

PoelControl – IO & Peripherals

1.Status

- 2006-04-10: First draft
- 2006-04-15: Added descriptions to all items – content complete except of updates
- 2006-05-19: Updates sensors (temperature sensors as I2C), actors (2nd pump), keys (2nd options button)

2.Intro

PoelControl is a project aimed at the development of a flexible and powerful microcontroller based solutions for the control of an installation for vegetable fuel (poel) as installed here in my vehicle.

The objective of this document is to give an overview over the input and output requirements and the peripherals connected to the microcontroller. As this is the first draft of the specification a wide range of possibilities are stated; not all of them might get implemented.

3.IO

The system developed needs information about the current operating conditions and other information i. e. input. Also, information needs to be transmitted to the user; actions need to be taken. This is denoted with Input/Output (IO).

Note: Some terms are german

Input

<i>Switches</i>	<i>Description</i>	<i># of Pins</i>
Master Switch	Main power switch. Turn the power supply on / off	0
Key 1 - ModeFuel Selector	Key (Button) for selecting the operation mode (Auto, Manual) and for setting the value of an option (decrease)	1
Key 2 - System Flush	Key (Button) for selecting the flush mode (KGR on / off) and for setting the value of an option (increase)	1
Key 3 - Options Key	Key (Button) for switching from normal mode to option mode. Key is used to iterate through display of auxiliary sensors. In options mode key is used to select next option.	1
Key 4 - Options Key 2	Additional Key (Button) that may be used to provide better / more comfortable navigation	1
<i>Voltage</i>	<i>Description</i>	<i># of Pins</i>
12 V	Permanent 12 V supply (terminal 30)	0
12V Ignition On	12 V supply if the ignition is turned on (terminal 15)	1
12 V Engine Running	12 V supply if the engine is running (e. g. D+ from alternator)	1

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Ground	Ground (terminal 31)	0
<i>Sensors</i>	<i>Description</i>	<i># of Pins</i>
Temperature Sensor 1	Mandatory sensor measuring the fuel temperature after ESP Out. This temperature is used to control the switch from Diesel to Poel.	I2C
Temperature Sensor 2 - 5	Auxiliary sensor for measuring and displaying an additional temperature. This temperature is not used for the POEL logic.	I2C
Outside Temperature Sensor	Auxiliary sensor for measuring the outside temperature. This temperature is not used for the POEL logic. For a defined temperature range (-4 .. 4 °C?) a <i>ice warning</i> is given to the user.	I2C
Exhaust Temperature Sensor	Auxiliary sensor for measuring the temperature of the exhaust gas. This temperature is used to detect <i>low load</i> operating conditions.	1 or I2C
Engine Speed (Rev/min)	Auxiliary sensor for measuring the engine speed in rev/min. The value is used to detect <i>idle operating conditions</i> . (terminal W)	1
Vehicle Speed	Auxiliary sensor for measuring the vehicle speed. The speed is used to detect <i>idle</i> operating conditions. It can be used to detect <i>low load</i> operating conditions if the speed is below a certain threshold. (GALA signal)	1
Fuel Pressure	Auxiliary sensor used to measure the absolute pressure before ESP In. This pressure can be used to detect blocked filters.	1
Boost Pressure	Auxiliary sensor for measuring the boost pressure of the turbo charger. The pressure is used to detect <i>load load</i> operating conditions. Note: Use either the <i>exhaust temperature sensor</i> or the <i>boost pressure sensor</i> .	1
Tank Level	Auxiliary sensor for measuring the level of the second tank. This value is used to give feedback about the tank level and warn the user if the level is below a certain threshold.	1
I2C Bus	Auxiliary bus for connecting additional sensors to the microcontroller. The I2C protocol is flexible to allow various configurations. See the additional documentation for further information.	2

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Output

<i>Name</i>	<i>Description</i>	<i># of Pins¹</i>
Valve 1 Switch	Used to set the state of valve 1 (on / off)	I2C
Valve 2 Switch	Used to set the state of valve 2 (on / off)	I2C
Valve 3 Switch	Used to set the state of valve 3 (on / off)	I2C
Valve 4 Switch	Used to set the state of valve 4 (on / off)	I2C
Feed Pump Switch	Used to set the state of the additional feed pump for the tank (on / off)	I2C
Feed Pump Switch 2	Used to set the state of the second feed pump for the second tank (on / off)	I2C
Electric Heater	Controls the additional electric heater (e.g. sam hotte heizer) in the fuel system (on / off). The heater is activated only if the fuel temperature is below a certain threshold.	I2C
Buzzer	Controls the buzzer for audio user feedback. The buzzer is used to inform the user about important events (e. g. Warning, Change of mode of operation).	1
Fuel Selection LED	Controls the LED for the fuel selection. Informs the user about the current fuel – either diesel (off), Pöl (on) or Mixed (blinking).	1
KGR on/off LED	Controls the LED for the KGR. Informs the user about the current flush state – either KGR on (on) or KGR off / flush (off).	1
Glow Plug Control	Controls the status of the glow plugs. The glow plugs are enabled in <i>low load</i> conditions to increase cylinder temperature.	I2C
Display	Shows status information to the user. The display is either connected via 4-Wire or I2C. See the additional documentation for further information.	4

Notes:

The function of the valves depends on the logic implemented and on the schema used for the Poel conversion.

4.Peripherals

The term peripherals includes electronic components connected to the microcontroller but not simple electronic parts like resistors, capacitors etc. Any pins on the microcontroller taken by these components are not shown in the tables above, see section 2.

¹ Denotes the number of pins used for connection to the microcontroller.

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<i>Name</i>	<i>Description</i>	<i># of Pins²</i>
RS 232 connection (UART)	The UART is used to connect a remote system (e. g. Computer) to the microcontroller via RS232. This can be used to access logged data etc. See the additional documentation for further information.	2
Storage (SD Card, EEPROM)	SD cards or external EEPROM chips extend the memory for permanent storage. This can be used to monitor and log the sytem state over time. See the additional documentation for further information.	I2C
Graphic LCD	A graphic LCD improves the presentation in comparison to a text LCD. Better visualization and therefore better information of the user can be achieved. See the additional documentation for further information.	4 or I2C
Quartz	An external quartz could be used to provide an additional clock source to the microcontroller for recurring events or for the implementation of a real time clock. See the additional documentation for further information.	1
VAG-COM / OBD / CAN Schnittstelle	The connection of the microcontroller to the data bus of a vehicle (e. g. OBD / CAN) allows for the retrieval of additional information about the operating conditions. This includes e.g. current fuel consumption for <i>low load</i> detection, additional temperatures etc. See the additional documentation for further information.	

² Denotes the number of pins used for connection to the microcontroller.