

FC-HAKO

Apexi PowerFC Compatible Tuning Hardware

WBo2 Information Guide

v1.04b (08-Dec-2015)

Introduction

FC-HAKO supports wideband controller (WBo2) input. However, obtaining a good signal is critical in getting correct-as-possible air/fuel ratio (AFR) number.

It is recommended that the wideband controller power and ground be connected as close as possible to the PowerFC ECU, preferably to the ECU harness within 30 cm (1 foot) of the ECU connector. This will reduce the possibility of "ground offset" and "ground noise".

Some wideband controllers do not internally connect "system ground" and "analog ground" (eg: AEM UEGO), so you will need to connect these two together, and only from there connect to FC-HAKO AN2 or AN4.

One of the WORST things to do is to ground most of your electronics to one place (i.e. the engine block), but ground one device somewhere else (eg: chassis). Not only can this result in ground offsets, it can also create a "path of least resistance" for high currents THROUGH a low-current device. This can also result in melted wires when starter currents flow through the gauges.

Installation & Setup

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 (6-wire version)	analog signal 2	BROWN	↔	RED	WB1 _{IN} (+) ("AN1")
	system ground	WHITE	↔	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")

Software Voltage-AFR conversion settings

The following is a list of known default AFR-Voltage conversion values, to be used by tuning software. If possible (eg: Innovate), alter the default values to have lowest multiplier for volts->AFR, eg: Powerdex values is a good option to reduce influence of noise/offset.

WBo2	AFR-Volts (min)		AFR-Volts (max)		AFR Equation
Innovate LC-1	7.35 AFR	0V	22.39 AFR	5V	$AFR = (V*3) + 7.35$
HKS / MoTeC	8 AFR	0.5V	20 AFR	4.5V	$AFR = (V*3) + 6.5$
AEM UEGO gauge	10 AFR	0V	20 AFR	5V	$AFR = (V*2) + 10$
Neko / SARD / PLX	10 AFR	0V	20 AFR	5V	$AFR = (V*2) + 10$
Powerdex AF	9 AFR	0V	16 AFR	5V	$AFR = (V*1.4) + 9$
TechEdge 2J1	9 AFR	0V	19 AFR	5V	$AFR = (V*2) + 9$

Tuning

For tuning information, please refer to <http://fc-hako.com/pfc/tuning-guide/>

Tuning should only be performed once AFR readings are within acceptable limits (+/- 0.2), with minimal noise and offset.

If offset does occur, please compensate this in either the software voltage-AFR conversion settings, or remember to remove or add 0.2 AFR to all readings.

Running slightly richer is safer than running too lean. Obtaining AFR accuracy to within 0.2 AFR is acceptable, as AFRs do change indirectly due to air temperature, humidity and barometric air pressure.

Questions

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

Reference

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