

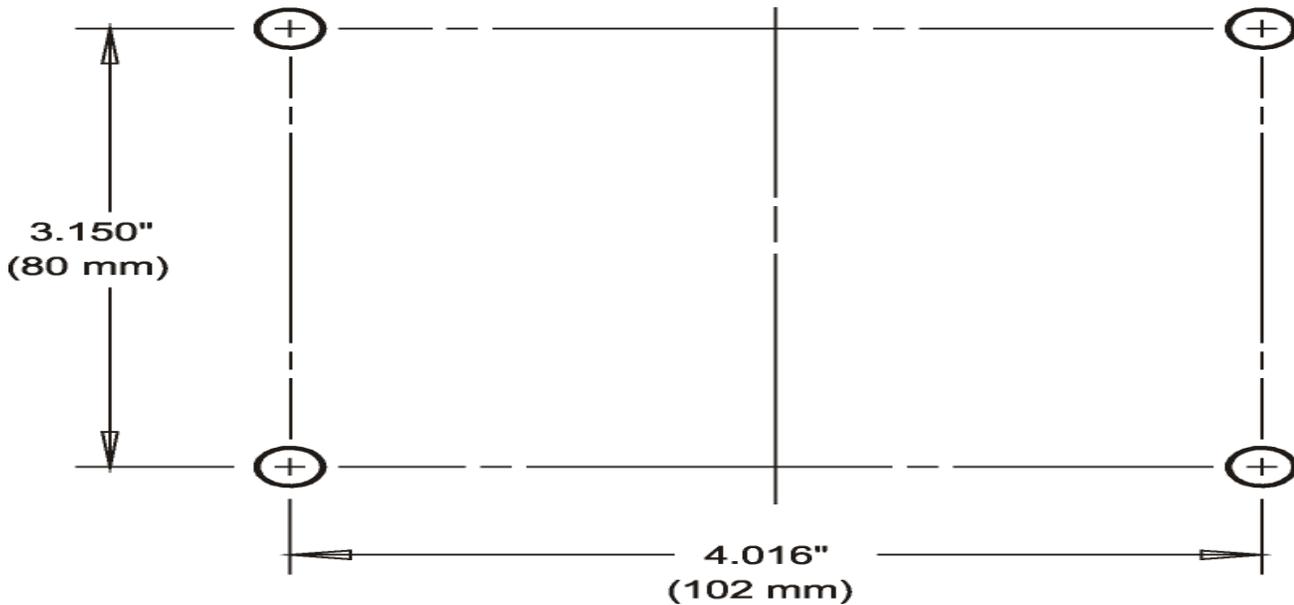
# HPV100 Manual



## CONTENTS OF KIT

Each HPV100 engine is delivered with the following components:

<u>Quantity</u>	<u>Description</u>
1	Sparkplug cap
1	Sparkplug (NGK BR10EG)
1	Exhaust System
2	Exhaust springs
1	Carburetion phenolic spacer
1	Carburetor
1	Air filter cup
1	Clutch
1	Coil



**Drill pattern for engine mount**

The engine crankcase must be fixed to the mount with 4 Allen screws M8.

Torque at 22 ÷ 24 Nm. Make sure to engage a thread length of approx.18mm in the crankcase fixing holes (the screw should protrude 18mm from the mount).

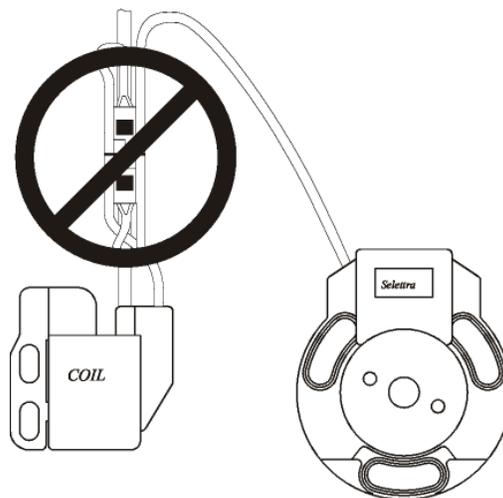
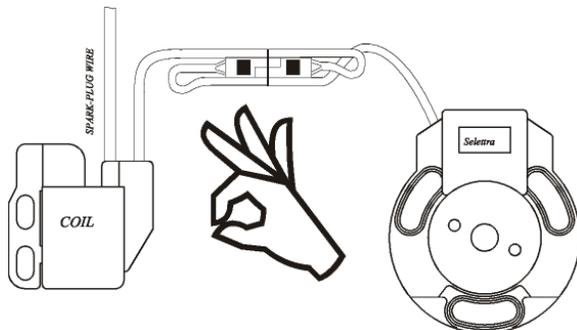
When installing the chain make sure that the engine sprocket and the axle sprocket are perfectly aligned, using a line up bar or straight edge.

After fixing the engine to the chassis, check that the chain is properly tensioned. To do this, make sure that the chain play halfway between the engine and the axle sprockets is between 1/2" to 3/4".

**Every time before the engine is started, make sure to check the torque of the fixing screws on the mount and on the engine mount clamps.**

**Warning!** The 7mm diameter high voltage wire to the spark plug must never touch the other coil wire(s) that connect to the magneto or kill switch. Reason, the high voltage can jump the circuit and burn out the coil.

Correct installation ↓



Always make sure to ground the coil. Failure install ground strap will cause the coil short circuit and be damaged beyond repair.

### **Warning!!!**

Never attempt to shut off engine by pulling off the high tension spark plug wire as over 15,000 volts can severely injure or kill a human.

The red connector is for a kill switch...

see photo. ⇒



### **How to install the carburetor**

Install the parts in the following order:

- gasket
- plastic spacer
- gasket
- Walbro carburetor

Fix these parts altogether using 2 screws M6 x 75mm. Tighten at 6 ÷ 10 Nm



Connect the plastic tube between the pressure pulse on the carburetor and on the fitting on the crankcase →



← Connect the throttle cable to the carburetor and use a spring to improve the quick response of the carb throttle

### Max RPM Range

HPV-1 13,200 – 13,800  
 HPV-2 13,800 – 14,400  
 HPV-3 14,400 – 15,000  
 HPV-4 14,800 – 15,500

### Cylinder Head Temperature

300° F to 325° F HPV-1 cadet class  
 325° F to 360° F HPV-2, 3, & 4 classes

### Fuel/Oil Mix

Use top quality 2 stroke racing oil like Horstman 2T blend of castor/synthetic. Mix 8 ounces oil per gallon of racing gasoline.

Many race events require spec fuel/oil mix therefore you must comply to compete. Do not allow any castor oil mix to stand for more than 6 hours. Use oils containing Castor Oil which guarantees an optimized lubrication at high temperatures. As on the other hand, use of Castor oils creates gummy residues which give origin to carbon deposits, it is necessary to check and clean, at least every 5 - 10 hours, the piston and the head.

Oils below are reliable blends:

- Horstman 2T .Torco GP7 or Maxima 2 stroke

### Break-in Engine

A new engine or rebuilding with a new piston must go through a break-in period. (See carburetor Break-in set up chart page 9)

1. Adjust the carburetor dialing needles out for extra rich mixture
2. Run engine on track for 5-10 minutes with short spans of acceleration from half throttle to full throttle 2-3 second bursts. Never exceed 11,000 rpm and never keep rpm the same very long.
3. Do not allow engine temp to exceed 300° F during break in period
4. Return to pits and allow engine to cool down then check all nuts and bolts on kart and engine for tightness especially header nuts.
5. After several 5-10 minute track sessions and cool down periods the rings and piston will seat correctly.
6. Now you can go back onto the track and adjust the carb to a leaner mixture of fuel/air to gain power and speed.



### SPARK PLUGS

Autolite AR51 *racing* is a good all round plug. Other brands are listed below

NGK	Bosch	Champion
BR 9 EG hot	WO8 CS	N 54R
BR 10 EG med	WO7 CS	N52R
BR 11 EG cold	WO6 CS	

# Clutch

This clutch is engineered for HPV100 Spec Class kart racing. Follow the instructions in this manual for maintenance. This clutch is a dry "direct drive" lock-up style with positive engagement at 5000 RPM.

## Crankshaft Preparation

***The taper on the crankshaft (See Fig. 1) must match the taper in the Clutch Drive Hub or the Clutch will not fit securely.***

In order to check for proper fit, mark the crankshaft with an ink marking pen. Slide the Clutch Hub onto the crankshaft and turn slowly by hand 180 degrees. Remove the Clutch Hub and inspect the crankshaft. A good match is achieved when the ink is wiped off the entire length of the taper after you have rotated the Clutch Hub. If a bad match occurs, lap the Hub and the crankshaft with fine lapping compound. Clean off the lapping compound before installation.

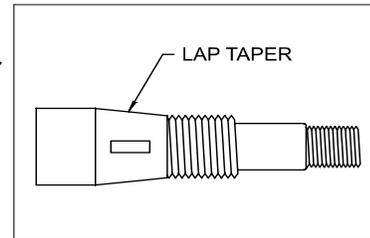


Fig. 1 Crankshaft

## Installation To HPV100 Engine

1. Insert Woodruff Key into crankshaft.
2. Slide clutch Drive Hub assembly onto taper of crankshaft. Be sure the keyway in the Drive Hub is aligned with the Woodruff Key.
3. Install Coned Safety Washer (item 7), Jam Nut (item 6) and tighten until Coned Safety Washer is flat. (450 in. lbs.)
4. Install the Internal Thrust Washer (item 5). Due to manufacturing tolerances, three sizes of the Internal Thrust Washer are provided with each Clutch. It is important to install the washer that provides proper clearance to allow the drum to spin free after the Starter Nut (item 1) is tight. (See fig. 2) Note: Chamfered side of washer faces engine.
5. Apply lithium grease to the Roller Bearing (item 3) before installing the Drum.
6. Install the Drum with Bearing onto the crankshaft.
7. Install the External Thrust Washer (item 2). Note: Chamfered side of washer faces engine.
8. Thread on the Starter Nut (item 1) and tighten to 300 in. lbs. Optional Spanner Wrench (P/N 99-5139) is designed to prevent the crankshaft from turning while tightening the Starter Nut.

## End Play (See Fig. 2)

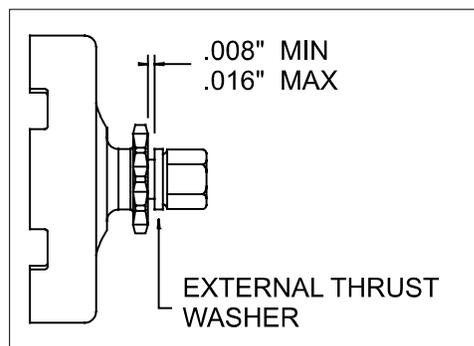


Fig. 2 End Play

End Play is important to allow Drum to spin free. Check end play with feeler gage after Starter Nut is tightened. Too little clearance will cause binding while too much will cause chain alignment problems. Optional internal washers are available to obtain proper tolerance. Min. .008" Max .016"

## Starting Engine & Entering Track

The Clutch is designed to permit easy starting with a battery operated Gun Starter. The Gun Starter should have a 5/16" hex drive.

When starting the engine be sure to keep the brake engaged in order to prevent any sudden acceleration. When the engine starts, the clutch will be in neutral until the engine reaches approximately 4000 RPM. At about 4000 RPM the clutch will start to engage and the kart will start to move. Since the Clutch engages at a low RPM, driving technique will be the same as a direct drive vehicle. This reduces clutch wear for less maintenance cost.

## Stall Speed

Stall speed is the RPM the clutch locks up solid. Spec stall speed maximum is 5000 RPM. For tech the minimum spring adjustment height is .236" and there is no maximum height however do not exceed .260". Use locktite on the retainers to prevent them from working loose. Fig 3

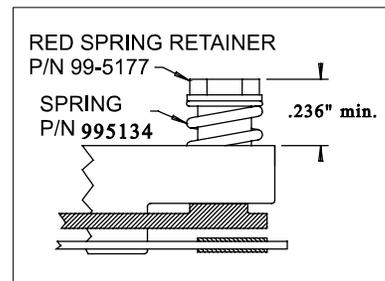


Figure 3

## Clutch Removal

1. Remove the Starter Nut ( item 1). Note: Clutch Spanner (P/N 99-5139) is designed to fit around the Drive Hub (item 12) to prevent the crankshaft from turning when loosening nut.
2. .Remove the External Thrust Washer (item 2), Drum (item 4), Roller Bearing (item 3) and Internal Thrust Washer (item 5). If bearing is hard to remove it is helpful to file or sand the burr of the crankshaft edge.
3. Remove Jam Nut (item 6) & Coned Safety Washer (item 7) Nut is normal RH thread
4. Remove the Clutch Drive Hub (item 12) using an optional Clutch Puller (P/N 99-5140)

## Maintenance and Repair

Due to the extreme demands of Racing it is important to properly maintain your Clutch in order to obtain maximum performance.

1. **Roller Bearing Item 3**  
Since the EXPD-A Clutch is a dry clutch, there is no oil supply for the bearing. It is necessary to apply lubricant to the bearing in order to prevent extreme wear or seizure to the crankshaft. Lithium grease works best. Apply grease or spray Tri-flow into bearing before each track session.
2. **Sprocket / Drum Assembly Item 4**  
Oiling the chain before each track session will increase the life of the sprocket. A worn or chipped chain should be replaced as it will quickly wear out the sprocket. The drum should be replaced when the teeth are worn to a sharp point. Note: Use chain oil ... Tri-flow is not chain oil
3. **Friction Disc Item 10 tech item**  
The Friction Disc has a steel core with ceramic friction material bonded to the surface. It should be inspected after four hours of use. Replace if lugs are worn or cracked or if lining is worn below .122" thick.
4. **Springs Item 13 p/n 995134 tech item**  
The springs are made from stainless steel. They will last many hours and only need to be replaced when broken or collapsed below .465" free length. **Warning: New springs must not exceed .505" free length and max. wire dia. .065"**
5. **Pressure Plate Item 11 tech item**  
The Pressure Plate is precision ground on the surface that engages the friction disc. This surface should be checked periodically for warp and or wear. Replace when badly warped or worn or studs loose. Minimum thickness .150"

6. **Drive Hub Item 12** *tech item*

Remove the Levers (item 16) from the Drive Hub, check for wear in the slotted area after 10 hours running time. Badly worn slots will cause poor performance. Tech item max width .700" x .670"min. also width at lever contact area max .380" min .370"

7. **Fixed Plate Item 9** *tech item*

Replace when worn below .125" or badly glazed

8. **Levers Item 16**

The pivot hole in the lever is subject to a stress due to frictional loading from centrifugal force. This causes the pivot hole to eventually elongate. Inspect the levers for pivot hole wear or flat spots whenever you rebuild the clutch.

9. **Dowel pins item 15**

The Dowel Pins must absorb high stress from the levers. Replace after 10 hours of use to avoid breakage.

10. **Thrust Washers and Nuts**

Visually inspect during teardown and replace if cracked or damaged. Apply grease to washers every race event.

### Clutch Assembly

1. **Clean parts with disc brake cleaner or WD-40. Disc brake cleaner comes in an aerosol spray can and is available at most automotive parts stores. Do not use gasoline or solvents to clean the Clutch!**
2. **Apply anti-seize or grease to the Dowel Pins (item 15). Slide Dowel Pins into the Levers (item 16). Groups of 3.**
3. **Insert Pressure Plate (item 11) into the Drive Hub (item 12).**
4. **Place each Spring (item 13) over a corresponding Pressure Plate Stud. Next, screw the Red Retainer (item 14) onto each Stud until the desired height of .246" is obtained. (See Fig. 4)**
5. **Lay the Friction Disc (item 10) onto the flat side of the Pressure Plate.**
6. **Place the Fixed Plate (item 9) over the Drive Hub and align the 3 holes in the Fixed Plate with the Drive Hub Holes.**
7. **Apply anti-seize to Screws (item 8) and insert into the bolt holes in the Hub (item 12). Tighten screws to 50 in. lbs. Note: These screws should not be tightened past 50 in. lbs. or they will be difficult to remove.**
8. **Clutch is ready for installation on crankshaft.**

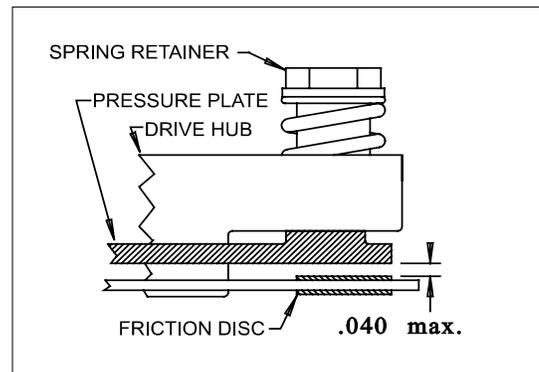
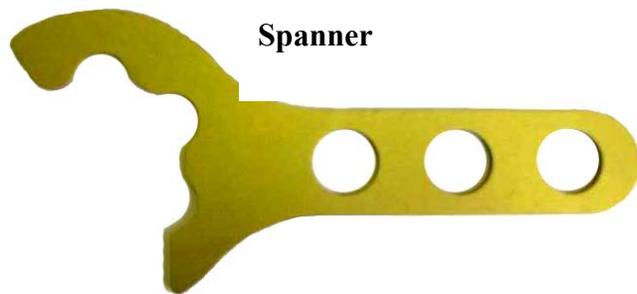
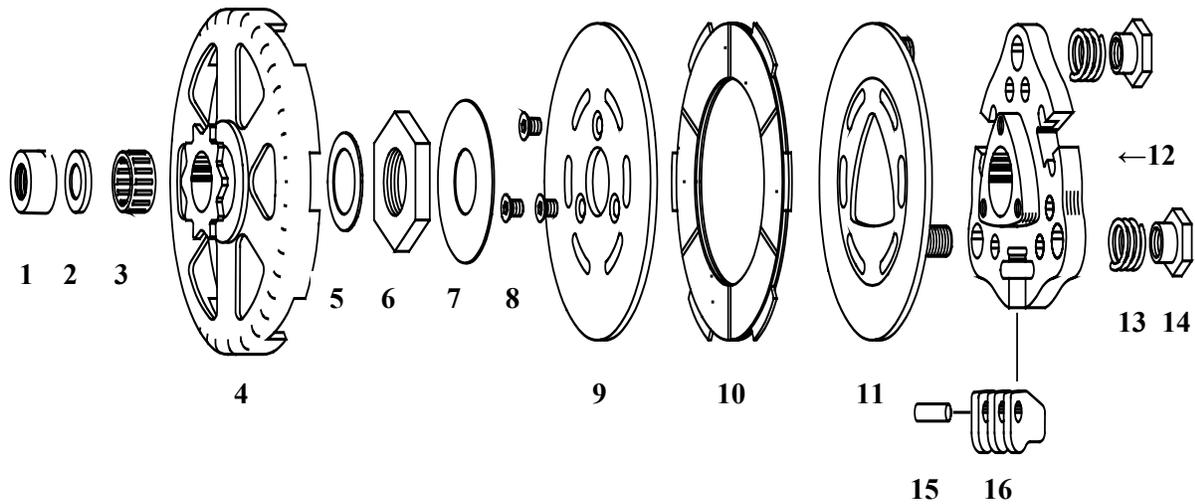


Figure 4

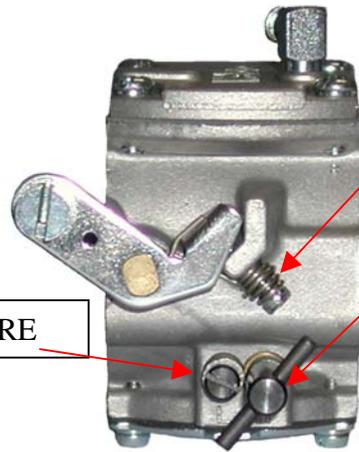
### Air Gap

Air Gap is a tech item....Air Gap is the clearance necessary for proper clutch engagement and disengagement. Permitted Air Gap maximum is .040". To check Air Gap measure space between fixed plate and pressure plate then subtract the friction disc thickness. When Air Gap exceeds .040" install a new Friction Disc (See Fig. 4)

Item Number	Part Number	Description	Units Required
	995153	EXPD II Clutch for HPV100 complete 10T	
	995154	EXPD II Clutch for HPV100 complete 11T	
1	995175	Starter nut M10x1	1
2	995121	Thrust washer, external	1
3	995123	Bearing	1
4	995166	Drum 10T 219 with bearing	optional
	995167	Drum 11T 219 with bearing	1
5	995124	Thrust washer 1.5mm	optional
	995125	Thrust washer 1.7mm	1
	995126	Thrust washer 1.8mm	optional
6	995127	Jam Nut M16x1	1
7	995128	Coned washer	1
8	995129	Screw M5x10 Flat head	3
9	995130	Fixed plate	1
10	995131	Friction disc	1
11	995146	Pressure Plate	1
12	995136	Drive hub	1
13	995134	Spring	3
14	995177	Retainer	3
15	995137	Dowel pin	3
16	995138	Lever	9
	995139	Spanner	optional
	995176	Puller tool	optional



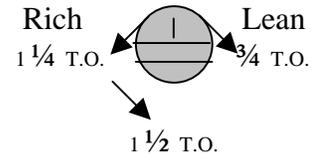
# WB-3A CARBURETOR MIXTURE SCREWS ADJUSTMENT GUIDE



(L) LOW SPEED FUEL MIXTURE

(I) IDLE SPEED SCREW

(H) HIGH SPEED FUEL MIXTURE



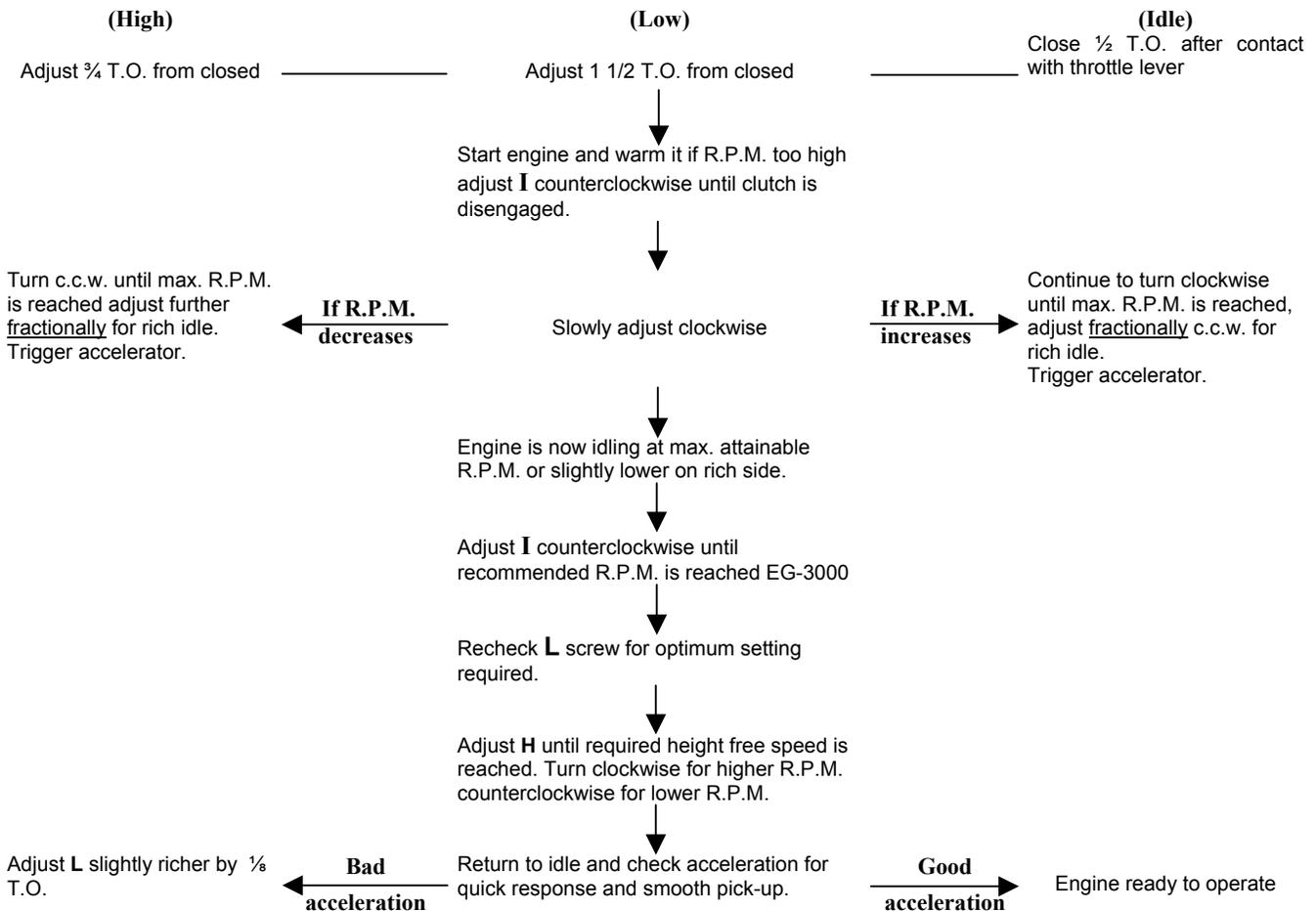
T.O. = TURNS OPEN

Normally the correct **break-in** setting of the mixture screws is the following:

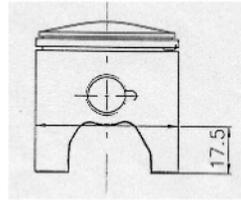
- 1 1/2 T.O. for the L (close the screws completely and then open)
- 3/4 T.O. for the H (close the screws completely and then open)

**ATTENTION:**

- NEVER LEAN TOO MUCH AS LEAN MIXTURE WILL OVERHEAT ENGINE AND CAUSE SEIZURE.
- DO NOT FORCE H OR L CLOSED. IT MAY DAMAGE THE PRECISION MACHINED ORIFICE AND RENDER THE CARB. UNSERVICEABLE.
- THE ADJUSTMENT OF SCREWS MUST BE PERFORMED WITH WARM ENGINE.



## Matching Piston



**ATTENTION** : Play between piston and liner must be .090 mm (.0035") If play exceeds .011 mm replace piston. Pistons are measured at 17.5 mm from bottom of piston and size measured must be 0.090 mm lower than what is stamped on piston top.

- Green Dot: size of liner is as marked on piston top.
  - Red Dot: add 0.01 mm to size of liner marked on piston top.
- Ring end gap .008" min to .015" max .203mm min to .381mm max

## Maintenance **Service should be performed by skilled craftsman**

1. Crankshaft Check status of crank halves ... replace when worn at bearing seat beyond 0.03mm
2. Crankpin Visually inspect and replace is scored or worn where it contacts big end bearing
3. Conrod Check top and bottom bearing bores ... replace rod when ovalization exceeds 0.01mm
4. Rollar cages Replace every 4 hours
5. Crankcase bearings Replace every 5 hours
6. Seals Replace every 4 hours
7. Piston Replace every 10 race events Make sure arrow faces exhaust
8. Piston pin Replace when using new piston
9. Cylinder head clean carbon buildup from combustion chamber ...do not scratch chamber Torque nuts with cross pattern to 1.8 kgm
10. Exhaust System check after each race for cracks or dents to all components ... replace as needed ... excessive carbon buildup can affect performance ... for best performance install a new exhaust chamber yearly. Spray outside of exhaust chamber each night after racing with WD-40 to reduce corrosion ... wait until pipe is cool to prevent possible flame Replace gasket every time header is removed torque exhaust nuts to 1 kg

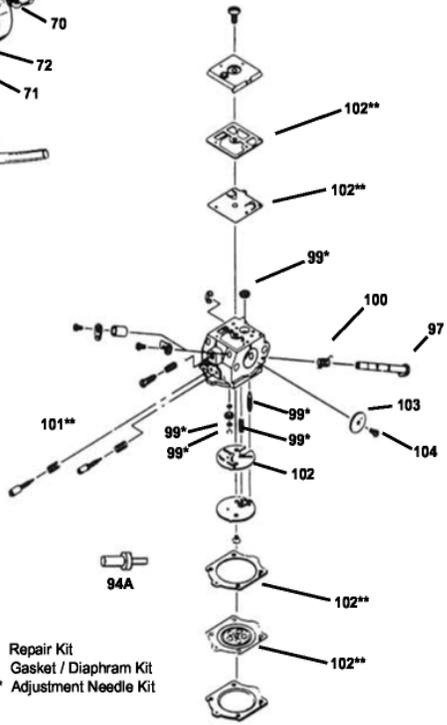
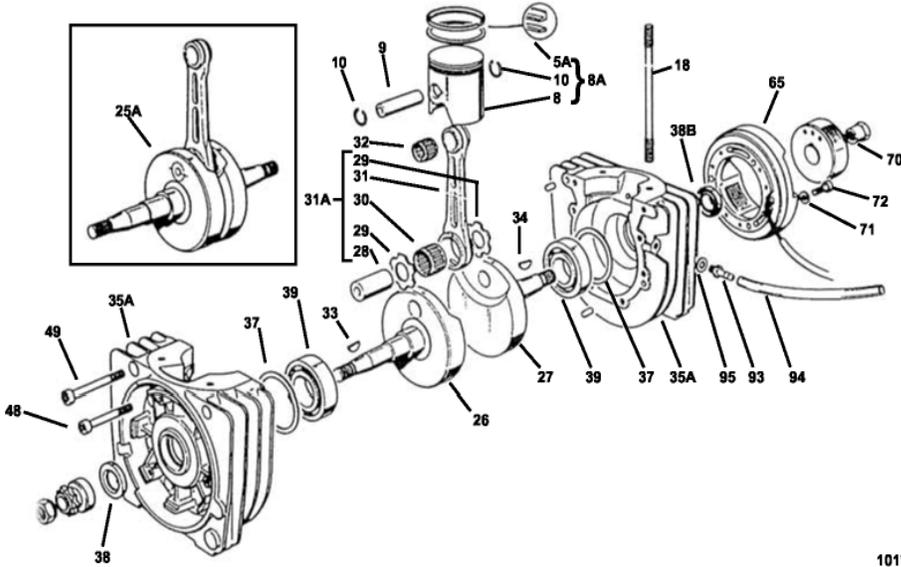
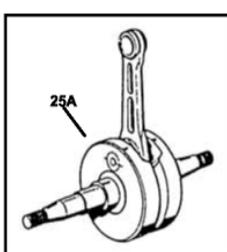
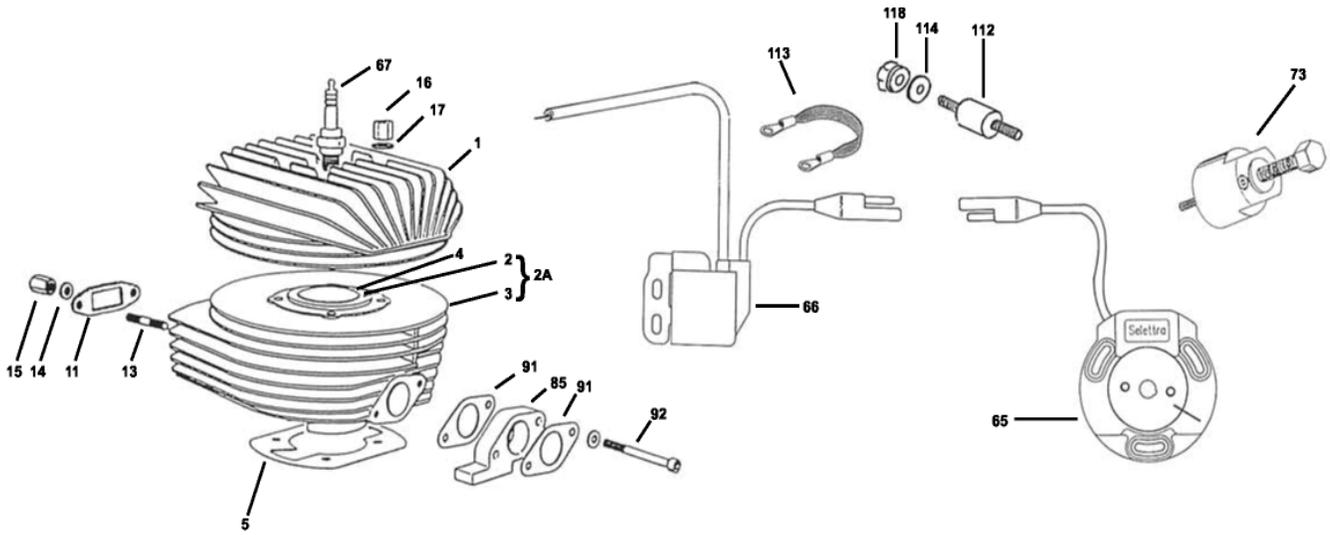
## Ignition Timing **.080" to .100" B.T.D.C.**

**excessive advance above .100" may cause pre-ignition and piston damage**

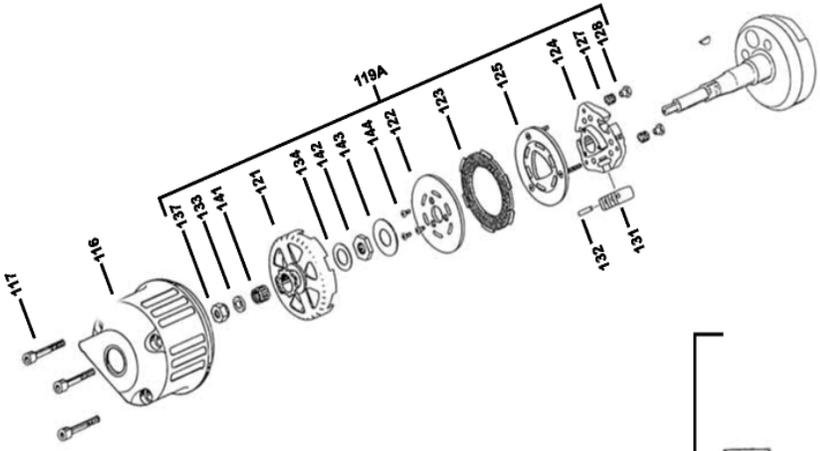
1. Install a dial indicator with adapter to spark plug threads in head
2. Rotate crankshaft until piston is at T.D.C.
3. Set gauge a Zero
4. Looking at ignition , turn rotor clockwise by 2.2mm Hold rotor to prevent turning
5. Rotate stator until the marks on rotor and stator line up
6. Tighten screws on stator

**Break-in Carburetor Setup Chart**

Class	Carb Model	Approximate Settings	Popoff
HPV-1 IKF Cadet / WKA Jr Sportsman	HPV-1	1 1/4 Low 1 1/4 High	20 lbs
HPV-2 IKF Jr / WKA Jr	WB-3A	1 1/2 Low 3/4 High	10 lbs
HPV-3 IKF Senior / WKA Senior	WB-3A	1 1/2 Low 3/4 High	10 lbs
HPV-4 IKF Senior / Outlaw Piston Port	WB-3A	1 1/2 Low 3/4 High	10 lbs
HPV-5 KART Road race	WB-3A	1 1/2Low 3/4 High	10 lbs



\* Repair Kit  
 \*\* Gasket / Diaphragm Kit  
 \*\*\* Adjustment Needle Kit



# HPV-100 Parts

0	992100 Engine Less Carb, HPV 100	39	992197 Bearing 6205-C4	124	995136 Drive Hub HPV-100
	992101 Engine Kit 7hp Cadet, 8-11	48	992198 Screw 6x60	125	995146 Pressure Plate
	992102 Engine Kit 11hp Jr., 12-15	49	992199 Screw 6x40	127	995134 Spring
	992103 Spec Engine Kit 14hp Sr.	65	992201 Ignition, Less Coil Selettra	128	995177 Retainer, Red Color
	992104 Spec Engine Kit 18hp Sr.	66	992202 Coil, Selettra	131	995138 Lever, Solid, EXPD-A
	992106 IKF Jr. Spec Engine Kit	68	992216 Spark Cap	132	995137 Dowel Pin, EXPD-A
1	992124 Cylinder Head HPV-100	70	992200 Nut, Magneto	133	995121 External Thrust Washer
2A	992126 Cylinder HPV-100/K71	71	992203 Flat Washer M5	134	995124 Internal Thrust Washer .060"
4	992219 Head Gasket .005"	72	992204 Screw M5		995125 Internal Thrust Washer .065"
	992220 Head Gasket .010"	73	992328 Rotor Puller, Selettra		995126 Internal Thrust Washer .070"
5	992127 Gasket .016" Cyl. Base	74	992327 Rotor Wrench, Selettra	137	995175 Starter Nut HPV-100
	992128 Gasket .008" Cyl. Base	85	992205 Carb Spacer WB3A	141	995123 Roller Bearing
	992129 Gasket .005" Cyl. Base		992305 Carb Spacer HPV1	142	995127 Jam Nut HPV-100
5A	992130 Piston Ring Set 52.43	86	992321 Manifold HPV1	143	995128 Cone Washer HPV-100
	992131 Piston Ring Set 52.53			144	995129 Screw, M5x10
	992132 Piston Ring Set 52.63	87	992307 Screw Manif/Cyl. HPV1	146	995139 Spanner Wrench
	992133 Piston Ring Set 52.73	88	992309 Screw Carb/Manif HPV1	148	995176 Puller, Clutch
	992134 Piston Ring Set 52.83			150	995260 Header
	992135 Piston Ring Set 52.90	89	992308 Gasket Carb/Manif HPV1		
8A	992136 Piston w/rings 52.4r			151	995265 Springs, Pair
	992137 Piston w/rings 52.4g	91	992206 Gasket Carb/Spacer WB3A		
	992138 Piston w/rings 52.42r	92	992207 Screw M6x70 WB3A	152	995266 Flex Tube HPV-1, HPV-2, HPV-3
	992139 Piston w/rings 52.42g	93	992208 Pulse Fitting WB3A Carb		995268 Flex Tube HPV-4
	992140 Piston w/rings 52.45r		992318 Pulse Fitting HPV1	153	995271 Exhaust Chamber HPV-1
	992141 Piston w/rings 52.45g	94	992322 Pulse Tubing WB3A Carb		995272 Exhaust Chamber HPV-2
	992142 Piston w/rings 52.5r		992319 Pulse Tubing HPV1 Carb		995273 Exhaust Chamber HPV-3
	992143 Piston w/rings 52.5g	94A	992317 Reducer, Fuel Line HPV1		995274 Exhaust Chamber HPV-4
	992144 Piston w/rings 52.52r	95	992209 Pulse Fitting Gasket, Universal		995280 Exhaust Chamber HPV-Pro
	992145 Piston w/rings 52.52g	96	992301 Carburetor HPV-1	154	995261 Exhaust System HPV-1
	992146 Piston w/rings 52.55r				995262 Exhaust System HPV-2
	992147 Piston w/rings 52.55g		992310 Carburetor WB3A		995263 Exhaust System HPV-3
	992148 Piston w/rings 52.6r		992299 Throttle Arm, Cable Anchor		995264 Exhaust System HPV-4
	992149 Piston w/rings 52.6g	97	992300 Throttle Shaft HPV-1		995283 Exhaust System HPV-Pro
	992150 Piston w/rings 52.62r			155	995178 Center Bolt Puller
	992151 Piston w/rings 52.62g	98	992320 Filter Cup HPV-1	156	995179 Bolt, Puller
	992152 Piston w/rings 52.65r		992323 Filter Cup WB3A	157	995277 <b>End Cap.</b> Fits HPV 1,2 & 3 pipes
	992153 Piston w/rings 52.65g	99	992324 Repair Kit HPV-1 Carb		
	992154 Piston w/rings 52.7r				
	992155 Piston w/rings 52.7g	100	992334 Spring, throttle HPV-1 Carb		
	992156 Piston w/rings 52.72r				
	992157 Piston w/rings 52.72g	101	992329 Adjustment, Needle Kit HPV-1		
	992158 Piston w/rings 52.75r				
	992159 Piston w/rings 52.75g	102	992315 Gasket, Carb HPV-1		
	992160 Piston w/rings 52.8r				
	992161 Piston w/rings 52.8g	103	992316 Throttle Shutter, HPV-1		
	992162 Piston w/rings 52.82r				
	992163 Piston w/rings 52.82g	104	992336 Screw, Throttle Shutter, HPV-1		
	992164 Piston w/rings 52.85r				
	992165 Piston w/rings 52.85g	105A	992210 Gasket Set		
	992166 Piston w/rings 52.9r				
	992167 Piston w/rings 52.9g	112	992211 Dampener, Coil		
9	992168 Piston Pin Sel. 2				
10	992171 Circlip	113	992212 Ground Cable, Coil		
11	992172 Gasket, Exhaust Pipe	115	992213 Nut M6		
13	992173 Stud, Exhaust	116	992214 Clutch Guard		
14	992174 Washer, Flat	117	992215 Screw M6x55		
15	992175 Exhaust Nut 8mm	118	992225 Nut		
16	992176 Head Nut	119A	995150 Clutch, EXPD-A 9T35 HPV-100		
17	992177 Washer, Head Nut		995151 Clutch, EXPD-A 10T35 HPV-100		
18	992178 Stud, Cylinder		995152 Clutch, EXPD-A 11T35 HPV-100		
25A	992180 Crankshaft Assy HPV-100		995153 Clutch, EXPD-A 10T219 HPV-100		
	992182 Crankhalf PTO HPV-100		995154 Clutch, EXPD-A 11T219 HPV-100		
			995155 Clutch, EXPD-A 12T219 HPV-100		
27	992183 Crankhalf Ign. HPV-100	121	995163 Drum w/brg 9T#35 chain		
28	992184 Crankpin 43mm		995164 Drum w/brg 10T#35		
29	992185 Washer, Bronze		995165 Drum w/brg 11T#35		
30	992186 Big End Cage 15r		995166 Drum w/Brg 10T#219 chain		
31	992187 Con Rod Only		995167 Drum w/Brg 11T#219		
31A	992188 Con Rod Assy		995168 Drum w/Brg 12T#219		
32	992189 Small End Cage		995190 Drum w/Brg 15T#219		
33	992190 PTO Shaft Key		995169 Drum w/Brg 16T 8mm Htd Belt		
34	992191 Mag Shaft Key		995188 Drum w/Brg 17T 8mm Htd Belt		
35A	992193 Crankcase Assy HPV-100		995189 Drum w/Brg 19T 8mm Htd Belt		
37	992217 Shim 0.1mm				
	992218 Shim 0.15mm	122	995130 Fixed Plate		
38	992194 Oil Seal 20x32x7 HPV-100				
38B	992196 Oil Seal 17x32x7 HPV-100	123	995131 Friction Disc		