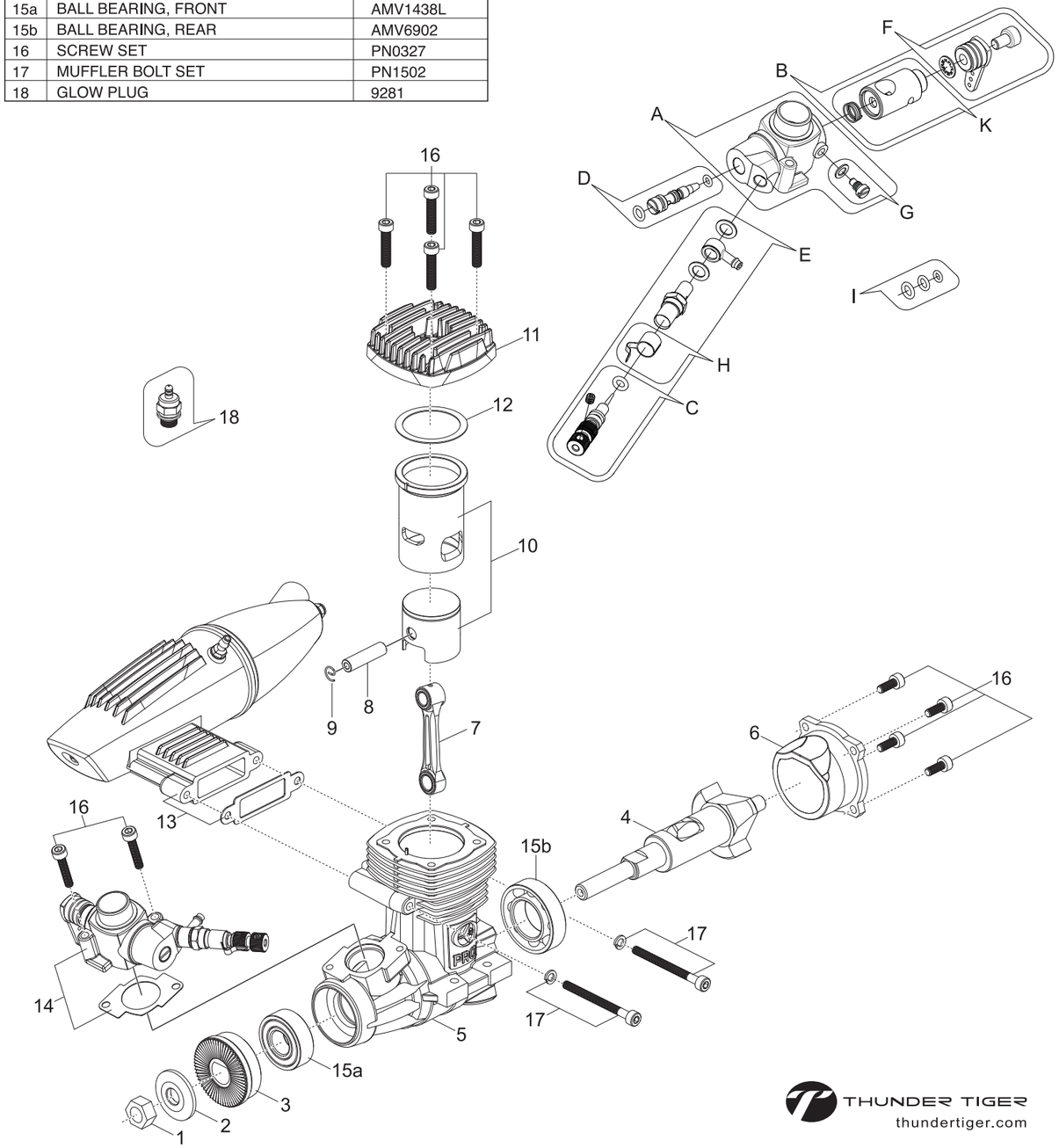
PARTS LIST / ENGINE

	Description	No.
1	PROP NUT	AA0025B
2	PROP WASHER	AA0026B
3	DRIVE WASHER SET	AA2375
4	CRANKSHAFT	AA2378
5	CRANKCASE	AN2377
6	BACKPLATE	AN2365
7	CONNECTING ROD	AN0325
8	WRIST PIN ASSEMBLY	AA0337
9	CIRCLIP	AA0327
10	CYLINDER&PISTON	AN0338
11	CYLINDER HEAD	AA2376
12	GASKET SET	PN0022
13	MUFFLER ASSEMBLY	9705
14	CARBURETOR ASSEMBLY	9720
15a	BALL BEARING, FRONT	AMV1438L
15b	BALL BEARING, REAR	AMV6902
16	SCREW SET	PN0327
17	MUFFLER BOLT SET	PN1502
18	GLOW PLUG	9281

PARTS LIST / CARBURETOR

	Description	No.
A	CARBURETOR BODY	PN1376
B	CARB.ROTOR ASSY	PN1377
C	NEEDLE VALVE ONLY	PN1029
D	SPRAY BAR ASSEMBLY	PN1378
E	NEEDLE VALVE ASSY.	PN1171
F	THROTTLE LEVER	PN1353
G	BOLT & SET	AA1108
H	RATCHET SPRING	AA1025B
I	O RING SET	PN1379
K	THROTTLE ROTOR SET	PN1380

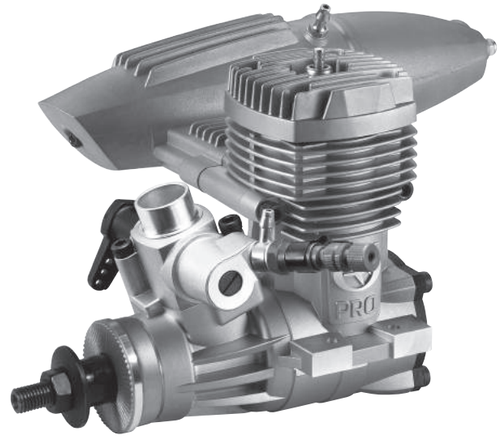


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JA0545

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ENGINE INSTRUCTIONS



NEW PRO-46 / 9143 SHOWN

INTRODUCTION

Congratulations on your purchase of a Thunder Tiger model engine. All Thunder Tiger engines have been designed to combine high performancewith easy handling and maintenance using CAD computer technology. Major components of the engines are machined from the highest quality materials using state-of-the-art CNC manufacturing techniques, resulting in consistent high quality and reliability.
The PRO series engines are equipped with dual ball bearings, Schnuerle porting, a special ABN type piston and cylinder sleeve, and automatic mixture control carburetors with safe angular needle valve. The engines have been designed for both beginners and experienced flyers.

FEATURES

1. Balancing Heat-Spreading design enhances cooling
2. Non-seizing flange mount carburetor
3. Steel inserted lightweight composite backplate
4. New crankcase for casting quality and structural strength
5. Thunder Tiger's swept back needle valve design for safety
6. Mixture screw and HS needle valve adjustment at same side
7. High performance streamlined muffler
8. Knife Edged 7075 Aluminum connecting rod
9. High silicon CNC machined piston
10. XC2 (Extreme Composite Coating) cylinder

CONTENT

There are 5 main content in the box
1. Engine x1
2. Carburetor and 2 mounting bolts
3. Muffler x1
4. REDLINE R2 glow plug x1
5. Allen wrench x2 pcs (1.5mm & 2.5mm)

IMPORTANT

This engine will provide you with years of safe use, provided that you carefully follow these safety instructions:
- This model engine IS NOT A TOY, but a powerful miniature engine that is capable of inflicting damage to both people and property if misused.
- Always mount the engine securely in a test stand or high-quality engine mount. Never, ever attempt to clamp your engine in a vise!
- Keep all spectators at least 20 feet away when operating your engine.
- Make sure that you use the correct propeller for your engine. See chart.
- Make sure that the propeller nut is securely fastened prior to each flight.
- Keep your body away from the path of the propeller when running your engine.
- Keep your hands away from the propeller, by using a "chicken stick" or electric starter to start your engine.
- Make all carburetor adjustments from behind the propeller.
- Never use your hands or any other part of your body to stop the propeller. Do not throw any object into the propeller to stop the engine. Stop the engine by removing the fuel line, pinching the fuel line closed or closing the throttle barrel completely.
- Never use a propeller that is cracked, nicked or damaged in any way.
- It is recommended that you wear safety glasses when operating any model engine.
- Do not run your engine around dirt, sand or loose gravel. Such material can be thrown into your eyes by the propeller, as well as damaging the engine if drawn into the carburetor.
- Take care to keep all loose clothing rags, tools etc. away from the propeller.
- Keep all fuel lines, glow clips, starter cords, etc. away from the propeller.
- Take care when handling your engine after it's been running as model engines get very hot during operation!
- Always operate your engine with proper ventilation. Model engines produce harmful fumes when run in a closed room or confined area.

SPECIFICATIONS

Engine	Item No.	Displacement (cc/cu.in)	Bore (mm/in)	Stroke (mm/in)	Practical RPM	OUTPUT (BHP/RPM)	Weight (w/muffler) (g/oz.)
NEW PRO-46	9143	7.47 / 0.456	21.8 / 0.858	20 / 0.787	2,000~17,000	1.60 / 16,000	464.5 / 16.38

NECESSARY ACCESSORIES

The following items are necessary for operating the engine, and are available at your local hobby dealer.

■Fuel
A good quality, commercially available fuel containing 25% lubricant and 75% methanol is
recommended for break-in/run-in and general use. We also recommend castor oil or a castor/ synthetic blend only for use as a lubricant. Fuel containing 5%-15% nitromethane and 20% lubricant is for use when more power is required. Most fuels containing synthetic lubricants (only) are much less tolerant of a lean run compared to fuel that contains castor oil. If availability or local conditions force you to use a fuel that contains only synthetic lubricant, we suggest that you keep the needle valve set to a slightly richer setting, allowing more lubricant to flow through the engine in order to extend engine life and maintain optimum reliability. Do not use fuel containing less than 20% lubricant.

■Glow Plug
The type and quality of glow plug used in your engine will have a major impact on overall performance and reliability. Thunder Tiger .10-.61 size engines operate best with a "hot"long-type plug such as K&B or O.S. No. 8.



■Glow Starter
The power source for heating the glow plug during starting the engine (1.2-1.5V).



■Plug Wrench
Used for tightening the glow plug and also fits the propeller nut. A Thunder Tiger 4-way wrench is preferred.



■Fuel Pump or Bottle
Required to transfer fuel into the fuel tank in your model. A Thunder Tiger hand-crank pump or an electric pump are available at your hobby dealer.

■Chicken Stick/Safety Stick
Used to flip the propeller for starting the engine by hand.



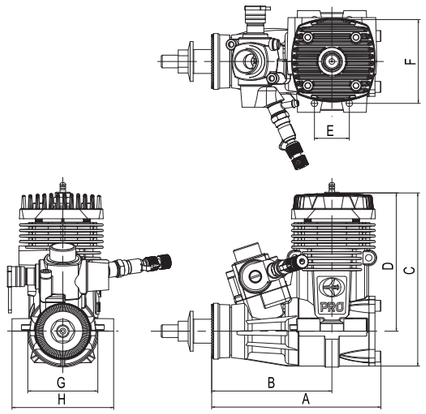
■Electric Starter with Starter Battery
Most engines can be started quickly with an electric starter. However, you will find Thunder Tiger PRO series engines are easy to start by hand using a chicken stick.

■Propeller
Suggested propeller sizes are shown in a chart earlier in this manual, with allowances for different types of aircraft and performance goals. Keep in mind that factors such as aircraft size, weight, style and type of flying will all affect your choice of propellers. After break-in, select the optimum propeller size by practical flying to determine what propeller size is best suited for your airplane/engine combination.
Don't use propellers with defective or chipped blades. Wood propellers are preferred, because some nylon propellers are not strong enough to withstand the R.P.M levels achieved by high-revving, ABN type engines. A blade thrown from a propeller can be a lethal projectile.

■Fuel Tank
Choose the proper tank to fit your model. A series of new Thunder Tiger fuel tanks are available at your hobby dealer.

INSTALLATION

Mount your engine securely to rigid hardwood rails (e.g. maple) or a radi-al mount of metal or glass-filled nylon composition. The top surfaces of the motor mount must be absolutely flat and parallel to avoid crankcase distortion and stress. Be sure to use only the highest quality mounting hardware (such as hard-ened steel screws, steel hex nuts, steel lock washers, etc.).
In order to reduce engine noise, flexible motor mounts can also be used, although you should expect a very slight decrease in performance of 100-200 R.P.M. at full throttle.



Engine	A (mm/in)	B (mm/in)	C (mm/in)	D (mm/in)	E (mm/in)	F (mm/in)	G (mm/in)	H (mm/in)	S(thread)
NEW PRO-46	84.9 / 3.34	60.3 / 2.37	86.8 / 3.42	69.3 / 2.73	17.5 / 0.69	42 / 1.65	35.1 / 1.38	51 / 2.01	UNF 1/4-28

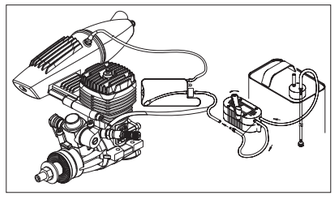
BREAK IN / RUN IN PROCEDURES

Because your Thunder Tiger PRO engine has been precision-made from quality materials and is an ABN (Aluminum Piston, Brass Cylinder with Nickel Coating)-type engine, a prolonged break-in period is not necessary. In fact, after a tank or so on the ground, your engine can be flown to break it in. The break-in period can take place on your model or on a test stand.
Many companies offer good quality, low cost engine test stands, should you choose to bench-run your engine prior to installation in the aircraft. Never use a vise to hold an engine for break-in as this can distort the crankcase and ruin your engine. No matter where the breaking-in is done, you can break-in your engine as follows:

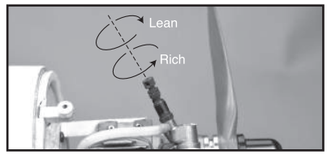
■Fuel Selection
We strongly recommend a fuel containing 20% castor/synthetic blend with no more than 10% nitromethane be used for break-in. We strongly discourage using fuel containing only synthetic lubricants during the initial break-in period. The break-in period can take place on your model or on a test stand.
Caution 1-Methanol and nitromethane are poisonous and highly flammable. Keep out the reach of small children and keep away from heat and open flame.
Caution 2-Excessive heat can greatly reduce the life of your engine. Most of the heat generated by combustion is removed via the lubricants that are contained in your fuel and exits the engine as exhaust vapor. As a precaution, you should periodically remove the muffler from your engine and visually inspect the exhaust port and piston. If the outer surface of the piston is stained a very dark color, it can indicate that your engine may be overheating. This can be caused by either an excessively lean needle setting or a lack of airflow across the cylinder and head.
Caution 3-Enclosed cowlings look great but can harm your engine if not constructed for proper airflow! A general “rule of thumb” is to allow twice the area of air exiting the cowl as entering it (i.e. if your cowl has 4 sq. in. of inlet area, it should have 8 sq. in. of exit area). The above guidelines are particularly critical when using fuels containing only synthetic lubricant.

■Install the Propeller
Refer to the chart included in this manual to determine the proper propeller size for break-in. Install the propeller securely to the engine, connect the fuel lines, and fill the fuel tank.
Install a long reach R/C glow plug in your engine. Refer to the following starting procedures.

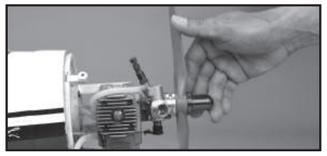
■Filling the Fuel Tank
Disconnect the pressure line from the pressure fitting on the muffler and fuel line from the fuel inlet on the carbure-tor. Connect the fuel line to the tubing from fuel pump to fill the fuel tank until fuel overflows into the pressure line indicating the tank is filled. Re-connect fuel line to fuel inlet and pressure line to pressure fitting. Be sure to not let dirt or dust enter fuel container.



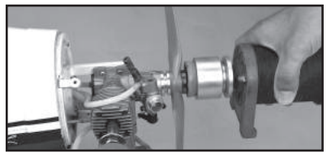
■Pre-Adjust Needle Valve
Turn the needle valve clockwise until you begin to feel resistance. This the fully closed position. Do not force the needle valve or you may damage your carburetor! Now turn the needle valve counter-clockwise about 2 - 2 1/2 turns. This will be a good place to start. (Turn the needle valve clockwise to “close” for leaner mixture, or counter-clockwise to “open” for richer mixture.)



■Choking/Priming Your Engine
Using your radio control system, move the stick to open the throttle to 1/2-3/4. Place your finger over the carburetor opening (without the glow plug battery connected!) and rotate the propeller
2-3 turns or until fuel flows through the fuel line into the carburetor.
The quantity of fuel drawn into the engine by priming is an important factor for starting your engine successfully. It needs more fuel for the first starting and when the engine is cold.



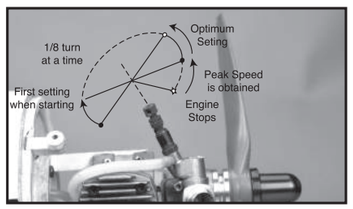
■Heating the Glow Plug
Fit the glo-starter or connect the 1.5 volt ignition battery onto the glow plug. The glow plug is designed to keep the engine running after removing the glo-starter or cutting off the ignition battery. The platinum alloy coil inside the glow plug is heated up with the starter battery current, and remains hot to keep the engine running even after the electric power is cut off.



■Flipping Propeller to Start
Using your radio control system, move the throttle stick so the carburetor barrel is 1/4 to 1/2 open. Flip the propeller to start the engine by using a “chicken-stick” or an electric starter.
The engine should fire after a few flips. When starting the engine, have a helper hold your aircraft to prevent it from moving.
Caution 1-Do not place anything in the path of the propeller.

Caution 2-Practice flipping the propeller quickly without connecting the battery. Quick flipping and adequate priming are important factors for starting your engine successfully.

■Needle Valve Adjustment
After the engine starts, advance the throttle to full open. At this point, the engine should be running very “rich” (i.e. dense smoke coming from the exhaust). Lean (turn clockwise) the needle valve gradually until you hear a noticeable sound due to an increase in R.P.M. Remove the glo-starter from the engine with care so that it does not touch the rotating propeller. The engine should keep running. If it stops, lean the needle valve a little further, and re-start the engine.



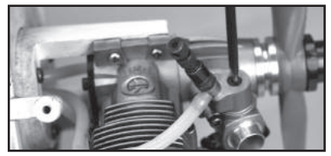
■Stop Your Engine
Cut off the fuel supply to the carburetor by pinching closed the fuel line or disconnecting the fuel line. You may also stop the engine using your radio control system, by going below the idle position with the throttle trim lever on your transmitter.
Caution-Do not use your hands, fingers, or any other parts of your body, or throw any object into the propeller to stop the engine. Be careful not to touch the rotating propeller or the hot engine.

“FINE-TUNING” THE CARBURETOR

The carburetor of your engine has been factory set for best running with fuel tank correctly located, it should not be required to adjust anything except the needle valve. Different operating conditions such as your choice of fuel or glow plug and the climate may make these adjust-ments necessary. Large adjustments to the carb should not be required.

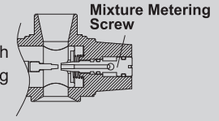
■Needle Valve Adjustment
To obtain optimum needle valve setting AFTER THE ENGINE IS BROKEN IN, have someone hold the airplane and advance the throttle to full open. Slowly lean the needle setting until the R.P.M. slows down, then richen to where the maximum R.P.M. is achieved. At that point, richen the needle setting slightly until you hear a slight (but noticeable) decrease in R.P.M.

■Idle Mixture Adjustment
This is used to adjust the idle and low throttle fuel mixture. Start the engine and adjust the needle valve as above. In order to determine which way to turn this adjustment (if any), you must first determine the present condition of the idle fuel mixture. There are two methods available for determining this.

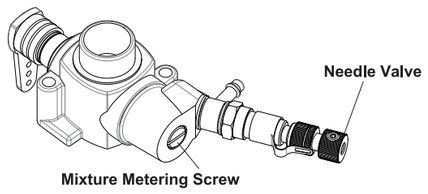


Method A: Close the throttle to the lowest position where the engine continues to run. Disconnect the fuel tubing from the carburetor and observe carefully what happens. If the engine speeds up before quitting, then the idle mixture is too rich. If the engine speed decreases and then quits, then the idle mixture is too lean.
Method B: Close the throttle setting below the stable idle position. When the engine starts to run unevenly, open the throttle all the way.
If the engine hesitates before picking up speed, then the idle mixture is too rich. If this is difficult to observe, then allow the engine to idle slightly longer before opening the throttle. If the idle mixture is too rich, there will be plenty of smoke and unburnt fuel from the exhaust.
If the idle mixture is too lean, the engine will stop abruptly when the throttle is opened.
If you have determined that the idle mixture is too rich, then turn the Mixture Metering Screw about 30˚ clockwise. If it is too lean, then turn the adjustment 30˚ counter clockwise. Repeat the test again. If necessary, adjust the idle mixture another 30˚ Never go more than 30˚ at a time. Never go more than one full turn total. If your engine cannot be adjusted within this range, then you may have other problems.

Note
Adjust the screw to make the head is flush with the carburetor body. This is the factory setting position.



CARBURETOR ADJUSTMENTS



The carburetor installed on RL engine is specially designed for the high performance RL helicopter engine and provide the proper air-fuel mixture automatically for helicopter flying at any throttle operating range.

Since the carburetor has been pre-set at the factory, large adjustments of this carburetor should not be required. However, under different operating conditions, minor re-adjustments may be required. These conditions include set-up of the helicopter, glow plug used, and weather conditions.

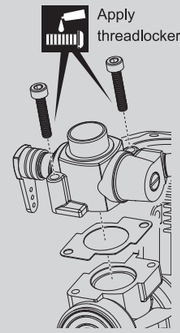
WARRANTY

Your engine is guaranteed to the original purchaser to be free from defects in materials and workmanship for a period of 3 years from the date of purchase when returned for service accompanied by proof of purchase (register receipt, credit card invoice, etc.). Crash damage or problems caused by improper use are specifically not covered under this warranty. Damage caused by customer disassembly, use of improper or substandard fuel, use of improper accessories (such as propellers, glow plugs, etc.) or any use of the product other than its specific intended use will automatically void this warranty.

ENGINE CARE

Always keep the outside of your engine clean. Use clean, fresh fuel and keep your fuel can, pump, and fueling system free from dirt particles. Install a fresh fuel filter between the fuel tank and carburetor, and between your fuel pump and filling line to prevent any potential of dirt entering your engine.
Model fuel contains alcohol, which is hydroscopic (meaning that it attracts moisture from the atmosphere). This can cause corrosion to the internal engine parts. After each flying session, run all the fuel out from inside the engine by disconnecting the fuel line from the carburetor. If you will not be using your engine for a while, put 4 or 5 drops of after-run oil (Marvel Mystery Oil, Prather, Pacer, etc.) into the carburetor and glow plug hole, wrap your engine in a soft cloth and store in a sealed plastic bag.
Do not dismantle your engine unnecessarily, as this may upset precision fits such as piston/cylinder and crank pin/connecting rod assembly. If it is necessary to clean your engine completely (such as after a crash), remove only the carb (do not disassemble), muffler, backplate, and cylinder head. Flush the entire engine with fresh fuel and reassemble. Apply after-run oil
to the engine and store or re-install the model. Do not disassemble your engine further than described above, or your warranty may be voided!

⚠ NOTE:
1. Apply proper threadlock on the thread of the bolts.
2. Gradually tighten the both bolts evenly.
3. Rotate the throttle from closed to fully open, it should be rotated smoothly. If not, please lossen the bolts and repeat step 2.



SERVICE PROCEDURES

Should your Thunder Tiger engine require service, please follow the following guidelines:
1 Do not return the engine to the place of purchase, as they are not authorized or equipped to perform service.
2 Remove the engine from the model. We cannot accept equipment for service other than the engine.
3 Along with your engine and proof of purchase, enclose a complete written explanation detailing the problem(s) with your engine. Be sure to include your name, address and daytime telephone number. BE SURE TO INCLUDE YOUR PROOF OF PURCHASE!!
4 For repairs not covered under warranty, the charges will be billed to you C.O.D. Please mention if you wish to have an estimate of non-warranty repair charges prior to us beginning service. (This may cause a slight delay in your repair.)
5 For customers outside of the U.S. and Canada, contact the authorized Thunder Tiger agent in your country.
6 For U.S. and Canadian customers, send your engine via insured mail or U.P.S. to