HP8440 Power Box

The Intelligent Power Distribution Module

Installation and User Guide for PCM Version 9.02

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1 Introduction

The Power Control Module is an innovative, intelligent and programmable module that replaces relays and circuit breakers, simplifies wiring harnesses and provides diagnostic capabilities.
The PCM is ultra-compact (197 x 107 x 46 mm including the Autosport connectors) and lightweight (only 710 grams), providing an effective and inspired alternative to conventional relays, circuit breakers, fuses and wires that can so often be a tangle of complexity and untidiness around a typical racing car's power junction box.
The PCM exchanges data with other modules in the car primarily via CAN. It can be controlled entirely by CAN or by combining any of the 32 CAN channels and additional 11 digital input switches. By using CAN channels to activate inputs in the PCM as few as two wires could control the switching of the system's 34 outputs.
Its CAN communication is highly user-defined, allowing an optimum integration with other modules in the car - for example the engine management system, our switch panel, CAN expansion modules, dashboard (to display error messages and status) and data logging system.
20 virtual input channels based on any combination of conventional inputs, CAN channels or outputs are also available, used to create logic links.

18 high power channels are available, each offering maximum peak current in excess of 35-65 amps and individual adjustable peak current time of up to 10 seconds.

Please note that the current draw per channel is limited by the connector - not by the driver stages. Each driver stage can handle in excess of 35-65 amps continuously.
We have rated the individual channel's current draw in relation to the connector manufacturer's specifications**.**

Additionally, 16 low power channels are available for secondary power supply.
Channel names, types of activation (latching or momentary, pulse, low or high frequency pulse width modulation), switch configuration and current trip values (in 0.1 amp steps) are user-configurable.
In its basic configuration the PCM is programmed to shut down overloaded channels. It is, however, possible to override this function and to program the module to reset automatically a number of times within a programmable time interval.
A manual reset function of all overloaded channels is also available.
The current draw status (in steps of 0.1 Amp) for the module and diagnostics for each channel can be logged and controlled via CAN. In addition, the power consumption of each high power channel can be monitored and exported via CAN to the vehicle's data logging system.

The PCM's programmability enables not only channel cut at specific currents, but also, for example, high initial peak current draw followed by a decrease to a lower, steady threshold level. So, something like an assisted gearshift compressor with a high startup current can be catered for without simply fitting a high rated fuse or circuit breaker.
The PCM's intelligence also enables the user to deactivate non-essential channels in the case of low battery voltage and it has a dedicated engine start feature.

Please note that the PCM is not intended to be used to control safety-critical systems on a vehicle, such as ABS braking, power steering, etc.
HP ELECTRONIK. Shall not be responsible for any incidental or consequential damages or injuries that may occur if the unit is used to control these, or similar, safety-critical systems.

2 Hardware

The PCM enclosure is CNC machined to the highest standards.
The two parts of the casing are sealed by an O-ring, located in a recess in the lower half. A lip in the upper casing presses on the O-ring and assures a water tight sealing. O-rings are also used around each of the four connectors and the tapped holes for the connector mountings are not drilled through the casing.

Connector 1 is a Deutsch Ltd. Autosport Heavy Duty single pin connector, type ASHD0 14-1 PN. This is a specially developed connector, designed to conduct very high currents with very low losses and to withstand very high temperatures.
The mating connector on the wiring loom must be ASHD614-1SN-C35.

Connector 2 is a Deutsch Autosport Ltd. connector, type AS0 14-97 SN. This connector has four size AWG 16 socket contacts and eight size AWG 20 socket contacts.
Deutsch Ltd. rates the AWG 16 contacts at 20 Amps and the AWG 20 contacts at 7.5 Amps.
The PCM uses each of the AWG 16 contacts for a single output driver. Four of the AWG 20 contacts are connected as two pairs, each pair connected to one output driver. In this way some channels can be rated at 15 Amps.
The mating connector on the wiring loom must be AS614-97PN – (Red Ring).

Connector 3 is a Deutsch Autosport Ltd. connector, type AS0 14-97 SA. It has a different keyway as used in connector 2, preventing incorrectly connections.
This connector has four size AWG 16 socket contacts and eight size AWG 20 socket contacts.
Deutsch Ltd. rates the AWG 16 contacts at 20 Amps and the AWG 20 contacts at 7.5 Amps.
The PCM uses each of the AWG 16 contacts for a single output driver. Four of the AWG 20 contacts are connected as two pairs, each pair connected to one output driver. In this way some channels can be rated at 15 Amps.
Two contacts (pin F and pin H) are Power Ground connections and must be connected to earth.
The mating connector on the wiring loom must be AS614-97PA – (Yellow Ring).

Connector 4 is a Deutsch Ltd. Autosport connector, type AS0 14-35 SN. This connector has 37 size AWG 22 contacts and is used for the low power output channels, for the conventional input switches, and for USB and CAN communication.
Deutsch Ltd. rates the AWG 22 contacts at 5 Amps.
The mating connector on the wiring loom must be AS614-35 PN.

Regarding Tools for the connectors – please download the Technical Brochure from Deutsch –
It can be found on www.hpelec.dk . Download section.

Please note, the current values written in this manual is based on our and our clients experience of the current draw in practical, we have much higher load on cables and connectors than the technical brochure advices, without any problems at all. It is of course important that loom and connectors is kept in good conditions to be able to make higher current draw.

3 Software installation

The software can be installed either from a software CD, provided with the PCM or downloaded from our web site – www.hpelec.dk

3.1 Software installing from a CD

Ask us for a CD Rom – Normally all files is to find on our website

3.2 Software installation from web-download

It is possible to download the PCM software from our web site. Go to www.hpelec.dk
Please select the Download tab.

When you have downloaded the PCM software, open the folder where you saved the file and double click on the installation file.

PC Software and Firmware Releases
For feature updates, please visit the site to get the latest information.

3.3 Connection to system

Communication with the PCM is established using a conventional USB cable. No dongle or interface Is required.

HP ELECTRONIK or your wiring loom manufacturer can provide you with the cable suitable for your installation and selected connectors.
First time you plug your cable in, Windows will install some drivers. Wait until you see that drivers are installed. After this, click CONNECTION in the main menu, click the proposed USB connection in the communication window and then click OK.
This procedure is done for each new PCM you connect to and for each USB port used. Once installed, the definitions are stored on your PC and used next time you connect to a particular PCM.

The software opens in the GENERAL section.

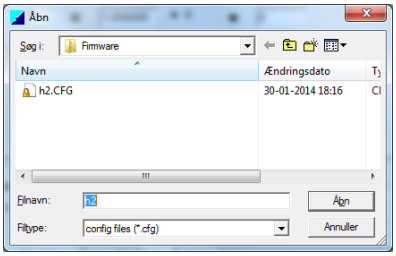
If you disconnect from the system, communication will be re-established when you plug the cable in again.

4 Main Menu

The software main menu has 4 sections:

4.1 File

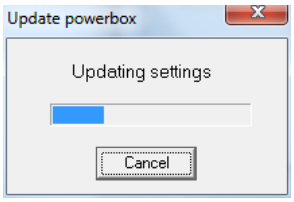
You can open an existing configuration file by clicking on FILE and then select OPEN.



Files are located in this folder: c:\program files\HPELEC\powerbox

You can save a configuration file on your PC by clicking on FILE, then SAVE. Now select the folder where you want to save the file (by default c:\program files\HPELEC\powerbox), type a file name and click OK.

You can read the PCM configuration file by clicking on READ or by pressing F8.



You can send a new configuration from your laptop to the PCM by clicking on UPLOAD or by pressing F9.

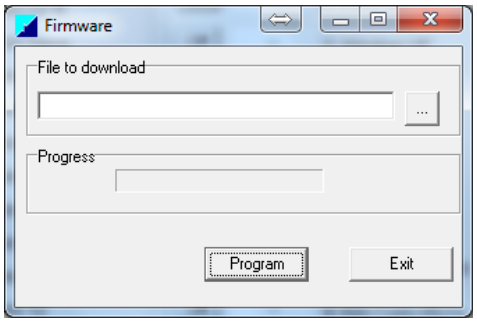
You can discard all changes and revert to the PCM default configuration file by clicking on DEFAULT SETTINGS.

4.2 Connection

Click here to establish a link between your PC and the PCM.
When connected, the PCM configuration file is loaded and displays the PCM status in real time in the General tab.
The PCM's configuration file will be loaded automatically when you establish communication.

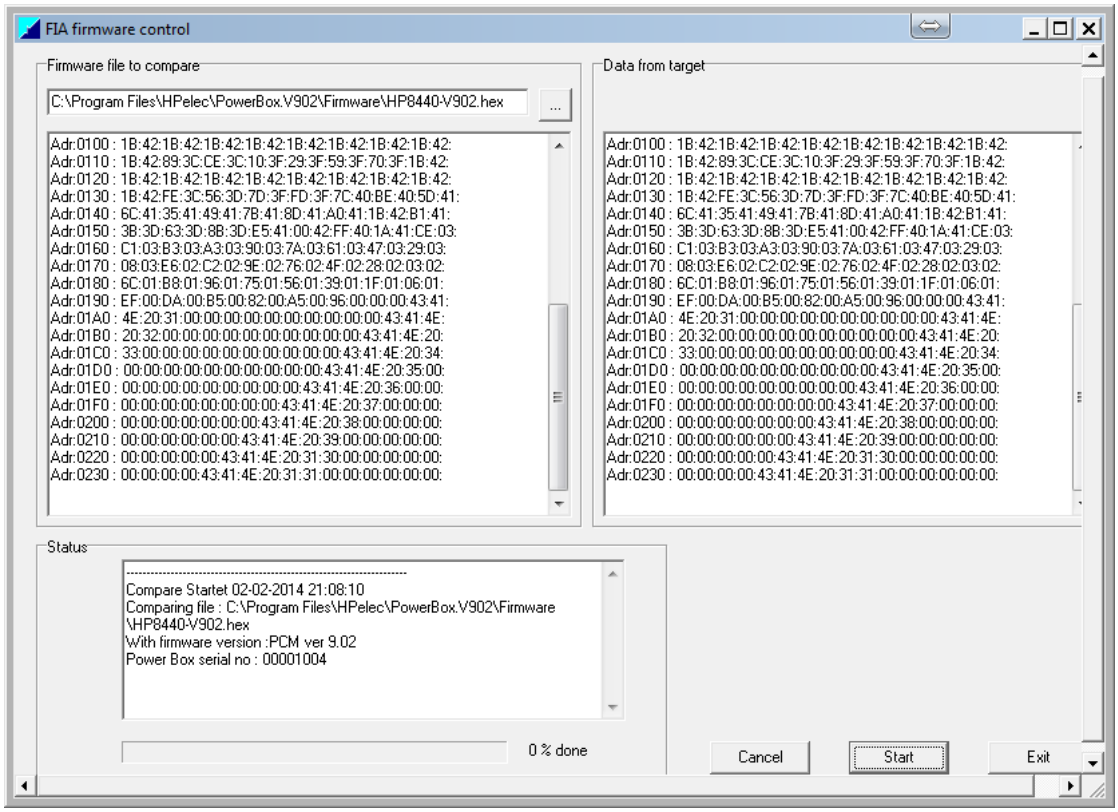
4.3 Tools - Firmware

Use this option only when you want to update the PCM firmware.
If no connection to the PCM is established, a warning message will appear.
Connect to the PCM.
A window called FIRMWARE opens. If the correct firmware file name is not displayed in the "File to Download" window, click the button on the right of this window.
Browse for the correct file.
When the selected firmware is displayed, click "Program".
Switch the PCM OFF, then ON to send the firmware.
Once the firmware is sent, reset the module by switching power off for some seconds and then switch it on again.



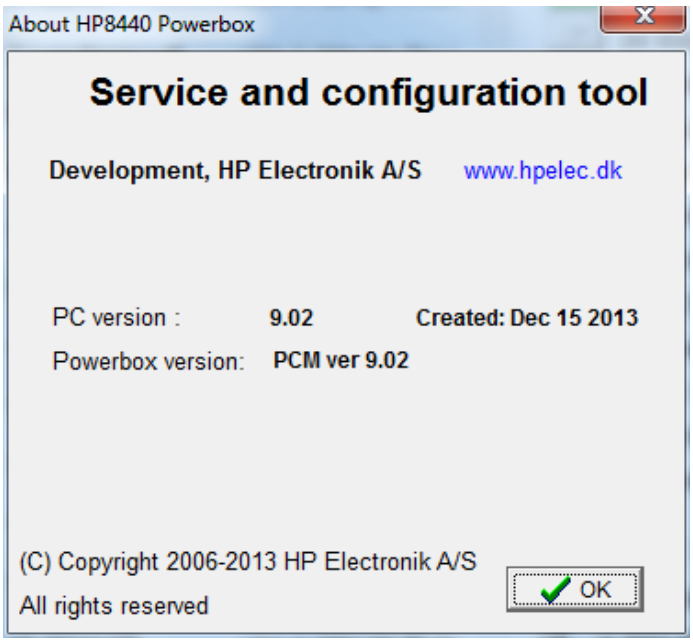
4.4 Tools - FIA

The Power Control Module is homologated by FIA for use in touring cars.
This section is for use by FIA scrutineers to verify the legality of the PCM firmware.



4.5 Help

Click HELP, then ABOUT to see the PC software version in use and to see which firmware is currently loaded into the PCM.

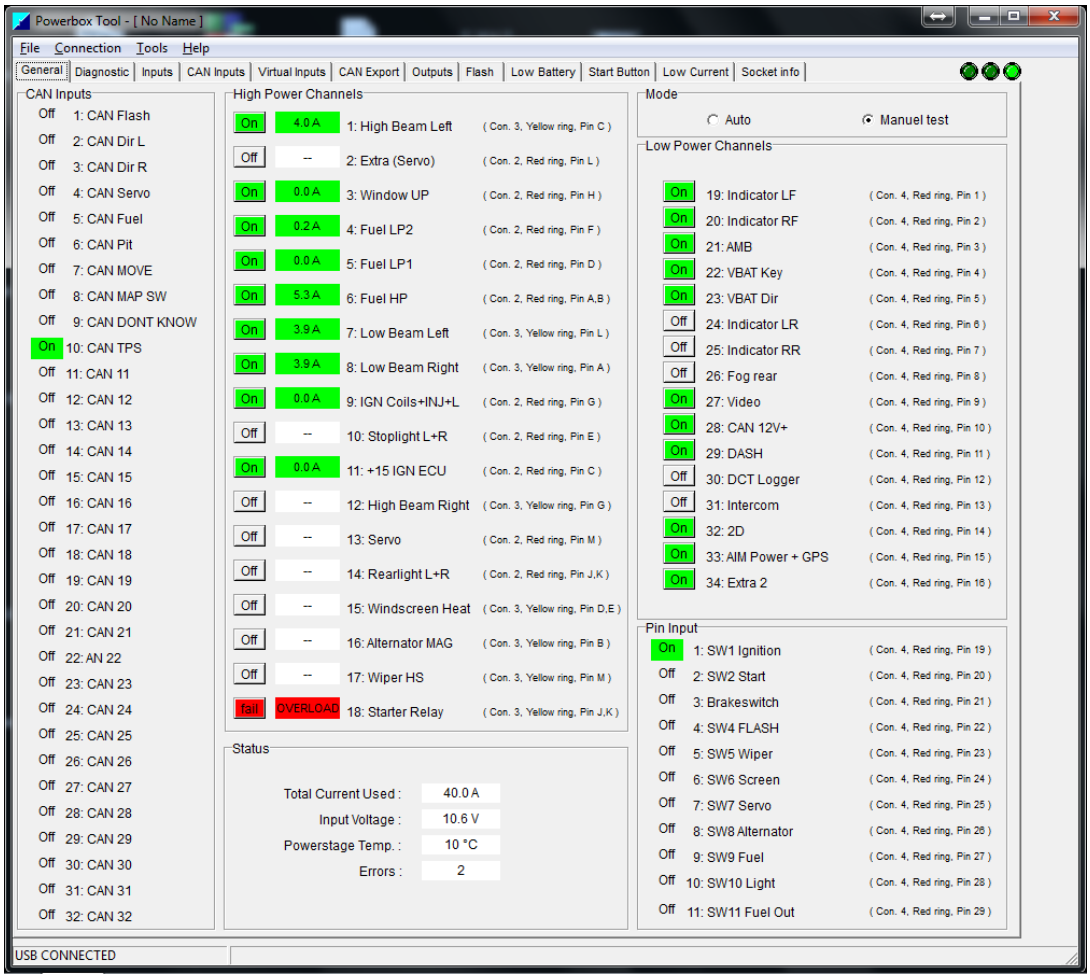


5 General

Connecting to the PCM when it is switched ON, the software reads the configuration file from the PCM and displays data in the General tab in real time.

The left section displays an overview of configured input channels and the status of the output channels. When a switch is ON, the window displays ON in a green window for each switch.

The center section shows the status of the high power channels.
If a channel is switched ON, the button color changes to green and displays ON.
The window to the right of the button displays the current draw for each channel in real time if switched ON.
The system checks for overload and short circuitry. Color coding is used to show the individual channel status:



- The channel status button and current draw window color is green for active, non-faulty channels.
- The channel status button and current draw window color changes to yellow if the system has detected an error since the last reset of the diagnostics.
- The channel status button and current draw window color is red if a fault is detected and still present. The button will display FAIL and the window displays for example SHORT.

The right section shows the status of the low power channels.
- The channel status button color is green for active, non-faulty channels.
- The channel status button color is red if a fault is detected and still present. The button will display FAIL.

The “Auto” setting displays status of the system switches. Switching to “Manual” overrides external or CAN switches. Manual mode allows togging channels on/off using the button to the left of the channel name window.

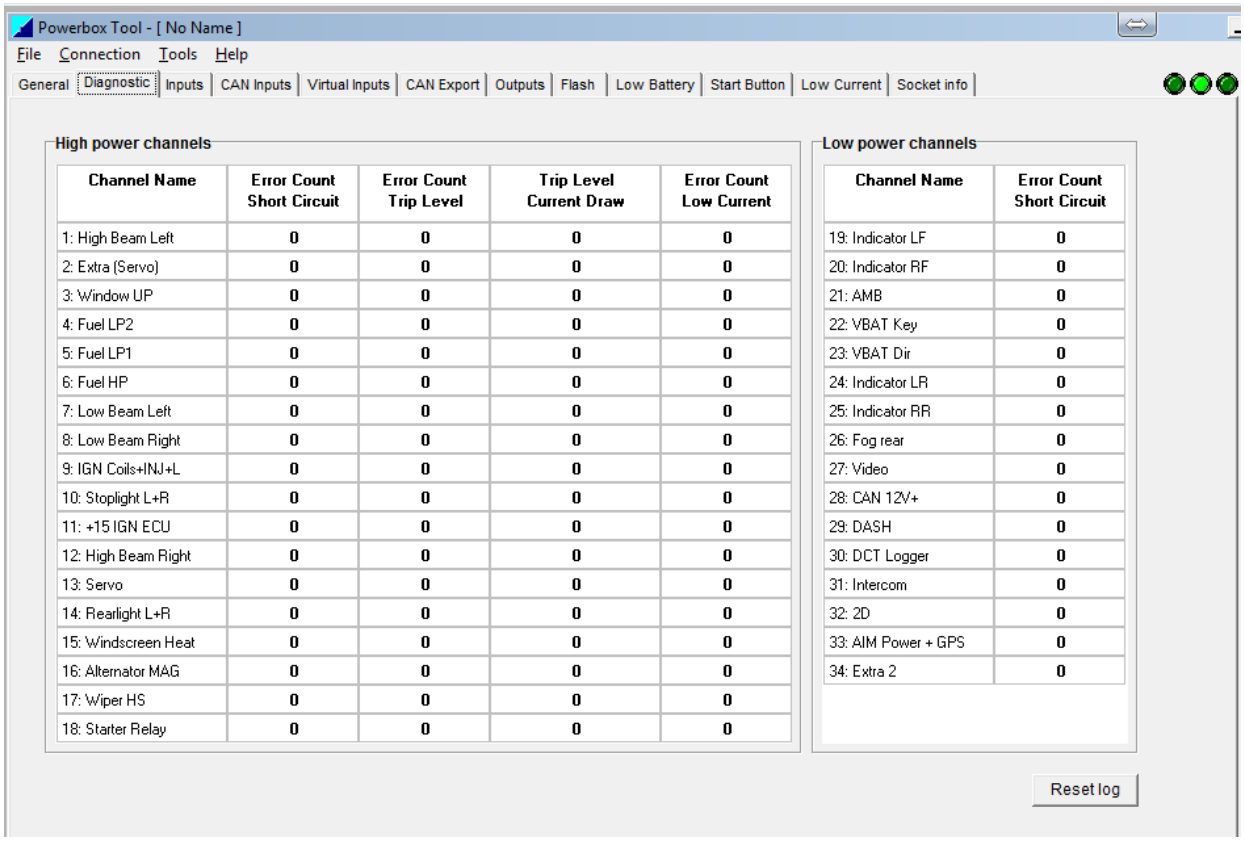
If you disconnect from one PCM and then re-connect to another module, the screen is cleared automatically and re-loaded once connection is established to the next PCM.

The Status window in the lower right corner of the General tab displays vital PCM information in real time:
- Total current draw
- Battery voltage
- Actual temperature of the driver stages
- Number of recorded errors

A status bar with 3 green LED’s is located in the upper right-hand corner of the screen and displays the PCM’s connection status.

6 Diagnostic

Click the Diagnostic tab to see the channels status, fault code and max recorded current.



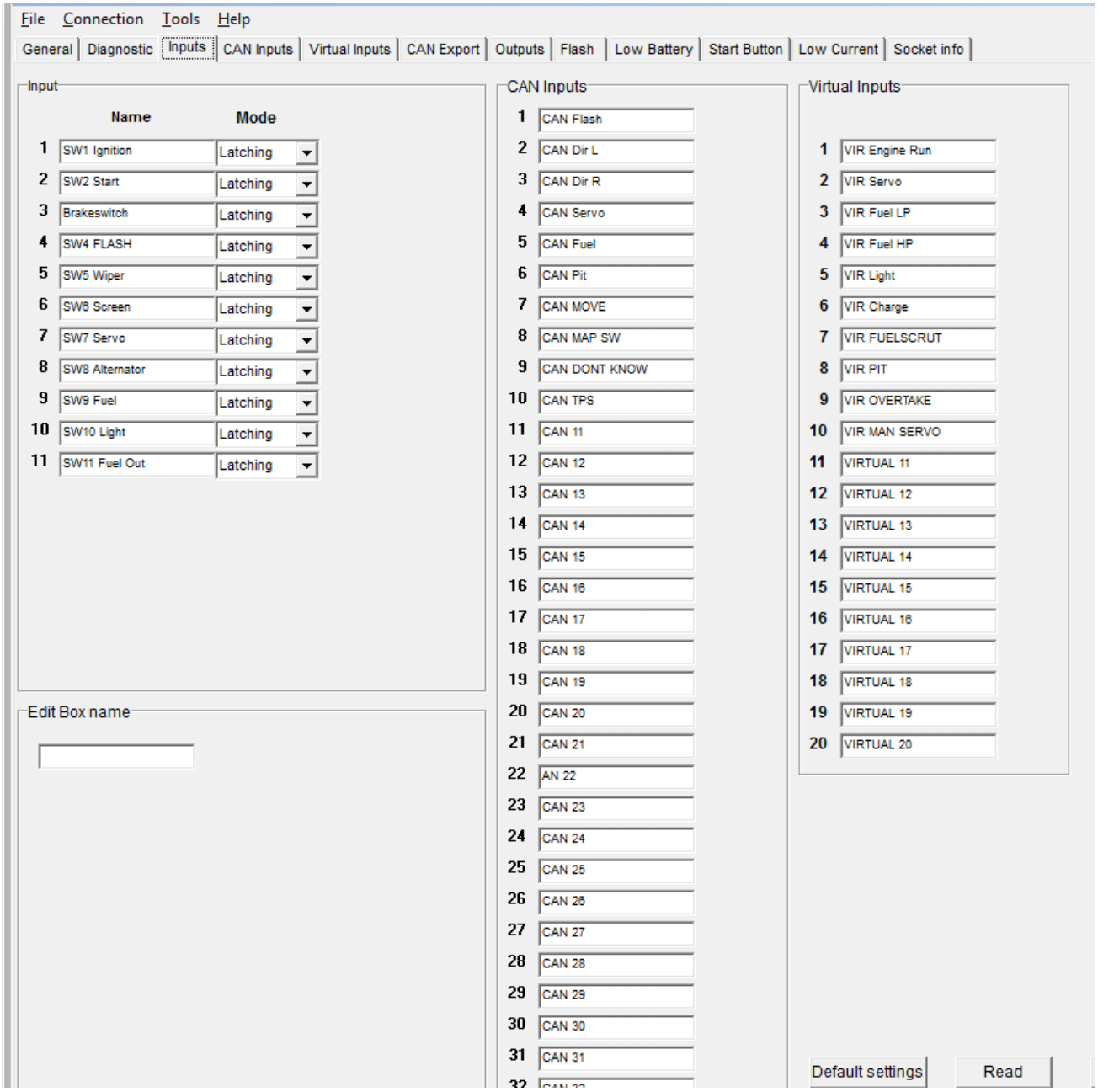
The diagnostic screen is divided into two windows, one for the high power channels and one for the low power channels.

- The first column in the high power window displays the channel name.
- Second column, “Error Count Short Circuit”, displays the number of times the channel has been short circuited to ground.
- Third column, “Error Count Trip Level”, displays the number of times the current draw has exceeded the trip level entered for that particular channel. The error count is activated AFTER the set peak time has expired.
- Fourth column, “Trip Level Current Draw”, displays the maximum current drawn from the failing channel just before the channel shuts down.
- Fifth column, “Error Count Low Current”, displays how many time the current draw for specific channels has dropped below the normal level.
- The first column in the low power window displays the channel name.
- Second column, “GND Short”, displays the number of times the channel has been short circuited to ground.

After a fault has been detected and corrected, the diagnostic circuitry can be reset by clicking the button “Reset Log”.

7 Inputs

The Power Control Module has 11 inputs from conventional switches and 32 inputs via CAN. Additionally, 20 virtual channels can be created, combining any input and output channels to generate logic switching conditions.
Flashing outputs are defined in a separate section.



The conventional inputs are digital channels. The standard configuration of the PCM only accepts connections switching to ground (except Switch #1 which has to switch to battery voltage to activate), either to enable or to disable a channel.
These inputs can be controlled by either manual external switches or by programmable outputs from the engine management system and data logging modules.

The intention with the PCM is to simplify the wiring installation as much as possible.
If you use the digital switches, you have to connect up to 11 signal wires to the module. But if you choose to control the PCM via CAN, you can control all functions, using only a 2-wire data bus.
HP ELECTRONIK can supply A/D-to-CAN converter modules, which converts 4 analogue inputs to CAN channels.

You can name all available input switches in this section, conventional switches, CAN and virtual channels.
Click on the switch window and type the name you want to assign to each individual switch.

Please note that switch #1 is fixed and must provide + 12 volts.

You can define the functionality of each conventional input switch.

- In **Latching** mode the channel is ON only when the switch is connected to ground.
- In **Momentary** mode the channel switches ON when the switch briefly connects to ground. Pressing the switch again, making a brief contact to ground, switches the channel OFF.

The trigger signal from either type of switch must be present in excess of 20 msec to be recognized as a valid trigger signal.

Pin Configuration Conventional Input Switches

Switch	Connector 4	Pin
1	14-35 red	19
2	14-35 red	20
3	14-35 red	21
4	14-35 red	22
5	14-35 red	23
6	14-35 red	24
7	14-35 red	25
8	14-35 red	26
9	14-35 red	27
10	14-35 red	28
11	14-35 red	29

In **Edit Box Name** you can label the actual Power Control Module, for example “Car 1”.

3 buttons are available in the lower right hand corner of the screen:

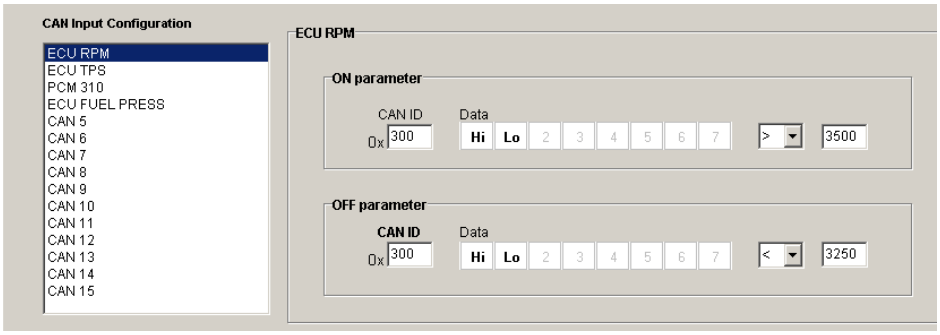
- Default settings — Load the default setting from the Power control Module.
- Read — Load the configuration file from the PCM (hotkey **F8**).
- Upload — Send the current configuration file to the PCM (hotkey **F9**).

8 CAN Inputs

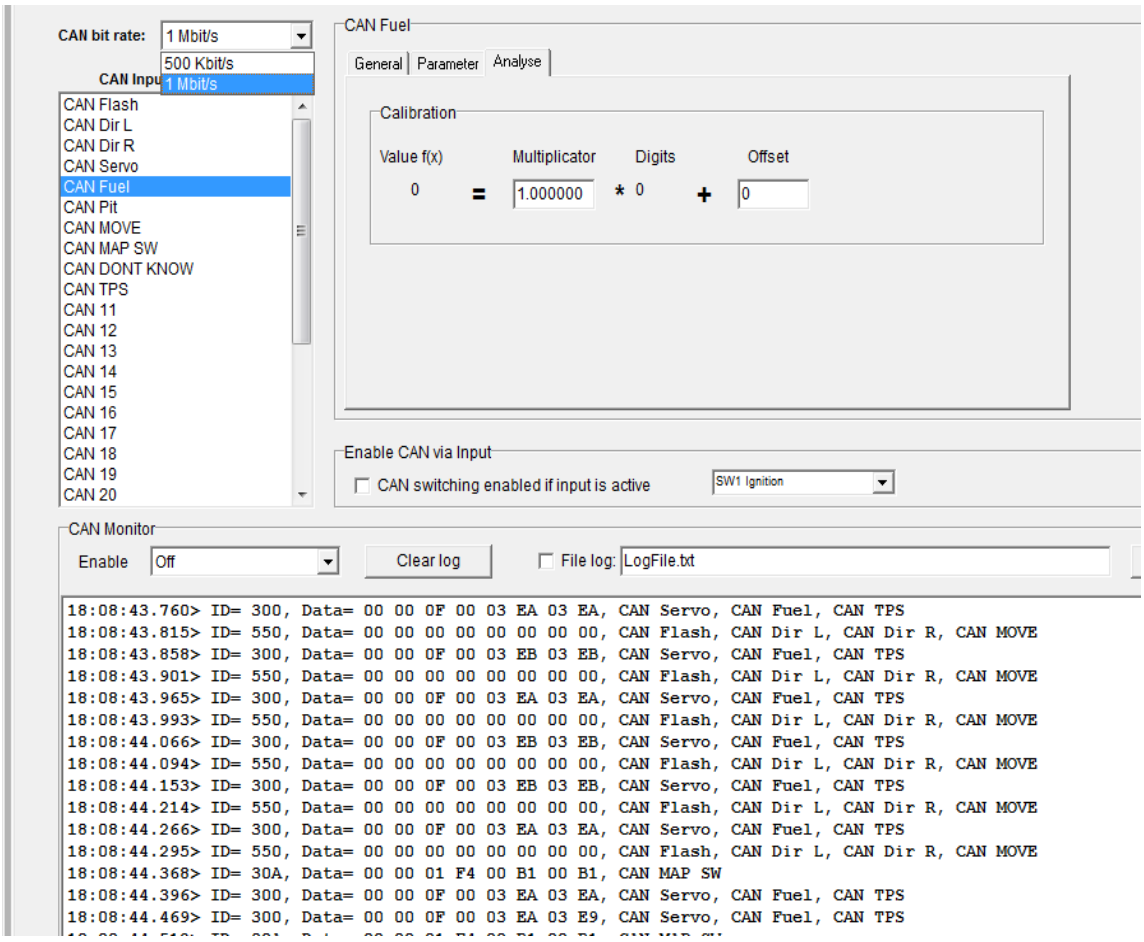
The PCM CAN bus is configured according to the 2.0B protocol, using 11 bit identifiers and Motorola or Intel data format. The CAN line is NOT terminated.

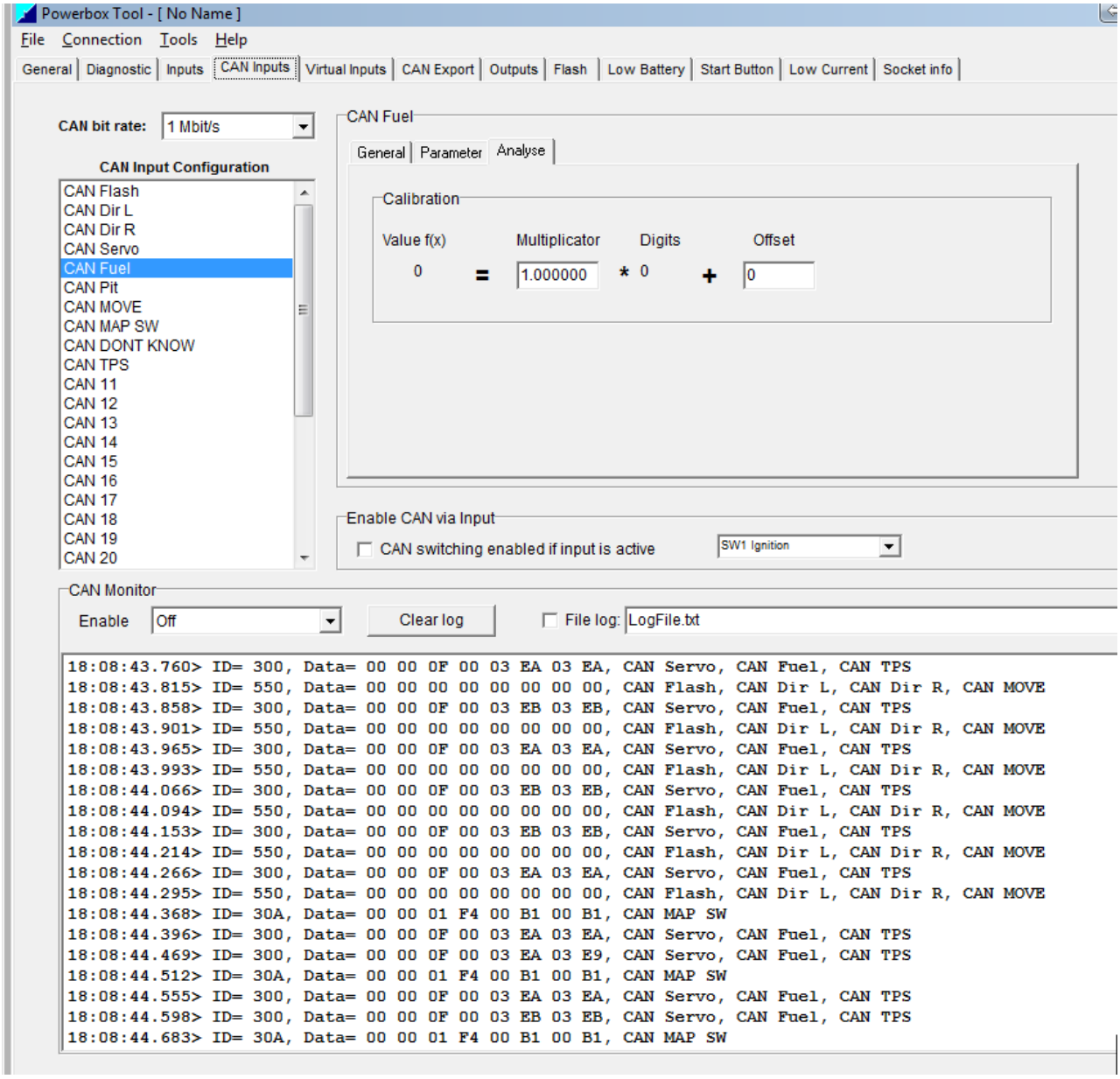
8.1 General

There are no limitations to the numbers of CAN identifier selected. Each of the 32 available CAN inputs can use a unique identifier. Identifiers do not have to be arrange in special groups.
The ID is specified in hex, for example 300, and contains 8 bytes of information.



The CAN Speed can be selected in the CAN Bit Rate Menu, the box supports 500kBit and 1Mbit Can speed.

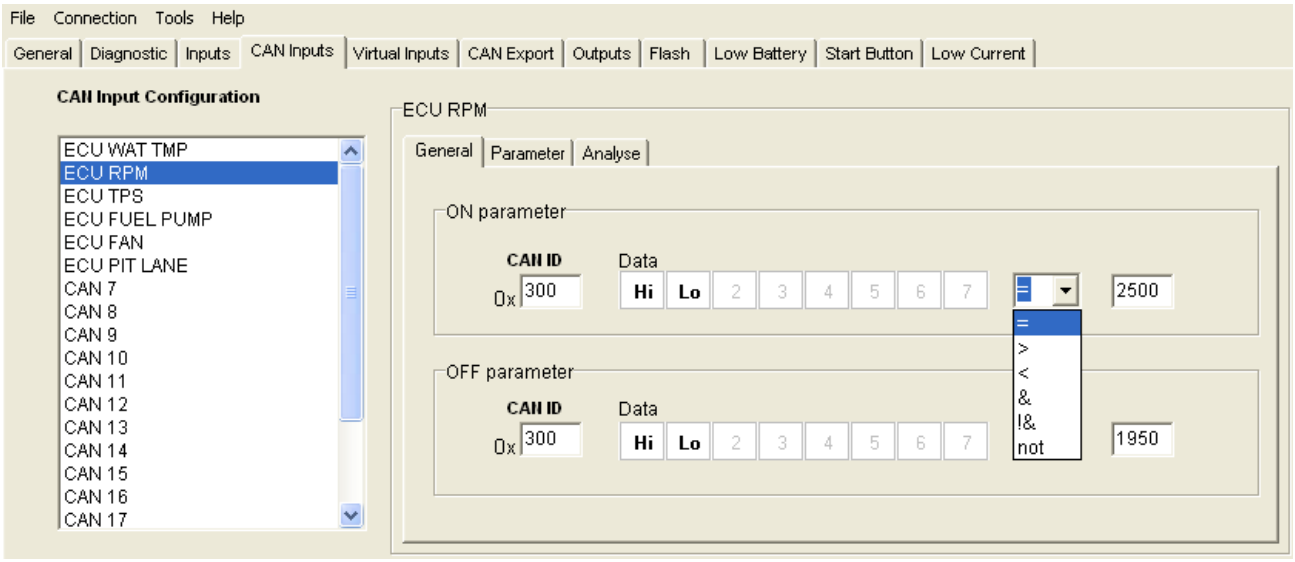




The Software can show the CAN traffic in the CAN Monitor window, it is possible to select between different filters, this helps to analyze the CAN traffic, a log to file function is also possible.

Refer to the CAN specifications for the modules in use and select the channels desired.
Specify the ID for the channel plus the channels position within that particular ID. This position is defined by 1 byte (marked LO) for an 8 bit channel and by 2 bytes (marked HI and LO respectively) for a word.
Click on the numbers on the bar to select the desired channel position. First click on the byte for the LO position, then click on the byte number for the HI position (to the left of the LO byte for Motorola format (MSB, LSB), to the right of the LO byte for Intel format (LSB, MSB)).

Select the preferred trigger conditions.



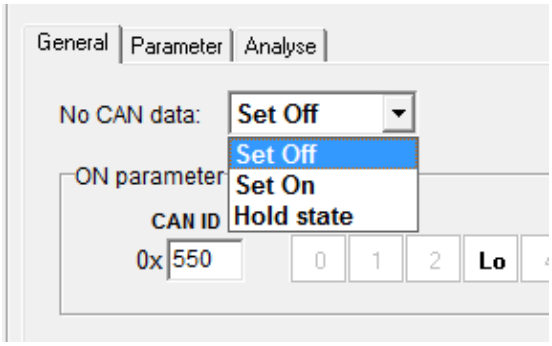
It is possible to specify the following conditions:

=	activate or deactivate if the channel value is equal to the selected value
>	activate or deactivate if the channel value is greater than the selected value
<	activate or deactivate if the channel value is less than the selected value
&	logic “and” - bit wise operator addressing individual bits with a selected byte
!&	logic “not” - bit wise operator addressing individual bits with a selected byte
not	byte condition defining any value but the one selected

Please note, that all CAN switching is disabled if the time interval between packages on the CAN bus is longer than 2 seconds.

A new feature in the software is the possibility to keep the CAN channel in different states, if the CAN traffic stops. (This can happen because of a broken CAN line).

Please see the No CAN data option in each CAN configuration window:
The features that can be selected is:
No CAN Data: Set off – Switches of the CAN channel
No CAN Data: Set on – Switches on the CAN Channel
No CAN Data: Keep state – Holds the channel on – example light switch, the headlight will not Turn off.



8.2 Bit Wise Operator

Using the built-in bit wise operator it is possible to address each individual bit within a selected byte.
Select the **&** parameter as the activation parameter and the **!&** as the de-activation parameter.
Address each individual bit within a byte by selecting the corresponding numbers:
Bit 0 is identified by number 1

- Bit 1 is identified by number 2
- Bit 2 is identified by number 4
- Bit 3 is identified by number 8
- Bit 4 is identified by number 16
- Bit 5 is identified by number 32
- Bit 6 is identified by number 64
- Bit 7 is identified by number 128

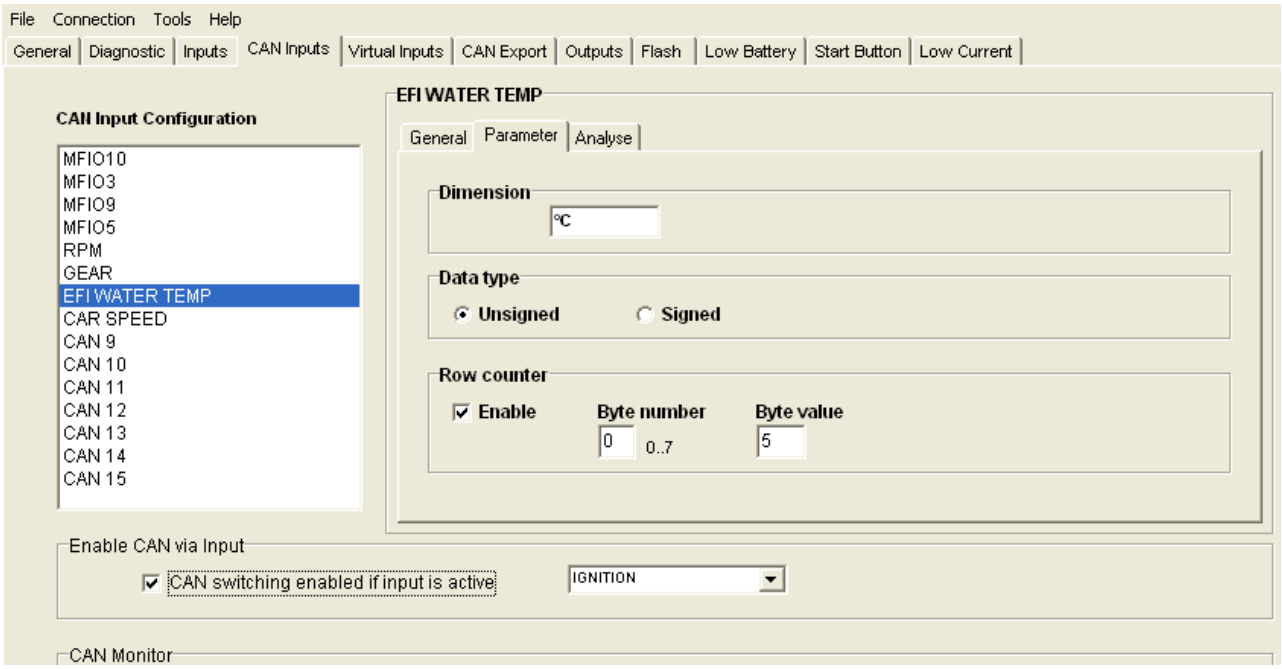
In section **Enable CAN via Input** you can assign a master switch channel. Tick the box and select one of the 11 conventional input switches. In this configuration, the CAN switching is only active if the selected digital channel is switched ON.
By ticking the ENABLE box in the **CAN Monitor** window, you can use the software as a Can analyzer, monitoring traffic on the CAN bus for the selected incoming ID's.

8.3 Parameter

The PCM can be controlled by an advanced CAN bus using row counters. It is possible to assign any byte as the row counter and then to assign the required byte to control the switching.

Tick the box **Row Counter Enable** to enable the use of rolling data channels in the CAN bus.

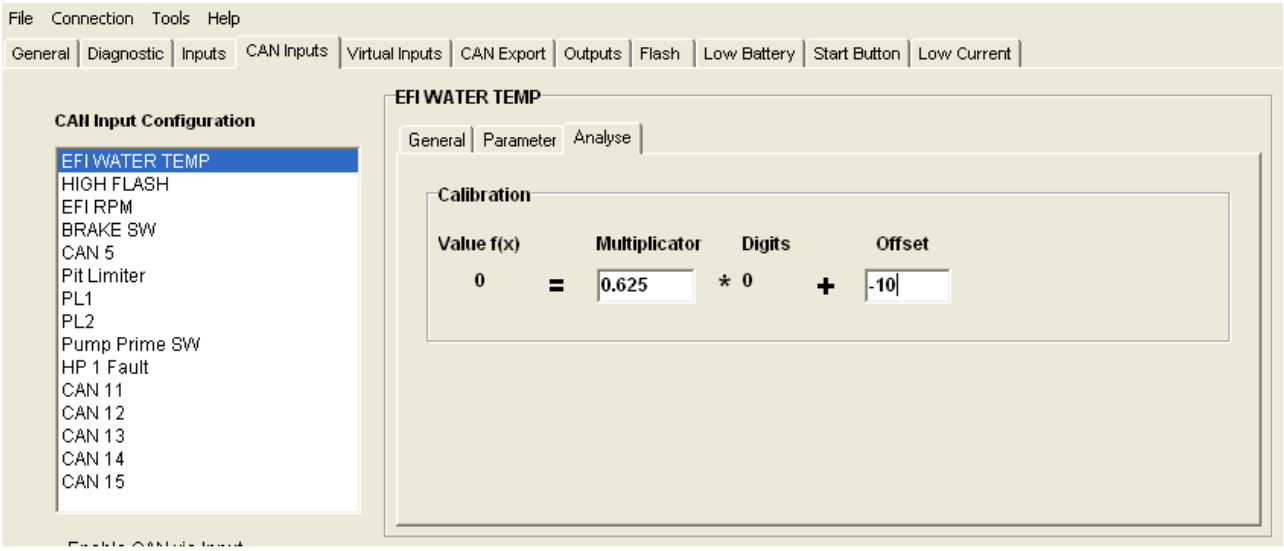
- In **Byte Number** type the byte number used as row counter.
- In **Byte Value** type the row count number in which the desired data channel is found.



Bytes are read as unsigned by default. This means that data is read in bits from 0..255, 0..1023 or 0..65535.
If the data channels use the signed format, tick the box “Signed” in Data Type.

8.4 Analyze

Use this section to scale the raw data input to an engineering unit.



The multiplier is the increase in engineering value per bit and the offset adjusts the channel's value at zero bit.
For example, an EFI ECU transmits a temperature sensor with a range of 160 degrees C as an 8 bit data channel with a range of 256 bits. The multiplier is calculated this way:

Multiplier = (160 / 256) => Multiplier = 0.625

The sensor has a range from -10 degrees to + 150 and the zero offset is therefore -10.

Pin Configuration for CAN Communication:

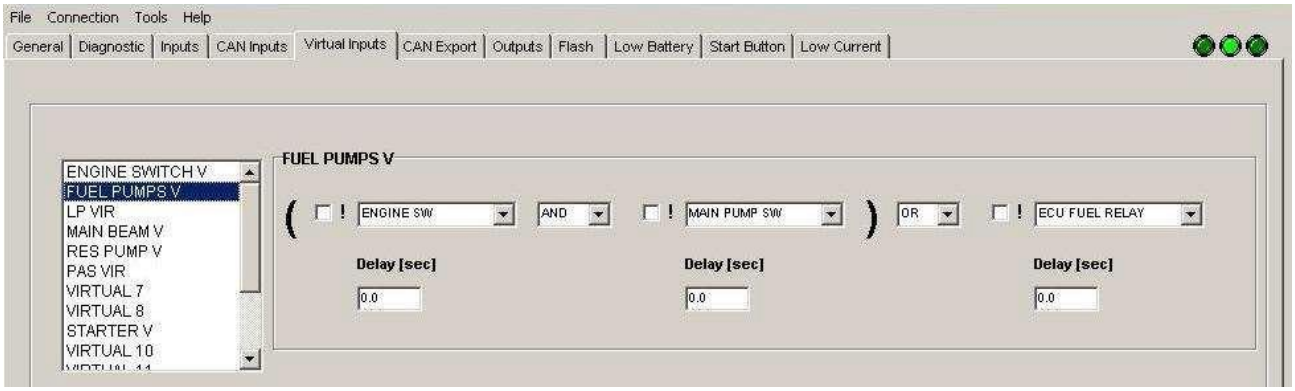
Name	Connector 4	Pin
CAN H	14-35 red	31
CAN L	14-35 red	33

3 buttons are available in the lower right hand corner of the screen:

- Default settings — Load the default setting from the Power control Module.
- Read — Load the configuration file from the PCM (hotkey **F8**).
- Upload — Send the current configuration file to the PCM (hotkey **F9**).

10 Virtual Inputs

Virtual channels are used to create logic connections.
A logic connection combines two or three channels, creating conditions for switching output channels on.
Up to 15 individual channels can be created.
A virtual channel can include other virtual channels.



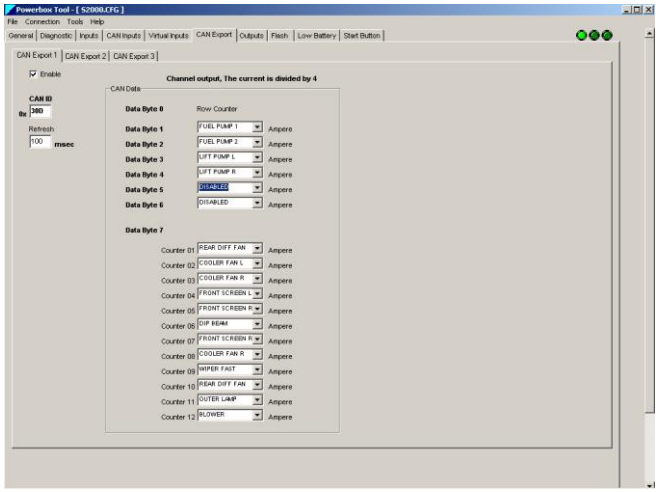
The strategy for virtual channels follows:

(Channel X [AND / OR / NOR] Channel Y) [AND / OR / NOR] Channel Z

The box marked "**!**" sets the channel selection to **NOT**, meaning the expression is true if the channel is not switched ON.
The selected output channel will be switched on only if the outcome of the combination of channels X and Y is true and then only if the outcome of the combination of the first statement and the third channel is true.
Additionally, each input channel has a delay timer. The channel value has to be true for the time interval entered before the channel condition is evaluated.

Channels X, Y and Z can be analogue switches, CAN channels, other virtual channels or output channels.

11 CAN Export



CAN export can be split between 4 CAN identifiers:

11.1 CAN Export 1

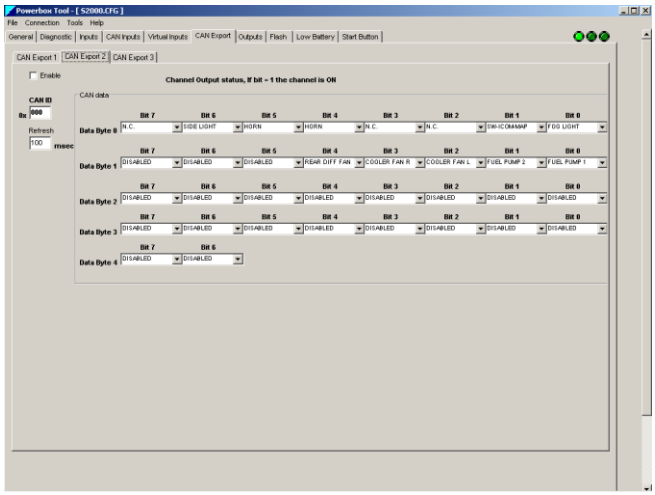
CAN Export 1 transmit the current draw for each of the 18 high power channels.

Tick the box Enable to transmit this ID.
In CAN ID, type the ID number (in hex) you want to assign to this packet.
In Refresh, type the broadcast rate with which you want to export the packet.
The first data byte (byte 0) in the ID is used as the row counter, defining data within byte 7.
Data in bytes 1..6 are broadcast with the transmission rate defined in section Refresh. Each time the packet has been transmitted, a new channel assigned in byte 7 will be sent. So, channels in byte 7 rotate each time a packet has been broadcast.
This means that if you have assigned 20 msec (50Hz) as the broadcast rate, channels in byte 7 are broadcast at 20 msec x 12 = 240 msec intervals (4.2 Hz).
The channel data is divided by 4 before being sent.

Type the number of channels rotating in byte 7 in the **Row Count** window.

11.2 CAN Export 2

CAN Export 2 transmit the output status of all 34 low and high power channels.



Tick the box Enable to transmit this ID.
In CAN ID, type the ID number (in hex) you want to assign to this packet.

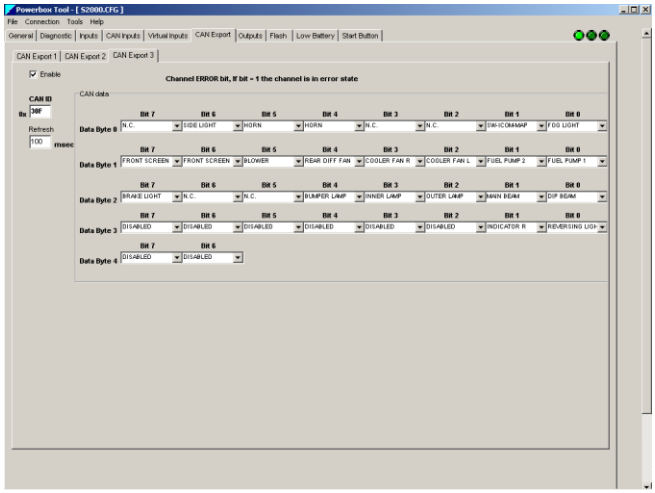
In Refresh, type the broadcast rate with which you want to export the packet.

If only the channel assigned to bit 0 is ON and other channels are OFF, the byte value is 1.
If only the channel assigned to bit 1 is ON and other channels are OFF, the byte value is 2.
If only the channel assigned to bit 2 is ON and other channels are OFF, the byte value is 4.
If only the channel assigned to bit 3 is ON and other channels are OFF, the byte value is 8.
If only the channel assigned to bit 4 is ON and other channels are OFF, the byte value is 16.
If only the channel assigned to bit 5 is ON and other channels are OFF, the byte value is 32.
If only the channel assigned to bit 6 is ON and other channels are OFF, the byte value is 64.
If only the channel assigned to bit 7 is ON and other channels are OFF, the byte value is 128.

If for example channels assigned to bit 2 and 6 are ON and all other channels are off, the byte value is 68.

The total current consumption is exported in byte 5. Scaling factor is 1 Amp per bit.

11.3 CAN Export 3



CAN Export 3 transmit the error status of all 34 low and high power channels.
Tick the box Enable to transmit this ID.
In CAN ID, type the ID number (in hex) you want to assign to this packet.
In Refresh, type the broadcast rate with which you want to export the packet.

If an error is detected for the channel assigned to bit 0, but no other channels have any errors, the byte value is 1.
If an error is detected for the channel assigned to bit 1, but no other channels have any errors, the byte value is 2.
If an error is detected for the channel assigned to bit 2, but no other channels have any errors, the byte value is 4.
If an error is detected for the channel assigned to bit 3, but no other channels have any errors, the byte value is 8.
If an error is detected for the channel assigned to bit 4, but no other channels have any errors, the byte value is 16.
If an error is detected for the channel assigned to bit 5, but no other channels have any errors, the byte value is 32.
If an error is detected for the channel assigned to bit 6, but no other channels have any errors, the byte value is 64.
If an error is detected for the channel assigned to bit 7, but no other channels have any errors, the byte value is 128.
If errors are detected for the channels assigned to bit 3 and 7, but no other channels have any errors, the byte value is 136.

The total current consumption is exported in byte 5. Scaling factor is 1 Amp per bit.

11.4 CAN Export 4

CAN Export 4 combines Export 2 and 3 in one CAN identifier.
The first 4 bytes are used to transmit output channels switch status while the last 4 bytes transmits error status of selected output channels.
Tick the box Enable to transmit this ID.

- In byte 0 assign the channel switch status for the MSP switches 9..16.
- In byte 1 assign the channel switch status for the MSP switches 1..8.
- In byte 4 assign the channel error status for the MSP switches 9..16.
- In byte 5 assign the channel error status for the MSP switches 1..8.

Pin Configuration for CAN Communication:

Name	Connector 4	Pin
CAN H	14-35 red	31
CAN Ground	14-35 red	32
CAN L	14-35 red	33

12 Outputs

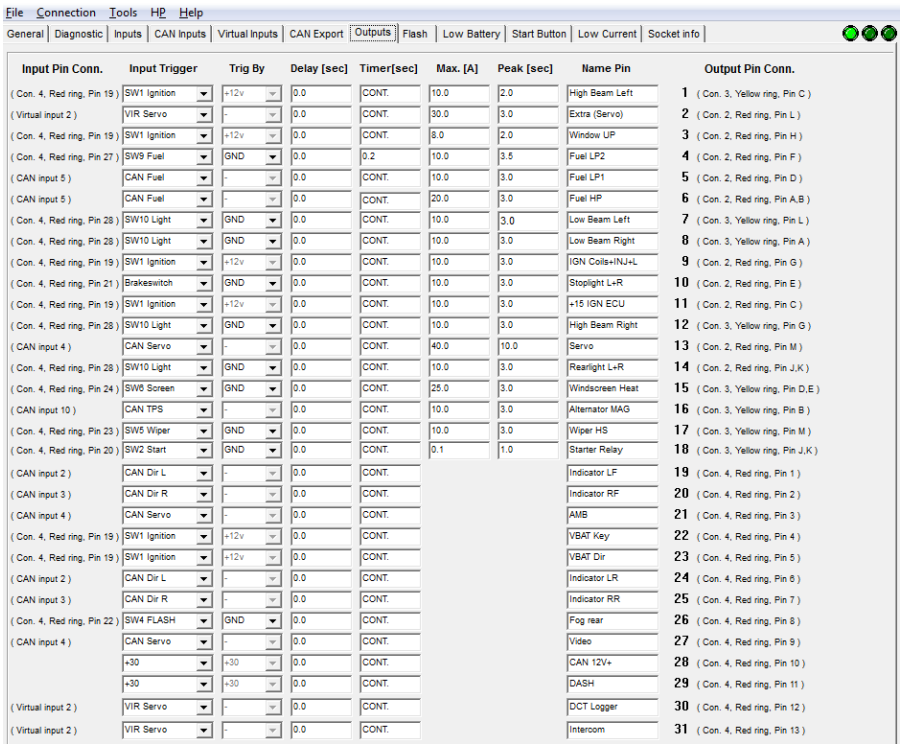
The PCM has 18 high power channels and 16 low power channels. Each high power channel allows a maximum peak current in excess of 35-65 amps and individual adjustable peak current time of up to 10 seconds.

Please note that the current draw per channel is limited by the connector - not by the driver stages. Each driver stage can handle in excess of 35-65 amps continuously.
We have rated the individual channel's current draw against our own experience. Please also check the connector manufacturer's specifications.

The 16 low power channels are arranged in groups of 4. The maximum continuous current draw for each group is 8 amps, but the maximum continuous current draw for one channel is 2.9 Amps.

Proceed as follows to configure an output channel:

- Re-name the output channel in the section "**Name Pin**". The position of the channel in connector 2 or 3 is listed.
- Select the input trigger from the drop-down column "**Input Trigger**". Select "DISABLED" if you do not want to use the output or if you only want to use the output with the flash function. When you select a conventional switch, its position in connector 4 is displayed.
- Define switch configuration "**Trig By**".
  If you want to switch the channel ON by switching to ground, select GND.
  If you want to switch the channel OFF when switching to ground, select OPEN.
- Set the delay for activating the output after switching it on in column "**Delay**".
- "**Timer**" defines a time interval during which the channel is switched ON.
  When terminated, the channel resets and requires re-activation to switch ON.
  Set the timer to 0 to disable the timer function.
- Set the trip level for the normal current draw in steps of 0.1 Amp in column "**Max.**



- Set the peak time in seconds during which the output channel can draw in excess of 35-65 Amps in column “Peak”. This peak time is applied when the channel is switched on and every time the current draw exceeds the trip level set in column “Max”.

12.1 High Power Channels

The pin configuration and maximum current draws for the high power channels are:

Channel	Max current, Amps	Connector 2	Pin
2	35	14-97 red	L
3	35	14-97 red	H
4	35	14-97 red	F
5	35	14-97 red	D
6	35	14-97 red	A + B
9	65	14-97 red	G
10	35	14-97 red	E
11	65	14-97 red	C
13	65	14-97 red	M
14	35	14-97 red	J + K

Channel	Max current, Amps	Connector 3	Pin
1	65	14-97 yellow	C
7	65	14-97 yellow	L
8	35	14-97 yellow	A
12	35	14-97 yellow	G
15	35	14-97 yellow	D + E
16	35	14-97 yellow	B
17	65	14-97 yellow	M
18	35	14-97 yellow	J + K

12.2 Low Power Channels

The pin configuration and maximum current draws for the high power channels are:

Channel	Max current, Amps	Connector 4	Pin
1	2.9 a)	14-35 red	1
2	2.9 a)	14-35 red	2
3	2.9 a)	14-35 red	3
4	2.9 a)	14-35 red	4
5	2.9 b)	14-35 red	5
6	2.9 b)	14-35 red	6
7	2.9 b)	14-35 red	7
8	2.9 b)	14-35 red	8
9	2.9 c)	14-35 red	9
10	2.9 c)	14-35 red	10
11	2.9 c)	14-35 red	11
12	2.9 c)	14-35 red	12
13	2.9 d)	14-35 red	13
14	2.9 d)	14-35 red	14
15	2.9 d)	14-35 red	15
16	2.9 d)	14-35 red	16

The current ratings are for continuous current draw. Peak ratings are much higher.

One input channel can control one or more output channels.

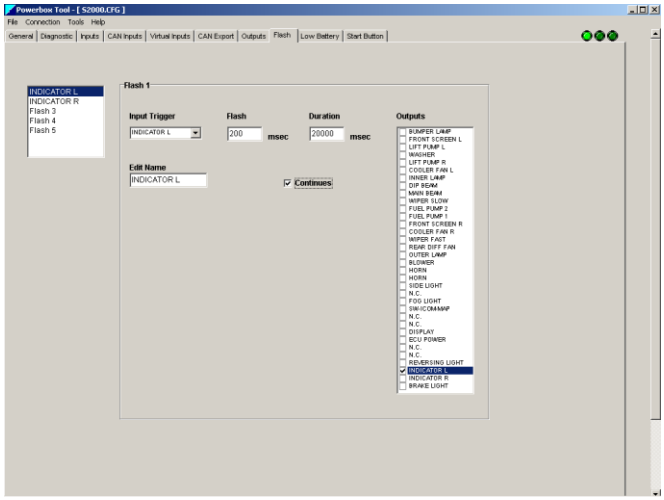
Note:

a) Max 2.9 amps per channel in this group but max 8 amps for the group.
b) Max 2.9 amps per channel in this group but max 8 amps for the group.
c) Max 2.9 amps per channel in this group but max 8 amps for the group.
d) Max 2.9 amps per channel in this group but max 8 amps for the group.

3 buttons are available in the lower right hand corner of the screen:

- Default settings — Load the default setting from the Power control Module.
- Read — Load the configuration file from the PCM (hotkey **F8**).
- Upload — Send the current configuration file to the PCM (hotkey **F9**).

13 Flash Function

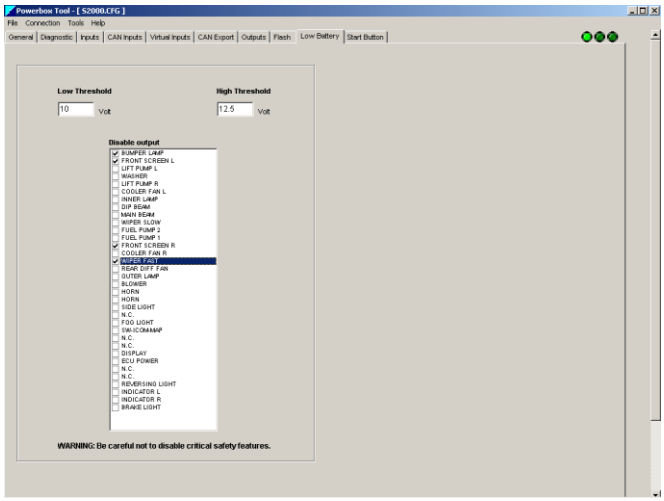


You can create up to 5 individual flash functions.
A flash enabled always has the highest switch priority. When activated, the assigned outputs will flash despite their current switch settings.
From the window select which of the 5 flash channels you want to configure.

- In “Input Trigger” select which input channel activates the flash function.
- In “Edit Name” you can label the flash channel.
- In “Flash” set the time in msec's you want the channel to flash. For example, select 100 msec and the output channel(s) will be ON for 100 msec's, then OFF for 100 msec's etc.
- In “Duration” set the total activation time for the flash channel. Maximum time is 25 seconds.

If you want the channel to flash as long as the input switch is activated, tick the box “Continues”.
The flash returns to its OFF position after time-out and when the input switch is switched off.

14 Low Battery

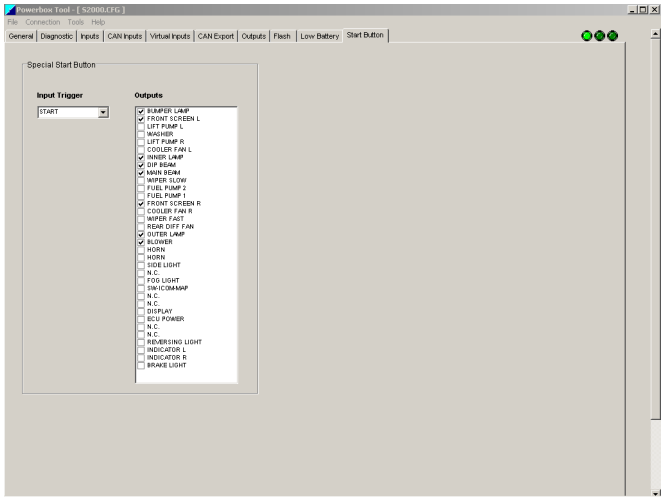


The Power Control Module can switch power channels off automatically to preserve battery power.
Set a threshold for low battery voltage in “Low Threshold”.
If the battery voltage drops below this voltage the PCM can switch channels off automatically.
In the window “Disable Outputs” tick the boxes for the channels you want the PCM to switch off (in case they are switched on) if the battery voltage drops below the low threshold.
The channels will automatically switch on when the battery voltage exceeds the high threshold.

3 buttons are available in the lower right hand corner of the screen:

- Default settings — Load the default setting from the Power control Module.
- Read — Load the configuration file from the PCM (hotkey **F8**).
- Upload — Send the current configuration file to the PCM (hotkey **F9**).

15 Start Button

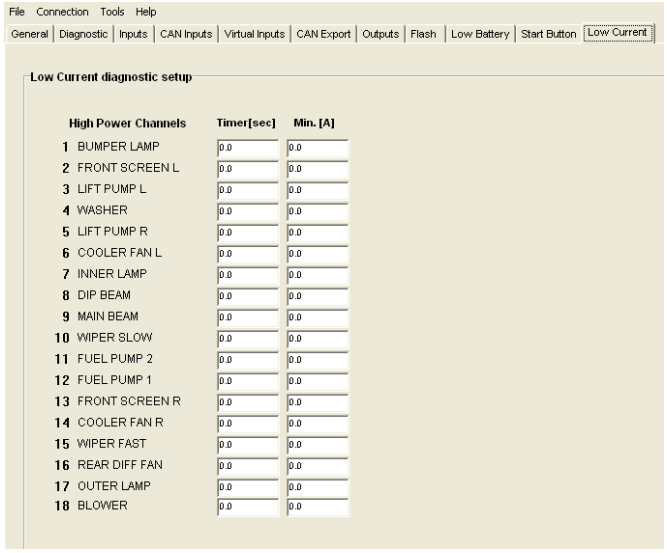


To maximize engine cranking speed and to preserve battery power the PCM can be configured to disabled other outputs whilst the starter motor is powered.
Select the starter switch in “Input Trigger”.
In the window “Outputs” tick the boxes for the channels you want the PCM to switch off (in case they are switched on) during the activation of the starter switch.

3 buttons are available in the lower right hand corner of the screen:

- Default settings — Load the default setting from the Power control Module.
- Read — Load the configuration file from the PCM.
- Upload — Send the current configuration file to the PCM.

16 Low Current



The PCM can detect failing and faulty components in the car and automatically warn the driver.
When the output driver is active, the PCM measures the current draw of each driver. If the current consumption drops below a minimum threshold for a predefined time, the system will set a flag in the diagnostics.

17 Additional Features

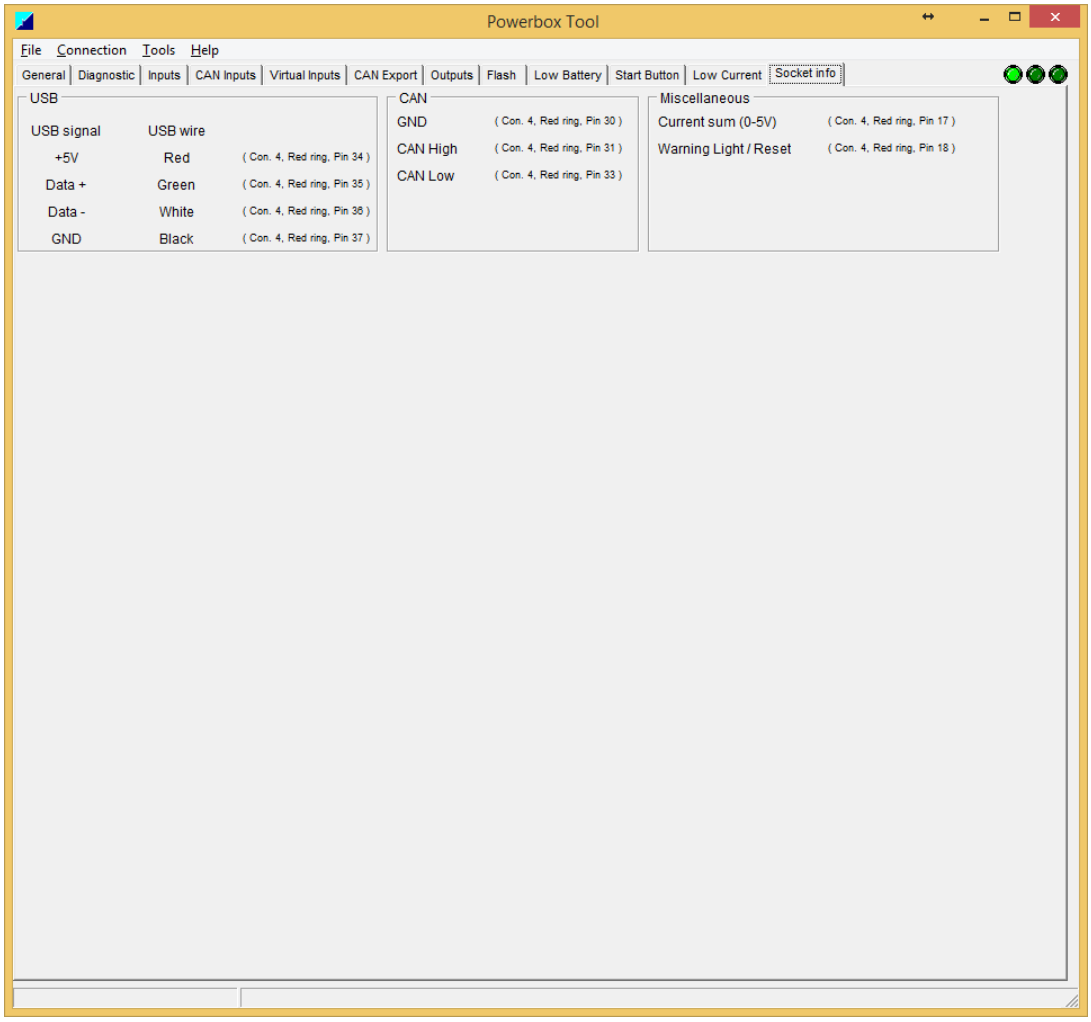
17.1 Warning Light

The PCM is equipped with a warning light for error detection. The driver output is found in connector 4, pin 18. If a fault is detected, the channel switches 12 volts ON.

17.2 Output Reset

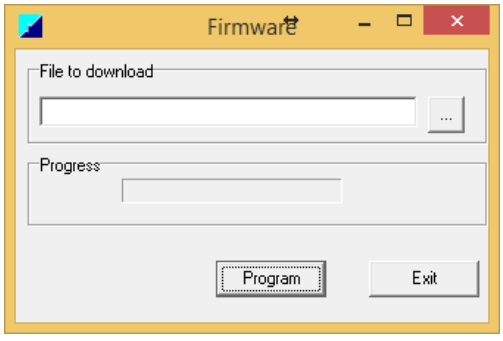
You can reset all output channels in error status by briefly connecting the warning light signal, pin 18 in connector 4, to ground.
This does not influence other channels but those in error status.

17.3 Socket info



This window explains the pin out of the USB, CAN and Miscellaneous functions.

17.4 Upgrade the firmware



This window allows you to put in the newest firmware in the HP8440 Powerbox, If you download the program the new .hex file (File for the controller) is included, please see our website www.hpelec.dk for the newest releases.

17.5 Pin Configuration

Connector 1 – battery power supply

Mating connector: ASHD614-1SN-C35

Connector 2 – high power outputs

Mating connector: AS614-97PN – RED

Pin	Used for	Max Rating (A) *)
A + B	Channel 6 High Power	35
C	Channel 11 High Power	65
D	Channel 5 High Power	35
E	Channel 10 High Power	35
F	Channel 4 High Power	35
G	Channel 9 High Power	65
H	Channel 3 High Power	35
J + K	Channel 14 High Power	35
L	Channel 2 High Power	35
M	Channel 13 High Power	65

Connector 3 – high power outputs

Mating connector: AS614-97PA - YELLOW

Pin	Used for	Max Rating (A) *)
A	Channel 8 High Power	35
B	Channel 16 High Power	35
C	Channel 1 High Power	65
D + E	Channel 15 High Power	35
F	**Power Ground**	
G	Channel 12 High Power	35
H	**Power Ground**	
J + K	Channel 18 High Power	35
L	Channel 7 High Power	65
M	Channel 17 High Power	65

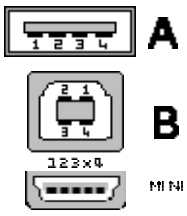
***) Please note that the current draw per channel is limited by the connector - Each driver stage can handle in excess of 35-65 amps continuously.**
We have rated the individual channel's current draw in relation to the connector manufacturer's specifications.

Connector 4 – low power outputs

Mating connector: AS6 14-35 PN

Pin	In / out	Used for	Max Rating (A)	Other
1	Output	Channel 1 Low Power	2.9 each channel, 8 amp / group	
2	Output	Channel 2 Low Power	2.9 each channel, 8 amp / group	
3	Output	Channel 3 Low Power	2.9 each channel, 8 amp / group	
4	Output	Channel 4 Low Power	2.9 each channel, 8 amp / group	
5	Output	Channel 5 Low Power	2.9 each channel, 8 amp / group	
6	Output	Channel 6 Low Power	2.9 each channel, 8 amp / group	
7	Output	Channel 7 Low Power	2.9 each channel, 8 amp / group	
8	Output	Channel 8 Low Power	2.9 each channel, 8 amp / group	
9	Output	Channel 9 Low Power	2.9 each channel, 8 amp / group	
10	Output	Channel 10 Low Power	2.9 each channel, 8 amp / group	
11	Output	Channel 11 Low Power	2.9 each channel, 8 amp / group	
12	Output	Channel 12 Low Power	2.9 each channel, 8 amp / group	
13	Output	Channel 13 Low Power	2.9 each channel, 8 amp / group	
14	Output	Channel 14 Low Power	2.9 each channel, 8 amp / group	
15	Output	Channel 15 Low Power	2.9 each channel, 8 amp / group	
16	Output	Channel 16 Low Power	2.9 each channel, 8 amp / group	
17	Output	VREF		
18	Output	Warning Light / Reset	Connect to ground to reset	
19	Input	Switch 1	Must switch +12 Volts to activate	
20	Input	Switch 2	Must switch to/off ground to activate	
21	Input	Switch 3	Must switch to/off ground to activate	
22	Input	Switch 4	Must switch to/off ground to activate	
23	Input	Switch 5	Must switch to/off ground to activate	
24	Input	Switch 6	Must switch to/off ground to activate	
25	Input	Switch 7	Must switch to/off ground to activate	
26	Input	Switch 8	Must switch to/off ground to activate	
27	Input	Switch 9	Must switch to/off ground to activate	
28	Input	Switch 10	Must switch to/off ground to activate	
29	Input	Switch 11	Must switch to/off ground to activate	
30	GND	GND General	Ground	
31	Comms	CAN H	CAN is NOT terminated	
32	GND	CAN Gnd	---	
33	Comms	CAN L	CAN is NOT terminated	
34	Comms	USB 5V	Red	USB pin 1
35	Comms	USB dp	Green	USB pin 3
36	Comms	USB dm	White	USB pin 2
37	Comms	USB Gnd	Black	USB pin 4

USB Connector layout:



18 Specifications

18.1 Inputs

Number of input switches	11 (selectable functions)
Number of CAN input channels	32

18.2 Outputs

All driver stages are thermally protected

18.2.1 High power channels

Number of individual drivers	18

***) Please note that the current draw per channel is limited by the connector - not by the driver stages. Each driver stage can handle in excess of 35-65 amps continuously. We have rated the individual channel's current draw in relation to the connector manufacturer's specifications.**

Maximum peak current each driver	65 Amps for short periods each channel

18.2.2 Low power channels

Number of individual drivers	16
Maximum continuously current draw per driver	3 Amps
Maximum current draw each block of 4 drivers	8 Amps
Maximum peak current per channel	35/65 Amps for short periods each
channel Maximum recommended output current	170 amps continuously > 200 amps peak current

18.3 Temperatures

Maximum operating temperature	> 100 deg C
Typical temperature rise over ambient	< 5 deg C @ 80 amps; 30 minutes < 20 deg C @ 170 amps; 30 minutes

18.4 Communication

PC Interface	USB
CAN communication	2.0B @ 500Kbit or 1 Mbit/sec (11 bit identifiers) Motorola or Intel format Free definition of identifiers Definition of signed and unsigned bytes Bit wise operator

18.5 Power Supply

Supply Voltage	6.5 to 22 Volt DC

18.6 Dimensions

Length x Width x Height	197 x 107 x 46 mm incl. connectors
Weight	710 grams