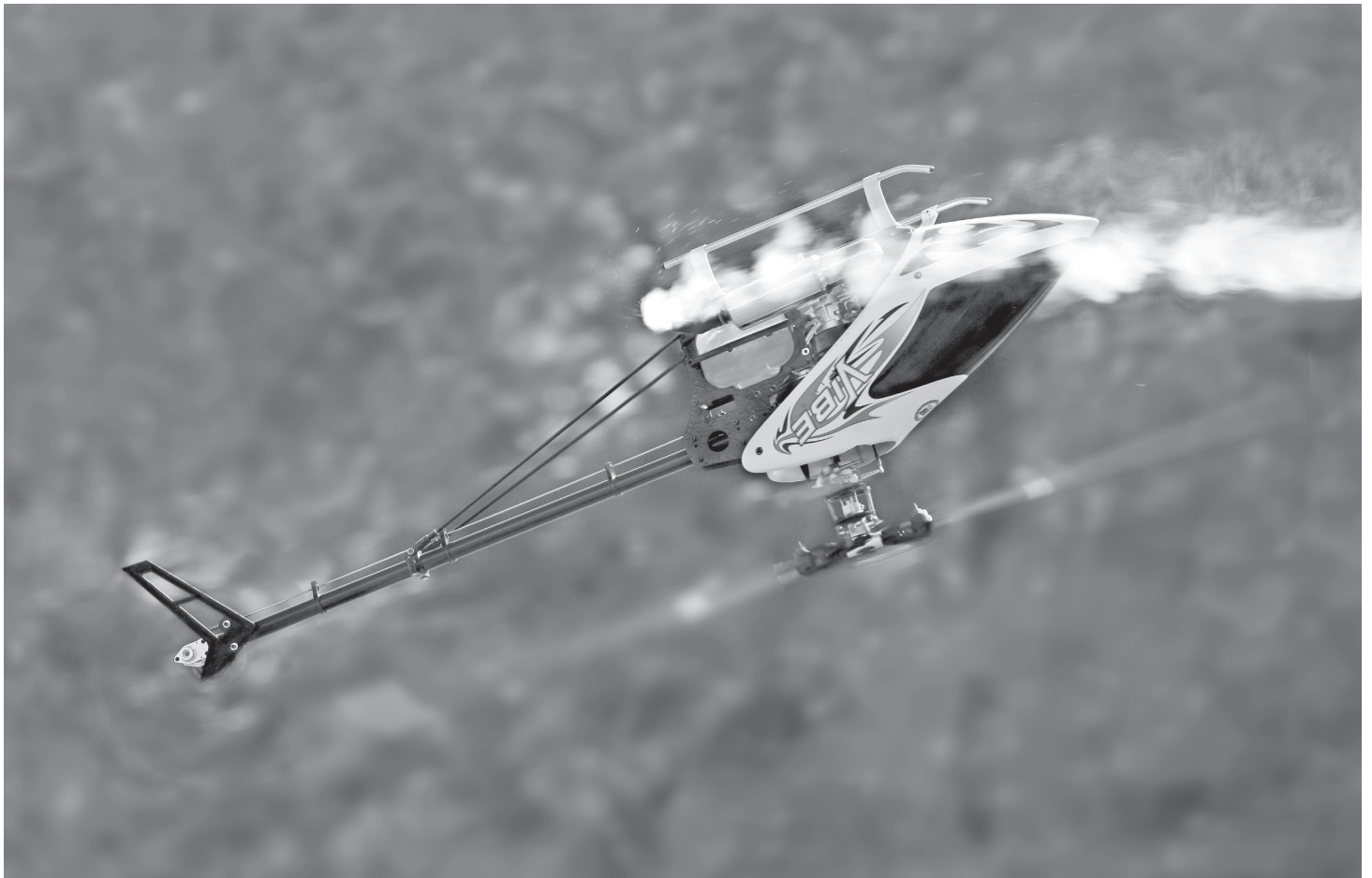


# VIBE

## FIFTY

### ASSEMBLY INSTRUCTIONS



#### Vibe 50 Specifications

Length.....	49.5 inches (1257mm)
Height.....	16.0 inches (406mm)
Main Rotor Diameter .....	52.8 inches (1341mm)
Tail Rotor Diameter.....	10.4 inches (264mm)
Gear Ratio .....	8.7:1:4.7
Weight.....	7.8–8.25 lb (3538–3742 g)
Engine .....	.50 cu in (8.17cc)
Bearings.....	Full Bearing Set Included
Control System.....	120 or 140 CCPM





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## INTRODUCTION

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JR's Vibe .50 was designed to provide outrageous 3D flight.

Everything about the Vibe .50 screams performance. The sleek, narrow profile reduces drag for smoother, faster backward flight. A lightweight, single-stacked frame creates an exceptionally rigid structure vital for mind-bending maneuvers. Fact is, many of the drivetrain parts are directly from the Vibe 90, resulting in an incredibly strong 50-size model. The 120/140 CCPM, so vital to precise handling, has been faithfully reproduced to assure flying qualities that will be a superb combination of precision and pizzazz.

While the new Vibe may be the most potent JR 50 heli ever, JR's legendary quality and ease-of-operation make your Vibe a joy to build and service. Modular construction and careful engineering make the Vibe perfect for active 3D fliers. The engine drops out in a couple of minutes, ditto for tank and tail rotor systems. As Horizon's John Adams put it : "The Vibe 50's awesome to work on."

## KEY FEATURES

---

- Dual stage main gear
- CNC machined aluminum head block
- Push-pull control on all cyclic servos
- Forward mount engine
- 120 or 140 CCPM control system
- Prepainted fiberglass canopy
- Accepts 600-620mm blades
- High tilt flybar
- Governor mount and predrilled clutch for governor magnets
- Break away body mounts
- High efficiency two piece fan housing
- Hi-cyclic head for extreme cyclic response
- Driven tail with free-floating aluminum shaft
- Robust clutch and drivetrain from Vibe 90
- Easily removed, vibration-isolated tank
- Weight adjustable flybar paddle design
- Dual yoke T/R actuator
- FRP canopy with decals

## PREASSEMBLY WARNING

When first opening your helicopter, you will notice that all of the parts are packaged and numbered to coordinate with the assembly step numbers of this instruction manual. All small hardware (nuts, bolts, washers, etc.) for each step are separated and packaged separately within the main parts bags. When beginning a section, you will need to open only the bag with the corresponding number to the section you are going to start. It is suggested that you place all of the hardware in an open container (e.g., coffee can) during assembly so as not to lose any of the small parts. It may also be helpful to familiarize yourself with the various sizes of screws, bolts, nuts, etc., as illustrated in the appropriate assembly section before you begin assembly. At the end of each assembly, in most cases, there should be no parts remaining.

*NOTE: Your kit also includes JR® red and green threadlock. Unlike conventional U.S.-made threadlock, JR red is actually the U.S. equivalent of blue. JR green is actually the equivalent of U.S. red.*

Great care has been taken in filling the bags with the correct quantity of parts and hardware for each section. However, occasionally mistakes do happen. In the event that you find a parts shortage or are in need of technical assistance, please contact your local JR Heli Division parts dealer or contact the Horizon Service Center directly.

## RECOMMENDED RADIO SYSTEM



12X 2.4 (JRP1200)  
12X MV (JRP1210)  
(Look for programming  
information on  
jrradios.com soon)



JRP X9303 2.4  
(JRP2925)



SPM DX7  
(SPM2712)



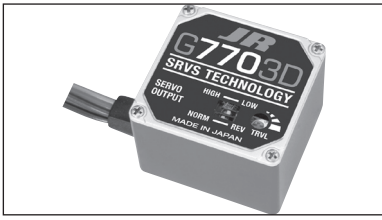
SPM DX6i  
(SPM6600)

### CCPM-Ready JR Radio Systems

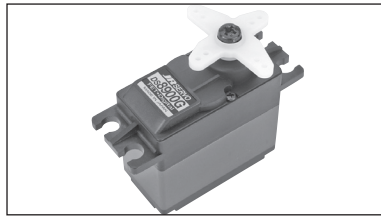
Most current JR and Spektrum heli radio systems (12X, XP9303, X9303 2.4, DX7 and DX6i) are equipped with 120° CCPM electronics for use with JR CCPM machines. Radios you may be flying now, like the X347, X388S, XP783 and XP8103\* have 120° CCPM capability built in but require activation by the Horizon Service Department. For details, please call (877) 504-0233.

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

# ITEMS REQUIRED TO COMPLETE ASSEMBLY



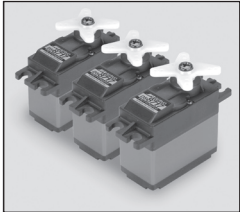
G770 3D Gyro (JRPG7703D)



8900G Gyro Servo (JRPG8900G)



Dual Output Regulator (SPMVR5203)



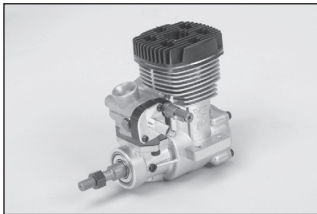
DS8717 Ultra Speed Cyclic Servo (x4 including throttle)



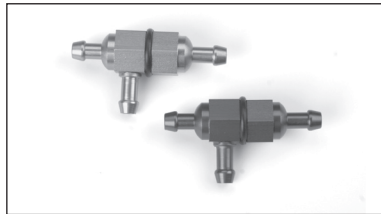
2300mAh (or larger) Receiver Battery (JRPB5006)



Switch Harness (JRPA001)



Engine 50-size nitro (YSE0030), muffler, glow plug (HAN3020)



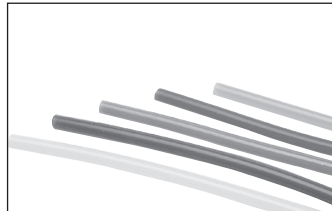
Fuel Filter Set (JRP960298)



Fuel Line Plug (DUB617)



JR Universal Pitch Gauge (JRP960326)



Fuel tubing (DYN2440)



Nylon Wire Ties (ASC7709)



Grease



Light Oil (EPXEP1302)



Rubbing alcohol



Double Sided ServoTape (BRP7541)



JB Weld (JBW8265S)

# 1-1

## CLUTCH BELL / START SHAFT ASSEMBLY



Setscrew, 4x4mm (1pc)

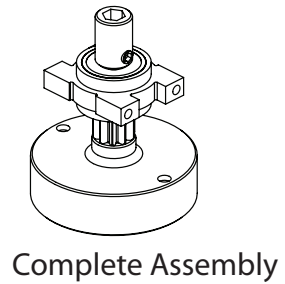
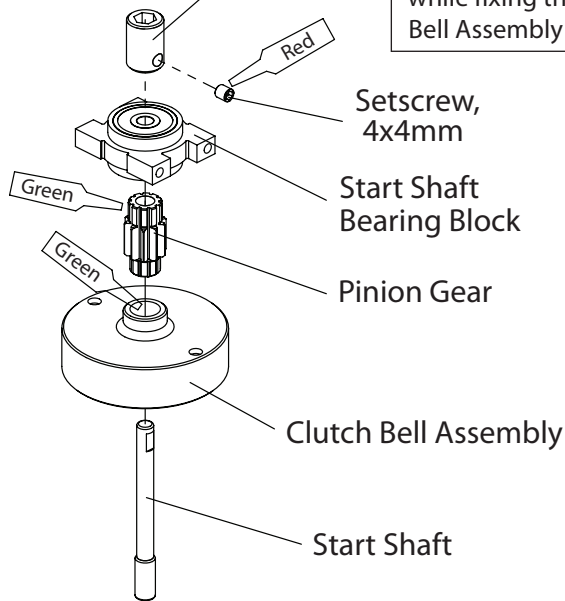
After assembly rotate the Starter Hex Adapter and check that no play is detected. This confirms that the Setscrew 4x4mm is secured in the proper position.

Be careful not to pull the Start Shaft up too hard while fixing the setscrew otherwise the Clutch Bell Assembly may not rotate freely.

**TIP:** Clean areas with rubbing alcohol to remove any oil residue before applying threadlock.

Be sure the bearing with the 6mm ID faces upward.

Starter Hex Adapter



# 1-2

## TAIL PINION ASSEMBLY (SHAFT DRIVE)



Cross Member, 28mm (3pcs)



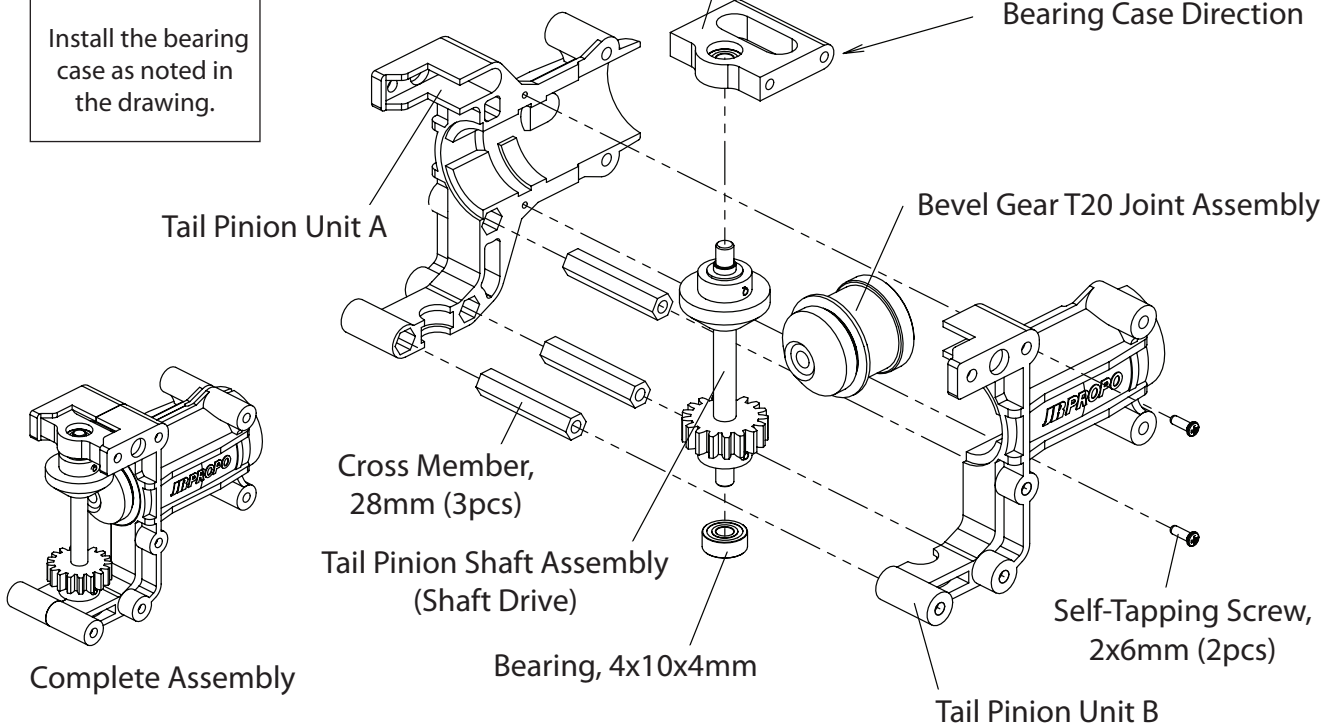
Self-Tapping Screw, 2x6mm (2pcs)

Install the bearing case as noted in the drawing.

Tail Pinion Unit Bearing Case A (Bearing 4x10x4mm)

Top






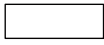
Bearing Case Direction



Complete Assembly

# 1-3

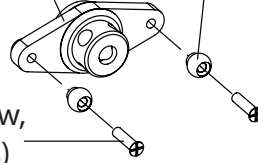
## T-ARM LEVER ASSEMBLY

	
Flat Head Screw, 2x8mm (8pcs)	
	
Steel Joint Ball (8pcs)	
	
Lever Collar (2pcs)	

Elevator Control Arm

Steel Joint Ball (2pcs)

Flat Head Screw,  
2x8mm (2pcs)



Assemble the T-Arms as necessary for 120 or 140 CCPM depending on the type you will use.

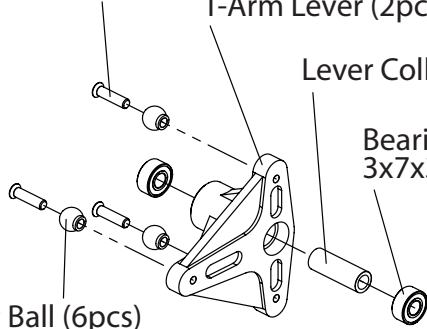
Flat Head Screw,  
2x8mm (6pcs)

T-Arm Lever (2pcs)

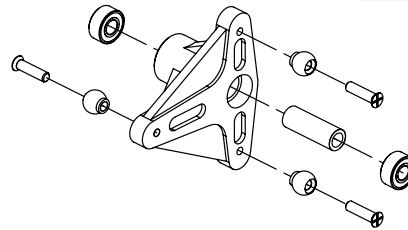
Lever Collar (2pcs)

Bearing,  
3x7x3mm (4pcs)

Steel Joint Ball (6pcs)













120 CCPM



140 CCPM

# 1-4

## ELEVATOR ARM ASSEMBLY

			
Socket Head Bolt, 2.3x15mm (1pc)		Washer, 3x4.5x0.4mm (1pc)	
			
Special Button Head Bolt, 3x27mm (1pc)		A-Arm Bearing Collar (2pcs)	
			
Nylon Lock Nut, 3mm (1pc)			

Universal Ball Link

A-Arm Bearing Collar (2pcs)

Elevator A-Arm

A-Arm Base

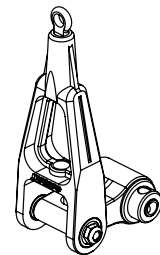
Special Button Head Bolt,  
3x27mm

Washer, 3x4.5x0.4mm

Socket Head Bolt,  
2.3x15 mm

Nylon Lock Nut 3mm

Bearing, F4x8x3mm (2pcs)

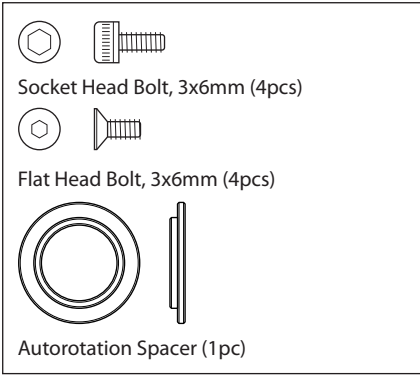


Complete Assembly

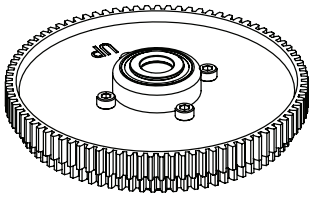


# 1-5

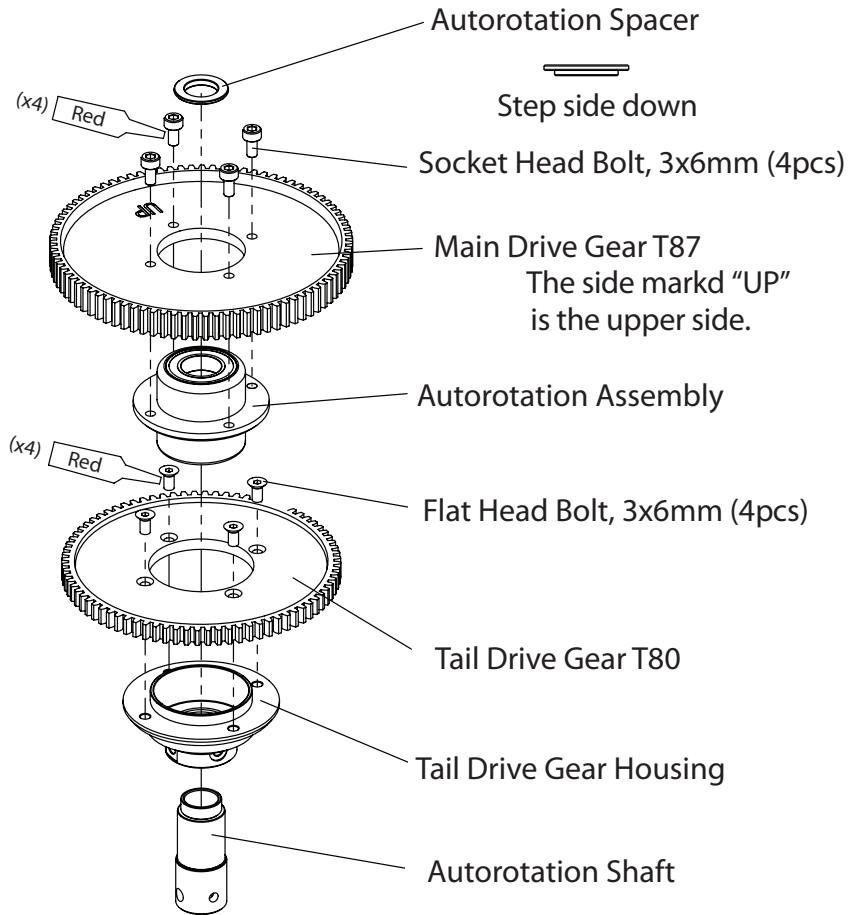
## DOUBLE MAIN DRIVE GEAR ASSEMBLY



Tighten the bolts for the main drive gear and the tail drive gear equally to prevent warping. Note the proper direction of Autorotation Spacer, Main Drive Gear and Tail Drive Gear.

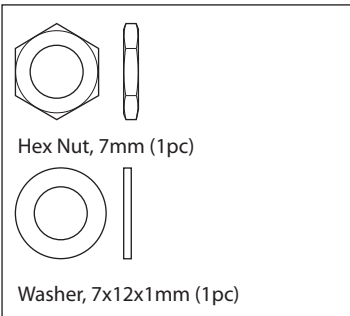


Complete Assembly

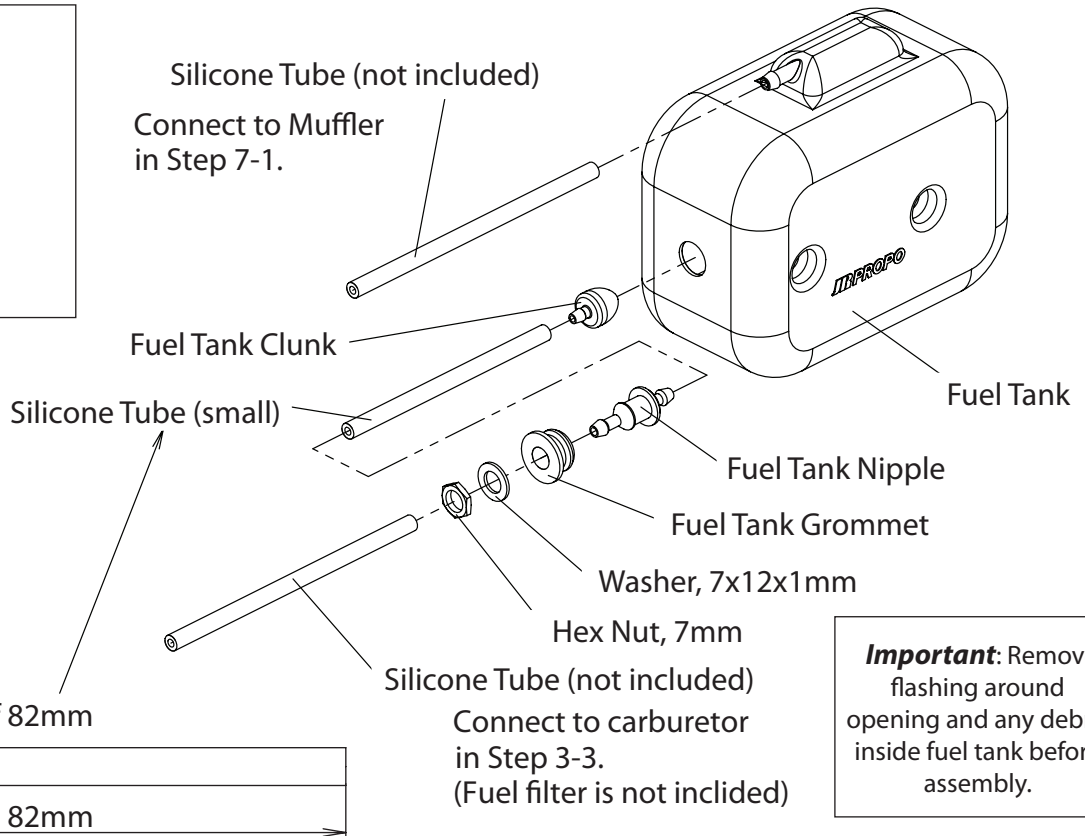


# 1-6

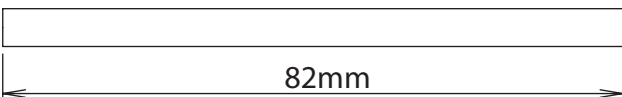
## FUEL TANK ASSEMBLY



Silicone Tube (not included)  
Connect to Muffler  
in Step 7-1.



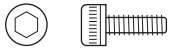
Cut to a length of 82mm



**Important:** Remove flashing around opening and any debris inside fuel tank before assembly.

# 2-1

# MAIN FRAME ASSEMBLY 1



Socket Head Bolt, 3x8mm (15pcs)

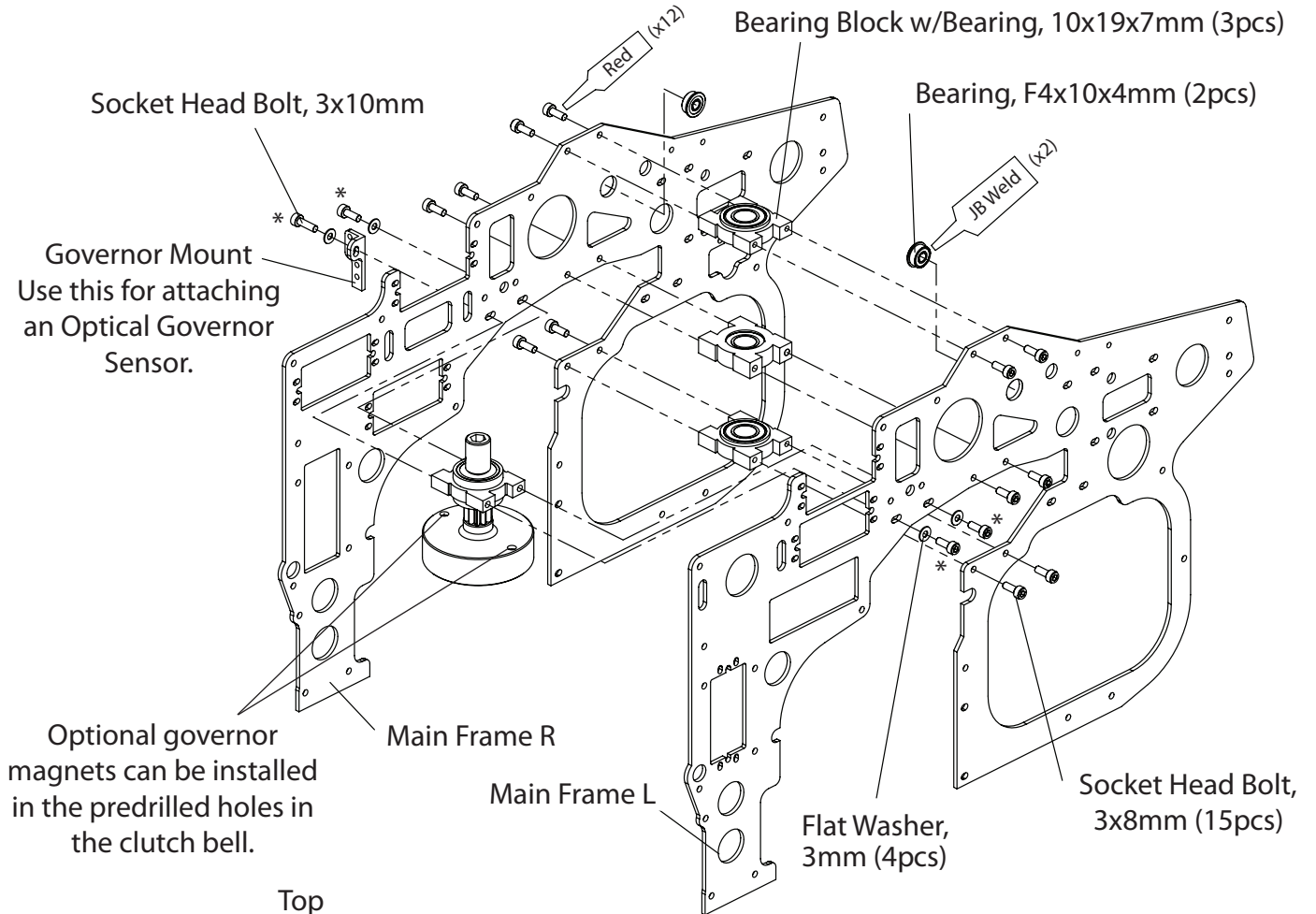


Socket Head Bolt, 3x10mm (1pc)

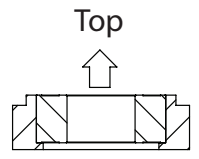


Flat Washer, 3mm (4pcs)

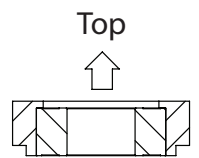
Note the proper direction of the Main Frame L / R and Bearing Blocks.



\* : Don't tighten bolts completely at this time.



Upper and Lower Bearing Case Direction



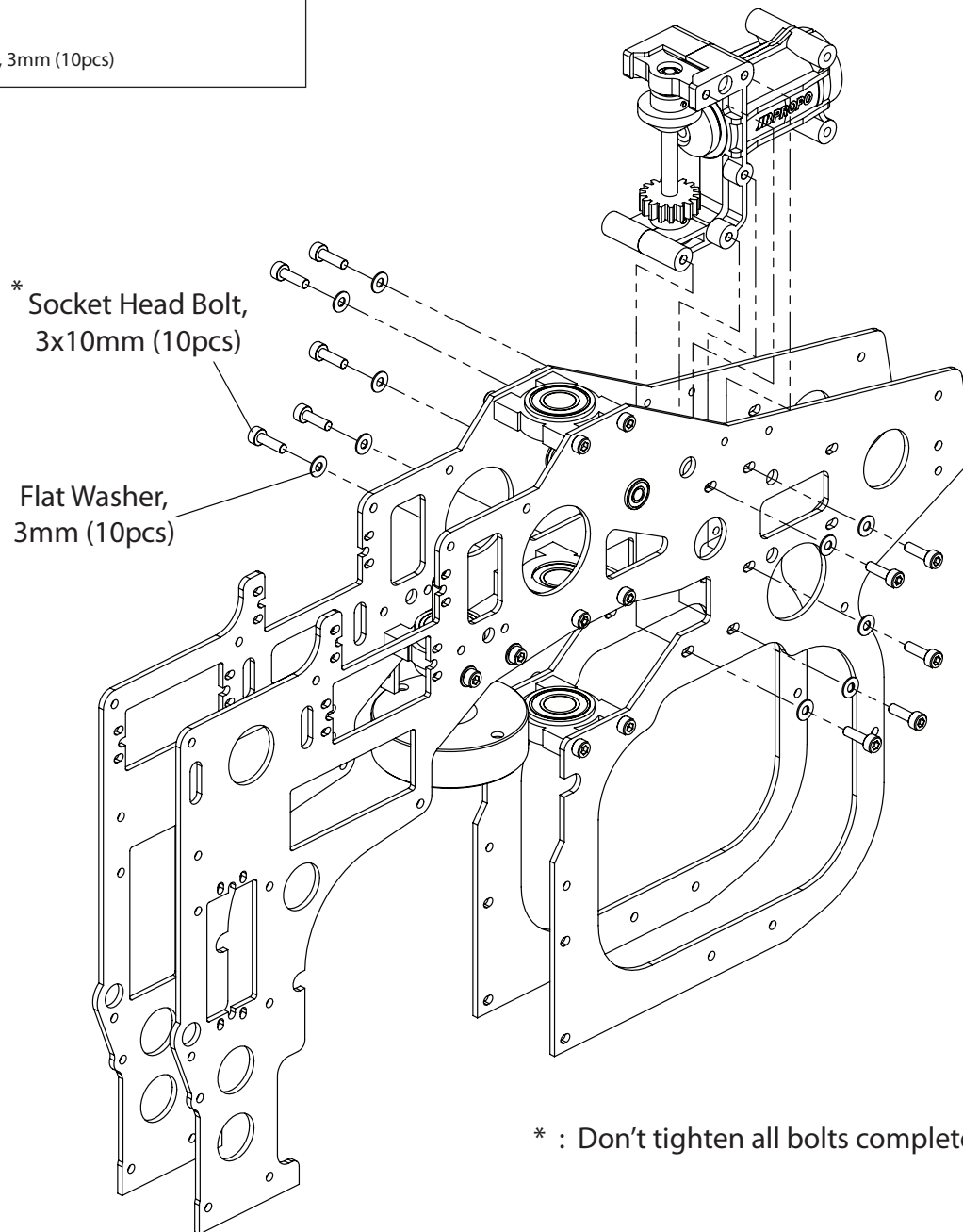
Center Bearing Case Direction




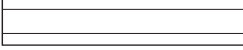
Socket Head Bolt, 3x10mm (10pcs)





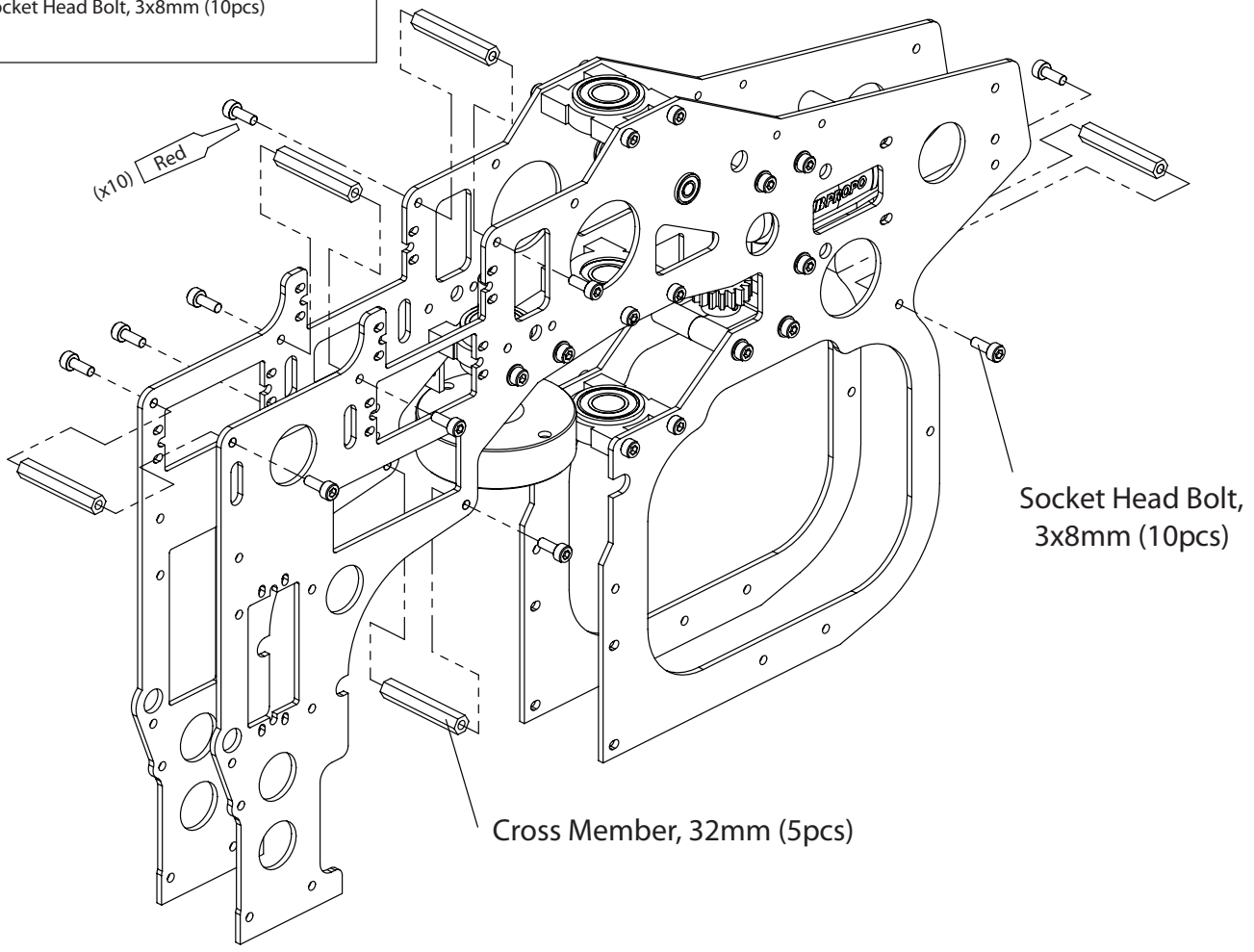
Flat Washer, 3mm (10pcs)



\* : Don't tighten all bolts completely at this time.

   
Cross Member, 32mm (5pcs)

   
Socket Head Bolt, 3x8mm (10pcs)



(x10) Red

Socket Head Bolt,  
3x8mm (10pcs)

Cross Member, 32mm (5pcs)

## 2-4

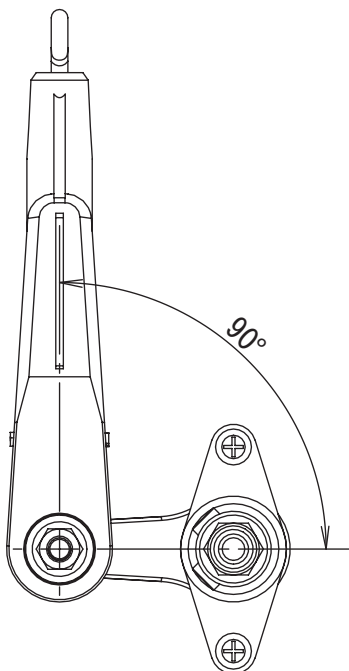
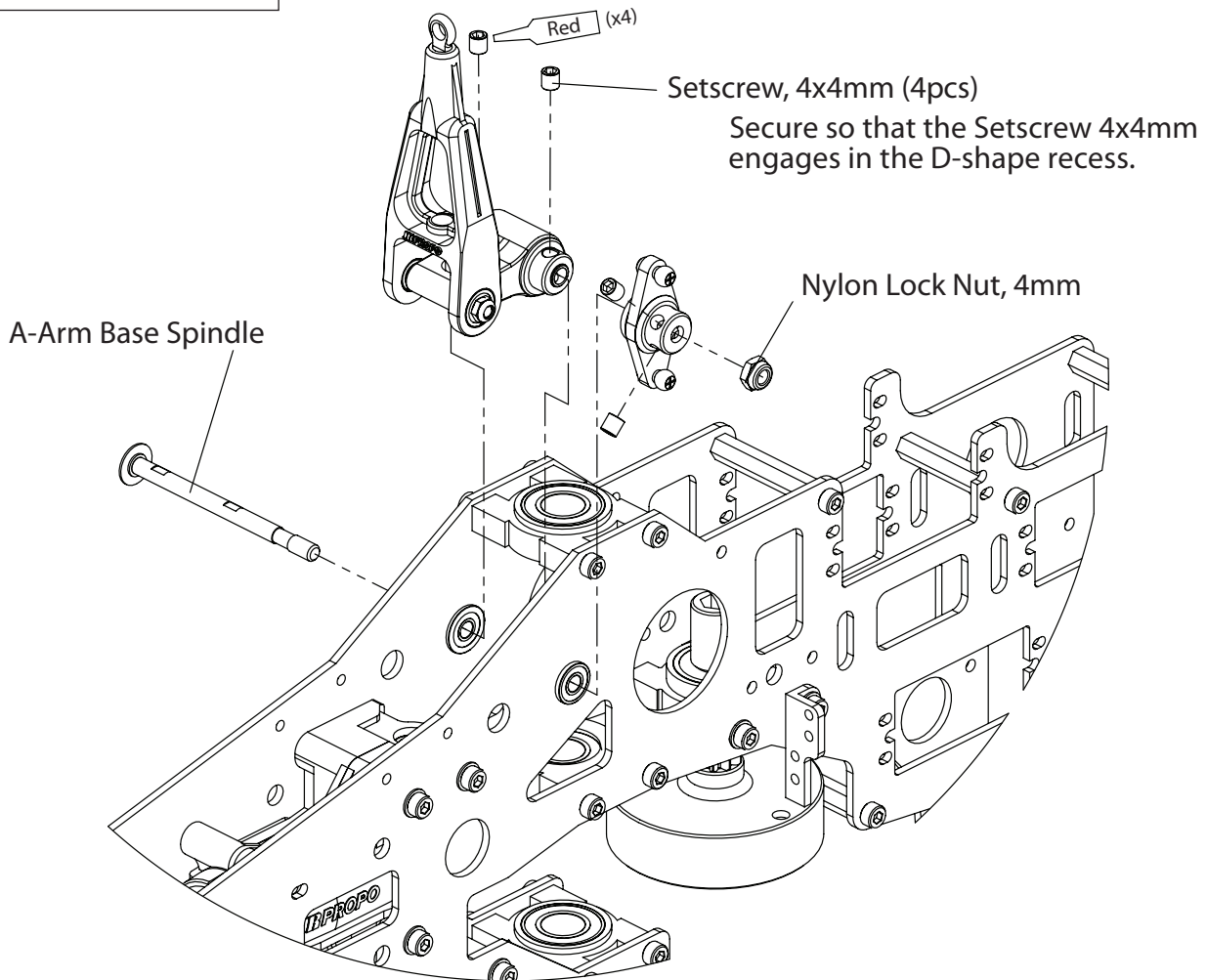
# ELEVATOR ARM INSTALLATION



Setscrew, 4x4mm (4pcs)



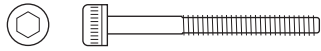
Nylon Lock Nut, 4mm (1pc)



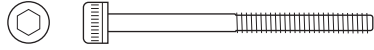
Make sure that the elevator control arm is installed so that it is 90° to the A-arm base. Use the locating hole in the main frame to help achieve the 90° position.

# 2-5

# T-ARM LEVER INSTALLATION



Socket Head Bolt, 3x28mm (2pcs)



Socket Head Bolt, 3x35mm (2pcs)



Nylon Lock Nut, 3mm (2pcs)

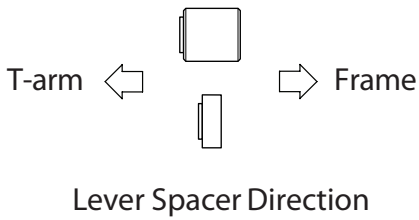
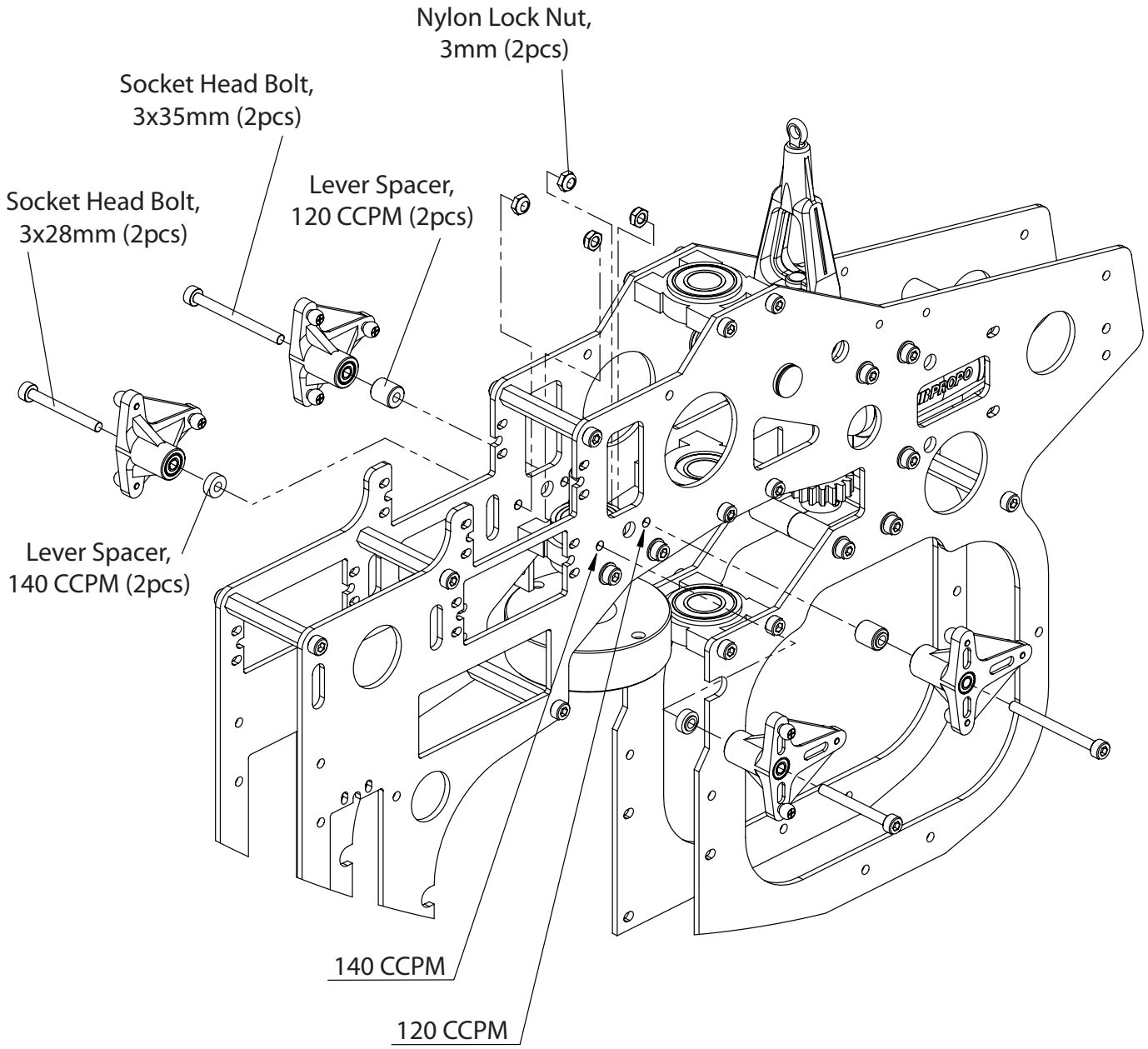


Lever Spacer, 120 CCPM (2pcs)

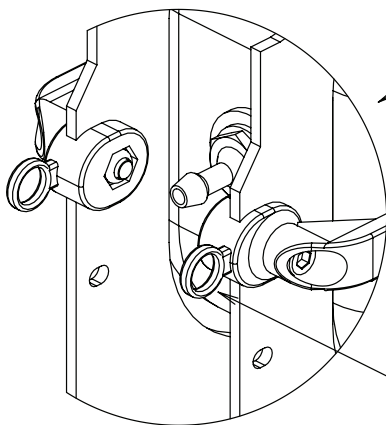
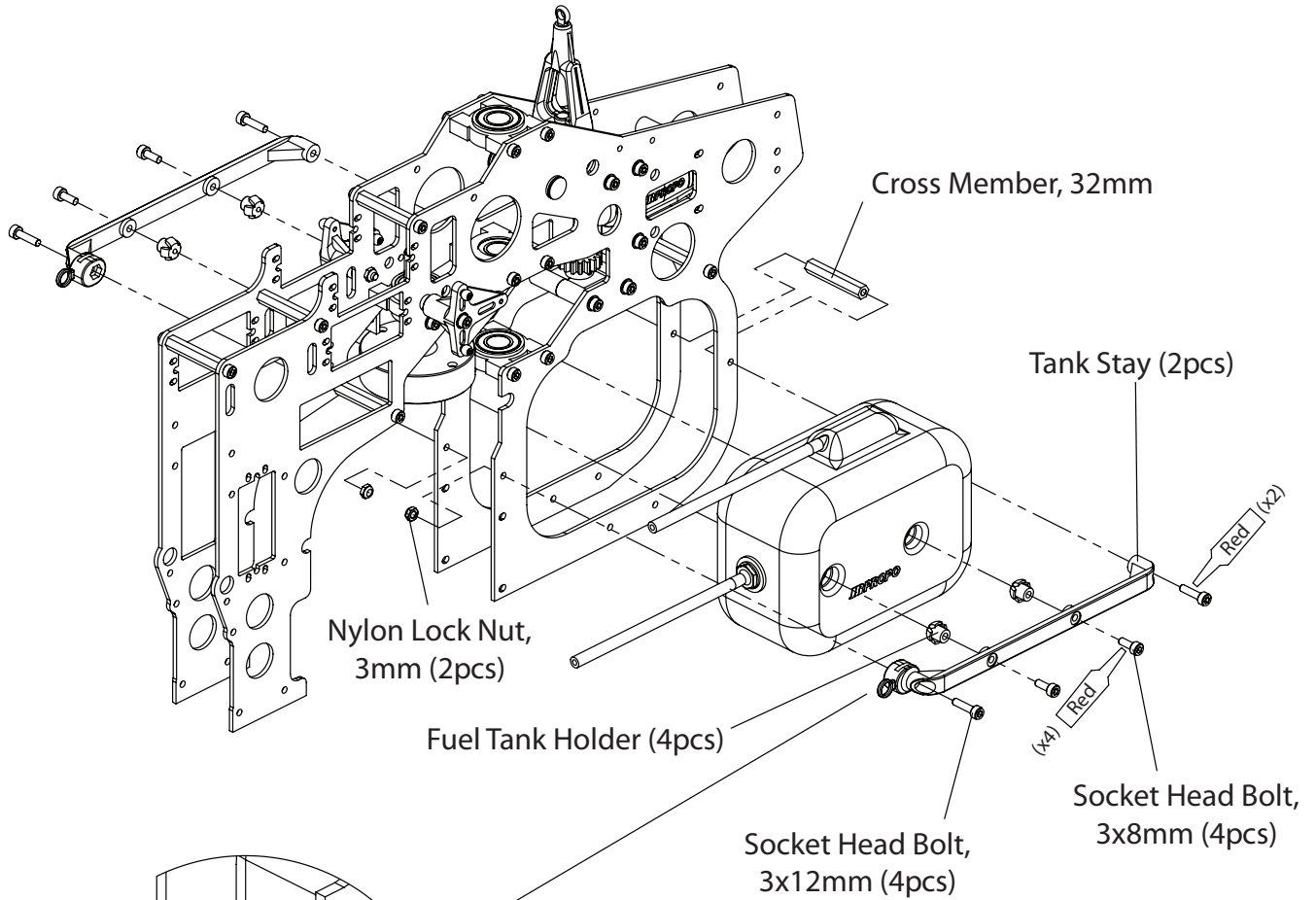
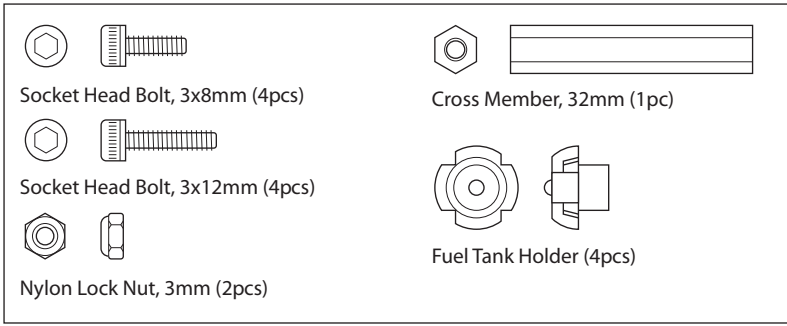


Lever Spacer, 140 CCPM (2pcs)

Install the T-Arms in the location as marked for 120 or 140 CCPM depending on the type you will use.

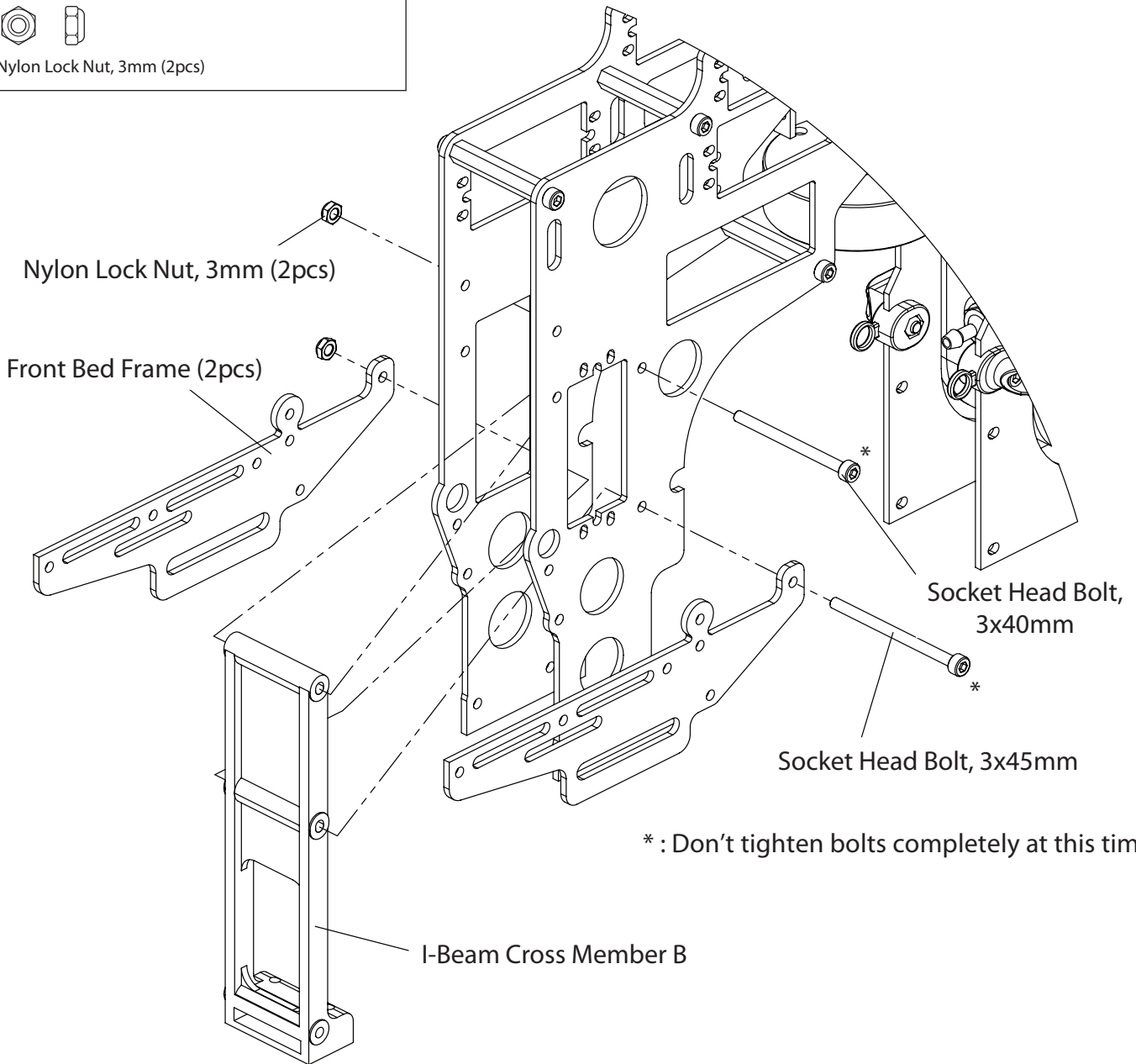
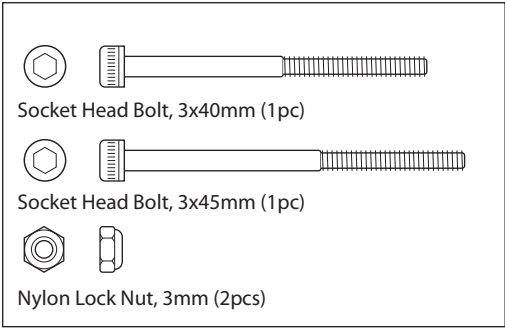


Install the T-Arms in this drawing.

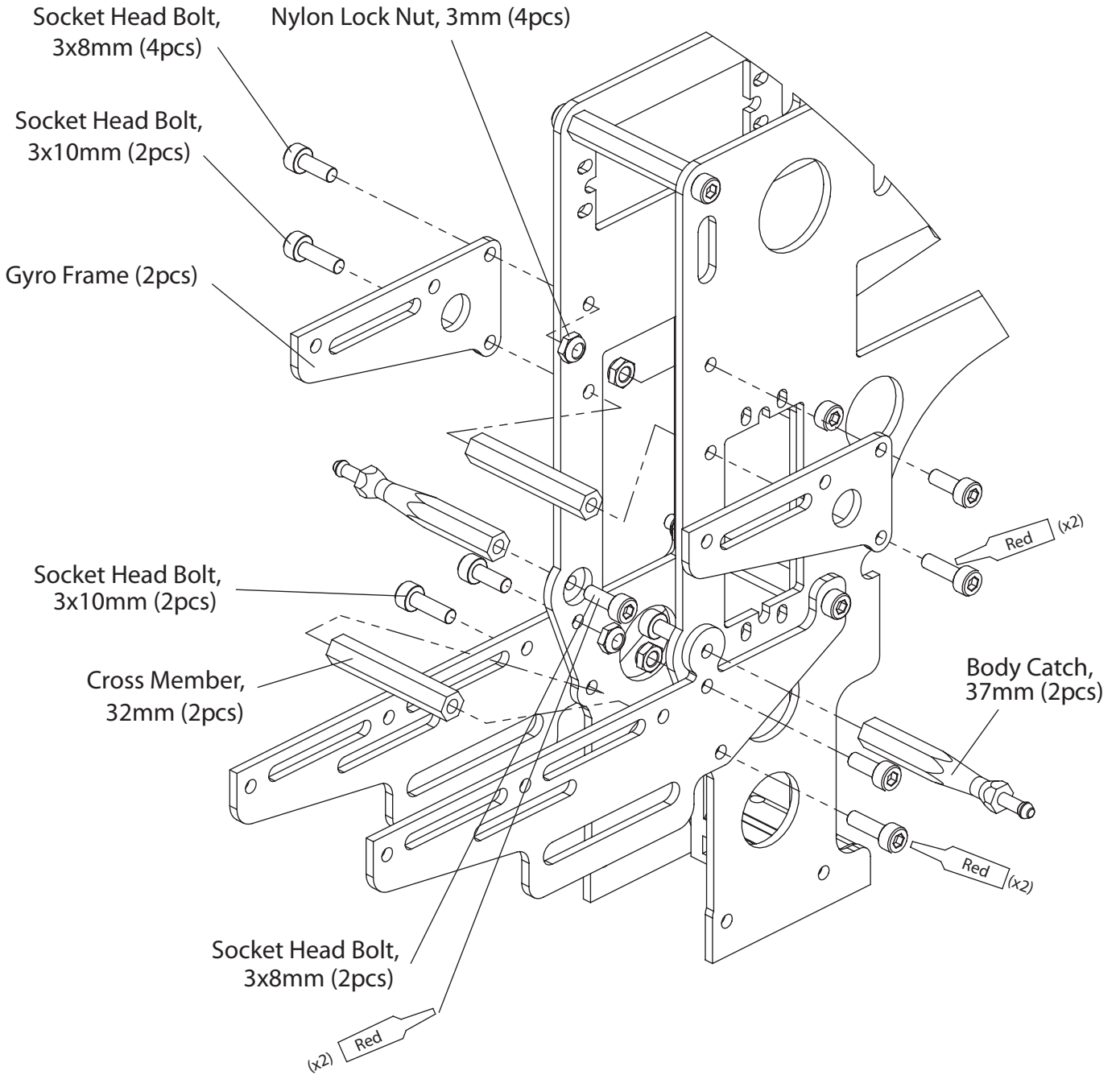
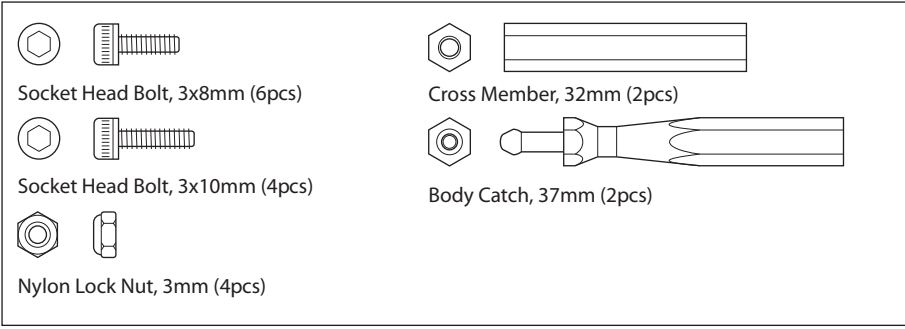







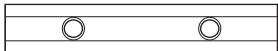
Install the Tank stay in this drawing.

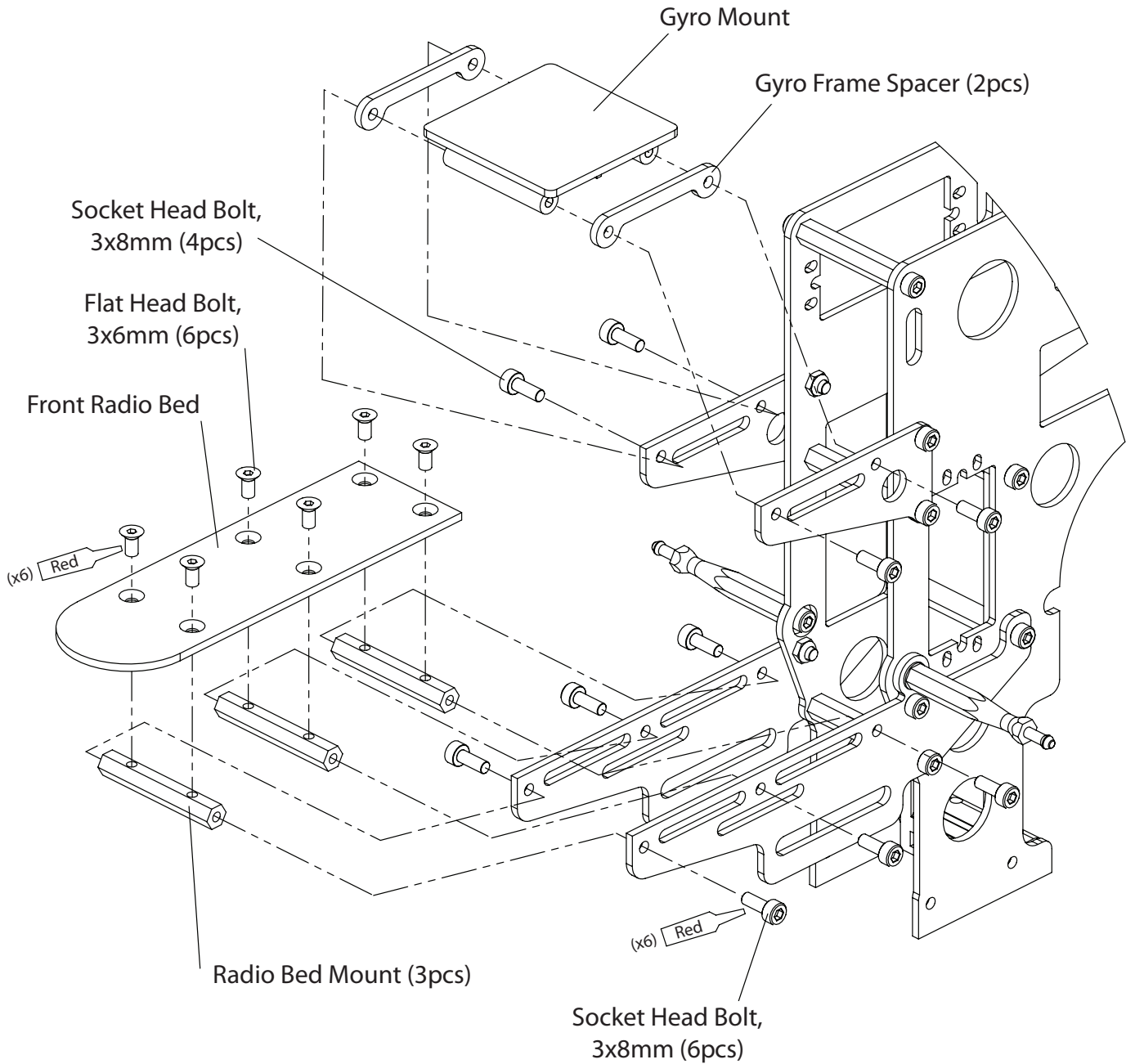
Pass silicon tube thru this hole.







	
Socket Head Bolt, 3x8mm (10pcs)	
	
Flat Head Bolt, 3x6mm (6pcs)	
	
Radio Bed Mount (3pcs)	



# 2-10

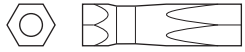
# BODY CATCH INSTALLATION



Socket Head Bolt, 2.6x8mm (4pcs)



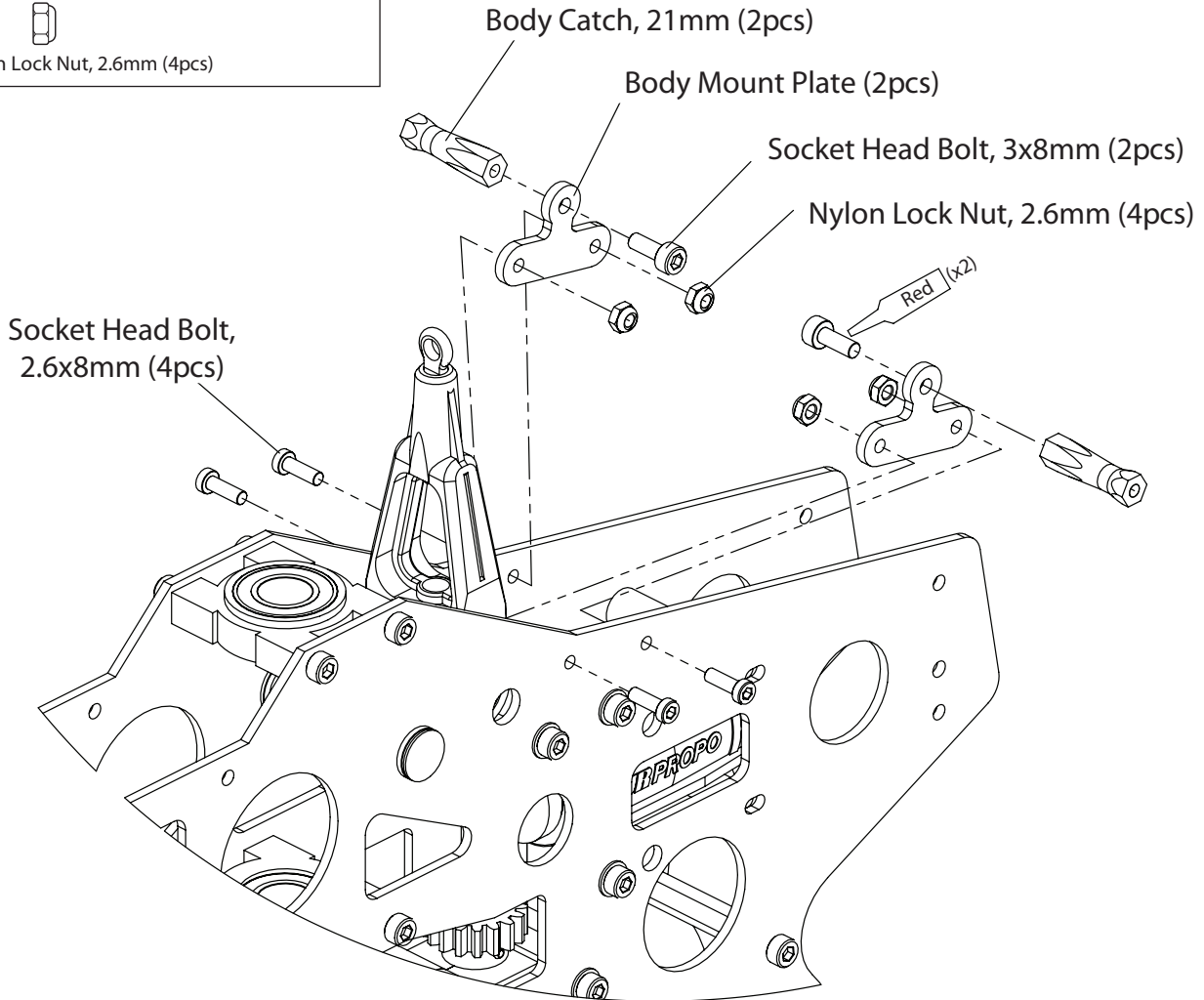
Socket Head Bolt, 3x8mm (2pcs)



Body Catch L, 21mm (2pcs)


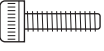

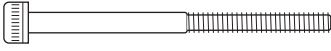





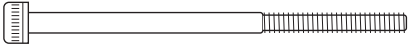



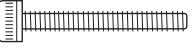

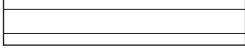




Nylon Lock Nut, 2.6mm (4pcs)

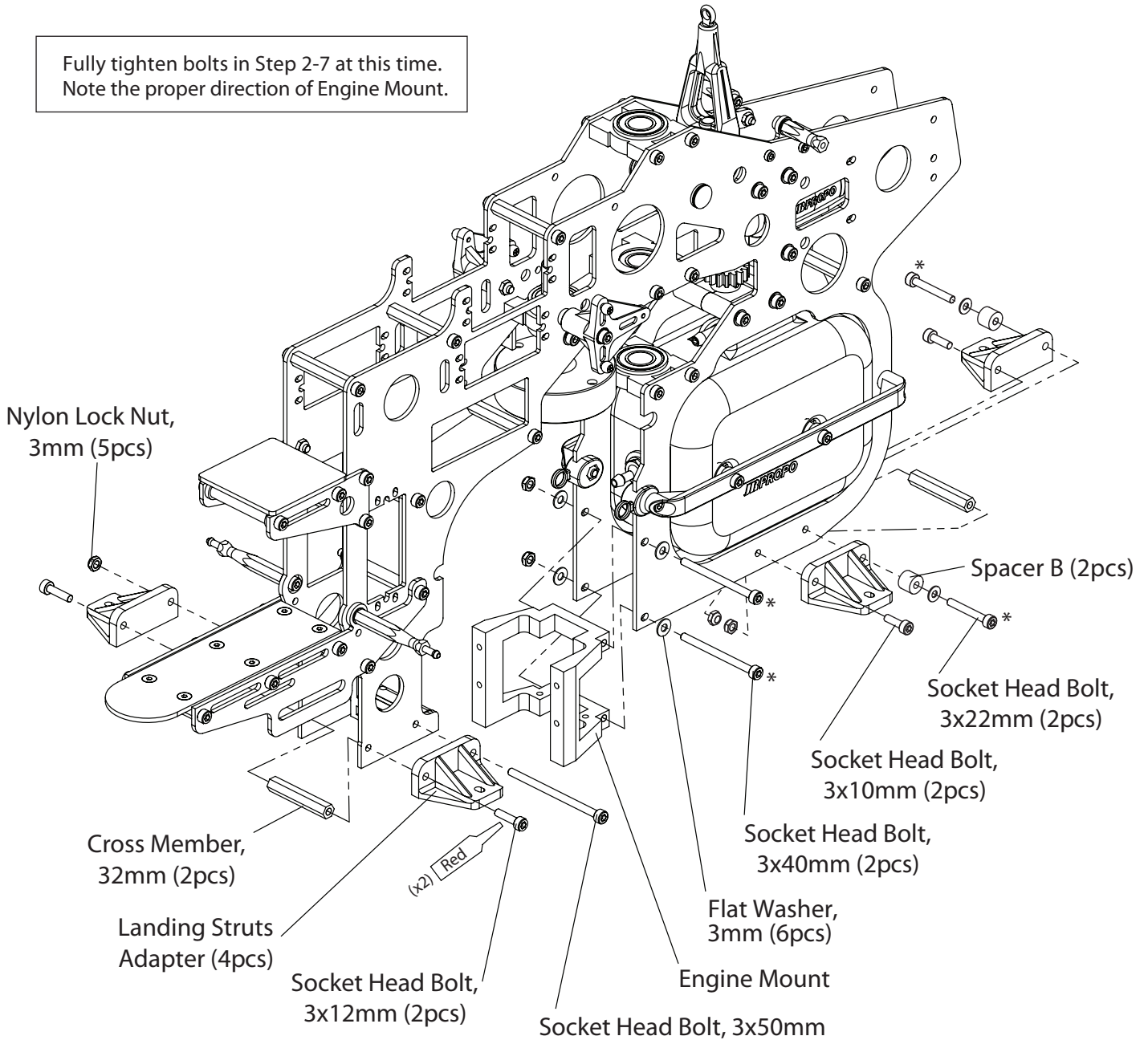


# 2-11

# ENGINE MOUNT INSTALLATION

					
Socket Head Bolt, 3x10mm (2pcs)		Socket Head Bolt, 3x40mm (2pcs)		Spacer B (2pcs)	
					
Socket Head Bolt, 3x12mm (2pcs)		Socket Head Bolt, 3x50mm (1pc)		Nylon Lock Nut, 3mm (5pcs)	
					
Socket Head Bolt, 3x22mm (2pcs)		Cross Member, 32mm (2pcs)		Flat Washer, 3mm (6pcs)	













Fully tighten bolts in Step 2-7 at this time.  
Note the proper direction of Engine Mount.

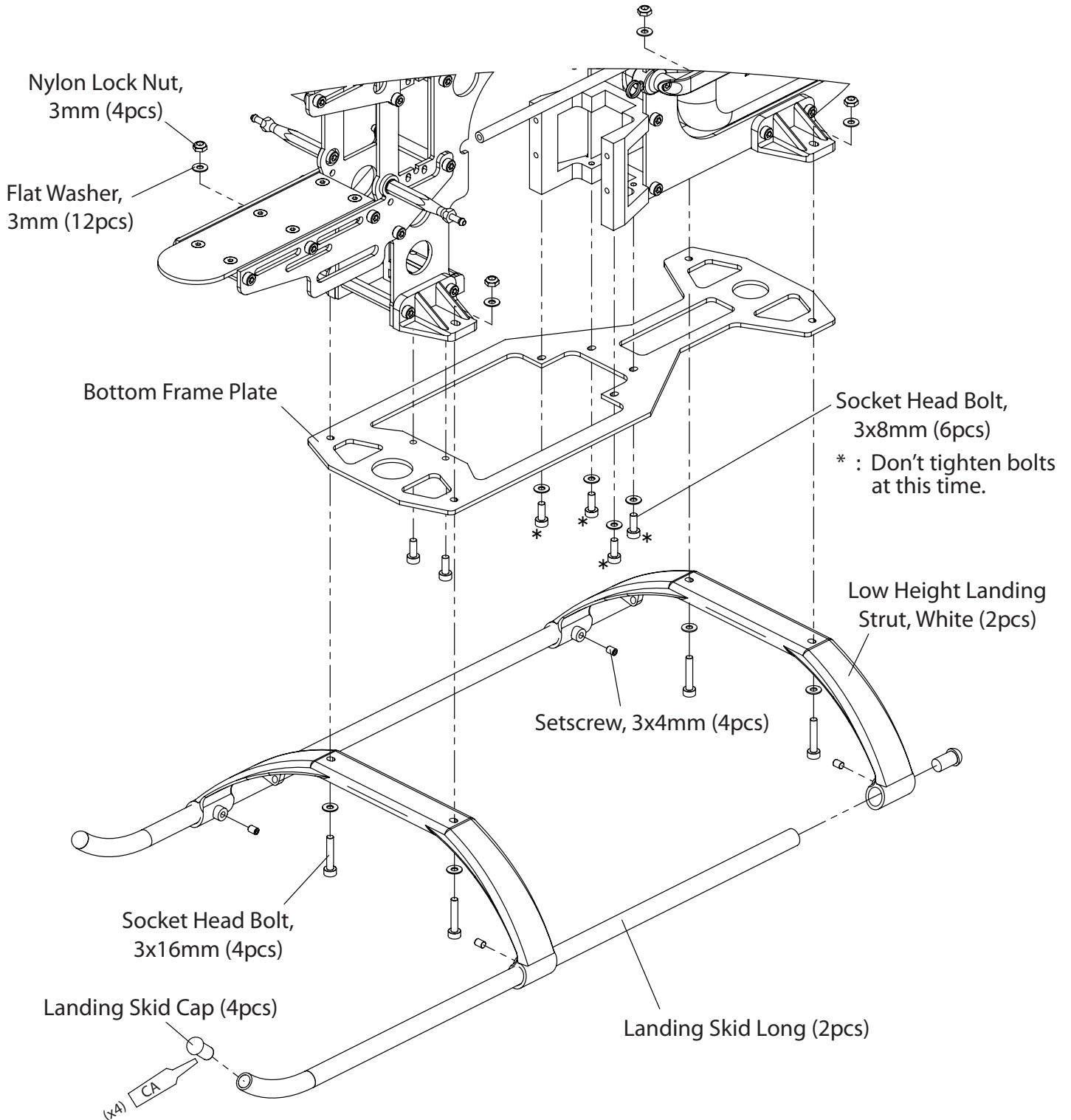


\* : Don't tighten Bolts at this time.

# 2-12









# LANDING GEAR INSTALLATION

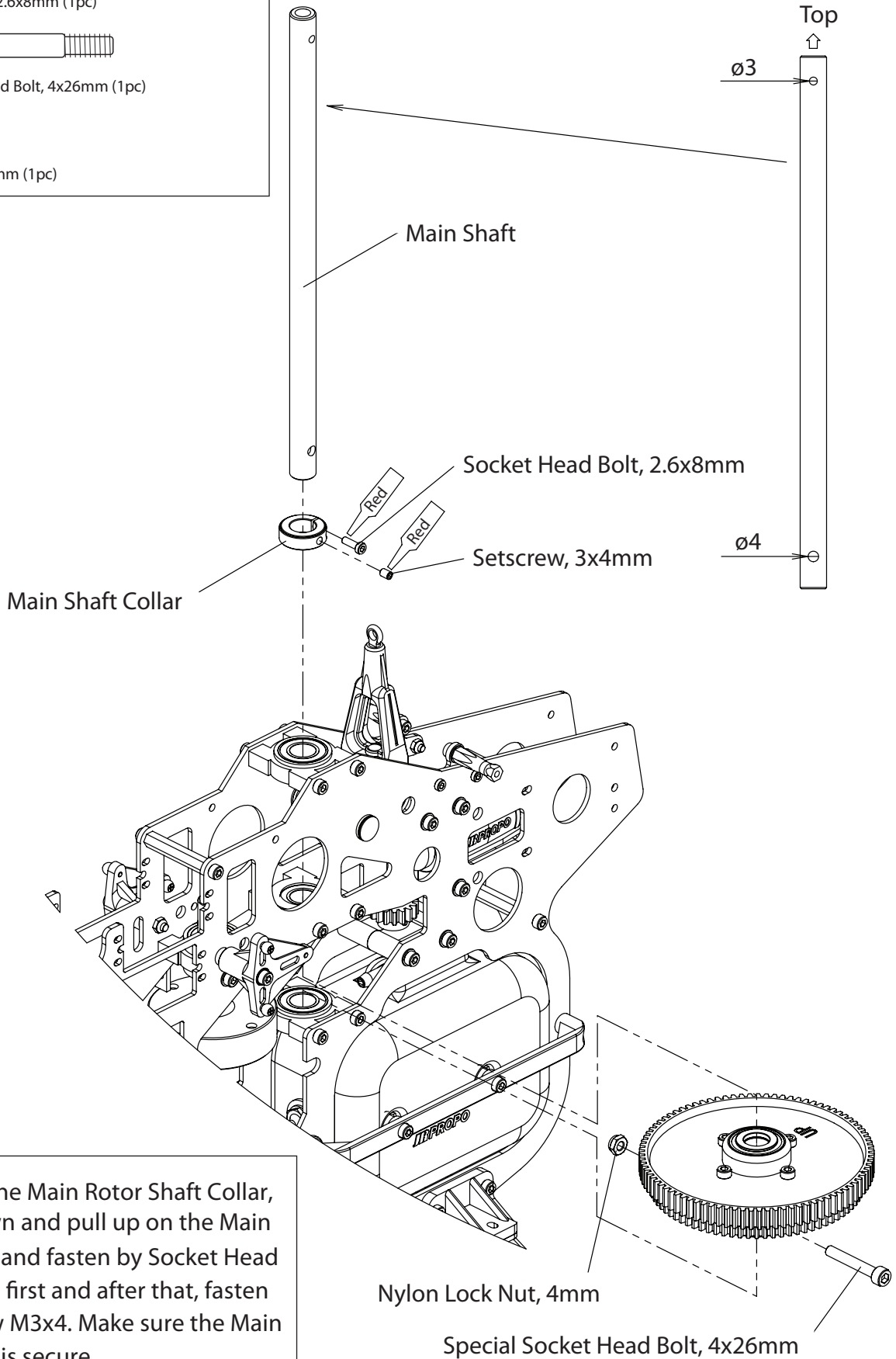
			
Setscrew, 3x4mm (4pcs)		Nylon Lock Nut, 3mm (4pcs)	
			
Socket Head Bolt, 3x8mm (6pcs)		Flat Washer, 3mm (12pcs)	
			
Socket Head Bolt, 3x16mm (4pcs)		Landing Skid Cap (4pcs)	



# 3-1

# MAIN SHAFT/MAIN DRIVE GEAR INSTALLATION

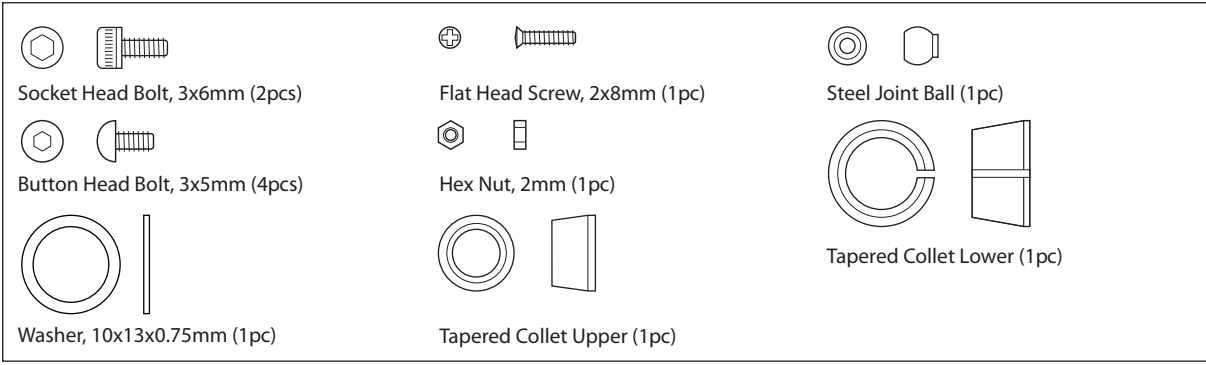
-   Setscrew, 3x4mm (1pc)
-   Socket Head Bolt, 2.6x8mm (1pc)
-   Special Socket Head Bolt, 4x26mm (1pc)
-   Nylon Lock Nut, 4mm (1pc)



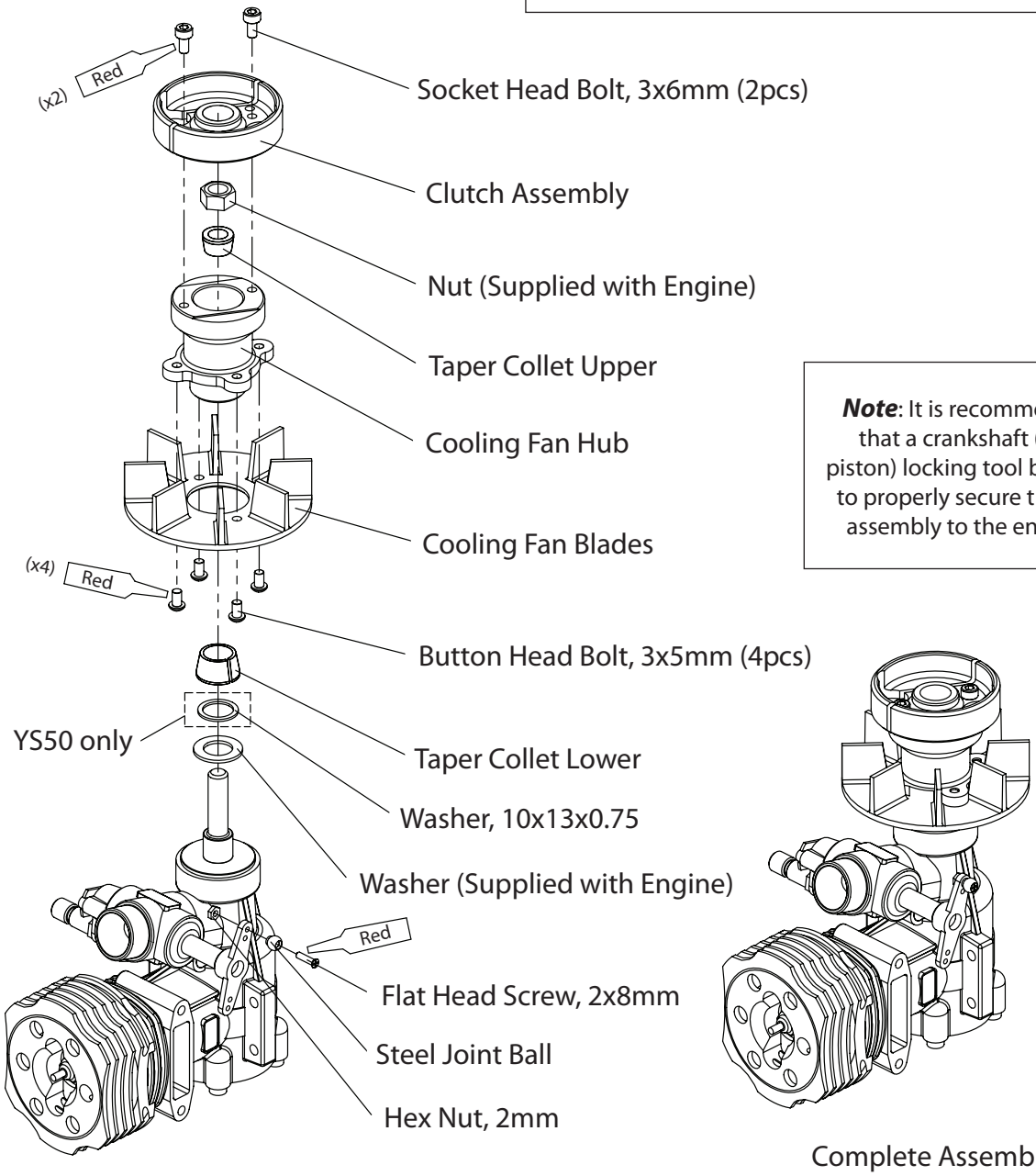
Fastening the Main Rotor Shaft Collar, push it down and pull up on the Main Rotor Shaft and fasten by Socket Head Bolt M2.6x8 first and after that, fasten by Setscrew M3x4. Make sure the Main Rotor Shaft is secure.

# 3-2

# COOLING FAN/CLUTCH INSTALLATION



**TIP:** Before the clutch is permanently attached, rotate the clutch/fan assembly to check for trueness. If any clutch runout is detected, reposition the clutch at 90 degree intervals through the use of the four holes in the fan hub until optimum clutch trueness is achieved.



**Note:** It is recommended that a crankshaft (not piston) locking tool be used to properly secure the fan assembly to the engine.

# 3-3

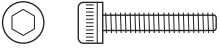
# ENGINE INSTALLATION



Self-Tapping Screw, 2x8mm (5pcs)



Self-Tapping Screw, 2.6x10mm (4pcs)



Socket Head Bolt, 3x15mm (4pcs)



Flat Washer, 3mm (4pcs)

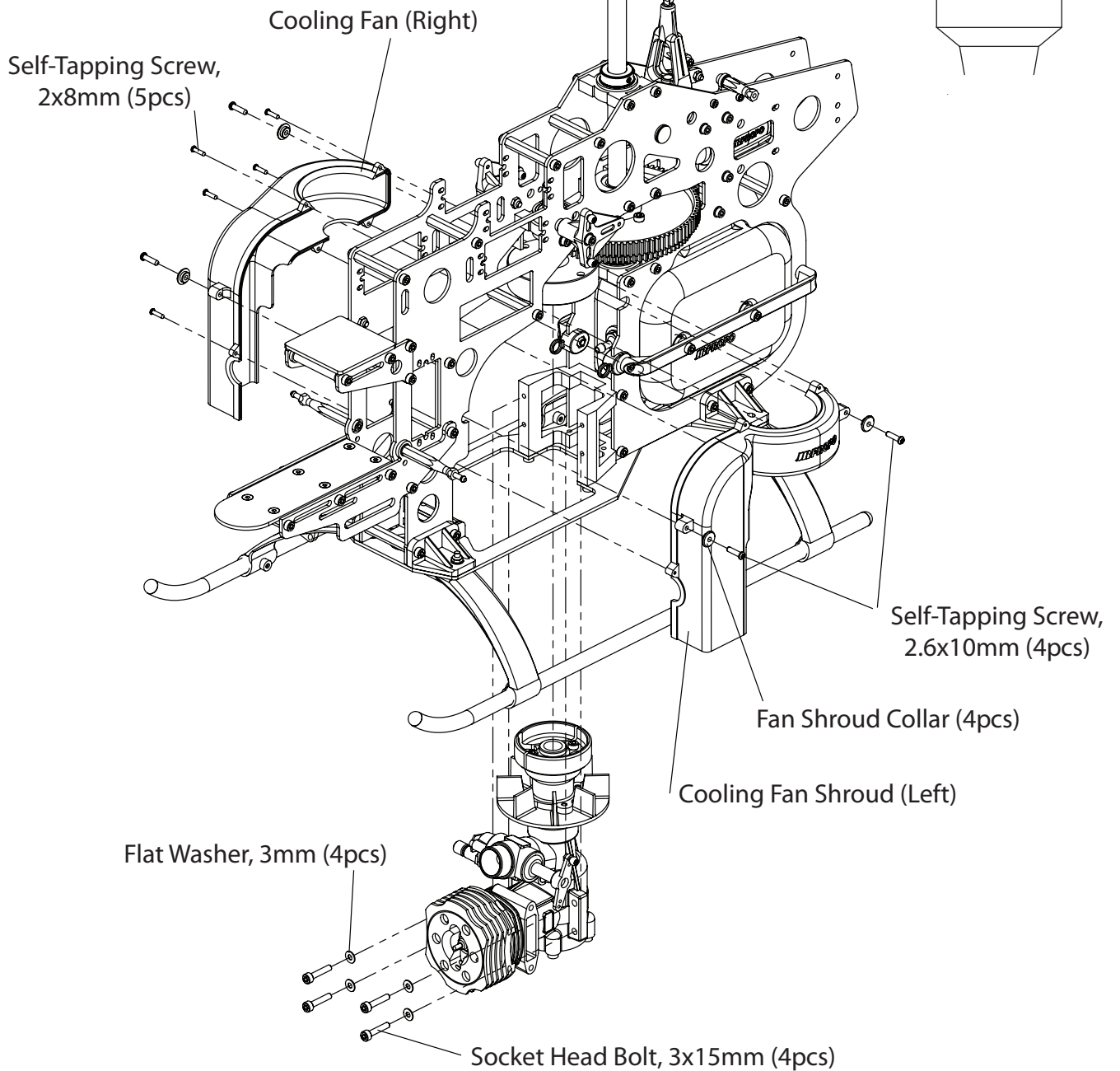
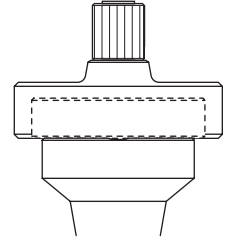


Fan Shroud Collar (4pcs)

Adjust the position of the engine so the bottom of the clutch assembly is flush with the bottom of the clutch bell. Also check to ensure that the clutch and clutch bell are parallel.

Fully tighten all bolts from Steps 2-1 through 3-3 at this time.

















To set the proper mesh, insert one thickness of paper (the same thickness as the pages of this manual) between the pinion gear and main drive gear, push the pinion bearing block until there is no gear backlash with the paper in place, and then tighten the bearing block screws. Then remove the paper and note that there should be a very slight amount of backlash in the gears. Repeat this procedure for setting the tail drive gear mesh.





# 4-1

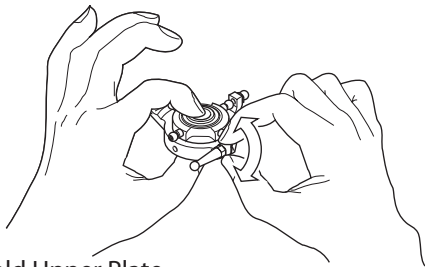
# SWASHPLATE/WASHOUT INSTALLATION

			
Setscrew, 3x3mm (3pcs)	Joint Ball Spacer, 2.75mm (4pcs)		
			
Socket Head Bolt, 3x14mm (2pcs)	Washer, 3x4.5x0.4mm (2pcs)		
			
Flat Head Screw, 2x10mm (6pcs)	Control Ball, 9mm (3pcs)		
			
Steel Joint Ball (6pcs)	Long Control Ball, 28.25mm (2pcs)		

Install the long control balls for 140 CCPM or the short control balls for 120 CCPM depending on the type you will use.

Install the washout assembly on the main rotor shaft so the longer portion of the washout base faces downward toward the washplate.

If there is play between the upper and lower Swashplate, tighten set screw 3 x 3 mm to lower the swashplate little by little. Do not overtighten as binding and damage to the bearing can occur.

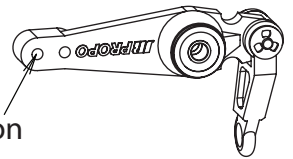


Hold Upper Plate and check play.

Washer, 3x4.5x0.4mm (2pcs)

Washout Base

This Position



Washout Arm Assembly (2pcs)

120/140 Swashplate Assembly

Socket Head Bolt, 3x14mm (2pcs)

Control Ball, 9mm

Flat Head Screw, 2x10mm (6pcs)

Steel Joint Ball (6pcs)

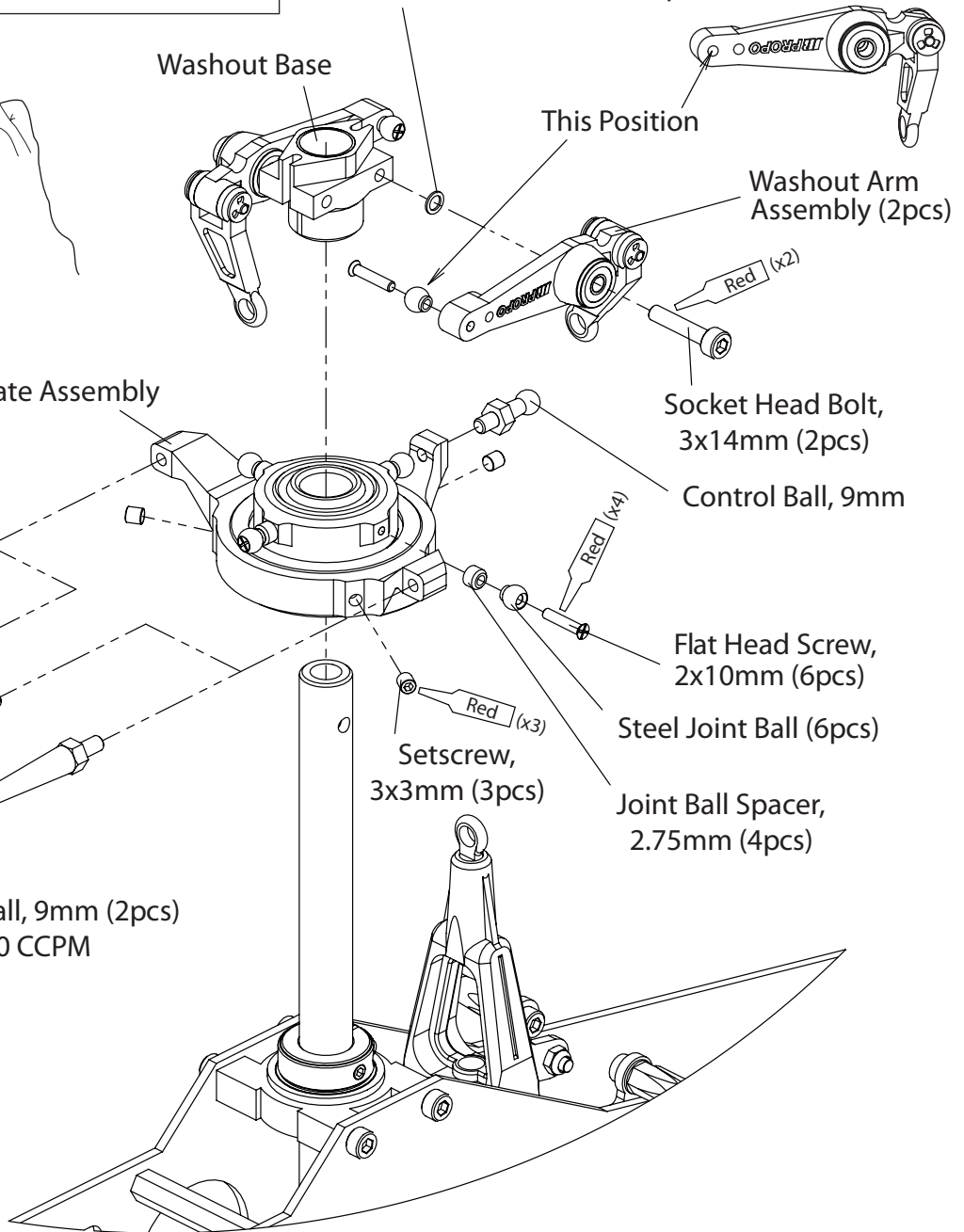
Long Control Ball, 28.25mm (2pcs)  
140 CCPM

Setscrew, 3x3mm (3pcs)

Joint Ball Spacer, 2.75mm (4pcs)


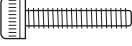












Control Ball, 9mm (2pcs)  
120 CCPM

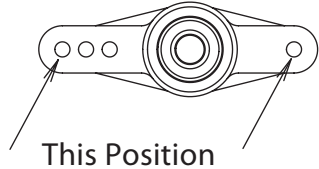
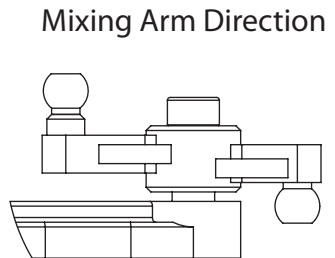
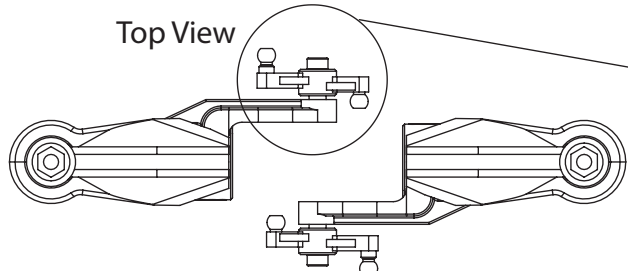
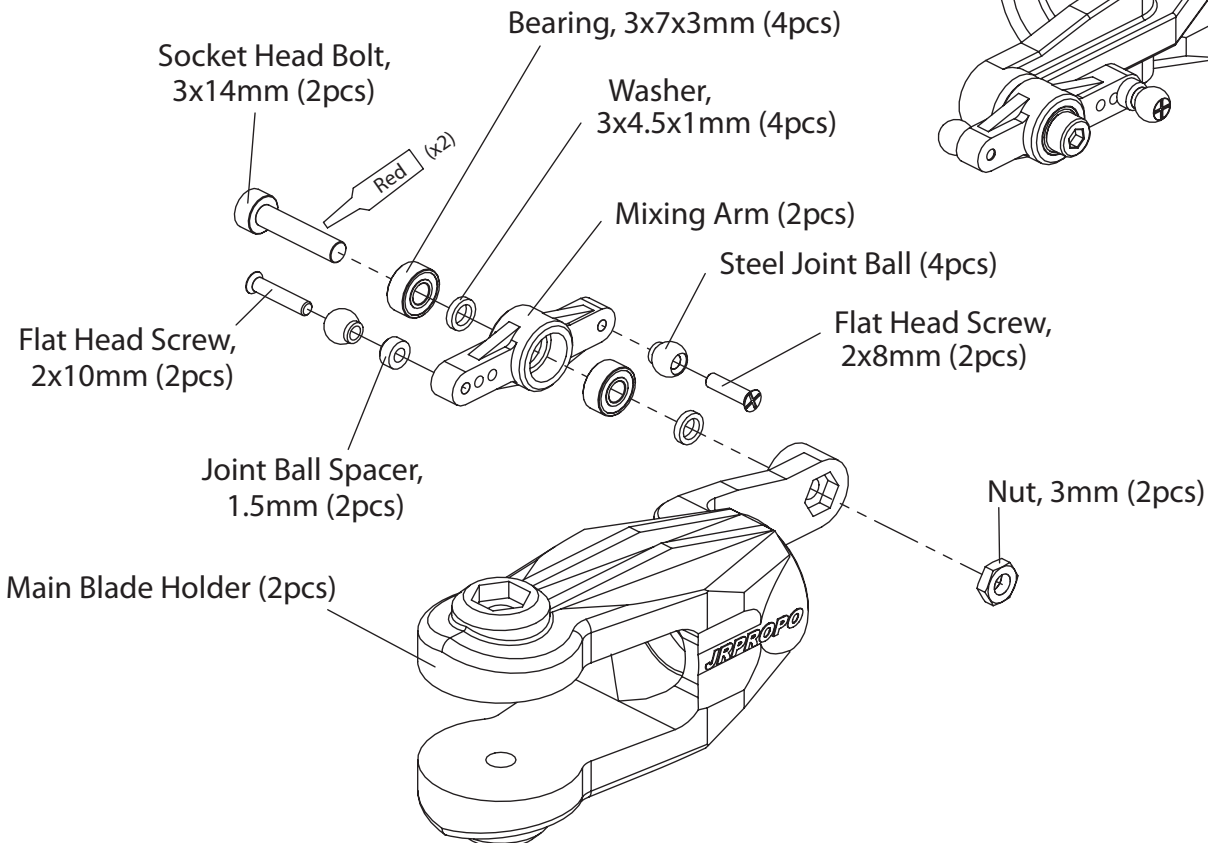
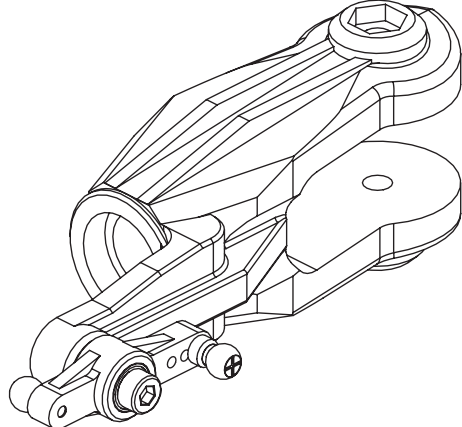
It is a good idea to size the ball links with the JR Ball Link Sizing tool prior to attachment.

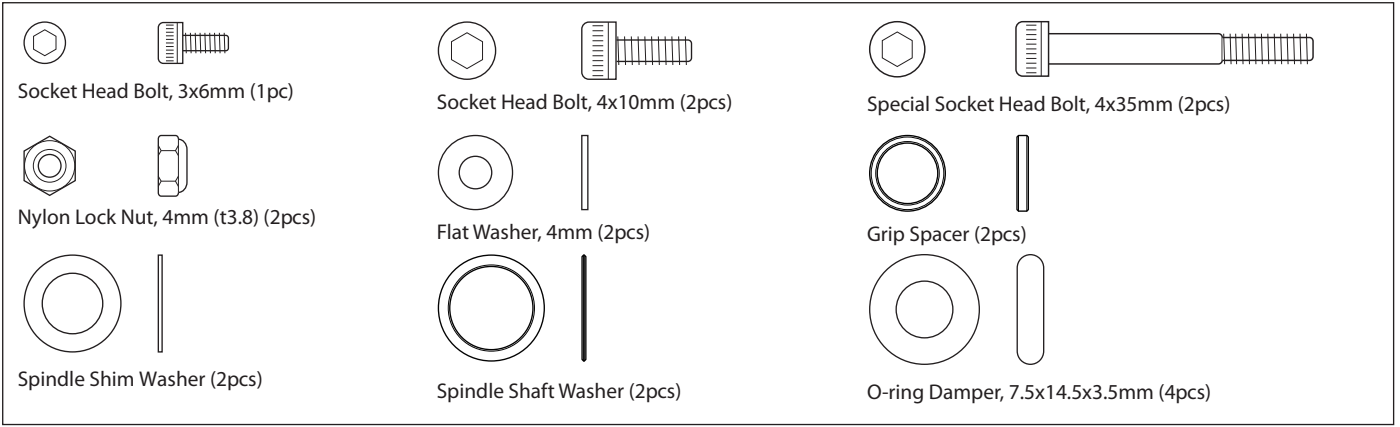


# 4-2

# MIXING ARM INSTALLATION

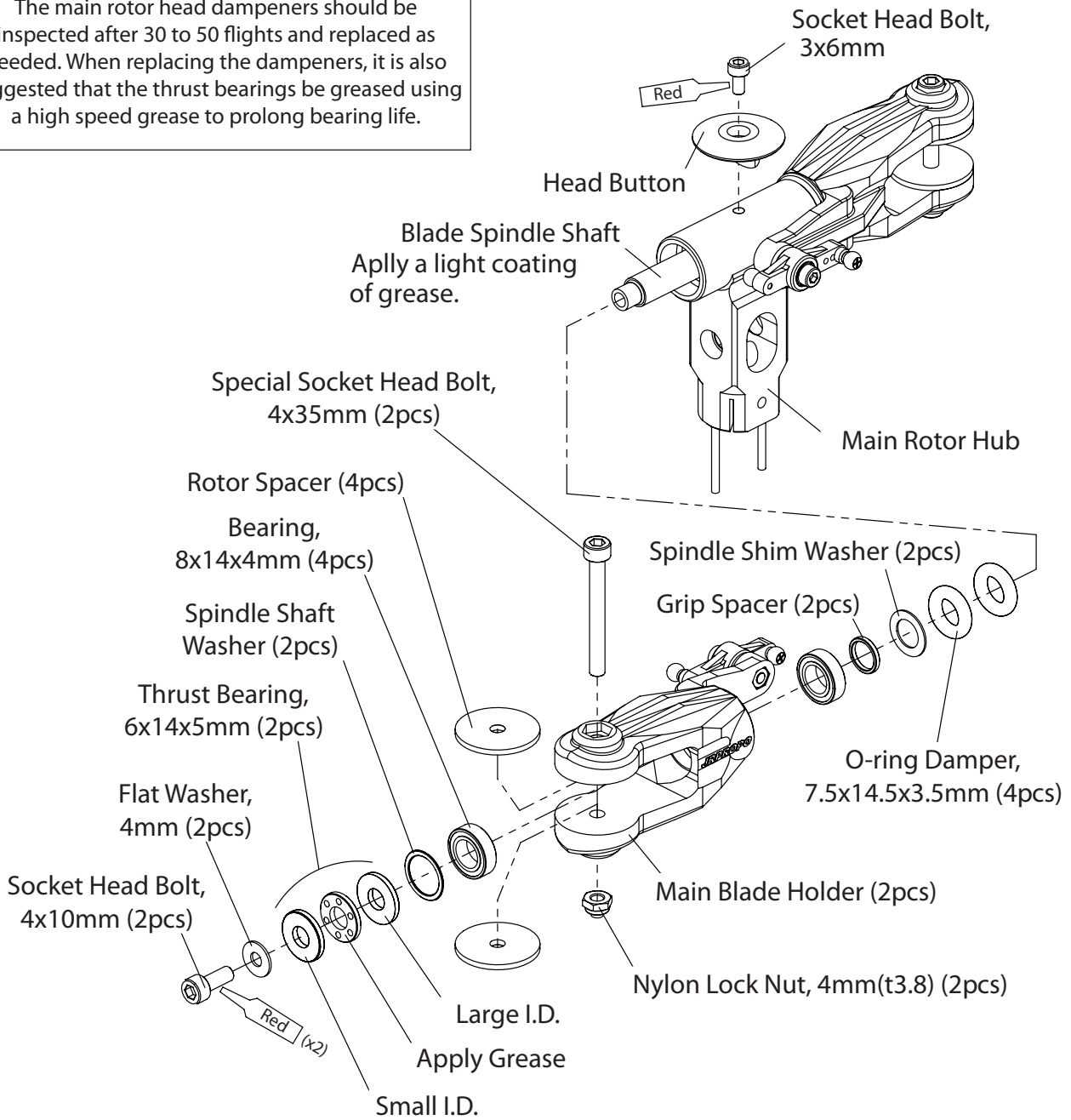
			
Socket Head Bolt, 3x14mm (2pcs)		Joint Ball Spacer, 1.5mm (2pcs)	
			
Flat Head Screw, 2x10mm (2pcs)		Washer, 3x4.5x1mm (4pcs)	
			
Flat Head Screw, 2x8mm (2pcs)		Nut, 3mm (2pcs)	
			
Steel Joint Ball (4pcs)			













**Attention**

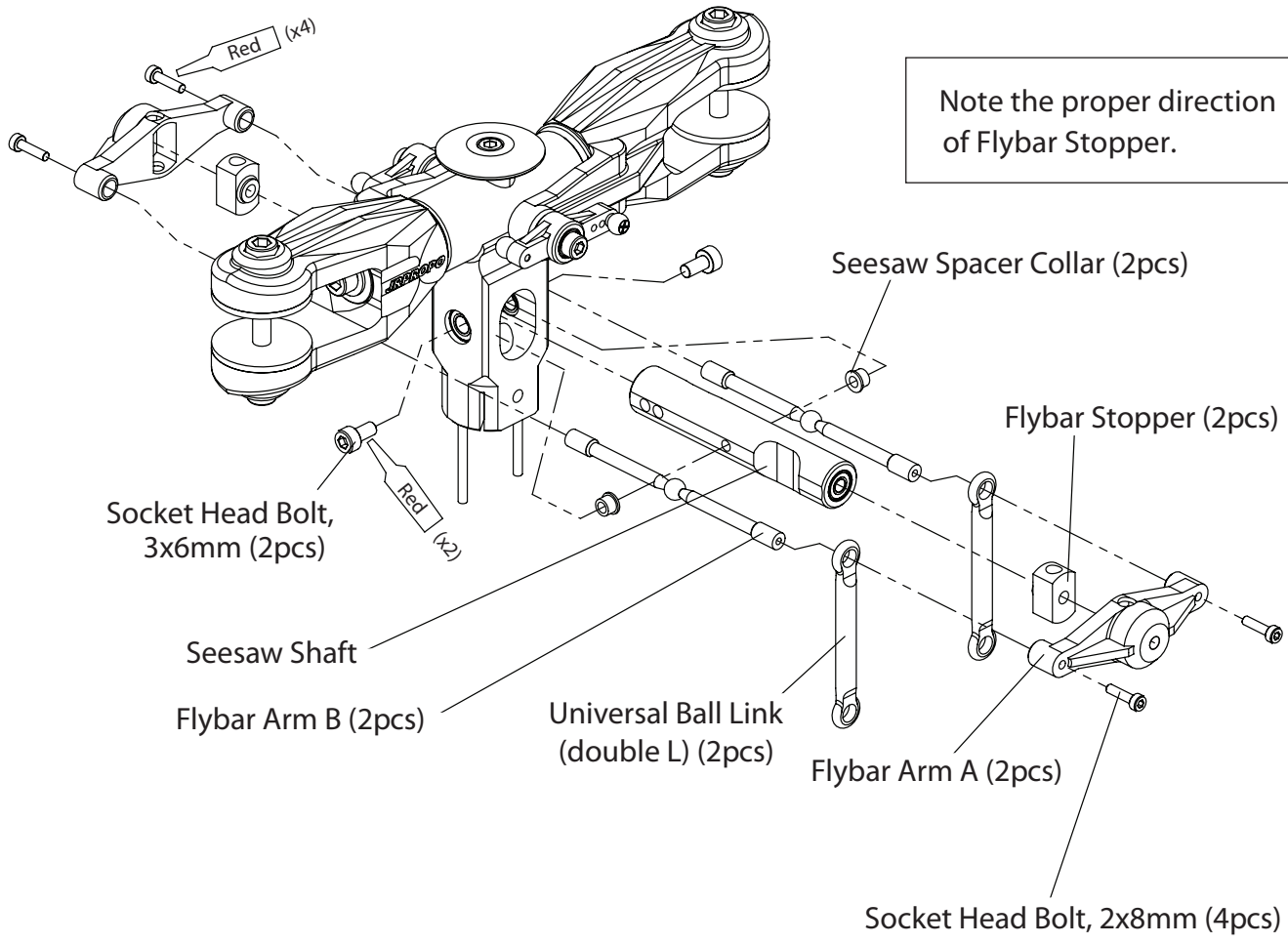
The main rotor head dampeners should be inspected after 30 to 50 flights and replaced as needed. When replacing the dampeners, it is also suggested that the thrust bearings be greased using a high speed grease to prolong bearing life.



# 4-4

# SEESAW SHAFT INSTALLATION

	
Socket Head Bolt, 2x8mm (4pcs)	
	
Socket Head Bolt, 3x6mm (2pcs)	
	
Seesaw Spacer Collar (2pcs)	
	
Universal Ball Link (double L) (2pcs)	

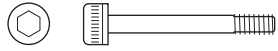




Setscrew, 3x3mm (4pcs)



Setscrew, 4x4mm (2pcs)



Special Socket Head Bolt, 3x22mm (1pc)



Nylon Lock Nut, 3mm (1pc)



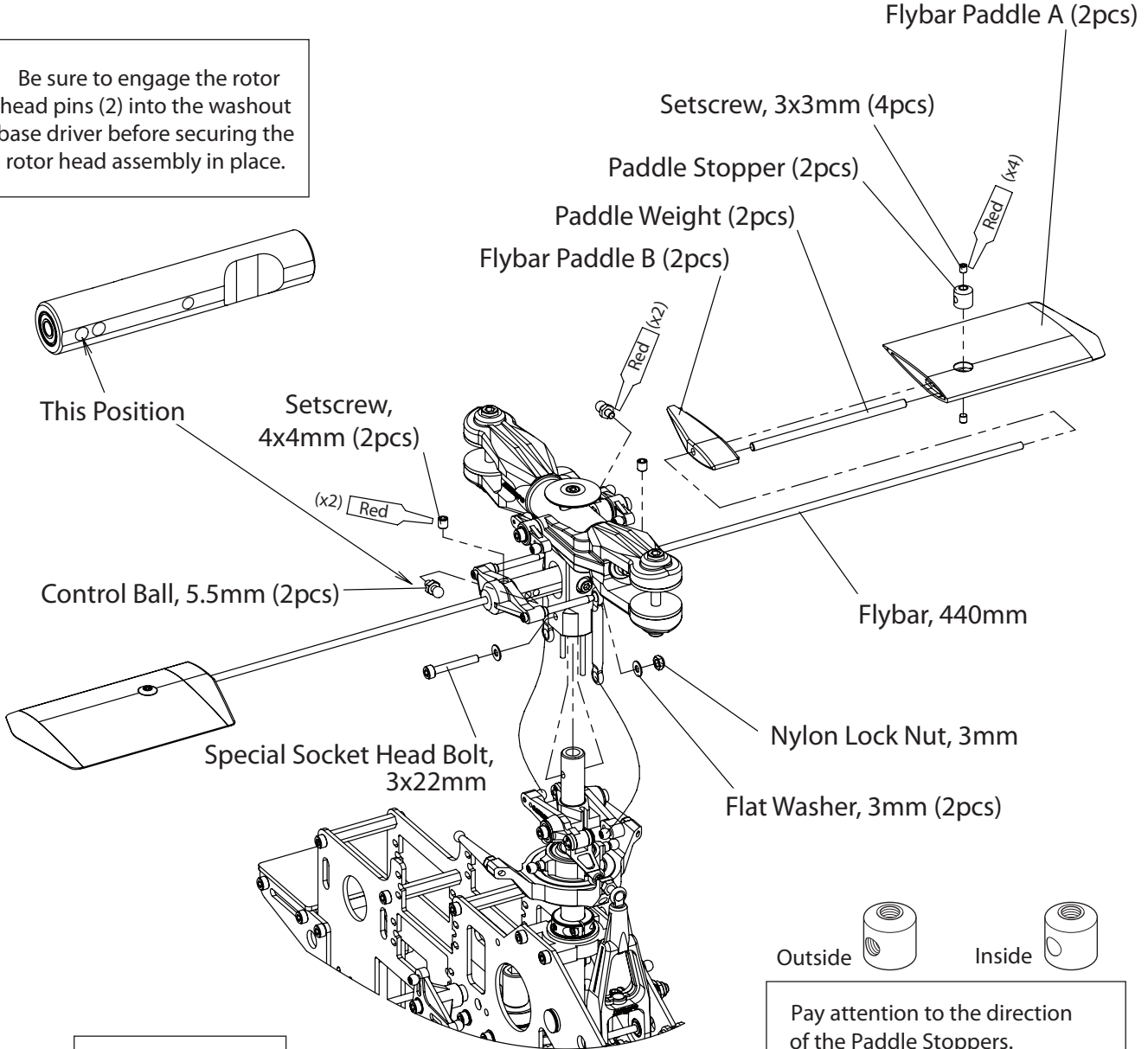
Flat Washer, 3mm (2pcs)



Control Ball, 5.5mm (2pcs)

**TIP:** For safety, it's important to note that a hardened bolt with a long shank should be used to attach the rotor head. We have seen many people, over time, replace these with standard bolts. This increases the chances of failures in flight.

Be sure to engage the rotor head pins (2) into the washout base driver before securing the rotor head assembly in place.

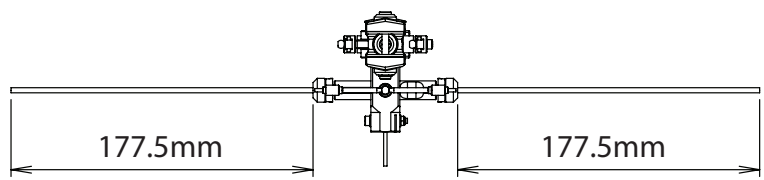
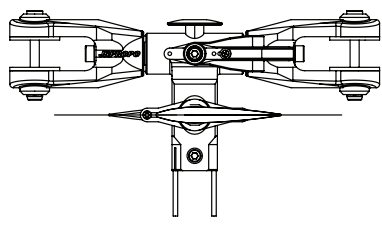


This Position

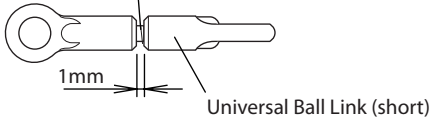


Pay attention to the direction of the Paddle Stoppers. The tapped one is outside (front) and the untapped one is inside (close to the Main Shaft).

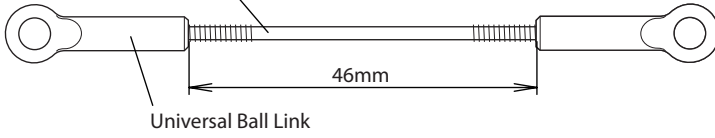
Align the flybar paddles to be even with each other and the flybar cage.



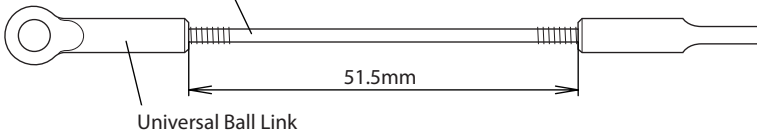
- A. MIXING ARM TO SEESAW .....2pcs  
Threaded Rod, 2.3x15mm



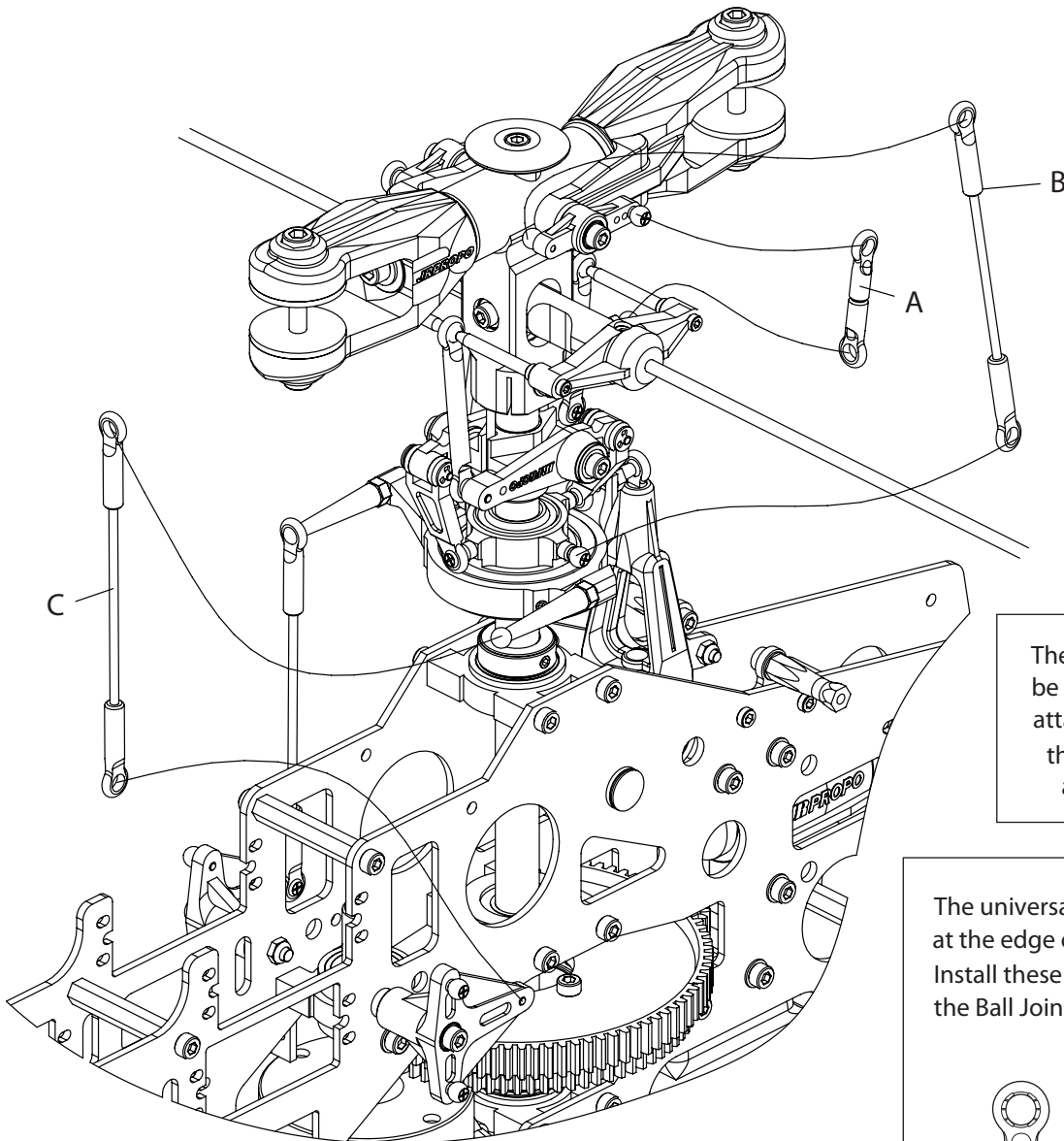
- B. MIXING ARM TO SWASHPLATE .....2pcs  
Threaded Rod, 2.3x70mm



- C. SWASHPLATE TO T-ARM .....2pcs  
Threaded Rod, 2.3x70mm

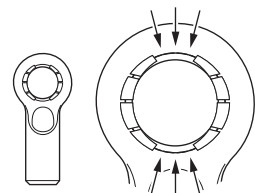


**TIP:** The JR Ball Links are designed with little ridges around the lip of the link. These ridges, in conjunction with the JR Ball Link Sizing Tool, are there to help you custom fit the link to the ball. If the link fits on the ball too tight, you can use the reaming tool to enlarge the link hole size. If the link fits too loose on the ball, you can push in on the ridges on the link with a small pair of pliers. This reduces the size of the link hole and makes the link fit tighter. JR links are some of the best links available. It is important to note that very little force is needed on the ridges to resize the link. Using pliers on any other part of the link can cause the links to break.





The universal links should be adjusted so that when attached to the Ball Joint, the words "JR PROPO" are to the outside.

The universal links (short) has gap at the edge on one side only. Install these links so this side faces the Ball Joint.

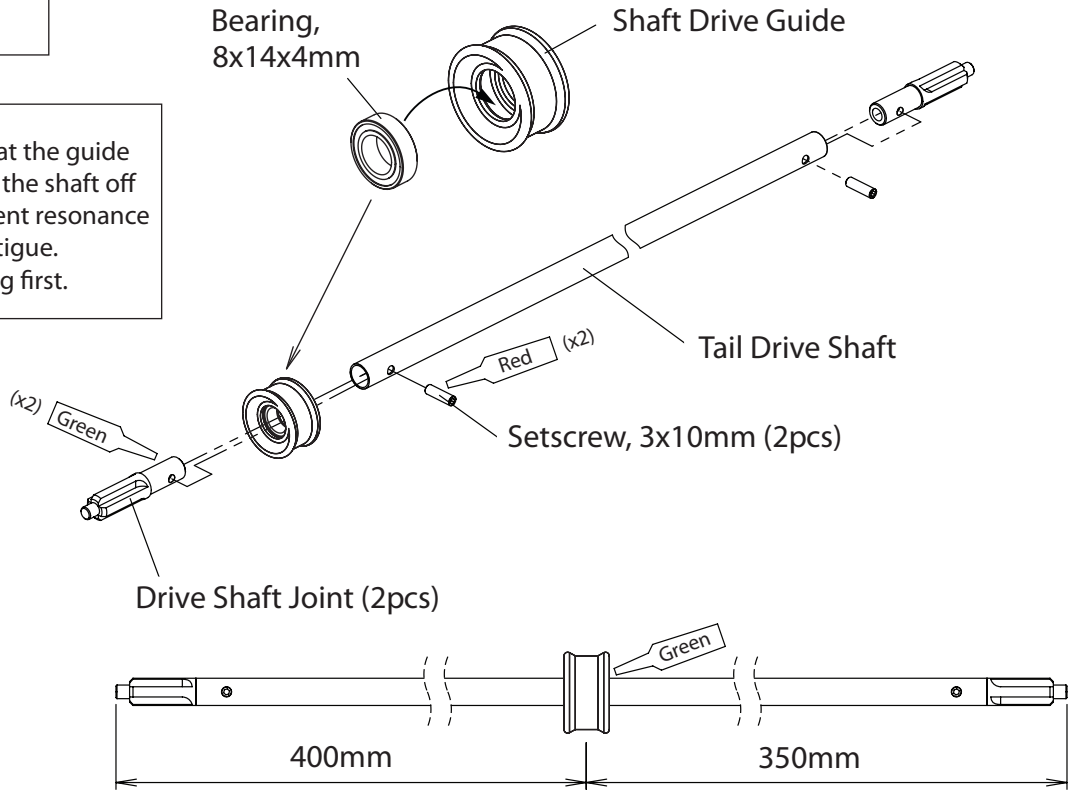


# 5-1

## TAIL DRIVE SHAFT ASSEMBLY


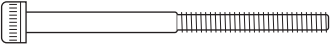




-   Setscrew, 3x10mm (2pcs)

It is very important that the guide bearing be attached to the shaft off center as shown to prevent resonance vibration and fatigue. Attach the bearing first.

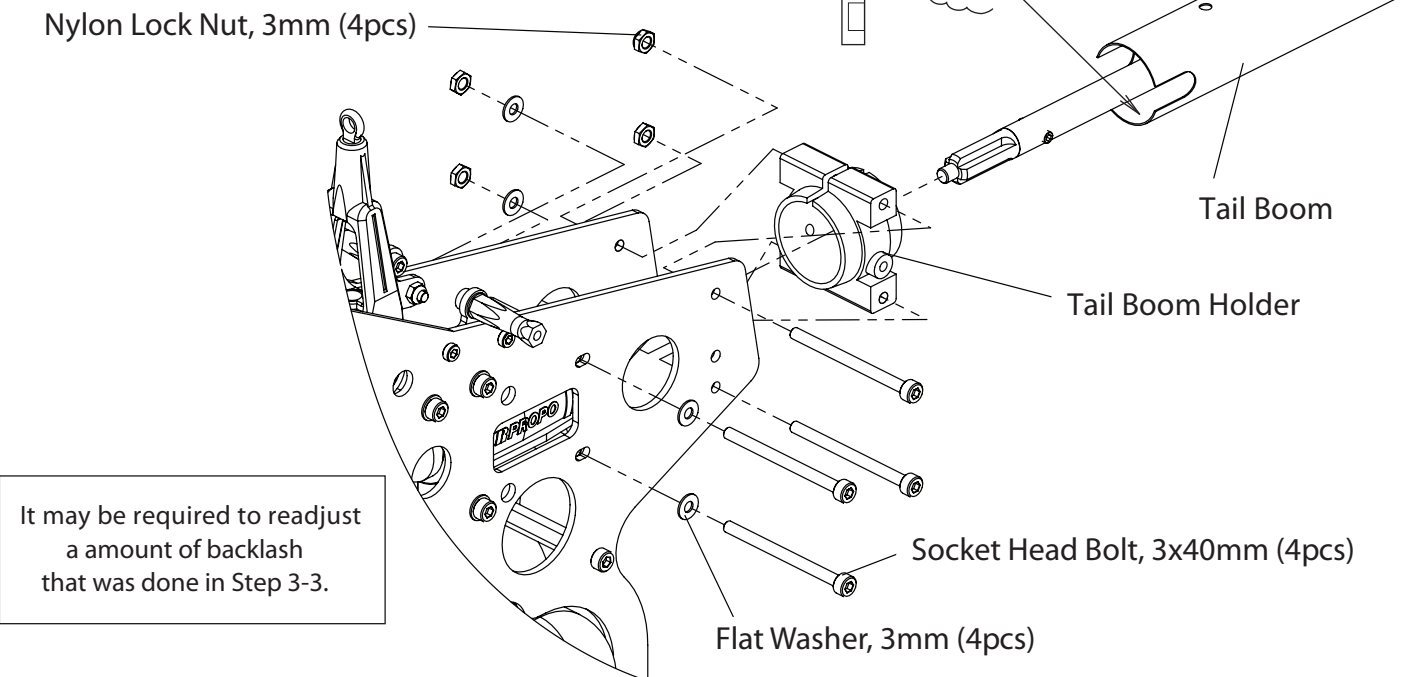











# 5-2

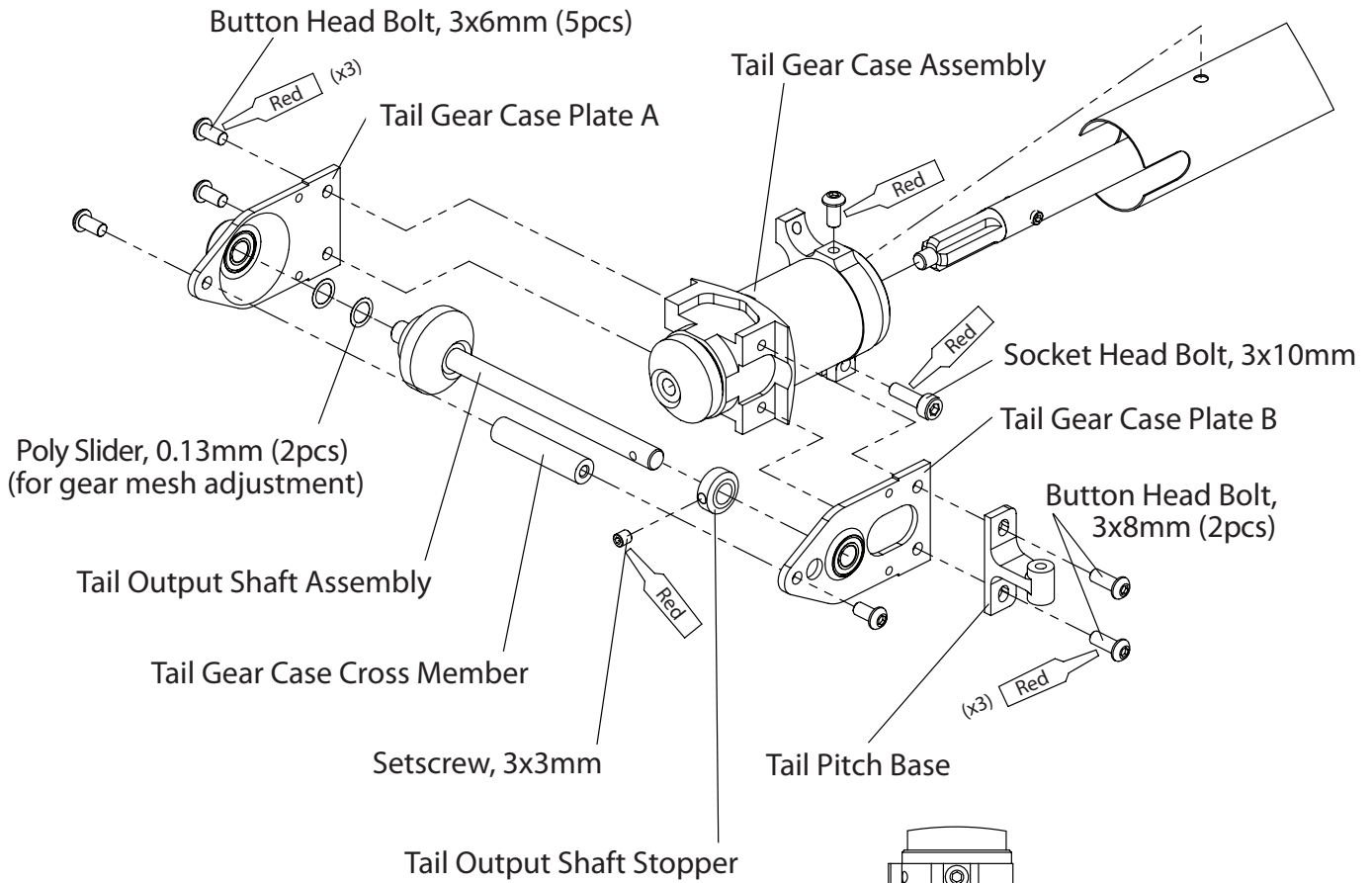
## TAIL BOOM INSTALLATION

-   Socket Head Bolt, 3x40mm (4pcs)
-   Nylon Lock Nut, 3mm (4pcs)
-   Flat Washer, 3mm (4pcs)

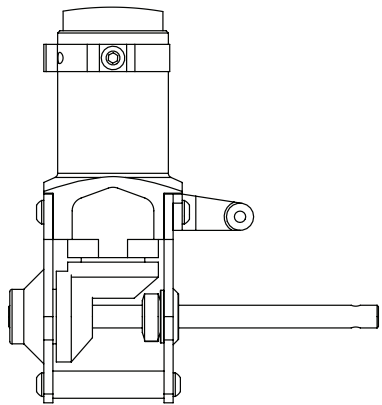
Apply oil to the inside of Tail Boom, then install Shaft Drive Guide.



 	
Setscrew, 3x3mm (1pc)	Poly Slider, 0.13mm (2pcs)
 	
Button Head Bolt, 3x6mm (5pcs)	Tail Output Shaft Stopper (1pc)
 	
Button Head Bolt, 3x8mm (2pcs)	Socket Head Bolt, 3x10mm (1pc)



Note the proper direction of Tail Pitch Base and Tail Gear Case Plate.



Complete Assembly



# 5-4

## TAIL GEAR CASE INSTALLATION 2



Socket Head Bolt, 2x6mm (2pcs)

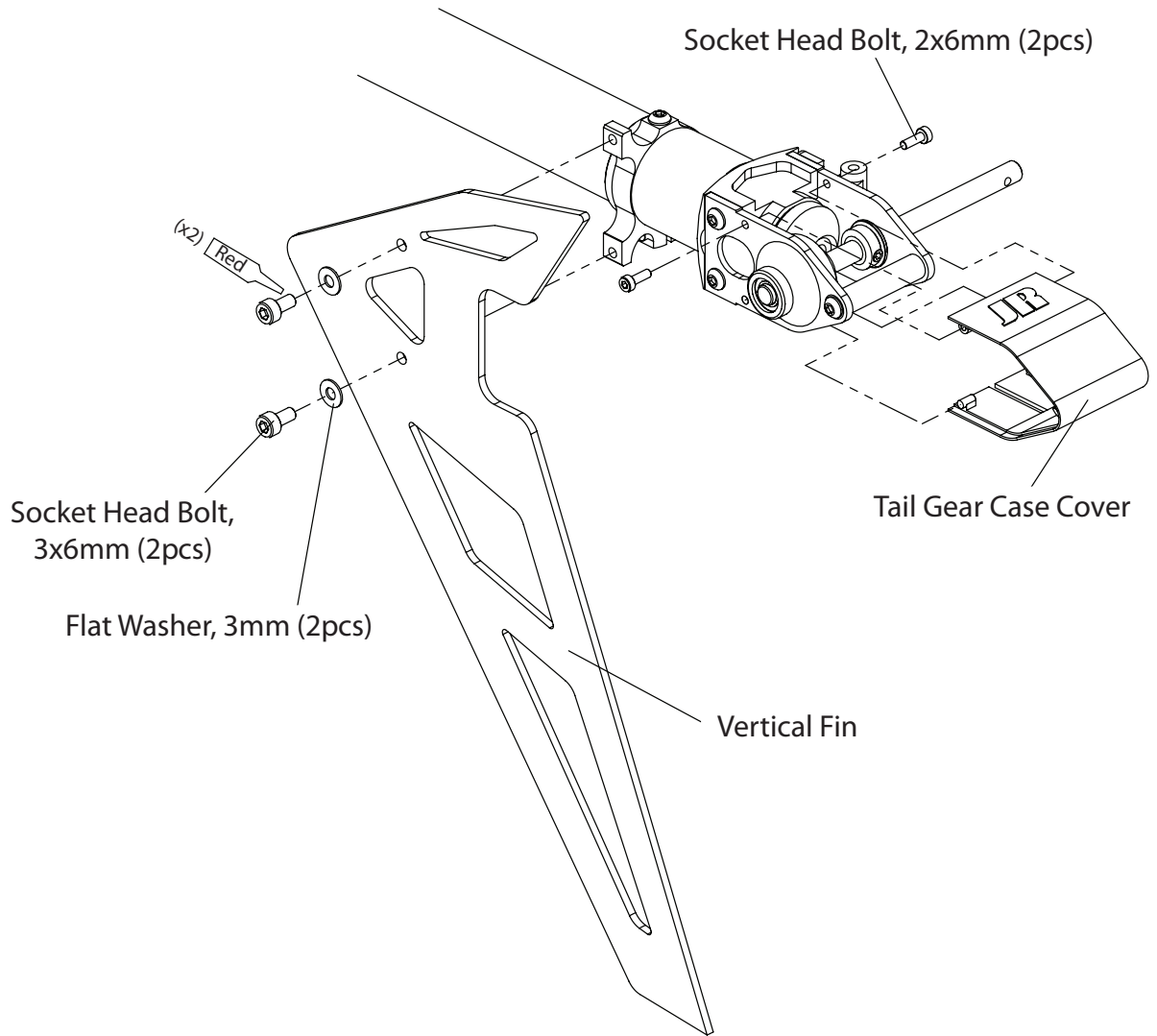


Socket Head Bolt, 3x6mm (2pcs)



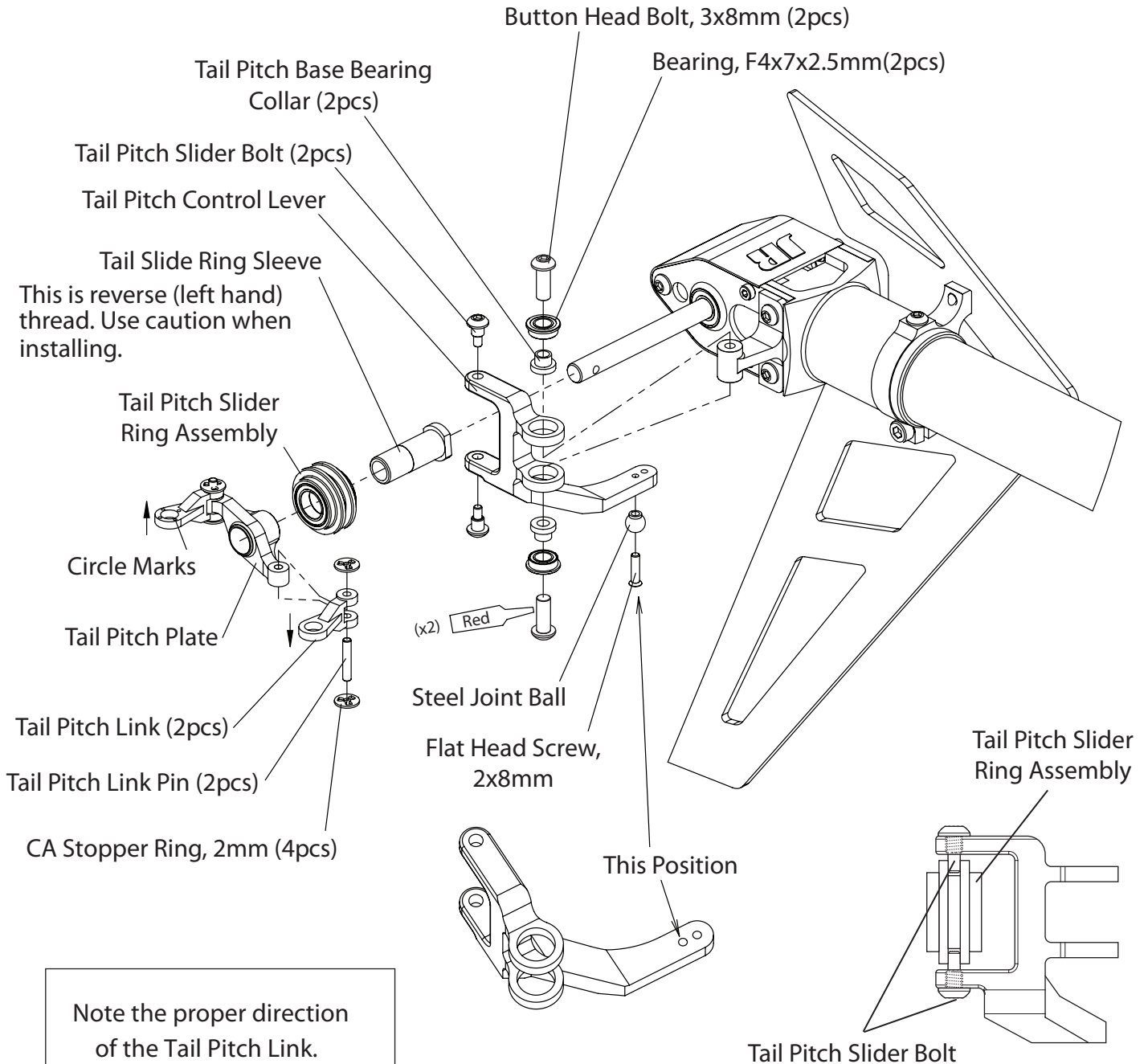
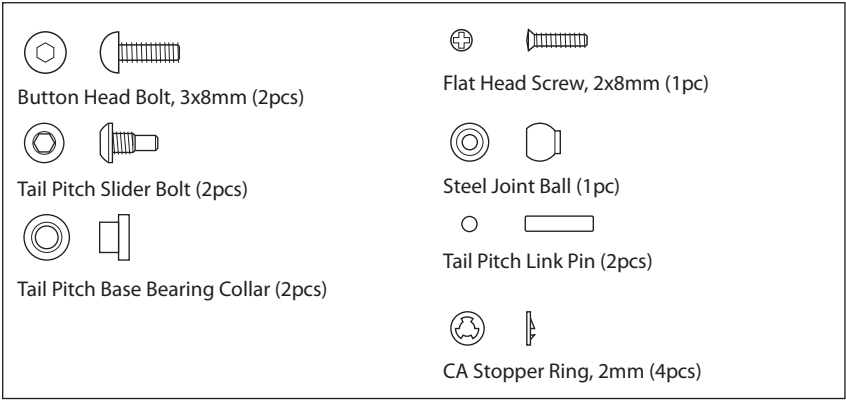
Flat Washer, 3mm (2pcs)

Position the vertical fin so that it is perpendicular to the building surface (parallel with the main rotor shaft) and tighten the tail gear case clamp bolt from the previous step.



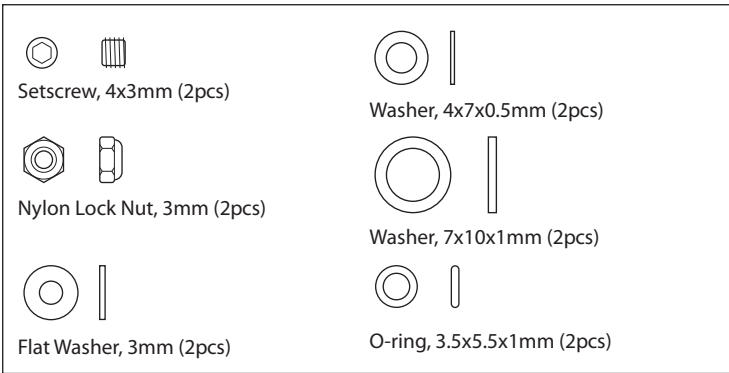
# 5-5

# TAIL PITCH CONTROL LEVER INSTALLATION

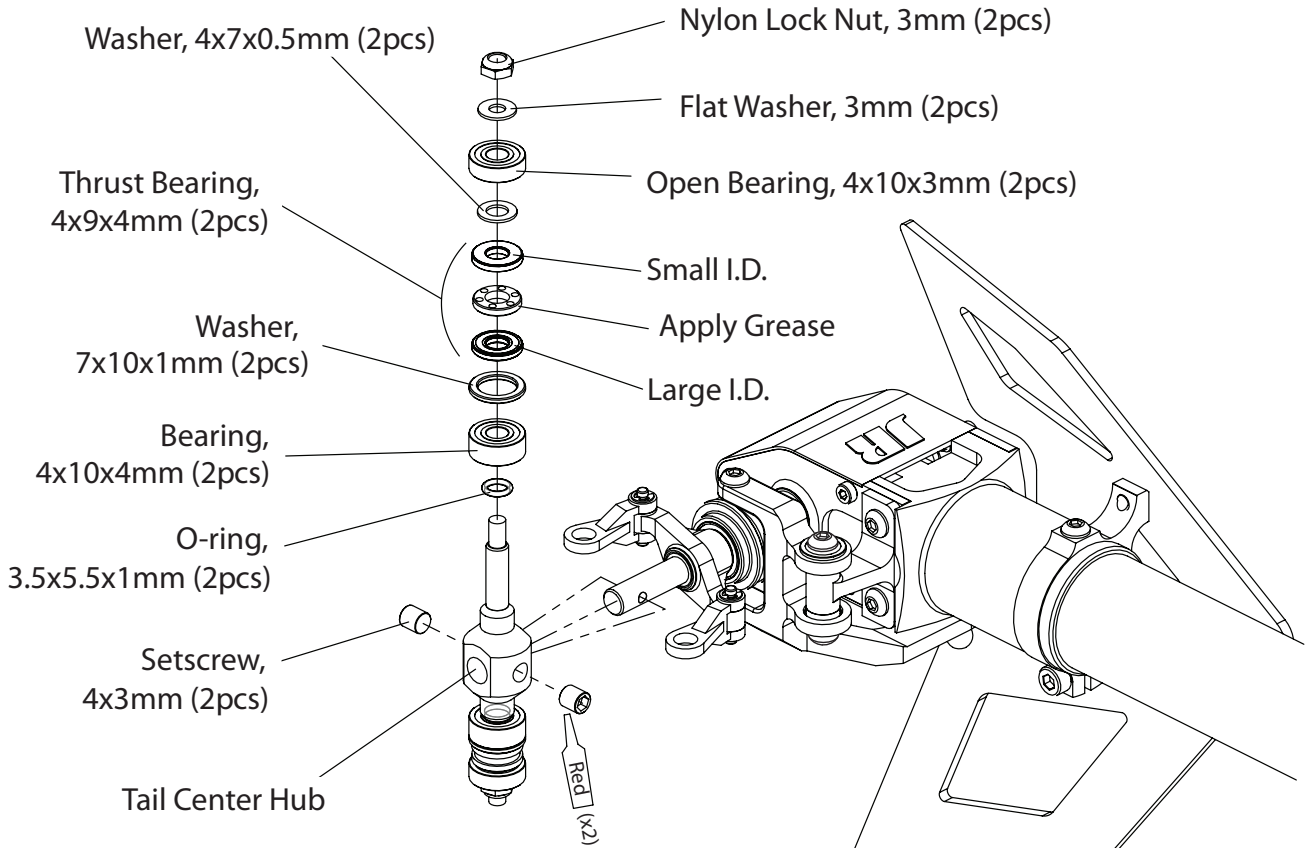


Note the proper direction of the Tail Pitch Link. The side with four circle marks is toward the direction of the arrow.

Install the Tail Pitch Control Lever in this drawing.






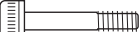








**TIP:** Use thin oil on the tail shaft to lubricate the tail pitch slider. Also apply grease to the tail thrust bearings.

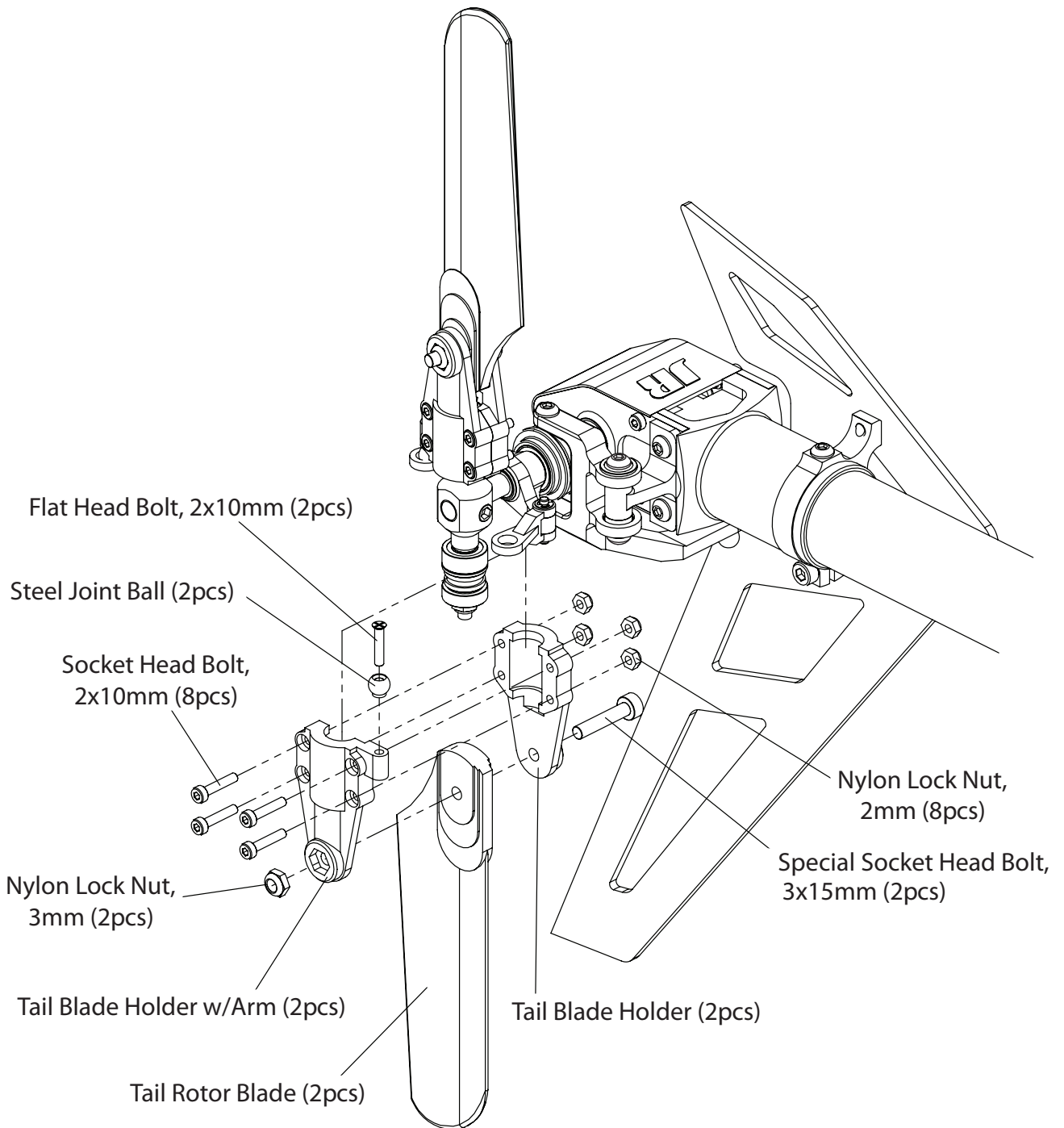


Slide the tail slide ring assembly on the tail output shaft before installation of the tail rotor hub. When attaching the tail rotor hub, be certain that the setscrews (4x3mm) engage into the holes at the end of the tail output shaft. Check to make sure the tail blade holder bearings can rotate freely, without play. If binding occurs, loosen the 3mm nylon lock nut.

# TAIL BLADE HOLDER ASSEMBLY

			
Socket Head Bolt, 2x10mm (8pcs)		Nylon Lock Nut, 2mm (8pcs)	
			
Special Socket Head Bolt, 3x15mm (2pcs)		Nylon Lock Nut, 3mm (2pcs)	
			
Flat Head Bolt, 2x10mm (2pcs)		Steel Joint Ball (2pcs)	

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

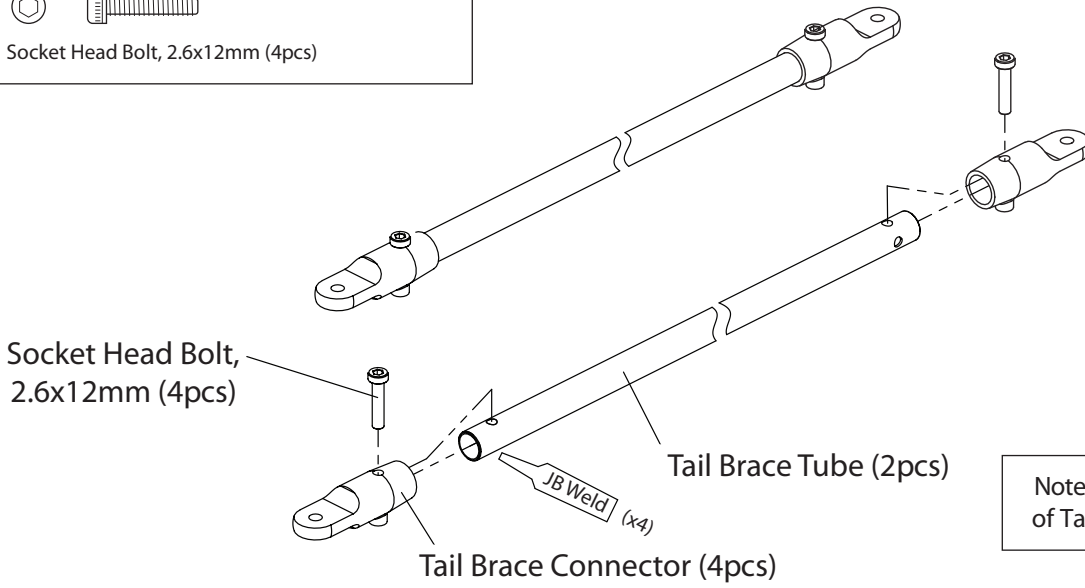


# 5-8

## TAIL BOOM BRACE ASSEMBLY



Socket Head Bolt, 2.6x12mm (4pcs)



Note the proper direction of Tail Boom Connectors.

# 5-9

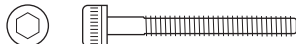
## TAIL BOOM BRACE INSTALLATION



Socket Head Bolt, 3x12mm (2pcs)



Nylon Lock Nut, 3mm (2pcs)



Socket Head Bolt, 3x25mm (2pcs)

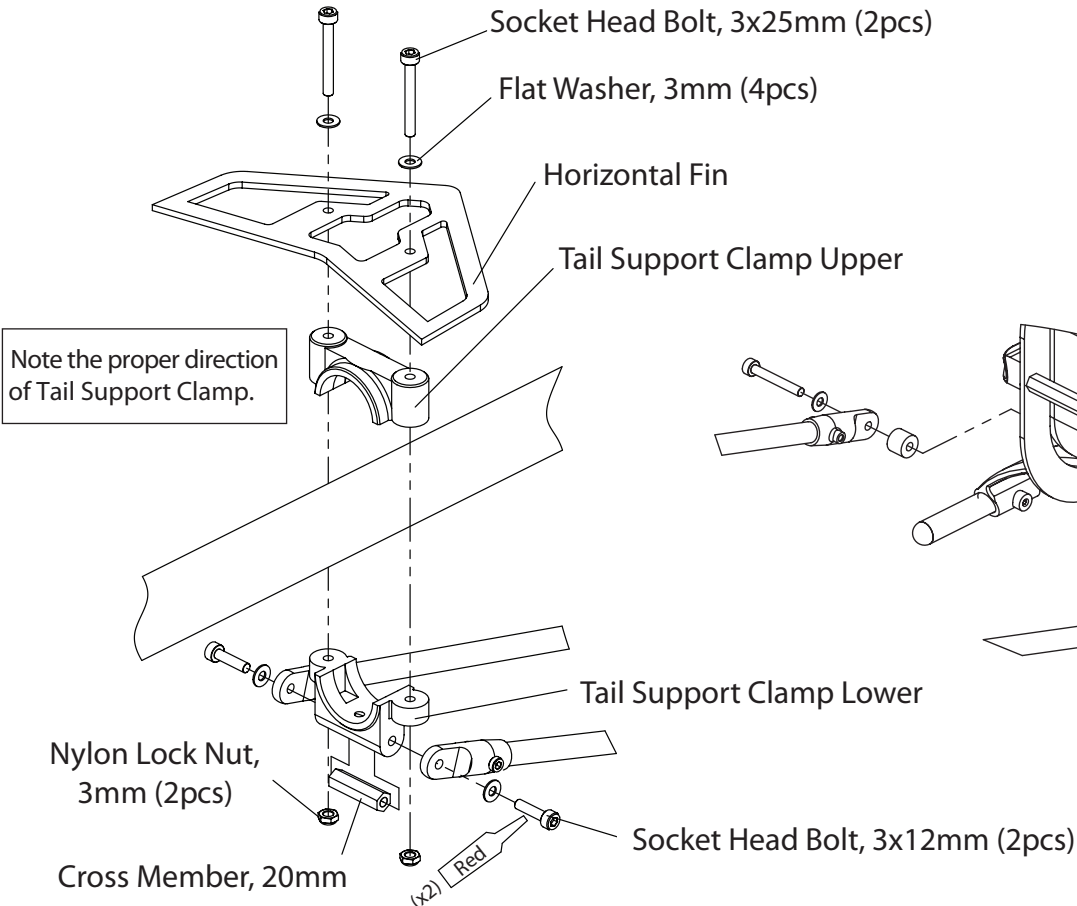


Flat Washer, 3mm (4pcs)



Cross Member, 20mm (1pc)

Position the horizontal fin so that it is level to the building surface (90 degrees to the main rotor shaft) and tighten the two Tail Support Clamp Bolts.

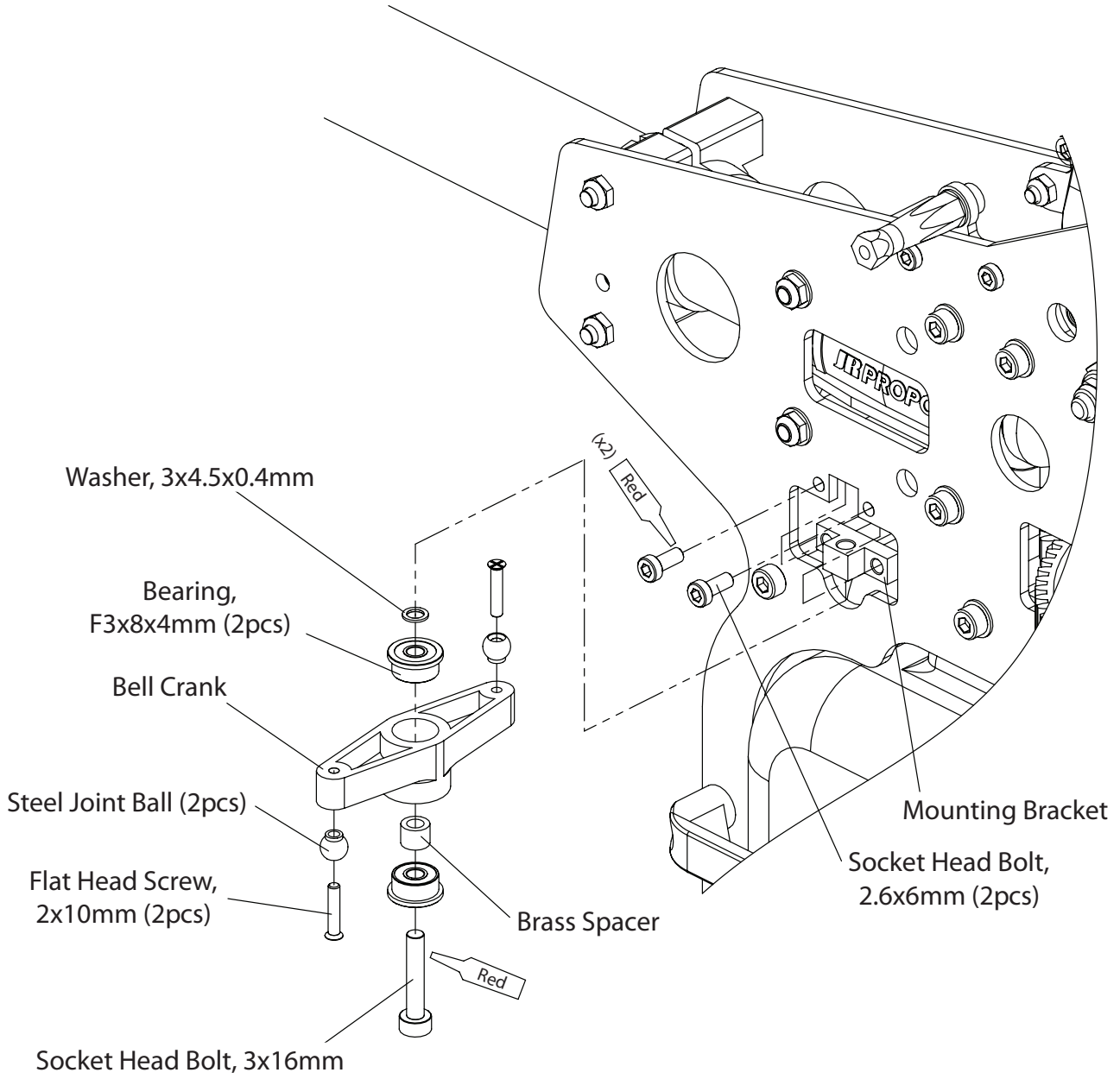


Fully tighten bolts in Step 2-11 at this time.

# 5-10


# TAIL BELL CRANK INSTALLATION



Socket Head Bolt, 2.6x6mm (2pcs)	Flat Head Screw, 2x10mm (2pcs)
Socket Head Bolt, 3x16mm (1pc)	Steel Joint Ball (2pcs)
Brass Spacer (1pc)	Washer, 3x4.5x0.4mm (1pc)


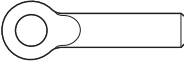


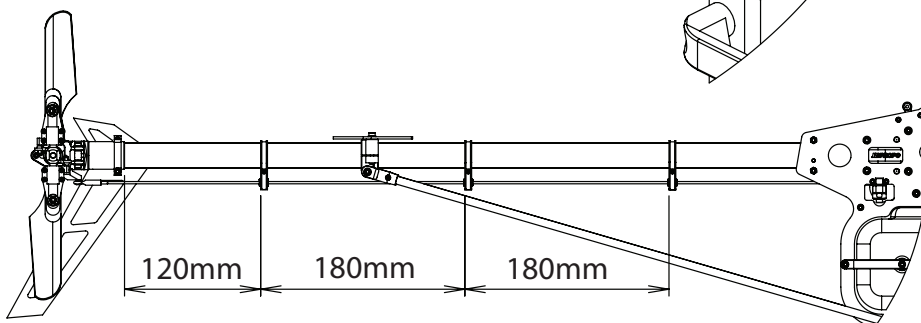
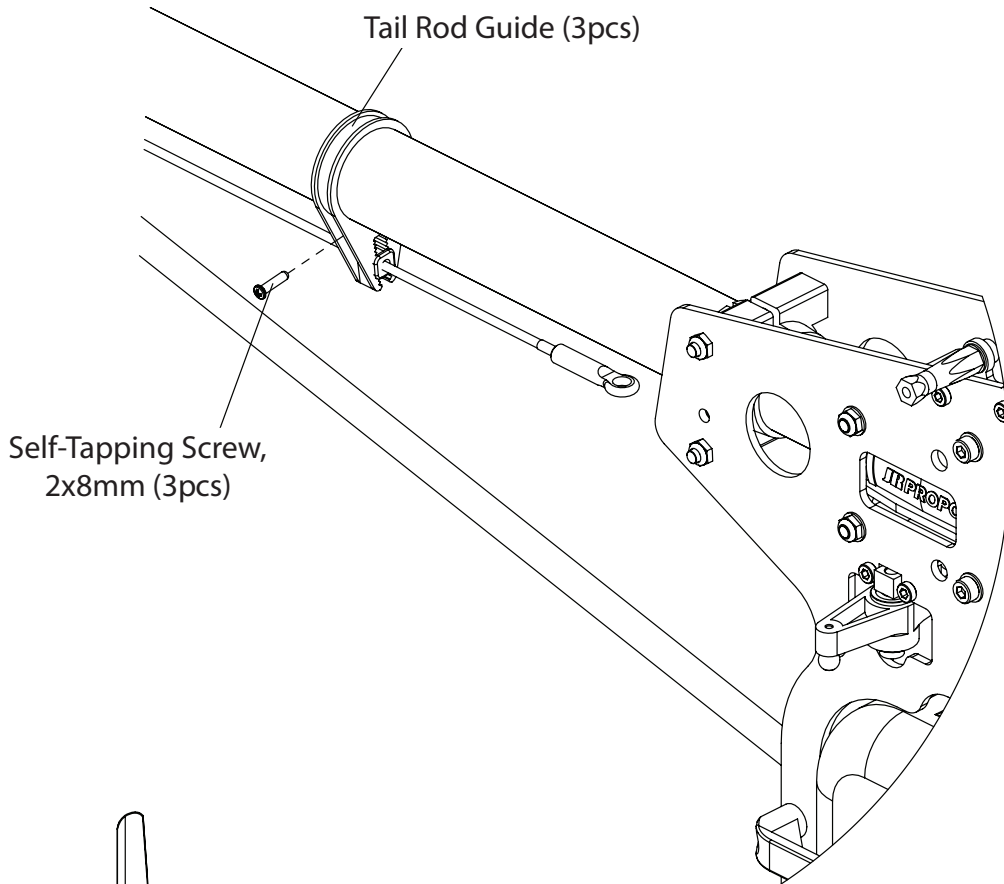
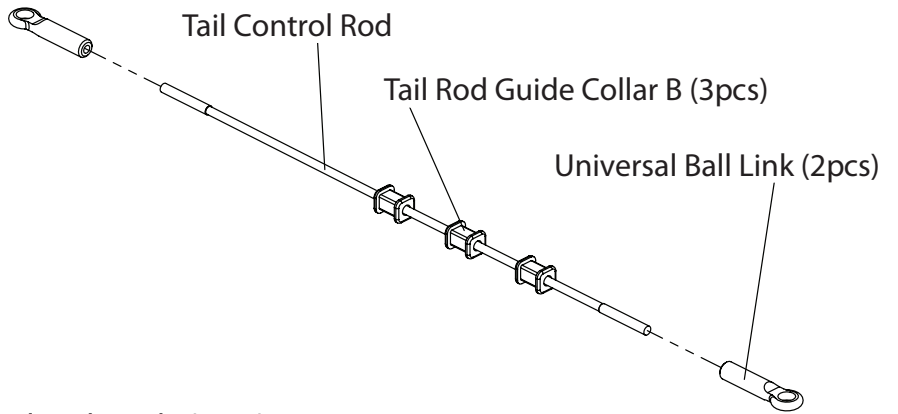
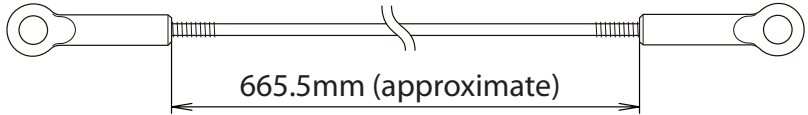
# 5-11

# TAIL CONTROL ROD ATTACHMENT

⊕  Self-Tapping Screw, 2x8mm (3pcs)

  Tail Rod Collar Guide B (3pcs)

  Universal Ball Link (2pcs)



# RADIO SYSTEM PREPARATION

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 ensure 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. Reset 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. 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.

## SERVO HORN INSTALLATION SUGGESTIONS

Since the servo output spline on a JR system has an odd number of teeth (23), 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.



# UNDERSTANDING CCPM CONTROL SYSTEMS

## 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.

The main difference in the way that these two systems operate is that unlike the one servo system where the three servos work completely independently 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.

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.

# UNDERSTANDING CCPM CONTROL SYSTEMS

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

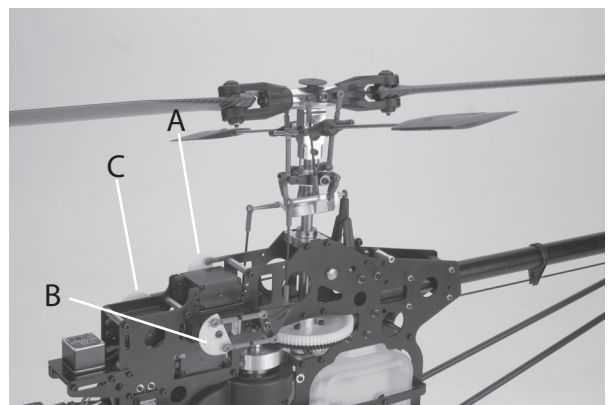
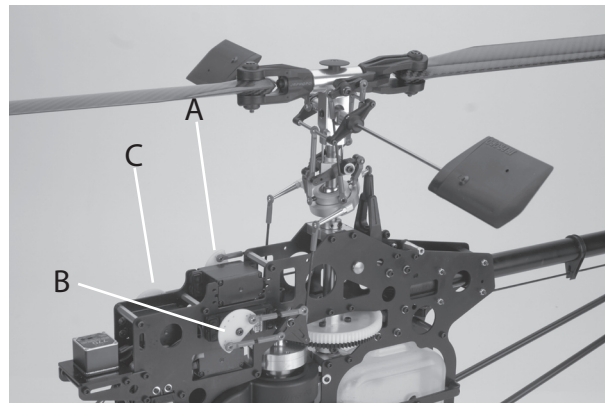
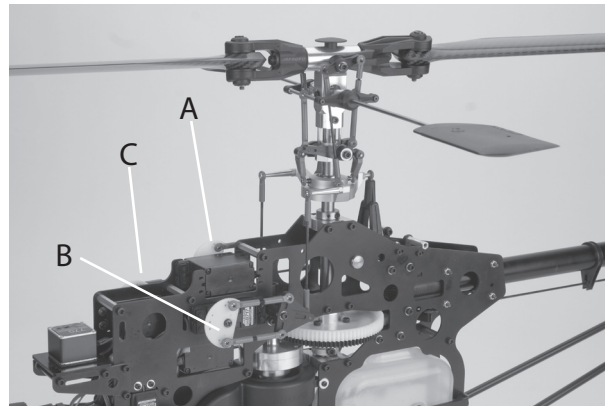
When a collective pitch input is given, all three servos (A, B, and C) move together in the same direction, at equal amounts, to raise and lower the swashplate while keeping the swashplate level. During this function, all three servos travel at the same value (100%) so that the swashplate can remain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

## 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 positions 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.

## 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, such as, when a right aileron command is given.



# IMPORTANT CCPM PROGRAMMING DO'S AND DON'TS

## A. TRAVEL ADJUST

It is extremely important that the travel adjustment values for the three CCPM servos (aileron, elevator and Aux1) 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 the final radio setup 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 vice 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.*

## C. CCPM SERVO CONNECTIONS

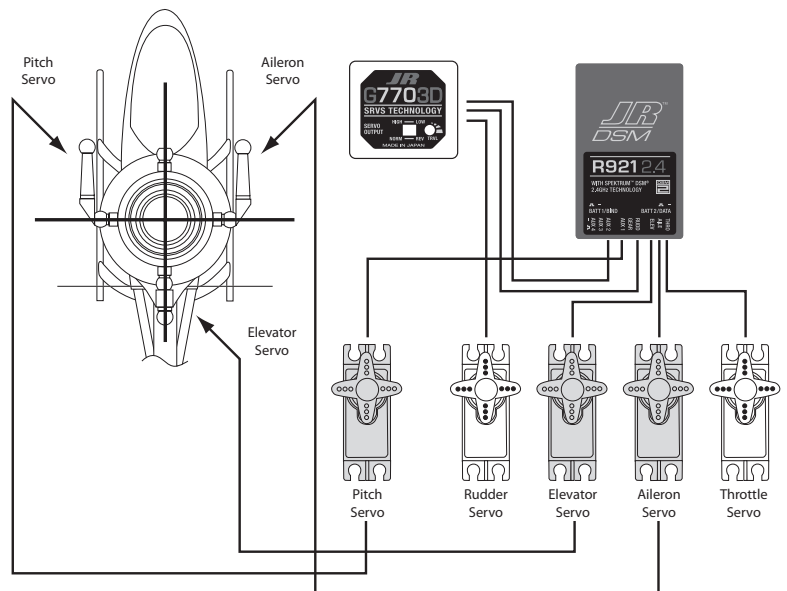
The JR® 120°/140° CCPM system requires the use of three servos to operate, aileron, elevator and Aux1 (Pitch). The labeling of these servos can become quite confusing because with the CCPM function; the three servos no longer work independently, but rather as a team, and their functions are now combined. For this reason, we will refer to the three servos in the following manner:

**Elevator Servo:** We will refer to this servo as the "Right Rear" servo. The channel number for this servo when using a JR radio is CH3.

**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.

**Aux 1 (Pitch) Servo:** We will refer to this servo as the "Left" 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.



# CCPM SOFTWARE INITIAL ADJUSTMENTS

## RADIO SYSTEM REQUIREMENTS (NOT INCLUDED)

6-channel or greater RC helicopter system with 120° or 140° CCPM function



JR 12X



JR X9303 2.4



SPEKTRUM DX7



SPEKTRUM DX6i

## CCPM-Ready JR Radio Systems

Most current JR and Spektrum heli radio systems (12X, X9303 2.4, XP9303, DX7, DX6i, as well as older 10 series systems) are equipped with 120° and/or 140° 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 877-504-0233 for details.

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

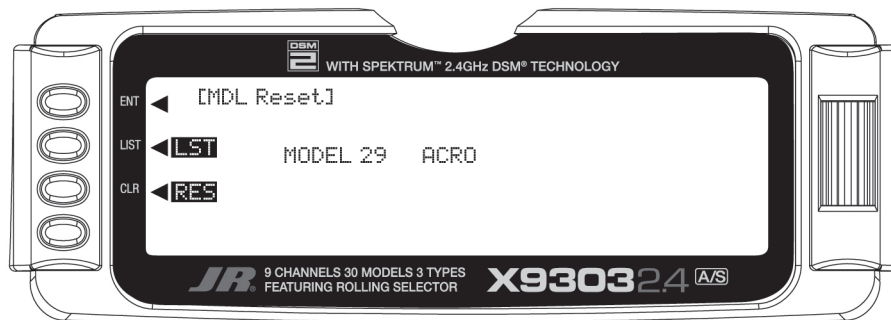
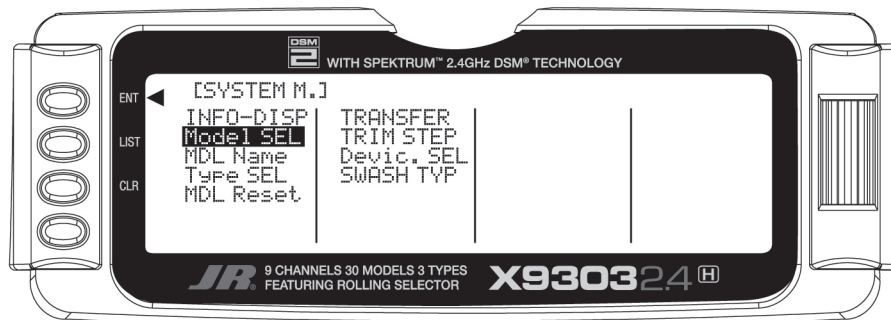
# JR X9303 2.4 AND XP9303: PROGRAMMING

The following activation and setup procedure should be used for the 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.

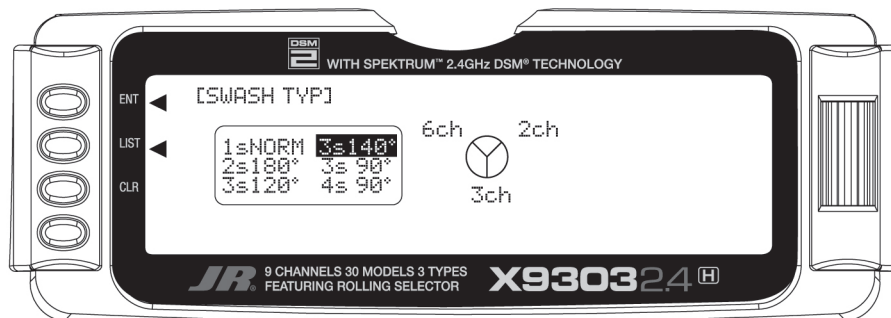
## A) Model Select/Data Reset

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 the roll selector. Move the roll selector to highlight MDL RESET, then press the roll selector. Press the CLEAR key, then press YES to reset the data of the current model selected.



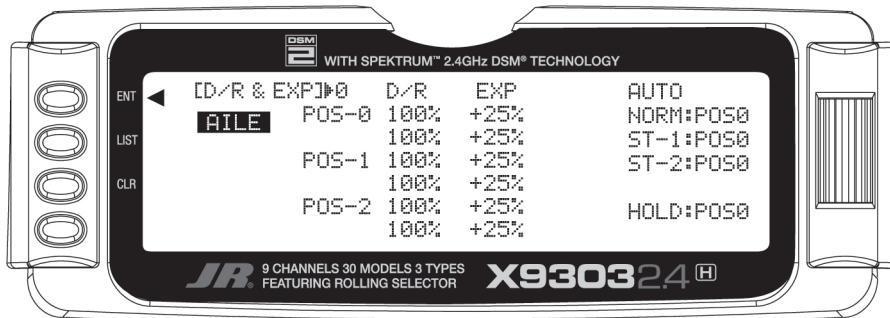
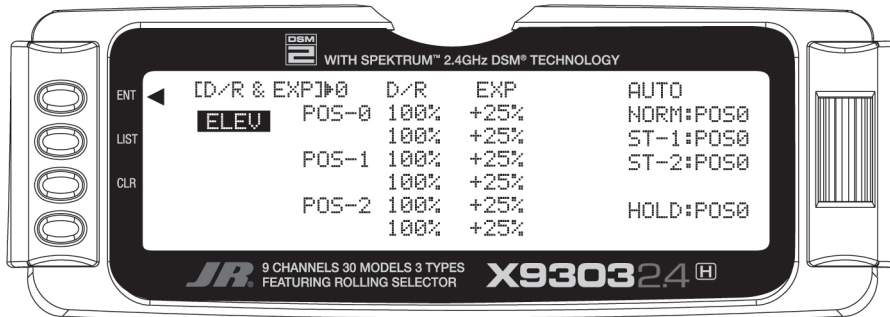
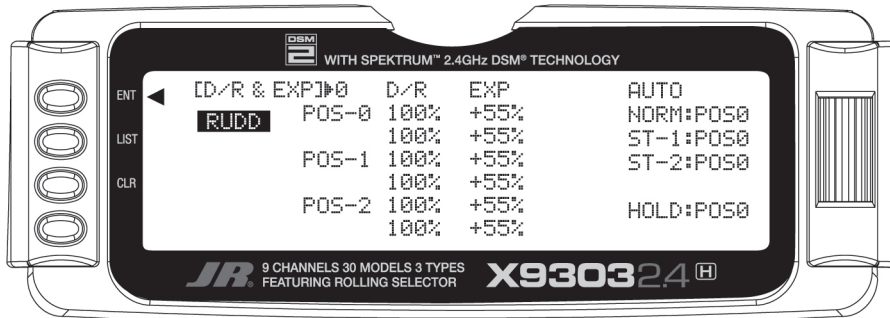
## B) CCPM Activation

Move the roll selector to highlight the SWASH TYP function, then press the roll selector 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 and press the roll selector to exit the system mode.



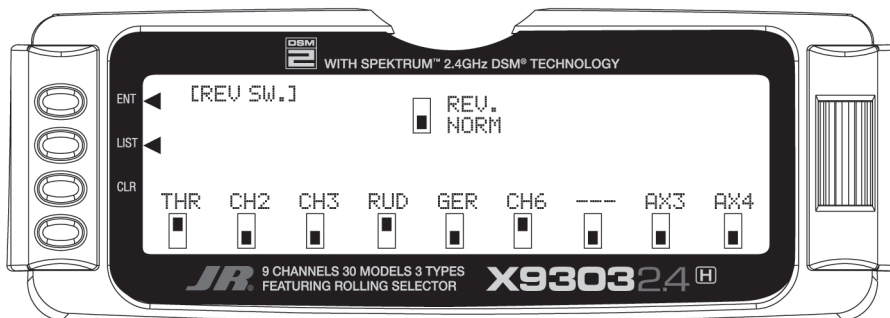
### C) D/R and EXPO Selection

Turn the power switch on, then press the ENT key to enter the function mode. Move the roll selector to highlight the D/R and EXPO function, then press the roll selector to enter the function. Set the Dual Rate and Expo values as desired, below are suggested settings. Press the LST key to return to the menu.



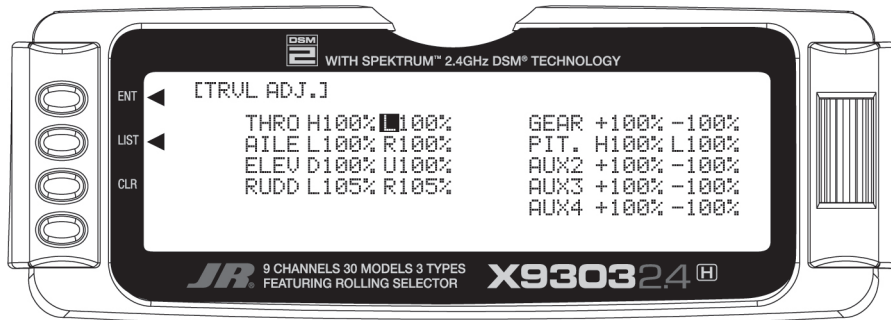
### D) Servo Reversing

Move the roll selector and highlight REV.SW on the screen, then press the roll selector to enter the function. Next, reverse channels 1, 4, and 6 by moving the Roll selector, and pressing as needed to change from NORM to REV. Press the LST key to return to the menu.



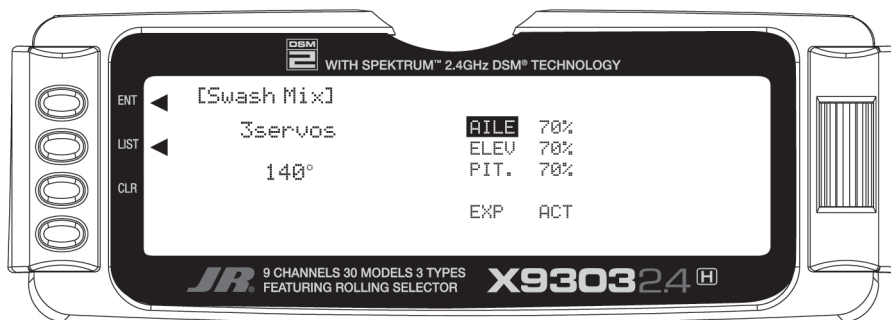
## E) Travel Adjustment

Move the roll selector until TRVL.ADJ is highlighted on the screen, then press the roll selector to enter the function. 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. Press the LST key to return to the menu.



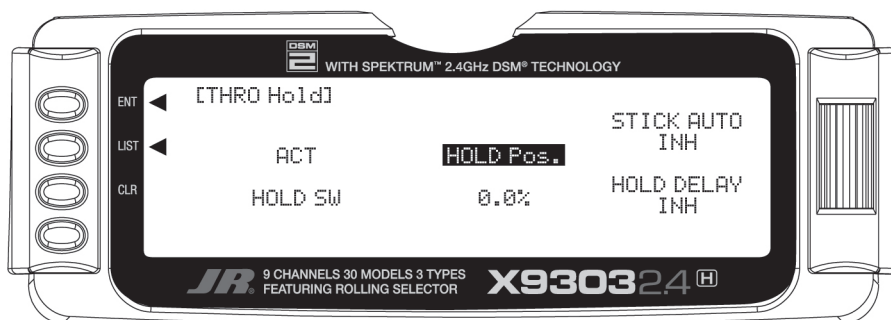
## F) CCPM Settings

Move the roll selector to highlight the SWASH MIX function, then press the roll selector to enter the function. Set the value of the aileron, elevator, and pitch functions from the factory default setting using the + and - keys. Press the LST key to return to the menu.



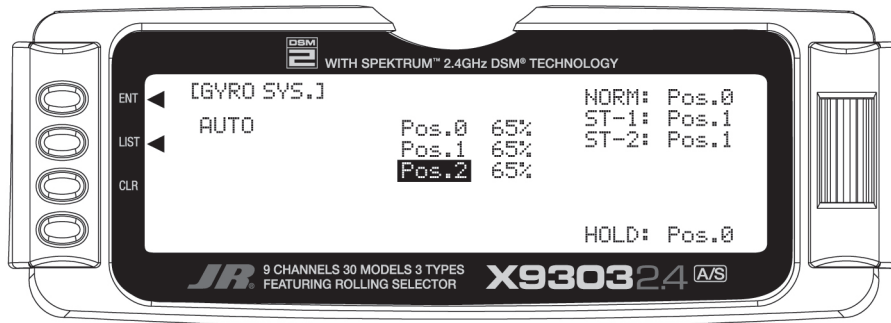
## G) Throttle Hold Setting

Move the roll selector to highlight the THRO HOLD function, then press the roll selector to enter the function. Activate the throttle hold function. Once the throttle linkage is set up, set the hold position in this function so that when the throttle hold switch is pulled, the throttle servo does not move with the throttle stick at idle and throttle trim set at the idle position. Press the LST key to return to the menu.



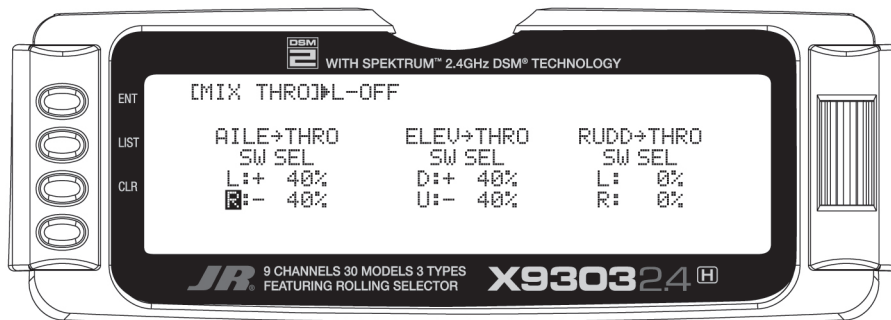
## H) Gyro Sensitivity Selection

Move the roll selector to highlight the GYRO function, then press the roll selector to enter the function. Set the gyro gain as shown as a starting point for the G770 3D gyro. Adjust the percentage as necessary when flying the heli. Other gyros may require different settings, consult your gyro manual for further information on setting the gain. Press the LST key to return to the menu.



## I) Mix to Throttle

Move the roll selector to highlight the MIX -> THRO function, then press the roll selector to enter the function. Set the Aileron to Throttle and Elevator to Throttle mixing as shown. This function is used to prevent the head speed from sagging during aerobatics. Adjust these values as needed in flight. This function is not required if using a governor. Press the LST key to return to the menu.





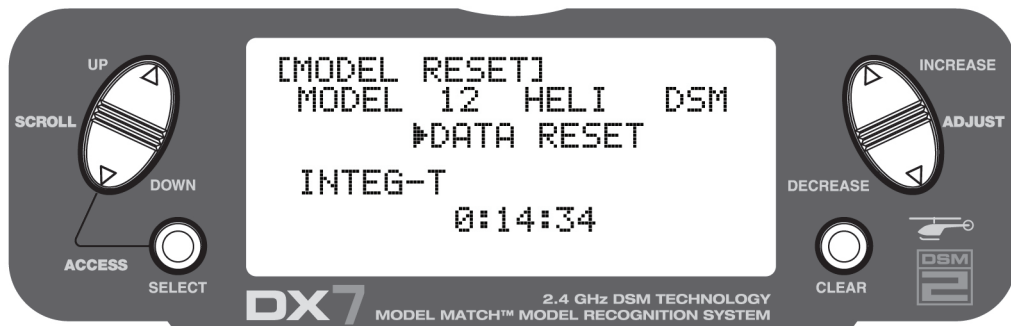
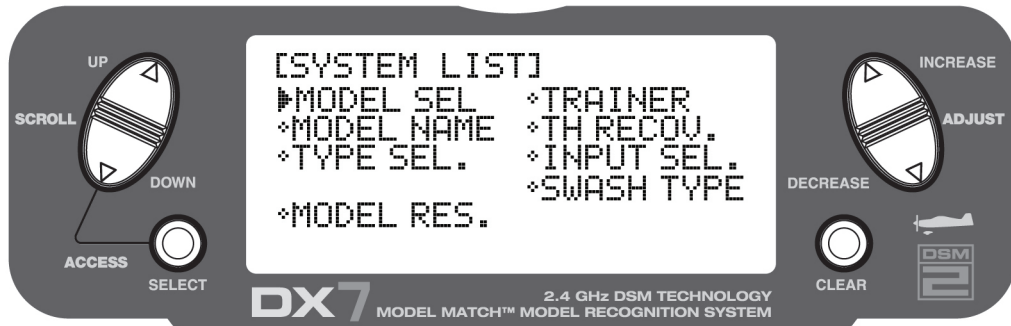
# JR 7202 AND SPEKTRUM DX7: PROGRAMMING

The following activation and setup procedure should be used for the JR 7202 and Spektrum DX7 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.

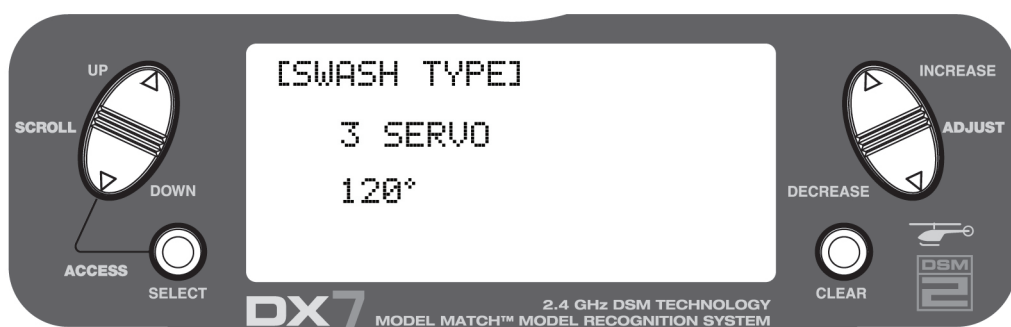
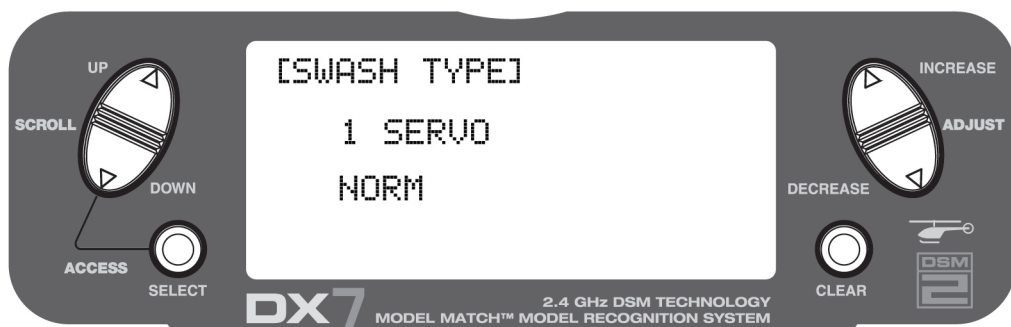
## A) Model Select/Data Reset

Press the Down and Select keys while turning the power switch on to enter the system mode. Next, move the cursor to the MODEL SEL function with the UP key. Select the desired model number to be used with the increase or decrease key. Next, press the UP key until MODEL RESET is displayed. Press the CLEAR key, then press YES to reset the data of the current model selected.



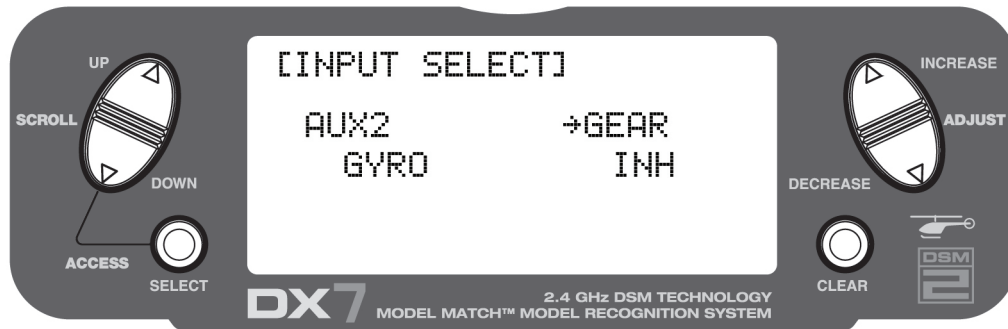
## B) CCPM Activation

Press the UP key until the SWASH TYPE function is displayed, then press the INCREASE key to select the desired 120 CCPM type as shown.



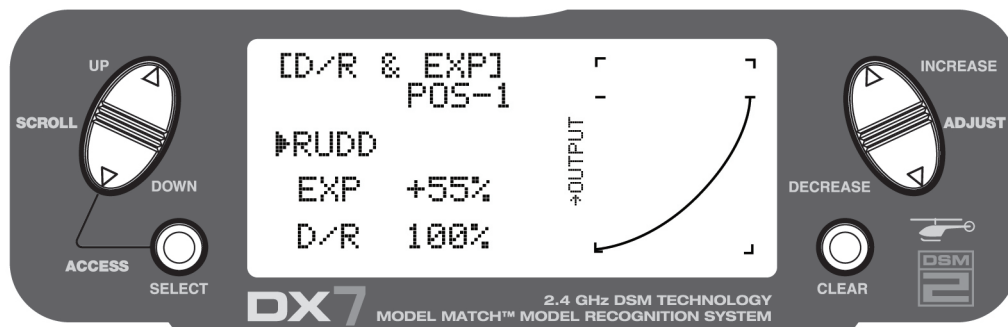
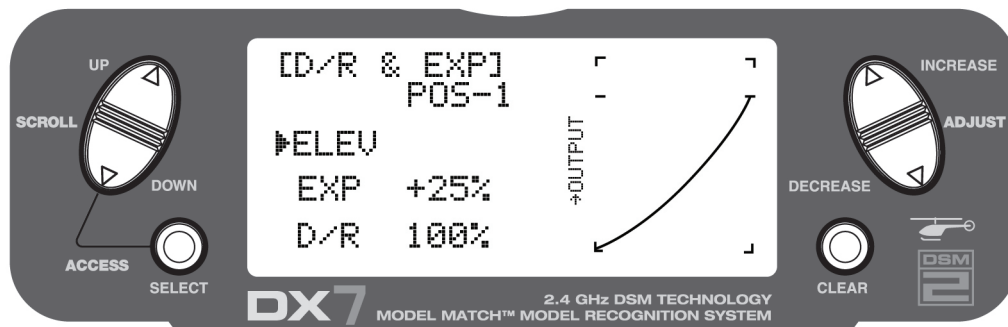
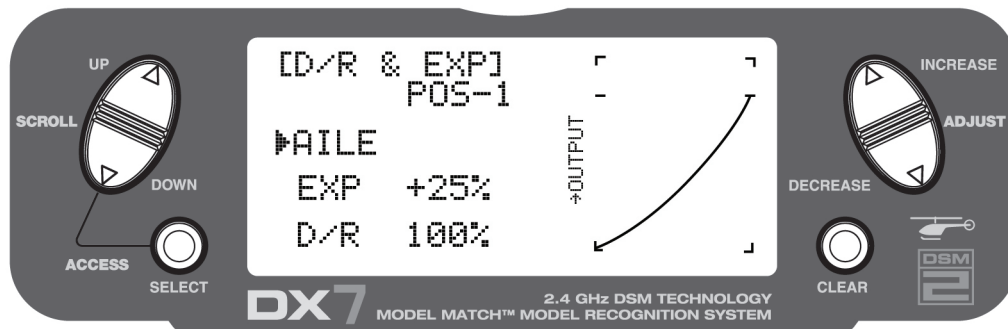
### C) Input Select function

Press the DOWN key until the INPUT SELECT function is displayed, then set AUX 2 to GYRO and GEAR to INH. (If channel 7 is not available for the GYRO function, select GYRO under gear and select INH under AUX 2.) Press the down and select keys together to exit the system menu.



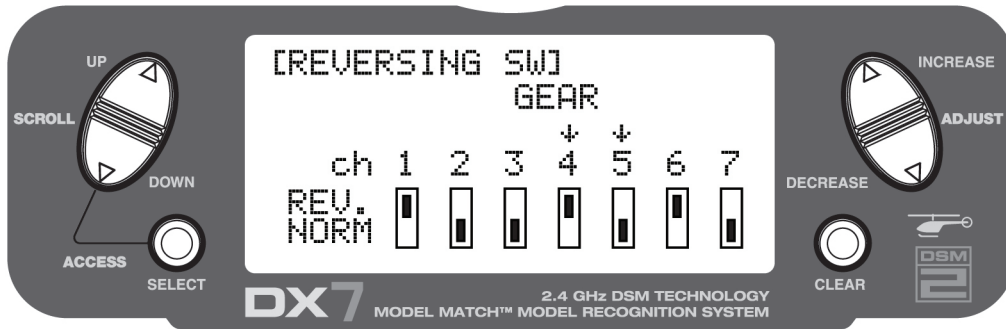
### D) D/R and EXPO Selection

Turn the power switch on, then press the DOWN and SELECT keys together to enter the function mode. Press the UP key to select the D/R and EXPO function. Set the Dual Rate and Expo values as desired, below are suggested settings.



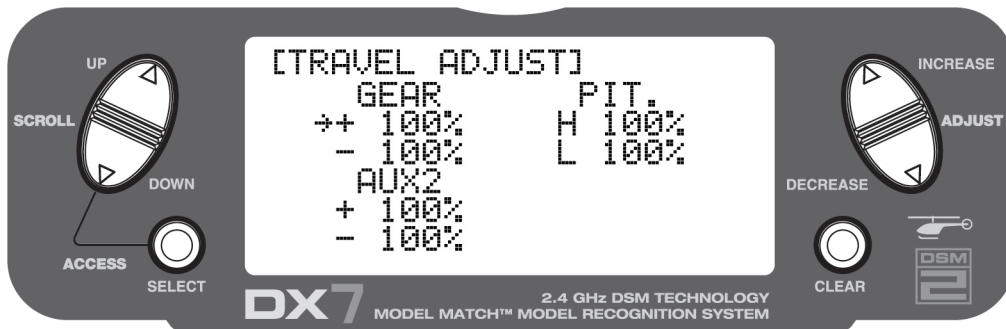
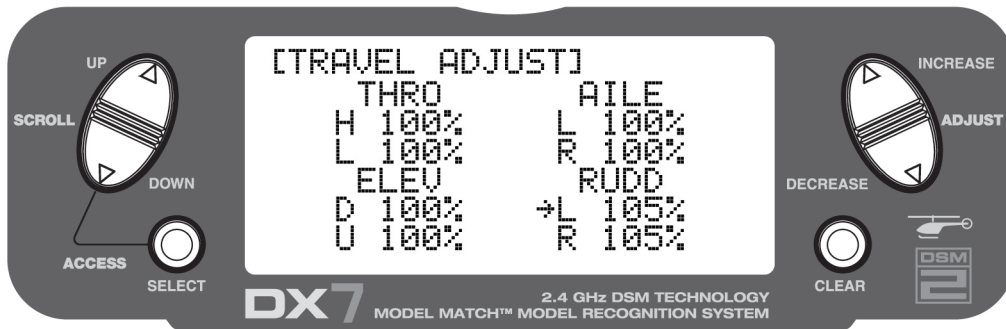
### E) Servo Reversing

Press the UP key to select the REVERSING function. Next, reverse channels 1, 4, and 6 by selecting the channel with the SELECT key, and pressing the INCREASE key as needed to change from NORM to REV.



### F) Travel Adjustment

Press the UP key to select the TRAVEL ADJUST function. Set the Travel Adjust values as shown as initial settings, 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.



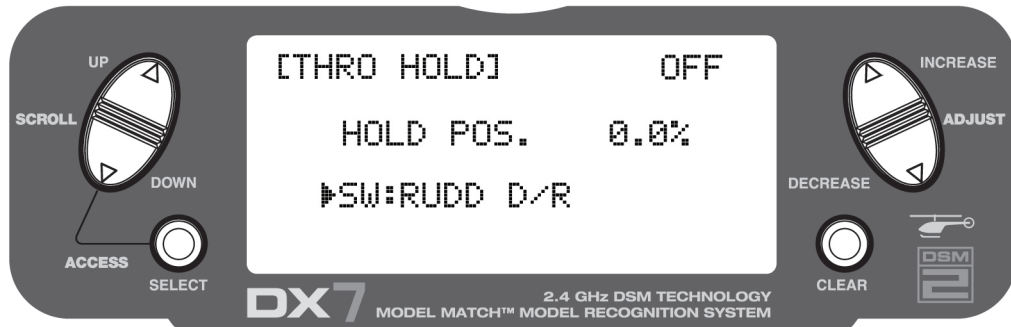
### G) CCPM Settings

Press the UP key to select the SWASH MIX function. Change the value of the aileron, elevator, and pitch functions from the factory default setting using the INCREASE key and selecting the channel with the select key to the values as shown.



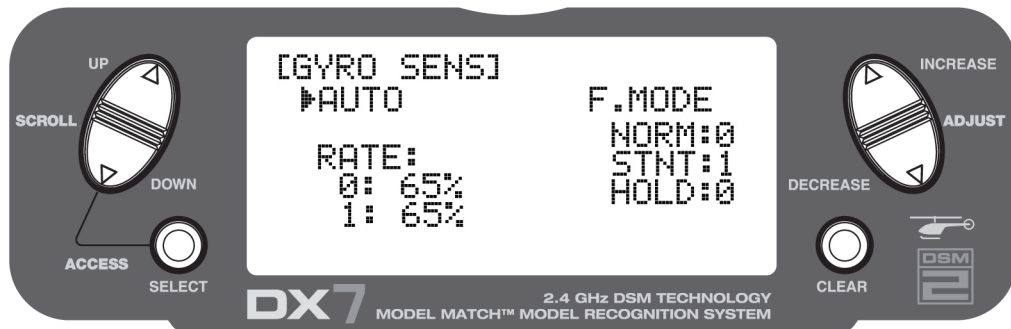
## H) Throttle Hold Setting

Press the UP key to select the THRO HOLD function. Press the INCREASE key to activate the function. Once the throttle linkage is set up, set the hold position in this function so that when the throttle hold switch is pulled, the throttle servo does not move with the throttle stick at idle and throttle trim set at the idle position.



## I) Gyro Sensitivity Selection

Press the UP key to select the GYRO SENS function. Set the gyro gain as shown as a starting point for the G770 3D gyro. Adjust the percentage as necessary when flying the heli. Other gyros may require different settings, consult your gyro manual for further information on setting the gain.



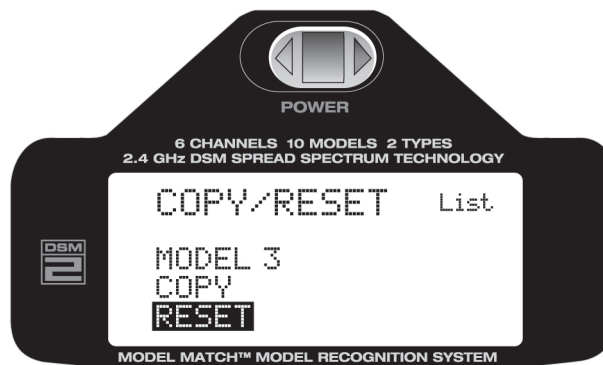
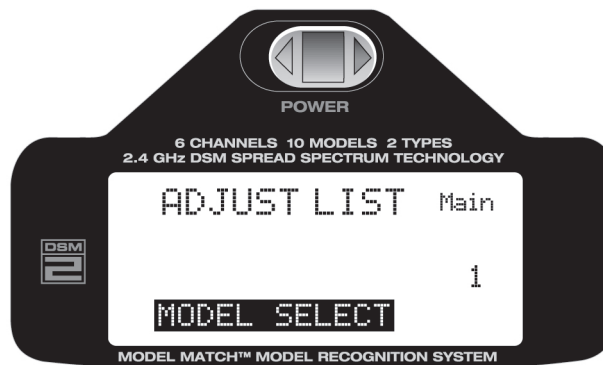
# SPEKTRUM DX6i SYSTEMS: PROGRAMMING

The following activation and setup procedure should be used for the Spektrum DX6i 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.

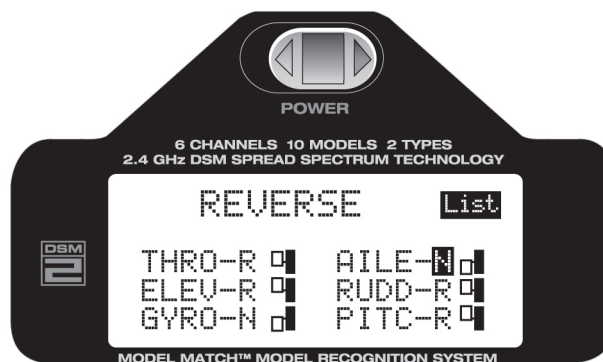
## A) Model Select/Data Reset

Turn the power switch on then press the roll selector to enter the Adjust List. 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. Move the roll selector to highlight SET UP LIST and press the roll selector. Then move the roll selector to highlight COPY / RESET, then press the roll selector. Move the roll selector to highlight RESET, press the roll selector, then press YES to reset the data of the current model selected.



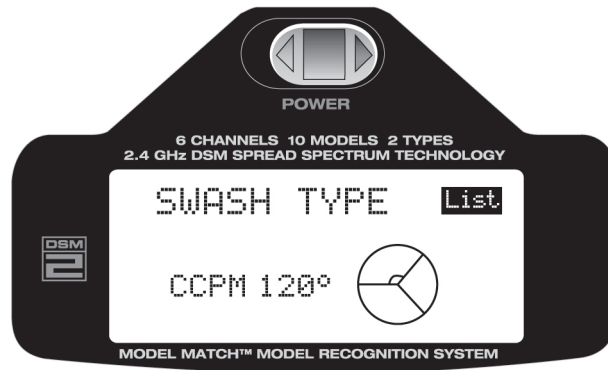
## B) Servo Reversing

Move the roll selector and highlight REVERSE on the screen, then press the roll selector. Next, reverse channels 1, 3, 4, and 6 by moving the Roll selector to highlight each channel, pressing the roll selector, then moving the roll selector to change to R from N as needed. After making each selection, press the roll selector to confirm the change, then proceed to the next channel. Move the roll selector to highlight LIST and press the roll selector to exit the function.



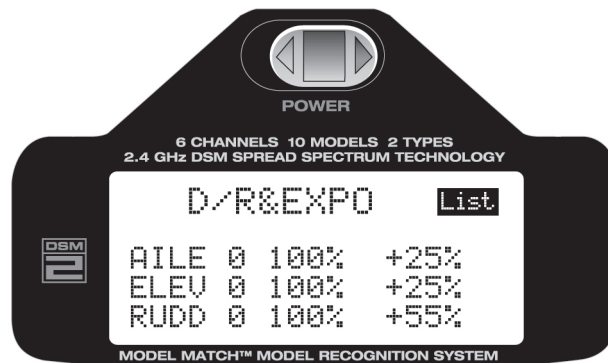
### C) CCPM Activation

Move the roll selector to highlight the SWASH TYPE function, then press the roll selector to access the swashplate type function. Move the roll selector to highlight the CCPM type, then press the roll selector to access the variations of CCPM mixing, then move the roll selector to select the 120 CCPM type. Move the roll selector to highlight LIST and press the roll selector to exit the function. Next move the roll selector to highlight ADJUST LIST and press the roll selector to access that menu. Move the roll selector to highlight LIST and press the roll selector to exit the function.



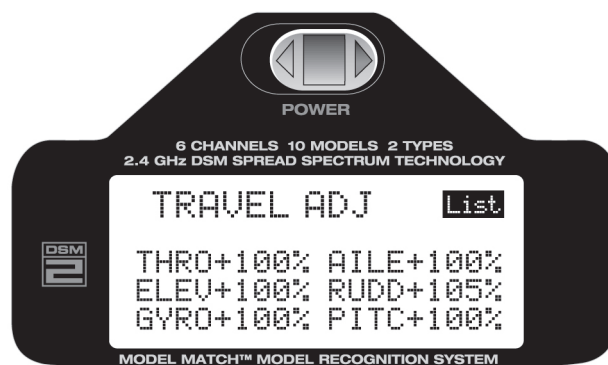
### D) D/R and EXPO Selection

Move the roll selector to highlight the D/R&EXPO function and then press the roll selector to enter the function. Set the Dual Rate and Expo values as desired, below are suggested settings. Move the roll selector to highlight LIST and press the roll selector to exit the function.



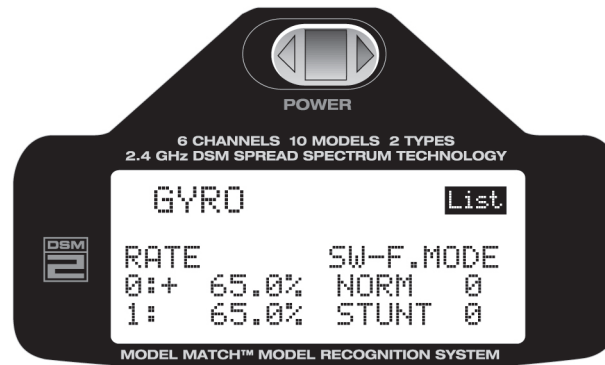
### E) Travel Adjustment

Move the roll selector until TRAVEL ADJ is highlighted on the screen, then press it to enter the function. 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. Move the roll selector to highlight LIST and press the roll selector to exit the function.



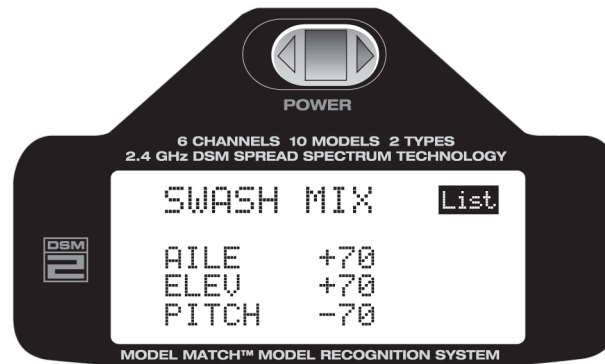
## F) Gyro Sensitivity Selection

Move the roll selector to highlight the GYRO function, then press the roll selector to enter the function. Set the gyro gain as shown as a starting point for the G770 3D gyro. Adjust the percentage as necessary when flying the heli. Other gyros may require different settings, consult your gyro manual for further information on setting the gain. Move the roll selector to highlight LIST and press the roll selector to exit the function.



## G) CCPM Settings

Move the roll selector to highlight the SWASH MIX function, then press the roll selector. Set the value of the aileron, elevator, and pitch functions from the factory default setting using the + and - keys. Move the roll selector to highlight LIST and press the roll selector to exit the function.



# 6-1

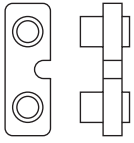
# SERVO INSTALLATION 1



Self-Tapping Screw, 2.6x12mm (12pcs)

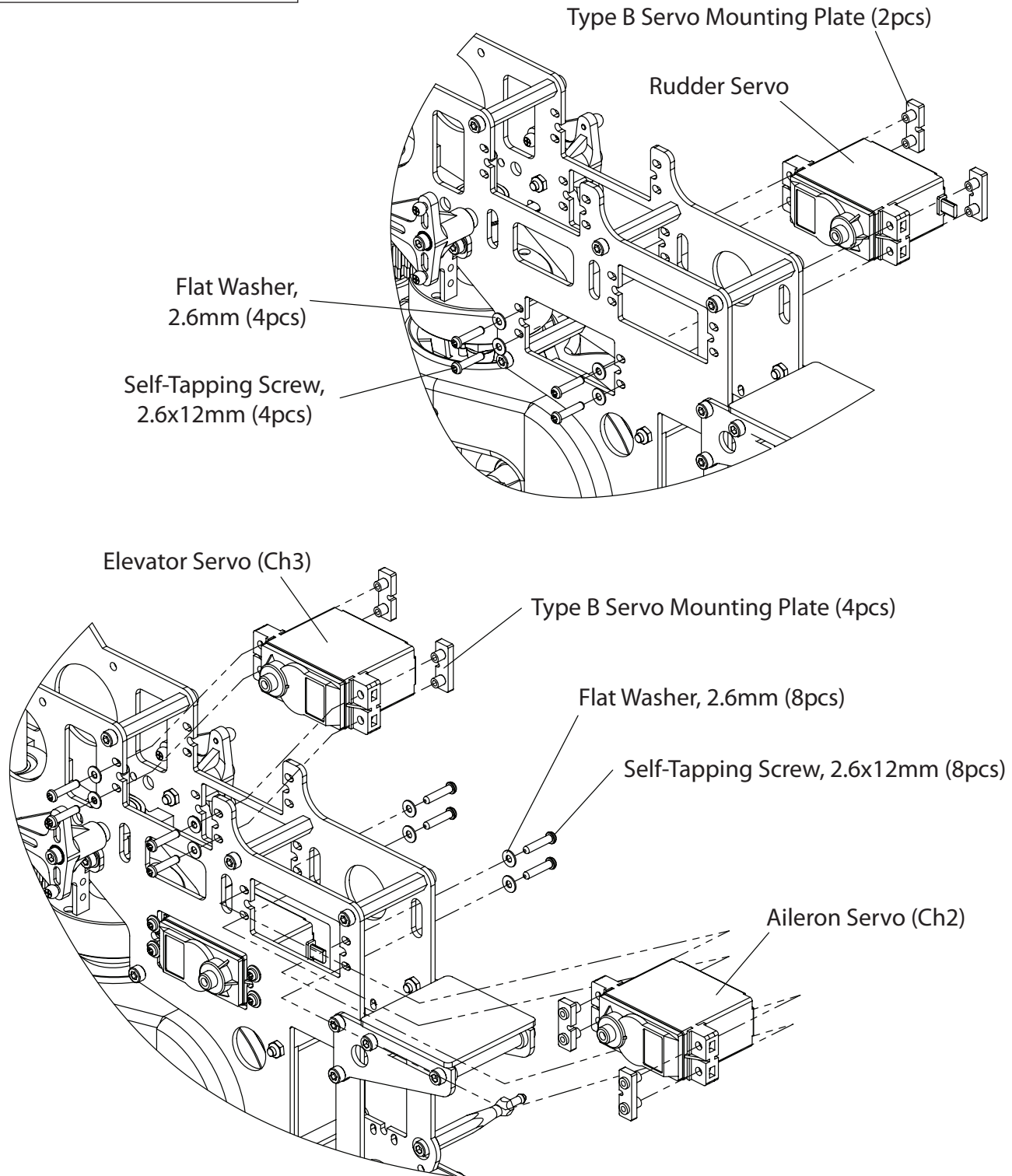


Flat Washer, 2.6mm (12pcs)

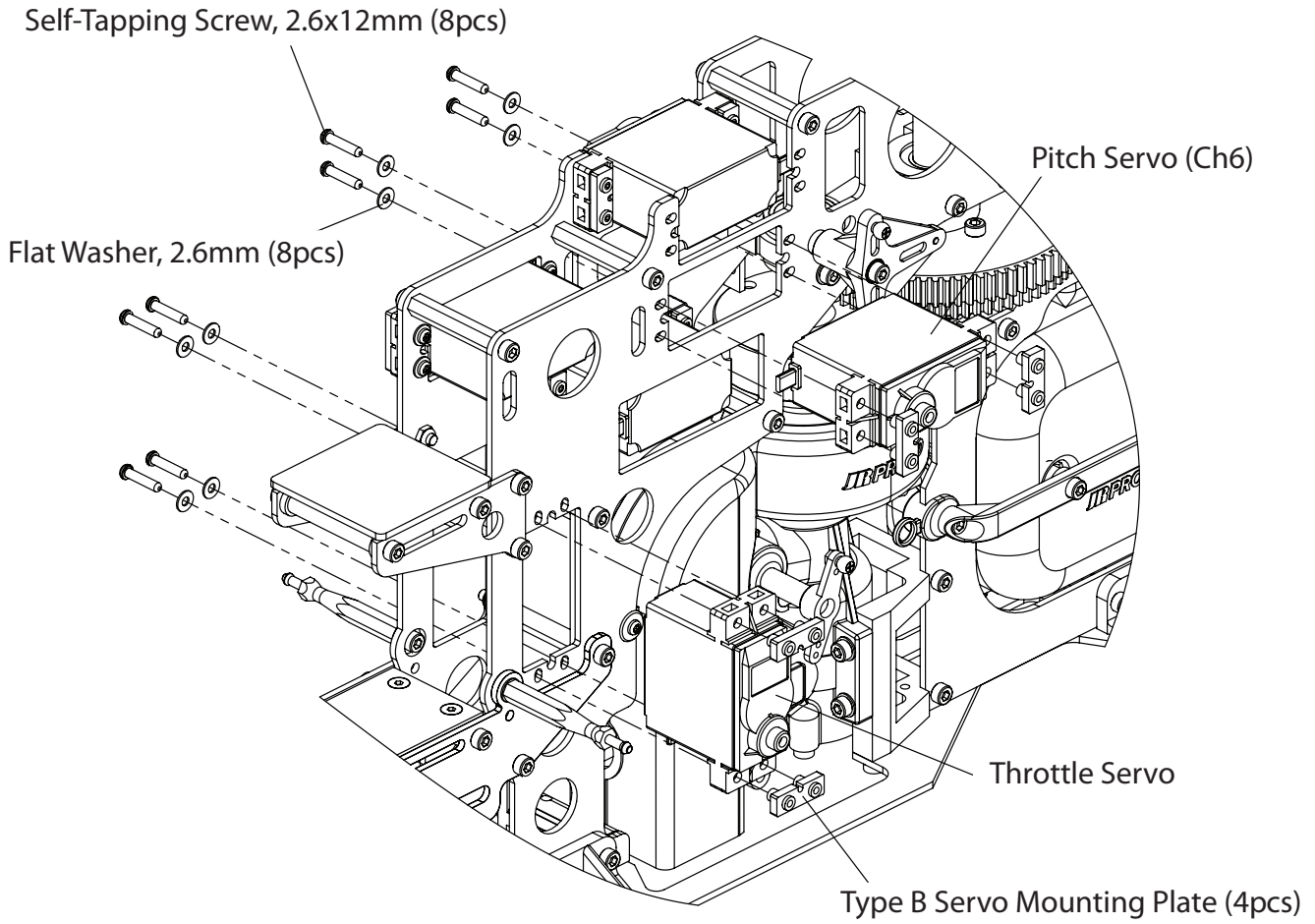
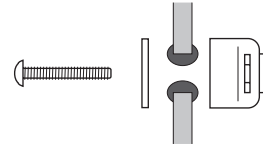
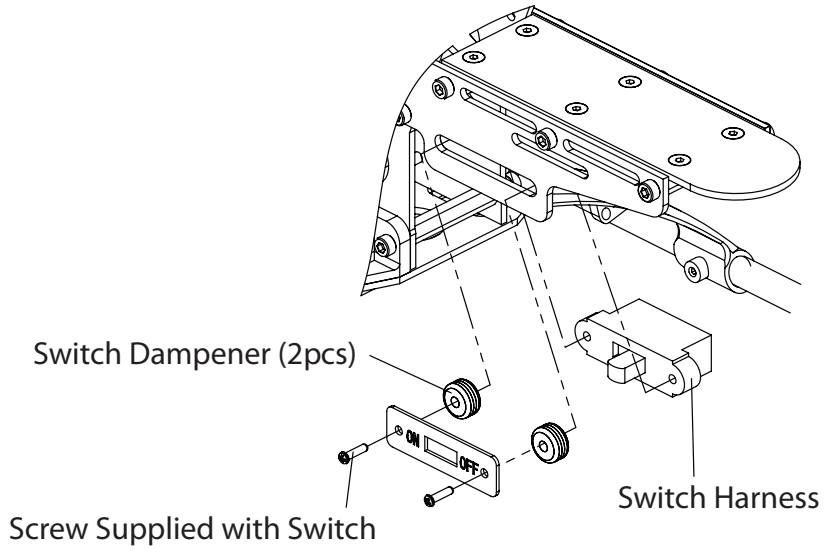
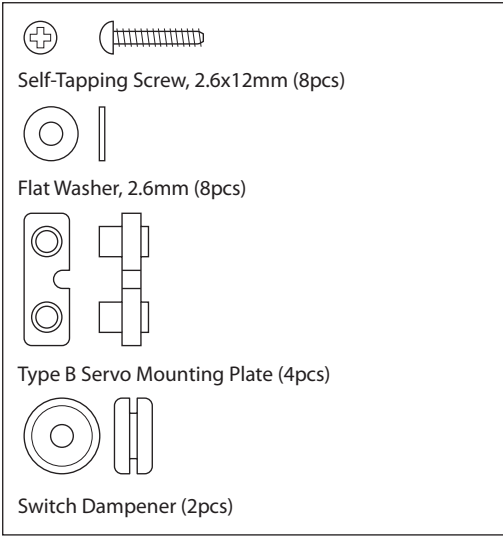


Type B Servo Mounting Plate (6pcs)

We recommend the same model be used for all Swashplate servos. Be careful when tightening the tapping bolt. If it is too loose, the servo will move. Over tightening it will cause damage. The ideal position will dent the rubber slightly. Be sure to note the direction of the Servos.









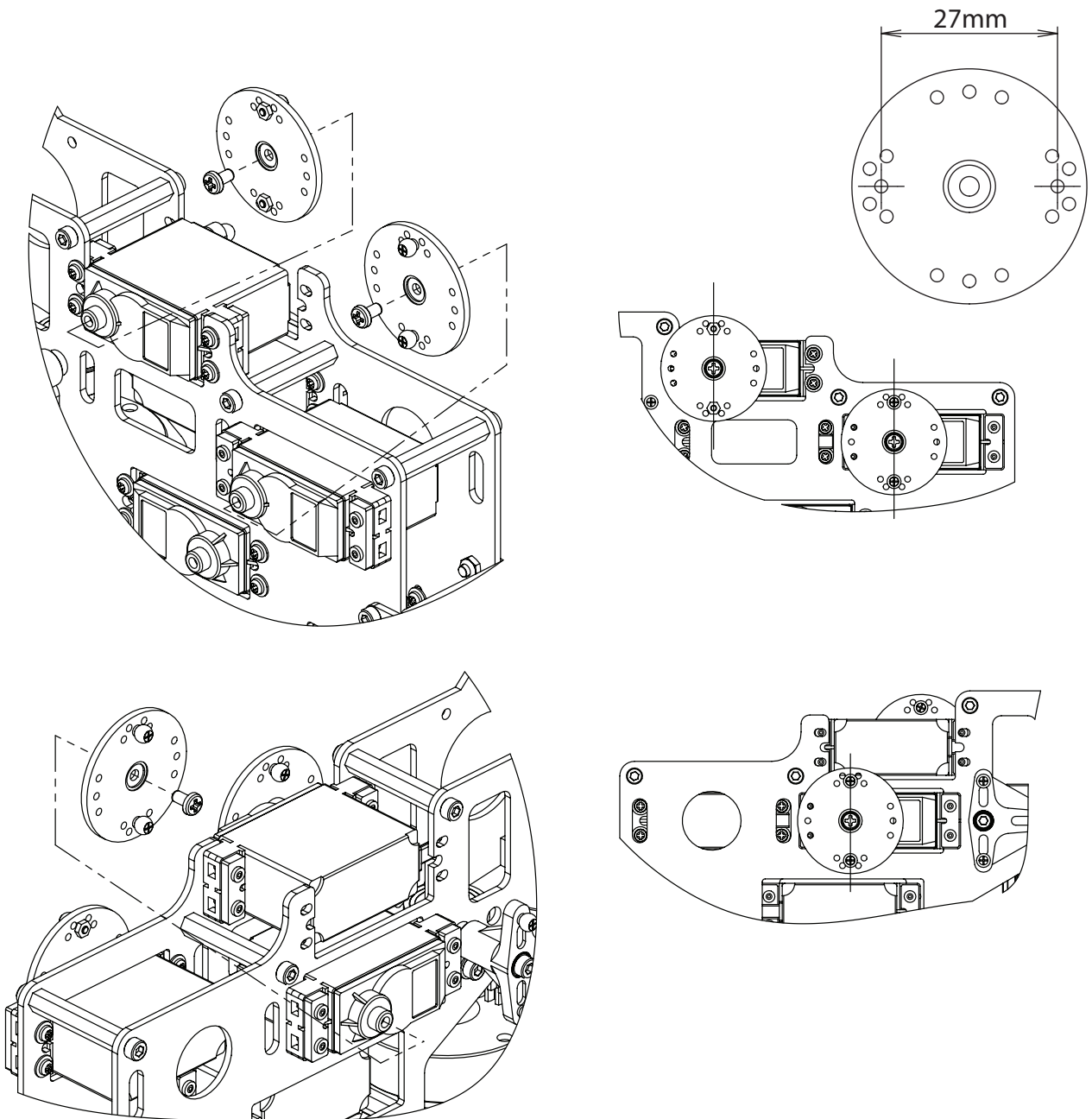
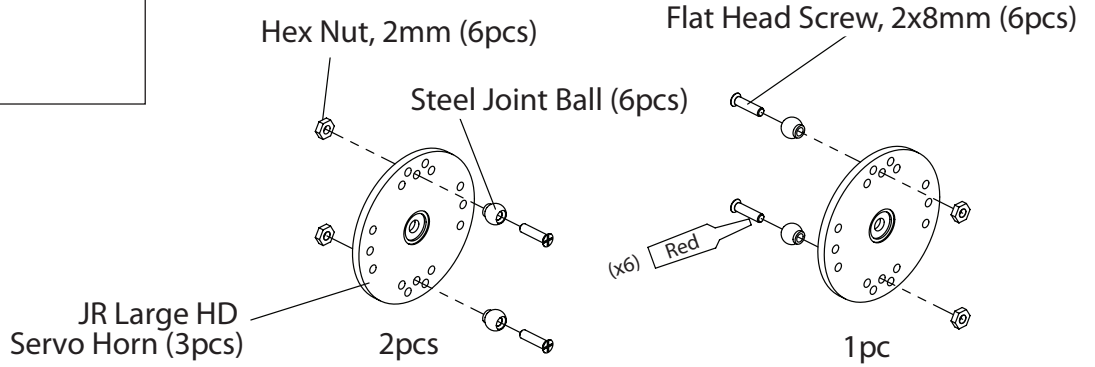




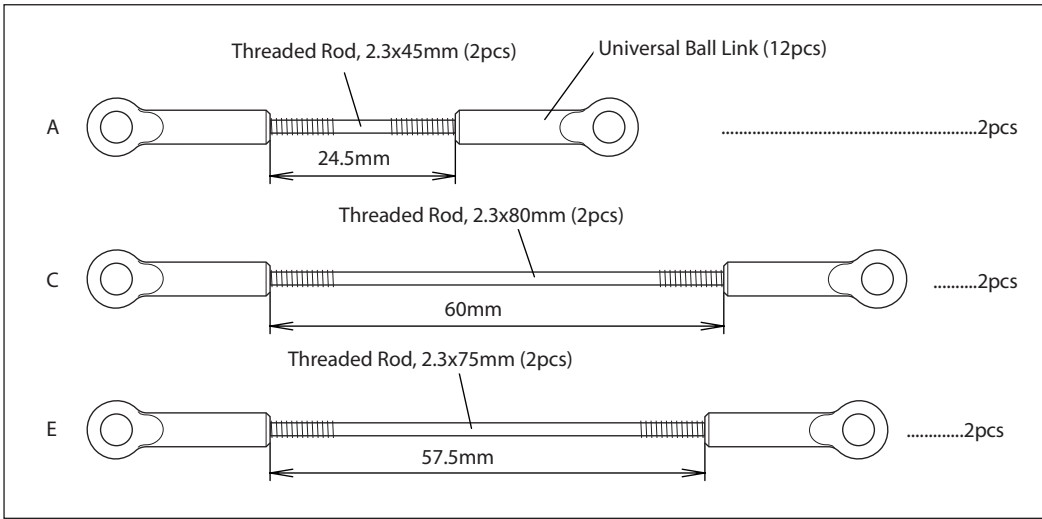
# 6-3

# SERVO HORN INSTALLATION

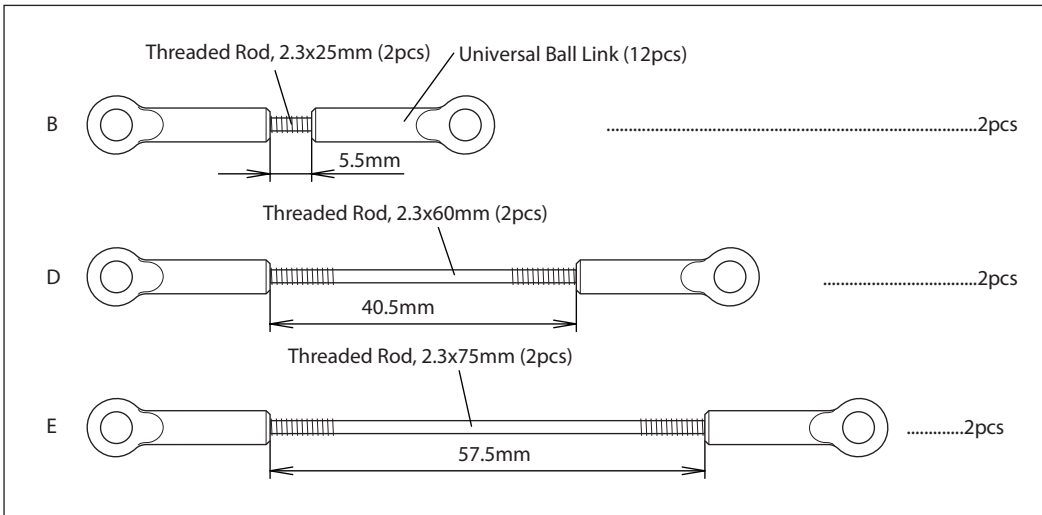
-    
Flat Head Screw, 2x8mm (6pcs)
-    
Steel Joint Ball (6pcs)
-    
Hex Nut, 2mm (6pcs)

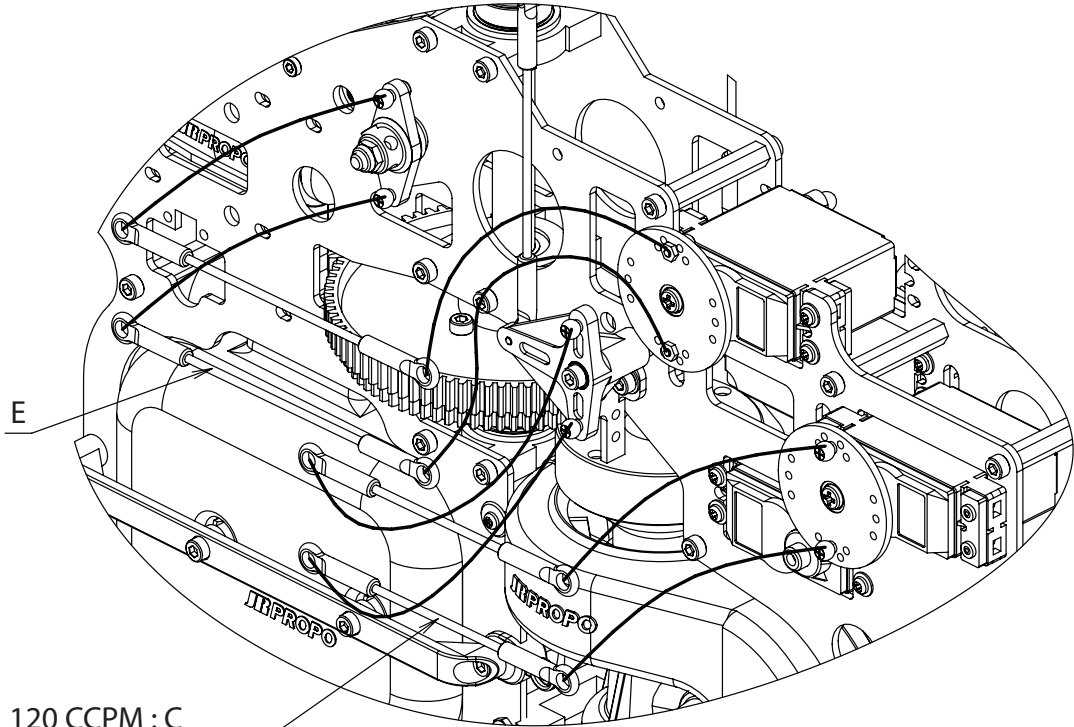


120 CCPM

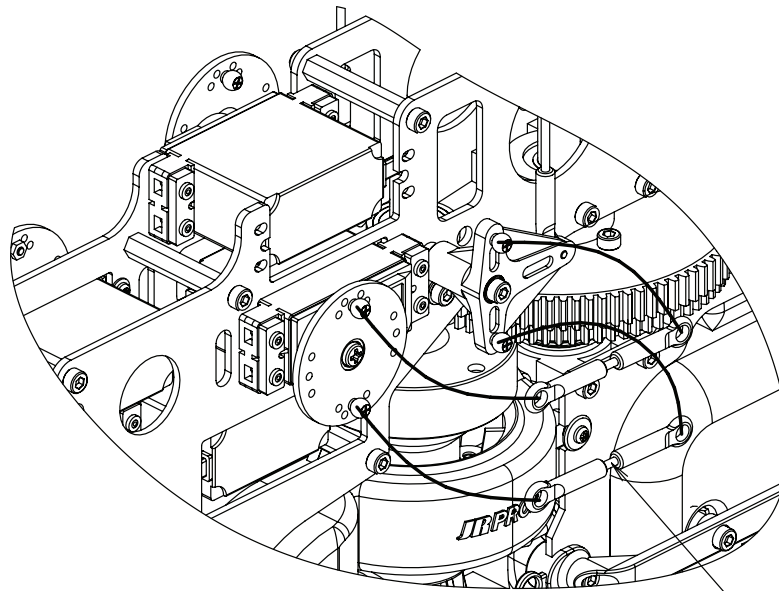


140 CCPM



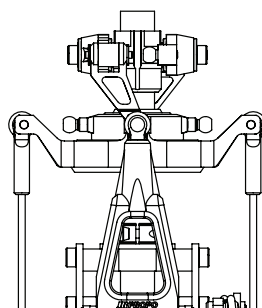
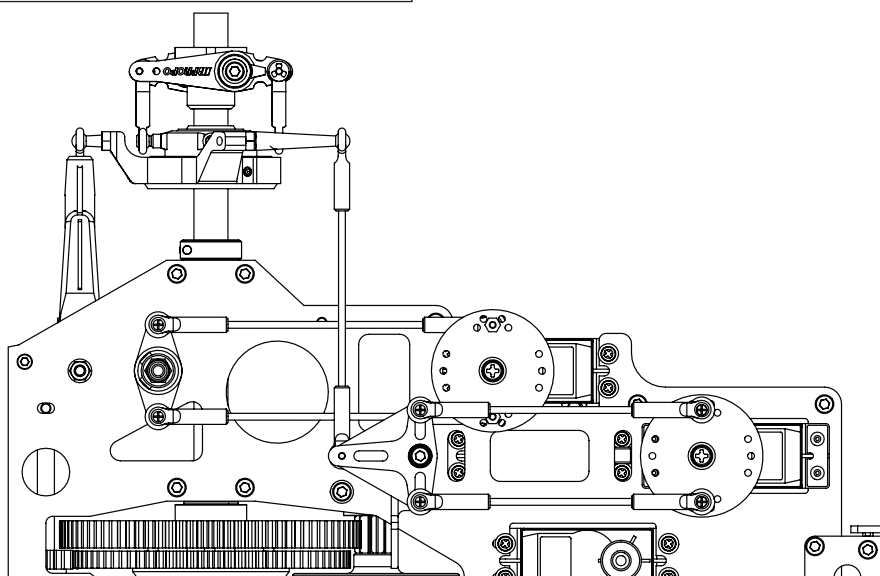
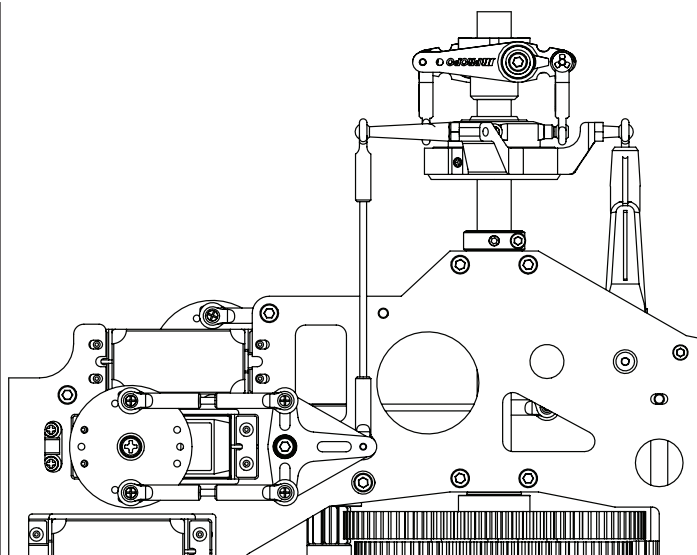


120 CCPM : C  
140 CCPM : D









120 CCPM : A  
140 CCPM : B

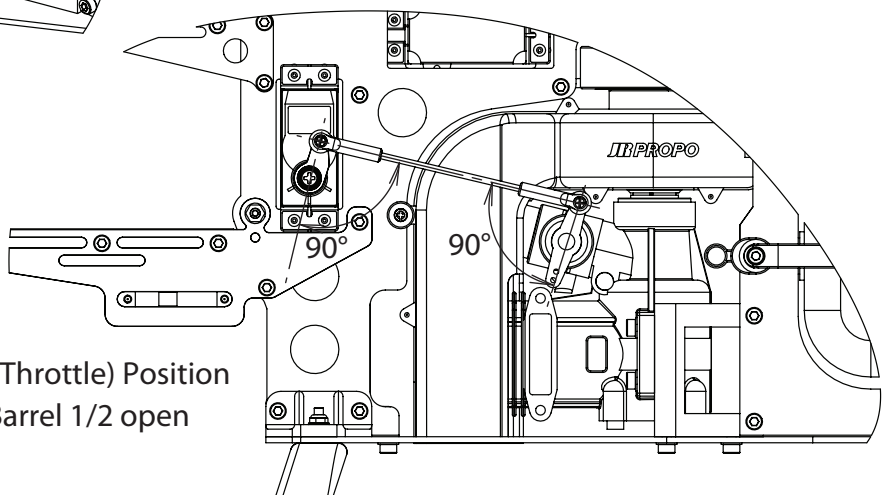
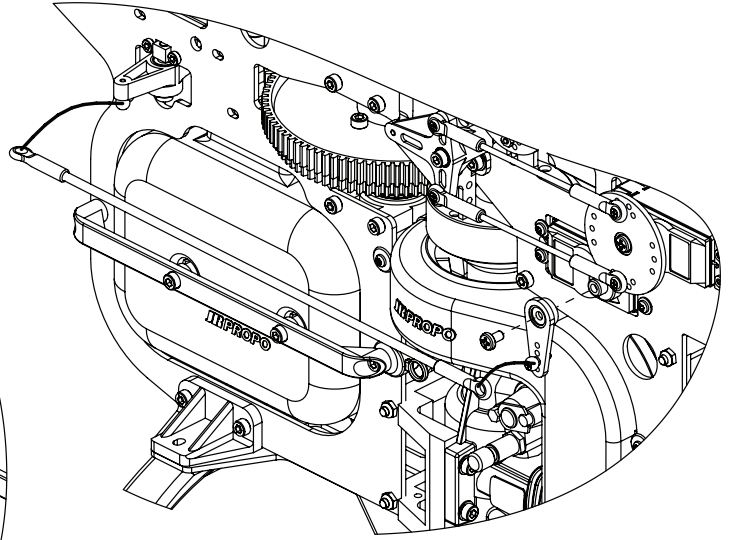
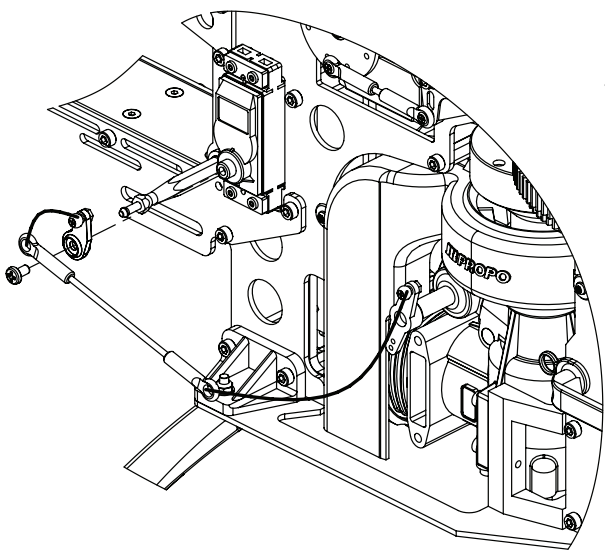
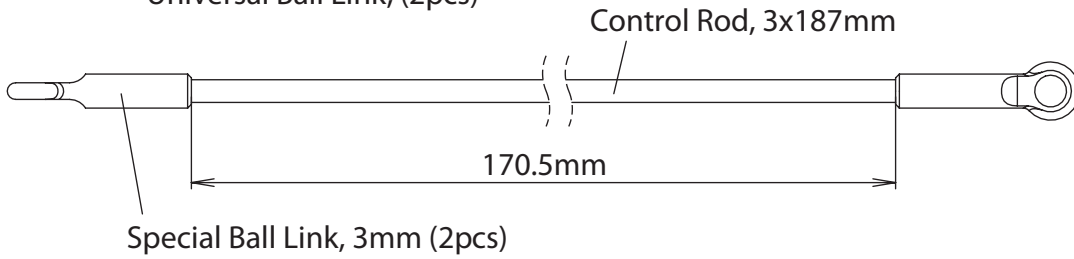
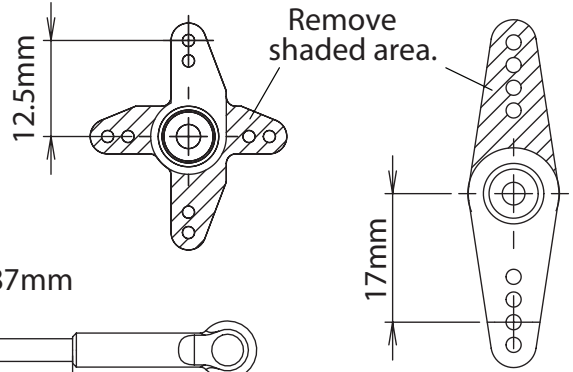
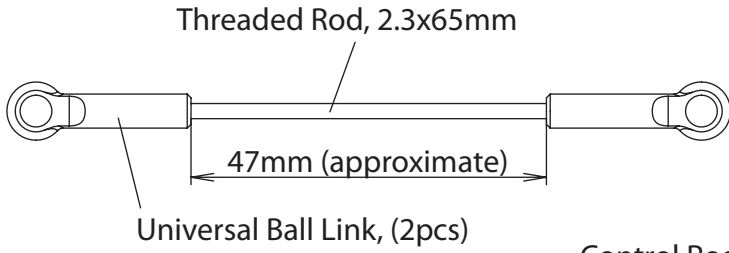
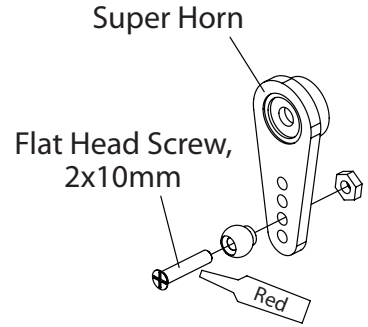
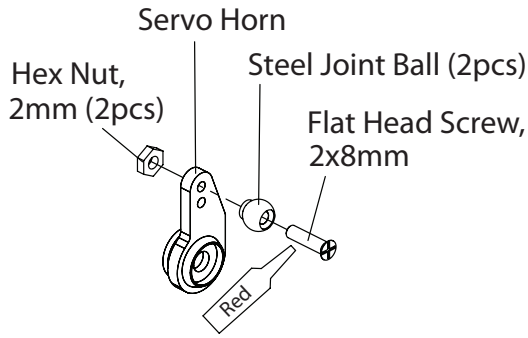
After the control linkages have been attached to the swashplate, it will be necessary to check the swashplate to ensure that it is level. To do this, turn on the radio system and place the collective stick in the center position as before. Next, check to make sure that all trim levers and knobs are also in their center position. Check to ensure that the servo arms are parallel to the servos as adjusted in the previous step. If the servos are not parallel, please adjust the sub trim function in the radio system 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 ensure 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 ensure 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 ensure 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 ensure that it is adjusted to the correct length.

Only minor adjustments should be made to the lengths of the control linkages at this time. Any major adjustments indicate either incorrect linkage lengths or incorrect servo arm positioning. If the control linkage lengths are altered from the recommended lengths more than one or two turns, this will have a great effect on the range and settings of the collective pitch in later steps.

-  Flat Head Screw, 2x10mm (1pc)
-  Flat Head Screw, 2x8mm (1pc)
-   Steel Joint Ball (2pcs)
-   Hex Nut, 2mm (2pcs)

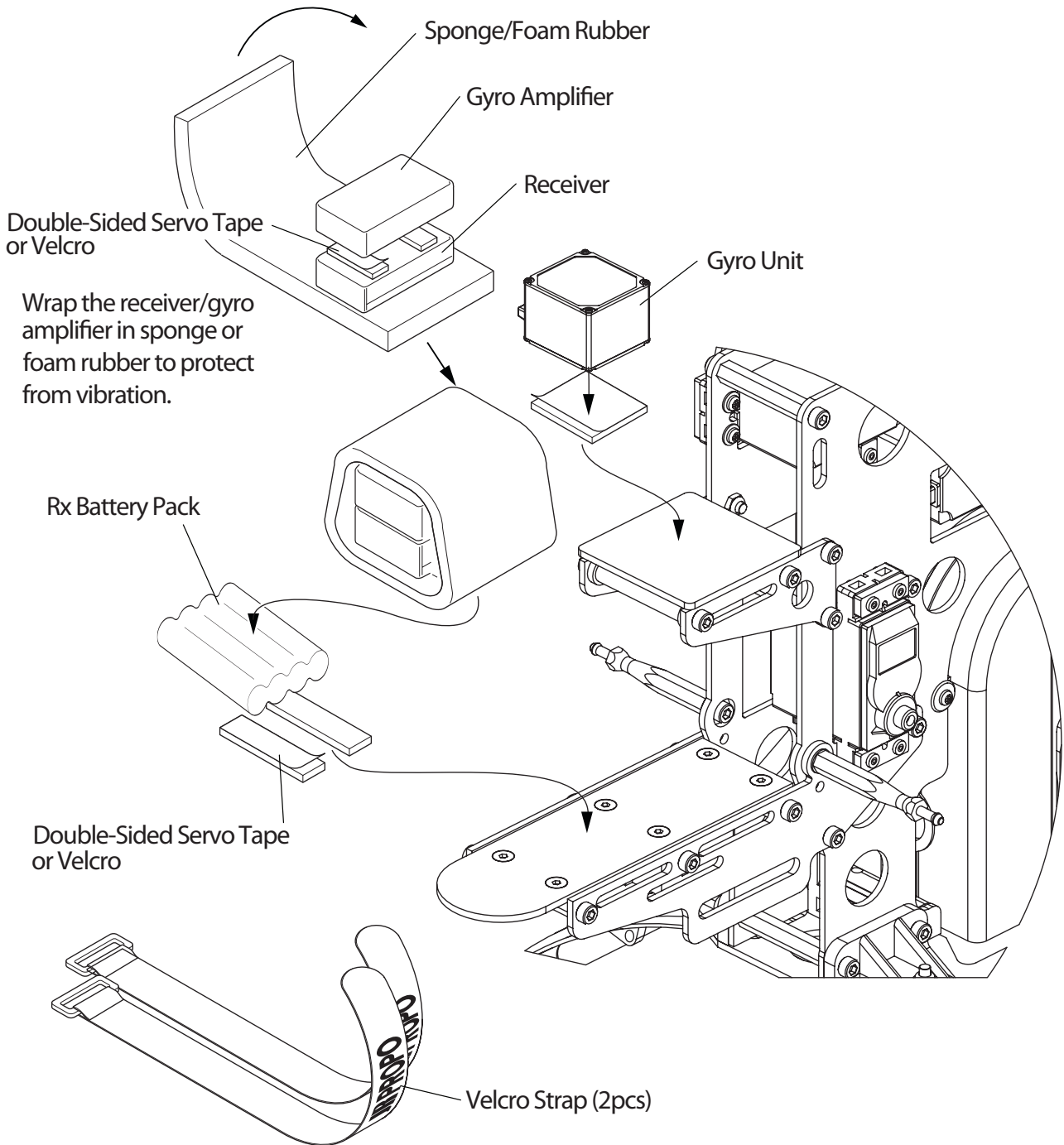


1/2 Stick (Throttle) Position  
Throttle Barrel 1/2 open

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.

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

Use Velcro strap that are included in this kit to fix it.



# GENERAL RADIO SETUP INFORMATION

## THROTTLE ARM/SERVO HORN POSITIONS

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.

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.

## CCPM SERVO CENTERING WITH THE SUB-TRIM FUNCTION

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. Adjust the sub-trim percentages through the radio system as necessary to make the servo wheels center properly. With proper servo arm positioning, little to no sub trim will be required.

## 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 and make sure the swashplate is level. 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 the next step.

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

In this condition, we suggest that the travel value for the left servo be increased 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 decreased slightly and retested. In most cases, it will require only the adjustment of the left or right servo to correct this situation. Once this condition has been corrected, repeat this procedure for the center-to-low collective pitch position and adjust as needed.



## 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 step. 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 backward as the collective has been increased to full high pitch. This would indicate that the top servo's maximum travel is less than that of the two left/right servos.

In this condition, we suggest that the travel value for the rear servo be increased 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.*



# FINAL SERVO ADJUSTMENT AND RADIO SETUP

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 ensure that all servos have been set to the correct direction.

## 2. 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.

## 3. Pitch/Throttle Curve Adjustment

It is very important that 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 -12, and your maximum positive pitch will be +12.

The maximum pitch range that you will require will be 24° 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 earlier.

Please refer to the CCPM activation section 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 pitch range positive and negative 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.

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 AND CURVE SETTINGS

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

## 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.

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.

## Gyro Gain Adjustment (All Gyros)

Please refer to your Gyro's instruction manual for proper gain settings.

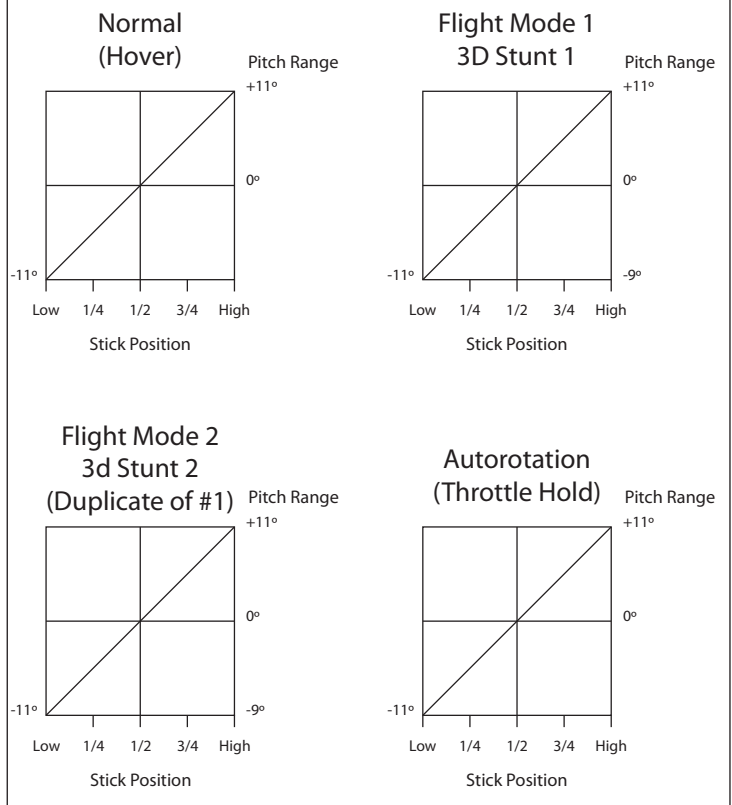
## Gyro Direction

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 right. If the arm moves in the opposite direction, reverse the gyro and re-test. Generally with the G770 3D gyro, it will be necessary to reverse the direction of the gyro with the switch on the gyro.

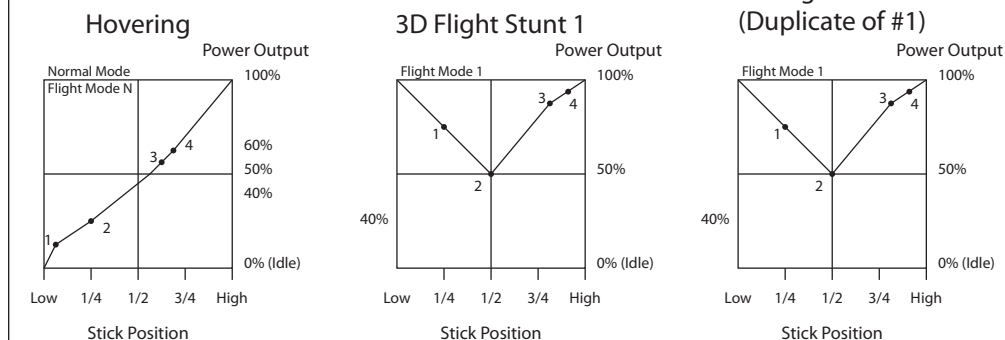
## Pitch Range Settings

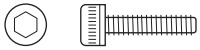
Flight Mode	Application	Low Pitch (Low Stick)	Hovering Pitch (Half Stick)	High Pitch (High Stick)
N	Hovering	-11°	0°	+11°
1	3D Flight #1	-11°	0°	+11°
*2	3D Flight #2	-11°	0°	+11°
H	Autorotation	-11°	0°	+11°

## Pitch Curve Settings



## Throttle Curve Settings





Socket Head Bolt, 3x12mm (2pcs)



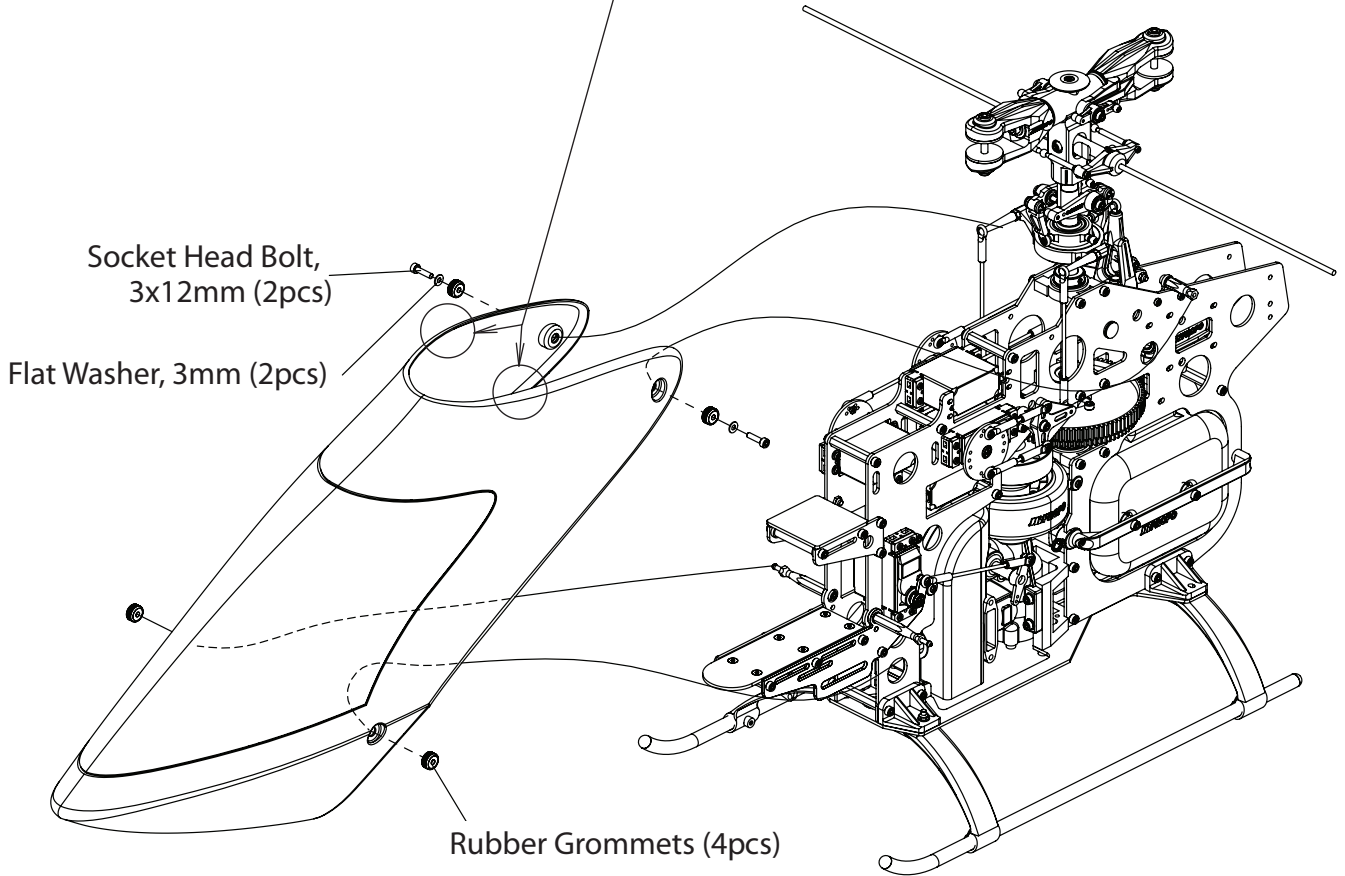
Flat Washer, 3mm (2pcs)



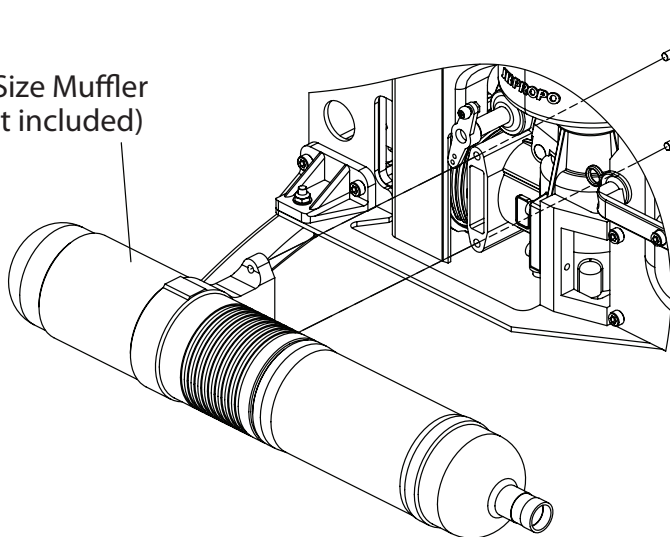
Rubber Grommets (4pcs)

**Tip:** Carefully cut out decals from provided decal sheet. Use a spray bottle w/two drops of dish soap and water to allow repositioning of the decals. Refer to the page 70 for decal placement.

In case the body interfere the linkage of swashplate, please sandpaper the body little bit to prevent it.



50-Size Muffler (not included)



Muffler Bolts (not included)

## FINAL PREFLIGHT CHECK

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Once all assemblies have been completed, please review the following suggestions before attempting initial flights.

- Review the instruction book and confirm that all assembly steps have been completed thoroughly.
- Check to ensure that all servos are operating smoothly and in the correct direction. Also verify that there is no binding in the control rods and that each servo horn is secured with a servo horn mounting screw.
- Check to ensure that all bolts and screws have been completely tightened and secured with threadlock where indicated.
- Verify that the gyro is operational and compensating in the correct direction.
- Make sure that both the transmitter and receiver have been fully charged (refer to your radio system instructions for proper charging procedures).
- Check to ensure that the throttle is working properly and in the correct direction.

## BLADE TRACKING ADJUSTMENT

---

Blade “tracking” is an adjustment to the main rotor blade pitch that must be accomplished during the initial test flights.

Although the blade pitch angle in each blade may appear equal, it is still possible for a set of main rotor blades to run “out of track,” making adjustment necessary.

Main rotor blades that are out of track with one another can cause vibration, instability and a loss of power due to additional drag.

On the initial flight, it will be necessary to increase the blade speed to just before lift-off rpm and view the rotor disc at eye level from a safe distance (approximately 15 to 20 feet).

Note which blade is running low (by colored tracking tape) and increase the pitch of the low blade one turn of the ball link at a time until each blade runs in track (on the same plane).

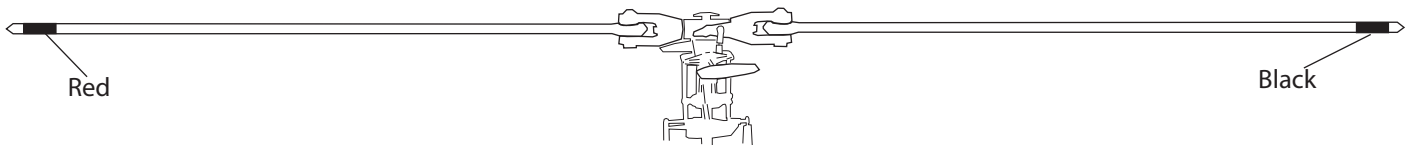
Please refer to the diagrams on the following page to identify the different tracking situations, as well as methods to mark each rotor blade for tracking identification.

# BLADE TRACKING IDENTIFICATION

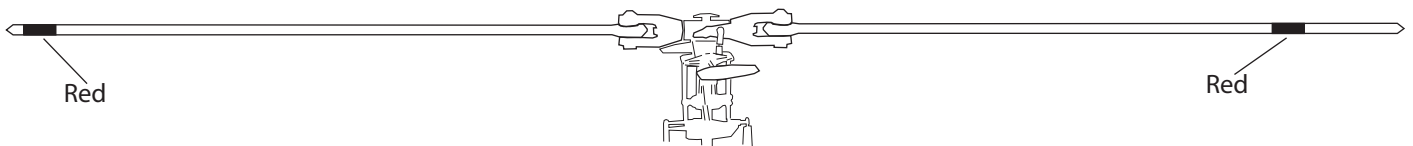


**Caution:** Be sure to maintain a safe distance from the helicopter (15 to 20 feet) when tracking main rotor blades.

## Blade Labeling for Tracking Purposes



A: Use two different blade tracking tape colors (e.g., black and red) at the tip of each main rotor blade.



B: Use the same color blade tracking tape located at different positions on each rotor blade.

**Note:** Adding additional blade tracking tape to the rotor blades at this stage will make it necessary to re-static balance the main rotor blades.

# GENERAL MAINTENANCE

## Engine

After each day of flying, fully drain the fuel tank. Then start the engine and let it idle until the engine and the fuel line are completely burned off. It is also suggested that an after-run oil be used to prevent premature engine corrosion.

## Check All Nuts and Bolts

A helicopter is subject to high vibration during flight. It is important to check that all screws, nuts and bolts are properly secured after each day of flying. It is also suggested that you perform a "quick" inspection between each initial test flight for approximately the first 6 to 10 flights.

## Main Rotor Head

It will be necessary for the main rotor head dampers to be checked/and or replaced every 30–50 flights to maintain maximum rotor head performance.

When replacing the main rotor head dampers, apply a light coating of oil to the dampers to prolong life.

It is also suggested at this time that the rotor head thrust bearings be lubricated using a high speed grease. This will prolong the visibility of the thrust bearings.

## Tail Gear Case

The tail gear case should be repacked with grease every 50 or so flights. The tail pitch slider and mechanism should be lightly oiled every 5–10 flights to help reduce wear.

## Washout Base

Lubricate the washout base using light oil every 10–15 flights to ensure smooth operation and reduce wear. Inspect the washout base every 50–75 flights. If excessive wear is noted, replace as needed.

## Tail Pitch Slider

Lubricate the tail pitch slider using light oil every 5–10 flights to ensure smooth operation and reduce wear.

## Check Ball Link Wear

Check to ensure that all universal links fit freely but securely to the control balls. If there is excessive play noted, adjust and/or replace the universal link in question.

## Battery Maintenance

Check to ensure that your batteries are properly mounted and charged. The most frequent cause of crashes (aside from pilot error) is battery failure or disconnection. Be certain that your batteries are fully charged and limit your flight time to 3 or 4 flights between charging. If more flight time is required, purchase a reliable quick field charger.

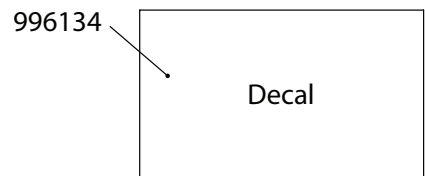
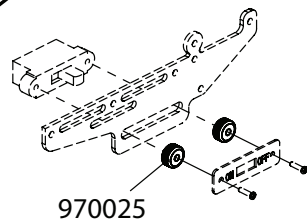
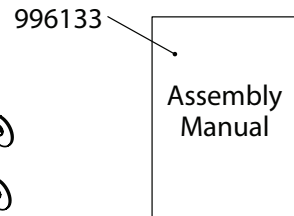
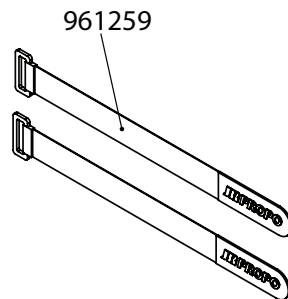
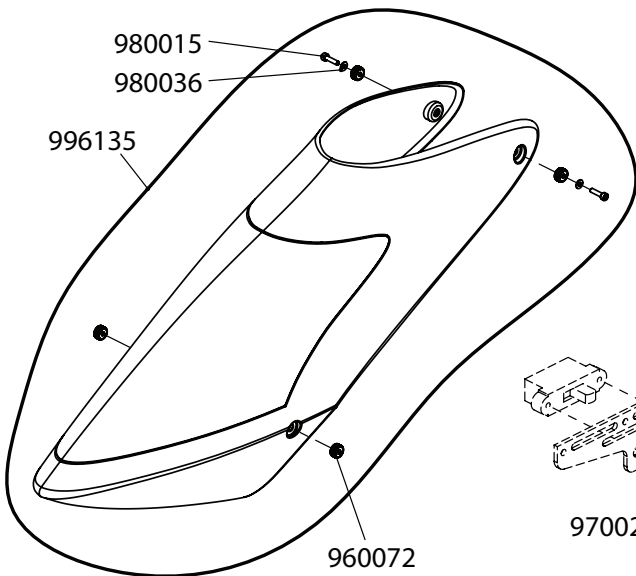
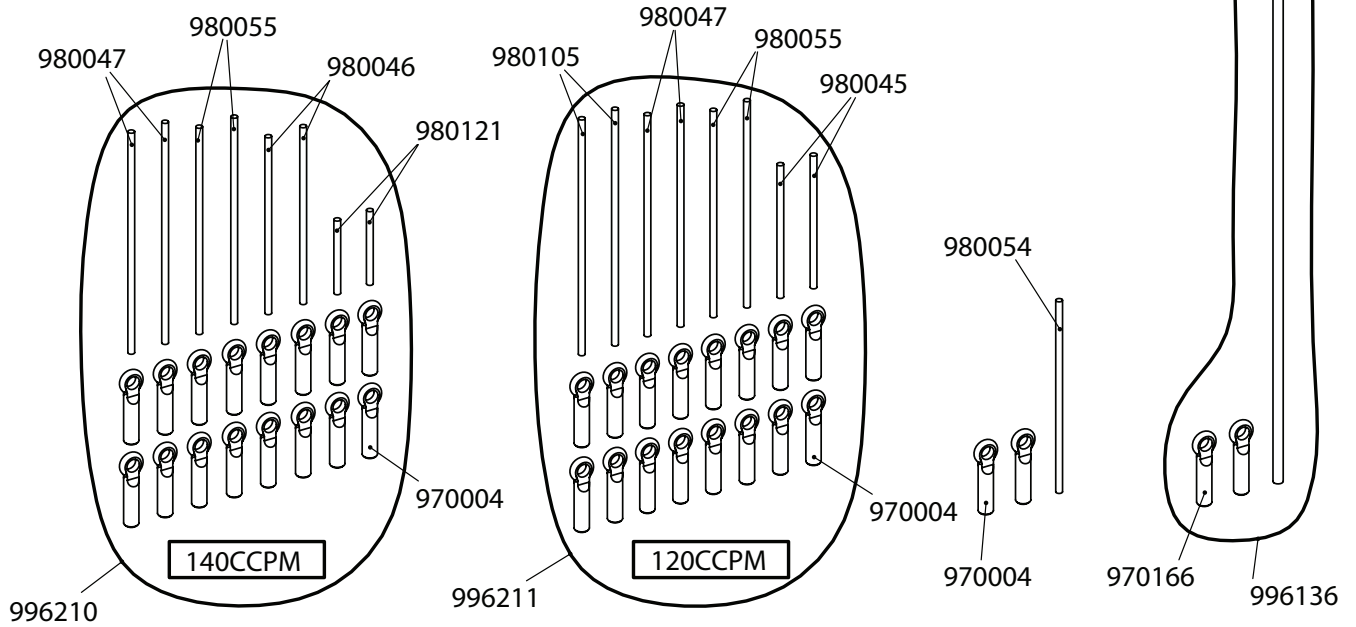
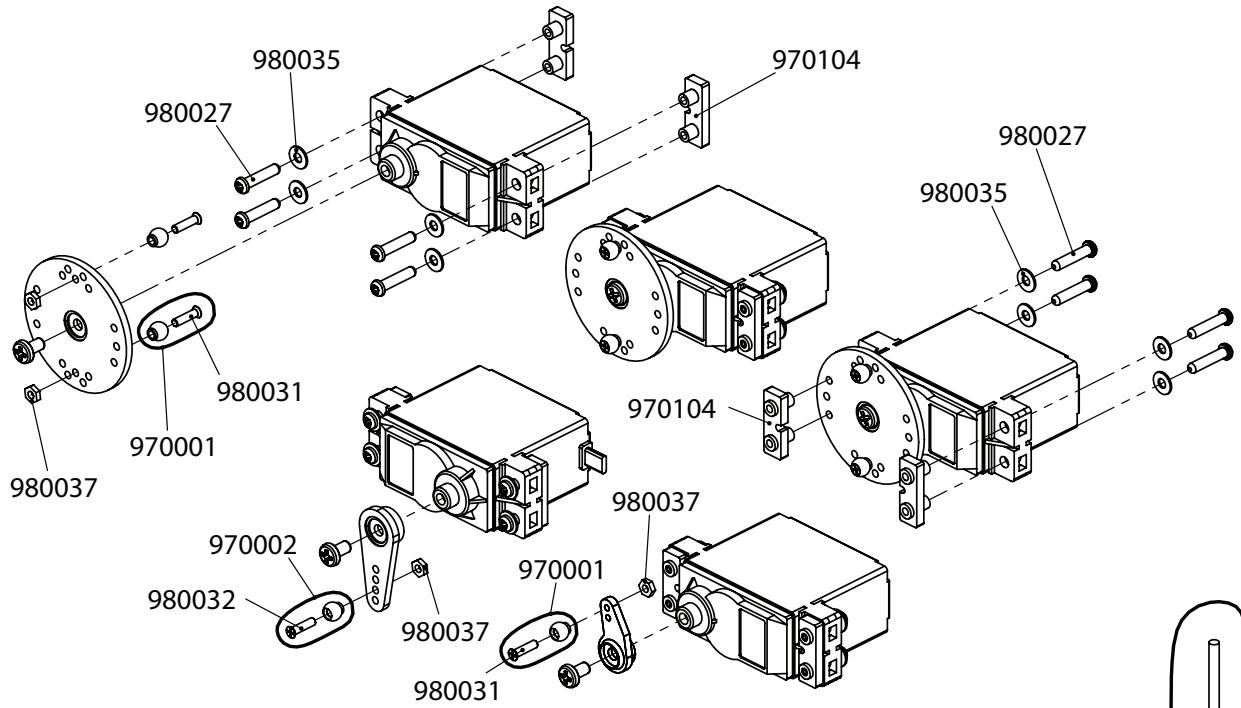
## Cleaning

At the end of each flight or flying session, wipe down your helicopter with a clean towel or rag. This is also a good time to inspect all parts for tightness or fatigue. Remember, a clean, well-maintained helicopter will provide you with many hours of trouble-free flight.


## Ball Links

Check ball links every 15–20 flights for increased play and looseness. Adjust the ball links using pliers to tighten the ball race if needed.

# REPLACEMENT PARTS LISTING

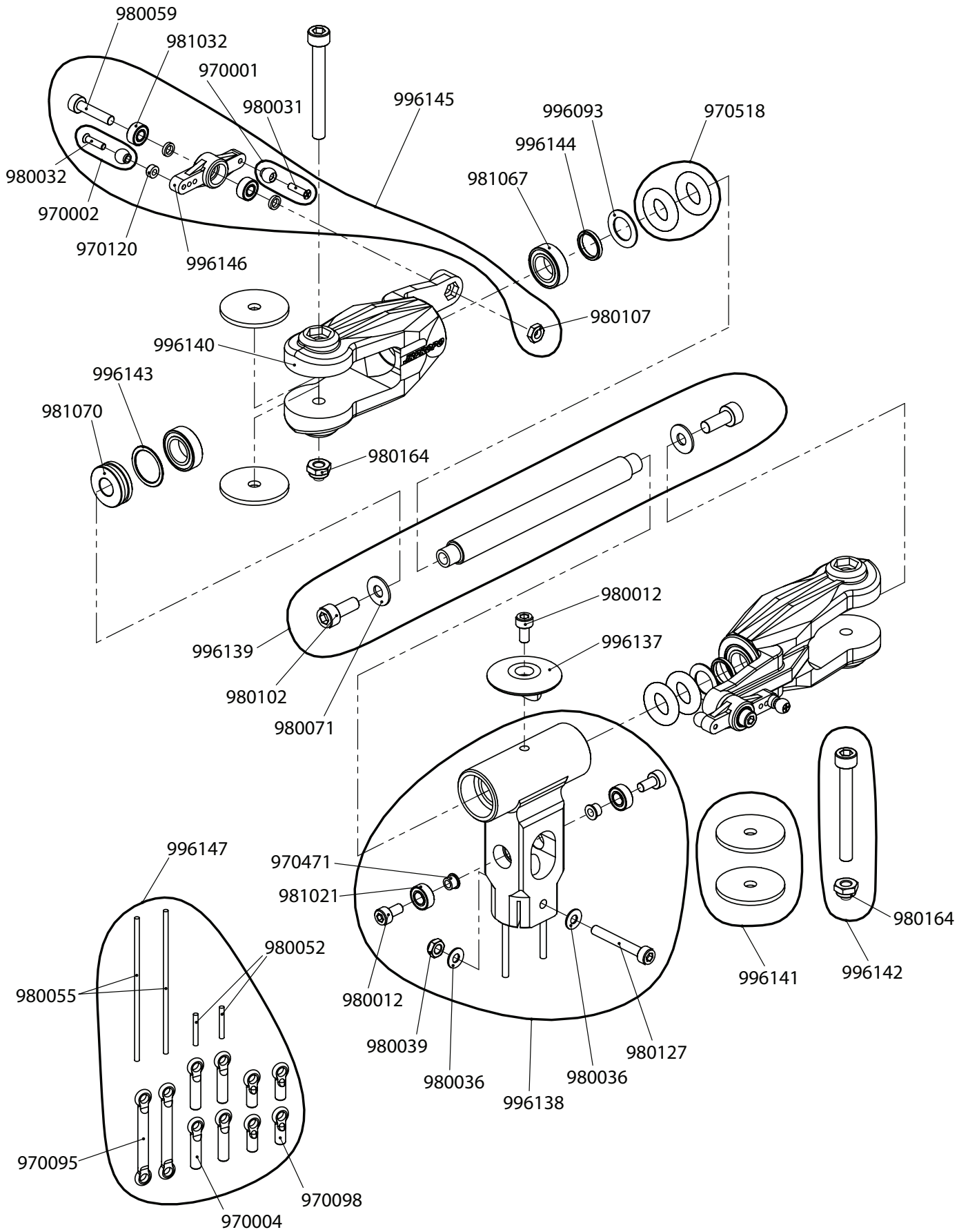






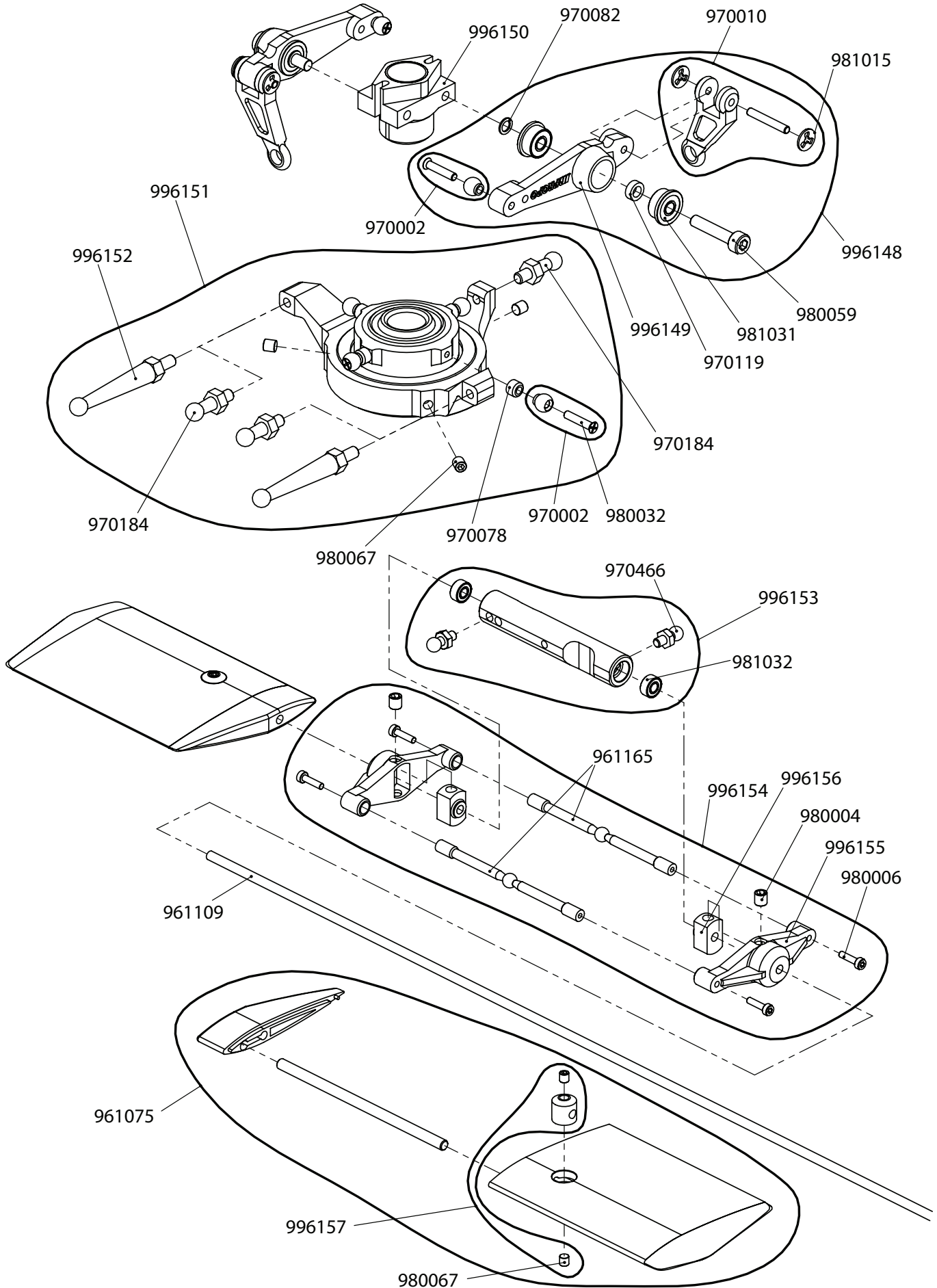
<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
980027	SELF-TAPPING SCREWS, 2.6x12mm	10
980035	PLATE WASHERS, 2.6mm	10
970104	SERVO MOUNTING PLATE	10
980031	FLAT HEAD SCREWS, 2x8mm	10
970001	JOINT BALLS, 2x8mm SCREWS	10
980037	HEX NUTS, 2mm	10
970002	JOINT BALLS, 2x10mm SCREWS	10
980032	FLAT HEAD SCREWS, 2x10mm	10
980047	CONTROL ROD, 2.3x75mm	2
980055	CONTROL ROD, 2.3x70mm	2
980105	CONTROL ROD, 2.3X80mm	2
980045	CONTROL ROD, 2.3x45mm	2
980121	CONTROL ROD, 2.3x25mm	2
980046	CONTROL ROD, 2.3x60mm	2
970004	UNIVERSAL BALL LINK: ALL	10
996211	LINKAGE SET 120CCPM	1
996210	LINKAGE SET 140CCPM	1
980054	CONTROL ROD, 2.3x65mm	2
970166	UNIVERSAL LINK 3mm	5
996136	TAIL CONTROL ROD, L187	1
996133	ASSEMBLY MANUAL VIBE 50	1
961259	VELCRO STRAP L	2
996134	DECAL VIBE 50	1
970025	SWITCH DAMPER RUBBER	4
980015	SOCKET HEAD BOLTS, 3x12mm	10
980036	PLATE WASHERS, 3mm	10
996135	FRP BODY SET VIBE 50	1
960072	RUBBER GROMMET	4

# REPLACEMENT PARTS LISTING



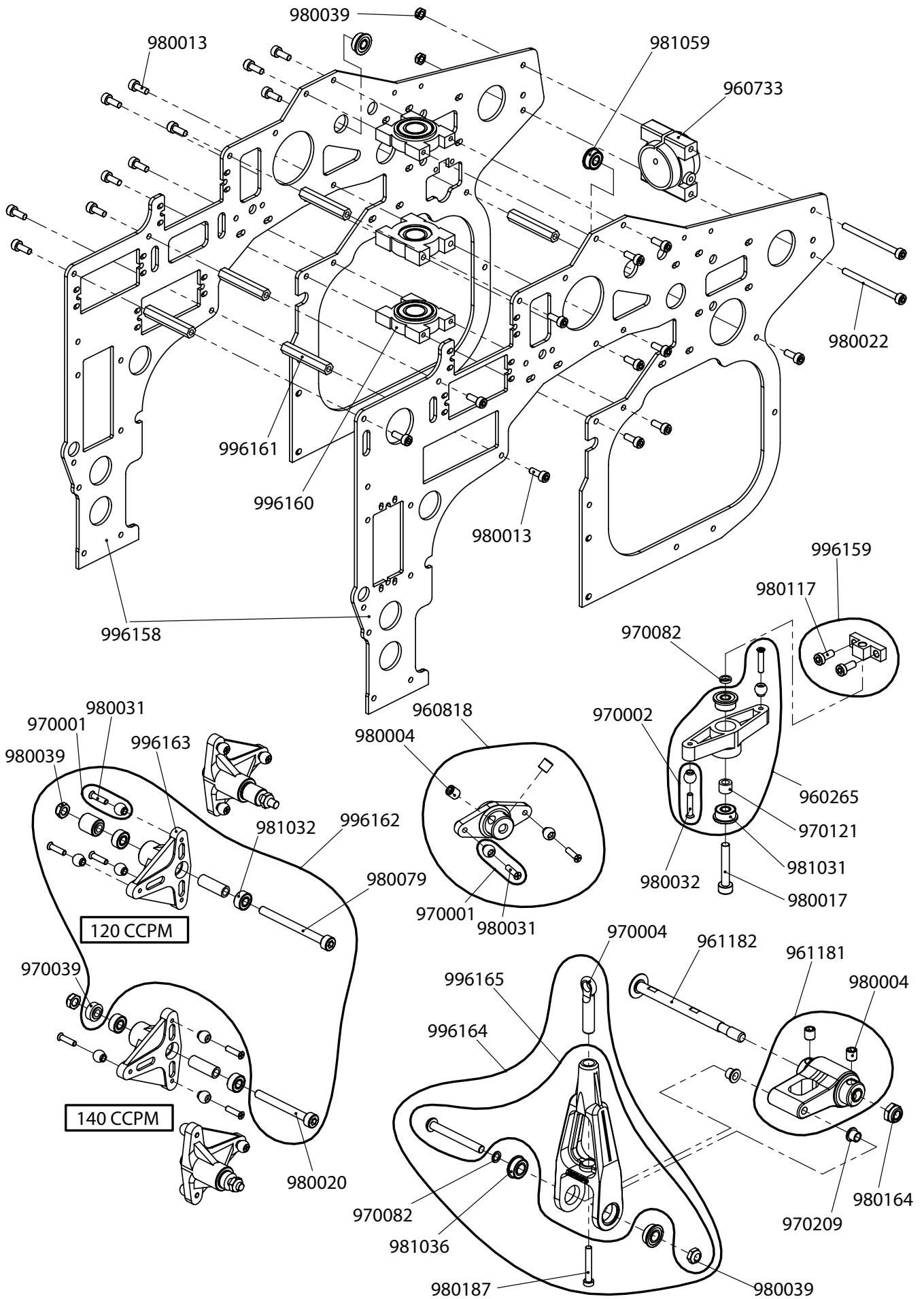
<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
980059	SOCKET HEAD BOLT, 3x14mm	10
981032	BEARING, SEALED, 3x7x3mm	2
996145	MIXING ARM SET w/BEARING	2
980031	FLAT HEAD SCREWS, 2x8mm	10
970001	JOINT BALLS, 2X8mm SCREWS	10
980032	FLAT HEAD SCREWS, 2x10mm	10
970002	JOINT BALLS, 2X10mm SCREWS	10
970120	CONTROL BALL SPACER, 1.5mm	2
996146	MIXING ARM	2
980107	HEX NUTS, 3mm	10
981070	THRUST BEARING 6x14x5	2
996143	SPINDLE SHAFT WASHER	2
996140	MAIN BLADE HOLDER	2
980164	NYLON LOCK NUT 4mm (t3.8)	10
981067	BEARING, SEALED, 8x14x4mm	2
996144	GRIP SPACER	2
996093	SPINDLE SHIM WASHERS	4
970518	DAMPER O-RING, 7.5x14.5x3.5mm	4
996139	BLADE SPINDLE SHAFT	1
980102	SOCKET HEAD BOLT, 4x10mm	10
980071	PLATE WASHERS, 4mm	10
980012	SOCKET HEAD BOLTS, 3x6mm	10
996137	HEAD BUTTON	1
996147	LINKAGE SET VR	1
980055	CONTROL ROD, 2.3x70mm	2
980052	CONTROL ROD, 2.3x15mm	2
970095	DOUBLE LINK, LONG	2
970004	UNIVERSAL BALL LINK: ALL	10
970098	UNIVERSAL BALL LINK (SHORT)	5
981021	BEARING, SEALED, 4x8x3mm	2
980039	NYLON LOCK NUTS, 3mm	10
980036	PLATE WASHERS, 3mm	10
996138	MAIN ROTOR HUB	1
980127	SPECIAL CAP BOLT, 3x22mm	5
996141	ROTOR SPACER, t1.5	4
996142	BLADE BOLTS SET	2
970471	SEESAW SPACER COLLAR	2

# REPLACEMENT PARTS LISTING



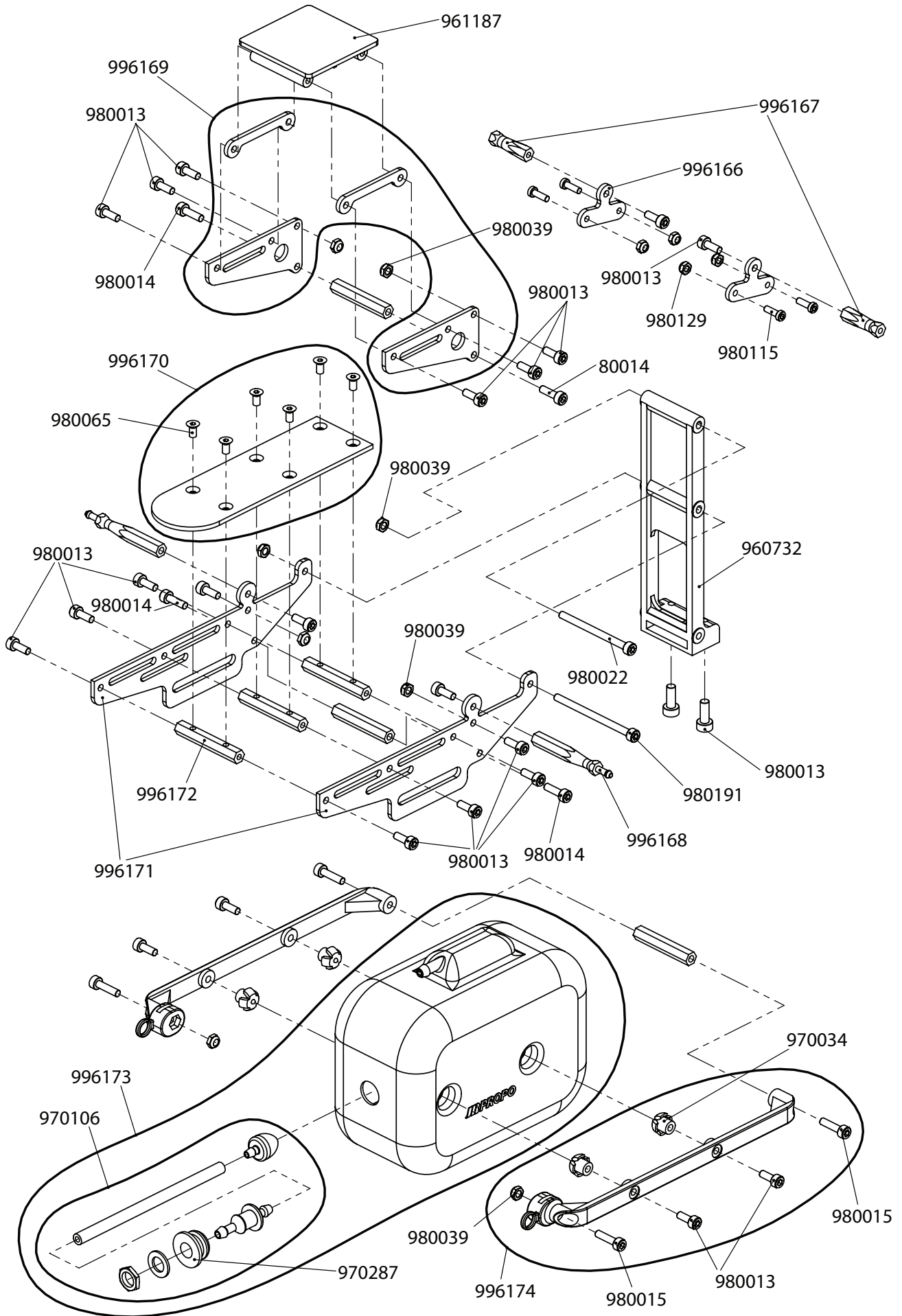
<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
996150	WASHOUT BASE METAL	1
970082	WASHER, 3x4.5x.4 mm	10
970010	WASHOUT LINK	2
981015	CA STOPPER RING, 2mm	10
996148	WASHOUT ARM SET w/BEARING	1
980059	SOCKET HEAD BOLTS, 3x14mm	10
981031	BEARING,FLANGED, 3x8x4mm	2
970119	SPACER, 3x.5x1.8mm	2
996149	WASHOUT ARM	2
970002	JOINT BALLS, 2x10mm SCREWS	10
996152	LONG CONTROL BALL	1
970184	BALL ARM, 9mm	1
996151	120/140 ALUMINUM SWASH PLATE	1
980032	FLAT HEAD SCREWS, 2x10mm	10
970002	JOINT BALLS, 2x10mm SCREWS	10
970078	CONTROL BALL SPACER, 2.75mm	2
980067	SETSCREWS, 3x3mm	10
970466	BALL ARM, 5.5mm	1
996153	SEESAW SHAFT w/BEARING	1
981032	BEARING,SEALED 3x7x3mm	2
961165	FLYBAR ARM B	2
996154	FLYBAR ARM A/B SET	1
996156	FLYBAR STOPPER	2
980004	SETSCREWS, 4x4mm	10
996155	FLYBAR ARM A	2
980006	SOCKET HEAD BOLTS, 2x8mm	10
961109	FLYBAR, 3x440mm	2
961075	FLYBAR PADDLES	2
996157	PADDLE STOPPER	2
980067	SETSCREWS, 3x3mm	10

# REPLACEMENT PARTS LISTING



<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
980013	SOCKET HEAD BOLTS, 3x8mm	10
980039	NYLON LOCK NUTS, 3mm	10
981059	BEARING, SEALED, F04x10x4mm	2
960733	TAIL BOOM HOLDER	2
980022	SOCKET HEAD BOLTS, 3x40mm	10
996160	BEARING BLOCK w/BEARING	1
996161	CROSS MEMBER, 32mm	2
996158	MAIN FRAME SET L/R	1
970001	JOINT BALLS, 2x8mm SCREWS	10
980031	FLAT HEAD SCREWS, 2x8mm	10
996163	T-ARM LEVER	2
981032	BEARING, SEALED, 3x7x3mm	2
996162	T-ARM LEVER SET 120/140	1
980079	SOCKET HEAD BOLTS, 3x35mm	10
980020	SOCKET HEAD BOLTS, 3x28mm	10
970039	PITCH LEVER SPACER	1
980004	SETSCREWS, 4x4mm	10
960818	SWASHPLATE CONTROL LEVER B	1
970002	JOINT BALLS, 2x10mm SCREWS	10
970082	WASHER, 3x4.5x.4 mm	10
980117	SOCKET HEAD BOLTS, 2.6x6mm	10
996159	RUDDER LEVER MOUNT	1
960265	MIXING LEVER w/BB	1
970121	SPACER, 3x5x3.8mm	2
981031	BEARING, FLANGED, 3x8x4mm	2
980017	SOCKET HEAD BOLTS, 3x16mm	10
980032	FLAT HEAD SCREWS, 2x10mm	10
970004	UNIVERSAL BALL LINK: ALL	10
980039	NYLON LOCK NUTS, 3mm	10
980187	SOCKET HEAD BOLTS, 2.3x15mm	5
981036	BEARING, FLANGED, 4x8x3mm	2
996164	ELEVATOR A-ARM SET	1
996165	ELEVATOR A-ARM	1
961182	BASE SPINDLE SHAFT	1
961181	SWASH CONTROL BASE	1
980164	NYLON LOCK NUT 4mm (t3.8)	10
970209	CCPM A-ARM COLLAR	2

# REPLACEMENT PARTS LISTING

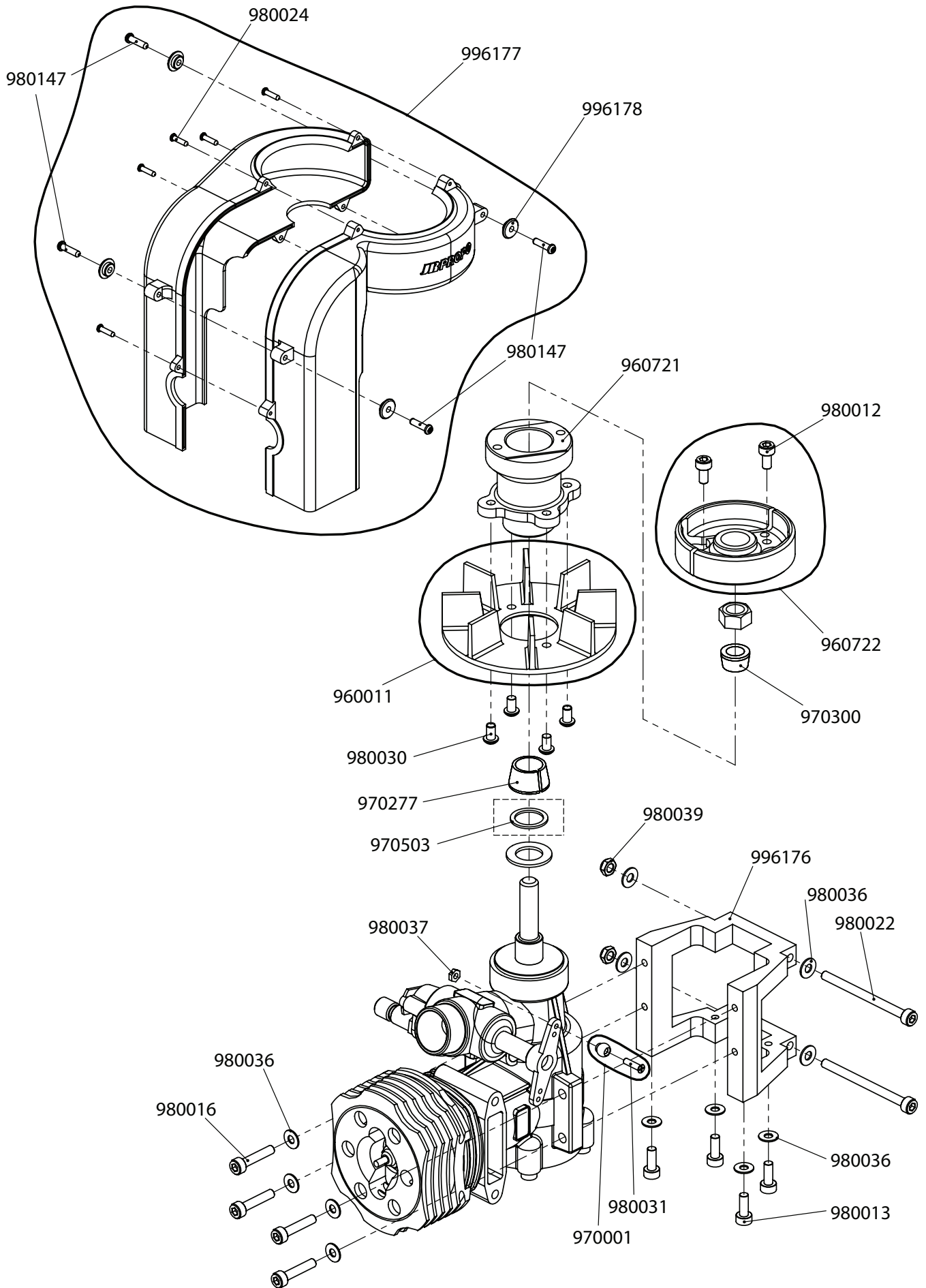






<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
980013	SOCKET HEAD BOLTS, 3x8mm	10
996169	GYRO FRAME SET	1
961187	GYRO TRAY	1
980039	NYLON LOCK NUTS, 3mm	10
980014	SOCKET HEAD BOLTS, 3x10mm	10
996167	BODY CATCH, 21mm	2
996166	BODY MOUNT PLATE	1
980115	SOCKET HEAD BOLTS, 2.6x8mm	10
980129	NYLON LOCK NUTS, 2.6mm	10
960732	CROSS MEMBER B	1
980022	SOCKET HEAD BOLTS, 3x40mm	10
980191	SOCKET HEAD BOLTS, 3x45mm	10
996168	BODY CATCH, 37mm	2
996172	FRONT BED MOUNT	3
996171	FRONT BED FRAME	1
980065	FLAT HEAD BOLT, 3x6mm	10
996170	FRONT BED	1
970106	FUEL TANK FITTING SET	1
996173	FUEL TANK	1
970287	TANK GROMMET	2
996174	TANK STAY	2
980015	SOCKET HEAD BOLTS, 3x12mm	10
970034	FUEL TANK HOLDER	4

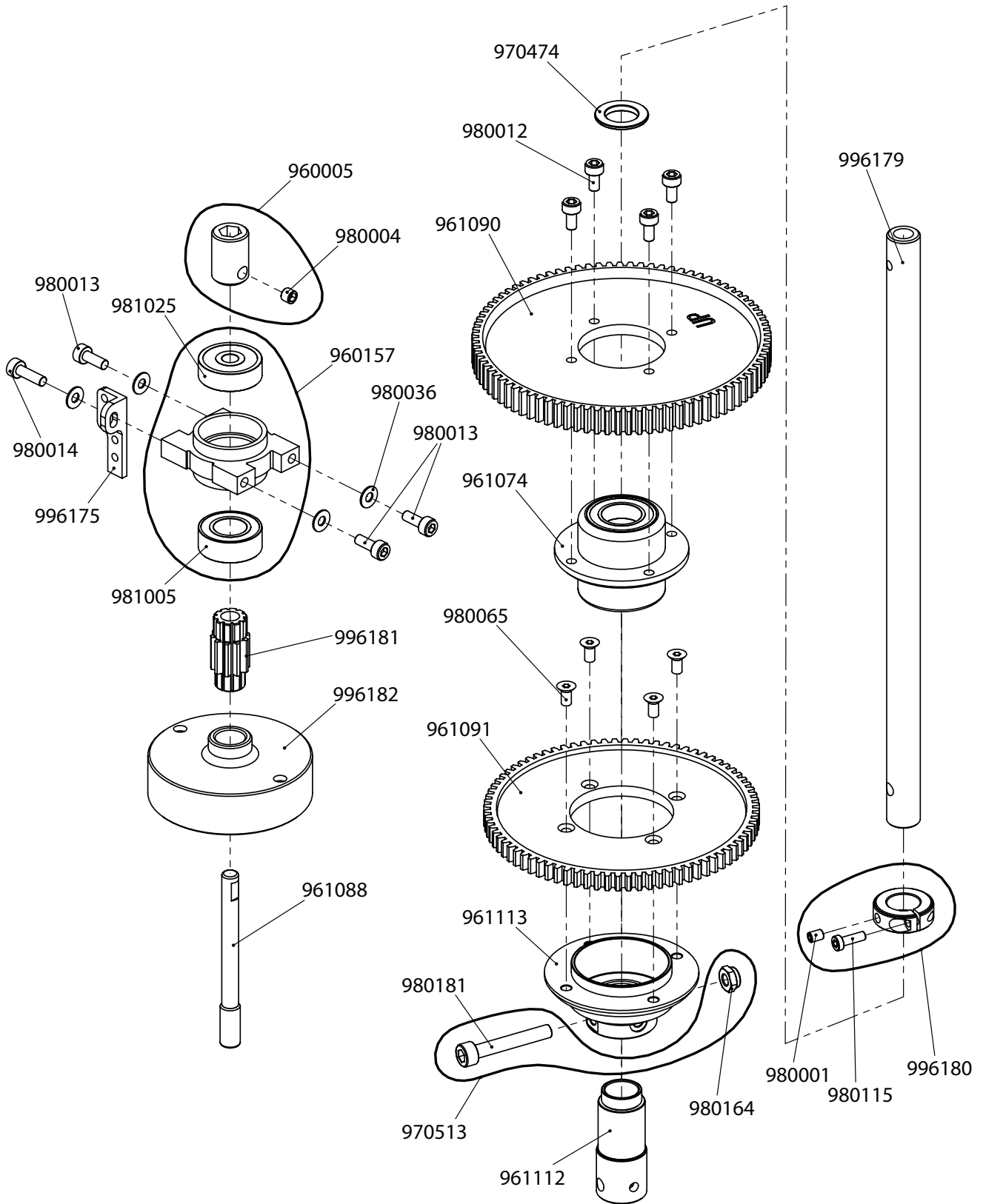
# REPLACEMENT PARTS LISTING





<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
980147	SELF-TAPPING SCREWS, 2.6X10mm	10
980024	SELF-TAPPING SCREWS, 2x8mm	10
996177	COOLING FAN SHROUD	1
996178	FAN SHROUD COLLAR	4
960721	FAN HUB	1
980012	SOCKET HEAD BOLTS, 3x6mm	10
960722	CLUTCH ASSEMBLY	1
970300	UPPER COLLET	1
960011	COOLING FAN BLADES	1
980030	BUTTON HEAD BOLTS, 3x5mm	10
970277	TAPER COLLET, LOWER	1
970503	THRUST WASHER L	2
980037	HEX NUTS, 2mm	10
980039	NYLON LOCK NUTS, 3mm	10
996176	ENGINE MOUNT	1
980022	SOCKET HEAD BOLTS, 3x40mm	10
980036	PLATE WASHERS, 3mm	10
980013	SOCKET HEAD BOLTS, 3x8mm	10
980031	FLAT HEAD SCREWS, 2x8mm	10
970001	JOINT BALLS, 2X8mm SCREWS	10
980016	SOCKET HEAD BOLTS, 3x15mm	10

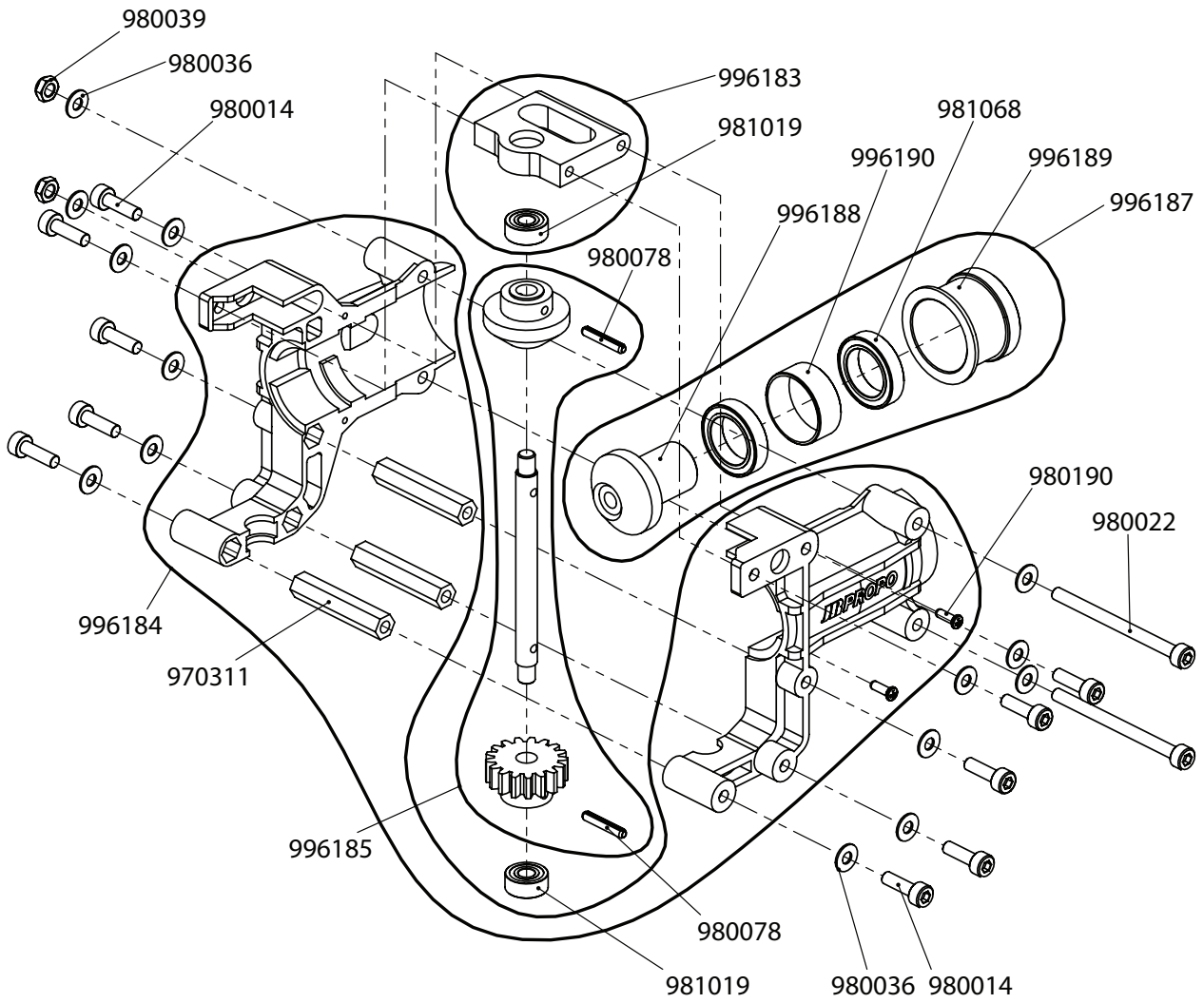
# REPLACEMENT PARTS LISTING





<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
980013	SOCKET HEAD BOLTS, 3x8mm	10
980014	SOCKET HEAD BOLTS, 3x10mm	10
960005	STARTER HEX ADAPTOR: ALL JR	1
980004	SETSCREWS, 4x4mm	10
960157	START SHAFT BEARING BLOCK	1
980036	PLATE WASHERS, 3mm	10
981005	BEARING, SEALED, 10x19x7mm	2
996175	GOVERNOR MOUNT	1
981025	BEARING,SEALED, 5x19x6mm	2
996181	PINION GEAR	1
996182	CLUTCH BELL ASSY w/LINING	1
961088	START SHAFT	1
996179	MAIN SHAFT	1
996180	MAIN SHAFT COLLAR	1
980115	SOCKET HEAD BOLTS, 2.6x8mm	10
980001	SETSCREWS, 3x4mm	10
970474	AUTOROTATION SPACER	1
980012	SOCKET HEAD BOLTS, 3x6mm	10
961090	MAIN DRIVE GEAR, 87T	1
961074	AUTOROTATION UNIT	1
980065	FLAT HEAD BOLT, 3x6mm	10
961091	MAIN TAIL DRIVE GEAR, 80T	1
961113	TAIL DRIVE GEAR HUB	1
980181	SPECIAL CAP BOLT, 4x26mm	2
970513	MAIN AUTOROTATION BOLT SET	1
980164	NYLON LOCK NUT, 4mm (t3.8)	10
961112	AUTOROTATION SLEEVE	1

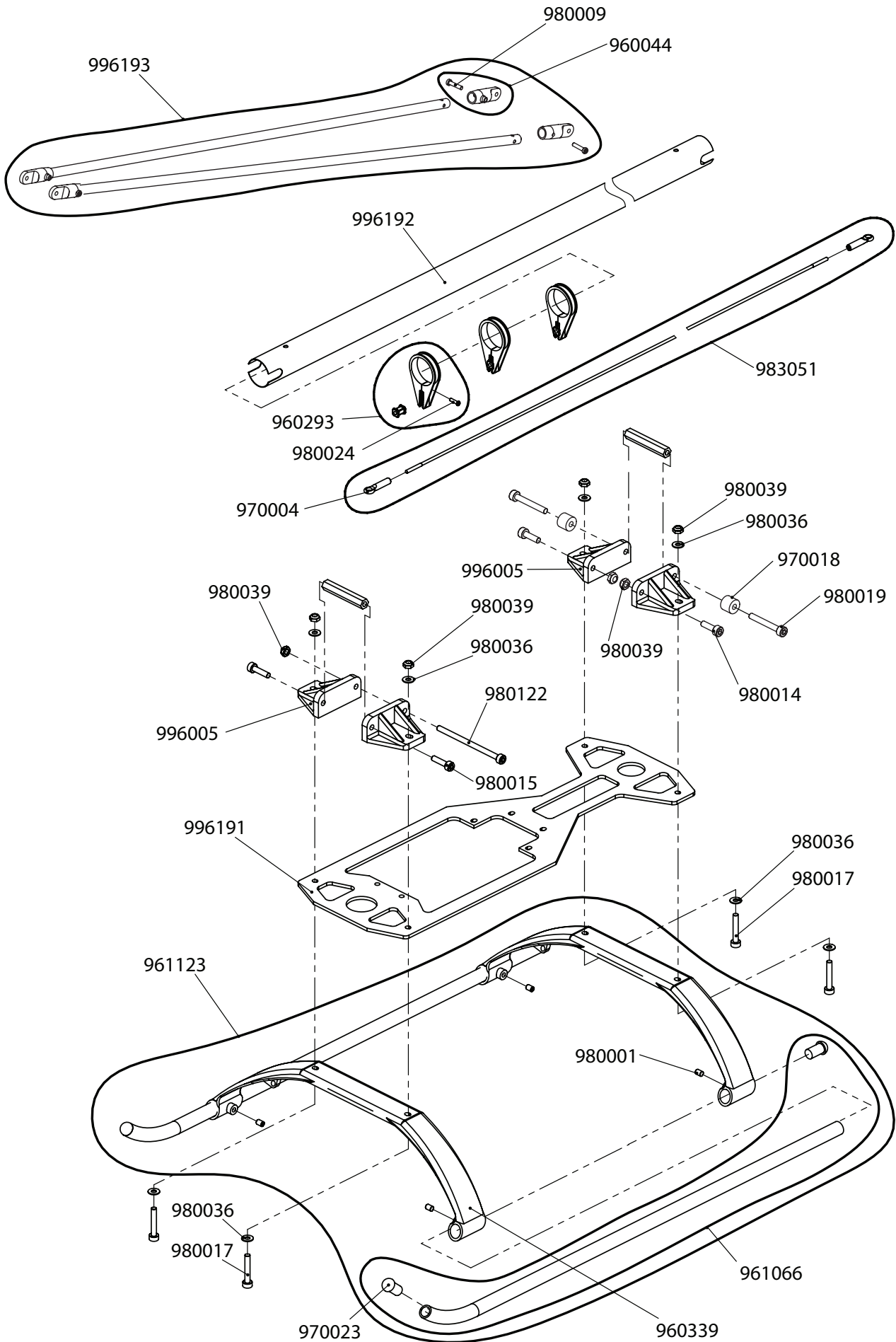
# REPLACEMENT PARTS LISTING





<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
980039	NYLON LOCK NUTS, 3mm	10
980036	PLATE WASHERS, 3mm	10
980014	SOCKET HEAD BOLTS, 3x10mm	10
996183	TAIL PINION UNIT BEARING CASE A	1
981019	BEARING, SEALED, 4x10x4mm	2
980078	TAIL PULLEY SPRING PIN	5
996188	BEVEL GEAR T20 JOINT	1
996190	BEARING COLLAR, 18x16.5x7mm	1
981068	BEARING, SEALED, 12x18x4mm	1
996189	TAIL PINION UNIT BEARING CASE B	1
996187	BEVEL GEAR T20 JOINT ASSY w/BEARING	1
980190	SELF-TAPPING SCREW M2x06	10
980022	SOCKET HEAD BOLTS, 3x40mm	10
996185	TAIL PINION SHAFT ASSEMBLY	1
970311	CROSS MEMBER L28	2
996184	TAIL PINION UNIT CASE LFT/RT	1

# REPLACEMENT PARTS LISTING

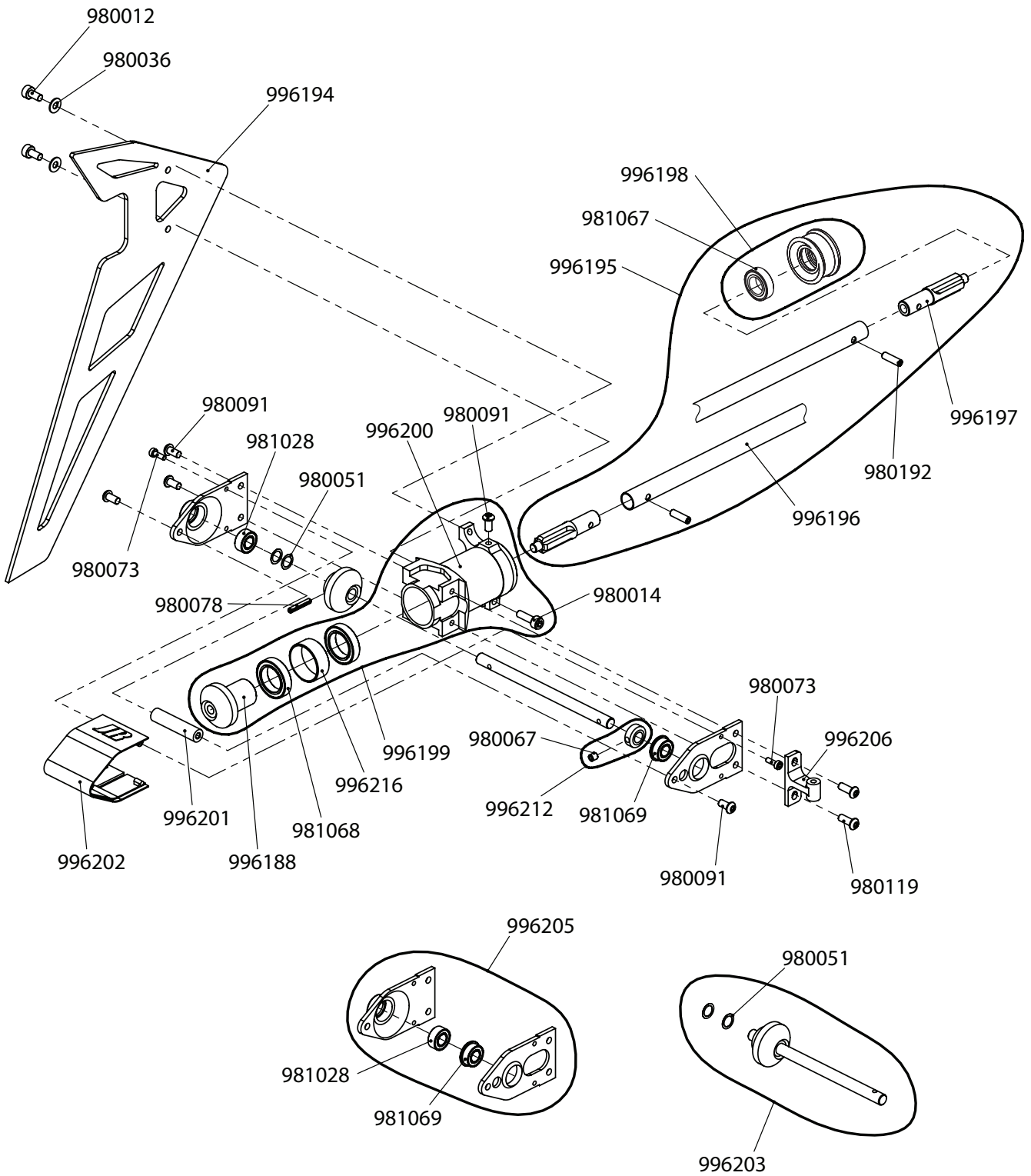






<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
996193	TAIL BRACE SET	1
980009	SOCKET HEAD BOLTS, 2.6x12mm	10
960044	TAIL BRACE CONNECTOR	1
996192	TAIL BOOM, 708mm	1
960293	TAIL ROD GUIDE SET: ALL JR	4
980024	SELF-TAPPING SCREWS, 2x8mm	10
970004	UNIVERSAL BALL LINK: ALL	10
983051	TAIL CONTROL ROD, L685	1
980039	NYLON LOCK NUTS, 3mm	10
996005	LANDING STRUT MOUNT	4
980036	PLATE WASHERS, 3mm	10
980015	SOCKET HEAD BOLTS, 3x12mm	10
980122	SOCKET HEAD BOLT, 3x50mm	10
996191	BOTTOM FRAME PLATE	1
961123	LANDING GEAR SET	1
980014	SOCKET HEAD BOLT, 3x10mm	10
980019	SOCKET HEAD BOLT, 3x22mm	10
970018	SPACER B	2
980001	SETSCREWS, 3x4mm	10
961066	LANDING SKIDS, LONG	2
960339	LANDING STRUTS, WHITE	2
970023	LANDING SKID CAP	4
980017	SOCKET HEAD BOLTS, 3x16mm	10

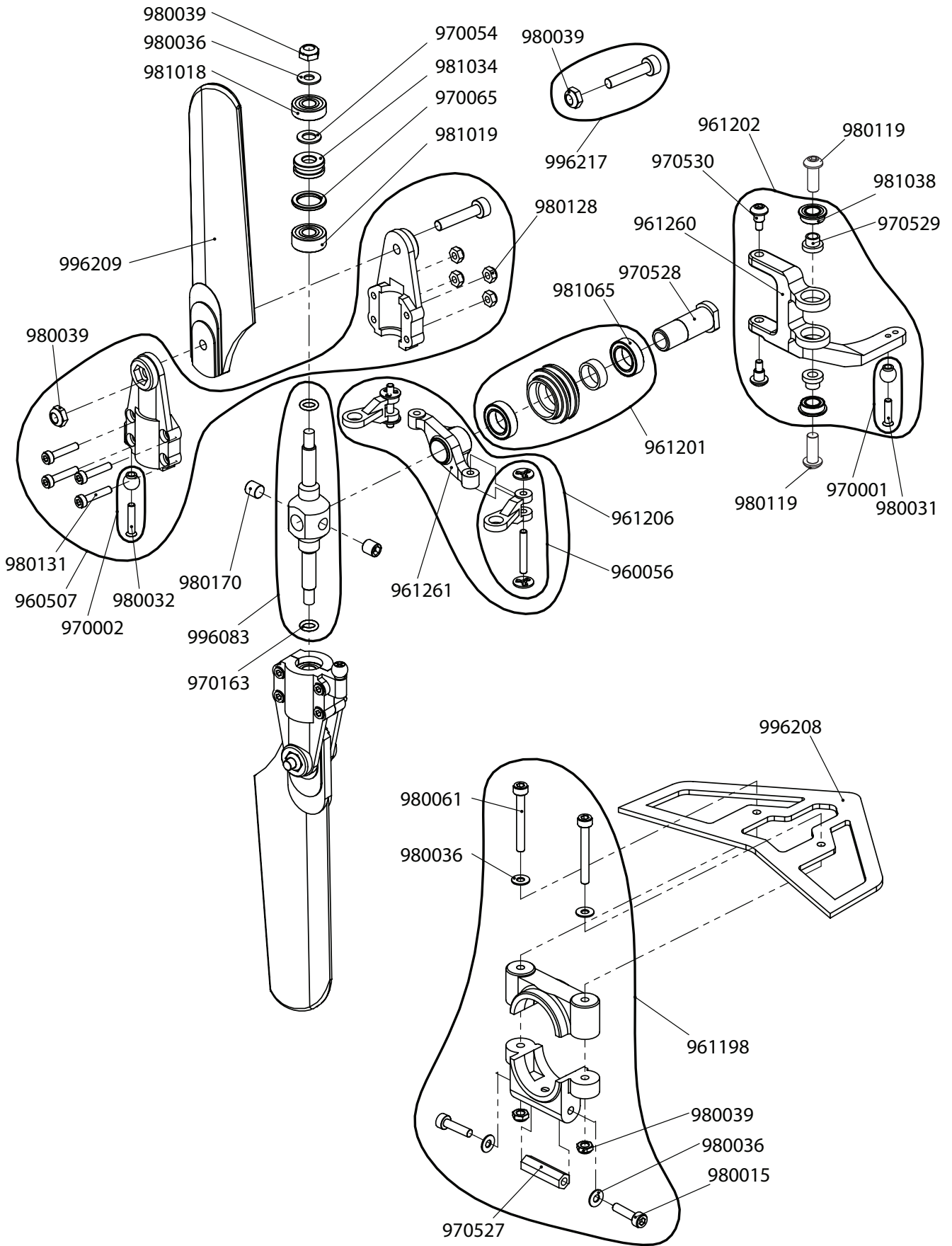
# REPLACEMENT PARTS LISTING





<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
980012	SOCKET HEAD BOLTS, 3x6mm	10
980036	PLATE WASHERS, 3mm	10
996194	VERTICAL FIN	1
996195	TAIL DRIVE SHAFT ASSEMBLY	1
996198	SHAFT DRIVE GUIDE	1
981067	BEARING, SEALED, 8x14x4mm	2
996197	DRIVE SHAFT JOINT	2
980192	SETSCREWS, 3x10mm	10
996196	TAIL DRIVE SHAFT	1
980091	BUTTON HEAD BOLT 3x6mm	10
981028	BEARING, SEALED, 5x10x4mm	2
996200	TAIL GEAR CASE	1
980014	SOCKET HEAD BOLT, 3x10mm	10
980073	SOCKET HEAD BOLT, 2x6mm	10
996206	TAIL PITCH BASE	1
980119	BUTTON HEAD BOLT, 3x8mm	10
981069	BEARING, SEALED, F05x10x4mm	2
996212	TAIL OUTPUT SHAFT STOPPER	1
980067	SETSCREWS, 3x3mm	10
996199	TAIL GEAR CASE ASSEMBLY	1
996216	BEARING COLLAR, 18x16.5x6.5mm	1
981068	BEARING, SEALED, 12x18x4mm	1
996188	BEVEL GEAR T20 JOINT	1
996201	TAIL GEAR CASE CROSS MEMBER	1
996202	TAIL GEAR CASE COVER	1
980078	TAIL PULLEY SPRING PIN	5
996205	TAIL GEAR CASE PLATE SET w/BEARING	1
980051	POLY SLIDER, t0.13	10
996203	TAIL OUTPUT SHAFT SET	1

# REPLACEMENT PARTS LISTING





<b>Item #</b>	<b>Description</b>	<b>Quantity</b>
980039	NYLON LOCK NUTS, 3mm	10
980036	PLATE WASHERS, 3mm	10
981018	BEARING, OPEN, 4x10x3mm	2
970054	TAIL WASHER, 4x7x.5mm	2
981034	THRUST BEARING, 4x9x4mm	2
970065	TAIL WASHER, 7x10x1 mm	2
981019	BEARING, SEALED, 4x10x4mm	2
996217	BLADE BOLTS SET (TAIL)	2
980128	NYLON LOCK NUTS, 2mm	10
981065	BEARING, SEALED, 7x11x3mm	2
970528	TAIL SLIDE RING SLEEVE	1
961201	TAIL SLIDE RING	1
961260	TAIL PITCH CONTROL LEVER	1
970530	TAIL PC SLIDE BOLT	2
961202	TAIL PITCH CONTROL LEVER SET	1
980119	BUTTON HEAD BOLTS, 3x8mm	10
981038	BEARING, FLANGED, 4x7x2.5mm	2
970529	TAIL PC BEARING COLLAR	2
980031	FLAT HEAD SCREWS, 2x8mm	10
970001	JOINT BALLS, 2x8mm SCREWS	10
961206	TAIL PITCH PLATE SET	1
960056	TAIL PITCH LINK	2
961261	TAIL PITCH PLATE	1
970163	TAIL HUB O-RING, 3.5x5.5x1mm	2
996083	TAIL CENTER HUB	1
980170	SETSCREWS, 4x3mm	10
980032	FLAT HEAD SCREWS, 2x10mm	10
970002	JOINT BALLS, 2x10mm SCREWS	10
960507	TAIL BLADE HOLDER SET	2
980131	SOCKET HEAD BOLT, 2x10mm	10
980061	SOCKET HEAD BOLTS, 3x25mm	10
996208	HORIZONTAL FIN	1
961198	TAIL BRACE CLAMP SET	1
980015	SOCKET HEAD BOLTS, 3x12mm	10
970527	CROSS MEMBER L20	2

## WARRANTY INFORMATION

### Warranty Period

Exclusive Warranty- Horizon Hobby, Inc., (Horizon) warrants that the Products purchased (the "Product") will be free from defects in materials and workmanship at the date of purchase by the Purchaser.

### Limited Warranty

(a) This warranty is limited to the original Purchaser ("Purchaser") and is not transferable. REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY IS THE EXCLUSIVE REMEDY OF THE PURCHASER. This warranty covers only those Products purchased from an authorized Horizon dealer. Third party transactions are not covered by this warranty. Proof of purchase is required for warranty claims. Further, Horizon reserves the right to change or modify this warranty without notice and disclaims all other warranties, express or implied.

(b) Limitations- HORIZON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCT. THE PURCHASER ACKNOWLEDGES THAT THEY ALONE HAVE DETERMINED THAT THE PRODUCT WILL SUITABLY MEET THE REQUIREMENTS OF THE PURCHASER'S INTENDED USE.

(c) Purchaser Remedy- Horizon's sole obligation hereunder shall be that Horizon will, at its option, (i) repair or (ii) replace, any Product determined by Horizon to be defective. In the event of a defect, these are the Purchaser's exclusive remedies. Horizon reserves the right to inspect any and all equipment involved in a warranty claim. Repair or replacement decisions are at the sole discretion of Horizon. This warranty does not cover cosmetic damage or damage due to acts of God, accident, misuse, abuse, negligence, commercial use, or modification of or to any part of the Product. This warranty does not cover damage due to improper installation, operation, maintenance, or attempted repair by anyone other than Horizon. Return of any goods by Purchaser must be approved in writing by Horizon before shipment.

### Damage Limits

HORIZON SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCT, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY. Further, in no event shall the liability of Horizon exceed the individual price of the Product on which liability is asserted. As Horizon has no control over use, setup, final assembly, modification or misuse, no liability shall be assumed nor accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability.

If you as the Purchaser or user are not prepared to accept the liability associated with the use of this Product, you are advised to return this Product immediately in new and unused condition to the place of purchase.

Law: These Terms are governed by Illinois law (without regard to conflict of law principals).

### Safety Precautions

This is a sophisticated hobby Product and not a toy. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this Product in a safe and responsible manner could result in injury or damage to the Product or other property. This Product is not intended for use by children without direct adult supervision. The Product manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or injury.

### Questions, Assistance, and Repairs

Your local hobby store and/or place of purchase cannot provide warranty support or repair. Once assembly, setup or use of the Product has been started, you must contact Horizon directly. This will enable Horizon to better answer your questions and service you in the event that you may need any assistance. For questions or assistance, please direct your email to [productsupport@horizonhobby.com](mailto:productsupport@horizonhobby.com), or call 877.504.0233 toll free to speak to a service technician.

### Inspection or Repairs

If this Product needs to be inspected or repaired, please call for a Return Merchandise Authorization (RMA). Pack the Product securely using a shipping carton. Please note that original boxes may be included, but are not designed to withstand the rigors of shipping without additional protection. Ship via a carrier that provides tracking and insurance for lost or damaged parcels, as **Horizon is not responsible for merchandise until it arrives and is accepted at our facility**. A Service Repair Request is available at [www.horizonhobby.com](http://www.horizonhobby.com) on the "Support" tab. If you do not have internet access, please include a letter with your complete name, street address, email address and phone number where you can be reached during business days, your RMA number, a list of the included items, method of payment for any non-warranty expenses and a brief summary of the problem. Your original sales receipt must also be included for warranty consideration. Be sure your name, address, and RMA number are clearly written on the outside of the shipping carton.

### Warranty Inspection and Repairs

**To receive warranty service, you must include your original sales receipt** verifying the proof-of-purchase date. Provided warranty conditions have been met, your Product will be repaired or replaced free of charge. Repair or replacement decisions are at the sole discretion of Horizon Hobby.

### Non-Warranty Repairs

**Should your repair not be covered by warranty the repair will be completed and payment will be required without notification or estimate of the expense unless the expense exceeds 50% of the retail purchase cost.** By submitting the item for repair you are agreeing to payment of the repair without notification. Repair estimates are available upon request. You must include this request with your repair. Non-warranty repair estimates will be billed a minimum of ½ hour of labor. In addition you will be billed for return freight. Please advise us of your preferred method of payment. Horizon accepts money orders and cashiers checks, as well as Visa, MasterCard, American Express, and Discover cards. If you choose to pay by credit card, please include your credit card number and expiration date.

Any repair left unpaid or unclaimed after 90 days will be considered abandoned and will be disposed of accordingly. **Please note: non-warranty repair is only available on electronics and model engines.**

Electronics requiring inspection or repair should be shipped to the following address:

Horizon Service Center  
4105 Fieldstone Road  
Champaign, Illinois 61822

All other Products requiring warranty inspection or repair should be shipped to the following address:

Horizon Product Support  
4105 Fieldstone Road  
Champaign, Illinois 61822

**Please call 877-504-0233 with any questions or concerns regarding this product or warranty.**

### Instructions for Disposal of WEEE by Users in the European Union

This product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased the product.





# HORIZON

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