Pro Racing Design CO., LTD.
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IMPORTANT: PLEASE READ THESE INSTRUCTIONS CAREFULLY AND COMPLETELY BEFORE OPERATING THE ENGINE RK80 FOR THE FIRST TIME.

Congratulations on your purchase of the PRD RK80 high performance kart engine. The PRD RK80 is the product of a thorough research, design and development program and employs the latest in engine performance.

The PRD RK80 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.

Please note that due to PRD's on-going development program there may be some data in this booklet that will be upgraded from time to time. If this situation arises, we suggest you consult your nearest PRD sales & service outlet for advice.

1. SPECIFICATIONS

1.	MODEL:	RK80
2.	TYPE:	2 STROKE AIR COOLED SINGLE CYLINDER PISTON PORT INDUCTION
3.	CAPACITY:	76cc
4.	BORE:	46.6mm
5.	STROKE:	46mm
6.	H.P. / RPM	9HP / 11,000 RPM
7.	CARBURETOR:	WALBRO WB44 WITH CHOKE
8.	IGNITION:	TRANSISTOR CONTROL IGNITION [TCI] WITH INTERNAL ROTOR
9.	IGNITION TIMING:	1.8mm BTDC [STANDARD]
10.	SPARK PLUG:	NDENSO W24ES-U [RUN IN ONLY] NDENSO 27ES-ZU TO 29ES-ZU [RECOMMENDED RACING]
11.	SPARK PLUG GAP:	0.60mm [0.024"]
12.	FUEL OIL RATIO:	20:1 PREMIUM GRADE UNLEADED PETROL
13.	PISTON TYPE:	UNCOATED SINGLE RING
14.	PISTON CLEARANCE:	0.10mm [STANDARD]
15.	RING TYPE:	FLAT TYPE 1mm THICK
16.	RING GAP:	0.25mm [0.010"]
17.	CYLINDER HEAD VOLUME:	8cc
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
21.	CRANKPIN:	GROUND STEEL – 18mm diameter x 45mm OVERALL LENGTH
22.	PISTON PIN:	GROUND STEEL – 14mm diameter x 37mm OVERALL LENGTH

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2. FUEL / OIL

2.1 For Australia: Use only premium grade unleaded pump petrol.

2.2 Other Countries: Consult your karting controlling organizations for the appropriate legal fuel.

2.3 Oil: Use only high quality 2-stroke racing oil in a mix ratio of 20:1.

RECOMMENDED OILS: SILKOLENE CASTORENE R30 / CASTROL R30 / SHELL X100 SUPER M.

WARNING: DO NOT ALLOW CASTOR OR OTHER VEGETABLE BASE OIL MIXES TO STAND MORE THAN 8 HOURS OR LEAVE CONTAINERS OPEN FOR PROLONGED PERIODS.

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 accelerator cable is correctly fitted and adjusted and the throttle valve in the carburetor opens and closes correctly. For starting set the walbro high & low speed needle jets to turn 1/2 HI & 1-1/4 LO.

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 abort the session and allow the engine to cool down. Check for any obvious cause of overheating before continuing. To excess heat may have simply been caused by an overlong on-track session or incorrect carburetor setting.

3.5 TRACK SESSIONS 1 & 2:
Do not allow full throttle for prolonged periods. Round the engine in short bursts between 1/2 to 3/4 throttle. Do not allow the engine to labor nor 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.

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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.

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 w24es-u spark plug as supplied for engine run-in only.
WARNING: Do not use the w24es-u spark plug under racing or prolonged full throttle operation.

We suggest the use of Denso 27ES-ZU [cold weather] & 29ES-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 circuit.

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

PRD can assist you establish your "Log Book" by providing the main data you should include.

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

WALBRO	**HIGH SPEED**	**1/2 OF A TURN**
	LOW SPEED	**1-1/4 TURNS**
TILLOTSEN	**HIGH SPEED**	**1-1/4 TURNS**
	LOW SPEED	**1-1/2 TURNS**

Needle "Blow-Off" pressure is 10psi, holding 9psi.

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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 malfunction due to insufficient fuel.

4.1.2 The metering lever [ref#7] 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 [see illus]. 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.

4.2 Ignition: The standard ignition timing is 1.8mm BTDC. Your engine will provides 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 1.8 to 2.2mm BTDC. We suggest you may care to experiment with these changes to extract increased performance.

Warning: Any increase in ignition setting 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 0.30 to 0.50mm. Adjust if necessary using a feeler gauge. Ensure the gap is uniform at top and bottom pole positions of the stator.

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 85mm.

A decrease in length will improve top-end performance.

An increase in length will improve bottom end performance.

4.4 Gear Ratio: The PRD engine is supplied standard with a 10 or 11 teeth engine sprocket. 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.

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As a guide, we suggest the following procedure:

Selection of the secondary reduction ratio

$$\text{Secondary reduction ration} = \frac{\text{Number of Axle sprocket teeth}}{\text{Number of engine sprocket teeth}}$$

Preconditions: For instance if 90T is axle sprocket and 10t is engine sprocket then secondary reduction ratio is 9:1

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.

5. ROUTINE ENGINE MAINTENANCE

This section has been provided to allow the owner to carry out sample maintenance tasks to ensure his engine runs smoothly & reliably. We suggest for the repair & service of a more serious nature that the owner consults his nearest PRD sales & service outlet.

5.1 Carburetor: The carburetor should be removed and cleaned after each race meeting or test 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 compressed air.

5.1.1 Diaphragms and gaskets should be checked for damage and replaced if necessary. [PRD recommends the use of walbro diaphragm repair kit #350-800 or PRD part #EPY669C where unleaded fuel is used]

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

5.1.2 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 &

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o-rings. Carefully below the fuel passageways clean with compressed air 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.

Symptoms of improper settings:

If your kart exhibits one or more of the symptoms below it may need some 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 are not too lean then check that your fuel is fresh and you have purchased the correct octane rating petrol / gasoline.

5.1.3 Needle & Seat: The maintenance of the correct blow-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. Blow-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 nearest PRD sales & service outlet.

5.2 Piston & Ring: The piston & ring should be checked after 3 race meeting or extended test session. 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 excess ignition advance and ignition timing should be checked and adjusted if necessary.

5.2.1 Carefully remove ring & place in top of cylinder and measure gap. If gap exceeds 0.25mm and

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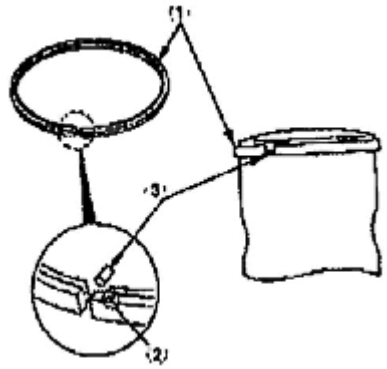
you wish to maintain top performance then replace ring. If the ring is distorted and not sealing perfectly then replace.

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.



NOTE:
The ring, if not damaged, may continue to be used where measurement exceeds 0.25mm but engine performance will be decreased.

5.2.2 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. Minor surface imperfections such as piston seizure damage can be removed by solvent and wet & dry sandpaper working in a crisscross pattern carefully and not excessively.

Carbon Deposits:
Deposits on piston crown can be carefully removed with fine grade [#600-800] wet & dry sandpaper. Deposits in ring groove can be carefully removed with wet & dry sandpaper or very fine miniature file.

Piston to Cylinder Clearance:
If piston to cylinder measurement exceeds maximum tolerance – replace piston.

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.

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Whilst 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.

5.3.1 Carbon deposits in the cylinder head can be removed with #600-800 wet & dry sandpaper.

Carbon deposits in the exhaust ports of the cylinder can be carefully removed with a round edge scraper and wet & dry sandpaper.

5.3.2 The cylinder should be inspected for any damage to the liner and 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. Measurement should be taken by either and 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.

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Reference should be made to the photos in the plug manufacturers specification booklet to assist in determining the correct visual appearance when "reading" a spark plug.

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.

THIS CONCLUDES OUR BRIEF OUTLINE OF PROCEDURES