FC-HAKO

Apexi PowerFC Compatible Tuning Hardware

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WBo2 Information Guide

v1.01 (21-Mar-2012)

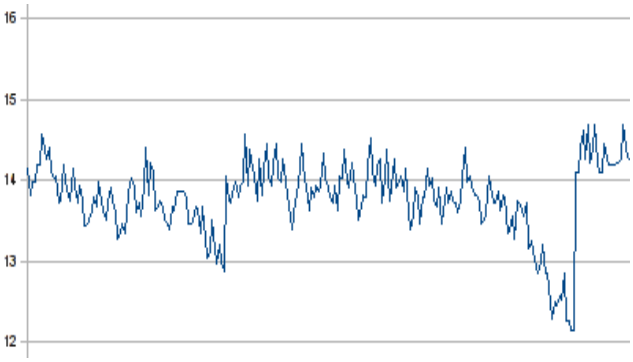
Introduction

FC-HAKO supports optional wideband controller (WBo2) input, converting the signal from analog to digital then sending it as a 8-bit value to the tuning software when requested. However, obtaining a good signal is critical in getting correct-as-possible air/fuel ratio (AFR) number. This document's purpose is to outline and recommend solutions in maximising the accuracy of AFR logging results.

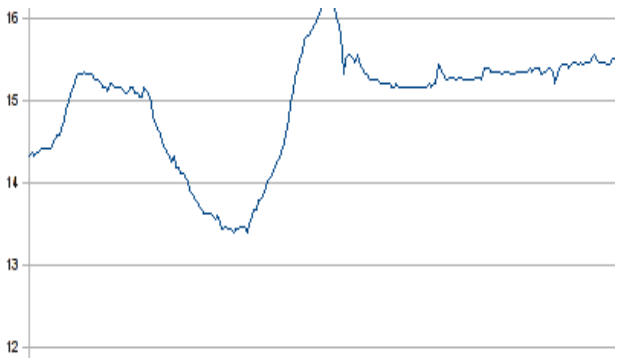
It is important to connect both **wideband controller linear outputs** to the correct pins of the **wideband logger linear input** (*FC-HAKO*) device. It is now strongly recommended to connect the FC-HAKO in **differential input logger** mode (*also informally known as AN1-AN2 delta mode*) as this has good noise and ground-offset rejection properties. In order to support this feature, FC-HAKO automatically switches to differential input mode when the voltage of **WBin(-)** (*yellow wire*) is measured to be less than 0.5 volts. This is a transparent feature meaning that regardless of tuning software that is used, the measured AFR value will be as best as possible.

The most important is to isolate the potential for ground-related issues. This could be poor soldering or path of wiring, which may have been damaged over time due to vibration, or quite possibly melted away.

The best way to confirm if WBo2 signal is problem-free is to graph AFR against time, both before and after logging. Here is proof in the form of a graph where there is noise in single-ended logger mode, compared to good signal in differential input logger mode, both unshielded wires. FC-HAKO hardware is used.



Graph 1: single-ended logger mode with noise



Graph 2: differential input mode, minor noise

Installation & Setup

FC-HAKO hardware revision II (*released 21 Mar 2012*) supports 4 analog inputs, which is suitable for two differential inputs (AN1-AN2, and AN3-AN4).

In order to support differential input mode, FC-HAKO and wideband controller must be connected exactly as intended, otherwise incorrect results will be obtained. The following table illustrates how to properly and correctly connect both devices:

WBo2 hardware	Wire name	Wire Colour		FC-HAKO	
Innovate MTX-L	analog signal 1	**YELLOW**	↔	**RED**	**$WB1_{IN}$ (+)** ("*AN1*")
	ground	**BLACK**	↔	**YELLOW**	**$WB1_{IN}$ (-)** ("*AN2*")
Innovate MTX-L	analog signal 1	**YELLOW**	↔	**BLUE**	**$WB2_{IN}$ (+)** ("*AN3*")
	ground	**BLACK**	↔	**GREEN**	**$WB2_{IN}$ (-)** ("*AN4*")
Innovate LC-1	analog signal 1	**YELLOW**	↔	**RED**	**$WB1_{IN}$ (+)** ("*AN1*")
	analog ground	**GREEN**	↔	**YELLOW**	**$WB1_{IN}$ (-)** ("*AN2*")
Innovate LM-1	analog signal 1	**pin 1 (tip)**	↔	**RED**	**$WB1_{IN}$ (+)** ("*AN1*")
	ground	**pin 3 (body)**	↔	**YELLOW**	**$WB1_{IN}$ (-)** ("*AN2*")
AEM UEGO	analog signal 1	**WHITE**	↔	**RED**	**$WB1_{IN}$ (+)** ("*AN1*")
	ground	**BLACK**	↔	**YELLOW**	**$WB1_{IN}$ (-)** ("*AN2*")
TechEdge 2J1	WBout (+)	**BLUE**	↔	**RED**	**$WB1_{IN}$ (+)** ("*AN1*")
	WBout (-)	**GREEN**	↔	**YELLOW**	**$WB1_{IN}$ (-)** ("*AN2*")

For some wideband controllers that have "analog signal 1" (WBo2) and "analog signal 2" (NBo2), do not connect both of these to FC-HAKO. Only one of these wires is required. The other should be ground, to **$WB1_{IN}$ (-)** ("*AN2*") or **$WB2_{IN}$ (-)** ("*AN4*") of FC-HAKO.

If you have an unlisted WBo2 controller and unsure how to connect it up to the FC-HAKO, please send an email to sales@fc-hako.com and David will assist.

Summary

- Connect in differential input mode only (*do not connect to BLACK wire*).
- Carefully determine which pins to connect as each differential output device is different!
- Graph AFR logs to verify if data is acceptable to use.
- If results are completely off, verify AFR-to-voltage curves on both controller and tuning software.
- If results is not acceptable, verify wiring as soldered wires may have become broken from vibration (*this did happen to my WBo2 controller to sensor wires!*).

Reference

- http://wbo2.com/2j/2j1.htm
- http://www.innovatemotorsports.com/resources/FCedit_tutorial.pdf