

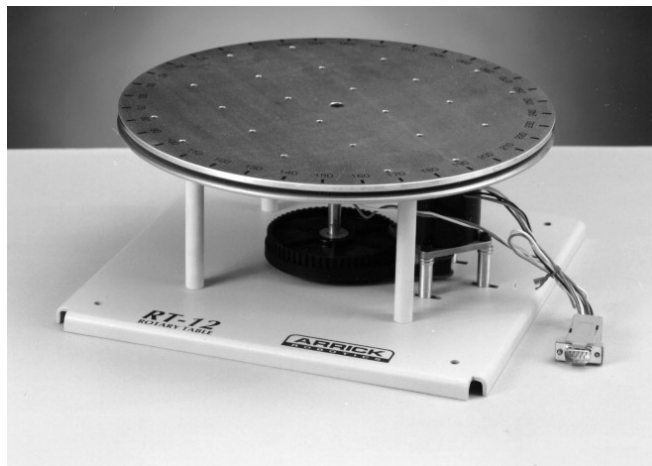
RT-12

Rotary Positioning Table

User's Guide

Revision B

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Description

The RT-12 rotary positioning table was designed as a cost-effective alternative to more expensive products. When coupled with our MD-2 stepper motor system and a personal computer, the user has complete programmable control over all motion. The 12" aluminum platform rides on ball bearings and can position payloads such as sensors or small tools. A total of 24 tapped holes are provided for mounting. The RT-12 can be used in conjunction with other positioning tables to create a multi-axis positioning system. A switch is included which is used for home reference. A timing belt, aluminum frame, and pulleys are used to create this rugged and cost-effective product. Size 23 motor not included.

Specifications

Mechanical Construction -

Shaft: .375 aluminum.
Bearings: 12" ball, .375 bronze.
Timing belt: .2" pitch x .375" wide. 14 inches.
Pulleys: 10 tooth, 60 tooth (6:1 ratio)
Frame: .125 aluminum.
Top Plate: 3/16" aluminum plate x 12" diameter.
Fasteners: 10-32 threads.

Motor Requirement -

NEMA frame size 23.
.25 dia shaft, .75" long.
1.86 square hole pattern, #10 screw.
1.8 degree full steps .9 degree half steps.
30 oz/inch torque minimum.

Home Switch -

Used for home reference positioning.
Mechanical plunger type SPDT switch.
15 amp contacts maximum.
Repeatability .0005".
10 ounces operating force.

The following specifications assume the use of a stepper motor with a .9 degree resolution such as our MD-2a motor control system and a payload of 2 pounds. Adding a PR23-3 3:1 pulley reducer would improve repeatability, accuracy, and resolution by a factor of 3. Speed may also increase depending on acceleration profile.

Unidirectional Repeatability: .1 degrees

The ability to return to the desired position repeatedly from one direction.

Bidirectional Repeatability: .4 degrees

The ability to return to the desired position repeatedly from both directions.

Accuracy: .1 degrees

The maximum difference between the actual and the desired position.

Resolution: .15 degrees

The minimum controllable motion interval that the platform is capable of moving.

Speed: 45 degrees per second

The velocity of the platform relative to the base.

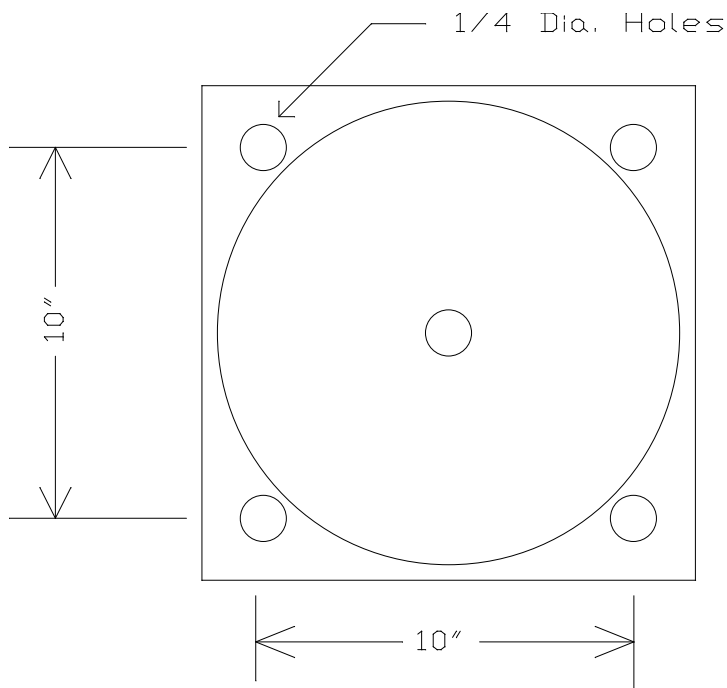
Specifications subject to change without notice

Unpacking

Open the box and remove the RT-12. Locate the package containing the hardware which will be needed to install the motor and mount the table. Fill out the warranty registration card and return it to ARRICK ROBOTICS. Keep the packaging for future shipment.

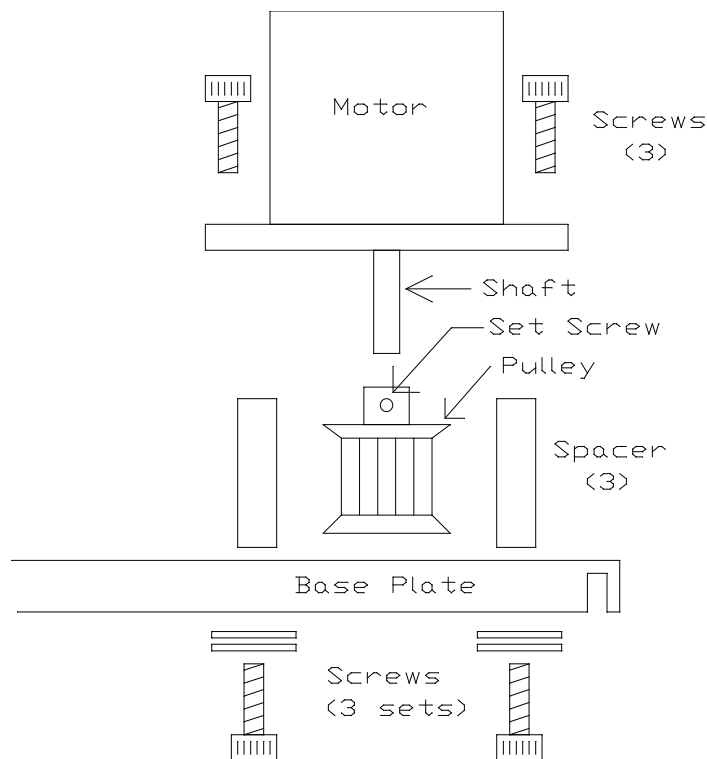
Mounting

Mount the RT-12 on a sturdy, flat surface. The RT-12 was not designed to operate in a vertical position although moderate performance can be achieved if the payload is small. Size 1/4-20 screws, washers and nuts are included to mount the RT-12 to your work surface. The following diagram details the mounting hole pattern:



Motor Installation

Motor installation is accomplished by first attaching the 10 tooth pulley to your motor. A hex wrench is supplied to tighten the set screw found on the pulley - do not over-tighten. Remove the 3 motor mounting spacers by removing the screws and washers from the bottom of the base plate. Attach the spacers to 3 of the the motor's mounting holes with the 3 10-32 screws provided in the hardware package. Now slide the motor on to the base plate and wrap the belt around the motor's pulley and the table's pulley. Align the motor so that the holes for the 3 spacers can be seen through the slots in the base plate. Use the 3 screws and washers to mount the motor. Pull the motor while tightening the screws so the belt will have moderate tension. Too much tension will keep the shaft from rotating smoothly, too little will result in poor positioning accuracy and repeatability. Attach the 2 home switch wires to the home switch's COMMON and NORMALLY OPEN contacts (see home switch section). Route the wire away from any moving parts.

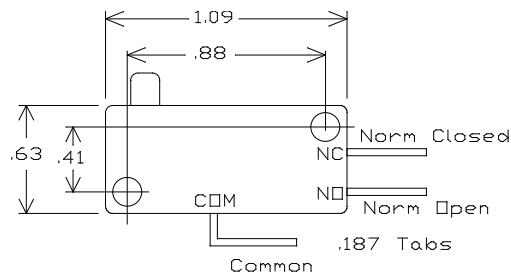


Belt Adjustment

Loosen the 3 screws that mount the motor found on the bottom of the base plate. Pull the motor while tightening the screws so the belt will have moderate tension. Too much tension will keep the shaft from rotating smoothly, too little will result in poor positioning accuracy and repeatability.

Home Switch

The home switch provides feedback to the motion control system so the computer's software will know the exact position of the rotary table. The home sequence software will search for this switch to establish the home reference position. All subsequent positioning is referenced to this home position. The home sequence can be activated any time to reestablish the home position. There is no adjustment necessary for the home switch. Attach the home switch wires to the COMMON and NORMALLY OPEN contacts on the switch (wire colors are not important). Replacing the switch requires removal of the top plate to access the 2 mounting screws. The following drawing describes the home switch.

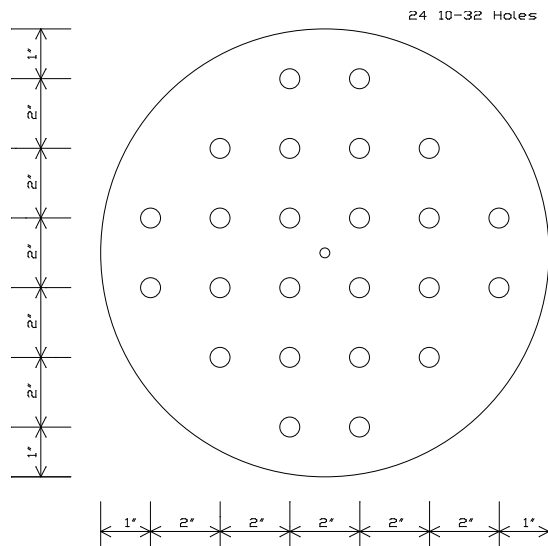


Attaching Payloads

Payloads can be attached to the platform by using the 24 tapped holes provided which have 10-32 threads. Do not over tighten these screws since stripping of the threads may occur. Do not use long screws that may come in contact with the bearing. Center the payload as much as possible to minimize stress on the bearings. Accuracy, repeatability, and other specifications are affected by the weight of the payload. As the weight of the payload increases, the speed may need to be decreased since stepper motors have more torque and slower speeds.

The positioning table is made to be used on a horizontal surface but can be mounted vertically to position payloads against gravity. A pulley reducer can be used to increase the torque of the system. The payload can also be counter-balanced by attaching a weight to one side or by using a spring hanging from above the system. These techniques have the effect of limiting the amount of torque required by the motor.

Top Plate Hole Pattern



MD-2 System Usage

This section discusses the use of the MD-2a dual stepper motor system with the RT-12 positioning table. The following motor parameters will work with most applications:

Backlash:	0
Home Direction:	Reverse
Home Offset:	.1
Forward Limit:	9999999
Reverse Limit:	-9999999
Minimum Speed:	250
Maximum Speed:	500
Motor Name:	"RT-12"
Slope:	200
Units Name:	steps
Units values:	1

It may be necessary to fine-tune the Minimum Speed, Maximum Speed, and Slope parameters for best performance with your payload.

Units conversion will not operate on the RT-12 because the resolution of .15 degrees will not evenly divide into 1. When using a PR23-3 3:1 pulley reducer, UNITS NAME can be set to "Degrees" and UNITS VALUE can be set to 20 since there are 20 .05 degree steps per degree. When using units conversion, remember that speed, slope, and other parameters must be given in units instead of steps.

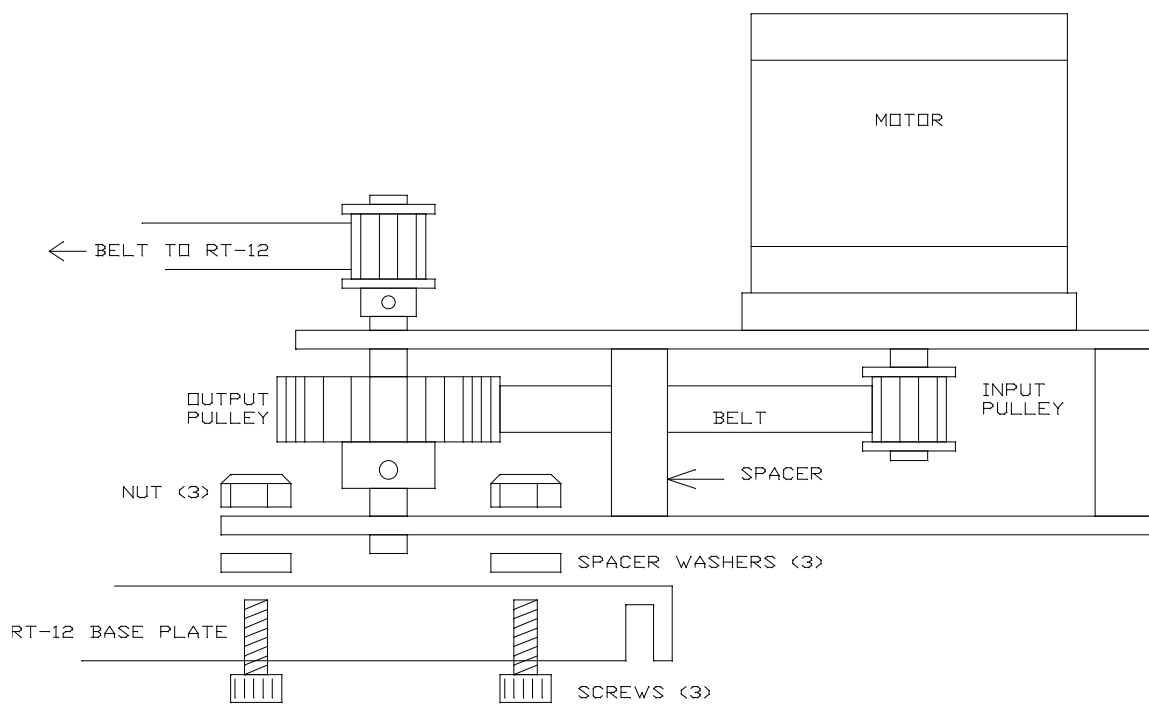
A forward motor direction results in clockwise platform rotation, reverse results in counterclockwise rotation.

Consult the MD-2 manual for additional information about parameters and motion programs.

Pulley Reducer Usage

The performance of the RT-12 can be improved by using a PR23-3 pulley reducer. The motor mounts to the PR23 and the entire assembly is mounted to the RT-12. The result is a 3-fold increase in the pulley reduction from 6:1 to 18:1. This results in resolution of .05 degrees per .9 degree motor step. Torque will increase by a factor of 3 and speed will be improved due to better use of the motor's torque curve.

Mount the pulley reducer according to the diagram below. It will be necessary to slide the RT-12's main pulley up higher on the shaft to accept the belt from the PR23.



Typical Applications

Many applications requiring relatively low accuracy and repeatability are candidates for the RT-12. Some of them include:

Sensor positioning

Automation simulation

Test probe positioning

Automated drilling, routing, or grinding

Camera positioning

Pick and place machines

Automated soldering

The modular design of the RT-12 and our other positioning products makes it easy to create your own custom motion control applications. The RT-12 can be used in conjunction with our linear positioning tables to construct multi-axis positioning systems.

Contact ARRICK ROBOTICS for more information about using our positioning tables and motor control systems.

Troubleshooting

The RT-12 positioning table is a relatively simple device than can normally be repaired using simple hand tools. A list of common problems with solutions can be found below.

Note: Do not oil bearings. Doing so may increase friction and reduce performance or result in erratic behavior.

1. If the accuracy or repeatability does not match the specifications, check the weight of the payload as performance will degrade as the payload's weight is increased. A loose belt or loose pulley can also be a source of positioning error. It is important that the top plate mounting screw (in center) is secured tightly. A star washer is supplied underneath the top plate to help prevent slippage.
2. If the table does not spin smoothly, locate the collar just under the top plate that is used for the home switch arm and loosen the collar's set screw. Press down on the top plate and up on the collar while tightening the collar. This has the effect of capturing the top plate on the bearing. An excessively tight fit will result in unnecessary friction and wear.
3. When using stepper motors to drive the table at high speeds with large payloads, lost steps can result. The torque of a stepper motor will decrease as the speed is increased and can cause lost steps or erratic behavior. Experiment with slower speeds and lighter payloads. Counter-balance the payload with weights or springs to reduce motor torque requirements.
4. Mounting the table on an uneven surface can result in binding and lost steps.
5. Mounting the table in a vertical position requires the motor to move the payload against gravity thus lowering the payload capacity and/or speed. Counter-balance the payload with weights or springs to reduce motor torque requirements.
6. Broken or worn parts can be replaced easily. Contact Arrick Robotics for replacement parts.

Warranty Information

Arrick Robotics warrants this product to be in good working order for a period of 1 year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, repair or replace the product at no charge except shipping and insurance charges. This limited warranty does not include service to repair damage to the product resulting from accident, disaster, misuse, abuse, or modification. To obtain warranty service, contact us at (817) 571-4528 to receive shipping instructions.

You agree to prepay shipping charges and to insure the product or assume the risk of loss or damage in transit. All express or implied warranties for this product including the warranties of merchantability and fitness for a particular purpose are limited in duration to a period of 1 year from the date of purchase, and no warranties, whether express or implied, will apply after this period.

If this product is not in good working order as warranted above, your sole remedy shall be repair or replacement as provided above. In no event will Arrick Robotics be liable for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use of or inability to use this product.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

Note:

Using inadequate packaging techniques may result in a damaged product. Before shipping the unit, contact ARRICK ROBOTICS for detailed instructions and shipping information.

Shipping Address: Arrick Robotics
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Eules, Texas 76040 USA



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