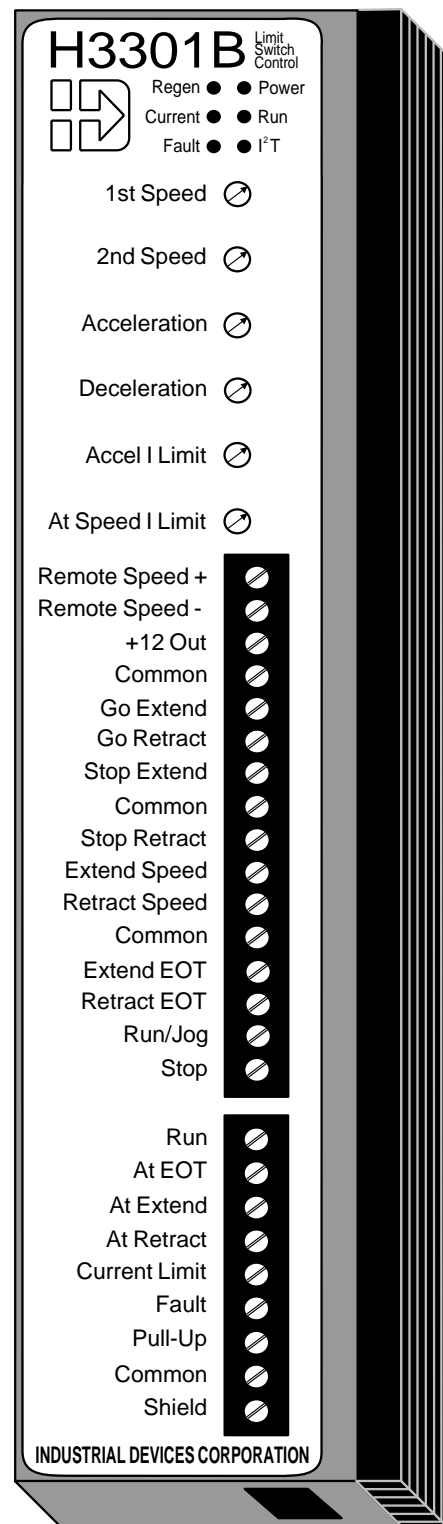# H3301B / H4301 Limit Switch Controls

Operator's Manual

P/N PCW-4705   Rev. 1.02   5/96

This manual covers the following IDC Products:

Limit Switch Controls:
H3301B — 160V / 2.5 Amp
H4301   — 160V / 5.0 Amp

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H3301B Limit Switch Control

Regen ● ● Power
Current ● ● Run
Fault ● ● I²T

1st Speed ⊘

2nd Speed ⊘

Acceleration ⊘

Deceleration ⊘

Accel I Limit ⊘

At Speed I Limit ⊘

Remote Speed +
Remote Speed -
+12 Out
Common
Go Extend
Go Retract
Stop Extend
Common
Stop Retract
Extend Speed
Retract Speed
Common
Extend EOT
Retract EOT
Run/Jog
Stop

Run
At EOT
At Extend
At Retract
Current Limit
Fault
Pull-Up
Common
Shield

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A. Overview

The H3301B and H4301 are low cost, high powered limit switch controls designed to run all IDC H Series Actuators for use in high duty cycle, high speed and high powered applications requiring simple linear positioning. An advanced PWM motor drive design providing an efficient and rugged motor/actuator performance.

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.

The microprocessor-based system commands control of linear move profiles based on input activation. Adjustable position sensors mounted on the side of an actuator can be used to signal a stop position, to change speeds, and reverse direction.

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

1. Benefits

◊   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

2. Compatibility

IDC Control	IDC Actuator	Control Options	Control Accessories
H3301B	NH R2H,R3H	-BC (brake output) -FK (fan kit) -VS (velocity servo)	RPACK-1 (regen) RP1, RP2 (hall effect) RPS-1, RPS-2 (reed)
H4301	TH R4H	-BC (brake output) -FK (fan kit) -VS (velocity servo)	RPACK-1 (regen) RP1, RP2 (hall effect) RPS-1, RPS-2 (reed)

3. Shipping Contents

All H3301B and H4301 controls are fully tested and operational when shipped from Industrial Devices. Each shipment should contain the following items.

H3301B Control
◊ H3301B Control
◊ H3301B/H4301 Manual
◊ Mounting Bracket
◊ 6ft AC Power Cable

H4301 Control
◊ H4301 Control
◊ H3301B/H4301 Manual
◊ Mounting Bracket
◊ 6ft AC Power Cable

4. System Components

The following list indicates the basic system components used in an H Series Limit Switch Control and Actuator System.
◊ H3301B or H4301 Control
◊ H Series Actuator (See Control/Actuator Compatibility Chart)
◊ Two Normally Closed, End of Travel Limit Switches
   [RPS-2 Reed Switch, RP2 Hall Effect Sensor]
◊ Normally Open Position Sensors   (quantity is user defined)
   [RPS-1 Reed Switch, RP1 Hall Effect Sensor]
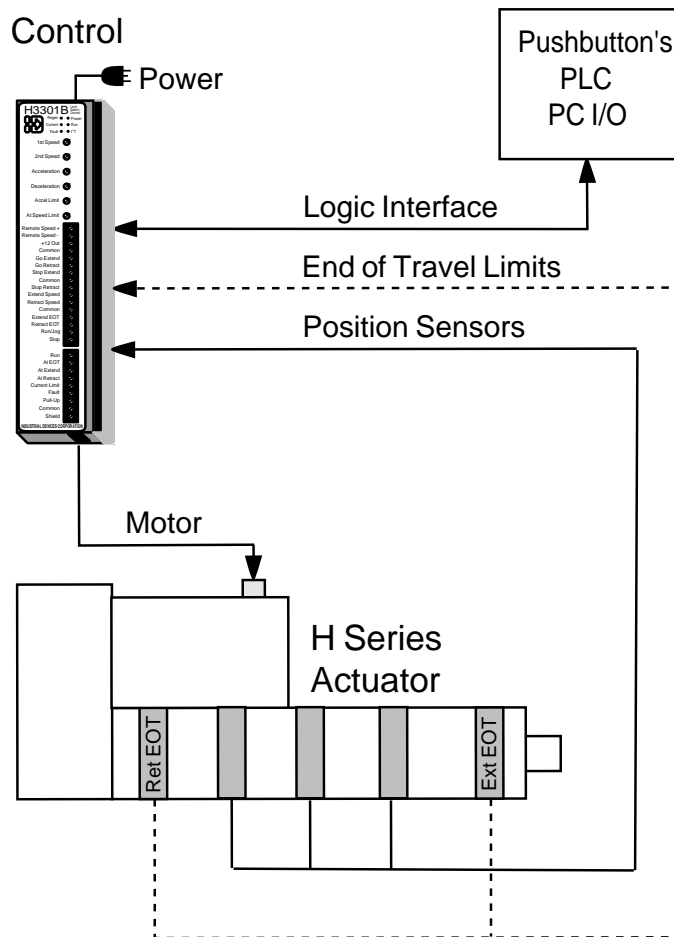
A. Three Easy Steps

The H3301B and H4301 can be quickly set up to operate by following the procedures contained in three easy steps; (1) Identify Control Features, (2) Basic Control Wiring, and (3) Applying Power to the Control.

1. Identify Control Features

Front View

H3301B Limit Switch Control

Regen ● ● Power
Current ● ● Run
Fault ● ● I²T

LED Indicators

1st Speed ⊘
2nd Speed ⊘
Acceleration ⊘
Deceleration ⊘
Accel I Limit ⊘
At Speed I Limit ⊘

Potentiometers

Remote Speed +
Remote Speed -
+12 Out
Common
Go Extend
Go Retract
Stop Extend
Common
Stop Retract
Extend Speed
Retract Speed
Common
Extend EOT
Retract EOT
Run/Jog
Stop

16 Terminal Logic I/O Conector

Run
At EOT
At Extend
At Retract
Current Limit
Fault
Pull-Up
Common
Shield

9 Terminal Logic I/O Conector

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Top View

Power
105-132 VAC
50/60 Hz

3 Terminal Power Conector

Line
Neutral
Earth

CAUTION
High Voltage On Exposed Terminals

Bottom View

7 Terminal Motor Conector

Brake Out
Brake Out
RPACK
RPACK
Shield
Motor +
Motor -

110VAC 240VDC 160VDC

CAUTION
High Voltage On Exposed Terminals

3

2. Basic Control Wiring

The figure below indicates the necessary interface wiring to operate your control in Manual Jog Mode. Wire and proceed to Step 3.
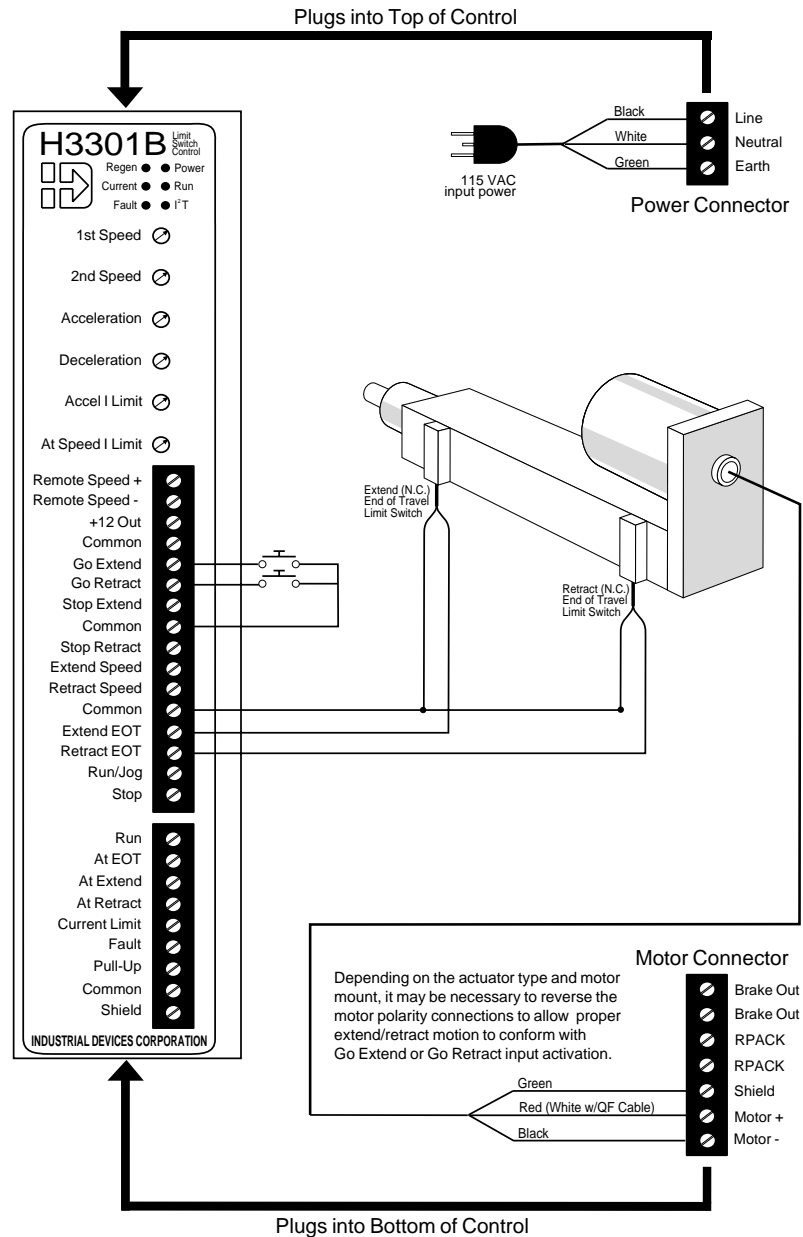
Plugs into Top of Control

H3301B Limit Switch Control

Regen ● ● Power
Current ● ● Run
Fault ● ● I²T

1st Speed ⊘
2nd Speed ⊘
Acceleration ⊘
Deceleration ⊘
Accel I Limit ⊘
At Speed I Limit ⊘

Remote Speed +
Remote Speed -
+12 Out
Common
Go Extend
Go Retract
Stop Extend
Common
Stop Retract
Extend Speed
Retract Speed
Common
Extend EOT
Retract EOT
Run/Jog
Stop

Run
At EOT
At Extend
At Retract
Current Limit
Fault
Pull-Up
Common
Shield

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Black — Line
White — Neutral
Green — Earth

115 VAC input power

Power Connector

Extend (N.C.) End of Travel Limit Switch

Retract (N.C.) End of Travel Limit Switch

Motor Connector

Depending on the actuator type and motor mount, it may be necessary to reverse the motor polarity connections to allow proper extend/retract motion to conform with Go Extend or Go Retract input activation.

Brake Out
Brake Out
RPACK
RPACK
Green — Shield
Red (White w/QF Cable) — Motor +
Black — Motor -

Plugs into Bottom of Control

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.

Application TIP

Motor drive is high voltage, voltage may be present on motor power connections even when motor is stopped. Never touch motor power connections unless AC Power is removed from the control.

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 H3301B or H4301. An internal magnet in the actuator activating 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.

Switch	Type	Normally Open/Closed
RPS-1	mechanical reed	normally open
RPS-2	mechanical reed	normally closed
RP1	hall effect	normally open
RP2	hall effect	normally closed

Typical wiring diagram of an RPS-1 or RPS-2 mechanical reed switch showing connections and color code
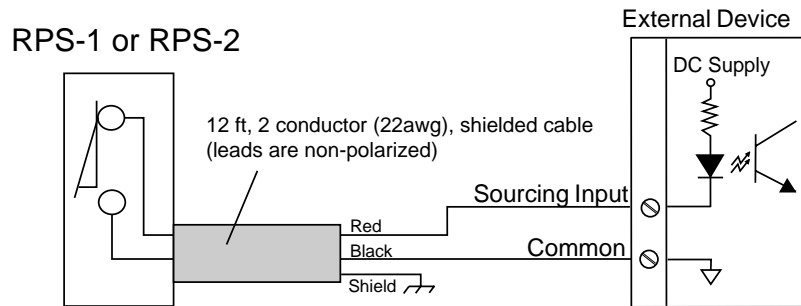
Typical wiring diagram of an RP1 or RP2 hall effect sensor showing connections and wire color code
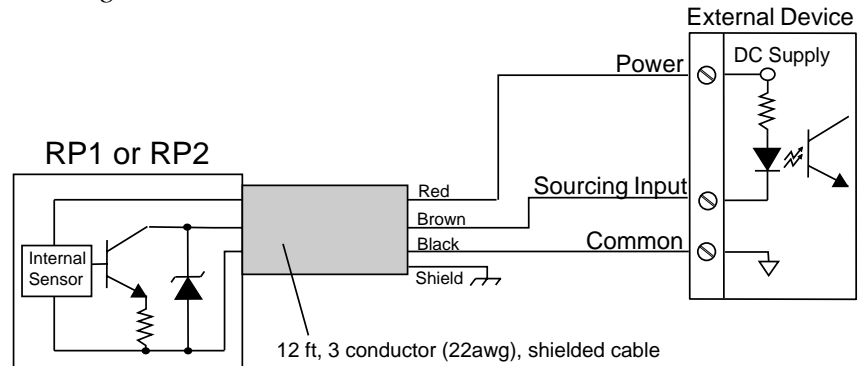
3. Applying Power to the Control

The next step is to apply power to your control and to jog the actuator. Follow the procedures below to verify your system is operational.

- Set Potentiometers
  1st Speed   25%   (1/4 turn CW)
  2nd Speed   0%   (Full CCW)
  Acceleration   50%   (1/2 turn CW)
  Deceleration   50%   (1/2 turn CW)
  Accel I Limit   50%   (1/2 turn CW)
  At Speed I Limit   50%   (1/2 turn CW)

  Note: All potentiometers are single turn pots. The % setting represents percentage of full turn where 100% is full Clockwise

- Apply Power (115VAC) to your Unit

  GREEN POWER LED should remain ON
  All other LED's should blink ON then REMAIN OFF

  Actuator should remain Stationary

  Note: If any of the above conditions is not met, remove power from the control and turn to the Troubleshooting Guide in the Appendices to isolate the problem.

- Unit powers up in JOG MODE; activate and maintain the Go Extend input to extend the actuator and Go Retract input to retract the actuator. The actuator should jog at 25% of the actuators available linear speed.

  YOUR SYSTEM IS OPERATIONAL

Section 3: Applying the Product offers 8 common MOVE PROFILE examples with their Setup and Operating Instructions.

Section 4 and 5: Hardware and Electrical Reference offers more detailed information on operational functions, electrical wiring, and system specifications.
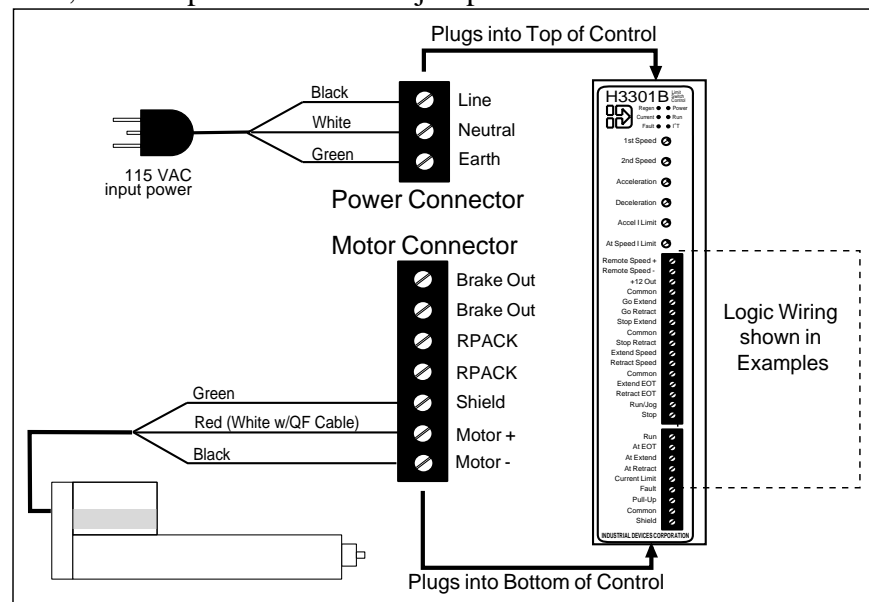

A. Application Examples

- Example 1: Jogging the Actuator
- Example 2: Simple Move Extend and Simple Move Retract
- Example 3: Changing Speed During a Move
- Example 4: Reducing Speed Prior to Reaching a Stop Position
- Example 5: Multiple Stop Positions
- Example 6: Auto Traverse Between Two Positions
- Example 7: Reversing Direction on a Current Limit
- Example 8: Clamping (Apply Holding Force) on Current Limit

With the H3301B and H4301, move profiles are based on a sequence of input activation. Adjustable position sensors mounted on the side of an actuator can be used to signal a stop position, to change speeds or to reverse direction.
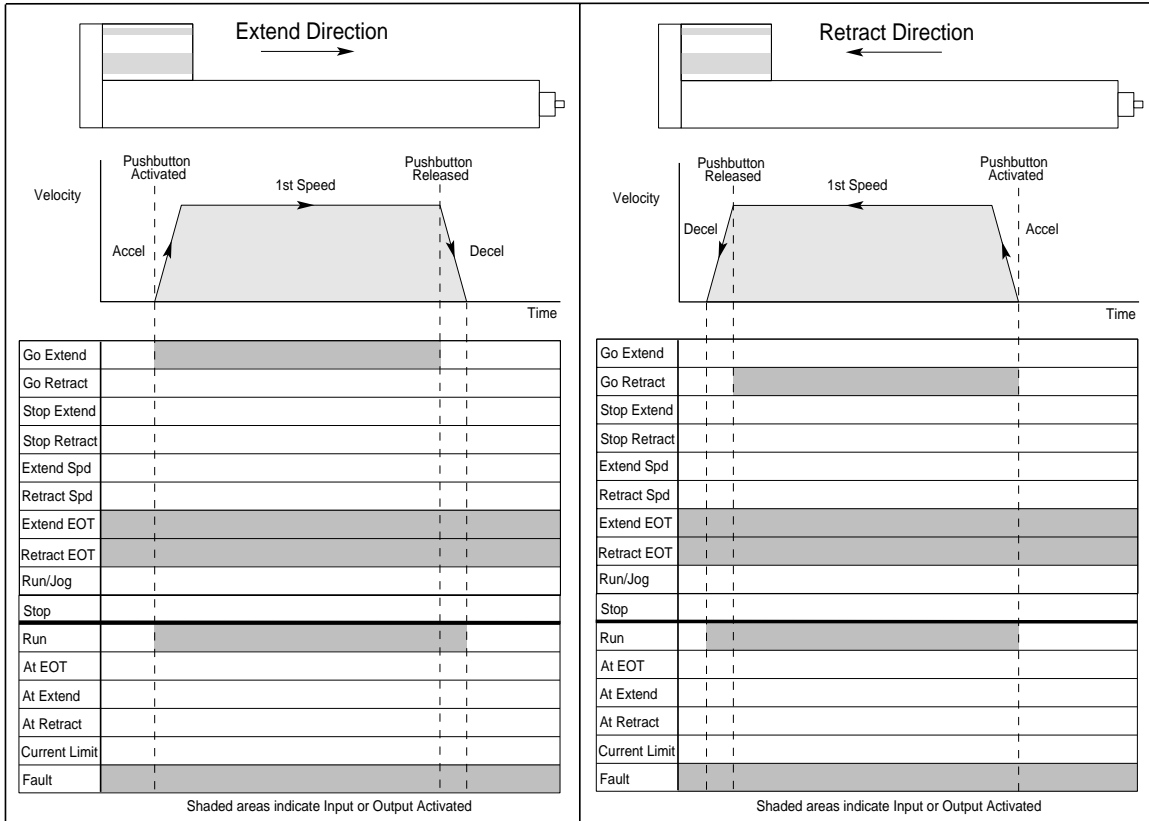
The examples in this section show the most common applications, providing the basic move profile, its input wiring scheme, an input activation chart (displaying the sequence of input and output activation) and its relation to actuator motion in the extend and retract directions. *Although push-buttons and limit switches are used to demonstrate various actuator moves, most input interfaces using a* <u>*Contact/Switch Closure or Sinking Output*</u> *can be used to achieve the same results. Typical devices are Push-buttons, Limit Switches, Position Sensors, Hall Effect Switches, Relays, or Outputs from a PLC or a PC.*

The diagram below indicates the minimum required wiring on the control for allowing motion to occur. If end of travel limits are not used, EOT inputs must also be jumpered to common.
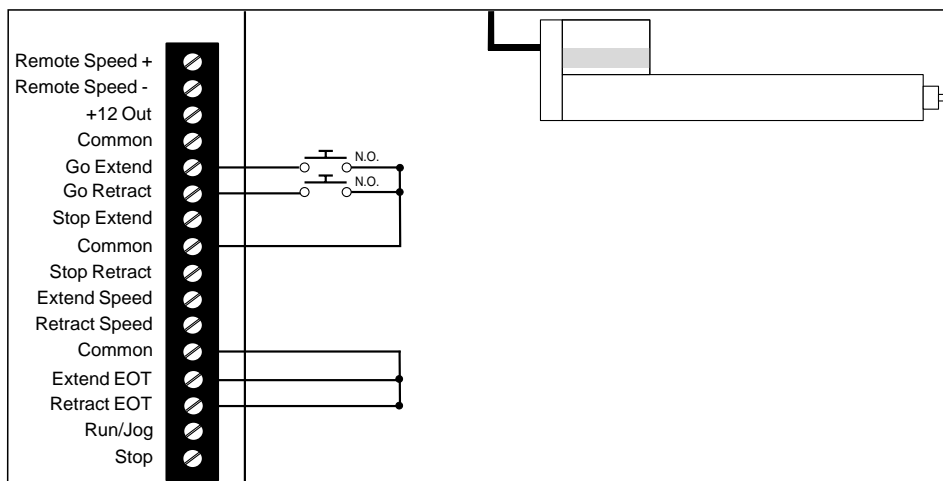
Example 1: Jogging the Actuator

Extend Direction			
Go Extend			
Go Retract			
Stop Extend			
Stop Retract			
Extend Spd			
Retract Spd			
Extend EOT			
Retract EOT			
Run/Jog			
Stop			
Run			
At EOT			
At Extend			
At Retract			
Current Limit			
Fault			

Shaded areas indicate Input or Output Activated
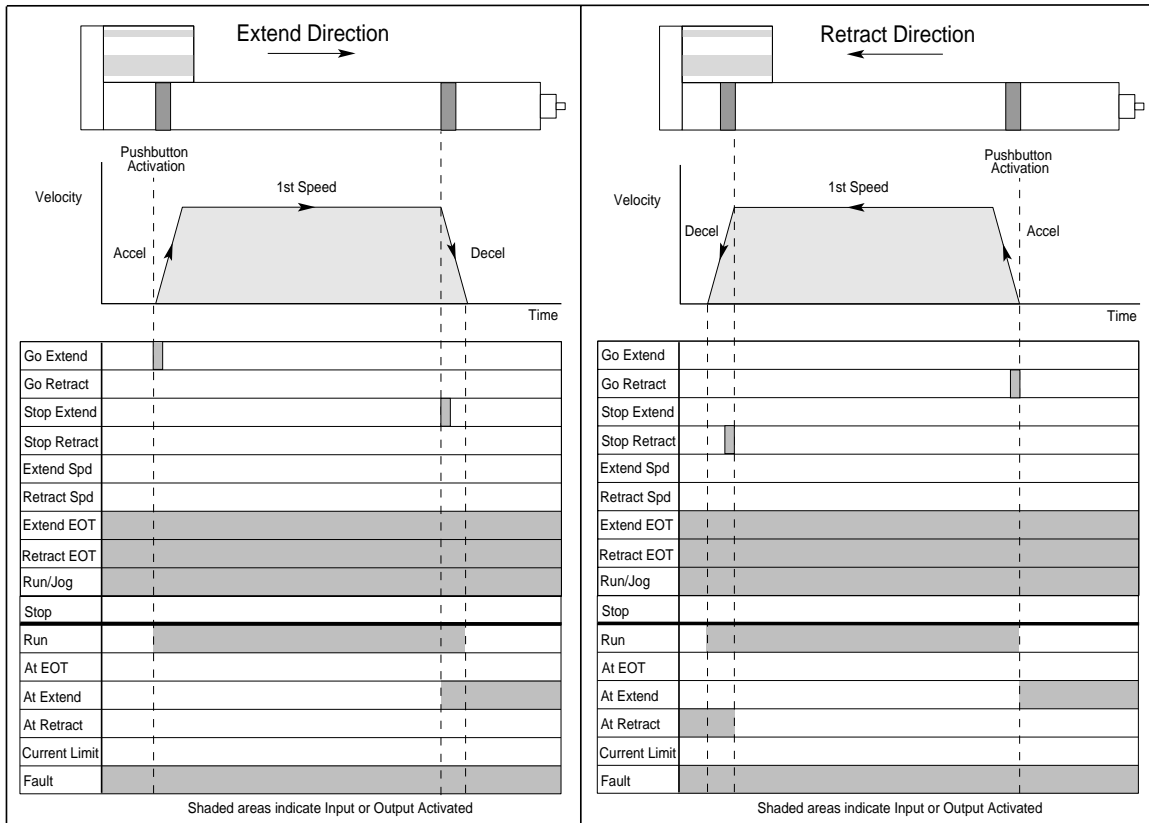
Shaded areas indicate Input or Output Activated

1. From a stop position, GO EXTEND is activated via push-button. The actuator begins to extend as it accelerates to the 1st Speed setting.
2. The unit continues to extend as long as the GO EXTEND input is maintained. When the input is released, the actuator decelerates to a stop.

1. From a stop position, GO RETRACT is activated via push-button. The actuator begins to retract as it accelerates to the 1st Speed setting.
2. The unit continues to retract as long as the GO RETRACT input is maintained. When the input is released, the actuator decelerates to a stop.
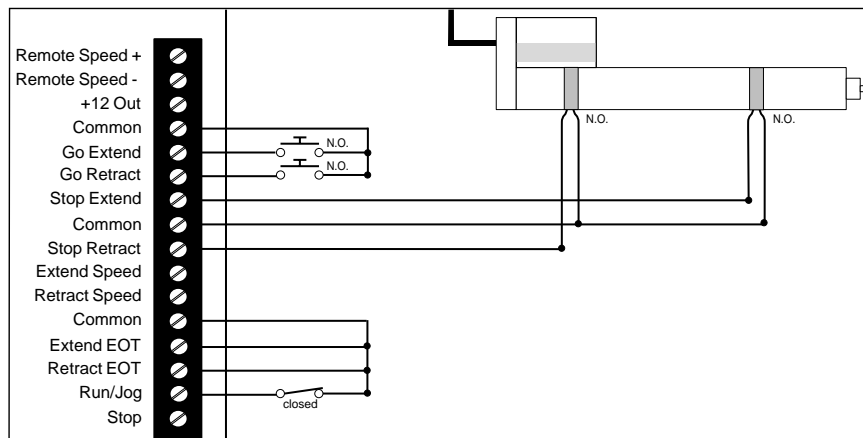

Remote Speed +
Remote Speed -
+12 Out
Common
Go Extend
Go Retract
Stop Extend
Common
Stop Retract
Extend Speed
Retract Speed
Common
Extend EOT
Retract EOT
Run/Jog
Stop

Example 2: Simple Move Extend; Simple Move Retract

Extend Direction

Pushbutton Activation
Velocity
1st Speed
Accel
Decel
Time

Go Extend	
Go Retract	
Stop Extend	
Stop Retract	
Extend Spd	
Retract Spd	
Extend EOT	
Retract EOT	
Run/Jog	
Stop	
Run	
At EOT	
At Extend	
At Retract	
Current Limit	
Fault	

Shaded areas indicate Input or Output Activated

Retract Direction

Pushbutton Activation
Velocity
1st Speed
Decel
Accel
Time

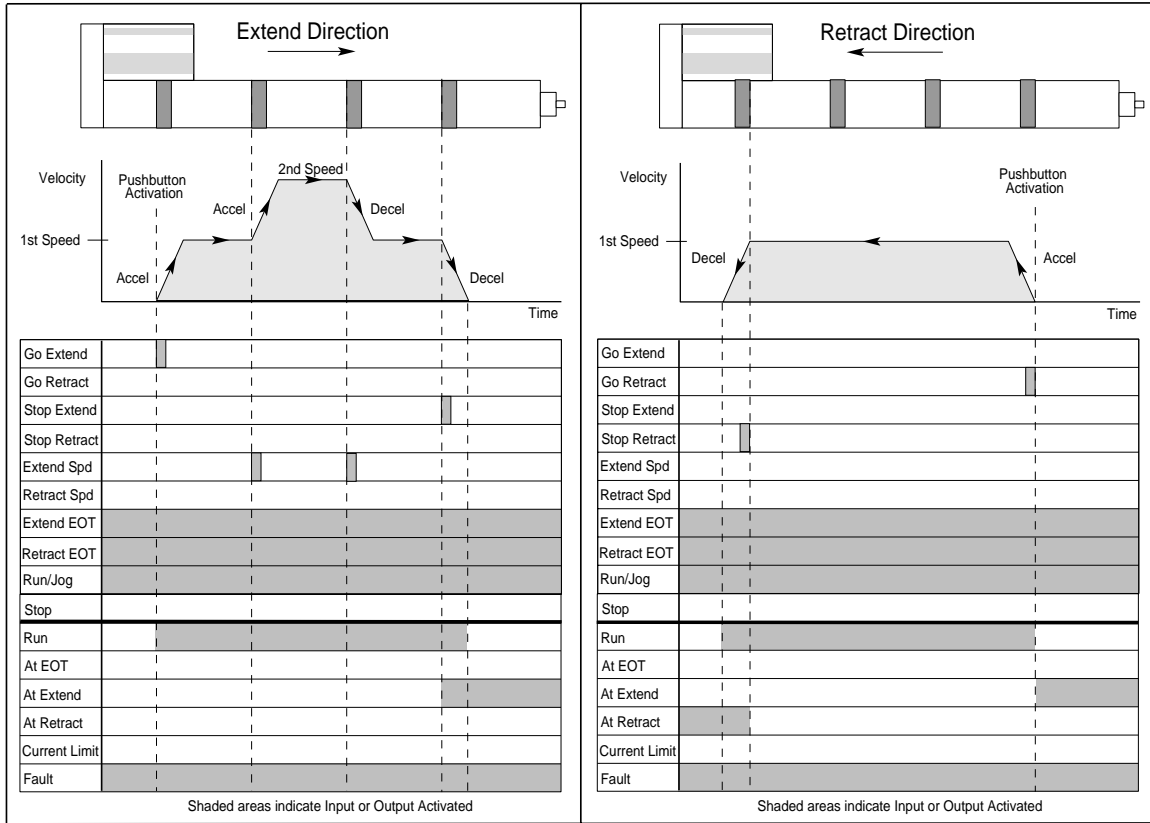|	
Go Extend	
Go Retract	
Stop Extend	
Stop Retract	
Extend Spd	
Retract Spd	
Extend EOT	
Retract EOT	
Run/Jog	
Stop	
Run	
At EOT	
At Extend	
At Retract	
Current Limit	
Fault	

Shaded areas indicate Input or Output Activated

1. From a stop position, GO EXTEND is activated momentarily. The actuator extends as it accelerates to the 1st Speed setting at a rate determined by the Acceleration pot.
2. The unit continues to extend at the 1st speed setting until STOP EXTEND is activated wherein the unit decelerates to a stop at a rate determined by the Deceleration pot.

1. From a stop position, GO RETRACT is activated momentarily. The actuator retracts as it accelerates to the 1st Speed setting at a rate determined by the Acceleration pot.
2. The unit continues to retract at the 1st speed setting until STOP RETRACT is activated wherein the unit decelerates to a stop at a rate determined by the Deceleration pot.


Remote Speed +
Remote Speed -
+12 Out
Common
Go Extend
Go Retract
Stop Extend
Common
Stop Retract
Extend Speed
Retract Speed
Common
Extend EOT
Retract EOT
Run/Jog
Stop

N.O.
N.O.
N.O.
N.O.
closed

Example 3: Changing Speed During a Move
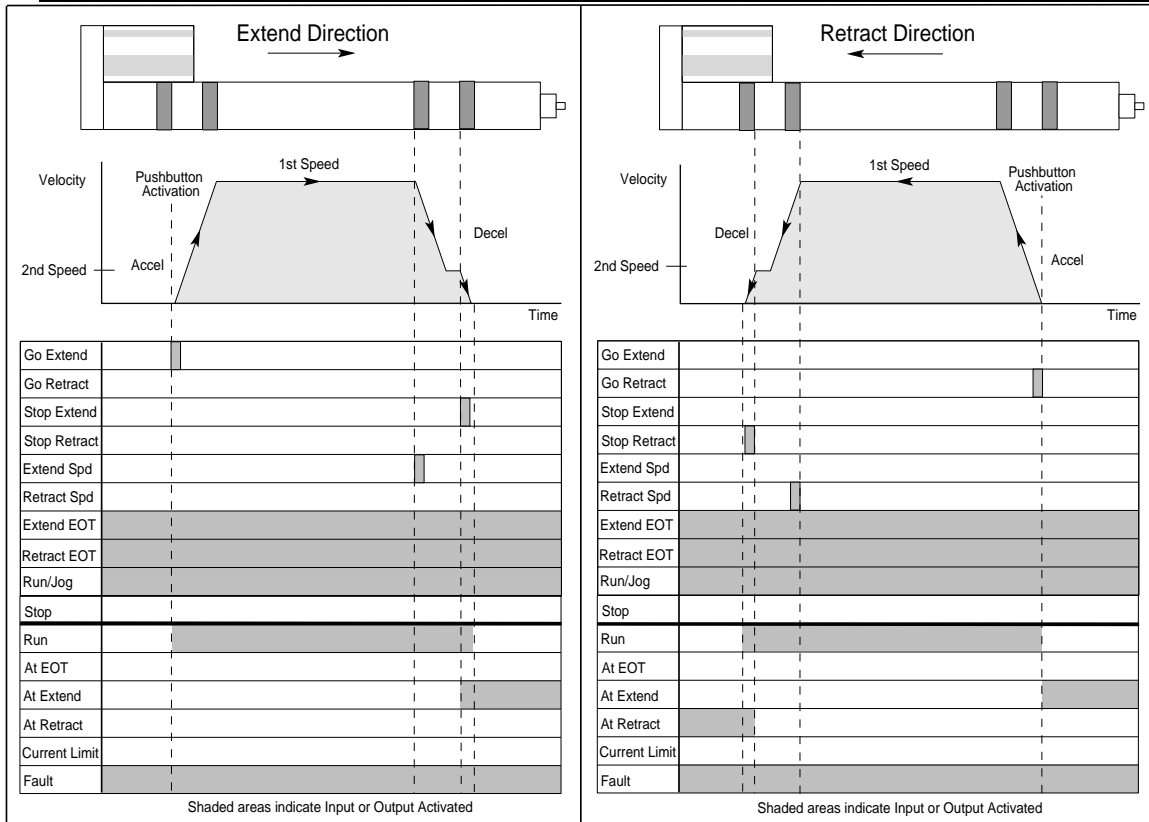

Shaded areas indicate Input or Output Activated

1. From a stop position, GO EXTEND is activated. The actuator extends at the 1st Speed setting.
2. EXTEND SPEED is activated. The unit accelerates to the 2nd Speed setting
3. EXTEND SPEED is activated a second time. It then decelerates back to the 1st speed setting and continues until STOP EXTEND is activated wherein the unit decelerates to a stop.

1. From a stop position, GO RETRACT is activated. The actuator retracts at the 1st Speed setting.
2. The unit continues to retract at the 1st Speed setting until STOP RETRACT is activated wherein the unit decelerates to a stop.
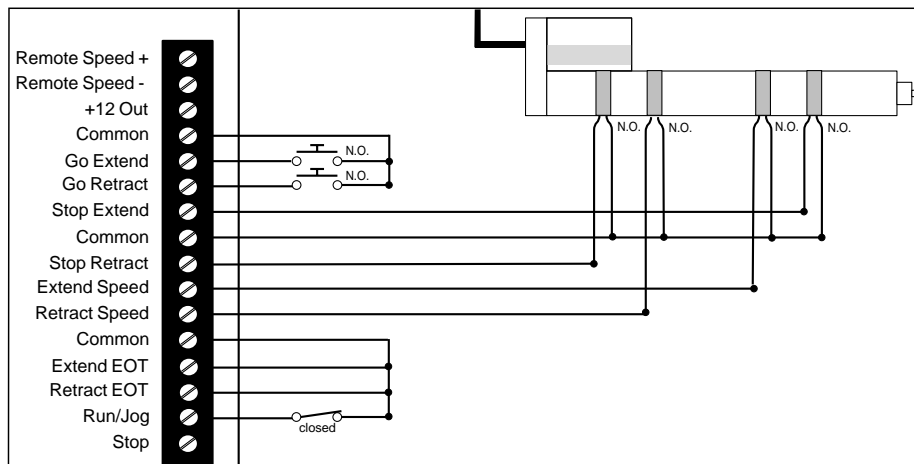
Note : 2nd Speed set higher than 1st Speed
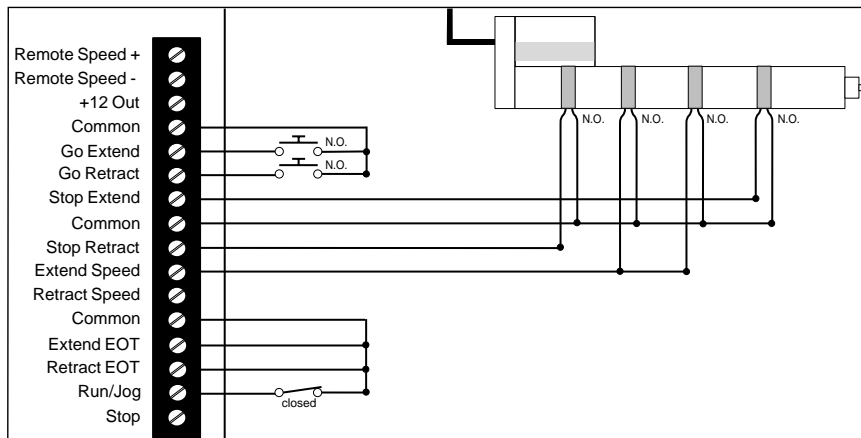
Example 4: Reducing Speed Prior to Reaching a Stop Position

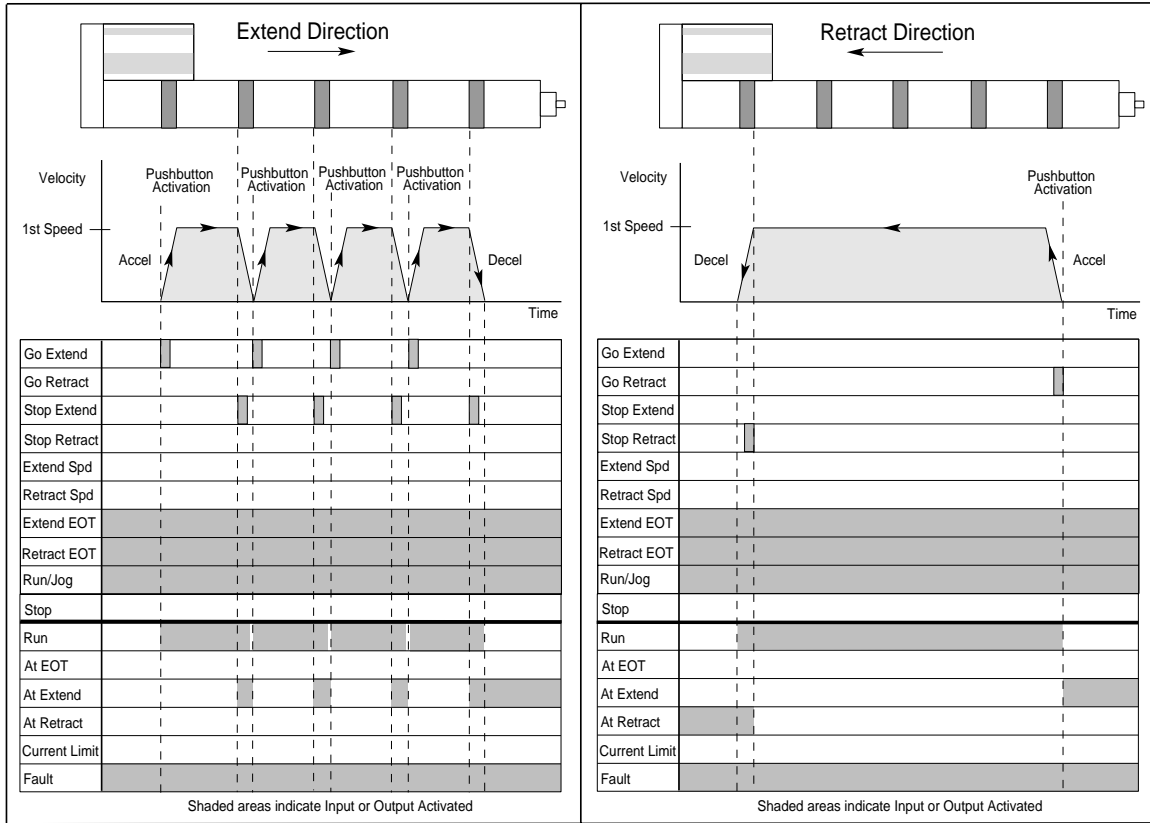Shaded areas indicate Input or Output Activated

1. From a stop position, GO EXTEND is activated. The actuator begins to extend as it accelerates to the 1st Speed setting.
2. The unit continues to extend until EXTEND SPEED is activated. It then decelerates to the 2nd Speed setting (set lower than 1st Speed).
3. It continues to extend until STOP EXTEND is activated wherein the unit decelerates to a stop.

1. From a stop position, GO RETRACT is activated. The actuator begins to retract as it accelerates to the 1st Speed setting.
2. The unit continues to retract until RETRACT SPEED is activated. It then decelerates to the 2nd Speed setting (set lower than 1st Speed).
3. It continues to retract until STOP RETRACT is activated wherein the unit decelerates to a stop.

Example 5: Multiple Stop Positions

Shaded areas indicate Input or Output Activated

1. From a stop position, GO EXTEND is activated. The actuator extends at the 1st Speed setting.
2. The unit continues until STOP EXTEND is activated wherein the unit decelerates to a stop at the first extend stop position.
3. It remains at this position until GO EXTEND is activated wherein the unit repeats step 2 and 3 to reach the next stop position. Cycle repeats.

1. From a stop position, GO RETRACT is activated. The actuator retracts at the 1st Speed setting.
2. The unit continues to retract until STOP RETRACT is activated wherein the unit decelerates to a stop.
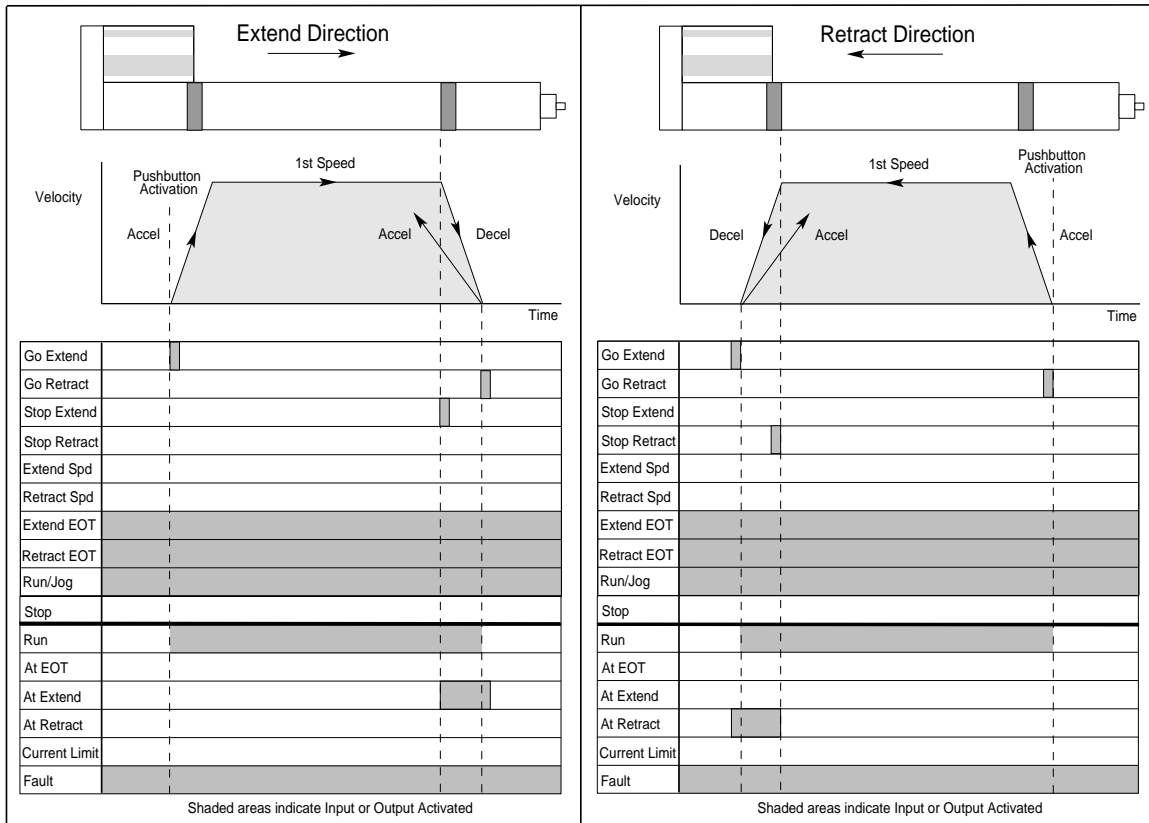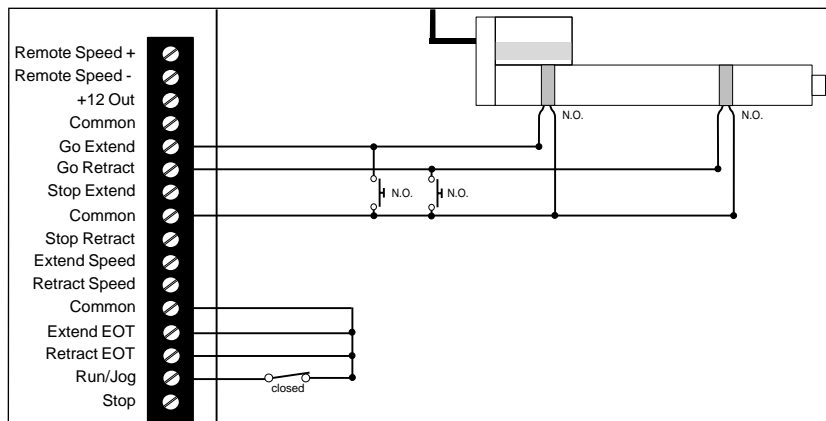
Example 6: Auto Traverse Between Two Positions

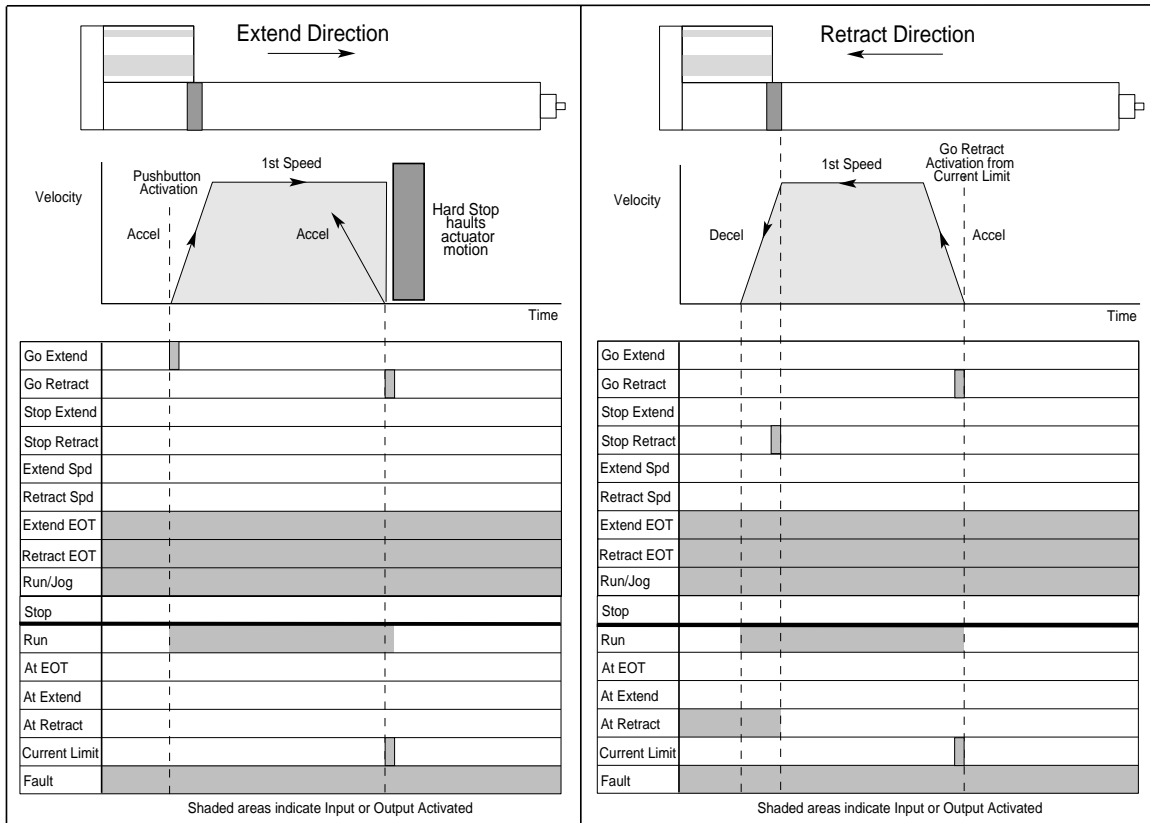

Shaded areas indicate Input or Output Activated
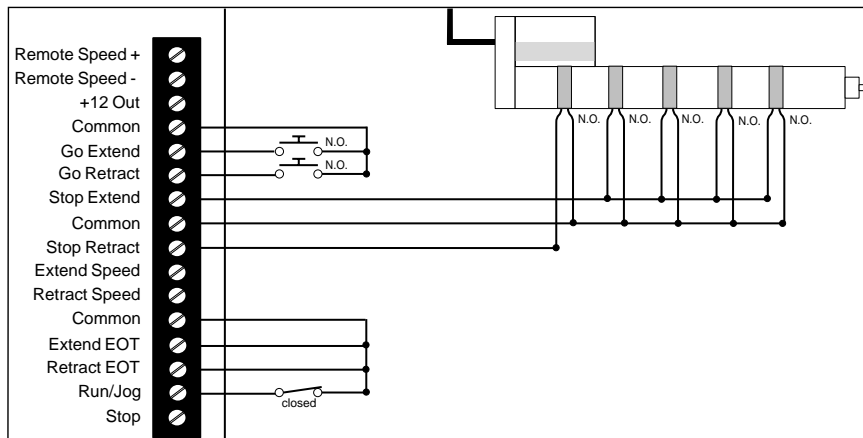
1. From a stop position, GO EXTEND is activated. The actuator extends at the 1st Speed setting.
2. It extends until GO RETRACT is activated. The unit decelerates to a stop and reverses direction.
3. It retracts at the 1st Speed setting until GO EXTEND is activated. The unit decelerates to a stop and reverses direction.
4. Cycle repeats until a STOP or EOT is activated.

1. From a stop position, GO RETRACT is activated. The actuator retracts at the 1st Speed setting.
2. It retracts until GO EXTEND is activated. The unit decelerates to a stop and reverses direction.
3. It extends at the 1st Speed setting until GO RETRACT is activated. The unit decelerates to a stop and reverses direction.
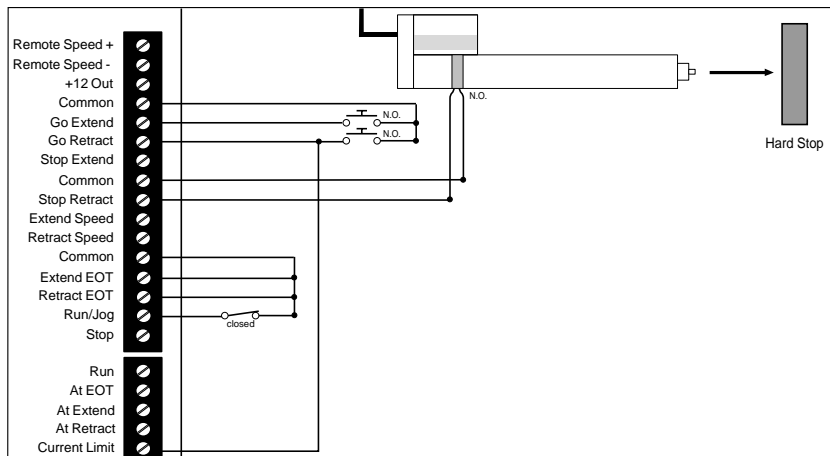4. Cycle repeats until a STOP or EOT is activated

Example 7: Reversing Direction on Current Limit

Extend Direction

Velocity

Pushbutton Activation

1st Speed

Accel

Accel

Hard Stop haults actuator motion

Time

Go Extend		
Go Retract		
Stop Extend		
Stop Retract		
Extend Spd		
Retract Spd		
Extend EOT		
Retract EOT		
Run/Jog		
Stop		
Run		
At EOT		
At Extend		
At Retract		
Current Limit		
Fault		

Shaded areas indicate Input or Output Activated

Retract Direction

Velocity

1st Speed

Go Retract Activation from Current Limit

Decel

Accel

Time

Go Extend		
Go Retract		
Stop Extend		
Stop Retract		
Extend Spd		
Retract Spd		
Extend EOT		
Retract EOT		
Run/Jog		
Stop		
Run		
At EOT		
At Extend		
At Retract		
Current Limit		
Fault		

Shaded areas indicate Input or Output Activated

1. From a stop position, GO EXTEND is activated. The actuator begins to extend as it accelerates to the 1st Speed setting.
2. While extending, the actuator runs into a physical hard stop. This stops motion and activates the CURRENT LIMIT output.
3. The output activates GO RETRACT which commands the unit to reverse direction.
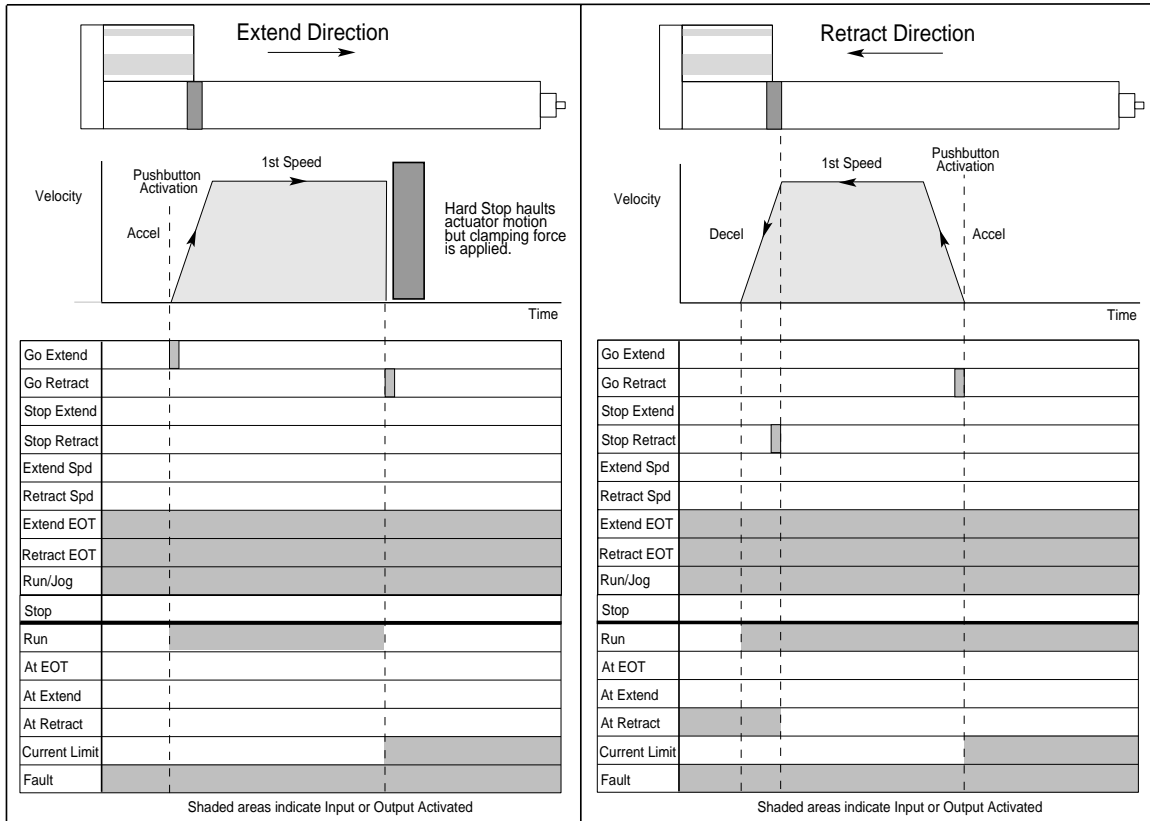
1. When the GO RETRACT input is activated, the actuator begins to retract at the first speed setting.
2. The unit continues to retract until STOP RETRACT is activated wherein the unit decelerates to a stop.
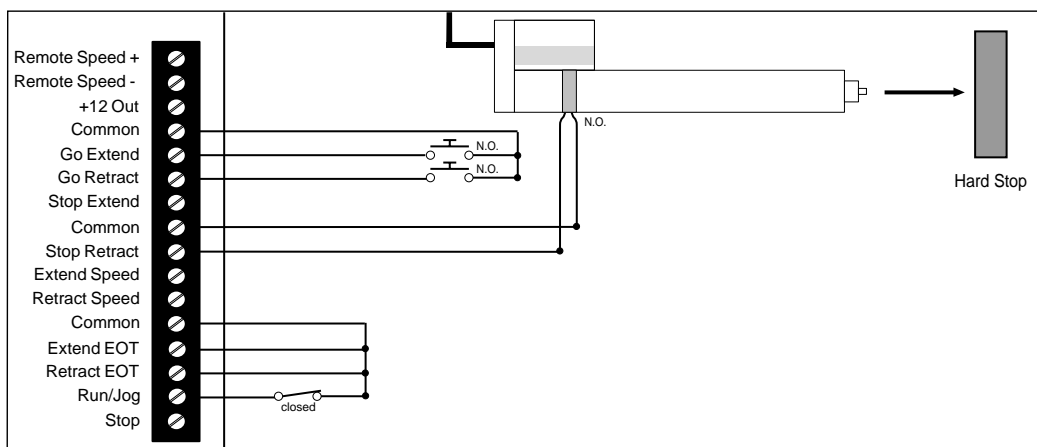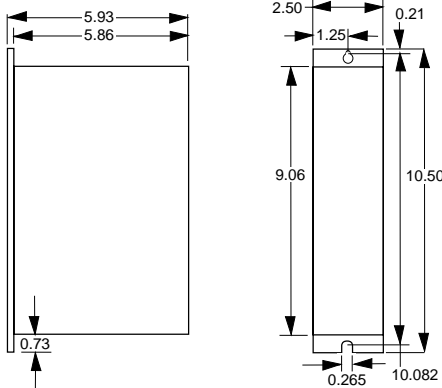
Remote Speed +
Remote Speed -
+12 Out
Common
Go Extend
Go Retract
Stop Extend
Common
Stop Retract
Extend Speed
Retract Speed
Common
Extend EOT
Retract EOT
Run/Jog
Stop

N.O.
N.O.
N.O.
closed

Hard Stop

Run
At EOT
At Extend
At Retract
Current Limit

Example 8: Clamping on Current Limit

Extend Direction

Velocity

Pushbutton Activation

1st Speed

Accel

Hard Stop haults actuator motion but clamping force is applied.

Time

Go Extend		
Go Retract		
Stop Extend		
Stop Retract		
Extend Spd		
Retract Spd		
Extend EOT		
Retract EOT		
Run/Jog		
Stop		
Run		
At EOT		
At Extend		
At Retract		
Current Limit		
Fault		

Shaded areas indicate Input or Output Activated

Retract Direction

Velocity

1st Speed

Pushbutton Activation

Decel

Accel

Time

Go Extend		
Go Retract		
Stop Extend		
Stop Retract		
Extend Spd		
Retract Spd		
Extend EOT		
Retract EOT		
Run/Jog		
Stop		
Run		
At EOT		
At Extend		
At Retract		
Current Limit		
Fault		

Shaded areas indicate Input or Output Activated

1. From a stop position, GO EXTEND is activated. The actuator begins to extend as it accelerates to the 1st Speed setting.
2. While extending, the actuator runs into a physical hard stop.
3. Although motion ceases, the actuator continues to apply a holding (clamping) force

1. While still applying a holding force in the extend direction, GO RETRACT is activated, the actuator begins to retract at the first speed setting.
2. The unit continues to retract until STOP RETRACT is activated wherein the unit decelerates to a stop.

Remote Speed +
Remote Speed -
+12 Out
Common
Go Extend
Go Retract
Stop Extend
Common
Stop Retract
Extend Speed
Retract Speed
Common
Extend EOT
Retract EOT
Run/Jog
Stop

N.O.
N.O.
N.O.

closed

Hard Stop

A. Specifications

General	
Dimensions:	
Environmental	
Temperature:	Thermal Shutdown occurs if heat sink exceeds 75C(167F)
Humidity:	0 - 90% non-condensing
Power	
Input:	105VAC to 132VAC, single phase, 50/60Hz, Operates at lower voltages with reduced performance
VA Rating:	H3301B: 0.96kVA, H4301: 1.6kVA
Motor Output	
Type:	PWM bipolar MOSFET H Bridge @20kHz
Current:	H3301B: 2.5A cont., 6A peak. H4301: 5A cont., 10A peak
Protection:	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:	12VDC @ 250mA max
Digital Inputs:	Optically isolated, sourcing inputs, each rated 10 - 25VDC @ 10mA, 3/11VDC Low/High Signal (Must be active 10ms to be recognized)
Digital Outputs:	Optically isolated, NPN open collector, sinking outputs, rated 100mA @ 0.4VDC
Analog Input	
Remote Speed:	0 to 10VDC (1 MΩ input impedance)
	4 to 20mA (10Ω input impedance)
Performance	
Velocity:	15:1 Speed Range (*linear speeds are actuator dependent)*
Accel/Decel:	adjustable rate (0.1 to 5 second range to full speed)

B. Functional Interface

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

1. 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.

I²T (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), activating a fault condition 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 Accel I Limit(during acceleration) and At Speed I Limit (during constant speed) potentiometers. *When this LED is active, current to the motor is reduced to the max values set by the Accel I Limit and At Speed I Limit pots, limiting actuator performance.*

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

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

OFF: Normal Operation

2. 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).

1st Speed

Sets the initial move velocity at which the actuator moves in response to a Go Extend or Go Retract input command. This speed is also obtained if the Extend Speed or Retract Speed input is activated while running at the 2nd Speed setting.

Range: 0 to 100% Available Linear Speed*
Rotation: CW increases 1st Speed Setting
           CCW decreases the 1st Speed Setting

* See Speed vs. Thrust Curves for your specific actuator in the *IDC Electric Linear Actuators and Controls Catalog*.

2nd Speed

Sets the move velocity of the actuator when the Extend Speed or Retract Speed input has been activated while running at the 1st Speed setting.

Range: 0 to 100% Available Linear Speed*
Rotation: CW increases 2nd Speed Setting
           CCW decreases the 2nd Speed Setting

Acceleration

Controls the acceleration rate of the actuator from a stop position to the 1st Speed setting or when changing from a lower to a higher speed.

Range: 0.1 to 5 seconds (at full speed)
Rotation: CW increases Acceleration Rate
           CCW decreases the Acceleration Rate

Deceleration

Controls the deceleration rate of the actuator from a constant velocity to zero speed when Stop Extend, Stop Retract, or the Stop input is activated or when Go Extend or Go Retract is released when in the Jog Mode. Used when ramping from a higher speed to a lower speed.

Range: 0.1 to 5 seconds (at full speed)
Rotation: CW increases Deceleration Rate
           CCW decreases the Deceleration Rate

Accel I Limit

Sets the maximum allowed current output to the motor during the acceleration and deceleration portions of a move profile. *If the limit is exceeded during acceleration or deceleration, the output current is clamped to the Accel I Limit setting which will reduce the speed or thrust of the actuator.*

Range: 0 to   6 Amps for the H3301B
       0 to 10 Amps for the H4301

Rotation: CW increases Accel I Limit
          CCW decreases the Accel I Limit

At Speed I Limit

Sets the maximum allowed current output to the motor during the "constant speed" portion of a move profile. *If the limit is exceeded during constant speed, the output current is clamped to the At Speed I Limit setting which will reduce the speed or thrust of the actuator.*

Range: 0 to 100% where 100% is the value set by the Accel I Limit pot. The At Speed I Limit is a function of the Accel I Limit setting.

Rotation: CW increases At Speed I Limit
          CCW decreases At Speed I Limit

Example(H3301B): If the Accel I Limit is set at 100% then the range of the At Speed I Limit pot is 0 to 6 Amps. If the Accel I Limit is set at 25% then the range of the At Speed I Limit pot is 0 to 1.5 Amps.

3. **Connector Pinouts**

Four removable connectors allow connections for AC Input Power, the Motor Output, Logic Inputs/Outputs, and for the Brake and RPACK options.

Logic Connector

Term	Label	Description
1	Remote Speed +	Remote Speed Input - Positive
2	Remote Speed -	Remote Speed Input - Negative
3	+12V Out	+12 Volt DC Supply Output
4	Common	Logic Common
5	Go Extend	Go Extend Input
6	Go Retract	Go Retract Input
7	Stop Extend	Stop Extend Input
8	Common	Logic Common
9	Stop Retract	Stop Retract Input
10	Extend Speed	Extend Speed Input
11	Retract Speed	Retract Speed Input
12	Common	Logic Common
13	Extend EOT	Extend End of Travel Input
14	Retract EOT	Retract End of Travel Input
15	Run/Jog	Run/Jog Mode Input
16	Stop	Stop Input

Logic Connector

Term	Label	Description
17	Run	Run Output
18	At EOT	At End of Travel Output
19	At Extend	At Extend Output
20	At Retract	At retract 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

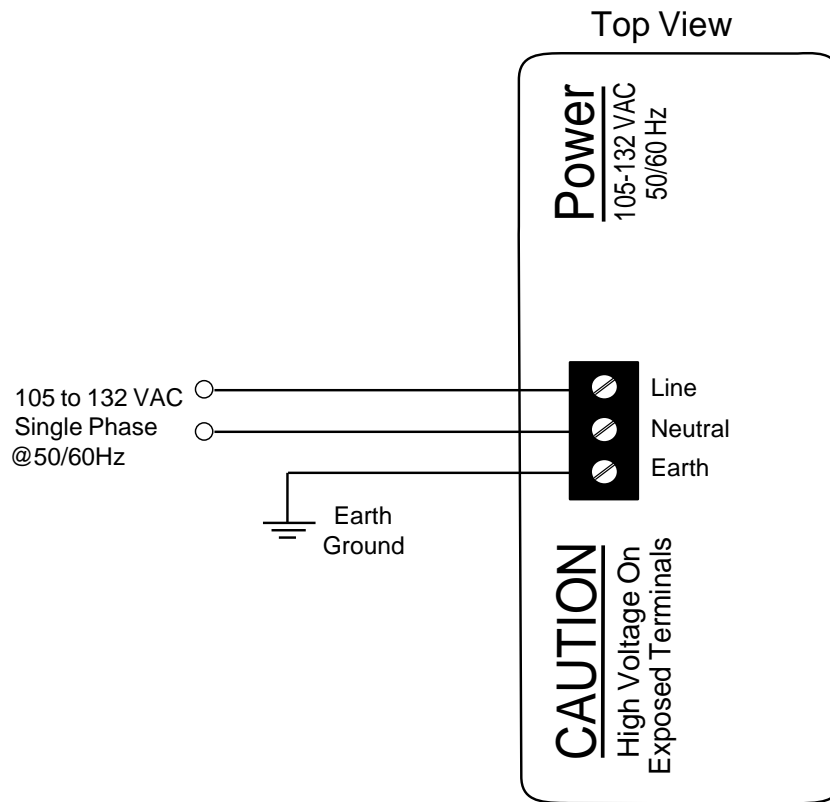| Term	Label	Description
1	Brake Out	Brake Output Connection
2	Brake Out	Brake Output Connection
3	RPACK	External RPACK (Regen) Option Connection
4	RPACK	External RPACK (Regen) Option Connection
5	Shield	Shield Connection (Motor Cabling)
6	Motor +	Motor Connection - Positive Lead
7	Motor -	Motor Connection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

A. Electrical Interface

In H3301B and H4301 systems, the logic signal ground (common), power circuits and chassis are electrically isolated from each other. This insures that currents are not induced into the logic wiring by motor and/or power supply currents. The following pages provide a guide to the electrical installation of the H3301B and H4301 Controls.

1. Power

The H3301B and H4301 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.

Top View

Power
105-132 VAC
50/60 Hz

105 to 132 VAC
Single Phase
@50/60Hz

Line
Neutral
Earth

Earth
Ground

CAUTION
High Voltage On
Exposed Terminals

Application TIP

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

2. **Motor**

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 Options. The Brake Option terminals are inactive unless the control has the -BC option installed. *Note: There is no polarity for the RPACK and Brake connections.*

Optional

RPACK-1
External Regen
Power Dissipation
Module

Bottom View

Brake Out
Brake Out
RPACK
RPACK
Shield
Motor +
Motor -

110VAC
240VDC
160VDC

Green
Red(White w/Q Cable)
Black

CAUTION
High Voltage On
Exposed Terminals

Motor

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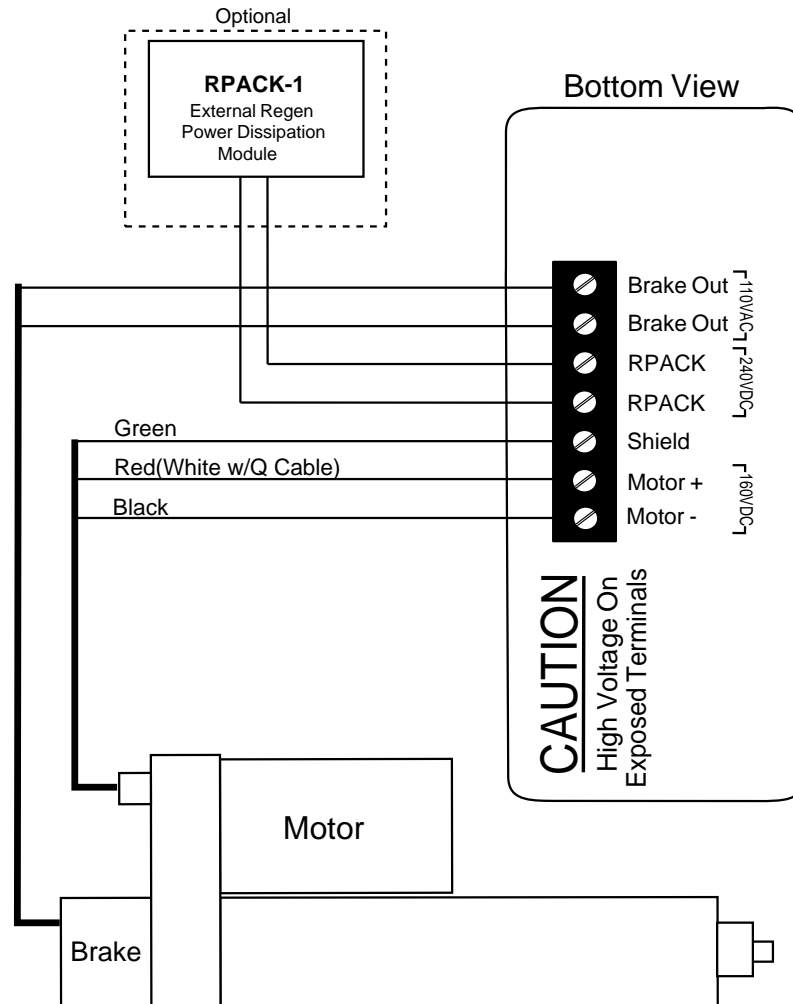
Application TIP Recommended wire gauge for user supplied motor cabling; 16AWG (less than 50ft), 14AWG (50-100ft) and 10AWG (100 -200 ft).

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 H3301B and H4301. It offers "regen" protection for applications where current is fed back into the control causing over voltage or over current faults on the drive.

3. Inputs

The logic inputs are optically isolated, sourcing inputs rated to draw 10mA at 12VDC. Each are 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. Remote Speed+/- are optically isolated Analog inputs accepting a 0 to 10VDC or 4 to 20mA signal.

Go Extend (#5) and Go Retract (#6)
Upon activation, commands the actuator to move in the specified direction at a speed set by the 1ST SPEED potentiometer.

In JOG MODE, the inputs must be maintained to continue motion. The unit will decelerate to a stop when the input is released. In RUN MODE, the input needs only to be activated momentarily (at least 10ms) to begin motion. Motion will cease when the corresponding STOP EXTEND, STOP RETRACT, STOP or either EOT input is activated.

Stop Extend (#7) and Stop Retract (#9)
Upon activation, commands the actuator to decelerate to a stop when moving in the specified direction at a rate set by the Deceleration potentiometer.

Extend Speed (#10) and Retract Speed (#11)
Momentary activation of this input when the actuator is moving in the specified direction will command the actuator to toggle between the 1ST and 2ND SPEEDS at rates determined by the ACCELERATION and DECELERATION potentiometers.

Example: If moving in the extend direction at the 1ST SPEED setting, activating EXTEND SPEED will command the unit to change to the 2ND SPEED setting and vice versa. Activating the input again would revert the unit back to the 1ST SPEED.

Extend EOT (#13) and Retract EOT (#14)
The extend and retract end of travel inputs are safety inputs which prevent the actuator from running into the "physical" ends of travel. They are typically 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 brake to a stop. The corresponding GO EXTEND or GO RETRACT input will not be active until one opposing GO command is given and the EOT connection is no longer broken.

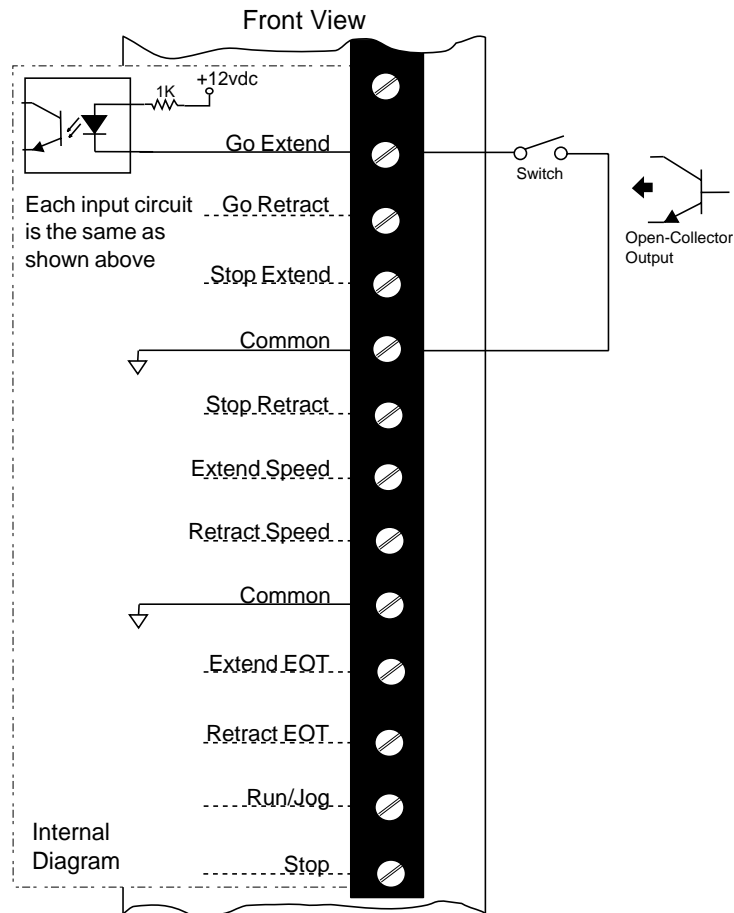### Run/Jog (#15)

Sets the mode of operation.

In JOG MODE (no connection), the GO EXTEND and GO RETRACT inputs must be activated and maintained to continue actuator motion, unit will decelerate to a stop when the GO input is released.

In RUN MODE (connection to common), the GO EXTEND and GO RETRACT inputs need only momentary activation to begin and maintain actuator motion. Motion will cease when a STOP or EOT input is activated.

STOP (#16)

During a move, momentary activation of this input will cause the actuator to immediately decelerate to a stop at a rate set by the DECELERATION potentiometer. This input is active in both directions of travel.

Input wiring diagram showing typical connections

Front View

Each input circuit is the same as shown above

+12vdc

1K

Go Extend

Switch

Go Retract

Open-Collector Output

Stop Extend

Common

Stop Retract

Extend Speed

Retract Speed

Common

Extend EOT

Retract EOT

Run/Jog

Internal Diagram

Stop

Remote Speed + (#1) and Remote Speed - (#2)

The analog command input allows users to replace the 1ST or 2ND SPEED potentiometers with an external potentiometer, 0 - 10VDC or 4 - 20mA velocity control signal. The inputs are made active by adjusting the respective speed pot full CCW(see chart below).

Remote Speed used for	1st Speed Pot Setting	2nd Speed Pot Setting
1st and 2nd Speed Pots	Full CCW	Full CCW
1st Speed Pot	Full CCW	>1% turn
2nd Speed Pot	>1% turn	Full CCW
neither	>1% turn	>1% turn

Application TIP

Hysteresis does exist with the remote speed feature. Once the 1st or 2nd Speed pot is replaced by the remote speed input, it can only be reactivated by turning the pot CW greater than 12%. The full range of the potentiometer returns once reactivated.

Application TIP

All standard controls have the REMOTE SPEED inputs configured to accept 0 to 10 Volts DC. Configuring for 4 to 20mA is done only at the IDC factory. An external potentiometer can be used only when the unit is configured for 0 - 10VDC.

External Diagram with remote potentiometer using on board supply with inputs configured for 0 - 10VDC
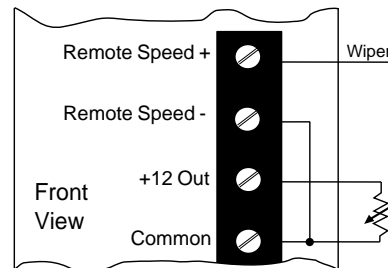
Internal Diagram with Inputs configured for 0 to 10VDC
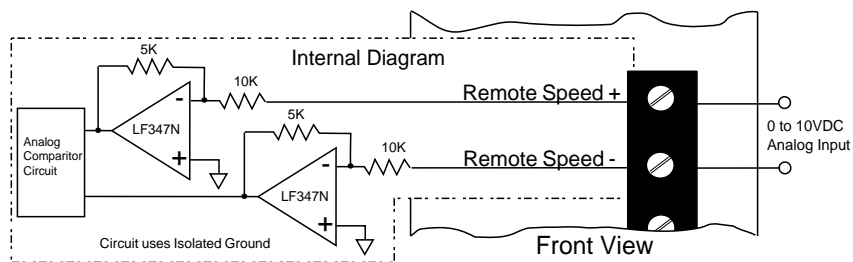
Internal Diagram with Inputs configured for 4 to 20ma
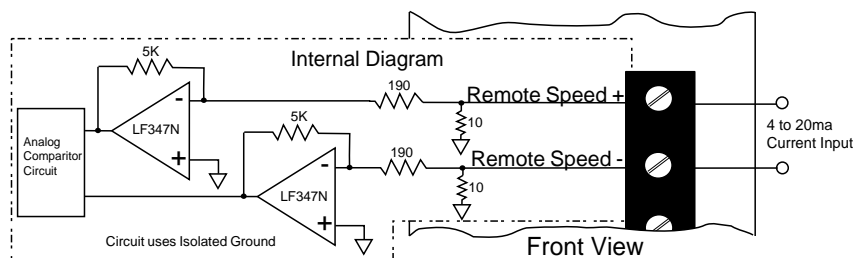
4. Outputs

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

Run (# 17)
ON: Motor is being command to move or apply a holding force.
OFF: No move or holding force is being commanded.

At EOT (Term#18)
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 a GO input is activated (unit must be commanded to move in the opposite direction of motion in which the EOT input was activated.

At Extend (#19)
ON: The STOP EXTEND input was activated while the actuator was moving in the extend direction.
OFF: Actuator moving, or unit did not stop at an extend direction stop position via the STOP EXTEND input.

Once activated, the output will remain set until another move (activation of GO EXTEND or GO RETRACT) is commanded.

At Retract (#20)
ON: The STOP RETRACT input was activated while the actuator was moving in the retract direction.
OFF: Actuator moving, or unit did not stop at a retract direction stop position via the STOP RETRACT input.

Once activated, the output will remain set until another move (activation of GO EXTEND or GO RETRACT) is commanded.

Current Limit (#21)

ON: Current limiting circuit is active. Motor current has
         exceeded the value set by the ACCEL I LIMIT or AT
         SPEED I LIMIT pots in which case the current is clamped to
         the specific pot setting. *When CURRENT LIMIT is ON,*
         current to the motor is automatically lowered which will
         reduce effective actuator thrust and speed.
OFF: Normal Operation

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

FAULT (#22)

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

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.*
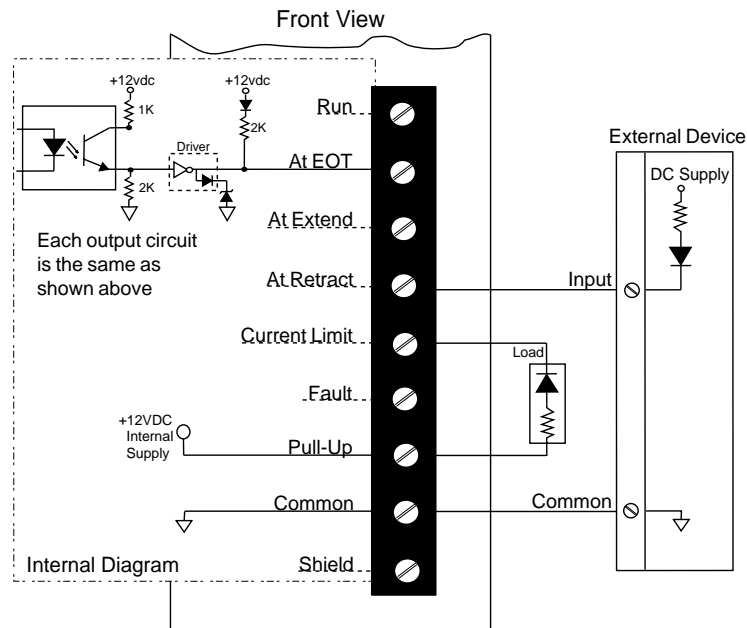
Appendix A: H Series Motors

H Motor (used with H3301B)

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
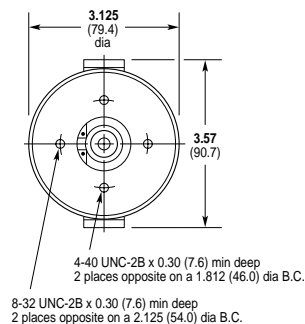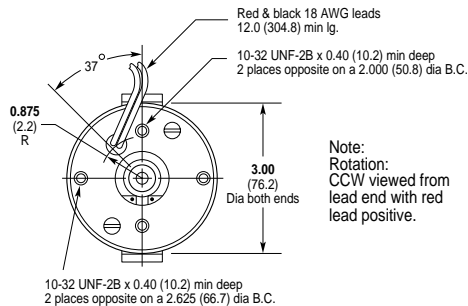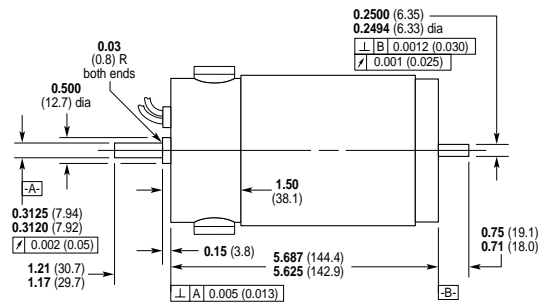
H4 Motor (used with H4301)

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
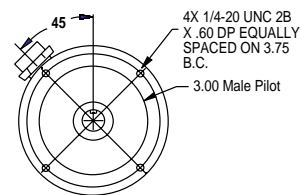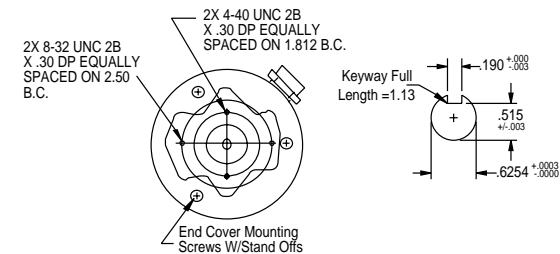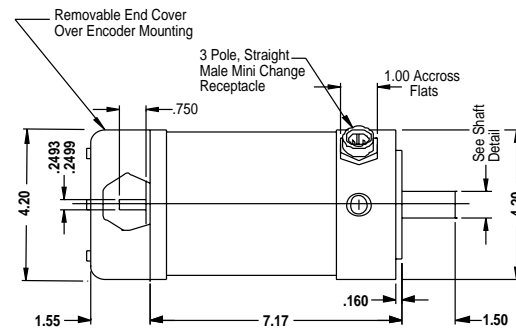
Appendix B: Troubleshooting Guide

Symptom	Cause	Remedy
Power LED fails to come on when AC applied	Internal Amplifier Failure	Return to IDC for Repair
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 backdriving load, high inertia, excessive speed	Reduce 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
	Accel too high for given load	Reduce Acceleration setting
	Accel I Limit, At Speed I Limit set too low	Increase Accel I Limit and/or At Speed I Limit setting
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
Slow System Response	Output current limited by Current Limit circuits	See Current LED activation
	Speed, Acceleration, or Deceleration settings too low	Increase Speed, Acceleration, Deceleration settings
Actuator Overshooting Position	Speed Set too High	Reduce Speed setting
	Decel Rate set too Low	Increase Deceleration Rate
Actuator goes in Opposite Direction than Commanded	Motor Polarity Connections Reversed	Remove Power to Control and swap Motor + and Motor -
Cylinder doesn't move when GO input activated	End of Travel connection broken	Check EOT Connections
	Speed setting too low	Increase Speed settings
	Current settings too low	Increase Accel I Limit, At Speed I Limit Settings

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.
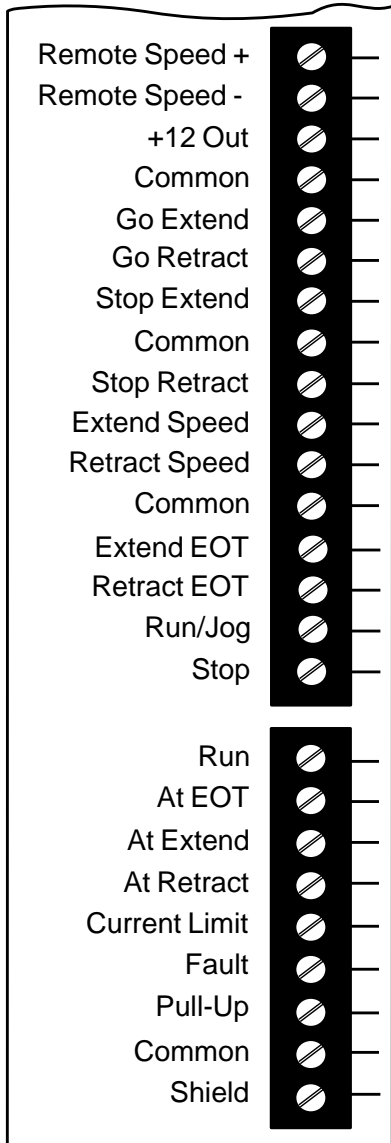4. Ship the unit prepaid, with the RMA number and documentation to:

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

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.

Remote Speed +
Remote Speed -
+12 Out
Common
Go Extend
Go Retract
Stop Extend
Common
Stop Retract
Extend Speed
Retract Speed
Common
Extend EOT
Retract EOT
Run/Jog
Stop

Run
At EOT
At Extend
At Retract
Current Limit
Fault
Pull-Up
Common
Shield

For More Information

If you require further information on the H3301B, the H4301 or another Industrial Devices product, please call your local IDC Distributor or Industrial Devices.

Local IDC Distributor

Company: _____

Contact: _____

Phone: _____

To get quick response to specific information when calling Industrial Devices, ask for the area of expertise that relates to your question

Technical Support?
Ask for Application Engineering

Product Information, Availability, or Repairs?
Ask for Inside Sales

Plugs into Top of Control

Black — Line
White — Neutral
Green — Earth

115 VAC input power

Power Connector

RPACK-1 Option

Motor Connector

Brake Out
Brake Out
RPACK
RPACK
Green — Shield
Red (White w/QF Cable) — Motor +
Black — Motor -

Plugs into Bottom of Control

Brake Option

H Series Actuator

Remote Speed +
Remote Speed -   0 to10VDC
+12 Out
Common
Go Extend   N.O.
Go Retract   N.O.
Stop Extend   N.O.
Common
Stop Retract   N.O.
Extend Speed   N.O.
Retract Speed   N.O.
Common
Extend EOT   N.C.
Retract EOT   N.C.
Run/Jog   N.O.
Stop   N.O.

Run   2K
At EOT   2K
At Extend   2K
At Retract   2K
Current Limit   2K
Fault   2K
Pull-Up
Common
Shield

INDUSTRIAL DEVICES CORPORATION