameter command was sent to the drive. Note that the state of the handshake bits are not based on a high or low state.

MASTER RECEIVE BIT	DRIVE SEND BIT	DESCRIPTION
0	0	Start up
0	1	Slave sends requested information
0	1	Bits not equal, Master saves data from slave
1	1	Master toggles receive bit
1	1	Bits equal, slave can send more data

2.7 Quick Commands (Forward/Reverse and Keypad Control)

Quick commands are issued by setting specific bits in IB-OUT BYTE1. They do NOT require handshaking or parameter numbers to activate. The supported commands (forward, reverse and keypad control) are actually written to the associated drive parameter in the background once a quick command bit changes state. Unpredictable results occur if the associated terminal parameter (96) or option status (122) parameters are written in conjunction with the quick commands.

NOTES

CHAPTER 3: COMMUNICATIONS CONTENT

3.1 Communication Content Overview

The protocol requires a parameter number byte and status/command byte when sending a command to the drive option card. The data word is only required if a write command is initiated. The option card will respond to a read command by sending the parameter number, status/error bits and the drive data value for the parameter number.

There are two types of commands; a parameter access command and a quick command. There are three quick command bits; forward, reverse and keypad control. They eliminate the need to execute the same function using a parameter and data value. The parameter access command uses the parameter and data value to access data in the drive. The two commands can be used together in one write command. This allows the drive speed and the drive direction to be set in one write. However, note that the quick command is executed immediately before the read/write parameter request. Chapter 3 discusses the parameter numbers and their descriptions.

3.2 IB-OUT BYTE 1 - Status/Command Bit Definitions

Master Handshake Send:

Description: Lets slave know a new command has been sent.

Bit Number: 0

Bit Value: Toggles

Master Handshake Receive:

Description: Lets slave know data has been received

Bit Number: 1

Bit Value: Toggles

Read/Write:

Description: Lets slave know parameter is read from or written to

Bit Number: 2

Bit Value: 0 = Read 1 = Write

Forward:

Description: Quick command to run drive forward (Same as writing a 1 to parameter 96)

Bit Number: 3

Bit Value: Change from 0 to 1 = Forward* Change from 1 to 0 = Stop Forward

Note: If forward is changed from a 1 to a 0 and reverse is changed from 0 to a 1 at the same time, the drive will immediately go into run reverse. It will not stop and then go reverse.

Reverse:

Description: Quick command to run drive reverse (Same as writing a 2 to parameter 96)

Bit Number: 4

Bit Value: Change from 0 to 1 = Reverse* Change from 1 to 0 = Stop Reverse

Note: If reverse is changed from a 1 to a 0 and forward is changed from 0 to a 1 at the same time, the drive will immediately go into run forward. It will not stop and then go forward.

Keypad Control:

Description: Quick command to give user keypad control on the drive
(Same as writing a 40h to parameter 122)

Bit Number: 7

Bit Value: 0 = Option card take control 1 = Keypad take control

* FORWARD and REVERSE SHOULD NEVER BE 1 AT THE SAME TIME.

3.3 IB-IN BYTE 1 - Status/Error Bit Definitions

Drive Handshake Send:

Description: Lets master know the slave has sent data.
Bit Number: 0
Bit Value: Toggles

Drive Handshake Receive:

Description: Lets master know slave has received command.
Bit Number: 1
Bit Value: Toggles

Run:

Description: Lets master know that the drive is running.
Bit Number: 2
Bit Value: 0 = Not Running 1 = Running

Drive Fault:

Description: Lets master know a fault condition exists in the drive.
Bit Number: 3
Bit Value: 0 = No fault condition 1 = Fault condition

Quick Command Fault:

Description: Lets master know the last quick command was not successful
Bit Number: 4
Bit Value: 1 = Fault occurred Cleared when quick command is successful

Parameter Command Fault:

Description: Lets master know the last parameter command was not successful
Bit Number: 5
Bit Value: 1 = Fault occurred Cleared when parameter command is successful

Drive Active:

Description: Lets master know the option card is O.K and ready to communicate.
Bit Number: 6
Bit Value: 0 = Problem with option card 1 = Option card O.K

Keypad Control Status:

Description: Lets master know what the control status is.
Bit Number: 7
Bit Value: 0 = Option card has control 1 = Drive keypad has control

3.4 Fault Description

When a fault occurs a STATERR is generated. This lets the master know a fault condition exists. The option card will react to the fault once the master issues a MODACK. There are four faults that can cause a STATERR. The following details the faults, the state of the fault when the STATERR is issued and the reaction to the MODACK.

The four faults are:

Drive Fault:

Description: The drive fault is a result of monitoring parameter 105 bit 4. This indicates a trip condition in the drive. The drive fault bit is set to 1 if a trip condition exists.

State: 1

Reaction: The option card resets the drive, clears the forward and reverse bits and clears the fault. The master has to reissue a forward/reverse command to start the drive if it was running prior to the fault.

Quick Command Fault:

Description: If a quick command fails then the quick command fault bit is set.

State: 1

Reaction: The fault is cleared.

Parameter Command Fault:

Description: The parameter command fault is set if the option card receives an invalid parameter number or an invalid data value for a given parameter

State: 1

Reaction: The fault is cleared.

Drive Active:

Description: The drive active bit is set after the option card establishes communication with the drive. If communication is unsuccessful, then the STATERR is issued and drive active bit is a 0. This is a fatal fault because the option card is not communicating with drive.

State: 0

Reaction: NONE (This is a fatal fault)

3.5 Communication Examples

The following examples describe what bits are manipulated and when a transmit and receive is to take place. The actual code is not shown but the handshaking example program could be used with the correct bits manipulated as the examples show. The steps for the send and receive routines are defined once again since they are an integral part of the examples.

SEND ROUTINE

- a. Check MASTER HANSHAKE SEND = DRIVE HANDSHAKE REC
- b. if not equal then read IB-IN BYTE 1 (input status), go to a.
- c. if equal then toggle MASTER HANSHAKE SEND and load IB-OUT byte 1 with status byte.

RECEIVE ROUTINE

- a. Read IB-IN BYTE 1 (input status)
- b. If DRIVE HANSHAKE SEND not equal MASTER HANSHAKE RECEIVE
- c. save IB-IN BYTE 0
- d. convert IB-IN BYTE 2 & IB-IN BYTE 3 to input word value

1. A drive speed value of 60.0 Hz is to be written to the drive.

The table in chapter 3 shows that parameter 95 is the high resolution frequency setting parameter. It uses format 14 to put the data in the correct format to send to the drive. Format 14 shows frequency to pulses is the absolute value of $60.0 \times 15 = 900$ (384h) pulses.

STEPS:

1. Load IB-OUT byte 0 with 95 (5Fh)
2. Load IB-OUT byte 2 with 84h (low byte of 900 (384h))
3. Load IB-OUT byte 3 with 3 (high byte of 900 (384h))
4. Set READ/WRITE bit
5. Call SEND ROUTINE

2. The drive is to run forward (no other commands).

- Set 'Forward' quick command in IB-OUT BYTE 1.

3. The drive is to run forward at 60.0 Hz

This can be accomplished with one write to the drive option card. It is a combination of examples 1 and

2. The write parameter access command will be executed first followed by the forward command.

STEPS:

1. This can be accomplished with two writes to the drive option card.
2. Load IB-OUT byte 2 with 84h (low byte of 900 (384h)
3. Set 'Read/Write' bit
4. Call Send Routine.
5. Set 'Forward' quick command in IB-OUT BYTE 1
6. Call SEND ROUTINE

4. The actual drive speed value is to be read from the drive.

The table in chapter 3 shows that parameter 101 is the output frequency parameter and it is read only. It uses format 14 to convert the drive data from pulses to Hz.

STEPS:

1. Load IB-OUT byte 0 with 101 (65h)
2. Clear READ/WRITE bit
3. Call SEND ROUTINE
4. Call READ ROUTINE
5. frequency = value/15

CHAPTER 4: AF300E\$ DRIVE PARAMETERS

Table 4.1 – Drive Parameters

PARAM NUMBER	PARAMETER DESCRIPTION	FC*	MINIMUM	MAXIMUM	UNIT	FORMAT	LENGTH	READ/ WRITE	CHANGE WHILE RUNNING
0	Frequency Command	00	0	2	-	0	1 WORD	R/W	N
1	Operation Method	01	0	1	-	0	1 WORD	R/W	N
2	Maximum Frequency	02	50	400	Hz	0	1 WORD	R/W	N
3	Base Frequency 1	03	50	400	Hz	0	1 WORD	R/W	N
4	Rated Voltage 1	04	0, 80	480	V	0	1 WORD	R/W	N
5	Acceleration Time 1	05	0.01	3600	s	5	1 WORD	R/W	Y
6	Deceleration Time 1	06	0.01	3600	s	5	1 WORD	R/W	Y
7	Torque Boost 1	07	0	20	-	1	1 WORD	R/W	Y
8	Elec. Thermal OL (Select)	08	0	2	-	0	1 WORD	R/W	Y
9	Elec. Thermal OL (Level)	09	Ratedx20	Ratedx135	A	6	1 WORD	R/W	Y
10	Restart after Power Failure	10	0	4	-	0	1 WORD	R/W	N
11	Frequency Limiter (High)	11	0	400	Hz	0	1 WORD	R/W	Y
12	Frequency Limiter (Low)	12	0	400	Hz	0	1 WORD	R/W	Y
13	Bias Frequency	13	0	400	Hz	0	1 WORD	R/W	Y
14	Gain (Freq. Setting Signal)	14	0	200	%	1	1 WORD	R/W	Y
15	Torque Limiter (Driving)	15	20	180,255	%	0	1 WORD	R/W	Y
16	Torque Limiter (Braking)	16	0,20	180,255	%	0	1 WORD	R/W	Y
17	DC Brake (Starting Freq.)	17	0	60	Hz	1	1 WORD	R/W	Y
18	DC Brake (Brake Level)	18	0	100	%	0	1 WORD	R/W	Y
19	DC Brake (Braking Time)	19	0	30	s	1	1 WORD	R/W	Y
20	Multistep Freq Setting 1	20	0	400	Hz	2	1 WORD	R/W	Y
21	Multistep Freq Setting 2	21	0	400	Hz	2	1 WORD	R/W	Y
22	Multistep Freq Setting 3	22	0	400	Hz	2	1 WORD	R/W	Y
23	Multistep Freq Setting 4	23	0	400	Hz	2	1 WORD	R/W	Y
24	Multistep Freq Setting 5	24	0	400	Hz	2	1 WORD	R/W	Y
25	Multistep Freq Setting 6	25	0	400	Hz	2	1 WORD	R/W	Y
26	Multistep Freq Setting 7	26	0	400	Hz	2	1 WORD	R/W	Y
27	Elec. Thermal OL (DB Res.)	27	0	2	-	0	1 WORD	R/W	Y
28	Slip Compensation Control	28	-9.9	5	Hz	1	1 WORD	R/W	Y
29	Torque Vector Control	29	0	1	-	0	1 WORD	R/W	N
30	Number of Motor Poles	30	2	14	-	0	1 WORD	R/W	N
31	Function Block (32-41)	31	0	1	-	0	1 WORD	R/W	Y
32	X1 - X5 Terminal Function	32	0	0x2222	-	11	1 WORD	R/W	N

* The performance of these parameters has not been fully evaluated at the time of publication of this manual.

PARAM NUMBER	PARAMETER DESCRIPTION	FC*	MINIMUM	MAXIMUM	UNIT	FORMAT	LENGTH	READ/ WRITE	CHANGE WHILE RUNNING
33	Acceleration Time 2	33	0.01	3600	s	5	1 WORD	R/W	Y
34	Deceleration Time 2	34	0.01	3600	s	5	1 WORD	R/W	Y
35	Acceleration Time 3	35	0.01	3600	s	5	1 WORD	R/W	Y
36	Deceleration Time 3	36	0.01	3600	s	5	1 WORD	R/W	Y
37	Acceleration Time 4	37	0.01	3600	s	5	1 WORD	R/W	Y
38	Deceleration Time 4	38	0.01	3600	s	5	1 WORD	R/W	Y
39	Base Frequency 2	39	50	400	Hz	0	1 WORD	R/W	N
40	Rated Voltage 2	40	0, 80	480	V	0	1 WORD	R/W	N
41	Torque Boost 2	41	0.1	20	-	1	1 WORD	R/W	Y
42	Function Block (43-51)	42	0	1	-	0	1 WORD	R/W	Y
43	FMP Terminal (Pulse Rate Mult.)	43	6	100	-	0	1 WORD	R/W	Y
44	FMP Terminal (Voltage Adjust)	44	50	120	-	0	1 WORD	R/W	Y
45	FMA Terminal (Voltage Adjust)	45	65	103	-	0	1 WORD	R/W	Y
46	FMA Terminal (Function)	46	0	3	-	0	1 WORD	R/W	Y
47	Y2 - Y5 Terminal Function(low word)	47	0	0xFFFF	-	12	2 WORD	R/W	N
48	Y1 Terminal Function(high word)		0	0xF	-	13		R/W	N
49	FAR Function Signal (Hysteresis)	48	0	10	Hz	1	1 WORD	R/W	Y
50	FDT Function (Level)	49	0	400	Hz	0	1 WORD	R/W	Y
51	FDT Function (Hysteresis)	50	0	30	Hz	1	1 WORD	R/W	Y
52	OL Function Signal (Level)	51	Ratedx20	Ratedx135	A	6	1 WORD	R/W	Y
53	Function Block (53-59)	52	0	1	-	0	1 WORD	R/W	Y
54	Jump Frequency (Jump Freq. 1)	53	0	400	Hz	0	1 WORD	R/W	N
55	Jump Frequency (Jump Freq. 2)	54	0	400	Hz	0	1 WORD	R/W	N
56	Jump Frequency (Jump Freq. 3)	55	0	400	Hz	0	1 WORD	R/W	N
57	Jump Frequency (Hysteresis)	56	0	30	Hz	0	1 WORD	R/W	N
58	Starting Frequency (Freq.)	57	0.2	60	Hz	1	1 WORD	R/W	N
59	Starting Frequency (Holding Time)	58	0	10	s	1	1 WORD	R/W	N
60	Freq. Setting Signal Filter	59	0.01	5	s	2	1 WORD	R/W	Y
61	Function Block (61-79)	60	0	1	-	0	1 WORD	R/W	Y
62	LED Monitor (Function)	61	0	8	-	0	1 WORD	R/W	Y
63	LED Monitor (Display at Stop Mode)	62	0	1	-	0	1 WORD	R/W	Y
64	Coeff. for Machine & Line Speed	63	0.01	200	-	2	1 WORD	R/W	Y
65	LCD Monitor	64	0	4	-	0	1 WORD	R/W	Y

* The performance of these parameters has not been fully evaluated at the time of publication of this manual.

PARAM NUMBER	PARAMETER DESCRIPTION	FC*	MINIMUM	MAXIMUM	UNIT	FORMAT	LENGTH	READ/ WRITE	CHANGE WHILE RUNNING
66	Pattern Operation (Mode Select)	65	0	3	-	0	1 WORD	R/W	N
67	Pattern Operation (Stage 1)	66	0	6000	s/-	7	1 WORD	R/W	Y
68	Pattern Operation (Stage 2)	67	0	6000	s/-	7	1 WORD	R/W	Y
69	Pattern Operation (Stage 3)	68	0	6000	s/-	7	1 WORD	R/W	Y
70	Pattern Operation (Stage 4)	69	0	6000	s/-	7	1 WORD	R/W	Y
71	Pattern Operation (Stage 5)	70	0	6000	s/-	7	1 WORD	R/W	Y
72	Pattern Operation (Stage 6)	71	0	6000	s/-	7	1 WORD	R/W	Y
73	Pattern Operation (Stage 7)	72	0	6000	s/-	7	1 WORD	R/W	Y
74	Acc./Dec. Pattern (Mode Select)	73	0	2	-	0	1 WORD	R/W	N
75	Energy Saving Operation	75	0	1	-	0	1 WORD	R/W	N
76	Rev. Phase Sequence Lock	76	0	1	-	0	1 WORD	R/W	N
77	Data Initializing (Data Reset)	77	0	1	-	0	1 WORD	R/W	N
78	Language (Japanes/English)	78	0	3	-	0	1 WORD	R/W	Y
79	LCD Display Brightness	79	0	10	-	0	1 WORD	R/W	Y
80	Function Block (81-94)	80	0	1	-	0	1 WORD	R/W	Y
81	Motor Sound (Carrier Frequency)	81	0	10	-	0	1 WORD	R/W	Y
82	Auto Restart (Restart Time)	82	0	5	s	1	1 WORD	R/W	N
83	Auto Restart (Freq. Fall Rate)	83	0	100	Hz/s	2	1 WORD	R/W	N
84	Auto Reset (Times)	84	0	7	-	0	1 WORD	R/W	Y
85	Auto Reset (Reset Interval)	85	2	20	s	0	1 WORD	R/W	Y
86	Motor 1 (Capacity)	86	0	3	-	0	1 WORD	R/W	N
87	Motor 1 (Rated Current)	87	0	2000	A	6	1 WORD	R/W	N
88	Motor 1 (No-Load Current)	88	0	2000	A	6	1 WORD	R/W	N
89	Motor 2 (Rated Current)	89	0	2000	A	6	1 WORD	R/W	N
90	Motor 1 Impedance (Tuning)	90	0	1	-	0	1 WORD	R/W	N
91	Motor 1 Impedance (%R1 Setting)	91	0	50	%	2	1 WORD	R/W	Y
92	Motor 1 Impedance (%X1 Setting)	92	0	50	%	2	1 WORD	R/W	Y
93	Data Protection	95	0	1	-	0	1 WORD	R/W	N
94*	Additional V1 Analog Voltage		-10	10	V	0	1 WORD	R/W	Y
95	High Res. Frequency Setting (Pulses)		-6000	6000	Pulses	14	1 WORD	R/W	Y
96	Terminal Input/Output (low word)		BIT MAP	BIT MAP	-	4	16 bits	R/W	Y
97	Terminal Input/O output (high word)		BIT MAP	BIT MAP	-	4	16 bits	R/W	Y
98*	Output Frequency Compensation Input		-6000	6000	Pulses	14	1 WORD	R/W	Y

* The performance of these parameters has not been fully evaluated at the time of publication of this manual.

PARAM NUMBER	PARAMETER DESCRIPTION	FC*	MINIMUM	MAXIMUM	UNIT	FORMAT	LENGTH	READ/ WRITE	CHANGE WHILE RUNNING
99	Drive Torque Limit Setting		20	180,255	%	0	1 WORD	R/W	Y
100	Braking Torque Limit Setting		0,20	180,255	%	0	1 WORD	R/W	Y
101	Output Frequency		-6000	6000	Pulses	14	1 WORD	R	Y
102	Output Current				%	10	1 WORD	R	Y
103	Output Voltage				%	10	1 WORD	R	Y
104	Output Torque				%	10	1 WORD	R	Y
105	Operation Status		BIT MAP	BIT MAP	-	8	16 bits	R	Y
106	Trip History (low word)				-	3	1 WORD	R	Y
107	Trip History (high word)				-	3	1 WORD	R	Y
108	Inverter Capacity				-	15	1 WORD	R	Y
109	Total Operation Time				h	0	1 WORD	R	Y
110	Inverter Rated Current				A	16	1 WORD	R	Y
111	Fin Temperature				C	0	1 WORD	R	Y
112	Internal Temperature				C	0	1 WORD	R	Y
113	Output Terminal Condition		BIT MAP	BIT MAP	-	9	16 bits	R	Y
114	V2 Terminal Voltage				V	1	1 WORD	R	Y
115	V1 terminal Voltage				V	1	1 WORD	R	Y
116	C1 Terminal Current				mA	1	1 WORD	R	Y
117**	FMP Frequency				Pulses	0	1 WORD	R	Y
118	FMP Output Voltage				V	1	1 WORD	R	Y
119	FMA Output Voltage				V	1	1 WORD	R	Y
120	Inverter Terminal Input (low word)		BIT MAP	BIT MAP	-	4	16 bits	R	Y
121	Inverter Terminal Input (high word)		BIT MAP	BIT MAP	-	4	16 bits	R	Y
122	Option Status		BIT MAP	BIT MAP	-	17	16 bits	R/W	Y

** Not operational at this time

4.2 Data Formats

The Drive Parameters listed in the previous pages list, among other things, the "format" in which the data is presented. There are 17 different formats, all listed in this manual section. For further details beyond this manual, consult the user documentation provided with the AF-300E\$ drive.

FORMAT 0
Direct Translation

FORMAT 1	
READ	WRITE
/10	X10

Format 3															
LOW WORD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	PRIOR FAULT #1				0	0	0	PRESENT FAULT					
HIGH WORD															
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
0	0	0	PRIOR FAULT #3				0	0	0	PRIOR FAULT #2					

Fault Codes					
Code	Type	Description	Code	Type	Description
0	-	No Trip History	12	OH3	Overheat (Internal Temp.)
1	OC1	Overcurrent During Acc.	13	OH2	External Fault
2	OC2	Overcurrent During Dec.	14	dbH	DB Resistor Overload
3	OC3	Overcurrent Steady State Running	15	FUS	DC Fuse Burnout
4	EF	Ground Fault	16	Er1	Memory Error
5	OV1	Overvoltage During Acc.	17	Er3	Inverter CPU Error
6	OV2	Overvoltage During Dec.	18	Er4	Option COmmunications Error
7	OV3	Overvoltage Steady State Running	19	Er5	Option Malfunction
8	LV	Low Voltage	20	Er6	Keypad Panel Operation Error
9	OL	Electric Thermal Overload Relay	21	Er7	Auto Tuning Error
10	OLU	Inverter Overload	22	Er2	Keypad Panel Communication Error
11	OH1	Heatsink Overheat			

FORMAT 4															
LOW WORD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DCB	AUT	PU	DOWN	UP	RT2	RT1	X3	X2	X1	RST	THR	BX	HLD	REV	FWD
HIGH WORD															
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	PRT	VF2

ABBREVIATION DEFINITIONS:

FWD	RUN DRIVE FORWARD	UP	INCREMENT SET FREQUENCY
REV	RUN DRIVE REVERSE	DOWN	DECREMENT SET FREQUENCY
HLD	N/A	PU	LINE TO INVERTER TRANSITION
BX	COAST STOP COMMAND	AUT	SELECT 4-20mA FOR FREQ SETTING
THR	N/A	DCB	DC BRAKE COMMAND
RST	FAULT RESET	VF2	2ND MOTOR V/F SELECTION
X1,X2,X3, RT1, RT2	SEE GEI-100211	PRT	DATA PROTECTION

FORMAT 5															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	BASE		ACCELERATION / DECELERATION TIME									
BASE		ACCEL / DECEL TIME													
0	10ms	1-999		0.01-9.99s											
1	0.1s	100-199		10.0-99.9s											
2	1s	100-199		100-999s											
3	10s	100-360		1000-3600s											

FORMAT 6															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	BASE		CURRENT DATA									
BASE		CURRENT DATA													
0	0.01A	1-999		0.01-9.99A											
1	0.1A	100-999		10.0-99.9A											
2	1.0A	100-999		100-999A											
3	10A	100-200		1000-2000A											

FORMAT 7															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DIR		TIME SELECT		BASE		ACCELERATION / DECELERATION TIME									
DIRECTION		TIME SELECT		BASE		ACCEL / DECEL TIME									
0	FWD	0	TIME 1	0	0.01S	1-999	0.01-9.99A								
1	REV	1	TIME 2	1	0.1S	100-999	10.0-99.9A								
		2	TIME 3	2	1.0S	100-999	100-999A								
		3	TIME 4	3	10S	100-600	1000-6000A								

FORMAT 8			
3	2	1	0
DC Brake Applying	RUN	REVERSE	FORWARD
7	6	5	4
Keypad Operation Status (LED)	Data Change Priority Option Side: 1, Keypad Side: 0	RUN Command by Keypad	Trip Condition

FORMAT 9							
7	6	5	4	3	2	1	0
0	0	0	Y5	Y4	Y3	Y2	Y1

FORMAT 10
(DRIVE VALUE / 4096) X NAMEPLATE VALUE = DESIRED VALUE
DRIVE VALUE / 40.96 = PERCENT VALUE

FORMAT 11															
WRITE															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
X1/X2 TERMINAL (0-FH)				X3 TERMINAL (0-FH)				X4 TERMINAL (0-FH)				X5 TERMINAL (0-FH)			
READ															
7	6	5	4	3	2	1	0								
X5		X4		X3		X1/X2									

FORMAT 12															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Y2 TERMINAL (0-FH)				Y3 TERMINAL (0-FH)				Y4 TERMINAL (0-FH)				Y5 TERMINAL (0-FH)			

FORMAT 13															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	Y1 TERMINAL (0-FH)			

FORMAT 14															
PULSES TO FREQUENCY = PULSES / 15															
FREQUENCY TO PULSES = absolute value of (FREQUENCY X 15)															

FORMAT 15			
200V Series		400V Series	
Capacity (HP)	Data	Capacity (HP)	Data
1/4	2	1/2	131
1/2	3	1	132
1	4	2	133
2	5	3	134
3	6	5	135
5	7	7.5	136
7.5	8	10	137
10	9	15	138
15	10	20	139
20	11	25	140
25	12	30	141
30	13	40	142
40	14	50	143
50	15	75	144
75	16	55	145
55	17	100	146
100	18	125	147
125	19	150	148
		175	149
		200	150
		250	151
		300	152

FORMAT 16	
Capacity (HP)	FORMULA
30HP and below	$CURRENT = DATA / 100$
40HP and above	$CURRENT = DATA / 10$

FORMAT 17			
3	2	1	0
Terminal Input (Run Command Input) thru option card (See also P1)	High Resolution Frequency Setting thru option card (See also P0)	0	0
7	6	5	4
0	1 = Local (Keypad) Control, 0 = Remote (Option Card) Control	Function Input thru Option card	Output Frequency Compensation thru Option card
11	10	9	8
0	0	0	0
15	14	13	12
0	0	0	0

CHAPTER 5: TERMINAL STRIP CONTROL

5.1 General

This chapter describes how to allow the VF Drive terminal strip to assume partial or total control of the VF Drive. This VF Terminal Strip control can be temporary or on a more permanent basis. VF Terminal Strip control is desired for several different applications including

1. Switching the VF Drive from "Remote" to "Local" mode and vice-versa. This transfers control of the drive from the Network Master/Option Card (Remote mode) to the VF Drive terminal strip (Local mode). This typically allows an operator to manually override the machine "automatic" mode.
2. Acquiring data *only* from the Option Card. Control functions are handled through the VF terminal strip by some other controller, such as a closed loop controller like the GE Fanuc Axis Positioning Module (APM). This is advantageous for applications which require very tight speed control.

The VF Drives are very flexible in their operation and allow the drive control functions to be divided between the Network Master(through the option card) and the VF Drive terminal strip. One of the VF Drive parameters controls how the various drive control functions are distributed. VF Drive Parameter 122 is the parameter which assigns control functions between the option card and the terminal strip.

5.2 Remote / Local Operation

A definition of "Remote" and "Local" Operation is as follows. "Remote" mode refers to the machine condition when the Controller, the Interbus-S Master, is in control of the VF Drive. Generally, the Master makes all the machine logic decisions and performs Start/Stop, Speed Control, and other control functions. "Local" mode refers to the machine condition when a machine operator, typically through a manual override located near the VF Drive, assumes control of the VF Drive. Logic decisions are performed by the machine operator through the use of manual pushbuttons and other switches wired to the VF Drive terminal strip.

Figure 5.1 shows an example hardwired pushbutton station which might be used in "Local" mode.

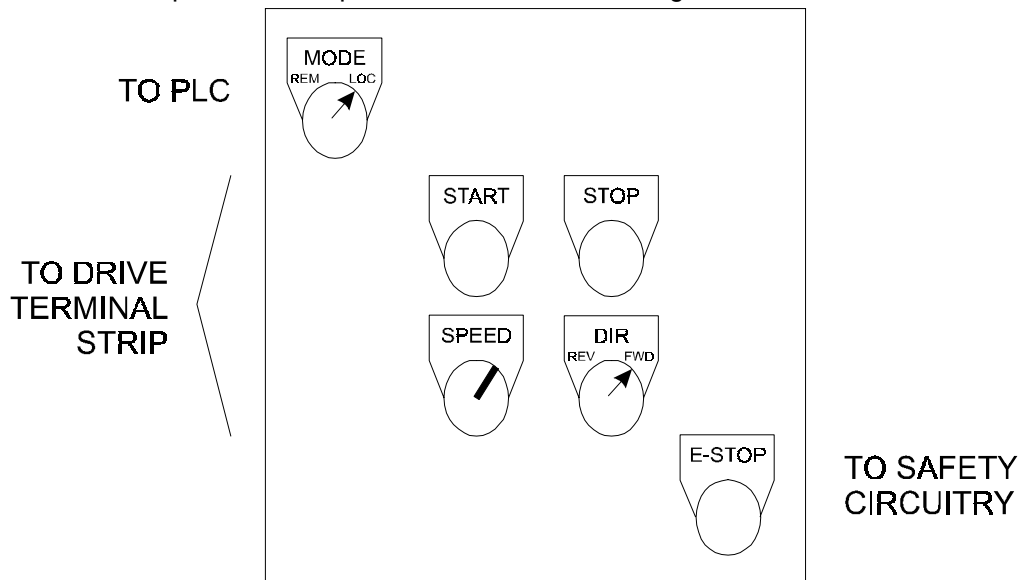


Figure 5.1 - Example Remote Panel

Note that some applications may require additional operators. Be sure to consult the VF Drive User's Documentation for proper wiring instructions.

For effective Remote/Local Operation of the VF Drive, several hardwired pushbuttons are required at the local station. Generally, they should include buttons to Start and Stop the drive, along with others to control speed and direction. These hard-wired pushbuttons are wired directly to the Terminal Strip of the VF Drive, per instructions provided in the VF Drive instruction manual. **In addition to the above mentioned operators, a selector switch wired to a PLC input is required.** This operator is required because the VF Drive is switched from Local to Remote mode (and vice-versa) by communications initiated by the Network Master.

Upon detecting a Remote-to-Local switch transition, the PLC initiates communications with the VF Drive in order to set VF Drive Parameter 122. **Table 5.1** shows the four most common settings for Parameter 122:

Note: For 48 (30H) and 56 (38H) on drives less than 40hp, Function 2 needs to be set to a 2 for an external source.

Table 5.1 - VF Drive Parameter 122 Common Data Values

VF Drive Parameter 122		
Parameter 122 Value (in Hex)	Parameter 122 Value (in Decimal)	Definition
003CH	60	PLC (option board) has full control of Start/Stop & Frequency
0030H	48	VF Drive terminal Strip has full control of Start/Stop & Frequency
0034H	52	PLC (option board) has Frequency Control, VF Terminal Strip has Start/Stop Control
0038H	56	PLC (option board) has Start/Stop Control, VF Terminal Strip has Frequency Control

In most applications, the Network Master assumes control of both Start/Stop and Frequency control during Remote mode, and the VF Terminal Strip assumes these functions during Local mode. Table 9-1 shows that for these applications, a Remote-to-Local mode transition involves setting Parameter 122 from a value of 60 (003CH) to a value of 48 (0030H). A Local-to-Remote mode transition requires that Parameter 122 be changed from 48 (0030H) back to 60 (003CH).

CHAPTER 6: WIRING DIAGRAMS

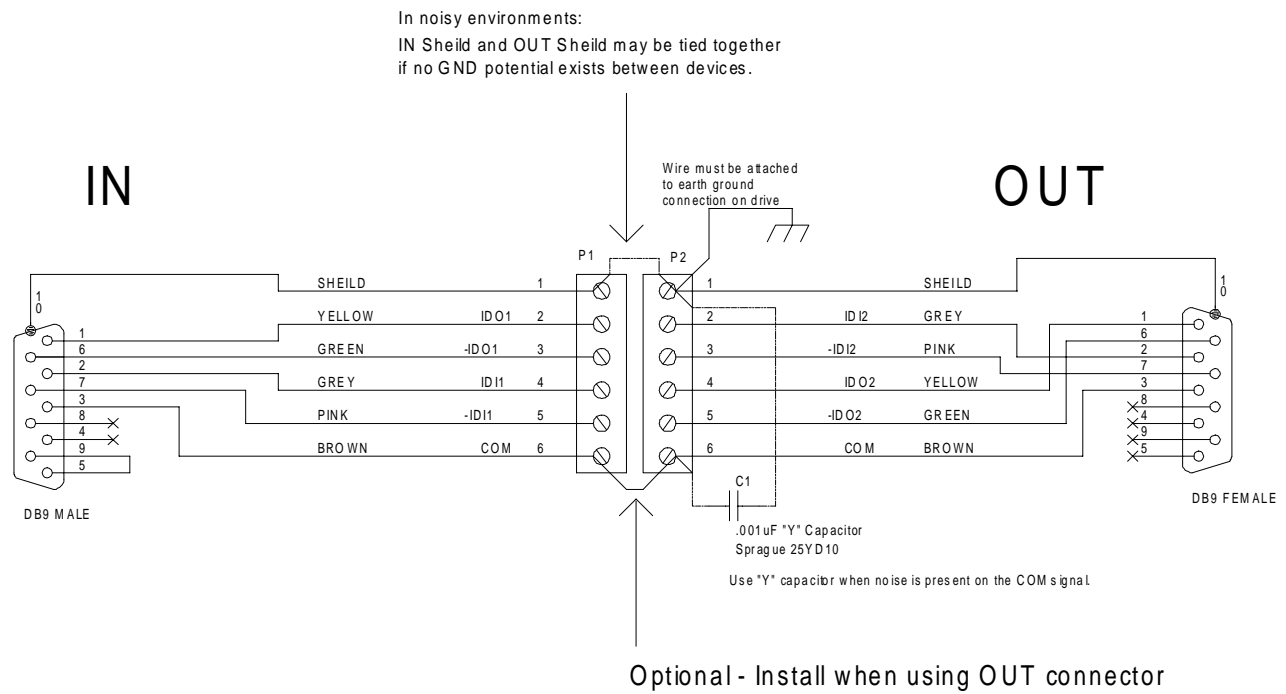


Table 6.1 – Wiring

1. IN Shield and OUT Shield may be tied together if no GND potential exists between devices. (Phoenix recommendation)
2. Optional COM jumper is installed and .001uF "Y" capacitor is installed. (Phoenix recommendation)
3. Optional COM jumper is not installed as long as there is not a 7V potential between the P1 pin 6 and P2 pin 6.

WARNING: If these recommendations are followed, it is crucial that ground potentials of 7V or higher do not exist between network devices. Equipment damage can result, which is not covered under warranty.

NOTES