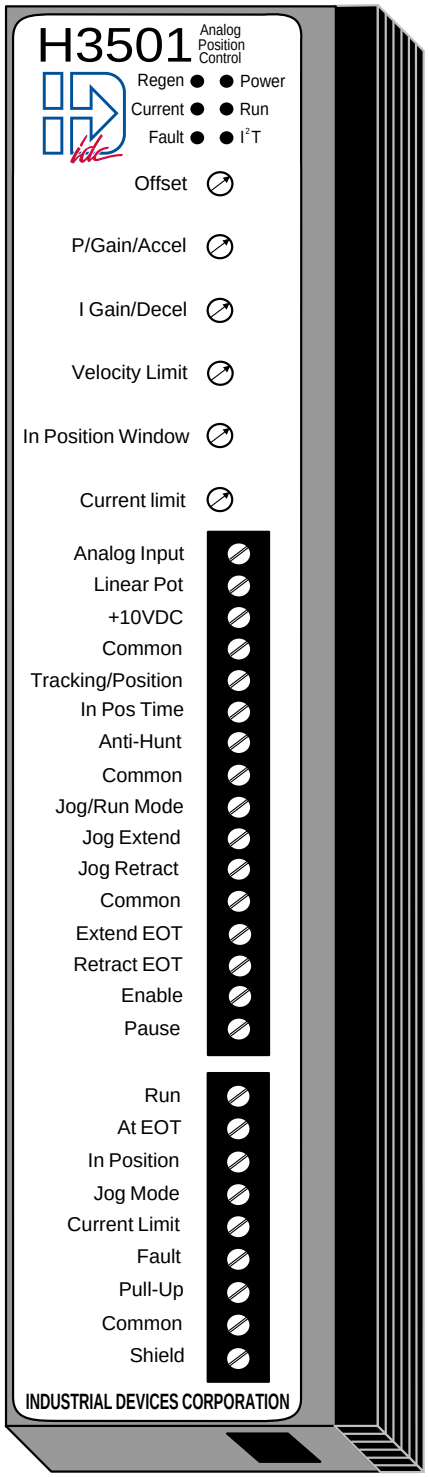
H3501 / H4501
Analog Position Controls



Operator's Manual

P/N PCW-4945 Revision 1.1 8/98

This manual covers the following IDC Products:

Analog Position Controls:
H3501 — 160V / 2.5 Amp
H4501 — 160V / 5.0 Amp

INDUSTRIAL DEVICES CORPORATION

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Overview

The H3501 and H4501 analog position controls provide a unique and cost effective approach to linear motion applications. By using an analog input for a position signal, and a linear potentiometer for feedback, a closed loop absolute positioning system can be built for a fraction of the cost of similar systems.

Compact and easy to mount, both controls are designed for easy setup and operation. Six LED's provide indication of operational status and six potentiometers allow the user to set two adjustable speeds, acceleration, deceleration, and current limits for the motor.

Ten optically isolated inputs and six optically isolated outputs allow for a variety of control interface connections to external devices such as PLCs, PC I/O Cards, simple push-button operator stations, and position sensors.

The control reads the analog input and positions the cylinder along the length of travel proportional to this input. The analog input can be 0 - 10VDC, 0 - 20 mA DC, or a potentiometer input.

Benefits of Using the H3501/4501

- ❑ Ease of integration speeds time-to-market
- ❑ Ease of setup during production lowers costs
- ❑ Smooth performance is easy on machinery
- ❑ Efficient, cool-running operation
- ❑ Enhanced reliability by design

IDC Component Compatibility

IDC Control	IDC Actuaor	Control Options	Control Accessories
H3501	NH R2H R3H NV-H EC2-H EC3-H	-FK (fan kit)	RPACK-1 (regen) RP1, RP2 (Hall Effect) RPS-1, RPS-2 (Reed) PSR-1, PSR-2 (Reed) PSN-1, PSN-2 (Hall Effect)
H4501	TH R4H EC5-H	-FK (fan kit)	RPACK-1 (regen) RP1, RP2 (Hall Effect) RPS-1, RPS-2 (Reed) PSR-1,PSR-2 (Reed) PSN-1, PSN-2 (Hall Effect)

Shipping Contents

All H3501 and H4501 controls are fully tested and operational when shipped from Industrial Devices. Each shipment should contain the following items.

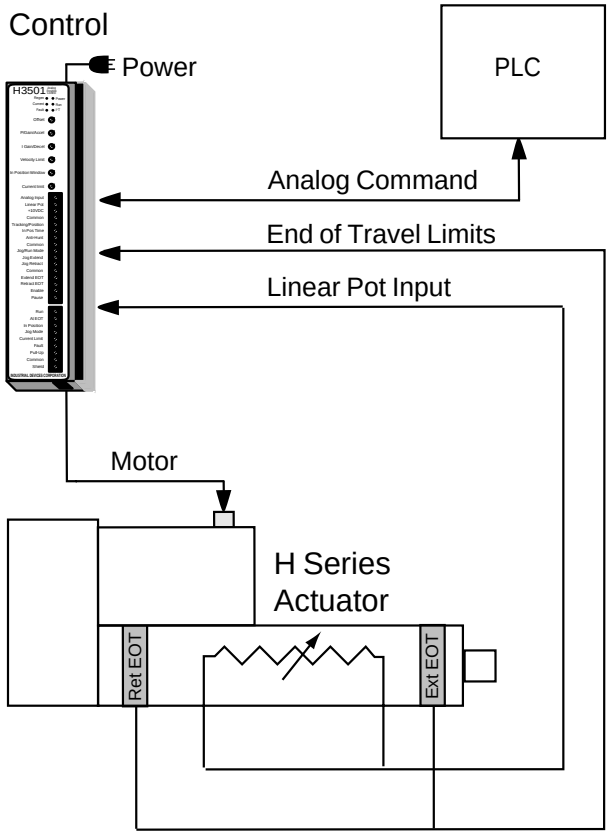
H3501 Control
- ❑ ❑ H3501 Control
- ❑ ❑ H3501/H4501 Manual
- ❑ ❑ Mounting Bracket (attached)
- ❑ ❑ 6ft AC Power Cable
- ❑ ❑ Slide Potentiometer
- ❑ ❑ Screws for optional mounting

H4501 Control
- ❑ ❑ H4501 Control
- ❑ ❑ H3501/H4501 Manual
- ❑ ❑ Mounting Bracket (attached)
- ❑ ❑ 6ft AC Power Cable
- ❑ ❑ Slide Potentiometer
- ❑ ❑ Screws for optional mounting

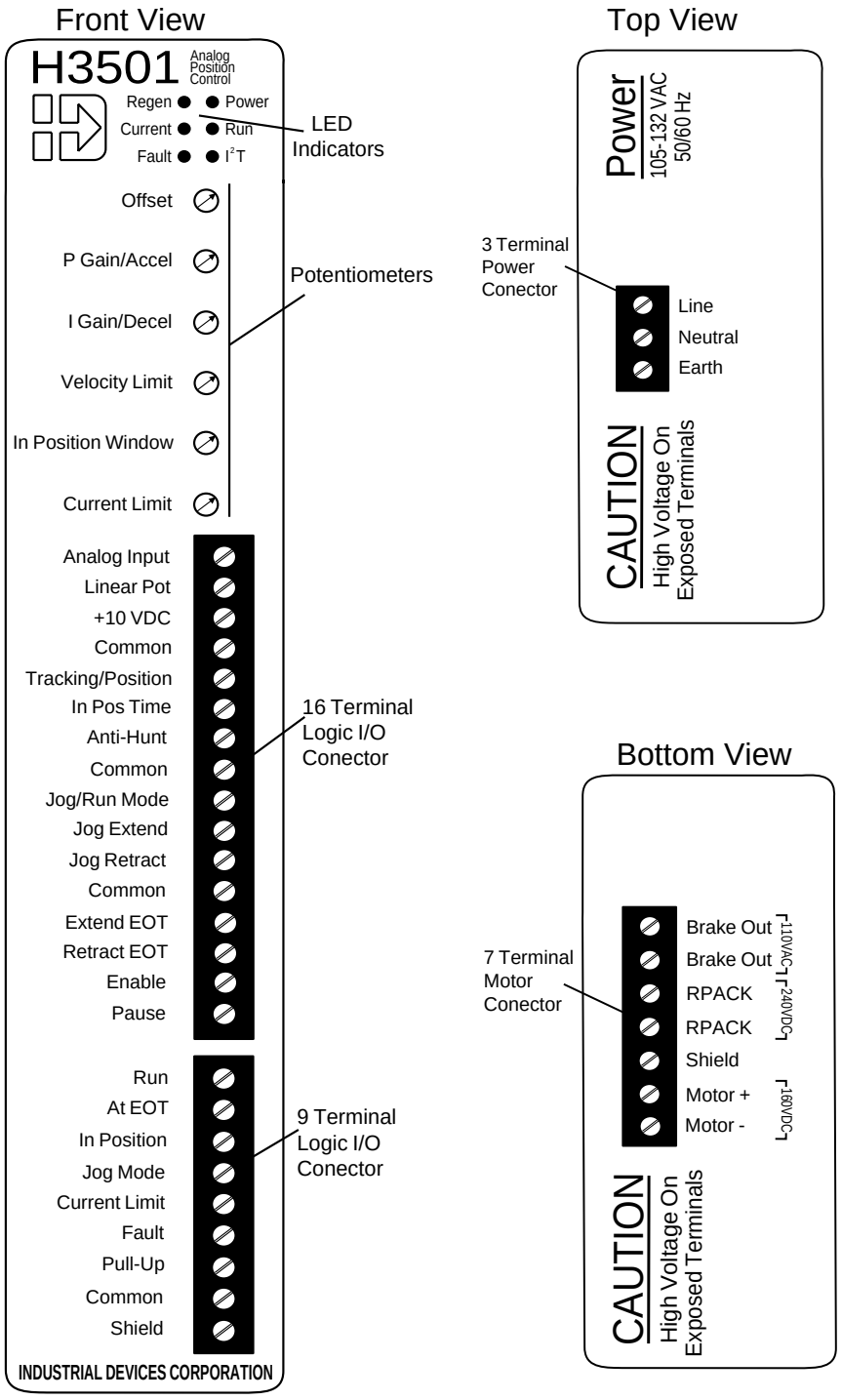
System Components

The following list indicates the basic system components used in an H Series Limit Switch Control and Actuator System.

- ❑ ❑ H3501 or H4501 Control
- ❑ ❑ H Series Actuator (See Control/Actuator Compatibility Chart)
- ❑ ❑ Two Normally Closed, End-of-Travel Limit Switches

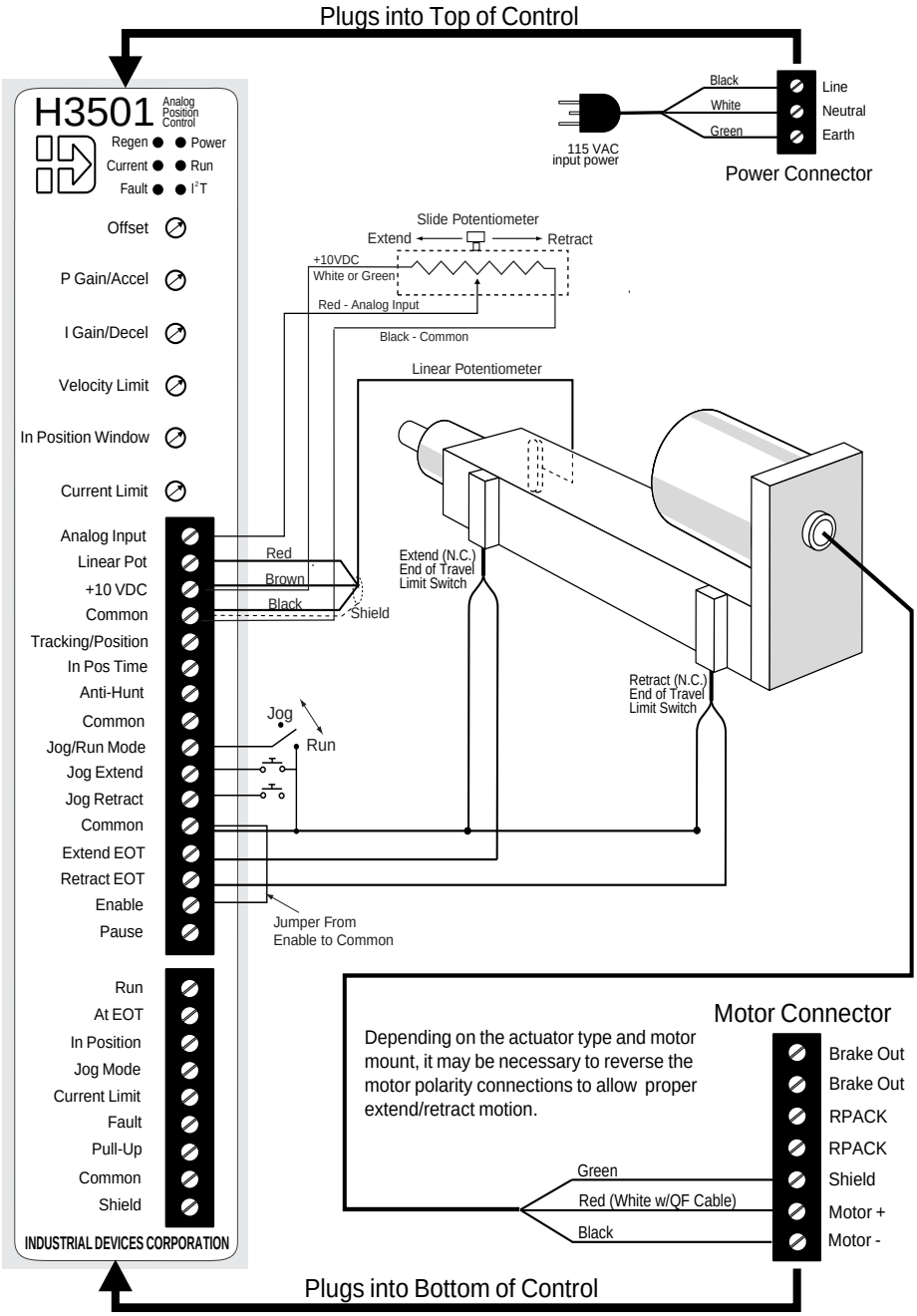


Control Features



Control Wiring

The figure below indicates the necessary interface wiring to operate your control in the Run mode.



WARNING: Do not touch motor power connections unless AC power has been removed from the control. High voltage may be present on motor power connections even when motor is stopped.

Application TIP

If End-of-Travel limit switches are NOT USED, inputs, Extend EOT (#13) and Retract EOT(#14) must be jumpered to Common (#12). Note: This is done at the factory prior to shipment.

Functional Interface

Each control has six LED Indicators to monitor system status and six potentiometers to set move parameters and current limits.

LED Indicators

Power (GREEN)
AC Power Indicator

ON: Normal Operation, AC Line Power is present and internal power supply is functioning.
OFF: No AC Power, or internal power supply failed.

Run (GREEN)
Indicates power is being supplied to the motor.

ON: Motor/actuator is being commanded to move or apply a holding force.
OFF: Motor/actuator is NOT being commanded to move or to apply a holding force.

I^2T (RED)
Indicates power going to the motor is exceeding the safe temperature limits of the motor.

ON: Excessive power is being supplied to the motor. An internal circuit monitors the calculated motor temperature based on output power (current applied to the motor over time). A fault condition is activatied when the motor's safe limit is exceeded. *When this LED is active, current to the motor is automatically reduced to zero. Power must be cycled and the move profile must be adjusted to reduce RMS motor current to clear the fault condition.*
OFF: The motor is being operated within safe power limits

Regen (YELLOW)
Regen Overload Indicator

ON: Indicates power is being fed back into the power supply through the motor causing an overvoltage or overcurrent condition. This typically occurs when an actuator is being back driven, an actuator is moving a high inertial load, or during rapid accel or decel during a move.
OFF: Normal Operation

Current (YELLOW)
Current Limit Indicator

ON: Indicates current going to the motor is exceeding the set value determined by the Current Limit potentiometer. *When this LED is active, current to the motor is reduced to the maximum values set by the Current Limit pot.*
OFF: Current to the motor is within the values set by the Accel I Limit and At Speed I Limit pots.

Fault (RED)
Fault Indicator

ON: Indicates a fault state exists within the control. The fault type is determined by a flashing code;
- One (1) Flash: Over Temperature
- Two (2) Flashes: Over Current
- Three (3) Flashes: Over Voltage, Regen
- Four (4) Flashes: I^2T Current Fault

OFF: Normal Operation

Note: Power must be cycled and the source of the fault must be corrected to clear an existing fault state.

Potentiometer Settings

All potentiometers are single turn pots where a 0% turn is full counter clockwise(CCW) and a 100% turn is full clockwise(CW).

Offset

Sets the analog offset of the control input. Offset is typically used to compensate a voltage offset of the analog position command. It can also be used to zero the position of your actuator.

CAUTION: The actuator may extend or retract during offset adjustment.

Range: 0 to 10% of position range
Rotation: CW decreases offset
CCW increases offset

P Gain/Accel

Sets the Proportional Gain of the servo loop. Increasing the P Gain setting causes a faster speed response for a given position error. (Accel applies to a special version of the product)

Range: 0 to 100% Gain
Rotation: CW increases Gain Setting
CCW decreases the Gain Setting

I Gain/Decel

Sets the Integral Gain of the servo loop. I Gain reduces the remaining error in the actuator system. The greater the I Gain setting, the greater the correction for the remaining error. (Decel applies to a special version of the product)

Range: 0 to 100% Gain
Rotation: CW increases Gain Setting
CCW decreases the Gain Setting

Velocity Limit

Sets the maximum actuator velocity. Can be used to limit critical speed of the actuator to a safe operating speed. See catalog for information on the critical speed of your specific actuator.

Range: 0-3000 RPM motor shaft speed.
Rotation: CW increases the maximum velocity
CCW decreases the maximum velocity

In Position Window

Range: 0-12% of total travel

Rotation: CW increases Window
CCW decreases the Window

This potentiometer is used along with the **In Pos Time** and **Anti-Hunt** Inputs. The state of these parameters determines both how long the actuator will Servo and when to set the **In Position** output. The potentiometer determines the amount of position error that is acceptable.

*How **In Position Window** relates to the **In Pos Time** input:* If the **In Pos Time** input is activated, the **In Position** output will not turn on until the actuator has settled within the **In Position Window** for 50ms. If the **In Pos Time** input is not activated, the **In Position** output provides the real time state of the **In Position** window. The output is on anytime it is within the window, even if the servo has not settled. This setting can cause the **In Position** output to flicker.

*How **In Position Window** relates to the **Anti-Hunt** input:* The control will stop servoing whenever it has positioned within the In Position Window if the Anti-Hunt input is activated.

The **Anti-Hunt** wndow is 50% of the **In Position Window**.

Current Limit

Sets the peak current output to the motor.

Range: 0 to 6 Amps for the H3501
0 to 10 Amps for the H4501

Rotation: CW increases Current Limit
CCW decreases the Current Limit

Analog Inputs

Analog Input and Linear Pot Input

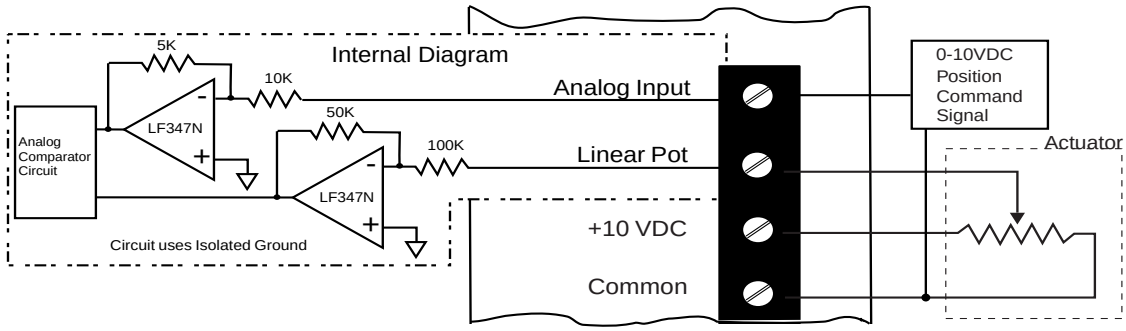
Analog Input and **Linear Pot** are optically isolated analog inputs accepting a 0 to 10VDC or 0 to 20mA signal (-C option).

The **Analog Input** is referenced to Common and is a 0 to 10VDC commanded input, as shown below. The Linear Potentiometer wiper (located inside the actuator) is connected to the **Linear Pot** analog input. The Linear Potentiometer +/- terminals should be connected to Common and +10VDC. See diagram below.

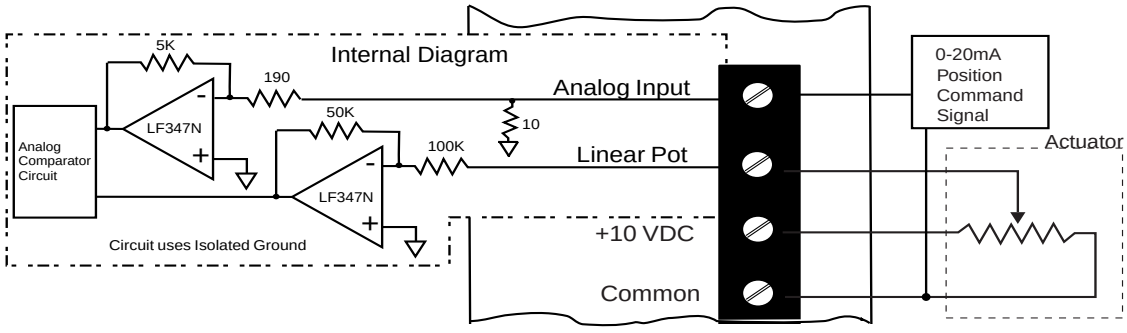
Application TIP

All standard controls are configured with the *0 to 10VDC* analog input circuitry. If your application requires the 0 to 20mA input version, please order part number H3501-C or H4501-C.

0 to 10VDC Input Configuration - Internal Diagram



0 to 20mA Input Configuration - Internal Diagram



Digital Inputs

The logic inputs are optically isolated, sourcing inputs rated to draw up to 10mA at 10-25VDC. Each is activated when connected to common via a switch or sinking output. All 10 logic inputs are normally open connections with the exception of the EOT inputs which are normally closed.

Tracking/Position *(not used)*

In Pos Time
If the **In Pos Time** input is activated the **In Position** output will not turn on until the actuator has settled within the **In Position Window** for 50ms. If the **In Pos Time** input is not activated the **In Position** output provides the real time state of the position error. The output is ON anytime it is within the window, even if the servo has not settled. This setting can cause the **In Position** output to flicker.

Anti-Hunt
The control will stop "servoing" when it has positioned within the **In Position Window** if the **Anti-Hunt** input is activated.
The **Anti-Hunt** window is 50% of the **In Position Window**.

Jog/Run Mode
This input selects whether the control is in **Jog** or **Run Mode**. In **Jog** Mode (input not activated) the control only responds to the **Jog Extend** and **Jog Retract** Inputs. Analog commands are ignored. In this mode the actuator will jog or move at 25% of the speed set by the **Velocity Limit** potentiometer. This mode is very useful for setting up or troubleshooting the control system.

In **Run Mode** (activated) the control continuously servos to a commanded analog position. **NOTE**: Assuming the control is enabled, the actuator is going to move as soon as the Servo Mode is activated.

Jog Extend and Jog Retract
These inputs are only active if the control is in **Jog Mode**. While active they move the actuator in the specific direction at 25% of the **Velocity Limit** setting.

Extend and Retract EOT
The **Extend** and **Retract End-of-Travel** inputs are safety inputs which prevent the actuator from running into the "physical" ends-of-travel. They must be connected to normally closed limit switches positioned at the extreme ends of travel on an actuator. If a connection is broken while the cylinder is moving in the specified direction, the actuator will immediately stop.
Moves beyond these positions will not be accepted.

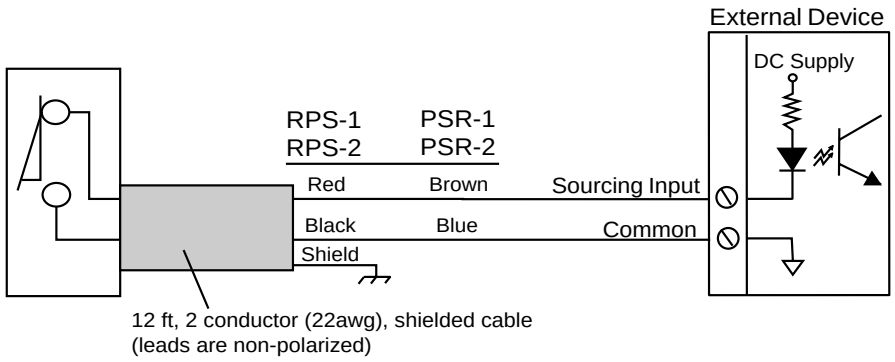
IDC Limit Switches

IDC limit switches consist of mechanical reed and hall-effect types available in both normally-open and normally-closed configurations. They mount to the sides of IDC H Series Actuators where they are used to provide feedback signals to the H3501 or H4501. An internal magnet in the actuator activates the switch as it passes.

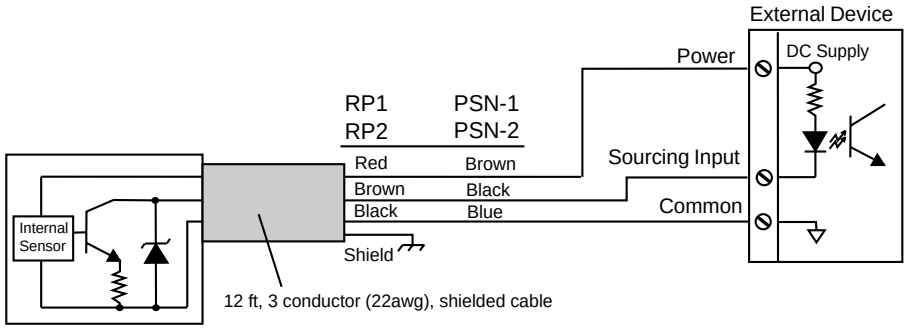
The normally-closed switches are used for End-of-Travel protection while the normally-open switches are used to signal a stop position , to change speeds, or to change direction.

IDC LIMIT SWITCHES		
Switch	Type	Normally Open/Closed
RPS-1, PSR-1	mechanical reed	normally open
RPS-2, PSR-2	mechanical reed	normally closed
RP1, PSN-1	hall effect	normally open
RP2, PSN-2	hall effect	normally closed

Typical wiring diagram of a mechanical reed switch showing connections and wiring color code



Typical wiring diagram of a Hall Effect sensor showing connections and wiring color code



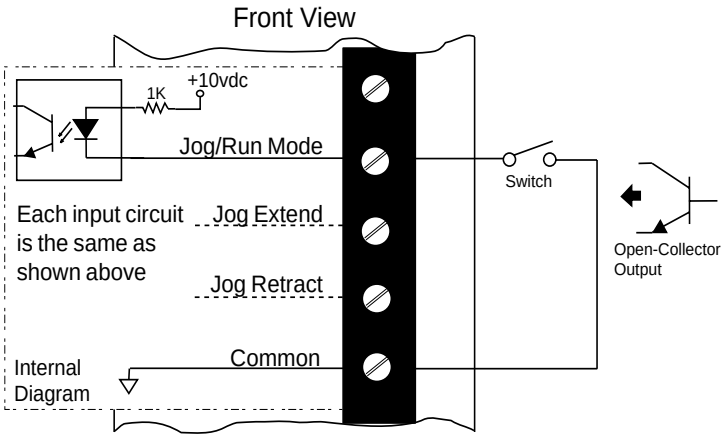
Enable

The control and motor are enabled when this input is activated. The amplifier is disabled unless this input is activated.

Pause

The control will stop moving while this input is active. When the input is not active the control will use the other mode inputs to determine operation.

Input wiring diagram showing typical connections



Outputs

The 6 logic outputs are optically isolated, 24 V open collector, sinking outputs rated for switching non-inductive loads up to 100mA @ 0 Volts (maximum supply voltage is 12 Volts).

Run
ON: Motor is being command to move or apply a holding force.
OFF: No move or holding force is being commanded.

At EOT
ON: An end of travel switch has been tripped, breaking the circuit.
OFF: No end of travel switches have been tripped.

Once activated it will remain set until the control is commanded to move in the opposite direction of the activated EOT input.

In Position
ON: The actuator is (or has settled) within the **In Position Window** for the In Pos Time setting.
OFF: The actuator is not (or has not settled) within the In Position Window for the In Pos Time setting.

See: In Position Window Potentiometer and the In Pos Time Input

Jog/Run Mode
ON: In Jog Mode.
OFF: In Servo mode the unit is servoing to the Analog Positioning input.

Current Limit
ON: Current limiting circuit is active. Motor current is clamped to the specific pot setting.
OFF: Normal Operation

Once activated, output remains set until current levels fall with normal set operation values.

FAULT

ON: A drive fault has occurred. Check FAULT LED for display of fault code.

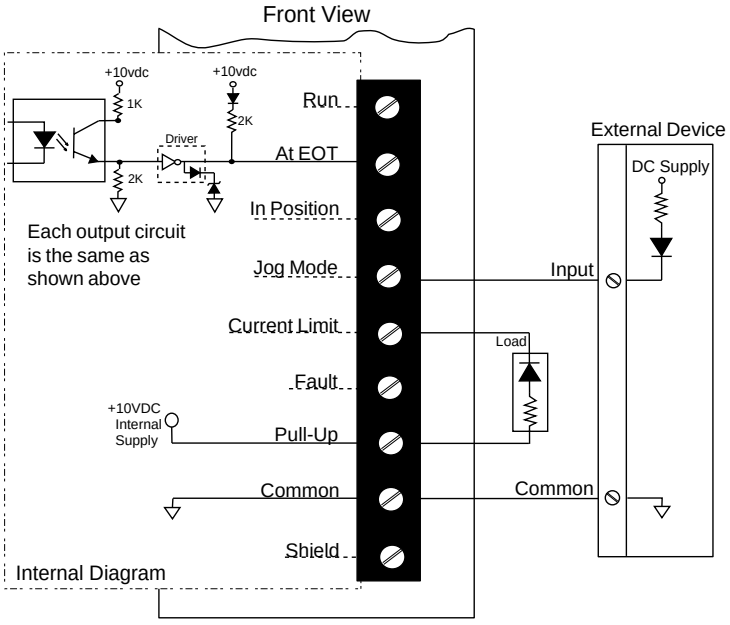
OFF: Normal Operation

FAULT LED Flash Codes

1 Flash:	Overheat	2 Flashes:	Motor Short
3 Flashes:	Regen., Overvoltage	4 Flashes:	I^2T Motor Protect

Note: Once activated, output remains set until power is cycled and the source of the fault had been corrected.

Internal Circuit Diagram of Outputs shows sample connections to external loads using either an on-board or external power supply.

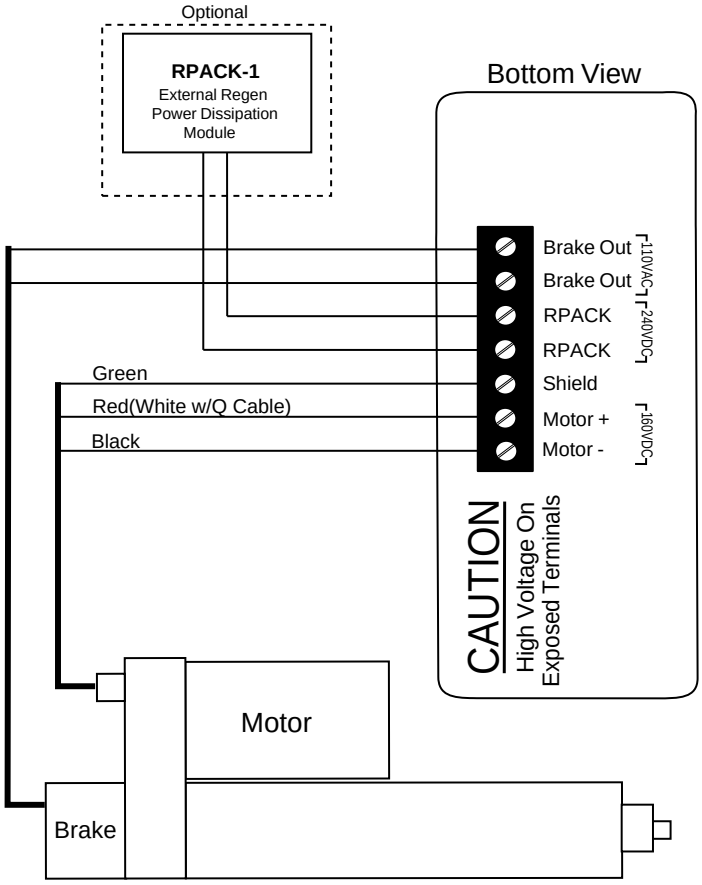


Electrical Interface

In H3501 and H4501 systems, the logic signal ground (common), power circuits, and chassis are electrically isolated from each other. This ensures that currents are not induced into the logic wiring by motor and/or power supply currents. This section provides a guide to the electrical installation of the H3501 and H4501 Controls.

Motor Connections

Motor connections can be made with an IDC supplied Quick Disconnect Cable or a user supplied cable to the 7-pin removable motor connector located on the bottom of the control. Terminals are also available for the RPACK-1 and Brake. *Note: There is no polarity for the RPACK and Brake connections.*



Application TIP

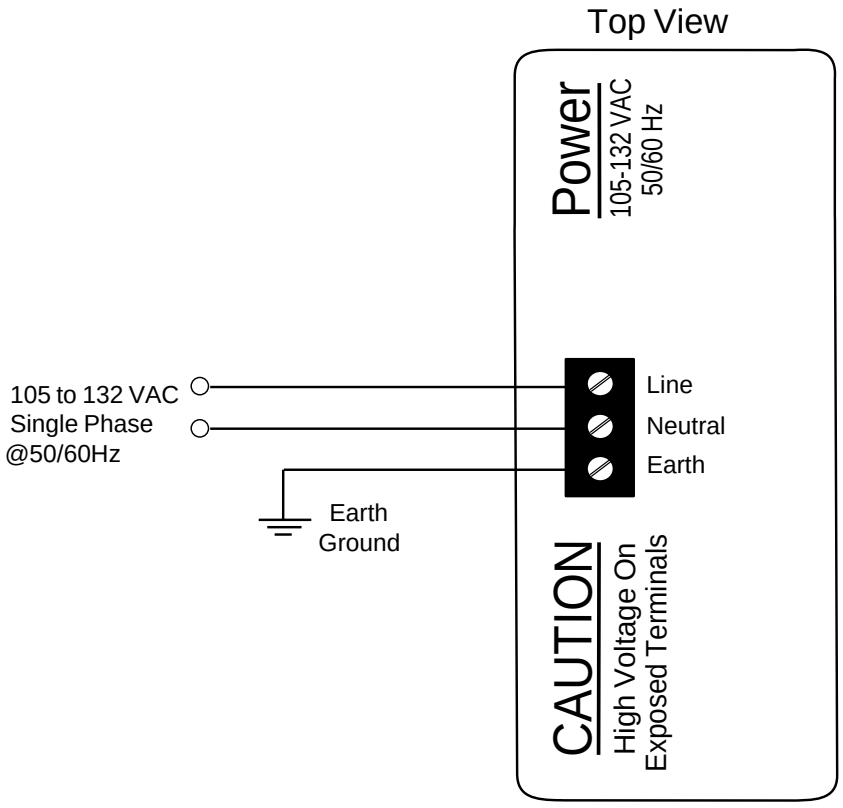
Recommended wire gauge for user supplied motor cabling; 16AWG (less than 50ft), 14AWG (50-100ft) and 10AWG (100 -200 ft).

Application TIP

Applications with a backdriving load (typical for vertical ballscrew applications), moving a high inertial load or making fast and frequent stop/starts, IDC recommends that the RPACK-1 option be used with the H3501 and H4501. It offers “regen” protection for applications where current is fed back into the control causing over voltage or over-current faults on the drive.

Connecting Power

The H3501 and H4501 accept single phase 120VAC wired directly into the AC input terminals located on the top of the control. A 6ft AC line cord is supplied with each control.



Application TIP

Earth ground should always be connected to the Earth terminal on the power connector.

Operating Your System

Each H3501 and H4501 Analog Position Control is shipped from the factory with an external joystick slide-potentiometer prewired to the **Analog Input** of the control. The pot provides a 0-10VDC command signal as the slide is manually moved from one end to the other. This slide pot is included for initial testing and setup of the control and should be removed when the desired position command signal is wired to the Analog Input terminal.

System Setup

1. Ensure that wiring and connections have been made as shown on page 4 to allow operation of your control in the **Jog** mode. This is done by deactivating the **Jog/Run Mode** input (typically by disconnecting the input from Common).

2. Turn each potentiometer to full counter-clockwise (CCW).

3. Set each of the potentiometers as shown below. These initial setup positions are performed as a precautionary measure to minimize any sudden motor/actuator movement when power is applied.

Initial Potentiometer Settings (beginning from full CCW)

Note: The arrows shown in the drawing below are shown in approximately accurate positions which should correspond with the actual pots on the control.

Potentiometer	Initial Setting
Offset	Fully CW (zero offset)
P Gain/Accel	¼ turn CW
I Gain/Decel	¼ turn CW
Velocity Limit	¼ turn CW
In Position Window	fully CW (largest window)
Current Limit	½ turn CW

Pots on H3501/4501

4. Apply power.

5. a. Use **Jog Extend** to manually move the actuator to the Extend EOT. The cylinder should stop at the EOT switch. If it does not, check the wiring.
b. Use **Jog Retract** to manually move the actuator to the Retract EOT. The cylinder should stop at the EOT switch. If it does not, check the wiring.

6. Jog the cylinder to the mid-stroke position.

7. Move the slide pot control to the middle position.

8. Activate the **Run Mode** by grounding the **Jog/Run Mode** input. The actuator may move slightly as soon as the input is grounded. This is normal.

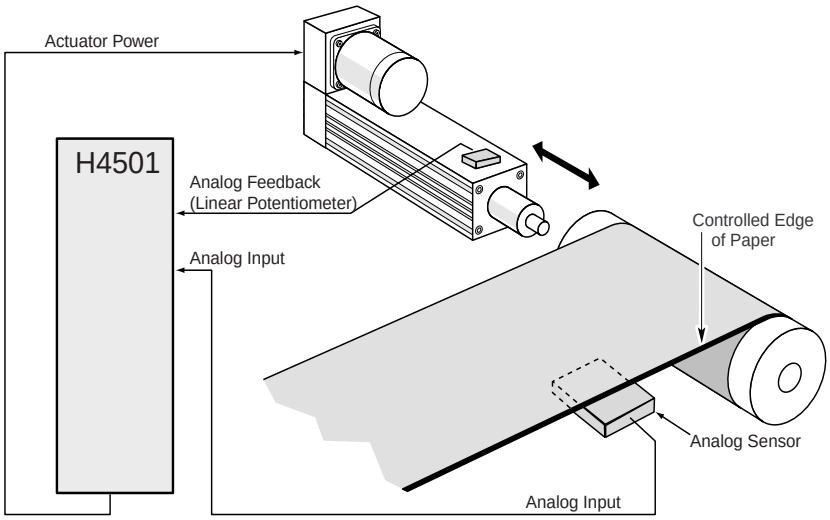
The slide potentiometer may now be used to move the actuator.

9. Move the slide pot control back and forth. The cylinder should follow the movement of the control.

10. Tune the system as desired.

Note: See **Digital Inputs** (section 3) for more information on **Jog/Run Mode**.

Application Examples



EDGE GUIDE Application

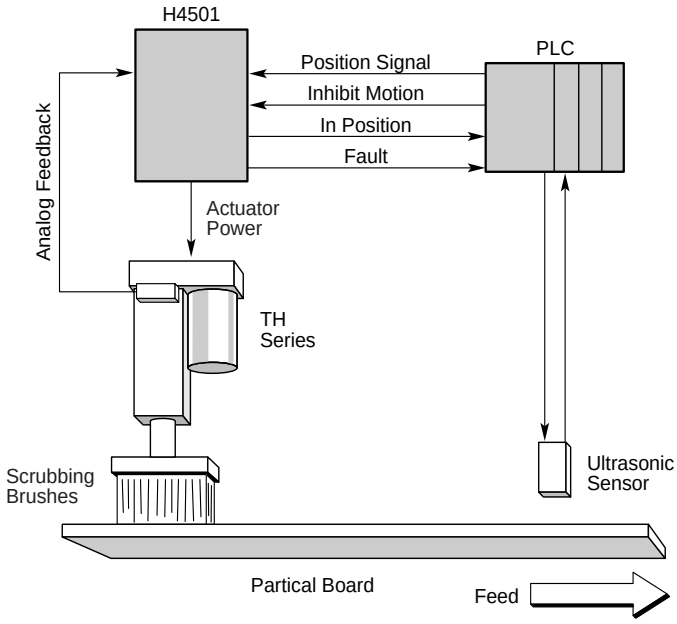
A manufacturer of paper products needed a highly responsive and reliable way of ensuring that a straight edge is maintained while its paper products are fed onto rolls. As shown in the drawing above, an H4501 control and a TH Series Actuator (with linear potentiometer) were teamed-up with an analog sensor to solve the problem.

As the paper is pulled onto the roll, its position is being monitored by the analog sensor. A 0-10 VDC input from the sensor is read by the H4501 control, which positions the actuator cylinder proportional to the analog input. The cylinder moves only when there is a difference in voltage between the analog input from the sensor and the analog feedback from the linear potentiometer.

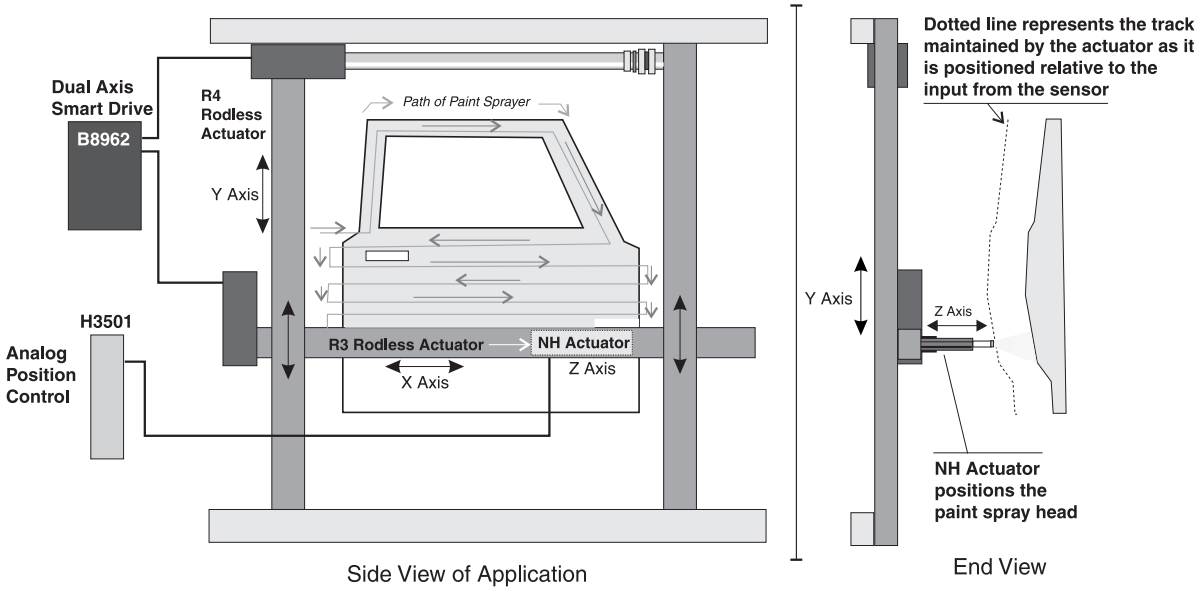
POSITION FOLLOWING Application

A particle board manufacturer needed an inexpensive way to automatically adjust the height of a scrubbing deck, based on the thickness of the material passing underneath. The rotating wire brushes on the scrub deck were used to smooth the surface of the wood.

Brush height control was easily realized using a H4501-C control which accepts a 0-20 mA analog position output from the PLC. The PLC takes the height measurement from an ultrasonic sensor and provides a corresponding position signal to the H4501 control.



FIXED DISTANCE TRACKING
Application



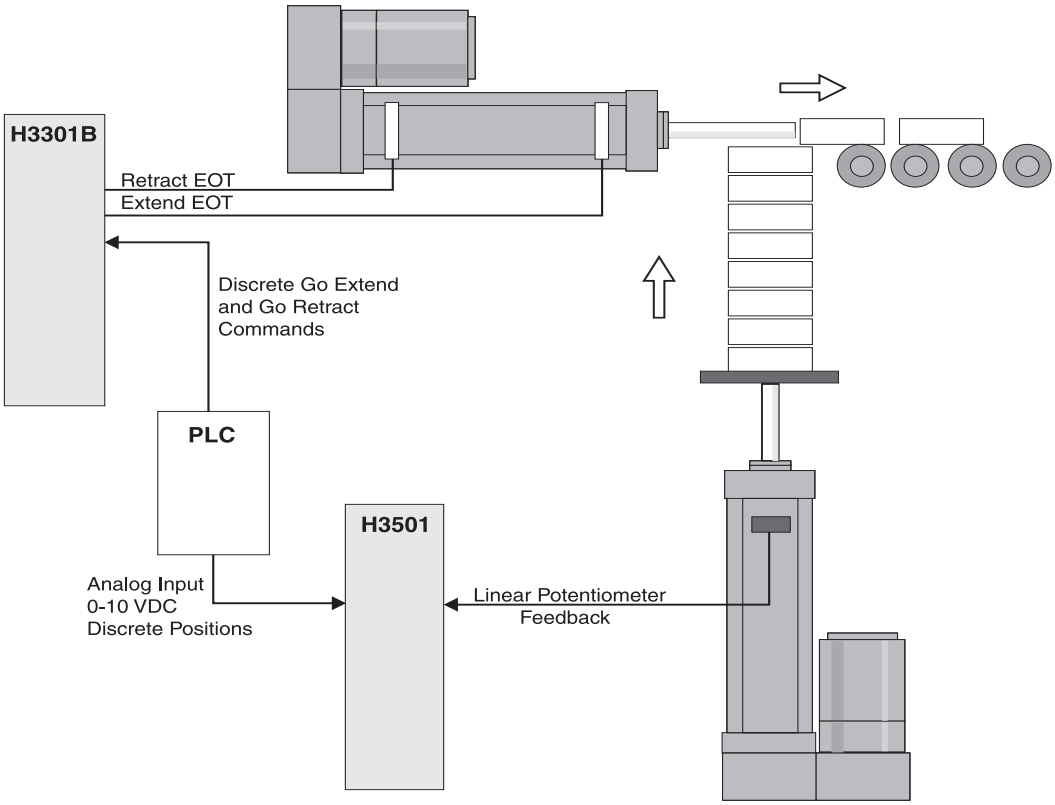
The design department of an auto manufacturer required a highly precise method of painting body parts with widely varying contours. Additional requirements included minimal setup, and quick changeover when switching between completely different body parts.

Armed with the best products in the motion control industry, IDC's applications group was able to quickly meet and perhaps even exceed the requirements of this client.

In the drawing above, a newly designed car door is being painted. A B8962 Smart Drive is used to move the gantry in the X-Y pattern necessary to paint the door. A simple raster-scanning pattern could be used in this example, but much more complex motion programs are possible as well.

With feedback from an ultrasonic sensor, the H3501 Analog Position Control and NH actuator automatically maintain a constant painting distance from the part. The net result is an extremely consistent paint finish.

POINT TO POINT
Application



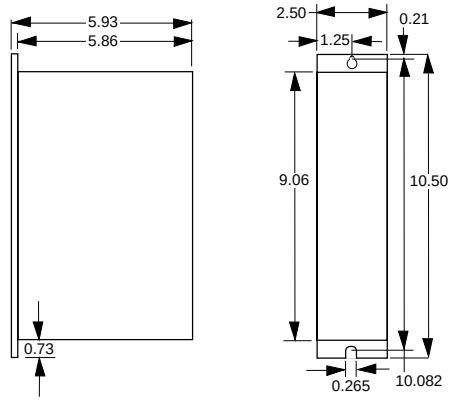
A manufacturer of architectural quality brick wanted a system for moving ceramic glazed bricks onto a roller-conveyer. The system needed to produce smooth, accurate moves and would hopefully be inexpensive.

The company received several quotes for servo controls which were capable of smoothness and accuracy but were too expensive for this application.

IDC also had servo controls, but more importantly we provided an equally effective but less expensive solution by combining a limit switch control (H3301B), analog position control (H3501), and two N-series actuators as shown above.

In this example, vertical positioning is managed by the H3501 which accepts a 0-10 VDC analog position signal from the PLC, compares it to the linear pot feedback from the actuator, then commands a positioning move. The H3301B smoothly moves each brick onto the conveyor, receiving its Go Extend and Go Retract commands from the PLC. Extend and Retract End-of Travel limit switches are included with both actuators and may be independently adjusted for most desirable cylinder travel.

Specifications

General Dimensions:	
Environmental Temperature: Humidity:	 Thermal Shutdown occurs if heat sink exceeds 65C(149F) 0 - 90% non-condensing
Power Input: VA Rating:	 105VAC to 132VAC, single phase, 50/60Hz, Operates at lower voltages with reduced performance H3501: 0.96kVA, H4501: 1.6kVA
Motor Output Type: Current: Protection:	 PWM bipolar MOSFET H Bridge @20kHz H3501: 2.5A cont., 6A peak. H4501: 5A cont., 10A peak Short Circuit, Undervoltage, Overcurrent, Over-temperature. Internally fused.
Regen. Output:	250VDC @ 8A, 50Ω minimum, short circuit protected (RPACK-1 option equivalent to 50Ω, 400W)
Brake Output:	Optically Isolated 115VAC triac, 1A max
Logic Power: Digital Inputs: Digital Outputs:	 10VDC @ 250mA max Optically isolated, sourcing inputs, each rated 10 - 25VDC @ 10mA, 3/11VDC Low/High Signal (Must be active 10ms to be recognized) Optically isolated, NPN open collector, sinking outputs, rated 100mA @ 0.4VDC
Analog Input **Resolution**	0 to 10VDC (1 MΩ input impedance) 0 to 20mA (10Ω input impedance) 1,024
Performance Velocity:	 15:1 Speed Range (*linear speeds are actuator dependent)*

Accel/Decel:	adjustable rate (0.1 to 5 second range to full speed)

Connector Pinouts

Four removable connectors allow connections for AC Input Power, the Motor Output, Logic Inputs/Outputs, and for the RPACK and Brake options (Brake option not currently available).

Logic Connector

Term	Label	Description
1	Analog Input	Command Signal (Ref. Common)
2	Linear Pot	Linear Pot Input (Ref. Common)
3	+10V Out	+10 Volt DC Supply Output
4	Common	Logic Common
5	Track/Position	Positioning Mode Selection
6	In Pos Time	Selects Real/20ms settling time
7	Anti-Hunt	Anti-Hunt mode selection
8	Common	Logic Common
9	Jog/Run Mode	Jog/Servo Mode selection
10	Jog Extend	Extend Jog Input
11	Jog Retract	Retract Jog Input
12	Common	Logic Common
13	Extend EOT	Extend End of Travel Input
14	Retract EOT	Retract End of Travel Input
15	Enable	Enable Amp Input
16	Pause	Pause Input

Logic Connector

Term	Label	Description
17	Run	Run Output
18	At EOT	At End of Travel Output
19	In Position	In Position Output
20	Jog Mode	Jog Mode Output
21	Current Limit	Current Limit Output
22	Fault	Fault Output
23	Pull-Up	Pull-Up Resistor
24	Common	Logic Common
25	Shield	Shield Connection (Logic Cabling)

Power Connector

Term	Label	Description
1	Line	AC Power Input - Line Connection
2	Neutral	AC Power Input - Neutral Connection
3	Earth	AC Power Input - Earth Ground

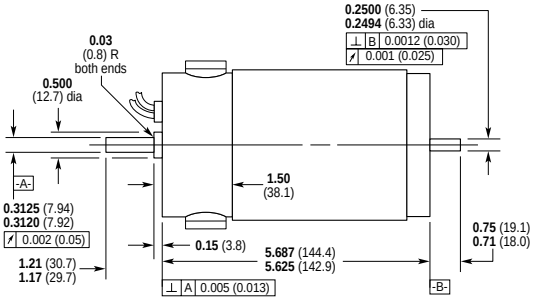
Motor Connector

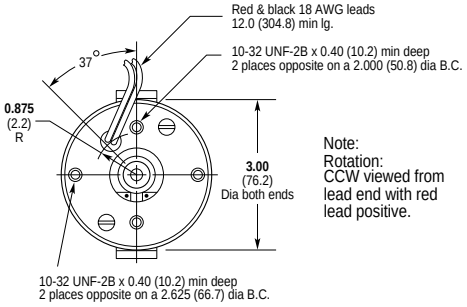
Term	Label	Description
1	Brake Out	Brake Output Connection (activates on Fault)
2	Brake Out	Brake Output Connection (activates on Fault)
3	RPACK	External RPACK (Regen) Option Connection
4	RPACK	External RPACK (Regen) Option Connection
5	Shield	Shield Connection (Motor Cabling)
6	Motor +	Motor Connection - Positive Lead
7	Motor -	Motor Connection - Negative Lead

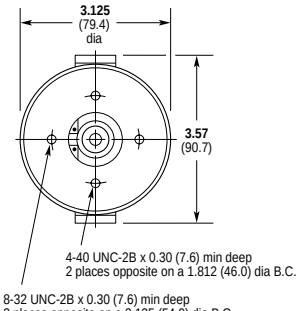
H Series Motors

H Motor (used with H3501)

Type: Permanent magnet, 2 Pole, 2 Lead DC motor
Voltage: Rated 160VDC, 180VDC max
Current: 2.5 Amps continuous, 6 Amps peak
No Load Speed: 3600 RPM
Torque Constant: 54 oz-in/Amp
Moment of Inertia: 0.034 oz-in-s^2
Windings:
Resistance: 6.4 Ohms ± 20%
Inductance: 21 mH ± 20%
Cabling: 16AWG (<50ft), 14AWG (50-100ft)
10AWG (100-200ft)
Brush Life: 5 Million Cycles, 5000 Hours

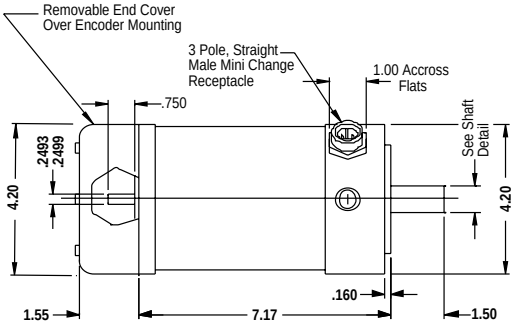


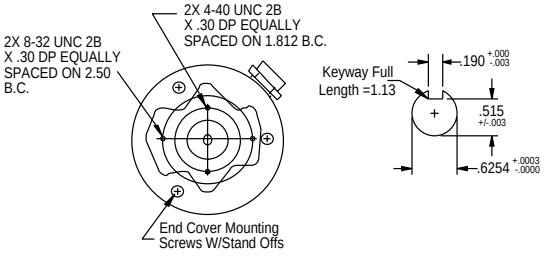


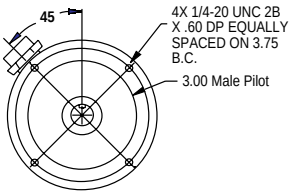


H4 Motor (used with H4501)

Type: Permanent magnet, 2 Pole, 2 Lead DC motor
Voltage: Rated 160VDC, 180VDC max
Current: 5 Amps continuous, 16 Amps peak
No Load Speed: 3200 RPM
Torque Constant: 67 oz-in/Amp
Moment of Inertia: 0.20 oz-in-s^2
Windings:
Resistance: 1.5 Ohms ± 20%
Inductance: 12 mH ± 20%
Cabling: 16AWG (<50ft), 14AWG (50-100ft)
10AWG (100-200ft)
Brush Life: 5 Million Cycles, 5000 Hours







Warranty

Industrial Devices Corporation warrants all products to be free of defects in workmanship for a period of one year from the date of shipment to the end user. Products returned prepaid to the factory will be repaired or replaced at our option at no charge, and returned prepaid to the user.

Products that have expended their useful life in less than one year or have been improperly used or damaged, in the opinion of the company, are not subject to the terms of this warranty.

Technical Support

Industrial Devices offers technical support through its factory authorized and trained Distributors, and through its factory based Application Engineering and Inside Sales department.

If an application problem exists or if the product has failed, contact your local Distributor or Industrial Devices for technical assistance. Contact our factory at 1-800-747-0064, outside the U.S. at 415-883-3535.

Repair Service

Product repairs are performed at our factory in Novato, California. Prior approval by Industrial Devices is required before returning a product for any reason. All return packages must be accompanied by an Industrial Devices supplied RMA(Return Material Authorization) Number.

In Case of Failure

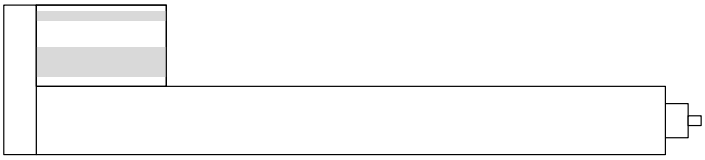
1. Get the Model and Serial Number of the defective unit, and document the nature of the failure using the RMA Data Form to help us repair the unit.
2. Prepare a purchase order for the repair cost in case the unit is out of warranty.
3. Contact your IDC Distributor or Industrial Devices Corporation for a Return Material Authorization Number RMA#. Provide information describing the nature of the failure.
4. Ship the unit prepaid, with the RMA number and documentation to:

   Industrial Devices Corporation
   64 Digital Drive
   Novato, CA 94949
   Attn: RMA#_____

Troubleshooting

SYMPTOM	CAUSE	REMEDY
Fault LED activates		
Single Blink	Over Temperature	Install fan kit (-FK) to control
Double Blink	Motor Short-Circuit	Check wiring, motor resistance
Triple Blink	Over Voltage, Excessive Regen	Install RPACK-1 option
Quadruple Blink	I^2T Current Overload	See I^2T LED activation
I^2T LED turns ON often	Calculated Motor Temperature too high	Reduce Actuator Speed
		May need more Heavy Duty Motor/Actuator
Regen LED comes ON often	Overvoltage or overcurrent condition caused by	Reduce Speed
	backdriving load, high inertia, excessive speed	Install RPACK-1 (regen) Option
Current LED comes ON often	Actuator/Load Binding	Check unloaded cylinder operation and mechanical mounting of load
	Velocity too high for given load	Reduce Velocity Setting
	I Limit set too low	Increase I Limit setting
Slow System Response	Output current limited by Current Limit circuits	See Current LED activation
	P, I, Current or Velocity settings too low	Increase settings
Actuator Overshooting Position	Speed Set too High	Reduce Speed setting
	P, I set too high	Reduce P, I
Actuator goes in Opposite Direction than Commanded	Motor Polarity Connections Reversed	Remove Power to Control and swap Motor + and Motor -
Cylinder doesn't move	End of Travel connection broken	Check EOT Connections
	Speed setting too low	Increase Speed settings
	Current settings too low	Increase I Limit

Fax Worksheet

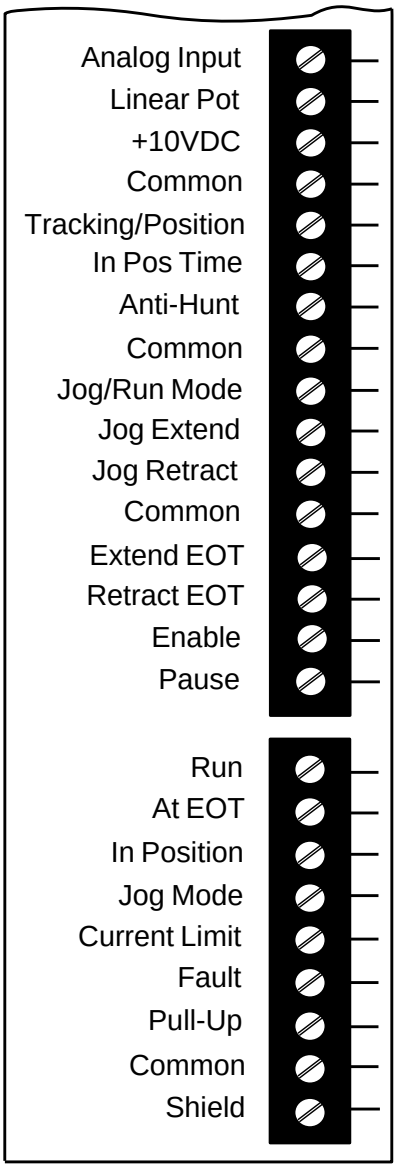


Technical Assistance?

1. Photocopy this page.

2. Complete the logic wiring diagram of your system.

3. Fax to Industrial Devices at (415) 883-2094 , Attn. Applications Engineering.



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Internet E-mail: support@idcmotion.com

H3501/H4501 Operator's Manual
P/N PCW-4945