

PRD 125CC FIREBALL ENGINE MANUAL

IMPORTANT: PLEASE READ THESE INSTRUCTIONS CAREFULLY AND COMPLETELY BEFORE OPERATING THE ENGINE RK125W FOR THE FIRST TIME.

Congratulations on your purchase of the PRD RK125 Fireball kart engine. The PRD RK125 Fireball is the product of a thorough research, design and development program and employs the latest in engine performance.

The PRD RK125 Fireball engine has been engineered to provide the user with trouble free operation and an extended service life with a minimum of routine maintenance. Please read this booklet carefully so that you can keep your engine in tip-top condition thus ensuring you have many satisfying hours of performance racing.

1. SPECIFICATIONS

1. MODEL:	RK125cc Fireball 07
2. TYPE:	2 STROKE WATER COOLED SINGLE CYLINDER REED VALVE INDUCTION ENGINE
3. CAPACITY:	124cc
4. BORE:	53.6mm FIRST PISTON
5. STROKE:	54mm
6. H.P. / RPM	28.5HP / 15,5800 RPM
7. CARBURETOR:	TILLOTSON HL-360A
8. IGNITION:	OPPAMA
9. IGNITION TIMING:	2.20mm BTDC [STANDARD] .075 TO .085
10. SPARK PLUG:	NDENSO W27ZU [RUN IN ONLY] W29ES-ZU [RECOMMENDED RACING]
11. SPARK PLUG GAP:	0.60mm [0.024"]
12. FUEL OIL RATIO:	PREMIUM GRADE FUEL 80Z TO THE GALLON
13. PISTON TYPE:	COATED SINGLE RING
14. PISTON CLEARANCE:	0.10mm [STANDARD] .004"
15. RING TYPE:	"L" RINK – DYKES
16. RING GAP:	0.25mm [0.010"] MIN.
17. CYLINDER HEAD VOLUME:	10.cc
18. COMPRESSION RATIO:	7:5.1 [NOMINAL]
19. CRANKSHAFT:	2 PIECE, FORGED & INDUCTION HARDENED, FULLY GROUND
20. CONROD:	100mm STEEL FORGED & MACHINED TOP AND BOTTOM NEEDLE ROLLER BEARING

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2. FUEL / OIL

- 2.1 Fuel: Premium grade fuel.
- 2.2 Oil: Use only high quality 2-stroke racing oil in a mix ratio of 16:1 (8 oz to the gallon).

RECOMMENDED OILS: BURRIS CASTOR/BURRIS BLEND

WARNING: DO NOT ALLOW CASTOR OR OTHER VEGETABLE BASE OIL MIXES TO STAND MORE THAN 8 HOURS WITHOUT VIGOROUSLY REMIXING.

3. ENGINE RUN-IN

- 3.1 Ensure the engine is mounted to the chassis correctly, all mounting bolts and nuts are tight and the drive chain is correctly aligned with the correct tension. Check all electrical & fuel line connections are secure.
- 3.2 Ensure that the throttle cable is correctly fitted and adjusted and the butterfly in the carburetor opens and closes correctly. For starting set the high & low speed needle jets to turn 1-3/8H & 2-1/4L.
- 3.3 The 45 minutes run-in period should be divided into 15 minutes periods.
- 3.4 Do not at any time allow the engine to overheat. If the engine shows signs of overheating stop the test session and allow the engine to cool down. Check for any obvious cause of overheating before continuing. Excess heat may have been caused by an excessively long on-track session or incorrect carburetor setting.
- 3.5 TRACK SESSIONS 1 & 2:
Do not allow full throttle for prolonged periods. Run the engine in short bursts between 1/2 to 3/4 throttle. Do not allow the engine to labor or remain on a constant throttle opening for any prolonged period if using a tachometer limit engine RPM to 7500 [1/2] to 9000 [3/4] maximum.
- 3.6 TRACK SESSION 3:
Gradually increase throttle opening from 3/4 to full for short bursts full throttle can be used for longer periods in the 4th & 5th sessions. If using a tachometer, limit engine RPM to 11,000 maximum when using full throttle.
 - 3.6.1 It is advisable to run the engine “rich” during run-in to assist engine cooling. Care should be taken not to foul the spark plug.
- 3.7 In the interval between on-track sessions check all engine & mounting bolts & other fasteners for tightness as looseness can occur due to vibration.

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- 3.8 Regularly check the spark plug tip for adverse discoloration and if necessary adjust the low & high speed needle settings to compensate fuel input.

Use the Denso 27ES-ZU spark plug as supplied for engine run-in only.

We suggest the use of Denso 29ES-ZU [cold weather] & 31ES-ZU [hot weather] for racing.

Your choice of another quality brand of spark plug is acceptable provided the suitable heat range is chosen for the prevailing weather conditions.

4. GOING RACING

In the previous section we dealt with the “run-in” period for your PRD engine. Once completed your engine is now ready for racing. In this section we will give you some tuning “TIPS” and advice that will help you successfully race your PRD.

It is highly recommended that you maintain a “Log Book” to record the vital data for each and every time you race or test/practice at every race track.

This “Log Book” will assist you in duplicating the correct data for each race track thus allowing you to minimize setup time & avoid choosing the wrong data for the track conditions.

- 4.1.1 Carburetor Needle Jets: The carburetor is equipped with high and low speed adjustable jets. The standard settings for these jets are.

TILLOTSON	HIGH SPEED	1-3/8 TURNS
	LOW SPEED	2-1/4

**Low speed needle is the one closest to the engine.
Needle “Pop-Off” pressure is 10psi, holding 9psi.**

Not every two stroke engine necessarily operates in the same way under the same conditions. Your engine may not operate in the same way from one race track to another or under varying atmospheric conditions. Therefore it may be necessary to adjust from standard the high and the low speed needles to compensate for these changes. A driver’s level of skill can also be a determining factor in changes to the jet settings.

Warning: Careful monitoring of the condition of the spark plug tip and engine temperature readings [where a heat gauge is fitted] will be necessary to prevent and engine failure due to insufficient fuel.

- 4.1.2 The metering lever will also influence the flow of fuel to the engine. This lever should be set at a measurement of 1.00mm below the diaphragm mount. Adjustment can be made by carefully bending the lever.

Warning: If you are not confident or competent to carry out this task we suggest you have this adjustment made by your local engine tuner.

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- 4.2 Ignition: The standard ignition timing is .075" BTDC. Your engine will provide satisfactory performance at this setting. As you gain experience with your engine you may wish to experiment with different settings. The PRD engine will provide crisp clean performance between .075" to .090" BTDC. You may choose to experiment with these changes to extract increased performance.

Warning: Any increase in ignition timing may result in an increase in engine heat. Monitoring of spark plug tip condition and heat gauge temperatures should be made until you are satisfied the changes are not detrimental to the engine performance.

- 4.2.1 Rotor Air Gap: The air gap between rotor and stators is .010" to .012". Adjust if necessary using a feeler gauge. Ensure the gap is uniform at top and bottom pole positions of the stator. If the coil leg has excess potting it should be carefully buffed off.
- 4.3 Exhaust Length: The overall length of the exhaust will have an influence on engine performance. The PRD engine is supplied as standard with a connector tube of 3 5/16" long. The optimal length is 3.00" long

A decrease in length will improve top-end performance and lean the carburetor.
An increase in length will improve bottom end performance and richen the carburetor.

- 4.4 Gear Ratio: The PRD engine is sold standard with an 11 tooth engine sprocket, but 10 tooth engine sprockets are also available. The choice of final drive ratio will be dependant upon a number of variables and may alter from race track to race track. Only detailed testing and analysis of lap times will allow you to determine the correct final drive ratio for any given set of track conditions.

As a guide, we suggest the following procedure:

Selection of the secondary reduction ratio

Ratio – A Secondary reduction ration = $\frac{\text{Number of Axle sprocket teeth}}{\text{Number of engine sprocket teeth}}$ **B - Numerator**
C – Denominator

Example: If you have an 85T is axle sprocket and a 10t is engine sprocket the gear ratio is 8.5:1. To get this ratio with 11T driver we would solve for the numerator = 93T

For fast course with long straight sections: Reduce the Axle sprocket.

For course with many curves and short straight sections: Increase the Axle sprocket.

Warning: The maximum kart speed will be developed towards the end of the straight sections and care must be taken not to over-rev the engine.

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ROUTINE ENGINE MAINTENANCE

This section has been provided to allow the owner to carry out simple maintenance tasks to ensure his/her engine runs smoothly & reliably. For repairs of a more serious nature consult the PRDUSA web site for list of recommended RLV-PRD dealers.

4.5 Carburetor: The carburetor should be removed and cleaned after each race or practice session. Partial disassembly should be undertaken to the diaphragm area. Dirt or foreign matter should be removed by washing with a safe cleaning solvent and carefully blow with low pressure air stream.

4.5.1 Diaphragms and gaskets should be checked for damage and replaced if necessary.

Re-assemble the diaphragms and gaskets in the carburetor body in the reverse order of disassembly.

4.5.2 High & Low Speed Needles: The carburetor contains 2 adjustable needles. These needles control the fuel mixture. Carefully remove both of the high & low speed needles, washers & o-rings. Carefully blow the fuel passageways clean with a low pressure air stream and refit needles & other parts in reverse order of disassembly.

Needle Adjustment:	Turn In	Leans mixture
	Turn Out:	Richens mixture

IMPORTANT:

The needle adjustment should be undertaken in 1/8th turn increments to prevent excessive adjustment that may result in engine malfunction or failure.

Always adjust the LOW speed needle before adjusting the HIGH speed needle.

The low speed needle is the one closest to the engine.

Symptoms of improper settings:

If your kart exhibits one or more of the symptoms below it may need carburetor tuning adjustments. Before attempting any changes make sure that everything else is in good condition and tuned and operating correctly. Check the condition of the Spark Plug and ensure the ignition timing is correct.

If your kart is TOO RICH, it will:	Accelerate poorly Misfire Smoke excessively Foul the Spark Plug Have a "deep rumbling" exhaust note
If your kart is TOO LEAN, it will:	Ping or rattle ** Accelerate erratically Act like it is running out of fuel Run extremely hot

** If your kart pings or rattles and the carburetor is not too lean then check that your fuel is fresh and you have purchased the correct octane rated gasoline.

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- 4.5.3 Needle & Seat: The maintenance of the correct pop-off pressure is essential to reliable carburetor performance. The owner can carry out this task with a suitable test gauge such as the TILLOTSON #243-504 gauge. The needle & seat should be removed and cleaned. As should the diaphragms etc., prior to carrying out this task. Pop-off pressure should be set at 10psi as standard and holding 9psi. If your carburetor fails to operate efficiently at this pressure, we suggest you consult your engine builder.
- 4.6 Piston & Ring: The piston & ring should be checked after 3 races or extended test sessions. Carefully remove the cylinder head & cylinder and inspect the piston & ring for any obvious signs of damage. Replace if necessary. Evidence of detonation on piston crown can be an indication of excessive ignition advance. Ignition timing should be checked and adjusted if necessary.
- 4.6.1 Carefully remove ring & place in top of cylinder and measure gap. If gap exceeds .010" and you wish to maintain top performance then replace ring. If the ring is distorted and not sealing perfectly then replace.
When re-installing the ring, ensure the ring is correctly positioned in the piston ring groove and the gap in the ring is located either side of the piston ring peg.

The ring, if not damaged, may continue to be used where measurement exceeds .010" but engine performance will be decreased.

- 4.6.2 Inspect the piston for any visible signs of damage and replace if necessary. Inspect for cracks in piston surface of other surface damage or signs of detonation on crown of piston.

Carbon Deposits:

Deposits on piston crown can be carefully removed with fine grade [#800] wet & dry sandpaper. Deposits in ring groove can be carefully removed with wet & dry sandpaper or very fine miniature file. Ensure the material does not fall into the bottom end. Clean well and oil before reassembling.

Piston to Cylinder Clearance:

If piston to cylinder measurement exceeds maximum tolerance – replace piston . Piston tolerance is .004" to .005".

WARNING:

If it is necessary to remove the piston from the conrod to carry out these procedures then care must be taken to prevent the piston pin circlips or any other foreign object falling into the crankcase of the engine.

Do not use excessive force to remove the piston pin.

While disassembled inspect piston pin and bearing for wear or abnormality, replace if necessary.

As a precaution on reassembly, replace old circlips with new.

- 5.3 Cylinder head and cylinder should be inspected for any damage or abnormality.

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5.3.1 Carbon deposits in the cylinder head can be removed with #800 wet sandpaper.

Carbon deposits in the exhaust ports of the cylinder can be carefully removed with wet & dry sandpaper.

5.3.2 The cylinder should be inspected for any damage to the liner. If damage is evident and cannot be removed by wet & dry sandpaper the cylinder should be re-bored. The cylinder should be measured for concentricity and if any out-of-roundness is detected, the cylinder should be re-bored and a new piston and ring fitted. A measurement should be taken by an inside micrometer or a cylinder bore gauge.

IMPORTANT:

When refitting the cylinder assembly,

care must be taken that you compress the piston ring with one hand and gently lower the cylinder onto the piston with the other hand.

Care must be taken that the ring is correctly located in the piston groove during this procedure.

5.4 Spark Plugs:

The heat range of a spark plug refers to the classification of a spark plug's ability to transfer heat from the firing tip of the insulator to the cylinder head.

The engine manufacturer through testing has determined the heat range appropriate to the engine. However, variables such as atmospheric conditions, carburetor tuning and engine modifications can have an influence on the recommended heat range.

WARNING:

When selecting a spark plug with a hotter or colder heat range then do so carefully and cautiously.

A spark plug with TOO HOT a heat range may lead to pre-ignition and possible engine damage.

A spark plug with TOO COLD a heat range may lead to fouling of the plug and failure to start or erratic poor performance.

The "reading" of a spark plug is an acquired skill.

The following table is a guide.

TABLE

Insulator Color	Decision
Medium to light tan	Normal
Whitish color	Lean fuel mixture or plug too hot
Blackish color	Rich fuel mixture or plug too cold

The insulator color is normally the indicator for the HIGH speed time of the engine.

The plug base color is normally the indicator for the LOW speed time of the engine.

5.5 Gaskets: It is recommended that gaskets be replaced at each partial or complete engine disassembly.

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WIRING DIAGRAM

Red wire	→	Battery
Black wire	→	Battery
Red wire (with boot)	→	Starter
Blue wire	→	Coil
White Black wire (ground)	→	Ground to engine
Black wire (ground)	→	Ground to engine
White Black wire	→	On/Off Switch
Blue wire	→	On/Off Switch
Red wire	→	Starter Button
Black wire	→	Starter Button