RELIANCE ELECTRIC

AutoMax Network Communication Option Board for use with GV3000/SE AC Drives

M/N 2AX3000

Instruction Manual D2-3308-7

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 printed circuit boards that are static-sensitive. Anyone who touches the drive components should wear an anti-static wrist band. 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.

CONTENTS

List of Figures

List of Tables

CHAPTER 1

Introduction

This manual describes the AutoMax™ Network Communication Option board (M/N 2AX3000). This board allows a GV3000/SE™ drive to be operated and monitored over the AutoMax network.

For normal operation, the GV3000/SE drive can be completely controlled using the Network Option board. This allows use of only 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 AutoMax network.

1.1 AutoMax Network Communication Option Board Description

The AutoMax Network Communication Option board (M/N 2AX3000) ships with one Network Drop Cable (M/N 2NC3000). The Network Drop Cable connects the GV3000/SE drive to the passive tap.

The Network Option board makes the GV3000/SE drive a slave drop on the AutoMax 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 has a two-connection terminal strip that connects to a single twisted-pair Network Drop Cable (M/N 2NC3000). The Network Drop Cable is connected to a passive tap on the AutoMax network.

1.2 Where to Find Additional Information

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

- *GV3000/SE AC General Purpose (Volts/Hertz) and Vector Duty Drive Software Start-Up and Reference Manual* (D2-3359)
- *GV3000/SE AC Power Modules Hardware Reference, Installation, and Troubleshooting* instruction manual (D2-3360)
- *GV3000/SE 230 VAC 1-20 HP General Purpose (Volts/Hertz) and Vector Duty Drive Software Start-Up and Reference Manual* (D2-3387)
- *GV3000/SE AC Drive Hardware Reference, Installation, and Troubleshooting, 1-20 HP @ 230 VAC* (D2-3388)
- *GV3000/SE 460 VAC General Purpose (Volts/Hertz) and Vector Duty Drive Software Start-Up and Reference Manual* (D2-3391)
- *GV3000/SE AC Drive Hardware Reference, Installation, and Troubleshooting 75-200 HP @ 460 VAC* (D2-3392)

- *GV3000/SE 230 VAC 30-100 HP General Purpose (Volts/Hertz) and Vector Duty Drive Software Start-Up and Reference Manual* (D2-3416)
- *GV3000/SE AC Drive Hardware Reference, Installation, and Troubleshooting 30-100 HP @ 230 VAC* (D2-3417)
- *GV3000/SE AC General Purpose (Volts/Hertz) and Vector Duty Bookshelf Drive Software Start-Up and Reference Manual* (D2-3426)
- *GV3000/SE AC Bookshelf Power Modules Hardware Reference, Installation, and Troubleshooting* (D2-3427)
- *Network Communications Module* (J2-3001)
- ReSource AutoMax Programming Executive instruction manual
- *Control and Configuration Software (CS3000)* instruction manual (D2-3348)

1.3 Related Hardware and Software

When the Network Option board is installed in a GV3000/SE drive, the drive can be used with the hardware and software listed in table 1.1.

Table 1.1 – Hardware and Software Used with AutoMax Network Option Board (Purchased Separately)

Option Name	Model Number	Description
75 Ohm Terminating Load	45C71	A terminating load is required at both ends of an AutoMax network coaxial cable system.
AutoMax Processor	57C430A 55C431 57C435	
AutoMax Programming Executive	Various	Includes the tools required for programming in Enhanced Basic, Control Block, and Ladder Logic/PC languages.
Communications Passive Tap	57C380	Required at each network drop for connection to coaxial cabling.
Drive Control and Configuration Software	2CS3000	Windows-based software that allows you to connect any personal computer running Microsoft Windows version 3.1 or later to a GV3000/SE drive. Allows you to create, store, upload, and download drive configurations.
Network Communications Module	57C404 57C404A 57C404B	The master drop (and all AutoMax rack slave drops) on the AutoMax network must contain a Network Communications module. The Network Option board emulates the functions of the Network Communications Module for the GV3000/SE drive.
ReSource™ Interface Cable	61C127	Cable that connects a personal computer to the AutoMax Processor module

1.4 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 1-800-726-8112.

CHAPTER 2

Installation

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

The AutoMax Network 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	2.4
1 HP	1V41xx	1V44xx	2.2
2 HP	2V21xx	2V24xx	2.4
2 HP	2V41xx	2V44xx	2.2
3 HP	3V21xx	3V24xx	2.4
3 HP	3V41xx	3V44xx	2.2
5 HP	5V21xx	5V24xx	2.4
5 HP	5V41xx	5V44xx	2.2
7.5 HP	7V21xx	7V22xx	2.4
7.5 HP	7V41xx	7V42xx	2.3
10 HP	10V21xx	10V22xx	2.4
10 HP	10V41xx	10V42xx	2.3
15 HP	15V21xx	15V22xx	2.4
15 HP	15V41xx	15V42xx	2.6
20 HP	20V21xx	20V22xx	2.4
20 HP	20V41xx	20V42xx	2.6
25 HP	25G41xx 25G42xx	25V41xx 25V42xx	2.6
30 HP	30V20xx		2.5
30 HP	30V41xx	30V42xx	2.6
40 HP	40V20xx		2.5
40 HP	40V41xx	40V42xx	2.6

Table 2.1 – Locating the Appropriate Installation Procedure (Continued)

Rating	GV3000/SE Model Number	Use the Procedure in Section ...
50 HP	50R41xx	2.7
50 HP	50T41xx	2.7
50 HP	50V20xx	2.5
50 HP	50V41xx 50V42xx	2.6
60 HP	60G41xx 60G42xx	2.6
60 HP	60V20xx	2.5
75 HP	75R41xx	2.7
75 HP	75T41xx	2.7
75 HP	75V20xx	2.5
75 HP	75V40xx	2.5
100 HP	100V20xx	2.5
100 HP	100V40xx	2.5
125 HP	125R41xx	2.7
125 HP	125V40xx	2.5
150 HP	150V40xx	2.5
200 HP	200V40xx	2.5
200 HP	200V41xx	2.8
250 HP	250V41xx	2.8
300 HP	300V41xx	2.8
350 HP	350V41xx	2.8
400 HP	400V41xx	2.8
2 to 15 Amp	31ER40xx 85ER40xx 31ET40xx 85ET40xx 38ER40xx 126ER40xx 38ET40xx 126ET40xx 55ER40xx 150ER40xx 55ET40xx 150ET40xx	2.9
24 to 30 Amp	240FR40xx 300FR40xx 240FT40xx 300FT40xx	2.9

2.1 Setting AutoMax Network Option Board Jumpers

The AutoMax Network option board is shipped with jumpers J4 and J5 connecting pins 1 and 2 (see figure 2.1).

You must change the position of jumpers J4 and J5 to connect pins 2 and 3 before installing the AutoMax Network option board if your drive is one of these model numbers:

50R41xx	38ER40xx	126ET40xx
50T41xx	38ET40xx	150ER40xx
75R41xx	55ER40xx	150ET40xx
75T41xx	55ET40xx	240ER40xx
125R41xx	85ER40xx	240ET40xx
31ER40xx	85ET40xx	300ER40xx
31ET40xx	126ER40xx	300ET40xx

To check the jumpers, remove the AutoMax Network option board from its anti-static wrapper. See figure 2.1 for jumper locations.

After changing or checking the jumpers, place the AutoMax Network option board back in its anti-static wrapper.

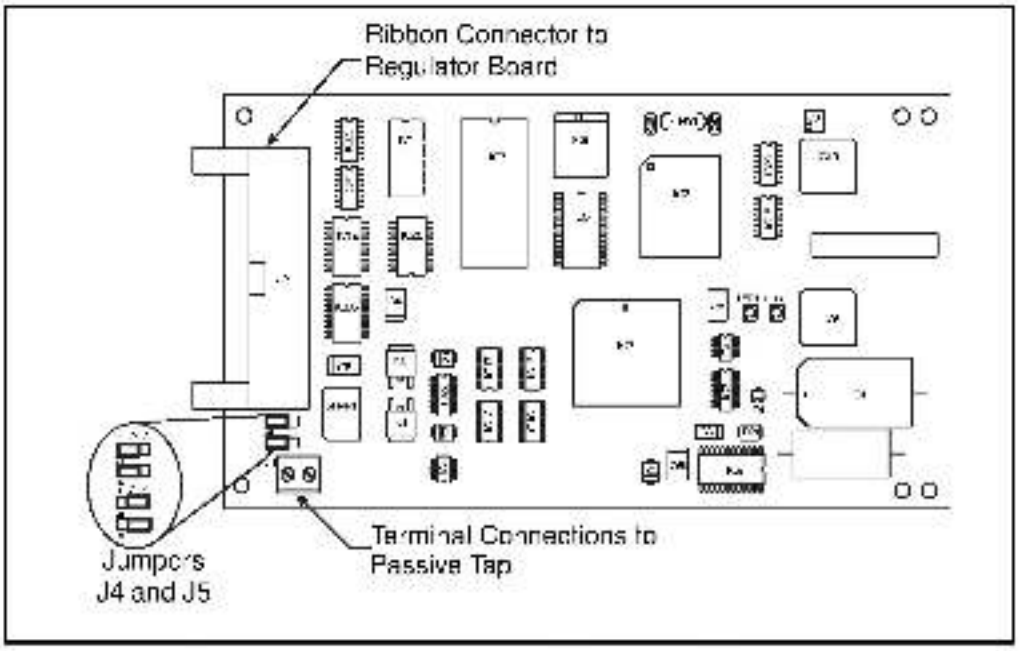

Figure 2.1 — Jumper Locations on AutoMax Network Option Board

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

Use this procedure to install the AutoMax Network option board in the drives listed in Table 2.2.

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

1V41xx 1V44xx	3V41xx 3V44xx
2V41xx 2V44xx	5V41xx 5V44xx

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

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

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

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 2.2.

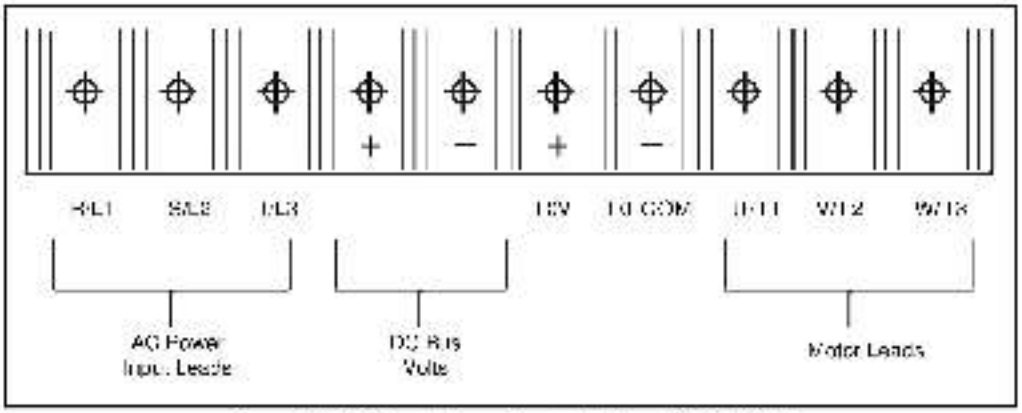

Figure 2.2 DC Bus Voltage Terminals (1 to 5 HP @ 460 V)

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 AutoMax Network Option Board in the Keypad Bracket

Refer to figure 2.3 for component locations.

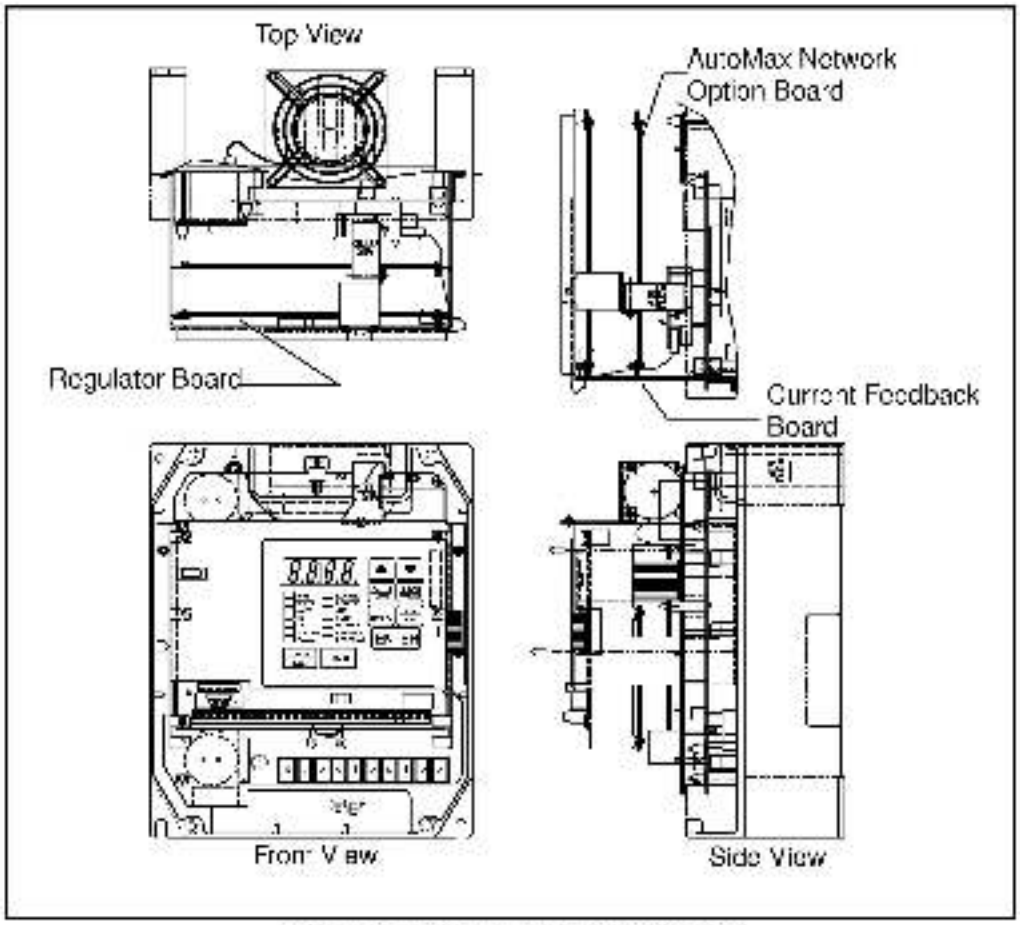

Figure 2.3 – 1 to 5 HP @ 480V GV3000/SE Drive

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

Step 4.2 Align the key on the connector of the AutoMax Network 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 AutoMax Network 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 AutoMax Network option board.

Step 4.5 Fasten the right side of the AutoMax Network 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 AutoMax Network 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 AutoMax Network option board. Do not remove the lockout and tagout if you have completed section 2.10, which provides instruction on connecting to the AutoMax network.

2.3 Installing the AutoMax Network Option Board in 7.5 to 10HP@460VAC Drives

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

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

Use this procedure to install the AutoMax Network option board in drives with model numbers 7V41xx, 7V42xx, 10V41xx, or 10V42xx.

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

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

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

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 2.4.

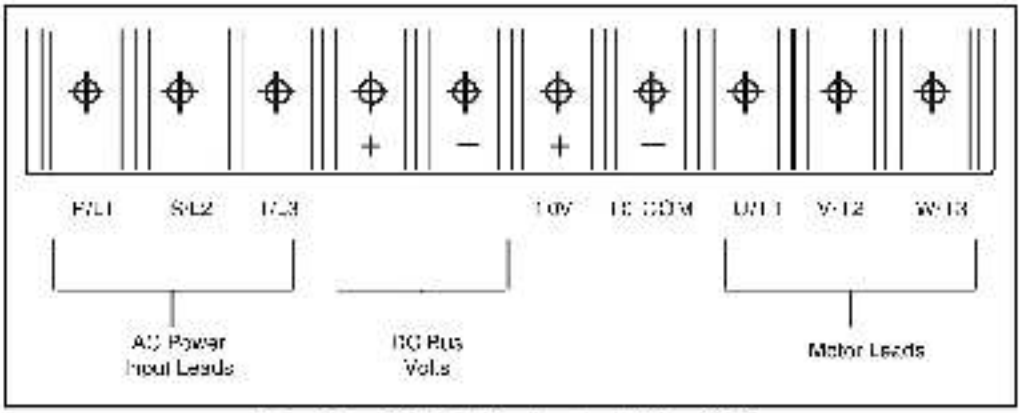

Figure 2.4 DC Bus Voltage Terminals (7.5 to 10 HP)

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 AutoMax Network Option Board in the Keypad Bracket

Refer to figure 2.5 for component locations.

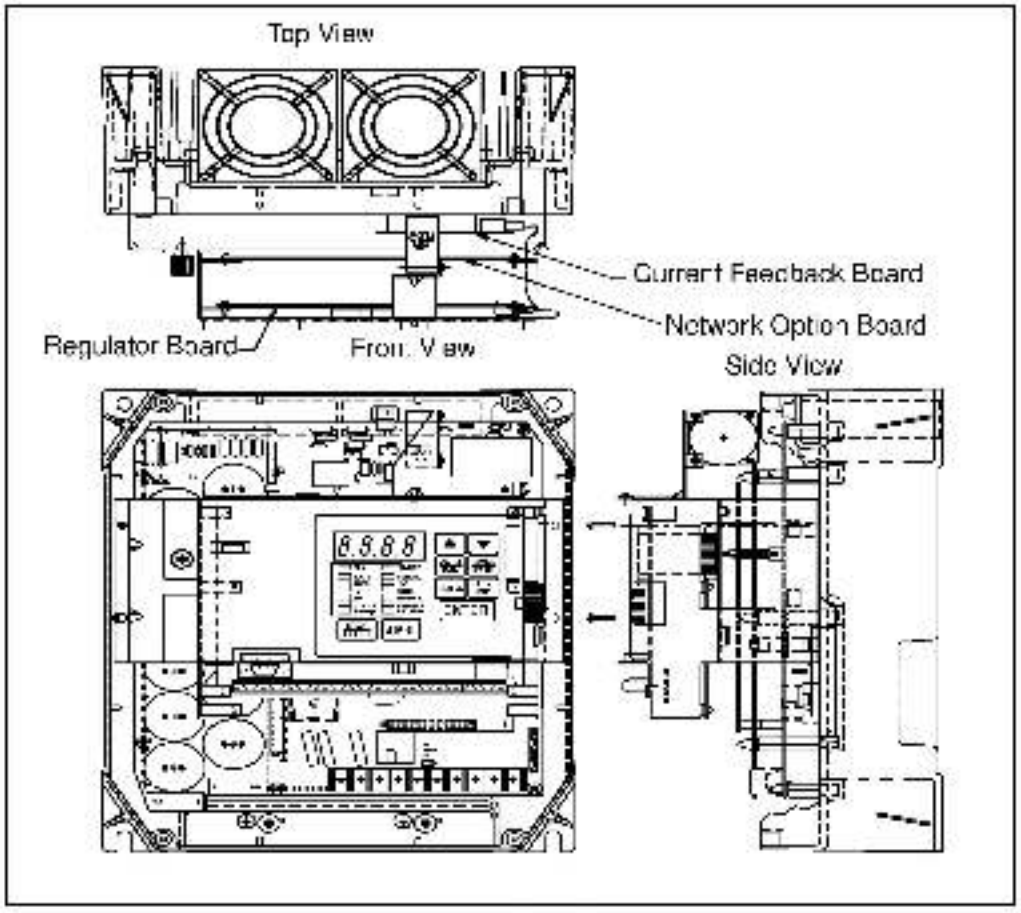

Figure 2.5 – 7.5 to 10HP @ 460V GV3000/SE Drive

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

Step 4.2 Align the key on the connector of the AutoMax Network 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 AutoMax Network 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 AutoMax Network option board.

Step 4.5 Fasten the right side of the AutoMax Network 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 AutoMax Network 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 AutoMax Network option board. Do not remove the lockout and tagout if you have completed section 2.10, which provides instruction on connecting to the AutoMax network.

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

Use this procedure to install the AutoMax Network 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 2.6.

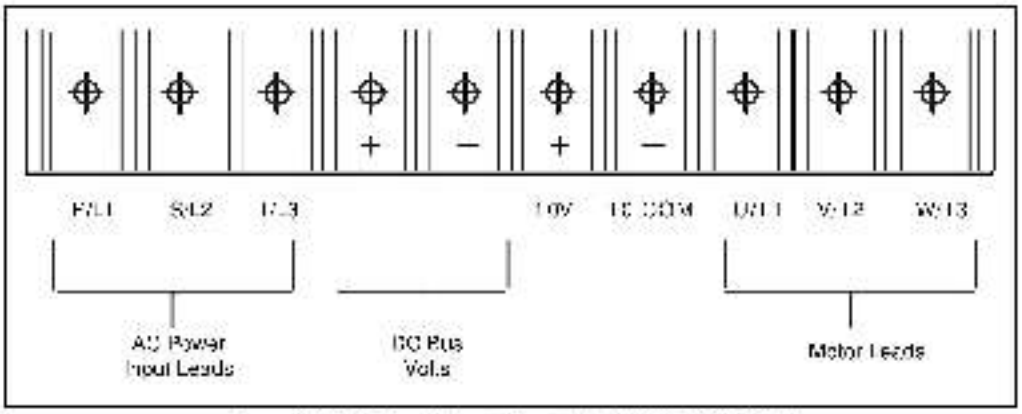

Figure 2.6 DC Bus Voltage Terminals (1 to 20HP @ 230V)

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 AutoMax Network Option Board in the Keypad Bracket

Refer to figure 2.7 for component locations.

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

Step 4.2 Align the key on the connector of the AutoMax Network 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 AutoMax Network 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 AutoMax Network option board.

Step 4.5 Fasten the right side of the AutoMax Network 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 AutoMax Network option board to the keypad bracket using the two plastic rivets.

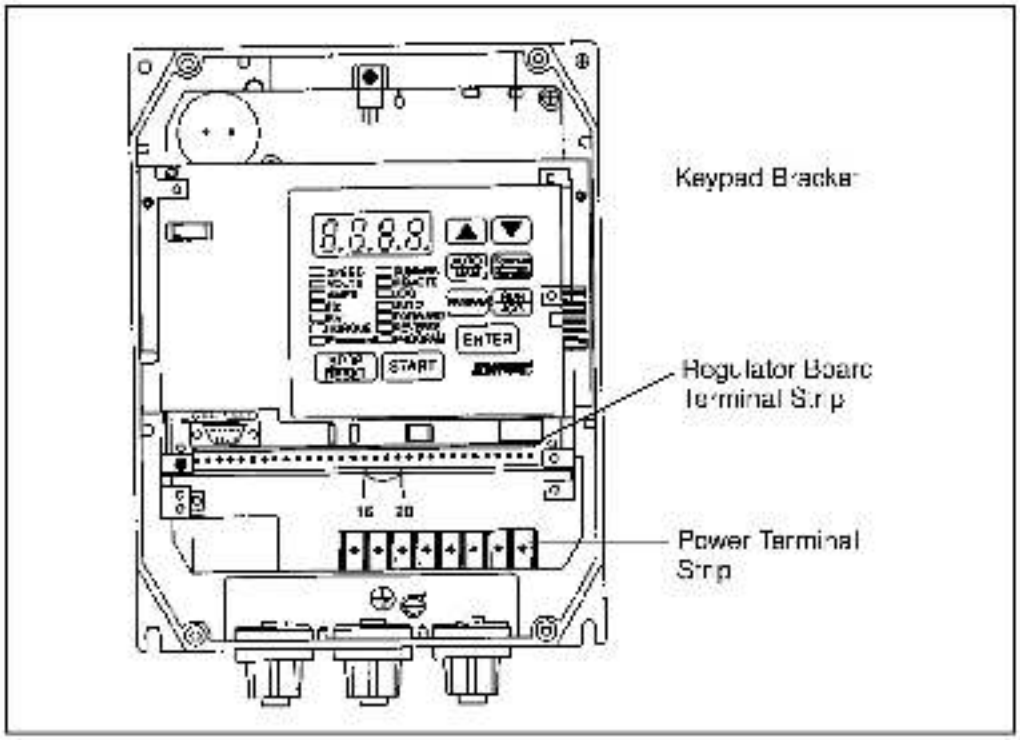

Figure 2.7 – 1 to 20 HP @ 230 V GV3000/SE Drive

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 AutoMax Network option board. Do not remove the lockout and tagout if you have completed section 2.10, which provides instruction on connecting to the AutoMax network.

2.5 Installing the AutoMax Network Option Board in 30 to 100HP@230VAC and 75 to 200 @ 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 printed circuit boards that are static-sensitive. An anti-static wrist band should be worn by any person who touches the drive's components, connectors, or wiring. Erratic machine operation and damage to, or destruction of, equipment can result if this procedure is not followed.

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

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

30 to 100HP@230VAC	75 to 200 @ 460VAC
30V20xx	75V40xx
40V20xx	100V40xx
50V20xx	125V40xx
60V20xx	150V40xx
75V20xx	200V40xx
100V20xx	

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 2.8.

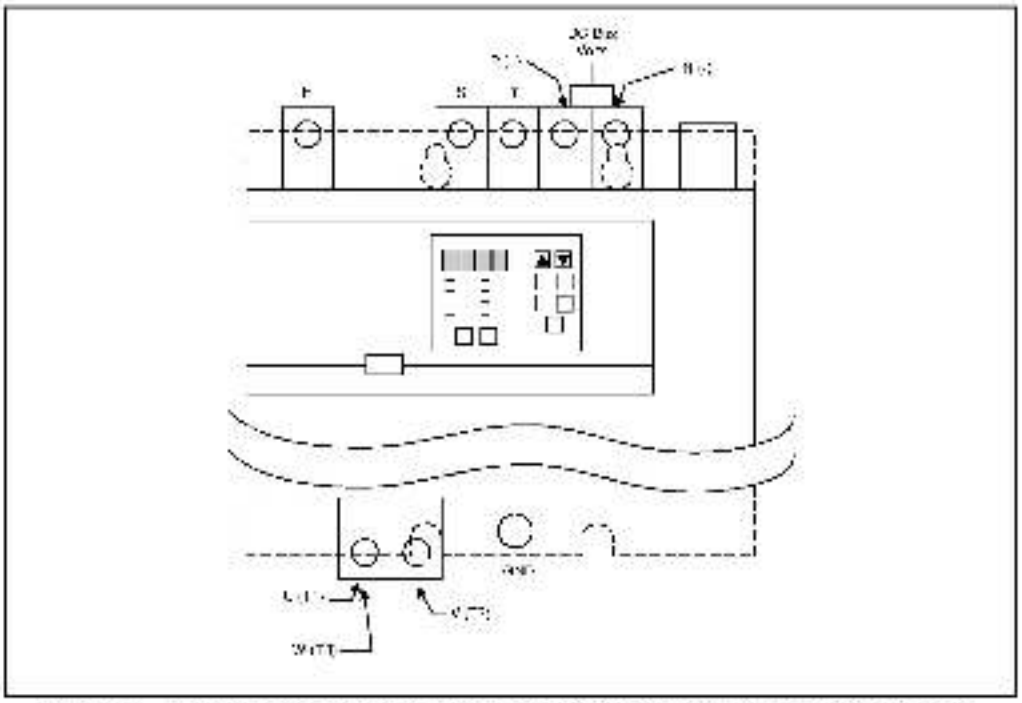

Figure 2.8 – DC Bus Voltage Terminals (30 to 100 HP @ 230VAC and 75 to 200 @ 460VAC Drives)

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 2.9.
- A terminal cover only: If you have this type of drive, this procedure is easier to perform if you lay the drive on its side. Remove the side cover from the drive. Use a long magnetized screwdriver to unfasten the four screws that hold the keypad bracket in.

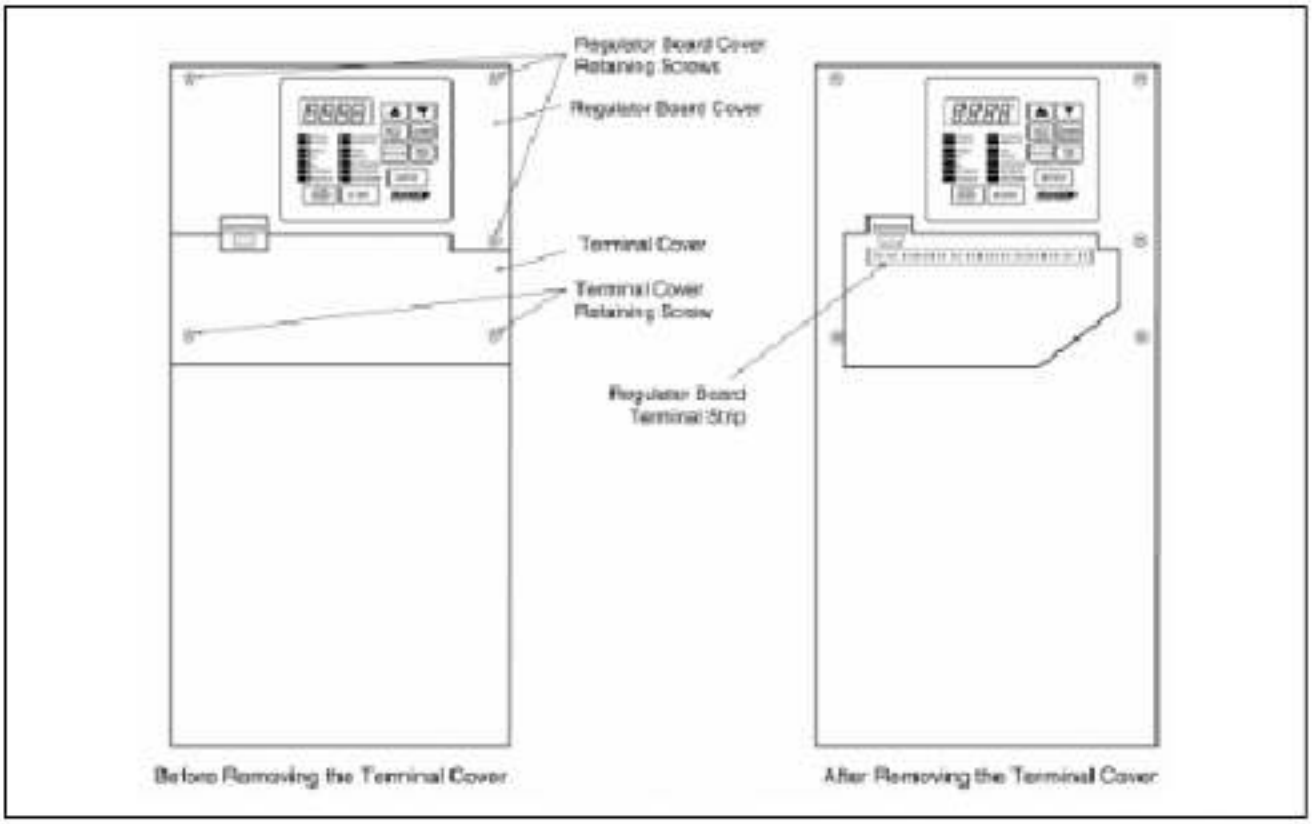

Figure 2.9 Location of Terminal Cover and Regulator Board Cover in 30 to 100 HP @ 230 VAC and 75 to 250 HP @ 460 VAC Drives

Step 3.2 Remove the terminal cover, which is below the keypad and fastened with two M4 screws. See figure 2.9.

Step 3.3 Record connections to the Regulator board terminal strip if they must be disconnected to remove the keypad bracket.

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 2.10.

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.

Step 4. Install the AutoMax Network Option Board in the Keypad Bracket

Refer to figures 2.9 and 2.10.

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

Step 4.2 Align the key on the connector of the AutoMax Network 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 AutoMax Network 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 AutoMax Network option board.

Step 4.5 Fasten the right side of the AutoMax Network 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 AutoMax Network option board to the keypad bracket using the two plastic rivets.

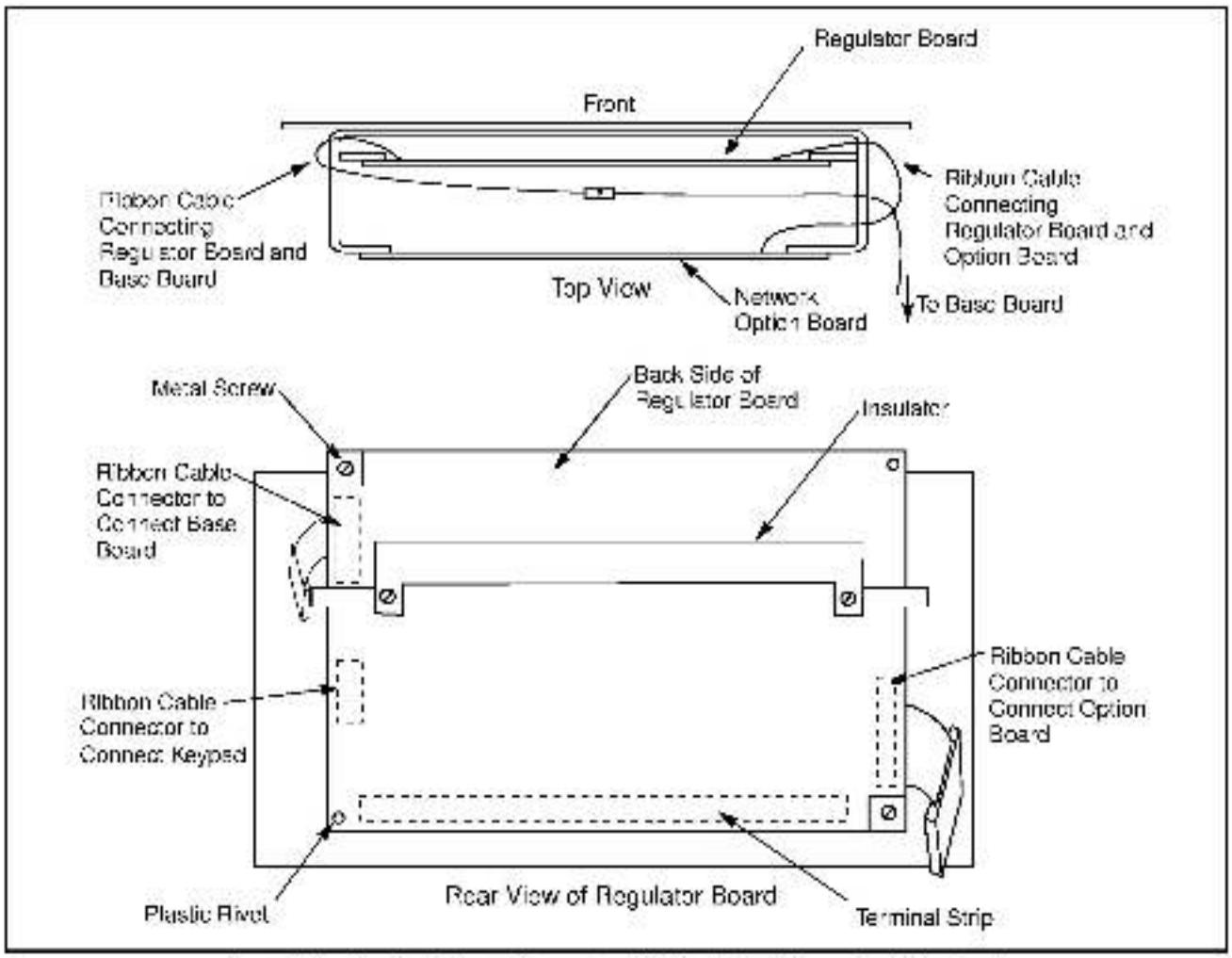

Figure 2-8 – Regulator Board's Connections to Option Board, Keypad, and Base Board

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 AutoMax Network option board. Do not remove the lockout and tagout until you have completed section 2.10, which provides instruction on connecting to the AutoMax network.

2.6 Installing the AutoMax Network Option Board in 15 to 25 HP and 25 to 60HP @ 460V Drives

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

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

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

Table 2.5 Model Numbers for 15 to 25 HP and 25 to 60HP@460V Drives

15 to 25 HP	25 to 60HP
15V41xx 15V42xx	25V41xx 25V42xx
20V41xx 20V42xx	30V41xx 30V42xx
25G41xx 25G42xx	40V41xx 40V42xx
	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 2.11 (15 to 25 HP) and 2.12 (25 to 60 HP).

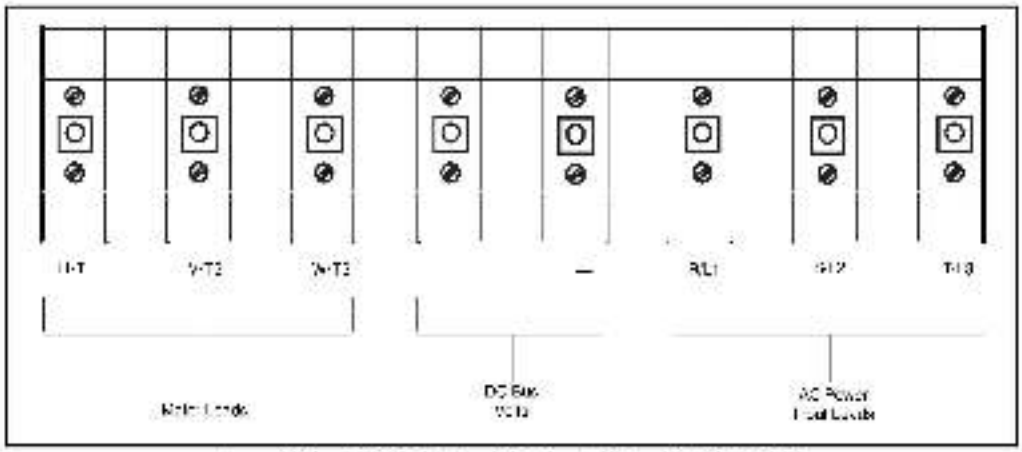

Figure 2.11 DC Bus Voltage Terminals (15 to 25 HP @ 460V)

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.

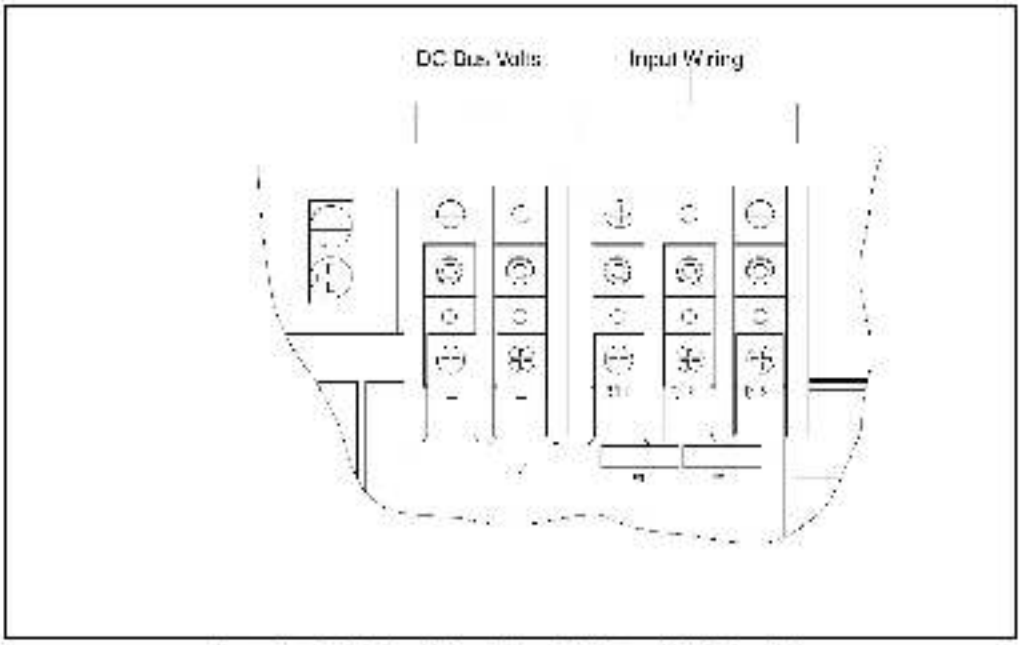

Figure 2.12 DC Bus Voltage Terminals (25 to 80 HP @ 460V)

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.

Step 4. Install the AutoMax Network Option Board in the Keypad Bracket

Refer to figure 2.13 for component locations.

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

Step 4.2 Align the key on the connector of the AutoMax Network 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 AutoMax Network 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 AutoMax Network option board.

Step 4.4 Fasten the right side of the AutoMax Network 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 AutoMax Network 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.

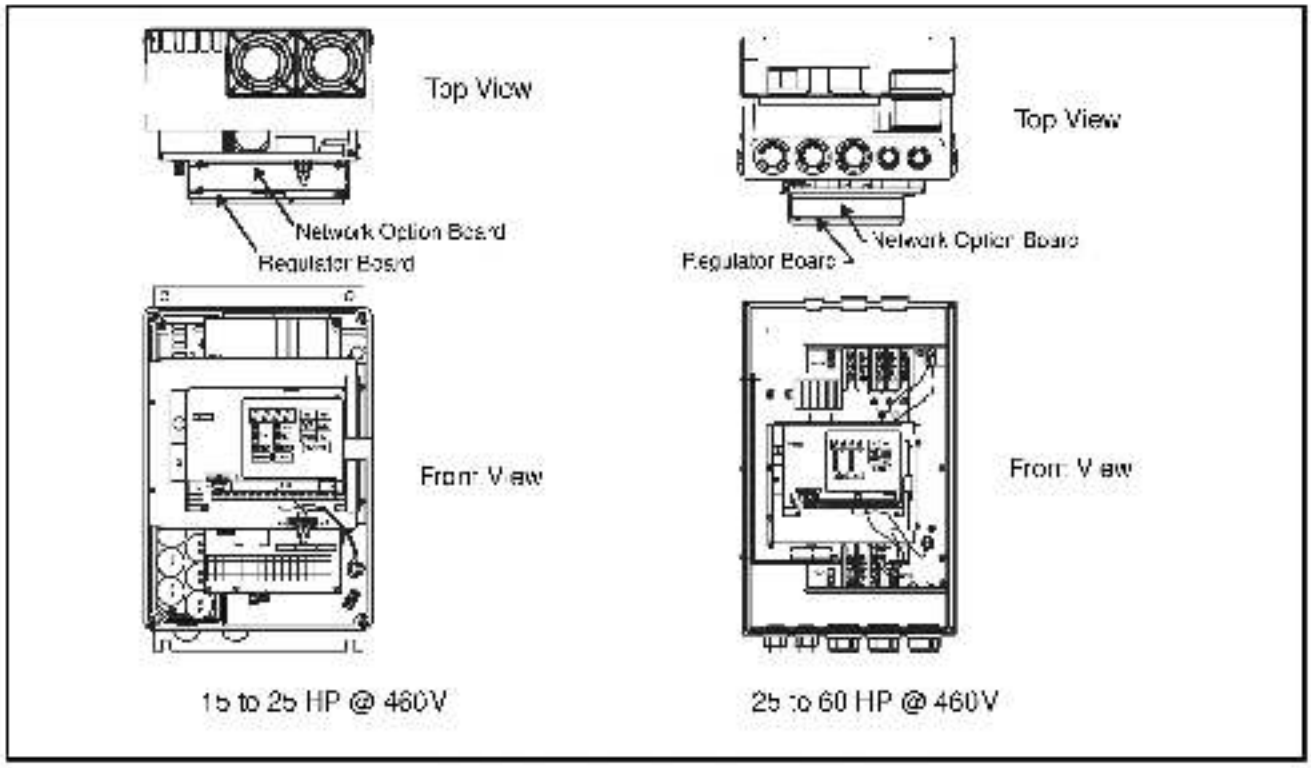

Figure 2-13 – 1b to 2b and 25 to 60 HP @ 460V GV3000/SE Drive

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 AutoMax Network option board. Do not remove the lockout and tag until you have completed section 2.10, which provides instruction on connecting to the AutoMax network.

2.7 Installing the AutoMax Network Option Board in 50 to 100 HP and 100 to 150 HP @ 460V Drives

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

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

Use this procedure to install the AutoMax Network option board in drives with the model numbers 50R41xx, 50T41xx, 75R41xx, 75T41xx, or 125R41xx.

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 2.14.

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 2.15.

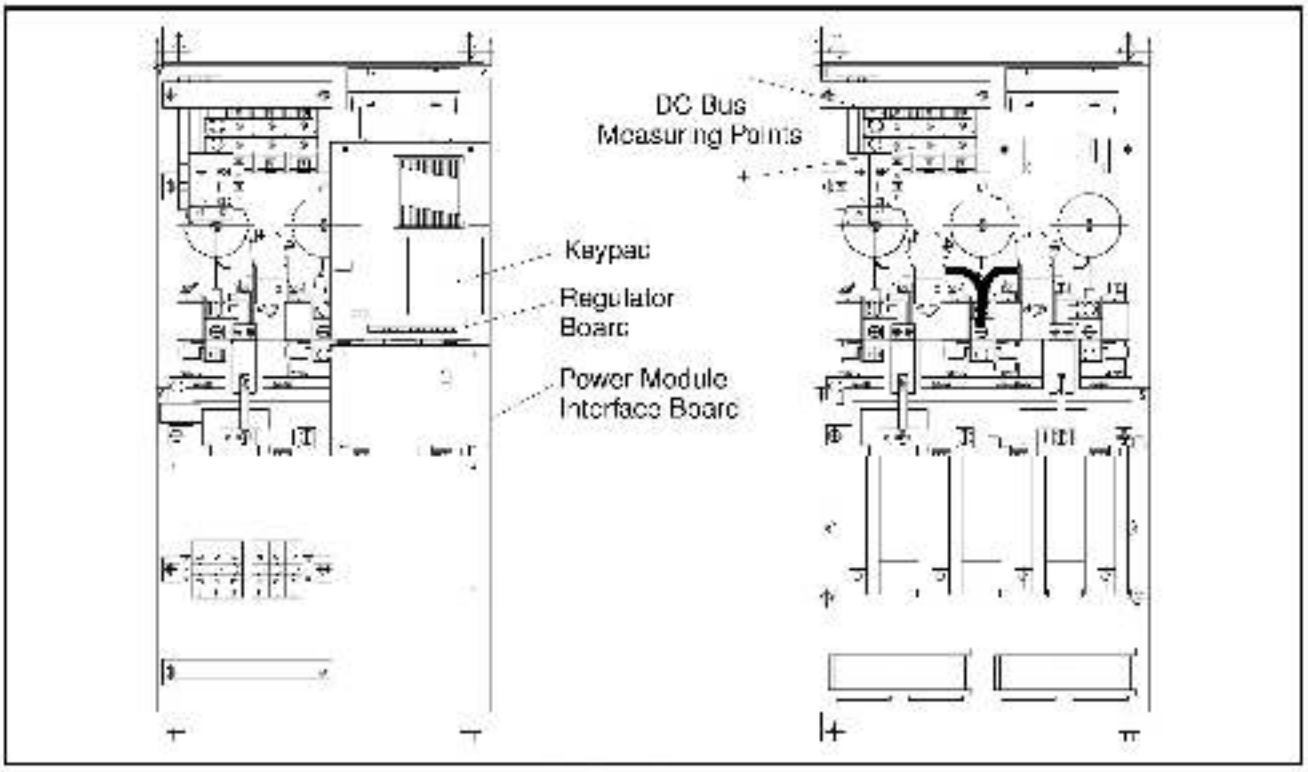

Figure 2.14 – 50 to 100 HP GV3000/SE Drive Components and Locations

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 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.

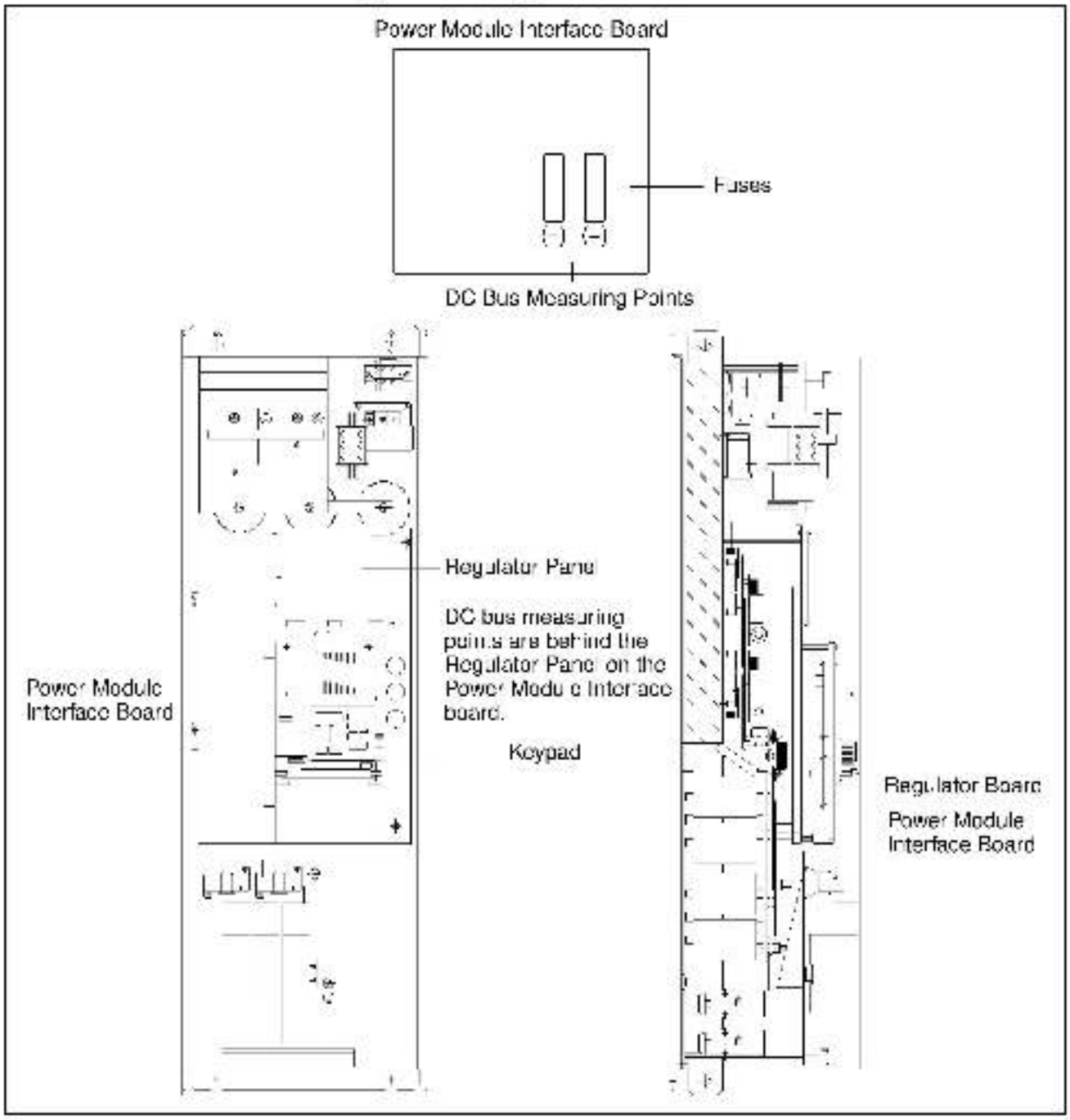

Figure 2-15 – 100 to 150 HP GV3000/SE Drive Components and Locations

Step 4. Install the AutoMax Network Option Board in the Keypad Bracket

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

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

Step 4.2 Align the key on the connector of the AutoMax Network 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 AutoMax Network 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 AutoMax Network option board.

Step 4.4 Fasten the right side of the AutoMax Network 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 AutoMax Network 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 keypad bracket to the hinged mounting panel using the four screws and lock washers removed earlier.

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

Step 5.3 100 to 150 HP drives: Align the Power Module Interface board on the eight plastic standoffs on the back of the mounting panel. Carefully press it into place. Make sure good contact has been made with the two grounding standoffs.

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 AutoMax Network option board. Do not remove the lockout and tagout if you have completed section 2.10, which provides instruction on connecting to the AutoMax network.

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

Use this procedure to install the AutoMax Network 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 2.16.

Step 3. Remove the Keypad Bracket from the Drive

Refer to figure 2.16 for component locations.

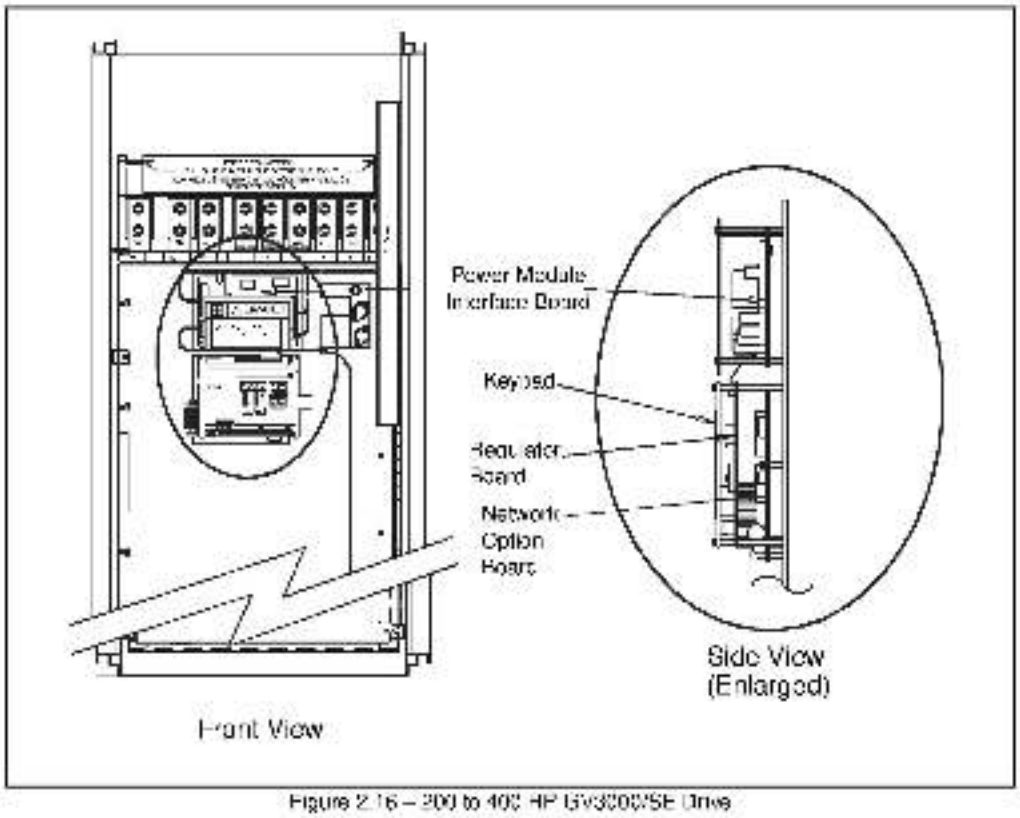

Figure 2.16 – 200 to 400 HP GV3000/SE Drive

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 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 AutoMax Network Option Board

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

The AutoMax Network option board mounts on four standoffs behind the Regulator board.

Step 4.2 Align the AutoMax Network 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 $\frac{5}{16}$" nuts. Metal nuts must be used for proper grounding of the AutoMax Network 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 AutoMax Network 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 AutoMax Network option board. Do not remove the lockout and tagout if you have completed section 2.10, which provides instruction on connecting to the AutoMax network.

2.9 Installing the AutoMax Network Option Board in 2 to 15 Amp and 24 to 30 Amp GV3000/SE Bookshelf Drives

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

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

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

Table 2.6 Model Numbers for 2 to 15 Amp and 24 to 30 Amp Drives

2 to 15 Amp	24 to 30 Amp
31ER40xx 31ET40xx	240ER40xx 240ET40xx
38ER40xx 38ET40xx	300ER40xx 300ET40xx
55ER40xx 55ET40xx	
85ER40xx 85ET40xx	
126ER40xx 126ET40xx	
150ER40xx 150ET40xx	

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

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

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

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.

Step 1.4 **2 to 15 A drives:** Remove the cover by removing the cover screw on the faceplate of the drive. See figure 2.17.

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

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

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 2.17 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 2.17 or 2.19.

Step 2.3 24 to 30 amp drives: Reattach the front panel after checking the DC bus potential.

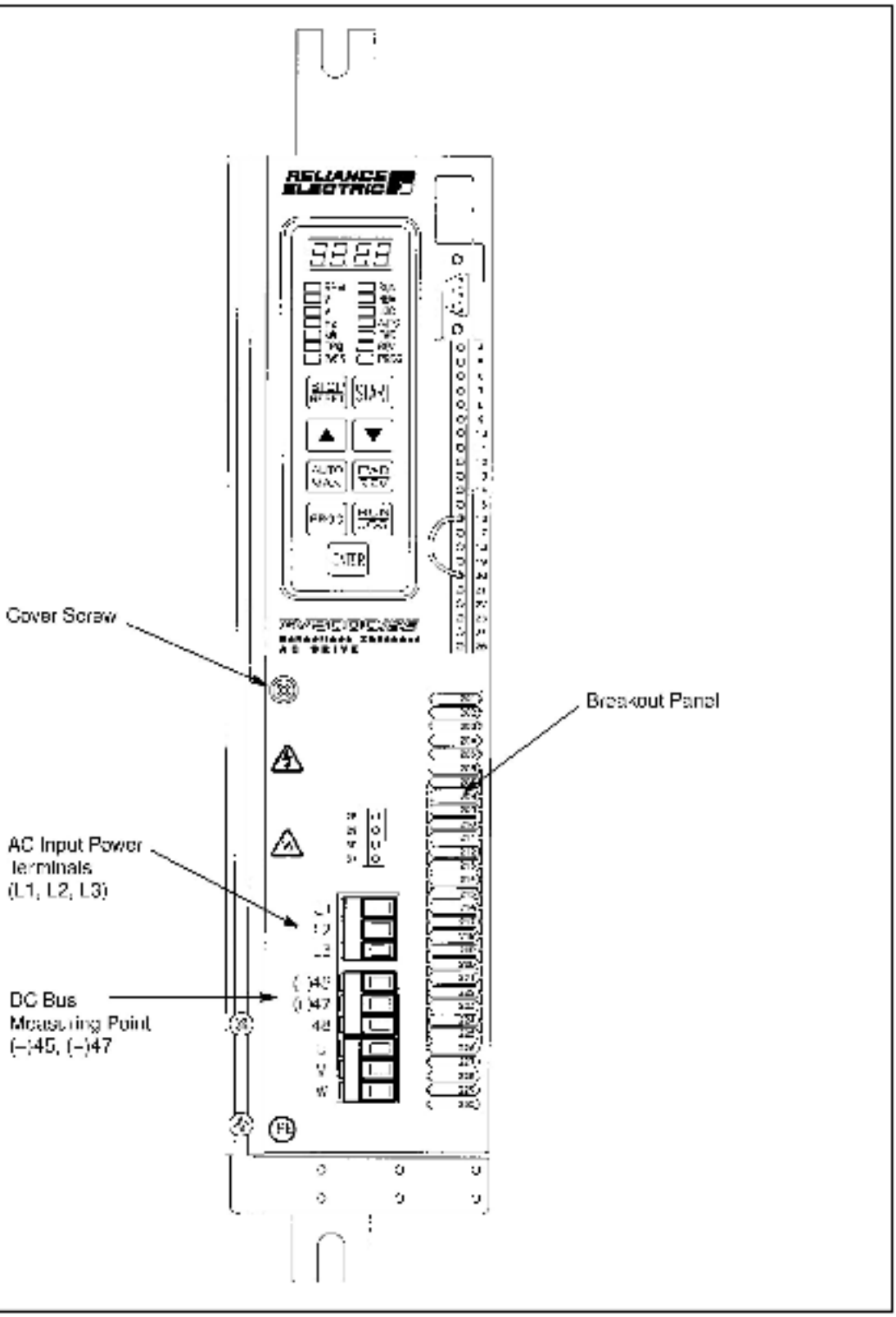

Figure 2.17 – 2 to 15 Amp GV3000/SE Bookshelf Drive

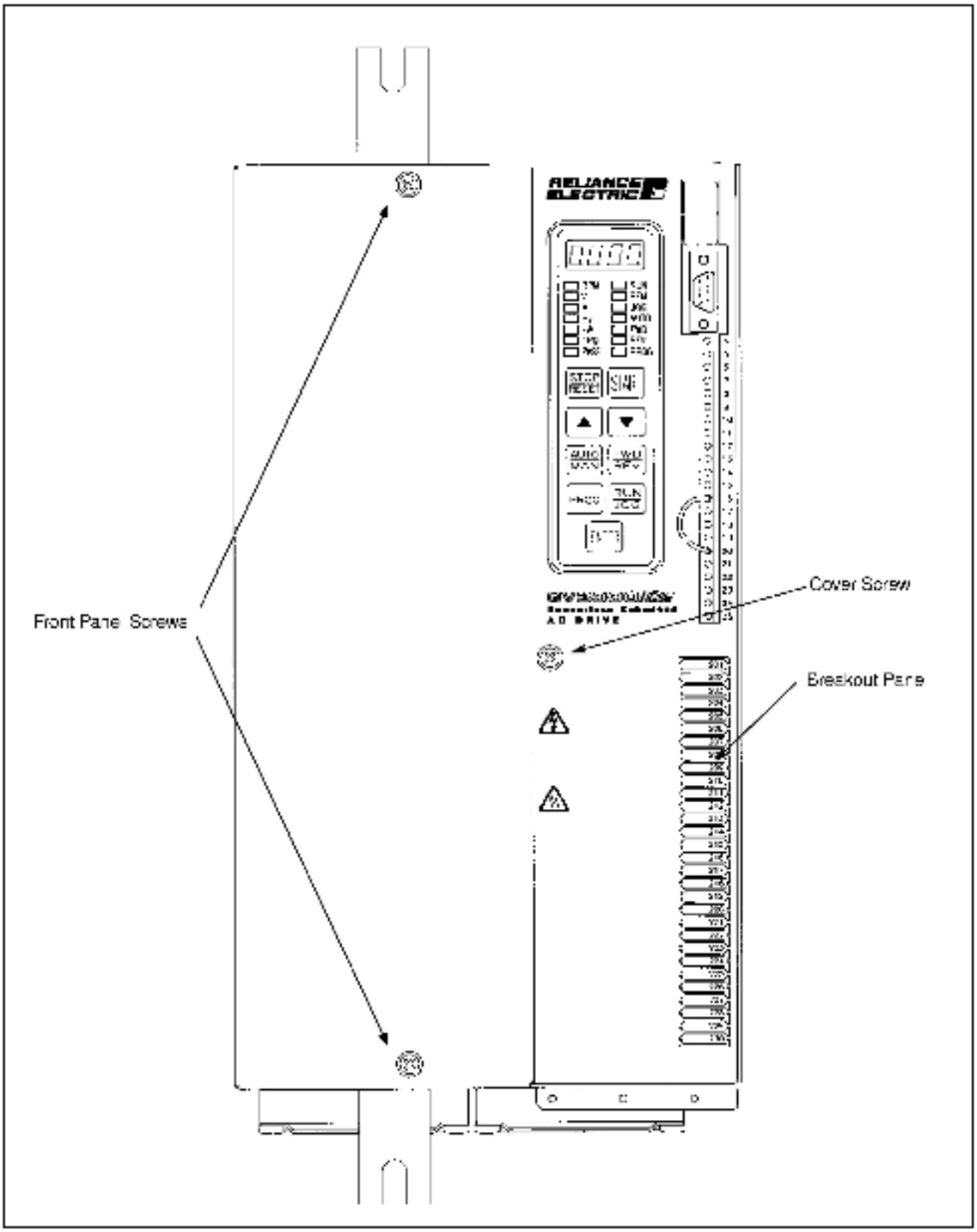

Figure 2.18 24 to 30 Amp GV3000/SE Bookshelf Drive

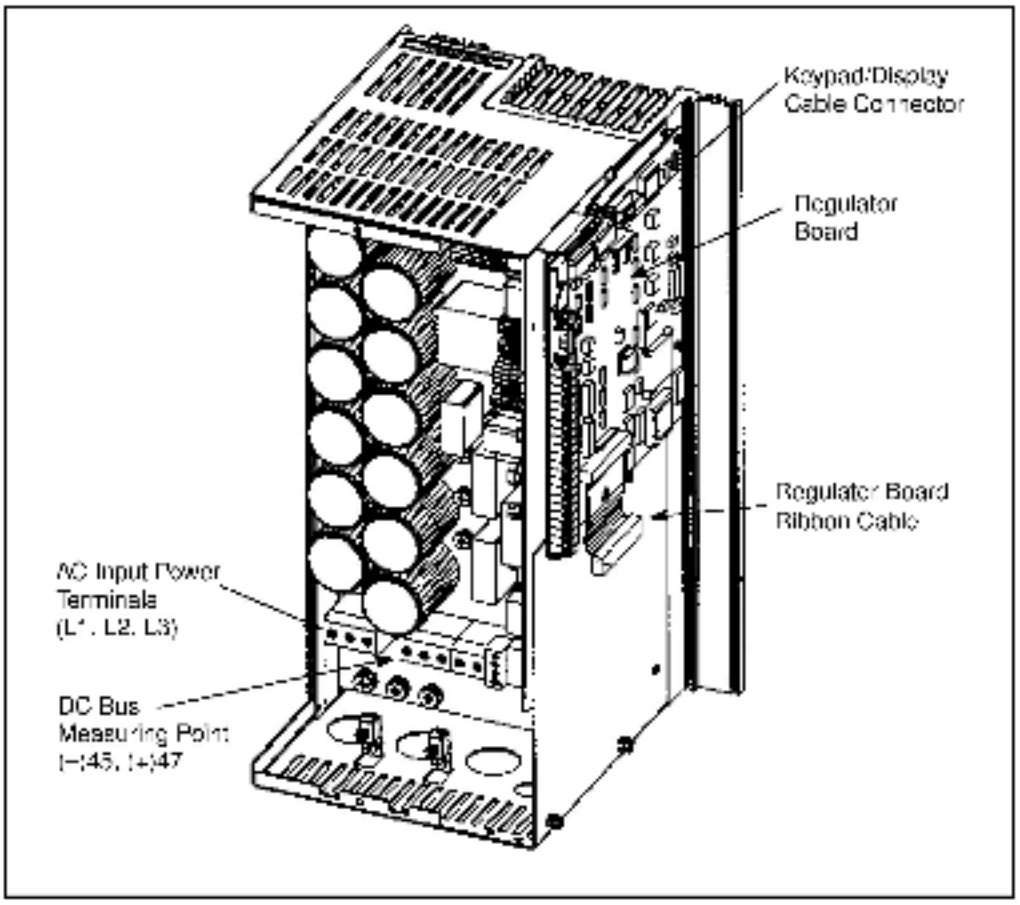

Figure 2-13 – 27 to 50 Amp GV3000/SE Book-shelf Drive (Cover and Front Panel Removed)

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

Step 3. Install the AutoMax Network Option Board in the Drive

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

Step 3.2 Align the key on the connector of the AutoMax Network 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 AutoMax Network 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.

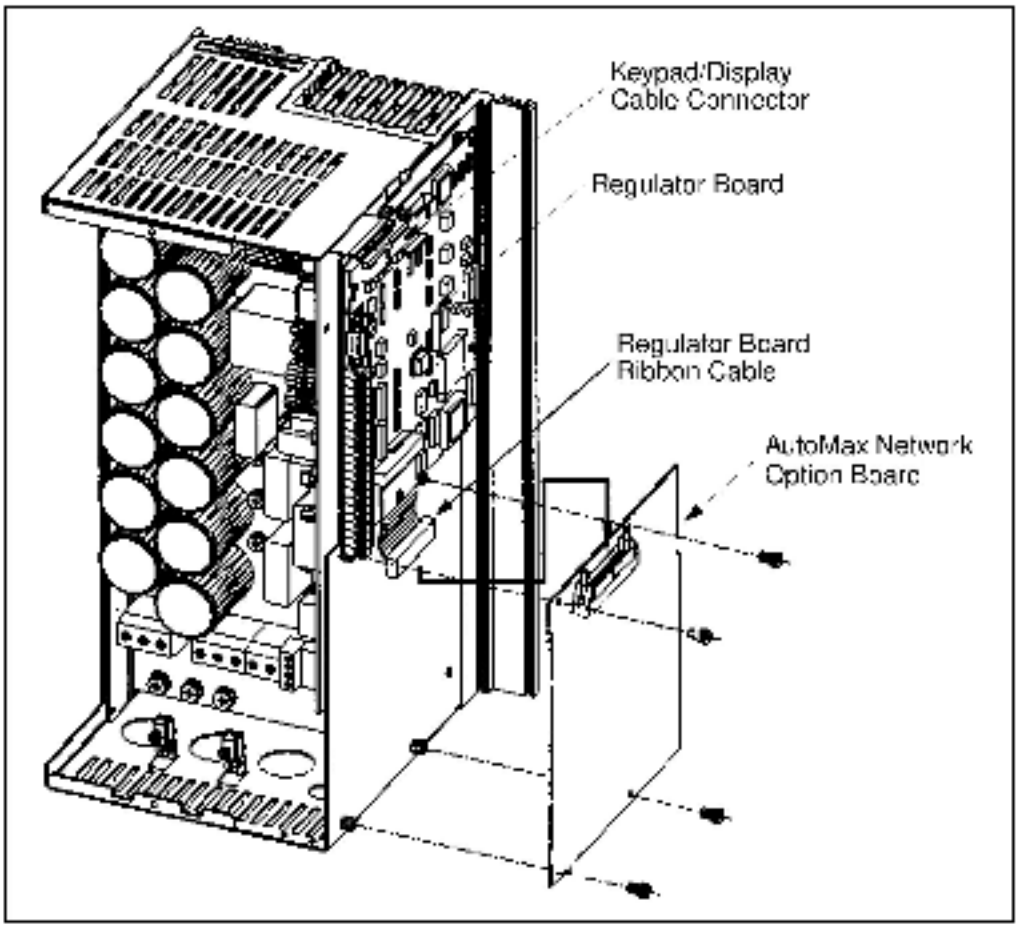

Figure 2.20 Installing the AutoMax Network Option Board in GV3000/SE Bookshelf Drive

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

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 AutoMax Network option board. Do not remove the lockout and tagout until you have completed section 2.10, which provides instruction on connecting to the AutoMax network.

2.10 Connecting the GV3000/SE Drive to an AutoMax Network

ATTENTION: AutoMax networks with more than 5 drops might produce communication errors if 10-foot drop cables are used. Wherever possible, 30-inch drop cables or, if necessary, 5-foot drop cables should be used. Failure to observe this precaution could result in damage to, or destruction of, equipment.

See figure 2.21 for cabling and termination connections.

Refer to the Network Communications Module instruction manual (I2-3001) for a detailed description of how to add a drop to the AutoMax network.

To connect the GV3000/SE drive to an AutoMax network:

Step 1. Stop any application tasks that are running.

Step 2. Use the 30-inch Network Drop Cable (M/N2NC3000) to connect to the Communications Passive Tap (M/N57C380).

Step 3. If the drop is at the end of the coaxial cable system, it must be terminated. Terminate by connecting a 75 ohm terminating load (M/N 45C71) to the remaining BNC connector on the passive tap.

Step 4. 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 the software manual for information on errors.

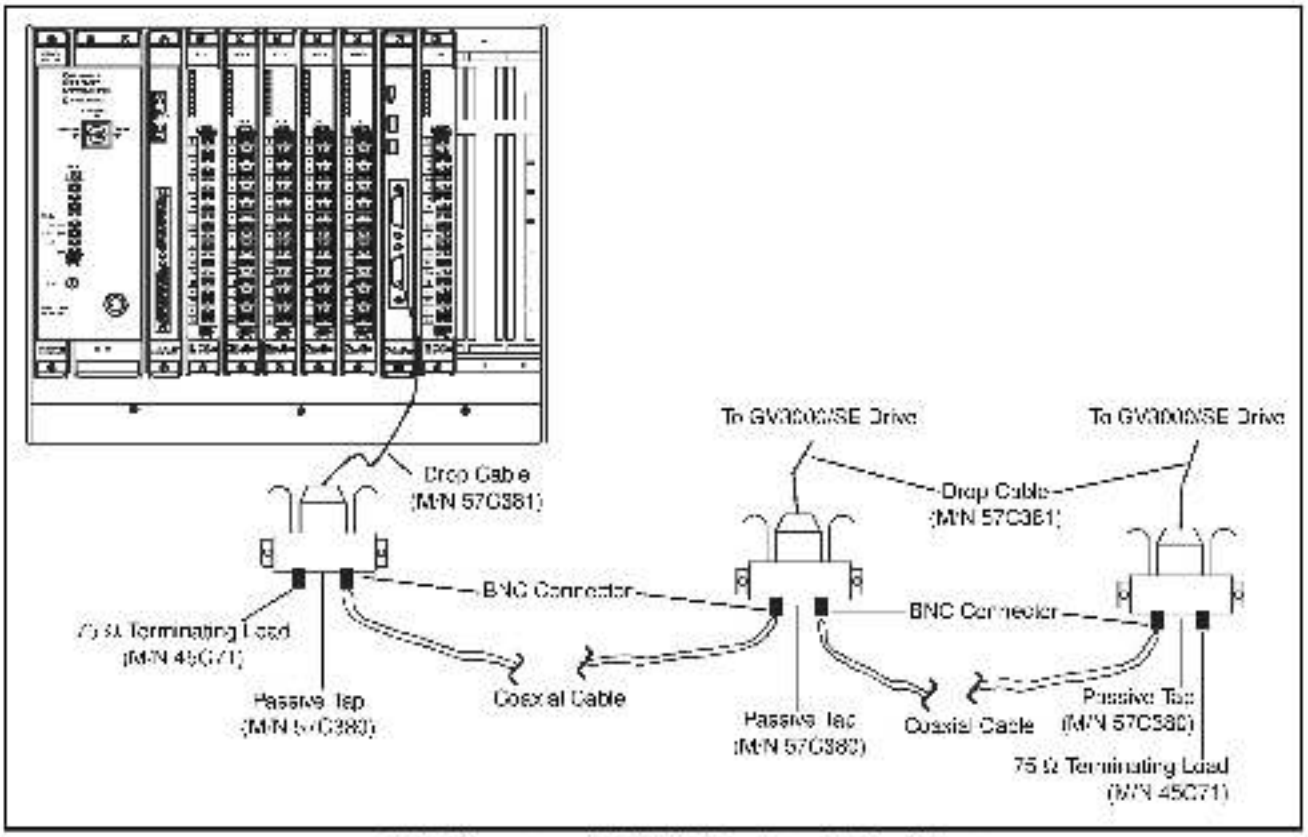

Figure 2.21 – Connecting a GV3000/SE Drive to the AutoMax Network

CHAPTER 3

Drive Configuration

This section describes how to configure a GV3000/SE drive for use with an AutoMax network.

When the Network Connection Type (P.061) parameter is configured for basic drive connection (P.061=0), the GV3000/SE drive occupies a single network drop. This first drop image is referred to as Drop_1 in this manual. The actual drop number is configured using the Network Drop Number (P.060) parameter.

When P.061 is configured for full drive connection (P.061=1), the GV3000/SE drive occupies three sequential network drops. They are referred to as Drop_1, Drop_2, and Drop_3 in this manual.

For network parameter descriptions, see section 3.3. For other drive parameter descriptions, see the drive software instruction manual (see section 1.2, "Where to Find Additional Information", for a listing of the manuals).

3.1 Configuring Network Communication

The drive will become active on the AutoMax network after you:

Step 1. Install the Network Option board in the GV3000/SE drive and connect the board to the network using a passive tap. See chapter 2 for this procedure.

Step 2. Apply power to the drive.

Step 3. Set the Volts/Hertz or Vector Regulation (P.048) parameter for your application.

Step 4. Assign a valid AutoMax network drop number to the drive through the Network Drop Number (P.060). You must set this parameter through the drive keypad or through the CS3000 software.

This drop number is the base drop the GV3000/SE drive will occupy.

After P.060 is set, you can set parameters using the network.

Step 5. Set the network connector type using the Network Connection Type (P.061) parameter. This defines the scope of data to be communicated and control that the master has with the connected drive.

Step 6. Apply power to the AutoMax network.

Step 7. Set the Control Source (P.000) to option port (OP) using the drive keypad or the CS3000 software.

Serial communication is established and information can be exchanged with the network master. The drive transfers output data whenever this connection is made.

3.2 Drive Response to Loss of Network Communication

The Network Option board attempts to remain active on the AutoMax network at all times, regardless of the control source setting.

At power up, the drive delays for approximately 20 seconds before indicating a loss of network communication.

If communication is interrupted:

Step 1. The Network Option board immediately notifies the drive regulator.

Step 2. The Network Option board attempts to re-establish communication with the network master.

Step 3. If Control Source (P.000) is set to Option port when the network is lost, the drive reacts to a network communication loss based on the setting of Option Port: Communication Loss Response (P.062).

Step 4. The front panel REMOTE LED blinks, indicating that the network is inactive. If you have an OIM connected to the drive, the NETWORK indicator above the CONTROL SOURCE SELECT key blinks, indicating that the network is inactive.

3.3 GV3000/SE Drive Network Parameters

Use these parameters to set up the GV3000/SE drive for use with the AutoMax network.

For DeviceNet applications, refer to the DeviceNet Network Communication Option Board manual (HE-HGV3DN).

For ControlNet applications, refer to the ControlNet Network Communication Option Board manual (D2-3390).

P.060 Network Drop Number

This parameter specifies the base drop number to which the AutoMax Network Communication board will respond on the AutoMax network.

Parameter Range:	1 to 55 (Basic drive connection) 1 to 53 (Full drive connection)
Default Setting:	1
Parameter Type:	Configurable
Refer also to parameters:	P.061 Network Connection Type

This parameter must be set at the drive through the keypad/display or a personal computer serial interface. This parameter cannot be written to the drive by the network master.

P.061 Network Connection Type

This parameter selects one of two AutoMax network connection types.

Parameter Range:	0 = Basic drive connection 1 = Full drive connection
Default Setting:	0
Parameter Type:	Configurable
Refer also to parameters:	N/A

Setting P.061 = 0 provides basic drive control from the AutoMax network. Only essential drive data (reference, sequencing, basic tuning, and feedback data) are transferred over the network. This allows a higher density network with moderate functionality. Select the basic connection type if your application does not require a complete configuration of the drive over the network.

Using the basic drive connection, you can control functions such as start/stop, reset, reference, and basic tunable parameters such as accel, decel, minimum speed, and maximum speed.

When basic drive connection is selected, the GV3000/SE drive occupies a single network drop. This drop area contains 32 read registers and 32 write registers.

Setting P.061 = 1 provides full drive control from the AutoMax network. Any drive data that has been assigned a network register is transferred over the network. Select this connection type if your application must be able to configure the drive over the network and have access to most parameters, operating variables, and diagnostic information.

The large amount of data transferred using the full connection type requires that the drive occupy multiple network drops, thus decreasing the potential number of devices on the network. When full drive connection is selected, the GV3000/SE drive will occupy three sequential network drops, beginning with the drop number specified with P.060.

P.062 Option Port: Communication Loss Response

This parameter specifies how the drive responds to a network communication loss when the Control Source (P.000) parameter is set to OP (Option port).

Parameter Range:	0 = IET fault 1 = Hold last reference 2 = Use terminal strip reference
Default Setting:	0
Parameter Type:	Tunable
Refer also to parameters:	P.000 Control Source

If the option port is not in control of the drive, but is only monitoring drive operation, then loss of network communications has no effect on drive operation. In all cases, the Network Option board, upon loss of communication with the network master, will attempt to re-establish the communication link.

To eliminate extraneous fault conditions when a drive configured for network operation is powered up, the drive will delay for approximately 20 seconds after power up before annunciating a fault condition. A fault condition will be annunciated if network communication is not established before the 20-second power-up timer expires, or if network communication was established and then lost.

If the drive loses communication with the network, overspeed protection for the drive will be in effect under all circumstances. For V/Hz regulation, you program overspeed protection in H.022. For vector regulation, overspeed protection is fixed at 130% of Maximum Speed (P.004). When the motor goes above the overspeed limit, the drive faults and stops.

If P.062 = 0

The drive will consider a loss of network communication to be a drive fault, resulting in an IET-type stop sequence.

When P.062 is set to IET fault (0) and communication is lost:

- The drive latches a fault condition and performs a coast stop.
- The network communication loss fault is generated (nCL is displayed).
- The front panel REMOTE LED blinks, indicating that the network is inactive.

When network communication is re-established, you must reset the fault before the drive can be re-started. See the drive software instruction manual for information on resetting faults. (A fault reset does not clear the error log.)

P.062 Option Port: Communication Loss Response *(continued)*

If P.062 = 1

The drive continues to operate, using the last reference received from the network master.

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.

ATTENTION: When P.055 is set to ON, the STOP/RESET key is functional only from the selected control source. As a safety precaution, Reliance Electric recommends that an emergency stop pushbutton be located near the drive in an easily accessible location. As a further safety precaution, the user should post a warning on the drive to alert personnel that the STOP/RESET key is not functional. Failure to observe this precaution could result in severe bodily injury or loss of life.

The response to network communication loss is:

- The drive continues to operate, using the last reference received from the network master.
- An entry is made into the drive's error log for each active-to-inactive transition of network communication status.
- The front panel REMOTE LED blinks, indicating that the network is inactive.

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 = ON and the start and stop inputs are on (1), the drive will start.

Note that in this configuration, it might not always be possible to stop the drive over the network.

P.062 Option Port: Communication Loss Response *(continued)*

If P.062 = 2

The drive gets its speed/torque reference from the terminal strip analog input and its stop input from the terminal strip stop input. All other inputs are held at the last values received from the network master.

This allows the network master to continue controlling the drive reference with a direct-wired analog output to input, and to stop the drive with a direct-wired digital output to input.

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

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.

Note that in this configuration, it might not always be possible to stop the drive over the network.

The response to network communication loss is:

- The drive continues to operate, using the analog input from the Regulator board terminal strip.
- An entry is made into the drive's error log for each active-to-inactive transition of network communication status.
- The front panel REMOTE LED blinks, indicating that the network is inactive.

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 = ON and the start and stop inputs are on (1), the drive will start.

ATTENTION: The drive is not equipped with a coast-stop pushbutton. You must install a hardwired operator-accessible pushbutton that provides a positive interrupt and shuts down the drive. See the drive hardware instruction manual for wiring information. Failure to observe this precaution could result in bodily injury.

P.063 Option Port: Network Reference Source

This parameter specifies where the drive gets its speed or torque reference when the option port is selected as the control source (P.000 = OP).

Parameter Range:	0 = Direct reference 1 to 8 = Broadcast
Default Setting:	0
Parameter Type:	Configurable
Refer also to parameters:	U.000 Torque Reference Source

Speed or torque control is configured by parameter U.000 (Torque Reference Source) and by specifying TRQ/SPD in P.007 (Terminal Strip Digital Inputs Configure). One of the selections in U.000 is the option port.

If P.063 = 0, the reference is from register 33 of the drive's Drop_1 register map.

In V/Hz regulation, the value in register 33 represents speed in hertz scaled 0 to 4095 for 0 to Maximum Speed (P.004).

In vector regulation, if U.000 = 2, the value in register 33 represents torque scaled 0 to 4095 for 0 to 150% torque. If U.000 ≠ 2, this value represents speed in RPM scaled 0 to 4095 for 0 to Top Speed (U.017).

If P.063 = 1 to 8, the reference is from one of the eight network broadcast data registers (network drop area 0, registers 32 to 39).

Refer to the *AutoMax Network Communications Module* instruction manual (I2-3001) for a description of network broadcast registers.

P.064 Option Port: Network Trim Reference Source

This parameter specifies where the drive gets its trim reference when the option port is selected as the control source (P.000 = OP).

Parameter Range:	0 = Direct trim reference register 1 to 8 = Broadcast register 1 to 8, respectively
Default Setting:	0
Parameter Type:	Configurable
Refer also to parameters:	P.063 Option Port: Network Reference Source U.000 Torque Reference Source

The option port trim reference can be used as the outer control loop reference or the speed trim reference (see P.014 Trim Reference Source in the drive software instruction manual).

If P.064 = 0, the trim reference is from register 34 of the first drop image.

If P.064 = 1 to 8, the trim reference is from network broadcast registers 1 through 8, respectively. For a description of the broadcast registers, refer to the *AutoMax Network Communications Module* manual (J2-3001).

In V/Hz regulation, the trim reference represents speed in hertz scaled 0 to 4095 for 0 to Maximum Speed (P.004).

In vector regulation, the trim reference represents speed scaled 0 to 4095 for 0 to Top Speed (U.017). When used for the outer control loop, the value should be scaled based on the scaling of the selected feedback.

See the drive software instruction manual for more information on drive regulation.

P.065 Option Port: Type and Version

This parameter displays the option type and the software version number of the option board.

Parameter Range:	N/A
Default Setting:	N/A
Parameter Type:	Read-only
Refer also to parameters:	N/A

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 v represents the software version number.

For example, if 2.103 is displayed, it means the drive is using the AutoMax network option and is running version 1.03 software.

P.066 to P.069 Network Output Register 1 Source through Network Output Register 4 Source

These parameters select the signal written to the option port network output registers 1 through 4.

See figure 3.1.

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 (vector only)
	2 = Speed reference at the fdbk summing junction (includes IR comp output and current compounding) (vector only)
	3 = Speed loop feedback (vector only)
	4 = Speed loop error (vector only)
	5 = Speed PI output (vector only)
	6 = Outer control loop feedback (vector only)
	7 = Outer control loop error (vector only)
	8 = Outer control loop output (vector only)
	9 = Terminal strip analog input normalized to speed (see drive software instruction manual)
	10 = Terminal strip analog input scaled (see drive software instruction manual)
	11 = Torque reference (vector only)
	12 = Torque feedback (vector only)
Default Setting:	0
Parameter Type:	Tunable
Refer also to parameters:	N/A

P.066 to P.069 Network Output Register 1 Source through Network Output Register 4 Source *(continued)*

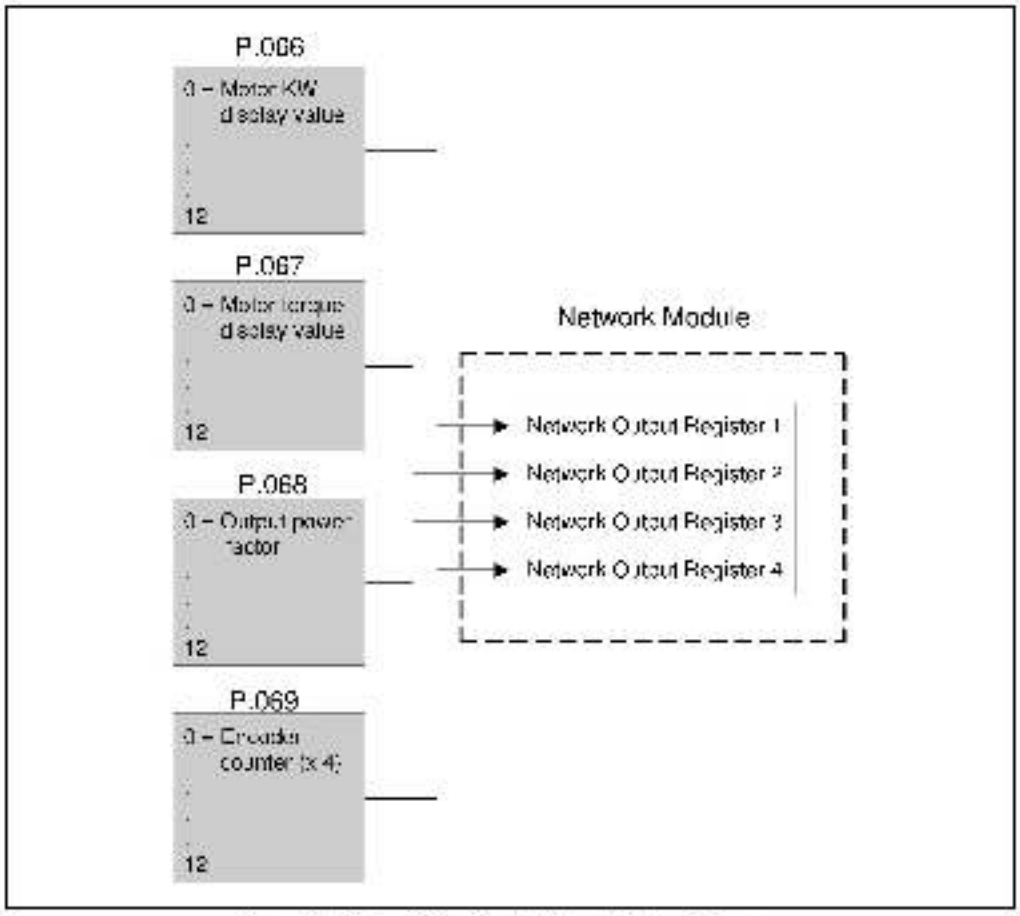

Figure 3.1 Signal Selection for Network Output Registers

CHAPTER 4

Programming

This section describes the organization of data in the AutoMax Network Option Board and how the network accesses the data.

4.1 The Network and Other Control Sources

You can use the front panel keypad/display to change parameter values when the Control Source parameter (P.000) is set to 2 (OP). However, if the tune/config input enable bit (Drop_1, register 32, bit 14) is on, any changes made through the keypad might be overwritten when the next network update occurs.

4.2 Network Transfer Rates

To write data to the drive, the Network Option board must be communicating with the master and the Control Source parameter (P.000) must be set to 2 (OP).

Data transfer rates between the AutoMax Network Option Board and Regulator board depend on whether input or output data are being transferred.

Input data is one of three types:

- **Control/Reference:** This is data that requires the fastest update rates. This includes data such as the sequencing inputs (Stop, Run, Jog, Fwd/Rev) and speed/torque reference. These inputs are transferred every speed loop scan period (every 5ms), or as required by the drive. For example, if the drive is configured to obtain its torque reference from the option port, it will read this data from the option port every torque loop control scan (512µs).
- **Tunable:** This is data that can be changed while the drive is running or stopped. Tunable data includes parameters such as Accel Time 2 (RAMP 2) (P.017) and Overfrequency Limit (H.022). Tunable inputs are transferred approximately every 350ms when the tune/config input enable bit (Drop_1, register 32, bit 14) is on.
- **Configurable:** This is data that cannot be changed while the drive is running. Configurable data includes parameters such as Terminal Strip Speed Reference Source (P.008) and Motor Nameplate Base Frequency (H.001). Configurable inputs are transferred from the Network Option board to the Regulator board approximately every 350ms while the drive is stopped and the tune/config input enable bit (Drop_1, register 32, bit 14) is on. Values sent from the network master while the drive is running are stored in the Network Option board but are not sent to the Regulator board until the drive is stopped.

Output data is one of two types:

- **Runtime Signal:** This is data such as the selected speed reference value, drive status (such as ready or running), drive fault flags, the state of terminal strip digital inputs, and motor status values (RPM, VOLTS, AMPS). This information is transferred every speed loop scan period (5ms).
- **Tunable, Configurable, and Status:** All other information provided by the drive. This typically includes all stored drive parameter values. For a full connection type, this output data provides a complete image of how the drive is configured and operating. Tunable, Configurable, and Status data are transferred approximately every 350 ms.

Output data is transferred from the Regulator board to the Network Option board regardless of the status of the AutoMax network (active or inactive) or the selected drive control source (keypad, terminal strip, or network).

4.2.1 I/O Update Enable Logic Summary

The logic strings shown in figure 4.1 summarize the output and input enable logic described in section 4.2.

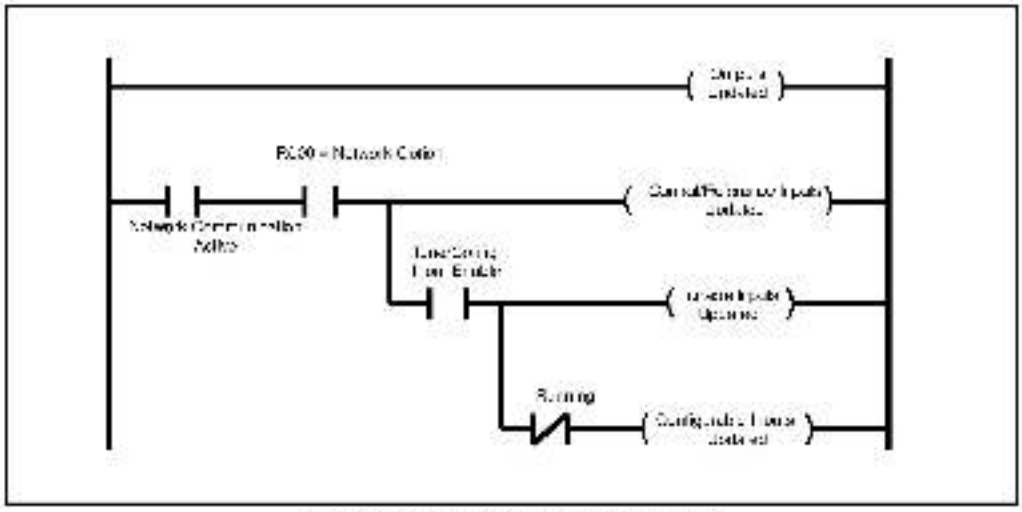

Figure 4.1 – I/O Update Enable Logic Strings

4.3 Setting Up Data Types That Can Be Transferred

You must enable the transfer of tunable and configurable inputs from the Network Option board to the Regulator board. Until you enable transfer, only control/reference data will be read by the Regulator board.

To enable transfer of tunable and configurable data, set the network-master-controlled tune/config input enable bit (Drop 1, register 32, bit 14) to 1.

For example, the master application program would typically initialize the tunable and configurable parameter data in the master's Network module's dual port memory before setting the tune/config input enable bit to 1.

If you only want to transfer control/reference data, leave the tune/config input enable bit at 0 (off). This forces you to configure the drive through another control source, such as the front panel keypad/display or CS3000 software, but allows you to control the drive (run, jog, stop, reset, and the reference) from the network master.

4.3.1 Tune/Config Update Synchronization Flag

This flag allows the network master application program to track when the drive has updated tunable and configurable inputs. By toggling the tune/config update synchronization flag in the master and by monitoring the copied value from the drive, the master's application program can determine when the drive has read in the data. This feature has no effect on drive operation. The tune/config update synchronization flag is at Drop_1, register 32, bit 15.

The drive regulator:

Step 1. Copies this bit to the tune/config update synchronization flag loopback bit (Drop_1, register 0, bit 7).

Step 2. Copies the tune/config update synchronization flag to the tune/config update synchronization flag loopback bit after it has read in and processed all tunable and configurable input registers.

To use the synchronization flag, set the tune/config input enable bit (Drop_1, register 32, bit 14) to 1.

Configurable inputs are only read in by the drive while it is not running. This will not affect the copying of the tune/config update synchronization flag to the tune/config update synchronization flag loopback bit, since tunable inputs will still be transferred.

To determine when changes to tunable and configurable data in the drive have been completed, the master performs the following sequence:

Step 1. Modify the tunable and/or configurable register data in the appropriate network register(s).

Step 2. Set the tune/config input enable flag (Drop_1, register 32, bit 14).

Step 3. Toggle the tune/config update synchronization flag (Drop_1, reg.32, bit 15).

Step 4. Monitor the tune/config update synchronization flag loopback bit (Drop_1, register 0, bit 7) until it equals the value written in step 3.

The tune/config update synchronization flag is defined in the first drop of the drive network drop connection. Therefore, it can only be used to indicate when data for the first drop has been read in and processed by the drive.

Alternative Synchronization Methods

The tune/config update synchronization flag applies only to Drop_1. To determine if the drive received data written to other drops, you must use other methods.

Some alternate methods are:

- Program a delay after writing to the network master's memory. If you know the number of drops on the network, and 350ms is added for processing time at the drive end, this time is predictable. (See your ReSource AutoMax Programming Executive instruction manual for information on calculating processing time.) Note that this method assumes that all requirements have been met for the drive to obtain its inputs from the network.
- Verify that output register data from the drive matches input data written to the drive. All parameter data written to the drive can be read back by the master in a different network register. This is usually the best alternative for full connection synchronization.

4.4 Monitoring Unacceptable Parameter Values

The parameter processing error status flag (Drop_1, register 14, bit 8) allows the network master to monitor parameter values that are unacceptable to the drive.

When this flag is set to 1, one or more parameters sent to the drive were rejected.

When this flag is set to 0, all parameters sent to the drive were accepted.

The tune/config inputs enable bit (Drop_1, register 32, bit 14) must be set to 1 before the drive will react or process any tune/config parameters. The parameter processing error flag is updated approximately every 350ms.

4.5 Timing Requirements

The transmit time required by the network master to transmit data to the GV3000/SE drive depends on the number of drops on the network.

Tunable and configurable drive input register values must be maintained by the network master's application program for the transmit time plus at least 350ms to assure that they are read by the drive.

Control/reference data types do not have this 350ms requirement because they are read by the drive every 5 to 20ms.

To start the drive, the Start input must be set to 0 for at least 20ms, then set to 1 for at least 20ms (a 0-to-1 transition). The drive might delay acting on the 0-to-1 transition for up to 100ms because of variable processing delays. This also allows the drive to synchronize a drive start to the processing of new configurable data.

To clear the error log, the clear error log bit (Drop_1, register 32, bit 8) must be set to 0 for at least 350ms, then to 1 for at least 350ms (a 0-to-1 transition).

To perform a fault reset, the fault reset bit (Drop_1, register 32, bit 2) must be set to 0 for at least 20ms, then to 1 for at least 20ms (a 0-to-1 transition).

4.6 Drive Ready Status Bit

The Drive Ready status bit (Drop_1, register 0, bit 0) indicates that a 0-to-1 transition on the start input will start the drive. The Drive Ready bit is ON (1) when all of these conditions are met, and OFF (0) if any one of these is not met:

- No drive faults are active (Drop_1, register 0, bit 2 – 1)
- Stop input is ON (Drop_1, register 32, bit 1 – 1)
- Front-panel STOP/RESET button is not pressed or is disabled
- Function loss terminal strip input is closed (Drop_1, register 0, bit 12 – 1)
- A download from the serial port (using the CS3000 software) is not in progress
- On larger drives (more than 50 HP) that contain a DC bus pre-charge resistor bypass relay, the pre-charge relay is closed.
- In JOG mode (Drop_1 register 0, bit 3 – 1), the vector parameter Torque Self-Tune Enable (U.008) is OFF.

4.7 Pulse Encoder Counter Register

The pulse encoder counter register (Drop_1, register 11 when P.069 is set to 0) is a 16-bit up/down roll-over counter of motor pulse encoder pulses received. The value in this register is the number of pulses times 4.

The counter counts up when the motor is rotating in the forward direction (CCW when viewing the motor from the shaft end). For example: 0, 1, 2, ... 65534, 65535, 0, 1 ...

The counter counts down when the motor is rotating in the reverse direction. For example: 65535, 65534, 65533, ... 2, 1, 0, 65535, 65534 ...

4.8 Network Register Organization

The register maps in tables 5.2 through 5.9 describe the registers and bits used by the GV3000/SE drive on the AutoMax network.

Registers 0 to 31 are read-only, while registers 32 to 63 are read/write. Refer to instruction manual I2-3001 (*Network Communications Module*) for a detailed description of network register assignments.

U parameters are updated only when the Volts/Hertz or Vector Regulation P.048 parameter is set to 1 (Vector).

H parameters are updated only when the Volts/Hertz or Vector Regulation P.048 parameter is set to 0 (V/Hz).

The data in Drop_3 depends on whether the selected regulator type is Vector or V/Hz.

Volts/Hertz or Vector Regulation P.048 can be set from either the front panel keypad/display or the CS3000 software. It cannot be set over the AutoMax network.

Update times assume communication is active. Outputs are transferred whenever communication is active. Inputs are only transferred when communication is active and P.000 is set to 2 (OP). See section 4.3 for information on setting up transferrable data types.

4.9 GV3000/SE Drive Parameters Not Accessible Over the Network

The following GV3000/SE drive parameters are not accessible over the AutoMax network at any time.

P.006, Second Menu Password
P.007, Terminal Strip Digital Inputs Configure
P.008, Terminal Strip Speed Reference Source
P.017, Accel Time 2 (RAMP 2)
P.018, Decel Time 2 (RAMP 2)
P.023, MOP Accel/Decel Time
P.024, MOP Reset Configuration
P.031, Preset Speed 1
P.032, Preset Speed 2
P.033, Preset Speed 3
P.034, Preset Speed 4
P.035, Preset Speed 5
P.036, Preset Speed 6
P.037, Preset Speed 7
P.038, Preset Speed 8
P.050, Restore Defaults
P.051, Programming Disable
P.060, Network Drive Number
P.090, Diagnostics Source
P.091, Diagnostics Display
U.008, Torque Self Tune Enable
H.020, Identification Request
RAM (r.) parameters

CHAPTER 5

Register Map Tables

This section presents the register map tables. Brief descriptions of parameters are provided in the register map tables. For detailed parameter descriptions, refer to the software manual. For parameter descriptions of network-specific parameters, see section 3.3.

These map tables are for version 6.03 of the Regulator board. Earlier versions of the board might have different parameter options.

5.1 Finding Data in the Register Map Tables

The register maps are listed in tables 5.2 through 5.9. The register maps describe the registers and bits used by the GV3000/SE drive on the AutoMax network.

Table 5.1 – Location of Information in the Register Map Tables

Drop	Data Type	Table	Page
1	Read Only	5.2	5-2
	Read/Write	5.3	5-5
2	Read Only	5.4	5-8
	Read/Write	5.5	5-10
3: Vector	Read Only	5.6	5-12
	Read/Write	5.7	5-13
3: V/Hz	Read Only	5.8	5-15
	Read/Write	5.9	5-16

Table 5.2 – Register Assignment for Drop 1 Area Read Only Registers

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
0		Status word 1 (includes terminal strip digital inputs)		5ms
	0	Drive ready		5ms
	1	Drive running		5ms
	2	Fault active		5ms
	3	Run/jog mode status	1 = Jog	5ms
	4	Forward/reverse reference invert command	1 = Reverse	5ms
	5	Stop sequence in progress		5ms
	6	Tune/config input enable (copied from Drop_1, register 32, bit 14)		5ms
	7	Tune/config update synchronization flag (copied from Drop_1, register 32, bit 15)		5ms
	8	Terminal strip digital input 1 (start)		5ms
	9	Terminal strip digital input 2 (stop)		5ms
	10	Terminal strip digital input 3 (fault reset)		5ms
	11	Terminal strip digital input 4 (run/jog select)		5ms
	12	Terminal strip digital input 5 (function loss)		5ms
	13	Terminal strip digital input 6		5ms
	14	Terminal strip digital input 7		5ms
	15	Terminal strip digital input 8		5ms
1		Selected speed reference value	Vector: 4095=Motor Top Speed (U.017); V/Hz:4095=Maximum Speed (P.004)	5ms
2		Speed reference sum. Limit block output, including trim and draw		5ms
3		Speed feedback	Vector: 4095 =Motor Top Speed (U.017)	5ms
4		Terminal strip analog input value (conditioned with offset, gain, and inversion)	_4095 = ±10V	5ms
5		Output speed/frequency (front panel RPM display)		5ms
6		Output voltage (front panel VOLTS display)		5ms
7		Output current (front panel AMPS display = amps x 10)		5ms
8		Network output register 1 (value determined by Drop_2, register 45, bits 0 to 7, (P.066))		5ms
9		Network output register 2 (value determined by Drop_2, register 45, bits 8 to 15 (P.067))		5ms
10		Network output register 3 (value is determined by Drop_2, register 46, bits 0 to 7 (P.068))		5ms
11		Network output register 4 (value determined by Drop_2, register 46, bits 8 to 15 (P.069))		5ms

***Update Times: 5 ms = 5 ms. 350 ms = 350ms or less.**

Table 5.2 – Register Assignment for Drop 1 Area Read Only Registers (Continued)

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
12		Drive fault latch bits – word 1		
	0	Overcurrent, steady state (OC)		350ms
	1	Overcurrent, at acceleration (OCA)		350ms
	2	Overcurrent, at deceleration (OCd)		350ms
	3	Overcurrent, at DC braking (OCb)		350ms
	4	High DC bus voltage (HU)		350ms
	5	Low DC bus voltage (LU)		350ms
	6	Electronic thermal overload (OL)		350ms
	7	Drive overtemperature (OH)		350ms
	8	Function loss (FL)		350ms
	9	Default parameter restore checksum error (CHS)		350ms
	10	Communication loss between Regulator/PC/OIM (SrL)		350ms
	11	Spurious hos; PC comm interrupt (CAr)		350ms
	12	Self tuning status (SFt. Vector only.		350ms
	13	Overspeed (OSP). Vector only.		350ms
	14	Motor output phase loss (OPL)		350ms
	15	Overfrequency (OF)		350ms
13		Drive fault latch bits — word 2		
	0	Network communication loss (nCL)		350ms
	1	DC bus charging bypass contactor (bYC)		350ms
	2	High line identification aborted (HId)		350ms
	3	Identification Request not yet performed (nId). V/Hz only.		350ms
	4	High line voltage (HIL)		350ms
	5	NVRAM write failure (EEr)		350ms
	6	Drive power electronic overload (PUc)		350ms
	7	Earth current failure (ground fault) (EC)		350ms
	8	Asymmetrical bus charge (UbS)		350ms
	9	Missing Power Module ID connector (PUc)		350ms
	10	Power Module not identified (PUn)		350ms
	11	Input phase loss (IPL)		350ms
	12	Encoder loss (EL)		350ms

***Update Times: 5 ms = 5 ms. 350 ms = 350ms or less.**

Table 5.2 – Register Assignment for Drop 1 Area Read Only Registers (Continued)

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
13 (cont.)	13	Analog input signal loss (Ain)		350ms
	14	Reserved		
	15	Fatal system error		350ms
14	0 to 7	Number of error log entries		350ms
	8	Parameter processing error flag		350ms
	9 to 15	Reserved		
15	0 to 7	Error log entry (second most recent error)		350ms
	8 to 15	Error log entry (most recent error)		350ms
16		Control Source (P.000)	0 = Front panel (local); 1 = Terminal strip; 2 = Option Port (Network master) 3 = Serial Port (PC HOST)	350ms
17		Accel Time 1 (RAMP 1) (P.001)	1 = 0.1 seconds	350ms
18		Decel Time (RAMP 1) (P.002)	1 = 0.1 seconds	350ms
19		Minimum Speed (P.003)	V/Hz: 1 = 0.1 Hz. Vector: 1 = 1 RPM	350ms
20		Maximum Speed (P.004)	V/Hz: 1 = 0.1 Hz. Vector: 1 = 1 RPM	350ms
21		Current Limit (P.005)	1 = 1%	350ms
22		Trim Gain Percentage (P.015)	1 = 0.1%	350ms
23		Draw Gain Percentage (P.016)	1 = 0.1%	350ms
24		Speed Regulator Proportional Gain (U.012). Vector only.	1 = 0.01	350ms
25		Speed Regulator Integral Gain (U.013). Vector only.	1 = 0.01	350ms
26		Status word 2		
	0	Torque or speed regulation. Vector only.	1 = speed	5ms
	1	Auto or manual (local) reference selected	1 = manual	5ms
	2	Outer control loop enabled	1 = enabled	5ms
	3 to 15	Reserved		
27		Elapsed Time Meter (P.029)	days	350ms
28		Network Connection Type (P.061)	0 = basic; 1 = full	350ms
29		Option Port: Communication Loss Response (P.062)		350ms
30	0 to 7	Option Port: Network Reference Source (P.063)	0 = direct; 1 to 5 = broadcast 1 to 8	350ms
	8 to 15	Option Port: Network Trim Reference Source (P.064)	0 = direct; 1 to 5 = broadcast 1 to 8	350ms
31		Software Version Number (P.098)	501 = Version 5.01	350ms

***Update Times: 5 ms = 5 ms. 350 ms = 350ms or less.**

Table 5.3 – Register Assignment for Drop 1 Area Read/Write Registers

Register	Bit	Description or GV3000/SE Parameter	Settings	Update†
32		Sequencing control word		5ms
	0	Start:	Run: 0 to 1 transition to start Jog: 0 = stop; 1 = start	5ms
	1	Stop	0 = stop; 1 = no stop	5ms
	2	Fault reset	0 to 1 transition to reset	5ms
	3	Run/jog select	1 = jog	5ms
	4	Forward/reverse select	1 = reverse	5ms
	5	Outer control loop (OCL) enable		5ms
	6	Reserved	Must be 0	5ms
	7	Speed regulation select. Vector only.	0 = torque regulation based on U.000 1 = speed regulation regardless of U.000	5ms
	8	Clear error log. Must be maintained for 350 ms to assure detection by the drive	0 to 1 transition to clear	350ms
	9 to 13	Reserved	Must be 0	
	*4	Tune/config input enable	0 = read only control data from network registers 1 = read all inputs from network registers	T
	*5	Tune/config update synchronization flag (write)		T
33		Option port speed/torque direct reference	Vector: 4095 = Motor Top Speed (U.017) V/Hz: 4095 = Maximum Speed (P.004)	5/0.5
34		Option port trim and OCL direct reference	Vector: 4095 = Motor Top Speed (U.017) V/Hz: 4095 = Maximum Speed (P.004)	5ms
35		Network inertia compensation		5ms
36		Reserved	Must be 0	
37		Accel Time 1 (RAMP 1) (P.001)	1 = 0.1 seconds	T
38		Decel Time (RAMP 1) (P.002)	1 = 0.1 seconds	T
39		Minimum Speed (P.003)	V/Hz: 1 = 0.1 Hz. Vector: 1 = 1 RPM	T
40		Maximum Speed (P.004)	V/Hz: 1 = 0.1 Hz. Vector: 1 = 1 RPM	T
41		Current Limit (P.005)	1 = 1%	T
42		Terminal Strip Analog Input Offset (P.009)		T

*Only the low byte (bits 0 to 7) of this register is transferred. The high byte is ignored by the drive.

†Update Times: 5 ms = 5 ms. 5/0.5: 5ms if speed reference; 0.5 ms if torque reference. 350 ms = 350ms or less. T = 350ms or less when tune/config enable is on. C = 350ms or less when tune/config enable is on and the drive is stopped.

Table 5.3 – Register Assignment for Drop 1 Area Read/Write Registers (Continued)

Register	Bit	Description or GV3000/SE Parameter	Settings	Update†
43		Terminal Strip Analog Input Gain (P.010)	1 = 0.001	T
44		Terminal Strip Analog Input Configure (P.011)	See software manual for settings.	T
45		Trim Gain Percentage (P.015)	1 = 0.1%	T
46		Draw Gain Percentage (P.016)	1 = 0.1%	T
47		Speed Regulator Proportional Gain (U.012). Vector only.	1 = 0.01	T
48		Speed Regulator Integral Gain (U.013). Vector only.	1 = 0.01	T
49		Jog Speed Reference (P.020)	V/Hz: 1 = 0.1 Hz; Vector: 1 = 1 RPM	T
50*	0 to 7	Stop Type (P.025)	0 = coast; 1 = ramp	T
	8 to 15	Reserved		
51*	0 to 7	Function Loss Response (P.026)	0 = fault; 1 = coast without fault	T
	8 to 15	Reserved		
52		Speed Display Scaling (P.028). Affects front-panel RPM display value reflected in Drop_1, register 5 (master read).		T
53		Control word		
	0	P.030, Elapsed Time Meter Reset	Reset: transition from 0 to 1	T
	1	Network inertia comp register enable (enables use of Drop_1, register 35)		5ms
	2	Network speed PI limit control enable (enables use of Drop_1, registers 59 & 60)		5ms
	3 to 15	Reserved	Must be 0	
54 and 55		Reserved	Must be 0	
56*	0 to 7	Output Relay Configuration (P.013)	0 = fault;1 & 2 = running; 3 = network active	C
	8 to 15	Reserved		
57*	0 to 7	Trim Reference Source (P.014)		C
	8 to 15	Reserved		
58	0 to 7	Torque Reference Source (L.000). Vector only.		C
	8 to 15	Outer Control Loop Feedback Select (U.010).Vector only.		C
59		Option port speed PI high limit. Vector only.		5ms
60		Option port speed PI low limit. Vector only.		5ms

*Only the low byte (bits 0 to 7) of this register is transferred. The high byte is ignored by the drive.

†Update Times: 5 ms = 5 ms. 5/0.5: 5ms if speed reference; 0.5 ms if torque reference. 350 ms = 350ms or less. T = 350ms or less when tune/config enable is on. C = 350ms or less when tune/config enable is on and the drive is stopped.

Table 5.3 – Register Assignment for Drop 1 Area Read/Write Registers (Continued)

Register	Bit	Description or GV3000/SE Parameter	Settings	Update†
51*	0 to 7	Network Connection Type (P061)	0 = basic; 1 = full	C
	8 to 15	Reserved		
52*	0 to 7	Option Port: Communication Loss Response (P062)		T
	8 to 15	Reserved		
53	0 to 7	Option Port: Network Reference Source (P063)	0 = direct; 1 to 8 = broadcast 1 to 8	C
	8 to 15	Option Port: Network Trim Reference Source (P064)	0 = direct; 1 to 8 = broadcast 1 to 8	C

*Only the low byte (bits 0 to 7) of this register is transferred. The high byte is ignored by the drive.

†Update Times: 5 ms = 5 ms. 5/0.5: 5ms if speed reference; 0.5 ms if torque reference. 350 ms = 350ms or less. T = 350ms or less when tune/config enable is on. C = 350ms or less when tune/config enable is on and the drive is stopped.

Table 5.A – Register Assignments for Drop 2 Area Read Only Registers

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
0		Vector torque reference	4095 = 150% torque	5 ms
1		Vector torque feedback	4095 = 150% torque	5ms
2		Reserved		
3	0 to 7	Network Output Register 1 Source (P.066)		350 ms
	8 to 15	Network Output Register 2 Source (P.067)		350 ms
4	0 to 7	Network Output Register 3 Source (P.068)		350 ms
	8 to 15	Network Output Register 4 Source (P.069)		350 ms
5		Terminal Strip Analog Input Offset (P.009)		350 ms
6		Terminal Strip Analog Input Gain (P.010)	1 = 0.001	350 ms
7		Terminal Strip Analog Input Configure (P.011)	See software manual for settings.	350 ms
8		Terminal Strip Analog Output Source (P.012)		350 ms
9		Output Relay Configuration (P.013)		350 ms
10		Trim Reference Source (P.014)		350 ms
11		S Curve Enable (P.019)	1 = enabled	350ms
12		Jog Speed Reference (P.020)	V/Hz: 1 = 0.1 Hz; Vector: 1 = 1 RPM	350ms
13		Jog Ramp Accel Time (P.021)	1 = 0.1 seconds	350ms
14		Jog Ramp Decel Time (P.022)	1 = 0.1 seconds	350ms
15	0 to 7	Stop Type (P.025)	0 = coast; 1 = ramp	350 ms
	8 to 15	Reserved		350 ms
16		Function Loss Response (P.026)		350 ms
17		Forward/Reverse Configuration (P.027)	See drive software instruction manual	350 ms
18		Speed Display Scaling (P.028). Affects front panel RPM display value reflected in Drop 1, register 5 (master read).		350 ms

***Update Times: 5 ms = 5 ms. 350 ms = 350 ms or less.**

Table 5-1 – Register Assignment for Drop 2 Area Read Only Registers (Continued)

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
19		Configurable Booleans (read)		
	0	Motor Overload Enable (P.040)	1 = enabled	350ms
	1	Level Sense Start Enable (P.054)	1 = enabled	350ms
	2	Low DC Bus Fault Avoidance Enable (SVC only) (U.023)	1 = enabled	350ms
	3	High DC Bus Fault Avoidance Enable (U.024). Vector only.	1 = enabled	350ms
	4	Outer Control Loop Proportional Trim Enable (U.040)	1 = enabled	350ms
	5 to 15	Reserved		
20		Motor Overload Type (P.041)	0 = nC; 1 = FC	350ms
21		Line Dip Ride Through Time (P.042). V/Hz only.	1 = 0.1 seconds	350ms
22		Fault Auto Reset Attempts (P.043)	0 = disable auto reset	350ms
23		Fault Auto Reset Time (P.044)	1 = 1 second	350ms
24		Tunable Booleans (Read)		
	0	Encoder Loss Enable (P.039)	1 = enabled	350ms
	1	Output Phase Loss Enable (P.045)	1 = enabled	350ms
	2	Manual Reference Preset Enable (P.053)	0 = do not preset the manual reference 1 = enable (see software manual)	350ms
	3	AUTO/MAN Key Disable (P.052)	1 = key disabled	350ms
	4	STOP/RESET Key Disable (P.055)	1 = key disabled	350ms
	5 to 15	Reserved		
25		Current Compounding Gain (U.026). Vector only.	1 = 0.001	350ms
26		Carrier Frequency (kHz) (P.047)	0 = 2kHz; 1 = 4kHz; 2 = 8kHz	350ms
27		Volts/Hertz or Vector Regulation (P.048)	0 = V/Hz; 1 = Vector	350ms
28		Country Defaults (P.049)	0 = USA; 1 = EU; 2 = JPn	350ms
29		Inertia Compensation Gain (U.027). Vector only.	1 = 0.001	350ms
30		Losses Compensation Gain (U.028). Vector only.	1 = 0.001	350ms
31		Option Port: Type and Version (P.065)	2103 = AutoMax Network V1.03	350ms

***Update Times: 5 ms = 5 ms. 350 ms = 350ms or less.**

Table 5.5 – Register Assignment for Drop 2 Area Read/Write Registers

Register	Bit	Description or GV3000/SE Parameter	Settings	Update†
32 to 33		Reserved	Must be 0	
34*	0 to 7	Terminal Strip Analog Output Source (P.012)	See drive software instruction manual	I
	8 to 15	Reserved	Must be 0	
35		Jog Ramp Accel Time (P.021)	1 = 0.1 seconds	I
36		Jog Ramp Decel Time (P.022)	1 = 0.1 seconds	T
37		Forward/Reverse Configuration (P.027)	See drive software instruction manual	I
38	0	Encoder Loss Enable (P.039)	1 = enabled	T
	1	Output Phase Loss Enable (P.045)	1 = enabled	I
	2	Manual Reference Preset Enable (P.053)	See drive software instruction manual	T
	3	AUTO/MAN Key Disable (P.052)	1 = key disabled	I
	4	STOP/RESET Key Disable (P.055)	1 = key disabled	T
	5 to 15	Reserved	Must be 0	
39		S-Curve Enable (P.019)	1 = enabled	C
40	0	Motor Overload Enable (P.040)	1 = enabled	C
	1	Level Sense Start Enable (P.054)	1 = enabled	C
	2	Low DC Bus Fault Avoidance Enable (SVC only) (U.023)	1 = enabled	C
	3	High DC Bus Fault Avoidance Enable (U.024). Vector only.	1 = enabled	C
	4	Outer Control Loop Proportional Trim Enable (L.048)	1 = enabled	C
	5 to 15	Reserved	Must be 0	
41		Motor Overload Type (P.041)	0 = nC; 1 = FC	C
42		Line Dip Ride-Through Time (P.042). V/Hz only.	1 = 0.1 seconds	C
43		Fault Auto Reset Attempts (P.043)	0 = disable auto reset	C
44		Fault Auto Reset Time (P.044)	1 = 1 second	C
45	0 to 7	Network Output Register 1 Source (P.066)	Set to 0 for backward compatibility. See section 3.3.	I
	8 to 15	Network Output Register 2 Source (P.067)		T
46	0 to 7	Network Output Register 3 Source (P.068)		I
	8 to 15	Network Output Register 4 Source (P.069)		T

*Only the low byte of this register is transferred. The high byte is ignored by the drive.

†Update Times: I = 350 ms or less. T = 350ms or less when tune/config enable is on. C = 350ms or less when tune/config enable is on and the drive is stopped.

Table 5.5 – Register Assignment for Drop 2 Area Read/Write Registers (Continued)

Register	Bit	Description or GV3000/SE Parameter	Settings	Update†
47*	0 to 7	Carrier Frequency (kHz) (P047)	0 = 2kHz; 1 = 4kHz; 2 = 8kHz	C
	8 to 15	Reserved		
48		Reserved	Must be 0	
49*	0 to 7	Country Defaults (P049)	0 = USA; 1 = EUR; 2 = JPN	C
	8 to 15	Reserved		

*Only the low byte of this register is transferred. The high byte is ignored by the drive.

†**Update Times: 350 ms = 350ms or less. T = 350ms or less when tune/config enable is on. C = 350ms or less when tune/config enable is on and the drive is stopped.**

Table 5.6 – Register Assignment for Drop 5 Area (Vector) Read Only Registers

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
0	0 to 7	Torque Reference Source (U.000).		350 ms
	8 to 15	Outer Control Loop Feedback Select (U.040)		350 ms
1		Encoder PPR (U.001)	0=512; 1=1024; 2=2048; 3=4096; 4=9F	350 ms
2		Motor Poles (U.002)	0=2; 1=4; 2=6; 3=8 poles	350 ms
3		Motor Nameplate Base Frequency (U.003)	1 = 0.1 Hz	350 ms
4		Motor Nameplate Amps (U.004)	1 = 0.1 amps	350ms
5		Motor Nameplate RPM (U.005)	1 = 1 RPM	350 ms
6		Magnetizing Current (U.006)	$\frac{\text{magnetizing amps}}{\text{rated amps}} \times 1000$	350 ms
7		Motor Nameplate Volts (U.007)	1 = 1 volts	350 ms
8		Torque Self-Tune Result (U.009)	See drive software instruction manual	350 ms
9		Reserved		
10		Torque Regulator Proportional Gain (U.014)	1 = 0.01	350ms
11		Torque Regulator Integral Gain (U.015)	1 = 0.1	350ms
12		Field Weakening Start RPM (U.016)	1 = 1 RPM	350ms
13		Motor Top Speed (U.017)	1 = 1 RPM	350ms
14		AC Line Volts (U.018)	1 = 1 volts	350 ms
15		Flux Current Regulator Proportional Gain (U.019)	1 = 0.01	350ms
16		Flux Current Regulator Integral Gain (U.020)	1 = 0.1	350ms
17		Rotor Time Constant (U.021)	1 = 0.001 seconds	350 ms
18		Motor Nameplate Horsepower (U.022)	1 = 0.1 HP	350ms
19		Zero Speed Hold Time (U.025)	1 = 0.1 seconds	350ms
20		SVC Slip Adjust (U.030)	1 = 0.01	350 ms
21	0 to 7	SVC Sync Direction (U.031)	See drive software instruction manual	350ms
	8 to 15	Outer Control Loop Lead/Lag Select (U.041)	0 = bypass; 1 = lead/lag; 2 = lag/lead	350ms
22		SVC Flux Current Regulator Gain (U.032)	1 = 1 rad/s	350ms
23		Outer Control Loop Lead/Lag Low Frequency (U.042)	1 = 0.01 rad/s	350ms
24		Outer Control Loop Lead/Lag Ratio (U.043)	1 = 1	350ms
25		Outer Control Loop Reference Gain (U.044)	1 = 0.001	350ms

*Update Times: 350 ms = 350ms or less.

Table 5.6 – Register Assignments for Drop 3 Area (Vector) Read Only Registers (Continued)

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
26		Outer Control Loop Proportional Gain (U.046)	1 = 0.01	350ms
27		Outer Control Loop Integral Gain (U.048)	1 = 0.01	350ms
28		Drive panel amps	1 = 0.1 amps	350ms
29		Drive panel volts	1 = 1 VAC	350ms
30		Outer Control Loop Trim Range Percentage (U.047)	1 = 0.001	350ms
31		Power Module Type (P.099)		350ms
***Update Times: 350 ms = 350ms or less.**				

Table 5.7 – Register Assignments for Drop 3 Area (Vector) Read/Write Registers

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
32		Encoder PPR (U.001)	0=512; 1=1024; 2=2048; 3=4096; 4=SE	C
33		Motor Poles (U.002)	0=2; 1=4; 2=6; 3=8 poles	C
34		Motor Nameplate Base Frequency (U.003)	1 = 0.1 Hz	C
35		Motor Nameplate Amps (U.004)	1 = 0.1 amps	C
36		Motor Nameplate RPM (U.005)	1 = 1 RPM	C
37		Magnetizing Current (U.006)	$\frac{\text{magnetizing amps}}{\text{rated amps}} \times 100$	C
38		Motor Nameplate Volts (U.007)		C
39		Torque Regulator Proportional Gain (U.014)	1 = 0.01	T
40		Torque Regulator Integral Gain (U.015)	1 = 0.1	T
41		Field Weakening Start RPM (U.016)	1 = 1 RPM	C
42		Motor Top Speed (U.017)	1 = 1 RPM	C
43		AC Line Volts (U.018)	1 = 1 volts	C
44		Flux Current Regulator Proportional Gain (U.019)	1 = 0.01	T
45		Flux Current Regulator Integral Gain (U.020)	1 = 0.1	T
46		Rotor Time Constant (U.021)	1 = 0.001 seconds	T
47		Motor Nameplate Horsepower (U.022)	1 = 0.1 HP	C
***Update Times: C=350ms or less when tune/config enable is on and the drive is stopped. T=350ms or less when tune/config enable is on.**				

Table 5.7 – Register Assignments for Drop 3 Area (Vector) Read/Write Registers (Continued)

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
48		Zero Speed Hold Time (U.025)	1 = 0.1 seconds	T
49		Current Compounding Gain (U.026).	1 = 0.001	T
50		Inertia Compensation Gain (U.027).	1 = 0.001	T
51		Losses Compensation Gain (U.028).	1 = 0.001	T
52		Reserved	Must be 0	
53		SVC Slip Adjust (U.030)	1 = 0.01	T
54	0 to 7	SVC Sync Direction (U.031)	See drive software instruction manual	C
	8 to 15	Outer Control Loop Lead/Lag Select. (U.041)	0 = bypass; 1 = lead/lag; 2 = lag/lead	T
55		SVC Flux Current Regulator Gain (U.032)	1 = 1 rad/s	T
56		Reserved	Must be 0	
57		Outer Control Loop Lead/Lag Low Frequency (U.042)	1 = 0.01 rad/s	T
58		Outer Control Loop Lead/Lag Ratio (U.043)	1 = 1	T
59		Outer Control Loop Reference Gain (U.044)	1 = 0.001	T
60		Outer Control Loop Proportional Gain (U.045)	1 = 0.01	T
61		Outer Control Loop Integral Gain (U.046)	1 = 0.01	T
62		Outer Control Loop Trim Range Percentage (U.047)	1 = 0.001	T
63		Reserved	Must be 0	

***Update Times: C=350ms or less when tune/config enable is on and the drive is stopped. T=350ms or less when tune/config enable is on.**

Table 5.8 – Register Assignments for Drop 3 Area (Volts/Hertz) Read Only Registers

Register	Bit	Description or GV3000/SE Parameter	Settings	Update Time
0		Motor Nameplate Volts (H.000)	1 – 1 VAC	350ms
1		Motor Nameplate Base Frequency (H.001)	1 – 0.1 Hz	350ms
2		Motor Nameplate Amps (H.002)	1 – 0.1 amps	350ms
3		Torque Boost Voltage (H.003)	1 – 0.1% of nominal inverter voltage	350ms
4		Slip Compensation (H.004)	1 – 0.01% of base frequency	350ms
5	0	DC Braking Enable (H.005)	1 – enabled	350ms
	1 to 15	Reserved		
6		DC Braking Start Frequency (H.006)	1 – 0.1 Hz	350ms
7		DC Braking Current (H.007)	1 – 1.0% of motor nameplate amps	350ms
8		DC Braking Time (H.008)	1 – 0.1 seconds	350ms
9	0	Avoidance Frequency Enable (H.009)	1 – enabled	350ms
	1 to 15	Reserved		
10		Avoidance Frequency Midpoint 1 (H.010)	1 – 0.1 Hz	350ms
11		Avoidance Frequency Band 1 (H.011)	1 – 0.1 Hz	350ms
12		Avoidance Frequency Midpoint 2 (H.012)	1 – 0.1 Hz	350ms
13		Avoidance Frequency Band 2 (H.013)	1 – 0.1 Hz	350ms
14		Avoidance Frequency Midpoint 3 (H.014)	1 – 0.1 Hz	350ms
15		Avoidance Frequency Band 3 (H.015)	1 – 0.1 Hz	350ms
16		Sync Direction (H.016)	See drive software instruction manual	350ms
17		Input Power/Snubber Configuration (H.017)	See drive software instruction manual	350ms
18		Volts/Hertz Curve Type (H.018)	See drive software instruction manual	350ms
19		Identification Result (H.019)	See drive software instruction manual	350ms
20		Reserved		
21		AC Line Volts (H.021)	1 – 1 VAC	350ms
22		Overfrequency Limit (H.022)	1 – 0.1 Hz	350ms
23 to 26		Reserved		
27		Power Module Cutout Amps (P.095)	1 – 0.1 amps	350ms
28		Drive panel amps	1 – 0.1 amps	350ms
29		Drive panel volts	1 – 1 VAC	350ms
30		Reserved		
31		Power Module Type (P.099)		350ms

*Update Times: 350 ms = 350ms or less.

Table 5.9 – Register Assignment for Drive 3 Area (Volts/Hertz) Read/Write Registers

Register	Bit	Description or GV3000/SE Parameter	Settings	Update*
32		Motor Nameplate Volts (H.000)	1 = 1 VAC	T
33		Motor Nameplate Base Frequency (H.001)	1 = 0.1 Hz	T
34		Motor Nameplate Amps (H.002)	1 = 0.1 amps	T
35		Torque Boost Voltage (H.003)	1 = 0.1% of nominal inverter voltage	T
36		Slip Compensation (H.004)	1 = 0.01% of base frequency	T
37	0	DC Braking Enable (H.005)	1 = enabled	T
	1 to 15	Reserved	Must be 0	
38		DC Braking Start Frequency (H.006)	1 = 0.1 Hz	T
39		DC Braking Current (H.007)	1 = 1.0% of motor nameplate amps	T
40		DC Braking Time (H.008)	1 = 0.1 seconds	T
41	0	Avoidance Frequency Enable (H.009)	1 = enabled	T
	1 to 15	Reserved	Must be 0	
42		Avoidance Frequency Midpoint 1 (H.010)	1 = 0.1 Hz	T
43		Avoidance Frequency Band 1 (H.011)	1 = 0.1 Hz	T
44		Avoidance Frequency Midpoint 2 (H.012)	1 = 0.1 Hz	T
45		Avoidance Frequency Band 2 (H.013)	1 = 0.1 Hz	T
46		Avoidance Frequency Midpoint 3 (H.014)	1 = 0.1 Hz	T
47		Avoidance Frequency Band 3 (H.015)	1 = 0.1 Hz	T
48		Sync Direction (H.016)	See drive software instruction manual	C
49		Input Power/Snubber Configuration (H.017)	See drive software instruction manual	C
50		Volts/Hertz Curve Type (H.018)	See drive software instruction manual	C
51 to 52		Reserved	Must be 0	
53		AC Line Volts (H.021)	1 = 1 VAC	C
54		Overfrequency Limit (H.022)	1 = 0.1 Hz	C
55 to 63		Reserved	Must be 0	

***Update Times: T=350ms or less when tune/config enable is on. C=350ms or less when tune/config enable is on and the drive is stopped.**

APPENDIX A

Register Map Summary

Table A.1 – Key to Table A.2

Update Rate	Indicated as
5ms	No shading with bold line around
350ms or less	No shading
350ms or less when tunescanlig enable is on	Shaded with bold line around
350ms or less when tunescanlig enable is on and the drive is stopped	Shaded

Table A.2 – Register Map Summary

	Description or GV3000 Parameter			
Reg	Drop 1	Drop 2	Drop 3 (Vector)	Drop 3 (V/Hz)
0	Status word 1	Vector torque reference	Torque Reference Source (U.003) (bits 0 to 7) OCL Feedback Select (U.040) (bits 8 to 15)	Motor Nameplate Volts (H.000)
1	Speed ref value	Vector torque feedback	Encoder PPR (U.001)	Motor Nameplate Base Frequency (H.001)
2	Speed ref sum	Reserved	Motor Poles (U.002)	Motor Nameplate Amps (H.002)
3	Speed feedback	Network Out Reg Sources (P.066, P.067)	Motor Nameplate Base Frequency (U.003)	Torque Boost Voltage (H.003)
4	Terminal strip analog input value	Network Out Reg Source (P.065, P.068)	Motor Nameplate Amps (U.004)	Slip Compensation (H.004)
5	Output speed/frequency	Terminal Strip Analog Input Offset (P.009)	Motor Nameplate RPM (U.005)	DC Braking Enable (H.005)
6	Output voltage	Terminal Strip Analog Input Gain (P.010)	Magnetizing Current (U.006)	DC Braking Start Frequency (H.006)
7	Output current	Terminal Strip Analog Input Configure (P.011)	Motor Nameplate Volts (U.007)	DC Braking Current (H.007)
8	Network output register 1	Terminal Strip Analog Output Source (P.012)	Torque Self-Tune Result (U.008)	DC Braking Time (H.008)
9	Network output register 2	Output Relay Configuration (P.013)	Reserved	Avoidance Frequency Enable (H.009)
10	Network output register 3	Trim Reference Source (P.014)	Torque Regulator Proportional Gain (U.014)	Avoidance Frequency Midpoint 1 (H.010)
11	Network output register 4	S-Curve Enable (P.019)	Torque Regulator Integral Gain (U.015)	Avoidance Frequency Band 1 (H.011)
12	Drive fault latch bits — word 1	Jog Speed Reference (P.020)	Field Weakening Start RPM (U.016)	Avoidance Frequency Midpoint 2 (H.012)
13	Drive fault latch bits — word 2	Jog Ramp Accel Time (P.021)	Motor Top Speed (U.017)	Avoidance Frequency Band 2 (H.013)
14	# of error log entries (bits 0 to 7) Parameter processing error flag (bit 8)	Jog Ramp Decel Time (P.022)	AC Line Volts (U.018)	Avoidance Frequency Midpoint 3 (H.014)
15	Error log entry	Stop Type (P.025)	Flux Current Regulator Prop. Gain (U.019)	Avoidance Frequency Band 3 (H.015)
16	Control Source (P.000)	Function Loss Response (P.026)	Flux Current Regulator Integral Gain (U.020)	Sync Direction (H.016)
17	Accel Time 1 (RAMP 1) (P.001)	Forward/Reverse Configuration (P.027)	Rotor Time Constant (U.021)	Power/Snubber Configuration (H.017)
18	Decel Time (RAMP 1) (P.002)	Speed Display Scaling (P.028)	Motor Nameplate Horsepower (U.022)	Volts/Hertz Curve Type (H.018)
19	Minimum Speed (P.003)	Motor Overload Enable (P.040) (bit 0) Level Sense Start Enable (P.054) (bit 1) Lo DC Bus Fault Avoid Enable (U.023) (bit2) Hi DC Bus Fault Avoid Enable (U.024) (bit3) OCL Proportional Trim Enable (U.040) (bit4)	Zero Speed Hold Time (U.025)	Identification Result (H.019)
20	Maximum Speed (P.004)	Motor Overload Type (P.041)	SVC Slip Adjust (U.030)	Reserved
21	Current Limit (P.005)	Line Dip Ride-Through Time (P.042)	SVC Sync Direction (U.031) (bits 0 to 7) OCL Lead/Lag Select (U.041) (bits 8 to 15)	AC Line Volts (H.021)
22	Trim Gain Percentage (P.015)	Fault Auto Reset Attempts (P.043)	SVC Flux Current Regulator Gain (U.032)	Overfrequency Limit (H.022)

Table A.2 – Register Map Summary (Continued)

Reg	Description of GV3000 Parameter			
	Drop 1	Drop 2	Drop 3 (Vector)	Drop 3 (V/Hz)
23	Draw Gain Percentage (P.013)	Fault Auto Reset Time (P.044)	OCL Lead/Lag Low Frequency (U.042)	Reserved
24	Speed Regulator Proportional Gain (U.012)	Encoder Loss Enable (P.039) (bit 0) Output Phase Loss Enable (P.015) (bit 1) Manual Reference Preset Enable P.053) (bit 2) AUTO/MAN Key Disable (P.052) (bit 3) STOP/RESET Key Disable (P.055) (bit 4)	OCL Lead/Lag Ratio (L.013)	Reserved
25	Speed Regulator Integral Gain (U.013)	Current Compounding Gain (L.026)	OCL Reference Gain (U.041)	Reserved
26	Status word 2	Carrier Frequency (kHz) (P.017)	OCL Proportional Gain (U.045)	Reserved
27	Elapsed Time Meter (P.029)	Volts/Hertz or Vector Regulation (P.018)	OCL Integral Gain (U.046)	Power Module Output Amps (P.095)
28	Network Connection Type (P.061)	Country Defaults (P.019)	Drive panel amps	Drive panel amps
29	Communication Loss Response (P.062)	Inertia Compensation Gain (U.027)	Drive panel volts	Drive panel volts
30	Network Reference Source (P.063, P.051)	Losses Compensation Gain (U.025)	OCL Trim Range Percentage (U.047)	Reserved
31	Software Version (P.092)	Type and Version (P.065)	Power Module Type (P.093)	Power Module Type (P.093)
32	Sequencing control word	Reserved	Encoder PPR (U.001)	Motor Nameplate Volts (H.000)
33	Option port speed/torque ref	Reserved	Motor Poles (U.002)	Motor Nameplate Base Frequency (H.001)
34	Option port trim reference	Terminal Strip Analog Output Source (P.012)	Motor Nameplate Base Frequency (U.003)	Motor Nameplate Amps (H.002)
35	Network inertia compensation	Jog Ramp Accel Time (P.021)	Motor Nameplate Amps (U.004)	Torque Boost Voltage (H.005)
36	Reserved	Jog Ramp Decel Time (P.022)	Motor Nameplate RPM (U.005)	Slip Compensation (H.031)
37	Accel Time 1 (RAMP 1) (P.001)	Forward/Reverse Configuration (P.027)	Magnetizing Current (U.006)	DC Braking Enable (H.006)
38	Decel Time (RAMP 1) (P.002)	Encoder Loss Enable (P.039) (bit 0) Output Phase Loss Enable (P.015) (bit 1) Manual Ref. Preset Enable (P.053) (bit 2) AUTO/MAN Key Disable (P.052) (bit 3) STOP/RESET Key Disable (P.055) (bit 4)	Motor Nameplate Volts (U.007)	DC Braking Start Frequency (H.003)
39	Minimum Speed (P.003)	S-Curve Enable (P.019) (bit 4)	Torque Regulator Proportional Gain (U.014)	DC Braking Current (H.007)
40	Maximum Speed (P.004)	Motor Overload Enable (P.010) (bit 0) Level Sense Start Enable (P.054) (bit 1) Lo DC Bus Fault Avoid. Enable (U.023) (bit 2) Hi DC Bus Fault Avoid. Enable (U.024) (bit 3) OCL Proportional Trim Enable (U.048) (bit 4)	Torque Regulator Integral Gain (U.015)	DC Braking Time (H.008)
41	Current Limit (P.005)	Motor Overload Type (P.011)	Field Weakening Start RPM (U.016)	Reactance Frequency Enable (H.039)

Table A.2 – Register Map Summary (Continued)

Reg	Description or GV3000 Parameter			
	Drop 1	Drop 2	Drop 3 (Vector)	Drop 3 (V/Hz)
42	Terminal Strip Analog Input Offset (P.009)	Line Dip Ride-Through Time (P.042)	Motor Top Speed (U.017)	Avoidance Frequency Midpoint 1 (H.010)
43	Terminal Strip Analog Input Gain (P.010)	Fault Auto Reset Attempts (P.043)	AC Line Volts (U.018)	Avoidance Frequency Band 1 (H.011)
44	TS Analog Input Configure (P.011)	Fault Auto Reset Time (P.044)	Flux Current Regulator Prop. Gain (U.019)	Avoidance Frequency Midpoint 2 (H.012)
45	Trim Gain Percentage (P.014)	Network Out Register Sources (P.066, P.067)	Flux Current Regulator Integral Gain (U.020)	Avoidance Frequency Band 2 (H.013)
46	Draw Gain Percentage (P.012)	Network Out Register Sources (P.068, P.069)	Rotor Time Constant (U.021)	Avoidance Frequency Midpoint 3 (H.014)
47	Speed Reg. Proportional Gain (U.012)	Carrier Frequency (kHz) (P.047)	Motor Nameplate Horsepower (U.022)	Avoidance Frequency Band 3 (H.015)
48	Speed Regulator Integral Gain (U.013)	Reserved	Zero Speed Hold Time (U.025)	Sync Direction (H.016)
49	Jog Speed Reference (P.020)	Country Defaults (P.048)	Current Compounding Gain (U.026)	Input Power/Snubber Configuration (H.017)
50	Stop Type (P.025)	Reserved	Inertia Compensation Gain (U.027)	Volts/Hertz Curve Type (H.018)
51	Function Loss Response (P.023)	Reserved	Losses Compensation Gain (U.028)	Reserved
52	Speed Display Scaling (P.026)	Reserved	Reserved	Reserved
53	Elapsed Time Meter Reset (P.030) (bit 0) Network inertia comp enable (bit 1) Network speed PI limit control en (bit 2)	Reserved	SVC Slip Adjust (U.030)	AC Line Volts (H.021)
54	Reserved	Reserved	SVC Sync Direction (U.031) (bits 0 to 7) CCL Lead/Lag Selec. (U.011) (bits 8 to 15)	Overfrequency Limit (H.022)
55	Reserved	Reserved	SVC Flux Current Regulator Gain U.032	Reserved
56	Output Relay Configuration (P.013)	Reserved	Reserved	Reserved
57	Trim Reference Source (P.014)	Reserved	CCL Lead/Lag Low Frequency (U.042)	Reserved
58	Torque Ref. Source (U.300) (bits 0 to 7) CCL Feedback Select (U.010) (bits 8 to 15)	Reserved	CCL Lead/Lag Ratio (U.043)	Reserved
59	Option port speed PI high limit	Reserved	CCL Reference Gain (U.044)	Reserved
60	Option port speed PI low limit	Reserved	CCL Proportional Gain (U.045)	Reserved
61	Network Connection Type (P.061)	Reserved	CCL Integral Gain (U.046)	Reserved
62	Communication Loss Response (P.062)	Reserved	CCL Trim Range Percentage (U.047)	Reserved
63	Network Reference Sources (P.063, P.064)	Reserved	Reserved	Reserved

APPENDIX B

Parameter-to-Register Cross Reference

Description or GV3000/SE Parameter	Read Only			Read/Write		
	Drop	Register	Bit	Drop	Register	Bit
AC Line Volts (P.021)	3, V/Hz	21		3, V/Hz	53	
AC Line Volts (U.016)	3, Vector	14		3, Vector	43	
Accel Time 1 (RAMP 1) (P.001)	1	17		1	37	
Analog input signal loss (Ain)	1	13	13	n/a		
Asymmetrical bus charge (Ub5)	1	13	6	n/a		
Auto or manual reference selected	1	26	1	n/a		
AUTO/MAN Key Disable (P.052)	2	24	3	2	36	3
Avoidance Frequency Band 1 (H.011)	3, V/Hz	11		3, V/Hz	43	
Avoidance Frequency Band 2 (H.013)	3, V/Hz	13		3, V/Hz	45	
Avoidance Frequency Band 3 (H.015)	3, V/Hz	15		3, V/Hz	47	
Avoidance Frequency Enable (H.009)	3, V/Hz	9	0	3, V/Hz	41	0
Avoidance Frequency Midpoint 1 (H.010)	3, V/Hz	10		3, V/Hz	42	
Avoidance Frequency Midpoint 2 (H.012)	3, V/Hz	12		3, V/Hz	44	
Avoidance Frequency Midpoint 3 (H.014)	3, V/Hz	14		3, V/Hz	46	
bYC	1	13	1	n/a		
Carrier Frequency (kHz) (P.047)	2	26		2	47	
CHS	1	12	9	n/a		
Clear error log	n/a			1	32	6
Communication loss between Regulator/PC/OIM (Srl)	1	12	10	n/a		
Configurable Rec cans (read)	2	19		n/a		
Control Source (P.000)	1	16		n/a		
Control word	n/a			1	53	
Country Defaults (P.048)	2	25		2	48	
Current Compounding Gain (U.025)	2	25		3, Vector	49	
Current Limit (P.005)	1	21		1	41	
DC Braking Current (H.007)	3, V/Hz	7		3, V/Hz	39	
DC Braking Enable (H.005)	3, V/Hz	5	0	3, V/Hz	37	0
DC Braking Start Frequency (H.006)	3, V/Hz	6		3, V/Hz	38	
DC Braking Time (H.008)	3, V/Hz	8		3, V/Hz	40	
DC bus charging bypass contactor (bYC)	1	13	-	n/a		
Decel Time (RAMP 1) (P.002)	1	18		1	38	
Default parameter restore (CHS)	1	12	9	n/a		
Diagnostics Display (P.091)	n/a			n/a		
Diagnostics Source (P.090)	n/a			n/a		
Draw Gain Percentage (P.016)	1	23		1	46	
Drive fault latch bits (word 1)	1	12		n/a		
Drive fault latch bits (word 2)	1	13		n/a		
Drive overtemperature (OH)	1	12	7	n/a		

Description or GV3000/SE Parameter	Read Only			Read/Write		
	Drop	Register	Bit	Drop	Register	Bit
Drive panel amps	3	28		n/a		
Drive panel volts	3	29		n/a		
Drive power electronic overload (PUo)	1	13	6	n/a		
Drive ready	1	0	0	n/a		
Drive running	1	0	1	n/a		
Earth current failure (ground fault) (EC)	1	13	7	n/a		
EEr	1	13	5	n/a		
EL	1	13	12	n/a		
Elapsed Time Meter (P.029)	1	27		1	33	0
Electronic thermal overload (OL)	1	12	6	n/a		
Encoder loss (EL)	1	13	12	n/a		
Encoder Loss Enable (P.039)	2	24	0	2	35	0
Encoder PPR (U.001)	3, Vector	1		3, Vector	32	
Error log clear	n/a			1	32	8
Error log entry (most recent error)	1	15	8 to 15	n/a		
Error log entry (second mos. recent)	1	15	0 to 7	n/a		
Fatal system error	1	13	15	n/a		
Fault active	1	0	2	n/a		
Fault Auto Reset Attempts (P.043)	2	22		2	43	
Fault Auto Reset Time (P.044)	2	23		2	44	
Fault reset	n/a			1	32	2
Field Weakening Start RPM (U.016)	3, Vector	12		3, Vector	41	
FL (function loss)	1	12	8	n/a		
Flux Current Regulator Integral Gain (U.020)	3, Vector	16		3, Vector	45	
Flux Current Regulator Prop. Gain (U.019)	3, Vector	15		3, Vector	44	
Forward/Reverse Configuration (P.027)	2	17		2	37	
Forward/reverse reference invert	1	0	4	n/a		
Forward/reverse select	n/a			1	32	4
Function loss (FL)	1	12	8	n/a		
Function Loss Response (P.026)	2	16		1	51	
H.000, Motor Nameplate Volts	3, V/Hz	0		3, V/Hz	32	
H.001, Motor Nameplate Base Freq.	3, V/Hz	1		3, V/Hz	33	
H.002, Motor Nameplate Amps	3, V/Hz	2		3, V/Hz	34	
H.003, Torque Boost Voltage	3, V/Hz	3		3, V/Hz	35	
H.004, Slip Compensation	3, V/Hz	4		3, V/Hz	36	
H.005, DC Braking Enable	3, V/Hz	5		3, V/Hz	37	0
H.006, DC Braking Start Frequency	3, V/Hz	6		3, V/Hz	38	
H.007, DC Braking Current	3, V/Hz	7		3, V/Hz	39	
H.008, DC Braking Time	3, V/Hz	8		3, V/Hz	40	
H.009, Avoidance Frequency Enable	3, V/Hz	9	0	3, V/Hz	41	0
H.010, Avoidance Frequency Midpoint 1	3, V/Hz	10		3, V/Hz	42	
H.011, Avoidance Frequency Band 1	3, V/Hz	11		3, V/Hz	43	
H.012, Avoidance Frequency Midpoint 2	3, V/Hz	12		3, V/Hz	44	
H.013, Avoidance Frequency Band 2	3, V/Hz	13		3, V/Hz	45	
H.014, Avoidance Frequency Midpoint 3	3, V/Hz	14		3, V/Hz	46	
H.015, Avoidance Frequency Band 3	3, V/Hz	15		3, V/Hz	47	
H.016, Sync Direction	3, V/Hz	15		3, V/Hz	48	
H.017, Input Power/Snubber Config.	3, V/Hz	17		3, V/Hz	49	
H.018, Volts/Hertz Curve Type	3, V/Hz	18		3, V/Hz	50	
H.019, Identification Result	3, V/Hz	19		n/a		
H.020, Identification Request	n/a			n/a		

Description or GV3000/SE Parameter	Read Only			Read/Write		
	Drop	Register	Bit	Drop	Register	Bit
H.021, AC Line Volts	3, V/Hz	21		3, V/Hz	53	
H.022, Overfrequency Limit	3, V/Hz	22		3, V/Hz	54	
HId (high line identification aborted)	1	13	2	n/a		
High DC Bus Fault Avoid. Enable (U.024)	2	19	3	2	40	3
High DC bus voltage (HU)	1	12	4	n/a		
High line voltage (HIL)	1	13	4	n/a		
High line identification aborted (HID)	1	13	2	n/a		
Identification request not performed (nId)	1	13	3	n/a		
Identification Result (H.019)	3, V/Hz	19		n/a		
Inertia Compensation Gain (U.027)	2	29		3, Vector	50	
Input phase loss (IPL)	1	13	11	n/a		
Input Power/Snubber Config. (H.017)	3, V/Hz	17		3, V/Hz	49	
IPL (input phase loss)	1	13	11	n/a		
Jog Ramp Accel Time (P.021)	2	13		2	35	
Jog Ramp Decel Time (P.022)	2	14		2	36	
Jog Speed Reference (P.020)	2	12		1	49	
Level Sense Start Enable (P.054)	2	19	1	2	40	1
Line Dip Ride Through Time (P.042)	2	21		2	42	
Losses Compensation Gain (U.026)	2	30		3, Vector	51	
Low DC Bus Fault Avoid. Enable (U.023)	2	19	2	2	40	2
Low DC bus voltage (LU)	1	12	5	n/a		
Magnetizing Current (U.006)	3, Vector	6		3, Vector	37	
Manual Reference Preset Enable (P.053)	2	24	2	2	38	2
Maximum Speed (P.004)	1	20		1	40	
Minimum Speed (P.003)	1	19		1	39	
Missing Power Module ID connector (PUc)	1	13	9	n/a		
Motor Nameplate Amps (H.002)	3, V/Hz	2		3, V/Hz	34	
Motor Nameplate Amps (U.004)	3, Vector	4		3, Vector	35	
Motor Nameplate Base Frequency (H.001)	3, V/Hz	-		3, V/Hz	33	
Motor Nameplate Base Frequency (U.003)	3, Vector	3		3, Vector	34	
Motor Nameplate Horsepower (U.022)	3, Vector	16		3, Vector	47	
Motor Nameplate RPM (U.005)	3, Vector	5		3, Vector	36	
Motor Nameplate Volts (H.000)	3, V/Hz	0		3, V/Hz	32	
Motor Nameplate Volts (U.007)	3, Vector	7		3, Vector	38	
Motor output phase loss (OPL)	1	12	14	n/a		
Motor Overload Enable (P.040)	2	19	0	2	40	0
Motor Overload Type (P.041)	2	20		2	41	
Motor Poles (U.002)	3, Vector	2		3, Vector	33	
Motor Top Speed (U.017)	3, Vector	13		3, Vector	42	
Network communication loss (nCL)	1	13	0	n/a		
Network Connection Type (P.061)	1	26		1	61	
Network Inertia comp register enable	n/a			1	53	1
Network Inertia compensation	n/a			1	35	
Network output register 1	1	8		n/a		
Network output register 2	1	9		n/a		
Network output register 3	1	10		n/a		
Network output register 4	1	11		n/a		
Network Output Register 1 Source (P.066)	2	3	0 to 7	2	45	0 to 7
Network Output Register 2 Source (P.067)	2	3	8 to 15	2	45	8 to 15
Network Output Register 3 Source (P.068)	2	4	0 to 7	2	46	0 to 7
Network Output Register 4 Source (P.069)	2	4	8 to 15	2	46	8 to 15

Description or GV3000/SE Parameter	Read Only			Read/Write		
	Drop	Register	Bit	Drop	Register	Bit
Network speed PI limit control enable	n/a			1	53	2
nId (Identification request not performed)	1	13	3	n/a		
Number of error log entries	1	14	0 to 7	n/a		
NVRAM write failure (EEr)	1	13	5	n/a		
OC (overcurrent, steady state)	1	12	0	n/a		
OCA (overcurrent, at acceleration)	1	12	-	n/a		
OCb (overcurrent, at DC braking)	1	12	3	n/a		
OCd (overcurrent, at deceleration)	1	12	2	n/a		
OF (overfrequency)	1	12	15	n/a		
OH (drive overtemperature)	1	12	7	n/a		
OL (electronic thermal overload)	1	12	6	n/a		
OPL (motor output phase loss)	1	12	14	n/a		
Option port speed PI high limit	n/a			1	59	
Option port speed PI low limit	n/a			1	60	
Option port speed/torque direct ref	n/a			1	33	
Option port trim ref (when P.014=2)	n/a			1	34	
Option Port: Comm Loss Response (P.062)	1	29		1	62	
Option Port: Network Ref Source (P.063)	1	30	0 to 7	1	63	0 to 7
Option Port: Netw Trim Ref Source (P.064)	1	30	8 to 15	1	63	8 to 15
Option Port: Type and Version (P.065)	2	31		n/a		
OSP (overspeed; vector only)	1	12	13	n/a		
Outer control loop (OCL) enable	n/a			1	32	5
Outer control loop enabled	1	26	2	n/a		
OCL Feedback (U.040)	3, Vector	0	8 to 15	1	56	8 to 15
OCL Integral Gain (U.046)	3, Vector	27		3, Vector	61	
OCL direct reference	n/a			1	34	
OCL Lead/Lag Low Freq. (U.042)	3, Vector	23		3, Vector	57	
OCL Lead/Lag Ratio (U.043)	3, Vector	24		3, Vector	58	
OCL Lead/Lag Select (U.041)	3, Vector	21	8 to 15	3, Vector	54	8 to 15
OCL Proportional Gain (U.045)	3, Vector	26		3, Vector	60	
OCL Proportional Trim Enable (U.048)	2	19	4	2	40	4
OCL Reference Gain (U.044)	3, Vector	25		3, Vector	59	
OCL Trim Range Percentage (U.047)	3, Vector	30		3, Vector	62	
Output Current	1	7		n/a		
Output Phase Loss Enable (P.046)	2	24	-	2	38	1
Output Relay Configuration (P.013)	2	9		1	56	
Output speed/frequency (RPM display)	1	5		n/a		
Output voltage (VOLTS display)	1	6		n/a		
Overcurrent, at acceleration (OCA)	1	12	-	n/a		
Overcurrent, at DC braking (OCb)	1	12	3	n/a		
Overcurrent, at deceleration (OCd)	1	12	2	n/a		
Overcurrent, steady state (OC)	1	12	0	n/a		
Overfrequency (OF)	1	12	15	n/a		
Overfrequency Limit (H.022)	3, V/Hz	22		3, V/Hz	54	
Overspeed; vector only (OSP)	1	12	13	n/a		
P.000, Control Source	1	18		n/a		
P.001, Accel Time 1 (RAMP 1)	1	17		1	37	
P.002, Decel Time (RAMP 1)	1	18		1	38	
P.003, Minimum Speed	1	19		1	39	
P.004, Maximum Speed	1	20		1	40	
P.005, Current Limit	1	21		1	41	

Description or GV3000/SE Parameter	Read Only			Read/Write		
	Drop	Register	Bit	Drop	Register	Bit
P.006, Second Menu Password	n/a			n/a		
P.007, Term Strip Digital Inputs Configure	n/a			n/a		
P.008, Term Strip Speed Reference Source	n/a			n/a		
P.009, Terminal Strip Analog Input Offset	2	5		1	42	
P.010, Terminal Strip Analog Input Gain	2	6		1	43	
P.011, Term Strip Analog Input Configure	2	7		1	44	
P.012, Term Strip Analog Output Source	2	8		2	34	0 to 7
P.013, Output Relay Configuration	2	9		1	56	
P.014, Trim Reference Source	2	10		1	57	
P.015, Trim Gain Percentage	1	22		1	45	
P.016, Draw Gain Percentage	1	23		1	46	
P.017, Accel Time 2 (RAMP 2)	n/a			n/a		
P.018, Decel Time 2 (RAMP 2)	n/a			n/a		
P.019, S Curve Enable	2	11		2	39	
P.020, Jog Speed Reference	2	12		1	49	
P.021, Jog Ramp Accel Time	2	13		2	35	
P.022, Jog Ramp Decel Time	2	14		2	36	
P.023, MOP Accel/Decel Time	n/a			n/a		
P.024, MOP Reset Configuration	n/a			n/a		
P.025, Stop Type	2	15	0 to 7	1	50	
P.026, Function Loss Response	2	16		1	51	
P.027, Forward/Reverse Configuration	2	17		2	37	
P.028, Speed Display Scaling	2	18		1	52	
P.029, Elapsed Time Meter	1	27		n/a		
P.030, Elapsed Time Meter Reset	n/a			1	53	0
P.031, Presc. Speed 1	n/a			n/a		
P.032, Presc. Speed 2	n/a			n/a		
P.033, Presc. Speed 3	n/a			n/a		
P.034, Presc. Speed 4	n/a			n/a		
P.035, Presc. Speed 5	n/a			n/a		
P.036, Presc. Speed 6	n/a			n/a		
P.037, Presc. Speed 7	n/a			n/a		
P.038, Presc. Speed 8	n/a			n/a		
P.039, Encoder Loss Enable	2	24	0	2	38	0
P.040, Motor Overload Enable	2	19	0	2	40	0
P.041, Motor Overload Type	2	20		2	41	
P.042, Line Dip Ride Through Time	2	21		2	42	
P.043, Fault Auto Reset Attempts	2	22		2	43	
P.044, Fault Auto Reset Time	2	23		2	44	
P.045, Output Phase Loss Enable	2	24	1	2	38	1
P.047, Carrier Frequency (kHz)	2	26		2	47	
P.048, Volts/Hertz or Vector Regulation	2	27		n/a		
P.049, Country Defaults	2	28		2	49	
P.050, Restore Defaults	n/a			n/a		
P.051, Programming Disable	n/a			n/a		
P.052, AUTO/MAN Key Disable	2	24	3	2	38	3
P.053, Manual Reference Preset Enable	2	24	2	2	38	2
P.054, Level Sense Start Enable	2	19	1	2	40	1
P.055, STOP/RESET Key Disable	2	24	4	2	38	4
P.060, Network Drop Number	n/a			n/a		
P.061, Network Connection Type	1	26		1	61	

Description or GV3000/SE Parameter	Read Only			Read/Write		
	Drop	Register	Bit	Drop	Register	Bit
P.062, Option Port: Comm Loss Response	1	29		1	62	
P.063, Option Port: Network Ref Source	1	30	0 to 7	1	63	0 to 7
P.064, Option Port: Netw Trim Ref Source	1	30	8 to 15	1	63	8 to 15
P.065, Option Port: Type and Version	2	31		n/a		
P.066, Network Output Register 1 Source	2	3	0 to 7	2	45	0 to 7
P.067, Network Output Register 2 Source	2	3	8 to 15	2	45	8 to 15
P.068, Network Output Register 3 Source	2	4	0 to 7	2	46	0 to 7
P.069, Network Output Register 4 Source	2	4	8 to 15	2	46	8 to 15
P.090, Diagnostics Source	n/a			n/a		
P.091, Diagnostics Display	n/a			n/a		
P.095, Power Module Output Amps	3, V/Hz	27		n/a		
P.098, Software Version Number	1	31		n/a		
P.099, Power Module Type	3	31		n/a		
Parameter processing error flag	1	14	8	n/a		
Power Module not identified (PU1)	1	13	10	n/a		
Power Module Output Amps (P.095)	3, V/Hz	27		n/a		
Power Module Type (P.099)	3	31		n/a		
Programming Disable (P.051)	n/a			n/a		
PUc (missing Power Module ID connector)	1	13	9	n/a		
PU1 (Power Module not identified)	1	13	10	n/a		
PUo (drive power electronic overload)	1	13	8	n/a		
Restore Defaults (P.050)	n/a			n/a		
RMI (r.) parameters	n/a			n/a		
Rotor Time Constant (U.021)	3, Vector	17		3, Vector	46	
Run/Jog status	1	0	3	n/a		
Run/Jog select	n/a			1	32	3
S Curve Enable (P.019)	2	11		2	39	
Selected speed reference value	1	1		n/a		
Self tuning status (SF)	1	12	12	n/a		
Sequencing control word	n/a			1	32	
Slip Compensation (H.004)	3, V/Hz	4		3, V/Hz	36	
Software Version Number (P.098)	1	31		n/a		
Speed Display Scaling (P.026)	2	15		1	62	
Speed feedback	1	3		n/a		
Speed reference sum	1	2		n/a		
Speed regulation select	n/a			1	32	7
Speed Regulator Integral Gain (U.013)	1	25		1	45	
Speed Regulator Prop Gain (U.012)	1	24		1	47	
Spurious host PC comm interrupt (LAr)	1	12	11	n/a		
SrL (comm loss between Regulator/PC/OIM)	1	12	10	n/a		
Start	n/a			1	32	0
Status word 1	1	0		n/a		
Status word 2	1	26		n/a		
Stop	n/a			1	32	1
Stop sequence in progress	1	0	5	n/a		
Stop Type (P.025)	2	15	0 to 7	1	50	
STOP/RESET Key Disable (P.055)	2	24	4	2	35	4
SVC Flux Current Regulator Gain (U.032)	3, Vector	22		3, Vector	55	
SVC Slip Adjust (U.030)	3, Vector	20		3, Vector	53	
SVC Sync Direction (U.031)	3, Vector	21	0 to 7	3, Vector	54	0 to 7

Description or GV3000/SE Parameter	Read Only			Read/Write		
	Drop	Register	Bit	Drop	Register	Bit
Sync Direction (H.016)	3, V/Hz	16		3, V/Hz	46	
Terminal Strip Analog Input Config (P.011)	2	7		1	44	
Terminal Strip Analog Input Gain (P.010)	2	6		1	43	
Terminal Strip Analog Input Offset (P.009)	2	5		1	42	
Terminal strip analog input value	1	4		n/a		
Terminal Strip Analog Output Source (P.012)	2	8		2	34	0 to 7
Terminal strip digital input 1 (start)	1	0	8	n/a		
Terminal strip digital input 2 (stop)	1	0	9	n/a		
Terminal strip digital input 3 (fault reset)	1	0	10	n/a		
Terminal strip digital input 4 (run/jog)	1	0	11	n/a		
Terminal strip digital input 5 (function loss)	1	0	12	n/a		
Terminal strip digital inputs 6	1	0	13	n/a		
Terminal strip digital inputs 7	1	0	14	n/a		
Terminal strip digital inputs 8	1	0	15	n/a		
Torque Boost Voltage (H.003)	3, V/Hz	3		3, V/Hz	35	
Torque or speed regulation	1	28	0	n/a		
Torque Reference Source (U.000)	3, Vector	0	0 to 7	1	58	0 to 7
Torque Regulator Integral Gain (U.015)	3, Vector	11		3, Vector	40	
Torque Regulator Prop Gain (U.014)	3, Vector	10		3, Vector	39	
Torque Self Tune Result (U.009)	3, Vector	8		n/a		
Trim Gain Percentage (P.015)	1	22		1	45	
Trim Reference Source (P.014)	2	10		1	57	
Tunable Booleans (Read)	2	24		n/a		
Tune/config input enable	1	0	6	1	32	14
Tune/config update synchronization flag	1	0	7	1	32	15
U.000, Torque Reference Source	3, Vector	0	0 to 7	1	58	0 to 7
U.001, Encoder PPR	3, Vector	1		3, Vector	32	
U.002, Motor Poles	3, Vector	2		3, Vector	33	
U.003, Motor Nameplate Base Freq	3, Vector	3		3, Vector	34	
U.004, Motor Nameplate Amps	3, Vector	4		3, Vector	35	
U.005, Motor Nameplate RPM	3, Vector	5		3, Vector	36	
U.006, Magnetizing Current	3, Vector	6		3, Vector	37	
U.007, Motor Nameplate Volts	3, Vector	7		3, Vector	38	
U.008, Torque Self Tune Enable	n/a			n/a		
U.009, Torque Self Tune Result	3, Vector	8		n/a		
U.012, Speed Regulator Prop Gain	1	24		1	47	
U.013, Speed Regulator Integral Gain	1	25		1	48	
U.014, Torque Regulator Prop Gain	3, Vector	10		3, Vector	39	
U.015, Torque Regulator Integral Gain	3, Vector	11		3, Vector	40	
U.016, Field Weakening Start RPM	3, Vector	12		3, Vector	41	
U.017, Motor Top Speed	3, Vector	13		3, Vector	42	
U.018, AC Line Volts	3, Vector	14		3, Vector	43	
U.019, Flux Current Regulator Prop Gain	3, Vector	15		3, Vector	44	
U.020, Flux Current Reg Integral Gain	3, Vector	16		3, Vector	45	
U.021, Rotor Time Constant	3, Vector	17		3, Vector	46	
U.022, Motor Nameplate Horsepower	3, Vector	18		3, Vector	47	
U.023, Low DC Bus Fault Avoid Enable	2	19	2	2	40	2
U.024, High DC Bus Fault Avoid Enable	2	19	3	2	40	3
U.025, Zero Speed Hold Time	3, Vector	19		3, Vector	48	
U.026, Current Compounding Gain	2	25		3, Vector	49	
U.027, Inertia Compensation Gain	2	29		3, Vector	50	

Description or GV3000/SE Parameter	Read Only			Read/Write		
	Drop	Register	Bit	Drop	Register	Bit
U.029, Losses Compensation Gain	2	30		3, Vector	51	
U.030, SVC Slip Adjust	3, Vector	20		3, Vector	53	
U.031, SVC Sync Direction	3, Vector	21	0 to 7	3, Vector	54	0 to 7
U.032, SVC Flux Current Regulator Gain	3, Vector	22		3, Vector	55	
U.040, OCL Feedback Select	3, Vector	0	8 to 15	1	56	8 to 15
U.041, OCL Lead/Lag Select	3, Vector	21	8 to 15	3, Vector	54	8 to 15
U.042, OCL Lead/Lag Low Frequency	3, Vector	23		3, Vector	57	
U.043, OCL Lead/Lag Ratio	3, Vector	24		3, Vector	58	
U.044, OCL Reference Gain	3, Vector	25		3, Vector	59	
U.045, OCL Proportional Gain	3, Vector	26		3, Vector	60	
U.046, OCL Integral Gain	3, Vector	27		3, Vector	61	
U.047, OCL Trim Range Percentage	3, Vector	30		3, Vector	62	
U.048, OCL Proportional Trim Enable	2	19	4	2	40	4
UAr (spurious host PC comm interrupt)	1	12	11	n/a		
UbS (asymmetrical bus charge)	1	13	8	n/a		
Vector torque feedback	2	1		n/a		
Vector torque reference	2	0		n/a		
Volts/Hertz Curve Type (P.016)	3, V/Hz	16		3, V/Hz	50	
Volts/Hertz or Vector Regulation (P.048)	2	27		n/a		
Zero Speed Hold Time (U.025)	3, Vector	19		3, Vector	45	

G

I

J

L

N

O

P

R

S

T

U

V

DIF

Documentation Improvement Form

Use this form to give us your comments concerning this publication or to report an error that you have found. For convenience, you may attach copies of the pages with your comments. After you have completed this form, please return it to:

Reliance Electric
Technical Documentation
24800 Tungsten Road
Cleveland, Ohio 44117

Fax: 216.266.7785

Publication Name: **AutoMax Network Option Board for the GV3000/SE Drive**	
Publication Number: **D2-3308-7**	Publication Date: **February 1999**

Comments: _____

Your Name:	Date:
Company Name:	Phone: ( )
Address:	

Thank you for your comments.

Technical Writing Internal Use	
Date:	DIF Number:
Follow-Up Action:	

Rockwell Automation

Reach us now at www.rockwellautomation.com

Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.

Americas Headquarters, 1201 South Second Street, Milwaukee, WI 53204, USA, Tel: +1 414 382-2000, Fax: +1 414 382-4444
European Headquarters SA/NV, avenue Hermann Debroux, 46, 1160 Brussels, Belgium, Tel: (32) 2 663 06 00, Fax: (32) 2 663 06 40
Asia Pacific Headquarters, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Rockwell Automation

Publication D2-3308-7 - February 1999