

Technical

Introduction

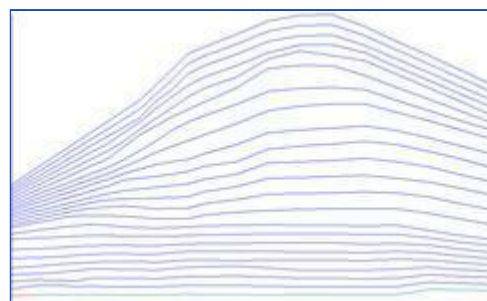
FC-HAKO is designed to work with official Apexi and third party software with the help of baud-rate detection implemented in hardware. This allows flexibility to use software that works best by the user, so you are not locked in to specific software. Also, **FC-HAKO** supports analog inputs with software that uses it (see [compatibility guide](#)). So if you need to perform logging with external analog inputs (wideband O2 controller and MAP sensor), **FC-HAKO** allows you to do this.

FC-HAKO works with legacy and universal Power FC communications protocol. This is done through auto-detection of the protocol, all transparently to the user. So there is no need to know whether you have an older or newer PowerFC (eg: Nissan Skyline RB25 vs ECR33), or a PowerFC which communicates only with the older protocol (eg: Toyota Supra JZA70 or Toyota MR2 SW20). This is the most common problem when it comes to hand controller incompatibility issues. **FC-HAKO** does away with that problem for the user.

FC-HAKO is perfect if you want to check the tune made by your tuner. Nearly all people assume that the tuner does a very good job, but its far from the truth. Yes, peak power may be tuned to the correct AFR, but there could be one particular point (load and RPM) where it feels like a flat spot. Or there may have been a mistake or two in the injection part of the map where interpolation was not correctly performed.

If you are looking for target AFR tables, here are some real examples:

- [Toyota 1JZ-GTE 370cc](#)
- [Toyota 2JZ-GTE 1000cc](#)
- [Nissan RB26DETT 720cc](#)
- [Nissan RB30DET 800cc](#)
- [Mitsubishi EVO 9 4G63](#)



FC-HAKO: Wideband controller input

The **FC-HAKO** features differential input logging for O2 wideband feedback for tuning purposes on supported software.

To connect up the wideband o2 controller to the FC-HAKO, the following table provides examples.

Alternatively, please download the [PDF document](#) for more information.

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")
TechEdge 2J1	WBout (+)	BLUE	↔	RED	WB1 _{IN} (+) ("AN1")
	WBout (-)	GREEN	↔	YELLOW	WB1 _{IN} (-) ("AN2")

FC-HAKO hardware revision II

Since 21 Mar 2012, there is now a new minor hardware revision of FC-HAKO. The main additions are:

- 4 analog inputs, suitable for 2 individual differential inputs (AN1-AN2 and AN3-AN4).
- automatic pulldown to zero volts if no external analog signal connected.
- internal LED for PowerFC communications, to visibly see activity of communications between FC-HAKO and PowerFC.

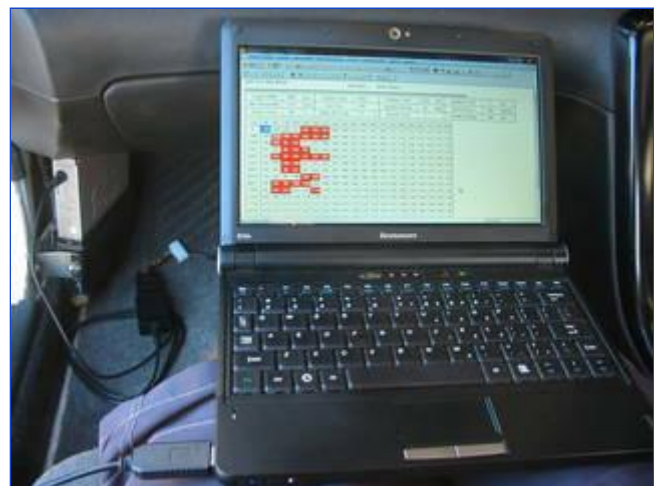
Software compatibility guide

FC-HAKO has been tested on the following operating systems:

- Windows 10 64-bit
- Windows 7 32-bit and 64-bit
- Windows XP Pro and Home

FC-HAKO has been designed to work with as many different tuning software as possible, including support of analog inputs.

Software	PFC (old)	PFC (new)	ADC supp
Copilot	YES*2	YES*2	YES
FC-Pro (JP)*1	YES	YES	YES
FC-Pro (US)*1	YES	YES	YES
FC-Edit	YES	YES	YES
PFCProbe (testing)	YES	YES	NO
PFCPing (testing)	YES	YES	NO



*1 - not FCC-Pro (not consumer version).

*2 - only those in the supported list of models. (1ZZ-FE and 2ZZ-GE, 3S-GTE and 3S-GE, 2JZ-GTE1 and 1JZGT3PRO, EJ20K and EJ207, RB25DET, RB26DETT and RB261PRO and RB26_2-D, 1JZ-GTE (JZX100), 3S-GT1PRO, SR20DET1, 4G63)

We do not provide support for the software so it is best to refer to enthusiast forums for more information:

* [Copilot](#) on mr2spyder.net

* [FC-Edit](#) on newcelica.org

PowerFC compatibility guide

FC-HAKO will work with all PowerFC made after August 1996, including those made by AP Engineering.

The following PowerFCs is NOT supported by FC-HAKO:

- Nissan SR201, date 9608, firmware 1.70B
- Nissan RB26, date 96??, firmware 3.11

Make	Model	Engine	Product code	PFC model
Honda	Civic (EG6,EG9)	B16A	4E14H01Y 4E14H01Z	B16A B16A2 B16A1PRO B16A2PRO D16A2 D16Y8
	Civic Type-R (EK9)	B16B	414-H001 414BH003 414-H006	B16B AH01 AH03 AH03T B16B1PRO B16B2PRO
	Integra Type-R (DC2)	B18C	414-H002 414BH004 414-H007	B18C B18C1 AH02 AH04 AH04T
Mazda	RX-7 (FCS3)	13B-T	4E14Z02Z	13BT1PRO
	RX-7 (FDS3 I-III)	13B-REW	414-Z002 414BZ004	FD3S2 FD3S4 13BR1PRO 13BR2PRO 13BR3PRO
	RX-7 (FDS3 IV)	13B-REW	414-Z001 414BZ005	FD3S FD3S5
	RX-7 (FDS3 V)	13B-REW	414-Z003 414BZ006	FD3S3 FD3S6
Mitsubishi	Evo 5 (CP9A)	4G63	414BM002 414BM005	CP9A5 EVO5D
	Evo 6 (CT9A)	4G63	414BM001 414BM004	CP9A6 EVO6D
	Evo 7 (CT9A)	4G63	414BM007 414BM008	CP9A7 EVO7D
	Evo 8 (CT9A)	4G63	414KM907 414KM908	CP9A8 EVO8D
Nissan	Pulsar GTi-R (RNN14)	SR20DET	4E14N03Z	RNN14
Nissan	Silvia S13	CA18DET	4E14N02Z	CA18DET1 CA181PRO
	Silvia S13	SR20DE	4E14N03Y 4E14N04Z 4E14N05Z 4E14N05Y	SR20DE1 HP10
	Silvia S13 (PS13)	SR20DET	414-N003 414BN014	SR202R SR2014 SR20DET2
	180SX (RPS13)	SR20DET	414-N004 414BN015 414-N006 414BN017 414BN020	SR202 SR20T2-D SR202PRO SR202R SR204 SR204PRO SR2014 SR2015 SR2017 SR2D21 SR2D23 SR20DET2 SR20DET4

414BN021
414BN023

	Silvia (S14)	SR20DET	414-N002 414-N013 414-N005 414BN016 414-N019 414BN030 414BN031	SR201 SR20T1-D SR201PRO SR203 SR203PRO S141 SR2016 SR2D19 SR20DET1 SR20DET3
	Silvia (S15)	SR20DET	414-N009 414BN018 414BN024	SR205 SR205PRO SR20T5-D SR2018 SR2D24 SR20DET5
Nissan	Skyline R32 GTR (BNR32)	RB26DETT	414-N001 414BN029 414BN026	RB26 RB26DETT RB261PRO RB262PRO RB26PRO1 RB26PRO2 GTR33D
	Skyline R33 GTR (BCNR33)	RB26DETT	414-N011 414BN029 414BN026	GTR33 GTR33L GTR33D
	Skyline R34 GTR (BNR34)	RB26DETT	414-N010 414BN028 414BN025	BNR34 BNR34L BNR34D
Nissan	Skyline R32 GTS-T (HCR32)	RB20DET	4E14N07Z	RB20DET1 RB201PRO
	Skyline R33 GTS-T (ECR33)	RB25DET	414-N007 414-N012 414BN032 4E14BN32	RB25DET1 RB25DET2 RB251PRO RB252PRO ECR33 ECR33L ECR33D
	Skyline R34 GTS-T (ER34)	RB25DET	414-N008 414BN033 4E14BN33	ER34 ER34L ER34D
Subaru	Legacy (BG5)	EJ20R	4E14F02Z	BG5
	WRX ver 1,2 (GC8/GF8 A-C)	EJ20G	414BF001	GC8A EJ20GPRO
	WRX ver 5,6 (GC8/GF8 F-G)	EJ207	414BF003	GC8F EJ207PRO
	WRX ver 3,4 (GC8/GF8 D-E)	EJ20K	414-F002 414BF005	GC8D GC8DL EJ20KPRO
Toyota	Altezza (SXE10)	3S-GE	414BT013 414BT006 414BT014 414BT010	SX10A SXE10 SX10TA SXE10T 3SGE1PRO
	Celica (ST205)	3S-GTE	4E14T02Z	3S-GTE1 3SGT1PRO
	Celica (ZZT231)	2ZZ-GE	414BT007	ZT231
	Chaser (JZX90)	1JZ-GTE	4E14T05Z	1JZ-GTE2 1JGT2PRO
	Chaser (JZX100)	1JZ-GTE	414BT009 414-T003 414BT011 4E14BT17	J100A JX100 J100M 1JZGT-AT
	Levin (AE86)	4A-GE	4E14T01Z	4A-GE2 4AGE1PRO 4AGE2PRO 4AGE3PRO

MR2 Gen II (SW20)	3S-GTE	414BT001	SW20 3S-GTE2 3S-GTE3 3SGT3PRO
MR2 Gen III (SW20)	3S-GTE	414BT001	SW20 3S-GTE
MR-S (ZW30)	1ZZ-FE	414BT008 414BT012	ZW30 ZW30T
Soarer (JZZ30)	1JZ-GTE	4E14T05Z	1JZ-GTE2 1JGT2PRO
Soarer VVTi (JZZ30)	1JZ-GTE	4E14T03Z	JZZ30 VVTi
Starlet (EP82,EP91)	4E-FTE	4E14T01W 4E14T01X 4E14T01Y	4E-FTE1 4EFT1PRO 4EFT2PRO
Supra MKIII (JZA70)	1JZ-GTE	4E14T05Y	1JZ-GTE3 1JGT3PRO
Supra MKIV non-VVTi (JZA80)	2JZ-GTE	4E14T05X	2JZ-GTE1 2JGT1PRO 2JGT2PRO

NOTE: 4E14 product code or PRO variant represents APEngineering.

NOTE: 414B product code represents currently-produced PowerFC.