

JawaMoped Electrics – Contact less Ignition Systems.

The Jawa / Babetta moped ignition systems are about as simple as you can get, as a result there is very little to go wrong. They were very advanced for their time, being the first mopeds in the world to be equipped with fully electronic, contact less ignition systems. Apart from regular spark plug cleaning or replacement, there is nothing that requires any maintenance or adjustment in the normal care of the moped. A few very late models had a more modern 12 volt system, see later in this sheet for details. I am talking here about the true mopeds – types 28, 207, 210, 225 etc., as the scooters & Mustang bikes, models 20, 21 and 23, are a little more complicated & more like a “proper” bike, with points that need cleaning and adjusting from time to time. Thanks are due to www.mz-b.com for some of the information in this data sheet from their web site.

Warning:- All vehicle ignition systems operate at several thousand volts, when checking the spark, hold the plug by insulated pliers. Dirt, moisture or damage on the plug cap or leads can cause the sparks to track to the outside and a “kick” from the ignition can be very unpleasant. People with electronic heart pacemakers especially, should stay away from vehicle ignition voltages.

System description

The generator is a permanent magnet alternator, the rotor, the solid drum in the centre, having a series of permanent magnets and so doesn't need a slip ring, commutator, brushes or coils to generate the magnetic field. The stator, the static ring around the outside of the rotor, has 4 coils attached to it, three of these are for lighting and auxiliary circuits but the upper most one is the ignition coil. The Alternating Current that this generates powers the ignition unit. One end of the coil is connected, by the red wire, to the G terminal of the ignition unit, the other end being connected to the moped frame.

Behind the ignition coil as part of the stator ring is the pulse forming coil that senses the position of the rotor and “fires” the ignition unit via a white or a yellow impulse wire connected to the I terminal, (see below for details of the two types) which creates the spark at the correct position of the piston.

Ignition unit types



fig. 1



fig. 2



fig. 3

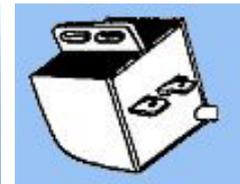


fig. 4

Fig. 1:- The red “**Transimo**” one part combined transistor ignition unit & coil was fitted to model 28s and early 207s and is probably the most troublesome of all the units. Any of these still in use would be at least 25 years old now. This part is no longer available although the thyristor semiconductor itself, the round silver device next to the connectors, is replaceable with a Tesla KD602 if you can find one. Re-solder the two wires to the new transistor, the right way round, and refit it with the two little screws. A better bet is to replace the complete unit with a newer version – see below.

Fig. 2:- The black **Thyristor** ignition unit with 4 round prong connectors used on later 207s and most 210s is a better unit. The plastic bodies of these shrink and crack with age but this doesn't seem to affect the operation. These are still available new. The only down side is that they need a separate 4 volt HT coil (a round silver unit) to power the spark plug. See below for a guide to checking these units or even for details of how to make your own !

Fig. 3:- A Hungarian made, one part combined thyristor ignition unit & coil with 3 blade connectors and an HT connector for screwing in the plug lead, used on 225s and later mopeds, is the best of the bunch. Small and easy to fit and wire up, doesn't need a separate coil, and still available new. These can be used to replace all of the other three types – see details below.

Fig. 4:- A Czech Republic made combined thyristor ignition unit & coil with just 2 blade terminals and a metal mounting lug, seem to have been fitted to some of the final Stella type mopeds. These can cause trouble when their earth connection through the mounting bracket corrodes. As a result of a bad ground connection the unit burns internally and fails.

Checking -- Spark and Wiring

The usual way of checking if the ignition system is working is to remove the plug from the cylinder & re-connect it to the plug lead, then holding the metal body of the plug against bare metal, say the cylinder fins, kick the engine over. You should be able to see a spark jump across between the plug electrodes. The plug may have to be shaded from bright light to be able to see the spark clearly. A spark here doesn't guarantee correct sparking under conditions inside the cylinder, but a good strong regular spark is a good indication that the ignition system is working OK. However, a possible problem is the ignition unit failing or going intermittent because of overheating during use.

If you are getting no spark or an irregular spark, there could be a faulty component in the system. First always check the components are wired up correctly against the appropriate wiring diagram which you can

get from my "manuals" page. Download the one for your type of ignition unit and with the same accessories fitted. Don't assume the wiring colours in your moped are the same as the diagram, sometimes different colours might be used in the factory or a previous owner might have changed some wires. If you are in any doubt, follow the colours through to find both ends match up to the correct connection points against the relevant wiring diagram.

Check all terminals are clean & tight, if new terminals have been fitted anywhere, make sure they are making good contact, old wire can corrode inside the insulation & stop a new connector making contact with the wire. If fitting new terminals, scrape the corroded wire back first to reveal bright metal. If your wiring is a particular mess it might be an idea to just remove the lot and temporarily re-wire the ignition circuit only for testing, as in my "ignition wiring" data sheet, to eliminate any source of problems, short circuits etc., with the lighting and auxiliary circuits, which can be reconnected after.

-- Spark Plug and HT

On all two strokes it is always best to try a new spark plug first, carbon build up or oiling can stop the plug working properly after only a short mileage. Recommended plug type is **PAL N7R** (see my "spark plug" data sheet for other brands) and the plug gap should be set to **0.5mm (.020")**. Bear in mind, it's not unknown for a brand new plug to malfunction straight out of the box. Plug cap & lead can cause problems and are only cheap so are worth replacing if in any doubt about their condition. Don't use the modern carbon HT leads, I always use the old fashioned copper cored HT wire. Make sure the screw-in connections to the plug cap and to the coil or ignition unit are clean, tight and making good contact.

-- Coil, Thyristor and Stator

The fig. 2 type thyristor is the most common type in use and is the version described here. You will need a multimeter set to 1 or 10 kilo ohm range or 'diode' setting. All terminals should be disconnected from the moped wiring when taking measurements.

This unit requires a separate HT coil (a round aluminium can), fig 5, which must be the correct 4 volt unit. The measured resistance, with all connections removed, between the 1 and 15 terminals should be less than 1 ohm. Many moped coils have higher resistance, up to 6 ohms, these won't work on a Jawa. The resistance between the 15 terminal & the HT connection should be about 6,000 ohms.

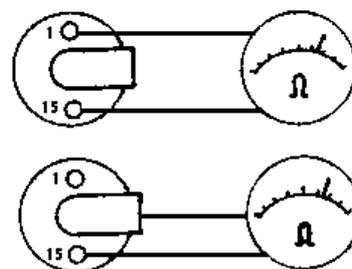
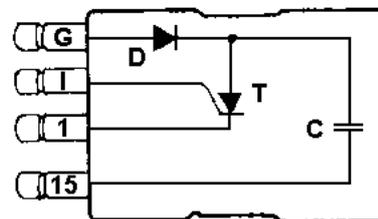


fig. 5

fig. 6

On the thyristor unit, fig.6, first check the trigger circuit by measuring the resistance between terminals I and 1 which should be about 50 to 400 ohms. Reverse the test prods and the resistance should be in the same range. A reading close to 0 or ∞ (open circuit) shows the unit is faulty. More detailed checks on this unit are described in the Model 210 Workshop Manual. There is a guide to making your own copy of this unit, with just three components and a bit of soldering, on the Moped Army web site at www.mopedarmy.com/wiki/Jawa_Thyristor



The ignition coil at the top of the stator should give a reading of 210 ohms to 230 ohms between the pole outlet (the red lead) and the pole core (ground). The pulse forming coil should read 16 to 18 ohms between the stator ring and its output (yellow lead).

Adjustment of ignition advance

Because the timing is non-adjustable and since no mechanical wear can take place, the spark should be occurring at the correct time in the engine cycle, unless the alternator has been removed and put back wrongly or otherwise "interfered with". If you suspect that the timing is incorrect, you can check or adjust it as follows.

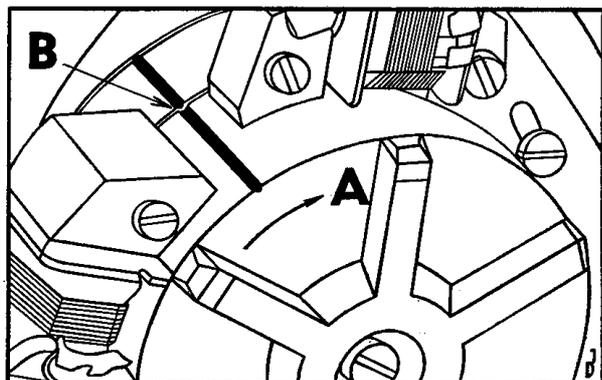


fig. 7

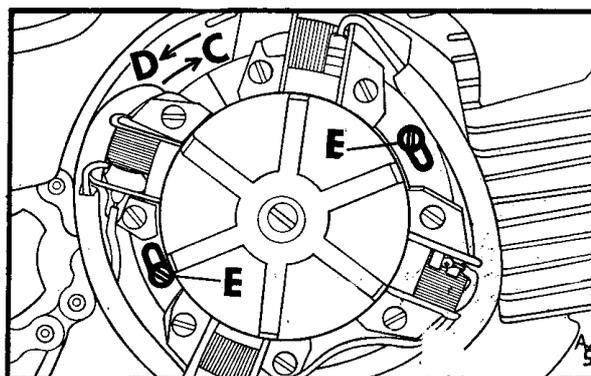


fig. 8

You will need a dial indicator or a timing gauge. Remove spark plug and insert dial indicator into hole. Find top dead centre by turning the rotor clockwise (fig. 7 A) until the dial gauge reads as high as it can. Zero-out

gauge and turn rotor backwards (counter-clockwise) one and one-half millimetres on the gauge (**1.5mm before top dead centre**). Compare the mark on the rotor with the mark on the stator (fig. 7 B). If they are in the same position the timing is correct and does not need adjustment. This isn't as easy as it sounds since the magnets in the rotor and the coil's steel laminates cause the rotor to try and jump round on its own and not stay where you put it. If the marks do not match up, loosen the stator screws (fig. 8 E) and rotate stator until the marks are in alignment and retighten screws. Then repeat procedure to re-check timing mark.

Replacing the Transimo (fig. 1) with the Hungarian unit (fig. 3)

The transimo (fig. 1) is no longer available and has not been the most reliable part. It can easily be replaced by the Hungarian thyristor unit (fig. 3), if at the same time the stator base ring containing the impulse triggering coil (fig. 9) is replaced (the coil is cast into the ring). The impulse wire of the Transimo stator ring is white, the impulse wire of the Thyristor stator ring is yellow.

Instructions:- 1) Replace the stator ring with the white impulse wire for a ring with a yellow wire (fig. 9). Swap the 4 generator coils onto the new stator. There will still be a white wire with an eye terminal for earth! Earth this to the stator ring with one of the coil fixings.

2) Remove the old Transimo unit and fasten the new thyristor in the same place as old unit, but with only one fixing screw.

3) Connect the wires as shown in the new wiring diagram (fig. 15). Compare this to the old diagram (fig. 13). Pins G and I remain the same, only Z is replaced by pin 1 (this is ground).

The ground wire from old pin Z goes to pin 1 on the new thyristor, directly next to the HT coil exit. The new yellow wire from the stator goes to pin I, the one in the middle. The red wire goes to pin G on the new thyristor.

fig. 9



Replacing the 4 pin Czech unit (fig. 2) with the Hungarian unit

Whilst the 4 pin unit is quite reliable, if you need to replace it you could use the later 3 pin unit. Simply remove the coil (the round silver unit) and its two connecting wires and the old thyristor unit. Screw the HT lead (preferably a new one) with plug cap into the socket on the new unit and fit the new unit in the same place as the old one. Connect the wires as shown in the diagram (fig. 15). Compare this to the old diagram (fig. 14). Red wire to pin G, Yellow wire from stator to pin I, and the white earth wire to pin 1, all the same as on the old 4 pin unit. Now there is no pin 15 or coil so the blue wire is not required.

Replacing the 2 pin Czech unit (fig. 4) with the Hungarian unit

The 3-pin thyristor is the more reliable unit because of its separate pin for ground connection.

Instructions:- 1) Unscrew the old 2 pin unit from the frame (2 screws) and fasten the new unit at the rear fastening hole on the frame with the wires pointing forward.

2) Make up a new wire (preferably a white wire) with, at one end a 6.3mm female blade terminal for the thyristor pin and at the other, a round M5 eye terminal for ground.

3) Connect the wires as shown in the new wiring diagram (fig. 15). The new white wire to pin 1 next to HT coil exit. The yellow wire to middle pin I. The red wire to last pin G.

4) Take the black generator cover from the engine and lead the new white wire alongside the existing harness down to the generator. Fix it there to one of the stator screws. Do not use a shortcut to connect the white wire to the frame, this is not reliable.

Later 12 volt systems

Shortly before the end of the Babettas a couple of different 12 volt systems were fitted:-



fig. 10

Magneton system - above,



fig. 11

and the Vape system.

These work in a similar way to the older systems but the main difference is that the rotor, which is still a permanent magnet item, fits over the outside of the stator and generating coils. In addition, as in the pictures, there are about 10 or 12 individual coils. A wiring diagram for the Vape systems is shown below (fig. 12). Two wires from the stator are for the ignition unit / coil and the third wire is the 12 volt for the auxiliary & lighting circuits. The "regulator" in the diagram seems to also be a flasher unit for the indicators.

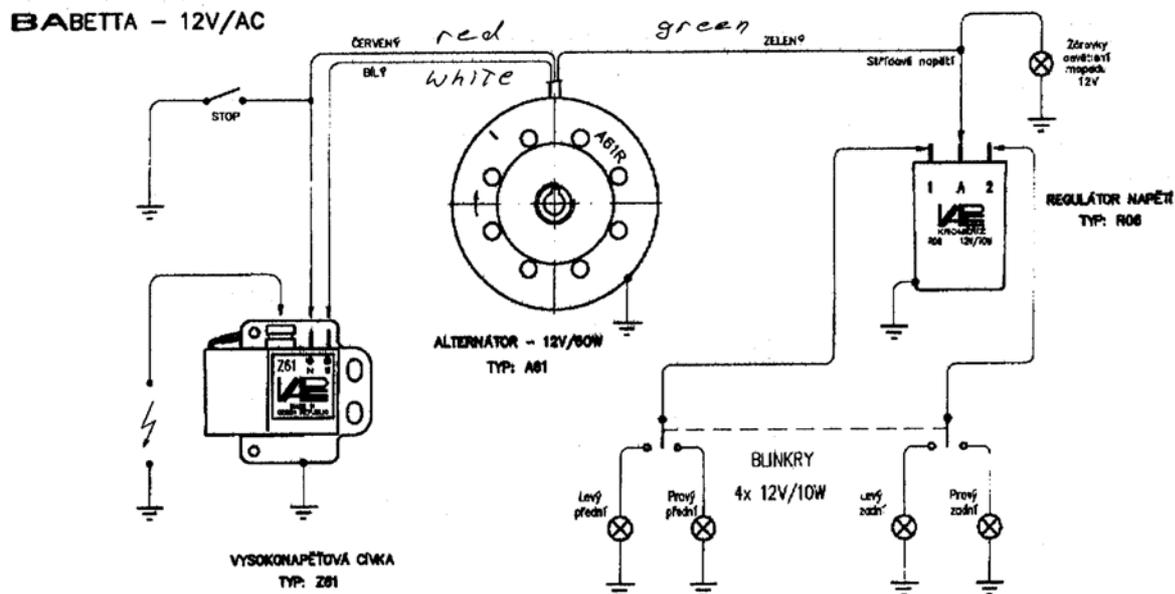


fig. 12

Fault finding

After all the above checks you should have either pinpointed any ignition faults or eliminated the ignition as a source of any problems. If you are still having problems it is time to look elsewhere for the cause. The following brief guide, taken from the model 210 Workshop Manual might help.

Engine will not start:-

- 1) The fuel tap is closed, or the fuel tank is empty.
- 2) Choked fuel hose, strainer or fuel jet. Water in float chamber.
- 3) Faulty ignition - carbon deposits on spark plug electrodes, defective spark plug insulator, excessive plug point gap, defective thyristor device, defective ignition coil or stator carrier.
- 4) Over flooded engine. - Remedy:- Shut off the fuel cock and work the pedals with the machine on its stand or pedal along till the engine fires. Use the decompressor if the moped is fitted with it. Then open the fuel cock. It may also be necessary to unscrew the spark plug and clean it and to turn the engine several times to expel excessive fuel through the spark plug hole. Reinstall the spark plug and repeat the starting procedure.
- 5) Slipping or defective starting clutch. This you can ascertain by removing the crankcase cover on the ignition side, when you will be able to see whether the rotor is turning.

Engine runs erratically

- 1) Overheated engine.
- 2) Faulty spark plug.
- 3) Partly obstructed fuel supply or main jet.
- 4) Leaky crankcase.
- 5) Faulty cable terminal (plug cap).
- 6) Faulty ignition.
- 7) Blocked fuel tank vent.

Loss of power

- 1) Clogged air cleaner.
- 2) Clogged exhaust silencer.
- 3) Damaged crankcase sealing ring.
- 4) Damaged piston, cylinder or piston rings.
- 5) Leaky cylinder head.
- 6) Maladjusted ignition advance.

Engine power is satisfactory, but acceleration is poor or peak speed cannot be attained.

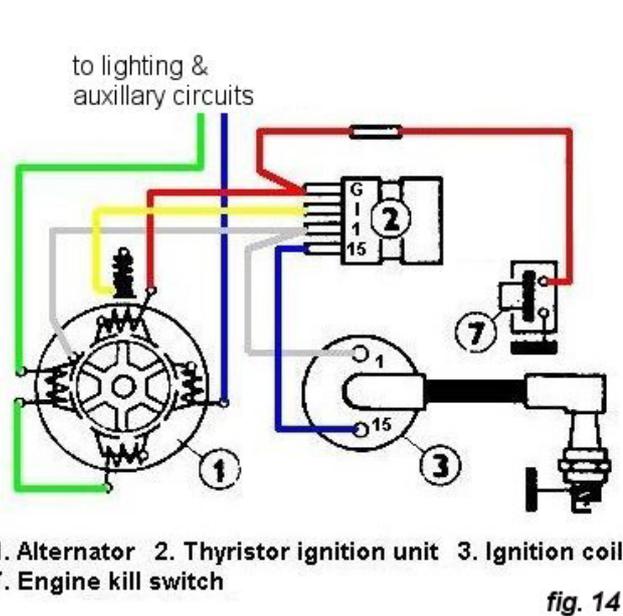
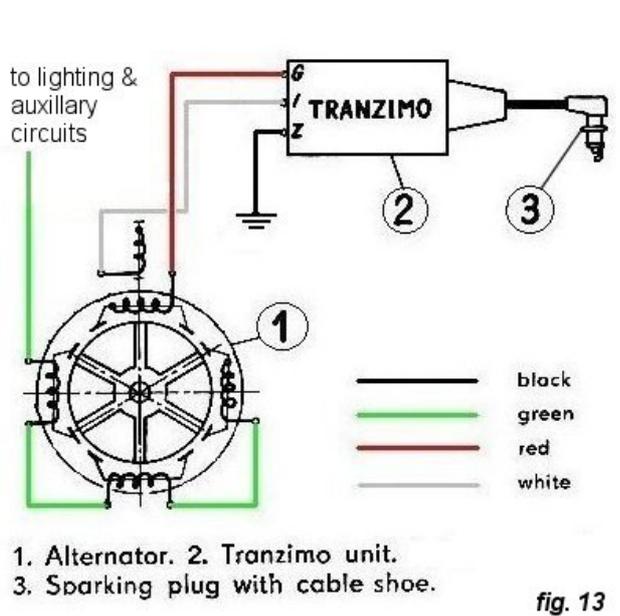
- 1) Brake shoes are fouling the drums.
- 2) Under inflated tyres.
- 3) Slipping starting clutch or 2nd-speed clutch.

Further help

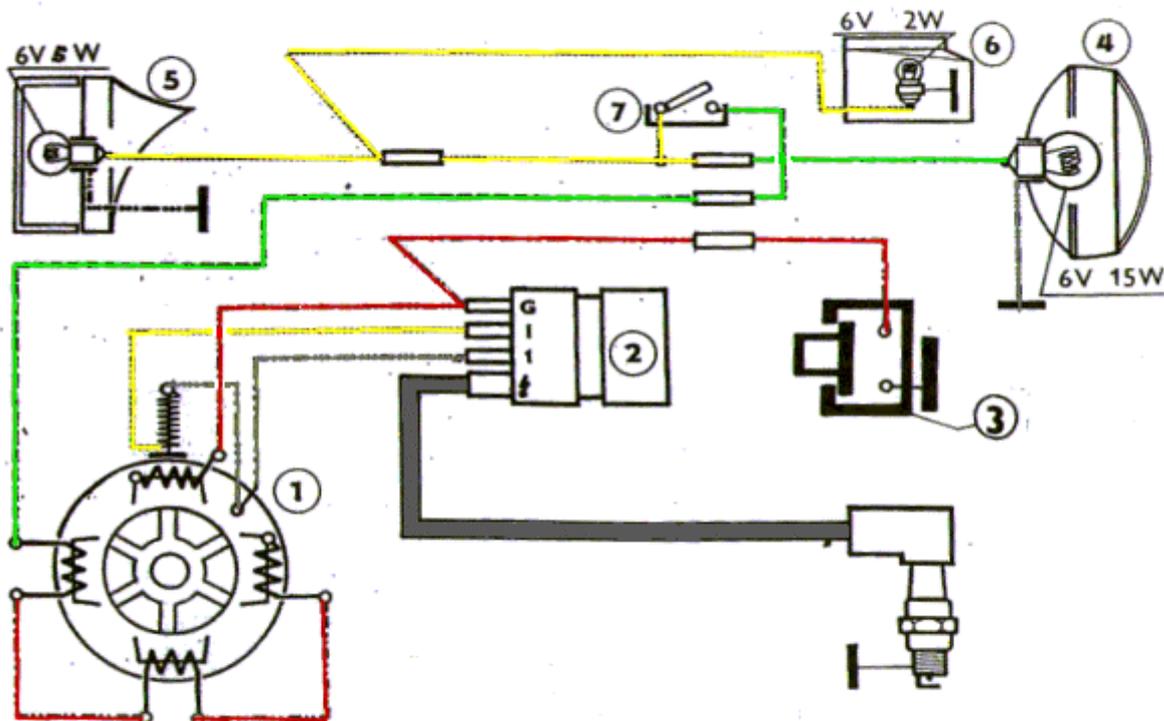
Some other of the Jawa handbooks and manuals from my 'manuals' page have further fault finding suggestions. There is very good general moped maintenance and repair information on the Moped Riders Association web site. Go to the web address <http://www.mopedriders.org/> click the link to 'Moped Repair' and read the excellent "Fred's Guide". Although the bit about points setting doesn't apply to the model 28/207/210/225s there is a lot of other very useful information about possible non-electrical faults that does apply to our mopeds. There is also on this site, to download, the very comprehensive "Paul Dempsey - Moped Repair handbook" with 270 pages of everything you ever wanted to know about mopeds.

Parts Availability

At the time of writing, the types 2 & 3 thyristor units, the HT coil, and the "yellow wire" stator rings are still available from <http://www.mz-b.com/> in Hungary.



*Schaltbild Babetta 210, Thyristorzündung
Wiring diagram Babetta 210, thyristor ignition*



1 Generator 2 Thyristor 3 Stopschalter/Killswitch 4 Scheinwerfer / Headlight
5 Rücklicht / Taillight 6. Tachobeleuchtung/Speedoillumination
7. Lichtschalter / Lightswitch

fig. 15