A neater solution to the much-discussed 'K-click' – a non-starting problem experienced by many with the Rover engine – is explained by **Andrew Revill.**

K-CLICK

Having recently suffered from the dreaded 'K-click' on a couple of occasions, I initially decided to perform the well-known additional relay modification.

The 'K-click' affects Rover K-series engine models which fail to start when the ignition key is turned to the 'start' position, with a firm click from the starter solenoid which, although receiving an electrical feed, fails to fully engage and operate the starter motor – particularly when the engine is hot. Although there has been much discussion about the true root cause (i.e. whether the starter relay or the solenoid on the starter motor is the real 'weak component'), it has been established in practice that performing a simple modification – involving adding an external starter solenoid relay – generally solves the problem for most people.

In a nutshell, this modification aims to provide a stronger (low resistance) electrical feed to the starter solenoid by bypassing the weak (high-resistance) relay within the Multi Function Relay Unit (MFRU). The MFRU is basically a box containing four relays. The traditional modification involves tapping into the connections to the MFRU to wire an additional relay, ideally taking the internal starter solenoid relay entirely out of the circuit.

Now I've never been a great fan of splicing and tapping into existing wires, nor do I like the idea of having redundant parts under my bonnet, so I decided to investigate this a little further to see if I could come up with a neater solution.

A word of warning...

This modification was performed on my car, a 2003 Roadsport SV VVC 160. The wiring on my car was consistent with the wiring diagrams provided in the Caterham K-series build manual – however I cannot be 100% sure that the wiring on every other K-series car will be identical. I have therefore included here a diagram of the existing connections to the MFRU in my car: **if your MFRU wiring does not correspond to mine, do not continue as the modification may not be applicable to your car.**

and a note of thanks

Our thanks go to **Haynes Publishing**, who kindly gave their permission for reproduction of their diagrammatic material from 'Automotive Engine Management & Fuel Injection Systems Manual'.

THE THEORY

By searching through a Haynes Manual, I was able to find the internal circuit diagram for the MFRU. This consists of four relays, as expected, with a number of connections between them as well as to the external pins. Note that the MFRU pin numbers used in the following descriptions are consistent with those used in the Haynes Manual and the included diagrams; however the Caterham wiring diagram appears to use a different pin numbering scheme (see **Fig 1**).

The four relays in the MFRU are...

The main relay: this is activated when the ECU pin 4 pulls MFRU pin 6/3 to ground, and switches power from pin 8/6 through to pins 8/8 and 8/3 (neither of which are connected in the Caterham installation) and to the coil of the oxygen sensor relay...

The oxygen sensor relay: this is activated when the ECU pin 36 pulls MFRU pin 6/5 to ground and the main relay is activated as described above. This switches power from pin 8/7 through to pins 8/2 only, which is not connected in the Caterham installation. This relay is, therefore, actually redundant. Given that the only remaining function of the main relay was to switch power to this relay, the **main relay** is also redundant.

The fuel pump relay: this is activated when the ECU pin 20 pulls MFRU pin 6/1 to ground and MFRU pin 6/2 is pulled to +12V by the ignition switch being in the 'run' or 'start' position. This switches power from pin 8/6 through to pin 8/4 to drive the fuel pump.

The starter relay (the one which causes the problem): this is activated when the MFRU pin 6/6 is pulled to +12V by the ignition switch being in the 'crank' position. This switches power from pin 8/7 through to pin 8/5 to drive the starter solenoid.

So, in essence, two of the four relays in the MFRU are doing nothing at all and one of them is being bypassed by the modification, leaving the entire MFRU performing the function of a single relay – namely the fuel pump relay. In addition, once all of the redundant circuitry is taken out of the equation, each external wire connected to the MFRU connects to, at most, a single relay pin (see **Fig 2**).

This means that the entire MFRU may simply be removed and replaced by two standard relays, with no wires needing to be spliced together – providing what I feel to be a much neater fix for the problem.

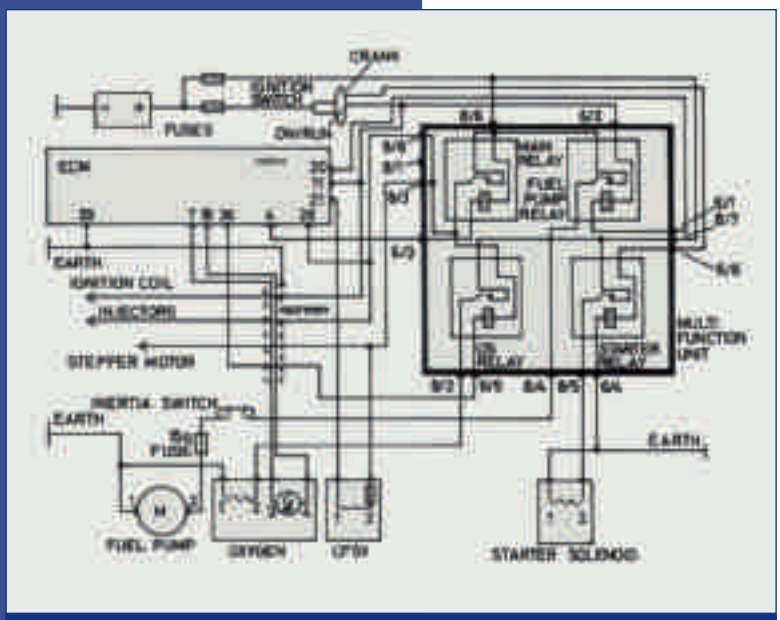

Fig 1: internal schematic of the standard MFRU and wiring (from Haynes manual; see warning on opposite page).

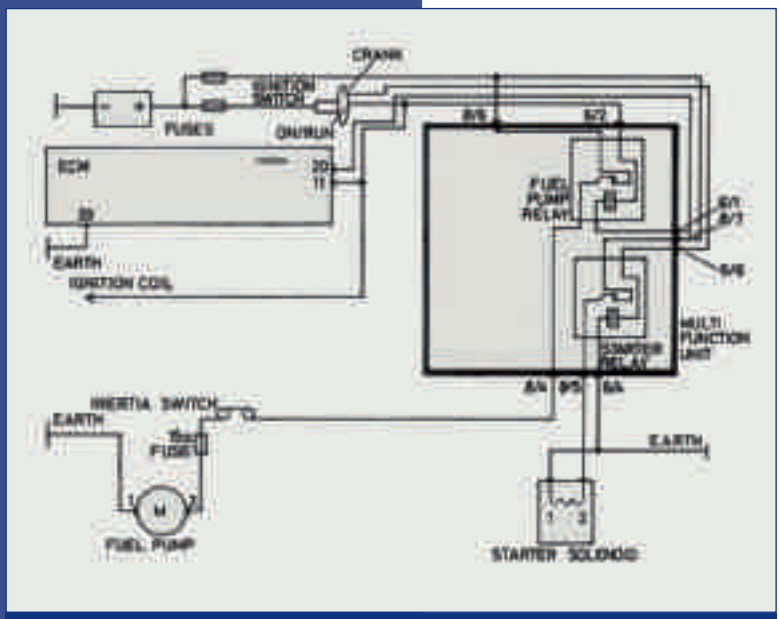

Fig 2: wiring diagram for the MFRU showing only the pins that are connected in the Caterham application.

THE MODIFICATION

- Disconnect the battery negative terminal for safety.

- Identify the coloured wires connected to the MFRU as shown in the **Fig 3**.
- *Remember: if your existing wiring does not match this, then do not proceed with this modification.*

- Unplug the two connectors from the MFRU; unclip the MFRU from the metal bracket above the ECU and remove it completely.

- Carefully cut each of the wires where they enter the MFRU plugs, leaving the remaining wires as long as possible (or alternatively, carefully extract each of the terminals from each MFRU plug with a small screwdriver or similar and then cut the wire close against the terminal to maximise the length of the remaining wires).
- **Note**: keep track of which brown wire was connected to which MFRU terminal.

- Drill two 6mm holes in the MFRU mounting bracket (ideally remove it from the car first) 30mm apart and use these to mount two standard 30A automotive relays using short M6 screws and nuts (nut on top with a lock washer).
  Use the slightly more expensive waterproof relays to ensure that water cannot enter the cases, which are mounted horizontally (e.g. search eBay for 'waterproof automotive relay' and choose something rated for at least 30A – for about £2.50 each).

- The white/pink wire originally connected to 30A pin 6/3, and the brown wire originally connected to MFRU pin 8/1, are no longer needed but should be well insulated. I crimped a butt-splice connector of an appropriate size onto the end of each wire and then used a tie-wrap to strap them back to the existing wiring loom out of harm's way.

- Crimp a 6.3mm insulated spade connector onto each of the remaining wires; alternatively use a relay connector terminal block for a neater result – these are designed to take uninsulated spade connectors which can be crimped or soldered onto the ends of the wires then clipped into the block.
  Connect the wires to the relay terminals as shown in **Fig 4**.

- **Note**: If the relays have a terminal labelled '87a' in the centre, this should be left unconnected. Do not under any circumstances use terminal '87a' in place of terminal '87'.

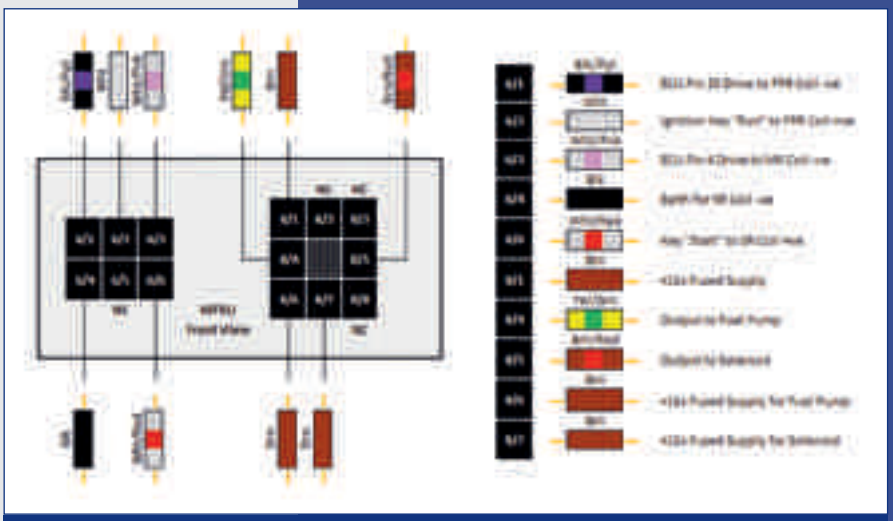

Fig 3: layout of connection pins, with key to the wiring colours, for the original Caterham MFRU.

- Double check that all connections are secure, that the correct colour-coded wires are connected to the correct relay terminals and that the unused wires are well insulated and secured.

- Reconnect the battery negative terminal. Turn the ignition key to 'Run' and check that the fuel pump can be heard to be running. Turn the ignition key to 'Start' and the engine should start as normal. **Fig 5** shows the finished installation in my car.

If anyone would like to discuss this modification further with me I am contactable by email on *andrew.d.revill@googlemail.com* or via *BlatChat*, where I am '*revilla*'.

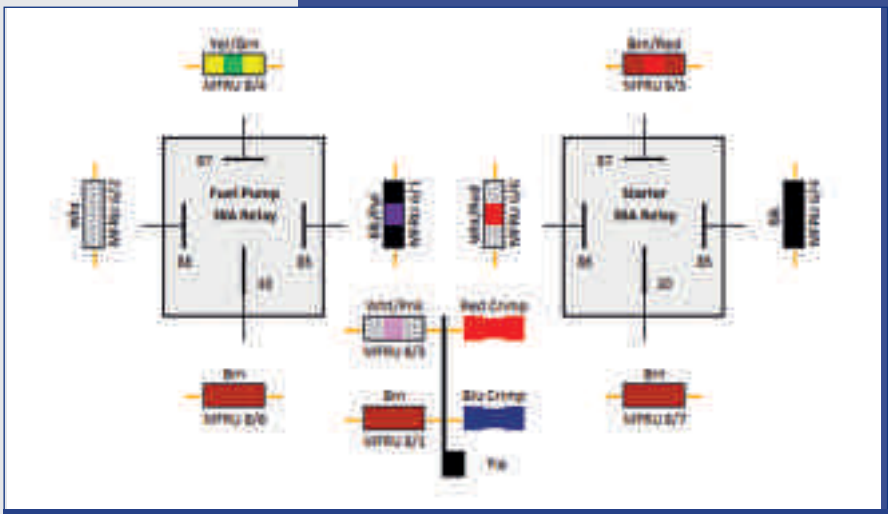

Fig 4: in the modified layout the unused wires, MFRU 6/3 and 8/1, are insulated at their ends with a crimp and secured to the loom with a cable tie to keep everything tidy.

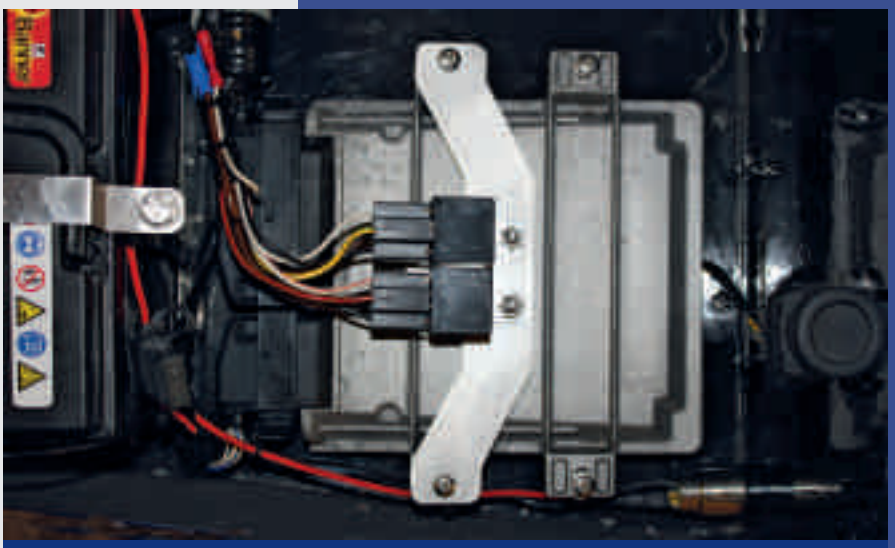

Fig 5: this is how the revised relay arrangement looks on Andrew's car.