



# BMS38BX1

## OPERATION, MAINTENANCE & OVERVIEW MANUAL

Heat-Cool Model with Drivers Unit

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## IMPORTANT INFORMATION



### Use R134a Refrigerant Only!

The A/C system is designed for use with R134a refrigerant. Do not use any other refrigerant. The use of any other refrigerant may result in damage to the A/C unit and/or compressor.



### Use Ester Oil Only!

The A/C system is designed for use with ester compressor oil. Do not use any other lubricating oil. The use of incorrect oil may result in damage to the A/C unit and/or compressor.



NOTE

### Handle Electronics With Care!

Do not attempt to remove, repair, or handle the climate control panel or any components in any way without referring to the correct procedures. The electrical control panel houses sensitive equipment that may be damaged if handled incorrectly.

Refer to the CCC007\* Climate Control System Manual for electronics service details.



### Temperature Probes

Each temperature probe in the unit is factory calibrated. Use Probes as they have been allocated.

DO NOT swap or mix the probes, as this may lead to unit damage and faulting.



### 24V DC ONLY

This unit is designed for a 24V DC electrical circuit ONLY. Do not under any circumstances use another voltage, as this may cause unit damage and faulting.



There is power to the motors all the time. Never attempt to do repairs on motors or motor wiring without manually breaking the correct circuit breaker first.



### Black Heat Sink

The black heat sink built onto the ESP109 PCB is at earth potential. DO NOT, under any circumstances, place an earth or a bridge circuit on the heat sink, as this will cause serious unit damage.



DO NOT use a test light. Use a suitable multimeter only!



DO NOT push the red reset button for more than 2 seconds, as this could provide unintentional access to the CCC007\* memory settings.

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## SECTION 1: - System Details

### 1.1 Introduction

This manual is a guide to the operation, maintenance and spare parts for the BMS38BX1 bus air conditioning system manufactured by Coachair as specifically developed for Bus & Coach International.

The BMS38BX1 air conditioning system consists of a high performance XT175 roof top A/C system for passenger comfort combined with a BMV5BX5 driver's A/C system for driver comfort and demisting the windscreen.

The BMS38BX1 air conditioning system is a 'split system' comprising of components that are designed to be integrated into the bus during its manufacture.

The BMS38BX1 system includes the following primary components (units):

- A roof mounted evaporator/condenser unit (XT175) providing A/C (cooling and heating) for the passenger area.
- One under dash type evaporator unit (BFW5BX5) and associated piping and harnesses (collectively referred to as BMV5BX5) providing A/C (cooling and heating) and demisting airflow;
- An off-engine mounted compressor.
- Two driver's dash panels each controlling either the roof unit or the Driver's system.
- Generic installation fittings.

The BMS38BX1 system has the following key features:

- Light-weight construction.
- Standard operating voltage of 24 V DC.
- Use of environmental friendly R134a refrigerant.
- Efficient use of engine heat for heating requirements.

#### 1.1.1 Hierarchy of Manuals

The BMS38BX1 A/C system units are drawn from the Coachair product family. Manuals already exist for the XT roof top unit and these have been retained as discrete documents to allow timely updates of information as products are refined and improved.

There are significant differences between the driver's unit described in the existing manual (SM348 - 2793 Dash A/C Unit – Installation, Operation & Maintenance Manual) and the BCI unit. As such the relevant information from that manual plus any additional information has been incorporated into this manual.

| <b>Manual</b>                           | <b>Description</b>                                                | <b>Purpose</b>                                                 |
|-----------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------|
| <b>BMS38BX1 Complete Bus A/C System</b> |                                                                   |                                                                |
| SM424 3381                              | BMS38BX1 Operation & Maintenance & Overview Manual                | Overview of A/C System and Special items                       |
| <b>XT175 Roof Top Unit</b>              |                                                                   |                                                                |
| SM417 3283                              | XT Bus & Coach A/C – Installation, Operation & Maintenance Manual | Installation, Operation & Maintenance Information              |
| SM425 3283                              | XT A/C Unit – Spare Parts Manual                                  | Spare Parts                                                    |
| SM423-3283                              | CCC007* Climate Control System Manual                             | Operation & Control                                            |
| <b>BMV5BX5 Drivers Unit</b>             |                                                                   |                                                                |
| SM424 3381                              | BMS38BX1 Operation & Maintenance & Overview Manual                | Installation, Operation, Maintenance & Spare Parts Information |
| <b>Other</b>                            |                                                                   |                                                                |
| 09704                                   | FKX50/775K Bock Compressor Manual                                 | Maintenance of Bock Compressor                                 |
| KK73.1                                  | Lang Clutch Operating Instructions                                | Maintenance of Lang Clutch                                     |

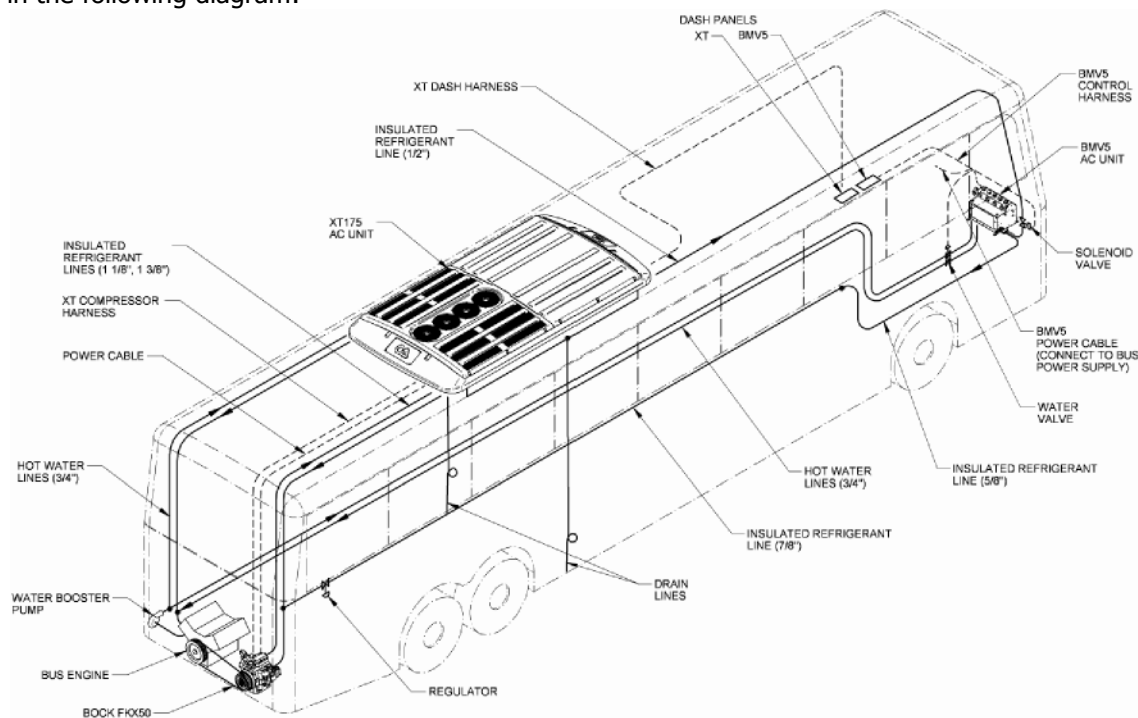
## 1.2 Specifications

The following specifications are correct for the A/C system at the time of printing.

|                                   |                                                                                                                                                                                                                                                      |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cooling Capacity (nominal)</b> | Combined: - 40 kW @ 35°C ambient, 27/19°C DB/WB Mixed Air<br>XT175: - 35 kW<br>BMV5BX5: - 5 kW                                                                                                                                                       |
| <b>Heating Capacity (nominal)</b> | Combined: - 42 kW<br>XT175: - 38 kW<br>BMV5BX5: - 4 kW                                                                                                                                                                                               |
| <b>Dimensions</b>                 | XT175 Unit: - 3810mm long x 1940mm wide x 235mm high<br>BFW5BX5 Unit: - 350mm high x 500mm wide x 350mm deep                                                                                                                                         |
| <b>Weight</b>                     | XT175 Unit: - 265 kg<br>BFW5BX5 Unit: - 14 kg<br>Compressor with Clutch: 54 kg                                                                                                                                                                       |
| <b>Refrigerant</b>                | R134a                                                                                                                                                                                                                                                |
| <b>Compressor</b>                 | Bock FKX50/775K reciprocating 6 cylinder design ~ 775 cc, engine driven.<br>Maximum speed 3,500 rpm                                                                                                                                                  |
| <b>Compressor Clutch</b>          | Lang KK73.1.23 2xSPB Ø 160mm OD electro-magnetic                                                                                                                                                                                                     |
| <b>Airflow</b>                    | XT175: - 1,444 l/s (5,200 m <sup>3</sup> /hr) at high speed (free blow)<br>BFW5BX5: - 200 l/s (720m <sup>3</sup> /hr) at high speed (free blow)                                                                                                      |
| <b>Operating Voltage</b>          | 24 V DC nom. Max. 30 V DC cont., 45 V DC momentary, 20 V DC Min.                                                                                                                                                                                     |
| <b>Current Draw</b>               | Combined: - 77A (max.)<br>XT175: - 62A (max.)<br>BFW5BX5: - 12A (max.)<br>Clutch: - 2.6A (max.)                                                                                                                                                      |
| <b>Condenser Unit</b>             | See SM417 manual.                                                                                                                                                                                                                                    |
| <b>Evaporator Unit</b>            | For XT see SM417 Manual. For Drivers Unit:<br>Coil: 1-off rifle copper tube with high efficiency aluminium fins<br>Motor: 1-off medium duty, long life, permanent magnet type, double shaft, steel ball bearings.<br>Fans: 2-off double inlet rotor. |
| <b>Expansion Valve</b>            | For XT see SM417 Manual. For Drivers Unit: Internally equalized block valve.                                                                                                                                                                         |
| <b>Drier Receiver</b>             | See SM417 manual.                                                                                                                                                                                                                                    |
| <b>Safety Features</b>            | High and low pressure cut-out safety switches<br>Electrical de-ice thermostat<br>Electrical protection fuses                                                                                                                                         |
| <b>Climate Controller</b>         | For XT see SM417 Manual. For Drivers Unit: Driver controlled modulating water valve.                                                                                                                                                                 |
| <b>Fresh air</b>                  | See SM417 manual.                                                                                                                                                                                                                                    |
| <b>Casing</b>                     | For XT see SM417 Manual. For Drivers Unit:<br>Primarily constructed of 2.0 mm aluminium ensuring resistance to corrosion and physical damage due to its robust design.                                                                               |
| <b>Corrosion Protection</b>       | For XT see SM417 Manual. For Drivers Unit:<br>The casing is chemically prepared for paint application to all internal and external surfaces.                                                                                                         |
| <b>Lubricant</b>                  | Ester Oil Type – Fuchs Reniso Triton SE 55 (Or Equivalent).                                                                                                                                                                                          |

## 1.3 System Layout

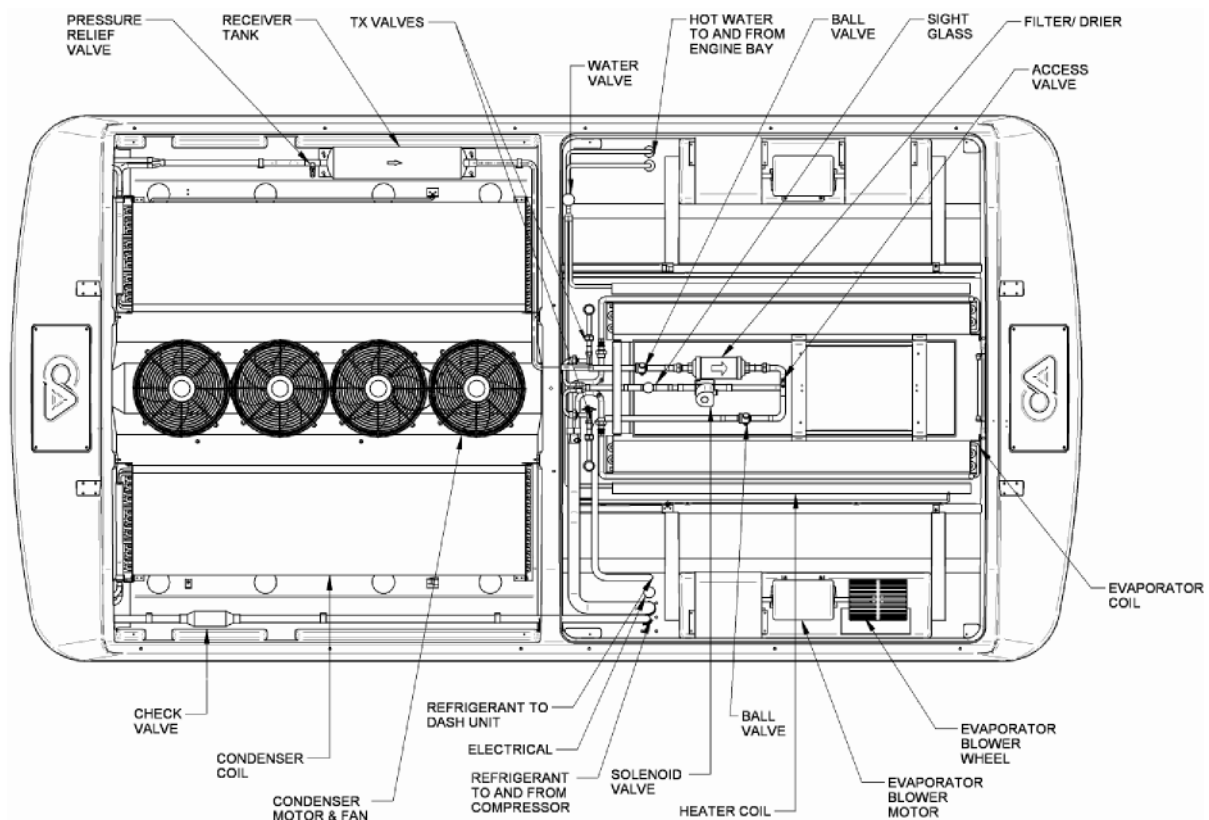
The typical configuration of the installed BMS38BX1 A/C system and its various components are shown in the following diagram:



Drawing No. T3381007 Issue A

### 1.3.1 XT175 Roof Top Unit

Drawing No. T3381002 Issue 00

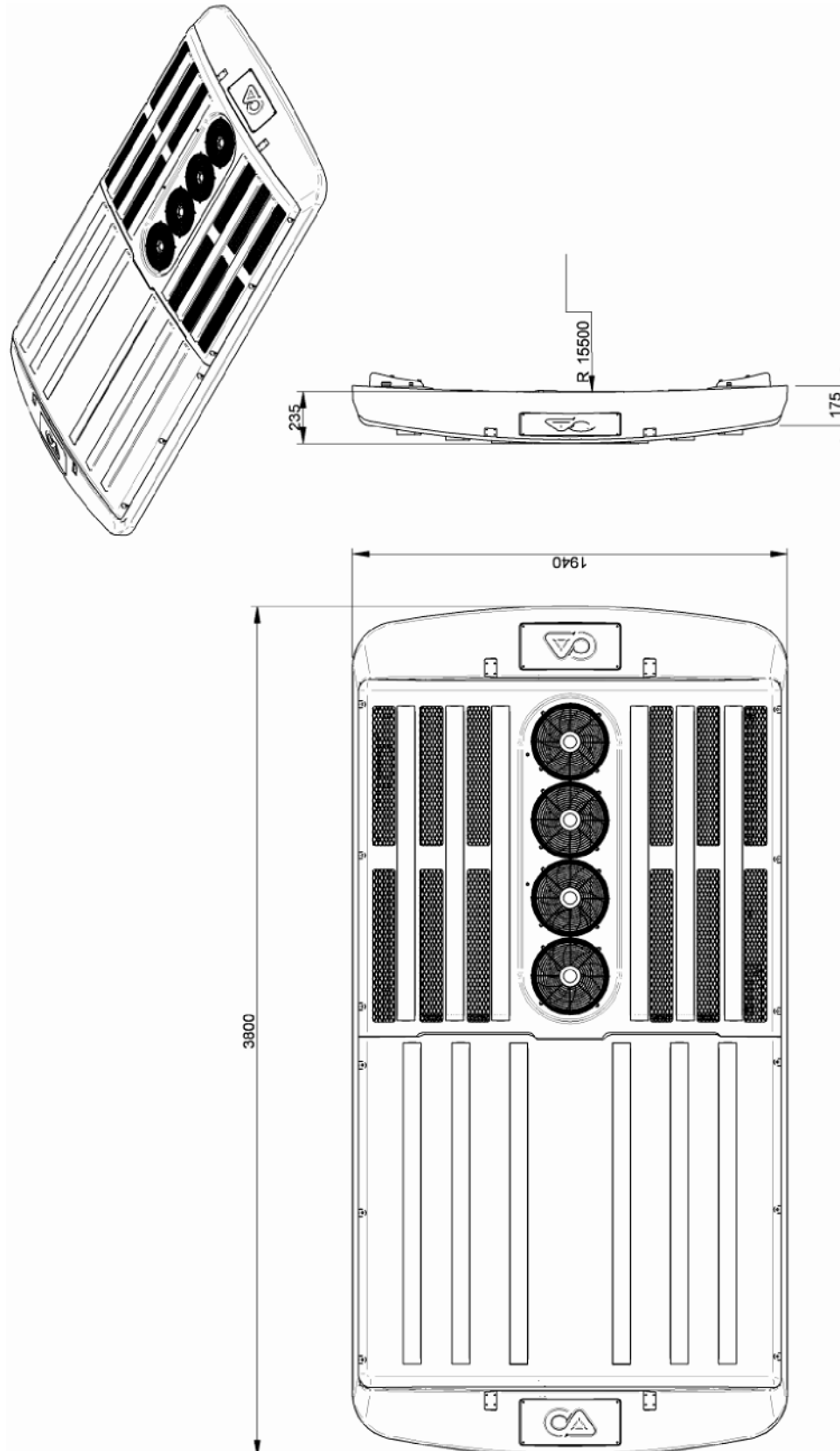




## 1.4 System Parameters

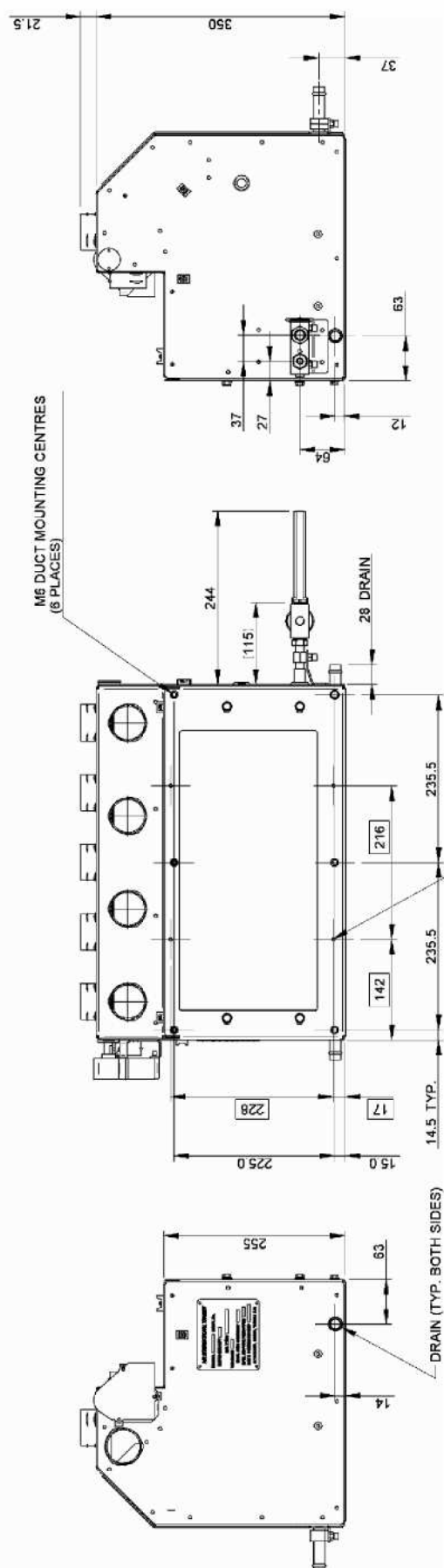
### 1.4.1 XT175 Roof Top Unit

Drawing No. T3381001 Issue 00



### 1.4.2 BFW5BX5 Evaporator Unit

Drawing No. T3381501 Issue 00

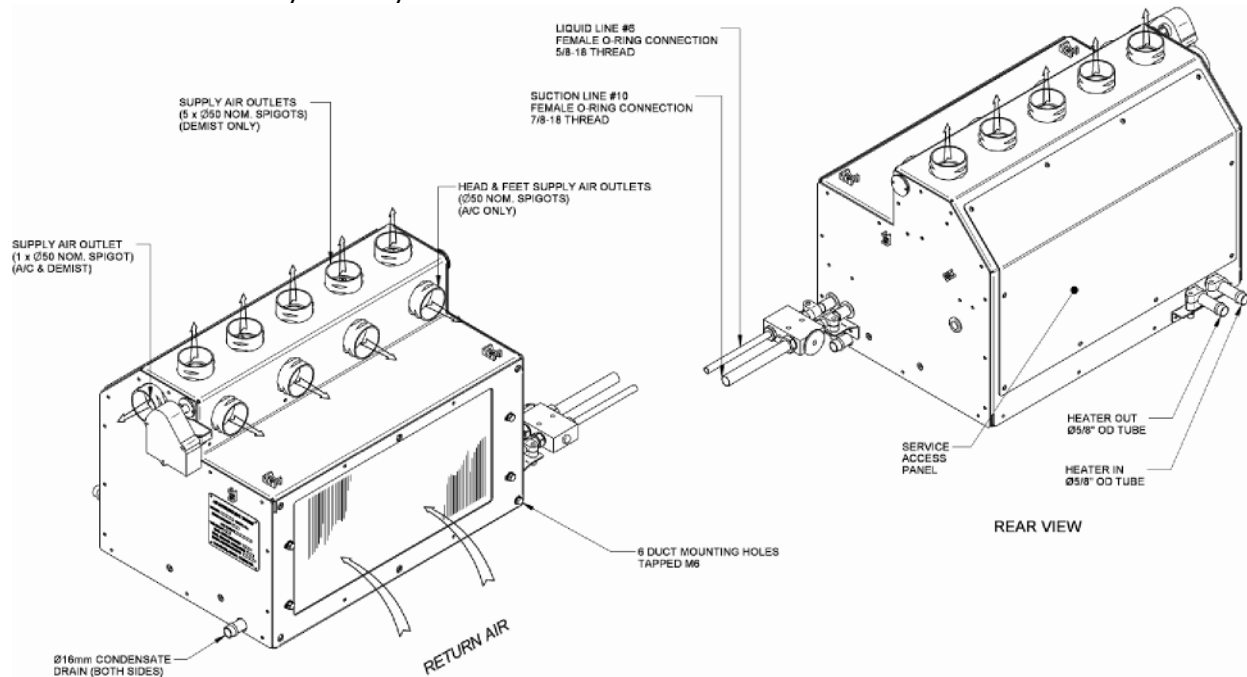


## 1.5 Air Flow

The XT175 roof top and Driver's unit are not connected on the air side. Refer to the SM417 manual for the XT Unit.

The Driver's unit utilises cooling and heating functions to deliver conditioned air to the driver and/or windscreen as determined by the control settings.

The unit is designed to be mounted under the dash in front of the bus driver. This positioning is shown in Section 1.3 - System Layout.



Drawing No. T3381502 Issue 00

- When operational the unit produces the following airflow:
- Return air from the bus cabin is drawn by the supply fan through the return air filter (Supplied by the Bus Body Builder) into the unit.
- The air is conditioned as it passes through the evaporator and heater coils inside the unit.

The evaporator coil cools and dehumidifies the air.

The heater coil heats the air.

The type and amount of air conditioning provided is controlled by the driver according to the water valve setting.

- The conditioned supply air is discharged from the unit through the A/C or DEMIST outlets by an electrically operated damper. This switches the main airflow between the driver outlets and the windscreen outlet.
- Five air outlets on the top of the unit are provided for supplying air to the windscreen during DEMIST mode.

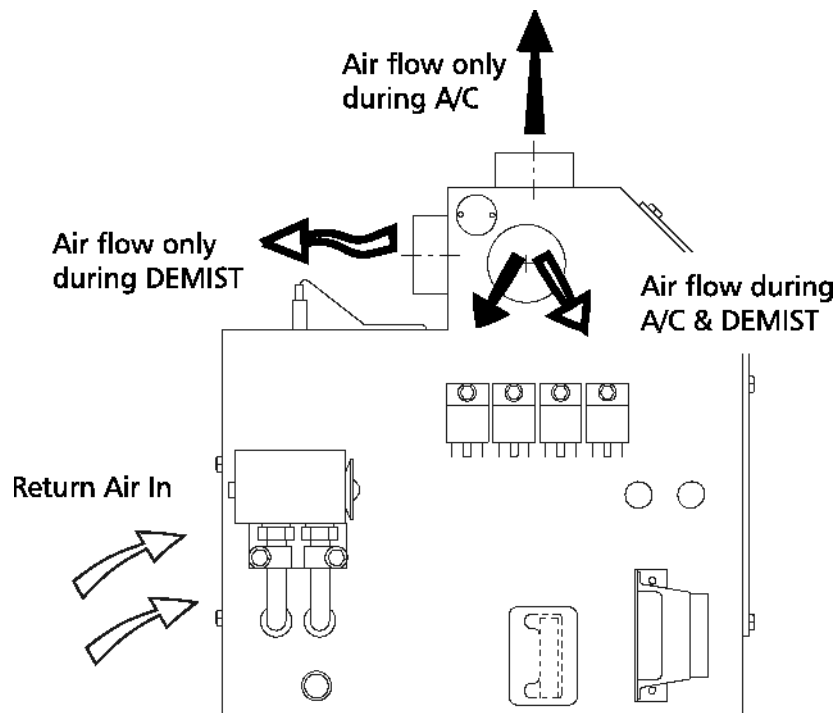
The airflow from these outlets is to be ducted by the bus body builder towards the windscreen.

- Four air openings are provided on the return air side of the unit for supplying air to the driver during A/C mode.

The airflow from this outlet is to be ducted by the bus body builder towards the driver face / body area.

- One foot outlet on the side of the unit supply air during A/C and DEMIST modes.

In A/C and DEMIST modes air exits from the two side outlets. The airflow from the two side outlets is not affected by the position of the shutter.



The airflow from these outlets is to be ducted by the bus body builder towards the driver's feet area (or may be blocked off as required).

## 1.6 Refrigeration System

The refrigeration system for the BCI system is based on the XT system described in the SM417 manual. There is a 1/2 liquid line take-off in the XT unit which supplies cooled refrigerant to the BFW5BX5 driver's evaporator Unit. The suction line from the driver's unit then returns, under the passenger floor, to the engine mounted compressor.

A solenoid valve is used to stop flow to the Driver's unit when cooling is not required. This solenoid valve is operated as a de facto compressor clutch for the driver's unit.

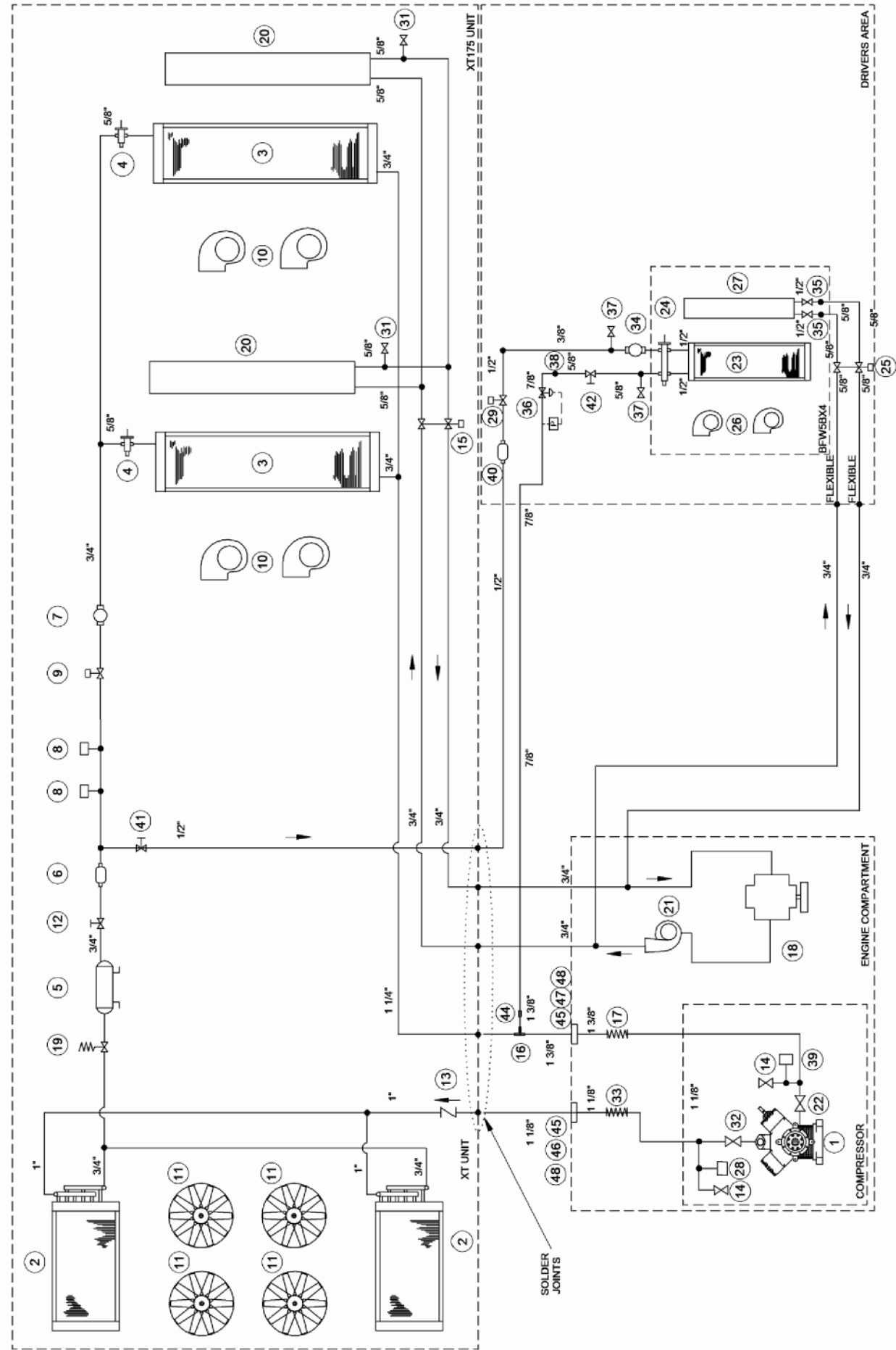
### 1.6.1 Refrigeration Piping and Connections

Drawing No. T3381005 Issue A

#### Component List

|      |            |                                   |     |      |               |                                  |     |
|------|------------|-----------------------------------|-----|------|---------------|----------------------------------|-----|
| 26   | BMV UNIT   | SUPPLY AIR BLOWER                 | 1   |      |               |                                  |     |
| 25   | BMV UNIT   | WATER MODULATING VALVE (5/8")     | 1   | 51   |               |                                  |     |
| 24   | BMV UNIT   | TX VALVE (1/2")                   | 1   | 50   |               |                                  |     |
| 23   | BMV UNIT   | EVAPORATOR COIL                   | 1   | 49   |               |                                  |     |
| 22   | COMPRESSOR | SUCTION SERVICE VALVE (1 3/8")    | 1   | 48   | MRG404        | GASKET                           | 2   |
| 21   | RAB181     | HOT WATER BOOSTER PUMP            | 1   | 47   | MRS4048       | SPIGOT MALE (1 1/8")             | 1   |
| 20   | XT UNIT    | HEATER COIL                       | 2   | 46   | MRS40411      | SPIGOT MALE (1 3/8")             | 1   |
| 19   | XT UNIT    | PRESSURE RELIEF VALVE             | 1   | 45   | MRF404        | SINGLE FLANGE                    | 2   |
| 18   | BUS        | ENGINE                            | 1   | 44   | 512583        | UNION 1 3/8" TO 7/8" SL          | 1   |
| 17   | RSK2031    | 1 3/8" FLEXIBLE HOSE              | 1   | 43   | MRF4200       | DOUBLE FLANGE                    | 1   |
| 16   | 515620     | TEE 1 3/8" SL CU                  | 6   | 42   | 517716        | ISOLATION BALL VALVE (5/8")      | 1   |
| 15   | XT UNIT    | WATER MODULATING VALVE (3/4")     | 1   | 41   | XT UNIT       | ISOLATION BALL VALVE (1/2")      | 1   |
| 14   | COMPRESSOR | SERVICE VALVES (SCHRAEDER)(1/4")  | 2   | 40   | 531354        | DANFOSS FILTER/ DRIER (1/2")     | 1   |
| 13   | XT UNIT    | CHECK VALVE (1 3/8")              | 1   | 39   | ERS040        | PRESSURE SWITCH (LOW)            | 1   |
| 12   | XT UNIT    | BALL VALVE (3/4")                 | 1   | 38   | 51270         | UNION 7/8" TO 5/8" SL            | 2   |
| 11   | XT UNIT    | CONDENSER FAN                     | 4   | 37   | RRV117        | SERVICE VALVES (1/4")            | 2   |
| 10   | XT UNIT    | SUPPLY AIR BLOWER                 | 2   | 36   | 525010        | REGULATOR (7/8")                 | 1   |
| 9    | XT UNIT    | SOLENOID VALVE (3/4")             | 1   | 35   | 517713        | ISOLATION BALL VALVE (1/2")      | 2   |
| 8    | XT UNIT    | PRESSURE SWITCH                   | 2   | 34   | 533102        | LIQUID/ MOISTURE INDICATOR(3/8") | 1   |
| 7    | XT UNIT    | LIQUID/ MOISTURE INDICATOR (3/4") | 1   | 33   | RSK2032       | 1 1/8" FLEXIBLE HOSE             | 1   |
| 6    | XT UNIT    | FILTER/DRIER (3/4")               | 1   | 32   | COMPRESSOR    | DISCHARGE SERVICE VALVE (1 3/8") | 1   |
| 5    | XT UNIT    | LIQUID RECEIVER (3/4")            | 1   | 31   | XT UNIT       | WATER BLEED VALVE                | 2   |
| 4    | XT UNIT    | TX VALVE (5/8")                   | 2   | 30   |               |                                  |     |
| 3    | XT UNIT    | EVAPORATOR COIL                   | 2   | 29   | 552042/668140 | SOLENOID VALVE (1/2")            | 1   |
| 2    | XT UNIT    | CONDENSER COIL                    | 2   | 28   | ERS038        | PRESSURE SWITCH (HIGH)           | 1   |
| 1    | 295200     | COMPRESSOR BOCK FKX50/775K        | 1   | 27   | BMV UNIT      | HEATER COIL                      | 1   |
| ITEM | PART No.   | DESCRIPTION                       | QTY | ITEM | PART No.      | DESCRIPTION                      | QTY |

## Piping Layout



## 1.6.2 Major Components

| <b>COMPONENT</b>                    | <b>DETAILS AND FUNCTION</b>                                                                                                                                                                                                                                      |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Compressor</b>                   | Compresses low pressure, low temperature refrigerant vapour to a high pressure, high temperature gas.                                                                                                                                                            |
| <b>Condenser Coils</b>              | Transfer heat from the refrigerant into the ambient air, causing the high pressure, high temperature gas to condense into a high-pressure liquid.                                                                                                                |
| <b>Condenser Fans</b>               | Draw air in the side grilles through the condenser coils and force it out through the other side grilles.                                                                                                                                                        |
| <b>Pressure Relief Valve</b>        | In case of high pressure the valve opens at 2,900 kPa to vent excess pressure to atmosphere.<br>The valve reseats at when the system pressure then reduces to 2,700 kPa.                                                                                         |
| <b>Receiver Tank</b>                | Stores and separates high pressure liquid from the gas/liquid mixture incoming from the condenser coils, to ensure that only liquid refrigerant passes on to the TX valve.                                                                                       |
| <b>Ball Valve</b>                   | Together with the solenoid valve, enables the Filter/Drier to be isolated from the system for removal & replacement without loss of refrigerant from the system.                                                                                                 |
| <b>Solenoid Valve</b>               | Eliminates liquid refrigerant migration from the low-pressure side of the system to compressor sump during off cycle, protecting the compressor against damaging liquid slugging.<br>The solenoid valve is in a closed position when the A/C system is off.      |
| <b>Filter/Drier</b>                 | Filters and removes moisture and foreign particles from the refrigerant.<br>The valves either side of the Filter/Drier enable easy replacement with reduced gas loss.                                                                                            |
| <b>Sight Glass</b>                  | Indicates the refrigerant level and moisture content in the system.<br>The positioning of the sight glass allows for easy viewing from inside the bus saloon area through the Return Air Plenum.                                                                 |
| <b>Thermal Expansion (TX) Valve</b> | Regulates the refrigerant flow into the evaporator coil by expanding the liquid from a high pressure, high temperature liquid to a low temperature, low pressure liquid.                                                                                         |
| <b>Evaporator Coils</b>             | Transfers heat from the air to the refrigerant, causing the low pressure, low temperature liquid to evaporate in the evaporator into a low-pressure vapour.<br>As air passes through the coil it is cooled and dehumidified.                                     |
| <b>Evaporator Blowers</b>           | Draws air into the unit through the return air & fresh air openings; through the evaporator coils – and directing it into the supply air openings.                                                                                                               |
| <b>Check Valve</b>                  | Prevents return of liquid refrigerant from the condenser to the compressor when the A/C system is inoperative.                                                                                                                                                   |
| <b>Pressure Regulator</b>           | Ensures not too much refrigerant cycles through the Driver's units.                                                                                                                                                                                              |
| <b>Unit Connections</b>             | Suction and discharge refrigeration pipelines are connected to the unit by leak-proof flanges. The connections are made at the unit base inside the vehicle on the nearside or off-side air supply roof opening, or at the back of the unit outside the vehicle. |
| <b>Compressor Connections</b>       | Piping is connected to the compressor via hoses with flange connections.                                                                                                                                                                                         |

### 1.6.3 Safety Devices

#### High and Low Pressure Switches

The compressor high and low-pressure switches on the compressor feed signals to the Coachair Climate Controller. If the refrigeration system pressures become abnormally high or low the climate controller will cut out the clutch.

##### LP Switch

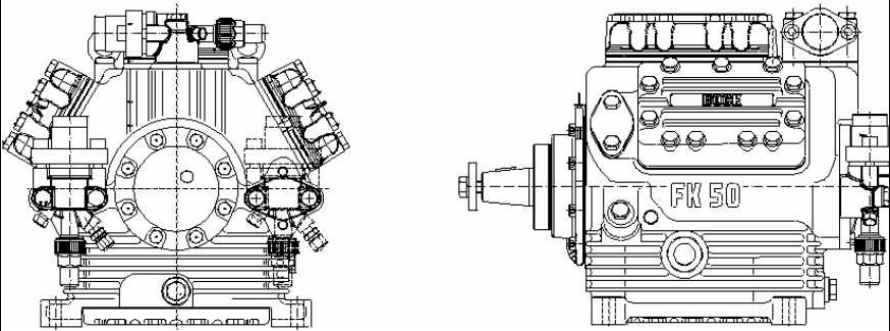
Cut-out: 40 kPa  
Cut-in: 175 kPa

##### HP Switch

Cut-out: 2,070 kPa  
Cut-in: 1,380 kPa

### 1.6.4 Compressor

The Bock FKX50/775K compressor is recommended to be used with the A/C system. Further details can be found in the compressor manual and at [www.rock.de](http://www.rock.de).

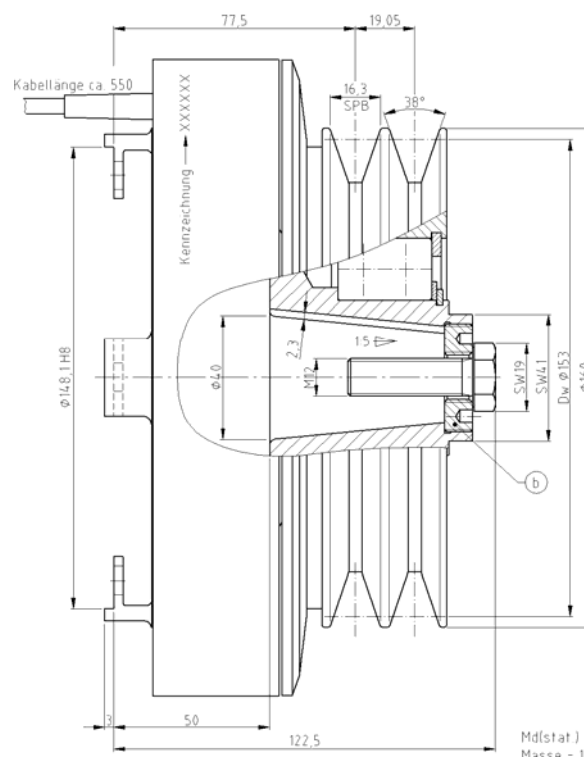
|                                                                                     |                         |
|-------------------------------------------------------------------------------------|-------------------------|
|  |                         |
| <b>Compressor</b>                                                                   | <b>Bock FKX50K/775K</b> |
| <b>Displacement per rev (cc)</b>                                                    | 775                     |
| <b>Speed Range (rpm)</b>                                                            | 500 – 3,500             |
| <b>Cylinders</b>                                                                    | 6                       |
| <b>Weight (kg)</b>                                                                  | 42                      |
| <b>Oil Charge (litres)</b>                                                          | 2.6                     |
| <b>Capacity Control</b>                                                             | 100% / 67% / 33%        |



### **1.6.5 Clutch**

The Lang KK73.1.23 160mm diameter electromagnetic clutch is recommended to be used with the A/C system. Further details can be found in the compressor manual and at [www.ealng.com](http://www.ealng.com).

The cross section of a typical clutch is illustrated below.



## 1.7 Heating System

The XT175 roof top and Driver's units heating systems can operate independently. Refer to the SM417 manual for how a typical heating system works.

The booster pump is controlled by the XT75 climate control system but is typically not required for the Driver's unit when it is operating alone.

## 1.8 Electrical System

Refer to the SM417 manual for the XT Unit.

The XT175 roof top and Drivers Unit are not connected electrically. The Driver's Unit requires the XT175 Unit to be in cooling mode (with the compressor clutch engaged) for then to provide cooling.

All system operations are controlled by the dash panel and the relays on the evaporator unit (Refer to diagram in the Section 2.8 – Electrical Installation).

The evaporator coil thermostat allows the system to disengage the electro-magnetic compressor clutch should the temperature drop too low. This is intended to prevent ice from forming on the coil.

Once the coil temperature rises clutch operation is re-enabled.

### **1.8.1 Power Supply**

**UNIT VOLTAGE IS 24 V DC.**

The power supply line is the red cable in the 6 pin plug from the evaporator unit to the bus battery. Coachair recommends that a 25A slow blow fuse is installed on the power supply line as close as possible to the battery pack. (See Section 2.8.4 – Connect A/C System to the Bus).

## 1.8.2 Ground Connection

The ground line is a black cable in the 6 pin plug from the evaporator unit to the bus frame/chassis. (See Section 2.8.4 – Connect A/C System to the Bus).



### Use a Multi-Meter Only!

DO NOT make a bridge connection between any terminals or use a test light. This may cause serious electrical damage to the unit and/or injury. Use a multi-meter only!

## 1.8.3 Temperature Probes

### Evaporator (De-Ice) Probe

The evaporator thermostat has a probe which is inserted into the fins of evaporator coils to measure the actual coil temperature. The de-ice probe are housed in stainless steel shafts to provide adequate strength & protection – as well as optimum contact with the coil fins.

## 1.8.4 De-Ice Control

Should the evaporator coil temperature drop too low ice may begin to form on the coils blocking airflow and compromising A/C unit operation. To prevent this situation, the thermostat reduces cooling by cutting power to the clutch (and unloaders if available) when the coil temperature drops too low.

## 1.8.5 Driver's Dash Control Panel

The driver manually controls the A/C system with the driver dash panel. The Dash Panel is connected to the relay harness on the evaporator unit and features controls for:

- Selecting the operating mode of the A/C system between OFF, DEMIST, and A/C
- Adjusting the blower fan speed
- Setting the desired amount of reheating of the conditioned air

## 1.8.6 (Refer to 3.1.1 De-Ice Operation (Driver's Unit))

A thermostat probe is located in the fins of the evaporator coil. The coil temperature is monitored by the thermostat to detect low temperatures and prevent icing of the coils.

To check the de-ice operation run the A/C system. Open the evaporator access cover or stop the evaporator blowers by removing their relays from the circuit. This will cause the evaporator coil temperature to drop quickly and activate the safety cut out.

- As the coil/de-ice probe temperature drops the solenoid valve should close at -3°C.
- As the coil/de-ice probe temperature rises the solenoid valve should open at +1°C.
- If necessary adjust the thermostat so that the valve operates at the required temperature.

Operating the A/C Unit)

## 1.8.7 Harness Arrangement

Refer to Section 2.8.2 - BMV5BX5 Harness Arrangement Detail.

## 1.8.8 Wiring Diagram

Refer to Section 2.8.3 - BMV5BX5 Wiring Diagram.

## SECTION 2: - Installation

---

Refer to the SM417 manual for the XT Unit.

### 2.1 Installation Checklist

- Check off all items.
- Inspect the evaporator units and loose items.
- Check for correct preparation of mounting locations.
- Check the ducting and distribution vent system.
- Install the evaporator and loose items.
- Install the return air grille.
- Install the condensate drains.
- Install refrigeration piping.
- Connect the piping to the evaporator and piping panels.
- Connect the piping to the XT system.
- Install heating system components.
- Install driver dash panel.
- Install electrical harnesses.
- Pressure test of the system.
- Evacuate the system.
- Charge the system with refrigerant.
- Finalise heating system installation.
- Check safety devices.
- Complete post-installation checklist.

### 2.2 Unit Inspection

Before beginning the installation, perform a visual inspection of the units. Check to make sure no damage has occurred during shipping:

- No external damage to the casing.
- No damage to coil fins or other external components.
- 5 - 10 mm clearance between the condenser fan blade and top grille.

**REPORT ANY VISIBLE DAMAGE!**



#### **Do Not Remove Sealing Caps!**

Do not remove the refrigeration sealing caps before installing the unit. The sealing flange is to be removed **immediately before** connecting the body piping.

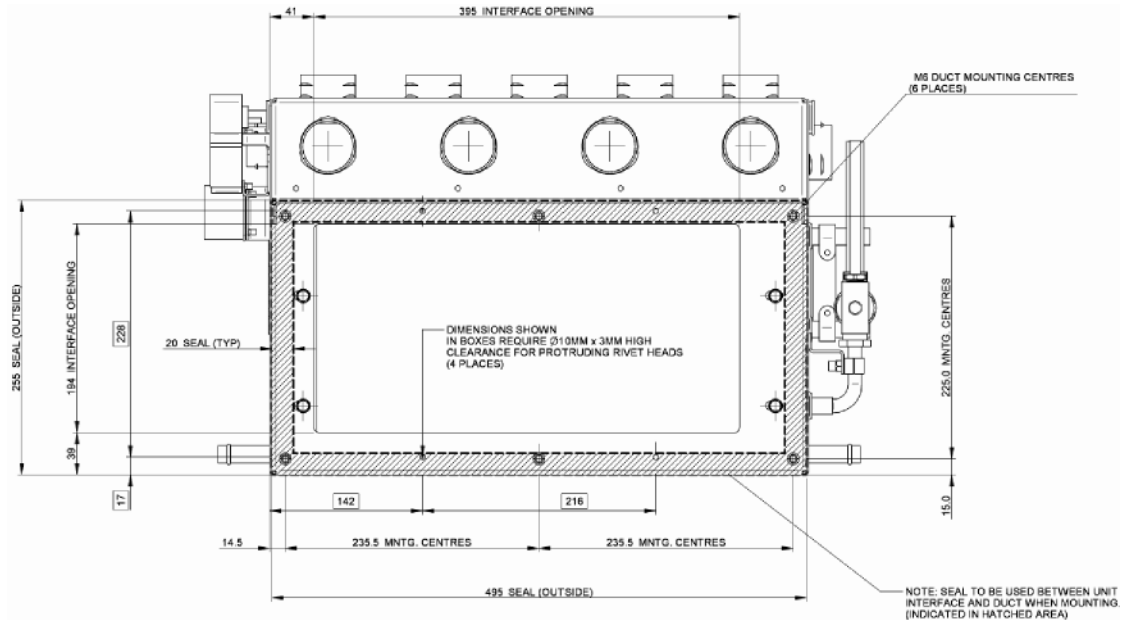
As supplied, the unit is sealed and pressurised to 350-400 kPa.

## 2.3 Ducting & Vent Distribution System

An appropriately designed bus air ducting and distribution system is essential for efficient and trouble-free operation of the A/C system. Use the guidelines given in SM417.

### 2.3.1 Return Air Interface

Six bolts are used to secure the return air duct to the Unit. The interface is shown below.



Drawing No. T2793004 Issue 00

### 2.3.2 Vent Arrangement

***2.3.3 Sufficient non-closing type relief vents should be provided for constant air distribution to the windscreen, head and feet regions (Refer to Section 1.4.2 - BFW5BX5 Evaporator Unit)***

Drawing No. T3381501 Issue 00





### ***2.3.4 Seal the Air Openings***

Seal the return air and supply air openings against water and air leakages, using a good quality non-drying type sealant. This seal ensures there is no air leakage or foreign matter (water, dust) can enter into the bus from this area.

### ***2.3.5 Return Air Grille***

Install the return air grille in the return air opening.

If the return air grille (and filter) assembly is to be provided by the body builder or installer, the following recommendations should be followed:

- The grille should be of a hinged or removable type so as to provide easy access into the unit evaporator section.
- The return air filter restriction should be less than 30 Pa @ 1.5 m/s air velocity.



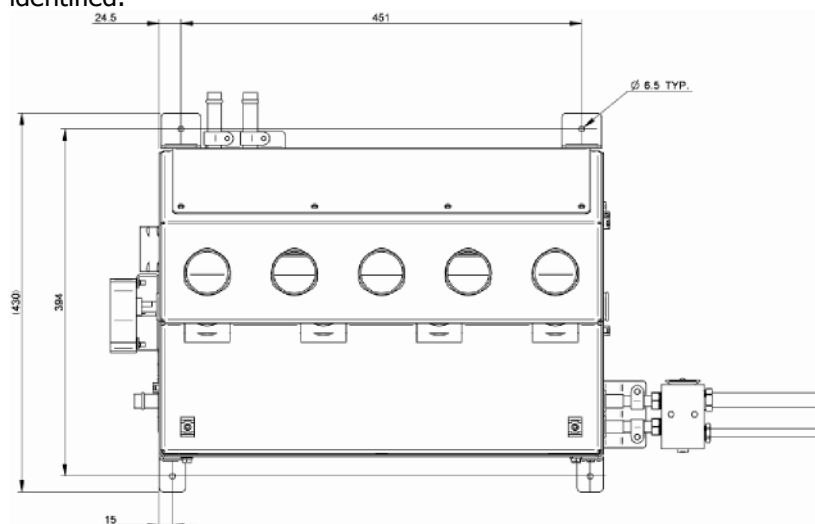
## 2.4 Unit Mounting

Refer to the SM417 manual for the XT Unit.

The driver's unit is secured to the bus via 4 brackets (2 at the front and 2 at the rear).

Sufficient clearance is required at the back of the unit to allow the access cover to be removed for access to the de-ice thermostat and evaporator motor.

Typically the unit must be removed from the return air side so the bulkhead it is attached to must also be removable or an alternate method of removal, say by taking the bonnet off the bus, must be identified.



Drawing No. T3381507 Issue 00

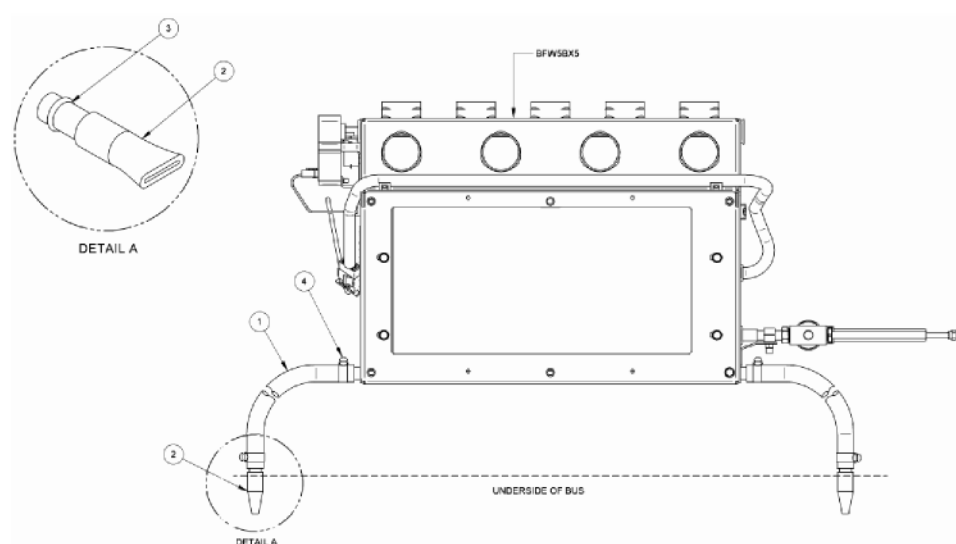
## 2.5 Condensate Drains

Refer to the SM417 manual for the XT Unit.

Included with the driver's unit are:

- 16mm PVC pipe
- 2x aluminium tubes
- 2x Drain nozzles
- 4 hose clips

The standard configuration of drain hoses is shown below.



Drawing No. T3381508 Issue 00

When installing drain hoses; the following notes must be adhered to:

- Route drain hoses to the bottom of the bus but to an area protected from road dirt and mechanical damage.
- Do not route the flow line uphill.
- Use correct size hose clamps and tighten securely.
- Make sure that there are no kinks or restrictions in the hoses at any point.
- Install drain nozzles to prevent air drawing up the drain hoses.

## 2.6 Refrigeration Piping

The diagram in Section 1.6.1 – Refrigeration Piping and Connections shows the refrigeration piping circuit. Refer to SM417 manual for typical detail on installing and connecting refrigeration piping.

### 2.6.1 Refrigeration Piping Considerations

For installation of the refrigeration piping Coachair recommends the following:

Only use the recommended pipe sizes:

|                   |                                                  |
|-------------------|--------------------------------------------------|
| SUCTION PIPING:   | 1 3/8" OD copper (XT175 unit)                    |
|                   | 7/8" OD copper [5/8" in vertical rise] (BFW5BX5) |
| DISCHARGE PIPING: | 1 1/8" OD copper                                 |
| LIQUID LINE:      | 1/2" OD copper (BMV5BX5 unit)                    |

### 2.6.2 Suction & Discharge Piping Panels

The driver's unit has two piping panels supplied loose. These contain the components required for the suction and discharge lines for the driver's unit. The water modulating valve is also included on the suction panel. These panels should be installed and connected as per the refrigeration diagram.



Drawing No. T3381501 Issue 00



Drawing No. T3381502 Issue 00

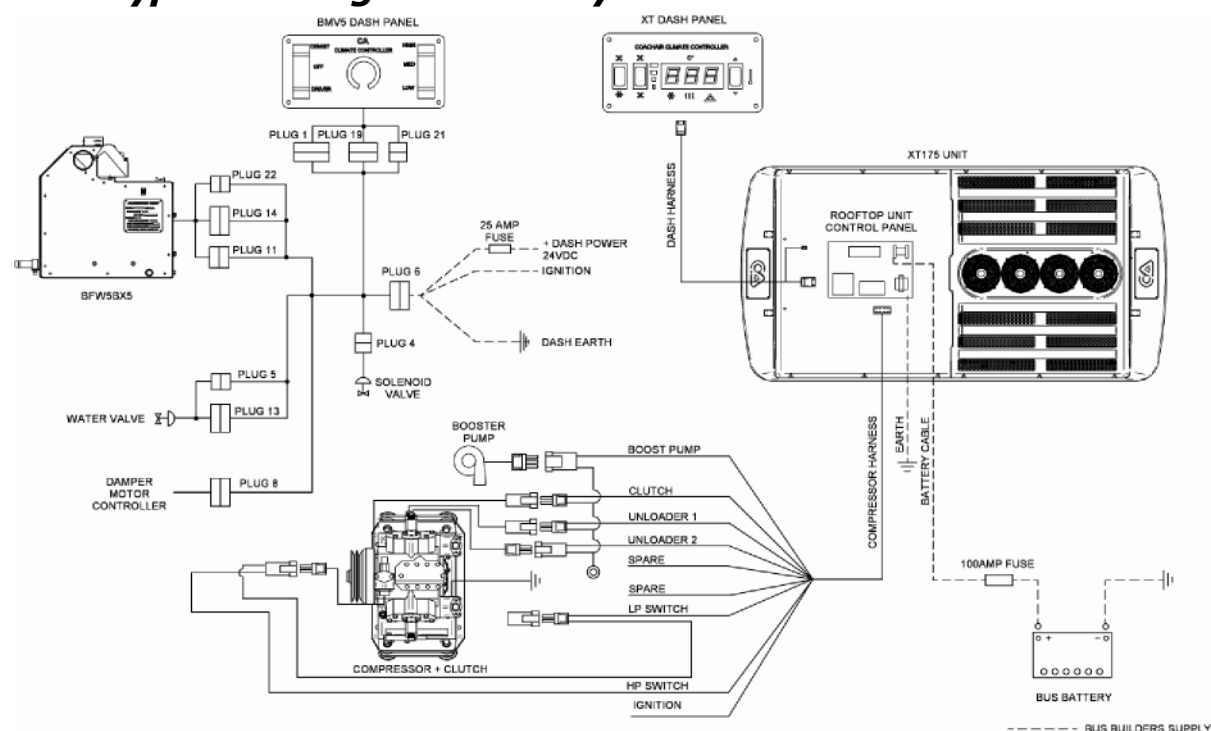
## 2.7 Heating System Components

Refer to SM417 manual for typical water piping details. The XT175 and BMV5BX5 unit should use 3/4" water pipe. The booster pump should be installed between the motor and the take off to both units. See the diagram in Section 1.6.1 – Refrigeration Piping and Connections

## 2.8 Electrical Installation

Refer to the SM417 manual for the XT Unit.

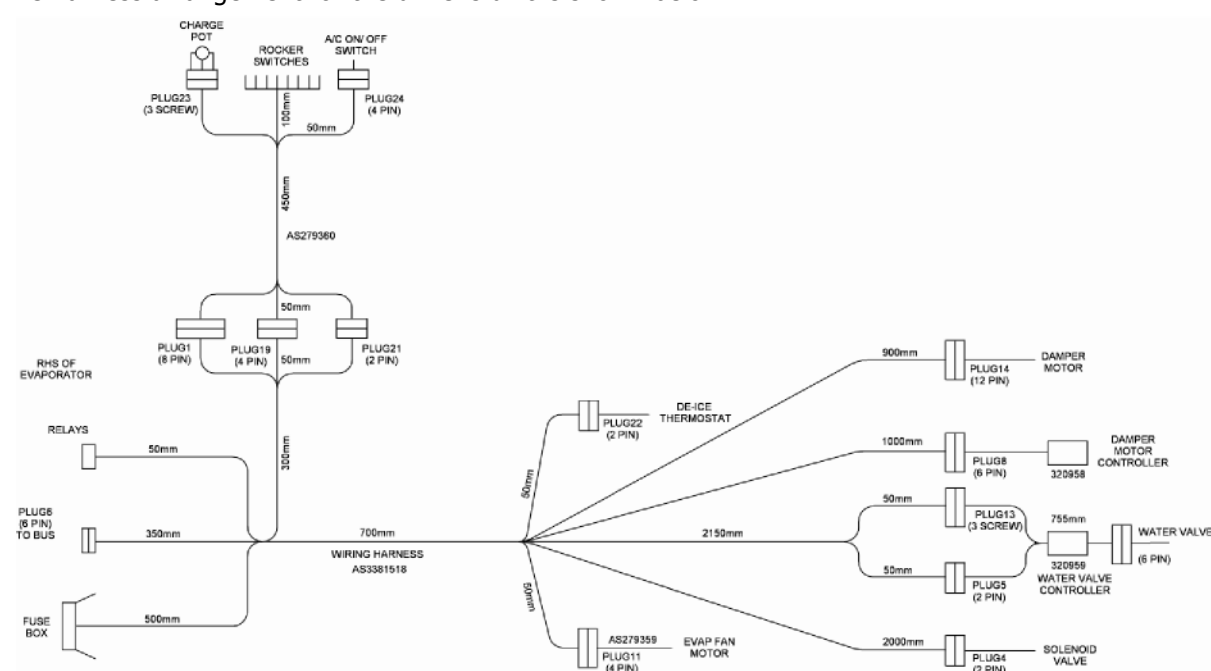
### 2.8.1 Typical Wiring Harness Layout BMS38BX1



Drawing No. T3381008 Issue A

### 2.8.2 BMV5BX5 Harness Arrangement Detail

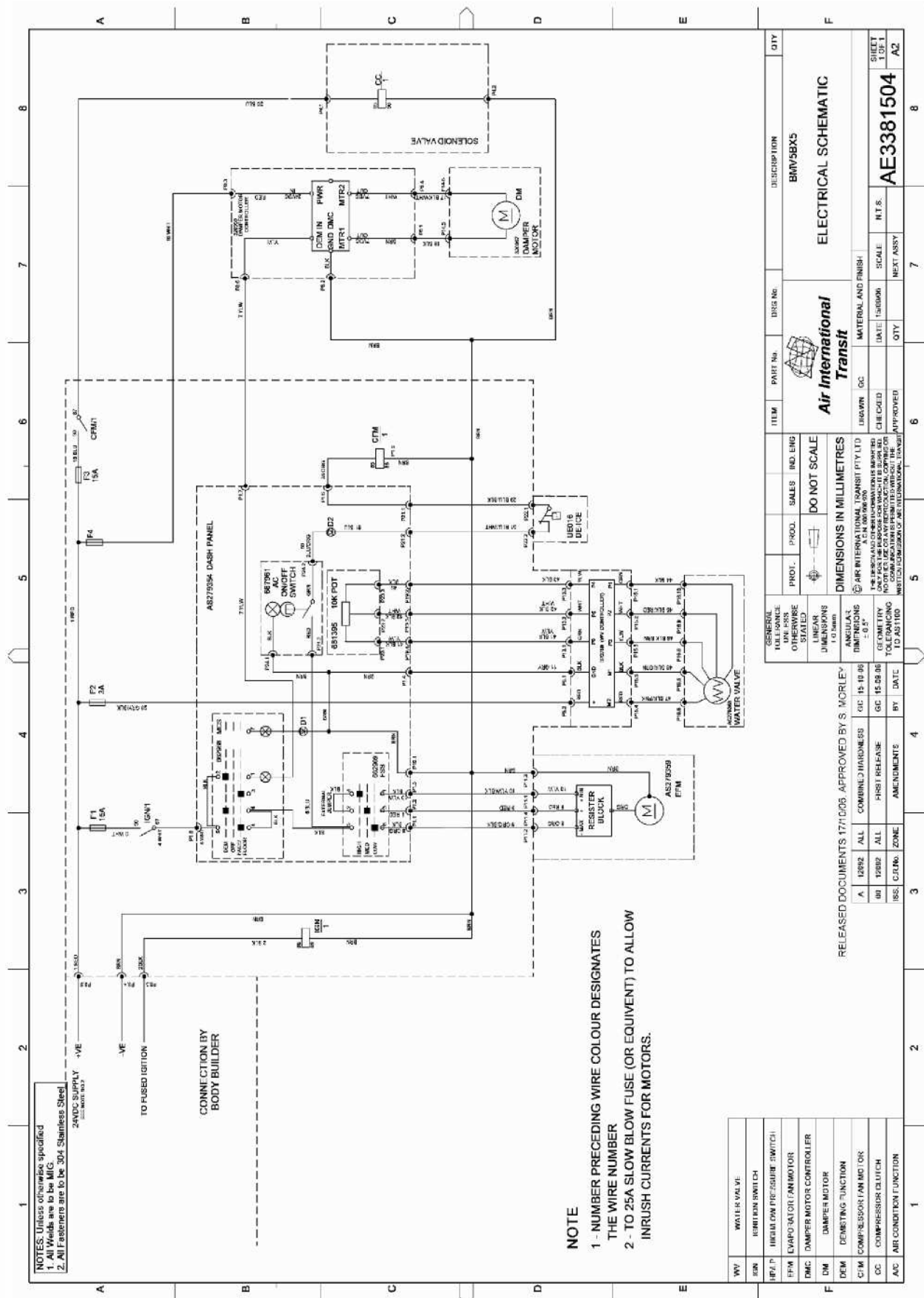
The harness arrangement for the driver's unit is shown below.



Drawing No. AS338150 Issue A

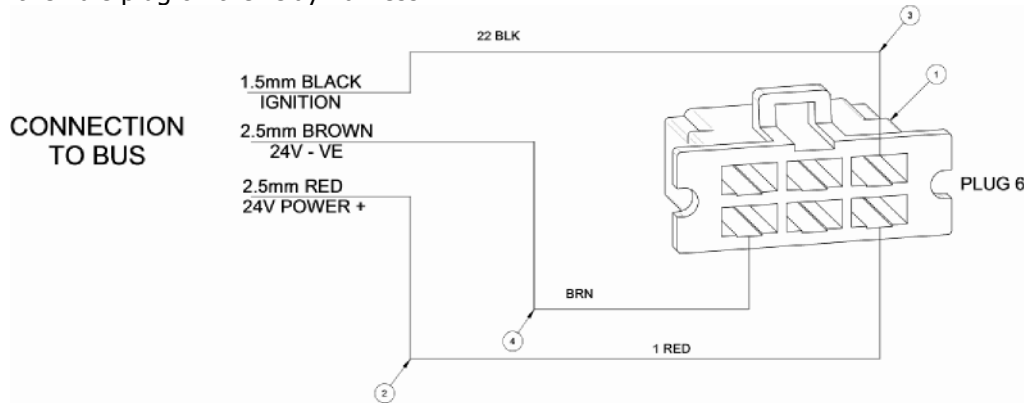
### 2.8.3 BMV5BX5 Wiring Diagram

The wiring for the driver's unit is shown below.



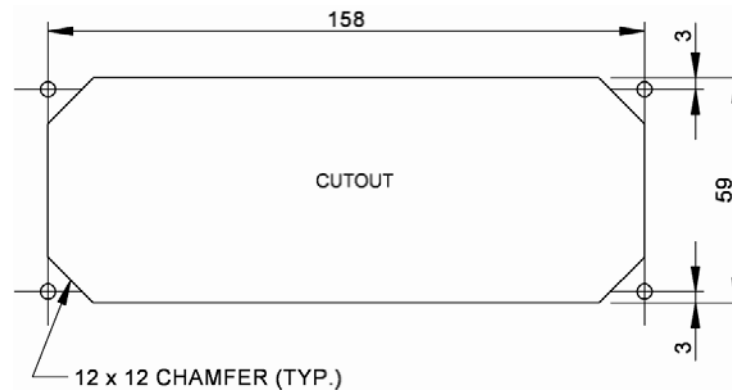
### 2.8.4 Connect A/C System to the Bus

The driver's unit is powered through a six pin plug on the main harness. The wiring on the bus required for this plug is shown below. The plug on the bus is a Carroll male QK6BLT connecting to the equivalent female plug on the relay harness.



### 2.8.5 Install Dash Panel and Harness

The dash panel is to be installed on the vehicle dashboard with the cut out shown below.



- Fix the dash panel using the four mounting holes.

The dash harness connects from the dash panel to the relay harness on the evaporator unit control.

- Run the cable along the shortest path.
- Secure the cable against vibration and shock.
- Keep the cable away from heat and electrical emissions. Do not run the dash harness with the battery cable or any other electrical wiring unless it is unavoidable.

### 2.8.6 Install Solenoid Valve Wiring

The solenoid valve acts as surrogate compressor (clutch) for the driver's unit. A 2 pin Carroll male QK2BSL connector is required on the cable connecting to the driver's unit.

Wiring should be as shown in Section 2.8.3 - BMV5BX5 Wiring Diagram

### 2.8.7 Install Water Modulation Valve wiring

The Coachair supplied cabling is used to connect the water modulation valve.

Harnesses should be as shown in Section 2.8.2 - BMV5BX5 Harness Arrangement Detail

### 2.8.8 Check Operation of All Fans

Check the operation and rotating direction of the evaporator blower immediately after installing the electrical harnesses, before refrigerant charging.

## **SECTION 3: - Testing and Commissioning**

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The commissioning of the A/C system must be carried out by Coachair Service personnel or authorised agents.

- Refer to the SM417 manual for Testing and Commissioning details.
- The XT175 unit must be in cool mode for the Driver's A/C system cooling to be tested.
- To balance the systems the pressure regulator on the Driver's Units suction line should be adjusted. On initial start up this should be in the fully open position to provide maximum flow to the Driver's Units

### **3.1.1 De-Ice Operation (Driver's Unit)**

A thermostat probe is located in the fins of the evaporator coil. The coil temperature is monitored by the thermostat to detect low temperatures and prevent icing of the coils.

To check the de-ice operation run the A/C system. Open the evaporator access cover or stop the evaporator blowers by removing their relays from the circuit. This will cause the evaporator coil temperature to drop quickly and activate the safety cut out.

- As the coil/de-ice probe temperature drops the solenoid valve should close at -3°C.
- As the coil/de-ice probe temperature rises the solenoid valve should open at +1°C.
- If necessary adjust the thermostat so that the valve operates at the required temperature.

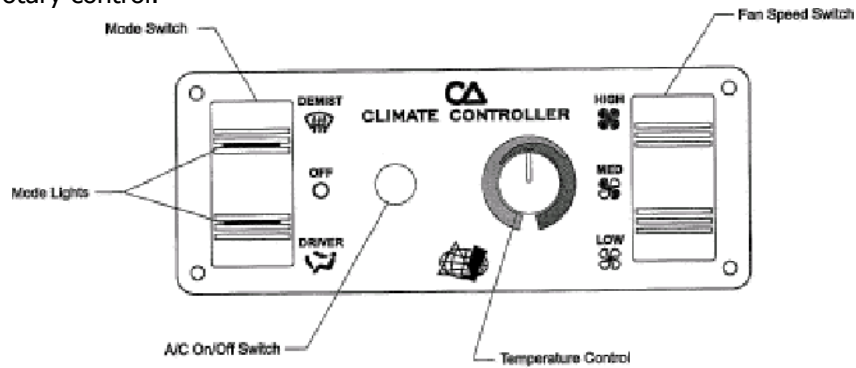
## SECTION 4: - Operating the A/C Unit

Refer to SM417 & SM423 manuals for operating the XT175 Unit.

- Where there is a conflict between instructions the XT175 instruction should take priority.
- For the Driver's A/C system to provide cooling the XT175 must be put into A/C mode and be operating.

### 4.1.1 Using the Dash Panel

Coachair supplies a dash panel for driver control of the driver's unit. The dash panel features three switches and a rotary control.



|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mode Switch</b>         | <p>Selects the A/C system operating mode between OFF, DEMIST, and A/C.</p> <p>Set switch to upper position.                      Set switch to middle position.                      Set switch to lower position.</p> <p>In DRIVER mode the unit provides ventilation / cooling / heating operation depending on the temperature control setting and the return air temperature. Fans operate at the selected speed.</p> <p>In DEMIST mode the unit operates at the heating level selected, with or without cooling, depending on the temperature control setting and the return air temperature. Fans operate at the selected speed. An output signal for an external damper motor is also provided.</p> |
| <b>Mode Lights</b>         | Illuminate when the switch is set to DEMIST or A/C to indicate operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Fan Speed Switch</b>    | <p>Selects the operating speed of the fan blowers during DEMIST and A/C modes.</p> <p>Set switch to upper position.                      Set switch to middle position.                      Set switch to lower position.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Temperature Control</b> | Provides for adjustment of the set point temperature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>A/C On/ Off Switch</b>  | Illuminates when the A/C system is providing cooling operation. When switched on, the compressor clutch engages, regardless of ambient conditions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

### 4.1.2 Damper Motor Controller

There are three lights (green, orange & red) on the damper motor controller which operate as follows:

- Green Blinking – Damper moving to top position
- Green Solid – Damper in top position
- Orange Blinking – Damper moving to bottom position
- Orange Solid – Damper in bottom position
- Red – fault present

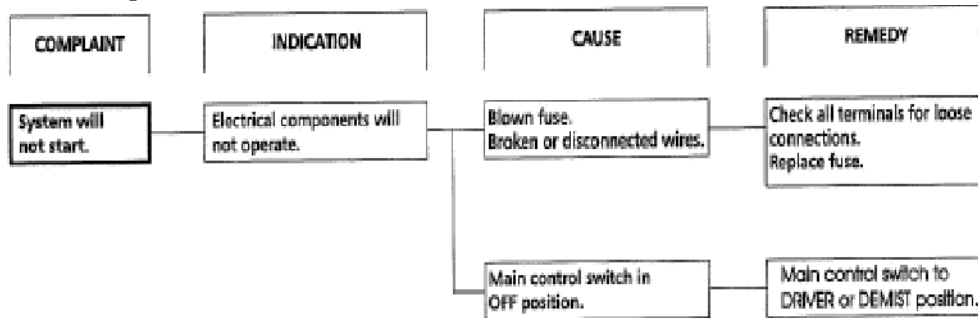


## SECTION 5: - Trouble Shooting

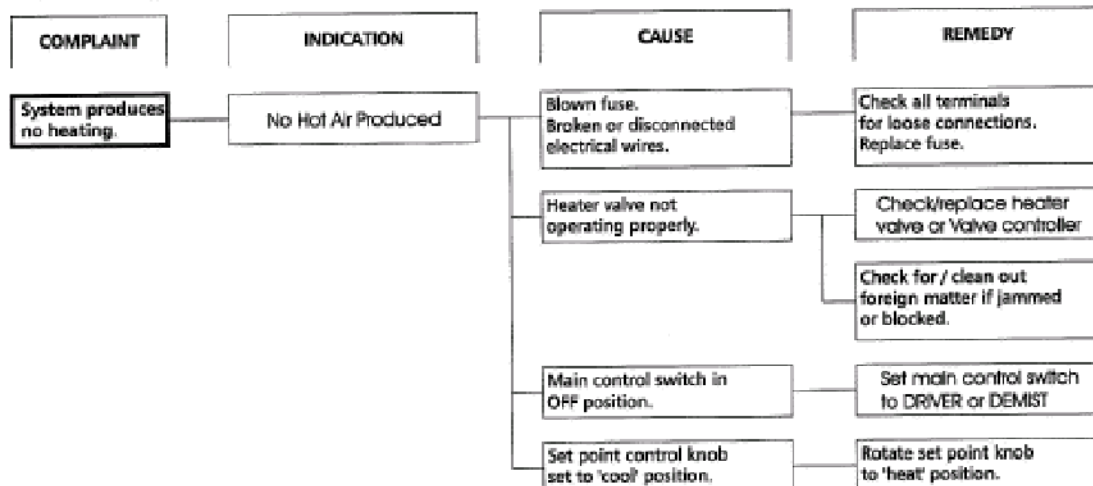
Refer to SM417 & SM423 manuals for operating the XT175 Unit.

- Where there is a conflict between instructions the XT175 instruction should take priority.
- For the Driver's A/C system to provide cooling the XT175 must be put into A/C mode and be operating.

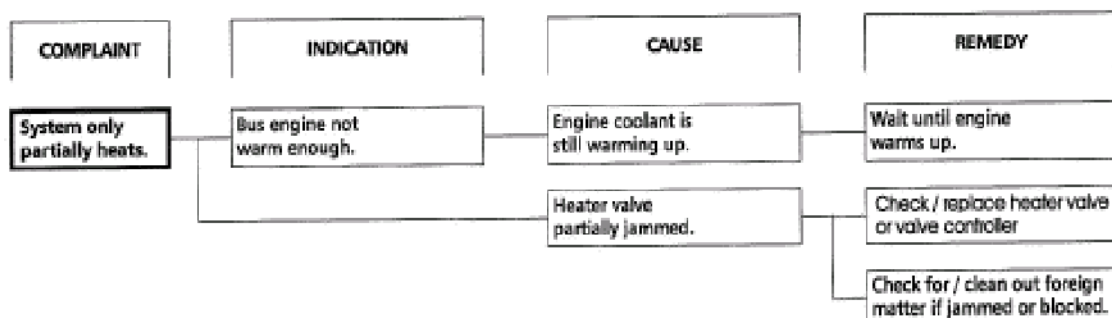
### 5.1.1 System will not start:



### 5.1.2 System produces no Heating:

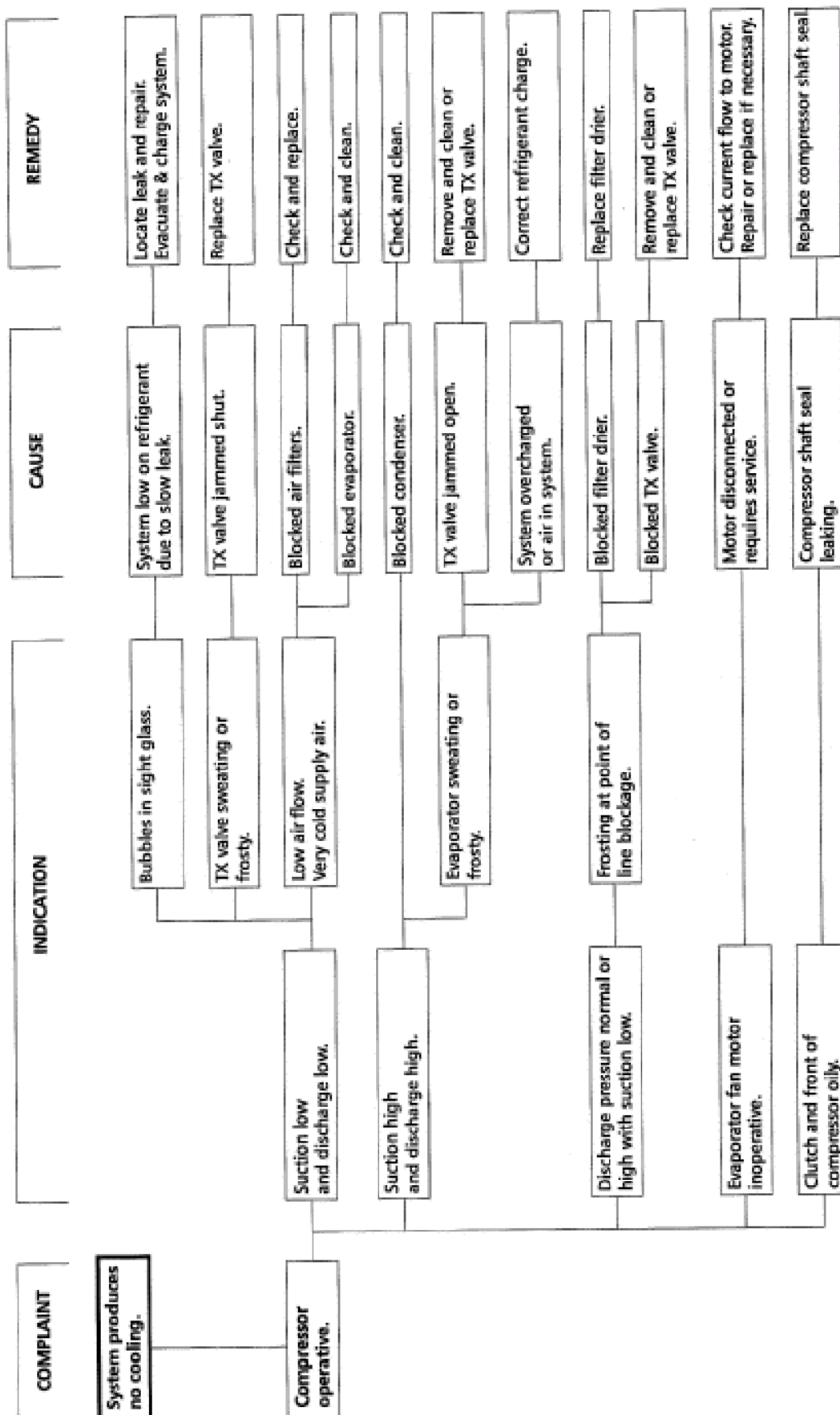


### 5.1.3 System only Partially Heats:





### 5.1.4 System produces No Cooling (compressor operative):



### 5.1.5 System provides only Partial Cooling:

| COMPLAINT                             | INDICATION                                     | CAUSE                                | REMEDY                                               |
|---------------------------------------|------------------------------------------------|--------------------------------------|------------------------------------------------------|
| System provides only partial cooling. | Suction high and discharge high.               | Faulty condenser fan.                | Check and rectify cause.                             |
|                                       |                                                | Blocked condenser coil.              | Check and clean.                                     |
|                                       | Suction low. Reduced supply air flow.          | Faulty supply air fan motor.         | Remove for service or replacement.                   |
|                                       |                                                | Blocked evaporator coil.             | Check and clean.                                     |
|                                       |                                                | Blocked return air filter.           | Check and clean.                                     |
|                                       | Suction normal. Discharge normal.              | Air or moisture in system.           | Leak test, evacuate and charge system.               |
|                                       |                                                | Heater valve not fully closed.       | Check or replace heater valve.                       |
|                                       | Suction low. Discharge low.                    | System low on refrigerant.           | Locate and rectify leak. Correct refrigerant charge. |
|                                       |                                                | Blocked TX valves.                   | Clean / replace valves.                              |
|                                       |                                                | Blocked filter drier.                | Replace filter drier.                                |
|                                       |                                                | Restriction in discharge line.       | Locate and rectify.                                  |
|                                       | Small displacement of air from discharge duct. | Blower motors sluggish in operation. | Remove blower motor for service or replacement.      |
|                                       |                                                | Blower motor possibly noisy.         |                                                      |

### 5.1.6 System is excessively noisy:

| COMPLAINT                    | INDICATION                                                           | CAUSE                                                                                 | REMEDY                                                         |
|------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------|
| System is excessively noisy. | Idler pulley whines or growls. Has rough spots when rotated by hand. | Worn bearings.                                                                        | Replace pulley bearing.                                        |
|                              | Clutch vibrates - may slip.                                          | Defective coil winding. Improper coil connection.                                     | Repair or replace as necessary.                                |
|                              | Belt slips and is noisy.                                             | Loose or worn drive belts.                                                            | Tighten or replace as required.                                |
|                              | Compressor vibrates.                                                 | Loose or worn compressor.                                                             | Check mountings. Remove compressor for service or replacement. |
|                              | Unit emits rattling noise.                                           | Loose panels. Hoses or pipes vibrating. Loose components inside unit.                 | Thoroughly check unit panels and components.                   |
|                              | Noisy compressor.                                                    | Low compressor oil.                                                                   | Check and rectify.                                             |
|                              |                                                                      | Faulty compressor.                                                                    | Replace compressor.                                            |
|                              |                                                                      | System overcharged.                                                                   | Correct system charge.                                         |
|                              |                                                                      | Suction gauge high. Discharge gauge low.                                              | Open valve immediately.                                        |
|                              |                                                                      | Rumbling noise in system. High discharge or suction pressure. Bubbles in sight glass. | Check system for leaks. Charge system.                         |
|                              | TX valve noisy.                                                      | Discharge gauge high.                                                                 | Open valve immediately.                                        |
|                              |                                                                      | Low suction/discharge pressures. Bubbles in sight glass.                              | Check system for leaks. Charge system.                         |
|                              |                                                                      | Suction gauge low.                                                                    | Replace receiver drier. Evacuate and charge system.            |
|                              | Noisy evaporator fan.                                                | Worn motor bearings or brushes. Damaged or loose fan blades or fan cowlings.          | Remove motor/fan for repair or replacement.                    |
|                              | Noisy condenser fan.                                                 |                                                                                       |                                                                |

### 5.1.7 System Cools Intermittently:

| COMPLAINT                    | INDICATION                                                                                               | CAUSE                                               | REMEDY                                              |
|------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|
| System cools intermittently. | Electrical components operate intermittently.                                                            | Defective thermostat, fan switch or motor.          | Remove defective part for service or replacement.   |
|                              |                                                                                                          | Broken or disconnected electrical wires.            | Check all terminals for loose connections.          |
|                              | Clutch disengages early during operation.                                                                | Improper ground, loose connection in clutch coil.   | Check connections or replace clutch coil.           |
|                              | Compressor operates until discharge pressure builds up, then clutch starts to slip. Clutch may be noisy. | Compressor clutch slipping.                         | Adjust air gap. Replace clutch if necessary.        |
|                              | Evaporator ices up intermittently.                                                                       | Return air filter dirty.                            | Clean / replace filter media.                       |
|                              |                                                                                                          | Supply air ducting damaged.                         | Repair / replace ducting.                           |
|                              |                                                                                                          | Faulty TX valve.                                    | Replace if necessary.                               |
|                              |                                                                                                          | De-ice T/stat incorrectly placed or malfunctioning. | Diagnosis of De-ice thermostat required.            |
|                              | System cools well in early morning or late evening. Will not cool during hot day.                        | Excessive moisture in system.                       | Replace receiver drier. Evacuate and charge system. |

## SECTION 6: - Maintenance Schedule

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Refer to SM417 manual for maintenance scheduling details.

## SECTION 7: - Maintenance Procedures

---



### Turn Isolating Switch to OFF and disconnect power!

Before performing any service procedures, ensure that the XT175 ignition-isolating switch on the unit control panel is set to the off position. Also ensure that the Driver's Units 6 pin power plug has been disconnected. See Section 2.8.4 - Connect A/C System to the Bus.

Refer to the SM417 manual for maintenance procedures for the system. •

Particular notes pertaining to the combined system are given below.

### 7.1 Pumping Down the System

Pumping down the system involves pumping the refrigerant into the condenser and receiver.

1. Connect a manifold gauge to the suction service valve.
2. Run both A/C units.
3. Close the unit ball valve (near the receiver).
4. Disable the low-pressure switch by bridging the contacts.
5. Check the operating pressures. When the suction pressure reaches 7 kPa vacuum shut down the A/C unit. If the pressure rises rapidly this indicates that there is still some residual refrigerant in the compressor crankcase. If this is the case run the A/C system again and check that it reaches 7 kPa vacuum. Do not reduce the pressure on the low side of the system any further, as a slight positive pressure will reduce the chance of contaminants rushing into the system when it is opened.
6. When the pressure remains at 7 kPa vacuum on system shutdown or raise very slowly close the compressor discharge valve.

### 7.2 Reclaiming Refrigerant

Correct evacuation and containment of the refrigerant enables the refrigerant to be re-used and reduces pollution.

In order to remove and store the refrigerant from the A/C system a commercial refrigerant recovery unit is required. Refer to the manufacturers instructions for the operation of the recovery unit.

With the check valve installed in the unit, the reclaim hoses need to be connected to either the service port at the receiver, the solenoid valves in **both** systems have to be energised to open during the reclaim process.

### 7.3 Pressure Testing

**Note: The solenoid valves in both systems have to be energised to open.**

### 7.4 System Evacuation

**Note: The solenoid valves in both systems have to be energised to open.**

### 7.5 Refrigerant Charging

**Note: Ensure both systems are run when charging the system.**

## 7.6 Safety Device Checks



### **WARNING**

#### **Be Ready to Shut Down the System!**

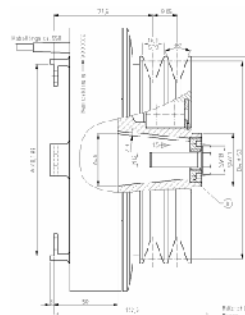
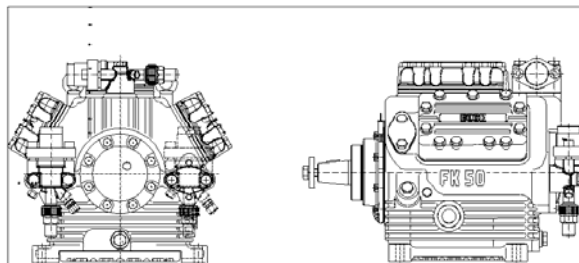
Take care while checking the pressure switch operation. You must be ready to shut down the system immediately if the pressure switches do not operate correctly. Personal injury and damage to the A/C equipment could result from a large build up of pressure.

- **Pressure switch test can be done with just the XT175 system operating**
- **Check both the XT175 and Driver's Unit de-ice sensors.**

## SECTION 8: - Spare Parts

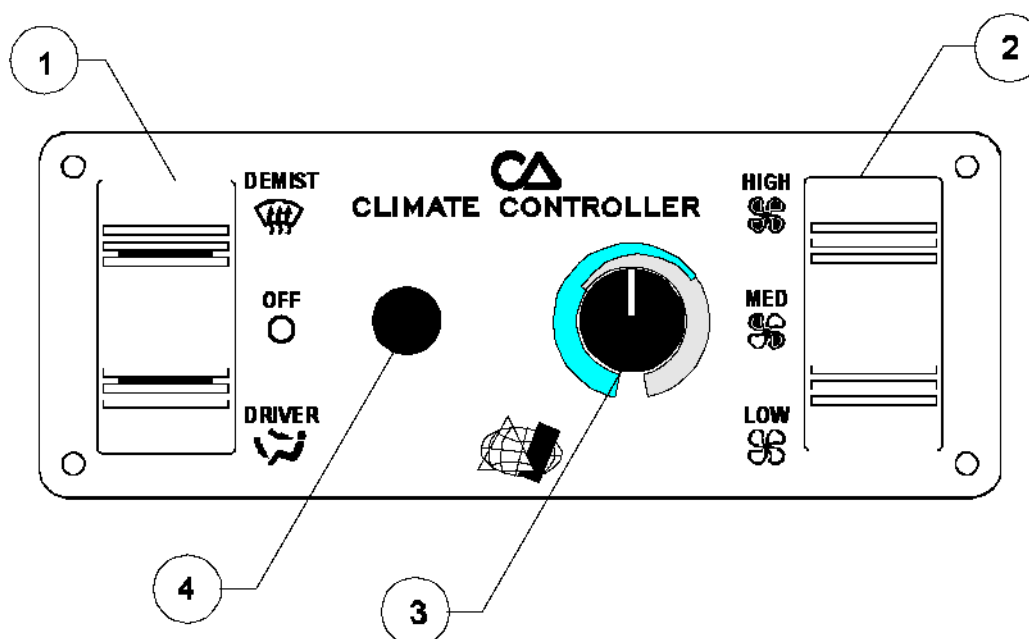
Refer to SM425 manual for typical XT175 spares.

### 8.1 Compressor Area (BMS38BX1)



| Part Number | Description                | Part Number | Description           |
|-------------|----------------------------|-------------|-----------------------|
| 295200      | Bock FKX50/775K Compressor | SLC004      | Lang KK73.1.23 Clutch |

### 8.2 Drivers Unit Dash Panel

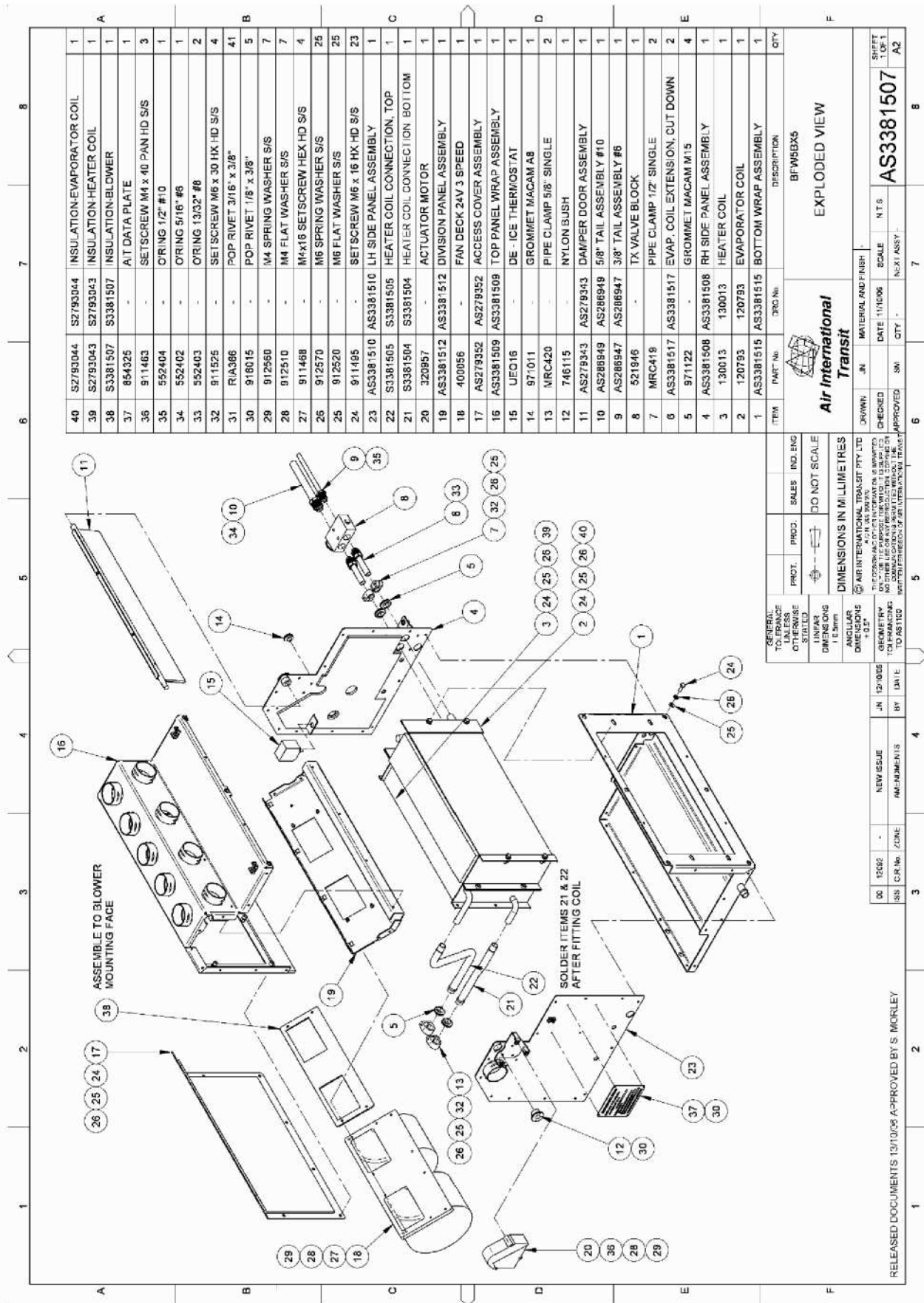


| Ref | Part Number | Description                 |
|-----|-------------|-----------------------------|
| -   | AS279354    | Complete Dash Panel         |
| 1   | 662968      | Rocker Switch - Mode        |
| 2   | 662969      | Rocker Switch - Fans        |
| 4   | 667173      | On/Off Switch (Push Button) |
| 3   | 681395      | Temperature Control Pot.    |
| -   | 854269      | Label                       |
| -   | S2793055    | Dash Panel metalwork        |



## 8.3 Evaporator Unit Assembly (BFW5BX5)

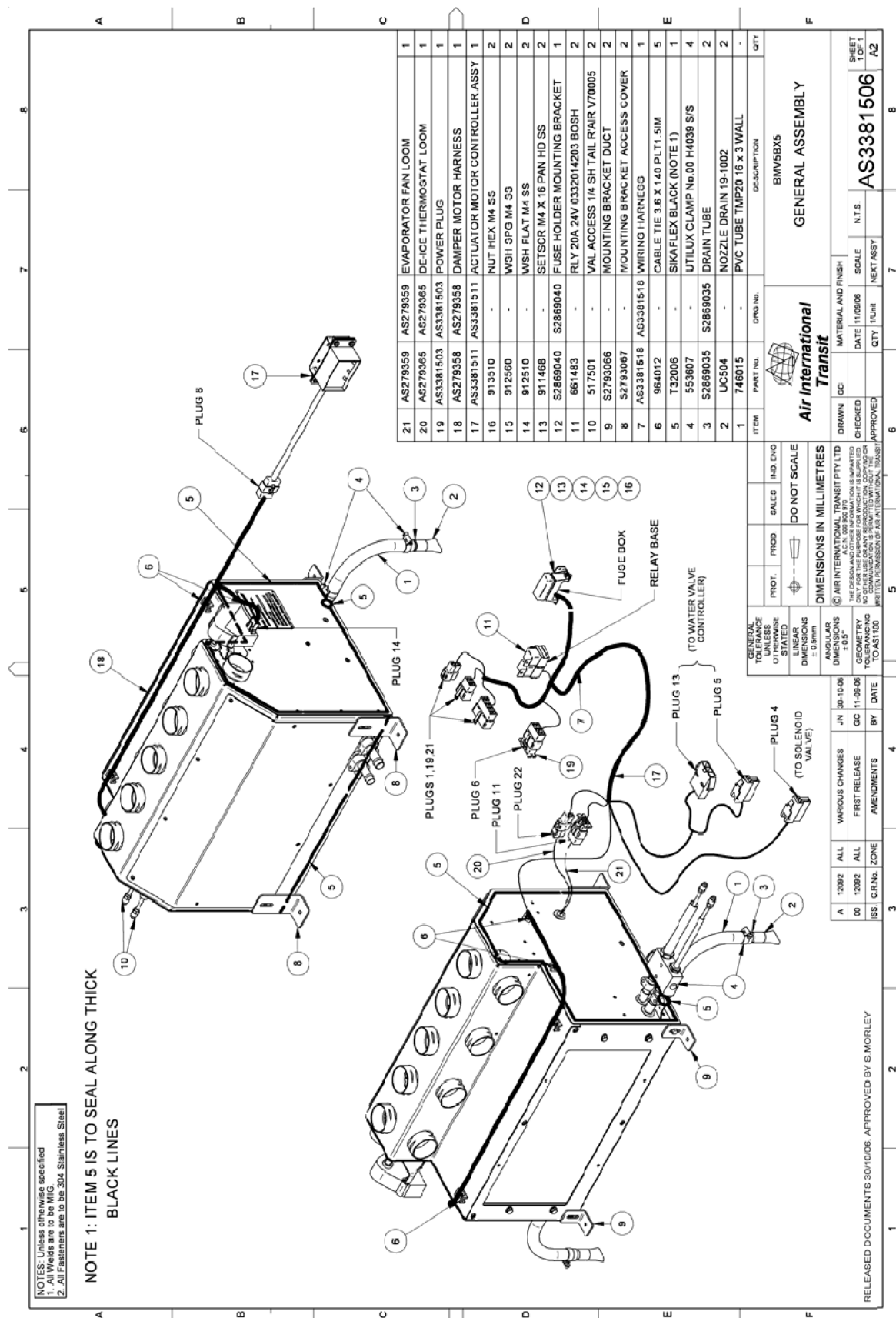
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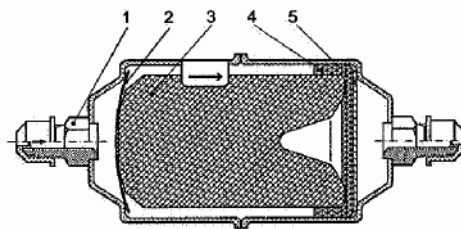
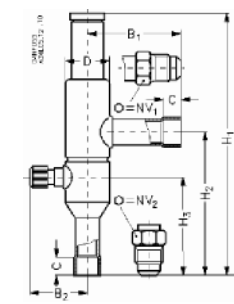


## 8.4 Driver's Unit Assembly (BMV5BX5)

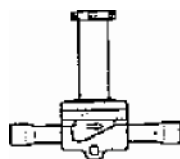
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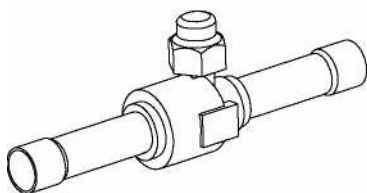
## 8.5 Other Components (BMV5BX5)



| Part Number | Description             | Part Number | Description       |
|-------------|-------------------------|-------------|-------------------|
| 525010      | 7/8" Pressure Regulator | 531354      | 1/2" Filter Drier |



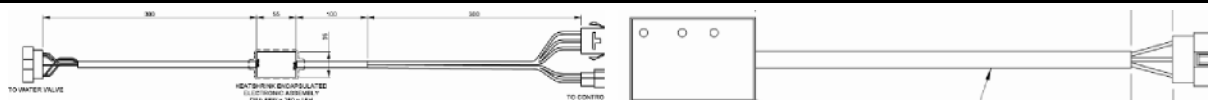
| Part Number | Description         | Part Number | Description             |
|-------------|---------------------|-------------|-------------------------|
| 552042      | 1/2" Solenoid Valve | 668140      | Coil for solenoid Valve |



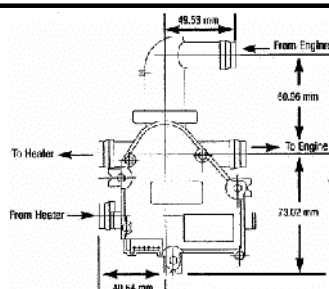
| Part Number | Description            | Part Number | Description             |
|-------------|------------------------|-------------|-------------------------|
| 517714      | Ball Valve 5/8" Solder | 744991      | BALL VALVE 1/2 FTOF BSP |
| 517713      | Ball Valve 1/2" Solder |             |                         |



| Part Number | Description                | Part Number | Description             |
|-------------|----------------------------|-------------|-------------------------|
| 518006      | FLARE NUT PLAIN 1/2 F10010 | RRV117      | Schrader Valve Assembly |



| Part Number | Description            | Part Number | Description               |
|-------------|------------------------|-------------|---------------------------|
| 320959      | Water Valve Controller | 320958      | Actuator Motor Controller |



| <b>Part Number</b> | <b>Description</b> | <b>Part Number</b> | <b>Description</b> |
|--------------------|--------------------|--------------------|--------------------|
| 522259             | Valve - 4 way      | AS279368           | WATER VALVE LOOM   |