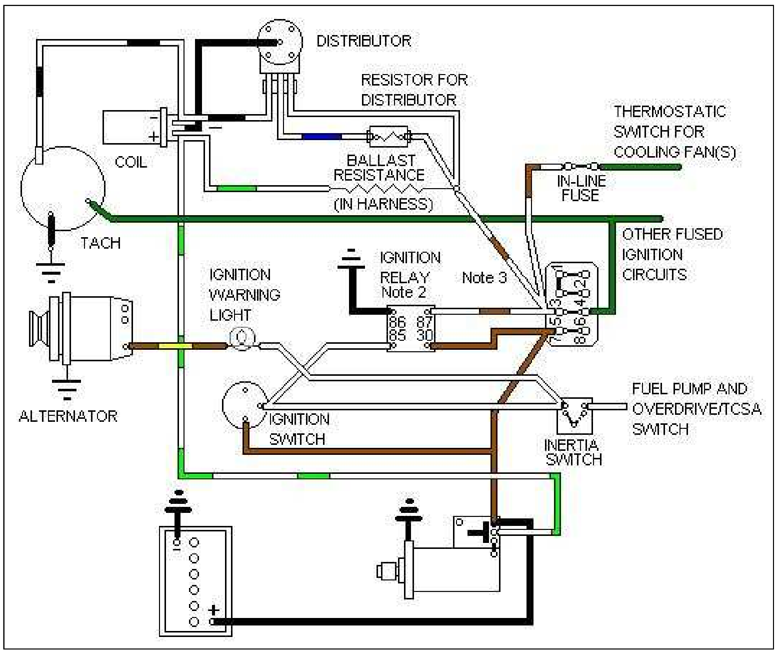
Ignition - 45DE4 Distributor (integral amplifier, 75-on)

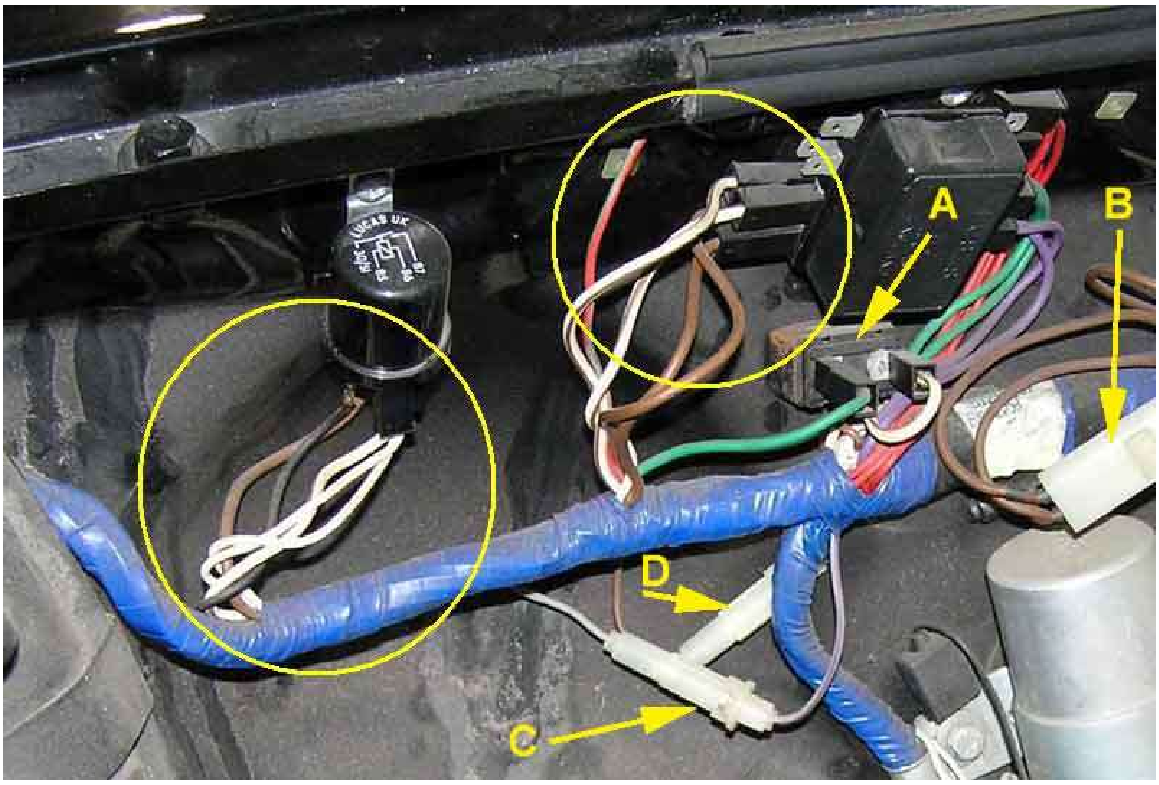
Hover over a wire to confirm the colour



Note 1: Fitted to North American cars only, this troublesome 45DE system was often dealer-replaced with the much more reliable 45DM system. Information on the ballast resistance can be found here.

Note 2: Ignition relay fitted from 1977 only, in 1976 the white from the ignition switch went direct to the fusebox and ignition components and there was no electric cooling fan.

Note 3: 1977 models with the ignition relay can suffer from a problem whereby the engine may continue to run normally (not Dieseling) when the ignition is switched off see here. For 1978 on the problem was corrected by moving the white/brown feed for the ignition coil circuits from the fusebox to the white at the ignition relay, leaving two at the fusebox and three wires at the relay. This also shows 'A' the thermal cut-out for the cooling fans; 'B' the 'double-brown up from the alternator; 'C' the anti-runon valve in-line fuse; and 'D' the hazard flasher in-line fuse:



Note 4: The schematics show the original rectangular Lucas relays with W1, W2, C1 and C2 terminal numbering, but in practice cylindrical relays with ISO numbering were fitted. The relationship is as follows:

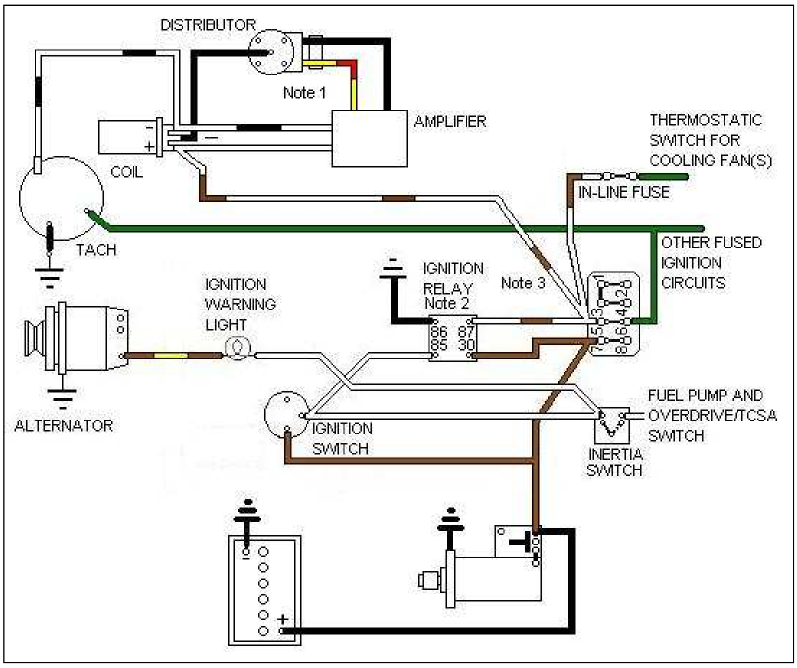
Wire colour	Original numbering	ISO numbering

White from ignition switch	W1	85
Black earth	W2	86
Brown 12v supply	C2	30
White/brown to ignition powered circuits	C1	87

The 'Resistor for distributor' in the above schematic is one of two power supplies for the electronics and is a 6.6 ohm metal-cased power resistor as shown below *picture: Monte Morris*

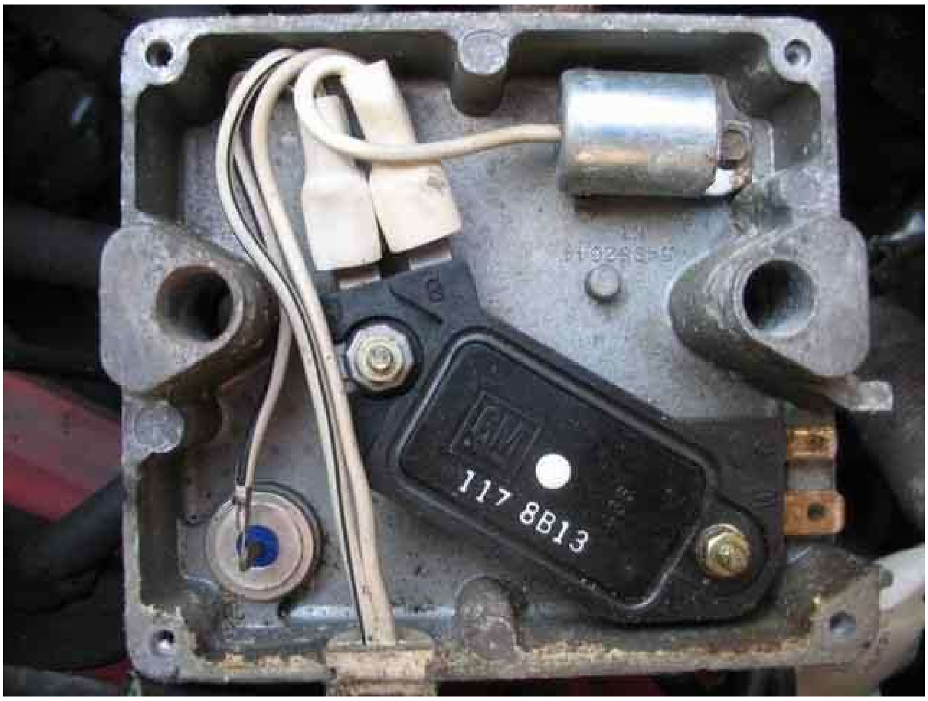
Ignition - 45DM4 Distributor (remote amplifier, 75-on)

Hover over a wire to confirm the colour



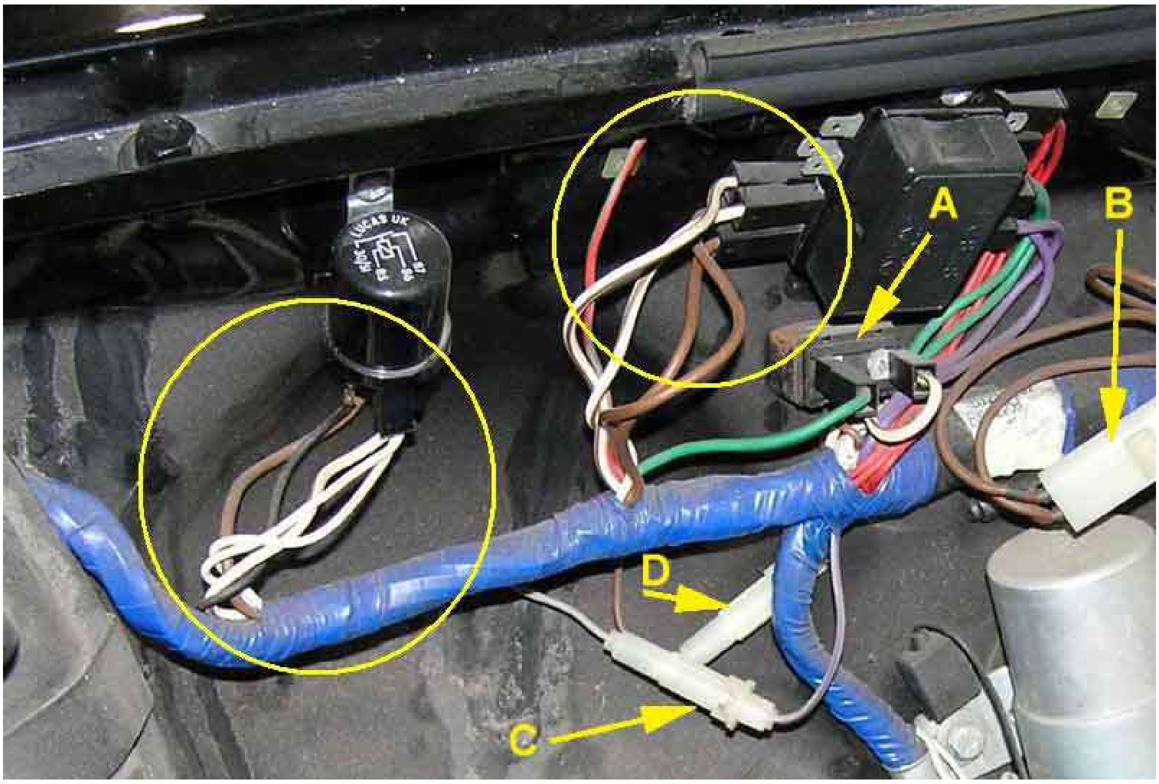
Note 1: Fitted to North American cars only. It did not use the ballasted ignition feed or solenoid bypass system, [see this bulletin](#) supplied by Allan Reeling showing how the troublesome 45DE system was replaced with the very reliable 45DM system.

Inside the external AB14 unit is the electronics module (GM in this case), plus a capacitor on the 12v supply to reduce electrical noise (a different function to the condenser inside a points distributor) and a zener diode on the coil wire. When the coil generates an HT spark it can also generate a pulse of several hundred volts in the primary. The electronics module must not exceed 400v so this zener diode 'clamped' the pulse to a maximum of 350v. Later versions of the electronic module did not need the capacitor or the zener diode: *(Anthony Piper)*



Note 2: Ignition relay fitted from 1977 only, in 1976 the white from the ignition switch went direct to the fusebox and ignition components and there was no electric cooling fan.

Note 3: 1977 models with the ignition relay can suffer from a problem whereby the engine may continue to run normally (not Dieseling) when the ignition is switched off see here. For 1978 on the problem was corrected by moving the white/brown feed for the ignition coil circuits from the fusebox to the white at the ignition relay, leaving two at the fusebox and three wires at the relay. This also shows 'A' the thermal cut-out for the cooling fans; 'B' the 'double-brown up from the alternator; 'C' the anti-runon valve in-line fuse; and 'D' the hazard flasher in-line fuse:



Note 3: The schematics show the original rectangular Lucas relays with W1, W2, C1 and C2 terminal numbering, but in practice cylindrical relays with ISO numbering were fitted. The relationship is as follows:

Wire colour	Original numbering	ISO numbering
White from ignition switch	W1	85
Black earth	W2	86
Brown 12v supply	C2	30
White/brown to ignition powered circuits	C1	87

Electronic Triggers

The no-name trigger contained within a distributor purchased from eBay.

Note the one-piece rotor and magnet ring, the magnets being in the wider ring at the base of the rotor (on the left, standard rotor on the right). This differs from other manufacturers who seem to supply just the magnetic ring with their triggers, a standard rotor going on the top. The complete thing was cheap at £50. Normally the triggers themselves are around £90 (Magnetronic and Aldon) although considerably cheaper from Pertronix at about £60, and with points distributors typically being about £80 new David didn't get a bad deal anyway even taking into account having to retro-fit points and a condenser.

Subsequently Gary Falkiner pointed me to this ETC5835k from various Land Rover specialists sold as a conversion kit using the original distributor. This image (from Britpart) looks pretty-much identical. Although this initially seemed to work OK it became inconsistent, and was picking up iron filings on the magnetic collar, so Gary has gone back to points as well.

Optronic trigger wire with strands broken inside the insulation and causing an intermittent misfire: (*Ben Columb*)

Ignition Diagnosis with a Voltmeter

If you have a rev counter instead of a tach then positioning a voltmeter in the cabin can be as useful a diagnostic tool as a tach and in one case better. Note an analogue meter is preferable as digital meters can give various results depending on their internal design.

Connect the voltmeter between the points terminal on the coil (CB or -ve) and earth, and if switchable on its 12v scale. On electronic ignition systems of the type typically available today if there are red and black wires from the ignition module to the coil then it will usually be the black wire.

When the points are open on a stopped engine the meter will display 12v and with them closed it should display 0v - this will be the same for both 12v ignition systems and ballasted systems. On a running engine the voltage will be continually switching between 14v (when charging) and 0v and the meter will display an average of the two that is dependent upon the dwell of the points.

For the 25D4 a dwell of 60 degrees in each 90 degrees of distributor rotation equates to 67% when they are closed (0v measured) and 33% when they are open (system voltage measured). So on a running engine at a theoretical system voltage of 12v you would see an average of 4v displayed, and at a charging voltage of 14v you would see 4.6v.

For a 45D4 the dwell is 51 degrees i.e. 57% closed i.e. 43% open so you would expect to see 6v and 7v. However you can expect to see some variation in that as the revs change, and with throttle opening as with a wider throttle there is a higher cylinder pressure which makes it harder for the spark to jump the plug gap, which means the HT voltage increases, and that is reflected back into the coil primary as a higher voltage. You would see similar voltages on a ballasted system as they still switch between system voltage with the points open and 0v with them closed the same as non-ballasted.

For typical fixed dwell electronic systems installed these days people have told me they have measured a higher dwell than the book value for points, so the voltage shown will be a little lower, and incidentally those coils will run hotter. But variable dwell systems only pass current through the coil for a given length of time largely independent of rpm as the coil doesn't need any more 'charge' than it gets at peak rpm on our systems, so the longer current flow at lower rpms is wasted energy as heat. Fixed dwell systems energise the coil for about 20ms at idle dropping to about 3ms at 6000rpm, whereas with variable dwell it's about 7ms at idle and again about 3ms at 5000rpm. So you will see much higher voltages on a variable dwell system at idle than you will at peak rpm.

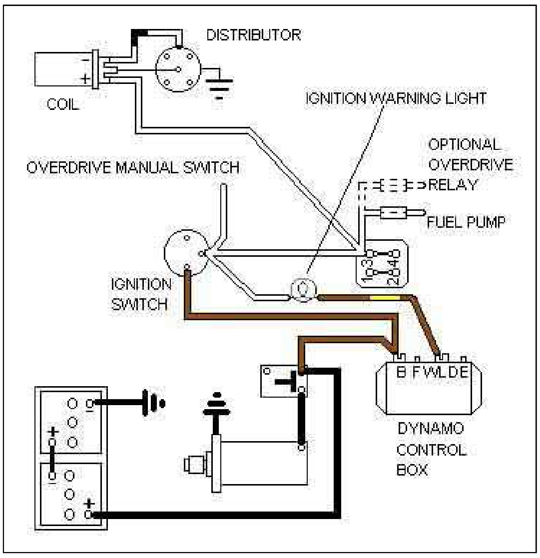
But all these variations can be ignored for the purposes of fault diagnosis, as what you are interested in is how the indication varies when a misfire or other problem becomes apparent, compared to when it's running correctly. If you do see a significant change then the implication is that the problem is in the ignition LT circuit although an open-circuit condenser won't give much of a change. There is a very easy way of determining if the condenser is the problem and that is by temporarily connecting a known good one also between the coil CB or -ve and earth. If the condenser inside the distributor is the problem the problem will go away. If it isn't then the problem will continue, and having effectively two condensers in parallel with each other will have no noticeable effect.

Other than the condenser I would expect to see such changes on a tach as well - and have done so with a loose coil terminal - as the problem will be changing either the current or the voltage at the tach as well, typically with wild swings or having dropped suddenly to zero while the engine is still spinning and the ignition is on. The only time it may not is if the points are still operating but the dwell has become so short that the coil can't charge up enough at higher rpms and there isn't enough HT to fire the plugs so you get a high rev or wide throttle opening misfire. In that case a voltmeter would reveal it as a much higher voltage than normal, as would a dwell meter of course if the short dwell is apparent all the time i.e. at idle with the bonnet up.

I have both conventional multi-meters and an automotive one with dwell and tach as well as voltage, resistance and current ranges and the latter meter has peculiarity that when I'm trying to measure voltage on the coil -ve it displays a much higher value than it should, higher even than the system voltage, because it is actually displaying the dwell value! So that is something to bear in mind.

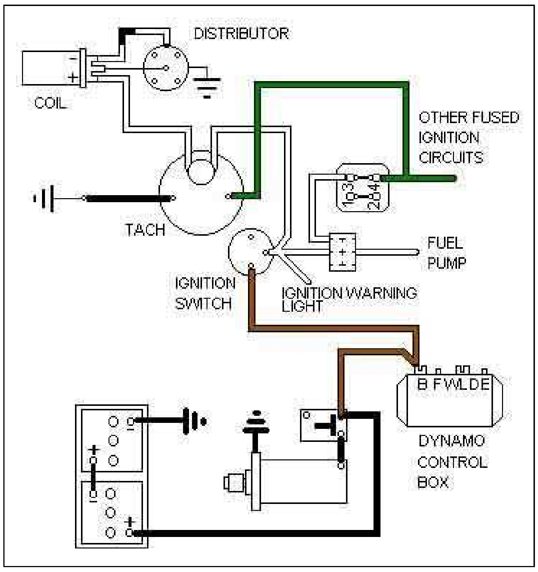
Ignition - 12v coil, mechanical rev-counter (62-64)

Hover over a wire to confirm the colour



Ignition - 12v coil and inductive tach (64-72)

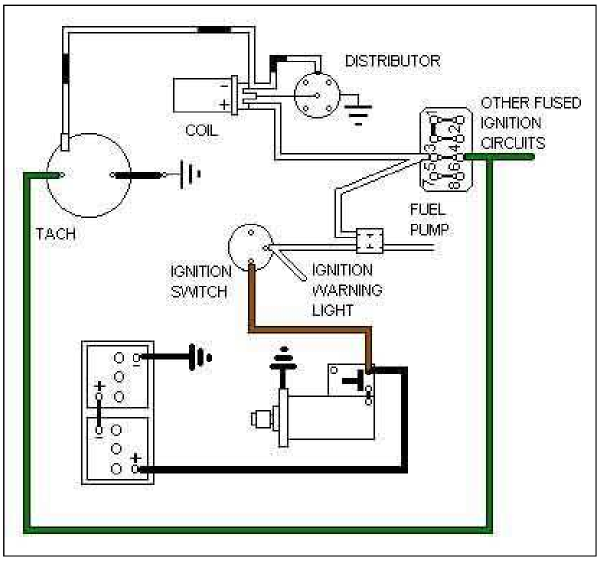
Hover over a wire to confirm the colour



Note 1: Dynamo up to 1967, alternator after that.
Note 2: Tach powered from white up to 1967, from green after that.
Note 3: See here for the overdrive wiring which changed for the Mk2
Note 4: Two-fuse block up to 1969, four-fuse after that.

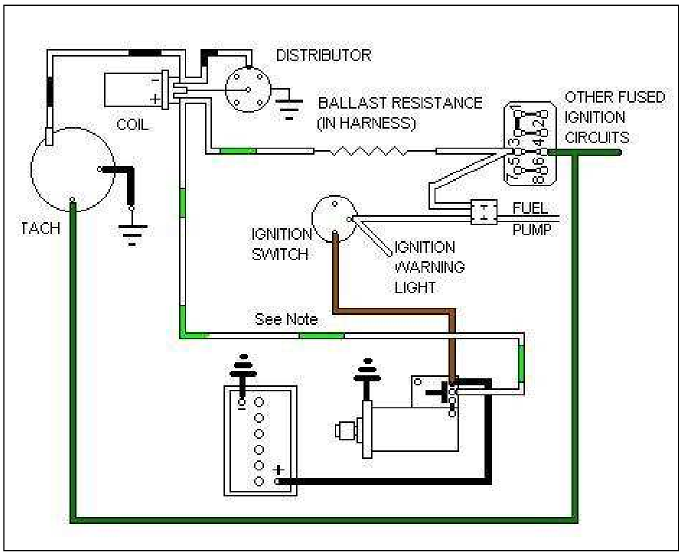
Ignition - 12v coil, voltage tach (73-74 1/2)

Hover over a wire to confirm the colour



Ignition - 6v coil (UK 1974 1/2-1976 and all V8)

Hover over a wire to confirm the colour

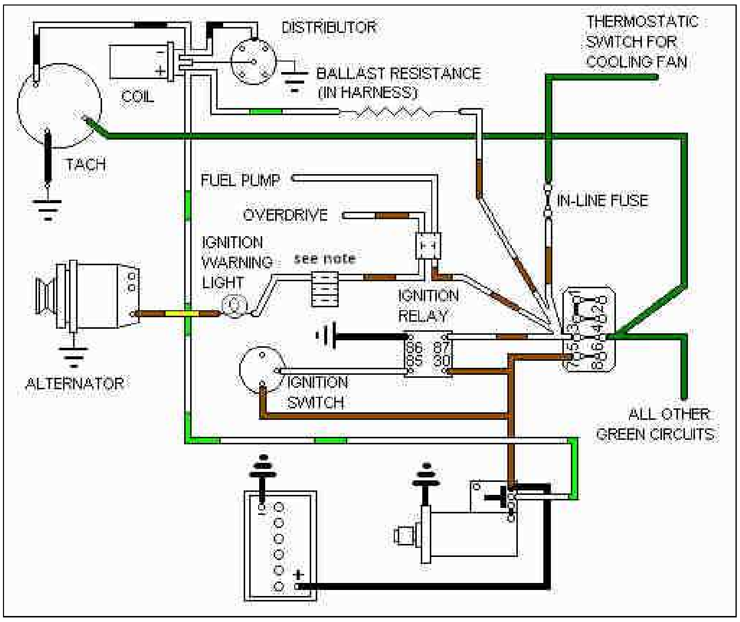


Note: On the factory V8 the wire from the coil to the starter solenoid is white with a blue tracer, but the wire from the harness ballast to the coil is white/light-green as shown.

Information on the ballast resistance can be found here.

Ignition - Ignition Relay, UK (1977)

Hover over a wire to confirm the colour



Note: This is one of three multi-way plugs behind the dash.

Added January 2010: 1977 models, with all switched ignition circuits powered by the ignition relay. Not shown in [Advance Autowire on-line version] or Haynes, their 'late UK market' diagram is for 1978 and later. It's not known exactly when that version came out but Geoff Turner's Oct/Nov 77 built 78 model has it so possibly part of the wiring changes for dual-circuit brakes on RHD cars in May 77 at chassis number 436465 (GT) and 437181 (roadster).

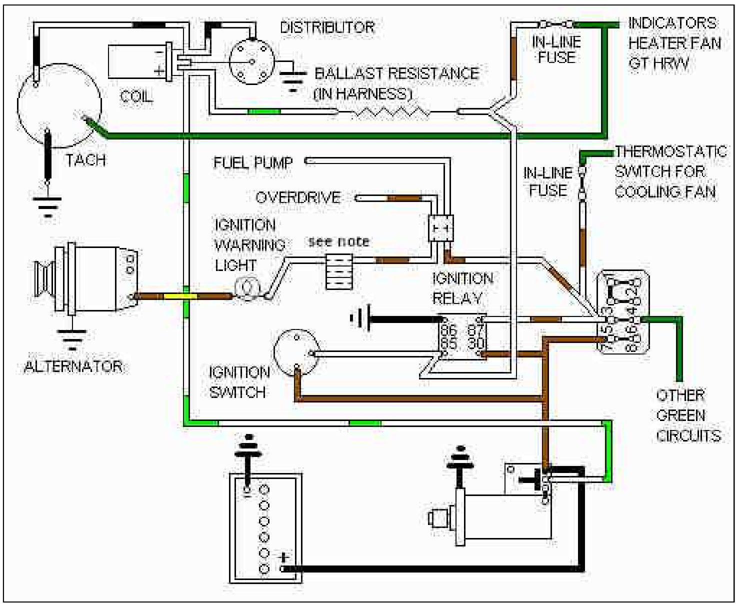
- There are two separate green circuits - the original circuit fed from the 2nd fuse up in the 4-way block for all the original green circuits, and another fed by an in-line fuse from the white/brown circuit on the relay output for the cooling fan. This fuse is located below the fusebox, probably with the hazard flasher fuse which has brown wires both sides.
- There are three separate white circuits - one from the ignition switch feeding the ignition relay, another in the rear harness feeding the fuel pump, and the third in the dashboard sub-harness feeding the ignition warning light. These last two are taken off the white/brown circuit from the relay output.
- The schematics show the original rectangular Lucas relays with W1, W2, C1 and C2 terminal numbering, but in practice cylindrical relays with ISO numbering were fitted. The relationship is as follows:

Wire colour	Original numbering	ISO numbering
White from ignition switch	W1	85
Black earth	W2	86
Brown 12v supply	C2	30
White/brown to ignition powered circuits	C1	87

Information on the ballast resistance can be found here.

Ignition - Ignition Relay, UK (78-on)

Hover over a wire to confirm the colour



Note: This is one of three multi-way plugs behind the dash.

Updated October 2023: This version is on 78 and later cars, several circuits having been removed from the ignition relay and put back on the ignition switch, possibly because of problems with relays sticking on. However the fuel pump is still on the relay - not ideal if it sticks on! It's not known exactly when the change to this version occurred but Geoff Turner's Oct/Nov 77 built 78 model has this version, so possibly part of the wiring changes for dual-circuit brakes on RHD cars in May 77 at chassis number 436465 (GT) and 437181 (roadster).

There are now three separately fused green circuits: The original circuit fed from the 2nd fuse up in the 4-way block, and two others each fed by their own in-line fuse under the fusebox - one feeding the cooling fan switch, and the other feeding indicators, heater switch, tach, and GT heated rear window switch. Both these in-line fuses have white/brown (unfused) one side and green (fused) the other.

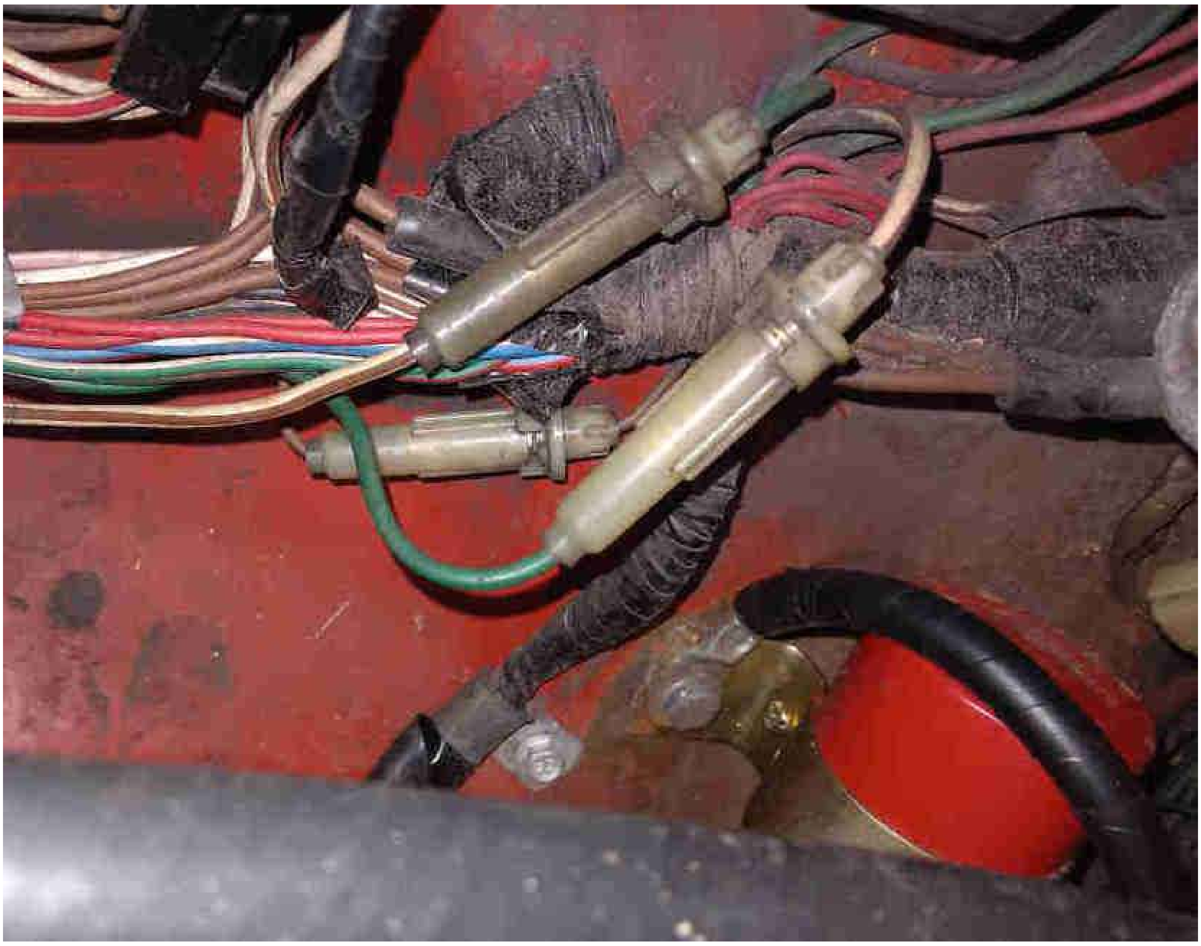
There is also the in-line fuse for the hazard flashers under the fusebox with brown wires both sides.

There are three separate white circuits: One from the ignition switch feeding the ignition relay and ballast resistance for the coil (which then changes to white/brown for one of the inline ignition circuit fuses), another in the rear harness feeding the fuel pump (which changes from white/brown at a bullet connector in the main harness), and the third feeding the ignition warning light (changing from white/brown at a multi-way plug behind the dash).

There are two separate white/brown circuits: One from the relay contact feeding the fusebox, cooling fan in-line fuse, overdrive, fuel pump and ignition warning light, the other feeding the in-line fuse for indicators, heater fan switch, tach, and GT HRW.

Multiple uses of the same colour and several changes from white/brown to white and back again does not help in diagnosing ignition problems.

This clearly shows the two white/brown to green ignition circuit in-line fuses nearest the camera and the brown to brown hazard fuse further away. It also clearly shows that the way the wires have been routed and the orientation of the ignition circuit in-line fuses that it's possible to erroneously connect white/brown to white/brown and green to green, which was how a new harness came to me from the supplier and caused some head-scratching when I first powered it up!



The schematics show the original rectangular Lucas relays with W1, W2, C1 and C2 terminal numbering, but in practice cylindrical relays (and then cube-type SRB 520) with ISO numbering were fitted. The relationship is as follows:

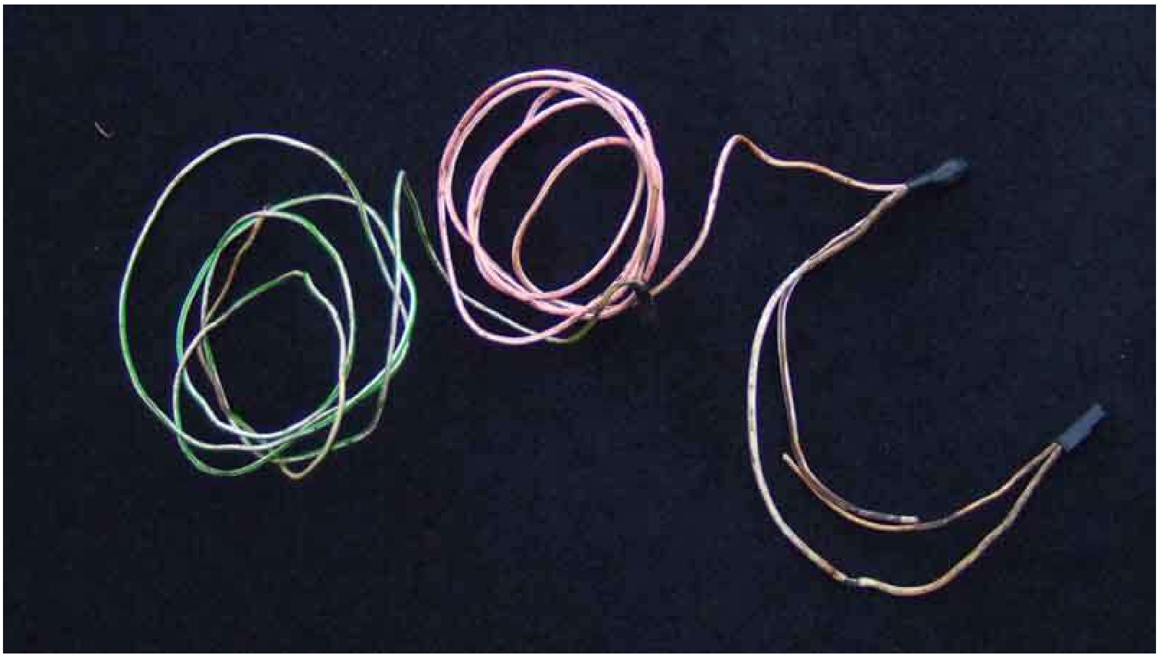
Wire colour	Original numbering	ISO numbering
White from ignition switch	W1	85
Black earth	W2	86
Brown 12v supply	C2	30
White/brown to ignition powered circuits	C1	87

Information on the ballast resistance can be found here.

Ballasted Ignition

Radio interference suppression capacitor

The physical arrangement of the ballast wiring, from a 1980 UK model:

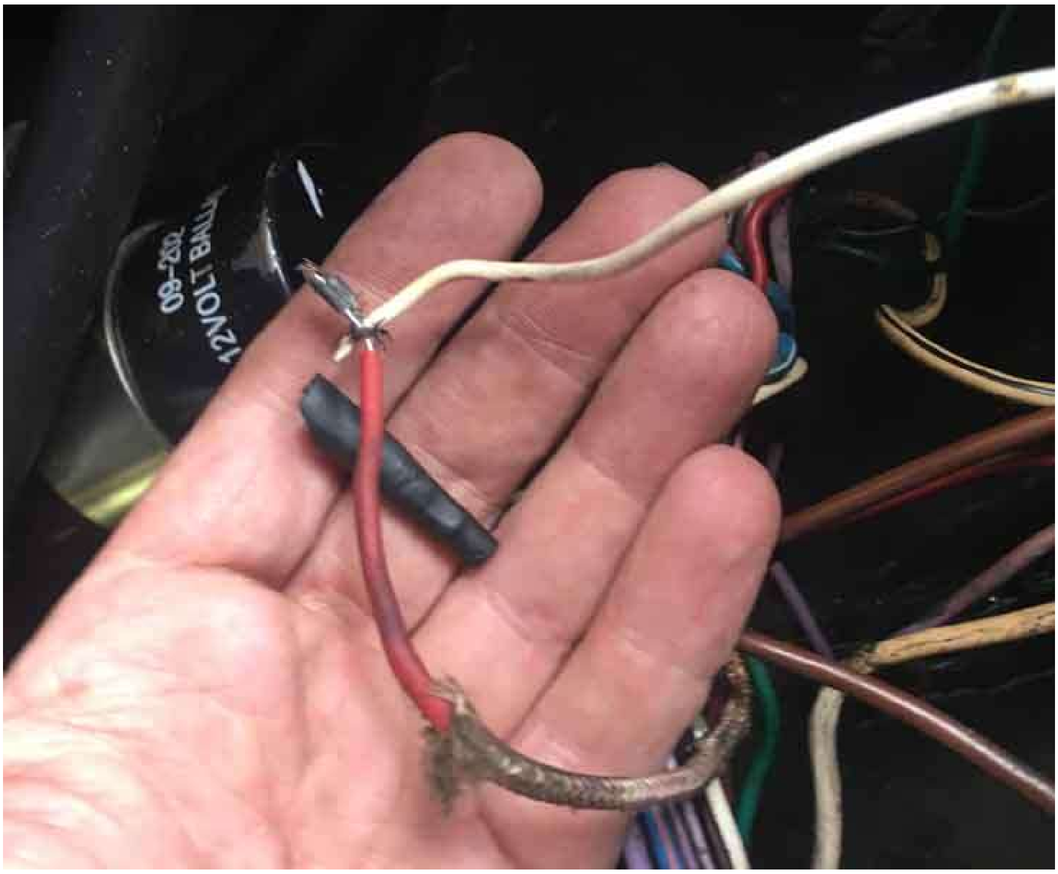


The pink/white resistance wire, measuring about 1.4 ohms, is in the centre.

There is a white/light-green tail on the left that goes to the coil positive and the starter solenoid bypass terminal.

On the right there are two tails - one is a white which comes from the ignition switch and the ignition relay operate terminal, the other is a white/brown that goes to the in-line fuse for the tach, indicators, heater fan and heated rear window on GTs.

This from a UK 1975 has much thicker resistance wire in its own braided sheath, the crimped (the resistance wire cannot be soldered) connection pictured had parted inside the wrapping which meant the engine would start but cut-out again as soon as the key was released: (*Colin Grimsley*)



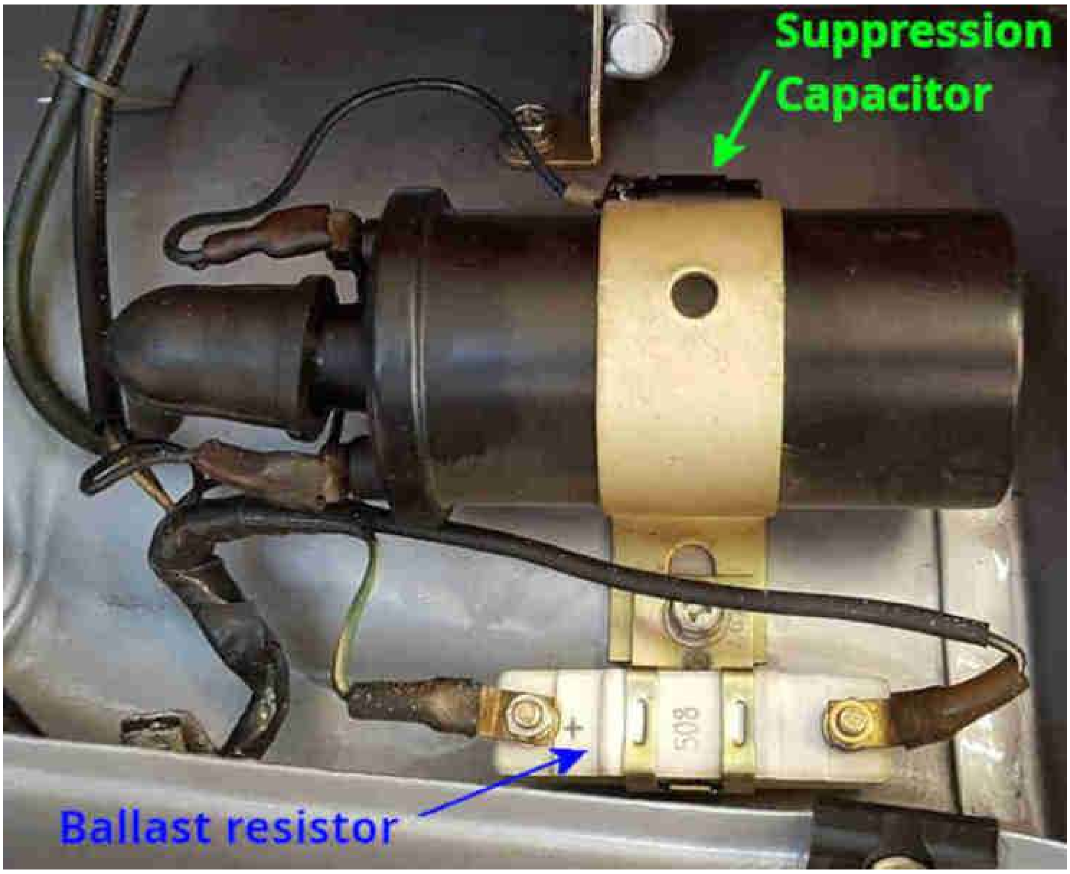
Note the coil is marked '12v ballast' which is how many are marked these days even though it is a 6v coil 'for use on a ballasted system', which is how they should be labelled.

This AC Delco coil has 12v embossed in the can:

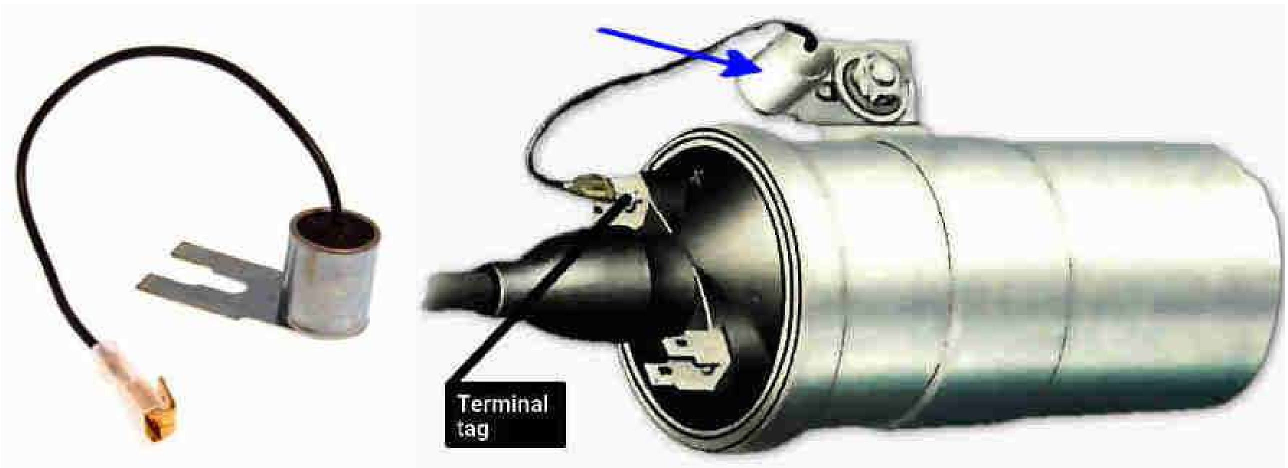
But also has a label saying it must be used with an 'approved' resistor:

The second example I have come across, this is from Peter Mitchell's 1978 UK car. The primary measures 2.2 ohms so it isn't a 12v, a 12v sport or a 6v! In this case the requirement for a resistor would be to prevent it overheating, but if it is any more than 0.3 ohms it would be degrading the HT spark energy, and with the factory ballast of 1.6 ohms it would be significantly degraded and may be why Peters car has been running poorly for a while. There is no mention of AC Delco coils being used in Clausager so it must be a replacement and is a good example of why replacement coils **must** be measured regardless of what the supplier, the packaging or the coil itself says.

Not used on MGBs from the factory but other marques and models, and some after-market coils for the MGB, may have a discrete ballast resistor mounted near the coil wired between the 12v supply and the coil +ve. This image from The Classic Z-Car Club shows a ballast resistor below the coil and a suppression capacitor above:



A radio interference suppression capacitor (not a ballast resistor), often found connected to the coil +ve (or SW) with the metal tag under a coil fixing bolt providing the earth connection. Can also be found on the instrument voltage regulator, fuel pump, indicator flasher unit, alternator, electric screen washer pump i.e. anything that can generate electrical noise, may also be rectangular:



This suppression capacitor is from Peter Mitchell's 1978 MGB and is 1uF at 150v. Typically these days they are described as being around 2.2uF at 100v, the values are not critical:

Note that suppression capacitors are always connected to the coil terminal that carries the 12v supply from the ignition switch or relay regardless of whether they are positive earth cars, positive earth cars converted to negative earth, or originally negative earth cars (Mk2 on) including both CB and RB. The same goes for all other places they are used i.e. always the on 12v supply terminal to the component.

HT Spark Testing

The original Gunson's Flashtest, adjustable to check the strength of the spark, you might pick one up on eBay cheaper than the Laser 5655:

A basic go/no-go but good value at around £8: *(Sealey VS526)*

Also no go, but check all four plugs at once at a price - £22: *(Laser 2780)*

Adjustable to check spark strength - expensive at £30: *(Laser 5655)*

HT Leads

[Types](#) [Positioning](#)

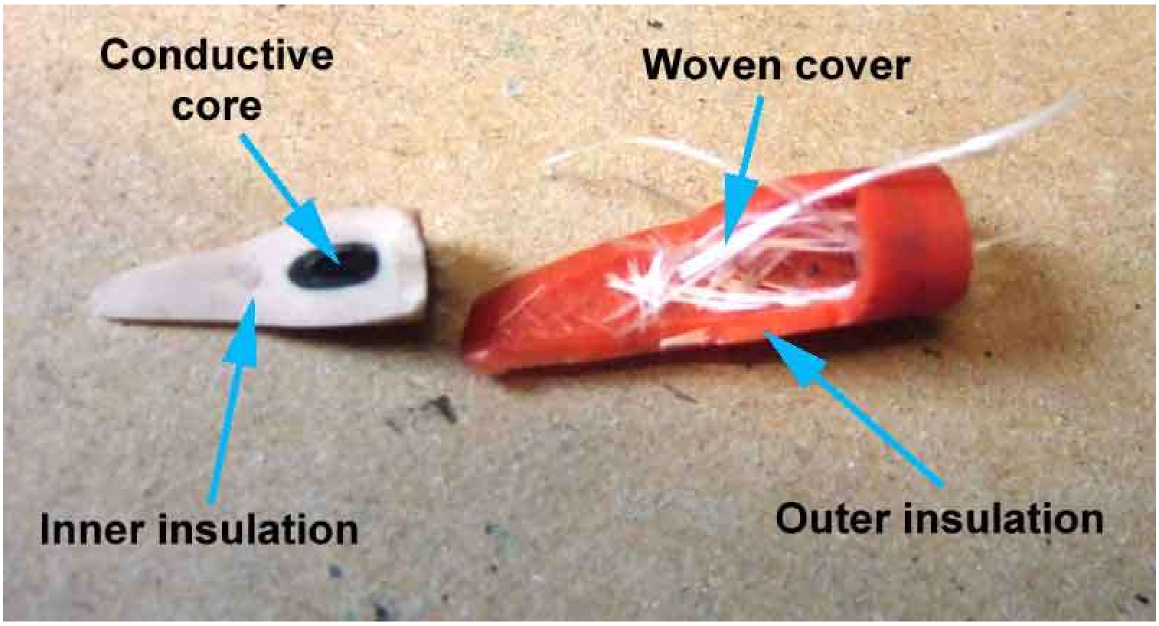
Types:

Yer basic silicone HT lead. I'd always though of 'HOTWIRES' as a gimmicky name when I saw it advertised, and was surprised to find the basic black leads I had bought from the MGOC were the same as these from Halfords.

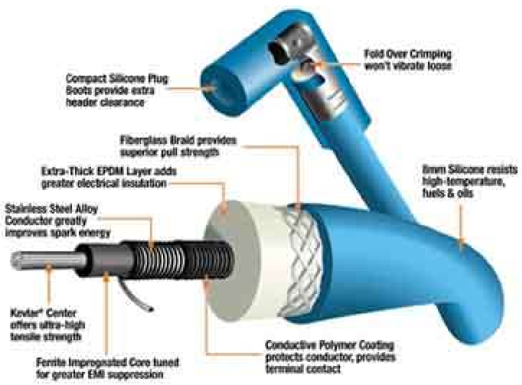
At first sight appears to have a single-strand resistive inner trapped under the crimped connector ...

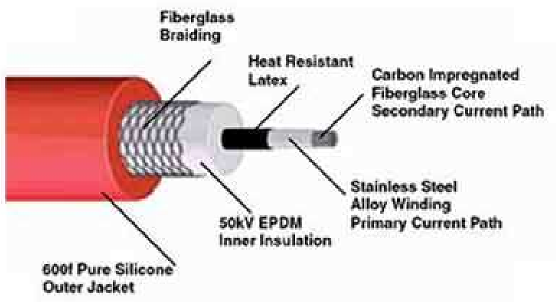
... but cutting diagonally through the cable shows it as many very fine strands which seem to have an outer coat bonding them into a single conductor. Each strand is conductive.

Construction



After that the sky is the limit as far as construction, claims and price are concerned. There are many that have a spiral wound steel conductor, which may have the central core as merely a strengthening device, or may be an additional resistive conductor such as in the basic silicone leads above. There is even one (at least) with 'capacitors' and braided earthing straps.





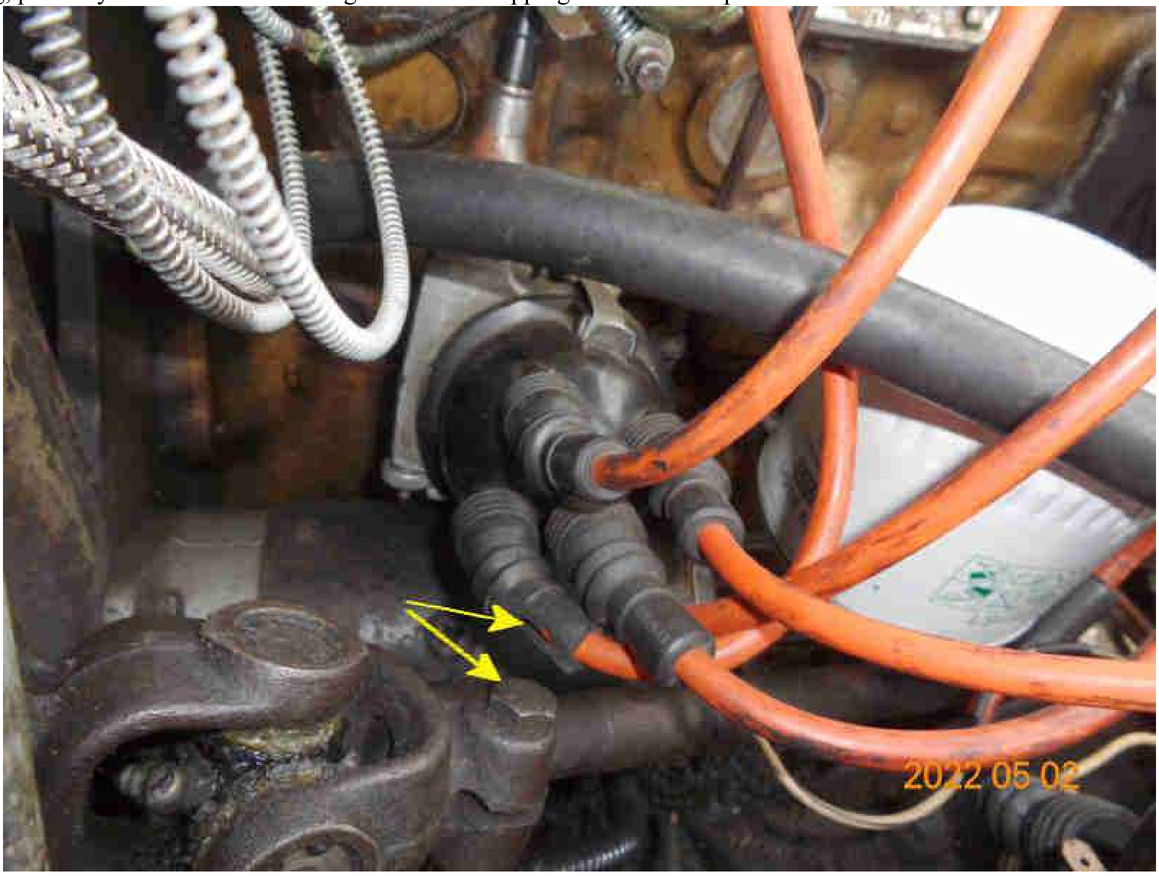
Magnecor have published an interesting document 'The Truth About Ignition Wire Conductors' that is very scathing about the claims made by many of these 'high-performance' aka highly priced leads. It includes the following statements:

- In effect, (when new) a coated "low-resistance" spiral conductor's true performance is identical to that of a high-resistance carbon conductor.
- ... a test performed by Circle Track Magazine (see May, 1996 issue) in the USA, show that NO "low-resistance" ignition wires for which a horsepower increase is claimed do in fact increase horsepower - the test also included comparisons with solid metal and carbon conductor ignition wires.
- Claims by Nology of their "HotWires" creating sparks that are "300 times more powerful," reaching temperatures of "100,000 to 150,000 degrees F" (more than enough to melt spark plug electrodes), spark durations of "4 billionths of a second" (spark duration is controlled by the ignition system itself) and currents of "1,000 amperes" magically evolving in "capacitors" allegedly "built-in" to the ignition wires are as ridiculous as the data and the depiction of sparks in photographs used in advertising material and the price asked for these wires!
- Unless you are prepared to accept poorly suppressed ignition wires that fail sooner than any other type of ignition wires and stretch your ignition system to the limit, and have an engine with no electronic management system and/or exhaust emission controls, it's best not to be influenced by the exaggerated claims, and some vested-interest journalists', resellers' and installers' perception an engine has more power after Nology wires are fitted. **Often, after replacing deteriorated wires, any new ignition wires make an engine run better.** (*My emphasis as that goes for anything on an MGB)*

Having said all that Magnecor produce their own range of wires from copper upwards, with prices for the MGB GT V8 ranging from £97 through £113 to £153!! You can get OE GHT107 from ANG for £12 (other sets for side-entry and RB), or a set from Clive Wheatley for £35 and that's the highest I would go ... if I really forced myself. Of course the same price differentials and sources apply to leads for the 4-cylinder, substituting any of the usual suspects for Clive as he doesn't supply parts for that engine.

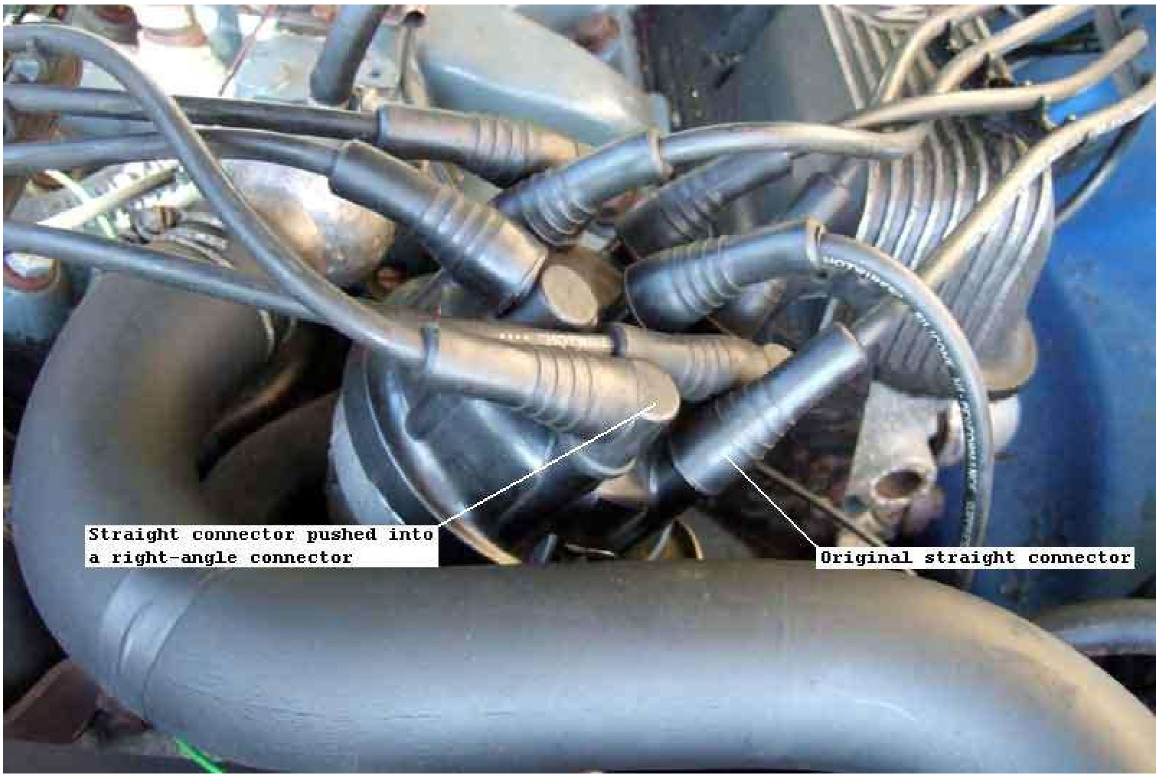
HT Lead Positioning

Showing how the 4-cylinder column UJ clamp bolt had gouged the rubber boot on the HT lead when it came straight of the cap to No.4 plug, probably not far short of causing a misfire. Wrapping it under the cap and the other leads holds it out of the way:

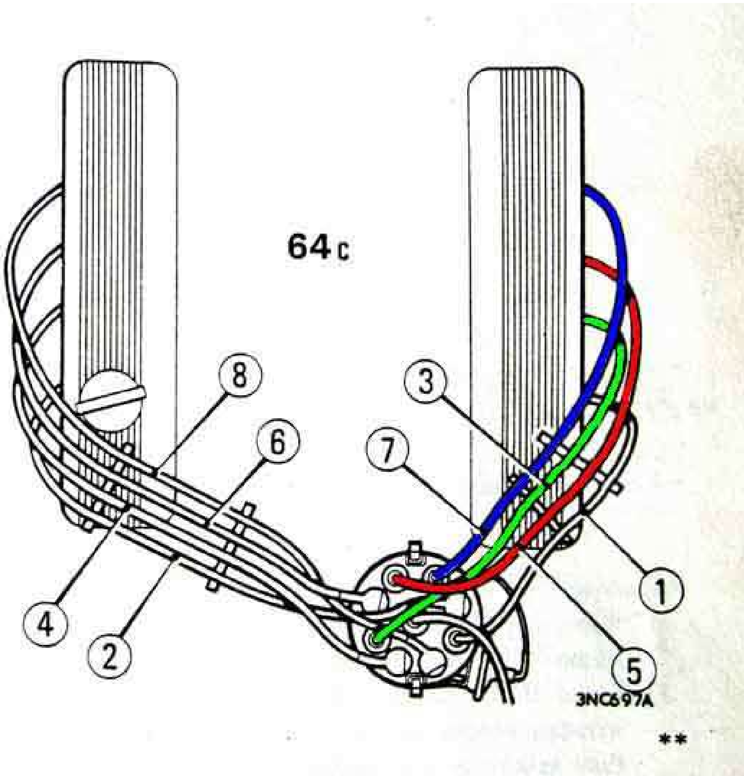


However these ANG HT leads have right-angle caps for the distributor (as well as for the plugs) so should solve the problem and are only £12.

Angled connectors fitted to the MGOC right-bank silicone leads for the V8:



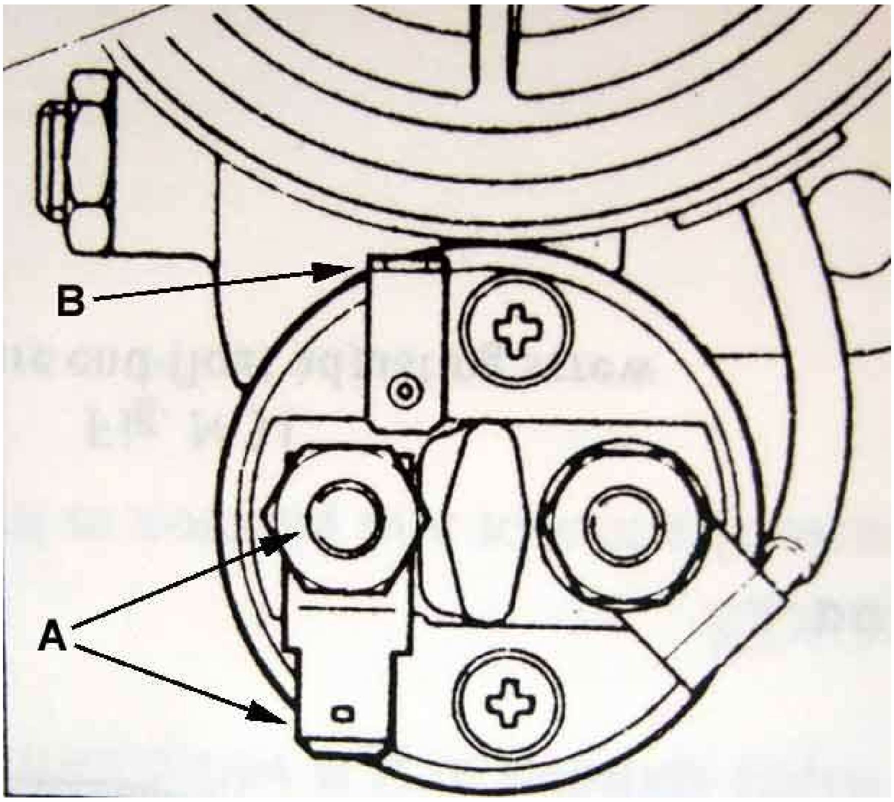
Separate leads 5 and 7 in the combs with lead 3 to prevent possibly parasitic ignition in cylinder 7 when 5 fires. Note the Leyland Workshop Manual Supplement states the direction of rotation incorrectly but the drawing of the firing order is correct: *(image from Leyland MGB GT V8 Workshop Manual Supplement)*



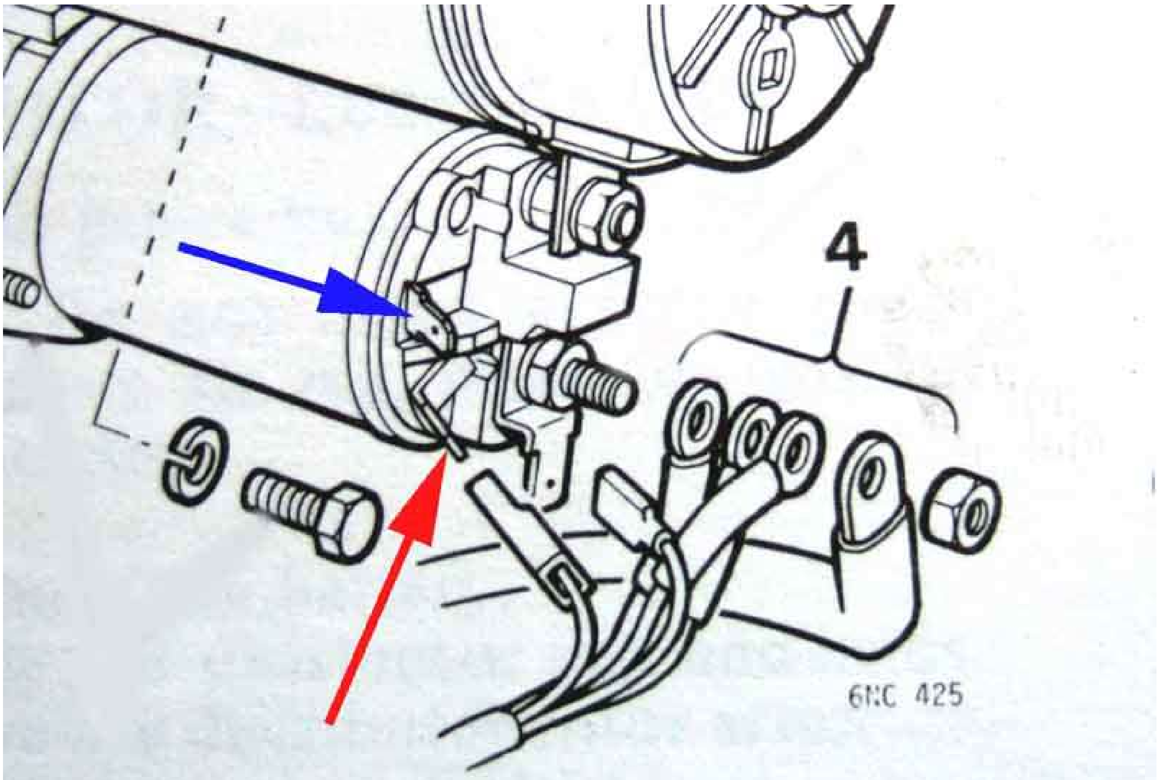
Solenoid Contacts

4-Cylinder pre-engaged:

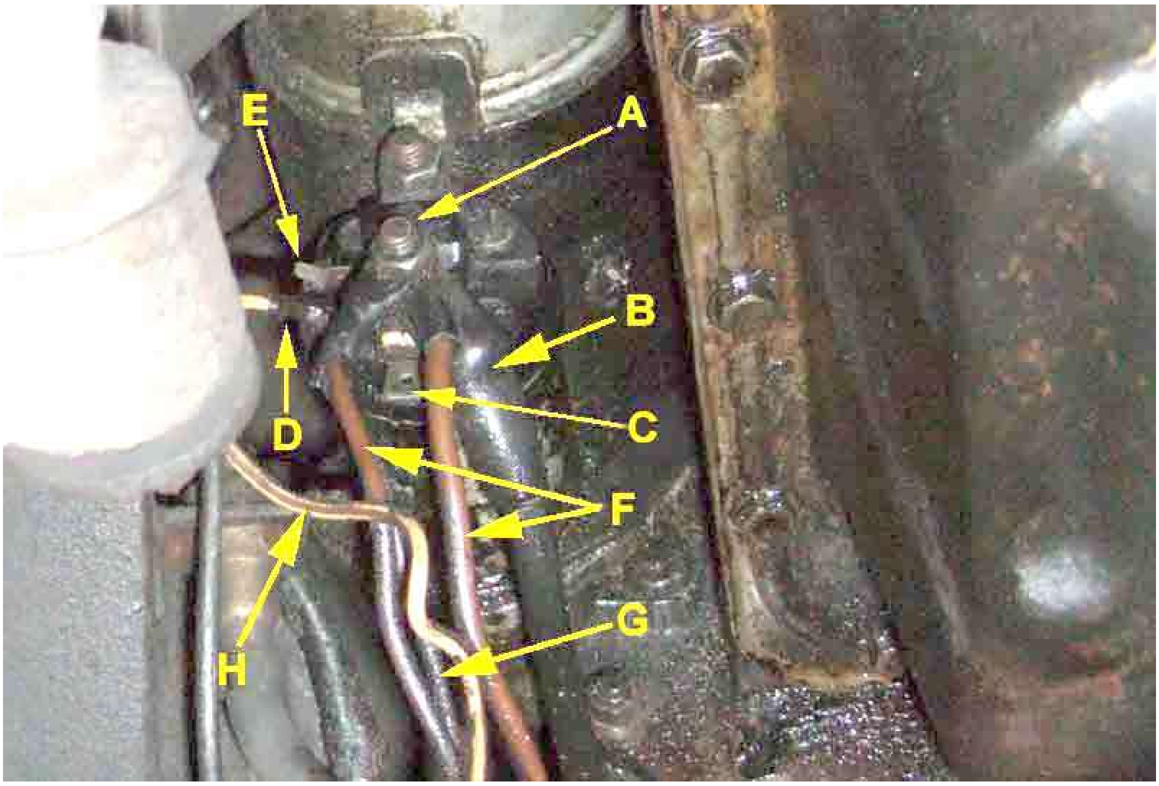
Earlier 2M100 pre-engaged starter on 18Gx engines: A - battery cable stud and large 12v spade. B - standard-sized solenoid operate spade. No 'boost' contact:



Later 2M100 pre-engaged starter on 18V engines, V8 starter is similar: Everything bracketed as '4' goes on the stud - battery cable and two or three brown wires. There should always be two thick brown wires (from the alternator and to the rest of the cars electrics) and an optional standard-gauge brown wire which goes to the alternator for voltage sensing. The large spade (9.5mm) on the stud is for compatibility with earlier models. The standard-sized spade (6.3mm) lower left (red arrow) is for the solenoid operate wire which is a thick white/brown or white/red (or possibly a brown/white, diagrams vary). The small spade above that (4.8mm) is for the coil boost wire (rubber bumper 4-cylinder and all V8s) which is a standard gauge white/light-green (white/light-blue on V8). (*Leyland Workshop Manuals*)



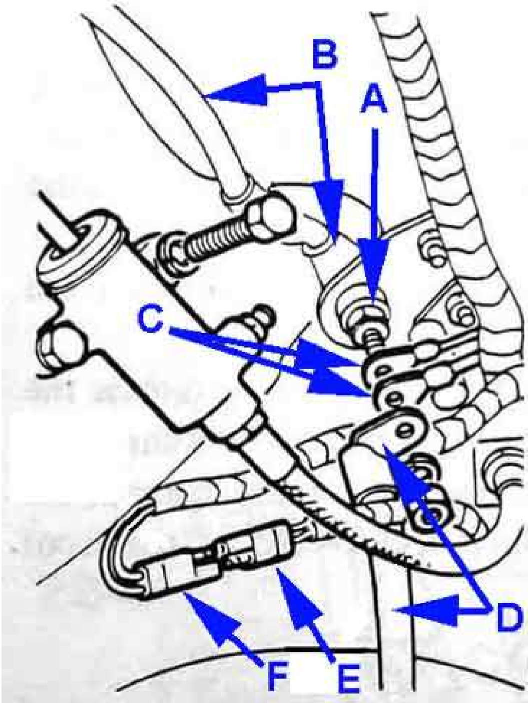
In practice: 'A' is the battery cable stud, 'B' the battery cable, 'C' the large spade for brown wires as used originally. 'F' are the brown wires to the cars electrics and the output from the alternator, 'G' is the additional smaller gauge wire to the alternator on cars that used battery sensing. 'D' is the solenoid operate terminal and 'H' the solenoid operate wire, 'E' is the coil boost terminal only used on rubber bumper cars and V8s:



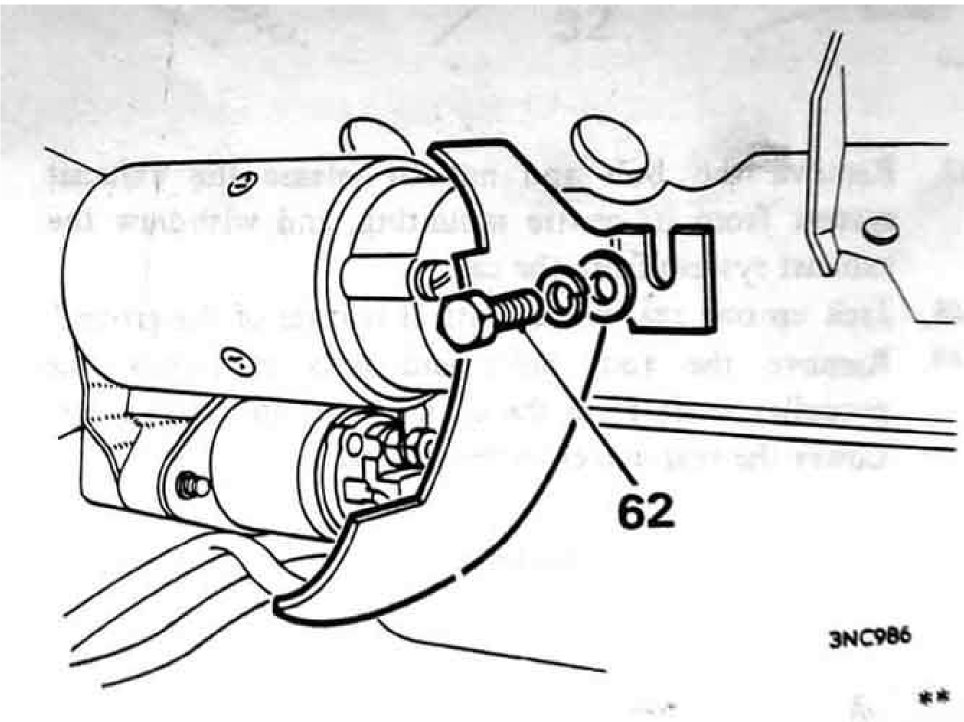
Rubber boot over the starter connections from May 72: (*Ahmed EL Abasiry, Canada*)

V8:

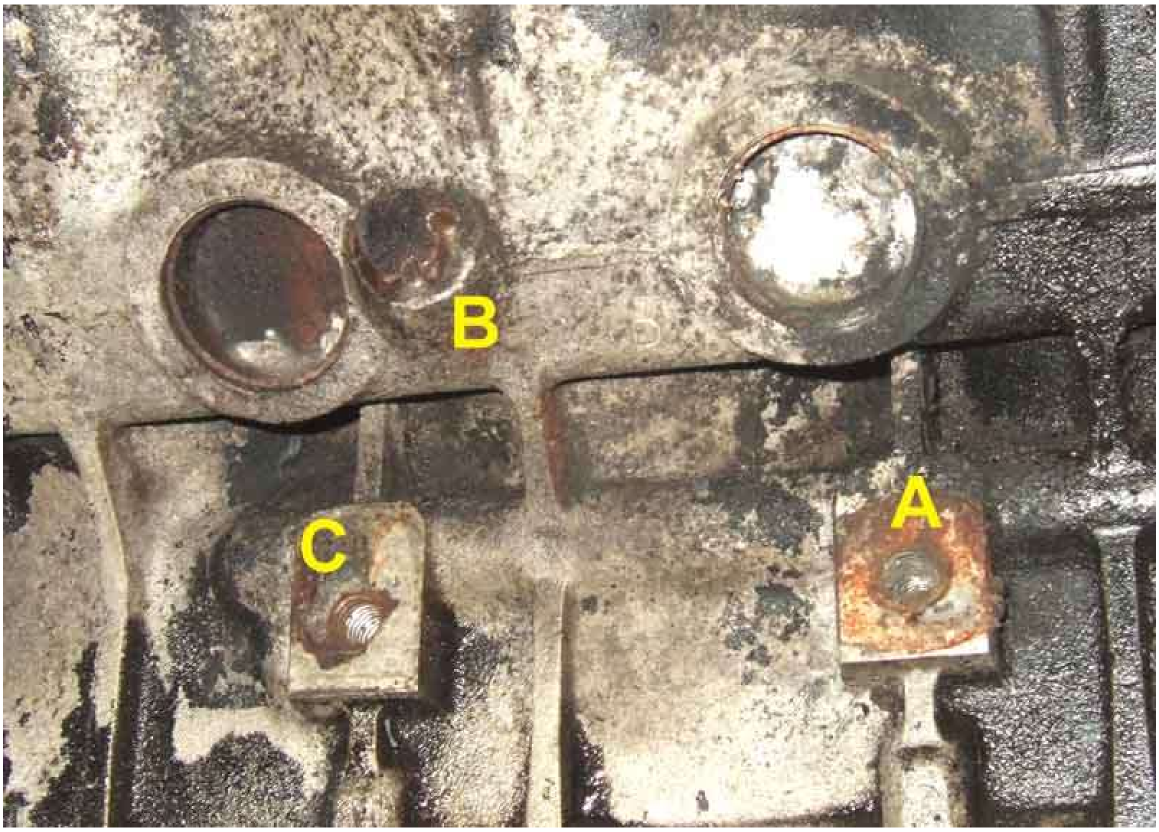
The intermediate connection in the V8 battery cable: 'A' is the insulated stud on its mounting plate bolted to the toeboard; 'B' is the cable from the battery mounted to the top part of the stud; 'C' are the two brown wires from the harness; 'D' is the short length of battery cable to the starter solenoid stud; 'E' is the 2-pin connector on the short sub-harness going to the solenoid spades; 'F' is the other half of the 2-pin connector on the main harness tail. This connector can only be assembled one way (and is the same as the cooling fan connectors): (*Leyland V8 Workshop Manual Supplement*)



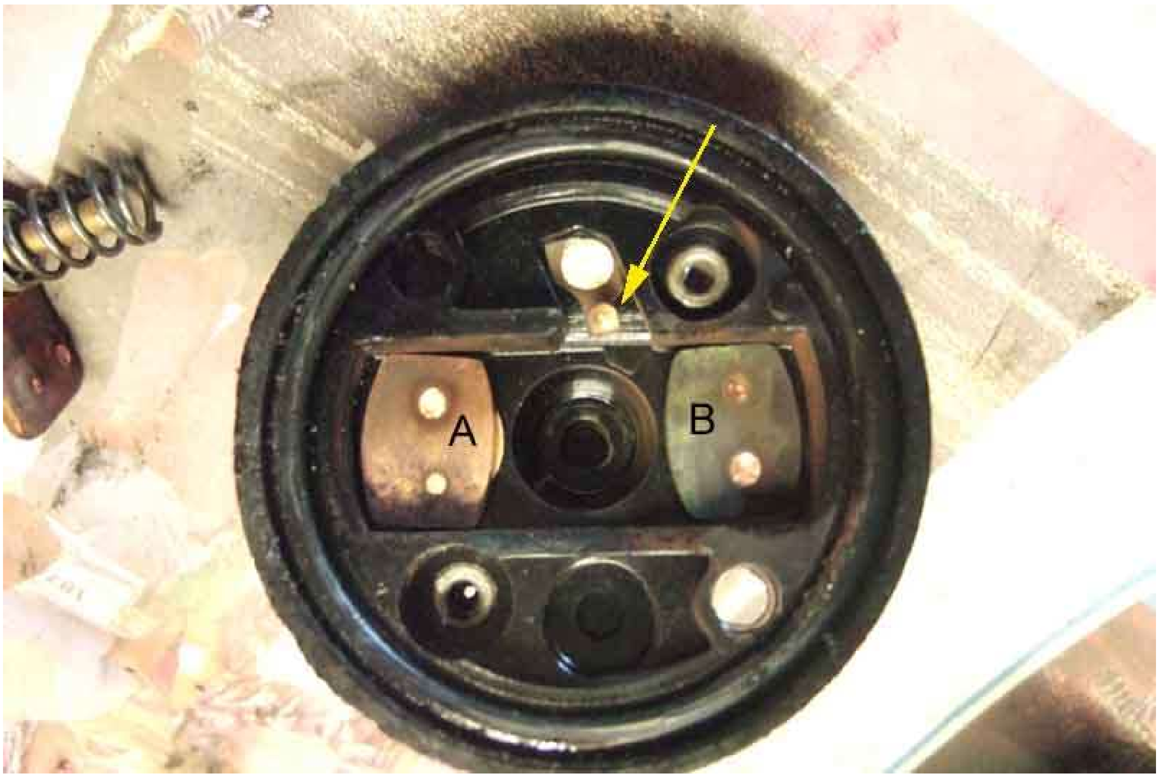
V8 starter heat-shield, the correct item is moulded heat-resistant material with a metal bracket riveted on. Not shown but the off-side exhaust down-pipe is immediately to the right of this, but it also passes underneath so although the end of the solenoid and starter are shielded the lower body of the solenoid isn't. The heat eventually weakens the ability of the solenoid to hold in once it has connected power to the motor and battery voltage has dropped, and it chatters as if the battery is flat. When Vee came to me it was just a tin sheet which wouldn't have helped much with keeping heat off the solenoid, with one of the bracket rivets broken away so with relatively light pressure it could by pushed against the battery cable stud shorting it out! (*Leyland V8 Workshop Manual Supplement*)



At least one person has said his block doesn't have a tapped hole for the fixing bolt, but both my original and an engine from elsewhere both have it. 'A' is the lower mounting point for the engine mounting plate, 'B' is the block drain plug, and 'C' is the hole for the heat shield:



Vee's replacement starter: A copper bar bridges the two stud contacts A and B when the solenoid operates and is supposed to connect power to the small coil boost contact as well. But that contact (arrowed) is bent back ...



... so that the copper bar misses it altogether, and has obviously never worked on this starter that I fitted in December 1999 as a newly rebuilt item:

The coil boost contact is straightened and positioned so that the copper bar touches it and pushes it down just before it reaches the two studs:

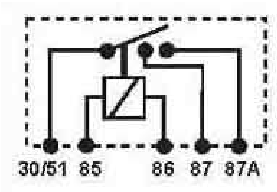
Coil Boost Circuit with Geared/Hi-torque Starters

November 2011: In recent weeks Blake Thornton and Michael Field have contacted me about coil-boost starting systems - Blake with a problem with the factory starter relay on a Jaguar, and Michael with an after-market geared starter that doesn't have the coil boost contact that his V8 should have, and for various reasons was causing starting problems.

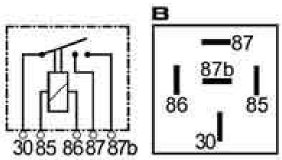
Many of these after-market starters don't have the coil-boost contact on the solenoid as fitted originally to rubber-bumper cars and all V8s (the one I had for a while didn't). Whilst starting should be OK under most normal conditions, under marginal conditions it can make the difference between starting and not starting, and it's possible to reprovide the coil boost in a number of ways.

The easiest way is to replace the existing starter relay with one with two normally-open contacts. Only one additional wire is required up from the existing white/light-green by the solenoid to the relay, with a male spade at the lower end to connect to the female connector on the end of the harness wire at 'A'. However these are less readily available and you must ensure the contacts operate as described before connecting and using the relay. Three types are available:

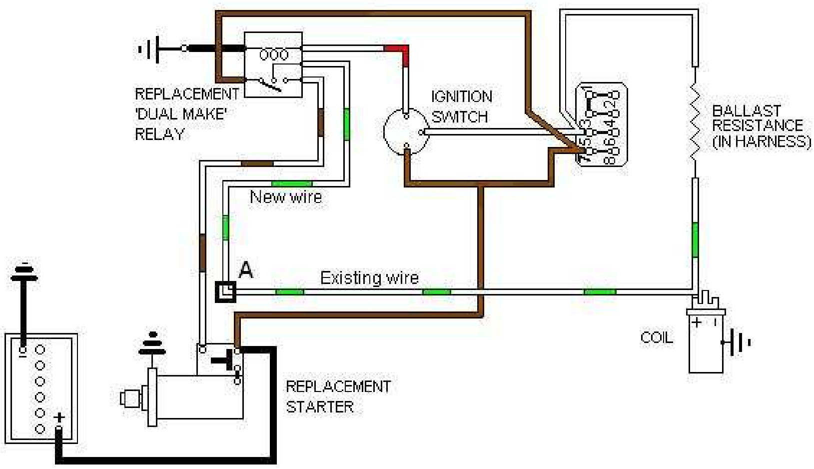
A Lucas SRB301 (22RA 33336 or 33356) in a metal can that is in keeping as a replacement for the original 6RA type. They were used as standard equipment on some Jaguars and Triumphs for exactly this purpose and are in fact called starter relays. These have a C4 terminal in addition to the W1, W2, C1 and C2 terminals. With the relay released C1, C2 and C4 should all be isolated from one other. When the relay is operated all three contacts should be connected together. Nothing else will do. The white/red wire goes to W1, black to W2, brown to C2, white/brown to C1, and white/light-green (white/light-blue for V8s) to C4.



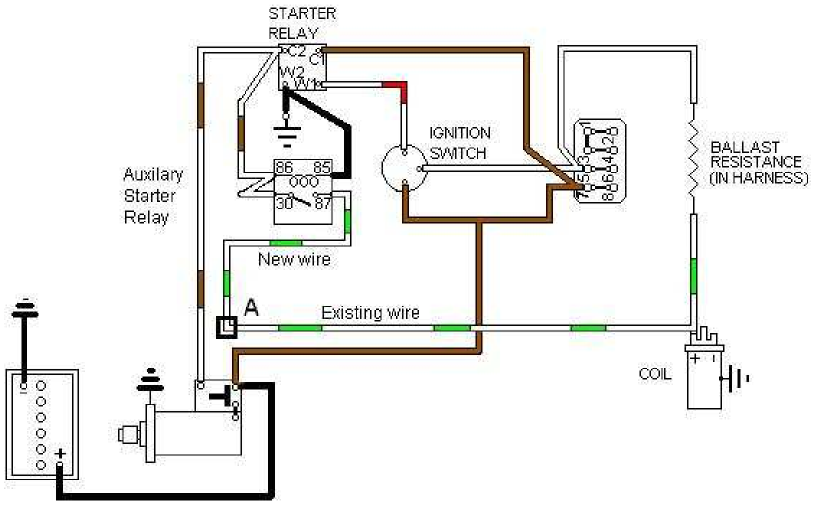
They are also available in cylindrical form (albeit blue) as SRB400 (26RA 33231), with an 87a terminal as well as an 87. However you have to be careful with this as 87a is also used for the normally-closed contact on other relay types, which must not be used in this application, so you have to look at the schematic on the relay as well as the terminal numbering. With the relay released 30/51, 87 and 87a should all be isolated from one other. When the relay is operated all three contacts should be connected together. Again nothing else will do. White/red goes to 85, black to 86, brown to 30/51, white/brown to 87, and white/light-green to 87a.



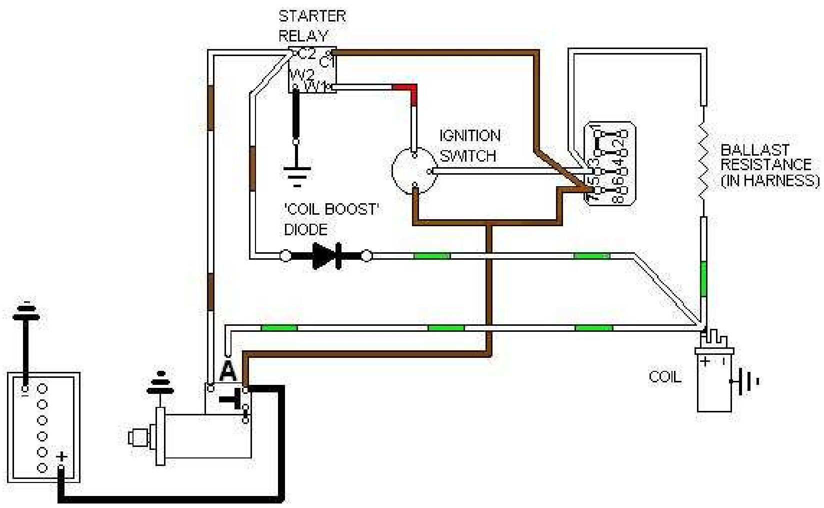
Finally there is a Bosch cube-type SRB521 with 30, 87 and 87b contact terminals. With the relay released 30, 87 and 87b should all be isolated from one other. When the relay is operated all three contacts should be connected together. Again nothing else will do. White/red goes to 85, black to 86, brown to 30, white/brown to 87, and white/light-green (white/light-blue for V8s) to 87b.



Another option is to provide an additional auxiliary starter relay which operates in tandem with the original relay. As well as tapping onto the existing white/brown and black wires on the existing relay using piggy-back connectors, a new white/light-green (4-cylinder cars, white/light-blue on V8) is run down to the solenoid with a male spade to connect to the existing female connector on the harness wire at 'A'. A readily available accessories relay from all the usual suspects will do this as shown here:



Finally you can get quite exotic and use a 10 amp diode between the solenoid operate wire and the coil boost wire down by the solenoid, but really need to know what you are doing with semiconductor diodes for this option. Also diodes, like all semi-conductors, exhibit a forward volt-drop when carrying current so do not provide as much boost as a relay. Basically you want current to flow from the solenoid operate wire to the coil boost wire, but not the other way. For that, typically the marked end of an axial diode is the positive end and would be connected to the coil boost wire, the negative end to the solenoid wire, as shown here:

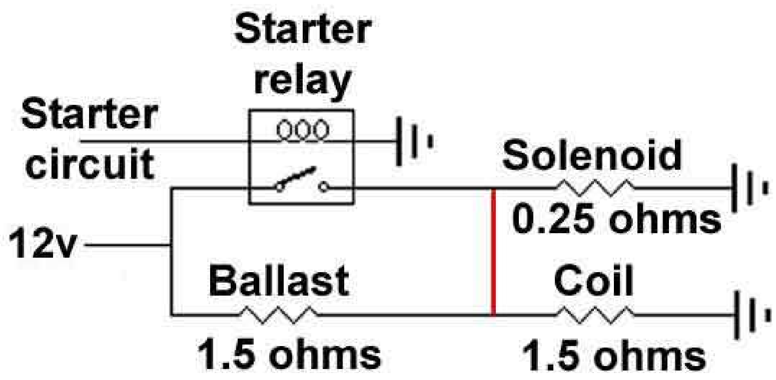


Whilst physically it would be easiest to install the diode at the solenoid ([Moss US supply an adapter for this purpose, see 'Instructions and resources')](#) environmentally conditions aren't very good for electric stuff down there so it would be better to install it higher up by the starter relay or coil. The original wire to the solenoid boost contact at 'A' should be insulated and taped back out of the way to prevent it shorting to anything.

Information on the ballast resistance can be found [here](#).

Note that the wire from the starter relay to the solenoid operate terminal is white/red on later cars, but a heavier gauge than normal wiring.

As to why the coil can't simply be linked to the solenoid contact on the starter relay, consider the circuit below which has just such a link shown in red:

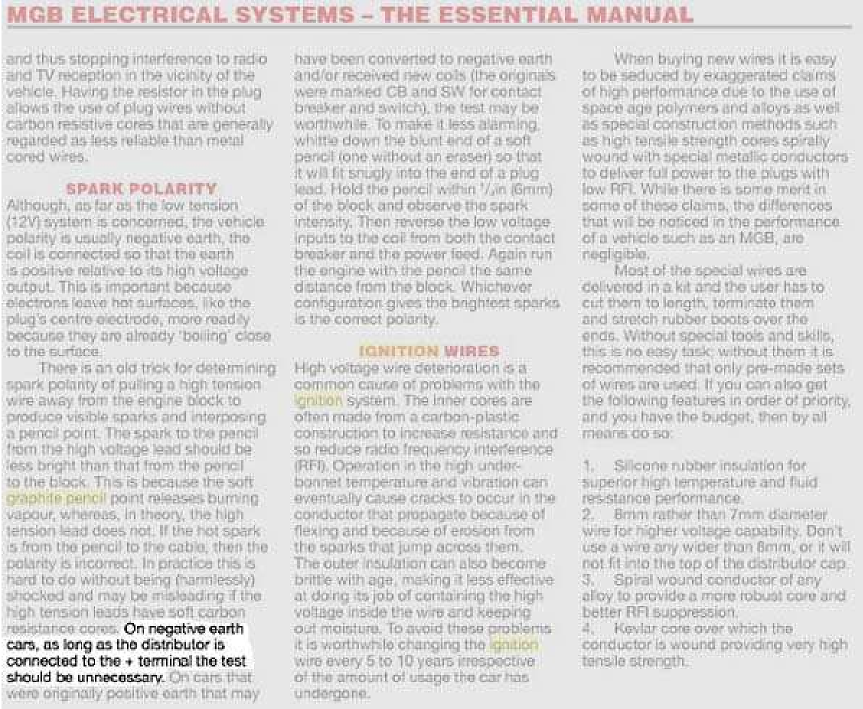


- This puts the solenoid in parallel with the ignition coil. The solenoid winding has a resistance of 0.25 ohms and the ignition coil is 1.5 ohms, which gives a combined resistance of 0.21 ohms.
- Those two in parallel are in series with the ballast resistance which gives an overall resistance of 1.71 ohms (1.5 ohms plus 0.21 ohms) and creates a network.
- The network has 12v applied to it, and its overall resistance of 1.71 ohms causes 7.02 amps to flow - I = V / R.
- That 7.02 amps is flowing through the 1.5 ohm ballast resistance and results in 10.5 volts being developed across it - V = I * R.
- With 10.5 volts across the ballast resistance that only leaves 1.5 volts for the coil and the solenoid.

  1.5 volts across the solenoid is largely irrelevant, but the coil is expecting four times that so the result will be a very weak HT and probably no spark at all. The engine will start normally as the starter relay connects a full 12v to the solenoid and to the coil, but when you release the key the engine will probably cut out.

Ignition Coil Polarity

This statement (highlighted below) is incorrect. On negative earth cars the distributor (i.e. the earth supply to the coil) should be connected to the - terminal, and the 12v ignition feed (the positive supply to the coil) to the + terminal.



MGB ELECTRICAL SYSTEMS – THE ESSENTIAL MANUAL

and thus stopping interference to radio and TV reception in the vicinity of the vehicle. Having the resistor in the plug allows the use of plug wires without carbon resistive cores that are generally regarded as less reliable than metal cored wires.

SPARK POLARITY

Although, as far as the low tension (12V) system is concerned, the vehicle polarity is usually negative earth, the coil is connected so that the earth is positive relative to its high voltage output. This is important because electrons leave hot surfaces, like the plug's centre electrode, more readily because they are already 'boiling' close to the surface.

There is an old trick for determining spark polarity of pulling a high tension wire away from the engine block to produce visible sparks and interposing a pencil point. The spark to the pencil from the high voltage lead should be less bright than that from the pencil to the block. This is because the soft graphite pencil point releases burning vapour, whereas, in theory, the high tension lead does not. If the hot spark is from the pencil to the cable, then the polarity is incorrect. In practice this is hard to do without being (harmlessly) shocked and may be misleading if the high tension leads have soft carbon resistance cores. **On negative earth cars, as long as the distributor is connected to the + terminal the test should be unnecessary.** On cars that were originally positive earth that may have been converted to negative earth and/or received new coils (the originals were marked CB and SW for contact breaker and switch), the test may be worthwhile. To make it less alarming, whittle down the blunt end of a soft pencil (one without an eraser) so that it will fit snugly into the end of a plug lead. Hold the pencil within ¼in (6mm) of the block and observe the spark intensity. Then reverse the low voltage inputs to the coil from both the contact breaker and the power feed. Again run the engine with the pencil the same distance from the block. Whichever configuration gives the brightest sparks is the correct polarity.

IGNITION WIRES

High voltage wire deterioration is a common cause of problems with the ignition system. The inner cores are often made from a carbon-plastic construction to increase resistance and so reduce radio frequency interference (RFI). Operation in the high under-bonnet temperature and vibration can eventually cause cracks to occur in the conductor that propagate because of flexing and because of erosion from the sparks that jump across them. The outer insulation can also become brittle with age, making it less effective at doing its job of containing the high voltage inside the wire and keeping out moisture. To avoid these problems it is worthwhile changing the ignition wire every 5 to 10 years irrespective of the amount of usage the car has undergone.

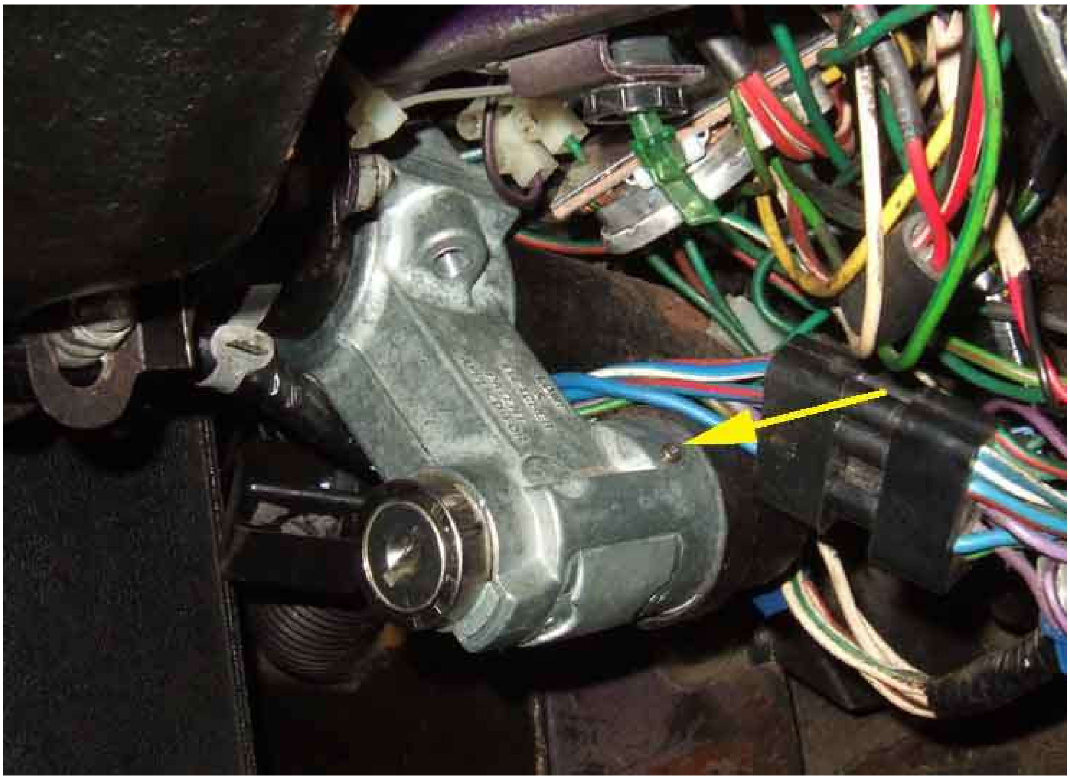
When buying new wires it is easy to be seduced by exaggerated claims of high performance due to the use of space age polymers and alloys as well as special construction methods such as high tensile strength cores spirally wound with special metallic conductors to deliver full power to the plugs with low RFI. While there is some merit in some of these claims, the differences that will be noticed in the performance of a vehicle such as an MGB, are negligible.

Most of the special wires are delivered in a kit and the user has to cut them to length, terminate them and stretch rubber boots over the ends. Without special tools and skills, this is no easy task; without them it is recommended that only pre-made sets of wires are used. If you can also get the following features in order of priority, and you have the budget, then by all means do so:

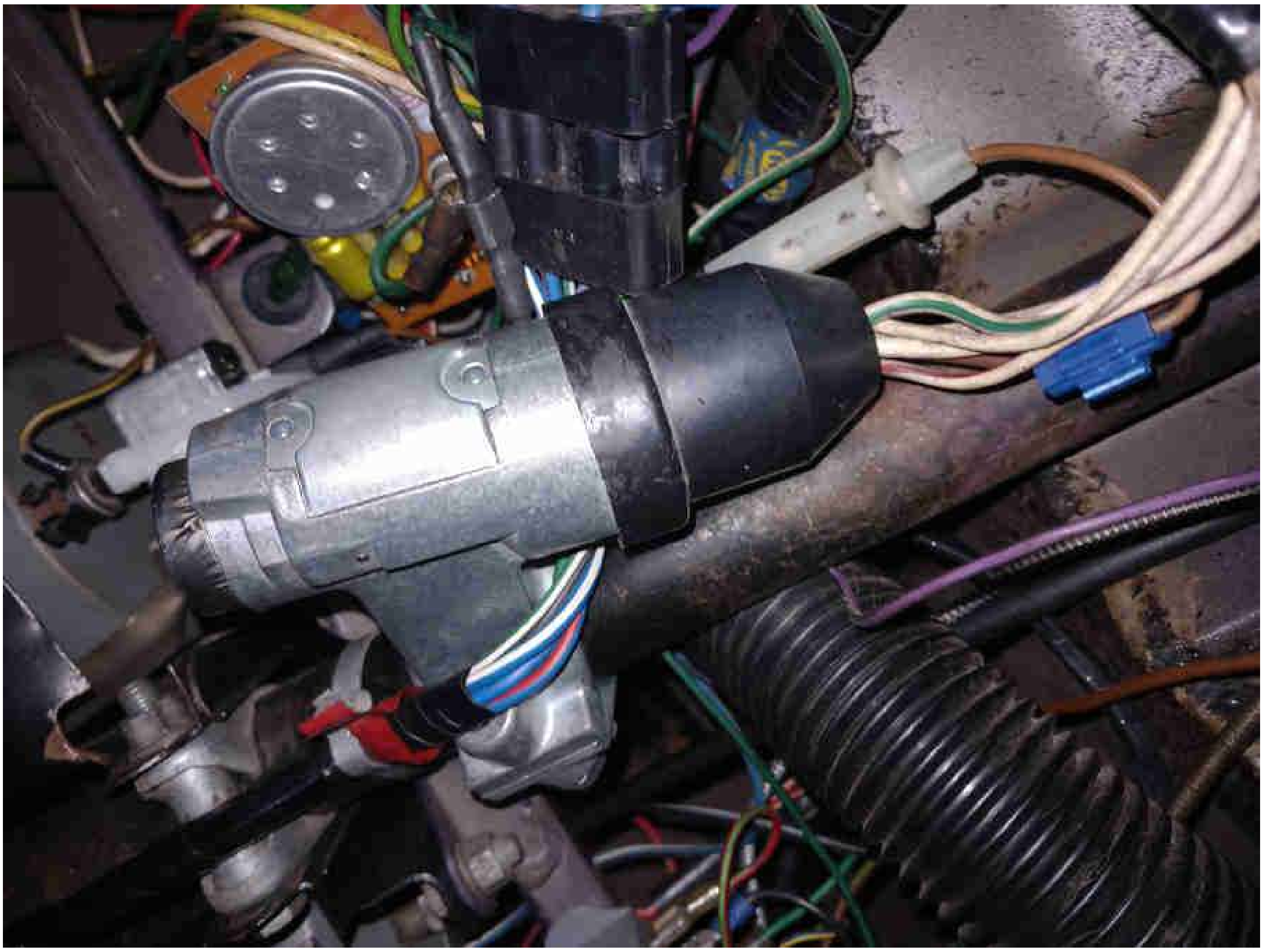
1. Silicone rubber insulation for superior high temperature and fluid resistance performance.
2. 8mm rather than 7mm diameter wire for higher voltage capability. Don't use a wire any wider than 8mm, or it will not fit into the top of the distributor cap.
3. Spiral wound conductor of any alloy to provide a more robust core and better RFI suppression.
4. Kevlar core over which the conductor is wound providing very high tensile strength.

Ignition Switch Removal

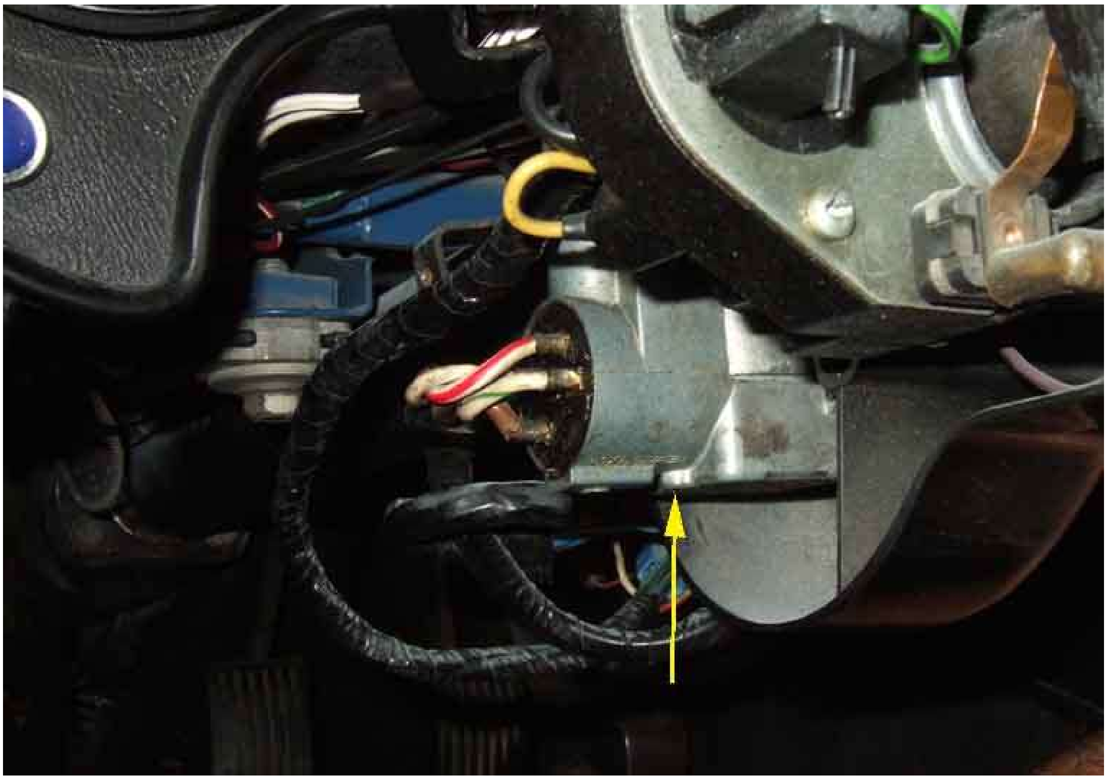
1973 roadster (Bee) collapsible column with front-entry lock - round-head screw on the side of the lock, fairly easy to grasp hold of as it comes out and put in a safe place:



This era of switch has bare spades and a protective rubber boot covers the connections:

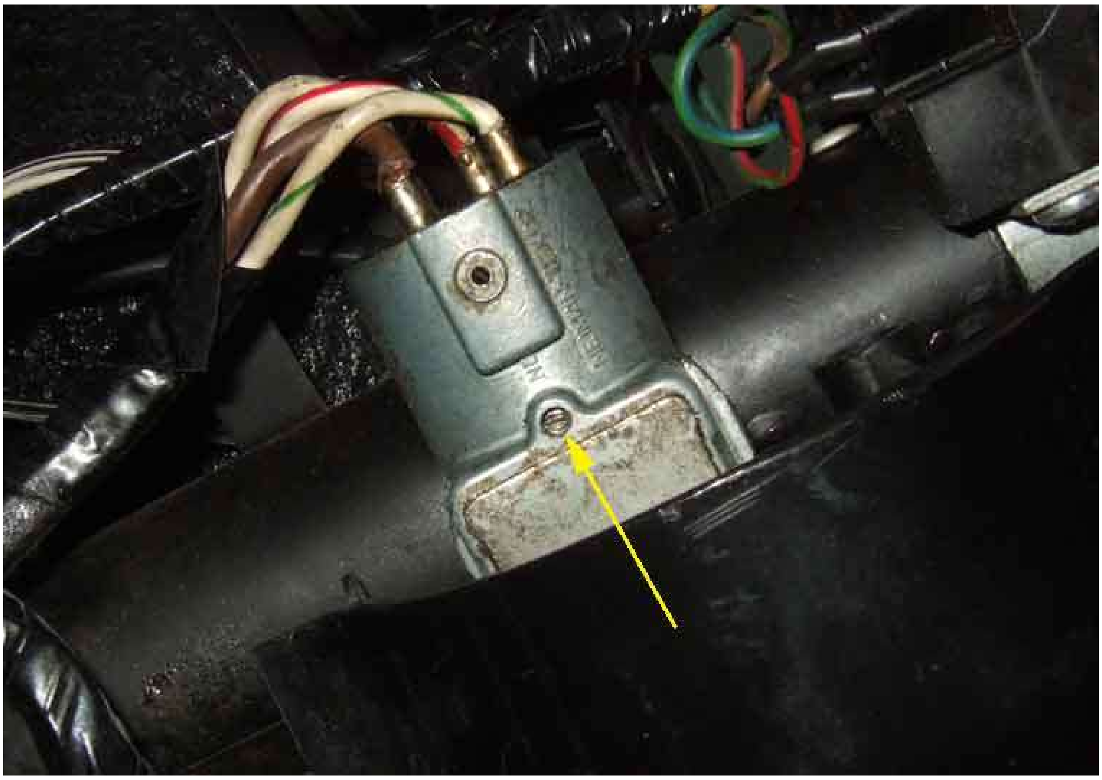


Later switches have a sub-harness on the switch with a large multi-plug for connection to the main harness and no cover. 1975 V8 (Vee) full energy-absorbing column with side entry lock (reputedly the final type as used on V8 and all RB cars) - on the bottom of the lock with the left-hand cowl removed:



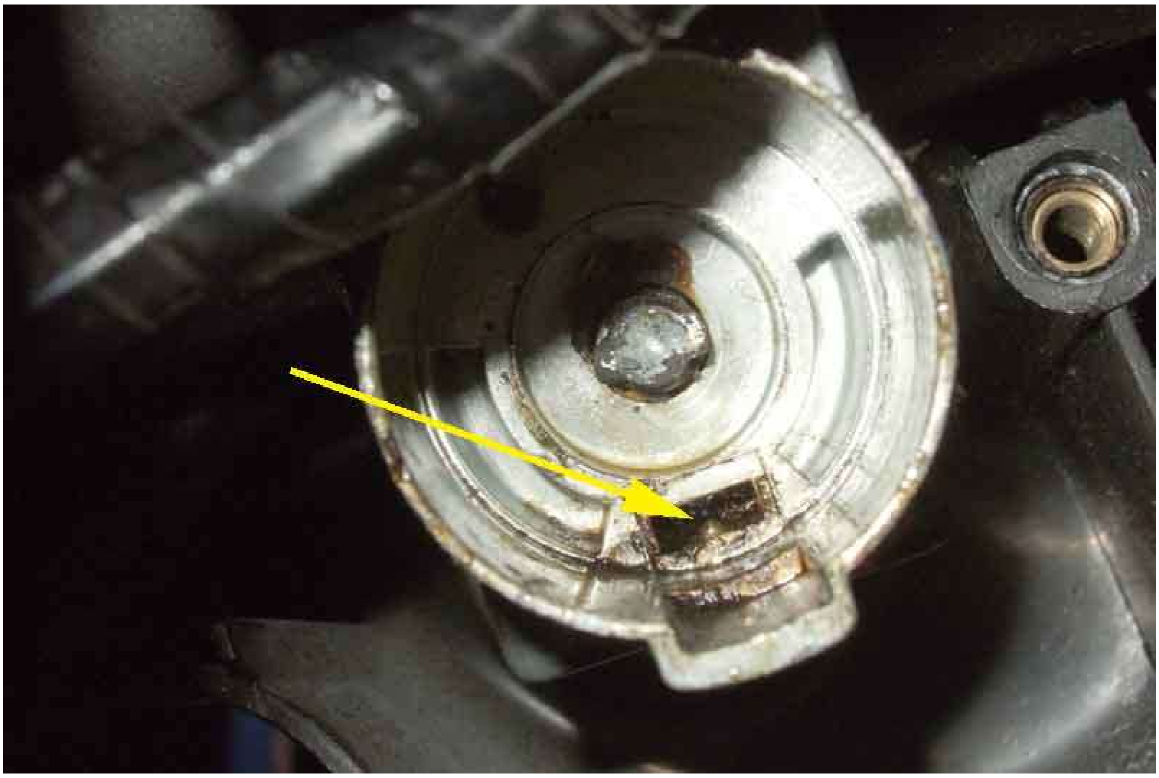
1

In this case a recessed grub-screw, still recessed when the switch is freed, be careful it doesn't fall out of its own accord when your attention is focussed on the switch as it is very small. It screws into the lock body and has a projection that fits into a recess in the switch body, so I kept the screwdriver in position while I pulled the switch out, then screwed it back in so as not to get lost:



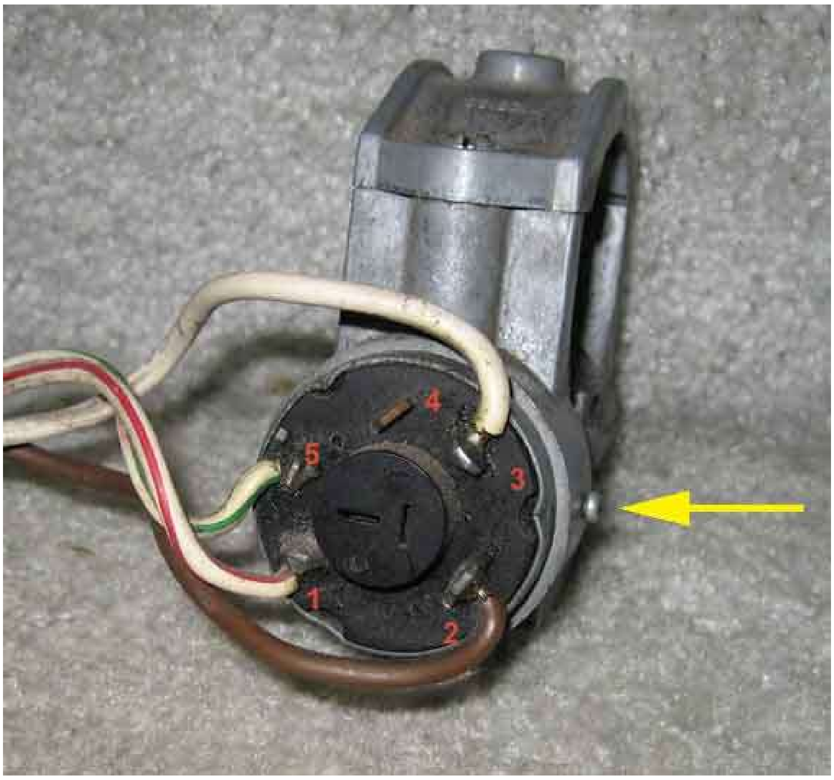
Note the switch is fully recessed into the lock, some switch bodies protrude from the lock body. Unless pushed all the way in it may not fully engage with the lock and fail to operate correctly. The hole closer to the switch entry is possibly an alternative screw position for other switches.

The screw locates into a hole in a tab on the switch:

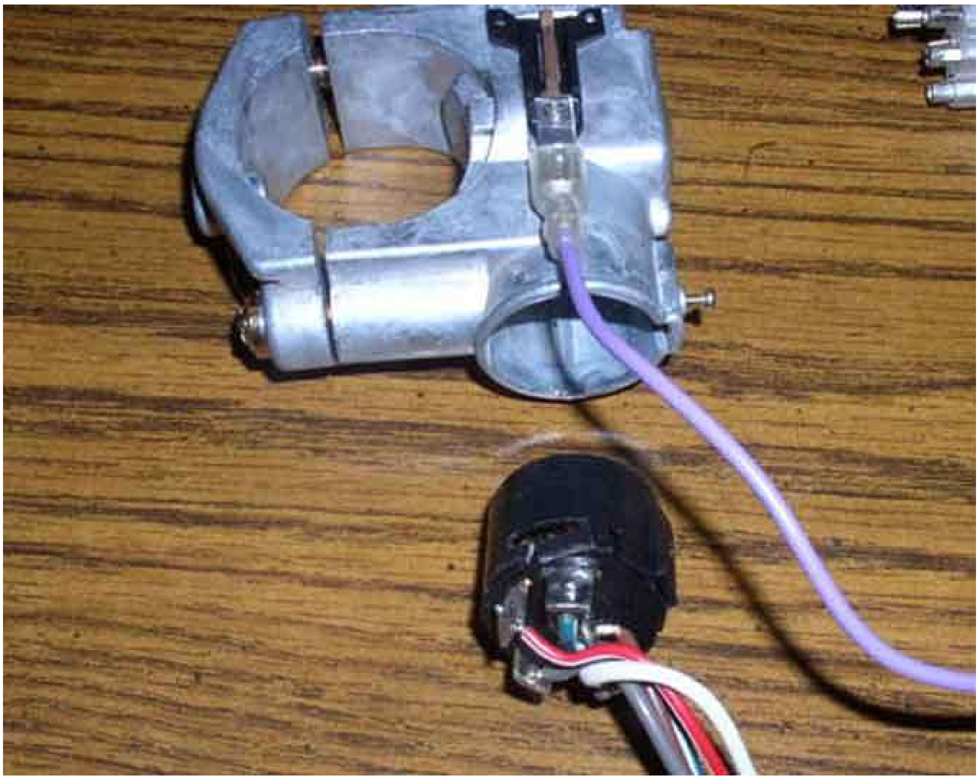


Late UK RB, with a countersunk head screw through the lock body closer to the lock. Both this and the 75 V8 lock above were made by Neiman: (*Crispin Allen*)

Early LHD side-entry lock - round-head screw facing the driver, although the edges of the socket seem to be peened over into recesses in the switch as well:

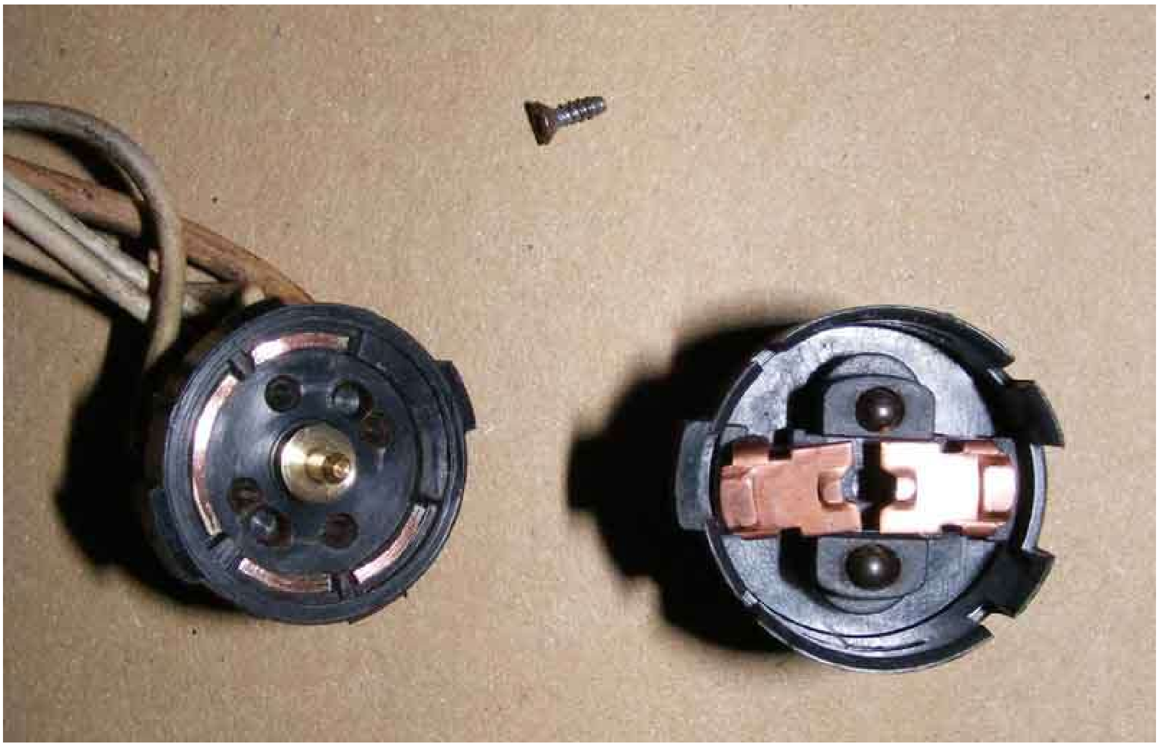


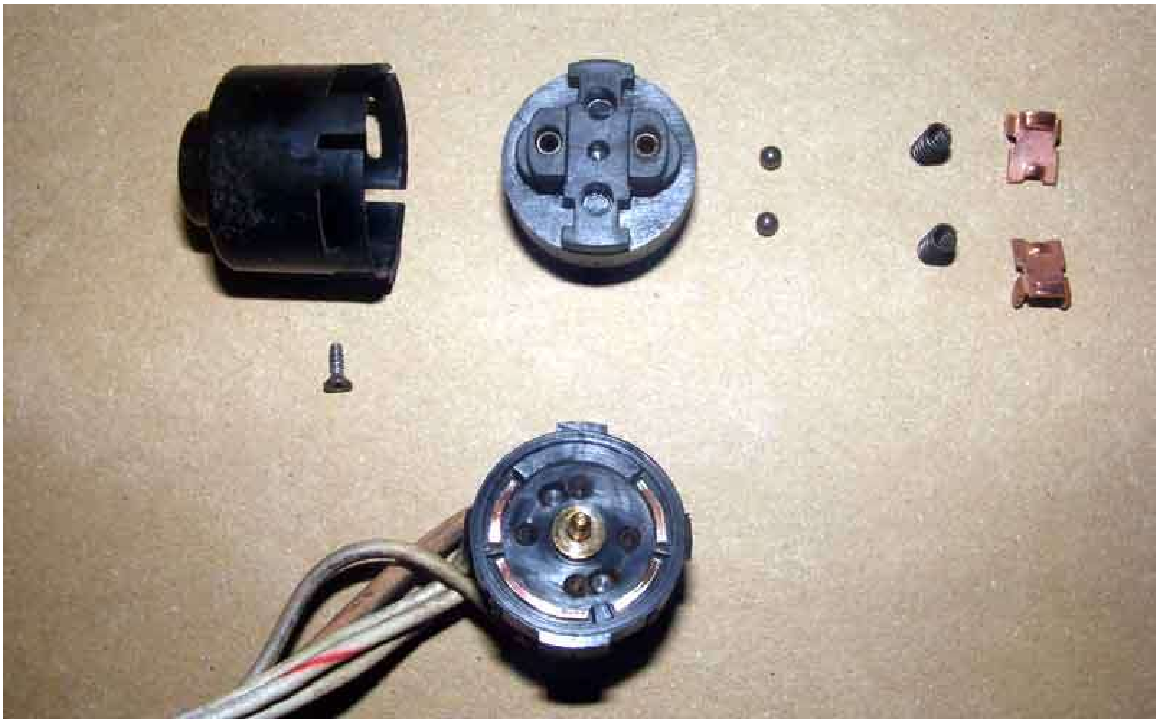
Later LHD side-entry lock, round-head screw under the lock, closer to the edge of the switch entry than Vee's lock as pictured above:



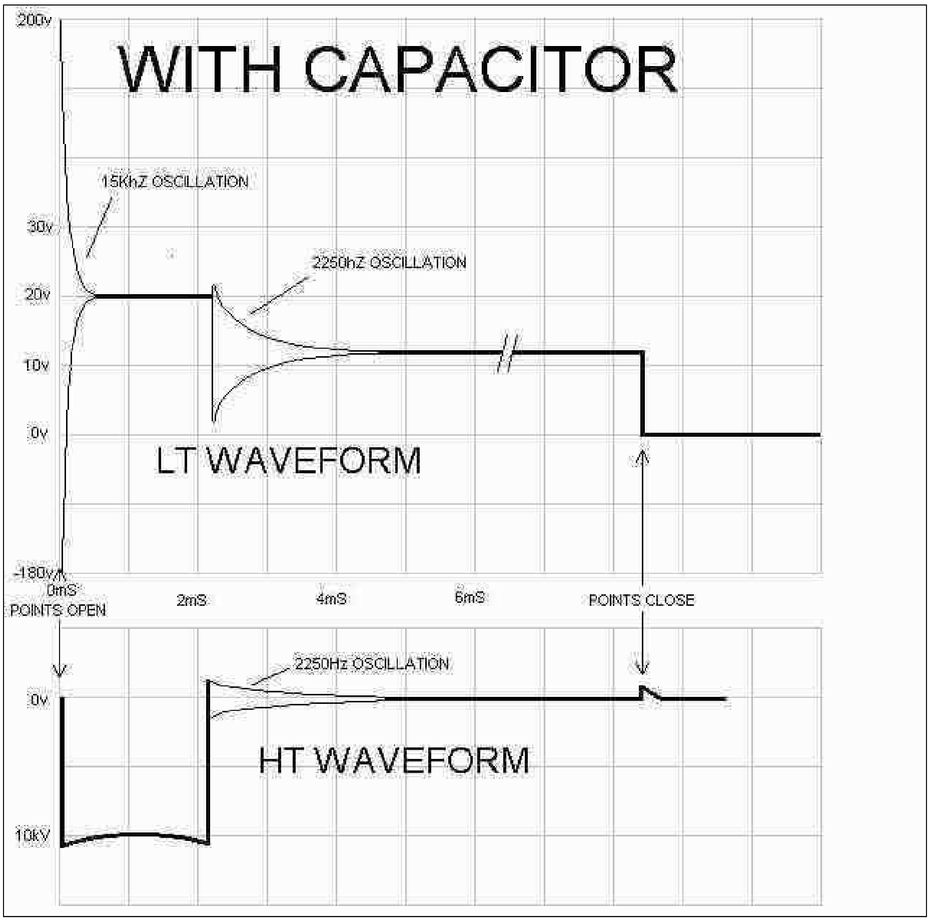
As there were a number of different lock manufacturers, it's possible the switches varied as well, which could mean marrying an original switch or lock to a replacement could be tricky. In Bee's case (top image) the original switch fitted the new lock without problem, but as can be seen above there were two different RB arrangements from the same manufacturer.

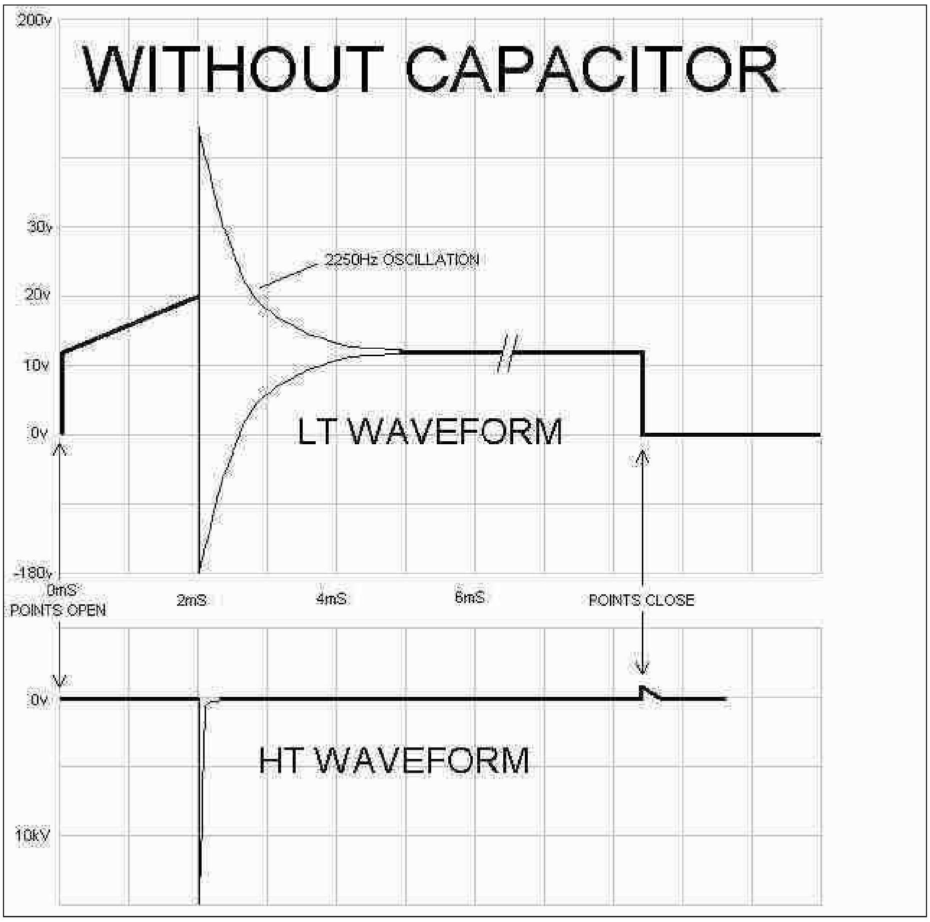
Late UK RB switch opened up for cleaning and lubricating (with Vaseline), which was all that was needed to fix a lock where the key could not be withdrawn: (*Crispin Allen*)





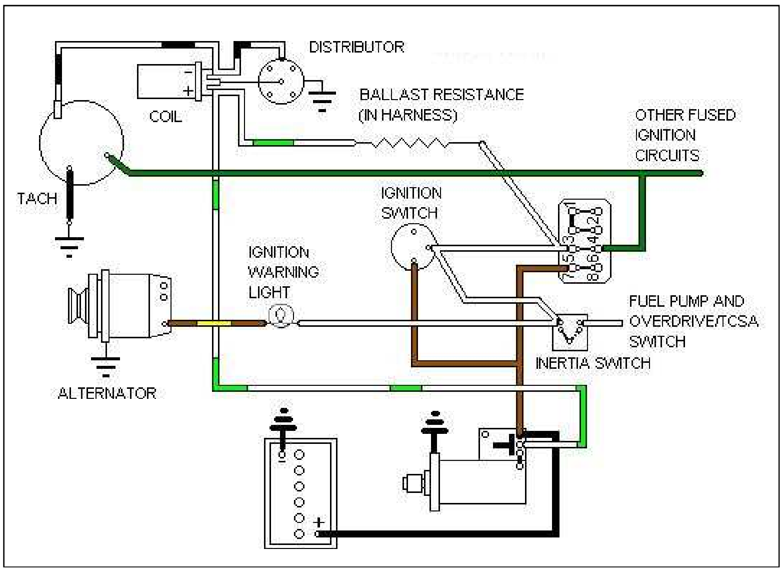
Ignition Voltage Waveforms





Ignition - 6v coil and points - North America (1974 1/2-1975)

Hover over a wire to confirm the colour

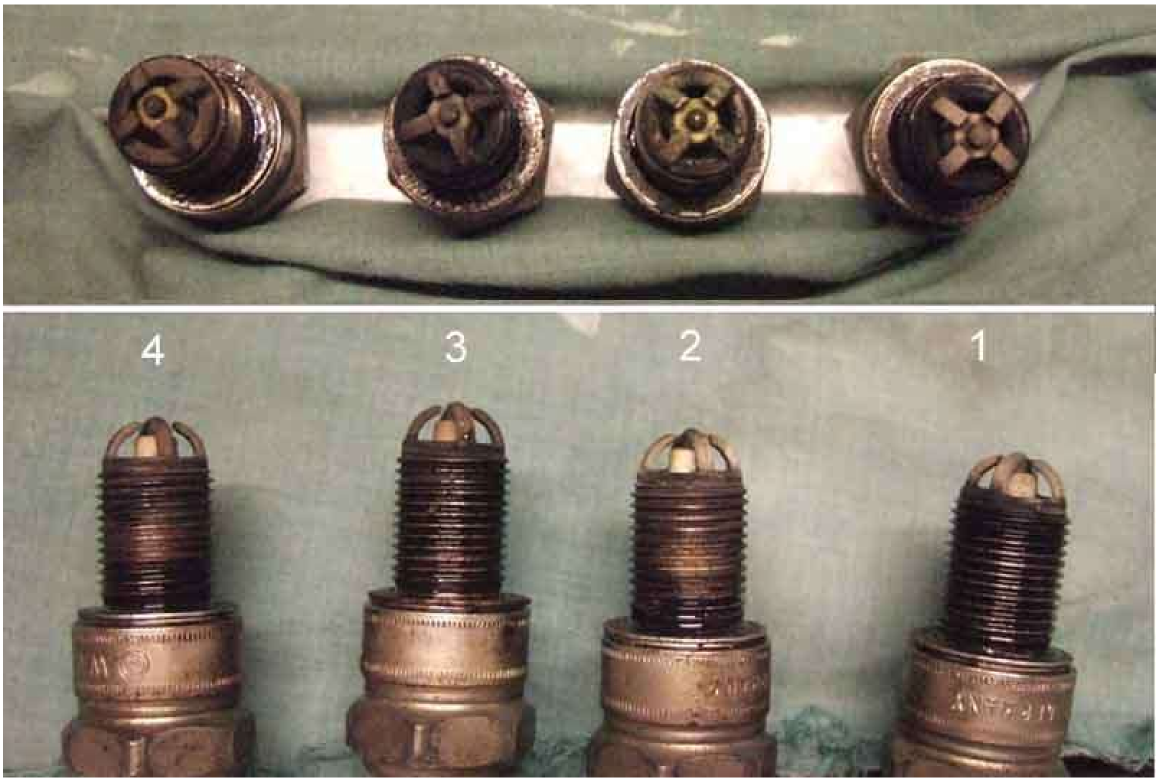


Note: The schematic for 1975 models does **not** show the second light-green/white wire from the coil +ve to the solenoid, but they do for 76 and later. It's not known whether this is an error in the schematic or an omission in the harness and solenoid, I can't think of any reason why it should be intended to be like that.

Information on the ballast resistance can be found here.

Sparkplug colour

These Bosch 4-point had been in since 1999, this was taken in 2014 after a 400-miler following a head gasket change, plugs only replaced in 2017 after some 40k. Back pair (on the left) a smidgen darker than the front pair, rear carb weakened a tad:



August 2023 - NGK fitted in 2017, about 8k since, the last time I would have messed with the carbs would have been after going lead free at that time. Again the front pair (on the right) very slightly weaker but less than before, I'll put half a flat on the front carb this time:

Timing Lights

Basic light using an orange neon discharge tube connected in series with the HT lead. It works, but needs to be used in low ambient light conditions with the timing marks clearly marked with white paint.

More sophisticated 12v style with a very bright white xenon discharge tube, easily viewed in daylight. Has 12v and earth connections for the electronics, and a clip-on pickup than can easily be moved from lead to lead while the engine is running. Versions available with an adjustable dial which is very useful for checking advance at various rpms, others with a digital tach/dwell/volts display. I dislike too many functions in one device, for a start it makes them much more expensive, but if any one of them fails either you have to scrap the tool and buy another, or buy an additional tool for the failed function, which you could have done in the first place.

Turn the knob until the flashing shows the timing marks at TDC, then the pointer on the knob indicates the amount of advance - simples.

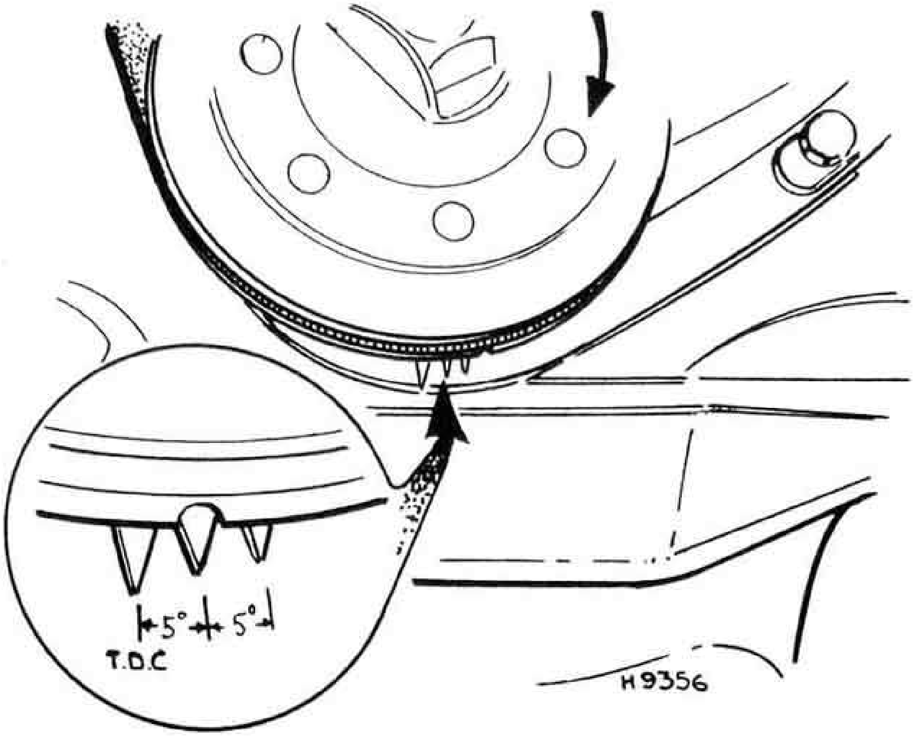
Timing Marks

[4-cylinder](#) [V8](#)

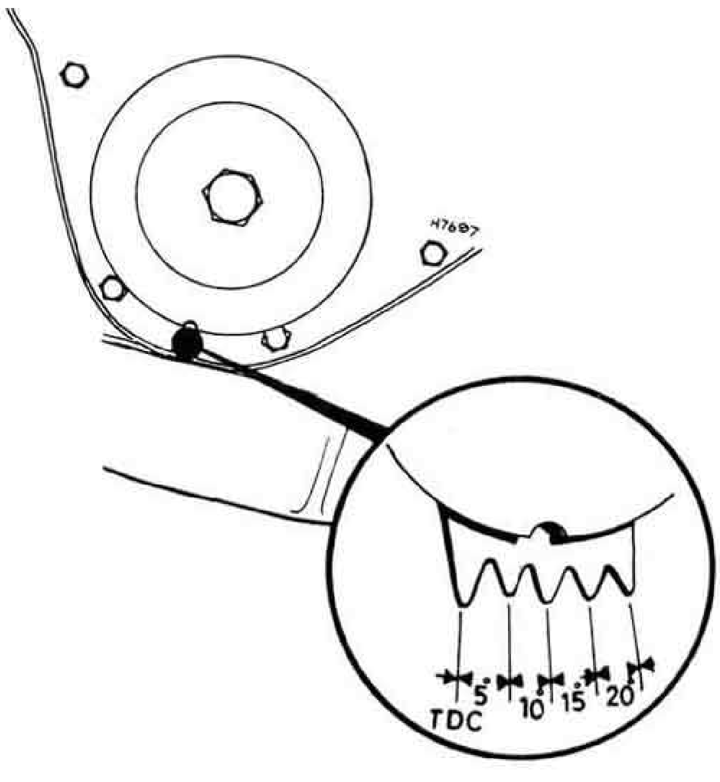
4-cylinder:

[Crank pulley bolt lock washer](#)

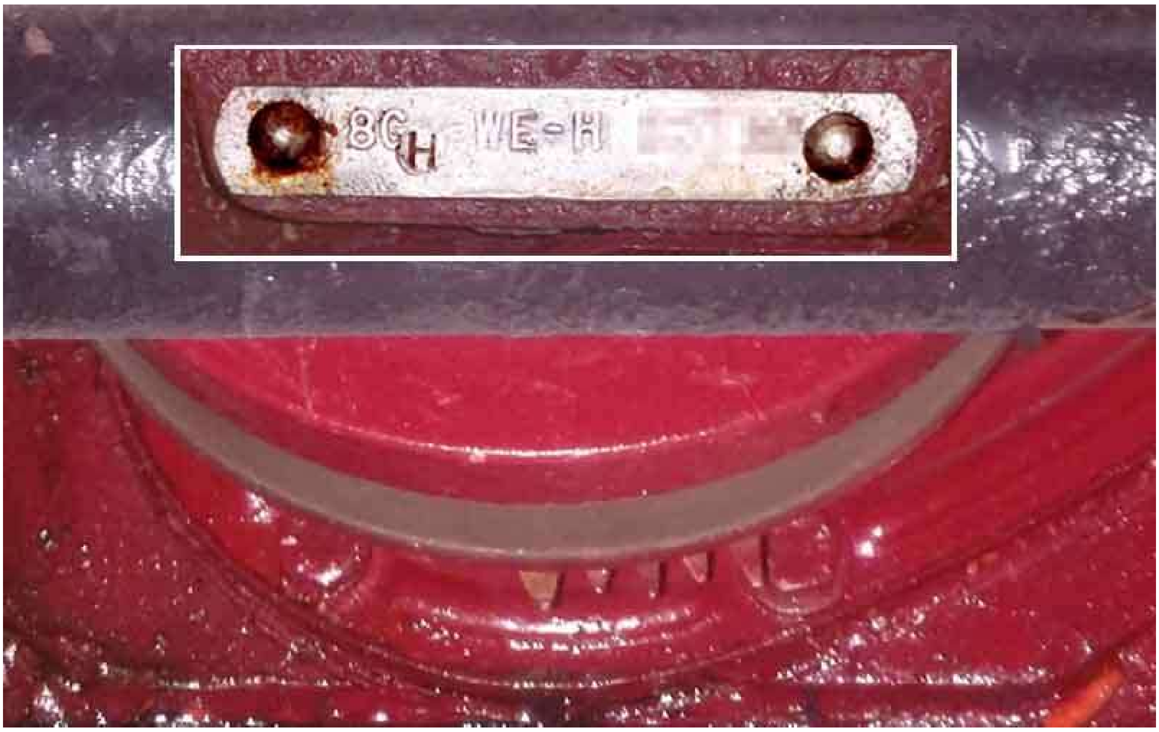
The earliest arrangement - pointers below, but only at TDC, and 5 and 10 degrees before (Haynes).



Haynes calls this 'later arrangement' but it still has the pointers below, but additionally at 15 and 20 degrees BTDC (Haynes). This is the only arrangement that my workshop manual shows.

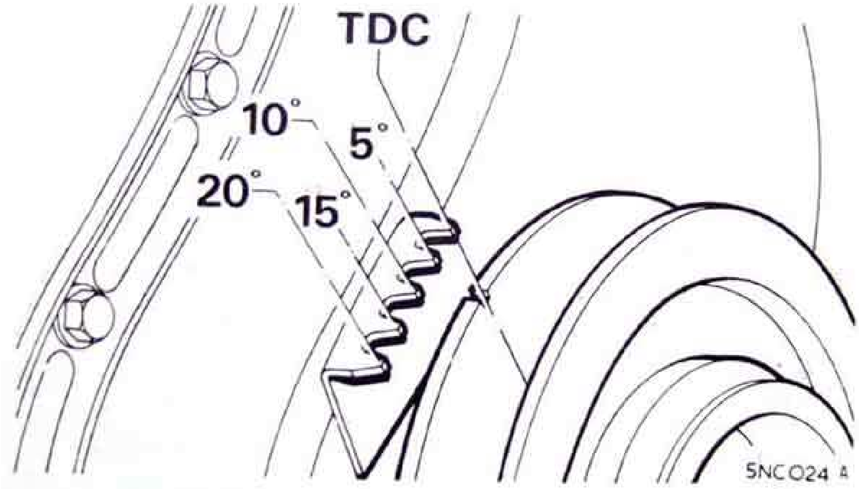


This on a 1970 18GH from Bill Etter has five, of varying height, but with the first one seeming to be the longest instead of the last. From the Parts Catalogue 18GJ would be the same, although by this time non-North American 18GG and GK engines had the timing marks on top:



Peter Basher writing on the MGOC MGB Technical forum shows this version on his 1970 which appears to have four pointers. Going by Bill Etter's it could be that the first pointer (closest to the cover bolt) has been snapped off, possibly because being large it was confusing as to which was TDC! Engine number not known but from October 68 non-North American engines should have had the pointers on top:

The later arrangement - probably on all 18V engines - above and angled towards the alternator: (*Leyland Workshop Manual*)



Even then there were two different positions - most CB on the left and late CB (18V779/780) and RB on the right because they had a larger crank pulley so the pointers were moved further out (from the Parts Catalogue, Clausager indicates this change didn't occur until the RB engines 18V846/847/836/837):

And there's more. Difficult to show on a CB (left) because of the closeness of the radiator but the pointers on that are about 5mm further out from the circumference of the pulley, whereas on the RB (right, John Pinna) they barely clear it:

Practical considerations: *September 2023*

Since the advent of unleaded I've always set the roadster timing by ear i.e. listening for pinking. Haynes suggests to set the timing so pinking can only just be heard when accelerating at full throttle from 30 to 50 in top gear, but I have found I can get pinking at part-throttle acceleration and flooring it stops it, so maybe Haynes is a bit aggressive. Eventually I decided to back off until I couldn't hear any at any combination of throttle opening, revs and load and ran like that for some time. Each year I check and note the timing and dwell to see if they have drifted at all. Dwell is always very consistent, and so is timing, but comparing the latter with the book figure I found I had been recording 12 to 15 degrees at 1000rpm, and most recently 20 at 2000. From the WSM my engine should have a static of 10 degrees and a strobe of 13 degrees at 600rpm. Combining the static figure and those from the centrifugal curve it should be 20 at 1000 and 28 at 2000, so mine seems well down. Using the very convenient Vernier adjustment on the side of the 25D4 I advanced about one degree and over a 288 mile run had no pinking, so wondered how much further I could go. But before that, not having looked at static timing for very many years I decide to do a static check ... and was very surprised:

Given that each pointer to the next represents 5 degrees this is very nearly at TDC! Wondering about slop in the mechanism I took the cap off. I found the rotor was fully at it's rest position, with the springs (replaced in my time) returning it almost all the way back when rotated by hand. Out of interest I checked the static timing with it fully advanced against the springs which gave 20 degrees:

However thinking about it later on if the strobe was supposed to be 20 at 1000 and I was getting 12 then it's hardly surprising that the static had reduced by a similar amount from 10 degrees to close to TDC.

Having a 25D4 with Vernier adjuster I advanced that 10 clicks at a time until I got to 16 degrees at 1k and 28 degrees at 2k, then checking the static again it was about 9 degrees and I'm guessing around 30 when fully advanced manually by twisting the rotor:

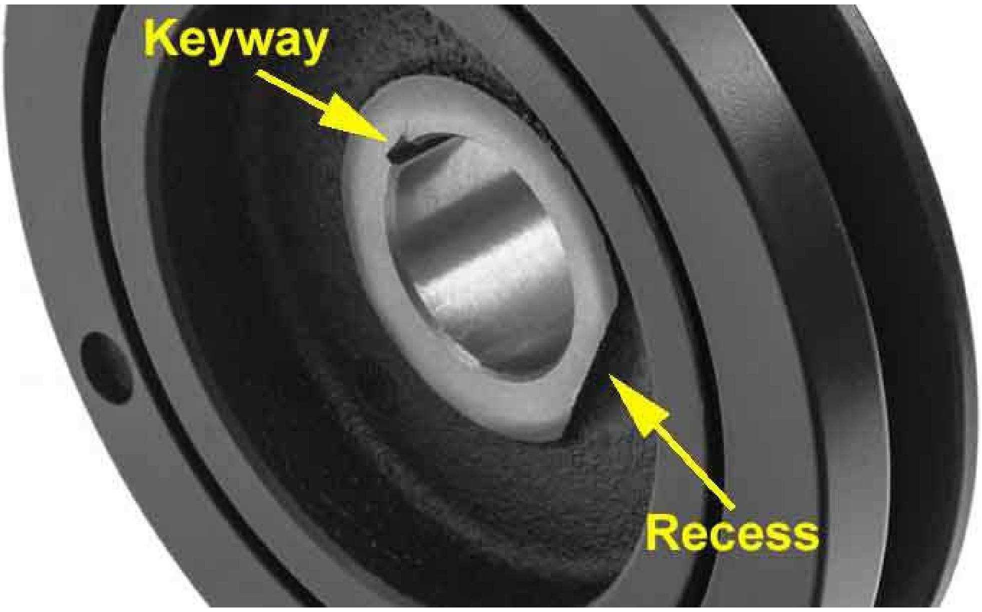
A bit of a run and loading up the engine showed no pinking, needs more running and perhaps more heat to be sure.

Crank pulley bolt lock washer:

Two types are shown for the part number given for all engines in the Parts Catalogue - 1G1319. Some suppliers show 12A398 as being a later number for the same part, but Googling either number shows the same mix of types. These shown by [Moss](#) (left) and Motaclan/Leacy (right):

Crankshaft pulley with keyway and recess: (*[Moss Europe](#)*)



The flat type seems to key to the crank then the other side is bent up to key to a bolt flat. The dished type is bent down to lock into the recess on one side and bent up to key to a bolt flat on the other, and the flat type can be locked in the same way if there is no key. If there is a crank key and it extends past the face of the pulley then the dished type would need a keyway to be filed out. However if the key extends past the lock washer then it may prevent the bolt tightening the pulley onto the crank. It seems more likely that the key **would not** extend past the face of the pulley, meaning either type can be used but both would have to be bent down into the recess and up to a bolt flat.

V8:

Pulley markings up to 10 degrees, at 2 degree intervals, for both BTDC and ATDC

The single pointer is adjustable, which on the face of it is simply to cater for different pulley sizes ... but!


You can clearly see that when looking directly down on the pulley markings, there is a difference of about five degrees between fully out and fully in, which would have a significant effect on timing. My pointer was set fully in i.e. close to the pulley, but I'll have to check what that represents as far as true TDC goes.

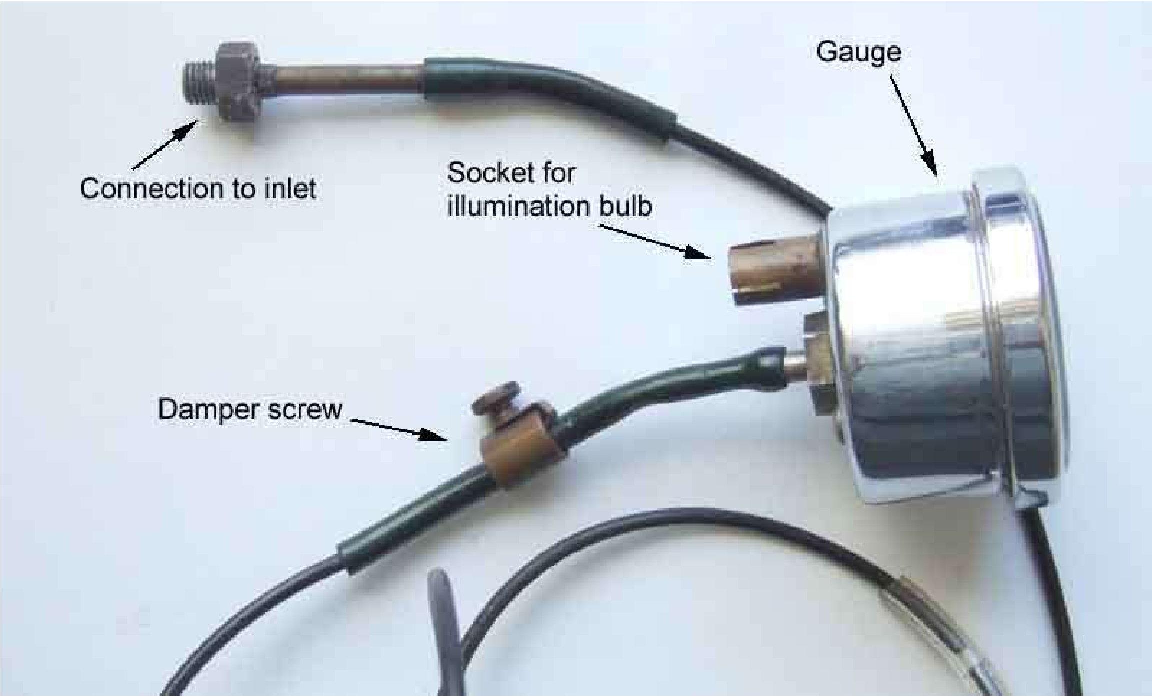
Although I bought a modified timing pointer from Rimmers I can't find any way of mounting it to the new front cover, so have to fabricate my own. With the old engine, front cover and water pump at home, I decide to best place to mount one is on two of the lower water pump bolts - one that goes right through the front cover and the other just into it. With the original pointer (which I had lost, but found again when it came back with various bits from the engine man this week) I was able to make a card template, and from that cut one out of sheet metal. With the pulley (which I now have back as well) in the front cover I turn that so the original pointer is over the TDC mark then remove that and fit the new one, for final tweaking of bolt holes and pointer angle to be in the same position. As the water pump and crank are in the same positions relative to each other on both old and new covers, the new pointer does the job.

Checking timing marks and adjusting the V8 pointer: Knock the ceramic insulator out of an old plug and insert a length of dowel. I was considering fixing the dowel in position, but opted to leave it sliding (but not loose) and marking it instead.

Vacuum Gauge

My REDeX gauge, bought in the late 60s

The component parts



Instructions for installation and use

CAR CARE ROBOT

ALSO AVAILABLE WITH METRIC DIAL
STANDARD 13/1/2 ILLUMINATED 13/1/5

Boxed complete with

Part No.	*Description*
4/3/2	**Synthetic Tubing**
4/2/5	**Damper Collar**
4/13/1	**Instrument Panel**
4/2/2	**2in. long 2BA Manifold Adaptor**
	Full Instructions

Part Numbers

STANDARD	13/1/1
ILLUMINATED	13/1/4

THE REDEX CAR CARE ROBOT

The REDEX Car Care Robot is a miniature edition of the REDEX Engine Tester which is used in most garages to test and tune engines. The Robot is packed complete with all components necessary for quick and easy fitting to any private or commercial vehicle having a four-stroke spark ignition engine with single carburettor. Kits are available for twin carburettors and for rear engine cars where longer tubing is necessary.

Construction

The REDEX Car Care Robot is made with a pressure sensitive element of the "C" type bourdon tube, manufactured from high quality, seamless drawn, phosphor bronze. This is connected through a link to the movement which is of the rack and pinion type. A tension spring is fitted to take up any back lash that may occur. The indicating pointer is fitted to the pinion spindle.

The Illuminated REDEX Car Care Robot is of the same construction with the exception that a hole has been drilled in the rear of the casing to let the bulb enter. A plastic pointer is fitted and is illuminated from inside the gauge. The bulb holder is held in position by one of the screws securing the movement to the gauge case.

Fitting

The Robot should be fitted where it can easily be seen whilst driving. With the aid of the bracket supplied, the instrument can be fitted to the top or the bottom of the dashboard with self-tapping screws and the Robot inserted. Alternatively, a flush fitting can be obtained on the dashboard by cutting a 2" diameter hole, inserting the instrument and securing it from behind.

The damper collar (Fig. 1) should be placed on the 6" length of (green) P.V.C. tube and one end of this tube fitted to the back of the Robot. The (black) Nylon tube should then be inserted into the end of the P.V.C. tube and the free end of the Nylon tube pushed through rubber grommets in the engine bulkheads until it has reached the manifold. It should then be joined to the permanent adaptor by means of the 2" length of P.V.C. tube.

The 2BA permanent adaptor (Fig. 2) should be fitted between the carburettor butterfly and the engine. It can be fitted into the inlet manifold as near as possible to the carburettor or in the carburettor flange (see illustations), using a No. 24 drill and a 2BA tap. Both the drill and the tap should be well greased to catch any loose swarf. Where an engine is fitted with a water-heated manifold, care must be taken to avoid this. The Robot may operate from existing take-off points on the inlet manifold but under no circumstances must the Robot be connected to the vacuum take-off to the distributor.

When an engine has more than one carburettor, it will be necessary to fit a 2BA adaptor for each. These can then be connected to the instrument by means of short lengths of tubing and a multi-way adaptor.

The Illuminated Robot wiring circuit can be made from any instrument light connection to the terminal at the rear of the Robot, which is insulated by a sleeve. The circuit is completed by earthing the Robot case.

REDEX Limited, 365 Chiswick High Road, London, W.4

Fitting — *Continued*

The damper collar should slide over the tube (Fig. 1) to a position near the Robot. WARNING: When the instrument is first fitted and before starting the engine, the damper collar screw should be tightened fully to make the instrument inoperative. As soon as the engine reaches normal working temperature, release damper collar screw, then gradually tighten again until needle is free from piston pulsations and steady, at the same time responsive to the slightest movement of the acceleration pedal.


Fig. 1.

Undue Noise or Sluggish Needle Movement

If a sucking noise or a sluggish needle movement occurs, this is an indication of petrol in the tube. The remedy for this is to disconnect the tube at the gauge head, run the engine to draw out petrol, stop engine and replace tube. Now remove green P.V.C. tube from engine manifold adaptor and insert a $\frac{1}{32}$" split pin into the outer end of the engine manifold adaptor, or into the Robot outlet of the 3-way adaptor.


Fig. 2.

In certain cases severe pulsations may cause needle vibration in the Robot Head; the insertion of a $\frac{1}{32}$" split pin in the manner described above will also overcome this difficulty.

Once the setting has been made in this way, the instrument should require no further attention.

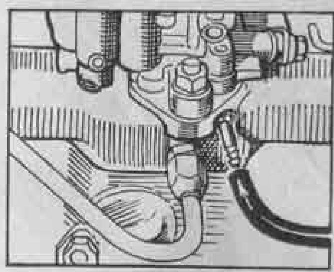


Fig. 3.

Principle of Operation

The Robot gives a scientific check on engine efficiency, since every aspect of carburation, ignition and engine condition influences the depression at the air intake as do also the impulses caused by valves, pistons and sparking plugs. Wear on these parts and their defects are revealed by characteristic movements of the Robot needle (see diagrams on page 4,) without dismantling any engine part. Disturbance in the balance of the engine or falling off of power output is indicated whether due to mechanical or electrical causes; to carbon, gumming or deficient lubrication; to a change in petrol quality, or to incorrect adjustments.

In addition to its use as an engine "X-ray", fitted to the dashboard, the Robot may be used for testing and tuning the engine. Disconnect the Robot and reconnect so that it is in a position visible whilst working on the engine.

Run the engine until a normal working temperature is reached, then carry out the following preliminary experiments, observing the movements of the Robot needle:—

(i) **Carburettor.** Alter mixture from extremely rich to extremely weak, noting how the needle "floats" or "weaves". (See page 4).
(ii) **Sparking Plugs.** Short each plug with a screwdriver, noting that the needle falls back slightly. (See page 4).
(iii) **Ignition Timing.** Rotate the distributor body to the extreme positions of over-advance and over-retard. Over-advance causes "kicking" of the needle, while over-retard gives a low but steady reading. (See page 4).
(iv) Read the Robot dial and make a rapid fault analysis according to the diagrams on page 4.

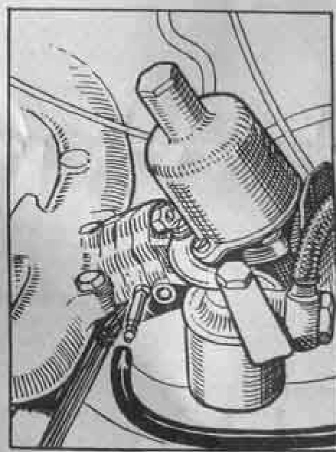


Fig. 4.

Normal Readings

The normal readings that could be expected from a 4, 6 or 8 cylinder correctly tuned and REDEXed engine are 19 to 22. In the case of a twin cylinder engine the reading could be considerably lower. Every 1,000 feet of altitude above sea level reduces the readings by 1 (i.e. 1" Hg.). The object is always to obtain the highest possible steady needle reading.

METHOD OF USE

Fuel Economy

The Robot helps to make economic driving a regular habit. The rate of fuel consumption is indicated by the position of the needle. For economy, drive at a steady speed and keep the needle reading as high as possible. Wide fluctuations show that you are over-accelerating and wasting petrol. Sustained low readings show that foot pressure is too heavy. Ease off the accelerator pedal and you will lose but little speed while the higher reading shows substantially less throttle opening and reduced consumption. Watch the Robot and you will drive more comfortably with less strain on yourself and the engine and arrive just as quickly at your destination.

Sparking Plugs

Set throttle to a fast tickover and short each plug in turn to earth with a screwdriver. The recorded drop of the needle indicates the efficiency of that particular cylinder.

A correctly tuned and balanced engine should show an even drop on all cylinders. If the needle drop is uneven this would indicate faulty plugs or cylinders.

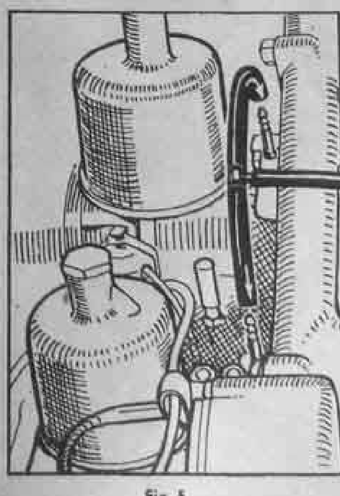


Fig. 5.

METHOD OF USE — *Continued*

Ignition Timing

1. Before setting the ignition timing ensure that the ignition vacuum advance control is connected and then adjust the carburettor so that the highest steady reading is obtained.
2. Increase engine speed by adjusting the throttle stop until the ignition warning light goes out.
3. Re-adjust damper collar of the gauge to allow sensitive movement of the needle.
4. Slightly enrichen carburettor mixture until the gauge reading fractionally falls. (This will obviate needle kicks caused by weak mixture, which could be misinterpreted as kicks due to over-advanced ignition).
5. Set the distributor micrometer adjusting screws (if fitted) to a central position, then loosen the distributor body clamp bolt. At this is stage it is recommended that the operator should familiarise himself with the effect on needle movement when the distributor is rotated in either direction.

Note. Rotation of the distributor body in the opposite direction to that of the rotor arm advances ignition.

6. Retard ignition until needle falls, then slowly rotate distributor, advancing ignition until needle kicks.
7. When needle kick is seen, carefully retard the ignition just sufficiently to maintain an absolutley steady needle (highest possible steady reading). From this point retard the ignition by a further ½" Hg. and tighten distributor clamp.
8. Reset the carburettor to a normal tickover and reset slow running mixture control.
9. This is the correct ignition setting which takes account of every engine condition, mechanical or otherwise also the grade of fuel in use.

Carburettor Setting

The carburettor should be cleaned and the jet and float level checked. Clogged jets must not be cleaned by mechanical means, any blockage should be removed by blowing out with an air jet.

All carburettor adjustments should be made at normal tickover. To obtain correct mixture, adjust mixture control until the reading is as high and as steady as possible.

On S.U. carburettors disconnect the choke wire or rod before adjusting the jet position. Do not attempt to tune an S.U. carburettor with hydraulic damper unless the chamber contains the correct amount of oil. On non-hydraulic types apply REDEX to the piston spindle. For best performance with this type of carburettor richen mixture until reading just starts to fall from highest steady position.

Multiple carburettors are synchronised in the following manner:—

(a) Remove air filters and slacken connecting linkage between carburettors.

(b) To ensure that all carburettors are balanced, listen to each in turn at tickover speeds (this is done by means of a short length of tubing placed into each air intake). Adjust throttle stops so that all carburettors are pulling evenly and re-tighten linkage.

(c) Connect all carburettors by means of "T" connectors. Before starting engine close all mixture controls completely, then open again an equal amount on each carburettor until engine runs satisfactorily. From this point adjust each mixture control alternatively the same amount until the highest steady reading is obtained.

Before refitting air filters ensure they are thoroughly cleaned, or if replaceable element type, renew elements.

Other Causes of "Floating" Needle Movement

(i) Excessive or insufficient fuel pump pressure. (ii) Blocked fuel line from petrol tank to fuel pump.
(iii) Worn butterfly spindle (also indicated by the engine failing to idle slowly).

Causes of Needle Tremor

If damper collar adjustment is correct and needle tremor persists after adjusting sparking plugs, ignition timing and carburettor setting, the contact points should be checked with a feeler gauge and reconditioned or renewed if burnt or badly pitted. A liberal dose of REDEX should be applied to the distributor weights and springs.

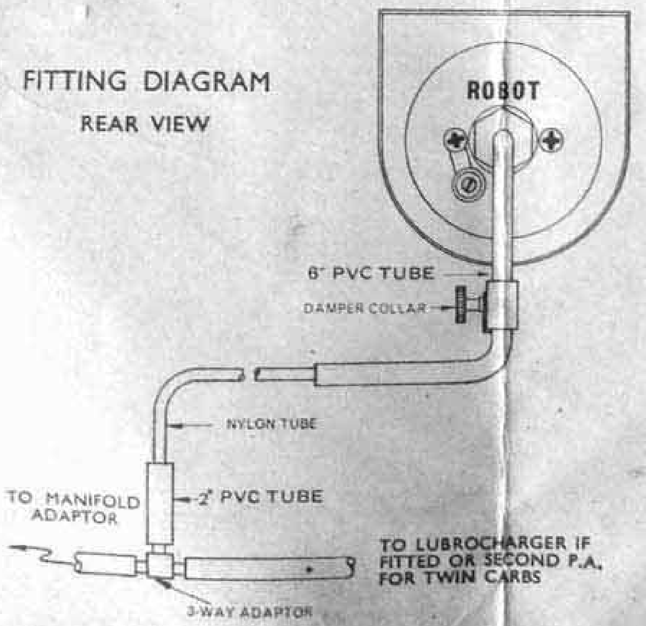
Choked Exhaust Systems

If the exhaust system is badly choked, the Robot needle will gradually recede to a low reading as back pressure is built up.

A quick check for exhaust efficiency can be made with the Robot connected to the inlet manifold adaptor. When the throttle is opened and closed quickly the needle should drop sharply, then rise rapidly to above the normal idling reading. This change should be rapid and any tendency for the needle to remain low or return sluggishly to normal indicates the presence of back pressure.

FITTING DIAGRAM

REAR VIEW



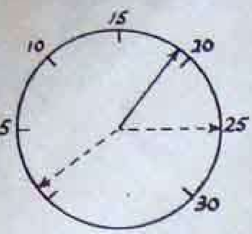
Compression Check

Connect the Robot to the manifold adaptor and, with the throttle completely closed and engine switched off, operate the starter. If the compressions are balanced the needle will rise to a steady reading of approximately 15. If reading is steady but low this could indicate an air leak. If the reading is an uneven pulsation this indicates unbalanced compressions; a check should therefore be made using the REDEX Compression Gauge.

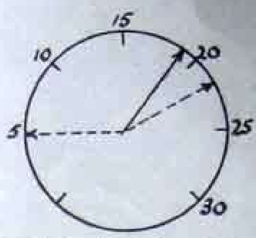
Perfect Balance

Correcting one condition in an engine may affect another. For example, the use of REDEX raises the efficiency of an engine to a new high level and the engine must be retuned to correspond. Advancement of ignition timing may call for readjustment of the carburettor mixture and both of these would again require adjustment if any alteration is made to carburettor jet size, plugs, points, air filter or any other component or condition of the engine. Therefore, a rapid check-over of carburettor and ignition timing should be made with the Robot to make certain of perfect, all-round balance before passing the engine as satisfactory.

GENERAL CHECK ON ENGINE CONDITION



OPEN AND CLOSE THROTTLE QUICKLY



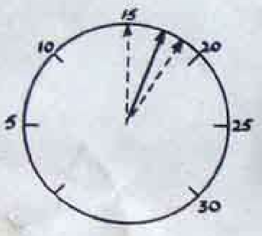
Needle falls sharply and returns quickly to about 25 then steadies to normal. Indicates good engine.

Needle falls slowly to about 5 then drifts back to normal. Engine in poor condition generally. Very slow return of needle indicates choked exhaust.

ENGINE FAULT DIAGNOSIS

LOW VACUUM 16-17

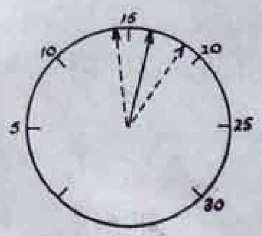
Floating or Weaving Needle.



Mixture too weak. Air leak at carburettor or manifold gaskets.

LOW VACUUM 15-18

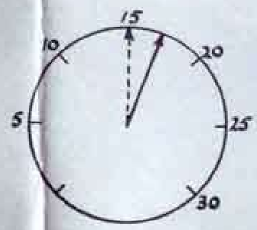
Regular Float.



Mixture too rich. Dirty air cleaner. Float level too high. Needle valve not seating. Punctured Float.

LOW VACUUM

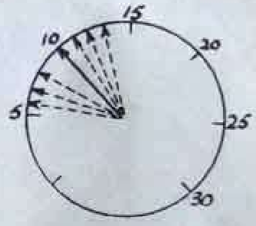
Regular beat.



Burnt Valve. No clearance on one or more valve tappets. Check with REDEX Compression Gauge whilst turning engine over slowly by hand.

LOW VACUUM

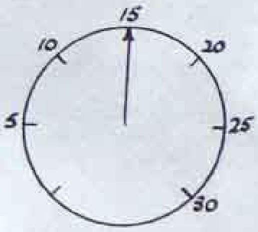
Very unsteady needle.



Hot spot plate or heat riser burnt through. Starter vacuum test will assist diagnosis.

LOW VACUUM

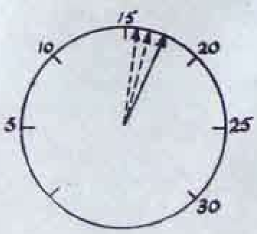
Steady Needle.



Ignition retarded. Late valve timing. Perforated hot spot.

SLIGHTLY LOW VACUUM

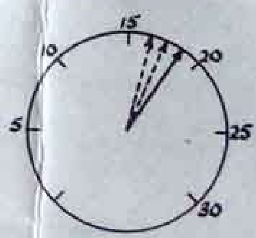
Needle tremor.



Tappets out of adjustment.

NORMAL VACUUM

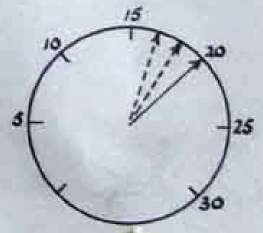
Irregular slight kick.



Plug points too close. Plugs fouled. Contact points pitted, burnt, or out of adjustment. Auto-advance springs loose.

NORMAL VACUUM

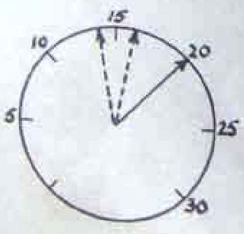
Irregular drop.



Gummy valve stems. Faulty plug.

NORMAL VACUUM

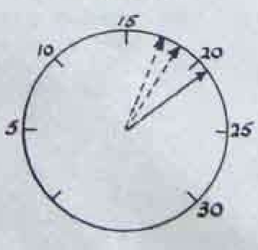
Irregular kick.



Sticking inlet valve.

HIGH VACUUM

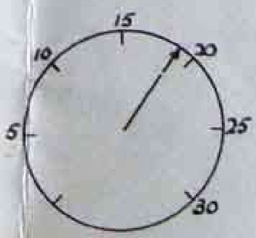
Irregular kick.



Over-advanced. Loose timing chain. Faulty condenser.

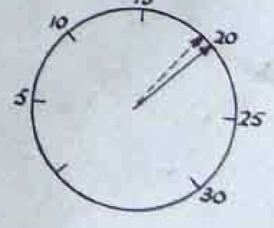
STEADY NEEDLE

18—21



Normal Vacuum prior to REDEX. Rising 10% or more after REDEX.

CHECKING PLUGS



Short each plug in turn. The needle drop should be even for all cylinders. Uneven drop indicates faulty plugs or cylinders.

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