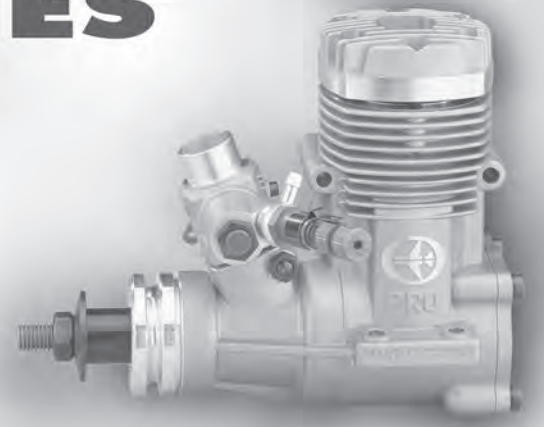
THUNDER TIGER CORPORATION http://www.thundertiger.com

JA0380.V3

PRO engine instructions

SERIES



PRO engine SERIES



No.9130 PRO-36



No.9140 PRO-40



No.9141 PRO-46



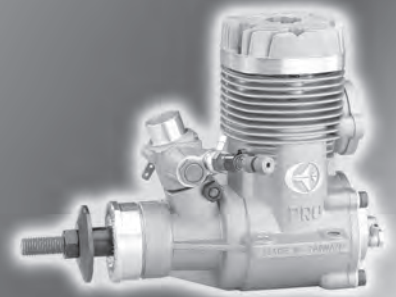
No.9160 PRO-61



No.9190 PRO-91



No.9195 PRO-120



No.9196 PRO-120RP

An Introduction to PRO Engines

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.

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)	Crankshaft Thread	Practical RPM	OUTPUT (BHP/RPM)	Weight (w/muffler) (g/oz.)
PRO-36	9130	5.98 / 0.365	20.8 / 0.819	17.6 / 0.693	UNF 1/4-28	2,000~17,000	1.1 / 16,000	313.6 / 11.06
PRO-40	9140	6.52 / 0.398	20.9 / 0.823	19.0 / 0.748	UNF 1/4-28	2,000~17,000	1.30 / 16,000	454.5 / 16.03
PRO-46	9141	7.47 / 0.456	21.8 / 0.858	20.0 / 0.787	UNF 1/4-28	2,000~17,000	1.60 / 16,000	448.5 / 15.82
PRO-61	9160	9.98 / 0.609	23.5 / 0.925	23.0 / 0.906	UNF 5/16-24	2,000~17,000	1.85 / 16,000	758.4 / 26.75
PRO-91	9190	14.96 / 0.913	28.0 / 1.102	24.3 / 0.957	UNF 5/16-24	2,000~16,000	2.75 / 15,000	(*1)562.0 / 19.83
PRO-120	9195	20.76 / 1.267	31.0 / 1.220	27.5 / 1.083	UNF 5/16-24	1,800~15,000	3.2 / 14,000	975.0 / 34.49
PRO-120RP	9196	20.76 / 1.267	31.0 / 1.220	27.5 / 1.083	UNF 5/16-24	1,800~15,000	3.5 / 14,000	(*1)780 / 27.51

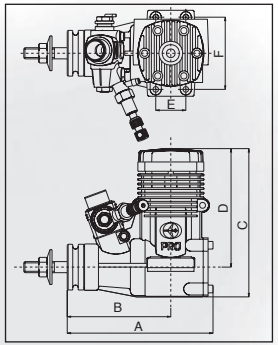
(*1)wo/muffler

Installation

■Engine

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.

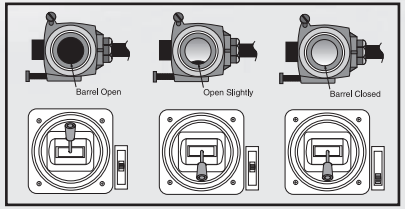


■Dimensions

Engine	A (mm/in)	B (mm/in)	C(mm/in)	D(mm/in)	E(mm/in)	F (mm/in)
PRO-36	74.5 / 2.93	53.0 / 2.09	75.3 / 2.96	59.5 / 2.34	15.0 / 0.59	38.0 / 1.49
PRO-40	84.9 / 3.34	60.3 / 2.37	86.3 / 3.39	69.0 / 2.72	17.5 / 0.69	42.0 / 1.65
PRO-46	84.9 / 3.34	60.3 / 2.37	87 / 3.43	69.7 / 2.74	17.5 / 0.69	42.0 / 1.65
PRO-61	94.9 / 3.72	67.0 / 2.64	104.8 / 4.13	83.0 / 3.27	25.0 / 0.98	52.0 / 2.05
PRO-91	94.9 / 3.72	67.0 / 2.64	105.6 / 4.16	83.8 / 3.3	25.0 / 0.98	52.0 / 2.05
PRO-120	106.2 / 4.18	74.4 / 2.93	117.5 / 4.63	93.0 / 3.66	30.0 / 1.18	59.0 / 2.32
PRO-120-RP	117.2 / 4.61	74.4 / 2.93	117.5 / 4.63	93.0 /3.66	30.0 / 1.18	59.0 / 2.32

■Radio Set-Up

Set-up your throttle servo linkage to the carb throttle arm so it provides the action indicated when the transmitter throttle stick is moved.



■Fuel Tank

The fuel tank should be located as close to the engine as possible. Ideally the centerline of the tank should be level with the carburetor spray bar/needle valve assembly. The design of your particular aircraft will determine actual tank location, but use the above instruction as a guide. Keep in mind that tank location can have a large impact on engine performance. Make sure that your entire fuel tank system is sealed and well constructed to eliminate the possibility of fuel or air leakage. If possible, wrap your fuel tank with high quality foam rubber to reduce fuel foaming due to airframe vibration.

■Muffler/Silencer

After the engine is mounted onto your model, secure the muffler to the engine with the supplied bolts and lock washers. Be sure to tighten them firmly. The rear half of the muffler can be rotated to direct the exhaust residue away. Check these two bolts and the long bolt that travels the length of the muffler on a regular basis. Tighten them when necessary.

■Fuel and Pressure Lines

After installing the engine, use knife or razor blade to cut the silicone tube to proper length for use as fuel and pressure lines. Then connect the fuel tank fill line to the carburetor and the fuel tank vent line to the pressure fitting on your muffler. Do not use any other tools to cut

the silicone tube that may cause it to split or crack.

■Glow Plug

Use 4-way wrench to screw the glow plug into your engine and do not over tighten. Be sure to put the glow plug washer between the cylinder head and glow plug to eliminate gas leakage.

■Propeller

Fix the propeller and spinner firmly to the engine. Screw the propeller slowly to the crankshaft of your engine in a clockwise direction until resistance is first felt as the piston nears TDC (Top Dead Center). Turn the propeller so that the blades are set at the 2 and 8 clock positions and use a 4-way wrench to tighten the propeller nut.

Engine	PRO-36	PRO-40	PRO-46	PRO-61	PRO-91	PRO-120	PRO-120-RP
Break-In	10x5	10x6	10x6	11x6	13x8	14x8	14x10
Normal	10x6	10x6	10x7	11x7	13x9	15x8	16x8

Caution-It is extremely important to check the balance of your propeller before attaching it onto your engine. An unbalanced propeller can cause substantial damage to both the aircraft and the engine!

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.

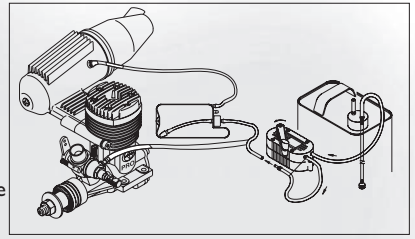
Caution 3-Enclosed cowlings look great but can harm your engine if not constructed for proper airflow! A general "rule of thumb" is to allow twice the area of air exiting the cowl as entering it (i.e. if your cowl has 4 sq. in. of inlet area, it should have 8 sq. in. of exit area). The above guidelines 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.

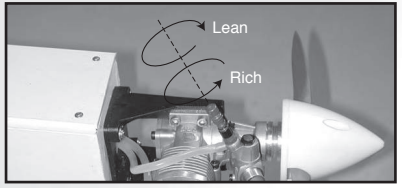
■Filling the Fuel Tank



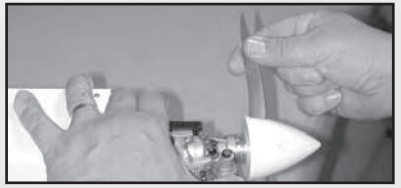
Disconnect the pressure line from the pressure fitting on the muffler and fuel line from the fuel inlet on the carburetor. Connect the fuel line to the tubing from fuel pump to fill the fuel tank until fuel overflows into the pressure line indicating the tank is filled. Re-connect fuel line to fuel inlet 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

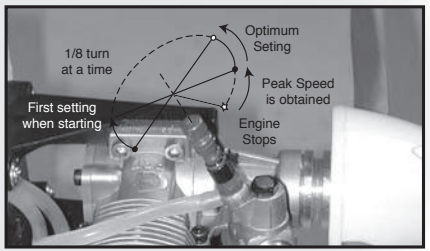
aircraft to prevent it from moving.

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

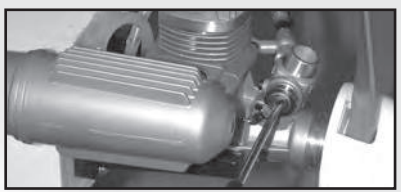
The carburetor of your engine has been factory set for best running with fuel tank correctly located, it should not be required to adjust anything except the needle valve. Different operating conditions such as your choice of fuel or glow plug and the climate may make these adjustments necessary. Large 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. It is located inside the throttle barrel on the right side of the carburetor. 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 idle mixture adjustment 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

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.

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

ACE HOBBY DISTRIBUTORS , INC.
26021 Commercentre Dr. Lake Forest, CA 92630-8853 , U.S.A.

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!

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.