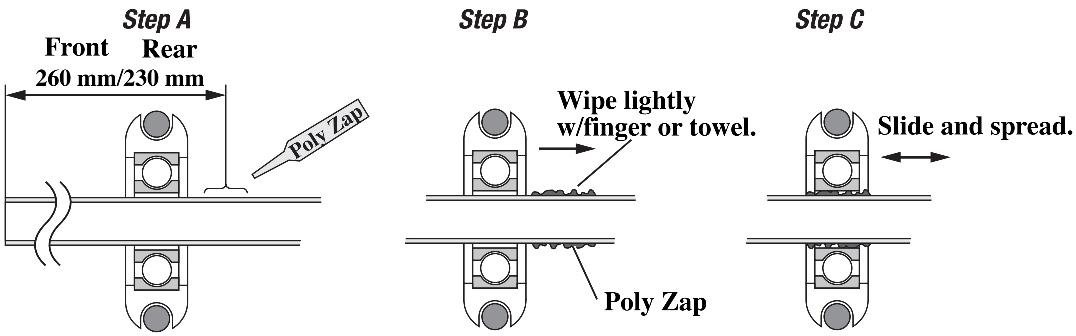
5-2 continued

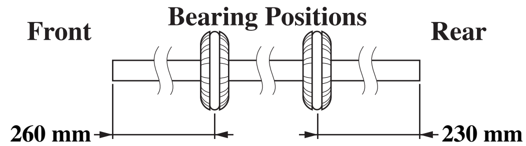
DRIVE SHAFT GUIDE BEARING ATTACHMENT

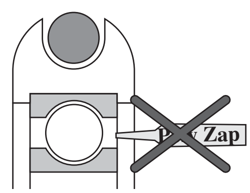
Follow this procedure when attaching:

Note:
Use Poly Zap (not included) to attach bearings to the drive shaft. **Once the Poly Zap is applied and the guide bearings are in their correct positions (260 mm/230 mm), the Poly Zap can be quick cured using Zip Kicker.** **Position the shaft assembly on a flat surface before/while the Poly Zap is curing.** **It is very important that the guide bearings be attached to the shaft at non equal measurements as shown to prevent resonance vibration and fatigue.**



Lightly oil bearings after the glue has dried.



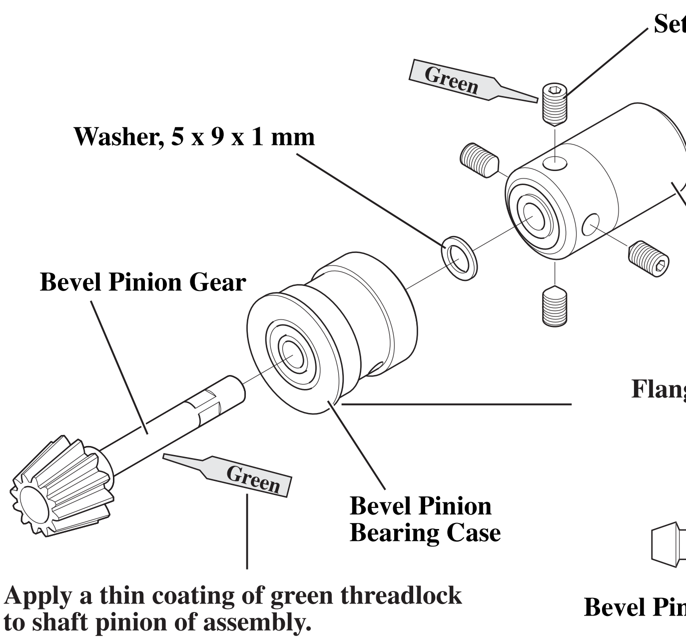
Note:	
Do not apply Poly Zap to inside of ball bearings.	

5-3 BEVEL PINION GEAR ASSEMBLY

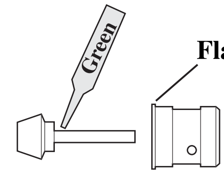
.... 4 pcs	Set Screw, 4 x 6 mm
........................1 pc	Washer, 5 x 9 x 1 mm

Use Green Threadlock

Attach the tail drive joint and secure so that there is no fore/aft movement of the shaft, but the shaft will spin freely in the bearing assembly.



Flange must face bevel gear.



Bevel Pinion Bearing Case Direction

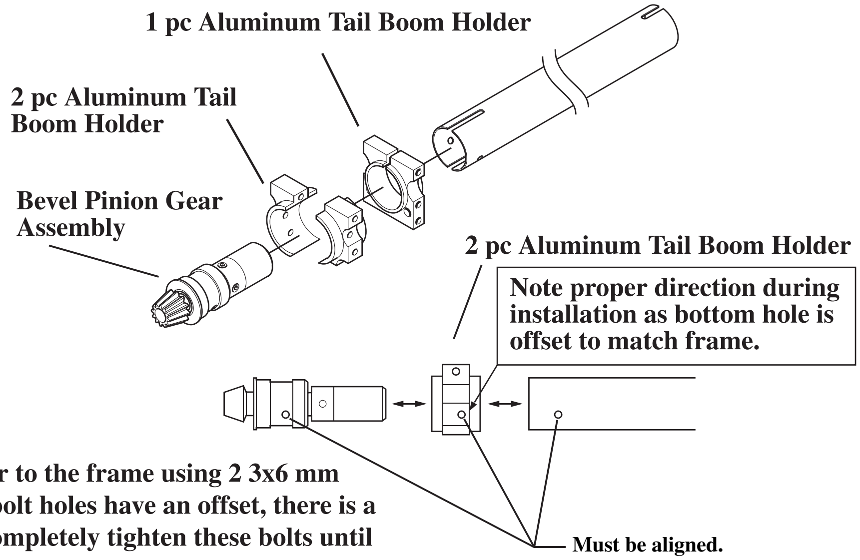
5-4 TAIL BOOM/BEVEL PINION GEAR INSTALLATION/ADJUSTMENT

.... 2 pc
Socket Head Bolt, 3 x 6 mm

Socket Head Bolt, 3 x 40 mm ..4 pcs

.... 4 pcs
Nylon Lock Nut, 3 mm

.... 4 pcs
Flat Washer, 3 mm



Step 1: Attach the 2pc front Tail Boom Holder to the frame using 2 3x6 mm Socket head Bolts. Please note that since the bolt holes have an offset, there is a Left and Right side to these clamps. Do not completely tighten these bolts until the gear mesh has been set.

Step 2: Insert the completed Bevel Pinion Gear assembly into the tail boom, and align the hole in the hub to the hole in the tail boom.

Step 3: Install the 1pc Rear Tail Boom Clamp to the boom.

Step 4: Insert the tail boom assembly into the frame, front clamps, and attach using the 4 3x40mm Socket Head Bolts as shown below.

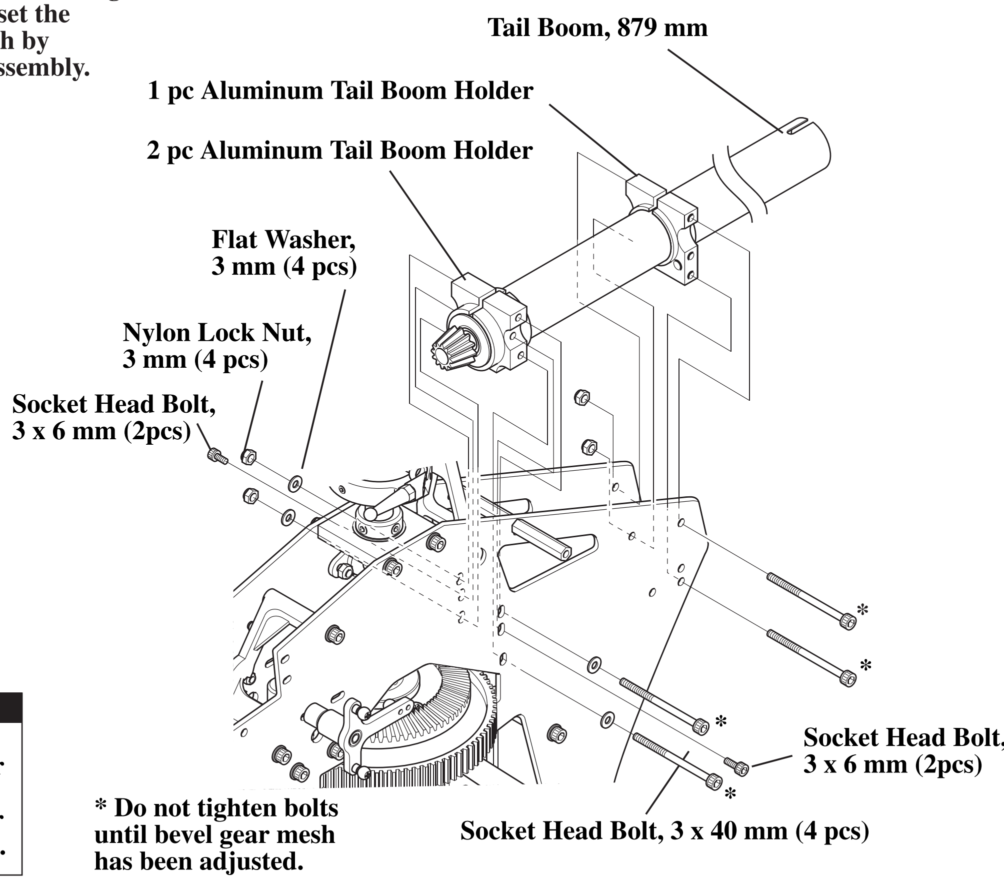
BEVEL GEAR MESH ADJUSTMENT

Before tightening of the 4 tail boom mounting clamp bolts, it will be necessary to set the bevel gear to bevel pinion gear mesh by raising or lowering the tail boom assembly.

To set the proper mesh, insert 1 thickness of paper (the same thickness as the pages of this manual) between the 2 bevel gears.

Next, push the tail boom assembly down so that there is no gear backlash with the paper in place.

Tighten the 4 tail boom mounting bolts. Next, remove the thickness of paper and check the gear mesh. There should be a very slight amount of backlash. If the backlash seems too much, repeat this procedure using thinner paper. If backlash can't be detected, double the paper thickness and retest.



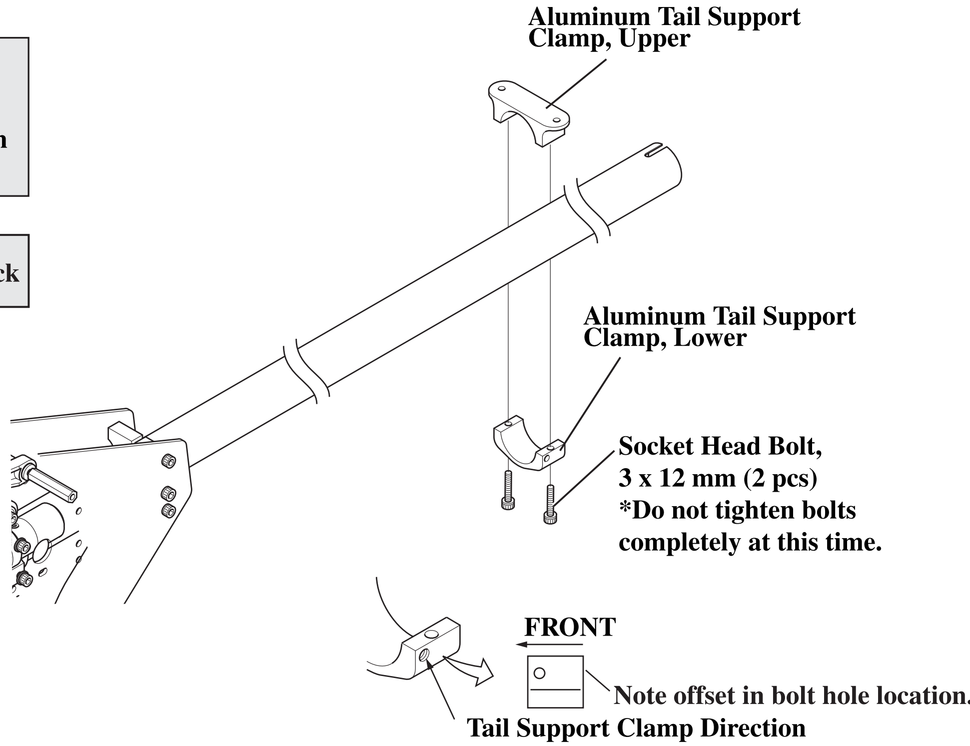
Note:

It is better to set this gear mesh slightly tight, rather than loose, or damage to the bevel gear can occur during extreme 3D flying or tail blade contact with the ground.

5-5 TAIL SUPPORT CLAMP INSTALLATION

.... 2 pcs
Socket Head Bolt, 3 x 12 mm

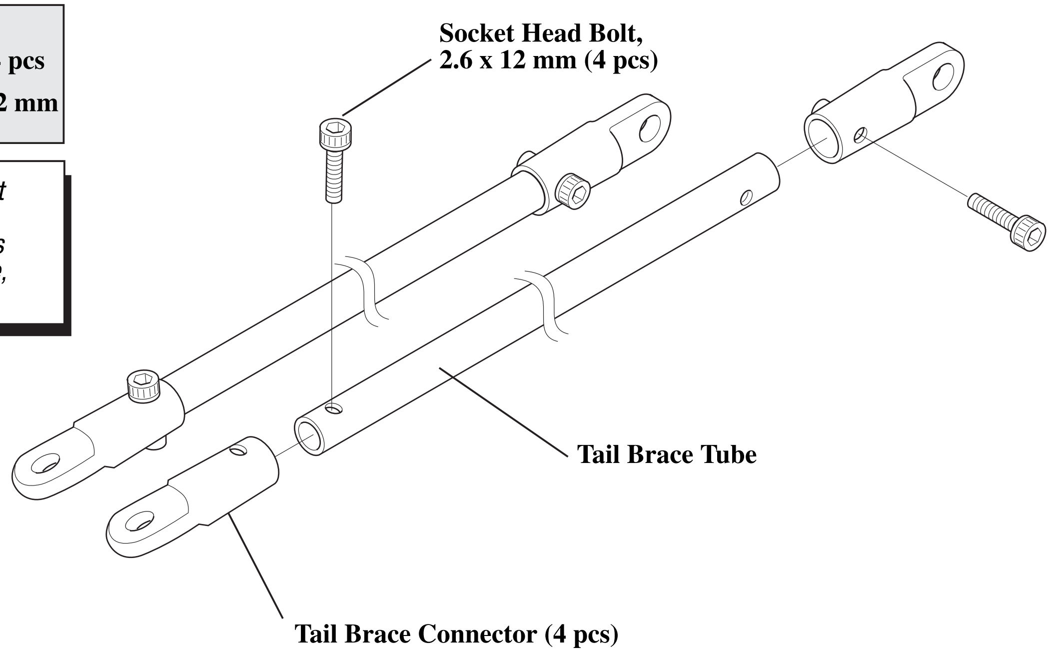
Use Red Threadlock



5-6 TAIL BOOM BRACE ASSEMBLY

...........4 pcs
Socket Head Bolt, 2.6 x 12 mm

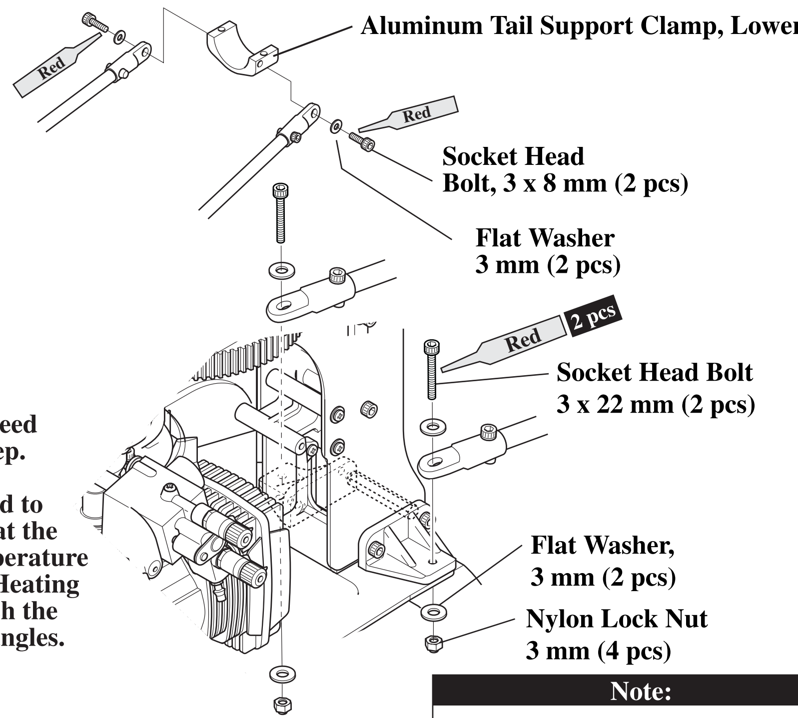
TEAM TIP: *It is suggested that the Tail Brace Connectors be bonded to the Tail Brace Tubes using either thick CA adhesive, or JB Weld.*



5-7 TAIL BRACE INSTALLATION

Socket Head Bolt, 3 x 8 mm	2 pcs
Flat Washer, 3 mm	2 pcs
Socket Head Bolt, 3 x 22 mm	2 pcs
Nylon Lock Nut, 3 mm	4 pcs

Use Red Threadlock



Note:
Push up on the center of the boom braces slightly when heating.

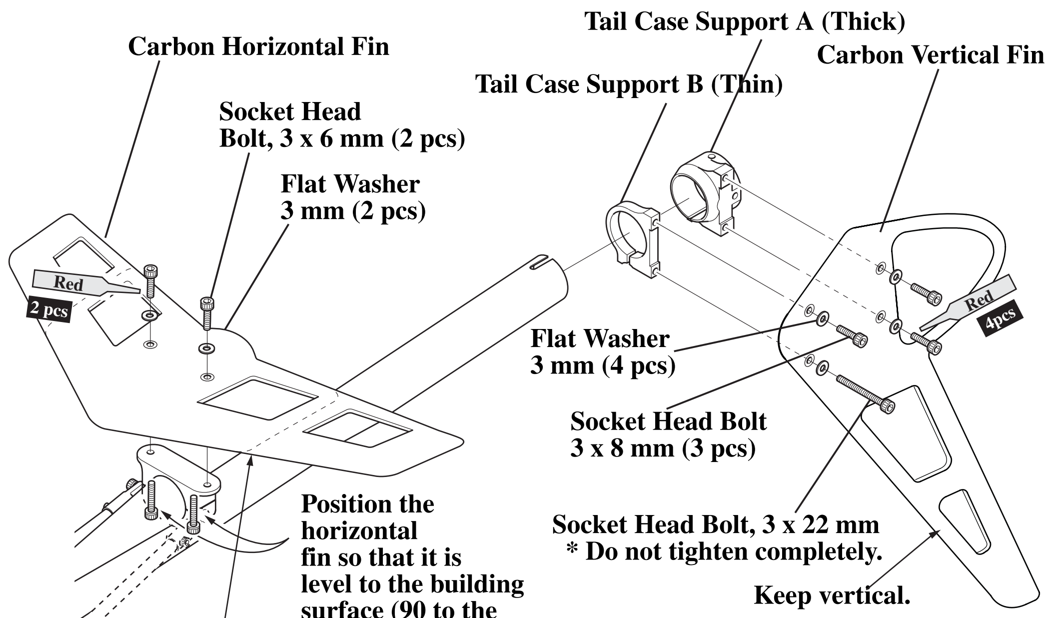
Attach the 2 Tail Boom Braces to the model as shown. The 2 front Plastic Tail Brace ends will need to be heated and bent upward in the following step.

Once the Horizontal Fin Clamp has been attached to the tail boom as shown, it will be necessary to heat the 2 Front Tail Brace Connectors using a High temperature hair dryer or Model aircraft covering heat gun. Heating these plastic connectors will help them to establish the correct angle/shape for the current boom brace angles.

5-8 HORIZONTAL/VERTICAL FIN INSTALLATION

Socket Head Bolt, 3 x 6 mm	2 pcs
Socket Head Bolt, 3 x 8 mm	3 pcs
Socket Head Bolt, 3 x 22 mm	1 pc
Flat Washer, 3 mm	6 pcs

Use Red Threadlock



Note:
For improved 3D performance and to reduce the possibility for resonance Vibration, the Horizontal fin can be shortened as shown prior to attachment.

5-9 TAIL CENTER HUB ASSEMBLY

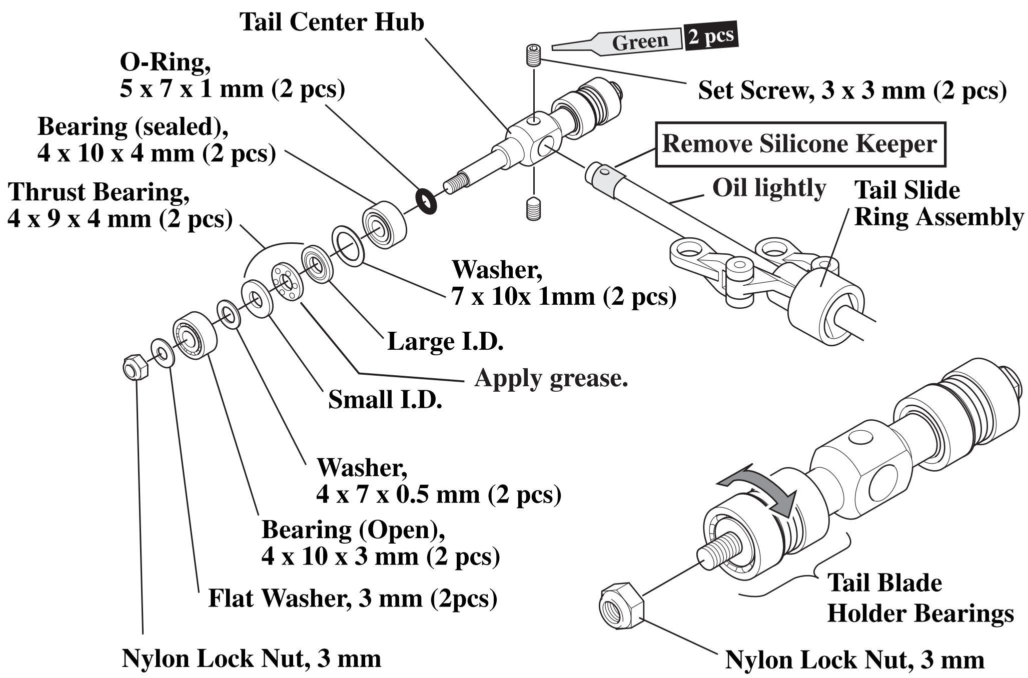
- Set Screw, 4 x 3 mm ....2 pcs
- Nylon Lock Nut, 3 mm ....2 pcs
- Bearing (sealed), 4 x 10 x 4 mm ....2 pcs
- Bearing (open), 4 x 10 x 3 mm ....2 pcs
- Washer, 7 x 10 x 1 mm ....2 pcs
- Washer, 4 x 7 x 0.5 mm ....2 pcs
- Flat Washer, 3 mm ....2 pcs
- Thrust Bearing, 4 x 9 x 4 mm ....2 pcs
- O-Ring, 5 x 7 x 1 mm ....2 pcs

Note:

Slide the tail slide ring assembly on the tail output shaft before installation of the tail rotor hub. When attaching the tail rotor hub, be certain that the set screws 3 x 3 mm engage into the holes at the end of tail output shaft. Use green threadlock.
Check to make sure the tail blade holder bearings can rotate freely, without play.
If binding occurs, loosen the 3 mm nylon lock nut.

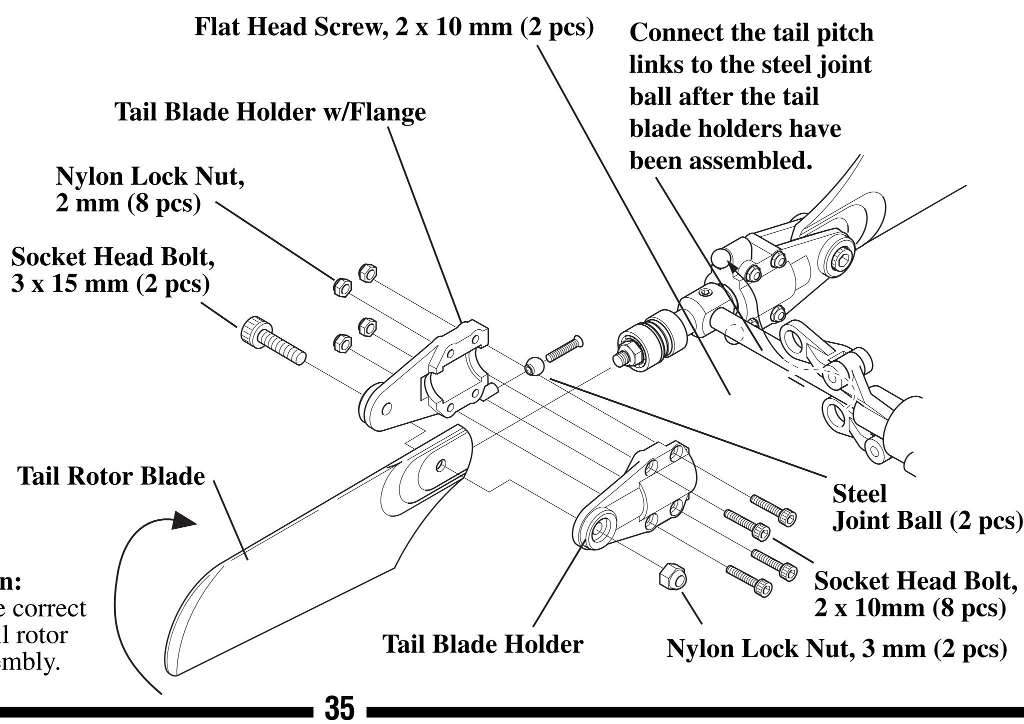
Use Green Threadlock

TEAM TIP: *Use thin oil on the tail shaft to lubricate the tail pitch slider. Also apply grease to the tail thrust bearings.*



5-10 TAIL BLADE HOLDER ASSEMBLY

- Flat Head Screw, 2 x 10 mm ....2 pcs
- Socket Head Bolt, 2 x 10 mm ....8 pcs
- Socket Head Bolt, 3 x 15 mm ..2 pcs
- Nylon Lock Nut, 2 mm ....8 pcs
- Nylon Lock Nut, 3 mm ....2 pcs
- Steel Joint Ball ....2 pcs



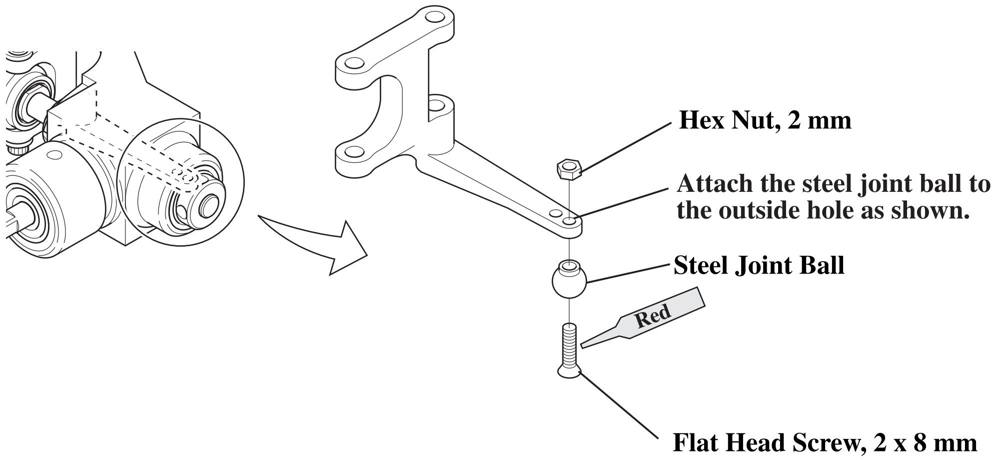
Rotation direction:
Be sure to note the correct direction of the tail rotor blades during assembly.

5-11 STEEL JOINT BALL INSTALLATION

.... 1 pc
Flat Head Screw, 2 x 8 mm

.... 1 pc
Steel Joint Ball

.... 1 pc
Hex Nut, 2 mm



5-12 TAIL DRIVE SHAFT/TAIL GEAR BOX INSTALLATION

.... 1 pc
Socket Head Bolt, 3 x 12 mm

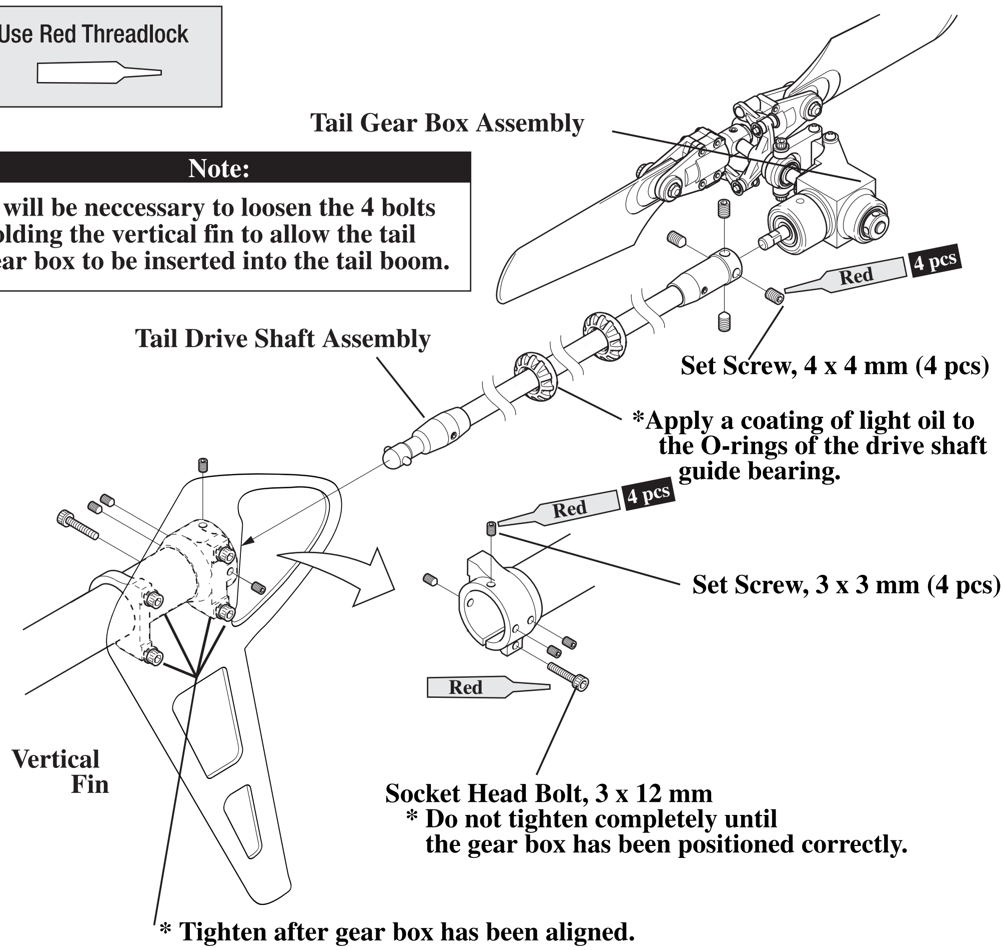
.... 4 pcs
Set Screw, 3 x 3 mm

.... 4 pcs
Set Screw, 4 x 4 mm

Use Red Threadlock

Note:
It will be neccessary to loosen the 4 bolts holding the vertical fin to allow the tail gear box to be inserted into the tail boom.

Attach the tail drive shaft to the tail gear box as shown using the 4–4 mm set screws (use Threadlock). Please leave a very slight space between the drive shaft and the bearing of the tail gear box.
Next, apply a light coating of oil to the drive shaft guide O-rings and install the assembly into the tail boom. To allow the tail gear box to be fully inserted into the boom, it may be necessary to rotate the front bevel pinion gear so the drive shaft can engage into the coupler. Level the tail output shaft of the tail gear box so that it is 90 to the main rotor shaft, and lock the tail gear box in place using the 3 mm socket head bolts and 3 mm set screws as shown.



6-1 TAIL BELCRANK ATTACHMENT

..........1 pc
Socket Head Bolt, 3 x 18 mm

.............2 pcs
Socket Head Bolt, 3 x 8 mm

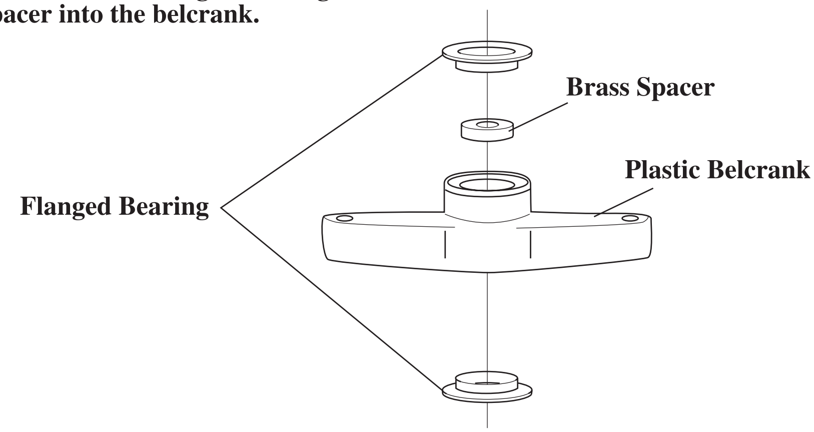
..............2 pcs
Flat Head Screw, 2 x 8 mm

..................1 pc
Nylon Lock Nut, 3 mm

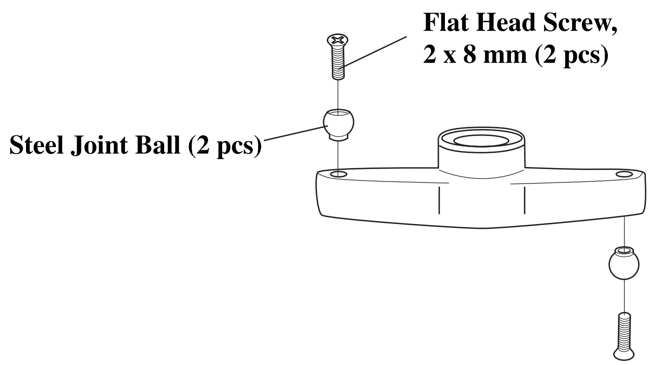
...................2 pcs
Steel Joint Ball

Use Red Threadlock

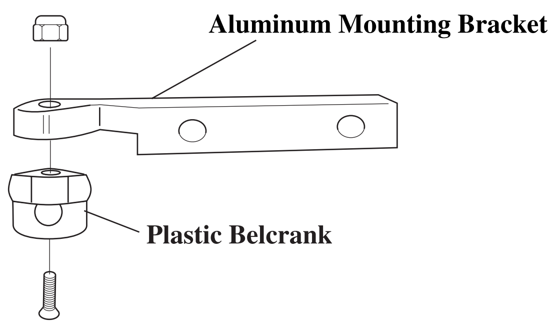
Step 1: Insert the 2 flanged bearings and spacer into the belcrank.



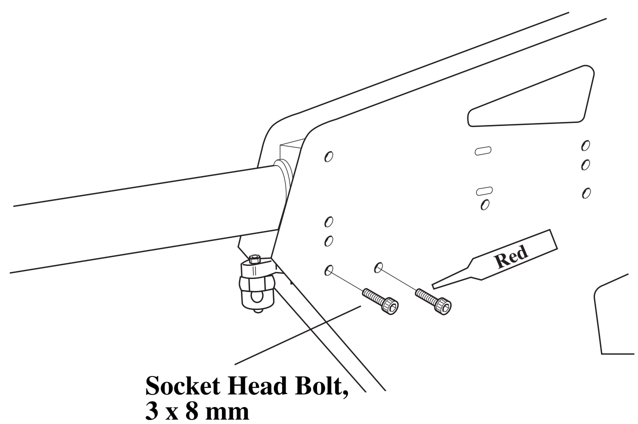
Step 2: Attach 2 Steel Control Balls to the belcrank as shown using 2 2x8 mm Flat Head Screws. Note position/location of balls.



Step 3: Attach the completed belcrank to the aluminum mounting bracket as shown.



Step 4: Attach the aluminum mounting bracket to the right rear frame as shown using 2 3x8 mm Socket Head Bolts.

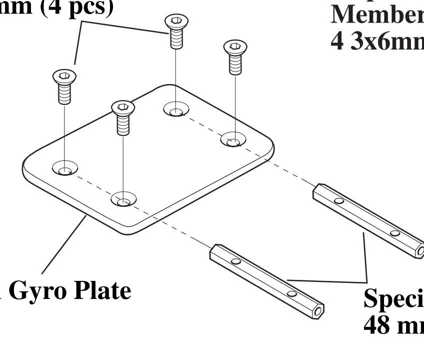


6-2 UPPER SERVO/GYRO TRAY ATTACHMENT

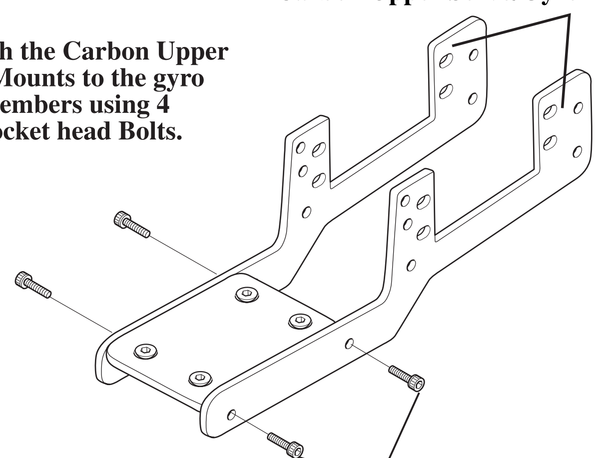
- Socket Head Bolt, 3 x 20 mm ....6 pcs
- Socket Head Bolt, 3 x 10 mm ....4 pcs
- Flat Head Bolt, 3 x 6 mm .... 4 pcs
- Cross Member, 32 mm ....3 pcs
- Special Cross Member, 48 mm ...2 pcs
- Spacer, 2.5 mm ....2 pcs
- Hex Standoff, 6 mm ....4 pcs

Use Red Threadlock

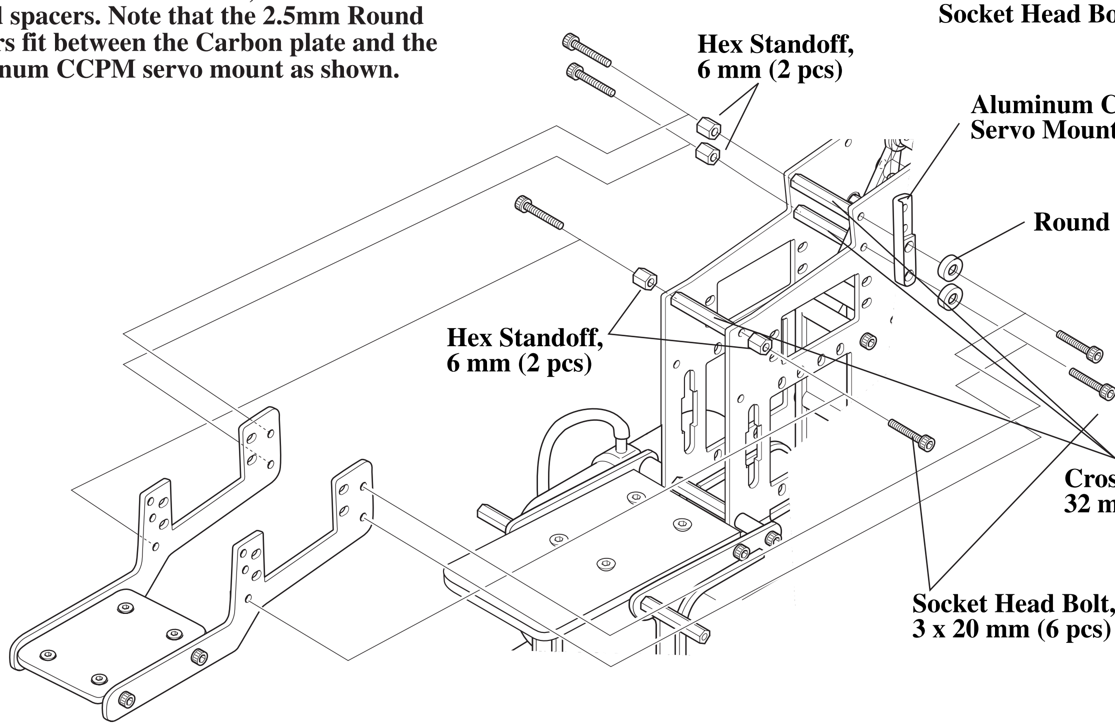
Step 1: Attach the 2 48mm Cross Members to the gyro plate using the 4 3x6mm Flat Head Screws



Step 2: Attach the Carbon Upper Servo/Gyro Mounts to the gyro plate cross members using 4 3 x 10 mm Socket head Bolts.

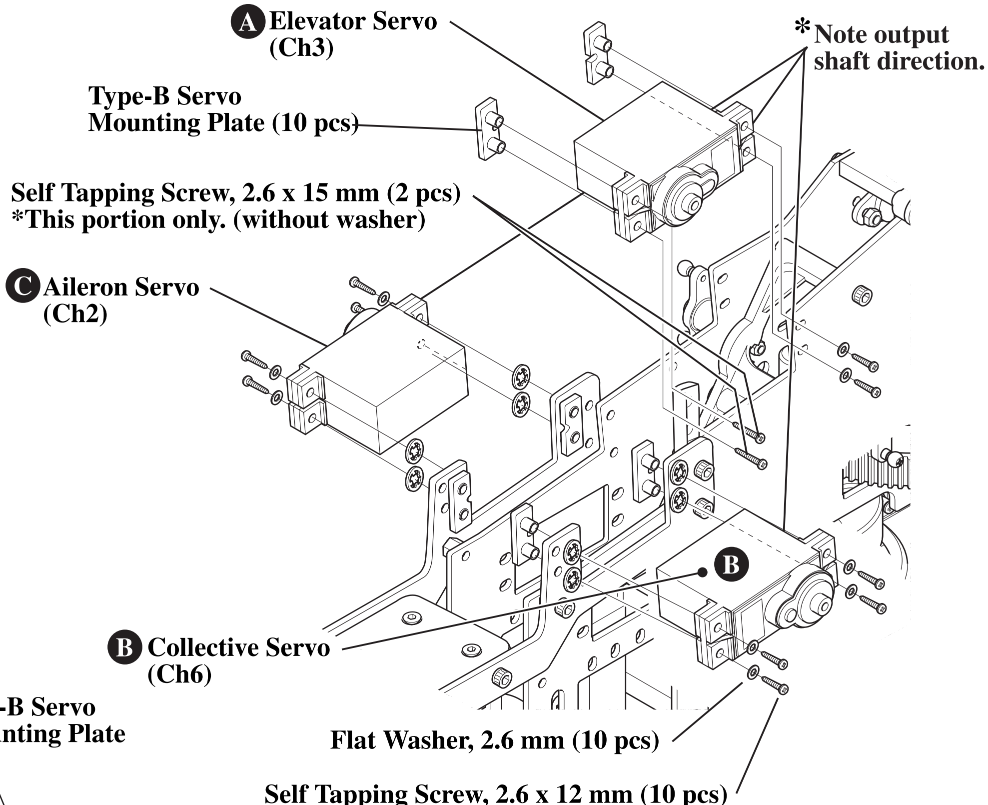


Step 3: Attach the completed assembly to the main frame using the 6- 3x20mm Socket head bolts, 4- 6mm Hex Standoffs, and 2- 2.5mm Round spacers. Note that the 2.5mm Round Spacers fit between the Carbon plate and the Aluminum CCPM servo mount as shown.

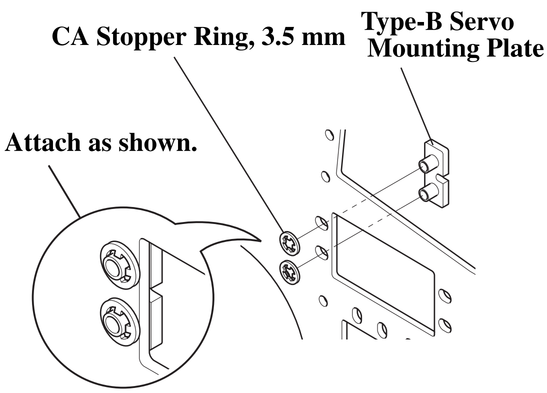


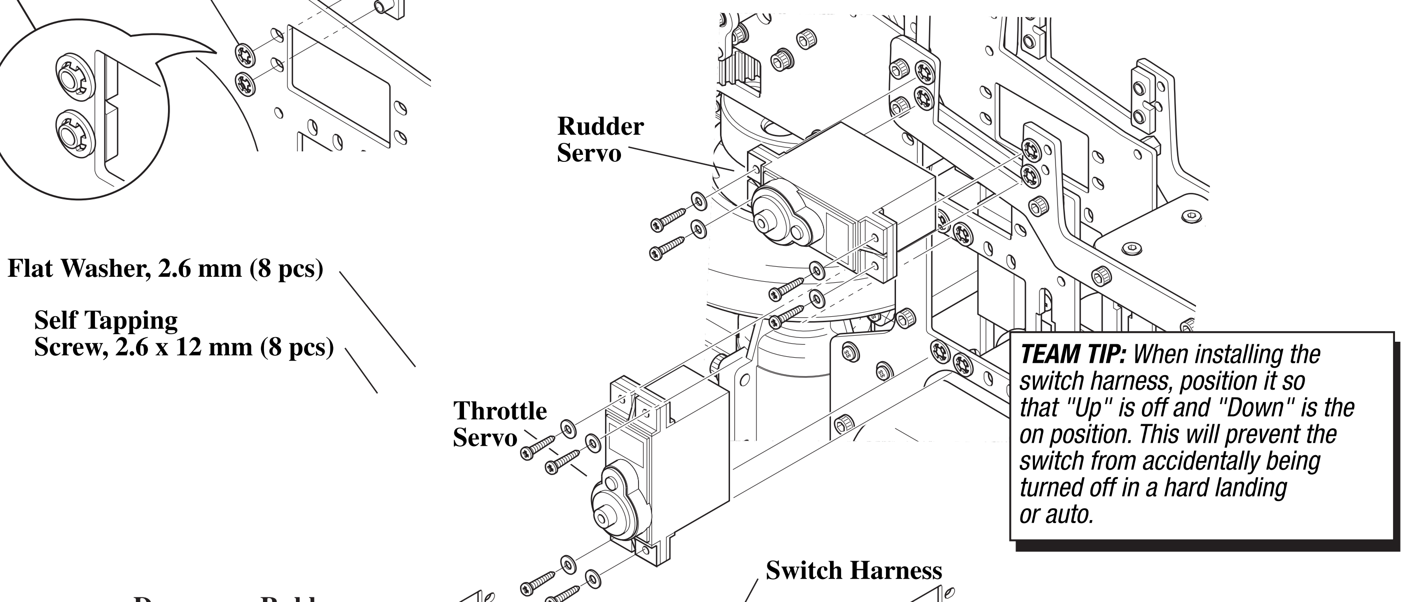
SERVO/SWITCH HARNESS INSTALLATION

- ....20 pcs — Self Tapping Screw, 2.6 x 12 mm
- ....2 pcs — Self Tapping Screw, 2.6 x 15 mm
- ....20 pcs — Flat Washer, 2.6 mm
- ....8 pcs — CA Stopper Ring, 3.5 mm
- ....10 pcs — Type-B Servo Mounting Plate

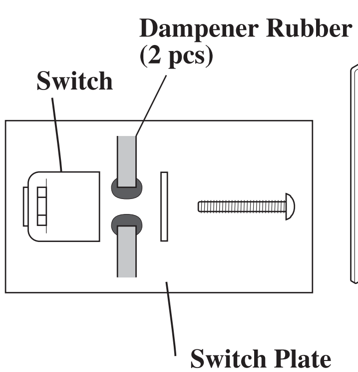


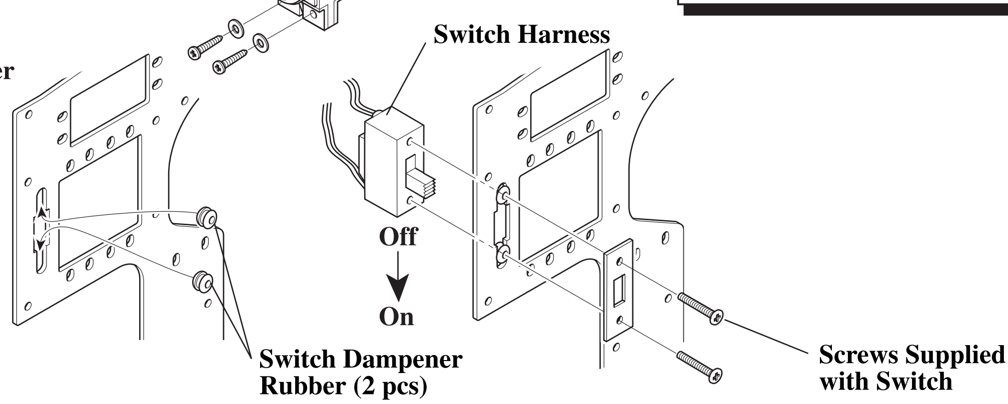
* Note correct servo output shaft orientation during installation.





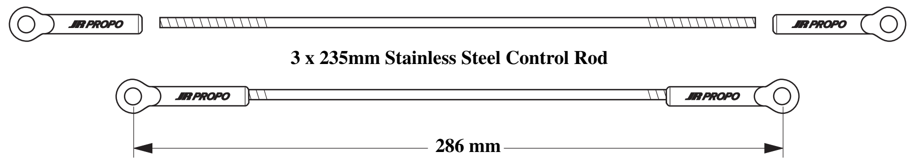
TEAM TIP: *When installing the switch harness, position it so that "Up" is off and "Down" is the on position. This will prevent the switch from accidentally being turned off in a hard landing or auto.*





6-4A INTERMEDIATE TAIL CONTROL ROD ASSEMBLY

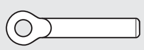
Special Ball Links, 3 mm ID... 2pc



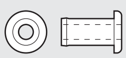
Attach the 2 special 3mm ID Ball Links to the 235mm Stainless Steel Control Rod as shown. Adjust the links so that the ball spacing is set to approximately 286 mm as shown.

Attach the completed control rod to the Intermediate Tail Belcrank (see previous step).

6-4B LONG TAIL CONTROL ROD ATTACHMENT

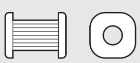


Universal Ball Link....... 2 pcs



.... 3 pcs

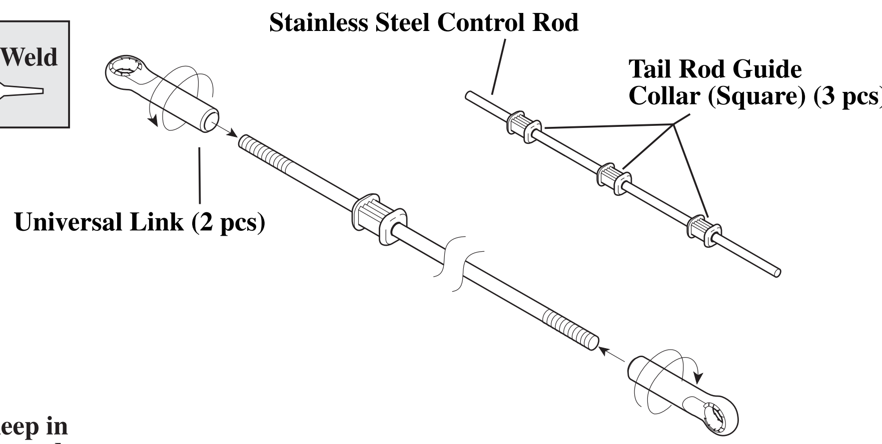
Tail Rod Guide Collar (round)



.... 3 pcs

Tail Rod Guide Collar (square)

Use JB Weld



ASSEMBLY PROCEDURE

1) **Slide the tail rod guides onto the rod and keep in place using masking tape on each end of the rod.**

2) **Thread the universal links onto the stainless steel rod as shown.**

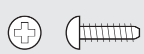
3) **Adjust the ball links so that the ball spacing is set to approximately 31-1/2" as shown.**

4) **Remove the masking tape, and attach the completed control rod to the intermediate and rear tail belcranks.**

Note:

Once this assembly has been completed, adjust the tail control rod as needed for proper tail rotor blade pitch prior to the initial flight.

6-4C LONG TAIL CONTROL ROD GUIDE ATTACHMENT

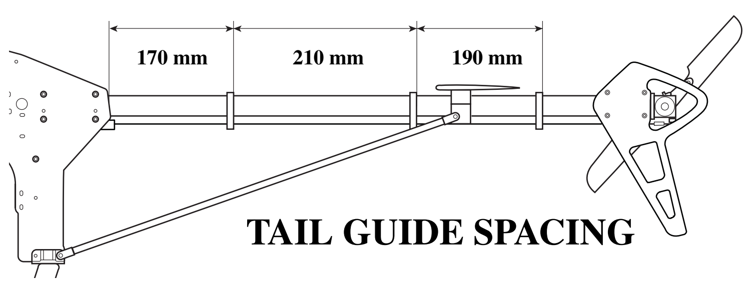


........3 pcs

Self Tapping Screw, 2 x 8 mm

Note:

The tail control rod final adjustment will need to be made prior to the first flight.

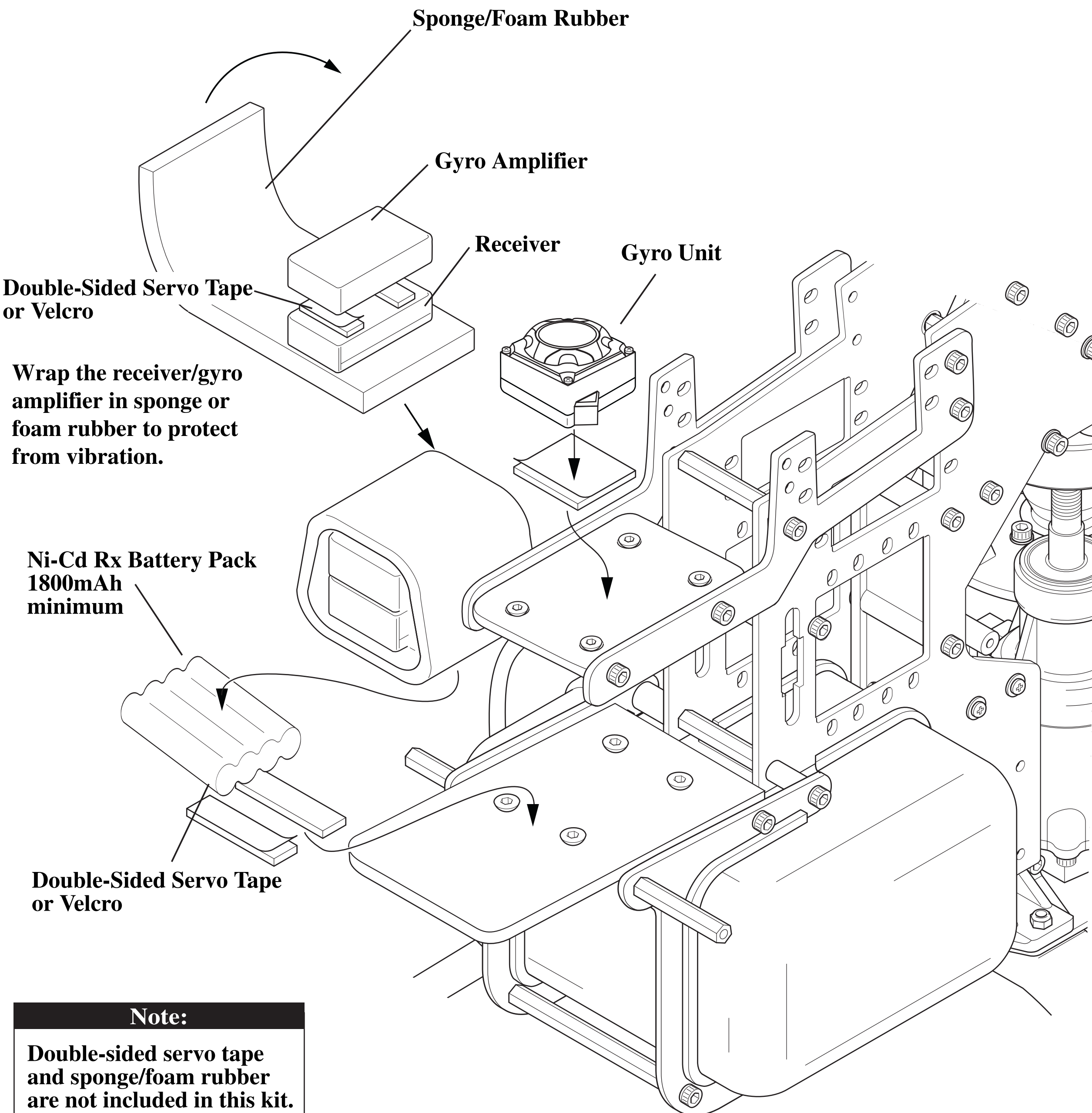


TEAM TIP: *Once tail guides are attached to the tail boom, check to insure that the tail control rod will move freely with little resistance. Rotate the tail guides as needed until the system moves as easily as possible. Once this has been achieved, apply a small amount of CA adhesive to bond the tail guides to the tail boom. This will prevent the guides from moving accidentally during flight. Apply oil to the rod and guides after assembly.*

GYRO/RECEIVER/BATTERY INSTALLATION

Note:

Be certain when installing the gyro unit to the front radio bed that it does not come in contact with the frame of the helicopter, etc. Also make sure that the front radio bed is free from oil and debris. Clean with rubbing alcohol if necessary to insure proper adhesion.



Note:

Double-sided servo tape and sponge/foam rubber are not included in this kit.

The following preparations are suggested for use with JR® radio systems. However, these procedures are applicable to most other brand radio systems. These suggested adjustments are necessary to insure correct installation and attachment of the control linkages and servo horns.

TRANSMITTER PREPARATION

1. Set all trim levers, knobs, and switches to the neutral or zero positions.
2. Turn the transmitter power switch to the *On* position.
3. Reset all functions and input values of your computer radio system to the factory preset position.
4. Move the throttle/collective control stick to the center or half stick position. Next slide the throttle trim lever to the full low position.

RECEIVER FLIGHT PACK PREPARATION

1. With the transmitter still on, slide the receiver switch to its *On* position. All servos should move to the neutral or center position.
2. Check that all servos operate with the appropriate control stick.
3. Rest the throttle stick to the center position, making sure the throttle trim is still at low.
4. Turn off the receiver switch first, followed by the transmitter.

SERVO HORN INSTALLATION SUGGESTIONS

For proper operation, it's important that the servo horns are positioned on the servos in the "exact" neutral position. Although most computer radio systems offer a sub-trim feature, it is suggested that the servo horns be manipulated on the servos to achieve the "exact" neutral settings.

Since the servo output spline on a JR system has an odd number of teeth (21), it's possible to reposition the servo arm on the servo at 90° intervals to achieve the proper neutral attachment of the servo horn.

Once the correct arm of the servo horn has been established, it's suggested that the remaining unused arms be removed from the servo horn as shown in the installation diagrams in the following section.

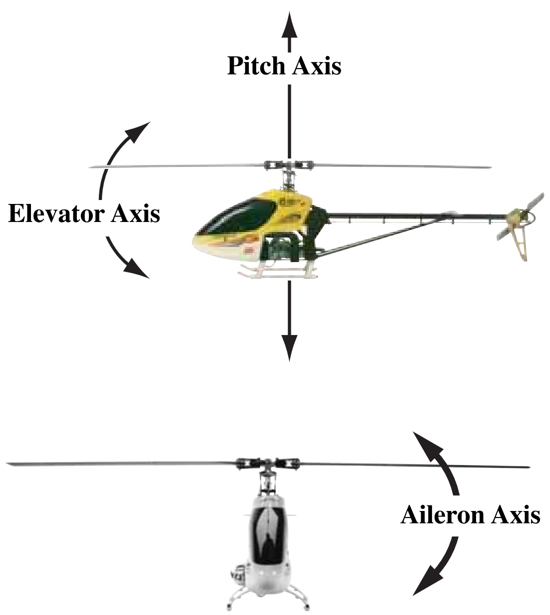
It will also be necessary to enlarge the appropriate hole in the servo horn slightly to allow correct installation of the steel control balls to the servo horn.

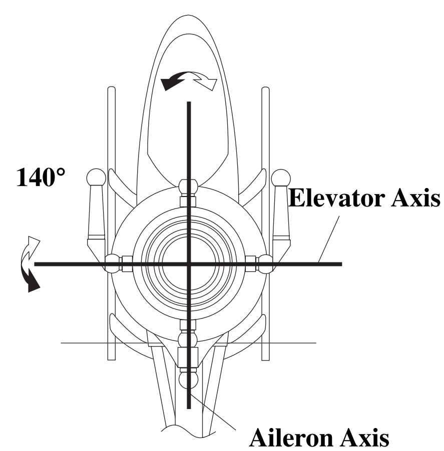
120/140 3-SERVO CCPM SWASHPLATE MIXING

The JR® 120°/140° CCPM or Cyclic/Collective Pitch Mixing system offers the user a control system that can accomplish the same control inputs as a one servo standard system, but with increased precision and reduced complexity.

As with the one servo system, the JR CCPM system utilizes three servos for the three main controls: aileron (roll), elevator(pitch), and collective. The CCPM lower swashplate ring is designed with only three control balls, spaced at 120° or 140° from each other, hence the 120°/140° CCPM designation. Although the control balls are not at 90° as in the standard system, the aileron (roll) axis is still parallel to the main mechanics of the helicopter, and the elevator (pitch) axis still functions at 90° to the mechanics as does the one servo system. Please refer to the diagram below for clarification.

The main difference in the way that these two systems operate is that unlike the one servo system where the three servos work completely independent from each other, the CCPM systems work as a team to achieve the same control inputs. For example, if an aileron (roll) input is given, two servos work together to move the swashplate left and right. If an elevator (pitch) input is given, all three servos work together to move the swashplate fore and aft. For collective, it’s also the strength of three servos that will move the swashplate up and down the main rotor shaft. With two or three servos working at the same time during any given control input, servo torque is maximized and servo centering is also increased. In addition to these benefits, CCPM achieves these control responses without the need for complex mechanical mixing systems that require many more control rods and parts to set up.





JR 120°/140° 3 Servo CCPM Control System

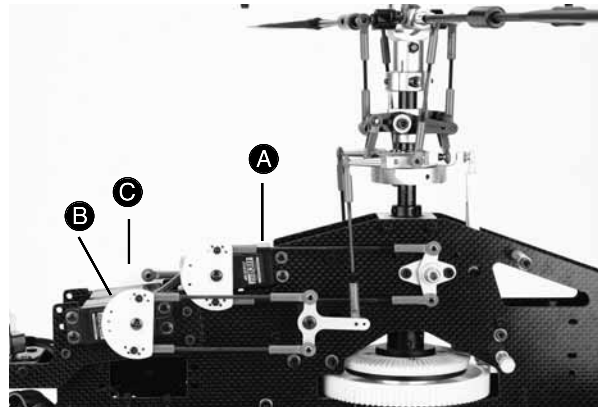
This amazing CCPM control is achieved through special CCPM swashplate mixing that is preprogrammed into many of today’s popular radio systems. Since the 120° and 140° CCPM function is preprogrammed, CCPM is no more complicated to set up than a conventional one servo standard system. When you factor in the reduced parts count and easy programming, CCPM is actually easier to set up and operate than many conventional systems.

For JR radio owners, please refer to the radio information contained at the front of this manual or on the following pages to determine if your radio system has the CCPM function. For other brands of radio systems, please contact the radio manufacturer for CCPM information. Please note that it is not possible to program a non-CCPM radio system for CCPM operation.

The JR 120°/140° three servo CCPM relies on the radio's special CCPM swashplate mixing, rather than a conventional mechanical mixer that is utilized to achieve the same results. The radio's 120° or 140° 3-servo CCPM function automatically mixes the three servos to provide the correct mixing inputs for aileron (roll), elevator (pitch), and collective. The following is an example of how each control input affects the servo's movement.

1. COLLECTIVE

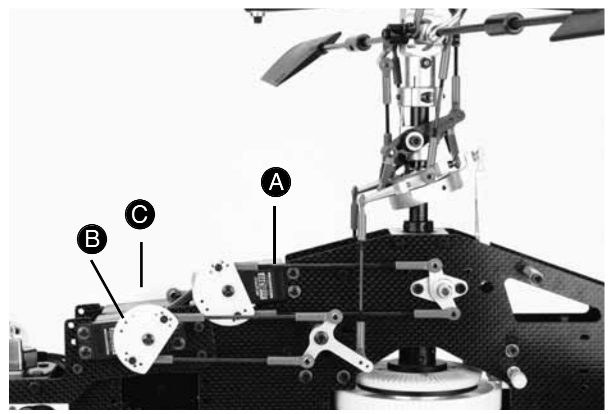
When a collective pitch input is given, all three servos (A, B, and C) move together in the same direction, at equal amounts, to raise and lower the swashplate while keeping the swashplate level. During this function, all three servos travel at the same value (100%) so that the swashplate can remain level during the increase and decrease in pitch. As mentioned, this mixing of the three servos is achieved through the radio's CCPM program.



1 Collective Movement

2. ELEVATOR (PITCH)

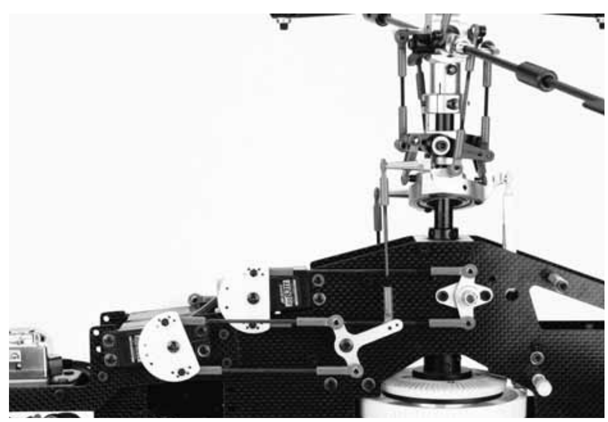
When an elevator input is given, all three servos must move to tilt the swashplate fore and aft, but their directions vary. The two front servos (B and C) move together in the same direction, while the top servo (A) moves in the opposite direction. For example, when a down elevator (forward cyclic) command is given, the two front servos (B and C) will move rearward, while the top servo (A) moves forward so that the swashplate will tilt forward. During this function with 120° CCPM, the top servo (A) travels at 100%, while the two front servos (B and C) travel at 50% ($^1/_2$ the travel value) of the top servo. This difference in travel is necessary due to the fact that the position of the 120 CCPM rear control ball is two times the distance of the two front control ball position as measured from the center of the swashplate. With 140° CCPM selected, all three servos travel at 100%, eliminating elevator trim changes during quick collective inputs. This mixing of the three servos is also achieved through the 140° CCPM program only found in JR 10X systems.



2 Elevator Movement

3. AILERON (ROLL)

When an aileron (roll) input is given, the two front servos (B and C) travel in opposite directions, while the top servo (A) remains motionless. For example, when a right aileron (roll) command is given, the left front servo (C) will move forward, while the right front servo (B) will move backward to tilt the swashplate to the right. As mentioned, the top servo (A) will remain motionless. The travel value for each of the two rear servos is 100%.



3 Aileron Movement

A. TRAVEL ADJUST

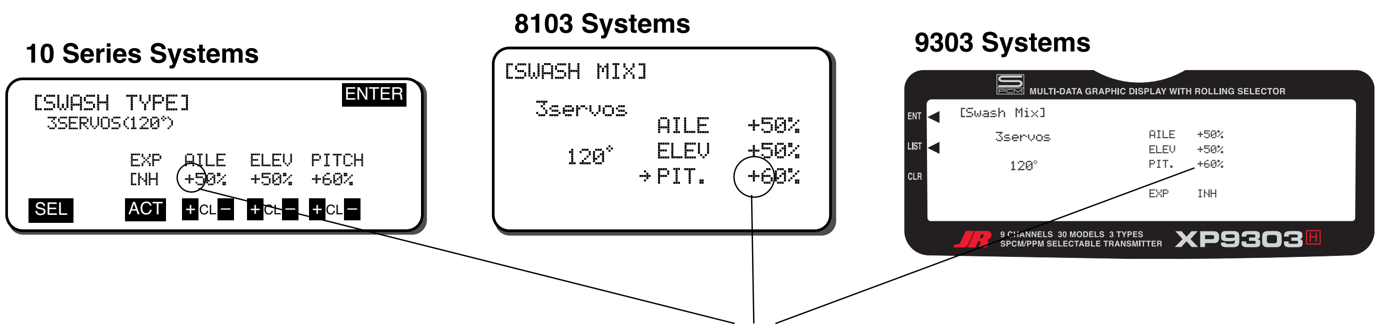
It is extremely important that the travel adjustment values for the three CCPM servos (aileron, elevator, Aux 1) be initially set to exactly the same travel value. If the travel value is not similar for each servo, it will create unwanted pitching and rolling of the swashplate during collective pitch inputs. The travel values for each servo will be adjusted in Step 7.8 and Step 7.9 to remove any minor pitch and roll coupling during pitch, roll, and collective movements.

Minor travel value adjustments are necessary due to slight variations in servo travel and centering. Although the three servos may appear to travel at the same amounts in each direction, in reality the servos can vary slightly. This variation is more common in analog type servos. If JR's new digital servos are used, the travel adjustment values will generally not need to be altered.

B. SERVO REVERSING

It is also extremely important that the servo reversing directions for the three CCPM servos (aileron, elevator, Aux 1) be set as indicated in the upcoming radio programming steps. If one or more servos is not set to the correct direction, the CCPM function will be out of synchronization, and the three control functions (Aileron, Elevator, Collective) will not move properly. In the event that a control surface is working in the wrong direction, the control function can only be reversed by changing the desired CCPM value for that function from a (+) to a (-) value or vise versa.

Example: If when you increase the collective pitch, the pitch of the main blades actually decreases, it will be necessary to access the CCPM function and change the travel value for this function from (+) to (-), or (-) to (+). This will reverse the direction of the collective pitch function without affecting the movement of the aileron and elevator functions.



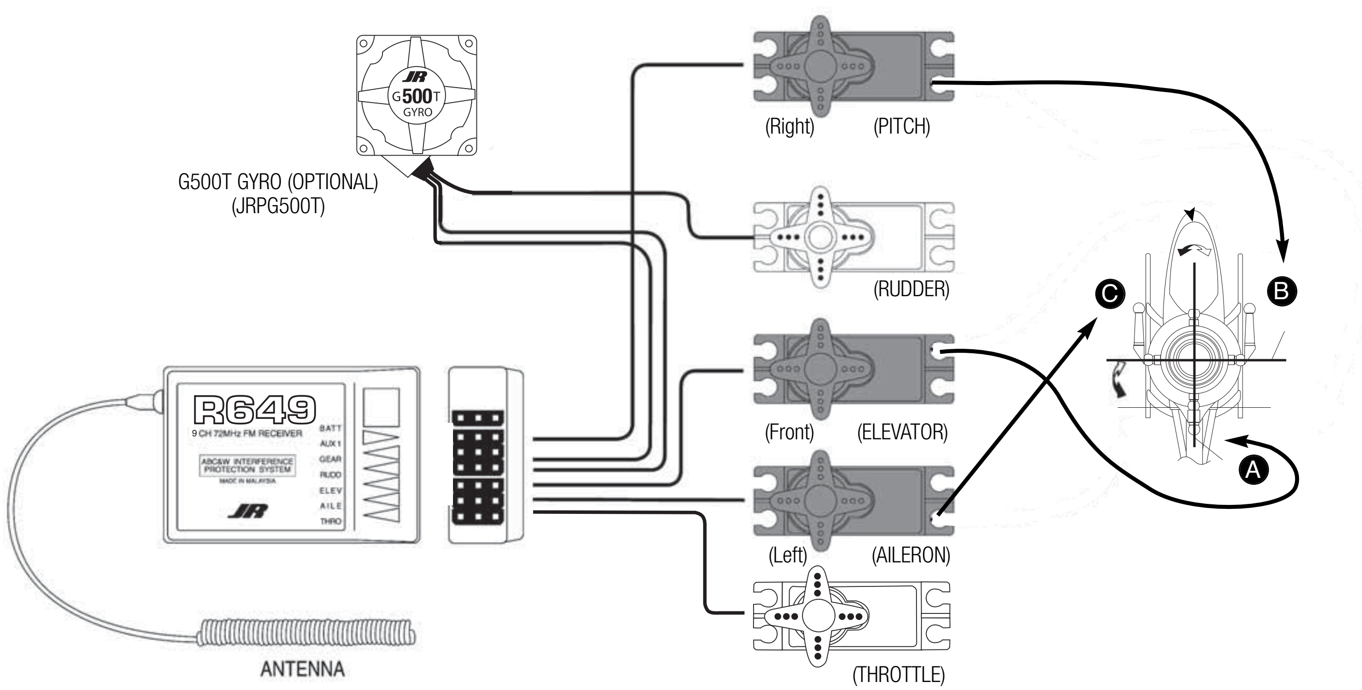
To reverse the direction of a CCPM control function, it's neccessary to change the value from (+) to (–) or (–) to (+) as needed.

C. CCPM SERVO CONNECTIONS

The JR® 120°/140° CCPM system requires the use of three servos to operate, aileron, elevator, and Aux 1(Pitch). The labeling of these servos can become quite confusing because with the CCPM function; the three servos no longer work independently, but rather as a team, and their functions are now combined. For this reason, we will refer to the three servos in the following manner:

A Elevator Servo: We will refer to this servo as the "Top" servo. The channel number for this servo when using a JR radio is CH3.
B Aileron Servo: We will refer to this servo as the "Right Front" servo. The channel number for this servo when using a JR radio is CH2.
C Aux 1 (Pitch) Servo: We will refer to this servo as the "Left Front" servo. The channel number for this servo when using a JR radio is CH6.

Please refer to the CCPM connections chart below for clarification. For non-JR radios, please consult your radio instructions for proper connection.



RADIO SYSTEM REQUIREMENTS (NOT INCLUDED):

6-channel or greater R/C helicopter system with 120° or 140° CCPM function

CCPM-Ready JR Radio Systems

Most current JR heli radio systems (XP662, XP8103 w/digital trims, XP9303, 10X, as well as older 10 series systems) are equipped with 120° CCPM electronics for use with JR CCPM machines. Radios you may be flying now, like the X347, X388S, XP783, and XP8103*, have 120° CCPM capability built in but require activation by the Horizon Service Department. Please call (217) 355-9511 for details.

*Please note that many XP8103 systems have the CCPM function already activated. Please check with the Horizon Service Center for details.

Current Radio Systems

JRP1656**PCM 10X, 120° & 140° CCPM
JRP8622**XP8103FM, 120° CCPM
JRP8653**XP8103PCM, 120° CCPM
JRP9252** XP9303 PCM 120/140 CCPM
JRP6822**XP662 FM,120° CCPM
JR G500T Gyro or equivalent

10X
120° or 140° CCPM

XP8103D.T.
120° CCPM Only

XP9303
120° or 140° CCPM

1. JR XP9303 SYSTEMS: PROGRAM INPUT

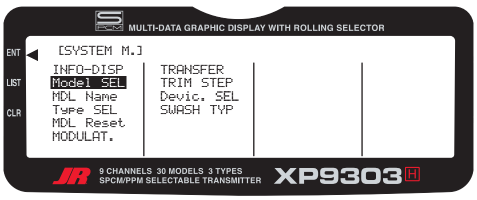
The following activation and setup procedure should be used for all JR 9303 systems.

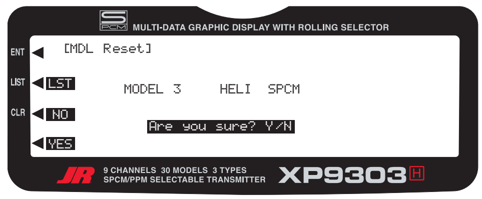
Prior to activating the CCPM function, it is first suggested that the data reset function be performed to reset the desired model number to be used back to the factory default settings.

Caution: Prior to performing the data reset function, it will be necessary to select the desired model number to be used.

A) Model Select/Data Reset

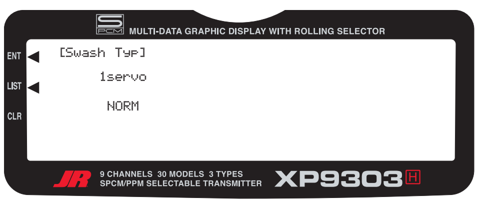
Press the ENT key while turning the power switch on to enter the system mode. Next, move the cursor to the MODEL SEL function. Press the roll selector to enter the model select function. Select the desired model number to be used, then press the roll selector. Next, move the roll selector to highlight LST, and press. Move the roll selector to highlight MDL RESET, then press. Press the CLEAR key, then press YES to reset the data of the current model selected.

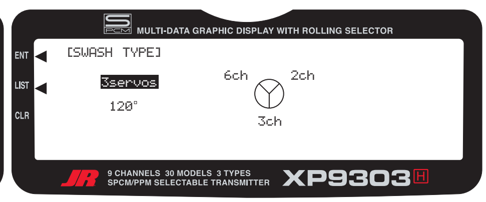




B) CCPM Activation

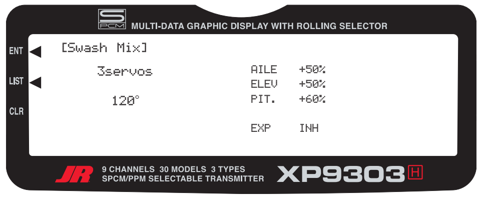
Move the roll selector to highlight the SWASH TYP function, then press to access the swashplate type function. Press the roll selector to access the variations of CCPM mixing, then move the roll selector to select the desired CCPM type (120 or 140). Move the roll selector to highlight LST to exit the system mode.





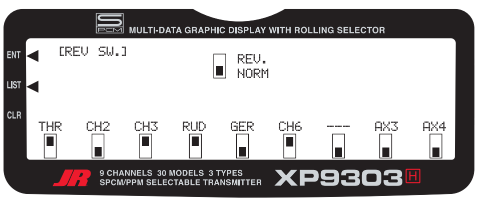
C) CCPM Settings

Turn the power switch on, then press the ENT key to enter the function mode. Move the roll selector to highlight the SWASH MIX function, then press P. Once this has been completed, it will be necessary to change the value of the aileron, elevator, and pitch functions from the factory default setting using the + and - keys.



D) Servo Reversing

Move the roll selector and highlight "Rev. Sw." (Servo Reversing) appears on the screen, then press. Next, reverse channels 3, 4, and 6 by moving the Roll selector, and pressing as needed to change from NORM to REV.

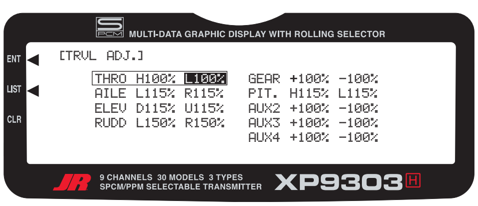


	REV	NORM
THR	●	
AIL		●
ELE	●	
RUD	●	
GER		●
PIT	●	
AUX1		●
AUX2		●

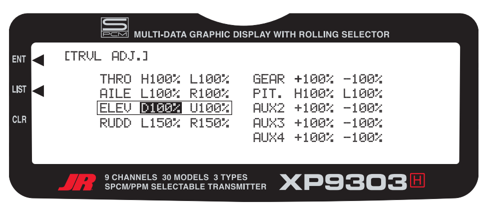
E) Travel Adjustment

Move the roll selector and highlight "TRVL. ADJ." (travel adjust) appears on the screen, then press. Adjust the values as shown by moving the roll selector to highlight the desired channel, while using the control stick to select up/down, or left/right values to be adjusted. Please note that the required travel values will vary based on the type of servo selected.

Digital Servos/Super Servos



Standard Servos



Note: The travel values shown for the rudder function are for use with solid state and Ring Sensor type gyros, like the JR G500T or G7000T type gyros.

2. JR 10 SERIES SYSTEMS: MANUAL PROGRAM INPUT

The following activation and setup procedure should be used for all JR PCM10, 10S, 10SX, 10SxII, and 10X systems.

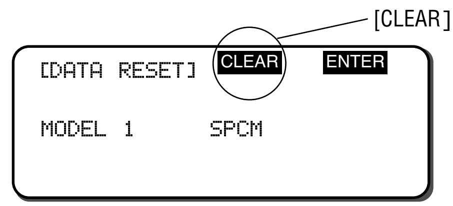
Prior to activating the CCPM function, it is first suggested that a data reset function be performed to reset the desired model number to be used back to the factory default settings.

Caution: Prior to performing the data reset function, it will be necessary to select the desired model number to be used. Access the model select function (code 84) and select the desired model to be used.

SETUP PROCEDURE

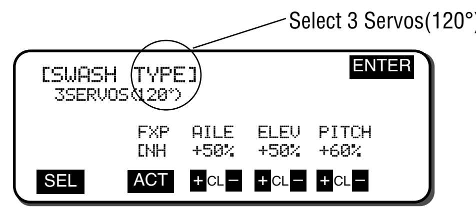
A) Data Reset

Access the data reset function (code 28) once the correct model number has been established. Next, press the *Clear* key to reset the current model. Press the *Enter* key to exit the data reset function.



B) CCPM Activation

Access the swash type function (code 65). Next, press the *SEL* key until "3 servos (120°)" appears on the screen. For 10X owners, press the *SEL* key until "3 servos (140°)" appears on the screen. 140 CCPM is only found in the JR 10X radio system and was specifically designed for use with the Vibe 90 3D. Once this is complete, it will be necessary to change the value of the aileron, elevator, and pitch function from the factory default settings using the + and - keys below the pitch value. Press *Enter* to exit the swash type function.



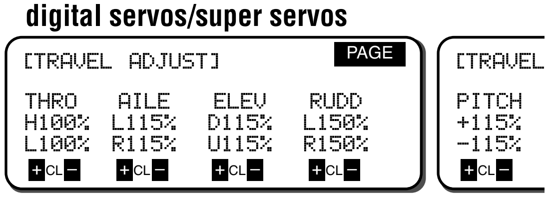
C) Servo Reversing

Access the servo reversing function (code 11). Next, reverse channels 1, 2, and 4 by pressing the desired channel number. The screen should appear as shown. Press *Enter* to exit the servo reversing function.

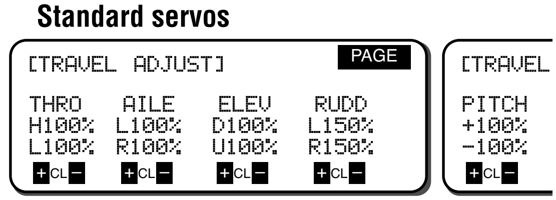
D) Travel Adjust

Access the travel adjust function (code 12) and adjust the servo travel values as shown. Please note that the required travel values will vary based on the type of servo selected. Press *Enter* to exit the travel adjust function.

digital servos/super servos



Standard servos



Note: The travel values shown for the rudder function are for use with solid state or Ring Sensor type gyros, like the JR G500T, or G7000T type gyros. If a conventional mechanical type gyro is used (JR 120, 130 etc.), then the travel value of the rudder channel will need to be reduced to approximately 100%.

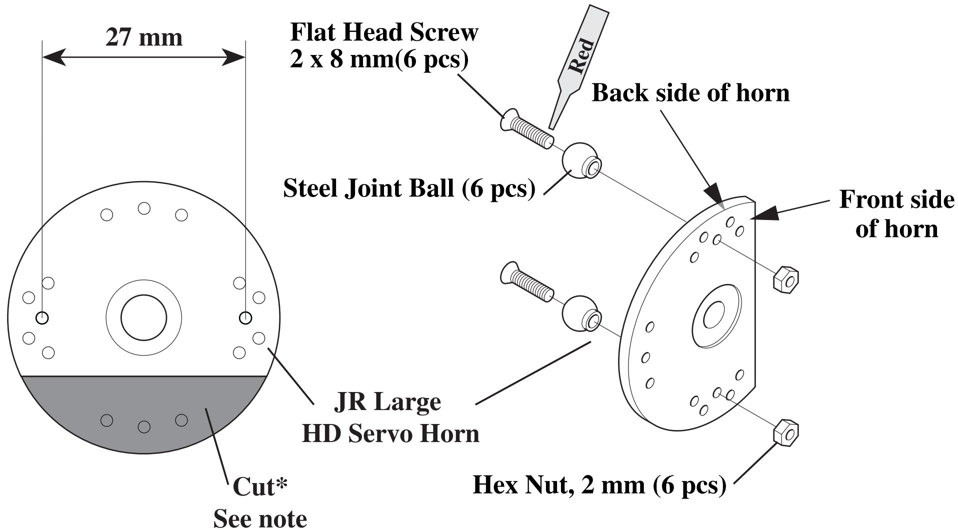
7-1 PREPARATION AND INSTALLATION OF SERVO HORNS

.... 6 pcs
Flat Head Screw, 2 x 8 mm

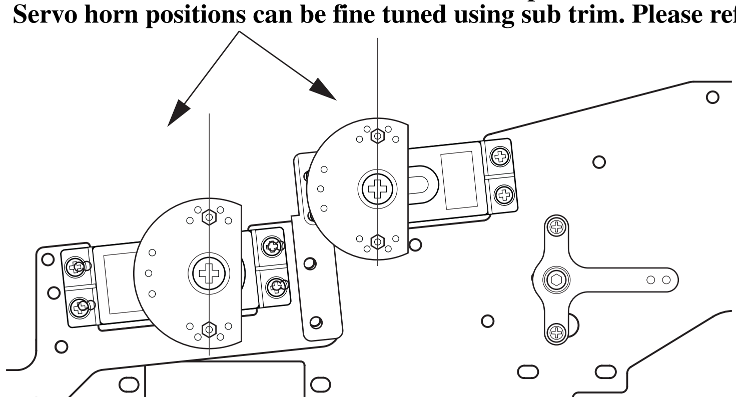
.... 6 pcs
Steel Joint Ball

.... 6 pcs
Hex Nut, 2 mm

Use Red Threadlock



Test fit the servo horns to achieve the correct position as shown.
Servo horn positions can be fine tuned using sub trim. Please refer to Section 7-2.



Note:

JR HD Servo Wheels or equivalent will be required for this step (JRPA216, not included)

Before trimming the servo horns as shown, it is first suggested that these horns be test fit to the servo to achieve the correct positioning. JR servos utilize a 21 spline output shaft, which allows the position of the servo arm to be varied when rotated at 180-degree intervals.

To test fit the servo horns, turn the radio system on, and set the collective stick to the center position.
Next, test fit the servo arms at 180-degree intervals to find the direction that will allow the horn to be positioned as close to the vertical position (90 degrees from the servo case) as possible as shown in the diagram. This will reduce the amount of sub trim needed to bring the servo horns to the exact 90-degree position as shown.

Once the position for each horn has been established, mark the servo arms for trimming, while also noting the servo that they have been fitted to (A, B, or C).

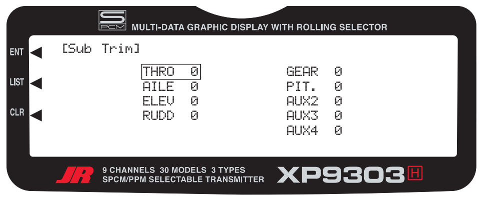
Trim the servo horns as shown and attach the steel control balls in the desired hole locations.

Reattach the servo horns to the servos, remembering to secure the horns to the servos using the servo horn screw. Final sub trimming of the servos will be performed in the proceeding Section 7-2.

It may be necessary to make minor servo centering adjustments with the use of the sub-trim function to achieve the desired servo arm positions. Please refer to your particular radio's section as listed below or consult your radio instruction manual for more information.

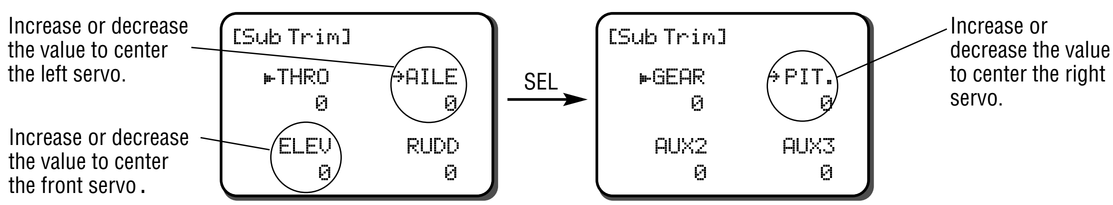
1. XP9303 SYSTEMS

1) With the radio power switch on, press the ENT key to enter the function mode.
2) Move the roll selector until until "Sub Trim" appears on the screen, then press.
3) Adjust the left (CH-2), right (CH-6), and top (CH-3) servos as needed until the servo arm is exactly parallel to the servo when the collective stick is in the center position.
4) Move the roll selector to LST to exit the Sub Trim function.



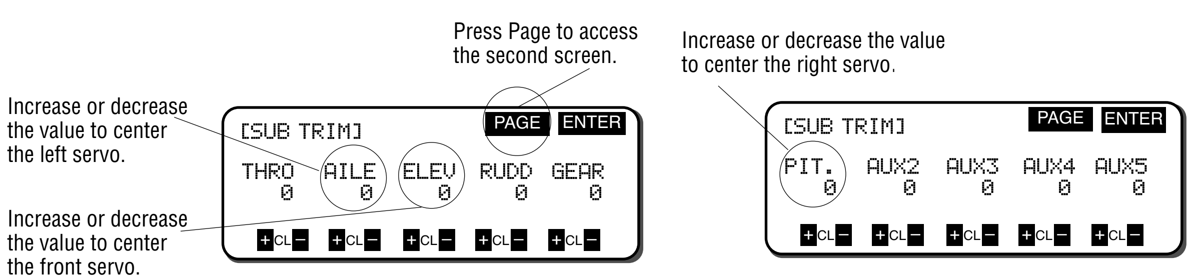
2. XP8103 SYSTEMS

1) With the radio power switch on, press the *Up* and *Down* keys simultaneously to enter the function mode.
2) Press the *Up* key until "Sub Trim" appears on the screen.
3) Adjust the left (aileron), right (Aux 1), and top (elevator) servos as needed until the servo arm is exactly parallel to the servo when the collective stick is in the center position. It will be necessary to press the *SEL* key once to access the right servo (Aux 1) sub-trim.
4) Press the *Up* and *Down* keys simultaneously to exit the function mode.



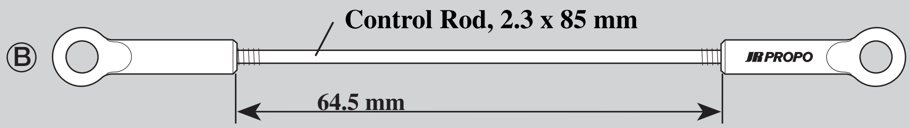
3. JR PCM10, 10S, 10SX, 10SXII, 10X SYSTEMS

1) Enter the sub-trim function (code 15).
2) Adjust the left (aileron), right (Aux 1) and top (elevator) servos as needed until the servo arm is exactly parallel to the servo when the collective stick is in the center position. It will be necessary to press the *Page* button to access the right servo (Aux 1) sub-trim value.
3) Press *Enter* to exit the sub-trim function.

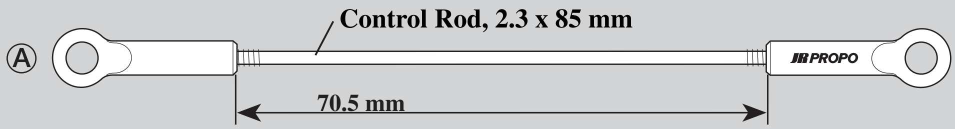


CONTROL ROD ASSEMBLY

120Standard Range (All Systems)

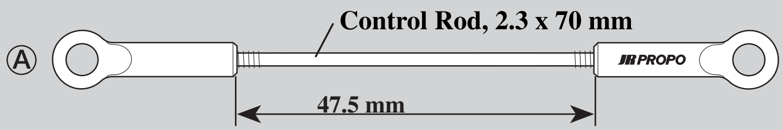


.........4 pcs

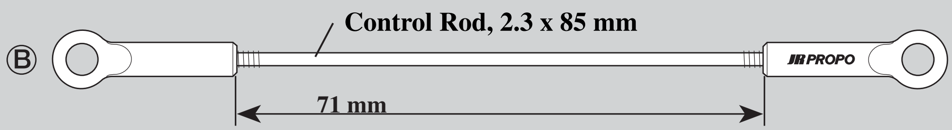


........2 pcs

140Standard Range (For 10X and XP9303 Systems only)



.........4 pcs



.........2 pcs

Note:

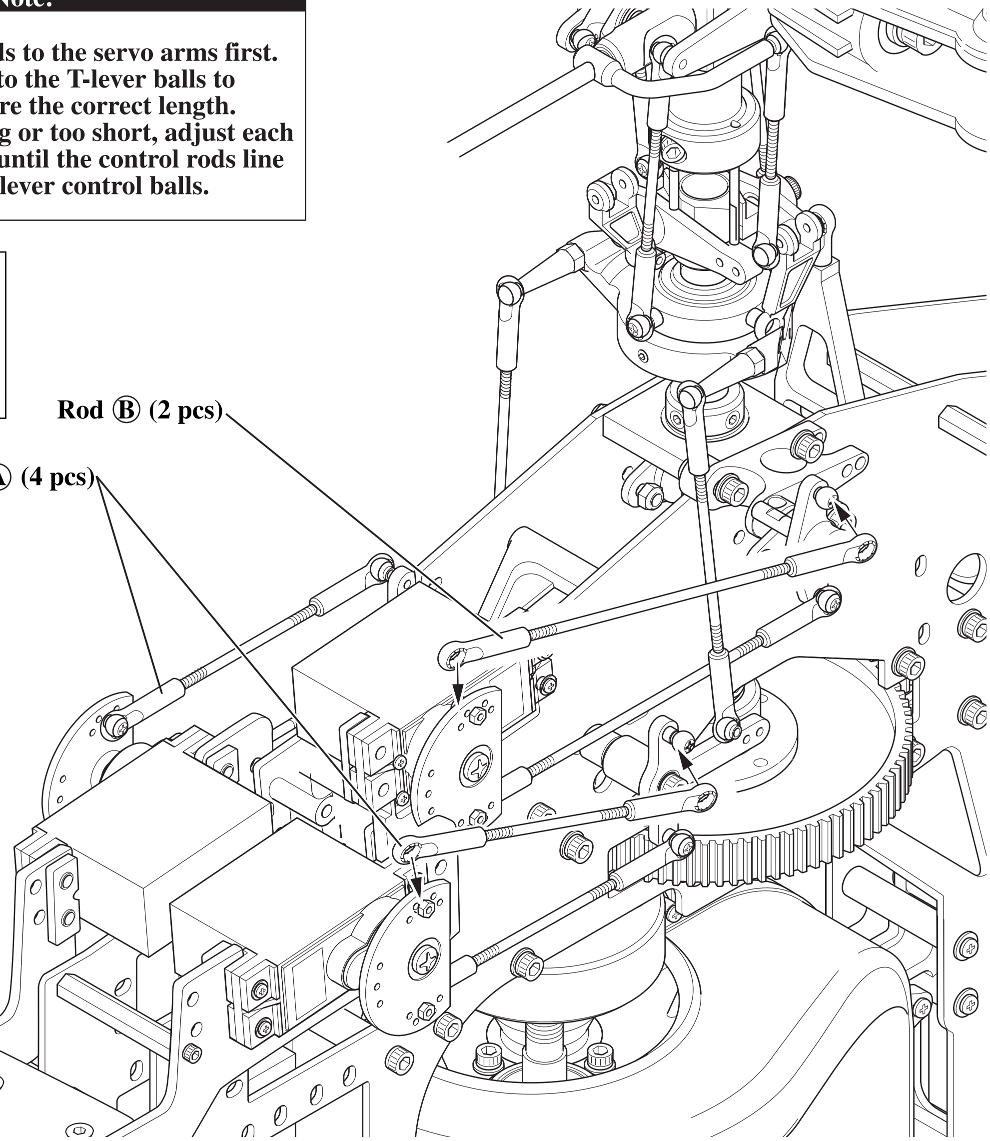
**All instructions are based on the use of the "standard range" CCPM setup.
It is not recommended that the "wide range" setup be used, as it reduces servo resolution.**

CCPM CONTROL ROD ATTACHMENT

Note:

Attach the control rods to the servo arms first. Next, test fit the rods to the T-lever balls to ensure that the rods are the correct length. If the rods are too long or too short, adjust each rod an equal amount until the control rods line up with each of the T-lever control balls.

Use JR Ball Link Sizing Tool

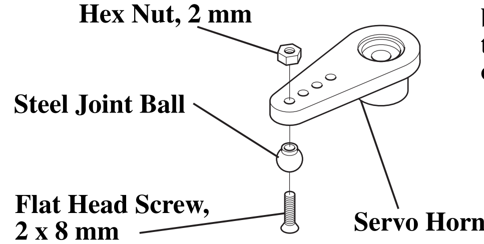


7-5 TAIL CONTROL ROD CONNECTION

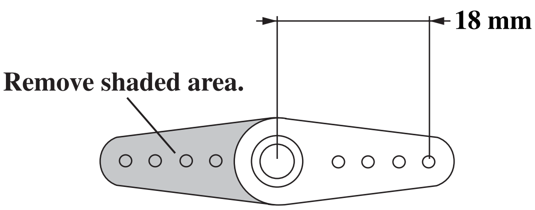
Flat Head Screw, 2 x 8 mm	1 pc
Steel Joint Ball	1 pc
Hex Nut, 2 mm	1 pc

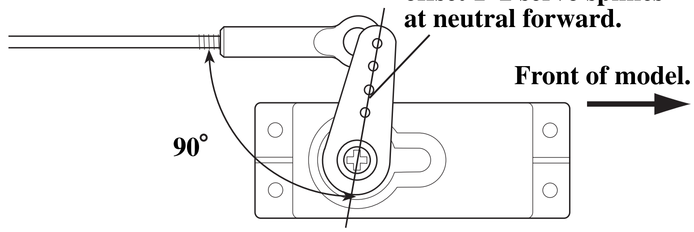
Use Red Threadlock

Adjust the length of the tail control rod until the tail pitch slider is in the center of its travel and the servo arm is at the position shown below (offset).



Note that control ball is attached to the inside of the servo arm.



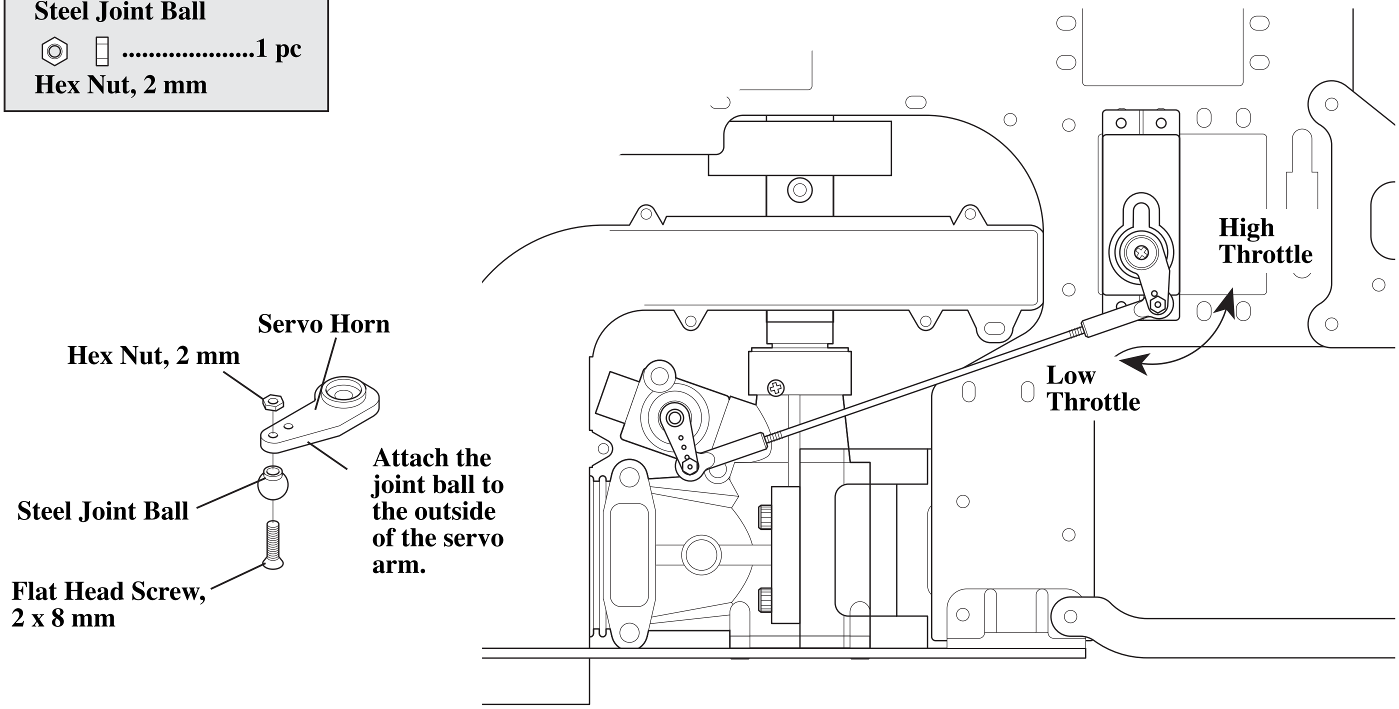


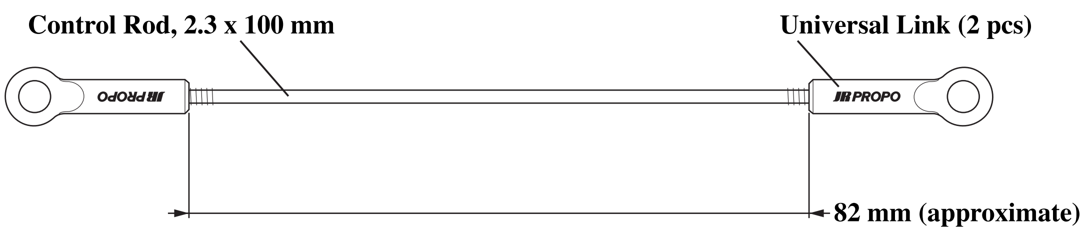
Offsetting the servo arm as shown will "balance" the feel of the tail rotor during flight.

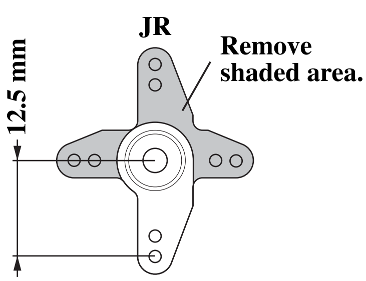
7-6A THROTTLE LINKAGE CONNECTION

..............1 pc	Flat Head Screw, 2 x 8 mm
.................1 pc	Steel Joint Ball
....................1 pc	Hex Nut, 2 mm

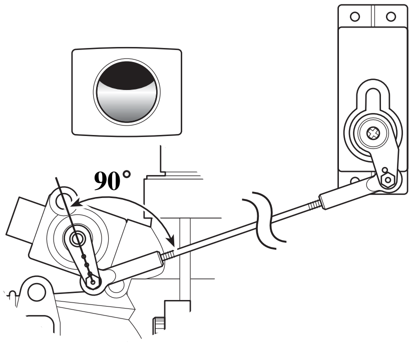
***Option: For smooth operation, pre-size the ball links with the JR ball link sizing tool prior to attachment.**



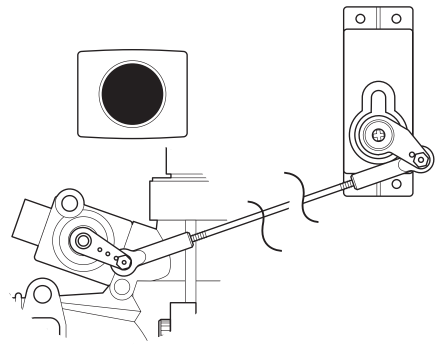




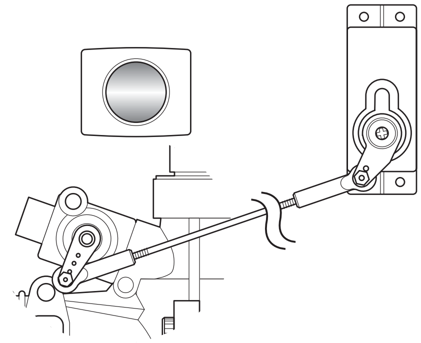
THROTTLE ARM/SERVO HORN POSITIONS



1/2 Stick (Throttle) Position
(Throttle Barrel 1/2 open)



High Stick (Throttle) Position
(Throttle Barrel Fully Open)



Low Stick (Throttle) Position
(Throttle Barrel Fully Closed)

*To avoid differential throttle travel, make certain both the throttle arm and the servo horn are positioned as shown in the above diagrams.

To achieve the correct position of the throttle/servo arm, it may be necessary to re-position the throttle arm on the carburetor. It may also be necessary to adjust the length of the throttle linkage slightly to achieve full open and closed positions of the carburetor.

Throttle Travel Adjustment (Initial Setup Only) 10 Series & Other Systems

It is also possible to increase/reduce the travel of the throttle servo through the travel adjust function found in most computer radio systems. If this function is used, make sure the values for the high and low positions remain equal (same value for high/low). If these values are not equal, it will create a differential, or uneven movement of the throttle, making rotor rpm adjustment and fine tuning more difficult.

Throttle Travel Adjustment (Full 3D Setup) with 8103 Systems

When setting up your throttle linkage for cyclic to throttle mixing with many radio systems, it will be necessary to make any adjustment in the throttle travel limits by mechanical means only. Move the control linkage in or out on the servo/throttle arms until the correct barrel travel is achieved. Please note that it is very important the ATV (travel volume) for both the high and low throttle setting remain at their maximum values (150%) to prevent over-travel and binding of the throttle linkage when cyclic to throttle mixing is used.

For initial cyclic to throttle mixing value information, please refer to the JR 8103 and PCM10X series data sheets located on pages 73-77 of this manual. Please note that the values and mixing channels shown are universal to most radio systems currently available.

Cyclic to Throttle Channel and Mixing Values (most systems)

Mix #1	Channel		Mixing Value	
	Master	Slave	Left	Right
	Aileron(2)*	Throttle (1)*	20	20
Mix #2			Up	Down
	Master	Slave	20	20
	Elevator(3)*	Throttle (1)*		

*Numbers shown correspond with the correct JR channel numbers

Mixing Value Adjustment

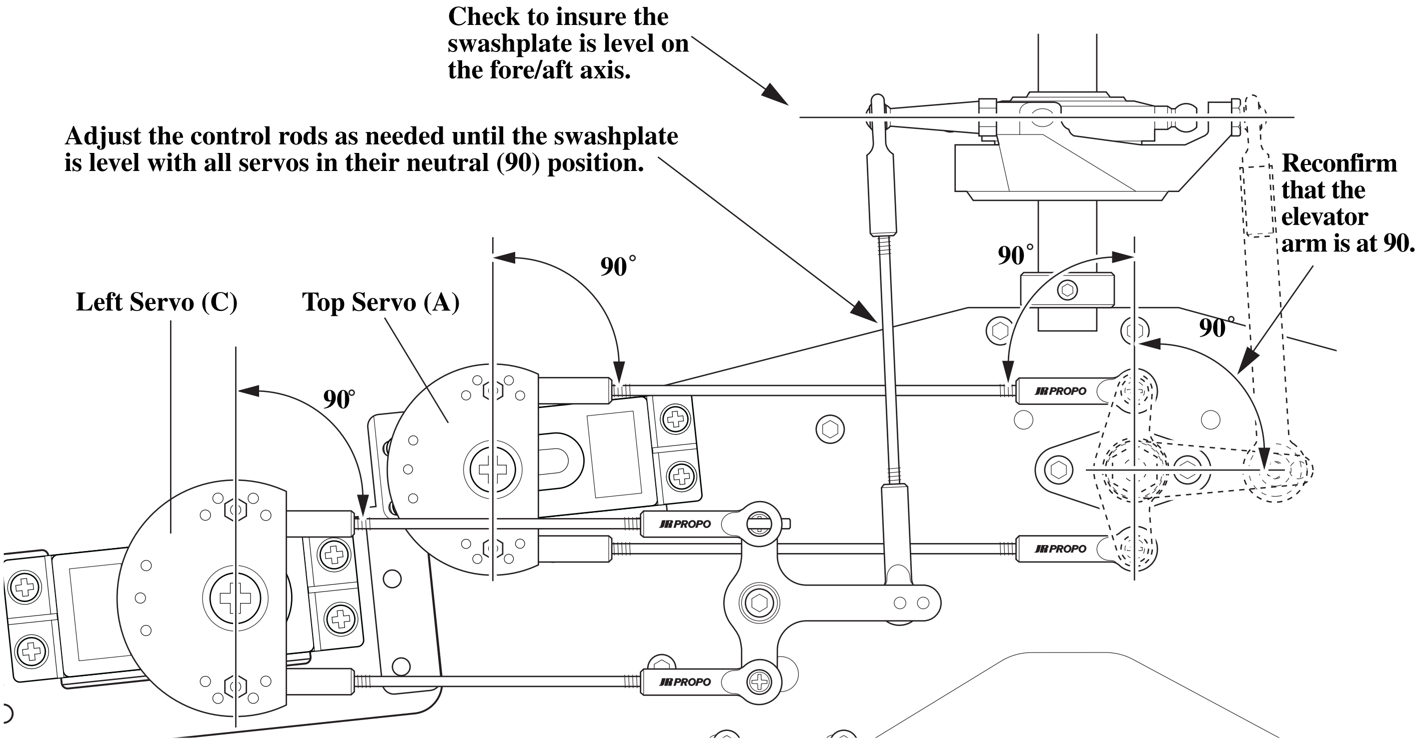
Please note that it will be necessary to determine if the desired mixing values need to be a + or - value based on servo direction, etc.

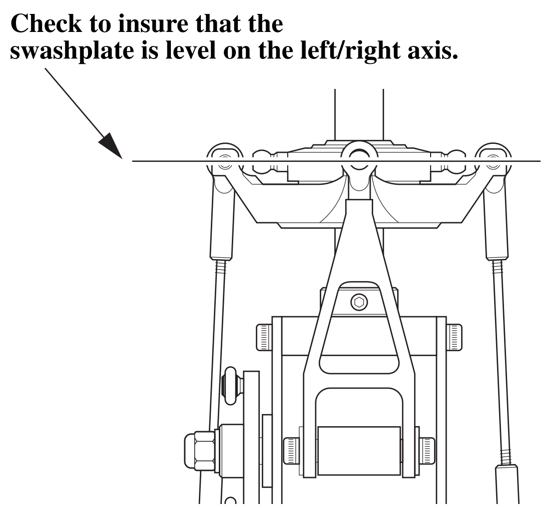
To verify the proper direction, move the control surface in each direction while watching the throttle arm. Throttle should increase each time a control surface input is given. Adjust the + or - value as necessary until the proper mix is achieved.

Note:

Also check to confirm that the throttle travel is correct and is not causing a bind in the control linkage after the cyclic mixing has been added.

7-7 CHECKING THE SWASHPLATE FOR LEVEL





After the control linkages have been attached to the swashplate, it will be necessary to check the swashplate to insure that it is level. To do this, turn on the radio system and place the collective stick in the center position as before. Next, check to make sure that all trim levers and knobs are also in their center position.

Check to insure that the servo arms are parallel to the servos as adjusted in the previous step. If the servos are not parallel, please refer to the sub-trim section 7-2 and readjust as necessary.

Once it's determined that the servo arms are parallel to the servos as required, it will now be necessary to check the swashplate to insure that it is also level or neutral in this position. It is suggested that the swashplate first be checked from the rear of the model to insure that it's level from left to right. If the swashplate is not level as compared to the frame of the model, adjust either the left or right servo control rods as needed. To determine which rod needs adjustment, it may be helpful to view the swashplate from the left and right side view of the model to determine which side is high or low.

Once this left to right adjustment is completed, it will now be necessary to check the fore/aft position of the swashplate to insure that it is also level on this axis. If the swashplate is not level in the fore/aft axis, it is suggested that the adjustment be made to the front servo control linkage as needed by slightly repositioning the elevator control arm on the elevator a-arm assembly, or adjusting both front servo control rods.

If you are unsure as to which linkage needs adjustment or are having difficulty obtaining the correct adjustment, please check the length of each control rod to insure that it is adjusted to the correct length as outlined in Step 5-3.

Note:

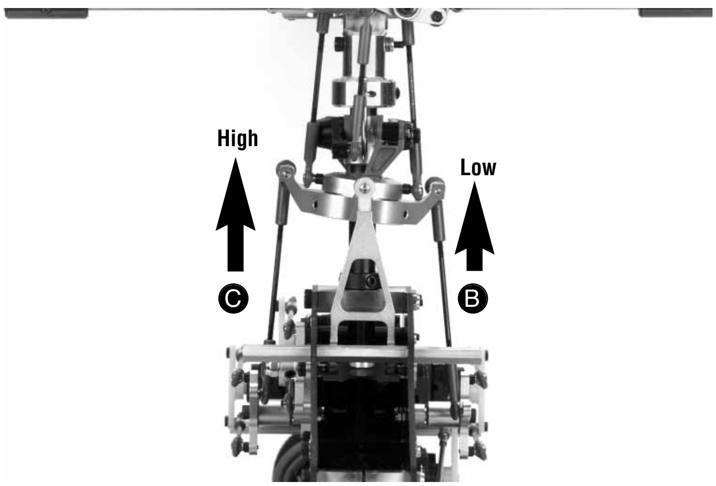
If care was taken in the linkage assembly in Steps 4-6 and 7-3, little or no adjustment should be required in this step. Only minor adjustments should be made to the lengths of the control linkages at this time. Any major adjustments indicates either incorrect linkage lengths or incorrect servo arm positioning. If the control linkage lengths are altered from the recommended lengths more that one or two turns, this will have a great effect on the range and settings of the collective pitch in later steps.

7-8 PITCH-TO-AILERON MIXING ADJUSTMENT WITH TRAVEL ADJUST

It is very possible that the travel of each servo varies slightly, which can cause the swashplate to be tilted to the left or right when the collective is moved to the extreme high and low pitch positions. This condition is generally more common when standard type servos are used. If JR® digital servos are used, the adjustment required is generally very small, if any. These variations in travel can be corrected by altering the travel value of each servo slightly through the travel adjustment function.

To check the pitch-to-aileron mixing, it will first be necessary to position the collective stick in the center position as in the previous steps. Next, move the collective stick from the center position to the high pitch position while viewing the swashplate from the rear of the model as shown in the diagram below. While moving the swashplate, look for any tendency for the swashplate to roll to the left or right as it reaches the high pitch position. Repeat this procedure several times to be sure that your observations are correct. If no rolling tendency is found, it will now be necessary to repeat this procedure from the center collective stick position to full low pitch. If no rolling tendency is found, proceed to Step 7-9.

In our example, we have shown that the swashplate has been tilted to the right as the collective has been increased to full pitch. This would indicate that the left servo's maximum travel is greater than the right servo's maximum travel.



View is shown from the rear of the model. Notice how the swashplate has tilted to the right as the collective has moved from center to full high pitch position.

Once this condition has been corrected, repeat this procedure for the center to low collective pitch position and adjust as needed.

ELEV=	Top Servo	Ⓐ
AUX1=	Right Front Servo	Ⓑ
AILE=	Left Front Servo	Ⓒ

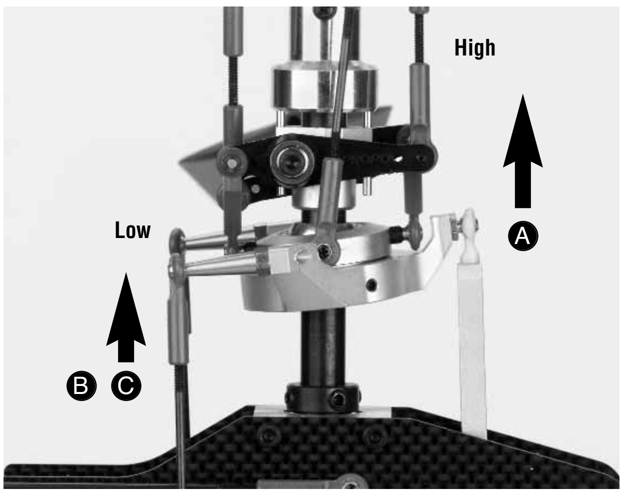
In this condition, we suggest that the travel value for the left servo be reduced slightly (5–10%). Repeat the procedure above if the same condition occurs, but to a lesser degree. The travel value of the right servo should be increased slightly and retested. In most cases, it will require only the adjustment of the left or right servo to correct this situation.

PITCH-TO-ELEVATOR MIXING ADJUSTMENT WITH TRAVEL ADJUST

The total travel of each servo can vary slightly, which can also cause the swashplate to be tilted fore and aft when the collective is moved to the extreme high and low pitch positions. This situation can also be corrected if necessary through the use of the travel adjustment function.

To check pitch-to-elevator mixing, it will first be necessary to position the collective stick in the center position as in the previous steps. Next, move the collective stick from the center to the high pitch position while viewing the swashplate from the left side of the model. While moving the swashplate, look for any tendencies for the swashplate to tilt fore or aft as it reaches the high pitch positions. Repeat this procedure several times to be sure that your observations are correct. If no fore or aft tilting tendencies are found, it will now be necessary to repeat this procedure from the center collective stick position to full low pitch. If no tilting tendency is found, proceed to the next step.

In our example, we have shown that the swashplate has tilted forward as the collective has been increased to full high pitch. This would indicate that the top servo's maximum travel is more than that of the two left/right servos.



View is shown from the left side of the model. Notice how the swashplate has tilted forward as the collective has moved from the center to the full high pitch position.

ELEV=	Top Servo	Ⓐ
AUX1=	Right Front Servo	Ⓑ
AILE=	Left Front Servo	Ⓒ

In this condition, we suggest that the travel value for the top servo be decreased slightly (5–10%). Repeat the above procedure and decrease the value as needed until the tilting tendency is eliminated. For information on the travel adjustment function, please refer to your radio's instruction manual for details. Once this condition has been corrected, repeat this procedure for the center to low collective pitch position and adjust as needed.

Note: It is very important that during this step, only the travel value for the top servo (elevator) be adjusted to correct any pitch-to-elevator tendencies. If the travel value of the left or right servo changes, this will affect the pitch-to-aileron tendencies corrected in the previous step. If you feel that readjustment of the left and right servo travel is necessary, then it is suggested that the travel for each servo be increased or decreased at the same amount and the pitch-to-aileron procedure be retested.

Now that the radio system is completely installed into the helicopter, it's necessary to check and adjust the following:

1. **Servo Direction (Servo Reversing)**
   Check to insure that all servos have been set to the correct direction as shown in the Control Linkage Installation section.

2. **Dual Rates**
   It's suggested that for initial flights, the dual rate function values be set as follows:
   0 Position (low rate) 100%
   1 Position (high rate) 100%

3. **Exponential Settings**
   It's suggested that the exponential rate settings remain in the 25-30% value range until the initial test flights. After initial flights, adjust the exponential values to achieve the desired control feel.

4. **Sub-Trim Settings**
   It's suggested that the correct neutral settings be achieved without the use of the Sub-Trim function, as this will affect the neutral position of the servos. Adjust the cyclic trim using the control rods until a neutral hover is achieved.

5. **Pitch/Throttle Curve Adjustment**
   It is very important the throttle and pitch curves are adjusted properly to achieve the best performance from your helicopter. When properly adjusted, the main rotor head rpm should remain consistent throughout all maneuvers and throttle stick positions. A constant rpm will also help to improve the effectiveness and accuracy of the tail rotor and gyro systems.

A) Pitch Curve

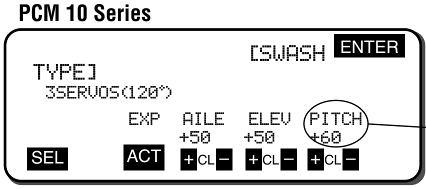
It will now be necessary to establish the maximum pitch value required for your application prior to adjustment. For example, if you are a 3D pilot, then your maximum negative pitch will be -10, and your maximum positive pitch will be +11. The maximum pitch range that you will require will be 21° total.

The maximum pitch range mentioned above must be established through the use of the pitch travel value in the CCPM function. As mentioned previously, do not try to establish the maximum pitch curve values through adjustment of the travel adjustment function, as this will alter the pitch-to-aileron and pitch-to-elevator travel values established in Steps 7-8 and 7-9. Please refer to the CCPM activation section (page 46) for information on how to access the CCPM function.

Once the CCPM function has been activated, set the maximum positive pitch settings as mentioned above. Since the CCPM function does not allow for independent travel settings for positive and negative pitch, it will be necessary to establish the maximum positive pitch, since this is generally the largest degree of pitch in the pitch range. Once the maximum positive pitch range is set, the maximum negative pitch range can be reduced as needed through the pitch curve function.

Set the main rotor pitch gauge to the desired maximum pitch setting, then increase or decrease the CCPM pitch travel (labeled Pitch or Ch6) as needed until this pitch setting is achieved.

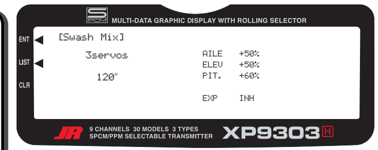
PCM 10 Series



Increase or decrease the value as needed.

XP8103 System

XP9303 System



Increase or decrease the value as needed.

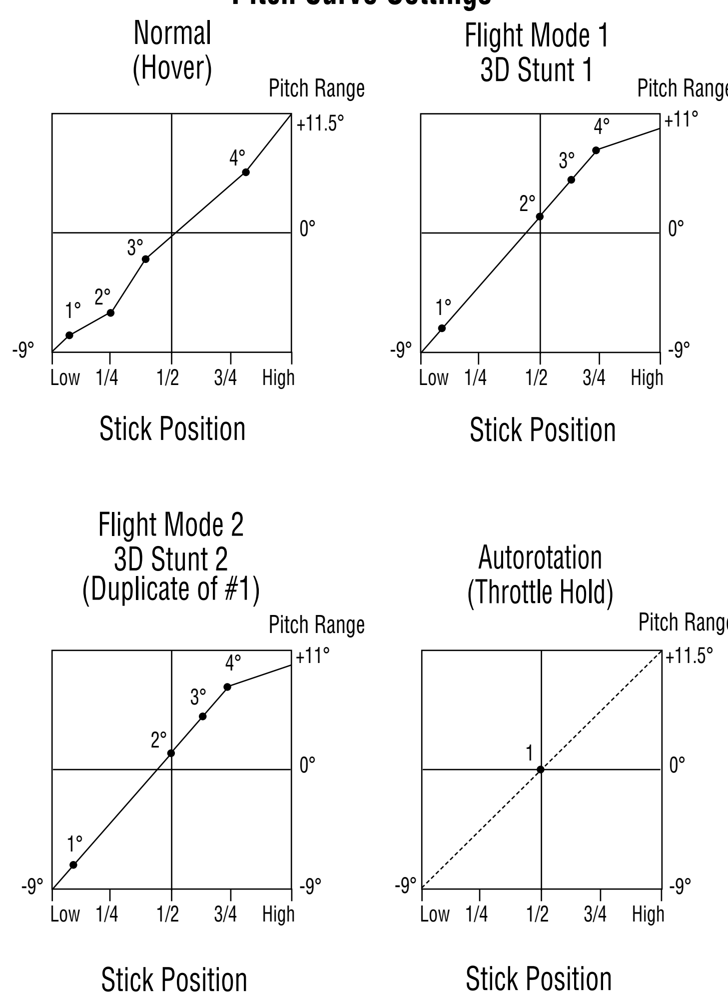
Once this procedure has been completed, the positive and negative pitch settings for each flight mode can be adjusted through the radio's pitch curve function. Please refer to your radio's instruction manual for more information.

Pitch Range Settings

Flight Mode	Application	Low Pitch (Low Stick)	Hovering Pitch (Half Stick)	High Pitch (High Stick)
N	Hovering	-10°	+5°	+10°
I	3D Flight #1	-10°	+5°	+11°
*2	3D Flight #2	-10°	+5°	+11°
H	Autorotation	-10°	+5°	+11.5°

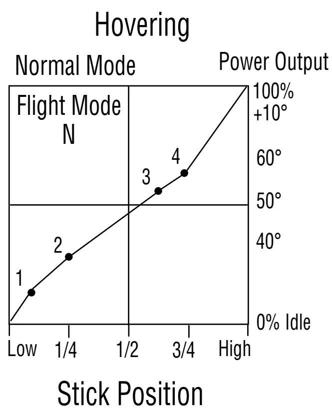
Note: Flight modes #1 and #2 are duplicated for safety.

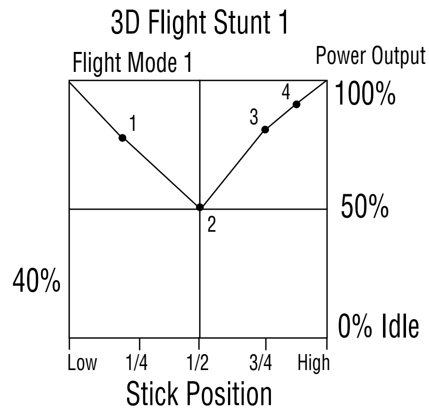
Pitch Curve Settings

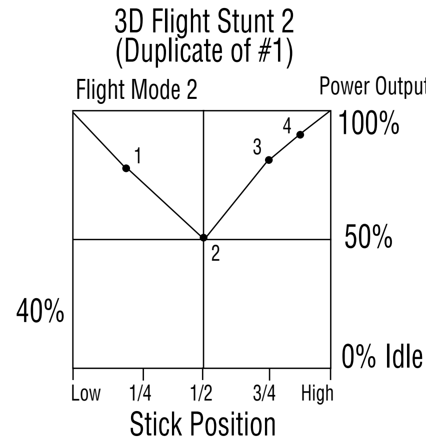


B) Throttle Curve Settings
Below are several examples of possible throttle curves during various flight conditions.

Since throttle curves can vary greatly due to engine and muffler combinations, it will be necessary to fine tune and adjust these values during test flights to achieve a constant main rotor rpm.







Note: The throttle curve examples shown correspond to the pitch curve examples show in Step 5 on the previous page.

It will also be necessary to set the correct idle speed of the engine when the throttle hold function is activated.

This idle value is located within the throttle hold function. This will allow the engine to remain at idle when practicing autorotations.

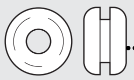
6. **Gyro Gain Adjustment (All Gyros)**
Please refer to your Gyro's instruction manual for proper gain settings.

Gyro Direction
It will also be necessary to confirm the direction the gyro compensates when the body of the helicopter is rotated.

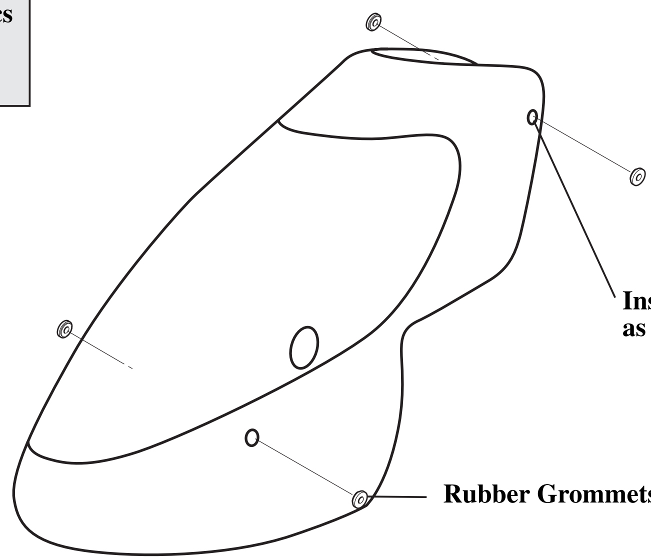
To do this, turn the radio system on and suspend the helicopter by the main rotor head. Next, move the rudder stick to the right and watch the direction that the tail rotor servo arm travels. Now while watching the tail rotor servo arm, rotate the body of the helicopter counterclockwise. The servo arm should move in the same direction as when the rudder stick was moved to the left.

If the arm moves in the opposite direction, reverse the gyro and re-test.

8-1 GROMMET ATTACHMENT


........4 (or 6) pcs

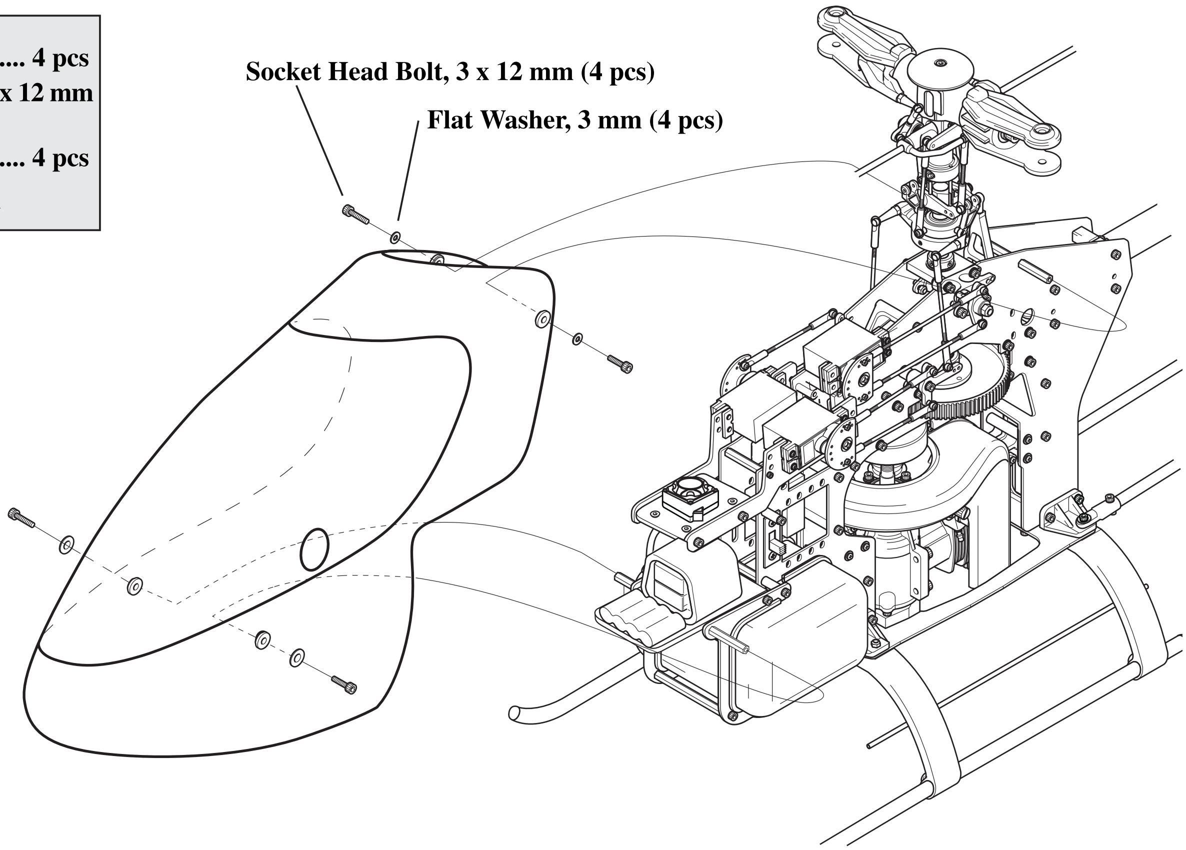
Rubber Grommets



8-2 BODY ATTACHMENT & FINAL FITTING

.... 4 pcs
Socket Head Bolt 3 x 12 mm

.... 4 pcs
Flat Washer, 3 mm



Check to insure the body does not come in contact with any portion of the main frame, muffler, servo, servo horns, etc. Trim for clearance if necessary.


VIBE 90
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