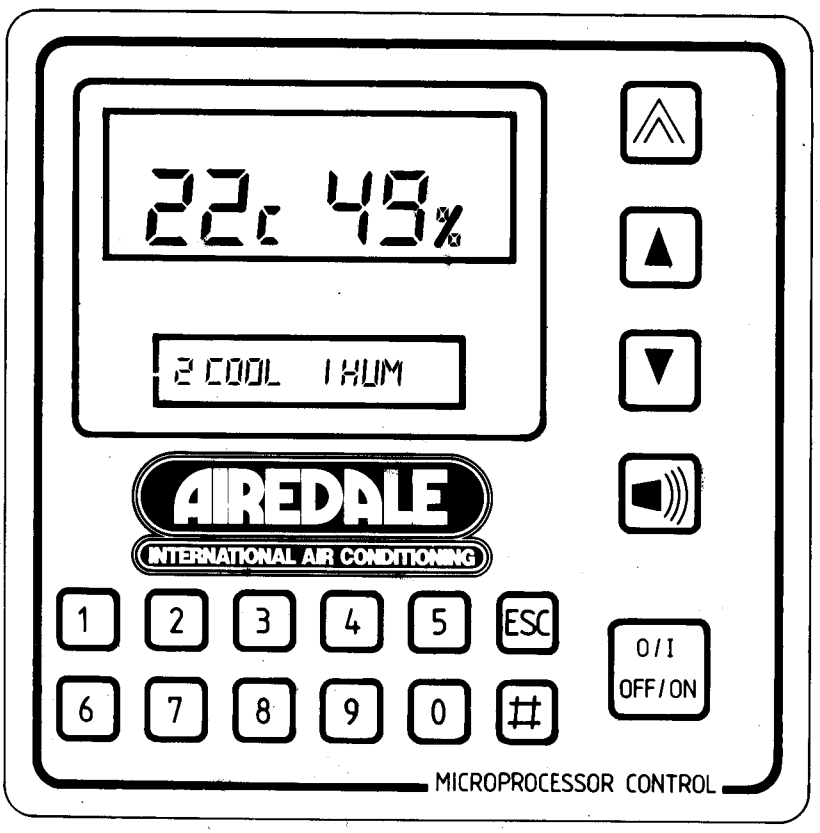
AIREDALE

INTERNATIONAL AIR CONDITIONING

THE AIREDALE MICROPROCESSOR CONTROLLER



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Configuring the Micro to the Unit

Each Microprocessor must be aware of the type of unit that it is controlling. To enable the control scheme to be set up there are sixteen small D.I.L. switches on the rear of the board, the functions that they have control over are:

a) Modulated or Stepped cooling or Heating
b) If Stepped number of steps
c) Free cooling option available?
d) Centigrade or fahrenheit display
e) Auto or Manual re-start
f) Battery ON or OFF

Sw. 2

1. Battery On/Off
2. °C/°F On = °F Off = °C
3. Man/Auto Restart On = Auto Off = Man

Cooling Type

	MC	None	1 Stage	2 Stage	3 Stage
4.	Off	On	On	On	On
5.	Off	On	On	Off	Off
6.	Off	On	Off	On	Off

Free Cooling

	None	Glycol	Fresh Air
7.	On	On	Off
8.	On	Off	On

Sw. 1

Heating Type

	MH	None	1 Stage	2 Stage	3 Stage	4 Stage	5 Stage
1.	Off	On	On	On	On	Off	Off
2.	Off	On	On	Off	Off	On	On
3.	Off	On	Off	On	Off	On	Off

Stages Dehum

	MDH	None	1 Stage	2 Stage
4.	On	On	On	Off
5.	Off	On	Off	On

Stages Hum

	None	1 Stage	2 Stage
6.	On	On	Off
7.	On	Off	On

8. BAUD RATE OFF = 9600 ON = 1200

MC = Modulating Cooling MH = Modulating Heating MDH = Dehum with Modulated Valve. Valve fully opens on Dehum

Serial Communication and Remote Control

The Microprocessor is fitted as standard with a serial communication port. Its purpose is to allow remote management of Airedale units, this can be achieved by using Taskscanner.

Taskscanner

Taskscanner is a comprehensive environmental management system. Up to 100 Airedale Microprocessors can be connected onto a network system.
The central supervisor can either be within the same building or remote, communication being carried out over a standard telephone line using modems.
Software packages available include:

a) Unit Status
b) Remote On/Off
c) Performance Graph
d) Data Log
e) Control Variables Change
f) Alarm Monitoring

Inputs and Outputs

The Microprocessor has the following inputs and outputs.
Sixteen character alpha-numeric display - used for displaying the unit status, prompts and alarm messages.

Customised Liquid Crystal Display

This is primarily used for displaying numerals such as temperature, humidity, hours run and comprises of four large digits. Also on the customised L.C.D. are alarm symbols, which are displayed in an alarm condition (see Alarm description).

Membrane Keyboard

The Keyboard comprises seventeen keys and is used for reviewing parameters and data entry (see figure 2).

Digital Inputs

These are switched 24V a.c. inputs and are used as the alarm inputs, there are twelve of these inputs, four of which are reserved for special site alarms.

Switched Outputs

There are thirteen relays on the Microprocessor board, these being permanently grouped as follows:

4 solenoid
5 heat
2 humidification
1 unit on/off
1 remote alarm relay (voltage free contacts)

Analogue Inputs

There are sixteen analogue inputs, of these 4 are designated as temperature (i.e. thermistor) inputs and 12 are designated as 0-10 volt inputs.

Analogue Outputs

There are four 0-10 volt analogue outputs, these are used for driving modulated valves or dampers.

Serial Communications Port

This communication port can be used to "talk" to another computer based system but is primarily provided for use with the Taskscanner systems.

Alarms

The Microprocessor displays alarms in the following ways:

1. Using the customised alarm symbols on the L.C.D.
2. Flashing the temperature and humidity displays in the case of an "out of limit" alarm.
3. Flashing up a written message with the unit in the normal display mode - Power fail/Default Memory/Flood.
4. Displays stored alarm messages when scanning through the review mode.

Alarm symbols and messages can be cleared by entering Level 2 security.

In all cases should an alarm occur the audible buzzer will sound, this can be silenced with the alarm mute key. It will again sound should another alarm become active. The alarm relay will also de-energise - this is so that power fail can be indicated.

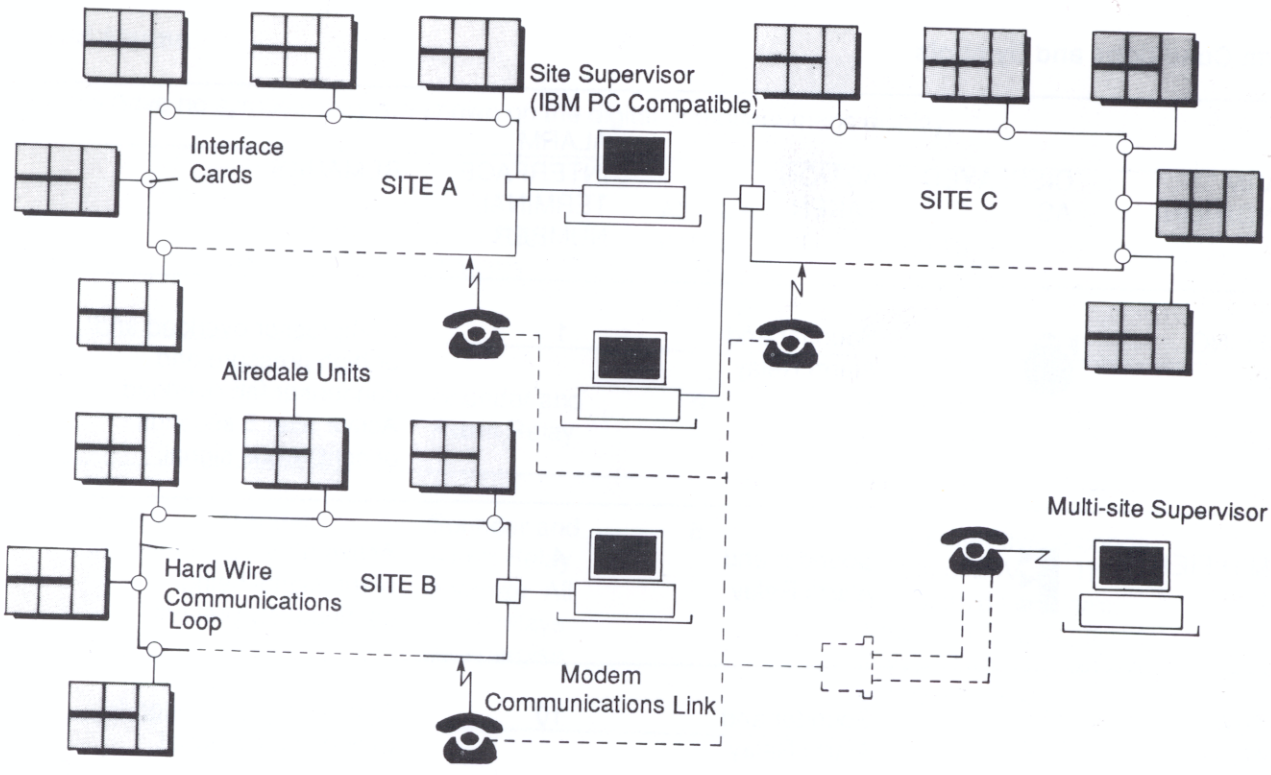


Figure 1 - Airedale Multi-Site Management

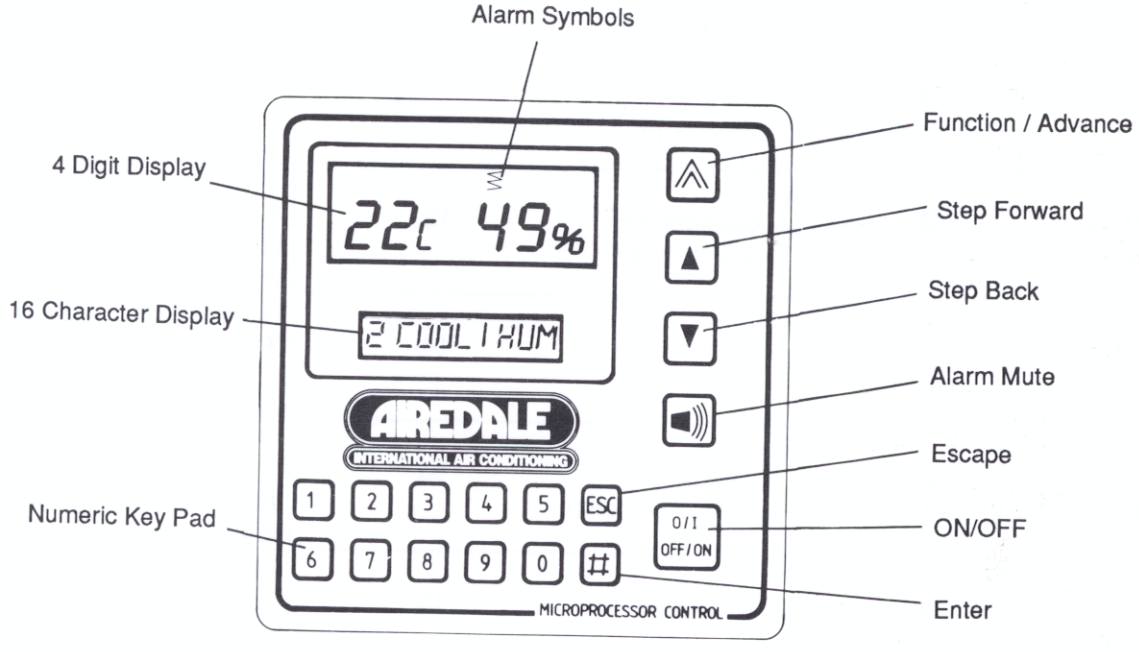


Figure 2 - Airedale Microprocessor Controller Status Panel

Alarm Conditions and Symbols

ALARM CONDITION	DISPLAYED AS	ACTION TAKEN	ALARM INTERFACE TERMINAL NUMBER	REMARKS
CHILLING FAIL		Sounder and Alarm Relay	1	Compressor overload and/ or high pressure and condenser fan overload. Active after 5 seconds of continuous signal.
HUMIDIFIER FAIL		Sounder and Alarm Relay	4	Active after 10-12 minutes of the signal being continuously present.
FILTER CHANGE		Sounder and Alarm Relay	10	Active after five seconds of continuous signal.
AIRFLOW FAIL		Sounder and Alarm Relay	7	Active after five seconds of loss of 24V ac. This is an active low alarm.
OVERHEAT		Sounder and Alarm Relay and Heater shut-down	3	Active after five seconds of continuous signal.
REMOTE 1 ALARM		Sounder and Alarm Relay	13	These inputs are for the use of the site engineer, who may have special requirements for alarm inputs. Active after five seconds of continuous signal. Alarm relay and actions are active until cleared by security 2. Note : When fitted with BMS system, remote alarms 1-4 will shutdown plant until reset by supervisor
REMOTE 2 ALARM		Heater shut-down	14	
REMOTE 3 ALARM		Chilling and hum. shut-down	15	
REMOTE 4 ALARM		Unit shut-down	16	

All the above alarms will also be written into the review mode if active; for example "AIRFLOW FAIL".

Specialised Alarms

These alarms have no symbols they are shown on the digital or alphanumeric display.

ALARM CONDITION	DISPLAYED AS	ACTION TAKEN	ALARM INTERFACE TERMINAL NUMBER	REMARKS
FLOOD	Flood	Sounder and Alarm Relay	9	Active after five seconds of continuous signal.
MANUAL ALARM	Manual	Sounder and Alarm Relay energise. All other relays de-energise	8	Active after five seconds of loss of 24V ac. This is an active low alarm. Active if any auto off manual switches are not in auto position.
POWER FAIL	Power Fail	Sounder and Alarm Relays	-	Display on power resumption if unit was on at power failure.
OUT OF LIMITS	Flashing of temp. or hum. digits	Sounder and Alarm Relays	-	Inhibited for half an hour after unit switches on to allow for unit control. High limit or low limit stored in REVIEW so the operator knows whether a high or low limit alarm occurred should control be restored.

Operating Modes

There are four modes in which the Microprocessor can operate:
Normal Display Mode, Review Mode, Level 1 Security Mode and Level 2 Security Mode.
When a unit is powered up but switched off, the alpha numeric display will read "UNIT OFF O/I = ON"
When a manual start unit is off due to a power fail then the display will read "POWER FAIL", this is also the case for an Auto start unit which has a delay on start.
To switch the unit on in any of the above cases, press the O/I key to immediately switch the unit on. The display will then go through a segment test before giving the normal display. If the unit switched off due to a power fail then "POWER FAIL" will be flashed up every 10 seconds.
To switch a unit off, press the O/I key, the display will read "PUSH [function advance key] IF SURE". After pressing the function advance key, the unit will switch off and read "UNIT OFF O/I =ON".

Note : *If attached to a BMS system, ensure that ON/OFF control is performed at the supervisor end. Aternatively for maintenance purposes, switch off at mains isolator.*

Normal Display Mode

Here the micro-processor displays room conditions, unit status and alarms (if any).
See drawing of "Airedale Microprocessor Controller Status Panel".

Review Mode

This allows anyone to review certain parameters without being able to alter them.
To enter this mode, press the function advance key. The Display will read; 'REVIEW MODE' To sequence through this mode press the step forward key. To back step through this mode, press the back step key. To leave the mode, press the escape key.

Review Topics

1. Temperature and Humidity Set Points
2. Temperature and Humidity High Limits
3. Temperature and Humidity Low Limits
4. Fan Running Hours
5. Individual compressor running hours
6. Written indication of any alarms
7. If the free cooling option is used, an indication of glycol temperature and the glycol valve position is given.

Options : On and off water temperature indication and air discharge temperature and humidity conditions.

Level 1 Security Mode

If the microprocessor suffers a DEFAULT MEMORY the set points will automatically revert to the factory settings as follows.
Temperature and Humidity Set Points (20°C 50%)
Temperature and Humidity High Limits (25°C 75%)
Temperature and Humidity Low Limits (15°C 25%)

PASSCODE 1 CHANGE

Set Points Change
This allows anyone with level 1 security to change Set-Points and High and Low Limits.
To enter this mode press, the function/advance key. The display will then read 'REVIEW MODE'
Press the above key again and the microprocessor will ask for the level 1 Security Code. (Unless the security code is 0 0 0 0 in which case security will be entered directly) Enter the code and press the enter key. The microprocessor will now display 'LEVEL 1 SECURITY' To sequence through this mode press the step forward key. To step back, press step back key. To change a variable enter the new data and press the enter key. Once again, to leave this mode press the Escape key.

Level 2 Security Mode

This allows anyone with level 2 security to change the control variables.
To enter this mode press function advance key and the display will read REVIEW MODE, press function/advance again and the microprocessor will ask for level 1 security code; enter level 1 code, press again and it will ask for level 2 security. (Unless the security code is 0 0 0 0 in which case security will be entered directly). Enter the level 2 security code and press the enter key.

The microprocessor will display 'LEVEL 2 SECURITY'.
To sequence through this mode press:
Step Forward key.
To change a variable enter new data and press Enter key.
To leave this mode press Escape key.

CONTROL VARIABLE CHANGE

Note : *Electric Heat = P, DX Cool = P, Modulating Outputs = P + I.*

1. Re-Setting of Hours Run on compressors and fans.

2. If Auto Re-Start is selected when a power failure occurs the unit will automatically restart when power is restored. A 0-20 minuted delay may be programmed in to avoid circuit overloads at restart. The start delay also has a random element to stagger multiple unit starts. If set to 0 the unit will start immediately. If set to 1 the unit will start within 1 minute. If set to 2 the unit will start between 1 minute and 2 minutes.

3. Change Passcode 2.

4. Heating P or P + I - (De-fault to P) P = 0000, P+I = 0001.

5. Cooling P or P + I - (De-fault to P) P = 0000, P+I = 0001.

6. Prop. band heating - (De-fault to 1°C - Range 1-99°C).

7. Prop. band cooling - (De-fault to 1°C - Range 1-99°C).

8. Prop. band hum. - (De-fault to 5% - Range 1-99%).

9. Deadband temperature loop - (De-fault to 0°C - Range 0-99°C).

10. Deadband humidity loop - (De-fault to 5% - Range 0-99%).

11. Integral action time on the temperature loop if P + I control is used 0-99 mins de-fault - 0.

12. Compressor off time regulates starts per hour, can be set 0-99 minutes (de-faults to 0).

Use of Control Values

1. P or P+I

P stands for proportional control and its relevant variable is the proportional band.
This is the control error required to bring on full cooling or heating.

e.g.	If the set point is	22°C
	The measured value is	18°C
	The error is	4°C

A proportional band of 4°C would bring on full heating, whereas a proportional band of 8°C would only bring on half the stages of heating.
It can be seen that an error is required to bring on any heating or cooling so that if there is a loading in the room an error must occur; this is known as proportional offset. The proportional offset can be calculated as follows:- e.g. The room loading is 30kW of heating and the cooling unit has 3 stages of cooling, each of 15kW, to balance the room load 2 stages of cooling must be applied. If the proportional band is 3°C then an error of 2°C will bring on the two compressors and balance the room load. The room conditions will settle out with the measured value 2°C higher than the set point.
It can be seen from the above example that the smaller the proportional band the smaller the proportional offset. A too small proportional band should not be set because if the room loading varies and the unit has been bought with spare capacity, the "gain" of the system will be too high and the control could become unstable e.g. using the same unit as before, the room loading is only 10kW, the proportional band is set to 1°C, so for only an error of 1°C the full 45kW cooling capacity of the unit will be switched on, the room temperature would quickly fall bringing on all the units heating. The temperature would quickly rise bringing on all the cooling and so on - the control is now totally unstable.
Proportional offset can be overcome using P+I control - Proportional plus Integral Control.
Here the control output is the sum of two parts, the P term as before and now the I term.
The variable affecting the I term is the "integral action time". The meaning of this can vary from company to company, the following only accurately applies to the Airedale Microprocessor Controller.
Here the integral action time is taken to be the time response of the room. i.e. If a load is suddenly applied to the room the integral action time is the time taken to reach 63% of its final value.
When the controller is switched on the control output is equal to that given by the P term after the integral action time, the controller will look at the measured value and the set point and adjust the output accordingly, depending on the size of the error and the proportional band, after a time the actual temperature should exactly (on a modulated system) match the set points.
On a stepped cooling or heating scheme P+I control may not be applicable because the I term adds very small amounts to the control output and these are not available on a stepped scheme. Having P+I on a stepped scheme will cause the temperature to oscillate slightly about the set point, this can lead to cycling compressors. If it is wished to have P+I on a stepped cooling scheme, and room loadings are not expected to change quickly, then the integral action time can be set to a value such that the starts/hours of the compressors are not exceeded i.e. 6 minutes.

2. Deadbands

If an error from set point is acceptable and energy savings are important then a deadband can be introduced, this allows the measured value to slip slightly from set point.
e.g. If the deadband is 2°C and the set point 20°C then the controller will heat to 18°C and cool to 22°C.
If more than one unit is feeding a common space it is recommended that a dead band of at least 1°C and 5% is used to prevent the units competing against each other.

3. Compressor Off Time

This is the time between a compressor being switched on and the next time it is switched on i.e. the minimum time between consecutive starting currents to allow the windings to cool down.

4. Minimum Allowable Free Cooling Temperature
In a glycol unit if the glycol temperature is too cold the unit will dehumidify the air, causing the humidifier to switch on losing any energy savings. This figure is 7°C.

5. Minimum Allowable Free Cooling Differential
This is the temperature difference required between the free cooling medium and the return air to get useful cooling. This is 2°C.

Software Functions

1. The microprocessor will always ramp stepped outputs i.e. there will be approximately 1 second delay between consecutive contacts pulling in. This prevents power surges and protects the control transformer.

2. The microprocessor will try and balance running hours on compressors. Because Dehum uses specific coils running hours cannot always be totally balanced. The relationship between cooling circuits and dehum circuits is as follows.

a) 1 Stage Stepped Cooling
First Stage Dehum Brings on SV1, RL9.
First Stage Cooling Brings on SV1, RL9.
Running hours are used for indication only.

b) 2 Stage Stepped Cooling
First Stage Cooling Brings on SV1 (RL9) or SV2 (RL8), whichever has the lowest running hours.
Second Stage Cooling Brings on SV1 (RL9) or SV2 (RL8), whichever has the greatest running hours.

Note *: Depending on the running hours, on some occasions 1 cool and 1 dehum will bring on SV1 and SV2, and on other occasions only, SV2 will be brought on. This is acceptable.*

c) 3 Circuit Unit
First Stage Cooling will bring on SV1 or SV2, whichever has the least running hours.
Second Stage Cooling will bring on SV1 or SV2, whichever has the greatest running hours.
Third Stage Cooling will bring on SV3 (RL7) and SV4 (RL6),
these not being dependent on running hours.
First Stage Dehum will bring on SV4 (RL6).
Second Stage Dehum will bring on SV2 (RL8).

d) On a modulated cooling scheme, only one stage of dehum is available, regardless of whether the DIL switches are set for 1 or 2 dehum. Should dehum be called for, the cooling valve will drive fully open.

Note *: Because running hours can be changed in Level 2, compressors can be forced to be lead circuits.*

Note : *This section assumes the unit is wired up and has been commissioned using the Hand/Off/Auto switches.* Read the whole manual before completing this section.

Commissioning Procedure

1. Check the unit is isolated from the mains supply.
2. Check all Hand/Off/Auto switches are in Auto.
3. Check all MCB's are switched off.
4. Turn on the memory back up battery. The switch for this is located on the micro PCB and is the upper most switch of SW2. (See microprocessor board layout diagram)
5. Check all connectors to the micro are firmly located.
6. Turn on the MCB for the mains supply to the transformers.
7. Turn on the 3 low voltage control MCB's.
8. Turn on the mains to the unit, the micro will read "POWER FAIL". If set as an auto restart unit, the fan contactors will switch on after a random delay of up to one minute.
9. Switch on the unit by pressing the O/I key, the micro will display the temperature and humidity measured at the sensor - Note: as the fans are not running this need not be the room conditions! The displayed temperature should be accurate to better than +/- 1°C.
10. Check all control parameters as detailed in the manual are sensible for the application.
11. Check correct operation of the contactors and solenoid valves by varying the set points.
12. Switch off the unit, turn off the isolator and switch on all the MCB's.
13. Switch the isolator and the unit back on and check the unit for control. If there is any doubt about the units control, check the setting of the control variables.

Airedale Microprocessor Controllers are fitted with a serial communication port suitable for distances of up to 35m. An additional node board can be fitted to include the unit in a local area network. This node board is connected to an Airedale network driver which can interface with the RS 232 communication port of a computer system. This is dependent on the relevant software being provided (by others).

Temperature Sensor Check

On a unit with a 37 way interface, disconnect the relevant sensor wire and measure the resistance between the wire and signal ground. Compare this resistance with the chart. On a unit where the sensor cables go directly from the micro to the combined sensor, the resistance must be measured at the sensor. Disconnect the temperature output and measure the resistance between the terminal and the signal ground terminal. Compare with chart. On a unit where a potted thermistor is fitted and no 37 interface, disconnect the sensor and measure the resistance. Compare with the chart.

Humidity Sensor Check

Humidity sensors can be checked by measuring the output voltage. The voltage varies 0-10V for 0-100% rh. This can be measured between the humidity output and signal ground or at the 37 way interface between the humidity input and signal ground. The power supply to the sensor is 12V ± 0.5V, this is between the supply terminal and signal ground. The 12V supply is terminal 19 of the 37 way interface.

Wire connections for the two types of combined sensor are as follows:

Johnson

Terminal

1 - 12V Supply
2 - Signal Ground
3 - Signal Ground
4 - Hum Output
5 - Signal Ground
6 - Temp. Output

Airedale

Terminal

1 - Hum Output
2 - Temp. Output
3 - Signal Ground
4 - Supply 12V

Resistance against Temperature for an Airedale Temperature Sensor

Temperature °C Resistance ohms	1 15520	2 14750	3 14030	4 13340	5 12700	6 12090	7 11510	8 10960	9 10440
	10 9950	11 9485	12 9045	13 8630	14 8230	15 7855	16 7500	17 7160	18 6840
	19 6535	20 6245	21 5970	22 5710	23 5460	24 5225	25 5000	26 4787	27 4583
	28 4389	29 4204	30 4029	31 3861	32 3702	33 3549	34 3404	35 3266	36 3134

Microprocessor Connectors

The 'P' designation refers to the identification on the microprocessor board itself.

P1	- 37 way	'D' connector for analogue inputs and outputs.
P2	- 9 way	'D' connector for remote control Serial Communication Port.
P9+P10	- 2 x 10 way	High current switched outputs.
P4	- 20 way	IDC Alarm inputs.

P1

1	Temp. Input 1, Return Temperature
2	Temp. Input 2, a) Free cooling temp b) Water coil 1 if there is 1 modulated coil
3	Temp. Input 3 Water on coil 1
4	Temp. Input 4 Air off coil
5	Analogue Input 1, Return Humidity
6	Analogue Input 2, Discharge Humidity
7-16	Spare analogue inputs
17	Analogue output 1 Free cooling
18	Analogue output 2 Modulated Cooling
19	+ 12 volts
20,21	Protective ground
22-35	Signal ground
36	Analogue output 3 Modulated Heating
37	Analogue output 4 Spare

Terminals used depend on the type of unit and the customers order.

P2

1	TX Out
2	RX In
3	Reset
4	+ 12 volts
5	- 12 volts
6	Tx Out
7	0 Volts
8	Protective
9	Ground

P9 + P10

1	24V to relays	
2	24 volt power to micro	
3	24 volt power to micro	
4	Center tap	
5	Center tap	
6	Heat 1	
7	Heat 2	
8	Heat 3	
9	Heat 4	
10	Heat 5	
11	Solenoid valve 4	
12	Solenoid valve 3	
13	Solenoid valve 2	
14	Solenoid valve 1	
15	Humidity 1	
16	Humidity 2	
17	UNIT ON	
18	Alarm n/c	) Shown with no power to
19	Alarm Common	)- micro. This will switch
20	Alarm n/o	) when the micro is powered
		) up with no alarms.

P4

1	Chilling fail
2	Low Press
3	Overheat
4	Bottle change
5	Neutral
6	Neutral
7	Airflow fail
8	Man alarm
9	Flood
10	Filter
11	Neutral
12	Neutral
13	R1
14	R2
15	R3
16	R4
17	Neutral
18	Neutral
19	No connection
20	No connection

Microprocessor Board Layout

RL1 H1 Heating
RL2 H2 Heating
RL3 H3 Heating
RL4 H4 Heating
RL5 H5 Heating
RL6 SV4 Solenoid Valve
RL7 SV3 Solenoid Valve
RL8 SV2 Solenoid Valve
RL9 SV1 Solenoid Valve
RL10 HY1 Humidity
RL11 HY2 Humidity
RL12 Unit On/Off
RL13 Alarm

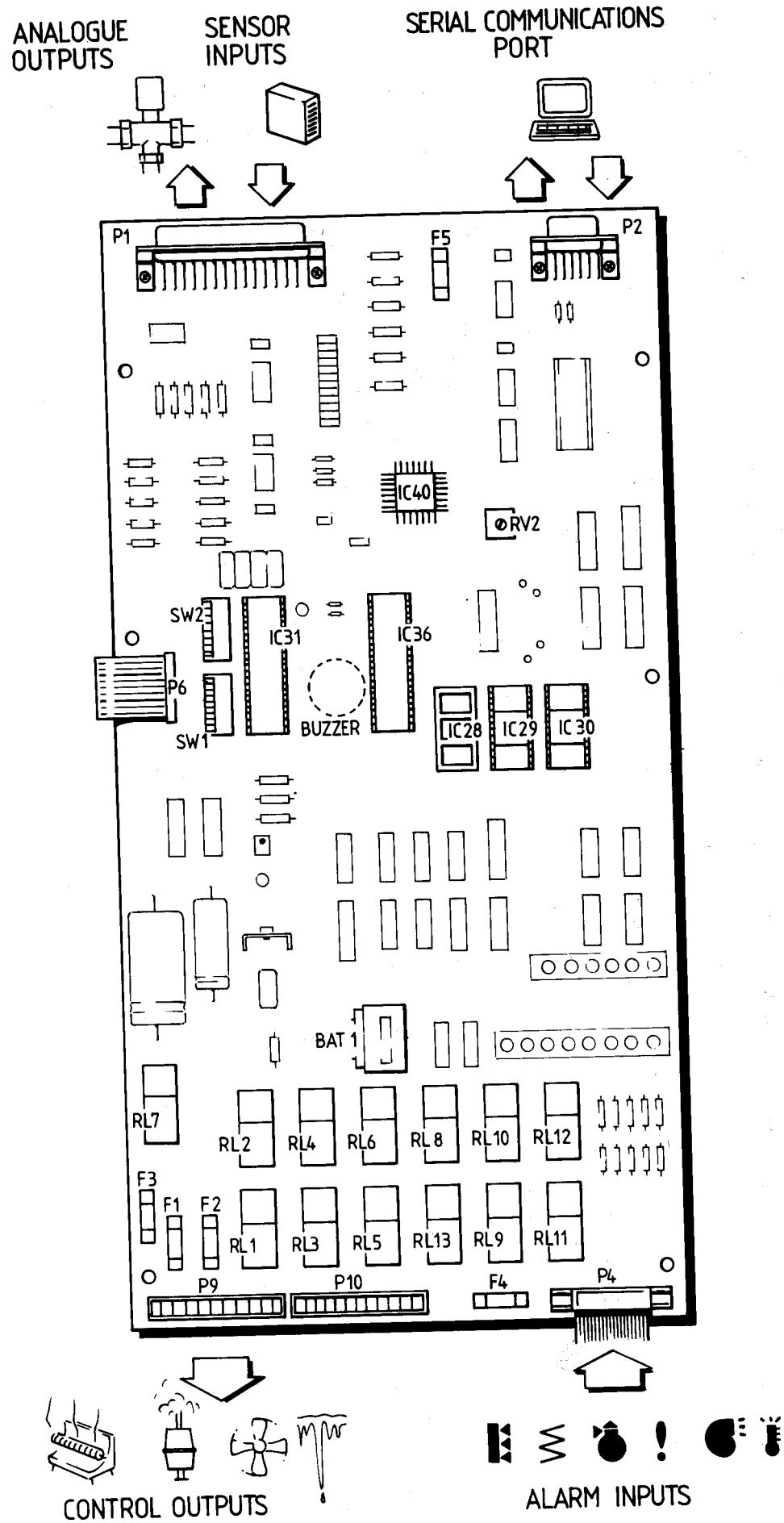
SW1 Configurement
SW2 Switches

IC28 Spare Memory Location
IC29 Tables EPROM
IC30 Main Program EPROM
IC36 Microprocessor
IC40 Custom Display Driver

BAT1 Battery
RV2 Viewing Angle Adjust on the Alpha-numeric display

F1 Micro Power Supply Fuse 3.15A
F2 Micro Power Supply Fuse 3.15A
F3 Control Output Fuse 6.3A
F4 Alarm Output Fuse 3.15A
F5 12 Volt d.c Output 100mA

P1 Analogue Outputs/ Sensor inputs
P2 Serial Communications port
P4 Alarm Inputs
P6 Membrane Connector
P9 Control Outputs
P10 Control Outputs



FAULT	POSSIBLE CAUSE	REMEDY / ACTION
A/C unit powered up but micro appears dead.	MCBs tripped. Fuses blown (F1 and F2). Connectors loose. Memory EPROMS not fitted correctly.	Check MCBs. Replace fuses F1 and F2. Check all connectors are firmly located. Check fitting of memory EPROMS.
Micro powered up but no switched outputs appear to function.	Alarm conditions indicated. Control MCB tripped or fuse 3 blown. Hand/Off/Auto switch fuse blown. Air flow fail switch operated. Relevant relays not pulling in.	Clear Alarm indications. Check MCB and F3. Replace fuse. Check switch. Check relay operation.
Micro powers up but no modulated outputs appear to function.	Micro display not calling for the modulated function. Incorrect voltage at actuator. Actuator cable incorrectly wired. Micro driven by another analogue by mistake.	Check operation. Check voltage. Check wiring. Check drive comes from the correct source.
Microprocessor has the wrong control scheme.	Configurement switches set wrongly. Wrong software version fitted.	Check switch positions. Check fitted software.
Microprocessor loses its memory.	Battery switched off.	Switch on battery.
Temperature display always reads 27°F.	Open circuit thermistor.	Replace thermistor.
Humidity display seems to count upwards.	Open circuit on humidity input.	Trace fault and rectify.
Humidity display reads 0% rh.	Fuse 5 blown.	Replace fuse 5.
Alpha numeric display seems faint.	Viewing angle incorrect.	Adjust angle with trimmer RV2.
Microprocessor does not control.	Control parameters in level 2 security incorrect.	Check and reset control parameters.

Parts List for Microprocessor Controlled Units	Part No.
Membrane Micro Controlled Unit	018-214
Backplate for Microprocessor	018-186
Microprocessor Controller IMS	009-133
Sensor Temp/Hum PCB for Micro	009-111
Temp and Humidity Sensor Box	610-085
Cable Sleeved 20 ways power	017-223
Cable Assy Micro Step/d Scheme	017-168
Interface 37 way Klippon 068386	017-233
Aux Switch Kit 831/1/208	006-085
Harness FC, and DF Micro 1m Lg.	017-169
Harness VA Micros 4m long	017-215
Connectors 10 way Micro Units	017-173
Cable Assy 37 ways 4m lg Micro	017-225
Cable Assy 37 ways 2m lg Micro	017-232
Cable Assy 37 ways 1m lg Micro	017-226
Transformer 50/60 VA Centre tap	014-053
Temp Sensor Water FC and Micro	009-120
Switch Board Hand/Off/Auto MP	009-121
Actuator ALE1326 Modulated Micro	006-083
Actuator ARE1302 DFG Micro	006-084
Linkage Kit 826/1/702	006-081
6.3A Fuse	002-148
3.15A Fuse	002-149
100mA Fuse	002-150

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Pub MC 9/89
Supersedes MC 5/88