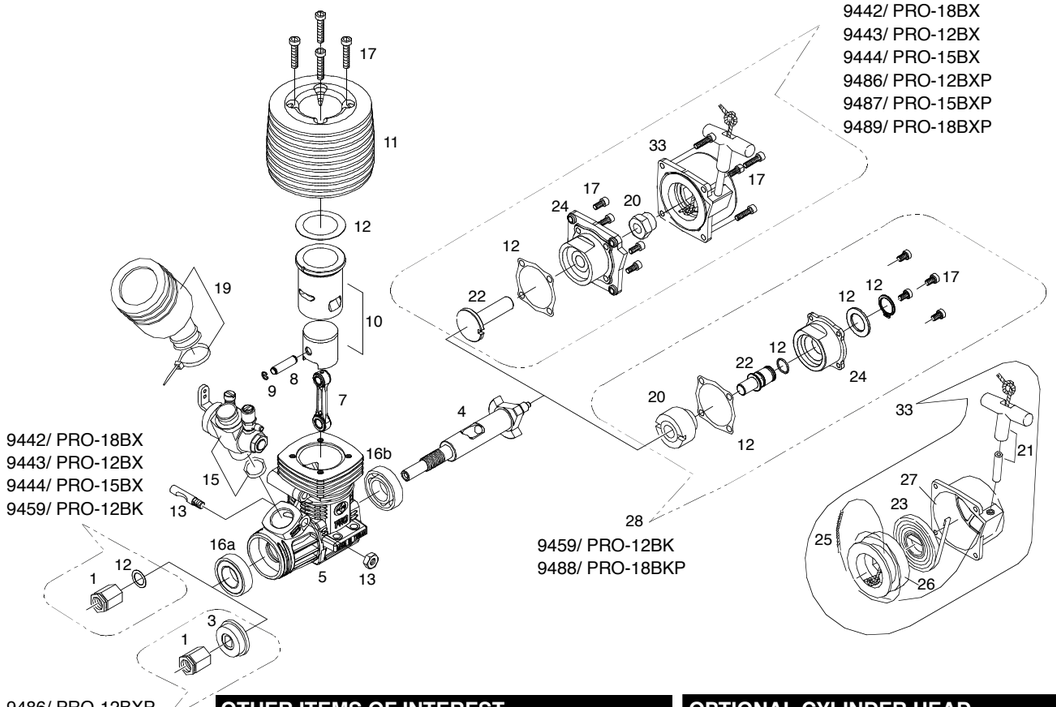
PARTS LIST / ENGINE

No.	DESCRIPTION	9442 PRO-18BX	9443 PRO-12BX	9444 PRO-15BX	9459 PRO-12BK	9486 PRO-12BXP	9487 PRO-15BXP	9488 PRO-18BKP	9489 PRO-18BXP
1	PROP NUT	AA0199B	AA0199B	AA0199B	AA0199B	AA0199B	AA0199B	AA0199B	AA0199B
3	DRIVE WASHER SET	*******	*******	*******	*******	AA0023	AA0023	AA0023	AA0023
4	CRANKSHAFT	AA2024	AA0728	AA0728	AA0728	AA0022	AA0022	AA2176	AA2176
5	CRANKCASE	AN2033	AN2020	AN2029	AN2020	AN2020	AN2029	AN2033	AN2033
7	CONNECTING ROD	AN2025	AN0433	AN0433	AN0433	AN0433	AN0433	AN2025	AN2025
8	WRIST PIN ASSEMBLY	AA2006	AA0134	AA0188	AA0134	AA0134	AA0188	AA2006	AA2006
9	CIRCLIP	AA0722	AA0722	AA0722	AA0722	AA0722	AA0722	AA0722	AA0722
10	CYLINDER&PISTON	AN2030	AN0918	AN0716	AN0918	AN0918	AN0716	AN2030	AN2030
11	CYLINDER HEAD	AA2121-R	AA2124-R	AA2125-R	AA2122	AA2124-R	AA2125-R	AA2121-R	AA2121-R
12	GASKET SET	PN0245	PN0250	PN0248	PN0247	PN0260	PN0261	PN0265	PN0266
13	CARB RETAINING BOLT	PN0188	PN0188	PN0188	PN0188	PN0188	PN0188	PN0188	PN0188
15	CARBURETOR ASSEMBLY	9785	9784	9785	9784	9784	9785	9785	9785
16a	BALL BEARING, FRONT	AMV6800Z	AMV6800Z	AMV6800Z	AMV6800Z	AMV6800Z	AMV6800Z	AMV6800Z	AMV6800Z
16b	BALL BEARING, REAR	AMV6800X	AMV6800X	AMV6800X	AMV6800X	AMV6800X	AMV6800X	AMV6800X	AMV6800X
17	SCREW SET	PN0196	PN0196	PN0196	PN0195	PN0196	PN0196	PN0195	PN0196
19	AIR CLEANER SET	9262	9262	9262	PD1212	9262	9262	9262	9262
20	ONE WAY CLUTCH SET	AN0924	AN0924	AN0924	AN0315	AN0924	AN0924	AN0315	AN0924
21	HANDLE SET	PN0050	PN0050	PN0050	*******	PN0050	PN0050	*******	PN0050
22	STARTING AXLE	AA0923	AA0923	AA0923	AA2017	AA0923	AA0923	AA2017	AA0923
23	STARTING SPRING	AA0735	AA0735	AA0735	*******	AA0735	AA0735	*******	AA0735
24	BACKPLATE	AN0764	AN0764	AN0764	AN2018	AN0764	AN0764	AN2018	AN0764
25	STARTING WHELL WIRE	AA0733	AA0733	AA0733	*******	AA0733	AA0733	*******	AA0733
26	STARTING WHELL	AA0721	AA0721	AA0721	*******	AA0721	AA0721	*******	AA0721
27	STARTING WHELL COVER	AN0720	AN0720	AN0720	*******	AN0720	AN0720	*******	AN0720
28	STARTING SET	*******	*******	*******	PN0267	*******	*******	PN0267	*******
33	STARTING COVER SET	PN0246	PN0246	PN0246	*******	PN0246	PN0246	******	PN0246



OTHER ITEMS OF INTEREST



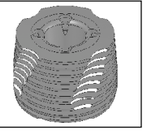
2408 PITMATE STARTER BOX



2409 PRO STARTER BOX

OPTIONAL CYLINDER HEAD

AA2034-R for PRO-18BX
AA2126-R for PRO-12BX/ 12BXP
AA2127-R for PRO-15BX/ 15BXP



THUNDER TIGER CAR ENGINES INSTRUCTIONS



PRO-18BX / 9442 SHOWN

INTRODUCTION

Congratulations on your purchase of a Thunder Tiger model engine. The latest Thunder Tiger PRO-12/ 15/ 18 series car engines have been designed for one tenth scale radio-controlled model cars to combine high performance with easy handing and maintenance using modern 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 consistently high performance and reliability. The PRO series engines are equipped with dual-ball bearings, Schnuerle porting, ABC type piston and cylinder, and automatic mixture control carburetors.

IMPORTANT

Be certain to completely read all of the instructions supplied with your engine, and pay close attention to the **"SAFETY INSTRUCTIONS AND WARNINGS"**.

SPECIAL ATTENTION

When you rotate the crankshaft of your engine by hand, you may find that it becomes rough or "notch" as the piston approaches TDC (Top Dead Center). This is not a defect or manufacturing fault, indeed it is normal for an engine of ABC type construction. When the engine runs, the cylinder actually expands as it heats. The cylinder has been precision machined so that (at optimum operating temperature) the cylinder walls are perfectly aligned with the piston. As the engine cools after a run, you will notice that the tightness will actually return. This is normal and typical of an ABC type engine.

SPECIFICATION

ITEMS	DISPLACEMENT (cc/cu.in.)	BORE (mm/in.)	STROKE (mm/in.)	PRACTIAL R.P.M. RANGE	OUTPUT (BHP/RPM)
PRO12-BK	2.11/ 0.129	13.85/ 0.545	14/ 0.551	3,000-30,000	0.6/ 29,000
PRO12-BX	2.11/ 0.129	13.85/ 0.545	14/ 0.551	3,000-30,000	0.6/ 29,000
PRO12-BXP	2.11/ 0.129	13.85/ 0.545	14/ 0.551	3,000-30,000	0.6/ 29,000
PRO15-BX	2.47/ 0.151	15/ 0.591	14/ 0.551	3,000-30,000	0.7/ 29,000
PRO15-BXP	2.47/ 0.151	15/ 0.591	14/ 0.551	3,000-30,000	0.7/ 29,000
PRO18-BX	2.97/ 0.181	16.2/ 0.638	14.4/ 0.567	3,000-32,000	0.8/ 31,000
PRO18-BKP	2.97/ 0.181	16.2/ 0.638	14.4/ 0.567	3,000-32,000	0.8/ 31,000
PRO18-BXP	2.97/ 0.181	16.2/ 0.638	14.4/ 0.567	3,000-32,000	0.8/ 31,000

LEARNING ABOUT YOUR ENGINE

Before actually operate your engine, the following information is for the benefit of the newcomers with no previous experience of model engines. Please put the engine near you and read this instruction. The model engine is just like the engine of a motorcycle or a car that needs a key to start. You have to prepare some accessories and knowledge. It is not hard to operate your model engine by following the instructions properly.

RECOIL STARTING SYSTEM & SHAFT STARTING SYSTEM

The Thunder Tiger "X" type series engines feature a built-in recoil starting system that eliminates the need for a separate electric starter and battery or a starter box, and allows the engine to be started easily by simply pulling the starter handle.

1) Pull the handle straight away from the starter housing so that it prevents the cord from being damaged by rubbing against the starting wheel cover or car body.
2) Let the cord recoil slowly while still holding the handle. Do not release the handle abruptly.
3) It is recommended to keep the cord away from fuel, as fuel will weaken the cord and cause it to break.
4) The recoil starter system is developed to operate in a counter clockwise direction (when viewed from front of the engine). If you attempt to crank the flywheel or force the engine in the opposite direction, the one-way clutch set will be damaged.
5) The spring in the recoil system is under extreme tension! If it is necessary to dismantle your engine, remove the starting wheel cover set gently to prevent damage or injury.

The Thunder Tiger "K" type series engines feature a built-in hexagonal shaft starting system that can be operated to start the engine as simple as the "X" type series. Please refer to the instruction of your model vehicle for the compatibility of installing the "K" type series engine on your model vehicle.

1) To use the Hex Starting shaft, either a cordless drill or 12V DC handy starter is required.
2) Install the extended 6mm hex starting tool into the cordless drill or a 12V DC starter.
3) BEFORE inserting the Hex Starting shaft into the back start output, squeeze the trigger and verify that the drill is turning the same direction as is shown on the sticker on the back start cover.
4) Attempting to start the motor by using a counter-clockwise direction could damage the pull-start mechanism or possibly the engine internal components. Insert the ball end of the Hex Start shaft into the Dual Start output. Grasp the drill tightly and squeeze the trigger.

NECESSARY ACCESSORIES

The following items are necessary for operating the engine, these are available at you hobby dealer.

FUEL

A good quality, commercially available fuel containing 25% lubricant and 75% methanol is recommended for break-in/run-in and general usage. We also recommend castor oil or a castor/synthetic blend only for use as a lubricant. Fuel containing 10%-30% 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 your needle valve set to a slightly richer setting, allowing more lubricant to flow through your engine to extend engine life and maintain optimum reliability. Do not use fuel containing less than 20% lubricant.

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 great 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 airstream across the cylinder and head.

GLOW PLUG

The type and quality of glow plug used in your engine will have a maior impact on overall performance and reliability. All of the Thunder Tiger engines operate best with a R/C long-type plug such as Thunder Tiger, K&B, or O.S. No.8. Fox plugs (while of excellent quality) have a colder heat range and may cause idle or throttle transition problems in smaller engines. Select the best one by practical tests.



NO.9281
GLOW PLUG

GLOW STARTER

The electric power source for heating the glow plug.



NO.2150/ 2151/ 2152
GLOW STARTER

PLUG WRENCH

Used for tighting or screwing off the glow plug. 4-way type (Thunder Tiger 4-way wrench) is preferred.



NO.1102
PLUG WRENCH

FUEL FILL BOTTLE OR FUEL PUMP

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.



NO.1645
FUEL PUMP

INSTALLATION

ENGINE

Locate your engine onto the engine mount on the chassis. Make sure the gear mesh is smooth without excessive backlash. Set the clearance and secure the engine mounting screw. Both the top and bottom surfaces of the engine mount must be absolutely flat and parallel to avoid crankcase distortion, stress and power loss.

MUFFLER/SILENCER

After the engine is mounted onto your model, secure the muffler to the engine with two screws equipped with your engine. Be sure to tighten them firmly. The rear half of the muffler can be rotated to direct the exhaust residue away.

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.

AIR CLEANER

It prevents damaging dust and dirt from being drawn into the engine through the carburetor. Even minute foreign particles can easily damage the engine and cause unreliable performance. It is necessary to check the filter element periodly and replace it as required.

PREPARATION FOR STARTING YOUR ENGINE

PRE-ADJUST NEEDLE VALVE

Turn the needle valve clockwise until you begin to feel resistance. This is the fully closed position. Do not force the needle valve or you may damage your carburetor! It may be convenient to remember the position of the mark on the end of the needle valve. Now turn the needle valve counter-clockwise about 2 1/2-3 turns. This will be a good place to start. (Turn the needle valve clockwise is to "close" for leaner mixture, while counter-clockwise is to "open" for richer mixture.)

CHOKING/PRIMING YOUR ENGINE

Turn on your control system and shift the throttle full to test. Press fuel pump in your fuel tank twice to prime your engine. The quantity of fuel drawn into the engine by priming is an important factor for starting your engine successfully. It needs more choke for the first starting and when the engine is cold.

HEATING GLOW PLUG

Fit the glo-starter or connect the 1.2 volt ignition battery onto the glow plug. The glow plug is made to keep the engine turning after removing the glow-starter or cutting off the ignition battery. The platinum alloy coil inside the glow plug is heated by the starter battery current, and remains hot to keep the engine running even after the electric power is cut off.

STARTING

1) Pull Start/ Starter Box- Turn the flywheel by using an electric starter/starter box or pull the handle of the recoil starting system to start the engine with the throttle opening slightly (approximately 1m/m). The engine should fire after one or two tries.

2) Hex Starter- Make sure that your drill/ starter is set to the clockwise or forward position. Fit the extension starting shaft to the drill/starter tight. Insert the shaft into the starting output on the engine and then power on the drill/starter. The engine should fire after one or two tries.

If the engine becomes flooded: turn off your vehicle, and then the radio. Remove the glow plug using a glow wrench and then remove the air filter. Turn the vehicle over to allow any excess fuel in the engine to run out. Turn the vehicle right side up. Reinstall the air cleaner. Slowly pull the start cord about 8 inches, 5 to 7 times. Reinstall the glow plug with the glow plug wrench. And return to the normal starting procedure.

CAUTION 1

Do not open the throttle beyond the setting position described above before starting. It can develop enou gh power to injure people seriously and do substantial property damage.

CAUTION 2

Never operate your engine at high R.P.M without a "load", that is, with the wheels off the ground. Otherwise, your engine may be damaged in a few seconds!

STOP YOUR ENGINE

Cut off the fuel supply to the carburetor by pinching the fuel line closed or disconnect the fuel line at idle.

BREAK-IN/RUN-IN PROCEDURES

Because your Thunder Tiger engine has been precision-made from quality materials and is an ABC-type engine, a prolonged break-in period is not necessary. In fact, your engine can be run in your car to break it in.

1) We strongly recommended a fuel containing 20% caster oil or 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.

2) Turn the needle valve clockwise to the fully closed position and back counter-clockwise about 3-3 1/2 turns. Start your engine as described above.

3) Use the throttle-stop screw to set the idle position (with the throttle opening approximately 1m/m) where the engine runs at a fast idle but without engaging the clutch. Then, disconnect the battery from the glow plug.

4) Let the car run down the longest available straight, or at least, around a wide curve of sufficient radius to permit full-throttle driving and allow the engine to consume the entire tank of fuel at this needle setting. If it stops from being over-rich (i.e. dense smoke coming from the exhaust), close the needle valve 1/8 turn and re-start the engine.

5) All adjustments during break-in will be made to the high speed needle valve. If your engine stops in the mid-range or does not accelerate smoothly (when the throttle is opened from any setting above idle), please adjust the mixture metering screw as described in the CARBURETOR ADJUSTMENT paragraph after break-in.

6) After the first tank full, allow the engine to cool for a few minutes before re-filling the tank. Then close the needle valve 1/8 turn and restart. During the second tank of fuel, run the engine at alternate throttle settings (i.e.1/2 throttle for 30 seconds, then full throttle for 30 seconds, etc.) for about half the tank. Advance the throttle to full, and slowly lean the needle setting (about 1/8 turn at a time) until the highest speed is obtained (the smoke has thinned to a light gray).

7) At this point, richen the needle setting about 1/8 turn (counter clockwise) and run a third tank of fuel at this needle setting. After 4-5 runs, your engine will be completely broken-in and ready for consistent performance.

CARBURETOR ADJUSTMENT

These Thunder Tiger carburetors are specially designed for use with the high performance Thunder Tiger engines. They are able to provide a proper air-fuel mixture automatically at all throttle ranges from idle to full speed. The carburetor has been pre-adjusted at the factory, which should give excellent engine performance in most cases. Large adjustments of the carburetor should not be required. However, different operation conditions (such as your choice of fuel, glow plug, gear ratio, clutch engagement point and climate) may make further adjustments necessary

NEEDLE VALVE ADJUSTMENT

This is used to adjust the high speed fuel mixture. Optimum setting is described in the BREAK-IN/RUN-IN PROCEDURES.

MIXTURE METERING SCREW ADJUSTMENT

This is used to obtain a smooth transition and stable idle.

1) After the needle valve has been set, keep running at the highest speed for about 10 seconds then abruptly close the throttle to the lowest speed. Run at idle for about 5 seconds. Then quickly open the throttle.

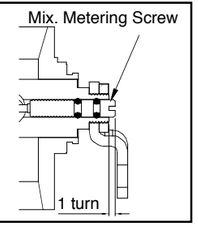
2) If the engine hesitates before picking up speed, and there is plenty of smoke and un-burned fuel coming out from the exhaust, the mixture is too rich. Screw in (clockwise) the mixture metering screw about 1/8 turn.

3) On the other hand, if it speeds up before quitting, the mixture is too lean. Screw it out about 1/8 turn.

4) If this is difficult to observe, then allow the engine to idle slightly longer before opening the throttle. Repeat procedure 1) patiently for few times to ensure the best running is obtained.

NOTE 1

The mixture metering screw of your carburetor has been pre-adjusted at the factory. If it is screwed in or out too far, reset it as follow:
Screw in or out the mixture metering screw until its end is flush with the throttle. Then screw the mixture metering screw out about 1 turn. Now it is the standard position.



THROTTLE-STOP SCREW ADJUSTMENT

This is used to set the minimum idle speed. If the engine runs too fast at the lowest throttle opening, turn the throttle stop screw counter-clockwise to reduce the throttle opening.

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 running session, run all the fuel out from inside the engine and disconnect the fuel line from the carburetor. Put 4 or 5 drops of after-run oil (Marvel Mystery Oil, Prather, Pacer, etc.) into the carburetor and turn the engine over by hand several times to protect the engine bearings and internal parts from corrosion.

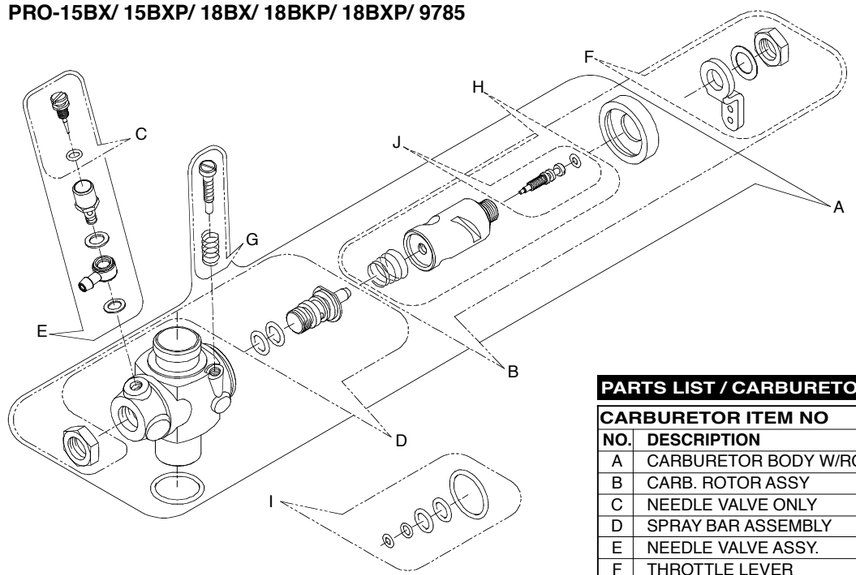
The use of after-run oil is also important during periods of prolonged storage (such as winter). We suggest removing the engine from the model, and liberally applying oil into the carburetor and glow plug hole, wrap your engine in a soft cloth and store in a sealed plastic bag.

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, remove only the carb. (do no 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 into the model. Do not disassemble your engine further than described above.

SERVICE PROCEDURES

Thunder Tiger strives to bring you the highest level of quality and service we can provide. We race and test our products around the world to bring you state-of-the-art items. Thunder Tiger guarantees that you should enjoy many hours of trouble free use from our R/C products. Thunder Tiger products have been sold worldwide through the authorized distributors that are supported directly and rapidly from Thunder Tiger. You may find that Thunder Tiger is always pursuing to explore new items creatively with highest quality. To update the latest product information and to get the best technical support, please feel free to contact your local hobby shops or Thunder Tiger authorized distributor.

PRO-12BX/ 12BK/ 12BXP/ 9784
PRO-15BX/ 15BXP/ 18BX/ 18BKP/ 18BXP/ 9785



PARTS LIST / CARBURETOR

CARBURETOR ITEM NO		9784	9785
NO.	DESCRIPTION	PART#	PART#
A	CARBURETOR BODY W/ROTOR	PN1304	PN1303
B	CARB. ROTOR ASSY	PN1125	PN1128
C	NEEDLE VALVE ONLY	PN1035	PN1035
D	SPRAY BAR ASSEMBLY	PN1036	PN1036
E	NEEDLE VALVE ASSY.	PN1037	PN1037
F	THROTTLE LEVER	PN1038	PN1038
G	BOLT&FUEL INLET	PN1039	PN1039
H	THROTTLE ROTOR SET	PN1124	PN1127
I	O RING SET	PN1041	PN1041
J	MIXTURE METERING SCREW SET	PN1042	PN1042