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.

PARTS LIST / CARBURETOR

	Description	RL-53H / 9749	RL-56H / 9716	RL-100H / 9718
A	CARBURETOR BODY SET	PN1331	PN1359	PN1369
B	CARB ROTOR ASSY	PN1332	PN1360	PN1370
C	NEEDLE VALVE ONLY	PN1333	PN1361	PN1371
D	SPRAY BAR ASSEMBLY	PN1334	PN1362	
E	NEEDLE VALVE ASSY	PN1335	PN1363	PN1372
F	THROTTLE LEVER	PN1336		
G	BOLT & FUEL INLET	PN1007		
H	RATCHET SPRING	AA1025B		
I	O RING SET, CARB	PN1337	PN1367	
J	MIX. MET. SCREW SET	PN1338	PN1364	PN1373
K	THROTTLE ROTOR SET	PN1339	PN1365	PN1374
L	NEEDLE HOLDER SET	PN1340	PN1366	PN1375

THUNDER TIGER 3 YEARS LIMITED 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 plug, etc.) or any use of product other than its specific intended use will automatically void this warranty.

PARTS LIST / ENGINE

	Description	RL-53H / 9606	RL-56H / 9612	RL-100H / 9611
1a	PROP NUT	AA0025B		AML5/16B
4	CRANKSHAFT	AA2257	AA2424	AA2294
5	CRANKCASE	AN2251	AN2351	AN2263
6	BACKPLATE SET	AA2262		AN2295
7	CONNECTING ROD	AN2258		AN2270
8	WRIST PIN ASSEMBLY	AA0337		AA2269
9	CIRCLIP	AA0327		AA0513
10a	PISTON	AN2261	AN2426	AN2267
10b	PISTON RING	AA0274	AA2429	AA2268
10c	CYLINDER/SLEEVE	AA2252	AA2425	AA2291
11	CYLINDER HEAD	AA2256-R	AA2427-R	AA2264-R
12a	CYLINDER GASKET	PN0311	PN1358	PN0326
12b	O-RING	AA1685		AA1562
12c	WASHER	AA0757		AMO10
15	CARBURETOR ASSEMBLY	9749	9716	9718
16a	FRONT BALL BEARING	AMV1438L		AMV6000L
16b	REAR BALL BEARING	AMV6902		AMV6904T
17	SCREW SET	PN0292	PN0324	PN0325
18	THERMAL INSULATOR	AA1491		
19	GLOW PLUG (REDLINE R3)	9775		

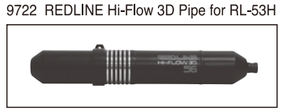
OPTIONAL PARTS



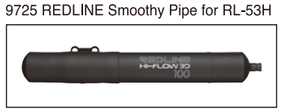
9722 REDLINE Hi-Flow 3D Pipe for RL-53H



9725 REDLINE Smoothy Pipe for RL-53H



9729 REDLINE Hi-Flow 3D Pipe for RL-56H



9724 REDLINE Hi-Flow 3D Pipe for RL-100H

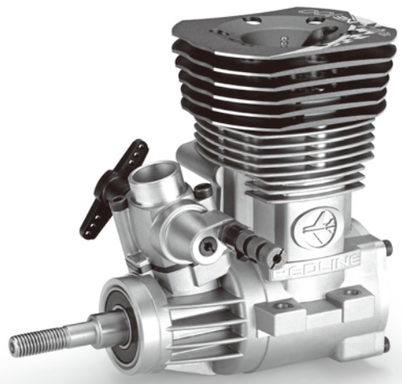
manufactured by **THUNDER TIGER**

http://www.thundertiger.com

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REDLINE

ENGINES INSTRUCTIONS



RL-100H / 9611 SHOWN

INTRODUCTION

REDLINE is a new engine product line of Thunder Tiger. High performance, extreme power will be the main features of this series engine.

RL-53H helicopter engine is the first engine in this series. With the biggest displacement and awesome power, RL-53H/56H/100H is the best choice nitro power plant for your .50/.90 size helicopter model.

Feature with non-seizing flange mount carburetor with thermo insulator makes it easy to be installed and align the carburetor position. Adopt a thermal insulator pad between the carburetor and crankcase to make the engine can run smoothly and accuracy air-fuel rate without be effected by the heat from the engine. The machinery with anodize cylinder head, not only make it looking good also offer the good heat transparent of the engine. Ringed type piston fit with the XC^2 plating cylinder to make the engine with good running performance and endurance life.

FEATURES

- Designed for stable hovering and aerobatic 3D flights
- NANO XC2 (extreme composite coating) cylinder liner with special criss-cross pattern etched
- Precisely-balanced crankshaft with Ni plating to further reduce corrosion
- Knife-edged design & high-strength connecting rod with bushings pre-installed
- Listened hypereutectic machined Al-Si ringed piston
- Machined over-sized heat sink head
- Reinforced resin rear cage ball bearing support
- 2 Needle valves with both Hex and FT driver head at same side for easy adjustment
- Approved non-seizing flange mount carburetor with thermo insulator
- Push-pull throttle lever
- State-of-the art CNC machineed components
- High performance Japan made Redline R3 glow plug included

CONTENT

There are 4 main content in the box—

1. engine x1
2. Carburetor with thermal isolator gasket and 2 mounting bolts
3. REDLINE R3 glow plug x1
4. Allen wrench x2 pcs (2.5mm & 3mm)

IMPORTANT

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

SPECIFICATIONS

ENGINE	ITEM NO	Displacement (c.c/cu.in)	Bore (mm/in)	Stroke (mm/in)	Practical RPM	OUPUT (BHP/RPM)	Weight (g/oz)
RL-53H	9606	8.670 / 0.529	22.5 / 0.886	21.8 / 0.858	2,000~21,000	2.1 / 17,000	380 / 13.4
RL-56H	9612	9.057 / 0.553	23.0 / 0.906	21.8 / 0.858	2,000~21,000	2.23 / 17,500	390 / 13.8
RL-100H	9611	16.38 / 1.00	29.0 / 1.14	24.8 / 0.98	2,000~16,000	3.91 / 14,500	625 / 22.0

NECESSARY ACCESSORIES

The following items are necessary for operation your engine, and are available from your local hobby supplier.

■ FUEL

A good quality, commercially available fuel containing 25% lubricant and 75% methanol is recommended for break-in/run-in and general use. Fuel containing 10%~30% nitromethane and 20% lubricant is for use when more power is required. Most fuels contain 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 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.

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.
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.
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 (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.

■ GLOW PLUG

The type and quality of glow plug used in your engine will have a major impact on overall performance and reliability. For Thunder Tiger REDLINE series engine, we strong recommend to use Thunder Tiger REDLINE R1(#9774), R2(#9281), R3(#9775) glow plug. A R3 glow plug is included in the box. And for other brand glow plug such as O.S No.8, Enya No.3, ATS #3..etc. are also good for the RL series engine.



GLOW PLUG



GLOW STARTER

■ GLOW STARTER

The electric power source for heating the glow plug during starting the engine(1.2~1.5V). Thunder Tiger have a series rechargeable glow starter to matching you operating requirement. (#2156~#2161,#2196, #2191,#2192,#2193). And a remote glow adaptor(#3803) is recommend to be used on the helicopter to make it more easy of the operating.



REMOTE GLOW ADAPTOR

■ PLUG WRENCH

Used for tightening the glow plug as well as the propeller nut. A Thunder Tiger #1102 4-way wrench is recommended.



PLUG WRENCH

■ FUEL PUMP

Required to fill the fuel tank in your model. A Thunder Tiger hand-crank pump (#1645) or 12V electric pump (#1658) are available from your hobby dealer.



FUEL PUMP

■ FUEL LINE

Choose a high quality, silicone fuel line (#1177) for use with your Thunder Tiger engine.



FUEL LINE

■ ELECTRIC STARTER & HEXAGON STARTING SHAFT

Use an electric starter with hexagon starting shaft and connecting with 12 Volt battery to start the engine. A Thunder Tiger #2674, #2675 Starter and #3801 Extension Shaft are recommended.



STARTER EXTENSION



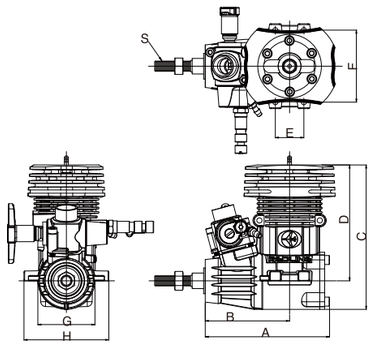
ELECTRIC STARTER



7.2V SEALED LEAD ACID BATTERY

INSTALLATION

The main basic dimensions of the engine are shown as below. Follow the helicopter model instruction manual to mount your engine securely to the rigid engine mount and cooling fan & clutch unit. Then install into the helicopter. Make sure the mounting surfaces are absolutely flat and parallel to avoid engine distortion (bearings, crankcase…) and power loss.

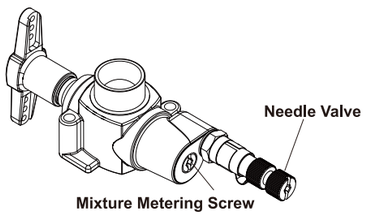


ENGINE	A(mm/in)	B(mm/in)	C(mm/in)	D(mm/in)	E(mm/in)	F(mm/in)	G(mm/in)	H(mm/in)	S(mm/in)
RL-53H	76.2/3.00	51.7/2.04	88.5/3.48	71/2.80	17.5/0.69	44/1.73	35.0/1.38	52.0/2.05	1/4"-28 UNF
RL-56H	76.2/3.00	51.7/2.04	90.1/3.55	90.1/3.55	17.5/0.69	44/1.73	35.0/1.38	52.0/2.05	1/4"-28 UNF
RL-100H	88/3.46	55.5/2.19	109.5/4.31	87.2/3.43	25/0.98	52/2.05	44.8/1.76	62/2.44	5/16-24 UNF

BREAK-IN / RUN-IN PROCEDURES

Proper break-in is critical to the life of any model engine. Because your Thunder Tiger RL series engine has been precision-made from quality material and is ringed type engine, a prolonged break-in period is not necessary. In fact, only a simple running-in procedure is required. The break-in period can take place on your model or on a test stand. You should set the engine on “rich” condition to run-in the engine.

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.

■ IMPORTANT

Before trying to adjust the carburetor, please note the following issues. In helicopters, engine failure in flight as a serious problem, especially for the inexperienced modeler. It can mean loss of control and resulting crash.

For ensuring safe and reliable control on the helicopter flight, it is a must that the engine keeps running and that the throttle has quick and reliable response. Therefore, the carburetor adjustment is very important for the helicopter and this should be done with great care to obtain an optimum throttle response. In the helicopter flight, the throttle response on the medium speed range with the partial throttle opening is very important. Because, medium speed range is widely used in the flight. On this carburetor, only two adjustable controls are provided.

1) Needle Valve – This valve controls the mixture strength of the engine speed range from half to fully opened throttle.
2) Mixture Metering Screw—This screw controls the mixture strength of the speed range from idling to half opened throttle. Basically, the adjustment of this Mixture Metering Screw is to obtain the steady idling and smooth acceleration response.

Please note the best mixture strength around half opened throttle is obtained with the balanced controls of both Needle valve and Mixture Metering Screw.

■ SETTING BEFORE ENGINE STARTING

Close (turn clockwise) the Needle Valve until it stops. Open the Needle Valve 3 turns from the closed position.

Make sure that the throttle linkage is set so that the throttle rotor is fully open when the transmitter stick is move to full high speed position and that the throttle rotor is fully closed when both the throttle stick and throttle trim lever are moved to the lowest position.

■ ADJUSTMENT

Following procedures are recommended to adjust the carburetor.

Adjustment low speed performance (range from idle to 1/3 opened throttle)

1) Start the engine with transmitter throttle stick fully down and the throttle trim level set the neutral position.
2) Set the throttle trim lever so that the engine runs with highest idling rpm but without engaging the clutch.
3) Increase the engine speed by advancing the transmitter throttle stick gradually until the helicopter just lift up (floats) from the ground. Warm up the engine by keeping above floating condition for approximately 10 seconds then slowly reduce the engine speed, land and allow the engine to idle for a while.
4) Repeat above procedure several times. If the engine tends to hesitate or stop after hesitation, the mixture at idle is not correct. Generally speaking, if the mixture at idle is too rich, the engine stops abruptly with short hesitation when the throttle is opened. On the other hand, if the mixture is too leans, the engine will hesitate a little longer with weakened exhaust sound.
5) If the engine runs with hesitation but does not stop then try to increase the engine speed by means of the transmitter. Try to hover the helicopter, maintaining the altitude of approx. 1 ft or 30cm from the ground, then carefully watch the exhaust smoke and will feel lazy throttle response. If the mixture is too lean, the engine runs with higher pitched exhaust sound, without any or very low exhaust smoke then the speed will be reduced showing overheating tendency and the helicopter is hard to continue hovering.
6) After you find the condition of the mixture, turn the Mixture Metering Screw 1/12 turn at a time, according to the mixture, by using a small screw driver to correct the mixture. If it is too rich, turn the screw clockwise. If it is too lean, turn the screw counter-clockwise.

Note

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



■ ADJUSTMENT HIGH SPEED PERFORMANCE

The optimum Needle Valve setting is usually 1/4~1/2 turn closed from the starting position (i.e 3 turns open from the fully closed position). It depend, of course, on 1) The individual characteristics of helicopter and its engine/muffler installation, 2) the fuel used and 3) atmospheric conditions.

The Needle Valve should be gradually closed until the highest performance is obtained in flight at full power.

However, take care not to close the Needle Valve to a too lean setting and risk overheating the engine, in the pursuit of maximum performance.

■ ADJUSTMENT MIDDLE RANGE PERFORMANCE

As previously stated, in helicopter flight, throttle response at medium (hovering) speeds is most important. If the Mixture Metering Screw (low speed) and Needle Valve (high speed) are properly balanced, the mixture will be correct, through the medium speed range.

If, however, minor re-adjustments prove to be necessary for the best possible throttle response, proceed as indicated by the following symptoms and required corrective action:

1) If the mixture at middle range is lean, gradually increased engine speed is accompanied by diminished exhaust smoke and a high-pitched exhaust sound if hovering is prolonged. In extreme cased, the engine will overheat and lose speed, so that hovering cannot be maintained. In this event, open the Needle Valve 1/24~1/12 turn and turn the Mixture Metering Screw 1/12~1/8 turn counter-clockwise.
2) If the mixture at middle range is too rich, positive and quick throttle response will not be obtained, the exhaust smoke will be dense and the exhaust sound will be lower, probably accompanied by fuselage vibration. In this even, close the Needle Valve 1/12~1/6 turn and turn the Mixture Metering Screw 1/12~1/8 turn clockwise.

Note

It is most important to make the Needle Valve adjustment in small increments of not more than 1/24~1/12 turn and the Mixture Metering Screw adjustment not more than 1/12~1/8 turn as advised, when seeking optimum middle range throttle response. Excessive re-adjustment will upset either low speed performance or high speed performance. Carry out re-adjustments patiently until the best balance of idling, hovering and high speed performance is achieved and the engine responds quickly and positively to the throttle control. Throttle response at hovering speeds is also affected by the relationship of the main rotor pitch angle to throttle opening. If the optimum middle range, throttle response cannot be obtained by the carburetor adjustments described above, try adjusting the helicopter's pitch control characteristics.

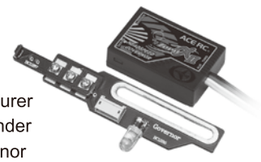
ROTOR HEAD RPM

For most of the .50/.90 size helicopter, it's recommended to set the rotor blade rpm (head speed) and gear ratio as follow setting:

	.50 SIZE	.90 SIZE
NORMAL	1450 ~ 1550	1500 ~ 1600
IDLE UP / AEROBATIC	1950 ~ 2100	1850 ~ 1950
GEAR RATIO	8.5 ~ 8.7	7.92

You can set the throttle / pitch curve on the transmitter to match the head speed setting.

It's also recommended to use the governor device to control the rotor speed. Please follow the governor manual that supplied by the manufacturer to do the installation and setting. Thunder Tiger high performance Zeroαll governor #8083 is recommended.



ENGINE CARE

Always keep the outside of your engine clean. Use clean, fresh fuel can keep your fuel can, pump, and fueling system free from dirt particles. Install a fresh filter between the fuel tank and carburetor, and between your fuel pump and filling line to prevent any dirt from entering your engine.

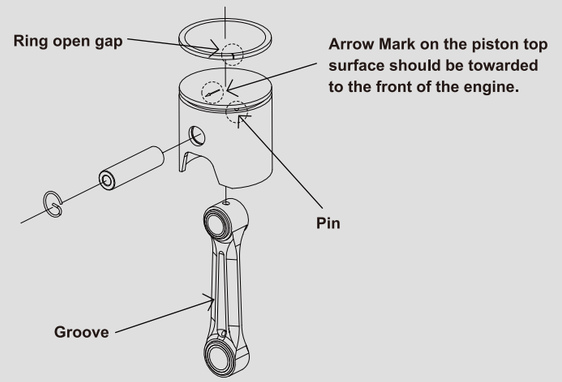
Model fuel contains alcohol, which is hydroscopic (meaning that it attracts moisture from the atmosphere). This can cause corrosion to the internal engine parts. After each flying session, run all the fuel out from inside the engine by disconnecting the fuel line from the carburetor.

If you will not be using your engine for a while, we suggest removing the engine from the model, liberally and applying 4 or 5 drops of after-run oil (Marvel Mystery Oil, Prather, Pacer, etc.) into the carburetor and glow plug hole, and 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 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

If you have to dismantle the piston/ring and connecting rod set from the engine, you must take care the direction when you re-install the piston/ring and connecting rod set. The incorrect installation will cause serious damage of the engine. On the piston, there is a small pin in the piston ring groove. The function of this pin is to fit the ring no rotating during engine is running. So when you re-install the ring into the piston, you have to adjust the ring open gap around the pin. There is a “arrow” mark on the piston top surface. When you install the piston/ring and connecting rod set, the arrow must be toward to the front direction of the engine. Please refer the following drawing to install of the piston/ring and connecting rod set.



Note

Apply proper threadlock on the thread of the bolts.

Gradually tighten the both bolts evenly.

Rotate the throttle from closed to fully open, it should be rotated smoothly. If not, please lossen the bolts and repeat step 2.

