

CHAPTER TWO

# Installation

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## IN THIS CHAPTER

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- Checking Your Shipment
  - Express Setup
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# Checking Your Shipment

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Inspect your shipment carefully. You should have received one or more of the following:

## Gemini Drives

GV-L3n (“n” can be E (for Encoder) or R (for Resolver))  
GV-U3n  
GV-U6n  
GV-U12n  
GV-H20n  
GV-H40n

## Ship Kit Items

The following ship with the drive:

Part	Part Number
Gemini GV Quick Reference Guide	88-017779-01
Gemini GV Hardware Installation Guide	88-017791-01
Gemini Programmer's Reference	88-017778-01
Gemini Motor Reference Manual	88-017790-01
Motion Planner CD-ROM	95-017633-01

## Options and Accessories

You may have ordered one or more of the following options or accessories.

Part	Part Number
GPDM Gemini Power Dissipation Module	GPDM
Drive Only (no accompanying manuals)	-NK

Cables: various cables, breakout modules, etc., are available. See *Appendix A Specifications* for cable and accessory information.

Cable clamps, EMC filters, ferrites, etc., are available. See *Appendix C Regulatory Compliance* for part numbers and more information.

## Motors

You may have ordered a motor from one of the following families of Compumotor motors:

SM Series	BE Series	J Series
NeoMetric Series	M Series	Linear Series

# “Express Setup” Overview

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This chapter gives instructions for performing an *express setup*. The purpose of the express setup is to verify that the drive, cables, and motor work properly as a system. It will also verify serial communications and controller connections.

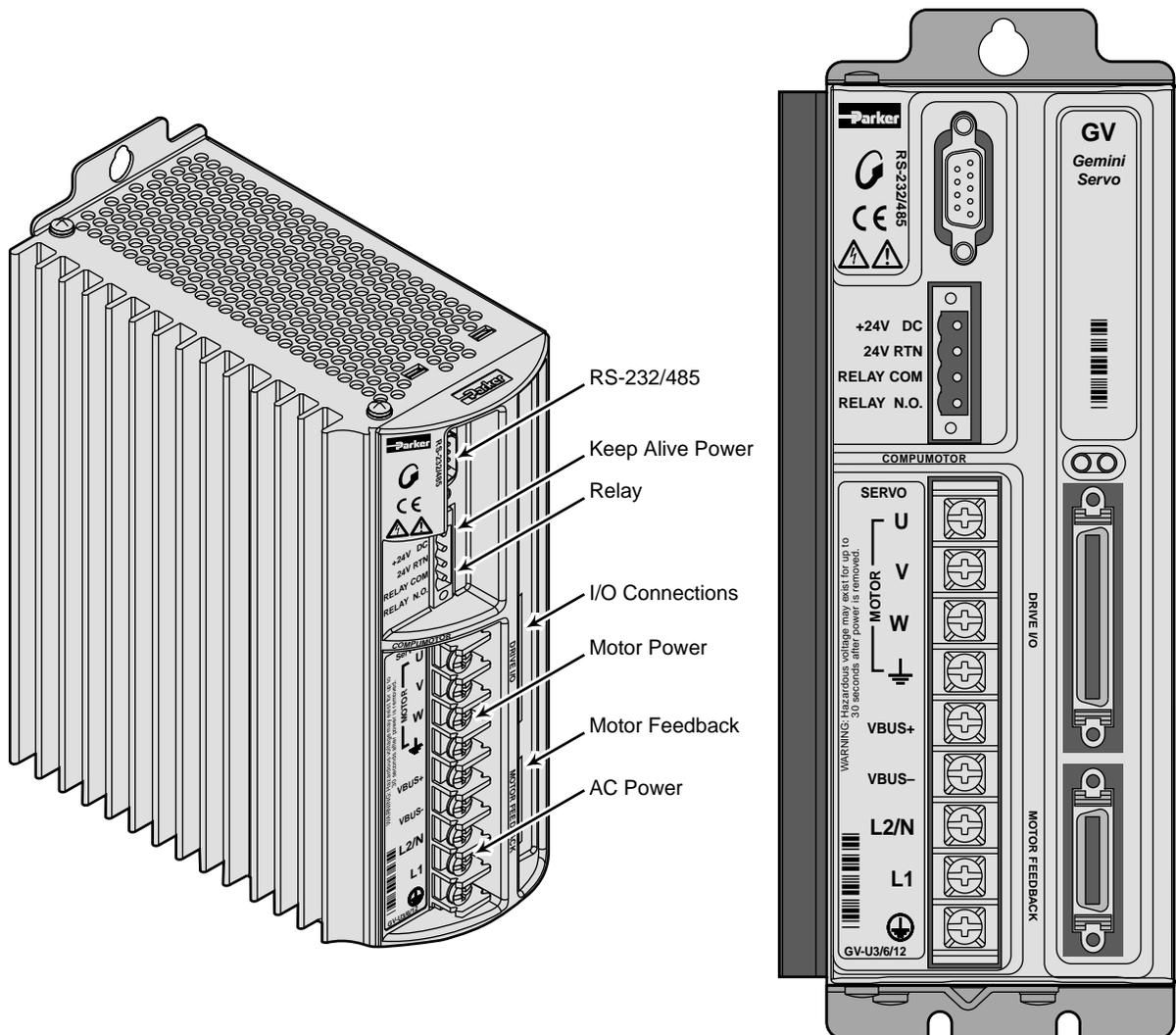
You will connect together only the components necessary to achieve basic motion—a drive, a motor (without a load connected), and a controller. You will use a computer to communicate with the drive, and with the controller.

In the express setup, we will give procedures for the following steps:

1. Connecting the motor to the drive (with no load attached)
2. Connecting AC power to the drive
3. Establishing communications and configuring the drive for autorun
4. Connecting a controller, enabling the drive, and observing the motor turn

Information you may need for final installation will be presented in *Chapter 3 Configuration*, in *Chapter 4 Special Features*, in *Appendix A Specifications*, and in the separate *Gemini Motor Reference Manual*.

The next drawing shows locations and names of the Gemini components that you will encounter during the installation procedure.



Component Locations

### Illustrations in this Installation Guide

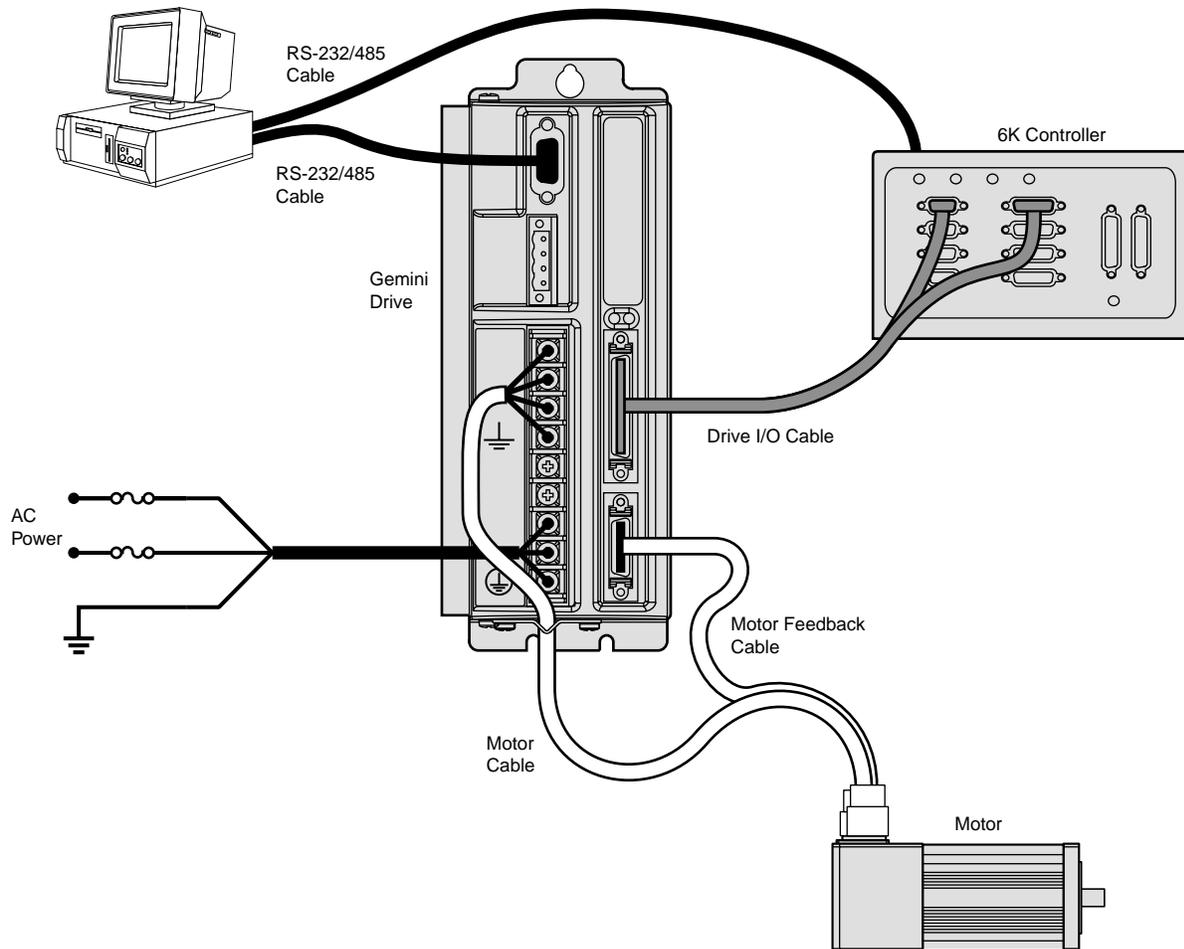
We will usually show the Gemini GV-U3n Drive in illustrations. Other Gemini drives have similar features. In cases where we need to illustrate *differences* between drives, we will show relevant drawings for each drive.

## System Overview

In this express setup procedure, we will give instructions for a Compumotor system—Gemini drive with Compumotor motor, Compumotor cables, and Compumotor 6K controller.

If you use non-Compumotor equipment, try to follow along and perform the steps in the Express Setup procedure; consult *Appendix A Specifications* for additional information you may need.

The next drawing shows the components of a Compumotor system.



### Compumotor System

If you use a Compumotor controller other than the 6K, see *Appendix A Specifications* for wiring instructions.

## Step 1 – Connecting the Motor

Compumotor's motor cable with the GS or GB option has an MS connector on one end. The other end has three black wires with identifying white numbers (1, 2, or 3), and one green/yellow wire. (See the separate *Gemini Motor Reference Manual* for motor specifications, dimensions, speed/torque curves, and wiring diagrams for your particular motor.)

### Connecting the Motor Cable

1. Connect the MS connector on the motor cable to the mating connector on the motor. (If you use a non-Compumotor motor, see *Appendix B* for information.)
2. Remove the clear plastic cover from the drive terminals. Connect the motor cable's green/yellow wire to the drive terminal with the  $\perp$  symbol. This connects the motor's protective conductor terminal to the drive's safety earth.
3. Connect your motor cable's phase wires 1, 2, and 3 to the drive's U, V, W terminals, respectively, as shown in the drawing below.



**WARNING**



The drive's barrier strip terminals are at hazardous voltages when power is applied to the drive, and up to 30 seconds after power is removed. Lower voltages may still be present for several minutes after power is removed. Reinstall the clear plastic terminal cover after you make connections.

4. Secure the cable to the drive by placing the exposed cable shield in the saddle clamp on the bottom of the drive (GV-H20n/H40n: R-Clamp on heatsink). Make the loop of cable between saddle clamp and drive terminals as short as possible.

### Connecting the Motor Feedback Cable

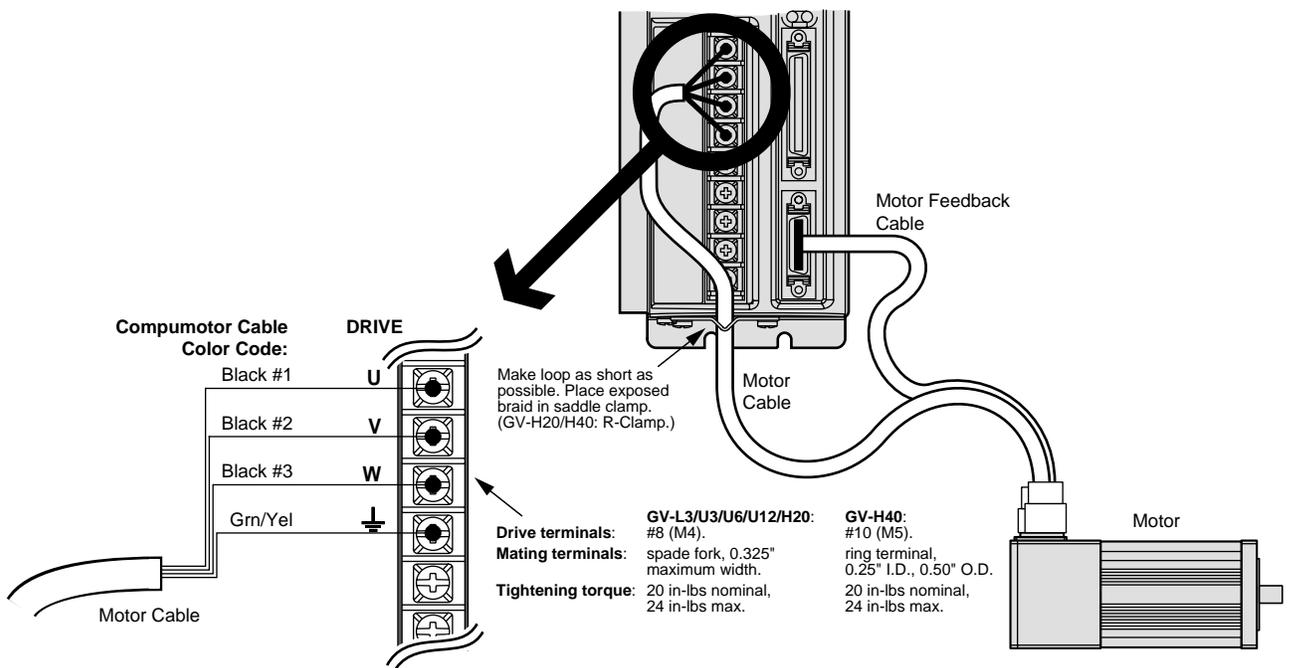
Compumotor's motor feedback cable with the GS or GB option has an MS connector on one end, and a 26 pin connector on the other end.

1. Connect the MS connector on the motor cable to the mating connector on the motor.
2. Connect the 26 pin connector on the motor cable to the drive's MOTOR FEEDBACK connector.
3. Tighten the jack screws on the connector housing to secure the connector to the drive.

### Secure the Motor

1. If your motor is not permanently mounted, clamp it securely in place during this Express Setup procedure.

The next drawing illustrates these connections.



Motor Wiring – Typical

## Step 2 – Connecting AC Power

Acceptable ranges of AC input voltage are listed below for each drive :

Drive	AC Input Range
GV-L3n	95 – 132VAC
GV-U3n/U6n/U12n	95 – 264VAC
GV-H20n	165 – 264VAC [single phase (1Ø) or three phase power (3Ø)]
GV-H40n	165 – 264VAC [three phase power (3Ø) only]



**WARNING**



You must connect the drive's protective conductor terminal, marked with the  $\oplus$  symbol, to a reliable system safety earth. Make the connection directly, by means of a low impedance path less than or equal to 0.1 ohm (no fuses, etc.). Under normal operation, no current should flow through the safety earth connection.



**WARNING**



The drive's barrier strip terminals are at hazardous voltages when power is applied to the drive, and up to 30 seconds after power is removed. Lower voltages may still be present for several minutes after power is removed. Reinstall the clear plastic terminal cover after you make connections.

### Fuse Information

Gemini drives have no internal fuses. For safety, you must provide a fuse in each of the AC input lines. Recommended fuse types and sizes are:

Drive Type	Fuse Style	Rating	Fuse Type
GV-L3n (120VAC)	125VAC Time Delay	10 amp	Type RK5 or better
GV-U3n/6n/12n (120VAC)	125VAC Time Delay	30 amp	Type RK5 or better
GV-U3n/6n/12n (240VAC)	250VAC Time Delay	30 amp	Type RK5 or better
GV-H20n (208/240VAC, 1Ø/3Ø)	250VAC Time Delay	30 amp	Type RK5 or better
GV-H40n (208/240VAC, 3Ø)	250VAC Time Delay	60 amp	Type RK5 or better

The next table lists part numbers for suitable fuses, from several manufacturers:

Amps	Bussmann	Goold	Littelfuse	Grainger
10	FRN-R-10	TR10R	FLNR10	1A693
30	FRN-R-30	TR30R	FLNR30	1A698
60	FRN-R-60	TR60R	FLNR060	1A700

## Connecting Power

### GV-L3n: Connecting AC Power



**CAUTION**

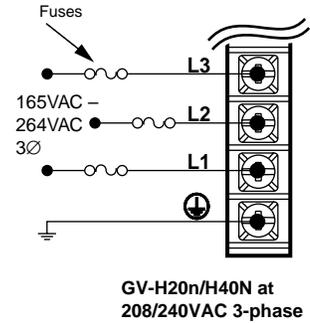
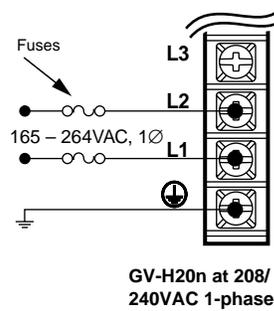
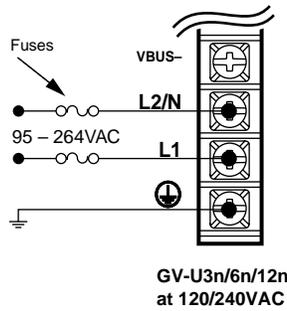
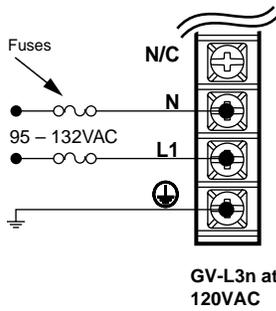


Do not operate the GV-L3n above 132VAC, or the drive will be permanently damaged.

#### 120VAC Operations:

1. Connect power system's safety earth to drive's protective conductor terminal, marked with the  $\oplus$  symbol. Do not fuse the protective conductor terminal.
2. Connect 120VAC, 50/60 Hz, single phase power line to drive's L1 terminal.
3. Connect neutral to drive's N terminal.
4. **Reinstall the clear plastic terminal cover after you make connections.**

Connections are illustrated in the next drawing.



<b>Drive terminals:</b>	GV-L3/U3/U6/U12/H20: #8 (M4).	GV-H40: #10 (M5).
<b>Mating terminals:</b>	spade fork, 0.325" maximum width.	ring terminal, 0.25" I.D., 0.50" O.D.
<b>Tightening torque:</b>	20 in-lbs nominal, 24 in-lbs max.	20 in-lbs nominal, 24 in-lbs max.

## Power Connections

### GV-U3n/6n/12n: Connecting AC Power

Connections are illustrated in the drawing above.

#### 208/240VAC Operations:

1. Connect power system's safety earth to drive's protective conductor terminal, marked with the  $\oplus$  symbol. Do not fuse the protective conductor terminal.
2. Connect 208/240VAC, 50/60 Hz, single phase power to drive's L1 and L2/N terminals.
3. **Reinstall the clear plastic terminal cover after you make connections.**

#### 120VAC Operations:

1. Connect power system's safety earth to drive's protective conductor terminal, marked with the  $\oplus$  symbol. Do not fuse the protective conductor terminal.
2. Connect 120VAC, 50/60 Hz, single phase power line to drive's L1 terminal.
3. Connect neutral to drive's L2/N terminal.
4. **Reinstall the clear plastic terminal cover after you make connections.**

### GV-H20n: Connecting Single Phase AC Power

Connections are illustrated in the drawing above.

#### Single Phase 208/240VAC Operations:

1. Connect power system's safety earth to drive's protective conductor terminal, marked with the  $\oplus$  symbol. Do not fuse the protective conductor terminal.
2. Connect 208/240VAC, 1Ø, 50/60 Hz power to drive's L1 and L2 terminals.
3. **Reinstall the clear plastic terminal cover after you make connections.**

NOTE: Default current settings are for three phase operation. For single phase, you must modify the current settings in *Step 3 – Configuring the Drive* on the next page.

### GV-H20n/H40n: Connecting Three Phase AC Power

Connections are illustrated in the drawing above.

#### Three Phase 208/240VAC Operations:

1. Connect power system's safety earth to drive's protective conductor terminal, marked with the  $\oplus$  symbol. Do not fuse the protective conductor terminal.
2. Connect 208/240VAC, 3Ø, 50/60 Hz power to drive's L1, L2 and L3 terminals.
3. **Reinstall the clear plastic terminal cover after you make connections.**

## Applying Power

1. Verify that the load is not connected to the motor, and that the motor is clamped securely in place.
2. Verify that a cable is not attached to the DRIVE I/O connector.
3. Apply power to the drive. After the power-up sequence, the LEDs should display the following state:

<b>Left LED</b>	<b>Right LED</b>	<b>Indicated State</b>
red	off	Drive ready, not enabled

Proceed to *Step 3 – Configuring the Drive*.

## Step 3 – Configuring the Drive

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Gemini drives have no DIP switches or potentiometers for configuration. You will use software tools to communicate with the drive and configure drive settings.

### Configuration Software

Two software programs are located on the Motion Planner CD-ROM. *Motion Planner* runs on a personal computer (PC). *Pocket Motion Planner* runs on a palm PC or Handheld Personal Computer (HPC) that uses Windows CE 2.0 or higher, or on a PC. These programs are also available on the Compumotor web site at <http://www.compumotor.com>.

Information about installing and using each of these software tools can be found in the *Gemini Programmer's Reference*.

### Establishing Communications

We assume you are using a Gemini drive and a 6K controller, and that you have only one serial port on your PC. The following procedures give instructions for moving the cable back and forth between the Gemini and 6K.



**WARNING**



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This procedure causes the motor shaft to move. Do not connect a load to the shaft.

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1. Verify that a load is not connected to the motor, and that the motor is clamped securely in place.
2. Verify that a cable is not attached to the DRIVE I/O connector.
3. Using a null modem cable, connect the drive's RS-232/485 connector to the serial port on your PC, palm PC, or HPC. (A null modem cable is available from Compumotor. See *Appendix A Specifications* for more information.) It is not necessary to turn off AC power before you plug in an RS-232 cable; however, connect RS-485 cables *before* applying AC power.
4. Install and launch Motion Planner or Pocket Motion Planner.

Proceed to *Configuring the Drive*.

## Configuring the Drive

Choose one of the columns below, based upon which software program you are using—Motion Planner, or Pocket Motion Planner—and follow the procedure to configure your drive.

NOTE: If this is not the first time the drive has been configured, issue an RFS command (Return to Factory Settings) from the terminal emulator, before performing the following procedures.

### Configuring the Gemini Drive with Motion Planner

1. Install and launch Motion Planner
2. When the product selection dialog appears, select a Gemini drive and select the COM port to which the Gemini is connected.
3. In the Editor window, click on the Gemini button at the top of the window to launch the setup wizard.
3. To verify communications with the drive, click the "Terminal" tab on the bottom of the screen to enter terminal mode. Issue the following command:  
TREV (transfers the drive's revision level)  
Revision level information for your drive should appear on the screen.  
**To solve communication problems:** see *RS-232/485 Communications* in *Chapter 4 – Special Features*.
4. Select "Express Setup", and select "Initialize wizard with factory defaults". (If you wish to keep the existing drive configuration, you should upload it and then initialize from the editor.)
5. Click the "Next" button to proceed with the wizard. Fill in the wizard dialogs as prompted, including choosing a motor series, frame size, and part number. At the end of the wizard, click the "finish" button; this creates the setup code and places it in the Editor window. (For GV-H20 using single phase power, see *Note 2* below.)
6. Select File/Save to save the setup code to a file (\*.prg) on your hard drive.
7. Select Communications/Download to download the setup code (contents of the Editor window) to the Gemini drive. When the download is complete, choose to "Reset" the drive.  
**Drive setup is complete.** All of the setup parameters (command values) are stored in the Gemini drive's EEPROM and are automatically recalled when you cycle power or reset the drive.
8. Click the "Terminal" tab on the bottom of the screen to enter terminal mode.
9. Issue a DMODE13 command. This configures the drive for autorun mode, in which the motor runs open loop in the clockwise direction at 1 rps. (The motor will not begin turning, though, because you have not yet enabled the drive.)

Proceed to *Step 4 – Connecting the 6K Controller*.<sup>1</sup>

<sup>1</sup> If you are not using a 6K controller, proceed to *Verifying Correct System Operations without a 6K Controller*, in *Step 4* on the following pages.

<sup>2</sup> GV-H20 default current values are for three phase operation. If you use single phase power with the GV-H20, you must manually modify the current values as follows:

- Set continuous current (DMTIC) to 11.3 amps rms or less
- Set peak current (DMTIP) to 28.3 amps rms or less

Depending upon which motor you selected, your settings may already be lower than these limits.

### Configuring the Gemini Drive with Pocket Motion Planner

1. Install and launch Pocket Motion Planner.
2. Select "Tools/Config Tool".
3. Select "Edit Current Configuration" for factory defaults. (Or upload the existing configuration, and then select "Edit Current Configuration".)
4. Select drive type by choosing "Auto Detect". The software will identify the drive type, and automatically use settings for your specific drive type. If the message "Auto Detect Failed" appears, see *RS-232 Communication Problems* in *Chapter 4 Troubleshooting*.
5. Select "Express Setup"
6. Choose a motor series, frame size, and part number. (For GV-H20 using single phase power, see *Note 2* below.)
7. Save your configuration file
8. Download the configuration file to the Gemini drive; choose to "Reset" the drive.
9. Enter terminal mode.
10. Issue a DMODE13 command. This configures the drive for autorun mode, in which the motor runs open loop in the clockwise direction at 1 rps. (The motor will not begin turning, though, because you have not yet enabled the drive.)

Proceed to *Step 4 – Connecting the 6K Controller*.<sup>1</sup>

## Step 4 – Connecting the 6K Controller

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### Connecting the 6K Controller and Enabling the Drive

In this section of Express Setup, you will use the 6K to enable the Gemini drive. When you issue the DRIVE1 command in Step 5, the 6K will connect the Gemini's enable input to ground, thus enabling the drive.

NOTE: If you are not using a 6K controller, proceed to *Verifying Correct System Operations Without a 6K Controller*, on the next page.

We assume below that you will connect the Gemini drive to Axis 1 on the 6K. If you use a different axis, modify the commands below accordingly.

NOTE: Pocket Motion Planner can *not* be used to communicate with the 6K. Only use Motion Planner to communicate with the 6K.

1. In Motion Planner, end the session with the Gemini drive by exiting the program. Save changes. (Exiting the program stops *binary* communications with the drive.)
2. Move the null modem cable from the drive's RS-232/485 connector to the 6K's COM port.
3. Restart Motion Planner and establish communications with the 6K:
  - Select File/New/Terminal Emulator/OK.
  - Under Communications/Settings, select the 6K product and COM port you are using. (When you select a 6K product, Motion Planner begins *ASCII* communications with that 6K product.)
4. From Motion Planner, issue the following commands to the 6K:
  - DRIVE0 (ensures the drive is disabled)
  - CMDDIR0 (ensures clockwise is the positive direction)
  - SMPER0 (disables position error fault)
5. Configure the 6K axis by sending one of the following commands:
  - AXSDEF1 (configures axis 1 for analog servo control)
  - AXSDEF0 (configures axis 1 for step and direction)
6. Connect the 6K's Axis 1 to the Gemini's DRIVE I/O connector. Use the appropriate cable for your mode of operation.
  - Torque or Velocity Mode: use the Analog Command Cable
  - Position Mode: use the Step & Direction Command Cable

Tighten the thumbscrews on the cable. It is not necessary to turn off AC power before you plug in the cable. (Because you issued a DRIVE0 command above, the drive should not enable when you connect the cable.)
7. From Motion Planner, issue the following command to the 6K
  - DRIVE1 (enables the drive)

The motor should begin turning.

Proceed to *Verifying Correct System Operations*.

## Verifying Correct System Operations

Choose one of the columns below, based upon which controller you are using—6K or non-6K—and follow the procedure to verify correct system operations.

### Verifying Correct System Operations with a 6K Controller

1. Verify that the drive is enabled. (Left LED is illuminated green; right LED flashes yellow/green during autorun.)
2. Verify that the motor is rotating clockwise at approximately one revolution per second, as viewed from the shaft end of the motor. (The motor is turning because earlier you configured the drive for autorun.)
3. (NOTE: If you operate the drive in position mode, skip Steps 3 and 4.)  
From Motion Planner, issue a TPE command to the 6K and note the response.
4. Repeat the TPE command. The response should be more positive than the previous response. This indicates that the encoder is turning in the correct direction.  
If your system does not perform properly, find and correct the problem before proceeding. If necessary, see *Chapter 4 Troubleshooting*.
5. From Motion Planner, issue the following commands:
  - DRIVE0 (disables the drive)
  - Reconfigure the SMPER setting to its previous value, if necessary. (Factory default value is 4000.)
  - For the 6K to read and react to a GV fault, enter the command DRFEN1 for each axis.
6. End the Motion Planner session with the 6K by closing the terminal and the editor.

Proceed to *Reconfiguring the Drive*, below.

### Reconfiguring the Drive

1. Connect the null modem cable from the PC to the drive's RS-232/485 connector.
2. In Motion Planner, establish communications with the Gemini drive:
  - Select File/New/Terminal Emulator/OK.
  - Under Communications/Settings, select the GV.
3. Configure the Gemini drive for the intended mode of operation:
  - Issue a DMODE2 command to configure the drive for torque mode.
  - Or, issue a DMODE6 command to configure the drive for step/direction mode.

This completes the *Express Setup* procedure.

### Verifying Correct System Operations without a 6K Controller

1. Enable the drive by connecting a jumper between pin 1 and pin 2 on the 50 pin DRIVE I/O connector. (For connector diagrams, see *Appendix A Specifications*.)
2. Verify that the drive is enabled. (Left LED is illuminated green; right LED flashes yellow/green during autorun.)
3. Verify that the motor is rotating clockwise at approximately one revolution per second, as viewed from the shaft end of the motor. (The motor is turning because earlier you configured the drive for autorun.)
4. (NOTE: If you operate the drive in position mode, skip Steps 3 and 4.)  
From the Motion Planner terminal, issue a TPE command to the Gemini and note the response.
5. Repeat the TPE command. The response should be more positive than the previous response. This indicates that the encoder is turning in the correct direction.  
If your system does not perform properly, find and correct the problem before proceeding. If necessary, see *Chapter 4 Troubleshooting*.

Proceed to *Step 3 of Reconfiguring the Drive*, below.

## What's Next?

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This chapter has given you information and instructions for performing an *Express Setup*. The following list explains the steps you should take to complete your installation, and indicates where to find additional information for each of those steps.

1. **Mount the drive.** For information on drive dimensions, environmental specifications, airflow and cooling, etc., see *Appendix A Specifications*.
2. **Mount the motor.** For information on motor dimensions, motor cables, encoders, speed/torque curves, etc., see the separate *Gemini Motor Reference Manual*.
3. **Make System Connections.** Information about Compumotor cables is in *Appendix A Specifications*. For information on cabling practices to reduce electrical noise, see *Appendix C Regulatory Compliance: UL and CE*.

Connect any of the drive's optional features you may wish to use (see *Appendix A Specifications* for more information):

- Reset Input
- VINref – Voltage Input Reference
- Digital Inputs (and CNTRL-P)
- Digital Outputs
- Encoder Output
- Analog Monitor

Connect any of the drive's special features you may wish to use (see *Chapter 4 Special Features* for more information):

- Relay, and how to control a Motor Brake
- +24VDC "Keep Alive" Power
- Multiple Drive Installations
- Connecting drive power buses together
- Regeneration and the GPDM Power Dissipation Module
- Aligning the Resolver
- RS-232 Daisy Chain
- RS-485 Multi-Drop

4. **Connect the Load.**
5. **Configure Your Drive.** After completing your hardware installation in Steps 1 – 4 above, proceed to *Chapter 3 Configuration* for information about additional drive configuration options.
6. **Tune Your System.** Tune your system according to the drive mode you use:
  - **Torque Mode** – When you selected a Compumotor motor during *Express Setup*, default tuning gains were downloaded into the drive's memory for that motor. In most cases, no further *drive* tuning is necessary. Consult your controller's user guide for *controller* tuning instructions.

If you need higher performance than you can achieve through controller tuning, you can perform the *Torque Mode Tuning* procedure, found at the end of *Chapter 3 Configuration*.

- **Velocity Mode** – Perform the *Velocity Mode Tuning* procedure, found at the end of *Chapter 3 Configuration*.
- **Position Mode** – Perform the *Position Mode Tuning* procedure, found at the end of *Chapter 3 Configuration*.