



Altair™ Electronic Ignition System for **ROYAL ENFIELD**

Bullet 350/500
Single Cylinder Motorcycles (12 Volt)



System# ALB

Altair Electronic Ignition System for

- **Enfield Bullet 350/500cc singles: Export, India, Redditch, Sixty 5, Electric Start 12 volt electrics, negative ground (can also be wired for positive ground)**

Features

- **Fully digital design**
- **Compact digital ignition module (fully encapsulated) - module size: 80x40x20mm**
- **Fully mapped ignition timing (electronic advance/retard)**
- **Programmed coil energy control**
- **Electronic tachometer drive output**
- **Reliable and rugged hall-effect sensor includes on-board static timing light for easy setting of ignition timing**
- **Works with the standard 12 volt Lucas type (or equivalent) points type ignition coil (available separately)**
- **Very low voltage operation - ideal for electric starters and kick starters**
- **Extremely efficient operation: high spark energy and low power consumption**
- **Wasted spark system (fires on compression & exhaust strokes)**
- **Very low maintenance**
- **Improved starting, idling and overall performance**
- **Covered by manufacturer's 7½ Year Warranty**

System Contents

- **Ignition module (black rectangular unit with wiring)**
- **Digital hall-effect trigger unit (circular printed circuit board with components)**
- **Electroplated steel rotor**
- **M6 x 25mm cap head screw + flat washer**
- **5K suppressor plug cap**
- **Adhesive cable tie mounting base (for ignition module)**
- **Crimp terminal connectors & insulators**
- **Black sleeving (for protecting wiring)**
- **Large & small cable ties**

Important notes

**Warning: this ignition system produces very high voltages
Always switch the ignition off before working on the bike**

- This system is designed to give optimum results with a 12 volt Lucas ignition coil (or equivalent type), with a primary resistance of 3 to 4.5 ohms. For a twin-plug head, we recommend running with two 6 volt ignition coils connected in series (linked plus to minus from coil#1 to coil#2).
- A 5k suppressor/resistor plug cap (as supplied) should be used with this system. A resistor spark plug can also be used. Attempting to run the system without any suppressors will result in excessive radio frequency interference (r.f.i.), which may cause misfiring, bad running, loss of ignition and interference with other electronic/electrical items.
- For reliability, copper or steel plug wire (h.t. lead) should be used. Carbon fibre plug wire should be avoided.
- If you are using the correct type/grade of spark plug, you do not need to change it when running with this system. As a guide, some standard plug types used are:
Bullet 350cc: B7HS (NGK) or BR7HIX (NGK Iridium), or W22FS-U/W22FS-ZU/IWF22 (Denso) or equivalents.
Bullet 500cc: B8ES/BR8ES (NGK) or BR8EIX (NGK Iridium) or W24ES-U/W24ES-ZU/W24ESR-ZU (Denso) or equivalents. Recommended plug gap: 0.020"-0.028" (0.5-0.7mm).
- This is a wasted spark system; the plug sparks on the compression & exhaust strokes, every 360° of crankshaft rotation.
- All electrical connections should be made using good quality crimped or soldered connectors. Twisted wires will not give satisfactory results.
- Wiring should be cut to the correct length. Excess wire should not be coiled up, as this can affect the correct operation of the system.
- If electric welding is to be carried out on the bike, the ignition module should be disconnected and removed.

Installation

1. All connections must be of the highest quality, using crimped or soldered connectors. Twisted wires will not give satisfactory operation.
2. For safety, open the battery box and disconnect the negative battery terminal.
3. Remove the seat to gain access to the ignition coil & wiring.
4. Mount the ignition module in a convenient place, but mount away from direct sources of heat. Suggested mounting locations include under the seat, or the toolbox area (outside or inside). Allow some air space around the module. Do not wrap in foam rubber or similar. A thin sheet of rubber can be placed between the module and frame, to minimise movement and vibration effects. If mounting close to the ignition coil or electronic rectifier/regulator (if fitted), allow some space between the module and these components, as they get warm. If securing the ignition module to the frame, this can be done using one or more large cable ties. An adhesive cable-tie mounting base is provided, which can be affixed to the side or back of the module case, and the cable tie passed through and around the module and frame. If securing the module to the side of the toolbox, an adhesive pad or adhesive velcro can be used.
5. Remove the cover of the contact-breaker (behind the cylinder barrel, left-hand side).
6. Disconnect the black wire from the contact-breaker. This wire runs up to the CB (negative or —) terminal on the ignition coil, or to the engine cut-off switch (fitted to some European Bullets).
7. Remove the two pillar screws holding the contact-breaker plate. Retain the screws for later. Remove the complete contact-breaker assembly.

8. Remove the nut holding the auto-advance timing unit (ATU). Gently tap around the unit until it frees from the taper, and pull out. If it does not pull out, remove the stud first. This can be done with grips on the unthreaded part, or by fitting two M6 nuts tightened together, then use a spanner on the inner nut (turn to remove).
9. Remove the spark plug and rotate the engine until piston top dead centre (TDC) is found, on the **compression** stroke. Note that this is slightly different to the static timing method used with points (where the engine is set slightly before tdc). Finding TDC can be done in various ways. Engage 4th gear and rotate the back wheel, until maximum piston height is found. To find this, the simplest method is by carefully inserting a rod or screwdriver through the plug hole touching the piston top, and feeling for maximum piston height. A more accurate method is to fix a dial gauge onto the plug hole, using a suitable adaptor. Note the pointer reading at about .050" before tdc, and .050" beyond tdc, measured in piston travel. Then the pointer position exactly halfway between these readings is exactly TDC. Other timing methods include using a homemade u-tube manometer. Note: the full advance timing figure for the Enfield Bullet is normally in the range 32-33° btdc. The timing method and advance graph shown in this installation guide is based on 32° btdc. The figure that works best for your engine will depend on various factors, including quality/grade of fuel used. With very low octane/ron fuels, lowering the full advance figure by 2-3° may be beneficial.
10. Take the ignition trigger assembly (round green printed circuit board) and pass a small cable tie through the set of holes in front of the 3-way connector block; leave unfastened at this stage. Fit the trigger assembly (connector block facing outwards) into the contact-breaker housing. Refit the original pillar fixings removed in step 7, loosely finger tighten so that the trigger can be rotated by hand. Rotate the trigger fully clockwise on its adjustment slots.
11. Fit the steel rotor into the end of the camshaft; this fits in the place of the auto-advance mechanism (removed earlier); it has a male taper that mates with the end of the camshaft. For the Enfield Bullet, the steel rotor will rotate in a clockwise direction.
12. Then, **without rotating the engine**, position the rotor so that one of the 'tabs' is approximately aligned with the static timing led on the trigger (see fig. 6, page 10). Note: in order to position/align the rotor correctly, it may be necessary to temporarily remove the trigger assembly. Take the M6 cap head screw & washer provided, and pass through the centre of the rotor and into the thread in the end of the camshaft.
13. Recheck that the rotor is seated fully in the taper and as central as possible. Excessive wobble of the rotor can give symptoms that include mistiming and/or misfiring. If in doubt, get an assistant to rotate the engine whilst you watch the rotor spin. To make sure the rotor is fully seated, you can gently tap the top of the rotor with a soft mallet. Tighten the rotor bolt with an 5mm allen (hex) key and re-check engine position and rotor alignment. It's important that the rotor bolt is correctly tightened, otherwise the engine may run poorly, or even refuse to start. Recheck the engine is still at the TDC position. The rotor centre thread (metric M8) is provided for attaching a puller, if the rotor should need to be removed for engine servicing, etc.

Wiring

See wiring diagrams on pages 6-8

1. Make a note of existing wire colours and connections on the ignition coil.
2. **For US/Canada Bullets fitted with an engine stop switch (on handle-bar):**
 - Remove the nut from the CB (negative or —) terminal on the ignition coil, and disconnect the black wire (this connects to the points). This wire is no longer required and can be taped up or removed from the harness, as preferred. Connect the violet wire from the ignition module to the CB (negative or —) terminal on the ignition coil. See page 6.

Note: for US/Canada models, the cut-off is connected (via white wires) between the ignition coil positive (+) terminal and the ignition switch (via a coupler). When this type of cut-off switch is activated it cuts power (+12 volts) to both the ignition module & coil.

For the rest of the wiring (all Bullet models), continue from step 5 (below).

3. For European Bullets fitted with an engine cut-off switch (on side-stand):

For these models, the cut-off is connected (via black or black/white wires) between the ignition coil CB terminal and the contact-breaker. If you no longer require use of the cut-off switch, proceed as step 4 below. Otherwise, proceed as follows:

- Locate the black wire that runs from the engine cut-off switch to the contact-breakers, and connect to the violet wire from the ignition module. See page 7.

When this type of cut-off switch is activated it interrupts switching (via the module violet wire) to the ignition coil negative terminal.

For the rest of the wiring (all Bullet models), continue from step 5 (below).

4. For Bullet models without an engine stop/cut-off switch:

- Remove the nut from the CB (negative or —) terminal on the ignition coil, and disconnect the black wire. This wire is no longer required and can be taped up or removed from the harness, as preferred. Connect the violet wire from the ignition module to the CB (negative or —) terminal on the ignition coil. See page 8.
5. Remove the nut from the SW (positive or +) terminal on the ignition coil, and connect the red wire from the ignition module together with the existing white wire on the coil.
 6. The ignition module trigger wires are coloured: White-Black, Violet-Red and White-Red. Route these wires and sleeving from the ignition module down to the ignition trigger assembly in the contact-breaker housing. Allow a minimum of 50mm/2" of excess wire between the trigger and the ignition module. If passing through holes in metalwork use grommets and/or sleeving to protect the wiring. Route the wires to the 3-way connector terminal block on the trigger assembly. Allowing some movement in the wiring (for trigger rotation, to set the ignition timing), cut the wiring and sleeving to length. Carefully strip back 4-5mm of insulation from the ends of the three wires. Insert the stripped ends of the three wires into the connector terminal block (from left to right) as follows: White-Black, Violet-Red & White-Red. The colours must match. See pages 6-8.
 7. Tighten the three screws with a small screwdriver. Secure the sleeved wires to the trigger plate with the small cable-tie (fitted earlier), using the set of holes provided in front of the connector block. Cut off the excess from the end of the cable tie.
 8. The module GREY wire provides an output signal to drive an electronic tachometer, if fitted. This is a 12 volt output and provides 1 pulse per 2 engine revolutions (0.5 pulse/rev). If required, connect the grey wire to the tachometer signal input wire/terminal. If you have a mechanical tacho or an incompatible type (e.g. Scitsu or Krober), leave the wire unconnected and insulate the end of the wire.
 9. Connect the black wire from the ignition module to the battery negative (—) terminal, together with the standard earthing/grounding wire (note: on some models this can be a red wire). See pages 6-8.
 10. Screw the new (supplied) suppressor plug cap onto the original spark plug wire.
 11. Refit the main fuse/reconnect the battery.
 12. Goto the IGNITION TIMING section.

WIRING DIAGRAM

US/Canada Bullets with engine stop switch on handle-bar

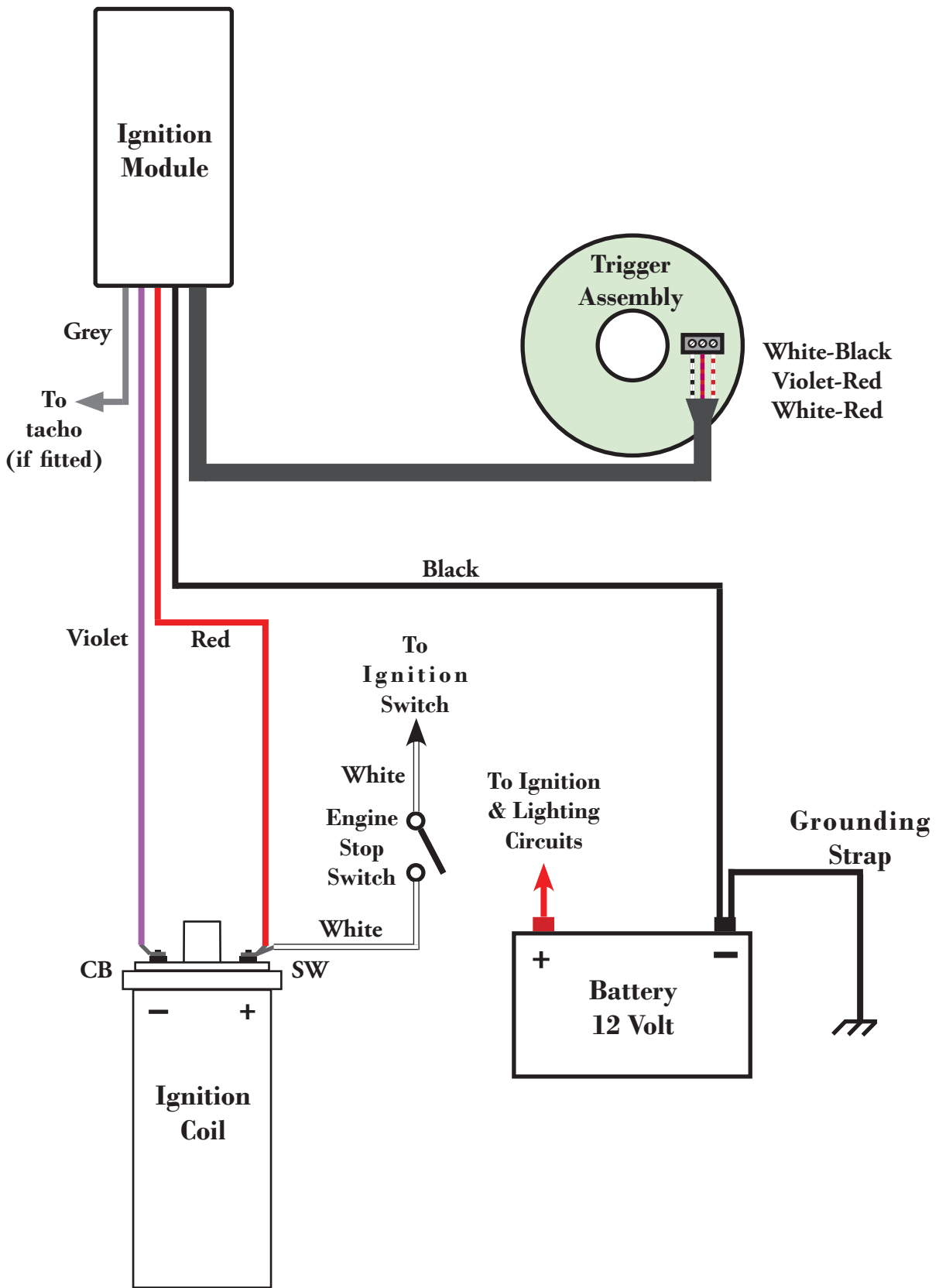


Fig. 1

WIRING DIAGRAM

European Bullets with engine cut-off switch on side-stand

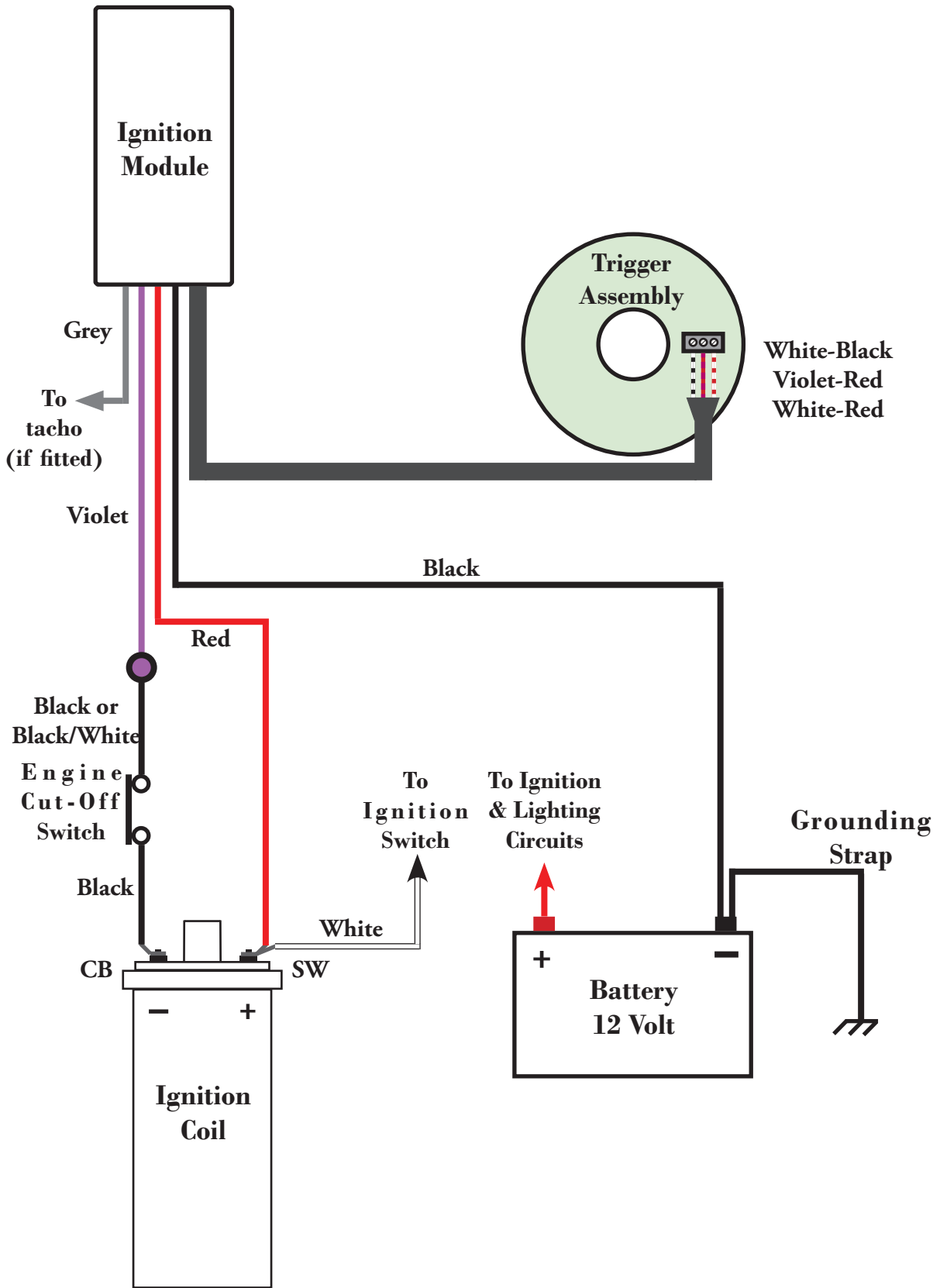


Fig. 2

WIRING DIAGRAM

Bullets with no engine stop/cut-off switch

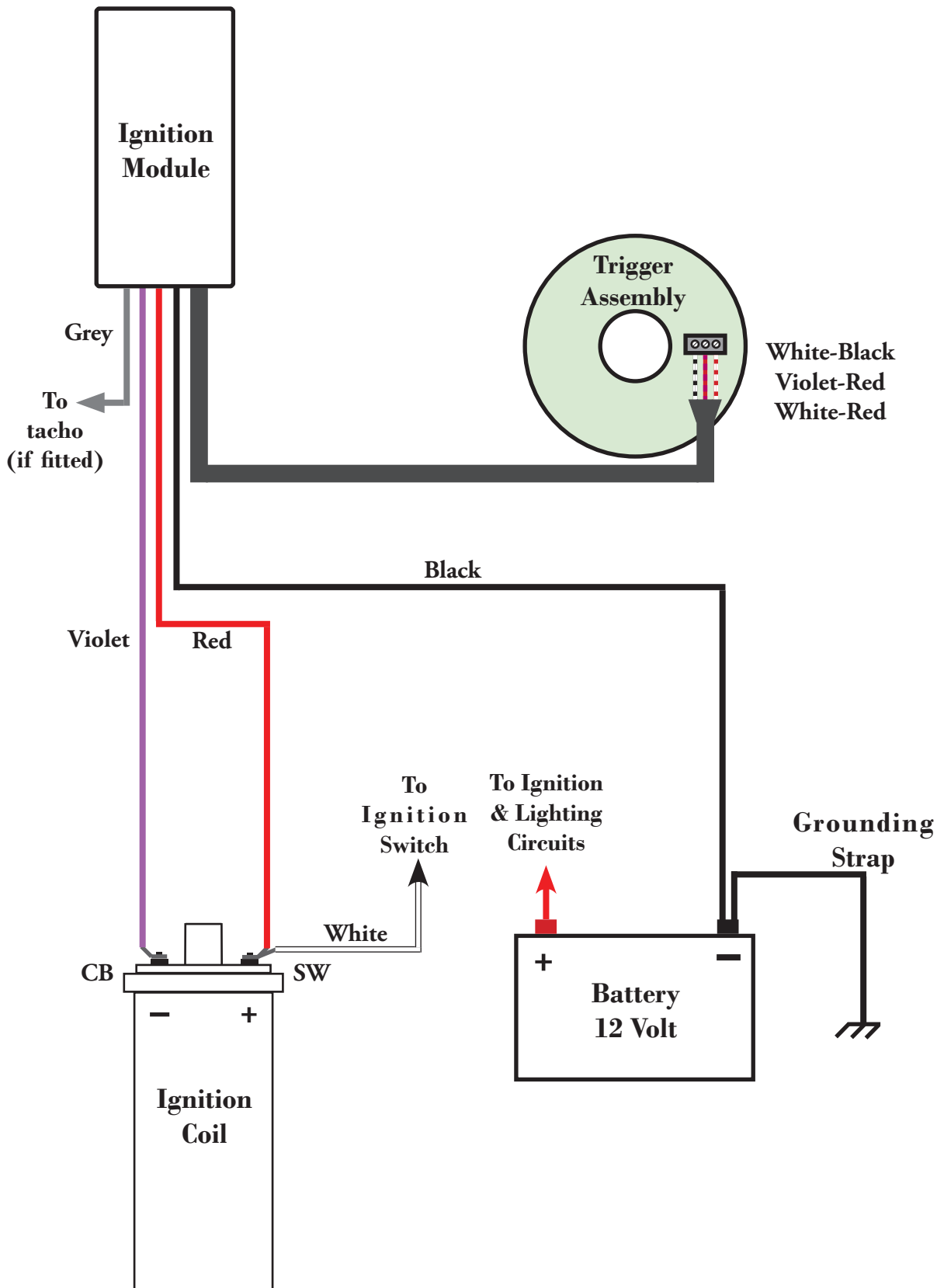


Fig. 3

Ignition Timing See figs 5-7 on pages 10-11

1. Switch off the ignition.
2. If necessary, slightly loosen the trigger pillar fixings so that the trigger can be rotated by hand.

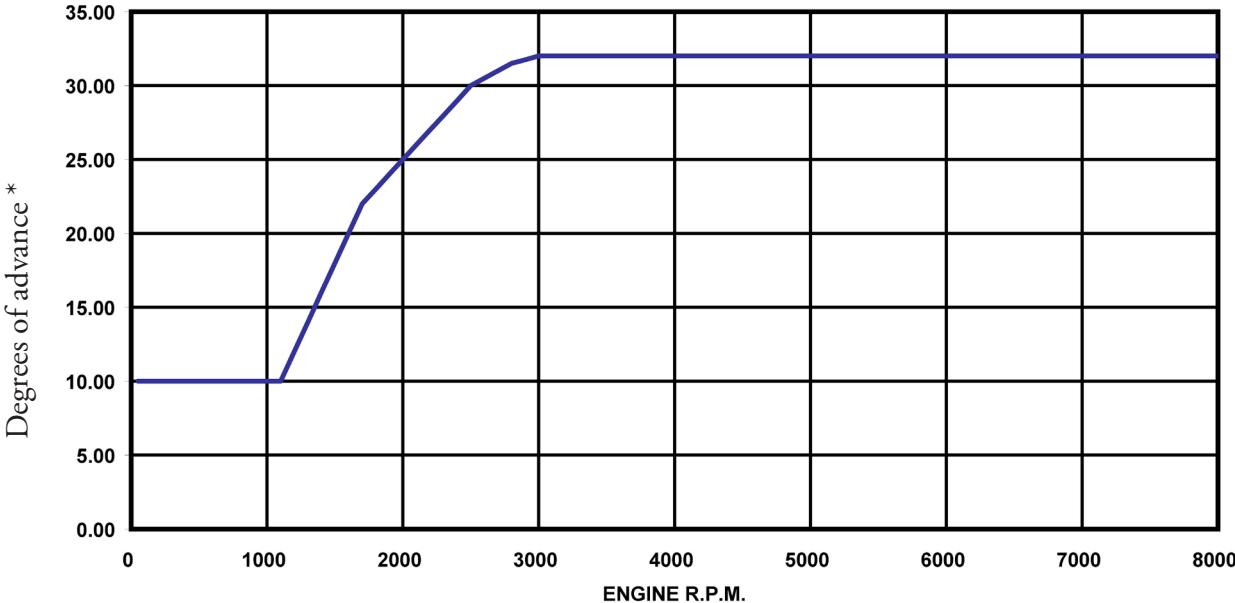
Warning: risk of electric shock.

Keep hands & body away from coil, plug wire (ht lead), plug cap and spark plug

3. The following operations may produce sparks from the plug. It is recommended that the violet wire be temporarily disconnected from the CB (negative or —) terminal of the ignition coil; place insulating tape over the end of the connector to prevent shorting to ground or other connections. This will prevent any undesired sparks whilst timing. Alternatively, the spark plug can be removed, inserted into the plug cap and grounded onto the cylinder head, *but note that the warning above applies.*
4. If not already done, reconnect the battery.
5. **Static timing procedure, with piston set at TDC on compression:**
 - If not already done, rotate the trigger fully clockwise on its adjustment slots. When in this position, the rotor should be aligned so that one of the tabs is approximately aligned with the static timing led (this is also the centre of the hall-effect sensor, on the underside of the trigger board). See fig. 6.
 - Switch the ignition on (the red static timing light on the trigger will normally be OFF)
 - Rotate the trigger slowly counter-clockwise until the red timing light turns ON. See fig. 7. **Stop rotating the trigger.** Carefully tighten the pillar fixings. Do not over-tighten or the trigger board may become distorted.
 - Switch the ignition off.
6. Reconnect the violet wire to the ignition coil, if disconnected in step 3 (above). Refit spark plug, if removed earlier.
7. If removed earlier, push the plug cap firmly onto the plug; it should click into place.
8. Refit the seat. The engine should now start, and after warming up should tick over well, provided everything else is in good order and correctly adjusted. The ignition will advance as per the programmed curve (see advance graph, page 10).
9. The final timing can be checked and, if strobe timing facilities are available, can be fine-tuned. This process is not essential but can be used to ensure that the timing has been set accurately, for best performance. The ignition timing is adjusted by moving the trigger assembly a small amount at a time on its adjustment slots. Proceed as follows:
 - Warm engine for 4-5 mins.
 - Connect a Xenon (white light) strobe lamp. It is recommended that a separate battery be used to power the strobe. Using the strobe, time the engine to the required full advance mark (recommended figure: 32° BTDC)
 - **For safety, switch the ignition off between adjustments**
 - To advance the timing, rotate the trigger the opposite way to the direction of rotor rotation
 - To retard the timing, rotate the trigger in the same direction as the direction of rotor rotation
 - Make very small adjustments; 1° of trigger movement equals 2° of crankshaft movement
 - The trigger has two sets of calibration marks on the outer edge to assist with timing adjustment (for the Bullet, use the set marked **clockwise**)
10. Refit the battery cover, contact-breaker cover, etc.
11. The timing is now set for life. The system requires no maintenance, but for satisfactory and reliable operation the wiring, battery, charging system, coil, plug wire, plug and carburettor must be maintained in good order.

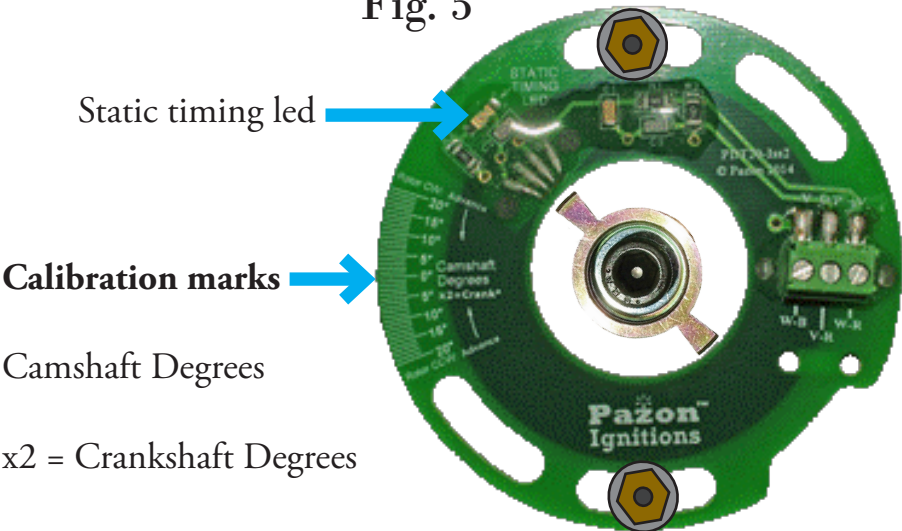
Altair Enfield Bullet Ignition Advance: MAP072

Fig. 4



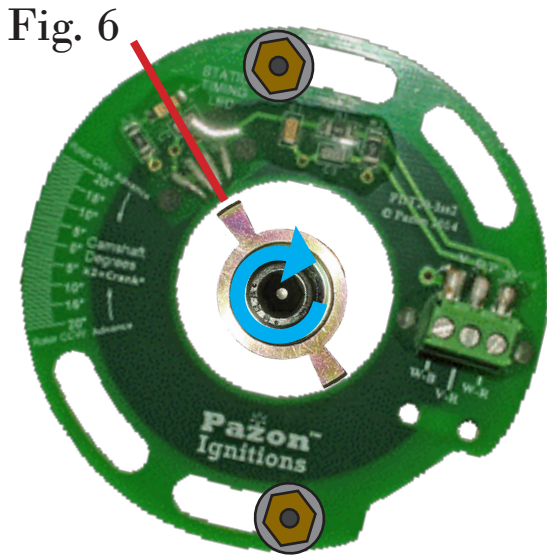
* Relative to static ignition timing

Fig. 5



Static Ignition Timing
CLOCKWISE Rotor Rotation (standard)
(Wiring not shown)

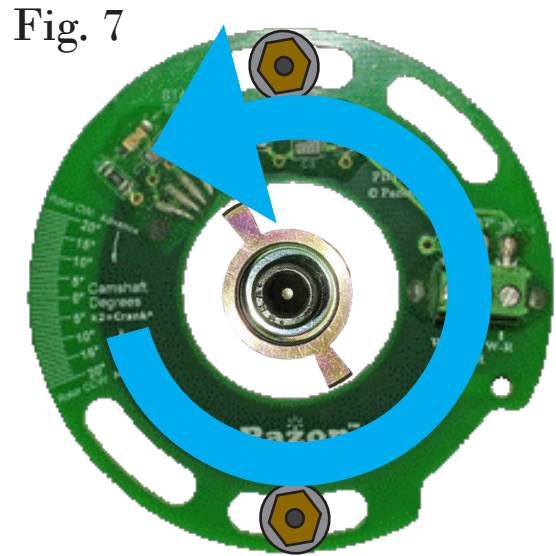
* See accompanying text on page 9 for a full description of the static timing light operation



Initial position of rotor @ TDC

*Trigger set fully clockwise
on adjustment slots*

*Rotor tab aligned with
centre of static timing led*



*Rotate trigger counter-clockwise
until red static timing
led turns ON*

STOP ROTATING
tighten trigger pillar fixings

Terms, Conditions and Warranty

- Use of this product indicates your acceptance of this notice.
- The product design, firmware & literature is Copyright © 2016 PAZON IGNITIONS LTD. and is protected under international copyright, trademark & treaty provisions.
- To provide the best ignition systems possible, Pazon Ignitions Ltd. reserves the right to alter and improve the specifications of its products without prior notice.

Ignition Systems

- Pazon Ignitions warrants to the original purchaser that the Pazon Ignition System be free from defects in workmanship & parts under normal use for a period of 7½ years from date of purchase.

Ignition Spares

- Spares are defined as item(s) not purchased as part of a complete ignition system. Pazon Ignitions warrants to the original purchaser that these item(s) be free from defects in workmanship & parts under normal use for a period of one year from date of purchase.
- Ignition coils will only be covered by the warranty if it can be proved that the fault is due to a manufacturing fault within the coil.

Limitation of Liability

- In no event shall Pazon Ignitions' liability related to the product exceed the purchase price actually paid for the product.
- Neither PAZON nor its suppliers shall in any event be liable for any damages whatsoever arising out of or related to the use or inability to use the product, including but not limited to the direct, indirect, special, incidental or consequential damages, or other pecuniary loss.
- This warranty will be void if the product or parts have been altered, damaged, abused or installed incorrectly.
- This warranty will be void if parts supplied by Pazon Ignitions are used with other makes of ignition. Your statutory rights are not affected.

Warranty Claims

- To make a claim under warranty, the product must be returned to Pazon Ignitions or its authorized representative, with a copy of your receipt (or evidence of date and place of purchase), within the warranty period. Include a detailed description of the problem and why you believe there is a fault within the ignition system.
- The system must be returned postage paid.
Proof of posting is not proof of receipt, therefore we recommend using a recorded mail service.
- Upon receipt we will thoroughly test the returned items and repair or replace any items found to be faulty and covered by the warranty.
- Please allow seven working days from receipt of the returned parts before contacting us, to allow sufficient time for a thorough test and evaluation.
- PLEASE CONTACT PAZON IGNITIONS FOR RETURN INSTRUCTIONS.

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