Vigor™ CS

Designed by Curtis Youngblood in conjunction with JR Engineers

ASSEMBLY INSTRUCTIONS
CCPM/SHAFT DRIVE

www.vigorpilot.com

VIGOR CS SPECIFICATIONS

Overall Length	56.25"
Overall Height	18"
Main Rotor Blade Length (Main rotor blades not included)	680 – 720 mm
Tail Rotor Diameter	10.34"
Gear Ratio	9.33:1:4.83
Gross Weight	10.2–10.5 lb

JRP9051.46
Revised 7/2001

JR® HELI DIVISION

Vigor™ CS

INTRODUCTION

The Wait is Over!
Congratulations on your purchase of the new JR® Vigor CS helicopter kit. The Vigor CS, designed by 2-time World Champion and 12-time U.S. Nationals Champion Curtis Youngblood, in conjunction with JR engineers, has been in development for nearly 4 years and thousands of test flights, to bring you a model that sets the new standard for others to be judged.

Designed By a Champion To Be a Champion
The Vigor CS was designed by Curtis with rigidity, durability, and simplicity in mind. The Vigor CS's unique main frame design utilizes two straight carbon fiber frame plates and achieves its unmatched strength and rigidity through the use of internal "I" beam supports, rather than the engine. This results in a very simple, yet highly rigid frame that eliminates any unwanted loads from being applied to the engine during flight.
In addition to the Vigor CS's unique frame, the cooling system has also been designed from the ground up by Curtis through countless hours of engine cooling fan efficiency testing. The end result is a cooling system that provides double the airflow of a conventional cooling system, with no increase in power consumption. This system will allow the engine to run more consistently, and at a more consistent temperature.

Low Parts Count Means Quick Assembly
You will find that your Vigor CS will assemble very quickly due to its well-thought-out/straight-forward design, low parts count, and preassembled main rotor head, washout unit, and tail pitch slider assemblies. The building time for the Vigor CS usually takes only 10–12 hours from start to finish.

CCPM Control System
Curtis and the JR engineers have taken the CCPM one step further. The Vigor CS can be set up with the normal 120-degree CCPM system that is supported in most of today's modern computer helicopter radio systems. Curtis has devised a new CCPM configuration. CCPM 140 places the ball links on the swashplate 140º back from the forward ball, then the rear balls are extended, placing them the same for to aft distance from the center of the mainshaft as the front ball. The main advantage is that all three servos going to the swashplate now have the same throw. With conventional 120 CCPM, the throws to the forward servos must be reduced with radio programming by 50%. This causes the longer-throwing servos to lag behind the shorter-throwing servo during quick cyclic inputs.

Team Tips
Throughout the sections of this instruction manual, you will find dozens of "Team Tips." These tips have been provided by Team JR's Curtis Youngblood and Len Sabato to guide you through the assembly of your Vigor CS with helpful tips and suggestions that will help you get the most from your new JR Vigor CS from the first flight.

www.vigorpilot.com
For the latest, up-to-date information on the Vigor CS, visit the Vigor Web page at www.vigorpilot.com. vigorpilot.com will contain up-to-date information on new upgrade parts and radio programming tips, as well as many helpful tips and suggestions from Team JR's pilots to keep you on the cutting edge of Vigor CS developments and fine tuning.

WARNING

The radio controlled model helicopter contained in this kit is not a toy but a sophisticated piece of equipment. This product is not recommended for use by children. Radio controlled models such as this are capable of causing both property damage and/or bodily harm to both the operator/assembler and/or spectator if not properly assembled and operated. Horizon Hobby, Inc. assumes no liability for damage that could occur from the assembly and/or use/misuse of this product.

AMA INFORMATION

We strongly encourage all prospective and current R/C aircraft pilots to join the Academy of Model Aeronautics. The AMA is a non-profit organization that provides services to model aircraft pilots. As an AMA member, you will receive a monthly magazine entitled *Model Aviation*, as well as a liability insurance plan to cover against possible accident or injury. All AMA charter aircraft clubs require individuals to hold a current AMA sporting license prior to operation of their models. For further information, you can contact the AMA at

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302
(317) 287-1256

PREASSEMBLY INFORMATION

When first opening your Vigor CS kit, 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.

Horizon Service Center
4105 Fieldstone Road
Champaign, IL 61822
(217) 355-9511 (9 a.m. to 5 p.m. CST)

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VIGOR™ CS FEATURES

Frame:
- Unique cabon fiber frame design derives structural integrity without the engine
- Stiffness of frame is double to triple conventional designs — reduces vibration for improved gyro, engine & powertrain performance
- Motor mount acts as a jig for easy, goof-proof powertrain alignment
- Straight frame design with full length I-beams can't scissor like conventional "stacked" frames

Tail Drive System:
- Goof-proof self-aligning torque tube tail drive system
- Ultra-durable aluminum drive shaft
- Preassembled tail gear box
- Dual point tail pitch slider & lever
- Special 3D carbon fin set
- Aluminum fin mounts

Control System:
- JR 120/140 push pull CCPM
- Dual bearing aluminum T levers
- CNC-machined aluminum elevator arm
- High-grade 120/140 CCPM swashplate

Rotor Head:
- Improved, ultra-true mounting clamp design
- Swashplate timing is pre-positioned at optimum setting
- Revised delta offset positioning offers improved forward flight stability and reduced boom strike potential
- New lightweight 25 gram paddle design is perfect for 3D or fun flying
- Flybar weights included

Drive Train/Cooling:
- Constant drive split main gear design for extreme 3D flying
- High-efficiency cooling system increases airflow to double the normal amount
- Main shaft bearing spacing is 50% wider than conventional designs for superior rigidity
- Additional BB engine drive pinion gear support keeps power loads from being introduced to the engine
- New larger 20-ounce fuel tank for extended flight times
- CNC-machined delrin bevel drive gear
- Optimum 9.33 to 1 to 4.83 gear ratio

ITEMS REQUIRED TO COMPLETE THE JR VIGOR CS

1. RADIO SYSTEM REQUIREMENTS (NOT INCLUDED):

6-channel or greater R/C helicopter system with 120° or 140° CCPM with 5 servos
1400mAh receiver battery and gyro

JR XP8103

JR PCM10X

JR G5000T Gyro OR

JR G550T Gyro

CCPM-Ready JR Radio Systems

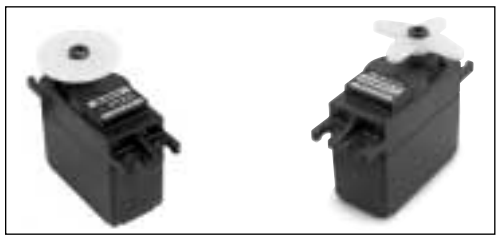
Most current JR heli radio systems (XP652, XP8103 w/digital trims, 10X, as well as older 10 series systems) are equipped with 120° CCPM electronics for use with JR CCPM machines. Radios you may be flying now, like the X347, X388S, XP783, and XP8103*, have 120° CCPM capability built in but require activiation by the Horizon Service Department. For details, please call (217) 355-9511.

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

Current Radio Systems

JRP1656**PCM 10X, 120° & 140° CCPM
JRP8622**XP8103FM, 120° CCPM
JRP8653**XP8103PCM, 120° CCPM
JRP6622**XP652 FM,120° CCPM

JRPS8411 Ultra Torque Digital OR JRPS8231 Ultra Precision Digital
Aileron, Elevator, Collective, Throttle Servos



8700G High Speed Super OR 8417 High Speed Digital
Tail Rotor Servos

JRPB4340
1400mAh Battery Pack

2. ENGINE REQUIREMENTS (not included):

A .60 – .61 R/C helicopter engine is required.

A special helicopter type muffler is also required.

OS 61 WC Heli Engine

YS STII Heli Engine

KSJ520 (O.S.)

KSJ583 (YS)

YEIMP900 Muscle Pipe Set: Right

3. BUILDING SUPPLIES (not included):

The following items are needed to complete the assembly of the JR Vigor CS:

Fuel Filter

Glow Plugs
(HAN3020)

High-Speed
Grease

Medium
Silicone Fuel
Tubing (3 ft)

Nylon Wire Ties
(to secure radio wires)

Double-Sided Servo
Mounting Tape

Light Oil

Rubbing Alcohol

Primer & Paint
(for canopy finishing)

Pacer Poly Zap 1/2 oz
(PAAPT22)

Pacer Zip Kicker
(PAAPT15) Optional

JB Weld Epoxy Adhesive
(JBW8265S)

Heavy-Duty Servo Wheels
(3 pcs) w/Screws
JRPA216 or equivalent

4. TOOLS NEEDED TO ASSEMBLE THE JR VIGOR CS (not included):

Phillips Screwdriver

Nut Drivers: 5 mm, 7 mm

Needle-Nose Pliers

Scissors

Drill and Drill Bits

Small Hammer

Hobby Knife

Metric Ruler

Sandpaper (80–120 Grit)

Allen Wrenches: 1.5, 2.0, 2.5, 3.0 mm

Adjustable Pliers

JR Ball Link Sizing Tool
JRP60219
(Optional)

5. FIELD EQUIPMENT REQUIRED (not included):

12-Volt Electric Starter

12-Volt Starting Battery

1.5-Volt Glow Plug Battery OR

Remote Glow Plug Adaptor

Must have long shaft to reach glow plug.

Helicopter Fuel 15% –30%

Fuel Pump

Glow Plugs
(HAN3020)

Hex Starting Shaft
(JRP960090)

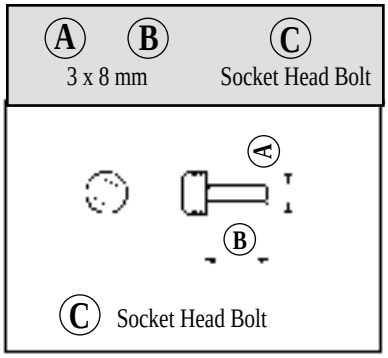
Pitch Gauge
(JRP960326)

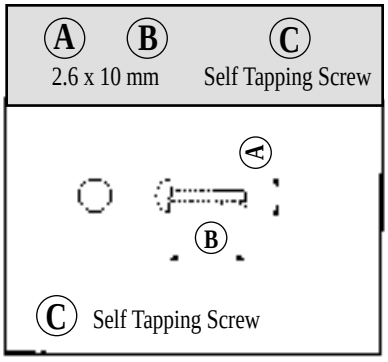
Ball Link Pliers
(RVO1005)

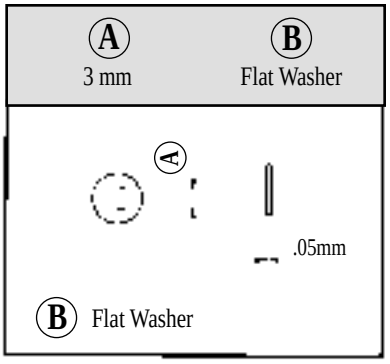
HARDWARE IDENTIFICATION

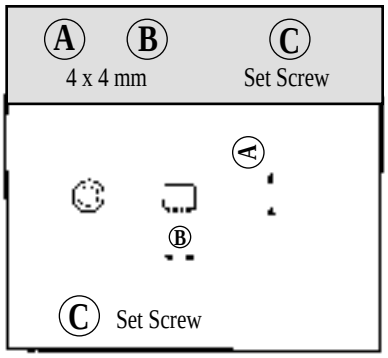
There are a variety of sizes and shapes of hardware included in this kit. Prior to assembly, please be careful to identify each screw by matching it to the full size screw outlines included in each step.

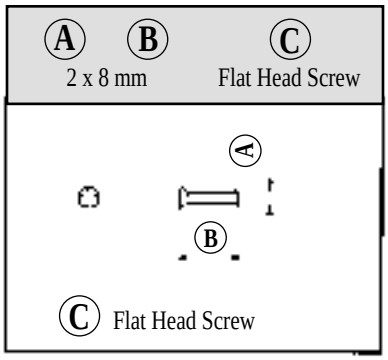
All of the hardware, screws, nuts, etc., contained in the Vigor™ CS kit are described in the following A, B, C manner:

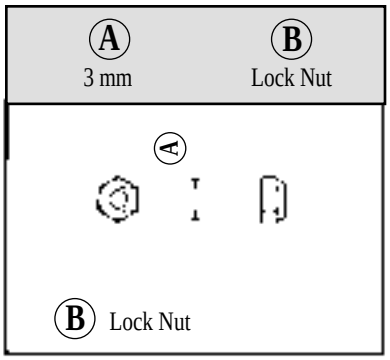


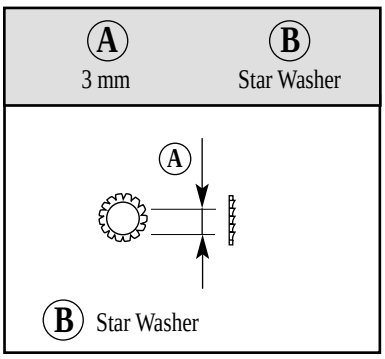


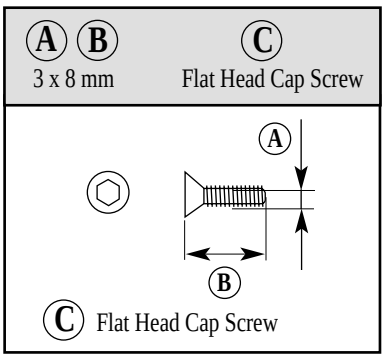


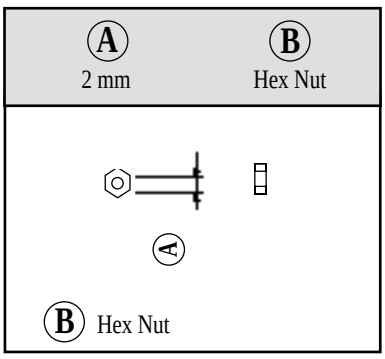












1-1 CLUTCH BELL/START SHAFT ASSEMBLY

...2 pcs
Socket Head Bolt, 3 x 14 mm

.....1 pc
Set Screw, 4 x 4 mm

.....2 pcs
Flat Washer, 3 mm

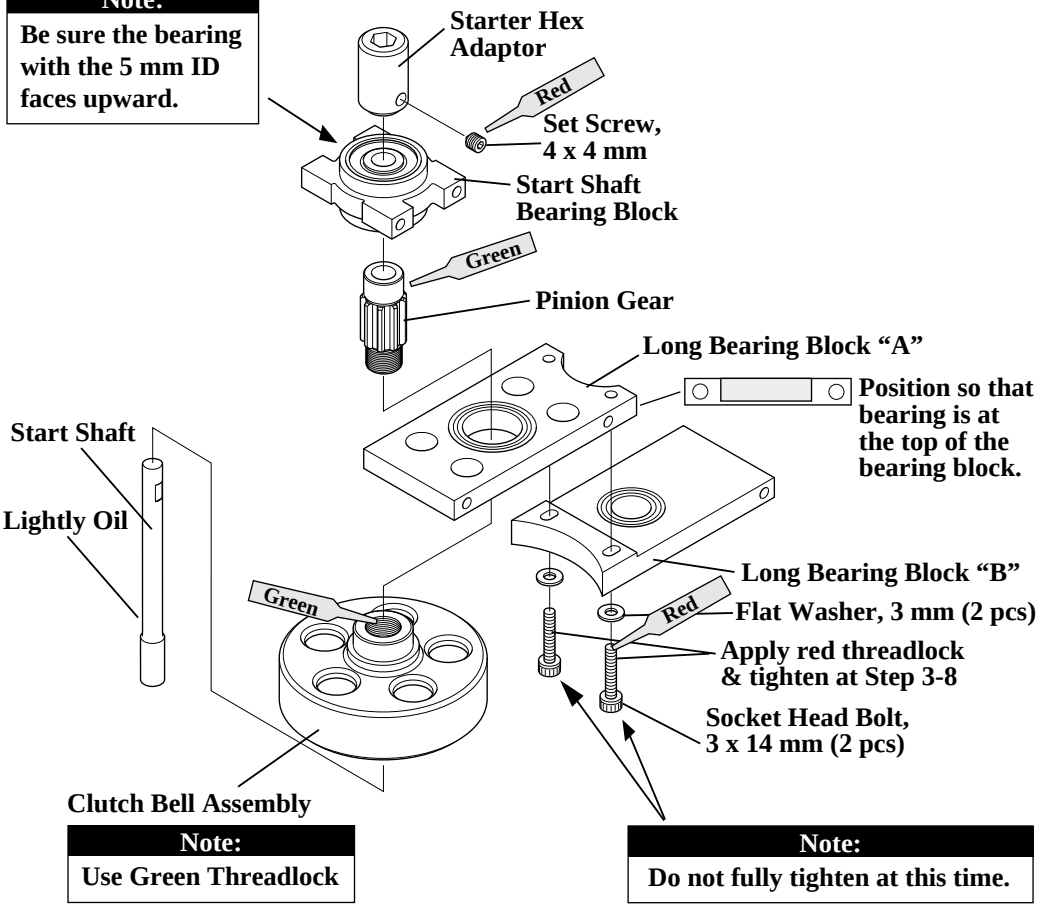
Use Red & Green Threadlock

Assembly Order:

1. Attach pinion to clutch bell
2. Attach clutch bell to bearing block "A"
3. Attach start shaft bearing block to pinion
4. Assemble start shaft assembly
5. Attach bearing block "B"

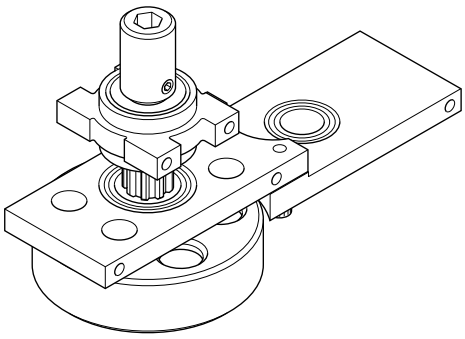
TEAM TIP: *Clean areas with rubbing alcohol to remove any oil residue before applying threadlock.*

Note:
Be sure the bearing with the 5 mm ID faces upward.



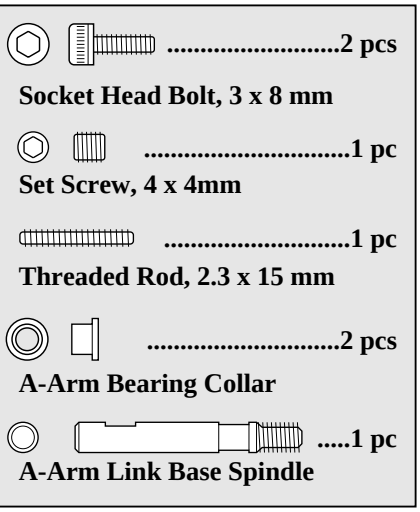
Note:
Use Green Threadlock

Note:
Do not fully tighten at this time.



Complete Assembly

1-2 ELEVATOR A-ARM ASSEMBLY



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

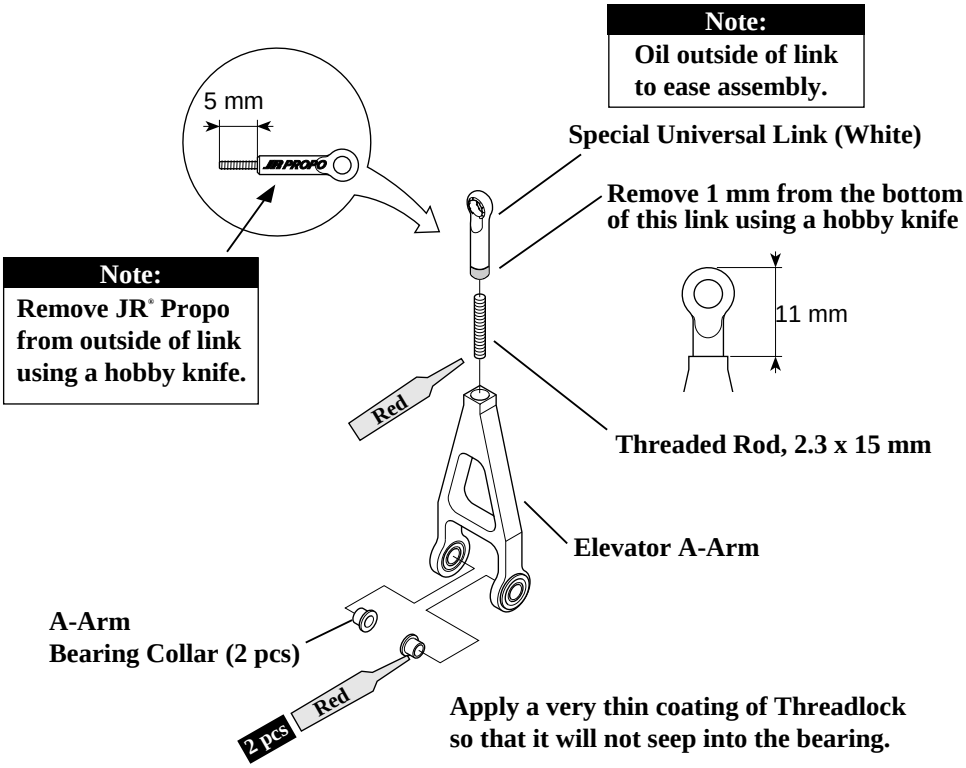
.....1 pc
Set Screw, 4 x 4mm

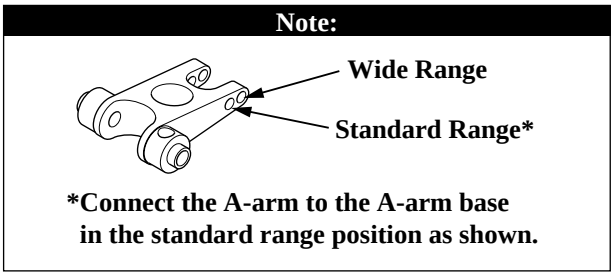
.....1 pc
Threaded Rod, 2.3 x 15 mm

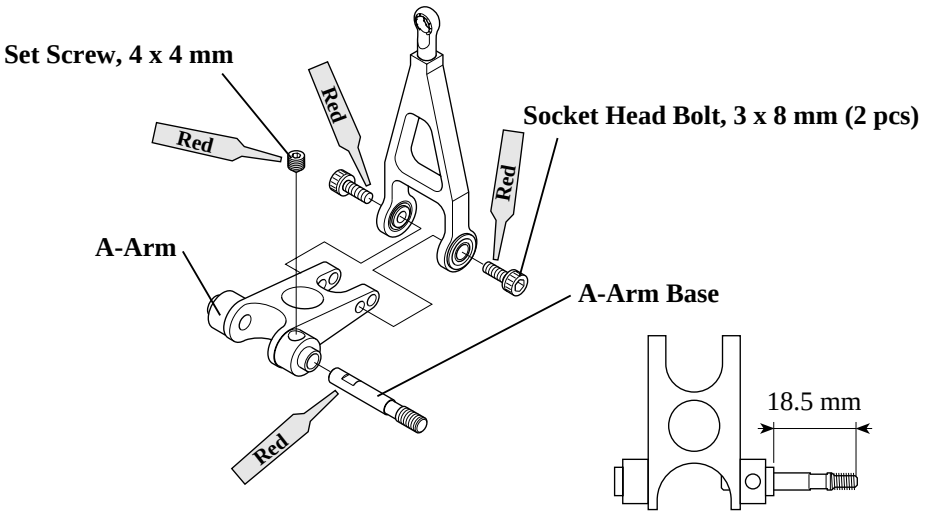
.....2 pcs
A-Arm Bearing Collar

.....1 pc
A-Arm Link Base Spindle

Use Red Threadlock







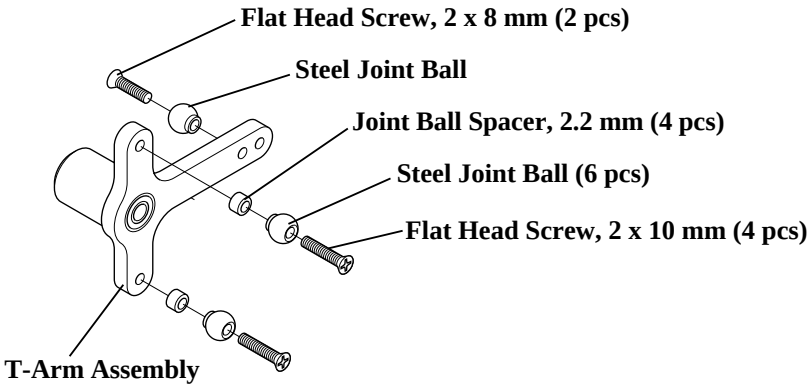
1-3 T-ARM LEVER ASSEMBLY

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

..... 4 pcs
Flat Head Screw, 2 x 10 mm

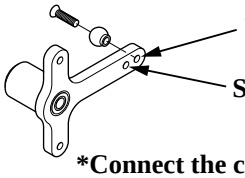
..... 8 pcs
Steel Joint Ball

.....4 pcs
Joint Ball Spacer, 2.2 mm

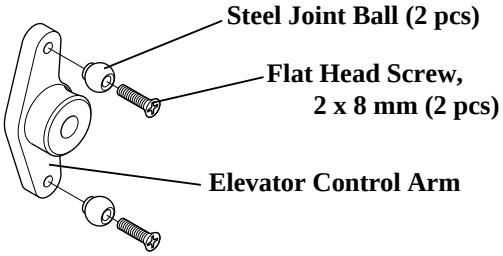


Use Red Threadlock on all screws

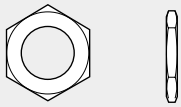
Note:



***Connect the control ball to the T-Arms in the standard range position as shown.**

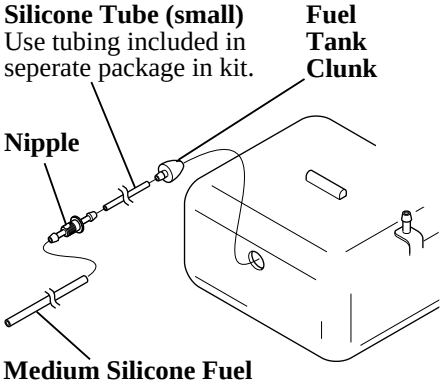


1-4 FUEL TANK ASSEMBLY (BAG #6)

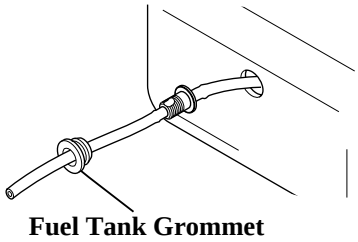


.....1 pc
Nut, 7 mm

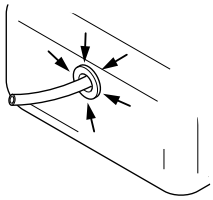
.....1 pc
Washer, 7 x 12 x 1 mm



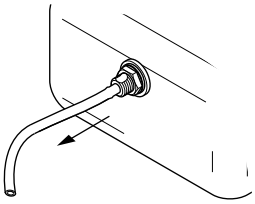
1. Cut the small silicone fuel tubing(included) to a length of 77 mm. Next, connect the fuel tank clunk, nipple, and medium silicone fuel tubing (not included) as shown above.



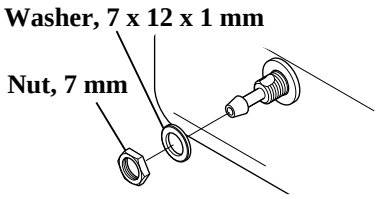
2. Insert the assembly into the fuel tank opening so that the nipple is inside the tank. Next, slide the fuel tank grommet over the medium fuel tubing.



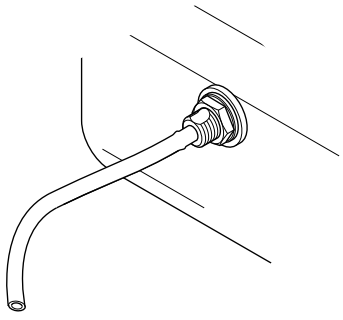
3. Inset the fuel tank grommet into the fuel tank opening, making sure that it is fully seated.



4. Pull the medium fuel tubing out of the fuel tank until the threads of the fuel tank nipple are exposed.



5. Remove the medium silicone fuel tubing from the nipple and secure the nipple to the fuel tank using the 7 x 12 x 1 mm washer and 7 mm nut supplied. Be sure to secure this assembly firmly to avoid leakage.



Complete Assembly

2-1A MAIN FRAME ASSEMBLY: BEARING BLOCK/CLUTCH INSTALLATION

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

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

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

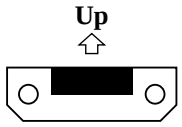
.....8 pcs
Flat Washer, 3 mm

Note:

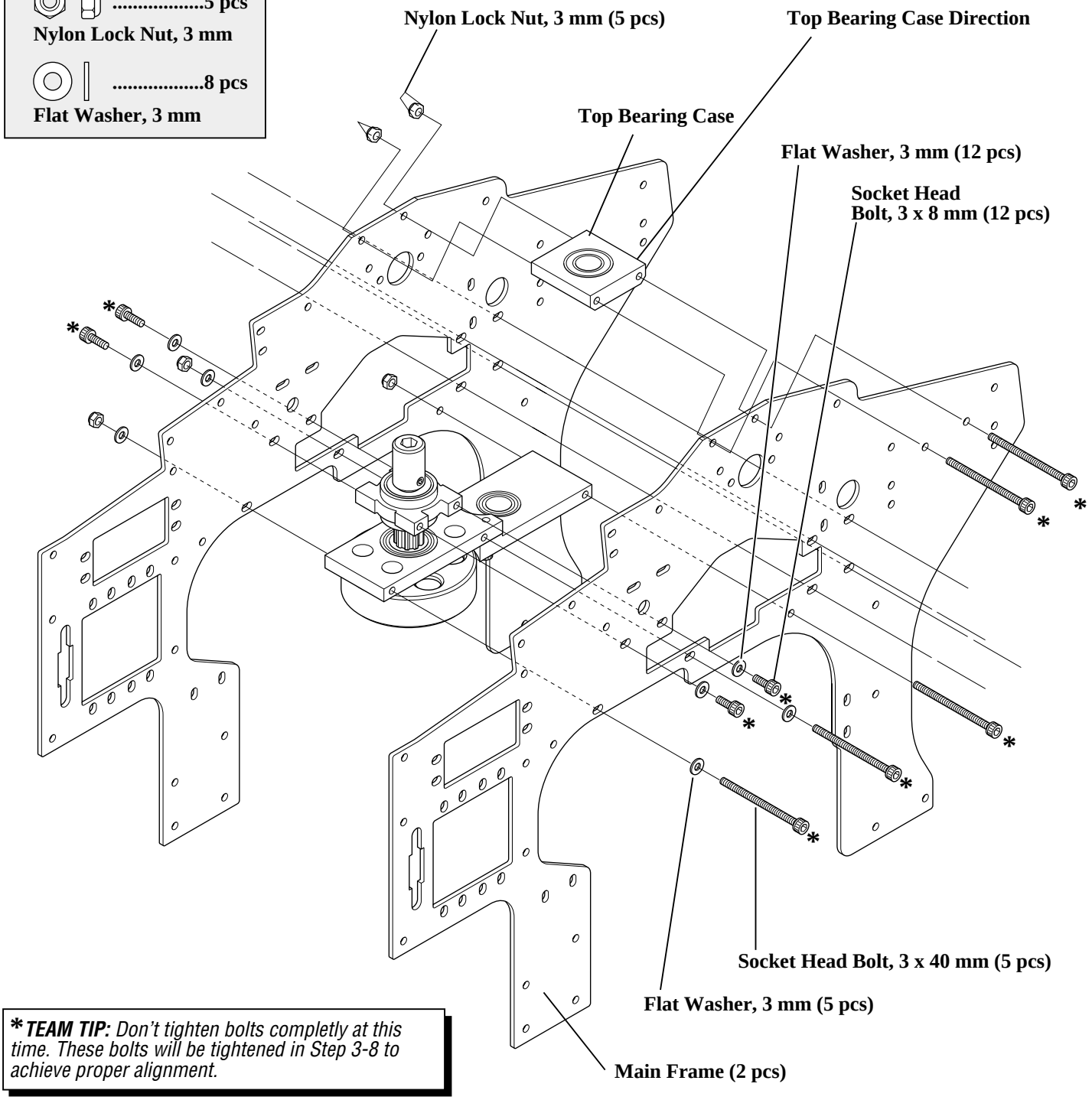
Prior to assembling the main frames, sand all edges of the frame using 120 grit sandpaper. This will prevent wire chaffing during continuous operation.

Note:

Positon so that bearing faces upward.



Top Bearing Case Direction



***TEAM TIP:** Don't tighten bolts completly at this time. These bolts will be tightened in Step 3-8 to achieve proper alignment.*

2-1B ELEVATOR ARM INSTALLATION

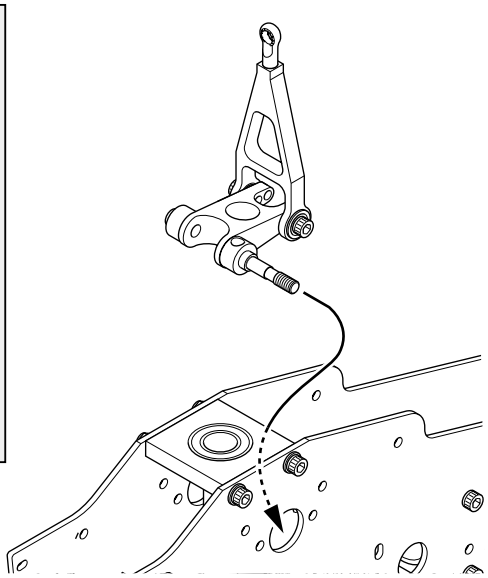
.....4 pcs
Socket Head Bolt, 3 x 8 mm

.....1 pc
Socket Head Bolt, 4 x 10 mm

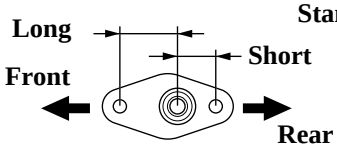
.....4 pcs
Nylon Lock Nut, 3 mm

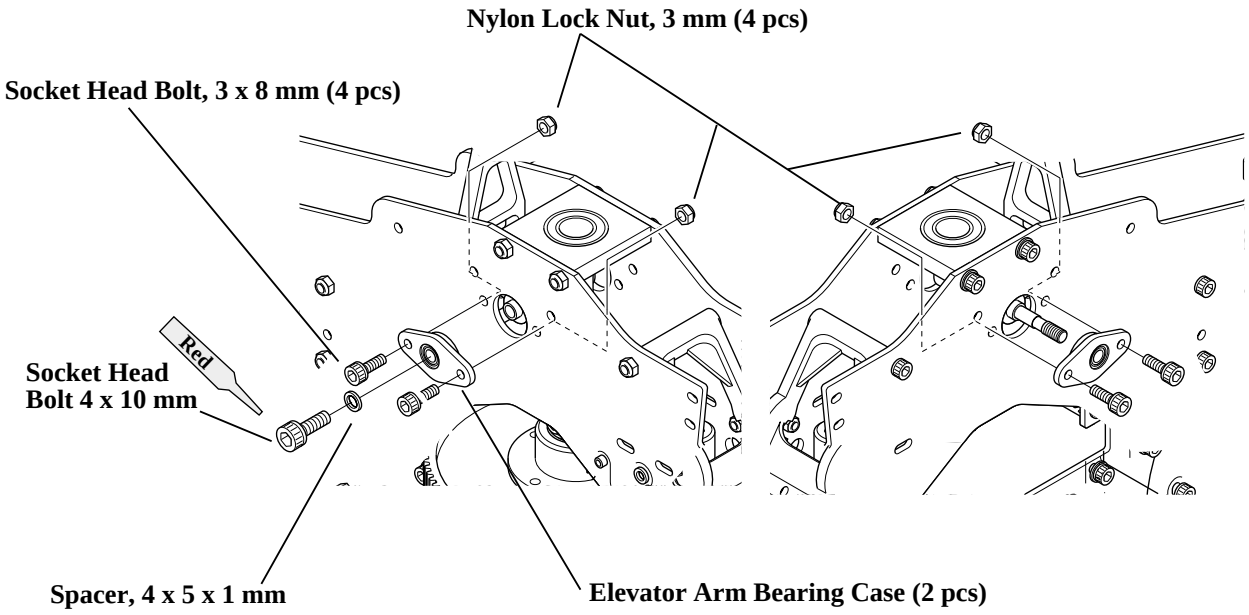
..... 1 pc
Spacer, 4 x 5 x 1 mm

Use Red Threadlock

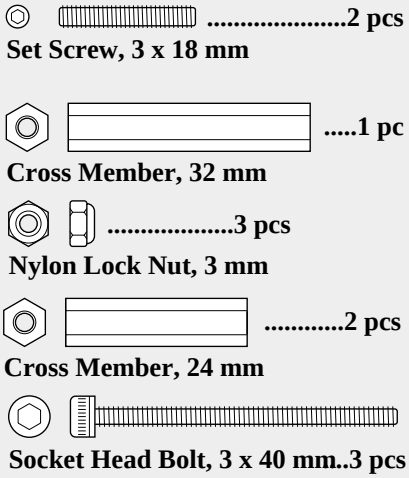


Direction of Installation

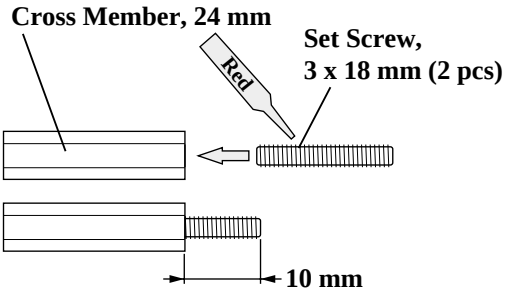




2-2 MAIN FRAME ASSEMBLY: CROSSMEMBER INSTALLATION



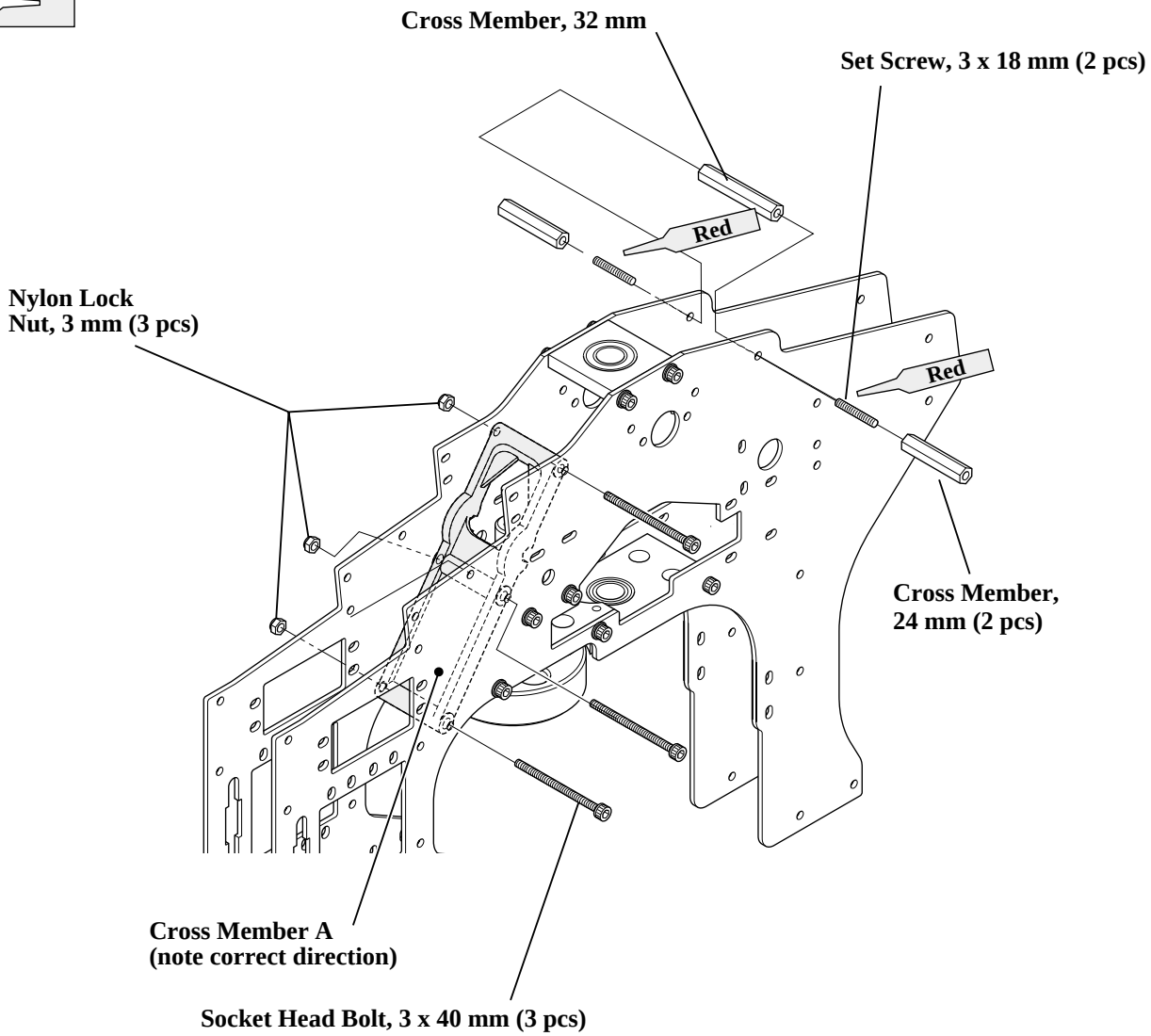
Use Red Threadlock



***TEAM TIP:** Do not apply Threadlock to bolts unless you will procede through Step 3-8 during this building session.*

Note:

When installing the cross member A, be careful not to over tighten.



***TEAM TIP:** Don't tighten bolts completely at this time. These bolts will be tightened in Step 3-8.*

2-3A T-LEVER INSTALLATION

Socket Head Bolt, 3 x 28 mm..2 pcs

.....2 pcs

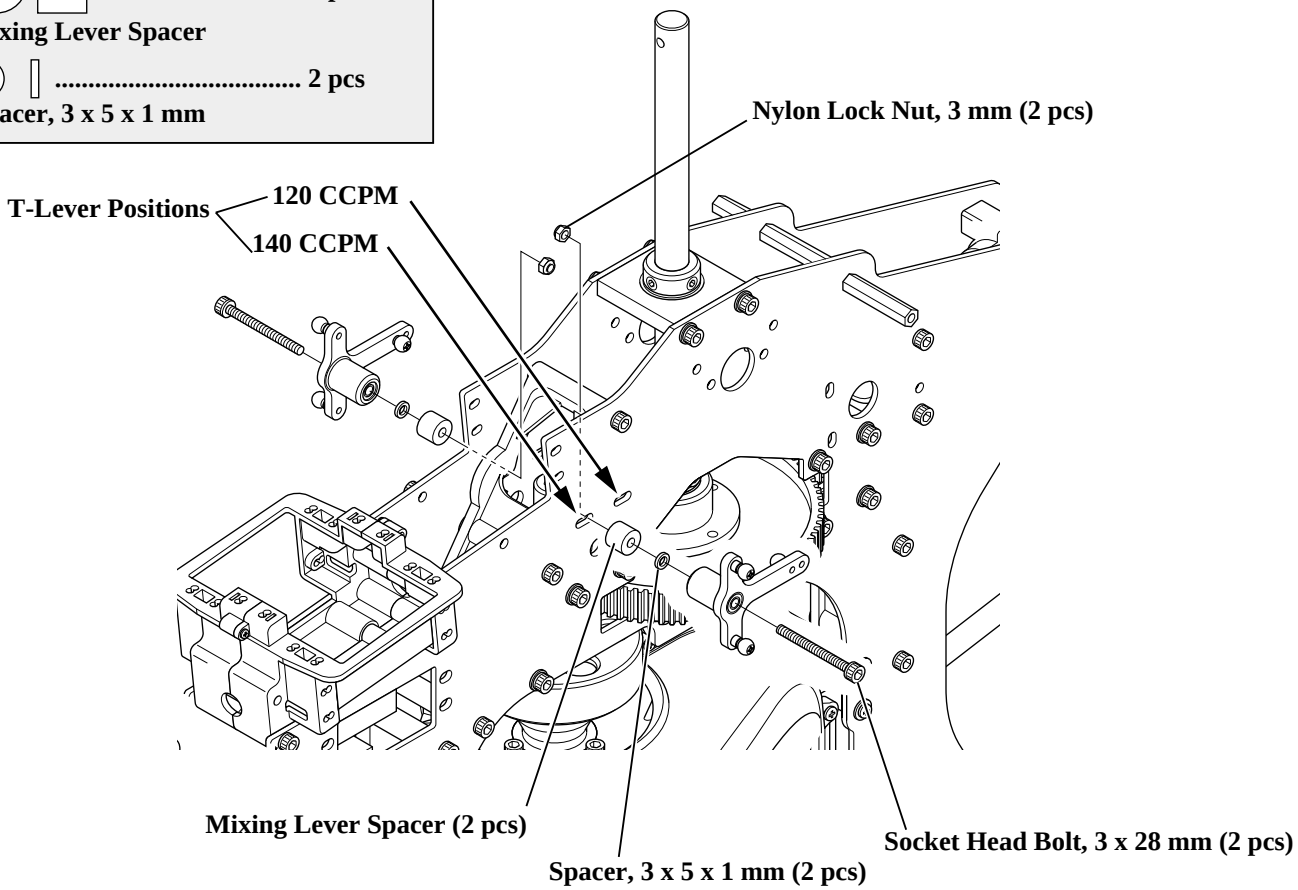
Nylon Lock Nut, 3 mm

.....2 pcs

Mixing Lever Spacer

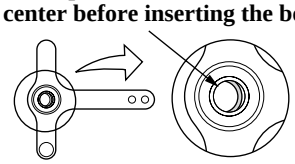
..... 2 pcs

Spacer, 3 x 5 x 1 mm



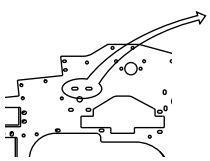
TEAM TIP: *If you have difficulty reaching the 3 mm T-lever nuts, remove the two top bolts from the plastic crossmember and slide the crossmember forward.*

If a collar in T arm is too one-sided, please correct the collar to center before inserting the bolts.



Note:

T-Lever Position on Main Frame Slots



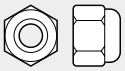
120 CCPM/Standard Range

140 CCPM/Standard Range

2-3B ELEVATOR CONTROL ARM INSTALLATION

.....2 pcs

Set Screw, 4 x 4 mm

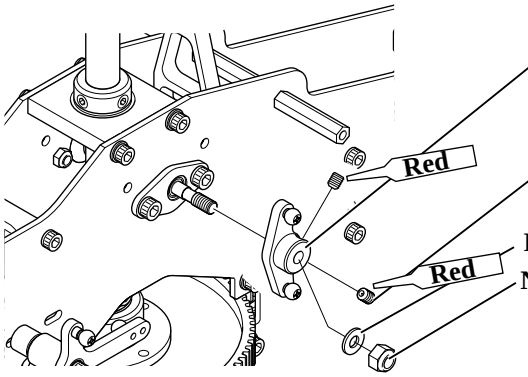

.....1 pc

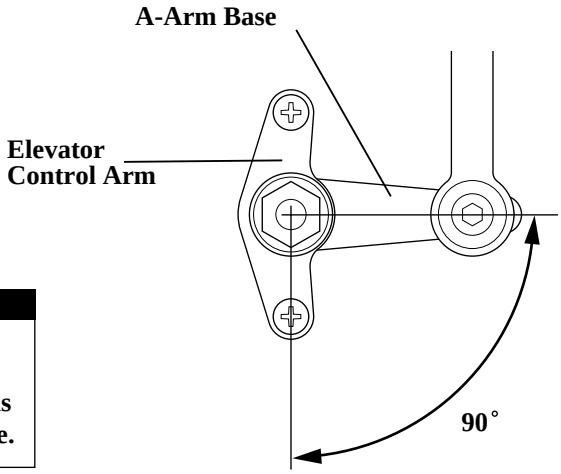
Nylon Lock Nut, 4 mm


.....1 pc

Flat Washer, 4 mm


Use Red Threadlock





Note:

Make sure that the elevator control arm is installed so that it is 90° to the A-arm base.

2-4 MAIN FRAME ASSEMBLY: ENGINE MOUNT/CROSS MEMBER INSTALLATION

.....2 pcs
Socket Head Bolt, 3 x 10 mm

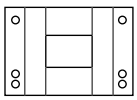
....6 pcs
Socket Head Bolt, 3 x 40 mm

Socket Head Bolt, 3 x 50 mm .....2 pcs

.....1 pc
Cross Member, 32 mm

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

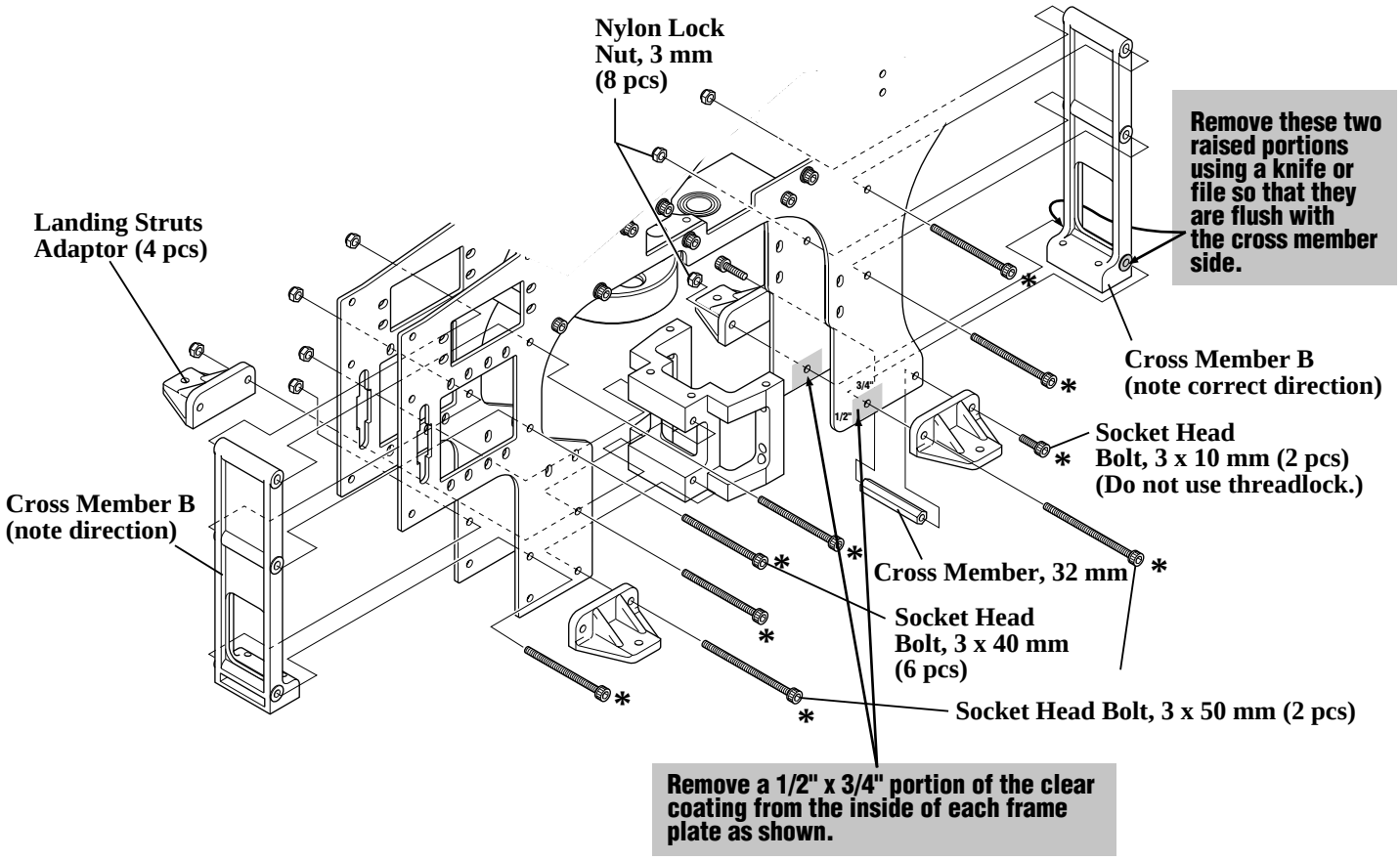
Up



O.S. Engines and YS Engines Engine Mount Direction

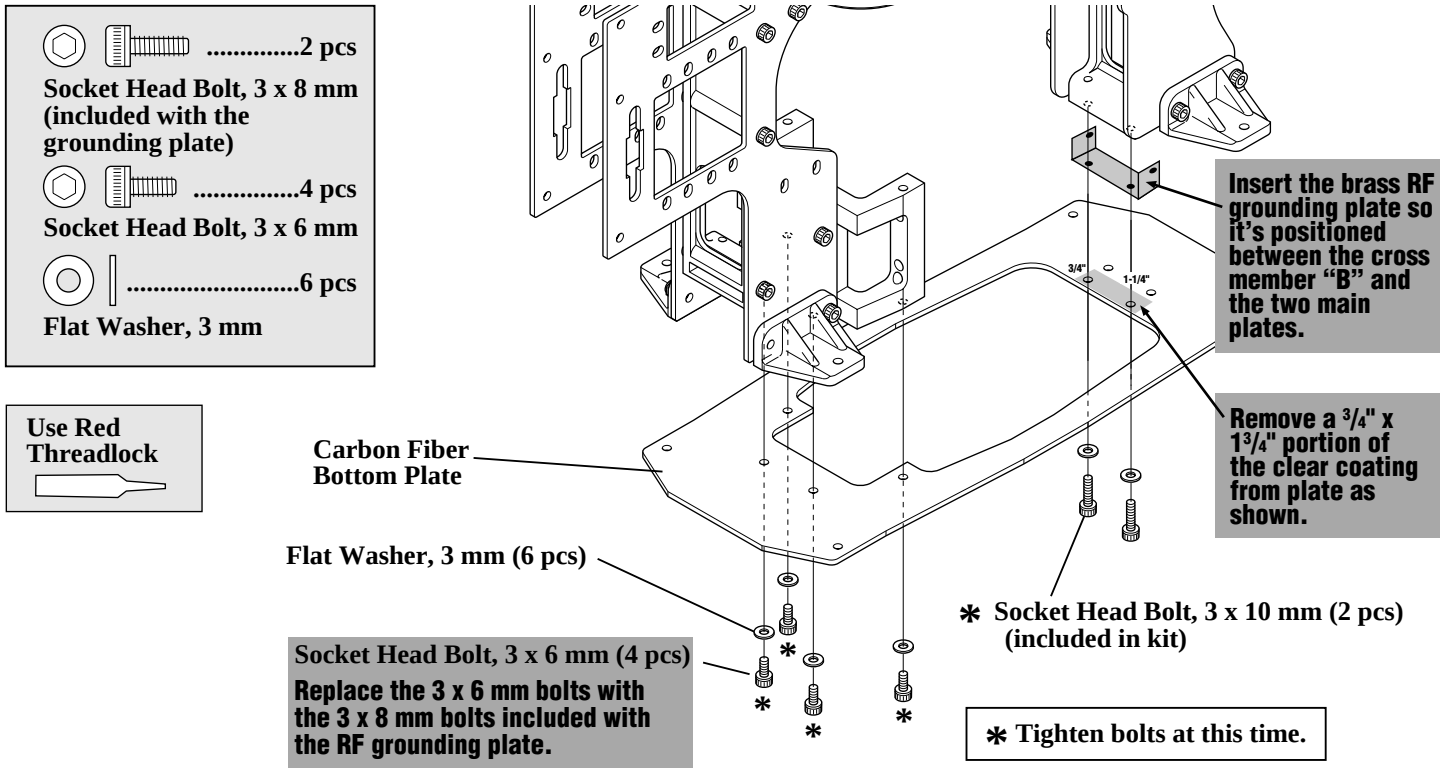
***TEAM TIP:** Do not tighten bolts completly as this time. These bolts will be tightened in Step 3-8.*

A) Remove the two raised portions from cross member "B" as shown.
B) Remove a 1/2" x 3/4" portion of the clear coating from the inside of each main frame as shown.



2-5 MAIN FRAME ASSEMBLY: BOTTOM PLATE INSTALLATION

A) Remove a 3/4" x 1 1/4" portion of the clear coating from the top of the bottom carbon fiber plate as shown.
B) Insert the brass RF grounding plate between the cross member "B" and the inside of the two main frames as shown.
C) When installing the carbon bottom plate, replace the four 3 x 6 mm socket head bolts that connect the carbon plate to the motor mount with the four 3 x 8 mm socket head bolts included with the RF grounding plate.



When properly installed, the RF grounding plate will make contact with both the two main frames and the bottom carbon plate in the areas where the clear coating has been removed. This will properly complete the ground between the main frame and the bottom carbon plate.

2-6 FUEL TANK INSTALLATION

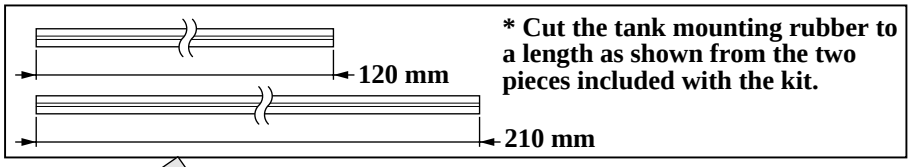
....6 pcs
Socket Head Bolt, 3 x 25 mm

.....4 pcs
Spacer, 3 x 6 x 14 mm

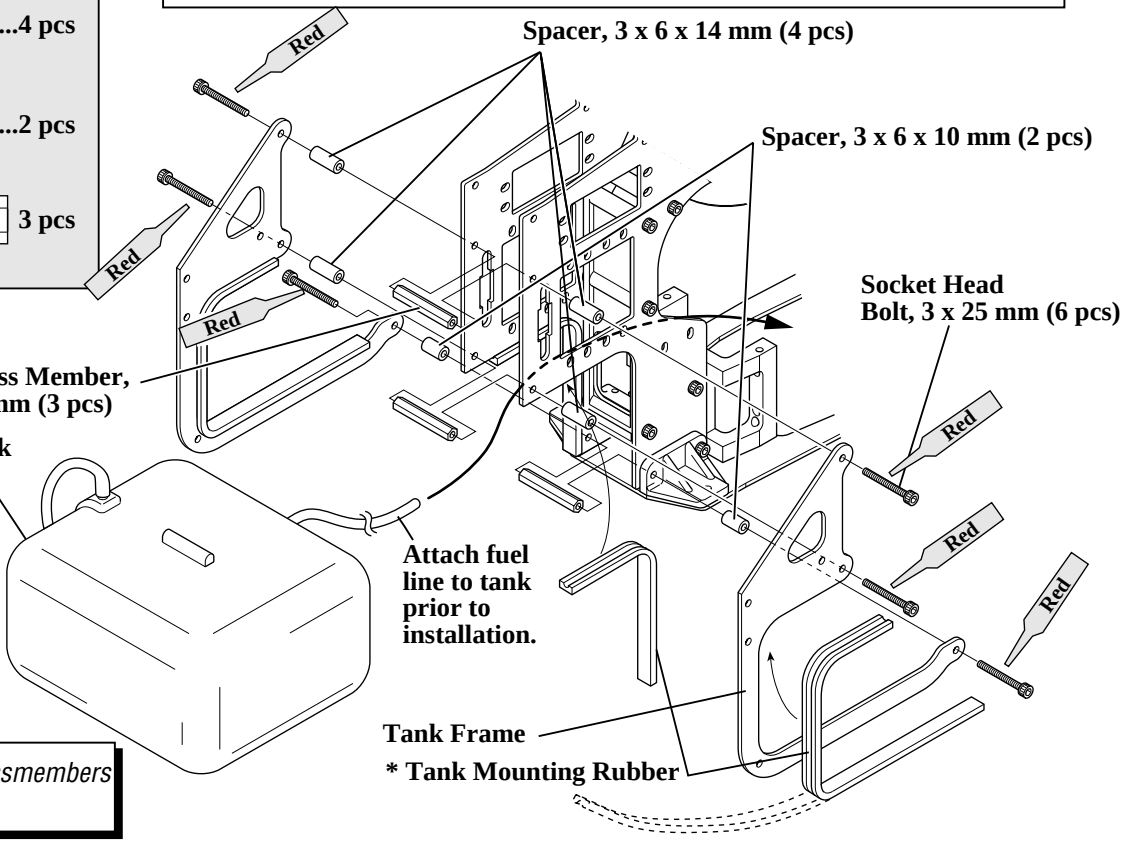
.....2 pcs
Spacer, 3 x 6 x 10 mm

3 pcs
Cross Member, 32 mm

Use Red Threadlock



* Cut the tank mounting rubber to a length as shown from the two pieces included with the kit.



*** Note:**
If a YS engine is to be used, replace the existing tank mounting rubber with Aerotrend large fuel tubing or equivalent.

***TEAM TIP:** Insert 32 mm crossmembers before installing the fuel tank.*

2-7 FRONT RADIO BED INSTALLATION

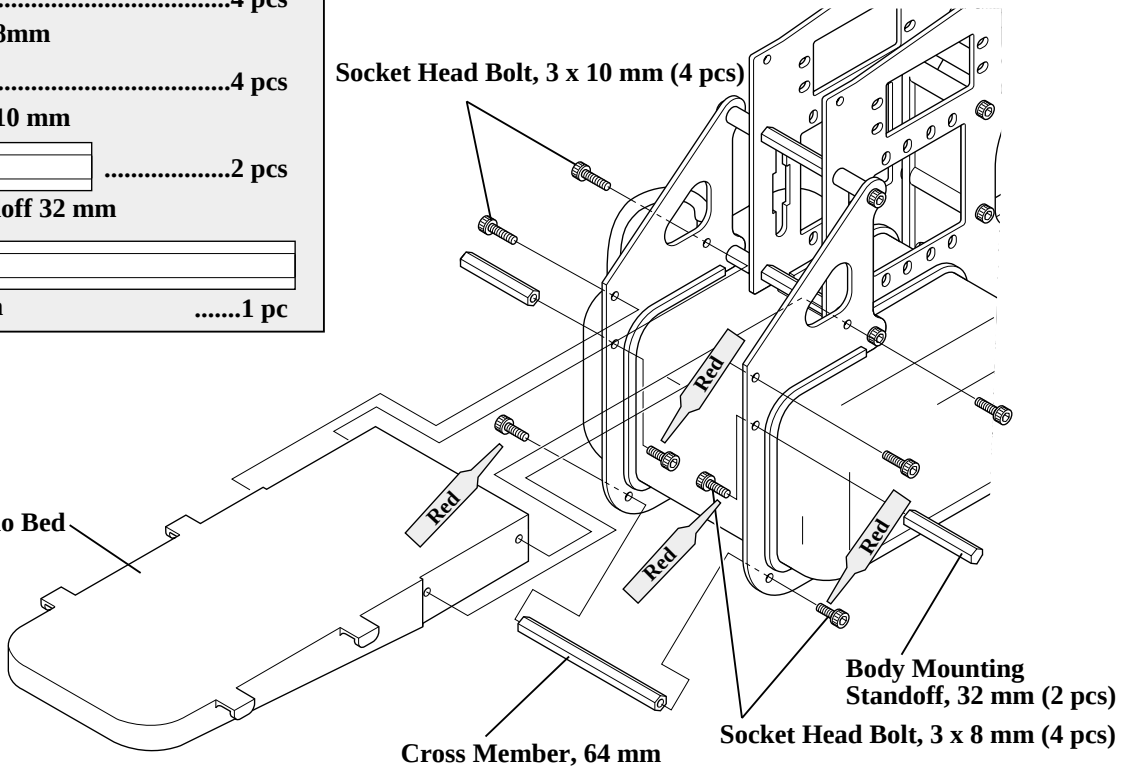
.....4 pcs
Socket Head Bolt 3 x 8mm

.....4 pcs
Socket Head Bolt 3 x 10 mm

.....2 pcs
Body Mounting Standoff 32 mm

Cross Member 64 mm .....1 pc

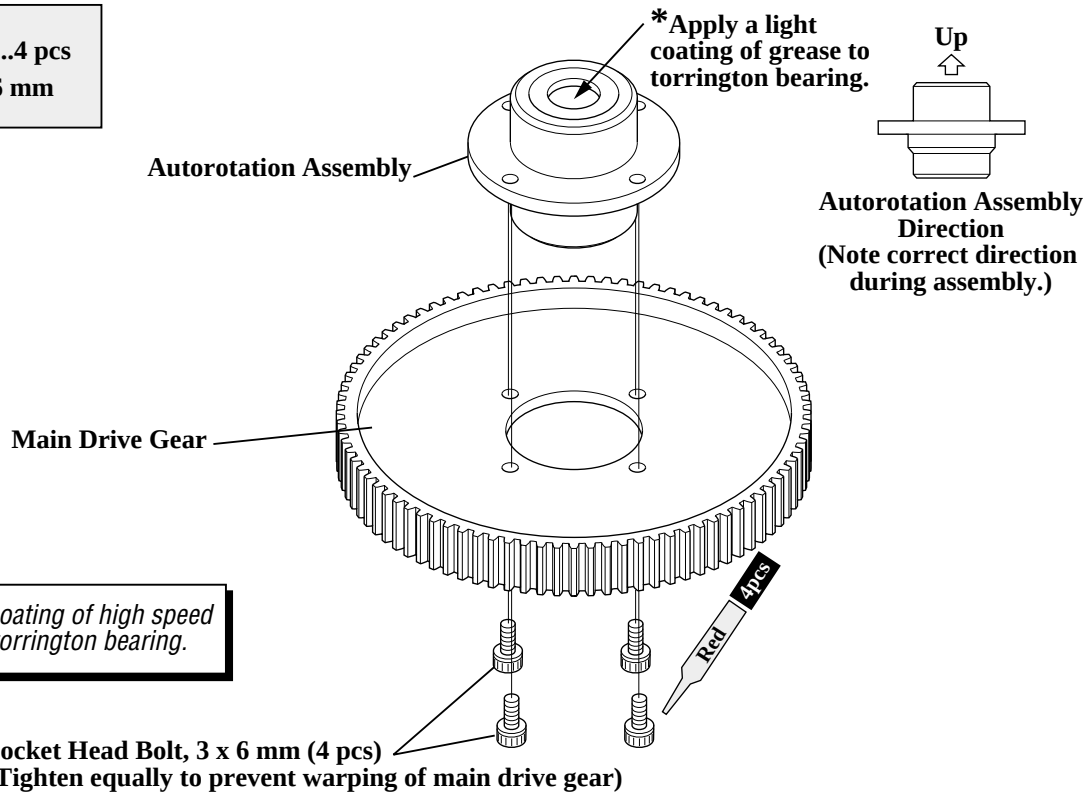
Use Red Threadlock



3-1A MAIN DRIVE GEAR/AUTOROTATION ASSEMBLY

.....4 pcs
Socket Head Bolt, 3 x 6 mm

Use Red Threadlock



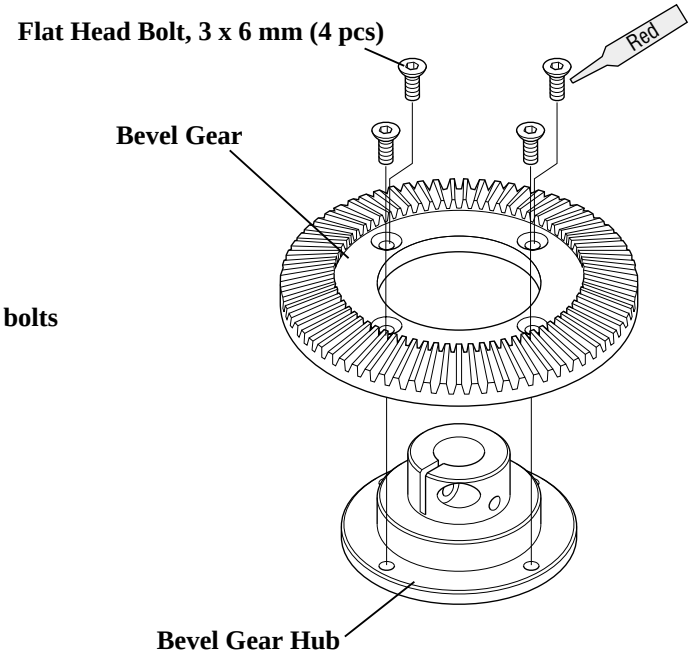
***TEAM TIP:** Apply a light coating of high speed grease to the inside of the torrington bearing.*

3-1B BEVEL GEAR ASSEMBLY

..... 4 pcs
Flat Head Bolt, 3 x 6 mm

Use Red Threadlock

Attach the bevel gear hub as shown.
Be sure not to overtighten the four 3 mm bolts as this could distort the bevel gear.



3-2 MAIN SHAFT/MAIN DRIVE GEAR INSTALLATION

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

... 1 pc
Socket Head Bolt, 3 x 20 mm

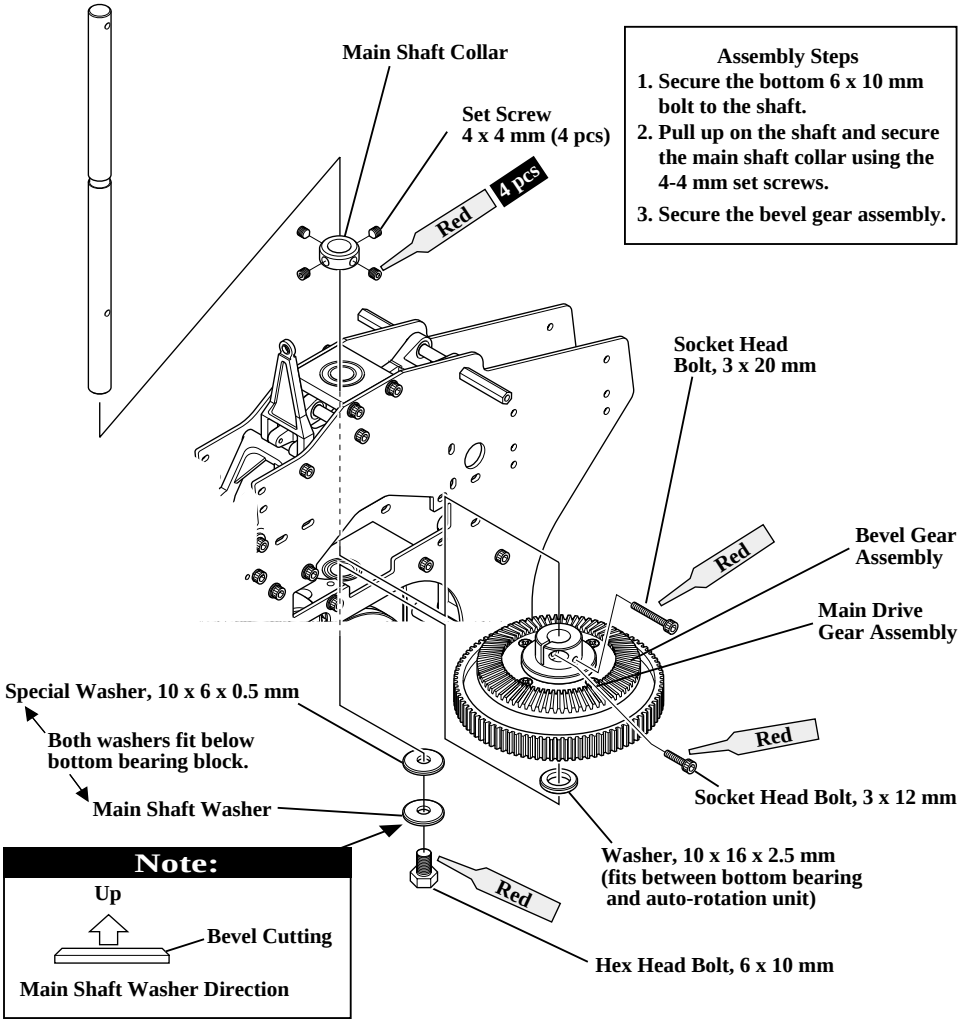
.....4 pcs
Set Screw, 4 x 4 mm

.....1 pc
Hex Head Bolt, 6 x 10 mm

.....1 pc
Steel Washer, 10 x 16 x 2.5 mm

.....1 pc
Main Shaft Washer

Use Red Threadlock



Assembly Steps
1. Secure the bottom 6 x 10 mm bolt to the shaft.
2. Pull up on the shaft and secure the main shaft collar using the 4-4 mm set screws.
3. Secure the bevel gear assembly.

Note:
Up
Bevel Cutting
Main Shaft Washer Direction

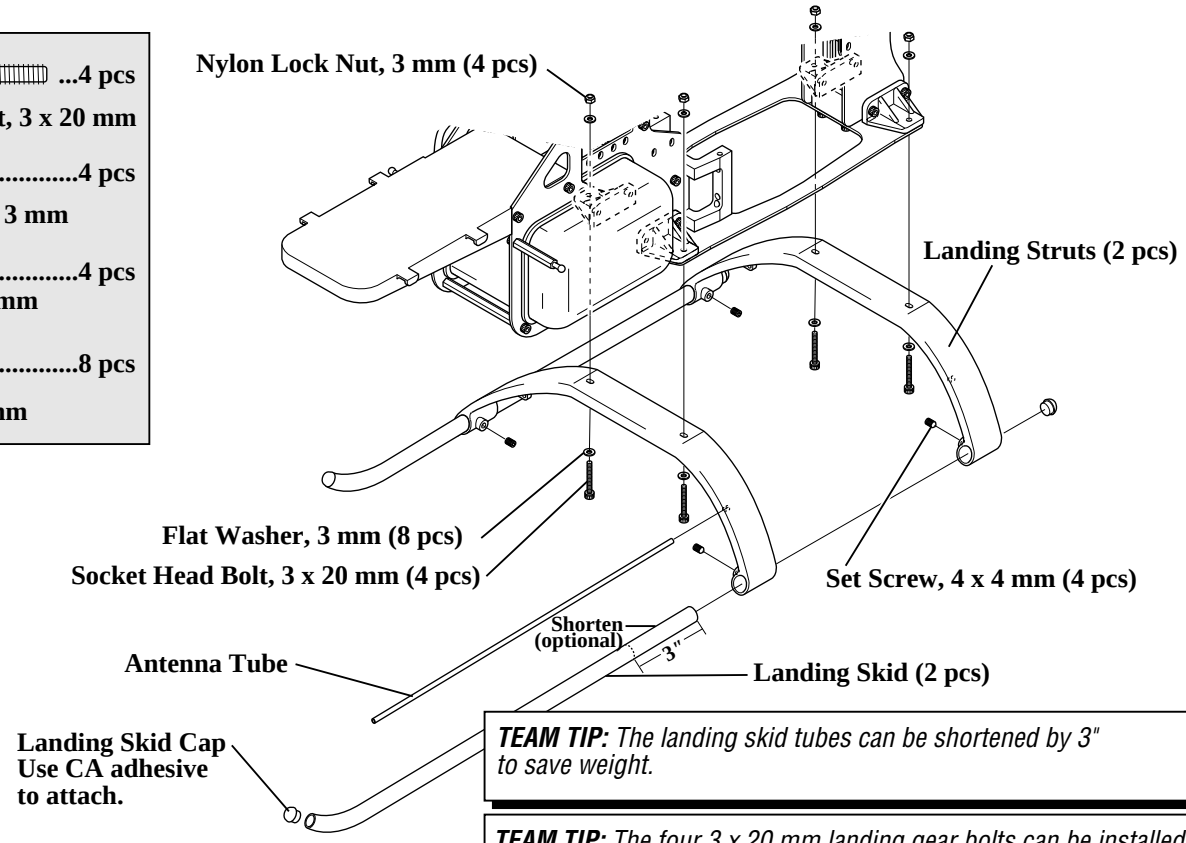
3-3 LANDING GEAR ASSEMBLY INSTALLATION

...4 pcs
Socket Head Bolt, 3 x 20 mm

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

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

.....8 pcs
Flat Washer, 3 mm



TEAM TIP: *The landing skid tubes can be shortened by 3" to save weight.*

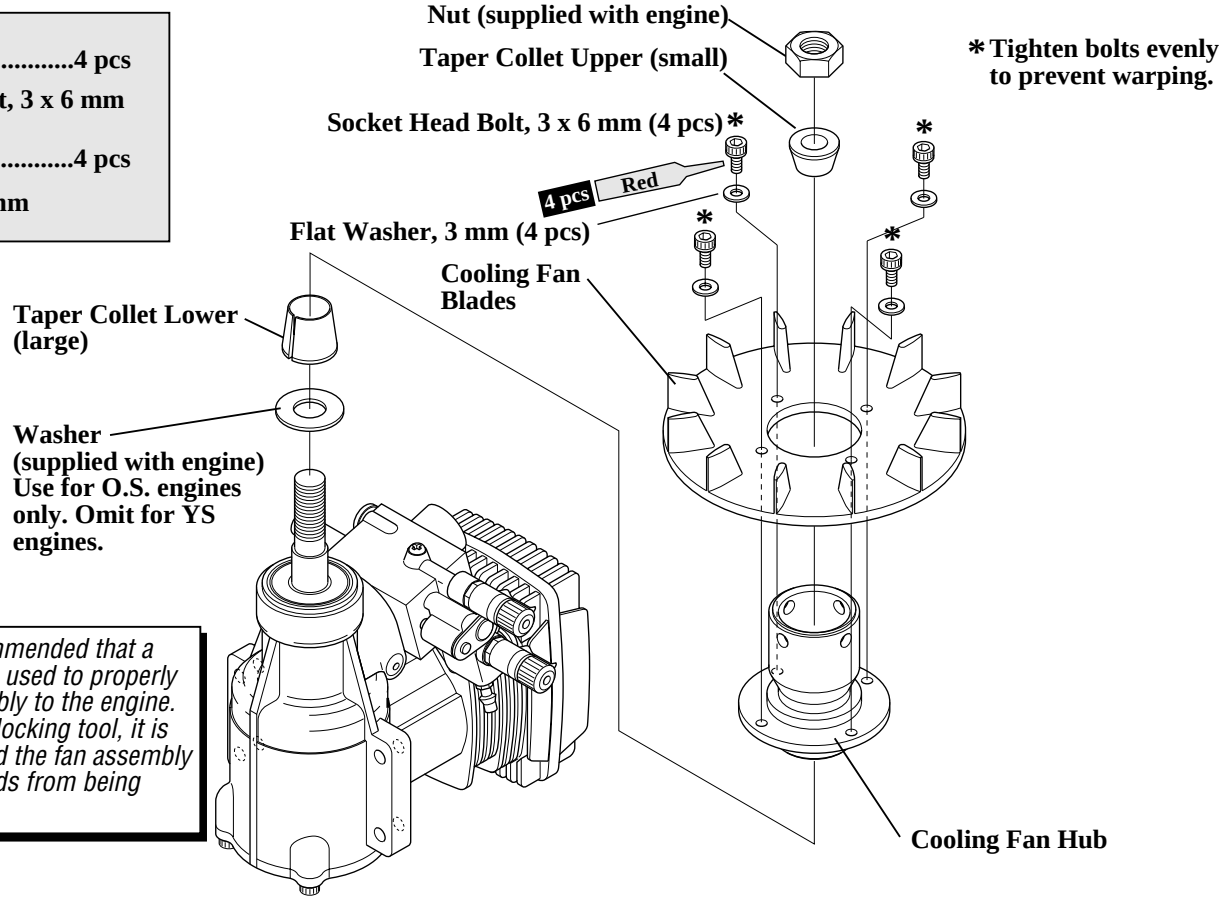
TEAM TIP: *The four 3 x 20 mm landing gear bolts can be installed from the top (opposite diagram) for a cleaner appearance.*

3-4 COOLING FAN/HUB INSTALLATION

.....4 pcs
Socket Head Bolt, 3 x 6 mm

.....4 pcs
Flat Washer, 3 mm

Use Red Threadlock



* Tighten bolts evenly to prevent warping.

TEAM TIP: *It is recommended that a piston locking tool be used to properly secure the fan assembly to the engine. When using a piston locking tool, it is necessary to also hold the fan assembly to prevent excess loads from being applied to the piston.*

3-5 CLUTCH ASSEMBLY ATTACHMENT

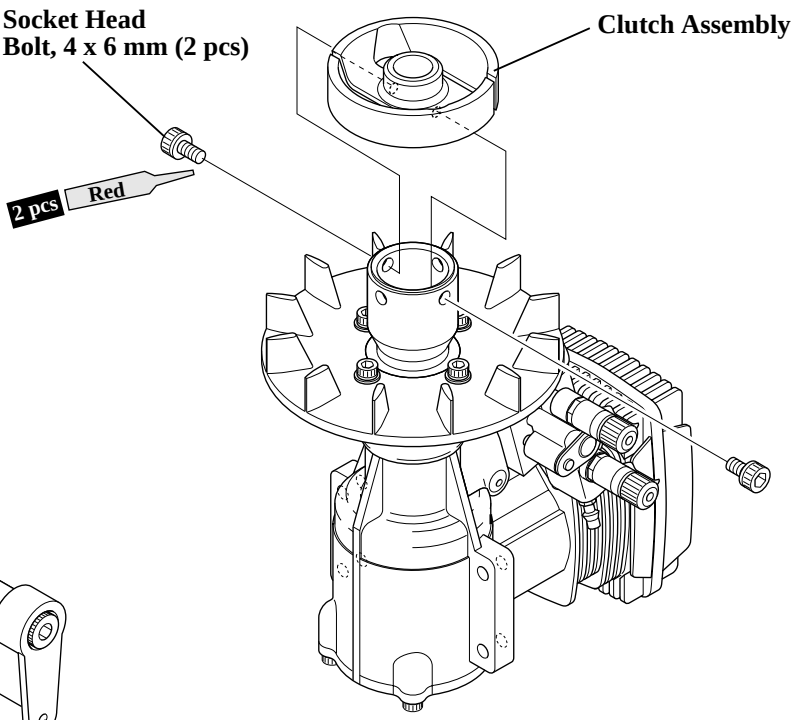
.....2 pcs
Socket Head Bolt, 4 x 6 mm

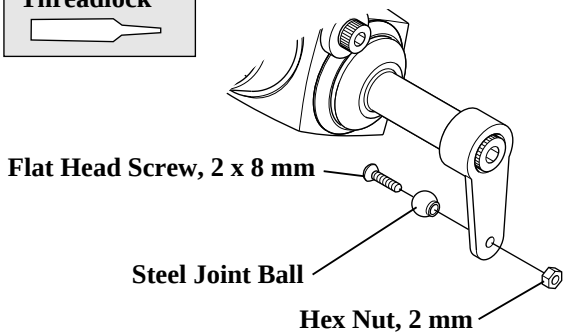
.....1 pc
Flat Head Screw, 2 x 8 mm

.....1 pc
Steel Joint Ball

.....1 pc
Hex Nut, 2 mm

Use Red Threadlock





TEAM 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° intervals through the use of the four holes in the fan hub until optimum clutch trueness is achieved.*

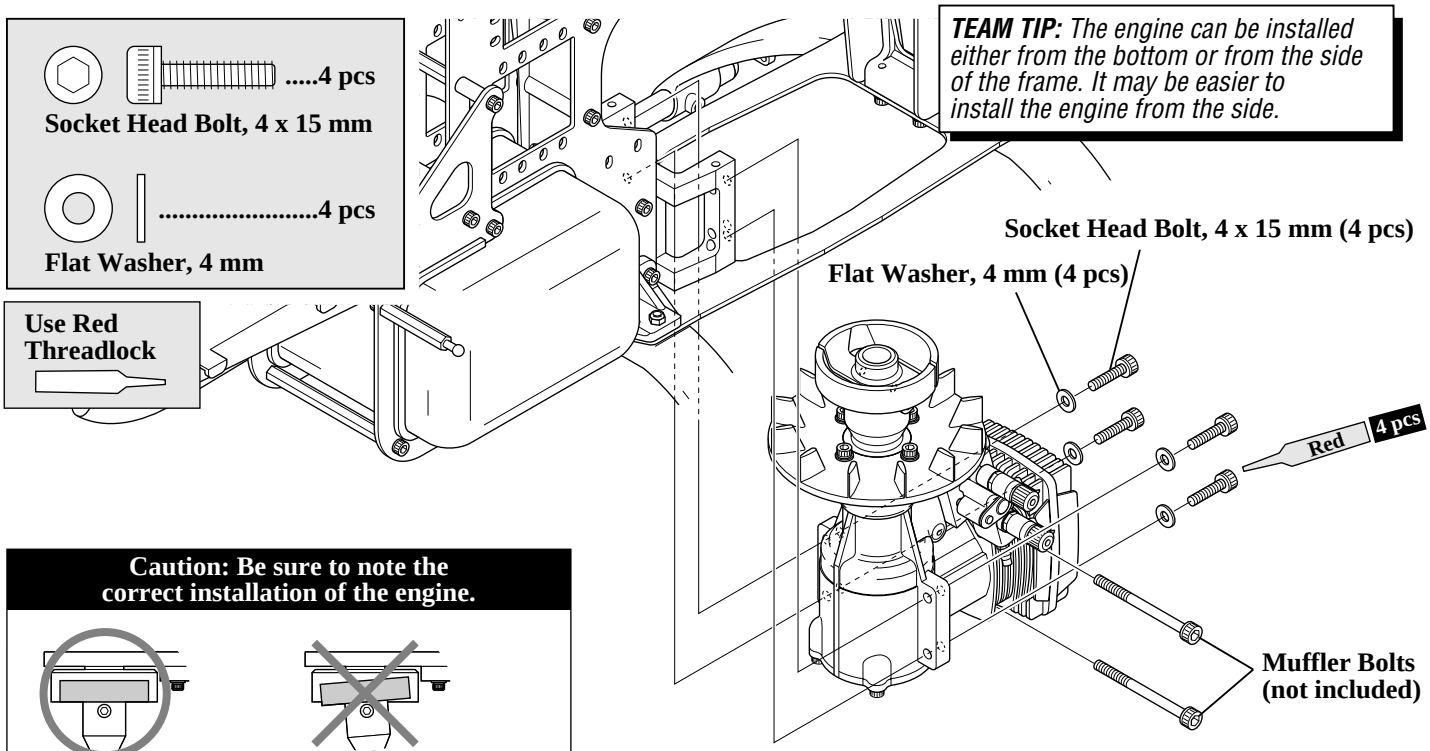
3-6 ENGINE INSTALLATION

.....4 pcs
Socket Head Bolt, 4 x 15 mm

.....4 pcs
Flat Washer, 4 mm

Use Red Threadlock

TEAM TIP: *The engine can be installed either from the bottom or from the side of the frame. It may be easier to install the engine from the side.*



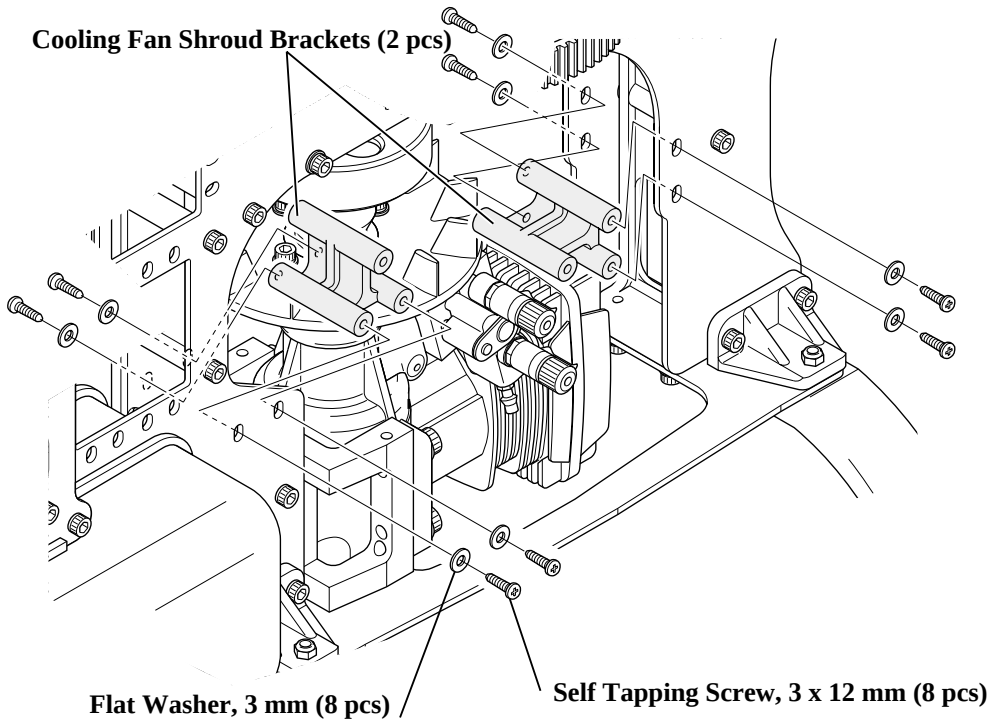
Caution: Be sure to note the correct installation of the engine.

1. Adjust the position of the engine as shown so the bottom of the clutch assembly is flush with the bottom of the clutch bell. Also check to insure that the engine and clutch bell are parallel.
2. It is highly recommended that you insert the muffler bolts into the engine case prior to installing the engine in the frame.

3-7 COOLING FAN SHROUD BRACKET ATTACHMENT

.....8 pcs
Self Tapping Screw, 3 x 12 mm

.....8 pcs
Flat Washer, 3 mm



Note:

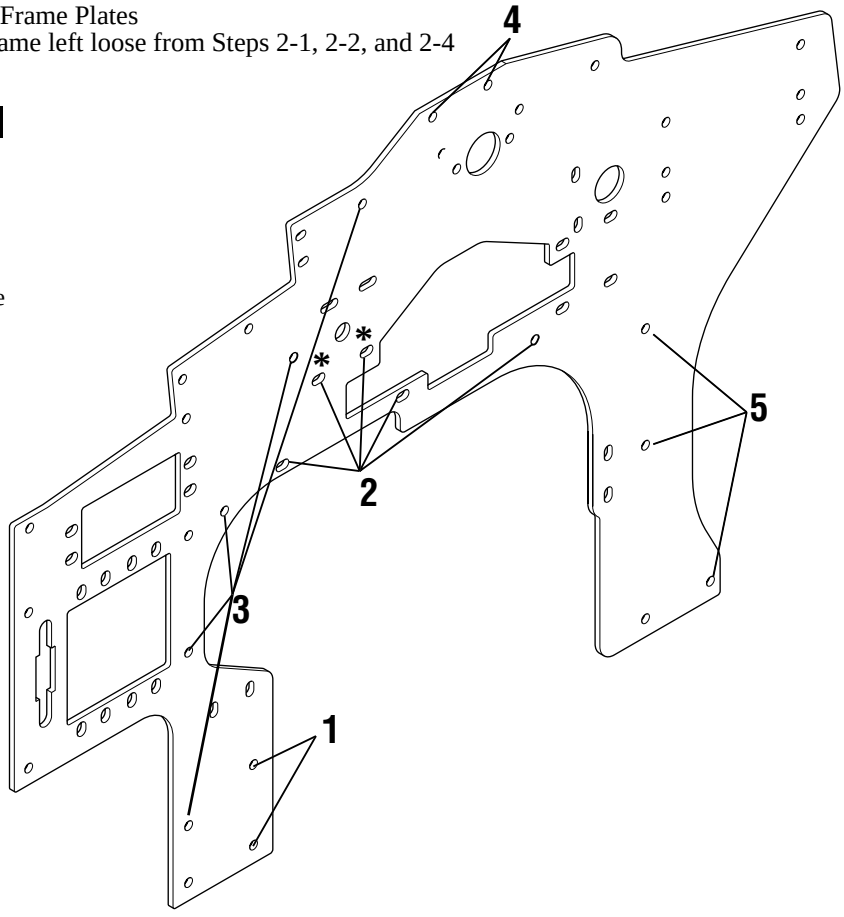
Do not tighten screws at this time. They will be tightened in Step 3-9.

3-8 BOLT TIGHTENING ORDER/GEAR MESH ADJUSTMENT

Use Red Threadlock

Bolt Tightening Order:
1. Motor Mount to Main Frame Plates
2. Start Shaft Bearing Block/Bearing Blocks “A” & “B”
3. Crossmember “A”, and front Crossmember “B” to Main Frame Plates
4. Upper Main Shaft Bearing Block to Main Frame Plates
5. Rear Crossmember “B” to Main Frame Plates
6. Tighten all remaining bolts on frame left loose from Steps 2-1, 2-2, and 2-4

6 Tighten all remaining bolts.



Gear Mesh Adjustment

Once the engine has been installed, adjust the gear mesh of the main pinion so that a slight amount of “backlash” is achieved. One method for achieving the proper clearance is to insert a folded piece of paper between the two gears, press the gears together, then secure the bearing blocks in place. When setting the gear mesh, make sure that the pinion gear remains parallel to the main drive gear teeth, as it is possible to alter the pinion gear angle during adjustment.

If you find difficulty achieving proper alignment of the pinion, it is also possible to loosen the six bolts that attach the engine mount to the main frame. This will allow the engine/mount to be repositioned to achieve the proper gear mesh.

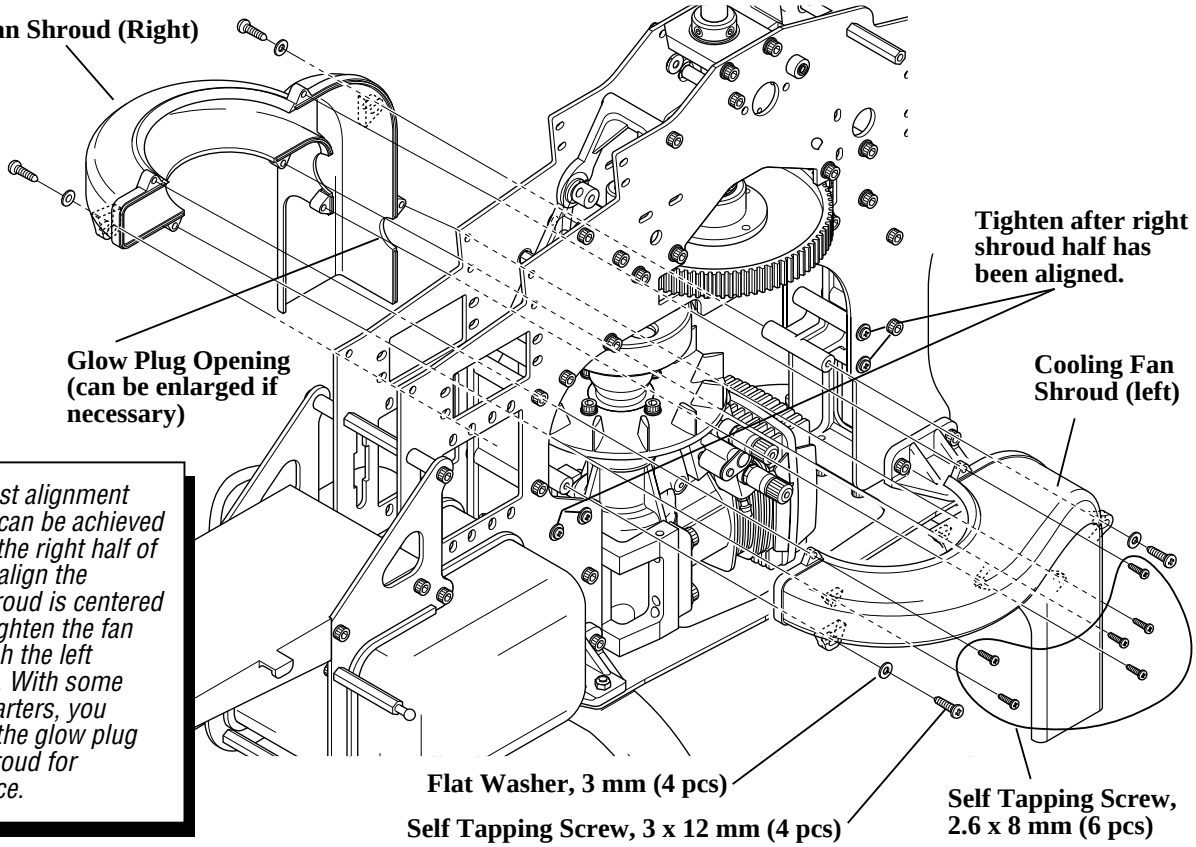
Once the desired gear mesh has been achieved, tighten all loose bolts from Step 2-1. Please remember to use thread-lock on the bolts securing the upper start shaft pinion block.

Please also remember to apply threadlock and tighten the two 3 x 14 mm socket head bolts that connect bearing block “A” to bearing block “B”. (see Step 1-1 for details).

TEAM TIP: *Once the gear mesh/engine alignment has been established, rotate the start shaft assembly first counterclockwise, then clockwise. When moved clockwise, the start shaft assembly should move freely with little or no resistance. If resistance is present, the clutch/start shaft assembly are not aligned properly. Readjust as necessary.*

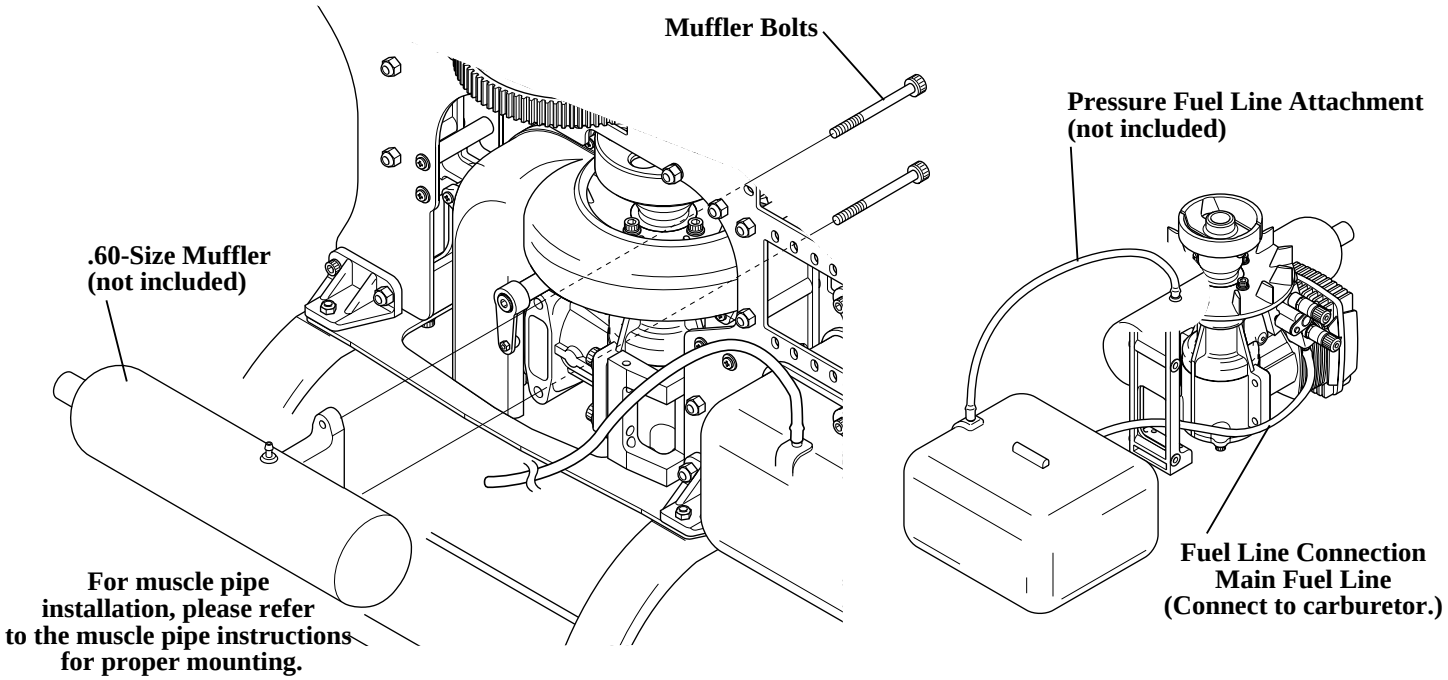
3-9 COOLING FAN SHROUD INSTALLATION

...4 pcs	.....6 pcs	.....4 pcs
Self Tapping Screw, 3 x 12 mm	Self Tapping Screw, 2.6 x 8 mm	Flat Washer, 3 mm



TEAM TIP: *The best alignment of the fan shroud can be achieved by attaching only the right half of the shroud. Next, align the mounts so the shroud is centered around the fan. Tighten the fan mounts then attach the left half of the shroud. With some engines and Ni-starters, you may need to trim the glow plug opening in the shroud for additional clearance.*

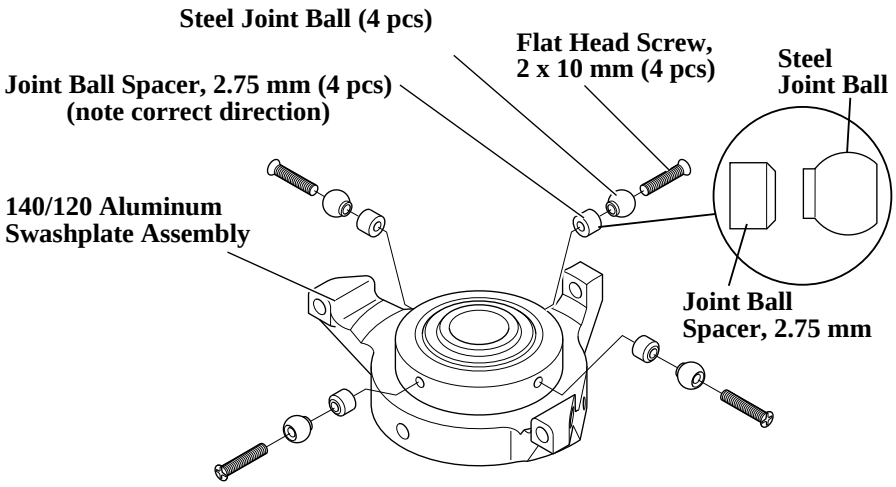
3-10 INSTALLATION OF THE MUFFLER/FUEL LINE CONNECTIONS

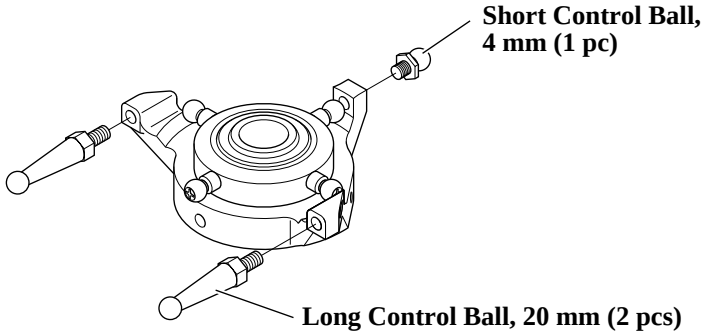


4-1 SWASHPLATE ASSEMBLY

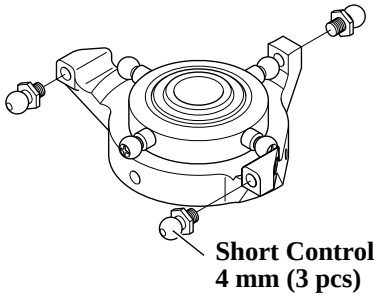
Set Screw, 3 x 3 mm	1 pc
Flat Head Screw, 2 x 10 mm	4 pcs
Steel Joint Ball	4 pcs
Joint Ball Spacer, 2.75 mm	4 pcs
Control Ball, 4 mm	3 pcs
Control Ball, 20 mm (140 CCPM)	2 pcs

Use Red Threadlock on all screws

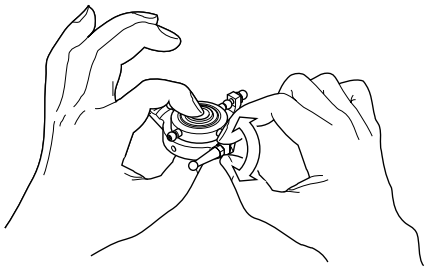


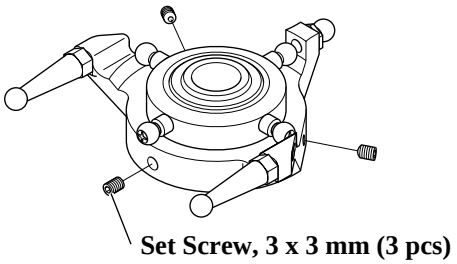


140 CCPM Swash Type



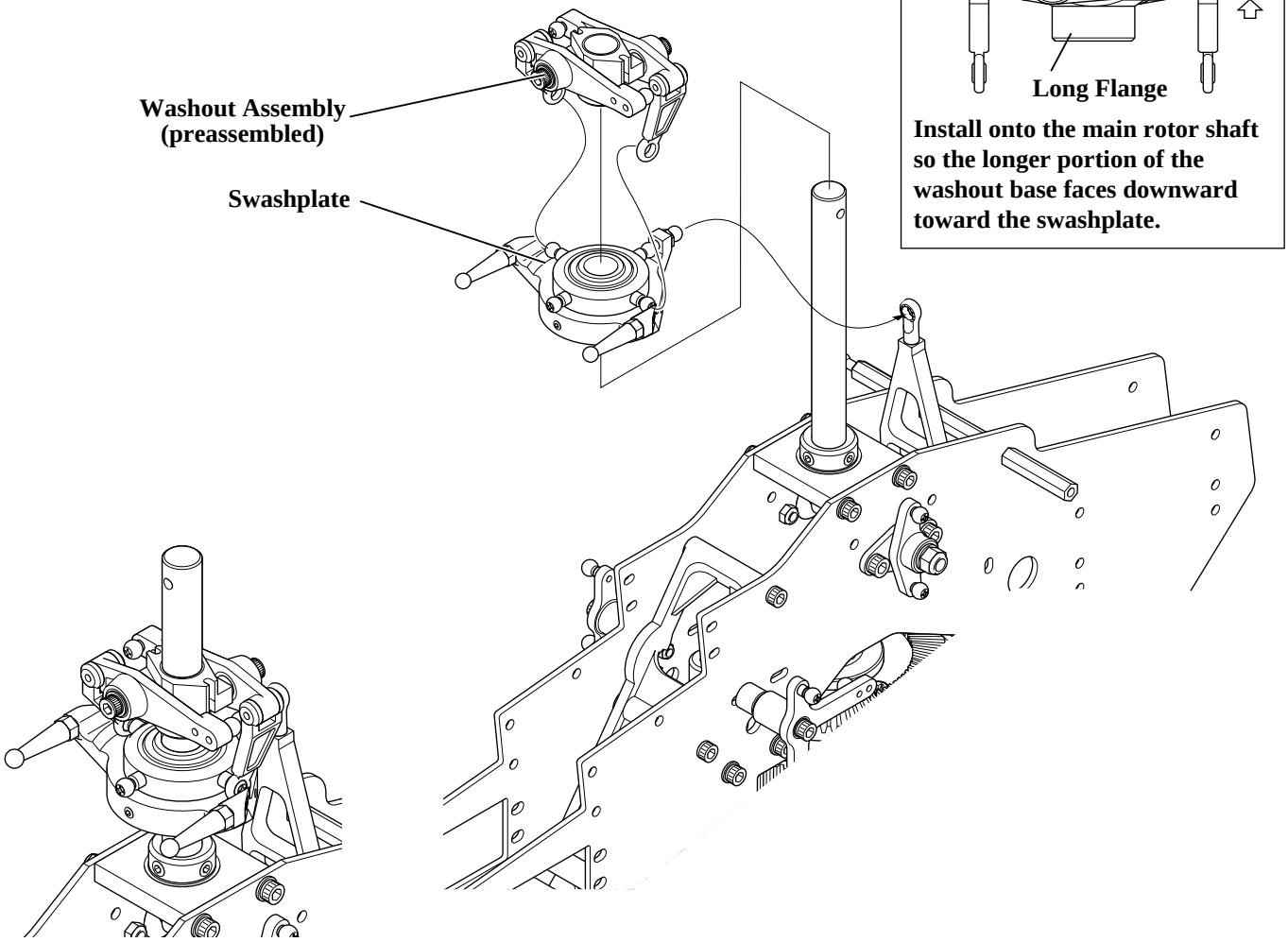
120 CCPM Swash Type





Note:

If there is play between the upper and lower swashplate, tighten set screw 3 x 3 mm to the lower of swashplate little by little.
***CAUTION: Do not tighten too much.**

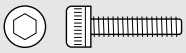


WASHOUT ASSEMBLY

Install onto the main rotor shaft so the longer portion of the washout base faces downward toward the swashplate.

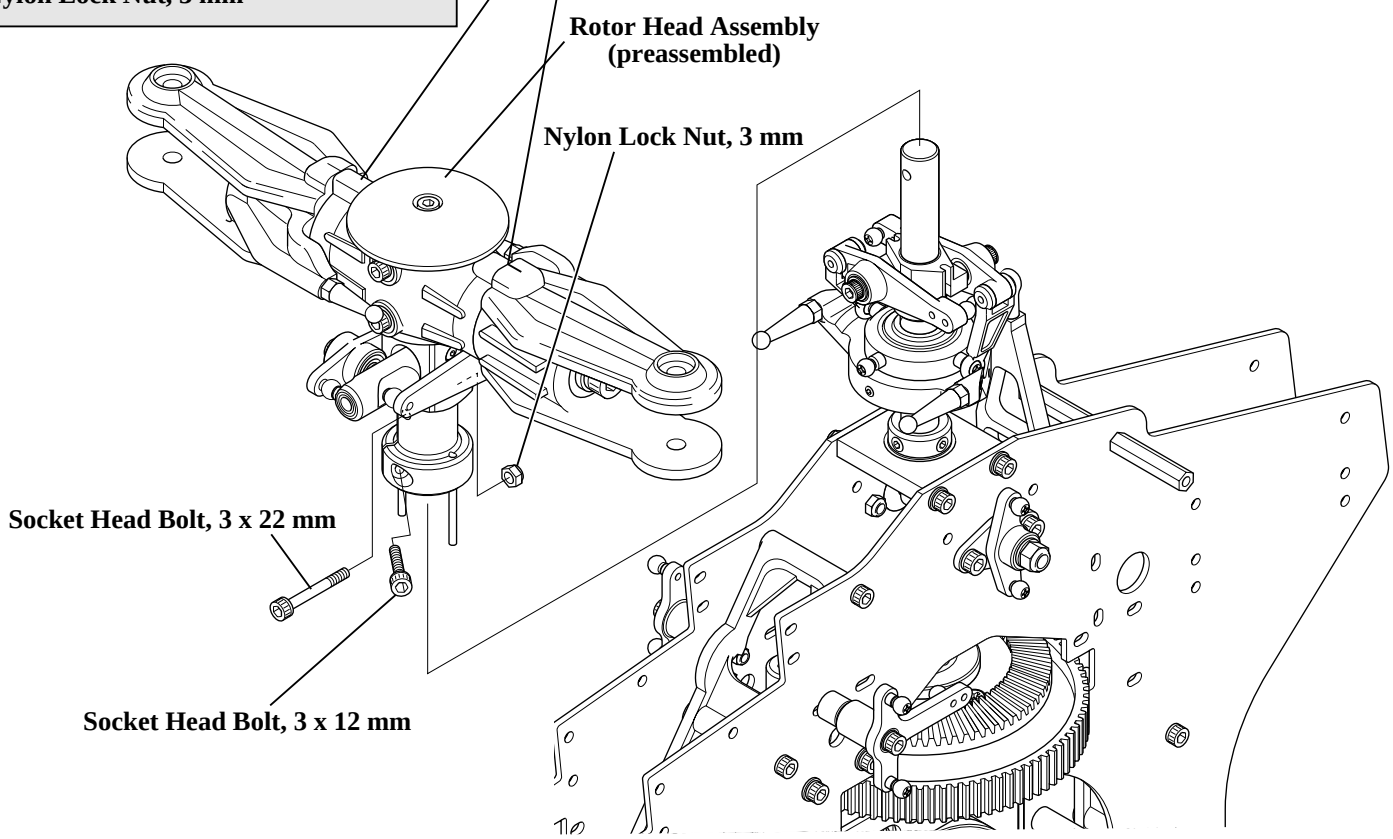
4-3 ROTOR HEAD INSTALLATION

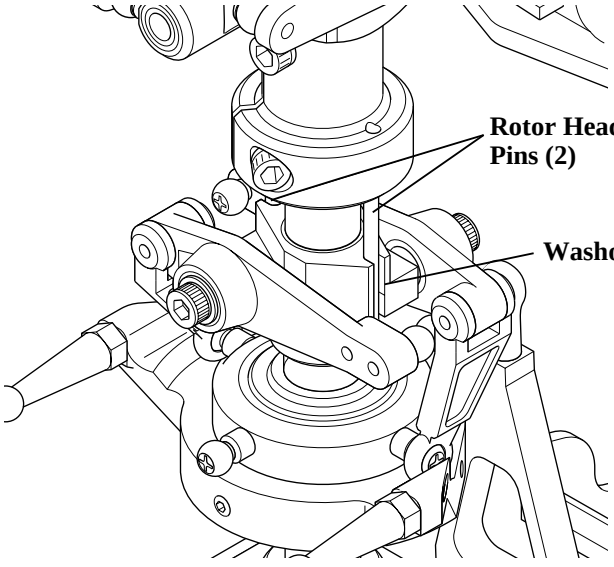

.....1 pc
Special Socket Head Bolt, 3 x 22 mm (Long Shank)


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


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

Main Rotor Head Dampeners Maintenance
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.





TEAM 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.*

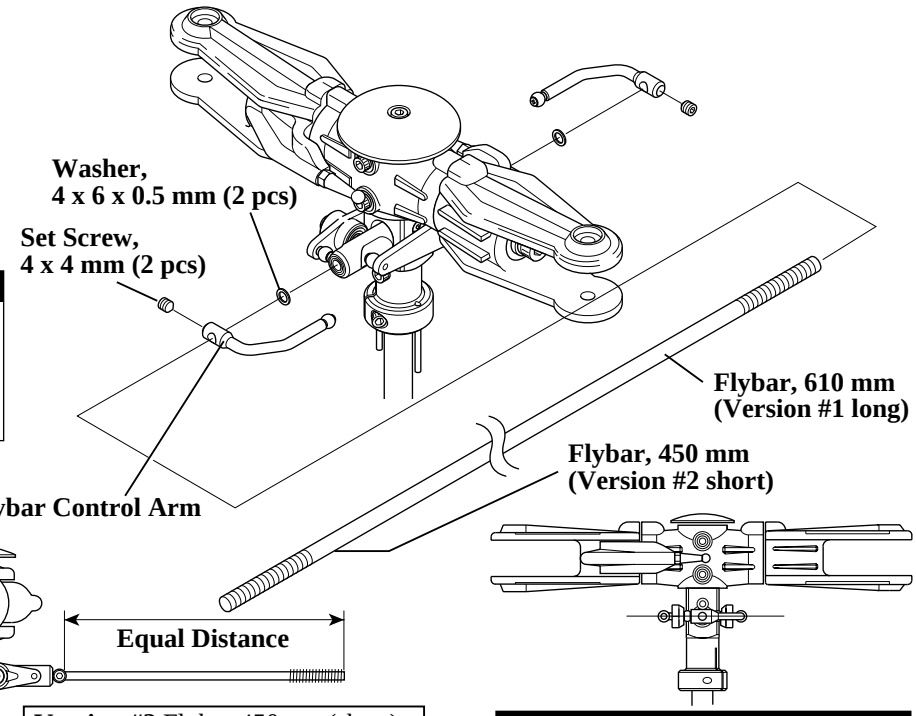
Note:
Be sure to engage the rotor head pins (2) into the washout base driver before securing the rotor head assembly in place.

4-4 FLYBAR INSTALLATION

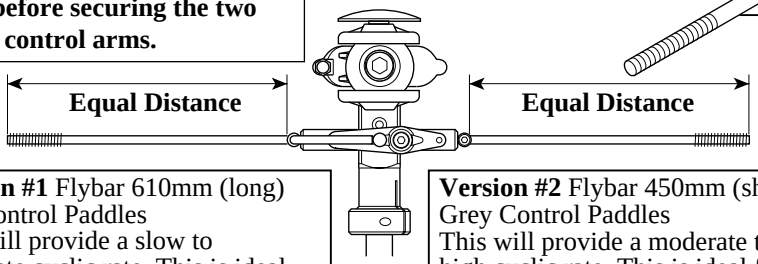
.....2 pcs
Set Screw, 4 x 4 mm

.....2 pcs
Washer, 4 x 6 x 0.5 mm

Note:
Your Vigor™ CS includes two sets of flybar paddle combinations, so the cyclic rate of the model can be adjusted for the desired "feel" or control response.



Caution:
Center the flybar in the seesaw shaft before securing the two flybar control arms.



Version #1 Flybar 610mm (long)
Red Control Paddles
This will provide a slow to moderate cyclic rate. This is ideal for contest or smooth 3D type flying.

Version #2 Flybar 450mm (short)
Grey Control Paddles
This will provide a moderate to high cyclic rate. This is ideal for smooth or agressive 3D type flying.

Caution:
Check to insure that the two flybar control arms are parallel to the center line of the flybar.

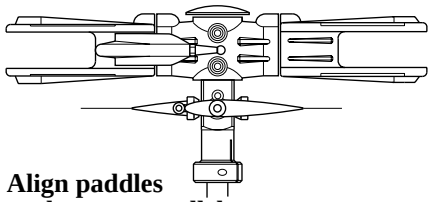
4-5 FLYBAR PADDLE ATTACHMENT

Version #1 only

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

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

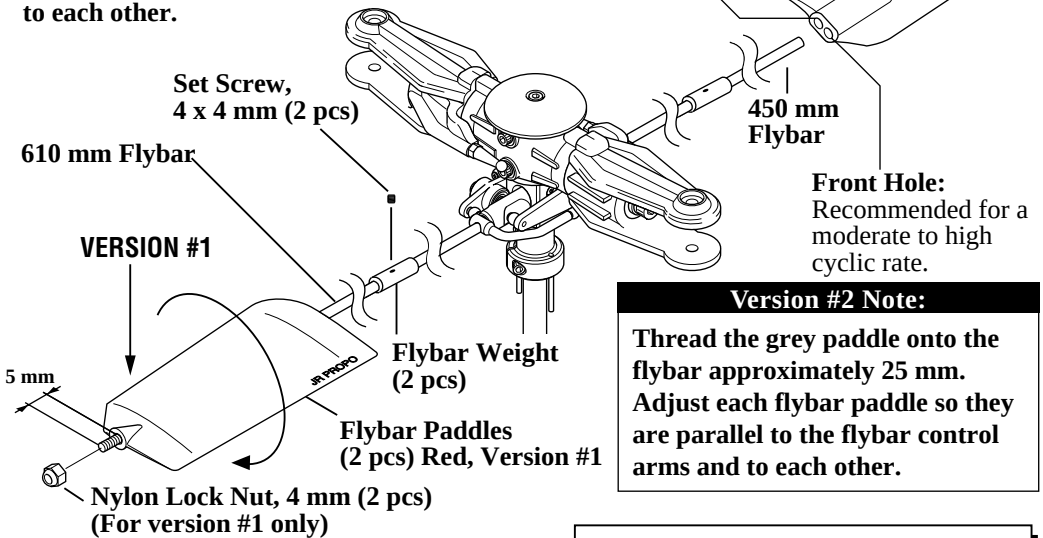
Version #1 Note:
Thread each flybar paddle onto the flybar until the threaded tip of the flybar protrudes approximately 5 mm. Adjust each flybar paddle so they are parallel to the flybar control arms and to each other. Secure to the flybar using two 4 mm nylon lock nuts. Note proper direction of each flybar paddle (short portion forward, clockwise rotation).



Align paddles so they are parallel to each other.

VERSION #2
Paddle threads onto 450 mm flybar.

Rear Hole:
Very agressive cyclic rate. Not recommended as the cyclic rate will be excessive.



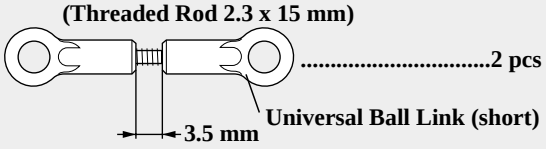
Version #2 Note:
Thread the grey paddle onto the flybar approximately 25 mm. Adjust each flybar paddle so they are parallel to the flybar control arms and to each other.

TEAM TIP: *Flight tune your Vigor to achieve the desired cyclic rate by moving the flybar weights in and out on the flybar (in=more cyclic rate, out=less). Make sure that they are set to the same distance or vibration can occur.*

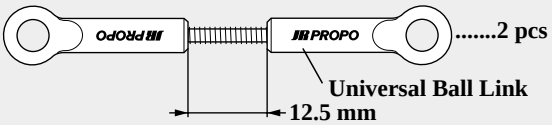
TEAM TIP: *Use JB-weld (epoxy steel) to glue the flybar paddles to the flybar. Still use the nut as well. The glue prevents the paddles from turning in flight.*

4-6 SWASHPLATE/T-ARM CONTROL ROD INSTALLATION

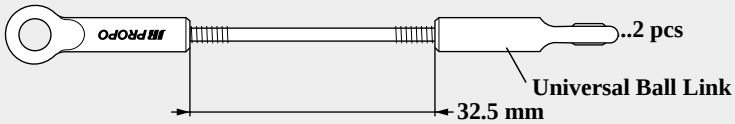
① SEESAW ARM TO MAIN BLADE HOLDER
(Threaded Rod 2.3 x 15 mm)



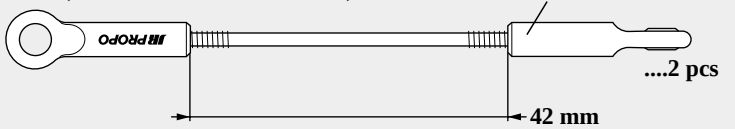
② WASHOUT ARM TO FLYBAR CONTROL ARM
(Threaded Rod 2.3 x 30 mm)



③ SWASHPLATE TO SEESAW ARM
(Threaded Rod 2.3 x 50 mm)



④ SWASHPLATE TO T-ARM
(Threaded Rod 2.3 x 60 mm)



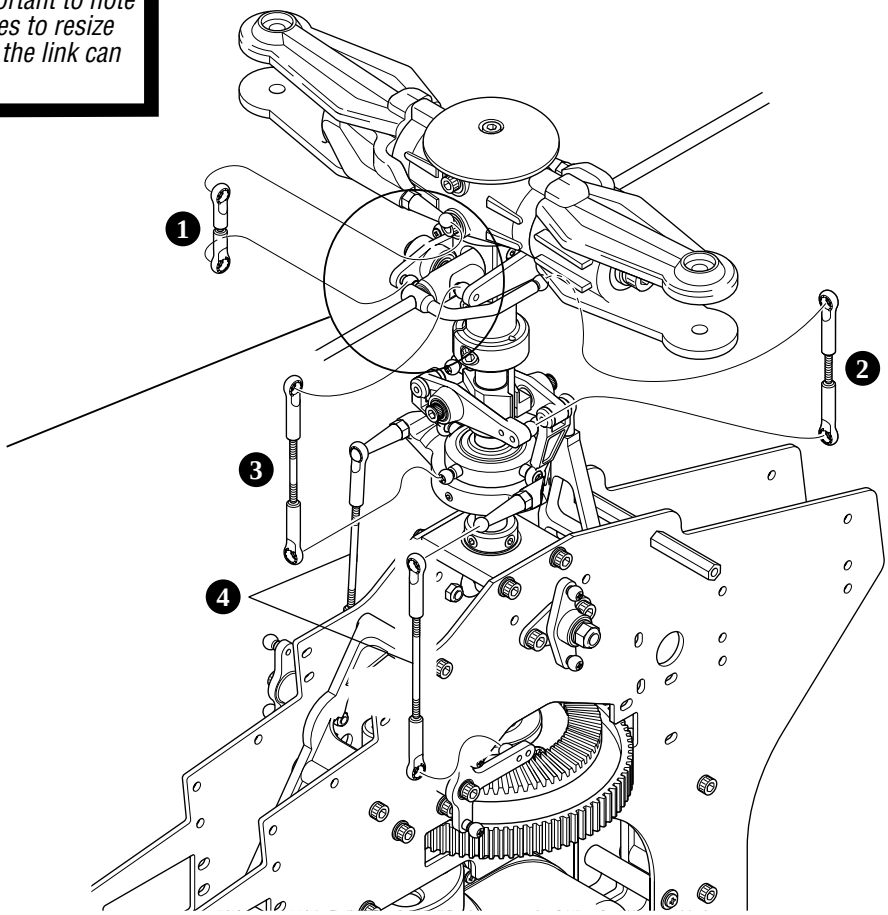
TEAM TIP: *The JR ball links are designed with little ridges around the lip of the link. These ridges, in conjunction with the JR ball link sizing tool, are there to help you custom fit the link to the ball. If the link fits on the ball too tight, you can use the reaming tool to enlarge the link hole 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.*

Use JR Ball Link Sizing Tool

TEAM TIP: *After many flights there can be excess play between the ball and link. It is usually the ball that has actually worn. So when replacing parts, you will actually get the best results by replacing the balls.*

Caution:

Please note that all universal links should be adjusted so that when attached to the control ball, the words "JR PROPO" are to the outside.

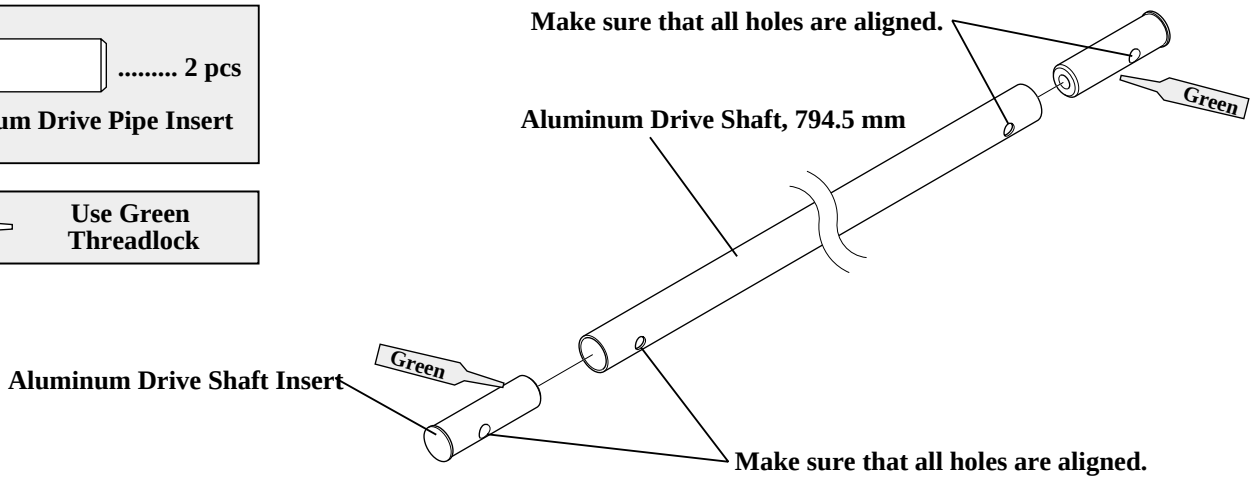


Note: The seesaw mixing arms included with the Vigor are designed to offer a pitch range of approx. 20° (+11°, -9°). If additional pitch range is required, it is possible to replace these arms with part #JRP960178B. These arms will provide a total pitch range of 23° (+13°, -10°). Please note that these optional mixing arms will also increase the "Bell" movement of the Rotor Head, which will alter the flight characteristics slightly. Also note that if these optional arms are used, the overall pitch and travel values may vary from that shown in the data sheets included in this manual (page 53).

5-1 TAIL DRIVE SHAFT PREPARATION

..... 2 pcs
Aluminum Drive Pipe Insert

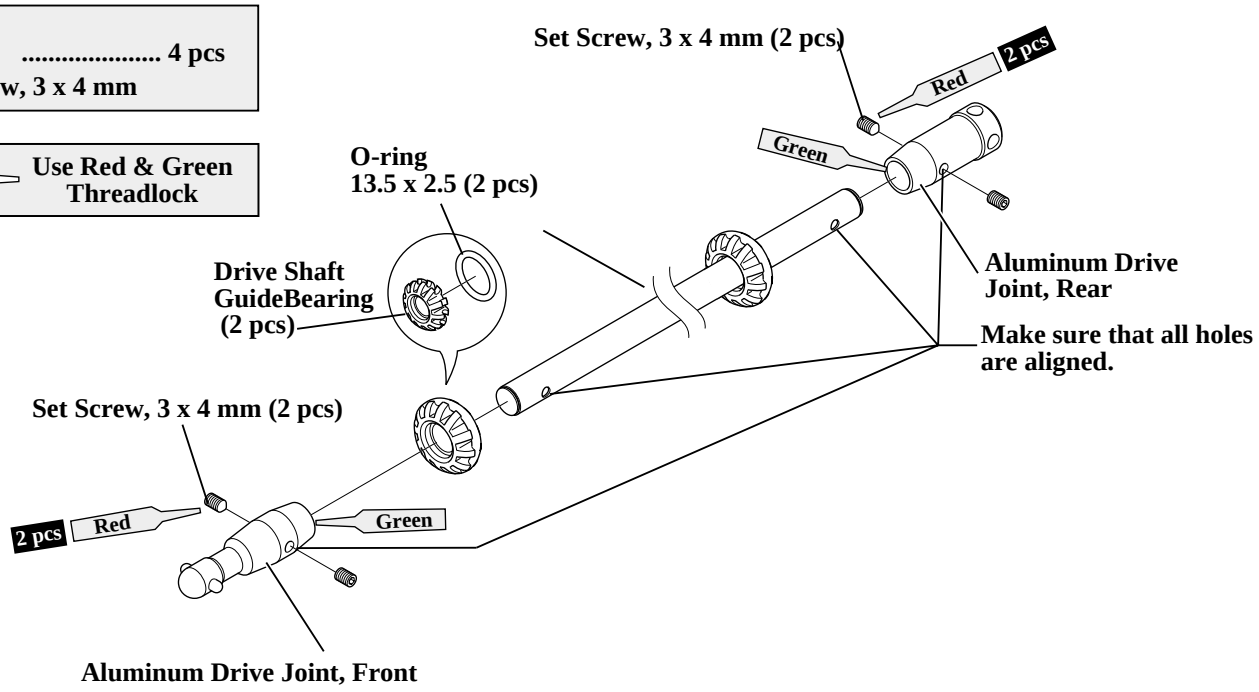
Use Green Threadlock



5-2 TAIL DRIVE SHAFT ASSEMBLY

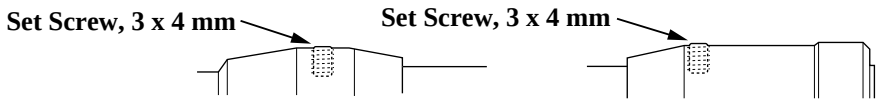
..... 4 pcs
Set Screw, 3 x 4 mm

Use Red & Green Threadlock



Note:

When secured, the 4 mm set screws should be nearly flush with the outside surface.



DRIVE SHAFT GUIDE BEARING ATTACHMENT

Follow this procedure when attaching:

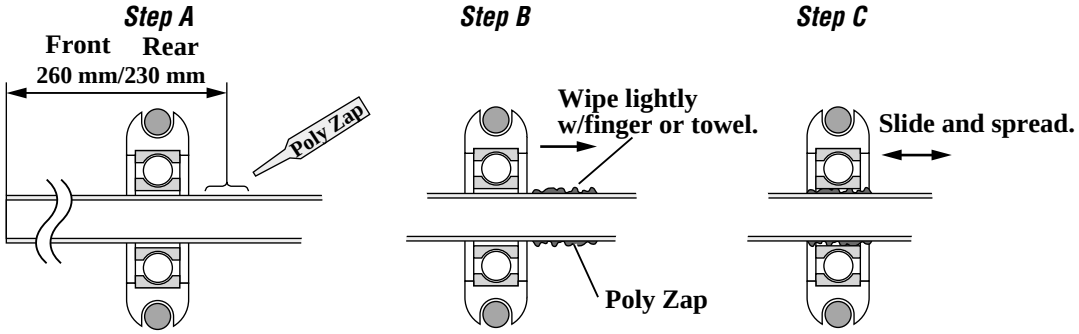
Note:

Use Poly Zap (not included) to attach bearings to the drive shaft.

Once the Poly Zap is applied and the guide bearings are in their correct positions (260 mm/230 mm), the Poly Zap can be quick cured using Zip Kicker.

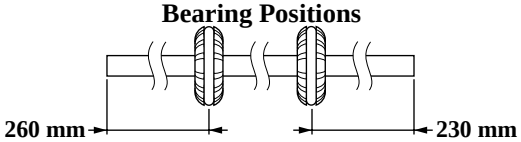
Position the shaft assembly on a flat surface before/while the Poly Zap is curing.

It is very important that the guide bearings be attached to the shaft at non equal measurements as shown to prevent resonance vibration and fatigue.



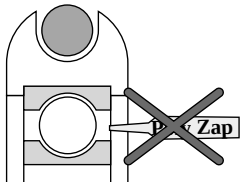
Lightly oil bearings after the glue has dried.

Bearing Positions



Note:

Do not apply Poly Zap to inside of ball bearings.



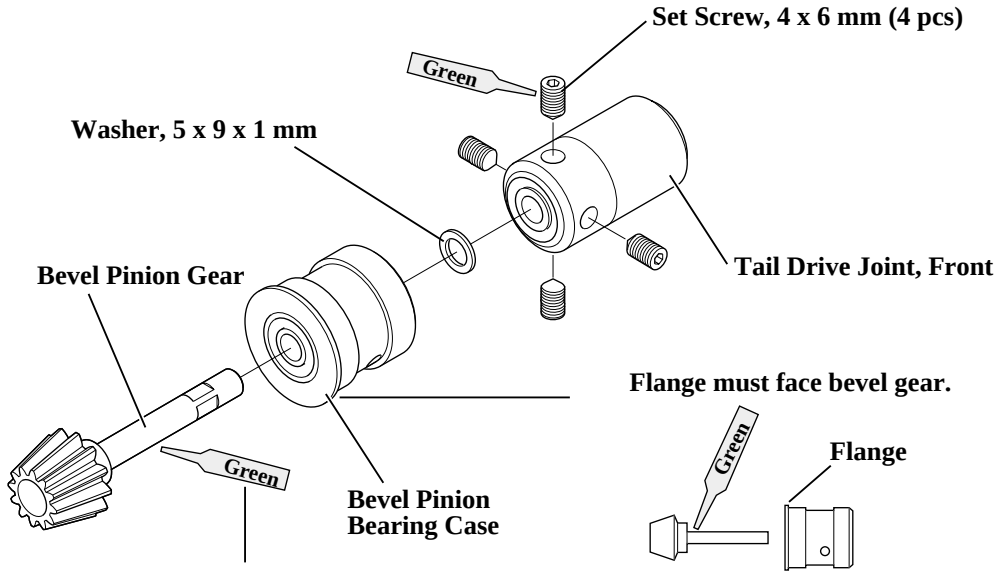
5-3 BEVEL PINION GEAR ASSEMBLY

..... 4 pcs
Set Screw, 4 x 6 mm

.....1 pc
Washer, 5 x 9 x 1 mm

Use Green Threadlock

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



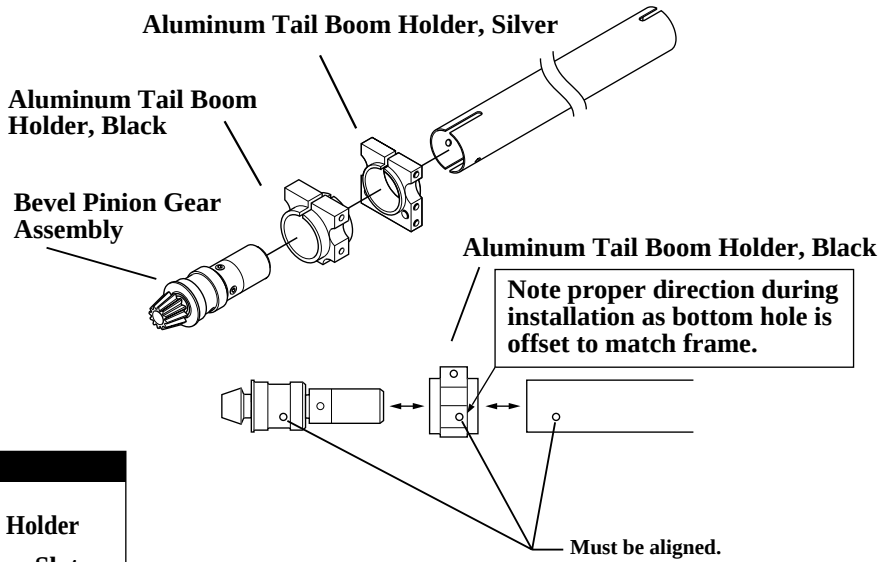
5-4 TAIL BOOM/BEVEL PINION GEAR INSTALLATION/ADJUSTMENT

..... 1 pc
Socket Head Bolt, 3 x 8 mm

Socket Head Bolt, 3 x 40 mm 2 pcs

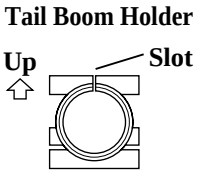
..... 3 pcs
Nylon Lock Nut, 3 mm

..... 4 pcs
Flat Washer, 3 mm



Note:

Install the tail boom holders so the slotted side is toward the top. Also, it's important to make sure that the black tail boom holder is at the front of the tail boom as shown.



Note:

The 2 3.5 x 6 mm bolts included in this step are not used.

BEVEL GEAR MESH ADJUSTMENT

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

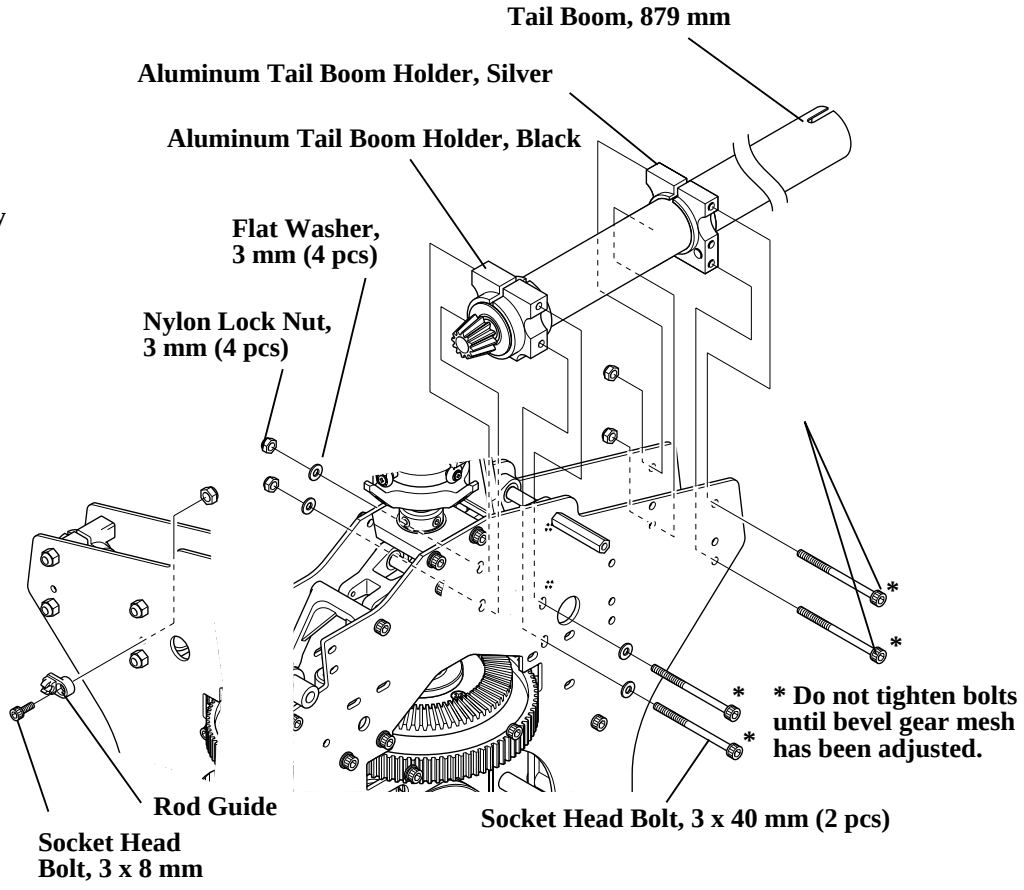
To set the proper mesh, insert 1 thickness of paper (the same thickness as the pages of this manual) between the 2 bevel gears.

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

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

Note:

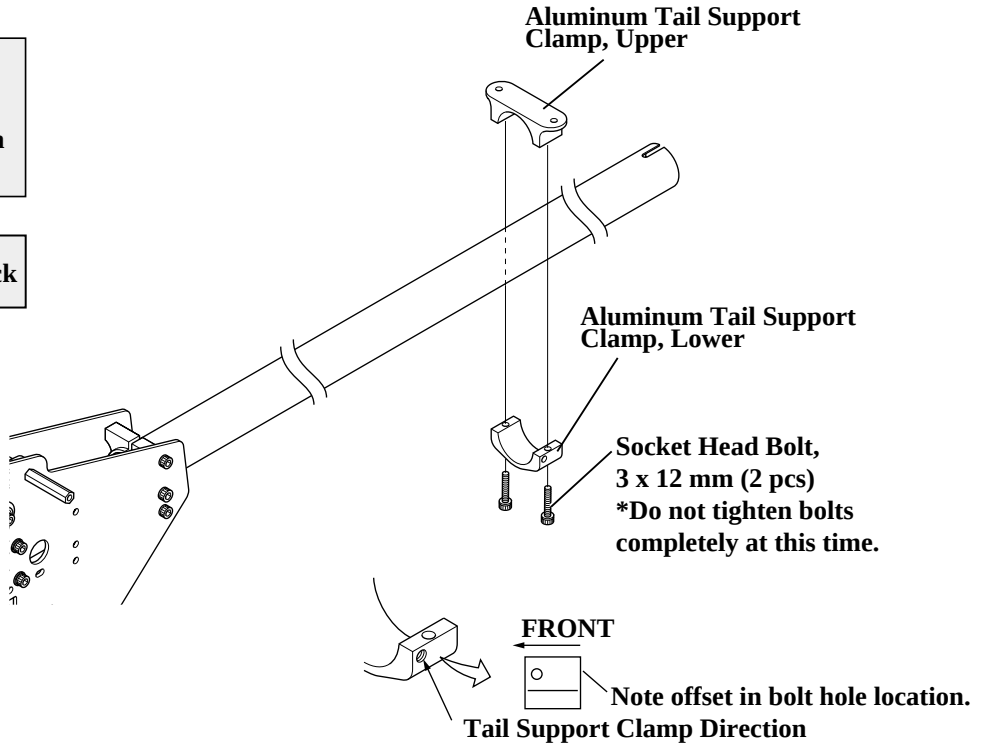
It is better to set this gear mesh slightly tight, rather than loose, or damage to the bevel gear can occur during extreme 3D flying or tail blade contact with the ground.



5-5 TAIL SUPPORT CLAMP INSTALLATION

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

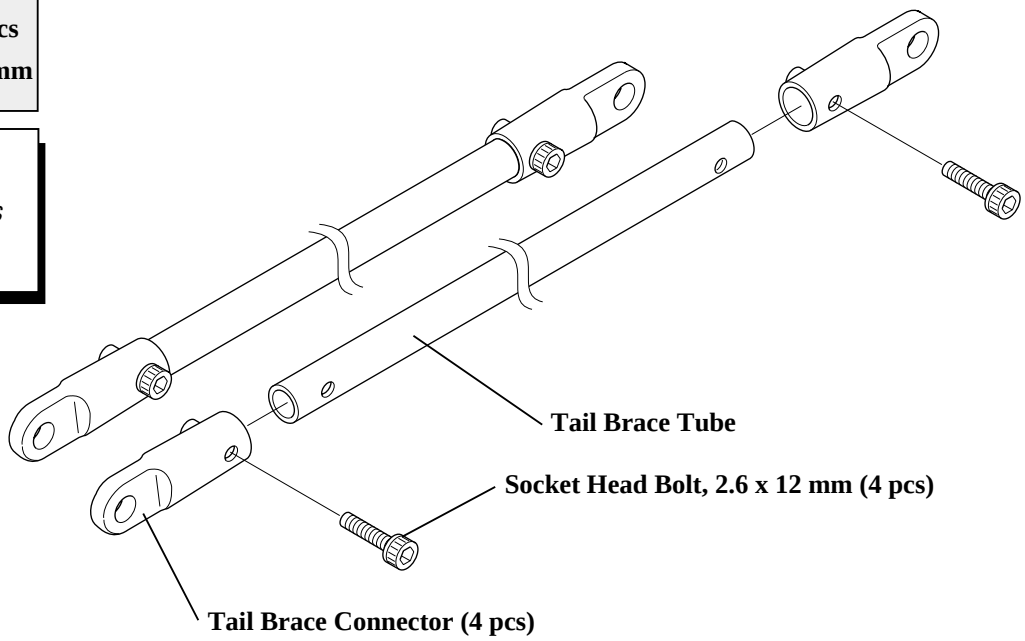
Use Red Threadlock



5-6 TAIL BOOM BRACE ASSEMBLY

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

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



5-7 TAIL BRACE INSTALLATION

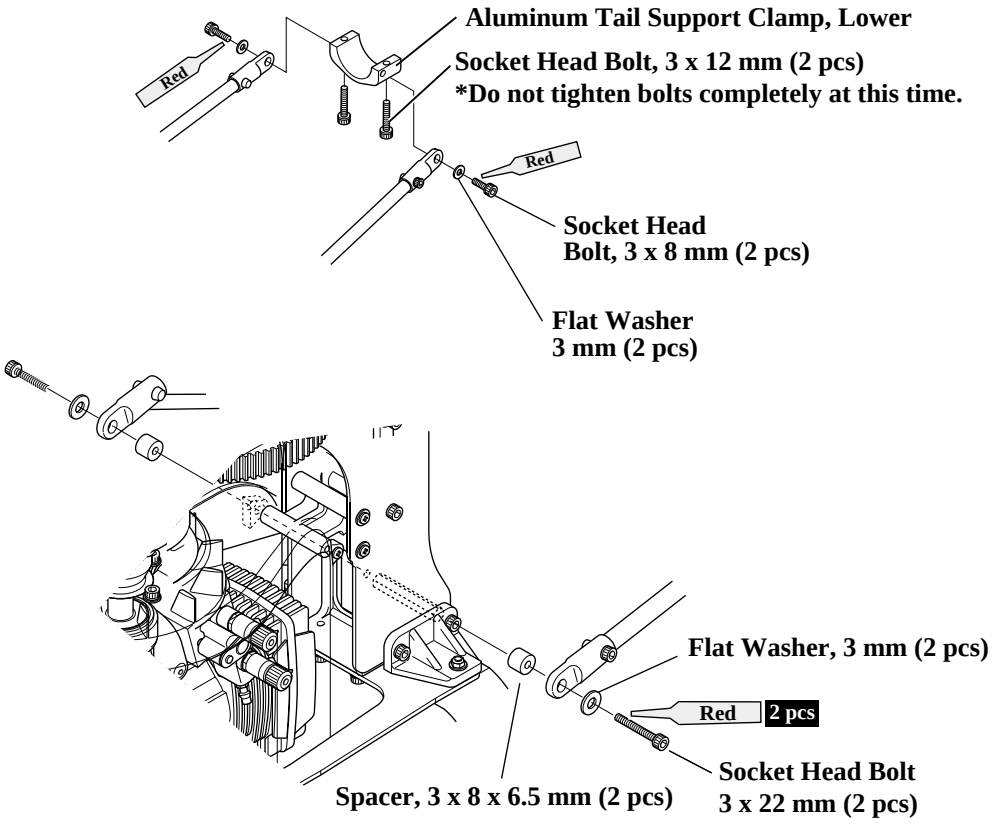
..... 2 pcs
Socket Head Bolt, 3 x 8 mm

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

..... 2 pcs
Flat Washer, 3 mm

2 pcs
Socket Head Bolt, 3 x 22 mm

Use Red Threadlock



5-8 HORIZONTAL/VERTICAL FIN INSTALLATION

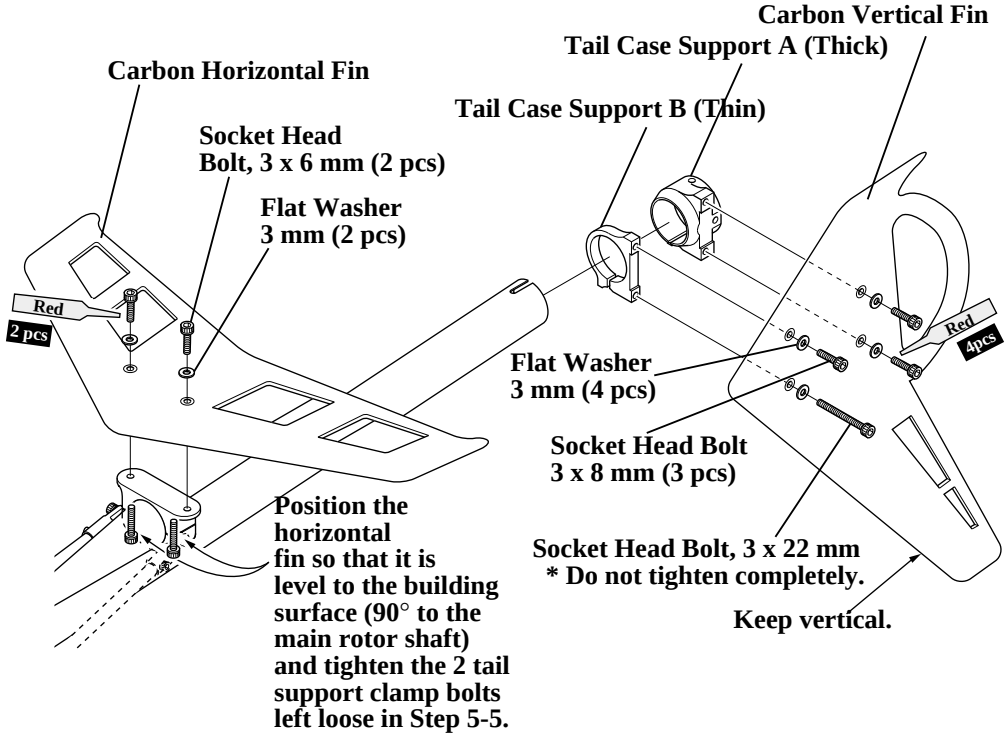
..... 2 pcs
Socket Head Bolt, 3 x 6 mm

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

1 pc
Socket Head Bolt, 3 x 22 mm

..... 6 pcs
Flat Washer, 3 mm

Use Red Threadlock



5-9 TAIL CENTER HUB ASSEMBLY

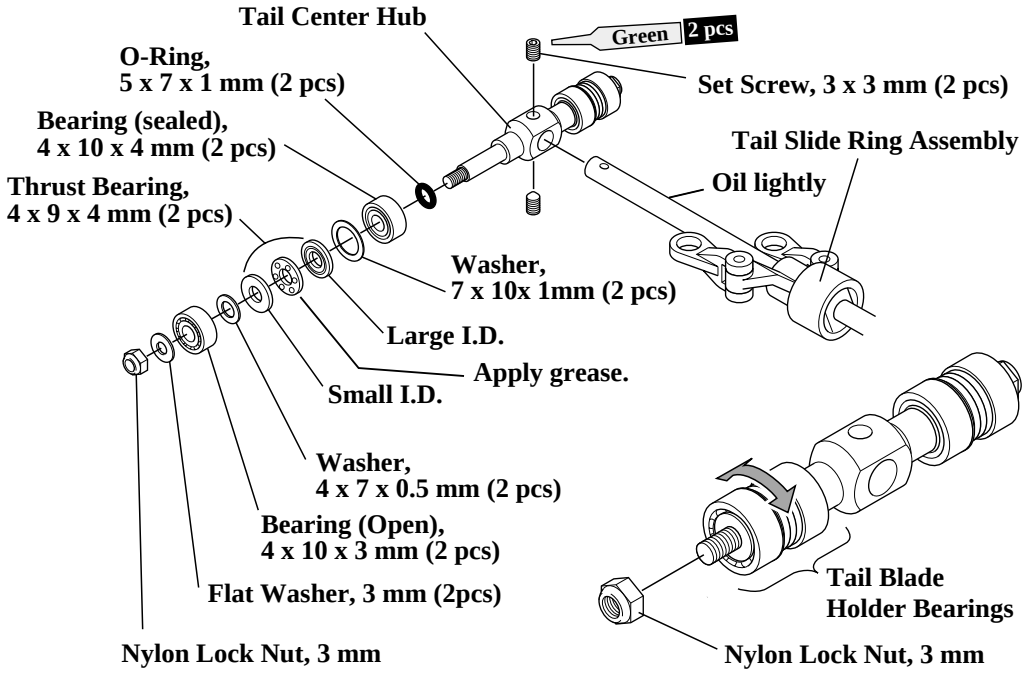
- Set Screw, 3 x 3 mm .....2 pcs
- Nylon Lock Nut, 3 mm .....2 pcs
- Bearing (sealed), 4 x 10 x 4 mm .....2 pcs
- Bearing (open), 4 x 10 x 3 mm .....2 pcs
- Washer, 7 x 10 x 1 mm .....2 pcs
- Washer, 4 x 7 x 0.5 mm .....2 pcs
- Flat Washer, 3 mm .....2 pcs
- Thrust Bearing, 4 x 9 x 4 mm .....2 pcs
-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

Note:

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

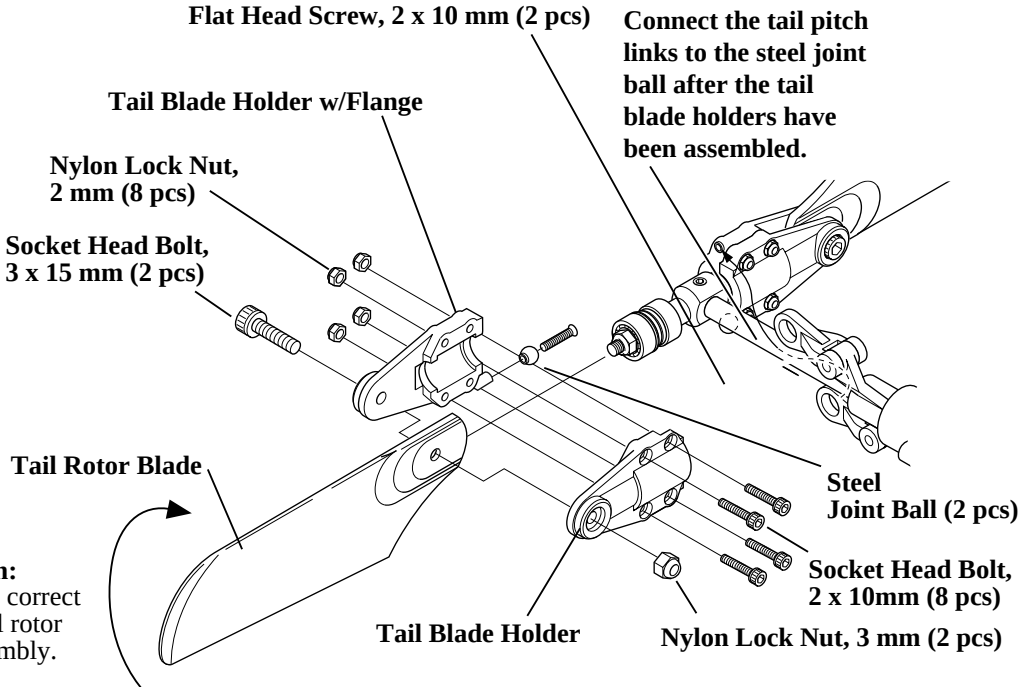
Use Green Threadlock

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



5-10 TAIL BLADE HOLDER ASSEMBLY

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



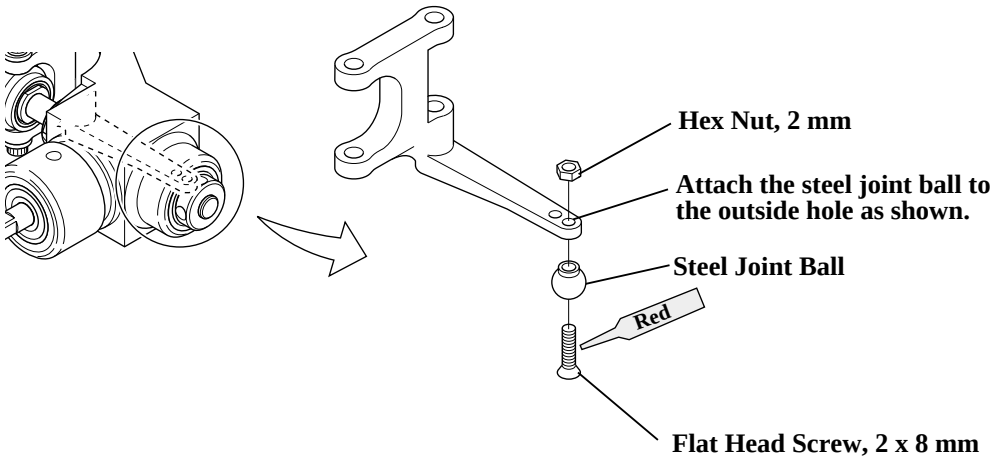
Rotation direction:
Be sure to note the correct direction of the tail rotor blades during assembly.

5-11 STEEL JOINT BALL INSTALLATION

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

..... 1 pc
Steel Joint Ball

..... 1 pc
Hex Nut, 2 mm



5-12 TAIL DRIVE SHAFT/TAIL GEAR BOX INSTALLATION

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

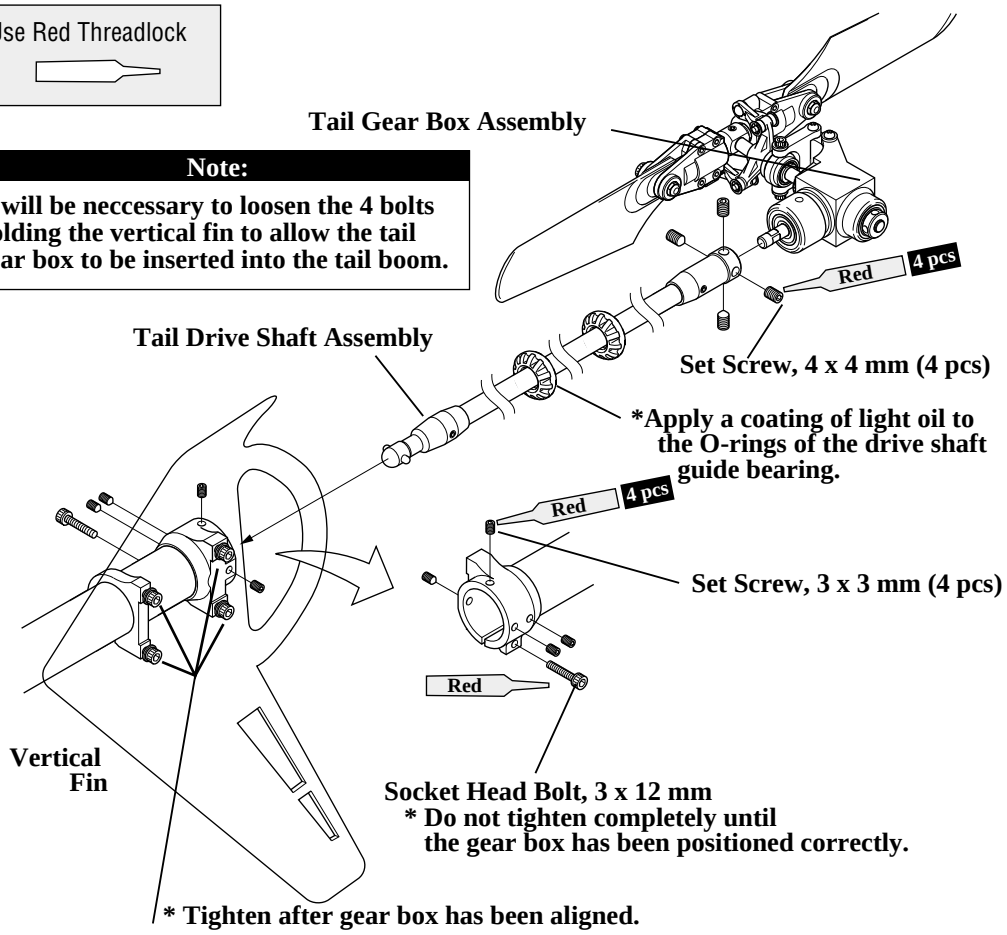
..... 4 pcs
Set Screw, 3 x 3 mm

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

Use Red Threadlock

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

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



6-1 UPPER SERVO TRAY/BODY MOUNT ATTACHMENT

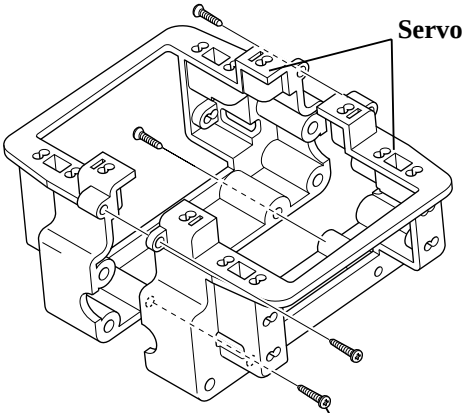

...3 pcs

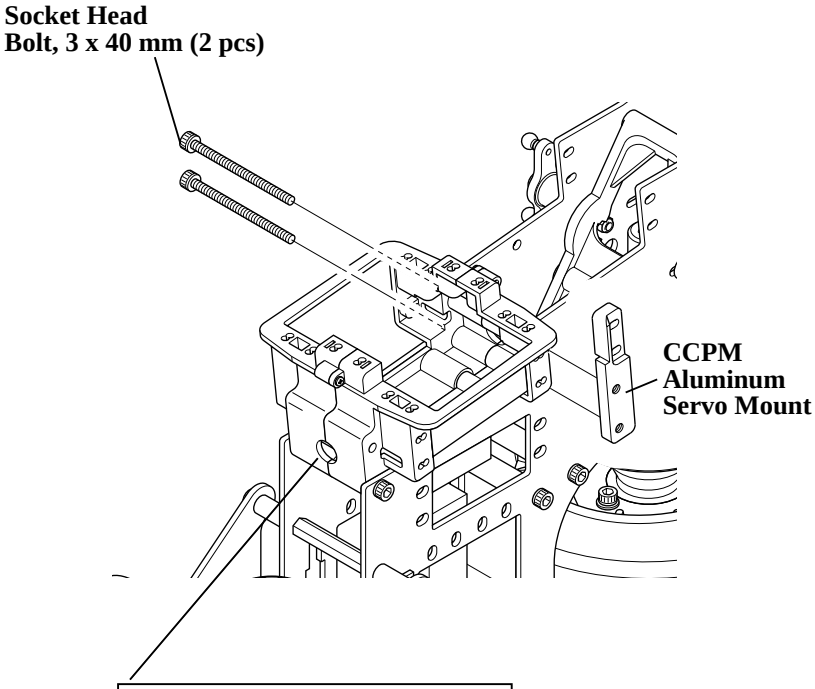
Socket Head Bolt, 3 x 40 mm


.....4 pcs

Self Tapping Screw, 2.6 x 8 mm

Note:
When installing the servo tray, be careful not to overtighten the screws.





TEAM TIP: *Increase the size of the hole using a Dremel tool. This will allow for easier insertion of the servo leads.*

BODY MOUNT ATTACHMENT

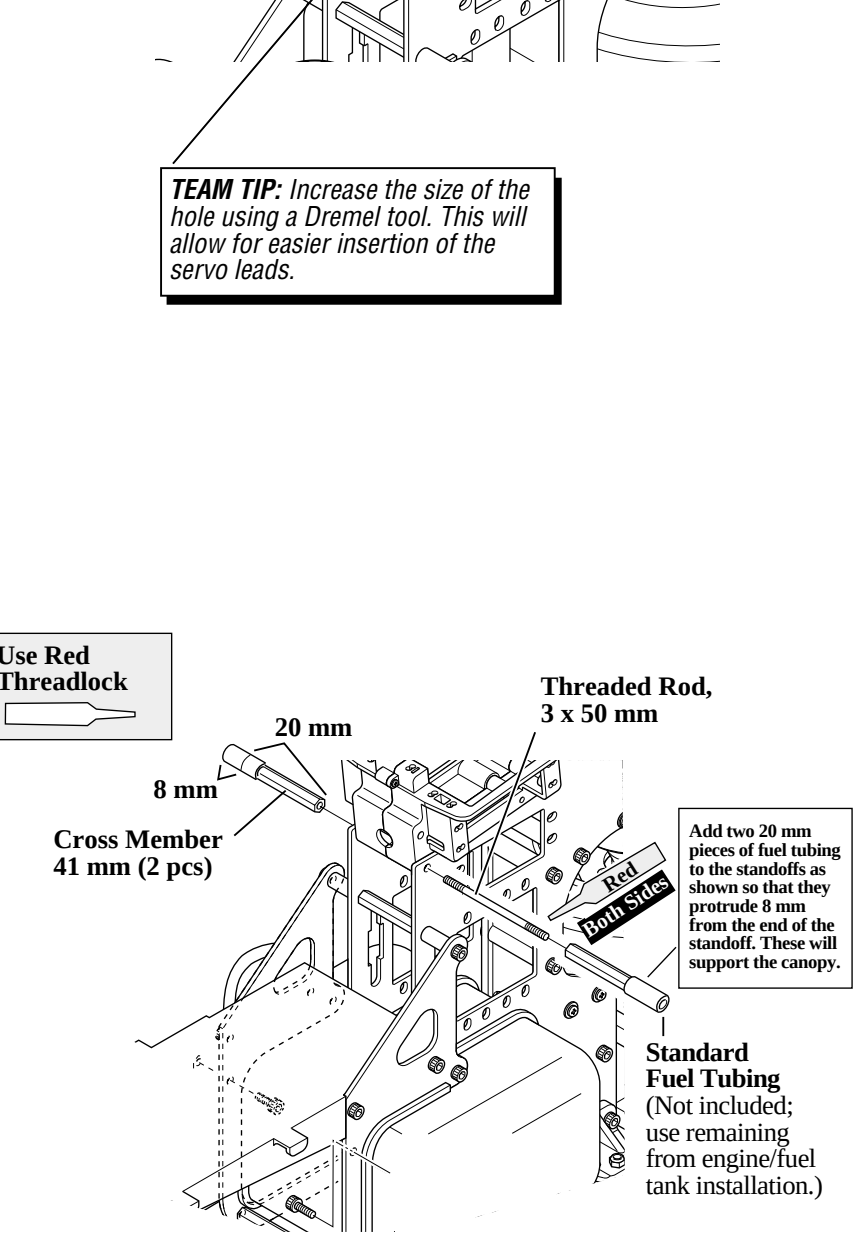

.....2 pcs

Cross Member, 41 mm


..1 pc

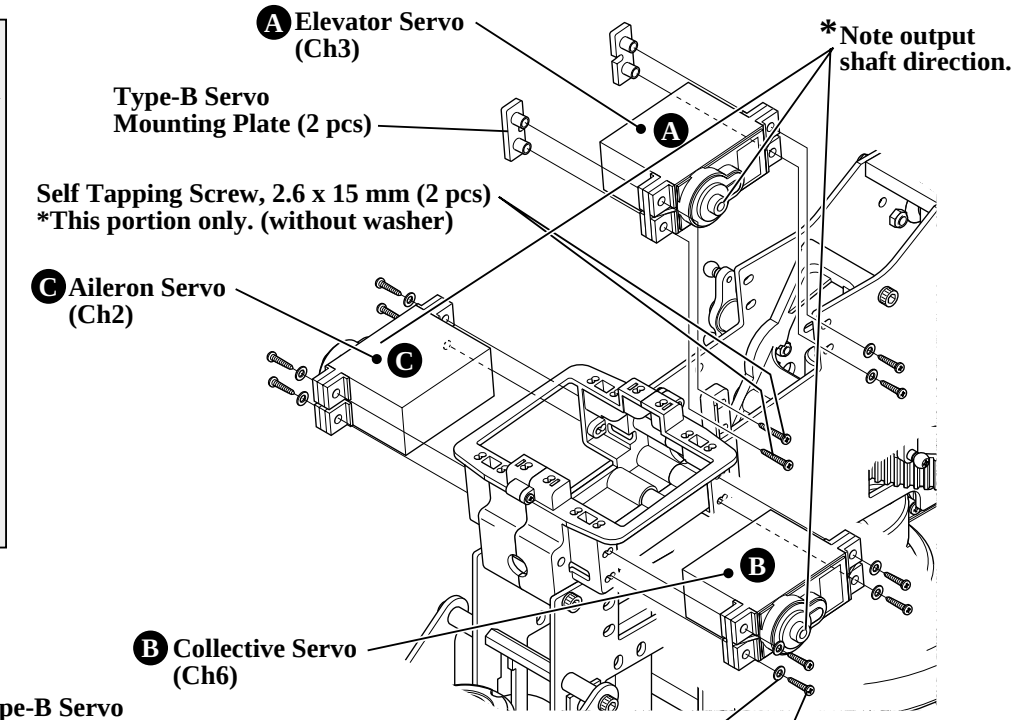
Threaded Rod, 3 x 50 mm

Use Red Threadlock

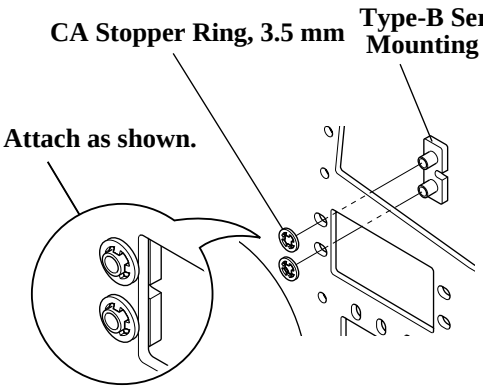


6-2 SERVO/SWITCH HARNESS INSTALLATION

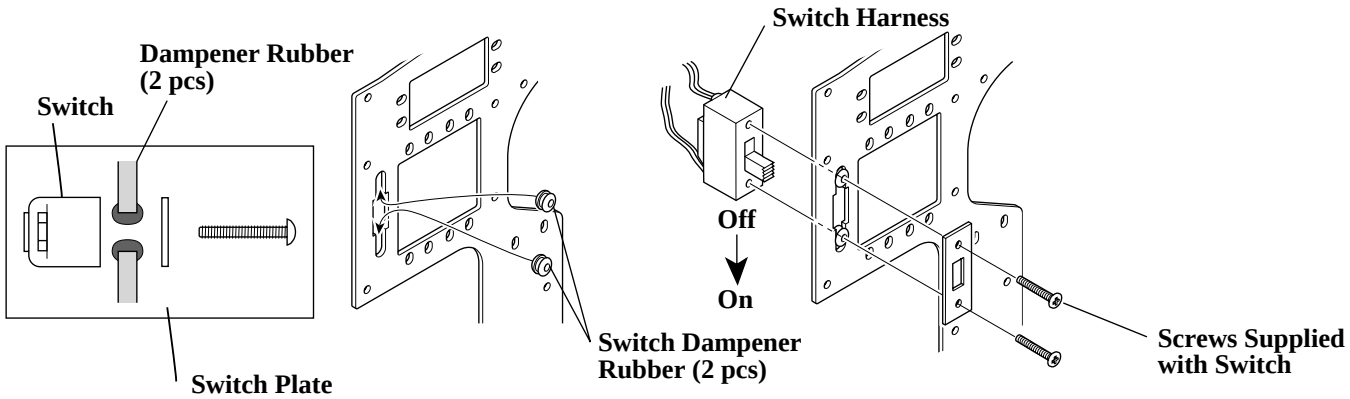
Self Tapping Screw, 2.6 x 12 mm	.....20 pcs
Self Tapping Screw, 2.6 x 15 mm	.....2 pcs
Flat Washer, 2.6 mm	.....20 pcs
CA Stopper Ring, 3.5 mm	.....8 pcs
Type-B Servo Mounting Plate	.....4 pcs



***** Note correct servo output shaft orientation during installation.



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



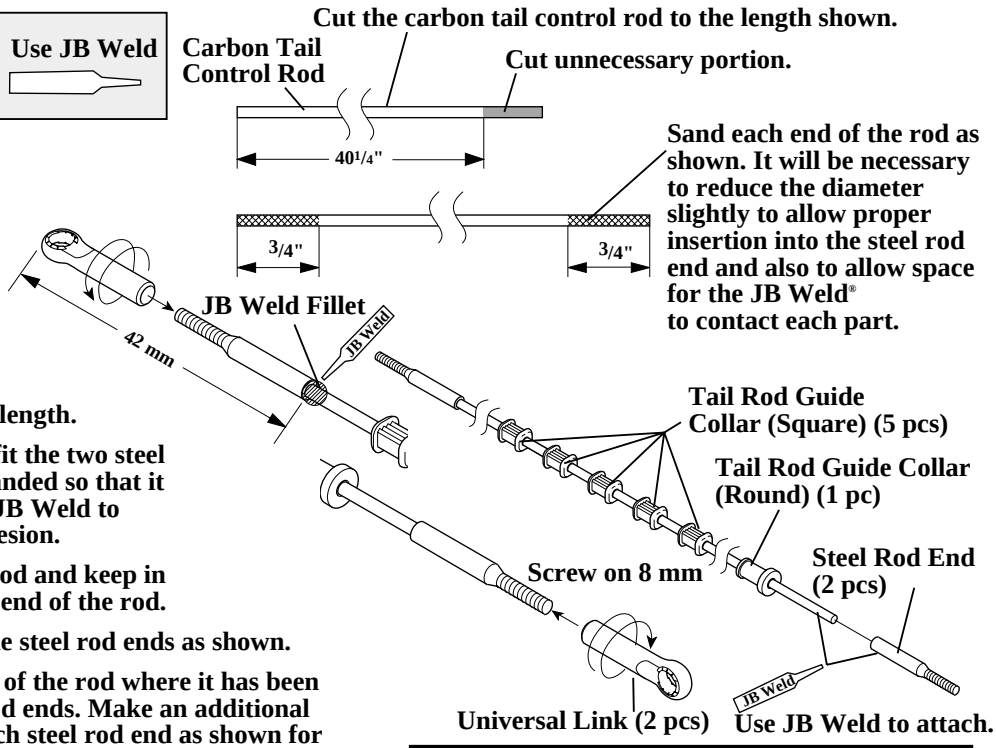
6-3 TAIL CONTROL ROD ASSEMBLY

... 2 pcs
Rod End

..... 1 pc
Tail Rod Guide Collar (round)

..... 5 pcs
Tail Rod Guide Collar (square)

Use JB Weld



ASSEMBLY PROCEDURE

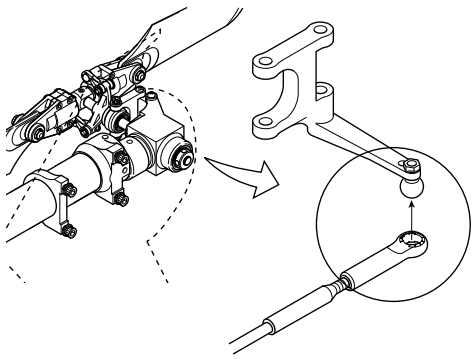
1) Cut the control rod to the correct length.
2) Sand each end as shown and test fit the two steel rod ends. Make sure that rod is sanded so that it is undersized. This will allow the JB Weld to remain on the rod for proper adhesion.
3) Slide the tail rod guides onto the rod and keep in place using masking tape on each end of the rod.
4) Thread the universal links onto the steel rod ends as shown.
5) Apply JB Weld epoxy to each end of the rod where it has been sanded and attach the two steel rod ends. Make an additional fillet of JB Weld at the back of each steel rod end as shown for proper adhesion.
6) Let assembly set on a flat surface until the JB Weld has cured.

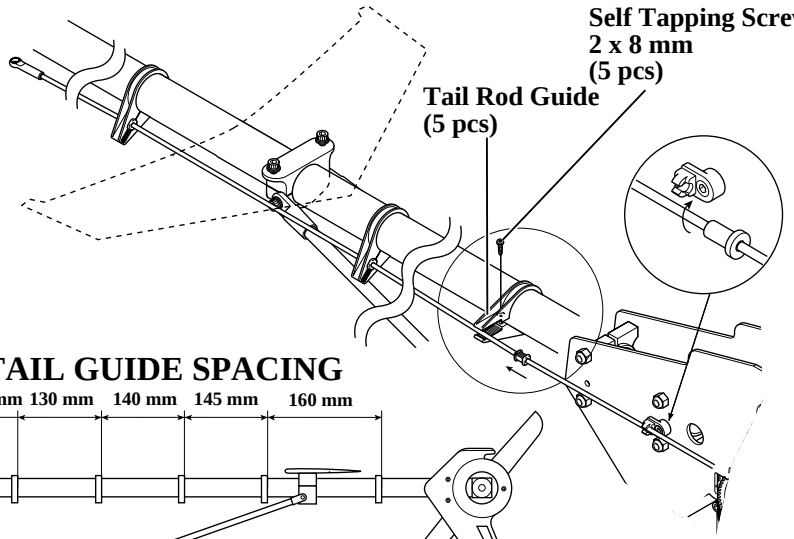
Note:

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

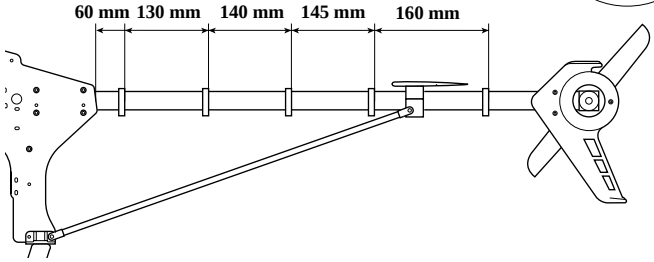
6-4 TAIL CONTROL ROD/TAIL GUIDE ATTACHMENT

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





TAIL GUIDE SPACING

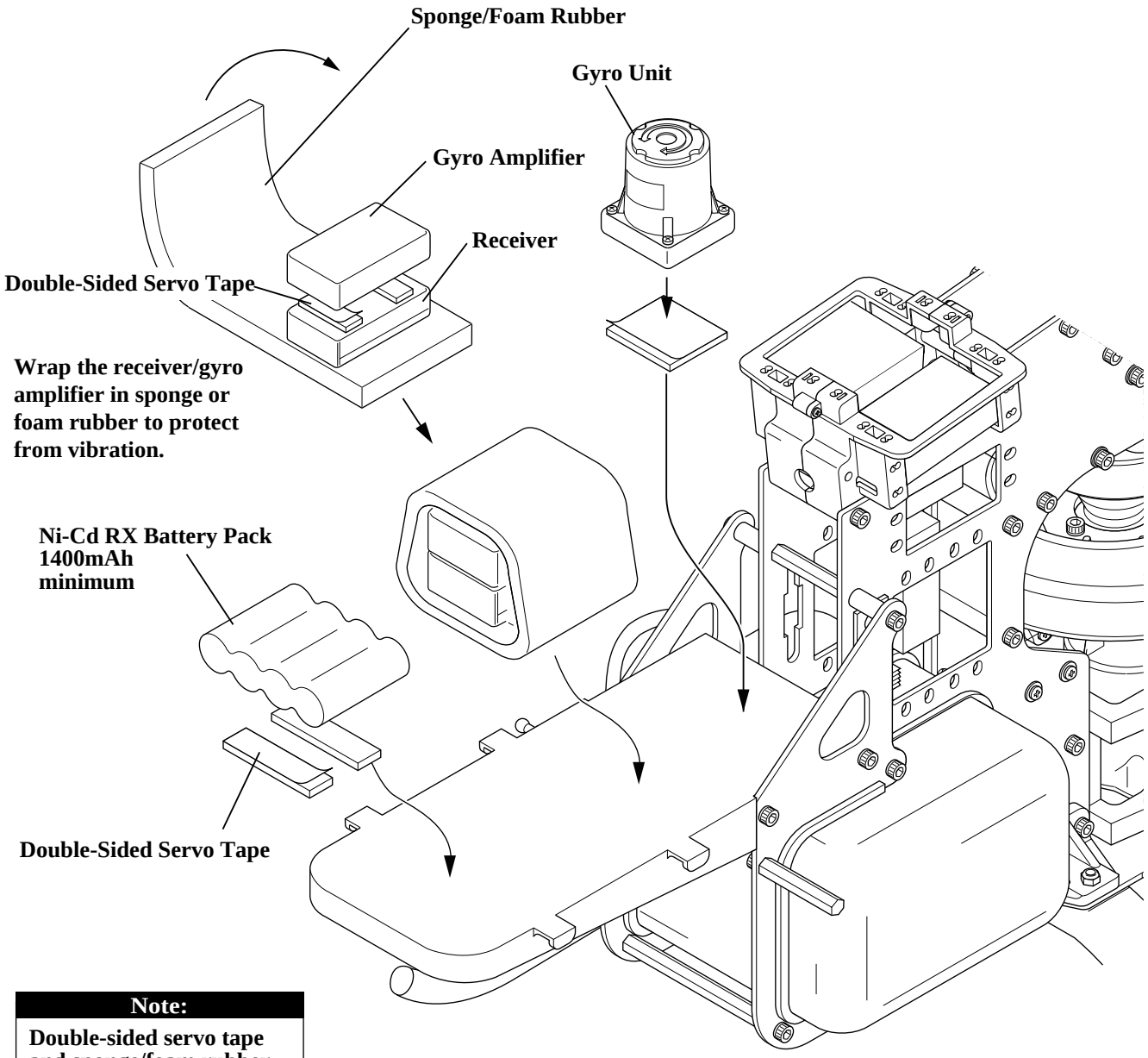


Note:

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

Note:

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



Note:

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

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

TRANSMITTER PREPARATION

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

RECEIVER FLIGHT PACK PREPARATION

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

SERVO HORN INSTALLATION SUGGESTIONS

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

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

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

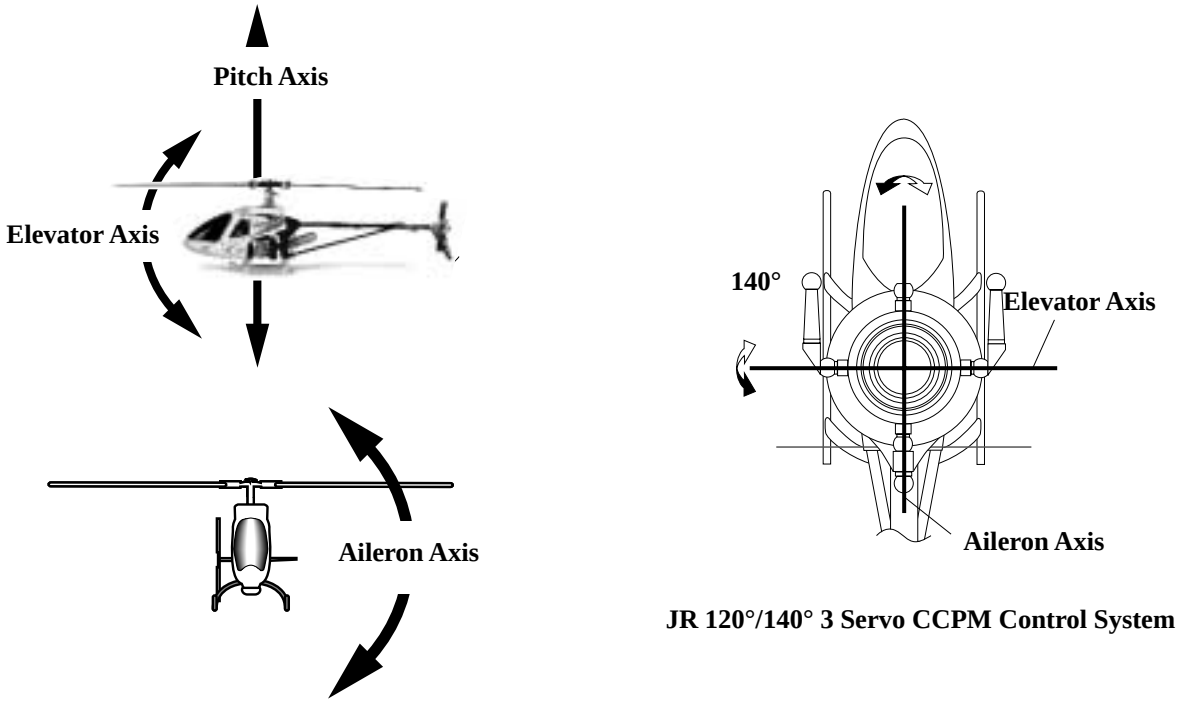
It will also be necessary to enlarge the appropriate hole in the servo horn slightly to allow correct installation of the steel control balls to the servo horn.

120/140 3-SERVO CCPM SWASHPLATE MIXING

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

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

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



JR 120°/140° 3 Servo CCPM Control System

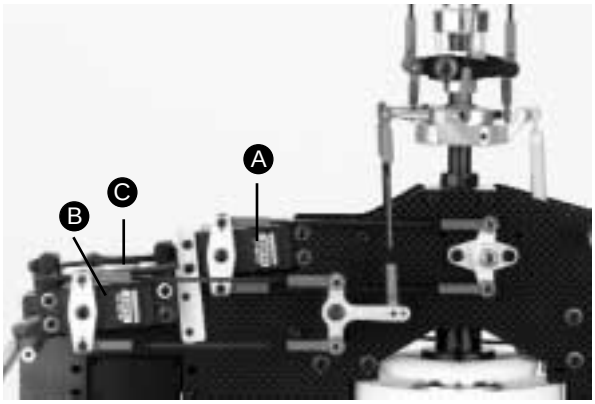
This amazing CCPM control is achieved through special CCPM swashplate mixing that is preprogrammed into many of today's popular radio systems. Since the 120° and 140° CCPM function is preprogrammed, CCPM is no more complicated to set up than a conventional one servo standard system. When you factor in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

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

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

1. COLLECTIVE

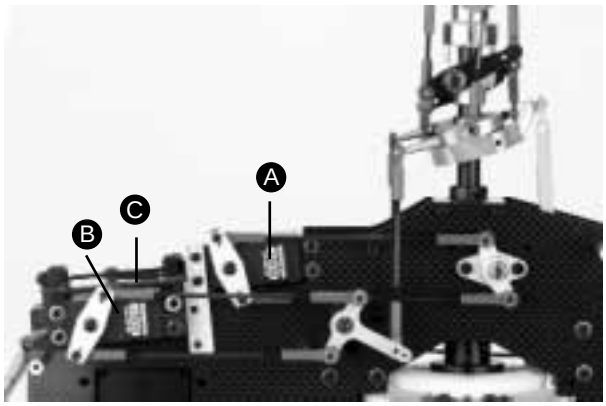
When a collective pitch input is given, all three servos (A, B, and C) move together in the same direction, at equal amounts, to raise and lower the swashplate while keeping the swashplate level. During this function, all three servos travel at the same value (100%) so that the swashplate can remain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



1 Collective Movement

2. ELEVATOR (PITCH)

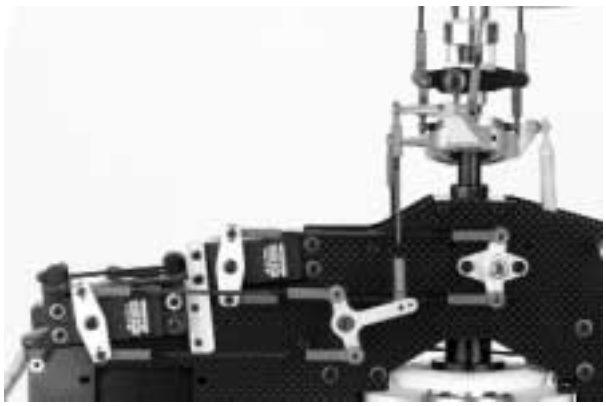
When an elevator input is given, all three servos must move to tilt the swashplate fore and aft, but their directions vary. The two front servos (B and C) move together in the same direction, while the top servo (A) moves in the opposite direction. For example, when a down elevator (forward cyclic) command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



2 Elevator Movement

3. AILERON (ROLL)

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



3 Aileron Movement

A. TRAVEL ADJUST

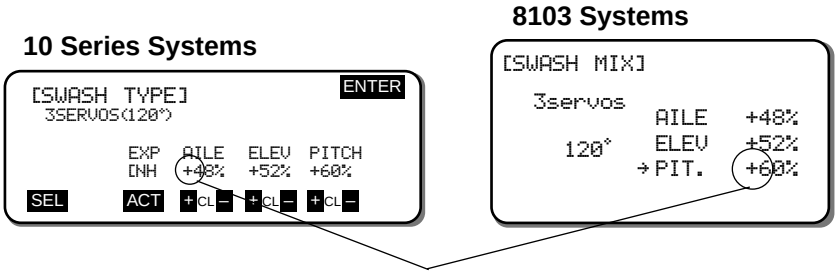
It is extremely important that the travel adjustment values for the three CCPM servos (aileron, elevator, Aux 1) be initially set to exactly the same travel value. If the travel value is not similar for each servo, it will create unwanted pitching and rolling of the swashplate during collective pitch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

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

B. SERVO REVERSING

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

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



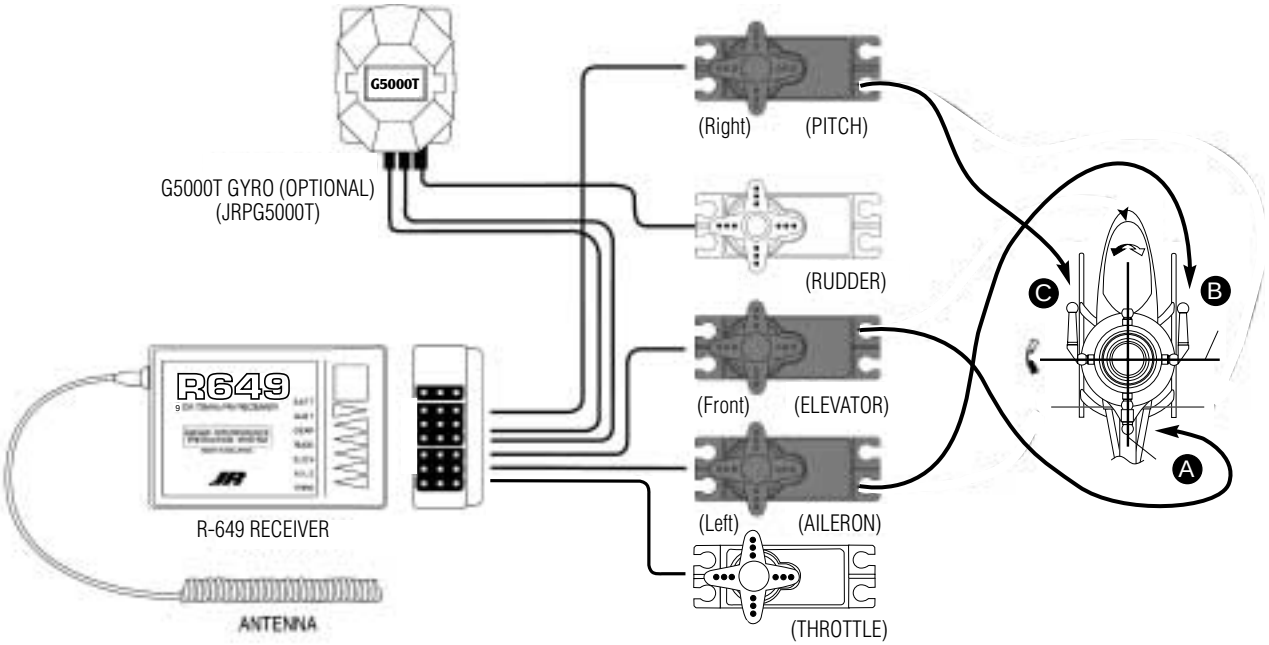
To reverse the direction of a CCPM control function, it's neccessary to change the value from (+) to (–) or (–) to (+) as needed.

C. CCPM SERVO CONNECTIONS

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

Ⓐ Elevator Servo: We will refer to this servo as the "Top" servo. The channel number for this servo when using a JR radio is CH3.
Ⓑ 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 Front" servo. The channel number for this servo when using a JR radio is CH6.

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



RADIO SYSTEM REQUIREMENTS (NOT INCLUDED):

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

CCPM-Ready JR Radio Systems

Most current JR heli radio systems (XP652, XP8103 w/digital trims, 10X, as well as older 10 series systems) are equipped with 120° CCPM electronics for use with JR CCPM machines. Radios you may be flying now, like the X347, X388S, XP783, and XP8103*, have 120° CCPM capability built in but require activiation by the Horizon Service Department. Please call (217) 355-9511 for details.

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

Current Radio Systems

JRP1656**PCM 10X, 120° & 140° CCPM
JRP8622**XP8103FM, 120° CCPM
JRP8653**XP8103PCM, 120° CCPM
JRP6622**XP652 FM,120° CCPM

10X
120° or 140° CCPM

XP8103D.T.
120° CCPM Only

JR 8103 DIGITAL TRIM AND 10X USERS WITH JR DATASAFE™

Included with your Vigor™ CS kit is a 3.5 disc containing Curtis's refined programming for the Vigor CS. 8103DT and 10X users can upload this information to their transmitters using the JR Datasafe system (sold separately). Uploading this information will save a considerable amount of time programming your transmitter, and will also insure that all data input will be correct. All programs and data contained on this disc are also listed on the 8103 and 10X data sheets included at the back of these instructions. Please refer to these data sheets if you have any questions with regards to the program content during setup. Please refer to the Datasafe instructions for information on saving this data to your Datasafe, as well as information on how to upload these programs to your transmitter. **It is suggested that the desired program should be uploaded to your transmitter at this time before proceeding to the next section.** Please note that sub trim and stunt trim (digital trim) values are not included in this program as they will vary from model to model depending on the servos used. Please refer to Section 7-2 for servo sub trim information. **Please note that the preprogrammed information on the Datasafe disc is set to "SPCM" modulation**.

Please note that the programming is designed for use with the following equipment:

Gyro: JR G5000T or G550T Tail Lock Gyros
Servos: JR 8231 or 8411 Digital Servos (Cyclic)
JR 8417 or 8700G Digital/Super Servos (Tail Rotor)
Engine: OS 61 SXH WC
Muffler: YEIMP900 Muscle Pipe Tuned exhaust system
Blades: NHP 700S Symmetrical or 700mm Symmetrical V Blades (Main)
NHP 105mm Tail Rotor Blades (Tail)

If a different combination of equipment is used, it will be necessary to alter the radio program to match the specific equipment.

Caution: Prior to the first flight, please check to make sure that all control surfaces move in the correct direction, and that all functions operated correctly.

A JR first!
After following complete, detailed setup instructions, JR XP8103 & 10X users can dowload Curtis's highly refined programming right into their transmitters using this included JR DataSafe disk and JR's DataSafe™ PC interface .
(DataSafe PC interface set, (JRPA300) not included)

If you have uploaded Curtis's program using the JR Datasafe, please proceed to Section 7-1.

2. JR 8103 SYSTEMS: MANUAL PROGRAM INPUT

The following activation and setup procedure should be used for all JR 8103 and 8103D.T. systems.

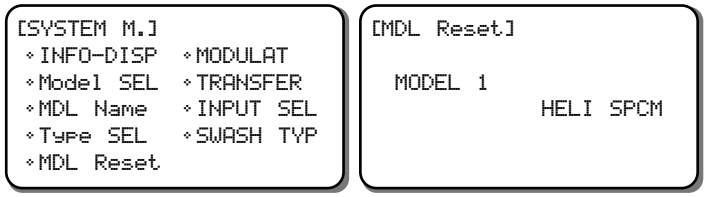
Note: Some early 8103 systems will require the activation of the CCPM software. It's easy to identify if your system has the CCPM function activated by identifying if the "SWASH TYP" function appears in the system mode as shown in Section A below. Please refer to Section A to access the system mode.

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.

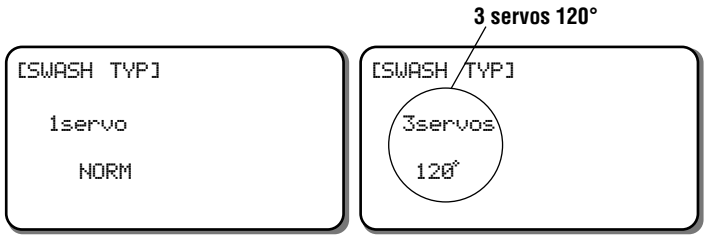
A) Model Select/Data Reset

Press the *Up* and *Down* keys simultaneously while turning the power switch on to enter the system mode. Next, press the *Up* or *Down* keys to move the cursor to the model select function. Press the *Up* and *Down* keys simultaneously to enter the model select function. Select the desired model number to be used, then press the *Clear* key to reset the current model to the factory default settings. Press the *Up* and *Down* keys simultaneously to exit the model select function.



B) CCPM Activation

Press the *Up* or *Down* keys to move the cursor to the swash type function, then press the *Up* and *Down* keys simultaneously to access the swashplate type function.



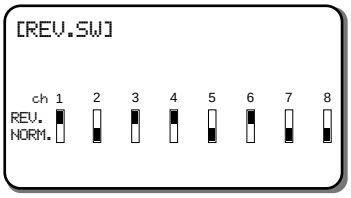
Press the *Up* or *Down* keys until "3 servo 120°" appears on the screen. Press the *Up* and *Down* keys simultaneously two times to exit the swashplate type function and the system mode.

C) CCPM Settings

Turn the power switch on, then press the *Up* and *Down* keys simultaneously to enter the function mode. Press the *Up* key until "Swash Mix" appears on the screen. Once this has been completed, it will be necessary to change the value of the aileron, elevator, and pitch functions from the factory default setting using the + and - keys.

D) Servo Reversing

Press the *Up* key until "Rev. Sw." (Servo Reversing) appears on the screen. Next, reverse channels 3, 4, and 6 by moving the cursor with the *Channel* key, then pressing the + or - keys.

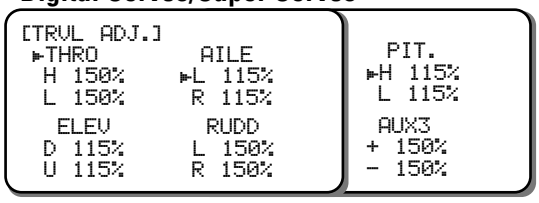


	REV	NORM
THR	●	
AIL		●
ELE	●	
RUD	●	
GER		●
PIT	●	
AUX1		●
AUX2		●

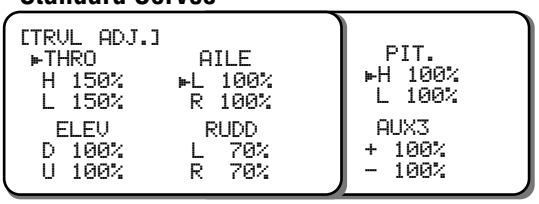
E) Travel Adjustment

Press the *Up* key until "TRVL. ADJ." (travel adjust) appears on the screen. Adjust the values as shown using the channel key to move the cursor, and the + and - keys to set the value. Press the *Sel* key to access the pitch channel values and set as indicated. Please note that the required travel values will vary based on the type of servo selected.

Digital Servos/Super Servos



Standard Servos



Note: The travel values shown for the rudder function are for use with Piezo type gyros, like the JR G550T or G5000T type gyros.

3. JR 10 SERIES SYSTEMS: MANUAL PROGRAM INPUT

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

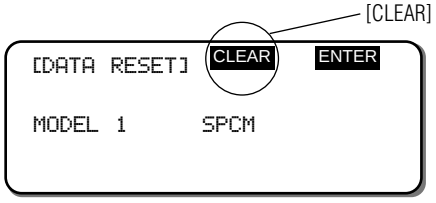
Prior to activating the CCPM function, it is first suggested that a data reset function be performed to reset the desired model number to be used back to the factory default settings.

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

SETUP PROCEDURE

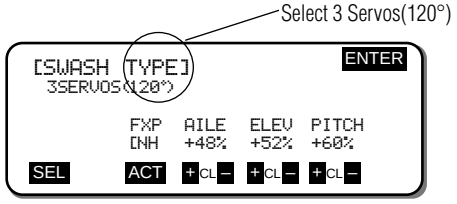
A) Data Reset

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



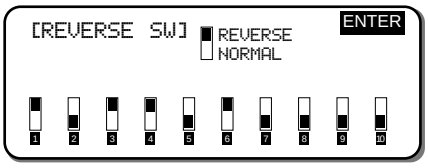
B) CCPM Activation

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



C) Servo Reversing

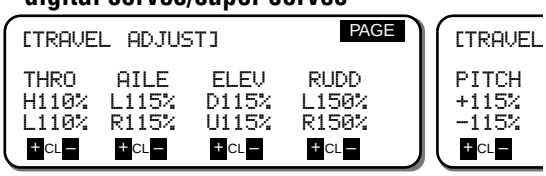
Access the servo reversing function (code 11). Next, reverse channels 1, 2, and 4 by pressing the desired channel number. The screen should appear as shown. Press *Enter* to exit the servo reversing function.



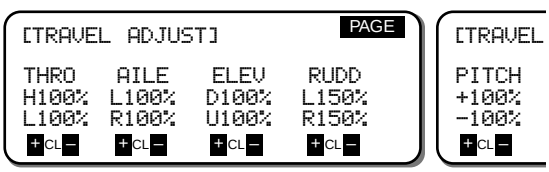
D) Travel Adjust

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

digital servos/super servos



Standard servos



Note: The travel values shown for the rudder function are for use with Piezo type gyros, like the JR G550T, or G5000T type gyros. If a conventional mechanical type gyro is used (JR 120, 130 etc.), then the travel value of the rudder channel will need to be reduced to approximately 100%.

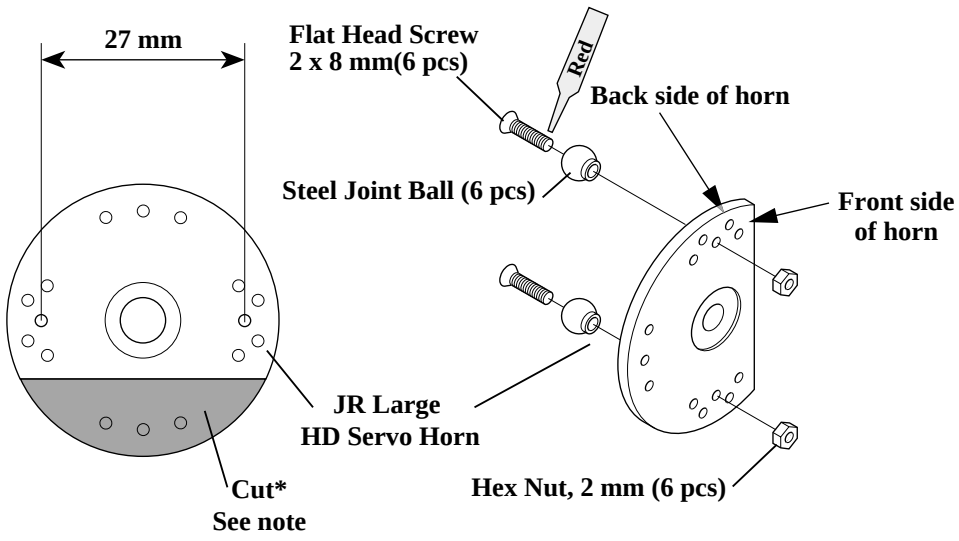
7-1 PREPARATION AND INSTALLATION OF SERVO HORNS

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

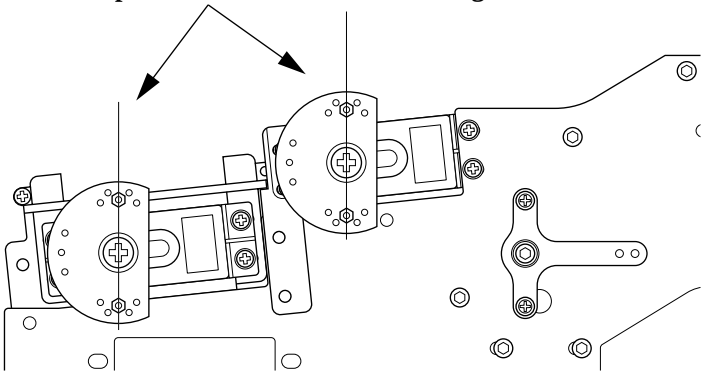
..... 6 pcs
Steel Joint Ball

..... 6 pcs
Hex Nut, 2 mm

Use Red Threadlock



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



Note:

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

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

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

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

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

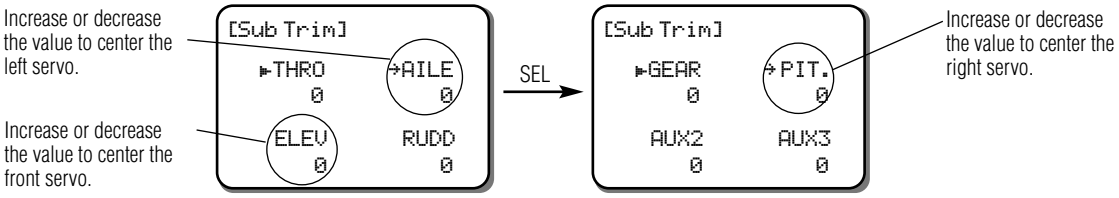
Reattach the servo horns to the servos, remembering to secure the horns to the servos using the servo horn screw. Final sub trimming of the servos will be performed in the proceeding Section 7-2.

7-2 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. Please refer to your particular radio's section as listed below or consult your radio instruction manual for more information.

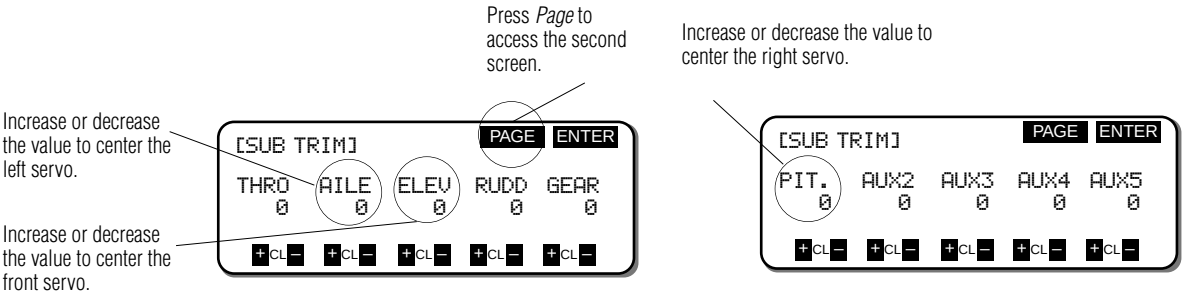
1. XP8103 SYSTEMS

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



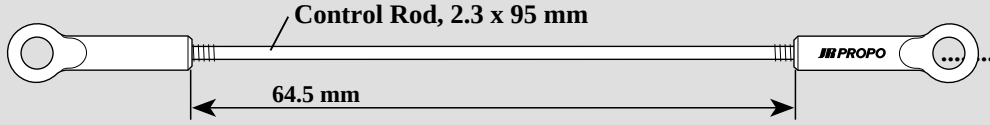
2. JR PCM10, 10S, 10SX, 10SXII, 10X SYSTEMS

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



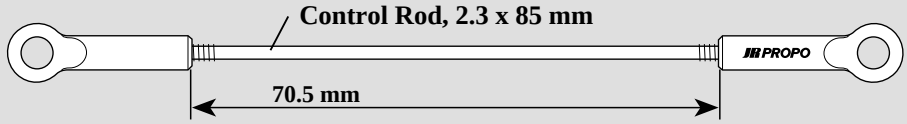
120Standard Range (For 8103 and 10 Series Systems)

Ⓐ Control Rod, 2.3 x 95 mm



...4 pcs

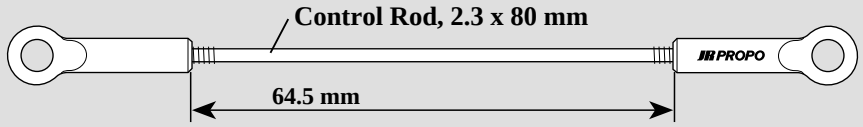
Ⓑ Control Rod, 2.3 x 85 mm



.....2 pcs

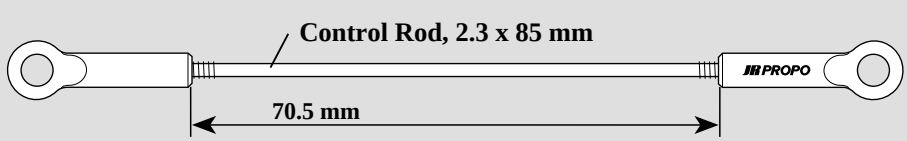
140Standard Range (For 10X Systems only)

Ⓐ Control Rod, 2.3 x 80 mm



.....4 pcs

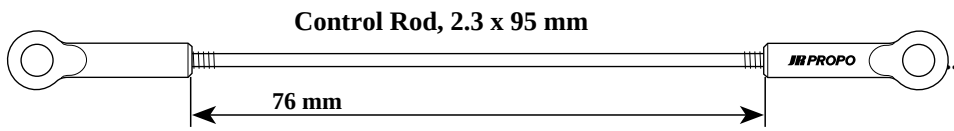
Ⓑ Control Rod, 2.3 x 85 mm



.....2 pcs

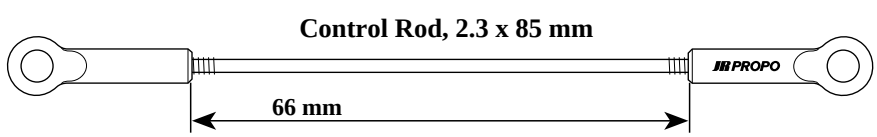
120Wide Range

Ⓐ Control Rod, 2.3 x 95 mm



.....4 pcs

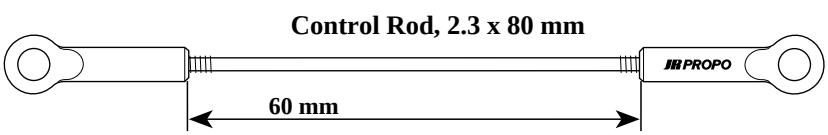
Ⓑ Control Rod, 2.3 x 85 mm



.....2 pcs

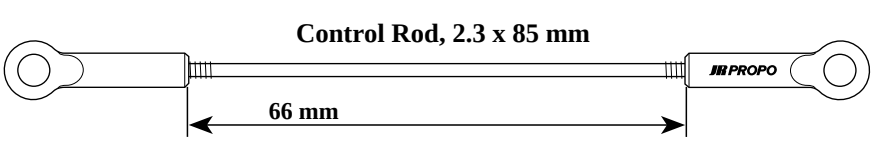
140Wide Range

Ⓐ Control Rod, 2.3 x 80 mm



.....4 pcs

Ⓑ Control Rod, 2.3 x 85 mm



.....2 pcs

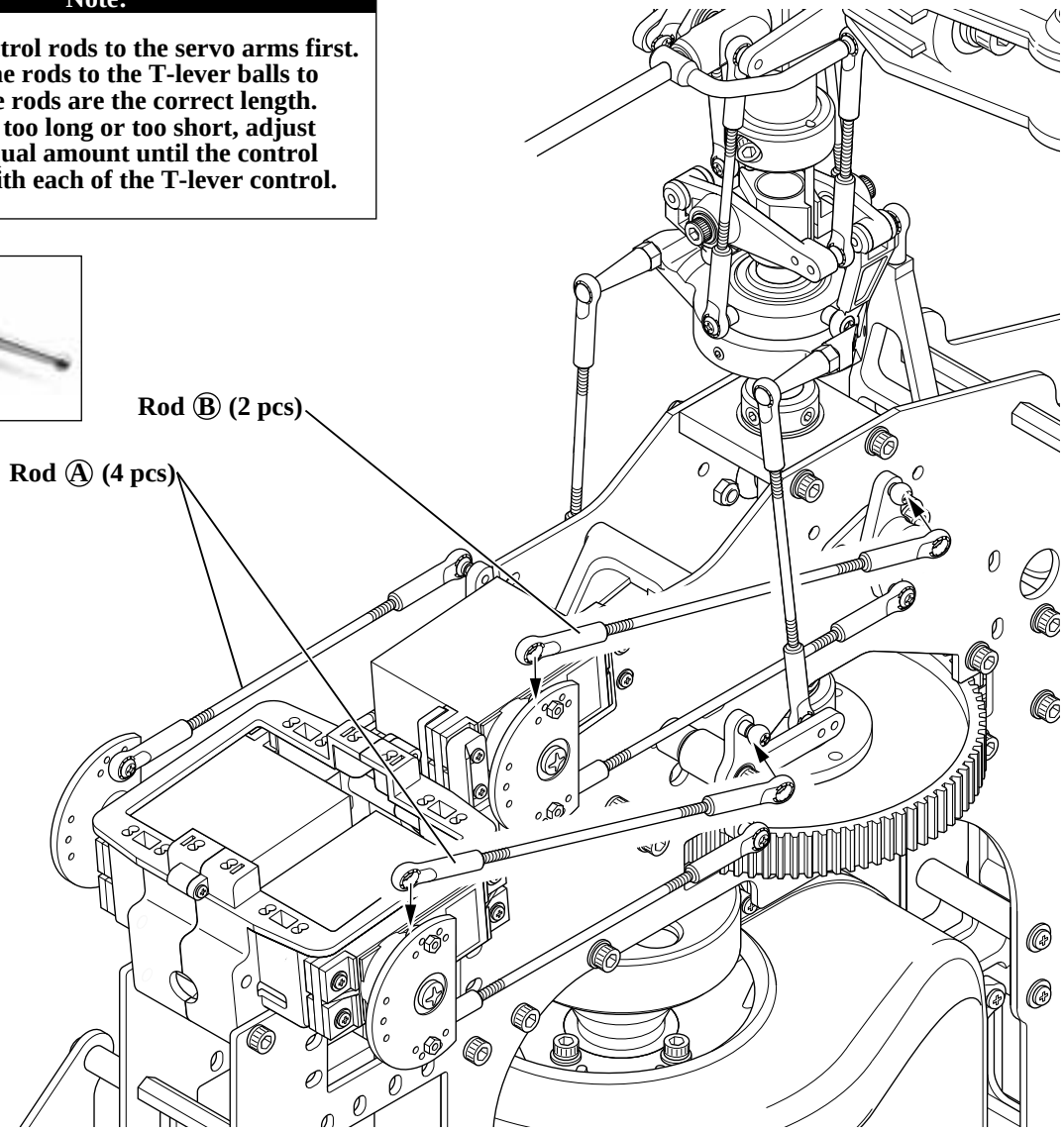
Note:

All instructions are based on the use of the "standard range" CCPM setup. It is not recommended that the "wide range" setup be used.

Note:

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

Use JR Ball Link Sizing Tool



7-5 TAIL CONTROL ROD CONNECTION

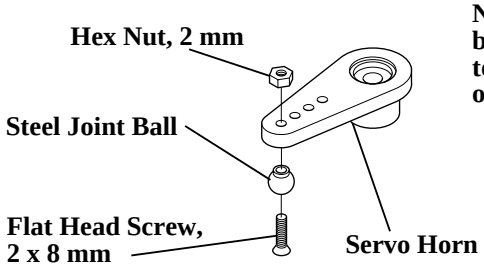
.....1 pc
Flat Head Screw, 2 x 8 mm

.....1 pc
Steel Joint Ball

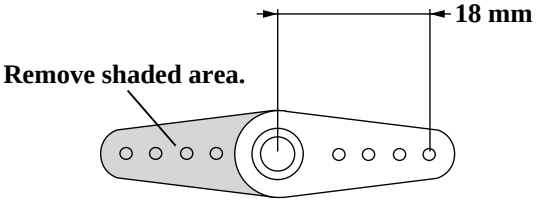
.....1 pc
Hex Nut, 2 mm

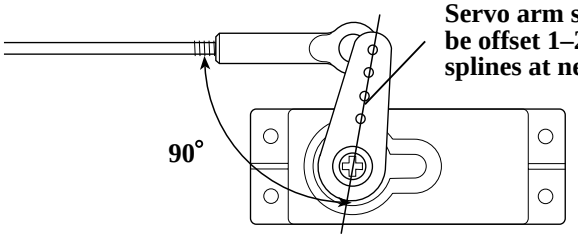
Use Red Threadlock

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



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





Servo arm should be offset 1–2 servo splines at neutral.

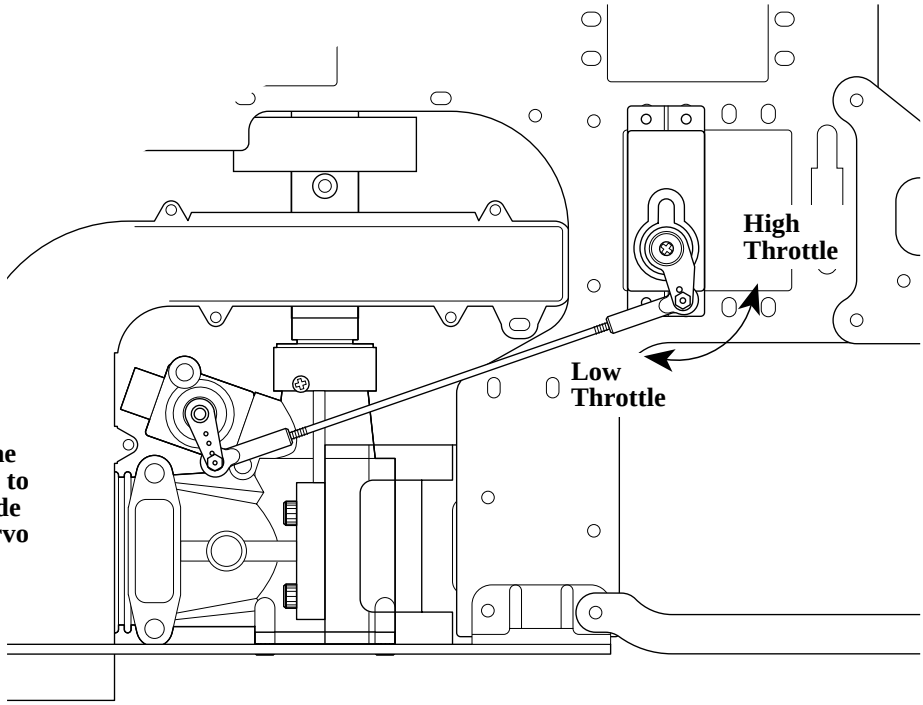
Offsetting the servo arm as shown will "balance" the feel of the tail rotor during flight.

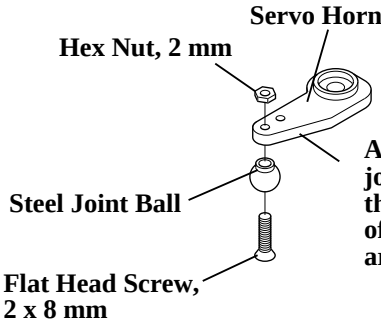
.....1 pc
Flat Head Screw, 2 x 8 mm

.....1 pc
Steel Joint Ball

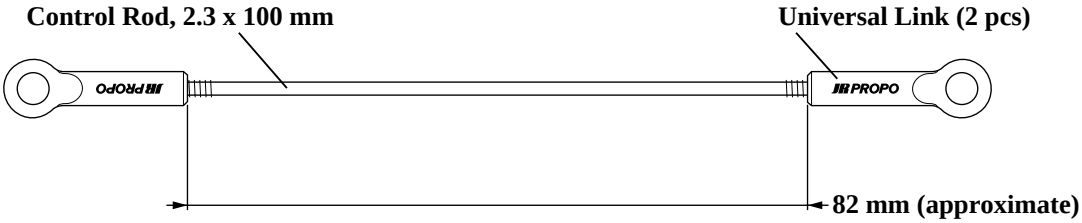
.....1 pc
Hex Nut, 2 mm

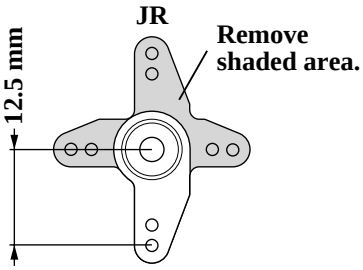
***Option: For smooth operation, pre-size the ball links with the JR ball link sizing tool prior to attachment.**



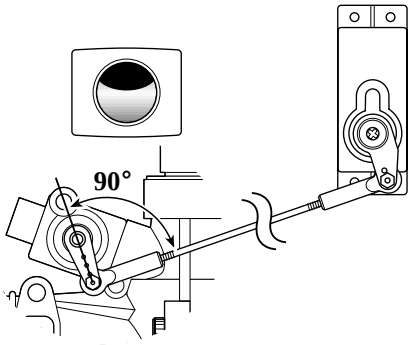


Attach the joint ball to the outside of the servo arm.

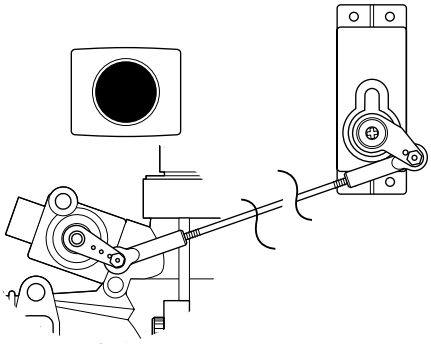




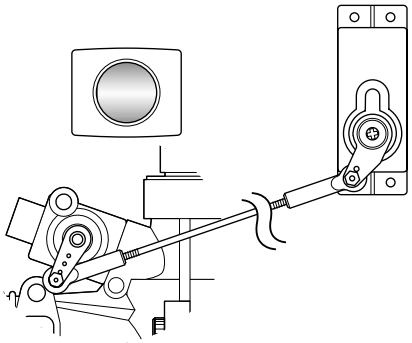
7-6.1 THROTTLE ARM/SERVO HORN POSITIONS



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



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



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

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

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

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

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

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

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

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

Cyclic to Throttle Channel and Mixing Values (most systems)

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

*Numbers shown correspond with the correct JR channel numbers

Mixing Value Adjustment

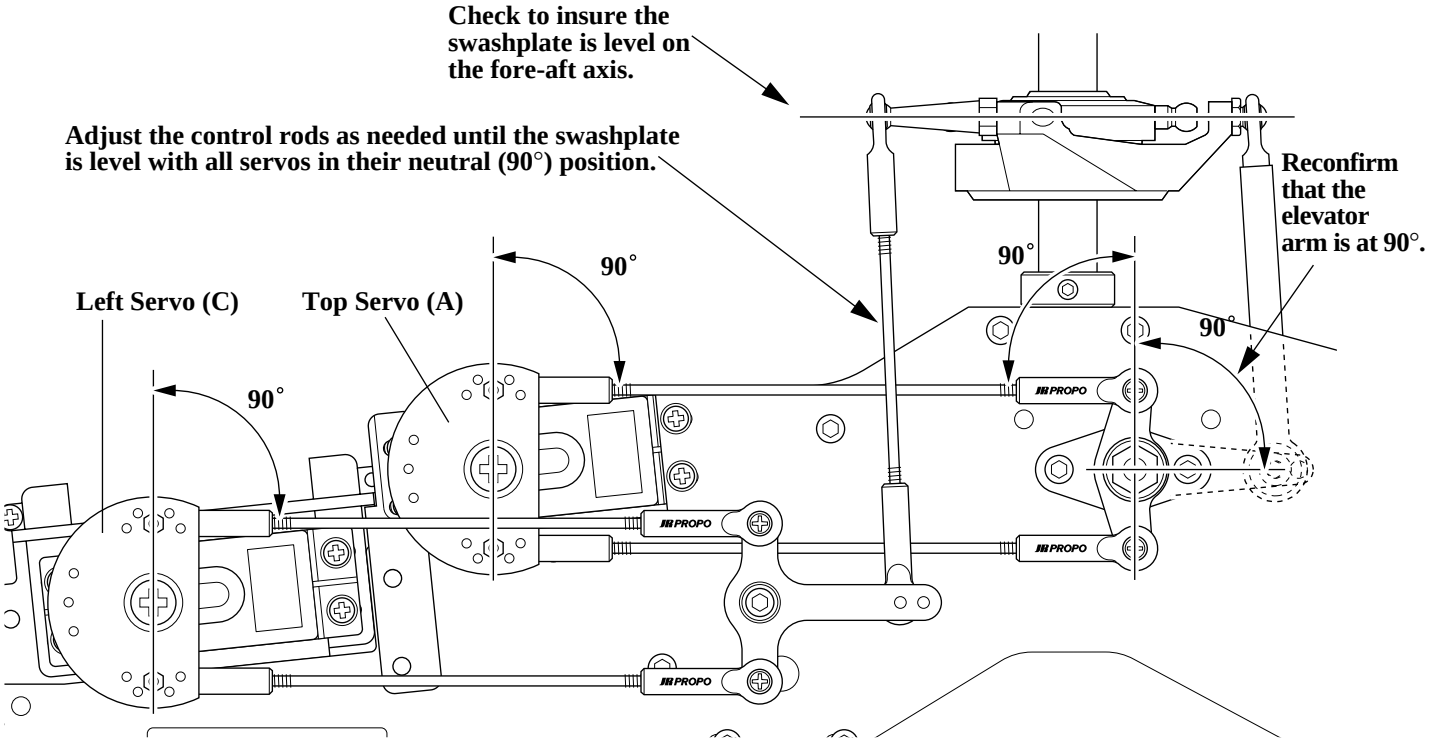
Please note that it will be necessary to determine if the desired mixing values need to be a + or - value based on servo direction, etc.

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

Note:

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

7-7 CHECKING THE SWASHPLATE FOR LEVEL



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

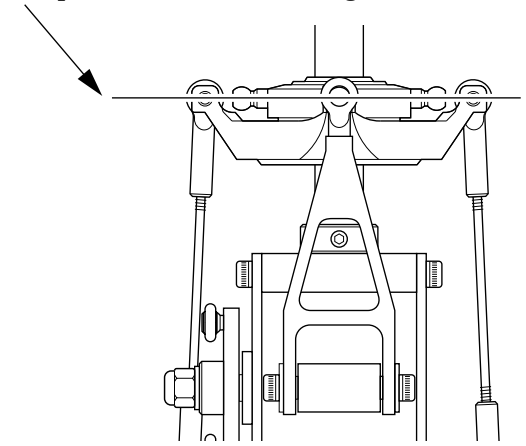
Check to insure that the servo arms are parallel to the servos as adjusted in the previous step. If the servos are not parallel, please refer to the sub-trim section 7-2 and readjust as necessary.

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

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

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

Check to insure that the swashplate is level on the left/right axis.



Note:

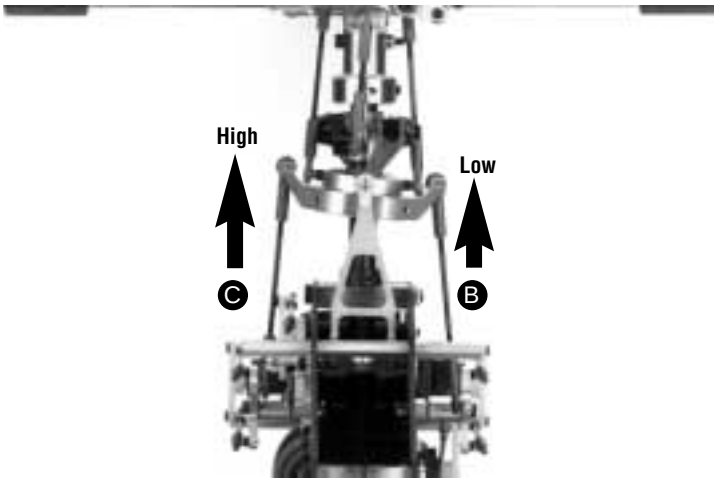
If care was taken in the linkage assembly in Steps 4-6 and 7-3, little or no adjustment should be required in this step. Only minor adjustments should be made to the lengths of the control linkages at this time. Any major adjustments indicates either incorrect linkage lengths or incorrect servo arm positioning.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

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

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

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

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



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

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

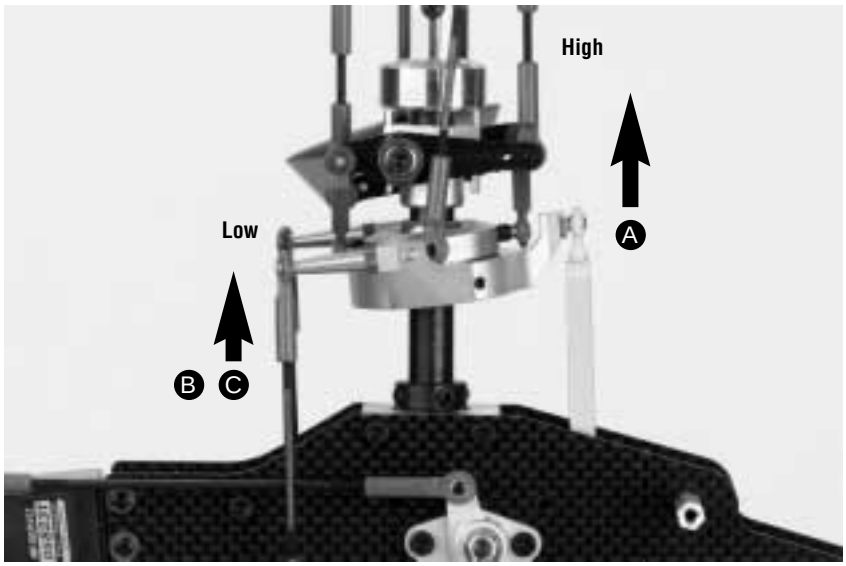
ELEV=	Top Servo	Ⓐ
AUX1=	Right Front Servo	Ⓑ
AILE=	Left Front Servo	Ⓒ

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

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

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

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



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

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

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

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

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

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

2. **Dual Rates**
   It's suggested that for initial flights, the dual rate function values be set as follows:
   0 Position (low rate) 90%
   1 Position (high rate) 100%

3. **Exponential Settings**
   It's suggested that the exponential rate settings remain in the 0 value position until the initial test flights. After initial flights, adjust the exponential values to achieve the desired control feel.

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

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

A) Pitch Curve

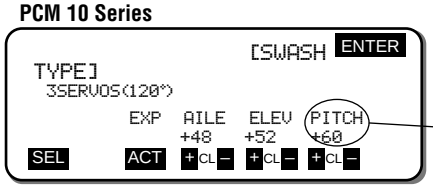
It will now be necessary to establish the maximum pitch value required for your application prior to adjustment. For example, if you are a 3D pilot, then your maximum negative pitch will be -10, and your maximum positive pitch will be +11. The maximum pitch range that you will require will be 21° total.

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

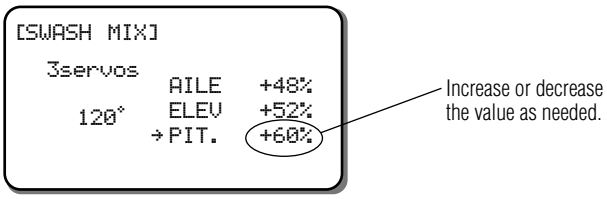
Once the CCPM function has been activated, set the maximum positive pitch settings as mentioned above. Since the CCPM function does not allow for independent travel settings for positive and negative pitch, it will be necessary to establish the maximum positive pitch, since this is generally the largest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

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

PCM 10 Series



XP8103 System



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

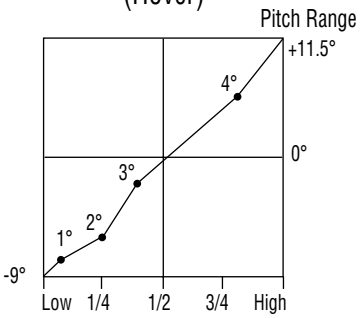
Pitch Range Settings

Flight Mode	Application	Low Pitch (Low Stick)	Hovering Pitch (Half Stick)	High Pitch (High Stick)
N	Hovering	-9°	+5°	+10°
I	3D Flight #1	-9°	+5°	+11°
*2	3D Flight #2	-9°	+5°	+11°
H	Autorotation	-9°	+5°	+11.5°

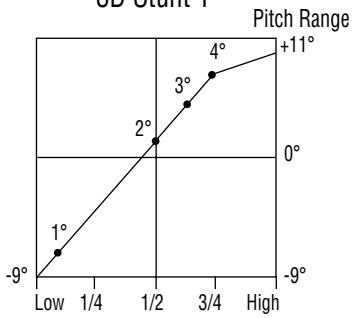
Note: Flight modes #1 and #2 are duplicated for safety.

Pitch Curve Settings

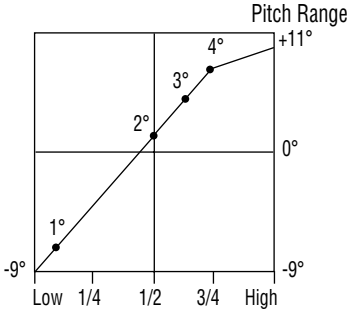
Normal (Hover)



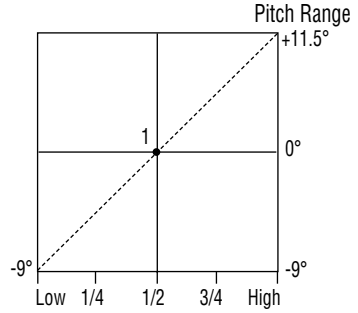
Flight Mode 1 3D Stunt 1



Flight Mode 2 3D Stunt 2 (Duplicate of #1)



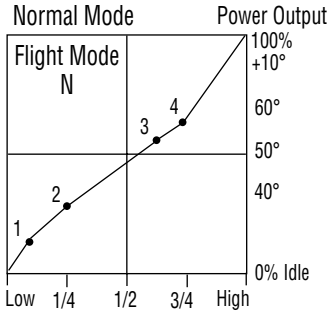
Autorotation (Throttle Hold)



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

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

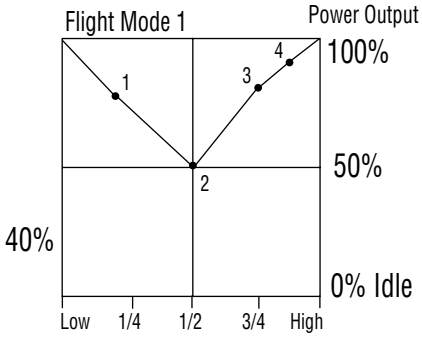
Hovering



Stick Position

Output
L: 0 3: 50
1: 29 4: 56
2: 38 H: 100

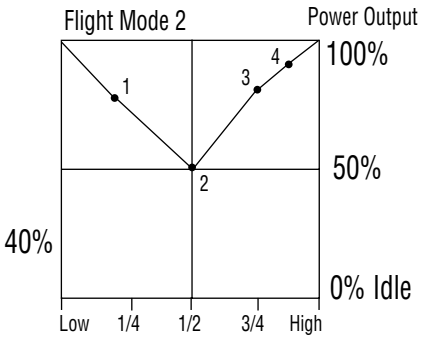
3D Flight Stunt 1



Stick Position

Output
L: 100 3: 86
1: 84 4: 94
2: 60 H: 100

3D Flight Stunt 2
(Duplicate of #1)



Stick Position

Output
L: 100 3: 86
1: 84 4: 94
2: 60 H: 100

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

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

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

6. **Revolution Mixing (Non-Tail Lock/Heading Lock Gyros)**
It will be necessary to adjust the revolution mixing to properly compensate for the torque of the engine during all flight conditions (except autorotation) if an on tail lock/heading lock gyros is used.

Since there are many variables that can alter the value of the revolution mixing (engine, blade pitch, fuel, etc.), it will be necessary to fine tune this function during test flights.

The following values are shown only as a starting point toward achieving proper compensation:

Flight Mode N	Flight Mode 1	Flight Mode 2 (3D)
Up 40	Up 15	Up 15
Down 20	Down 10	Down 15

7. **Gyro Gain Adjustment (All Gyros)**
It will be necessary to adjust the "gain" or compensation of the gyro to create the correct amount of "holding power" necessary for a solid neutral tail rotor. The intent of the gyro is to compensate for abrupt movements, or wind direction changes, working in conjunction with the Revolution Mixing Function (non-heading lock gyros).

For hovering, it's recommended that you start with the gyro gain at approximately 80° and continue to increase slightly until the tail of the helicopter "hunts," then reduce the value slightly.

This same adjustment will also be necessary to achieve proper forward flight. Generally, the gyro gain for forward flight will be approximately 10% – 20% less than that of the established hover gain due to aerodynamic forces present in forward flight. This variance depends greatly on the specific gyro used.

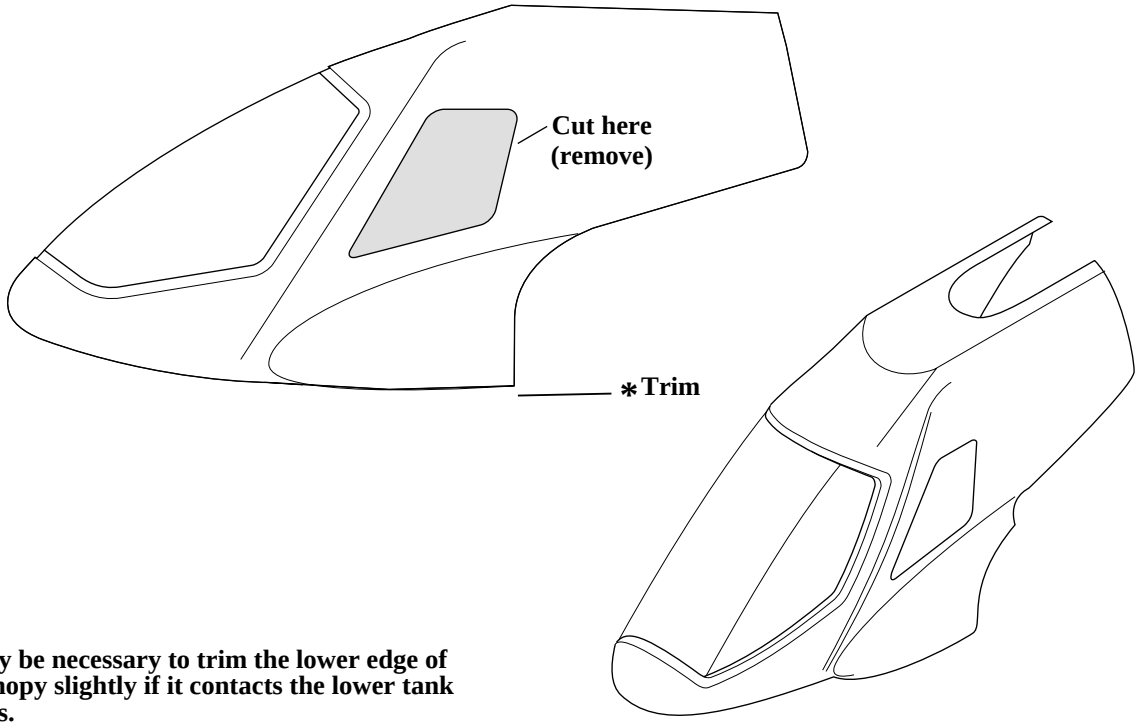
If you are using a dual rate gyro, adjust the gain so you are using the "higher" gain setting for hover and the "lower" gain setting for forward flight.

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

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

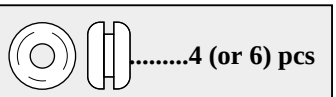
If the arm moves in the opposite direction, reverse the gyro and re-test.

8-1 TRIMMING OF BODY ASSEMBLY

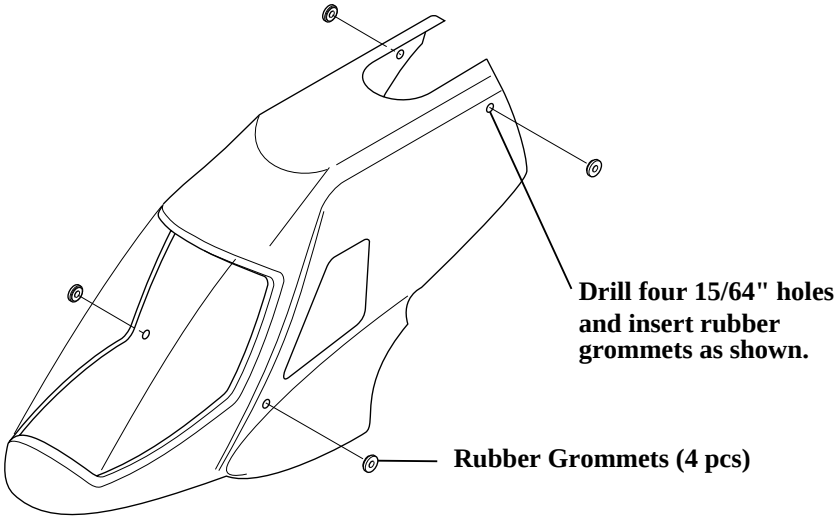


***It may be necessary to trim the lower edge of the canopy slightly if it contacts the lower tank mounts.**

8-2 GROMMET ATTACHMENT

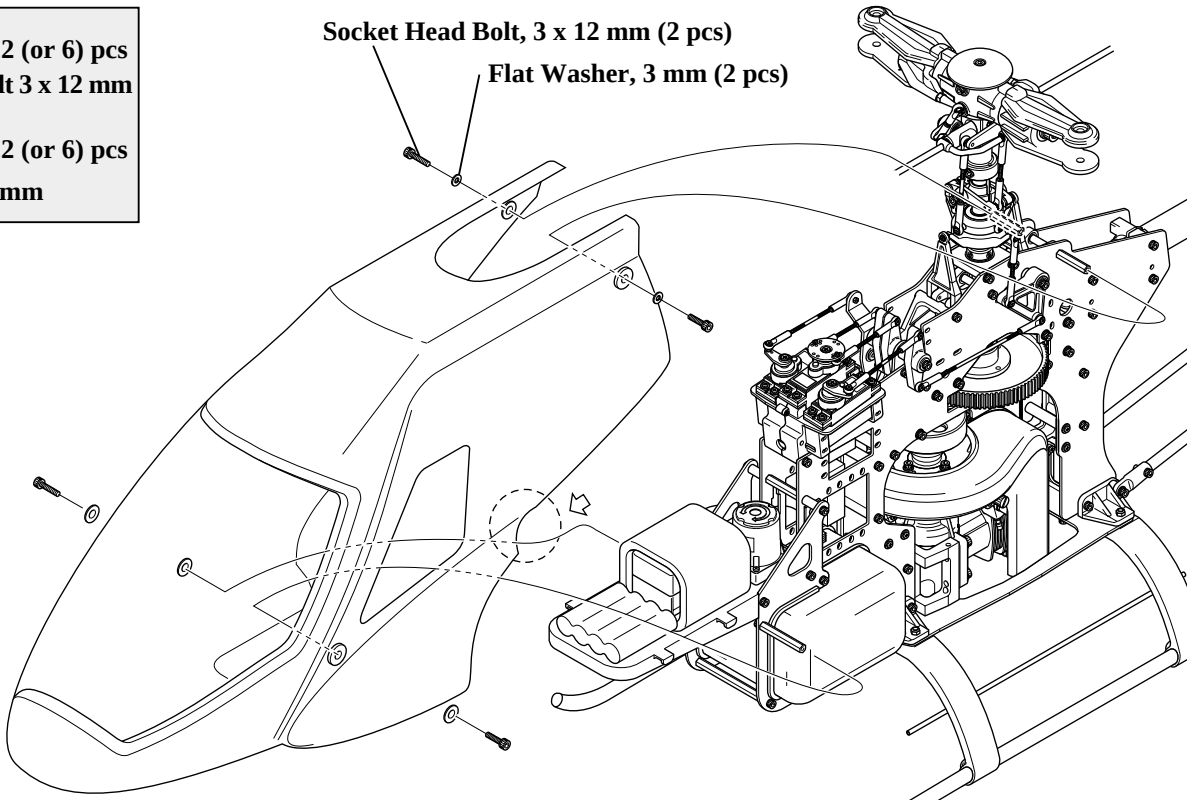


.....4 (or 6) pcs
Rubber Grommets



...2 (or 6) pcs
Socket Head Bolt 3 x 12 mm

.....2 (or 6) pcs
Flat Washer, 3 mm



Check to insure the body does not come in contact with any portion of the main frame, muffler, servo, servo horns, etc. Trim for clearance if necessary. Trim and remove a small portion of the canopy shown in the circle above as it is very close to the cooling fan shroud (left side only).

CANOPY PREPARATION AND PAINTING

Before sanding or painting the canopy, it is first suggested that the canopy be cleaned using Lacquer thinner, or rubbing alcohol to remove any mold release agent that may still be present on the canopy.

Lightly sand the entire canopy using 180 to 220 grit sandpaper or "Scotchbrite" sanding material so that all areas of the canopy have a dull appearance.

Clean the canopy again using rubbing alcohol to remove all sanding dust.

Apply a coating of primer to the canopy. Many modelers use a lacquer based automotive primer available in most automotive supply stores.

Once the primer dries, check the canopy for any pinholes that may exist. These pinholes can be spot filled using either an automotive "Glazing" putty, or a special pinhole filler like BVM (Bob Violett Models) BVM1925 pinhole filler.

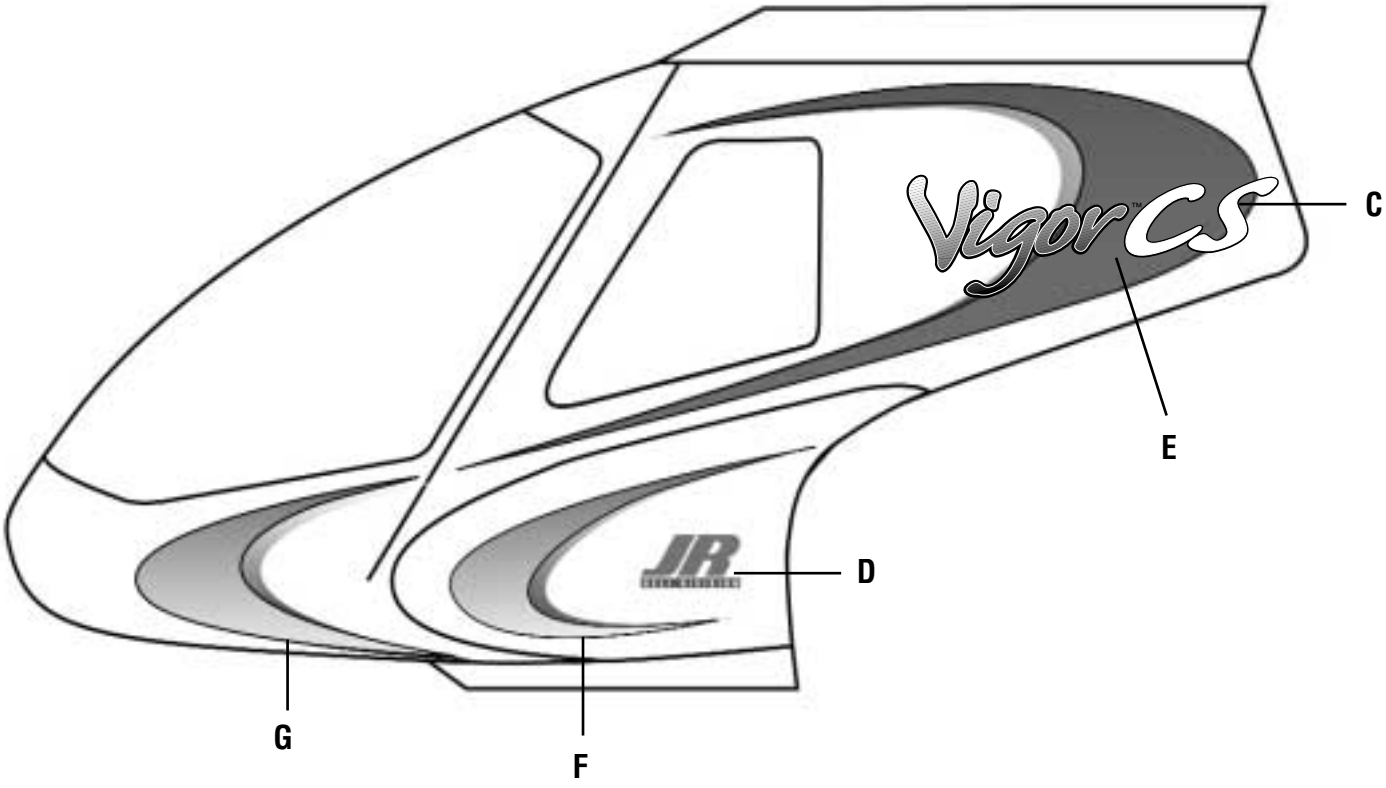
Sand the spot filler and apply a fresh coat of primer. Repeat the filling procedure as needed until all of the pinholes have been filled.

Clean the canopy again to remove any sanding dust and apply your favorite brand of Fuel Proof paint. Many pilots also use an automotive based paint for color coats, although the automotive paint will need to be sealed using a fuel proof clear coat.

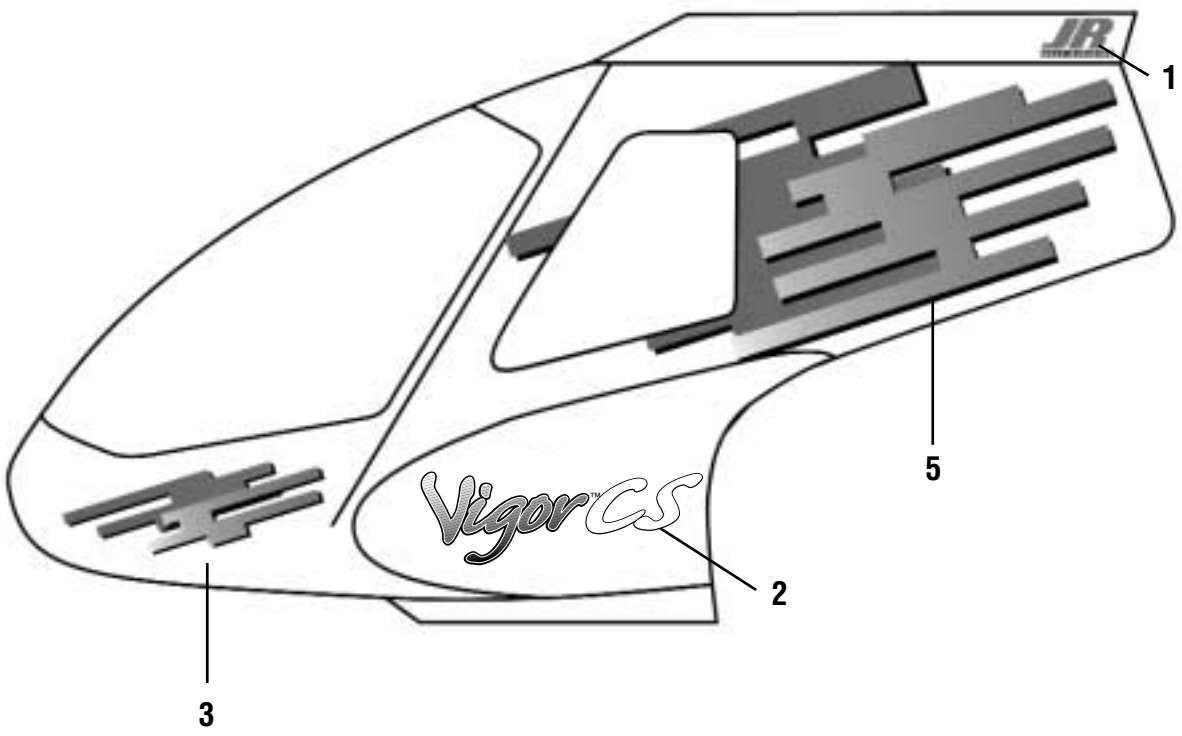
For a quick and attractive paint job, Goldberg Ultra Paint will also work well and is fuel proof for up to 15% nitro (direct fuel contact).

Once the canopy has been painted to the desired finish, apply the decals to the canopy as shown in the following pages.

A



B



8-4 MAIN ROTOR BLADE ATTACHMENT (BLADES NOT INCLUDED)

Two sets required

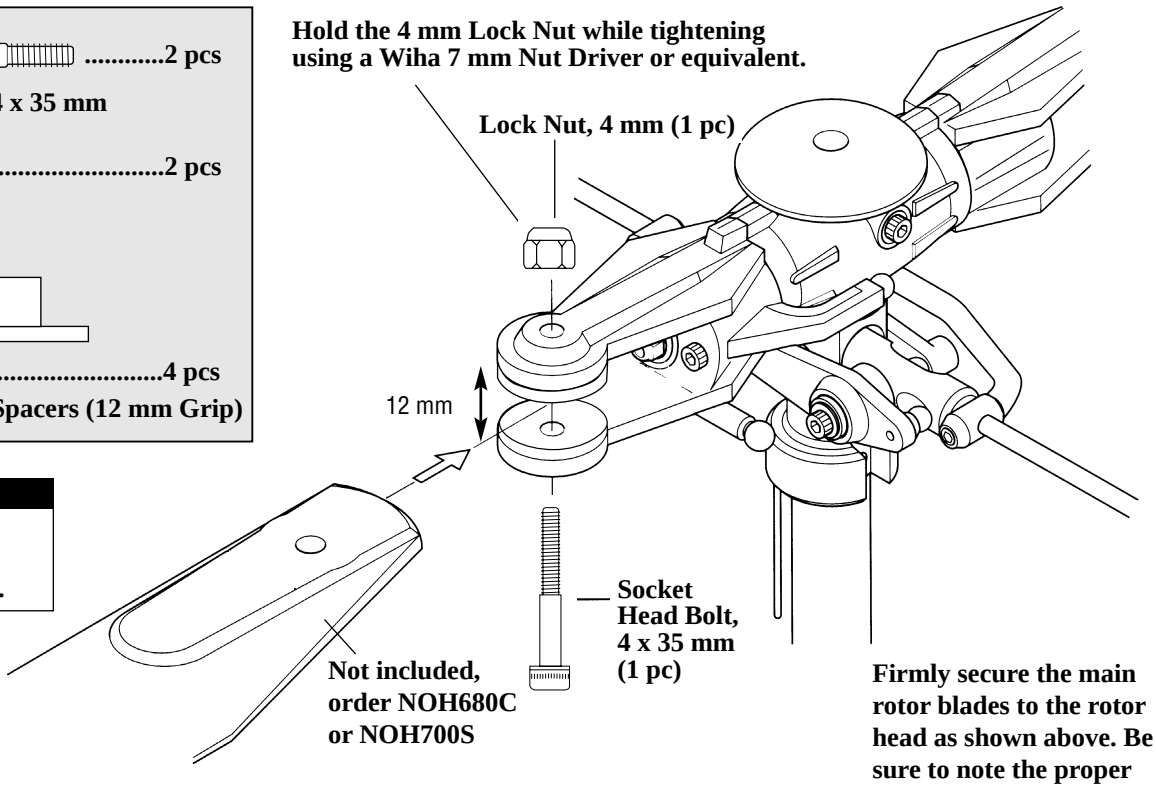
.....2 pcs
Socket Head Bolt, 4 x 35 mm

.....2 pcs
Lock Nut, 4 mm

.....4 pcs
Main Roter Blade Spacers (12 mm Grip)

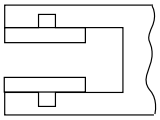
Note:
5 x 35 mm bolts and 5mm nuts are also included with this kit.

Hold the 4 mm Lock Nut while tightening using a Wiha 7 mm Nut Driver or equivalent.



Insert the main rotor blade spacers as shown.

Apply a light drop of CA adhesive to hold the main rotor blade spacers in place.

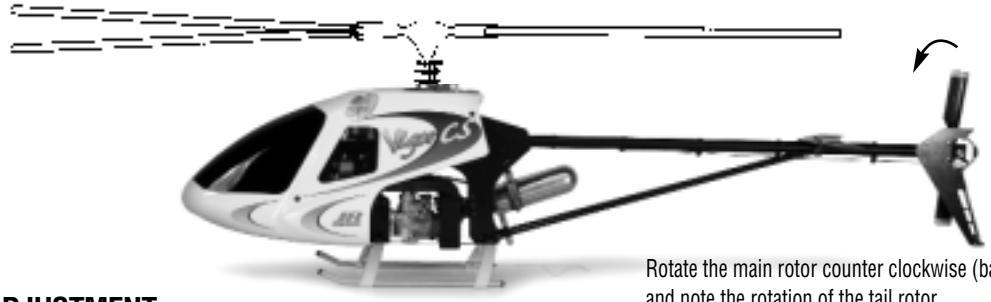


Firmly secure the main rotor blades to the rotor head as shown above. Be sure to note the proper direction of the rotor blades when assembling (clockwise rotation). Main blades should be tightened so they can pivot when moderate pressure is applied. Do not allow the main blades to swing freely within the main blade holders.

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 insure 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 insure 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 (detailed in Section 7, page 61).
- Make sure that both the transmitter and receiver have been fully charged (refer to your radio system instructions for proper charging procedures).
- Check to insure that the throttle is working properly and in the correct direction.

Correct Main/Tail Rotor Rotation Direction



Rotate the main rotor counter clockwise (backward) and note the rotation of the tail rotor.

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.

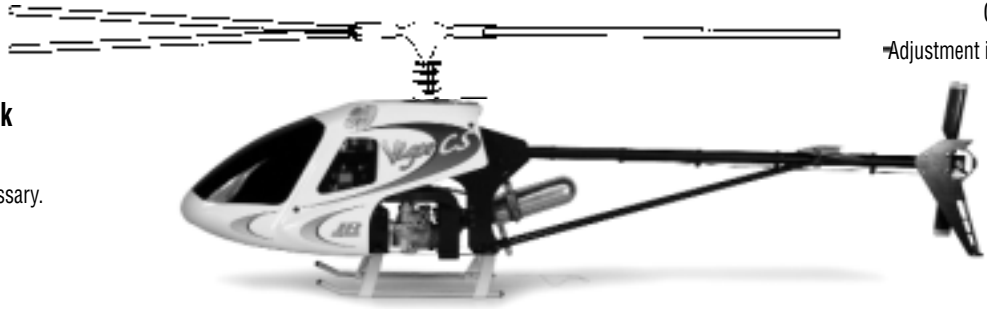
On the initial flight, it will be necessary to increase the blade speed to just before lift-off rpm and view the rotor disc at eye level from a safe distance (approximately 15 to 20 feet).

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 below to identify the different tracking situations, as well as several methods to mark each rotor blade for tracking identification.

BLADE TRACKING IDENTIFICATION

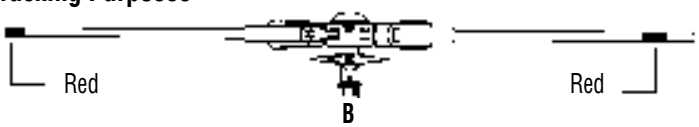
In Track
Correct
Adjustment is **not** necessary.



Out of Track
Incorrect
Adjustment **is** necessary.

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.

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 dampners to be checked/and or replaced every 30–50 flights to maintain maximum rotor head performance. When replacing the main rotor head dampners, apply a light coating of oil to the dampners 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 oiled lightly every 5–10 flights to help reduce wear.

Washout Base

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

Tail Pitch Slider

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

Check Ball Link Wear

Check to insure 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 insure 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

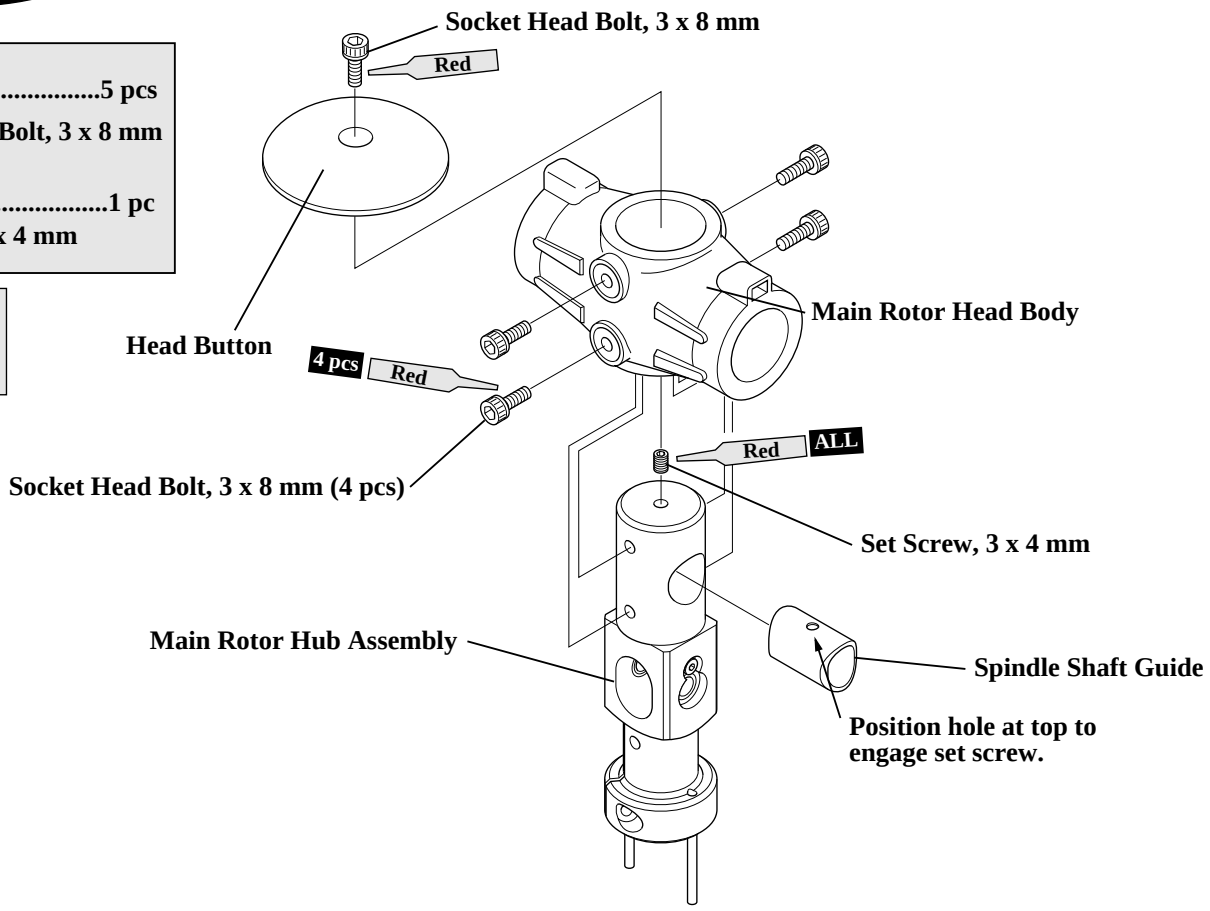
Check ball links every 15–20 flights for increased play and looseness. Adjust the ball links using plyers to tighten the ball race if needed.

P-1 ASSEMBLY PROCESS – MAIN ROTOR HEAD 1

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

.....1 pc
Set Screw, 3 x 4 mm

Use Red Threadlock



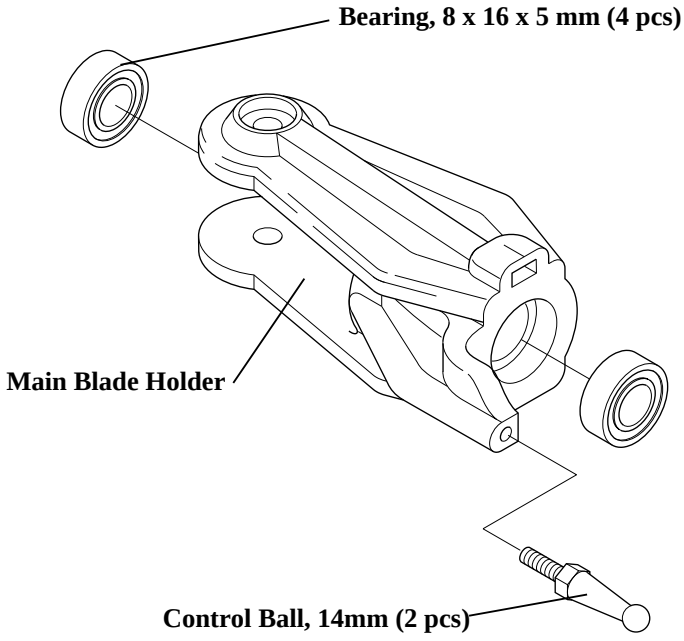
P-2 ASSEMBLY PROCESS – MAIN ROTOR HEAD 2

..2 pcs
Control Ball, 14 mm

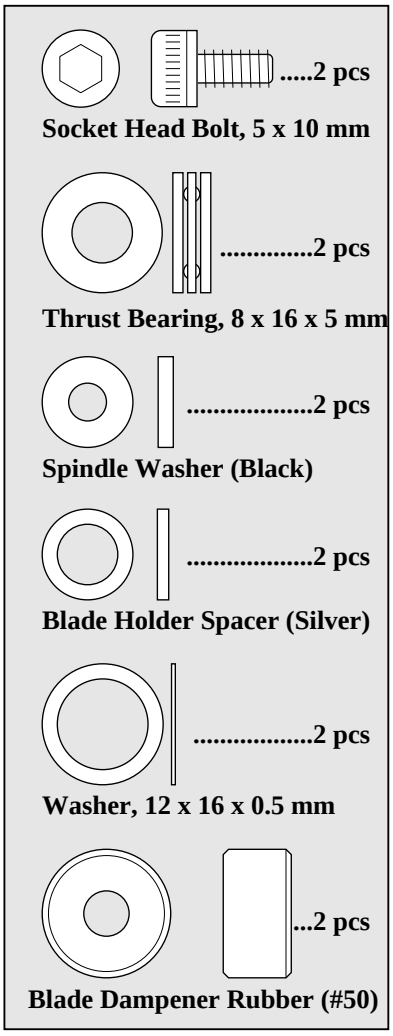
.....4 pcs
Bearing, 8 x 16 x 5 mm

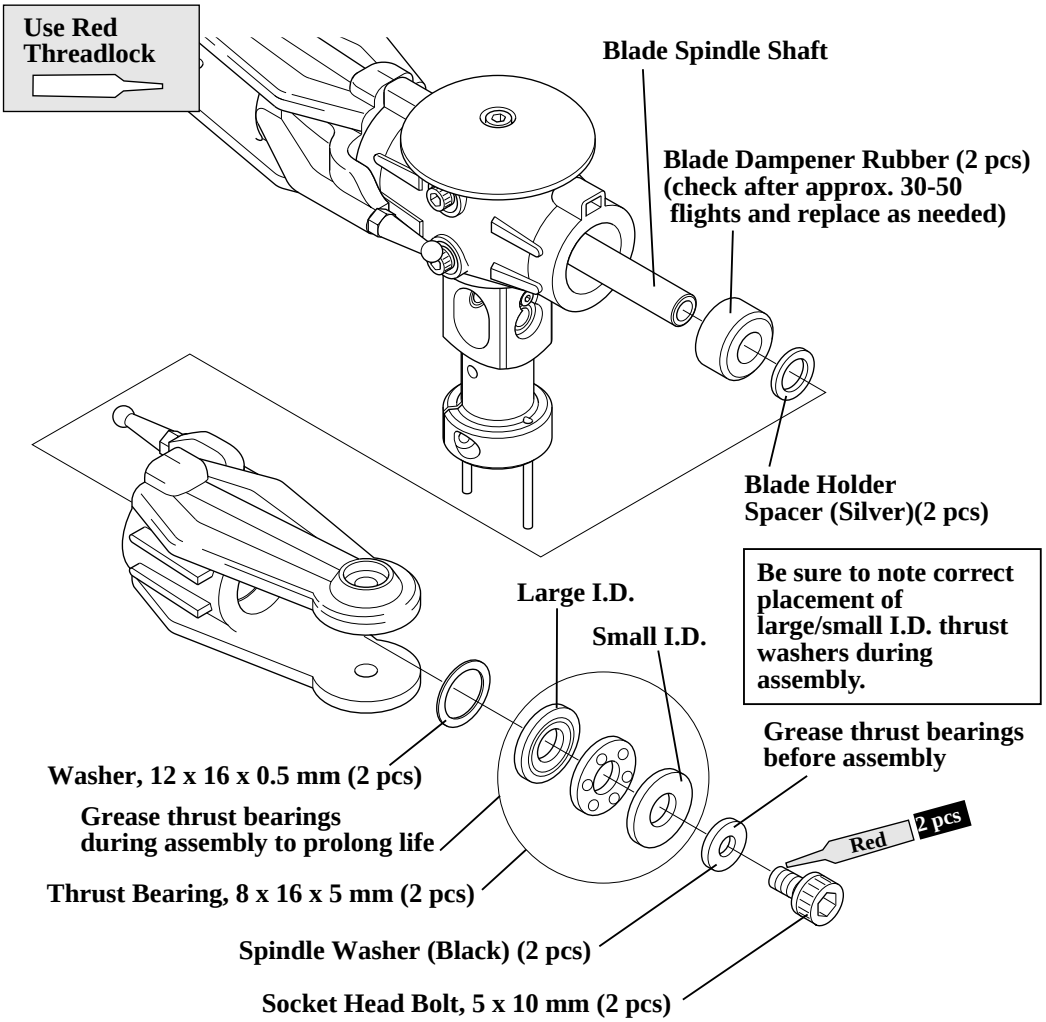
Use caution when inserting the main blade holder bearings so as not to distort/damage the main blade holders.
Make two main blade holders.

TEAM TIP: *JB Weld the bearings into the blade holders to reduce play in the blade holders.*

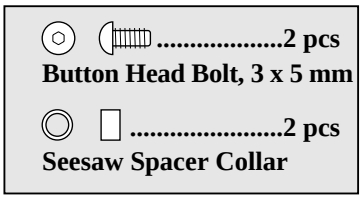


P-3 ASSEMBLY PROCESS PARTS – MAIN ROTOR HEAD 3

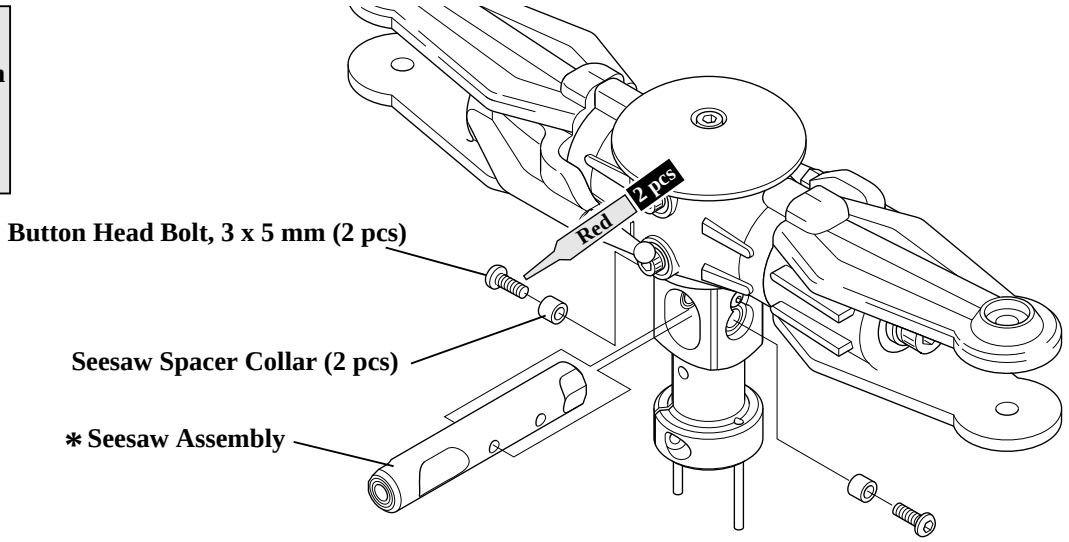




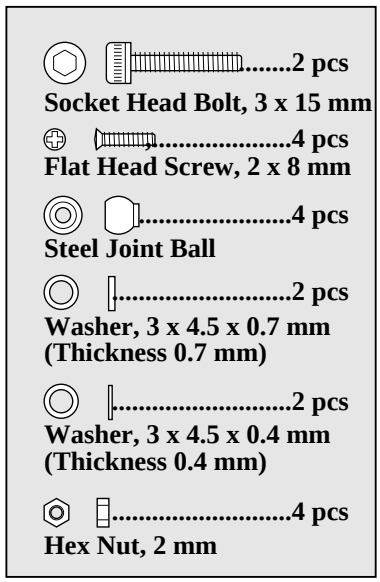
P-4 ASSEMBLY PROCESS - MAIN ROTOR HEAD 4

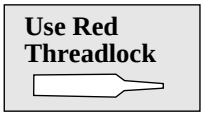


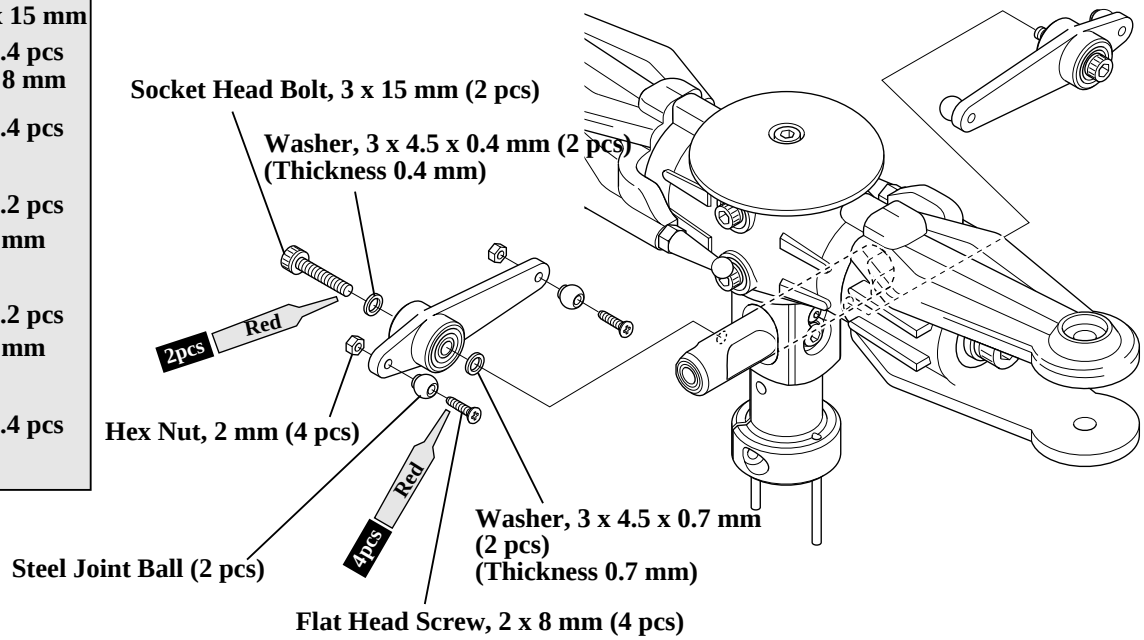
∗ Be sure to note correct placement of the front and the back of the seesaw assembly.



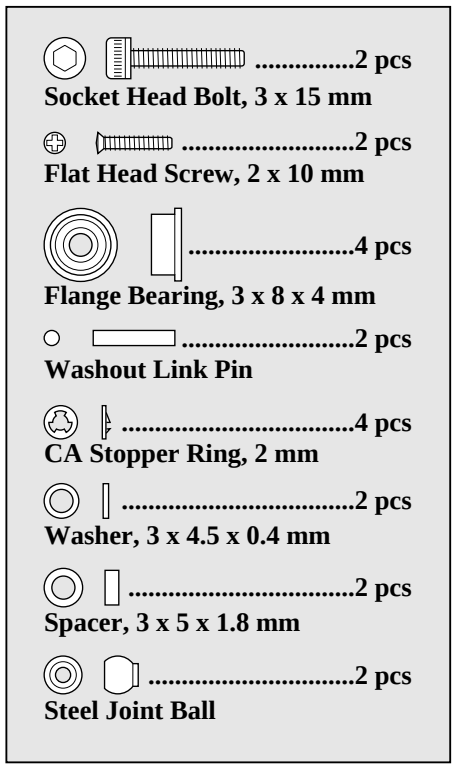
P-5 ASSEMBLY PROCESS – MAIN ROTOR HEAD

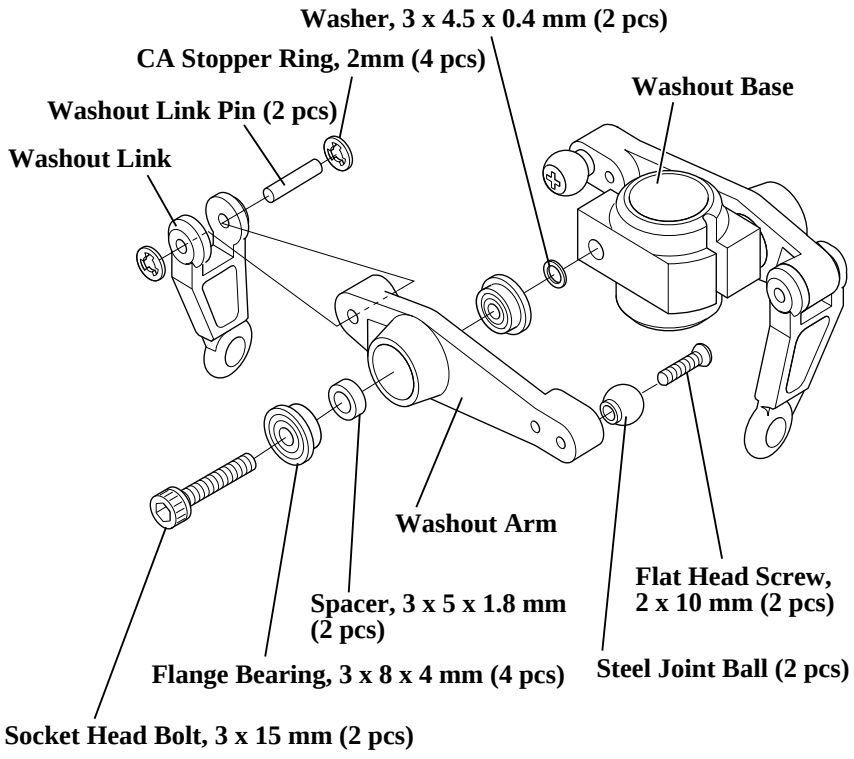






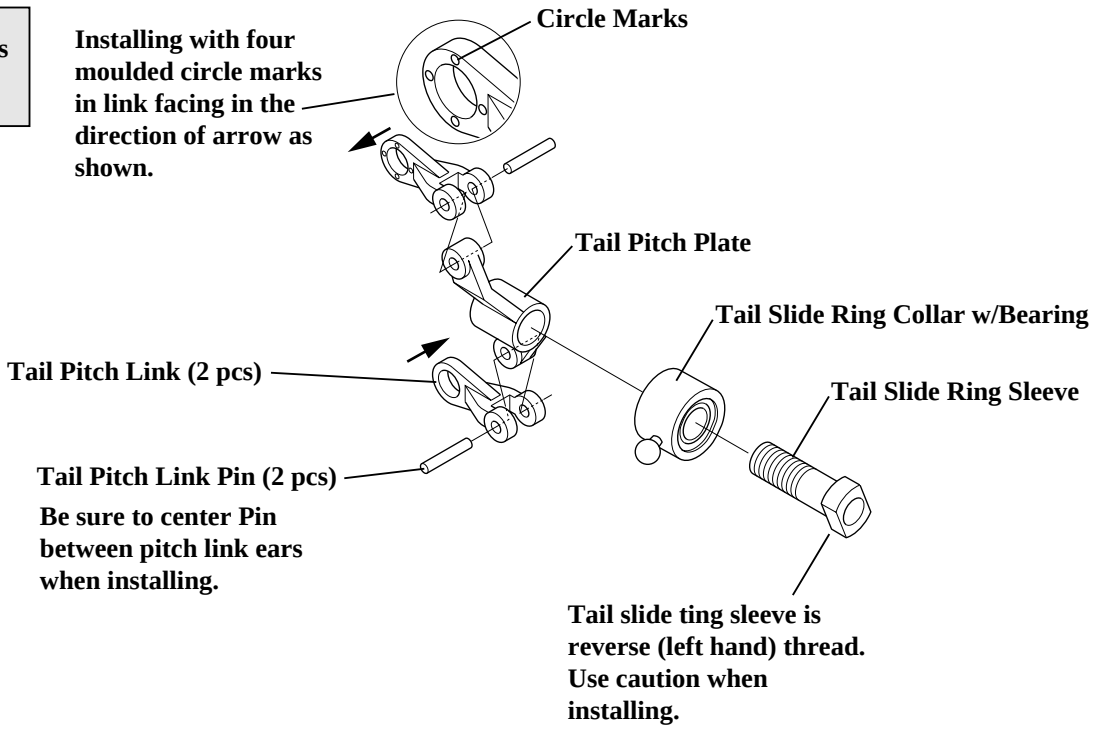
P-6 ASSEMBLY PROCESS – WASHOUT UNIT





P-7 ASSEMBLY PROCESS – TAIL SLIDE RING

○ ▭.....2 pcs
Tail Pitch Link Pin



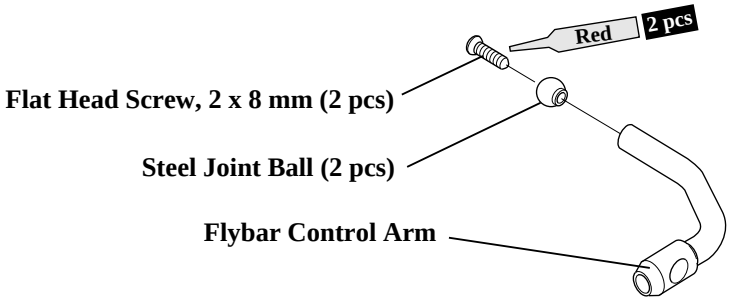
P-8 ASSEMBLY PROCESS – FLYBAR CONTROL ARM

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

◎ ▭.....2 pcs
Steel Joint Ball

Make two flybar control arms.

Use Red Threadlock



XP8103 Curtis Vigor™ CS Program 120° CCPM as Contained on the DataSafe Disk

EQUIPMENT:
Gyro: JR G5000T or G550T
Engine: OS 61SXH WC
Muffler: YEI Muscle Pipe
Servos: JR Digital

MODEL NO. _____

MODEL NAME VIGOR CS

MODULATION (SPCM) - ZPCM - PPM _____

			AILE	ELEV	RUDD
DUAL-RATE • EXP	0	D/R	100%	100%	100%
		EXP	0%	0%	+45%
	1	D/R	100%	100%	100%
		EXP	0%	0%	+65%

AUTO D/R (POS. 1)	ST1	INH • (ACT)
	ST2	INH • (ACT)
	HOLD	(INH) • ACT

INPUT SEL	AUX2	HOLD SW• PIT.TRIM•INH
	GEAR	ACT • INH

	THRO	AILE	ELEV	RUDD	GEAR	PIT	AUX2	AUX3
REVERSE SW	NORM • (REV)	(NORM) • REV	NORM • (REV)	NORM • (REV)	(NORM) • REV	NORM • (REV)	(NORM) • REV	(NORM) • REV
SUB-TRIM	ADJUST SO THAT NO TRIM IS REQUIRED							
TRAVEL ADJUST	H 150% L 150%	L 115% R 115%	D 115% U 115%	L 150% R 150%	+ 100% - 100%	H 115% L 115%	+ 150% - 150%	+ 150% - 150%
FAIL SAFE (SPCM)	SET TO DESIRED SETTINGS							

Throttle travel must be set to 150% if program mixing is to be used.

		EXP	L	1	2	3	H
THROTTLE CURVE	N	OFF•(ON)	0%	38%	44%	50%	100%
	1	OFF•(ON)	100%	84%	60%	86%	100%
	2	OFF•(ON)	100%	84%	60%	86%	100%
PITCH CURVE	N	OFF•(ON)	0°	28%	59%	75%	97%
	1	OFF•(ON)	0°	26%	53%	80%	98%
	2	OFF•(ON)	0°	26%	53%	80%	98%
	H	OFF•(ON)	0°	30%	60%	80%	100%

GYRO SENS	INH • RUDD D/R • (AUTO)	0	40%
		1	30%
		NORM	0
		STNT	1
		HOLD	0
		INVT	

SWASH MIX 3 SERVO 120° EXP(ACT)	AIL	+48%
	ELEV	+52%
	PIT	+60%

THRO HOLD	INH • (ACT)	POS: Set for Idle

REVO MIX	NORMAL	UP	0°
		DOWN	0°
	STUNT	UP	0°
		DOWN	0°
ACC MIX			

TRIM STEP SYSTEM MODE	
AIL	4
ELEV	1
RUDD	1

		CHANNEL	SW	EXP	L	1	2	3	H	SW
PROGRAM MIX	MIX1	AILE→THRO	ON	OFF-(ON)	20	–	0	–	20	F-S12
	MIX2	ELEV→THRO	ON	OFF-(ON)	20	–	0	–	20	F-S12
				+POS		-POS		OFFSET		
	MIX3	ELEV→AILE		+14%		+14%		0		F-S12

10X Curtis Vigor™ CS Program 140° CCPM as Contained on the DataSafe Disk

EQUIPMENT:
Gyro: JR G5000T or G550T
Engine: OS 61SXH WC
Muffler: YEI Muscle Pipe
Servos: JR Digital

MODEL NO. (84) _____

MODEL NAME (81) JR Vigor CS 140

MODULATION (85) (SPCM)-ZPCM-PPM

	THRO	AILE	ELEV	RUDD	GEAR	PITCH	AUX2	AUX3	AUX4	AUX5
REVERSE SW (11)	(R) N	R (N)	(R) N	(R) N	R (N)	(R) N	R (N)	R (N)	R (N)	R (N)
TRAVEL ADJUST (12) H	125%	L 115 %	D 115 %	L 150 %	+ 100 %	+ 115 %	+ 150 %	+ 150 %	+ 150 %	+ 150 %
TRAVEL ADJUST (12) L	125%	R 115 %	U 115 %	R 150 %	– 100 %	– 115 %	– 150 %	– 150 %	– 150 %	– 150 %
SUB-TRIM (15)										
TRIM RATE (83)	60 %	4	1	1						

			AILE	ELEV	RUDD
D/R EXP (13)	0	D/R	100 %	100 %	90 %
		EXP	0 %	0 %	+60 %
		TYPE	LIN/EXP	LIN/EXP	LIN/EXP
	1	D/R	100 %	100 %	100 %
		EXP	0 %	0 %	+70 %
		TYPE	LIN/EXP	LIN/EXP	LIN/EXP
	2	D/R	100 %	100 %	100 %
		EXP	0%	0%	+45%
		TYPE	LIN/EXP	LIN/EXP	LIN/EXP
AUTO D/R (23)	ST-1	INH•(ACT)	0 (1) 2	0 (1) 2	0 (1) 2
	ST-2	INH•(ACT)	0 (1) 2	0 (1) 2	0 • 1 • (2)
	ST-3	INH•ACT	0 • 1 • 2	0 • 1 • 2	0 • 1 • 2
	ST-4	INH•ACT	0 • 1 • 2	0 • 1 • 2	0 • 1 • 2
	HOLD	INH•(ACT)	0 • 1 • (2)	0 • 1 • (2)	0 • 1 • (2)

THROTTLE HOLD (16)	HOLD SW	INH• (HOLD) GEAR	
	POS	Adjust for idle	
	AUTO CUT	(INH)•ACT	
		POS	
	Delay	1/4 1/2 3/4 1	

FUNCTION SELECT (17)	FLIGHT EXTRA	(INH)• GEAR AILE	
	GEAR SW	(INH)• GEAR HOLD	
	AUX2 SW	(INH)•ACT	
	PIT. LEVER	LOW	(INH)•ACT
		HI	(INH)•ACT
	ADT STUNT	INH•(ACT)	

GYRO SENS (44)	INH • AUX 3 • AUTO	0	40					
		1	30					
		2	40					
		NR	S1	S2	S3	S4	HD	
		0	1	1	1	1	2	

				CHANNEL MASTER	CHANNEL SLAVE	TRIM	SW	OFFSET	+GAIN	–GAIN
PROGRAM MIX (51) - (58)	5	1	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER			
	5	2	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER			
	5	3	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER			
	5	4	INH • (ACT)		ELEV → AILE	(OFF) • ON	NR•(S1)(S2)(S3)(S4) HD•AX2•GER	0	+14	+14

								EXP		L	1	2	3	4	5	6	H
PROGRAM MIX (51) - (58)	5	5	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 • HD•AX2•GER	OFF	IN	0							100
								ON	OUT								
	5	6	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 • HD•AX2•GER	OFF	IN	0							100
								ON	OUT								
	5	7	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 • HD•AX2•GER	OFF	IN	0							100
								ON	OUT								
	5	8	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 • HD•AX2•GER	OFF	IN	0							100
								ON	OUT								

		EXP		L	1	2	3	4	5	6	H
THRO CURVE (18) TH,TRIM=SLOW HOV.T=CENTER	N	OFF • ON	IN	0	14	28	74	88	——	——	100
			OUT	0	29	38	50	56	——	——	100
			HOV.SEL	——	HOV	HOV	HOV	HOV	HOV	HOV	——
	1	OFF • ON	IN	0	25	48	74	88	——	——	100
			OUT	100	84	60	86	94	——	——	100
	2	OFF • ON	IN	0	25	48	74	88			100
			OUT	100	84	60	86	94			100
	3	OFF • ON	IN	0							100
			OUT								
	4	OFF • ON	IN	0							100
			OUT								
PITCH CURVE (68) P,TRIM=CENTER HOV.P=CENTER	N	OFF • ON	IN	0	13	26	39	80	——	——	100
			OUT	0	16	27	51	78	——	——	97
			HOV.SEL	——	HOV	HOV	HOV	HOV	HOV	HOV	——
	1	OFF • ON	IN	0	50	65	85	——	——	——	100
			OUT	0	52	69	88	——	——	——	98
	2	OFF • ON	IN	0	50	65	85	——	——	——	100
			OUT	0	52	69	88	——	——	——	98
	3	OFF • ON	IN	0							100
			OUT								
	4	OFF • ON	IN	0							100
			OUT								
	HOLD	OFF • ON	IN	0	50	——	——	——	——	——	100
			OUT	0	60	——	——	——	——	——	100

TAIL ROTOR CURVE (47)	N	NOR	IN	L	1	2	3	4	5	6	H
		ORG	OUT								
	1	NOR	IN								100
		ORG	OUT								
	2	NOR	IN								100
		ORG	OUT								
	3	NOR	IN								100
		ORG	OUT								
	4	NOR	IN								100
		ORG	OUT								
MIX RATE		1/1 • 1/2 • 1/4 • 1/10									

TRIM OFFSET (82)	HV.T	HV.P	LO.P	HI.P

Rudder→Throttle 4→1 MIX (41)		+15 %
		-15 %
MODE SELECTION	NR • S1 • S2 • S3 • S4 • AX2	

FAIL-SAFE (77)	Z	MODE	HOLD • 1.0s • 0.5s • 0.25s
		MEMORY	
	S	MEMORY	Throttle at 1/4 stick

Aileron→Throttle 2→1 MIX (42)		+20 %
		-20 %
MODE SELECTION	NR • S1 • S2 • S3 • S4 • AX2	

Elevator→Throttle 3→1 MIX (43)		+20
		-20
MODE SELECTION	NR • S1 • S2 • S3 • S4 • AX2	

SWASHPLATE MIXING TYPE (65)	1 SERVO • 3SERVO - 120°CCPM • 3SERVO - 140°CCPM					
	1SERVO	ELE → AIL	D	0 %		
			U	0 %		
		AIL → ELE	L	0 %		
			R	0 %		
	SWITCH	NR • S1 • S2 • S3 • S4 • HD				
3 SERVO 120° CCPM	AIL	%	ELE	%	PIT	%
3 SERVO 140° CCPM	AIL	+48 %	ELE	+52 %	PIT	+60 %

10X Curtis Vigor™ CS Program 120° CCPM as Contained on the DataSafe Disk

EQUIPMENT:
Gyro: JR G5000T or G550T
Engine: OS 61SXH WC
Muffler: YEI Muscle Pipe
Servos: JR Digital

MODEL NO. (84) _____

MODEL NAME (81) JR Vigor CS 120

MODULATION (85) (SPCM) ZPCM-PPM

	THRO	AILE	ELEV	RUDD	GEAR	PITCH	AUX2	AUX3	AUX4	AUX5
REVERSE SW (11)	(R) N	R (N)	(R) N	(R) N	R (N)	(R) N	R (N)	R (N)	R (N)	R (N)
TRAVEL ADJUST (12)	H 125%	L 115 %	D 115 %	L 150 %	+ 100 %	+ 115 %	+ 150 %	+ 150 %	+ 150 %	+ 150 %
	L 125%	R 115 %	U 115 %	R 150 %	– 100 %	– 115 %	– 150 %	– 150 %	– 150 %	– 150 %
SUB-TRIM (15)										
TRIM RATE (83)	60 %	4	1	1						

			AILE	ELEV	RUDD
D/R EXP (13)	0	D/R	100 %	100 %	90 %
		EXP	0 %	0 %	+60 %
		TYPE	LIN/EXP	LIN/EXP	LIN/EXP
	1	D/R	100 %	100 %	100 %
		EXP	0 %	0 %	+70 %
		TYPE	LIN/EXP	LIN/EXP	LIN/EXP
	2	D/R	100 %	100 %	100 %
		EXP	0%	0%	+45%
		TYPE	LIN/EXP	LIN/EXP	LIN/EXP
AUTO D/R (23)	ST-1	INH•(ACT)	0•(1)•2	0•(1)•2	0•(1)•2
	ST-2	INH•(ACT)	0•(1)•2	0•(1)•2	0•1•(2)
	ST-3	INH•ACT	0•1•2	0•1•2	0•1•2
	ST-4	INH•ACT	0•1•2	0•1•2	0•1•2
	HOLD	INH•(ACT)	0•1•(2)	0•1•(2)	0•1•(2)

THROTTLE HOLD (16)	HOLD SW	INH• (HOLD) GEAR	
	POS	Adjust for idle	
	AUTO CUT	(INH) •ACT	
		POS	
	Delay	1/4 1/2 3/4 1	

FUNCTION SELECT (17)	FLIGHT EXTRA	(INH)• GEAR AILE	
	GEAR SW	(INH)• GEAR HOLD	
	AUX2 SW	(INH) •ACT	
	PIT. LEVER	LOW	(INH) •ACT
		HI	(INH) •ACT
	ADT STUNT	INH•(ACT)	

GYRO SENS (44)	INH • AUX 3 • AUTO	0	40					
		1	30					
		2	40					
		NR	S1	S2	S3	S4	HD	
		0	1	1	1	1	2	

				CHANNEL MASTER	CHANNEL SLAVE	TRIM	SW	OFFSET	+GAIN	–GAIN
PROGRAM MIX (51) - (58)	5	1	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER			
	5	2	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER			
	5	3	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER			
	5	4	INH • (ACT)		ELEV → AILE	(OFF) • ON	NR•(S1)•(S2)•(S3)•(S4) HD•AX2•GER	0	+14	+14

								EXP		L	1	2	3	4	5	6	H
PROGRAM MIX (51) - (58)	5	5	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER	OFF • ON	IN	0							100
									OUT								
	5	6	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER	OFF • ON	IN	0							100
									OUT								
	5	7	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER	OFF • ON	IN	0							100
									OUT								
	5	8	INH • ACT		→	OFF • ON	NR•S1•S2•S3•S4 HD•AX2•GER	OFF • ON	IN	0							100
									OUT								

		EXP		L	1	2	3	4	5	6	H
THRO CURVE (18) TH,TRIM=SLOW HOV.T=CENTER	N	OFF ON	IN	0	14	28	74	88	——	——	100
			OUT	0	29	38	50	56	——	——	100
			HOV.SEL	——	HOV	HOV	HOV	HOV	HOV	HOV	——
	1	OFF ON	IN	0	25	48	74	88	——	——	100
			OUT	100	84	60	86	94	——	——	100
	2	OFF ON	IN	0	25	48	74	88	——	——	100
			OUT	100	84	60	86	94	——	——	100
	3	OFF ON	IN	0	13	26	39	80	——	——	100
			OUT	0	16	27	51	78	——	——	97
	4	OFF ON	IN	0							100
			OUT								
PITCH CURVE (68) P,TRIM=CENTER HOV.P=CENTER	N	OFF ON	IN	0	13	26	39	80	——	——	100
			OUT	0	16	27	51	78	——	——	97
			HOV.SEL	——	HOV	HOV	HOV	HOV	HOV	HOV	——
	1	OFF ON	IN	0	50	65	85	——			100
			OUT	0	52	69	88	——			98
	2	OFF ON	IN	0	50	65	85	——			100
			OUT	0	52	69	88	——			98
	3	OFF ON	IN	0							100
			OUT								
	4	OFF ON	IN	0							100
			OUT								
	HOLD	OFF ON	IN	0	50	——	——	——	——	——	100
			OUT	0	60	——	——	——	——	——	100

TAIL ROTOR CURVE (47)	N	NOR	IN	L	1	2	3	4	5	6	H
		ORG	OUT								
	1	NOR	IN								100
		ORG	OUT								
	2	NOR	IN								100
		ORG	OUT								
	3	NOR	IN								100
		ORG	OUT								
	4	NOR	IN								100
		ORG	OUT								
MIX RATE		1/1 • 1/2 • 1/4 • 1/10									

TRIM OFFSET (82)	HV.T	HV.P	LO.P	HI.P

Rudder→Throttle 4→1 MIX (41)		+15 %
		-15 %
MODE SELECTION	NR • S1 • S2 • S3 • S4 • AX2	

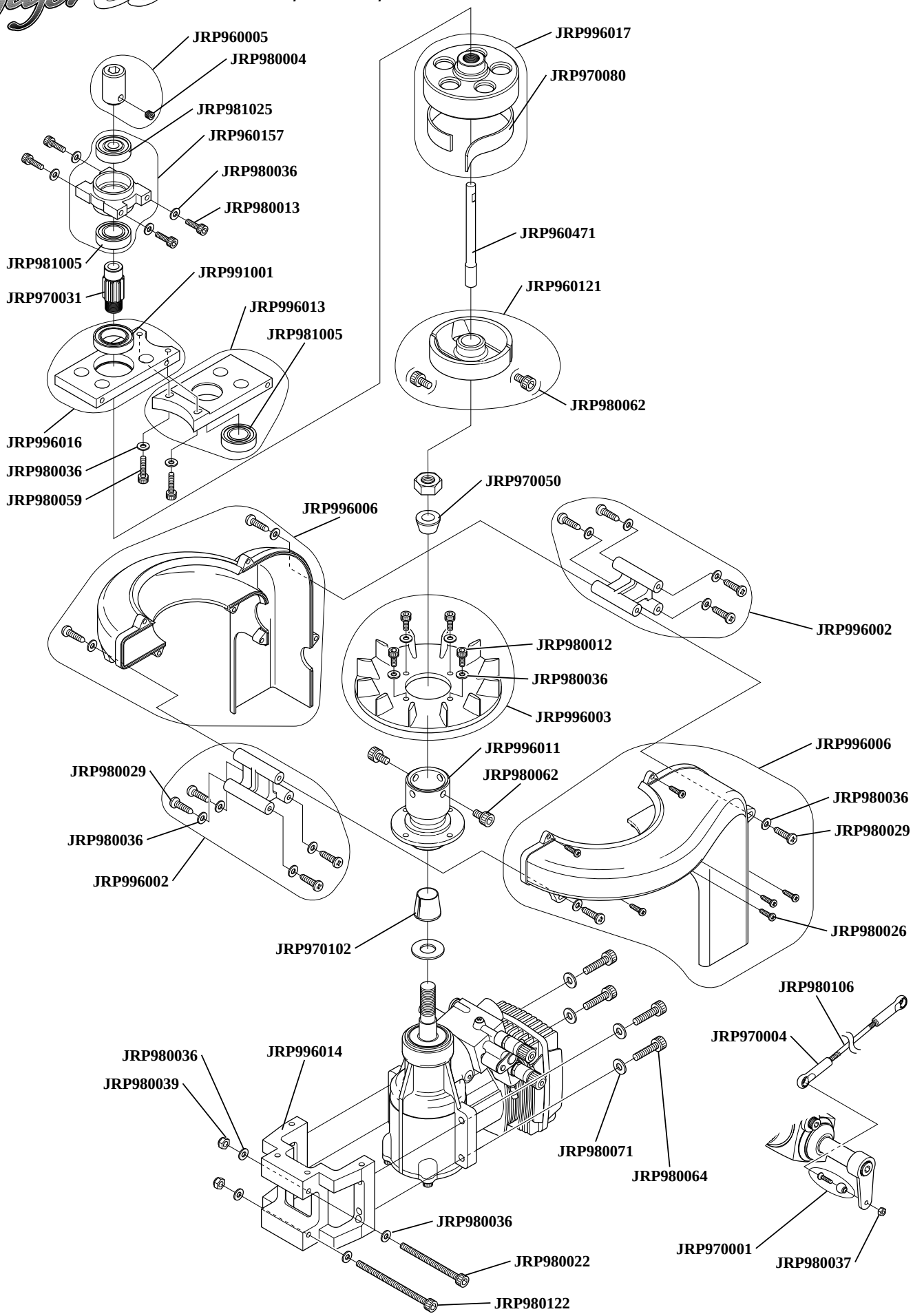
FAIL-SAFE (77)	Z	MODE	HOLD • 1.0s • 0.5s • 0.25s
		MEMORY	
	S	MEMORY	THROTTLE 1/4 STICK

Aileron→Throttle 2→1 MIX (42)		+20 %
		-20 %
MODE SELECTION	NR • S1 • S2 • S3 • S4 • AX2	

Elevator→Throttle 3→1 MIX (43)		+20 %
		-20 %
MODE SELECTION	NR • S1 • S2 • S3 • S4 • AX2	

SWASHPLATE MIXING TYPE (65)	1 SERVO • 3SERVO - 120°CCPM • 3SERVO - 140°CCPM					
	1SERVO	ELE → AIL	D	%		
			U	%		
		AIL → ELE	L	%		
			R	%		
	SWITCH	NR • S1 • S2 • S3 • S4 • HD				
3 SERVO 120° CCPM	AIL	+48 %	ELE	+52 %	PIT	+60 %
3 SERVO 140° CCPM	AIL	%	ELE	%	PIT	%

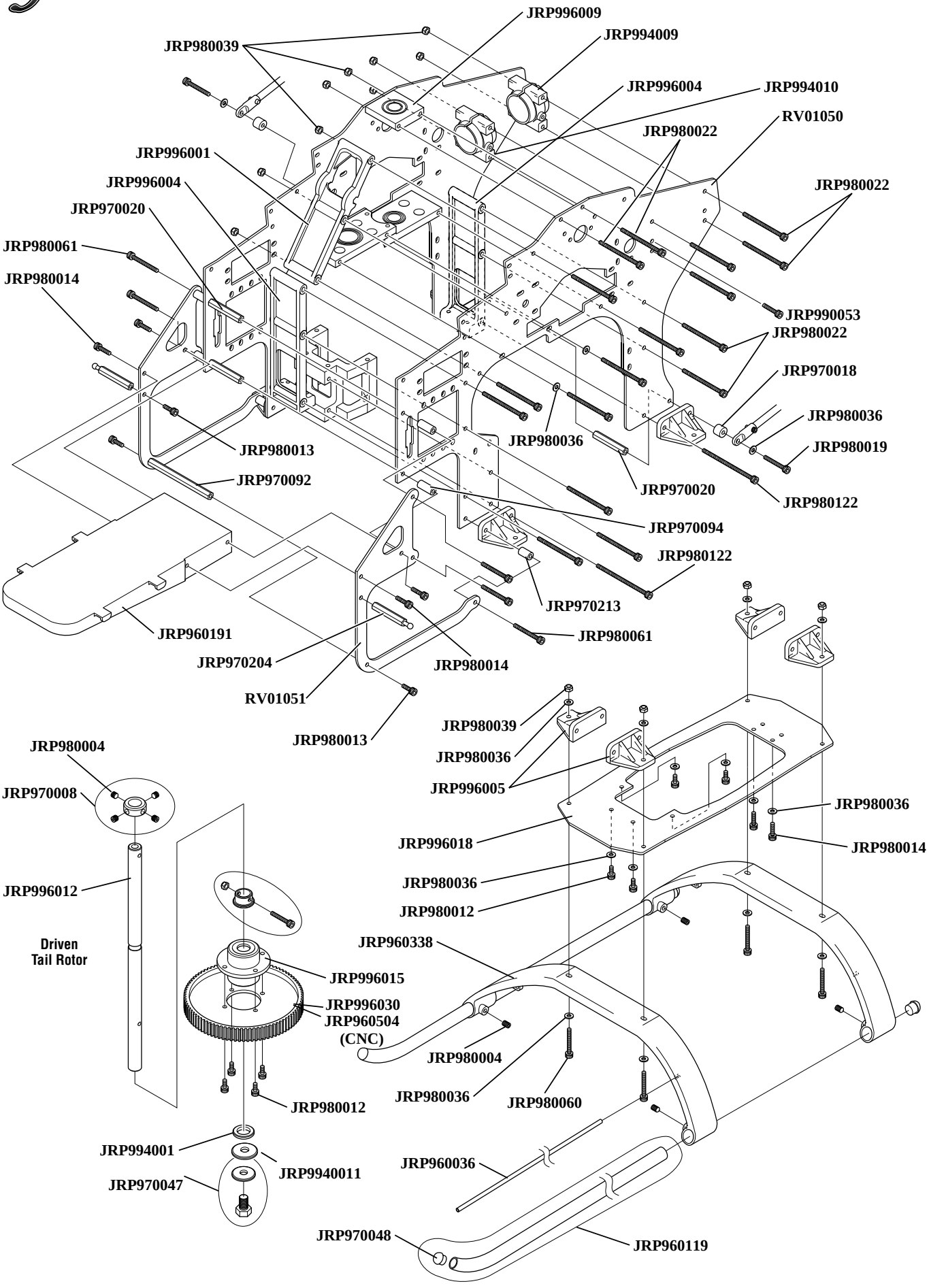
START SHAFT/ CLUTCH/ ENGINE ASSEMBLY



VIGOR™ CS MANUAL PARTS LISTINGS
Start Shaft/ Clutch/ Engine Assembly

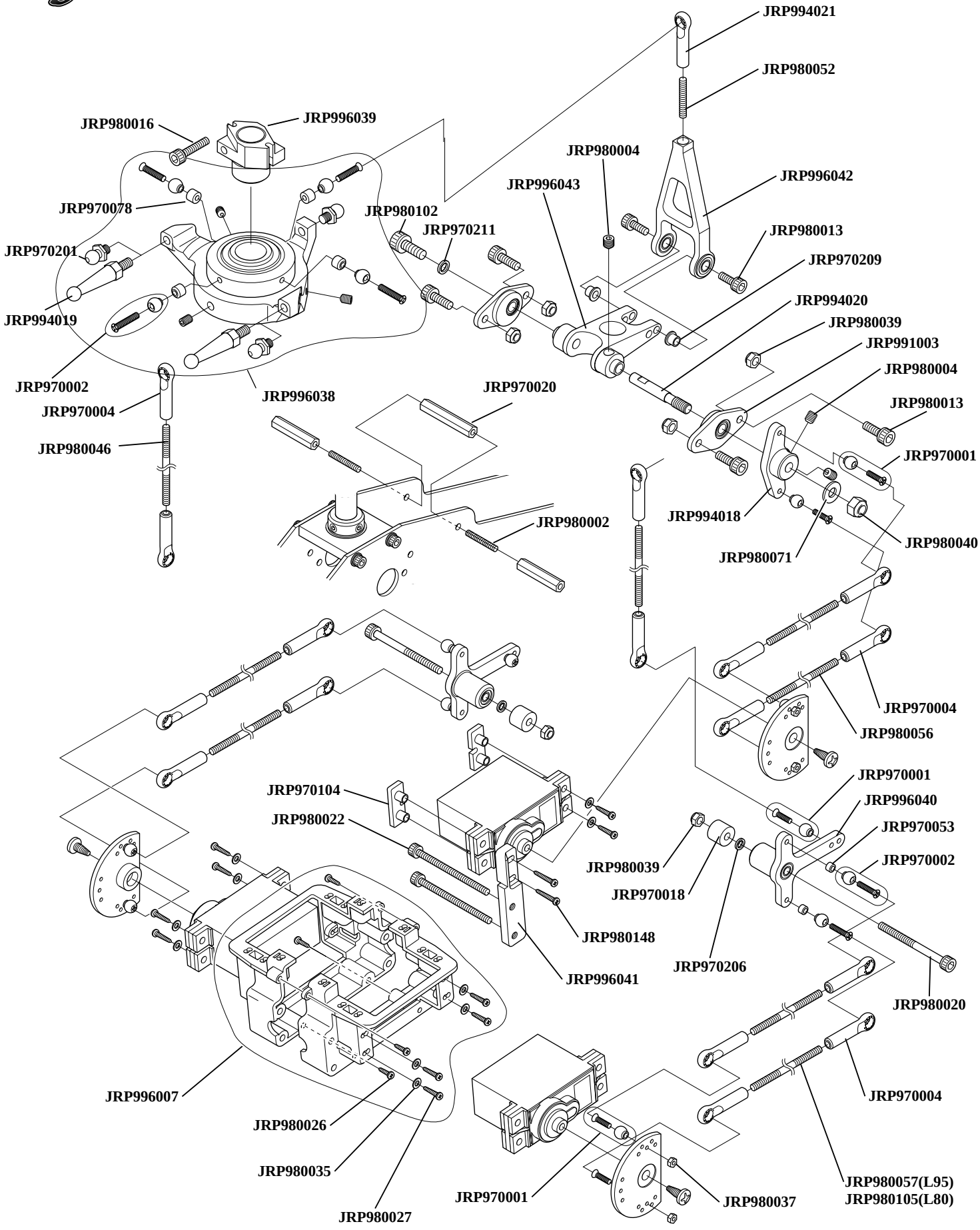
Part #	Description	Quantity	Comments/ Additional Contents
960005	Hex Shaft Adaptor	1	Complete w/two 4 x 4 mm set screws
980004	Set Screw, 4 x 4 mm	10	
981025	Bearing, Sealed, 5 x 19 x 6 mm	2	
960157	Start Shaft Bearing Block w/BB	1	
980036	Flat Washer, 3 mm	10	
980013	Socket Head Bolt, 3 x 8 mm	10	
996017	Clutch Bell Assembly w/BB	1	Complete w/bearing & clutch lining
970080	clutch lining	1	
960471	Start Shaft	1	
960121	Clutch Assembly	1	Complete w/two 4 x 6 mm bolts
980062	Socket Head Bolt, 4 x 6 mm	10	
981005	Ball Bearing, 10 x 19 x 7 mm	2	
970031	Pinion Gear, 9 Tooth	1	
991001	Ball Bearing, 15 x 24 x 5 mm	1	
996013	Long Bearing Block “B”	1	Complete w/bearing
996016	Long Bearing Block “A”	1	Complete w/bearing
980059	Socket Head Bolt, 3 x 14 mm	10	
970050	Taper Collet “B”, Upper	1	
996006	Cooling Fan Shroud	1	1-left, 1-right half Complete w/screws
996002	Cooling Shroud Brackets	2	Complete w/screws and washers
996003	Cooling Fan Blades	1	Complete w/screws and washers
996011	Cooling Fan Hub	1	
980062	Socket Head Bolt, 4 x 6 mm	10	
980029	Self Tapping Screw, 3 x 12 mm	10	
970102	Taper Collet “C”, Lower	1	
980039	Nylon Lock Nut, 3 mm Low Profile	10	
996014	Engine Mount	1	
980022	Socket Head Bolt, 3 x 40 mm	10	
980122	Socket Head Bolt, 3 x 50 mm	10	
980071	Flat Washer, 4 mm	10	
980064	Socket Head Bolt, 4 x 15 mm	10	
970001	Steel Joint Ball w/2 x 8 mm Screw	10	Complete w/ten 2 x 8 mm screws
980037	Hex Nut, 2 mm	10	
970004	Universal Ball Link	10	

MAIN FRAME/LANDING GEAR/AUTOROTATION ASSEMBLY



VIGOR™ CS MANUAL PARTS LISTINGS
Main Frame/Landing Gear/Autorotation assembly

Part #	Description	Quantity	Comments/ Additional Contents
980039	Nylon Lock Nut, 3 mm Low Profile	10	
996009	Upper Main Shaft Bearing Block w/BB	1	Complete with ball bearing
994010	Tail Boom Mounting Clamp	1	
994009	Tail Boom Mounting Clamp (Aluminum)	1	Complete w/one 3.5 x 6 & one 3.5 x 8 bolt
996004	I-Beam Crossmember “B”	2	
RV01050	Main Frame Set	1	Complete Set (2 pcs)
980022	Socket Head Bolt, 3 x 40 mm	10	
996001	I-Beam Crossmember “A”	1	
970020	Main Frame Crossmember, 32 mm	2	
980061	Socket Head Bolt, 3 x 25 mm	10	
980014	Socket Head Bolt, 3 x 10 mm	10	
990053	Socket Head Bolt, 3.5 x 6 mm	10	
970018	Mixing Lever Spacer	2	
980036	Flat Washer, 3 mm	10	
980019	Socket Head Bolt, 3 x 22 mm	10	
980122	Socket Head Bolt, 3 x 50 mm	10	
980013	Socket Head Bolt, 3 x 8 mm	10	
970092	Main Frame Crossmember, 64 mm	2	
970094	Spacer, 3 x 6 x 14 mm	2	
970213	Spacer, 3 x 6 x 10 mm	2	
RV01051	Fuel Tank Mounting Frames	2	
970204	Canopy Mounting Standoff	2	
960191	Front Radio Bed	1	
980004	Set Screw, 4 x 4 mm	10	
970008	Main Shaft Collar	1	Complete w/four 4 x 4 mm set screws
996012	Main Rotor Shaft	1	
996005	Landing Strut Mounts	4	
980014	Socket Head Bolt, 3 x 10 mm	10	
996018	Carbon Bottom Frame Plate	1	
980012	Socket Head Bolt, 3 x 6 mm	10	
960338	Landing Struts, white	2	
980004	Set Screw, 4 x 4 mm	10	
980060	Socket Head Bolt, 3 x 20 mm	10	
960036	Antenna Tube	3	
960119	Landing Skids	2	Complete w/four skid caps
970048	Landing Skid Caps	4	
996015	Autorotation Assembly	1	
996030	84T Molded Main Drive Gear	1	(standard)
970047	Main Shaft Washer and Bolt	1	Complete w/one 6 x 10 mm hex bolt
994001	Steel Auto Hub Washer	1	
960504	84T CNC Main Drive Gear	1	(optional)


JRP994021
JRP980052
JRP980016
JRP996039
JRP980004
JRP996042
JRP996043
JRP970078
JRP980102
JRP970211
JRP980013
JRP970201
JRP970209
JRP994020
JRP994019
JRP980039
JRP991003
JRP970002
JRP980004
JRP970020
JRP996038
JRP980013
JRP970004
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JRP980040
JRP980071
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JRP980056
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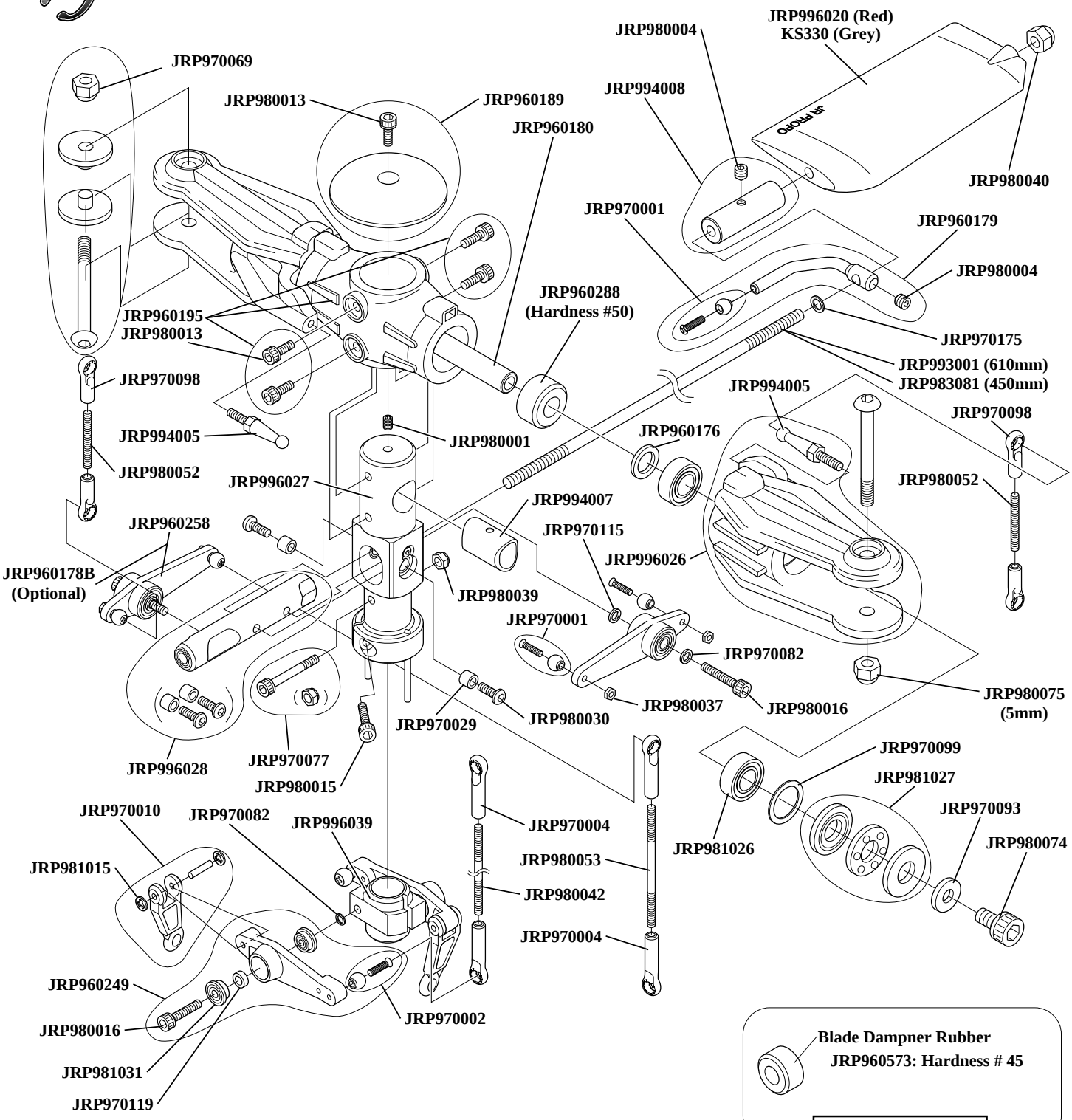
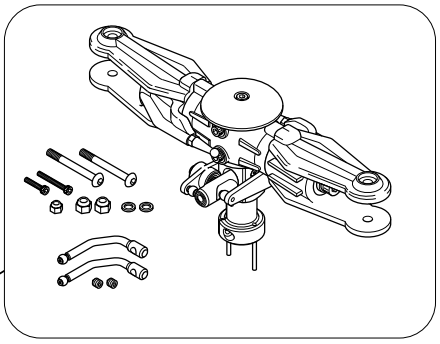
JRP970002
JRP970018
JRP980148
JRP970206
JRP996041
JRP980020
JRP996007
JRP970004
JRP980026
JRP980035
JRP980057(L95)
JRP980105(L80)
JRP970001
JRP980037
JRP980027

VIGOR™ CS MANUAL PARTS LISTINGS
Swashplate/CCPM Control System

Part #	Description	Quantity	Comments/ Additional Contents
JRP970001	Joint Balls w/8 mm screws	10	
JRP970002	Joint Balls w/10 mm screws	10	
JRP970004	Universal Links	10	
JRP970018	Mixing Lever Spacer	2	
JRP970020	Main Frame Standoff, 32 mm	2	
JRP970053	Control Ball Spacer	2	
JRP970078	Control Ball Spacer, 2.75 mm	2	
JRP970082	Washer, 3 x 4.5 x 4 mm	2	
JRP970104	Servo Mounting Plates	8	
JRP970201	Control Ball, 4 mm	2	
JRP970206	CCPM T Lever Spacer	2	
JRP970209	CCPM A Arm Collar	2	
JRP970211	Shaft Washer, CCPM	2	
JRP980002	Set Screws,3 x 4 mm	10	
JRP980004	Set Screws,4 x 4 mm	10	
JRP980013	Socket Head Bolts,3 x 8 mm	10	
JRP980016	Socket Head Bolts,3 x 15 mm	10	
JRP980020	Socket Head Bolts,3 x 28 mm	10	
JRP980022	Socket Head Bolts,3 x 40 mm	10	
JRP980027	Self Tapping Screws,2 x 8 mm	10	
JRP980035	Plate Washer, 2.6 mm	10	
JRP980037	Hex Nuts, 2 mm	10	
JRP980039	Nylon Lock Nuts, 3 mm	10	
JRP980040	Nylon Lock Nuts, 4 mm	10	
JRP980046	Control Rod, 2.3 x 60 mm	2	
JRP980052	Control Rod, 2.3 x 15 mm	2	
JRP980056	Control Rod, 2.3 x 85 mm	2	
JRP980057	Control Rod, 2.3 x 95 mm	2	
JRP980067	Set Screws, 3 x 3 mm	10	
JRP980071	Plate Washers, 4 mm	10	
JRP980102	Socket Head Bolts, 4 x 10 mm	10	
JRP980105	Control Rod, 2.3 x 80 mm	2	
JRP980148	Self Tapping Screws,2.6 x 15 mm	10	
JRP991003	CCPM Control Arm Block w/bb	1	
JRP994018	CCPM Elevator Control Arm	1	
JRP994019	Control Ball, 20 mm	2	
JRP994020	CCPM Control Arm Shaft	1	
JRP994021	Special Universal Link (White)	10	
JRP996038	CCPM Swashplate Assembly	1	Complete with control balls and screws
JRP996040	CCPM T Lever Assm. w/BB	1	
JRP996041	CCPM Top Servo Mounting Post	1	
JRP996042	CCPM A Arm Assembly	1	
JRP996043	CCPM Elevator Arm Assembly	1	
JRP996039	Aluminum Washout Base	1	


JRP996020 (Red)
KS330 (Grey)
JRP980004
JRP970069
JRP994008
JRP980013
JRP960189
JRP960180
JRP980040
JRP970001
JRP960179
JRP980004
JRP960288
(Hardness #50)
JRP960195
JRP980013
JRP970175
JRP993001 (610mm)
JRP983081 (450mm)
JRP970098
JRP994005
JRP994005
JRP970098
JRP980001
JRP960176
JRP980052
JRP980052
JRP996027
JRP994007
JRP960258
JRP970115
JRP960178B
(Optional)
JRP996026
JRP980039
JRP970001
JRP970082
JRP980037
JRP980016
JRP980075
(5mm)
JRP970029
JRP980030
JRP996028
JRP970077
JRP980015
JRP970099
JRP981027
JRP970010
JRP970082
JRP996039
JRP970004
JRP970093
JRP981026
JRP980074
JRP981015
JRP980053
JRP980042
JRP970004
JRP960249
JRP970002
JRP980016
JRP981031
JRP970119

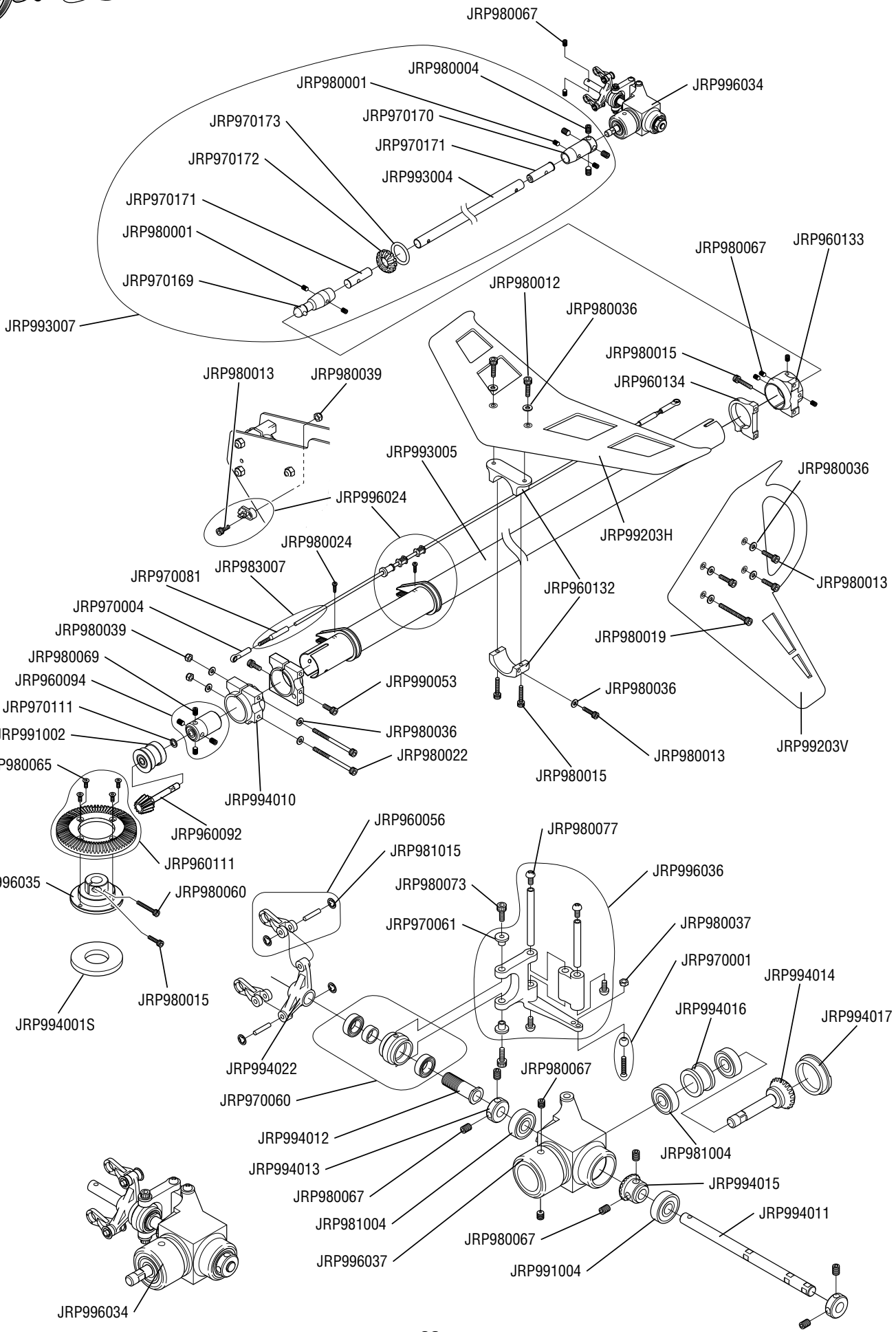
Blade Dampner Rubber
JRP960573: Hardness # 45
OPTION


JRP996021

VIGOR™ CS MANUAL PARTS LISTINGS
Main Rotor Head/ Washout Assembly

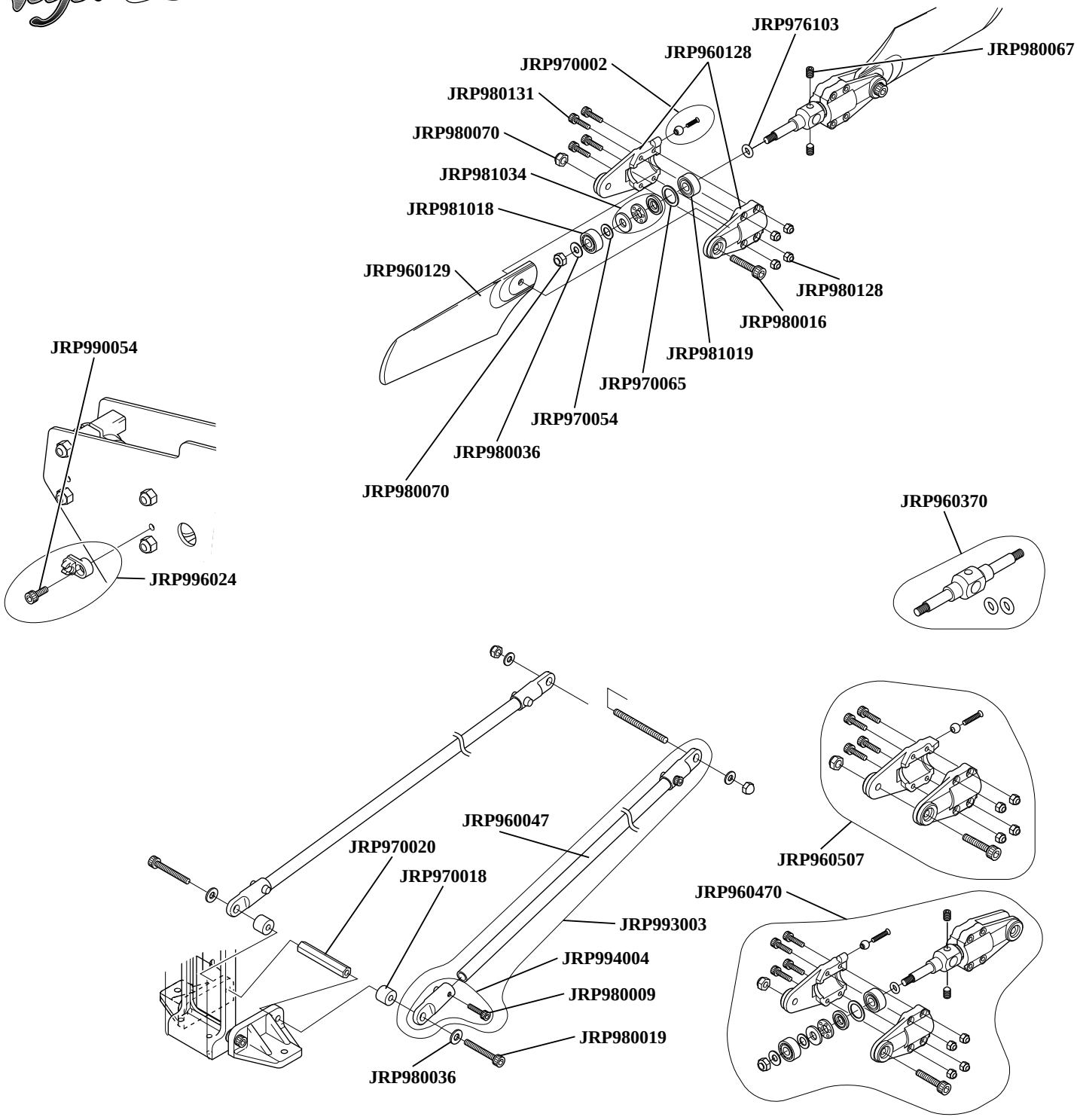
Part #	Description	Quantity	Comments/ Additional Contents
980013	Socket Head Bolt, 3 x 8 mm	10	
980004	Set Screw, 4 x 4 mm	10	
996020	Flybar Paddles, Red	1	
994008	Flybar Weights	2	Complete w/set screws
960189	Head Button	1	Complete w/one 3 x 8 mm socket head bolts
960180	Blade Spindle Shaft	1	Complete w/two 5 x 10 mm socket head bolts
980040	Nylon Lock Nut, 4 mm	10	
960179	Flybar Control Arm	2	Complete w/steel joint ball and screws
960288	Blade Dampeners, 50	2	
960195	Main Rotor Body	1	Complete w/four 3 x 8 mm socket head bolts
970098	Universal Ball Link (short)	10	
994005	Control Ball, 14 mm	2	
960176	Blade Holder Spacer	2	
980001	Set Screw, 3 x 4 mm	10	
980052	Control Rod, 2.3 x 15 mm	2	
960258	Seesaw Mixing Arm Assm. w/BB	1	Complete w/all hardware
960178B	Seesaw Mixing Arm w/BB (23) (optional)	2	Hardware not included
980039	Nylon Lock Nut, 3 mm Low Profile	10	
994007	Spindle Shaft Guide	1	
970115	Washer, .03 x 4.5 x 0.7	10	
996026	Main Blade Holder	2	Complete w/two 14 mm control balls
970082	Washer, .03 x 4.5 x 0.4	10	
980037	Hex nut, 2 mm	10	
980030	Button Head Bolt, 3 x 5 mm	10	
970069	Blade Bolts w/Spacers	2	Complete w/two 4 mm bolts, and 12 mm grip spacers
980075	Nylon Lock Nut. 5mm	10	
980016	Socket Head Bolt, 3 x 15 mm	10	
970029	Seesaw Spacer Collar	2	
970077	Main Rotor Shaft Bolt, 3 x 22 mm	2	Complete w/two lock nuts and washers
996028	Seesaw Shaft Assembly	1	Complete w/all hardware
970010	Washout Link	2	Complete w/all hardware
981015	CA Stopper Ring	10	
960013	Washout Base	1	
970004	Universal Ball Link	10	
980053	Control Rod, 2.3 x 50 mm	2	
980042	Control Rod, 2.3 x 30 mm	2	
981026	Bearing, 8 x 16 x 5 mm	2	
970099	Washer, 12 x 16 x 0.5 mm	2	
981027	Thrust Bearing, 8 x 16 x 5 mm	2	
970093	Spindle Shaft Washer	2	
980074	Socket Head Bolt, 5 x 10 mm	10	
960573	Blade Dampeners, 45	2	
996021	Main Rotor Head Assembly, Complete	1	Preassembled w/all hardware
960249	Washout Arm w/BB	1	Complete w/all hardware
980016	Socket Head Bolt, 3 x 15 mm	10	
981031	Bearing w/Flange, 3 x 8 x 4 mm	2	
970119	Spacer, 3 x 5 x 1.8 mm	2	
996012	Main Rotor Shaft	1	
KSJ330	Flybar Paddles, Grey	1	

TAIL DRIVE SYSTEM/SHAFT DRIVE PARTS



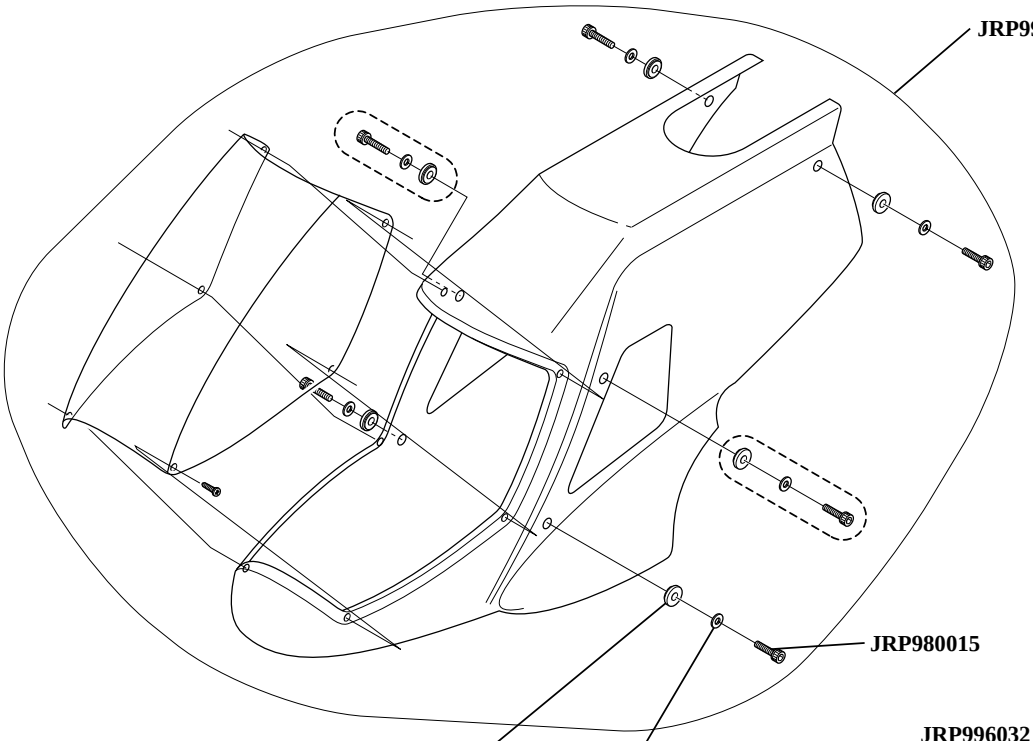
Part #	Description	Quantity	Comments/ Additional Contents
JRP960056	Tail Pitch Link	2	
JRP960092	Bevel Front Pinion Gear (metal)	1	
JRP960094	Tube Drive Joint, Front	1	
JRP960111	Bevel Tail Drive Gear (Plastic)	1	Complete with screws
JRP960132	Aluminum Tail Support Clamp	1	
JRP960133	Tail Gear Box Clamp A	1	
JRP960134	Tail Gear Box Clamp B	1	
JRP970001	Joint Balls w/8 mm Screws	10	
JRP970004	Joint Balls w/10 mm Screws	10	
JRP970060	Tail Pitch Slider Assembly	1	
JRP970061	Tail Control Arm Collar	1	
JRP970081	Control Rod Ends	2	
JRP970111	Washer, 8 x 9 x 1 mm	2	
JRP970169	Shaft Drive Universal, Front	1	
JRP970170	Shaft Drive Joint, Rear	1	
JRP970171	Shaft Drive Tube Inserts	2	
JRP970172	Shaft Drive Guides w/Bearings	2	
JRP970173	Shaft Drive Guide O-Rings	2	
JRP980001	Set Screws, 3 x 4 mm	10	
JRP980004	Set Screws, 4 x 4 mm	10	
JRP980012	Socket Head Bolts, 3 x 6 mm	10	
JRP980013	Socket Head Bolts, 3 x 8 mm	10	
JRP980015	Socket Head Bolts, 3 x 12 mm	10	
JRP980019	Socket Head Bolts, 3 x 22 mm	10	
JRP980022	Socket Head Bolts, 3 x 40 mm	10	
JRP980024	Self Tapping Screws, 2 x 8 mm	10	
JRP980036	Plate Washer, 3 mm	10	
JRP980037	Hex Nuts, 2 mm	10	
JRP980039	Nylon Lock Nuts, 3 mm	10	
JRP980060	Socket Head Bolts, 3 x 2 0mm	10	
JRP980065	Flat Head Bolts, 3 x 6 mm	10	
JRP980067	Set Screws, 3 x 3 mm	10	
JRP980069	Set Screws, 4 x 6 mm	10	
JRP980073	Socket Head Bolts, 2 x 6 mm	10	
JRP980077	Self Tapping Screws, 2 x 4 mm	10	
JRP981004	Ball Bearing, 5 x 13 x 4 mm	2	
JRP981015	CA Stopper Ring, 2 mm	10	
JRP983007	CF Tail Control Rod	1	Compete with rod ends and links
JRP990053	Socket Head Bolts, 3.5 x 6 mm	2	
JRP991002	Front Pinion Case w/ Bearings	1	
JRP993004	Tail Drive Shaft, Aluminum	1	
JRP993005	Tail Boom, Aluminum	1	
JRP993006	Tail Brace Set (Black)	1	Complete with all hardware
JRP993007	Tail Drive Shaft Assm. Complete	1	Complete with all hardware
JRP994010	Tail Boom Mounting Clamp B	1	
JRP994011	Tail Output Shaft	1	
JRP994012	Tail Slide Ring Sleeve	1	
JRP994013	Tail Output Shaft Collar	2	
JRP994014	Tail Case Input Gear w/ Shaft	1	
JRP994015	Tail Case Output Gear	1	
JRP994016	Tail Case Input Gear Collar	1	
JRP994017	Tail Case Rear Cap	1	
JRP994022	Tail Pitch Plate	1	
JRP996024	Tail Guide Clamp Set	1	One Compete set with screws
JRP996034	Tail Gear Box Assm. Complete	1	
JRP996035	Split Gear Hub Adapter	1	
JRP996037	Tail Gear Case Set	1	
JRP996036	Tail Case Control Lever	1	
JRP99203H	CF Tail Fin, Horizontal	1	
JRP99203V	CF Tail Fin, Vertical	1	
JRP994001S	Special Washer 16 x 10 mm	1	

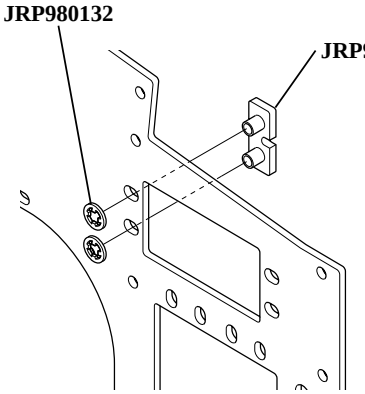
TAIL ROTOR BLADE HOLDER/TAIL BRACE

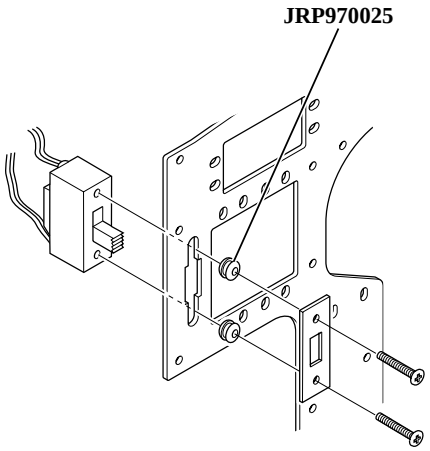


VIGOR™ CS MANUAL PARTS LISTINGS
Tail Brace/ Tail Boom Assembly

Part #	Description	Quantity	Comments/ Additional Contents
994004	Tail Brace Connector	1	Complete w/bolt
960047	Tail Brace Tube	2	
996024	Tail Rod Guide Set	5	Complete w/all hardware
970020	Main Frame Standoff , 32 mm	2	
980009	Socket Head Bolt, 2.6 x 12 mm	10	
980036	Flat Washer, 3 mm	10	
980070	Nylon Lock Nut, 3 mm	10	
993003	Tail Brace Set	1	Two brace tubes, 4 brace connectors and hardware
970002	Steel Joint Ball w/ 2 x 10 mm Screw	10	Complete w/ten 2 x 8 mm screws
960128	Tail Blade Holder Set	1	One complete set (4 pcs)
976103	O-Ring, Tail Hub	2	
980131	Socket Head Bolt, 2 x 10 mm	10	
981034	Thrust Bearing, 4 x 9 x 4 mm	2	
981018	Open Bearing, 4 x 10 x 4 mm	2	
960129	Tail Rotor Blades	2	
970054	Washer, 4 x 7 x 0.5 mm	2	
970065	Washer, 7 x 10 x 1 mm	2	
981019	Sealed Bearing, 4 x 10 x 4 mm	2	
980128	Nylon Lock Nut, 2 mm	10	
980067	Set Screw, 3 x 3 mm	0	
970018	Mixing Lever Spacer	2	
960470	Tail Rotor Hub Assembly, Complete	1	Complete assembly
960507	Tail Blade Holder Set w/Hardware	1	One complete set (4 pcs) with hardware
960370	Tail Center Hub w/O-rings	1	Complete w/two O-rings





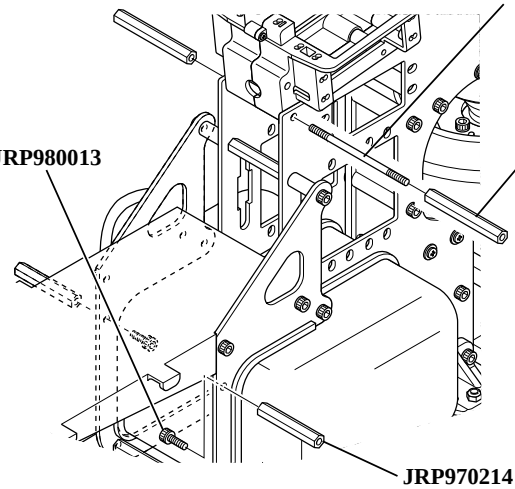


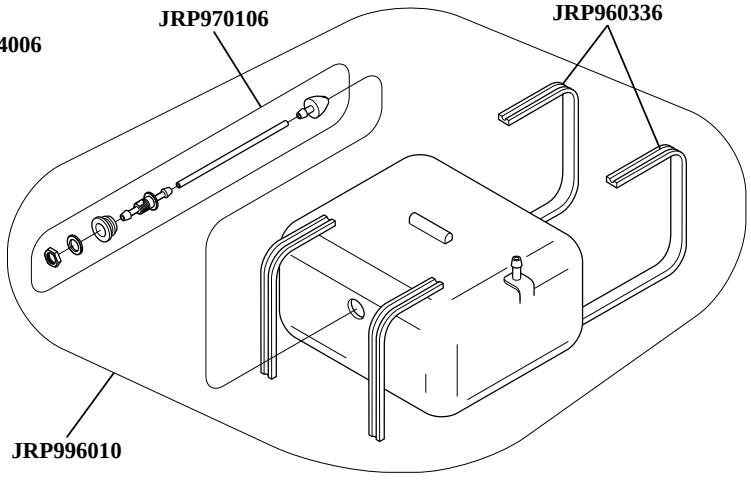
JRP996032

Assembly Manual

Decal JRP996029

Vigor CS Decal
JRP9960291





VIGOR™ CS MANUAL PARTS LISTINGS
Body Set/ Fuel Tank Assembly

Part #	Description	Quantity	Comments/ Additional Contents
9920011	Vigor Body Set	1	
960072	Rubber Body Grommets	4	
980036	Flat Washer, 3 mm	10	
980015	Socket Head Bolt, 3 x 12 mm	10	
980132	CA Stopper Ring, 3.5 mm	10	
970104	Servo Mounting Plates, Type B	10	
970025	Switch Mounting Grommets	4	
990051	Threaded Rod, 3 x 50 mm	2	
994006	Main Frame Standoff, 41 mm	2	
980013	Socket Head Bolt, 3 x 8 mm	10	
970214	Main Frame Standoff, 21 mm	2	
970106	Fuel Tank Hardware Set	1	Complete with stopper, clunk, nut, and washer
996010	Vigor Fuel Tank Set	1	Complete with all tank hardware
960336	Tank Mounting Rubber (3 ft)	1	
996032	Vigor CS Instruction Manual	1	
996029	Vigor Decal Set	1	
9960291	Vigor CS Decal Set	1	

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