RELIANCE ELECTRIC

GV3000/SE AC Drive ControlNet Network Communication Option Board

M/N 2CN3000

Instruction Manual D2-3390-2

Rockwell Automation

The information in this manual is subject to change without notice.

Throughout this manual, the following notes are used to alert you to safety considerations:

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

Important: Identifies information that is critical for successful application and understanding of the product.

The thick black bar shown on the outside margin of this page will be used throughout this instruction manual to signify new or revised text or figures.

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

ATTENTION: The drive is at line voltage when connected to incoming AC power. Disconnect, lockout, and tag all incoming power to the drive before performing installing any option kits. 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 disconnecting input power, wait five minutes for the DC bus capacitors to discharge and then check the voltage with a voltmeter to ensure that the DC bus capacitors are discharged before touching any internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution can result in bodily injury.

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CHAPTER 1

Introduction

This manual describes the GV3000/SE™ ControlNet™ Network Communication Option Board (M/N 2CN3000). This board lets you operate and monitor a GV3000/SE drive over the ControlNet network.

For normal operation, the GV3000/SE drive can be completely controlled using the Network Option board. The only connections you need are a network interface connection, hardwired emergency stop, and three-phase input and output power wiring. Start, stop, reset, fault codes, and complete control can be done over the ControlNet network.

1.1 About the ControlNet Network Communication Option Board

The ControlNet Network Communication Option Board makes the GV3000/SE drive a node on the ControlNet network. It is a printed circuit board assembly that mounts inside a GV3000/SE drive and connects to the drive's Regulator board using a ribbon cable. The Network Option board is powered from the standard drive power supply.

The Network Option board is equipped with flash memory that lets you easily update the board with the latest firmware revisions without having to remove the board from the drive. An RS-232C serial port lets you connect a serial programming device to the Network Option board for updating the board's flash memory.

The Network Option board connects to the ControlNet network using two BNC connectors that provide for redundant communication. You can connect a programming device for accessing nodes using the Network Access Port, which is an RJ-45 connector.

Three LEDs provide information to you about the board. Refer to chapter 8 for descriptions of how the LEDs function.

See figure 1.1 for the locations of the connectors and LEDs.

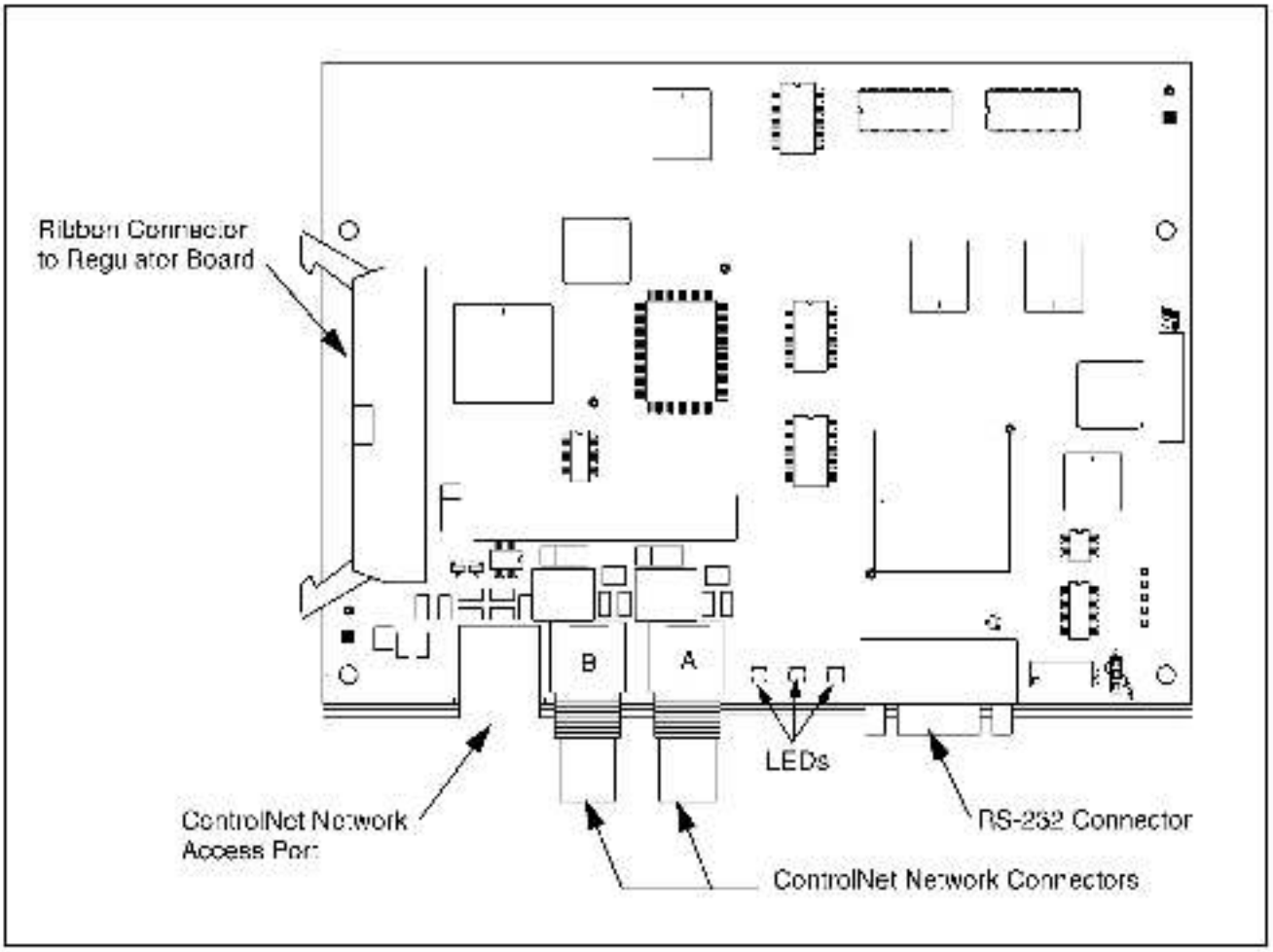

Figure 1.1 – ControlNet Network Communication Option Board

1.2 Where to Find Additional Information

You must be familiar with all the instruction manuals that describe your system configuration. These manuals can include:

- GV3000/SE AC General Purpose (Volts/Hertz) and Vector Duty Drive Software Start-Up and Reference Manual (D2-3359)
- GV3000/SE AC Drive Hardware Reference, Installation, and Troubleshooting (D2-3360)
- GV3000/SE AC General Purpose (Volts/Hertz) and Vector Duty Bookshelf Drive Software Start-Up and Reference Manual (D2-3426)
- GV3000/SE AC Bookshelf Drive Hardware Reference, Installation, and Troubleshooting (D2-3427)
- ControlNet Network System Overview (1786-2.9)
- ControlNet Cable System Component List (AG-2.2)
- ControlNet Cable Planning and Installation Manual (1786-6.2.1)
- ControlNet Coax Tap Installation Manual (1786-5.7)
- ControlNet Network Access Cable Installation Instructions (1786-2.6)
- ControlNet Repeater Installation Instructions (1786-5.8)

You can obtain the ControlNet manuals listed above from The Automation Bookstore at http://www.theautomationbookstore.com.

1.3 Getting Assistance from Reliance Electric

If you have any questions or problems with the products described in this instruction manual, contact your local Reliance Electric sales office.

For technical assistance, call 1-864-284-5444. Before calling, please review the troubleshooting section of this manual and check the standard drives website for additional information. When you call this number, you will be asked for the drive model number and this instruction manual number. Also, please have your product version number ready.

CHAPTER 2
Installation

Contact Reliance if the drive installation must be in compliance with the European Community Electromagnetic Compatibility Standards.

The ControlNet option board installation procedure differs depending on the drive type. Use table 2.1 to locate the appropriate procedure for your drive.

Table 2.1 – Locating the Appropriate Installation Procedure

Rating	GV3000/SE Model Number	Use the Procedure in Section ...
1 HP	1V21xx 1V24xx	2.3
1 HP	1V41xx 1V44xx	2.1
2 HP	2V21xx 2V24xx	2.3
2 HP	2V41xx 2V44xx	2.1
3 HP	3V21xx 3V24xx	2.3
3 HP	3V41xx 3V44xx	2.1
5 HP	5V21xx 5V24xx	2.3
5 HP	5V41xx 5V44xx	2.1
7.5 HP	7V21xx 7V22xx	2.3
7.5 HP	7V41xx 7V42xx	2.2
10 HP	10V21xx 10V22xx	2.3
10 HP	10V41xx 10V42xx	2.2
15 HP	15V21xx 15V22xx	2.3

Table 2.1 – Locating the Appropriate Installation Procedure

Rating	GV3000/SE Model Number	Use the Procedure in Section ...
15 HP	15V41xx 15V42xx	2.5
20 HP	20V21xx 20V22xx	2.3
20 HP	20V41xx 20V42xx	2.5
25 HP	25G41xx 25G42xx 25V41xx 25V42xx	2.5
30 HP	30V20xx	2.4
30 HP	30V41xx 30V42xx	2.5
40 HP	40V20xx	2.4
40 HP	40V41xx 40V42xx	2.5
50 HP	50R41xx	2.6
50 HP	50T41xx	2.6
50 HP	50V20xx	2.4
50 HP	50V41xx 50V42xx	2.5
60 HP	60G41xx 60G42xx	2.5
60 HP	60V20xx	2.4
75 HP	75R41xx	2.6
75 HP	75T41xx	2.6
75 HP	75V20xx	2.4
75 HP	75V40xx	2.4
100 HP	100V20xx	2.4
100 HP	100V40xx	2.4
125 HP	125R41xx	2.6
125 HP	125V40xx	2.4
150 HP	150V40xx	2.4
200 HP	200V40xx	2.4

Table 2.1 – Locating the Appropriate Installation Procedure

Rating	GV3000/SE Model Number	Use the Procedure in Section ...
200 HP	200V41xx	2.7
250 HP	250V41xx	2.7
300 HP	300V41xx	2.7
350 HP	350V41xx	2.7
400 HP	400V41xx	2.7
2 to 15 Amp	31ER10xx 31ET10xx 38ER10xx 38ET10xx 55ER10xx 55ET10xx 85ER10xx 85ET10xx 126ER10xx 126ET10xx 150ER10xx 150ET10xx	2.8
24 to 30 Amp	240ER40xx 240ET40xx 300ER40xx 300ET40xx	2.8
43 Amp	430ER10xx 430ET10xx	2.8

2.1 Installing the ControlNet Option Board 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 at 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 disconnecting 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 internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution can result in bodily injury.

Use this procedure to install the ControlNet option board in the drives listed in table 2.2.

Table 2.2 – Model Numbers for 1 to 5HP @ 460 VAC Drives

1V411xx 1V444xx	3V411xx 3V444xx
2V411xx 2V444xx	5V411xx 5V444xx

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.

Step 1. Shut Down the Drive

Step 1.1 Disconnect, lock out, and tag all incoming power to the drive.

Step 1.2 Wait five minutes for the DC bus capacitors to discharge.

Step 1.3 Remove the cover by loosening the four cover screws.

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

Step 2. Verify that the DC Bus Capacitors are Discharged

Step 2.1 Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

Step 2.2 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 as shown in figure 2.1.

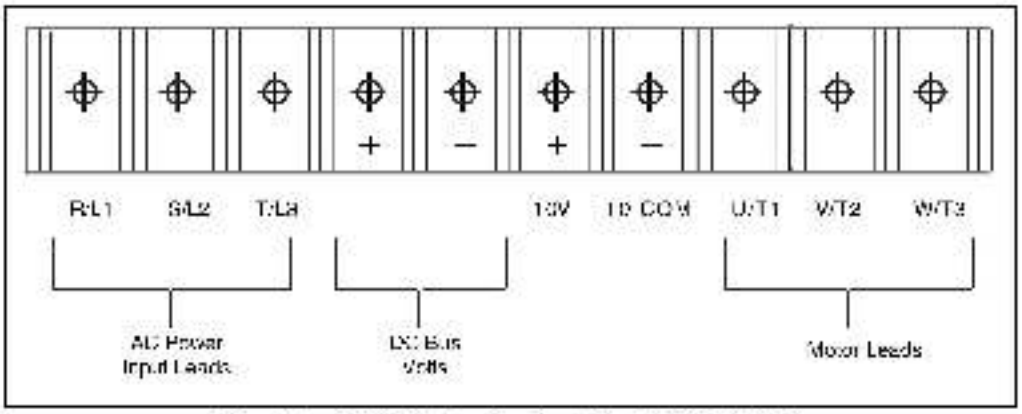

Figure 2.1 DC Bus Voltage Terminals (1 to 5 HP @ 460 VAC)

Step 3. Remove the Keypad Bracket from the Drive

Step 3.1 Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

Step 3.2 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.

Step 3.3 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.

Step 3.4 Move the keypad support bracket aside.

Step 3.5 Pinch the retaining clip that is through the center of the Current Feedback board and carefully pull out the Current Feedback board.

Step 3.6 Unplug the internal fan assembly power connector (CONN7) from the drive.

Step 4. Install the ControlNet Option Board in the Keypad Bracket

Refer to figure 2.2 for component locations.

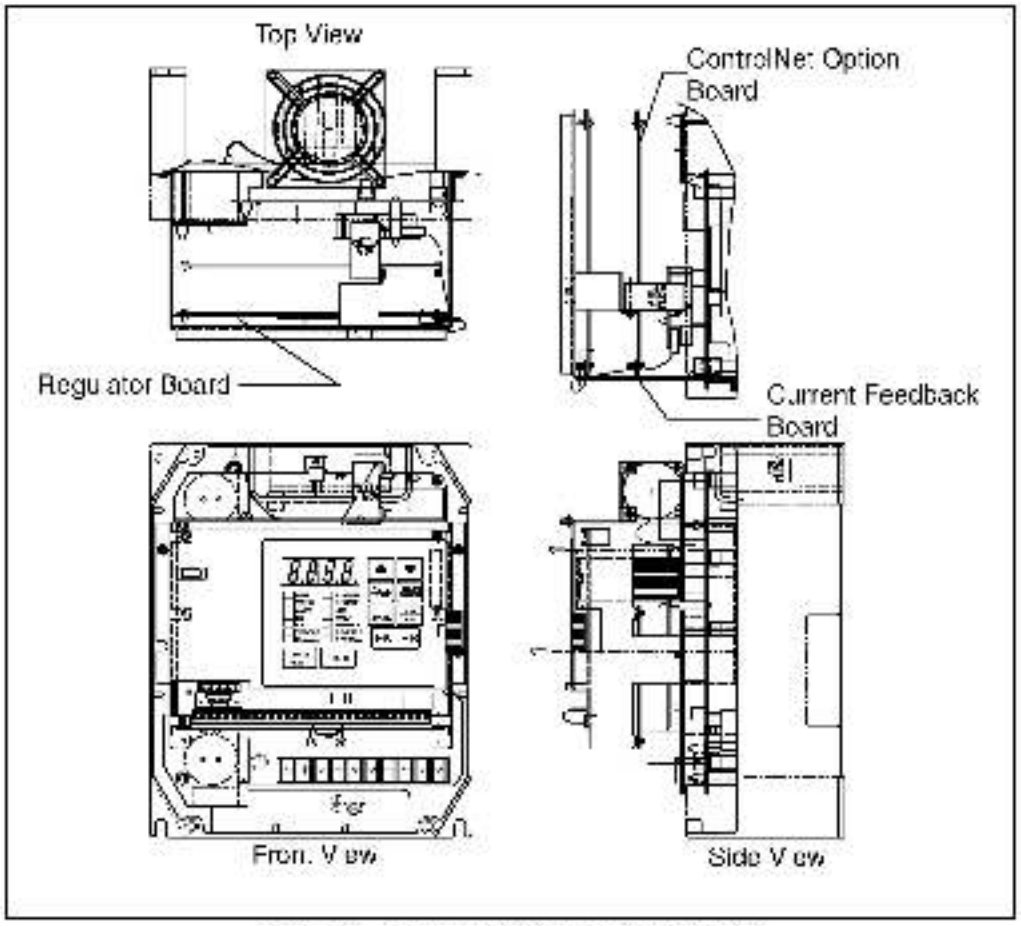

Figure 2.2 – 1 to 5HP @ 480VAC GV3000/SE Drive

Step 4.1 Remove the ControlNet option board from its anti-static wrapper.

Step 4.2 Align the key on the connector of the ControlNet option board ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

Step 4.3 Route the 26-conductor ribbon cable for the Current Feedback board out of the side of the keypad bracket.

Step 4.4 Align the ControlNet option board on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the ControlNet option board.

Step 4.5 Fasten the right side of the ControlNet option board 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.

Step 4.6 Fasten the left side of the ControlNet option board to the keypad bracket using the two plastic rivets.

Step 5. Reinstall the Keypad Bracket in the Drive

Step 5.1 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.

Step 5.2 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.

Step 5.3 Inspect the Current Feedback board connector thoroughly for bent or misaligned pins.

Step 5.4 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.

Step 5.5 Align the Regulator board's 26-conductor ribbon cable connector with the Current Feedback board connector. Press it in until it locks into position.

Step 5.6 Route the Network Drop Cable through the left-most opening at the bottom of the drive.

Step 5.7 Connect the brown wire to terminal 1 of the 2-connector terminal strip. Connect the white wire to terminal 2.

Step 5.8 Reconnect any wiring that was removed from the Regulator board.

Step 5.9 NEMA 4X/12 drives only: Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

Step 5.10 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 2.2 Nm (20 in-lb) of torque on these screws.

This completes the hardware installation of the ControlNet option board. Do not remove the lockout and tag until you have completed section 2.9, which provides instruction on connecting to the ControlNet network.

2.2 Installing the ControlNet Option Board in 7.5 to 10 HP @ 460 VAC 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 at 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 disconnecting 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 internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution can result in bodily injury.

Use this procedure to install the ControlNet option board in drives with model numbers 7V411xx, 7V412xx, 10V411xx, or 10V412xx.

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.

Step 1. Shut Down the Drive

Step 1.1 Disconnect, lock out, and tag all incoming power to the drive.

Step 1.2 Wait five minutes for the DC bus capacitors to discharge.

Step 1.3 Remove the cover by loosening the four cover screws.

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

Step 2. Verify that the DC Bus Capacitors are Discharged

Step 2.1 Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

Step 2.2 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 shown in figure 2.3.

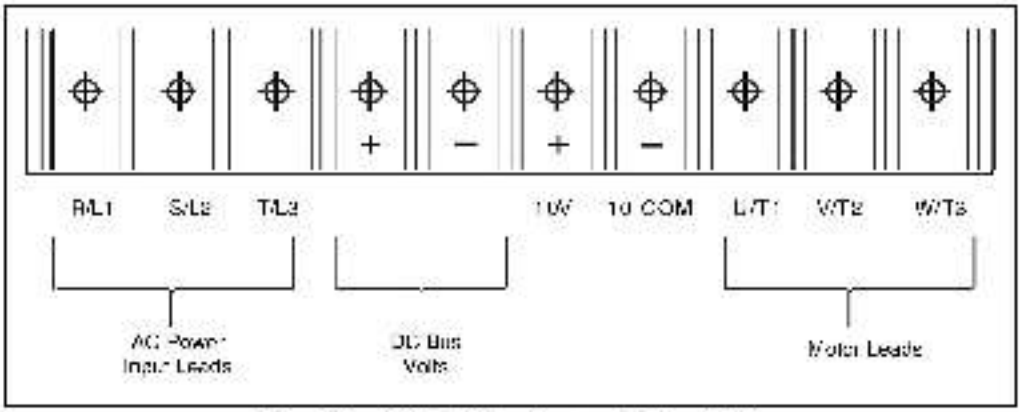

Figure 2.3 – DC Bus Voltage Terminals (7.5 to 101 P)

Step 3. Remove the Keypad Bracket from the Drive

Step 3.1 Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

Step 3.2 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.

Step 3.3 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.

Step 4. Install the ControlNet Option Board in the Keypad Bracket

Refer to figure 2.4 for component locations.

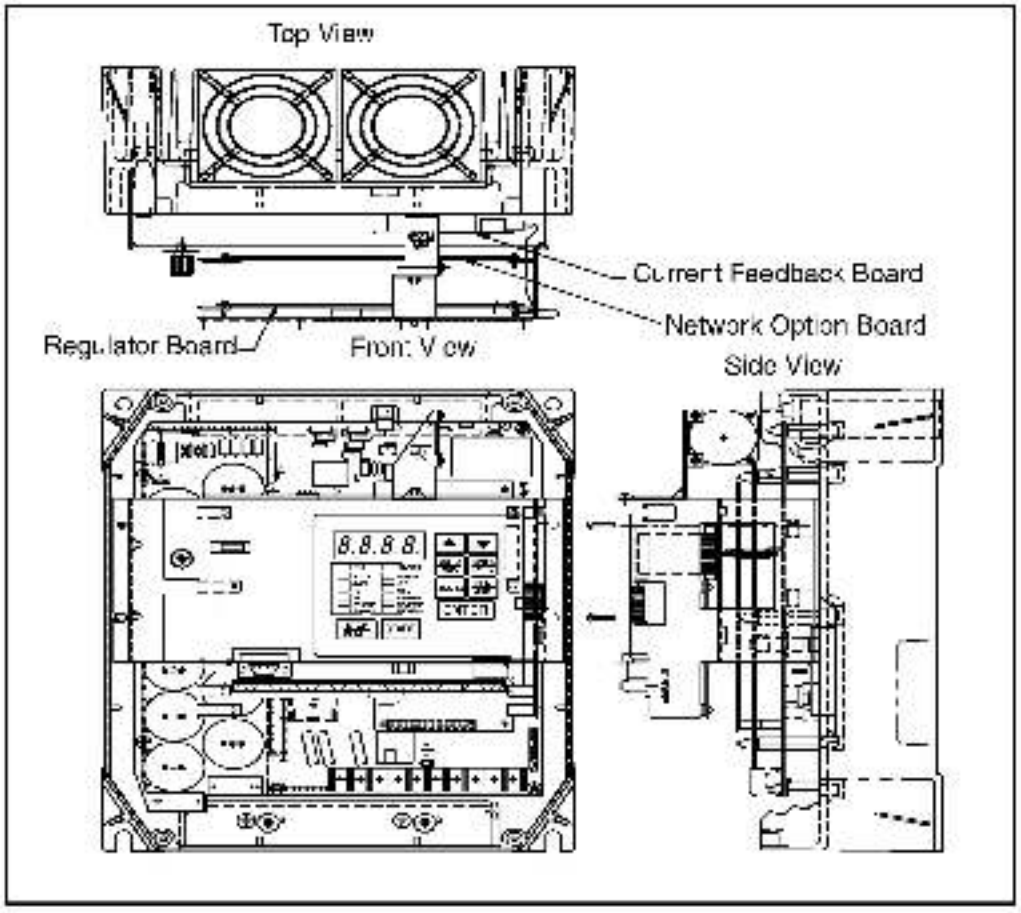

Figure 2.4 – 7.5 to 10 HP @ 460 VAC GV3000/SE Drive

Step 4.1 Remove the ControlNet option board from its anti-static wrapper.

Step 4.2 Align the key on the connector of the ControlNet option board ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

Step 4.3 Route the 20-conductor ribbon cable for the Current Feedback board out of the side of the keypad bracket.

Step 4.4 Align the ControlNet option board on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the ControlNet option board.

Step 4.5 Fasten the right side of the ControlNet option board 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.

Step 4.6 Fasten the left side of the ControlNet option board to the keypad bracket using the two plastic rivets.

Step 4.7 Reconnect the keypad bracket to the keypad support bracket by inserting the mounting tabs into the slots in the support bracket and tightening the thumb screw.

Step 4.8 Align the Regulator board's 26-conductor ribbon cable connector with the Current Feedback board connector. Press it in until it locks into position.

Step 5. Reinstall the Keypad Support Bracket in the Drive

Step 5.1 Route the Network Drop Cable through the left-most opening at the bottom of the drive.

Step 5.2 Connect the brown wire to terminal 1 of the 2-connector terminal strip. Connect the white wire to terminal 2.

Step 5.3 Reconnect any wiring that was removed from the Regulator board.

Step 5.4 NEMA 4X/12 drives only: Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

Step 5.5 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 2.2 Nm (20 in-lb) of torque on these screws.

This completes the hardware installation of the ControlNet option board. Do not remove the lockout and tag until you have completed section 2.9, which provides instruction on connecting to the ControlNet network.

2.3 Installing the ControlNet Option Board 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 at 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 disconnecting 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 internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution can result in bodily injury.

Use this procedure to install the ControlNet option board in the drives listed in table 2.3.

Table 2.3 – Model Numbers for 1 to 20HP @ 230VAC Drives

1V21xx 1V24xx	7V21xx 7V22xx
2V21xx 2V24xx	10V21xx 10V22xx
3V21xx 3V24xx	15V21xx 15V22xx
5V21xx 5V24xx	20V21xx 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.

Step 1. Shut Down the Drive

Step 1.1 Disconnect, lock out, and tag all incoming power to the drive.

Step 1.2 Wait five minutes for the DC bus capacitors to discharge.

Step 1.3 Remove the cover by loosening the four cover screws.

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

Step 2. Verify that the DC Bus Capacitors are Discharged

Step 2.1 Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

Step 2.2 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 shown in figure 2.5.

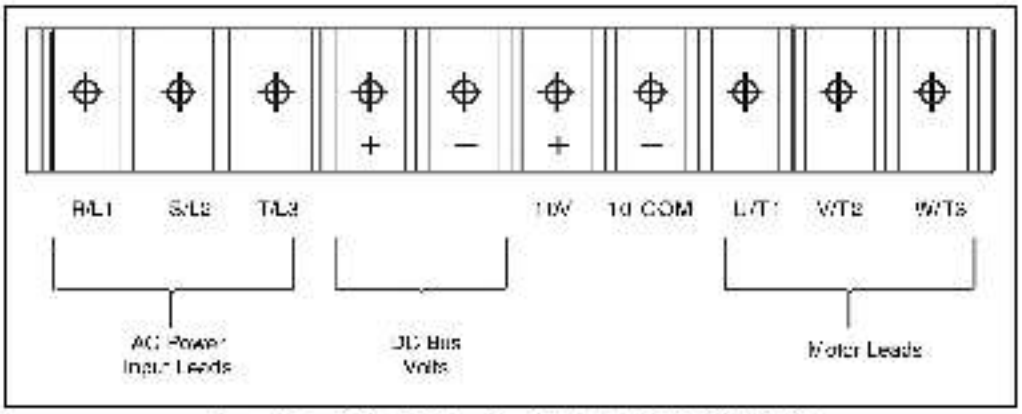

Figure 2.5 DC Bus Voltage Terminals (1 to 20 HP @ 230 VAC)

Step 3. Remove the Keypad Bracket from the Drive

Step 3.1 Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

Step 3.2 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.

Step 3.3 Spread the retaining clips on the Regulator board ribbon cable (on the right side) to disconnect it from the Base Board.

Step 3.4 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.

Step 4. Install the ControlNet Option Board in the Keypad Bracket

Refer to figure 2.6 for component locations.

Step 4.1 Remove the ControlNet option board from its anti-static wrapper.

Step 4.2 Align the key on the connector of the ControlNet option board ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

Step 4.3 Route the other ribbon cable out of the side of the keypad bracket.

Step 4.4 Align the ControlNet option board on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the ControlNet option board.

Step 4.5 Fasten the right side of the ControlNet option board 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.

Step 4.6 Fasten the left side of the ControlNet option board to the keypad bracket using the two plastic rivets.

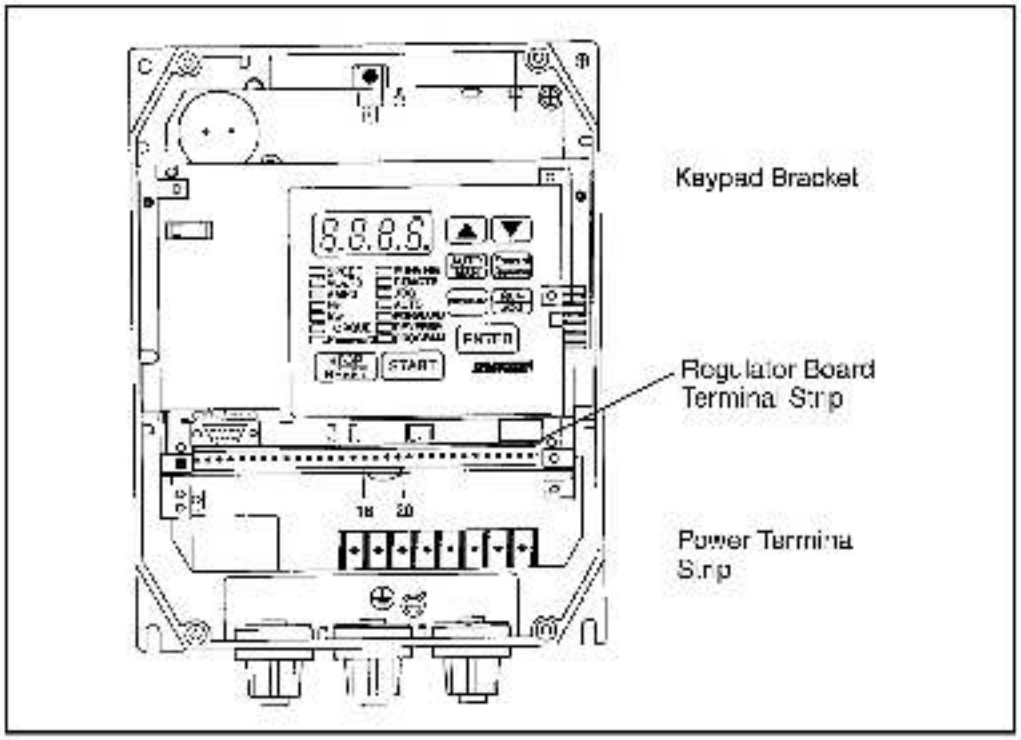

Figure 2.6 — 1 to 20HP @ 230 VAC GV3000/SE Drive

Step 5. Reinstall the Keypad Bracket in the Drive

Step 5.1 Place the keypad support bracket back into position. Use a magnetic screwdriver to fasten it to the heatsink with the screws removed earlier.

Step 5.2 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.

Step 5.3 Route the Network Drop Cable through the left-most opening at the bottom of the drive.

Step 5.4 Connect the brown wire to terminal 1 of the 2-connector terminal strip. Connect the white wire to terminal 2.

Step 5.5 Reconnect any wiring that was removed from the Regulator board.

Step 5.6 NEMA 4X/12 drives only: Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

Step 5.7 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 2.2 Nm (20 in-lb) of torque on these screws.

This completes the hardware installation of the ControlNet option board. Do not remove the lockout and tag until you have completed section 2.9, which provides instruction on connecting to the ControlNet network.

2.4 Installing the ControlNet Option Board in 30 to 100 HP @ 230 VAC and 75 to 200 HP @ 460 VAC 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 at 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 disconnecting 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 internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution can result in bodily injury.

Use this procedure to install the ControlNet option board in the drives listed in table 2.4.

Table 2.4 – Model Numbers for 30 to 100 HP @ 230 VAC and 75 to 200 HP @ 460 VAC Drives

30V20xx	100V20xx
40V20xx	100V40xx
50V20xx	125V40xx
60V20xx	150V40xx
75V20xx	200V40xx
75V40xx	

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.

Step 1. Shut Down the Drive

Step 1.1 Disconnect, lock out, and tag all incoming power to the drive.

Step 1.2 Wait five minutes for the DC bus capacitors to discharge.

Step 2. Verify that the DC Bus Capacitors are Discharged

Step 2.1 Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

Step 2.2 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 shown in figure 2.7.

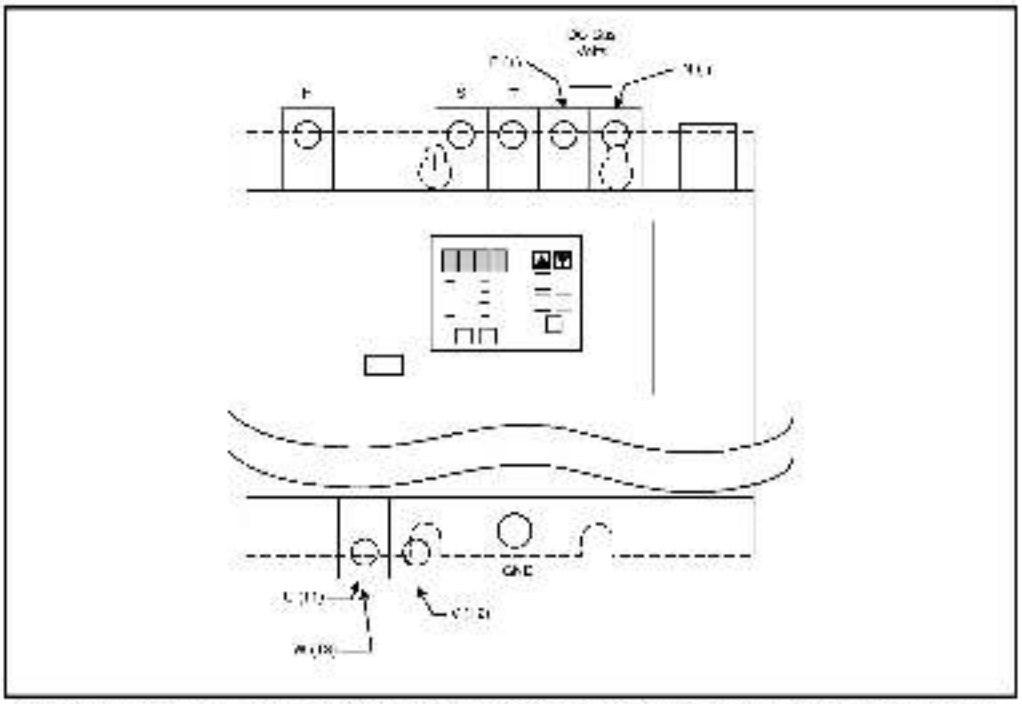

Figure 2.7 – DC Bus Voltage Terminals (30 to 100 HP @ 230VAC and 75 to 200 HP @ 460VAC Drives)

Step 3. Remove the Keypad Bracket from the Drive

Step 3.1 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 2.8.
- 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.

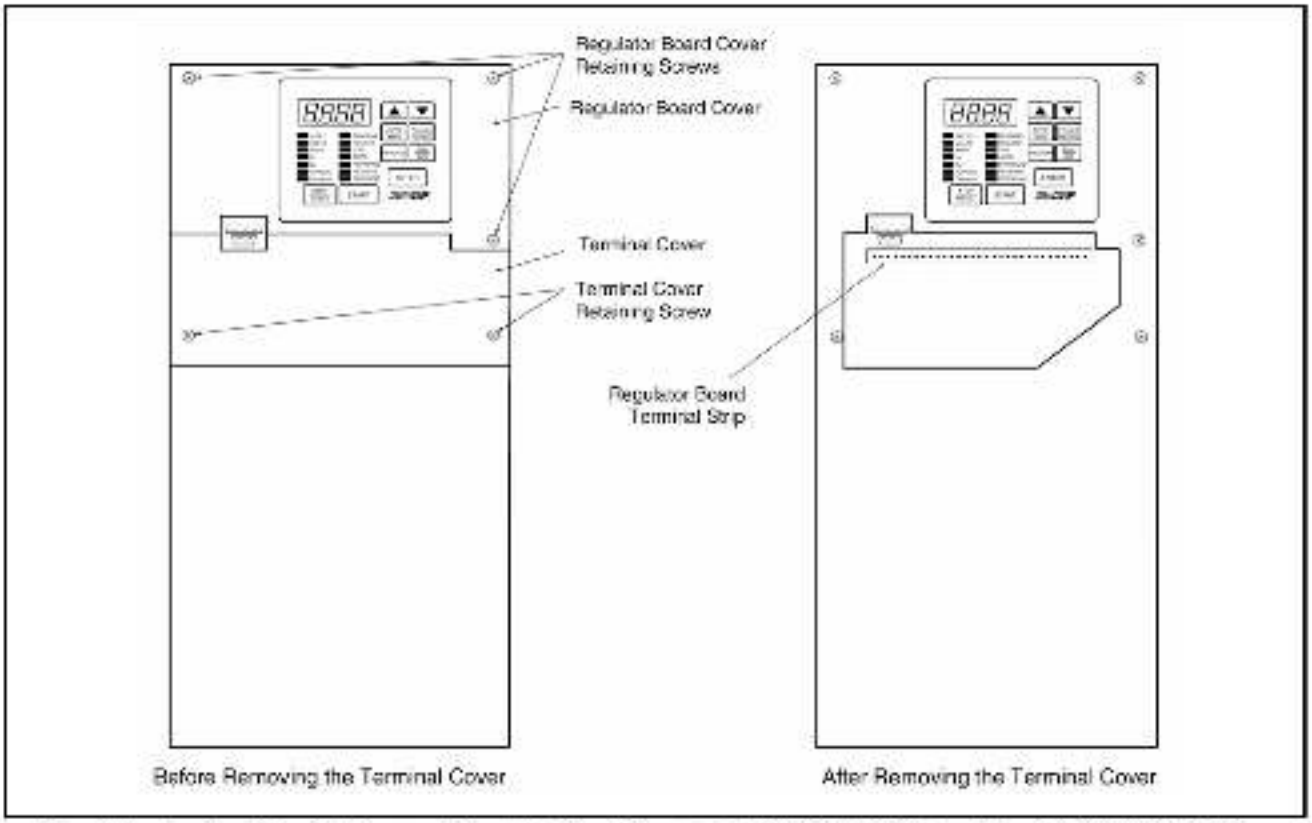

Figure 2.8 Location of Terminal Cover and Regulator Board Cover in 75 to 200 HP (460 VAC) and 30 to 100 HP (230 VAC) Drives

Step 3.2 Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

Step 3.3 Remove the terminal cover, which is below the keypad and fastened with two M4 screws. See figure 2.8.

Step 3.4 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 2.9.

Step 3.5 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.

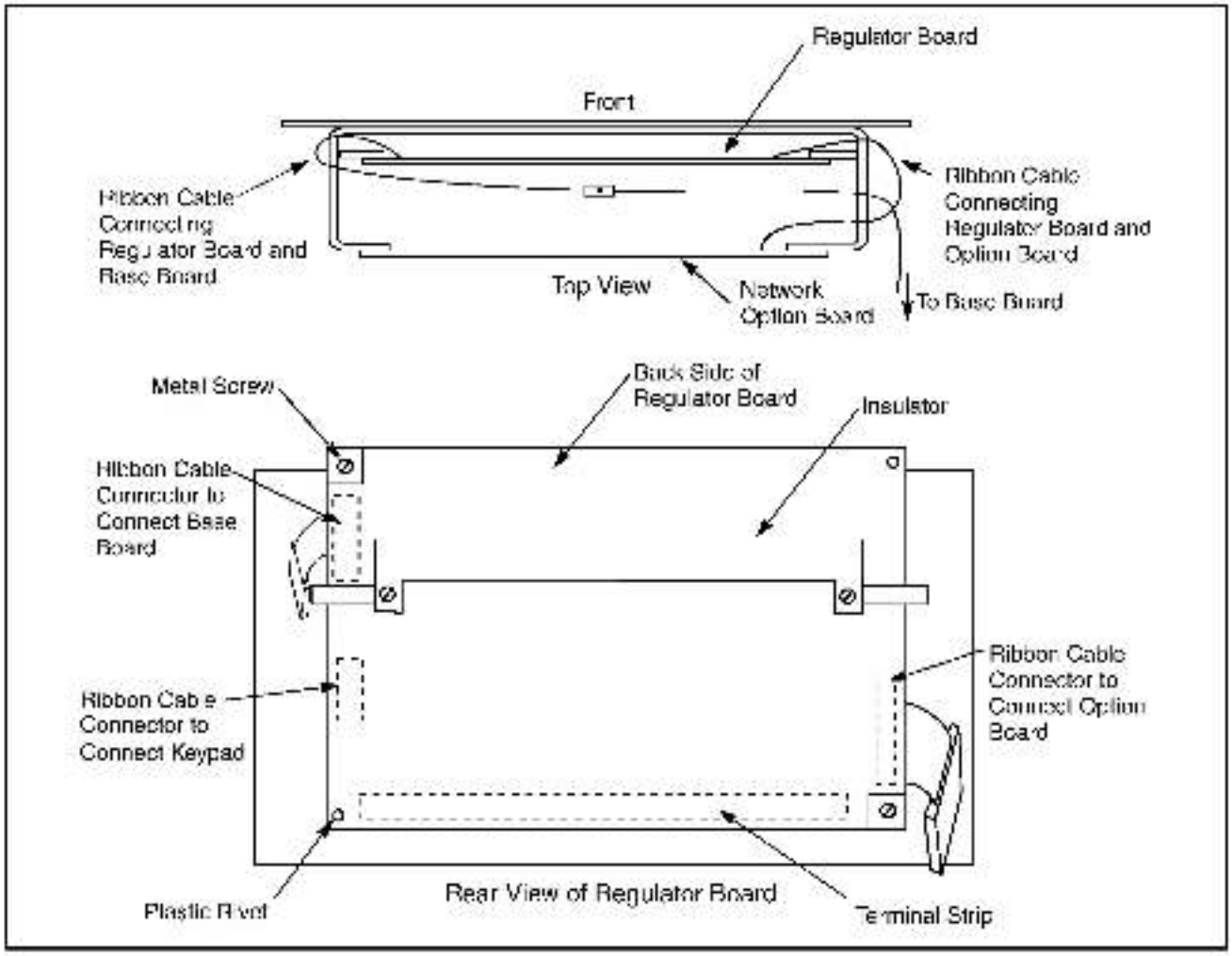

Figure 2.9 — Regulator Board's Connections to Option Board, Keypad, and Basc Board

Step 4. Install the ControlNet Option Board in the Keypad Bracket

Refer to figures 2.8 and 2.9.

Step 4.1 Remove the ControlNet opt or board from its anti-static wrapper.

Step 4.2 A ign the key on the connector of the ControlNet option board ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

Step 4.3 Route the other ribbon cable out of the side of the keypad bracket.

Step 4.4 A ign the Contro Net option board on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not p nched between the keypad bracket and the ControlNet option board.

Step 4.5 Faster the right s de of the Contro Net option board to the keypad bracket. Use the two metal M3 screws and lock washers for ground ng.

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

Step 4.6 Fasten the left side of the ControlNet option board to the keypad bracket using the two plastic rivets.

Step 5. Reinstall the Keypad Bracket in the Drive

Step 5.1 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.

Step 5.2 Place the keypad bracket back into position.

Step 5.3 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.

Step 5.4 Route the Network Drop Cable through the left-most opening at the bottom of the drive.

Step 5.5 Connect the brown wire to terminal 1 of the 2-connector terminal strip. Connect the white wire to terminal 2.

Step 5.6 Reconnect any wiring that was removed from the Regulator board.

Step 5.7 Replace the terminal cover (below the keypad). Fasten it using the two M4 screws removed earlier.

This completes the hardware installation of the ControlNet option board. Do not remove the lockout and tag until you have completed section 2.9, which provides instruction on connecting to the ControlNet network.

2.5 Installing the ControlNet Option Board in 15 to 25 HP and 25 to 60 HP @ 460 VAC 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 at 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 disconnecting 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 internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution can result in bodily injury.

Use this procedure to install the ControlNet option board in drives with the model numbers listed in table 2.5.

Table 2.5 – Model Numbers for 15 to 60 HP @ 460 VAC Drives

15V41xx 15V42xx	30V41xx 30V42xx
20V41xx 20V42xx	40V41xx 40V42xx
25G41xx 25G42xx 25V41xx 25V42xx	50V41xx 50V42xx
	60G41xx 60G42xx

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.

Step 1. Shut Down the Drive

Step 1.1 Disconnect, lock out, and tag all incoming power to the drive.

Step 1.2 Wait five minutes for the DC bus capacitors to discharge.

Step 1.3 Remove the cover by loosening the four cover screws.

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

Step 2. Verify that the DC Bus Capacitors are Discharged

Step 2.1 Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (R/L1, S/L2, T/L3).

Step 2.2 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 as shown in figures 2.10 (15 to 25 HP) and 2.11 (25 to 60 HP).

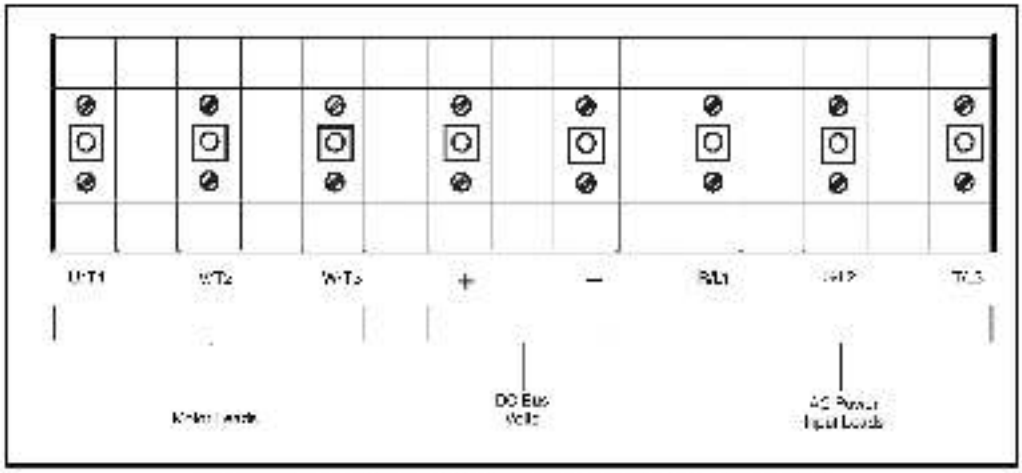

Figure 2.10 – DC Bus Voltage Terminals (15 to 25 HP @ 460VAC)

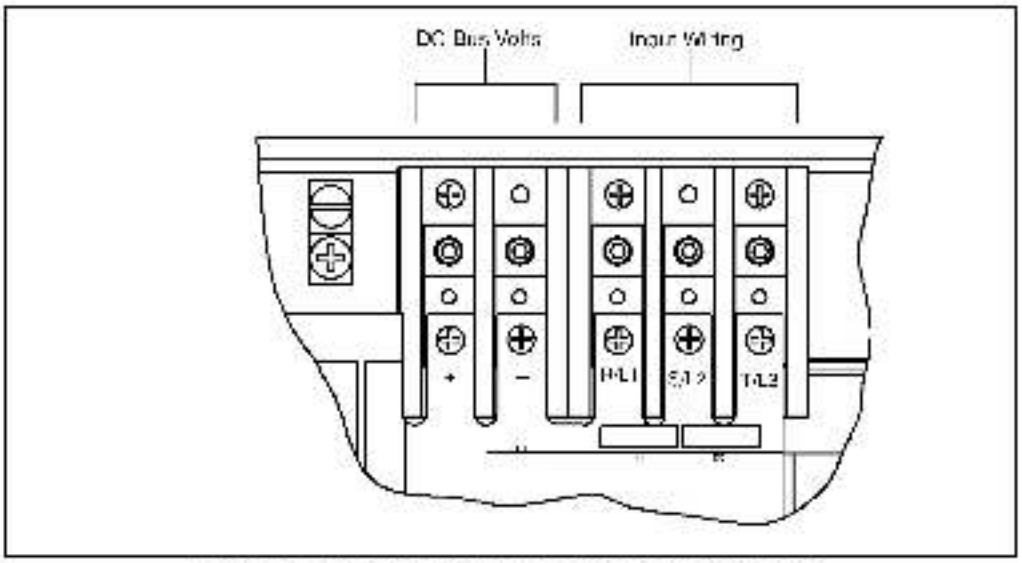

Figure 2.11 – DC Bus Voltage Terminals (25 to 60 HP @ 460VAC)

Step 3. Remove the Keypad Bracket from the Drive

Step 3.1 Record connections to the Regulator board terminal strip. They must be disconnected to remove the keypad bracket.

Step 3.2 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.

Step 3.3 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.

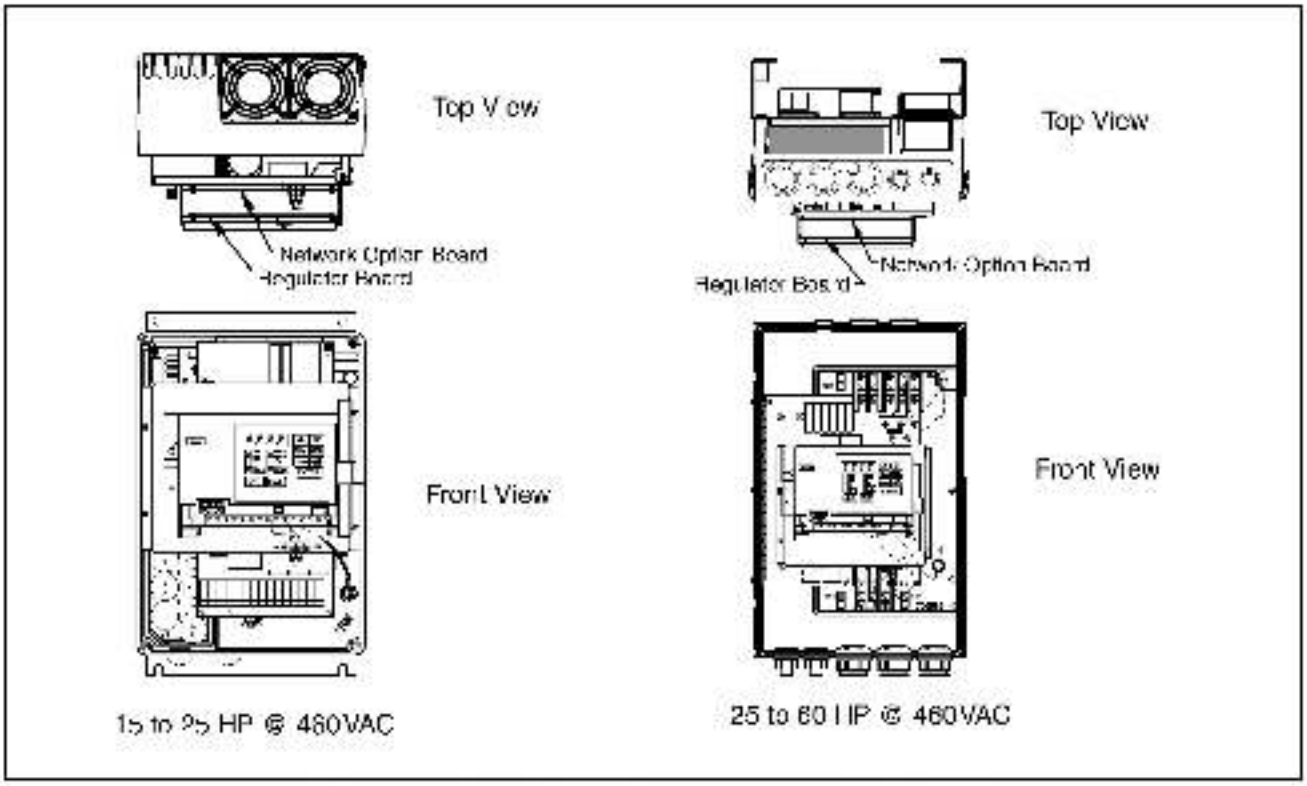

Figure 2.12 – GV3000/SE Drive (15 to 25 and 25 to 60 HP @ 460VAC)

Step 4. Install the ControlNet Option Board in the Keypad Bracket

Refer to figure 2.12 for component locations.

Step 4.1 Remove the ControlNet option board from its anti-static wrapper.

Step 4.2 Align the key on the connector of the ControlNet option board ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

Step 4.3 Align the ControlNet option board on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the ControlNet option board.

Step 4.4 Fasten the right side of the ControlNet option board 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.

Step 4.5 Fasten the left side of the ControlNet option board to the keypad bracket using the two plastic rivets.

Step 4.6 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.

Step 5. Reinstall the Keypad Bracket in the Drive

Step 5.7 Reconnect the keypad bracket to the keypad support bracket by inserting the mounting tabs into the slots in the support bracket and tightening the thumb screw.

Step 5.8 Route the Network Drop Cable through the left-most opening at the bottom of the drive.

Step 5.9 Connect the brown wire to terminal 1 of the 2-connector terminal strip. Connect the white wire to terminal 2.

Step 5.10 Reconnect any wiring that was removed from the Regulator board.

Step 5.11 NEMA 4X/12 drives only: Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

Step 5.12 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 2.2 Nm (20 in-lb) of torque on these screws.

This completes the hardware installation of the ControlNet option board. Do not remove the lockout and tag until you have completed section 2.9, which provides instruction on connecting to the ControlNet network.

2.6 Installing the ControlNet Option Board in 50 to 100 HP and 100 to 150 HP @ 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 at 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 disconnecting 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 internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution can result in bodily injury.

Use this procedure to install the ControlNet option board in drives with the model numbers 50R/1xx, 50T/1xx, 75R/1xx, 75T/1xx, or 125R/1xx.

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.

Step 1. Shut Down the Drive

Step 1.1 Disconnect, lock out, and tag all incoming power to the drive.

Step 1.2 Wait five minutes for the DC bus capacitors to discharge.

Step 1.3 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.

Step 2. Verify that the DC Bus Capacitors are Discharged

Step 2.1 Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals (1L1, 1L2, 1L3).

Step 2.2 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. 50 to 100 HP @ 460 V only: Use a voltmeter to measure the DC bus potential at the diode bridge. Refer to figure 2.13.

c. 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 2.14.

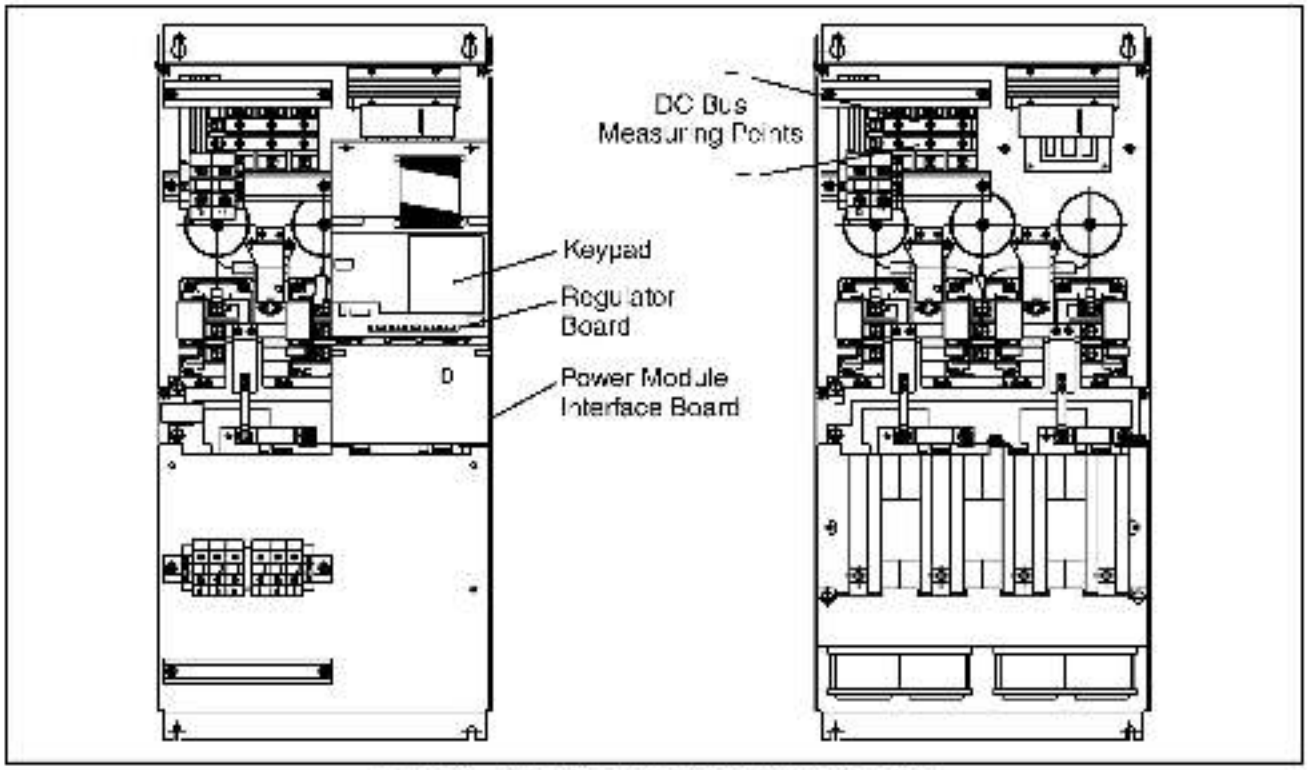

Figure 2.13 – 50 to 100 HP Drive Components and Locations

Step 3. Remove the Keypad Bracket from the Drive

Step 3.1 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 drive chassis.

Step 3.2 Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

Step 3.3 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.

Step 3.4 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.

Step 4. Install the ControlNet Option Board in the Keypad Bracket

Refer to figure 2.13 (50 to 100 HP drives) or 2.13 (100 to 150 HP drives) for component locations.

Step 4.1 Remove the ControlNet option board from its anti-static wrapper.

Step 4.2 Align the key on the connector of the ControlNet option board ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

Step 4.3 Align the ControlNet option board on the four mounting tabs on the keypad bracket. Make sure that the ribbon cable is not pinched between the keypad bracket and the ControlNet option board.

Step 4.4 Fasten the right side of the ControlNet option board 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.

Step 4.5 Fasten the left side of the ControlNet option board to the keypad bracket using the two plastic rivets.

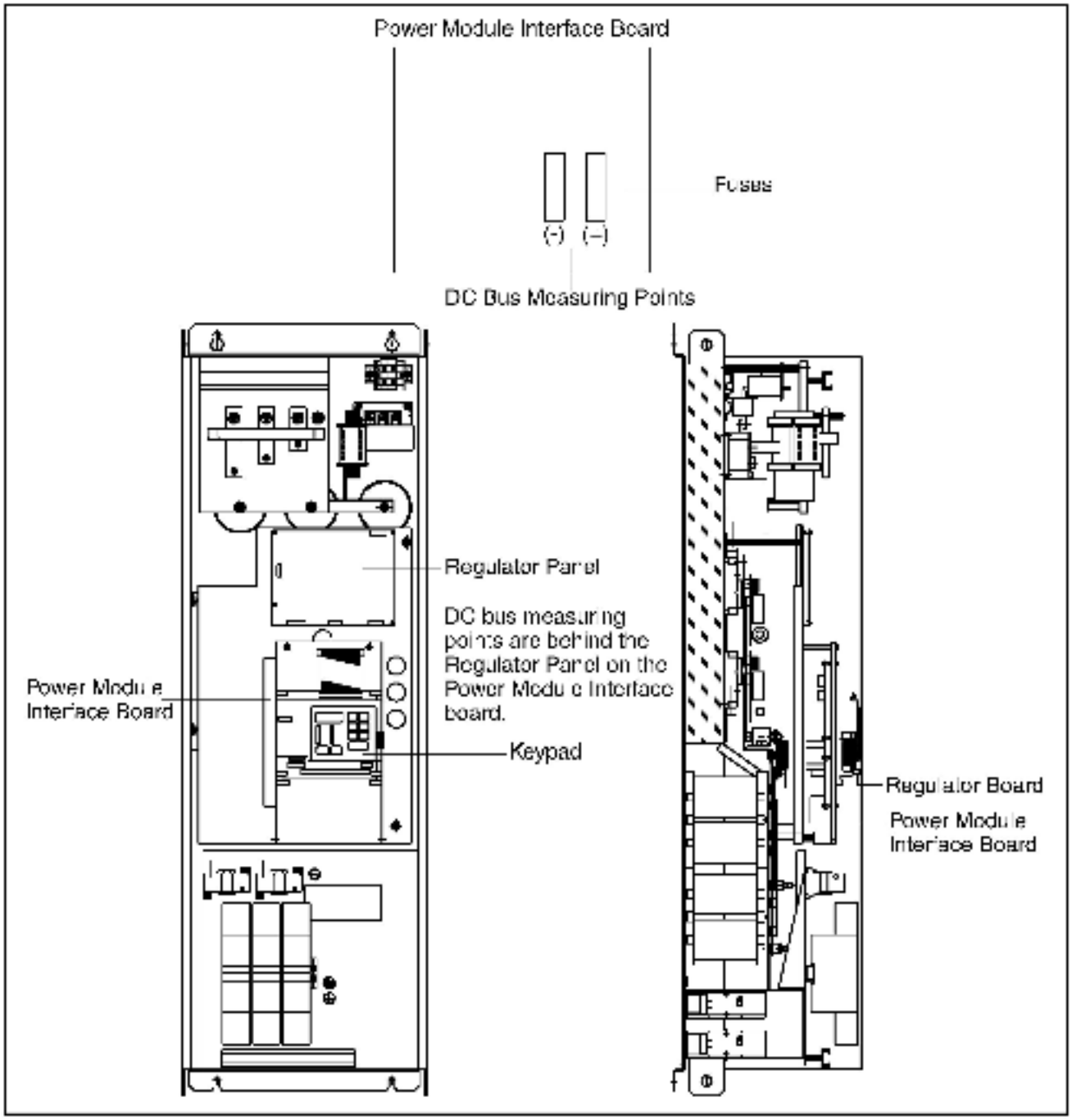

Figure 2.14 – 100 to 150 HP Drive Components and Locations

Step 5. Reinstall the Keypad Bracket in the Drive

Step 5.1 Reconnect the keypad bracket to the hinged mounting panel using the four screws and lock washers removed earlier.

Step 5.2 100 to 150 HP drives only: Remove the tie that was fastened to the Power Module Interface board earlier.

Step 5.3 100 to 150 HP drives only: 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 that good contact has been made with the two grounding standoffs.

Step 5.4 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.

Step 5.5 Swing the hinged mounting panel back into position. Make sure no wires or cables are pinched by the panel.

Step 5.6 Refasten the two screws at the top of the panel.

Step 5.7 Route the Network Drop Cable through the right-most opening at the bottom of the drive, away from the AC lines.

Step 5.8 Connect the brown wire to terminal 1 of the 2-connector terminal strip. Connect the white wire to terminal 2.

Step 5.9 Reconnect any wiring that was removed from the Regulator board.

Step 5.10 Replace mounting panel and fasten with two screws at the top of the hinged panel (where the keypad bracket is mounted).

Step 5.11 NEMA 4X/12 drives only: Before installing the cover, check that the gaskets on the cover are flat and within the gasket channels.

Step 5.12 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 ControlNet option board. Do not remove the lockout and tag until you have completed section 2.9, which provides instruction on connecting to the ControlNet network.

2.7 Installing the ControlNet Option Board in 200 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 at 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 disconnecting 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 internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result. If this procedure is not followed. Failure to observe this precaution can result in bodily injury.

Use this procedure to install the ControlNet option board in drives with part number 200V41xx, 250V41xx, 300V41xx, 350V41xx, 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.

Step 1. Shut Down the Drive

Step 1.1 Disconnect, lock out, and tag all incoming power to the drive.

Step 1.2 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.

Step 2. Verify that the DC Bus Capacitors are Discharged

Step 2.1 Open the drive's outer cabinet door.

Step 2.2 Lower the plastic terminal strip shield at the top of the drive.

Step 2.3 Use a voltmeter to verify that there is no voltage at the drive's AC input power terminals: R, S, and T.

Step 2.4 Replace the plastic terminal strip shield.

Step 2.5 Ensure that the DC bus capacitors are discharged. To check DC bus potential:

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

b. Use a voltmeter to check the DC bus potential at the Voltmeter Test Points on the Power Module Interface board. See figure 2.15.

Step 3. Remove the Keypad Bracket from the Drive

Refer to figure 2.15 for component locations.

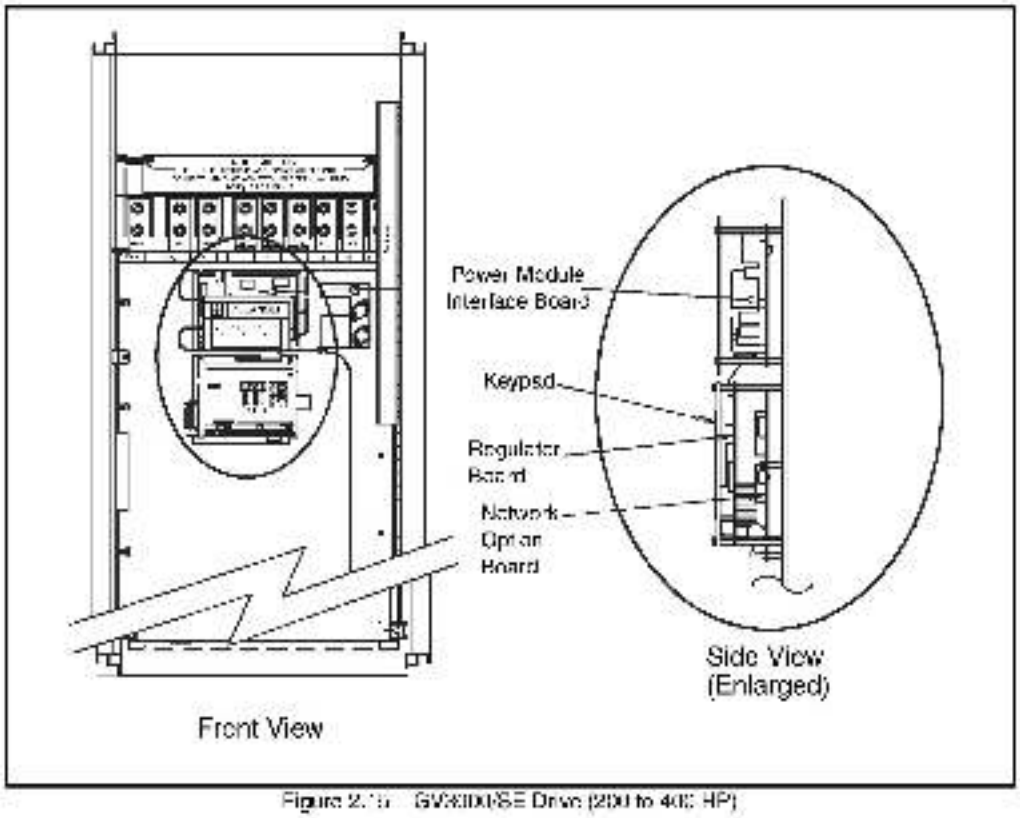

Figure 2.15 GV3000/SE Drive (200 to 400 HP)

Step 3.1 Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

Step 3.2 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.

Step 3.3 Disconnect the Regulator board ribbon cable from the Power Module Interface board.

Step 4. Install the ControlNet Option Board

Step 4.1 Remove the ControlNet option board from its anti-static wrapper.

The ControlNet option board mounts on four standoffs behind the Regulator board.

Step 4.2 Align the ControlNet option board's four mounting holes with the four standoffs on the hinged mounting panel of the drive.

Step 4.3 Fasten the board to the drive with four 3/32" nuts. Metal nuts must be used for proper grounding of the ControlNet option board.

Step 4.4 Connect the brown wire to terminal 1 of the 2-connector terminal strip. Connect the white wire to terminal 2.

Step 4.5 Align the key on the connector of the ControlNet option board ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

Step 4.6 Route the Network Drop Cable through the signal wiring tray on the right side of the drive.

Step 5. Reinstall the Keypad Bracket in the Drive

Step 5.1 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.

Step 5.2 Reconnect the keypad bracket to the hinged mounting panel using the four screws removed earlier.

Step 5.3 Reconnect any wiring that was removed from the Regulator board.

Step 5.4 Close and secure the outer cabinet door of the drive.

This completes the hardware installation of the ControlNet option board. Do not remove the lockout and tag until you have completed section 2.8, which provides instruction on connecting to the ControlNet network.

2.8 Installing the ControlNet Option Board in 2 to 43 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 at 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 disconnecting 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 internal components. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution can result in bodily injury.

Use the procedure in this section to install the ControlNet option board in the drives listed in table 2.6.

Table 2.6 Model Numbers for 2 to 15 Amp and 24 to 43 Amp Drives

2 to 15 Amp	24 to 30 Amp	43 Amp
31ER40xx 31ET40xx	240ER40xx 240ET40xx	430ER40xx 430ET40xx
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.

Step 1. Shut Down the Drive

Step 1.1 Disconnect, lock out, and tag all incoming power to the drive.

Step 1.2 Wait five minutes for the DC bus capacitors to discharge.

Step 1.3 Disconnect all faceplate wiring.

Important: The cover is connected to the drive by the keypad/display cable. To disconnect the cover, use the procedure below. Do not remove the keypad/display.

Step 1.4 Remove the cover as follows:

a. Unscrew the attaching screw on the cover.

b. Lift the cover and carefully take it out of the heatsink as far as the flat ribbon keypad cable will allow. This cable connects the display with the Regulator board.

c. Use a screwdriver to slide the cable out of the connector on the Regulator board to completely detach the cover.

Step 1.5 24 to 43 A drives only: Remove the front panel by unscrewing the two attaching screws.

Step 2. Verify that the DC Bus Capacitors are Discharged

Step 2.1 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 2.16 or 2.19 for the location of these terminals.

Step 2.2 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 ((–)45, (–)47) shown in figure 2.16 or 2.19.

Step 2.3 24 to 43 A drives only: Reattach the front panel after checking the DC bus potential.

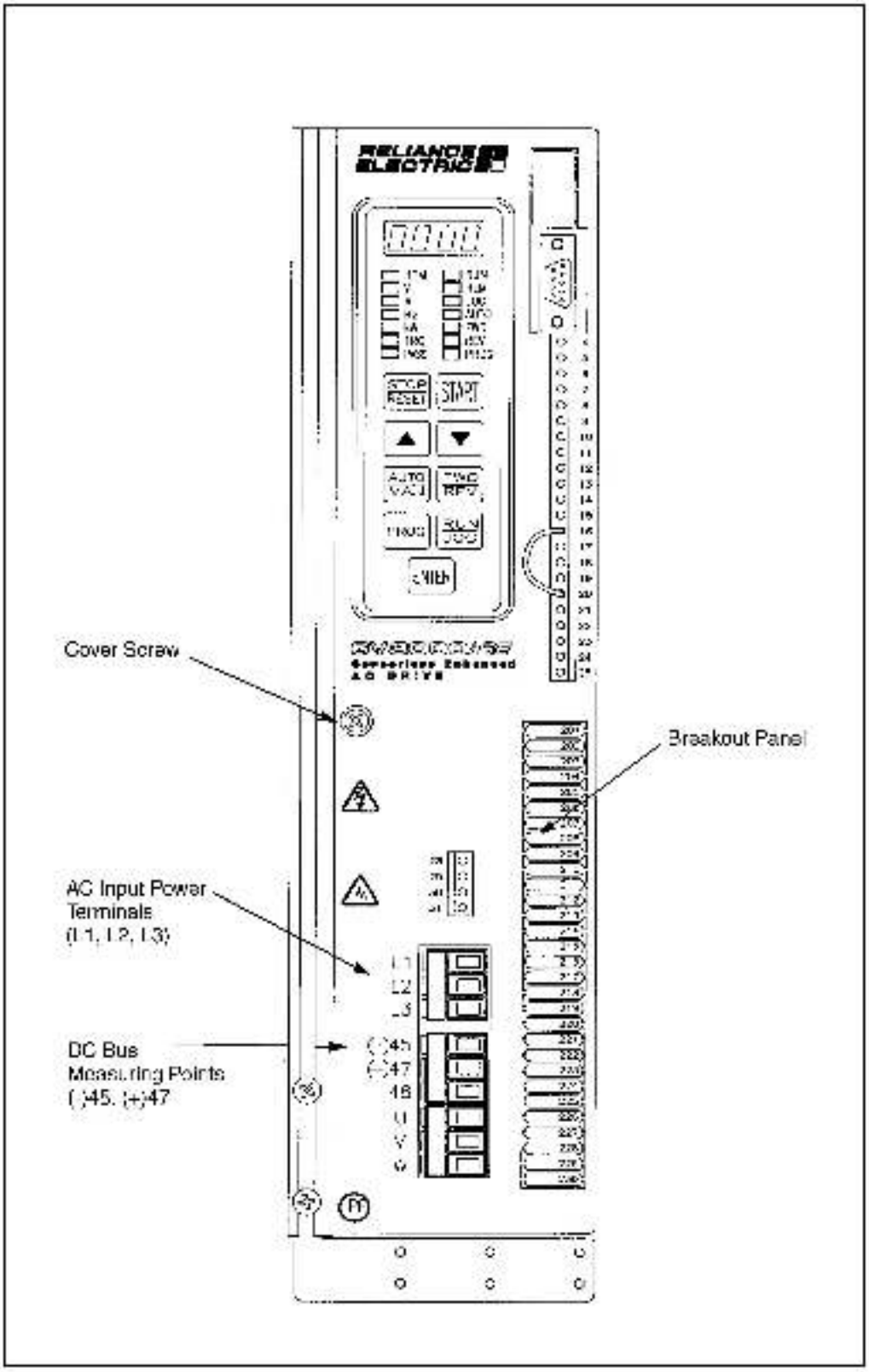

Figure 2.16 2 to 15 Amp GV3000/SE Bookshelf Drives

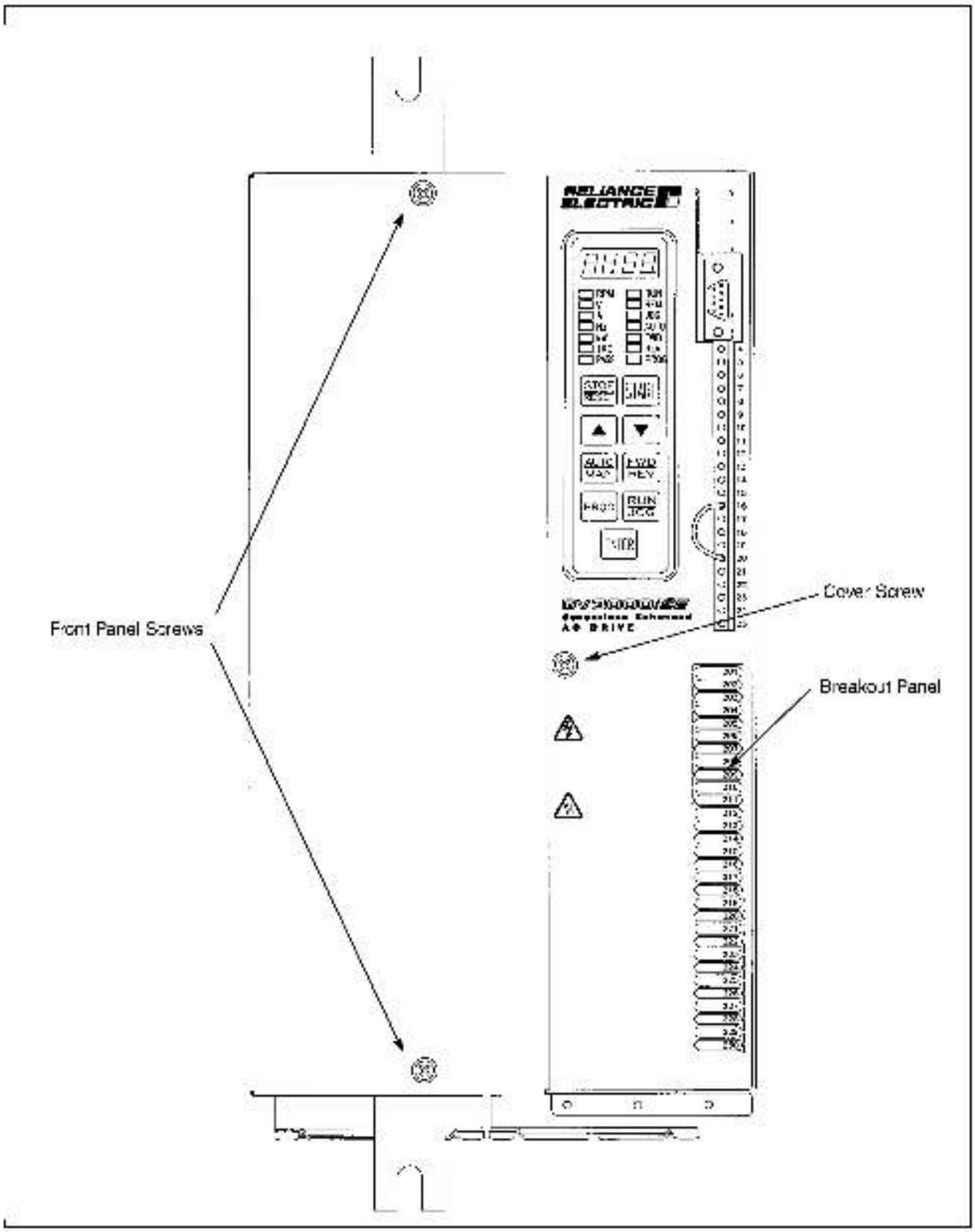

Figure 2.17 – 21 to 30 Amp GV3000/SE Bookshelf Drives

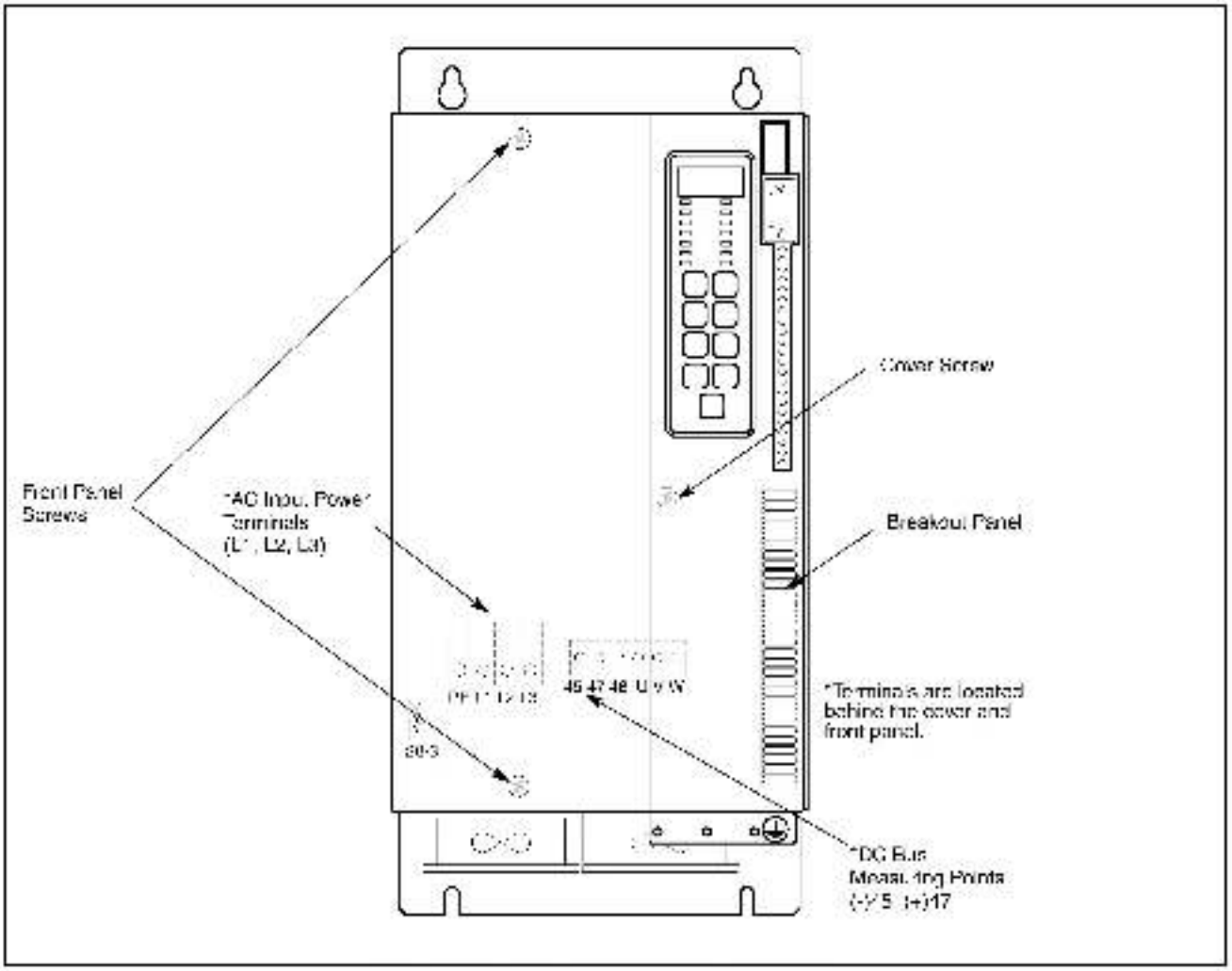

Figure 2.18 – 7.5 Amp CV2000/SE Bookshelf Drives

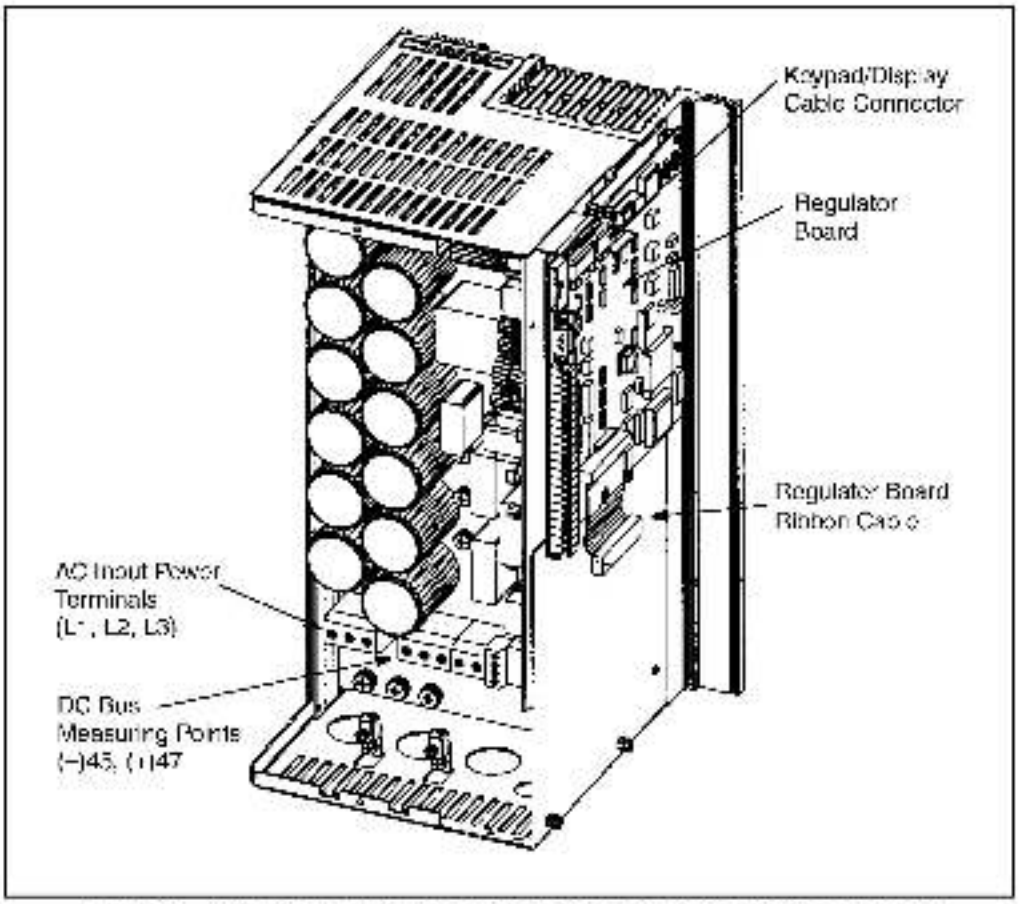

Figure 2.19 – 21 to 30 Amp SVS000/SE Bookshelf Drive (Cover and Front Panel Removed)

ATTENTION: The drive contains ESD- (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing the drive. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed. Failure to observe this precaution can result in bodily injury.

Step 3. Install the ControlNet Option Board in the Drive

Step 3.1 Remove the ControlNet option board from its anti-static wrapper.

Step 3.2 Align the key on the connector of the ControlNet option board ribbon cable with the key on the Regulator board connector. Press the ribbon cable connector in until it locks into position.

Step 3.3 Fasten the ControlNet option board to the drive using the screws provided.

Step 3.4 Connect the brown wire of the Network Drop Cable to terminal 1 of the 2 connector terminal strip. Connect the white wire to terminal 2.

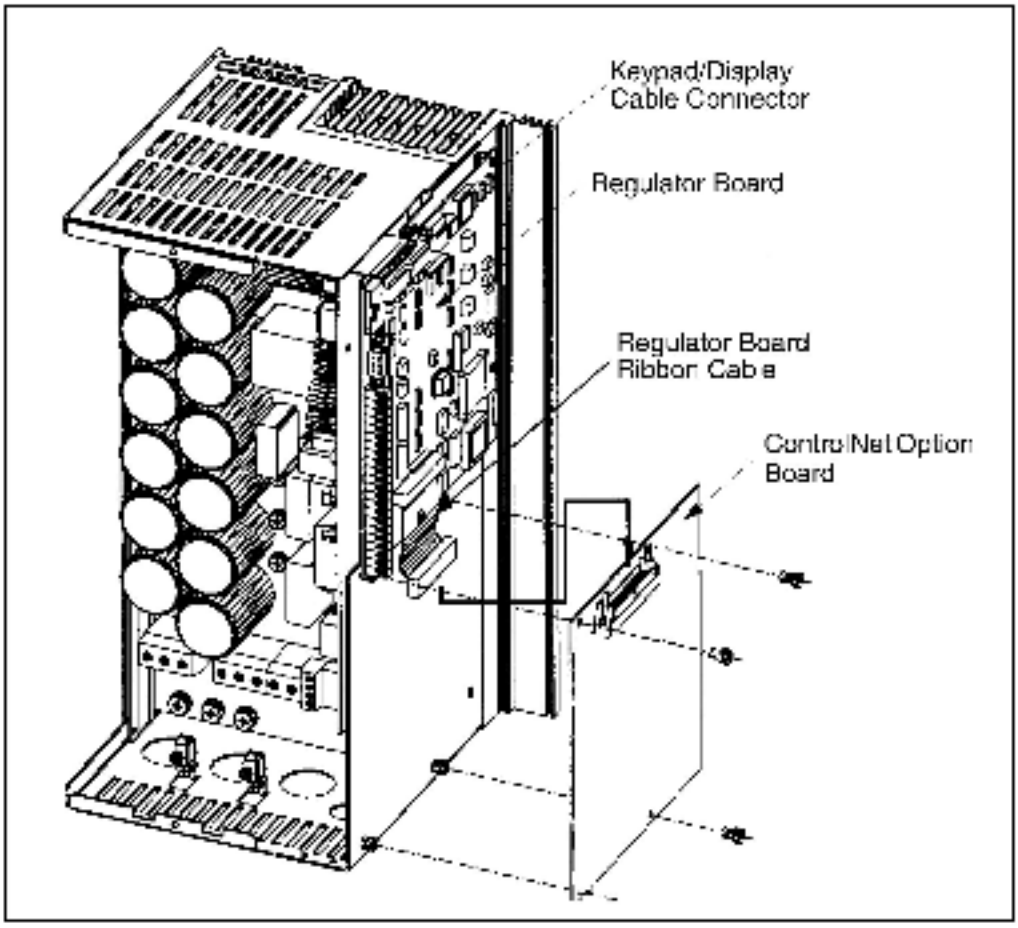

Figure 2.20 – Installing the ControlNet Option Board

Step 4. Reattach the Cover

Step 4.1 Remove enough tabs on the faceplate breakout panel to allow the Network Drop Cable through.

Step 4.2 Route the Network Drop Cable through the breakout panel.

Step 4.3 Reconnect the keypad/display cable to the cover.

Important: Check that the display cable is reconnected to the Regulator board. You will need to fold and route the cable under the heatsink before replacing the cover.

Step 4.4 Reattach the cover using the single faceplate screw.

Step 4.5 Reconnect all faceplate wiring.

This completes the hardware installation of the ControlNet option board. Do not remove the lockout and tag until you have completed section 2.9, which provides instruction on connecting to the ControlNet network.

2.9 Connecting the GV3000/SE Drive to a ControlNet Network

ATTENTION: Do not let any metallic surfaces on the BNC connectors, plugs, or optional accessories touch grounded metallic surfaces. This contact could cause noise on the network. Failure to follow this precaution could result in damage to equipment.

The ControlNet network is composed of:

- trunk cables
- drop cables (run from a tap on the trunk cable to a node)
- taps
- terminators
- repeaters

Refer to your ControlNet Network Planning and Installation manual for a detailed description of how to install a ControlNet network and add a drop to an existing ControlNet network.

Step 4.1 Stop any application tasks that are running.

Step 4.2 Remove the lockout and tag. Apply power to the drive. SELF is displayed while the drive performs power up diagnostics. If there is an error during diagnostics, it is logged. See your drive software manual for information on errors.

Step 4.3 Connect a Contrc Net Network drop cable to one of the BNC connectors on the optior board. Connect the other end to a tap.

See figure 2.21 for cabling and termination connections.

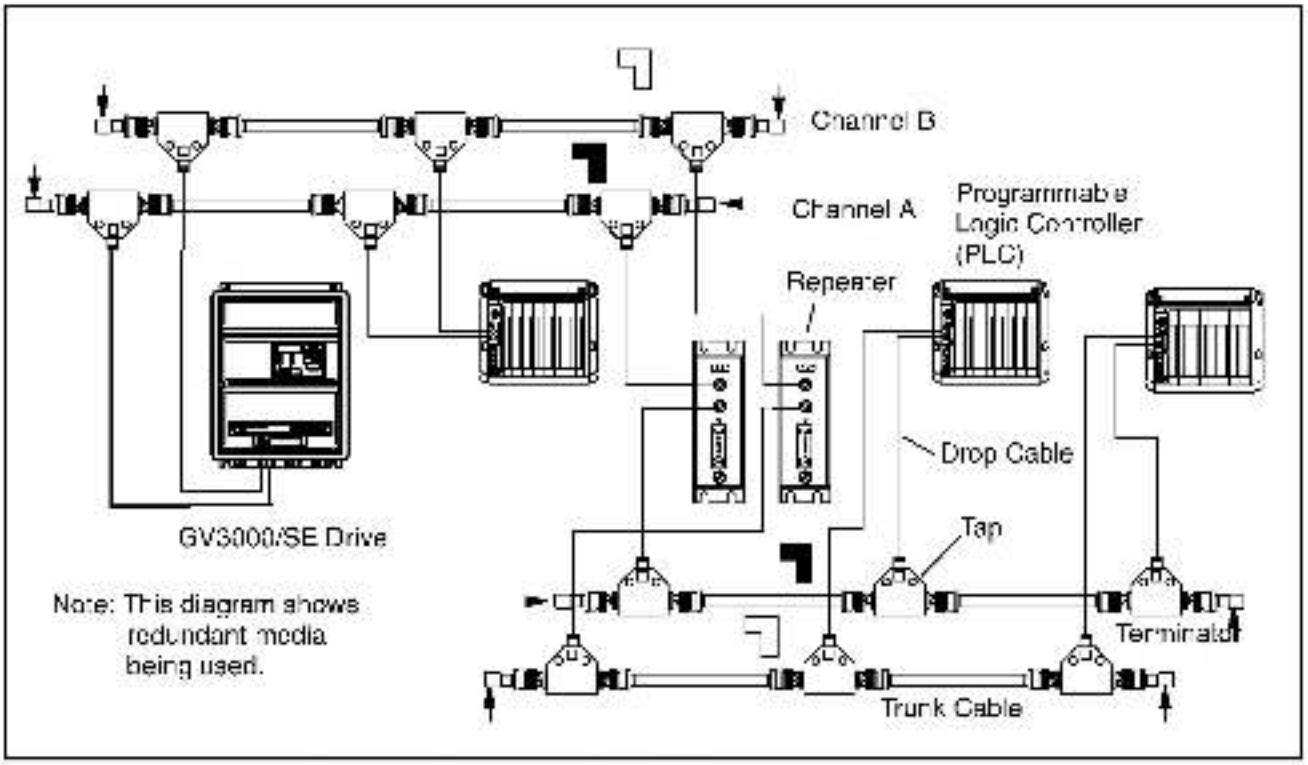

Figure 2.21 Connecting a GV3000/SE Drive to the ControlNet Network

You can run a second trunk cable between your ControlNet nodes for redundant media. With redundant media, nodes send signals on two separate segments. The receiving node automatically compares the quality of the two signals and accepts the better signal. This also provides a backup cable should one cable fail. When using redundant media, you must use two passive taps.

If you do not use redundant media, the option board can operate using only channel A or channel B, as long as all other drops on the network are using the same channel.

2.10 Connecting a Programming Device to the Option Board's Network Access Port

You can gain full access to the ControlNet network by connecting a programming device to the option board's network access port, an RJ-45 connector.

Important: Be sure to use a network access cable that is approved by a ControlNet vendor. Using an unsuitable cable could result in possible network failures.

CHAPTER 3

Setting Up the GV3000/SE Drive

This chapter describes how to configure a GV3000/SE drive for use with a ControlNet network. The sections that follow describe the GV3000/SE parameters related to ControlNet operation.

3.1 Setting the Control Type (P.048)

The first parameter that must be set up is P.048 (Volts/Hertz or Vector Regulation). This parameter is used to select the control type as volts/hertz or vector. All units ship from the factory with the control type set to volts/hertz (P.048 = U-H). If this is not the desired mode of operation, you must change P.048.

Important: When P.048 is changed, all P parameters (except P.048 and P.049) are reset to their default values.

Parameter P.048 cannot be written over the ControlNet network.

Parameter Range:	U-H = V/Hz control UEC = vector control
Default Setting:	U-H
Parameter Type:	Non-volatile, Configurable (Read Only over the ControlNet network)

3.2 Setting the Node Number (P.060)

Use parameter P.060 (Network Drop Number) to assign a node number to the GV3000/SE drive. The node number can be changed (through a local operator interface) only when the drive is stopped. This parameter cannot be written over the ControlNet network.

The node number must be changed to a value greater than 1 to begin ControlNet communication. After the network has been configured and after parameter P.060 is set to a value greater than 1, the LEDs on the network option board should turn solid green to indicate that communication is active.

If the node number is changed from any value other than 1, the power to the drive must be turned off and back on to have the new value take effect. If parameter P.000 is not equal to 1 on power-up, the drive will attempt to begin communicating on ControlNet immediately after the drive diagnostics complete.

Parameter Range:	1-99
Default Setting:	1
Parameter Type:	Non-volatile, Configurable (Read Only over the ControlNet network)

3.3 Setting the Control Source (P.000)

Use parameter P.000 (Control Source) to determine the source of control information for the drive (start, jog, direction, etc.). To start and stop the drive over the network, parameter P.000 must be set to OP. This parameter can be written over the ControlNet network only when the drive is stopped.

After parameter P.000 is set to OP, the Remote LED on the keypad should turn on to show the network is in control of the drive. Note that parameter P.000 does not prevent the drive from communicating on ControlNet; it only allows the drive to be controlled, and the reference to be supplied, from ControlNet. Parameter P.000 does not have to be set to OP to modify or read drive parameters.

Parameter Range:	LOCL = Local keypad/display rE = Terminal strip remote inputs OP = Option port SErL = Serial port (CS3000 or OIM)
Default Setting:	LOCL
Parameter Type:	Non-volatile, Configurable

3.4 Setting the Run/Program Response (P.061)

ATTENTION: This parameter allows you to configure the drive to continue to run when the PLC is put into program mode. You must provide some form of hardwired stop, since stopping the drive through the network might not be possible. Failure to observe this precaution could result in bodily injury or damage to, or destruction of, equipment.

Use parameter P.061 to select how the drive responds when communicating with a programmable controller while the programmable controller is in program mode. This parameter can be written over the ControlNet network. Note that the Function Loss input on the terminal strip remains active at all times regardless of the setting of this parameter.

When P.061 = 0 (Stop), the drive stops when the programmable controller is put into program mode. The drive can be started only when the programmable controller is in run mode.

When P.061 = 1 (Not Stop), the drive does not stop when the programmable controller is put into program mode. The drive can be started when the programmable controller is in either program or run mode.

When P.061 = 3 (Use terminal strip digital inputs), the drive uses the terminal strip inputs for start, stop, reset, and run/jog when the programmable controller is put into program mode. Depending on how P.007 and P.008 are configured, the drive may also use the terminal strip inputs for forward/reverse, ramp 1/2, torque/speed, MOP up, MOP down, and preset speed selection. The only terminal strip signal that cannot be used is remloc. The function loss digital input remains active at all times. While the programmable controller is in program mode, the speed reference is the analog input, the MOP, or one of the preset speeds, depending on the value of P.008 and the configured digital inputs. When the programmable controller returns to run mode, the drive transfers the control source back to the ControlNet network.

Parameter Range:	0 = Stop 1 = Not Stop 3 = Use terminal strip contro
Default Setting:	0
Parameter Type:	Non-volatile, Tunable

3.5 Setting the Communication Loss Response (P.062)

ATTENTION: This parameter allows you to configure the drive to continue to run if a loss of network communication occurs. You must provide some form of hardwired stop in case of communication loss, since stopping the drive through the network might not be possible. Failure to observe this precaution could result in bodily injury or damage to, or destruction of, equipment.

Parameter P.062 defines how the drive responds when a loss of scheduled communication is detected. This parameter can be written over the ControlNet network.

When P.062 = 0 (IET fault), the drive will fault stop when loss of communication is detected.

When P.062 = 1 (Hold last reference), the drive maintains the last reference until communication is re-established and the programmable controller has completed one scan to evaluate a new drive reference value.

If network communication is re-established, the drive will again follow the reference and sequencing control inputs supplied by the network master. Note that if P.054 (Level Sense Start Enable) = ON and the start and stop inputs are on (1), the drive may start.

ATTENTION: In volts/hertz regulation, if P.000 (Control Source) is set to OP (Option Port), and P.062 is set to 1 (Hold Last Reference), and the drive loses communication with the network, the drive will maintain the last frequency command sent to it. Ensure that drive machinery, all drive-train mechanisms, and application material are capable of safe operation at the maximum operating speed of the drive. Failure to observe this precaution could result in bodily injury.

ATTENTION: In vector regulation, if U.000 (Torque Reference Source) is set to 2 (Option Port), and P.062 is set to 1 (Hold Last Reference), and the drive loses communication with the network, the drive will no longer be regulating speed. Instead, motor speed will vary according to the load, up to the overspeed limit. Ensure that driven machinery, all drive-train mechanisms, and application material are capable of safe operation at the maximum operating speed of the drive. Failure to observe this precaution could result in bodily injury.

When P.062 = 2 (Use terminal strip reference), the drive uses the terminal strip analog input for the reference value if P.008 = 0. If P.008 ≠ 0, the selected source will be used. After communication is re-established and the programmable controller has completed one scan to evaluate a new drive reference value, ControlNet will resume control. Note that when using this setting, the terminal strip Stop input must be maintained for the drive to run.

Note that if P.054 (Level Sense Start Enable) = OFF and the drive is stopped while in this mode, it cannot be restarted until network communication is re-established or the Control Source (P.000) is changed.

Also note that if P.054 (Level Sense Start Enable) = ON and the start and stop inputs are on (1), the drive may start.

ATTENTION: If P.062 = 2 and P.054 (Level Sense Start Enable) = ON and network communication is lost while the drive is running, the terminal strip stop input will function as a STOP/RUN input. If the terminal strip stop input is opened, the drive will stop. If the terminal strip stop input is closed, the drive will re-start. Failure to observe this precaution could result in severe bodily injury or loss of life.

When P.062 = 3 (Use terminal strip control), the drive uses the terminal strip inputs for start, stop, reset, and run/jog when loss of communication is detected. Note that if P.054 (Level Sense Start Enable) = ON and the start and stop inputs are on (1), the drive may start.

Depending on how P.007 and P.008 are configured, the drive may also use the terminal strip inputs for forward/reverse, ramp 1/2, torque/speed, MOP up, MOP down, and preset speed selection. The only terminal strip signal that cannot be used is rem/loc. The function loss digital input remains active at all times.

While communication is lost, the speed reference is the analog input, the MOP, or one of the preset speeds, depending on the value of P.008 and the configured digital inputs. When network communication is re-established, the drive will again follow the reference and sequencing control inputs supplied by the network master. Note that if P.054 = ON and the network start and stop commands are on (1), the drive will start.

Important: The drive regulator may become operational before the ControlNet network becomes active (sending and receiving start/stop commands). If this occurs, the drive will start on power up when P.062 = 3 and all of the following conditions are true:

- P.000 (Control Source) = OP
- P.054 (Level Sense Enable) = ON
- The terminal strip stop input is closed
- The terminal strip function loss input is closed
- The terminal strip start signal is closed and maintained.

When communication is established and the network becomes active, the drive will receive its start/stop commands from the network.

When P.062 = 4 and an nCL or F62 error occurs, then the drive will operate as described above for P.062 = 3.

ATTENTION: F62 indicates a watchdog timeout on the ControlNet Interface Module. This normally results in drive shutdown with the F62 latching fault annunciated. The F62 is typically a result of faulty interface module hardware. It can also occur as a result of excess noise generated during an event that severs the controlnet cable. This mode of operation should be used only in applications where motor stoppage would result in damage to costly equipment. Failure to observe this precaution could result in damage to equipment.

Parameter Range:	0 = IET fault 1 = Hold last reference 2 = Use terminal strip reference 3 = Use terminal strip control 4 = Use terminal strip control for nCL or F82
Default Setting:	0
Parameter Type:	Non-volatile, Tunable
Refer also to parameters:	N/A

3.6 Setting the Network Output Register Sources P.066 to P.069)

Parameters P.066 through P.069 define the signals written to network output registers 1 through 4. These parameters can be written over the ControlNet network.

Figure 3.1 provides a graphical representation of these parameters.

Parameter Range:	0 = (P.066) Motor Kw display value (P.067) Motor torque display value* (P.068) Output power factor (P.069) Encoder counter (x4)* 1 = Speed reference rate limit output* 2 = Speed reference at the ref/fdbk summing junction (includes OCL output and current compounding)* 3 = Speed loop feedback* 4 = Speed loop error* 5 = Speed PI output* 6 = Outer control loop feedback* 7 = Outer control loop error* 8 = Outer control loop output* 9 = Terminal strip analog input normalized to speed (see Appendix G) 10 = Terminal strip analog input scaled (see Appendix G) 11 = Torque reference* 12 = Torque feedback*
Default Setting:	0
Parameter Type:	Tunable
Refer also to parameters:	N/A

*These signals are valid only in vector control (P.076 = UEC).

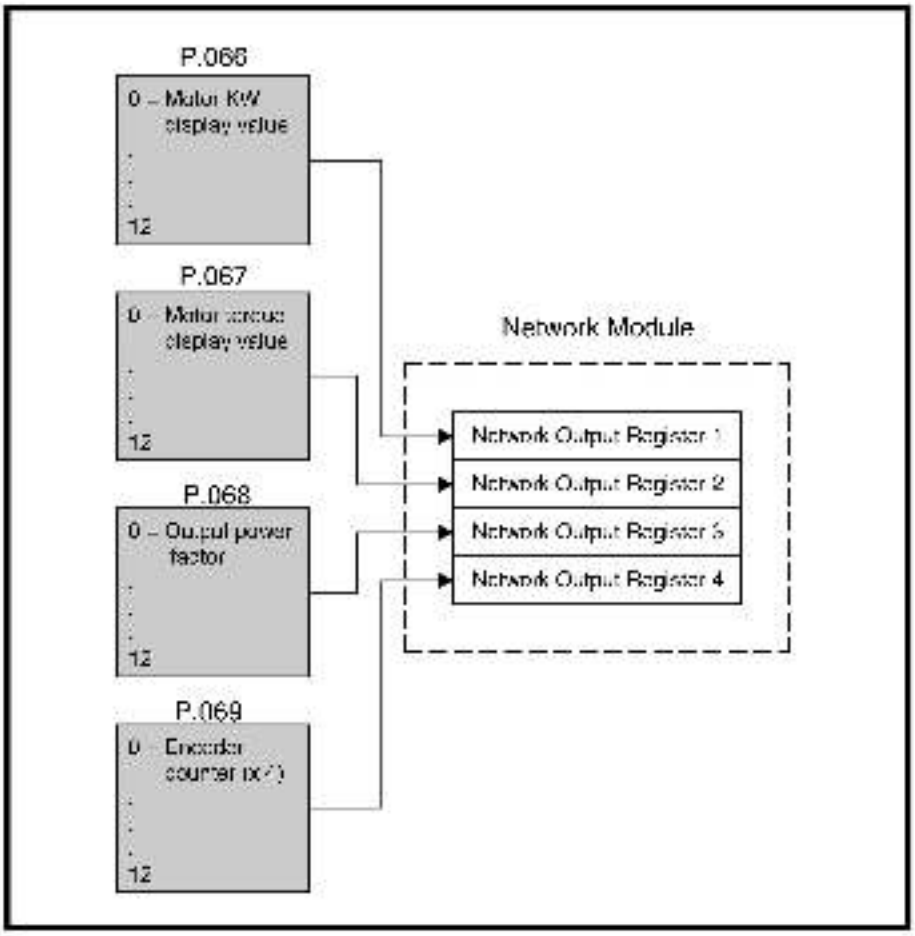

Figure 3.1 – Signal Selection for Network Output Registers

3.7 Option Port: Type and Version (P.065)

Parameter P.065 displays the option type and the software version number of the network option board. This parameter is read only over the ControlNet network.

The display format is N.vvv, where N represents the option type (1 – RMI, 2 – AutoMax network, 4 – DeviceNet network, and 5 – ControlNet network) and vvv represents the software version number.

For example, if 5.602 is displayed, it means the drive is using the ControlNet network option and is running software version 6.02.

3.8 Network Reference Source (P.063) and Network Trim Reference Source (P.064)

Parameters P.063 and P.064 are not used with the ControlNet Network Option board. Do not write to these parameters.

CHAPTER 4

Programming the Drive

This section describes how to program the drive over the ControlNet network.

4.1 About ControlNet Network Communication

The ControlNet network transports time-critical control information (e.g. drive reference and feedback information) as well as non-time-critical information (e.g. accessing drive parameters). The transportation of the non-time-critical information does not interfere with the time-critical messages.

A node's access to the network is controlled by a time-slice access algorithm, which determines a node's opportunity to transmit in each network update interval. You configure how often the network update interval repeats by selecting a network update time in milliseconds. The minimum network update time you can specify is 2 msec. See table 4.1 below for more information about the components of the network update time.

Table 4.1 – Network Update Time Components

This network update time component	Allows:
scheduled	Information that is *time-critical* (drive reference and feedback) should be sent during this part of the NUT interval.
unscheduled	Information that *can be delivered without time constraints* should be sent during this part of the NUT interval. The amount of time available for the unscheduled portion is determined by the traffic load of the scheduled portion. During this part of the interval, nodes may have many or no chances to transmit.

For optimum throughput, assign addresses to ControlNet nodes in a sequential order.

4.2 Configuring Drive Reference and Feedback Data as Scheduled Transfers

This section describes how to:

- configure scheduled traffic for the GV3000/SE drive
- control the drive using the drive reference data
- use scheduled drive feedback data

4.2.1 Configuring Scheduled Data Transfers

Before the drive can communicate on the ControlNet network, you must configure its scheduled traffic information by using some type of ControlNet configuration software. By configuring scheduled traffic, you define how much data the drive will send, how often the data is sent, and where the data is written to and read from (mapped) in the programmable controller.

You must configure each drive on the ControlNet network. Table 4.2 lists the configuration information you must enter.

Table 4.2 – ControlNet Scheduled Traffic Configuration Information

In this field:	Enter this information:
Node	Enter the drive's node number that you defined in P.060.
Slot Message	These fields are not used by the GV3000/SE drive.
Module	Enter GV3000/SE.
API	This field is read only.
RPI	Enter how often you want to exchange scheduled data between the programmable controller and the drive.
Connection Type	Select "Exclusive Owner." The GV3000/SE does not support Multicast operation.
Input Address	Enter the programmable controller's input file number that will store data **received from** the drive (drive feedback data).
Input Size	Enter the number of words of drive feedback data that you want the programmable controller to **receive from** the drive (1 to 6). See section 4.2.3 for information about the type of data that is sent.
Output Address	Enter the programmable controller's output file number that will store data **sent to** the drive (drive reference data).
Output Size	Enter the number of words of drive reference data that you want the programmable controller to **send to** the drive (1 to 6). See section 4.2.2 for information about the type of data that is sent.
Status Address	Enter the programmable's integer file number that will store the status of the ControlNet connection to the drive.
Config Address Config Size	These fields are not used by the GV3000/SE drive.

4.2.2 Programming Scheduled Drive Reference Data

To control the drive over the ControlNet network with the scheduled drive reference data, parameter P.000 must be set to OP, specifying the option board as the drive's control source. The programmable controller controls the drive by using the drive reference data, which is transmitted over the ControlNet network as scheduled data.

You can write from one to six words of data to the file you defined during drive configuration as the Output Address. The value you defined as the Output Size determines how many words of data the option board can accept from the programmable controller. During a scheduled data transfer, the programmable controller writes the data contained in the Output Address to the option board.

Scheduled drive reference data is composed of from one to six words. The first word of the scheduled drive reference data is always the drive control word. Should you configure less than six words of output data, you can access the drive reference data through file N12 as an unscheduled data transfer. See section 4.3.

Table 4.3 describes the function of each word of the scheduled drive reference data.

Table 4.3 – Scheduled Drive Reference Data

Word:	Bit:	Description:
Word 0 – Drive Control	—	Set and reset (clear) the bits in this word via your programmable controller application program to control the state of the drive. The drive control bits that are used for drive sequencing are evaluated in the drive every 20 msec.
	0 Start	Use this bit to start the drive. When the drive is in run mode, a 0-to-1 transition starts the drive. When the drive is in jog mode, a value of 1 jogs the drive. A value of 0 stops the drive.
	1 Stop	Use this bit to stop the drive. 0 = stop the drive 1 = allow the drive to run
	2 Fault Reset	Use this bit to reset latched faults. Faults are reset via a transition from 0 to 1. The error log is unaffected by this bit.
	3 Run/Jog	Use this bit to select run or jog mode. 0 = run mode 1 = jog mode
	4 Forward/Reverse	Use this bit to select the direction of the drive. 0 = forward 1 = reverse
	5 OCL Enable	Use this bit to enable the Outer Control Loop. 0 = OCL disabled 1 = OCL enabled

Table 4.2 – Scheduled Drive Reference Data (Continued)

Word:	Bit:	Description:
	7 Torque/Speed	Use this bit to select torque or speed regulation. The drive must be configured for vector control (P.048 = UEC and U.000 = 3). 0 = torque regulation 1 = speed regulation
	8 Error Log Clear	Use this bit to reset the error log. The error log resets when this bit transitions from 0 to 1. The latched faults are not affected by this bit.
Word 1 – Speed/Torque Reference [1, 2]	—	Use this word to control a speed or torque reference. When using volts per hertz (V/Hz) control, a value of 4095 corresponds to the frequency in parameter P.001 (Maximum Speed). When using vector speed regulation, a value of 4095 corresponds to the speed in parameter U.017. When using torque regulation, a value of 4095 corresponds to 150% of rated torque.
Word 2 – Trim Reference[1]	—	Use this word to control the trim reference value. The scaling for the trim reference is the same as the speed reference. This word is not used for torque regulation.
Word 3 – Inertia Compensation[1]	—	Use this word to provide the inertia compensation input to the speed loop. To to use this data, you must set bit 1 of parameter P.030.
Word 4 – Speed PI High Limit[1]	—	Use this word to modify the speed loop PI high limit. The output of the speed PI will not be greater than this value. A value of 4095 represents 150% of the rated torque. To use this data, set bit 2 of parameter P.030.
Word 5 – Speed PI Low Limit[2]	—	Use this word to modify the speed loop PI low limit. The output of the speed PI will not be less than this value. A value of -4095 represents -150% of the rated torque. To use this data, set bit 2 of parameter P.030.

[1] If the drive is configured as a speed regulator, the speed reference, trim reference, inertia compensation, and PI limits are used in the speed loop, which is executed every 5 msec.

[2] If the drive is configured as only a torque regulator, the torque reference is used in the torque loop, which runs every 500 µsec. The fastest network update time is 2 msec, so in torque mode the drive uses the same torque reference value a minimum of four times.

4.2.3 Using Scheduled Drive Feedback Data

The drive feedback data provides status to the programmable controller. This data is sent over the ControlNet network as scheduled data, which is transmitted at the configured update rate. However, the drive sends the feedback data to the option board every 5 msec. Feedback data is sent to the option board regardless of the value of parameter P.000.

Scheduled drive feedback data is composed of from one to six words. The value you defined as the Input Size determines how many words of data the programmable controller accepts from the option board. During a scheduled data transfer, the option board writes the data contained in the Input Address to the programmable controller.

The first word of the scheduled drive feedback data is always the drive status word. Should you configure less than six words of input data, you can access the drive reference data through file N12 as an unscheduled data transfer. See section 4.3.

Table 4.4 describes the function of each word of the scheduled drive feedback data.

Table 4.4 – Scheduled Drive Feedback Data

Word:	Bit:	Description:
Word 0 – Drive Status	—	The drive writes to these bits to provide status about the drive.
	0 Drive Ready	This bit indicates the status if the drive is ready. 0 = interlock missing 1 = drive ready
	1 Drive Running	This bit indicates whether the drive is running. 0 = stopped 1 = running
	2 Fault Active	This bit indicates whether the drive has faulted. 0 = no fault 1 = fault
	3 Run/Jog	This bit indicates whether the drive is in run or jog mode. 0 = run 1 = jog
	4 Forward/Reverse	This bit indicates the drive's direction. 0 = forward 1 = reverse
	5 Stop in Progress	Use this bit to determine the drive's stopping status. 0 = not stopping 1 = stopping
	6 Auto/Manual	This bit indicates whether the drive is in auto or manual mode. 0 = auto 1 = manual
	7 Torque/Speed	This bit indicates whether the drive is using torque or speed control. 0 = torque 1 = speed
	8 Digital In 1 (Start)	This bit indicates the status of digital input 1.
	9 Digital In 2 (Stop)	This bit indicates the status of digital input 2.

Table 4.4 – Scheduled Drive Feedback Data (Continued)

Word:	Bit:	Description:
	10 Digital In 3 (Reset)	This bit indicates the status of digital input 3.
	11 Digital In 4 (Run/Jog)	This bit indicates the status of digital input 4.
	12 Digital In 5 (FL)	This bit indicates the status of digital input 5.
	13 Digital In 6	This bit indicates the status of digital input 6.
	14 Digital In 7	This bit indicates the status of digital input 7.
	15 Digital In 8	This bit indicates the status of digital input 8.
Word 1 – Speed Reference	—	This word indicates the speed reference being used by the drive. Values range from +4095.
Word 2 – Selected Output 1	—	This word indicates the value selected in parameter P.066. See table 4.5.
Word 3 – Selected Output 2	—	This word indicates the value selected in parameter P.067. See table 4.5.
Word 4 – Selected Output 3	—	This word indicates the value selected in parameter P.068. See table 4.5.
Word 5 – Selected Output 4	—	This word indicates the value selected in parameter P.069. See table 4.5.

Table 4.5 explains the values that are available for words 2 - 5.

Table 4.5 – Signals That Can Be Displayed in Words 2 - 5

Value:	Parameters			
	P.066	P.067	P.068	P.069
0	Motor KW	Motor Torque	Power Factor	Encoder Counts
1	Speed reference limited output [1]			
2	Speed reference plus OCL output [1]			
3	Speed feedback [1]			
4	Speed error [1]			
5	Speed PI output [1]			
6	OCL feedback [1]			
7	OCL error [1]			

Table 4.5 – Signals That Can Be Displayed in Words 2 - 5

Value:	Parameters
8	OCL output [1]
9	Terminal Strip Analog Input (Normalized)
10	Terminal Strip Analog Input
11	Torque Reference [1]
12	Torque Feedback [1]

[1] These signals are valid only in vector control.

4.3 Using Unscheduled Transfers

Use the unscheduled transfer portion of the network update time (NUT) to:

- read and write drive parameters that are not time-critical
- read drive display data
- read and write drive reference and feedback data that are not time-critical
- read the status of Typed Write messages.

In a PLC-5, you can use the MSG instruction to initiate unscheduled transfers.

4.3.1 Programming the MSG Instruction in a PLC-5

By including the PLC-5 MSG instruction in your application program you can read data from the drive and write data to the drive during the unscheduled transfer time. You can have up to four MSG instructions enabled at the same time.

Figure 4.1 shows an example of an MSG instruction in a PLC-5.

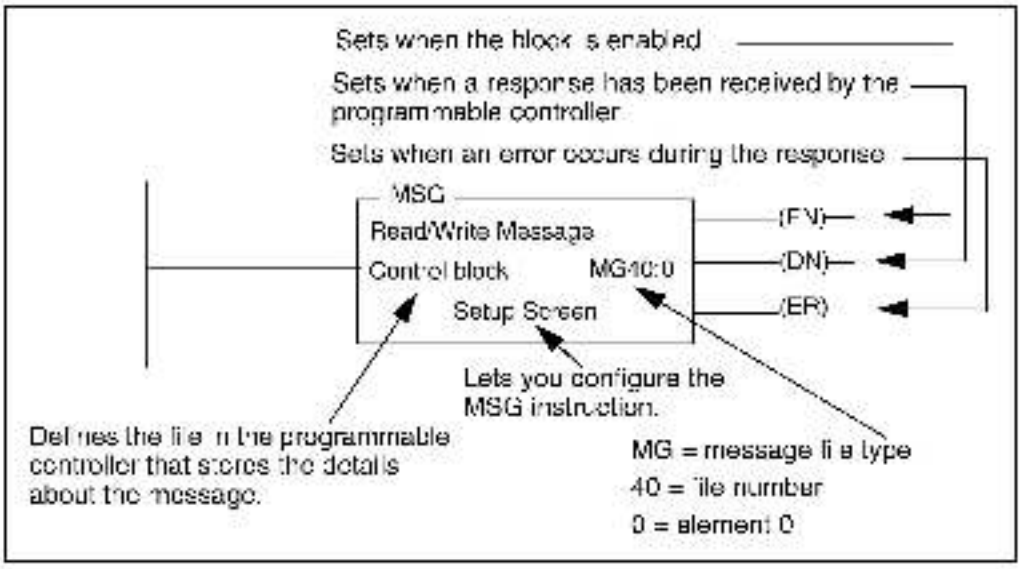

Figure 4.1 – An Example of a MSG Instruction in a PLC-5

To configure the MSG instruction, you must enter information about the data's location, size etc. Use table 4.6 to help you.

Table 4.6 – MSG Configuration Information

In this field:	Do this:
PLC-5 Configuration	
Communication Command	To read information from the drive, enter PLC5 Typed Read. To write data to the drive, enter PLC5 Typed Write.
Data Table Address	When reading information from the drive, enter the file in which you want to store the data received from the drive. When writing information to the drive, enter the file that will contain the data you want to send to the drive.
Size in Elements	Enter the number of words to read or write. The largest size you can use depends upon which file is being accessed.
Port Number	Enter 2 to select ControlNet communication.
Target Device Configuration	
Data Table Address	Enter the file in the drive where you want to read data from or write data to. See section 4.3.3
ControlNet Path	Enter the node number of the drive.

4.3.2 About MSG Instruction Timing

When a Typed Read message is sent to the drive, the response is sent to the PLC-5 programmable controller in under 20 msec. When a Typed Write message is sent to the drive, the message is first processed by the drive. Therefore, 100-200 msec may elapse before the response is returned to the PLC-5 programmable controller. These times are applicable only when the network update time and unscheduled traffic bandwidth are not limiting factors.

4.3.3 About the Files You Can Access

When you send an unscheduled message to the drive, the data table address you specify for the target device determines what drive information you want to access. The data table address is in the form of:

Nff:eee

where: N specifies the file type as integer, ff is the file number, and eee is the element number (word).

The GV3000/SE ControlNet Option Board supports these file numbers:

- N10 – Drive parameters (read and write)
- N11 – Drive display data (read only)
- N12 – Drive reference and feedback data (read and write)
- N20 – Status of the most recent write parameter command (read only)

Figure 4.2 shows how the drive information maps to the drive information integer files.

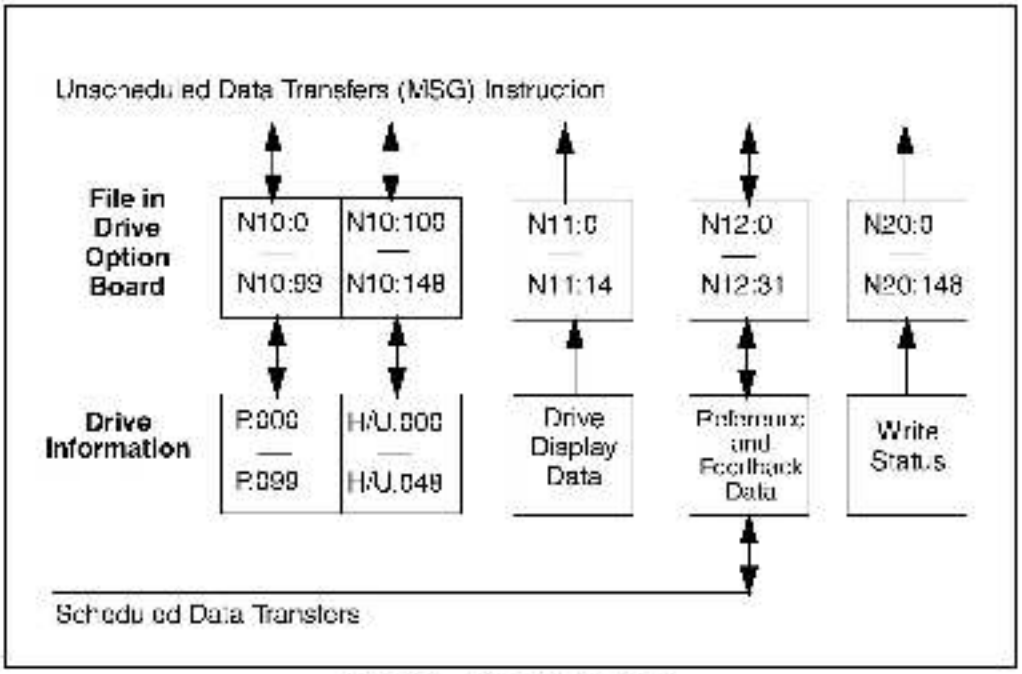

Figure 4.2 – Drive Information Map

4.3.4 Using the Drive Parameters Data (N10:X)

Use file N10 to access drive parameters with unscheduled data transfers. Parameters P:000 through P:099 map to N10:0 to N10:99. The H (Volts/Hertz) and U (Vector) parameters map to N10:100 to N10:148 and share the same element numbers.

You can access all the parameters with one MSG instruction. By specifying only a range of words in the MSG instruction, you can change any subset of contiguous parameters without sending a complete new copy of the file to the drive.

See chapter 5 for a complete listing of the parameters and the drive file elements to which they are mapped.

4.3.5 Using the Drive Display Data (N11:X)

Use file N11 to access the drive display data. This file lets you access information such as the drive fault bits, information about the motor, and the error log.

The GV3000/SE drive updates the drive display data every 100 msec. The drive operation data is averaged over a 500 msec period. See chapter 5 for a complete listing of the data you can access and its location.

4.3.6 Using the Drive Reference and Feedback Data (N12:X)

When you use scheduled data transfers to transmit less than six words of either drive reference or feedback data, you can access the information that is not transmitted as scheduled data by using unscheduled data transfers. Use a MSG instruction to access any or all of the data, except the drive control word, which is read only. See chapter 5 for a complete listing of the data you can access and its location.

4.3.7 Using the Write Status File (N20:X) to Troubleshoot a Drive Parameter Write Command

You can troubleshoot errors that may occur when you write values to parameters in the drive. The drive may not accept the values because the drive is running or the value is less than the minimum value or greater than the maximum value. When this occurs, the MSG instruction's ER bit is set and an error code is written into an element in N20 that corresponds to the drive parameter's location in N10. Each element in file the N20 corresponds to an element in file N10. For example: N10:0 stores the Control Source parameter data (P.000). If you were writing a value to N10:0 and an error occurred, you could read N20:0 and determine that an error occurred when writing to parameter P.000.

See table 6.3 for the error codes that the drive will return to the PLC when a Typed Read or Typed Write message fails.

CHAPTER 5

Configuring ControlLogix Applications

Chapter 5 provides information and examples that explain how to use I/O Messaging to control, configure, and monitor scheduled and unscheduled data on a GV3000 drive using a ControlNet scanner module.

ATTENTION: The examples in this publication are intended solely for purpose of example. There are many variables and requirements with any application. Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use of the examples shown in this publication. Failure to observe this precaution could result in bodily injury or damage to equipment.

Configuring a ControlLogix CNB scanner, and the network, is mainly done using RSLogix 5000 software (figure 5.1). RSNetWorx is still required, but only at the end of the configuration process. Start the RSLogix 5000 software to begin the configuration process.

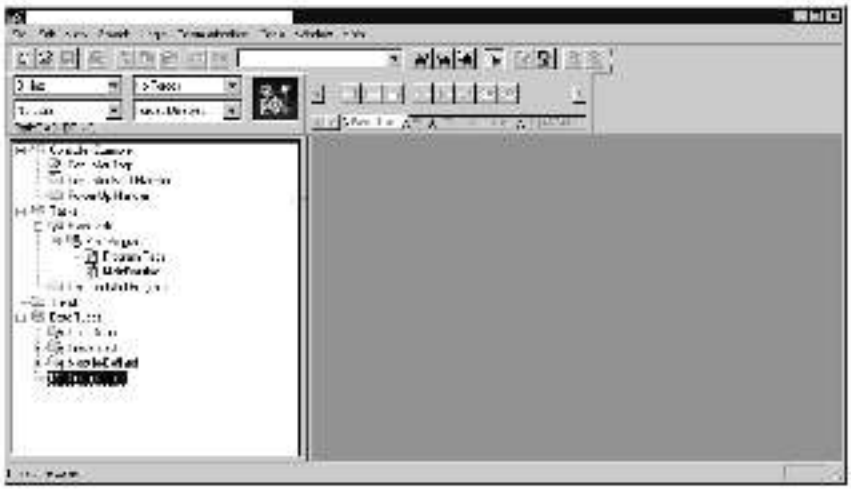

Figure 5.1 RSLogix 5000: I/O Configuration Selection

Step 1. Right-click on the **I/O Configuration** folder and select **New Module** (figure 5.2).

Figure 5.2 – RSLogix 5000: New Module Selection

Step 2. Select the ControlNet module used by the controller. In this example (figure 5.3), a 1756-CNB Series B ControlNet Bridge is selected.Click **OK**.

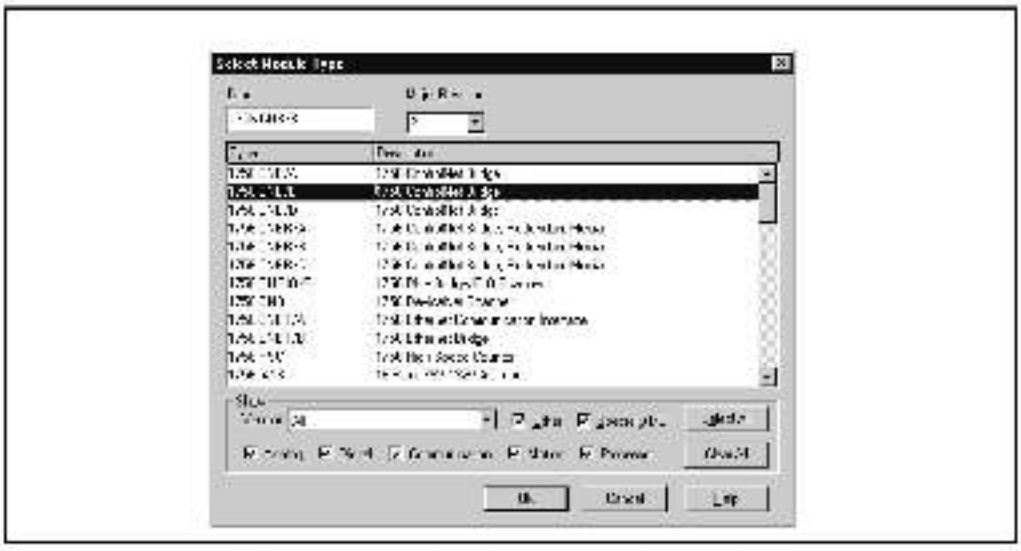

Figure 5.3 – Select Module Type: 1756-CNB/B Selection

Step 3. Enter a **Name**, **Slot** number, and **Revision** number (figure 5.4). Click **Next>**.

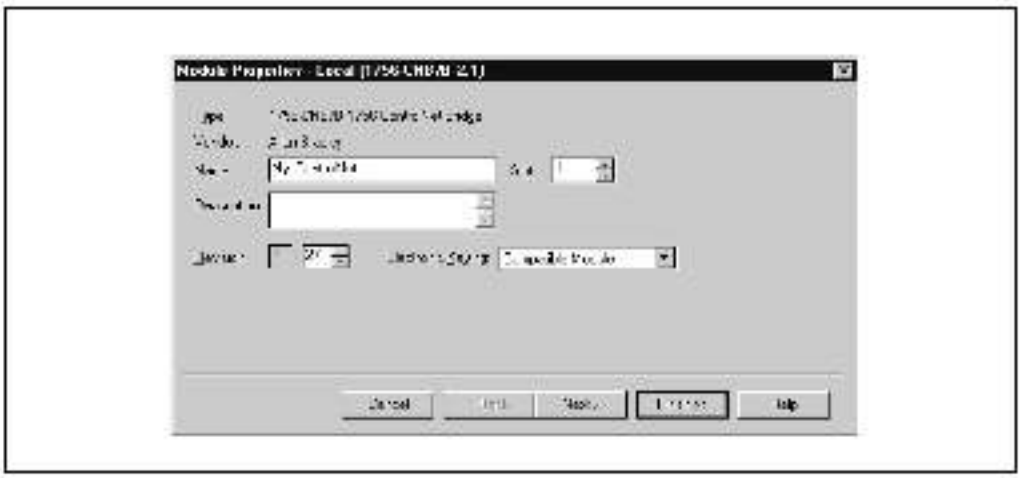

Figure 5.4 – Module Properties: Name Selection

Step 4. This step is used to define controller-to-module behavior (figure 5.5). **Inhibit Module** inhibits/uninhibits the connection to the module. The **Major Fault** check box selects if a failure on the connection of this module causes a major fault on the controller if the connection for the module fails. Click **Next>**.

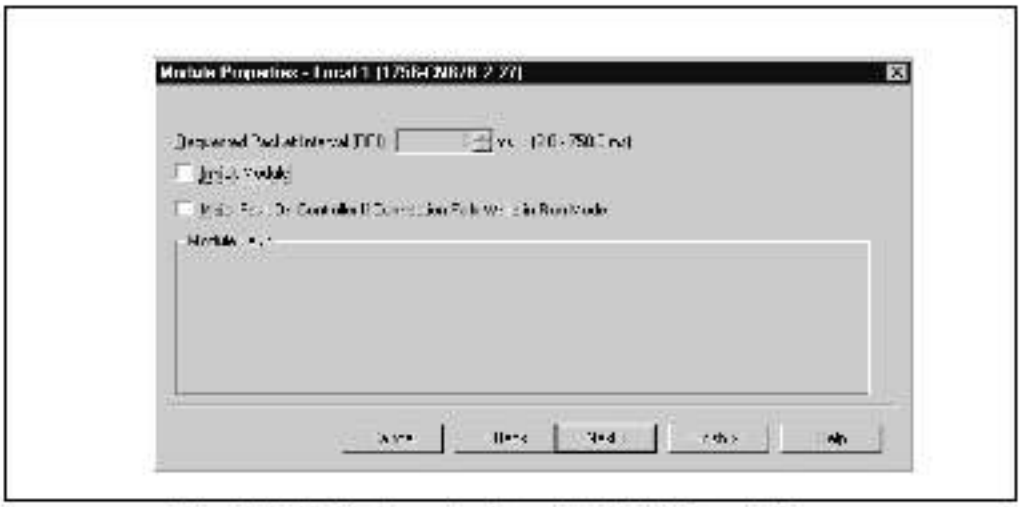

Figure 5.5 – Module Properties, Controller-to-Module Behavior Screen

Step 5. This window (figure 5.6) is displayed for informational purposes only. Click **Next>**.

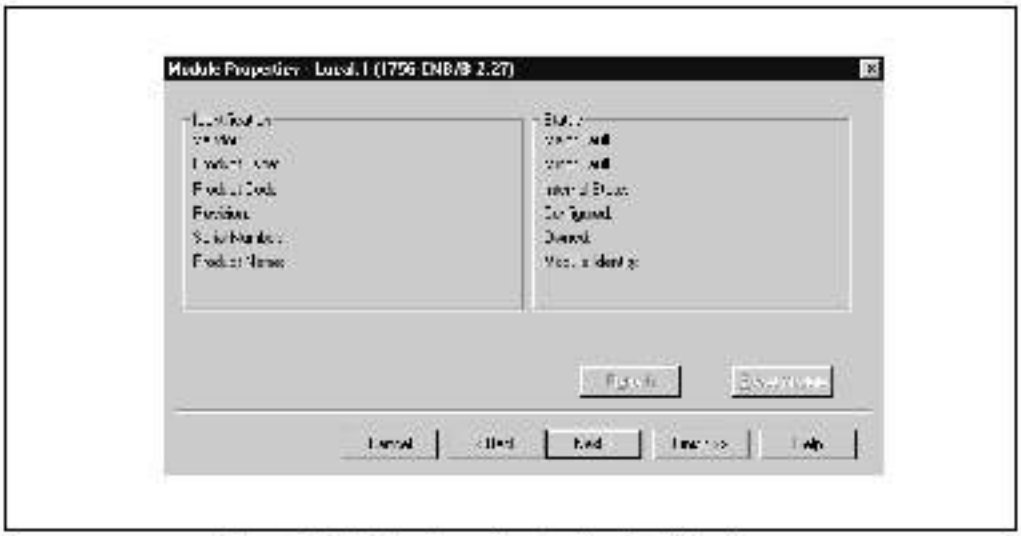

Figure 5.6 – Module Properties: Identification/Status Screen

Step 6. This window (figure 5.7) is displayed for informational purposes only. Click **Finish>>**.

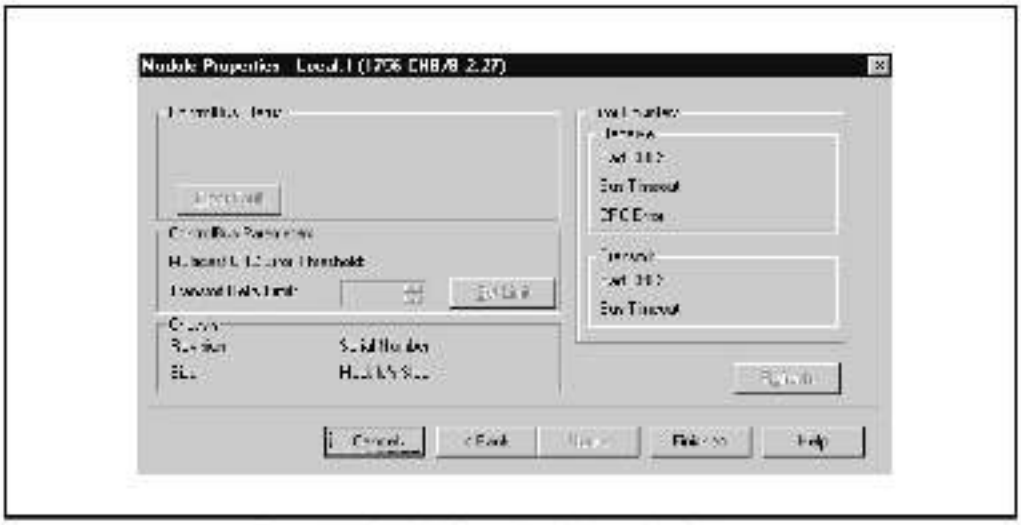

Figure 5.7 – Module Properties: Informational Screen

Step 7. The 1756-CNB/B now appears in the I/O Configuration folder (figure 5.8).

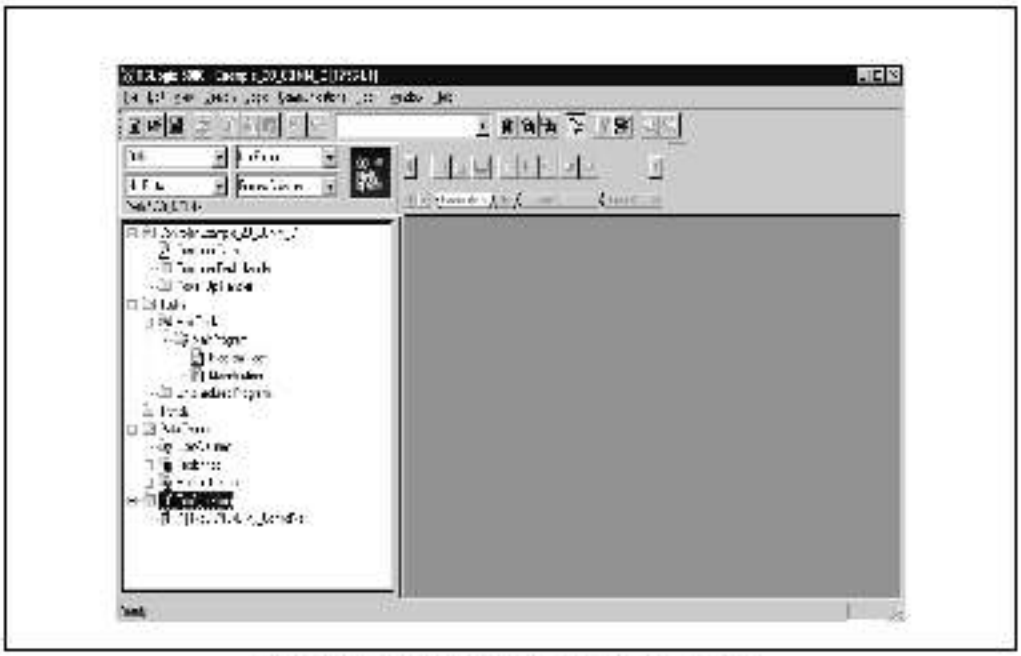

Figure 5.8 – RSLogix 5000 I/O Configuration Folder

Step 8. Right-click on the 1756-CNB and select **New Module** (figure 5.9).

Figure 5.9 – RSLogix 5000 New Module Selection Screen

Step 9. To configure a GV3000 drive, select the **GV300** (figure 5.10). Click **OK**.

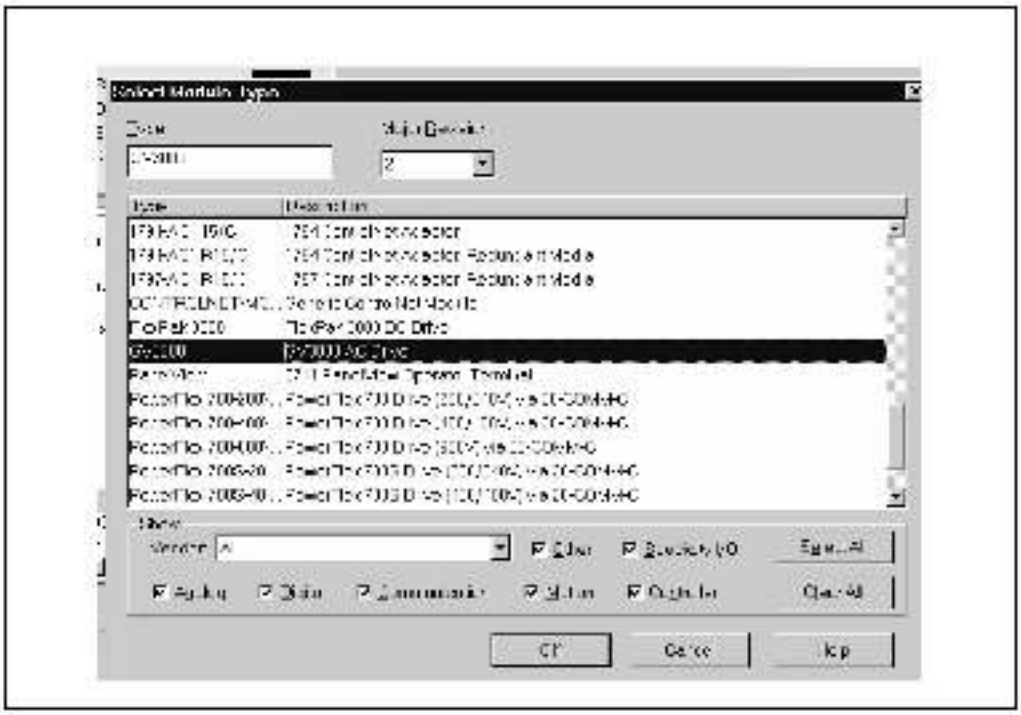

Figure 5.10 – Select Drive Type: GV3000

Step 10. Enter a **Name**, **Node** number, and **Revision** number (figure 5.11). Click **Next>**.

Important: Electronic Keying should be set to disabled.

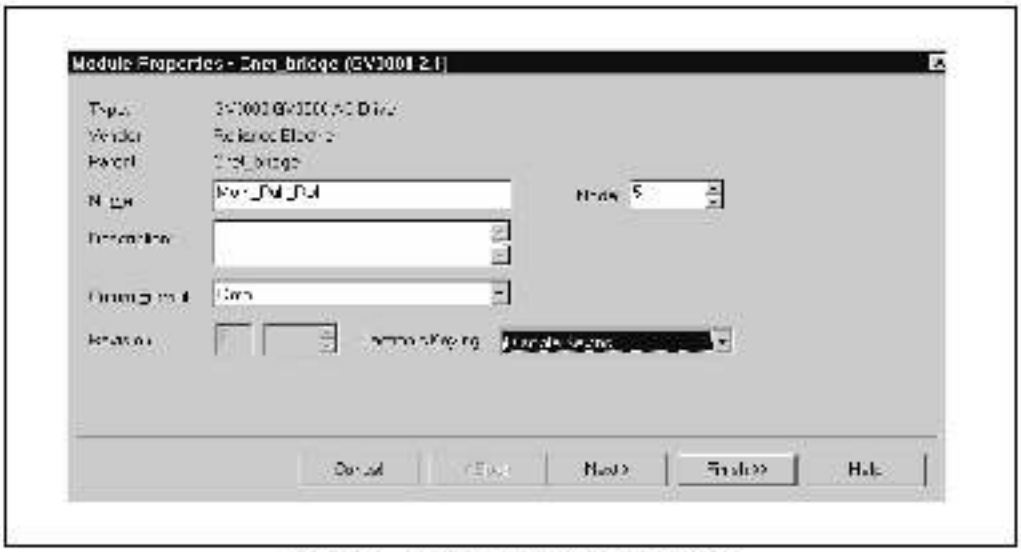

Figure 5.11 Module Properties: Name Selection

Step 11. The **Requested Packet Interval (RPI)** schedules the connection to move data to or from the module at least this often or the connection will fail with the RPI Not Valid error. Set this value to 5 ms or greater, and click **Next>** (figure 5.12).

Important: The RPI time must be set greater than or equal to the Network Update Time (NUT).

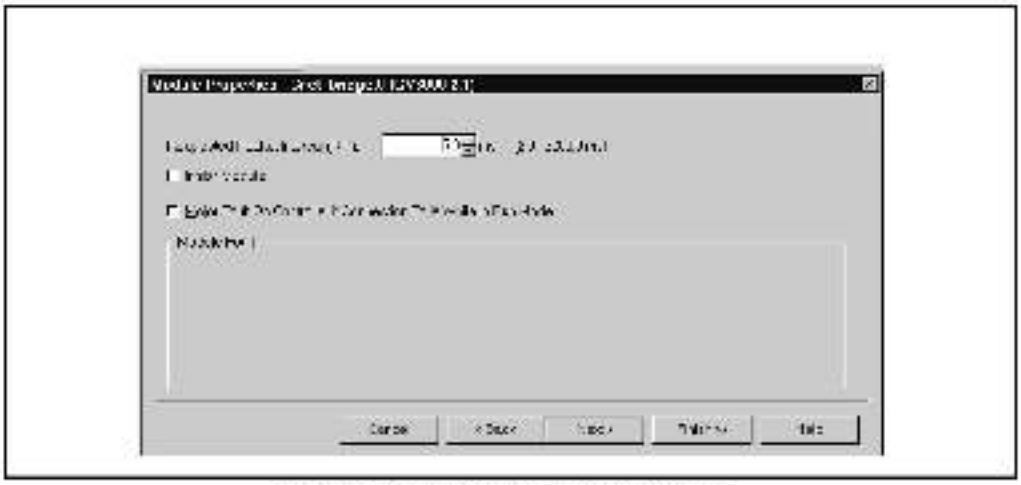

Figure 5.12 – Module Properties: RPI Selections

Step 12. This window (figure 5.13) is for informational purposes only. Click **Finish>>**.

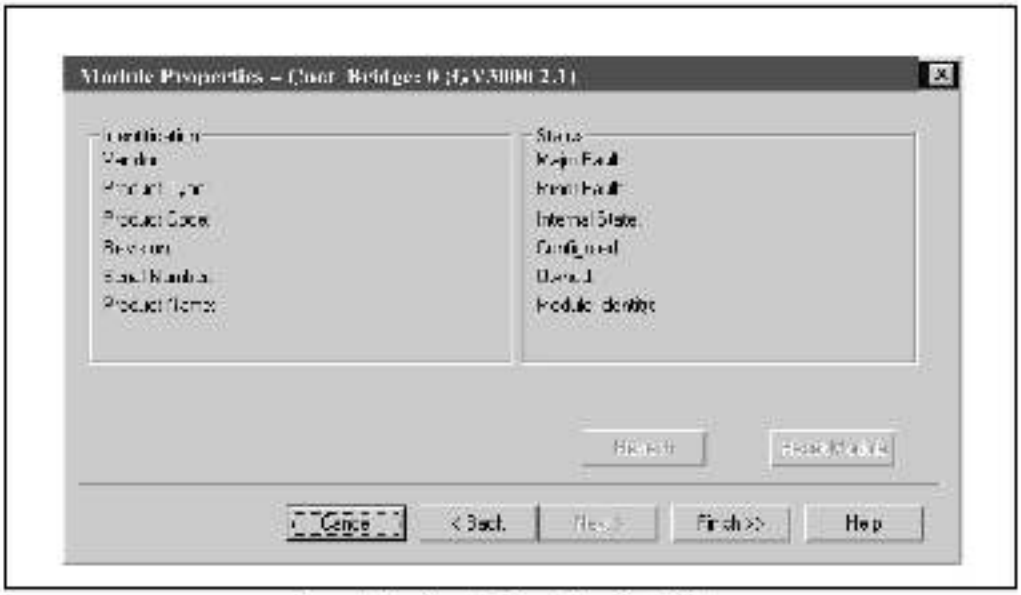

Figure 5.13 Module Properties: Chas. Bridge

Step 13. The configured node ("GV3000" in this example) now appears under the 1756-CNB module in the I/O Configuration folder.

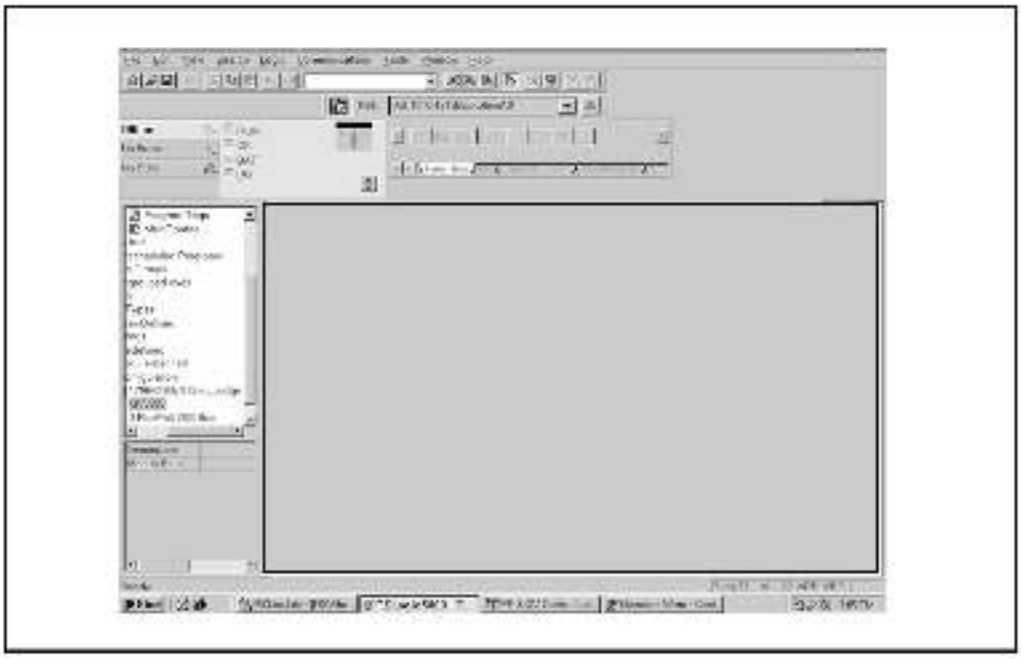

Figure 5.14 – RSLogix: Configure Additional Nodes Screen

Step 14. Repeat the previous steps for each additional node you need to configure.

Step 15. In the **Data Types** folder, click on the **Module-Defined** sub folder. When you create a module, module defined data types and tags are automatically created. These tags allow you to access the Input and Output Data of the module via the controller's ladder logic.

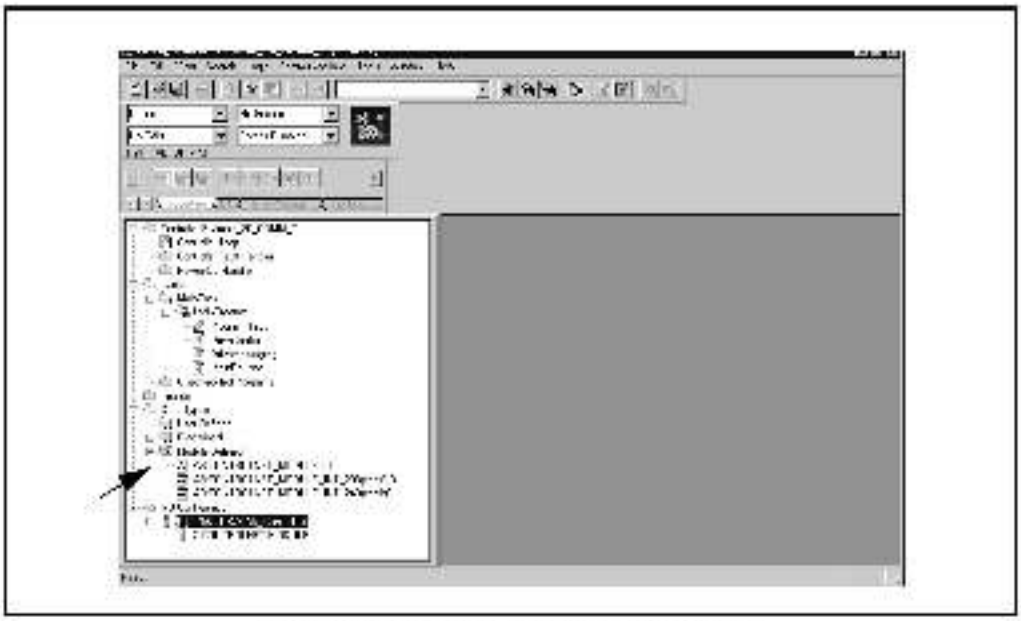

Figure 5.15 – RSLogix 5000, Module-Defined Screen

Step 16. Select **Communications / Download** to download the configuration to the controller (figure 5.16). RSLogix automatically enters on-line mode when complete.

Figure 5.16 Download to the Controller Dialog Box

Step 17. An Attention symbol is located next to the Node 2 (GV3000) icon in figure 5.17, which indicates the ControlNet scanner needs to be configured.

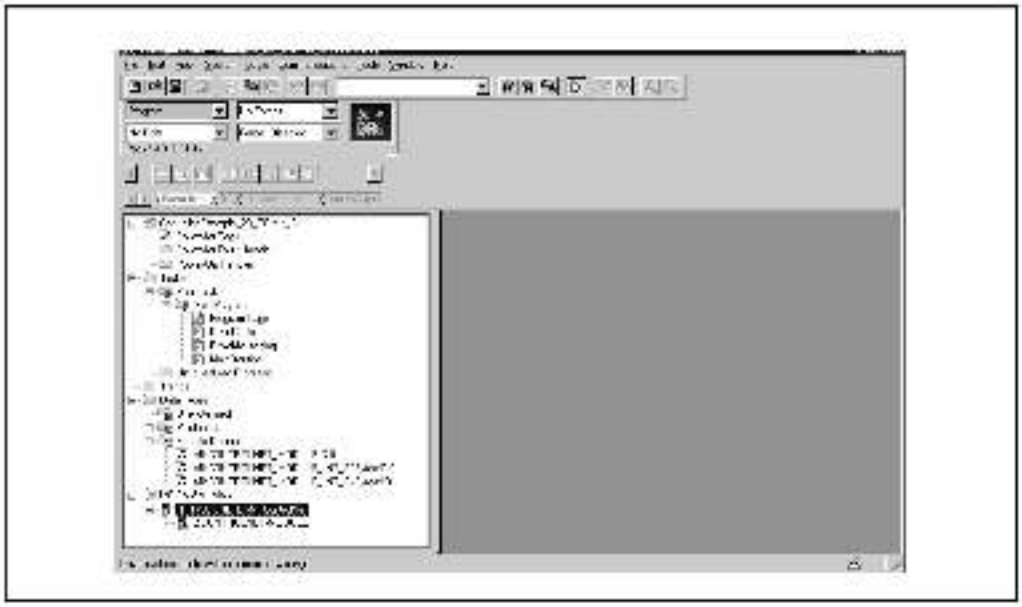

Figure 5.17 – RSLogix Attention Symbol

Step 18. Start RSNetWorx and perform the following:

a. Click the On-line icon and browse the network.

b. Select Edits Enabled and view the messages in the Message View for completion (figure 5.18). The icon should disappear from the nodes in the Graphical View.

c. Select **File / Save** and save the project.

d. Close RSNetworx.

This schedules the I/O that was configured in the RSLogix 5000.

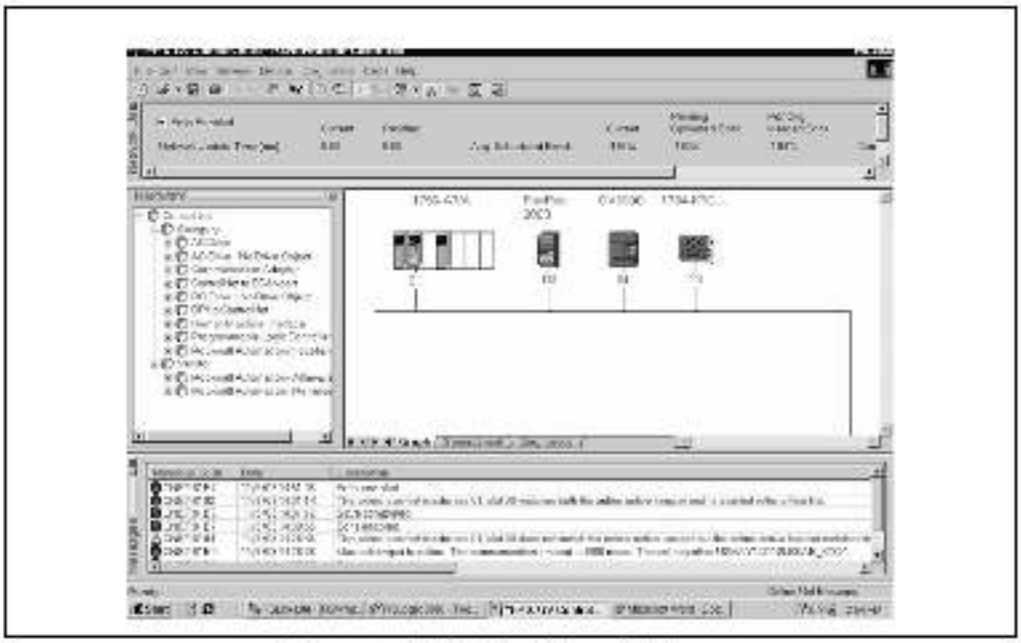

Figure 5.15 RSNetWorx for ControlNet Screen

Step 19. The Attention symbol on the RSLogix 5000 connection tree will disappear if the network has been configured properly. You are now ready to develop your ladder logic program.

CHAPTER 6

Configuring SLC500 Applications

Chapter 6 describes how to configure a SLC500 PLC on a ControlNet network with a GV 3000 drive.

Both the 1747-SCNR and 1747-KFC15 modules are required to communicate fully with a drive and both must be configured as drops on the ControlNet network. If the application only calls for access to Drive Reference and Feedback Data (such as Drive Control and Status Words), and does not call for access to any N10, N11, or N12 drive parameters, the 1747-KFC card will not be required. However, Unscheduled Messaging will not be possible and another connection option to the processor will be required for downloading the required ladder logic.

This chapter is intended for use by personnel familiar with the installation and operation of the Reliance Drive and the installation, programming, I/O configuration and operation of the SLC processor using RSLinx, RSLogix 5000 and RSNetWorx for ControlNet software. Personnel should also be familiar with the system configuration documentation.

6.1 Required Software and Equipment

Software and equipment required for configuring a SLC500 on a ControlNet network is listed in table 6.1.

Table 6.1 – Required Software and Equipment

Equipment Description	Version
RSLinx Software	Version 2.20 or later
RSNetWorx for ControlNet software	Version 2.25 or later
RSLogix 500 software	Version 3.01 or later
SLC 500 Chassis w/appropriately sized Power Supply	
SLC 5/03 processor (1747-L532) or SLC 5/04 processor	OS 301 or higher Any OS
ControlNet Scanner Module: 1747-SCNR	
ControlNet RS-232 Interface: 1747-KFC15	
PC with 1784-KXTC15 or 1784-PCIC interface card	
GV3000 ControlNet Communications Board (2CN3000)	Version 2.20 or later

6.2 Network Configuration

Configure the ControlNet network using RSLinx and RSNetWorx for ControlNet software.

Using the parameters suggested in chapter 4 of this manual, configure scheduled traffic with RSNetWorx, by doing a scanlist configuration of the 1747-SCNR module to the drive. It is recommended that Input and Output files are used instead of M1 and M0 files, as discrete I/O is more appropriate for critical data transfer. Make sure keyswitch is in "program" position before download of configuration.

Input address should be [I:x:y] with x = slot of SCNR module and y = 1 or greater. Output address should be [O:x:y] with x = slot of SCNR module and y = 1 or greater.

Input and Output size for the GV3000 drive = 6.

Important: Any address offset is limited by 31 words maximum minus the drive I/O word size.

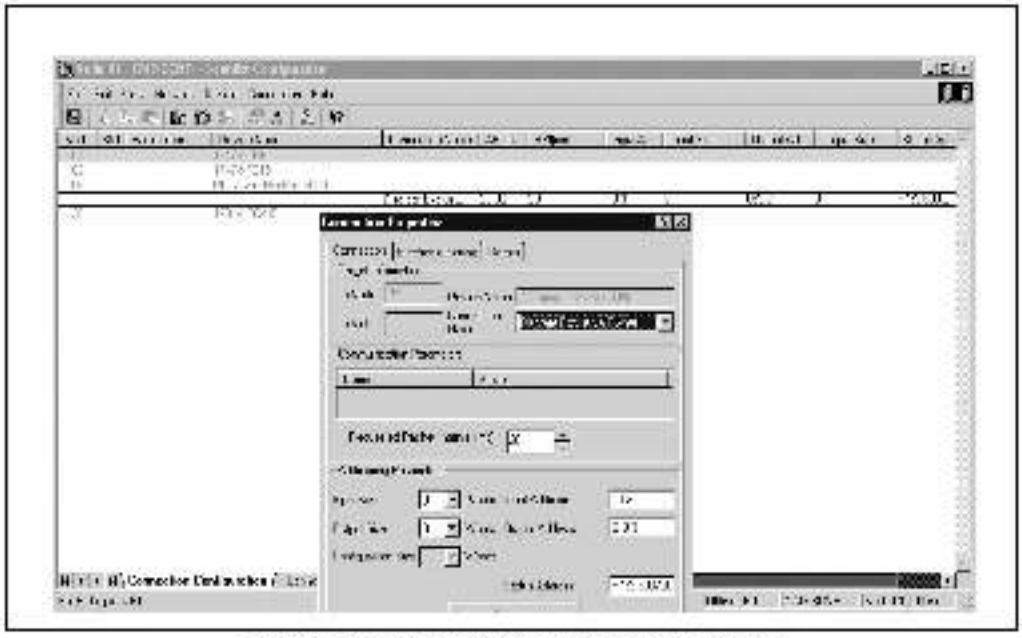

Figure 6.1 – Network Configuration: Connection Properties

6.3 1747-KFC15 Set Up

Unlike PLC5 or ControlLogix controllers, the unscheduled messages between the SLC controller and the drive must pass through the KFC15 module and the serial cable, included with the KFC15 module, that physically connects the module and the processor.

Important: ControlNet unscheduled messaging is not fully deterministic and may be further limited by the baud rate selected for Channel 0 (RS232/DF1) communications.

The communication parameters between the SLC500 and the KFC15 must be identical. Set the DIP switches on the KFC15 according to the application. In most cases, choose all default settings. However, the value 19200 is preferable over the default value (1200) for Serial Port Baud Rate.

In RSLog x5000, choose Channel Configuration in the project tree and verify that the "General" and "Chan 0-System" parameters are the same as you set on the KFC15 DIP switches.

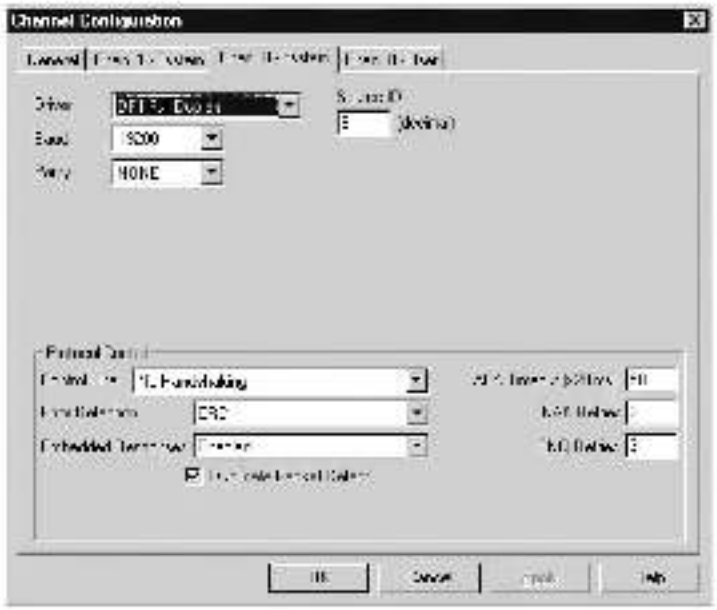

Figure 6.2 – Channel Configuration: Chan 0-System

In the project tree, choose Controller Properties and Controller Communications. Set the appropriate Driver, Node and Path for Communications. The Node and Path must be the Control Net. Node of the 1747-KFC15 module. After applying all settings, download to the processor.

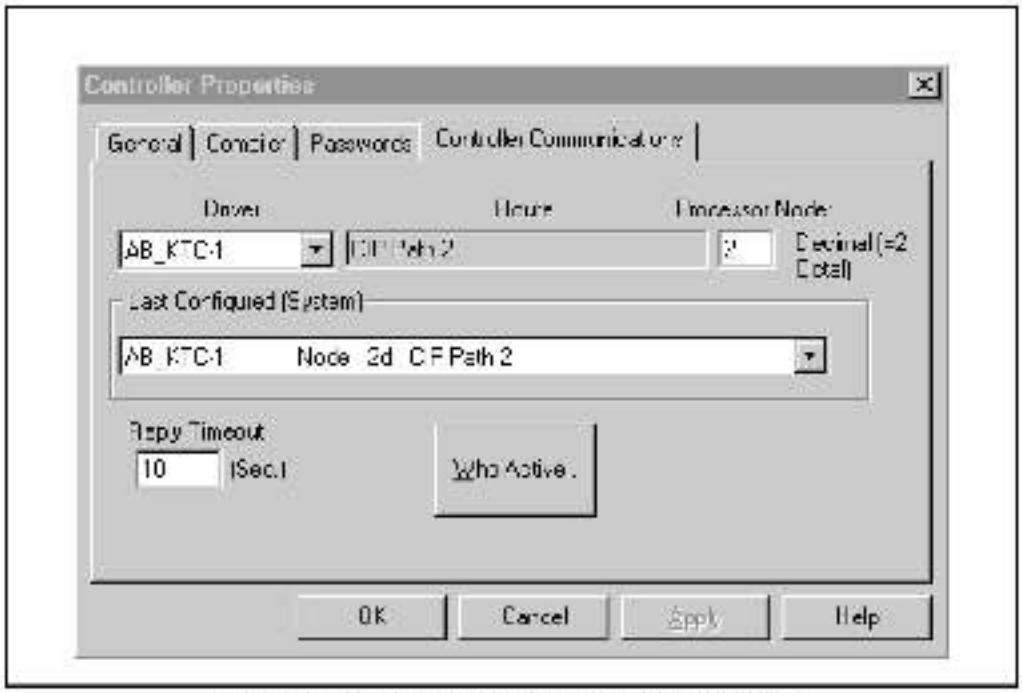

Figure 6.3 – Controller Properties: Controller Communications

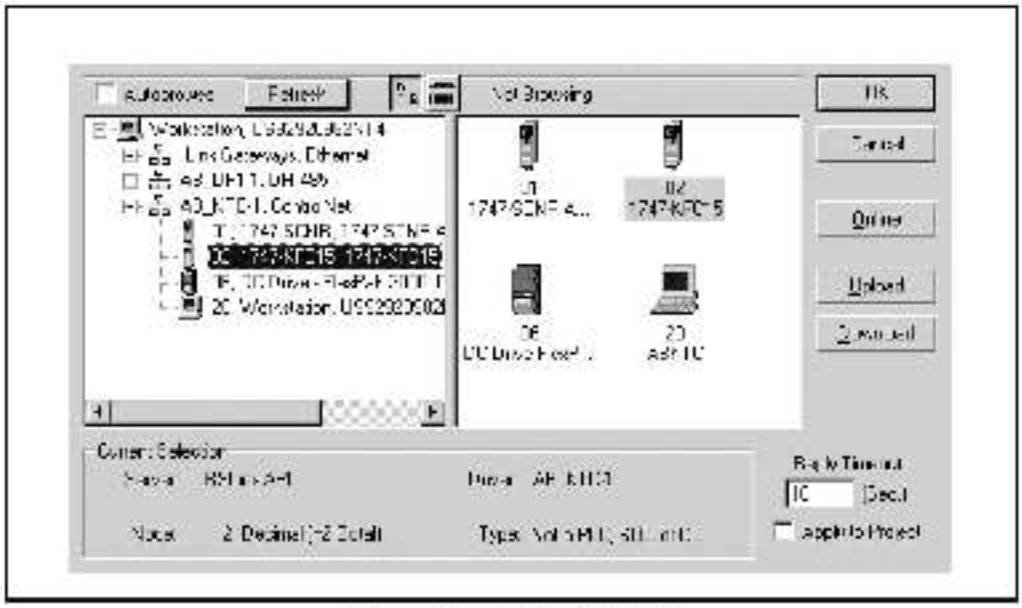

Figure 6.4 – 1747-KFC15 Set Up

6.4 Scheduled Messaging (I/O)

To use scheduled messaging, the Ladder Logic must include a line that sets a bit in the SCNR module. The processor must be in run or remote run. Include a line that has a coil that sets word 0, bit 10 in the SCNR module. [O:x:0/10], where x = the slot number where the SCNR module resides. Output word "0" is the SCNR command word. Input word "0" is the SCNR status word.

In the example below:

- O:3.3 had been set up as the output address and I:3.3 had been set up as the input address. **There is a four (4) word offset in the discrete I/O Input.** The drive appears to the processor as an IO rack with several modules, causing the Input offset.
- O:3.3 (Output register of the SCNR, word 3) shows the Word 0 - Drive Control Word. It is set to 3, meaning bits 00 and 01 (Run and Stop Not) are asserted and the drive is running. O:3.4 is Word 1 - Speed/Torque Reference. It shows the drive reference at 50% full speed. O:3.5 is Word 2 - Field Reference. If a GV3000 is using a field current regulator kit option, this parameter must be set high enough to prevent a drive Field Loss Fault.
- I:3.7 is Word 0 - Drive Status Word (shown in decimal). Individual bits could be used for programming information. I:3.8 is Word 1 - Speed Feedback, which closely follows Output Speed Reference.

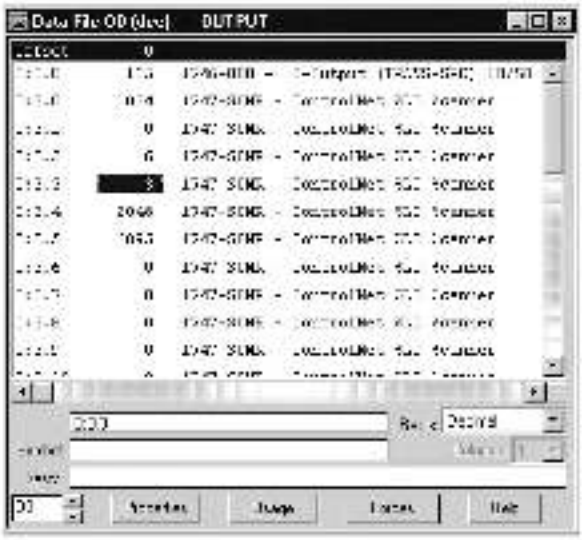

Figure 6.5 – Scheduled Messaging Example 1s

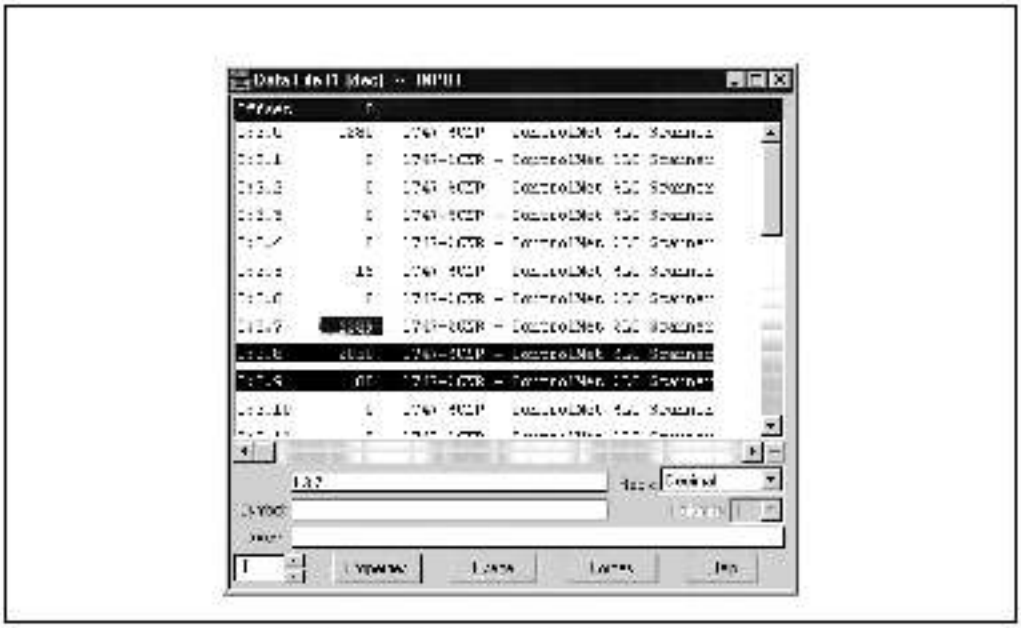

Figure 6.6 Scheduled Messaging Example 1b

6.5 Unscheduled Messaging

Unscheduled communications must use PLC5 Typed Read and Write messages.

In the example below, drive (Cnet mode 6) parameters at file address N10:0 through N10:9 are read into the controller registers N10:0 through N10:9.

Important: For each message, the element size may not exceed the processor limit of 103 elements.

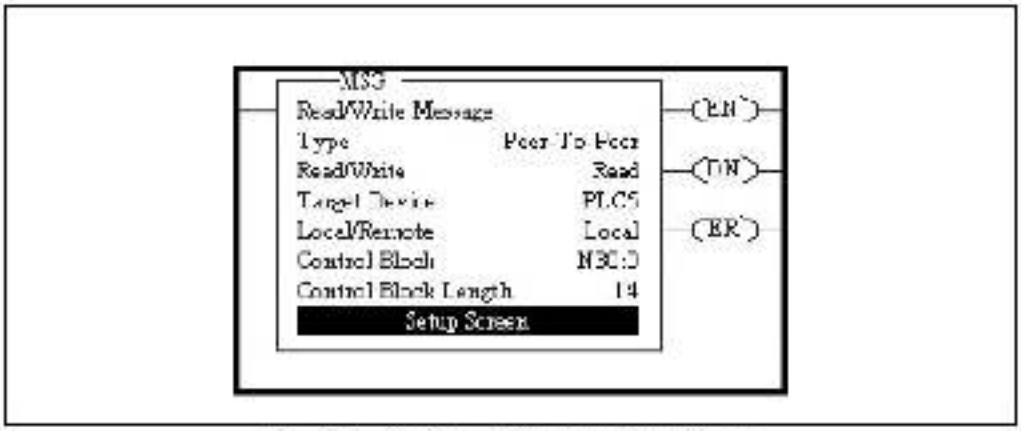

Figure 6.7 – Unscheduled Messaging Setup Screen

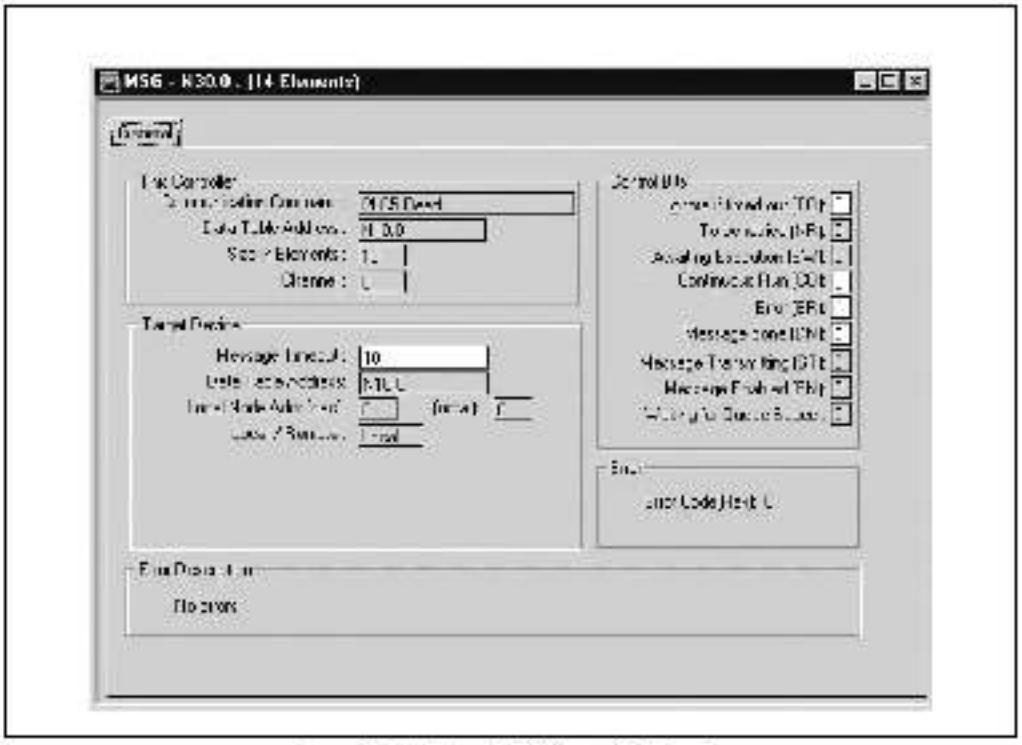

Figure 6.8 Unscheduled Messaging Example

6.6 SLC500 Support

For drives technical assistance, call 1-800-726-8112.

For assistance from Rockwell Software, call 1-440-646-7800.

To reach the Control and Information Group (SLC Modules), call 1-440-646-6800.

Section 1.3 of this manual outlines the information that you need before calling for support.

CHAPTER 7

Register Map

Table 7.1 – File N10:X (Drive Read/Write Parameters)

File Address	Parameter Name	Parameter Number	Type	Notes
N10:0	Control Source	P.000	Configurable	0 = Front Panel (Local) 1 = Terminal strip 2 = Option Port (Network) 3 = Serial Port (PC-host)
N10:1	Accel Time 1 (RAMP 1)	P.001	Tunable	1 = 0.1 sec
N10:2	Decel Time 1 (RAMP 1)	P.002	Tunable	1 = 0.1 sec
N10:3	Minimum Speed	P.003	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:4	Maximum Speed	P.004	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:5	Current Limit	P.005	Tunable	100 = 100%
N10:6	Second Menu Password	P.006	Tunable	Note 1
N10:7	Term Strip Dig Inputs Config	P.007	Configurable	0 through 12
N10:8	Term Strip Spd Ref Source	P.008	Configurable	0 through 7
N10:9	Term Strip Anlg In Offset	P.009	Tunable	100 = 100
N10:10	Term Strip Anlg In Gain	P.010	Tunable	1000 = 1.000
N10:11	Term Strip Anlg In Configure	P.011	Configurable	0 through 7
N10:12	Term Strip Anlg Out Source	P.012	Tunable	0 through 3
N10:13	Output Relay Configuration	P.013	Configurable	0 through 3
N10:14	Trim Reference Source	P.014	Configurable	0 through 3
N10:15	Trim Gain Percentage	P.015	Tunable	999 = 99.9%
N10:16	Draw Gain Percentage	P.016	Tunable	999 = 99.9%
N10:17	Accel Time 2 (RAMP 2)	P.017	Tunable	1 = 0.1 sec
N10:18	Decel Time 2 (RAMP 2)	P.018	Tunable	1 = 0.1 sec
N10:19	S-Curve Enable	P.019	Configurable	0 = off; 1 = on
N10:20	Jog Speed Reference	P.020	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:21	Jog Ramp Accel Time	P.021	Tunable	1 = 0.1 sec
N10:22	Jog Ramp Decel Time	P.022	Tunable	1 = 0.1 sec
N10:23	MOP Accel/Decel Time	P.023	Tunable	1 = 0.1 sec
N10:24	MOP Reset Configuration	P.024	Tunable	0 to 2
N10:25	Stop Type	P.025	Tunable	0 = Coast; 1 = Ramp
Note 1: This parameter cannot be changed from the ControlNet network, or it is reserved. When writing to this parameter, use a value of 0. When you read this parameter, you receive a value of 0.				

Table 7.1 – File N10:X (Drive Read/Write Parameters)

File Address	Parameter Name	Parameter Number	Type	Notes
N10:26	Function Loss Response	P.026	Tunable	0 = IET; 1 = Coast
N10:27	Forward/Reverse Configure	P.027	Tunable	0 = enable; 1 = rev. disable; 2 = latch
N10:28	Speed Display Scaling	P.028	Tunable	Units
N10:29	Elapsed Time Meter	P.029	Read Only	Days
N10:30	Control Bits	P.030		bit 0 = Elapsed Time Reset bit 1 = CNI Inertia Compensation bit 2 = CNI Speed PI Limit Enable
N10:31	Preset Speed 1	P.031	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:32	Preset Speed 2	P.032	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:33	Preset Speed 3	P.033	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:34	Preset Speed 4	P.034	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:35	Preset Speed 5	P.035	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:36	Preset Speed 6	P.036	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:37	Preset Speed 7	P.037	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:38	Preset Speed 8	P.038	Tunable	50 = 5.0 Hz / 150 = 150 RPM
N10:39	Encoder Loss Enable	P.039	Tunable	0 = off; 1 = on
N10:40	Motor Overload Enable	P.040	Configurable	0 = off; 1 = on
N10:41	Motor Overload Type	P.041	Configurable	0 = nC; 1 = FC
N10:42	Line Dip Ride-Through Time	P.042	Configurable	1 = 0.1sec
N10:43	Fault Auto Reset Attempts	P.043	Configurable	0 to 10
N10:44	Fault Auto Reset Time	P.044	Configurable	8 = 8 sec
N10:45	Output Phase Loss Enable	P.045	Tunable	0 = off; 1 = on
N10:46	Reserved	P.046		Note 1
N10:47	Carrier Frequency (kHz)	P.047	Configurable	0 = 2 kHz; 1 = 4 kHz; 2 = 8 kHz
N10:48	V/Hz or Vector Regulation	P.048	Configurable	0 = V/Hz; 1 = Vector
N10:49	Country Defaults	P.049	Configurable	0 = USA; 1 = EUr; 2 = JPn
N10:50	Restore Defaults	P.050		Note 1
N10:51	Programming Disable	P.051	Tunable	Enter the password (26)*
N10:52	AUTO/MAN Key Disable	P.052	Tunable	0 = off; 1 = on
N10:53	Manual Ref. Preset Enable	P.053	Tunable	0 = off; 1 = on
N10:54	Level Sense Start Enable	P.054	Configurable	0 = off; 1 = on
N10:55	STOP/RESET Key Disable	P.055	Tunable	0 = off; 1 = on
N10:56	Reserved	P.056		Note 1
N10:57	Reserved	P.057		Note 1

* When you write to P051, entering the password toggles disabling programming from the drive keypad. When you read P051, 0 – programming enabled, 1 – programming disabled.

Note 1: This parameter cannot be changed from the ControlNet network, or it is reserved. When writing to this parameter, use a value of 0. When you read this parameter, you receive a value of 0.

Table 7.1 – File N10:X (Drive Read/Write Parameters)

File Address	Parameter Name	Parameter Number	Type	Notes
N10:58	Reserved	P.058		Note 1
N10:59	Reserved	P.059		Note 1
N10:60	Node Number	P.060	Read Only	2 to 99
N10:61	Prog/Run Mode	P.061	Configurable	0 = stop,1 = not stop, 3 = term strip control
N10:62	Option Port: Communication Loss Response	P.062	Tunable	0 = IET flt; 1 = hold last; 2 = term strip reference; 3 = term strip control
N10:63	Option Port: Network Ref. Source (not used)	P.063		Note 1
N10:64	Option. Port: Network Trim Ref. Source (not used)	P.064		Note 1
N10:65	CNI Version	P.065	Read Only	5200 = CNI version 2.00
N10:66	Network Output Reg 1	P.066	Tunable	0 to 12
N10:67	Network Output Reg 2	P.067	Tunable	0 to 12
N10:68	Network Output Reg 3	P.068	Tunable	0 to 12
N10:69	Network Output Reg 4	P.069	Tunable	0 to 12
N10:70 | N10:89	Reserved	P.070 | P.089		Note 1
N10:90	Diagnostics Source	P.090	Tunable	0 to 19
N10:91	Diagnostics Display	P.091	Read Only	
N10:92	Reserved	P.0920		Note 1
N10:93	Reserved	P.093		Note 1
N10:94	Reserved	P.094		Note 1
N10:95	Power Module Output Amps	P.095	Read Only	100 = 10.0 A
N10:96	Reserved	P.096		Note 1
N10:97	Reserved	P.097		Note 1
N10:98	Software Version Number	P.098	Read Only	600 = version 6.00
N10:99	Power Module Type	P.099	Read Only	7.005 = 460 V, 5 HP
		H Parameters		
N10:100	Motor Nameplate Volts	H.000	Configurable	460 = 460 V
N10:101	Motor Nameplate Base Freq	H.001	Configurable	600 = 60.0 Hz
N10:102	Motor Nameplate Amps	H.002	Configurable	100 = 10.0 A
N10:103	Torque Boost Voltage	H.003	Configurable	5 = 0.5%
N10:104	Slip Compensation	H.004	Tunable	0 = 0.0%
N10:105	DC Braking Enable	H.005	Tunable	0 = off; 1 = on
N10:106	DC Braking Start Frequency	H.006	Tunable	50 = 5.0 Hz

Note 1: This parameter cannot be changed from the ControlNet network, or it is reserved. When writing to this parameter, use a value of 0. When you read this parameter, you receive a value of 0.

Table 7.1 – File N10:X (Drive Read/Write Parameters)

File Address	Parameter Name	Parameter Number	Type	Notes
N10:107	DC Braking Current	H.007	Tunable	1 = 1%
N10:108	DC Braking Time	H.008	Tunable	30 = 3.0 sec
N10:109	Avoidance Frec. Enable	H.009	Tunable	0 = off; 1 = on
N10:110	Avoidance Frec. Midpoint 1	H.010	Tunable	50 = 5.0 Hz
N10:111	Avoidance Frec. Band 1	H.011	Tunable	20 = 2.0 Hz
N10:112	Avoidance Frec. Midpoint 2	H.012	Tunable	50 = 5.0 Hz
N10:113	Avoidance Frec. Band 2	H.013	Tunable	20 = 2.0 Hz
N10:114	Avoidance Frec. Midpoint 3	H.014	Tunable	50 = 5.0 Hz
N10:115	Avoidance Frec. Band 3	H.015	Tunable	20 = 2.0 Hz
N10:116	Sync Direction	H.016	Configurable	0 = off; 1 = F; 2 = r; 3 = Fr; 4 =rF
N10:117	Input Pwr/Snubber Config.	H.017	Configurable	0 to 5
N10:118	Volts/Hertz Curve Type	H.018	Configurable	0 to 2
N10:119	Identification Result	H.019	Read Only	0 to 6
N10:120	Identification Request	H.020	Configurable	Note 1
N10:121	AC Line Volts	H.021	Configurable	460 = 460 V
N10:122	Overfrequency Limit	H.022	Configurable	900 - 90.0 Hz
N10:123 to N10:148	Reserved			Note 1
	U Parameters			
N10:100	Torque Reference Source	U.000	Configurable	0 to 3
N10:101	Encoder PPR	U.001	Configurable	0 = 512; 1 = 1024; 2 = 2048; 3 = 4096; 4 = SE
N10:102	Motor Poles	U.002	Configurable	0 = 2; 1 = 4; 2 = 6; 3 = 8
N10:103	Motor Nameplate Base Freq	U.003	Configurable	600 = 60.0 Hz
N10:104	Motor Nameplate Amps	U.004	Configurable	100 = 10.0 A
N10:105	Motor Nameplate RPM	U.005	Configurable	1785 = 1785 RPM
N10:106	Magnetizing Current	U.006	Configurable	500 = 50.0%
N10:107	Motor Nameplate Volts	U.007	Configurable	460 = 460 V
N10:108	Torque Self-Tune Enable	U.008	Configurable	Note 1
N10:109	Torque Self-Tune Result	U.009	Read Only	0 to 7
N10:110	Reserved	U.010		Note 1
N10:111	Reserved	U.011		Note 1
N10:112	Spd. Reg. Prop. Gain	U.012	Tunable	500 = 5.00
N10:113	Spd. Reg. Integral Gain	U.013	Tunable	500 = 5.00
N10:114	Torque Reg. Prop. Gain	U.014	Tunable	40 = 0.40

Note 1. This parameter cannot be changed from the ControlNet network or is reserved. When writing to this parameter, use a value of 0. When you read this parameter, you receive a value of 0.

Table 7.1 – File N10:X (Drive Read/Write Parameters)

File Address	Parameter Name	Parameter Number	Type	Notes
N10:115	Torque Reg. Integral Gain	U.015	Tunable	2000 = 200.0
N10:116	Fld. Weakening Start RPM	U.016	Configurable	1785 = 1785 RPM
N10:117	Motor Top Speed	U.017	Configurable	7200 = 7200 RPM
N10:118	AC Line Volts	U.018	Configurable	460 = 460 V
N10:119	Flux Cur. Reg. Prop. Gain	U.019	Tunable	500 = 5.00
N10:120	Flux Cur. Reg. Integral Gain	U.020	Tunable	400 = 40.0
N10:121	Rotor Time Constant	U.021	Tunable	100 = 100 msec
N10:122	Motor Nameplate HP	U.022	Configurable	10 = 1.0 HP
N10:123	Low DC Bus Flt. Avoid En.	U.023	Tunable	0 = off; 1 = on
N10:124	High DC Bus Flt. Avoid En.	U.024	Tunable	0 = off; 1 = on
N10:125	Zero Speed Hold Time	U.025	Tunable	1 = 0.1 sec
N10:126	Current Compounding Gain	U.026	Tunable	1 = 0.001
N10:127	Inertia Compensation Gain	U.027	Tunable	1 = 0.001
N10:128	Losses Compensation Gain	U.028	Tunable	1 = 0.001
N10:129	Reserved	U.029		Note 1
N10:130	SVC Slip Adjust	U.030	Tunable	100 = 1.00
N10:131	SVC Sync Direction	U.031	Configurable	0 = Off; 1 = F; 2 = r; 3 = Fr; 4 = rF
N10:132	SVC Flux Cur. Reg. Gain	U.032	Tunable	500 = 500 rad/sec
N10:133	Reserved	U.033		Note 1
N10:134	Reserved	U.034		Note 1
N10:135	Reserved	U.035		Note 1
N10:136	Reserved	U.036		Note 1
N10:137	Reserved	U.037		Note 1
N10:138	Reserved	U.038		Note 1
N10:139	Reserved	U.039		Note 1
N10:140	OCL Feedback Source	U.040	Configurable	0 = TS analog in; 1 = Spd Loop PI out
N10:141	OCL Lead/Lag Select	U.041	Tunable	0 = bypass; 1 = lead/lag; 2 = lag/lead
N10:142	OCL Lead/Lag Low Freq.	U.042	Tunable	1 = 0.01 rad/sec
N10:143	OCL Lead/Lag Ratio	U.043	Tunable	1 = 1
N10:144	OCL Reference Gain	U.044	Tunable	1 = 0.001
N10:145	OCL Proportional Gain	U.045	Tunable	10 = 0.10
N10:146	OCL Integral Gain	U.046	Tunable	1 = 0.01
N10:147	OCL Trim Range Percent	U.047	Tunable	1 = 0.1% (gain of 0.001)
N10:148	OCL Prop.Trim EnableFil	U.048	Configurable	0 = off; 1 = on

Note 1: This parameter cannot be changed from the ControlNet network or it is reserved. When writing to this parameter, use a value of 0. When you read this parameter, you receive a value of 0.

Table 7.2 – File N11:X (Drive Display Data (Read Only))

File Address	Name	Description
N11:0	Fault Word 1	This element displays the status of the drive fault bits. Some are vector (v), some are V/Hz (h), and some are common to both regulators(c). b00 Overcurrent (c) b01 Overcurrent Accelerating (c) b02 Overcurrent Decelerating (c) b03 DC Braking Fault (h) b04 High DC Bus (c) b05 Low DC Bus (c) b06 Electronic Thermal Overload (c) b07 Overtemperature (c) b08 Function Loss (c) b09 Check Sum Failed (c) b10 Loss of Serial Communication (c) b11 Serial Port Spurious Interrupt (c) b12 Self Tune Failed (v) b13 Overspeed (u) b14 Motor Phase Loss (c) b15 Overfrequency (c)
N11:1	Fault Word 2	This element displays the status of the drive fault bits. Some are vector (v), some are V/Hz (h), and some are common to both regulators(c). b00 Network Communication Loss (c) b01 Bypass Contact (c) b02 High Time ID Aborted (h) b03 Drive ID Aborted (c) b04 High Line (h) b05 EEPROM Write Failed (c) b06 PU Overload (c) b07 Ground Current (c) b08 Asymmetrical Bus (c) b09 Missing PU Connector (c) b10 PU No. Selected (c) b11 Input Phase Loss (c) b12 Encode Loss (u) b13 Analog Input 4-20 mA Loss b14 b15 Fatal System Error (c)
N11:2	Motor Speed	This element displays drive speed as scaled by P.028.
N11:3	Motor Volts	This element displays motor voltage, where 460 = 460 VAC)
N11:4	Motor Amps	This element displays motor current, where 150 = 15.0 amps)
N11:5	Motor KW	This element displays motor kilowatts, where 150 = 1.50 kW.
N11:6	Motor Torque	This element displays torque, where 100 = 100%.
N11:7	Power Factor	This element displays power factor, where 10000 = 1.0
N11:8	Error Log Count	This element displays the number of entries in the error log.
N11:9	Error Log 0,1	These elements display the drive error log packed in bytes. For example: N11:8 = 3; the value 3 indicates there are 3 errors in the error log. N11:9 = 0408; the value 04 in the upper byte indicates that the first error is a High DC Bus. The value 08 in the low byte indicates that the second error is a Function Loss. Hex values 00 - 0F correspond to Fault Word 1 above, bits b00 - b15. Hex values 10 - 1F correspond to Fault Word 2 above, bits b00 - b15. See the *GV3000/SE Software Reference* for a listing of drive fault codes. N11:10 = 1Bxx; the value 1B in the upper byte indicates that the third error is an Input Phase Loss.
N11:10	Error Log 2,3	
N11:11	Error Log 4,5	
N11:12	Error Log 6,7	
N11:13	Error Log 8,9	
N11:14	Secondary Status Bits	b00 OCL Enabled (vector only)

Table 7.3 – File N12:X (Drive Reference and Feedback Data)

Drive Reference Data	Drive Feedback Data
N12:0 Drive Control Word	N12:16 Drive Status Word
N12:1 Speed/Torque Reference	N12:17 Speed Feedback
N12:2 Trim Reference	N12:18 Selected Output 1
N12:3 Inertia Comp	N12:19 Selected Output 2
N12:4 Speed PI High Limit	N12:20 Selected Output 3
N12:5 Speed PI Low Limit	N12:21 Selected Output 4
N12:6 Reserved | N12:15	N12:22 Reserved | N12:31

CHAPTER 8

Troubleshooting

8.1 Diagnostic LEDs

The ControlNet Network Communication Option board has three bicolor (red/green) LEDs. The Health LED indicates the status of the network communication board and each of the two Communications LEDs indicates the status of its associated channel.

The Health LED provides the status of the network option board. It indicates whether or not the board has power and is operating properly.

Table 8.1 – Health LED

LED State	Probable Cause	Recommended Action
Off	Power off	Turn power on.
Flashing Red/Green	Device Test	None
Flashing Green/Off	Incorrect node configuration	Check network address and other ControlNet configuration parameters
Steady Green	Normal operation	The network communication board is configured correctly.
Flashing Red/Off	Non-critical Fault	An invalid configuration is loaded. This is the indication that no OS is loaded.
Steady Red	Critical Fault	The network communication board has an unrecoverable fault.

The Communications LEDs can be off, red, green, or some alternating pattern. In table 6.2, the term "flashing" is used to describe LEDs that are always in the same state, or in phase. The term "alternating" is used to describe LEDs that are always in opposite states, or out of phase.

Table 8.2 – Communications LEDs

LED State	Probable Cause	Recommended Action
Off	No power	Turn power on
Steady Red (A & B)	Faulted unit	Cycle power. If the fault persists, contact your Reliance Electric representative.
Alternating Red/Green (A & B)	Self test	None
Alternating Red/Off (A & B)	Incorrect node configuration	Check the network address and other ControlNet configuration parameters.
Off	Channel disabled	None: configure for communication.
Steady Green	Normal operation	None
Flashing Green/Off	Temporary error Node is not configured	Verify that the node number has been set. Check that the cable is properly terminated. Verify that the config manager node is working.
Flashing Red/Off	Media Fault No other nodes present on the network This channel's cable is not as good as the other.	Check media for problems. Add other nodes to the network. Never remove the green channel if the other is red: communication may be lost.
Flashing Red/Green	Incorrect network configuration	Cycle power. If the fault persists, contact your Reliance Electric representative.

8.2 Communication Error Codes

Table 6.3 defines the error codes that are returned by the drive for Typed Read and Typed Write messages.

Table 8.3 – Communication Error Codes

Status			Description
ControlLogix™		PLC-5	
Error	Extended Error	Error	
0	0	0	No Error
00F0	0002	-4094 (0xF002)	Incomplete address
00F0	0003	-4093 (0xF003)	Incorrect address
00F0	0006	-4090 (0xF006)	Addressed file does not exist in target processor
00F0	0007	-4089 (0xF007)	Destination file is too small for number of words requested
00F0	000B	-4085 (0xF00B)	Privilege error, access denied
00F0	000C	-4084 (0xF00C)	Requested function is not available
00F0	0011	-4079 (0xF011)	Data type requested does not match available

This section defines some ControlNet network and GV3000/SE drive terminology.

C

Configuration Manager Node
The node responsible for distributing ControlNet configuration data to all nodes on the network.

Configurable (parameter)
A parameter that can be adjusted or changed only when the drive is stopped.

Connection
An opened communication path between two nodes on a ControlNet network.

ControlNet Status Indicators
Channel A and channel B indicators on your node indicating status on the ControlNet link.

D

Drop Cable
A cable that connects a node to the trunk cable.

F

Frame
A single data transfer on a ControlNet link.

L

Link
A collection of nodes within unique addresses (in range of 1-99). Segments connected by repeaters make up a link; links connected by bridges make up a network.

M

Maximum Scheduled Node
The node with highest network address that can use *scheduled* time a ControlNet link.

Maximum Unscheduled Node
The node with highest network address that can use *unscheduled* time a ControlNet link.

MSG Instruction (Message Instruction)
Instructions used by ControlNet PLC-5 processors for peer-to-peer communications.

N

NAP (Network Access Port)
A port that provides a temporary network connection through an RJ-45 connector.

Network
A series of nodes connected by some type of communication medium. The connection paths between any pair of nodes can include repeaters, routers, bridges, and gateways.

Network Address
A node's address on the network.

Node
The port of a physical device connected to the network that requires a network address to function on the network. A link may contain a maximum of 127 nodes.

NUI (Network Update Interval)
A single occurrence of the network update time (NUT)

NUT (Network Update Time)
Repetitive time interval in which data can be sent on the ControlNet network.

R

Redundant media
A dual cable system that lets you receive the best signal over a network.

Repeater
A two-port active physical-layer device that reconstructs and retransmits all traffic it hears on one segment to another segment.

S

Scheduled transfer
Deterministic and repeatable transfers that are continuous and asynchronous to the ladder-logic program scan.

Segment
Trunk-cable sections connected via taps with terminators at each end; a segment does not include repeaters.

T

Tap

A component that connects products to the ControlNet trunk cable. A tap is required for each node and for both sides of each repeater.Terminator

Terminator

A 75-Ω resistor (mounted in a BNC plug) placed on the ends of segments to prevent reflections from occurring at the ends of cables.

Trunk-Cable

The bus or central part of the ControlNet cable system.

Trunk-Cable Section

The length of trunk cables between any two taps.

Tunable (parameter)

A parameter that can be adjusted or changed when the drive is running or stopped.

U

Unscheduled Transfers

Non-deterministic data transfers through ladder-initiated communication or programming devices.

Numerics

B

C

D

E

F

G

I

L

M

N

P

R

S

T

U

W

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