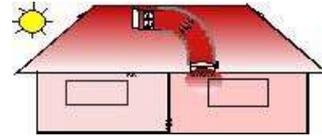




Attic Heat Harvester



“Harvesting attic heat to reduce your annual heating cost”

Attic Heat Harvester Controller Manual

The Attic Heat Harvester System is controlled and monitored by a specifically developed controller that makes it the best choice for harvesting attic heat.

Controller features include:

- ✓ System performance data logging
- ✓ User settable parameters that permit you to configure the system to meet you preferences and to achieve the highest possible efficiency and annual heating and cooling cost reduction
- ✓ A programmable timer permitting separate heating start times to be set for weekdays and weekends
- ✓ Integrated power on self test functions, system tests and error messages



The Attic Heat Harvester Controller has a 2 line back-lit LCD display and 3 key buttons: 'Mode', '+' and '-'.

The 'Mode' key, together with other keys selects: Display, System Performance, Parameter Setting, Test, Performance History Reset, and Fan On modes.

The '+' and '-' keys are used together with the Mode key to select the display mode, in Parameter Setting mode to change pre-set parameters, and to select system test modes.

When any key is pressed the display back light is turned on for 60 seconds.

When the Attic Heat Harvester Controller display is in 'Normal Mode', i.e. displaying Room and Attic temperatures, additional functions can be selected as follows:

- 1) A short 'Mode' key press starts 'System Performance Display' mode

- 2) A long 'Mode' Key press starts 'Parameter Setting' mode
- 3) A short 'Mode' and '-' key press starts 'System Test' mode
- 4) A long 'Mode' and '-' key press starts 'Performance Data Reset' mode
- 5) A short 'Mode' and '+' key press starts Fan ON mode
- 6) A short '+' key press in Room and Attic temperature display mode displays system output status for one second in every eight for a minute
- 7) Any key press turns on the LCD display back light for 1 minute

When the controller is switched on it automatically performs Power On Self Tests.

When the controller is operating it continually performs error checks and displays problems detected.

1 Normal Display mode

When operating normally the LCD displays the Room Temperature (RmT) and the Attic Temperature (AtT) in °C or °F units as selected by the Units setup parameter.

RmT 19.5
AtT 31.2

If the '+' key is pressed for a short period the current system output status is displayed for 1 second in every 8 for 60 seconds. The 4 outputs (OP's) are: Heat Fan, Main Air Valve (MAV), Cool Fan, and Valve Power (VPwr).

Cool Fan
VPwr

Heat Fan
MAV_

2 System Performance Display mode

The Attic Heat harvester Controller calculates and stores system performance data, this mode is selected by pressing the 'Mode' Key and releasing it within 1 second.

Nine sequential displays show system performance data at 6 second intervals:

- a) 'Current Power (CkW)' and 'Current Efficiency (CEff)'

CkW 4.9
CEff56.9

- b) 'Total Power (kWh)' and 'Total Efficiency (TEff)'

kWh 1405
TEff24.2

- c) 'Heating Fan running cost (Heating Cost)'

Heating
Cost8.02

- d) 'Fan running hours (FHR)' and the average 'Attic - Room temperature (AvTD)'

FHR637.3
AvTD 8.5

- e) The available heat in the attic that has been un-used because the room temperature is at or above the preset maximum room temperature parameter preventing the heating fan from operating

Un-Used
kWh 1107

- f) Attic Cooling Fan running costs (Cooling Cost) - option, dependant on system ordered

Cooling
Cost1.10

- g) 'Attic Cooling Fan running hours' (Cooling Hrs) - option, dependant on system ordered

Cooling
Hrs131.4

- h) 'Maximum Attic Temperature (MxAT)' and 'Minimum Attic Temperature (MnAT)'

MxAT51.5
MnAT-0.7

- i) 'Current Time', if set at or after power up, in day, hours and minutes in 24 hour format

Time
Sun21:56

j) The display then reverts to operating normally displaying Room and Attic temperatures.

If the '+' is quickly pressed during the display of performance data the next data will be displayed.

If, during the display sequence, the 'Mode' key is pressed for 1 second the display reverts to normal mode displaying temperatures.

At power on the controller gives the option of setting the clock parameters detailed in section 3j, 3k and 3l below.

Before the clock time can be displayed the current time minutes must be set either at power on or in Parameter Setting Mode.

If the current clock time is not set, or the weekday or weekend heat on times are at 00:00, the harvesting system operates on respective days whenever attic, room temperatures and user pre-set parameters permit.

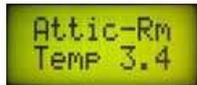
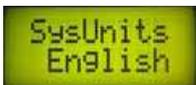
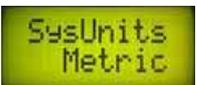
System performance data is stored at power down and restored at the next power up.

3 Parameter Setting Mode

Parameter Setting mode is entered by pressing and holding the 'Mode' key for 2 seconds or more, then releasing it.

You can set the following parameters to meet your needs to for example 'maximise system power generated' or 'maximise system, efficiency'. We recommend that you optimise the controller settings to suit the current season at your location.

When this mode is selected the 11 parameters are displayed sequentially at 6 second intervals:

		Default Values
a) The minimum 'Attic - Room' temperature required to operate the fan:		3°C (5.4°F)
b) The maximum Room Temperature above which the fan is off		23°C (73.3°F)
c) The maximum Attic temperature before the attic cooling fan operates, (option)		43°C (110°F)
d) The Heating Fan air Flow rate		1400 m ³ /hr (820ft ³ /min)
e) The Heating Fan Power		80 watts
f) The Cooling Fan Power (option)		60 watts
g) The electricity cost per kWh		0.14 currency units
h) Either Metric (Metric) or English (English) units	 	Metric
i) Current Day and Time as 'Day':'Hour':'Minute'		Mon:00:00
j) WeekDay Heat On Time as 'Hour':'Minute'		0:00
k) Weekend Day and Time as 'Hour':'Minute'		0:00
l) The display then reverts to operating normally displaying Room and Attic temperatures		

If during a) thru k) above either the '+' or '-' key is pressed the parameter displayed or highlighted, is increased, or decreased, to it's permitted maximum or minimum value. The display sequence resumes 4 seconds after the last key was pressed.

If during h) above either the '+' or '-' key is quickly pressed, system units are toggled.

If, during the display sequence the 'Mode' key is pressed and released the display reverts to normal display mode.

Day, hours and minutes are set sequentially; the LCD display cursor shows the active units. Whenever Current Time minutes are changed current time seconds are set to 00.

Before weekday and weekend clock times are displayed the current time minutes must be set.

When the system is set to operate in 'Metric' units temperatures are displayed in degrees Centigrade and fan flow is displayed in cu mtrs/Hr.

When the system is set to operate in 'English' units temperatures are displayed in degrees Fahrenheit and fan flow is displayed in cu ft/min.

Current AHH Controller set-up parameters, except for times, are stored at power down and restored at the next power up.

4 System Tests

System Test mode is selected by pressing both the 'Mode' and '-' Keys together and releasing them within 1 second.

System Test mode tests the main Attic Heat Harvester Controller system elements.

If no keys are pressed the following System Tests are executed sequentially at 6 second intervals.

a) 'Firmware Version and Date'.

b) 'Display Test' tests the LCD display.

c) 'Key Pad Test' permits each key to be tested. During this test if a key is pressed it is displayed.

d) 'System 12 and 5 volt supply Test' displays the voltage levels of the 12 volt and 5 volt supplies. The 5 volt level should be from 4.75 to 5.25 volts. The 12 volt supply level should be between 11.5 and 17 volts.

e) System Early Power Down voltage test displays the Early Power Down voltage input, this should be between 2.0 and 3.2 volts.

f) System Outputs Test sequentially operates the Heating Fan, Main Air Valve, Cooling Fan, Valve Power, outputs at 1 second intervals, 3 times.

g) Time shows the current time in hours minutes and seconds.

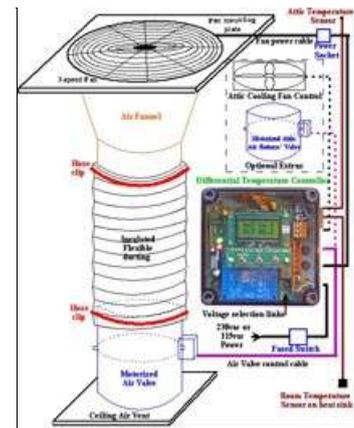
h) Normal display Mode is then resumed.

During all system tests:

i) If the '-' is pressed and released within 1 second the current test pauses until the '-' key is pressed again when the test sequence is resumed.

j) If the '+' key is pressed and released within 1 second the next test is selected with the exception of Key Test.

k) Except in test c) Key Test above if the 'Mode' key is pressed then released, System Test mode is ended, normal display mode is then resumed.



5 Reset Performance Data Mode

Reset Performance Data mode is selected by pressing and holding both the 'Mode' and '-' keys for 2 seconds or more then releasing them.

If the system memory capacity is not exceeded the Attic Heat Harvester Controller calculates and stores Total Power, Total Efficiency, Harvesting costs, Fan running Hours and average Attic - Room Temperatures, un-used heat, Cooling costs, Cooling Fan running hours, and Maximum and Minimum Attic Temperatures.

Performance data is stored in non-volatile memory when power is removed from the system.

When in Reset Performance Data mode performance data can be reset, i.e. 'set to 0' by the following sequence:

- After Reset Performance mode has been selected the messages 'To Clear Data Mem' and 'Press Mode & -' are displayed sequentially for 4 seconds.
- To clear Performance Data Memory within 4 seconds press and hold both the 'Mode' and '-' keys together and then release them.

If b) above is not completed within the time allowed 'Aborted!' is displayed, performance data memory is unchanged and normal display mode is resumed.



6 Fan ON Mode

Fan On mode is selected by pressing both the 'Mode' and '+' keys for a short period then releasing them.

Fan on mode opens the air valve then after a short delay turns on both the main and, if fitted, the Cooling Fan, in this mode the display shows Room and Attic Temperatures.

Fan On mode is ended by pressing the 'Mode' key, the fan is turned off and air valve is closed.

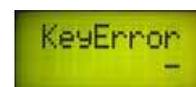


7 Power On Self Test and Sequence

At power on the Attic Heat Harvester Controller automatically sequentially performs the following:

- Display Connection Test - This checks that there are no display connection short circuits. If a short circuit is detected the 'yellow Running LED' is flashed rapidly.

- Key Test - This checks that no key is depressed, if a key appears to be pressed 'KeyError' is continually displayed together with the key seen.



- System Power test - This test system power levels, errors are displayed.



If no problems are detected the Attic Heat Harvesting controller Displays the system sign On and version messages.



- Displays 'Set Clock' and 'Mon:00:00' permitting the user to optionally set the current day, hour and minute indicated by a flashing cursor. When the minute is set seconds are set to 00. '(Hr:Min:Sec)' can be displayed in System Test Mode. If no keys are pressed the next stage begins in 18 seconds.



If minutes are set in e) above the following 2 items are displayed

e) Displays the weekday heat on time permitting the user to optionally set the hour and minute that the attic heat harvester heating system is activated each weekday. If no keys are pressed the next stage begins in 18 seconds. If no time is set the system is active on every weekday.

f) Displays the weekend heat on time permitting the user to optionally set the hour and minute that the attic heat harvester heating system is activated on Saturday and Sunday. If no keys are pressed the next stage begins in 18 seconds. If no time is set the system is active on every Saturday and Sunday.

g) The Attic Heat Harvesting controller begins normal operation displaying room and attic temperatures.

8 Error Messages

When the Attic Heat Harvester Controller is operating it continually performs the following checks:

a) The correct operation of the room and attic temperature sensors - errors will be displayed. If either of these errors are detected check and repair or replace the temperature sensor cables.

b) The maximum system Current Power level is 65,535 watts which is obtained by multiplying a constant by the current attic - room temperature difference and the fan air flow parameter. If the product exceeds 65,535 'PwrLimit Exceeded' is displayed, indicating that future Total Power data is understated. Should this error message be displayed check the Fan Flow parameter setting.

c) The maximum system efficiency is 999.9, if either the current or total efficiency calculated exceeds 999.9 either 'CEff 2Hi' or 'TEff 2Hi' will be displayed.

d) The system 12 volt supply, should this drop below 9 volts the Attic Heat Harvester Controller will think it is being turned off and will save its current settings and system performance data in non-volatile memory then display the AC Volts Too Low message until the power dies. When the unit is next turned on the system settings and performance data are reloaded.

If any Performance Data Value is within 88% of it's maximum design value the Attic Heat Harvester Controller will continue to work normally and the LCD backlight will flash continually and a warning message will be displayed. This gives the user the option of reading and recording the system's performance data then resetting Performance Data Memory. Typically it will take more than a year for performance data to reach near maximum capacity values.

If any Performance Data Value is within 99% of it's maximum design value the Attic Heat Harvester Controller will turn the Fan off and stop recording further Performance Data. A relevant warning message is then continually displayed and the display back-light is turned ON and OFF. In this mode the keys and system menus still operate. The Systems Performance memory must then be cleared to restore normal operation.

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