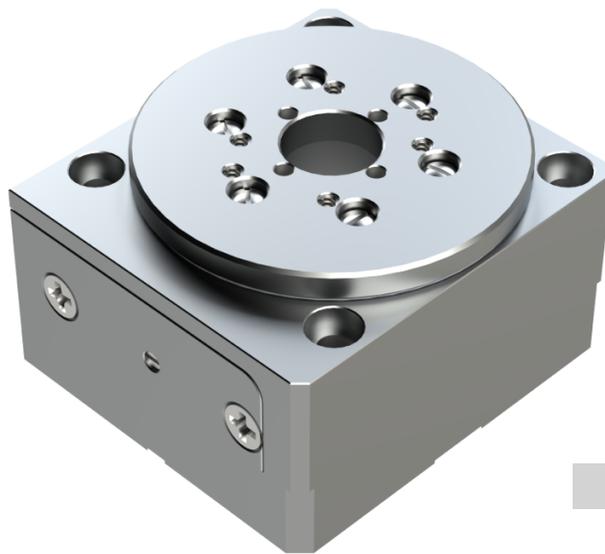


PR-32CR

Series



Piezo Rotation Stage Reference Manual (Open and Closed Loop Versions)

PR-32CR

Precision Rotation Stage

Reference Manual

Rev 1.0

MICRONIX USA, LLC
Tel: 949-480-0538
Fax: 949-480-0538
Email: info@micronixusa.com
<http://micronixusa.com>

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1. Introduction

1.1 Product Description

The PR-32CR is a compact rotation stage with unlimited travel and a 8mm clear aperture. Steel crossed roller bearings ensure smooth motion, high stability and continuous 360° travel.

Product Specifications	PR-32CR Piezo Motor	
Travel	360°, Limitless	
Max Speed	>5°/s (MMC-100)	>20°/s (MMC-110)
Open Loop Resolution	1 μ°	
Digital Encoder Resolution	10 μ°	
Absolute Encoder Resolution	<200 μ°	
Max Load (Vertical)	1 kg	

Direction of positive motion



1.2 Recommended Controllers

The following controllers are available from MICRONIX USA:

Controller	Piezo Motor	Digital Encoder	Absolute Encoder
MMC-100	✓	✓	
MMC-110	✓	✓	✓
NanoDrive	✓	✓	✓
MMX-120	✓	✓	✓

1.3 Technical Data and Ordering Information

Detailed specifications and ordering information can be found on the PR-32CR product page on the MICRONIX USA website.

2. Preparing to Install the PR-32CR Stage

2.1 Installation Preparation

When mounting the stage, it is important to consider the flatness of the mounting surface, as the stage will conform to it as the performance and structural integrity are impacted, recommended mounting surface flatness is $<10\mu\text{m}$.

The stage specification is tested at a temperature of $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ unless otherwise specified. Ensure the following conditions are met before operating the stage:

- Mounting surface is clean and free of debris, burrs or dings.
- Mounting surface flatness $<10\mu\text{m}$.
- Indoor atmosphere is free of corrosive gases, excessive dust, and condensation.
- Operating temperature range of $5-40^{\circ}\text{C}$.
- Relative humidity between 20-80%.
- The stage is located away from water, heat, and electrical noise.

2.2 Package Contents

The package contains all necessary components for the PR-32CR stage setup. If the product is damaged or there are missing components, contact MICRONIX USA immediately. Do not discard product packaging in case of return shipment.

Package Should Contain:

- PR-32CR Rotation Stage
- Reference Manual
- Any other previously agreed upon components such as a controller.

3. Installing the PR-32CR Stage

3.1 PR-32CR Installation

Follow these steps to securely mount the PR-32CR Stage, open loop and closed loop shown.

1. Optionally, use two M1.5 dowel pins to align the stage.
2. Secure the stage to the mounting surface using four M2 socket head cap screws at 0.2 Nm recommended torque.

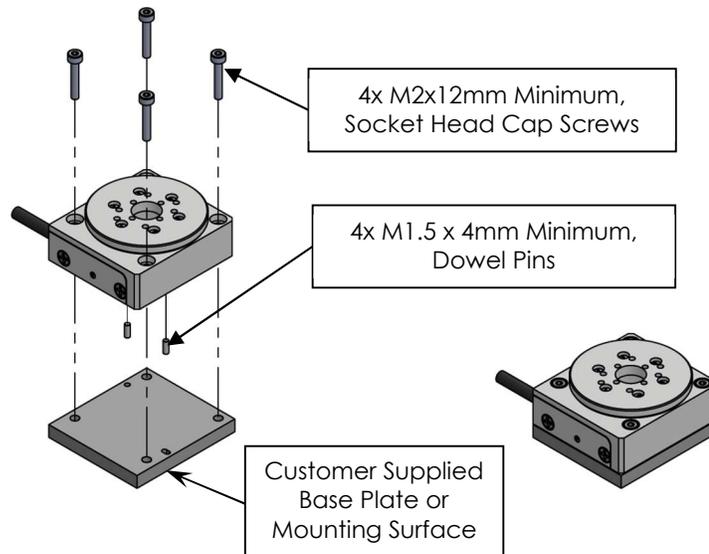


Figure 3-A. PR-32CR Open Loop Stage Installation

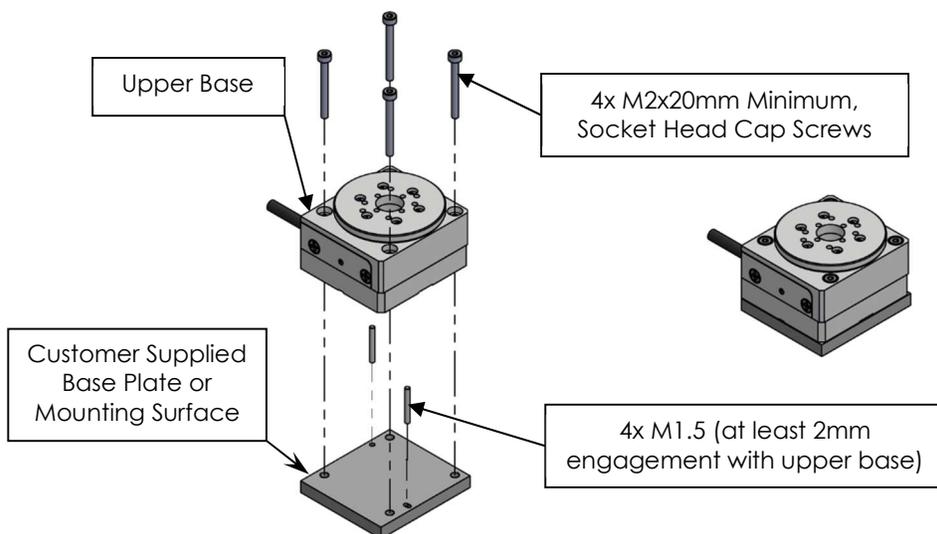
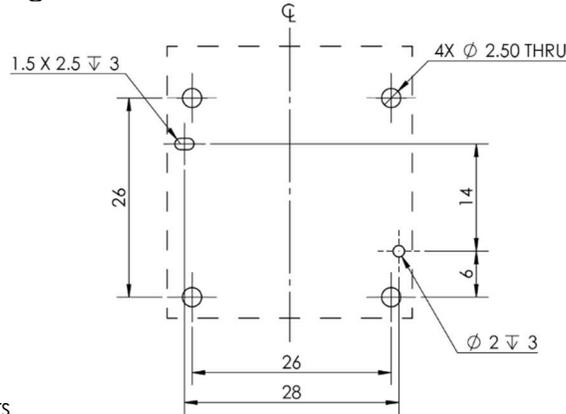


Figure 3-B. PR-32CR Closed Loop Stage Installation

3.1.1 General Mounting Pattern

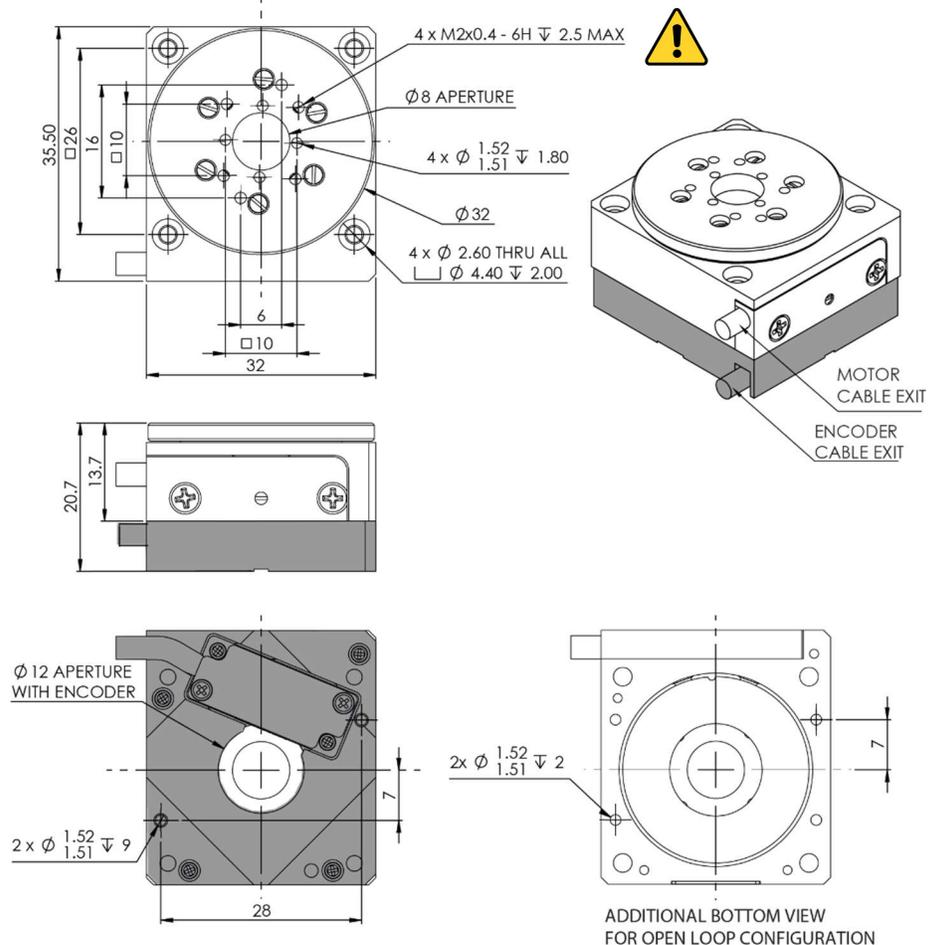
Pin-slot dowel pin alignment is recommended.



Dimensions are in millimeters

4. Dimensions

4.1 PR-32CR Standard Dimensions



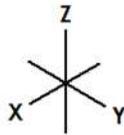
* all dimensions are in millimeters
 * grey parts for closed loop only



WARNING: Do not use screws with a thread depth exceeding 2.5mm into the carriage

5. Stacking Configurations (Examples)

- Additional configurations available upon request
- Images are positioned according to:

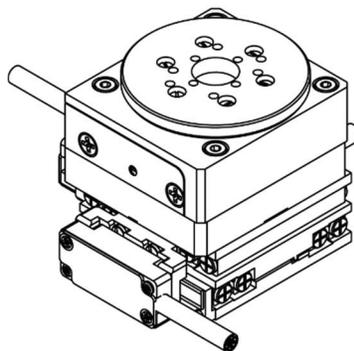


5.1 PR-32CR Interface with Other Micronix stages

The PR-32CR can be mounted directly onto a limited number of MICRONIX USA stages. Adapter plates enable additional multi-axis configurations, contact MICRONIX USA for bracket inquiry if not available in this manual. Below are examples of stages that support direct mounting and options that require an adapter bracket.

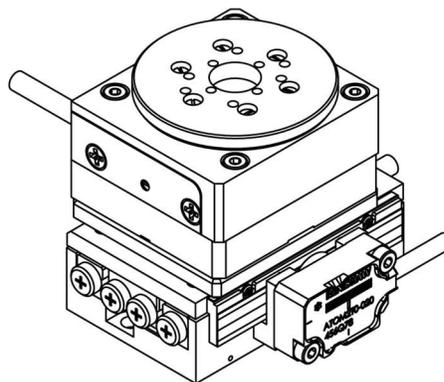
5.1.1 PR-32CR + PPX-32CR, Rotation + XY Translation

The PR-32CR can mount directly on PPX-32CR for 360 deg + 18mm by 18mm XY travel. Both open loop and closed loop versions are compatible with PPX-32CR mounting.



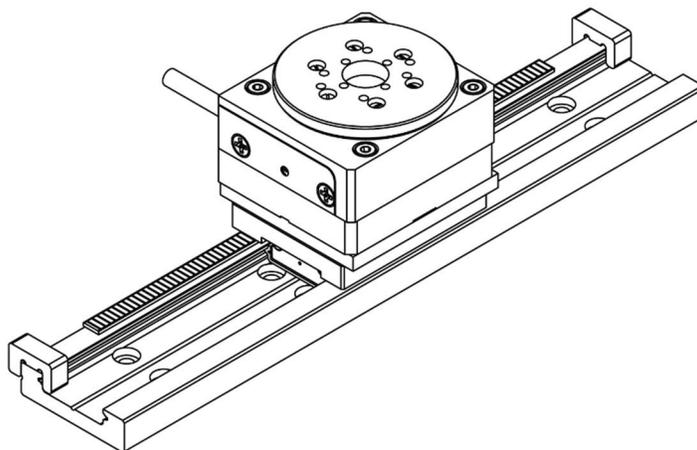
5.1.2 PR-32CR + PPS-28, Rotation + Translation Stage

The PR-32CR can mount on PPS-28 piezo motor or stepper motor versions using 430517 Adapter Bracket for 360 deg + up to 102mm travel. PPS-28 can be arranged in XYZ configurations. Refer to PPS-28 Reference Manual for more details.

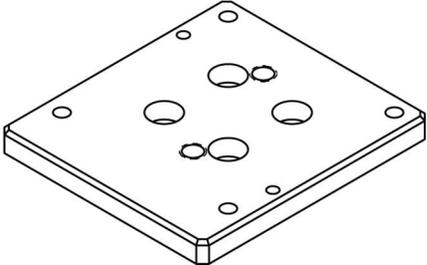
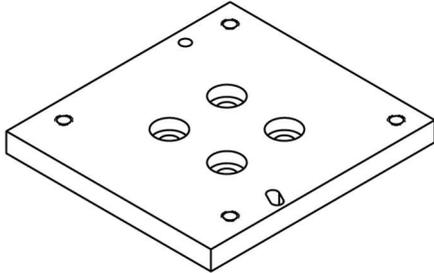


5.1.1 PR-32CR + MLS-25, Rotation + Translation

The PR-32CR can mount on MLS-25 using 431540 Adapter Bracket for 360 deg + up to 236mm travel. MLS-25 is a modular stage that can be assembled in XYZ configurations. Refer to MLS-25 Reference Manual for more details.



5.2 Accessories

 <p style="text-align: center;">PN: 430517</p>	 <p style="text-align: center;">PN: 431540</p>
<p>Use to mount PR-32CR to any PPS-28 stage. Both piezo motor and stepper motor are compatible.</p>	<p>Use to mount PR-32CR to the MLS-25 stage</p>

6. Connecting the PR-32CR Stage

6.1 Atmospheric Environments (MMC-Controller)

For controller information, refer to the appropriate MMC controller manual.

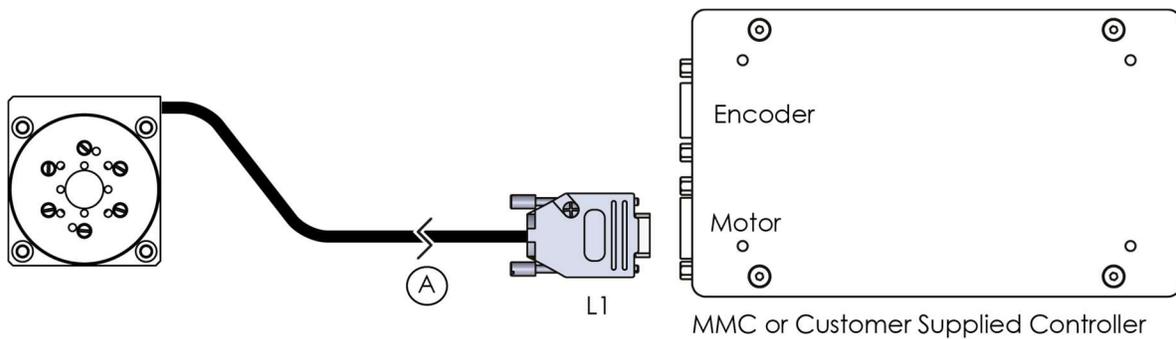
Note: MMC controller is only compatible with PR-32CR piezo motor version only.

6.1.1 Open Loop, Atmospheric Wiring Diagram

Connecting the PR-32CR rotary stage in an open loop configuration only requires that the D-sub 9 Pin Motor Cable be connected to a compatible controller. No other cables or components are required. See Appendix section A.2.1 for pinout information.

Cable Descriptions:

A. Motor Cable (Male Dsub9 Pin, 1.5m PVC Black Cable)



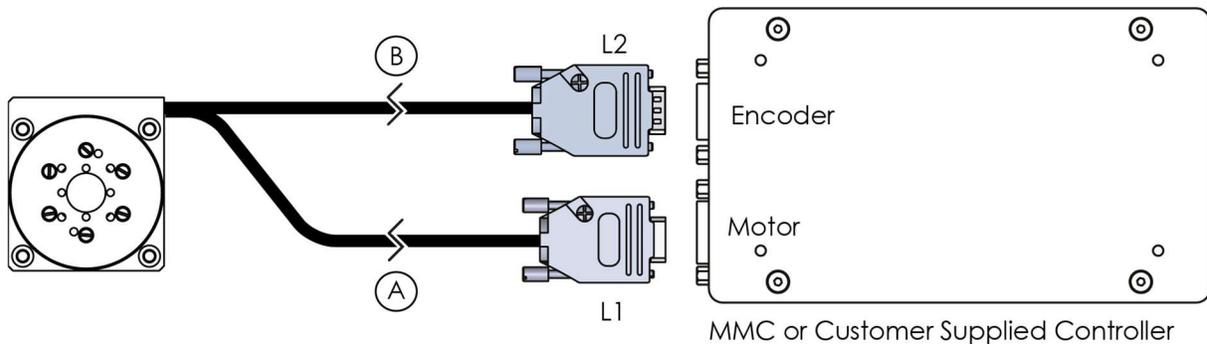
6.1.2 Closed Loop (Encoder), Atmospheric Wiring Diagram

Using the PR-32CR stage with an encoder requires a closed loop controller that recognizes the proper type of encoder feedback. Connect the stage as shown below, see Appendix section A.2.2 , A.2.3 for digital and absolute pinouts respectively.

Cable Descriptions:

A. Motor Cable (Male Dsub9 Pin, 1.5m PVC Black Cable)

B. Encoder Cable (Female Dsub9 Pin Module, 1.5m PVC Black Cable)



6.2 Vacuum Environments (MMC-Controller)

6.2.1 Handling and Preparation

When handling the stage for vacuum environments, take the necessary precautions, such as wearing clean latex gloves, clean room clothing, etc. Avoid any contaminants. Maximum bake-out temperature is 100°C. MICRONIX USA optionally supplies the stage with vacuum compatible connectors, see chart below.

Connector Description	Connector Material	Contacts	Backshell
High Vacuum Glass- filled Diallyl Phthalate D-Subminiature	DAP	T2 Female Crimps, Gold Pins (Accuglass P/N: 111652)	Nickle-plated Zinc Backshell Strain Relief
Ultra-High Vacuum D-Subminiature	PEEK	T1 Female Crimps, Gold Pins (Accuglass P/N: 100180)	PEEK UHV Strain Relief

Environment	Open Loop	Closed Loop
High Vacuum (10 ⁻⁶ mbar)	9 Pin Female DAP	15 Pin Female DAP
Ultra-High Vacuum (10 ⁻⁹ mbar)	9 Pin Female PEEK	15 Pin Female PEEK

Connecting an open loop PR-32CR into a vacuum chamber requires the use of a feed-through connector at the vacuum chamber wall.

The vacuum compatible PR-32CR includes a straight through feedthrough (not a cross over gender changer). MICRONIX USA supplies test connectors that simulate the vacuum feedthrough to allow for functionality testing prior to installation in a vacuum chamber, see Appendix A.4 for feedthrough pins.

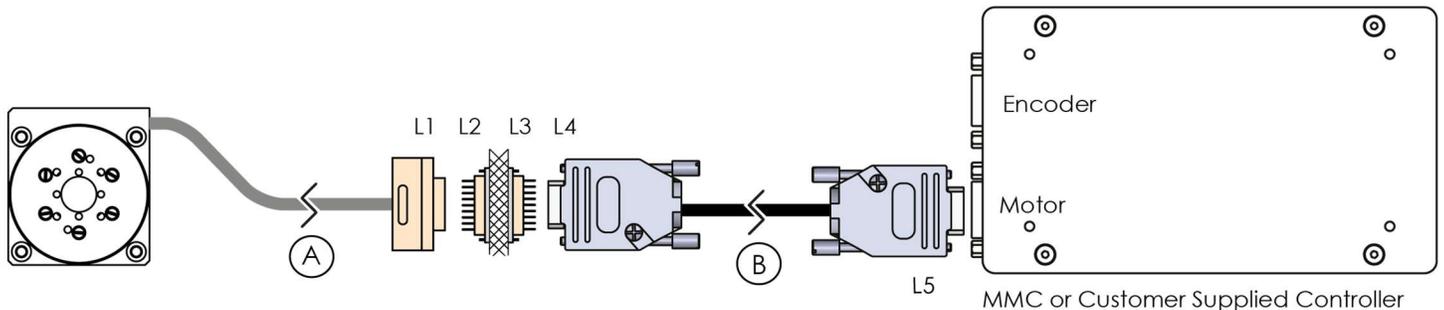
For wiring diagram information please contact MICRONIX USA.

6.2.2 Open Loop, Vacuum Wiring Diagram

Connecting the PR-32CR rotary stage in an open loop configuration only requires that the D-sub 9 Pin Motor Cable be connected to a compatible controller. No other cables or components are required. See Appendix section A.2.4 for pinout information.

Cable Descriptions:

- A. Vacuum side – Motor Cable (Female Dsub9 Pin PEEK or DAP, 1.5m silver braided cable)
- B. Atmospheric Side – Motor Cable (Female Dsub9 Pin to Male Dsub9 Pin, 1.5m PVC Black Cable)

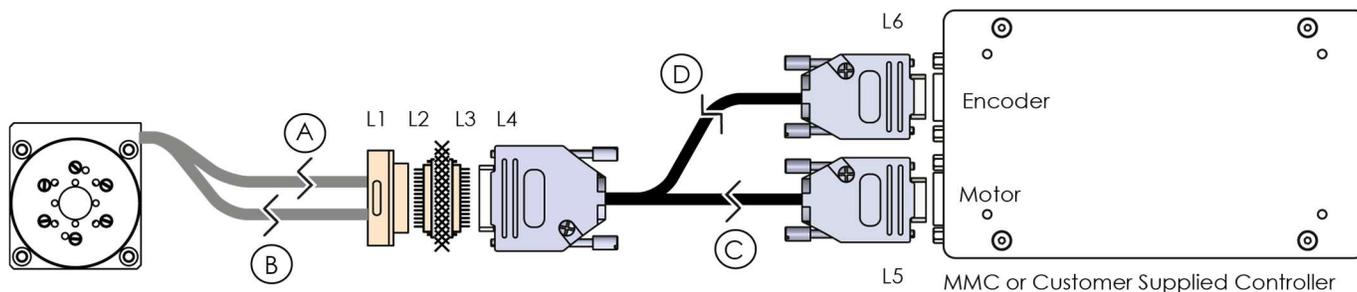


6.2.3 Closed Loop (Encoder), Atmospheric Wiring Diagram

Using the PR-32CR stage with an encoder requires a closed loop controller that recognizes the proper type of encoder feedback. Connect the stage as shown below, see Appendix section A.2.5 & A.2.6 for digital and absolute pinouts respectively.

Cable Descriptions:

- A. Vacuum side – Motor Cable (Female Dsub 9 PEEK or DAP, 1.5m Silver braided cable)
- B. Vacuum side – Encoder Cable (Female Dsub 9 PEEK or DAP, 1.5m Silver braided cable)
- C. Motor Cable (Male Dsub9 Pin, 1.5m PVC Black Cable)
- D. Encoder Cable (Female Dsub9 Pin Module, 1.5m PVC Black Cable)



7. Supplementary Information

7.1 Maintenance and Handling

- The PR-32CR series of rotary stages utilizes a maintenance-free design. Do not modify the stage or perform any maintenance unless specifically instructed to do so by MICRONIX USA personnel. If the stage is not performing up to the original specifications, please contact MICRONIX USA.
- The PR-32CR rotary stage is a precision mechanical device and should be handled with care. Do not drop or mishandle the stage.
- Keep hands clear of all moving parts while the stage is in motion to avoid personal injury.
- Use proper cable management to ensure a clean and safe operating environment.
- Properly connect the stage to the controller before powering on the controller. Failure to do so can result in damage to the stage.
- Allow for easy access to the stage in case of servicing.

7.2 Units and Conventions

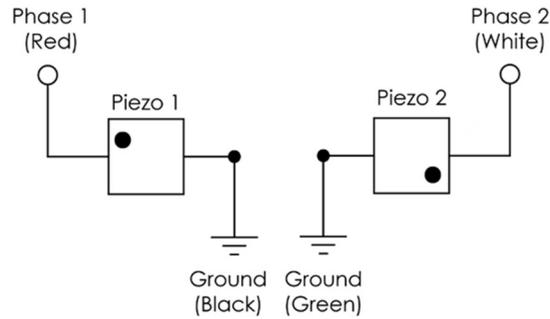
All measurements in this document are in the metric system of units.

Metric Unit	English Unit
1 millimeter	0.0394 inches
1 micron	0.0000394 inches
1 Newton	0.2248 lbs.
1 Newton-meter	8.85 in-lbs.

A. Appendix

A.1 Piezo Motor Electrical Specifications

A.1.1 2 Phase Piezo Motor Wiring Diagram



A.1.2 Piezo Motor Specifications

Voltage	60V maximum
Capacitance	150nf \pm 15%

A.2 Piezo Motor Wiring Pinouts

A.2.1 PR-32CR-11000 – Piezo, Open Loop, Atmospheric Pinout (MMC)

Pinout for PR-32CR-11000			Cable A Dsub9M
	Description	Color	L1
Motor	Phase 1	Red	1
	Phase 2	White (Green TP)	2
	Ground	Black/Green	5
	Shield	-	Casing
PR-32CR-X1010, Open Loop with Limit Switch			
Limit Switch (Optional)	Home Switch (LSN)	White (Violet TP)	6
	+5V	White (Grey)	8
	GND	Grey	9

A.2.2 PR-32CR-11300 – Piezo, Digital, Atmospheric Pinout (MMC)

Pinout for PR-32CR-11300			Cable A Dsub9M
	Description	Color	L1
Motor	Phase 1	Red	1
	Phase 2	White (Green TP)	2
	Ground	Black/Green	5
	Shield	-	Casing

			Cable B Dsub9F
	Description	Color	L2
Encoder	A +	Brown	1
	B +	Blue	2
	Index+	Violet	3
	GND	Grey	4
	+5V	White (Grey TP)	5
	A -	White (Brown TP)	6
	B -	White (Blue TP)	7
	Index-	White (Violet TP)	8
	Shield	-	Casing

A.2.3 PR-32CR-11500 – Piezo, Absolute, Atmospheric Pinout (MMC)

Pinout for PR-32CR-11500			Cable A Dsub9M
	Description	Color	L1
Motor	Phase 1	Red	1
	Phase 2	White (Green TP)	2
	Ground	Black/Green	5
	Shield	-	Casing

			Cable B Dsub9F
	Description	Color	L2
Encoder	SLO + / DATA +	Blue	1
	MA + / CLK +	Brown	2
	SLI +	Violet	3
	GND	Grey	4
	5V _{dc}	White (Grey TP)	5
	SLO - / DATA -	White (Blue TP)	6
	MA - / CLK -	White (Brown TP)	7
	SLI -	White (Violet TP)	8
	Shield	-	Casing

A.2.4 PR-32CR-11006 – Piezo, Open Loop, High Vacuum Pinout (MMC)

Pinout for PR-32CR-11006		Cable A			Feedthrough	Cable B	
		Dsub9F	Dsub9M				Dsub9M
Description	Color	L1	L2	L3	Color	L4	L5
Phase 1	Red	5	5	1	Red	1	1
Phase 2	White (Green TP)	4	4	2	White (Green TP)	2	2
Ground	Black/Green	1	1	5	Black/Green	5	5
Home Switch	White (Violet TP)	9	9	6	White (Violet TP)	6	6
+5V	White (Grey)	7	7	8	White (Grey)	8	8
GND	Grey	6	6	9	Grey	9	9

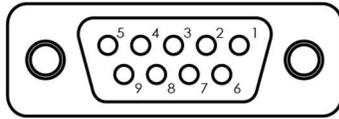
A.2.5 PR-32CR-11306 – Piezo, Digital, High Vacuum Pinout (MMC)

Pinout for PR-32CR-11306		Cable A&B			Feedthrough	Dsub15F	Cable C	Cable D
		Dsub15F			Dsub15M			Dsub9F
Description	Color	L1	L2	L3	Color	L4	L5	L6
Phase 1	Red	1	1	8	Red	8	1	-
Phase 2	White (Green TP)	2	2	7	White (Green TP)	7	2	-
Ground	Black/Green	9	9	15	Black/Green	15	5	-
Shield	-	10	10	14	-	14	Casing	-
A+	Blue	7	7	2	Blue	2	-	1
B+	Brown	4	4	5	Brown	5	-	2
Index+	Violet	14	14	10	Violet	10	-	3
GND	Grey	8	8	1	Grey	1	-	4
+5V	White (Grey TP)	6	6	3	White (Grey TP)	3	-	5
A-	White (Blue TP)	5	5	4	White (Blue TP)	4	-	6
B-	White (Brown TP)	12	12	12	White (Brown TP)	12	-	7
Index-	White (Violet TP)	13	13	11	White (Violet TP)	11	-	8
Shield	-	15	15	9	-	9	-	Casing

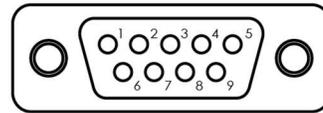
A.2.6 PR-32CR-11506 – Piezo, Absolute, High Vacuum Pinout (MMC)

Pinout for PR-32CR-11506		Cable A&B			Feedthrough	Dsub15F	Cable C	Cable D
		Dsub15F			Dsub15M			Dsub9F
Description	Color	L1	L2	L3	Color	L4	L5	L6
Phase 1	Red	1	1	8	Red	8	1	-
Phase 2	White (Green TP)	2	2	7	White (Green TP)	7	2	-
Ground	Black/Green	9	9	15	Black/Green	15	5	-
Shield	-	10	10	14	-	14	Casing	-
SLO+/Data+	Blue	7	7	2	Blue	2	-	1
MA+/CLK+	Brown	4	4	5	Brown	5	-	2
SLI+	Violet	14	14	10	Violet	10	-	3
Enc GND	Grey	8	8	1	Grey	1	-	4
+5V	White (Grey TP)	6	6	3	White (Grey TP)	3	-	5
SLO-/Data-	White (Blue TP)	5	5	4	White (Blue TP)	4	-	6
MA-/CLK-	White (Brown TP)	12	12	12	White (Brown TP)	12	-	7
SLI-	White (Violet TP)	13	13	11	White (Violet TP)	11	-	8
Shield	-	15	15	9	-	9	-	Casing

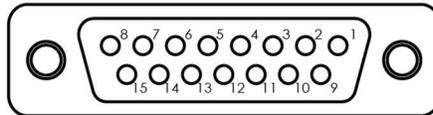
A.3 Standard Dsub Connector Pinout



Dsub9F - Front View
9 Pin Female Connector



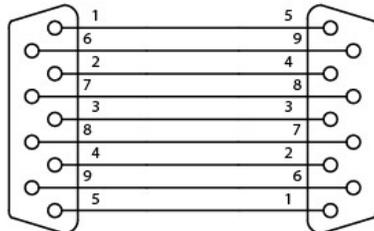
Dsub9M - Front View
9 Pin Male Connector



Dsub15F - Front View
15 Pin Female Connector

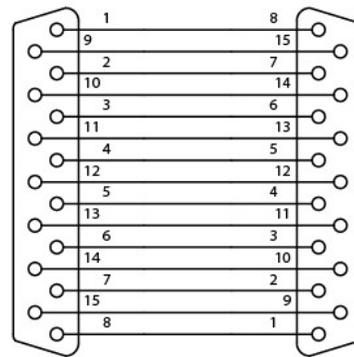
A.4 Vacuum Feedthrough Pinout

Recommended feedthrough pinout based on off the shelf feedthroughs.



Male DB9

Male DB9



Male DB15

Male DB15

A.5 Using the Digital Encoder

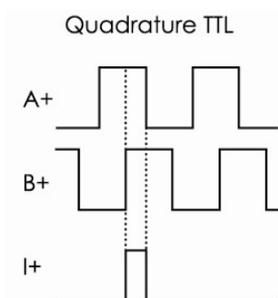
A.5.1 Encoder Overview

The PR-32CR with Digital Encoder must be paired with an appropriate controller. The PR-32CR with a digital encoder will be supplied with a 9-pin connector that incorporates these encoder signals.

A.5.2 Operating and Electrical Specifications

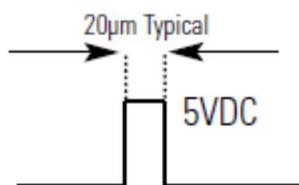
Power Supply	5VDC \pm 10% @ < 35mA (No outputs terminated) @ < 85mA (A, B, I, and both limits terminated); 50mA at the sensor
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A.5.3 Output Signals



***Note:** The index pulse may be aligned with A- or B- at some interpolation values.

A.5.4 Index Window



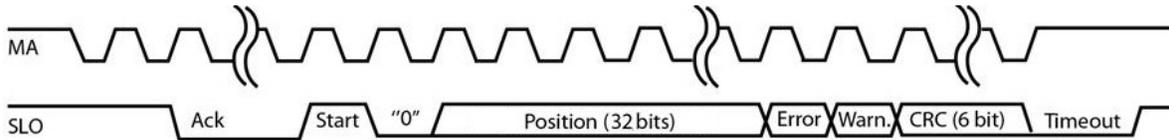
A.5.5 Resolution

For piezo motor, digital encoder resolution of 10µ° is achievable. Resolution is a factory pre-set value.

A.6 Using an Absolute Encoder

A.6.1 Encoder Overview

The Micronix absolute encoder operates using standard BiSS C-mode (continuous) interface, transmitting 32-bits of position data on each request. The controller will clock position acquisitions via the MA signal. The SLO signal will transmit position data from the encoder.

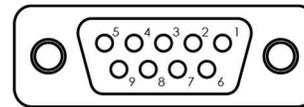


A.6.2 Operating and Electrical Specifications

Power Supply	5VDC ±10% (< 30mA for sensor)
--------------	-------------------------------

A.6.2.1 Absolute Encoder Pinout

Pin DE9S	Description
1	SLO+ / DATA+
2	MA+ / CLK+
3	SLI+
4	Ground
5	+5V
6	SLO- / DATA-
7	MA- / CLK-
8	SLI-
9	Not In Use



Dsub9F - Front View
9 Pin Female Connector

A.6.3 Absolute Encoder Setup

Absolute Encoder BiSS-C	
Absolute Resolution	32 Bits
Encoder BiSS Frequency	5 MHz
Encoder BiSS CRC Polynomial	0
Position Integer Type	Unsigned
Number of Status Bits	0
Error Bits Mask	0
CRC Error Suppression	None
Data Alignment	Left Justified

A.6.1 Resolution

Absolute encoder with an MMC or NanoDrive controller has an achievable resolution of <200 μ°. Resolution is a factory pre-set value.