



Fireball 125cc-TaG Engine



INSTALLATION

&

USER GUIDE

Courtesy of



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GENERAL ENGINE DESCRIPTION

The PRD 125cc Fireball engine is a “TaG” (Touch and Go) style engine. This engine is a hobby engine and designed only for closed course racing on tracks built for this specific purpose. The engine is a single cylinder 2-stroke.

Piston & Ring Single ring piston with an L-type cast iron & chrome plated ring.

**Cylinder &
Crank Case** Cast aluminum alloy.

Crank Case Liner The cast iron liner is fully machined then cast with an aluminum water jacket creating a tamper proof locking system which ensures proper alignment and stability.

Head The head is cast aluminum and fully machined on the combustion side and attached to the cylinder with four (4) studs.

Crank Shaft Made of alloy steel machined, hardened and ground to exacting specifications. The crank is supported in the case by C6305 ball bearings. The connecting rod is investment forged for accuracy and durability.

Ignition Fully digital with a CDI ignition module, solid state relay and the rev limiter preventing RPM's in excess of 16,000. It is made for easy use and great starting ability.

Bendix & Gear Engages the starter ring gear to start the engine.

Clutch The clutch is designed so the clutch gear may be easily changed to achieve required gear ratios. The ring gear is part of the low stall dry clutch that requires no adjustment. The ring gear/flywheel is part of the clutch assy.

Carburetor HL-360A or HL-395A/HL-166 manufactured by Tillotson. Both are diaphragm style with built in fuel pump, fully adjustable high and low speed needles which can be set before starting the engine off the track.

GENERAL ENGINE DESCRIPTION (continued)

| | |
|----------------------------------|---|
| Battery | 12 volt with a battery box to hold the battery. |
| Exhaust Pipe & Header | Supplied with a connector tube to create the preferred tuned length. |
| Complete Kit | Includes all switches, radiator, radiator mount, radiator hoses, water pump and more. |

GENERAL ENGINE SPECIFICATIONS

| | |
|-----------------------------|--|
| Single Cylinder | 2 stroke (2-cycle) |
| Volume of Cylinder | 122.25cc |
| Maximum Bore | 54.25mm |
| Stroke | 54mm |
| Water Cooled | 130°F +/- 15° |
| Carburetor | Tillotson HL-360A or Tillotson HL-395A/HL-166 |
| Reed Valve Induction | (2) Two petal reeds |
| Lubrication | Fuel/Oil 10oz to 1 gallon |
| Electric Starter | 12 volt |
| Clutch | Dry, fixed-centrifugal |
| Max RPM's | 16,000 (built in rev limiter) |

Section 1

COMPLETE ENGINE PACKAGE

Engine Box

Engine
Header
Reed manifold & reeds (installed)
Dry clutch (installed)
Starter (installed)
Bendix (installed)

Accessory Box

Cooling System

Radiator
Radiator hoses
Radiator mount
Water pump
Water pump pulley
(2) Water pump belts

Electrical System

Battery
Battery box
Wiring harness
On/off switch
Starter button
Switch plate
Coil
Clutch cover/Coil mount
Relay
CDI ignition module
Spark plug
Spark plug boot

Exhaust System

Pipe
Flex
Heat wrap
(4) Pipe Springs
(2) Pipe Cradle Springs

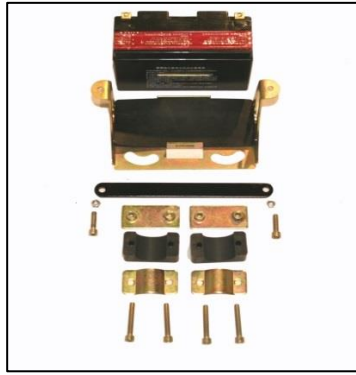
Induction System

Tillotson Carburetor
Spec reeds (optional)
Filter Cup
Air box with hose clamp

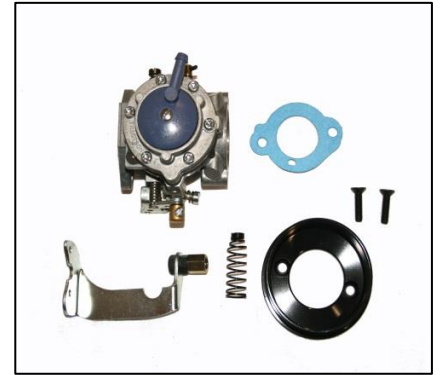
ACCESSORIES



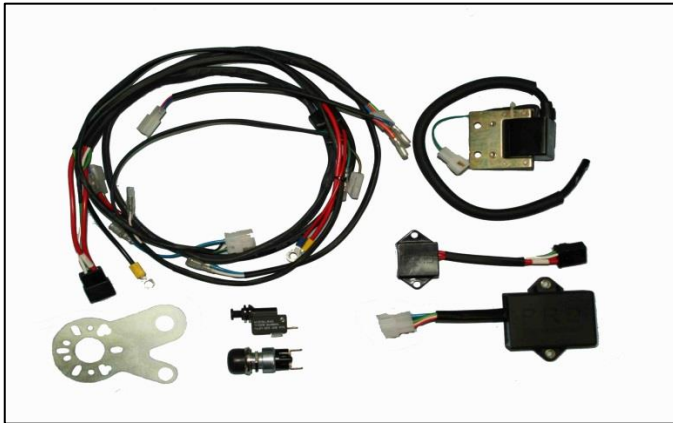
Exhaust



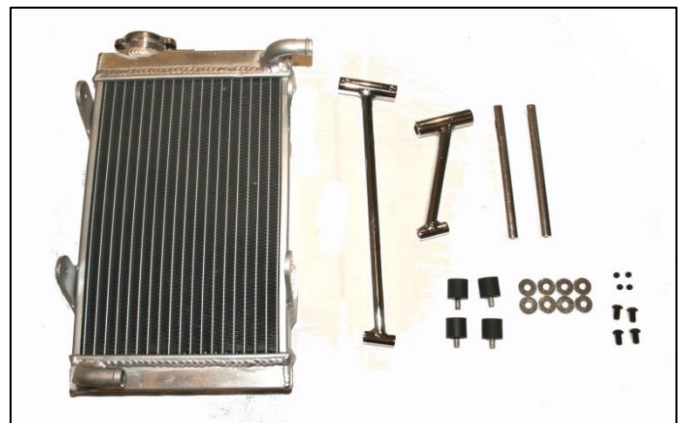
Battery and Box



Tillotson Carburetor



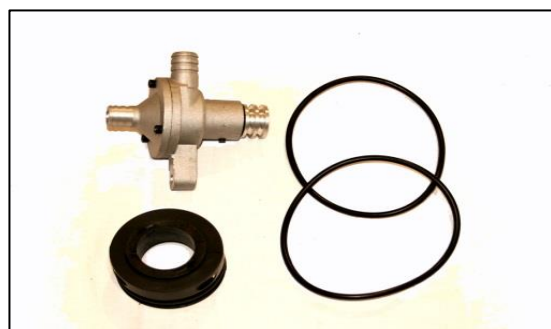
Easy Start Ignition System



Radiator and Mounting



Clutch Cover w/ Coil



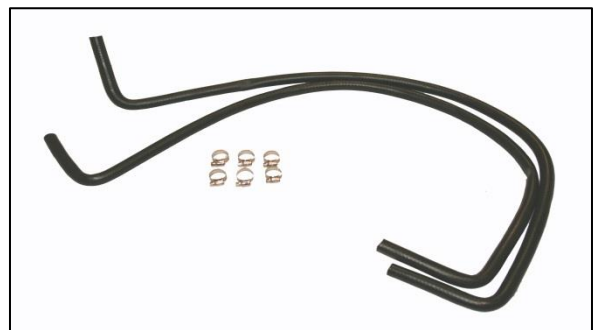
Complete Water Pump



Intake Silencer



Spark Plug

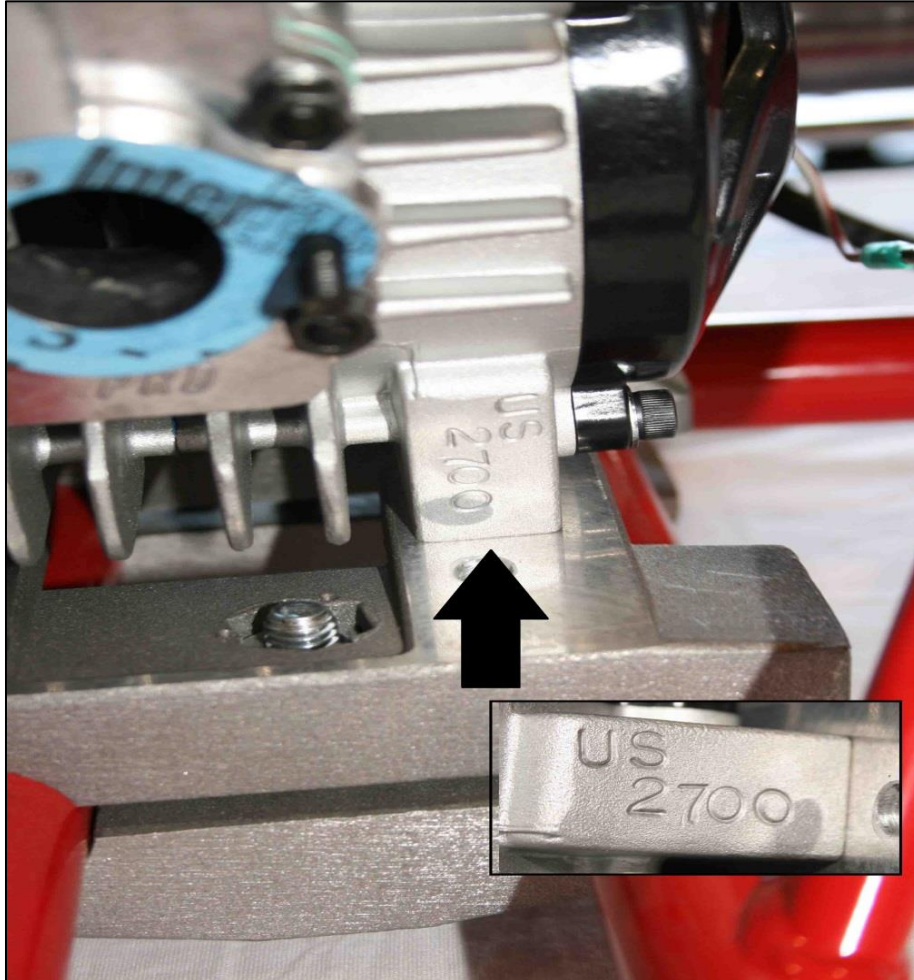


Radiator Hose Kit

Section 2

ENGINE SERIAL NUMBERS

Each engine is stamped with a unique serial number. The serial number is displayed to the right of the intake manifold at the base of the engine. This serial number will always start with US and a four digit number "US 2700" as seen below. This serial number is referenced when seeking support or information on your engine.

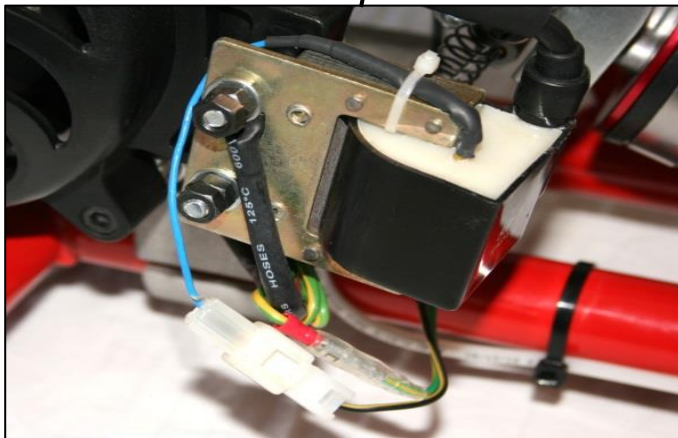
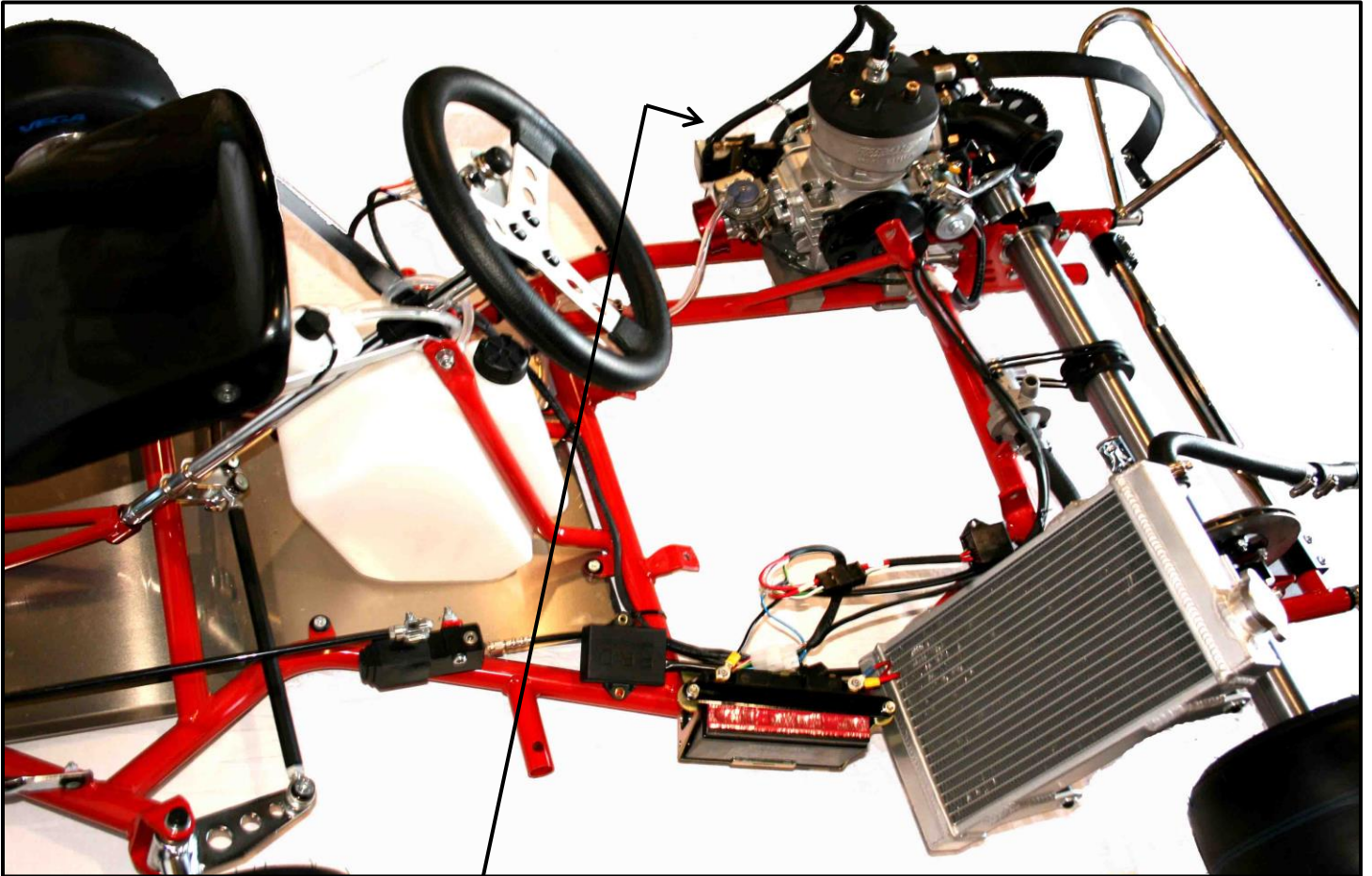


Section 3

INSTALLATION INSTRUCTIONS

Note: If your engine is already assembled and mounted on the chassis move to section 4.

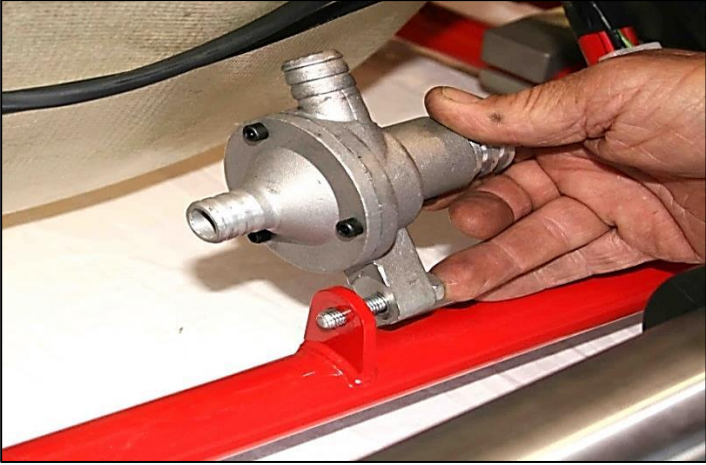
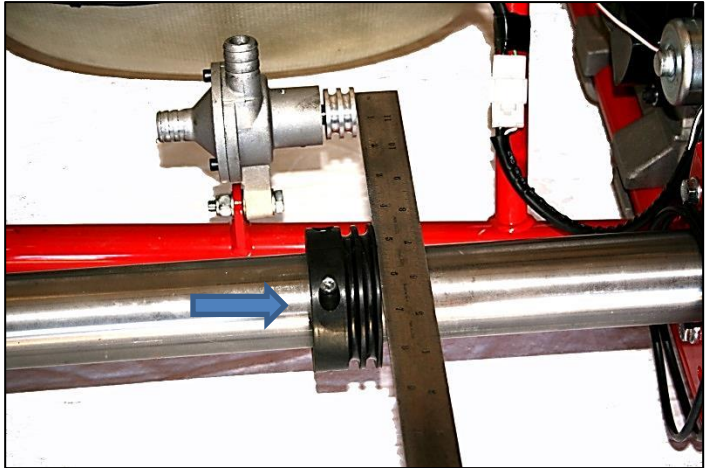
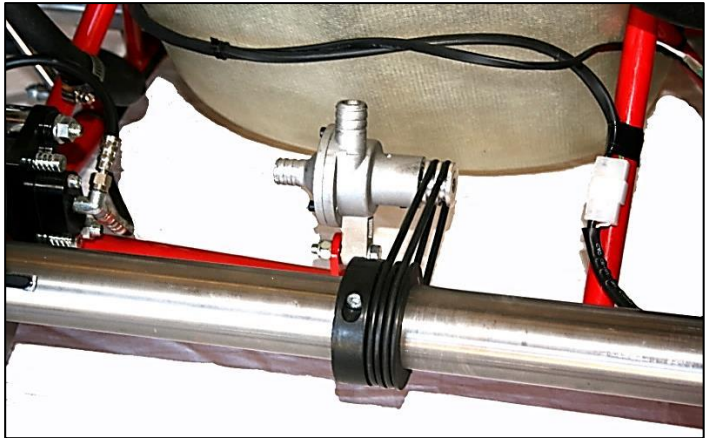
Section 3.1 General wiring layout of a kart frame with the engine mounted.



Section 3.2

INSTALLING THE WATER COOLING SYSTEM

Note: To install the belts it is necessary to remove the axle from one side of the kart. Once done slide the belts over the axle and reinstall the axle. (Installing a spare set of belts will eliminate removing the axle to replace a broken belt).

| | | |
|-----------------|---|---|
| <p>1</p> | <p>Install the water pump as shown in <u>Fig. 1</u>. Use an M8x45 bolt and a nylock nut (not included) to fasten to frame.</p> | <p>Fig. 1</p>  |
| <p>2</p> | <p>Install the water pump pulley as shown in <u>Fig. 2</u>. Align the water pump pulley with a straight edge to the pump. Tighten the pulley to the axel.</p> | <p>Fig. 2</p>  |
| <p>3</p> | <p>Install the belts and tension, then tighten the water pump in place as shown in <u>Fig. 3</u>.</p> | <p>Fig. 3</p>  |

Before installing the radiator attach the mount brackets.

4

Slide mount bar through the upper tube of each bracket. Add washer and rubber isolators to the end of each mount bar and tighten as shown in Fig. 4.

Fig. 4



5

Install set screws in the upper tube of each bracket as shown in Fig. 5. Leave loose until mounted on the kart.

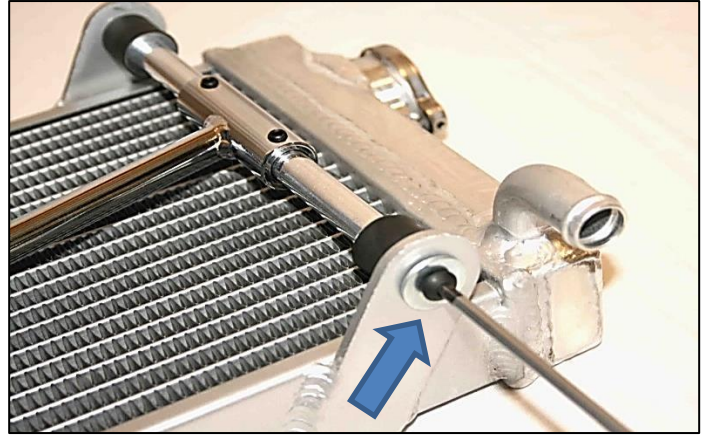
Fig. 5



6

With set screws facing out install the long bracket into the upper tabs on the radiator. Use a washer and M5x10 bolt as shown in Fig. 6.

Fig. 6



7

Follow the instructions from Fig. 6 for the short bracket. Install them into the lower tabs as shown in Fig. 7.

Fig. 7


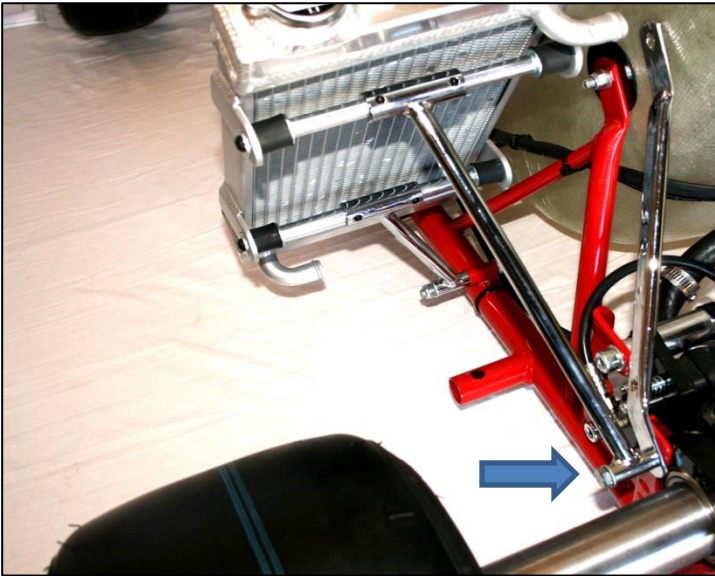
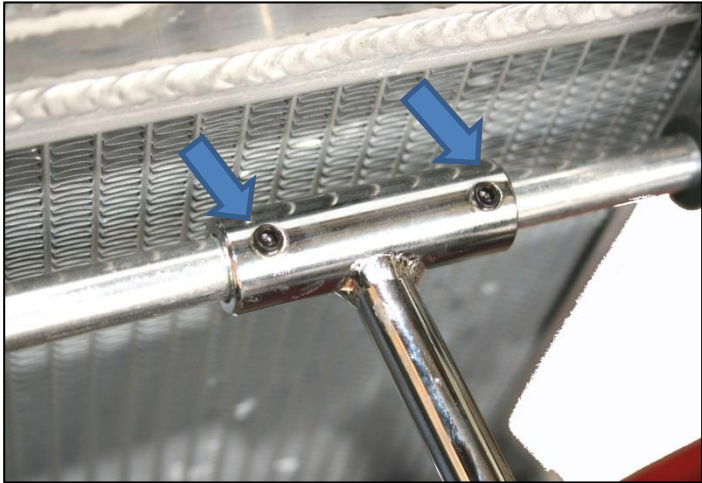


8

The radiator is now ready to install on to the kart. Notice the angle of the mount bars.

Fig. 8



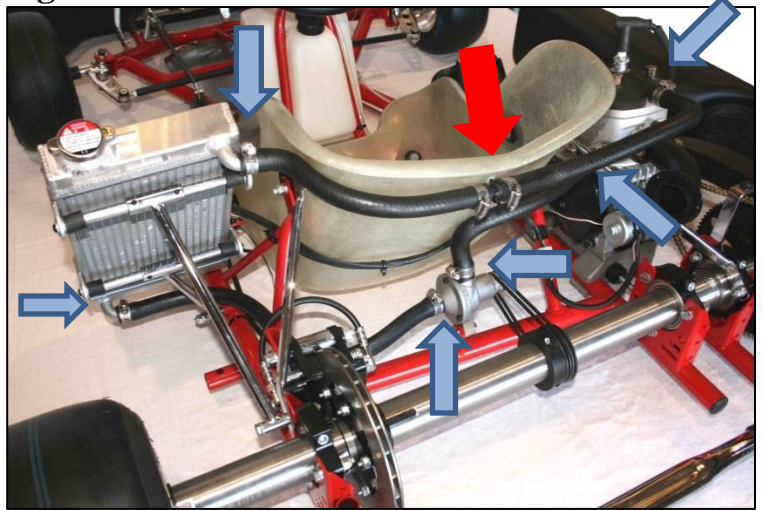
| | | |
|------------------|---|--|
| <p>9</p> | <p>Mount the lower bracket to the chassis using an M6x70 bolt (not included) as shown in <u>Fig.9</u>. Leave loose for final positioning.</p> | <p>Fig. 9</p>  |
| <p>10</p> | <p>Mount the upper bracket to the bearing cassette or where best suited using an M6x70 bolt (not included) as shown in <u>Fig. 10</u>. Leave loose for final positioning.</p> | <p>Fig. 10</p>  |
| <p>11</p> | <p>Once the radiator is in position, tighten set screws and bolts using blue loctite as shown in <u>Fig. 11</u>.</p> | <p>Fig. 11</p>  |

12

The kit includes 2 water hoses that must be cut to fit.

- Connect the first hose to the top of the radiator and to the top of the engine. (Depending on the seat size the hose may need to be cut and coupled behind seat; see red arrow).
- Cut second hose and connect to the bottom of the radiator and inlet side of water pump.
- Use one of the residual hoses to connect to the water pump outlet (top) and engine inlet.

Fig. 12



BEFORE THE FIRST START OF THE ENGINE:

- Fill the radiator to the top and then rotate the rear axle to allow trapped air to escape. Refill radiator and repeat this step until level stays full.
- After the first run session check the water and top off as necessary.

Section 3.3

INSTALLING THE HEADER

1

Remove the exhaust nuts and paper plug from exhaust port.

2

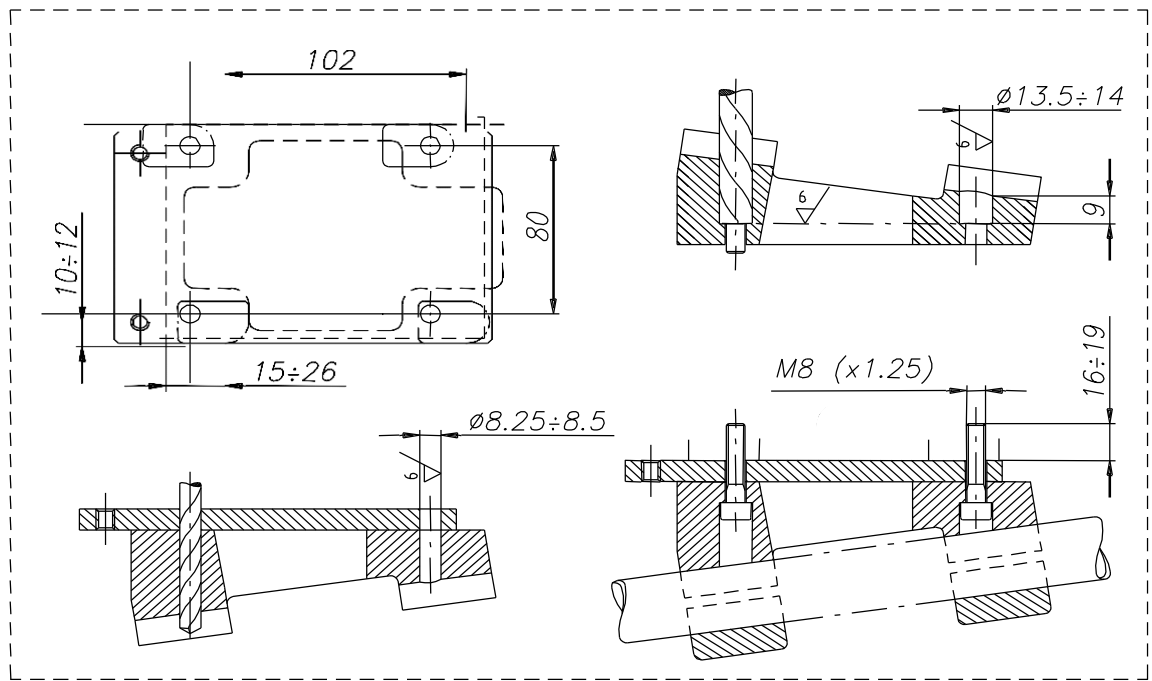
Install the header onto the three studs of the cylinder as shown in Fig.1. Tighten the header with exhaust nuts.

Fig. 1



1

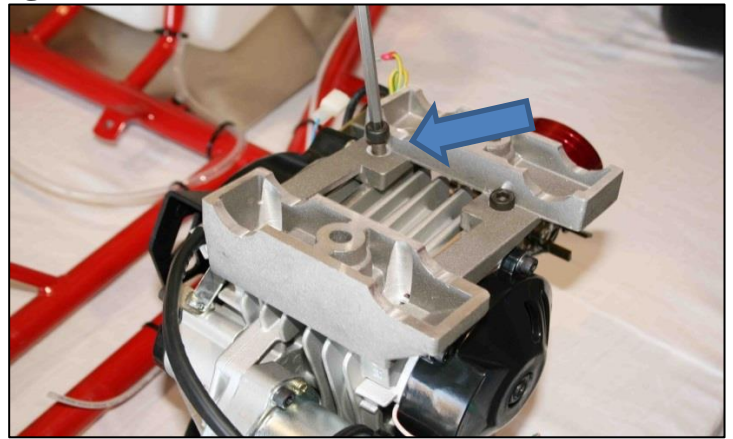
***If the engine mount is not drilled the engine bolt pattern is 102mm x 80mm.**



2

Bolts should extend through the mount $\frac{3}{4}$ ". Turn the engine upside down and install the engine mount as shown in Fig. 2. Tighten bolts in a cross pattern. (Length of bolt is determined by your engine mount. Bolt is an M8x1.25)

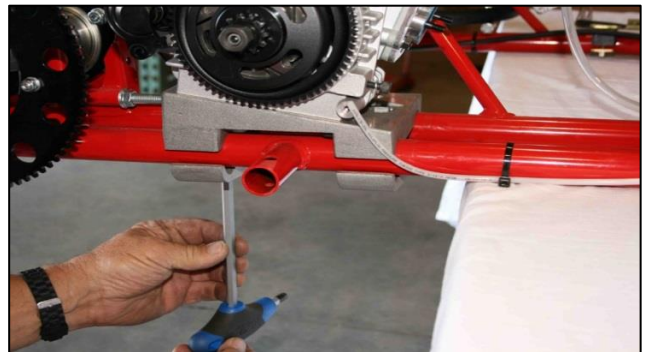
Fig. 2

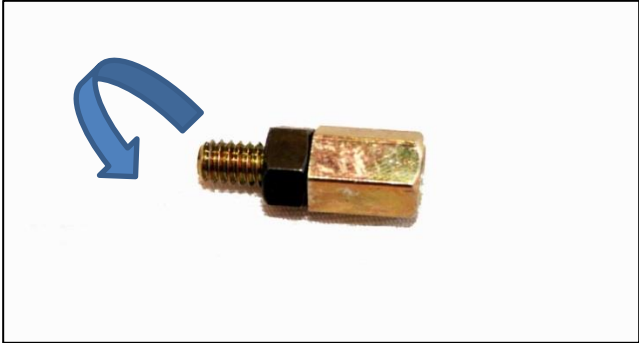




3

Once mounted, place the engine on the chassis and fasten with lower clamps and bolts as shown in Fig.3. Leave loose for chain installment.

Fig. 3

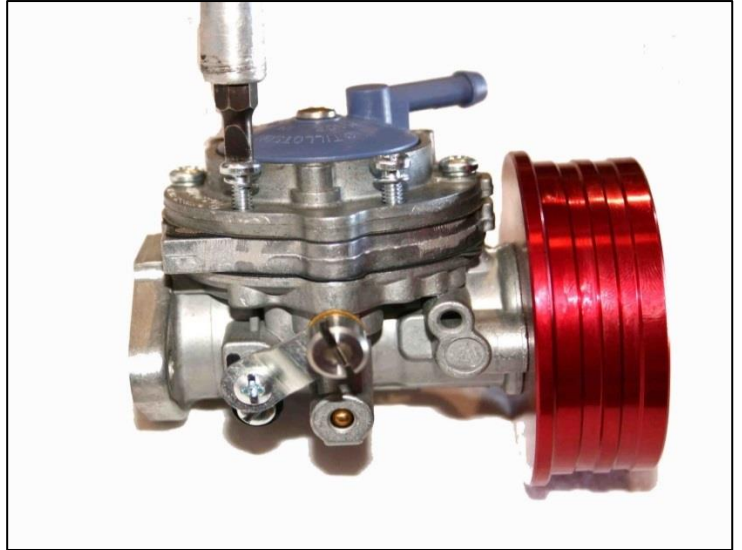


| | | |
|----------|--|---|
| 1 | Install the nut on to the cable adapter as shown in <u>Fig.1</u> . | Fig. 1  |
| 2 | Insert cable adapter through the throttle bracket and tighten with the nut as shown in <u>Fig. 2</u> . | Fig. 2  |
| 3 | Install the filter cup on to the front of the carburetor and tighten with bolts as shown in <u>Fig. 3</u> . (Blue loctite on bolts is suggested) | Fig. 3  |

4

Remove the two top screws over the throttle arm as shown in Fig. 4.

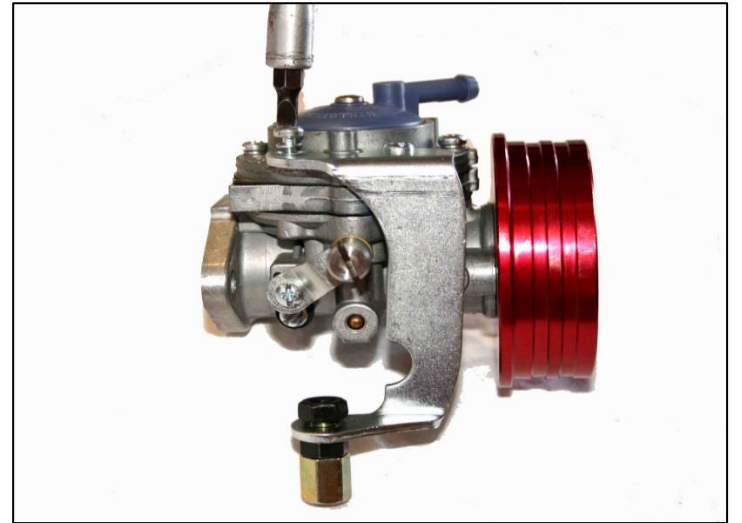
Fig. 4



5

Install the throttle bracket and reinsert the two top screws as shown in Fig. 5.

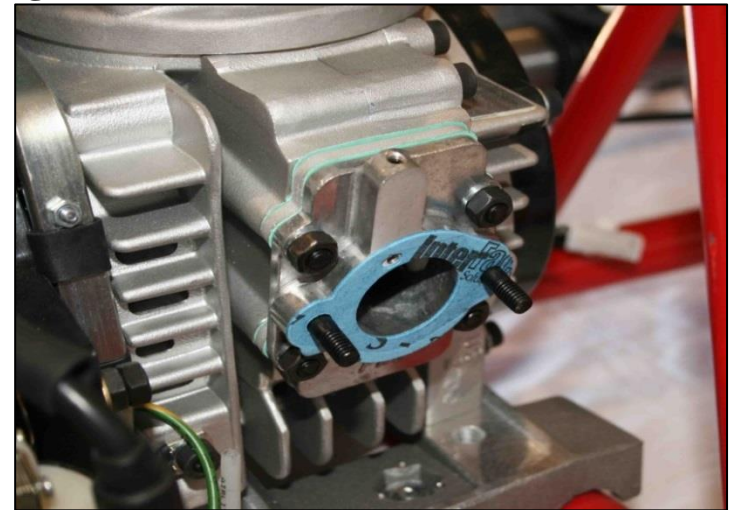
Fig. 5




6

Place the carburetor gasket over the two intake studs as shown in Fig. 6.

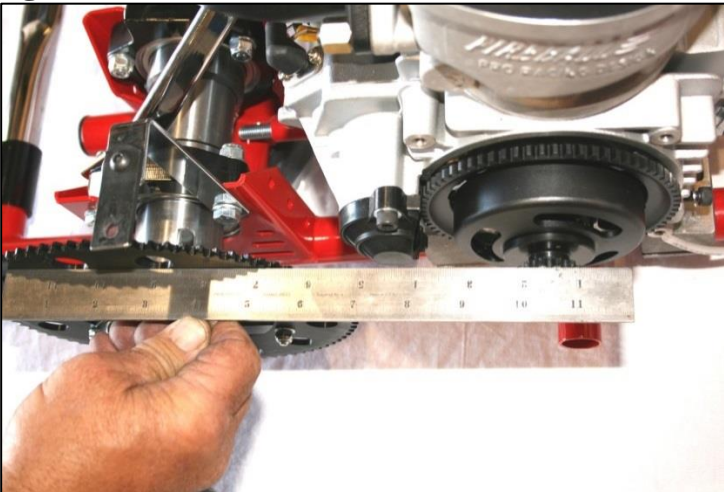
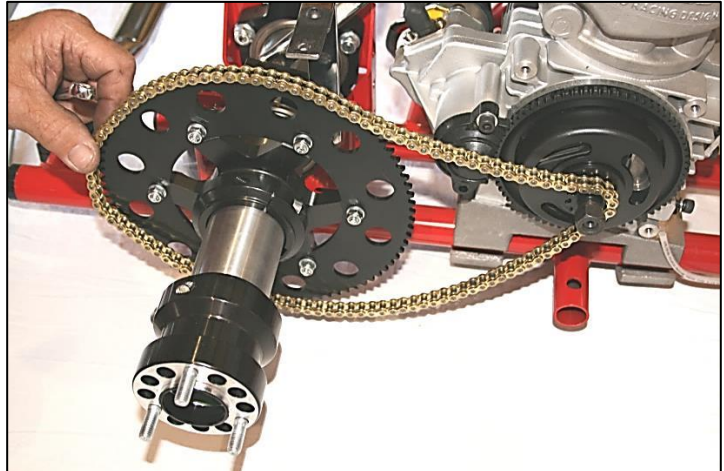
Fig. 6

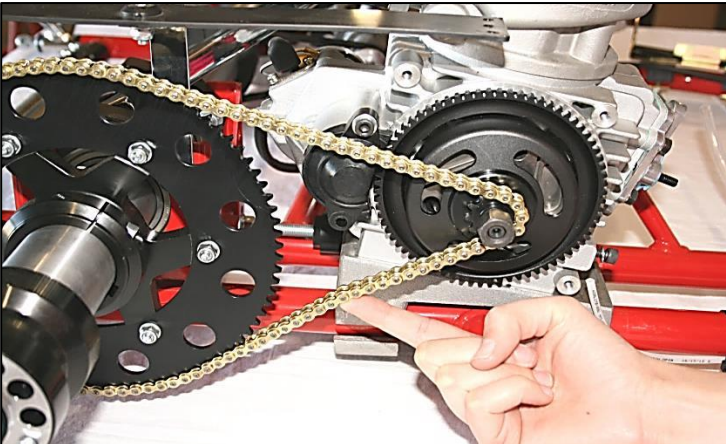


| | | |
|----------|--|---|
| <p>7</p> | <p>Install the carburetor on to the two intake studs as shown in <u>Fig. 7</u>. Fasten with the two nuts provided.</p> | <p>Fig. 7</p>  |
|----------|--|---|


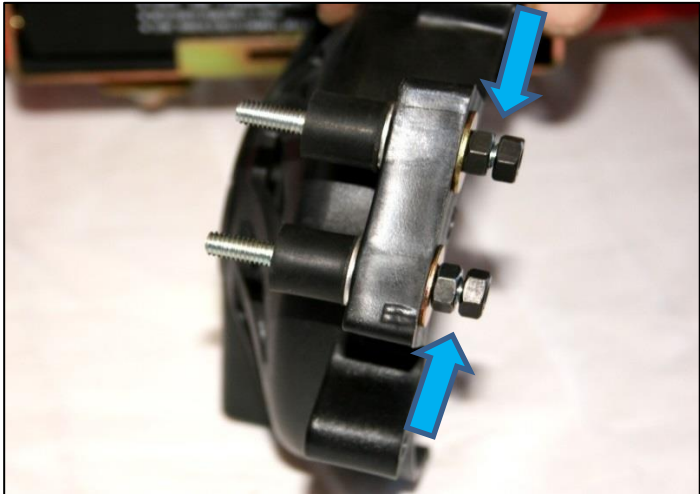
Section 3.6


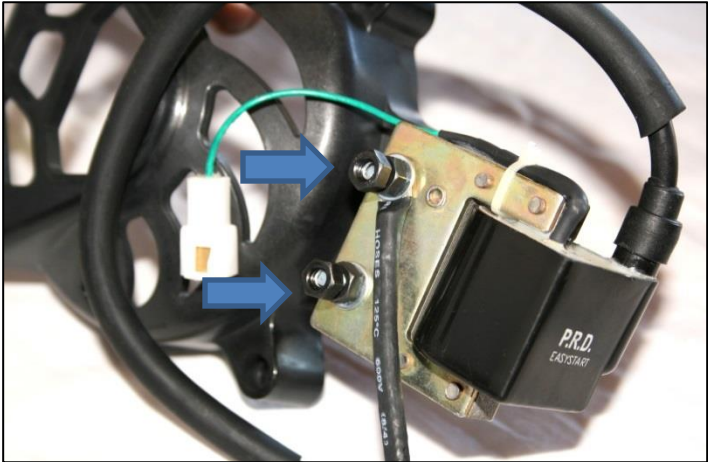
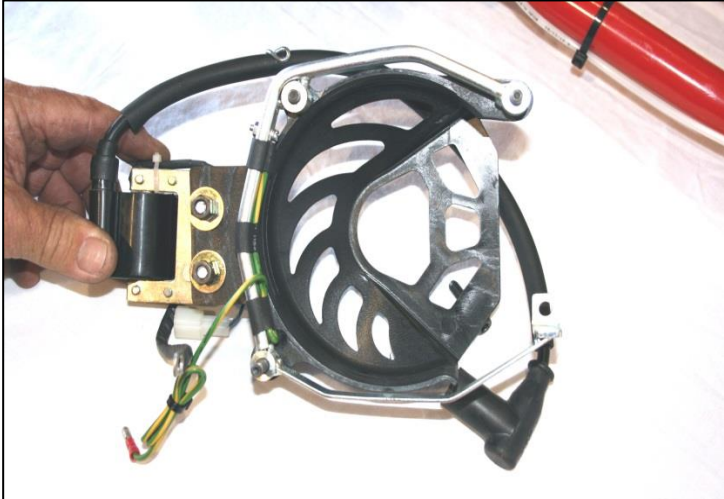
INSTALLING THE CHAIN

| | | |
|----------|---|---|
| <p>1</p> | <p>Align the rear sprocket with the clutch drum as shown in <u>Fig. 1</u>.</p> | <p>Fig. 1</p>  |
| <p>2</p> | <p>Install #219 Xtreme Ultra Performance chain from the clutch drum to the rear sprocket as shown in <u>Fig. 2</u>.</p> | <p>Fig. 2</p>  |

| | | |
|-----------------|---|---|
| <p>3</p> | <p>Tighten the engine on to the chassis leaving approximately ½” free play as shown in <u>Fig. 3</u>.</p> | <p>Fig. 3</p>  |
|-----------------|---|---|

Section 3.7 INSTALLING THE CLUTCH COVER, GEAR PLATE GUARD & COIL

| | | |
|-----------------|--|---|
| <p>1</p> | <p>Add the medium silver washer to the long side of the rubber isolator and insert through the clutch cover. Add the large washer as shown in <u>Fig. 1</u>. Repeat this step for the second hole on the clutch cover.</p> | <p>Fig. 1</p>  |
| <p>2</p> | <p>Secure each isolator with two nuts as shown in <u>Fig.2</u> and tighten.</p> | <p>Fig. 2</p>  |

| | | |
|-----------------|--|---|
| <p>3</p> | <p>Place medium silver washers on the other sides of the rubber isolators as shown in <u>Fig.3</u>.</p> | <p>Fig. 3</p>  |
| <p>4</p> | <p>Place the coil on to the isolators then add the ground wire to the top isolator. Add a small silver washer to each of the isolators followed by two nuts as shown in <u>Fig. 4</u> and tighten.</p> | <p>Fig. 4</p>  |
| <p>5</p> | <p>Place the gear plate guard inside of clutch cover as shown in <u>Fig.5</u>.</p> | <p>Fig. 5</p>  |

6

Attach the clutch cover assembly and fasten with bolts provided as shown in Fig. 6.

Attach the ground wire from the coil to the engine as shown in Fig. 6.1.

Fig. 6

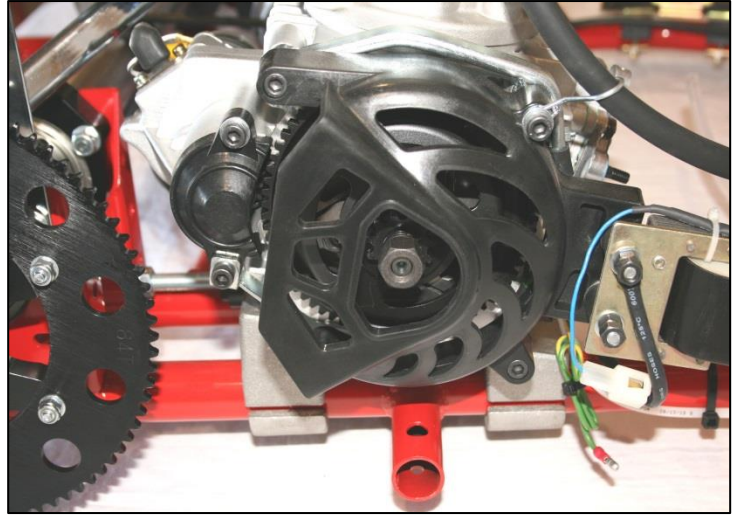
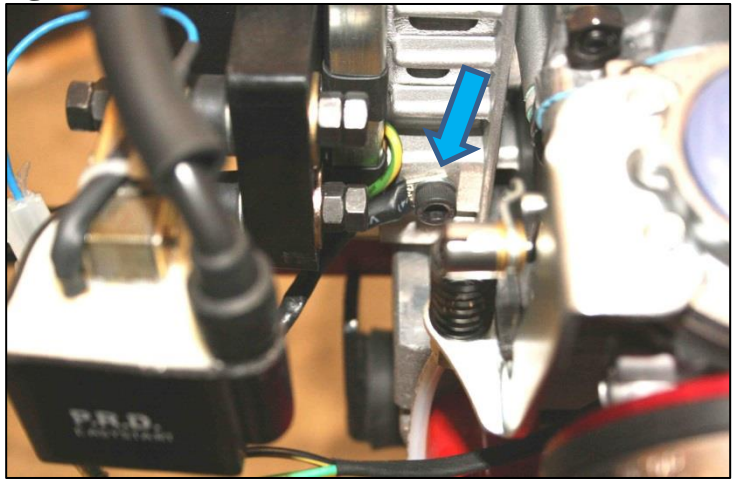


Fig. 6.1



Section 3.8


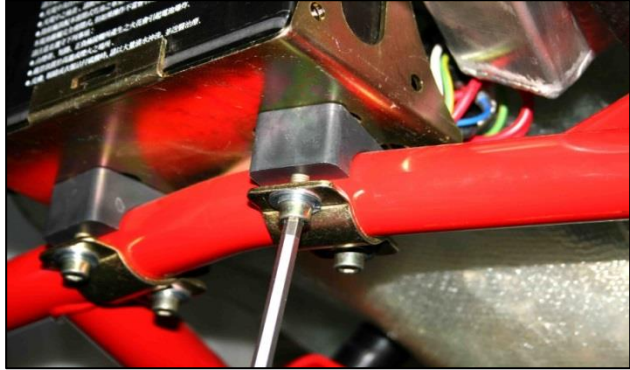


INSTALLING THE ELECTRICAL SYSTEM


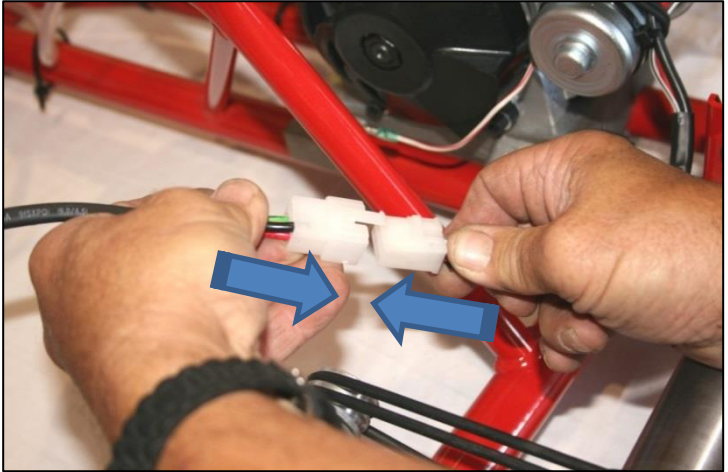
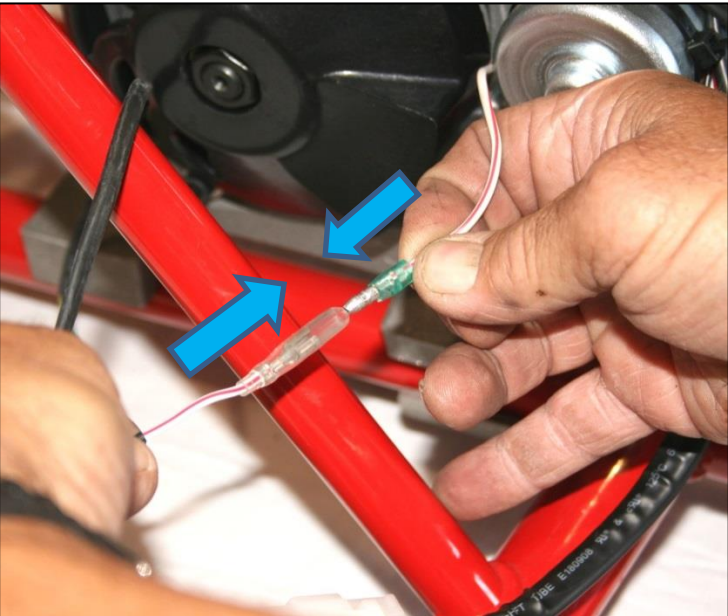
1

Insert the two brackets into the battery box as shown in Fig. 1.

Fig. 1



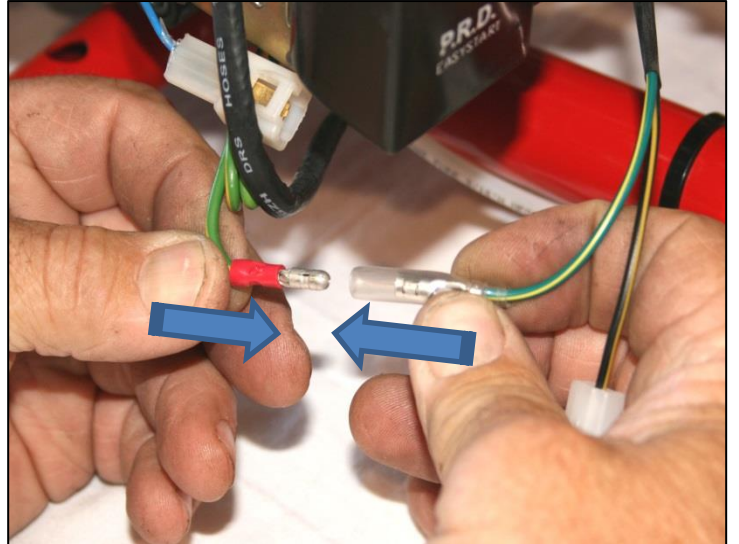
| | | |
|-----------------|---|---|
| <p>2</p> | <p>Position the plastic mounts onto the bottom of the battery box so they attach to the brackets as shown in <u>Fig. 2</u>.</p> | <p>Fig. 2</p>  |
| <p>3</p> | <p>Place the battery box on to the chassis and add the bottom bracket. Secure with the two bolts provided. Repeat this step for the second bracket as shown in <u>Fig. 3</u>.</p> | <p>Fig. 3</p>  |
| <p>4</p> | <p>Insert the battery protector into the bottom of the battery box as shown in <u>Fig. 4</u>.</p> | <p>Fig. 4</p>  |
| <p>5</p> | <p>Place the battery into the battery box and secure with the top strap as shown in <u>Fig. 5</u>.</p> | <p>Fig. 5</p>  |

| | |
|---|---|
| <p>6</p> <p>Fasten the top strap with the bolt and nut provided as shown in <u>Fig.6</u>.</p> | <p>Fig. 6</p>  |
| <p>7</p> <p>Connect the starter wire from the engine to the harness as shown in <u>Fig. 7</u>.</p> | <p>Fig. 7</p>  |
| <p>8</p> <p>Connect the stator wire to the harness as shown in <u>Fig. 8</u>.</p> | <p>Fig. 8</p>  |

9

Connect the gear plate wire to the harness as shown in Fig. 9.

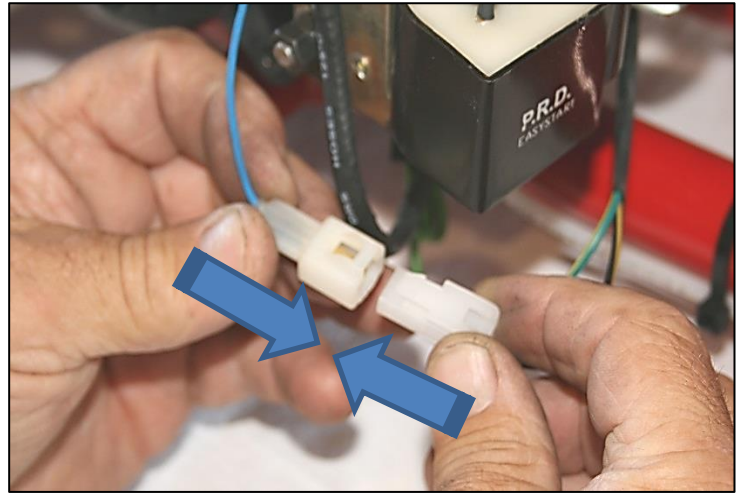
Fig. 9



10

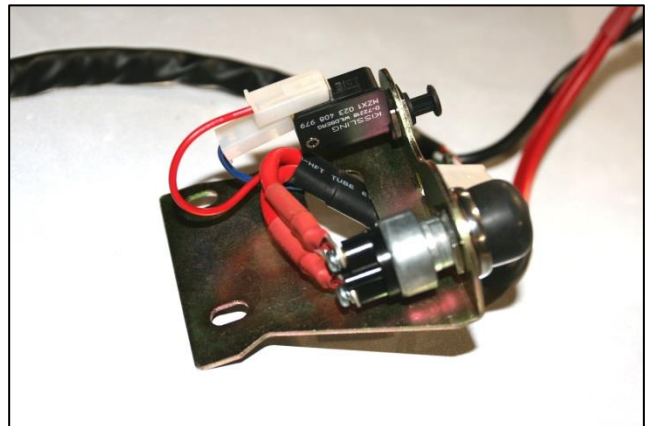
Connect the coil wire to the harness as shown in Fig. 10.

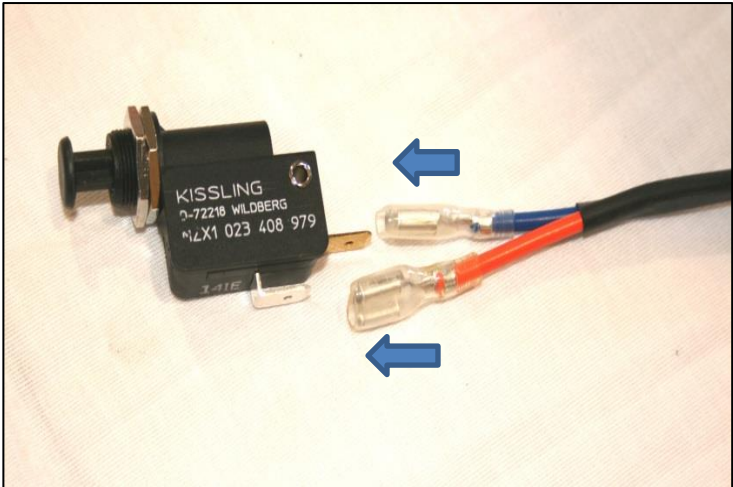
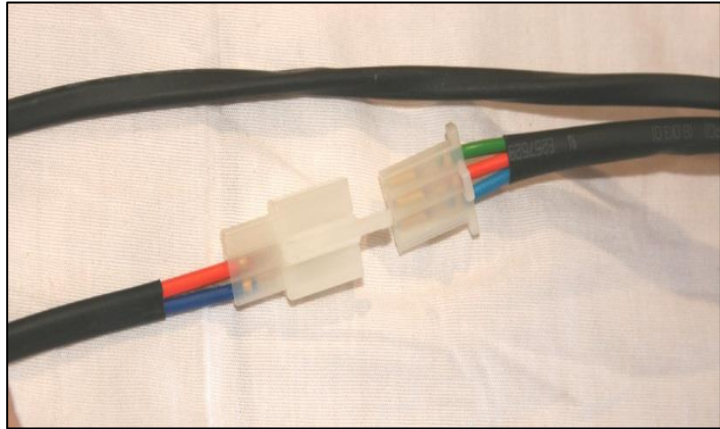
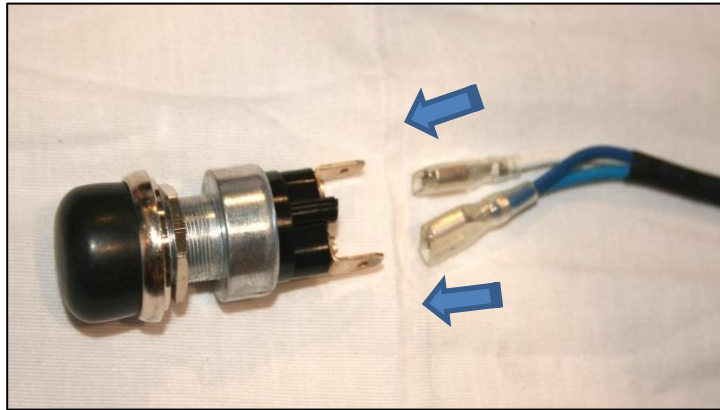
Fig. 10



NOTE

IF YOU HAVE A 2016 PRD FIREBALL 125CC ENGINE PLEASE CONNECT THE WIRING HARNESS TO THE SWITCH PLATE AS SHOWN (IGNORE STEPS 11-18)

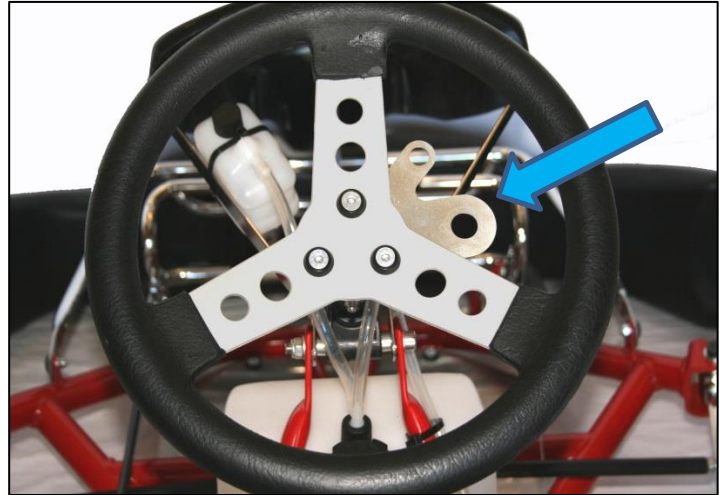


| | |
|--|--|
| <p>11</p> <p>Connect the on/off switch to the harness as shown in <u>Fig. 11</u>. (Notice the orange wire is longer and goes on the silver spade connector)</p> | <p>Fig. 11</p>  |
| <p>12</p> <p>Connect the on/off switch pigtail to the harness as shown in <u>Fig. 12</u>.</p> | <p>Fig. 12</p>  |
| <p>13</p> <p>Connect the starter button on to the harness as shown in <u>Fig.13</u>. It does not matter which way it is connected.</p> | <p>Fig. 13</p>  |

14

Install the switch bracket in between the steering hub and the steering wheel as shown in Fig.14.

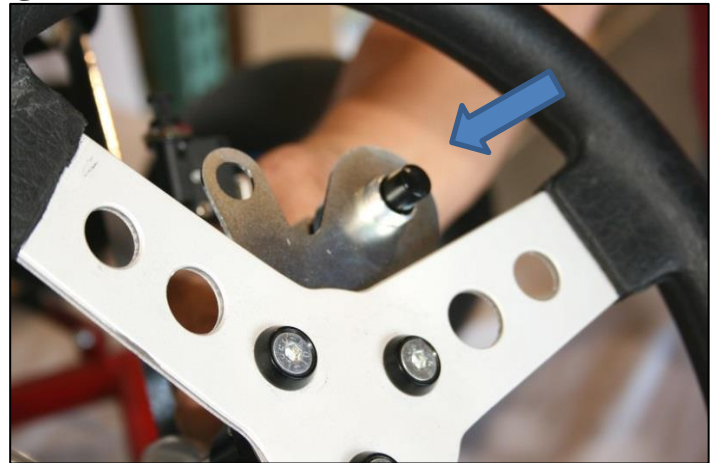
Fig. 14



15

Unscrew the rubber cover on the starter button. Insert the starter button through the larger hole on the switch bracket as shown in Fig.15.

Fig. 15

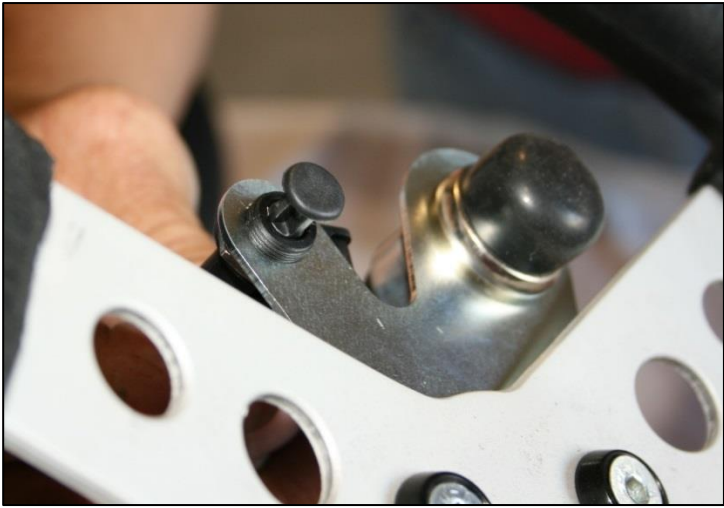

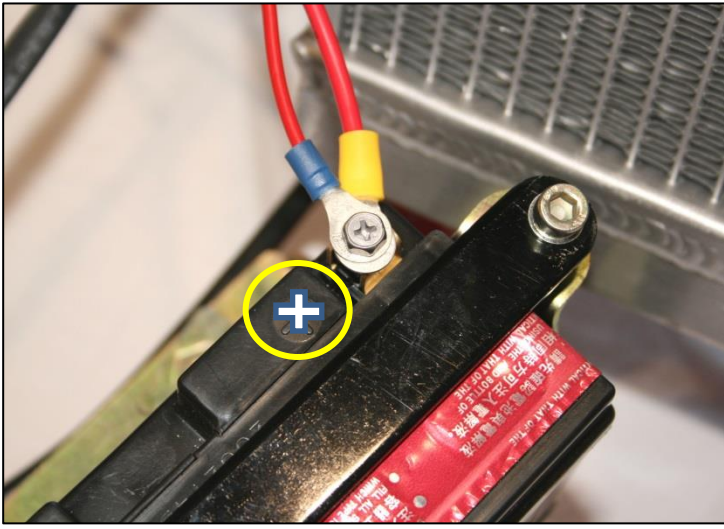


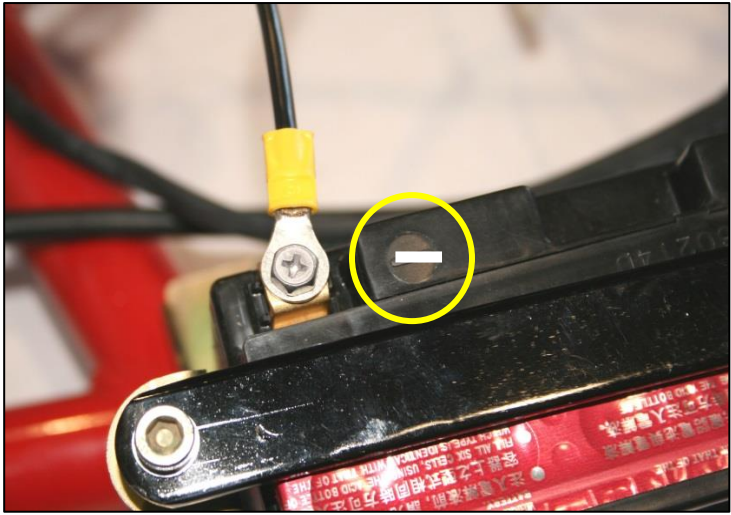
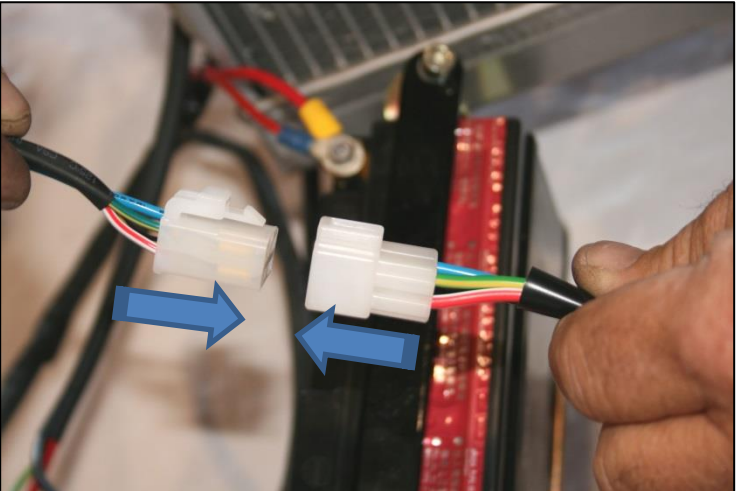
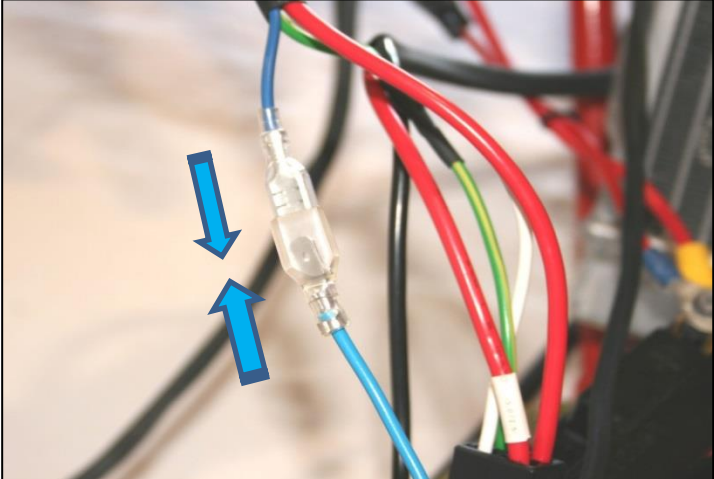
16

Reattach the rubber cover on the starter button as shown in Fig.16. (Blue loctite suggested)

Fig. 16



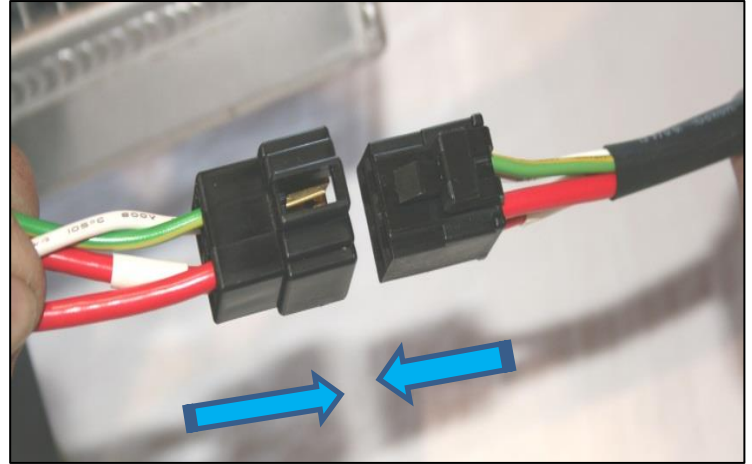
| | | |
|--|--|--|
| <p>17</p> <p>Insert the on/off switch through the smaller hole on the switch bracket as shown in <u>Fig.17</u>.</p> | | <p>Fig. 17</p>  |
| <p>18</p> <p>Fasten the on/off switch with the nut provided as shown in <u>Fig.18</u>.</p> | | <p>Fig. 18</p>  |
| <p>19</p> <p>Attach the two red wires to the positive (+) terminal on the battery as shown in <u>Fig. 19</u>.</p> | | <p>Fig. 19</p>  |

| | |
|--|--|
| <p>20</p> <p>Attach the black wire to the negative (-) terminal on the battery as shown in <u>Fig. 20</u>.</p> | <p>Fig. 20</p>  |
| <p>21</p> <p>Connect the CDI box (the larger of the two) to the harness as shown in <u>Fig.21</u>.</p> | <p>Fig. 21</p>  |
| <p>22</p> <p>Connect the blue wire from the primary harness to the blue wire on the secondary harness as shown in <u>Fig. 22</u>.</p> | <p>Fig. 22</p>  |

23

Connect the relay to the harness as shown in Fig. 23.

Fig. 23



24

Use a zip-tie or black electrical tape to secure the harness to the chassis as shown in Fig. 24.

Note: Do not over tighten zip-ties as wire failure will occur.

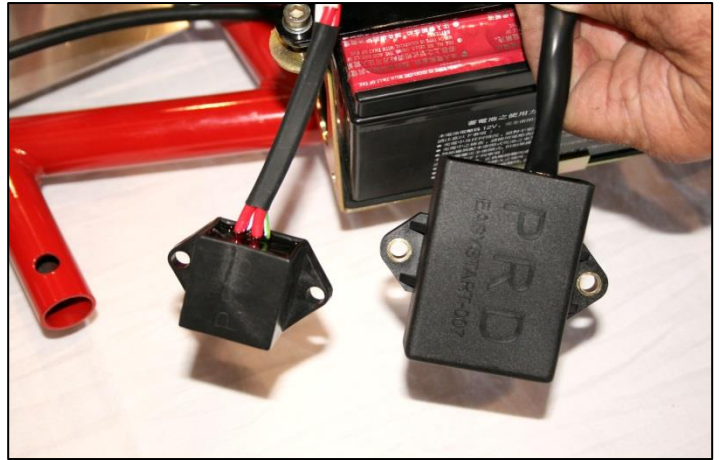
Fig. 24



25

Velcro the CDI and Relay (shown in Fig.25) to the battery or bolt to the seat.

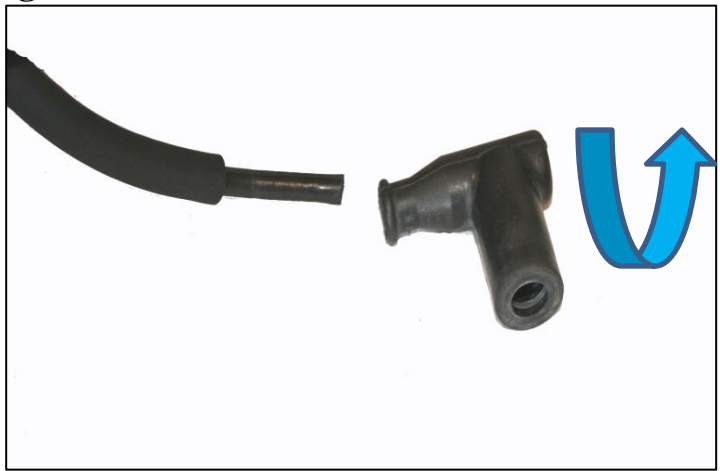
Fig. 25



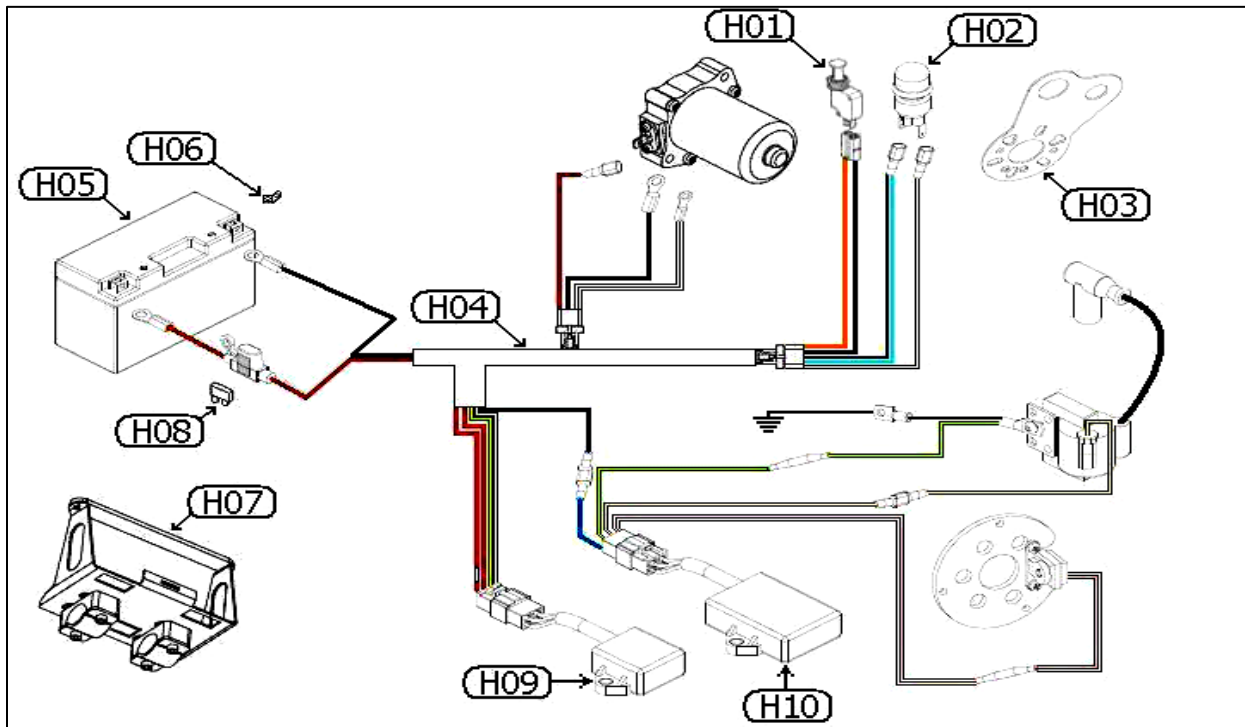
26

Twist on the spark plug cap to the coil wire as shown in Fig. 26.



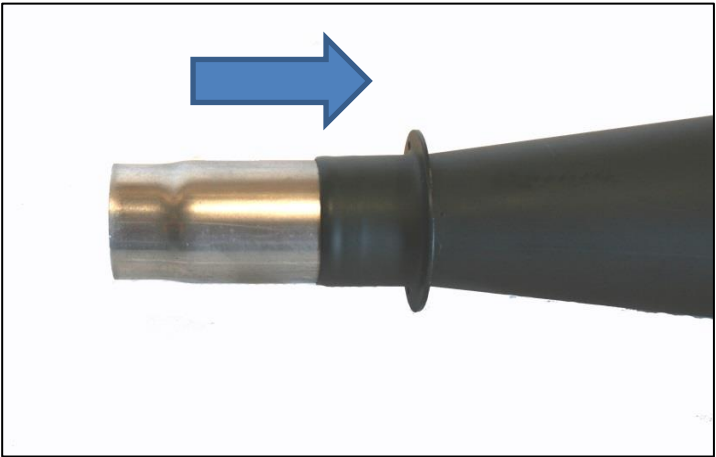
Fig. 26



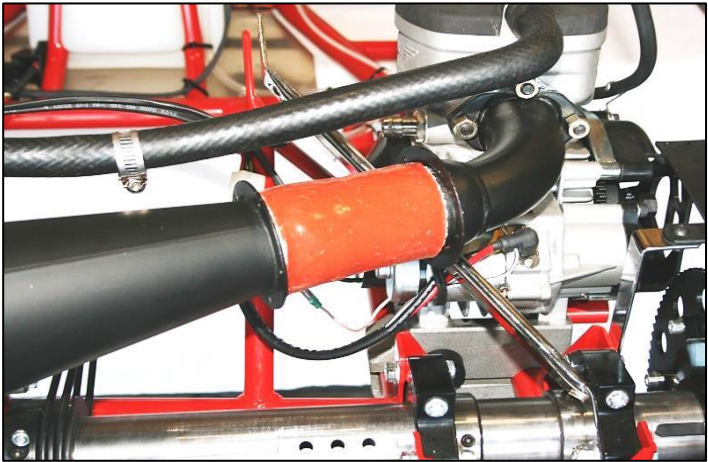


COMPLETE ELECTRICAL SYSTEM DIAGRAM



| | | | | |
|----------------------------|----------------------------|------------------------------|--|-------------------------|
| H01: On/Off Switch | H03: Switch Bracket | H05: Yuasa Battery | H07: Battery Box | H09: Relay |
| H02: Starter Button | H04: Wire Harness | H06: Battery Terminal | H08: 7.5AMP Fuse for Wire Harness | H10: CDI Modular |

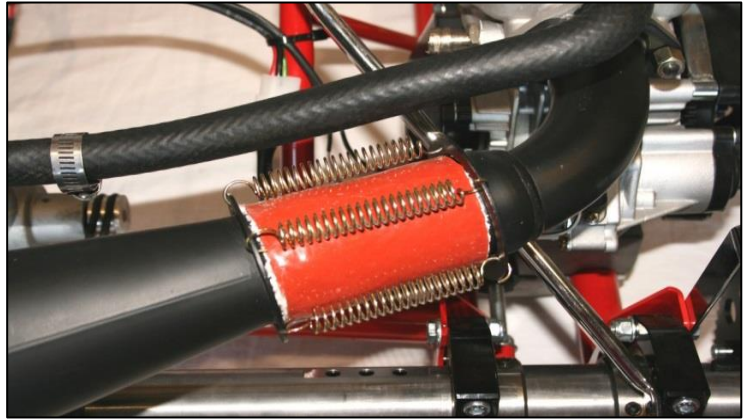
| | | |
|-----------------|--|---|
| <p>1</p> | <p>Attach the rubber boot of the airbox to the filter cup as shown in <u>Fig. 1</u>.</p> | <p>Fig. 1</p>  |
| <p>2</p> | <p>Secure the rubber boot with the hose clamp provided as shown in <u>Fig. 2</u>.</p> | <p>Fig. 2</p>  |
| <p>3</p> | <p>Insert connector tube into the exhaust as shown in <u>Fig.3</u>.</p> | <p>Fig. 3</p>  |

| | | |
|--|--|---|
| <p>4</p> <p>Place the insulating sleeve over the connector tube as shown in <u>Fig. 4</u>.</p> | | <p>Fig. 4</p>  |
| <p>5</p> <p>Cut back the insulating sleeve $\frac{3}{4}$" shorter than the connector tube as shown in <u>Fig. 5</u>.</p> | | <p>Fig. 5</p>  |
| <p>6</p> <p>Insert the exhaust into the header as shown in <u>Fig. 6</u>.</p> | | <p>Fig. 6</p>  |

7

Attach the springs from the header to the exhaust as shown in Fig. 7.

Fig. 7



8

Attach the two springs around the pipe to the pipe cradle as shown in Fig. 8.

Fig. 8



Section 4

FUEL AND OIL

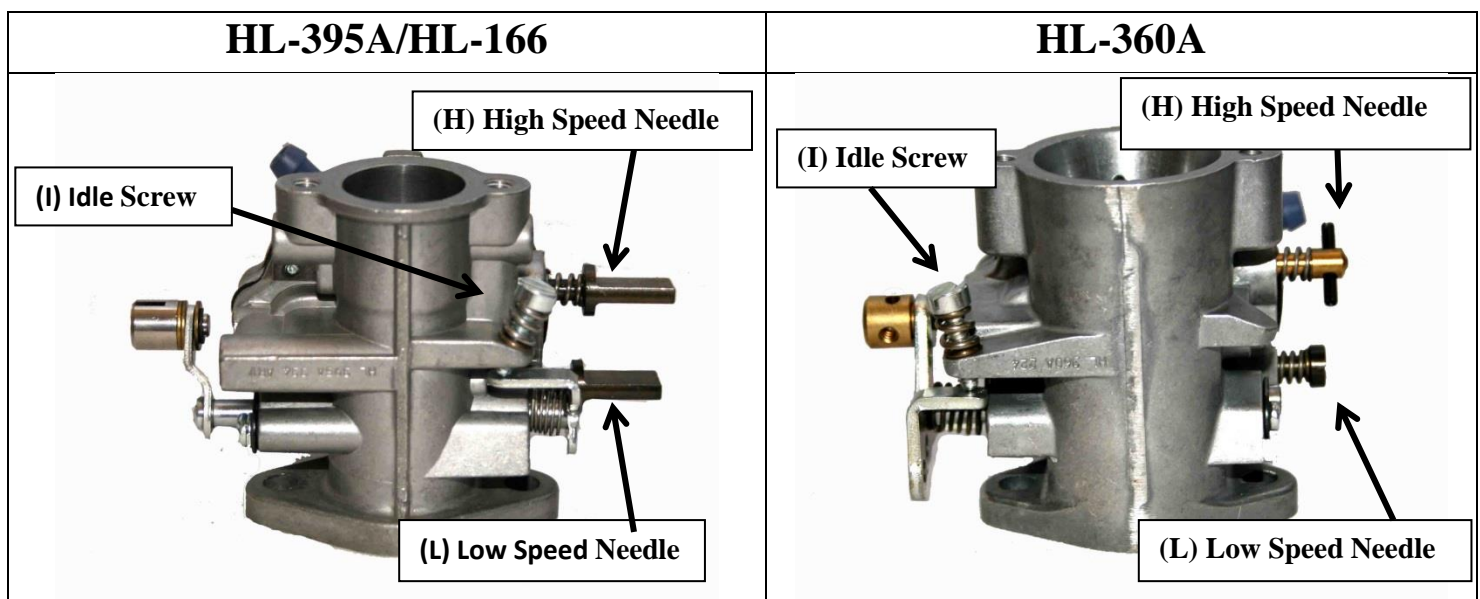
Use premium or race gasoline with 92 octane or greater mixed with 10 ounces of oil to the gallon.

Straight castor oil is highly recommended or a synthetic oil with castor oil blend. Please note straight castor oil will leave a deposit on the top of the piston and head. Check and clean the top of the piston and head at least every five (5) hours.

Always ensure the fuel line is full and the fuel reaches the carburetor before the engine is started.

Section 5

CARBURETOR SPECIFICATIONS



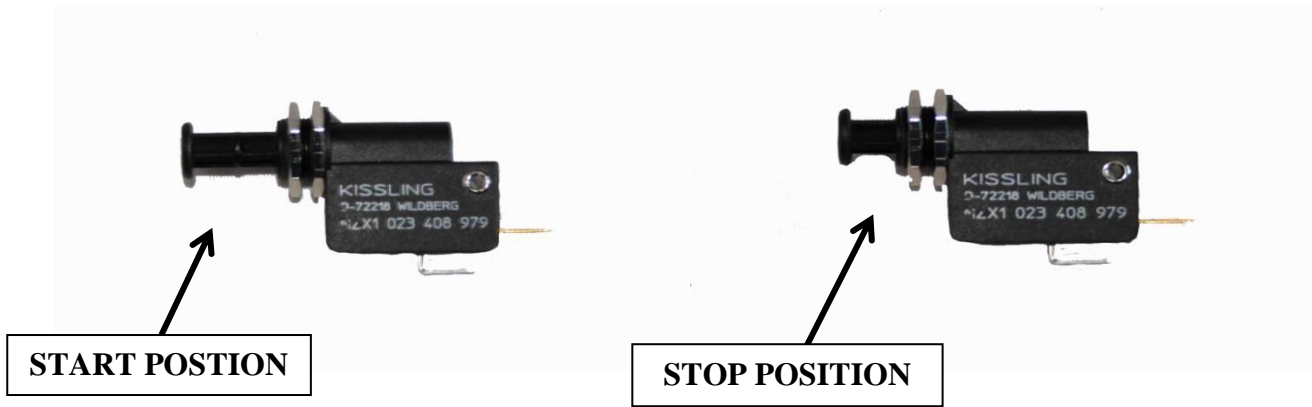
To achieve the needle spring settings below close the low and high speed needles by gently screwing them in clockwise. Then screw counterclockwise to the settings of your class.

The settings below are a good starting point, but may vary depending on weather conditions (ie: Hot Weather= Less Fuel/ Cold Weather= More Fuel)

| HL-395A/HL-166 | | | | | | HL-360A |
|----------------|------------------|------------------|------------------|------------------|------------------|--------------------------|
| CADET | JR I | JR INT'D | JR II | SR | MSTR | SENIOR & MASTERS CLASSES |
| .412 cup | .462 cup | .502 cup | .877 cup | .880 cup | .880 cup | |
| L: 1 H: 1/8 | L: 1 ¼ H: 1/8 | L: 1 ½ H: 1/4 | L: 2 ½ H: 1/4 | L: 2 ½ H: 1/4 | L: 2 ½ H: 1/4 | L: 2 ¼ H: 1 3/8 |

Section 6

STARTING AND STOPPING THE ENGINE



To start the engine pull switch outwards to the start position, press the starter button while choking the carburetor by covering the airbox tubes with your hand. When the engine starts remove your hand from the airbox tubes.

To stop the engine push the switch inwards to the stop position.

Section 7

ENGINE BREAK IN PROCEDURE

Start with the prescribed needle settings found on page 32. Then turn the low speed needle counterclockwise 1/4 turn more and turn the high speed needle counterclockwise 1/8 turn more. Use these settings for the entire break in period.

Warm up the engine slowly over five (5) minutes at about 1/2 throttle, lapping the track at a low speed by modulating the throttle from closed to open. **DO NOT REV BEYOND 11,500 RPM'S FOR THIS SESSION.**

The second five (5) minute session will be conducted at 3/4 throttle. Vary the RPM's during this session.

The third and final five (5) minute session will be conducted at full throttle in the infield tight portion of the track. Half way down the straight sections of the track at full throttle cover the two (2) intake tubes of the airbox with your hand for one (1) second. Continue this for the entire session to allow a rich charge of fuel to be introduced into the engine. The engine is now broke in.

Note: When the final break in session is completed allow the engine to cool. When the engine is cold re-torque the 3 exhaust nuts. Torque value table is located in Section 22. At this time reset the carburetor to standard settings (see Section 5).

Section 8

MAXIMUM RPM

The CDI box is set to 0° advance at 16,000 RPM's and will not produce power beyond this point. It is recommended that gearing be used not to exceed 15,500 RPM's to ensure adequate power while in "the draft". RPM's are limited to increase the longevity of the engines life.

Section 9

INTAKE SILENCER/AIRBOX

Ensure the intake silencer is mounted on the engine two (2) inlet holes are pointing up (12:00) and are not plugged. Secure the intake silencer with a hose clamp to the filter cup. It is recommended when using an internal foam filter an airbox mount be used (RLV P/N 0370). Clean the intake silencer and filter periodically.

Section 10

EXHAUST SYSTEM

The header must be properly secured to the engine and is free of damage or leakage.

The staged connector must have no tearing or compression. The standard connector is 84mm (3 5/16") and is intended for the HL-360A carburetor. When using the HL-166A or HL-395A carburetor the 109mm (4 5/16") should be used.

Use the four (4) springs to attach the pipe to the header; never operate with less than four (4) springs.

The end cap (rear outlet) on the pipe must be securely attached. If castor oil is being used as the primary lubricant to the fuel, every 15-20 hours the end cap should be removed and the small holes on the internal perforated cone should be cleaned.

Basic pipe tuning: Lengthening the connector tube (1/4" increments) shifts the power band of the engine towards the low end. Shortening the connector tube (1/4" increments) will shift the power band of the engine towards the top end. This assumes starting with the recommended connector length. In addition, shorter connectors will make more heat and usually will need more fuel and gear (larger rear sprocket). Longer connectors will run a little cooler and usually require less gear (smaller rear sprocket).

Section 11

DRY CENTRIFUGAL CLUTCH

The clutch and all the components including the ring gear/flywheel should be checked every five (5) hours. If any wear, damage or cracking is detected all such parts should be replaced immediately. **NEVER** use a cracked flywheel this could result in bodily injury.

Check clutch if metal to metal noise is heard.

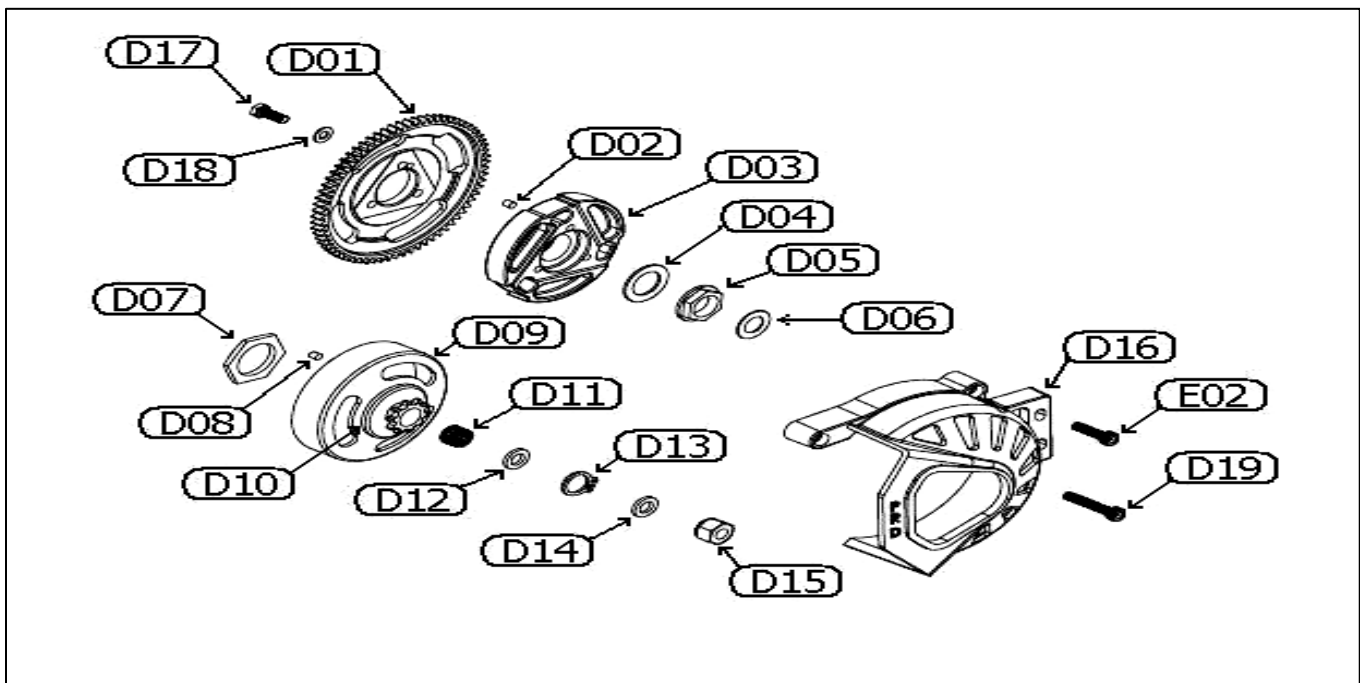
Check clutch if stall speed exceeds 6,000.

Check clutch and components if the clutch ever overheats.

Note: After starting the engine **NEVER** rev the engine while on the kartstand or on the ground. Do not unnecessarily rev the engine while on the track. These actions will result in premature failure of the clutch center and ring gear/flywheel.

Section 12

CLUTCH ASSEMBLY & MAINTENANCE



| | | | |
|--------------------------------|---------------------------------------|---------------------------------------|--|
| D01 = Gear Plate | D06 = Clutch Drum Inner Washer | D11 =Clutch Drum Bearing | D16 =Clutch Cover Plastic w/ Coil Mount |
| D02 = Clutch Center Pin | D07 = Driver Sprocket Nut | D12 = Clutch Drum Outer Washer | D17 =Clutch Bolt 6x1.0x16mm |
| D03 = Clutch Center | D08 = Drive Sprocket Pin | D13 =Snap Ring Retainer | D18 =Clutch Washer |
| D04 = Spring Washer | D09 = Clutch Drum | D14 =Clutch Washer | D19 =Socket Head Bolt M6x45mm |
| D05 = Clutch Nut | D10 = Drive Sprocket 10T/11T | D15 =Clutch Drum Nut | E02 = Clutch Cover Bolt M6x50mm |

CLUTCH REMOVAL

1. Remove the clutch cover and gear plate guard with a 5mm allen wrench.
2. Install the clutch plate gear holder (PRD-0142).
3. Remove the clutch drum nut (D15) with a 17mm wrench or socket.
4. Remove the clutch washer (D14), snap ring retainer (D13) with snap ring pliers, clutch drum outer washer (D12), clutch drum bearing (D11), drum assembly (D09) and clutch drum inner washer (D06).
5. Remove the clutch nut (D05) and spring washer (D04) with a 24mm socket and a clutch wrench (PRD-0146).
6. Heat the clutch center to loosen the loctite using a hair dryer or heat gun.
7. Install the clutch puller (PRD-7193) and remove the clutch. Do not use a hammer on the clutch puller.
8. Remove the 3 M6x16mm bolts (D17) to remove clutch center from the gear plate using a 10mm socket or wrench.

CLUTCH INSTALLATION

1. Using a 10mm socket or wrench install the clutch center to the gear plate with the dowel pin using 3 M6x16mm bolts (D17) torqued to 90 in/lb and red loctite.
2. Coat the inside of the clutch center with green loctite.
3. Install the assembly on to the crank shaft and tighten with the spring washer (D04) and clutch nut (D05) using a 24mm socket and torque to 75ft/lb.
4. Install the clutch drum inner washer (D06) with bevel towards the clutch.
5. Clean and grease the clutch drum bearing (D11) and install.
6. Install the clutch drum assembly (D09), clutch drum outer washer (D12), snap ring retainer (D13), clutch washer (D14) and clutch drum nut (D15) with a 17mm socket, blue loctite and torqued to 200 in/lb.
7. Install the gear plate guard and cover assembly (D16) with a 5mm allen wrench.

Section 13

BATTERY

Twelve (12) volt. Always wear safety glasses and plastic gloves when initially adding the battery electrolytes as well as performing maintenance.

The battery must be charged at all times. Use 1.8 amp charger. Full charge time at this rate is ten (10) hours.

Note: Overcharging or quick charging with excessive input could damage the battery.

When installing the battery the positive (+) terminal must be connected first and the negative (-) terminal second. When disconnecting the battery, disconnect the negative (-) first and the positive (+) second.

Warning: If the battery electrolyte (diluted sulfuric acid) comes in contact with the skin or clothes, wash with water immediately.

If the battery electrolyte comes in contact with the eyes flush eyes immediately with large amounts of water and seek immediate medical attention.

Never store or put the battery near an open flame. Do not ever discard the battery in a fire.

Never store or put the battery in contact with oil, gas, solvents plasticizers (acetone) or rags containing such substances. These substances could damage the external housing of the battery.

Never try to bend or move the battery terminals. This could break the external battery housing causing electrolytes to leak and create an unsafe environment.

Never short circuit or misconnect the terminals.

Check the external battery case for cracking, breakage or swelling, replace immediately if damaged.

When the battery reaches its full life expectancy never dispose of the battery in the trash or the environment. The battery must be taken to a designated disposal site.

Section 14

ELECTRICAL SYSTEM WARNINGS

Always depress the on/off button when the engine is off. Failure to do this will result in the battery being drained.

Never disconnect the ground cable when the engine is in operation or the on/off switch is in the on position.

Never use tab washers when attaching the ground eyelet terminals of the wiring harness, use flat or open washers.

Never pull on the cables when disconnecting the male/female connectors. Depress the locking tongue to release to avoid damage to the wiring harness.

Install the CDI box and the starter relay with the connectors towards the bottom to avoid water, moisture, dampness or dirt from getting in the connectors.

Always connect the coil with both screws. Ensure the coil body lamination is connected to the engine with the grounding cable. The eyelet connector must be in contact with the lamination on the coil.

Always use a PRD-Fireball coil. Use of a non-PRD coil may cause damage to the CDI.

The ignition system requires the use of a resistor spark plug cap or plug. The resistor value must be $\geq 5\text{kohm}$.

Always connect the battery as indicated in section 13. If connection is done in reverse a fuse in the wiring harness will trip and must be replaced. Disconnect both terminals on the battery and only use a 7 amp strip fuse.

Always disconnect the battery from both terminals before charging with an external charger and always use a 12 volt battery.

Never connect batteries in parallel. This may result in explosion, injury and/or over revving the starter and Bendix.

Section 15

SPARK PLUG

The NGK-BR10EG spark plug which sits in the middle of the heat range is supplied with each engine. This spark plug is excellent for break in and most operational needs. Other heat range plugs may be used depending on weather, fuel and track layout. (table below)

| | |
|-----------------|---------------------|
| NGK-BR9EG PLUG | HOT HEAT RANGE |
| NGK-BR10EG PLUG | STANDARD HEAT RANGE |
| NGK-BR11EG PLUG | COLD HEAT RANGE |

Note: Hot and cold heat range relates to the heat range of the plug, not the ambient temperature.

Below are the symptoms of too hot a plug, too cold a plug and correct plug. The plug and piston top must be read to determine how the plug is performing.

Plug too hot:

Electrode & insulator will have a porous look and a very clean color.

The top of the piston is dry with poc marks as a result of deterioration on the pre-ignition.

Note: Some of the symptoms may be a result of too lean a mixture.

Plug too cold:

The insulator and electrode will be partially to fully covered with black loose soot.

Note: A wet electrode could also be a result of a rich carburetor.

Correct plug:

The insulator end will appear yellow/grey to dark brown. Yellow indicates a bit too lean and brown indicates a bit too rich. This plug is a workable and correct plug.

Section 16

GEAR RATIO

The following gear ratio chart should help determine what ratio is best for each track without abusing the engine. The engine is supplied with an eleven (11) tooth sprocket on the clutch. A ten (10) tooth sprocket is also available.

| REAR AXLE SPROCKET TEETH | RATIO 10 TOOTH SPROCKET | RATIO 11 TOOTH SPROCKET |
|-------------------------------------|--|--|
| 74 | 7.40 | 6.73 |
| 75 | 7.50 | 6.82 |
| 76 | 7.60 | 6.91 |
| 77 | 7.70 | 7.00 |
| 78 | 7.80 | 7.09 |
| 79 | 7.90 | 7.18 |
| 80 | 8.00 | 7.27 |
| 81 | 8.10 | 7.36 |
| 82 | 8.20 | 7.45 |
| 83 | 8.30 | 7.55 |
| 84 | 8.40 | 7.64 |
| 85 | 8.50 | 7.73 |
| 86 | 8.60 | 7.82 |
| 87 | 8.70 | 7.91 |
| 88 | 8.80 | 8.00 |
| 89 | 8.90 | 8.09 |
| 90 | 9.00 | 8.18 |

EXAMPLE:


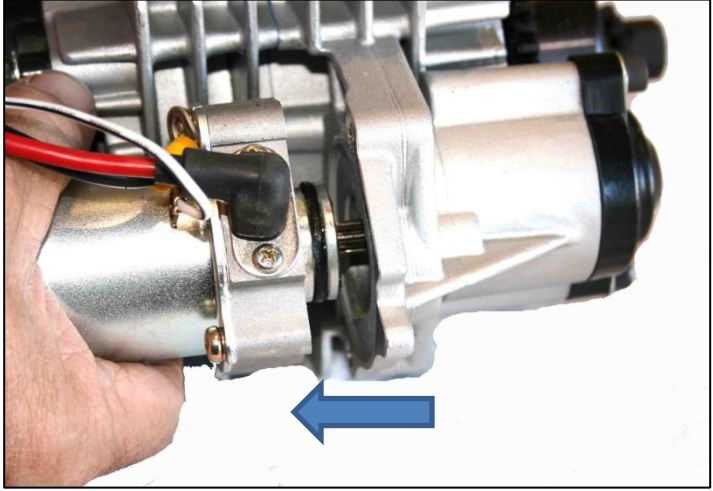
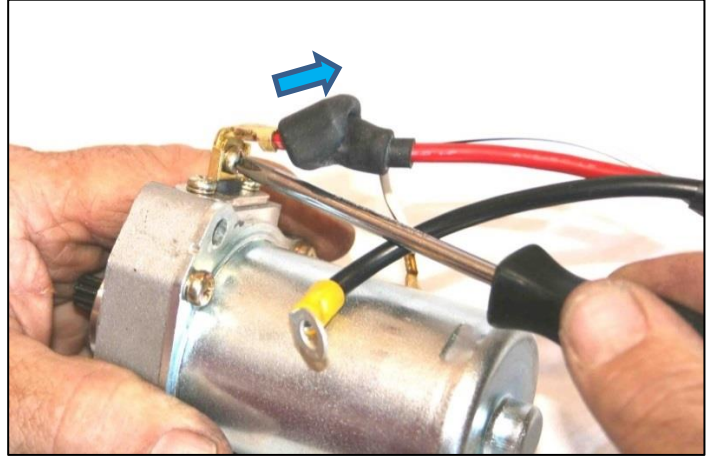
The target RPM's is 15,500 using a 11 tooth engine sprocket and a 81 tooth axle sprocket which yields a gear ratio of 7.36. Lapping the track a bit the RPM's are 14,000. The rule of thumb for #219 chain is plus or minus one (1) axle sprocket tooth will increase or decrease RPM's by 200.

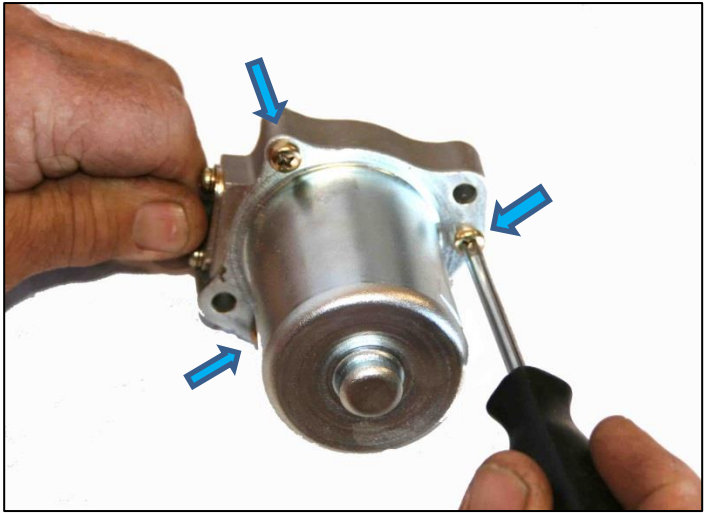
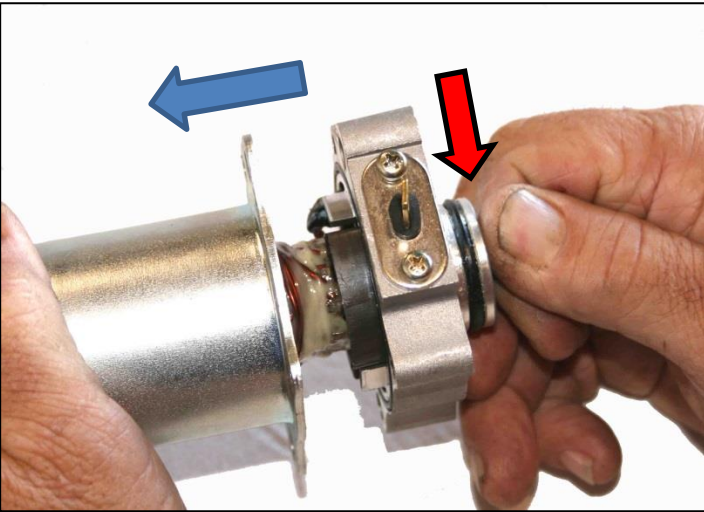
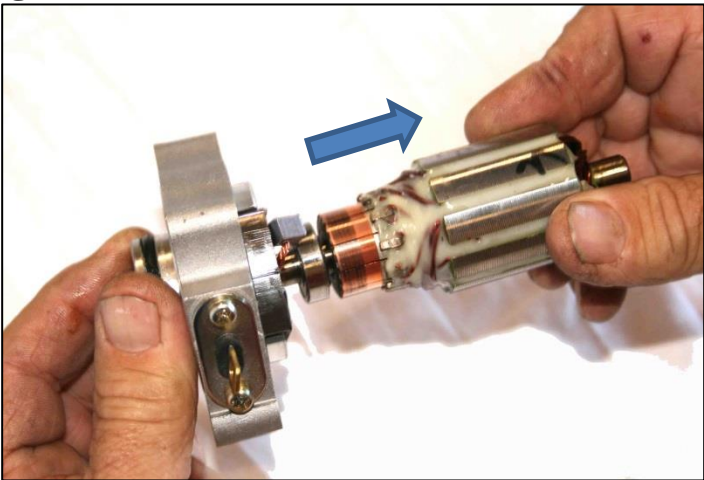
| | |
|-------------------------------|--|
| <i>RPM's to achieve</i> | <i>15,500</i> |
| <i>Current RPM's achieved</i> | <i><u>14,000</u></i> |
| <i>RPM's lacking</i> | <i>1,500 divided by 200 RPM's = 7.50 teeth</i> |

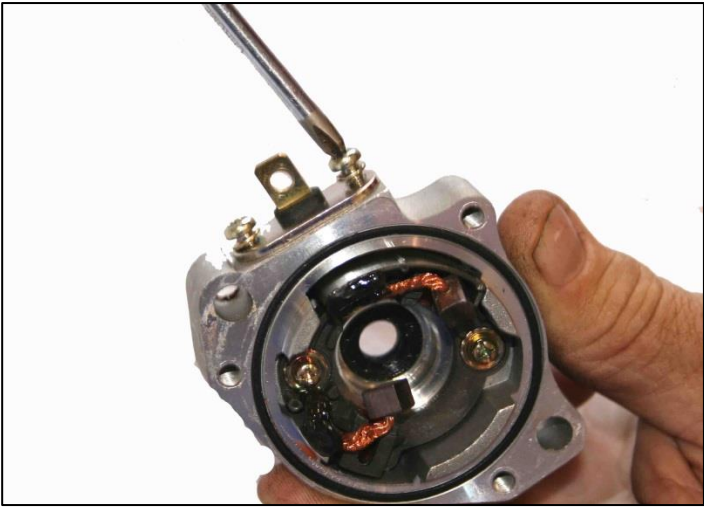

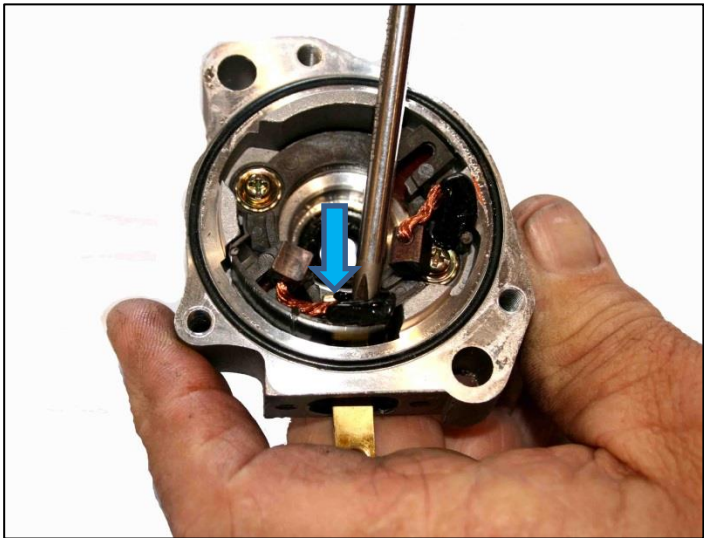
Add 7 or 8 teeth to achieve the 15,500 RPM's.


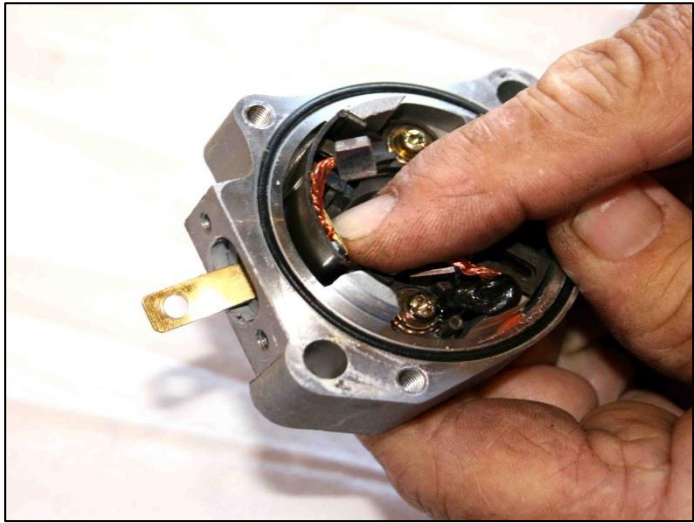
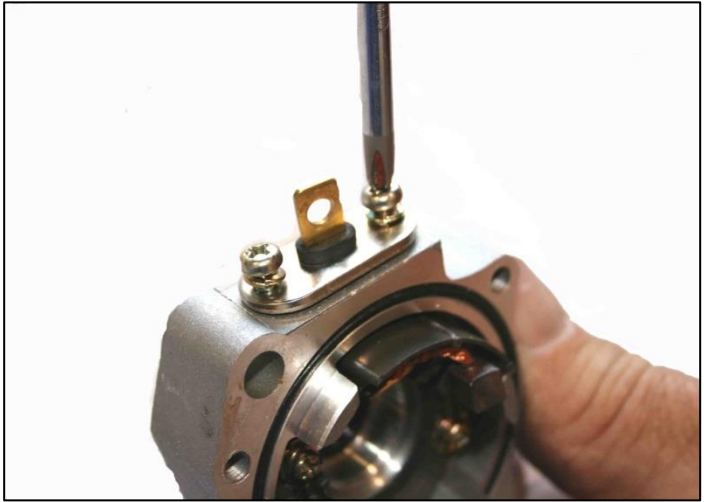
The example will get it close, fine tuning may be required to maximize performance.

Note: The engine life forecasting is based on operating the engine in the prescribed RPM range. Operating beyond the upper recommended limit will cause the engine to wear out more quickly and may cause catastrophic failure. The operating maximum limit is 16,000 RPM's and the ignition is set to that limit. Never exceed the maximum RPM limit.

| | | |
|---|---|---|
| 1 | Remove two M6x35 bolts from the starter using an allen wrench as shown in <u>Fig. 1</u> . | Fig. 1  |
| 2 | Remove the starter from the engine as shown in <u>Fig. 2</u> . | Fig. 2  |
| 3 | Pull back the cover boot from the red wire and remove the screw as shown in <u>Fig. 3</u> . | Fig. 3  |

| | | |
|---|--|---|
| <p>4</p> <p>Remove the three housing retention bolts as shown in <u>Fig. 4</u>.</p> | | <p>Fig. 4</p>  |
| <p>5</p> <p>Hang on to the drive gear (red arrow in Fig. 5) and remove the housing as shown in <u>Fig. 5</u>.</p> | | <p>Fig. 5</p>  |
| <p>6</p> <p>Remove the armature as shown in <u>Fig. 6</u>.</p> <p>Note: Brushes and springs may fall out from the gear housing as you pull the armature out.</p> | | <p>Fig. 6</p>  |

| | | |
|--|--|---|
| <p>7</p> <p>Remove the two screws and the brush retention plate as shown in <u>Fig. 7</u>.</p> | | <p>Fig. 7</p>  <p>A close-up photograph of a hand holding a motor's brush assembly. A screwdriver is being used to remove a screw from the brush retention plate. The brush assembly is partially disassembled, showing the brush holder and the brush. The motor housing is visible in the background.</p> |
| <p>8</p> <p>Remove the rubber insulator from the brush terminal as shown in <u>Fig.8</u>.</p> | | <p>Fig. 8</p>  <p>A close-up photograph of a hand holding a motor's brush assembly. A blue arrow points to a rubber insulator on the brush terminal. The brush assembly is partially disassembled, showing the brush holder and the brush. The motor housing is visible in the background.</p> |
| <p>9</p> <p>Remove the silicone from both of the brush braids as shown in <u>Fig. 9</u>.</p> | | <p>Fig. 9</p>  <p>A close-up photograph of a hand holding a motor's brush assembly. A screwdriver is being used to remove silicone from the brush braids. A blue arrow points to the brush braids. The brush assembly is partially disassembled, showing the brush holder and the brush. The motor housing is visible in the background.</p> |

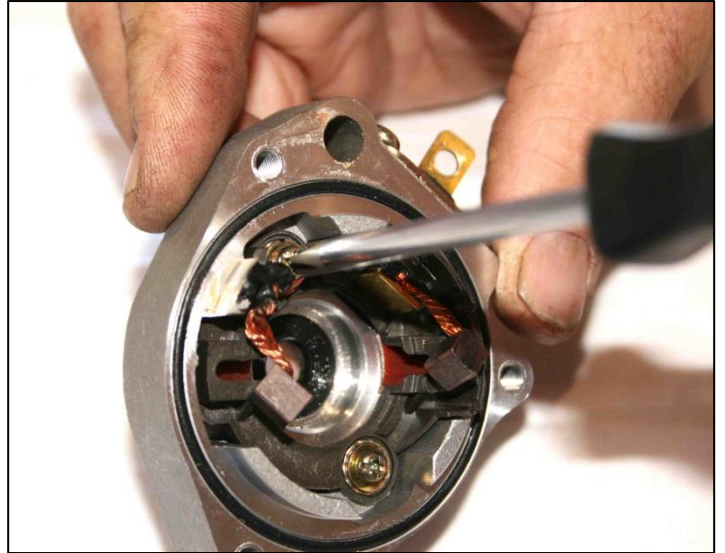
| | | |
|--|--|--|
| <p>10</p> <p>Remove the brush from the gear housing as shown in <u>Fig. 10</u>.</p> | | <p>Fig. 10</p>  |
| <p>11</p> <p>Install the new brush into the gear housing as shown in <u>Fig. 11</u>.</p> | | <p>Fig. 11</p>  |
| <p>12</p> <p>Reinstall the rubber insulator, the retention plate and fasten with the two screws as shown in <u>Fig. 12</u>.</p> | | <p>Fig. 12</p>  |

13

Remove the screw that holds in the second brush as shown in Fig. 13.

Replace with new brush.

Fig. 13



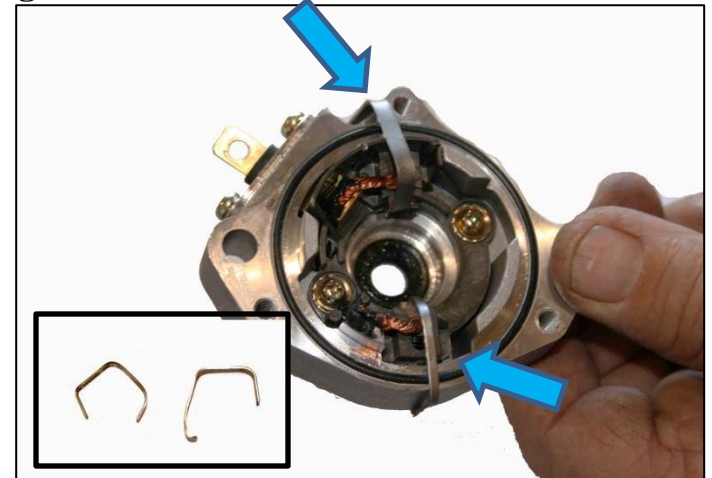
14

Pre-bend two metal strips to retain spring/brush assembly as shown in the bottom picture of Fig. 14.

Insert one spring and one brush into its guide and retain it with the pre-bent clip as shown in Fig. 14.

Repeat this for the second spring/brush assembly.

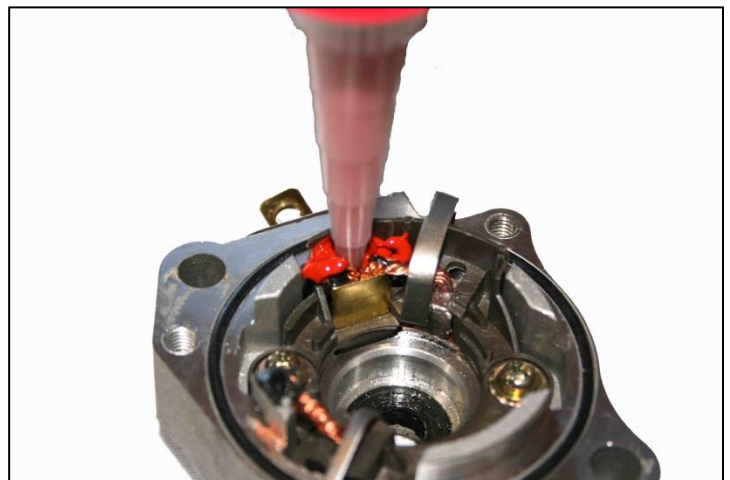
Fig. 14

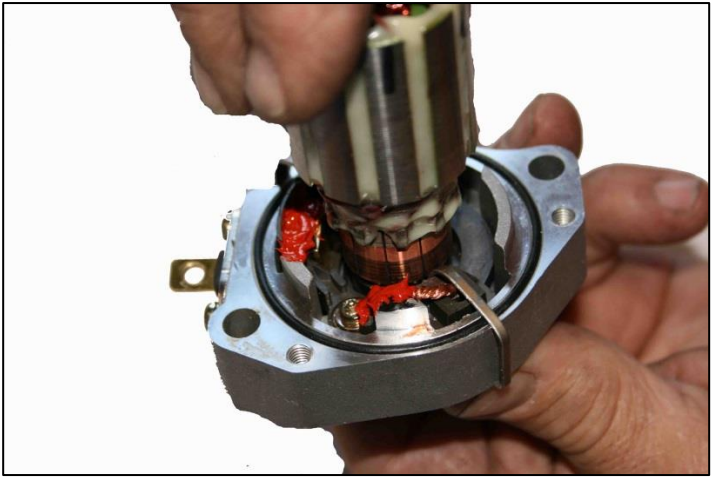

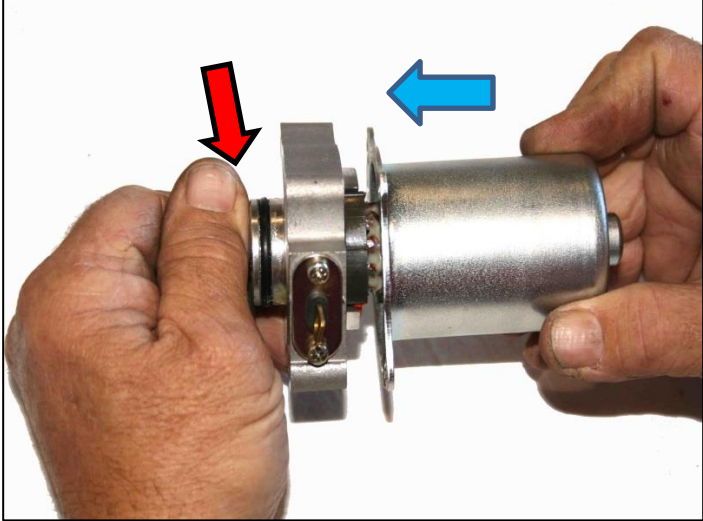


15

Add silicone to both of the brush braids as shown in Fig. 15.

Fig. 15



| | |
|---|--|
| <p>16</p> <p>Insert the armature into the gear housing as shown in <u>Fig. 16</u>.</p> <p>Note: Be careful to not knock off the clips.</p> | <p>Fig. 16</p>  |
| <p>17</p> <p>Remove the clips as shown in <u>Fig.17</u>. Be sure that the brushes are in contact with the copper part of the armature after removing the clips.</p> | <p>Fig. 17</p>  |
| <p>18</p> <p>Be sure to tightly hold on to the drive gear to ensure that the housing (magnet) does not pull the armature out and loose the brushes that are in place as shown in <u>Fig. 18</u>.</p> | <p>Fig. 18</p>  |

19

Replace the three housing screws with blue loctite as shown in Fig. 19.

Fig. 19



20

Reinstall the red wire on to the brush terminal and fasten with the screw as shown in Fig. 20.

Slide the rubber boot over terminal.

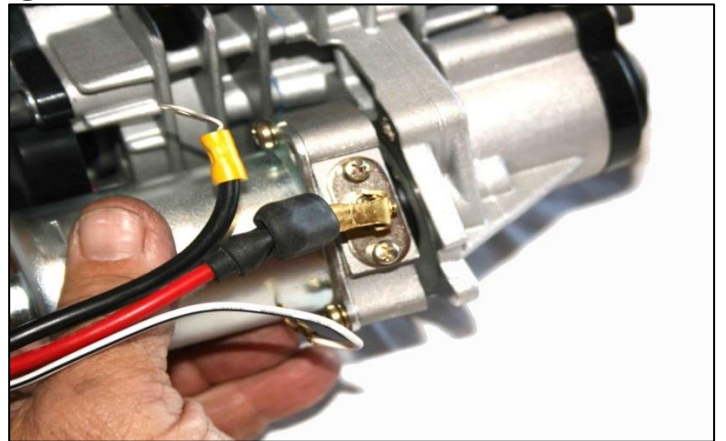
Fig. 20



21

Reinstall the starter on to the engine and fasten with two M6x35 bolts as shown in Fig. 21.

Fig. 21



GENERAL MAINTENANCE SCHEDULE

| HOURS | REQUIRMENT | REPLACE |
|----------------------------|--|--|
| Before use | Exhaust springs on header | Check status |
| | Exhaust springs on cradle | Check status |
| | Silencer endcap | Check screws |
| | Engine Sprocket | Check wear Check alignment with axle sprocket |
| | Engine Chain | Check tensioning and oil chain |
| | Battery | Check status and charge |
| | Cables and connectors | Check status and connections |
| | Grounding of engine and electronic box | Check status and connections |
| | Engine mount and clamps | Check torques |
| After use | Battery | Disconnect |
| | Chain | Check status and oil chain |
| | Engine | External cleaning |
| | Exhaust muffler | Remove muffler end, clean |
| | Inlet Silencer/Airbox | Open, clean |
| | Clutch | Clean drum & center |
| | Clutch needle bearing | Clean & grease |
| | Carburetor | Carburetor kit |
| Bendix assembly (optional) | Remove cover (see fig. below) and clean internally | |

Section 19

RECOMMENDED ENGINE MAINTENANCE SCHEDULE

| HOURS | REQUIREMENT | REPLACE |
|------------------|---|---|
| First 6-8 | Top End Rebuild | Base gasket Small end rod bearing Piston pin Circlips Piston & Ring All head o-rings |
| | <i>Inspect Starter & brushes</i> | Replace if necessary |
| | <i>Inspect Reeds</i> | Replace if necessary |
| | <i>Inspect Starter ring gear/flywheel</i> | Replace if necessary |
| Next 6-8 | Full Rebuild | Base gasket Piston pin Circlips Piston & Ring All head o-rings Main bearings Main seals |
| Total 12-16 | | Small and large rod bearing |
| | <i>Inspect Starter & brushes</i> | Replace if necessary |
| | <i>Inspect Reeds</i> | Replace if necessary |
| | <i>Inspect Starter ring gear/flywheel</i> | Replace if necessary |
| Next 6-8 | Top End Rebuild | <i>(same as above)</i> |
| Total 18-24 | | |
| Next 6-8 | Complete Rebuild | Base gasket Piston pin Circlips Piston & Ring All head o-rings Main bearings Main seals Small and large rod bearing Reeds |
| Total 24-32 | | Replace if necessary |
| | <i>Inspect Starter & brushes</i> | Replace Starter ring gear/flywheel |
| | <i>Inspect Rod for roundness</i> | Replace if out of tolerance |

This is a recommended maintenance schedule for the life of the engine, consult your engine builder for further recommendations.

| SYMPTOMS | POSSIBLE CAUSES | SOLUTIONS |
|---|--|---|
| Engine will not turn over | Dead/low battery | Check connections, charge or replace the battery |
| | Bad ground wire | Check the connection and tighten |
| | Failed starter button | Replace or check with tester |
| | Failed starter | Rebuild starter |
| | Failed relay | Replace relay |
| Engine turns over but will not start | Bad spark plug | Replace the plug |
| | No fuel to carburetor | Check fuel line for blockage; Rebuild Carburetor |
| | Bad high tension coil | Check connections or replace |
| | Failed CDI box | Check connections or replace |
| Engine will not stay running | Loose ground wire on starter | Check connection or replace eyelet connector |
| | CDI box failing | Replace CDI box |
| | Loose electrical connection | Check all connections |
| Engine lacks performance | Worn piston (low compression) | Replace piston |
| | Carburetor out of adjustment | Check settings |
| Clutch rattles or locks up | Cracked or broken shoe | Replace clutch center |
| High water temperature | No water in the radiator | Add water to the radiator |
| | Bad water pump | Replace pump |
| | Water pump belts are off | Reinstall belts |
| Unusually loud exhaust | Missing springs between header and exhaust | Replace missing springs |
| | Broken header | Weld or replace header |
| | Bad or broken end cap | Replace end cap |

Section 21**ENGINE STORAGE**

When the engine will be stored for an extended period of time the following preventative actions should be followed:

Disconnect the battery and charge it periodically.

Disconnect carburetor and clean it.

Seal the engine inlet and exhaust with tape.

Clean the outside of the engine and spray un-plated steel parts with a light coat of oil.

Keep the engine in a dry, low moisture environment at room temperature.

Drain the water from the water cooling system

Section 22**ENGINE TIGHTENING TORQUE SETTINGS**

| | | |
|-------------------------|-------------------------------|--------------------------|
| CYLINDER HEAD | 15 FT/LB | 180 IN/LB |
| SPARK PLUG | 14 FT/LB | 165 IN/LB |
| CRANKCASE BOLTS | 7 FT/LB | 80 IN/LB |
| ROTOR MOUNTING NUT | 15 FT/LB | 180 IN/LB |
| CARB NUTS | 5 FT/LB | 60 IN/LB |
| EXHAUST NUTS | 20 FT/LB | 240 IN/LB |
| REED BLOCK NUTS | 5 FT/LB | 60 IN/LB |
| CLUTCH CENTER MOUNT NUT | 70 – 80 FT/LB W/GREEN LOCTITE | 900 IN/LB |
| CLUTCH DRUM NUT | 10 FT/LB W/ BLUE LOCTITE | 120 IN/LB |
| AIR FILTER CUP BOLT | 2 FT/LB | 24 IN/LB W/ BLUE LOCTITE |
| COIL BOLT | 5 FT/LB | 60 IN/LB |
| IGNITION STATOR BOLT | 3 FT/LB | 35 IN/LB |
| STARTER BOLT | 5 FT/LB | 60 IN/LB |
| CLUTCH COVER BOLT | 5 FT/LB | 60 IN/LB |
| STARTER RING BOLT | 7.5 FT/LB | 90 IN/LB |