ZABER

LSQ Product
User's Manual
Firmware 5.00 and up

Last Update: December 10 2015
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Table of Contents

Disclaimer

Zaber’s devices are not intended for use in any critical medical, aviation, or military applications or situations where a product's use or failure could cause personal injury, death, or damage to property. Zaber disclaims any and all liability for injury or other damages resulting from the use of our products.

Precautions

Zaber's motion control devices are precision instruments and must be handled with care. In particular, moving parts must be treated with care. Avoid axial loads in excess of the rated thrust load, axial and radial impact, dust and other contaminants and damage to the leadscrew thread. These will reduce the performance of the device below stated specifications.

Installation

Physical Installation

Mounting

There are several options available for mounting Zaber stages. Use the mounting holes in the bottom to mount to a surface or to another stage. You might have to move the carriage to access the bottom mounting holes. Some stages have mounting holes in the end plates for mounting vertically. Mounting screws are included with most stages.

Caution: Some stages have threaded through-holes in the top mounting plate of the carriage. Be sure not to install mounting screws too deep, causing them to interfere with inside parts of the stage.

Grounding

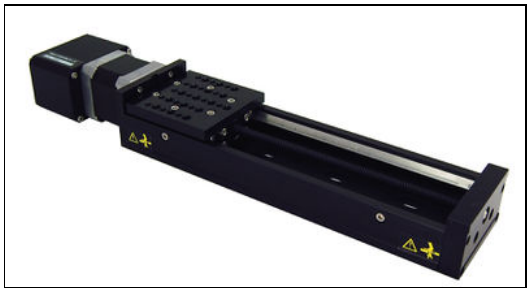
To prevent damage to the device due to static buildup, the device should be properly grounded.

Failure to ground the unit may result in the unit shutting down unexpectedly or ceasing to communicate with the computer. This problem can be minimized by not touching the unit during operation. If the unit fails due to static discharge, unplugging it and plugging it back in or sending a Restore Settings command will usually fix the problem.

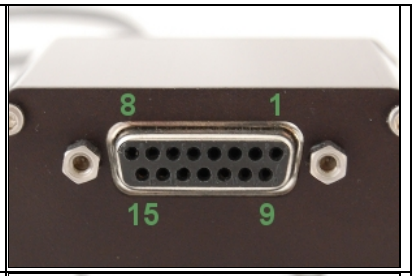
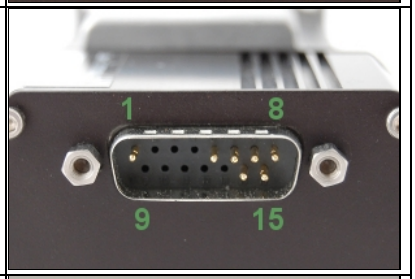
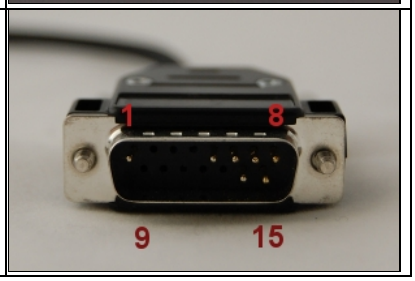
Most Zaber devices are grounded via the shield wire of the data cables. This should normally provide a path to ground via the computer. For units which are being used without a computer, a ground lead should be connected to the shield of one of the data cables.

Operation

The LSQ-T3 stages are designed to be controlled with any of Zaber's X-Series or A-Series Stepper Motor Controllers. Zaber's controllers and peripherals are designed for ease of use when used together. Optimal settings for each peripheral (such as the default current, speed, acceleration, and limit settings) can be loaded by setting the peripheralid (T:66) on the controller. The peripheral ID is listed as the ID on the peripheral's label. A list of IDs is also available on the ID Mapping page. For more information on device operation, refer to the controller's user manual.



Pinout for D-sub 15 Connectors (A-series and X-Series controllers and peripherals)

A- or X-series controller (female)	
T3 Peripheral (male)	
T4 Peripheral (male)	

Pin #	Function
1	+5V

2	Encoder Error ****
3	*reserved*
4	Away Sensor ***
5	Home Sensor
6	Ground
7	Motor B1
8	Motor A1
9	+5V *
10	Encoder A *
11	Encoder B *
12	Encoder Index **
13	Ground *
14	Motor B2
15	Motor A2

** encoder embedded peripherals only*
*** devices with encoders with index only*
**** devices with away sensors only*
***** devices with linear or direct-reading encoders only*

Alternate Controllers

The actuators may be controlled by any 2-phase stepper motor controller with home sensor input. **Warning: Operating the stage without correctly wiring up the home sensor can cause permanent damage to the sensor. We do not recommend using your own controller unless you are familiar with how to control a stepper motor with a hall sensor limit switch.** The following information is provided for reference only. Damage to the stage or hall sensor due to incorrect wiring is not covered by warranty.

Motor

The LSQ stage uses a size 17 stepper motor.

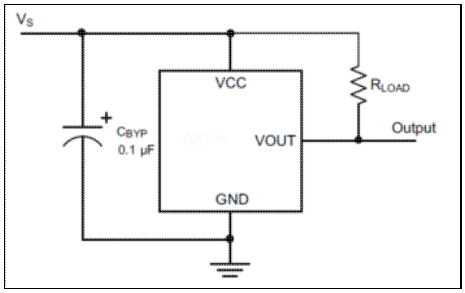
- 0.85 A / Phase
- 3.3 / phase
- 2.8 mH / phase

Home Sensor Wiring

A Hall effect sensor is mounted in the device for use as a home sensor. It is part number A1122LUA-T made by Allegro. Click here for data sheet. Your controller should be configured so the stage stops immediately (little deceleration) when the home sensor is triggered.

- Wire colour code:
  - 3.6-24 Vdc input - red
  - Home signal - yellow
  - Ground - black

The Hall sensor has an open-collector output. The default output is high impedance when the Hall sensor is not active. When the sensor detects a magnet, the Hall sensor pulls the output low to ground.



If you are not using a Zaber controller, ensure that your controller has a pull-up resistor on the output line of the Hall sensor as shown in the diagram. The bypass capacitor is optional, but may help to eliminate false triggering in noisy environments. The typical value for the pull-up resistor (R_{LOAD}) is 10k and for the bypass capacitor is 0.1uF to 1uF. The larger the capacitance, the better the noise filtering but the slower the response time.

Appendix B - Carriage Field-Tuning

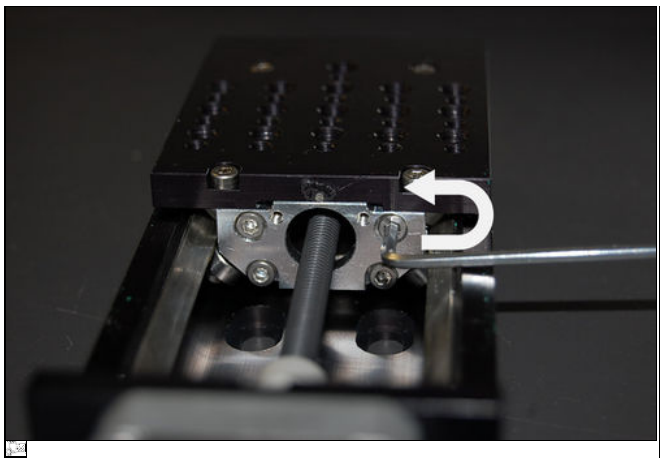
LSQ and LSR stages shipped after August 2013 contain a feature that allows the carriage pre-loading to be tuned in the field. Your stage has this feature if it contains a semi-cylindrical spring inside the carriage. It is possible to see the spring with good lighting inside the open hole in one end of the carriage. Contact us for assistance if you are not sure.

The carriage should always fit tightly and roll smoothly in the stage base. If the carriage develops play, follow these easy steps to reset the preloading. This can be done with another stage or load mounted on top of the stage, as long as the load is balanced and there is access to the screws shown below.

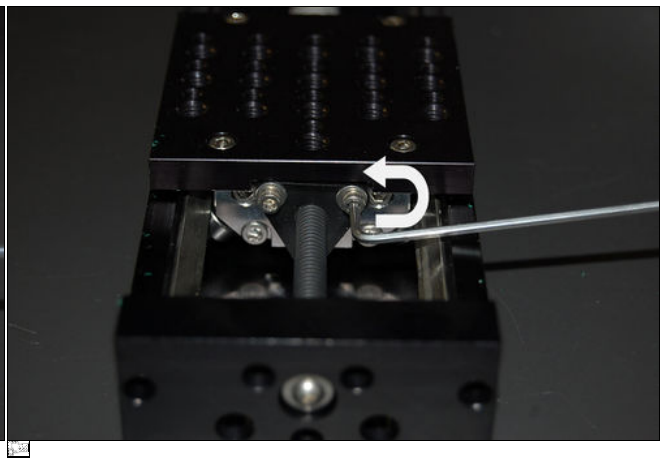
Equipment Required

- Hex drivers (Allen keys), 2.5mm, 2.0 mm
- Two 1.5 mm thick spacers, at least 50 mm long, at least 4 mm wide. Any stiff material will work like metal or hard plastic.

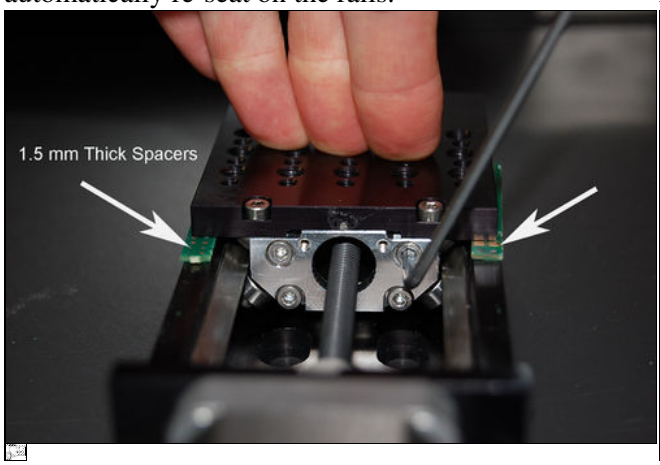
Procedure

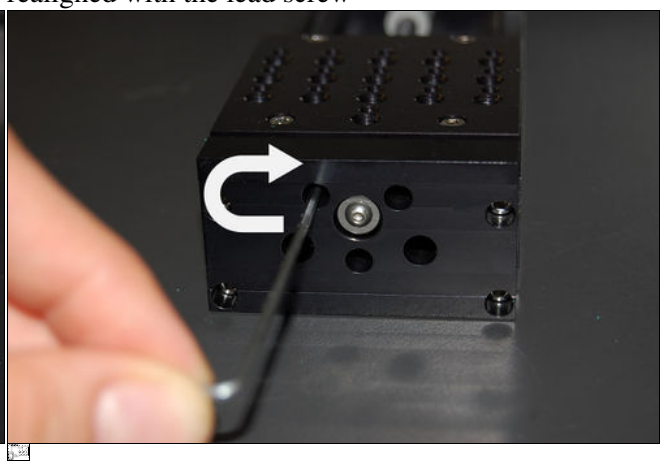


1. Loosen the four screws 1/2 turn on both carriage end plates with a 2.5 mm hex driver. The bearings will automatically re-seat on the rails.



2. Loosen the three screws 1/2 turn on the lead nut with a 2 mm hex driver. The lead nut will have to be realigned with the lead screw





3. Insert 1.5 mm spacers into the gap between the stage top and base. This sets the correct height and parallelism of the stage top. Pushing down on the stage top, tighten the four screws on each end plate (2.0 Nm)

4. Move the stage to its maximum position and tighten the three lead nut screws (0.7 Nm) through the end plate. This realigns the lead nut with the lead screw where it is constrained at the thrust bearing.

Warranty and Repair

For Zaber's policies on warranty and repair, please refer to the Ordering Policies

Standard products

Standard products are any part numbers that do not contain the suffix ENG followed by a 4 digit number. Most, but not all, standard products are listed for sale on our website. All standard Zaber products are backed by a one-month satisfaction guarantee. If you are not satisfied with your purchase, we will refund your payment minus any shipping charges. Goods must be in brand new saleable condition with no marks. Zaber products are guaranteed for one year. During this period Zaber will repair any products with faults due to manufacturing defects, free of charge.

Custom products

Custom products are any part numbers containing the suffix ENG followed by a 4 digit number. Each of these products has been designed for a custom application for a particular customer. Custom products are guaranteed for one year, unless explicitly stated otherwise. During this period Zaber will repair any products with faults due to manufacturing defects, free of charge.

How to return products

Customers with devices in need of return or repair should contact Zaber to obtain an RMA form which must be filled out and sent back to us to receive an RMA number. The RMA form contains instructions for packing and returning the device. The specified RMA number must be included on the shipment to ensure timely processing.

Email Updates

If you would like to receive our periodic email newsletter including product updates and promotions, please sign up online at www.zaber.com (news section). Newsletters typically include a promotional offer worth at least $100.

Contact Information

Contact Zaber Technologies Inc by any of the following methods:

Phone	1-604-569-3780 (direct) 1-888-276-8033 (toll free in North America)
Fax	1-604-648-8033
Mail	#2 - 605 West Kent Ave. N., Vancouver, British Columbia, Canada, V6P 6T7
Web	www.zaber.com
Email	Please visit our website for up to date email contact information.

The original instructions for this product are available at http://www.zaber.com/wiki/Manuals/LSQ.

Specification	Value	Alternate Unit
Integrated Controller	No	
Recommended Controller	X-MCB1 (48 V) Recommended	
Encoder Type	None	
Maximum Centered Load	200 N	44.9 lb
Maximum Cantilever Load	800 N-cm	1,132.9 oz-in
Guide Type	Roller bearing	
Vertical Runout	< 13 µm	< 0.000512 "
Horizontal Runout	< 13 µm	< 0.000512 "
Pitch	0.05 degrees	0.873 mrad
Roll	0.01 degrees	0.175 mrad
Yaw	0.02 degrees	0.349 mrad
Maximum Current Draw	810 mA	
Motor Steps Per Rev	200	
Motor Type	Stepper (2 phase)	
Inductance	2.8 mH/phase	
Motor Connection	D-sub 15	
Mechanical Drive System	Precision lead screw	
Limit or Home Sensing	Magnetic home sensor	
Axes of Motion	1	
Mounting Interface	M6 threaded holes and 8-32 threaded holes	
Vacuum Compatible	No	
Operating Temperature Range	0 to 50 degrees C	
Stage Parallelism	< 100 µm	< 0.003937 "
RoHS Compliant	Yes	
CE Compliant	Yes	

Comparison - LSQ Series

Part Number	Microstep Size (Default Resolution)	Travel Range	Accuracy (unidirectional)	Repeatability
LSQ075A-T3	0.09921875 µm	75 mm (2.953 ")	23 µm (0.000906 ")	< 2.5 µm (< 0.000098 ")
LSQ075B-T3	0.49609375 µm	75 mm (2.953 ")	15 µm (0.000591 ")	< 2.5 µm (< 0.000098 ")
LSQ075D-T3	1.984375 µm	75 mm (2.953 ")	15 µm (0.000591 ")	< 3 µm (< 0.000118 ")
LSQ150A-T3	0.09921875 µm	150 mm (5.906 ")	45 µm (0.001772 ")	< 2.5 µm (< 0.000098 ")
LSQ150B-T3	0.49609375 µm	150 mm (5.906 ")	15 µm (0.000591 ")	< 2.5 µm (< 0.000098 ")
LSQ150D-T3	1.984375 µm	150 mm (5.906 ")	15 µm (0.000591 ")	< 3 µm (< 0.000118 ")
LSQ300A-T3	0.09921875 µm	300 mm (11.811 ")	90 µm (0.003543 ")	< 2.5 µm (< 0.000098 ")
LSQ300B-T3	0.49609375 µm	300 mm (11.811 ")	30 µm (0.001181 ")	< 2.5 µm (< 0.000098 ")
LSQ300D-T3	1.984375 µm	300 mm (11.811 ")	30 µm (0.001181 ")	< 3 µm (< 0.000118 ")
LSQ450A-T3	0.09921875 µm	450 mm (17.717 ")	135 µm (0.005315 ")	< 2.5 µm (< 0.000098 ")
LSQ450B-T3	0.49609375 µm	450 mm (17.717 ")	45 µm (0.001772 ")	< 2.5 µm (< 0.000098 ")
LSQ450D-T3	1.984375 µm	450 mm (17.717 ")	45 µm (0.001772 ")	< 3 µm (< 0.000118 ")
LSQ600A-T3	0.09921875 µm	600 mm (23.622 ")	150 µm (0.005906 ")	< 2.5 µm (< 0.000098 ")
LSQ600B-T3	0.49609375 µm	600 mm (23.622 ")	150 µm (0.005906 ")	< 2.5 µm (< 0.000098 ")
LSQ600D-T3	1.984375 µm			

			600 mm (23.622 ")	150 µm (0.005906 ")	< 3 µm (< 0.000118 ")
Part Number	**Backlash**	**Maximum Speed**	**Minimum Speed**	**Speed Resolution**	
LSQ075A-T3	< 5 µm (< 0.000197 ")	53 mm/s (2.087 "/s)	0.000061 mm/s (0.00000 "/s)	0.000061 mm/s (0.00000 "/s)	
LSQ075B-T3	< 7 µm (< 0.000276 ")	280 mm/s (11.024 "/s)	0.000303 mm/s (0.00001 "/s)	0.000303 mm/s (0.00001 "/s)	
LSQ075D-T3	< 20 µm (< 0.000787 ")	1000 mm/s (39.370 "/s)	0.001211 mm/s (0.00005 "/s)	0.001211 mm/s (0.00005 "/s)	
LSQ150A-T3	< 5 µm (< 0.000197 ")	53 mm/s (2.087 "/s)	0.000061 mm/s (0.00000 "/s)	0.000061 mm/s (0.00000 "/s)	
LSQ150B-T3	< 7 µm (< 0.000276 ")	280 mm/s (11.024 "/s)	0.000303 mm/s (0.00001 "/s)	0.000303 mm/s (0.00001 "/s)	
LSQ150D-T3	< 20 µm (< 0.000787 ")	1000 mm/s (39.370 "/s)	0.001211 mm/s (0.00005 "/s)	0.001211 mm/s (0.00005 "/s)	
LSQ300A-T3	< 5 µm (< 0.000197 ")	53 mm/s (2.087 "/s)	0.000061 mm/s (0.00000 "/s)	0.000061 mm/s (0.00000 "/s)	
LSQ300B-T3	< 7 µm (< 0.000276 ")	280 mm/s (11.024 "/s)	0.000303 mm/s (0.00001 "/s)	0.000303 mm/s (0.00001 "/s)	
LSQ300D-T3	< 20 µm (< 0.000787 ")	1000 mm/s (39.370 "/s)	0.001211 mm/s (0.00005 "/s)	0.001211 mm/s (0.00005 "/s)	
LSQ450A-T3	< 5 µm (< 0.000197 ")	53 mm/s (2.087 "/s)	0.000061 mm/s (0.00000 "/s)	0.000061 mm/s (0.00000 "/s)	
LSQ450B-T3	< 7 µm (< 0.000276 ")	280 mm/s (11.024 "/s)	0.000303 mm/s (0.00001 "/s)	0.000303 mm/s (0.00001 "/s)	
LSQ450D-T3	< 20 µm (< 0.000787 ")	1000 mm/s (39.370 "/s)	0.001211 mm/s (0.00005 "/s)	0.001211 mm/s (0.00005 "/s)	
LSQ600A-T3	< 5 µm (< 0.000197 ")	42 mm/s (1.654 "/s)	0.000061 mm/s (0.00000 "/s)	0.000061 mm/s (0.00000 "/s)	
LSQ600B-T3	< 7 µm (< 0.000276 ")	225 mm/s (8.858 "/s)	0.000303 mm/s (0.00001 "/s)	0.000303 mm/s (0.00001 "/s)	
LSQ600D-T3					

	< 20 µm (< 0.000787 ")	800 mm/s (31.496 "/s)	0.001211 mm/s (0.00005 "/s)	0.001211 mm/s (0.00005 "/s)	
Part Number	**Peak Thrust**	**Maximum Continuous Thrust**		**Linear Motion Per Motor Rev**	**Weight**
LSQ075A-T3	160 N (35.9 lb)	100 N (22.4 lb)		1.27 mm (0.050 ")	1.20 kg
LSQ075B-T3	80 N (17.9 lb)	80 N (17.9 lb)		6.35 mm (0.250 ")	1.20 kg
LSQ075D-T3	20 N (4.5 lb)	20 N (4.5 lb)		25.4 mm (1.000 ")	1.20 kg
LSQ150A-T3	160 N (35.9 lb)	100 N (22.4 lb)		1.27 mm (0.050 ")	1.40 kg
LSQ150B-T3	80 N (17.9 lb)	80 N (17.9 lb)		6.35 mm (0.250 ")	1.40 kg
LSQ150D-T3	20 N (4.5 lb)	20 N (4.5 lb)		25.4 mm (1.000 ")	1.40 kg
LSQ300A-T3	160 N (35.9 lb)	100 N (22.4 lb)		1.27 mm (0.050 ")	1.80 kg
LSQ300B-T3	80 N (17.9 lb)	80 N (17.9 lb)		6.35 mm (0.250 ")	1.80 kg
LSQ300D-T3	20 N (4.5 lb)	20 N (4.5 lb)		25.4 mm (1.000 ")	1.80 kg
LSQ450A-T3	160 N (35.9 lb)	100 N (22.4 lb)		1.27 mm (0.050 ")	2.30 kg
LSQ450B-T3	80 N (17.9 lb)	80 N (17.9 lb)		6.35 mm (0.250 ")	2.30 kg
LSQ450D-T3	20 N (4.5 lb)	20 N (4.5 lb)		25.4 mm (1.000 ")	2.30 kg
LSQ600A-T3	147 N (33.0 lb)	100 N (22.4 lb)		1.27 mm (0.050 ")	2.9 kg
LSQ600B-T3	75 N (16.8 lb)	80 N (17.9 lb)		6.35 mm (0.250 ")	2.9 kg
LSQ600D-T3					2.9 kg

18 N (4.0 lb)	20 N (4.5 lb)	25.4 mm (1.000 ")