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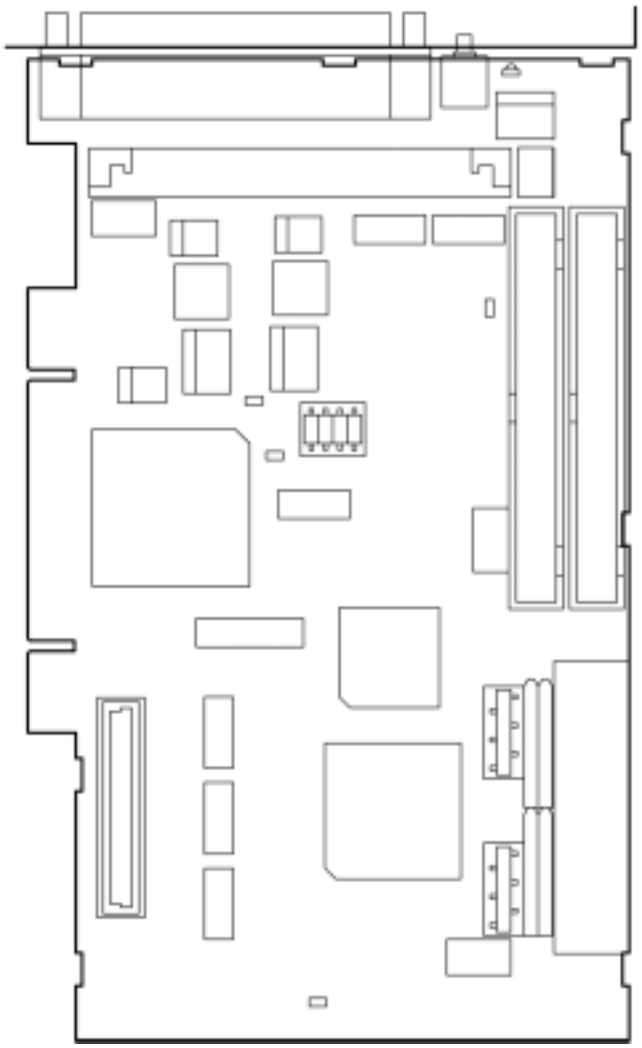
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Parker
Automation

p/n 88-023416-01D

ACR1505
Hardware Installation

Effective: October 2004



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IMPORTANT

User Information

Warning!

ACR 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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Warning!

Risk of damage and/or personal injury

The ACR1505 Controller cards described in this guide only contain user-serviceable fuses. Attempting to replace any other internal component may result in damage to the unit and/or personal injury. This may also void the warranty.

Symbols	Description
	Protective Earth Ground
	Functional Earth (Ground) Terminal
	Shield, Frame, or Chassis Terminal
	Caution Risk of Electrical Shock
	Caution, Refer to Accompanying Documentation

Warning!

Do not install the ACR1505 in an AT motherboard. Doing this will permanently damage the controller card.

The ACR1505 is only compatible with ATX motherboards, which supply both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of motherboard is in your computer, consult the technical manual for your computer or the manufacturer.

Warning!

Do not install the ACR1505 in a computer that uses an AT power supply. Doing this will permanently damage the controller card.

The ACR1505 is only compatible with ATX power supplies, which provide both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of power supply is in your computer, consult the technical manual for your computer or the manufacturer.

Warning!

Do not connect external power to the ACR1505 through the ACRCOMM card. Doing this will permanently damage the ACR1505.

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Important Information for Users

It is important that motion control equipment is installed and operated in such a way that all applicable safety requirements are met. It is your responsibility as an installer to ensure that you identify the relevant safety standards and comply with them; failure to do so may result in damage to equipment and personal injury. In particular, you should study the contents of this user guide carefully before installing or operating the equipment.

The installation, set up, test, and maintenance procedures given in this User Guide should only be carried out by competent personnel trained in the installation of electronic equipment. Such personnel should be aware of the potential electrical and mechanical hazards associated with mains-powered motion control equipment—please see the safety warnings below. The individual or group having overall responsibility for this equipment must ensure that operators are adequately trained.

Under no circumstances will the suppliers of the equipment be liable for any incidental, consequential or special damages of any kind whatsoever, including but not limited to lost profits arising from or in any way connected with the use of the equipment or this guide.



Safety Warning!



High-performance motion control equipment is capable of producing rapid movement and very high forces. Unexpected motion may occur especially during the development of controller programs. KEEP WELL CLEAR of any machinery driven by stepper or servo motors. Never touch any part of the equipment while it is in operation.

This product is sold as a motion control component to be installed in a complete system using good engineering practice. Care must be taken to ensure that the product is installed and used in a safe manner according to local safety laws and regulations. In particular, the product must be positioned such that no part is accessible while power may be applied.

This and other information from Parker Hannifin Corporation, its subsidiaries, and authorized distributors provides product or system options for further investigation by users having technical expertise. Before you select or use any product or system, it is important that you analyze all aspects of your application and review the information concerning the product in the current product catalog. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, safety, and warning requirements of the application are met.

If the equipment is used in any manner that does not conform to the instructions given in this user guide, then the protection provided by the equipment may be impaired.

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Change Summary

Revision D Changes

This document, 88-021610-01D, supercedes 88-021610-1C. Changes associated with ACR1505 User Guide revisions, and document clarifications and corrections are as follows:

Topic	Description
High Speed outputs	Added specifications for High-Speed Outputs, added to P2 Connector pinout.

Revision C Changes

This document, 88-021610-01C, supercedes 88-021610-1B. Changes associated with ACR1505 User Guide revisions, and document clarifications and corrections are as follows:

Topic	Description
Specifications	Added specification for vibration under section titled Environment & Cooling.
Connectors	Corrected connecter labels for Figure 14.

Revision B Changes

This document, 88-021610-01B, supercedes 88-021610-1A. Changes associated with ACR1505 User Guide revisions, and document clarifications and corrections are as follows:

Topic	Description
Breakout Box	Corrected part numbers under section titled Checking your Shipment.
Breakout Box	Corrected number of pins on the Digital I/O headers. See Digital I/O Cables.
Breakout Box	Corrected dimensions (reversed) in illustration. See Breakout Box Dimensions.

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CHAPTER ONE

1 Introduction

IN THIS CHAPTER

- ACR1505 Products—Overview 2
- Compatible Parker Products 3
- Requirements 4
- Checking Your Shipment 5
- Assumptions of Technical Experience 5
- Technical Support 5

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ACR1505 Products—Overview

The ACR1505 is a PC-bus based controller in the ACR family of high-performance motion controllers. As a half-length 32-bit PCI card, the ACR1505 can run up to four servo drives or stepper drives with up to four encoders.

The 1505 controller has 16 fixed inputs, 16 fixed outputs, and an additional 16 configurable I/O points. In addition, the ACR1505 also provides an expansion slot to accommodate the ACRCOMM module, which lets you add serial communications to the ACR1505.

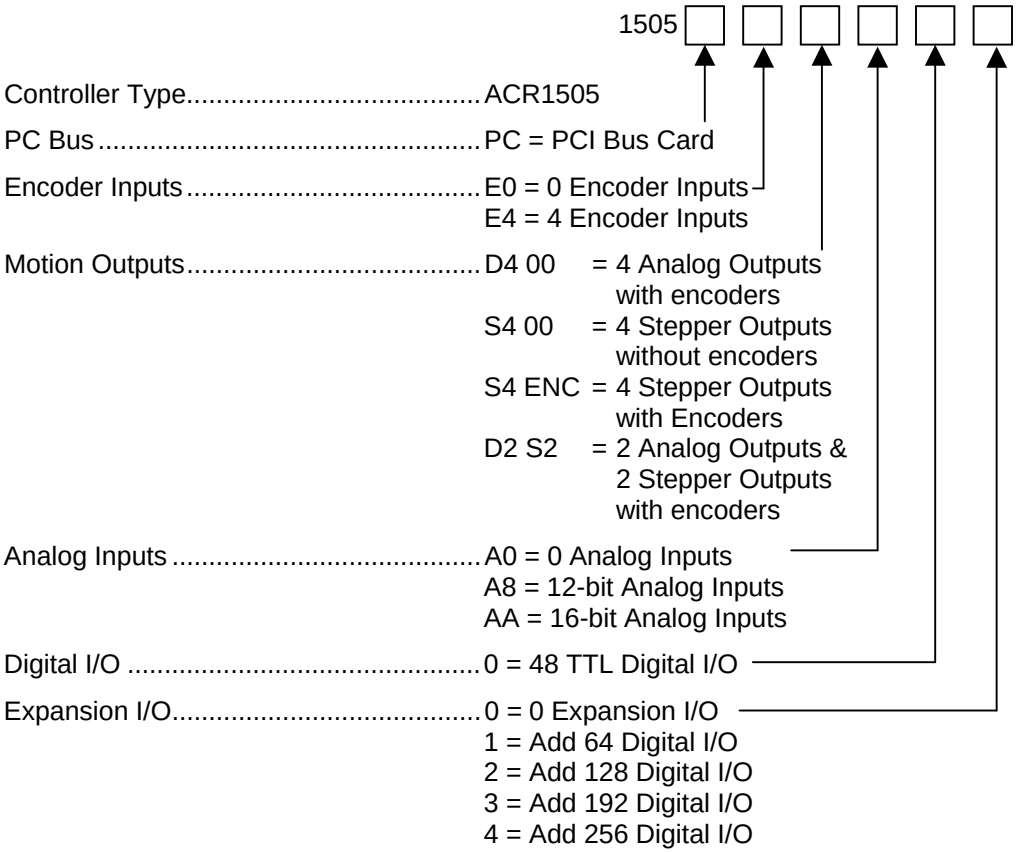
The ACR1505 transmits and receives data through its Dual Port Memory, accessible on the PCI bus. The Windows™ Plug and Play interface automatically configures the dual port memory address range.

Another feature lets users instruct a program on the ACR1505 to interrupt the host computer through the PCI bus. This advanced feature lets users create programs that signal the host computer to perform additional actions. (The interrupt is automatically configured through the Windows™ Plug and Play interface.)

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ACR1505 Names

The following helps explain the meaning of ACR1505 part numbers:



Options

For the latest additions, see our website at www.parkermotion.com

Compatible Parker Products

Drives	Aries, Dynaserv G2, Gemini GT, Gemini GV, E-AC/E-DC, OEM750, OEM770T, and Zeta
Software	AcroView
Motors	SE/SM Series, BE Series, NeoMetric Series, J Series, MaxPlus Rotary, MaxPlus Linear, LXR Linear Series, SL Linear Series, ILM Linear Series

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Requirements

The ACR1505 is a PCI compatible motion controller card for your personal or industrial computer.

Operating System	Windows 98SE, Windows NT 4.0, Windows 2000, or Windows XP
Motherboard	ATX, with 32 bit PCI bus version 2.1 or 2.2
Power Supply	ATX
Processor	Pentium 200 MHz, minimum
Memory	64 MB, minimum



Warning!



Do not install the ACR1505 in an AT motherboard. Doing this will permanently damage the controller card.

The ACR1505 is only compatible with ATX motherboards, which supply both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of motherboard is in your computer, consult the technical manual for your computer or the manufacturer.



Warning!



Do not install the ACR1505 in a computer that uses an AT power supply. Doing this will permanently damage the controller card.

The ACR1505 is only compatible with ATX power supplies, which provide both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of power supply is in your computer, consult the technical manual for your computer or the manufacturer.

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Checking Your Shipment

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

Controller Ship Kit	
Part Name	**Part Number**
Strain Relief Connector	XCN085
P2 Connector	XCN086
ACR SDK Compact Disc	95-021500-01

Table 1 Ship Kit Items

Assumptions of Technical Experience

The ACR1505 is designed for industrial applications. To effectively install and troubleshoot the ACR1505, you must have a fundamental understanding of the following:

- Motion control applications
- Electromechanical actuators
- Electrical concepts such as voltage, current, switches, etc.
- Serial Communication (RS-232 or RS-422) depending on which communications protocol you are using (applicable only if using the ACRCOMM module).

Technical Support

For solutions to your questions about implementing the ACR1505, first refer to this manual. 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 telephone numbers listed on page ii.

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CHAPTER TWO

Hardware Configuration

IN THIS CHAPTER

- Overview—Configuring the Hardware 7
- Jumpers, Resistors, and Encoders 7
- Encoder Input Connector (P1) 14
- Analog/Digital I/O—P2 Connector 16
- Digital I/O—P3 & P4 Connectors 20
- Installation Test 32

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Overview—Configuring the Hardware

Before installing the ACR1505, you must configure the card for your specific application.

The ACR1505 is capable of handling line driver encoders, and either +5 VDC or +12 VDC open collector encoders (not recommended).

The ACR1505 ships with resistor packs installed, which supply termination resistance for line driver encoders. In addition, the pull-up jumpers are configured for +5 VDC.

Warning!

Incorrect jumper or resistor configuration may damage the feedback device and ACR1505.

Warning!

Do not install the ACR1505 in an AT motherboard. Doing this will permanently damage the controller card.

The ACR1505 is only compatible with ATX motherboards, which supply both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of motherboard is in your computer, consult the technical manual for your computer or the manufacturer.

Jumpers, Resistors, and Encoders

Some versions of the ACR1505 include the encoder option. Before connecting feedback devices, configure the following for each device you want to connect:

- Jumpers JP1 and JP2
- Resistor packs RP1 through RP4

Jumpers

The ACR1505 can supply +5 VDC or +12 VDC to each encoder. Use Table 2 and Table 3 to determine the correct jumper configurations. For the location of the jumpers, see Figure 14 on page 28.

Factory Default.....JP1 & JP2 configured for +5 VDC for standard Parker encoders

Jumper (JP1)		
Encoder	**+5 VDC**	**+12 VDC**
0	Pins 1 & 2	Pins 2 & 3
1	Pins 4 & 5	Pins 5 & 6

Table 2 Jumper (JP1) Configuration for Encoder Voltage

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Jumper (JP2)		
Encoder	**+5 VDC**	**+12 VDC**
2	Pins 1 & 2	Pins 2 & 3
3	Pins 4 & 5	Pins 5 & 6

Table 3 Jumper (JP2) Configuration for Encoder Voltage

Resistor Packs

The ACR1505 comes with termination resistor packs installed. If using open collector or single ended encoders (not recommended), you must replace the packs. For more information, see “Differential Encoders (Parker Drives and Encoders)”.

For the location of the resistor packs, see Figure 14 on page 28.

Factory Default..... Termination resistor packs are installed for differential line-driver encoders

Encoder	Resistor	Jumper
0	RP1	JP1
2	RP2	JP2
1	RP3	JP1
4	RP4	JP2

Table 4 Resistor Packs and Voltage Jumpers

Differential Encoders (Parker Drives and Encoders)

Parker encoders are differential line-driven (balanced pair). You can use the supplied 8-pin, isolated, termination resistor packs. No additional modifications should be necessary.

Differential, Open Collector

For differential open collector encoders, replace the factory supplied termination resistor packs with common, 8-pin, 1 KΩ pull-up resistor packs. This supplies pull-up voltages necessary for each signal on the encoder input channels.

Depending on the application, you might need to pull up to +5 VDC or +12 VDC. Five volt DC provides faster response times, but has lower noise immunity. It may be necessary to use +5 VDC with high frequency applications—encoder rates higher than 1 MHz. Twelve volt DC provides higher noise immunity, but has slower response times.

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Warning!

When using open collector encoders, replace the terminating resistor packs (factory installed) with common, 8-pin, 1 KΩ pull-up resistor packs.

Warning!

When using pull-up resistor packs (necessary with open collector encoders), the ACR1505 is not able to detect encoder failures. An encoder fault can occur, but the ACR1505 Controller is unable to notify the user.

For a wiring schematic, see Figure 1.

1. On the ACR1505, remove the termination resistor packs:
   a. Insert a small, standard screwdriver underneath one end of the resistor pack.

      Gently rock the screwdriver to loosen the resistor pack. Use caution to not damage the socket. Repeat this action at the opposite end of the resistor pack.

   b. Using a thin pair of needle nose pliers, firmly grip the resistor pack in its center. Lift the resistor pack straight up.
2. Insert the following type of resistor packs.
   - For +5 VDC encoders, install common 1 KΩ, 8-pin pull-up resistor packs.
   - For +12 VDC encoders, install common 2.2 KΩ, 8-pin pull-up resistor packs.

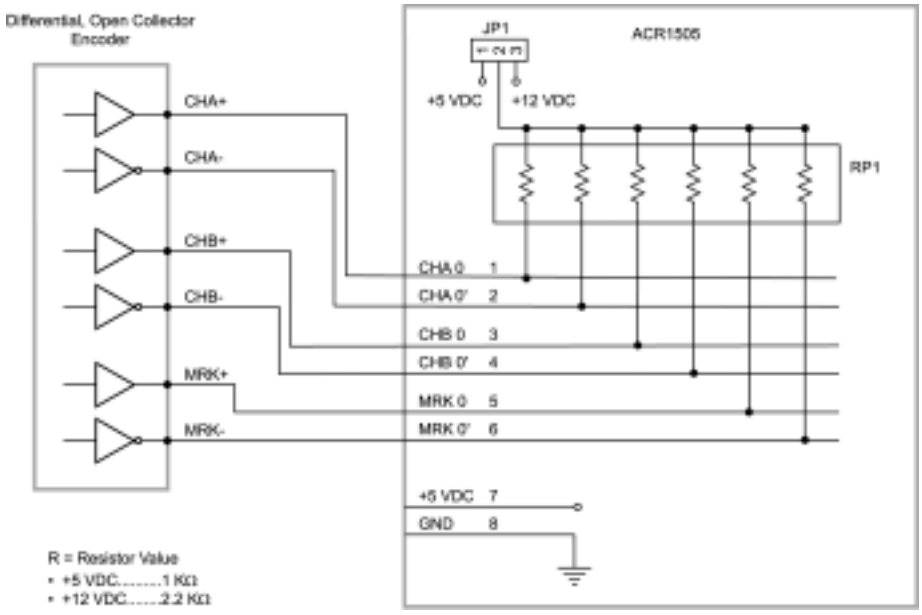


Figure 1 Differential, Open Collector Encoder with internal pull-up resistors

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Differential, Line Driver

Using line driven, differential encoders requires no additional setup. For a wiring schematic, see Figure 2.

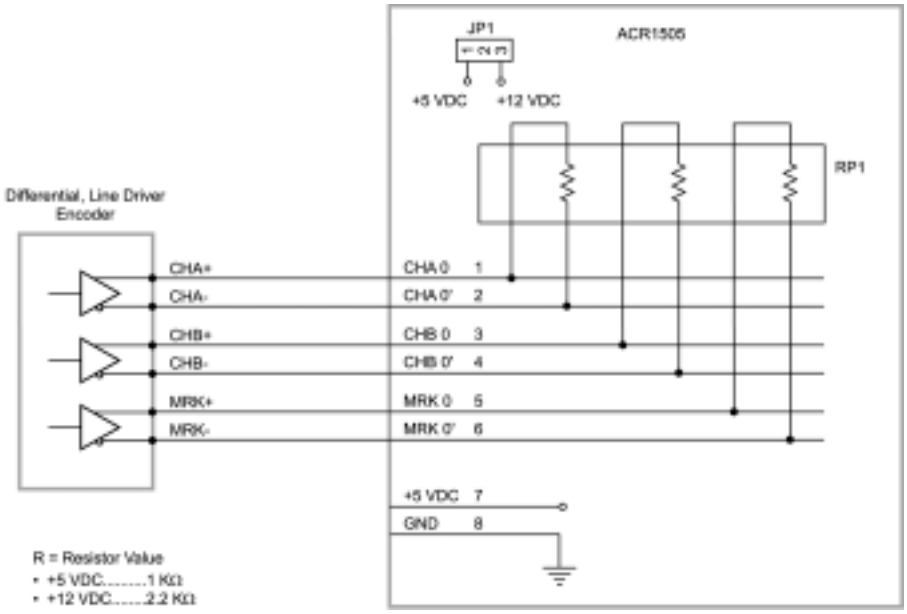


Figure 2 Differential, Line Driver Encoder with internal termination resistors

Single-Ended Encoders (not recommended)

Single-ended encoders (encoders without the A–, B–, or Marker outputs) require specific setup. You can install pull-up resistors on the ACR1505, or you can install resistors external to the card.

- Use only the positive (+) side of the differential input signal for the encoder signal connection.
- Use a network of pull-up and pull-down resistors to set the signal level to a fixed voltage.

  For +5 VDC encoders, set the voltage to approximately +2.5 VDC.

  For +12 VDC encoders, set the voltage to approximately +6 VDC.

Single-Ended, Open Collectors

For open collector encoders, replace the factory supplied termination resistor packs with common, 8-pin, 1 KΩ pull-up resistor packs. This supplies pull-up voltages necessary for each signal on the encoder input channels.

Depending on the application, you might need to pull up to +5 VDC or +12 VDC. Five volt DC provides faster response times, but has lower noise immunity. It may be necessary to use +5 VDC with high frequency applications—encoder rates higher than 1 MHz. Twelve volt DC provides higher noise immunity, but has slower response times.

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Warning!

When using open collector encoders, replace the terminating resistor packs (factory installed) with common, 8-pin, 1 KΩ pull-up resistor packs.

Warning!

When using pull-up resistor packs (necessary with open collector encoders), the ACR1505 is not able to detect encoder failures. An encoder fault can occur, but the ACR1505 Controller is unable to notify the user.

Configuration 1

This configuration provides pull-up resistors on the ACR1505, and external pull-down resistors for the encoder input signals.

For a wiring schematic, see Figure 3.

1. On the ACR1505, remove the termination resistor packs:
   a. Insert a small, standard screwdriver underneath one end of the resistor pack.

      Gently rock the screwdriver to loosen the resistor pack. Use caution to not damage the socket. Repeat this action at the opposite end of the resistor pack.

   b. Using a thin pair of needle nose pliers, firmly grip the resistor pack in its center. Lift the resistor pack straight up.
2. Insert the following type of resistor packs.
   - For +5 VDC encoders, install common 1 KΩ, 8-pin pull-up resistor packs.
   - For +12 VDC encoders, install common 2.2 KΩ, 8-pin pull-up resistor packs.
3. On the negative (–) side of the differential signal, install an external pull-down resistor.
   - For +5 VDC encoders, install common 1 KΩ, 8-pin pull-down resistor packs.
   - For +12 VDC encoders, install common 2.2 KΩ, 8-pin pull-down resistor packs.
4. Set the voltage jumpers to the encoder voltage. For more information, see Table 2 and Table 3 on page 7.

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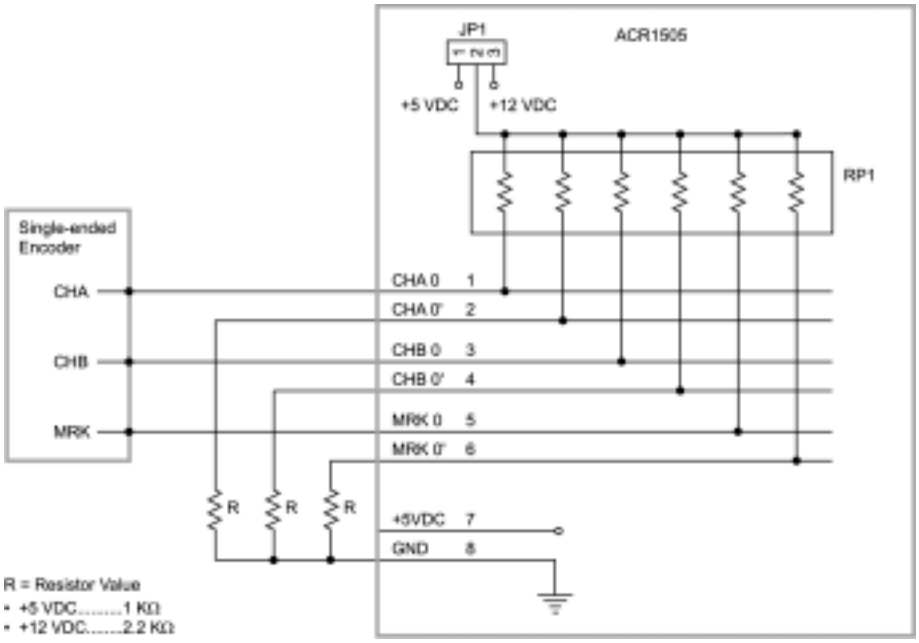


Figure 3 Single-Ended Encoder with internal pull-up resistors

Configuration 2

This configuration provides external pull-up and pull-down resistors. Only +5 VDC power is available using this configuration. If using +12 VDC encoders, you must supply power externally.

For a wiring schematic, see Figure 4.

1. Remove the termination resistor packs for the associated encoder input channels:
   a. Insert a small, standard screwdriver underneath one end of the resistor pack.

      Gently rock the screwdriver to loosen the resistor pack. Use caution to not damage the socket. Repeat this action at the opposite end of the resistor pack.

   b. Using a thin pair of needle nose pliers, firmly grip the resistor pack in its center. Lift the resistor pack straight up.

      Leave the sockets empty.
2. On the positive (+) side of the differential signal, install an external pull-up resistor.
   - For +5 VDC encoders, install common 1 KΩ, 8-pin pull-up resistor packs.
   - For +12 VDC encoders, install common 2.2 KΩ, 8-pin pull-up resistor packs.
3. On the negative (–) side of the differential signal, install an external pull-up resistor.
   - For +5 VDC encoders, install common 1 KΩ, 8-pin pull-up resistor packs.

Continued on next page

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Continued from previous page

- For +12 VDC encoders, install common 2.2 KΩ, 8-pin pull-up resistor packs.

4. On the negative (–) side of the differential signal, install an external pull-down resistor.
   - For +5 VDC encoders, install common 1 KΩ, 8-pin pull-down resistor packs.
   - For +12 VDC encoders, install common 2.2 KΩ, 8-pin pull-down resistor packs.
5. Set the voltage jumpers to +5 VDC. If using +12 VDC encoders, you must provide external +12 VDC power. For more information, see Table 2 and Table 3 on page 7.

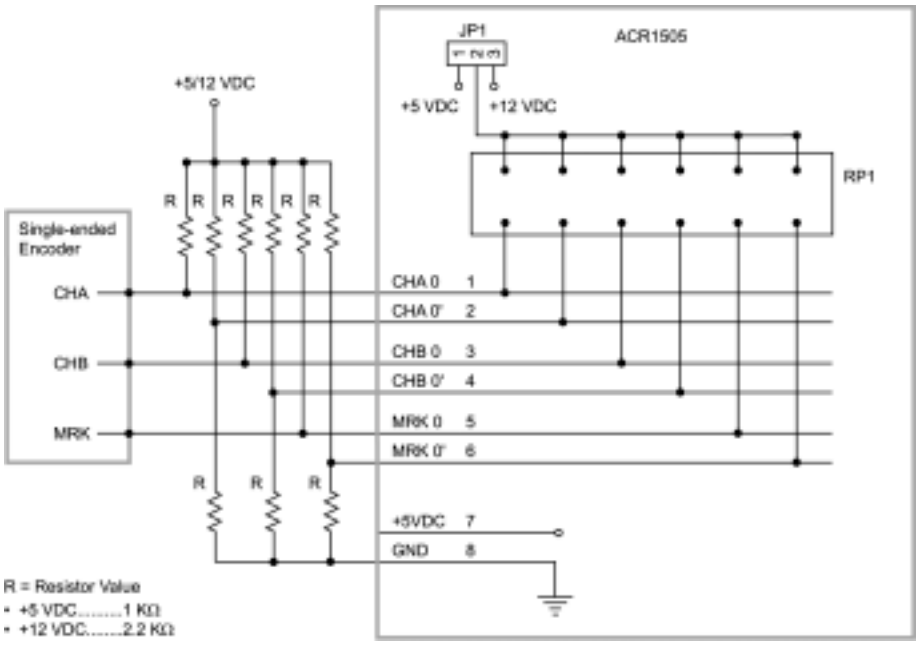


Figure 4 Single-Ended Encoder with external pull-up and pull-down resistors

Configuring the Voltage Jumpers and Resistor Packs

Encoder	Pull-up Jumper Setting	Resistor Pack
Differential Line Driver (+5 VDC Outputs) (Parker Drives and Encoders)	Configure JP1 and JP2 for +5 VDC	Termination resistor packs (factory installed)
Open Collector Driver (No pull-ups on encoder)	Configure JP1 and JP2 for +12 VDC	Common pull-up resistors
Open Collector Driver (With pull-ups to +5 VDC on encoder)	Configure JP1 and JP2 for +5 VDC	Common pull-up resistors
TTL Driver (+5 VDC Outputs)	Remove jumper	Remove termination resistor packs

Table 5 Resistor Pack and Voltage Jumper Configuration

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Encoder Input Connector (P1)

Inputs for the encoder feedback are located on the 34-pin ENCODER INPUT connector.

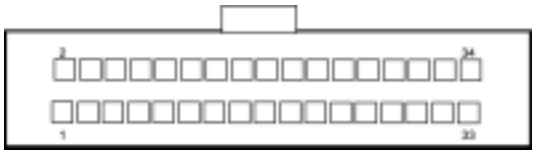


Figure 5 P1 ENCODER INPUT connector, male drive connector pinout

Important!

Install the correct type of resistor packs as determined by the type of feedback device you are using:

- For line driver (balanced pair) encoders, use the supplied, standard, 8-pin, isolated, termination resistor packs.
- For open collector encoders, replace the factory supplied termination resistor packs with common, 8-pin, pull-up resistor packs.
- For single-ended (not recommended) encoders (encoders without the A–, B–, or Marker outputs), you must add pull-up and pull-down resistor packs. For more information, see Single-Ended, Open Collectors on page 11.

Voltage	+5 VDC
Current Rating	100 mA maximum, per encoder
Interface	Differential Quad Encoder Supports Open-Collector or Line Driver Encoders
Pre-quadrature frequency	7.5 MHz
Post-Quadrature Frequency	30 MHz
Current per Channel	100 mA, maximum; not to exceed 400 mA for four encoders.

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P1 Connector Pinout		
Signal	**Pin**	**Description**
CHA0+	1	Encoder A Channel in
CHA0–	2	Encoder A Channel in
CHB0+	3	Encoder B Channel in
CHB0–	4	Encoder B Channel in
ENC0+/MRK0+	5	Encoder Z Channel in
ENC0–/MRK0–	6	Encoder Z Channel in
+5 VDC (100 mA, max) *	7	+5 VDC Encoder power
GND	8	Encoder Power Return
CHA1+	9	Encoder A Channel in
CHA1–	10	Encoder A Channel in
CHB1+	11	Encoder B Channel in
CHB1–	12	Encoder B Channel in
ENC2+/MRK1+	13	Encoder Z Channel in
ENC2–/MRK1–	14	Encoder Z Channel in
+5 VDC (100 mA, max) *	15	+5 VDC Encoder power
GND	16	Encoder Power Return
CHA2+	17	Encoder A Channel in
CHA2–	18	Encoder A Channel in
CHB2+	19	Encoder B Channel in
CHB2–	20	Encoder B Channel in
ENC2+/MRK2+	21	Encoder Z Channel in
ENC0–/MRK2–	22	Encoder Z Channel in
+5 VDC (100 mA, max) *	23	+5 VDC Encoder power
GND	24	Encoder Power Return
CHA3+	25	Encoder A Channel in
CHA3–	26	Encoder A Channel in
CHB3+	27	Encoder B Channel in
CHB3–	28	Encoder B Channel in
ENC3+/MRK3+	29	Encoder Z Channel in
ENC3–/MRK3–	30	Encoder Z Channel in
+5 VDC (100 mA, max) *	31	+5 VDC Encoder power
GND	32	Encoder Power Return
RESERVED	33	RESERVED
RESERVED	34	RESERVED
* Maximum current draw per encoder is 100 mA, not to exceed 400 mA for four encoders.		

Table 6 P1 MOTOR FEEDBACK Connector Pinout

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Analog/Digital I/O—P2 Connector

Inputs and outputs for the drive's analog connections are located on the ANALOG I/O connector.

Note: For an ACR1505 Controller with two servo and two stepper axes, the servo signals are sent across channels zero and one, and the stepper signals are sent across channels two and three.

I/O Signal

Signal High ..... 4.2 VDC minimum at +20 mA

Signal Low ..... 0.5 VDC maximum at –20 mA

Active High ..... + output for each driver

Active Low ..... – output for each driver

DAC Outputs

Voltage ..... ±10 VDC

Current Rating ..... 5 mA, maximum

Resolution 16-bit

- Programmable output (`DAC GAIN`, `DAC OFFSET`)
- Differential analog input amplifiers (preferred)
- Single-ended input amplifiers (not recommended)—use caution to avoid ground loops

High-Speed Outputs

Output delay ..... <200 ns, after comparing actual encoder position with specified values

Open-Collector Output ..... 24V at 30 mA, max output drive capability (no pull-ups on board), digital output

Stepper Outputs

Step and Direction ..... Differential, digital line driver outputs

Step Output Frequency ..... 0 to 6 KHz, pulse width 167 µs
6 KHz to 4 MHz, approximately 50% duty cycle

P2 Connector

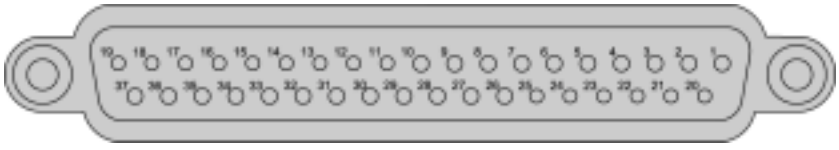


Figure 6 P2 ANALOG I/O connector, male drive connector pinout

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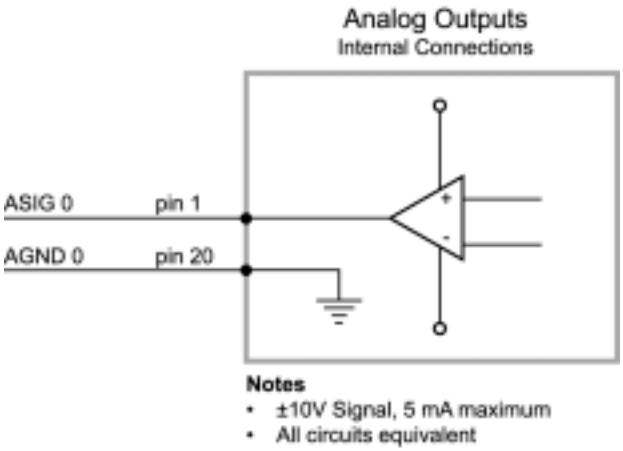


Figure 7 P2 ANALOG I/O connector—internal circuit diagram

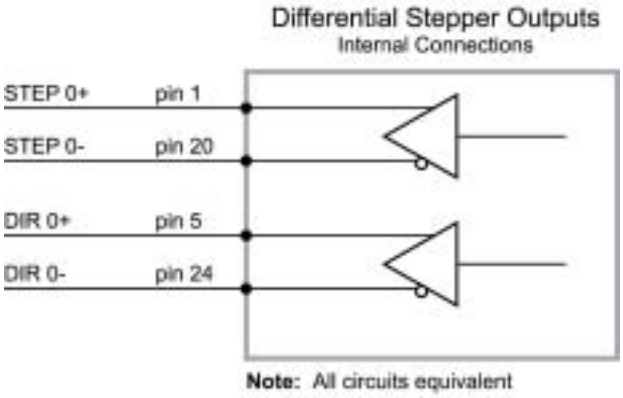


Figure 8 P2 STEPPER I/O connector—internal circuit diagram

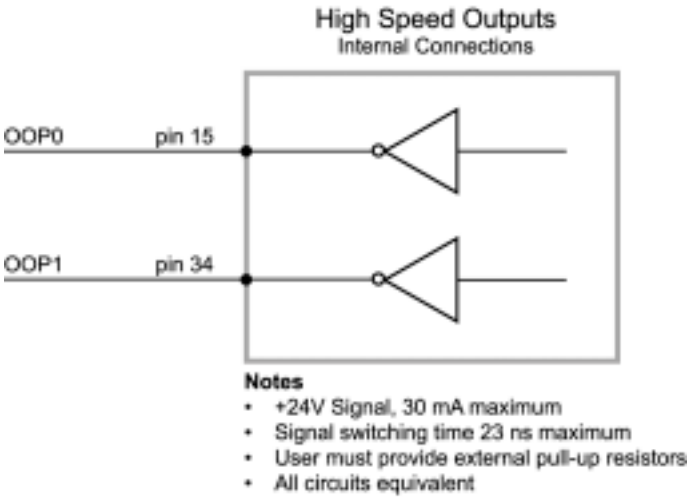


Figure 9 P2 HIGH-SPEED OUTPUT connector—internal circuit diagram

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Note: A box surrounding pins indicates a requirement for twisted pair wiring.

P2 Connector Pinout		
Signal	**Pin**	**Description**
ASIG 0 (Step 0+)	1	Channel 0 DAC/Step+
AGND 0 (Step 0–)	20	Channel 0 DAC GND/Step–
ASIG 1 (Step 1+)	2	Channel 1 DAC/Step+
AGND 1 (Step 1–)	21	Channel 1 DAC GND/Step–
ASIG 2 (Step 2+)	3	Channel 2 DAC/Step+
AGND 2 (Step 2–)	22	Channel 2 DAC GND/Step–
ASIG 3 (Step 3+)	4	Channel 3 DAC/Step+
AGND 3 (Step 3–)	23	Channel 3 DAC GND/Step–
DIR 0+	5	Channel 0 Direction+
DIR 0–	24	Channel 0 Direction–
DIR 1+	6	Channel 1 Direction+
DIR 1–	25	Channel 1 Direction–
DIR 2+	7	Channel 2 Direction+
DIR 2–	26	Channel 2 Direction–
DIR 3+	8	Channel 3 Direction+
DIR 3–	27	Channel 3 Direction–
AIN 0 *	9	ADC Input
AIN 2 *	10	ADC Input
AIN 4 *	11	ADC Input
AIN 6 *	12	ADC Input
+5 VDC (0.250A max)	13	+5 VDC power supply
+5 VDC (0.250A max)	14	+5 VDC power supply
OOP0	15	High-speed Output, Axis 0
RESERVED	16	RESERVED
GND	17	Power Return
GND	18	Power Return
AGND *	19	ADC Ground
AIN 1 *	28	ADC Input
AIN 3 *	29	ADC Input
AIN 5 *	30	ADC Input
AIN 7 *	31	ADC Input
+5 VDC (0.250A max)	32	+5 VDC power supply

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P2 Connector Pinout		
Signal	**Pin**	**Description**
+5 VDC (0.250A max)	33	+5 VDC power supply
OOP1	34	High-speed Output, Axis 1
RESERVED	35	RESERVED
Watchdog	36	Watchdog signal (high)
Watchdog	37	Watchdog signal (low)
* Available only when the ADC Input Module is installed. **Note**: Stepper pinouts are in parentheses.		

Table 7 P2 ANALOG I/O Connector Pinout

Watchdog Signal

The watchdog provides a digital signal to monitor the health of the ACR1505 controller. When a fault occurs, the watchdog disables all connected drives. You must manually clear the fault and reset the controller.

Output Open Collector ..... +24 VDC, 30 mA maximum

Signal switching time ..... 2 ms maximum

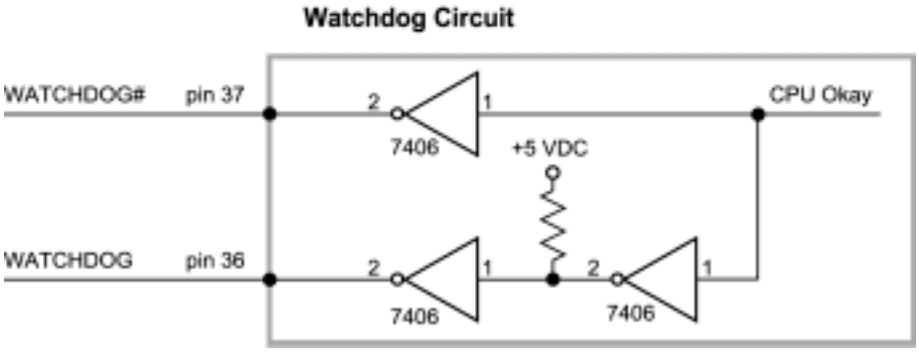


Figure 10 Watchdog Signal—internal circuit diagram

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Digital I/O—P3 & P4 Connectors

The ACR1505 has two 50-Pin headers (P3 and P4) for TTL compatible Digital I/O. Both connectors are Opto-22 compatible.

There are 48 software configurable I/O points, which you can group as follows:

- 24 inputs and 24 outputs
- 32 inputs and 16 outputs
- 16 inputs and 32 outputs

You can configure the digital inputs and outputs through software settings. The ACR1505 Controller uses the standard bit flags for the ACR series.

- Input bit flags are mapped as bits 0 through 31 (parameter P4096).
- Output bit flags are mapped as bits 32 through 63 (parameter P4097).

TTL Compatible Digital I/O..... Software configurable:
24 inputs and 24 outputs
(factory default)

Logic Polarity..... Software configurable:
Positive logic
—or—
Negative logic (factory default)

I/O State	Negative Logic (Input TTL Level)	Positive Logic (Input TTL Level)
ON	Logic Level Low	Logic Level High
OFF	Logic Level High	Logic Level Low

Table 8 Logic Polarities and I/O States

Input Signal

Logic High ..... 2.0V to 5.25V

Logic Low ..... 0.0V to 0.8V

No pull-up or pull-down resistors are provided on-board (inputs are floating when not connected.)

Output Signal

Logic High ..... 2.4V minimum

Logic Low ..... 0.5V maximum

Logic High Current ..... 32 outputs at 4 mA each, continuous

Logic Low Current ..... 32 outputs at 8 mA each, continuous
—or—
16 outputs at 15 mA each, continuous

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P3 Connector Pinout

Inputs and outputs for the controller's digital connections are located on the DIGITAL I/O connector.

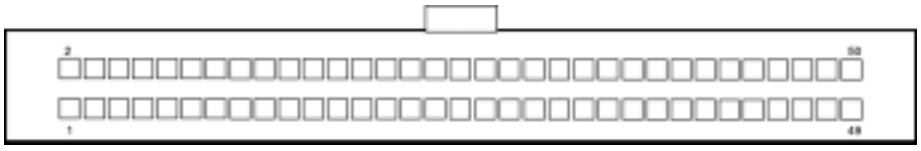


Figure 11 P3 DIGITAL I/O connector diagram

P3 Connector Pinout				
Signal	**Bit**	**Pin**	**Signal**	**Pin**
I/O 47	55	1	GND	2
I/O 46	54	3	GND	4
I/O 45	53	5	GND	6
I/O 44	52	7	GND	8
I/O 43	51	9	GND	10
I/O 42	50	11	GND	12
I/O 41	49	13	GND	14
I/O 40	48	15	GND	16
I/O 39	47	17	GND	18
I/O 38	46	19	GND	20
I/O 37	45	21	GND	22
I/O 36	44	23	GND	24
I/O 35	43	25	GND	26
I/O 34	42	27	GND	28
I/O 33	41	29	GND	30
I/O 32	40	31	GND	32
I/O 31	39	33	GND	34
I/O 30	38	35	GND	36
I/O 29	37	37	GND	38
I/O 28	36	39	GND	40
I/O 27	35	41	GND	42
I/O 26	34	43	GND	44
I/O 25	33	45	GND	46
I/O 24	32	47	GND	48
+5 VDC (1A, max)		49	GND	50

Table 9 DIGITAL I/O Connector Pinout

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P4 Connector Pinout

Inputs and outputs for the controller's digital connections are located on the DIGITAL I/O connector.

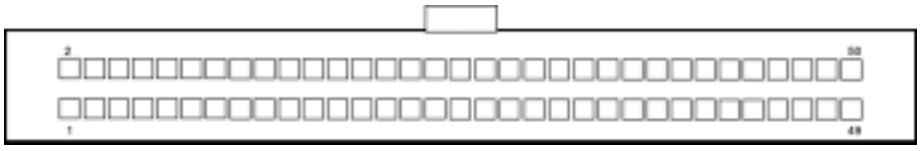


Figure 12 P4 DIGITAL I/O connector diagram

P4 Connector Pinout				
Signal	**Bit**	**Pin**	**Signal**	**Pin**
I/O 23	23	1	GND	2
I/O 22	22	3	GND	4
I/O 21	21	5	GND	6
I/O 20	20	7	GND	8
I/O 19	19	9	GND	10
I/O 18	18	11	GND	12
I/O 17	17	13	GND	14
I/O 16	16	15	GND	16
I/O 15	15	17	GND	18
I/O 14	14	19	GND	20
I/O 13	13	21	GND	22
I/O 12	12	23	GND	24
I/O 11	11	25	GND	26
I/O 10	10	27	GND	28
I/O 9	9	29	GND	30
I/O 8	8	31	GND	32
I/O 7	7	33	GND	34
I/O 6	6	35	GND	36
I/O 5	5	37	GND	38
I/O 4	4	39	GND	40
I/O 3	3	41	GND	42
I/O 2	2	43	GND	44
I/O 1	1	45	GND	46
I/O 0	0	47	GND	48
+5 VDC (1A, max)		49	GND	50

Table 10 DIGITAL I/O Connector Pinout

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I/O Configuration Modes and the P3 Connector

Factory Default..... I/O Configuration Mode 0

Use	Pin	I/O Config Mode 0	I/O Config Mode 1	I/O Config Mode 2
I/O-47	1	OUT55	INP31	OUT55
I/O-46	3	OUT54	INP30	OUT54
I/O-45	5	OUT53	INP29	OUT53
I/O-44	7	OUT52	INP28	OUT52
I/O-43	9	OUT51	INP27	OUT51
I/O-42	11	OUT50	INP26	OUT50
I/O-41	13	OUT49	INP25	OUT49
I/O-40	15	OUT48	INP24	OUT48
I/O-39	17	OUT47	OUT47	OUT47
I/O-38	19	OUT46	OUT46	OUT46
I/O-37	21	OUT45	OUT45	OUT45
I/O-36	23	OUT44	OUT44	OUT44
I/O-35	25	OUT43	OUT43	OUT43
I/O-34	27	OUT42	OUT42	OUT42
I/O-33	29	OUT41	OUT41	OUT41
I/O-32	31	OUT40	OUT40	OUT40
I/O-31	33	OUT39	OUT39	OUT39
I/O-30	35	OUT38	OUT38	OUT38
I/O-29	37	OUT37	OUT37	OUT37
I/O-28	39	OUT36	OUT36	OUT36
I/O-27	41	OUT35	OUT35	OUT35
I/O-26	43	OUT34	OUT34	OUT34
I/O-25	45	OUT33	OUT33	OUT33
I/O-24	47	OUT32	OUT32	OUT32
+5 VDC (1A, max)	49			

Table 11 P3 Connector Pinout and I/O Mode Configuration

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I/O Configuration Modes and the P4 Connector

Factory Default..... I/O Configuration Mode 0

Use	Pin	I/O Config Mode 0	I/O Config Mode 1	I/O Config Mode 2
I/O-23	1	INP23	INP23	OUT63
I/O-22	3	INP22	INP22	OUT62
I/O-21	5	INP21	INP21	OUT61
I/O-20	7	INP20	INP20	OUT60
I/O-19	9	INP19	INP19	OUT59
I/O-18	11	INP18	INP18	OUT58
I/O-17	13	INP17	INP17	OUT57
I/O-16	15	INP16	INP16	OUT56
I/O-15	17	INP15	INP15	INP15
I/O-14	19	INP14	INP14	INP14
I/O-13	21	INP13	INP13	INP13
I/O-12	23	INP12	INP12	INP12
I/O-11	25	INP11	INP11	INP11
I/O-10	27	INP10	INP10	INP10
I/O-09	29	INP9	INP9	INP9
I/O-08	31	INP8	INP8	INP8
I/O-07	33	INP7	INP7	INP7
I/O-06	35	INP6	INP6	INP6
I/O-05	37	INP5	INP5	INP5
I/O-04	39	INP4	INP4	INP4
I/O-03	41	INP3	INP3	INP3
I/O-02	43	INP2	INP2	INP2
I/O-01	45	INP1	INP1	INP1
I/O-00	47	INP0	INP0	INP0
+5 VDC (1A, max)	49			

Table 12 P4 Connector Pinout and I/O Mode Configuration

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Address Jumper for Serial Communication

Serial communications via the COM1 and COM2 communications ports on the ACRCOMM module are performed with multiple cards using different ACR1505 numbers. Use Table 13 to determine the jumper configuration necessary to assign a communication address.

Important! Do not assign number 15 to an ACR1505 unless you want to put it in Flash Bypass Mode. For more information, see “Flash Bypass Mode”.

Card No.	JP3D*	JP3C	JP3B	JP3A
0	ON			
1	ON	ON	ON	OFF
2	ON	ON	OFF	ON
3	ON	ON	OFF	OFF
4	ON	OFF	ON	ON
5	ON	OFF	ON	OFF
6	ON	OFF	OFF	ON
7	ON	OFF	OFF	OFF
8–14	RESERVED			
15	OFF			

* Leave jumper JP3D in the ON position unless you want to put the card in Flash Bypass Mode. For more information, see “Flash Bypass Mode”.

Table 13 JP3 Jumper Configuration—Assigning a Serial Communications Address

Flash Bypass Mode

You can use Flash Bypass Mode to circumvent loading program information from the flash memory at power-up or reset. Serial communications recognizes the card’s address as card 15.

Once you have finished working in Flash Bypass Mode, assign the controller a valid address before returning it to normal operations.

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CHAPTER THREE

3 Hardware Installation

IN THIS CHAPTER

- Environment & Cooling 27
- Weight 27
- Dimensions 27
- Hardware Installation 29

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Environment & Cooling

The ACR1505 operates in an ambient temperature range of 0°C (32°F) to 45°C (113°F). The controller can tolerate atmospheric pollution degree 2—only dry, non-conductive pollution is acceptable. Therefore, it is recommended that the card be mounted in a suitable enclosure. The ACR1505 is designed for mounting in a PC (personal computer)—you should select a PC that meets the atmospheric pollution protection mentioned above.

Notes

- Make sure the ambient air temperature entering the PC (personal computer) or rising up to the ACR1505 is within acceptable ambient temperature limits.
- After installation, verify that the ambient air temperature directly below the top-most ACR1505 controller does not exceed the Ambient Operating Temperature. In addition, make sure that nothing obstructs the circulating airflow.

Ambient Operating Temperature ..... 0°C (32°F) to 45°C (113°F)

Storage Temperature ..... –40°C to 85°C (–40°F to 185°F)

Humidity ..... 0–95%, non-condensing

Pollution Degree ..... 2 (per IEC 61010)

Installation Category ..... 2 (per IEC 61010)

Vibration ..... 10-2000 Hz at 2 Grms

Weight

Use Table 14 to determine the weight of your controller.

Card	Weight *ounces (g)*
ACR1505	≈ 4.7 (133.4)
Note: The exact weight depends on the card configuration you ordered.	

Table 14 Controller Weight

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Dimensions

Card Dimensions..... 4.200” x 6.875”

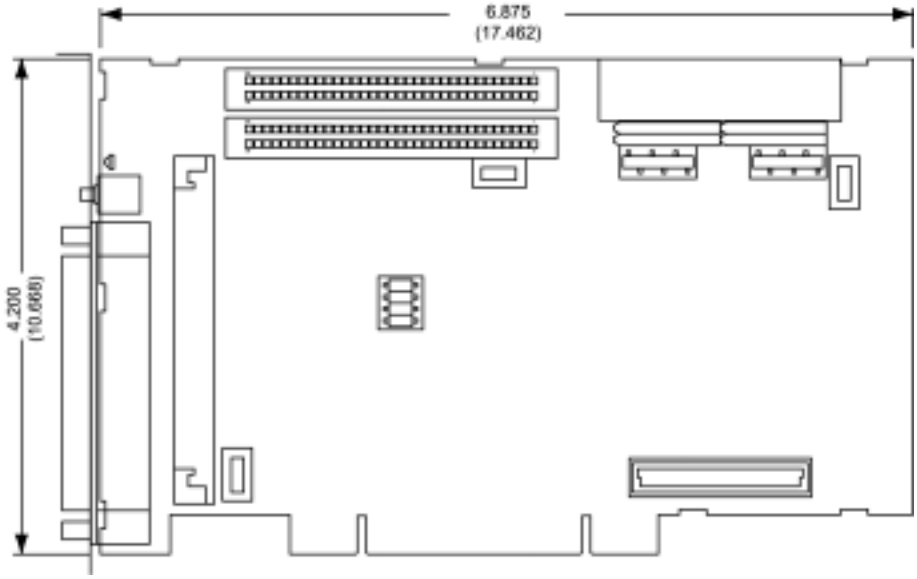


Figure 13 Dimensions

Connectors

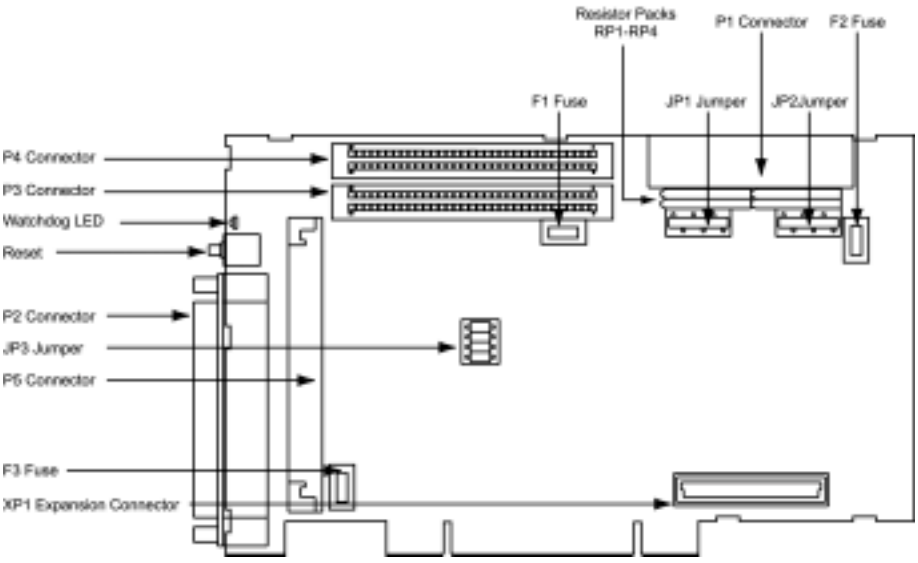


Figure 14 Connector, Jumper, and Fuse Locations

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Hardware Installation

You can install the ACR1505 Controller in any open, compatible 32-bit PCI expansion slot. For power consumption specifications, see Power Consumption on page 39.

 Warning! 

Do not install the ACR1505 in an AT motherboard. Doing this will permanently damage the controller card.

The ACR1505 is only compatible with ATX motherboards, which supply both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of motherboard is in your computer, consult the technical manual for your computer or the manufacturer.

 Warning! 

Do not install the ACR1505 in a computer that uses an AT power supply. Doing this will permanently damage the controller card.

The ACR1505 is only compatible with ATX power supplies, which provide both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of power supply is in your computer, consult the technical manual for your computer or the manufacturer.

Precautions

During installation, take the normal precautions regarding electrostatic discharge.

- Wear earth wrist straps.
- Include a mains power switch or circuit breaker within each reach of the machine operator. Label, clearly, the switch or breaker as the disconnecting device.

Installing the Hardware

Before installing your ACR1505 in a PC (personal computer), verify your system uses an ATX motherboard and ATX power supply. In addition, verify your power supply provides enough power for the ACR1505 Controller, encoder inputs, and Add-on Modules in addition to all other devices connected to your computer.

For power consumption specifications, see Power Consumption on page 39.

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Warning!

Do not install the ACR1505 in an AT motherboard. Doing this will permanently damage the controller card.

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If you are not sure which type of motherboard is in your computer, consult the technical manual for your computer or the manufacturer.

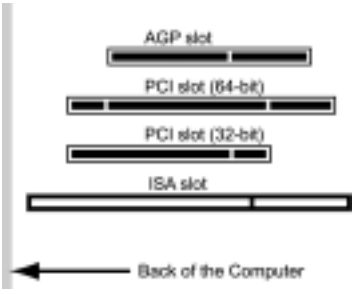
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The ACR1505 is only compatible with ATX power supplies, which provide both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of power supply is in your computer, consult the technical manual for your computer or the manufacturer.

1. To install the ACR SDK (software development kit), do the following:
   a. Turn on the computer.
   b. In the disc drive, insert the ACR SDK disc.
   c. Follow the installation instructions.
   d. When installation is complete, restart the computer to complete the software installation.
2. Turn off the computer and all peripheral devices.
3. Put on an earth wrist strap and attach it to the computer chassis.
4. Disconnect all peripheral devices from their power sources—including the monitor and all telecommunication/network connections. This helps reduce possible injury due to shock.
5. Disconnect the power cable to the computer, and wait at least 30 seconds for the motherboard to dissipate any residual power.
6. To insert the ACR1505, do the following:
   a. Locate the PCI slot (32-bit) you want to use, and remove the expansion slot cover on the back of the computer. Save the screw for the mounting bracket.



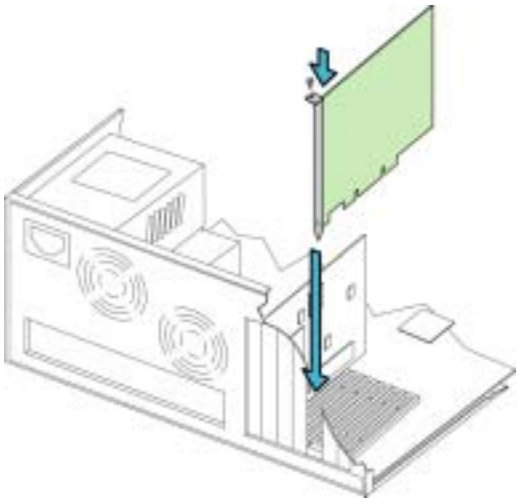
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Continued from previous page

b. Position the ACR1505 over the expansion slot. Using firm and even pressure, push the card into the PCI slot until it is firmly seated.

c. Using the screw from step a, secure the bracket to the computer chassis.



7. Connect the power and peripherals, and restart the computer.
8. When the computer detects the new hardware, you are prompted to install the drivers.

   Browse the ACR SDK disc and select the amcspci.inf file.

Notes

- To disconnect a cable, unscrew any jackscrews, grasp the body of the cable-connector, and pull on the connector. Do not pull on the cable as you may damage it.
- The ACR1505 is a sensitive device. Do not remove the card from its antistatic package until you are ready to install it in the computer.
- Hold a card by the edges, or the mounting bracket. In addition, do not touch the components on the card.

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Installation Test

Once you have made the necessary mechanical and electrical connections, you can test the controller.

> **Safety Warning!**
>
> High-performance motion control equipment is capable of producing rapid movement and very high forces. Unexpected motion may occur especially during the development of controller programs. KEEP WELL CLEAR of any machinery driven by stepper or servo motors. Never touch any part of the equipment while it is in operation.

You must do the following before testing the controller:

1. If the motor is connected to a load, disconnect the motor so that it is free to turn unimpeded.
2. Verify the card is powered up. The Green LED on the card should be illuminated.
3. Start the AcroView PC-Bus software. The software will notify you if it does not find the card or the card is not communicating correctly.
4. Disable the drives. Then check for encoder feedback using the AcroView software.

   On the **View** menu, click **Parameters**. In the Parameter window, select **Encoder 0..7** in the left list.

   Turn the shaft of the motors by hand and make sure the encoder parameters are updated correctly.
5. Before performing any motion related testing, configure the controller for your command outputs and encoders. For more information, see the `CONFIG` and `ATTACH AXIS` commands in the "ACR Motion Controller User's Guide, Part 1".
6. Depending on your configuration, do the following:

   Servo Axes

   a. Verify the DAC output. In the AcroView terminal, send the following commands (where n is the axis number):

      ```
      AXISn OFF
      DACn GAIN –3276.8
      ENCn MULT4
      DACn OFFSET 0.1
      ```

      Repeat these command instructions for the remaining servo axes.

   b. Enable the drives. You should now see all servo axes moving in the counter clockwise direction.

      If motion is clockwise on an axis, send the command `DACn GAIN +3276.8` (where n is the axis number). You should now see all servo axes moving in the counter clockwise direction.

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c. On the **View** menu, click **Parameters**. In the Parameter window, select **Encoder 0..7** in the left list. You should see the encoders count in the negative direction.

   If n encoder is counting in the positive direction, then send the command `ENCn MULT –4` (where n is the axis number).

d. To stop motion, disable the drives.

e. Send the following commands to return the controller to normal operation (where n is the axis number):

```
DACn OFFSET 0.00

AXISn ON
```

   Repeat these command instructions for the remaining servo axes.

f. To save the configuration to non-volatile memory, send the command `ESAVE`.

Stepper Axes

a. Enable the drives.

b. In AcroView, define `PROG0` as follows:

```
PROG0

ATTACH MASTER 0

ATTACH SLAVE0 AXIS0 “X”

ATTACH SLAVE1 AXIS1 “Y”

ATTACH SLAVE2 AXIS2 “Z”

ATTACH SLAVE3 AXIS3 “A”

X4000 Y4000 Z4000 A4000
```

   At this point, you should see all axes are moving in a clockwise direction.

c. To stop motion, send the following commands:

```
HALT ALL
```

7. The installation test is complete.

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CHAPTER FOUR

Troubleshooting

IN THIS CHAPTER
• First Troubleshooting Steps ..... 35 • General Troubleshooting..... 36

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Troubleshooting Guidelines



Warning!



Do not install the ACR1505 in an AT motherboard. Doing this will permanently damage the controller card.

The ACR1505 is only compatible with ATX motherboards, which supply both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of motherboard is in your computer, consult the technical manual for your computer or the manufacturer.



Warning!



Do not install the ACR1505 in a computer that uses an AT power supply. Doing this will permanently damage the controller card.

The ACR1505 is only compatible with ATX power supplies, which provide both +3.3 VDC and +5 VDC to the PCI bus.

If you are not sure which type of power supply is in your computer, consult the technical manual for your computer or the manufacturer.



Warning!



Do not connect external power to the ACR1505 through the ACRCOMM card. Doing this will permanently damage the ACR1505.

First Troubleshooting Steps

Some issues you might encounter at first power-up are as follows:

- Incompatible operating system—Windows 95, Windows 98 first Edition, Windows ME (Millennium), or Linux

  For compatible operating systems, see “Requirements” on page 4.

- Is there PCI communication with the ACR1505?

  If not, the card might not have been detected or installed correctly. For installation instructions, see “Hardware Installation” on page 30.

- Is the computer “locking up”?

  If not, the card might not have been detected or installed correctly. For installation instructions, see “Hardware Installation” on page 30.

- Is the Green LED illuminated?

  If not, look for problems with DC power. Check that the motherboard provides both 3.3 VDC and 5 VDC to the ACR1505.

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General Troubleshooting

Problem	Cause	Solution
Feedback device counts missing	Feedback fuse blown	Check the feedback fuse (F2) using the `DIAG` command. Check wiring. Replace fuse if necessary and restore power.
	Incorrect Termination/ pull-up resistors	Check that the correct type of resistor (termination or pull-up) is installed for the type of encoder being used.
Feedback device counts the wrong direction	Incorrect `MULT` value	Check the encoder count direction using the `MULT` command. If necessary, change the mode. Check feedback device wiring.
Opto-22 compatible I/O not functioning correctly	I/O fuse blown	Check the feedback fuse (F1) using the `DIAG` command. Check wiring. Replace I/O fuse if necessary and restore power.
	I/O Mode not set correctly	Check the I/O Mode using the `CONFIG` command. Make sure the mode and polarity are set correctly.
PCI communication errors	Card not installed correctly	Reinstall the ACR1505. For compatible operating systems, see “Requirements” on page 4.
	AcroView interface not working correctly	Start AcroView and check PCI communications. Shut down the PC (personal computer) and restart.
Erratic Operation	Electrical Noise	Reduce electrical noise or move product away from noise source.
	Improper shielding	Use shielded, twisted pair wiring (P2 cable, encoder inputs, DAC/stepper outputs, ADC inputs).
	Improper wiring	Check wiring for shorts, opens, and mis-wired connections.
Stepper output motion does not occur	ACR1505 not configured for stepper output in software	Check for proper stepper configuration. Use the `CONFIG` and `ATTACH` commands. The tuning gains must remain at default values: • `PGAIN`= 0.002441406 • `IGAIN`, `ILIMIT`, `IDELAY`, `DGAIN`, `DWIDTCH`, `FFVEL`, `FFACC`, and `TLM`=0 For more information, see “User’s Guide Part 1”.

Continued on next page

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Table 15—Continued

Problem	Cause	Solution
No motion	Master and Slave attachments have not been made in a program	Check for proper system attachments using the ATTACH MASTER and ATTACH SLAVE commands. For more information, see “User’s Guide Part 1”.
	Incorrect commanded velocity	Check if the commanded velocity is set at zero.
	Incorrect commanded feed-rate override	Check if the commanded feed-rate override (FOV) is set at zero.
	Incorrect torque limit	Check if the commanded torque limit (TLM) is set at zero.
Undesirable motion	DAC GAIN using incorrect value	The ACR1505 hardware inverts the output voltage. Make sure you are using the correct setting for your drive. A positive DAC GAIN physically sends out a negative voltage, and a negative DAC GAIN physically sends out a positive voltage. The default DAC GAIN is –3276.8
	Incorrect commanded velocity	Check the commanded velocity.
	Incorrect commanded feed-rate override	Check the commanded feed-rate override (FOV).
	Incorrect torque limit	Check the commanded torque limit (TLM).

Table 15 Troubleshooting—Causes and Solutions

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APPENDIX A

Additional Specifications

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- Power Consumption 39
- Encoder Inputs 39
- Analog I/O 40
- Digital I/O 41
- Fuses 42

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Hardware

CPU	32-bit floating point DSP
Processor Type	Texas Instruments TMS320VC33
Trajectory Calculation	64-bit Precision
User Memory	512 KB
System Memory	512 KB
Firmware	Flash-based
Flash Memory	8 MB
Operating System	Multi-tasking RTOS

Power Consumption

+3.3 VDC	±0.2 VDC at 2A
+5 VDC	±0.2 VDC at 2A
+12 VDC	±0.5 VDC at 150 mA
–12 VDC	±0.5 VDC at 150 mA
Expansion Cards (4 maximum)	5 VDC at 2.5A

Encoder Inputs

Voltage	+5 VDC
Current Rating	100 mA maximum, per encoder
Interface	Differential Quad Encoder Supports Open-Collector or Line Driver Encoders
Pre-quadrature frequency	7.5 MHz
Post-Quadrature Frequency	30 MHz
Current per Channel	100 mA, maximum; not to exceed 400 mA for four encoders.

P1 Connector Specification—ACR1505

Manufacturer	AMP or equivalent
Connector Type	34-Pin Box Header (male connector)
AMP Part Number	103311-7

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P1 Connector Specification—Mating Connector

Manufacturer	AMP or equivalent
Connector Type	34-Pin Receptacle (female connector) with strain relief
AMP Part Number	746285-8

Note: Mating connectors are not provided with the ACR1505. Parker cables are available with mating connectors attached.

Analog I/O

I/O Signal

Signal High	4.2 VDC minimum at +20 mA
Signal Low	0.5 VDC maximum at –20 mA
Active High	+ output for each driver
Active Low	– output for each driver

DAC Outputs

Voltage	±10 VDC
Current Rating	5 mA, maximum
Resolution	16-bit

- Programmable output (`DAC GAIN`, `DAC OFFSET`)
- Differential analog input amplifiers (preferred)
- Single-ended input amplifiers (not recommended)—use caution to avoid ground loops

Stepper Outputs

Step and Direction	Differential, digital line driver outputs
Step Output Frequency	0 to 6 KHz, pulse width 167 µs 6 KHz to 4 MHz, approximately 50% duty cycle

Watchdog Signal

Output Open Collector	+24 VDC, 30 mA maximum
Signal switching time	2 ms maximum

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P2 Connector Specification—ACR1505

Manufacturer ..... AMP or equivalent

Connector Type..... 37-Pin High Density D-Subminiature (female socket)

AMP Part Number 747847-4

P2 Connector Specification—Mating Connector

Manufacturer ..... AMP or equivalent

Connector Type..... 37-Pin High Density D-Subminiature (male connector) Gold flash

AMP Part Number 747916-4

Note: Mating connectors are not provided with the ACR1505. Parker cables are available with mating connectors attached.

Digital I/O

Input Signal

Logic High ..... 2.0V to 5.25V

Logic Low ..... 0.0V to 0.8V

No pull-up or pull-down resistors are provided on-board (inputs are floating when not connected.)

Output Signal

Logic High ..... 2.4V minimum

Logic Low ..... 0.5V maximum

Logic High Current ..... 32 outputs at 4 mA each, continuous

Logic Low Current ..... 32 outputs at 8 mA each, continuous
—or—
16 outputs at 15 mA each, continuous

High Speed Outputs

Output delay ..... <200 ns, after comparing actual encoder position with specified values

Open-Collector Output ..... 24V at 30 mA, max output drive capability (no pull-ups on board), digital output

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P3 & P4 Connector Specification—ACR1505

Manufacturer ..... AMP or equivalent

Connector Type..... 50-Pin Box Header (male connector)

AMP Part Number 1–103309–0

P3 & P4 Connector Specification—Mating Connector

Manufacturer ..... AMP or equivalent

Connector Type ..... 50-Pin Receptacle (female socket) Gold flash

AMP Part Number 1-746285-0

Note: Mating connectors are not provided with the ACR1505. Parker cables are available with mating connectors attached.

Cables

The total cable length between active components cannot exceed 13 feet. This applies to all cables for the ACR1505, as well as the ACRIO and EXPAXIS modules.

Note: The RBC1505 Breakout Box is not an active component.

ACR1505 to Breakout Box..... 3 feet, maximum

Breakout Box to Drive ..... 10 feet, maximum

Fuses

When replacing fuses for the ACR1505, use the following to determine the correct part numbers. Only use fuses supplied by Littelfuse.

P1 Connector

Voltage ..... +5 VDC

Current Rating..... 750 mA

Type ..... Littelfuse 454.750 Time Delay Fuse

P2 Connector

Voltage ..... +5 VDC

Current Rating..... 500 mA

Type ..... Littelfuse 454.500 Time Delay Fuse

P3 & P4 Connector

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Voltage	+5 VDC
Current Rating	2A
Type	Littelfuse 454.002 Time Delay Fuse

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APPENDIX B

Breakout Box

IN THIS CHAPTER
• Breakout Box Overview....45 • Checking your Shipment....45 • Breakout Box Dimensions....47 • Environment & Cooling....46 • Breakout Box to User Interconnect....48

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Breakout Box Overview

The RBC1505-xx Breakout Box connects an ACR1505 to your system's electrical and mechanical components. Be sure to test your system for safety under all potential conditions. Failure to do so can result in damage to equipment and serious injury to personnel.

Checking your Shipment

Confirm that you have received all items. If you are missing an item, call the factory (see Technical Assistance on page ii).

Note: If you are making or purchasing custom length cables, do not exceed a 10-foot length. Otherwise, you might encounter signal degradation.

Part Name	Part Number
P2 Cable	71-021134-03
HP1A Ribbon Cable	71-021137-03
HP3 Ribbon Cable	71-013016-01
HP4 Ribbon Cable	71-013016-01
HP5 Ribbon Cable	71-021137-03

Table 16 Ship kit for RBC1505

Cables—ACR1505 Controller to RBC1505

The configuration of your controller card determines which cables to use with the breakout box.

Encoder Input Cables

The HP1 34-pin header provided on the RBC1505-xx Breakout Box supplies encoder feedback signals to the ACR1505.

The Encoder Input cables supply current, from the ACR1505 Controller, through the DB-26 pin AXIS connector. The configuration of your ACR Controller Card determines how much current you can supply.

Encoders 4

Maximum Power per Channel..... 100 mA

Digital I/O Cables

There are two 50-pin headers provided on the RBC1505-xx Breakout Box to interface Digital I/O signals to an ACR1505 Controller Card. The digital I/O use the 50-pin headers.

Connections are as follows:

- Digital I/O 24–47 HP3 (Breakout Box) to P3 (ACR Controller Card)
- Digital I/O 0–23 HP4 (Breakout Box) to P4 (ACR Controller Card)

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Environment & Cooling

The RBC1505-xx Breakout Box operates in an ambient temperature range of 0°C (32°F) to 45°C (113°F). The breakout box can tolerate atmospheric pollution degree 2—only dry, non-conductive pollution is acceptable. Therefore, it is recommended that the card be mounted in a suitable enclosure

Notes

- Make sure the ambient air temperature entering the RBC1505-xx Breakout Box or rising up to the ACR1505 is within acceptable ambient temperature limits.
- After installation, verify that the ambient air temperature directly below the top-most RBC1505-xx does not exceed the Ambient Operating Temperature. In addition, make sure that nothing obstructs the circulating airflow.

Ambient Operating Temperature ..... 0°C (32°F) to 45°C (113°F)

Storage Temperature ..... –40°C to 85°C (–40°F to 185°F)

Humidity ..... 0–95%, non-condensing

Pollution Degree..... 2 (per IEC 61010)

Installation Category ..... 2 (per IEC 61010)

Weight

Use Table 17 to determine the weight of your breakout box.

Breakout Box	Weight *ounces (g)*
RBC1505-xx	≈ 11.4 (323.2)

Table 17 Breakout Box Weight

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Breakout Box Dimensions

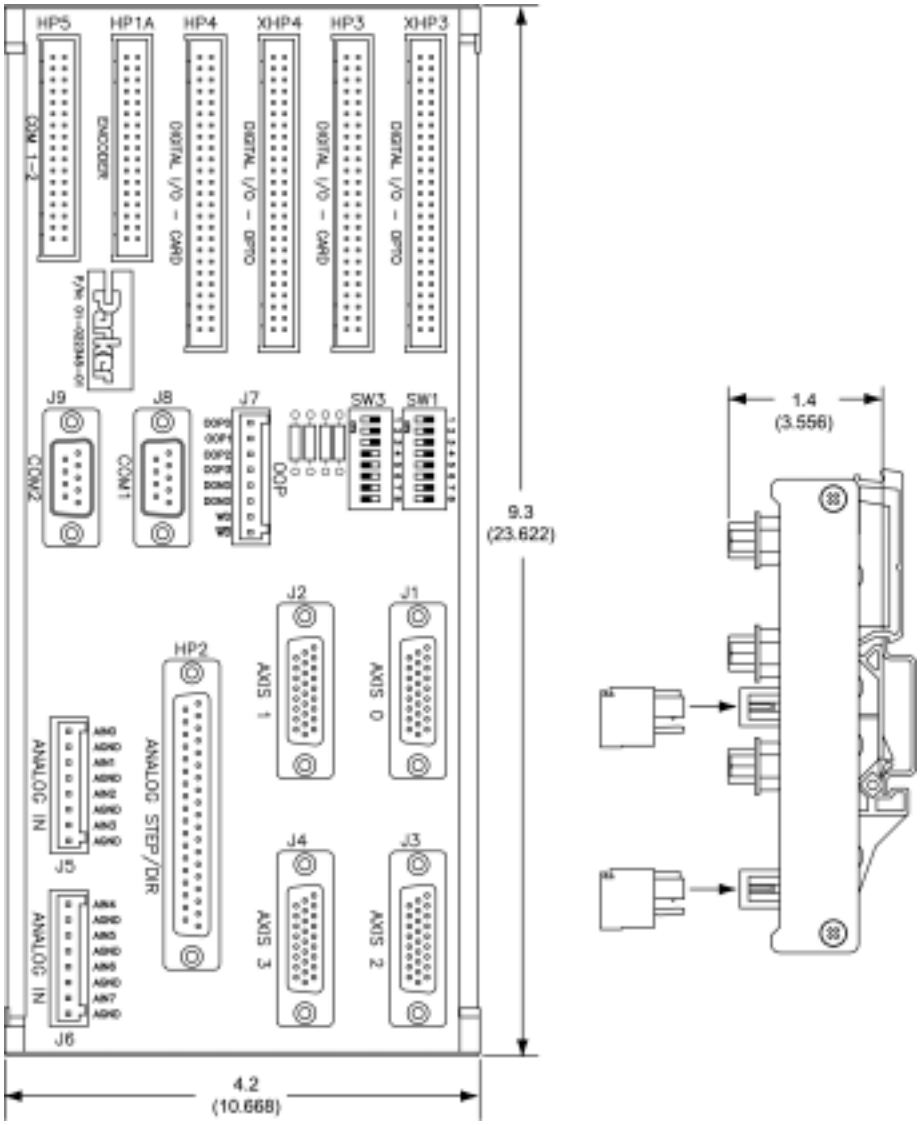


Figure 15 Breakout Box Dimensions

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Breakout Box to User Interconnect

COM1/COM2 Serial Port Connector Pinouts

There are two standard DB-9 male connectors provided on the RBC1505-xx Breakout Box to interface with serial communication ports.

Important! The parallel port on ACRCOMM Card is not accessible through the RBC1505 Breakout Box.

COM 1 Serial Port Connector		
RS-232 Signal	**RS-422 Signal**	**Pin**
n/c	RXD1A	1
RXD1	n/c	2
TXD1	n/c	3
n/c	TXD1A	4
DGND	DGND	5
DGND	DGND	6
n/c	RXD1B	7
n/c	TXD1B	8
n/c	n/c	9
Note: Use a standard Null Modem cable for COM connections.		

Table 18 COM1 Serial Port Connector

COM 2 Serial Port Connector		
RS-232 Signal	**RS-422 Signal**	**Pin**
n/c	RXD2A	1
RXD2	n/c	2
TXD2	n/c	3
n/c	TXD2A	4
DGND	DGND	5
DGND	DGND	6
n/c	RXD2B	7
n/c	TXD2B	8
n/c	n/c	9
Note: Use a standard Null Modem cable for COM connections.		

Table 19 COM2 Serial Port Connector

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Drive Enable and Drive Reset

Configuration

The ACR Controller general-purpose outputs (32-39) are always sent to the Digital Out on the XHP3 connector. However, you can also send the signals through the Axis connectors.

The DIP switch SW1 lets you independently enable or disable each Drive Enable and Drive Reset signal on each Axis connector. The factory default for all Axis connectors is ON. For Axis connector pinouts, see Table 22 on page 50.

Note: Use the SET command to activate the appropriate outputs for each axis.

DIP Switch SW1

RBC1505-xx		Signal	ACR1505 Controller	
Pin	Axis		Digital Out (Bit)	Pin
1	0	Drive Enable*	32	47
2	0	Drive Reset	33	45
3	1	Drive Enable	34	43
4	1	Drive Reset	35	41
5	2	Drive Enable	36	39
6	2	Drive Reset	37	37
7	3	Drive Enable	38	35
8	3	Drive Reset	39	33

* The Drive Enable signal is also known as the Drive Shutdown signal for steppers.

Table 20 DIP Switch SW1

Drive Faults

Configuration

The ACR Controller general-purpose inputs (0-4) signals are always sent to the Digital In on the XHP4 connector. However, you can also send the signals through the Axis connectors.

The DIP switch SW3 lets you independently enable or disable each Drive Fault signal on each Axis connector. The factory default for all Axis connectors is ON. For Axis connector pinouts, see Table 22 on page 50.

Note: Use the BIT command to read the appropriate input for each axis.

Important!

- If you are using the Axis connectors for the Drive Fault signal, do not connect to the comparable signal on the XHP4 connector.
- On DIP switch 3, make sure pins 5-8 remain in the OFF position for correct operation.

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Factory Default..... Pins 1-4 are ON
Pins 5-8 are OFF

DIP Switch SW3

RBC1505-xx		Signal	ACR1505 Controller	
Pin	Axis		Digital In (Bit)	Pin
1	0	Drive Fault	0	47
2	1	Drive Fault	1	45
3	2	Drive Fault	2	43
4	3	Drive Fault	3	41

Table 21 DIP Switch SW3

Axis Connectors

There are four DB-26 female connectors to interface with drives.

Axis Connector Pinout

Signal	Pin	Signal	Pin
+5 VDC	1	ASIG (STEP+) ‡	14
DGND	2	AGND (STEP-) ‡	15
CHA+	3	RESERVED	16
CHA–	4	DRV FAULT IN	17
CHB+	5	+5 VDC	18
CHB–	6	DGND	19
ENC+/MRK+	7	RESERVED	20
ENC–/MRK–	8	DRV ENABLE OUT *	21
+5 VDC	9	RESERVED	22
ASIG (STEP+) †	10	DRV RESET OUT	23
AGND (STEP-) †	11	DGND	24
DIR+ †	12	RESERVED	25
DIR- †	13	RESERVED	26

† Stepper Drives use pins 10 –13.

‡ Servo Drives use pins 14 & 15.

* The Drive Enable signal is also known as the Drive Shutdown signal for steppers.

Note: Pins 11 & 14 are shorted together, as are pins 13 & 15, in the ACR Breakout Box. Connect only to pins 10 – 13, or pins 14 & 15;
Do not connect to both.

Table 22 Axis Connector Pinout

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