

PPX-32CR

Series



Precision Positioner Stage Reference Manual (Open and Closed Loop Versions)

PPX-32CR

Piezo Positioner Stage

Reference Manual

Rev 1.00

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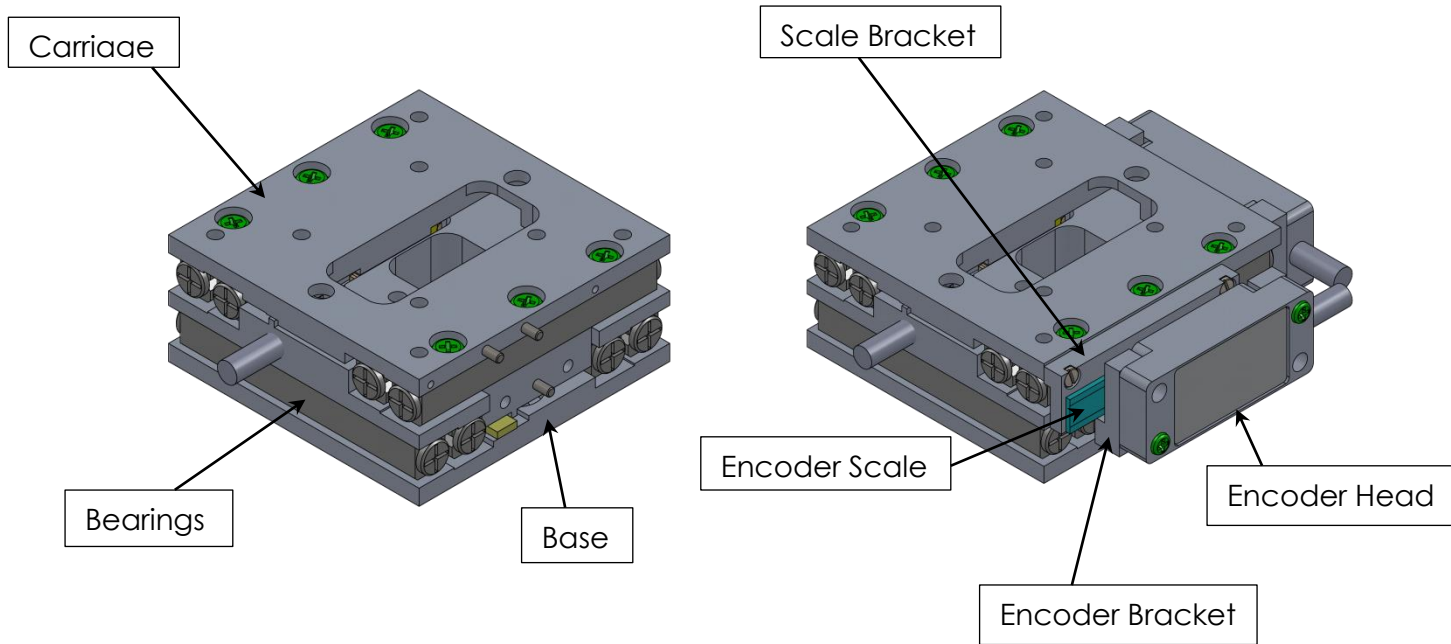
1. Introduction

1.1 Product Description

The PPX-32CR is a low profile XY-stage designed for space saving applications where nano positioning is required. Optional linear encoders provide nanometer repeatability, while a multi-phase motor and two ball slides ensure smooth motion. The PPX-32 can also be combined with the PR-32 rotation stage without the use of an adapter plate.

Features:

- Travel ranges of 18 mm x 18mm
- Load capacity up to 1kg
- 10 nm analog encoder resolution
- Low Profile, 14 mm stage height



PPX-32 Open Loop
(Shown in center position)

PPX-32 Closed Loop
(Shown in center position)

1.2 Recommended Controllers

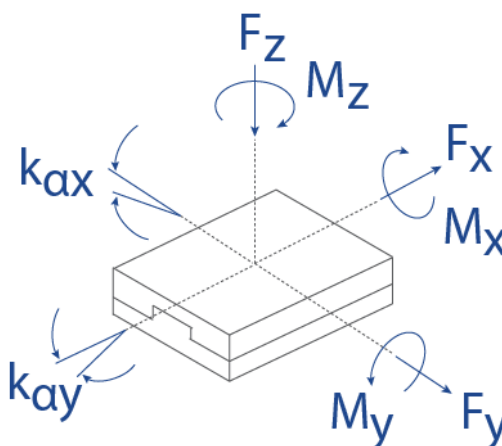
The following controllers are available from MICRONIX USA:

- MMD-100
- MMC-100
- MMC-110

1.3 Technical Data

Motor	PM-002
Speed Max. (mm/sec)	2 (MMC-100), 10 (MMC-110)
Resolution Typical (nm)	1 (open loop), 10 (Analog), 2 (Digital)
Bi-directional Repeatability (nm)	N/A (open loop), ± 50 (with encoder)
Uni-directional Repeatability (nm)	N/A (open loop), 50 (with encoder)

1.4 Load Characteristics



Load Characteristics	$F_{x(N)}$	$F_{y(N)}$	$F_{z(N)}$	$M_{x(Nm)}$	$M_{y(Nm)}$	$M_{z(Nm)}$	k_{ax} [$\mu\text{rad/Nm}$]	k_{ay} [$\mu\text{rad/Nm}$]
PM-002	2	2	10	0.6	0.6	0.6	-	-

2. Model configurations

2.1 PPX-32CR Order Numbers

Order No.	PPX-32CR-	1	1		0	
Piezo Motor PM-002.....	1					
18x18mm Travel.....	1					
None.....	0					
Analog (1V _{pp}).....	2					
Digital (RS-422).....	3					
None.....	0					
Atmospheric.....	0					
High Vacuum, 10 ⁻⁶ mbar.....	6					
Ultra High Vacuum, 10 ⁻⁹ mbar.....	9					

Contact MICRONIX USA for custom version and stacking configurations.

3. Preparing to Install the PPX-32CR

3.1 **Installation Preparation**

When mounting the stage it is important to consider the flatness of the mounting surface, as the stage will conform to the shape of that mounting surface. A surface that is not flat can adversely affect the performance and structural integrity of the stage.

The stage is calibrated and guaranteed to be within specification at 20°C ±5°C. Be sure to use the stage under the following conditions:

- Mount to a clean and flat surface which is free of debris, burrs or dings
- An indoor atmosphere free of corrosive gasses, and condensation
- Temperature range of 0-40°C
- Relative humidity between 20-80%
- Locate away from water, heat, and electrical noise

3.2 **Package Contents**

If 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:

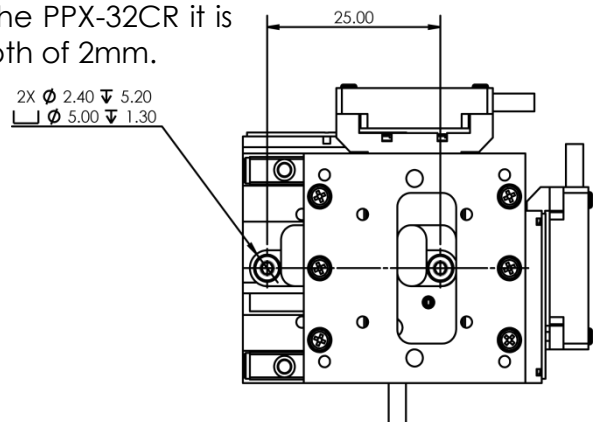
- PPX-32CR Linear Stage
- Reference Manual
- Any other previously agreed upon components such as a controller

4. Installing the PPX-32CR

All mounting patterns require M2 screws for mounting and M1.5 x 5mm dowel pins for precision alignment. Additional brackets and screws may be needed for custom applications.

4.1 **Mounting to the PPX-32CR top plate**

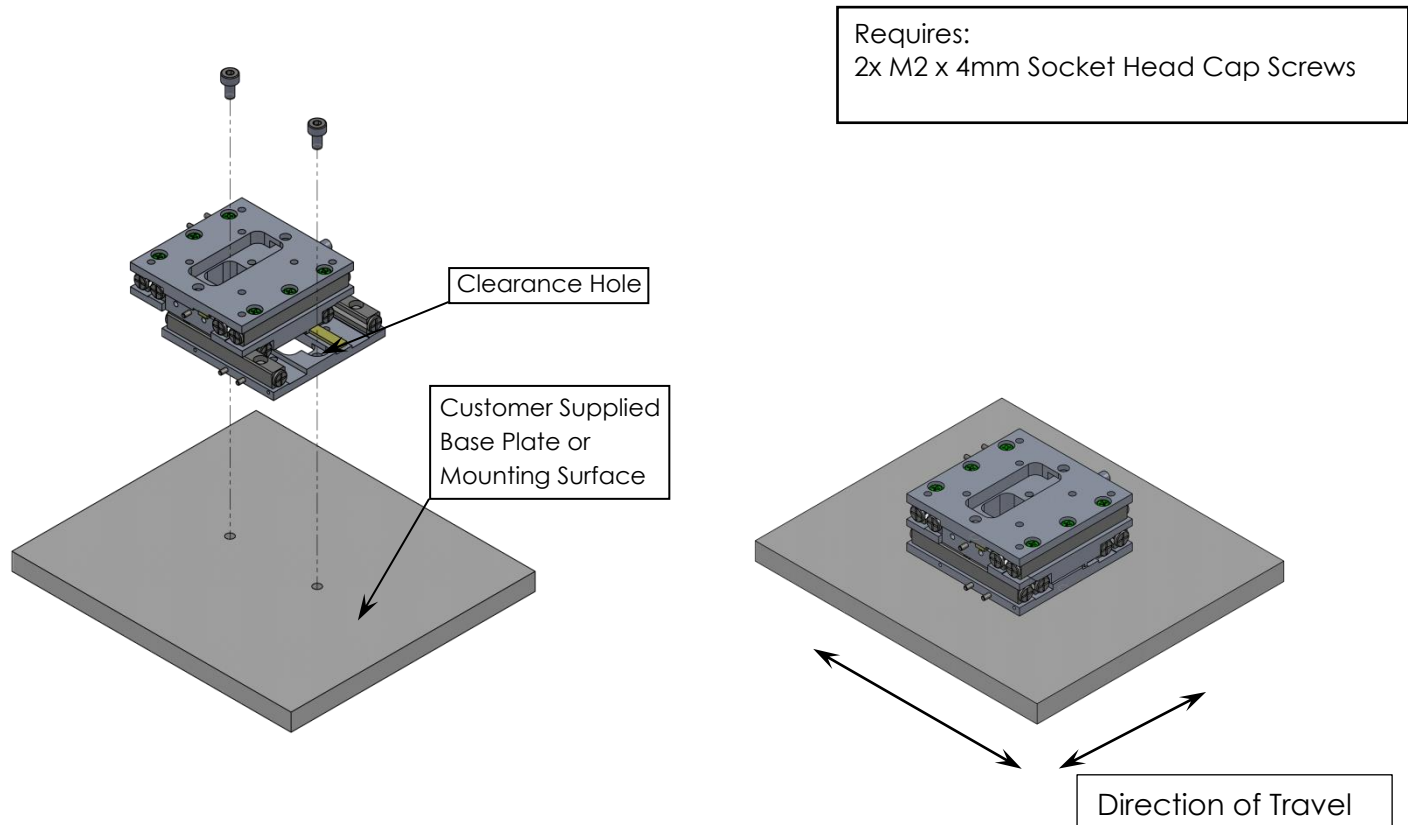
When mounting to the top plate of the PPX-32CR it is important to not exceed a screw depth of 2mm.



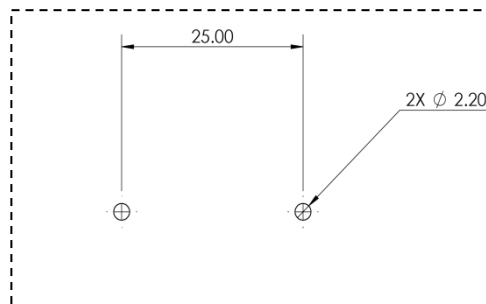
4.2 PPX-32CR Installation

4.2.1 General Mounting

For general mounting configurations, mount the base to the mounting surface. Align carriage with clearance holes to access base mounting pattern.



1. Align the Carriage with the Base Clearance Holes. Install M2 Socket Head Cap Screws.



Base Mounting Pattern

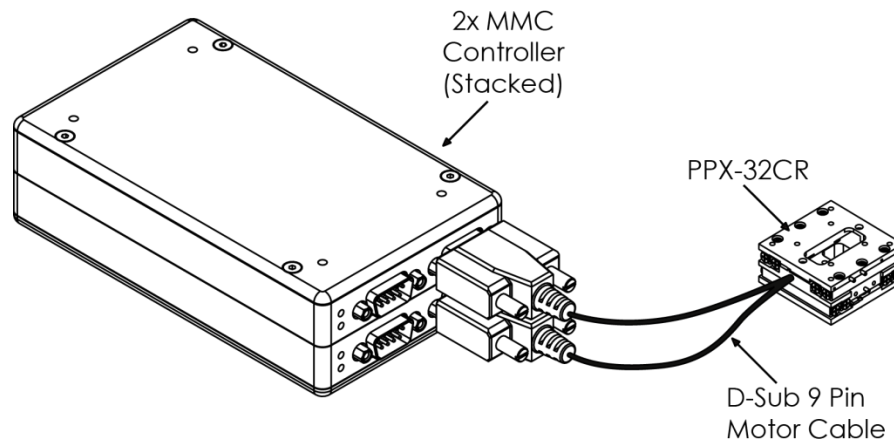
5. Connecting the PPX-32CR

5.1 Atmospheric Environments

For controller information refer to the appropriate MMC controller manual.

5.1.1 Open Loop Installation & wiring Diagram

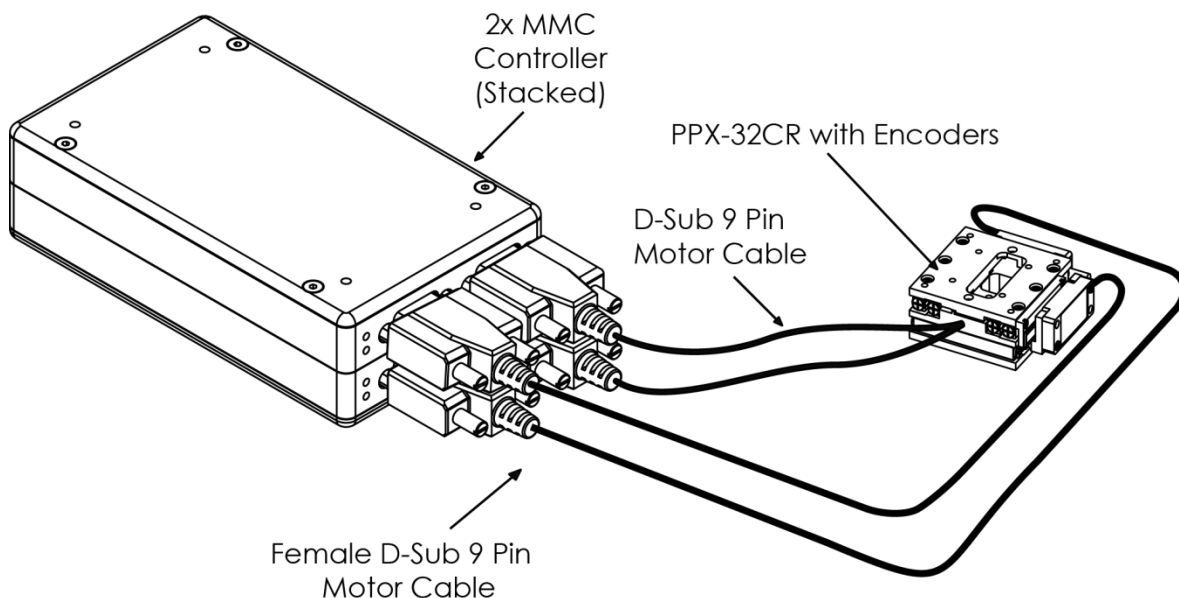
Connecting the PPX-32CR in an open loop only requires that the D-sub 9 Pin Motor Cable be connected to a compatible controller (MMC-100 or MMC-110). Since the PPX-32CR has two motors, two controllers are required for X-Y operation.



For all setups, the MMC-100 controllers may be stacked (as shown above) or connected separately (as shown below), depending on the application.

5.1.2 Closed Loop / Encoder Installation & Wiring Diagram

Using the PPX-32CR stage with an encoder requires a closed loop compatible controller (MMC-100) that recognizes encoder feedback. Connect the stage as shown below.



5.2 Vacuum Environments

5.2.1 Handling and Preparation

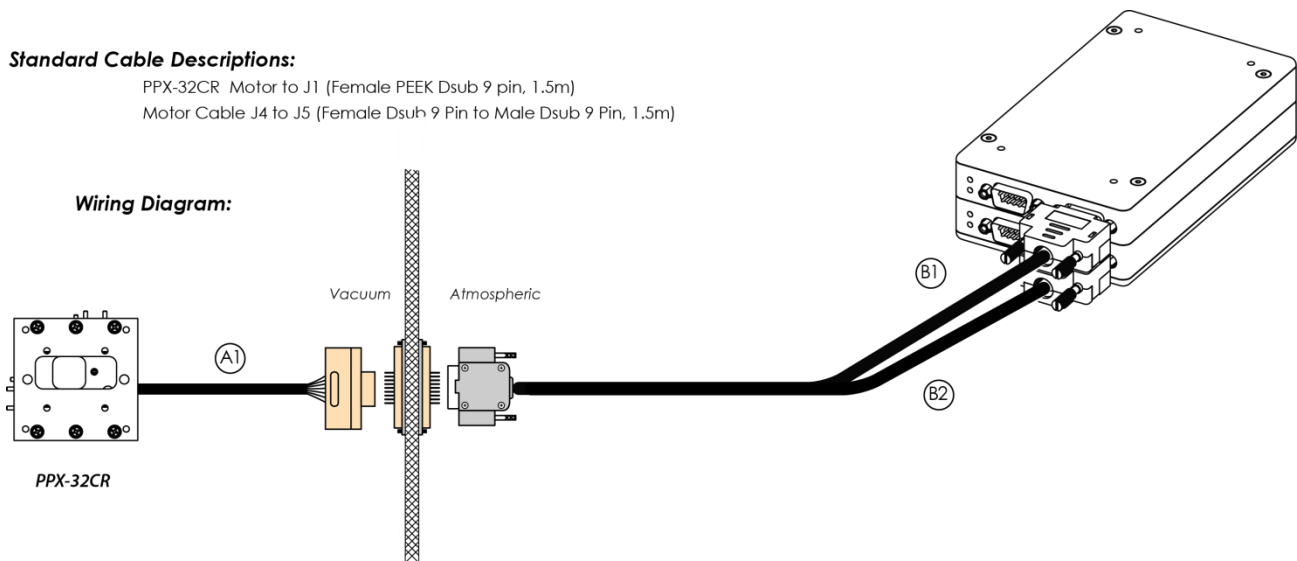
When preparing the stage for vacuum environments, take the necessary precautions (such as wearing gloves, clean room clothing, etc.) when handling the stage as to avoid any contaminants. Maximum Bake-out temperature is 100°C. MICRONIX USA supplies the stage with vacuum compatible connectors: a 9-pin female PEEK connector for open loop, 15-Pin female PEEK connector for closed loop

5.2.2 Open loop Installation & Wiring Diagram

Connecting an open loop PPX-32CR in a vacuum chamber requires the use of a feed through connector at the vacuum chamber wall. The vacuum compatible PPX-32CR will be supplied with wiring for a straight through feed through not a cross over gender changer. MICRONIX USA supplies test connectors that simulate the vacuum feed through to allow functionality test prior to installation in a vacuum chamber. For details regarding the pin-out and feed through specifications see the Appendix A.3.

Standard Cable Descriptions:

- PPX-32CR Motor to J1 (Female PEEK Dsub 9 pin, 1.5m)
- Motor Cable J4 to J5 (Female Dsub 9 Pin to Male Dsub 9 Pin, 1.5m)



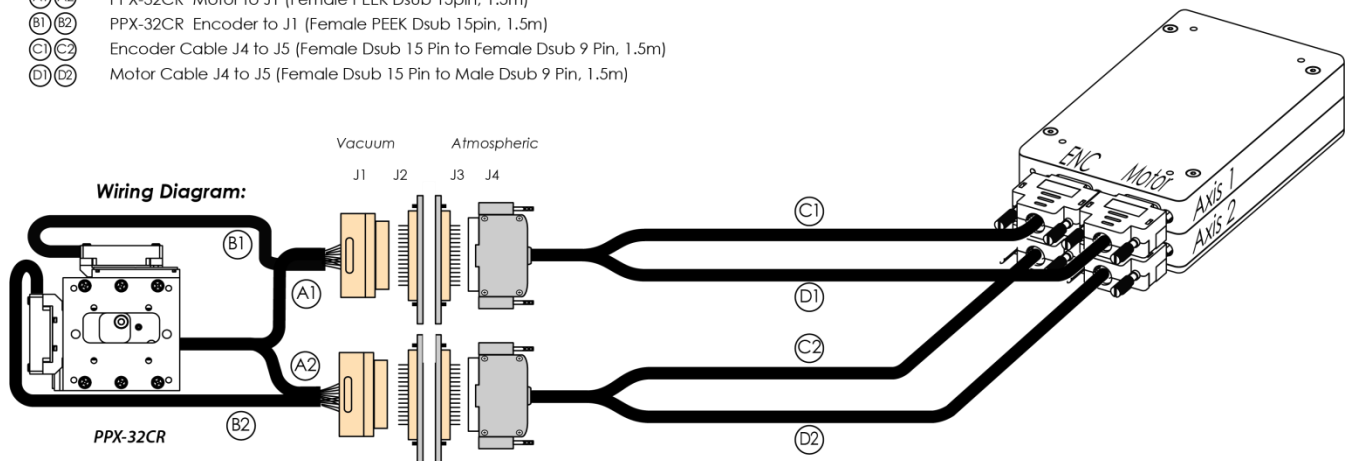
5.2.3 Closed Loop / Encoder Installation & Wiring Diagram

Closed loop installation of the PPX-32CR stage in vacuum environments requires an intermediate feed through connector at the vacuum chamber wall that can accommodate both the motor cable, and the encoder cable.

The vacuum compatible PPX-32CR will be supplied with wiring for a straight through feed through not a cross over gender bender. MICRONIX USA supplies test connectors that simulate the vacuum feed through to allow functionality test prior to installation in a vacuum chamber. For details regarding the pin-out and feed through specifications see the Appendix A.4.5.

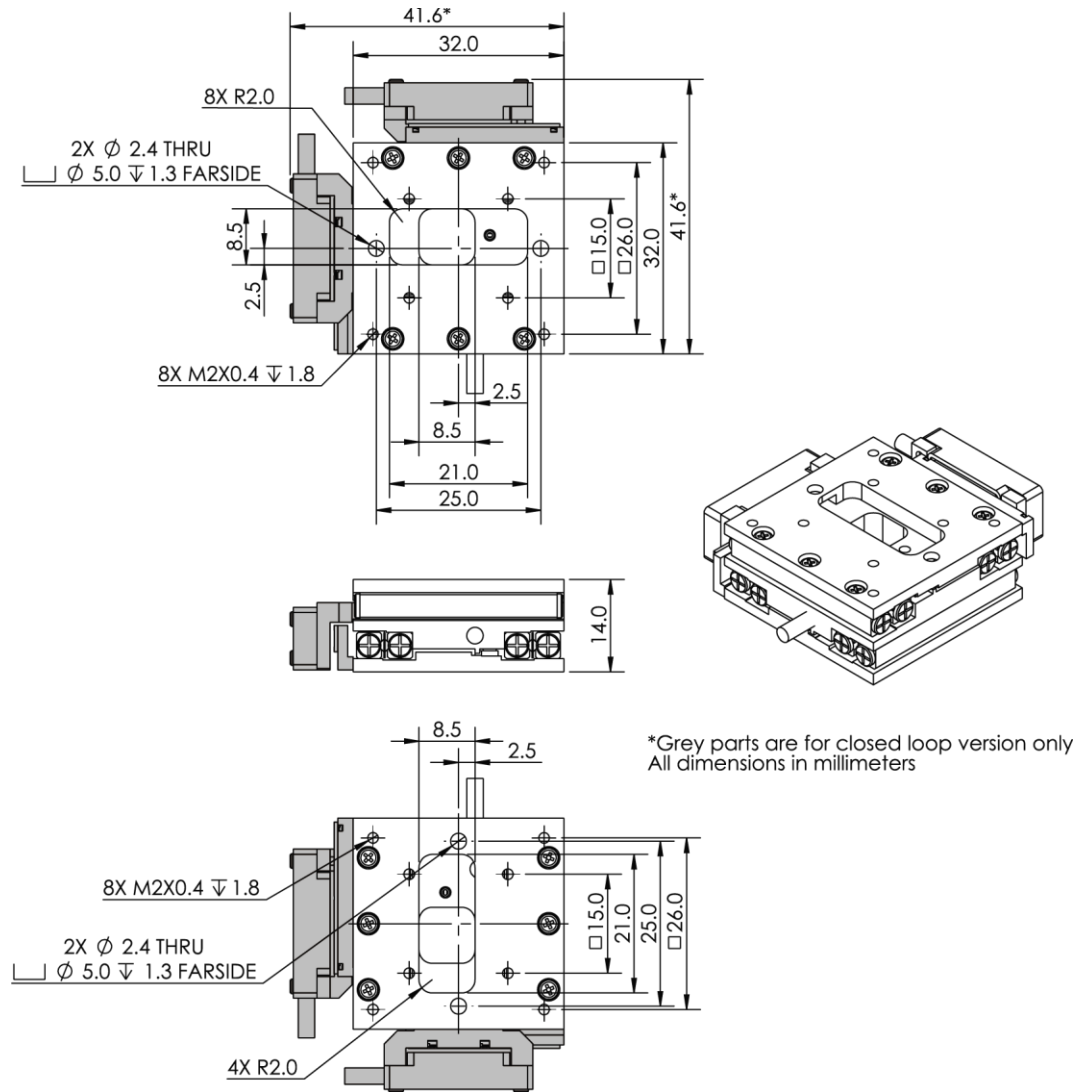
Standard Cable Descriptions:

- (A1) (A2) PPX-32CR Motor to J1 (Female PEEK Dsub 15pin, 1.5m)
- (B1) (B2) PPX-32CR Encoder to J1 (Female PEEK Dsub 15pin, 1.5m)
- (C1) (C2) Encoder Cable J4 to J5 (Female Dsub 15 Pin to Female Dsub 9 Pin, 1.5m)
- (D1) (D2) Motor Cable J4 to J5 (Female Dsub 15 Pin to Male Dsub 9 Pin, 1.5m)



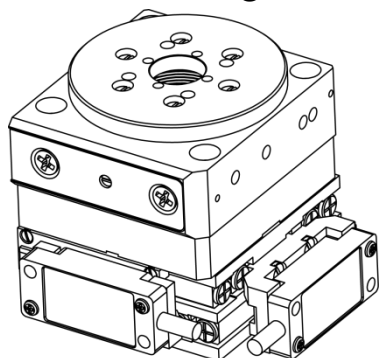
6. Technical Specifications

6.1 Dimensions

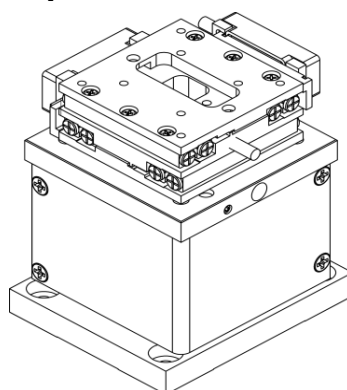


7. Stacking Configuration

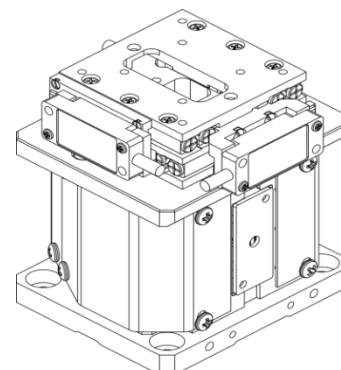
7.1 Configuration Examples (Additional configurations available upon request)



PPX-32CR & PR-32



PPX-32CR & ES-50



PPX-32CR & ES-50 Piezo

8. Supplementary Information

8.1 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

8.2 Maintenance

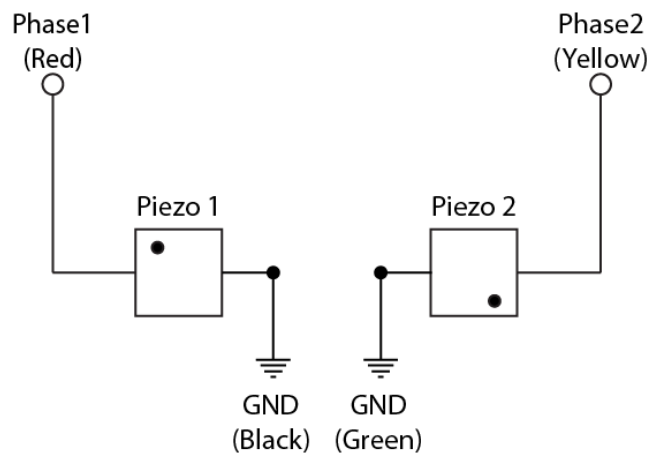
- The PPX-32CR series of linear X-Y stages utilizes a maintenance free design. Do not modify the stage or perform any maintenance unless specifically instructed to do so by MICRONIX USA personal. If the stage is not performing up to the original specifications, please contact MICRONIX USA.
- The PPX-32CR linear X-Y stage is a precision mechanical device and should be handled with care. Do not drop or mishandle the stage.
- Do not touch the bearings, as this will contaminate the lubrication and jeopardize the longevity of the stage.
- Follow the *Installation Preparation* requirements and use proper cable management to ensure a clean and safe operating environment.

A. Appendix

A.1 DB-9 Male Motor Connector

Pin	Description	Color
1	Phase 1	Red or Blue
2	Phase 2	Yellow or Orange
3	N/C	N/C
4	Not In Use	N/C
5	Ground	Black & Green or Brown & Violet
6	+5V(output)	N/C
7	+5V(output)	N/C
8	Not In Use	N/C
9	Not in Use	N/C

A.2 2-Phase Piezo Motor Wiring Diagram

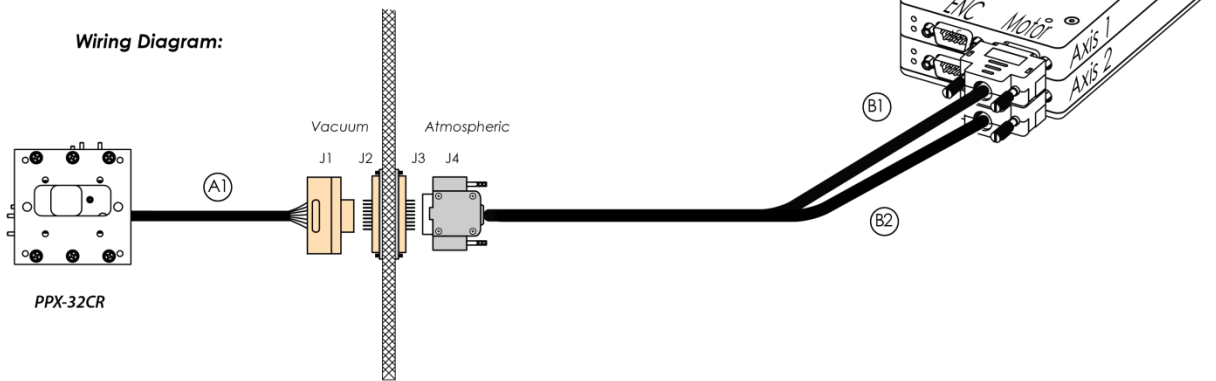


A.3 Open Loop Vacuum Wiring

Diagram

Standard Cable Descriptions:

- (A1) PPX-32CR Motor to J1 (Female PEEK Dsub 9 pin, 1.5m)
- (B1) (B2) Motor Cable J4 to J5 (Female Dsub 9 Pin to Male Dsub 9 Pin, 1.5m)

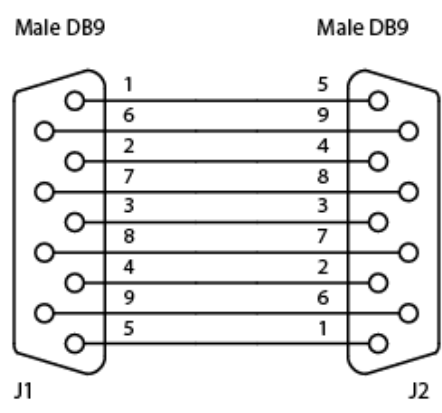


Pinout for Axis 1&2 Cables A1, B1, B2

Description:	Color	J1	J2	J3	J4	J5
X-Phase 1	Red	1	1	5	5 (Red)	1
X-Phase 2	Yellow	2	2	4	4 (White - Green TP)	2
X-Ground	Black/Green	6	6	9	9 (Black & Green)	5
Shield	-	7	7	8	8 (Shield)	Casing
Y-Phase 1	Blue	5	5	1	1 (Blue)	1
Y-Phase 2	Orange	4	4	2	2 (Violet)	2
Y-Ground	Violet/Brown	9	9	6	6 (White - Blue&Viol. TP)	5
Shield	-	8	8	7	7 (Shield)	Casing



A.3.1 Db9 Straight Through Feed Through



A.4 Using an Analog encoder

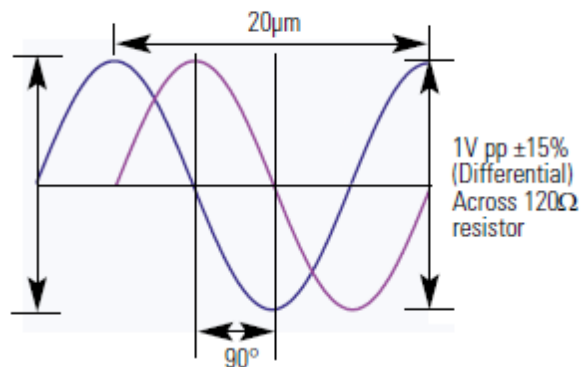
A.4.1 Encoder Pin-out

Pin	Color	Description
1	Brown	A+/Cos+
2	Red	B+/Sin+
3	Orange	Index +
4	Yellow	Ground
5	Green	+5V
6	Blue	A-/Cos-
7	Purple	B-/Sin-
8	Grey	Index -
9	Black	Not In Use

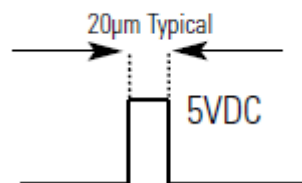
A.4.2 Operating and Electrical Specifications

Power Supply	5VDC \pm 5% @ 330mA (60mA for sensor)
Operating Temperature	0 to 70°C
Humidity	10 - 90% RH non-condensing

A.4.3 Analog Output (Pins 1,2,6, and 7)



A.4.4 Index Window (Pin 3)



A.4.5 Resolution

Interpolation done in controller to a higher resolution as specified in the sales order. With an analog encoder the MMC-100 has an achievable Resolution down to 10nm.

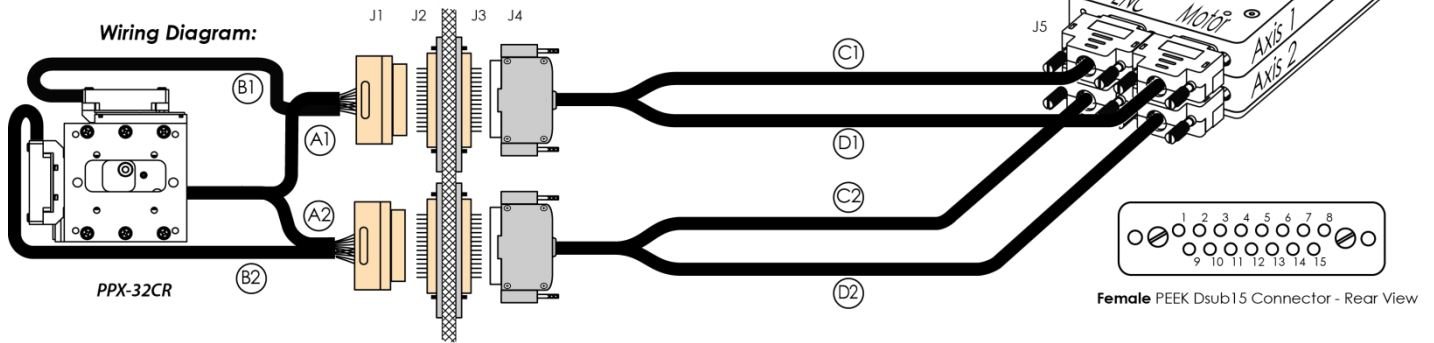
A.4.6 Analog Encoder Wiring Diagram

Pinout for Axis 1 Cables A1, B1, C1, D1

Description:	Color	J1	J2	J3	J4	J5
A1 & D1 Phase 1	Red	1	1	8	8 (Red)	1
Phase 2	Yellow	2	2	7	7 (White - Green TP)	2
Ground	Black/Green	9	9	15	15 (Black & Green)	5
Shield	-	10	10	14	14 (Shield)	Casing
B1 & C1 GND	Black	8	8	1	1 (Black)	4
Cos+	Brown	7	7	2	2 (Brown)	1
+5V	Red	6	6	3	3 (Red)	5
Cos-	Orange	5	5	4	4 (White-Brown TP)	6
Sin+	Yellow	4	4	5	5 (Yellow)	2
Sin-	Green	12	12	12	12 (White - Yellow TP)	7
Index-	Blue	13	13	11	11 (White - Violet TP)	8
Index+	Violet	14	14	10	10 (Violet)	3
Shield	-	15	15	9	9 (Shield)	Casing

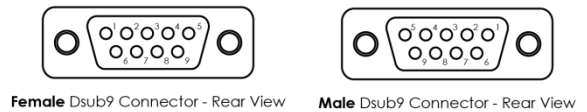
Standard Cable Descriptions:

- (A1) (A2) PPX-32CR Motor to J1 (Female PEEK Dsub 15pin, 1.5m)
- (B1) (B2) PPX-32CR Encoder to J1 (Female PEEK Dsub 15pin, 1.5m)
- (C1) (C2) Encoder Cable J4 to J5 (Female Dsub 15 Pin to Female Dsub 9 Pin, 1.5m)
- (D1) (D2) Motor Cable J4 to J5 (Female Dsub 15 Pin to Male Dsub 9 Pin, 1.5m)

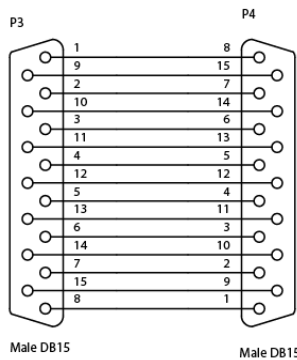


Pinout for Axis 2 Cables A2, B2, C2, D2

Description:	Vac Color	J1	J2	J3	J4	J5
A2 & D2 Phase 1	Blue	1	1	8	8 (Red)	1
Phase 2	Orange	2	2	7	7 (White - Green TP)	2
Ground	Violet/Brown	9	9	15	15 (Black&Green)	5
Shield	-	10	10	14	14 (Shield)	Casing
B2 & C2 GND	Black	8	8	1	1 (Black)	4
Cos+	Brown	7	7	2	2 (Brown)	1
+5V	Red	6	6	3	3 (Red)	5
Cos-	Orange	5	5	4	4 (White - Brown TP)	6
Sin+	Yellow	4	4	5	5 (Yellow)	2
Sin-	Green	12	12	12	12 (White - Yellow TP)	7
Index-	Blue	13	13	11	11 (White - Violet TP)	8
Index+	Violet	14	14	10	10 (Violet)	3
Shield	-	15	15	9	9 (Shield)	Casing



A.4.7 Straight Through 15-Pin Feed Through



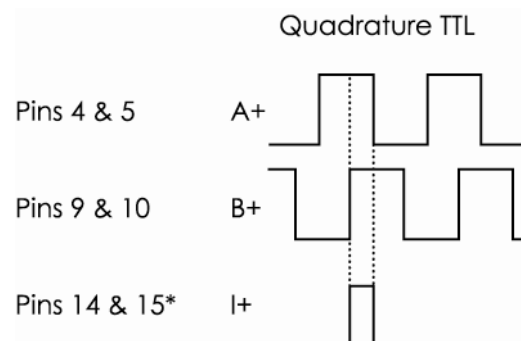
A.5 Using the Encoder Module

When connected, the Encoder Module should display two green LED's indicating a power source and proper encoder alignment. A Red or Yellow LED indicates misalignment of the Encoder Head, if this occurs contact MICRONIX USA. Do not manually adjust the Encoder Head or scale. For more information refer to MicroE Systems Mercury Encoders

A.5.1 Operating and Electrical Specifications

Power Supply	5VDC \pm 5% @ 330mA (30mA for sensor)
Operating Temperature	0 to 70°C
Humidity	10 - 90% RH non-condensing

A.5.2 Output Signals



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

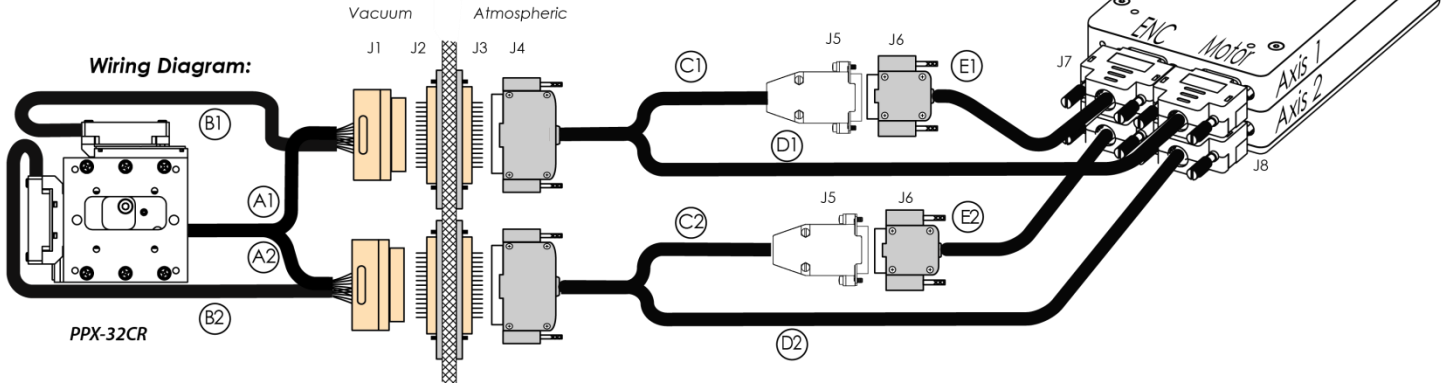
A.5.3 Digital Encoder Wiring Diagram

Pinout for Axis 1 Cables A1, B1, C1, D1

		Description:	Color	J1	J2	J3	Atmo Color	J4	J7	J8
Motor	A1 & D1	Phase 1	Red	1	1	8	Red	8	-	1
		Phase 2	Yellow	2	2	7	White - Green TP	7	-	2
		Ground	Black/Green	9	9	15	Black & Green	15	-	5
		Shield	-	10	10	14	-	14	-	Casing
Encoder	B1, C1, E1	GND	Black	8	8	1	Black	1	4	
		Cos+	Brown	7	7	2	Brown	2	1	
		+5V	Red	6	6	3	Red	3	5	
		Cos-	Orange	5	5	4	Orange	4	6	
		Sin+	Yellow	4	4	5	Yellow	5	2	
		Sin-	Green	12	12	12	Green	12	7	
		Index-	Blue	13	13	11	Blue	11	8	
		Index+	Violet	14	14	10	Violet	10	3	
		Shield	-	15	15	9	-	9	-	Casing

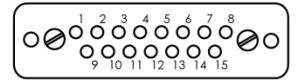
Standard Cable Descriptions:

- (A1) (A2) PPX-32CR Motor to J1 (Female PEEK Dsub 15pin, 1.5m)
- (B1) (B2) PPX-32CR Encoder to J1 (Female PEEK Dsub 15pin, 1.5m)
- (C1) (C2) M3500 Breakout Cable J4 to J5 (Female Dsub 15 Pin to M3500 Encoder, 1.0m)
- (D1) (D2) Motor Breakout Cable J4 to J8 (Female Dsub 15 Pin to Male Dsub 9 Pin, 1.5m)
- (E1) (E2) Encoder Adapter J6 to J7 (Female Dsub 15 Pin to Female Dsub 9pin, 1.5m)

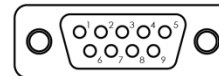


Pinout for Axis 2 Cables A2, B2, C2 D2

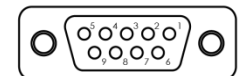
		Description:	Vac Color	J1	J2	J3	Atmo Color	J4	J7	J8
Motor	A2 & D2	Phase 1	Blue	1	1	8	Red	8	-	1
		Phase 2	Orange	2	2	7	White - Green TP	7	-	2
		Ground	Violet/Brown	9	9	15	Black & Green	15	-	5
		Shield	-	10	10	10	-	14	-	Casing
Encoder	B2, C2, E2	GND	Black	8	8	1	Black	1	4	
		Cos+	Brown	7	7	2	Brown	2	1	
		+5V	Red	6	6	3	Red	3	5	
		Cos-	Orange	5	5	4	Orange	4	6	
		Sin+	Yellow	4	4	5	Yellow	5	2	
		Sin-	Green	12	12	12	Green	12	7	
		Index-	Blue	13	13	11	Blue	11	8	
		Index+	Violet	14	14	10	Violet	10	3	
		Shield	-	15	15	9	-	9	-	Casing



Female PEEK Dsub15 Connector - Rear View



Female Dsub9 Connector - Rear View



Male Dsub9 Connector - Rear View

Note: Standard Pinouts for all configurations of J6 & J7