



## Rover MEMS SPI

Modular Engine Management system (MEMS) has been with us for some time. In fairness given its production number and the type of vehicle s fitted has proved reliable. It has problems, especially later in life but has, in our experience suffered abuse and neglect. In keeping with all our new articles we begin with evaluation, choice and preparation.

Evaluation always begins with careful assessment without prejudgement of the symptoms, road test with the customer if necessary to get a “feel” for the problem and most importantly establish clear relevant background history that may relate to the problem.

Serial diagnostics is the simplest approach and often overlooked. With the absence of a MIL lamp on early Rover MEMS vehicles the use of a serial diagnostic tool is essential. Pre cat vehicles have a mixture adjustment capability.

My preferred choice of equipment for this vehicle is,

1. ASNU injector bench
2. Sykes Pickavant ACR 4
3. Autodiagnos Break Out Box
4. Fluke 196 colour oscilloscope.

Preparation, this may become a but of a bore by the end of the series but overlook it at your peril. Examine DTC's note, clear and ignore for now. They may be man made, intermittent or false and misleading, due to external influence such as radio frequency induction (R.F.I.) injector errors, poor vacuum or valve timing all effect serial data interpretation if not supported by parallel testing of actual inputs and outputs measuring voltage and current. Complimented by mechanical testing, injector evaluation using a flow bench, fuel pressure and manifold vacuum.

Remove plugs and leads, examine and replace if corona ringing is present around insulator base, examine the cap and rotor for the modified item if not fitted. Check the vacuum hose to the ECM for splits and blockage using a multivac pump. Check the hose circuit for pressure drop. Attach a vacuum gauge to the manifold and confirm a correct value of 20 INHg. Errors here may indicate incorrect valve timing; blocked exhaust or valve seat and tappet errors; these must be rectified before proceeding. This is a pressure sensed management system. Assuming no errors at this point attach Autodiagnos Break Out Box to ECM this may seem overkill but its so quick and easy to access and provides all the sensor and actuator readings with easy access. Leave the vacuum gauge attached to monitor engine mechanical condition, don't omit fuel pressure and flow checks if prudent with the symptoms.

My personal choice and based on overwhelming experience with single point systems would be to remove test and service the injector. Most problems with fuelling errors stem from the injector fouling. It is crucial to ensure satisfactory injector performance before pre cat adjustment or post cat mixture control evaluation. Forget on car treatment products the only way to professionally test and confirm injector elecmechancial errors in a flow bench, period.

Evaluate the vehicle ignition systems whilst warming up, don't be fooled into a fuelling problem when poor ignition energy is the case. The fluke 196 colour scope is without exception the finest hand held oscilloscope available not withstanding its also one of the cheapest on the market!

Many oscilloscope reputed to be vehicle compliant are not appropriate and often cause running disorder when attached to sensitive circuits such as Lambda and crank angle sensor circuits. Do

not compare this tool to anything currently offered with in the hand held product range. To compliment measurement of voltage and time use a current clamp, this allows exact and detailed evaluation of the actuator circuits.

Correct ignition burn time for MEMS is 1-1.2 m/s current flow (peak) during dwell is 6amps. (See print 1)

Whilst monitoring parallel data (waveforms and current) through the breakout box attach the Sykes ACR 4 to the serial socket and cross-reference serial data with actual inputs. Especially the map sensor value which is internal to the ECM. This must be checked against actual vacuum and should agree exactly. If the ECM value differs from the actual reading from the gauge, providing all power and grounds have been confirmed correctly, then it would seem the ECM is faulty.

By using parallel and serial data, a top quality electronic oscilloscope and current measurement with a little experience and accurate data you eliminate the need for ECM testing services off the car, which are often incomplete and unreliable.

Stepper motor control is a common problem with MEMS systems and often causes difficulty with evaluation. Firstly and simply when you switch off the ignition a healthy and clear noise should be heard from the stepper motor as it assumes its start up position. Check for free mechanical movement and apply a little light oil to the mechanism. Ensure the throttle potentiometer is operating correctly and the idle contact switch is closed. Attach an oscilloscope to the 4 drive circuits and current clamp to either the power or ground circuits (either will do) and operate the throttle. Monitor the voltage and current plot. (See print) #2. Look for poor voltage pattern and low current. If out of specification switch off, disconnect the BOB from the ECM and check resistance. Access both stepper motor circuits. This resistance measurement takes into account the loom and motor windings, if ok you need a new ECM. Power supplies should be stable and within 1v of battery voltage. Ground circuits a maximum of 200mv peak on load, do not conduct static and tests.

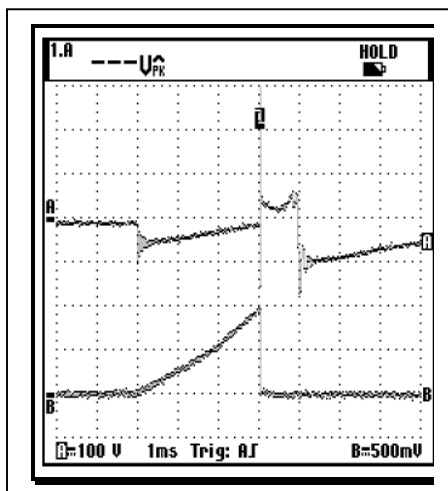
Moving onto emission testing first check the injector pulse time and current in a similar manner to Ignition and stepper action. Hot pulse time should be ( ) with a current peak of about 3 amps, dropping to 1.25 amps during the current control phase.

Set the CO% of the pre Kat using the ACR 4 to achieve a balance of gasses to Lambda 1.

With closed loop systems monitor the Lambda sensor switch electronically, with a minimum frequency of 1Hz and amplitude of .2-. 8v will guarantee crisp throttle response and good fuel consumption.

The final checks using a gas analyser should confirm correct catalyst operation. Ensure no blockage within the catalyst if previous problems with misfiring or tappet jacking were present. Regular flushing and the use of a quality fully synthetic oil will guarantee trouble free mechanical operation.

Print #1



Print #2

