Fuel Injection Fault Finding for bosh motronic, bmw K11 by Frank Warner.

I had high fuel consumption, this is how I found the problem.

My fuel consumption rapidly increased, leading to overly rich running. Adjusting the CO2 pot did reduce the rich running at idle but had not effe consumption. The motronic unit does store errors, but it will only store gross errors not subtle errors. Gross errors are shorts or open circuits, a changes its characteristic will not be detected as that would be simply assumed to be a change in the sensed quality.
These notes are for my 1993 K11LT and may have some relevance to other motronic equipped vehicles, but you need to do the thinking to ch differences. The date of manufacture looks to be indicated within engine serial number mine says xxxxx 2293 xxxx. I think this is the same struc dates, 22 is the 22nd week of the year (about end of May?), 93 is 1993.
The following is firstly a description of the motronic brains memory and its readout. Then a description on the test setup. Then on each compon characteristics and methods to test them.

First

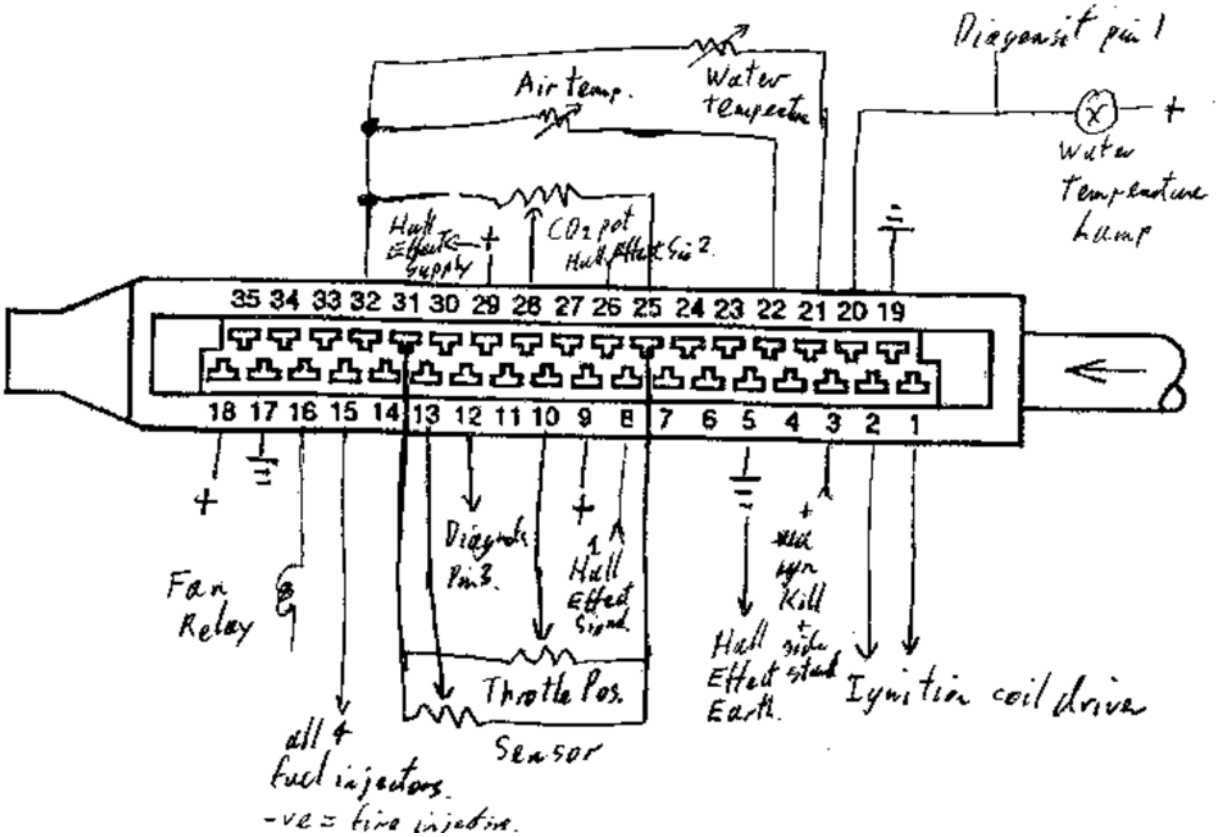
The motronic brain stores faults within it self, these stored faults should be retrieved and investigated as this could save a lot of work.
There is a blue 3 way connector on the left side of the bike near the battery, you'll need to remove the side cover to gain access. Turn on the ig shorting the number 1 pin on this connector to earth for 5 seconds, then the temperature light near the tachometer will flash. The light will light fo seconds, then a give a number of short flashes, count these short flashes. This count is for the first number, if this is a 1 then you have a fault. An of light follows the first count, then follows the second count and this is repeated for the third and fourth count. This repeats until you turn off the the pin 1 to earth for 5 seconds to get the next fault.

Code	Fault
1133	Hall effect - no signal No 1 motronic plug connections 8 (signal)
1122	Hall effect - no signal No 2 motronic plug connections 26 (signal)
1223	Water Temperature motronic plug connections 21 to 32
1224	Air Temperature motronic plug connections 22 to 32
1215	Throttle Position Sensor motronic plug connections 25 to 31; 13 to 31 and 10 to 31
1111	CO2 pot motronic plug connections 25 to 31; 25 to 28 and 28 to 31
4444	No Fault
0000	No Fault
3333	Not a fault - a fan test and memory erasure.

Hall effect sensors can fail due to failure of the power on motronic plug connections 5 (power ground) and 29 (power >9 volts). These connec checked if both hall effect devices fail. Check that 5 is connected to ground. Then check for a voltage >9 volts on pin 29 when the ignition is on is connected.
The unit can store more than one fault, once you have read out one fault, repeat the shorting for a further 5 seconds and check for another fault code 0000 or 4444 then you have all the faults. You may note that no fault codes exist for the brain it self, this may be because that most brain the brain to ceases functioning at all.
The easiest way to remove the storage of fault codes from the brain maybe to just remove the connector from the brain for a period of time, wh how about checking the battery? The time take to check the battery will ensure that the brain memory is erased.
To ensure correct start up once the brain is reconnected to the system, the first time you turn on the ignition rotate the throttle slowly over its full off the ignition and then all should be ready.

Test Set Up

You will need a ohm meter (resistance meter, most Digital Voltmeter [DVMs] have them included these days) to do these tests. You will need electrical plug from the motronic brain located on top of the Battery. You need to do this as part of battery maintenance anyway. Once the brai will lose all stored faults, so this should be tested before disconnection.



All the connector numbers refer to the motronic connector above, unless specified other wise. This is done so that there is a common test conn following wires and connectors. This makes the test simple. If a test fails then you should test the interconnecting wires and connectors. It may l the procedure here does not check for shorts to the chassis, you should do these while flexing any and all wires from this connector to the item

CO2 Potentiometer (Pot)

Located on the left side of the fuse/relay box is this Pot, it has a slotted screw driver adjustment. This is a ten turn Pot meaning that the adjustm about 10 turns (complete revolutions) to go (travel) from one extreme to the other.
Measure the resistance from 31 to 25, this should be 1k ohms +/- 10% and is the value of the pots resistance.
Measure the resistance from 28 to 25 and is the slider to bottom resistance. Measure the resistance from 28 to 31 and is the slider to top resist the slider resistance should approximately add up to the value of the pots resistance. If either or both of the slider resistance is well above the p it is faults - get a new one.
If you record the slider resistances then you can always return to this setting. If the bike is running rich at idle then you may like to turn the adjus clockwise to try to lean the mixture off. But as you as testing the fuel injection system now then I would continue with the tests.

Air Temperature Sensor

Located somewhere in the inlet tract, this is a fragile component! This is a Negative Temperature Coefficient resistor. That means as the tempe resistors resistance falls.
Measure the resistance from 22 to 32. BMW say it measures 2k5 ohms at 20 degrees C. As your air temperature will not be 20 degrees your will be different, but should not be less than 10 ohms or more then 200k ohms.
The real test comes with the next sensor measurement, provided your water temperature is at ambient temperature (eg if you bike has not been hours).

Temperature Celisicus	Resistance; Ohms
0	5500
20	2500
40	1250
60	600
80	320
100	190

Water (Engine) Temperature Sensor

Located on the left side of the water inlet riser in a most difficult to get at location! This is a Negative Temperature Coefficient resistor. That me temperature rises the resistors resistance falls.
Measure the resistance from 32 to 21. BMW say it measures 2k5 ohms at 20 degrees C. As your water temperature will not be 20 degrees yc will be different, but should not be less than 10 ohms or more then 200k ohms.
Compare the measured valve of the Air sensor and the water sensor, they should be within 10% of each other provided the engine is 'cold'. If r them is faulty. To determine which one it is probably easiest to start the engine and get it a little warm then remeasure the water sensor s resista significantly reduced then the water temperature sensor is at fault.
I measured 2k66 for the air and 2k52 for the water, a difference of 6%. A mild warming of the engine decreased the water sensor reading to 1

Throttle Position Sensor (TPS)

Located on the left side at the end of the throttle body. This is two inter connected potentiometers.
Measure the resistance from 31 to 25. BMW say it measures between 500 and 1000 ohms, I get about 700ohms.
Measure the resistance from 31 to 13. BMW say it measures between 600 and 2400 ohms. Measure the resistance from 31 to 10. BMW say between 600 and 2400 ohms.

Throttle	Resistance	Resistance
Position	From 31 to 13	From 31 to 10
Idle	995	880
1/4	1610	1286
1/2	1594	1586
3/4	1579	1883
Full	1580	1742


The photos show the internals of the TPS. They show that the slider consist of 4 contacts, the upper pair are connected together, as are the lov tracks (the black carbon semi circles) are inter connected off to the TPS connectors. I measured the following values inside the TPS. The horiz the 071 is about 870 ohms. The top arc is about 10 ohms, the next one 800, the next 1000 and 20 ohms the lower track. Pin 2 of the TPS cor hand side of the middle 2 tracks by a 70 ohm resistance. Pin 3 of the TPS connects to the middle of the bottom track by a 400 ohm resistance
My comment: I think this unit has been constructed to ease the computations of the motronic unit in determining the fuels to inject and the ignitic a simple sensor would be worth the added computational complexity! the simpler sensor would be easier to test, cheaper and easier to replace a spare or obtain a replacement.

You can e-mail me at Yahoo.

Back to my home page Dated 20 March 2002.