

Arrow Shark X-60 Marine Engine

Owner Manual

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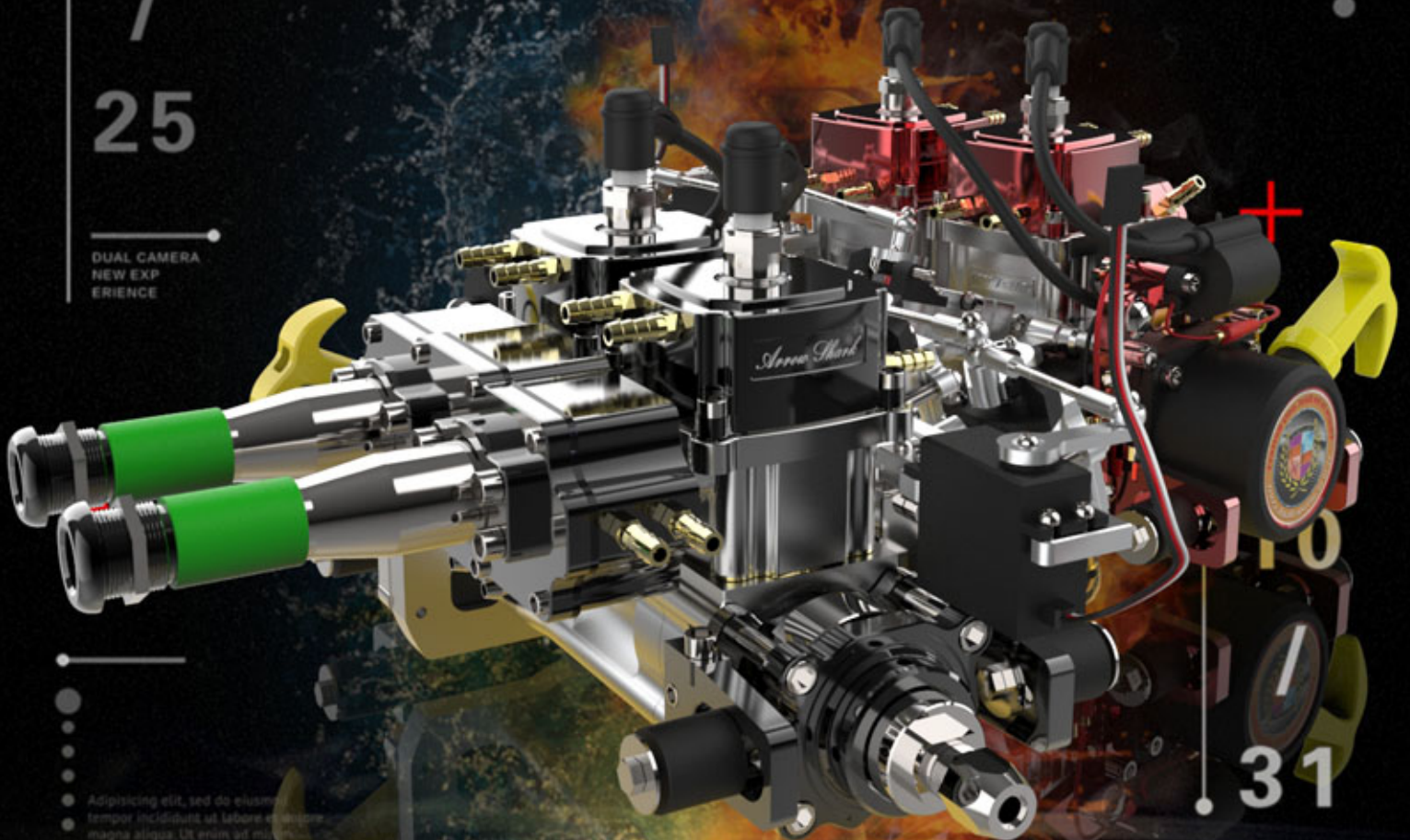
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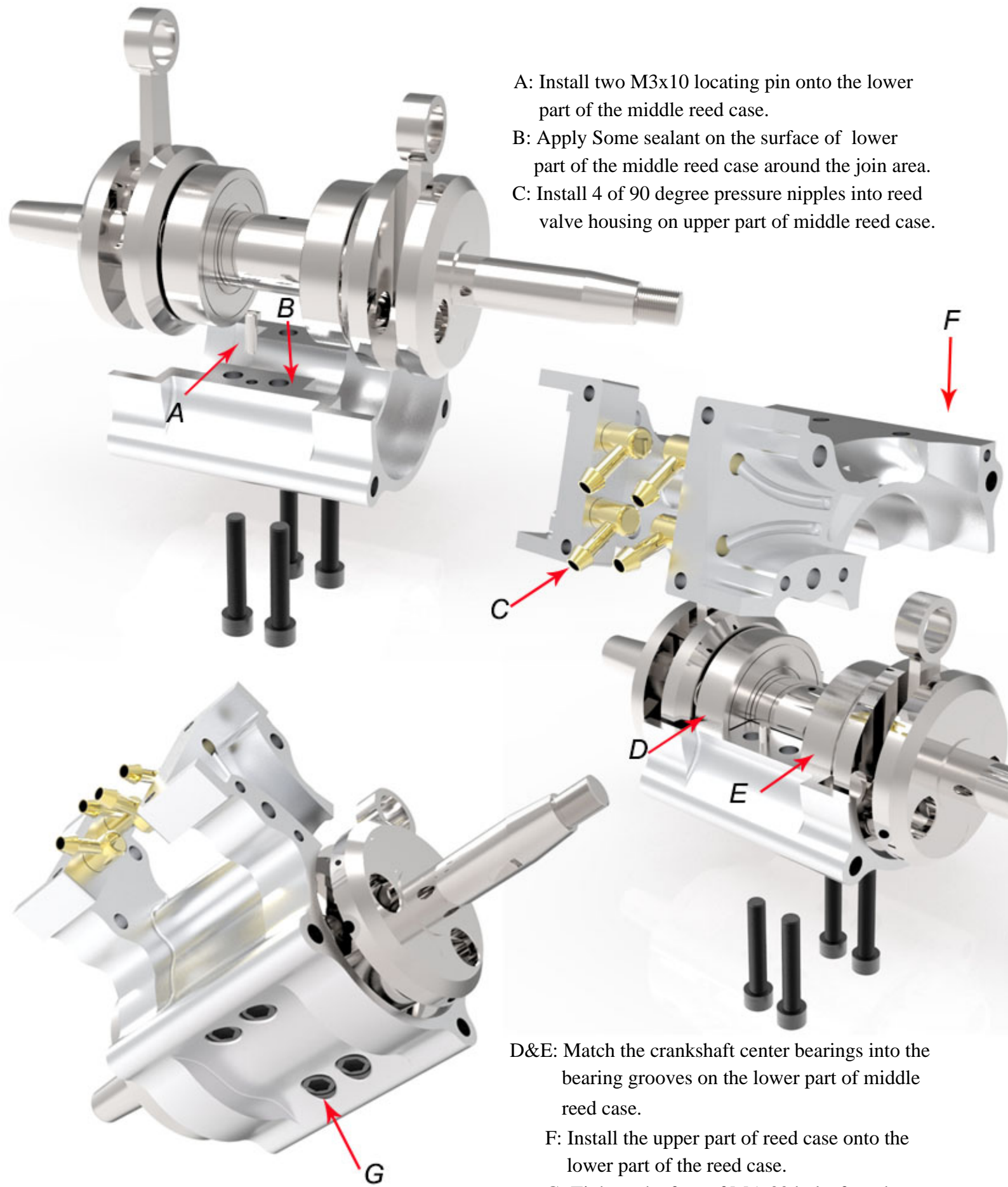
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Table of Contents

X-60 Assembly Procedure-----	3-16
Middle Reed Case & Crankshaft Assembly-----	3
Front & Back Case Assembly-----	4
Coil Plate Installation-----	5
Pistons Assembly-----	5
Cylinders Installation-----	6
Water Jacket Installation-----	7
Flywheel Installation-----	8
Source Coils Installation-----	9
Ignition Mount Assembly-----	9
Back Engine Mount & Ignition Coil Installation-----	10
Kill Switches Installation-----	11
Pull Starter Installation-----	11
M-39X Mod Carburetor Installation-----	12
Throttle Control Device Installation-----	13
Shaft Collet Installation-----	14
Clutch V3 Installation-----	14
X-Cooler & Exhaust Header Installation-----	15
Turbo Box Installation-----	16
Dimension Guide-----	17
Specifications of X-60-----	18
Regarding Horse Power-----	18
M-39X Carburetor Setting-----	19-20
Needle Setting	
Setting Your Throttle Servo	
M-39X Adjustment Tips	
Carbon Fiber Petal Installation-----	20
Starting X-60-----	21
Breaking In X-60-----	22
X-60 Care and Maintenance-----	22
TS760-Marine Onboard Starter-----	23

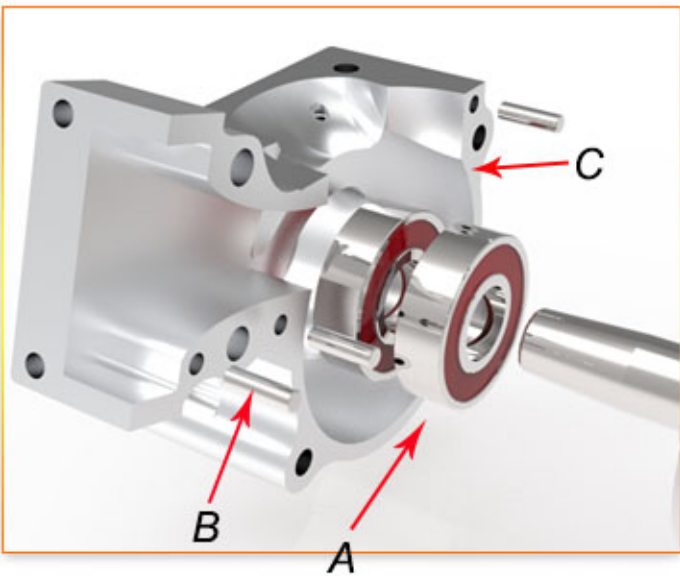
Middle Reed Case & Crankshaft Assembly



- A: Install two M3x10 locating pin onto the lower part of the middle reed case.
- B: Apply Some sealant on the surface of lower part of the middle reed case around the join area.
- C: Install 4 of 90 degree pressure nipples into reed valve housing on upper part of middle reed case.

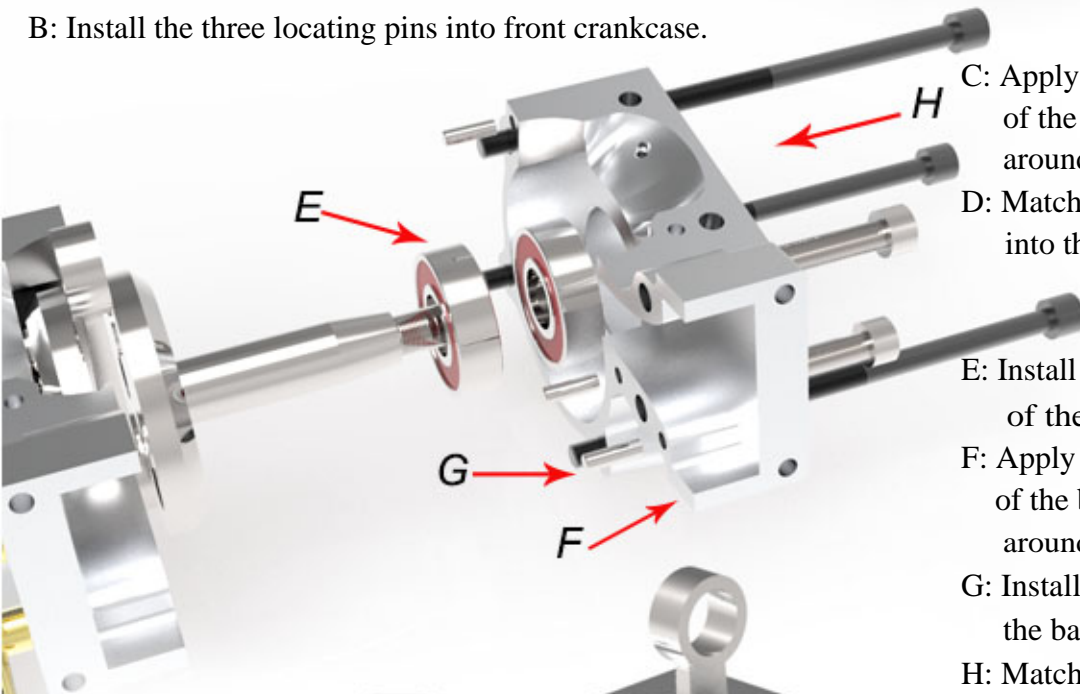
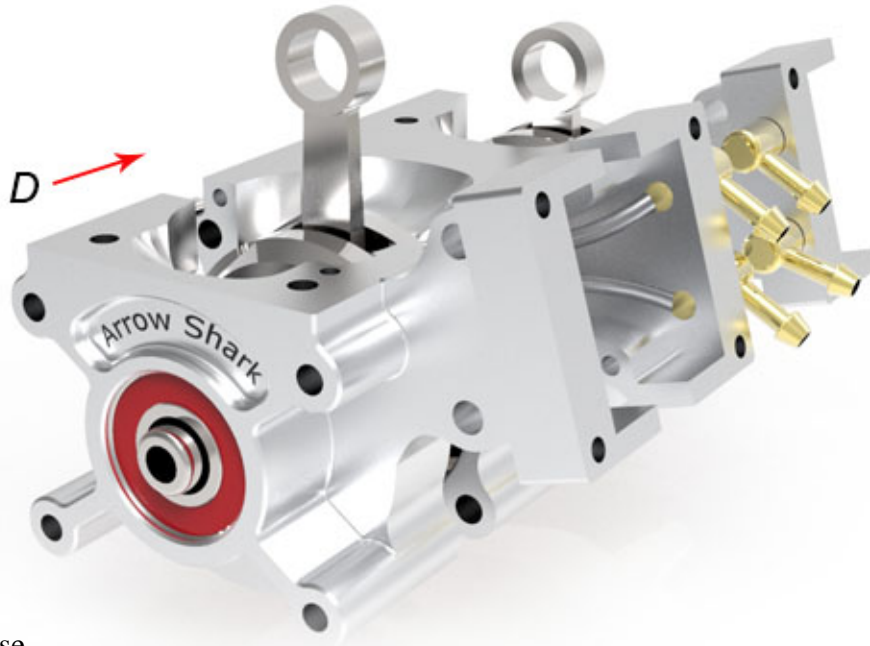
- D&E: Match the crankshaft center bearings into the bearing grooves on the lower part of middle reed case.
- F: Install the upper part of reed case onto the lower part of the reed case.
- G: Tighten the four of M5x30 bolts from bottom of the lower part middle case, and make sure all bolts must be applied with mid strength loctite.

Front & Back Case Assembly



A: Install two bearings into front part of the crankcase.

B: Install the three locating pins into front crankcase.



C: Apply some sealant on the surface of the front part of the crankcase around the join area.

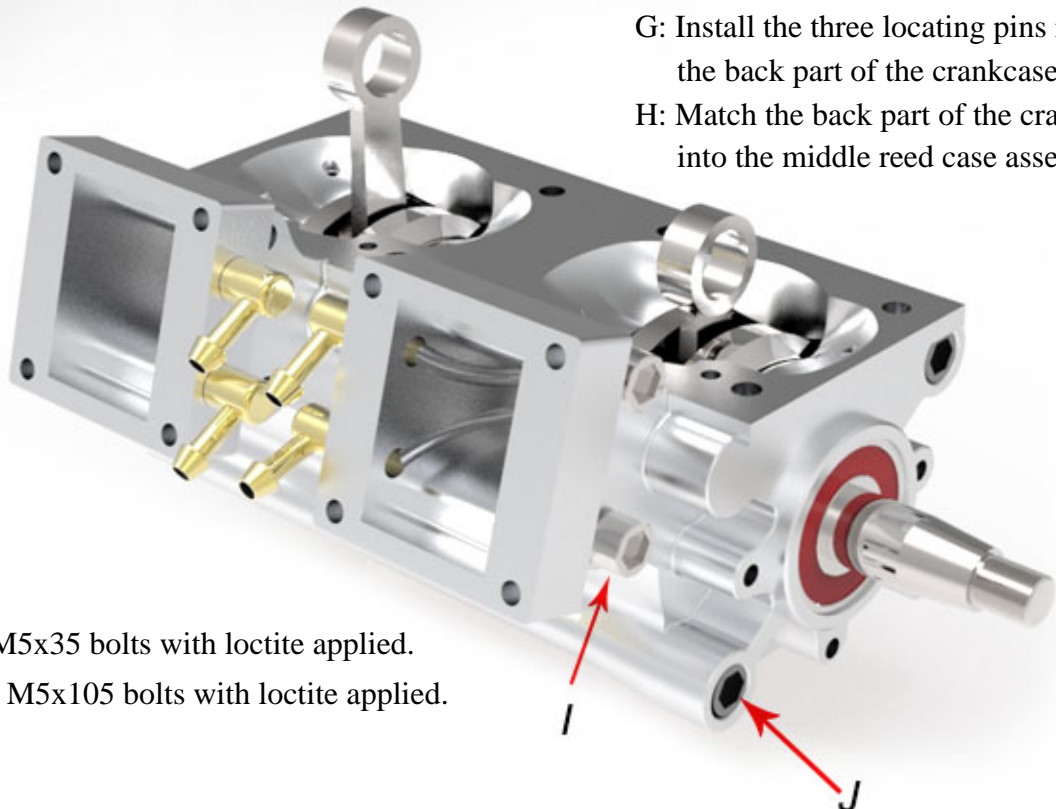
D: Match the front part of the crankcase into the middle reed case assembly.

E: Install two bearings into back part of the crankcase.

F: Apply some sealant on the surface of the back part of the crankcase around the join area.

G: Install the three locating pins into the back part of the crankcase.

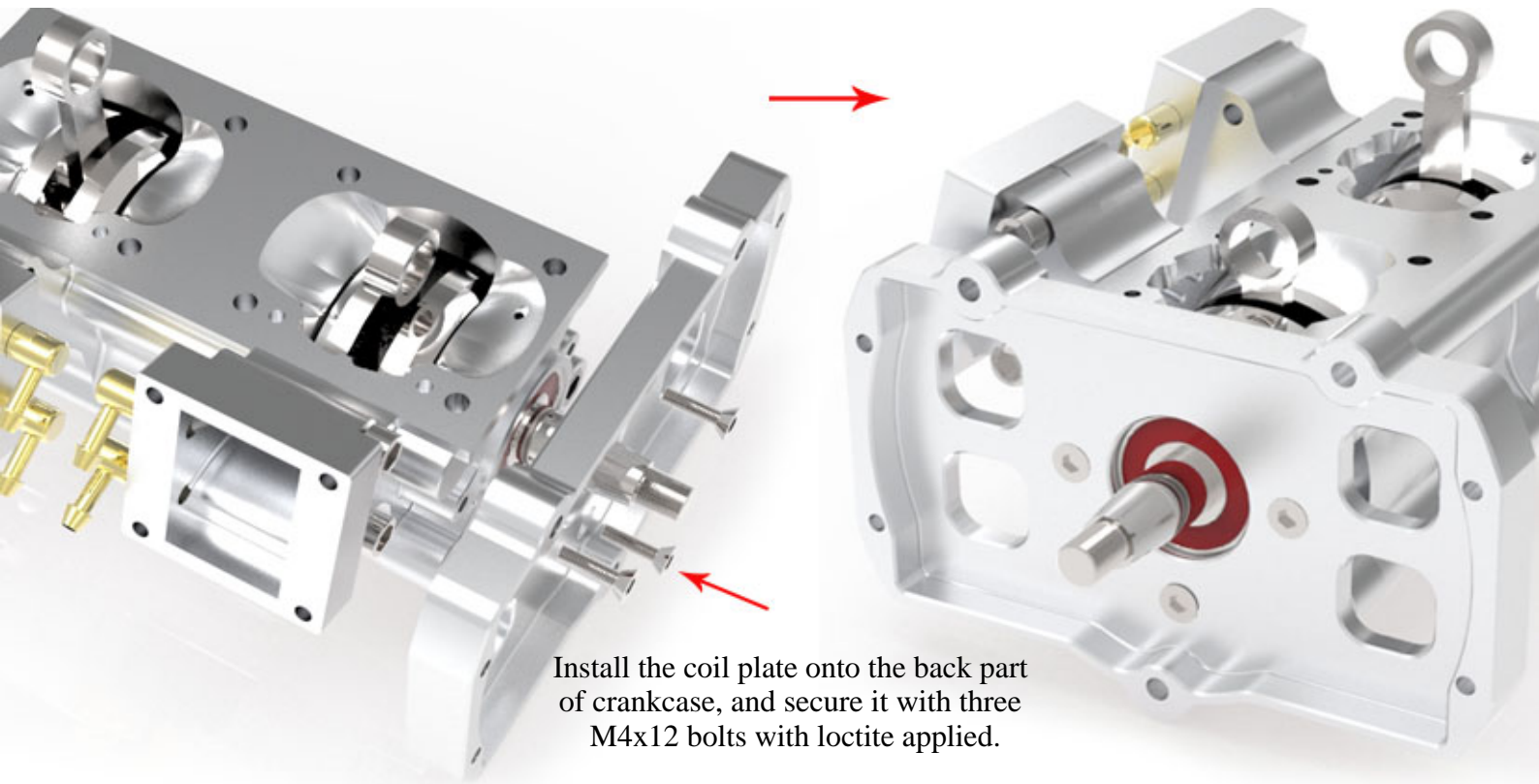
H: Match the back part of the crankcase into the middle reed case assembly.



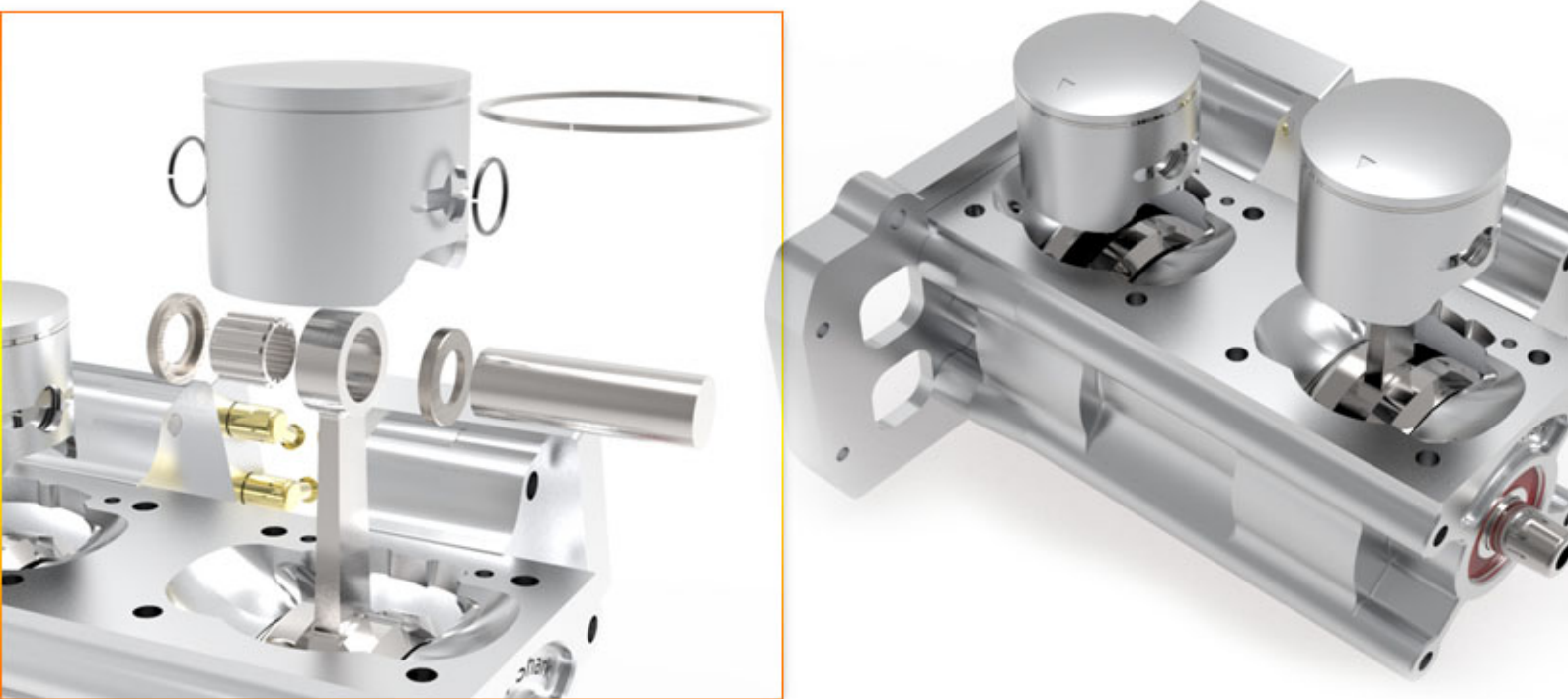
I: Tighten these two M5x35 bolts with loctite applied.

J: Tighten these three M5x105 bolts with loctite applied.

Coil Plate Installation

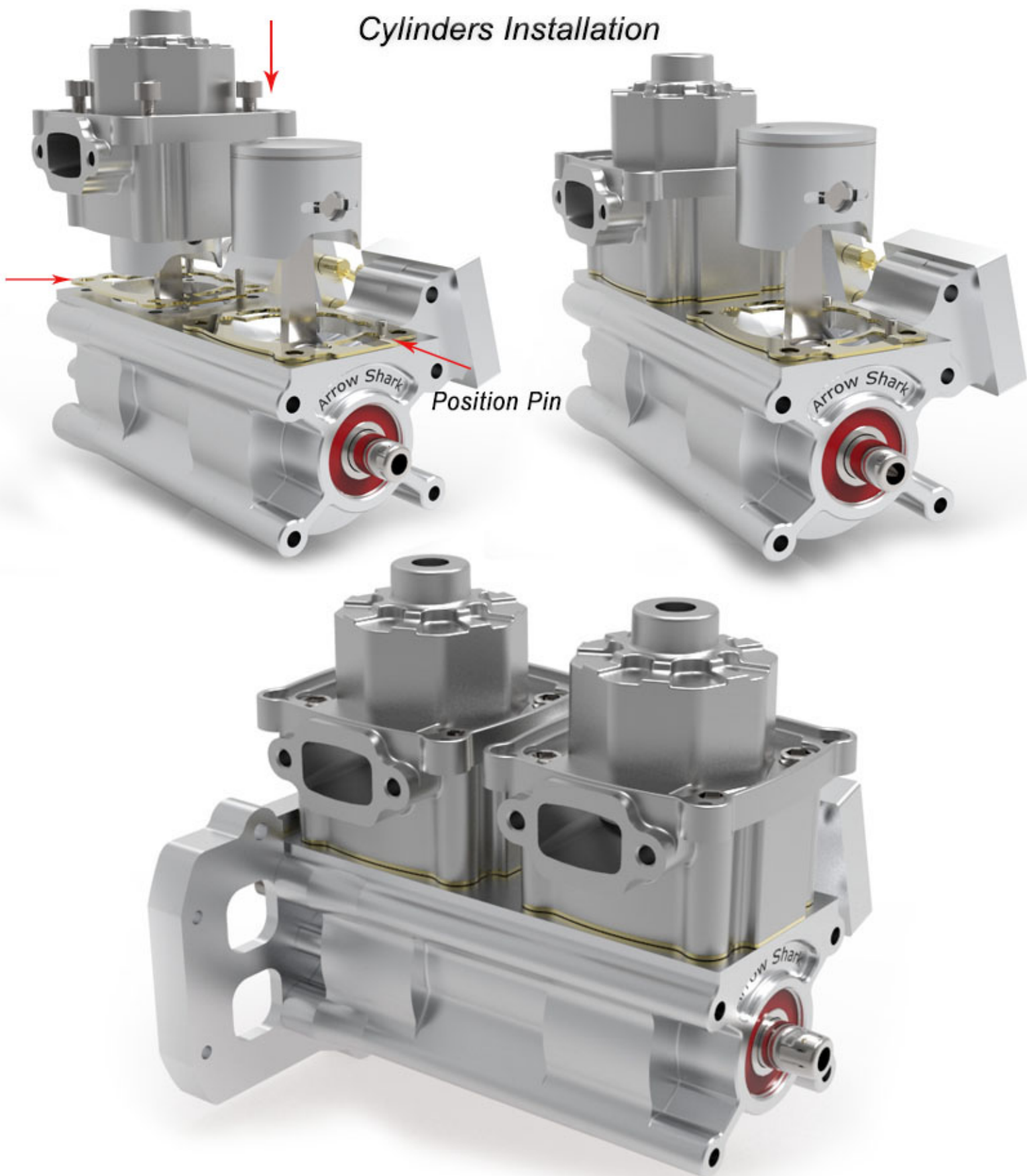


Pistons Installation



- 1: Using needle nose pliers, install the first “C” Clip into the piston by slowly turning it into the slot hole. This “C” Clip should be installed in the hole facing the billet coil mounting plate, while the Arrow sign on the piston should be facing the exhaust side.
 - 2: Insert the wrist pin into the entry of the other hole on the piston – but do not push it in yet, just leave it in the hole opening.
 - 3: Install both wrist pin bearings and washers to the crankshaft connecting rod.
 - 4: Match the wrist pin to the hole on the connecting rod, and push the pin all the way through.
 - 5: Insert the second “C” Clip to secure the wrist pin in place.
 - 6: Slowly slide the piston ring into the slot in the piston.
- Note: Do not try to open the ring wide - you will snap it if you do so.
- 7: Make sure the opening side of the piston ring is always facing to the engine carburetor side, and the arrow sign always face exhaust side. Piston Assembly Completed!
 - 8: Repeat the same procedure for the second piston.

Cylinders Installation

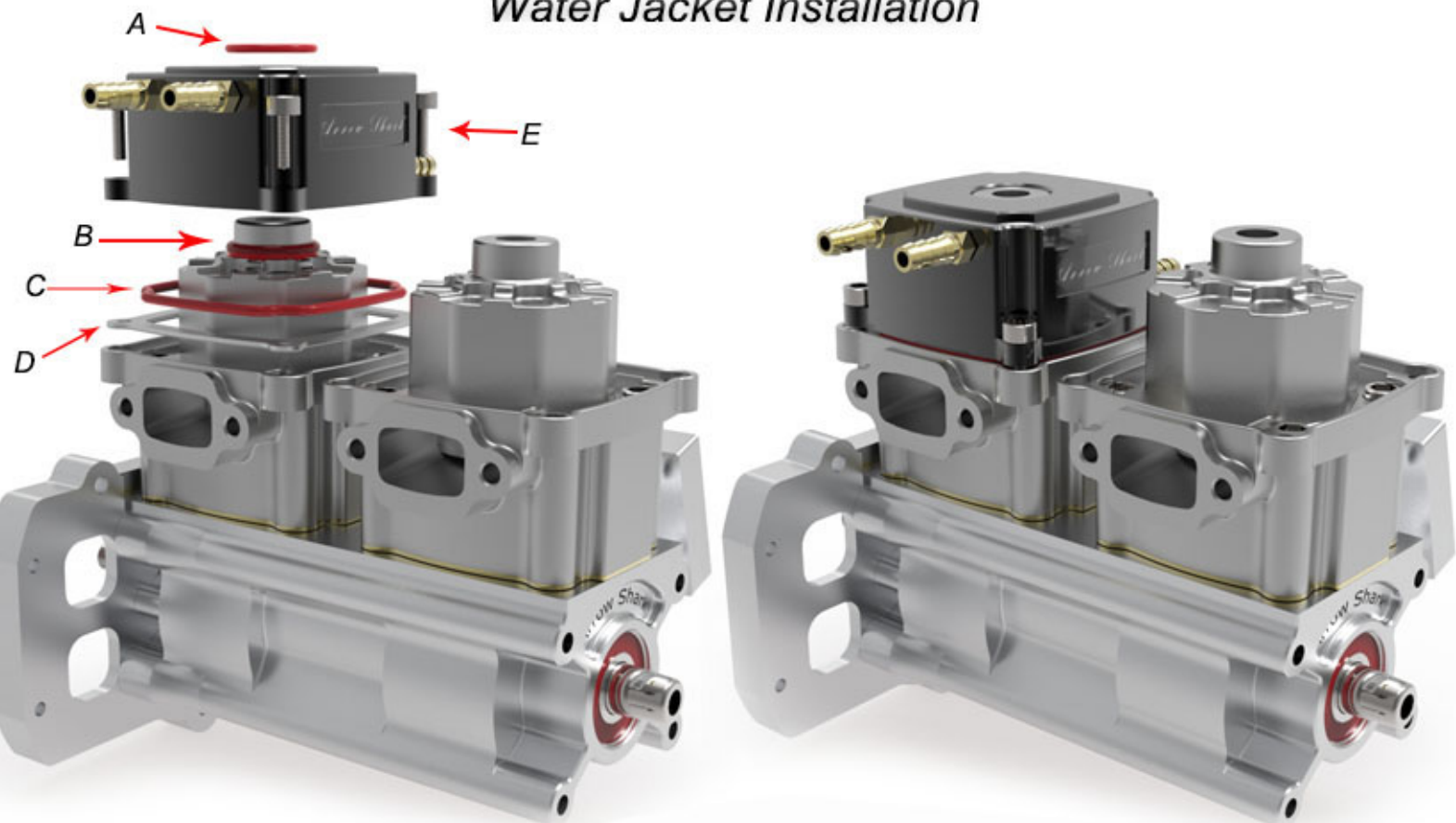


Apply some sealant on the both side of the copper gasket for leaking-free of the engine, install four position pins onto the top of crankcase before install the cylinder.

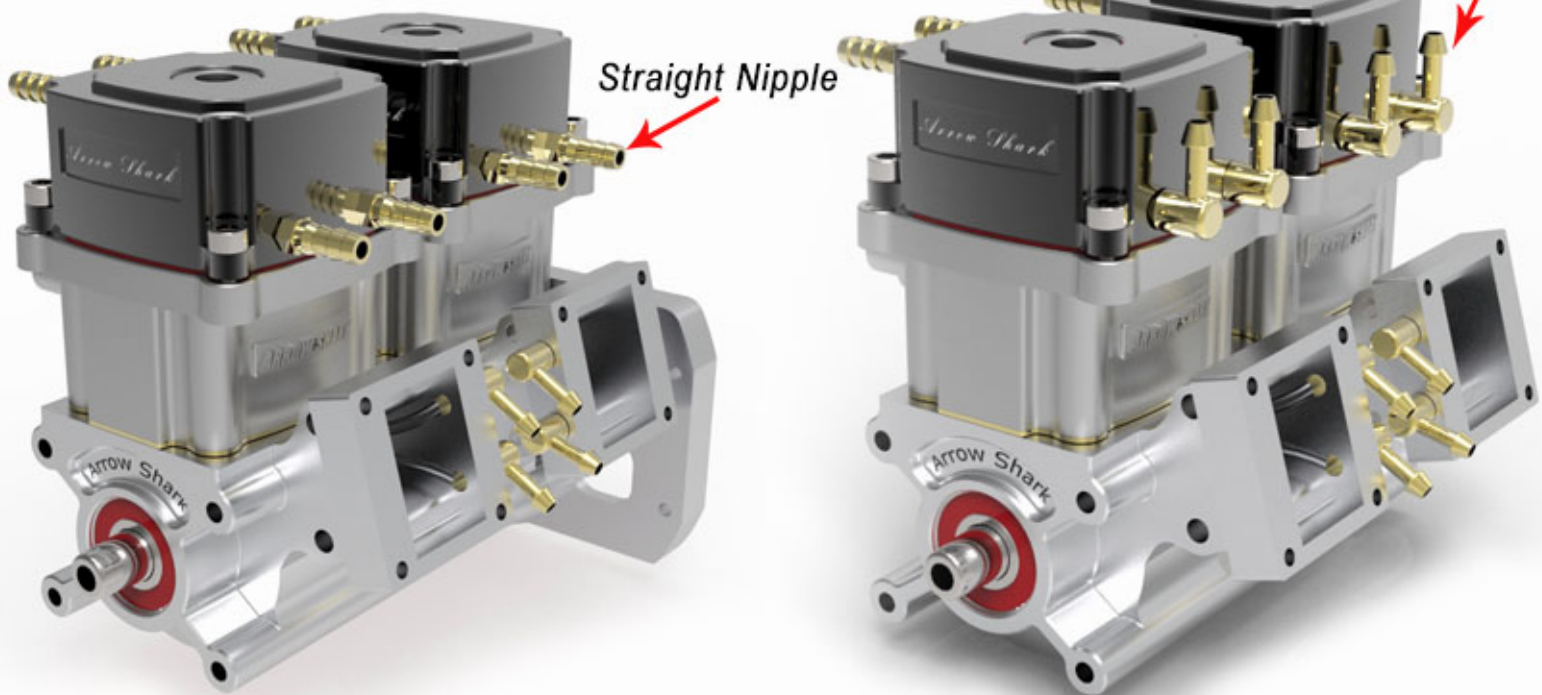
Use a small slotted screwdriver to fully adjust the piston ring into the cylinder, then screw down the bolts through the cylinder all the way into the crankcase. Tighten the bolts a little at a time in turn until they are fully secure. All bolts must applied with mid strength loctite.

Repeat the same procedure for the second cylinders.

Water Jacket Installation

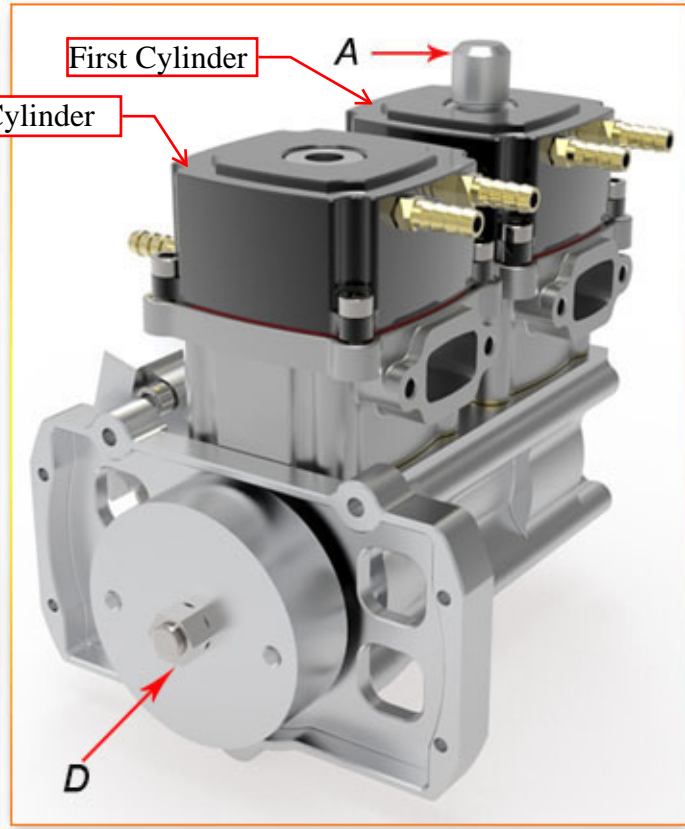
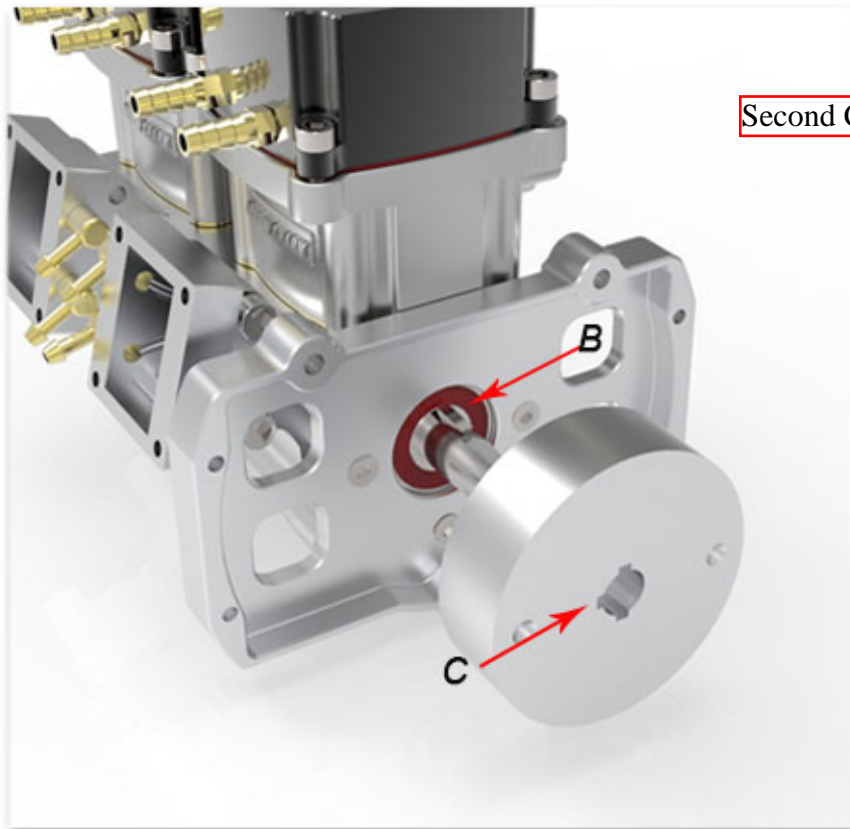


In the owner manual we demonstrate with straight water inlet nipple, but, you will receive the engine with 90 degree nipple instead for more convenience to connect the water tube without interfere with throttle control kit.



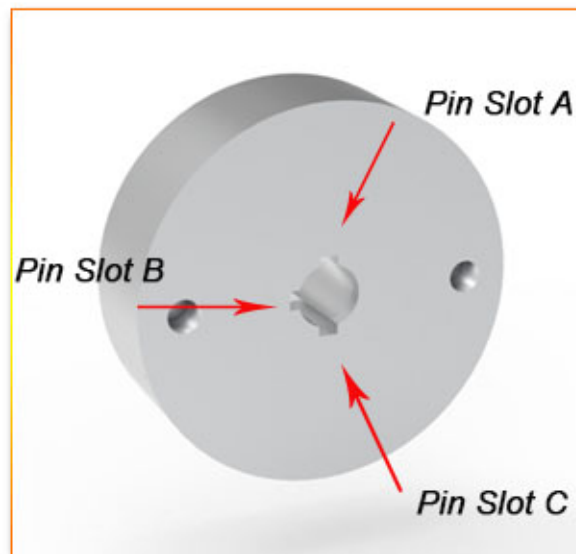
- A: This O-ring installs inside top of water jacket to prevent water leaking from center spark plug area.
- B: This O-ring installs on the top of cylinder to against the inside bottom of water jacket.
- C: This O-ring installs on the bottom slot of the water jacket.
- D: This aluminum gasket combines with silicone will be installed on the top of cylinder against the "C" O-ring to prevent any water leaking from the bottom of water jacket. (aluminum part face up)
- E: Securing bolts for water jacket, tighten them when all sealing rings in place.

Flywheel Installation



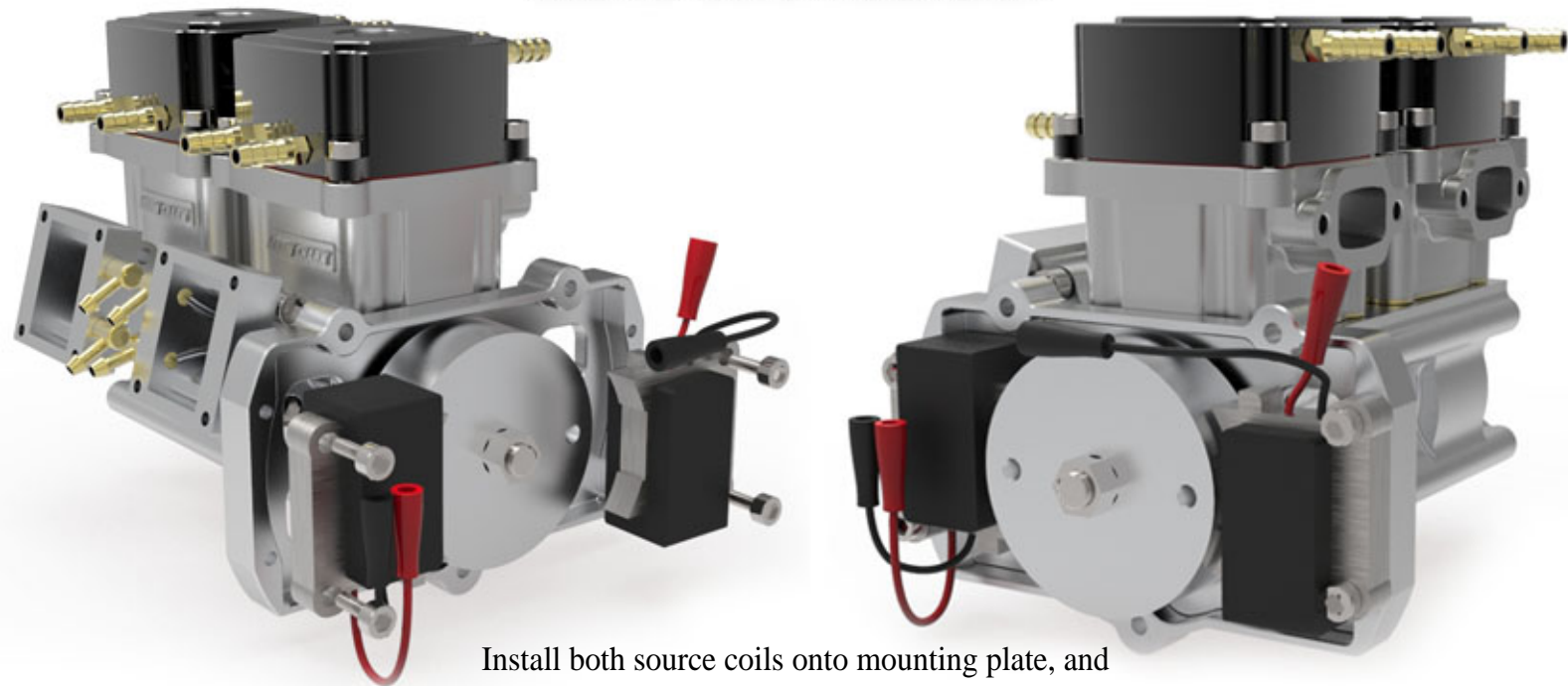
- A: Install piston stopper into either one cylinder spark plug hole.
- B: Position the flywheel key on the top of the crankshaft slot.
- C: Slide the flywheel onto the crankshaft.(the middle slot on the flywheel where the red arrow points will be face to the left side as shown in the picture.)
- D: Apply some Loctite on the thread of the crankshaft, tighten the nut to secure the flywheel firmly in place.

X-60 Flywheel



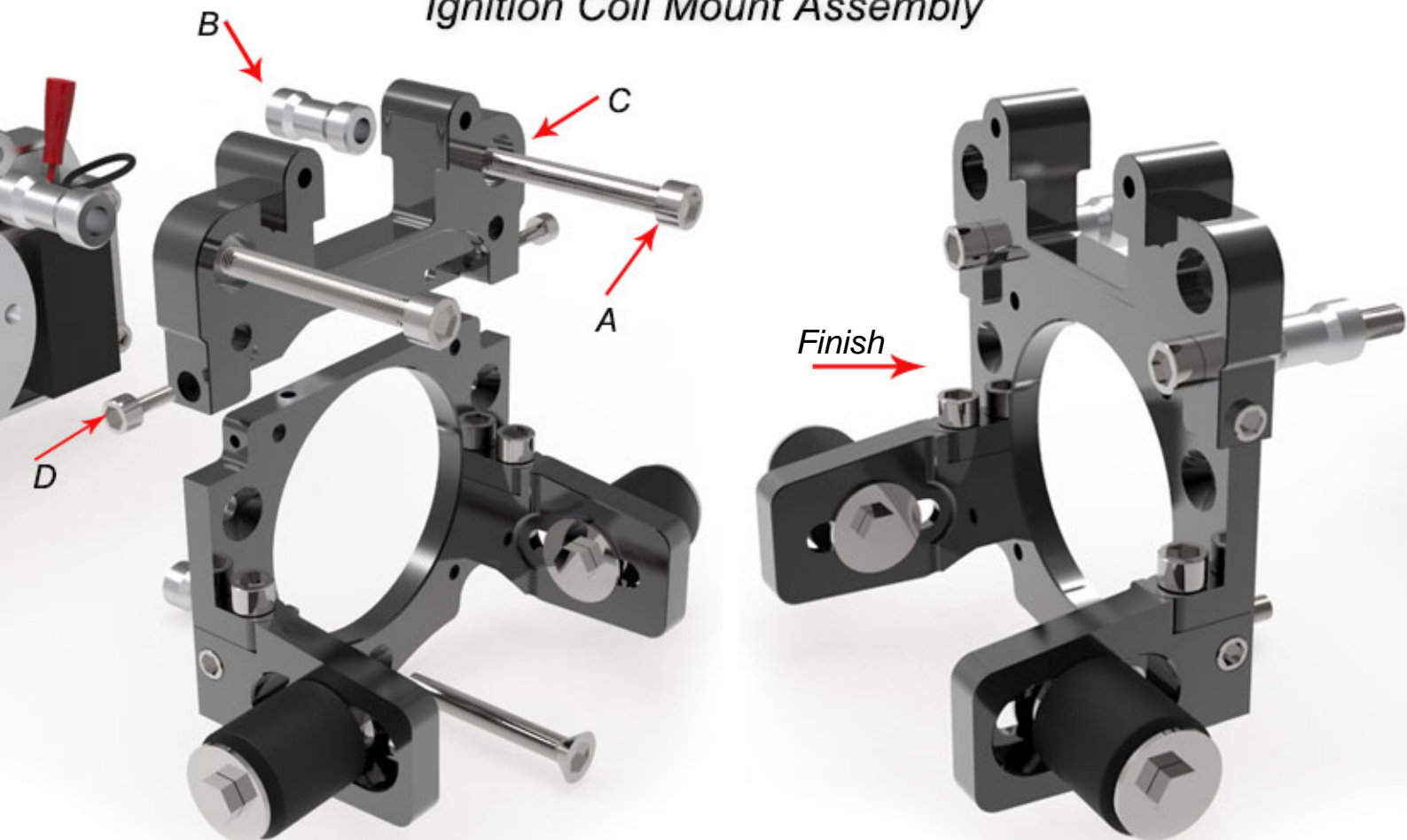
X-60 engine flywheel key must match into either Pin Slot A or Pin Slot C, we install the flywheel with Pin Slot A whilst the pin key is on the top position of the crankshaft, this way the source coil on the right side will be the timing to fire the first cylinder, if you install the flywheel with Pin Slot C into the top position crankshaft pin key, then, the timing for the source coil on the right side will be work for the second cylinder. the The Pin Slot B is for the application of single cylinder engine such as X-30.

Source Coils Installation



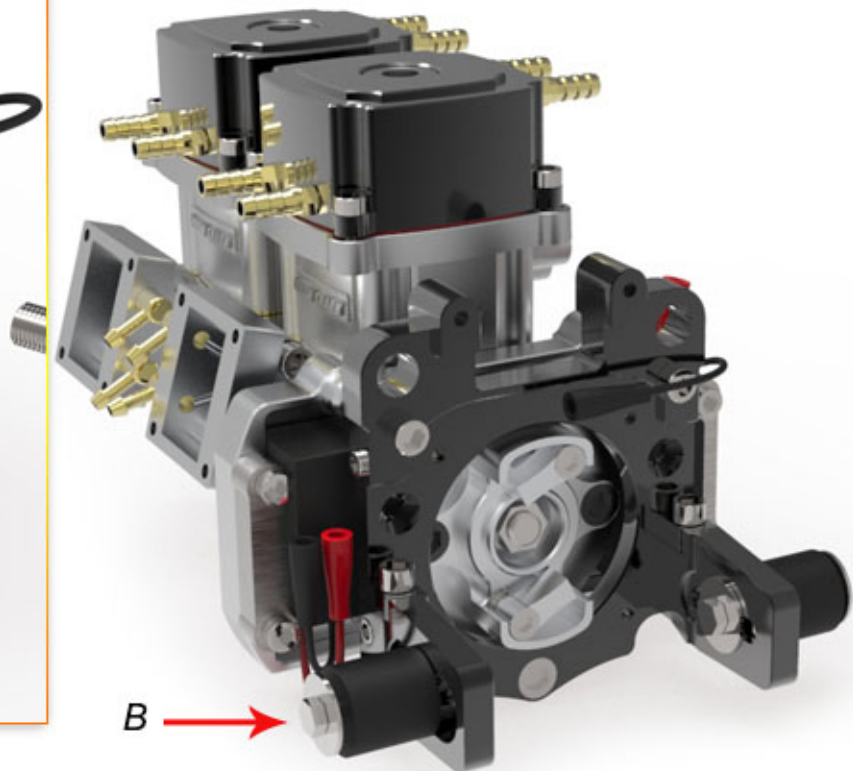
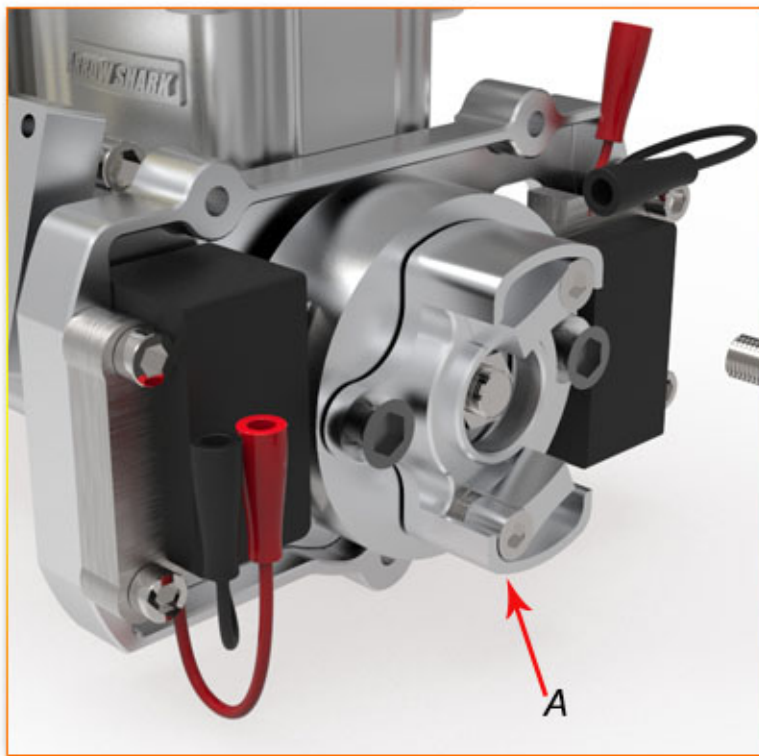
Install both source coils onto mounting plate, and secure it with M4x16 bolts, before tighten the bolts, adjust the gap between the flywheel and source coil at 0.6mm.

Ignition Coil Mount Assembly



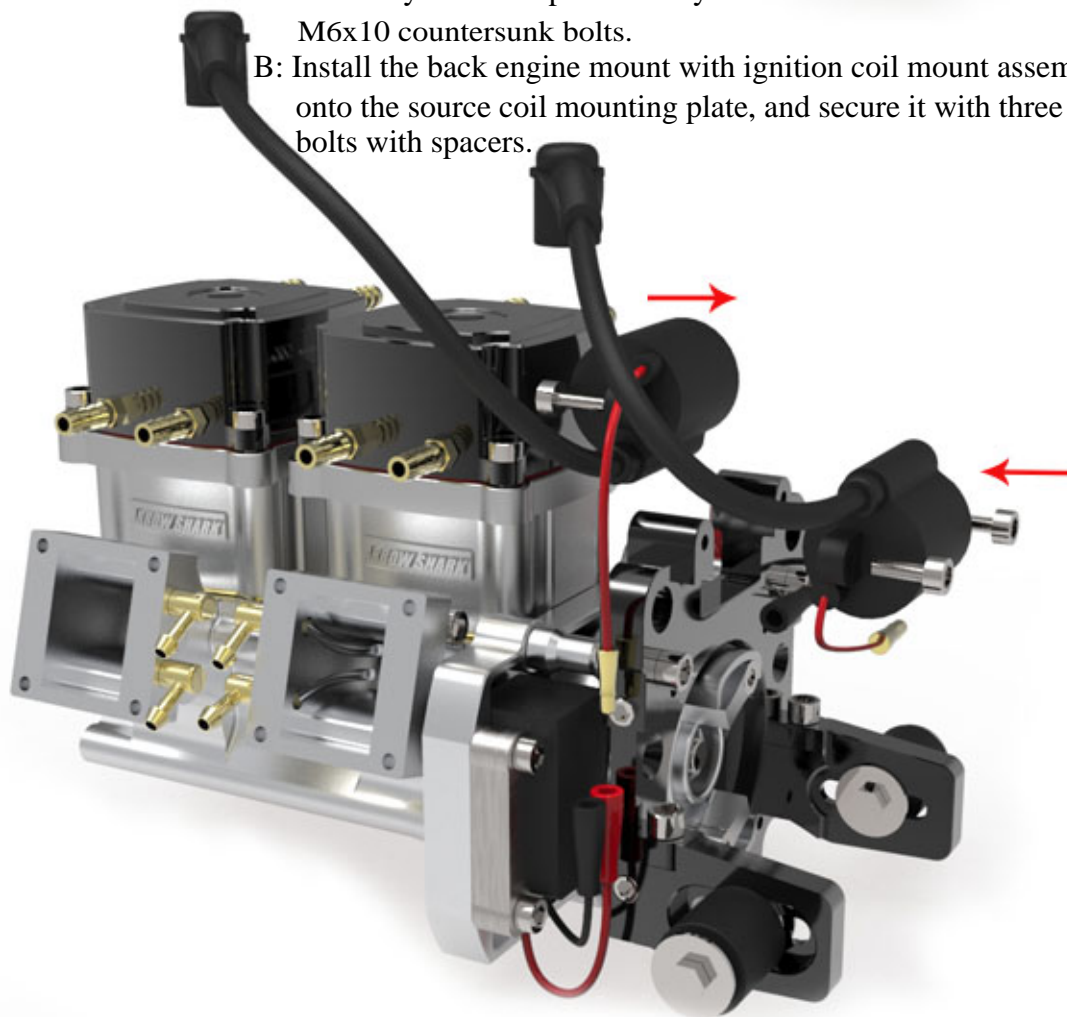
- A: Install two M5x40 bolts through both ignition coil mount and spacers, also install the M5x35 countersunk head bolt through the bottom of the back engine mount and spacer, ready for next installation.
- C: Match the ignition coil mount onto the top of engine mount, and secure them together by tighten "D" M3x10 bolts from both side. the bolts must applied with mid strength loctite.

Back Engine Mount & Ignition Coils Installation



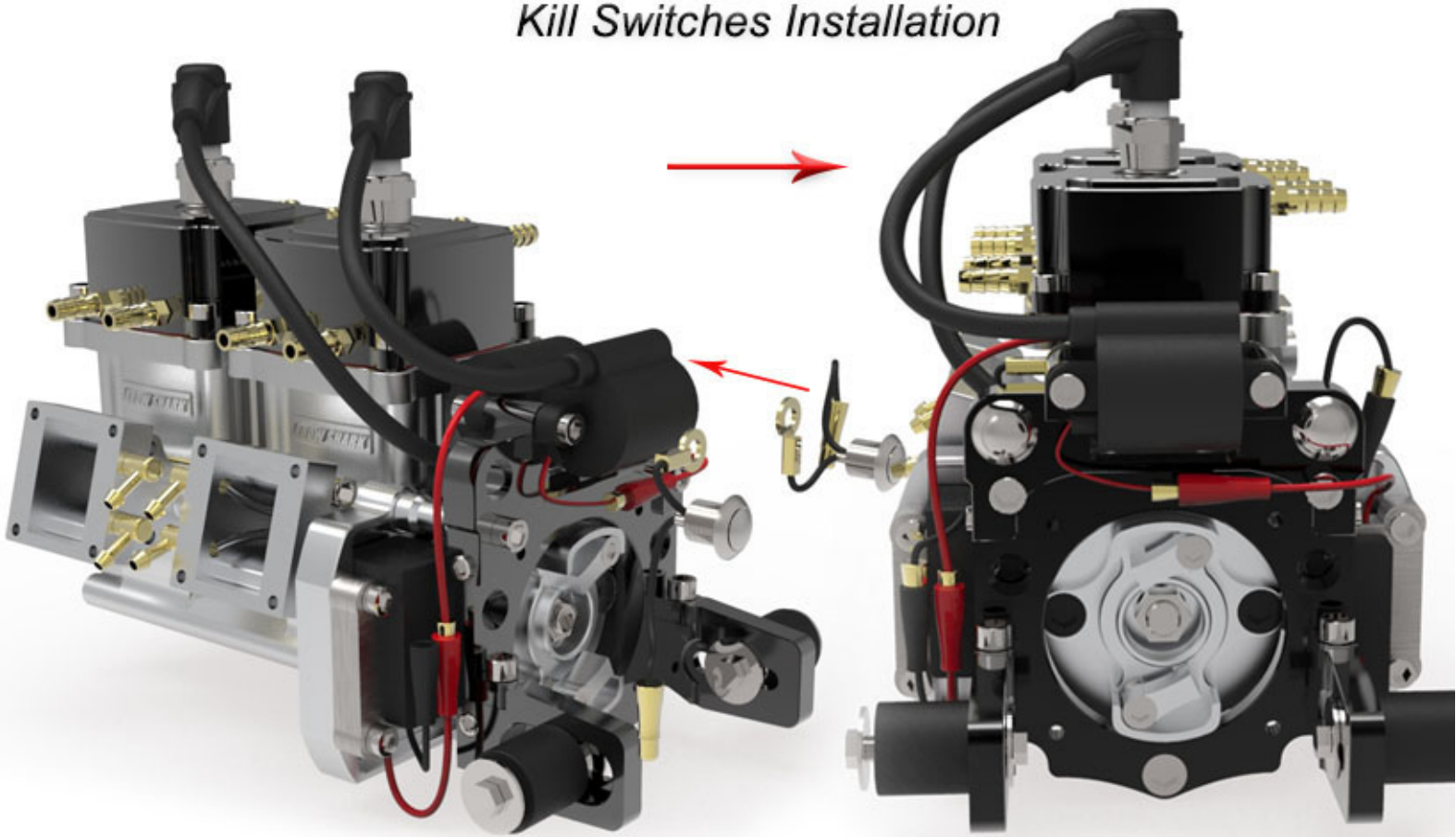
A: Install flywheel adaptor onto flywheel and secure it with two M6x10 countersunk bolts.

B: Install the back engine mount with ignition coil mount assembly onto the source coil mounting plate, and secure it with three M5 bolts with spacers.



Install two ignition coils onto coil mount, secure them with M4x12 bolts, then, connect the red wires with the red wires from source coils.

Kill Switches Installation

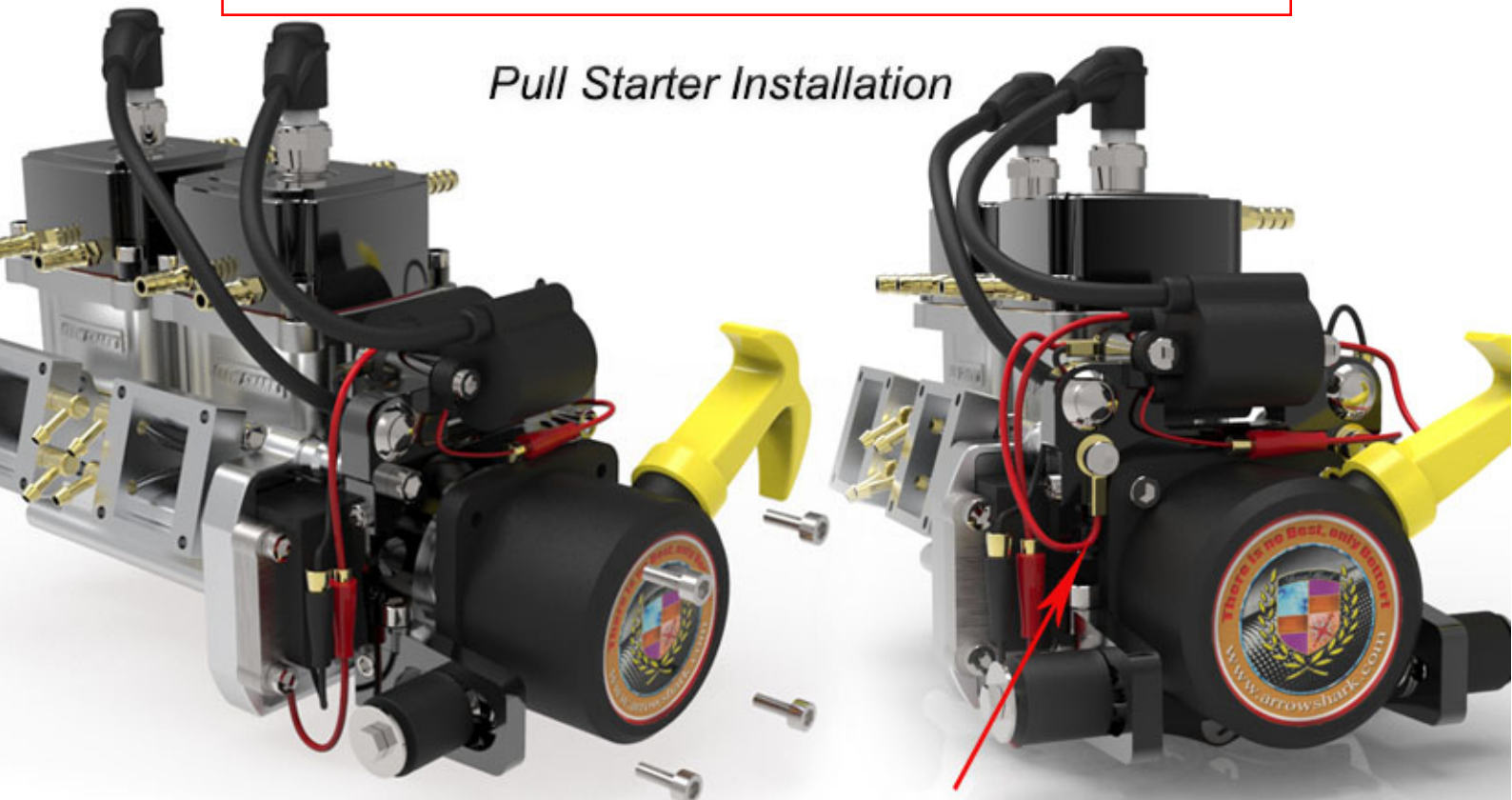


A: Install the kill switches into the 10mm holes on the ignition coil mount and secure it with the nut comes with the switch.

B: Ground the wire on the coil mount with the same bolt that securing the ignition coil.

C: Connection the other wire from kill switch with the black wire from source coil.

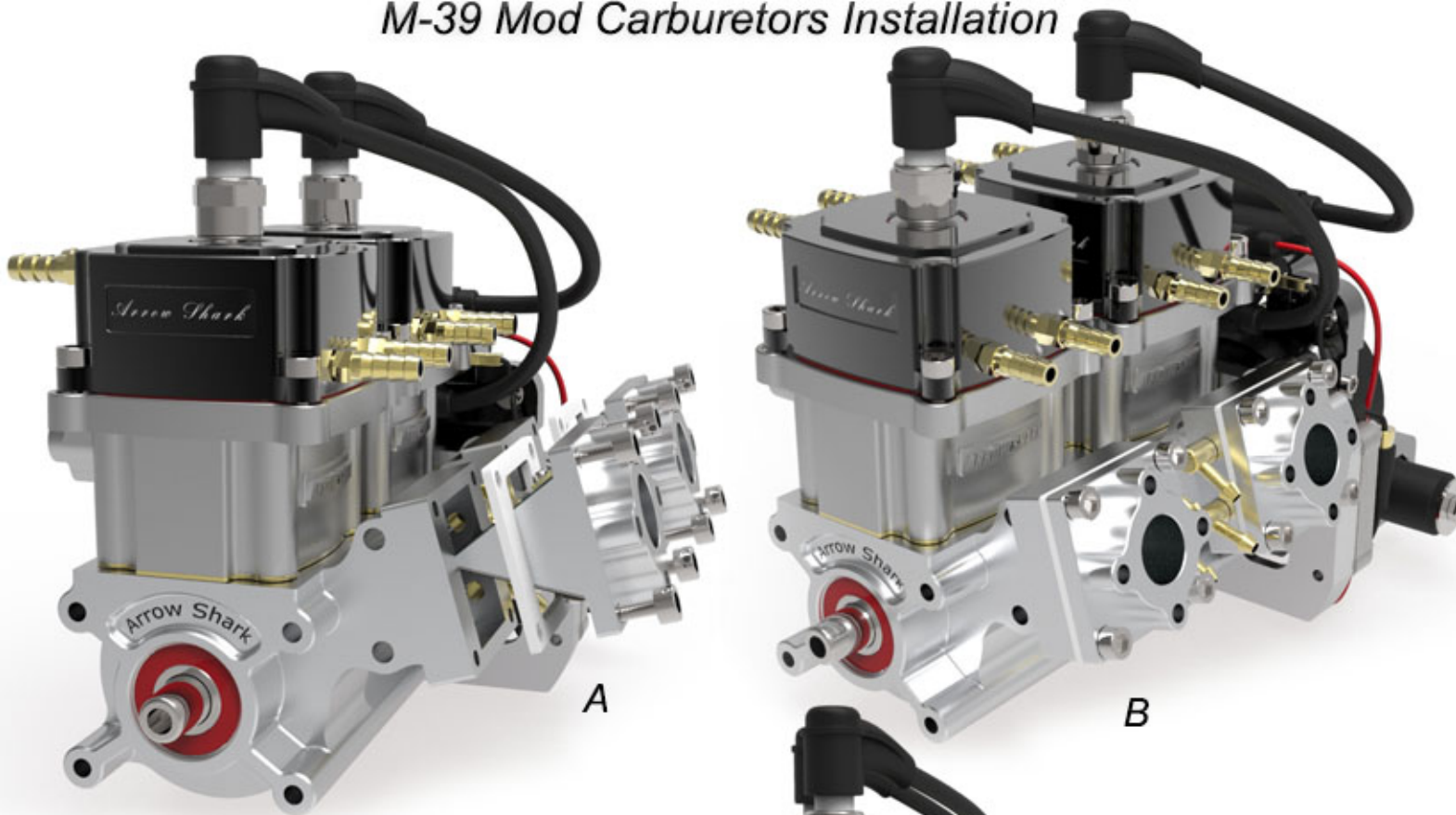
Pull Starter Installation



Reinforcement Ground Wire

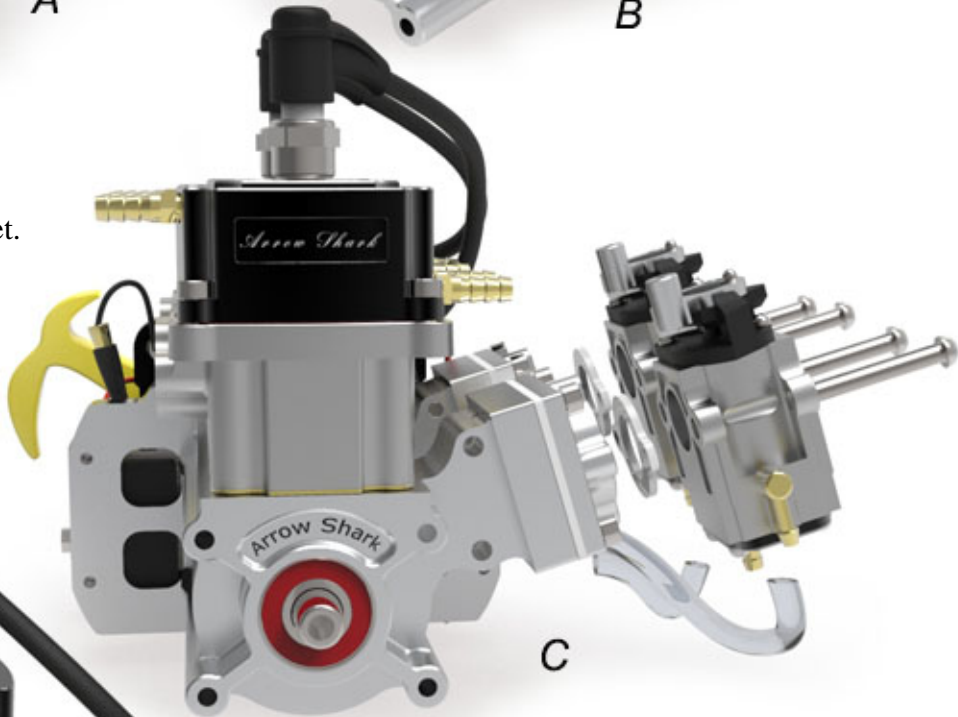
Install the pull starter onto the engine back plate with the bolts supplied. your engine will be shipped to you with reinforcement ground wires installed at both side below the kill switch to create stronger spark from spark plugs.

M-39 Mod Carburetors Installation



A. Insert the billet reed valve assembly into the reed case with supplied Teflon gasket.

B: Secure reed valve with gasket onto the reed case with supplied four of M4x12 bolts, all bolts must applied with loctite.



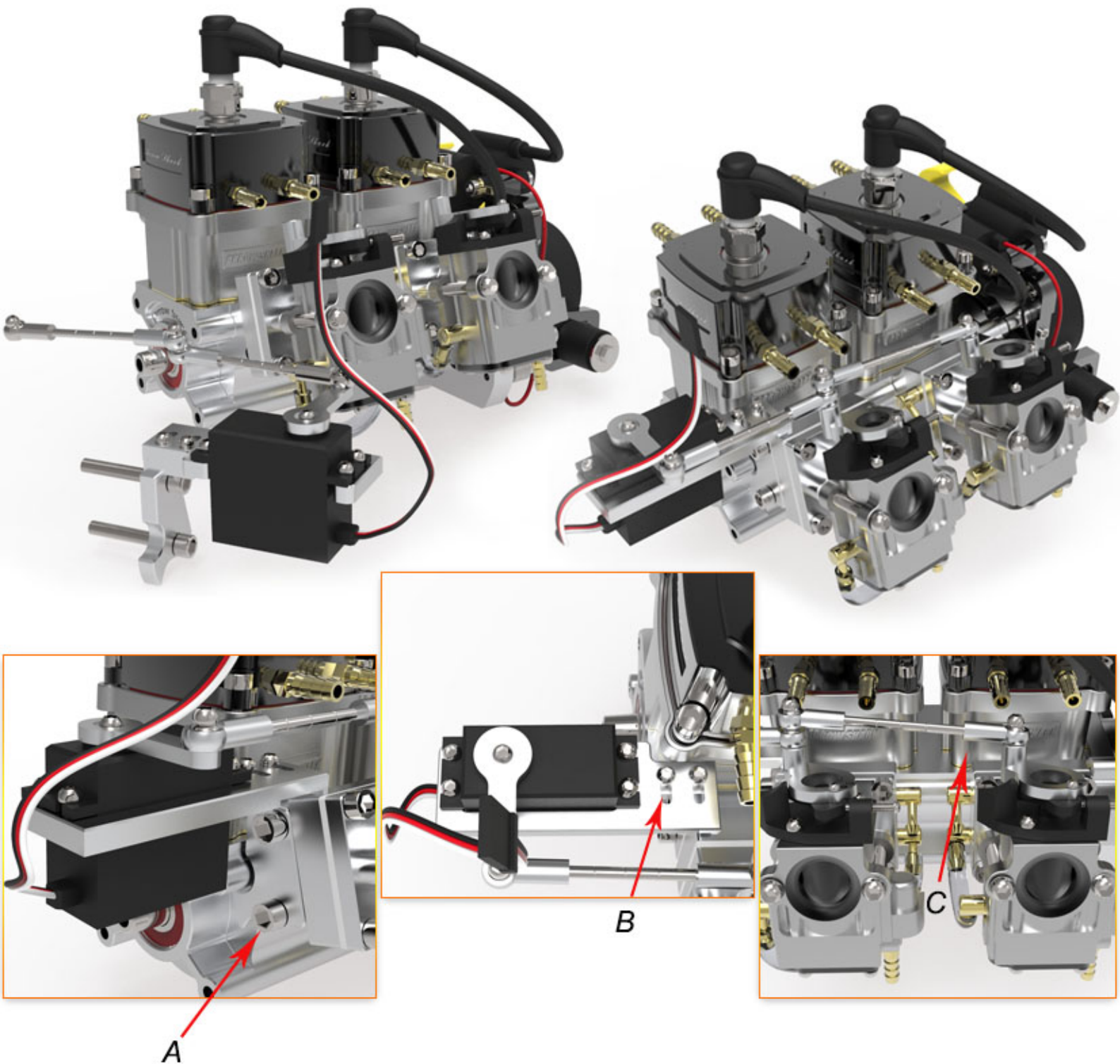
C: Insert the supplied M5x40 bolts via the supplied Teflon gasket and carburetor, and then tighten them to secure the M-39X carburetors to the billet reed valve.



D: There are 4 pressure outlet nipples on the reed case, two of them for the connection to the carburetors, the other two are the spare pressure outlets for the connections to water pumps. so, connect either two nipples to the carburetors with tubes supplied.

Note: If the other two pressure outlet nipples not in use, you will need to plug them with a short length of gas tube, the other end of the tube can be block with a M4 bolt.

Throttle Control Device Installation



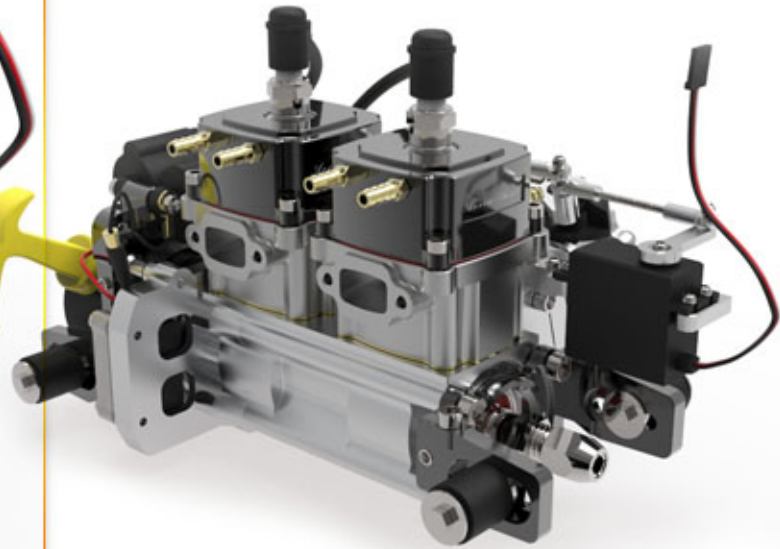
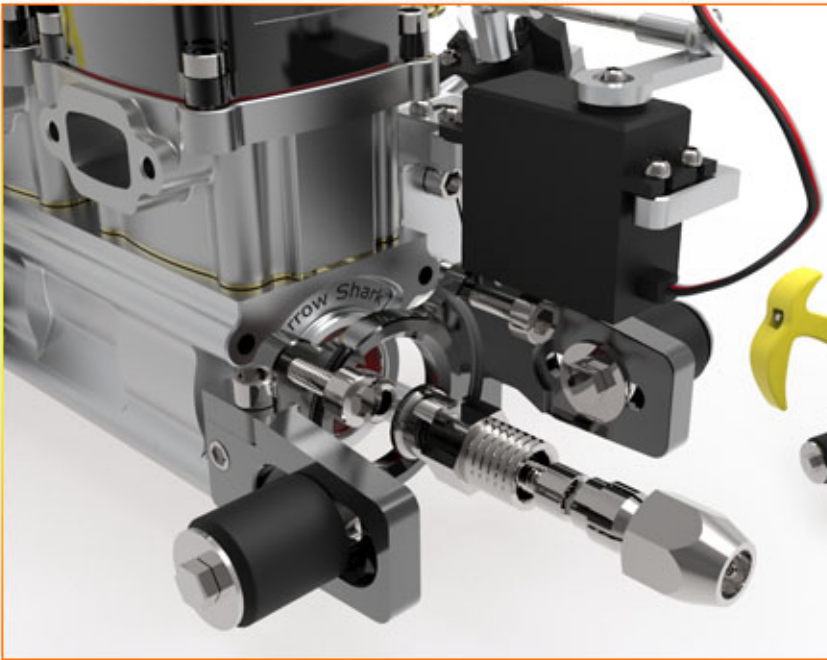
X-60 Marine engine comes with a unique design throttle control device that positions the carburetor's low speed needle on the top which makes the needle adjustment more convenience than never before, the carburetor barrels was link up together with a ball joint tie rod linkage and control by a 15KG metal gear hi-torque servo for the most directly and effective throttle operation.

A: This two M5x40 bolts secure the servo mount on the reed case.

B: Loosen these two M3x12 bolts allow you to horizontal adjusting the servo arm position for more straight up linkage to the carburetor barrel adaptors.

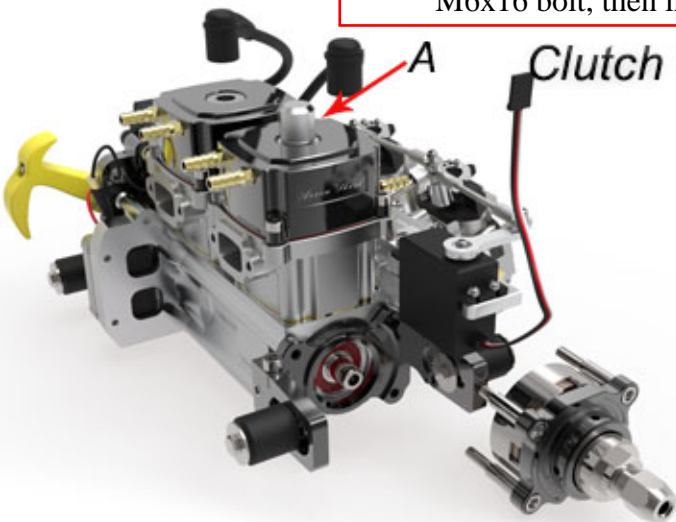
C: The length of tie rod between these two ball joints must be adjusted properly in order for the two barrels to be open and closed identically.

Shaft Collet Installation

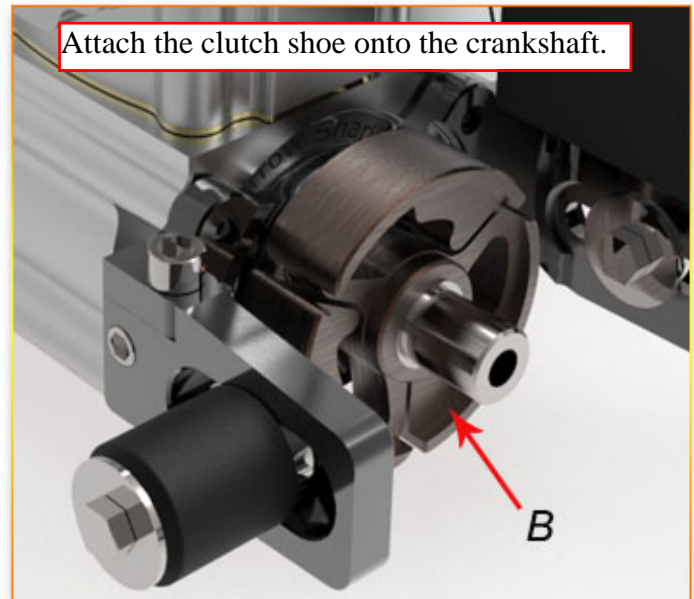


Screw the piston stopper into the spark plug hole, and install the front engine mount onto the front case, then insert the shaft collet base on the crankshaft and tighten it with supplied M6x16 bolt, then insert the front adaptor into the base, screw the top cap down.

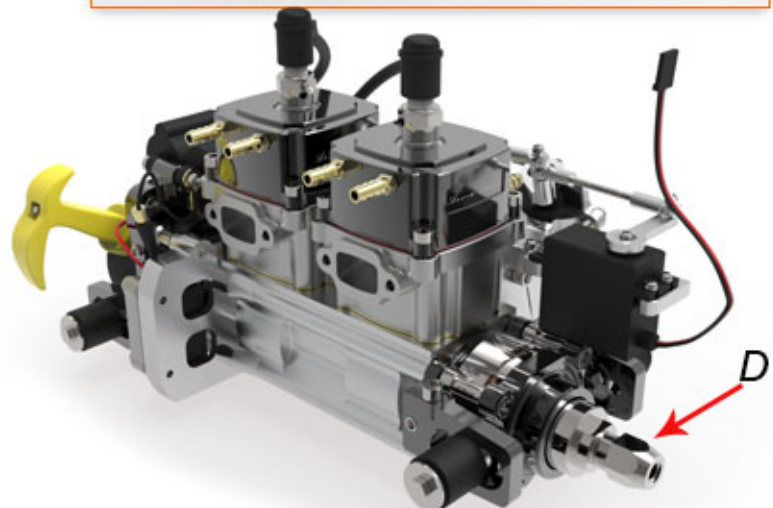
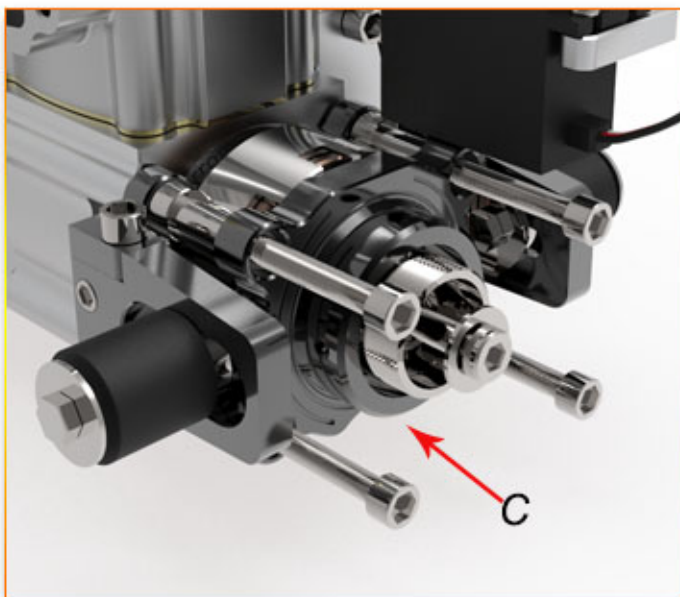
Clutch V3 Installation



Install the piston stopper into the spark plug hole.

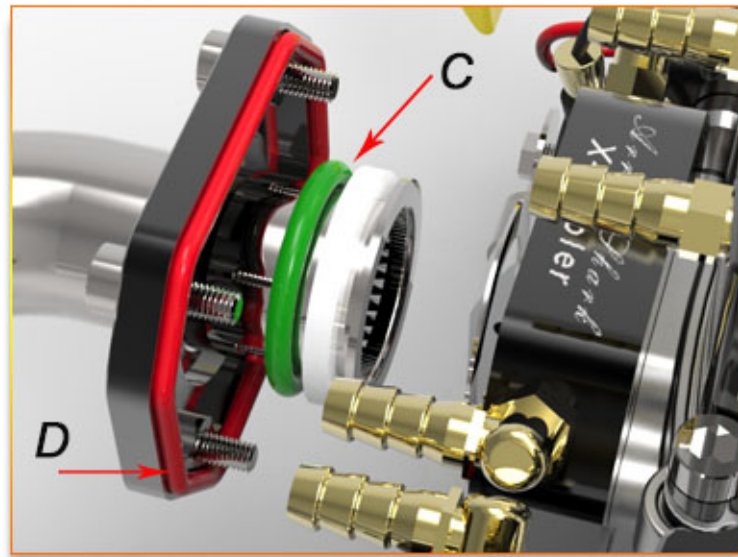
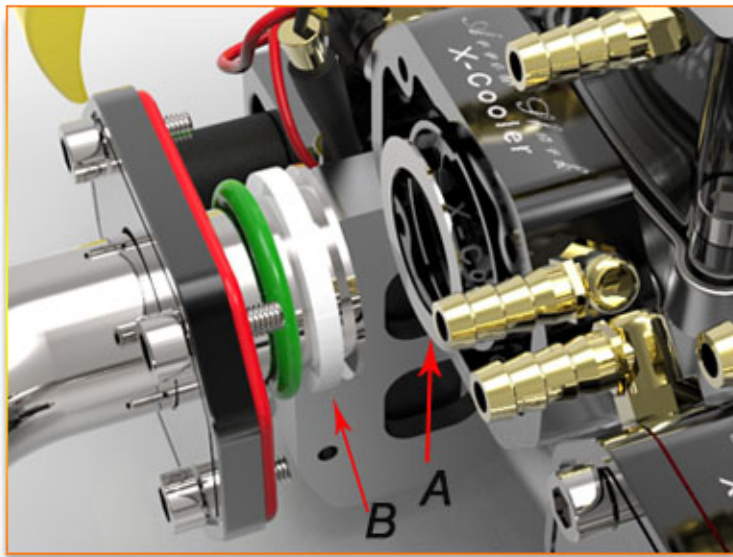


Attach the clutch shoe onto the crankshaft.



After all bolts are tighten, turn the clutch bell by finger to make sure it is spinning freely, then, screw in the front adaptor and install the insert and cap.

X-Cooler & Exhaust Header Installation



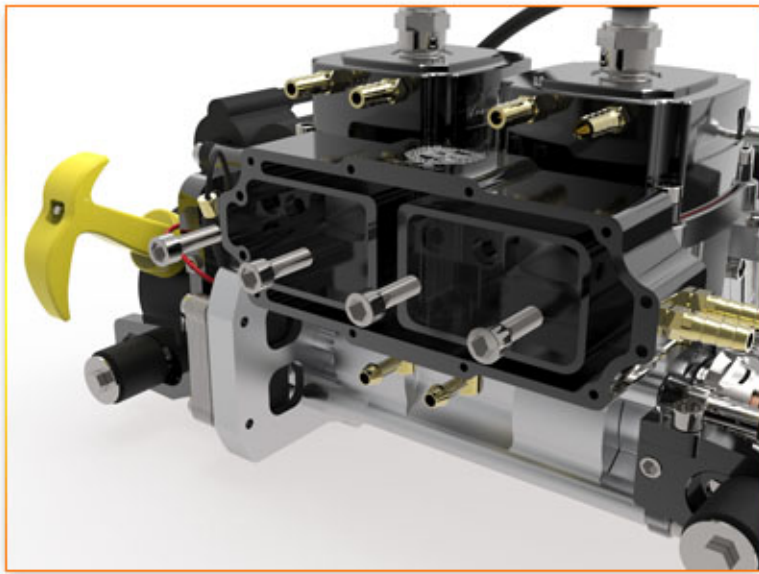
- A: This stainless steel gasket installs at center hole of the X-Cooler base against the flat flange on the steel header.
- B: This silicone O-ring installs behind the header flange to prevent water leaking into the exhaust header.
- C: This green fluorine O-ring installs behind the silicone O-ring to prevent the water leaking out from the center hole of the cover.
- D: This O-ring installs in the groove of the X-Cooler cover against the main block to prevent the water leaking from join area.



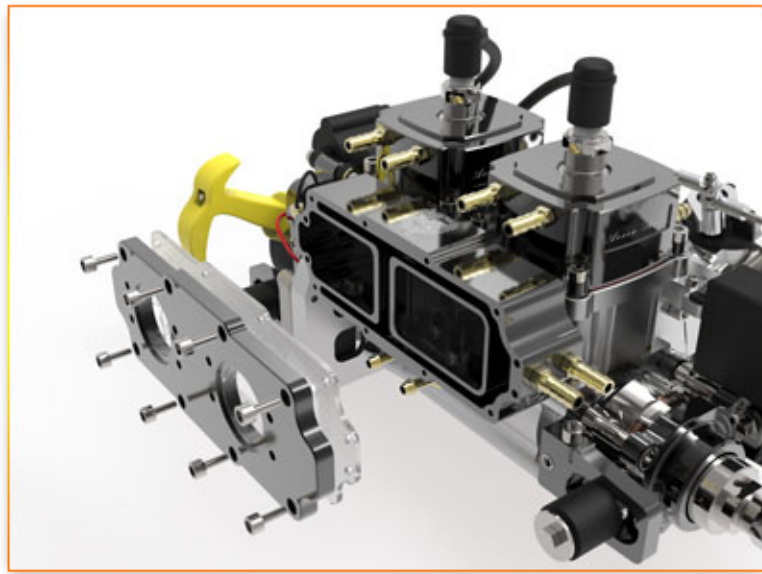
We recommend to use one 105 degree exhaust header on the front cylinder, and one 90 degree exhaust header on the second cylinder in order to stagger two tuned pipes not to getting in touch each other.

Tuned exhaust pipes boost engine power by using the pressure waves generated by exhaust gases to literally pull more fuel into the cylinder. However, to achieve this, it is critical to have the right length for the exhaust gases as they travel from the exhaust manifold to the “belly” of the tuned pipe (that’s where the pipe is at its widest diameter). For our X-60, this distance is between 320 and 330mm which needs to be measured from the exhaust port along the curves of header and then along the tuned pip to its “belly”. The shorter tuned length will increase more RPM, whilst the longer tuned length will increase more torque from engine.

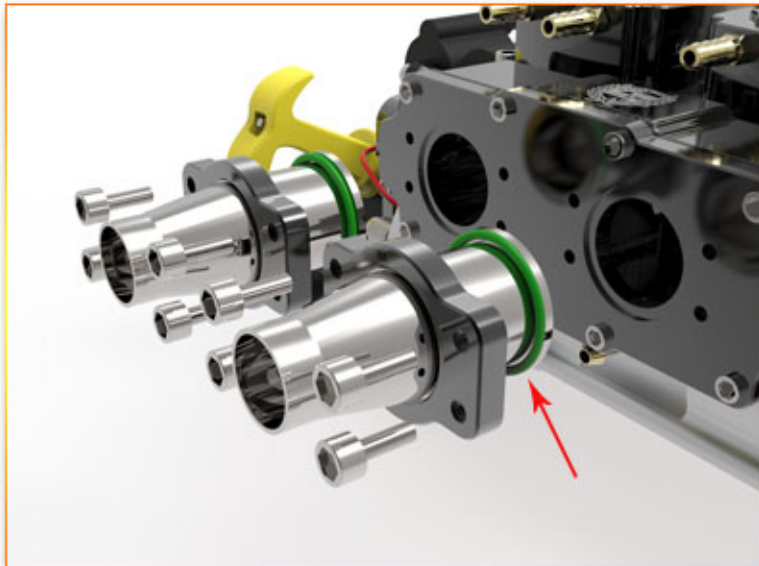
Turbo Box Installation



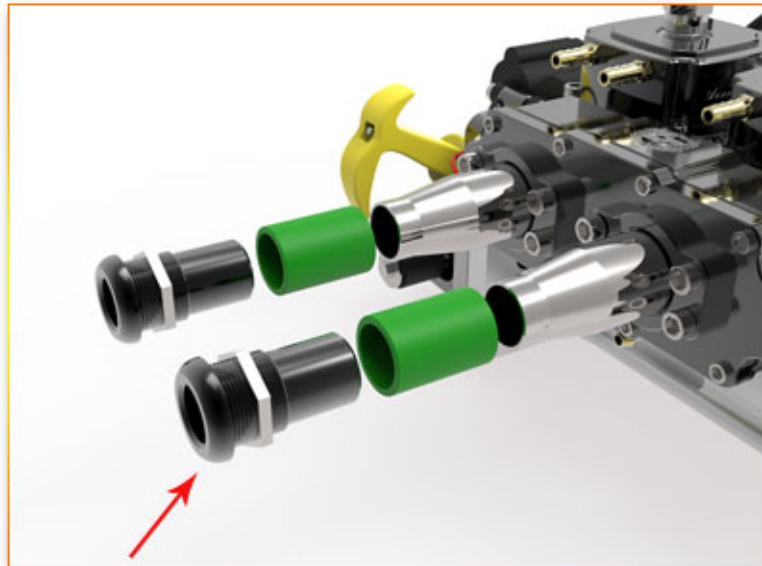
Install the turbo box base onto X-60 cylinders, match the thread holes on the cylinders, and secure it with four of M5x12 bolts.



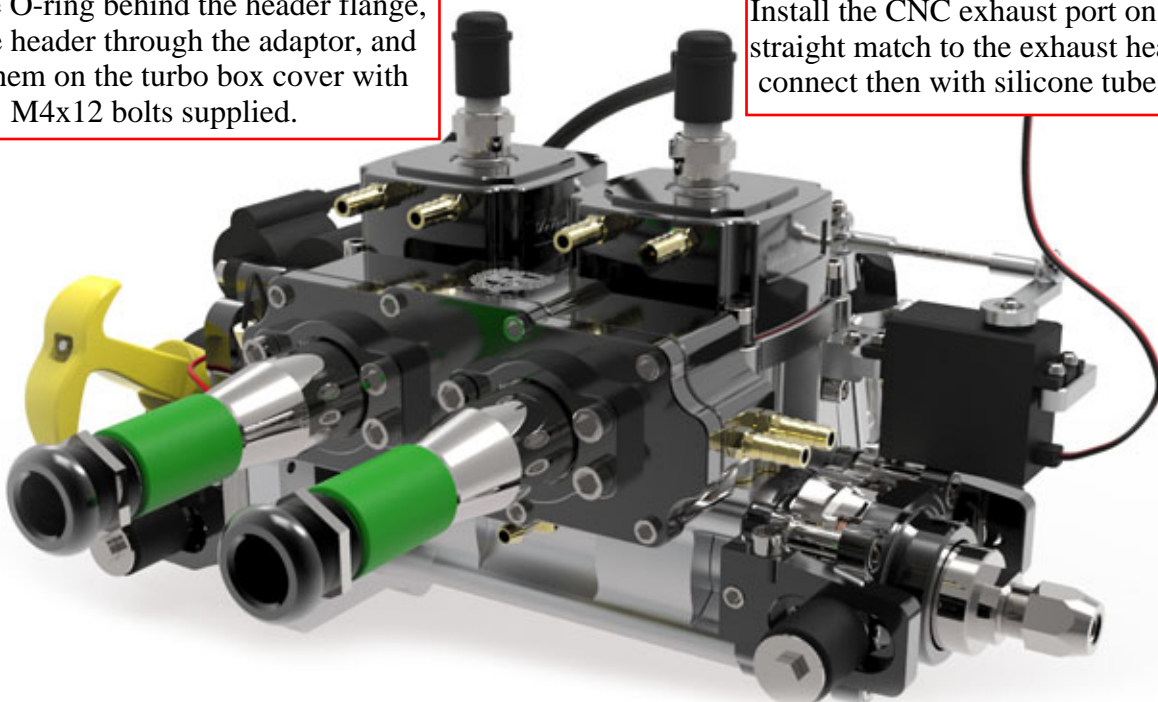
Match the turbo box cover along with silicone gasket onto turbo box base, and secure it with supplied eight M3x12 bolts. All bolts must be applied with loctite.



Install the O-ring behind the header flange, insert the header through the adaptor, and secure them on the turbo box cover with M4x12 bolts supplied.

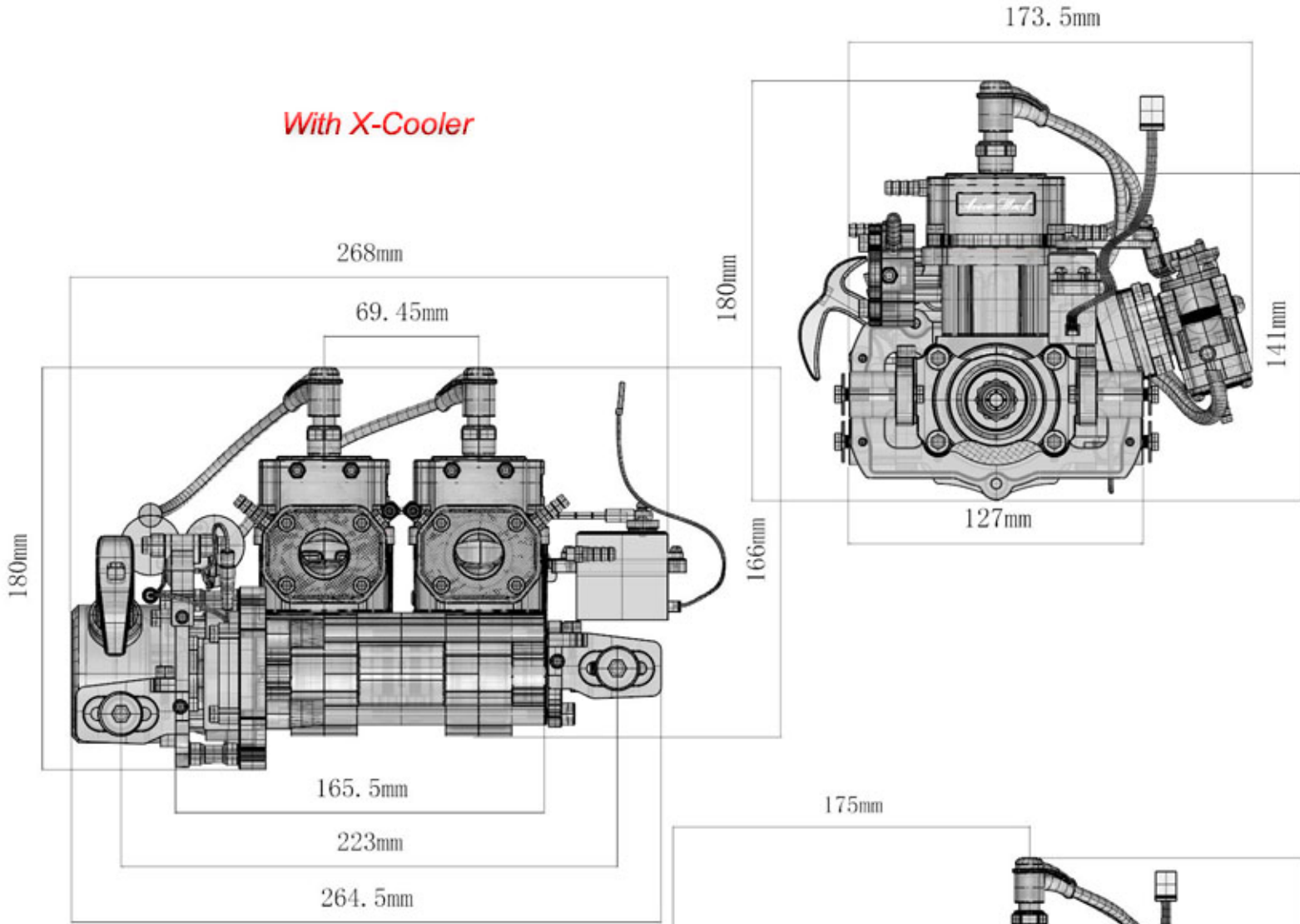


Install the CNC exhaust port on your hull straight match to the exhaust header, then connect them with silicone tube supplied.

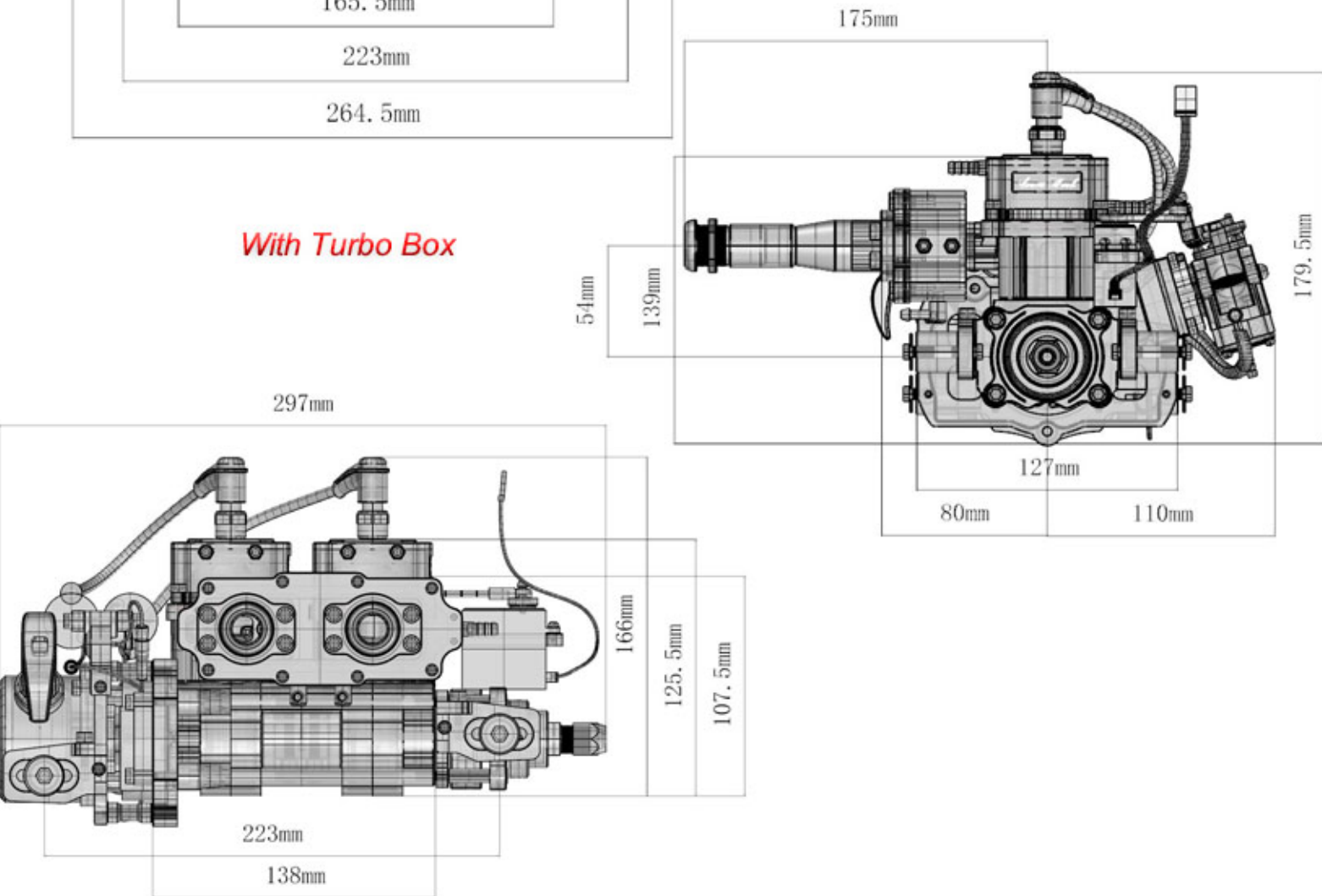


Dimension Guide

With X-Cooler



With Turbo Box



Specification of X-60

Six Transfer Ports Cylinderx2
Billet Twin Inline Reed Crankcase
Inline 1mm+ Full-Circle Crankshaft
Billet Reed Valve & Carbon Fiber Petals x2
CG position Changeable Billet Mount V2
Triple Seals Billet Water Jacket x2
Modified M-39X Carburetor x2
X-Cooler Water-Cooled Flange x2
15KG Metal Gear Throttle Servo
Heavy Duty Pull Starter

Bore & Stroke: 36mm by 29mm
Capacity: 59c

Weight: 4000 grams (With Engine Mount & Shaft Collet)
Weight: 4680 grams (With Engine Mount & Clutch)

Regarding Horse Power

For the development of X-30 and X-60 marine engine, the horse power was not the priority factor of our consideration, as these two version engine were not planned to make for racing, they were designed to work with our 2020 large scale carbon fiber RC boat line, and most of our RC boat packages equip with billet scale drives and related hardware which considering as heavy setting package compare to the race boat set up, so it more likely better suit for the leisure run rather than competition racing.

At most of the time, the horse power specification is just for the reference purpose, a well performance boat is not depending on a single super high horse power engine, it is a precisely calculating combination set up with countless time spending on the testing until getting the result of satisfactions, therefore, we will not risk to sacrifice the stability of the engine performance for getting slightly more horse power, we would prefer to focus on the user-friendly functional design of these engines and setting up each of our boat packages correctly.

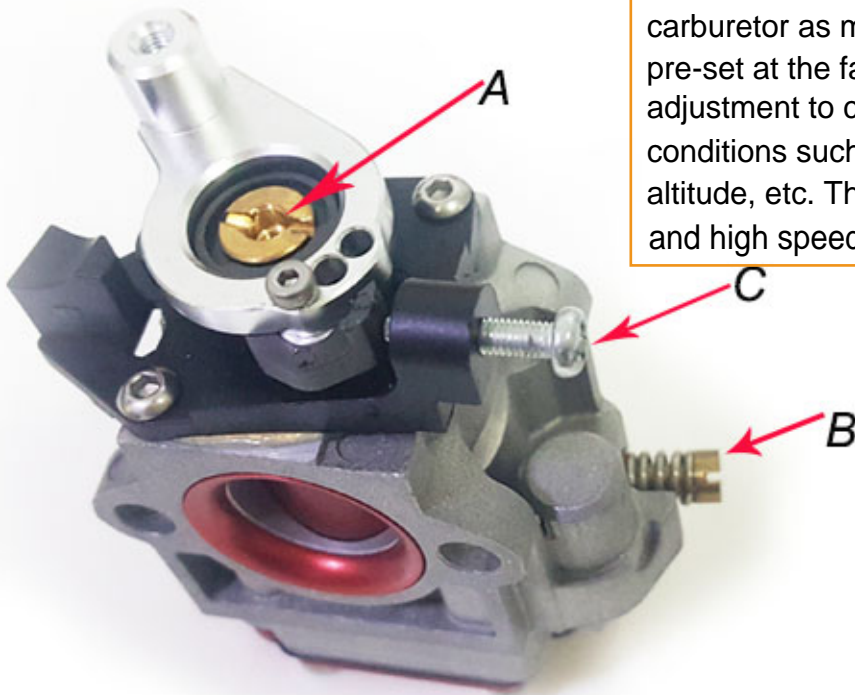
However, the current version of the X-30 and X-60 that we manufactured considering as a “stock” Version engine, it still have a big room left for the experts to reform it and make it becoming a real racing monster.

Thank you for choosing the Arrow Shark X-60 Marine Engine, If this is your first purchase from Arrow Shark, welcome to our “family”. There are countless enthusiasts around the world enjoying the fun and excitement of our boats, engines and scale drives, and we sincerely hope that you will soon happily feel to be part of this. We also hope you will obtain many hours of enjoyment and satisfaction, as well as pride of ownership, from your new engine and any other new products from our 2020 new releasing.

M-39X Carburetor Setting

Needle Setting

The X-60 comes with a Arrow Shark M-39X Pro-Mod carburetor as mentioned above, and the carb has been pre-set at the factory. However, it may require little adjustment to compensate for different ambient conditions such as varying temperature, humidity, altitude, etc. The carb has three adjustments - the low and high speed needles and the idle screw.



A: The Low-Speed Needle: The low speed needle of the M-39x carburetor is hidden in the center of the carburetor barrel. You need to use a small precision flat blade screwdriver to adjust it. When adjusting the Low-Speed Needle, apply Loctite#222 on the needle thread in order to hold the needle in position during operation.

The Low-Speed Needle is set at 7 turns out from fully closed (or fully screwed in).

B: High-Speed Needle: The High-Speed Needle is set approximately 2 turns out from fully closed.

C: Idle Screw: Set this at the lowest RPM where the engine idles reliable without stopping. Screwing the idle screw in will make your engine rev faster.

Setting Your Throttle Servo

You will need to adjust the radio settings for your throttle servo. This needs to be set so that the engine idles smoothly when your radio transmitter trigger (or other throttle control if not a wheel/trigger transmitter) is at its neutral position. You may need to adjust the throttle pushrod linkage and/or use your throttle trim to adjust the idle speed up or down to get a reliable idle. When your trigger is pulled fully open for high speed, the servo movement should have the engine's throttle barrel fully open. You may need to adjust your pushrod linkage and/or the servo's travel so that the throttle barrel is fully open with the trigger pulled all the way, but the servo should not stall by trying to force the barrel further than it will go. Finally, the servo should be adjusted so that it fully closes the barrel and stops the engine when you push the trigger (or apply the "brake" in RC car terms).

Your radio should also be equipped with a "Fail Safe" system which closes the throttle in the event of radio failure or loss of signal. If this is not an integral facility within your radio, you will need to fit a separate Fail Safe – these are readily available from good hobby stores. Follow the radio or Fail Safe instructions and set it so that the M-39X barrel is fully closed when your transmitter is turned off.

M-39X Adjustment Tips

When adjusting the needles from their standard settings, move them only 1/8 of a turn a time. Check the results then adjust further as needed. Never attempt to tune the high-speed needle by running the engine at full throttle out of the water! This is very dangerous and damages the engine. The following tips may assist in setting your M-39X Carburetor for optimum engine performance.

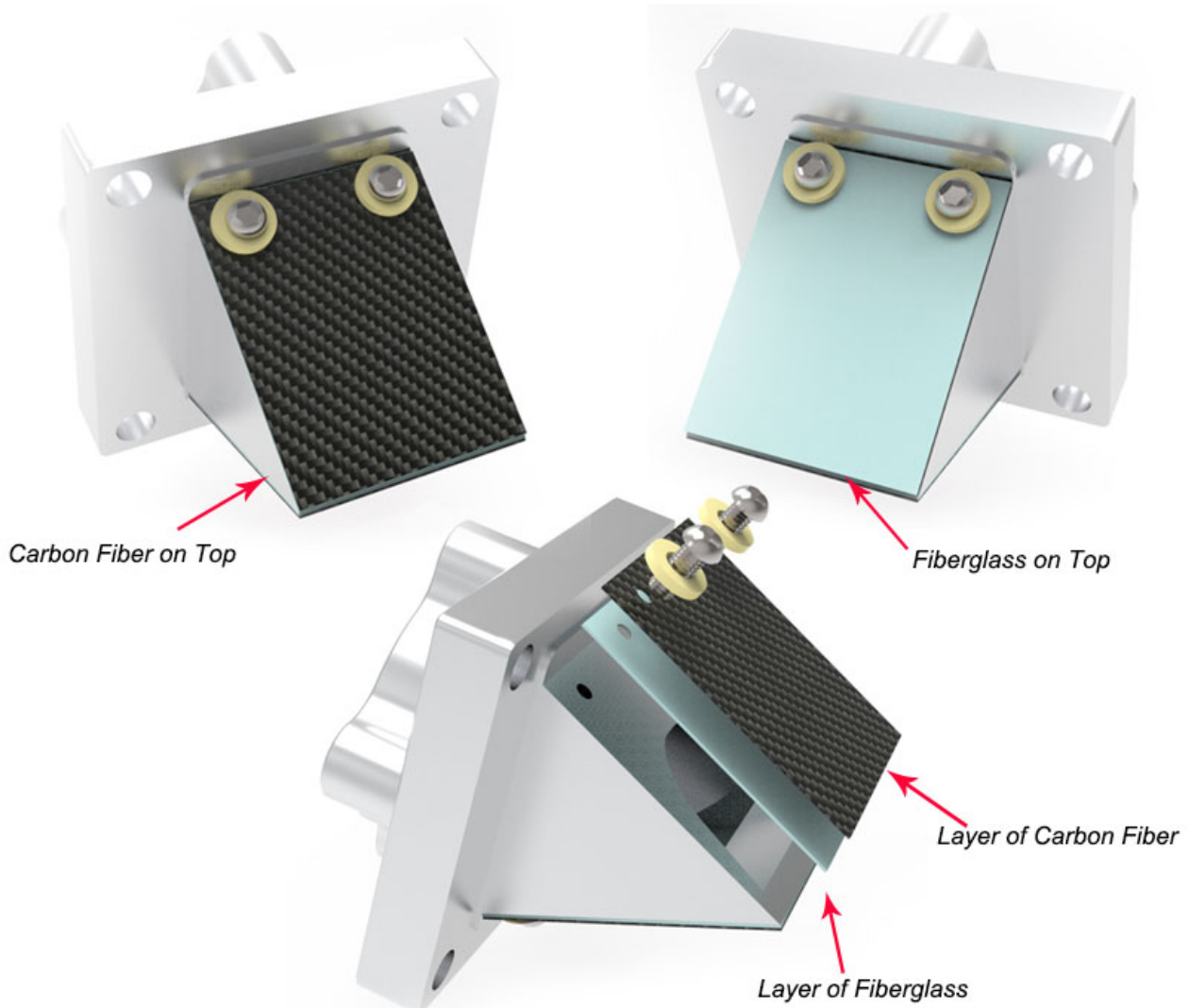
A: Low-Speed Needle

If the engine is easy to start, and idles a little rough (rich), and responds well when you open the throttle with a brief show of smoke through the exhaust, then the low speed needle is close to being correct. If the engine tends to hesitate or bog down when you open the throttle quickly (especially when the engine is cold), or if the idle speed is too high even with the throttle barrel nearly closed, the low speed needle is probably too lean and you need to screw it out (1/8 of a turn at a time). If the engine floods easily and is hard to start, the low speed needle is probably set too rich and you need to screw it in slightly.

B: High-Speed Needle

When this needle is correctly set, the engine will run cleanly, accelerate well from half throttle without hesitation, and will not lose RPMs during turns. It is tempting to lean the high speed needle to optimize the mixture for peak power and on-water RPM, but going too lean can be risky as the engine will suffer from overheating and reduced lubrication. This can lead to damage or shorter life for your engine. If the engine stops or loses RPMs when your boat is running on the water, the high speed needle is probably set too lean and you need to screw it out slightly. If the engine is not running cleanly and seems to hesitate or not reach peak RPMs, then the high speed needle is probably set too rich and you need to screw it in slightly. Running with a slightly rich mixture may cause a small drop in top speed, but it will allow your engine to run cooler and with good lubrication for reliability and long life.

Carbon Fiber Petals Installation



The reed valve petals in X-60 was custom compounded by high quality carbon fiber and fiberglass sheet in order to achieve optimum flapping tension control for the long lasting performance, the both side of the petal can be installed for the operation, when fiberglass side is damaged, just simply flip it over and use carbon fiber side till both sides damage, then replace a new one.

Starting X-60

Note: Before starting your engine, make sure that it is securely mounted in your boat with appropriate fuel and exhaust systems. Read through all the following instructions before starting. If your radio is installed and your throttle servo linked to the engine, ensure that the carburetor controls operate as explained in the “Carb Settings” section. If the engine is connected to your flex shaft drive and propeller, check that they are properly aligned and that due care is taken to keep everything well clear of the prop. Remember that the prop is very sharp, and also that the engine and exhaust will get quite hot when running. Do not run the engine for more than a minute without a supply of cooling water, and never run the engine at more than low revs with the boat out of the water.

The X-60 comes with a Pro-Mod -39X racing carburetor which does not have a primer bulb, choke or return gas line like the more common WT644 or WT711 carbies that are usually fitted to stock Zenoah or CY engines. The M-39X carb gives ultimate performance but does require a different starting procedure. Having prepared your engine and boat in the usual way (with full regard to all safety aspects), and having filled your fuel tank, follow these steps for easy starting:

- * We recommend to start one cylinder first, so, leave the other cylinder without spark plug installed in order to reduce the compression for easier starting with pull starter.
- * Manually choke the engine by blocking the carb intake venturi with your thumb or finger and slowly pull the starter rope a few times. The M-39X venturi is much larger than other carbies, so you may need to wear a glove for your thumb or finger to fully seal the venturi for effective choking of the engine.
- * Check that fuel is being sucked along the gas line up to the carb; continue slowly pulling the starter rope until the gas line is clear or bubbles and you can feel fuel wetting your thumb or finger.
- * Remove your thumb or finger from the carb and open the throttle a bit less than half way.
- * Slowly pull the starter rope one more time to check the engine is not flooded (see below).
- * Smartly pull the starter rope in the usual way until the engine starts.
- * Bring the throttle back to a steady idle - DO NOT allow the engine to over-rev as this can cause damage.

If too much fuel is sucked into the engine as you choke it, the engine will be flooded and will not start. It may be harder to pull over on the starter as the excess fuel increases compression. If this happens:

1. Remove the spark plug and carefully wipe dry the electrodes with a clean rag before setting the plug safely aside.
2. Hold the clean rag just above the plug hole and pull the starter rope smartly a few times to clear the excess fuel.
3. Re-install the spark plug and open the throttle a bit less than half way.
4. Slowly pull the starter rope to check that compression is back to normal.
5. Smartly pull the starter rope in the usual way until the engine starts.
6. Bring the throttle back to a steady idle.

For “hot re-starts” you may not need to choke the engine. Check that the fuel line is full of gas without any bubbles and smartly pull the starter rope. If the engine doesn’t start after a few pulls, then manually choke the engine as above and slowly pull the starter rope until you can feel fuel wetting your thumb or finger before removing it from the carb venturi. Slowly pull the starter one more time to check the engine is clear, and then pull smartly until the engine starts.

After the first cylinder is started, let it run for 30 seconds to warm up the engine, then, stop the engine by click on the built-in kill switch on the engine, and install the spark plug into second cylinder and pull the starter cord to start the both cylinder at once.

Breaking-in X-60

To ensure long life and good performance from your engine, you MUST break it in properly. To obtain the optimum fuel for your engine, mix 87 or 90 Octane regular pump gas with 100% Synthetic Quality oil at a ratio of 16:1 (6% oil). Another choice for oil is quality marine outboard engine oil. Operate your engine at about 1/2 to 3/4 maximum throttle opening during the break-in process. DO NOT run at full throttle while breaking in your engine. Patience is very important here; the boat will run more slowly during the break-in process and the engine's output power will increase gradually over the first 3-4 tanks of fuel. Once the engine is broken in, the power will increase substantially.

X-60 Care and Maintenance

A: Keep your engine clean. Spray it with WD40 or a similar product after each outing and wipe it clean to prevent corrosion and to avoid any build-up of dirt that might enter the engine and cause wear or overheating.

B: Do not allow your engine to run with too lean a fuel mixture – this causes overheating and rapid wear or even damage.

C: Do not run your engine with a damaged or unbalanced prop; this causes vibration and can damage your engine or cause other problems including with your radio equipment.

D: Do not overheat the engine. Frequently check that cooling water is flowing from the outlets in your hull and never allow your engine to run for more than a minute or so at idle without water flowing through the cylinder jacket and exhaust cooling fittings.

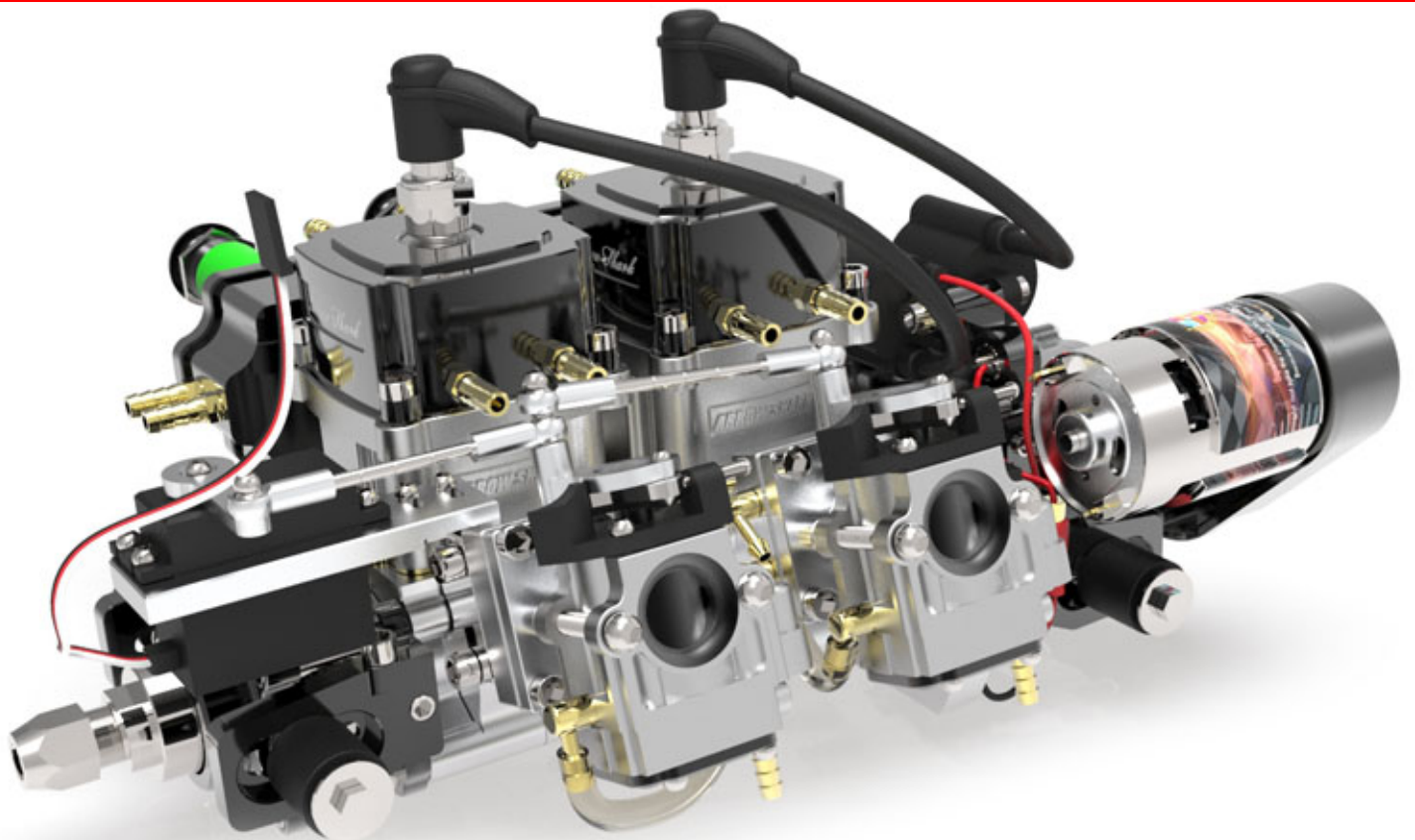
E: Avoid using old fuel in the engine. Always run all of the fuel out of the engine. After running for the day, use after-run oil and work it into the engine by pulling the starter 2-3 times. If you run your boat in salt water, flush the cooling system afterwards with fresh water for several minutes. Drain all water from the cooling system.

F: Store your engine somewhere that is not subject to extreme temperature change.

G: If you are not planning to run your engine for more than a month, drain the fuel tank and remove any fuel from inside the carburetor by running the engine at idle until it stops by running out of fuel. Keeping gasoline inside the carburetor over an extended period of time will damage the diaphragm valve and clog passages inside the carburetor.

TS760-Marine Starter & X-60

We also offer onboard electric starter-TS760-Marine as optional product for X-60 marine engine to be easily started by just single click from the third channel switch of your transmitter, for more information regarding the TS760-Marine onboard electric starter, please visit our website by simply click the pictures below.



There is no Best, only Better!



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