Crustcrawler Pro-Series Robotic Arm Builders Guide

VERSION 2.0

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WARRANTY

CrustCrawler warrants its products against defects in materials and workmanship for a period of 30 days. If you discover a defect, CrustCrawler will, at its option, repair, replace, or refund the purchase price. Simply call for a Return Merchandise Authorization (RMA) number, write the number on the outside of the box and send it back to CrustCrawler. Please include your name, telephone number, shipping address, and a description of the problem. We will return your product, or its replacement, using the same shipping method used to ship the product to CrustCrawler. This warranty does not cover the Robotis servos as they are covered under the Robotis warranty and require a Return Merchandise Authorization (RMA) number authorized by Robotis only. Crustcrawler does not have the authority to replace or repair the Robotis line of servos as all repair replacement authority is completed by Robotis.

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Support

Crustcrawler wants to ensure your success, so if you ever need support you can contact us at:

Phone: - 480-577-5557
E-mail – support@crustcrawler.com
CrustCrawler Forum - http://forum.crustcrawler.com/phpBB3/index.php

http://support.robotis.com

The Robotis support site is loaded with free software downloads including a complete Software Development Kit (SDK) for both multiple controllers. Visit this site often as it is updated on a daily basis.

Preparing to Assemble the Crustcrawler Pro-Series Robotic Arm Components

REQUIRED TOOLS

The following tools will be required to build the CrustCrawler Pro-Series of components:

- Small head, 6 in.(15.24cm) or longer Phillips screwdriver
- Needle nose pliers
- Loctitite thread locker (or equivalent thread locker)

Note: CrustCrawler provides the allen wrenches with all kit components.

Safety

- Always maintain a minimum distance of 3 feet from the farthest reach or your robotic arm when powering and/or operating your robotic arm.

- Always disconnect power from your robotic arm before approaching and handling the robotic arm in any way.

COMPATIBILITY

The Crustcrawler Pro-Series of robotic arm components are compatible with the following Robotis servos:

- AX-12A / AX-18A
- MX28T / MX-28R / RX-28 (HN07-N101 Type only)
- MX-64T / MX-64R / RX64 (HN05-N101 Type only)
- MX106T / MX106R

Note #1:

The "HN05-N101 Type and HN07-N101 Type" designations indicates the type of servo horn hole pattern that comes standard with the servo. HN05-N101 and HN07-N101 type servos have the same servo horn hole patterns as the MX servo series and will work with the Crustcrawler Pro-Series of robotic arm components.

Note #2:

The MX-28T, MX-64T and the MX-106T type servos are 3-pin serial and the MX28R/64R/106R use 4-pin RS232 communication protocols. Please keep this in mind when selecting the type of servo you are going to use on the CrustCrawler Pro-Series Robotic arm.

Note #3:

Since the connections between servos are to be connected to each other (daisy chained) when building the robotic arm, it is a best practice to use servos of the same type of communication protocol but is not necessarily required.

CRUSTCRAWLER PRO-SERIES COMPONENTS

The Crustcrawler Pro-Series of arm components are made to connect in a number of different ways using simple hand tools. The following is a list of Pro-Series Arm components with a complete listing of hardware parts contained within each kit.

FIXED AND ADJUSTABLE GIRDERS

PART #	DESCRIPTION	HARDWARE
	**2.5in (6.35cm) Girder** **Weight - .8oz.**	**(12) #4 Lock nuts** **(4) #4 - 1/4" screws** **(8) #4- .31in. Countersink Screws**
	**5 in. (12.7cm) Girder** **Weight - 1.3oz.**	**(12) #4 Lock nuts** **(4) #4 - 1/4" screws** **(8) #4- .31in. Countersink Screws**
	**Adjustable 8.31in. (21.11cm) to 13.21 in. (33.81cm) Girder** **Weight - 3.9oz**.	**(12) #4 Lock nuts** **(4) #4 - 1/4" screws** **(8) #4 - .31in. Countersink Screws**
	**Single Plate Adapter** This plate is required any time a single axis is going to be connected to one end of the girder. **Weight - .6oz.**	**(4) #4 - .31in. Countersink Screws**

SINGLE AND DUAL AXIS MODULES

PART #	DESCRIPTION	HARDWARE
	**MX/RX-28 Single Axis Kit** **Height = 2.91in.(7.39cm)** **Width = 1.89in(4.8cm)** **Weight = 3.4 oz.**	**(4) #4 Lock nuts** **(4) #4- 1/4in. Screws** **(4) M2.5 – 8mm screws/ nuts** **(4) #4 .31in countersink screws**
	**MX/RX-64 Single Axis Kit** **Height = 3.50in.(8.89cm)** **Width = 2.21in.(5.6cm)** **Weight = 6 oz.**	**(4) #4 Lock nuts** **(4) #4- 1/4in. Screws** **(4) M2.5 – 8mm screws / nuts** **(4) #4 .31in countersink screws**
	**MX-106 Single Axis Kit** **Height = 3.6in (9.14cm)** **Width = 2.45in. (6.22cm)** **Weight = 6.9oz.**	**(4) #4 Lock nuts** **(4) #4- 1/4in. Screws** **(4) M2.5 – 8mm screws/ nuts** **(4) #4 .31in countersink screws**
	**MX/RX-28 Dual Axis Kit** **Height = 3.10in.(7.87cm)** **Width = 4.94in.(12.54cm)** **Weight = 8.10oz.**	**(16) #4- .31" countersink screws** **(4) #4-1/4" screws** **(8) #4- Lock Nuts** **(8) M2.5 – 8mm screws / nuts**
	**MX/RX-64 Dual Axis Kit** **Height = 3.68in.(9.34cm)** **Width = 5.10in.(12.95cm)** **Weight = 13.2oz.**	**(16) #4- .31" countersink screws** **(4) #4-1/4" screws** **(8) #4- Lock Nuts** **(8) M2.5 – 8mm screws/ nuts**

	**<u>MX-106 Dual Axis Kit</u>** **Height = 3.79in. (9.62cm)** **Width = 5.32in (13.51cm)** **Weight = 15oz.**	**(16) #4- .31" countersink screws** **(4) #4-1/4" screws** **(8) #4- Lock Nuts** **(4) M2.5 – 8mm screws/nuts**

WRIST ROTATE MODULES

	**AX Series** **Weight = 3.5oz.**	**(4) M2 – 14mm screws** **(12) #4 – ¼" screws** **(4) #4 lock nuts** **(2) AX Side brackets** **(2) RX/MX-28 angle brackets** **(1) .394" (9.93mm) Axis Spacer**
	**RX/MX-28 Series** **Weight = 4.5oz.**	**(4) M2 – 14mm screws** **(8) M2.5 – 8mm screws** **(12) #4 – ¼" screws** **(4) #4 lock nuts** **(2) MX Side brackets** **(2) RX/MX-28 angle brackets** **(1).394" (9.93mm) Axis Spacer**
	**RX/MX-64 / 106 Series** **Weight =6.6oz.**	**(4) M2.5 – 14mm screws** **(8) M2.5 – 8mm screws** **(12) #4 – ¼" screws** **(4) #4 lock nuts** **(2) MX Side brackets** **(2) RX/MX-64 angle brackets** **(1) .394" (9.93mm) Axis Spacer** **(4) #2 - 5/16" screws, washers and lock nuts**

PRO-SERIES TURNTABLES

PART #	DESCRIPTION	HARDWARE
	**MX/RX-28 Turntable** **Dimensions - 4.5" X 4.5" (11.43cm X 11.43cm)** **Mounting Tabs - 5.25" (13.33cm) center to center**	**(4) M2 8mm countersink screws** **(4) M2 10mm screws** **(4) M2.5 8mm screws** **(1) Turntable spacer** **(1) Turntable bearings set**
	**MX/RX-64 Turntable** **Dimensions - 4.5" X 4.5" (11.43cm X 11.43cm)** **Mounting Tabs - 5.25" (13.33cm) center to center**	**(4) M2.5 8mm countersink screws** **(4) M2.5 8mm screws** **(4) M2.5 10 mm screws** **(1) Turntable spacer (.165" / 4.21mm)** **(1) Turntable bearing set**
	**MX-106 Turntable** **Dimensions - 4.5" X 4.5" (11.43cm X 11.43cm)** **Mounting Tabs - 5.25" (13.33cm) center to center**	**(4) M2.5 6mm countersink screws** **(4) M2.5 - 8mm screws** **(4) M2.5 – 8mm screws** **(1) Turntable spacer (.061" / 1.57mm)** **(1) Turntable bearing set**

CRUSTCRAWLER PRO-SERIES CONSTRUCTION TIPS

Below are some construction tips that should be followed when construction the Crustcrawler Pro-Series robotic arm components.

- Always build the robotic arm from the turntable upwards. When you want to change the arm configuration, always disassemble the arm from the end effecter (gripper, pointer etc) towards the base of the arm.

- Thread-locker is optional and can be used for any screws that do not screw into a lock nut.

- There are multiple ways to assemble the components of the Crustcrawler Pro-Series of Robotic arms. The builders guide shows you some ways of assembling the components together along with some building tips but does not necessarily show all of the ways of constructing the robotic arm.

- Lay out each of your Pro-Series building components before construction and place them in the order of which you are going to put each of the components together. This helps to organize the construction process and allows you to see what your next construction steps will be and which components will be next in the build process.

- Pay attention as to which types of screws are called out in the construction process. Some screws are "countersink" type screws and other screws are standard head screws.

- Both the single and dual mounting plates have counter-sink screw holes on them. Be sure you orient the mounting plates correctly before installing them to the robotic arm assembly.

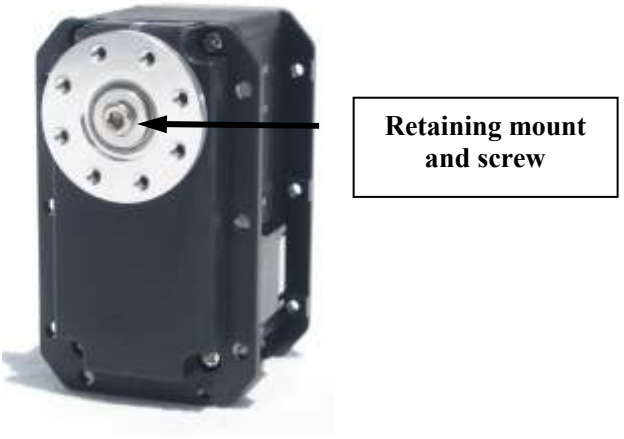
INSTALLING SERVO HORNS

The following steps illustrate how to install the servo horns and brackets to the RX/MX series of servos.

1. BACK OF THE SERVO

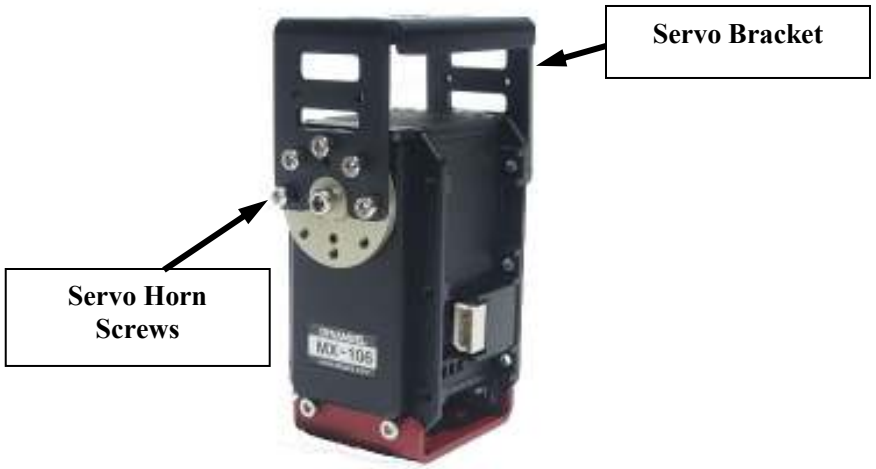
2. PUSH ON THE BEARING

3. SLIDE ON THE SERVO HORN



4. INSTALL THE RETAINER

5. INSTALL THE SERVO HORN



6. INSTALL THE SERVO BRACKET

TIPS

- Tightening the servo horn mounting screw will help to push the front servo horn onto the servo spindle.
- When installing the servo bracket to the servo horns, secure the front of the servo bracket with (1) screw onto the servo horn and then secure the back of the servo bracket with (1) screw. Once in place install the rest of the screws to the servo horn.
- Always ensure that the front and rear servo horn screws have been installed completely and tightly onto the servo before installing the servo bracket to ensure a proper fit.

MX-106 SERIES NOTE

The front and rear mounting holes on the MX-106 servo differs from the rest of the RX and MX series of servos in that the front holes of the servo are threaded and the back holes are non-threaded. When installing an MX mounting bracket to the bottom or side of the MX-106 servo, use the M2.5 allen screws to install the MX bracket to the front of the servo and the M2.5 – 8mm screws and nuts to install the back of the bracket as illustrated in figure X and X.

Front view

M2.5 - Allen Screws

Back view

M2.5 – 8mm screws / nuts

SCREW INSTALLATION TIPS

Be sure to take advantage of the holes offered on the MX mounting brackets, single and dual axis mounting plates and girders when installing screws to the various Crustcrawler Pro-Series robotic arm parts.

BUILDING YOUR CRUSTCRAWLER PRO-SERIES ROBOTIC ARM

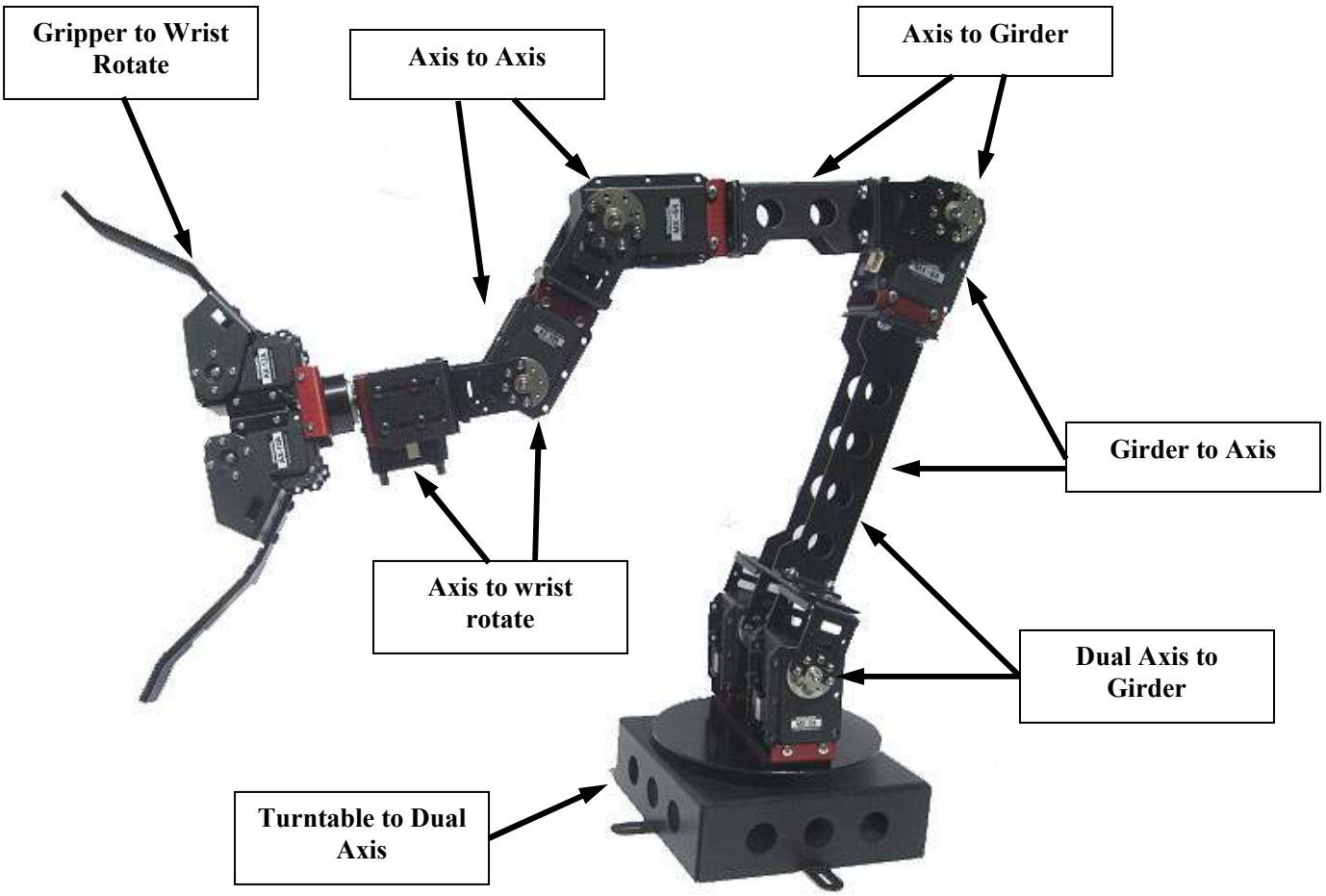
The Crustcrawler Pro-Series Robot Arm can be built from the turntable upwards in the following configurations:

- **Turntable to Dual Axis**
- **Turntable to Single Axis**
- **Turntable to Girder**
- **Dual Axis to Girder**
- **Single Axis to Girder**
- **Axis to Axis**
- **Axis to Girder**
- **Girder to Axis**
- **Axis to Wrist Rotate**

End effectors, such as Crustcrawler's line of grippers can be attached to the Pro-Series of components in several ways as well:

- **End effecter to servo**
- **End effecter to wrist rotate kit**
- **End effecter to girder (Crustcrawler Dual Gripper and Big Gripper kits only)**

This construction guide will illustrate the most common and useful build configurations for the Crustcrawler Pro-Series Robotic Arm components but not necessarily all of the combinations that can be attained with the Pro-Series interchangeable components. We encourage you, our customer, to explore the various ways that to build your robotic arm using the flexible Crustcrawler Pro-Series of components.


Gripper to Wrist Rotate
Axis to Axis
Axis to Girder
Girder to Axis
Axis to wrist rotate
Dual Axis to Girder
Turntable to Dual Axis

CRUSTCRAWLER PRO-SERIES TURNTABLE ASSEMBLY

The turntable assembly section of this guide applies can be used to build all of the Crustcrawler Pro-Series of turntables. The term “servo” in the construction guide refers to the Robotis AX,RX/MX 12A, 18A, 28, 64 and 106 servos.

1. Using (4) M2.5 – 8mm screws and nuts, install the servo to the turntable base as shown in figure 1. Obtain the nuts from the hardware bag that came with the servo.

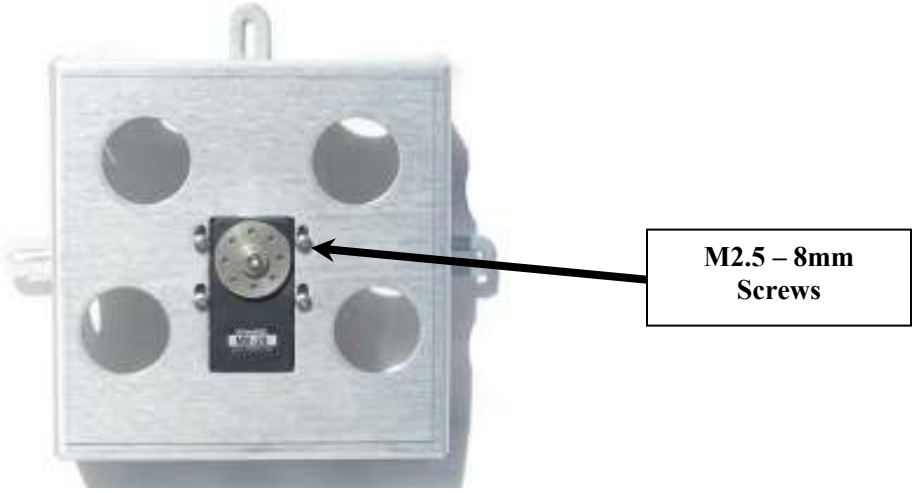


Figure 1

2. Install the (4) turntable bearings into the (4) holes as shown in figure 2.

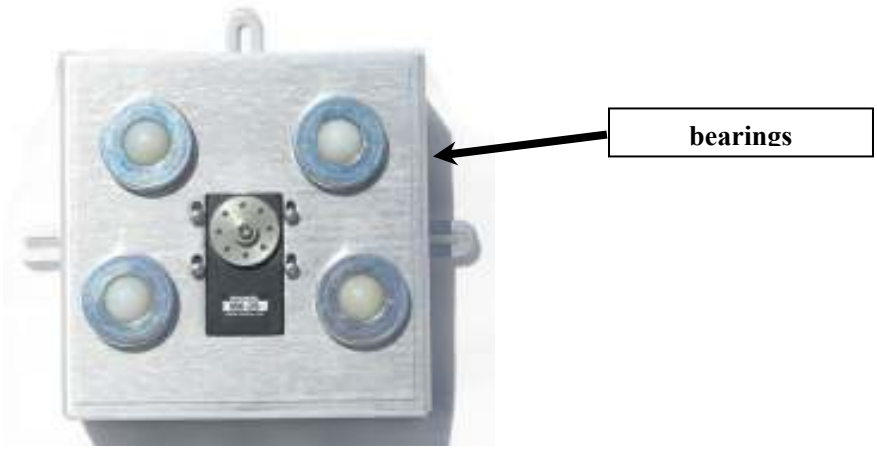


Figure 2

3. Using the plastic spacer, line up the holes on the spacer with the holes on the servo horn and press the plastic spacer onto the servo horn. As illustrated in figure 3

Note:

There are (3) types of spacers depending on the turntable purchased. The turntable in this example uses the RX/MX-28 spacer. If you purchased the RX/MX-64 or MX-106 turntable, use the spacer that comes with that kit.

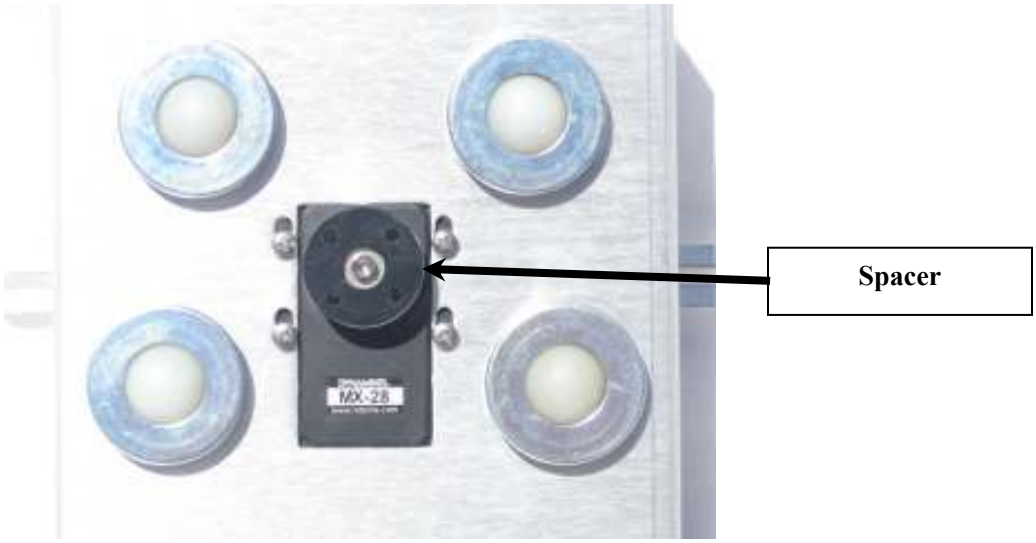


Figure 3

4. Place the turntable to the side as the turntable assembly will be completed once a single or dual axis configuration is built in the part of the assembly.

GIRDER TO TURNTABLE INSTALLATION

The following steps illustrate how to install the Crustcrawler girder to the Pro-Series turntable.

Note:

- In the example below, any size girder can be used

1. Using (8) #4-.31" countersink screws and lock nuts, install the single axis adapter plate to both sides of the girder as shown in figure 4. (A dual axis adapter plate can be used on one end of the girder if a dual axis is to be installed)

2. Using (4) #4-.31" countersink screws, install the MX bracket for the next axis in your build sequence as shown in figure 5.

Figure 4

Figure 5

3. Install the assembly from step 2 to the turntabletop and the turntable assembly from step 4.

- If you are installing the single axis to the RX/MX28 Pro-Turntable, use the screws holes of the inner bolt circle and the M2 10mm screws.

- If you are installing the single axis to the RX/MX64/106 Pro-Turntable, use the screws holes of the outer bolt circle and the M2.5 -10mm screws for the MX-64 or the M2.5 -8mm for the MX-106.

.

Figure 6

Figure 7

SINGLE AXIS TO TURNTABLE INSTALLATION

2. Using (4) 10mm screws, install the MX side bracket to the turntable.

Note:

For the MX-28 Side bracket:

- For MX-28 side bracket installations, use the inner bolt circle and the **M2 10mm screws as** illustrated in figure 8

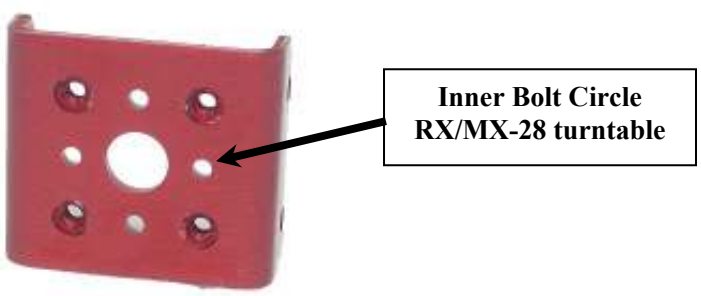


Figure 8

For the MX-64/106 Side bracket:

- If you are installing the single axis to the RX/MX-28 Pro-Turntable, use the screws holes of the inner bolt circle and the **M2 - 10mm screws**.

- If you are installing the single axis to the RX/MX-64/106 Pro-Turntable, use the screws holes of the outer bolt circle and the **M2.5 - 10mm screws for the MX-64 and the M2.5 - 8mm screws for the MX-106**.

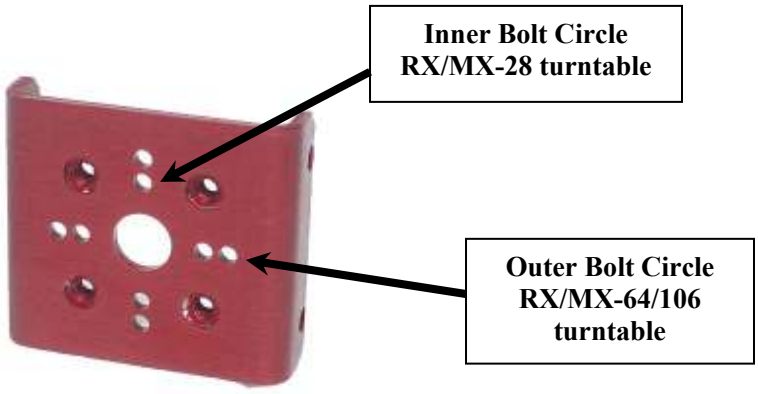


Figure 9

3. Install the nuts supplied with the servo to the bottom of the servo as shown in figure 10

Figure 10

Figure 11

4. Install the servo horns to the front and back of the servo from your Single Axis kit as shown in figure 11.

5. Using (4) M2.5 - 8mm screws, install the servo to the MX-side bracket as shown in figure 12.

Tip

To ensure the nuts do not fall out of their sockets during screw installation, use the supplied allen wrench to hold the nuts in place while turning the screws onto the nuts.

Figure 12

DUAL AXIS TO TURNTABLE INSTALLATION

1. Build (2) complete servos as shown in figure 13.

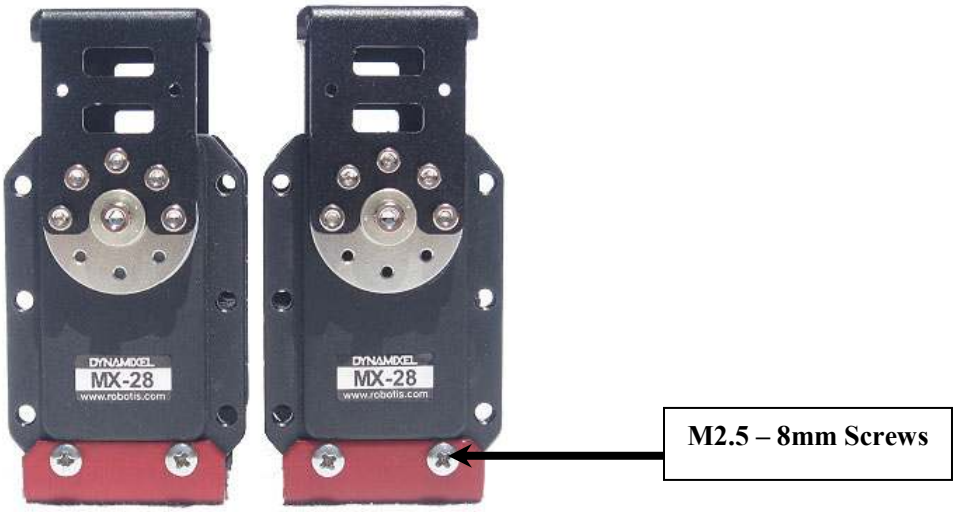


Figure 13

2. Using (8) #4 – .31" countersink screws, install the dual axis plate to the bottom of the MX adapter as shown in figure 14.

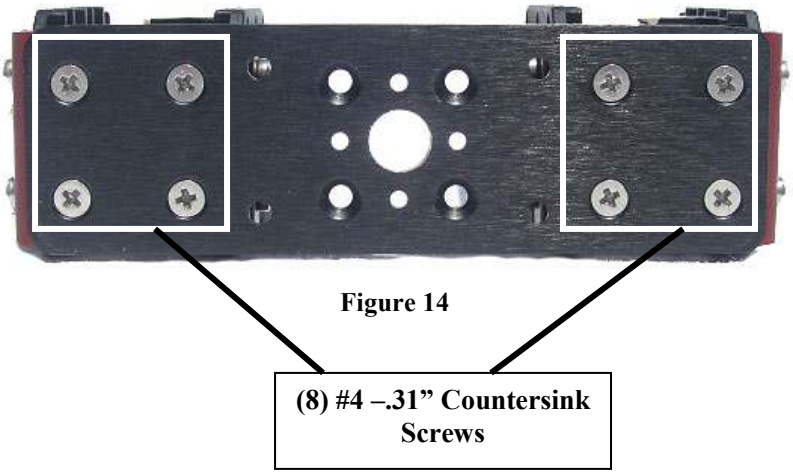


Figure 14

Figure 15

Tip:

- Note the orientation of the servos on the dual axis plate in figure 15.

Note:

a. If you are installing the dual axis to the RX/MX28 Pro-Turntable, use the screws holes of the inner bolt circle and M2 10mm screws (Figure 16).

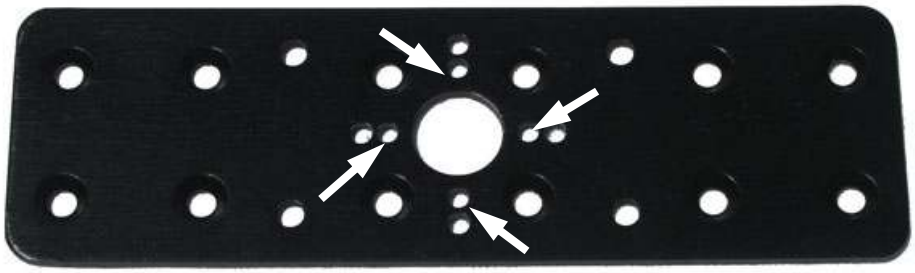


Figure 16

b. If you are installing the dual axis to the RX/MX64/106 Pro-Turntable, use the screws holes of the outer bolt circle and the **M2.5 - 10mm screws for the MX-64 and the M2.5 - 8mm screws for the MX-106**. (Figure 17).

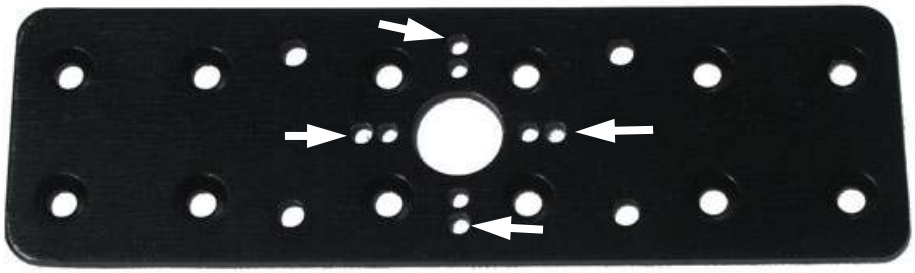


Figure 17

3. In figure 18 below, the inner bolt circle was used as the assembly is being installed to an MX-28 Pro turntable.

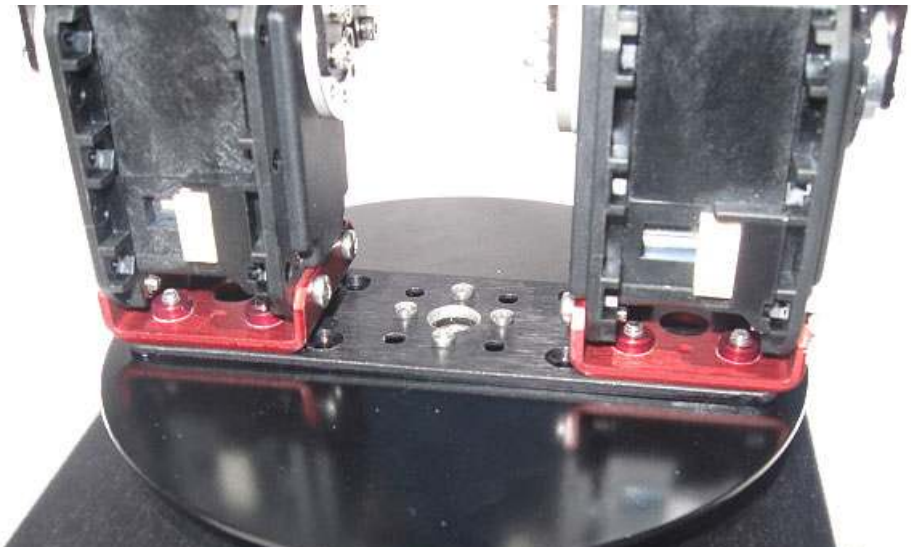


Figure 18

Figure 19

DUAL AXIS TO GIRDER INSTALLATION

4. Using (4) #4 – .31" countersink screws and lock nuts, install a dual axis adapter to the girder as shown in figure 20 and 21. Be sure <u>to center the dual axis adapter to the girder before tightening the lock nuts.</u>

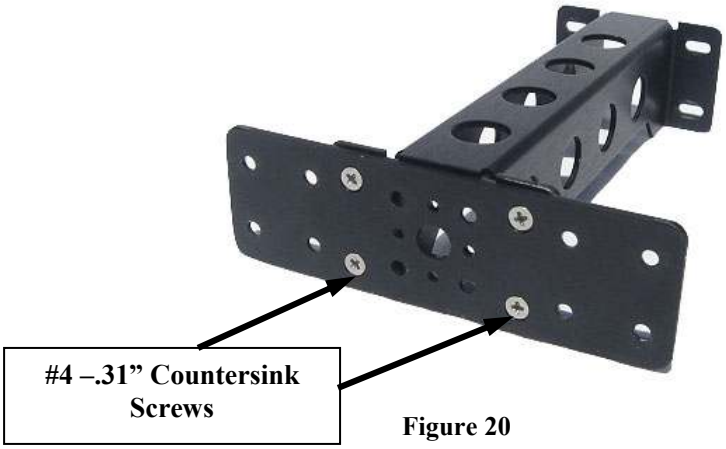


Figure 20

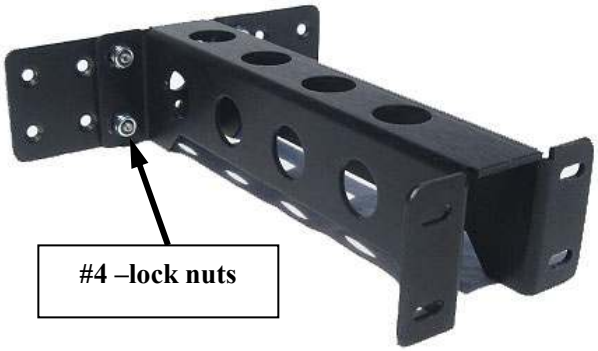


Figure 21

5. Using (4) #4 – .31" countersink screws and locknuts, install the single axis adapter to the opposite end of the girder as shown in figure 22.

Figure 22

6. Using (4) #4 – .31” countersink screws, install the MX side bracket of the next servo in sequence to be added to the girder as shown in figure 23.

Figure 23

7. Using (8) #4 – .31” countersink screws and lock nuts, install the girder assembly to the servo dual servo bracket assembly as shown in figure 24. The holes on the dual axis adapter will line up with the holes on the brackets as illustrated in figure 25.

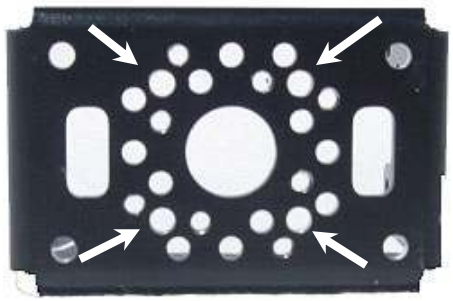


Figure 24
RX/MX- 64/106 Servo Bracket

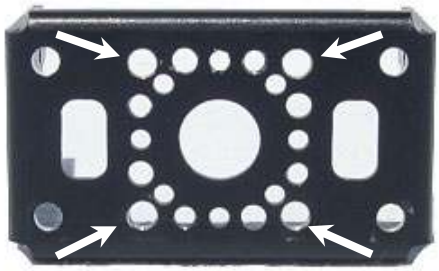


Figure 25
RX/MX- 28 Servo Bracket

Installation Tip

Tilt the (2) brackets at an angle and use needle nose pliers to hold the lock nuts in place while tightening the #4 – .31” countersink screws (Figure 26).

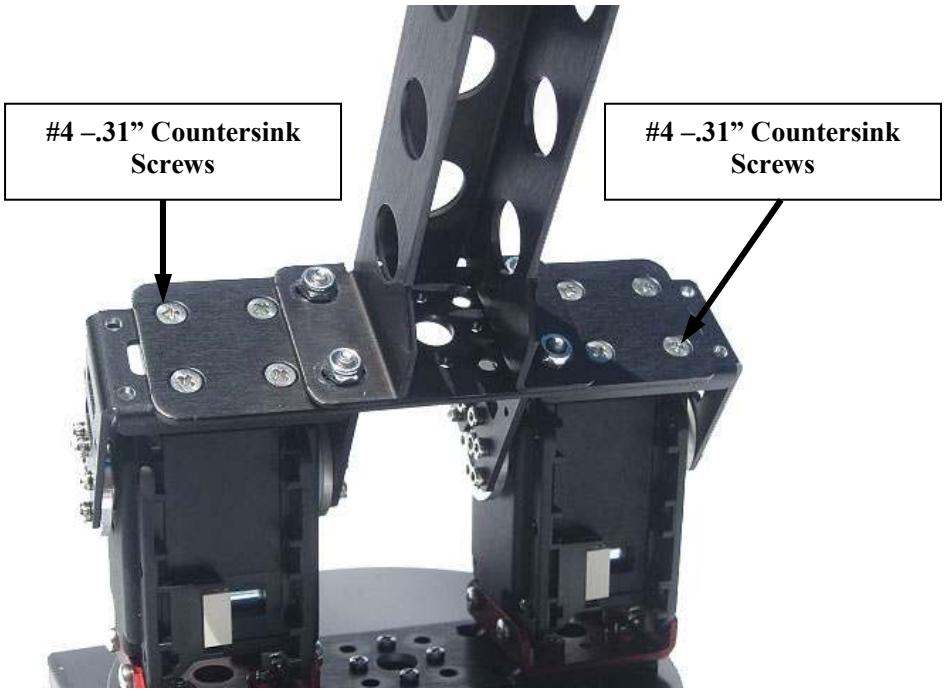


Figure 26

- The completed assembly

DUAL AXIS TO SINGLE AXIS INSTALLATION

The following steps illustrate how to connect a dual axis to a single axis assembly.

1. Using (4) M2.5 – 8mm screws and nuts, attach the RX/MX side bracket to a single axis servo as shown in figure 27.

Figure 27

2. Using (4) #4- ¼" screws, install the assembly from step 1 to the center of the dual axis plate as shown in figure 28.

Note:

- The (4) #4 – ¼" screws are installed on the non-countersink side of the dual axis plate.

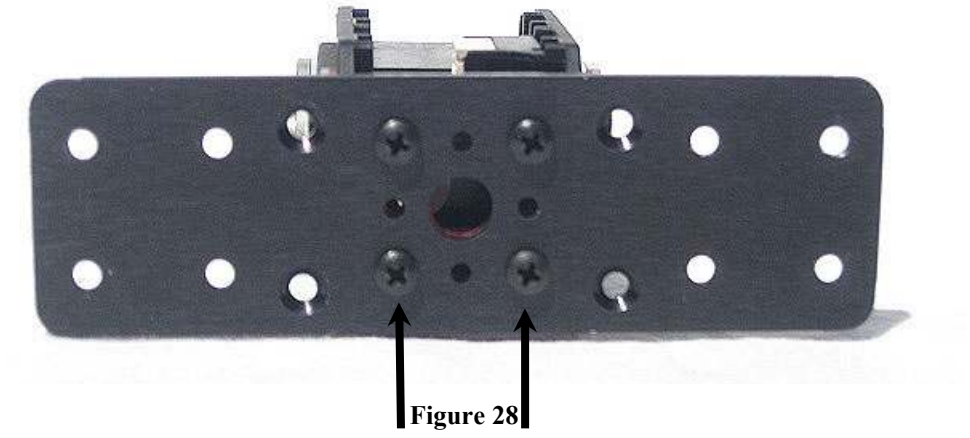


Figure 28

- The completed assembly

3. Using (8) #4 – .31” countersink screws and lock nuts, install the assembly from the previous step to the dual axis assembly as shown in figure 29.

Figure 29

AXIS TO GIRDER AND ***GIRDER TO AXIS*** INSTALLATION

1. Using (4) #4 – .31” countersink screws and lock nuts, install the single axis adapter plate as shown in figure 30 and figure 31. When installing the single axis adapter to the girder, be sure to center the single axis adapter plate before tightening the screws.

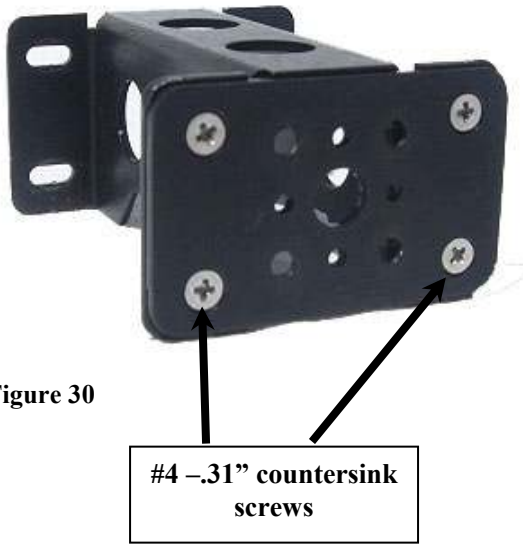


Figure 30

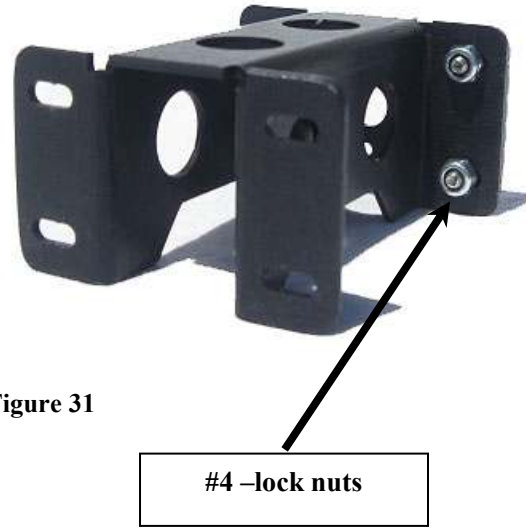


Figure 31

2. Using (4) #4 – .31” countersink screws and lock nuts, install the servo bracket to the single axis adapter plate (using the holes for each type of bracket) as shown in figure 32 and figure 33.

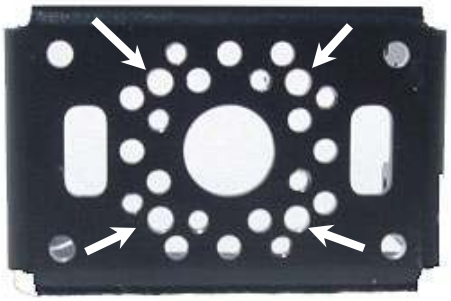


Figure 32

RX/MX- 64/106 Servo Bracket

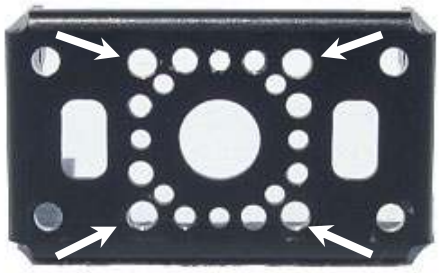


Figure 33

RX/MX- 28 Servo Bracket

Figure 34- The completed Assembly

3. Using (4) #4 – .31” countersink screws and lock nuts, install a single axis adapter plate to the opposite side of the girder with the countersink screw holes to the inside of the girder bracket as shown in figure 35.

Figure 35

4. At this time in the construction process, it is a good time to add the MX side bracket to the next axis in the construction process. Using (4) #4 – .31” countersink screws, install the mx side bracket to the single axis adapter plate as shown in figure X.

    - Note the orientation of the MX side bracket when installing.

    - Always turn the #4 screws into the pem nuts evenly before tightening.

Figure 36

6. Using the servo horn screws from the servo kit, install the assembly from figure 36 to the servo horn as shown in figure 37.

Figure 37

GIRDER TO AXIS INSTALLATION

7. Using M2.5 – 8mm screws and nuts, install the next assembled servo (Servo horns mounted to the front and back of the servo) to the MX side bracket as shown in figure 38.

Tip

To ensure the nuts do not fall out of their sockets during screw installation, use the supplied allen wrench to hold the nuts in place while turning the screws onto the nuts.

Figure 38

AXIS TO AXIS INSTALLATION

8. Using (4) M2.5 – 8mm screws and nuts, install the MX side bracket to the bottom of the next servo in the build process as shown in figure 39.

Figure 39

9. Identify the holes as outlined in figure 40 or 41 which will be used in the next step of the assembly process.

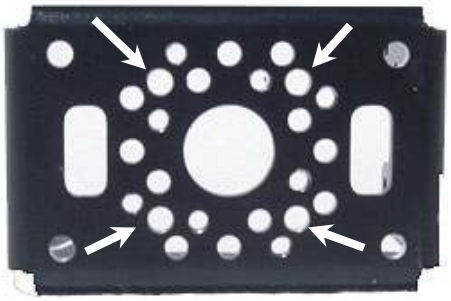


Figure 40

RX/MX- 64/106 Servo Bracket

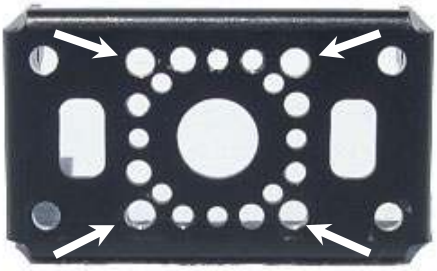


Figure 41

RX/MX- 28 Servo Bracket

10. Using (4) – ¼” screws, install the servo bracket to the MX servo brackets Pem nuts from step 8 as shown in figure 42 and figure 43.

Figure 42

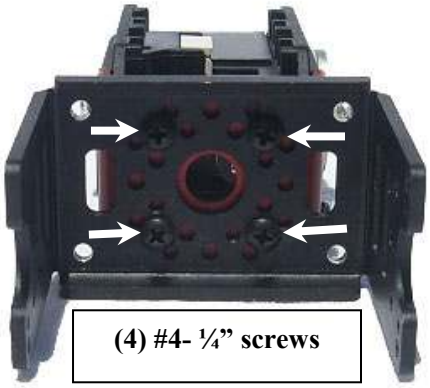


Figure 43

11. Using the servo horn screws, install the assembly from step 10 to the previous axis as shown in figure 44.

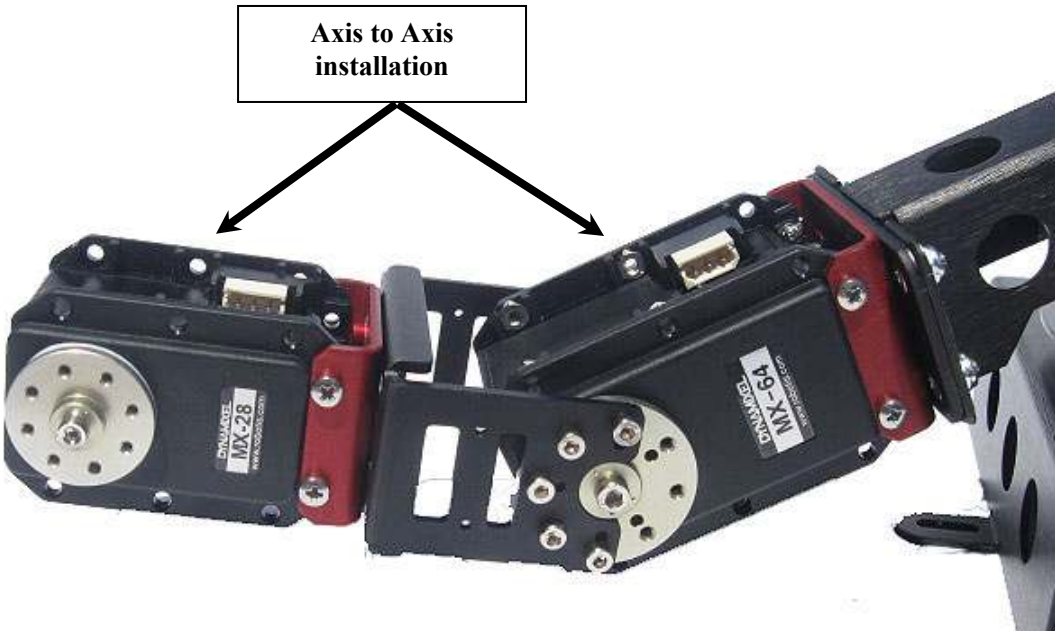


Figure 44

- At this point in the build process, you can add more girders or another axis to axis connection by repeating the previous steps in this builders guide.

ADDING A GRIPPER ASSEMBLY

There are serveral ways of connecting Crustcrawler grippers to the asembly of your Pro-Series robotic arm. The most common connections are:

1. Servo to Gripper
2. Servo to Wrist Rotate to Gripper
3. Servo to Girder to Gripper

AXIS TO GRIPPER – INSTALLING THE CRUSTCRAWLER DUAL GRIPPER

Installing Crustcrawler's popular Duel gripper requires just a few easy steps.

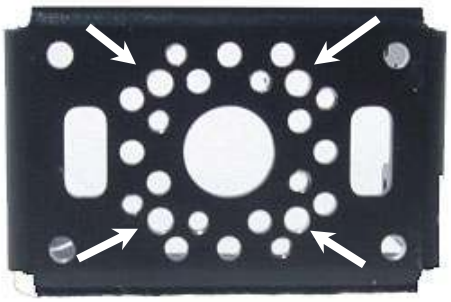
1. Complete the construction of the Dual Gripper as per the Dual Gripper construction guide.

Figure 45 – Completed Gripper

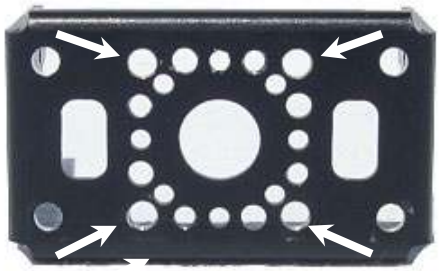
Integrated #4 Pem nuts

Figure 46

2. Using (4) #4-1/4” screws, install the servo bracket to the back of the dual gripper using the holes as shown in figure 47.



RX/MX- 64/106 Servo Bracket



RX/MX- 28 Servo Bracket

Figure 47

3. Using the servo horn screws, install the assembly from step #2 to the axis servo of the robotic arm assembly as shown in figure 48.

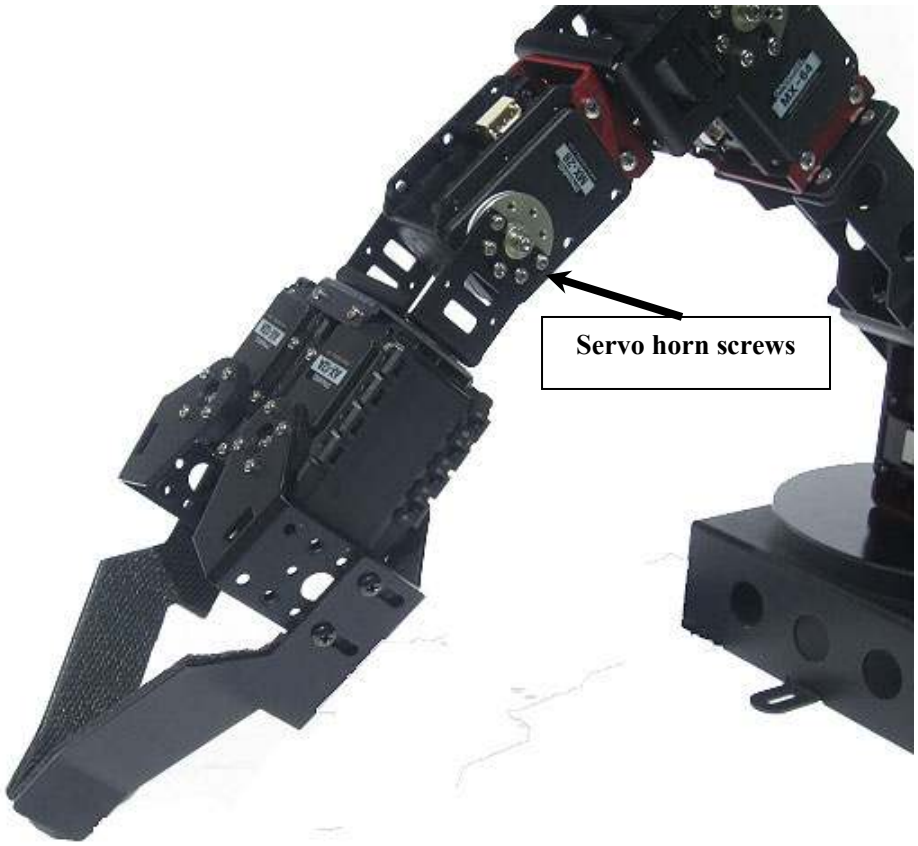


Figure 48

AXIS TO WRIST ROTATE TO GRIPPER

Crustcrawler has developed (3) wrist rotate assemblies to adapt to the AX, RX and MX series of servos.

The wrist rotate assemblies are comprised of the following kits:

1. **Wrist Rotate Assembly AX** – Accommodates the AX-12A, AX-18A servos
2. **Wrist Rotate Assembly 28** – Accommodates the RX-28, MX-28 servos
3. **Wrist Rotate Assembly 64** – Accommodates the RX-64, MX-64 and MX-106 servos

Wrist Rotate Assembly AX

Wrist Rotate Assembly 28

Wrist Rotate Assembly 64

AXIS TO WRIST ROTATE – RX / MX SERIES OF SERVOS

The following steps illustrate how to connect the single axis to a wrist rotate assembly.

1. Using (4) #4 – ¼" screws and lock nuts, install the angle brackets to the holes in the servo bracket shown in figure 51 and 52. Tighten the nuts just enough to hold the brackets in place but loose enough so they can be adjusted in the next step.

Note:

If your transitioning from an RX/MX-64/106 servo to RX/MX-28 wrist rotate servo assembly, use the RX/MX-64 angle brackets in place of the RX/MX28 angle brackets.

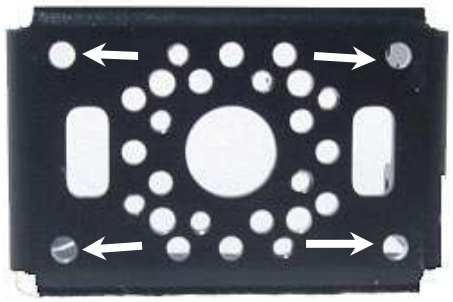


Figure 49

RX/MX- 64/106 Servo Bracket

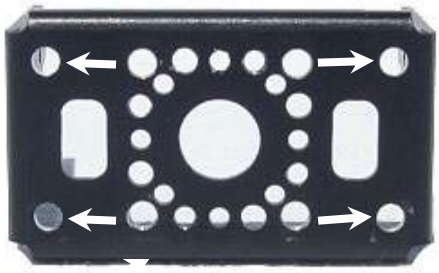


Figure 50

RX/MX- 28 Servo Bracket

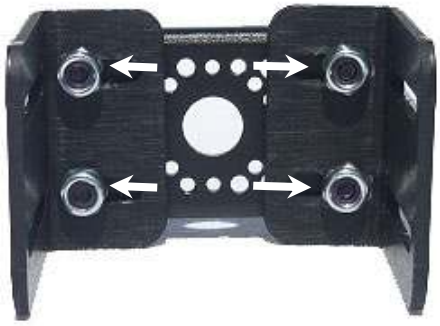


Figure 51

Angle Bracket View

Figure 52

Servo Bracket - view

2. Using (8) M2.5 – 8mm screws and nuts, install the MX side bracket to the sides of the wrist rotate servo as shown in figure 53. (you may want to connect the servo connector before installing the MX-side bracket).

Figure 53

3. Slide the assembly from step 1 onto the side of the MX bracket in figure 54 and squeeze the assembly together and center them to ensure the proper spacing for the brackets. Once the assembly width has been adjusted, slide off the assembly from step #1 and tighten the lock nuts.

4. Using (8) #4 ¼" screws, install the assembly from step 1 to the assembly in step 2 as shown in figure 54. (Install the #4-1/4" screws into the Pem nuts on the MX bracket).

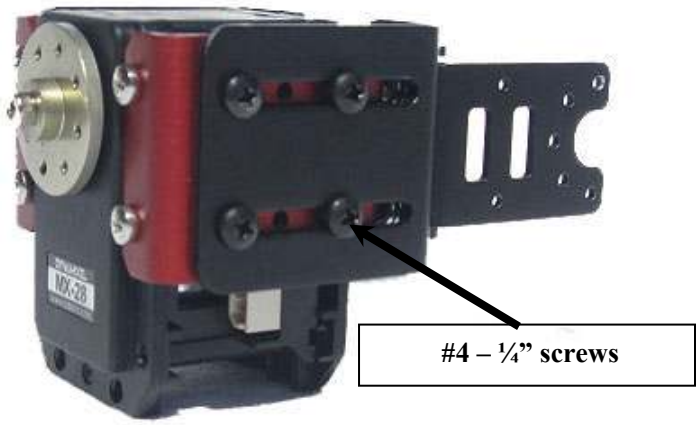


Figure 54

For the RX/MX-28 Servo – Dual Gripper Installation

4. Using **(4) M2 – 14mm screws**, install the Axis spacer and dual gripper adapter to the servo horn as shown in figure 55. Use the **inner bolt circle** on the axis spacer and dual gripper adapter.

For the RX/MX-64/106 Servo – Dual Gripper Installation

5. 5. Using **(4) M2.5 – 14mm screws**, install the Axis spacer and dual gripper adapter to the servo horn as shown in figure 55. Use the **outer bolt circle** on the axis spacer and dual gripper adapter.

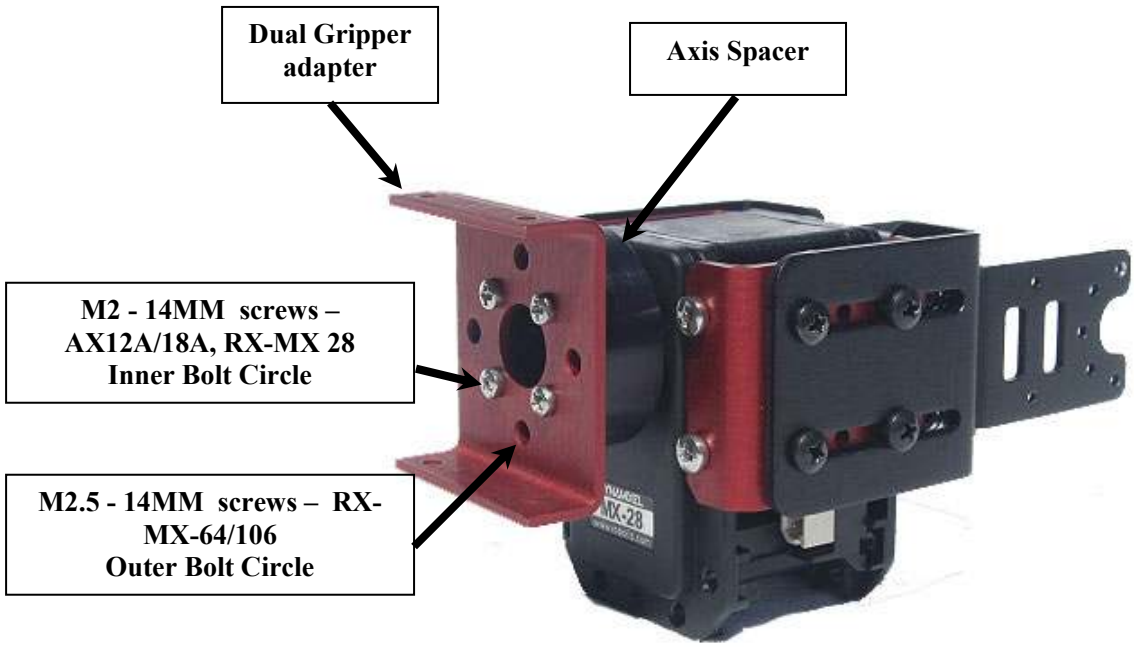


Figure 55

6. Install the assembly from the previous step to the servo arm assembly as shown in figure 56.

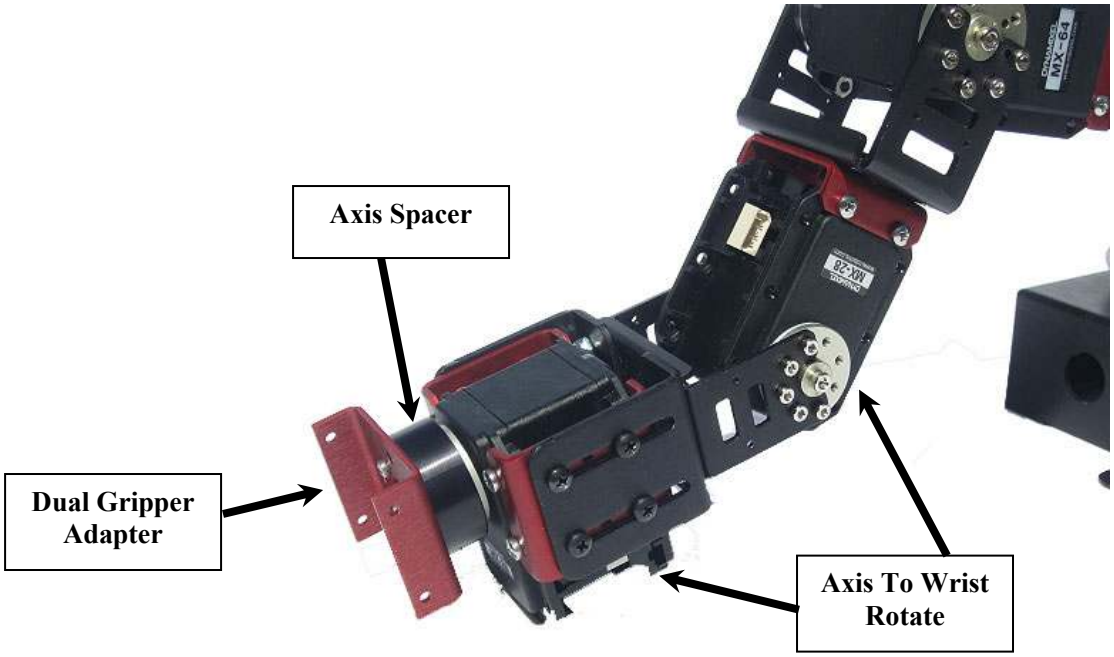


Figure 56

7. Using the AX-12A screws and nuts, install the AX-12A/AX-18A Dual gripper to the assembly in the previous step as shown in figure 57.

Note: Do not use the back-plate that comes with the dual gripper kit for this step.

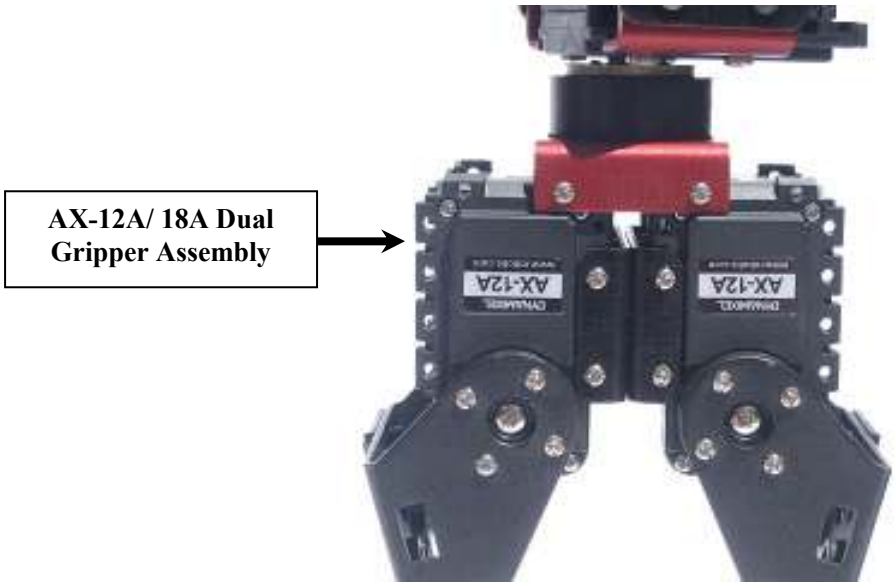


Figure 57

GIRDER TO WRIST ROTATE – RX / MX SERIES OF SERVOS

- This sequence of steps illustrate how to attach a girder to the wrist rotate assembly.

Note:

- Use the RX/MX-64 angle bracket in place of the RX/MX-28 angle bracket for RX/MX-28 wrist rotate installations. This bracket is sold separately on the Crustcrawler web site.

1. Using (4) #2-5/16”” screws and lock nuts, install the angle bracket to the girder. Tighten the screws just enough so that the assembly can be adjusted in the next step as illustrated in figure 58 and 59.

Figure 58

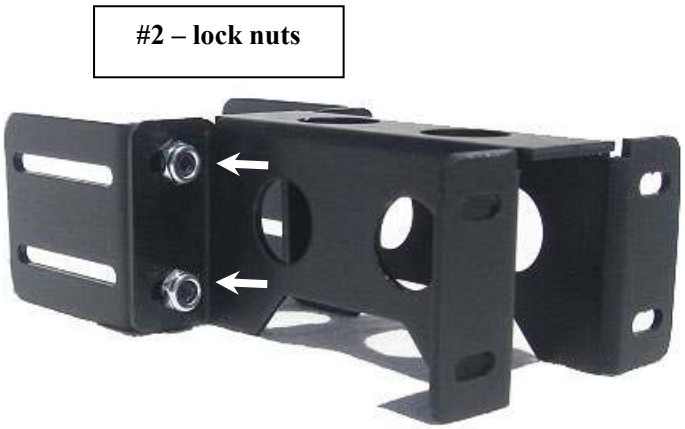


Figure 59

2. Using (8) M2.5 – 8mm screws and nuts, install the MX side bracket to the sides of the wrist rotate servo as shown in figure 60.

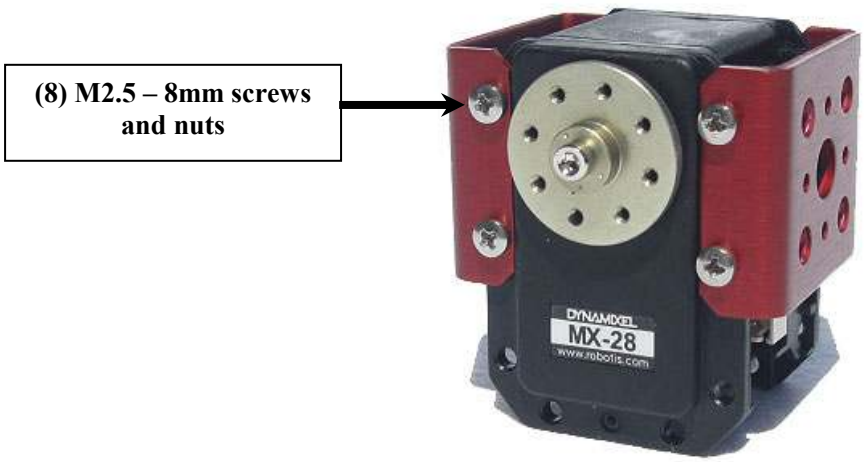


Figure 60

3. Slide the assembly from step 1 onto the side of the MX bracket in figure 60 and squeeze the assembly together and center them to ensure the proper spacing for the brackets. Once the assembly width has been adjusted, slide off the assembly from step #1 and tighten the lock nuts.

4. Using (8) #4 ¼" screws, install the assembly from step 1 to the assembly in step 2 as shown in figure 61. (Install the #4-1/4" screws into the Pem nuts on the MX bracket).

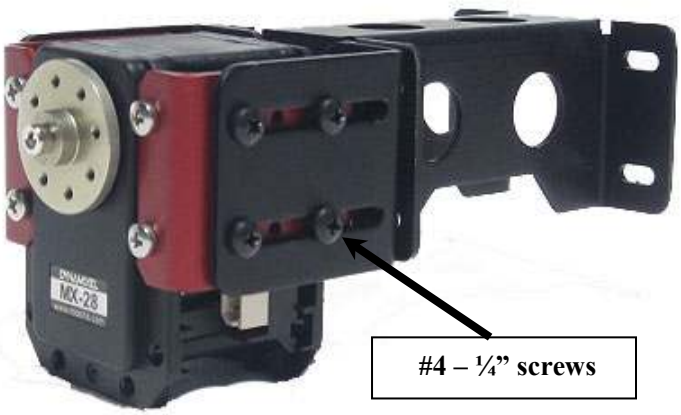


Figure 61

- Repeat steps4 thru 7on page 46 if you are installing Crustcrawlers Dual gripper kit to the assembly.

- At this point in the build process, Crustcrawler's selection of grippers may be added and/or end effectors of your choosing may be added to the assembly.

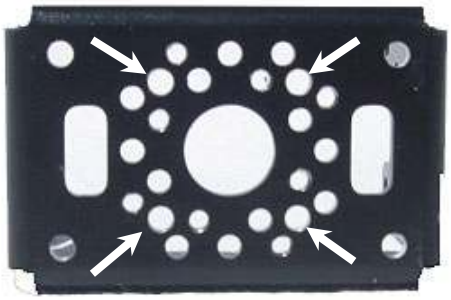
AXIS TO WRIST ROTATE – AX SERIES OF SERVOS

The following steps illustrate how to connect the single axis to a wrist rotate assembly for the AX-series of servos.

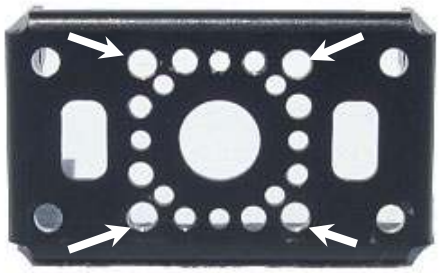
1. Using (8) M2 screws and nuts from the AX-12/18 servo box, install the AX-side bracket to the AX servo as shown in figure 62.

Figure 62

2. Using the hole pattern shown below, use (4) #4-1/4” screws and lock nuts to install the servo bracket to the RX/MX 28 angle bracket**.** Tighten the screws just enough so that the assembly can be adjusted in the next step.



RX/MX- 64/106 Servo Bracket



RX/MX- 28 Servo Bracket

3. Slide the assembly from step 2 onto the side of the AX bracket assembly from step 1 and squeeze the assembly together to ensure the proper spacing for the RX/MX 28 angle brackets. Once the assembly width has been adjusted, slide off the assembly from step #1 and tighten the lock nuts.

4. Using (8) #4 ¼” screws, install the assembly from step 1 to the assembly in step 2 as shown in figure 63. (Install the #4-1/4” screws into the integrated Pem nuts on the AX brackets).

Figure 63

- If you are installing the AX-12A/18 wrist rotate assembly to Crustcrawler’s Dual gripper (optional) go to the next steps. At this point in the build process an end effecter of your choice can be added to the wrist rotate assembly.

5. Using (4) M2 14 mm screws, install the axis spacer and AX-12A rear bracket from the dual gripper assembly to the servo as shown in figure 64.

6. Using the M2 allen screws, install the assembly to the previous axis in your build sequence as shown in figure 64.

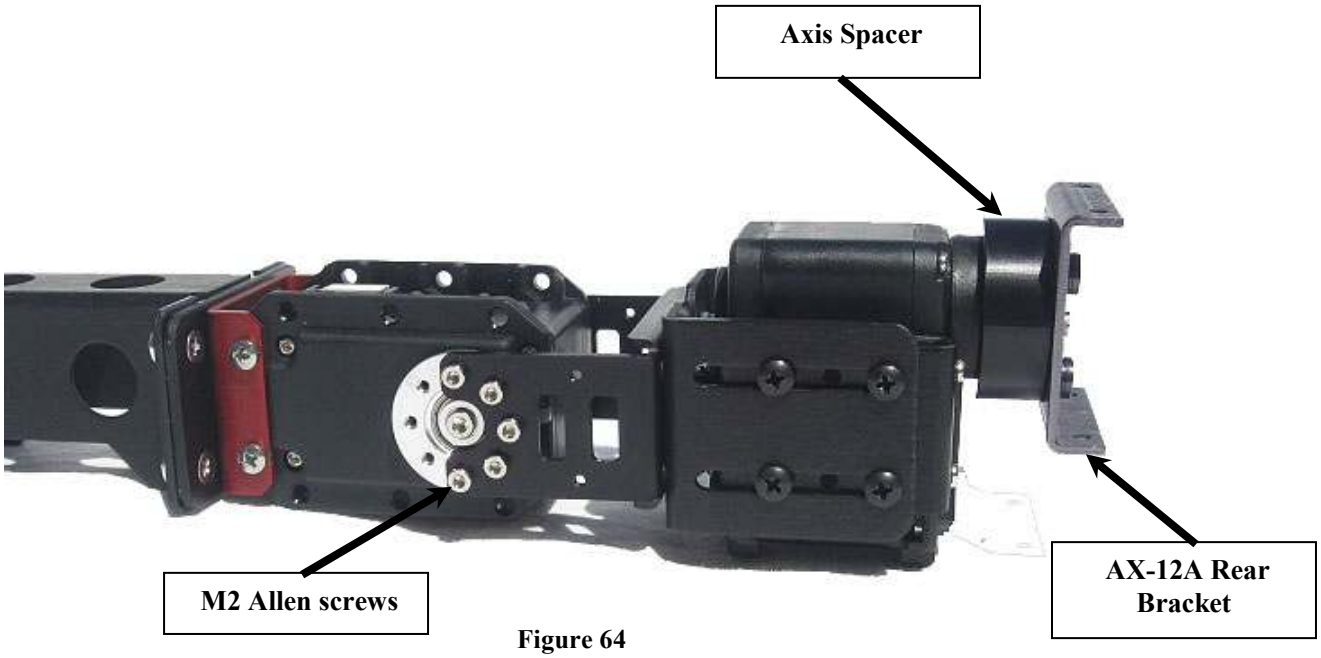


Figure 64

7. Using the AX-12A M2 screws and nuts from the servo box, install the AX-12A/AX-18A Dual gripper to the assembly in the previous step as shown in figure 65.

Figure 65

GIRDER TO WRIST ROTATE – AX SERIES OF SERVOS

The following steps illustrate how to connect the girder to a wrist rotate assembly for the AX-series of servos.

1. Using (4) #4 – .31" countersink screws and lock nuts, install the single axis adapter plate to the girder as shown in figure 66.

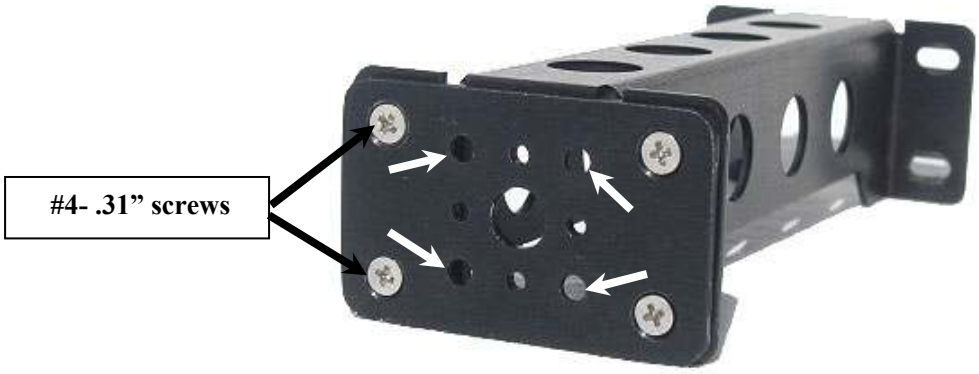


Figure 66

2. Using (4) #4-.31 countersink screws and lock nuts, install the RX/MX 28 angle bracket to the single axis adapter plate using the holes outlined in figure 66. Tighten the screws just enough so that the assembly can be adjusted in the next step(figure 67).

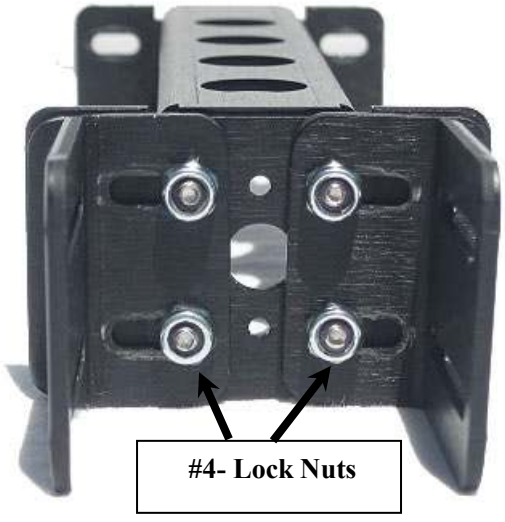


Figure 67

3. Using (8) M2 screws and nuts from the AX-12A/18A servo box, install the AX-side brackets to the AX servo as shown in figure 68.

Figure 68

4. Slide the assembly from step 2 onto the assembly in step 3 and squeeze the assembly together to ensure the proper spacing for the RX/MX 28 angle brackets**.** Once adjusted, slide the assembly off and tighten the #4 lock nuts.

5. Using (8) #4 ¼" screws, install the assembly from step 2 to the assembly in step 3 as shown in figure 69. (Install the #4-1/4" screws into the integrated Pem nuts on the AX brackets).

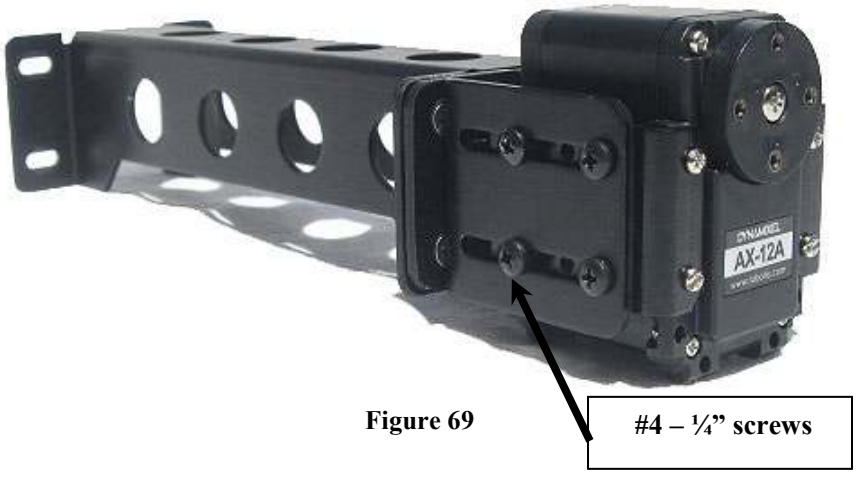


Figure 69

- If you are installing the AX-12A/18 wrist rotate assembly to Crustcrawler's Dual gripper (optional) go to the next steps. At this point in the build process an end effecter of your choice can be added to the wrist rotate assembly.

6. Using (4) M2-14 mm screws, install the axis spacer and AX-12A rear bracket from the dual gripper assembly to the AX12A/18A servo as illustrated in figure 70.

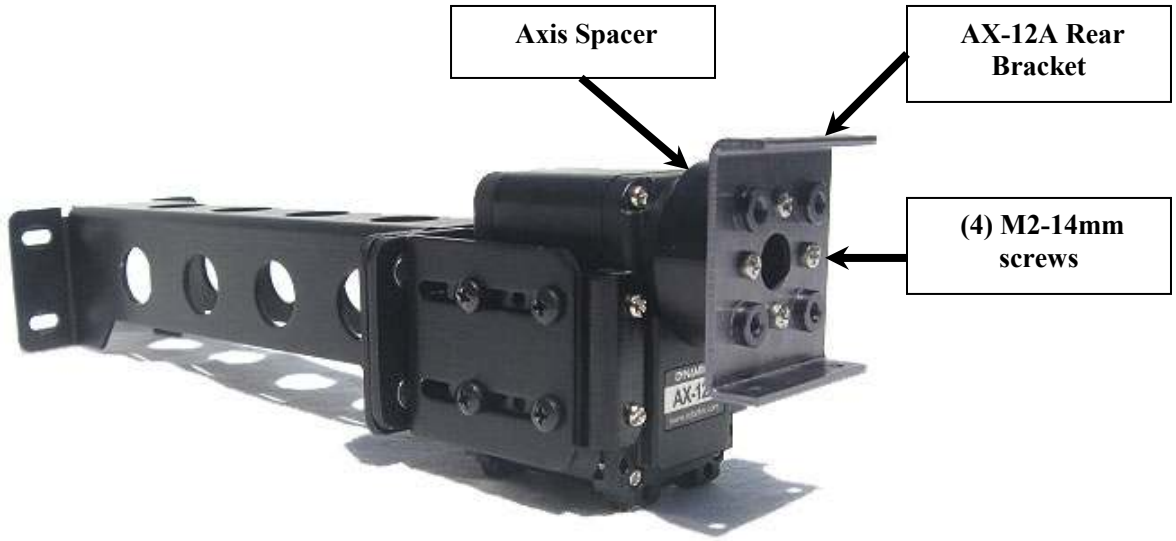


Figure 70

7. Using (4) M2 screws and nuts from the AX12A/18A servo box, install the dual gripper assembly to the assembly in step 6 as shown in figure 71.

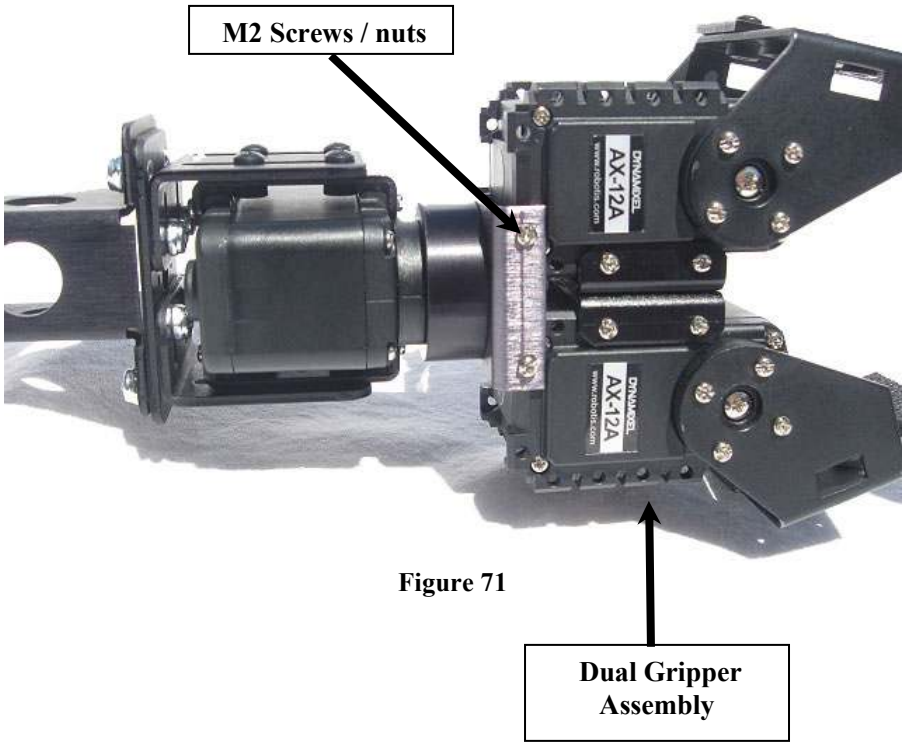


Figure 71

Pro-Series Quick Tips

- Download the latest Crustcrawler Pro Series Builders guide from the following link:

  http://www.crustcrawler.com/pro.pdf

- Always reference and read the construction guide FIRST before attempting to build your pro-series robotic arm. The construction guide has various sections that refer to specific build sequences based on the Pro-Series components you have purchased. Reference the sections that refer to your build sequence to ensure you understand the building sequence of your components.

- Whenever you are controlling a dual axis, make sure your software control program is rotating the dual servos in parallel. A good reference check would be to build the dual axis without the top, dual axis plate installed to the servo brackets. Run your software program and observe the brackets to ensure they are rotating evenly together. If there is a physical discrepancy between the bracket rotations, one or more of the servo in the dual axis can overheat.

- All of the Dynamixel servos have thermal shutdown capability if overheated. This helps to protect the motors during operation of the robotic arm. Thermal shutdown is indicated by the servo losing power and the LED at the back of the servo will start to blink. Always allow at least 15 minutes for the servo to cool down before returning to operation or damage and degrading torque performance will occur.

- Always practice safe handling and operation of your Pro-Series Robotic arm by:

  1. Bolting the Robotic arm down to a solid surface before use.

  2. Provide a minimum of a 3 foot clearance from the farthest physical reach of the arm when powering on and operating the arm.

  3. Always shut down the Robotic arms power before approaching and handling the robotic arm components.

Example Crustcrawler Pro-Series Robotic Arm Configurations

Here are just a few of the many robotic arm configurations that can be assembled using the Crustcrawler Pro hardware modules.


CrustCrawler
Pro-Series