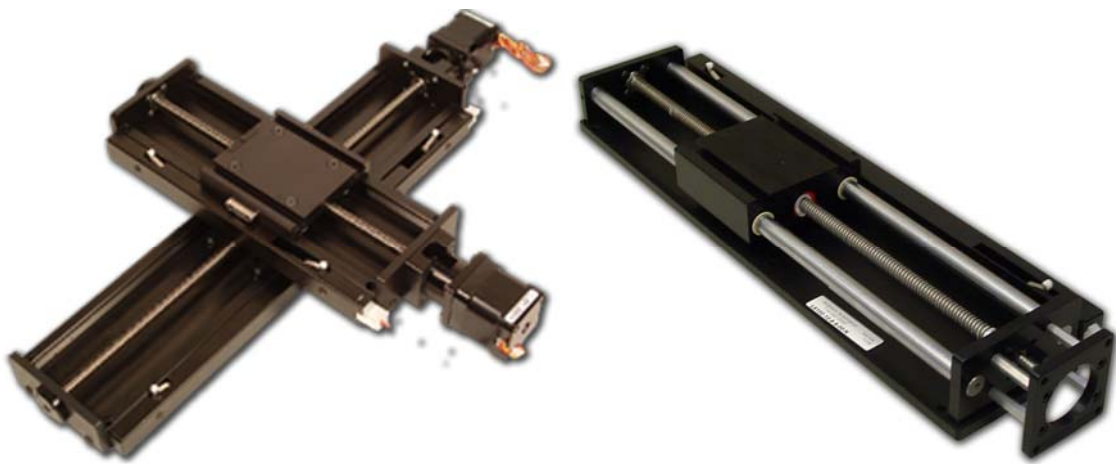


LS100 Series USER'S GUIDE





This manual, as well as the software described in it, is furnished under license and may be used or copied only in accordance with the terms of such license. The content of this manual is furnished for informational use only, is subject to change without notice and should not be construed as a commitment by Anaheim Automation. Anaheim Automation assumes no responsibility or liability for any errors or inaccuracies that may appear herein.

Except as permitted by such license, no part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, recording, or otherwise, without the prior written permission of Anaheim Automation.

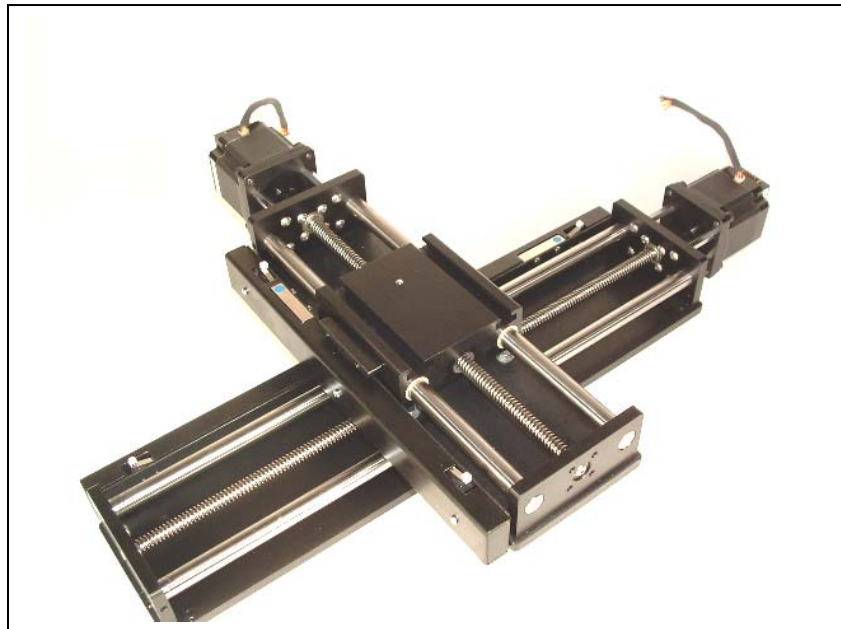
Anaheim Automation
910 E. Orangefair Lane
Anaheim, CA 92801
(714) 992-6990
(714) 992-0471 Fax
www.anaheimautomation.com

Anaheim Automation's LS100 Series Positioning tables offer precision performance for use in a variety of General Automation Applications such as:

- Lab Automation
- Biotech Automation
- Inspection Stations
- Part Scanning
- Pick & Place
- Liquid Dispensing
- Part Insertion
- And many others.

Construction

Anaheim Automation's LS100 Series Positioning tables are designed to provide accurate precision while minimizing physical size and cost. These tables use a low friction, preloaded stainless steel acme lead screw, twin railed linear system. The linear rails are mounted to a rigid support on opposite ends of the precision machined aluminum end plates. The load is mounted to a precision machined aluminum carriage, which has T-Slots for inserts that are designed to fit T-Nuts. The T-Nuts are threaded for high strength and wear. All Anaheim Automation Standard tables are built with ACME Lead Screws that offer the needed resolutions and precision at a low price. The tables are designed to accommodate a variety of options, which can feature items such as End of Travel (EOT) & HOME Switches, rotary encoders, cables for our motors, switches and encoders. A motor/driver hybrid (23MD Series) is also an option that combines the needed driver to a step motor, simplifying the need for STEP & DIRECTION Signals from an external controller. Long T-Nuts are provided to add the option to assemble XY Stages together when applicable.



ACME Screws

Three different acme screws can be installed in the LS100 series tables, providing solutions for typical industrial applications. We offer a high, mid and low resolution leads to allow for a range of solutions.

Screw Selection	Screw Type	Lead per Revolution (inches)	Lead Accuracy		Resolution per 1/2 Step (inches)	Torque to Raise 1 Lb	Bidirectional Repeatability (inches)
			(in/in)	(in/ft)			
A	3/8-16 ACME	0.0625	0.0003	0.003	0.000156	0.58 oz-in	0.001
D	3/8-10, 2 Start ACME	0.2	0.0003	0.003	0.0005	0.92 oz-in	0.001
H	3/8-8, 4 Start Stub ACME	0.5	0.0003	0.003	0.00125	1.80 oz-in	0.001

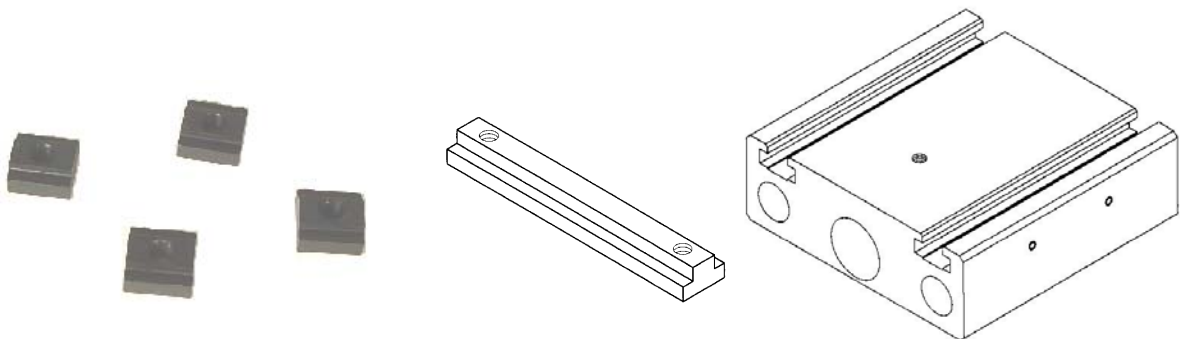
(Refer to the Specification Section for more Table details.)

Carriage T-NUTS (Optional)

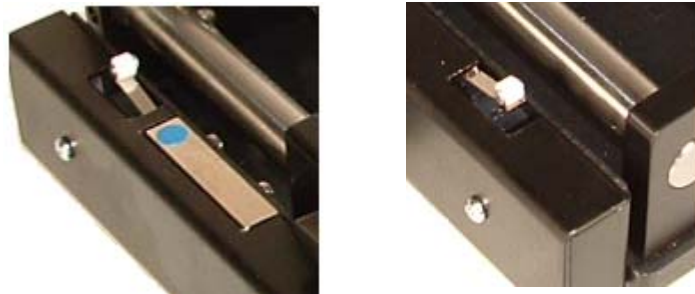
Recommended carriage T-NUTS can be slotted directly into the carriage of the LS100 series tables, providing the easy multiple axis configuration and ability to mount external loads to the carriage.

Also known as tapped-thru nuts or T-Slot Nuts, these nuts are threaded all the way through so studs can extend beyond the bottom of the nut for increased take-up. Nuts are made of case-hardened C1018 steel with a black-oxide finish which is comparable to low strength steel. Each table carriage has T-Slots for mounting the user supplied load. A load adapter plate should be used between the load and the carriage surface if your load requires additional base mounting holes to properly securing the load.

End of Travel and Home Switches (Optional)



The LS100 series tables can be provided with end of travel (EOT) and home proximity switches, which are assembled / wired onto the table assembly. Most position controllers can utilize the EOT switches to stop the carriage motion when exceeding table travel has been reached in either direction. The home switch provides a known datum location or zero position on the table that establishes a known HOME position for the positioning controller used.



Rotary Encoders (Optional)

Incremental encoders can be mounted to the step motors in order to provide positional feedback data to a motion controller.



Motor Adapter Brackets

The NEMA 23 is the Standard motor mount for all LS100 Series Tables.

Special NUT with Rolled ACME Screw

A solid polymer nut has no rolling elements in it providing smoother motion and less audible noise than most ball nuts, and is ideal for clean and harsh environments.

Maximum Carriage Speed

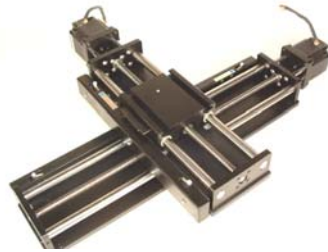
The maximum speed of the carriage is determined by the screw lead, screw length, screw diameter and bearing support system. *Refer to Specifications for more details.*

Backlash

The drive nut offered is a pre-loaded, zero backlash nut offering zero backlash operation that automatically adjusts for wear to insure zero backlash for the life of the positioning table.

Linear Guide Rods

The linear guides used are 60 CASE Hard Ground Rods that are made to provide smooth operation and reduce wear on rod bearings.



Connections to Table Assembly

Separate cables with mating connectors for the step motor, EOT/ Home Limit Switches and Encoder are provided for ease of operation. Anaheim Automation will provide and assemble standard NEMA 23 Step Motor that will be sized based on the application.

Cable P/N	Function / Description
CBL-AA4101	10ft Limits/ Home Sensor Cable with 6 PIN Mating Connector
CBL-AA4102	10ft Motor Cable with 8 PIN Mating Connector
CBL-AA4175	10ft Encoder Cable with 5 PIN Mating Connector
CBL-AA4266	10ft, 23MD Series Motor/Driver Cable with 7 PIN Mating Connector

***Cables included per the table part number selected.**



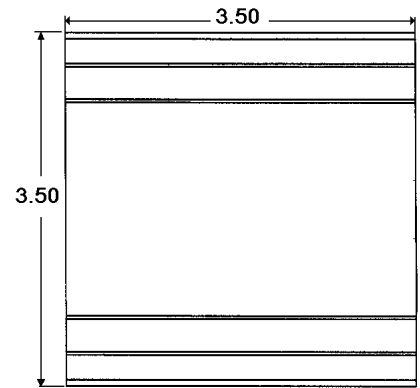
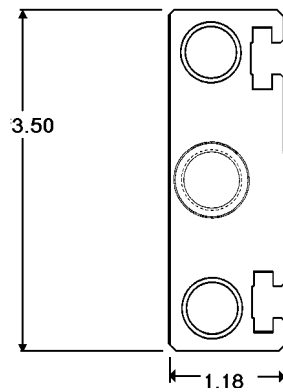
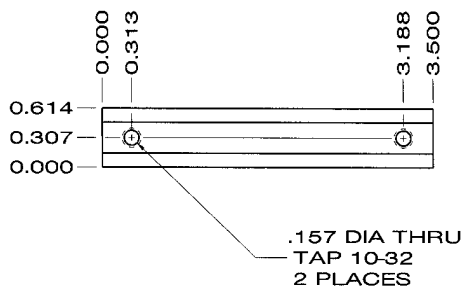
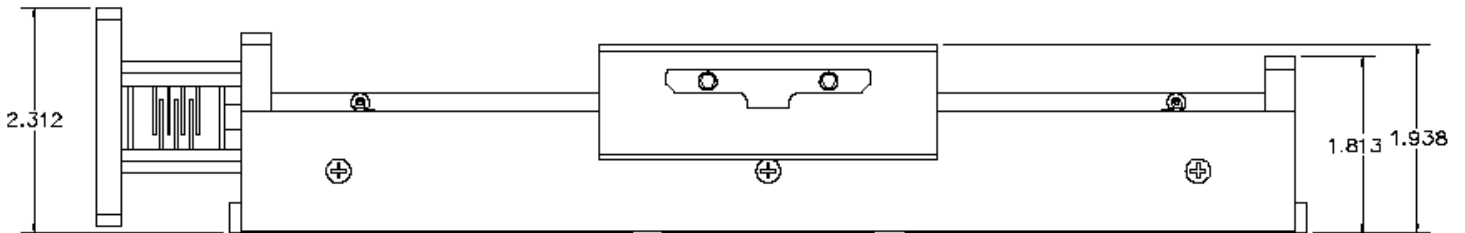
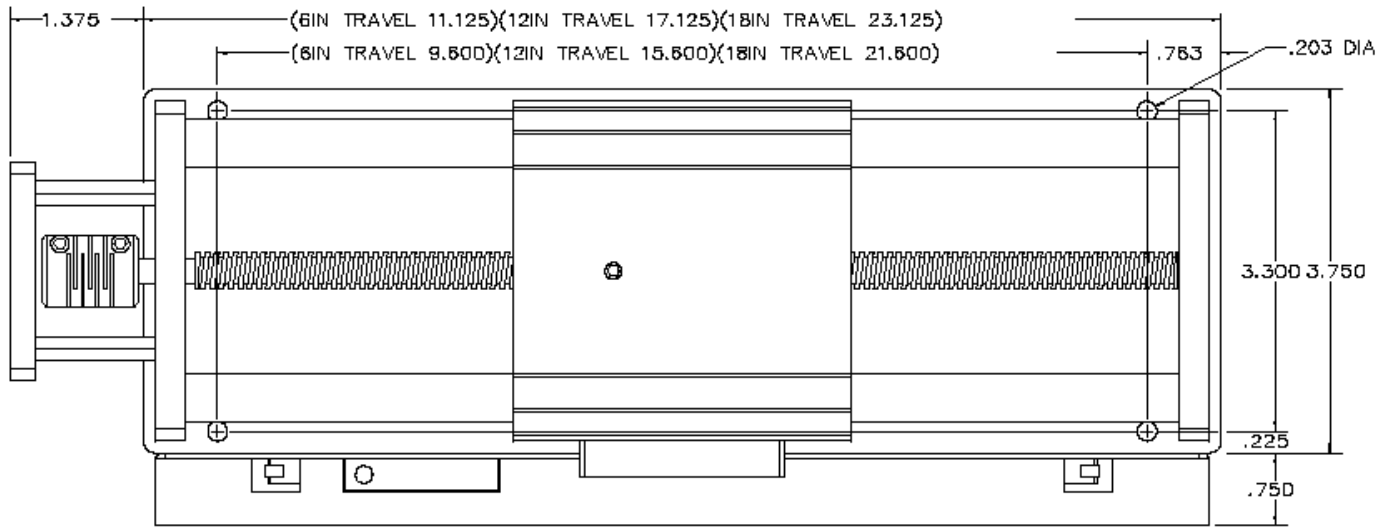
Lubrication

The type of lubrication recommended is Lithium Grease or Synthetic Teflon Grease. It is recommended that the linear rails and screw assembly be lubricated depending on the application duty, speed, and environment installed. Insufficient lubrication can result in excessive wear which may cause scoring of the rails, rough table operation, corrosion, and even failure of the positioning system. **WARNING:** Avoid the use WD-40, or other cleaning solvents, as they can cause damage to the screw assembly and linear rails.

ACME screws & polymer nut screw driven positioning tables have a solid surface contacting a solid surface, therefore sufficient lubrication is required. Apply lubrication directly onto the entire length of the screw and linear rails on a regular basis. **(Not provided with purchase)**

The critical factor in the life of a plastic nut is the heat build up in the nut. Each application has different heat conditions and each application has differences in lubrication requirements. These have dramatic effect on the nut life. There is NO formula that can account universally for these variations.

Dimensions





All table assemblies will include a NEMA 23 Step Motor based on table length and system load requirements.

Please contact the factory prior to selecting the complete table assembly to insure a proper selection.

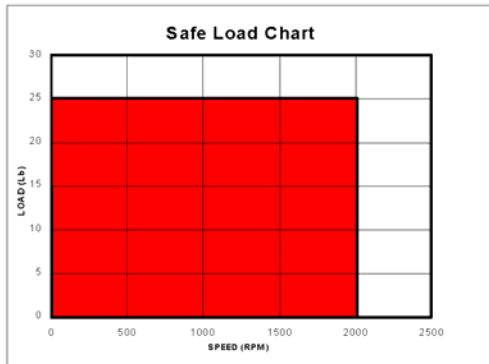
T-NUTS are recommended to allow for the assembly of additional materials to the table carriage, please refer to the Ordering Information Section for the T-Nut Part Numbers & Descriptions.

T-NUTS P/N	Description/ Function
LS100-TNUT-01	Small T-Nut, ¼"-20 Thread, ¼" Height, 0.5625" Long Accommodates the ability to mount additional mounting plates or Load.
LS100-TNUT-02	Long T-Nut, 10-32 Thread, ¼" Height, 3.5" Long Accommodates the ability to mount additional LS100 Tables, Qty 4 10-32 Screws will be included.

SPECIFICATIONS

Travel		6	12	18
Resolution (with Divide-by- 64)	0.0625 in/rev lead (0,0016 m/rev)	4.88 x10 ⁻⁶ inches (0,12µm) @ 12,800 steps/rev resolution		
	0.2 in/rev lead (0,0051 m/rev)	15.6 x10 ⁻⁶ inches (0,39µm) @ 12,800 steps/rev resolution		
	0.5 in/rev lead (0,0127 m/rev)	39.1 x10 ⁻⁶ inches (0,99µm) @ 12,800 steps/rev resolution		
	0.0625 in/rev lead (0,0016 m/rev) w/ 400 Line Encoder	0.39 x10 ⁻⁴ inches (0,9µm) @ 1,600 counts/rev encoder resolution		
	0.2 in/rev lead (0,0051 m/rev) w/ 400 Line Encoder	1.25 x10 ⁻⁴ inches (3,18µm) @ 1,600 counts/rev encoder resolution		
	0.5 in/rev lead (0,0127 m/rev) w/ 400 Line Encoder	3.12 x10 ⁻⁴ inches (7,93µm) @ 1,600 counts/rev encoder resolution		
	0.0625 in/rev lead (0,0016 m/rev) w/ 1000 Line Encoder	0.156 x10 ⁻⁴ inches (0,4µm) @ 4,000 counts/rev encoder resolution		
	0.2 in/rev lead (0,0051 m/rev) w/ 1000 Line Encoder	0.50 x10 ⁻⁴ inches (1,27µm) @ 4,000 counts/rev encoder resolution		
	0.5 in/rev lead (0,0127 m/rev) w/ 1000 Line Encoder	1.25 x10 ⁻⁴ inches (3,18µm) @ 4,000 counts/rev encoder resolution		
Encoder Outputs	-	TTL square wave, Two Channel A & B		
Maximum Travel Speed	0.0625 in/rev (0,0016 m/rev)	0.5 Inches/ second (0,013 m/sec)		
	0.2 in/rev lead (0,0051 m/rev)	2 Inches/ second (0,051 m/sec)		
	0.5 in/rev lead (0,0127 m/rev)	10 Inches/ second (0,254 m/sec)		
Rated Maximum Dynamic Load Capacity of Carriage	Horizontal (orientation)	20 Lbs (11.34 kg)		
	Vertical (orientation)	15 Lbs (6.80 kg)		
	Side (orientation)	20 Lbs (9.07 kg)		
Maximum Deflection (center point)	5 Lbs (2.27kg)	0.0005" (12,7µm)	0.002" (50,8µm)	0.003" (76,2µm)

	10 Lbs (4.53kg)	0.001" (25,4µm)	0.003" (76,2µm)	0.007" (0.18x10 ⁻³ m)
	20 Lbs (9.07kg)	0.0025" (63,5µm)	0.007" (0.18x10 ⁻³ m)	0.015 (0.381x10 ⁻³ m)
Repeatability Bidirectional	Leadscrew	< 0.001 inches (25.4µm)		
Stage Weight	—	4.5Lb (2.0 kg)	6.0Lb (2.7 kg)	7.5Lb (3.4kg)
	23MD Series included	6.25Lb (2.8 kg)	7.75Lb (3.5kg)	9.25Lb (4.2kg)
Material	—	Aluminum		
Finish	—	Blake Anodize		
Flatness, Straightness & Orthogonality	-	<0.001 [inch / inch] (<25,4µm/µm)		
Screw Material	-	Stainless Steel		
Nut Efficiency	-	36% for 0.0625" Lead 65% for 0.2" Lead 79% for 0.5" Lead		
Nut Temperature	-	32°F-180° F (0°C - 82°C)		
Nut – Screw friction coefficient	-	0.08 – 0.14		
Duty	-	Low to Mid (< 50%)		



The area below 25 pounds and less than 2000RPM is the recommended load region.

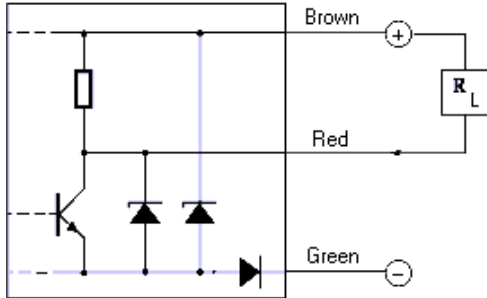
Wiring Instructions – Limits / Encoder / Motor

EOT and Home Proximity Switch Cable Connections

LS100 Series Table- Limits / Sensor Wiring Instruction Chart

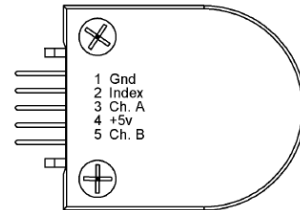
Connector PIN#	Cable Color	Description
1	BROWN	PROX +VDC (10-30Vdc, 200mA)
2	RED	PROX HOME SWITCH
3	GREEN	0 VDC , COMMON
4	BLUE	LIMIT SWITCH HARD -
5	WHITE	LIMIT SWITCH HARD +
6	BLACK	NO CONNECTION





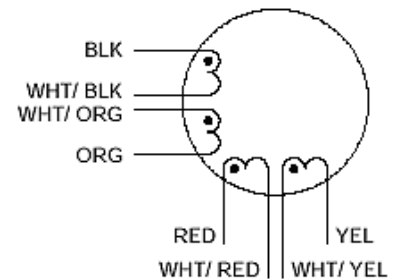
Encoder Cable Connection

Encoder Cable – Functions & Color Code	
Function	Color
0Vdc	BLACK
Index	N/C
CH A	GREEN
+5Vdc	RED
CH B	WHITE



Motor Cable Connections

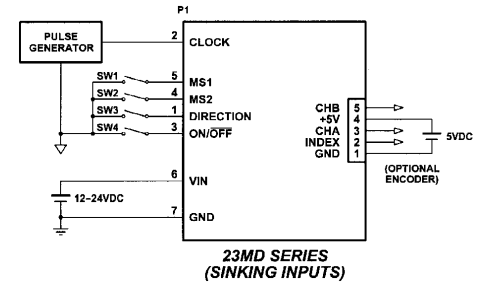
Connection	Lead Name	Lead Color
4 –Lead Bipolar Series	Phase A	Black
	Phase /A	Orange
	Phase B	Red
	Phase /B	Yellow
	Tie Connection	White/ Black & White/ Orange
	Tie Connection	White/ Red & White/ Yellow
4 –Lead Bipolar Parallel	Phase A	Black & White/Orange
	Phase /A	Orange & White/ Black
	Phase B	Red & White/ Yellow
	Phase /B	Yellow & White Red
6 –Lead Unipolar	Phase A	Black
	Phase /A	Orange
	Phase B	Red
	Phase /B	Yellow
	COMMON A & /A	White/ Black & White/ Orange
	COMMON B & /B	White/ Red & White/ Yellow



Cables will be supplied based on the table part number selected. All cables have a mating connector to the table assembly and have flying leads on the opposite end to connect to Driver/ Controller/ Power Supply Terminals.

Cable P/N	Function / Description
CBL-AA4101	10ft Limits/ Home Sensor Cable with 6 PIN Mating Connector
CBL-AA4102	10ft Motor Cable with 8 PIN Mating Connector
CBL-AA4175	10ft Encoder Cable with 5 PIN Mating Connector
CBL-AA4266	10ft, 23MD Series Motor/Driver Cable with 7 PIN Mating Connector

Motor Option	Holding Torque 2 phases on (oz-in)		Voltage per Phase (V / phase)	Current per Phase (A/Phase Peak)		Resistance (ohm/ph) Unipolar	Inductance per Phase (mH/phase) Unipolar	Shaft Options
	Unipolar	Bipolar		Unipolar	Bipolar Series			
2A	55	77	3.3	1.5	1.5	2.2	2.0	Single Ended
3A	55	77	1.8	3.0	3.0	0.6	0.6	Single Ended
3B	126	151	2.3	3.0	3.0	0.75	1.1	Single Ended
3C	188	226	3.0	3.0	3.0	1.0	1.6	Single Ended
2B	55	77	Same as 2A				Double Ended	
3E	55	77	Same as 3A				Double Ended	
3F	126	151	Same as 3B				Double Ended	
3G	188	226	Same as 3C				Double Ended	
4G	-	55	Refer to Literature #L010130 for detailed Specifications on 23MD Series Motor/Drivers http://www.anaheimautomation.com/manuals.htm					
4H	-	55						
4E	-	105						
4F	-	105						
4I	-	155						
4J	-	155						



Input Pin Descriptions

Pin #	Description	CBL-AA4031 Wire Color
1	Direction	Brown
2	Clock	Red
3	On/Off	Orange
4	MS2	Yellow
5	MS1	Green
6	12VDC-24VDC	Blue
7	0VDC (Gnd)	Violet

Direction: Logic "1" CW
Logic "0" CCW

Clock: Active - 1 Step
Inactive (open) - Reduce Current Mode

On/Off: Active - Off
Inactive (open) - On

Note:
Open Inputs are inactive and internally pulled up to +5VDC for 23MDX06X-XX-00-00 (Sinking)
Open Inputs are inactive and internally pulled down to 0VDC for 23MDX06X-XX-24-00 (Sourcing)

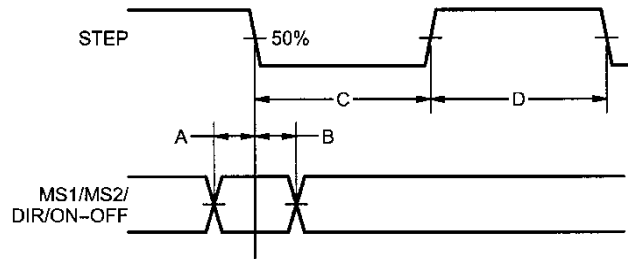
Encoder Pin Descriptions

Pin #	Description	CBL-AA4032 Wire Color
1	0VDC (Gnd)	Brown
2	Index	Red
3	Channel A	Orange
4	+5VDC	Yellow
5	Channel B	Green

- A. Minimum Command Active Time
Before Clock Pulse (Data Set-Up Time) ... 200nS
- B. Minimum Command Active Time
After Clock Pulse (Data Hold Time) 200nS
- C. Minimum CLOCK Pulse Width 1.0uS
- D. Minimum CLOCK Off Time 1.0uS
- Maximum CLOCK Frequency 500kHz

Control Inputs (Pins 1, 2, 3, 4, 5):

Microstep Resolution Truth Table		
MS1	MS2	Resolution
Active	Active	Full Step
Inactive (Open)	Active	Half Step
Active	Inactive (Open)	Quarter Step
Inactive (Open)	Inactive (Open)	Eighth Step



For the sinking version (23MDX06X-XX-00-XX) the inputs are considered inactive or Logic "1" if left open, or active or Logic "0" if grounded. For the sourcing version (23MDX06X-XX-24-XX) the inputs are considered inactive or Logic "0" if left open, or active or Logic "1" if pulled to 3.5 - 24VDC.

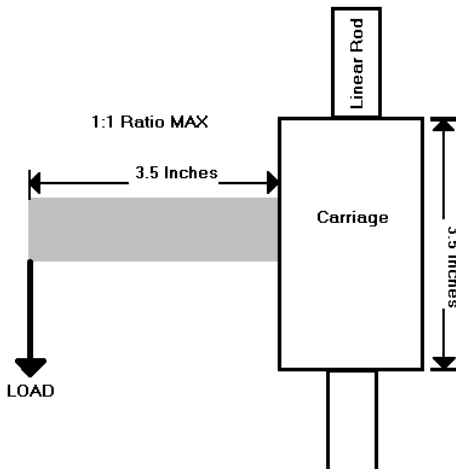
Mounting Requirements

In order to achieve the published accuracy & repeatability of an LS100 Series positioning Table, care must be taken when mounting the table to your surface. The mounting surface of the positioning table must be as flat, or flatter than the positioning table itself. If the surface is not flat, "shimming may be required. Proper table mounting is essential and highly recommended so that the table can be supported over its entire length and that all table base mounting holes are used. This will prevent the table from deflecting over unsupported regions when the load travels over that area. It also maintains the systems rigidity, and prevents shortened positioning table life from structural fatigue.

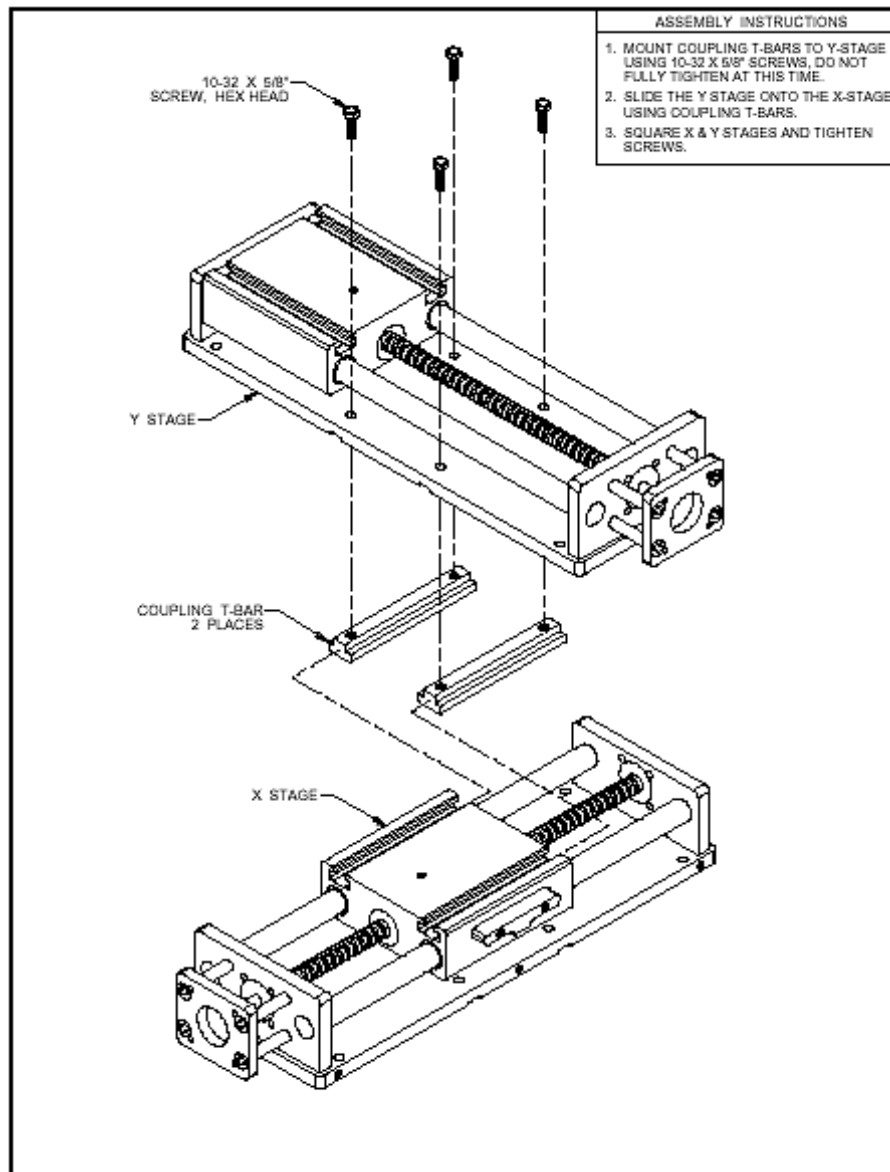
Recommended Base Mounting Screws: English mount #10-32
Base Mounting screws are NOT provided by Anaheim Automation

Cantilever Load

It is recommended that a 1:1 ratio be used when loading the carriage of the LS100 Series Tables. The 3.5" Carriage Length predetermines the attached MAX Length that the extended load should rest from.



XY Mounting Assembly Instruction





Terms and Conditions

Limited Warranty

All Anaheim Automation products are warranted against defects in workmanship and materials, when used under normal operating conditions and when used in accordance with the factory's specifications. This warranty is in effect for a period of twelve months from the date of purchase, or eighteen months from the date of manufacture, whichever comes first. Anaheim Automation will repair or replace at its' option, any of its products found to be defective and are within the warranty period. Anaheim Automation is not responsible for removal, installation, or incidental expenses incurred in shipping to and from the factory. Anaheim Automation is not liable, under any circumstances, for any consequential, incidental or indirect damages or expenses associated with the warranted product. Product that is damaged due to misuse, abuse, negligence, exposure, accident, improper installation or hook-up, or has been modified or dismantled, is NOT covered under this warranty.

Open Accounts

Anaheim Automation extends credit to Government agencies, industrial and distributor accounts with a good published credit rating. Companies may apply for an open account by filling out Anaheim Automation's Credit Application Form, or by supplying credit information on their company's letterhead to Anaheim Automation's Accounting Department. Credit Information supplied by the buyer, or by others on the customer's behalf, shall become part of the Credit Application and any false or misleading information shall constitute fraud. All orders are shipped prepaid, COD, cash, wire-transfer, VISA or Mastercard, until an open account is established.

Payment Terms for Open Accounts

Terms are Net 30 days. FOB is Anaheim, California.

Account Management and Remedies

In the event it becomes necessary for Anaheim Automation to file suit to enforce payment of past due invoices, such a suit will be brought in Orange County, California. Anaheim Automation shall be entitled to collection of fees, court costs, and interest at 10% per annum or such legal maximum rate as is allowed, on all invoice amounts past due. All purchase agreements are governed by the laws of the State of California.

Shipping

Anaheim Automation ships UPS Ground. If the customer prefers another carrier, or a premium routing method, this information must be clearly stated on the Purchase Order and confirmed, in writing, by Anaheim Automation. The customer must authorize any additional expenses that will incur. If quoted "factory stock," and Anaheim Automation has received a Purchase Order by noon PST, the order will ship the following day. For customers with an urgent request, there exists a possibility to ship later the same day. However, an "expedite fee" is charged, along with any other expenses incurred to fulfill this request.

All promises of shipment or delivery are approximated as closely as possible by Anaheim Automation, but are subject to delivery estimates made by our suppliers, weather conditions, fires, strikes, disputes, accidents, delays in transportation, material, fuel, or labor shortages, or any other cause beyond reasonable control of Anaheim Automation. *In no event will Anaheim Automation assume any responsibility for any delays in shipments or deliveries.*

Expediting Orders

If orders must be expedited, interfering with the normal flow of manufacturing, a minimum of a 15% "expediting fee" will incur. The minimum "expediting" charge is \$50.00 per order.

Blanket Orders

All Blanket Orders must be confirmed with a written Purchase Order, and include scheduled release dates. Any changes to the schedule or the quantity purchased, must be agreed upon by Anaheim Automation, Inc., and a written "Change Order" must be in processed to confirm such changes. **NOTE: Blanket Orders are Non-Cancelable and Non-Returnable.**

Shortages or Damages

All claims for shortages or shipment errors must be made within 15 days after the receipt of the shipment. Anaheim Automation's liability is limited to the value of material value on the invoice. Claims for other loss or damages are filed against the carrier involved in the specific shipment.

Discontinued Items

Items are subject to change or discontinuance without notice. Ask a Customer Service Representative for advice on any possible substitution for your application.



Returns (RMA) and Repairs

Anything being returned to Anaheim Automation must have a RMA (Return Materials Authorization) number assigned by the factory, and it must be referenced on all the paperwork accompanying the return/repair. Items that do not reference the RMA number will not be processed. Do NOT return product using a Debit Memo. No product will be accepted for Credit after 30 days from the date of shipment. Product must be shipped with freight prepaid. ***Special, custom or modified products are Non-Returnable, and no credit shall be offered.***

Product in need of repair must have previous authorization to return it to the factory. It is critical to do so, as the advice the factory can offer is invaluable, and can often save the customer money. The factory will determine upon inspection whether the product is covered under warranty. The factory charges a "flat-rate" fee based on model number, regardless of the problem found. The fee is charged for all returns, including those where no problem is found, as inspection and test is time-consuming.

Cancellations and Restocking Charges

Cancellation of any order must be approved by Anaheim Automation and will be on terms that protect us from any loss. The restocking charge is 15% on all product returned. The minimum restocking charge is \$25.00. Returns must be made within 30 days of receipt of product. Shipping expenses are paid by the customer. All products are subject to factory inspection and must be in resellable condition to receive credit. ***Special, custom and modified products are Non-Returnable and Non-Cancelable.***

Engineering or Technical Assistance

Technical assistance is available at no charge to help the customer in choosing Anaheim Automation products for a specific application. However, any selection, quotation, or application suggestion offered from Anaheim Automation, its' representatives or distributors, are only to assist the customer, and in all cases, determination of fitness for purpose or use are solely the customers' responsibility. While every effort is made to offer solid advice and to produce technical data and illustrations accurately, such advice and documents are for reference only, and subject to change without notice. Programming of product is the customer's responsibility.

All Sales are made pursuant to the Terms and Conditions herein, are in lieu of any other expressed or implied terms, including but not limited to any implied warranties.