POWER PALLET
v4-6
COMPONENTS AND ACCESSORIES

Change Log

Revision	Notes	Signee
3	added problem 4, added change log	Jay

770-00030

Process Control Unit (PCU)

DESCRIPTION

The PCU comes standard with the Power Pallet. ALL Power Labs also offers the PCU board separately in full or half fill configurations for alternative development projects. This section mainly describes the PCU as its integrated on the Power Pallet system.

Power Input

The power requirement for the PCU is 9-12 vDC, 1A.

Field Effect Transistors (FETs)

The 8 FETs control component relays. On/off switching for pumps, motors, solenoids, etc. For the Power Pallet systems, the FETs are wired to the components as follows:

1. Feedstock Auger

2. Grate Shaker

3. Flare Igniter

4. Engine Ignition Coil

5. Engine Starter Motor

6. Oxygen Sensor Power

7. Warning Alarm

8. Auxiliary (not in use)

RS232 Communication Port

This port allows communication with the PCU. The code on the PCU of the Power Pallet outputs all sensor data to the serial port. For more information see section IV. Data logging with the PCU.

Thermocouple Connectors

Standard plug connections are offered on ports T0-T6 and screw terminal connections are available for T7-T14. For the Power Pallet, T0 is populated with T_tred thermocouple and T1 detects the temperature of T_bred.

Micro SD card port

Card not included. Currently no code has been written for the SD card that is on board the PCU. However, user code may be generated for data logging, etc. by interfacing via SPI.

Differential Pressure Sensors

Two ranges of pressure sensors are located on the PCU board, high range (P0-P3) +/- 28 WC and low range (P4 & P5) +/- 8 WC.

On the Power Pallets, the dedicated pressure sensors are:
P0-Combustion Pressure (P_comb), measures pressure at the top of the reactor.
P1-Reactor Pressure (P_react), measures the pressure after the reduction zone near the gas outlet.
P3-Filter Pressure (P_filt), measures the pressure at the outlet of the packed bed filter.

Keypad

Four buttons are available for user input.

LCD screen and contrast knob

The LCD screen allows adjustment of the contrast for better visibility.

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Analogue Inputs

> (from first column top down to second column)
> 1. Coolant Temperature
> 2. Feedstock Auger Current
> 3. Key Switch State
> 4. Oxygen Sensor Signal
> 5. Aux- Governor Signal (not in use)
> 6. Throttle Position
> 7. Engine Oil Pressure
> 8. Fuel Switch State

Microprocessor

> Atmel ATmega 1280

CANbus communication port

> Currently no code is included for the CANbus. However, user generated code could make use of this digital bus communication port.

Reset Button

> Resets the PCU.

Frequency Timer

> This port is typically used for hertz measurement from the generator.

Status LEDs

> The power (PWR) LED comes on when power is applied to the PCU board. The diagnostic (DIAG) LED is prompted in the code to blink for each loop in the code logic.

Data logging with the PCU

The code running on the PCU provided with the Power Pallets outputs all the sensor data via the USB port at a baud rate of 115200. Use a terminal program such as PuTTy Tel (puttytel.exe) to access the serial port. When the board is powered, connect to the board via USB connection on your computer and data log the values by the following:

Windows

> 1. Open puttytel.exe
> 2. In the Data logging tab, choose a location to save files (you can also save files with the date and time as part of the name)
> 3. Enter the correct COM# that the PCU registers under.

Mac

> 1. Open terminal
> 2. Use the following command:
>   screen -L /dev/tty.usbserial.
> 3. This will save the output to the user folder in a file named screenlog.0

PCU Data Output

The PCU outputs data from all of its sensors as well as data from calculations in the code. When the PCU is first turned on, it will output the header with the data for each of the fields following. The header and data are in order as follows:
Time,
T_tred,
T_bred,
T_eng_coolant,

T_reactor_gas_out,
P_reactor,
P_filter,
P_comb,
P_Q_air_rct,
P_Q_gas_eng,
ANA0,
ANA1,
ANA2,
ANA3,
ANA4,
ANA5,
ANA6,
ANA7,
Grate,
P_ratio_reactor,
P_ratio_state_reactor,
Grate_Val,
P_ratio_filter,
P_ratio_filter_state,
Lambda_In,
Lambda_Out,
Lambda_Setpoint,
Lambda_P,
Lambda_I,
Lambda_D,
P_reactorLevel,
T_tredLevel,
T_bredLevel,
Engine,
AugerCurrent,
AugerLevel,
FuelSwitchLevel,
OilPressureLevel,
OilPressureValue,

MAINTENANCE

No maintenance is required for the PCU. Be sure to keep any moisture away from the electronics.

TROUBLESHOOTING

Problem 1: Unable to read LCD screen.

Possible Cause	Corrections/Solutions
Contrast non-ideal for lighting conditions.	Adjust the contrast knob or cover the LCD screen to shade from direct sun.

Problem 2: Nothing on LCD screen.

Display connection not secure.	Secure connection.
Display malfunction.	Replace screen.

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Problem 3: Blocks across screen.	
Program corrupt.	Reprogram the board.
Contrast not ideal.	Adjust contrast knob.

Problem 4: LCD screen stuck on splash screen.	
Program timing glitch due to key switch being on when system is turned on.	Turn off system. Turn keyswitch into the off position and turn system back on.

RESOURCES

- *GCU Technical Manual*
- *Gasifier-Control-Unit page on the GEK Wiki website*
- *PCU-Getting Started*
- *Features of the KS_Power Pallet v1.1 Controls*
- *PuttyTel (puttytel.exe) or other serial terminal program*

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