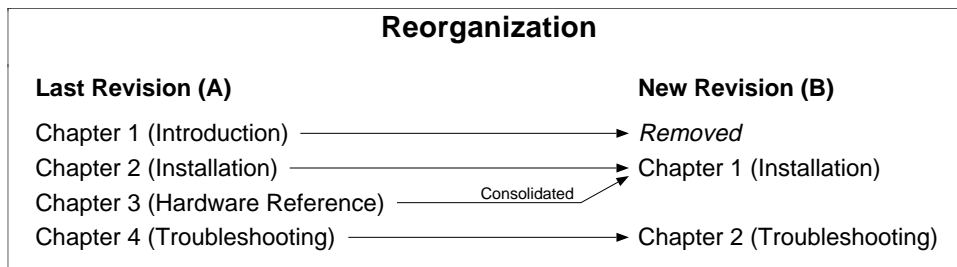


Change Summary

AT6n00 Installation Guide

Rev B

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. This book, p/n 88-014541-01B, supersedes 88-014541-01A.



Topic	Description
AT6200 Release	Addition: This book is updated to accommodate user information for the newly released AT6200 2-axis stepper controller.
Mounting	Correction: The vertical spacing between mounting holes (flat-mount view) on the DC AUX board version is 10.70 inches (271.78 mm), not 11.70 inches.
Back Cover Quick Reference	Additions: <ul style="list-style-type: none">• Internal I/O schematics.• Pin Outs for the DRIVE connector. Corrections: <ul style="list-style-type: none">• Pin outs on the AUXILIARY and LIMITS 3/4 connectors were corrected.• The AT6n00 has 24 general-purpose programmable outputs (not 28).• Removed the reference to a +15VDC power supply requirement for the DC AUX board version (DC AUX boards accept only +5VDC input).• “ENCODER Fault” was changed to “Drive Fault” (“ENCODER Fault” input does not exist).

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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 Guide*.

“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 Guide*, 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
- *Motion Architect User Guide*, Parker Hannifin Corporation, Compumotor Division; part number 88-013056-01
- 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

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

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
AT6200 DC version (with ship kit).....	AT6200-DC
AT6400 120VAC version (with ship kit).....	AT6400-120
AT6400 240VAC version (with ship kit).....	AT6400-240
AT6400 DC version (with ship kit).....	AT6400-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 (AT6200 AC & AT6400-240 only)	43-011905-01
Mounting clips (AC version only)	53-012068-02
Mounting screws (AC version only).....	51-006037-01
(This user guide).....	88-014541-01
<i>6000 Series Software Reference Guide</i>	88-012966-01
<i>6000 Series Programmer's Guide</i>	88-014540-01
<i>Motion Architect User Guide</i>	88-013056-01
Motion Architect diskettes: Disk 1.....	95-013070-01
Disk 2.....	95-013070-02
Operating system/DOS Support diskette:	95-013069-01
Warranty registration card	88-013468-01

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

Electrical Noise

The guidelines listed below should help you minimize the potential for electrical noise.

- 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 for I/O cables are provided on page 19.

Airborne Contaminants

Contaminants that may come in contact with the AT6n00 should be carefully controlled. Particulate contaminants, especially electrically conductive material such as metal shavings, can damage the AT6n00.

General Specifications

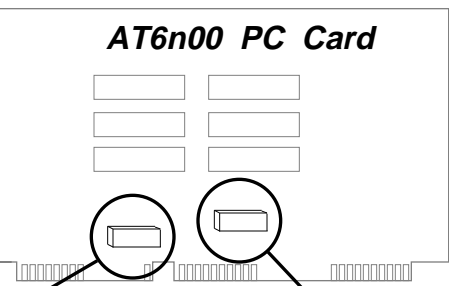
Parameter	Specification
Power	
AT6n00 PC Card.....	5VDC @ 3.5A from the PC-AT bus
AT6200 AC AUX Board (AC or DC input)	90-264VAC, 50/60Hz, 0.3A @ 240VAC, single-phase; or connect an external power source (5VDC ±5% @ 1.6A) to a +5V terminal on the AUXILIARY connector
AT6400-120V AUX Board (AC or DC input).....	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, 0.3A @ 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 <i>Status LEDs</i> 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):	
$\text{Error in steps} = \frac{(v_p * \frac{t}{2})^2}{r}$	
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,	HCMOS-compatible*; internal 6.8 KΩ pull-ups to 5V; voltage range is 0-24V. Trigger, Release, & Auxiliary
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.

Configuration/Customization—Optional DIP Switch Settings

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

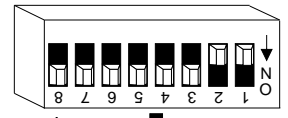
NOTE
 If you change the Address or Interrupt settings and you intend to use Motion Architect, be sure to configure the same settings in Motion Architect's Terminal or Panel Modules.



DIP Switch SW2
 Factory Default Setting Shown



DIP Switch SW1
 Factory Default Setting Shown



= ON position

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		Default Setting
	Decimal	Hex	
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.

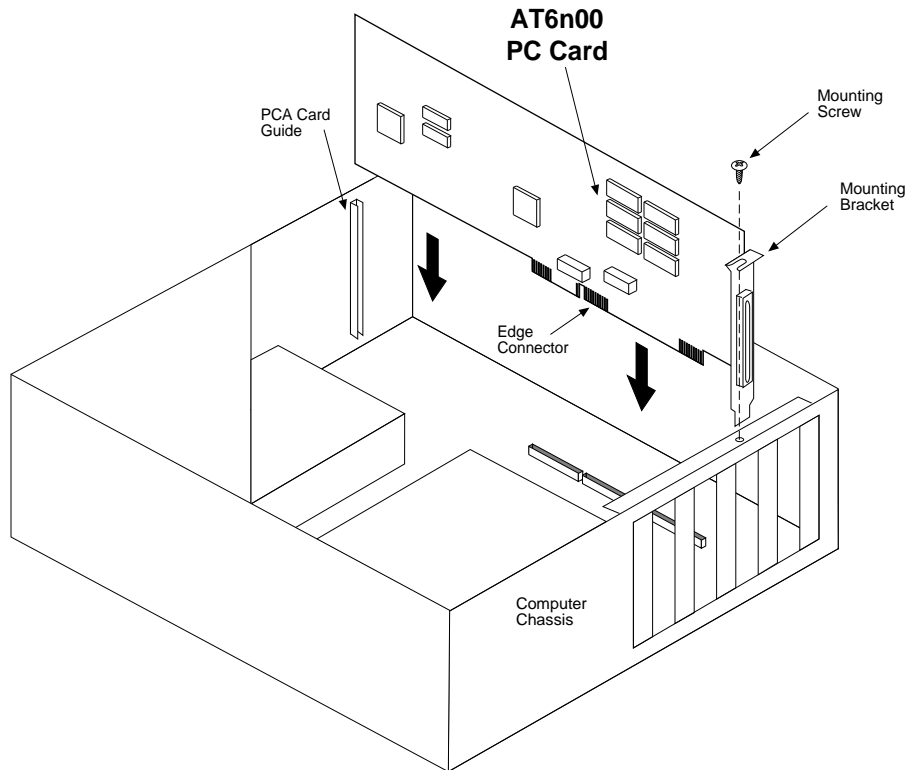
Computer I/O Address Space Map		
Address Range	Description	
	Decimal	Hex
000-255	000-0FF	Used by AT mother-board
496-511	1F0-1FF	Hard Disk (AT)
512-527	200-20F	Game Controller
528-543	210-21F	Expansion Unit
568-571	238-23B	Bus Mouse
572-575	23C-23F	Alternate Bus Mouse
624-639	270-27F	Parallel Printer 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)

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 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).

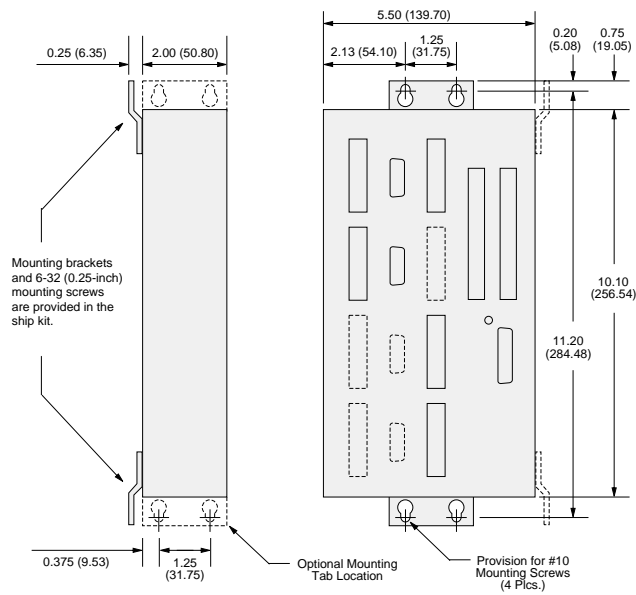
Mounting

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.

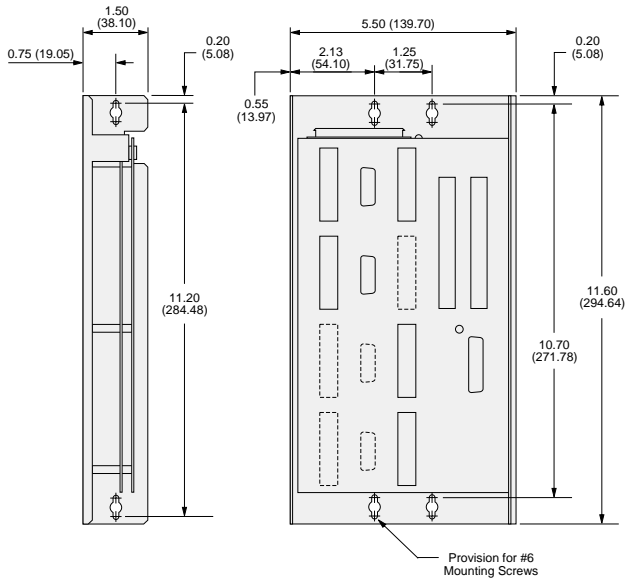
Observe the following mounting precautions:

- 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).

AC Input AUX Boards

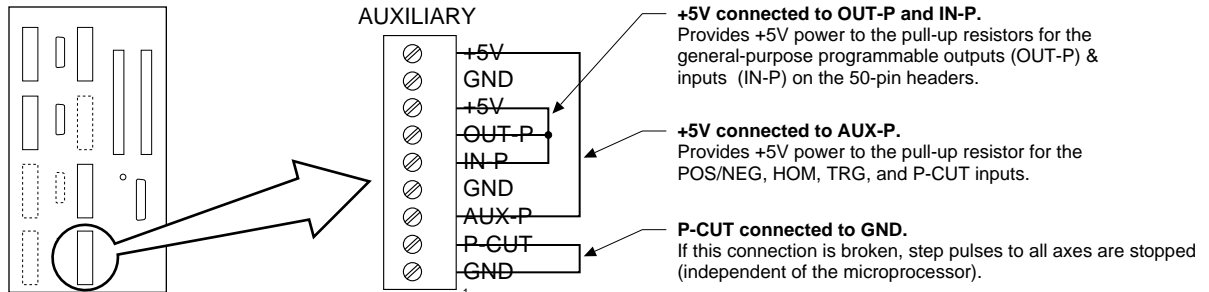


DC Input AUX Boards

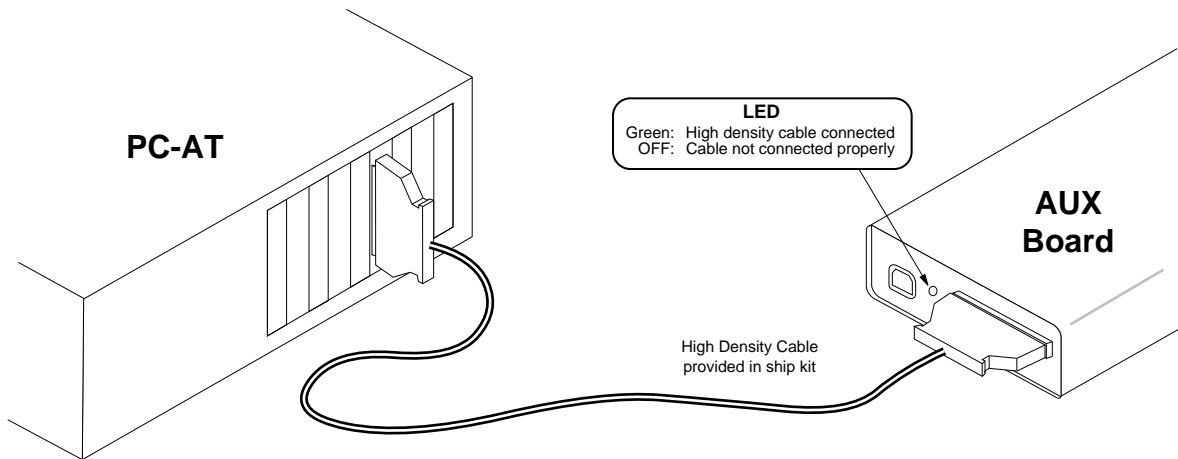


System Electrical Connections

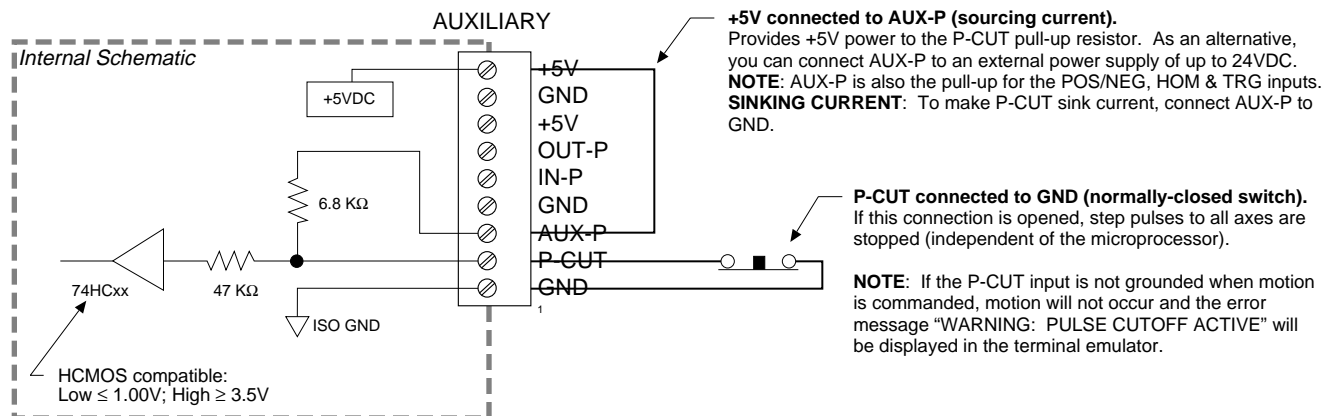
Verify Factory-Wired Connections



AUX Board Cable

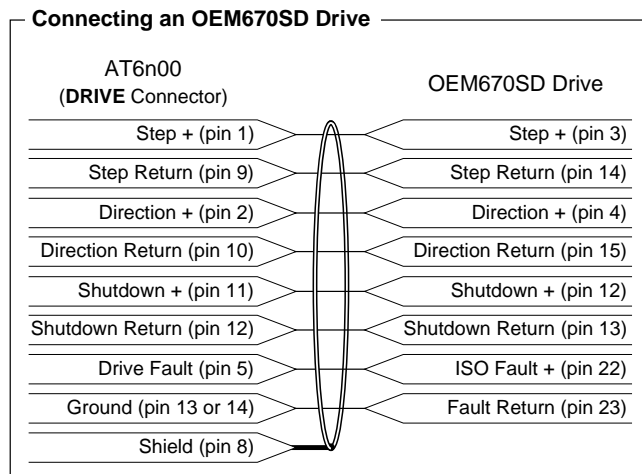
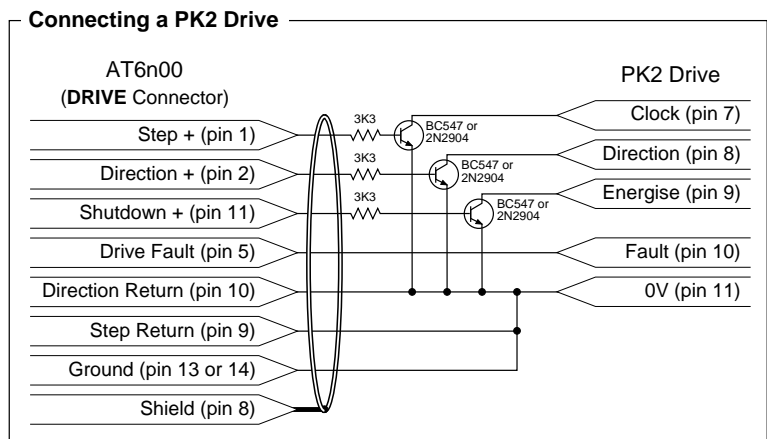
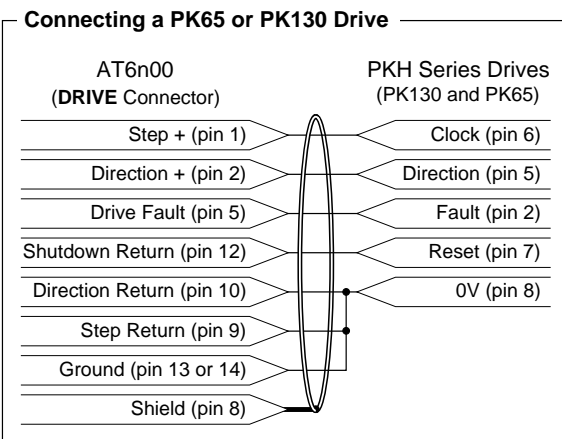
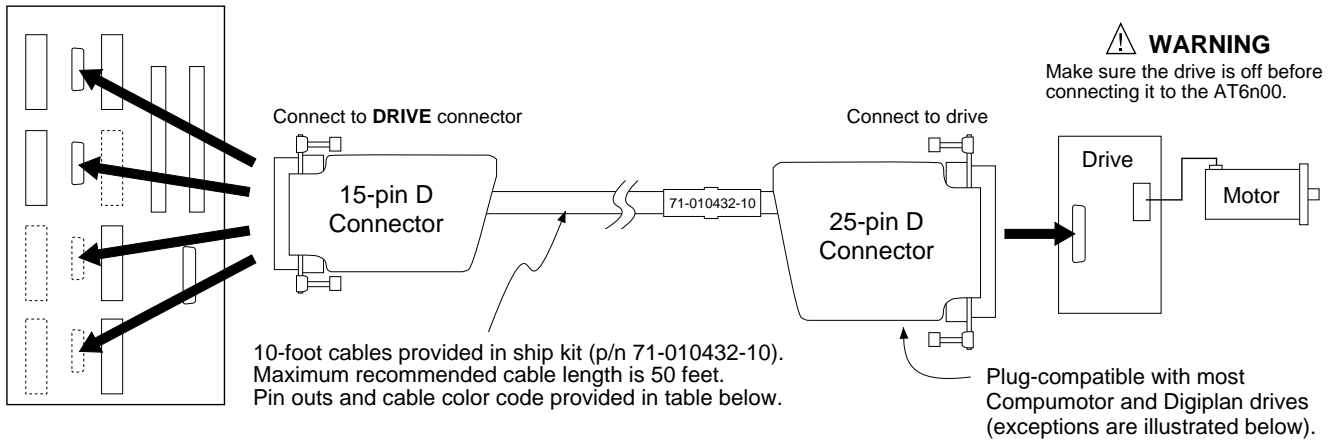


Pulse Cut-Off (P-CUT) — Emergency Stop Switch



Motor Drivers

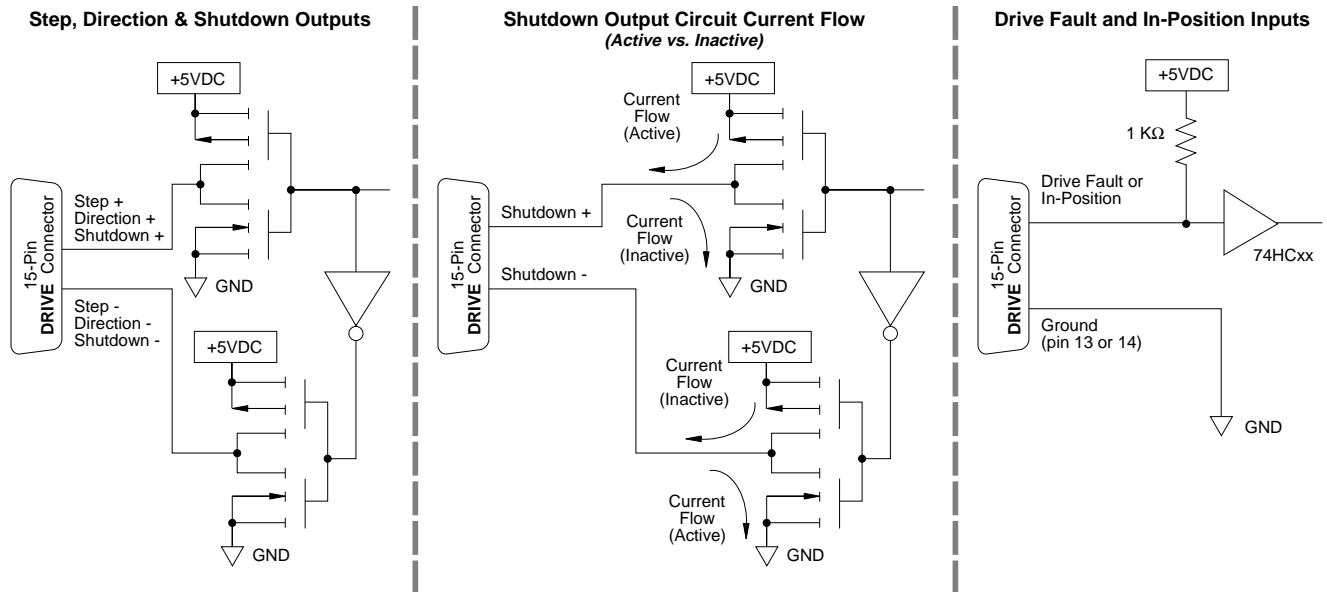
CONNECTIONS



PIN OUTS & SPECIFICATIONS (15-pin DRIVE Connector)

15 D Pin #	Cable 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 $\leq 1.0\text{VDC}$ @ -30mA, High $\geq 3.5\text{VDC}$ @ +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 $\leq 1.0\text{VDC}$ @ -30mA, High $\geq 3.5\text{VDC}$ @ +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 $\leq 1.0\text{V}$, High $\geq 3.25\text{V}$). 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 $\leq 1.0\text{V}$, High $\geq 3.25\text{V}$). 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 $\leq 1.0\text{VDC}$ @ -30mA, High $\geq 3.5\text{VDC}$ @ +30mA.
12	Purple/17	OUT	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	-----

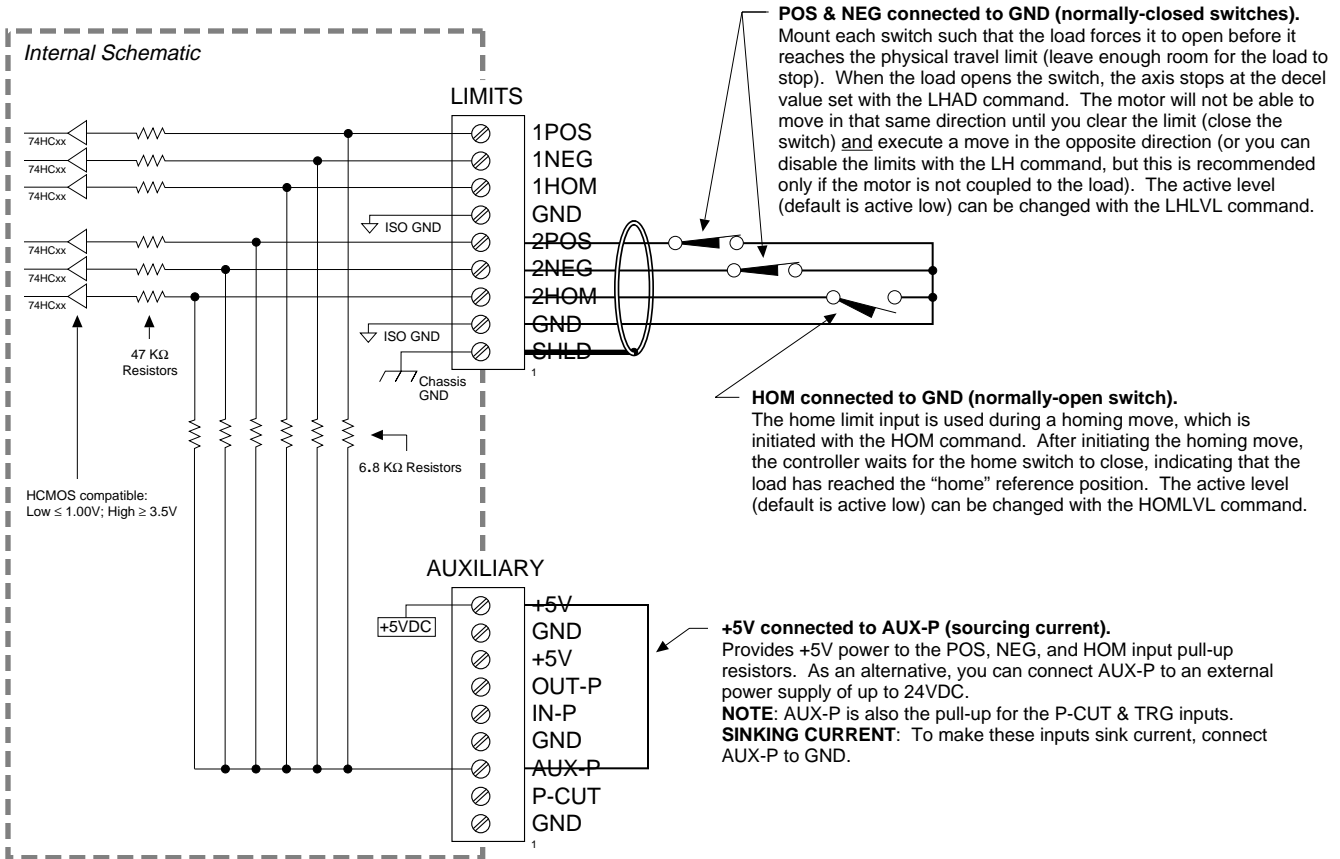
INTERNAL SCHEMATICS



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



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	<i>Shield</i> —Internally connected to chassis ground (earth).

Specification for all limit inputs

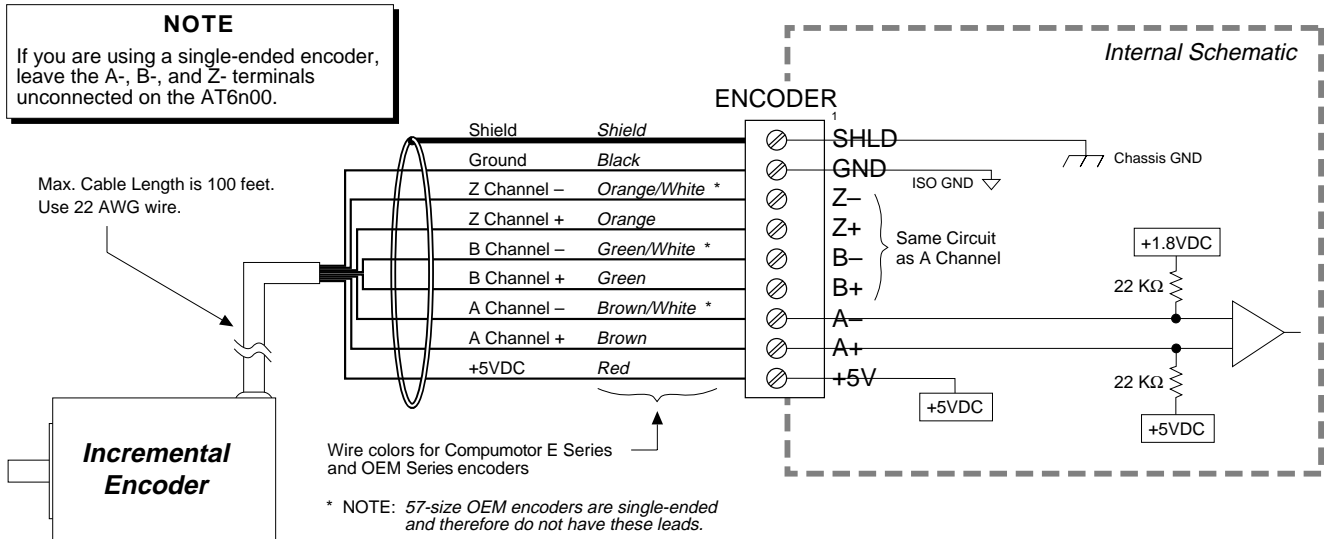
HCMS compatible (voltage levels: Low ≤ 1.00V, High ≥ 3.25V); internal 6.8 KΩ pull-ups to AUX-P terminal (AUX-P is wired at factory to +5V); voltage range is 0-24V.

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).

Encoders

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 is 1.6 MHz. Minimum time between transitions is 625 ns. TTL-compatible voltage levels: Low $\leq 0.4V$, High $\geq 2.4V$. Maximum input voltage is 5VDC.

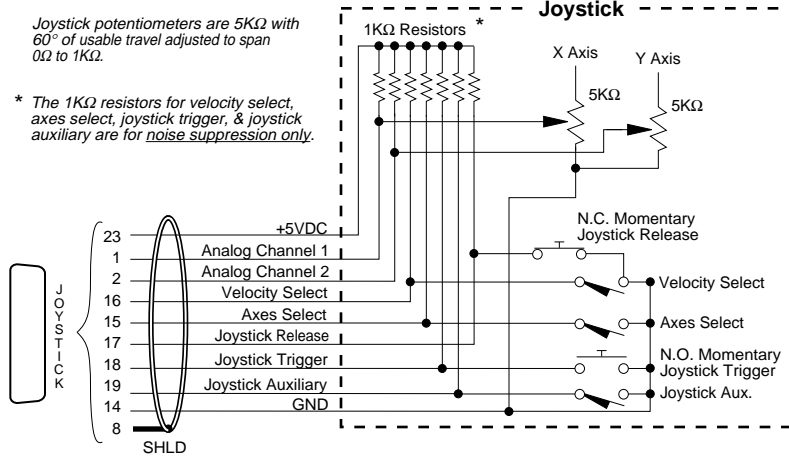
- Requirements for Non-Compumotor Encoders**

 - 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 $\leq 0.4V$, high $\geq 2.4V$) 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.

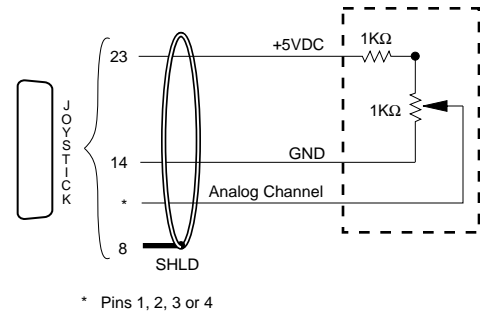
Joystick & Analog Inputs

CONNECTIONS

Joystick

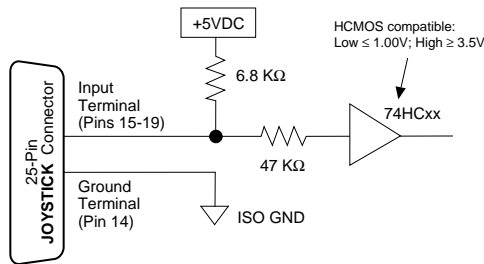


Feedrate Control (Using a Potentiometer)



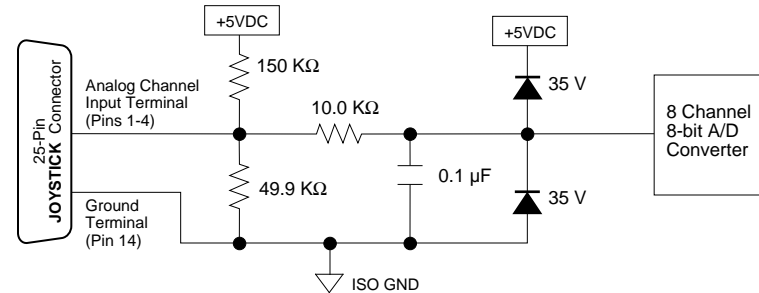
INTERNAL SCHEMATICS

Joystick Input Circuit



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

Analog Channel Input Circuit

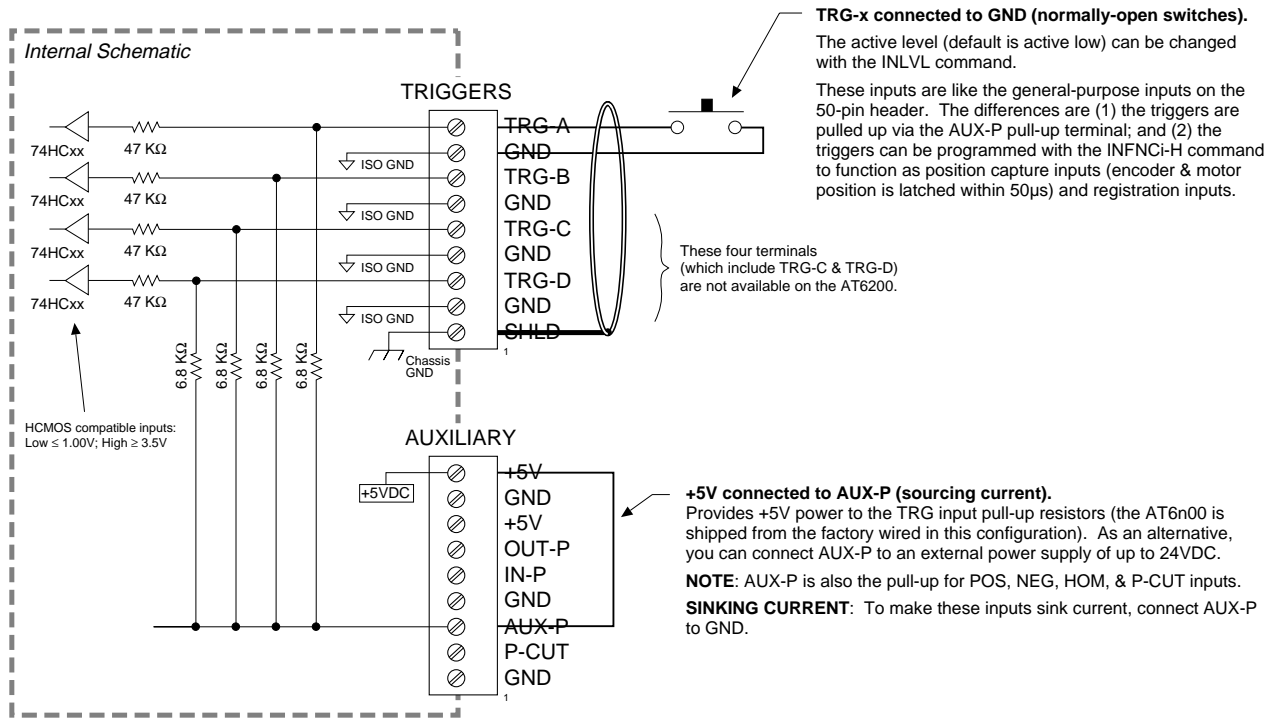


PIN OUTS & SPECIFICATIONS

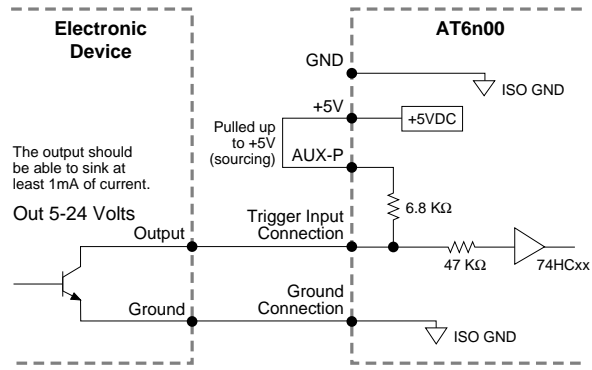
Pin	In/Out	Name	Description
1	IN	Analog Channel 1	Analog input for feedrate control or joystick control of axis. Voltage range is 0-2.5VDC, 8-bit A/D converter. CAUTION: Input voltage must not exceed 5VDC.
2	IN	Analog Channel 2	(same description as pin 1 above).
3	IN	Analog Channel 3	(same description 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).

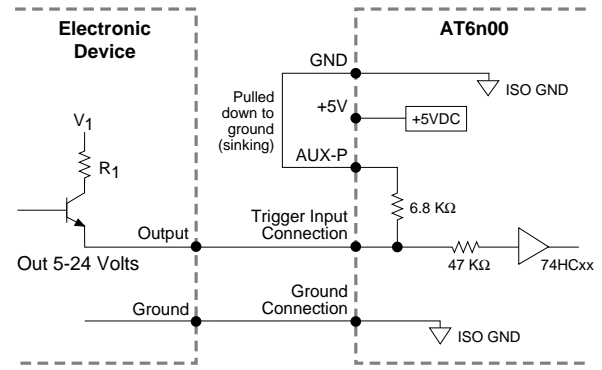
Trigger Inputs



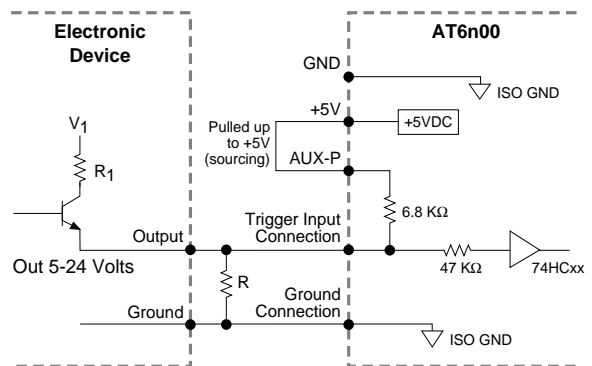
Connection to a Sinking Output Device



Connection to a Sourcing Output Device



Connection to a Combination of Sinking & Sourcing Outputs



Typical value for R = 450Ω (assuming R₁ = 0)

Note: The value of R may vary depending on the value of R₁ and V₁.

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 (0 = active low, default setting).

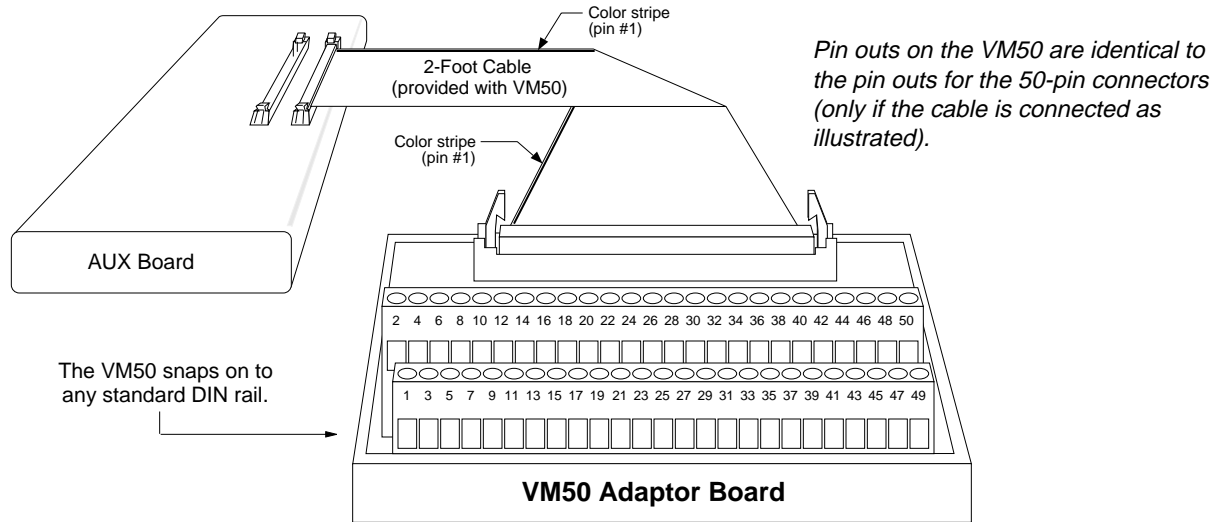
Connecting to a sourcing output? Set the trigger input's active level to high with the INLVL command (1 = active high).

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.

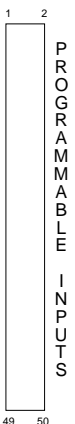
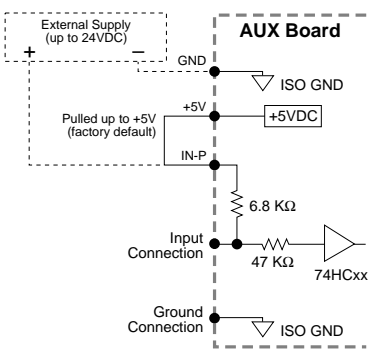
For details on setting the active level and checking the input status refer to the INLVL and TIN command descriptions in the 6000 Series Software Reference Guide.

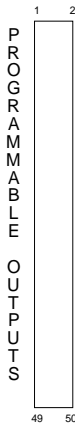
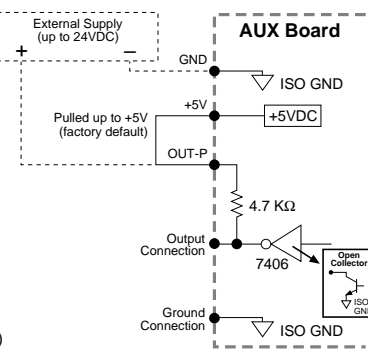
General-Purpose Programmable Inputs & Outputs

VM50 ADAPTOR — for screw-terminal connections



PIN OUTS & SPECIFICATIONS

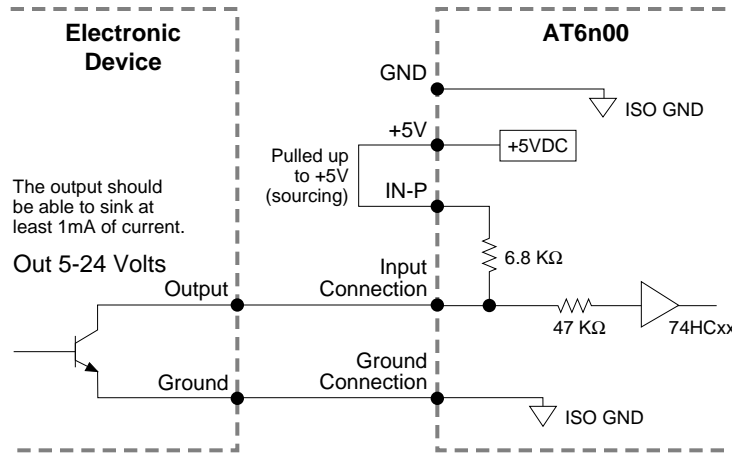
Inputs	Pin #	Function	Pin #	Function	Internal Schematic	Specifications
 1 2 P R O G R A M M A B L E I N P U T S 49 50	49	+5 VDC	23	Input #13		HCMOS-compatible voltage levels (low $\leq 1.00V$, high $\geq 3.25V$). Voltage range = 0-24V.
	47	Input #1 (LSB)	21	Input #14		50-pin plug is compatible with OPTO-22™ signal conditioning equipment.
	45	Input #2	19	Input #15		Sourcing Current: On the AUXILIARY connector, connect IN-P to +5V or to your own power supply of up to 24VDC.
	43	Input #3	17	Input #16		Sinking Current: On the AUXILIARY connector, connect IN-P to GND.
	41	Input #4	15	Input #17		STATUS: Check with the TIN status command.
	39	Input #5	13	Input #18		Active level: Default is active low, but can be changed to active high with the INLVL command.
	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					

Outputs	Pin #	Function	Pin #	Function	Internal Schematic	Specifications
 1 2 P R O G R A M M A B L E O U T P U T S 49 50	49	+5 VDC	23	Output #13		Open collector output.
	47	Output #1 (LSB)	21	Output #14		Pull-up connection on AUXILIARY connector: Connect OUT-P to +5V, or to an external supply of up to 24V.
	45	Output #2	19	Output #15		Max. voltage in the OFF state (not sinking current) = 24V, max. current in the ON state (sinking) = 30mA.
	43	Output #3	17	Output #16		50-pin plug is compatible with OPTO-22™ signal conditioning equipment.
	41	Output #4	15	Output #17		STATUS: Check with the TOUT status command.
	39	Output #5	13	Output #18		Active level: Default is active low, but can be changed to active high with the OUTLVL command.
	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					

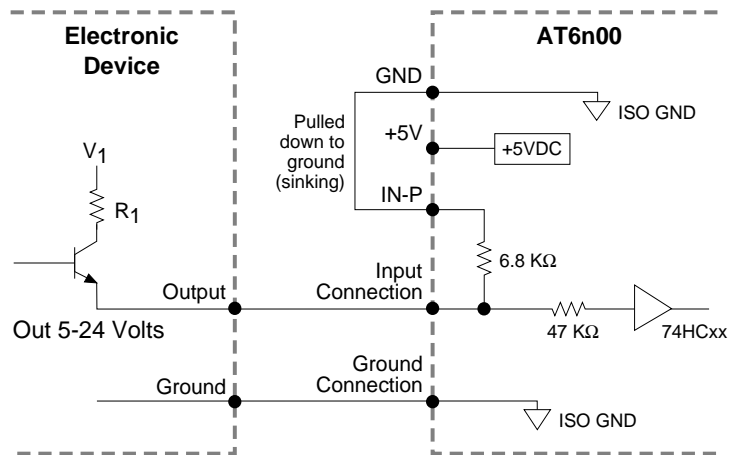
NOTE: All even-numbered pins are connected to a common logic ground (DC ground).
LSB = least significant bit; MSB = most significant bit

INPUT CONNECTIONS — Connecting to electronic devices such as PLCs

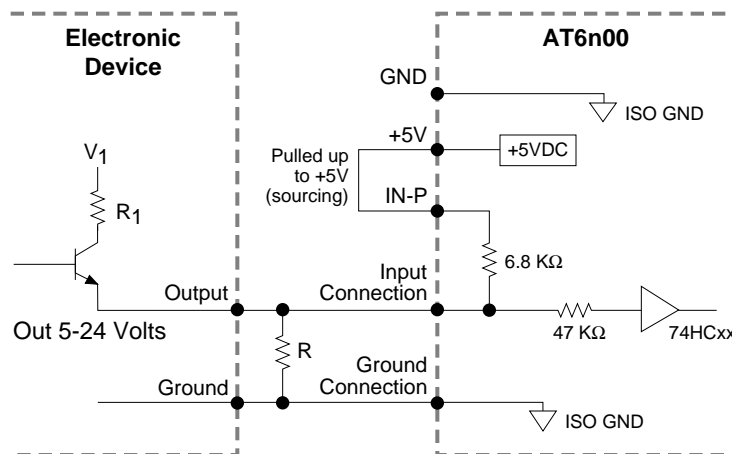
Connection to a Sinking Output Device



Connection to a Sourcing Output Device



Connection to a Combination of Sinking & Sourcing Outputs



Typical value for R = 450Ω (assuming R₁ = 0)
Note: The value of R may vary depending on the value of R₁ and V₁.

PROGRAMMING TIP

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

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

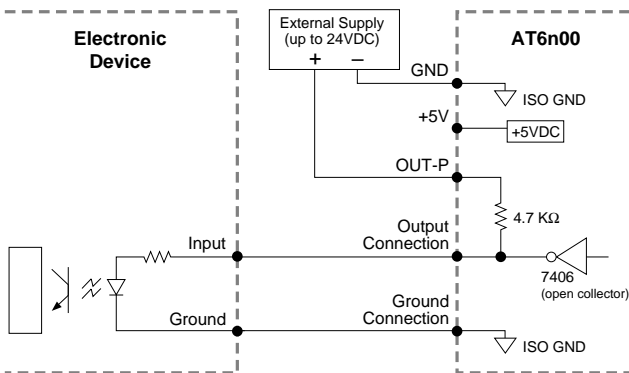
Thus, when the output is active, the `TIN` status command will report a "1" (indicates that the input is active), regardless of the type of output that is connected.

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*.

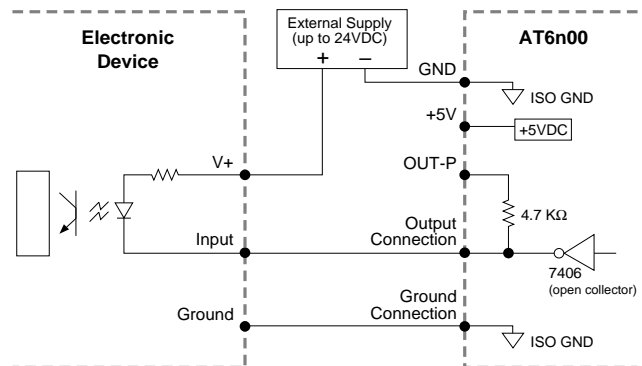
If you will be connecting to a combination of sourcing and sinking outputs, connect **IN-P** to **+5V** to accommodate sinking output devices. Then for each individual input connected to a sourcing output, wire an external resistor between the AT6n00's programmable input terminal and ground (see illustration).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

OUTPUT CONNECTIONS — for electronic devices such as PLCs

Connection to a Sinking Input (active high)

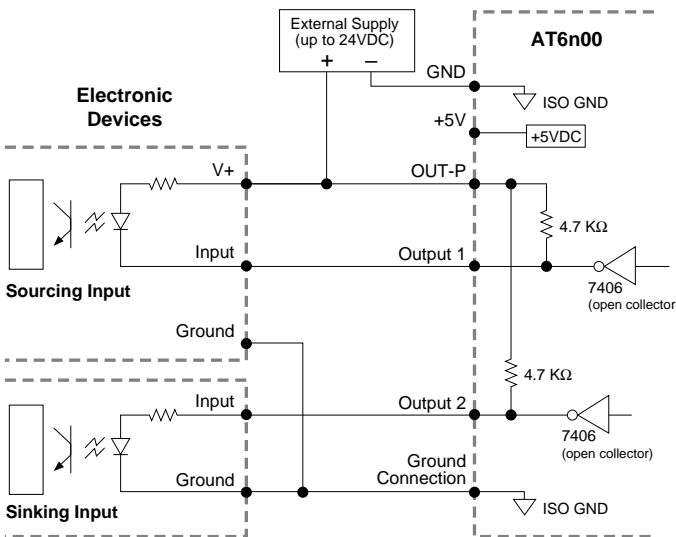


Connection to a Sourcing Input (active low)



NOTE: It is not necessary to use the OUT-P pin for a sourcing input.

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.

PROGRAMMING TIP

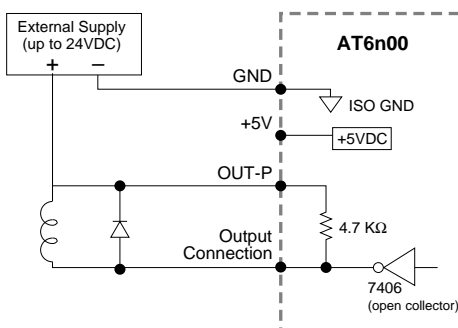
Connecting to an active-high sinking input? Set the output's active level to high with the OUTLVL command (1 = active high).

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 Guide*.

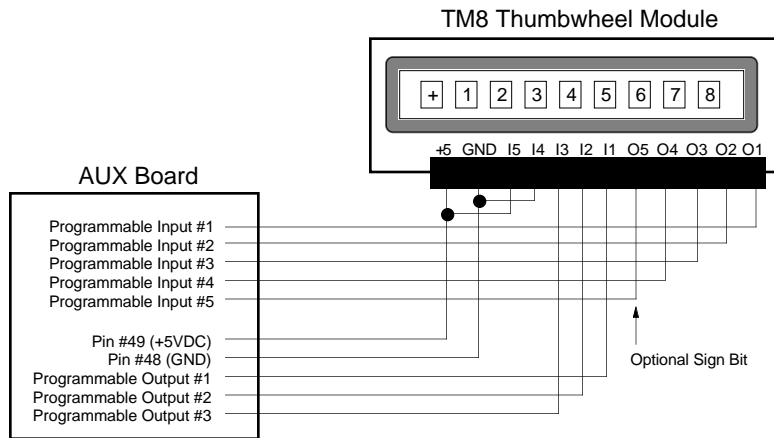
Connection to an Inductive Load (active low)



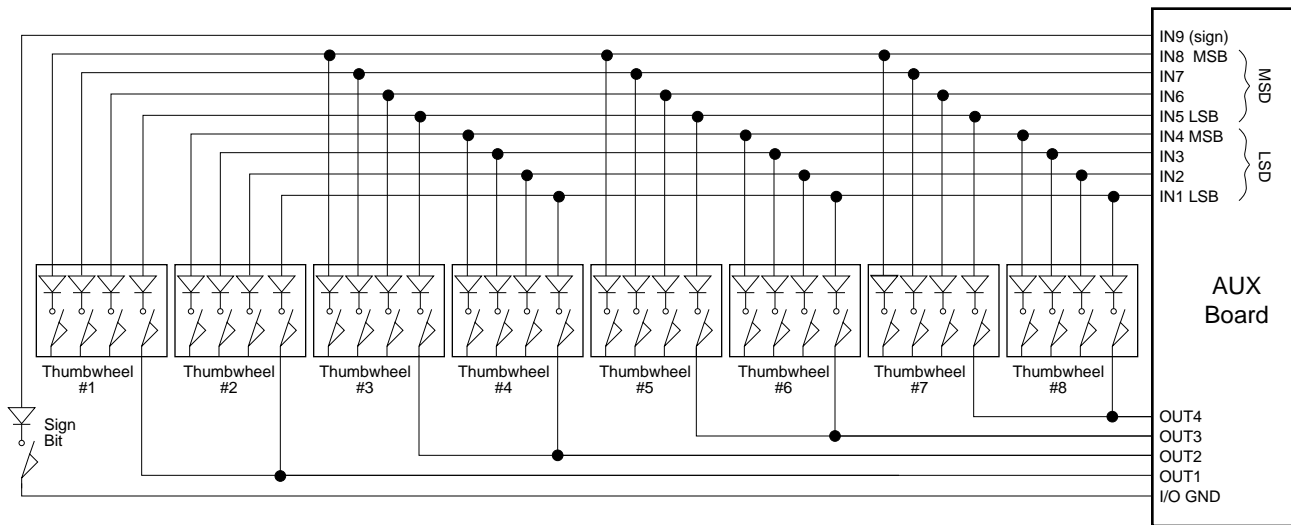
Use an external diode when driving inductive loads. Connect the diode in parallel to the inductive load, attaching the anode to the AT6n00 output and the cathode to the inductive load.

THUMBWHEEL CONNECTIONS — for entering BCD data

Connection to the Compumotor TM8 Module



Connection to your own Thumbwheel Module



Input Power

120VAC Input (AT6200 & AT6400-120)

Grounded 120VAC Power Source

120VAC-Compatible AUX Board

6-ft. 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, 0.3A @ 240VAC, single-phase
 AT6400-120.....90-132VAC, 50/60Hz, 1.5A @ 120VAC, single-phase

240VAC Input (AT6200 & 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.

Grounded 240VAC Power Source

User supplied power cable with a cross section of 1 mm² (18 AWG)

25mm
6mm

EIA plug (part # 43-011905-01) from the ship kit

Clamp
Ground
AC Neutral
AC Line

Power Input Specification (AT6200 & AT6400-240)
 90-264VAC, 50/60Hz, 0.3A @ 240VAC, single-phase

DC Input

AUXILIARY

+	5V
-	GND
+	5V
+	OUT-P
-	IN-P
-	GND
-	AUX-P
-	P-CUT
-	GND

External 5VDC Power Supply

+5VDC
Ground

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.

STATUS LEDs

Green: High density cable connected
 OFF: Cable not connected properly

PC-AT

AUX Board

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).

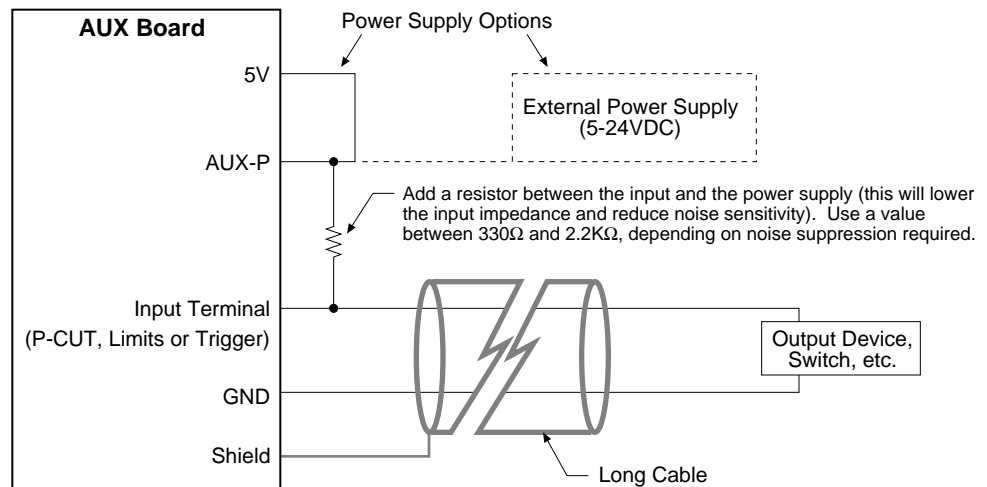
Board Monitor Alarm (BMA): Detects un-recoverable faults in hardware and software. When the BMA detects a fault, the status LED on AT6n00 PC card turns off. The BMA can be reset by cycling power to the PC-AT, or by re-downloading the AT6n00 operating system.

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).



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.

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 Guide* 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 (refer to the *Motion Architect User Guide* for detailed information):

- **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)

- **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.

CHAPTER TWO

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

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.

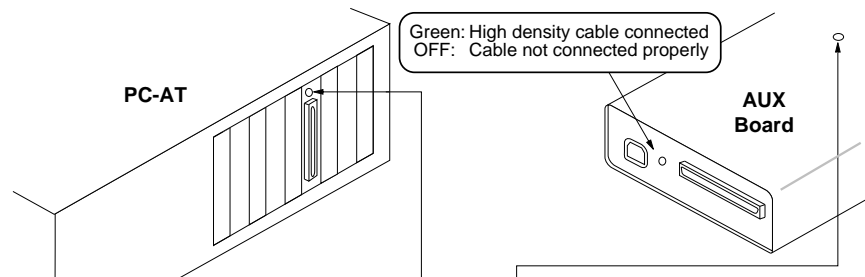
Log (document) all testing and problem isolation procedures. Also, if you are having difficulty isolating a problem, be sure to document all occurrences of the problem along with as much specific information as possible. You may need to review and consult these notes later. This will also prevent you 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 the guidelines on page 19. General information on reducing electrical noise can be found in the Engineering Reference section of the Parker Compumotor/Digiplan *Positioning Control Systems and Drives Catalog*.

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 20 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.

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. For more information, refer to the *Motion Architect User Guide*.

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.	<ol style="list-style-type: none"> 1. Communication program looking for card at wrong address. 2. Address conflict. 3. AT6n00 card not properly seated. 	<ol style="list-style-type: none"> 1. Select correct address for communication program. 2. See <i>Address Selection</i> 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.	<ol style="list-style-type: none"> 1. Interrupt conflict. 2. See problem: <i>Communication Errors</i>. 	<ol style="list-style-type: none"> 1.a. Turn interrupt DIP switches OFF. 1.b. See <i>Interrupt Selection</i> section below.
Direction is reversed.	<ol style="list-style-type: none"> 1. Direction connections on AUX board reversed. 2. Phase of step motor reversed. 	<ol style="list-style-type: none"> 1. Switch DIR+ with DIR- connection to drive. 2. Switch PHA+ with PHA- connection from drive to motor.
Distance is incorrect as programmed.	<ol style="list-style-type: none"> 1. Incorrect resolution setting. 2. Pulse width too narrow. 	<ol style="list-style-type: none"> 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. <p style="margin-left: 20px;">Resolution values for Compumotor encoders: E Series: 1000-line (4000 counts/rev post quad) OEM Series motors (stepper): 83 size: 1000 lines (4000 counts/rev post quad) 57 size: 512 lines (2048 counts/rev post quad)</p> 3. Set pulse width to drive specifications using the PULSE command.
Encoder counts missing.	<ol style="list-style-type: none"> 1. Improper wiring. 2. Encoder slipping. 3. Encoder too hot. 4. Electrical noise. 5. Encoder frequency too high. 	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 1. Electrical Noise. 2. Improper shielding. 3. Improper wiring. 	<ol style="list-style-type: none"> 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. 3. Check wiring for opens, shorts, & mis-wired connections.

Common Problems and Solutions (continued)

Problem	Cause	Solution
Joystick mode: Motor does not move.	<ol style="list-style-type: none"> Joystick Release input not grounded. Improper wiring. 	<ol style="list-style-type: none"> Ground Joystick Release input. 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.	<ol style="list-style-type: none"> PC-to-AUX cable is not connected. 	<ol style="list-style-type: none"> Make sure the cable is securely connected at both ends.
LEDs: LED on AT6n00 PC card is off.	<ol style="list-style-type: none"> No power. Operating system not downloaded. 	<ol style="list-style-type: none"> Check PC-AT power and check proper card installation in bus slot. Download operating system.
LEDs: LED on AT6n00 PC card is red.	<ol style="list-style-type: none"> Internal Board Monitor Alarm (BMA) has detected a non-recoverable fault. 	<ol style="list-style-type: none"> Recycle power to the AT6n00. Ensure +5V is not shorted to GND on the I/O connections.
LEDs: STATUS LED on AUX board is red.	<ol style="list-style-type: none"> Operating system not downloaded. 	<ol style="list-style-type: none"> Download operating system.
LEDs: STATUS LED on AUX board off.	<ol style="list-style-type: none"> Computer not on. AUX cable not connected. No AC power to AUX board. 	<ol style="list-style-type: none"> Computer must be on since the AUX board turns on and off automatically with the computer. Make sure both ends of cable connectors are securely latched. Check AC power to AUX board.
Motion does not occur.	<ol style="list-style-type: none"> STATUS LED on AUX board off or red. End-of-travel limits are active. Step pulse too narrow for drive to recognize. Drive fault level incorrect. Improper wiring. P-CUT (Pulse cut-off) not grounded. Load is jammed. No torque from motor. 	<ol style="list-style-type: none"> See LED troubleshooting as noted above. <ol style="list-style-type: none"> Move load off of limits or disable limits with the <code>LH0, 0, 0, 0</code> command. Set <code>LSPOS</code> to a value less than <code>LSNEG</code>. Set pulse width to drive specifications using the <code>PULSE</code> command. Set drive fault level using the <code>DRFLVL</code> command. Check step, direction, drive fault, & limit connections. Ground P-CUT connection on AUX board. Remove power and clear jam. See problem: <i>Torque, loss of.</i>
Motor creeps at slow velocity in encoder mode.	<ol style="list-style-type: none"> Encoder direction opposite of motor direction. Encoder connected to wrong axis. 	<ol style="list-style-type: none"> Switch encoder connections A+ & A- with B+ & B-. Switch DIR+ with DIR- connection to drive. <ol style="list-style-type: none"> Check encoder wiring.
Mouse stops working or serial ports affected (after AT6n00 is installed).	<ol style="list-style-type: none"> Interrupt conflict. Address conflict. 	<ol style="list-style-type: none"> See <i>Interrupt Selection</i> section below. See <i>Address Selection</i> section below.
Operating system will not download, or download stops part way through.	<ol style="list-style-type: none"> Address conflict. Download error. 	<ol style="list-style-type: none"> See <i>Address Selection</i> section below. See <i>Downloading Errors</i> table below.
Programmable inputs not working.	<ol style="list-style-type: none"> IN-P (input pull-up) on AUX board not connected to a power supply. If external power supply is used, the grounds must be connected together. Improper wiring. 	<ol style="list-style-type: none"> When inputs will be pulled down to 0V by an external device, connect IN-P to +5V supplied or other positive supply. When inputs will be pulled to 5V or higher by an external device, connect IN-P to 0V. <ol style="list-style-type: none"> Connect external power supply's ground to AT6n00's ground (GND). Check wiring for opens, shorts, and mis-wired connections.
Programmable outputs not working.	<ol style="list-style-type: none"> Output connected such that it must source current (pull to positive voltage). OUT-P (output-pull-up) on AUX board not connected to a voltage source. If external power supply is used, the grounds must be connected together. Improper wiring. 	<ol style="list-style-type: none"> Outputs are open-collector and can only sink current -- change wiring. Connect OUT-P to the +5V supply on the AUX board or to an external supply of up to 24V. Connect the external power supply's ground to the AT6n00's ground (GND). Check wiring for opens, shorts, and mis-wired connections.
Torque, loss of.	<ol style="list-style-type: none"> Improper wiring. No power to drive. Drive failed. Drive faulted. Drive shutdown. 	<ol style="list-style-type: none"> Check wiring to the drive, as well as other system wiring. Check power to drive. Check drive status. Check drive status. Enable drive with the <code>DRIVE1111</code> command.
Trigger inputs not working.	<ol style="list-style-type: none"> If external power supply is used, the grounds must be connected together. Improper wiring. 	<ol style="list-style-type: none"> Connect external power supply's ground to AT6n00's ground (GND). <ol style="list-style-type: none"> Check wiring for opens, shorts, and mis-wired connections. When inputs will be pulled down to 0V by an external device, connect AUX-P to +5V supplied or other positive supply. 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 <i>Distance</i> problem noted above.	

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 ≤ port ≤ 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.

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 In North America, call Parker Compumotor for a Return Material Authorization (RMA) number. Returned products cannot be accepted without an RMA number. The phone number for Parker Compumotor Applications Department is (800) 358-9070.
- Ship the unit to: Parker Hannifin Corporation, Compumotor Division
5500 Business Park Drive, Suite D
Rohnert Park, CA 94928
Attn: RMA # xxxxxxx
- Step 4 In the UK, call Parker Digiplan for a GRA (Goods Returned Authorization) number. Returned products cannot be accepted without a GRA number. The phone number for Parker Digiplan Repair Department is 0202-690911. The phone number for Parker Digiplan Service/Applications Department is 0202-699000.
- Ship the unit to: Parker Digiplan Ltd.,
21, Balena Close,
Poole, Dorset,
England. BH17 7DX
- Step 5 Elsewhere: Contact the distributor who supplied the AT6n00.

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