

Measuring Tyre Temperature and Pressure

Abstract

This application note describes how to interface and use Brightwater Technologies Ltd tyre pressure and Temperature sensors with a VBOXIII.

In order to collect this example data Brightwater Technologies tyre pressure and temperature sensors were fitted to the two front wheels of the test vehicle.

The central control unit for these sensors is then connected to the CAN/VCI input of a VBOXIII

Introduction

It is often useful for vehicle and tyre test engineers to be able to measure tyre pressure and temperature during testing.

A vehicle performing turning, braking and accelerating manoeuvres will cause changes in pressure and temperature within the tyre. This data will be of great interest during vehicle and tyre development.

This application note describes tests that were performed by a Racelogic representative engineer demonstrating the incorporation of the tyre temperature and pressure sensors to VBOX data.

Equipment

- 1 x VBOXIII – **VBOX GPS based datalogger**
- 1 x PC running VBOX software
- 1 x Cigar lighter adaptor (RLVBCAB10)
- 1 x GPS Magnetic Aerial (RLVBACS050)
- 1 x 32Mb Compact Flash (CF) Card (RLVBACS005)
- 2 x Automotive Pressure and Temperature Transmitters (VS50) supplied by Brightwater technologies.
- 1 x TMS AS receiver supplied by Brightwater technologies.
- 1 x Digital camera

The picture below shows one tyre and pressure sensor one receiver unit and the tools used during installation.



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Test Setup

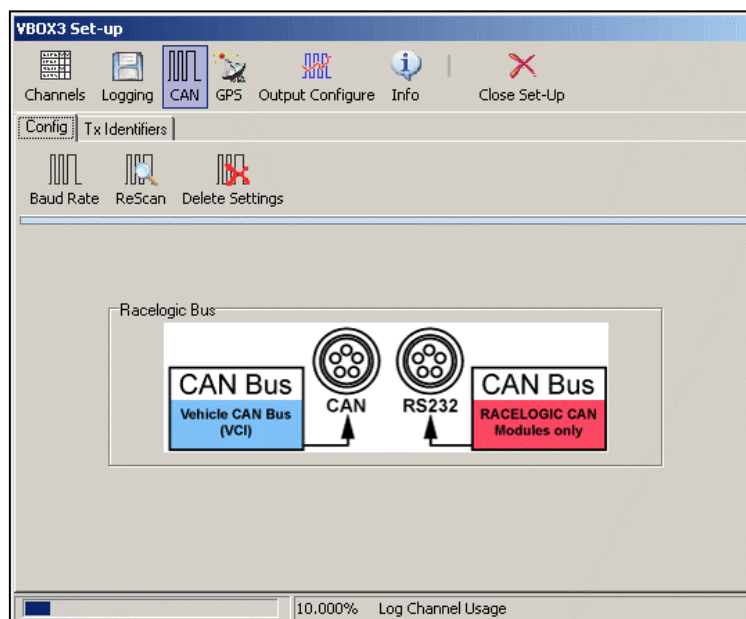
Sensor Setup

1. Each tyre pressure and temperature sensor was fitted on to the rim of the wheels to be used on the test vehicle.
2. The sensors replace the original valve on the rim of the wheel.
3. The tyre is then refitted
4. The sensors communicate with the receiver unit via an in-built RF telemetry link.
5. The Receiver unit then transmits the data from each sensor on CAN.



VBOX Setup

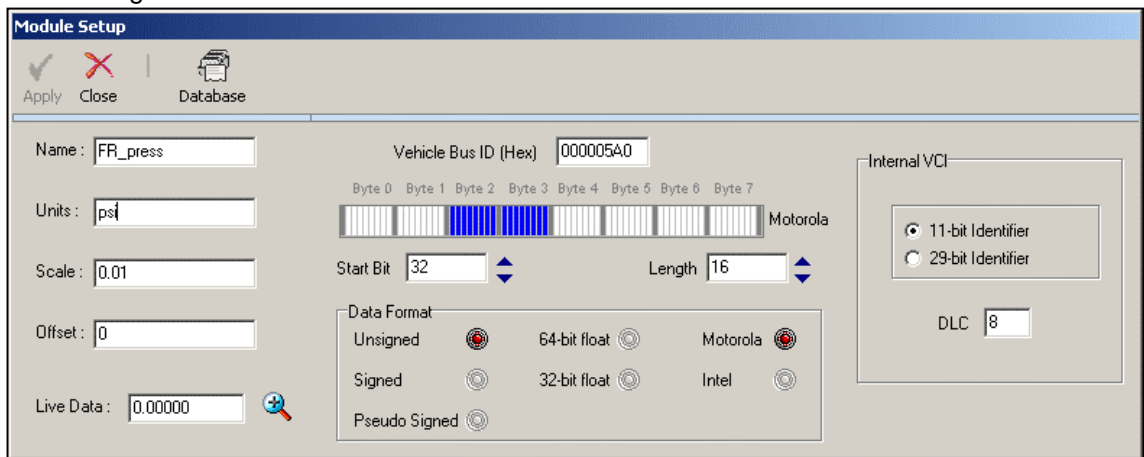
1. The VBOX was setup on the vehicle as for any vehicle test. This involved:
 - a. Placing the magnetic GPS aerial in the centre of the roof.
 - b. Placing VBOX in the passenger compartment and connecting it the cigar lighter socket via the power adaptor lead and connecting the GPS aerial to it.
2. The tyre pressure and temperature receiver unit is then connected to the CAN socket of the VBOXIII.
3. The VBOXIII is connected to a computer running the latest VBOX software. The VBOX setup is run and the VCI port is assigned to the CAN socket. Then quit out of VBOX setup to implement this change.



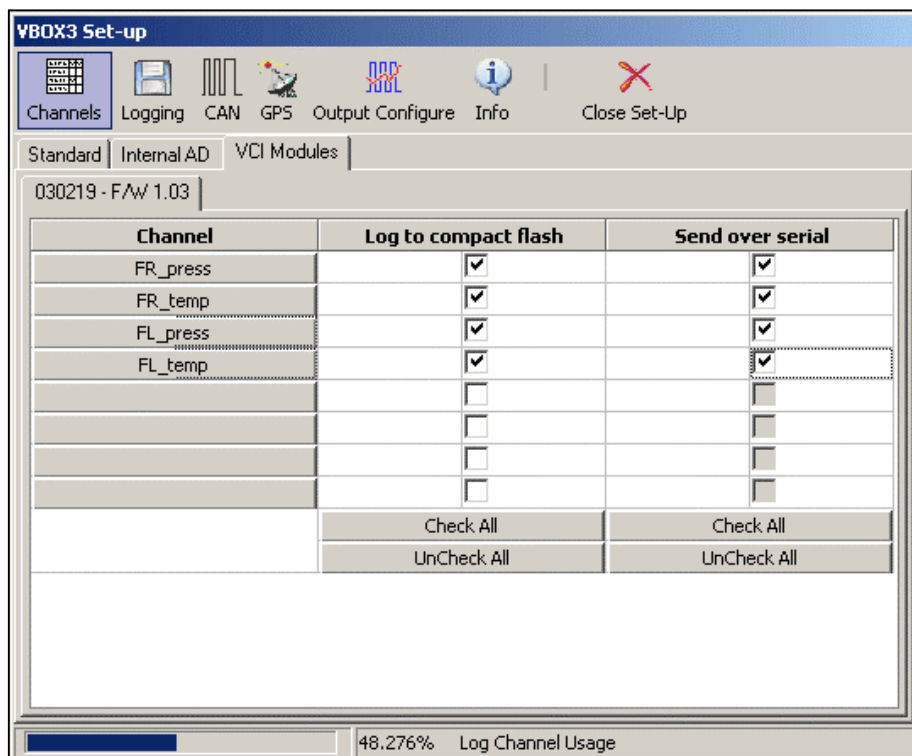
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- Go back into VBOX setup and then click on the 'VCI modules' tab. Because the tyre temperature and pressure signals are CAN based the signals from each wheel need to be individually assigned to a VCI channel in the VBOXIII. Each one of these VCI channels therefore needs to be configured. Brightwater Technologies supplies data that enables this. Racelogic are also able to supply a CAN database file that allows the channels to be loaded quickly and easily.

The screen shot below shows an example of the CAN settings for tyre pressure sensor in the front right wheel.



The following screen shot shows the four channels logged in this test, tyre temperature and pressure for the two front wheels. Each is enabled for logging and sending over the serial link.



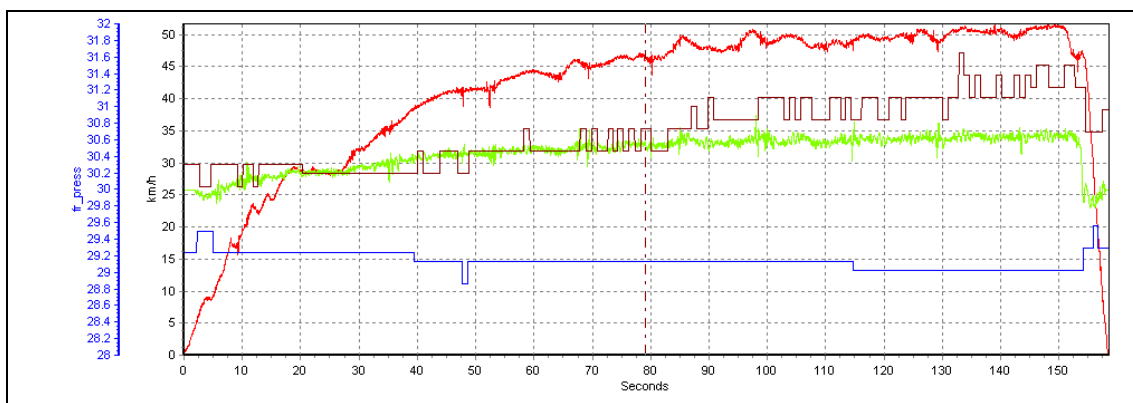
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Test Procedure

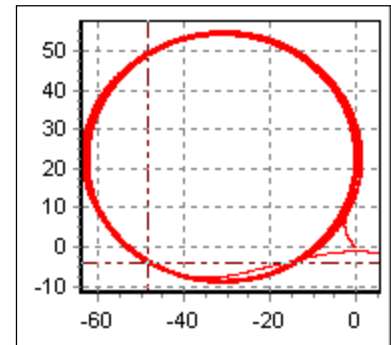
In this test the vehicle fitted with the sensors was driven around two different circuits over a short period of time to demonstrate the sensors.
 The first circuit was a circular track around which the vehicle was driven at an increasing speed.
 The second circuit was a short circuit with right and left corners.
 During each test the data was logged to a compact flash card.

Results

The logged tests are loaded into the VBOX software and then viewed in the Graph screen.



This first screen shot above is from an anti clockwise circular test of increasing speed. It can be seen from the plot that the Brown, front right wheel pressure increases as the lateral acceleration and speed increases. Simultaneously the front right tyre pressure goes down as the vehicle weight moves to the right hand side of the car.



The screen shot to the right shows the circuit plot of this circular test.

In the following screen shot the tyre temperature channels are shown. It can be seen that as the temperature of the loaded tyre on the right side of the car goes up the temperature on the unloaded tyre on the left side of the car goes down.

