AIREDALE

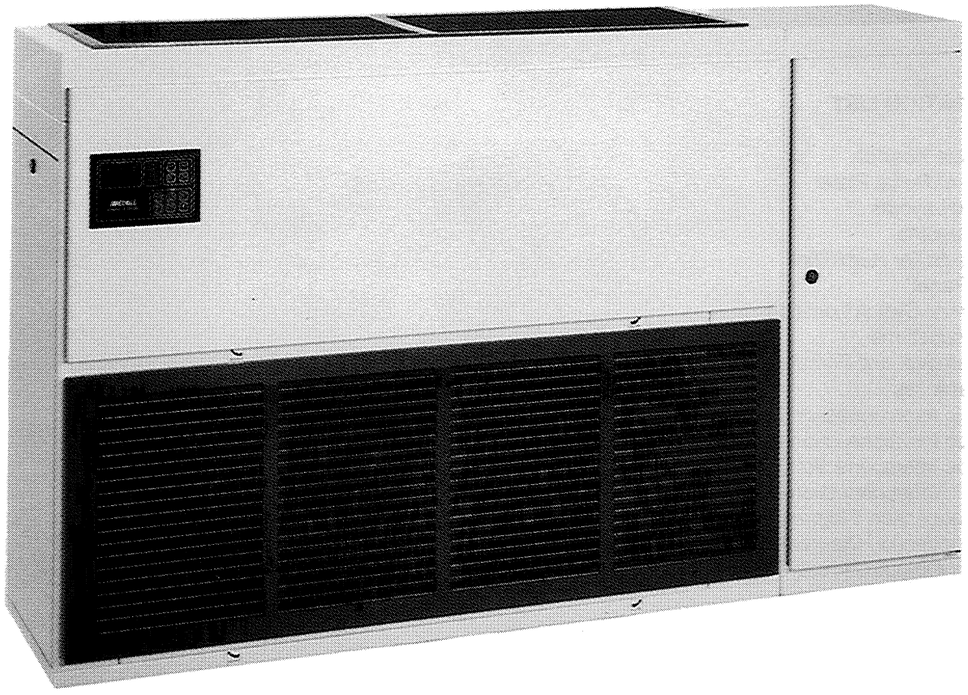
Airedale International Air Conditioning Limited,
Leeds Road. Rawdon, Leeds LS19 6JY.
Tel: 0113 239 1000. Fax: 0113 250 7219.

Pub: Mistral 10/90 I&M
Supersedes: Mistral 9/89 I&M



AIREDALE

# MISTRAL RANGE
## INSTALLATION AND MAINTENANCE MANUAL
### AIR COOLED/WATER COOLED/GLYCOL COOLED/CHILLED WATER



BS5750 PART1 ISO9001 EN:29001
BSI REGISTERED FIRM
Cert No. FM 542
Registered November 1985

# CONTENTS



**ILLUSTRATION LIST**



All technical data is derived from tested results and expanded by computer.
AIREDALE INTERNATIONAL AIR CONDITIONING LIMITED have a policy of continuous product development and reserve the right to amend specifications without prior notice being given.

**GENERAL**
Inspect last Maintenance Report and any intervening Service Reports.

| PERIOD | ACTION |
|---|---|
| 1 Month | Check condition of filters |
| | Check operation of filters blockage pressure switch. |
| | Check condensate drain, ensure water runs away freely. |
| | Ensure condensate trays are clean and free from sediment |
| 1 Year | Check coil water temperatures. (Chilled Water Only). |
| | Clean Cabinet Externally. |
| | Tighten all electrical terminals within air handling units, motors heaters etc. |
| | Remove filters and inspect coil. |
| | Check electrical heater elements and check amperage. |

**ELECTRODE BOILER HUMIDIFIER**

| PERIOD | ACTION |
|---|---|
| 3 Months | Check through sequence of boiler - actuate by hand if necessary. If cylinder near end of life change and clean drain solenoid and manifold. |
| | Check drain water flows away freely - actuate manual drain if necessary. Clean if required. |
| 1 Year | Check amperage against commissioning data. Adjust if necessary. |
| | Clean feed solenoid. Ensure cylinder is back to full operating current. |
| | Clean drain pipe adjacent to unit. Use rodding positions if necessary. |
| | Tighten all terminals in panel and on electrodes. |

**CONTROL SYSTEM**

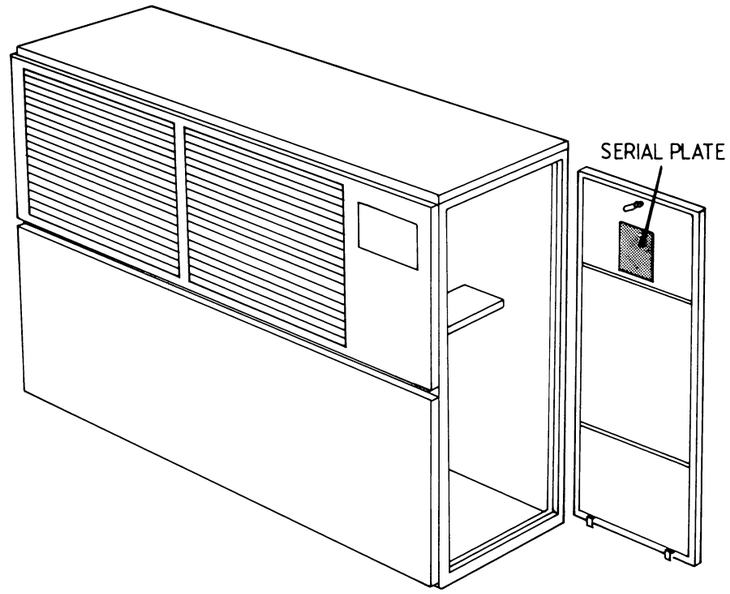
| PERIOD | ACTION |
|---|---|
| 3 Months | Check control sequence of temperature and humidity controls. Note set point prior to operation. Where valves are fitted, check that they shut off at both ends of travel. |
| | Check operation of overheat outlet. |
| 1 Year | Check calibration controls against sling hygrometer. Check chart recorder if applicable at same time. |
| | Tighten all terminals within panel and associated control system. |
| | Inspect leading compressor/heater/humidifier contactor for contact wear. replace if significant signs of wear. |





**Important**
For the warranty to be valid, copies of the relevant commissioning sheets must be returned to Airedale, Leeds, within 28 days of commissioning the equipment.

**Serial Number**
To ensure the warranty documents are valid and spare parts match the units, it is important that the serial number of the relevant unit is quoted.




E M DF A 5 D

E - European (50Hz)
M - Mistral Range
DF - Downflow
V - Upflow
A - Air Cooled - Remote Condensing Unit
X - Air Cooled - Remote Condenser
W - Water Cooled Fully Packaged
G - Glycol Cooled
CW - Chilled Water Cooled
2
3
4 - Model Number
5
6 - (Downflow Only)
D - Dual Refrigeration Circuit
EMC - Mini Condenser
EMCU - Mini Condensing Unit
EC - Condenser
ECU - Condensing Unit

**UNIT IDENTIFICATION**

AIREDALE INTERNATIONAL AIR CONDITIONING

Airedale International Air Conditioning Ltd.,
Leeds Road, Rawdon
Leeds LS19 6JY
England.
Tel (0532) 391000
Telex. 557111 G
Fax. (0532) 507219

Cert. No. FM 542
QAS 3784/96

| | |
|---|---|
| UNIT TYPE | EMDFA6 |
| UNIT SERIAL No. | U37202 |
| DATE OF MANUFACTURE | 20/10/90 |
| ELECTRICAL SUPPLY | 415 V 3 PH 50 Hz |
| SUPPLY FAN MOTOR No. 1 | 6.0 FLA 1 PH .55 KW |
| SUPPLY FAN MOTOR No. 2 | 6.0 FLA 1 PH .55 KW |
| SUPPLY FAN MOTOR No. 3 | 6.0 FLA 1 PH .55 KW |
| ELECTRIC HEATERS | 20.8 A 15.0 KW |
| ELECTRIC HUMIDIFIER | 4.3 A 3.0 KW |
| SUPPLY FUSE RATING | 40.0 A |
| REFRIGERANT TYPE & CHARGE | R22 |
| FACTORY TEST PRESSURE | HIGH SIDE 300 PSIG<br>LOW SIDE 150 PSIG |

Example of Serial Plate

The Mistral range is designed specifically to provide close control of temperature and humidity in small and medium size computer rooms.
The range is offered in both upflow and downflow models with a choice of air cooled, water or glycol cooled and chilled water systems.
'Full function' units include fully controlled cooling, electric heating and steam humidification. All models are attractively packaged in low profile cabinets to blend unobtrusively with most decor. A comprehensive range of system-matched air cooled condensers/condensing units and air cooled liquid chillers is available from Airedale to complete the package.

**Cabinet.**
Cabinets manufactured from Zintec sheet steel are one piece welded construction. After assembly cabinets are degreased and coated with a standard textured Airedale colour dry powder epoxy resin paint, baked after application. The paint finish is easily cleaned and hardwearing to give maximum protection. Airedale standard colour scheme, off-white and grey, can be altered to match any decor. Removable panels give easy access to all internal components.
Cabinets are lined throughout with 12mm thick thermal and acoustic insulation.

**Filtration**
Disposable 25mm thick fibreglass filters with cardboard retaining frame are fitted as standard. Conforming to EU3 determined by Eurovent 4/5 they have an arrestance of 89%

**Dirty Filter Indication**
A factory preset diaphragm type low pressure switch samples pressure differences across the filter bank and operates a warning indication and audible alarm. On site adjustment of the switch is possible by means of a micro adjustment screw.

**Fan and Motor Assembly**
The unit is equipped with direct drive, double width, double inlet, forward curved, centrifugal fans, statically and dynamically balanced for quiet operation. The fan impeller and casing are made from Galvatite mild steel to protect against corrosion. The direct drive motor has sealed-for-life bearings and inherent automatic overload protecion.

**Airflow Switch**
An airflow switch is installed in all units so that in the event of fan or motor failure, control power supply is broken to cut out all functions.

**Electric Reheat**
Electric reheat batteries fitted after the cooling coil are designed to maintain room dry bulb conditions when the system is calling for dehumidification. Elements are finned design and manufactured from Incoloy.

**Heater Elements table of Sizes**

| Unit | Size | Number |
|---|---|---|
| EMDF 2,3 | 2.5kW | 2 |
| EMDF 4,5 | 2.5kW | 3 |
| EMDF 6 | 2.5kW | 6 |
| EMV 2 | 2.5kW | 2 |
| EMV 3 | 2.5kW | 3 |
| EMV 4 | 2.5kW | 3 |
| EMV 5 | 2.5kW | 6 |



**Electrode Boiler Humidifier**
Humidification is provided by an electrode boiler humidifier. The sealed humidifier design ensures that only 'clean steam' is provided to the conditioned space and corrosive salts and minerals are held in the disposable boiler. Variable capacity output is a specific feature of the model.

**Controls**
Standard units are supplied with factory installed electronic control schemes, mcb's mounted on a common Din rail and wiring conforming to relevant European codes and standards.

**Status Panel**
The status panel contains touch sensitive control buttons, function and alarm indicators. The indicator panel is connected to the control system by a single multi-pin connector.
The touch sensitive buttons provide on/off and silencing of an audible alarm. The visual alarm indicator will remain illuminated until the system fault has been corrected.

**Models A, X, W, G**

**Control Scheme**
The temperature control thermostat provides one-stage cooling on all single circuit units. Double circuit units have two-stage cooling. One stage reheat is provided on models 2 - 4 and two-stage reheat on larger models. The humidistat, located in the return air stream, operating on 24 Volt supply, gives one stage of humidification and one stage of dehumidification.

**Evaporator**
The evaporator is manufactured from aluminium fins mechanically bonded to refrigeration quality copper tubes. Twin independent interlaced circuits ensure accurate and economic control of the system on units EMDFA 5D, 6D and EMVA 5D.

**Refrigeration Components**
All evaporator circuits are installed with adjustable superheat, externally equalized, thermal expansion valves connected to multi-way distributor, Schrader charging valves, and solenoid valve to operate a pumpdown cycle.

**Integral Compressor (X,W,G)**
Hermetic compressors are installed with crankcase heaters to guard against floodback conditions on start-up; internal thermal overloads for motor protection; internal spring isolators and muffler to reduce noise and vibration. The compressor is mounted in a module on the side of the cabinet.

**Water and Water/Glycol Cooled Condenser (W,G)**
Shell and coil type. Steel outer shell with internal copper coil for maximum heat coefficient. Fusible plug safety device tested to 30 bar, the shell capacity is sufficient to hold the system R22 charge.





**General**
The equipment detailed in this manual contains live electrical parts and rotating items, whenever remedial work or servicing is to be carried out, it should be electrically isolated from the supply. Due regard should be given to the Health and Safety Act especially where there may be members of the public close to the equipment being worked on.

**Fan System**
Access is gained to the fan chamber by lifting off the front access door. This will reveal the direct drive fans and their connections. There is very little maintenance required because of the direct drive. At each service the fans should be checked for free rotation and any signs of bearing wear. Should signs of damage be apparent the whole fan assembly should be replaced and not just the impeller or motor alone as they are balanced assemblies.

**Cabinet**
The air conditioning cabinet is manufactured from Zinc coated sheet steel, powder coated and stoved to form a hard exterior finish. Scratches can sometimes be taken out with a mild flatting paste if they are not deep and a touch-up paint is available if so required. Particular attention should be paid to the inside of the cabinet. Where moisture is present any signs of corrosion should be dried, cleaned, inhibited and suitably repainted with water resistant paint.

**Filters**
Under normal office conditions primary filters should last 2-3 months. However, each site varies and only experience with a particular site will determine how frequently they require changing. Filter blockage is indicated by a light on the front of the unit being actuated by a differential pressure switch across the filters. When this occurs the filters should be changed.
Filter changing should be carried out whilst the unit is stopped because of the risk of distributing the dust in the filters across the conditioned area. Access is through removable covers. When removing the filters care should be taken that the filter media or frame does not catch on the humidistat mounted adjacent. Similar care should be exercised when fitting new filters especially if they have a metal grid encasing the media. It is advisable to check the cleanliness of the coil face at the same time, if this shows signs of dirt, a soft brush should be used to clear the deposits. It is important that the correct filters are used otherwise the airflow may not return the correct design figure and lead to problems in the future.
To check the calibration of the 'filter blocked' pressure differential switch, block two thirds of the filter area when filters are clean and adjust until the light operates.

**Refrigeration**
Read in conjunction with Maintenance Section of Condensers and Condensing Units. The air handling section is connected to the condensing unit by refrigeration pipework and the maintenance should be carried our concurrently. As the majority of the equipment is housed within the condensing unit the maintenance description is included within that section.



**Electric Heater Battery**
Due to expansion and contraction of the elements, the terminations may become loose, every year these should be checked. Check the thermal cut-out to ensure it trips out the heater contactors on very low airflow failure.

**Cooling Coils (Chilled Water)**
Check at each service visit that the valves motors through its travel and positively shut off. This is checked by motoring the valves to both ends of their travel and ensuring the port to the coil is closed by using a contact thermometer on the 'dead leg' (the dead leg is approximately the ambient temperature). When moving the valve via the controller, ensure that the control point is noted. If there is any doubt about the shut off make further checks with the manometer. Check the coil temperature once a year and check the commissioning pressure drops. Check annually that the cooling coil face is clean. Any accumulation of dust should be cleaned down with a soft brush and vacuum cleaner.

**Electrode Boiler Humidifier**
Under normal circumstances little maintenance is required to the humidifier, the maintenance schedule lists the operations and frequency.

**Steam Cylinder Exchange**
Access to the steam cylinder is relatively easy on all units. Before switching off the supply to the humidifier, first isolate the water and drain down the cylinder by activating the manual drain switch. Remove the discharge hose from the top of the steam cylinder, the element electrodes and the cylinder level electrodes. The cylinder can then be pulled from the feed/drain manifold assembly and a new one inserted. The feed/drain manifold should be inspected whenever a new cylinder is installed and the 'O' ring replaced. Always flush the drain pipework when a cylinder is replaced and any stubborn solids should be removed by using the rodding points installed in the drain pipework. Do not forget to open water supply. Watch the unit, after replacing a cylinder, through its initial start-up period and ensure that it is operating at the correct current.

**Control System**
Look through the Customers Service Reports. See whether any problems have occurred since the last maintenance visit and ensure that no problems are arising from these. Every two or three months carry out a complete operational check. Note the setpoints of both the thermostat and humidistat. Run each in turn through its range of control and check the operation of the relevant contactors and/or relays - Investigate any faults. Once a year check tighten all terminals within the control panel and on associated equipment, such as heaters, fan motors, solenoid valves etc.

**ELECTRODE BOILER HUMIDIFIER**

| FAULT | POSSIBLE CAUSE | REMEDY / ACTION |
|---|---|---|
| Main fuses blow when initially switched on. | Cylinder damage (short electrode). | Test with meter/megger should read infinity between electrodes. |
| Water in barrel/ Contactor in. | Control fuse failed. | Check wiring - replace 5A fuse. |
| Unit 'Called for' but but not filling. | Water not available at cylinder. | Check all stop cocks in line - open if closed. Slacken strainer plug for quick check. |
| | | Check unit strainer - clean if necessary. |
| | | Solenoid not operating - check feed and solenoid coil. Renew coil or control board as required. |
| | | Solenoid valve stuck - free. |
| | Water available - cylinder filling. | Drain solenoid open, check manual switch is on auto. |
| | | Drain pump leaking, clean or replace. |
| Cylinder Operating low current or output. | Low conductivity. | Output potentiometer, check if correctly set. |
| | | Conductivity has not risen enough due to new bottle/service - allow to operate to bring up conductivity. Encourage by adding a teaspoon of salt to system. |
| | | Drain pump leaking, allowing too much fresh water. Clean or renew. |
| | Second stage not working. | Check calibration/operation of controller - rectify. |
| | Cylinder nearing end of life. | Change cylinder. |





**CHILLED WATER UNITS MODEL CW**

**Control Scheme**
The unit mounted temperature sensor located in the return air stream provides a signal to a low-voltage temperature controller which drives the two-way chilled water valve. The humidistat, located in the return air stream, operating on 24-volt supply, gives one stage of humidification and one stage of dehumidification.

**Cooling Coil**
The cooling coil is manufactured from aluminium fins mechanically bonded to copper tubes. Coils are circuited from a header to ensure only low water pressure drops.

## OPTIONS

**Mains Isolator Switch**
The remote mounted isolator switch is matched to unit capacity.

**Low Pressure Hot Water Heating**
Available instead of electric heating, is a factory installed low pressure hot water heating coil. Controls are included within the unit for an externally mounted control valve and actuator.

**Head Pressure Control (Water and Glycol Cooled Models)**
A 2 or 3-way head pressure controlled water/glycol regulating valve, modulates coolant flow rate through the condensers to maintain a steady pre-selected condensing temperature. All units are factory piped, wired, run and tested prior to despatch.

**Flood Detectors**
Solid state water detectors can be installed in critical areas for immediate detection of water loss. Sensors can be contained within the unit or mounted remotely. Legend indicator panel provides audible and visual alarm indication of water loss.

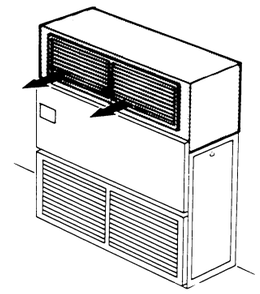
**Condensate Pump**
Factory installed, the pump has a 4 litre reservoir, 0.324l/s capacity at 6m total head. Sub base required for upflow units.

***Note:*** *Factory fitted where possible as it can be dependent on which other options are fitted.*

**Smoke Detectors**
The remote smoke detector upon sensing the presence of smoke will shut down the system and activate the alarm

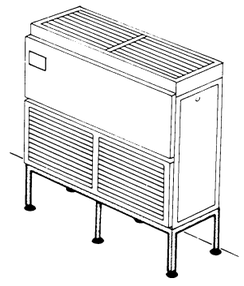
**Fire Detector**
Installed in the unit return air stream, the detector shuts down the system in the event of an unusually high return air temperature.

**Front Discharge**
Available for upflow units with adjustable deflector grills for front discharge only, finished to the same standard as the unit.



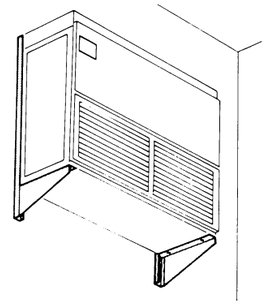
**FRONT DISCHARGE UPFLOW ONLY**

**Floor Stand**
Finished to the same standard as the unit and available up to a height of 450mm. The stand has adjustable legs and permits connection of the unit prior to installation of the raised floor. For downflow models an enclosed stand with a turning vane is available.



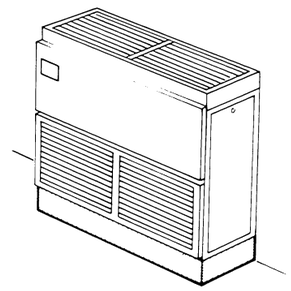
**FLOOR STAND ALL MODELS**

**Wall Brackets**
Finished to the same standard as the unit, wall mounting brackets are available for positioning upflow units at high level. Manufactured from mild steel they are designed for fastening to suitable flat surfaces.



**WALL BRACKETS EMVA/EMVCW 2 - 4 ONLY**

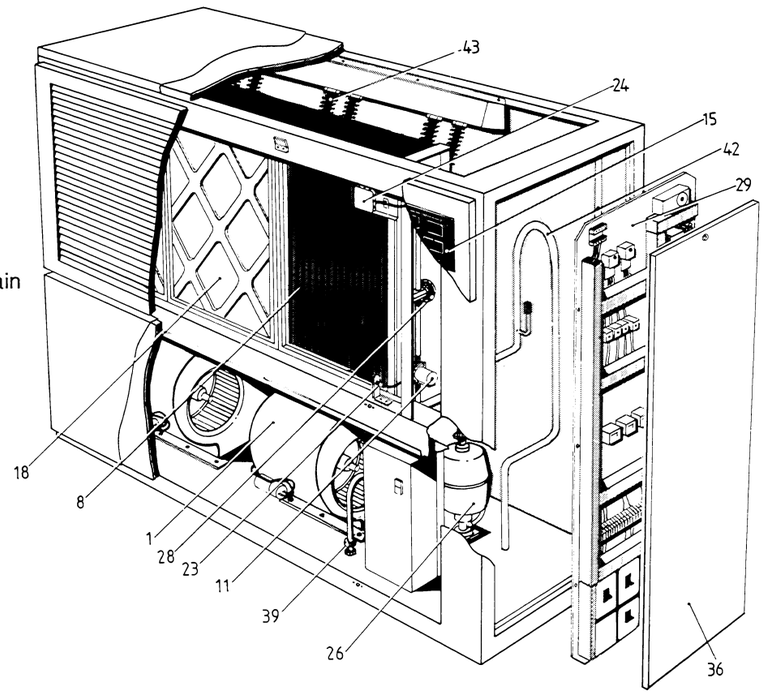
**Sub-Base**
Designed for applications where there is no raised floor. Access for the pipework is gained through pre-formed knockouts in the back and sides of the sub-base.



**SUB-BASE UPFLOW ONLY.**

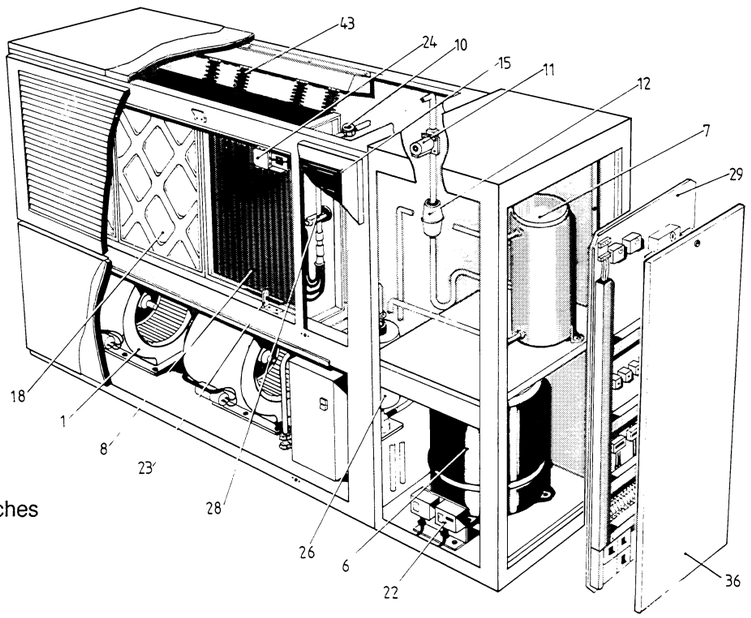
**EMDFA**

1. Fan with Integral Motor
8. Coil
11. Solenoid Valve
15. Status Panel
18. Standard Filter
23. Temperature Sensor
24. Humidity Sensor
26. Humidifier
28. Expansion Valve
29. Control Panel
36. Removable Panel
39. Condensate/Humidifier Drain
42. Suction Line
43. Electric Heaters




**EMDFX/W/G**

1 Fan with Integral Motor
6. Compressor
7. Condenser
8. Coil
10. Sight Glass
11. Solenoid Valve
12. Drier
15. Status Panel
18. Standard Filter
22. High & Low Pressure Switches
23. Temperature Sensor
24. Humidity Sensor
26. Humidifier
28. Expansion Valve
29. Control Panel
36. Removable Panel
43. Electric Heaters








**GENERAL** (Continued)

| FAULT | POSSIBLE CAUSE | REMEDY / ACTION |
|---|---|---|
| High Humidity | Humidifier controller 'welded' in. | Check contactor - replace if necessary. |
| | Dehumidifying circuit(s) inefficient. | See refrigeration section. |
| | Cooling Coil inefficient (CHILLED WATER) | Water temperature too high - check chiller and its control. |
| | | Low waterflow - check isolating valves and strainers. |
| | Control malfunction. | Check transformer primary/secondary supply - replace if faulty. |
| | | Check calibration of controls - recalibrate if necessary. |
| | | Humidistat locked on humidifying. Check humidistat setting. |
| | (CHILLED WATER) | Cooling valve closed or partly open to coil. Valve may be stuck free or replace. |
| | | If all above fails replace thermostat/humidistat and recalibrate. |
| | Too much fresh air in summer. | Check fresh air quantity. |
| Low Humidity | Filter blocked. | Inspect visually and with manometer across filters/coil - renew if required. Check differential pressure switch and light - recalibrate/replace as necessary. |
| | Humidifier problem. | See humidifier section. |
| | Too much fresh air externally in winter. | Check fresh air quality. |
| | Control malfunction. | Check calibration of controls - recalibrate if necessary. |
| | | Humidistat lock on dehumidifying - check motor and wiring, also detector - no short circuit. Check humidistat setting. |
| | | Cooling valve open fully to coil. Valve may be stuck, free or replace. |
| | (CHILLED WATER) | If all above fails replace humidistat and recalibrate. |

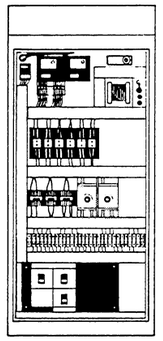
**GENERAL** (Continued)

| FAULT | POSSIBLE CAUSE | REMEDY / ACTION |
|---|---|---|
| High Temperature | Control malfunction | Check transformer/secondary supply - replace if necessary. |
| | | Check calibration of controls - recalibrate if necessary. |
| | | Thermostat locked on heating - check motor and wiring from controller also detectors not short circuited - repair/replace. |
| | (CHILLED WATER) | Cooling valve closed or partly open to coil. Valve may be stuck - free or replace. |
| | (HOT WATER) | Heating valve may be stuck - free or replace. |
| | | If all above fails replace controller/thermostat and recalibrate. |
| Low Temperature | Unit not operating. | Switch on. |
| | Heating hand/off/auto switch in off position. | Check heater battery cut-out. |
| | Heater cut-out. | Check if filters blocked - replace. |
| | Heating coil inefficient (HOT WATER) | Water temp. to low - check boiler/calorifier and its controls. |
| | | Low water flow - check isolating valves, strainers throughout system. |
| | Control malfunction. | Check transformer primary/secondary supply - replace if faulty. |
| | | Check calibration of controls - recalibrate if necessary. |
| | | Thermostat locked on cooling - check motor and wiring from controller, also detector from open circuit - repair/replace. |
| | | If all above fails replace controller/thermostat and calibrate. |

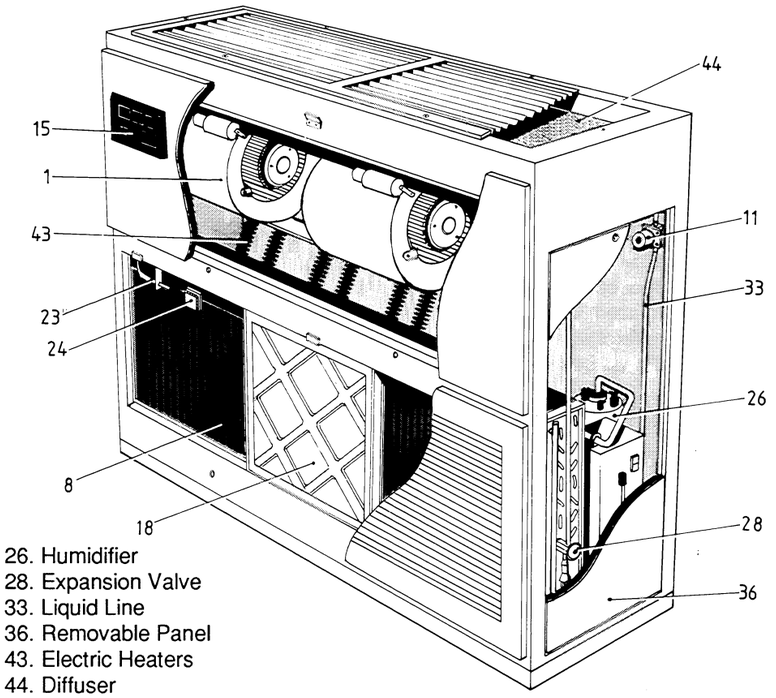




**EMVA**

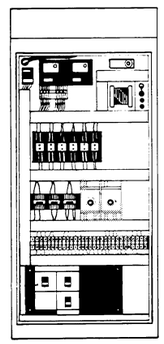


**View on LH Side**
**Typical Control Panel**

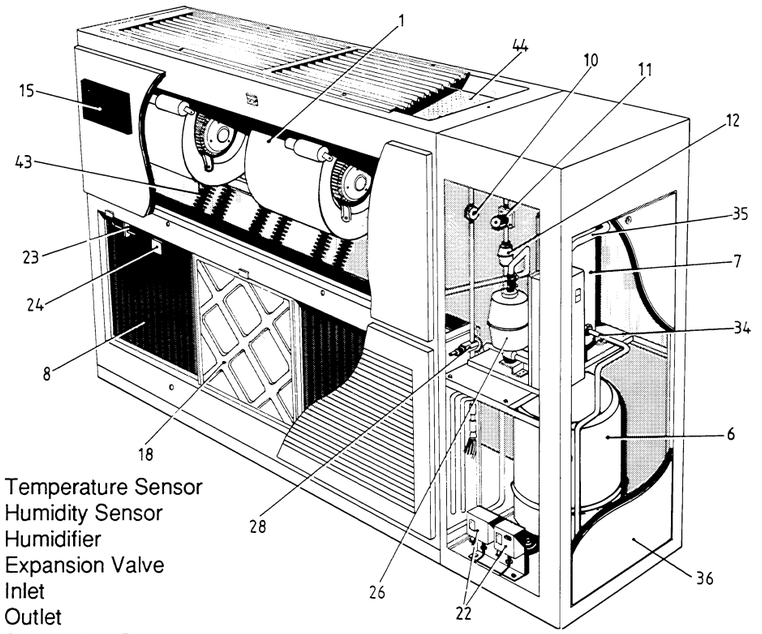



1 Fan with Integral Motor
8. Coil
11. Solenoid Valve
15. Status Panel
18. Standard Filter
23. Temperature Sensor
24. Humidity Sensor
26. Humidifier
28. Expansion Valve
33. Liquid Line
36. Removable Panel
43. Electric Heaters
44. Diffuser

**EMVX/W/G**



**View on LH Side**
**Typical Control Panel**




1 Fan with Integral Motor
6. Compressor
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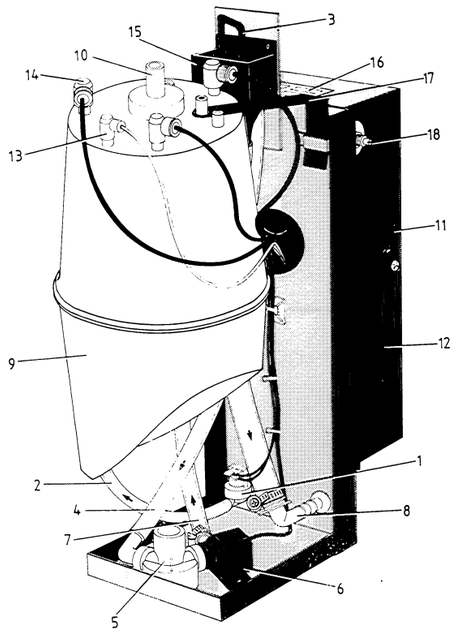
10. Sight Glass
11. Solenoid Valve
12. Drier
15. status Panel
18. Standard Filter
22. High & Low Pressure Switches
23. Temperature Sensor
24. Humidity Sensor
26. Humidifier
28. Expansion Valve
34. Inlet
35. Outlet
36. Removable Panel
43. Electric Heaters
44. Diffuser

**Unit Operation**

Air is drawn in via the front return air grille and enters the return air filter. It passes through the cooling coil which may be in one or two circuits depending on the model of the unit. The air passes over the electric heater or low pressure hot water heater battery and is returned to the conditioned space by the fans.

**Electrode Boiler Humidifier**

The humidifier works on the electrode boiler principle. An electrical supply is made to two or three electrodes within the cylinders and until water touches the electrodes, completing the circuit, no current passes. Once current starts to pass between the electrodes it heats the water to produce steam. If the water is completely pure, little or no current will pass but with very hard water and the same level of water in the cylinder considerably more current will pass because the conductivity of hard water is higher.




1. Feed Inlet Solenoid
2. Feed Inlet Pipe
3. Feed Pipe
4. Bottle Feed Pipe
5. Feed/Drain Manifold
6. Drain Pump
7. Bottle Drain Pipe
8. Drain
9. Vapac Cylinder
10. Steam Feed Pipe
11. Run/Off/Drain Switch
12. Control Panel
13. Water Level Sensor
14. Heating Elements
15. Feed/Drain Tundish
16. Serial Plate
17. Bottle Support Bracket
18. Potentiometer

The initial start-up must be carefully monitored. Initially the humidifier cylinder will be empty, the drain pump off and the feed solenoid valve open. The cylinder will fill until the water reaches the level sensing electrode which will close the feed solenoid. When the water reaches the electrode, current will pass and start to heat the water. The initial current taken will usually remain low and the addition of salt may be required in the soft water areas to improve conductivity.

As the water boils the water level in the cylinder will drop and the level sensing electrode will open the feed solenoid valve, allowing further water into the cylinder. As the water boils away and is replaced by new water, the solids within the cylinder gradually build up bringing the conductivity of the water within the barrel higher. The desired operating current is reached, the process taking a few minutes or several hours according to the hardness of the water. In soft water areas this process will take several hours and areas supplied by hard water will take a matter of minutes.

The initial start-up procedure only occurs with a new steam cylinder or after cylinder service.

Once the start-up period has been completed, the cylinder will operate automatically at approximately the same output. The condition is set during commissioning and is explained in the commissioning instructions.

Once this current value is exceeded with a cylinder in normal operation, the feed solenoid opens and the drain pump runs simultaneously for a short time allowing the high solid content water to drain - diluting it with new feed water. After this preset time the drain will close, the feed valve will remain open until the normal operating water level is reached. The water being below boiling point will then re-heat and continue to operate at the correct output. The humidifier will then operate under the dictates of the humidistat following this procedure.

As the electrodes become scaled up, the electronic sensing device allows the conductivity (solids) of the water in the cylinder to gradually rise, keeping the current reasonably static at the desired value. As this process progresses, the drain down periods taking away solids to waste, become less frequent. Eventually they cease altogether, the electrodes are badly coated with scale and the electrode current will then drop rapidly causing the alarm to sound. At this juncture the boiler requires changing and the initial start-up sequence must be followed again.

**Control System**

Indication of the operational and fault conditions is achieved by the use of a legend panel fitted on one of the front removable panels.

The components for the legend plate are fitted on a printed circuit board fixed behind the plate. For reliability the indicator lights are solid state LED's and should not require maintenance or replacement. Fitted to the printed circuit board is a control circuit fuse for component protection. This is rated at 1.0 amps and is accessible by removing the sheet steel cover.

The units are normally shipped with manual restart so that in the event of a power failure the "ON" button must be pressed to manually restart the unit. If the auto restart facility is required it may be accomplished by removing the steel cover over the printed circuit board revealing a two position switch labelled '1' and '2'. In position '1' the unit will be in the MANUAL start mode and in position '2' the unit will be in the AUTO start mode.

If this switch is to be altered it is important to switch off and disconnect the power to the unit.







**GENERAL**

| FAULT | POSSIBLE CAUSE | REMEDY / ACTION |
|---|---|---|
| Unit not Operating | Main isolator off. | Check all isolators from mains to unit. |
| | Main fuse(s) failed. | Check all fuses in mains. Replace after correcting fault. |
| Unit not Operating Power On | Unit not switched on. | Switch on. |
| | Fire detection or external interlock fault, no fault on wire. | Investigate and correct. Do not link out fire detector without customers written consent. |
| | Control MCB failed. | Re-set after investigating and correcting fault. |
| | Loose wire in Control Circuit. | Investigate and tighten wire connections. |
| | Fan overload tripped. | Allow time to reset - after investigating power wiring and MCB. If it trips again check motor windings. |
| Unit Operating No Cooling/Heating | Airflow Switch inoperative. | Investigate - repair or replace DO NOT SHORT OUT. |
| | Loose wire in control circuit. | Investigate and tighten wire connections. |
| High Temperature | Unit not operating. | See unit not operating / Unit not operating with power on. |
| | Cooling hand/off/auto switches 'off'. | Switch on to 'auto'. |
| | FIlters blocked. | Inspect visually, or manometer across filters/coil - renew if required. Check differential pressure switch and light, recalibrate/replace if necessary. |
| | Condensing units inoperative/ efficient. | See refrigeration section. |
| | Cooling coil inefficient (chilled water). | Water temperature too high, check chiller and its control. |
| | | Low water flow, check isolating valves and strainers throughout the system. |

9. Check superheats and adjust to 5.5/6.5°C rechecking charge if the superheats have been adjusted to any great extent. A period of approximately half an hour should be allowed between each resetting of the valve to allow pressures to stabilise.
10. Check that HP/LP switches are to the following settings:

| | |
|---|---|
| LP switch | cut out 2.1 to 2.4 bar |
| LP switch | cut in 3.8 to 4.1 bar |
| LP switch | differential 1.7 bar |
| HP switch | cut out 27.6 bar |

Ensure that the HP/LP switches shut off the condensing units. The setting of these switches must be checked using your gauges. (Do not rely on the scale readings as these are only a guide).
11. Set controls to maintain the design temperature and humidity. It will probably be necessary to reset the control once or twice during the initial running of the air conditioning system.
12. Record Commissioning Data
See Warranty

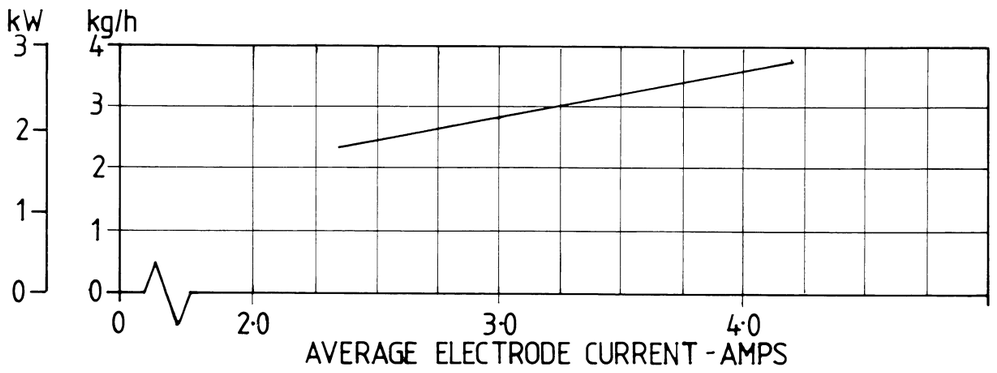
**Electrode Boiler Humidifier**
**Pre Start Checks**
1. Ensure a water supply is available to the humidifier at the correct pressure and that the water softener, if fitted, has been commissioned.
2. Ensure the drain line is connected and that water flows away freely. This can be carried out by filling then draining the cylinder.
3. Ensure that the steam distribution pipe is connected securely at both the distribution and cylinder ends and is not kink or damaged.

**Startup Procedure**
1. Open the water supply valve adjacent to the unit.
2. Ensure that the water is feeding to the humidifier and the drain solenoid valve is closed. Watch the initial startup procedure commence. Fit clamp on ammeter onto one of the wires feeding the electrodes and observe the current.
3. Use graph at the end of this section to check output against current.
4. With soft water or if a water softener has been added, this initial start period may take several hours. To reduce this add a teaspoon of common table salt through the steam outlet, turn the output controller to maximum and commence startup procedure.
5. Observe the clip on ammeter and gradually reduce the output controller until the desired value is reached (control potentiometer is on humidifier assembly panel).
6. Observe the humidifier watching it through its normal operation for a drain period.

**Control System**
**Direct Expansion Model**
The temperature and control system on the standard direct expansion model is simple to commission. Check the calibration of the thermostat and humidistats against a sling thermometer. These are mass produced so there may be a slight difference between the scale readings and the actual temperatures registered. Any local heat loads in the room adjacent to the unit may cause the thermostat to be set at a slightly higher or lower setting to allow for the offset caused.
The differential on the thermostats is factory set and is not field adjustable.
When setting the thermostat allow the room to stabilise for about an hour then re-check the temperatures and adjust as necessary. A little time spent during commissioning will save a return visit later.

**Humidistat Setting**
The humidistat can only be set once the temperature is controlled, because temperature and humidity are interdependent.
If a control band of total 3°C is obtained then the best humidity will be 10% total. Any attempt to reduce the humidity bandwidth with the above temperature bandwidth will result in instability and hunting of the room condition.

**Humidistat**
The two stage humidistat (one hum, one dehum) is used with the standard Airedale Humidity sensor. The desired level of humidity is selected by setting the value required using the pointer on the humidistat.



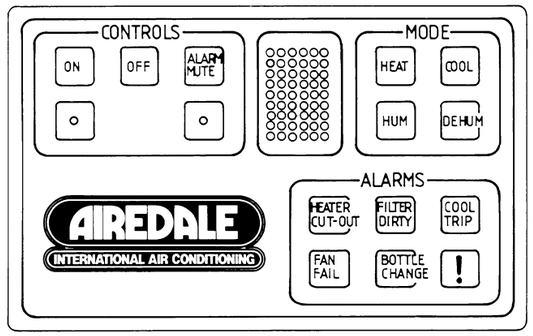

Humidifier Output/Current Graph







This panel incorporates the following switches and indicator lights:
1. ON and OFF push buttons
2. ALARM MUTE push buttons
3. COOLing on indicator
4. HEATing on indicator
5. HUMidifying on indicator
6. DEHUMidifying on indicator
7. HEATER CUT-OUT alarm
8. FILTER DIRTY indication
9. FAN FAIL alarm
10. COOLing TRIP alarm
11. BOTTLE CHANGE alarm
12. ! Other alarm

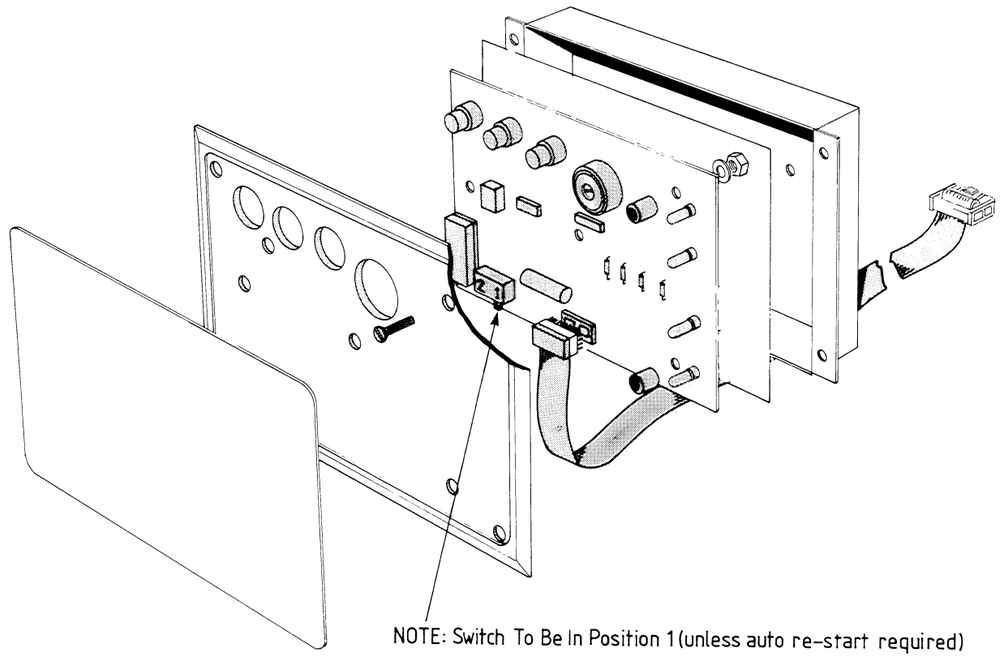



**Legend Panel**

*Note: If the switch is set in the 'Auto' position it is the responsibility of the Installer to affix a label warning Users of the unit of automatic re-start.*
Fitted behind the legend plate is an audible alarm which will operate in the event of an alarm condition and may be muted by the 'MUTE' button. The visual indication will remain until the relevant fault is corrected.

**Control Panel**
The control panel is located at the right-hand end of the downflow unit and left hand end of the upflow units housing all the components required to enable fully automatic operation of the unit.
The panel contains:
1. A panel on which the HAND/OFF/AUTO switches and humidifier controls are situated.
2. The contactors and relays.
3. The miniature circuit breakers (MCB's)
4. The control circuit transformer
5. The legend panel interface and connector board.
6. The control thermostat (direct expansion models).
7. The necessary terminals for internal and external connections.

The HAND/OFF/AUTO switches enable the automatic controls to be overridden during commissioning or in the event of a control fault. They also enable any faulty circuit to be switched off whilst the rest of the unit operates normally.




**Auto/Manual Switch Location**

**Direct Expansion Control Circuit Operation**

The control circuit is fed by two circuit breakers, a 240 volt and a 24 volt single pole type. When power is fed to the control transformer via the fire detection system link the unit is ready for operation.

When the 'ON' button is pressed a live feed goes to the fan relay which supplies the fan contactor (or contactors depending upon the number of fans in the unit). If the airflow switch senses sufficient airflow to operate, the unit will continue running once the 'ON' button is released. If airflow is not present, the unit will stop as soon as the 'ON' button is released.

When the fans are running a feed goes to the cooling and heating thermostat and also to the humidifier control system.

The cooling stages are controlled by a 'pump-down' system using a liquid line solenoid valve to control the refrigeration circuits operation. Each compressor is controlled by its own contactor. These contactors are actuated by the respective HP/LP pressure switch and sense whether the liquid line solenoid valve is open or shut and respond accordingly.

Humidity is controlled by a two stage humidistat. This is independent of the operation of the cooling/heating thermostat. If dehumidification is required, the humidistats will override any temperature control and call for the cooling to operate. If the room temperature drop the heaters will switch on via the control thermostat to compensate. When dehum is called for the fan speed decreases to assist rapid dehumidification.

On two circuit units only the second stage of cooling will be called for during dehumidification.

| | Temperature Control |
|---|---|
| EMDF/V 2<br>EMDF/V 3 | 1 Cool 1 Heat |
| EMDF/V 4<br>EMDF/V 5<br>EMDF 6 | 1 Cool 2 Heat |
| EMDF/V 5/D<br>EMDF 6/D | 2 Cool 2 Heat |

The control system for the chilled water and low pressure hot water units is similar to the direct expansion units except that the control is achieved by a three way step control valve driven by the return air thermostat.

**Chilled Water System**

Depending upon the return air condition, the mechanical control stat will supply a signal to drive the valve actuator to fully open or to close. The valve will step on and off to maintain room control.

If dehum is called for, control is overridden by the dehum relay causing the valve to move to the fully open position. If the cooling effect is too great the mechanical thermostat will call for heating to maintain the required condition.

**Low Pressure Hot Water System**

The operation of the valve on a low pressure hot water system is identical to the chilled water system except that the valve is located in the heating coil rather than the cooling coil.







**General**

The following commissioning schedule gives the suggested order of commissioning including a check list which highlights small details which are occasionally forgotten.

**Airflow**

To enable the equipment to work to its design specification it is essential that the airflow be correct to design. Use an anemometer across the return air grille for measuring airflow. The grille free area is 66%. Airflow = average velocity x grille area x 0.66.

If the measured unit airflow is more than 10% either side of design please consult Airedale. These conditions may cause the unit to operate outside its design limits and may damage components.

**Refrigeration**

The commissioning schedule details the work to be carried out on the refrigeration system. The table below will enable you to accurately charge your refrigeration circuits be weighing the exact amount of refrigerant required. The length of pipework should be measured and not estimated.

| UNIT TYPE | REFRIGERANT CHARGE (Air Handling Unit + Condensing Unit or Condenser) |
|---|---|
| 2 | 2.4kg |
| 3 | 3.2kg |
| 4 | 4.66kg |
| 5 | 5.0kg |
| 6 | 6.14kg |
| 5/D | 2 x 2.4kg |
| 6/D | 2 x 3.2kg |

Table of Refrigerant Charge per 3m length of pipe

The above weights are for suction temperature 4°C, discharge temperature 40°C, refrigerant R22.

*Note: Although the table gives accurate weights of refrigerant for various units final charge level MUST be ascertained by measuring suction and discharge pressures and superheats.*

**Cooling Coil (Chilled Water)**

The cooling coils must have the correct flow of water and inlet temperature otherwise capacities cannot be met.

The best way to control waterflow is by incorporating orifice and double regulating valves (DRV) at each coil, so enabling readings to be taken on the orifice valve regulating the flow on the DRV. If these valves have not been installed pressure drop readings should be taken across the coil and valve using the CV curve of the particular valve.

These readings should be taken with an accurate manometer. Having set the flow accurately, the on and off coil temperatures should be tested on both air and water sides to ensure they correspond with the design conditions. An electronic multipoint temperature measuring device should be used for this process taking readings within a second of each other.

**Pre-Start Checks**

Before switching on the electrical supply, the following checks should be made (if applicable).

1. The unit is exactly as ordered.
2. All the switches are in the OFF position.
3. All electrical terminals are tight
4. Mains are available to the unit.
5. Clean filters of the correct efficiency are fitted.
6. The control circuit transformer is on the correct tapping.
7. Water is available to the humidifier.
8. Drain line is connected and water flows away freely.
9. Drain line has a 75mm trap.
10. Cooling and heating coils and associated pipework are vented.
11. Check holding charge in refrigeration lines is to the same pressure temperature relationship as left by the installation team (there is no leak). If there is a leak, further checks and re-evacuation should be carried out.
12. Check that all interlocking on each condensing unit is correct i.e. that solenoid valves, pressure switched and power for compressor number 1 operate when hand switch number 1 is switched on.

**Start-up Procedure**

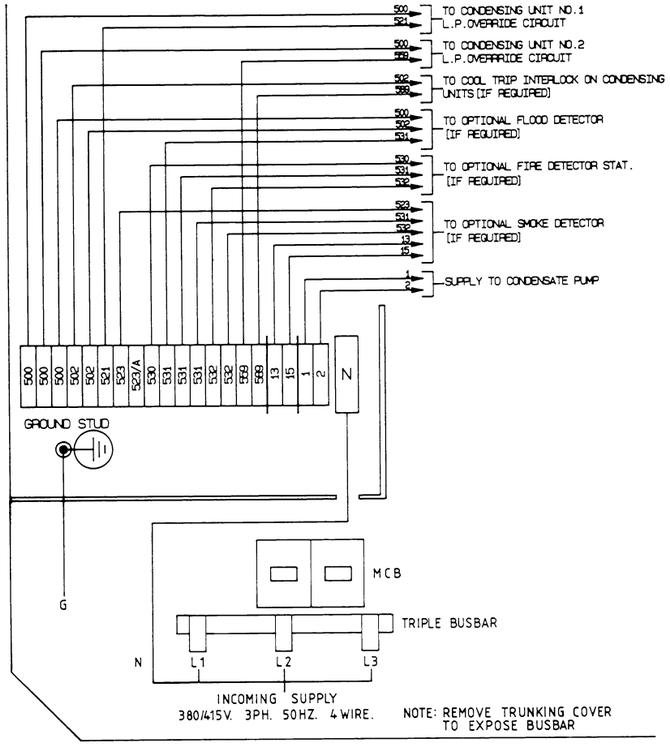
1. With only the control 240 volt and 24 volt circuit breakers made, and with a shorting link across the "fan fail" pressure switch, check the operation of the control circuit through the various sequences and approximately set the controls.
*Note: Remove shorting link on pressure switch after this operation.*
2. With the control circuit MCB still made, turn on crankcase heaters and ensure that they are on for approximately 6 hours before compressor start-up. This allows liquid refrigerant to be "boiled off" from the compressor crankcase.
3. Close the MCB's, switch on fans, check fan rotation direction, check motor amps.
4. Reduce the airflow by partially blanking the return air grille and ensure the audible and visual alarms on the legend plate are activated.
5. Check the airflow of the unit and ensure that it is within plus or minus 10% of the stated design. If it is outside these limits ascertain cause and remedy before proceeding further.
6. a) Check heater battery elements take the correct current and that the safety thermostat cuts out the elements.

$$\frac{\text{Watts/Phase}}{\text{Phase Voltage}} = \text{Current}$$

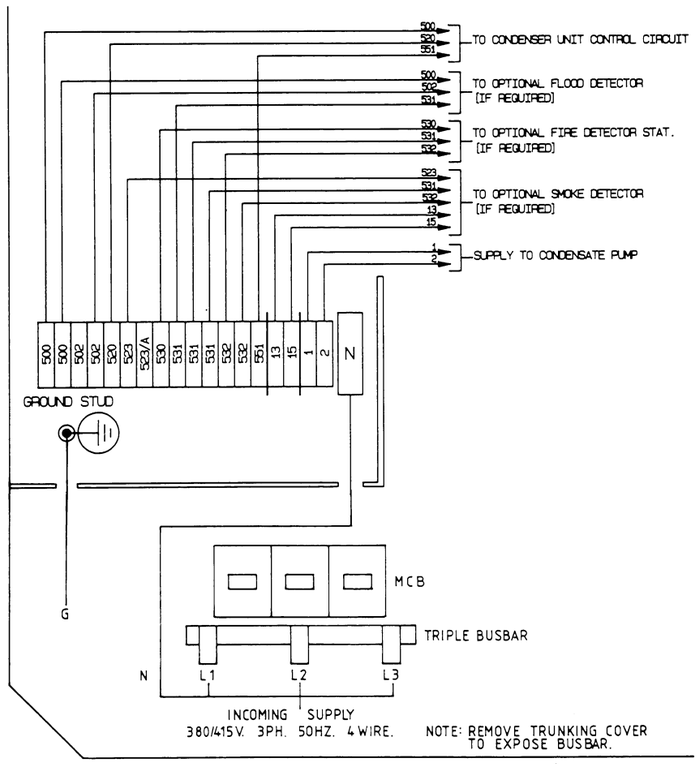
***Note**: All heaters are rated at 240V. For 220V multiply by 0.84.*

b)Set the humidifier to correct amperage.

7. Charge refrigeration systems using clip-on ammeter and refrigeration charts. Use sight glass as an aid only. The charges recommended are set out in the Refrigeration Section.
8. Set the head pressure control device to maintain the design condensing pressure.




EMDFA
EMVA




EMDFX
EMVX

Wiring Connection Diagrams - A/X



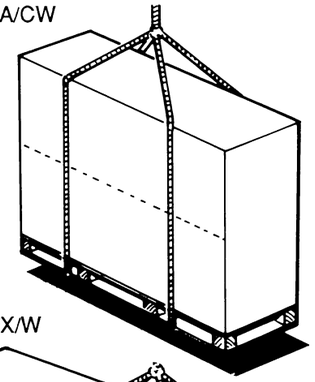


## General

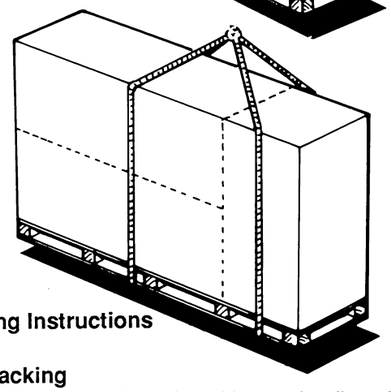
### Lifting

Whenever possible all lifting and handling of equipment should be carried out with the packing and pallet in position. If the unit is to be lifted or craned it is most important that the units are evenly supported across the base. It should be noted that units incorporating compressor(s) will have the centre of gravity offset from the centre of the units. If the unit is dropped it should be immediately unpacked and inspected for damage.

EMDF/EMV/A/CW



EMDF/EMV/X/W



**Lifting Instructions**

### Unpacking

Remove the cardboard packing and pallet taking care not to scratch or damage the unit. If the unit has been crated extra care should be taken with regard to nails, staples etc.

Underneath the cardboard is a polythene cover which can be used to protect the unit from dust during installation.

The key for the control panel end door is taped inside the unit behind the inlet grille. Access is obtained by removing the cover incorporating the grilles. This is achieved by pulling the lower edge forward to release the spring catches and then lifting the cover off the retaining brackets.

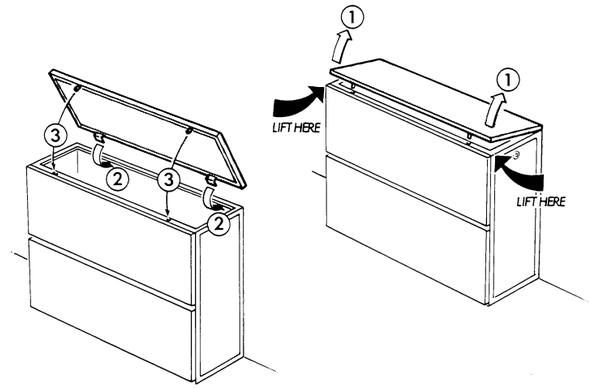
***Note**: When removing the cover with the legend panel fitted, ensure that the flexible cable to the panel is not strained or kinked. When replacing cover ensure cable is not trapped.*

### Inspection

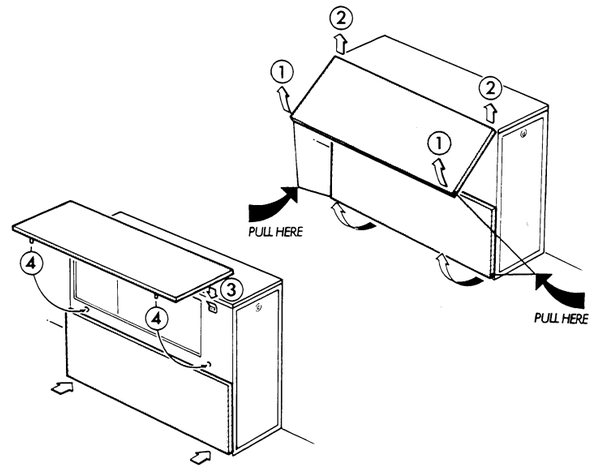
The unit should be thoroughly inspected within three days of arrival on site and any damage reported immediately to Airedale and confirmed in writing within seven days.

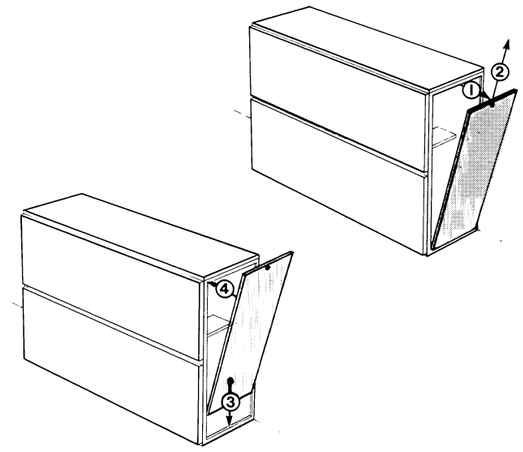
It is advisable to use the polythene cover as protection throughout the installation period and the cardboard packing as additional protection if building or other constructional work is in progress.

Removing & Refitting Top Panel




Removing & Refitting End Panels



Removing & Refitting Front Panels

**Positioning**
Considerable damage can occur to the unit during positioning to the panelling and exterior paintwork. When moving use an adequate number of personnel and the correct tools. Three or four short lengths of 40mm steel pipe used as rollers will aid positioning, when pushing the unit try to apply pressure near to the base and at corners. The unit is designed to remain upright, care should be taken when lifting the unit up steps or onto plinths. Airedale will accept no responsibility for mishandling during the positioning of the equipment.

**Levelling**
The unit should be positioned in an upright position - level in both directions. Failure to carry out levelling correctly may cause operational problems, particularly with regard to the drainage of the equipment. The units are assembled on a level base and any misalignment of doors or panels will indicate that the unit is not level. Always used a spirit level for this operation and if packing pieces are used they should be applied at the corners of the unit.

**Plinth**
Where a false floor is installed, a plinth or floor stand will be required to support the unit. If the unit is the type that supplies air to the floor void, it is important that the joint between the unit and the plinth is sealed by a gasket. Particular attention should be paid to sealing the plinth at the rear so that there is no bypass of air at the rear of the unit. With a small floor void the plinth should incorporate a turning vane to assist turning the airflow from the fans. Failure to use a turning vane may cause a high resistance and lower the unit airflow which may in turn cause operational problems.

**Electrical**
Airedale equipment is designed for an electrical supply 415 volts +/- 6%, three phase, 4 wire 50Hz to the relevant IEE Regulations and British Standards.
Other supply voltages and frequencies can be supplied on request but care should be used when applying the standard current rating to these voltages.
All mains wiring and interconnecting wiring between units should be carried out to national and local codes. The wires should be capable of carrying the maximum load current under non-fault conditions at the stipulated voltages. Care should be taken to avoid significant voltage drops on cable runs particularly to low voltage wiring.

**Refrigeration Pipework**
All refrigeration pipework should be installed to national and local standards.
Extreme care should be taken to keep refrigeration tubing clean and dry prior to installation, the following procedures will help you to adhere to good practice.

1. Only refrigeration grade copper tubing correctly sealed against contamination should be used.
2. Do not carry out installation outside if it is raining.
3. Always cap the free end of tubing during installation.
4. Do not leave dehydrated compressors or filter driers open to atmosphere (one or two minutes maximum is suggested).
5. Use only copper eutectic or specialist soft solders containing at least 3.5% silver on suction and liquid lines and high temperature copper eutectic rods or silver solder on discharge lines.
6. With any high temperature rod where oxidization is liable to take place use an inert gas such as dry nitrogen or carbon dioxide to avoid scale formation inside the tubing. Dry nitrogen is preferred.
7. When using soldering paste or flux use the minimum required to prevent contamination of the filter and joint. Flux only the male part of the connection - never female. After making the joint remove the surplus flux with a damp cloth.
8. Where vibration eliminators are used, the ends should be wrapped with a damp cloth and brazing rods with a melting temperature of no greater the 650°C should be used, to avoid damage to the internal joints.

All refrigeration pipework should be designed to good refrigeration practice to ensure pressure drops are kept to a minimum whilst being commercially acceptable.

**Suction Lines**
Design pressure drop of 1°C.
Horizontal runs should have a slope of 1 in 200 minimum towards the compressor (direction of flow).
Vertical risers should be trapped at the foot of each riser and every 5/6 metres of riser. These suction risers should have sufficient velocity to carry oil with the refrigerant.

**Liquid Lines**
Design pressure drop of 0.5°C.
The primary concern in liquid line sizing is to ensure a solid liquid head of refrigerant at the expansion valve. Ideally the liquid should be slightly sub-cooled on entering the expansion valve. It is advisable to insulate liquid lines when they pass hot environments such as a boiler-house.

**Discharge Lines**
Use the same parameters for pressure drop as the suction lines. Take care when routing discharge pipework immediately after the compressor as abrupt changes of direction result in high velocity noises and vibration.

**Water Pipework**
All water pipework must be installed to national and local standards and in particular local Water Board requirements regarding mains water supply and overflows.

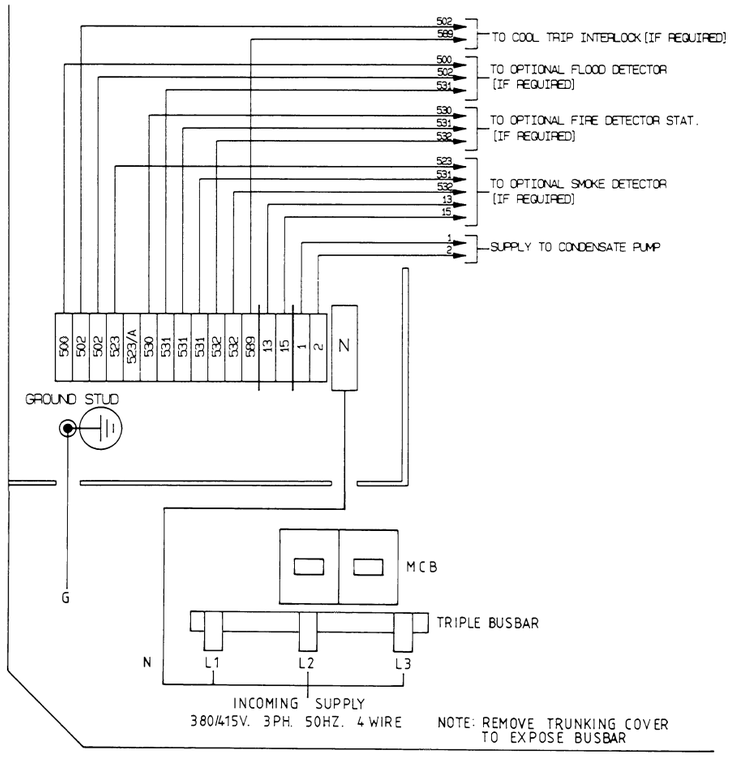
**Chilled water Pipework**
All chilled water pipework must be installed and vapour sealed to avoid condensation.

1. Air vents are to be installed at all high points and whenever air is likely to be trapped.
2. Drain points are to be installed at all low points in the system and adjacent to the unit, to facilitate maintenance to the cooling coil.
3. Isolating valves should be installed adjacent to all items of equipment for ease of maintenance.
4. Access points should be installed across all items of equipment with suitable balancing valves to ensure correct balancing of the system.
5. A suitable water make-up supply is to be installed on all systems and an expansion tank for a closed system.

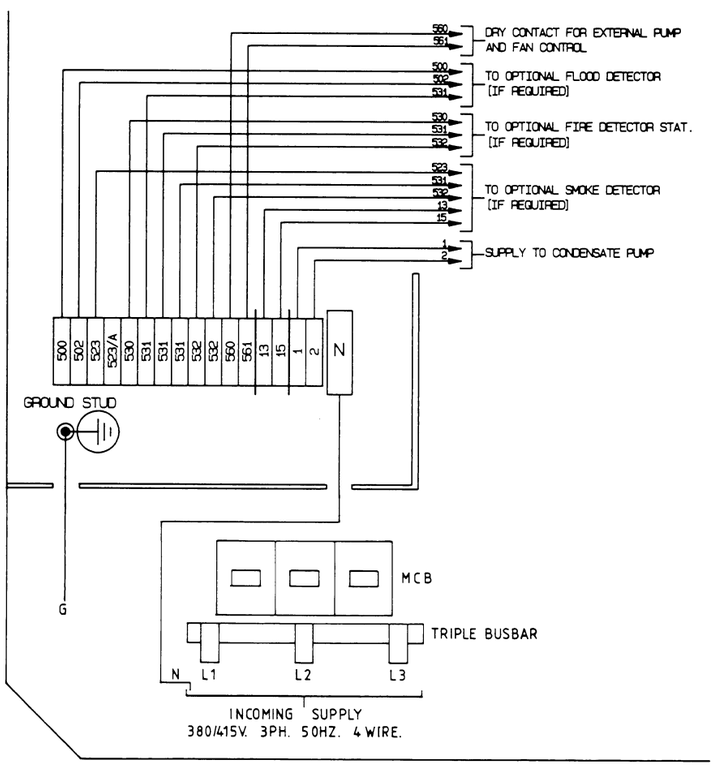
**Water Treatment**
All chilled water systems should have water treatment to inhibit the system to avoid dissimilar metal corrosion.








EMDF/CW
EMV/CW




EMDF/W/G
EMV/W/G

Wiring Connection Diagrams - W/G/CW

**Electrode Boiler Humidifier**
The humidifier is the OEM size 1 'D' assembly for the Airedale range of air conditioning equipment. Fitted with a 4kg cylinder, it is mounted in the base of the unit.

**Electrical Connections**
All electrical connections are made between the vapac sub-assembly and the control system.

**Water Connections**
Supply - 15mm Brass Stub **(combines with**
Drain - 22mm Copper **main condensate.)**
Pressure range - 0.3 to 8 bar
Both supply and drain pipework must be installed to national and local standards. Always incorporate a stop-cock adjacent to the unit prior to the water inlet solenoid. The drain pipework would be jointed to the condensate drain from the drip tray but as humidifier waste is hot the first 2m should be non-ferrous metal tubing. This line should be at least 32mm and preferably 42mm dia. All drain pipework operating under gravity should be sloped away from the equipment and the gradient should be made as steep as possible. Suitable rodding positions should be incorporated particularly if the run is long.
In very hard water areas a water softener can be connected to prolong the life of the cylinders. Consult water treatment specialists on the size of water softeners required, or ask Airedale for further details.

**Humidifier Supply Connection**
The unit is fitted with a 15mm brass stub suitable for compression fitting or sweated connection.

**Condensate/Humidifier Drain Connection**
All drip trays have a 22mm condensate drain from the drip tray, into which tees (if fitted) drain from the humidifier.
If there is only condensate to run to waste, this can be carried out in standard plastic plumbing 32mm tube. It should be supported at regular intervals to avoid bowing and have a slope of at least 1 in 50. If the run is long and has a number of bends in it then the size of tube should be increased and suitable cleaning eyes be installed at the bends.
*Note: All drains should be trapped adjacent to the unit and be at least 75mm (3") in depth.*

**Control System**
All mains interconnecting and control wiring should be carried out to national and local standards. The location of the control section is on right-hand side of the unit.
If local isolators are required for the air handlers and condensing units (or condensers) these are available as an optional extra and may be fitted adjacent to the respective units.

**Mains Supply**
The mains cable can be brought into the unit adjacent to the control panel, although it is possibly easier to connect if brought adjacent to the termination point. Ensure when using SWA cable that allowance is made for a good radius on the cable to avoid strain on the incoming terminal block or isolator.
The mains cable should be capable of carrying the full load current without significant voltage drop and your Airedale Distributor will help you calculate the maximum running load if required.
If mains cables are being run over long distances the cable size will have to be increased to allow for voltage drop and a local reduction in cable size may have to be considered when terminating in the unit itself.
This particularly applies where aluminium supply cables are used as they normally have a greater cross-sectional area than copper equivalents.

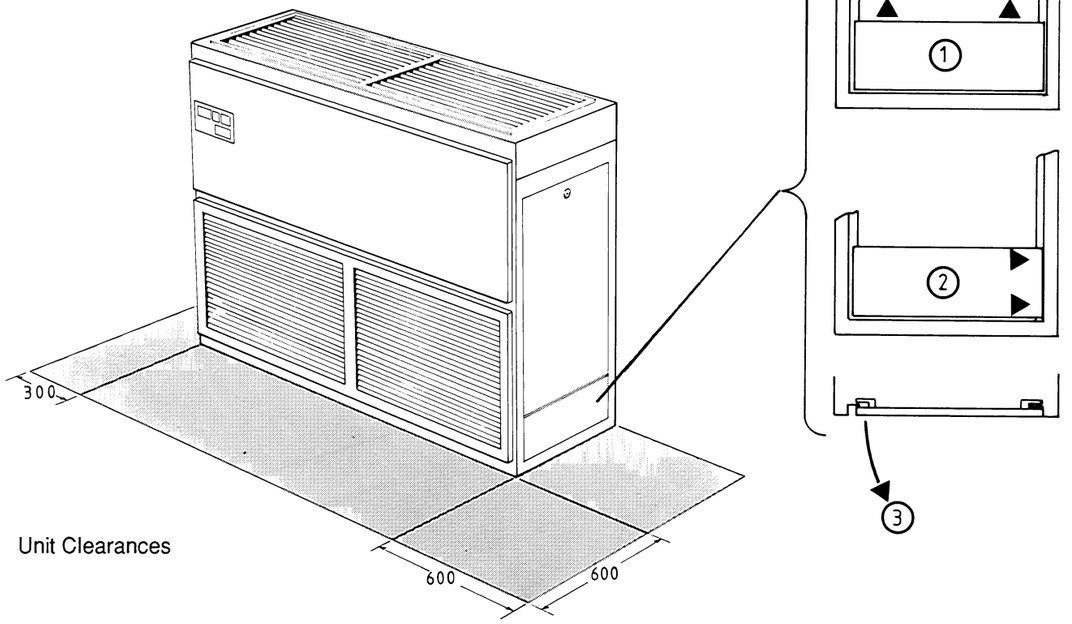
**Detector Wiring**
The temperature and humidity detectors are fitted and wired into the unit as standard by Airedale.





**Clearances**
Enough room must be allowed around the unit for access panels to be removed without hindrance and for the control panel door to be opened fully for maintenance purposes.

**Pipework Connections**
Pipes can be brought to the unit through the base because all connections are made within the unit. When running the pipe, care must be taken not to obstruct the airflow from the unit by running the pipes in front of the air discharge. Use rubber grommets where pipework is brought into the unit to avoid pipework wear or chaffing.
***Note:*** *These Connections are the factory termination sizes of refrigerant and water pipes. The correct sizes of pipework between the various modules should be selected using the appropriate pipe sizing charts giving due regard for fitting losses.*

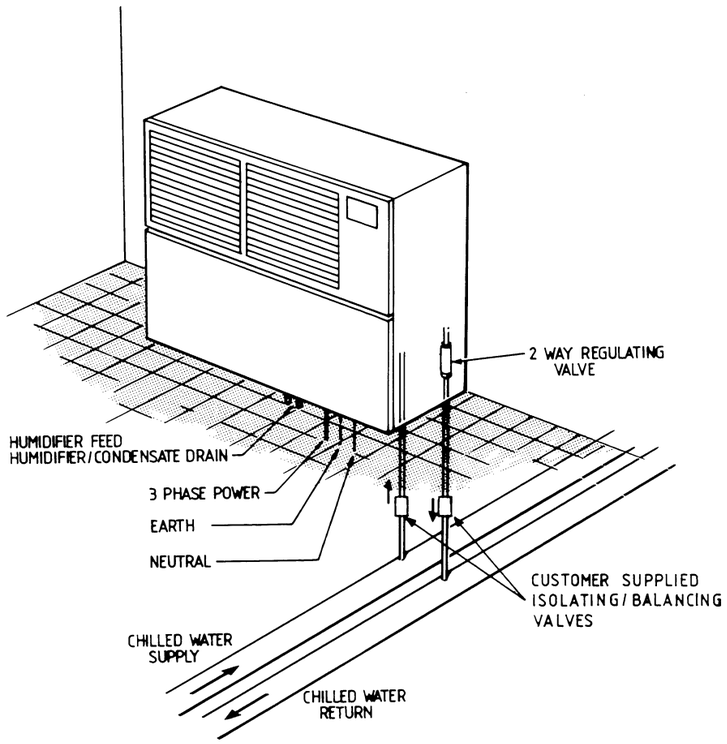


Unit Clearances

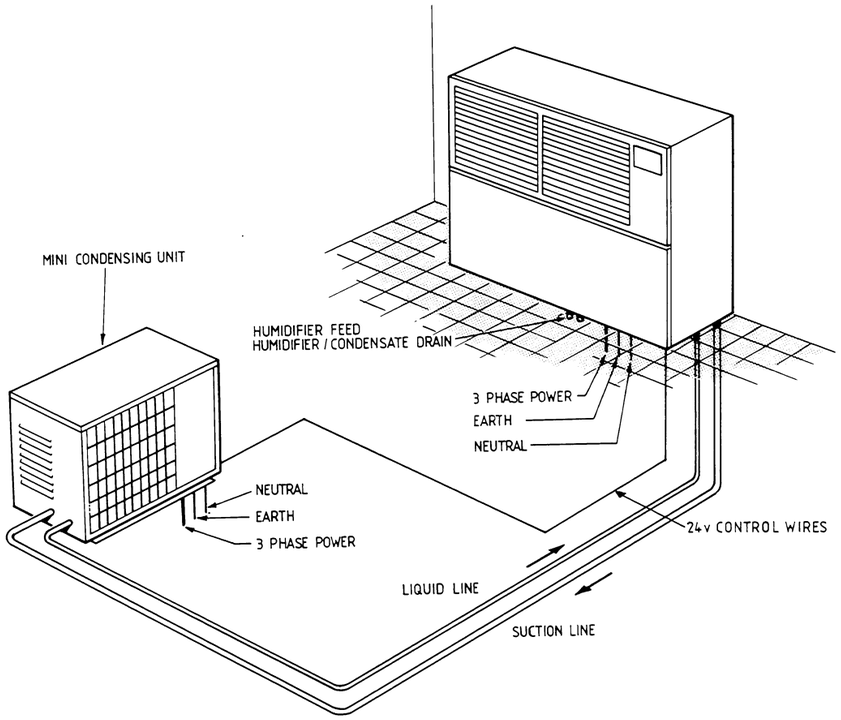
Upflow models have a split side access panel to allow side connections through a fixed lower section.
The lower section has concealed fixing brackets and can be removed in the following manner.
1. Pull the panel upwards approximately 20mm. The LH retaining clips should then align with the notches in the side of the cabinet.
2. Push the panel to the right until LH retaining clips clear the side of the cabinet.
3. Pull the panel at the LH side and it will swing outwards until the RH side retaining clips are clear of the cabinet.
4. Replacement is the reverse of the above procedure.

**Connections**

| UNIT SIZE | | 2 | 3 | 4 | 5 | 5D | 6 | 6D |
|---|---|---|---|---|---|---|---|---|
| Suction Line | (EMDFA range) | 7/8 | 7/8 | 7/8 | 7/8 | 7/8 | 7/8 | 7/8 |
| | (EMVA range | 7/8 | 7/8 | 7/8 | 7/8 | 7/8 | | |
| Liquid Line | | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 5/8 | 1/2 |
| Discharge Line | (EMDFX range) | 1/2 | 1/2 | 1/2 | 5/8 | - | 5/8 | - |
| | (EMVX range) | 1/2 | 1/2 | 1/2 | 5/8 | - | - | - |
| Chilled Water | (EMDFCW range) | 22mm | 28mm | 28mm | 28mm | - | 42mm | - |
| | (EMVCW range) | 22mm | 22mm | 28mm | 28mm | - | - | - |
| Humidifier Supply | | 15mm Brass Stub | | | | | | |
| Humidifier Drain | | ALL 22mm (Conex) COPPER PIPE COMPRESSION FITTING | | | | | | |



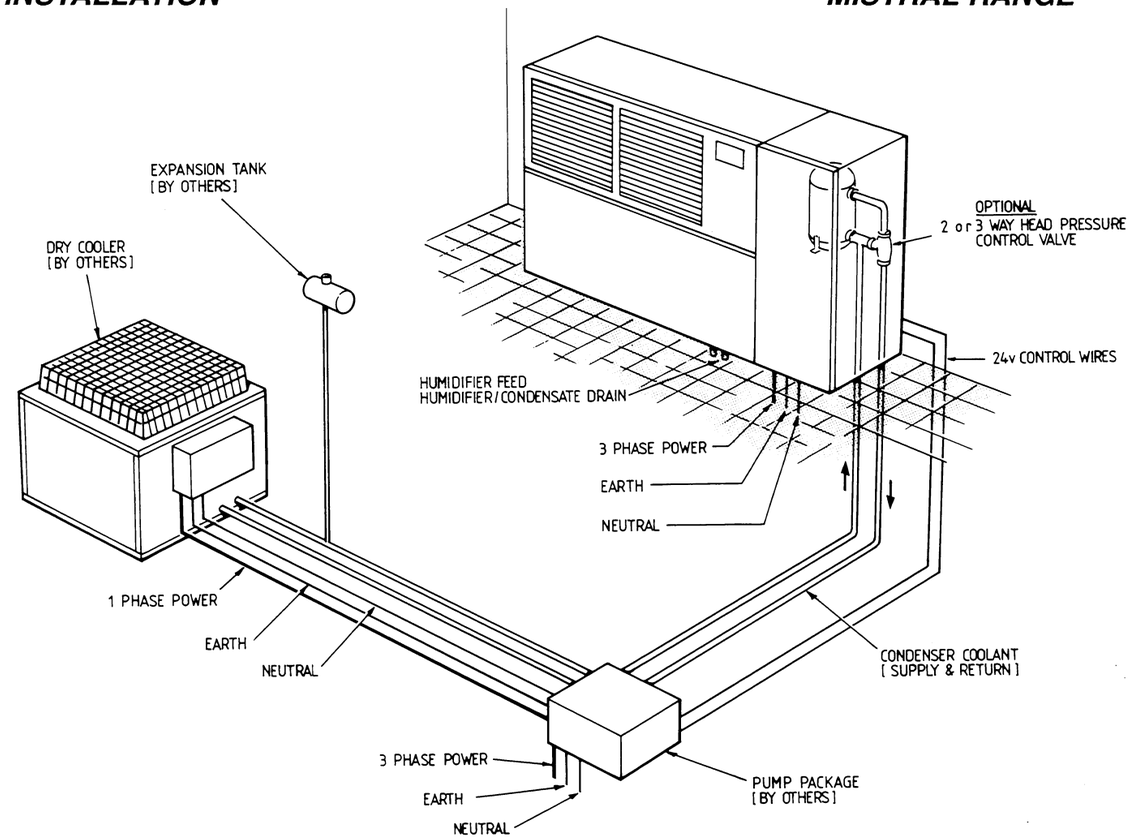

Schematic Interconnection Diagram - Chilled Water



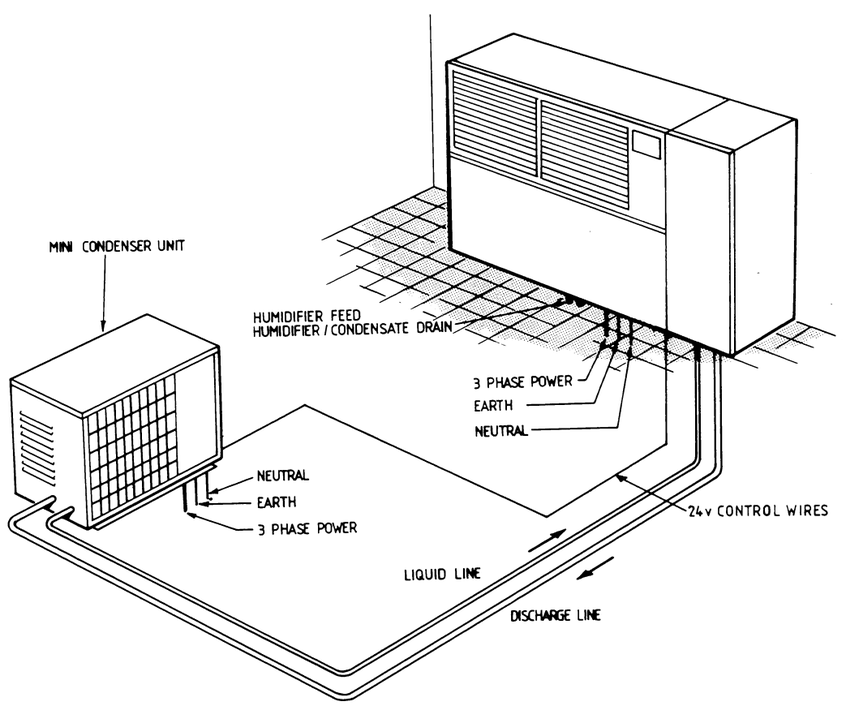

Schematic Interconnection Diagram - EMDFA/EMVA








Schematic Interconnection Diagram - EMDFW/EMVW




Schematic Interconnection Diagram - EMDFX/EMVX