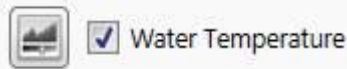



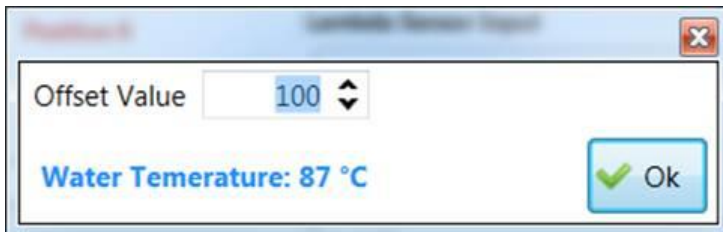
Water Temperature Sensor

Settings and Tuning




The water temperature sensor is used mainly for cold start compensation with fuel and spark timing graphs. There is however a couple of functions that requires compensation with temperature like idle control, accelerator pump, prime pulse etc. Neglecting to wire the sensor in may result in the engine not being drivable when it is cold. All fuel injected engines have water temperature sensors mounted in the thermostat housing area. Not all are compatible with the Spitronics ECU but there are aftermarket sensors that can be fitted. Spitronics ECU's use a 2K NTC (Negative Temperature Co efficient) resistor. It is the standard under water sensors for most engine manufacturers. It has a fixed calibration curve which is programmed in the firmware and it cannot be altered. It can however be slightly calibrated by giving it an offset percentage. The normal setting is 100%. Click on the

calibrate  button left of the Water sensor check box.



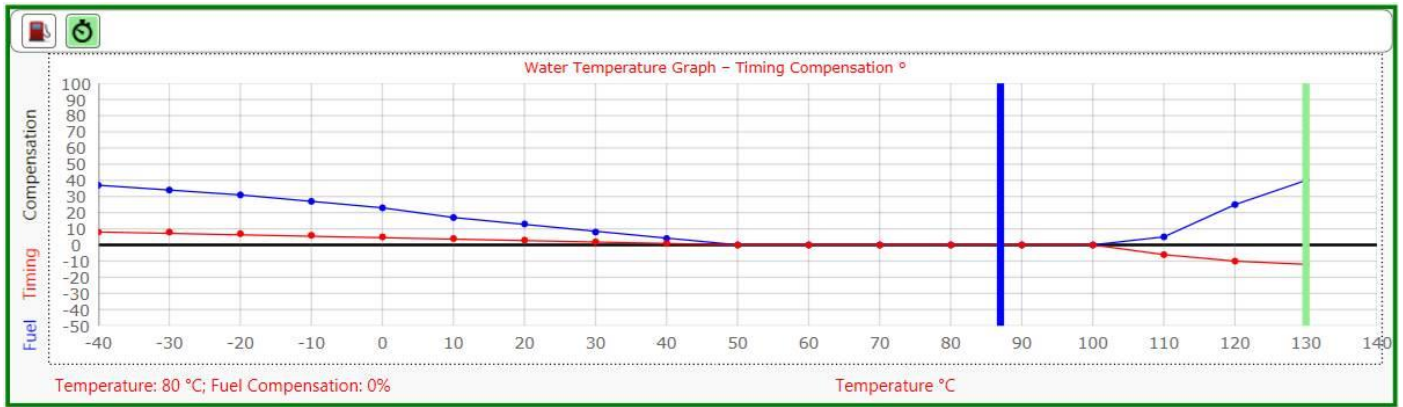
Reduce or increase the value to slightly shift the reading value. Do this at the critical temperature for instance where the fan must come on or off. If the error is too large you may need to replace it or get the correct sensor. These sensors are measured at 25°C with an ohm meter to see which type it is. If you have the wrong type you may need to change the sensor to a 2K sensor. Save to

ECU  button will make the changes permanent.

You may be required to do adjustment tuning in the winter and then in the summer. Remember to enable it on the active sensors page. When the engine is used in the winter, you may advance the timing slightly as the fuel burns at a slower rate. The fuel must be increased till the engine runs properly. Especially for racing fuel It may even require a richer mixture for these conditions. In the hot engine condition, you may retard the timing and increase the fuel. A richer mixture helps to cool the engine down. The thermostat controls maximum temperature so it may be difficult to tune. Nevertheless, put some extra fuel and less timing in the graph.

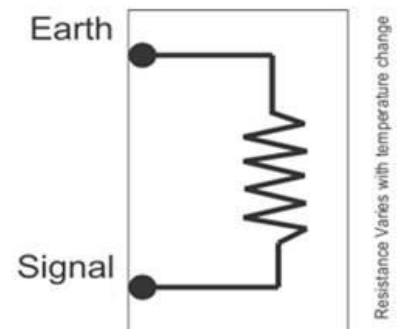
Water temperature correction can only be done in the morning when the engine is at its coldest. To set this graph, start with the example below. Now start the engine and let it idle. Adjust the AFR to be on the rich side. You may later have to tweak prime pulse, start enrichment and accelerator pumps to get a smooth pull off and start when cold.

Water Temperature Graph



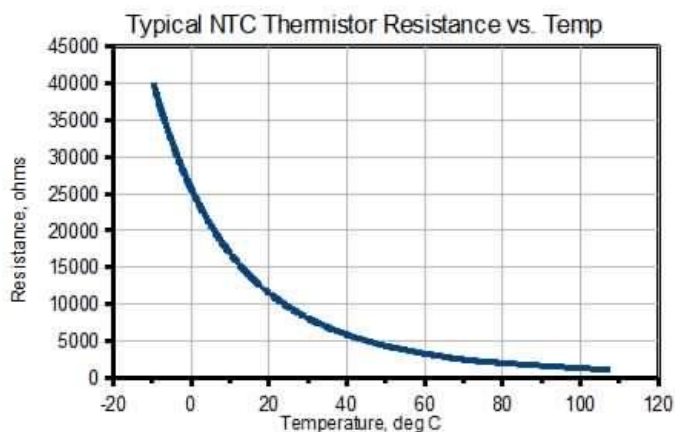
Sensor Description

The water temperature sensor is mostly used by the ECU for cold-start and run enrichment, engine over temperature limit and thermostatic radiator fan control. They come in different shapes and resistance values.



Operation

The resistance of the temperature sensor changes in relation to the temperature it senses. It has a negative temperature resistance co-efficiency (NTC). Each sensor has a preprogrammed curve to indicate its resistance to temperature. **Note:** The Spitronics ECU uses a 2K resistance NTC and this value is measured at 25°C. (See below a sample of such a curve.)



Electronics sensors

Spitronics build and supply small sensors for customers to build into their own units. There are 2 sizes but it does the same work. Note: These sensors require a pull-up resistor to let a constant current through them. (See below a picture of what these sensors look like in their raw form.)



How to measure a sensor

Use a multi-meter set to the 10,000 ohm (10 K) range. With the sender unit at approximately 25°C, measure the resistance. It should be between 1800ohm and 2200ohm at 25°C. Those two pins will be used for the ECU. The remaining two pins are normally used for the dash cluster and measure in the region of 3500ohm at 25°C. This same test can be done on engines with multiple sender units to determine which sender unit will be used for the ECU. Example: Toyota 1uz-fe, where there is three water temperature sender units.

Multiple Devices on One Sender Unit.

Do not share temperature sender units between two devices. Only one device may be coupled onto a sender unit at any one time. Both devices will excite the sensor with current which in turn will change the signal value and then both will display the wrong temperature. In such a case you may need to add an extra sensor for the Spitronics ECU. The only exception for this rule is when a data logging device is used that has no internal pull up resistor. Example: Race Technology DL1.

Sensor Location.

The ideal location for the temperature sender unit is on the engine side of the thermostat as this side will show the exact temperature at all times. The radiator side of the thermostat will show lower temperatures and take longer to react.

Air Cooled Engines

For air cooled engines it is better to measure cylinder head temperature for cold start compensation as the oil takes too long to pick up temperature. A simple cylinder head temperature sender unit can be made by clamping an NTC 2k ohm thermistor on a lug terminal and bolting it onto the cylinder head.