User Manual for the
HE300RSL130

FLN Communication Option Board for use with GE AF-300E$ Inverter

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PREFACE

This manual explains how to use the Horner APG's FLN Communication Option Board.

For user manual updates, contact Horner APG, Technical Support Division, at (317) 916-4274 or visit our website at www.heapg.com.

LIMITED WARRANTY AND LIMITATION OF LIABILITY

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To obtain warranty service, return the product to your distributor with a description of the problem, proof of purchase, post paid, insured and in a suitable package.

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 the FLN Communication Option Board to appropriately design the end system, to appropriately integrate the FLN Communication Option Board 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.

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CHAPTER 1 - INTRODUCTION

1.1 General

The HE300RSL130 is a plug-in FLN Communication Option Board which allows a GE Drive's AF-300E$ Drive to be upgraded with Landis & Staefa's FLN (Floor Level Network) capability. This Option Board functions as a FLN "device" and provides the AF-300E$ with the ability to be commanded and monitored over a FLN network. Access to most drive control functions, status and a limited number of tuning parameters (Function Codes) are available to a Landis & Staefa Field Panel through the Option Board's FLN subpoints.

The FLN Communication Option Board is installed in the AF-300E$ just above the regulator board. Field installation is possible by removing the AF-300E$ face cover, installing the "plug-in" Option Board, connecting the FLN network cable, optionally connecting the Local/Net switch and replacing the AF-300E$ face cover.

The FLN Communication Option Board allows network operation of the AF-300E$ by overriding the input from the drive's physical input terminal and keypad, and directly controlling the drive's internal parameters. The Option Board sub-divides the internal parameters into three sets and allows each set to be individually configured for either network or local (physical input terminal/keypad) control. Additionally, the Option Board contains inputs for an optional Local/Net switch that allows switching the internal parameter sets (configured for network control) between local and net control.

The FLN Communication Option Board can detect when FLN network traffic has ceased. Once the Option Board has determined that network communications has been lost, it enters a "Loss-of-communication" state. Three configurable options: Fault, Use-last-values and Use-term-values are available for the Loss-of-communication state.

1.2 Additional Information

1. Drive wiring, configuration and operation are included in the manuals supplied with the drive.

   AF-300E$ 1/2 - 300 Horsepower Instructions (m/n GEI-100211)

2. Landis & Staefa Equipment Controller Application Manual

   Application 2711 AF-300E$ Adjustable Frequency AC Drive

1.3 Mechanical Description

The FLN Communication Option Board is a printed circuit assembly that mounts inside the housing of a AF-300E$ Inverter. It connects to the drive through a multi-pin connector that is located under the front cover and next to the keypad connector. It has a 'pluggable' screw-terminal connector that is used to connect to a FLN cable. Also provided is a screw-terminal, which is used to connect an optional local/net control switch.

1.4 Electrical Description

The FLN Communication Option Board contains its own microprocessor and memory. The Option Board communicates with the AF-300E$ Inverter through a provided serial communications channel on the regulator board connector. Power to the Option Board is also provided through the same connector and is isolated by a power converter. The communications port is an isolated RS485 full-duplex port. The Local/Net switch connection sources an isolated voltage that should only be switched by a dry connection.

CHAPTER 2 - INSTALLATION

2.1 Provided Installation Hardware

Included in the packaging with the AF-300E$ option board are the following items:

a. The option board
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
d. The User Manual for the HE300RSL130

2.2 The Installation Procedure for Drives Under 40 Horsepower

The AF-300E$ Communications Option Cards are designed to integrate seamlessly with the AF-300E$ Inverter. The option card is installed within the drive cover so that the NEMA rating of the drive is maintained.

1 Power down the drive.

2 Remove the cover the AF-300E$ drive as shown in the diagram below.

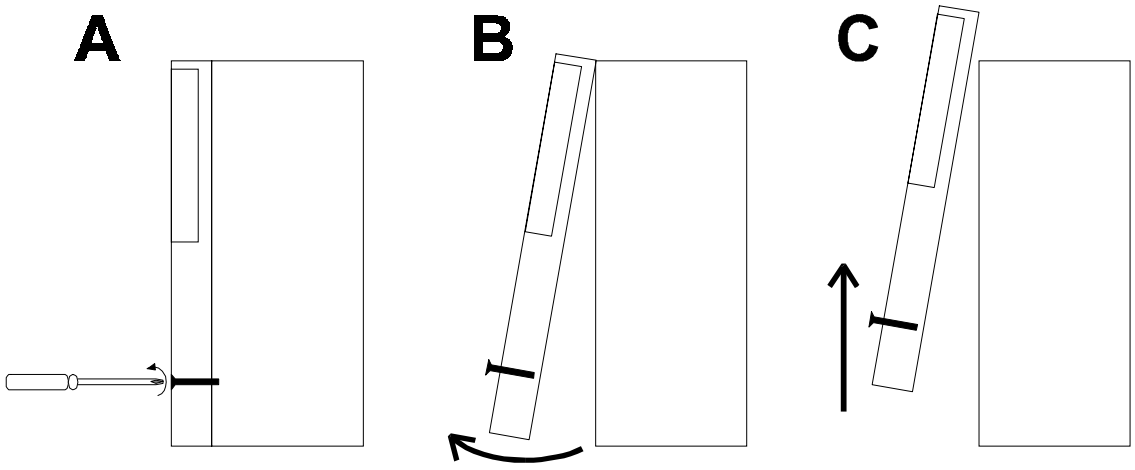

Figure 2.1- Drive Front Cover Removal Procedure

3 Install the supplied plastic 1/2" standoff (A') in hole (A).

1/2HP AF-300E$ Viewed from the Front.

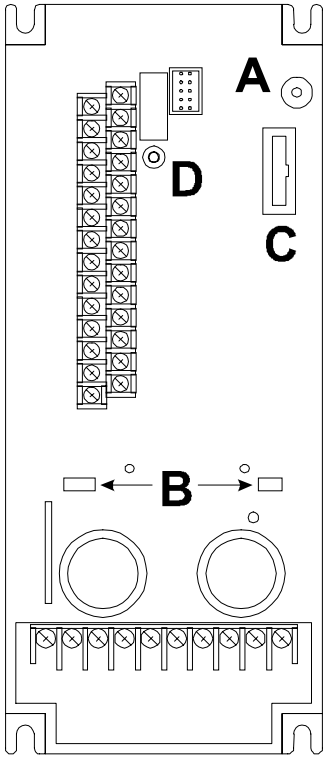

Fig. 2.2 - Figure Drive Mounting Holes and Connectors (left)

Fig. 2.3 - Mounting Hardware (Not to Scale)

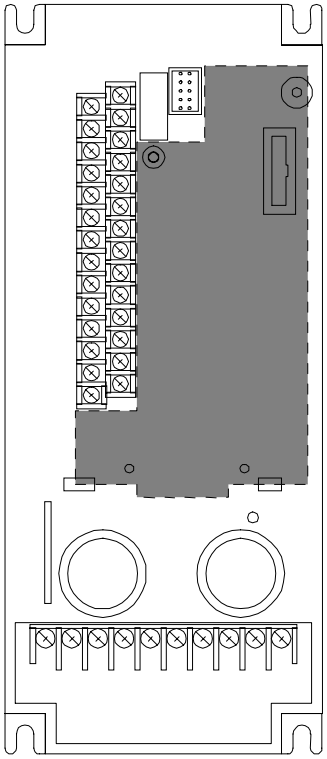

Fig. 2.4 - Option Board Location (right)

4 Install the HE300RSL130 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 Verify that jumper JP4 is removed and JP3 is on the two pins closest to the "E".

7 After completing field wiring to the removable terminal strip(s), replace the front cover.

8 Power up the drive as needed.

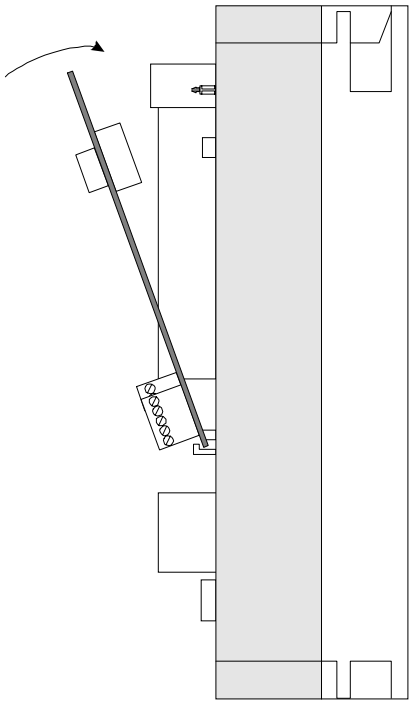

Figure 2.5 - Installing the Option Board
(Side View of AF-300E$ 1/2HP shown)

2.3 The Installation Procedure for Drives 40 Horsepower and Larger

The AF-300E$ Communications Option Board has been designed to integrate seamlessly with the AF-300E$ Drive. The option board is installed within the drive cover so that the NEMA rating of the drive is maintained. See Figure 2.6.

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.

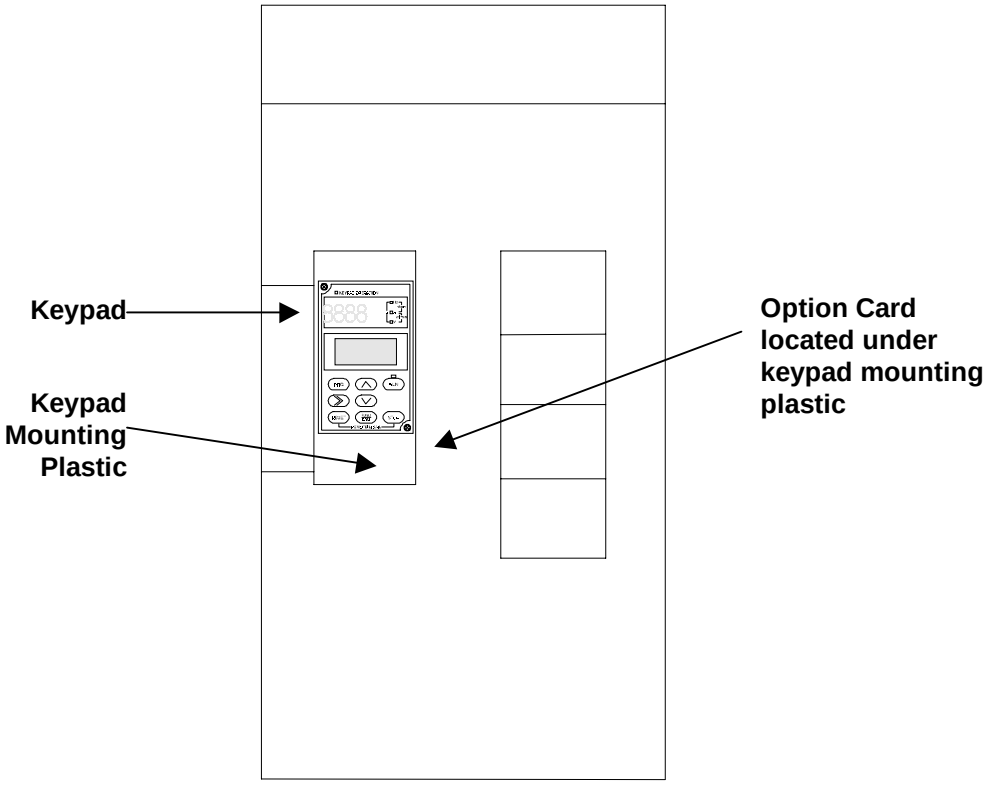

Figure 2.6 – Drive Keypad, Keypad Mounting Plastic and Option Board Location
(Drive shown is a 40HP AF-300E$ viewed from the front.)

4 Install corner brackets (A') on bottom corners of interface board (A).

5 Install corner brackets (A') on metal brackets (B') using the supplied M3 x 5 screws and lock washers in the corner bracket mounting holes (C).

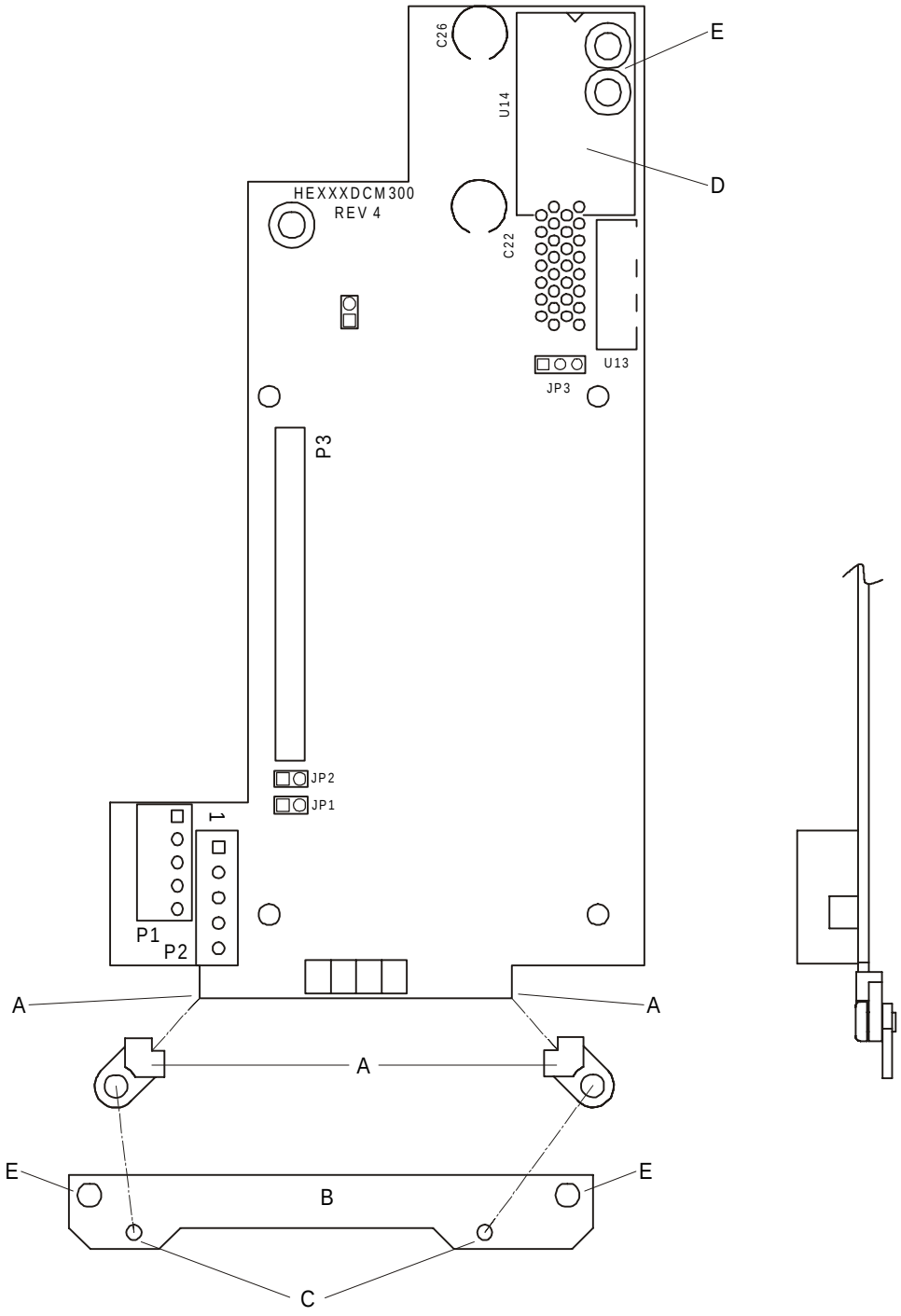

Figure 2.7 – Option Board Assembly (Front and Side View)

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 Verify that jumper JP4 is installed and JP3 is on the two pins closest to the "E".

8 Replace the keypad mounting plastic and the keypad.

9 After completing field wiring to the terminal strip(s), replace the front cover.

10 Power up the drive as needed.

2.4 Procedures for Using Alternate Metal Standoff

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 going to be used, the steps below must 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 a finger while unscrewing the plastic standoff.

2. Once the standoff is removed, screw on the metal standoff that is supplied with the HE300KIT401.

3. 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 of the standoff.

2.5 FLN Network connection

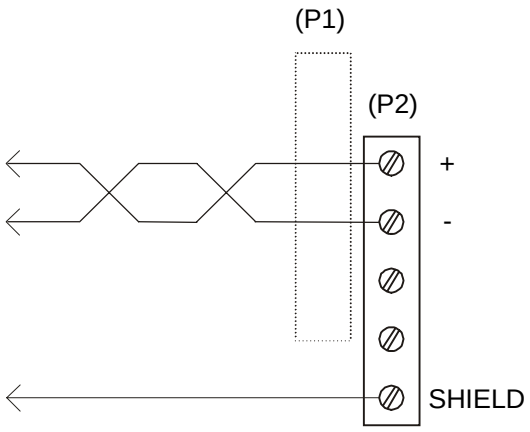

Figure 2.8 – FLN Network Connection

2.6 Local/Net Contact Connection

∗If the optional switch is not utilized, the RTS-CTS connections must be shorted for network access to configured control sets.

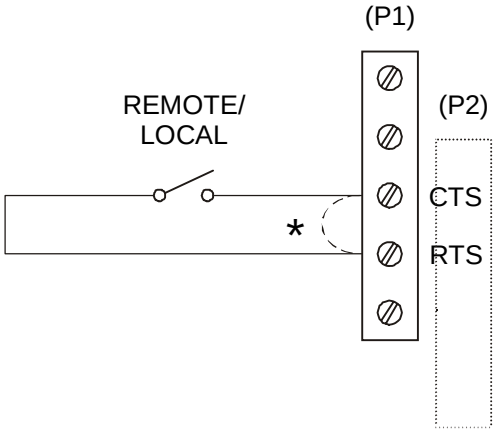

Figure 2.9 – Local/Net Connection

NOTES

CHAPTER 3 - CONFIGURATION

3.1 Option Function Codes Overview

Before placing the Option Board on an active network, configure the FLN address, Control Mode Configuration, Loss-of-communications function and timeout values. Access to these parameters is only through the Drive's keypad. **Since keypad write access to Option Function Codes is sometimes blocked when in Net mode, place the Local/Net switch in Local position (or remove alternate shorting terminal wire) when modifying these parameters.**

When an Option Board such as the HE300RSL130 is installed in the Drive, an extra set of Function Codes not defined in the AF-300E$ Inverter instruction manual appears at the end of the Function Code list when examined with the keypad. These additional codes that are identified with a 'P' prefix are referred to as Option Function Codes. These Option Function Codes are used to store the Option Board specific parameters such as the FLN address. Only the first five Option Function Codes from those available are used for this Option Board. Option Function Codes are stored in the Drives EEPROM and are 'remembered' even if the Option Board is changed out.

Entering an invalid value in an Option Function Code may generate an Option Board fault (Er5) on the inverter. Whenever an Option Board fault occurs (Er5), and the fault reporting feature is enabled, the Option Board writes a specific error indicator to Option Function Code P00. Therefore, if an Er5 fault occurs at configuration, the user may examine P00 to determine which Function Code is at fault. Refer to Table 5.1: Er5 Fault codes for a listing of faults values.

WARNING: Since EEPROM's have a limited write life (in the order of 100,000 writes), continuous writing to the P00 Option function code can cause premature failure of the configuration memory.

Setting P00 to a value other than 255 enables the fault-reporting indicator. Should Er5 faults occur frequently (network communication errors) as part of normal operation, disable this feature to save the Drive's EEPROM memory from excessive writes. Should a network communication error occur later with this code disabled, it can be re-enabled to display the error as long as the network error condition still exist. To re-enable, set the control mode to Local and temporally use the keypad to set P00 to zero. Then set the control mode back to Net and the error code appears in the P00 code.

3.2 Accessing Option Function Codes through the Inverter's Keypad

Access to the Option Function Codes is only available through the AF-300E$ Inverter's keypad. This section summarizes how to use the Inverter's keypad to set the Option Function Codes. For more information on using the AF-300E$ Inverters keypad, refer to the associated AF-300E$ Inverter's Instruction Manual.

1. After powering up the drive, the drive's keypad LCD displays the following:

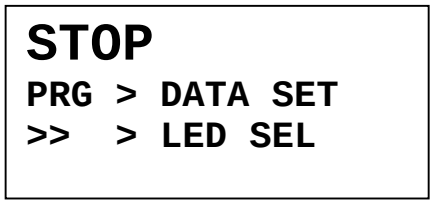

Figure 3.1

This display indicates that the drive is in STOP mode, and that the PRG key must be pressed in order to set the drive data.

2. Press the PRG key. The display now shows the start of the list of the normal drive parameters as follows:

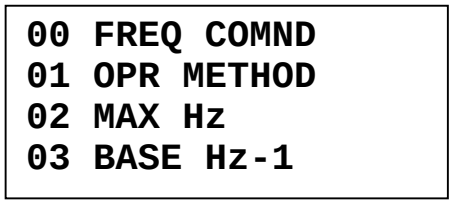

Figure 3.2

The Option Function Codes are at the bottom of the list, and cannot be seen until the cursor keys are pressed multiple times to display them. After pressing the UP or DOWN cursor keys repeatedly, the option board parameters are finally displayed as follows (note that holding the cursor keys down continuously causes the display to scroll quickly:

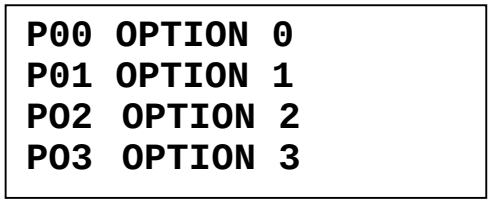

Figure 3.3

NOTE: For illustrative purposes, the option parameter P00 is set to a value of 25.

In order to set P00, use the cursor keys (UP and/or DOWN) to highlight P00.

NOTE: The highlight is represented below with the underlined text.

3. Pressing the FUNC/DATA key shows the current value of P00.

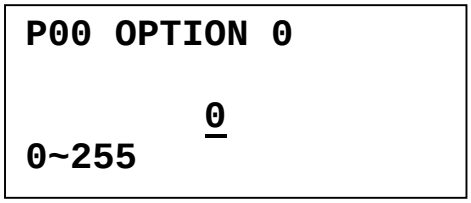

Figure 3.4

The bottom line of the display flashes between the allowable data range (in this case **0~255**) and the prompt **STORE > F/D KEY**. Should the keypad not have write access (because the Option board is in Net mode), **OPTION ACTIVE** is displayed instead. In this case, switch the Local/Net switch to Local position. Should the keypad not have write access (because Data Protect feature is active), **DATA PRT** is displayed. In this case, refer to the AF-300E$ Inverter's Instruction Manual to deactivate this feature.

The current value of the parameter is shown on the third line (in this case 0). Pressing the cursor keys (UP, DOWN or >>) causes the new value to change. See the AF-300E$ Inverter's Instruction Manual for detailed instructions on keypad data entry operation. In this case, pressing the UP key causes the new value to increment, and move the current stored value from the third line to the second line, as shown below:

```
P00 OPTION 0
0
        25
0~255
```

Figure 3.5

4. When the option parameter is at the desired value (in this case 25), pressing the FUNC/DATA key causes the parameter to be stored. As the data is being stored, the bottom line of the display shows a **DATA STORING** message. After the data has been stored, the option parameter list returns to the display and the next option parameter is highlighted, as shown below:

```
P01 OPTION 1
P02 OPTION 2
P03 OPTION 3
P04 OPTION 4
```

Figure 3.6

Because option parameter P00 was just edited, option parameter P01 is now highlighted.

NOTE: It is important to note that the keypad allows a larger data value to be input than is legal for a given parameter. Option Function Code parameters with Illegal data values are flagged by an Option Board error (Er5) when drive control is transferred from the keypad to the Option Board.

3.3 Setting Option Function Codes (Network Operation)

The following parameters must be set through the AF-300E$ Inverter keypad before attaching the Option Board to the FLN network. Entered values only take effect after the next power-cycle or mode change from Local-to-Net.

Set P00 - Network Fault indicator [0 - enable, 255 - disable] (may be set by firmware if enabled and an Er5 occurs)

Set P01 - Station Id [0-99]

FLN allows addressing of up to 100 different bus addresses. Address 99 is reserved.

Care must be taken not to assign the same address to different devices on the same network.

Set P02 – Network Control Mode Configuration

P02	Data Setting	Description
0	XX0	Drive Control from Network
	XX1	Drive Control from keypad or terminal strip
1	X0X	Freq. Reference from Network
	X1X	Freq. Reference from keypad or terminal strip
2	0XX	Function Code input from Network
	1XX	Function Code input from keypad

When the Net/Local switch is set to Net, the above configuration defines which internal drive parameters are controlled from the network.

Set P03 – Loss of communications action

P03	Action
0	Er5 trip occurs which stops the motor. Fault cannot be reset until the communications is reestablished or placed in Local.
1	Drive maintains the state of operation at the time of communications loss
2	Drive transfers control of the drive to the drive terminal strip (or) keypad.

Set P04 – Loss of communications timeout

The amount of time after the last FLN Poll request before the drive determines that communications is lost. Parameter is in terms of Seconds. A value of zero shuts off the communications timer preventing a Loss-of-communication action. The recommended timeout value is 30 Sec.

3.4 Setting Drive Function Codes (Drive Operation)

Before attempting drive operation, initialize the drive's Function Codes. These Function Codes, which are defined in the AF-300E$ Inverter Instruction manual, define the drive's operation. Drive Function Codes, which are stored in EEPROM, are configured with the drive's keypad.

The current state of configuration parameter P03 and the Local/Net switch (or shorting wire) determines if the keypad has write access to the Function Codes. For more information on the Drive function codes, refer to the GE AF-300E$ Instruction manual.

NOTES

CHAPTER 4 - OPERATION

4.1 Power-Up

At power-up, the Option Board examines the Option Function Codes (P0x) that are programmable by the user through the keypad. These parameters, which are only available at the keypad when the Option Board is installed, controls the operation of the Option Board on the FLN network. This examination is a rough check only to determine if the parameters are with-in range for valid network operation. The following checks are made:

P01: FLN Network Id < 100
P02: Network control configuration (each digit < 2)
P03: Loss of communications action (< 3)

Should any of these tests fail, the Option Board immediately causes the Drive to Er5 with the appropriate error response placed in P00 (if enabled). Furthermore, it is not be possible to start the drive regardless of the Local/Net switch position until these parameters are corrected. Correction of a parameter through the keypad automatically causes the Er5 to be reset. However, if one of the following Option Function Codes is also incorrect, the Er5 remains in effect. If correcting a parameter does not release Er5 as expected, recheck P00 to determine the Option Function Code in error.

Once the Option Function Codes are verified, the Option Board initializes the FLN port with the values from those codes and then examines the state of the Local/Net contact. If the contact is closed, the Option Board toggles to 'Net' mode and the Drive waits (time specified in P04) for an FLN COV poll message. Should communications fail to be established within this time-out period, the drive reverts to the configured Loss-of-communications action. If the contact is open, the Option Board toggles to 'Local' mode and the Drive indefinitely assumes the state as defined by the keypad and/or physical terminal contacts regardless of any network errors.

4.2 Local/Net mode

The Option Board provides two modes of operation (Local/Net) which are controllable through an optional external switch. Shorting the switch contacts activates Net mode while opening the switch contacts returns the Option Board to Local mode. When Net mode is selected, the Drive is controlled over the FLN network. Otherwise, in Local mode, the Drive is controlled through the keypad and/or physical terminal. It is valid to switch between modes during normal operation; however, precautions should be observed to prevent adverse motor changes. Should the Local/Net switch or wiring fail and the circuit opens, the Option Board reverts to Local mode. **If the optional (Local/Net) switch is not utilized, the switch contacts at the Option Board must be shorted to allow network control (Net mode).**

While in Net mode, the actual amount of Drive control over the network is configurable. This is possible because the Drive control parameters are divided into three subsets: Drive control, Frequency reference and Function codes. Drive control is a set of discrete inputs, which controls items such as direction, run, stop and reset. The Frequency reference is the analog input that sets the speed of the drive. The Function Codes are both discrete and analog values that tune the operation of the drive.

Each of these control subsets can be individually configured for control over the network when the Option Board is in Net mode. Individual configuration is through Option Function Code P02 that contains a bit for each subset. When a subset bit is cleared in P02 and the Net mode is selected, that respective subset is controlled over the network. Therefore, the user is free to select which subset(s) are controlled from the network. When the Option Board is in Local

mode, all subsets revert to local keypad and/or physical terminal control regardless of the P02 configuration. The following describes each control subset and its reaction to Local and Net modes. Each subset is considered in Net mode when both its respective flag is set in P02 and the optional switch is in Net position.

The Drive control inputs, when in Local mode, are received from the Drive's physical control terminal. The keypad may also be placed in line with these controls to provide final localized start/stop control (when configured with Function Code 01). When in Net mode, the Drive control inputs instead come from FLN CMD subpoints. However, note that the keypad may still be placed in line with the controls to maintain localized control of Run/Stop.

The Drive's physical control terminals X1 through X5 are not exactly duplicated by the FLN subpoints (70-78). This is because the Drive's physical control terminal inputs X1-X5 are routed (through Function Code 32) to associate the 'X' terminals with special control functions. Alternately, FLN subpoints can control these functions directly by generally bypassing Function Code 32 entirely. The following compares the difference between the control terminal X1-X5 inputs (Local mode) and the corresponding FLN subpoints (Net mode) and their dependency on Function Code 32.

Table 4.1 - Special Function Access

Action	Drive terminals	FC32	FLN Subpoints (CMD)	FC32
Multistep speed selection	X1,X2, [X3]	0[0]xx	X1,X2,X3	ignored
Up/Dn speed (from zero)	X1,X2	1xxx	Up/Dn	1xxx
Up/Dn speed (from previous)	X1,X2	2xxx	Up/Dn	2xxx
Speed from line Hz.	X3	x1]xx / x2xx	Pu	ignored
Acc/Dec selection	X4,[X5]	xx0[0]	RT1/RT2	ignored
Speed from C1 (current input)	X4	xx1x	Not supported	
DC Brake	X4	xx2x	DCB	xx2x
Select Motor 2	X5	xxx1	VF2	ignored
Data protect	X5	Xxx2	Not supported	

The Frequency reference, when in Local mode, can be configured (through Function Code 00) to come from the keypad or control terminal (analog) inputs. When in Net mode, the Frequency reference comes from FLN subpoint 60. Note that this parameter is in terms of percent of full-scale.

Function Code access, when in Local mode, is through the keypad. When in Net mode, access to a limited number of Function Codes over the network is possible through FLN subpoints. Note that certain Function Codes are not writable while the drive is running. Attempting to write to a Function Code that is run protected while the drive is running returns a Network error of "Operator Priority too low".

For Drive control and Frequency reference parameters, the drive internally maintains two sets of parameters. The first set is retrieved from the keypad and/or the physical input terminal. The second set is retrieved from the Option Board. The set currently being used to control the drive is dependent on the Local/Net mode. Since both sets of parameters are maintained, the Option Board Drive control or Frequency references (FLN control subpoints) are always writable regardless of the current Net/Local mode.

For Function Codes, the drive only maintains one internal set. The Net/Local mode simply selects which source (Option Board or keypad) has current write permissions. Attempting to write to a Function Code from the Network, while in Local mode, returns a Network error message of 'Operator Priority too low'. Likewise, attempting to write to a Function Code from the keypad while under Net mode returns a keypad message of 'Option Active'. While write access is selected by the mode, read access is always available from either the keypad or the network regardless of the mode.

Table 4.2 - Mode selection parameter access (assumes all subsets enabled by P02)

	Local	Net
Physical Control Terminal	Active	Inactive
Network Binary Outputs	Inactive (accessible)	Active
Local Freq Reference**	Active	Inactive
Network Freq Reference	Inactive(accessible)	Active
Keypad Function Code Access	Read + Write	Read Only
Network Function Code Access	Read Only	Read + Write

* Keypad start button can be assigned for final start control even under network control. Keypad stop button functions as an emergency stop even under network control.
** Local frequency control can be assigned to either the keypad or terminal analog input.

Drive status information is always available at both the keypad and FLN status subpoints regardless of the mode. Included in the FLN subpoint status information are points 37-39 which reflect the control state of each of the three parameter subsets. A master controller can use this information in determining if it currently controlling the configured subsets (Net mode).

Switching from Local to Net also causes the Option Function Code P(xx) parameters to be re-read and the network reconfigured if any are changed which would modify network operation. This allows the configuration to be changed without power-cycling the drive.

4.3 Loss of Communications

The Option Board tracks the incoming FLN Poll messages and maintains a time-out timer. If the Option Board is in Net mode and does NOT receive a FLN Poll message with-in the timeout period, it assumes that the network connection has been lost. The Option Board then toggles drive control to one of three Loss-of-communications options that was preprogrammed by the user through Option Function Code P03.

Under startup conditions (when the Option Bard is in Net mode and until network communications is established) the drive is held in "stop" mode for the configured time-out period. If communications is not established by the end of that time-out period, the Option Board then toggles drive control to the preprogrammed Loss-of-communications action. The time-out period of the timer is configurable through Option Function Code P04; however, the Landis & Staefa recommended time is 30 Seconds.

The Loss-of-communication configuration parameter can be preset to one of three values: 0-Fault (Er5), 1-Use_Last_Values and 2-Use_Term_Value. The following describes the actions of the drive for each of these values. Each description assumes that both the Control Terminal and Frequency control subsets are configured to be active when in Net mode. Should either of these control subsets not be configured in P02, its associated network parameter will NOT be active and can be ignored in the following descriptions.

0 - Fault

When communications are lost, the Drive immediately control-stops the motor and faults with an Er5. Additionally, both the network RUN.STOP CMD(24) and REF INPUT(60) subpoints are set to zero. Therefore, when communications is restored, the drive is maintained at stop until the Field Panel commands these subpoints to new values. Additionally, the Er5 must be reset either locally or over the network (depending on the current Local/Net mode) before any motion commands are accepted. Note that the reset command is NOT accepted as long as the drive is being commanded to RUN.

The user takes local control of the drive when in Er5 by switching to Local mode and issuing a reset at the Drive's local terminal or keypad (Note that command terminal controls must NOT be commanding the drive to run before a reset can be issued). Switching back to Net mode with the network still inactive causes an Er5 to re-occur. Switching back to Net mode with the network restored causes the drive to revert control to the network Command Terminal and Frequency parameters. However, subpoints RUN.START CMD (24) and INPUT REF (60) are reset to zero until commanded to new values from the Field Panel.

1 - Use_Last_Values

When communications are lost, the Drive continues to run using the last received network Control Terminal and Frequency control parameters. On restoring network communications, the current network Control Terminal and Frequency control parameters continue to be used until new values are commanded.

WARNING:	**When in this mode, the only way to stop the drive is through local control. This requires either a switch to Local mode <or> use the STOP button on the local keypad. It is the user's responsibility to take the appropriate safety precautions.**

The user can take local control of the drive while in this state by switching to Local mode. Switching back to Net mode with the network still inactive reverts control back to the network Command Terminal and Frequency control parameters. However, the network subpoints RUN.START CMD (24) and INPUT REF (60) are reset to zero at that time. That is, if the user switches back to Net mode before the network is restored, the drive is stopped regardless of the state of the last FLN commands. Switching back to Net mode with the network restored switches control to the network Command Terminal and Frequency control parameters, which is at the last commanded value.

2 - Use_Term_Values

When communications are lost, the drive reverts to local Command Terminal and Frequency control parameters (as if Option Board was placed in Local mode). Additionally, both the network RUN.STOP CMD(24) and REF INPUT(60) subpoints are set to zero. On restoring network communications, the drive reverts control to network Command Terminal and Frequency parameters which are zero until commanded to new values by the Field Panel.

WARNING:	**When in this mode, the drive reverts to the current state set at the terminal. It is the user's responsibility to preset this to a safe state.**

The user can take local control of the drive while in this mode by switching to Local. This essentially does nothing since the local Command Terminal and Frequency parameters are already being used. Switching back to Net mode with the network still inactive essentially does nothing since the drive continues to use the local Terminal and Frequency controls until the network is made active. Switching back to Net mode with the network restored switches control to the network Command Terminal and Frequency control parameters. However, subpoints RUN.START CMD (24) and INPUT REF (60) are reset to zero until commanded to new values by the Field Panel.

NOTE:	**If FWD or REV contacts are closed at terminal at power-up an ER6 is be generated.**

4.4 Network Access to Drive Parameters

Once the drive and the FLN Communication Option Board have been installed, configured and connected to the FLN Network, the drive can be controlled from the associated FLN Field Panel. The Field Panel accomplishes control of the drive by monitoring and commanding the Option Board's application subpoints.

Table 4.3 - Point Description Table

Descriptor	Address	Command -able	Description
CTLR ADDRESS	01	N	Identifies the controller on the LAN trunk.
APPLICATION	02	N	The identification number of the program running in the controller.
FREQ OUTPUT	{03}	N	Actual frequency of the drive voltage supplied to the motor.
PCT SPEED	{04}	N	Calculated motor speed as a percentage of maximum (Based on FC02 MAX Hz setting).
SPEED	{05}	N	Calculated motor speed calibrated in motor RPM (Requires correct setting of FC30 MTR POLES).
CURRENT	{06}	N	Actual current output of drive as a percentage of the pre-configured nameplate current.
TORQUE	{07}	N	Actual torque output of drive as a percentage of maximum (Valid only in Vector mode).
DRIVE TEMP	{09}	N	Actual internal temperature of drive.
RUN TIME	{12}	N	Actual run-time of drive in hours (minimum resolution is 2 hours).
OVRD TIME	{20}	N	This point is present, but not used in this application.
FWD.REV MON	{21}	N	Actual status indication of motor rotation direction currently commanded to drive.
FWD.REV CMD	{22}	Y	Specifies the direction of motor rotation when commanded to RUN.
RUN.STOP MON	{23}	N	Actual status indication of current RUN state of drive.

Descriptor	Address	Command -able	Description
RUN.STOP CMD	{24}	Y	RUN commands the drive to start the motor. Drive must be under net control and the appropriate fail-safe contact closed before RUN is accepted. See CMD MODE MON (37) and EXT THERM SW (36).
BX MON	{25}	N	Status indication of if coast-to-stop is currently commanded.
BX CMD	{26}	Y	Command to coast -to-stop the motor.
DCB MON	{27}	N	Status indication of whether drive is commanded to DC Brake
DCB CMD	{28}	Y	Command to DC Brake drive when drive frequency reaches zero. Used to hold motor rotor in stopped position. Independent of DC Injection Braking. Refer to motor over-heating precautions in Drive Instruction manual. (Requires correct setting of FC32:X4)
DAY.NIGHT	{29}	Y	This point is present, but not used in this application.
ACCEL TIME 1 (FC05)	31	Y	Configured amount of time (Sec) in which the motor ramps from zero to Maximum Speed. Establishes a Hz/Sec rate.
DECEL TIME 1 (FC06)	32	Y	Configured amount of time (Sec) in which the motor ramps from Maximum Speed to zero. Establishes a Hz/Sec rate
EXT THERM SW	{36}	N	Indicates if physical interlocks (THR) are closed at drive cabinet.
CMD MODE MON	{37}	N	Indicates if drive's control (terminal) is currently maintained from CMD subpoints. Otherwise, drive control is maintained from drive's physical terminal strip.
REF MODE MON	{38}	N	Indicates if drive's reference is controlled from subpoint INPUT REF (60). Otherwise, drive reference is maintained from drive's terminal strip or keypad.
FUN MODE MON	{39}	N	Indicates if drive's Function codes are currently command-able from associated subpoints. Otherwise, drive's Function Codes are only 'writeable' from drive's keypad.
Y1 OUTPUT	{40}	N	Indicates state of Physical DO point Y1
Y2 OUTPUT	{41}	N	Indicates state of Physical DO point Y2
Y3OUTPUT	{42}	N	Indicates state of Physical DO point Y3
Y4 OUTPUT	{43}	N	Indicates state of Physical DO point Y4
Y5 OUTPUT	{44}	N	Indicates state of Physical DO point Y5
HIGH FRQ LIM (FC11)	50	Y	Clamp on the maximum Drive output frequency.

Descriptor	Address	Command -able	Description
LOW FRQ LIM (FC12)	51	Y	Clamp on the minimum Drive output frequency.
DRV TRQ LIM (FC15)	52	Y	Clamp on the amount of torque that the Drive provides in the driving direction (value of 999 disables).
JMP FREQ 1 (FC53)	53	Y	Avoidance frequencies to avoid natural mechanical vibration of a particular load.
JMP FREQ 2 (FC54)	54	Y	
JMP FREQ 3 (FC55)	55	Y	
JMP FREQ HYS (FC56)	56	Y	Sets hysteresis range on avoidance frequencies (jump width).
START FREQ (FC57)	57	Y	Starting frequency used to optimize available starting torque.
START HOLD T (FC58)	58	Y	Amount of time (sec) which starting frequency is applied.
INPUT REF	{60}	Y	The setpoint for open-loop speed. Value is commanded in terms of percentage of maximum speed.
X1 CMD	{70}	Y	Subpoints 70-78 are Special function commands. Refer to Table 4.1 – Special function access.
X2 CMD	{71}	Y	
X3 CMD	{72}	Y	
RT1 CMD	{73}	Y	
RT2 CMD	{74}	Y	
UP CMD	{75}	Y	
DN CMD	{76}	Y	
PU CMD	{77}	Y	
VF2 CMD	{78}	Y	
LAST FAULT	{90}	N	Current fault number (See Table 5.2 - Drive Faults).
FAULT	{93}	N	Status indication if a drive fault is currently active.
RESET FAULT	{94}	Y	Commandable reset of current fault (Fault must be corrected before reset is accepted).
ERROR STATUS	{99}	Y	This point is present, but not used in this application.

Notes:

1. Points not listed are not used in this application
2. Point numbers that appear in brackets{} may be unbundled

4.4.1 Status FLN Subpoints

Status FLN subpoints are identified in table 4.3 with a “commandable” indication of N (read/only). These subpoints can be unbundled, but respond to a Field Panel attempt to command with an ‘Operator priority too low’ (0xD7) network response.

4.4.2 Control FLN Subpoints

Control FLN subpoints are identified in table 4.3 with a “commandable” indication of Y (read/write). These subpoints can be unbundled and commanded (Set or Panel_Initialize). Write values out-of-range causes an ‘Invalid value’ (0xFE) network response.

On power-up, the RUN.STOP CMD and INPUT REF subpoint current values are reset to zero regardless of the initial (Panel_Initialize) value. This is to prevent un-expected start up of the drive without network control.

Because of internal buffering, it takes a finite amount of time for a subpoint change to be writen to a drive parameter. Set/Reset command sequences such as that required for the RESET command must be held in each state for at least 100mSec.

4.4.3 Setup FLN Subpoints

The network accessable drive Function Code (FC) parameters such as ACCEL TIME 1 and DECEL TIME 1 are Memorize only parameters. These parameter have no current value and cannot be unbundled. Attempting to write to these parameters when FUN MODE is LOCAL causes an ‘Operator Priority too low’ (0xD7) network response.

4.4.4 Fault FLN Subpoints

If the drive is faulted, both a discrete FLN subpoint FAULT (93) and a fault identification FLN subpoint LAST FAULT (90) can be monitored. Refer to Table 5.2 for the fault code definitions.

CHAPTER 5 - FAULTS AND DIAGNOSTICS

5.1 Option Board Faults (Er5)

An Option Board fault causes the Drive to enter an **Er5** error state. Generally, an Option Board fault is due to an invalid configuration parameter or a Loss-of-communications error. Examine Option Function Code P00 (if enabled) to determine the specific error.

Table 5.1 - Er5 Fault codes
101 - Invalid Id (must be greater than zero)
102 - Invalid Network control (each field must be 0-1)
103 - Invalid Loss-of-communications (must be less than 3)
201 - Connection time-out

5.2 Drive Faults

An enumerated value of the last drive fault is stored in FLN subpoint LAST FAULT(90). The following table gives the definition for each enumerated value. Refer to the AF-300E$ Inverter Instruction manual for more descriptive information on faults.

Table 5.2 - Drive Faults			
Fault Number	**Meaning**	**Fault Number**	**Meaning**
1	Overcurrent during accel (OC1)	12	Overheat [Internal Temp.] (OH3)
2	Overcurrent during decel (OC2)	13	External fault (OH2)
3	Overcurrent steady state (OC3)	14	DB reistor overload (dbH)
4	Ground fault (EF)	15	DC fuse burnout (FUS)
5	Overvoltage during accel (OV1)	16	Memory error (Er1)
6	Overvoltage during decel (OV2)	17	Inverter CPU error (Er3)
7	Overvoltage steady state (OV3)	18	P1 Option card failure (Er4)
8	Low voltage (LV)	19	P1 Option card error (Er5)
9	Thermal overload relay (OL)	20	Keypad panel error (Er6)
10	Inverter overload (OLU)	21	Auto tuning error (Er7)
11	Heatsink overheat (OH1)	22	Keypad panel fault (Er2)

NOTES