User Manual for the
HEC-GV3-P1 Option Card
(Reliance m/n 2LS3000)

FLN Interface Module
for use with the
Reliance Electric VTAC 7 Drive

First Edition,
01 August 1999

MAN0278-01

PREFACE

This manual explains how to use the Horner APG 's FLN Interface Module for use with Reliance Electric VTAC 7 AC Drive.

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LIMITED WARRANTY AND LIMITATION OF LIABILITY

Horner APG, LLC., ("HE-APG") warrants to the original purchaser that the FLN Interface Module (HEC- GV3-P1) manufactured by HE-APG for use with Reliance Electric's VTAC 7 AC Drive is free from defects in material and workmanship under normal use and service. The obligation of HE-APG under this warranty shall be limited to the repair or exchange of any part or parts which may prove defective under normal use and service within two (2) years from the date of manufacture or eighteen (18) months from the date of installation by the original purchaser whichever occurs first, such defect to be disclosed to the satisfaction of HE-APG after examination by HE-APG of the allegedly defective part or parts. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES AND HE-APG NEITHER ASSUMES, NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR HE-APG, ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF THIS FLN Interface Module for use with Reliance Electric's VTAC 7 AC Drive. THIS WARRANTY SHALL NOT APPLY TO THIS FLN Interface Module for use with Reliance Electric's VTAC 7 AC Drive OR ANY PART THEREOF WHICH HAS BEEN SUBJECT TO ACCIDENT, NEGLIGENCE, ALTERATION, ABUSE, OR MISUSE. HE-APG MAKES NO WARRANTY WHATSOEVER IN RESPECT TO ACCESSORIES OR PARTS NOT SUPPLIED BY HE-APG. THE TERM "ORIGINAL PURCHASER", AS USED IN THIS WARRANTY, SHALL BE DEEMED TO MEAN THAT PERSON FOR WHOM THE FLN Interface Module for use with Reliance Electric's VTAC 7 AC Drive IS ORIGINALLY INSTALLED. THIS WARRANTY SHALL APPLY ONLY WITHIN THE BOUNDARIES OF THE CONTINENTAL UNITED STATES.

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To obtain warranty service, return the product to your distributor with a description of the problem, proof of purchase, postage paid, insured and in a suitable package. problem, proof-of-purchase, postage 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 FLN Interface Module for use with Reliance Electric VTAC 7 AC Drive to appropriately design the end system, to appropriately integrate the Reliance Electric VTAC 7 AC Drive 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

Horner's FLN (Floor Level Network) Interface Module (HEC-GV3-P1/Reliance m/n 2LS3000) allows a Reliance VTAC 7 AC Drive to be upgraded with Landis & Staefa's FLN communications capability. This Interface Module board functions as a FLN "device" and provides the VTAC 7 with the ability to be commanded and monitored over a FLN network. Commanding and monitoring are easily accomplished through a Landis & Staefa System Field Control Panel by accessing the FLN Interface Module board application subpoints.

The FLN Interface Module board requires installation in the VTAC 7 just below the regulator board. Field installation is possible with the removal of a few screws, installation of the card and connection to the VTAC 7 regulator board through a single existing flexible ribbon cable.

In normal operation, most of the's drive functionality can be accessed over the FLN network. In many applications, there may be only a network interface connection, hard-wired emergency stop (function loss input), and three-phase input and output power wiring. Network control functions include: motion control, speed control and fault recovery. Network status functions include: drive motion, motor run-time parameters and fault information. Additionally, the FLN Interface Module board allows access to the Outer Control Loop (OCL) drive function which allows the drive to perform local PI speed control (optionally configured vector mode only). The drive's Tune/Config type parameters are NOT accessible over the network and can only be modified though the drive's keypad.

1.2 Product Description

The mechanical and electrical characteristics of the FLN Interface Module board are described as follows:

a. Mechanical Description

The FLN Communication Option board is a printed circuit assembly that mounts inside a VTAC 7 Controller. It connects to the regulator board within the controller via a ribbon cable. It has a standard DB15 connector which is used to provide connection to a FLN cable (twisted pair with shield).

b. Electrical Description

The FLN Interface Module board is microprocessor controlled and communicates with the VTAC 7 controller board through a high-speed parallel interface. The board contains a watchdog timer which will fault the drive on a hardware failure. Visual indication of Module and Network status is provided by a pair of diagnostic LEDs. Communications occurs through a non-isolated RS485 communications port which contains open-circuit bias and an optionally enabled 120 ohm terminating resister.

1.3 Additional Information

The focus of this manual is to provide the information required for the initial installation of the FLN Interface Module board in the VTAC 7. Also as part of the installation process, the user must refer to the following document for initialing the drives configuration parameters.

Rockwell Automation/Reliance Electric,
Instruction Manual D2-3372,
VTAC 7™ Users Guide

Landis & Staefa distributes (internally only) an Equipment Controller Applications Manual which includes Application 2710. This application describes the functionality of the FLN Interface Module as it applies the Landis & Staefa Field Panels.

CHAPTER 2: INSTALLATION

2.1 Determining Procedure (Drive) for FLN Interface Module Installation

The FLN Interface module installation procedure differs depending on the drive type. Use table 2.1 to locate the appropriate procedure. Once the option card is installed, refer back to Section 2.10 for terminating the FLN cable to the Option card.

Table 2.1 – Locating the Appropriate Installation Procedure

Rating	Drive Module Number	Use Procedure in Section …
1 HP	1H21xx 1H24xx 1V21xx 1V24xx	2.4
1 HP	1H41xx 1H44xx 1V41xx 1V44xx	2.2
2 HP	2H21xx 2H24xx 2V21xx 2V24xx	2.4
2 HP	2H41xx 2H44xx 2V41xx 2V44xx	2.2
3 HP	3H21xx 3H24xx 3V21xx 3V24xx	2.4
3 HP	3H41xx 3H44xx 3V41xx 3V44xx	2.2
5 HP	5H21xx 5H24xx 5V21xx 5V24xx	2.4
5 HP	5H41xx 5H44xx 5V41xx 5V44xx	2.2
7.5 HP	7H21xx 7H22xx 7V21xx 7V22xx	2.4
7.5 HP	7H41xx 7H42xx 7V41xx 7V42xx	2.3
10 HP	10H21xx 10H22xx 10V21xx 10V22xx	2.4
10 HP	10H41xx 10H42xx 10V41xx 10V42xx	2.3
15 HP	15H21xx 15H22xx 15V21xx 15V22xx	2.4
15 HP	15H41xx 15H42xx 15V41xx 15V42xx	2.6
20 HP	20H21xx 20H22xx 20V21xx 20V22xx	2.4
20 HP	20H41xx 20H42xx 20V41xx 20V42xx	2.6
25 HP	25H41xx 25H42xx 25V41xx 25V42xx	2.6
30 HP	30W21xx 30V20xx	2.5
30 HP	30H41xx 30H42xx 30V41xx 30V42xx	2.6
40 HP	40W21xx 40V20xx	2.5
40 HP	40H41xx 40H42xx 40V41xx 40V42xx	2.6

Rating	Drive Module Number	Use Procedure in Section …
50 HP	50W21xx 50V20xx	2.5
50 HP	50H41xx 50H42xx 50V41xx 50V42xx	2.6
50 HP	50R41xx 50T41xx	2.7
60 HP	60W21xx 60V20xx	2.5
60 HP	60H41xx 60H42xx 60V41xx 60V42xx	2.6
75 HP	75W21xx 75V20xx	2.5
75 HP	75H41xx 75W41xx 75V40xx	2.5
75 HP	75R41xx 75T41xx	2.7
100 HP	100H21xx 100V21xx	2.5
100 HP	100H41xx 100W41xx 100V40xx	2.5
125 HP	125H41xx 125W41xx 125V40xx	2.5
125 HP	125R41xx 125T41XX	2.7
150 HP	150H41xx 150W41xx 150V40xx	2.5
200 HP	200H41xx 200W41xx 200V40xx	2.5
250 HP	250H41xx 250V41xx	2.8
300 HP	300H41xx 300V41xx	2.8
350 HP	350H41xx 350V41xx	2.8
400 HP	400H41xx 400V41xx	2.8
2 to 15 Amp	31ER40xx 31ET40xx 38ER40xx 38ET40xx 55ER40xx 55ET40xx 85ER40xx 85ET40xx 126ER40xx 126ET40xx 150ER40xx 150ET40xx	2.9
24 to 30 Amp	240ER40xx 240ET40xx 300ER430xx 300ET40xx	2.9

2.2 Installation in 1 to 5HP @ 460VAC Drives

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive is a line voltage when connected to incoming AC power. Disconnect, lock out, and tag all incoming power to the drive before performing the following procedure. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnection input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any interval components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains printed circuit boards that are static-sensitive. An anti-static wristband should be worn by any person who touches the drive's components, connectors or wiring. Erratic machine operation and damage to.

Use this procedure to install the FLN Interface Module in the drives listed in table 2.2.

Table 2.2 – Model Numbers for 1 to 5 HP @ 460VAC Drives	
1H41xx 1V41xx 1H44xx 1V44xx	3H41xx 3V41xx 3H44xx 3V44xx
2H41xx 2V41xx 2H44xx 2V44xx	5H41xx 4V41xx 5H44xx 5V44xx

If the drive is panel-mounted, this procedure will be easier to perform if the drive is removed from the panel.

Unless otherwise indicated, keep all hardware that is removed. You will need it for reassembly. This includes screws, lock washers, and rivets.

Important: Read and understand the warning labels on the outside of the drive before proceeding.

2.2.1. Shut Down the Drive

a. Disconnect, lock out, and tag all incoming power to the drive.

b. Wait five minutes for the DC bus capacitors to discharge.

c. Remove the cover by loosening the four cover screws.

Important: Read and understand the warning labels on the inside of the drive before proceeding.

2.2.2 Verify that the DC Bus Capacitors are Discharged

a. Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

b. Ensure that the DC bus capacitors are discharged. To check DC bus potential:

i. Stand on a non-conductive surface and wear insulated gloves.

ii. Use a voltmeter to measure the DC bus potential at the DC bus power terminals shown in figure 2.2.

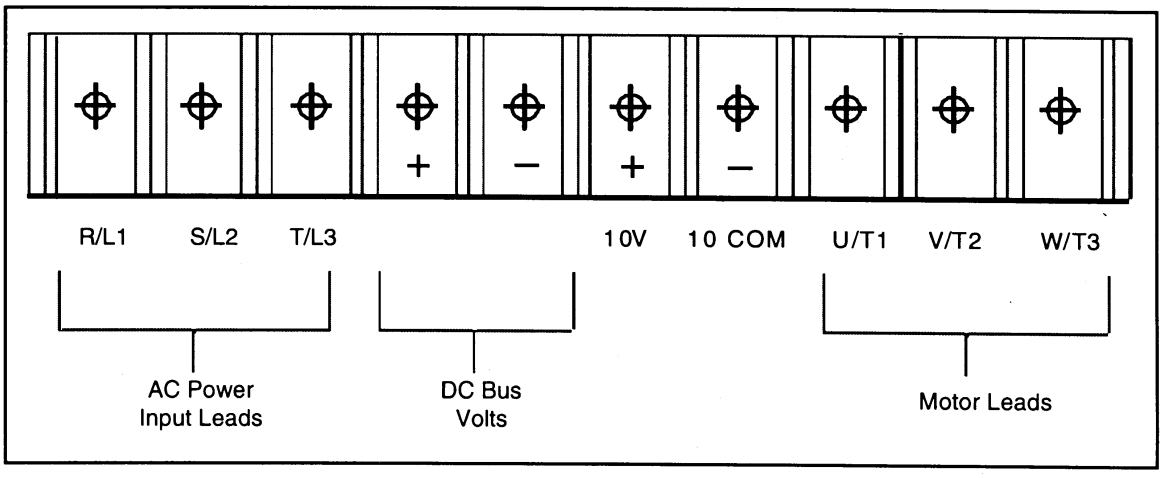

Figure 2.2 – DC Bus Voltage Terminals (1 to 5 HP @ 460V)

2.2.3. Remove the Keypad Bracket from the Drive

a. Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

b. Use a magnetic screwdriver to remove the three M4 x 10 screws that fasten the bottom of the keypad support bracket to the drive heat sink.

Important: The keypad support bracket is connected to the drive by wiring. Do not lift the bracket completely out of the drive to prevent damage to wiring.

c. Spread the retaining clips on the 26-conductor Regulator board ribbon cable connector to disconnect it from the Current Feedback board. The Current Feedback board is located on the right below the keypad.

d. Move the keypad support bracket aside.

e. Pinch the retaining clip that is through the center of the Current Feedback board and carefully pull out the Current Feedback board.

f. Unplug the internal fan assembly power connector (CONN7) from the drive.

2.2.4. Install the FLN Interface Module in the Keypad Bracket

Refer to figure 2.3 for component locations.

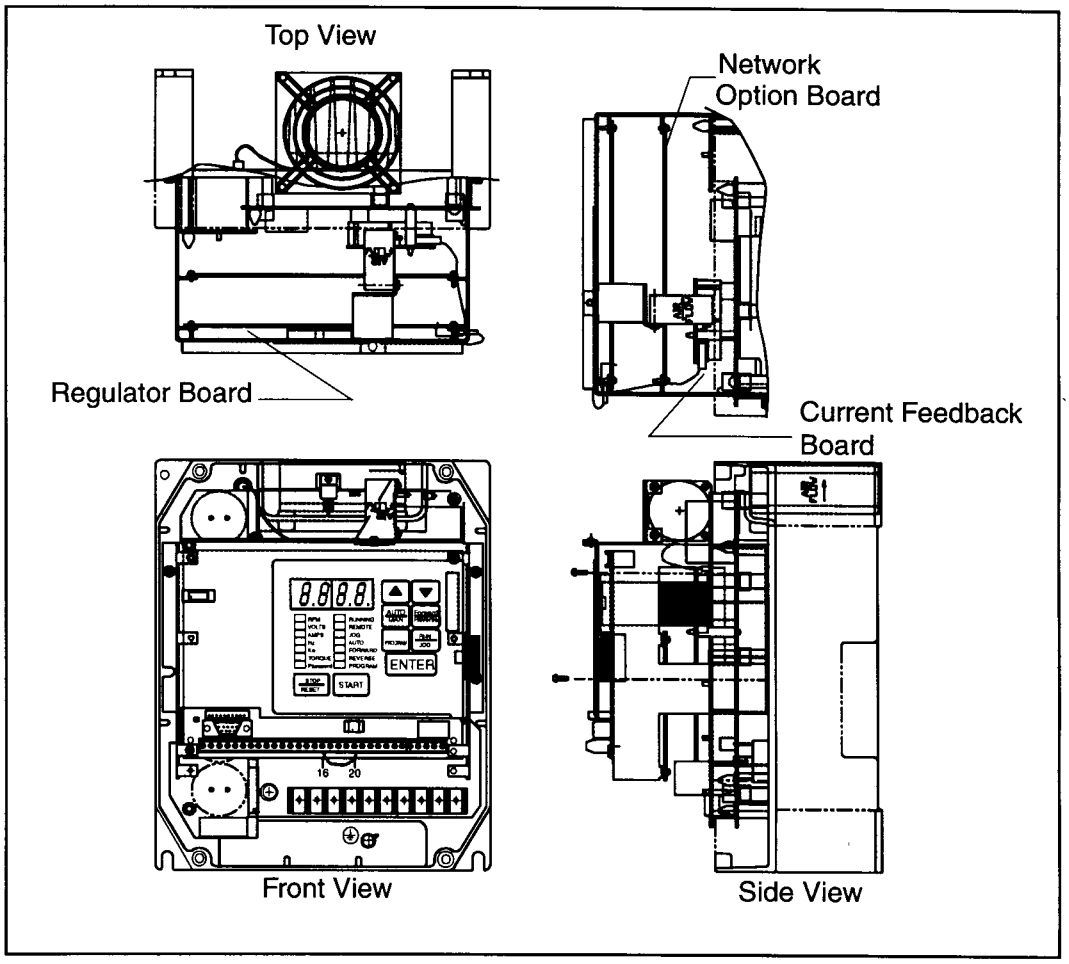

Figure 2.3 – 1 to 5 HP @ 460V

a. Remove the FLN Interface Module from its anti-static wrapper.

b. Align the key on the connector of the FLN Interface Module ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

c. Route the 26-conductor ribbon cable for the Current Feedback board out of the side of the keypad bracket.

d. Align the FLN Interface Module on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the FLN Interface Module.

e. Fasten the right side of the FLN Interface Module to the keypad bracket. Use the two metal M3 screws and lock washers for grounding.

Important: You must use the lock washers to properly ground the option board. Improper grounding of the option board can result in erratic operation of the drive.

f. Fasten the left side of the FLN Interface Module to the keypad bracket using the two plastic rivets.

2.2.5. Reinstall the Keypad Bracket in the Drive

a. Reconnect the internal fan assembly power connector (CONN7) to the drive. Align the key on the connector with the slot in the receptacle. Press the connector into position.

ATTENTION: Proper alignment of the Current Feedback board is critical. Verify that the connector pins on the Current Feedback board are correctly aligned with their corresponding connectors on the drive. Failure to observe this precaution can result in bodily injury.

b. Reinstall the Current Feedback board. Carefully align the two sets of connector pins on the Current Feedback board with their matching connectors on the drive. Gently press the board into place. The board should go in easily. If you feel resistance, a pin might be bent or misaligned. Recheck alignment and retry installation.

c. Inspect the Current Feedback board connector thoroughly for bent or misaligned pins.

d. Align the keypad support bracket with the mounting holes in the drive heat sink. Fasten the bracket with the three M4 x 10 screws removed earlier.

e. Align the Regulator board's 26-conductor ribbon cable connector with the Current Feedback board connector. Press it in until it locks into position.

f. Route the Network Drop Cable through the left-most opening at the bottom of the drive.

g. Terminate the Network Drop Cable as described in Section 2.10.

h. Reconnect any wiring that was removed from the Regulator board.

i. **NEMA 4X/12 drives only:** Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

j. Reinstall the cover. Align all cover screws into the heat sink before tightening any of them.

To maintain the integrity of NEMA 4X/12 drives, sequentially tighten the cover screws to ensure even compression of the gaskets. Do not exceed 2.2Nm (20in-lb) of torque on these screws.

This completes the hardware installation of the FLN Interface Module.

2.3 Installation in 7.5 to 10HP @ 460VAC Drives

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive is a line voltage when connected to incoming AC power. Disconnect, lock out, and tag all incoming power to the drive before performing the following procedure. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnection input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any interval components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains printed circuit boards that are static-sensitive. An anti-static wrist band should be worn by any person who touches the drive's components, connectors or wiring. Erratic machine operation and damage to,

Use this procedure to install the FLN Interface Module in drives with model numbers 7H41xx, 7V41xx, 7H42xx, 7V42xx, 10H41xx, 10V41xx, 10H42xx or 10V42xx.

If the drive is panel-mounted, this procedure will be easier to perform if the drive is removed from the panel.

Unless otherwise indicated, keep all hardware that is removed. You will need it for reassembly. This includes screws, lock washers, and rivets.

Important: Read and understand the warning labels on the outside of the drive before proceeding.

2.3.1. Shut Down the Drive

a. Disconnect, lock out, and tag all incoming power to the drive.

b. Wait five minutes for the DC bus capacitors to discharge.

c. Remove the cover by loosening the four cover screws.

Important: Read and understand the warning labels on the inside of the drive before proceeding.

2.3.2. Verify That the DC Bus Capacitors are Discharged

a. Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

b. Ensure that the DC bus capacitors are discharged. To check DC bus potential:

i. Stand on a non-conductive surface and wear insulated gloves.

ii. Use a voltmeter to measure the DC bus potential at the DC bus power terminals shown in figure 2.4.

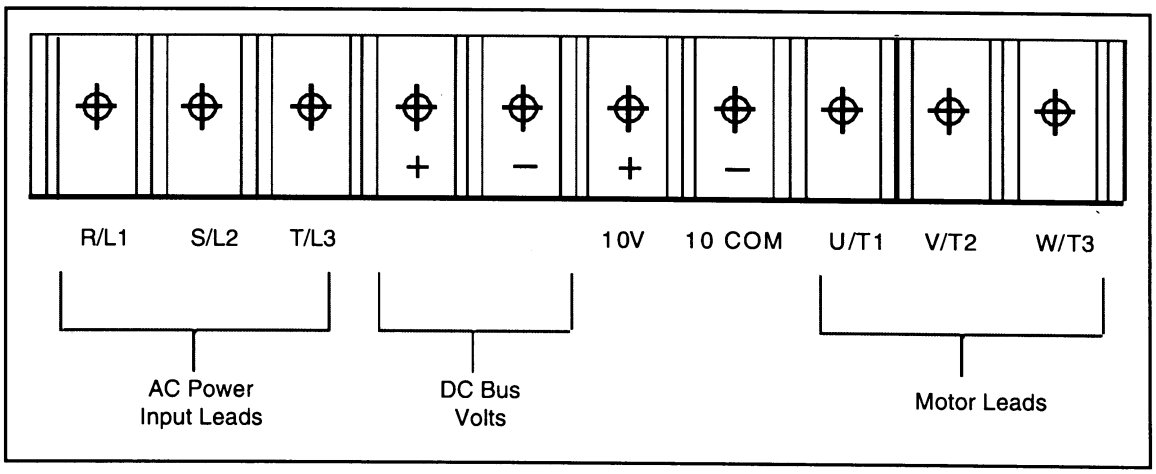

Figure 2.4 – DC Bus Voltage Terminal (7.5 to 10HP)

2.3.3. Remove the Keypad Bracket from the Drive

a. Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

b. Loosen the thumb screw on the left side of the keypad bracket. Hold the bracket on the left and lift the bracket up and to the left to separate it from the keypad support bracket.

Important: The bracket is connected to the drive by wiring. Do not attempt to lift the bracket out completely as this can damage or pull out wiring. Tie up or support the bracket to prevent damage to the wiring.

c. Spread the retaining clips on the 26-conductor Regulator board ribbon cable connector to disconnect it from the Current Feedback board. The Current Feedback board is located on the right below the keypad.

2.3.4. Install the FLN Interface Module in the Keypad Bracket

Refer to figure 2.5 for component locations.

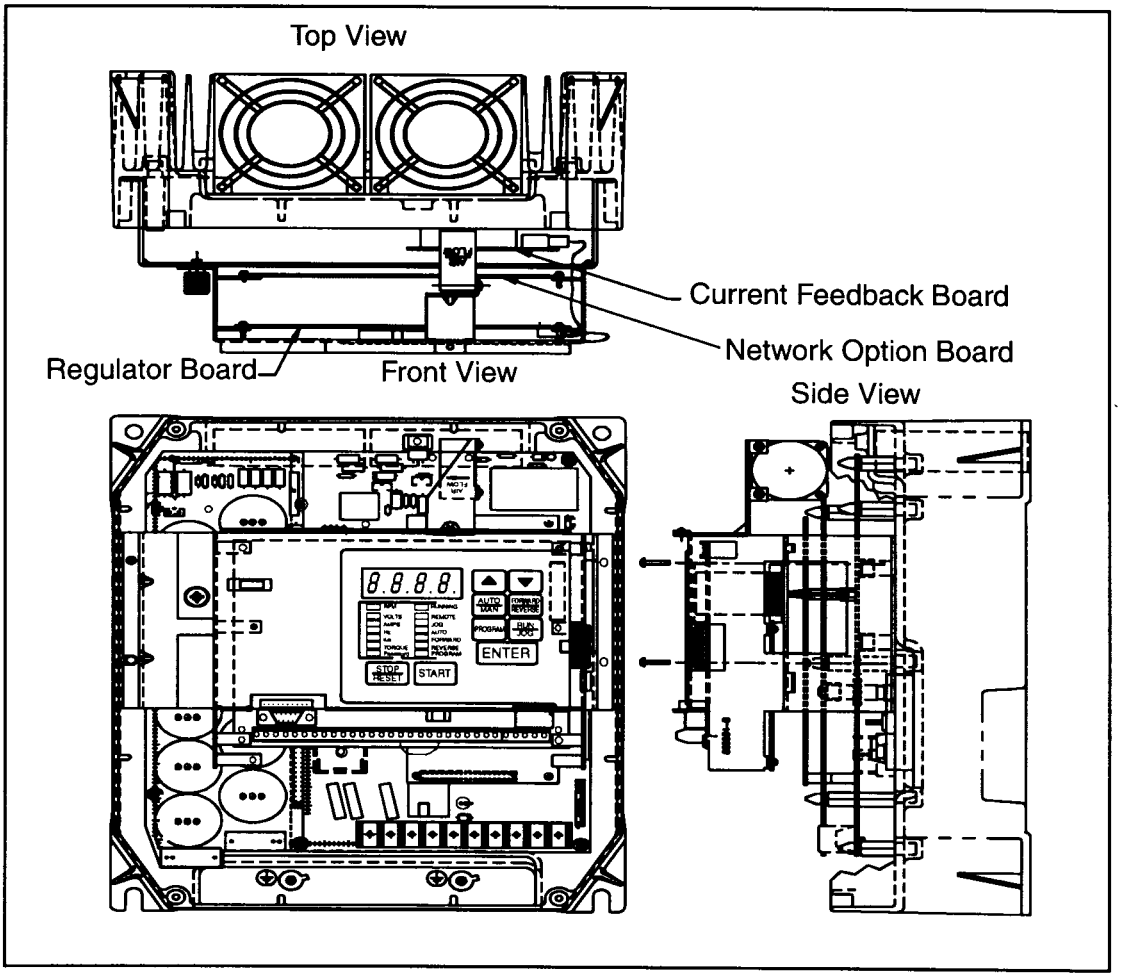

Figure 2.5 – 7.5 to 10 HP @ 460V

a. Remove the FLN Interface Module from its anti-static wrapper.

b. Align the key on the connector of the FLN Interface Module ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

c. Route the 26-conductor ribbon cable for the Current Feedback board out of the side of the keypad bracket.

d. Align the FLN Interface Module on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the FLN Interface Module.

e. Fasten the right side of the FLN Interface Module to the keypad bracket. Use the two metal M3 screws and lock washers for grounding.

Important: You must use the lock washers to properly ground the option board. Improper grounding of the option board can result in erratic operation of the drive.

f. Fasten the left side of the FLN Interface Module to the keypad bracket using the two plastic rivets.

g. Reconnect the keypad bracket to the keypad support bracket by inserting the mounting tabs into the slots in the support bracket and tightening the thumbscrew.

h. Align the Regulator board's 26-conductor ribbon cable connector with the Current Feedback board connector. Press it in until it locks into position.

2.3.5. Reinstall the Keypad Support Bracket in the Drive

a. Route the Network Drop Cable through the left-most opening at the bottom of the drive.

b. Terminate the Network Drop Cable as described in Section 2.10.

c. Reconnect any wiring that was removed from the Regulator board.

d. **NEMA 4X/12 drives only:** Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

e. Reinstall the cover. Align all cover screws into the heat sink before tightening any of them.

To maintain the integrity of NEMA 4X/12 drives, sequentially tighten the cover screws to ensure even compression of the gaskets. Do not exceed 2.2Nm (20in-lb) of torque on these screws.

This completes the hardware installation of the FLN Interface Module.

2.4 Installation in 1 to 20HP @ 230VAC Drives

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive is a line voltage when connected to incoming AC power. Disconnect, lock out, and tag all incoming power to the drive before performing the following procedure. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnection input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any interval components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains printed circuit boards that are static-sensitive. An anti-static wrist band should be worn by any person who touches the drive's components, connectors or wiring. Erratic machine operation and damage to.

Use this procedure to install the FLN Interface Board in the drives listed in table 2.3.

Table 2.3 – Model Numbers for 1 to 20 HP @ 230 VAC Drives	
1H21xx 1V21xx 1H24xx 1V24xx	7H21xx 7V21xx 7H22xx 7V22xx
2H21xx 2V21xx 2H24xx 2V24xx	10H21xx 10V21xx 10H22xx 10V22xx
3H21xx 3V21xx 3H24xx 3V24xx	15H21xx 15V21xx 15H22xx 15V22xx
5H21xx 5V21xx 5H24xx 5V24xx	20H21xx 20V21xx 20H22xx 20V22xx

If the drive is panel-mounted, this procedure will be easier to perform if the drive is removed from the panel.

Unless otherwise indicated, keep all hardware that is removed. You will need it for reassembly. This includes screws, lock washers, and rivets.

Important: Read and understand the warning labels on the outside of the drive before proceeding.

2.4.1. Shut Down the Drive

a. Disconnect, lock out, and tag all incoming power to the drive.

b. Wait five minutes for the DC bus capacitors to discharge.

c. Remove the cover by loosening the four cover screws.

Important: Read and understand the warning labels on the inside of the drive before proceeding.

2.4.2. Verify That the DC Bus Capacitors are Discharged

a. Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

b. Ensure that the DC bus capacitors are discharged. To check DC bus potential:

   i. Stand on a non-conductive surface and wear insulated gloves.

   ii. Use a voltmeter to measure the DC bus potential at the DC bus power terminals shown in figure 2.6.

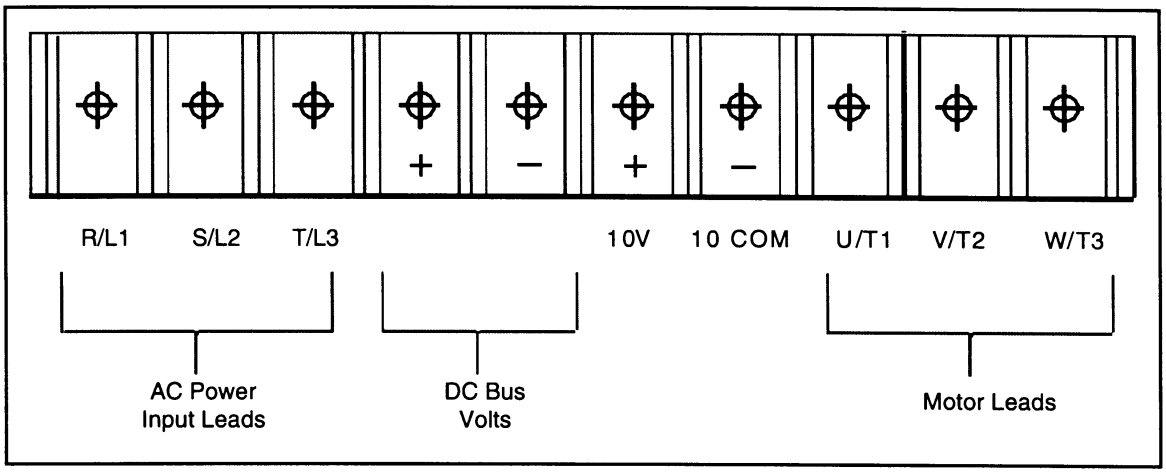

Figure 2.6 – DC Bus Voltage Terminals (1 to 20 HP @ 230V)

2.4.3. Remove the Keypad Bracket from the Drive

a. Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

b. Use a magnetic screwdriver to remove the M4 x 10 screws that fasten the bottom of the keypad support bracket to the drive heat sink.

c. Spread the retaining clips on the Regulator board ribbon cable (on the right side) to disconnect it from the base board.

d. Remove the keypad bracket. Place it with the keypad down on a flat surface. If you cannot lay it flat, tie it up to prevent damage to wiring.

2.4.4. Install the FLN Interface Module in the Keypad Bracket

Refer to figure 2.7 for component locations.

a. Remove the FLN Interface Module from its anti-static wrapper.

b. Align the key on the connector of the FLN Interface Module ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

c. Route the other ribbon cable out of the side of the keypad bracket.

d. Align the FLN Interface Module on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the FLN Interface Module.

e. Fasten the right side of the FLN Interface Module to the keypad bracket. Use the two metal M3 screws and lock washers for grounding.

Important: You must use the lock washers to properly ground the option board. Improper grounding of the option board can result in erratic operation of the drive.

f. Fasten the left side of the FLN Interface Module to the keypad bracket using the two *plastic rivets.

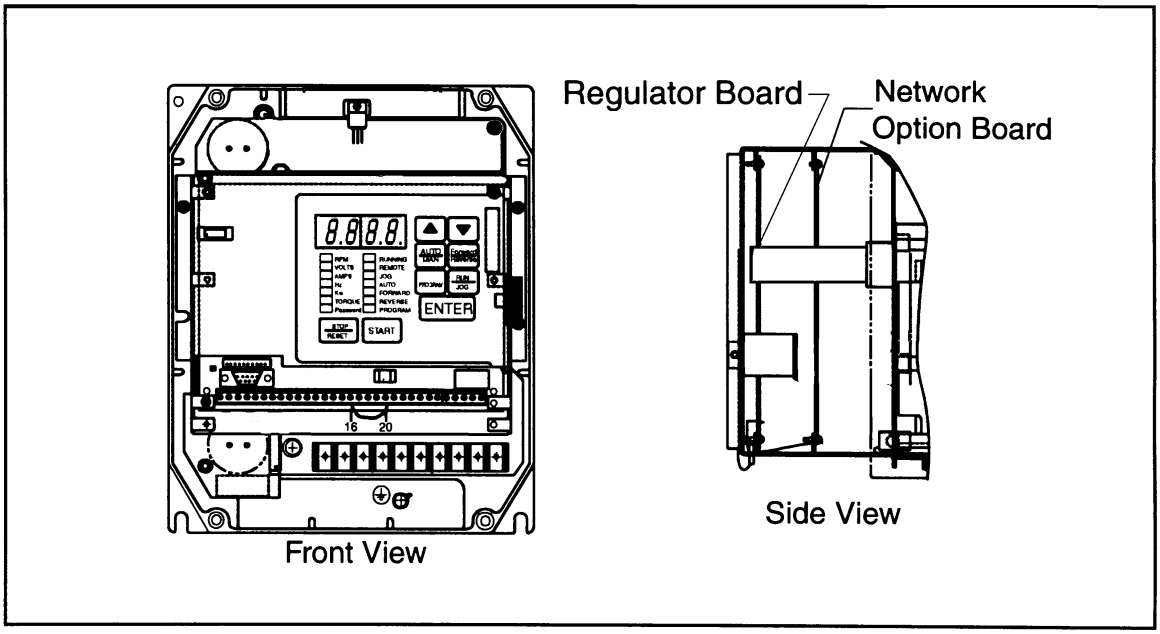

Figure 2.7 – 1 to 20 HP @ 230V

2.4.5. Reinstall the Keypad Bracket in the Drive

a. Place the keypad support bracket back into position. Use a magnetic screwdriver to fasten it to the heatsink with the screws removed earlier.

b. Realign the 26-conductor ribbon cable connector with the connector inside the slot in the keypad support bracket. Carefully press the ribbon cable connector in until the retaining clips lock into place.

c. Route the Network Drop Cable through the left-most opening at the bottom of the drive.

d. Terminate the Network Drop Cable as described in Section 2.10.

e. Reconnect any wiring that was removed from the Regulator board.

f. **NEMA 4X/12 drives only:** Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

g. Reinstall the cover. Align all cover screws into the heat sink before tightening any of them.

To maintain the integrity of NEMA 4X/12 drives, sequentially tighten the cover screws to ensure even compression of the gaskets. Do not exceed 2.2Nm (20in-lb) of torque on these screws.

This completes the hardware installation of the FLN Interface Module.

2.5 Installation in 30 to 100HP @ 230VAC and 75 to 200HP @ 460VAC Drives

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive is a line voltage when connected to incoming AC power. Disconnect, lock out, and tag all incoming power to the drive before performing the following procedure. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnection input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any interval components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains printed circuit boards that are static-sensitive. An anti-static wrist band should be worn by any person who touches the drive's components, connectors or wiring. Erratic machine operation and damage to.

Use this procedure to install the FLN Interface Module in the drives listed in table 2.4.

Table 2.4 – Model Numbers for:

30 to 100HP @ 230VAC	75 to 200 @ 460VAC
30W21xx 30V20xx	75H41xx 75W41xx 75V40xx
40W21xx 40V20xx	
50W21xx 50V20xx	100H41xx 100W41xx 100V40xx
60W21xx 60V20xx	
75W21xx 75V20xx	125H41xx 125W41xx 125V40xx
100H21xx 100V21xx	
	150H41xx 150W41xx 150V40xx
	200H41xx 200W41xx 200V40xx

Unless otherwise indicated, keep all hardware that is removed. You will need it for reassembly. This includes screws, lock washers, and rivets.

Important: Read and understand the warning labels on the outside of the drive before proceeding.

2.5.1. Shut Down the Drive

a. Disconnect, lock out, and tag all incoming power to the drive.

b. Wait five minutes for the DC bus capacitors to discharge.

2.5.2. Verify That the DC Bus Capacitors are Discharged

a. Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

b. Ensure that the DC bus capacitors are discharged. To check DC bus potential:

i. Stand on a non-conductive surface and wear insulated gloves.

ii. Use a voltmeter to measure the DC bus potential at the DC bus power terminals shown in figure 2.8.

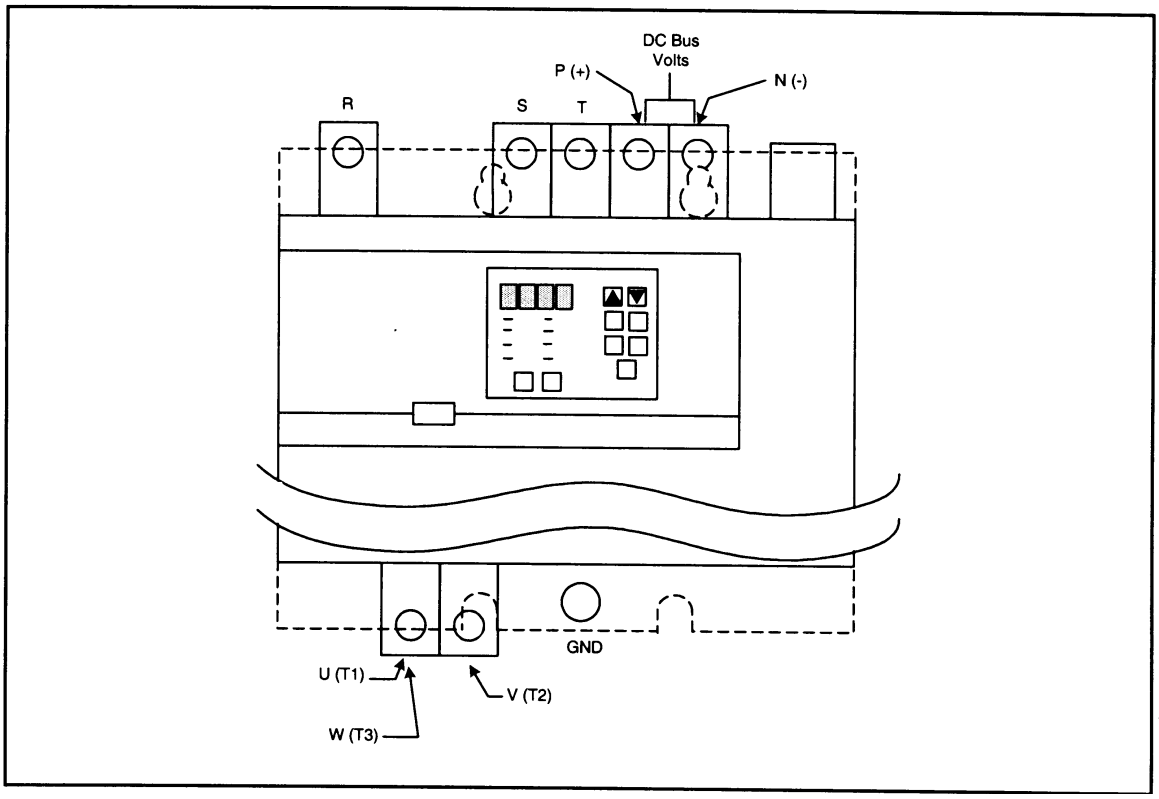

Figure 2.8 – DC Bus Voltage Terminals (30 to 100 HP @ 230VAC and 75 to 200 HP @ 460VAC)

2.5.3. Remove the Keypad Bracket from the Drive

a. If the drive has:

- **A Regulator board cover and terminal cover:** Remove the three M4 screws from the Regulator board cover. Remove the cover. See figure 2.9.

- **A terminal cover only:** If you have this type of drive, this procedure is easier to perform if you lay the drive on its side. Remove the side cover from the drive. Use a long magnetized screwdriver to unfasten the four screws that hold the keypad bracket in.

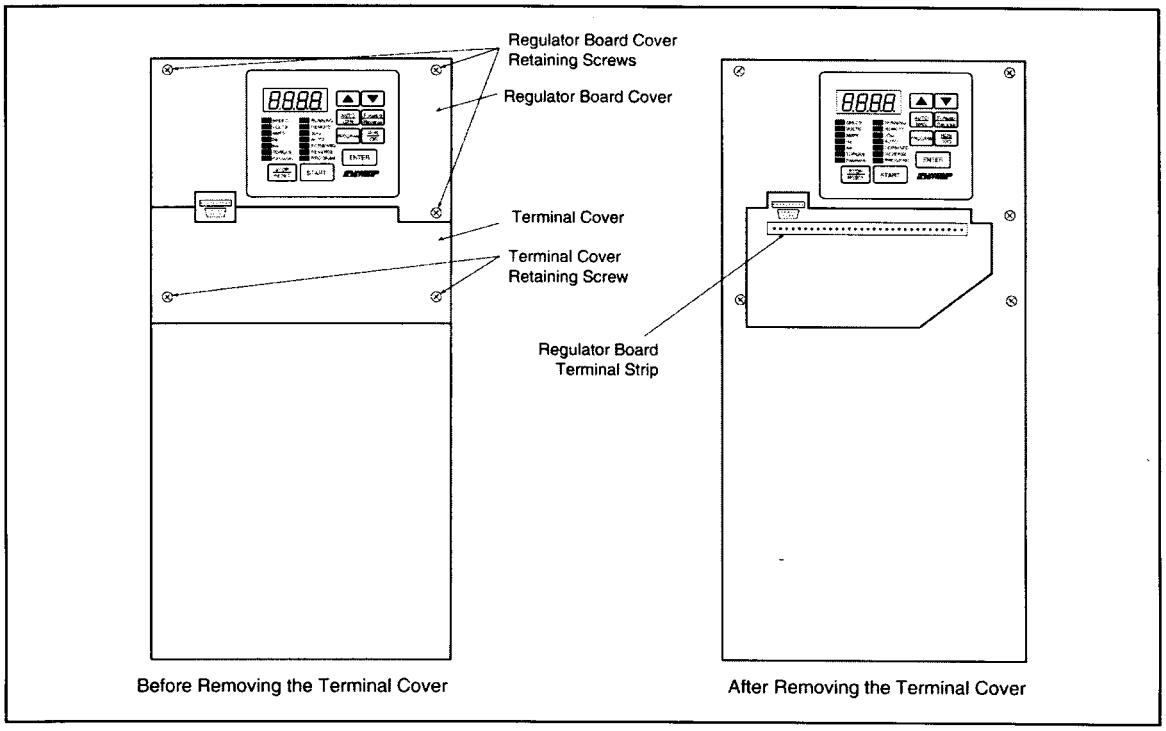

Figure 2.9 – Location of Terminal Cover and Regulator Board Cover in 30 to 100 HP @ 230VAC and 75 to 200 HP @ 460VAC

b. Remove the terminal cover, which is below the keypad and fastened with two M4 screws. See figure 2.9.

c. Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

d. Pull the keypad assembly partly out of the drive. Spread the retaining clips on the Regulator board ribbon cable (on the right side) to disconnect it from the base board. See figure 2.10.

e. Remove the keypad bracket. Place it with the keypad down on a flat surface. If you cannot lay it flat, tie it up to prevent damage to wiring.

2.5.4. Install the FLN Interface Module in the Keypad Bracket

Refer to figures 2.9 and 2.10.

a. Remove the FLN Interface Module from its anti-static wrapper.

b. Align the key on the connector of the FLN Interface Module ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

c. Route the other ribbon cable out of the side of the keypad bracket.

d. Align the FLN Interface Module on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the FLN Interface Module.

e. Fasten the right side of the FLN Interface Module to the keypad bracket. Use the two metal M3 screws and lock washers for grounding.

Important: You must use the lock washers to properly ground the option board. Improper grounding of the option board can result in erratic operation of the drive.

f. Fasten the left side of the FLN Interface Module to the keypad bracket using the two plastic rivets.

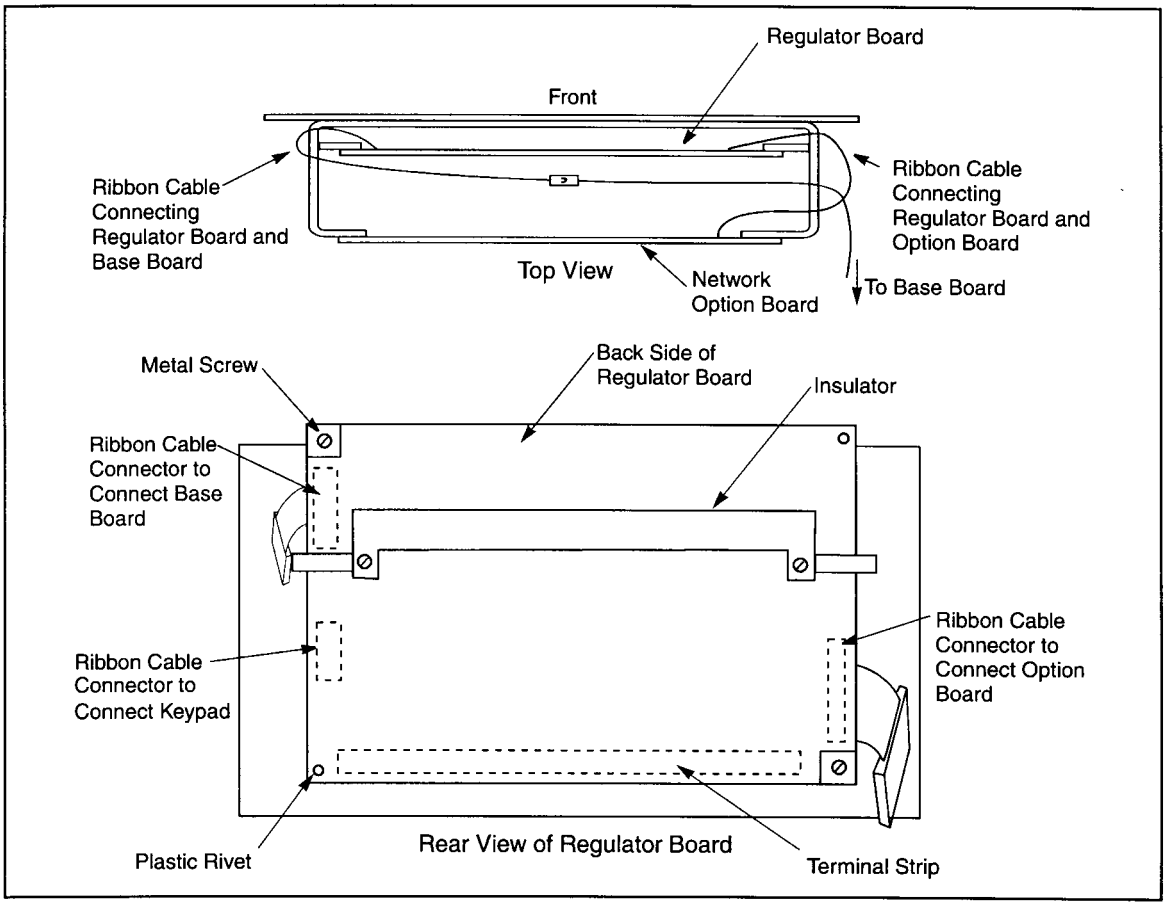

Figure 2.10 – Regulator Board's Connection to Option Board, Keypad and Base Board

2.5.5. Reinstall the Keypad Bracket in the Drive

a. Align the Regulator board ribbon cable connector with the connector to the base board. Carefully press the ribbon cable connector in until the retaining clips lock into place.

b. Place the keypad bracket back into position.

c. If the drive has:

- **A Regulator board cover and terminal cover:** Replace the Regulator board cover. Fasten it using the three M4 screws removed earlier.

- **Only a terminal cover:** Use a long magnetized screwdriver to fasten the four screws that hold the keypad bracket. Replace the side cover on the drive.

d. Route the Network Drop Cable through the left-most opening at the bottom of the drive.

e. Terminate the Network Drop Cable as described in Section 2.10.

f. Reconnect any wiring that was removed from the Regulator board.

g. Replace the terminal cover (below the keypad). Fasten it using the two M4 screws removed earlier.

This completes the hardware installation of the FLN Interface Module.

2.6 Installation in 15 to 60HP @ 460V Drives

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive is a line voltage when connected to incoming AC power. Disconnect, lock out, and tag all incoming power to the drive before performing the following procedure. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnection input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any interval components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains printed circuit boards that are static-sensitive. An anti-static wrist band should be worn by any person who touches the drive's components, connectors or wiring. Erratic machine operation and damage to.

Use this procedure to install the FLN Interface Module in drives with the model numbers listed in table 2.5.

Table 2.5 – Model Numbers for:	
15H41xx 15V41xx 15H42xx 15V42xx	40H41xx 40V41xx 40H42xx 40V42xx
20H41xx 20V41xx 20H42xx 20V42xx	50H41xx 50V41xx 50H42xx 50V42xx
25H41xx 25V41xx 25H42xx 25V42xx	60H41xx 60V41xx 60H42xx 60V42xx
30H41xx 30V41xx 30H42xx 30V42xx	

Unless otherwise indicated, keep all hardware that is removed. You will need it for reassembly. This includes screws, lock washers and rivets.

If the drive is panel-mounted, this procedure will be easier to perform if the drive is removed from the panel.

Important: Read and understand the warning labels on the outside of the drive before proceeding.

2.6.1. Shut Down the Drive

a. Disconnect, lock out, and tag all incoming power to the drive.

b. Wait five minutes for the DC bus capacitors to discharge.

c. Remove the cover by loosening the four cover screws.

Important: Read and understand the warning labels on the inside of the drive before proceeding.

2.6.2. Verify That the DC Bus Capacitors are Discharged

a. Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

b. Ensure that the DC bus capacitors are discharged. To check DC bus potential:

   i. Stand on a non-conductive surface and wear insulated gloves.

   ii. Use a voltmeter to measure the DC bus potential at the DC bus power terminals as shown in figures 2.11 (15 to 25 HP) and 2.12 (25 to 60 HP).

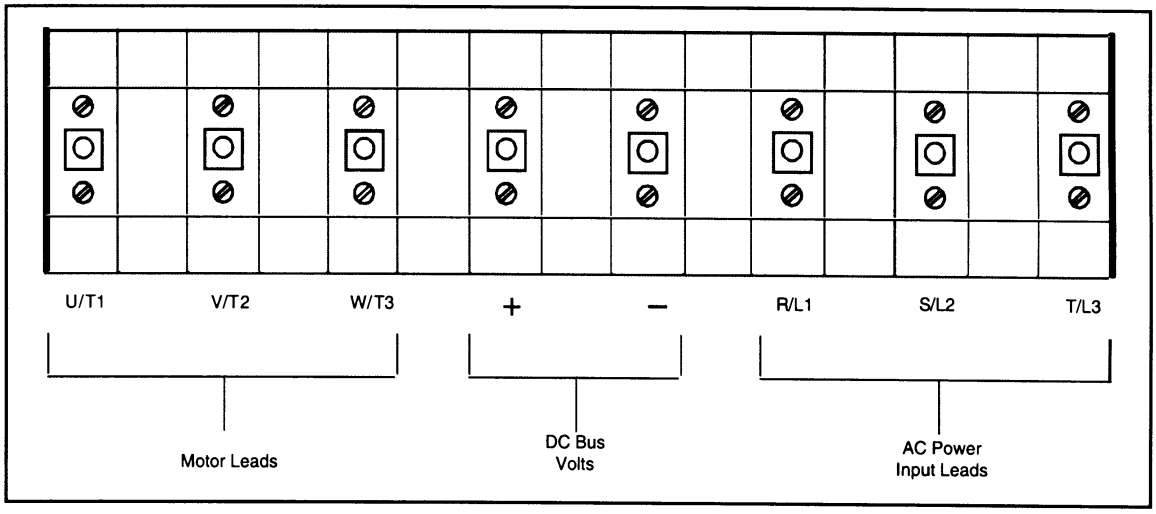

Figure 2.11 – DC Bus Voltage Terminals (15 to 25 HP @ 460V)

2.6.3. Remove the Keypad Bracket from the Drive

a. Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

b. Loosen the thumb screw on the left side of the keypad bracket. Hold the bracket on the left and lift the bracket up and to the left to separate it from the keypad support bracket.

Important: The bracket is connected to the drive by wiring. Do not attempt to lift the bracket out completely as this can damage or pull out wiring. Tie up or support the bracket to prevent damage to the wiring.

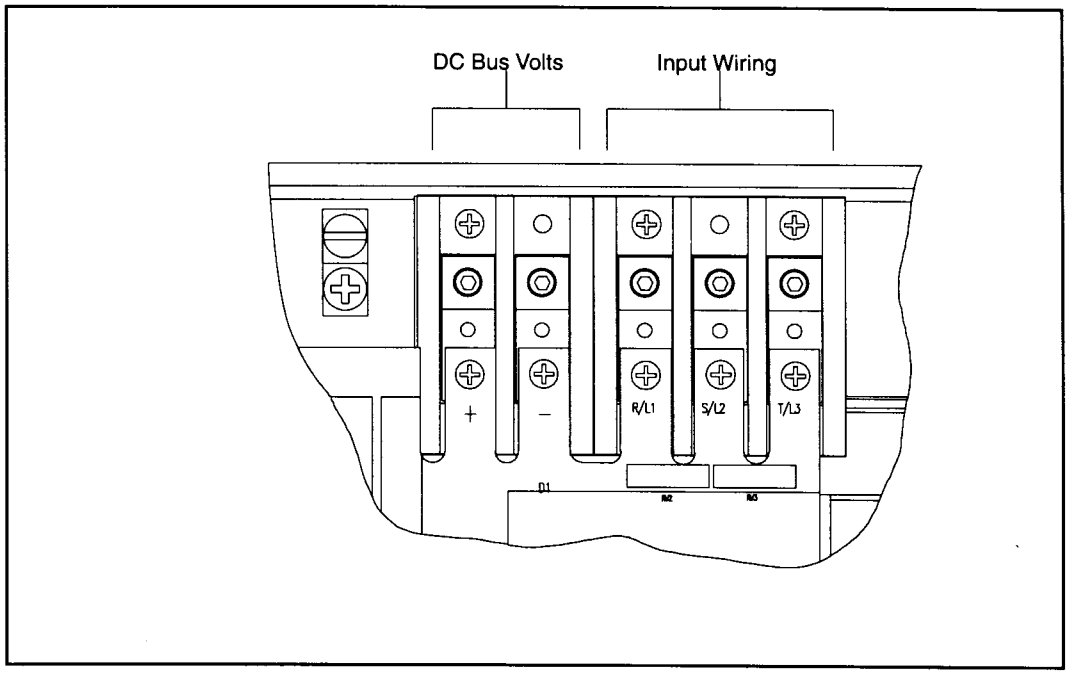

Figure 2.12 – DC Bus Voltage Terminals (25 to 60 HP @ 460V)

c. Disconnect the 26-conductor Regulator board ribbon cable from the Power Supply board (located on the right side below the keypad). You can see the connector through the slot on the keypad support bracket. Use a small screwdriver inserted through the slot to spread the retaining clips on the connector to release it.

2.6.4. Install the FLN Interface Module in the Keypad Bracket

Refer to figure 2.13 for component locations.

a. Remove the FLN Interface Module from its anti-static wrapper.

b. Align the key on the connector of the FLN Interface Module ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

c. Align the FLN Interface Module on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the FLN Interface Module.

d. Fasten the right side of the FLN Interface Module to the keypad bracket. Use the two metal M3 screws and lock washers for grounding.

Important: You must use the lock washers to properly ground the option board. Improper grounding of the option board can result in erratic operation of the drive.

e. Fasten the left side of the FLN Interface Module to the keypad bracket using the two plastic rivets.

f. Realign the 26-conductor ribbon cable connector with the Power Supply board connector inside the slot in the keypad support bracket. Carefully press the ribbon cable connector in until the retaining clips lock it into place.

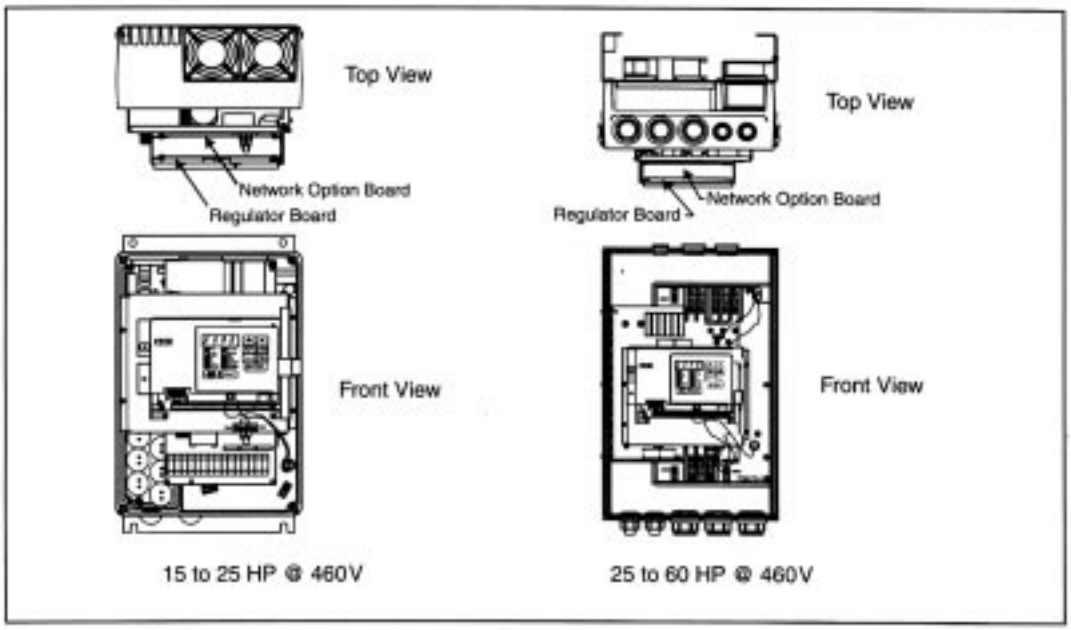

Figure 2.13 – 15 to 25 and 25 to 60 HP @ 460V

2.6.5. Reinstall the Keypad Bracket in the Drive

a. Reconnect the keypad bracket to the keypad support bracket by inserting the mounting tabs into the slots in the support bracket and tightening the thumbscrew.

b. Route the Network Drop Cable through the left-most opening at the bottom of the drive.

c. Terminate the Network Drop Cable as described in Section 2.10.

d. Reconnect any wiring that was removed from the Regulator board.

e. **NEMA 4X/12 drives only:** Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

f. Reinstall the cover. Align all cover screws into the heat sink before tightening any of them.

To maintain the integrity of NEMA 4X/12 drives, sequentially tighten the cover screws to ensure even compression of the gaskets. Do not exceed 2.2Nm (20in-lb) of torque on these screws.

This completes the hardware installation of the FLN Interface Module.

2.7 Installation in 50 to 125HP @ 460V Drives

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive is a line voltage when connected to incoming AC power. Disconnect, lock out, and tag all incoming power to the drive before performing the following procedure. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnection input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any interval components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains printed circuit boards that are static-sensitive. An anti-static wrist band should be worn by any person who touches the drive's components, connectors or wiring. Erratic machine operation and damage to

Use this procedure to install the FLN Interface Module in drives with the model numbers 50R41xx, 50T41xx, 75R41xx, 75T41xx, 125R41xx or 125T41xx.

Unless otherwise indicated, keep all hardware that is removed. You will need it for reassembly. This includes screws, lock washers and rivets.

Important: Read and understand the warning labels on the outside of the drive before proceeding.

2.7.1. Shut Down the Drive

a. Disconnect, lock out, and tag all incoming power to the drive.

b. Wait five minutes for the DC bus capacitors to discharge.

c. Remove the cover from the drive by removing the six cover screws.

Important: Read and understand the warning labels on the inside of the drive before proceeding.

2.7.2. Verify that the DC Bus Capacitors are Discharged

a. Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (1L1, 1L2, 1L3).

b. Ensure that the DC bus capacitors are discharged. To check DC bus potential:

i. Stand on a non-conductive surface and wear insulated gloves.

ii. **50 to 100 HP @ 460 V only:** Use a voltmeter to measure the DC bus potential at the diode bridge. Refer to figure 2.14.

iii. **100 to 150 HP @ 460 V only:** Take care not to touch any conductive traces. Use a voltmeter to measure the DC bus potential at the bottom of the fuse holders on the Power Module Interface board on the back of the Regulator panel. Refer to figure 2.15.

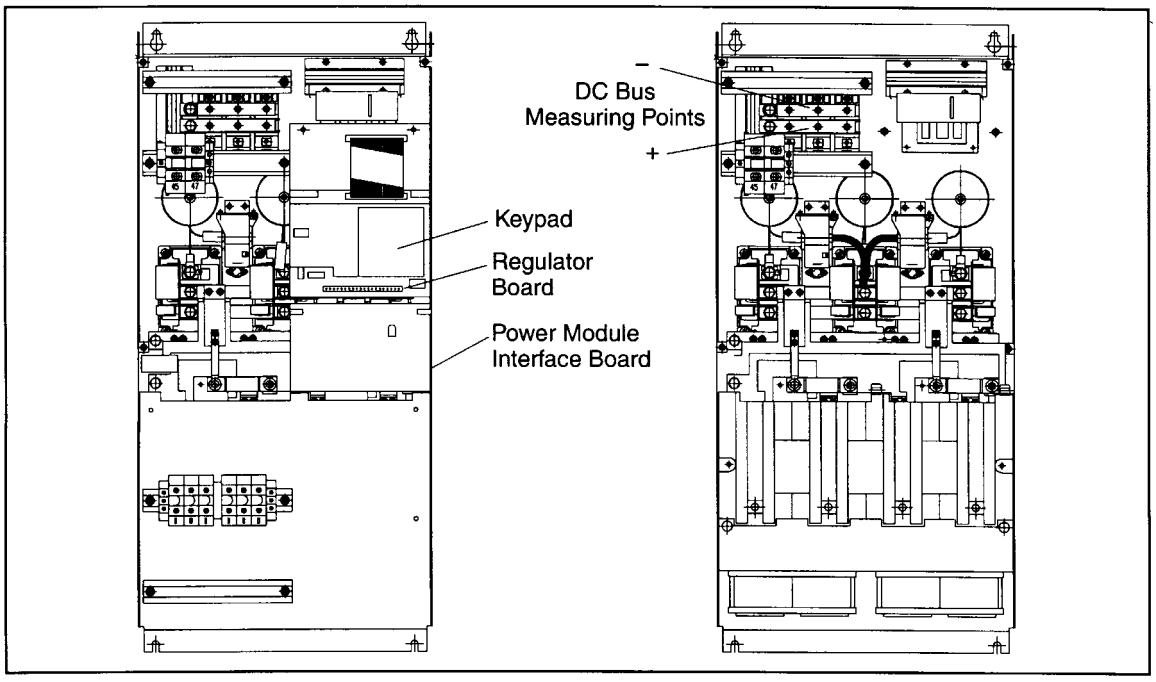

Figure 2.14 – DC Bus Voltage Terminals and Components (50 to 100 HP)

2.7.3. Remove the Keypad Bracket from the Drive

a. Loosen the two screws from the top of the hinged panel (where the keypad bracket is mounted). Tilt the mounting panel forward out of the chassis.

b. Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

c. Spread the retaining clips on the Regulator board's 60-conductor ribbon cable connector to disconnect it from the Power Module Interface board. This ribbon cable runs from the top of the Regulator board through a slot in the mounting panel to the Power board on the other side. Slip the ribbon cable out of the slot to free it from the mounting panel.

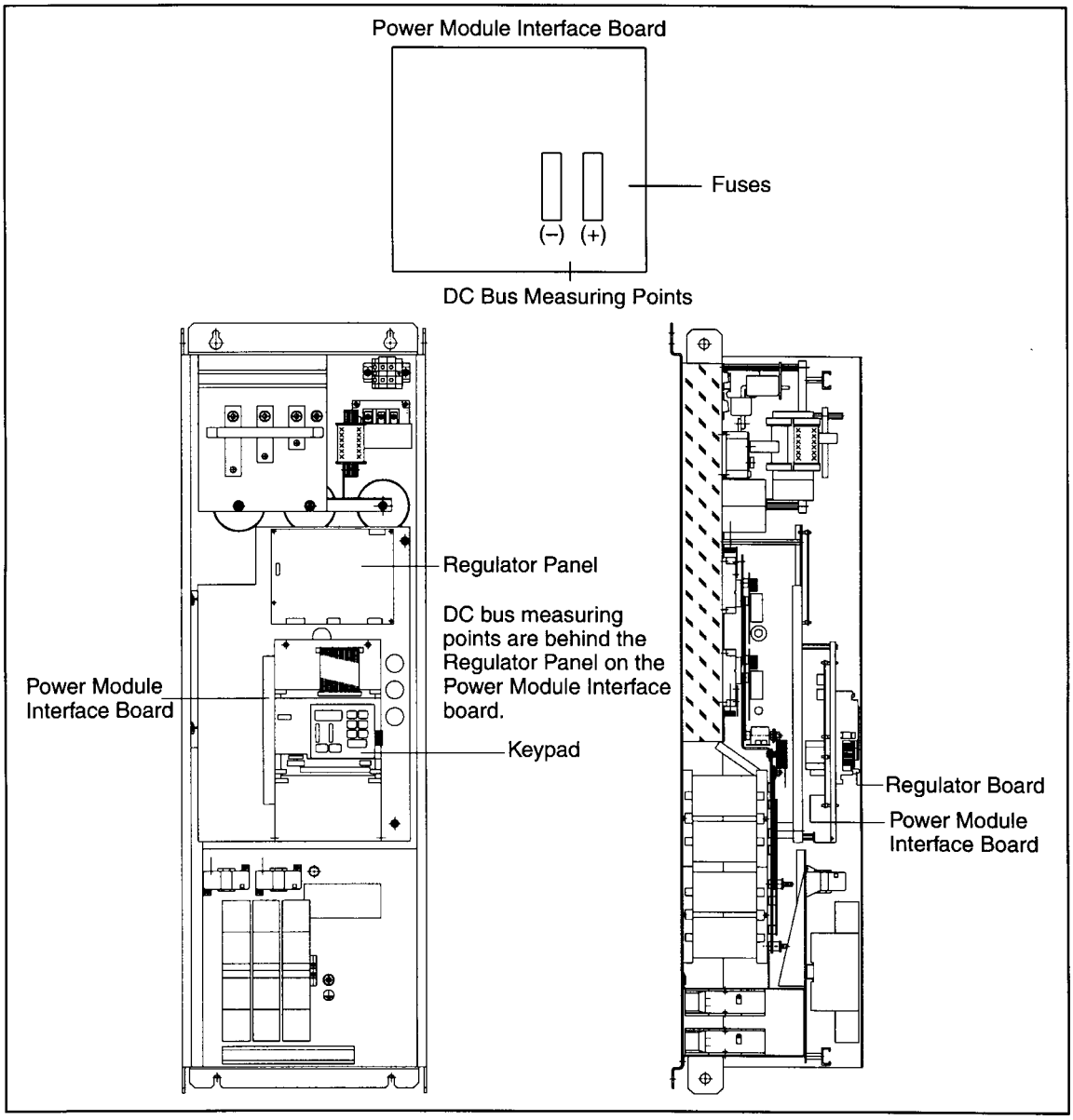

Figure 2.15 – DC Bus Voltage Terminals and Components (100 to 150 HP)

d. Use a magnetic screwdriver to remove the four screws and lock washers that fasten the keypad bracket to the hinged mounting panel. Hold the keypad bracket as you remove the screws.

2.7.4. Install the FLN Interface Module in the Keypad Bracket

See figure 2.14 (50 to 100 HP drives) or 2.15 (100 to 150 HP drives) for part locations.

a. Remove the FLN Interface Module from its anti-static wrapper.

b. Align the key on the connector of the FLN Interface Module ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

c. Align the FLN Interface Module on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the FLN Interface Module.

d. Fasten the right side of the FLN Interface Module to the keypad bracket. Use the two metal M3 screws and lock washers for grounding.

Important: You must use the lock washers to properly ground the option board. Improper grounding of the option board can result in erratic operation of the drive.

e. Fasten the left side of the FLN Interface Module to the keypad bracket using the two plastic rivets.

2.7.5. Reinstall the Keypad Bracket in the Drive

a. Reconnect the keypad bracket to the hinged mounting panel using the four screws and lock washers removed earlier.

b. **100 to 150 HP drives:** Remove the tie that was fastened to the Power Module Interface board earlier.

c. **100 to 150 HP drives:** Align the Power Module Interface board on the eight plastic standoffs on the back of the mounting panel. Carefully press it into place. Make sure good contact has been made with the two grounding standoffs.

d. Route the Regulator board's 60-conductor ribbon cable through the slot in the hinged mounting panel to the connector on the Power Module Interface board. Align the two connectors. Place your thumb beneath the Power Module Interface board for support and carefully press the ribbon cable connector in until it locks into position.

e. Swing the hinged mounting panel back into position. Make sure no wires or cables are pinched by the panel.

f. Refasten the two screws at the top of the panel.

g. Route the Network Drop Cable through the right-most opening at the bottom of the drive, away from the AC lines.

h. Terminate the Network Drop Cable as described in Section 2.10.

i. Reconnect any wiring that was removed from the Regulator board.

j. Replace mounting panel and fasten with two screws at the top of the hinged panel (where the keypad bracket is mounted).

k. **NEMA 4X/12 drives only:** Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

l. Reinstall the cover with the six screws removed in step 1.3. Make sure no wires or cables are pinched by the cover.

To maintain the integrity of NEMA 4X/12 drives, sequentially tighten the six cover screws to ensure even compression of the gaskets. Do not exceed 2.2 Nm (20 in-lb) of torque on these screws.

This completes the hardware installation of the FLN Interface Module.

2.8 Installation in 250 to 400HP @ 460VAC Drives

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive is a line voltage when connected to incoming AC power. Disconnect, lock out, and tag all incoming power to the drive before performing the following procedure. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnection input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any interval components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains printed circuit boards that are static-sensitive. An anti-static wrist band should be worn by any person who touches the drive's components, connectors or wiring. Erratic machine operation and damage to.

Use this procedure to install the FLN Interface Module in drives with part number 250H41xx, 250V41xx, 300H41xx, 300V41xx, 350H41xx, 350V41xx, 400H41xx or 400V41xx.

Unless otherwise indicated, keep all hardware that is removed. You will need it for reassembly. This includes screws, lock washers, and rivets.

Important: Read and understand the warning labels on the outside of the drive before proceeding.

2.8.1. Shut Down the Drive

a. Disconnect, lock out, and tag all incoming power to the drive.

b. Wait five minutes for the DC bus capacitors to discharge.

Important: Read and understand the warning labels on the inside of the drive before proceeding.

2.8.2. Verify That the DC Bus Capacitors are Discharged

a. Open the drive's outer cabinet door.

b. Lower the plastic terminal strip shield at the top of the drive.

c. Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals, R, S and T.

d. Replace the plastic terminal strip shield.

e. Ensure that the DC bus capacitors are discharged. To check DC bus potential:

i. Stand on a non-conductive surface and wear insulated gloves. (600 V)

ii. Use a voltmeter to check the DC bus potential at the Voltmeter Test Points on the Power Module Interface board. See figure 2.16.

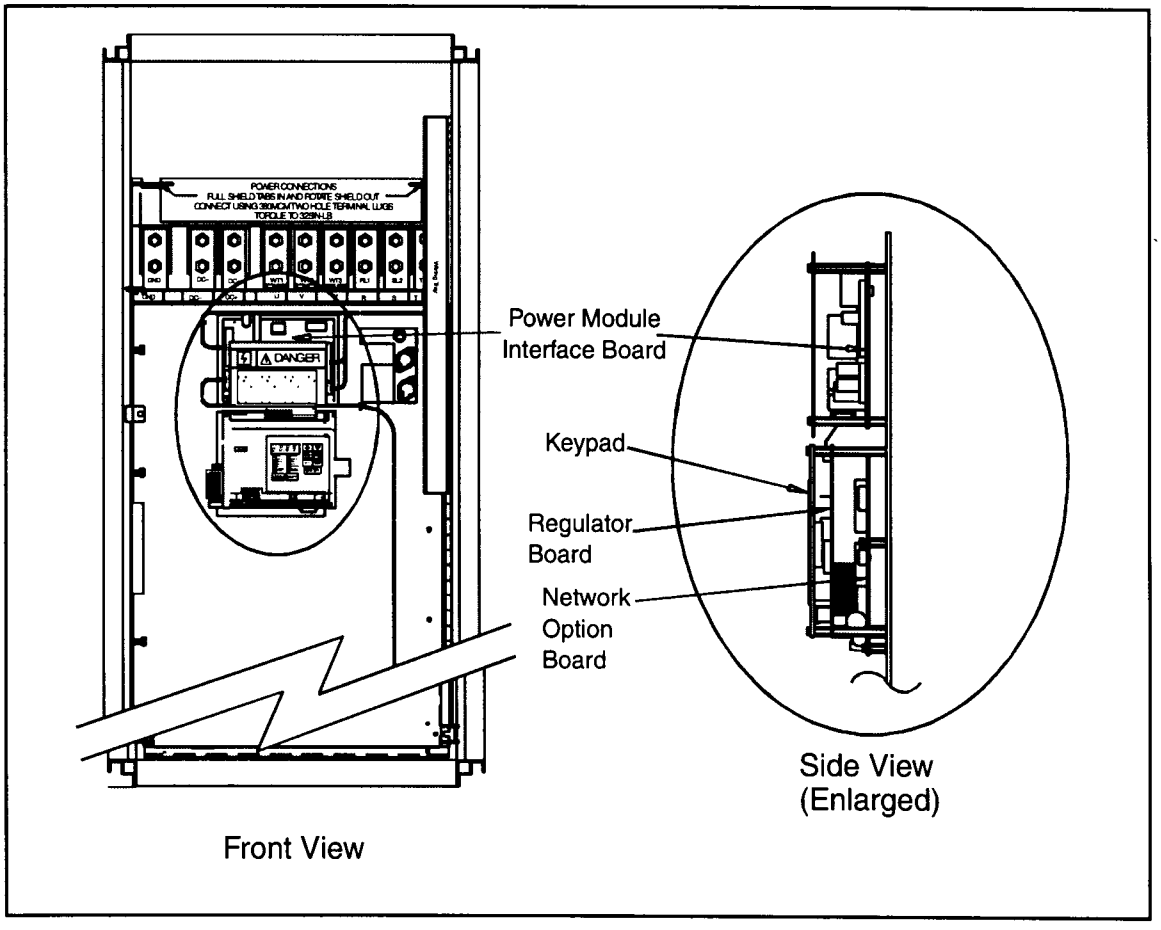

Figure 2.16 – 200 to 400 HP

2.8.3. Remove the Keypad Bracket from the Drive

Refer to figure 2.16 for component locations.

a. Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

b. Use a magnetic screwdriver to remove the four screws and lock washers that fasten the keypad bracket to the hinged mounting panel. Hold the keypad bracket as you remove the screws.

c. Disconnect the Regulator board ribbon cable from the Power Module Interface board.

2.8.4 Install the FLN Interface Module

a. Remove the FLN Interface Module from its anti-static wrapper.

b. Align the FLN Interface Module's four mounting holes with the four standoffs on the hinged mounting panel of the drive (The FLN Interface Module mounts on four standoffs behind the Regulator board).

c. Fasten the board to the drive with four nuts. Metal nuts must be used for proper grounding of the FLN Interface Module.

d. Align the key on the connector of the FLN Interface Module ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

e. Route the Network Drop Cable through the signal wiring tray on the right side of the drive.

f. Terminate the Network Drop Cable as described in Section 2.10.

2.8.5. Reinstall the Keypad Bracket in the Drive

a. Align the key on the connector from the Regulator board with the key of the connector on the Power Module Interface board. Press the ribbon cable connector in until it locks into position.

b. Reconnect the keypad bracket to the hinged mounting panel using the four screws removed earlier.

c. Reconnect any wiring that was removed from the Regulator board.

d. Close and secure the outer cabinet door of the drive.

This completes the hardware installation of the FLN Interface Module.

2.9 Installation in 2 to 15 Amp and 24 to 30 Amp GV3000/SE Bookshelf Drives

ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive is a line voltage when connected to incoming AC power. Disconnect, lock out, and tag all incoming power to the drive before performing the following procedure. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: DC bus capacitors retain hazardous voltages after input power has been disconnected. After disconnection input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure the DC bus capacitors are discharged before touching any interval components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains printed circuit boards that are static-sensitive. An anti-static wrist band should be worn by any person who touches the drive's components, connectors or wiring. Erratic machine operation and damage to

Use the procedure in this section to install the FLN Interface Module in the drives listed in table 2.6.

Table 2.6 – Model Numbers for:	
2 to 15 Amp	**24 to 30 Amp**
31ER40xx 31ET40xx	240ER40xx 240ET40xx
38ER40xx 38ET40xx	300ER40xx 300ET40xx
55ER40xx 55ET40xx	
85ER40xx 85ET40xx	
126ER40xx 126ET40xx	
150ER40xx 150ET40xx	

This procedure requires access to the right side of the drive. Remove the drive from the panel if necessary.

Unless otherwise indicated, keep all hardware that is removed. You will need it for reassembly. This includes screws, lock washers, and rivets.

Important: Read and understand the warning labels on the outside of the drive before proceeding.

2.9.1. Shut Down the Drive

a. Disconnect, lock out, and tag all incoming power to the drive.

b. Wait five minutes for the DC bus capacitors to discharge.

c. Disconnect all faceplate wiring.

d. Remove Cover

- **2 to 15 A drives:** Remove the cover by removing the cover screw on the faceplate of the drive. See figure 2.17.

- **24 to 30 A drives:** Remove the cover by removing the cover screw on the faceplate of the drive. Then remove the front panel by removing the two screws on the faceplate of the drive. See figure 2.18.

Important: The cover is connected to the drive by the keypad/display cable. To disconnect the cover, use a screwdriver to slide the cable out of the connector.

2.9.2. Verify that the DC Bus Capacitors are Discharged

a. Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3). Refer to figure 2.17 or 2.19 for the location of these terminals.

b. Ensure that the DC bus capacitors are discharged. To check DC bus potential:

a. Stand on a non-conductive surface and wear insulated gloves.

b. Use a voltmeter to measure the DC bus potential at the DC bus power terminals ((û)45, (+)47)) shown in figure 2.17 or 2.19.

c. **24 to 30 amp drives:** Reattach the front panel after checking the DC bus potential.

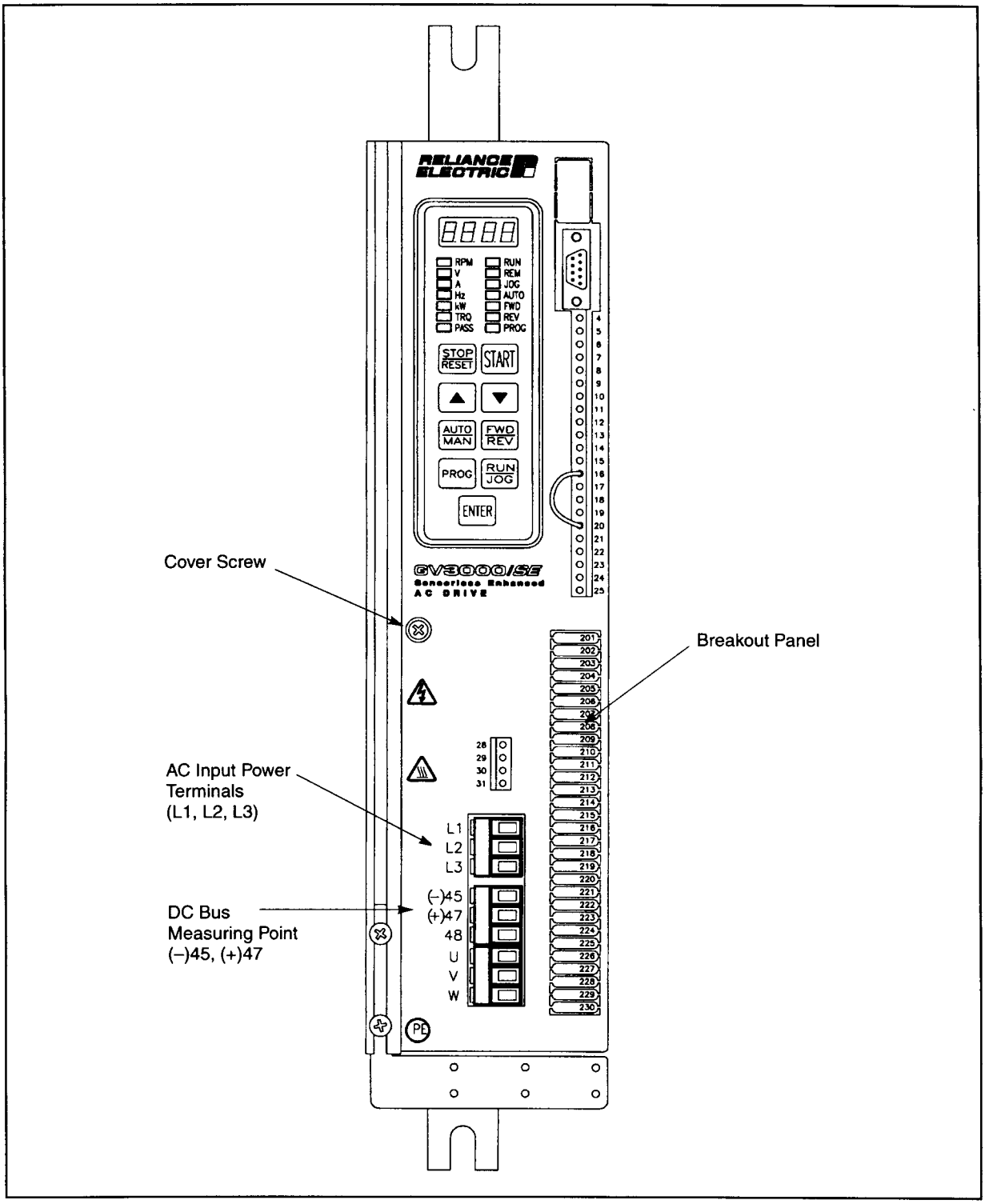

Figure 2.17 – 2 to 15 Amp Bookshelf Drive

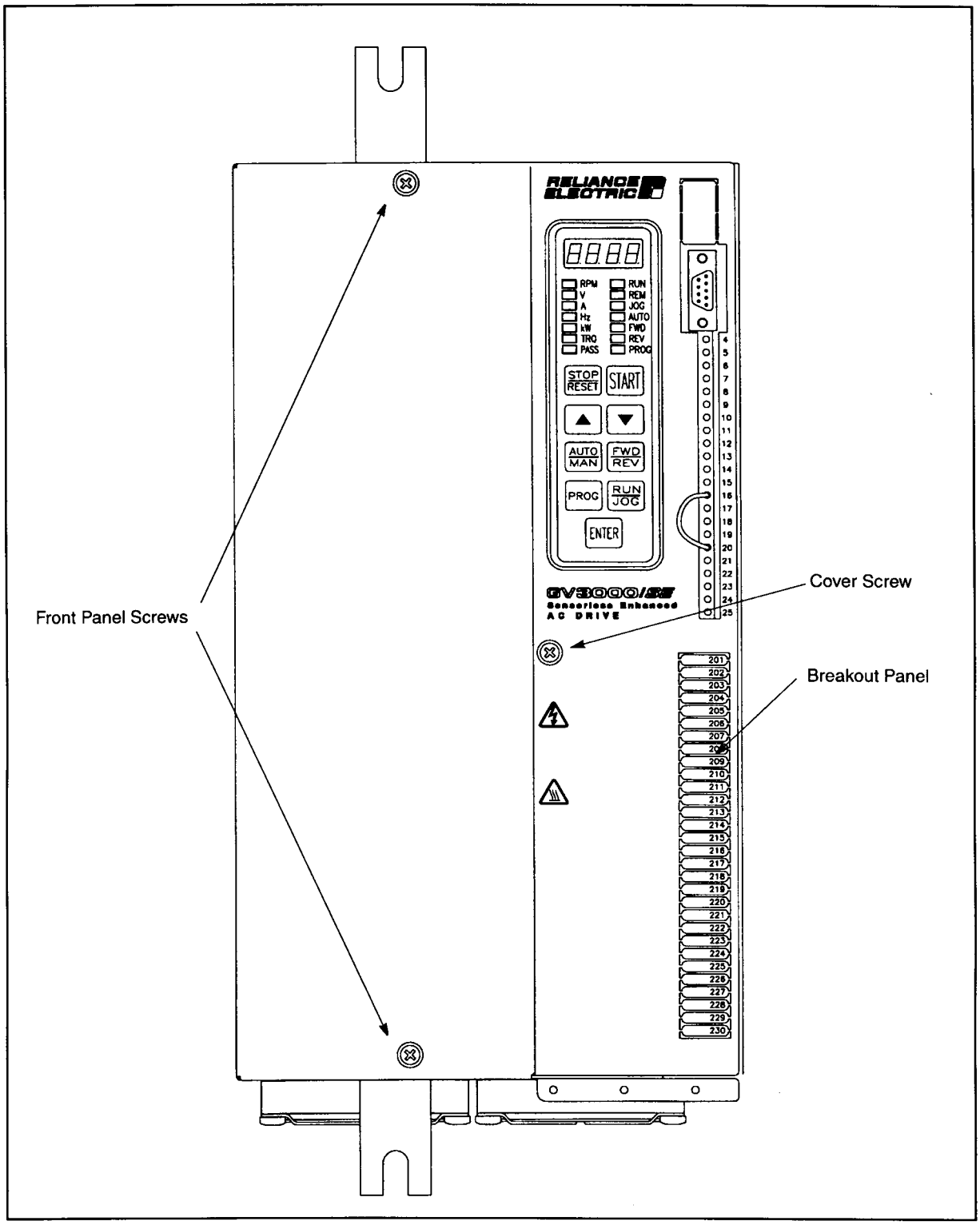

Figure 2.18 – 24 to 30 Amp Bookshelf Drive

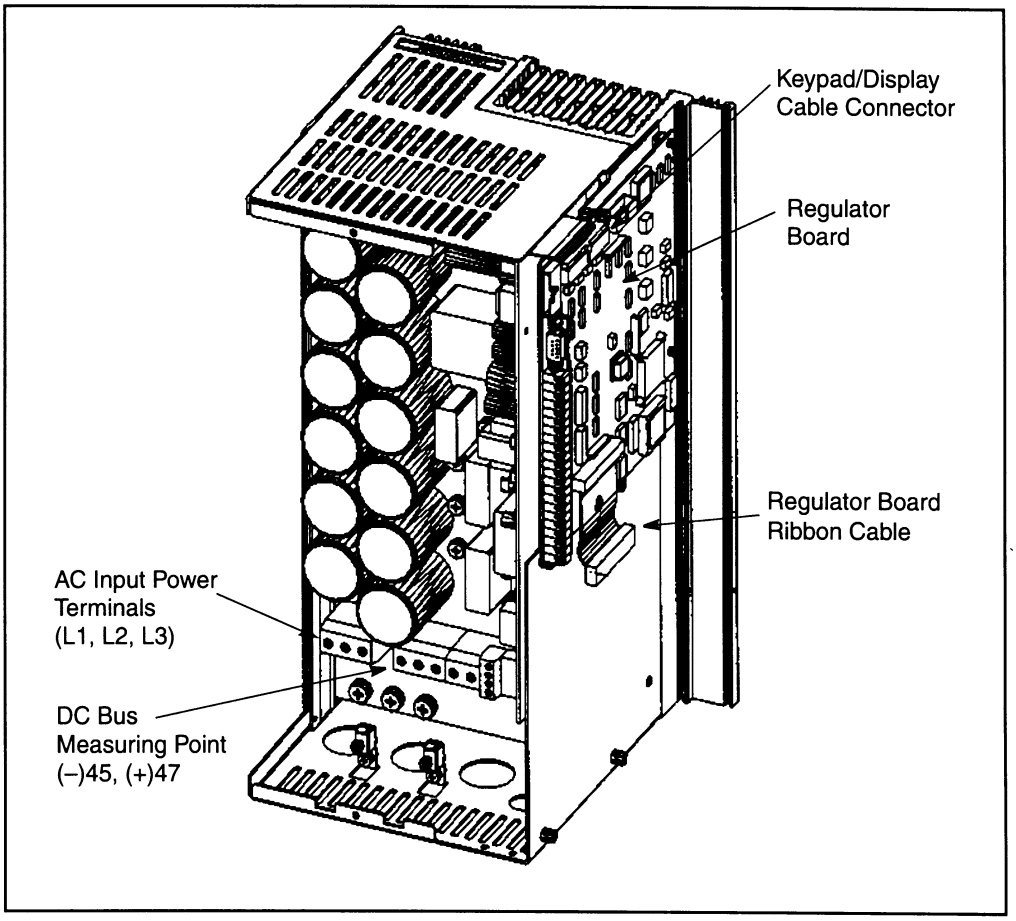

Figure 2.19 – 24 to 30 Amp Bookshelf Drive (cover and Front Panel Removed)

ATTENTION: The drive contains printed circuit boards that are static-sensitive. An anti-static wrist band should be worn by any person who touches the drive's components, connectors or wiring. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed.

2.9.3. Install the FLN Interface Module in the Drive

a. Remove the FLN Interface Module from its anti-static wrapper.

b. Align the key on the connector of the FLN Interface Module ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

c. Fasten the FLN Interface Module to the drive using the screws provided.

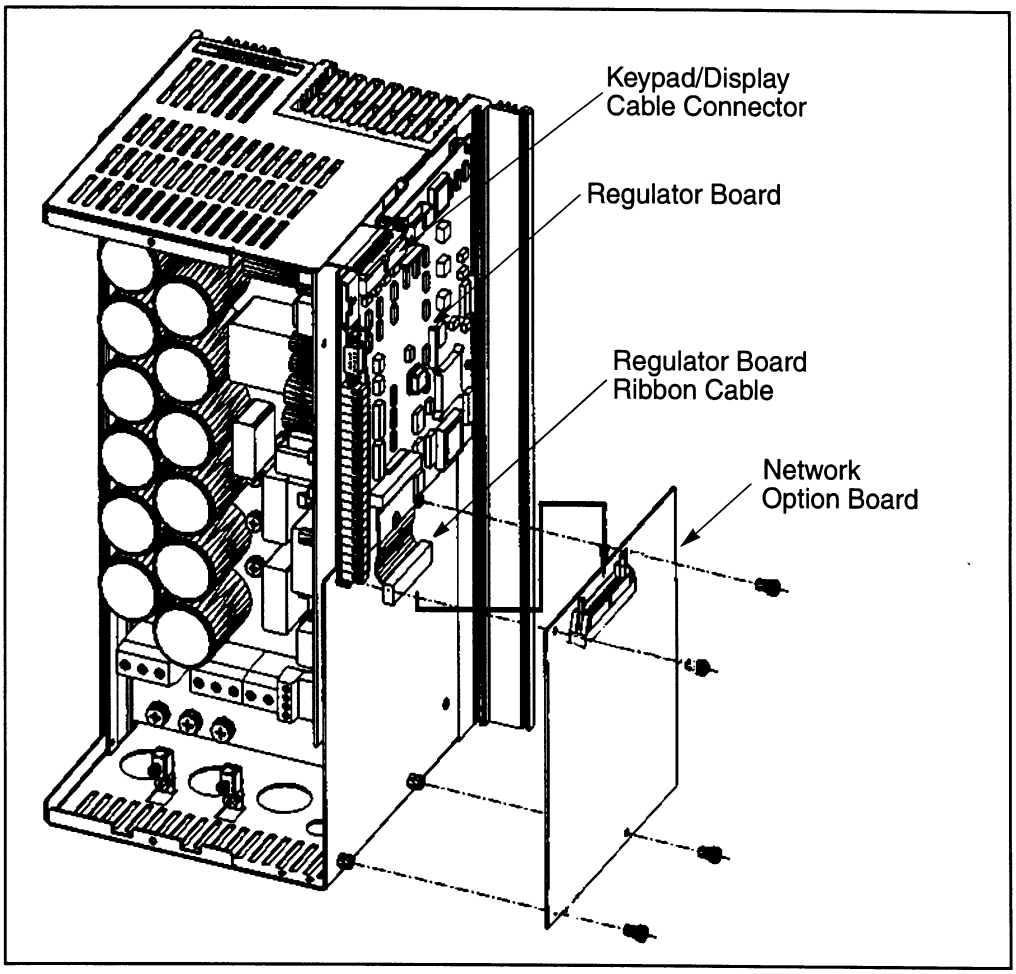

Figure 2.20 – Installing the Network Option Board in Bookshelf Drive

2.9.4. Reattach the Cover

a. Remove enough tabs on the faceplate breakout panel to allow the Network Drop Cable and Network Drop Termination Board through.

b. Route the Network Drop Cable through the breakout panel.

c. Reconnect the keypad/display cable to the cover.

Important: For 24 to 30 amp drives, fold and slide the keypad/display cable under the heatsink at the top of the drive before attaching the cover.

d. Reattach the cover using the single faceplate screw.

e. Reconnect all faceplate wiring.

f. Terminate the Network Drop Cable as described in Section 2.10.

This completes the hardware installation of the FLN Interface Module.

2.10 Terminating the FLN cable to the Interface module.

Connection to the FLN cable is through the DB15 (J1) connector on the FLN Interface Module. Provided with the FLN Interface Module is a Quick Termination Board which provides conversion from the DB15 (J1) connector to screw terminals. Also provided is the pin-out for the DB15 should the user prefer a more permenent connection directly to a DB15 male connector (not included).

A. Quick Terminal Board

1. Screw the Quick Terminal Board (QTB) down to J1 (DB15) connection on the FLN Interface module.
2. Verify that QTB jumper EN_TERM is NOT installed.
3. Verify that QTB jumper DIS_ISO is NOT installed.
4. Strip and connect FLN cables as shown in Fig 2.21. The shield cable lead must be kept as short as possible and mounted such that it will not SHORT with any exposed metel.

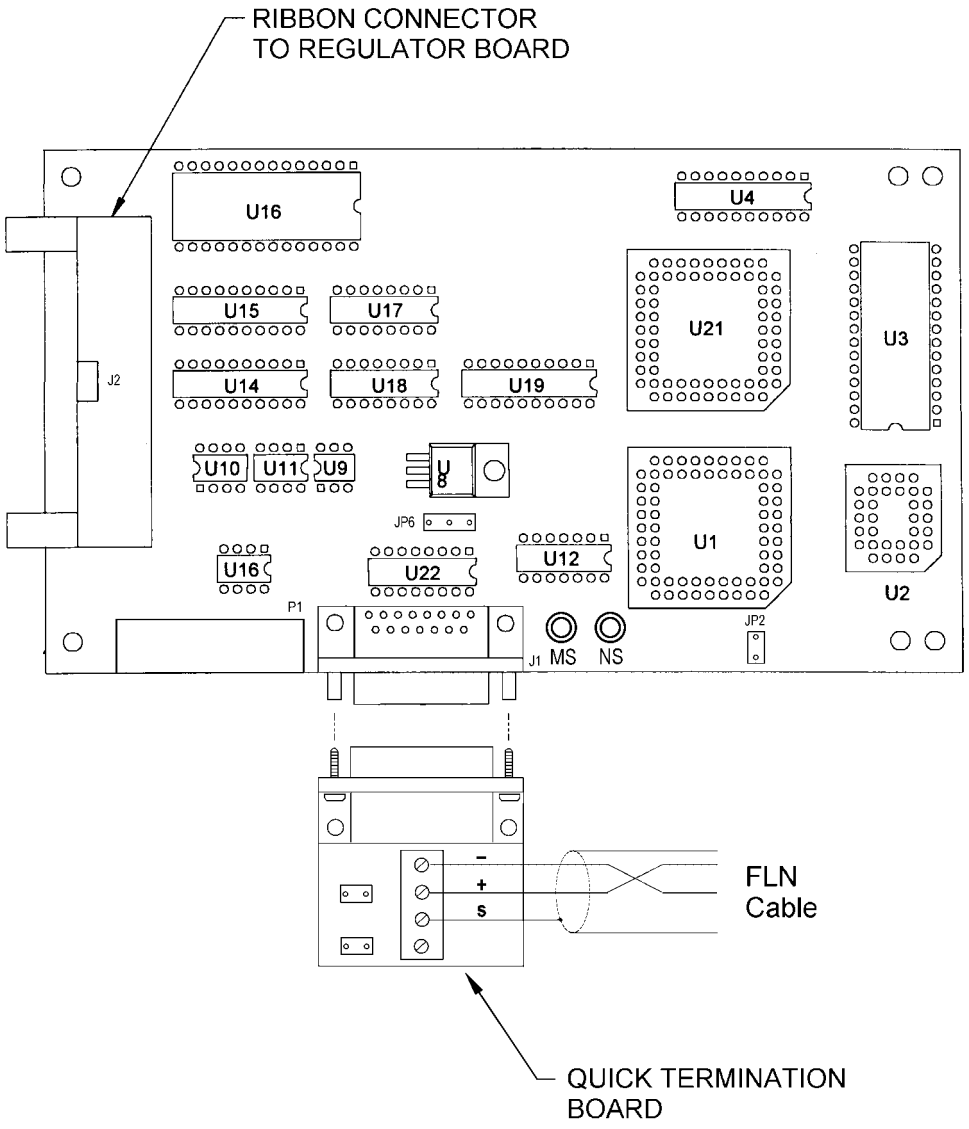

Figure 2.21 – FLN cable connection to QTB

B. DB15 Pin-out:

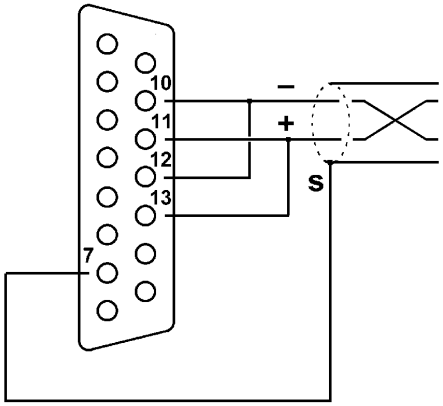

Figure 2.22 – FLN cable connection to DB15

NOTES

CHAPTER 3: CONFIGURATION

3.1 General

Once installed, two groups of parameters require configuration before the FLN Interface Module is fully operational. The first group includes those drive parameters that define the drive's (functional) operation. These drive operation parameters such as accel/decel rates, min/max speed, and method of control are accessed through the drive's keypad. The second group includes those drive parameters that define the FLN Interface Module operation. These Interface Module parameters such as Network Drop Number, Communications Loss Response and Communications Loss Timeout are also accessed through the drive's keypad.

3.2 Configure Drive Operation Parameters through drive keypad

Refer to the VTAC 7 Users Guide (see section 1.3 Additional Information) for information on setting the drive's operation parameters and the drive's keypad operation. These parameters should be set through the drive's keypad before attempting to start the drive.

3.3 Configure FLN Interface Module Parameters through drive keypad

This section specifiies the group of drive parameters which directly effect the operation of the FLN Interface Module board. The following parameter values and descriptions supercede those which may be different than that defined in the VTAC 7 Users Guide.

1. Set parameter **Control Source (P.000)** according to desired control source.

   This parameter is typically set to 'OP' for option card (FLN Interface Module) control of the drive. Regardless of selected control source, the FLN Interface Module can always monitor (read-only) selected drive parameters.

2. Set parameter **Speed Display Scaling (P.028)** as described in the VTAC 7 Users Manual.

   This parameter scales the speed (rpm) displayed by the keypad and reported at subpoint SPEED (5).

3. Set parameter **Level Sense Start Enable (P.054)** to Off.

This parameter does not effect the operation of the subpoint Run.Stop Cmd (23). However, if this parameter is set to ON, it may not be possible to stop the drive locally through the keypad when the option card is the selected control source.

4. Set parameter **Network Drop Number (P.060)**.

   This parameter sets the actual network address [subpoint CNTL ADDRESS(1)] of the FLN Interface Module. On this module the address range is limited to 1 - 53.

5. Set parameter **Network Connection Type (P.061)** to 1 (Full drive connection)

   This parameter setting is required to for certain FLN subpoints to return accurate values.

6. Set parameter **Communications Loss Response (P.062)** as defined in the VTAC 7 Users Guide

Under loss of network conditions, the drive may continue to run unsupervised. Please note the warnings and precautions described in the VTAC 7™ Users Guide. Some modes, for safety reasons will require a hard-wired stop switch.

7. Set parameter **Communications Loss Timeout (P.063)** to the acceptable delay time between network Poll COV messages [FLN Interface Module board redefines this parameter which Reliance documentation specifies as the Network Reference Source].

   0 - Timer Off (will not enter Communications Loss Response state).
   1 - 10Sec
   2 - 20Sec
   3 - 30Sec **(Landis&Staefa recommend value)**
   4 - 40Sec
   5 - 50Sec
   6 - 60Sec
   7 - 70Sec

8. Set Parameter **Network Trim Source (P.064)** to 0 (reserved)

9. Set Parameter **Network Output Register 1 Source (P.066)** to 0.

   Selects Motor power (KW) output for FLN subpoint 8

10. Set Parameter **Network Output Register 2 Source (P.067)** to 6.

    Selects Outer control loop (OCL) feedback for FLN suboint 62

11. Set Parameter **Network Output Register 3 Source (P.068)** to 8.

    Selects Outer control (OCL) output for FLN subpoint 65

NOTES

CHAPTER 4: OPERATION

4.1 FLN Subpoints

4.1.1 General

Once the drive and the FLN Interface Module 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 FLN Interface Module's application subpoints.

With the FLN Interface Module, only a selected group of the drive's control and status registers are accessible over the network (FLN subpoints). Configuration parameters such as the P.xxx, U.xxx and H.xxx parameters that are accessible with the drive's keypard are NOT writtable over the network. Additionally, only a very few of these configuration parameters are available for monitoring. Table 4.1 summarizes the drive register subpoints accessible over the FLN network.

Table 4.1 - Point Description Table

Descriptor	Address	Commanable	Description
CTLR ADDRESS	01	N	Identifies the controller address on the LAN trunk.
APPLICATION	02	N	The identification number of the program running in the controller (2710).
PCT SPEED	{04}	N	Actual speed output of the drive as a percentage of maximum.
SPEED	{05}	N	Actual speed output of the drive calibrated in motor RPM.
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).
POWER	{08}	N	Actual power output of drive
RUN TIME	{12}	N	Actual number of days that drive has been under power since last Elapsed Time Meter Reset (drive keypad parameter).
OVRD TIME	{20}	N	This point is present, but not used in this application.
FWD.REV MON	{21}	N	Actual status indication of direction currently commanded to drive.
FWD.REV CMD	{22}	Y	FWD commands the drive to rotate in a forward direction while REV commands to rotate in the opposite direction.
RUN.STOP MON	{23}	N	Actual status indication of current run state of drive.
RUN.STOP CMD	{24}	Y	RUN commands the drive to start rotating. Drive must be in ready state and under net control before run is accepted. See RUN ENABLE (35) and CMD MODE MON (27).
RUN.PUR MON	{25}	N	Status indication of whether drive is in run or purge (jog) mode.
DRIVE READY	{26}	Y	Status indication of whether conditions have been met

such that drive run command will be accepted. See ENABLE(35), INTERLOCKS(36) and FAULT(93).

Descriptor	Address	Commandable	Description
CMD MODE MON	{27}	N	Status indication of whether drive is under network control (pre-configured through the drive's keypad parameter P.000).
CAL MODE MON	{28}	N	Status indication of which type of drive speed regulation is currently selected (pre-configured through the drive's keypad parameter P.048). VECTOR mode must be enabled for local PI (OCL) control.
DAY.NIGHT	{29}	Y	This point is present, but not used in this application.
CURRENT LIM	{30}	N	Actual pre-configured limitation of drive current in percentage of maximum.
ACCEL TIME 1	{31}	N	Actual pre-configured amount of time in which the motor ramps from zero speed to Maximum Speed.
DECEL TIME 1	{32}	N	Actual pre-configured amount of time in which the motor ramps from Maximum Speed to zero speed.
SEL HND.AUTO	33	Y	AUTO enables PI(OCL) local control where drive maintains speed by minimizing the error between the PI REF(61) and PI FEEDBACK(62). MAN disables PI local control and maintains open-loop speed control through INPUT REF(60). AUTO only enables local control loop when drive is in VECTOR mode.
RUN ENABLE	{35}	Y	Must be commanded to ON before RUN command is accepted. Commanding to OFF will stop drive if in motion. If commanded OFF, DRIVE READY will indicate NOTRDY.
INTERLOCKS	{36}	N	Indicates if physical interlocks (function-loss) are closed at drive cabinet. If interlocks are OPEN, DRIVE READY will indicate NOTRDY.
TB DIN 6	{37}	N	Reflects physical input status of drive terminal strip inputs 6,7 and 8. Actual function of inputs is configurable at drive keypad.
TB DIN 7	{38}	N	
TB DIN 8	{39}	N	
INPUT REF	{60}	Y	The setpoint for open-loop speed control or an offset for PI (OCL) closed-loop speed control. Value is commanded in terms of percentage of maximum speed.
PI REF	{61}	Y	The setpoint for closed-loop speed control. Value is commanded in terms of percentage of maximum speed. Actual percentage of PI output applied to internal speed regulation must be pre-configured at drive's keypad.
PI FEEDBACK	{62}	N	Actual process variable value (such as speed or pressure) as returned to physical input of drive. Value is expressed in percentage of maximum input value.
P GAIN	{63}	N	Actual pre-configured Proportional Gain

I GAIN	{64}	N	Actual pre-configured Integral Gain (radian/sec)
PI OUTPUT	{65}	N	Actual PI output in percentage of maximum

Descriptor	Address	Commandable	Description
FAULT NUMBER	{90}	N	Current fault number (See Table 4.2 - VTAC 7 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

4.1.2 Status FLN Subpoints

Status FLN subpoints are identified in table 4.1 with a “commandable” indication of N (read/only). These subpoints can be unbundled, but will respond to a Field Panel attempt to command with an ‘Operator priority too low’ (0xD7) network response.

4.1.3 Control FLN Subpoints

Control FLN subpoints are identified in table 4.1 with a “commandable” indication of Y (read/write). These subpoints can be unbundled and commanded (Set or Panel_Initialize). Write values out-of-range will respond with an ‘Invalid value’ (0xFE) network response.

On power-up, the RUN.STOP CMD and DRIVE RDY subpoint current values are reset to zero regardless of the last ‘Set’ value. This is to prevent un-expected start up of the drive without network control. Note that subpoints INPUT REF and PI REF will retain the last ‘Set’ or ‘Panel_Initialize’ value.

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

4.1.4 Setup FLN Subpoints

Setup FLN subpoint SEL HND.AUTO (33) is a Memorize only parameter. This parameter has no current value and cannot be unbundled.

4.1.5 Fault FLN Subpoints

By monitoring FLN subpoints FAULT (93) and FAULT NUMBER (90), drive fault and drive fault type can be determined. Refer to Table 4.2 below for the fault code definitions.

4.2 Drive Faults

Should the FLN Interface Module fail, the VTAC 7 keypad will display a fault of F60 (Power-up fault) or F26 (run-time interface fault). Otherwise, any other drive fault will be reported over FLN subpoint FAULT NUMBER (90). The fault codes which may appear in FLN subpoint FAULT NUMBER (90) are described below in Table 4.2. For more descriptive information on each of these faults, refer to the VTAC 7 Users Guide.

Table 4.2 - VTAC 7 Drive Faults.

Fault Number	Meaning	Fault Number	Meaning
1	Overcurrent, steady state	17	Network comm loss
2	Overcurrent, while accelerating	18	Bypass contact failure
3	Overcurrent, while decelerating	19	High-time id aborted
4	Overcurrent, while DC braking	20	Drive not identified
5	DC bus too high	21	High line voltage
6	DC bus too low	22	Write to EEROM failure
7	Electronic thermal overload	23	Power unit overload
8	Thermostat over temperature	24	Earth current failure
9	Function loss	25	Asymmetrical bus charge
10	EPROM defaults restored	26	Missing power unit ID connector
11	Reserved	27	Unselected power unit
12	Spurious UART interrupt	28	Input phase loss
13	Torque/current self-tuning fault	29	Encoder loss
14	Over speed	30	Analog input loss
15	Output phase loss	31	Reserved
16	Over frequency	32	Fatal System Error

4.3 Loss-of-Communications Considerations

When the drive's 'Control Source Select' (P.000) is set to OP (Option port), the drive will only respond to the FLN subpoints control data when the network is 'Active'. The network is considered 'Active' if the Field Panel is actively sending Poll-for-COV network messages to the FLN Interface Module. On each Poll-for-COV message, the FLN Interface Module starts a timer preloaded with the value placed in parameter 'Communications Loss Timeout' (P.063). Should the timer time-out before receiving the next Poll-for-COV message for this address, the drive enters the state defined by parameter 'Communications Loss Response' (P.062).

When the drive's 'Control Source Select' (P.000) is set to 'OP' and the network status is 'Active', the drive's 'Remote' LED will be lite solid. Alternately, should network 'Active' status is lost, the drive's keypad 'Remote' LED will flash to alert the user.

If network 'Active' status is lost and the 'Communications Loss Response' (P.062) is set to '1-IET Fault', the drive will fault. The fault may be cleared over the network by re-establishing communications and issuing the appropriate Reset (OFF-ON-OFF) sequence through subpoint RESET FAULT (94). Note that parameter RUN.STOP CMD(24) must be commanded to STOP before reset will be accepted.

Refer to the VTAC 7 User's Manual "Communication Loss Response" (P.062) parameter definition for a detailed description of the drives response to loss-of-communications.

4.4 Run Considerations

The control FLN subpoints (while always commandable) only control the drive when the drive's Control Source (P.000) is currently set to OP(tion) mode. The Field Control Panel can determine if it currently has control of the drive by monitoring point CMD MODE MON (27).

The drive can only be started if certain conditions have been meet. These conditions are:

1. Keypad STOP/RESET is not being pressed
2. No Faults exist as indicated by point FAULT (93).
3. Interlocks (function loss) contact closed as indicated by point INTERLOCKS (36).
4. RUN ENABLE (35) has been commanded ON.

Once these conditions have been met, the subpoint DRIVE READY (26) indicates READY, which means that the drive is ready to be started.

If the control point is currently assigned to the network and the drive is ready, point STOP.RUN.CMD (24) can be commanded to RUN or STOP to control the drive. Point FWD.REV.CMD (22) can be commanded to change the drive direction. If reverse capability is not desired, drive parameter "Forward/Reverse Configuration" (P.027) can be set to 'lock-out' reverse motion capability.

The point SEL MAN.AUTO (34) should only be commanded to AUTO mode when Outer Control Loop (OCL) closed-loop control is desired. Manual mode disables the OCL and allows the drive to be controlled by direct speed reference only. Under manual mode the direct speed reference is provide through INPUT REF (60). AUTO mode is only activates the OCL if drive is configured for Vector regulation.

4.5 Diagnostic LEDs

With the drive's protective cover removed, two LEDs will be visiable on the front of the FLN Module. These LEDs: MS (Module Status) and NS (Network Status) can be useful in determining hardware and network problems.

Table 4.3 – Diagnostic LED indications

MS LED	NS LED	Problem/Condition
Off	Off	No power to drive.
Red (Solid)	Off	Load firmware mode (contact Tech. Support).
Grn (Blinking)	Off	Failed communication with drive[1]
Grn (Solid)	Off	No Invalid messages (or) No messages received which were addressed to FLN Interface Module board.
''	Grn (Flash)	Received valid FLN message addressed to FLN Interface Module board.
''	Red (Flash)	Received corrupted FLN messages.

[1]At power-up, may take up to 2 sec. for FLN Interface Module to establish communications with drive.

During power-up, and LED test is performed where both LEDS are cycled through both Red and Green.

NOTES