UNIVERSAL MOTION INTERFACE (UMI) ACCESSORY

This user guide describes how to use the UMI-4A, UMI-Flex4, and UMI-Flex6 accessories.

Introduction

The UMI products are connectivity accessories you can use with your motion control boards for up to four or six axes of simultaneous or independent control. Ideally suited to industrial and laboratory applications, UMI accessories connect power supplies, servo amplifiers or stepper drivers, motors, encoders, and limit switches to National Instruments plug-in motion control boards.

A UMI accessory simplifies field wiring with separate encoder, limit switch, and amplifier/driver removable screw terminal blocks per-axis. All terminal blocks are industry standard and do not require any special tools for wire installation. The UMI-4A connects to ValueMotion boards via a 50-pin interface cable; the UMI-Flex4 and UMI-Flex6 connect to FlexMotion boards via a 100-pin interface cable. The UMI accessory has a host bus monitor power interlock that automatically disables the amplifiers if the host computer is shut down or the interface cable is disconnected.

The UMI-4A and UMI-Flex4 come with an integrated DIN-rail mounting base. The UMI-Flex6 is encased in metal and comes with attached rubber feet for desktop use; a DIN-rail mounting kit is available separately.

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What You Need to Get Started

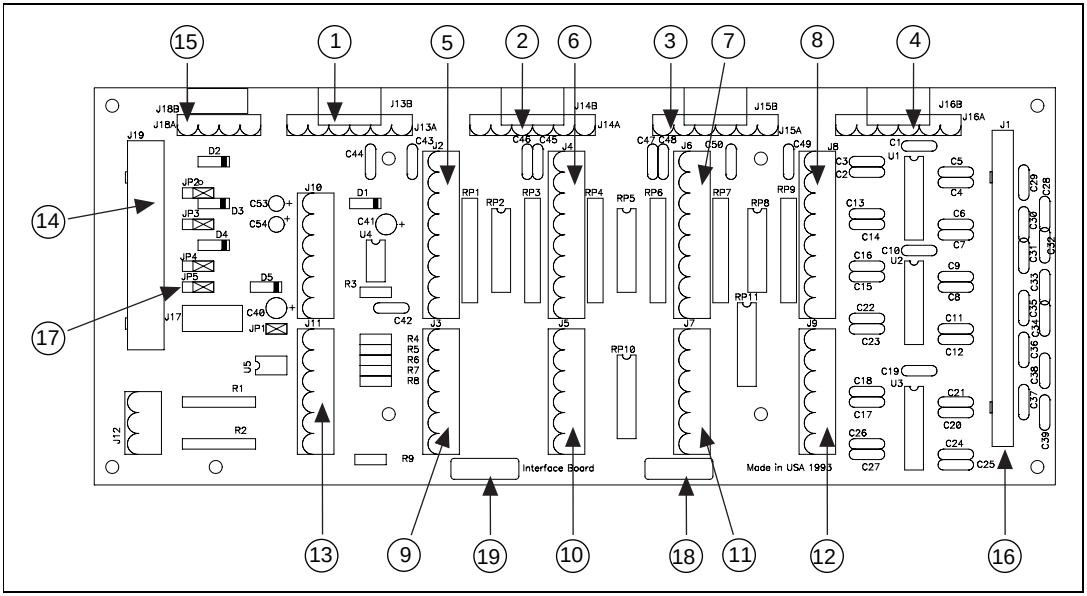
To set up and use your UMI accessory, you will need the following items:

- ❑ One of the following UMI accessories:
  - UMI-4A
  - UMI-Flex4
  - UMI-Flex6
- ❑ *Universal Motion Interface (UMI) Accessory User Guide*
- ❑ One of the following National Instruments cables:
  - SH68-68-S shielded cable and 68M-50F Step Bulkhead Cable Adapter (for PXI ValueMotion boards and UMI-4A)
  - NB1 ribbon cable (for non-PXI ValueMotion boards and the UMI-4A)
  - SH50-50 shielded cable (for non-PXI ValueMotion boards and the UMI-4A)
  - SH100-100-F shielded cable (for FlexMotion boards and the UMI-Flex4 or UMI-Flex6)
- ❑ 5 V power supply
- ❑ (Optional) Auxiliary power supply (UMI-4A only)
- ❑ (Optional) ISO power supply (UMI-Flex4 and UMI-Flex6 only)

Detailed specifications for the UMI accessories are in the *Specifications* section later in this guide.

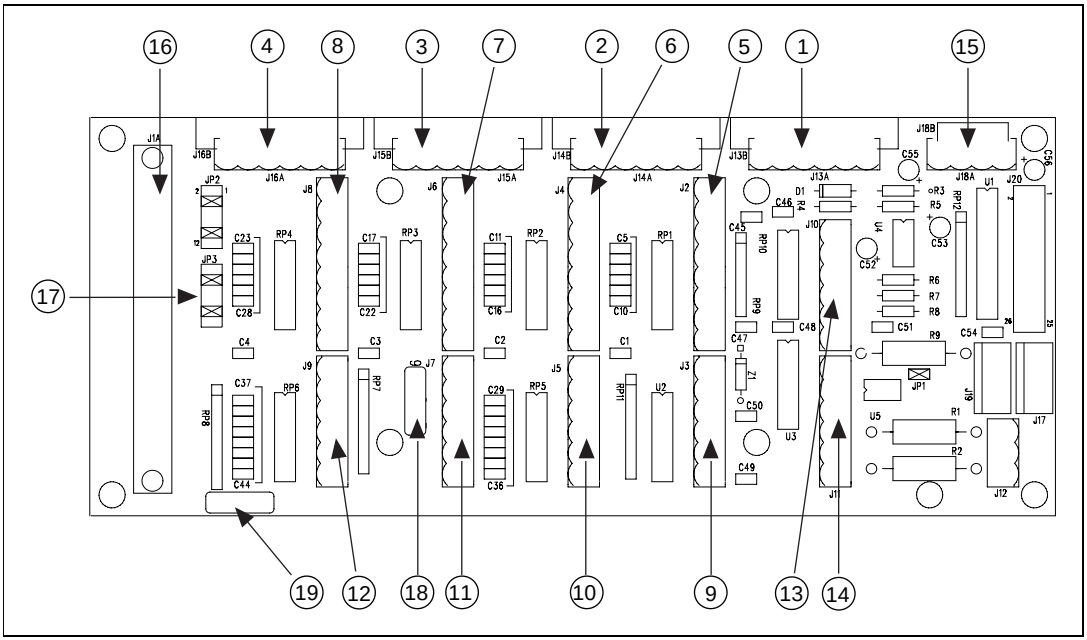
About The UMI Removable Screw Terminal Blocks

This section provides information on each of the UMI terminal blocks. Refer to Figures 1 through 3 to help you locate the different parts of the UMI-4A, UMI-Flex4, and UMI-Flex6 accessories.



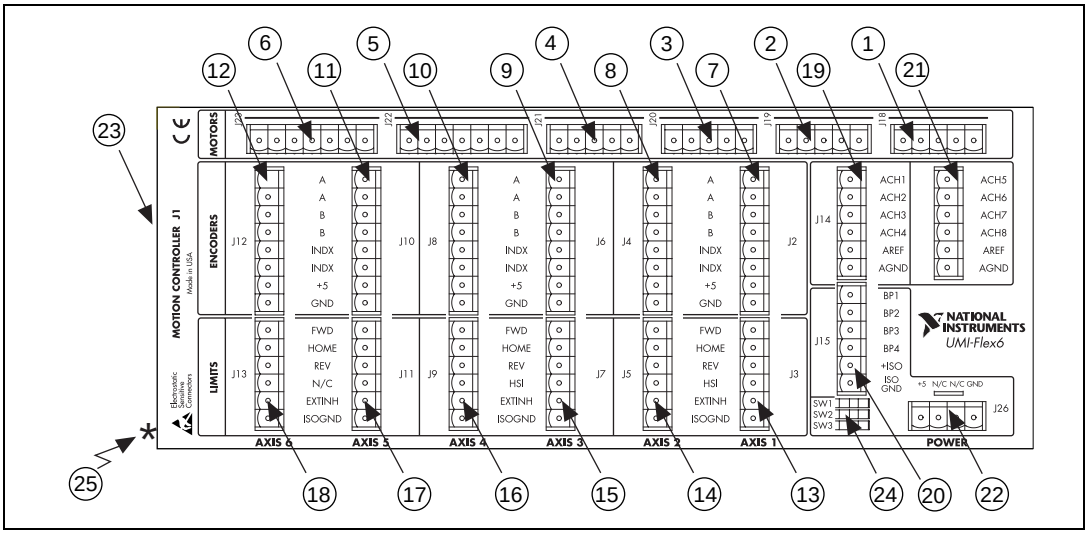
1 Amplifier Connector (Axis 1) (J13)	6 Encoder Connector (Axis 2) (J4)	13 I/O Bits 1–4 (J10) I/O Bits 5–8 (J11) I/O Connector
2 Amplifier Connector (Axis 2) (J14)	7 Encoder Connector (Axis 3) (J6)	14 Opto 22 Compatible Connector (J19)
3 Amplifier Connector (Axis 3) (J15)	8 Encoder Connector (Axis 4) (J8)	15 Power Connector (J18)
4 Amplifier Connector (Axis 4) (J16)	9 Limits Connector (Axis 1) (J3)	16 ValueMotion Controller (J1)
5 Encoder Connector (Axis 1) (J2)	10 Limits Connector (Axis 2) (J5)	17 Jumpers (Axes 1–4)
	11 Limits Connector (Axis 3) (J7)	18 Assembly Number
	12 Limits Connector (Axis 4) (J9)	19 Serial Number

Figure 1. UMI-4A Parts Locator Diagram



1 Amplifier Connector (Axis 1) (J13)	6 Encoder Connector (Axis 2) (J4)	13 Analog Input Connector (J10)
2 Amplifier Connector (Axis 2) (J14)	7 Encoder Connector (Axis 3) (J6)	14 Breakpoint Output Connector (J11)
3 Amplifier Connector (Axis 3) (J15)	8 Encoder Connector (Axis 4) (J8)	15 Power Connector (J18)
4 Amplifier Connector (Axis 4) (J16)	9 Limits Connector (Axis 1) (J3)	16 FlexMotion Controller (J1)
5 Encoder Connector (Axis 1) (J2)	10 Limits Connector (Axis 2) (J5)	17 Jumpers
	11 Limits Connector (Axis 3) (J7)	18 Assembly Number
	12 Limits Connector (Axis 4) (J9)	19 Serial Number

Figure 2. UMI-Flex4 Parts Locator Diagram



1	Amplifier Connector (Axis 1) (J18)	7	Encoder Connector (Axis 1) (J2)	19	Analog Input (1-4) Connector (J14)
2	Amplifier Connector (Axis 2) (J19)	8	Encoder Connector (Axis 2) (J4)	20	Breakpoint Connector (J15)
3	Amplifier Connector (Axis 3) (J20)	9	Encoder Connector (Axis 3) (J6)	21	Analog Input (5-8) Connector (J16)
4	Amplifier Connector (Axis 4) (J21)	10	Encoder Connector (Axis 4) (J8)	22	Power Connector (J26)
5	Amplifier Connector (Axis 5) (J22)	11	Encoder Connector (Axis 5) (J10)	23	FlexMotion Controller (J1)
6	Amplifier Connector (Axis 6) (J23)	12	Encoder Connector (Axis 6) (J12)	24	Switches
		13	Limits Connector (Axis 1) (J3)	25	Assembly and serial number (bottom)
		14	Limits Connector (Axis 2) (J5)		
		15	Limits Connector (Axis 3) (J7)		
		16	Limits Connector (Axis 4) (J9)		
		17	Limits Connector (Axis 5) (J11)		
		18	Limits Connector (Axis 6) (J13)		

Figure 3. UMI-Flex6 Parts Locator Diagram

Amplifier/Driver Removable Screw Terminal Block

UMI-4A

For amplifier/driver wiring, each UMI-4A axis provides a separate 6-position terminal block. Figure 4 shows the terminal block pin assignment for the UMI-4A amplifier/driver used with a servo board. Refer to Figure 1 to help you locate the amplifier/driver terminal block on your UMI-4A accessory.

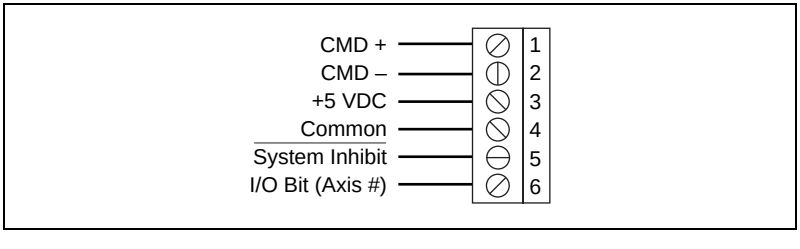


Figure 4. UMI-4A Amplifier/Driver with Servo Terminal Block Pin Assignment

Figure 5 shows the UMI-4A amplifier/driver terminal block pin assignment used with a stepper board.

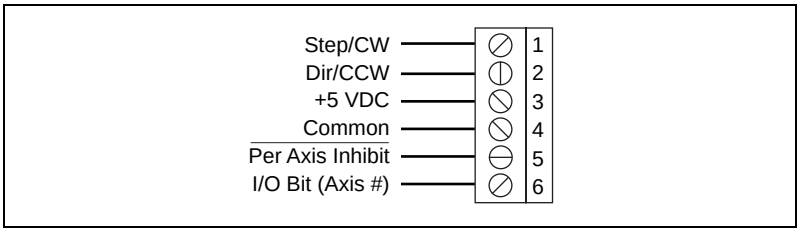


Figure 5. UMI-4A Amplifier/Driver with Stepper Terminal Block Pin Assignment

To configure your UMI-4A accessory for servo, move all four jumpers to the right. To configure your accessory for stepper, move all four jumpers to the left. See Figure 6 for more information on configuring your UMI-4A jumpers. Refer to Figure 1 to help you locate the jumpers on your UMI-4A accessory.

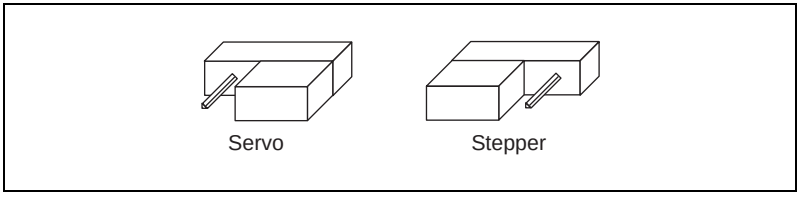


Figure 6. UMI-4A Jumper Configuration

UMI-Flex4

For amplifier/driver wiring, the UMI-Flex4 has four separate 5-position terminal blocks. Figure 7 shows a UMI-Flex4 terminal block pin assignment. The first two terminal blocks (items 1 and 2 in Figure 2) are dedicated to servo axes 1 and 2. The third terminal block (item 3 in Figure 2) is jumper configurable to support servo axes 3 and 5 and stepper axis 5. The fourth terminal block (item 4 in Figure 2) is jumper configurable to support servo axes 4 and 6 and stepper axis 6. See Figure 8 for more information on configuring these jumpers.

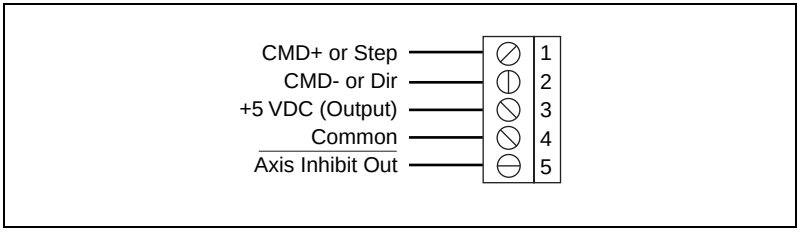


Figure 7. UMI-Flex4 Axes 1 through 6 Amplifier/Driver Terminal Block Pin Assignment

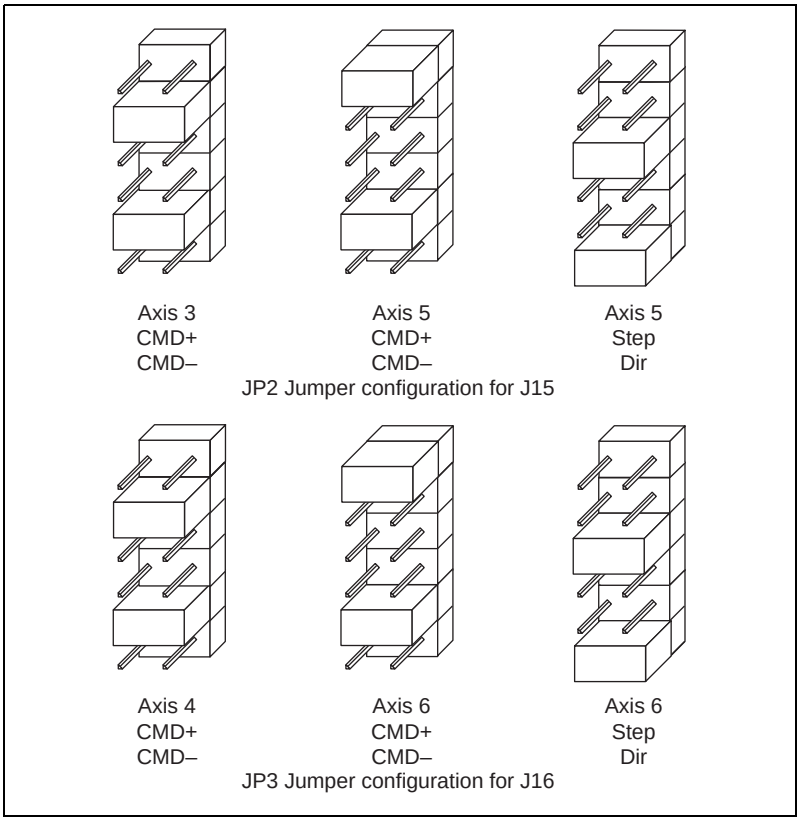


Figure 8. UMI-Flex4 Jumper Configuration

UMI-Flex6

For amplifier/driver wiring, each UMI-Flex6 axis has a separate 5-position terminal block. Figure 9 shows the UMI-Flex6 amplifier/driver terminal block pin assignment for axes 1 through 4. Refer to Figure 3 to help you locate the amplifier/driver terminal blocks on your UMI-Flex6 accessory. The 5-position UMI-Flex6 terminal block supports the servo axes.

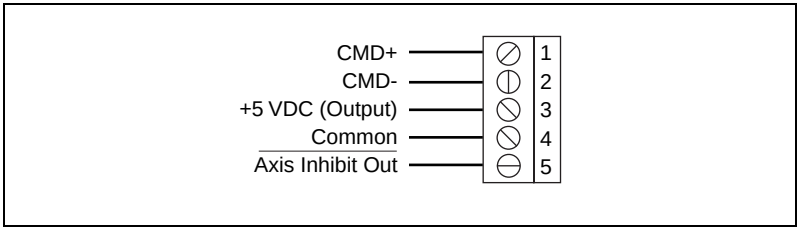


Figure 9. UMI-Flex6 Axes 1 through 4 Amplifier/Driver Terminal Block Pin Assignment

Figure 10 shows the separate 7-position terminal block pin assignment for axes 5 and 6. The 7-position terminal block supports the combined servo and stepper axes.

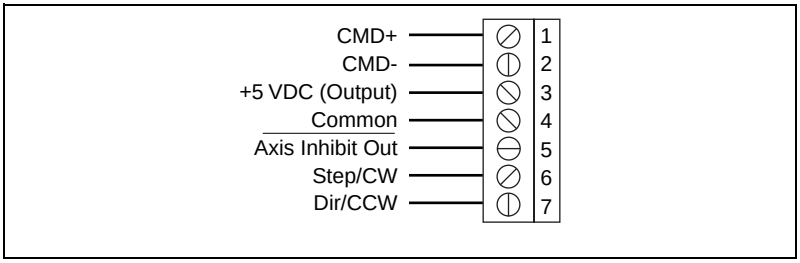


Figure 10. UMI-Flex6 Axes 5 and 6 Amplifier/Driver Terminal Block Pin Assignment

You can configure the Axis Inhibit Out signal as active-low or active-high outputs using switch SW2. Setting SW2 to the right configures the signal as active-low; setting SW2 to the left configures the signal as active-high.

Encoder Removable Screw Terminal Block

For incremental encoder connections, each UMI axis provides a separate 8-position terminal block. UMI accepts either single-ended TTL or differential line driver inputs. You can connect open collector encoders to the UMI accessory by installing a 2.2 kΩ pull-up resistor to +5 VDC.

☞ **Note** ***Encoders with line driver outputs are recommended for all applications and must be used if the encoder cable length is greater than 10 feet.***

Power for the encoders is internally routed from the power terminal block and is available on pin 7 (+ 5 V). Figure 11 shows the wiring for the differential encoder. Refer to Figures 1 through 3 to help you locate the encoder terminal blocks on your UMI accessory.

☞ **Note** ***The dotted loop indicates a shielded cable.***

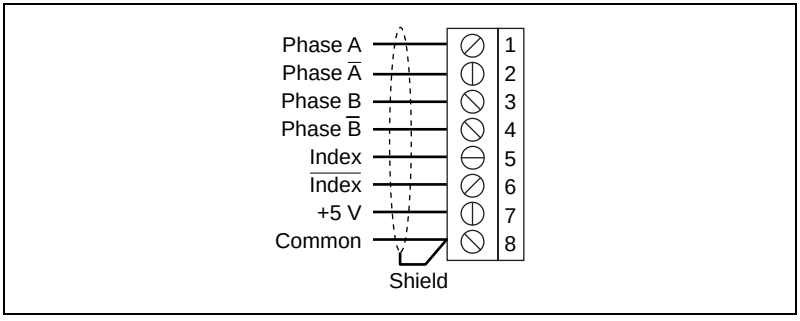


Figure 11. Differential Encoder Wiring

Figure 12 shows the wiring for the single-ended encoder.

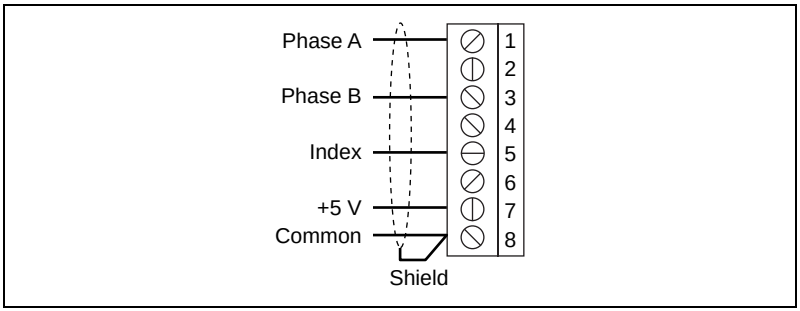


Figure 12. Single-Ended Encoder Wiring

The UMI accessory allows for differential inputs for Phase A, Phase B, and Index signals. You can easily accommodate encoders with phase relationships different from Figure 13 by swapping the signals as required by the specific application. The Index pulse must occur when both Phase A and Phase B signals are logic low as shown in Figure 13. Servo and closed-loop stepper applications require encoder feedback and consistent directional polarity between the motor and encoder for stable operation. The UMI standard is:

Positive = forward = Clockwise (CW) facing motor shaft

Negative = reverse = Counter-clockwise (CCW) facing motor shaft

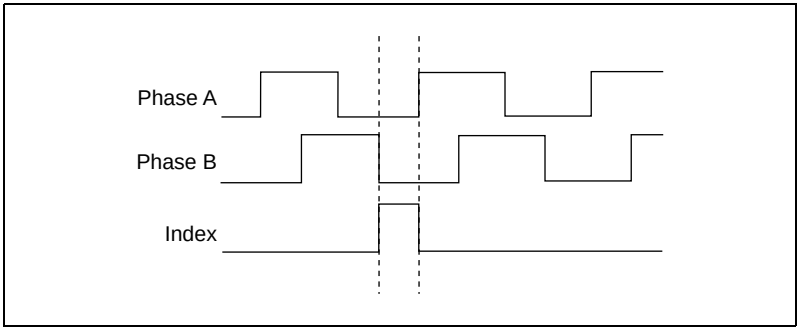


Figure 13. Encoder Signal Phasing–CW Rotation

The encoder inputs are filtered by both analog and digital noise filters. You must use cables with twisted pairs and an overall shield for improved noise immunity. When connecting the encoder to the UMI, you should use at least 24-AWG wire.

Caution ***Using an unshielded cable allows noise to corrupt the encoder signals, which results in lost counts, reduced accuracy, and other erroneous encoder and controller operations.***

Limit Switch Removable Screw Terminal Block

UMI-4A

For CW and CCW limit and home switch connections, each UMI-4A provides a separate 6-position terminal block per axis. All limit and home switch inputs are pulled up to 5 V through 3.3 kΩ resistors on the controller board and are low-pass filtered on the UMI-4A to enhance noise immunity.

The UMI-4A supports active and passive limit switches. You can use auxiliary VDC, on pin 4 to power active, open collector limit switches. To use the auxiliary VDC you must supply a voltage to the auxiliary VDC input (pin 2 of the power terminal block). Figure 14 shows an example of a passive limit switch terminal block pinout. Refer to Figure 1 to help you locate the limit switch terminal block on your UMI-4A accessory.

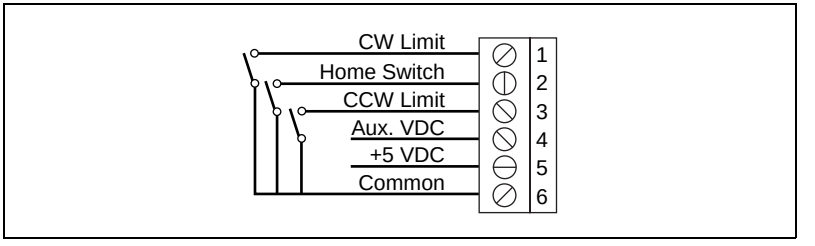


Figure 14. UMI-4A Limit Switch Terminal Block Pin Assignment (Passive Limit Switch Connection Example)

UMI-Flex4 and UMI-Flex6

For CW and CCW limit and home switch connections, each UMI-Flex4 and UMI-Flex6 provides a separate 6-position terminal block per axis. All limit and home switch inputs are connected to the Opto-coupled inputs on the FlexMotion board. See Figure 15 for the UMI-Flex4 and UMI-Flex6 limit switch terminal block pinout. Refer to Figures 2 and 3 to help you locate the limit switch terminal block on your UMI-Flex4 and UMI-Flex6 accessories.

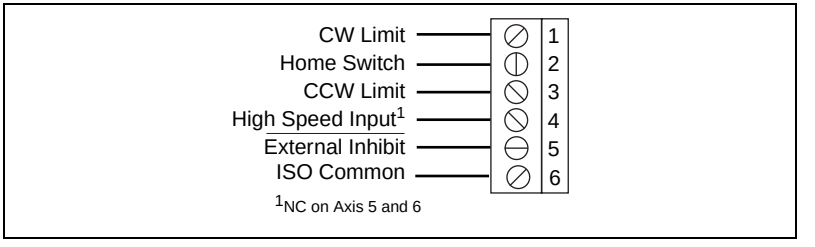


Figure 15. UMI-Flex4 and UMI-Flex6 Limit Switch Terminal Block Pin Assignment

UMI-Flex6 (Only)

You can configure the external inhibit input signals as active-low global inhibits or active-high E-Stop inputs using switch SW1. Setting SW1 to the right configures the signals as global inhibits; setting SW1 to the left configures the signals as E-Stop. When SW1 is configured for E-Stops, use switch SW3 to enable or disable the input. Setting SW3 to the right disables the E-Stops; setting SW3 to the left enables the E-Stops.

Standard I/O Connections

UMI-4A

The UMI-4A has two I/O connectors: a 34-pin male box header (J19), which is compatible with standard Opto 22 I/O racks, and two 6-pin removable screw terminal blocks (J10 and J11) for all other I/O configurations. You can use both I/O configurations separately or in parallel.

Pin 5 of each terminal block (J10 and J11) is an Enable Input connection. This connection controls a system enable–system inhibit function. If your configuration uses the inhibit output signal available on each per-axis driver/amplifier terminal block, the enable input on J10 or J11 must be connected to the common (ground) signal to enable the driver/amplifier.

Note ***You do not need to duplicate the switch on both J10 and J11; use only one or the other.***

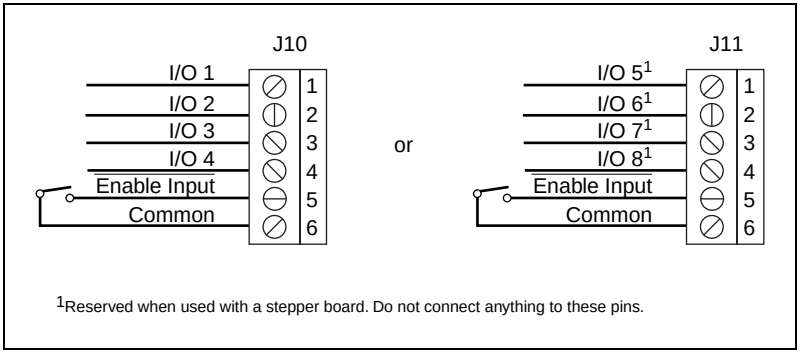


Figure 16. Using Available Pins On J10 and J11

Caution ***If the enable/disable function is defeated when you connect the enable input to the common signal, you need to provide enable/disable control of the drivers/amplifiers elsewhere in the system.***

Figure 17 shows the 34-pin Opto 22 compatible connector.

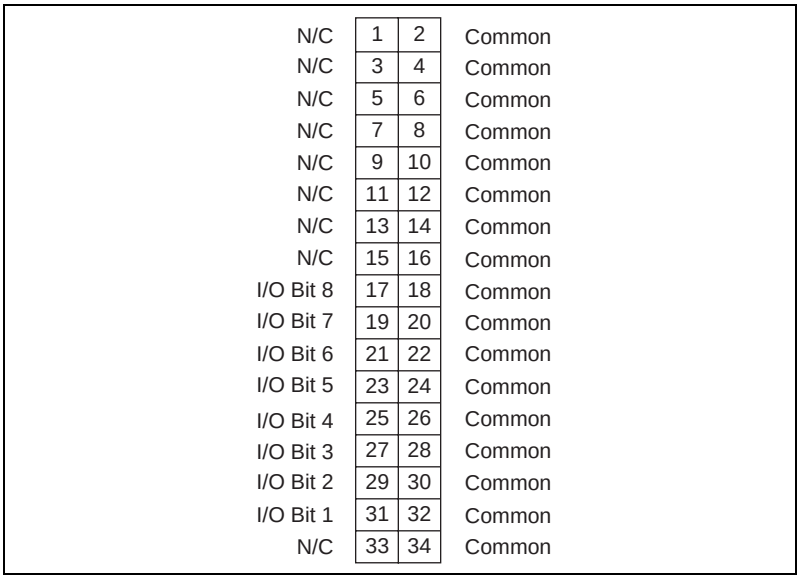


Figure 17. 34-Pin Opto 22 Compatible Connector Pin Assignment

UMI-Flex4 and UMI-Flex6

For analog input wiring, the UMI-Flex4 provides one, 6-position terminal block while the UMI-Flex6 provides two, 6-position terminal blocks. Each connector provides access to four of the eight analog input channels on the FlexMotion boards. See Figures 18 and 19 for analog input terminal block pinout information. Refer to Figures 2 and 3 to help you locate the analog input terminal blocks on your UMI-Flex4 and UMI-Flex6 accessories.

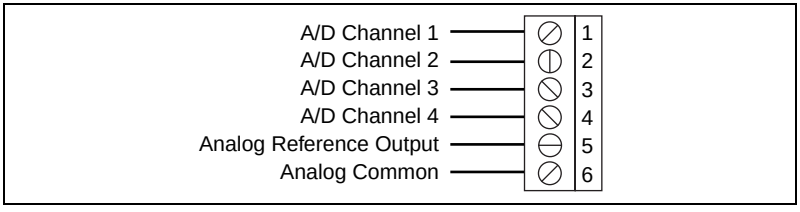


Figure 18. UMI-Flex4 and UMI-Flex6 Analog Input Channels 1 through 4

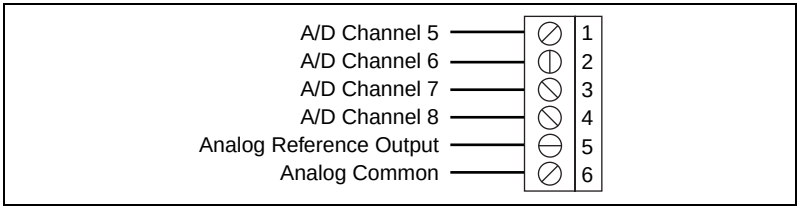


Figure 19. UMI-Flex6 Analog Input Channels 5 through 8

Breakpoint Output Removable Screw Terminal Block

For breakpoint output wiring, the UMI-Flex4 and UMI-Flex6 provide a 6-position terminal block. This terminal block provides two input signals for supplying an external isolated voltage and isolated ground return path. This terminal block also provides access to the four breakpoint outputs as well as the isolated voltage input. See Figure 20 for more information on breakpoint output wiring.

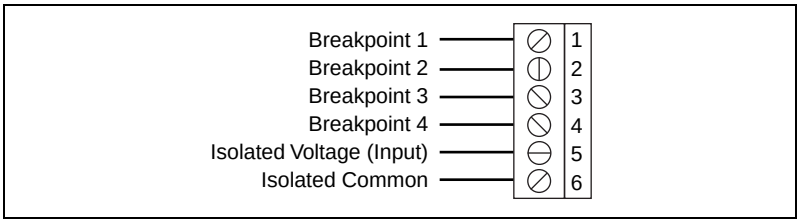


Figure 20. UMI-Flex4 and UMI-Flex6 Breakpoint Output Channels 1 through 4

Power Removable Screw Terminal Block

The UMI provides a 4-position terminal block for wiring power to the unit. Figure 21 shows the 4-position terminal block pinout. Refer to Figures 1 through 3 to help you locate the power terminal block on your UMI accessory.

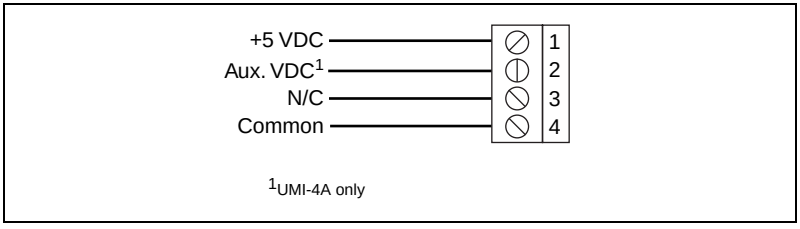


Figure 21. 4-Position Power Terminal Block Pin Assignment

Notes ***To properly operate your UMI accessory, you must supply a +5 VDC voltage to the power terminal block.***

The auxiliary VDC input on the power terminal block is optional and is redistributed to other terminal blocks as an output power source.

Specifications

This section lists the specifications of the UMI accessories.

UMI-4A

This section lists the specifications of the UMI-4A accessory. These specifications are typical at 25° C unless otherwise specified.

Encoder Interface (Each Axis)

Inputs .....Quadrature with index

Type .....Differential or single-ended

Voltage Range .....0 to 5 VDC

Noise Filter 1µs

Limit and Home Switch Inputs (Each Axis)

Voltage Range .....0 to 15 VDC

Voltage Threshold .....TTL

Noise Filter .....10 µs

Configurable I/O

Input Voltage .....0 to 15 VDC

Input Voltage Threshold.....TTL

Output Voltage .....0 to 5 VDC

Output Current .....60 mA sink max.

Opto 22 Compatible.....via J19 connector

Operating Environment

Temperature.....0° to 45° C

Humidity.....5 to 95% (noncondensing)

Power Requirements

+5 VDC ..... 0.2 amps + user-defined encoder power

Aux. VDC ..... User-defined limit switch power

Host Bus Voltage Interlock

Voltage ..... 5 VDC ± 5%

Physical

Dimensions..... 23.62 by 10.03 cm (9.3 by 3.95 in.) Universal DIN-rail base (supplied)

UMI-Flex4 and UMI-Flex6

This section lists the specifications of the UMI-Flex4 and UMI-Flex6 accessories. These specifications are typical at 25° C unless otherwise specified. Refer to the *FlexMotion User Manual* for detailed specifications on encoder inputs, limit and home switch inputs, high speed inputs, breakpoint outputs, and analog inputs.

Axis Inhibit Out

Voltage Range..... 0 to 5 VDC

Output Current ..... 16 mA sink max.

Operating Environment

Temperature ..... 0° to 45° C

Humidity ..... 5 to 95% (noncondensing)

Power Requirements

+5 VDC ..... 0.2 amps + user-defined encoder power

+ISO

Voltage ..... 5 to 24 VDC

Current ..... User-defined isolated signals

Host Bus Voltage Interlock

Voltage.....5 VDC ± 5%

Physical

UMI-Flex4

Dimensions .....23.62 by 10.03 cm
(9.3 by 3.95 in.)
Universal DIN-rail base
(supplied)

UMI-Flex6

Dimensions .....26.67 by 11.18 cm
(10.5 by 4.4 in)

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