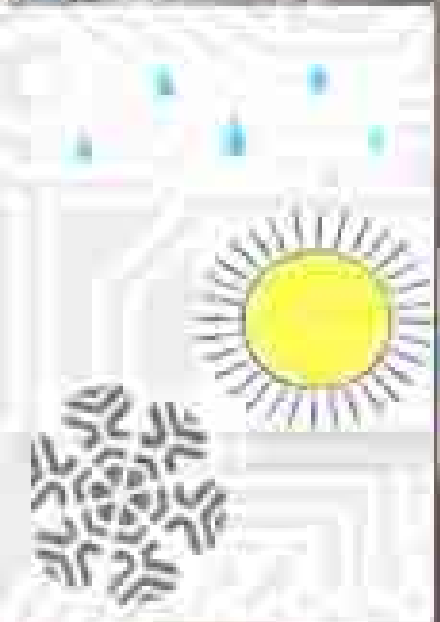
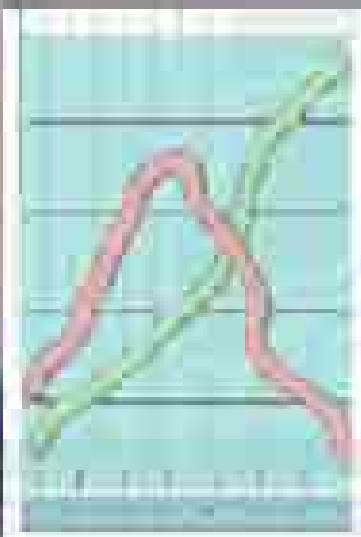
SEron





Environment Monitoring and Control System

Installation, User and Service Manual for

SEron

Environment Monitoring and Control System

Mushroom Farming Version
Hardware Version 1.4
Software Version 2.0

Manual Version 1.0

By: Gary Sutcliffe, 15 December 2004

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Introduction

Seron monitoring and control system has been designed for the monitoring and control of temperature and humidity primarily for mushroom farming, but can be used in many other areas that require the monitoring and control of temperature and humidity.
This system can be used purely for monitoring purposes or with the use of the control card for control of temperature and humidity.
The system is designed for the optional reporting of readings back to a PC for monitoring and recording.
The control card is intended to interface with an airconditioning system and a dehumidifier heater.

Installation

There are three possible configurations for the SEron system each has its separate installation instructions listed :

1. Monitoring only

To install the unit for local and remote PC monitoring only follow the these instructions:

1. Install the wiring for the ring bus as shown in Appendix D using cat 5 or other cable acceptable for the RS484 protocol. The T-joins can be made with telephone crimp joiners or soldered the head shrunk. Insure there is enough length on each cable drop to terminate the unit in the required mounting spot.
2. Fix unit box to wall where air temperature and humidity monitoring is required
3. Thread bus cable through a rubber grommet on the underside of the box (see Appendix A.)
4. Strip back about 10 cm of the cable outer sheathing, then about 0.5 cm off the wires to be connected.
5. Connect the wires to the screw terminals as in diagram 5.
6. If the device is at one of the ends of the bus insert a terminating resistor across the two comms screw terminals as well as the wires. (see diagram 5)
7. Switch the power jumper to ring bus position. (see Appendix E)
8. Thread the external compost temperature cable through a spare rubber grommet on the underside of the box and connect the wires to the sensor board screw terminals as in Appendix E.
9. Once all units have been installed connect a 12 to 24 V DC soured to the brown (+) and brown/white (- or gnd) wires on the cable drop for the converter/computer connection.
10. Switch the power on and check all units are working before proceeding further.
11. set the parameters for each unit (each unit must have a unique device address), and calibrate each sensor. (see the relevant sections in this manual on these processes)
12. Install the monitoring software on the PC, then shut down and switch of the PC.
13. Configure and connect the rs485/rs232 converter to the computer and to the green and green/white wires as in Appendix G.
14. Start the computer and run the monitoring software.
15. Add and configure each device in the software using add new device in the menu.
16. The reading should now start to display on the screen. Consult the problems section of this manual if any problems are encountered.

2. Control only

To install the unit for control and local monitoring only follow the these instructions:

1. Fix unit box to wall where air temperature and humidity monitoring is required
2. Thread the external compost temperature cable through a spare rubber grommet on the underside of the box and connect the wires to the sensor board screw terminals as in Appendix E.
3. Get a licensed electrical trades person to Install and wire the control card using Appendix B and Appendix F as a guide. (each installation may very depending on the air-conditioning units and setup)
4. Connect a ribbon cable between the control card and the main unit. (see Appendix E & F)
5. Switch the power jumper on the main card to control card. (see Appendix E)
6. Switch on the power to the airconditioner, check the SEron unit has power and test all features. Consult the problems section of this manual if any problems are encountered.

3. Monitoring and control

To install the unit for local and remote PC monitoring and control follow the these instructions:

1. First follow the instructions for the monitoring only installation.
2. If all units are working well the control card can now be installed.
3. Get a licensed electrical trades person to Install and wire the control card using Appendix B and Appendix F as a guide. (each installation may very depending on the air-conditioning units and setup)
4. Connect a ribbon cable between the control card and the main unit. (see Appendix E & F)
5. Switch the power jumper on the main card to control card. (see Appendix E)
6. Switch on the power to the airconditioner. Check the SEron unit has power.
7. Set the parameters for the unit, and calibrate each sensor. (see the relevant sections in this manual on these processes)
8. Test all features. Consult the problems section of this manual if any problems are encountered.

Setup

Menu system

The menu can be scrolled through by pressing the menu (<) button
The value of a menu item can be change with the up and down arrows
To save the new value the enter button should be pressed (>)

Menu Item	unit	default value
aircon mode	(off/Fan only/auto/continuous)	off
Control temp	deg C	
Control Humidity	%	
Fan low=0 high=1		high
Air Sensor Cal		
Comp Sensor Cal		
RH Sensor Cal	%	
Aux Sensor Cal		
ACon Cool cutin	deg C	
ACon Cool cutout	deg C	
ACon Heat cutout	deg C	
ACon Heat cutin	deg C	
Humidity cutin	%	
Humidity cutout	%	
Startup Delay	Seconds	5
Device Address	(0-99)	0

Setting the parameters

If the unit is connected to a computer the first value to be changed is the Device Address, other values can be changed to suit the desired setup and operation. See the relevant sections or the following descriptions for parameter details.

Device address

Each unit attached to the computer must have a unique address between 0 and 99. Step through the menu using the menu key until “device address” appears on the display, set the address with the up/down arrows and press enter.

Aircon mode

This is to put the airconditioner in to one of the four desired operational modes:

1. **Off** – airconditioner in standby mode with all relays de-energised
2. **Fan only** – inside fan only running (no heating or cooling)
3. **Auto** – Inside fan only on when heating or cooling required
4. **continuous** – Inside fan always on

Fan low=0 high=1

This sets the normal inside fan speed (if multi speed fan installed), a **0** sets the fan to low speed, **1** sets the fan to high speed. The fan speed will be forced high when the humiditysat switches to an on state.

Startup delay

The startup delay is designed to reduce cycling of the airconditioner compressor during periods of unstable mains power. Should the unit be located in an area with unstable mains the startup delay should be increased to a more suitable delay. The startup delay can also be set differently on each unit to provide a staggered startup of units, thus reducing the startup surge after a power outage.
During the startup delay period no settings can be adjusted.

Sensor calibration

A compression calibration should be performed using a calibrated temperature and humidity meter.

Temperature sensor calibration:

1. Put the calibration meter as close as possible to the sensor that is to be calibrated
2. Leave 10 minutes to allow the reading to adjust and stabilise.
3. Check the difference between the calibration meter and the SEron reading.
4. Adjust the Sensor Cal value for that sensor up or down by the difference
5. Recheck the value and if there is still a difference alter the “Sensor Cal value” accordingly.
6. Perform the same procedure for the other temperature sensor

Humidity calibration:

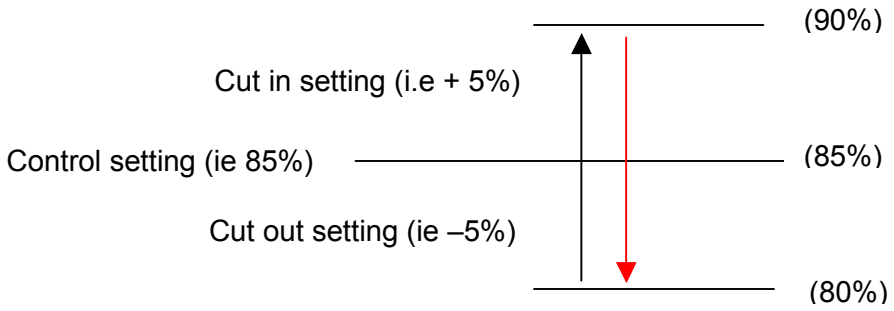
1. Put the calibration meter as close as possible to the Humidity sensor
2. Leave for 15 minutes to allow the reading to adjust and stabilize
3. Adjust the “RH Sensor Cal” up or down
4. Recheck the sensor values
5. Repeat the adjust and recheck until the humidity is reading the same as the calibration meter (an alteration of 10-40 may be required to change the display value by 1%)

Air conditioner control

Humidistat

The humidistat controls one 16A relay.
The humidity control setting is used to set the desired humidity level
The humidity cut in and cut out settings set the differential and are referenced to the control setting.
When the humidistat cuts in the high / low relay for the fan speed is force high to assist in the dehumidifying process.
Consult a refrigeration engineer if unsure of the required deferential settings.

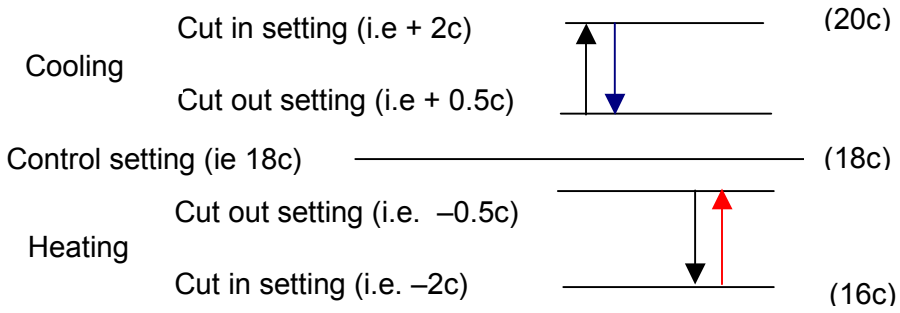
Example humidistat operation:



Thermostat

The thermostat controls two 16A relay.
One to switch the compressor unit on and off, and the other to switch between heating and cooling (hot gas solenoid)
The temperature control setting is used to set the desired temperature level
The heating and cooling cut in and cut out settings set the temperature differential and are referenced to the control setting.
The indication LED on the front of the main unit indicates green when the airconditioner is cooling, orange when it is heating and unlit in any other normal condition.
Consult a refrigeration engineer if unsure of the required deferential settings.

Example thermostat operation:



Problems

The table below can be used by the user or a technician to assist in rectifying any faults or problems. Consult the service agent or the manufacture on the contacts page of this manual for parts or servicing should the problem be unable to be rectified. The details of available replacement parts are listed in Appendix H.

Fault finding table		
Symptom	**Possible cause**	**Possible fix**
Device not working at all (display not lit)	Power supply jumper set wrong	Check Appendix E for jumper setting
	Fuse on main board blown	Check fuse and replace if needed
	Power supply to unit faulty	If getting power from ring bus check that power supply is working. If power from control card check fuse there.
	Device locked up	Remove power for 30 seconds then reconnect
	Cable fro control card faulty or connected not seated properly	Check connections are firm, try replacing with a known good cable
	LCD display faulty	Replace display with known good one
	Power supply IC faulty	Check there is 5 volts DC at the output of the IC (ground to pin 3 of IC?). If there is voltage in but none out this IC probably requires replacement
	Main chip faulty	Replace the main chip with a known good one
Device not working at all (display and control card LEDs not lit)	Fuse on control card blown	Check fuse and replace if needed
	No power to the transformer	Check the 240 volt AC power source
	Transformer faulty	If power on input to transformer and none on the output (12-30V AC) try replacing the transformer
Display not showing information or showing incorrect characters	Display or device locked up	Remove power to device for 30 seconds then reconnect
	LCD display faulty	Replace display with known good one
	Cable to display faulty or connected not seated properly	Check connections are firm, try replacing with a known good cable
	Reset IC faulty	Remove chip, if device now works properly replace with a known good chip
	Main chip faulty	Replace the main chip with a known good one
Temperature reading is incorrect	Calibration my be wrong	Check calibration for that sensor
	Sensor board faulty	Replace sensor board with known good one
	Sensor faulty	Replace sensor with known good one
	Cable to sensor or sensor board faulty or connected not seated properly	Check connections are firm, try replacing with a known good cable
	Main chip faulty	Replace the main chip with a known good one
	Incorrect sensor used	Check the sensor is correct type
Humidity reading is incorrect	Calibration my be wrong	Check calibration for that sensor
	Sensor board faulty	Replace sensor board with known good one
	Sensor faulty	Replace sensor with known good one
	Cable to sensor or sensor board faulty or connected not seated properly	Check connections are firm, try replacing with a known good cable
	Main chip faulty	Replace the main chip with a known good one

Display doesn't change and device seems to be locked up	Device locked up	Remove power for 30 seconds then reconnect
	Keypad button stuck	Check all buttons are working properly, replace if needed
	Keypad faulty	Replace key pad with known good one
	Reset IC faulty	Remove chip, if device now works properly replace with a known good chip
Thermostat working incorrectly	Settings incorrect	Check control and cut-in / cut-out settings are correct
	Readings wrong	See - Temperature reading is incorrect
	Buffer IC faulty	Replace the buffer chip with a known good one
	Main chip faulty	Replace the main chip with a known good one
	Faulty relay	Check control relay or replace control card
Humiditystat working incorrectly	Settings incorrect	Check control and cut-in / cut-out settings are correct
	Readings wrong	See - Humidity reading is incorrect
	Buffer IC faulty	Replace the buffer chip with a known good one
	Main chip faulty	Replace the main chip with a known good one
	Faulty relay	Check heater relay or replace control card
Fan stuck on high speed	Humidity stat on and heater relay energised	As a normal function of this device the fan will switch to high speed while the humidity stat heater relay is on
	The installation done for only one speed	Check with installer
	Faulty relay	Check fan speed relay or replace control card
	Buffer IC faulty	Replace the buffer chip with a known good one
	Main chip faulty	Replace the main chip with a known good one
Not controlling air conditioner correctly	Thermostat or humidity stat settings incorrect	Go to - Thermostat working incorrectly or humidity stat working incorrectly
	Air-conditioned Faulty	Get Air-conditioned checked out
	Faulty relay	Check control relays or replace control card
	Buffer IC faulty	Replace the buffer chip with a known good one
	Main chip faulty	Replace the main chip with a known good one
Readings not being read by PC from this device only	Device locked up	Remove power for 30 seconds then reconnect
	Software fault on computer	restart computer
	Device address set wrong	Check the device number in the settings is correct and not the same as any other device
	Comms isolator switch is switched to comms off (if installed)	Switch to on position
	Comms IC faulty	Replace comms chip
	Terminating resister not installed at each end of bus	Check resisters are installed
	Main chip faulty	Replace the main chip with a known good one
	Fault with wiring	Check all
Readings not being read by PC from a number of devices	Software fault on computer	restart computer
	One of the device address is set wrong	Check the device number in the settings is correct and not the same as any other device
	RS232/RS485 converter faulty	Check the unit has power and the wiring is ok, otherwise may need repair replacing.
	Terminating resister not installed at each end of bus	Check resisters are installed

	One divce has a faulty comms IC	Isolate each device by either switching the comms switch to off or removing the comms chip. Then put then re-enable the comms on each device one by one until the readings aren't correct. Replace the comms chip for the last device. This step may need repeating if there is more than one problem.
Can't access menu	Device locked up	Remove power to device for 30 seconds then reconnect
	Keypad faulty	Replace key pad with known good one
Can't save menu settings	Value may be outside limits	Try increasing or decreasing the value to save
	Device locked up	Remove power to device for 30 seconds then reconnect
	Keypad faulty	Replace key pad with known good one

contacts

Manufacturer:

Sutcliffe Technologies

Contact: Gary Sutcliffe

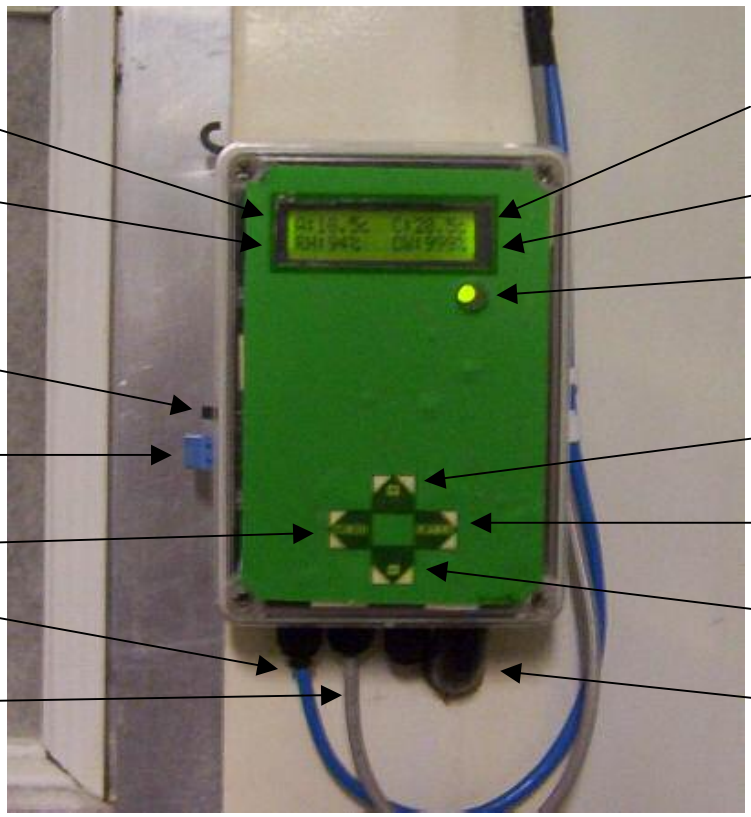
Email: seron @ sutcliffetech.com.au

Web: www.sutcliffetech.com.au

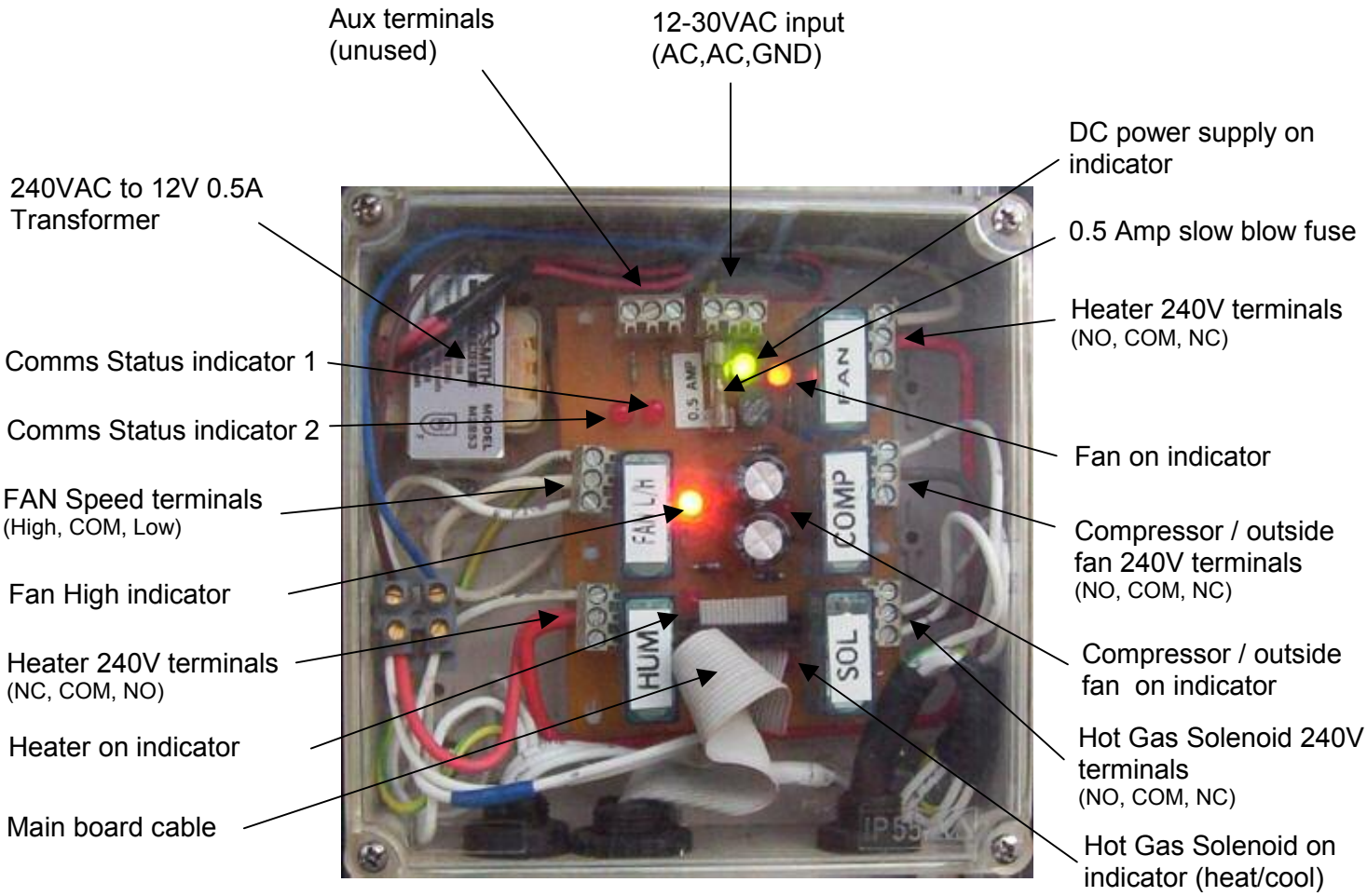
Service agent:

Refer to Manufacturer

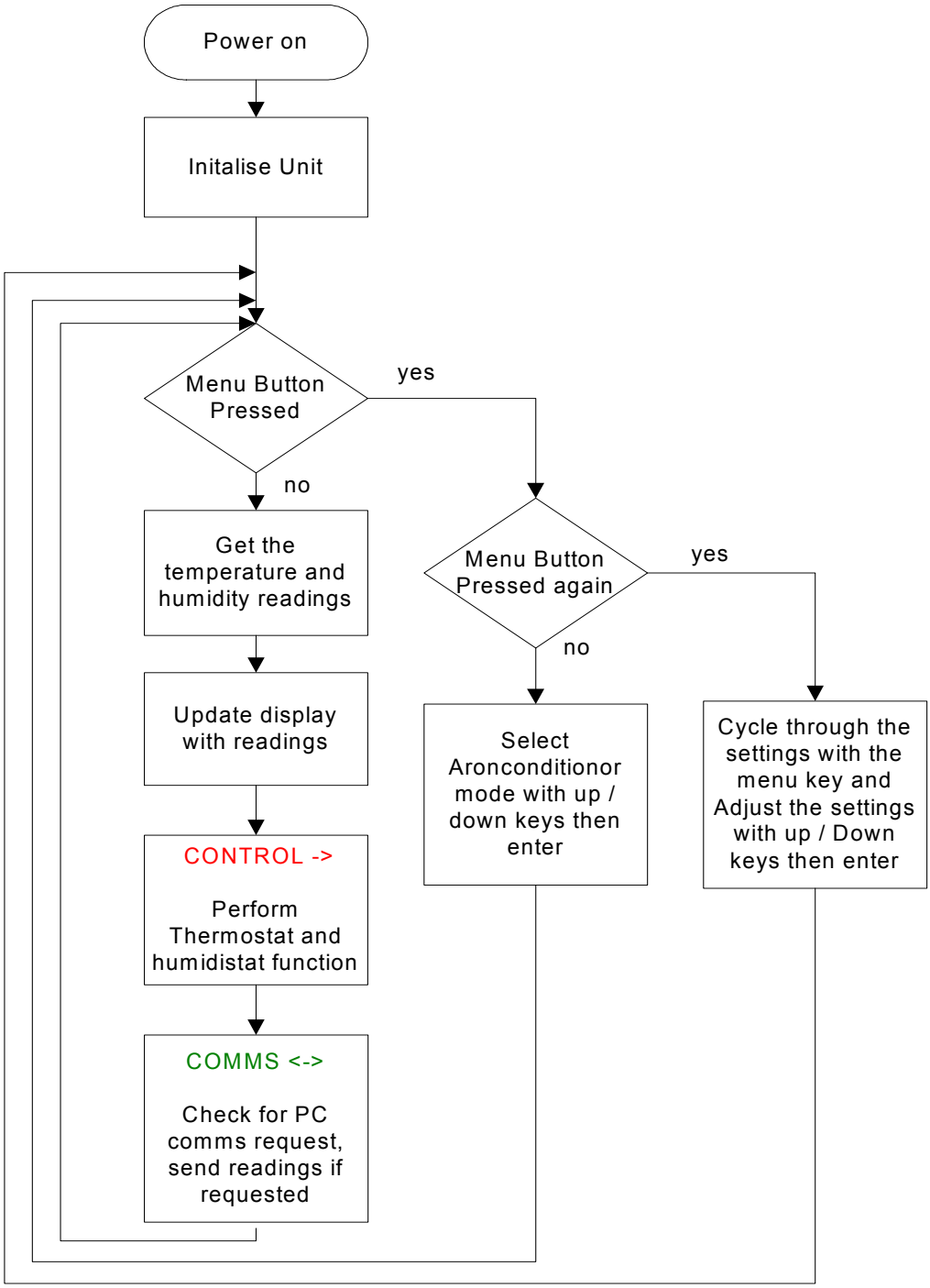
Appendix A - Installation diagram of main unit



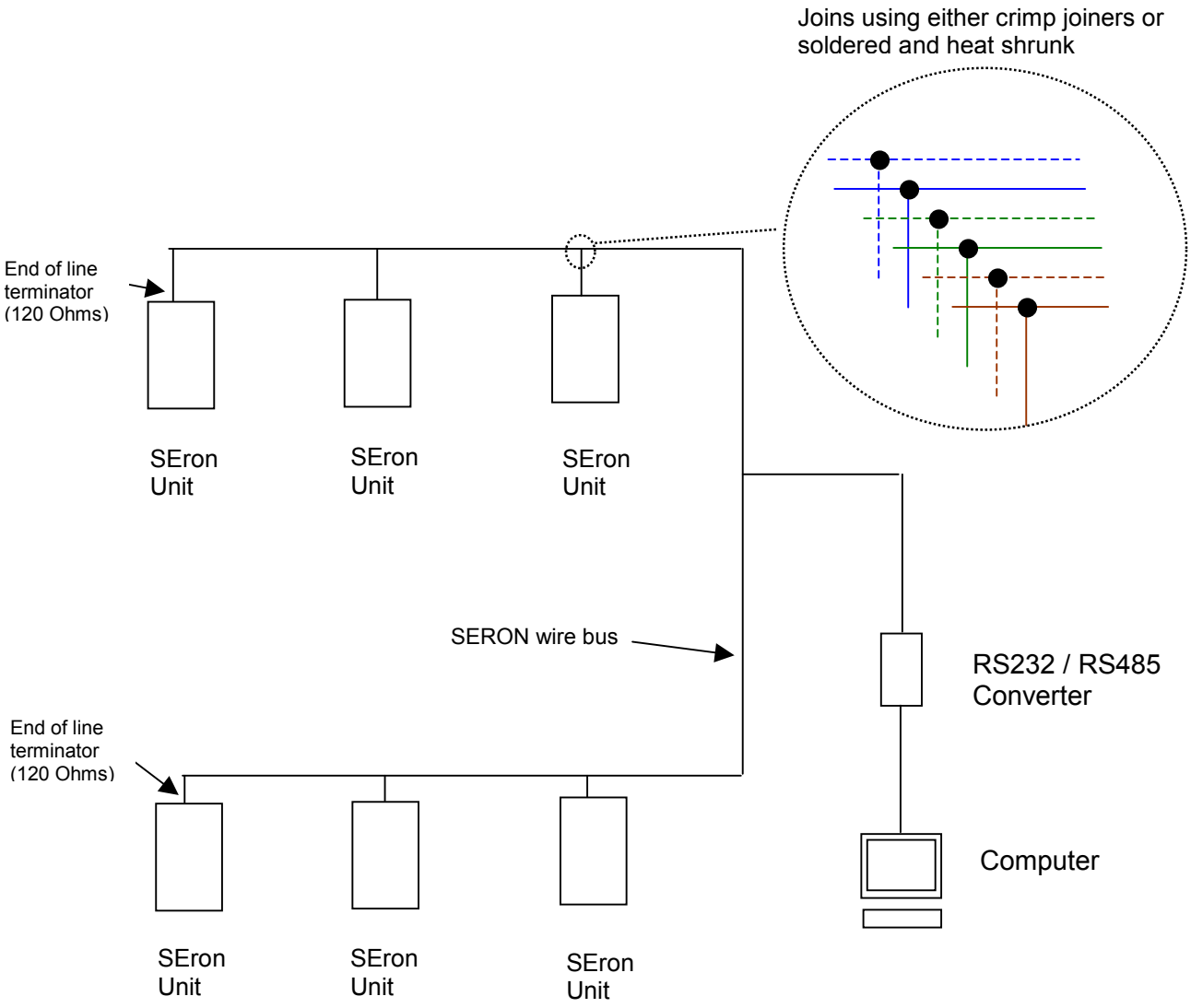
Appendix B - Control card installation diagram



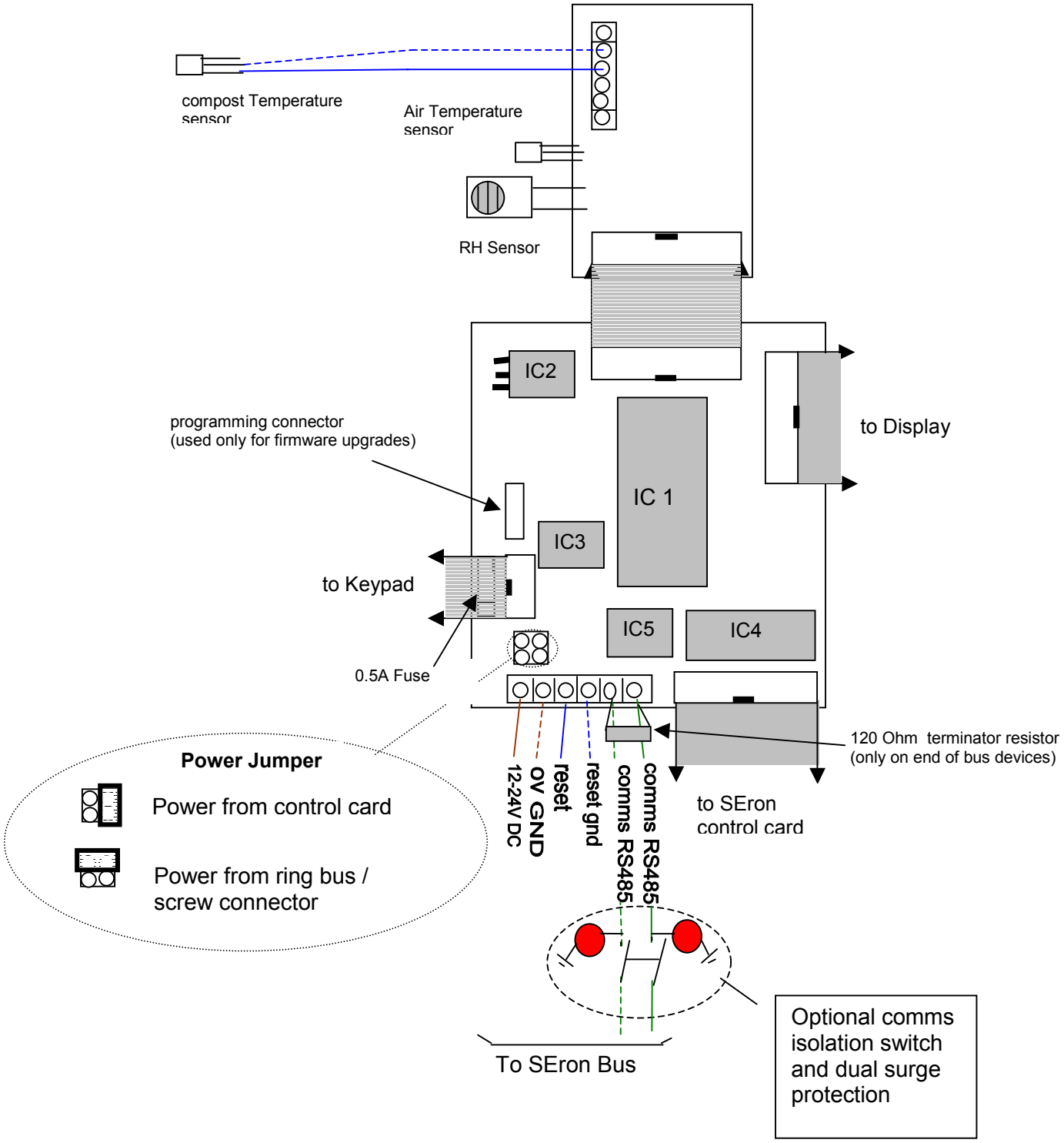
Appendix C - Flow Diagram of SEron operation



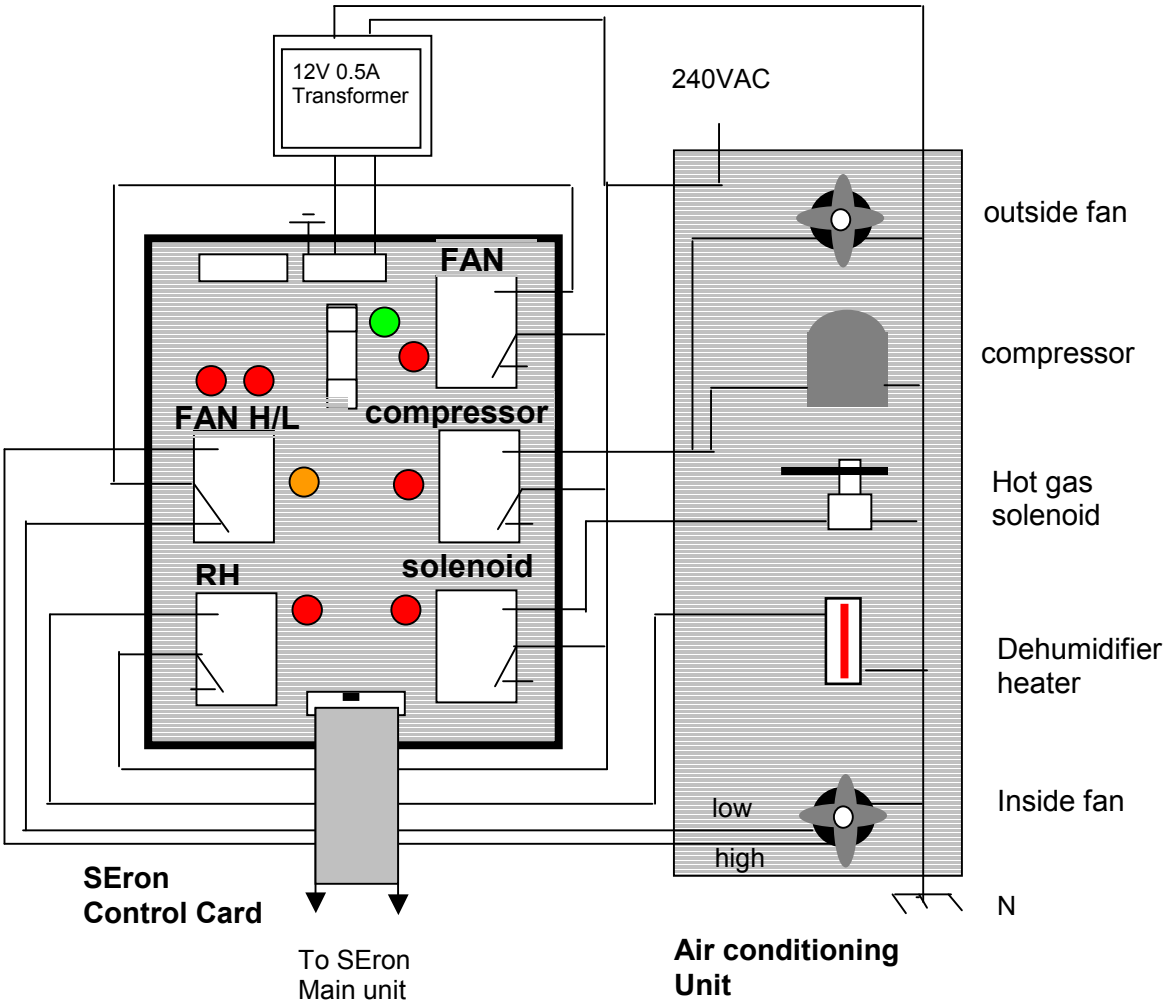
Appendix D - Typical installation of many Units



Appendix E - Main Unit board layout diagram



Appendix F - Typical installation of the control card

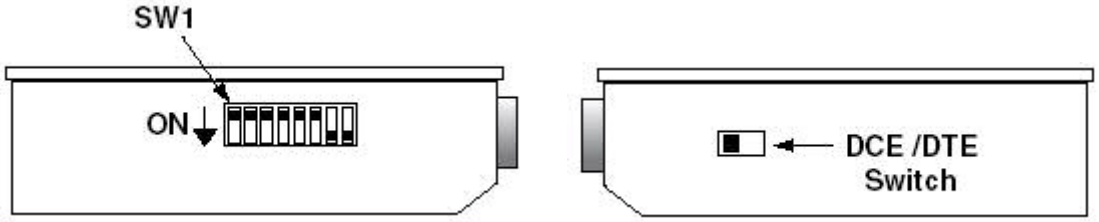


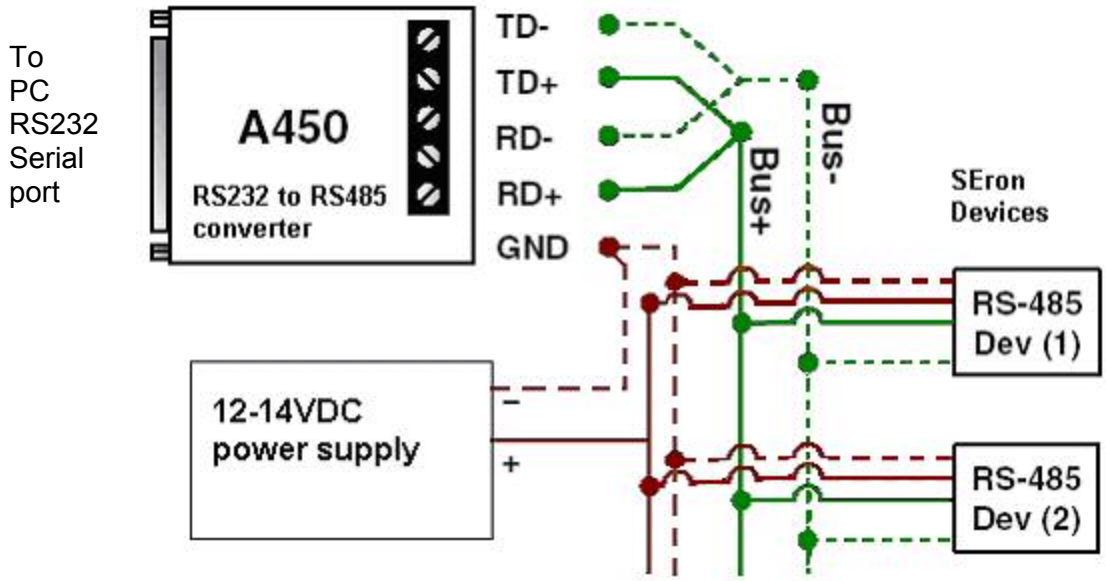
CAUTION 240 Volts AC

* Relay contacts are rated at 16A 240VAC

** This diagram is an example only each installation may vary the installation should be performed only by a licensed electrical trades person

Appendix G - RS485 converter setup and ring power diagram





Appendix H - Replacement Part Details

Componant ID	Part Number	Description	Supplier	Supplier Part No.
Main board				
IC 1	AT90S8535	8 bit microprocessor	Sutcliffe Technologies	Seron IC1-v1.4 (DSE z9205)
IC 2	7805	5V Regulator	DSE	z6543
IC 3	MAX709L	power supply monitor	FEC	639114
IC 4	uln2003	Darlington driver array	DSE	z5380
IC 5	LTC1481	RS485 Transceiver	FEC	569112
X1	A140A	8Mhz crystal	FEC	130914
Temperature sensor	LM335Z	temperature sensor	DSE	Z6051
Humidity Sensor	HS15P	30-100% RH sensor	FEC	732837
Fuse	-	0.5 Amp slow blow	-	-
LCD	-	16 line back lit LCD display	Oatley Electronics / Sutcliffe Technologies	
Mounting box	LUC50882	Clear Lid - 135x110	L&H	
Control board				
Control Relays		16A SPDT		
Bridge Rectifier		500 mA		
Power diods	1N4004			
LEDs	-	Green / red / yellow LEDs	-	-
R	-	650 ohm ¼ watt resistors	-	-
C	-	2200uF 25V Capacitors	-	-
Transformer		240V, 12V 500mA transformer	DS	M2853
Fuse		0.5 Amp slow blow		
Mounting box		Clear Lid	L&H	
Key pad				
Switches		Momentary on micro switch		
Sensor board				
Peripherals				
RS485 conv	A450	RS232 to RS484 converter		

Appendix I - PCB Designs

Main board

Sensor board

Key pad

Control board

Appendix J – A450 User manual

A450

Appendix K – Temperature sensor data sheet

LM335Z

Appendix L – Humidity sensor data sheet

HS15P

Appendix M – IC data sheets

1. Main chip - AT90S8535
2. 5 Volt Regulator - 7805
3. Power supply monitor - MAX709L
4. Darlington driver array (buffer) - uln2003
5. RS485 comms chip - LTC1481

Appendix N – LCD display data sheets