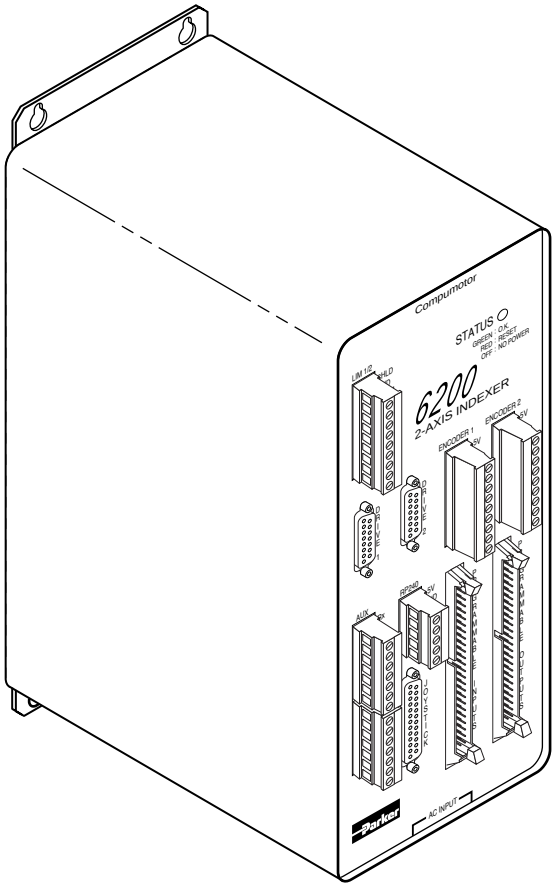
Compumotor

6200 Indexer

Installation Guide



Compumotor Division
Parker Hannifin Corporation
p/n 88-016454-01A September 1997

Parker

IMPORTANT

User Information

⚠ WARNING ⚠

6000 Series products are used to control electrical and mechanical components of motion control systems. You should test your motion system for safety under all potential conditions. Failure to do so can result in damage to equipment and/or serious injury to personnel.

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6200

Documentation Enhancements

Topic	Description
New Documentation Set	The *6200 User Guide* (p/n 88-013168-01), which contained hardware and software documentation, is replaced by this document (*6200 Installation Guide*, p/n 88-016454-01) and the *6000 Series Programmer's Guide* (p/n 88-014540-01).
Miscellaneous Clarifications	• All inputs and outputs are optically isolated from the internal microprocessor (not from the other inputs and outputs). • **CAUTION:** You must select either the on-board +5V terminal or an external 5-24VDC power supply to power the OUT-P pull-up resistor. Connecting OUT-P to the +5V terminal and to an external supply will **damage the 6200**.
LVD and EMC Installation Guidelines CE	The 6200 is in compliance with the Low Voltage Directive (72/23/EEC) and the CE Marking Directive (93/68/EEC) of the European Community. When installed according to the procedures in the main body of this installation guide, the 6200 may not necessarily comply with the Low Voltage Directive (LVD). To install the 6200 so that it is LVD compliant, refer to supplemental installation instructions provided in Appendix A. If you do not follow these instructions, the protection of the 6200 may be impaired. The 6200 is sold as a complex component to professional assemblers. As a component, it is not required to be compliant with Electromagnetic Compatibility Directive 89/336/EEC. However, Appendix B provides guidelines on how to install the 6200 in a manner most likely to minimize the 6200's emissions and to maximize the 6200's immunity to externally generated electromagnetic interference.

ABOUT THIS GUIDE

Purpose of This Guide

This document is designed to help you install and troubleshoot your 6200 hardware system. Programming related issues are covered in the *6000 Series Programmer's Guide* and the *6000 Series Software Reference*.

What You Should Know

To install and troubleshoot the 6200, you should have a fundamental understanding of:

- Electronics concepts, such as voltage, current, switches.
- Mechanical motion control concepts, such as inertia, torque, velocity, distance, force.
- Serial communication and terminal emulator experience: RS-232C

Related Publications

- *6000 Series Software Reference*, Parker Hannifin Corporation, Compumotor Division; part number 88-012966-01
- *6000 Series Programmer's Guide*, Parker Hannifin Corporation, Compumotor Division; part number 88-014540-01
- Current *Parker Compumotor Motion Control Catalog*
- Schram, Peter (editor). *The National Electric Code Handbook (Third Edition).* Quincy, MA: National Fire Protection Association

LVD & EMC Compliance

CE

The 6200 is in compliance with the Low Voltage Directive (72/23/EEC) and the CE Marking Directive (93/68/EEC) of the European Community.

When installed according to the procedures in the main body of this installation guide, the 6200 may not necessarily comply with the Low Voltage Directive (LVD). To install the 6200 so that it is LVD compliant, refer to supplemental installation instructions provided in Appendix A. If you do not follow these instructions, the protection of the 6200 may be impaired.

The 6200 is sold as a complex component to professional assemblers. As a component, it is not required to be compliant with Electromagnetic Compatibility Directive 89/336/EEC. However, Appendix B provides guidelines on how to install the 6200 in a manner most likely to minimize the 6200's emissions and to maximize the 6200's immunity to externally generated electromagnetic interference.

Online Manuals This manual (in Acrobat PDF format) is available from our web site: `http://www.compumotor.com`

CHAPTER ONE

1

Installation

IN THIS CHAPTER

- Product ship kit list
- Things to consider before you install the 6200
- General specifications table
- Optional pre-installation alterations (requires removal of chassis)
  - DIP switch settings for device address and autobaud feature
  - Jumper setting for programmable inputs to source or sink current
- Mounting the 6200
- Connecting all electrical components (includes specifications)
- Testing the installation
- Preparing for what to do next

CE

To install the 6200 so that it is LVD compliant, refer to the supplemental instructions in Appendix B. Appendix C provides guidelines on how to install the 6200 in a manner most likely to minimize the 6200's emissions and to maximize the 6200's immunity to externally generated electromagnetic interference.

What You Should Have *(ship kit)*

If an item is missing, call the factory (see phone numbers on inside front cover).

Part Name		Part Number
6200 standard product (with ship kit)		**6200**
Ship kit:	(2) 10-foot, 15 D to 25 D drive cables	71-010432-01
	120VAC 8-foot power cord	44-000054-01
	240VAC connector	44-011905-01
	This user guide (*6200 Installation Guide*)	88-016454-01
	6000 Series Software Reference	88-012966-01
	6000 Series Programmer's Guide	88-014540-01
	Motion Architect diskettes: Disk 1	95-013070-01
	Disk 2	95-013070-02
	Driver & Samples Disk	95-016324-01

Before You Begin

⚠ WARNINGS ⚠

The 6200 is used to control your system's electrical and mechanical components. Therefore, you should test your system for safety under all potential conditions. Failure to do so can result in damage to equipment and/or serious injury to personnel.

Always remove power to the 6200 before:

- Connecting any electrical device (e.g., drive, encoder, inputs, outputs, etc.)
- Adjusting the DIP switches or other internal components

Recommended Installation Process

This chapter is organized sequentially to best approximate a typical installation process.

1. Review the general specifications.
2. Perform configuration/adjustments (if necessary).
3. Mount the 6200.
4. Connect all electrical system components.
5. Test the installation.
6. Mount the motor and couple the load.
7. Program your motion control functions. Programming instructions are provided in the *6000 Series Programmer's Guide* and in the *6000 Series Software Reference*. We recommend using the programming tools provided in Motion Architect for Windows (found in your ship kit). You can also benefit from the optional iconic programming interface called Motion Builder (sold separately) and from other software tools listed on page 22.

Electrical Noise Guidelines

- Do not route high-voltage wires and low-level signals in the same conduit.
- Ensure that all components are properly grounded.
- Ensure that all wiring is properly shielded.
- Page 19 provides noise suppression guidelines for lengthening I/O cables.
- Appendix B (page 31) provides guidelines on how to install the 6200 in a manner most likely to minimize the 6200's emissions and to maximize the 6200's immunity to externally generated electromagnetic interference.

General Specifications

Parameter	Specification
Power	
AC input	110-240VAC (±10%) single-phase, 50/60Hz, 0.6A @ 120VAC.
Status LED	GREEN if proper AC input power supply is connected. RED if power reset is required. OFF if no power.
Environmental	
Operating Temperature	32 to 122°F (0 to 50°C).
Storage Temperature	-22 to 185°F (-30 to 85°C).
Humidity	0 to 95% non-condensing.
Performance	
Position Range & Accuracy	Position range: ±2,147,483,648 steps; Accuracy: ±0 steps from preset total.
Velocity Range, Accuracy, & Repeatability	Range: 1-2,000,000 steps/sec; Accuracy: ±0.02% of maximum rate; Repeatability: ±0.02% of set rate.
Acceleration Range	1-24,999,975 steps/sec^2.
Motion Algorithm Update Rate	2 ms.
Serial Communication	
Connection Options	RS-232C, 3-wire (Rx, Tx & GND on the AUX connector).
Maximum units in daisy-chain	99 (use DIP switch or ADDR command to set individual addresses for each unit).
Communication Parameters	9600 baud (range is 9600-1200—see *AutoBaud*, page 4), 8 data bits, 1 stop bit, no parity; full duplex.
Inputs	*All inputs are optically isolated from the microprocessor (not from the other inputs).*
Home; CW/CCW Limits; Triggers; Pulse Cut; Joystick inputs (pins 15-19): Axes Select, Velocity Select, Trigger, Release, and Auxiliary.	TTL compatible* with internal 6.8 KΩ pull-up resistor to +5V**;** Voltage range = 0-24V.
Drive Fault and In Position (**DRIVE** connector)	TTL compatible* with internal 1.0 KΩ pull-up resistor to +5V; Voltage range = 0-5V.
Encoder	Differential comparator accepts two-phase quadrature incremental encoders with differential (recommended) or single-ended outputs. Maximum voltage = 5VDC. Switching levels are TTL-compatible*. Maximum frequency = 1.6 MHz. Minimum time between transitions = 625 ns.
24 General-Purpose Programmable (**PROGRAMMABLE INPUTS** connector)	TTL compatible* with internal 6.8 KΩ pull-ups to +5V (sourcing current). To sink current on all programmable inputs, change internal jumper JU2 to position 1/2. Voltage range = 0-24V.
Analog input channels (**JOYSTICK** connector)	Voltage range = 0-2.5VDC; 8-bit A/D converter. Input voltage must not exceed 5V.
Outputs	*All outputs are optically isolated from the microprocessor (not from the other outputs).*
26 Programmable (includes **OUT-A** & **OUT-B**)	Open collector output with 10.0 KΩ pull-ups. Can be pulled up by connecting **OUT-P** to power source (**+5V** terminal or an external 5-24V supply); **OUT-P** can handle 0-24V with max. current of 50mA. Outputs will sink up to 30mA or source up to 5mA at 5-24VDC. 24 general-purpose outputs on **Programmable Outputs** connector, **OUT-A** & **OUT-A** on **AUX** connector.
+5V Output	Internally supplied +5VDC. **+5V** terminals are available on multiple connectors. Load limit (total load for all I/O connections) is 1.5A.
Step, Direction, Shutdown (**DRIVE** connector)	Differential line driver output. Signal high > 3.5VDC @ +30mA, signal low < 1.0VDC @ -30mA. **+output** for each differential driver is active high; **-output** for each driver is active low. Step pulse width is 0.3 µs to 20 µs (depending on the PULSE command—0.3 µs default).

* TTL-compatible switching voltage levels: Low ≤ 0.4V, High ≥ 2.4V.

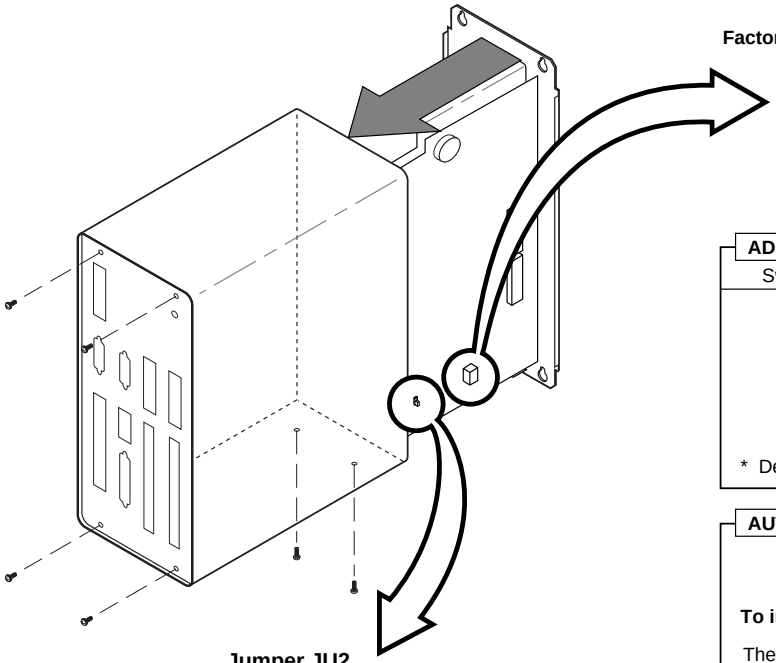
Pre-installation Adjustments — Optional

Factory Settings May Be Sufficient (if so, skip this section)

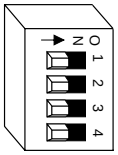
- DIP Switches (Device Address Selection; Autobaud Feature): Device address is set to zero. **NOTE**: If you are connecting multiple units in a daisy-chain or multi-drop, you can automatically establish the device address by using the ADDR command, thereby eliminating the need to access the internal DIP switches. The factory default baud rate is 9600 (maximum setting).
- Jumper JU2 (Configuring the Programmable Inputs as Sourcing or Sinking): The factory configuration is that all of the general-purpose programmable inputs (24 inputs on the **PROGRAMMABLE INPUTS** 50-pin connector) source current; that is, they are pull-up to the internal +5V supply through internal jumper JU2.

CAUTIONS

- Remove power before removing the 6200's enclosure (unplug the AC power cord).
- Remove the screw-terminal connectors from the front panel and make sure the clips on the 50-pin connectors are pushed inward so that they do not catch on the front panel.
- While handling the 6200 printed circuit assembly (PCA), be sure to observe proper grounding techniques to prevent electro-static discharge (ESD).



DIP Switch
Factory Default Setting Shown



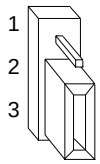
Switches 1-3 …… Address Selection
Switch 4 ..... AutoBaud Feature

ADDRESS

Switch #1	Switch #2	Switch #3	Device Address	
OFF	OFF	OFF	Ø	(default)
ON	OFF	OFF	1	
OFF	ON	OFF	2	
ON	ON	OFF	3	
OFF	OFF	ON	4	
ON	OFF	ON	5	
OFF	ON	ON	6	
ON	ON	ON	7	

* Device address is checked upon power up or reset.

Jumper JU2
Factory Default Setting Shown



AUTO BAUD

Switch #4 ON = Auto Baud Enabled
Switch #4 OFF = Auto Baud Disabled (default)

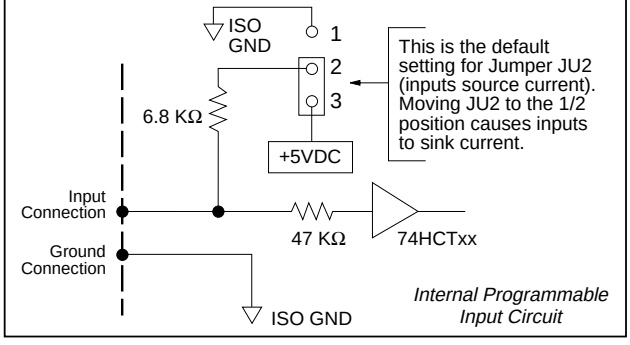
To implement the Auto Baud feature:

The default baud rate is 9600. As an alternative, you can use this procedure to automatically match your terminal's speed of 1200, 2400, 4800, or 9600 baud.

1. Set switch 4 to ON.
2. Connect the 6200 to the terminal.
3. Power up the terminal.
4. Cycle power to the 6200 and immediately press the space bar several times.
5. The 6200 should send a message with the baud rate on the first line of the response. If no baud rate message is displayed, verify steps 1-3 and repeat step 4.
6. Change switch 4 to OFF.
7. Cycle power to the 6200. This stores the baud rate in non-volatile memory.

NOTE: If Auto Baud is enabled, the 6200 performs its auto baud routine every time it is powered up or reset. The 6200 is only capable of matching 1200, 2400, 4800, and 9600 baud. Once the baud rate has been determined, the 6200 stores that baud rate in non-volatile memory; therefore, Switch #4 should be set to the OFF position after the baud rate has been determined.

SINKING OR SOURCING PROGRAMMABLE INPUTS

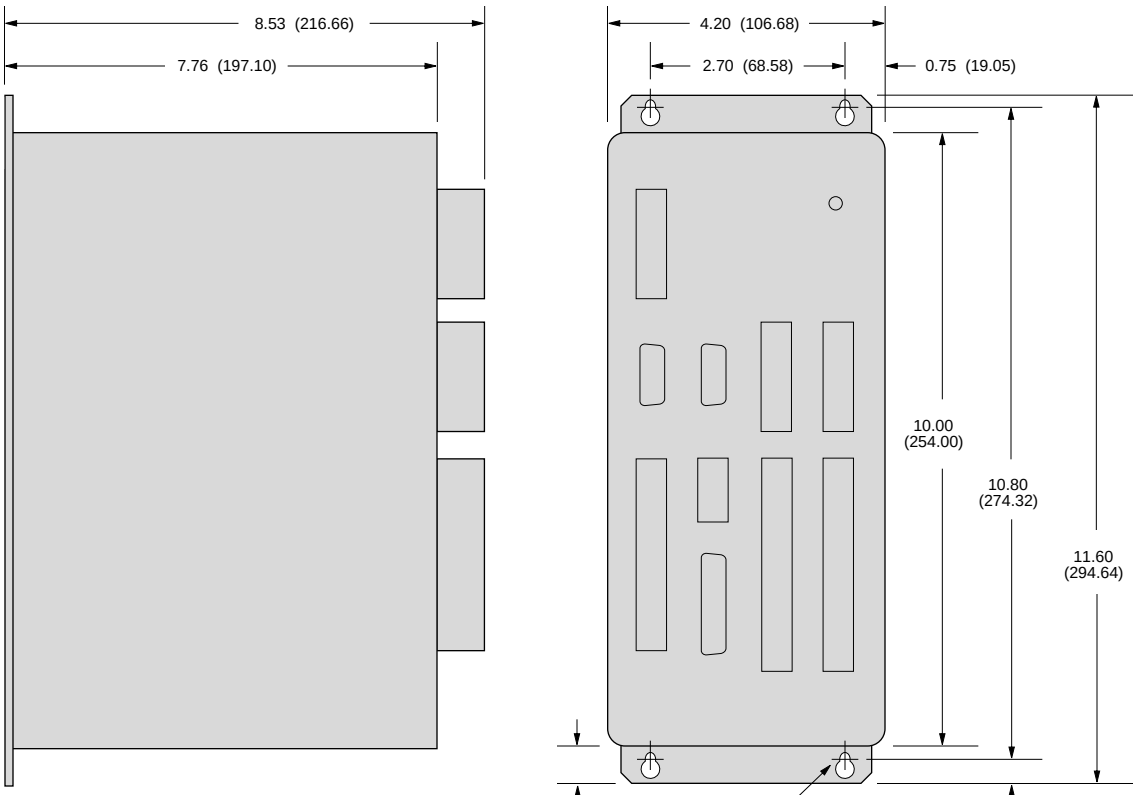


Mounting the 6200

Before you mount the 6200

Check the list below to make sure you have performed all the necessary configuration tasks that require accessing internal components (DIP switches and jumper JU2).

- Select device address (DIP switches). If you are not connecting multiple 6200 units in an RS-232C daisy chain, use the factory setting. If you need to change this setting, refer to page 4 for instructions.
- Select sinking or sourcing configuration for the 24 programmable inputs (jumper JU2). If your application requires the 6200's 24 programmable inputs (on the **PROGRAMMABLE INPUTS** connector) to source current, use the factory setting. If your application requires the programmable inputs to sink current, refer to page 4 for instructions.



inches (millimeters)

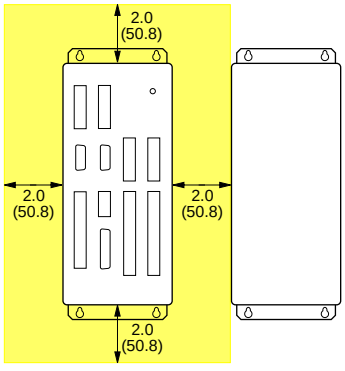
Environmental Considerations

Temperature. Operate the 6200 in ambient temperatures between 32°F (0°C) and 122°F (50°C). Provide a minimum of 2 inches (50.8 mm) of unrestricted air-flow space around the 6200 chassis (see illustration). Fan cooling may be necessary if adequate air flow is not provided.

Humidity. Keep below 95%, non-condensing.

Airborne Contaminants, Liquids. Particulate contaminants, especially electrically conductive material, such as metal shavings and grinding dust, can damage the 6200. Do not allow liquids or fluids to come in contact with the 6200 or its cables.

Minimum Airflow Space = 2 inches

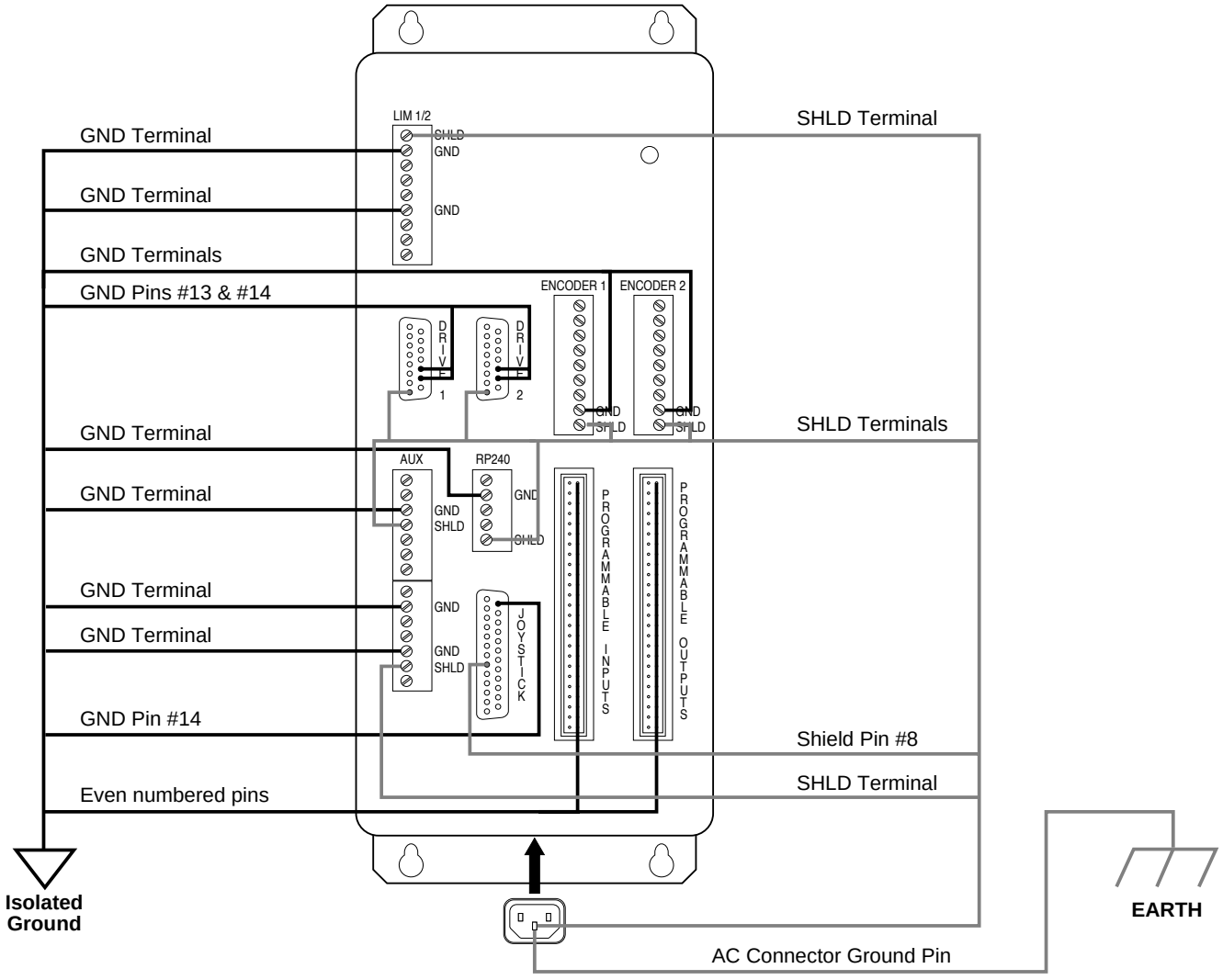


Electrical Connections

To install the 6200 so that it is LVD compliant, refer also to the supplemental instructions in Appendix A (page 29).

Appendix B (page 31) provides guidelines on how to install the 6200 in a manner most likely to minimize the 6200's emissions and to maximize the 6200's immunity to externally generated electromagnetic interference.

Grounding System

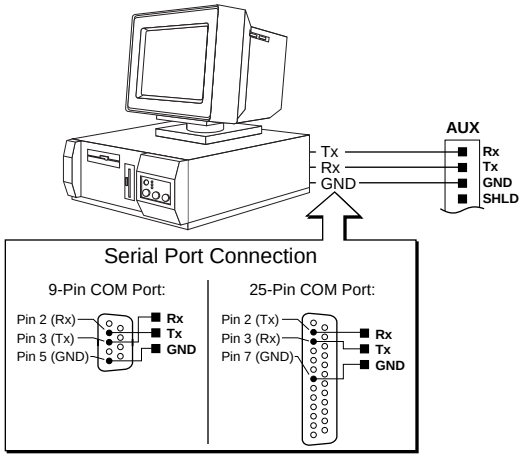


Opto-Isolation on Inputs and Outputs

The inputs and outputs are isolated from the internal micro-processor, but are not isolated from the other inputs and outputs.

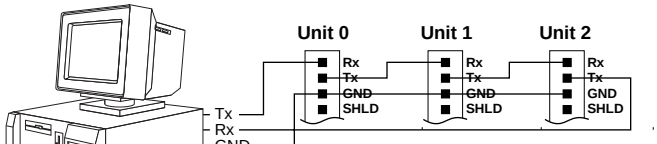
Serial Communication (RS-232C)

RS-232C Connections

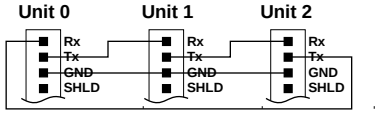


NOTE: Maximum RS-232C cable length is 50 feet (15.25 meters)

RS-232C Daisy-Chain Connections*



Daisy Chain to a Computer or Terminal



Stand-Alone Daisy Chain

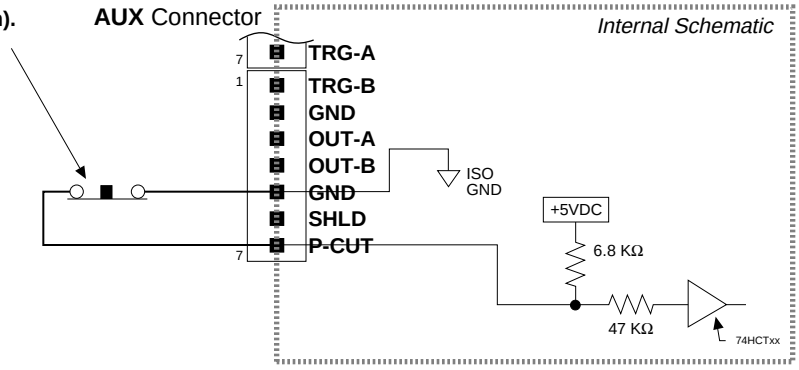
***** Be sure to set unique devices addresses for each unit. To set the address, use the DIP switch (see page 4), or use the ADDR command (see *6000 Series Software Reference*).

Pulse Cut-off (P-CUT) Input — Emergency Stop Switch

P-CUT connected to GND (normally-closed switch). If this connection is opened, motion is killed and the program in progress is terminated.

If the P-CUT input is not grounded when motion is commanded, motion will not occur and the error message "`WARNING: PULSE CUT INPUT ACTIVE`" will be displayed in the terminal emulator.

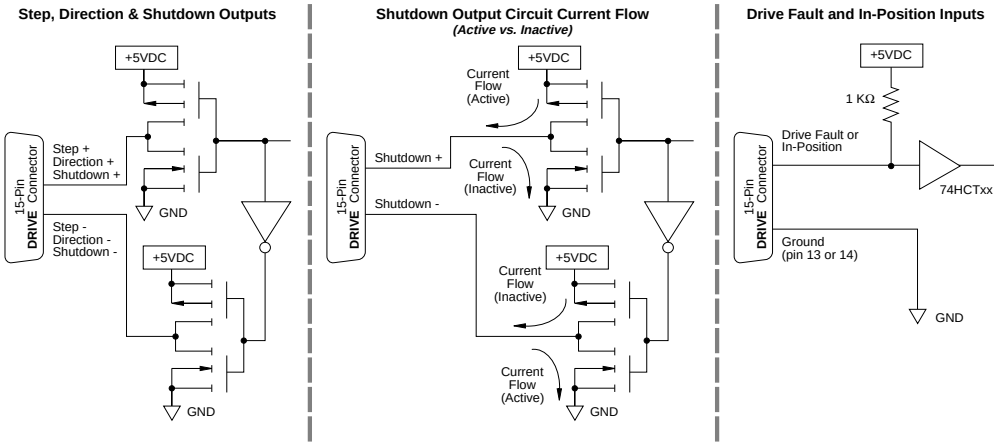
TTL compatible (switching levels: low ≤ 0.4V, high ≥ 2.4V).
Voltage range = 0-24V.



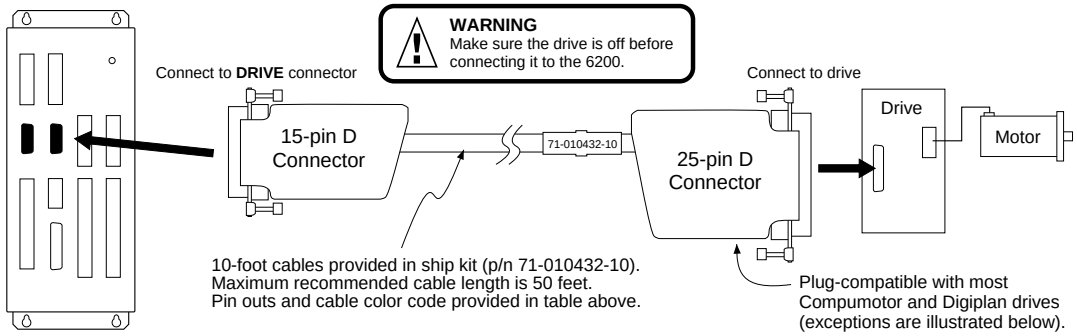
PIN OUTS & SPECIFICATIONS *(15-pin DRIVE Connector)*

15 D Pin #	Cable (71-010432-10) Color (25 D Pin #)	Name	In/Out	Description
1	Red (pin #1)	Step (+)	OUT	Differential output. Step (pulse) output to the drive. Step + signal is active high. Signal levels: Low ≤ 1.0VDC @ -30mA, High ≥ 3.5VDC @ +30mA.
2	Green (pin #2)	Direction (+)	OUT	Differential output. High signal on Direction + specifies motion in the positive direction; Low signal on Direction + specifies motion in the negative direction. Signal levels: Low ≤ 1.0VDC @ -30mA, High ≥ 3.5VDC @ +30mA.
3	—	*Reserved*	—	----------
4	Gray (pin #10)	In-Position	IN	Used for digital servo drives to indicate that the motor has reached the target position. TTL switching levels (Low ≤ 0.4V, High ≥ 2.4V). Voltage range: 0-5V.
5	Yellow (pin #9)	Drive Fault	IN	An active-high (current not flowing) signal that tells the 6200 a drive has faulted. TTL switching levels (Low ≤ 0.4V, High ≥ 2.4V). You can use the `DRFLVL` command to change the active level to low (current flowing) if desired. **NOTE**: Drive Fault input will not be recognized until the input functions are enabled with `INFEN1` command.
6	—	*Reserved*	—	----------
7	—	+5V	OUT	+5V output.
8	Bare Wire (pin #5)	Shield	—	Connected to chassis (earth) ground within the 6200.
9	Black (pin #14)	Step Return (-)	IN	Differential output. Step (pulse) output to the drive. Step - signal is active low.
10	White (pin #15)	Direction Return (-)	IN	Differential output. Low signal on Direction - specifies motion in the positive direction; High signal on Direction - specifies motion in the negative direction.
11	Blue (pin #16)	Shutdown (+)	OUT	Differential output. This signal is used to turn off current in the motor windings. High signal on Shutdown + indicates the motor winding current should be off. Signal levels: Low ≤ 1.0VDC @ -30mA, High ≥ 3.5VDC @ +30mA.
12	Purple (pin #17)	Shutdown Return (-)	IN	Differential output. This signal is used to turn off current in the motor windings. Low signal on Shutdown - indicates the motor winding current should be off.
13	Orange (pin #21)	Ground	—	Isolated logic ground
14	Brown (pin #22)	Ground	—	Isolated logic ground
15	—	*Reserved*	—	----------

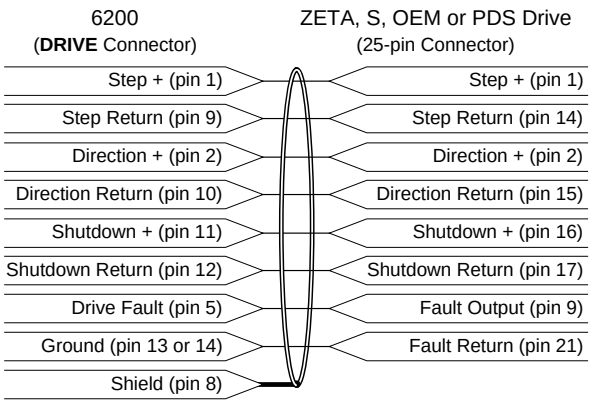
INTERNAL SCHEMATICS



CONNECTIONS

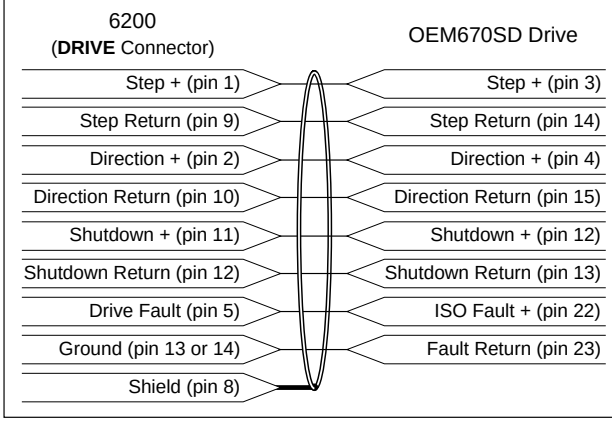


Connecting a ZETA, S, OEM650, OEM750 or PDS Drive

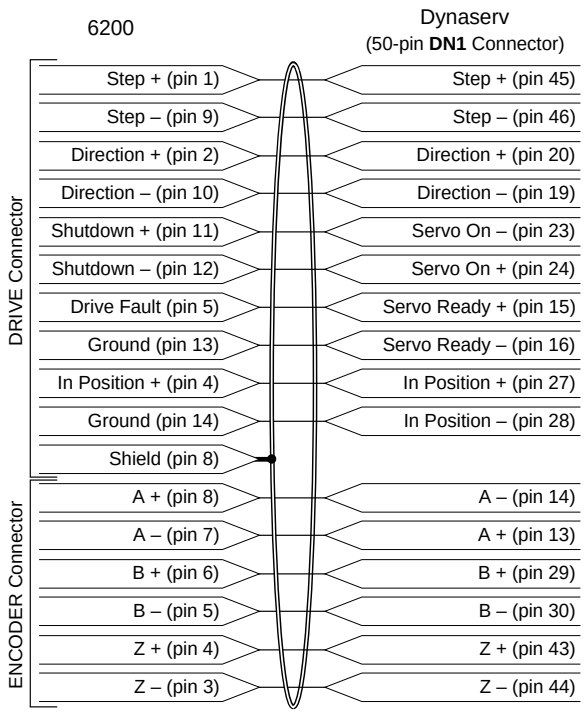


Use the 71-010432-10 10-foot cable for plug compatibility with ZETA, S, OEM, and PDS.

Connecting an OEM670SD Drive

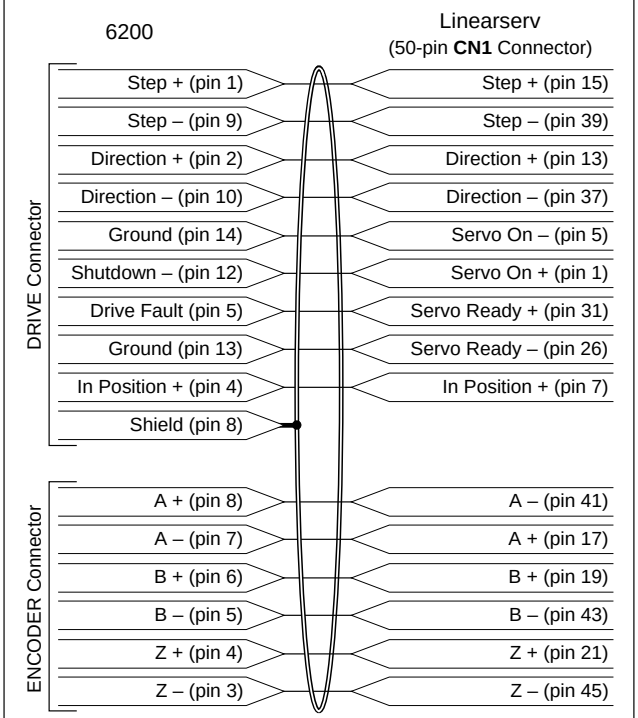


Connecting a Dynaserv Drive

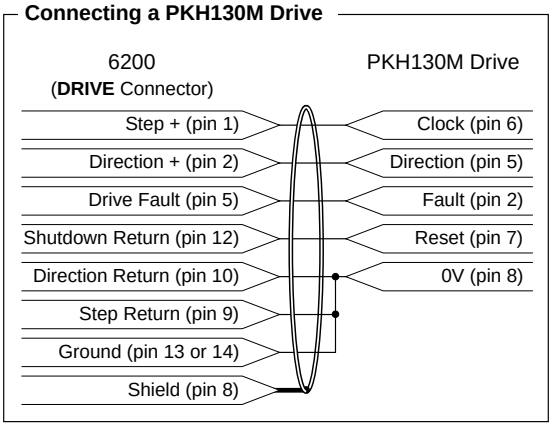


Order the 71-012985-10 10-foot cable for easy plug compatibility with the Dynaserv.

Connecting a Linearserv Drive



Connecting a PKH130M Drive



End-of-Travel and Home Limit Inputs

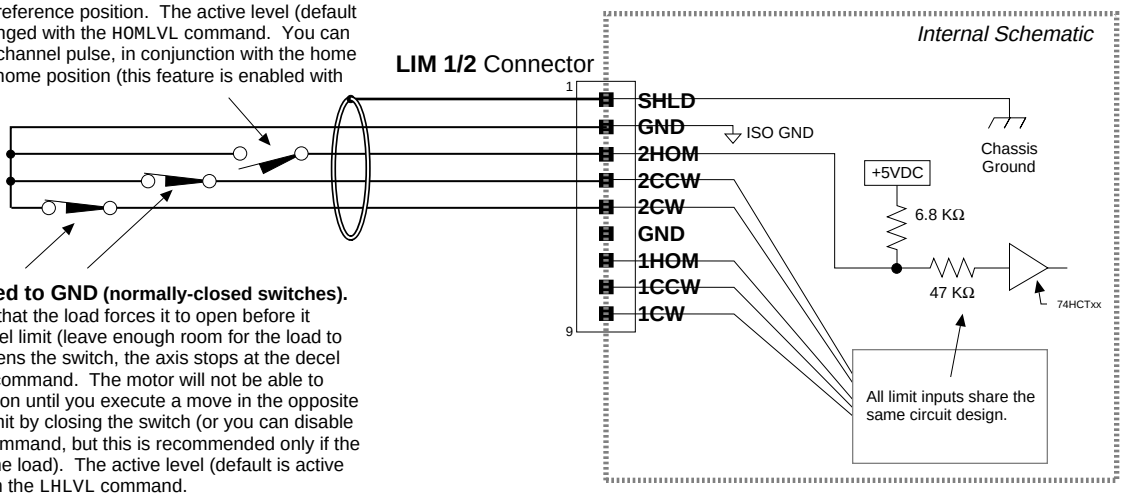
NOTES

- Motion will not occur on an axis until you do one of the following:
  - Install end-of-travel (**CW** & **CCW**) limit switches.
  - Disable the limits with the LHØ command (recommended only if load is not coupled).
  - Change the active level of the limits with the LHLVL command.
- Refer to the *Basic Operation Setup* chapter in the *6000 Series Programmer's Guide* for in-depth discussions about using end-of-travel limits and homing.

CONNECTIONS & INTERNAL SCHEMATICS

HOM connected to GND (normally-open switch).
The home limit input is used during a homing move, which is initiated with the HOM command. After initiating the homing move, the controller waits for the home switch to close, indicating that the load has reached the "home" reference position. The active level (default is active low) can be changed with the HOMLVL command. You can also use an encoder's Z channel pulse, in conjunction with the home switch, to determine the home position (this feature is enabled with the HOMZ1 command).

CW & CCW connected to GND (normally-closed switches).
Mount each switch such that the load forces it to open before it reaches the physical travel limit (leave enough room for the load to stop). When the load opens the switch, the axis stops at the decel value set with the LHAD command. The motor will not be able to move in that same direction until you execute a move in the opposite direction and clear the limit by closing the switch (or you can disable the limits with the LHØ command, but this is recommended only if the motor is not coupled to the load). The active level (default is active low) can be changed with the LHLVL command.



PIN OUTS & SPECIFICATIONS *(LIM 1/2 Connector)*

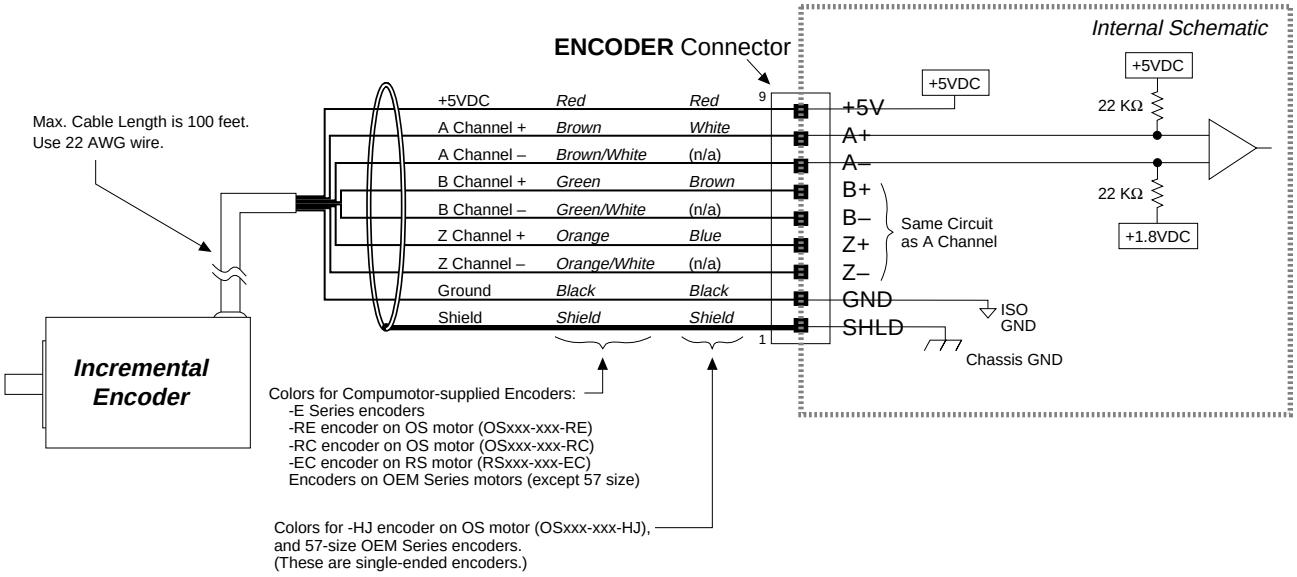
Pin	Name	In/Out	Description
1	SHLD	—	Chassis ground (earth).
2	GND	—	Isolated ground.
3	2HOM	IN	Home limit input, axis 2.
4	2CCW	IN	Negative-direction end-of-travel limit input, axis 2.
5	2CW	IN	Positive-direction end-of-travel limit input, axis 2.
6	GND	—	Isolated ground.
7	1HOM	IN	Home limit input, axis 1.
8	1CCW	IN	Negative-direction end-of-travel limit input, axis 1.
9	1CW	IN	Positive-direction end-of-travel limit input, axis 1.

Specification for all limit inputs

- TTL compatible switching levels (Low ≤ 0.4V, High ≥ 2.4V). Internal 6.8 KΩ pull-up resistor to +5V. Voltage range = 0-24V.
- Active level for HOM is set with HOMLVL (default is active low, requires n.o. switch).
- Active level for CW & CCW is set with LHLVL (default is active low, requires n.c. switch).

Encoder

CONNECTIONS & INTERNAL SCHEMATICS



PIN OUTS & SPECIFICATIONS *(ENCODER Connector)*

Pin	Name	In/Out	Description
9	+5V	OUT	+5VDC output to power the encoder.
8	A+	IN	A+ Channel quadrature signal input.
7	A–	IN	A– Channel quadrature signal input.
6	B+	IN	B+ Channel quadrature signal input.
5	B–	IN	B– Channel quadrature signal input.
4	Z+	IN	Z+ Channel signal input.
3	Z–	IN	Z– Channel signal input.
2	GND	-----	Isolated ground.
1	SHLD	-----	*Shield*—Internally connected to chassis ground (earth).

Specification for all encoder inputs

Differential comparator accepts two-phase quadrature incremental encoders with differential (recommended) or single-ended outputs. Max. frequency is 1.6 MHz. Minimum time between transitions is 625 ns. TTL-compatible voltage levels: Low ≤ 0.4V, High ≥ 2.4V. Maximum input voltage is 5VDC.

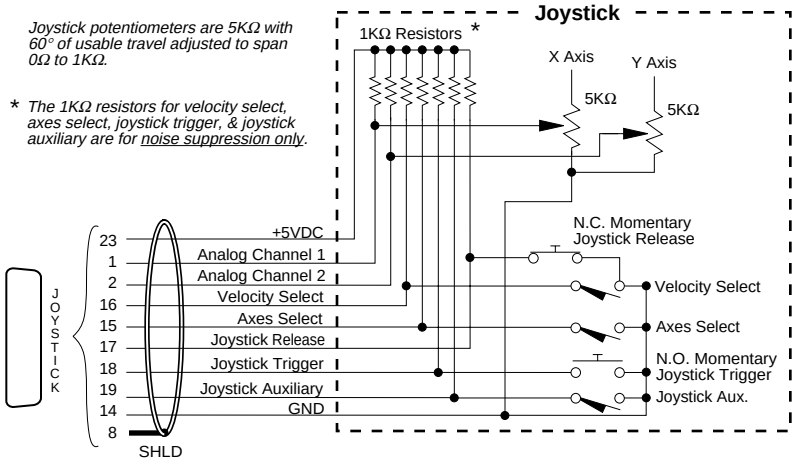
Requirements for Non-Compumotor Encoders

- Use incremental encoders with two-phase quadrature output. An index or *Z channel* output is optional. **Differential outputs are recommended.**
- It must be a 5V (< 200mA) encoder to use the 6200's **+5V** output. Otherwise, it must be separately powered with TTL-compatible (low ≤ 0.4V, high ≥ 2.4V) or open-collector outputs.
- If you are using a single-ended encoder, leave the **A–**, **B–** and **Z–** terminals on the 6200 unconnected.

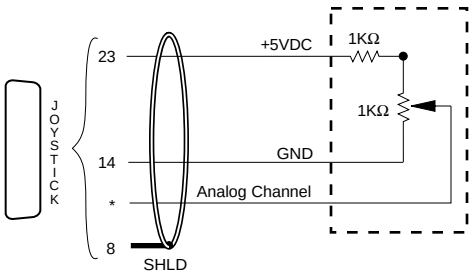
Joystick & Analog Inputs

CONNECTIONS

Joystick



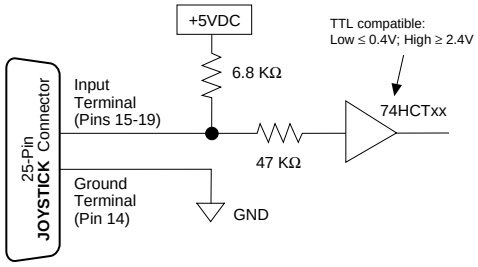
Feedrate Control *(Using a Potentiometer)*



* Pins 1, 2 and 3

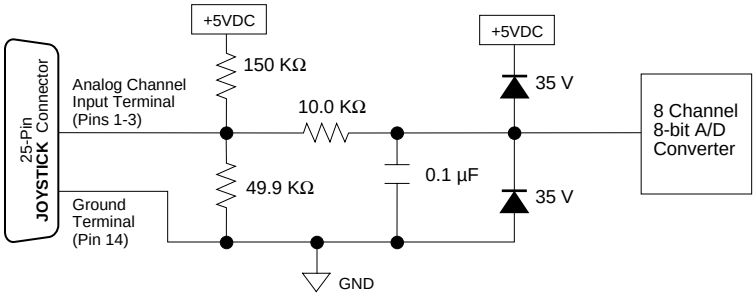
INTERNAL SCHEMATICS

Joystick Input Circuit



This input circuit applies to Axes Select, Velocity Select, Joystick Release, Joystick Trigger, & Joystick Auxiliary.

Analog Channel Input Circuit



PIN OUTS & SPECIFICATIONS

Pin	In/Out	Name	Description
1	IN	Analog Channel 1	Analog input for feedrate control or joystick control of axis. Voltage range is 0-2.5VDC, 8-bit A/D converter. CAUTION: Input voltage must not exceed 5VDC.
2	IN	Analog Channel 2	(same description as pin 1 above).
3	IN	Analog Channel 3	(same description as pin 1 above).
8	—	Shield	Shield (chassis ground).
14	—	Ground	Digital ground.
15	IN	Axes Select	If using one joystick, you can use this input to alternately control axes 1 & 2. *
16	IN	Velocity Select	Input to select high or low velocity range (as defined with the JOYVH or JOYVL commands). *
17	IN	Joystick Release	When low (grounded), joystick mode can be enabled. When high (not grounded), program execution will continue with the first command after the joystick enable (JOY) statement. *
18	IN	Joystick Trigger	Status of this active-low input can be displayed with the TINOF command, or read by a program (using the INO command) to control program flow or to enter the 6200 into joystick mode (JOY1). *
19	IN	Joystick Auxiliary	Status of this active-low input can be displayed with the TINOF command, or read by a program (using the INO command) to control program flow. *
23	OUT	+5VDC (out)	+5VDC power output.

* Input voltage range for pins 15-19 is 0-24VDC. TTL compatible (switching voltage levels: Low ≤ 0.4V, High ≥ 2.4V).

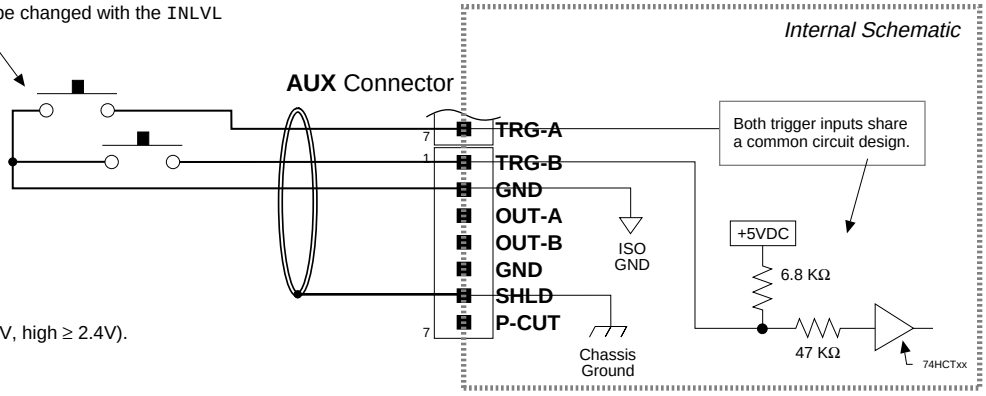
Trigger Inputs

TRG-A and TRG-B connected to GND (normally-open switches).

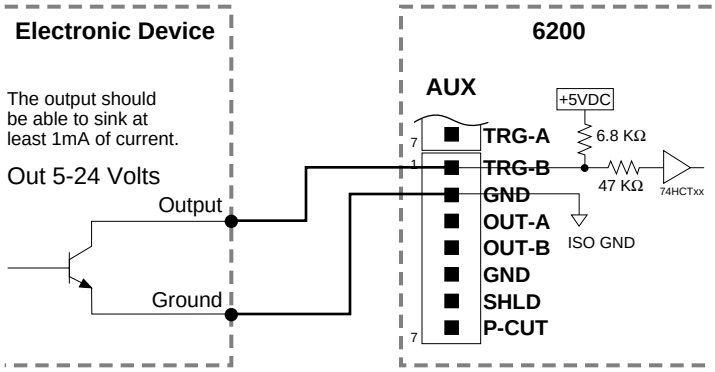
The active level (default is active low) can be changed with the `INLVL` command.

These inputs are like the general-purpose inputs on the 50-pin header. The differences are (1) the triggers are always internally pulled up to +5V and are not affected by jumper JU2; and (2) the triggers can be programmed with the `INFNCi-H` command to function as position capture inputs and registration inputs.

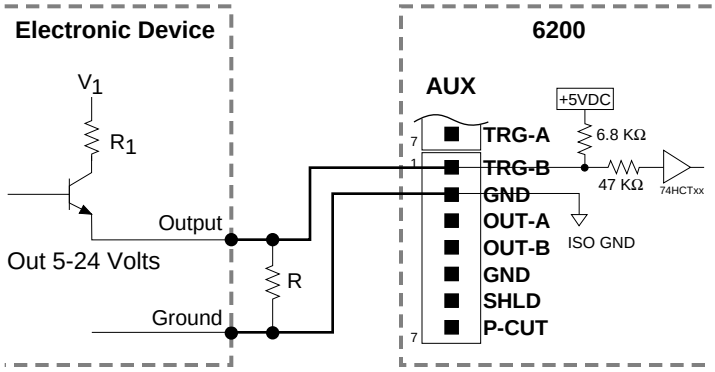
TTL compatible (switching levels: low ≤ 0.4V, high ≥ 2.4V). Voltage range = 0-24V.



Connection to a Sinking Output Device



Connection to a Sourcing Output Device



Typical value for R = 450Ω (assuming $R_1 = 0$)

Note: The value of R may vary depending on the value of R_1 and V_1.

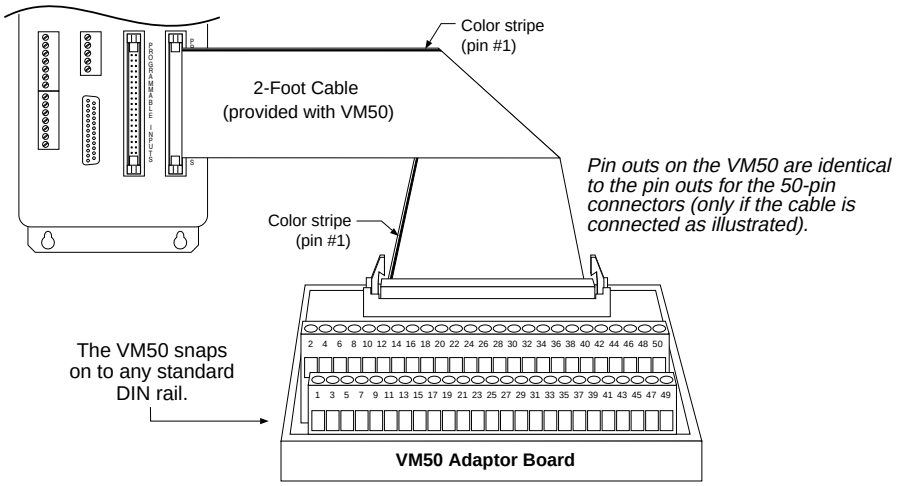
The resistor provides a path for current to flow from the device when the output is active.

PROGRAMMING TIP

Connecting to a sinking output? Set the trigger input's active level to low with the `INLVL` command (Ø = active low, *default setting*). **Connecting to a sourcing output?** Set the trigger input's active level to high with the `INLVL` command (1 = active high). Thus, when the output is active, the `TIN` status command will report a "1" (indicates that the input is active), regardless of the type of output that is connected. For details on setting the active level and checking the input status refer to the `INLVL` and `TIN` command descriptions in the *6000 Series Software Reference*.

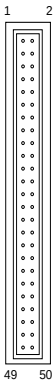
General-Purpose Programmable Inputs & Outputs

VM50 ADAPTOR — *for screw-terminal connections*



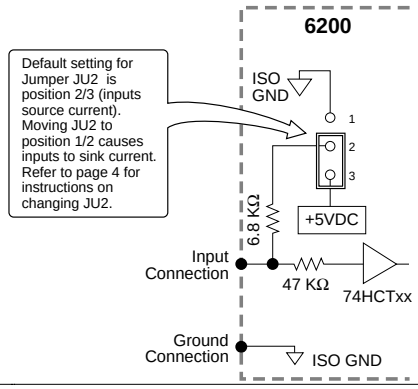
PIN OUTS & SPECIFICATIONS

Inputs



Pin#	Function	Pin#	Function
49	+5 VDC	23	Input #13
47	Input #1 (LSB)	21	Input #14
45	Input #2	19	Input #15
43	Input #3	17	Input #16
41	Input #4	15	Input #17
39	Input #5	13	Input #18
37	Input #6	11	Input #19
35	Input #7	9	Input #20
33	Input #8	7	Input #21
31	Input #9	5	Input #22
29	Input #10	3	Input #23
27	Input #11	1	Input #24 (MSB)
25	Input #12		

Internal Schematic



Specifications

TTL-compatible voltage levels (low ≤ 0.4V, high ≥ 2.4V).

Voltage range = 0-24V.

Sourcing Current: Leave as is to use the internally supplied +5VDC pull-up supply (internal jumper JU2 in position 2/3).

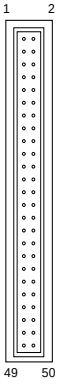
Sinking Current: Move internal jumper JU2 to position 1/2 (see instructions on page 4).

50-pin plug is compatible with VM24 and OPTO-22™ signal conditioning equipment.

STATUS: Check with `TIN` or `INFNC`.

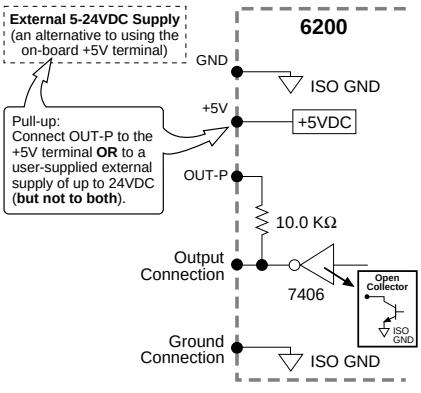
Active level: Default is active low, but can be changed to active high with the `INLVL` command.

Outputs



Pin#	Function	Pin#	Function
49	+5 VDC	23	Output #13
47	Output #1 (LSB)	21	Output #14
45	Output #2	19	Output #15
43	Output #3	17	Output #16
41	Output #4	15	Output #17
39	Output #5	13	Output #18
37	Output #6	11	Output #19
35	Output #7	9	Output #20
33	Output #8	7	Output #21
31	Output #9	5	Output #22
29	Output #10	3	Output #23
27	Output #11	1	Output #24 (MSB)
25	Output #12		

Internal Schematic



Specifications

Includes the 24 general-purpose outputs (**PROGRAMMABLE OUTPUTS** connector), and **OUT-A** & **OUT-D** (**AUX** connector).

Open collector outputs. Max. voltage in the OFF state (not sinking current) = 24V; max. current in the ON state (sinking) = 30mA.

Pull-up connection on **AUX** connector: Connect **OUT-P** to **+5V**, or to an external 5-24VDC power supply (but not to both).

50-pin plug is compatible with VM24 and OPTO-22™ signal conditioning equipment.

STATUS: Check with `TOUT` or `OUTFNC`.

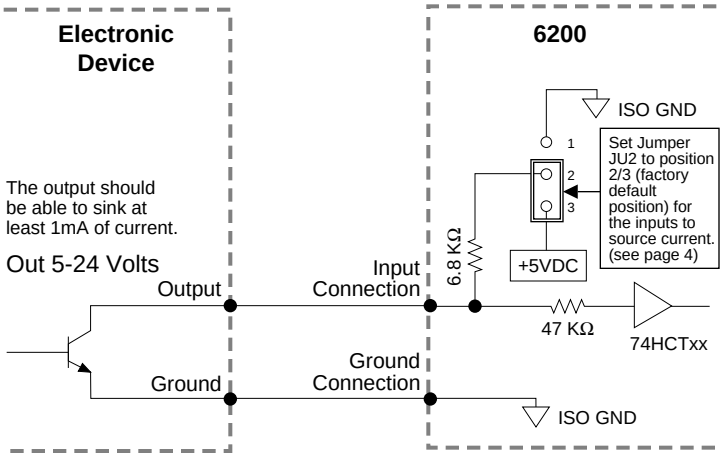
Active level: Default is active low, but can be changed to active high with the `OUTLVL` command.

NOTE: All even-numbered pins are connected to a common logic ground (DC ground) — see drawing on page 6.
LSB = least significant bit; MSB = most significant bit

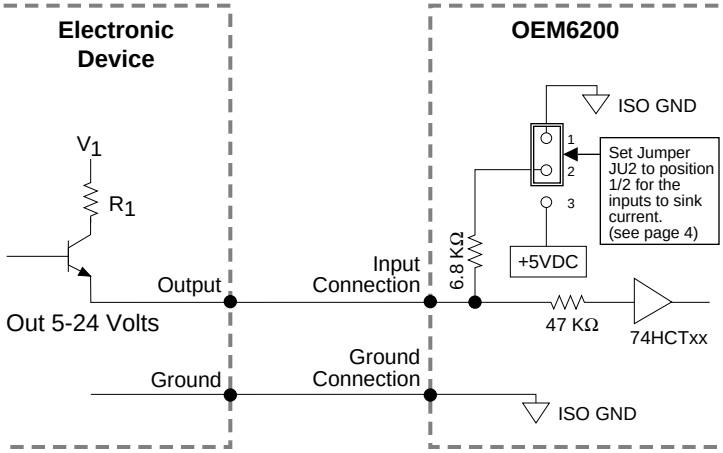
CAUTION: You must select either the on-board **+5V** terminal or an external power supply to power the **OUT-P** pull-up resistor. Connecting **OUT-P** to the **+5V** terminal and an external supply will **damage the 6200**.

INPUT CONNECTIONS — *Connecting to electronic devices such as PLCs*

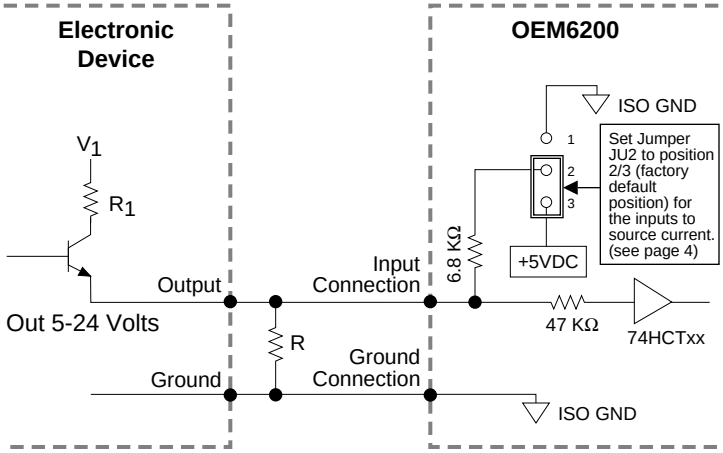
Connection to a Sinking Output Device



Connection to a Sourcing Output Device



Connection to a Combination of Sinking & Sourcing Outputs



Typical value for R = 450Ω (assuming R_1 = 0)

Note: The value of R may vary depending on the value of R_1 and V_1.

PROGRAMMING TIP

Connecting to a sinking output? Set the input's active level to low with the `INLVL` command (`Ø` = active low).

Connecting to a sourcing output? Set the input's active level to high with the `INLVL` command (`1` = active high).

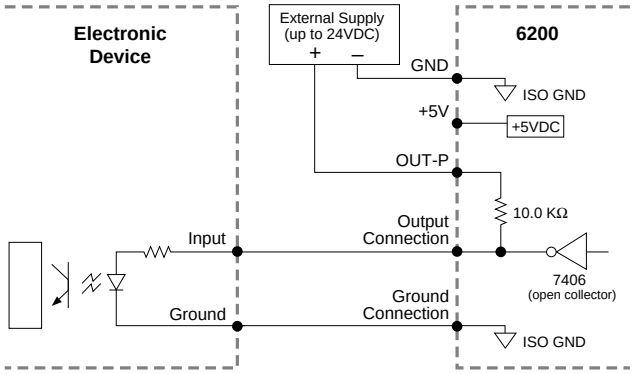
Thus, when the output is active, the `TIN` status command will report a "1" (indicates that the input is active), regardless of the type of output that is connected.

Details on setting the active level and checking the input status are provided in the *6000 Series Programmer's Guide*. Refer also to the `INLVL` and `TIN` command descriptions in the *6000 Series Software Reference*.

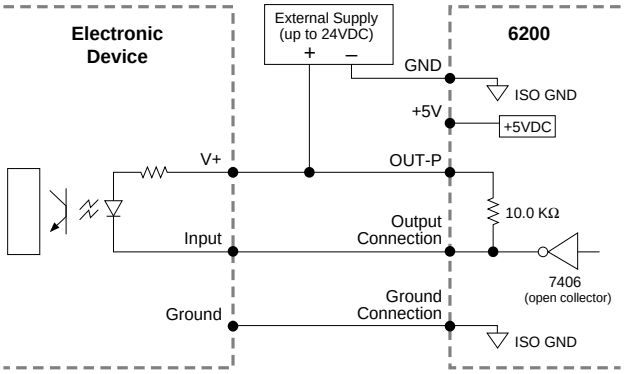
NOTE: If you will be connecting to a combination of sourcing and sinking outputs, set internal jumper JU2 to position 2/3 so that the inputs source current to **+5V** to accommodate sinking output devices (factory default setting). (See page 4 for instructions on setting JU2.) Then for each individual input connected to a sourcing output, wire an external resistor between the 6200's programmable input terminal and ground (see "R" in above drawing). The resistor provides a path for current to flow from the device when the output is active.

OUTPUT CONNECTIONS (includes OUT-A & OUT-B) — *for electronic devices such as PLCs*

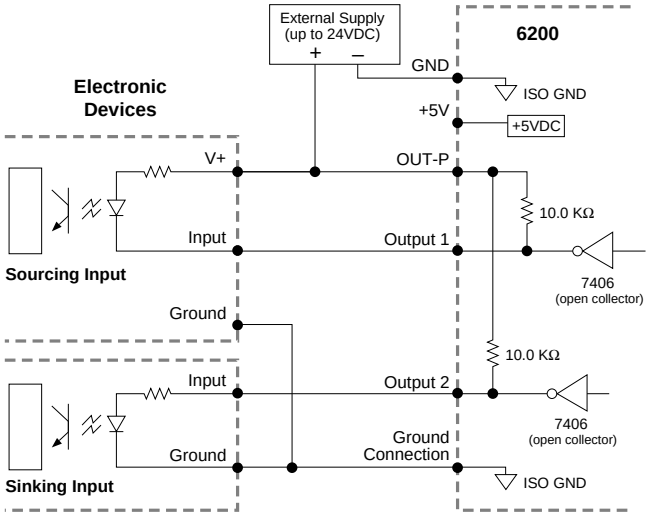
Connection to a Sinking Input (active high)



Connection to a Sourcing Input (active low)

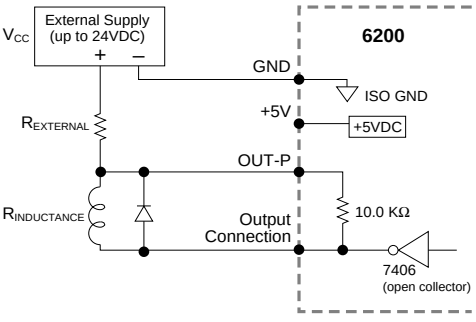


Connection to a Combination of Sinking & Sourcing Inputs



Combinations of sourcing and sinking inputs can be accommodated at the same voltage level. Be aware of the input impedance of the sourcing input module, and make sure that there is enough current flowing through the input module while in parallel with the OUT-P pull-up resistor.

Connection to an Inductive Load (active low)



Use an external diode when driving inductive loads. Connect the diode in parallel to the inductive load, attaching the anode to the 6200 output and the cathode to the supply voltage of the inductive load, via an external resistor. To size the external resistor, use this formula:

$$\frac{V_{CC}}{R_{EXTERNAL} + R_{INDUCTANCE}} \leq 30mA$$

PROGRAMMING TIP

Connecting to an active-high sinking input? Set the output's active level to high with the OUTLVL command (1 = active high).

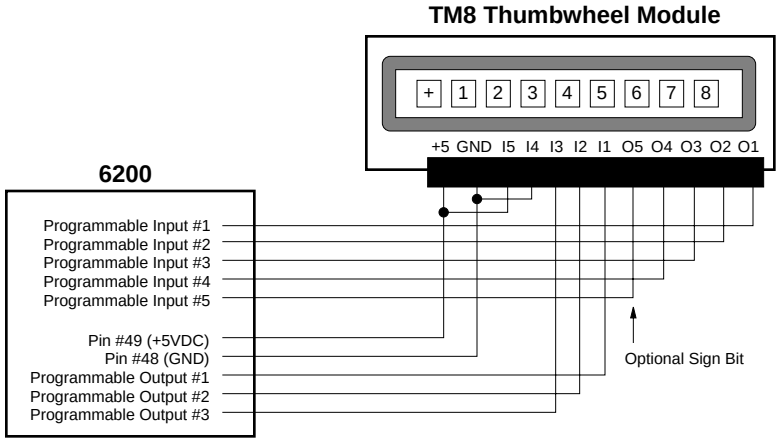
Connecting to an active-low sourcing input? Set the output's active level to low with the OUTLVL command (Ø = active low).

Thus, when the 6200's output is activated, current will flow through the attached input and the TOUT status command will report a "1" (indicates that the output is active), regardless of the type of input that is connected.

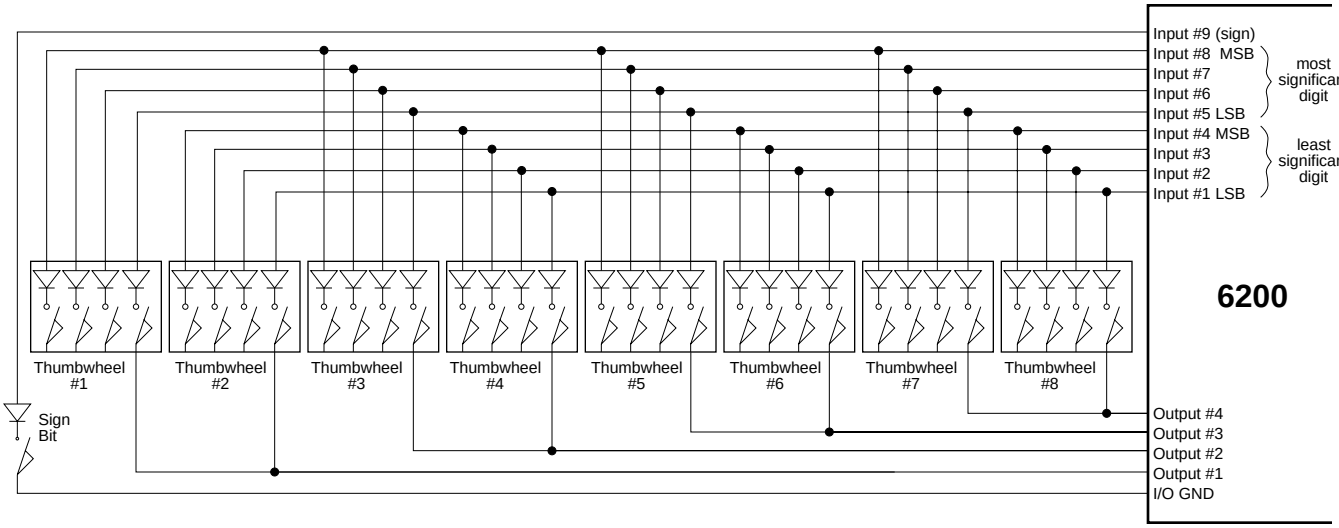
Details on setting the active level and checking the output status are provided in the *6000 Series Programmer's Guide*. Refer also to the OUTLVL and TOUT command descriptions in the *6000 Series Software Reference*.

THUMBWHEEL CONNECTIONS — *for entering BCD data*

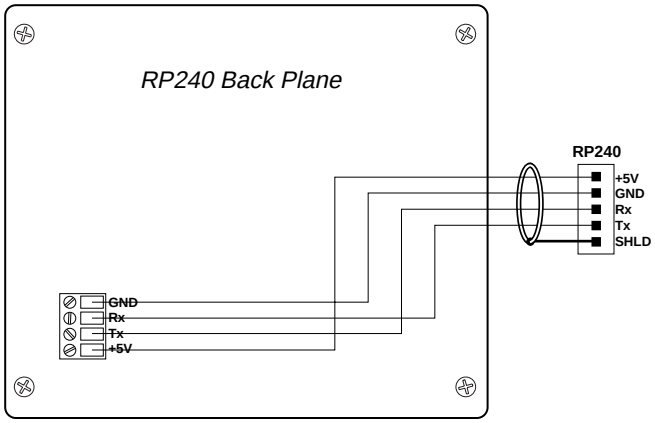
Connection to the Compumotor TM8 Module



Connection to your own Thumbwheel Module



RP240 Remote Operator Panel

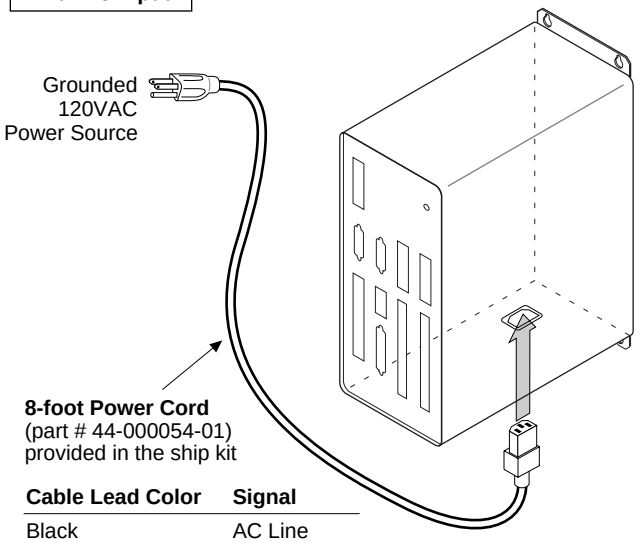


Input Power

WARNING: The 6200's SHLD terminals are grounded through the AC power connector ground pin. You must provide a proper AC power ground for safety purposes.

AC Input — 110-240VAC (±10%) single-phase, 50/60Hz, 0.6A @ 120VAC

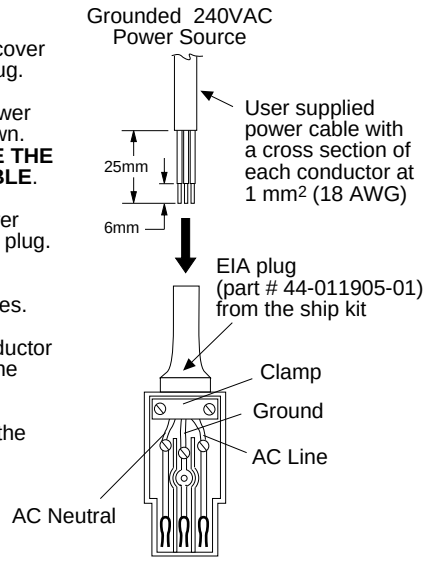
120VAC Input



Cable Lead Color	Signal
Black	AC Line
White	AC Neutral
Green	Earth Ground

240VAC Input

1. Remove the cover on the EIA plug.
2. Build your power cable as shown. **DO NOT USE THE 120VAC CABLE**.
3. Slide the power cable into the plug.
4. Connect the conductor wires.
5. Lock the conductor wires under the clamp.
6. Reassemble the plug.

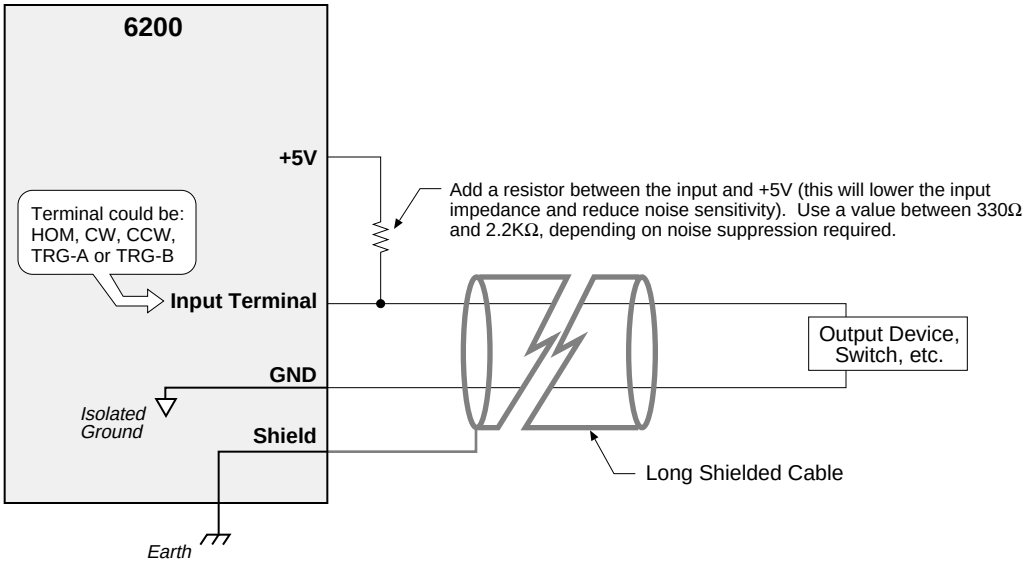


Lengthening I/O Cables

Bear in mind that lengthening cables increases noise sensitivity. (The maximum length of cables is ultimately determined by the environment in which the equipment will be used.) If you lengthen the cables, follow the precautions below to minimize noise problems.

- Use a minimum wire size of 22 AWG.
- Use twisted pair shielded cables and connect the shield to a **SHLD** terminal on the 6200. Leave the other end of the shield disconnected.
- Do not route I/O signals in the same conduit or wiring trays as high-voltage AC wiring or motor cables.

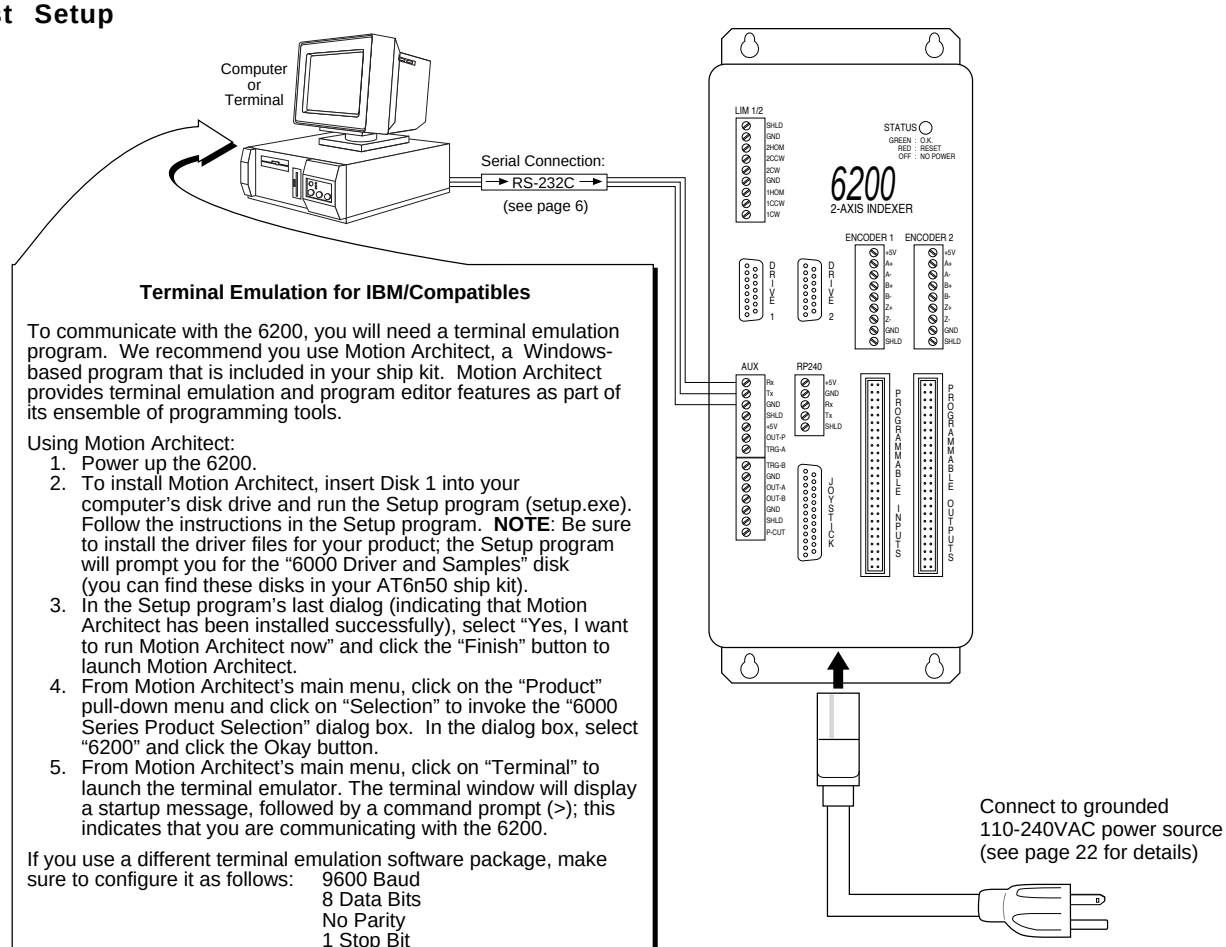
Reducing noise on limit inputs (HOM, CW, & CCW) and trigger inputs (TRG-A and TRG-B). If you are experiencing noise problems, try adding resistors to reduce noise sensitivity (see illustration below).



⚠ WARNING ⚠

This test procedure allows you to control I/O and produce motion. Make sure that exercising the I/O will not damage equipment or injure personnel. We recommend that you perform these tests with the motor uncoupled from the load; however, if you leave the motor coupled to the load, make sure that you can move the load without damaging equipment or injuring personnel (and be ready to use the **P-CUT** emergency stop switch or the <ctrl>K command to stop motion in a moment's notice).

Test Setup



Terminal Emulation for IBM/Compatibles

To communicate with the 6200, you will need a terminal emulation program. We recommend you use Motion Architect, a Windows-based program that is included in your ship kit. Motion Architect provides terminal emulation and program editor features as part of its ensemble of programming tools.

Using Motion Architect:

1. Power up the 6200.
2. To install Motion Architect, insert Disk 1 into your computer's disk drive and run the Setup program (setup.exe). Follow the instructions in the Setup program. **NOTE**: Be sure to install the driver files for your product; the Setup program will prompt you for the "6000 Driver and Samples" disk (you can find these disks in your AT6n50 ship kit).
3. In the Setup program's last dialog (indicating that Motion Architect has been installed successfully), select "Yes, I want to run Motion Architect now" and click the "Finish" button to launch Motion Architect.
4. From Motion Architect's main menu, click on the "Product" pull-down menu and click on "Selection" to invoke the "6000 Series Product Selection" dialog box. In the dialog box, select "6200" and click the Okay button.
5. From Motion Architect's main menu, click on "Terminal" to launch the terminal emulator. The terminal window will display a startup message, followed by a command prompt (>); this indicates that you are communicating with the 6200.

If you use a different terminal emulation software package, make sure to configure it as follows:

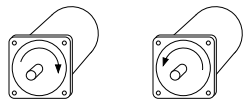
9600 Baud
8 Data Bits
No Parity
1 Stop Bit
Full Duplex
Enable XON/XOFF

Having serial communication problems?
Refer to page 26 for help.

NOTE

The test procedures below are based on the factory-default active levels for the 6200's inputs and outputs. Verify these settings with the following *status* commands:

Command Entered	Response Should Be
INLVL	*INLVLØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØ
HOMLVL	*HOMLVLØØ
LHLVL	*LHLVLØØØØ
OUTLVL	*OUTLVLØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØ

Connections	Test Procedure	Response Format (left to right)
End-of-travel and Home Limits	**NOTE**: If you are not using end-of-travel limits, issue the Disable Limits (LHØ,Ø) command and ignore the first two bits in each response field. 1. Enable the hardware end-of-travel limits with the LH3,3 command. 2. Close the end-of-travel switches and open the home switches. 3. Enter the TLIM command. The response should be *TLIM11Ø_11Ø. 4. Open the end-of-travel switches and close the home switches. 5. Enter the TLIM command. The response should be *TLIMØØ1_Ø01. 6. Close the end-of-travel switches and open the home switches (return to original config.). 7. Enter the TLIM command. The response should be *TLIM11Ø_11Ø.	TLIM response: bit 1 = Axis 1 CW limit bit 2 = Axis 1 CCW limit bit 3 = Axis 1 HOM limit bit 4 = Axis 2 CW limit bit 5 = Axis 2 CCW limit bit 6 = Axis 2 HOM limit "CW" means positive travel. "CCW" means negative travel. "HOM" means home.
Motor and Encoder (motion)	1. Enter the ENCØØ command to enable the motor step mode for both axes. Enter the PSETØ,Ø command to set the motor position to zero on both axes. Enter the TPM command to report the motor positions. The response should be *TPM+Ø,+Ø (motors are both at position zero). Enter the D25ØØØ,25ØØØ command, followed by the GO command. The motors will move one rev (25000 steps) in the clockwise direction (viewed from the flange end). Enter the TPM command to report the motor positions. The response should be *TPM+25ØØØ,+25ØØØ (motors are both at position 25000). 2. **NOTE:** Ignore this step if you are <u>not</u> using encoder feedback. This test assumes you are using a 1000-line encoder yielding a 4000 count/rev resolution. Enter the ENC11 command to enable the encoder step mode on both axes. Enter the PSETØ,Ø command to set the encoder position to zero on both axes. Enter the TPE command to report the encoder positions. The response should be *TPE+Ø,+Ø (encoders are both at position zero). **If the encoders are coupled to the motor shafts:** Enter the D4ØØØ,4ØØØ command, followed by the GO command. The encoders (and motors) will move one revolution (4000 counts) in the clockwise direction (viewed from the flange end). **If the encoders are <u>not</u> coupled to the motor shafts:** Manually rotate the encoder shafts one revolution in the clockwise direction (viewed from the flange end). Enter the TPE command to report the encoder positions. The response should be *TPE+4ØØØ,+4ØØØ (encoders are at position 4000). Enter the ENCØØ command to return the 6200 to the default motor step mode.	TPM response (motor counts): ±motor1, ±motor2 TPE response (encoder counts): ±encoder1, ±encoder1 Direction of rotation:  Clockwise (positive counts) Counter-clockwise (negative counts)
Programmable Inputs (incl. triggers)	1. Open the input switches or turn off the device driving the inputs. 2. Enter the TIN command. The response should be *TINØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØ. 3. Close the input switches or turn on the device driving the inputs. 4. Enter the TIN command. The response should be *TIN1111_1111_1111_1111_1111_1111_11.	TIN response: bits 1-24 = prog. inputs 1-24 bits 25-26 = TRG-A and TRG-B
Programmable Outputs (incl. OUT-A and OUT-B)	1. Enter the OUTALL1,26,1 command to turn on (sink current on) all programmable outputs. Verify that the device(s) connected to the outputs activated properly. 2. Enter the TOUT command. The response should be *TOUT1111_1111_1111_1111_1111_1111_11. 3. Enter the OUTALL1,26,Ø command to turn off all programmable outputs. Verify that the device(s) connected to the outputs de-activated properly. 4. Enter the TOUT command. The response should be *TOUTØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØØØ_ØØ.	TOUT response: bits 1-24 = prog. outputs 1-24 bits 25-26 = OUT-A and OUT-B

RP240	1. Cycle power to the 6200.
	2. If the RP240 is connected properly, the RP240's status LED should be green and one of the lines on the computer or terminal display should read *RP24Ø CONNECTED.
	If the RP240's status LED is off, check to make sure the +5V connection is secure.
	If the RP240's status LED is green, but the message on the terminal reads *NO REMOTE PANEL, the RP240 Rx and Tx lines are probably switched. Remove power and correct.
	3. Assuming you have not written a program to manipulate the RP240 display, the RP240 screen should display the following:
	`COMPUMOTOR 6200 INDEXER`
	`RUN JOG STATUS DISPLAY ETC`	

Pulse Cutoff and Joystick Inputs	1. Open the pulse cutoff input (P-CUT) switch, and open the joystick input switches or turn off the device driving the joystick inputs. 2. Enter the TINO command. The response should be *TINOØØØØ_ØØØØ. 3. Close the P-CUT switch, and close the joystick input switches or turn on the device driving the inputs. 4. Enter the TINO command. The response should be *TINO1111_11ØØ.	TINO response: bit 1 = joystick auxiliary bit 2 = joystick trigger bit 3 = joystick axes select bit 4 = joystick velocity select bit 5 = joystick release bit 6 = Pulse cutoff (P-CUT) input bits 7 & 8 are not used

What's Next?

By now, you should have completed the following tasks, as instructed earlier in this chapter:

1. Review the general specifications — see page 3.
2. Perform configuration/adjustments (if necessary) — see page 4.
3. Mount the 6200 — see page 5.
4. Connect all electrical system components — see pages 6-19
   EMC installation guidelines are provided in Appendix B.
5. Test the installation — see pages 20-21.

Program Your Motion Control Functions

You should now be ready to program your 6200 for your application. Knowing your system's motion control requirements, refer now to the *6000 Series Programmer's Guide* for descriptions of the 6200's software features and instructions on how to implement them in your application. Be sure to keep the *6000 Series Software Reference* at hand as a reference for the 6000 Series command descriptions.

For assistance with your programming effort, we recommend that you use the programming tools provided in Motion Architect for Windows. Additional powerful programming and product interface tools are available (see below).

Motion Architect

Motion Architect® is a Microsoft® Windows™ based 6000 product programming tool that provides these features:

- **System configurator and code generator**: Automatically generate controller code for basic system set-up parameters (I/O definitions, feedback device operations, etc.).
- **Program editor**: Create blocks or lines of 6000 controller code, or copy portions of code from previous files. You can save program editor files for later use in BASIC, C, etc., or in the terminal emulator or test panel.
- **Terminal emulator**: Communicating directly with the 6200, you can type in and execute controller code, transfer code files to and from the 6200.
- **Test panel and program tester**: You can create your own test panel to run your programs and check the activity of I/O, motion, system status, etc. This can be invaluable during start-ups and when fine tuning machine performance.
- **On-line context-sensitive help and technical references**: These on-line resources provide help information about Motion Architect, as well as access to hypertext versions of the *6000 Series Software Reference* and the *6000 Series Programmer's Guide.*

Other Software Tools Available

To Order these software packages, contact your local Automation Technology Center (ATC) or distributor.

Motion Builder™. A Windows-based iconic programming interface that removes the requirement to learn the 6000 programming language.

CompuCAM™. A CAD-to-Motion (CAM) program that allows you to easily translate DXF, HP-GL, and G-Code files into 6000 Series Language motion programs. Windows environment.

DDE6000™. Facilitates data exchange between the 6200 and Windows™ applications that support the dynamic data exchange (DDE) protocol. NetDDE™ compatible.

Motion Toolbox™. A library of LabVIEW® virtual instruments (VIs) for programming and monitoring the 6200. Available for the Windows environment.

CHAPTER TWO

2 Troubleshooting

IN THIS CHAPTER

• Troubleshooting basics:
  - Reducing electrical noise
  - Diagnostic LED
  - Test options
  - Technical support
• Solutions to common problems
• Resolving serial communication problems
• Product return procedure

Troubleshooting Basics

When your system does not function properly (or as you expect it to operate), the first thing that you must do is identify and isolate the problem. When you have accomplished this, you can effectively begin to resolve the problem.

The first step is to isolate each system component and ensure that each component functions properly when it is run independently. You may have to dismantle your system and put it back together piece by piece to detect the problem. If you have additional units available, you may want to exchange them with existing components in your system to help identify the source of the problem.

Determine if the problem is mechanical, electrical, or software-related. Can you repeat or re-create the problem? Random events may appear to be related, but they are not necessarily contributing factors to your problem. You may be experiencing more than one problem. You must isolate and solve one problem at a time.

Log (document) all testing and problem isolation procedures. You may need to review and consult these notes later. This will also prevent you from duplicating your testing efforts.

Once you isolate the problem, refer to the problem solutions contained in this chapter. If the problem persists, contact your local technical support resource (see *Technical Support* below).

Reducing Electrical Noise

Refer to the guidelines on page 19. Appendix B (page 31) provides guidelines on how to install the 6200 in a manner most likely to minimize the 6200's emissions and to maximize the 6200's immunity to externally generated electromagnetic interference.

Diagnostic ("STATUS") LED

GREEN.....AC input power supply is connected.
RED.....Power reset is required.
OFF.....No power.

Test Options

- **Hardware Test Procedure** (see pages 20-21).
- **Test Panel**. Motion Architect's Panel Module allows you to set up displays for testing system I/O and operating parameters.
- **Motion Test**. A test program is available to verify that the 6200 is sending pulses to the drive and that the drive and motor are functioning properly. The test program can be initiated by issuing the TEST command over the serial interface, or by accessing the RP240 TEST menu (see *6000 Series Programmer's Guide* for RP240 menu structure).

  After you enter the TEST command, axis 1 moves one rev in the "positive" direction (clockwise as you face the motor flange) at one rev per second, and then one rev in the "negative" direction (counter-clockwise) at the same velocity, coming to rest at the original starting position. Axis 2 then repeats the same pair of moves as axis 1. (The distance and velocity will be different if your drive's resolution is not 25,000 steps/rev.)

  WARNING

  The TEST program causes the end-of-travel limits to be ignored. If necessary, disconnect the load to ensure the test moves do not damage your equipment or injure personnel.

Technical Support

If you cannot solve your system problems using this documentation, contact your local Automation Technology Center (ATC) or distributor for assistance. If you need to talk to our in-house application engineers (or use our web site, email, BBS, or FaxBack resources), please contact us at the numbers listed on the inside cover of this manual. (These numbers are also provided when you issue the HELP command.)

Common Problems & Solutions

NOTE

Some software-related causes are provided because it is sometimes difficult to identify a problem as either hardware or software related.

Problem	Cause	Solution
Communication (serial) not operative, or receive garbled characters.	1. Improper interface connections or communication protocol. 2. Serial communication is disabled. 3. In a daisy chain, the unit may not be set to proper address.	1. See *Troubleshooting Serial Communication* section below. 2. Enable serial communication with the E1 command. 3. Verify DIP switch settings (see page 4), or proper use of ADDR command.
Direction is reversed.	1. Direction connections to the drive are reversed. 2. Phase of encoder reversed (reported TPE direction is reversed).	1.a. Software remedy: You can use the CMDDIR1 command to reverse the polarity of both the commanded direction and the polarity of the encoder counts). 1.b. Hardware remedy: Switch DIR- with the DIR+ connection to the drive (if your drive does not accept differential outputs this will not work). You will also have to change the feedback device wiring or mounting so that it counts in same direction as the commanded direction. 2.a. Software remedy: For the affected axis, issue the encoder feedback polarity reversal command (ENCPOL1). 2.b. Hardware remedy: Swap the A+ and A- connections to the 6200.
Distance, velocity, and accel are incorrect as programmed.	1. Incorrect resolution setting. 2. Pulse width too narrow.	1.a. Use the DRES command to configure the 6200 to match the resolution of the drive (usually set with DIP switches). The 6200's default drive resolution for both axes is set to 25,000 steps/rev (DRES25000,25000). 1.b. If using encoder feedback, match the ERES command setting (default ERES setting is 4,000 counts/rev for both axes: ERES4000,4000) to the post-quadrature resolution of the encoder. ERES values for Compumotor encoders: E Series Encoders: ERES4000 OS motor with -HJ encoder (OSxxx-xxx-HJ): ERES2048 OS motor with -RE encoder (OSxxx-xxx-RE): ERES4000 OS motor with -RC encoder (OSxxx-xxx-RC): ERES4000 RS motor with -EC encoder (RSxxx-xxx-EC): ERES4000 OEM Series Encoders: 83 size: ERES4000 57 size: ERES2048 2. Set the pulse width to the drive specifications using the PULSE command (default pulse width setting is 0.3 µs).
Encoder counts missing.	1. Improper wiring. 2. Encoder slipping. 3. Encoder too hot. 4. Electrical noise. 5. Encoder frequency too high.	1. Check wiring. 2. Check and tighten encoder coupling. 3. Reduce encoder temperature with heatsink, thermal insulator, etc. 4.a. Shield wiring. 4.b. Use encoder with differential outputs. 5. Peak encoder frequency must be below 1.6MHz post-quadrature. Peak frequency must account for velocity ripple.
Erratic operation.	1. Electrical noise and/or improper shielding. 2. Improper wiring.	1.a. Reduce electrical noise or move 6200 away from noise source. 1.b. Refer to *Reducing Electrical Noise* on page 24. 2. Check wiring for opens, shorts, & mis-wired connections.
Joystick Mode: motor does not move.	1. Joystick Release input not grounded. 2. Improper wiring.	1. Ground the Joystick Release input. 2. Check wiring for opens, shorts, and mis-wired connections.
LEDs	See *Diagnostic LED* above (page 24)	
Motion does not occur.	1. Check "STATUS" LED. 2. End-of-travel limits are active. 3. P-CUT (pulse cut) input not grounded. 4. Drive fault detected. 5. Improper wiring. 6. Load is jammed. 7. No torque from motor. 8. Step pulse width is too narrow for the drive to recognize.	1. See *Diagnostic LED* above. 2.a. Hardware limit switches: Move the load off of the limits or disable the limits with the LH0,0 command. 2.b. Software limits: Set LSPOS to a value greater than LSNEG. 3. Ground the P-CUT connection. 4.a. Check status with TASXF command (see bit #4). 4.b. Verify correct drive fault level setting (DRFLVL command value). 5. Check command (CMD), shutdown (SHTNC or SHTNO), drive fault (DFT), and end-of-travel limit connections. 6. Remove power and clear jam. 7. See problem: *Torque, loss of*. 8. Set the pulse width to the drive specifications using the PULSE command (default pulse width setting is 0.3 µs).
Motor creeps at slow velocity in encoder mode.	1. Encoder direction opposite of motor direction. 2. Encoder connected to wrong axis.	1. Switch encoder connections A+ & A- with B+ & B-. 2. Check encoder wiring.

Problem/Cause/Solution Table *(continued)*

Problem	Cause	Solution
Programmable inputs not working.	1. Inputs are incorrectly configured for sinking or sourcing (jumper JU2). 2. Improper wiring.	1. If you need all 24 inputs to be sourcing current (pulled up the internal +5V supply), make sure internal jumper JU2 is set to position 2/3 (this is the factory default setting). If you need all 24 inputs to be sinking current, make sure internal jumper JU2 is set to position 1/2. Instructions for accessing JU2 are provided on page 4. 2. Check wiring for opens, shorts, and mis-wired connections.
Programmable outputs not working.	1. Output connected such that it must source current (pull to positive voltage). 2. OUT-P not connected to power source. 3. If external power supply is used, the grounds must be connected together. 4. Improper wiring.	1. Outputs are open-collector and can only sink current -- change wiring. 2. Connect OUT-P to the +5V terminal or to an external supply of up to 24V (not to both). 3. Connect the external power supply's ground to the 6200's ground (GND). 4. Check wiring for opens, shorts, and mis-wired connections.
Torque, loss of.	1. Improper wiring. 2. No power (STATUS LED off). 3. Drive failed. 4. Drive shutdown.	1. Check wiring to the motor, as well as other system wiring. 2. Check power connection (STATUS LED should be green). 3.a. Check the drive fault TASXF report (see bit #4). 3.b. Check the drive condition. 4. Enable drive(s) with the DRIVE11 command.
Trigger, home, end-of-travel, or P-CUT inputs not working.	1. Improper wiring.	1. Check wiring for opens, shorts, and mis-wired connections.

Troubleshooting Serial Communication Problems

General Notes

- Power up your computer or terminal *BEFORE* you power up the 6200.
- Make sure the serial interface is connected as instructed on page 7. Shield the cable to earth ground at one end only. The maximum RS-232 cable length is 50 feet (15.25 meters).
- RS-232: Handshaking must be disabled. Most software packages allow you to do this. You can also disable handshaking by jumpering some terminals on the computer's/ terminal's serial port: connect RTS to CTS (usually pins 4 and 5) and connect DSR to DTR (usually pins 6 and 20).

Test the Interface

1. Power up the computer or terminal and launch the terminal emulator.
2. Power up the 6200. A power-up message (similar to the following) should be displayed, followed by a prompt (>):

```
*PARKER COMPUMOTOR 6200 - 2 AXIS STEPPER CONTROLLER
*RP240 CONNECTED

>
```

3. Type "TREV" and press the ENTER key. (The TREV command reports the software revision.) The screen should now look like the following (if not, see Problem/Remedy table below).

```
*PARKER COMPUMOTOR 6200 - 2 AXIS STEPPER CONTROLLER
*RP240 CONNECTED

>TREV
*TREV92-012222-02-4.7 6200
```

Problem	Remedy (based on the possible causes)
No Response	• COM port not enabled for 6000 language communication. Issue the "PORT1" command and then the "DRPCHKØ" command. • Echo may be disabled; enable with the ECHO1 command. • Faulty wiring. See instructions on page 7. Also check for shorts or opens. • Is the cable or computer/terminal bad? Here's a test: 1. Disconnect the serial cable from the 6200 end only. 2. Connect the cable's Rx and Tx lines together (this echoes the characters back to the host). 3. Issue the TREV command. If nothing happens, the cable or computer/terminal may be faulty. • The controller may be executing a program. Issue the !K command or the <ctrl>K command to kill the program.
Garbled Characters	• Verify setup: 9600 baud (range is 9600-1200—see *AutoBaud*, page 4), 8 data bits, 1 stop bit, no parity; Full duplex. • Faulty wiring. See instructions on page 7. Also check for shorts or opens.
Double Characters	• Your terminal emulator is set to half-duplex; set it to full-duplex.

Product Return Procedure

Step 1 Obtain the serial number and the model number of the defective unit, and secure a purchase order number to cover repair costs in the event the unit is determined by the manufacturers to be out of warranty.

Step 2 Before you return the unit, have someone from your organization with a technical understanding of the 6200 system and its application include answers to the following questions:

- What is the extent of the failure/reason for return?
- How long did it operate?
- Did any other items fail at the same time?
- What was happening when the unit failed (e.g., installing the unit, cycling power, starting other equipment, etc.)?
- How was the product configured (in detail)?
- Which, if any, cables were modified and how?
- With what equipment is the unit interfaced?
- What was the application?
- What was the system environment (temperature, enclosure, spacing, contaminants, etc.)?
- What upgrades, if any, are required (hardware, software, user guide)?

Step 3 Call for return authorization. Refer to the *Technical Assistance* phone numbers provided on the inside front cover of this document. The support personnel will also provide shipping guidelines.

Appendix A

LVD Installation Instructions

When installed according to the procedures in the main body of this installation guide (pages 2-21), the 6200 may not necessarily comply with the Low Voltage Directive (LVD). To install the 6200 so that it is LVD compliant, following the instructions provided in this appendix. If you do not follow these instructions, the protection of the 6200 may be impaired.

For more information about the Low Voltage Directive (LVD), see 73/23/EEC and 93/68/EEC, published by the European Economic Community (EEC).

Environmental Conditions

Pollution Degree: The 6200 is designed for pollution degree 2.

Installation Category: The 6200 is designed for installation category II.

Electrical

Connecting & Disconnecting Power Mains

The 6200's protective earth connection is provided through its make-first/break-last earth terminal on the power mains connector. You must reliably earth the 6200's protective earth connection. Attach or remove the 6200's power plug only while input power is OFF.

Changing Power Cords

You must provide a LVD-approved 240V AC power cord if your 6200 is to be operated from a 240VAC power mains. Power supplies in the 6200 are rated for operation at both 120V and 240V, nominal. The 6200 is shipped with a standard 120V UL-rated cord, because it is not feasible to accommodated the variety of power mains connector configurations found in the European Community. Compumotor provides in the ship kit a mating connector for 6200 AC input power connector which can be attached to your LVD-approved 240V AC power cord.

⚠ **WARNING** — Do not modify the 120V AC power cord shipped with the 6200 for use with 240V AC power mains. This will violate the LVD stipulations regarding the use of properly rated parts.

Mechanical

Installing in an Enclosure: The 6200 must be installed within an enclosure. The enclosure's interior must not be accessible to the operator. The enclosure should be opened only by skilled or trained service personnel.

Servicing the 6200

Changing Firmware: Only skilled or trained personnel should change firmware.

Changing Batteries: The 6200 contains a replaceable lithium battery, of type Duracell DL2450, or Sanyo CR2450, or equivalent. Only skilled or trained personnel should change batteries. Dispose of batteries in accordance with local regulations.

Do Not Replace Fuses: The 6200 has no fuses designed to be replaced by the user. Fuse failure indicates that other components have also failed. Fuses and other components should only be replaced by Compumotor or its designated repair facilities.

Table of Symbols & Warnings

The following symbols may appear in this manual, and may be affixed to the products discussed in this manual.

Symbol	Description
	Earth Terminal
	Protective Conductor Terminal
	Frame or ChassisTerminal
	Equipotentiality
	Caution, Risk of Electric Shock
	Caution, Refer to Accompanying Text
	Hot Surface
	Recycle Battery

Appendix B

EMC Installation Guidelines

General Product Philosophy

The 6200 was not designed originally for EMC compliance. Therefore, it will require specific measures to be taken during installation. The ultimate responsibility for ensuring that the EMC requirements are met rests with the systems builder.

It is important to remember that for specific installations, the full protection requirements of the EMC Directive 89/336/EEC need to be met before the system is put into service. This must be verified either by inspection or by testing. The following EMC installation instructions are intended to assist in ensuring that the requirements of the EMC directive are met. It may be necessary to take additional measures in certain circumstances and at specific locations.

It should be stressed that although these recommendations are based on expertise acquired during tests carried out on the 6200, it is impossible for Compumotor to guarantee the compliance of any particular installation. This will be strongly influenced by the physical and electrical details of the installation and the performance of other system components. Nevertheless, it is important to follow ***all*** the installation instructions if an adequate level of compliance is to be achieved.

Safety Considerations

The 6200 is intended for installation according to the appropriate safety procedures including those laid down by the local supply authority regulations. The recommendations provided are based on the requirements of the Low Voltage Directive and specifically on EN60204. It should be remembered that safety must never be compromised for the purpose of achieving EMC compliance. Therefore, in the event of a conflict occurring between the safety regulations and the following recommendations, ***the safety regulations always take precedence.***

Ferrite Absorbers and P-Clips

Ferrite Absorber Specifications

The absorbers described in these installation recommendations are made from a low-grade ferrite material which has high losses at radio frequencies. They therefore act like a high impedance in this waveband.

The recommended components are produced by Parker Chomerics (617-935-4850) and are suitable for use with cable having an outside diameter up to 10-13mm. The specification is as follows:

Chomerics part #	83-10-M248-1000	83-10-A637-1000
Outside diameter	17.5mm	28.5mm
Inside diameter	10.7mm	13.77mm
Length	28.5mm	28.57mm
Impedance at 25MHz	80Ω	135Ω
Impedance at 100MHz	120Ω	210Ω
Curie temperature	130°C	130°C

(*the device should not be operated near this temperature*)

Handling & Installing Ferrite Absorbers

Take care when handling the absorbers—they can shatter if dropped on a hard surface. For this reason the suggested method of installation is to use a short length of 19mm diameter heat-shrink sleeving (see Figure 1). This gives a degree of physical protection while the cable is being installed. The sleeving should have a shrink ratio of at least 2.5:1. Cable ties may be used as an alternative, however they give no physical protection to the absorber.

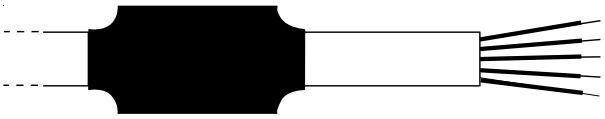


Figure 1. Ferrite Sleeve Installation

P-Clip Installation Details

The function of the P-clip is to provide a 360-degree metallic contact and thus a convenient means of ensuring a proper R.F. ground. When dealing with EMI issues, it is important to remember that continuity, a DC connection, does not at all speak to the integrity of an AC (high-frequency) connection. High-Frequency bonding typically involves wide, flat cabling to establish a suitable system ground. When applied properly, the P-clip has been shown to give an adequate high-frequency contact.

When installing a P-clip (see Figure 2), install as close to the cable end as possible, provided a suitable ground, backplane, earth stud or bus bar is accessible, (this may mean removing the paint from a cabinet or panel). Remove only the outer (vinyl) jacket of the braided screen

cable (this allows the braid to continue to the cable connector), be careful not to damage the braid. Snap the P-clip over the exposed braid, and adjust for a tight fit. Secure the clip to the designated ground with a machine screw and lock washer. The use of brass or other inert conductive metal P-clip is recommended. Cover any exposed bare metal with petroleum jelly to resist corrosion.

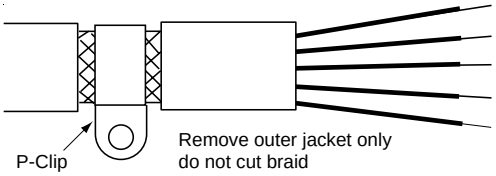


Figure 2. P-Clip Installation

Installation

External Enclosure

Introduction

The measures described in this section are primarily for the purpose of controlling conducted emissions. To control radiated emissions, all drive and control systems must be installed in a steel equipment cabinet which will give adequate screening against radiated emissions. This external enclosure is also required for safety reasons. There must be no user access while the equipment is operating. This is usually achieved by fitting an isolator switch to the door assembly.

To achieve adequate screening of radiated emissions, all panels of the enclosure must be bonded to a central earth point. The enclosure may also contain other equipment and the EMC requirements of these must be considered during installation. Always ensure that drives and controllers are mounted in such a way that there is adequate ventilation.

Preparing the 6200: The 6200 must be mounted to a conductive panel. Before mounting the 6200, remove the paint from the rear face of the mounting hole that will be closest to the input filter location as shown in Figure 3 below, and if necessary from the corresponding area on the rear panel of the enclosure. This is to guarantee a good high-frequency connection between the drive case and the cabinet. After mounting the unit use petroleum jelly on the exposed metal to minimize the risk of future corrosion.

Filtering the AC Supply

Introduction

These recommendations are based on the use of proprietary screen filter units which are readily available. However, the full EMC test includes a simulated lightning strike which will damage the filter unless adequate surge suppression devices are fitted. These are not normally incorporated into commercial filters since the lightning strike test can be destructive. This test is normally carried out on the overall system and not on individual components; therefore, the surge protection should be provided at the system boundary.

The 6200 incorporates a switch-mode power supply operating directly from the AC input. The substantial filtering effect of a mains isolation transformer is therefore not available, and additional external filtering is required. The solution offered uses a single filter to control both differential and common-mode emissions. The manufacturer's part numbers for suitable filters are:

Corcom 3EB1	**Schaffner FN610-3/06**
Corcom World Headquarters	Schaffner EMC Inc.
Phone: 847-680-7400	Phone: 201-379-7778
Fax: 847-680-8169	Fax: 201-379-1151

Mount the filter within 2 inches (50mm) of the 6200 as shown in Figure 3 below. Ensure that there is no paint on the mounting panel under the filter mounting lugs—it is vital that there is good large-area contact between the filter and the panel.

Connect the incoming AC supply cable to the push-on terminals on the filter, with the earth lead connected to a local earth stud, bus bar or metal back-plane. Route the supply cable so that it runs close to the walls of the enclosure. Connect the earth terminal on the filter case to the earth stud.

Fit a ferrite absorber over the cable before wiring the filter output terminals to the AC input on the drive. Locate the absorber as close as possible to the drive using heat-shrink sleeving (see Figure 1 above). Take the 6200 earth connection from the same stud that retains the filter case earth, as shown in Figure 3 below.

Control Signal Connections

High-quality braided screen cable should be used for control connections. In the case of differential outputs (such as step & direction), it is preferable to use a cable with twisted pairs to minimize magnetic coupling. A connection is made to the cable screen at the controller end by exposing a short length of the braided screen and anchoring this to earth using a P-clip (see Figure 2). Fit a ferrite absorber close to the I/O connector and run the cable down to the mounting panel as shown in Figure 3.

The level at which the I/O operates means that the signals are unlikely to meet EMC immunity requirements if taken outside the enclosure without proper screening.

50-Pin Ribbon Cable: It is recommended when using the 50-Pin Ribbon Cable I/O found on the 6200 that a terminal break-out box such as the VM50 be used (see Figure 3). Mount the VM50 close to the 6200, keeping the ribbon cable as short as possible. Bundle any excess ribbon cable and secure close to a panel wall. Individual I/O points will require the use of individually shielded cable runs, with braids bonded to the panel (close to VM50) with a P-clip.

Communications: In applications that require serial communications with the 6200, take special care to use proper wiring practices. Use good quality braided screen cable for the communication cabling. No connection is made to the cable screen at the 6200 itself. Fit a ferrite absorber close to the communications connector and run the

cable down to the mounting panel as shown in Figure 3. Expose a short length of the braided screen and anchor to the panel with a P-clip. Avoid routing communication cables near high power lines and sources of high energy impulses.

Remember to route control signal connections well away (at least 8 inches) from relays and contactors. Control wiring should not be laid parallel to power or motor cables and should only cross the path of these cables at right angles. Bear in mind that control cables connected to other equipment within the enclosure may interfere with the controller, particularly if they have come from outside the cabinet. Take particular care when connecting external equipment (e.g., a computer or terminal) with the cabinet door open; static discharge may cause damage to unprotected inputs.

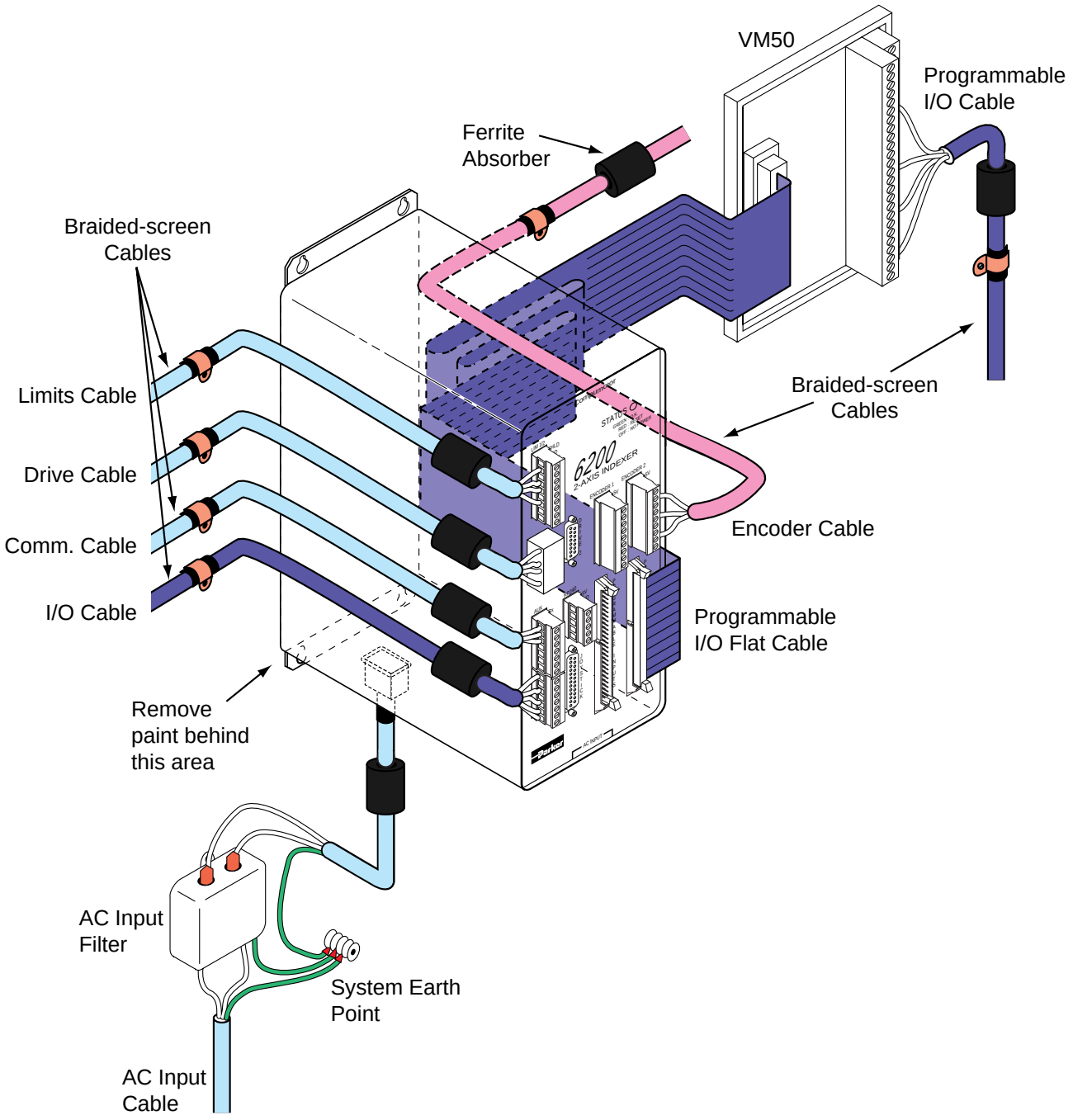


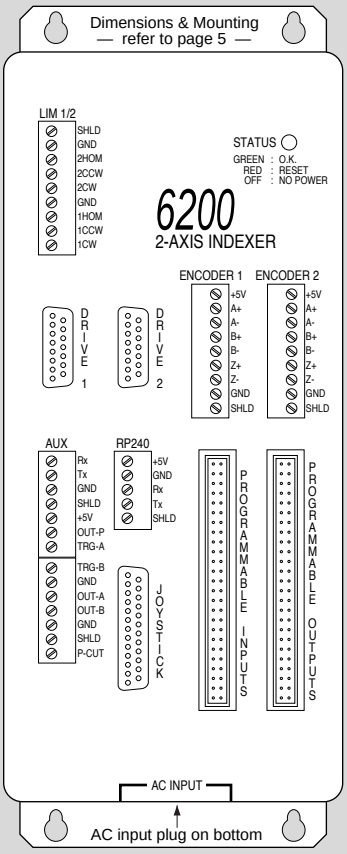
Figure 3. EMC Connections for 6200

I N D E X

6200 2-Axis Indexer

Parker Automation

Connections *See also pages 6-21*



OTHER PIN OUTS

PROGRAMMABLE INPUTS

Pin	Function
49	+5VDC
47	Input #1 (LSB)
45	Input #2
43	Input #3
41	Input #4
39	Input #5
37	Input #6
35	Input #7
33	Input #8
31	Input #9
29	Input #10
27	Input #11
25	Input #12
23	Input #13
21	Input #14
19	Input #15
17	Input #16
15	Input #17
13	Input #18
11	Input #19
9	Input #20
7	Input #21
5	Input #22
3	Input #23
1	Input #24 (MSB)

PROGRAMMABLE OUTPUTS

Pin	Function
49	+5VDC
47	Output #1 (LSB)
45	Output #2
43	Output #3
41	Output #4
39	Output #5
37	Output #6
35	Output #7
33	Output #8
31	Output #9
29	Output #10
27	Output #11
25	Output #12
23	Output #13
21	Output #14
19	Output #15
17	Output #16
15	Output #17
13	Output #18
11	Output #19
9	Output #20
7	Output #21
5	Output #22
3	Output #23
1	Output #24 (MSB)

Even numbered pins are connected to logic ground.
MSB = Most Significant Bit; LSB = Least Significant Bit

DRIVE

Pin	Function
1	Step +
2	Direction +
4	In-Position
5	Drive Fault
7	+5VDC Output
8	Shield (chassis gnd)
9	Step Return (–)
10	Direction Return (–)
11	Shutdown +
12	Shutdown Return (–)
13	Isolated Ground
14	Isolated Ground

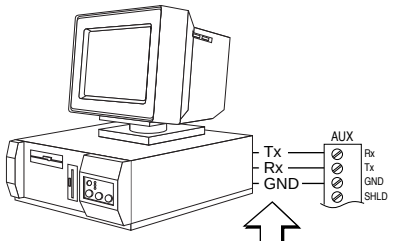
Pins 3, 6, & 15 are reserved

JOYSTICK

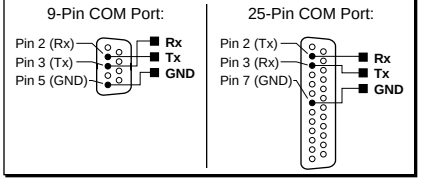
Pin	Function
1-3	Analog Channels 1-3
8	Shield (chassis gnd)
14	Isolated Ground
15	Axes Select Input
16	Velocity Select Input
17	Release Input
18	Trigger Input
19	Auxiliary Input
23	+5VDC Output

Pins 4-7, 9-13, 20-21, 24-25 are reserved

SERIAL COMMUNICATION



Serial Port Connection



Maximum RS-232C cable = 50 feet (15.25 meters)

To communicate with the 6200, you will need a terminal emulation program. We recommend you use Motion Architect, a Windows-based program that is included in the 6200 ship kit. Motion Architect provides terminal emulation and program editor features as part of its ensemble of programming tools.

Getting Started with Motion Architect:

1. Connect the 6200 to the computer.
2. Power up the computer and then the 6200.
3. To install Motion Architect, insert Disk 1 into your computer's disk drive and run the Setup program (setup.exe). Follow the instructions in the Setup program.
4. Run Motion Architect.
5. From Motion Architect's main menu, click on the "Product" pull-down menu and click on "Selection". In the dialog box, select "6200" and click the Okay button.
6. From Motion Architect's main menu, click on "Terminal" to launch the terminal emulator. The terminal window will display a command prompt (>); this indicates that you are communicating with the 6200.

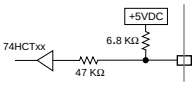
Having serial communication problems?
Refer to page 26 for help.

I/O SPECIFICATIONS & INTERNAL SCHEMATICS

AC Input.....110-240VAC (±10%) single-phase, 50/60Hz, 0.6A @ 120VAC.
Connection instructions – see page 18.

Serial Com.....RS-232C 3-wire (Rx, Tx & GND on the AUX connector);
Up to 99 units in a daisy chain.
9600 baud (or use AutoBaud feature – see page 4);
8 data bits; 1 stop bit; no parity.
Connection instructions – see page 7.
Terminal emulation – see page 20.
Address & AutoBaud DIP switches – see page 4.

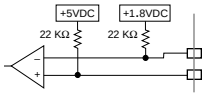
P-CUT, Limits, Triggers, and Joystick Inputs (pg. 7, 10, 12, 13)



P-CUT, CW, CCW, HOM, TRG-n, and Joystick digital inputs (pins 15-19)

Specs: TTL-compatible*; voltage range = 0-24VDC.

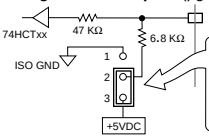
Encoder Inputs (pg. 11)



A–, B–, or Z–
A+, B+, or Z+

Specs: Differential comparator. Use 2-phase quadrature encoders; max. frequency = 1.6 MHz; min. time between transitions = 625 ns. TTL levels (Low ≤ 0.4V, High ≥ 2.4V); range = 0-5VDC.

Programmable Inputs (pg. 14)

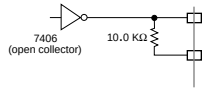


General-Purpose Programmable Input

Factory Default: Inputs are pulled up to 5V via jumper JU2 in position 2/3. To sink current, move JU2 to position 1/2. Refer to page 4 for instructions on changing JU2.

Specs: TTL-compatible*; voltage range = 0-24VDC.

Programmable Outputs, including OUT-A & OUT-B (pg. 14)

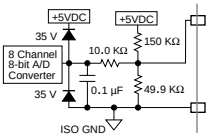


General-Purpose Prog. Output

OUT-P. Connect to the +5V terminal on the AUX connector, **or** to an external supply of up to 24V (**not to both**). **CAUTION**: Connecting OUT-P to the +5V terminal **and** to an external supply with damage the 6200.

Specs: Open collector output. Max. voltage in OFF state (not sinking current) = 24V; Max. current in ON state (sinking) = 30mA.

Joystick Analog Inputs (pg. 12)

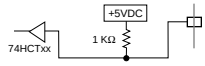


Analog Channel Inputs (pins 1-3)

Ground (pin 14)

Specs: Voltage range = 0-2.5VDC, 8-bit. Must not exceed 5VDC.

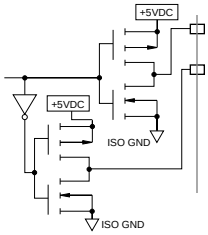
Drive Inputs (pg. 8)



Drive Fault or In-Position (pin 5 or 4)

Specs: TTL-compatible*; voltage range = 0-5VDC.

Drive Outputs (pg. 8)

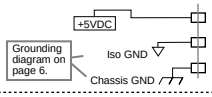


Step+, Direction+, or Shutdown+ (pins 1, 2, or 11)

Step–, Direction–, or Shutdown– (pins 9, 10, or 12)

Specs: Differential line driver output. Signal high ≥ 3.5VDC @ +30mA; signal low ≤ 1.0VDC @ -30mA. +output for each differential driver is active high; -output for each driver is active low. Step pulse width is 0.3 µs to 20 µs (see PULSE command—default is 0.3 µs).

Terminals found on multiple connectors



5V terminal found on all I/O connectors. Total load limit is 1.5A.

** TTL-compatible levels: Low ≤ 0.4V, High ≥ 2.4V.*

Troubleshooting *See also pages 24-27*

- STATUS LED: Green = 110-240VAC power is applied. Red = power reset required. Off = no power.
- Status information (see command descriptions in *6000 Series Software Reference*):
  General status information.....TASF, TSSF, TSTAT
  Limits (end-of-travel, home).....TASF, TLIM
  P-CUT input.....TINOF (bit #6)
  Programmable inputs and TRG-n.....TIN, INFNC
  Programmable outputs and OUT-n.....TOUT, OUTFNC
- P-CUT input must be grounded to GND terminal to allow motion.
- CW & CCW inputs must be grounded to GND terminal to allow motion (or disable with LHØ command).
- To help prevent electrical noise, shield all connections at one end only (see also Appendix B).
- Error messages while programming or executing programs – see *6000 Series Programmer's Guide.*
- Technical support – see phone numbers on inside of front cover, and the HELP command response.

We welcome your feedback on our products and user guides. Please send your responses to our email address: 6000user@cmotor.com
Direct your technical questions to your local ATC or distributor, or to the numbers printed on the inside front cover of this document.

email