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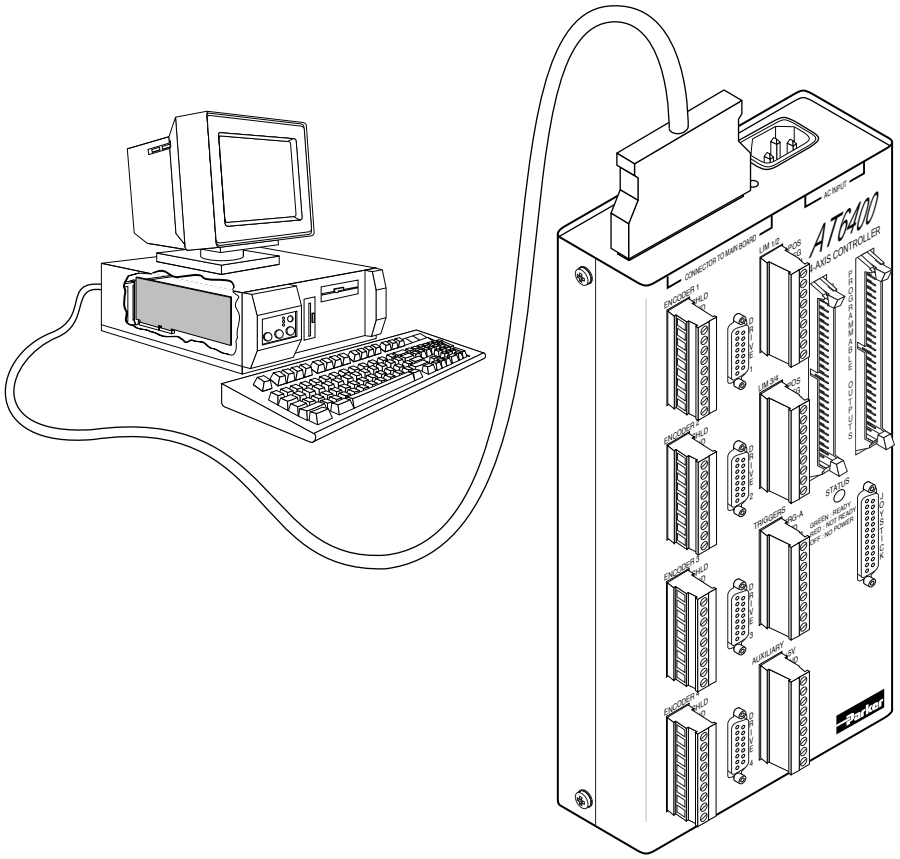
Find the *Parker / Compumotor AT6400* at our website: *Click HERE*

Compumotor

CE

AT6200 & AT6400 Indexer

Installation Guide



Compumotor Division
Parker Hannifin Corporation
p/n 88-014541-02A October 1997

Parker

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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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Technical Assistance ⇨ *Contact your local automation technology center (ATC) or distributor,* ***or ...***

North America and Asia:
Compumotor Division of Parker Hannifin
5500 Business Park Drive
Rohnert Park, CA 94928
Telephone: (800) 358-9070 or (707) 584-7558
Fax: (707) 584-3793
FaxBack: (800) 936-6939 or (707) 586-8586
BBS: (707) 584-4059
e-mail: tech_help@cmotor.com
Internet: http://www.compumotor.com

Europe *(non-German speaking)*:
Parker Digiplan
21 Balena Close
Poole, Dorset
England BH17 7DX
Telephone: +44 (0)1202 69 9000
Fax: +44 (0)1202 69 5750

Germany, Austria, Switzerland:
HAUSER Elektronik GmbH
Postfach: 77607-1720
Robert-Bosch-Str. 22
D-77656 Offenburg
Telephone: +49 (0)781 509-0
Fax: +49 (0)781 509-176

Parker
Motion & Control

Product Feedback Welcome
E-mail: 6000user@cmotor.com

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Change Summary

AT6n00 Installation Guide

88-014541-02 REV. A

The following is a summary of the primary technical changes to this installation guide for the AT6200 and AT6400 products, collectively referred to as the "AT6n00" products. The part number of this guide changed to reflect the changes required to make the AT6n00 CE-compatible. This book, p/n 88-014541-02A, supersedes 88-014541-01**B**.

Topic	Description
CE Installation Instructions CE	The AT6n00 may now conform to the EMC, LVD, and Marking Directives necessary for CE compliance when it is installed per the instructions in Appendix A*. The ultimate responsibility for ensuring that the CE requirements for the system are met rests with the system builder. This CE compliance is valid for Serial Numbers 971101xxxx and greater. Also valid for Serial Numbers prior to this if CE sticker is present on the unit. *Note: The AT6400-AUX1-DC and AT6200-AUX1-DC versions of the AT6n00 are not guaranteed to be CE compliant.
General Specifications	**Corrections**: • The current requirement for the AT6n00 PC card was changed from 3.5A to 1.8A. • The current requirement for the AT6200 AC Auxiliary board and the AT6400-240 AC Auxiliary board was changed from 0.3A to .75A.
Drive Connections	**Addition**: Diagrams were added to show how to connect to Linearserv, Dynaserv, Zeta, S, OEM650, and PDS drives. **Deletion**: The diagram showing how to connect to the PK2 drive was removed.
Encoder Connections	**Addition:** Wire colors were added for Compumotor OS and RS Series motors.
Output Connections	**Correction:** Diagram for Connection to a Sourcing Input now shows OUT-P pulled up by external power supply.
Input Power	**Correction:** Removed reference to AT6200 from 240VAC Input diagram. Also, • The current requirement for the AT6n00 PC card was changed from 3.5A to 1.8A. • The current requirement for the AT6200 AC Auxiliary board and the AT6400-240 AC Auxiliary board was changed from 0.3A to .75A.
Troubleshooting	**Correction:** Solution 2b. for "Motion Does Not Occur" problem was corrected from "Set LSPOS to a value less than LSNEG." to "Set LSPOS to a value greater than LSNEG."
Back Cover Quick Reference	**Correction:** The current requirement for the AT6200 AC Auxiliary board and the AT6400-240 AC Auxiliary board was changed from 0.3A to .75A.

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ABOUT THIS BOOK

Chapter 1. Installation

What You Should Have (ship kit)....2
Before You Begin....2
- Electrical Noise....2
- Airborne Contaminants....2

General Specifications....3
Configuration/Customization—Optional DIP Switch Settings....4
PC Card Installation....5
Mounting....6
System Electrical Connections....7
- Grounding System....7
- Verify Factory-Wired Connections....8
- AUX Board Cable....8
- Pulse Cut-Off (P-CUT) — Emergency Stop Switch....8
- Motor Drivers....9
- End-of-Travel and Home Limit Inputs....11
- Encoders....12
- Joystick & Analog Inputs....13
- Trigger Inputs....14
- General-Purpose Programmable Inputs & Outputs....15
- Input Power....19
- Lengthening I/O Cables....20

Installation Test....21
What's Next?....22

Chapter 2. Troubleshooting

Troubleshooting Basics....24
- Reducing Electrical Noise....24
- Diagnostic LEDs....24
- Test Program....24
- Motion Architect's Panel Module....25
- Technical Support....25

Common Problems & Solutions....25
- Problem/Cause/Solution Table....25
- Interrupt & Address Selection....27
- Downloading Errors (downloading the operating system)....27

Product Return Procedure....28

Appendix A: CE Installation Guide....29

Index....35

Purpose of This Book

This book describes how to install and troubleshoot the AT6200 and AT6400 hardware. Programming related issues are covered in the *6000 Series Programmer's Guide* and the *6000 Series Software Reference*.

"AT6n00"
Hereafter, the AT6200 and AT6400 are referred to collectively as the "AT6n00."

What You Should Know

To install and troubleshoot the AT6n00, you should have a fundamental understanding of:

- IBM PC-compatible computer hardware and software operations
- Basic electronics concepts (such as voltage, switches, current, etc.)
- Basic motion control concepts (such as torque, velocity, distance and force)

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*
- Operations user guide for the IBM-compatible PC-AT computer
- Schram, Peter (editor). *The National Electric Code Handbook (Third Edition).* Quincy, MA: National Fire Protection Association

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AT6n00 Indexer: CE Compliance



Product Type: AT6200-120/240, AT6400-AUX1-120V, and AT6400-AUX1-240V

The above products have been demonstrated to be CE compliant, per the following directives, when installed according to the instructions in Appendix A of this Installation Guide.

- 89/336/EEC Electromagnetic Compatibility Directive (EMC)
- 72/23/EEC Low Voltage Directive (LVD)
- 93/68/EEC CE Marking Directive

AT6n00 Indexers, when installed according to just the procedures in the main body of this Installation Guide, may not necessarily comply with the LVD or EMC directives. To install an AT6n00 Indexer so that it complies with the LVD and EMC directives, you must follow the additional procedures described in Appendix A, under *CE Installation Instructions.* In some installations, additional measures may be required. If you do not follow these instructions, the protection of the product may be impaired. The ultimate responsibility for ensuring that the CE requirements for the system are met rests with the system builder.

This CE compliance is valid for units with Serial Numbers 971101xxxx and greater. It is also valid for Serial Numbers prior to this if the CE sticker is present on the unit.

Note: The AT6200-AUX1-DC and AT6400-AUX1-DC versions of the AT6n00 have not been demonstrated to be CE compliant. Following the installation instructions in Appendix A will improve performance, but does not ensure CE compliance for the AT6200-AUX1-DC and AT6400-AUX1-DC.

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CHAPTER ONE

1 Installation

IN THIS CHAPTER
• Product ship kit list • General specifications table • PC card installation procedures • Mounting procedures • Electrical connection procedures (including specifications) • Installation test procedures • Preparation for what to do next

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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
One of the following line items:	
AT6200 120/240VAC version (with ship kit)	**AT6200-120/240**
AT6200 DC version (with ship kit)	**AT6200-AUX1-DC**
AT6400 120VAC version (with ship kit)	**AT6400-AUX1-120V**
AT6400 240VAC version (with ship kit)	**AT6400-AUX1-240V**
AT6400 DC version (with ship kit)	**AT6400-AUX1-DC**
Ship kit: High density cable, 5-foot (standard)	71-012832-05
High density cable, 15-foot (optional)	71-012832-15
(2) 10-foot, 15 D - 25 D drive cables	71-010432-10
120VAC power cord	44-000054-01
240VAC EIA power cord connector (AT6400-240 only)	43-011905-01
Mounting clips (AC version only)	53-012068-02
Mounting screws (AC version only)	51-006037-01
Ferrite absorber beads (2 included)	47-015956-01
Cable clamp (1 included, in 2 pieces)	53-016131-01
(This installation guide)	88-014541-02
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
Drivers & Samples Disk	95-016324-01

Before You Begin

⚠ WARNINGS ⚠

The AT6n00 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 computer before:

- Installing or removing the AT6n00 PC card
- Adjusting the DIP switches on the AT6n00 PC card after it is installed in the computer
- Connecting electrical devices to the AT6n00 PC card after it is installed in the computer

Recommended Installation Process

- Review the general specifications.
- Install the AT6n00 card.
- Mount the AUX box.
- Connect all electrical system components.
- Test the installation.
- Mount the motor and couple the load.
- Program your motion control functions. Programming instructions are provided in the 6000 Series Programmer's Guide and 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 an optional iconic programming interface call Motion Builder (sold separately).

Electrical Noise Minimization 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.
- Noise suppression guidelines are provided on page 20 and in Appendix A.

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General Specifications

Parameter	Specification
Power	
AT6n00 PC Card	5VDC @ 1.8A from the PC-AT bus
AT6200 AC AUX Board (AC or DC input)	90-264VAC, 50/60Hz, 0.75A @ 240VAC, single-phase; or connect an external power source (5VDC ±5% @ 1.6A) to a +5V terminal on the **AUXILIARY** connector
AT6400-120V AUX Board (AC or DC input)	90-132VAC, 50/60Hz, 1.5A @120VAC, single-phase; or connect an external power source (5VDC ±5% @ 1.6A) to a +5V terminal on the **AUXILIARY** connector
AT6400-240V AUX Board (AC or DC input)	90-264VAC, 50/60Hz, 0.75A @ 240VAC, single-phase; or connect an external power source (5VDC ±5% @ 1.6A) to a +5V terminal on the **AUXILIARY** connector
AT6n00-DC AUX Board	+5VDC (±5%) @ 1.6A
Status LEDs/fault detection	Refer to *Status LEDs* in Chapter 2
Environmental	
Operating Temperature	32-122°F (0-50°C)
Storage Temperature	-22-185°F (-30-85°C)
Humidity	0-95% non-condensing
Performance	
Position Range	±2,147,483,648 steps
Velocity Range	1-1,600,000 steps/sec
Acceleration Range	1-24,999,975 steps/sec^2
Stepping Accuracy	±0 steps from preset total
Velocity Accuracy	±0.02% of maximum rate
Velocity Repeatability	±0.02% of set rate
Motion Algorithm Update Rate	2 ms
Calculation to determine contouring deviation from an arc (due to straight-line approximation to a curve):	Error in steps = $\frac{(v_p * \frac{t}{2})^2}{r}$ Where: v_p = steps/sec, r = radius in steps, t = system update period (2 msec)
Inputs	***ALL INPUTS ARE OPTICALLY ISOLATED***
Home, POS/NEG Limits, Trigger, P-CUT	HCMOS compatible*; internal 6.8 KΩ pull-ups to AUX-P terminal (wired at factory to +5V); voltage range is 0-24V.
Joystick inputs: Axes Select, Velocity Select, Trigger, Release, & Auxiliary	HCMOS-compatible*; internal 6.8 KΩ pull-ups to 5V; voltage range is 0-24V.
Drive Fault and In-Position	HCMOS-compatible*; internal 1.0 KΩ pull-up to 5V; voltage range is 0-5V.
Analog (joystick connector)	Voltage range = 0-2.5VDC, 8-bit A/D converter. Input voltage must not exceed 5V.
Encoder	Differential comparator accepts two-phase quadrature incremental encoders with differential (recommended) or single-ended outputs. Maximum voltage = 5VDC. Switching levels (TTL-compatible): Low ≤ 0.4V, High ≥ 2.4V. Maximum frequency = 1.6 MHz. Minimum time between transitions = 625 ns.
24 General-Purpose Programmable	HCMOS compatible* with internal 6.8 KΩ pull-ups to IN-P terminal (wired to +5V terminal at factory). Voltage range = 0-24V. 50-pin plug is compatible with OPTO-22™ signal conditioning equipment.
Outputs	***ALL OUTPUTS ARE OPTICALLY ISOLATED***
24 General-Purpose Programmable	Open collector output with 4.7 KΩ pull-ups. Can be pulled up by connecting OUT-P to +5V, or to user-supplied voltage of up to 24V. Max. voltage in the OFF state (not sinking current) = 24V, max. current in the ON state (sinking) = 30mA. 50-pin plug is compatible with OPTO-22™ signal conditioning equipment.
Step, Direction, Shutdown	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 range is 0.3 µs to 20 µs (depends on the value of the PULSE command—default is 0.3 µs).
+5V Output	+5V terminals are available on the **ENCODER** and **AUXILIARY** connectors. Load limit (total load for all I/O connections): 1.5A for the AT6400-120, 1.0A for the AT6400-240 and the AT6200 AC version. Load limit for the DC versions of the AUX boards depends on your external +5V power supply.

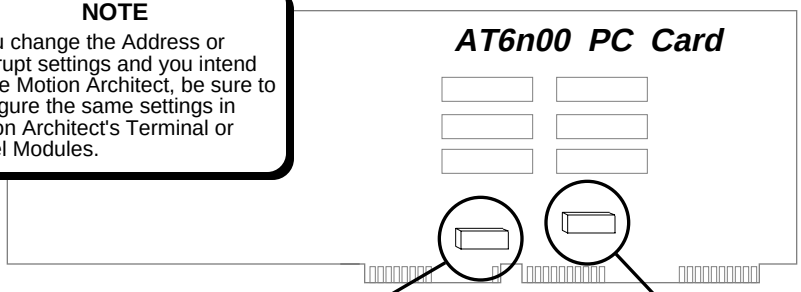
* HCMOS-compatible switching voltage levels: Low ≤ 1.00V, High ≥ 3.25V.
TTL-compatible switching voltage levels: Low ≤ 0.4V, High ≥ 2.4V.

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Configuration/Customization—Optional DIP Switch Settings

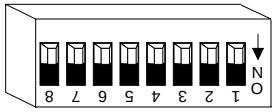
Default Settings
Address = 300 Hex (768 Decimal)
Transfer Mode = 16-Bit
Interrupts Selected = None

NOTE
If you change the Address or Interrupt settings and you intend to use Motion Architect, be sure to configure the same settings in Motion Architect's Terminal or Panel Modules.

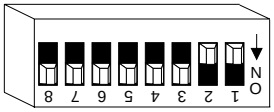


= ON position

DIP Switch SW2
Factory Default Setting Shown



DIP Switch SW1
Factory Default Setting Shown



Switch #8

INTERRUPTS (SW2)

Switch #	Interrupt	Description	Default Setting
1	IRQ3	Serial Port (COM4)	OFF
2	IRQ4	Serial Port (COM3)	OFF
3	IRQ5	Parallel Printer	OFF
4	IRQ7	Parallel Printer	OFF
5	IRQ10	Unassigned	OFF
6	IRQ11	Unassigned	OFF
7	IRQ12	Unassigned	OFF
8	IRQ15	Unassigned	OFF

Switches are positive-true (ON selects the interrupt setting). Only one switch may be ON at one time.

ADDRESS (SW1, switches 1-7)

Switch #	Binary Value *Decimal*	Binary Value *Hex*	Default Setting
1	512	200	OFF
2	256	100	OFF
3	128	80	ON
4	64	40	ON
5	32	20	ON
6	16	10	ON
7	8	8	ON

Switches are negative-true (OFF selects the address value). The sum of the binary values of DIP switches 1-7 comprise the PC card's device address. The device address must be an even multiple of eight.

TRANSFER MODE (SW1, switch 8)

Switch #8 ON = 16-Bit Transfer Mode (default)
Switch #8 OFF = 8-Bit Transfer Mode

The 16-bit transfer mode offers higher performance than the 8-bit mode.

Computer I/O Address Space Map

Address Range *Decimal*	Address Range *Hex*	Description
000-255	000-0FF	Used by AT mother-board
496-511	1F0-1FF	Hard Disk (AT)
512-527	200-20F	Game Controller
528-543	210-21F	Expansion Unit
568-571	238-23B	Bus Mouse
572-575	23C-23F	Alternate Bus Mouse
624-639	270-27F	Parallel Printer Port
688-734	2B0-2DF	EGA Card
736-743	2E0-2E7	GPIB
744-751	2E8-2EF	Serial Port (4)
760-767	2F8-2FF	Serial Port (2)
768-799	**300-31F**	**Prototype Card**
800-815	320-32F	Hard Disk (XT)
888-895	378-37F	Parallel Printer
896-911	380-38F	SDLC
928-943	3A0-3AF	SDLC
944-955	3B0-3BB	Monochrome Card
956-959	3BC-3BF	Parallel Printer
960-975	3C0-3CF	EGA Card
976-991	3D0-3DF	CGA Card
1000-1007	3E8-3EF	Serial Port (3)
1008-1015	3F0-3F7	Floppy Disk
1016-1023	3F8-3FF	Serial Port (1)

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PC Card Installation

Step 1 Turn off the power to the computer.

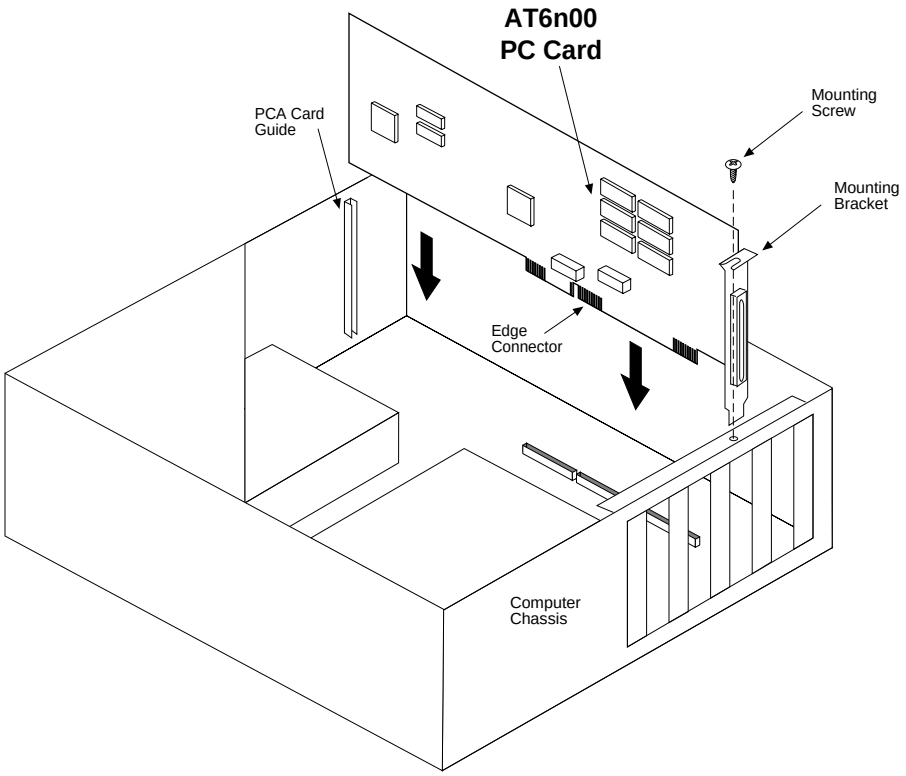
Step 2 Remove the computer's cover to access the internal slots where peripheral cards are added.

Step 3 Select an expansion slot in your PC and remove the sheet metal bracket that covers the associated external access slot. *Save the screw*. On IBM AT and IBM AT-compatible computers, this is at the rear access panel where all external connections are made. This bracket is replaced by the bracket on the end of the AT6n00 card.

Step 4 Select a 16-bit slot to install the AT6n00 card.

> **CAUTION**
> While handling the AT6n00 card, be sure to observe proper grounding techniques to prevent damage from electro-static discharge (ESD).

Step 5 Insert the bottom corner of the AT6n00 PC card into the card guide slot near the front of the computer. Ease both ends of the card simultaneously down into the computer until the card's edge connector reaches the computer's mating connector (see drawing below). Adjust the card until the edge connectors align and press it down into the mating connector.



Step 6 Using the screw that secured the original access slot cover bracket, fasten the AT6n00 mounting bracket to the computer chassis (see drawing above).

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Mounting

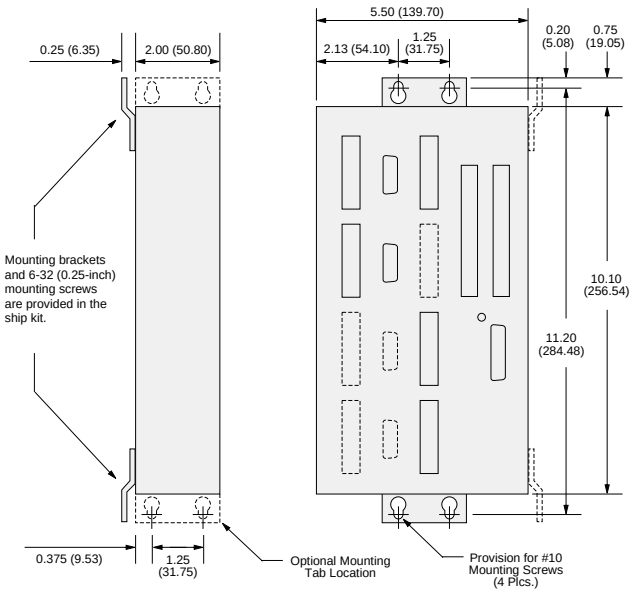
This mounting procedure will not ensure CE compliance. Refer to Appendix A for specific CE installation instructions.

To mount the AUX board, you must first attach the mounting brackets. The mounting brackets and 6-32 (0.25-inch) mounting screws are provided in the ship kit. Do not use screws longer than 0.25 inches; they protrude too far into the box and may damage the AUX board.

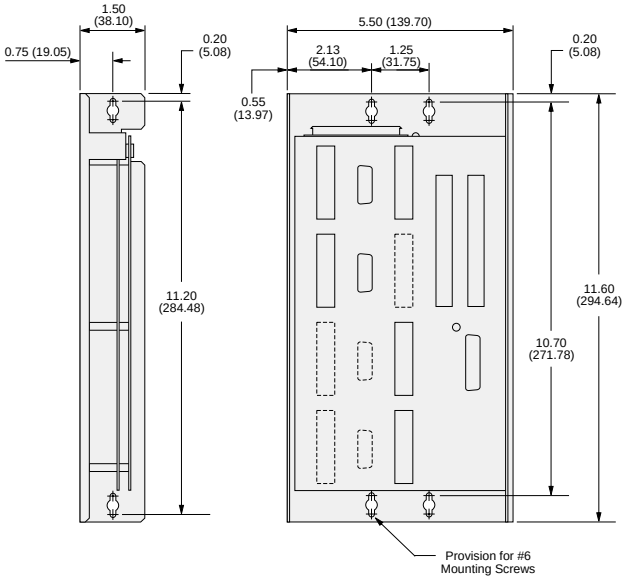
Observe the following mounting precautions:

- Mount the AUX board within the reach of the supplied 5-foot indexer-to-AUX cable. **You may not lengthen or shorten this cable.** You can order custom cables up to 15 feet from Compumotor's Custom Products Group at (800) 358-9068. A 15-foot cable is available (part number 71-012832-15).
- If you mount the AUX board in an enclosure with other equipment, be sure to maintain at least 6 inches of unrestricted air-flow space around the board. The maximum allowable ambient temperature directly below the AUX board is 122°F (50°C). Fan cooling may be necessary if adequate air flow is not provided.

AC Input AUX Boards



DC Input AUX Boards



Environmental Considerations

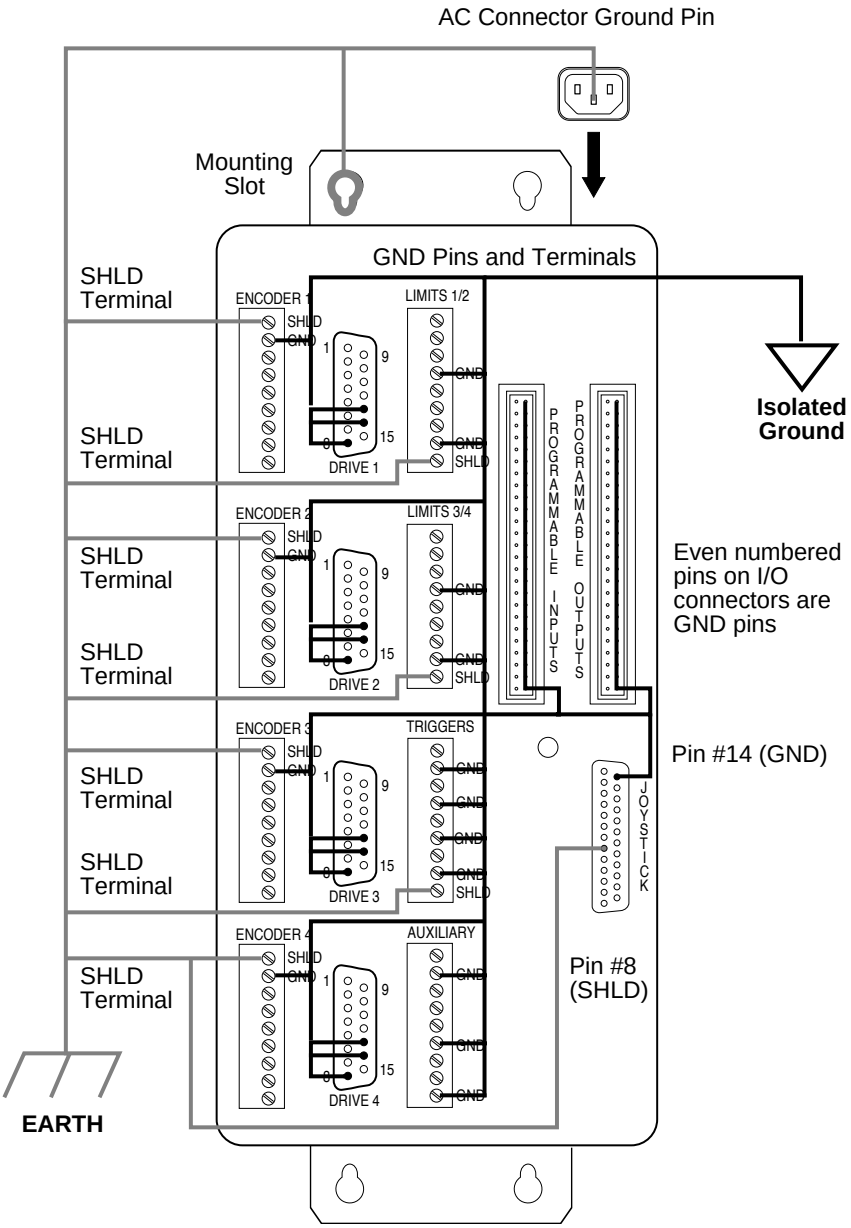
Temperature	Operate the AT6n00 in ambient temperatures between 32°F (0°C) and 122°F (50°C)
Humidity	Keep below 95%, non-condensing.
Airborne Contaminants, Liquids	Particulate contaminants, especially electrically conductive material, such as metal shavings and grinding dust, can damage the AT6n00. Do not allow liquids or fluids to come in contact with the AT6n00 card, its AUX board, or its cables.

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System Electrical Connections

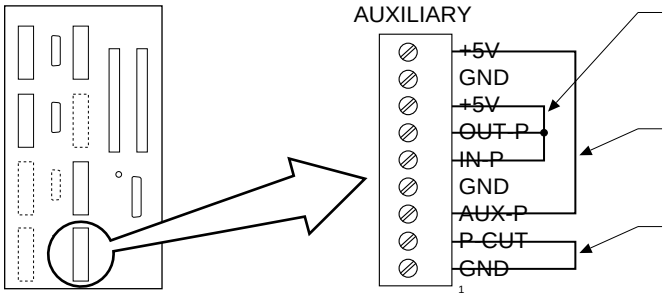
Appendix A provides guidelines on how to install the AT6n00 to comply with CE requirements. This will minimize the AT6n00's emissions and maximize the AT6n00's immunity to externally generated electromagnetic interference.

Grounding System



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Verify Factory-Wired Connections

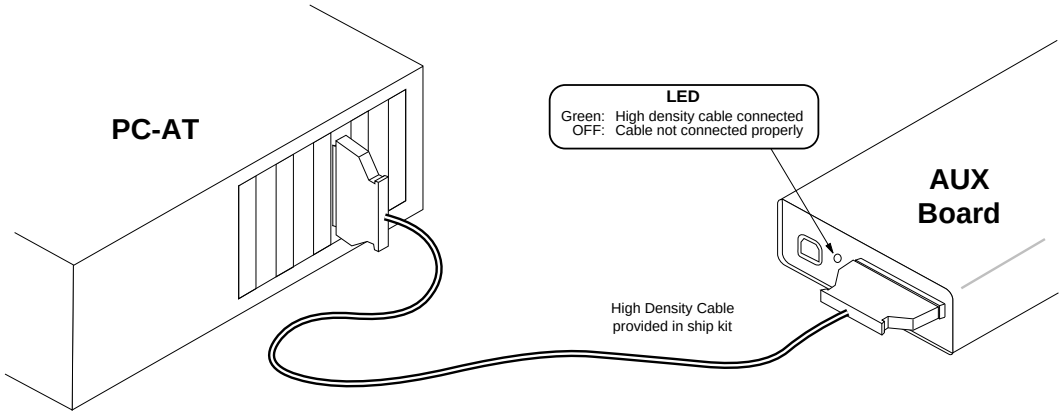


+5V connected to OUT-P and IN-P.
Provides +5V power to the pull-up resistors for the general-purpose programmable outputs (OUT-P) & inputs (IN-P) on the 50-pin headers.

+5V connected to AUX-P.
Provides +5V power to the pull-up resistor for the POS/NEG, HOM, TRG, and P-CUT inputs.

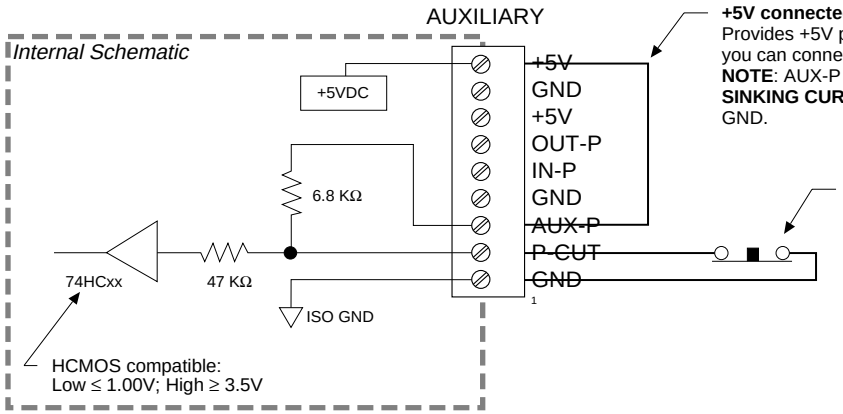
P-CUT connected to GND.
If this connection is broken, step pulses to all axes are stopped (independent of the microprocessor).

AUX Board Cable



This cable installation procedure will not ensure CE compliance. Refer to Appendix A for specific CE installation instructions.

Pulse Cut-Off (P-CUT) — Emergency Stop Switch



+5V connected to AUX-P (sourcing current).
Provides +5V power to the P-CUT pull-up resistor. As an alternative, you can connect AUX-P to an external power supply of up to 24VDC.
NOTE: AUX-P is also the pull-up for the POS/NEG, HOM & TRG inputs.
SINKING CURRENT: To make P-CUT sink current, connect AUX-P to GND.

P-CUT connected to GND (normally-closed switch).
If this connection is opened, step pulses to all axes are stopped (independent of the microprocessor).

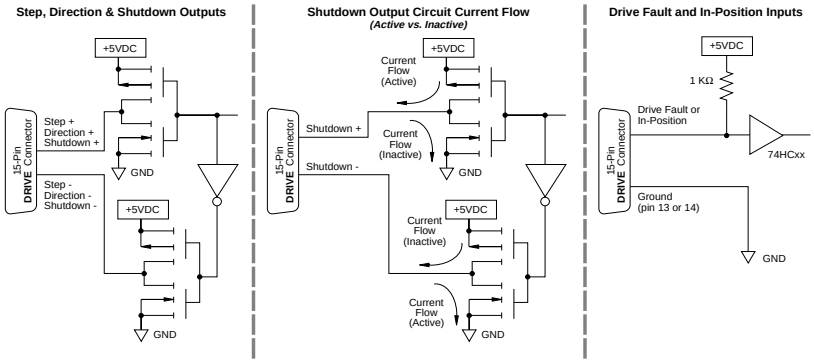
NOTE: If the P-CUT input is not grounded when motion is commanded, motion will not occur and the error message "WARNING: PULSE CUTOFF ACTIVE" will be displayed in the terminal emulator.

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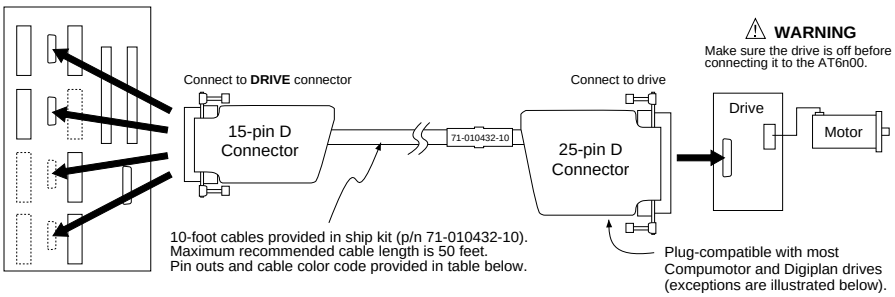
PIN OUTS & SPECIFICATIONS *(15-pin DRIVE Connector)*

15 D Pin #	Cable (71-010432-10) Color/25 D Pin #	In/Out	Name	Description
1	Red/1	OUT	Step (+)	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/2	OUT	Direction (+)	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/10	IN	In-Position	Used for digital servo drives to indicate that the motor has reached the target position. HCMOS switching levels (Low ≤ 1.0V, High ≥ 3.25V). Voltage range: 0-5V.
5	Yellow/9	IN	Drive Fault	An active-high (current not flowing) signal that tells the AT6n00 a drive has faulted. HCMOS switching levels (Low ≤ 1.0V, High ≥ 3.25V). You can use the `DRFLVL` command to change the active level to low (current flowing) if desired. **NOTE**: The Drive Fault input will not be recognized until the input functions are enabled with the `INFEN1` command.
6	—	—	*Reserved*	----------
7	—	OUT	+5V	Isolated +5V**.**
8	Bare Wire/5	—	Shield	Connected to chassis (earth) ground within the AT6n00.
9	Black/14	IN	Step Return (-)	Differential output. Step (pulse) output to the drive. Step - signal is active low.
10	White/15	IN	Direction Return (-)	Differential output. Low signal on Direction - specifies motion in the positive direction; High signal on Direction - specifies motion in the negative direction.
11	Blue/16	OUT	Shutdown (+)	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/17	IN	Shutdown Return (-)	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/21	—	Ground	Isolated logic ground
14	Brown/22	—	Ground	Isolated logic ground
15	—	—	*Reserved*	----------

INTERNAL SCHEMATICS



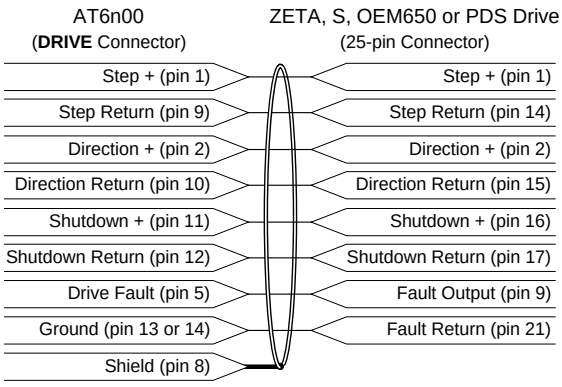
CONNECTIONS



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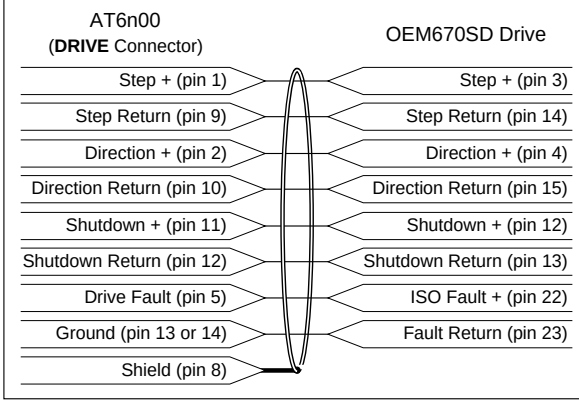
Motor Driver Connections (cont'd)

Connecting a ZETA, S, OEM650 or PDS Drive

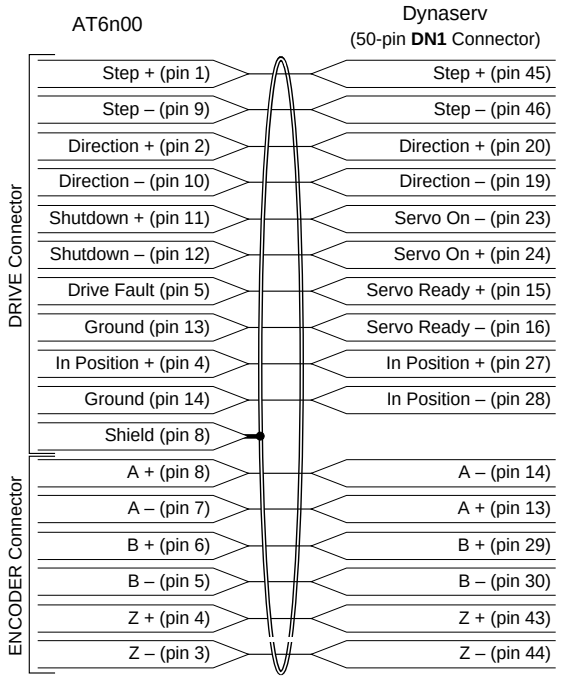


Order the 71-010432-10 10-foot cable for plug compatibility with ZETA, S, OEM650, and PDS.

Connecting an OEM670SD Drive

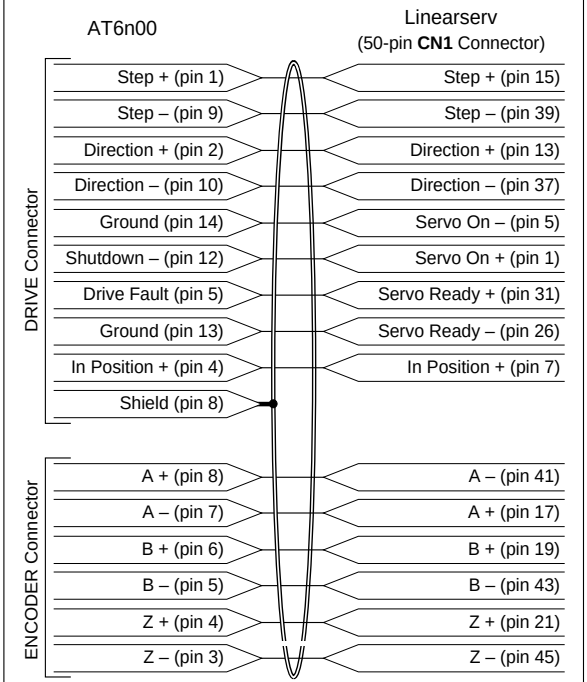


Connecting a Dynaserv Drive

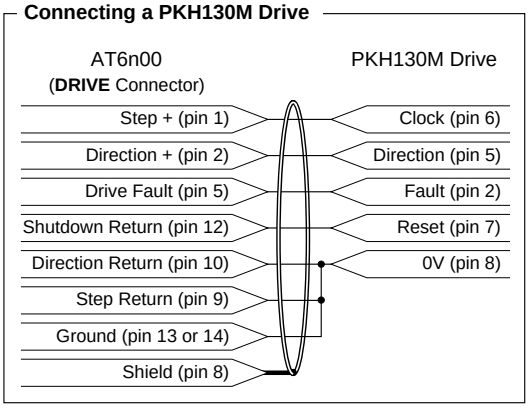


Order the 71-012985-10 10-foot cable for easy plug compatibility with the Dynaserv.

Connecting a Linearserv Drive



Connecting a PKH130M Drive



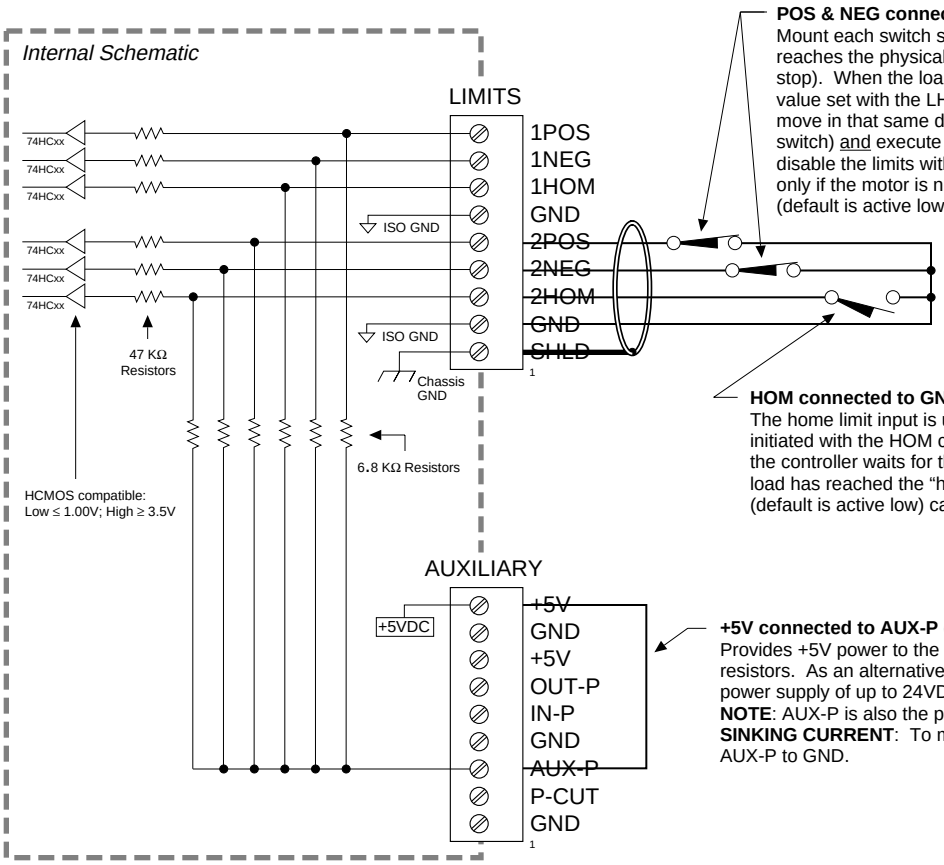
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End-of-Travel and Home Limit Inputs

NOTES

- Motion will not occur on a particular axis until you do one of the following:
  - Install end-of-travel (**POS** & **NEG**) 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 Operations Setup* chapter in the *6000 Series Programmer's Guide* for in-depth discussions about using end-of-travel limits and homing.

CONNECTIONS & INTERNAL SCHEMATICS



POS & NEG 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 clear the limit (close the switch) and execute a move in the opposite direction (or you can disable the limits with the LH 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.

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.

+5V connected to AUX-P (sourcing current). Provides +5V power to the POS, NEG, and HOM input pull-up resistors. As an alternative, you can connect AUX-P to an external power supply of up to 24VDC.
NOTE: AUX-P is also the pull-up for the P-CUT & TRG inputs.
SINKING CURRENT: To make these inputs sink current, connect AUX-P to GND.

PIN OUTS & SPECIFICATIONS *(9-pin LIMITS Connectors)*

Pin #	In/Out	Name, Axes 1 & 2	Name, Axes 3 & 4	Description
9	IN	1POS	3POS	Positive-direction end-of-travel limit input.
8	IN	1NEG	3NEG	Negative-direction end-of-travel limit input.
7	IN	1HOM	3HOM	Home limit input.
6	—	GND	GND	Isolated ground.
5	IN	2POS	4POS	Positive-direction end-of-travel limit input.
4	IN	2NEG	4NEG	Negative-direction end-of-travel limit input.
3	IN	2HOM	4HOM	Home limit input.
2	—	GND	GND	Isolated ground.
1	—	SHLD	SHLD	*Shield*—Internally connected to chassis ground (earth).

Specification for all limit inputs

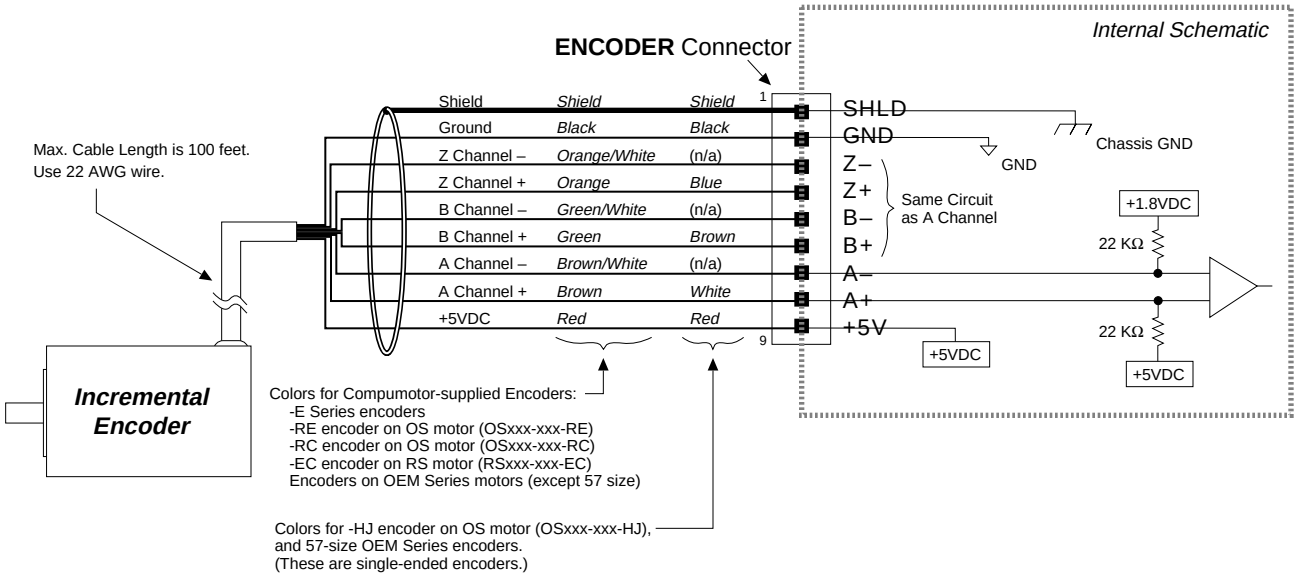
HCMOS compatible (voltage levels: Low ≤ 1.00V, High ≥ 3.25V); internal 6.8 KΩ pull-ups to AUX-P terminal (AUX-P is wired at factory to +5V); voltage range is 0-24V.

Active level for POS & NEG is set with the LHLVL command (default is active low, requiring normally-closed switch).

Active level for HOM is set with the HOMLVL command (default is active low, requiring normally-open switch).

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CONNECTIONS & INTERNAL SCHEMATICS



PIN OUTS & SPECIFICATIONS *(9-pin ENCODER Connectors)*

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

Specification for all encoder inputs

Differential comparator accepts two-phase quadrature incremental encoders with differential (recommended) or single-ended outputs. Max. frequency is1.6 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

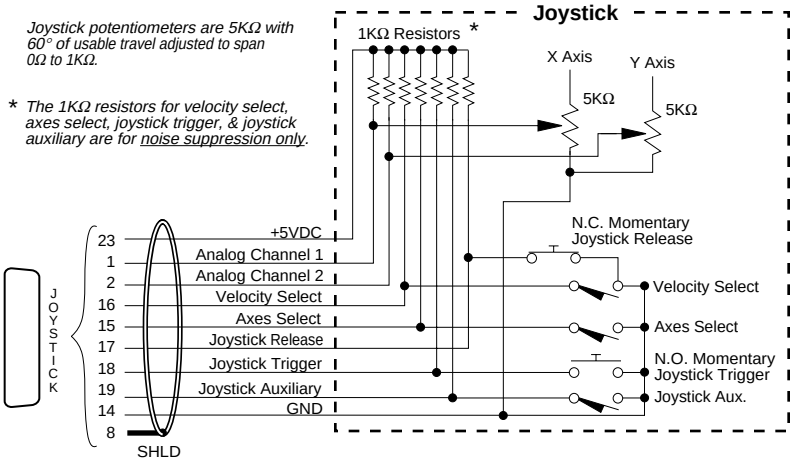
- Use incremental encoders with two-phase quadrature output. An index or *Z channel* output is optional. **Differential outputs are recommended.**
- It must be a 5V encoder to use the AT6n00's **+5V** output. Otherwise, it must be separately powered with TTL-compatible (low ≤ 0.4V, high ≥ 2.4V) or open-collector outputs.
- The decoded quadrature resolution should be less than the motor resolution by a factor of four to take advantage of the AT6n00's position maintenance capability.
- If you are using a single-ended encoder, leave the **A–**, **B–**and **Z–** terminals unconnected on the AT6n00.

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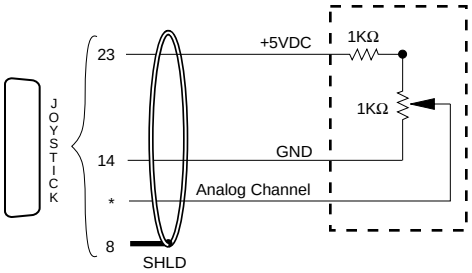
Joystick & Analog Inputs

CONNECTIONS

Joystick



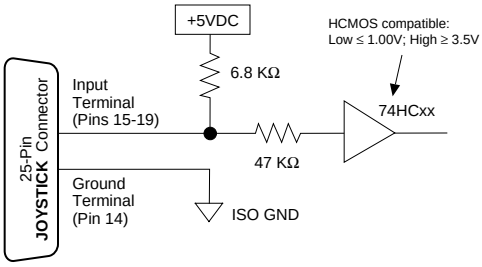
Feedrate Control *(Using a Potentiometer)*



* Pins 1, 2, 3 or 4

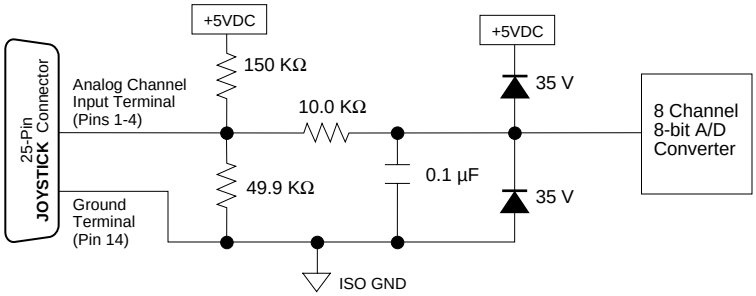
INTERNAL SCHEMATICS

Joystick Input Circuit



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

Analog Channel Input Circuit



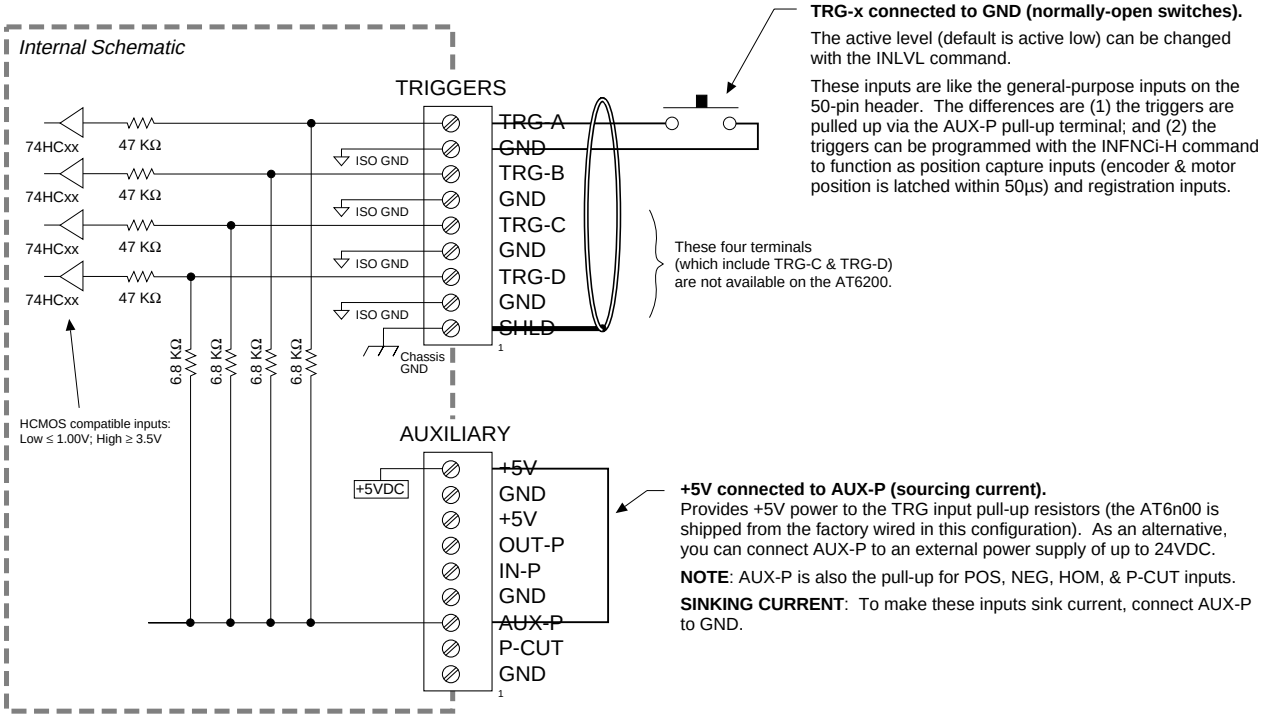
PIN OUTS & SPECIFICATIONS

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).
4	IN	Analog Channel 4	(same description as pin 1 above).
8	—	Shield	Shield (chassis ground).
14	—	Ground	Ground (isolated).
15	IN	Axes Select	If using one joystick, you can use this input to alternately control axes 1 & 2 or axes 3 & 4. *
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 read by a program (using the INO or TINO commands) to control program flow, or to enter the AT6n00 into joystick mode. *
19	IN	Joystick Auxiliary	Status of this active-low input can be read by a program (using the INO or TINO commands) to control program flow. *
23	OUT	+5VDC (out)	+5VDC power output.

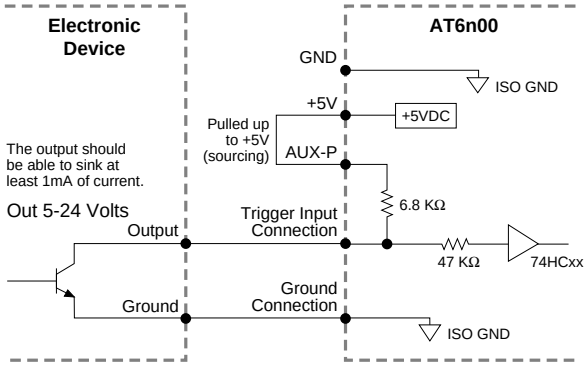
* Input voltage range for pins 15-19 is 0-24VDC. HCMOS compatible (switching voltage levels: Low ≤ 1.00V, High ≥ 3.25V).

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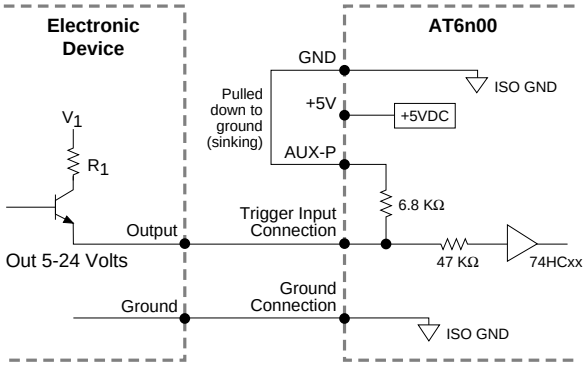
Trigger Inputs



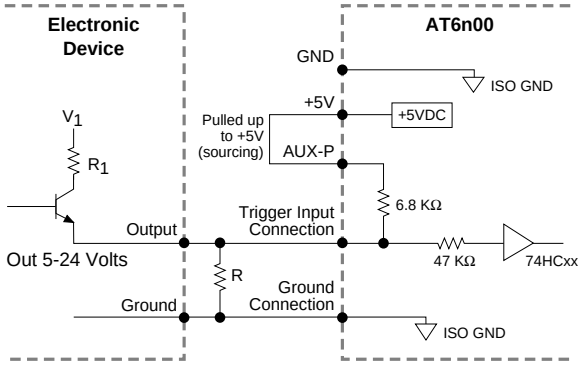
Connection to a Sinking Output Device



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.

If you will be connecting to a combination of sourcing and sinking outputs, connect **AUX-P** to **+5V** to accommodate sinking output devices. Then for each individual input connected to a sourcing output, wire an external resistor between the AT6n00's trigger input terminal and ground (see illustration). 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).

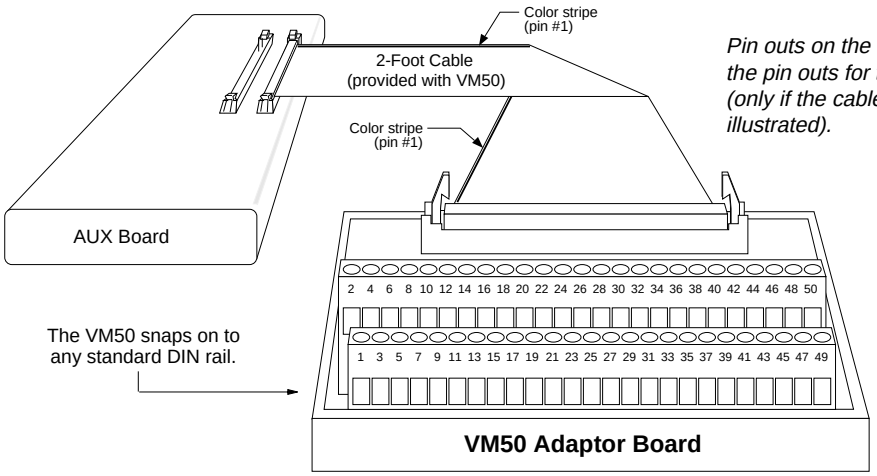
Thus, when the output is active, the `TIN` status command will report a "1" (indicates that the input is active), regardless of the type of output that is connected.

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 Guide*.

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General-Purpose Programmable Inputs & Outputs

VM50 ADAPTOR — *for screw-terminal connections*



Pin outs on the VM50 are identical to the pin outs for the 50-pin connectors (only if the cable is connected as illustrated).

Note: This configuration will not ensure CE compliance. Refer to Appendix A for specific CE installation instructions.

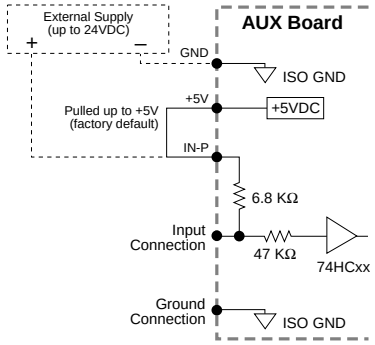
PIN OUTS & SPECIFICATIONS

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

HCMOS-compatible voltage levels (low ≤ 1.00V, high ≥ 3.25V).

Voltage range = 0-24V.

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

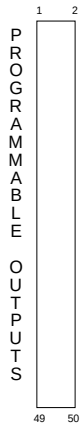
Sourcing Current: On the **AUXILIARY** connector, connect **IN-P** to **+5V** or to your own power supply of up to 24VDC.

Sinking Current: On the **AUXILIARY** connector, connect **IN-P** to **GND**.

STATUS: Check with the `TIN` status command.

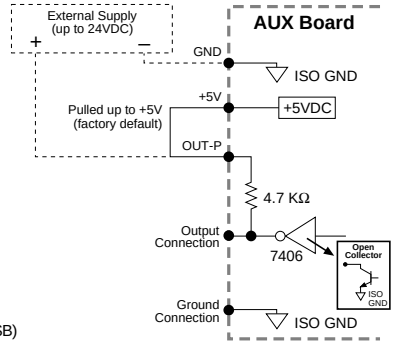
Active level: Default is active low, but can be changed to active high with the `INLVL` command.

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

Open collector output.

Pull-up connection on **AUXILIARY** connector: Connect **OUT-P** to **+5V**, or to an external supply of up to 24V.

Max. voltage in the OFF state (not sinking current) = 24V, max. current in the ON state (sinking) = 30mA.

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

STATUS: Check with the `TOUT` status command.

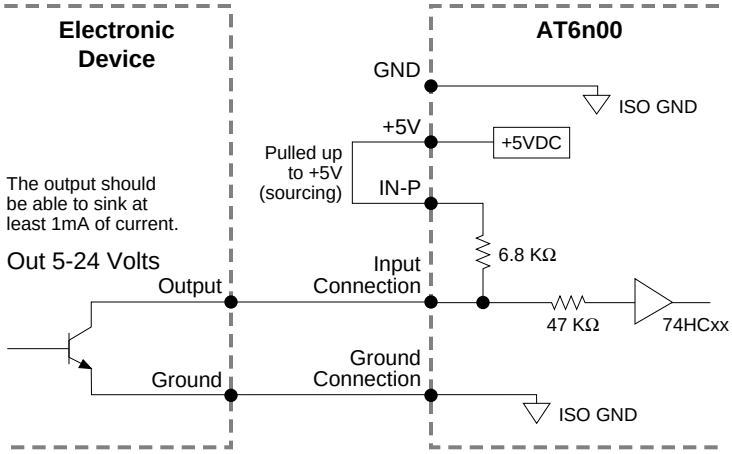
Active level: Default is active low, but can be changed to active high with the `OUTLVL` command.

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

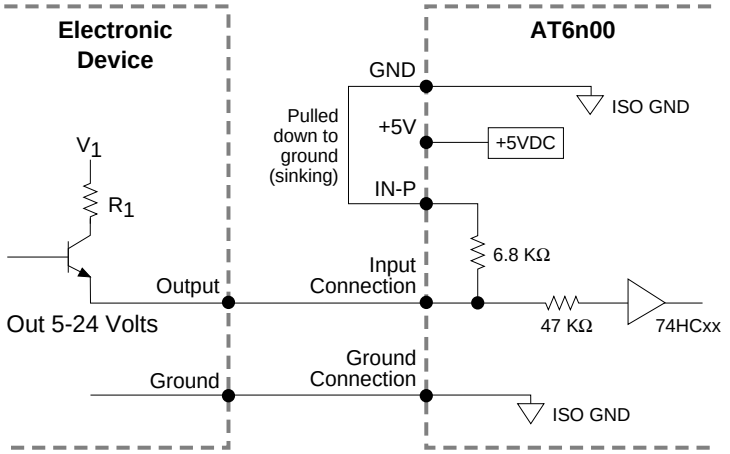
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INPUT CONNECTIONS — *Connecting to electronic devices such as PLCs*

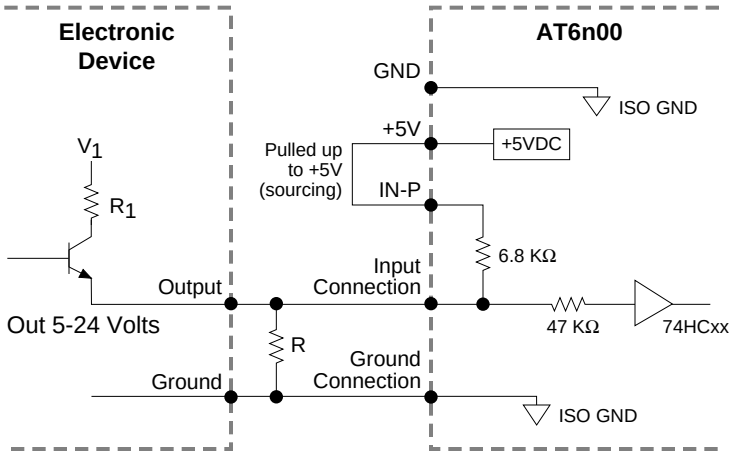
Connection to a Sinking Output Device



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.

If you will be connecting to a combination of sourcing and sinking outputs, connect **IN-P** to **+5V** to accommodate sinking output devices. Then for each individual input connected to a sourcing output, wire an external resistor between the AT6n00's programmable input terminal and ground (see illustration). 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 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).

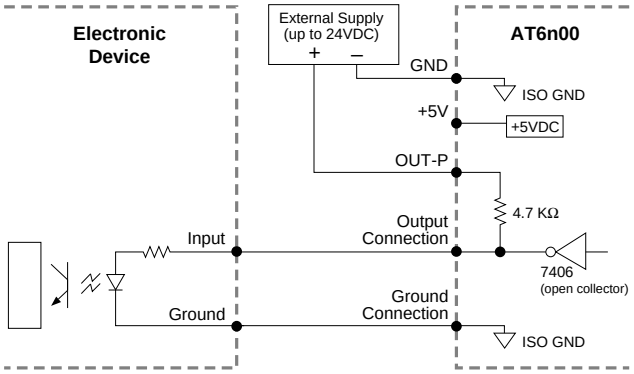
Thus, when the output is active, the `TIN` status command will report a "1" (indicates that the input is active), regardless of the type of output that is connected.

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 Guide*.

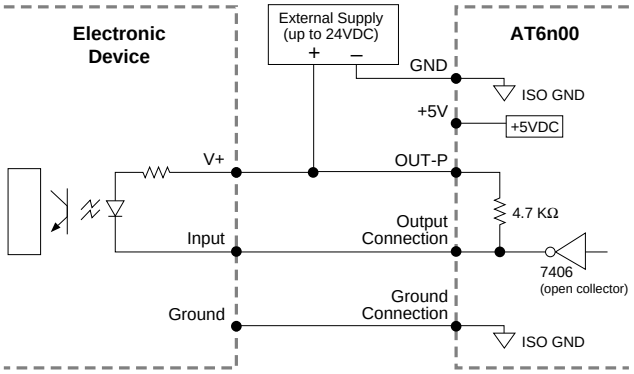
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OUTPUT CONNECTIONS — *for electronic devices such as PLCs*

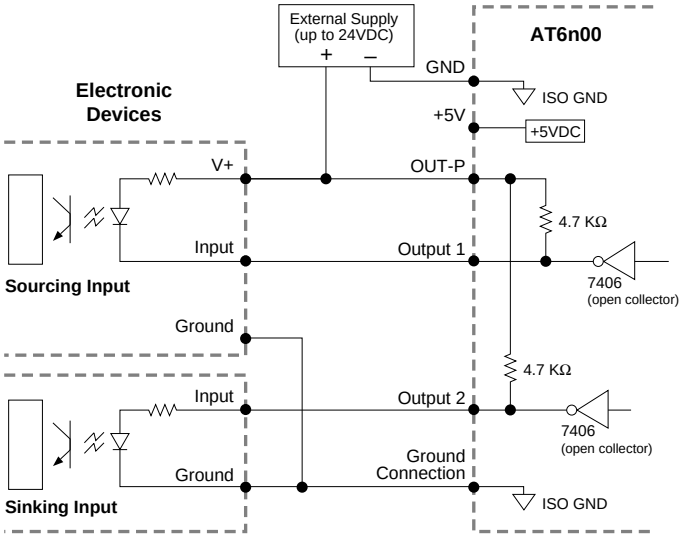
Connection to a Sinking Input (active high)



Connection to a Sourcing Input (active low)

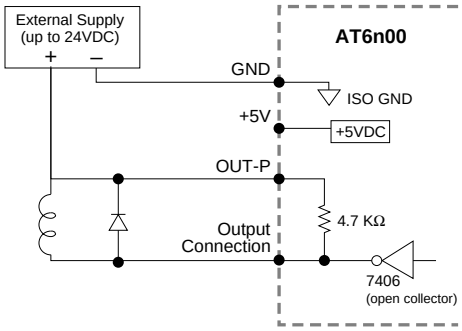


Connection to a Combination of Sinking & Sourcing Inputs



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 AT6n00 output and the cathode to the supply voltage of the inductive load.

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).

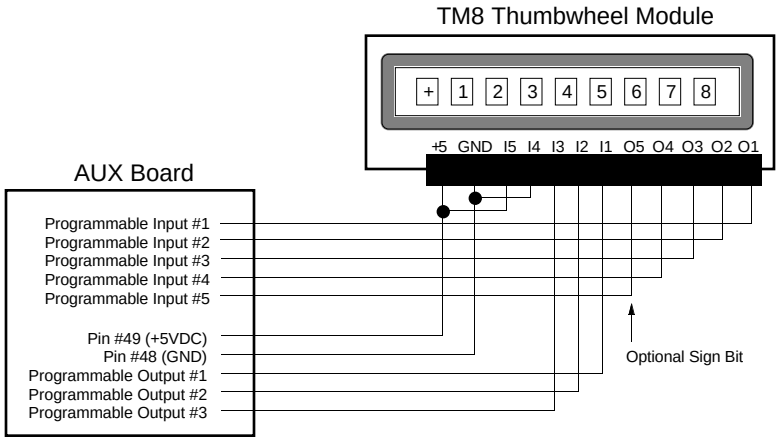
Thus, when the AT6n00's output is activated, current will flow through the attached input and the TOUT status command will report a "1" (indicates that the output is active), regardless of the type of input that is connected.

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*.

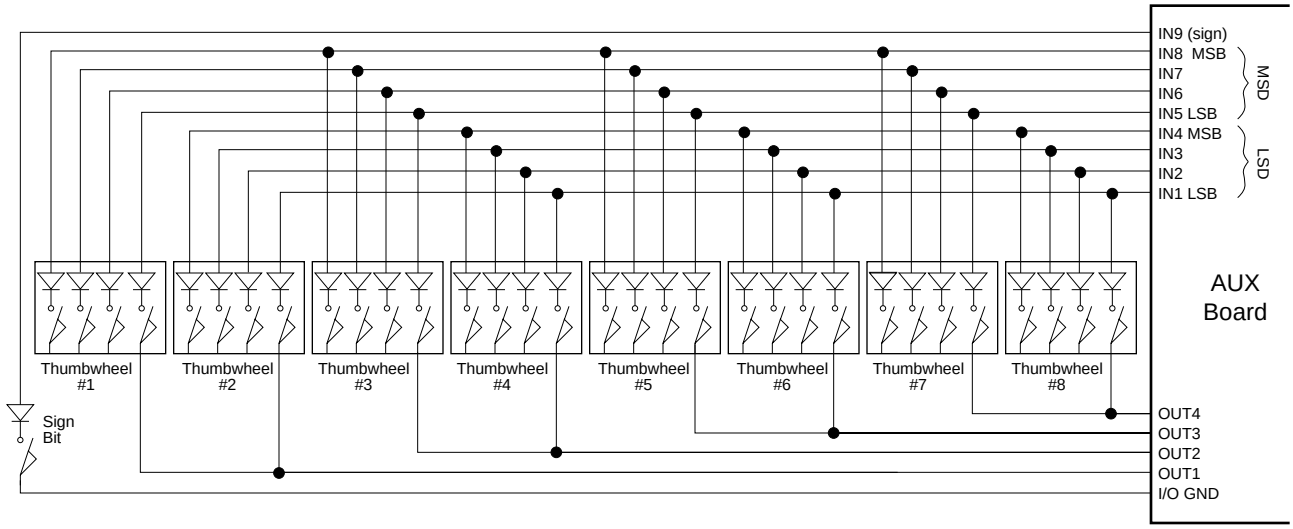
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THUMBWHEEL CONNECTIONS — *for entering BCD data*

Connection to the Compumotor TM8 Module



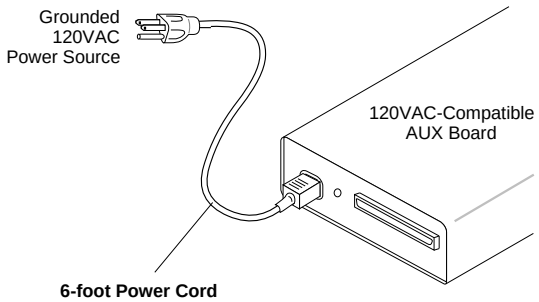
Connection to your own Thumbwheel Module



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Input Power

120VAC Input *(AT6200 & AT6400-120)*



6-foot Power Cord
(part # 44-000054-01)
provided in the ship kit

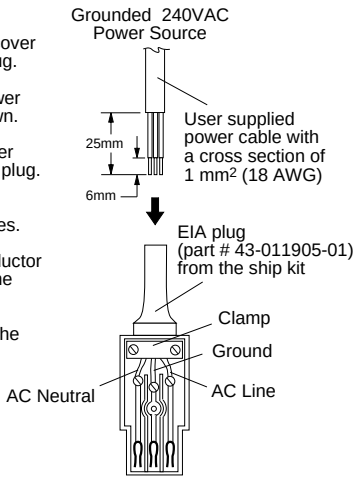
Cable Lead Color	Signal
Black	AC Line
White	AC Neutral
Green	Earth Ground

Power Input Specification

AT6200.....90-264VAC, 50/60Hz, 0.75A @ 240VAC, single-phase
AT6400-120.....90-132VAC, 50/60Hz, 1.5A @ 120VAC, single-phase

240VAC Input *(AT6400-240)*

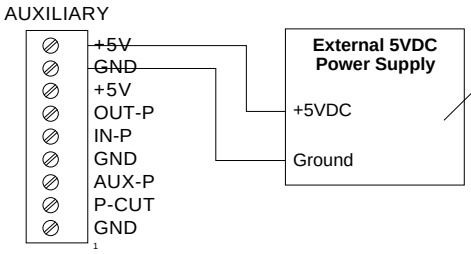
1. Remove the cover on the EIA plug.
2. Strip your power cable as shown.
3. Slide the power cable into the plug.
4. Connect the conductor wires.
5. Lock the conductor wires under the clamp.
6. Reassemble the plug.



Power Input Specification (AT6400-240)

90-264VAC, 50/60Hz, 0.75A @ 240VAC, single-phase

DC Input (*AT6200 &AT6400-DC*)



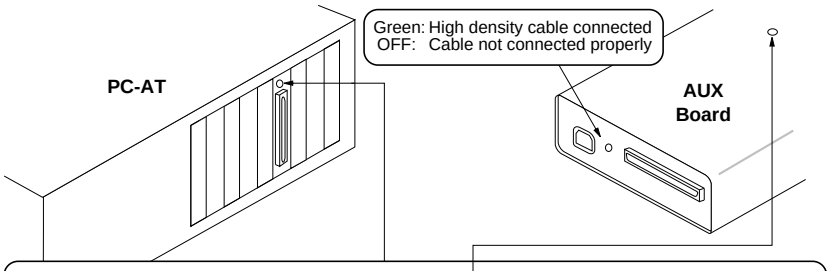
Power Input Specification

+5VDC (±5%) @ 1.6A. *This provides the power for all the +5V terminals on all I/O connectors.*

NOTE: If you have an AC version of the AUX board, you may use this power supply method as an alternative to the VAC input connection illustrated above.

Note: This input power configuration will not ensure CE compliance. Refer to Appendix A for specific CE installation instructions. DC versions of the AT6n00 are not CE compliant.

STATUS LEDs



After applying power, the status LED on the AT6n00 PC card will be off and the status LED on the AUX board should be red. If the LED on the AUX board is off, the AUX board does not have AC power.

After downloading the operating system, the status LEDs on the AUX board and the PC card will turn green indicating the system is ready for operation. If both status LEDs do not turn green after downloading the operating system, an error has occurred. The download program (`AT6400`) issues an error message if it cannot find the card or if the download operation is not successful (refer also to the troubleshooting information in Chapter 2).

Board Monitor Alarm (BMA): Detects un-recoverable faults in hardware and software. When the BMA detects a fault, the status LED on AT6n00 PC card turns off. The BMA can be reset by cycling power to the PC-AT, or by re-downloading the AT6n00 operating system.

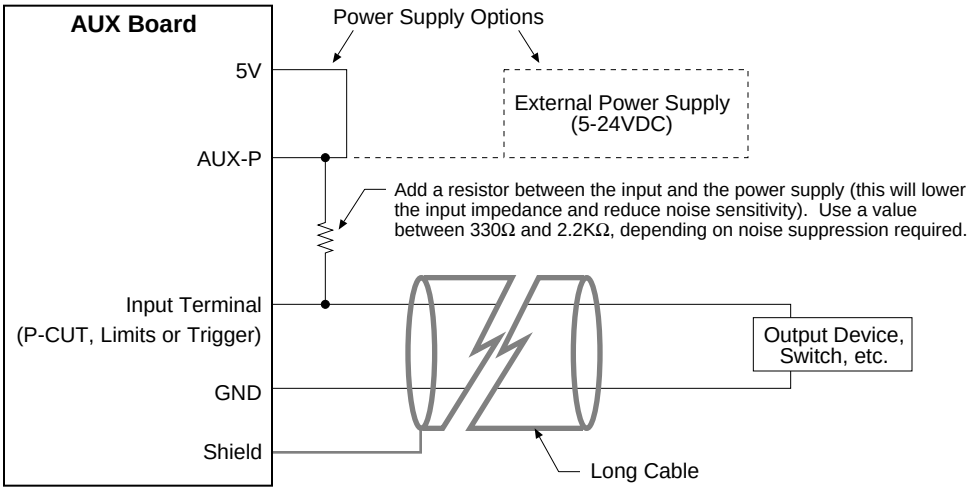
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Lengthening I/O Cables

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 an AUX board connector. 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.

Reducing noise on limit, trigger, and P-CUT inputs. If you are experiencing noise problems, try adding resistors to reduce noise sensitivity (see illustration below).



Note: This cabl configuration will not ensure CE compliance. Refer to Appendix A for specific CE installation instructions. DC versions of the AT6n00 are not CE compliant.

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Installation Test *(DOS Support Software)*

The DOS Support Software diskette (supplied in the ship kit) contains a utility program to help verify proper system installation. The program is called `TEST.EXE`. To verify system installation, follow the steps below.

> ⚠ **WARNING** ⚠
>
> The test program allows you to control I/O and produce motion. Make sure that exercising the I/O will not adversely affect other components in your system. If you have coupled the load to the motor, make sure that the load can move without causing injury to equipment or personnel.

1. Apply power to the computer system, the AUX board, and the motor drives.
2. Install the DOS support software by placing the DOS Support Software Diskette in drive A and typing `a:\install`.
3. When prompted, identify the destination drive and directory. The default directory is `AT6400`. (Note that the default name of the directory is "AT6400", regardless of whether you have an AT6400 or an AT6200.)
4. Change to the directory in which you installed the DOS Support Software. If you installed the support software in the default directory, type `cd \AT6400`.
5. Initiate the test program by typing `TEST`.
6. The program prompts you to identify the AUX board version you are using. Type "1" to select the AUX1 and press ENTER.
7. The program prompts you for the base port address of the AT6n00 PC card. If you have not changed the default DIP switch setting (default is 768 decimal), just press ENTER. If you changed the DIP switch (see page 4), type in the new address and press ENTER. The program displays this menu:

```
     Parker Compumotor's Motion and I/O Test Program

1.  Limits
2.  Pulse Cutoff (P-CUT)
3.  Programmable Inputs
4.  Joystick Inputs
5.  Programmable Outputs
6.  Encoders
7.  Motion
8.  Terminal Emulation
9.  Exit
```

8. Step through menu items 1 through 7, following the test procedures within each selection. To execute each menu item, type in the number of the desired selection (or use an arrow key to position the cursor on the selection) and press ENTER.
   NOTE: Values corresponding to axes 3 and 4 are not updated if you have the AT6200.
9. Select menu item #8 (`Terminal Emulation`). The program prompts you for the AT6n00 address—repeat step 6 above. Terminal Emulation places the computer in direct communication with the AT6n00 card. While in this mode, you can send 6000 Series commands directly to the AT6n00.

   As an example, type `TSTAT`. The computer then displays a screen full of AT6n00 status information. Press Esc to return to the main menu.
10. Type `9` and press ENTER to exit the test program.

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What's Next?

By now, you should have completed this chapter's configuration, mounting, connection, and test instructions. You should be ready to begin developing your motion control program based on the 6000 Series programming language.

Assuming you have already determined your system's motion control requirements and identified the AT6n00 software features that you will use in your application, refer to your *6000 Series Programmer's Guide* to learn how to implement these features. Be sure to keep the *6000 Software Reference* at hand as a reference for the 6000 Series command descriptions.

Motion Architect

To assist you in your programming effort, we recommend using Motion Architect®, an intuitive Microsoft® Windows™ based programming tool. Motion Architect, included in your ship kit, 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 6000 controller, the terminal emulator allows you to type in and execute controller code, transfer code files to and from the 6000 product. If you are using a bus-based 6000 controller, you can use this module to transfer (download) the soft operating system.
- **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 interactive access to the contents of the *6000 Series Software Reference Guide.*
- **Dynamic Link Library**: A DLL device driver is provided for bus-based controller customers who wish to create a Windows-based application to interface with the controller.

Other Software Tools Available
(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.
- **DDE6000™**. Facilitates data exchange between the AT6n00 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 AT6n00.

Technical Support

Troubleshooting instructions are provided in chapter 2 of this manual (for hardware-related problems) and in the *6000 Series Programmer's Guide* (for software-related problems). If you cannot find the answer in this documentation, contact your local Automation Technology Center (ATC) or distributor for assistance.

If you need to talk to our in-house application engineers, please contact us at the phone/FAX/BBS numbers listed on the inside cover of this manual. (The phone numbers are also provided when you issue the HELP command to the AT6n00.) **NOTE**: The BBS contains the latest software upgrades and late-breaking product documentation.

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CHAPTER TWO

2 Troubleshooting

IN THIS CHAPTER

• Troubleshooting basics:
  - Reducing electrical noise
  - Diagnostic LEDs
  - Test program
  - Motion Architect Test Panel
  - Technical support
• Solutions to common problems
• Corrective actions in response to operating system download errors
• Product return procedure

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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.

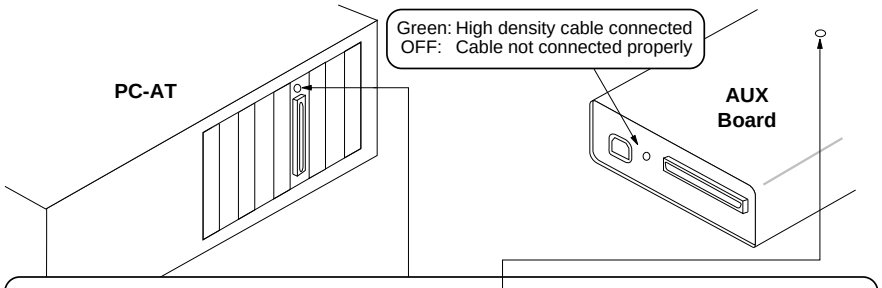
Log (document) all testing and problem isolation procedures. Also, if you are having difficulty isolating a problem, be sure to document all occurrences of the problem along with as much specific information as possible. You may need to review and consult these notes later. This will also prevent you 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 Appendix A for information on reducing electrical noise to the levels necessary for CE compliance.

Diagnostic LEDs



After applying power, the status LED on the AT6n00 PC card will be off and the status LED on the AUX board should be red. If the LED on the AUX board is off, the AUX board does not have AC power.

After downloading the operating system, the status LEDs on the AUX board and the PC card will turn green indicating the system is ready for operation. If both status LEDs do not turn green after downloading the operating system, an error has occurred. The download program (`AT6400`) issues an error message if it cannot find the card or if the download operation is not successful (refer also to the Download Error Table provided later in this chapter).

Board Monitor Alarm (BMA): Detects un-recoverable faults in hardware and software. When the BMA detects a fault, the status LED on AT6n00 PC card turns off. The BMA can be reset by cycling power to the PC-AT, or by re-downloading the AT6n00 operating system.

Test Program

A test program is available to test the functionality of many system components. Refer to page 21 for step-by-step test procedures.

CAUTION

The TEST program will re-download the AT6n00 operating system, erasing all programs stored in the AT6n00. Therefore, prior to launching the TEST program, you should save a copy of your application program to an external disk.

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Motion Architect's Panel Module

As an alternative to the test program noted above, you can use the Panel Module in Motion Architect. The Panel Module allows you to set up displays for the purpose of testing various system I/O and operating parameters.

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, please contact us at the phone/FAX/BBS numbers listed on the inside cover of this manual. (The phone numbers are also provided when you issue the HELP command to the AT6n00.) **NOTE**: The BBS contains the latest software upgrades and late-breaking product documentation.

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 errors.	1. Communication program looking for card at wrong address. 2. Address conflict. 3. AT6n00 card not properly seated.	1. Select correct address for communication program. 2. See *Address Selection* section below. 3. Seat board properly in slot. Apply pressure directly over area with gold card edge fingers.
Computer will not boot with AT6n00 installed.	1. Interrupt conflict. 2. See problem: *Communication Errors.*	1.a. Turn interrupt DIP switches OFF. 1.b. See *Interrupt Selection* section below.
Direction is reversed.	1. Direction connections on AUX board reversed. 2. Phase of step motor reversed.	1. Switch DIR+ with DIR- connection to drive. 2. Switch PHA+ with PHA- connection from drive to motor.
Distance is incorrect as programmed.	1. Incorrect resolution setting. 2. Pulse width too narrow.	1.a. Set the resolution on the drive (usually set with DIP switches) to match the AT6n00's DRES command setting (default DRES setting is 25,000 steps/rev). 1.b. Match the AT6n00's ERES command setting (default ERES setting is 4,000 counts/rev) to match the post-quadrature resolution of the encoder. Resolution values for Compumotor encoders: E Series: 1000-line (4000 counts/rev post quad) OS motor with -HJ encoder (OSxxx-xxx-HJ): 512 lines OS motor with -RE encoder (OSxxx-xxx-RE): 1000 lines OS motor with -RC encoder (OSxxx-xxx-RC): 1000 lines RS motor with -EC encoder (RSxxx-xxx-EC): 1000 lines OEM Series motors (stepper): 83 size: 1000 lines (4000 counts/rev post quad) 57 size: 512 lines (2048 counts/rev post quad) 3. Set pulse width to drive specifications using the PULSE command. (default pulse width setting is 0.3 µsec).
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. 4a. Shield wiring. 4b. 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. 2. Improper shielding. 3. Improper wiring.	1. Reduce electrical noise or move AT6n00 away from noise source. 2. Refer to the Electrical Noise portion of the Technical Reference section in the Compumotor/Digiplan catalog and Appendix A. 3. Check wiring for opens, shorts, & mis-wired connections.

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Common Problems and Solutions *(continued)*

Problem	Cause	Solution
Joystick mode: Motor does not move.	1. Joystick Release input not grounded. 2. Improper wiring.	1. Ground Joystick Release input. 2. Check wiring for opens, shorts, and mis-wired connections.
LEDs: LED next to the PC-to-AUX cable connector on the AUX board is off.	1. PC-to-AUX cable is not connected.	1. Make sure the cable is securely connected at both ends.
LEDs: LED on AT6n00 PC card is off.	1. No power. 2. Operating system not downloaded.	1. Check PC-AT power and check proper card installation in bus slot. 2. Download operating system.
LEDs: LED on AT6n00 PC card is red.	1. Internal Board Monitor Alarm (BMA) has detected a non-recoverable fault.	1.a. Recycle power to the AT6n00. 1.b. Ensure +5V is not shorted to GND on the I/O connections.
LEDs: STATUS LED on AUX board is red.	1. Operating system not downloaded.	1. Download operating system.
LEDs: STATUS LED on AUX board off.	1. Computer not on. 2. AUX cable not connected. 3. No AC power to AUX board.	1. Computer must be on since the AUX board turns on and off automatically with the computer. 2. Make sure both ends of cable connectors are securely latched. 3. Check AC power to AUX board.
Motion does not occur.	1. STATUS LED on AUX board off or red. 2. End-of-travel limits are active. 3. Step pulse too narrow for drive to recognize. 4. Drive fault level incorrect. 5. Improper wiring. 6. P-CUT (Pulse cut-off) not grounded. 7. Load is jammed. 8. No torque from motor.	1. See LED troubleshooting as noted above. 2a. Move load off of limits or disable limits with the `LHØ,Ø,Ø,Ø` command. 2b. Set `LSPOS` to a value greater than `LSNEG`. 3. Set pulse width to drive specifications using the `PULSE` command. 4. Set drive fault level using the `DRFLVL` command. 5. Check step , direction, drive fault, & limit connections. 6. Ground P-CUT connection on AUX board. 7. Remove power and clear jam. 8. See problem: *Torque, loss of.*
Motor creeps at slow velocity in encoder mode.	1. Encoder direction opposite of motor direction. 2. Encoder connected to wrong axis.	1a. Switch encoder connections A+ & A- with B+ & B-. 1b. Switch DIR+ with DIR- connection to drive. 2. Check encoder wiring.
Mouse stops working or serial ports affected (after AT6n00 is installed).	1. Interrupt conflict. 2. Address conflict.	1. See *Interrupt Selection* section below. 2. See *Address Selection* section below.
Operating system will not download, or download stops part way through.	1. Address conflict. 2. Download error.	1. See *Address Selection* section below. 2. See *Downloading Errors* table below.
Programmable inputs not working.	1. IN-P (input pull-up) on AUX board not connected to a power supply. 2. If external power supply is used, the grounds must be connected together. 3. Improper wiring.	1a. When inputs will be pulled down to 0V by an external device, connect IN-P to +5V supplied or other positive supply. 1b. When inputs will be pulled to 5V or higher by an external device, connect IN-P to 0V. 2. Connect external power supply's ground to AT6n00's ground (GND). 3. 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 (output-pull-up) on AUX board not connected to a voltage 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 supply on the AUX board or to an external supply of up to 24V. 3. Connect the external power supply's ground to the AT6n00's ground (GND). 4. Check wiring for opens, shorts, and mis-wired connections.
Torque, loss of.	1. Improper wiring. 2. No power to drive. 3. Drive failed. 4. Drive faulted. 5. Drive shutdown.	1. Check wiring to the drive, as well as other system wiring. 2. Check power to drive. 3. Check drive status. 4. Check drive status. 5. Enable drive with the `DRIVE1111` command.
Trigger inputs not working.	1. If external power supply is used, the grounds must be connected together. 2. Improper wiring.	1. Connect external power supply's ground to AT6n00's ground (GND). 2.a. Check wiring for opens, shorts, and mis-wired connections. 2.b. When inputs will be pulled down to 0V by an external device, connect AUX-P to +5V supplied or other positive supply. 2.c. When inputs will be pulled to 5V or higher by an external device, connect AUX-P to 0V.
Velocity & acceleration is incorrect as programmed.	See *Distance* problem noted above.	

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Interrupt & Address Selection

CAUTION

Refer to your PC-AT's documentation to avoid interrupt and address conflicts, and the resulting possibility of system damage.

If you are using Motion Architect and you change these settings, be sure to configure the same address and interrupt settings in Motion Architect's Terminal or Panel modules.

Interrupts

The AT6n00 is factory configured with no interrupts selected. The AT6n00 does not need interrupts to function properly. If you want to use interrupts, select an interrupt in your system that is not already used in the system (refer to instructions on page 4).

Interrupts that are unassigned on the AT bus are IRQ10, 11,12, and 15. If serial port COM1 is not used, IRQ4 may be available. If serial port COM2 is not used, IRQ3 may be available. IRQ5 and 7 are defined for parallel printer ports and one or both of these may be available if your system has one or no parallel printer ports.

Address

The AT6n00 is factory-set to address 300H. If another card in your system uses address 300H (default setting), select a different address (refer to instructions on page 4).

If you are unsure which addresses are used, the following address are likely to be available: 308H, 310H, 318H, 380H, 388H, 3A0H, or 3A8H.

Downloading Errors *(downloading the operating system)*

Error	Description	Reason/Corrective Action
1	Operating System File Not Found	The operating system specified, or the default operating system (if unspecified) could not be found by the `AT6400.EXE` loader program. Put the `AT6400.OPS` file in the same directory as the `AT6400.EXE` file.
2	Invalid Operating System File	The operating system specified, or the default operating system (if unspecified) is not a valid operating system or is corrupted. Re-install the operating system from the original disk.
3	Unexpected EOF	An EOF character was received during the download. Re-install the operating system from the original disk.
4	Invalid Port Address	The port address specified while downloading is invalid. Use another address setting ($768 \leq port \leq 1024$ in increments of 8).
5	Unknown Option	An unknown option was specified on the `AT6400.EXE` command line.
6	Base Port Address Greater than 1024	The base port address is too high. Specify an address between 768 and 1024 decimal with the `/PORT=` parameter.
7	Base Port Address Less than 255	The base port address is too low. Specify an address between 768 and 1024 decimal with the `/PORT=` parameter.
8	Base Port Address Not a Multiple of 8	The base port address is not a multiple of 8. Specify a valid address with the `/PORT=` parameter.
9	Modified Download Requested	A partial download was requested on the command line.
10	Card Controller Error	The card controller did not respond as expected. Verify that you are downloading to the correct address. Make sure there are no other peripheral cards (network adapters, bus mouse, etc.) at the same address. Try changing the card address.
11	Card Not found	The card did not respond as expected. Verify that you are downloading to the correct address. Make sure there are no other peripheral cards (network adapters, bus mouse, etc.) at the same address. Try changing the card address.
12	Reading Card Rev	The card appeared to be working as expected until the revision was requested. Verify that you are downloading to the correct address. Make sure there are no other peripheral cards (network adapters, bus mouse, etc.) at the same address. Try changing the card address.
13	Waiting for Data Ready	The card did not respond when expected. Verify that you are downloading to the correct address. Make sure there are no other peripheral cards (network adapters, bus mouse, etc.) at the same address. Try changing the card address.
14	Purging Data Out Buffer	The card output buffer could not be emptied. Verify that you are downloading to the correct address. Make sure there are no other peripheral cards (network adapters, bus mouse, etc.) at the same address. Try changing the card address.
15	Waiting for Data Input Buffer Empty	The card did not respond to the data sent to it. Verify that you are downloading to the correct address. Make sure there are no other peripheral cards (network adapters, bus mouse, etc.) at the same address. Try changing the card address.

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Downloading Errors *(continued)*

Error	Description	Reason/Corrective Action
16	Time-out Waiting for Processor Startup	The card did not respond as expected. The green LED on the back of the PC-card should be on for this error to occur. Verify that you are downloading to the correct address. Make sure there are no other peripheral cards (network adapters, bus mouse, etc.) at the same address. Try changing the card address. Use a fresh copy of the operating system from the disk that was shipped with the card. If the green LED on the back of the card flashes briefly during download of the operating system, the card may need repair.
17	CRC Error	The CRC value calculated during download is not the same as stored with the operating system. Either the file is corrupted on disk, or was corrupted during download. Try a fresh copy of the operating system. If your computer has a Turbo switch, switch it to low speed because some computers violate ISA bus timing specifications at high speed.
18	Operating System Rev not Compatible with Loader Rev	The operating system being downloaded is not compatible with the `AT6400.EXE` file (downloader) being used. Use the same downloader on the diskette with the operating system.
19	Incompatible Card ROM rev	The card ROMS and the `AT6400.EXE` file (downloader) are incompatible. If you are using a new downloader, obtain a new set of ROMS from the factory.
20	Card Read Error (bad compare)	The downloader is unable to communicate reliably with the card. Try switching to 8-bit mode on the card, switching out of Turbo mode on your PC, or a different address.
21	Card Read Error (outbuf)	The downloader is unable to empty the output buffer. There may be an address conflict with another board. Try a different address.
22	Card ROMS - Command Line Parameter Passing Not Supported	The card ROMS are an old revision that do not support command line arguments. Obtain a ROM update from the factory.
23	Card ROMS - Unsupported Option Requested	The card ROMS do not support the option specified on the command line. Obtain a ROM update from the factory.
24	NULL Error	

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 AT6n00 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, etc.)?
- How was the product configured (in detail)?
- What, 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 product shipping guidelines.

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Appendix A

CE Installation Instructions

General Product Philosophy

The AT6n00 has been demonstrated to conform to the EMC, LVD, and Marking directives necessary for CE compliance when it is installed per the instructions in this appendix. This CE compliance is valid for Serial Numbers 971101xxxx and greater (and for Serial Numbers prior to this if the CE sticker is present on the unit).

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 of the system. The following 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.

These instructions are based on expertise acquired during tests carried out on the AT6n00. It has been shown that when installed per these instructions, this product can be made to comply with relevant CE standards. It is important to follow ***all*** the installation instructions if an adequate level of compliance is to be achieved. In some installations, additional measures may be required.

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

Note: The AT6200-AUX1-DC and AT6400-AUX1-DCversions of the AT6n00 have not been demonstrated to be CE compliant. Following these installation instructions may improve performance, but does not ensure CE compliance for the AT6200-AUX1-DC and AT6400-AUX1-DC.

Safety Considerations

The AT6n00 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 (LVD) and specifically on EN61010-1. 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.***

Environmental Conditions

Pollution Degree: The AT6n00 is designed for pollution degree 2 of the LVD.

Installation Category: The AT6n00 is designed for installation category II of the LVD.

Electromagnetic Emission: EN55011, Group 1, Class A

Susceptibility: EN50082-2

Required Hardware

The AT6n00 requires three specific types of hardware to meet CE criteria: ferrite absorbers, P-clips, and a clam-shell clamp. The clam-shell clamp and two ferrite absorbers are included in the AT6n00 ship kit.

Ferrite Absorber Specifications

The absorbers described in these installation instructions 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, dissipating unwanted high frequency energy that could be conducted or radiated into, or out of, the system.

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

Chomerics part #	83-10-A637-1000
Outside diameter	28.5mm
Inside diameter	13.77mm
Length	28.57mm
Impedance at 25MHz	135Ω
Impedance at 100MHz	210Ω
Curie temperature	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 30mm 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.

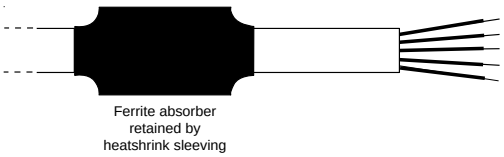


Figure 1a. Ferrite Sleeve

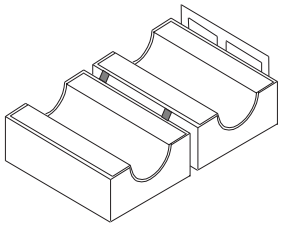


Figure 1b. Snap-on Ferrite

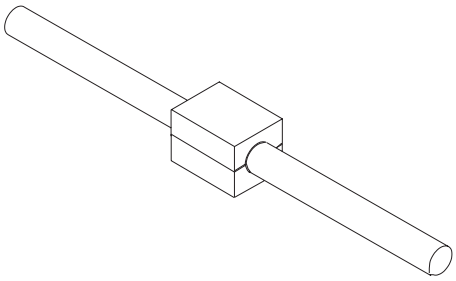


Figure 1c. Snap-on Ferrite Installation

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 a reliable 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.

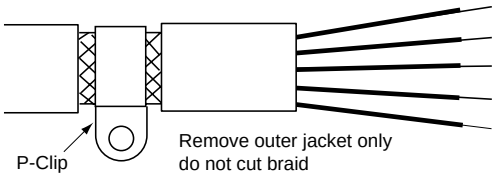


Figure 2. P-Clip Installation

Clam-shell clamp

The function of the clam-shell clamp is to bond, both physically and electrically, the high-density cable to the system cabinet, which in turn must be reliably bonded to Earth.

Clam-shell clamp Installation Details

1. Cut a hole in the front panel of the system cabinet through which to pass the high density cable. See Fig. 3 for cut-out dimensions.
2. Remove the paint from around the panel cut-out to ensure a good Earth connection.
3. Pass the mating connector of the high-density cable through the panel cut-out. Position the connector in the approximate place where the Auxiliary Box will be mounted. (If the Auxiliary Box is already mounted in the enclosure, connect the high density cable to the connector on the top of the box.)
4. Remove approximately 1/4 inch of the outer jacket of the high-density cable at the point where the cable passes through the panel cut-out. Remove only the outer (vinyl) jacket of the braided screen cable (this allows the braid to continue to the cable connector). Use a razor blade or utility knife, taking care to not cut the braid.
5. Position the two clam-shell clamp pieces around the exposed braid of the high density cable, as shown in Fig. 4a. Fit the center slots of the clamp pieces around the cable, with the clamp pieces overlapping each other, as shown in Fig. 4b. The clamp pieces must make contact with the exposed braid of the high density cable to ensure a good electrical connection.
6. Secure the clam-shell clamp and cable to the enclosure using #10 nuts and bolts.
7. In harsh environments, it may be necessary to cover any exposed bare metal with petroleum jelly to resist corrosion.

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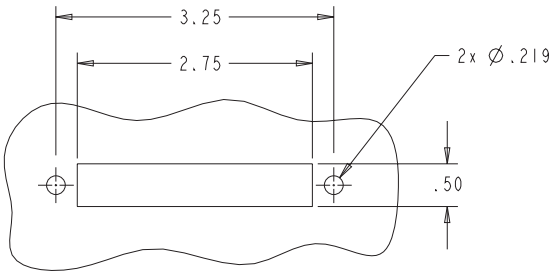


Figure 3. Panel cut-out dimensions for high density cable.

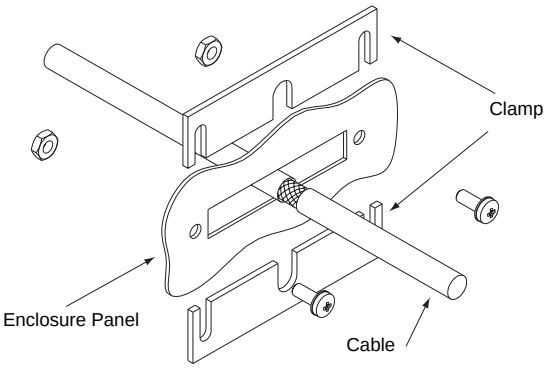


Figure 4a: Installation of clam-shell clamp

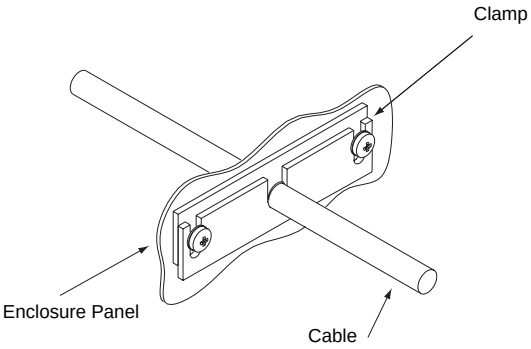


Figure 4b. Completed installation of clam-shell clamp

Electrical

Connecting & Disconnecting Power Mains

The earth connection for the Auxiliary Box of the AT6n00 is provided through its make-first/break-last earth terminal on the power mains connector. You must reliably earth the Auxiliary Box' protective earth connection.

Using an Isolation Transformer

The mains voltage for the Auxiliary Box is limited to 120 VAC nominal for the AT6400-120, and 240 VAC for the AT6400-240 and AT6200. If your mains voltage is higher, use an isolation transformer located between the power mains and the Auxiliary Box. Your isolation transformer should be insulated to ~2300V rms.

Do not interrupt the protective earth conductor between the source mains and the isolation transformer's secondary. The core of the isolation transformer and the drive's protective conductor terminal must *both* be connected to the mains protective earth conductor.

CAUTION — For safety reasons, do not use an autotransformer.

Adding Line Fuses

Line fuses need to be added to protect the transformer and associated wiring. If the live wire cannot be readily identified, fuse both phase conductors. The value of fuse required is given by: (1.5 x VA)/(supply volts) [amps]

Fuse types should be anti-surge HBC.

⚠ **WARNING** — Safety Ground (Earth Ground) should **never** be fused.

Installation

Installing the AT6n00 Card

Install the AT6n00 card itself into your computer per the instructions on page 5 of this Installation Guide. In order for the AT6n00 card to be CE compliant, it must be mounted in a CE-compliant computer. The AT6n00 will not compromise the EMC integrity of the host computer or its peripherals.

Installing the Auxiliary Box in an External Enclosure

Introduction

The measures described in this section are primarily for the purpose of controlling conducted emissions. To control radiated emissions, all peripheral equipment for the AT6n00 control system 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 components are mounted in such a way that there is adequate ventilation.

Preparing the Auxiliary Box: The Auxiliary Box for the AT6n00 must be mounted to a conductive panel of the enclosure. The Auxiliary Box is shipped with no paint affixed to its mounting surfaces. Before mounting the Auxiliary Box, remove the paint from the mounting surface of the enclosure. This is to guarantee a good high-frequency connection between the Auxiliary Box case and the enclosure.

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1. Mount the Auxiliary Box to the surface of the enclosure. Cover any exposed bare metal with petroleum jelly to resist corrosion.
2. Connect the high-density cable to the AT6n00 and to the mating connector at the top of the Auxiliary Box. Prepare the panel cut-out per the instructions in the Required Hardware section.
3. Install the clam-shell clamp per the instructions in the Required Hardware section.
4. Install a snap-on ferrite absorber on the high-density cable within 2 inches (50 mm) of the connection to the AT6n00 card.
5. Install a snap-on ferrite absorber on the high-density cable within 2 inches (50 mm) of the clam-shell clamp, outside of the enclosure.

Filtering the AC Supply

Introduction

These instructions 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.

A filter must be installed between the incoming AC supply and the input to the Auxiliary Box. 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 Auxiliary Box of the AT6n00, as shown in Figure 5 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.

Take the earth connection for the Auxiliary Box of the AT6n00 from the same stud that retains the filter case earth, as shown in Figure 5 below.

Control Signal Connections

High-quality braided screen cable should be used for control connections. In the case of the AT6n00, which has differential step-direction inputs, it is preferable to use a cable with twisted pairs to minimize magnetic coupling.

No connection is made to the cable screen at the Auxiliary Box itself. Fit a ferrite absorber close to the I/O connector and run the cable down to the mounting panel as shown in Figure 5. Expose a short length of the braided screen and anchor to the panel with a P-clip.

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 Auxiliary Box of the AT6n00 that a terminal break out box such as the VM50 be used (see Figure 5). Mount the VM50 close to the Auxiliary Box, 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.

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 with the cabinet door open, for instance a computer or terminal; static discharge may cause damage to unprotected inputs.

Feedback Cables

Feedback devices such as encoders also require the use of high-quality braided screen cable. If it is necessary to replace the standard feedback cable, select a braided screen cable that matches the gage of the devices original cable and attach as close to the transducer as possible. Avoid complex and bulky connections that can cause degradation in feedback signal quality. If possible, use in-line cable splicing techniques, and cover the splice point with heat-shrink tubing. Remove a section of the braided shield cable's insulation to expose the braid, and tie the braid to earth using the same P-clip 360° bond as shown in Figure 2. Differential signals should use twisted pair cable to minimize magnetic coupling. At the receiving end, fit a ferrite absorber over the feedback cable before wiring the connector, then P-clip the braid to a suitable ground (metal back-plane of drive mounting panel, or earth point of device that receives the feedback)— see Figure 5.

Servicing the AT6n00

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

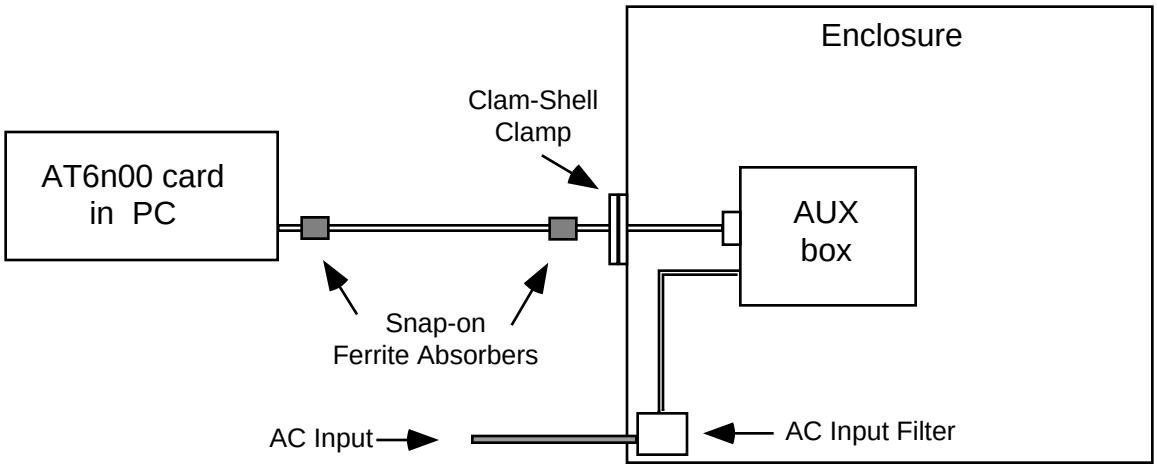
Do Not Replace Fuses: The AT6n00 has no fuses designed to be replaced by the user. Fuse failure indicates that other components have also failed. Fuses and other components should only be replaced by Compumotor or its designated repair facilities.

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Table of Graphic 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



Note: Also use P-clips, ferrite absorbers, and braided-screen cables for connections to the AUX box within the enclosure.

Figure 5a. EMC connections to AT6n00 card

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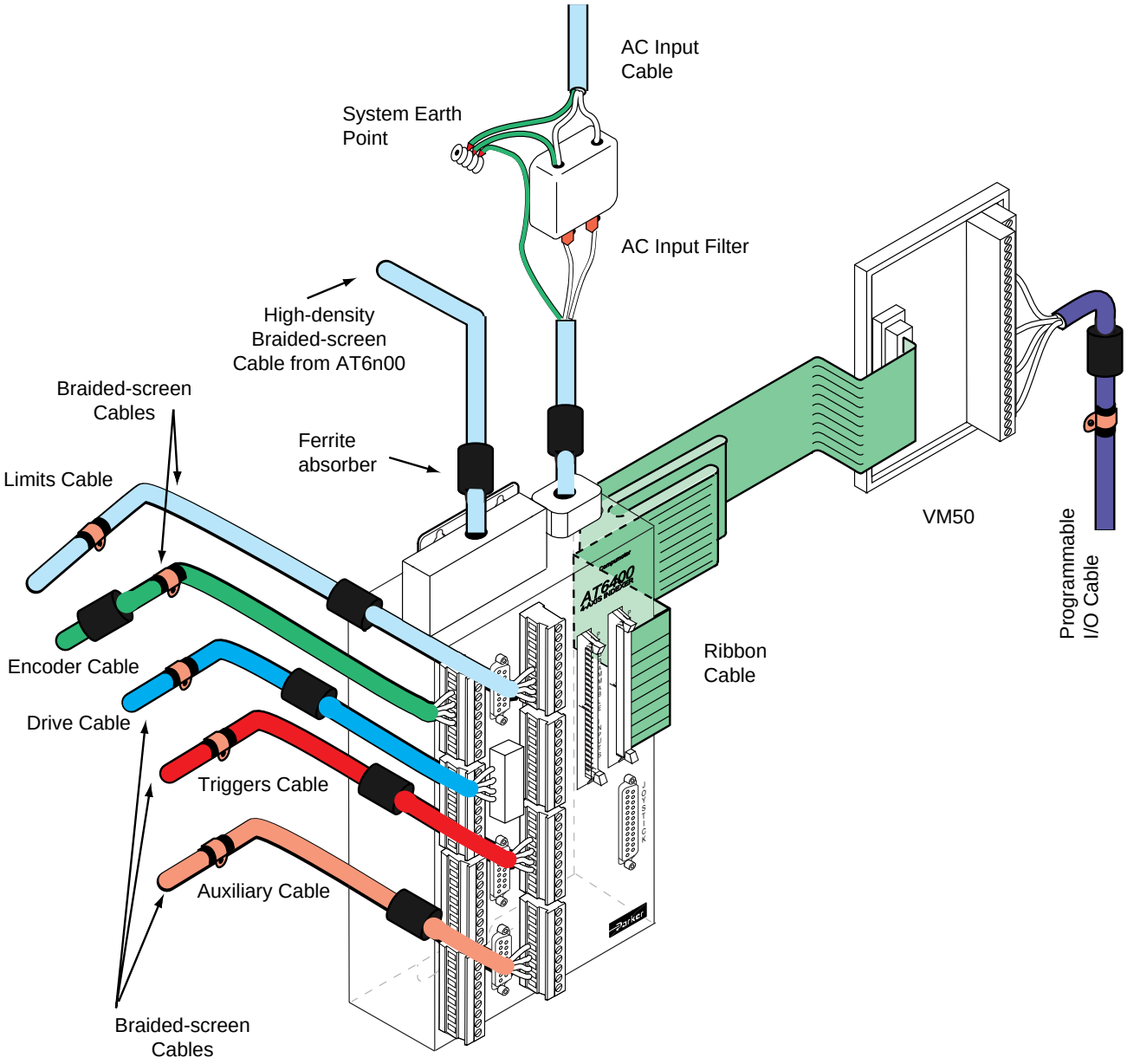


Figure 5b. EMC connections for AT6n00 AUX box within the System Enclosure

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I N D E X

16-bit transfer mode 4
8-bit transfer mode 4

A

AC input power connections & specs 19
acceleration range 3
accuracy
  stepping 3
  velocity 3
active levels *(see polarity)*
address
  conflict 25
    avoiding 27
  DIP switch settings 4
  match the setting in Motion Architect 27
air-flow space, minimum 6
analog inputs (joystick), connections & specs 13
assumptions (skills & knowledge required for installation) i
AUX board
  connect to controller card 8
  mounting 6
auxiliary input (joystick), connections & specs 13
axes select input connections & specs 13

B

base address *(see address)*
BBS (bulletin board service) 22, 25
BCD input via thumbwheels 18
bracket, mounting
  AUX board 6
  PC card 5

C

cables, extending 20
CE installation guidelines 29
change summary i
circuit drawings *(see back cover of manual, and "schematics, internal")*
communication
  Motion Architect 22
  problems 25
CompuCAM™ 22
computer
  I/O address space map 4
  installing the PC card 5
  interrupt assignments 4
  operations guide i
  turn off before installing cards 5
conduit 2, 20
configuration–DIP switches (address, interrupts, transfer mode) 4
connections
  analog channel inputs 13
  AUX board cable 8
  CE-compliance guidelines 29
  drive(s) 9, 10
  encoder 12
  end-of-travel limit inputs 11
  home limit inputs 11
  joystick 13
  lengthening cables 20
  PLC inputs 17
  PLC outputs 16
  power input 19
  pre-wired (factory) 8
  programmable inputs 16
  programmable outputs 17
  pulse cut-off input (P-CUT) 8
  testing 21
  thumbwheels 18
  trigger inputs 14
  VAC power input 19
  VDC power input 19
  VM50 screw terminal adaptor 15
contaminants 6
controller-to-AUX connections 8

D

damage from electro-static discharge (ESD) 5
DC input power connections & specs 19
DDE6000™ 22
device address *(see address)*
dimensions, AUX board 6
DIP switch settings (address, interrupts, transfer mode) 4
DOS support software
  terminal emulation 21
  test 21
downloading, operating system
  errors 27
  from Motion Architect 22
  LED status 26
  problems 26
drive
  connections 9, 10
  drive fault input 9

E

edge connector, PC card 5
electric codes i
electrical noise
  CE installation guidelines 29
  suppressing 20
EMC installation guidelines 29
emergency stop (pulse cut-off) switch 8
encoder, connections and specs 12
environmental considerations 6
environmental specifications 3
extending I/O cables 20

F

factory connections 8
factory set DIP switches 4
FAX number for technical support 22, 25
feedrate control (potentiometer), connections 13
ferrite absorbers 29
filtering the AC input supply 31
firmware, changing 32
fuses
  adding line fuses 31
  internal (do not replace!) 32

G

grounding 2
grounding system 7

H

hard limits (end-of-travel) 11
HCMOS-compatible switching voltage levels 3
heat 3
helpful resources (publications) i
hex address 4
high-density cable 8
humidity 6
humidity 3

I

I/O cabling 20
I/O test program 21
in-position input 9
indexer-to-AUX cable 6
inductive load, connecting outputs to 17
inputs
  analog (joystick) 13
  encoder 12

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end-of-travel limits 11
general-purpose programmable 15
problems 26
home limit 11
input pull-ups (IN-P & AUX-P) 8
joystick 13
P-CUT 8
trigger 14
problems 26
installation
CE guidelines 29
connections *(see connections)*
DIP switch settings 4
mounting 6
precautions 2
test 21
interrupts
conflict 25
avoiding 27
DIP switch settings 4
match the setting in Motion Architect 27

J

joystick
connections & specs 13
problems 26

L

LEDs 19, 24
limit input connections 11
line fuses, adding 31

M

minimum air-flow space 6
motion algorithm update rate 3
Motion Architect 22
Motion Builder™ 22
Motion Toolbox™ 22
motor driver *(see drive)*, *(see drive)*
mounting 6
EMC compliant 31

N

National Electric Code Handbook i
negative-travel limits 11
noise, electrical 2
suppression on I/O cables 20

O

operating system, downloading
from Motion Architect 22
LED status 26
problems 26
outputs
general-purpose programmable 15
problems 26
output pull-up (OUT-P) 8

P

P-clips 30
P-CUT (pulse cut-off) input
connections & specs 8
PC-AT *(see computer)*
performance specifications 3
pin outs *see also back cover of manual*
drive connector 9
encoder connector 12
joystick connector 13
limits connector 11
programmable inputs 15
programmable outputs 15
PLC connections 16
polarity
end-of-travel limit inputs 11
home input 11
programmable inputs 15
programmable outputs 15
trigger inputs 14
position range 3
positive-travel limits 11
power (AC and DC) input connections & specs 19
power supply
AC input, filtering 31
for P-CUT, limit inputs, & trigger inputs 8, 11, 14
for programmable inputs & outputs 15
pre-wired connections 8
precautions
installation 2
mounting 6
product return procedure 28
pulse cut-off (P-CUT) 8

R

reference documentation i
release input (joystick), connections & specs 13
resolution, decoded quadrature 12
return procedure 28

S

safety 2
safety stops 11
schematics, internal *(see also back cover)*
drive inputs and outputs 9
encoder inputs 12
joystick/analog inputs 13
limit inputs 11
P-CUT input 8
programmable inputs and outputs 15
trigger inputs 14
screw, mounting 5
shielding 2
I/O cables 20
ship kit 2
sinking input device, connecting to 17
sinking output device, connecting to 14, 16
software, update from BBS 22, 25
sourcing input device, connecting to 17
sourcing output device, connecting to 14, 16
specifications, overall list of (see also back cover of manual) 3
status commands *(see also test on page 20)*
axis (see TAS command)
joystick analog input voltage (see TANV command)
joystick digital inputs (see TINO command, bits 1-5)
limit switches (see TLIM command)
P-CUT input (see TINO command, bit 6)
programmable inputs (see TIN command)
programmable outputs (see TOUT command)
trigger inputs (see TIN command)
status LEDs 19, 24, 26
stepping accuracy 3
stopping distance, actual 11
support software
Motion Architect 22
SW1 & SW2 (DIP switches) 4

T

technical support 22, 25
temperature 6
temperature range 3
terminal emulation
Motion Architect 22
test program 21
test
program 21, 24
system installation 21
thumbhole connections 18
transfer mode 4
transformer, isolating 31
travel limits 11
trigger input (joystick), connections & specs 13
troubleshooting 24
common problems & solutions 25
diagnostic LEDs 24
test panels, Motion Architect 25
test program 24
TTL-compatible switching voltage levels 3

V-Z

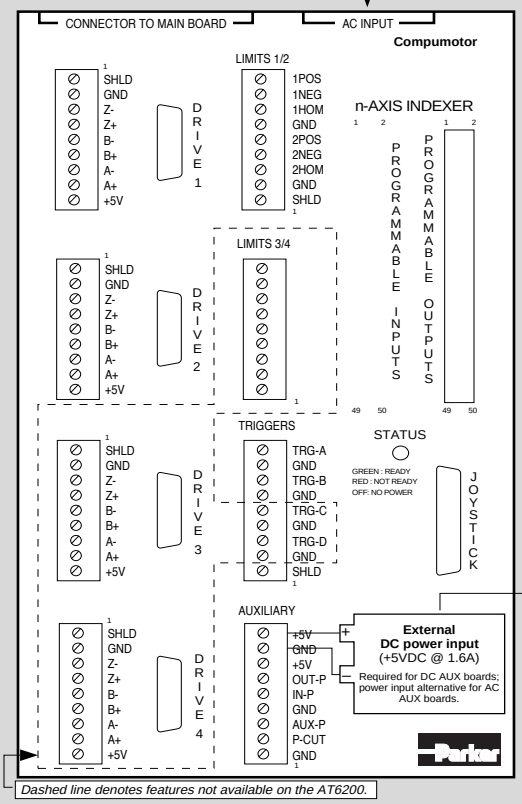
velocity accuracy 3
velocity range 3
velocity repeatability 3
velocity select input, connections & specs 13
verify system installation 21
VM50 adaptor 15
Z channel output 12

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AT6200 & AT6400 Indexers

Parker Automation

Connections *See also pages 7-20*



Dashed line denotes features not available on the AT6200.

PIN OUTS FOR "D" CONNECTORS

PROGRAMMABLE INPUTS & OUTPUTS

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

Even numbered pins are connected to logic ground.

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 Logic gnd
14	Isolated Logic gnd

Pins 3, 6, & 15 are reserved

JOYSTICK

Pin	Function
1-4	Analog Channels 1-4
8	Shield (chassis gnd)
14	Isolated Logic gnd
15	Axes Select Input
16	Velocity Select Input
17	Release Input
18	Trigger Input
19	Auxiliary Input
23	+5VDC Output

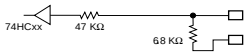
Pins 5-7, 9-13, 20-21, 24-25 are reserved

I/O SPECIFICATIONS AND INTERNAL SCHEMATICS

Power Input:
- AT6200 AC AUX Board.....90-264VAC, 50/60 Hz, 0.75A @ 240VAC, single-phase.
- AT6400 120V AUX Board.....90-132VAC, 50/60 Hz, 1.5A @ 120VAC, single-phase.
- AT6400 240V AUX Board.....90-264VAC, 50/60 Hz, 0.75A @ 240VAC, single-phase.
- AT6n00 DC AUX Board.....+5VDC (±5%) @ 1.6A (connect to the AUXILIARY connector).

Internal Schematics

Limits, P-CUT, & Trigger Inputs

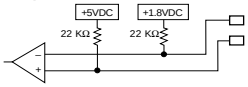


POS, NEG, HOM, P-CUT, or TRG-x

AUX-P (connect to the +5V terminal on the AUXILIARY connector, or to an external supply of up to 24VDC)

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

Encoder Inputs

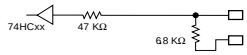


A–, B–, or Z–

A+, B+, or Z+

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

Programmable Inputs

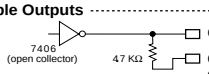


General-purpose Programmable Input

IN-P (Connect to the +5V terminal on the AUXILIARY connector, or to an external supply of up to 24VDC. To sink current, connect to a GND terminal.)

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

Programmable Outputs

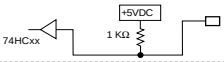


General-purpose Programmable Output

OUT-P (connect to the +5V terminal on the AUXILIARY connector, or to an external supply of up to 24VDC)

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

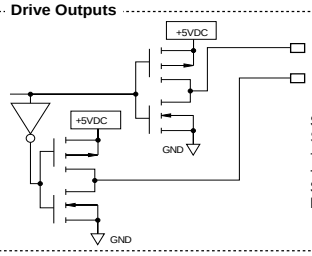
Drive Inputs



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

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

Drive Outputs

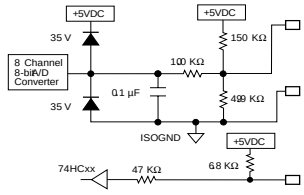


Step+, Direction+, or Shutdown+ (pins 1, 2, or 11)

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 (depends on the value of the PULSE command—default is 0.3 µs).

Joystick Analog and Digital Inputs



Analog Channel Inputs (pins 1-4)

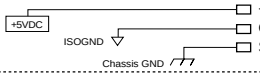
Specs: Voltage range = 0-2.5VDC, 8-bit. Must not exceed 5VDC.

Ground (pin 14)

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

Axes Select, Velocity, Release, Trigger, or Auxiliary (pins 15-19)

Terminals found on multiple connectors



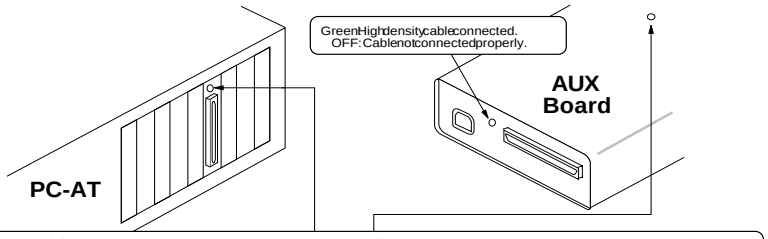
+5V
GND
SHLD

5V Load Limit (for all I/O connections): 1.5A for AT6400-120; 1.0A for AT6200 AC & AT6400-240. Limit for DC AUX boards depends on external power supply.

** HCMOS-compatible levels: Low ≤ 1.00V, High ≥ 3.25V.*

Troubleshooting *See also pages 23-28*

- LEDs – see illustration (right).
- Status information (see descriptions in *6000 Series Software Reference*):
  - Axis status (general problem conditions)...TAS command
  - Joystick analog voltage.....TANV command
  - Joystick digital inputs.....TINO command (bits 1-5)
  - Limit switches.....TLIM command
  - P-CUT input.....TINO command (bit 6)
  - Programmable and trigger inputs.....TIN command
  - Programmable outputs.....TOUT command
- P-CUT input terminal must be grounded to GND terminal to allow motion.
- Programmable input functions (INFNC command) and drive fault detection will not be operable until you enable input functions with the INFEN1 command.
- Incorrect drive fault level (DRFLVL command) will prevent motion.
- To help prevent electrical noise, shield all connections at one end only.
- Error messages while programming or executing programs – see the *6000 Series Programmer's Guide*.
- Download errors – see page 27.
- Address, transfer mode, and interrupt DIP switch settings – see page 4.
- Technical support – see phone numbers on inside of front cover..›



After applying power, the status LED on the AT6n00 PC card will be off and the status LED on the AUX board should be red. If the LED on the AUX board is off, the AUX board does not have AC power.

After downloading the operating system, the status LEDs on the AUX board and the PC card will turn green indicating the system is ready for operation. If both status LEDs do not turn green after downloading the operating system, an error has occurred. The download program (AT6400) issues an error message if it cannot find the card or if the download operation is not successful (refer also to the troubleshooting information in Chapter 2, Troubleshooting).

Board Monitor Alarm (BMA): Detects un-recoverable faults in hardware and software. When the BMA detects fault, the status LED on AT6n00 PC card turns off. The BMA can be reset by cycling power to the PC-AT, or by re-downloading the AT6n00 operating system.

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