ON Semiconductor

# Test Procedure for the ADT7462EBZEVB Evaluation Board

OBJECTIVE

The evaluation board allows all the input and output functions of the ADT7462 to be demonstrated. The software allows control and monitoring of the ADT7462's internal registers. Using the evaluation board and its accompanying software, the ADT7462 can be interfaced to any personal computer running Windows XP or Windows 2000 via the USB port.

EVALUATION BOARD HARDWARE

The evaluation board contains:

- An ADT7462 device
- Two remote transistors for temperature sensing
- Two 5V fans and fan drive circuitry
- 12V fan connectors
- Electronic configuration switches
- Indicator LEDs
- On-board heaters (allows demonstration of fan response to over temperature)
- USB interface circuitry
- External 12V power connectors (required for fans and heaters, the ADT7462 is powered from the USB port)
- Potentiometers for voltage measurement
- Push buttons for THERM assertion, Chassis Intrusion and Reset functions
- Terminals to allow access to the pins of the ADT7462
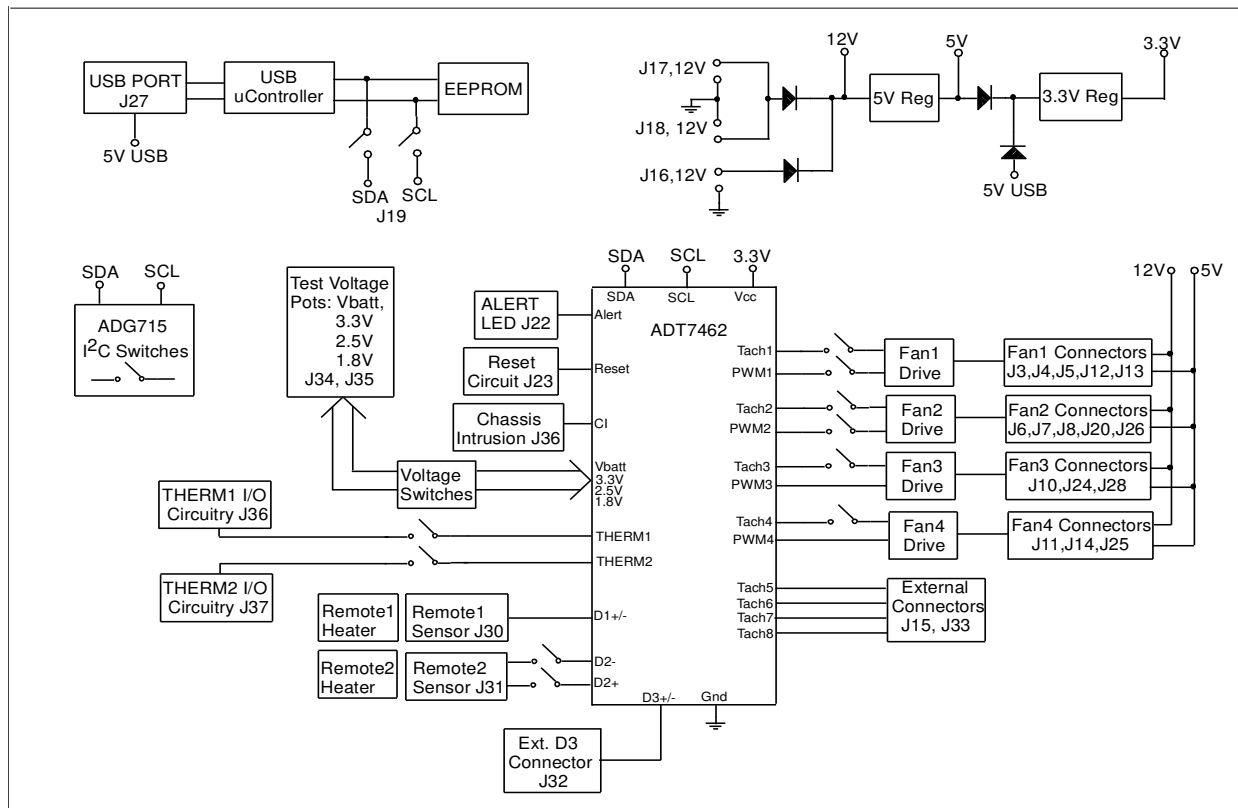
Quick guide to setting up and using the ADT7462 evaluation kit

SOFTWARE

Note: Do not connect the board before installing the software.
This applies to ADT7462 software versions 1.0.5 and higher.

The following text will fully describe the functionality available in the ADT7462 Evaluation Software.

SETUP
When the software is first run a Setup window will be shown (see figure 2). This allows some basic options to be set to help with getting started. These options include setting the Easy Configuration bits to quickly set the pin functions, enabling tach measurements (disabled by default), PWM settings and setting the Setup Complete bit so that temperature monitoring is enabled. If the user does not wish this window to appear then the 'Show at start-up' option can be disabled. The window can also be accessed by clicking on 'Configuration' in the menu and selecting 'Easy Setup' .
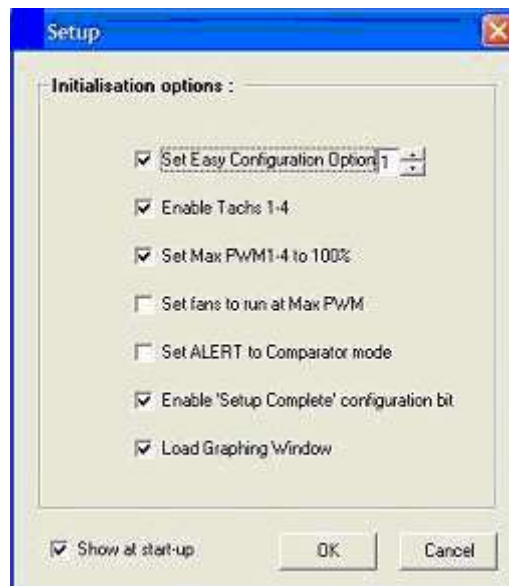

Figure 2 : Setup Options

REGISTER ACCESS
This window allows read/write access to all of the registers on the ADT7462 (see figure 3). Registers are grouped by function in the 'Register Map' box. under a set of headings (green). Clicking on the heading will display a set of sub-headings (red). Expanding the sub-headings gives access to the relevant registers (blue). Clicking on the register label will cause the register details to be displayed such as register address, current value and corresponding bit labels. The 'Read/Write' box allows data to be written in hex or decimal. Writable registers can also be modified by clicking on the individual bits in the 'Bit Display' box. Enabling the 'Continuous Read' option will update the window with the selected register contents once every second allowing the user to view variable registers such as temperature or PWM. This window can be accessed by clicking on 'View' in the menu and selecting 'Register Map'. More information and a full register map is available in the ADT7462 datasheet.
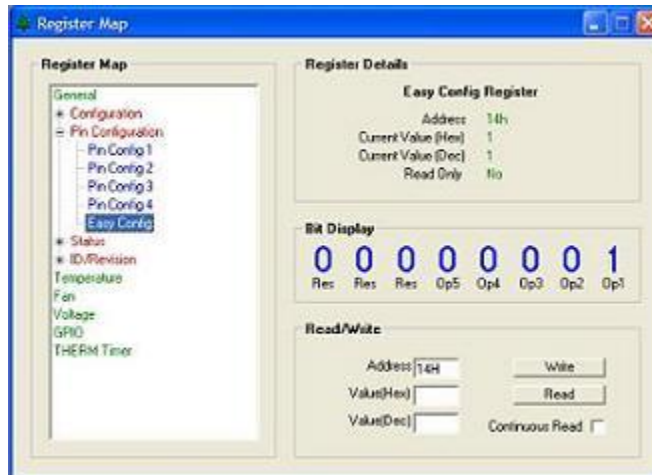
Figure 3: Register Access window

GRAPHING

This window allows all of the variables monitored or controlled by the ADT7462 to be viewed (see figure 4). Clicking on the 'Select Graph' box displays the options available. The user can select:

- Temperature
- Tach
- Voltage
- THERM%
- PWM%

To help with analyzing the fan control loops the user can also choose to graph temperature with tach input or temperature with PWM% output. The update rate can be set for this window using the 'Update Rate (ms)' box. To access this window click on 'View' in the menu and select 'Graphs'.
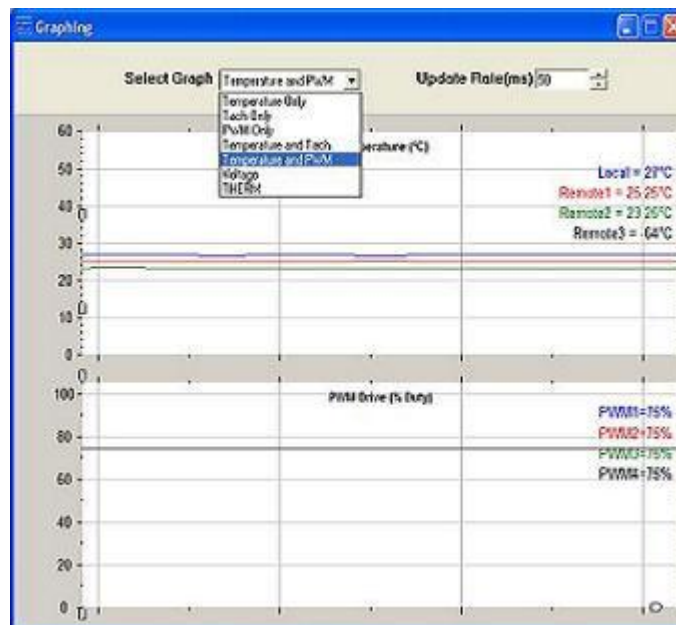

Figure 4: Visual Display window

![ON Semiconductor logo]

DISPLAYING LIMITS and INTERRUPTS

All of the limits for the measurement channels can be set here. The interrupt status and mask options for all interrupt sources can also be accessed here (see figure 5). The channels are grouped by function. They are:

- Temperature
- Fans
- Voltage
- THERM Timer (when set as input)
- THERM limits (fan assertion)
- Digital/VRD

The indicators on each tab will reflect the current interrupt status for each source. Most of the sources have an associated mask bit that can be set disable the source. The limits associated with each channel can be modified by selecting the channel from the combo box and then dragging the limits on the bar graph to the required value (for channels with upper and lower limits: blue is the upper limit and grey is the lower). If the device is in Alert mode (requires the register to be read in order to clear the interrupts) then interrupts will only be cleared when this window is open.

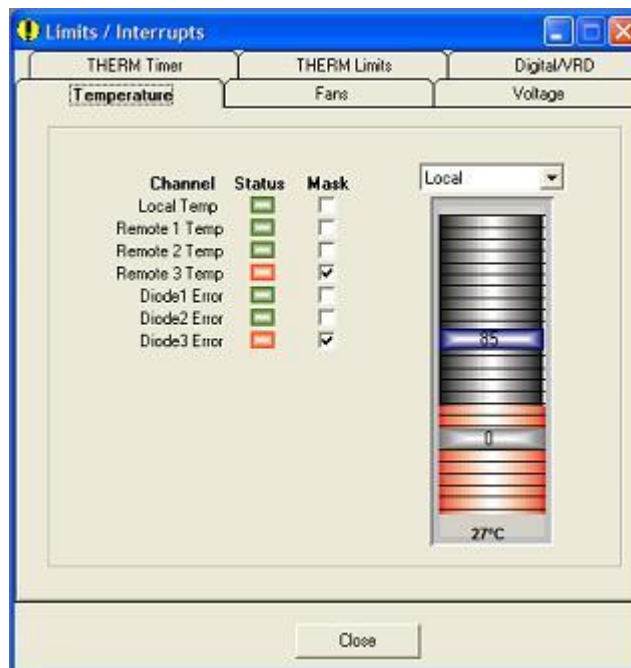To access this window click on 'View' in the menu and select 'Limits/Interrupts'.

Figure 5: Limits/Interrupts window

GENERAL CONFIGURATION

The settings in this window relate to over-all operation of the ADT7462 (see figure 6). Options include:

- Setup Complete bit (must be set for correct operation)
- Temperature and Voltage monitoring
- Voltage Averaging
- Interrupt Mode
- Shutdown Mode
- SDA/SCL Timeout

- Low VID Threshold
- Vcore_Low setting
- Control Loop setting (ADT7468)

To access this window click on 'Configuration' in the menu and select 'General Configuration'. Changes will not be programmed to the device unless 'Apply' or 'OK' are clicked.
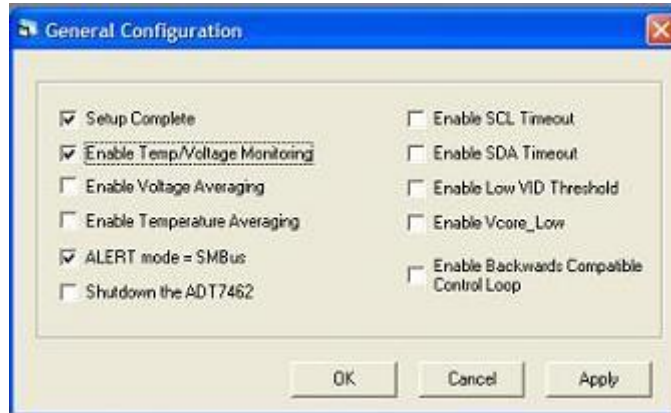

Figure 6: General Configuration

PIN CONFIGURATION

The pin settings for the ADT7462 can be viewed and configured in this window (see Figure 7). The 'Easy Configuration' tab allows the user to set the 'Easy Option' bits. It also displays information on the settings for each option. The 'Individual Pin Configuration' tab can be used to modify the function of each pin. The 'Apply' button must be clicked for the selected option to be programmed to the device. To access this window click on 'Configuration' in the menu and select 'Pin Configuration'.
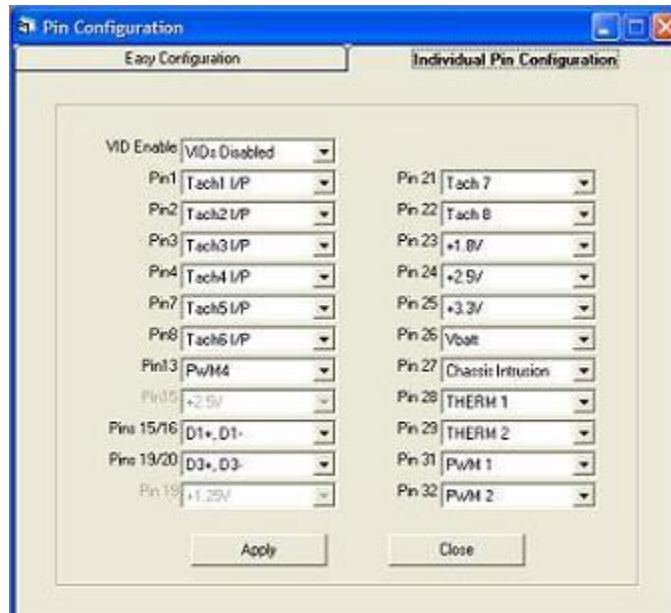

Figure 7: Pin Configuration

![ON Semiconductor logo]

CONFIGURING the FANS

The options for setting up the fans on the ADT7462 can be accessed in this window (see figure 8). The 'All Fans' tab allows the general fan settings to be modified. These are:

- High/Low PWM frequency
- Fast Measurement
- VRD1/VRD2 Boost
- Full Speed on THERM1/THERM2 assertion
- Run at Full Speed
- Spin-Up
- Maximum PWM
- Fan tach pulses/rev

Tabs 'PWM1' to 'PWM4' allow the settings specific to each PWM channel to be accessed. The options available on these tabs are:

- Continuous Tach Reading
- PWM Operation below Tmin
- PWM Polarity
- Enhanced Acoustics Settings
- Minimum PWM duty cycle
- Spin-Up Timeout
- PWM channel control
- PWM frequency

The 'Tachs' tab allows Tachs 1-8 to be enabled or disabled.

Changes will not be programmed to the device unless 'Apply' or 'OK' are clicked. To access this window click on 'Configuration' in the menu and select 'Fan Configuration'.

Figure 8: Fan Configuration

VOLTAGE ATTENUATORS

The attenuators on the voltage channels can be enabled or disabled individually. To access these settings click on 'Configuration' in the menu and select 'Voltage Configuration'. Changes will not be programmed to the device unless 'Apply' or 'OK' are clicked.

THERM PIN SETTINGS

The THERM pins can be set as inputs allowing the PROCHOT signal to be monitored or as outputs to allow THERM assertions. To access the THERM settings window (see figure 9) click on 'Configuration'in the menu and select 'THERM Configuration'. Changes will not be programmed to the device unless 'Apply' or 'OK' are clicked.
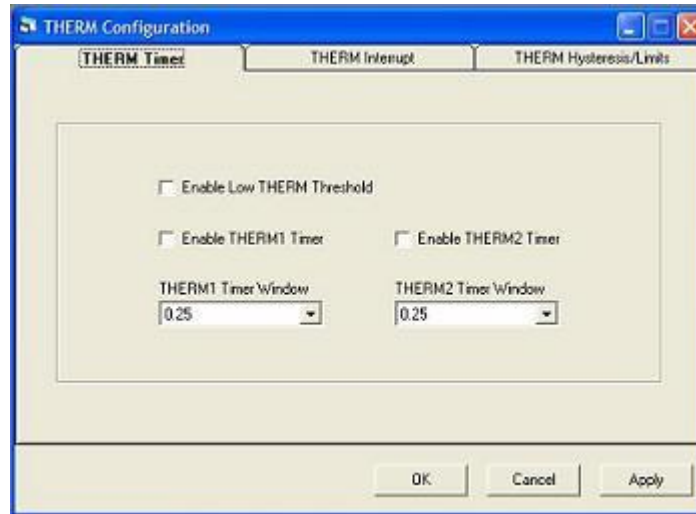

Figure 9: THERM Configuration

GPIO SETTINGS

The settings for the eight GPIO pins on the ADT7462 (see figure 10) can be accessed by clicking on 'Configuration' in the menu and selecting 'GPIO Configuration' . The direction, polarity and status can be viewed and modified. The 'Pin Enable' indicator for each channel indicates if the corresponding pin has been configured as a GPIO pin. To enable the GPIO pins use the 'Pin Configuration' window. The settings in this window are programmed automatically when changed.
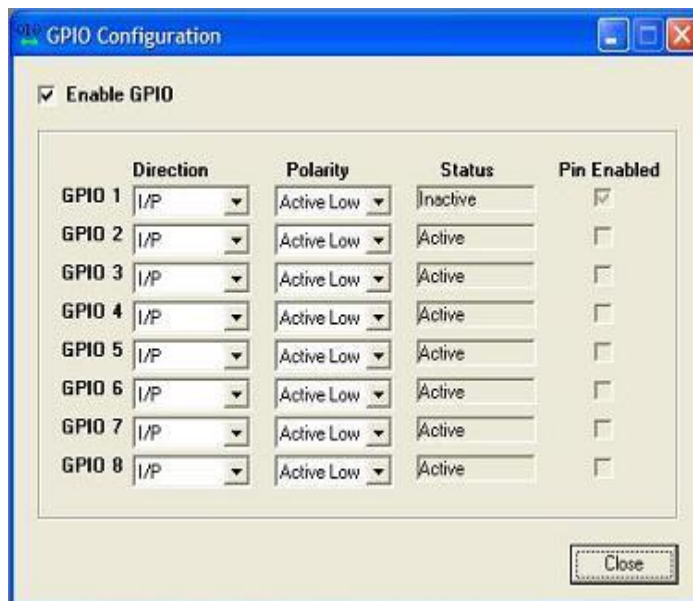

Figure 10: GPIO Settings

EDO SETTINGS

EDO settings can be accessed by clicking on 'Configuration' in the menu and selecting 'EDO Configuration'. These settings allow the user to enable EDO1 and EDO2 and to mask the EDO event for GPIOs, Fans, THERM and voltage. Changes will not be programmed to the device unless 'Apply' or 'OK' are clicked.

AUTOMATIC FAN CONTROL

The 'Automatic Control' window allows the user to set up the ADT7462 control parameters for each PWM channel and to view the corresponding control curve for each channel (see figure 11). The 'All Fans' box allows the user to set the maximum PWM and to enable/disable the full speed on THERM assertion bits. The PWM tabs give access to the settings for each channel. The options available are:

- Minimum Duty Cycle
- PWM behaviour below Tmin (off or PWMmin)
- Control Source for the channel

The tabs for the thermal control zones give access to the following options:

- Tmin
- Tmin hysteresis
- Trange
- THERM1 and THERM2 limits
- THERM hysteresis

The device and the graph are automatically updated with the programmed settings, The graph also shows the current control point (i.e. current zone temperature against channel PWM%). Under normal operation this point will lie on the curve but may deviate due to VRD fan assertion.

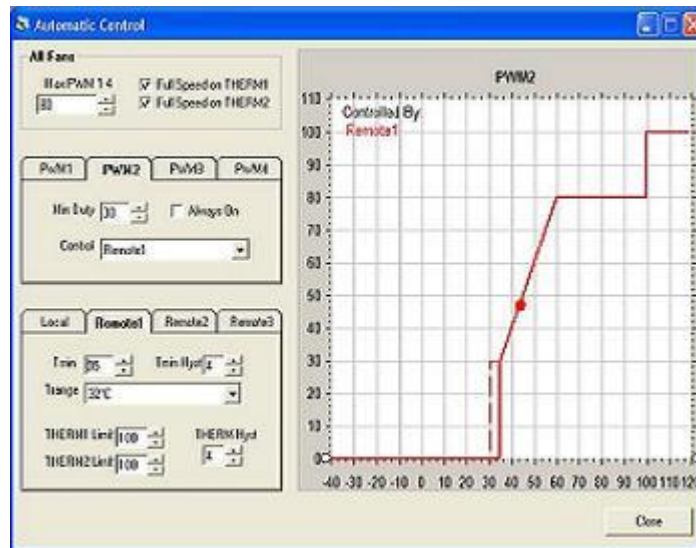To access this window click on 'Fan Control' in the menu and select 'Automatic Fan Control'.

Figure 11: Automatic Fan Control

DYNAMIC Tmin CONTROL

The ''Dynamic Tmin Settings' window allows the user to configure the ADT7462 to control the fans based on a specific operating point temperature (see figure 12). The options available in this window (for Remote1 and Remote2) are:

- Enable/disable Dynamic Tmin
- Load Operating point with temperature on THERM1 or THERM2 assertion
- Loop cycle time
- Operating point value
- Tmin value
- Low limit value
- High limit value
- Operating point hysteresis
- Backwards compatible control (ADT7468)

The graph displays the relevant values for operation of the control loop. It also displays the PWM output for any PWM channel controlled by Remote1 or Remote2. Changes to the settings are automatically programmed to the ADT7462. To access this window click on 'Fan Control' in the menu and select 'Dynamic Tmin Control'.
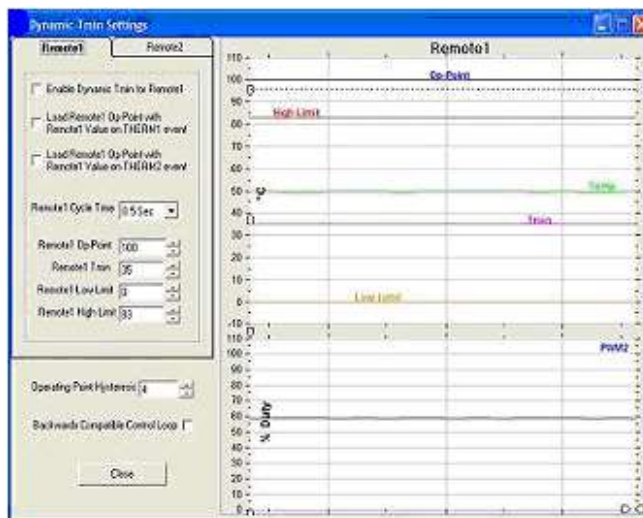
Figure 12: Dynamic Tmin Control

MANUAL FAN CONTROL

If any of the PWM channels are configured for manual control then the PWM value can be programmed using the 'Manual Fan Control' window. An indicator will show for each fan whether it is under manual control or not (use the 'Fan Configuration' window to enable manual mode). To access the manual control window click on 'Fan Control' in the menu and select 'Manual Control'.

SAVING/RECALLING DEVICE CONFIGURATIONS

The user may save the current device configuration to a text file or recall a previous configuration that has been saved by clicking on 'File' in the menu and selecting 'Save/Recall Configuration'. The option 'Save registers that differ from default' will minimize the save file by ignoring any register that has a current value equal to its default value. A comment may be added to the save file if required.

DATA LOGGING

The user may log any of the measurements taken or the PWM output generated by the ADT7462. To access the data logging window click on 'File' in the menu and select 'Log Data to File'. Alternate pin functions and disabled channels will be grayed out. The user can select any of the available channels for logging and set the logging interval.

ON-BOARD HEATERS

The on-board heaters may be used to demonstrate the automatic control loops. The heaters are in contact with the remote sensors which are mounted in the airflow of fans 1 and 2. To access the heater control click on 'Hardware' in the menu and select 'Heaters'. The heater control is driven by a PWM signal. The sliders on the heater control window set the PWM drive value. The current Remote1 and Remote2 temperatures are also displayed.

SWITCH CONTROLS

For some functions the electronic switches are automatically programmed (i.e. switches connected to pins that can be configured as GPIOs will be opened if GPIO is enabled). If an external diode is to be connected to D2+,D2- then the user must disconnect switches using this window. Switches on other pins such as voltage pins can also be disabled if the user wishes to connect an external source. To access the switch control window click on 'Hardware' in the menu and select 'Switches'.