MAGNETO Conversion

Bob Brassington shows how to convert a single cylinder magneto to run a coil ignition system

The magneto is the heart of any good single cylinder motor cycle, which should fire up at the first prod and be crisp at low revs. Magnetos are designed so that maximum efficiency occurs at full advance and at high engine revs. Any loss of magneto efficiency will badly affect the energy of the spark at low engine revs or when the ignition is retarded, making starting difficult.

With coil ignition, maximum spark is available at low revs and is completely unaffected by advance or retard or engine speed. Now we are talking.

My HS Ariel scrambler is in a high state of tune. This means that combustion chamber filling is instant and copious. Starting the 500cc single became difficult. My theory was that the spark provided by the old magneto was so weak that it was literally being blown out by the fuel. Balderdash, said my friends, but I was determined to prove my point by converting to coil ignition.

Now the Ariel starts first kick, runs smoother, and picks up more cleany. The smile of smug satisfaction has never left my face. All I pray is that the dynamo keeps doing its stuff as I am now totally dependent upon a good battery and the charging system.

Parts list

The cost of parts for the conversion is less than £20 if you fit all new items, available from your local auto parts shop. Scrapyard prices would be a lot less. My Ariel has been converted to 12v, so I used:

- One standard ignition coil (Intermotor part number 11100, screw in HT, non ballast type) or order a sports coil (Intermotor part number 11030, push in HT, non ballast type)
- A condenser (part number 34570)
- A set of alternator brushes (part number 61210)
- An ignition switch. A simple on/off toggle switch will do, but I used an Ariel Square Four ignition switch.

Dismantling the magneto

Remove the emergency spark-gap screw if fitted — hidden under the body on magnetos for singles — and the earth brush which is under a large brass screw. Take off the contact breaker assembly, HT pick-up, and magneto end plate. There may be a number of shims; put them to one side. Draw the armature out of the magneto housing. Pull off the bearing race and carefully remove the slip ring by gently prising at two opposite points.

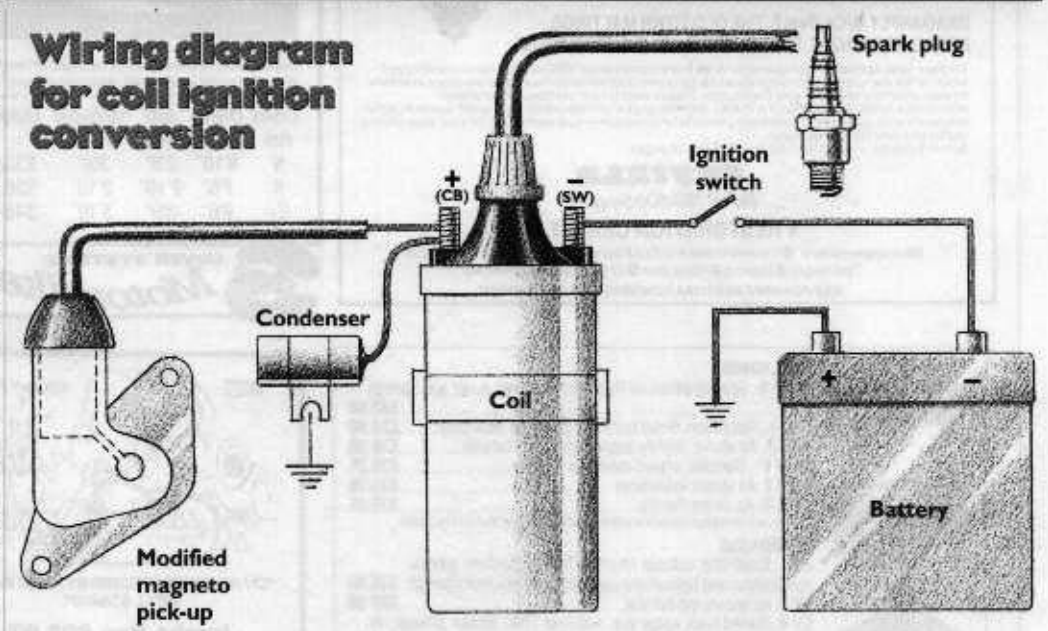
Modifying the armature

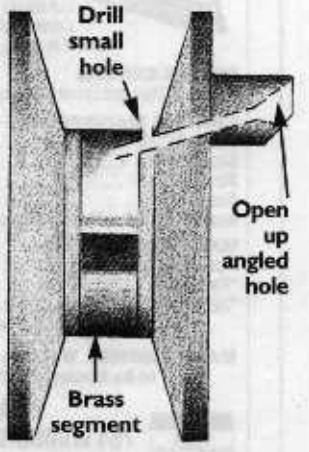
Partially dismantle the armature so that you can strip off the copper wire windings. Undo the two long screws — they may be extremely tight — that secure the brass end pieces of the armature. Leave the contact breaker end firmly assembled to the soft iron core. Before going any further, mark the position of the brass end piece carrying the contact breaker shaft so that it can be replaced in exactly the same position should it come loose.

Now strip down the condenser by removing the two small screws and peeling off the mica laminations, but retain the base plate. The centre screw holding the points assembly to the armature is insulated from the armature shaft and screws into the base plate of the condenser. This screw will be used to connect the points to the slip ring.

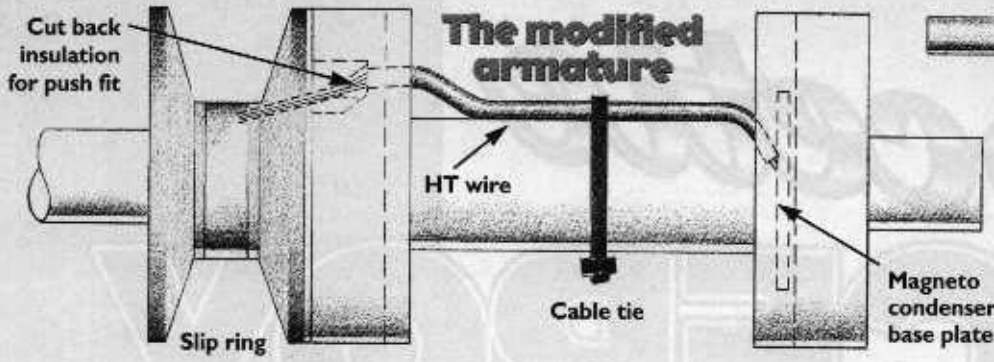
Cut through the fine outer copper wire secondary windings and peel them off the heavy primary windings which can then be unwound. Clean up the soft iron core.

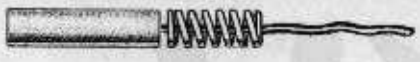
Carefully open out the angled hole in the Bakelite insulator boss on the slip ring which leads to the brass segment with a small drill bit. Take a short length of PVC covered high tension (HT) cable, use solder to tin about ⅛in of the wire, and push it into the brass segment of the slip ring. The tinned wire must be a snug fit in the hole. Open up the Bakelite boss on the slip ring to accommodate the insulation sleeve of the HT cable.





Slip ring changes





Above: modify alternator brush for use in magneto pick-up — radius corners, cut spring, extend wire.

It may help to drill a small hole in the slip ring adjacent to the brass segment so that you can see that the wire is in the brass. Solder can be introduced through this hole.

Use a soldering iron to heat up the brass ring next to where the tinned wire is, and solder in the HT wire.

Allow it to cool before testing the joint by pulling on the cable and then connect a test lead and bulb to ensure electrical contact is good. Clean up the slip ring by removing surplus solder with abrasive paper or a smooth file.

Armature re-assembly

Place the slip ring back in position and feed the HT lead along the central soft iron core. After trimming to suitable length, solder the other end of the HT lead to the remnants of the condenser base plate. Use a nylon cable tie to anchor the HT lead to the core. Remember that the armature rotates at up to 3000 rpm, so we don't want things flying around or chafing.

Now bolt the points assembly to the armature and test using a bulb and battery or meter. The current should flow from the brass of the slip ring to the centre bolt of the points assembly, and from the bolt to the moving contact. Check that there is no earthing between the slip ring and the body of the armature.

The armature may now be assembled into the magneto housing. This can be tricky because Lucas armatures were mass produced in painfully cost conscious days and it is difficult to get them to run true again. If you have access to a lathe and clock gauge this would help. I did it by trial assemblies until the armature was spinning freely within the magneto housing.

Fasten the end cover screws finger tight and rotate the armature. If the armature is not running true, the cover will move in the same direction as the eccentricity. Gently tap the armature and housing end piece at the appropriate spot. It takes patience to get things right.

Pick-up brush modification

The original HT pick-up brush is not suitable for carrying low tension current. Modify an alternator brush by cutting off the terminal tab, but retaining as much of the flexible lead as possible. Don't lose the spring. Gently radius the corners of the carbon brush with a smooth file until the brush is a snug but free fit in the HT pick-up. Reduce the spring length by about 60 per cent. Solder a short length of electrical flex, stripped of its insulation, to the copper wire of the carbon brush. Leave as much as possible of the flexible portion free of solder as the brush must be able to move in its holder without fouling or bottoming on the soldered part. The brush is now ready for assembly into the HT pick-up.

Pick-up modification

Drill a hole of about ⅛in diameter into the HT pick-up. Use a smaller drill as a pilot so that you can adjust the hole if it is not in the correct position. Bakelite is forgiving stuff.

Replace the shortened brush spring on the flex. Now comes the tricky bit. The extended brush wire is fed into the ⅛in hole to emerge into the HT cable ferrule to make direct contact with the HT cable. The HT cable will no longer carry high tension voltage — it will run to the positive terminal of the ignition coil. A little petroleum jelly on assembly prevents corrosion and a rubber sleeve is essential to stop water running into the pick-up and so into the magneto.

Final assembly

The magneto is now ready for re-assembly. Replace any shims so that the armature rotates freely, but without any end-float. Remember to replace the earthing brush which bears on the brass end-piece.

Check your work by wiring the magneto assembly to the ignition coil and condenser as shown in the wiring diagram. Rotate the magneto armature, and you should get a fat, bright spark at the plug.

Now the exciting bit. Assemble the magneto unit on to your motor cycle and check the ignition timing. Mount the ignition coil out of sight — but it is vital that it is insulated from vibration and that it recieves an air flow to keep it cool. Note that old coils are marked CB (contact breaker) and SW (switch), and new ones are marked + and -, so check the polarity of the battery terminal. If your machine is positive earth, connect the lead from the magneto pick-up to + on the ignition coil: the - side of the coil to the ignition switch.

The switch may be hidden for security reasons, but I like to have easy access to mine in case of emergency, such as a throttle stuck open. The condenser needs to be protected from the rain but do make sure there is an air flow or enough space for it to keep cool. It should be sited as close to the magneto as possible — otherwise its function will be impaired — and be well earthed.

Complete the wiring circuit, set the spark plug gap to .025in and away you go. The old days of difficult starting are long gone. Pleased? You will be! ■