



ABRX Hardware Manual

Revision: 1.00.00



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Safety Procedures and Warnings

This manual tells you how to carefully and correctly use and operate the ABRX.

- Read all parts of this manual before you install or operate the ABRX or before you do maintenance to your system.
- To prevent injury to you and damage to the equipment, obey the precautions in this manual.
- Aerotech continually improves its product offerings; listed options may be superseded at any time. All drawings and illustrations are for reference only and were complete and accurate as of this manual's release. Refer to www.aerotech.com for the most up-to-date information.

If you do not understand the information in this manual, contact Aerotech Global Technical Support.

NOTE: This product has been designed for light industrial manufacturing or laboratory environments. If the product is used in a manner not specified by the manufacturer: The protection provided by the equipment could be impaired. The life expectancy of the product could be decreased.



DANGER: This product contains potentially lethal voltages. To reduce the possibility of electrical shock, bodily injury, or death the following precautions must be followed.

1. Access to the ABRX and component parts must be restricted while connected to a power source.
2. Do not connect or disconnect any electrical components or connecting cables while connected to a power source.
3. Disconnect electrical power before servicing equipment.
4. All components must be properly grounded in accordance with local electrical safety requirements.
5. Operator safeguarding requirements must be addressed during final integration of the product.



WARNING: To minimize the possibility of electrical shock, bodily injury or death the following precautions must be followed.

1. Moving parts can cause crushing or shearing injuries. Access to all stage and motor parts must be restricted while connected to a power source.
2. Cables can pose a tripping hazard. Securely mount and position all system cables to avoid potential hazards.
3. Do not expose this product to environments or conditions outside of the listed specifications. Exceeding environmental or operating specifications can cause damage to the equipment.
4. The ABRX must be mounted securely. Improper mounting can result in injury and damage to the equipment.
5. Use care when moving the ABRX. Lifting or transporting the ABRX improperly can result in injury or damage to the ABRX.
6. If the product is used in a manner not specified by the manufacturer, the protection provided by the product can be impaired and result in damage, shock, injury, or death.
7. Operators must be trained before operating this equipment.
8. All service and maintenance must be performed by qualified personnel.

EU Declaration of Incorporation

Manufacturer: Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA 15238-2811
USA

herewith declares that the product:

ABRX Air-Bearing Direct Drive Rotary Stage
is intended to be incorporated into machinery to constitute machinery covered by the Directive 2006/42/EC as amended;

and that the following harmonized European standards have been applied:

EN ISO 12100:2010

Safety of machinery - Basic concepts, general principles for design

EN 60204-1:2010

Safety of machinery - Electrical equipment of machines - Part 1: General requirements

and further more declares that

it is not allowed to put the equipment into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of the Directive 2006/42/EC and with national implementing legislation, for example, as a whole, including the equipment referred to in this Declaration.

This is to certify that the aforementioned product is in accordance with the applicable requirements of the following Directive(s):

2011/65/EU

RoHS 2 Directive

EU 2015/863

Amendment RoHS 3 Directive

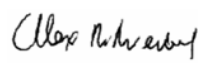
Authorized Representative:



/ Simon Smith, European Director

Aerotech Ltd
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UK

Engineer Verifying Compliance



/ Alex Weibel

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Pittsburgh, PA 15238-2811
USA

Date

10/8/2021



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Chapter 1: Overview

Table 1-1: Model Options

ABRX Series Air-Bearing Direct-Drive Rotary Stage	
ABRX100	100 mm wide air-bearing rotary stage
ABRX150	150 mm wide air-bearing rotary stage
ABRX250	250 mm wide air-bearing rotary stage
Feedback (Required)	
-E1	Incremental analog sinewave encoder, 1Vp-p
-E2	Incremental analog sinewave encoder, 1Vp-p, high performance
-E3	Incremental encoder, digital RS422, 0.13 arc sec electrical resolution
Accessories (To be Ordered as a Separate Line Item)	
-ABF	Air bearing filtration kit

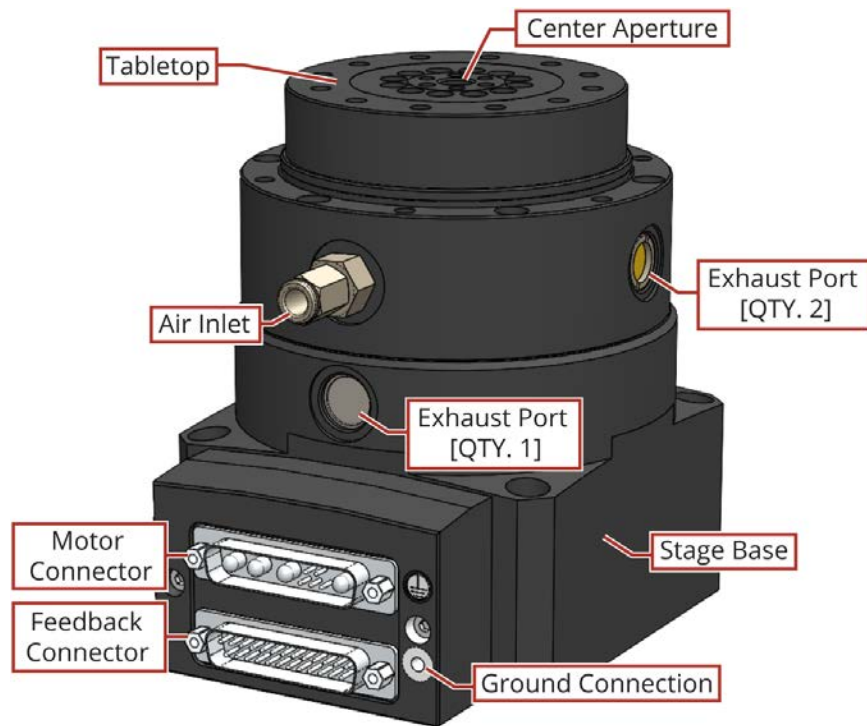


Figure 1-1: ABRX Series Rotary Air-Bearing Stage

1.1. Environmental Specifications

Table 1-2: Environmental Specifications

Ambient Temperature	Operating: 10° to 35° C (50° to 95° F) The optimal operating temperature is 20° C \pm 2° C (68° F \pm 4° F). If at any time the operating temperature deviates from 20° C, degradation in performance could occur.
	Storage: 0° to 40° C (32° to 104° F) in original shipping packaging
Humidity	Operating: 20% to 60% RH
	Storage: 10% to 70% RH, non-condensing in original packaging
Altitude	Operating: 0 m to 2,000 m (0 ft to 6,562 ft) above sea level Contact Aerotech if your specific application involves use above 2,000 m or below sea level.
Vibration	Use the system in a low vibration environment. Excessive floor or acoustical vibration can affect system performance. Contact Aerotech for information regarding your specific application.
Protection Rating	The ABRX stages are not suited for dusty or wet environments. This equates to an ingress protection rating of IP00.
Use	Light industrial, laboratory indoor environments only.



WARNING: Do not expose this product to environments or conditions outside of the listed specifications. Exceeding environmental or operating specifications can cause damage to the equipment.

1.2. Accuracy and Temperature Effects

Aerotech products are designed for and built in a 20°C (68°F) environment. Extreme temperature changes could cause a decrease in performance or permanent damage to the ABRX. At a minimum, the environmental temperature must be controlled to within 0.25°C per 24 hours to ensure the ABRX specifications are repeatable over an extended period of time. The severity of temperature effects on all specifications depends on many different environmental conditions, including how the ABRX is mounted. Contact the factory for more details.

1.3. Basic Specifications

NOTE: Aerotech continually improves its product offerings; listed options may be superseded at any time. All drawings and illustrations are for reference only and were complete and accurate as of this manual's release. Refer to www.aerotech.com for the most up-to-date information.

Resolution is dependent upon the encoder resolution and the controller interpolation.

Table 1-3: ABRX Series Specifications

ABRX Series		ABRX100	ABRX150	ABRX250
Travel		360° Continuous		
Accuracy ⁽¹⁾	Standard	± 1 arc sec		
	High-Performance	± 0.5 arc sec		
Bidirectional Repeatability ⁽¹⁾		± 0.2 arc sec		
Resolution (Minimum Incremental Motion) ⁽²⁾		0.05 arc sec	0.03 arc sec	0.02 arc sec
Total Tilt Error Motion ^(1, 3)		0.2 arc sec	0.2 arc sec	0.1 arc sec
Total Axial Error Motion ^(1, 3)		25 nm	25 nm	30 nm
Total Radial Error Motion ^(1, 3)		25 nm	25 nm	30 nm
Maximum Speed ⁽⁴⁾		1500 rpm	1200 rpm	800 rpm
Maximum Torque	Peak	1.16 N·m	2.84 N·m	9.35 N·m
	Continuous	0.19 N·m	0.44 N·m	2.34 N·m
Load Capacity ⁽⁵⁾	Axial	17 kg	40 kg	110 kg
	Radial	7 kg	14 kg	72 kg
	Tilt	3.8 N·m	10 N·m	110 N·m
Operating Pressure ^(6, 7)		80 psig		
Air Consumption ⁽⁷⁾		18 SLPM	25 SLPM	30 SLPM
Rotor Inertia		0.0005 kg·m ²	0.0022 kg·m ²	0.0308 kg·m ²
Stage Mass		3.2 kg	6.7 kg	25.4 kg
Material		Aluminum		
1. Certified with each stage. Requires the use of an Aerotech controller. 2. With the -E2 feedback option 3. All error motion specifications are measured at 60 rpm. 4. Maximum speed based on stage capability assuming 340 VDC bus and balanced loading conditions. Maximum application speed could be limited by the system resolution and data rate. Consult the factory for more information. 5. Maximum loads are mutually exclusive. 6. To monitor the air-bearing supply, use an under-pressure switch that is interfaced to the stage controller I/O (refer to Section 1.4. Air Requirements). 7. Air supply must be clean, dry to 0° F dew point and filtered to 0.25 µm or better. Recommend nitrogen at 99.9% purity.				

1.4. Air Requirements



WARNING: Wear eye protection when you are close to compressed air components.



WARNING: Do not attempt to rotate the stage table until the air supply has been installed. Moving the stage table without air supplied can cause permanent damage to the stage.

Connect the air supply hose to the air inlet fitting. The location of the air inlet is shown in the dimensional drawings ([Section 2.2.](#)).

It is important to the operation of the ABRX that the air supply meets Aerotech specifications.

- For nitrogen (preferred), the nitrogen must be 99.99% pure and filtered to 0.25 microns. Filtration is required to prevent particles from clogging the air bearing orifices and other parts.
- For compressed air, the air must be filtered to 0.25 microns, dry to 0°F dew point, and oil free.

Air pressure must be in the range of 551 kPa \pm 34 kPa (80 psi \pm 5 psi) with an airflow rate of 56 SLPM (standard liters per minute) at 551 kPa for a single axis. Aerotech recommends that you connect the air supply with a polyurethane air hose.

Aerotech also recommends that you install a pressure switch (Aerotech P/N: MCA03094) tied to the emergency stop (ESTOP) of the motion controller that will remove power to the air bearing if pressure drops below 40 psi. A drop in pressure could result in contact between bearing surfaces which could cause damage to the surfaces. Aerotech's ABF accessory kit incorporates air filtration plus a pressure monitoring switch.

1.5. Vacuum Operation

The ABRX is an air-bearing stage and is not compatible with operation in a vacuum environment. Contact Aerotech for alternate solutions.

Chapter 2: Installation



WARNING: ABRX installation must be in accordance to instructions provided by this manual and any accompanying documentation. Failure to follow these instructions could result in injury or damage to the equipment.

2.1. Unpacking and Handling the Stage



DANGER/HEAVY: Do not attempt to manually lift a stage that is too heavy (in excess of 18 kg). Refer to [Section 1.3](#). for stage mass specifications.

- Do not attempt to manually lift heavy loads single handed.
- Use a fork lift or cart to transport the stage.



WARNING: It is the customer's responsibility to safely and carefully lift the stage.

- Make sure that all moving parts are secure before moving the ABRX. Unsecured moving parts may shift and cause bodily injury.
- Improper handling could adversely affect the performance of the ABRX. Use care when moving the ABRX.

NOTE: If any damage has occurred during shipping, report it immediately.

Carefully remove the ABRX stage from its protective shipping container.

- Lift only from the base or, for the ABRX250, use the hoist rings ([Figure 2-1](#))
- Do not use any of the cables as lifting points.
- Do not use the tabletop as a lifting point.



WARNING: Do not attempt to rotate the stage table until the air supply, detailed in [Section 1.4.](#), has been installed. Moving the stage table without air supplied can cause permanent damage to the stage.

Gently set the ABRX stage on a smooth, flat, and clean surface.

Allow the stage to stabilize at room temperature for at least 12 hours before you attempt to operate it. A stabilized stage will ensure that all of the alignments, preloads, and tolerances are the same as they were when tested at Aerotech. Use compressed nitrogen or clean, dry, oil-free air to remove any dust or debris that has collected during shipping.

Each ABRX has a label listing the system part number and serial number. These numbers contain information necessary for maintaining or updating system hardware and software. Locate this label and record the information for later reference.

Shipping Clamps

Shipping clamps (typically red, anodized aluminum) have been installed to secure the system prior to shipment.



WARNING: Make sure that you install the air supply before you remove the shipping clamps (refer to [Section 1.4.](#)).

Remove the shipping clamps prior to machine start up.

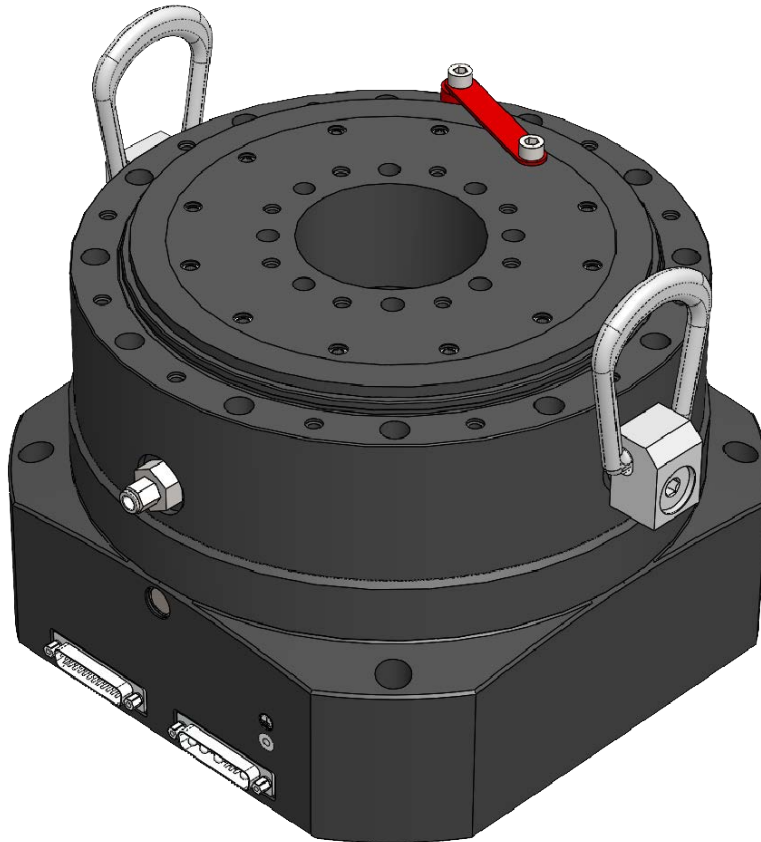


Figure 2-1: ABRX250 with Shipping Clamps and Hoist Rings

2.2. Dimensions

NOTE: Aerotech continually improves its product offerings; listed options may be superseded at any time. All drawings and illustrations are for reference only and were complete and accurate as of this manual's release. Refer to www.aerotech.com for the most up-to-date information.

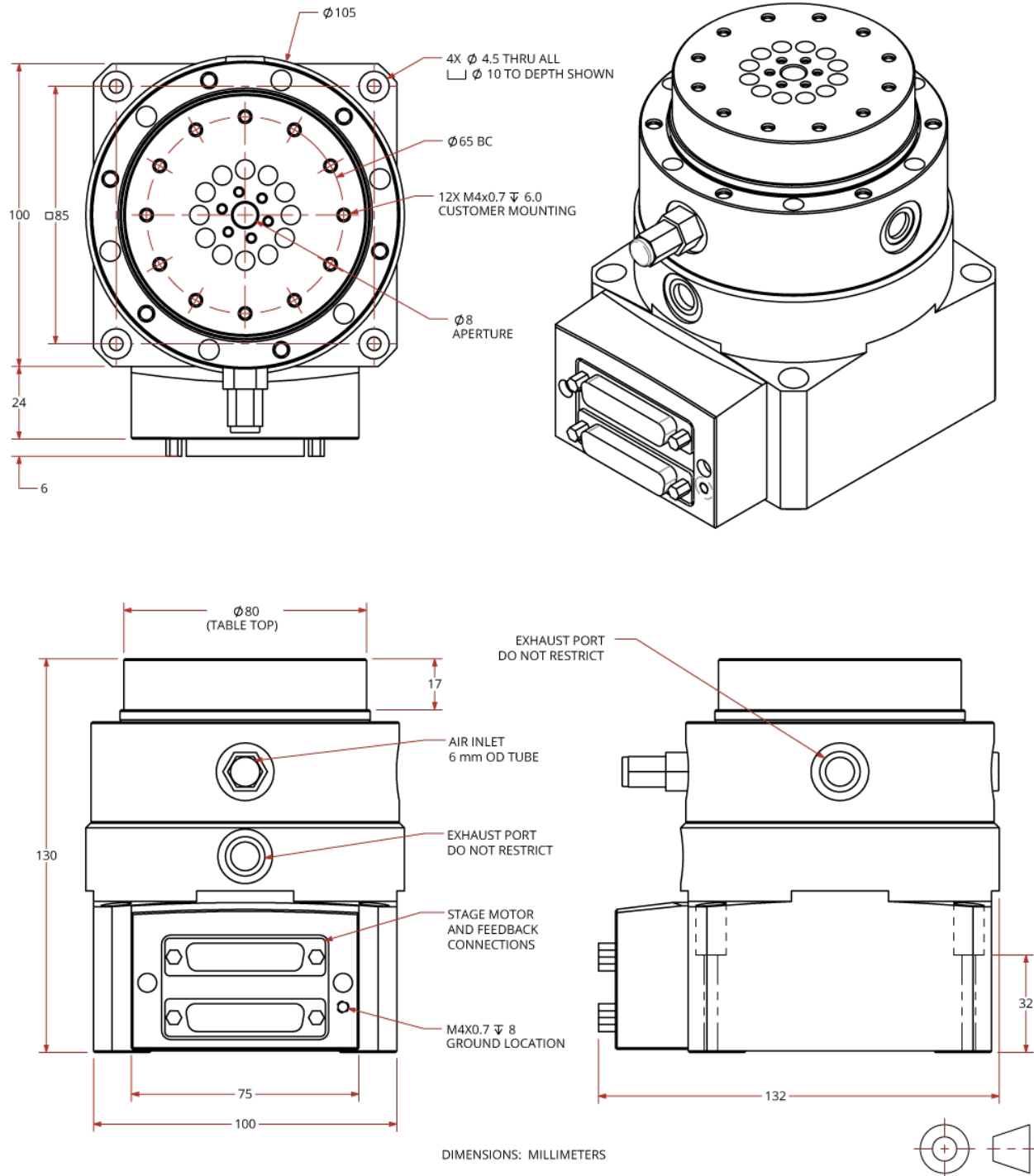


Figure 2-2: ABRX100 Dimensions

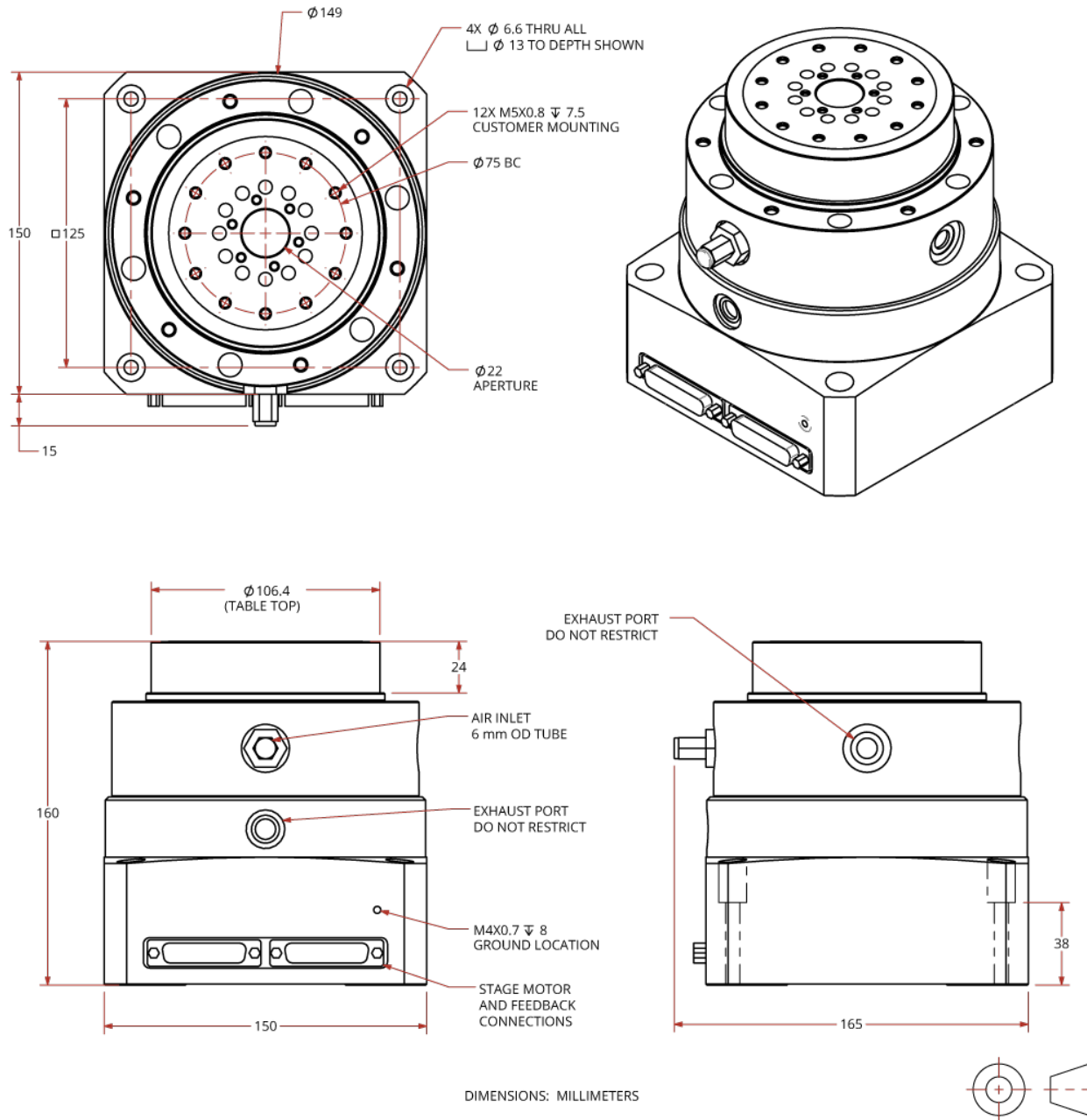


Figure 2-3: ABRX150 Dimensions

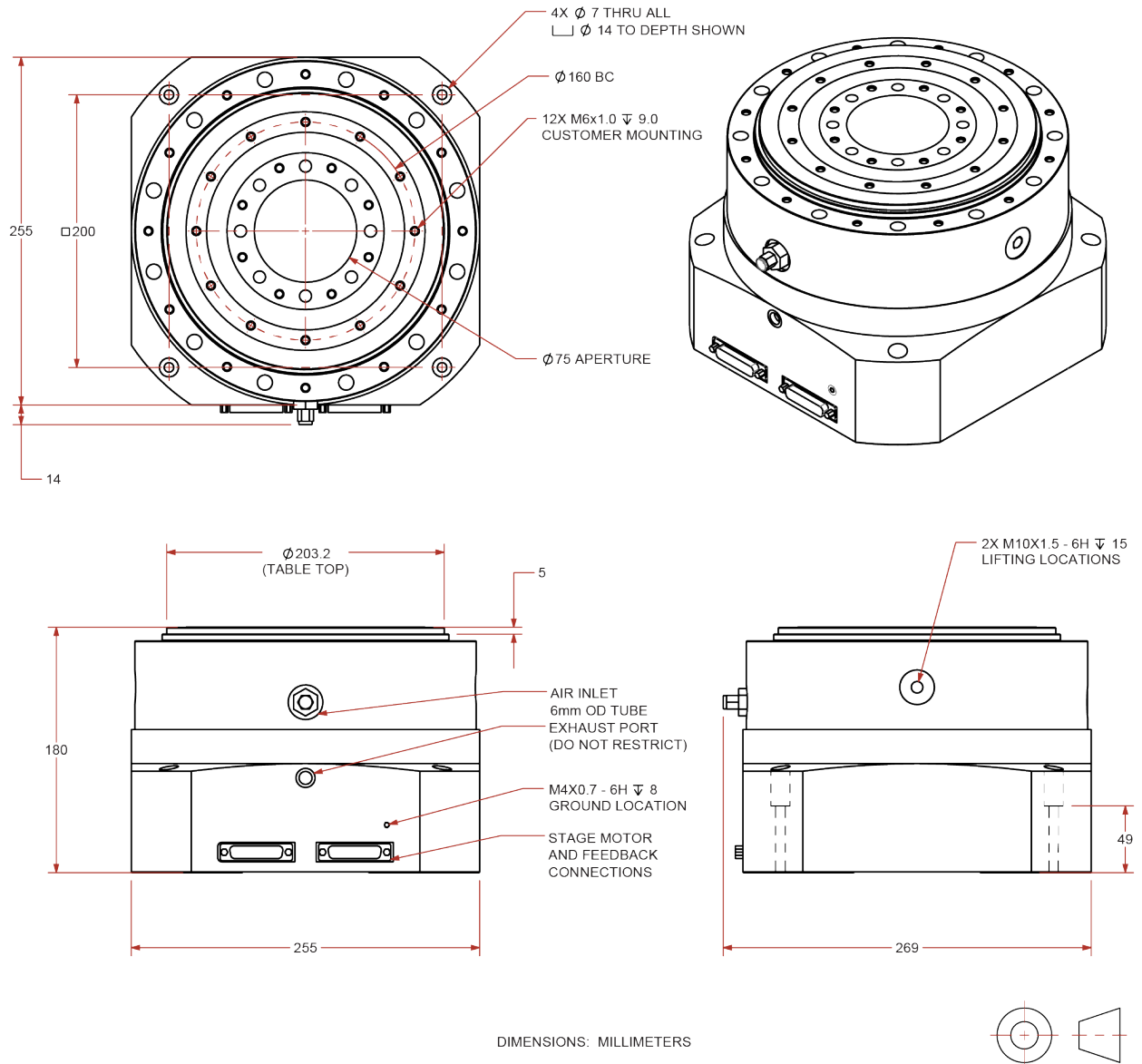


Figure 2-4: ABRX250 Dimensions

2.3. Securing the Stage to the Mounting Surface



WARNING: Make sure that all moving parts are secure before moving the ABRX. Unsecured moving parts may shift and cause bodily injury.



WARNING: Do not attempt to manually move the ABRX if it is connected to a power source.



WARNING: The ABRX must be mounted securely. Improper mounting can result in injury and damage to the equipment.

The mounting surface must be flat and have adequate stiffness to achieve the maximum performance from the ABRX stage. When it is mounted to a non-flat surface, the stage can be distorted while the mounting screws are tightened. This distortion will decrease overall accuracy. Adjustments to the mounting surface must be done before the stage is secured.

Inspect the mounting surface for dirt or unwanted residue and clean if necessary. Use precision flatstones on the mounting surface to remove any burrs or high spots. Clean the mounting surface with a lint-free cloth and acetone or isopropyl alcohol and allow the cleaning solvent to completely dry. Gently place the stage on the mounting surface.

NOTE: To maintain accuracy, the mounting surface must be flat to within 2 μm TIR.

NOTE: The stage base is precision machined and verified for flatness prior to stage assembly at the factory. If machining is required to achieve the desired flatness, it should be performed on the mounting surface rather than the stage base. Shimming should be avoided if possible. If shimming is required, it should be minimized to improve the rigidity of the system.

ABRX series stages have a fixed mounting pattern (as shown in [Figure 2-5](#)).

The ABRX should be mounted with the axis of rotation in the vertical direction using the counterbored mounting holes shown in [Figure 2-5](#). Mounting the stage with the axis of rotation in a horizontal orientation is not recommended because this orientation can have a negative effect on performance. Consult Aerotech for more information if your application requires a horizontal axis of rotation configuration.

Tightening torque values for the mounting hardware are dependent on the properties of the surface to which the stage is being mounted. Values provided in [Table 2-1](#) are typical values and may not be accurate for your mounting surface. Refer to [Section 2.2](#) for specific model mounting locations and dimensions.

Table 2-1: Stage to Mounting Surface Hardware

Mounting Hardware		Typical Screw Torque ⁽¹⁾
ABRX100	M4 SHCS	2 N·m
ABRX150, ABRX 250	M6 SHCS	6.9 N·m
<small>(1) The screw torque specification assumes an aluminum mounting surface.</small>		

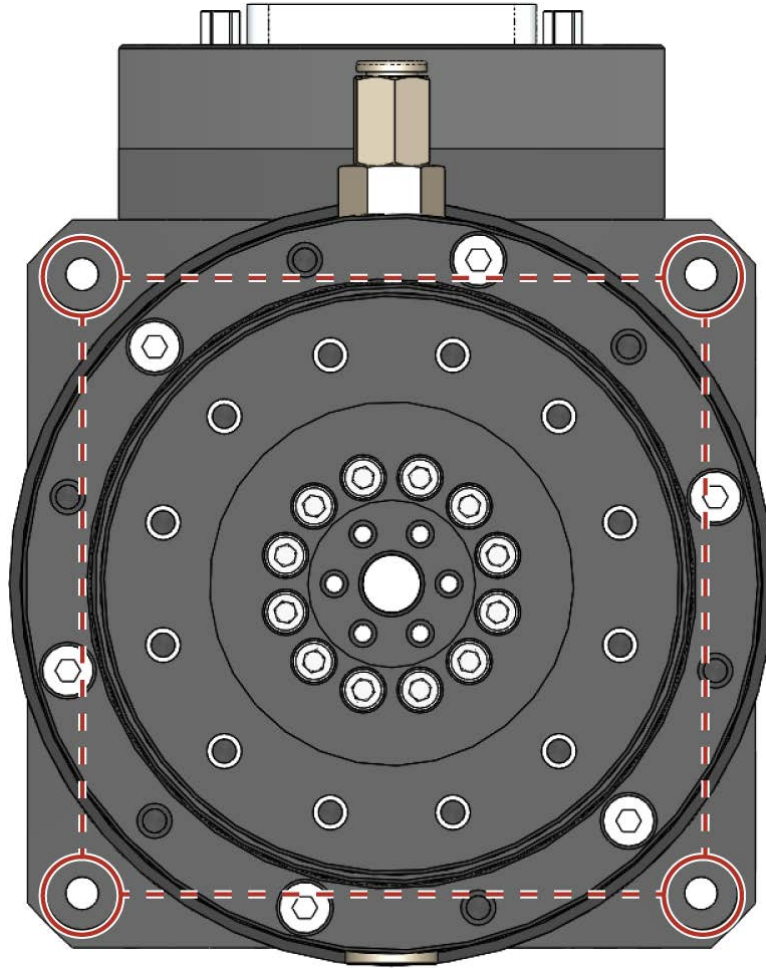


Figure 2-5: Top View of an ABRX250 Stage Showing Mounting Holes

2.4. Attaching the Payload to the Stage

Inspect the mounting surface for dirt or unwanted residue and clean if necessary. Clean the mounting surface with a lint-free cloth and acetone or isopropyl alcohol and allow the cleaning solvent to completely dry.

Aerotech recommends that customers use a representative payload during start-up to prevent accidental damage to the stage and the payload. Proceed with the electrical installation and test the motion control system in accordance with the system documentation. Document all results for future reference. For information on electrical installation refer to [Chapter 3](#) and the documentation delivered with the stage.



IMPORTANT: If your ABRX was purchased with Aerotech controls, it might have been tuned with a representative payload based on the information provided at the time of order. If the ABRX is started up without a payload, the servo gains provided by Aerotech with the shipment may not be appropriate and servo instability can occur. Refer to the controller help file for tuning assistance.

The payload must be flat, rigid, and comparable to the stage in quality to maintain optimum performance. Additionally, the payload must be reasonably balanced in order to maintain stage accuracy. Consult Aerotech to determine if the payload may potentially result in any deterioration of stage performance.

Refer to [Section 2.2. Dimensions](#) for the location of the mounting holes on the stage tabletop to mount payloads. The payload mounting holes have reinforced threads to allow frequent removal and installation of mounting screws.

NOTE: For valid system performance, the mounting interface should be flat within 2 μm TIR.



WARNING: Refer to the dimensions in [Section 2.2.](#) for maximum allowable thread engagement. A screw extending through the stage table can affect travel and damage the stage.

The ABRX rotary stage loading specifications are shown in [Section 1.3. Basic Specifications](#).

Chapter 3: Electrical Installation



WARNING: Electrical installation must be performed by properly qualified personnel.

Electrical installation requirements will vary depending on product options. Installation instructions in this section are for ABRX stages equipped with standard Aerotech motors intended for use with an Aerotech motion control system. Contact Aerotech for further information regarding products that are otherwise configured.

Aerotech motion control systems are adjusted at the factory for optimum performance. When the ABRX is part of a complete Aerotech motion control system, setup usually involves connecting the ABRX to the appropriate drive chassis with the cables provided. Labels on the system components usually indicate the appropriate connections.

If system level integration was purchased, an electrical drawing showing system interconnects has been supplied with the system (separate from this documentation).

The electrical wiring from the motor and encoder are integrated at the factory. Refer to the sections that follow for standard motor wiring and connector pinouts.



WARNING: Operator access to the base and tabletop must be restricted while connected to a power source. Failure to do so could expose the operator to electrical shock or mechanical dangers.



DANGER: Remove power before connecting or disconnecting electrical components or cables. Failure to do so could cause electric shock or damage to the equipment.



WARNING: Applications that require access to the ABRX must be restricted to qualified and trained personnel. The system integrator or qualified installer is responsible for determining and meeting all safety and compliance requirements when they integrate the ABRX into a completed system.

3.1. Motor and Feedback Connectors

Stages equipped with standard motors and encoders come from the factory completely wired and assembled.

NOTE: Refer to the other documentation accompanying your Aerotech equipment. Call your Aerotech representative if there are any questions on system configuration.

The protective ground connection of the ABRX provides motor frame ground protection only. Additional grounding and safety precautions are required for applications requiring access to the stage while it is energized. The System Integrator or qualified installer is responsible for determining and meeting all safety and compliance requirements necessary for the integration of this stage into the final application.



DANGER: Remove power before connecting or disconnecting electrical components or cables. Failure to do so could cause electric shock or damage to the equipment.



WARNING: The protective ground connection must be properly installed to minimize the possibility of electric shock.



CAUTION: The stage controller must provide over-current and over-speed protection. Failure to do so could cause electric shock or damage to the equipment.

Table 3-1: 4-Pin Motor Connector Pinout


Pin	Description	Connector
Case	Shield Connection	
A1	Motor Phase A	
A2	Motor Phase B	
A3	Motor Phase C	
1	Reserved	
2	Reserved	
3	Reserved	
4	Reserved	
5	Reserved	
A4	Frame Ground (motor protective ground)	

Table 3-2: Mating Connector Part Numbers for the 4-Pin Motor Connector

Mating Connector	Aerotech P/N	Third Party P/N
Backshell	ECK00656	Amphenol #17E-1726-2
Sockets [QTY. 4]	ECK00659	ITT Cannon #DM53744-6
Connector	ECK00657	ITT Cannon #DBM9W4SA197

Table 3-3: 25-Pin Feedback Connector Pinout


Pin	Description	Connector
Case	Shield Connection	
1	Reserved	
2	Over-Temperature Thermistor sensor	
3	+5 V power supply	
4	Reserved	
5	Hall Effect sensor, phase B	
6	Marker-N	
7	Marker	
8	Reserved	
9	Reserved	
10	Hall Effect sensor, phase A	
11	Hall Effect sensor, phase C	
12	Reserved	
13	Reserved	
14	Cosine	
15	Cosine-N	
16	+5 V power supply	
17	Sine	
18	Sine-N	
19	Reserved	
20	Common ground	
21	Common ground	
22	Reserved	
23	Reserved	
24	Reserved	
25	Reserved	

Table 3-4: Mating Connector Part Numbers for the 25-Pin Feedback Connector

Mating Connector	Aerotech P/N	Third Party P/N
Backshell	ECK00656	Amphenol #17E-1726-2
Connector	ECK00300	FCI DB25S064TLF

3.2. Motor and Feedback Wiring

All motor and controller manufacturers have their own designations for motor phases A/B/C and Hall signals A/B/C (refer to Section 3.5. for motor phasing). Shielded cables are required for the motor and feedback connections.

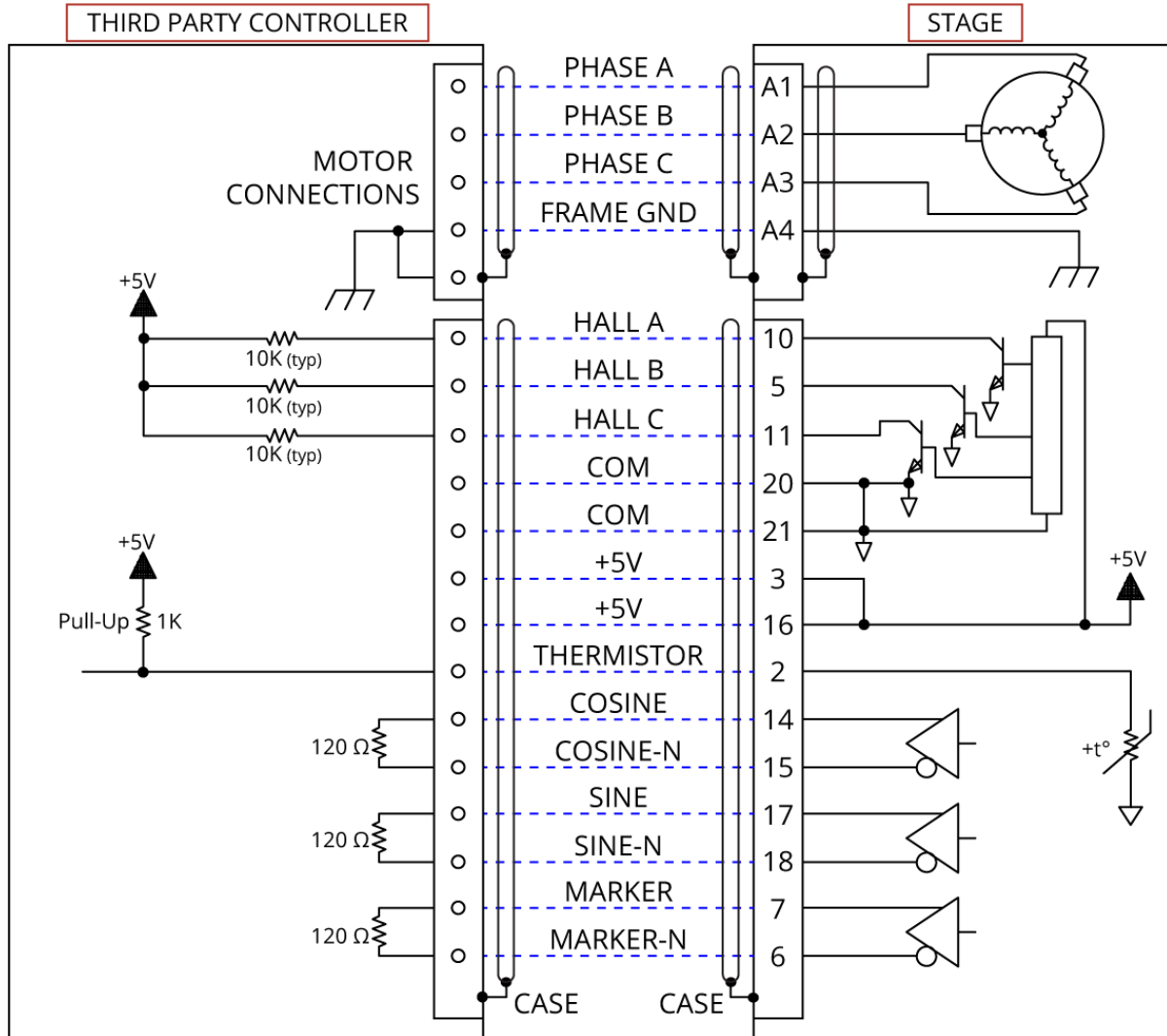


Figure 3-1: Motor and Feedback Wiring

3.3. Motor and Feedback Specifications

Table 3-5: Feedback Specifications

Hall-Effect Sensors Specifications	
Supply Voltage	5 V \pm 5%
Supply Current	50 mA
Output Type	Open Collector
Output Voltage	24 V max (pull up)
Output Current	5 mA (sinking)

Thermistor Specifications	
Polarity	Logic "0" (no fault)
	Logic "1" (over-temperature fault)
Cold Resistance	\sim 100 Ω
Hot Resistance	\sim 10 K
Note: 1K pull-up to +5V recommended.	

Encoder Specifications		
Supply Voltage	5 V \pm 5%	
Supply Current	250 mA (typical)	
Output Signals	-E1/-E2 Options	SIN+, SIN-, COS+, COS- Differential analog sinewave, 1Vpk-pk signals (into 120 Ω terminations). MRK+, MRK- Differential digital RS422 signals (into 120 Ω terminations).
	-E3 Option	SIN+, SIN-, COS+, COS-, MRK+, MRK- Differential digital RS422 signals (into 120 Ω terminations).

Table 3-6: Encoder Resolution Specifications

		ABRX100	ABRX150	ABRX250
Fundamental Resolution	-E1	5,000 lines/rev	10,052 lines/rev	22,304 lines/rev
	-E2	23,000 lines/rev	30,000 lines/rev	63,000 lines/rev
	-E3	5,000 lines/rev	10,052 lines/rev	22,304 lines/rev
Electrical Resolution (1)	-E1	0.016 arc sec	0.008 arc sec	0.004 arc sec
	-E2	0.004 arc sec	0.003 arc sec	0.001 arc sec
	-E3	0.13 arc sec	0.13 arc sec	0.116 arc sec
(1) -E1, -E2 shown 16,000x total multiplication (including quadrature). Higher multiplication factors are available. Contact Aerotech for details..				

Table 3-7: Maximum Speed (rpm) Per Encoder Option

Resolution Speed	ABRX100	ABRX150	ABRX250
-E1	Motor Limited	Motor Limited	Motor Limited
-E2	Motor Limited	Motor Limited	Motor Limited
-E3	153 rpm	156 rpm	149 rpm

NOTE: The encoders used on all ABRX series stages come standard with a MHz clock rate. Aerotech can provide slower or faster clock rates to match the controller being used. Consult Aerotech for more information.

Table 3-8: ABRX100 Series Motor Specifications

		ABRX100
Winding		-A
Performance Specifications (1) (5)		
Stall Torque, Continuous ⁽²⁾	N·m (oz·in)	0.19 (26)
Peak Torque ⁽³⁾	N·m (oz·in)	0.7 (106)
Rated Speed	rpm	1000
Rated Power Output, Continuous	W	17.6
Electrical Specifications⁽⁵⁾		
BEMF Constant (line to line, maximum)	$V_{pk}/Krpm$	18.14
Continuous Current, Stall ⁽²⁾	A_{pk}	1.3
	A_{rms}	0.9
Peak Current, Stall ⁽³⁾	A_{pk}	5.0
	A_{rms}	3.5
Torque Constant ^(4, 8)	$N·m / A_{pk}$ (oz·in / A_{pk})	0.149 (21.1)
	$N·m / A_{rms}$ (oz·in / A_{rms})	0.211 (29.8)
Motor Constant ^(2, 4)	$N·m/\sqrt{W}$ (oz·in/ \sqrt{W})	0.043 (6.04)
Resistance, 25°C (line-line)	Ω	12.54
Inductance (line-line)	mH	1.42
Maximum Bus Voltage	V_{DC}	340
Thermal Resistance	°C/W	3.93
Number of Poles	P	12
1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature 2. Values shown @ 31°C rise (motor temperature) above a 25 °C ambient temperature, with thermally isolated stage. 3. Peak torque assumes correct rms current; consult Aerotech 4. Torque constant and motor constant specified at stall 5. All performance and electrical specifications ±10% 6. Maximum winding temperature is 130 °C 7. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures 8. All Aerotech amplifiers are rated A_{pk} ; use force constant in N·m/ A_{pk} when sizing.		

Table 3-9: ABRX150 Series Motor Specifications

		ABRX150
Winding		-A
Performance Specifications (1) (5)		
Stall Torque, Continuous ⁽²⁾	N·m (oz·in)	0.40 (57)
Peak Torque ⁽³⁾	N·m (oz·in)	1.6 (229)
Rated Speed	rpm	1000
Rated Power Output, Continuous	W	38.1
Electrical Specifications⁽⁵⁾		
BEMF Constant (line to line, maximum)	V_{pk}/K_{rpm}	38.22
Continuous Current, Stall ⁽²⁾	A_{pk}	1.3
	A_{rms}	0.9
Peak Current, Stall ⁽³⁾	A_{pk}	5.2
	A_{rms}	3.7
Torque Constant ^(4, 8)	$N·m / A_{pk}$ (oz·in / A_{pk})	0.311 (44.1)
	$N·m / A_{rms}$ (oz·in / A_{rms})	0.440 (62.3)
Motor Constant ^(2, 4)	$N·m/\sqrt{W}$ (oz·in/ \sqrt{W})	0.068 (9.66)
Resistance, 25°C (line-line)	Ω	21.33
Inductance (line-line)	mH	2.8
Maximum Bus Voltage	V_{DC}	340
Thermal Resistance	°C/W	2.13
Number of Poles	P	16
1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature 2. Values shown @ 31°C rise (motor temperature) above a 25 °C ambient temperature, with thermally isolated stage. 3. Peak torque assumes correct rms current; consult Aerotech 4. Torque constant and motor constant specified at stall 5. All performance and electrical specifications $\pm 10\%$ 6. Maximum winding temperature is 130 °C 7. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures 8. All Aerotech amplifiers are rated A_{pk} ; use force constant in N·m/ A_{pk} when sizing.		

Table 3-10: ABRX250 Series Motor Specifications

		ABRX250
Winding		-A
Performance Specifications (1) (5)		
Stall Torque, Continuous ⁽²⁾	N·m (oz·in)	1.20 (10.6)
Peak Torque ⁽³⁾	N·m (oz·in)	4.80 (42.4)
Rated Speed	rpm	500
Rated Power Output, Continuous	W	62.8
Electrical Specifications⁽⁵⁾		
BEMF Constant (line to line, maximum)	$V_{pk}/Krpm$	134.4
Continuous Current, Stall ⁽²⁾	A_{pk}	1.1
	A_{rms}	0.8
Peak Current, Stall ⁽³⁾	A_{pk}	4.3
	A_{rms}	3.1
Torque Constant ^(4, 8)	$N\cdot m / A_{pk}$ (oz·in / A_{pk})	1.11 (9.8)
	$N\cdot m / A_{rms}$ (oz·in / A_{rms})	1.57 (13.9)
Motor Constant ^(2, 4)	$N\cdot m/\sqrt{W}$ (oz·in/ \sqrt{W})	0.314 (2.78)
Resistance, 25°C (line-line)	Ω	12.8
Inductance (line-line)	mH	1.90
Maximum Bus Voltage	V_{DC}	340
Thermal Resistance	°C/W	5.15
Number of Poles	P	18
<p>1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature</p> <p>2. Values shown @ 31°C rise (motor temperature) above a 25 °C ambient temperature, with thermally isolated stage.</p> <p>3. Peak torque assumes correct rms current; consult Aerotech</p> <p>4. Torque constant and motor constant specified at stall</p> <p>5. All performance and electrical specifications $\pm 10\%$</p> <p>6. Maximum winding temperature is 130 °C</p> <p>7. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures</p> <p>8. All Aerotech amplifiers are rated A_{pk}; use force constant in N·m/A_{pk} when sizing.</p>		

3.4. Limits, Marker, and Machine Direction

Aerotech stages are configured to have positive and negative "machine" directions. The machine direction defines the phasing of the feedback and motor signals and is dictated by the stage wiring (refer to [Section 3.5](#) for Motor and Feedback phasing information). Programming direction of a stage is set by the controller that is used to move the stage. Programming direction is typically selectable in the controller, while machine direction is hardwired in the stage. [Figure 3-2](#) shows the machine direction of ABRX stages.

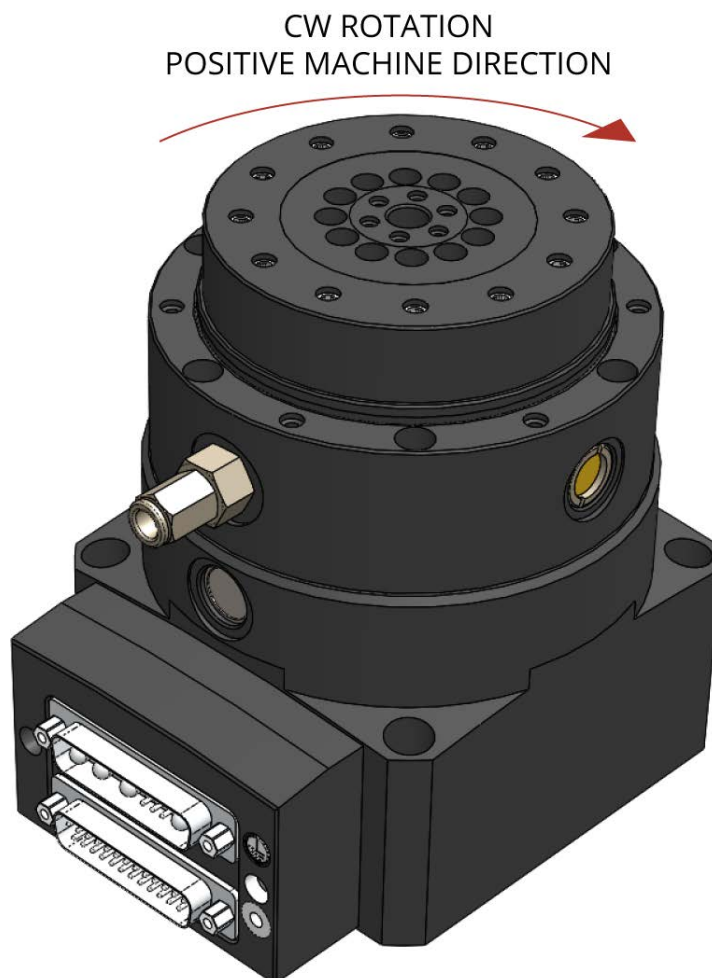


Figure 3-2: Machine Direction

3.5. Motor and Feedback Phasing

Motor phase voltage is measured relative to the virtual wye common point.

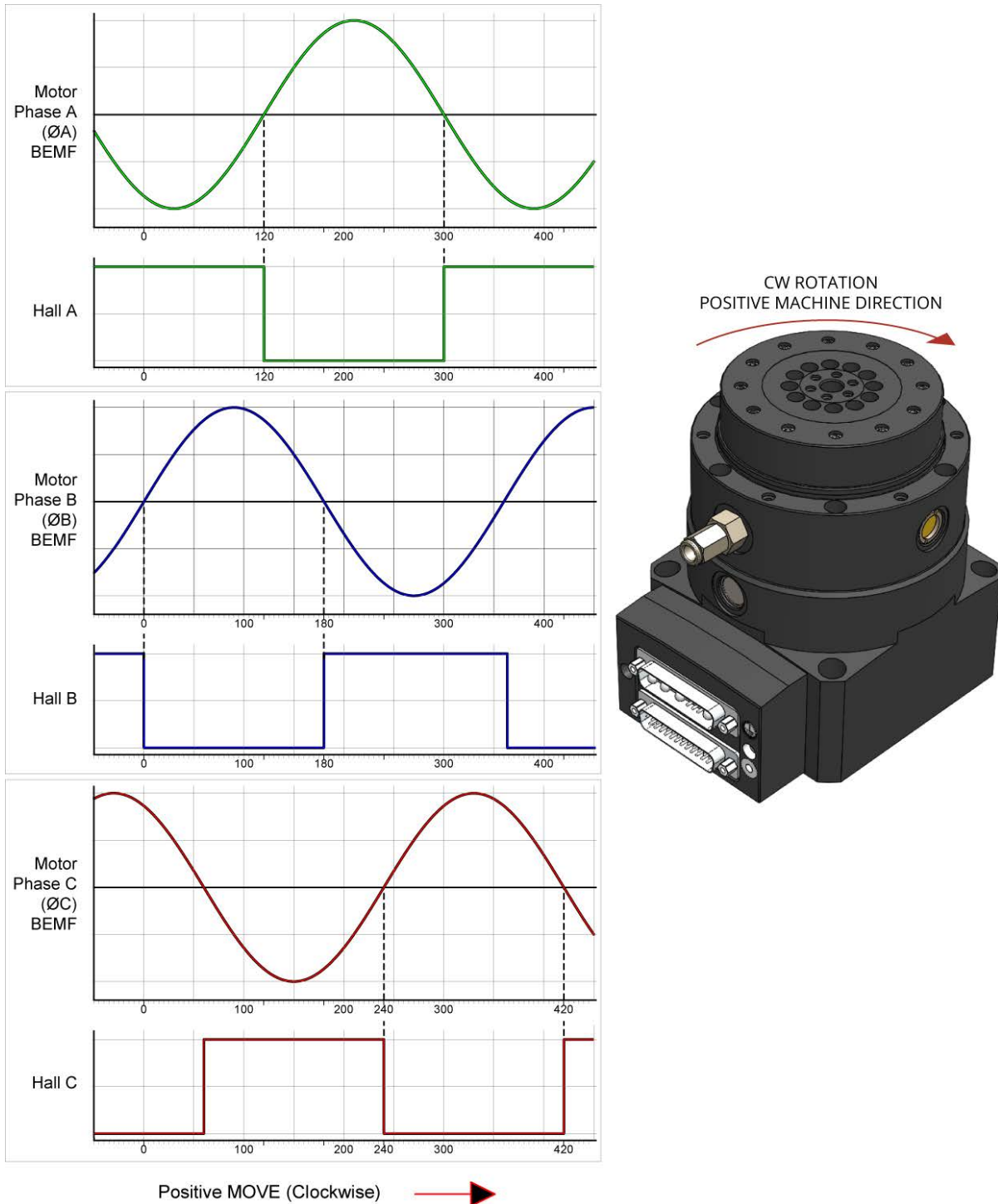


Figure 3-3: Hall Phasing

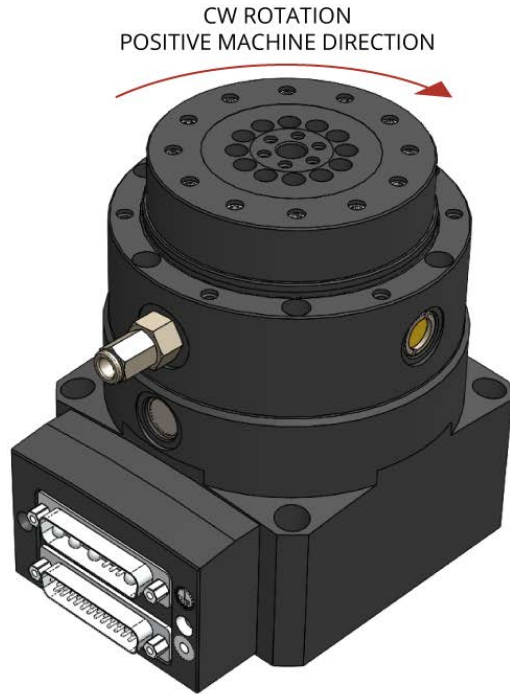
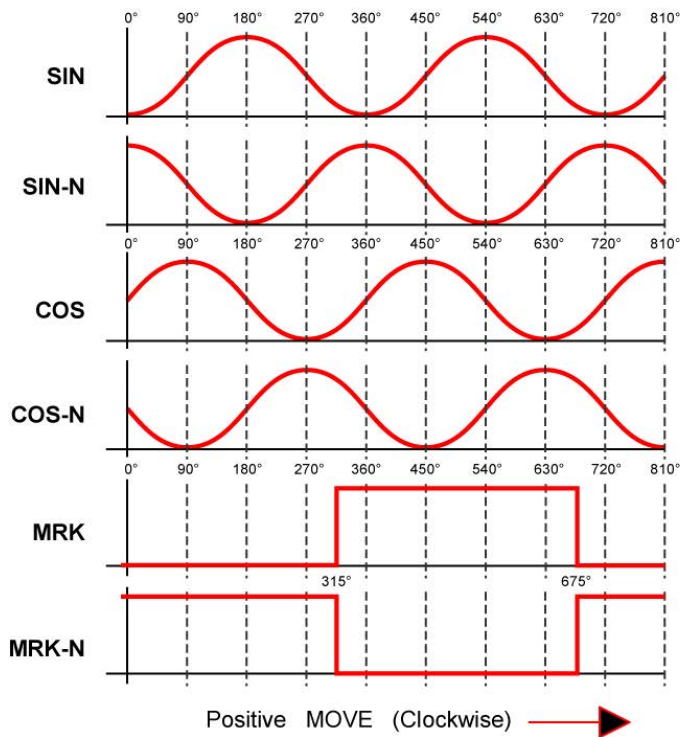


Figure 3-4: Analog Encoder Phasing Reference Diagram (-E1 Encoder Option)

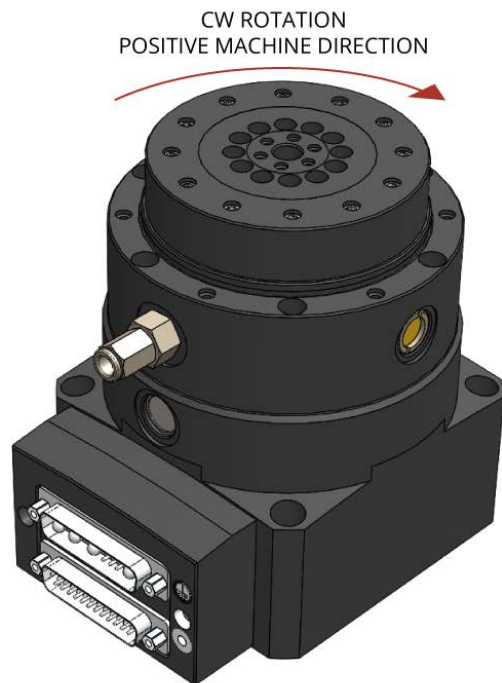
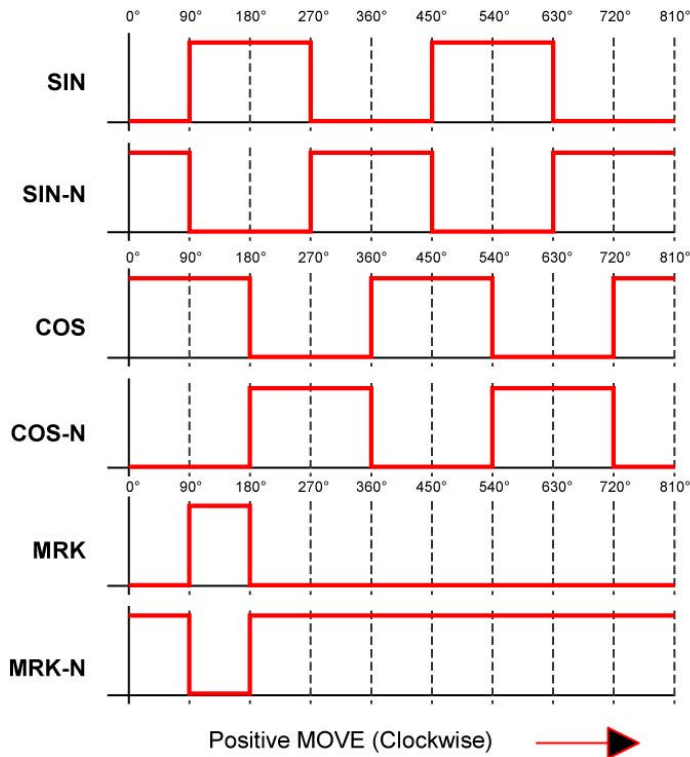


Figure 3-5: Digital Encoder Phasing Reference Diagram (-E2 Encoder Option)

Chapter 4: Maintenance

The ABRX series stages are designed to require minimum maintenance. Due to the non-contact air bearing design, there are no friction surfaces or dynamic seals to wear or require lubrication. This chapter will detail the cleaning process and specify recommended cleaning solvents.



DANGER: To minimize the possibility of bodily injury or death, disconnect all electrical power prior to performing any maintenance or making adjustments to the equipment.

NOTE: The stage must be kept free of foreign matter and moisture; otherwise, the performance and life expectancy of the stage will be reduced.

4.1. Service and Inspection Schedule

Inspect the ABRX at least once per month. A longer or shorter inspection interval may be required depending on the application and conditions, such as the duty cycle, speed, and environment.

Monthly inspections should include but not be limited to:

- Visually inspect the stage and cables.
- Re-tighten loose connectors.
- Replace or repair damaged cables.
- Clean the ABRX and any components and cables as needed.
- Repair any damage before operating the ABRX.
- Inspect and perform an operational check on all safeguards and protective devices.

In general, repair and/or replacement of damaged or malfunctioning components by Aerotech field service personnel is not possible. Repair typically requires that the unit be returned to the factory. Please contact Aerotech Global Technical Support for more information.

4.2. Cleaning and Lubrication



DANGER: To minimize the possibility of bodily injury or death, disconnect all electrical power prior to performing any maintenance or making adjustments to the equipment.

Cleaning

Before using a cleaning solvent on any part of the ABRX, blow away small particles and dust with nitrogen or, less preferably, clean, dry, compressed air.

Any external metal surface of the ABRX can be cleaned with isopropyl alcohol on a lint-free cloth. Avoid getting excess cleaning solvent on the surfaces, as it could damage the delicate electronics inside.



WARNING: Make sure that all solvent has completely evaporated before attempting to move the stage.

Lubrication

There are no elements on ABRX stages that require lubrication.

4.3. Troubleshooting

Symptom	Possible Cause and Solution
Stage will not move	Make sure that the air supply is connected (refer to Section 1.4.). Controller trap or fault (refer to the Controller documentation).
Stage moves uncontrollably	Encoder (sine and cosine) signal connections (refer to Chapter 3 and Controller documentation). Motor Connections (refer to Chapter 3 and the Controller documentation).
Stage oscillates or squeals	Gains misadjusted (refer to the Controller documentation). Encoder signals (refer to the Controller documentation).

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Appendix A: Warranty and Field Service

Aerotech, Inc. warrants its products to be free from harmful defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products that are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability on any claim for loss or damage arising out of the sale, resale, or use of any of its products shall in no event exceed the selling price of the unit.

THE EXPRESS WARRANTY SET FORTH HEREIN IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE. IN NO EVENT SHALL AEROTECH BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES.

Return Products Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within thirty (30) days of shipment of incorrect material. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. A "Return Materials Authorization (RMA)" number must accompany any returned product(s). The RMA number may be obtained by calling an Aerotech service center or by submitting the appropriate request available on our website (www.aerotech.com). Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than thirty (30) days after the issuance of a return authorization number will be subject to review.

Visit <https://www.aerotech.com/global-technical-support.aspx> for the location of your nearest Aerotech Service center.

Returned Product Warranty Determination

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an expedited method of return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Fixed Fee Repairs - Products having fixed-fee pricing will require a valid purchase order or credit card particulars before any service work can begin.

All Other Repairs - After Aerotech's evaluation, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within thirty (30) days of notification will result in the product(s) being returned as is, at the buyer's expense.

Repair work is warranted for ninety (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

Rush Service

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

On-site Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

On-site Non-Warranty Repair

If any Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

Service Locations

<http://www.aerotech.com/contact-sales.aspx?mapState=showMap>

Appendix B: Revision History

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1.00.00	New Manual

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