

As Built Note 5 Building Temperature Control

Design Requirements

In an ideal situation, the type of equipment used for this station would be best housed in a building sealed from outside air moisture and would use a heat pump to extract any surplus heat from the enclosure. This approach keeps the equipment very clean and dry but is impractical for a site with an off grid power supply.

An alternative low cost and efficient heat extraction system is to reticulate sufficient outside air through the enclosure to prevent over heating of the equipment in operation. The challenge with fresh air cooling is to ensure good filtering of the intake air and regular air filter maintenance is carried out to prevent premature deterioration of the equipment in the enclosure.

The quiescent dissipation is estimated to be less than 50 watts and should require no forced air extraction for most of the time. Depending upon the transmitting duty cycle, a sufficient volume of air needs to be moved through the enclosure to extract heat of say 2 kW during peak dissipation. In SSB mode this is less at about 300 Watts average power per transceiver/linear combo.

Practical Design for automatic heat extraction

A filtered air intake is installed on the lower part of the enclosure door. The exhaust cowl is in the top half of the door and is shuttered to prevent backflow and entry by insects.

The following assumptions are made for automatic control of the environment.:

Minimum enclosure temperature: Shutter closed. No lower limit. No heating control.

Target Temperature Range 25 - 30° C. Shutters open at 25° C and extraction fans turn on.

Maximum Enclosure Temperature: Alarm Condition: 35° C when there is an excessive temperature warning. (this is adjustable and could be set higher if required)

Air is to flow to the outside of the enclosure when the shutter in the exhaust cowl is opened and the fans are turned on. The shutter and fans are intended to operate automatically at 25° C. (easily adjustable to a different temperature)

Cool air is filtered at the air intake cowl mounted lower in the same door. There is an option to add an electronically controlled shutter on the air intake that would operate in concert with the exhaust system if desired. Initially this has not been fitted.

Being thermostatically controlled means the running cycle of the fans will be dependent on the transmit duty cycle of the transceivers and linear amplifiers within the enclosure. This is expected to result in efficient and relatively low consumption of the station's power supply.

A high temperature alarm is also provided completely independent of the fan and shutter control. This alarm is connected to the SCADA. This is adjustable and is intended to be set at 35° C. Another SCADA indication could be added at the 6-pin DIN socket if required to indicate the fans running but this has not been included initially.

Technical Design

There are three modular items the form the system:

1. **Building temperature Controller** module that contains two electronic thermostats: one to turn on the air exhaust and one to provide an over temperature alarm.
2. The **Exhaust Vent controller** module that houses the limit controllers for the exhaust shutter and slave relay for turning the fans on and off.
3. The **Door Panel** that includes: two 24 volt extraction Fans mounted in the exhaust duct. (easily upgraded to four if the need arises), and one Futaba 5Volt model control servo, to open and close the air exhaust shutter.

Technical Description

The temperature control system is independent all other control systems in the building and simply requires a connection to the 24V primary power supply of the station to operate automatically.

Building Temperature Controller

The two separate sub-boards are low cost W1209 temperature controllers with digital LED readout of temperature. These operate on 12 Volts derived from the 24 to 12 V voltage boost buck.

The servos and the control relay operate on 5 Volts derived from a 12V to 5V voltage buck. This is also housed within the **Building Temperature Controller** module.

At a temperature below the set point on each controller the K1, K2 contact is normally open (NO) and nothing happens.

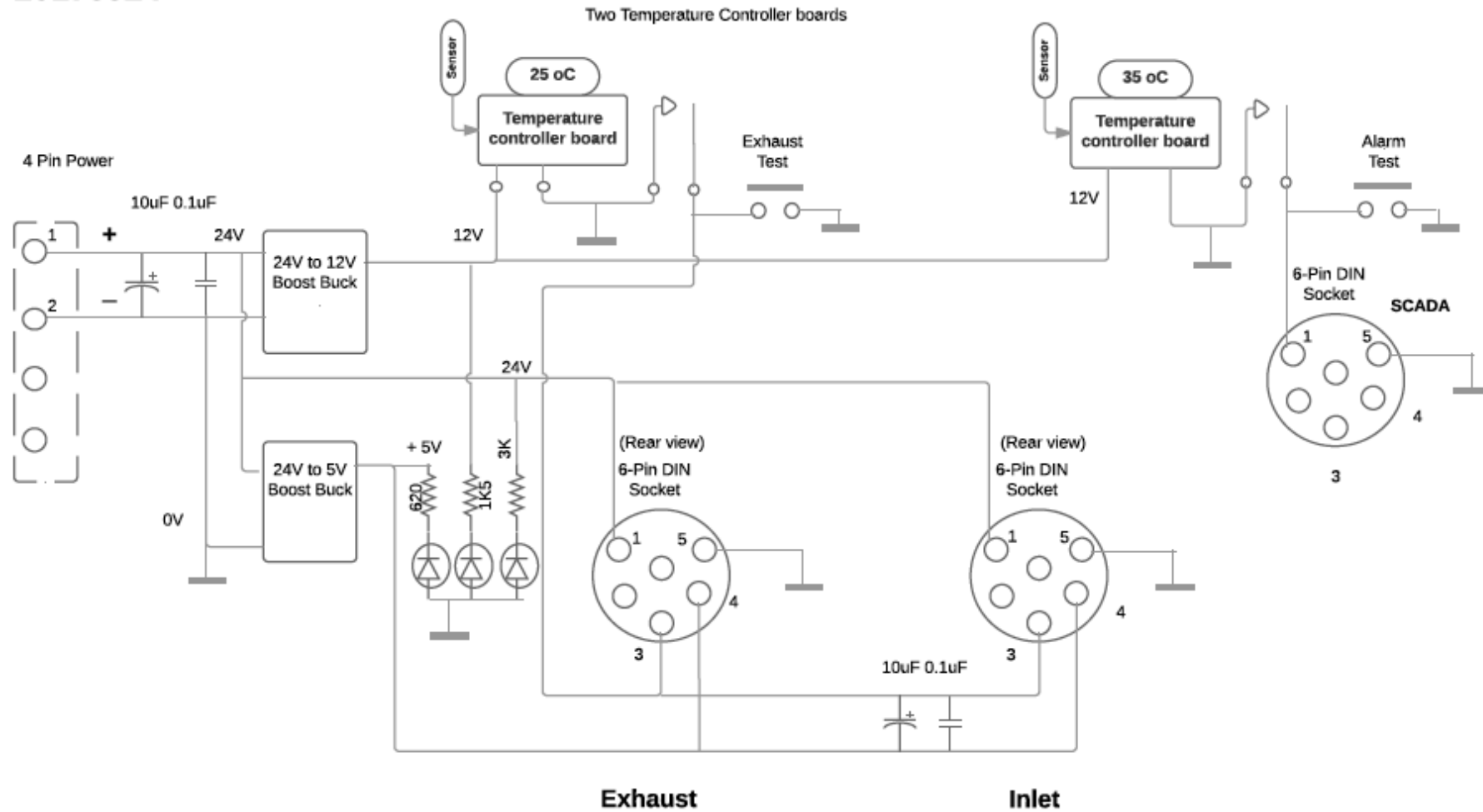
At a temperature above the set point on the Exhaust controller the K1, K2 contact is closed. This conveys a command to the Exhaust vent controller module which opens the exhaust shutter and starts the fans.

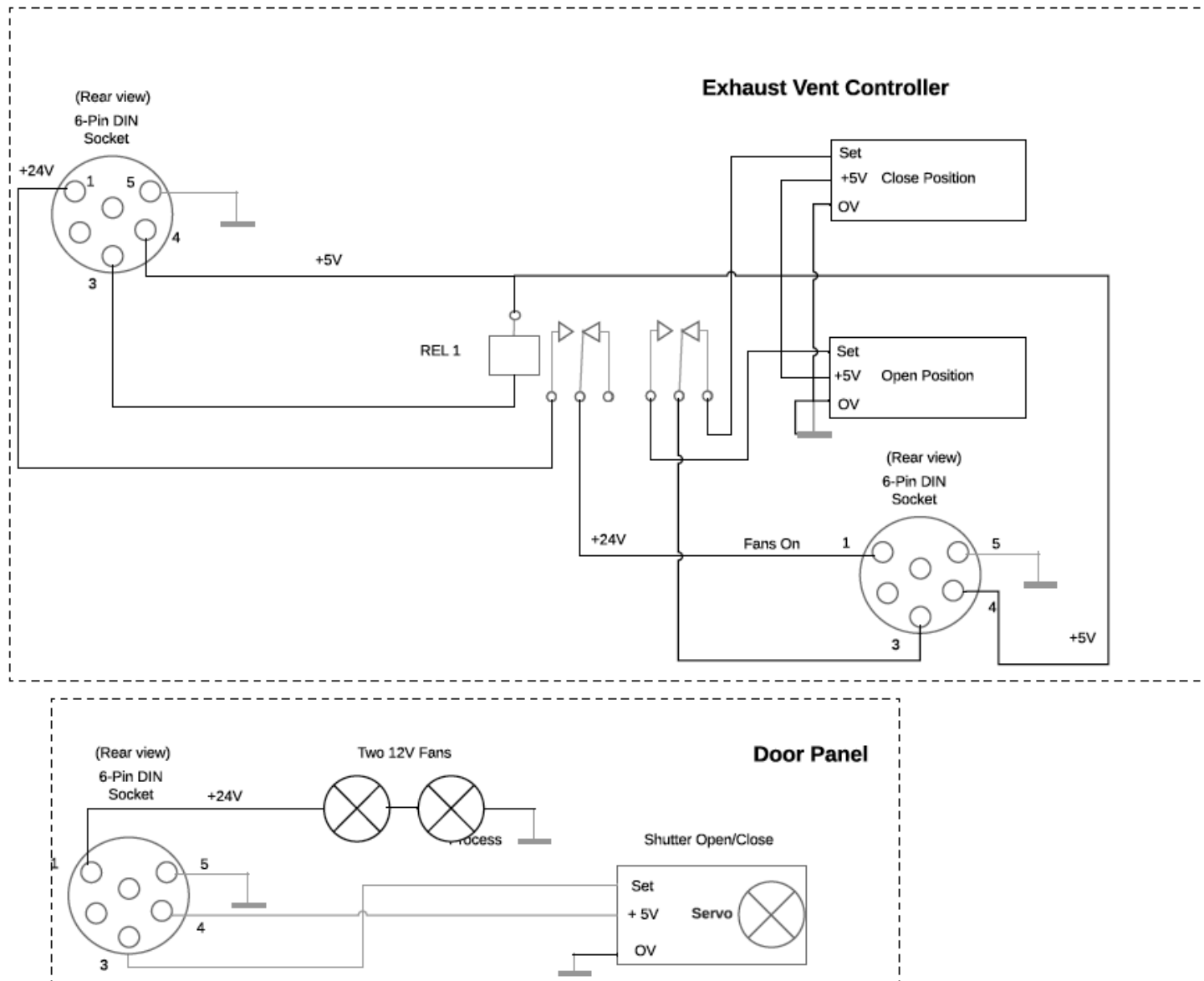
At a temperature above the set point on the Alarm controller the K1, K2 contact is closed. This conveys an alarm indication on pin 1 of the SCADA 6-pin DIN Socket. This is active low (ground for an indication).

Bill of Materials – Environment Control Unit

Item	Description	Each	Approx Cost
1	Temperature controllers W1209	2	\$10.00
2	Model Servos MG996R	1	\$11.00
3	5V relays REL 1 and 2 SPDT	1	\$7.00
4	Voltage regulator 24V to 12V	1	\$5.00
5	Voltage Regulator 12V to 5V	1	\$5.00
6	Servo position Modules (Servo Testers)	2	\$10.00
7	Veroboard, terminals, cabinets and miscellaneous parts		22.00
	Total:		\$70.00

CIRCUIT DIAGRAM BUILDING TEMPERATURE CONTROLLER 20170924





Appendix

Temperature Controller Board W1209 Instructions



W1209 DC 12V (-50 to +110°C) Temperature Cont...

By: **Parijat** 2016-12-28 15:28:36

The module runs on a 12V DC supply and draws about 20mA or 70mA when the relay is energised. Here's the programming info: A brief press of SET enters the main temperature adjustment mode with the current set temperature flashing. This can be adjusted with the UP/DN buttons, and holding them will make them auto-repeat. When finished adjusting, the unit will store your new setting and revert back to normal operation after several seconds. Holding down SET for about 5 seconds will enter programming [Read more](#)



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Great value, seems accurate.

By: **philtinker** 2017-01-16 05:32:04

Impressed by this unit at the price. Easy to set trigger temperature using 'set' and + - buttons. Settings retained after power loss. Worth knowing: Switching hysteresis is 2C, Relay is single pole, so no change-over. Relay contacts are closed above set temperature. Relay is rated at 125V, 20A, presume it's OK for 230V. Length of pre-wired temperature sensor lead is 50cm. Temp sensor is a small cylinder, approx. 2cm x 3mm, looks as if it could be water resistant.