Design, Installation & Servicing Instructions

SEPTEMBER 2011

Ecodan® Air Source Heat Pump and Flow Temperature Controller 2

Flow Temperature Controller 2 Model Number

- PAC-IF03IB-E (FTC2)

Ecodan Air Source Heat Pump Model Number

- PUHZ-W50VHA-BS
- PUHZ-W85VHA-BS
- PUHZ-W85VHA(2)-BS
- PUHZ-HW140VHA-BS / YHA-BS
- PUHZ-HW140VHA-BS(2) / YHA(2)-BS

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Air Conditioning | Commercial Heating
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Contents

"FTC2" is an abbreviation of "Flow Temperature Controller 2" and used throughout this manual.

IMPORTANT INFORMATION

FTC1 and FTC2 Differences

The Flow Temperature Controller 2 (FTC2) has some fundamental differences to the previous Flow Temperature Controller (FTC1).

It is important that these differences are fully understood in order to ensure correct installation. This manual covers all the changes which affect both the installation and the functionality of the system in detail, however the major changes are highlighted below.

- The interconnecting cable between Ecodan and FTC2 no longer carries 240V potential so does not need an earth or switching through an isolator, this is now a two core cable not three core plus earth as on FTC1.
- S1 is no longer in use on FTC2 and only connections between S2 and S3 are necessary, FTC2 is not powered from the outdoor unit as is the case for FTC1.
- DIP switch SW8-3 on the outdoor unit must be switched to the ON position in order for the Ecodan to recognise that power for the interface is provided by the FTC2.
- Immersion heater control can be provided directly from the FTC2 so no additional third party timer is required if this control method is selected. The preferences for immersion frequency can be adjusted via DIP switches SW2-4 and SW2-5 on the FTC2 main circuit board. To use FTC2 to control the immersion heater directly, an optional relay control box is required. If it is chosen to indirectly control the immersion heater as with FTC1 using an additional third party timer, then DIP switch SW1- 4 must be switched OFF and SW2-7 switched ON.
- When setting the hot water temperatures on the PAR-W21MAA remote controller please be aware that this is no longer flow temperature to the cylinder as is selected on FTC1. For FTC2, cylinder target temperature is selected so it is important to ensure that no more than 55°C is selected for hot water mode.
- TH5 cylinder sensor is now supplied with the package and should be immersed in a dry cylinder pocket mounted one third to half way up the cylinder, it should not be surface mounted in order to ensure accurate readings.
- TH5 sensor should not be installed on pipework or undesirable operation will be encountered, this will be especially true when automatic changeover mode is in operation.
- The Honeywell wiring centre is no longer used with FTC2, all components are now wired directly to the relay board.
- Please ensure that after commissioning the PAR-W21MAA remote controller it is locked, this is essential as it is possible to turn the system on via the PAR-W21MAA when there is no demand for hot water or central heating through the programmer, in this case the system can run without any pumps or valves energised which will result in a high pressure fault.
- Only use spring return type zone valves with FTC2 units, this unit is not directly compatible with motor closed valves.

Useful Numbers

After Sales Technical Support: 0870 3000 300
Hatfield Head Office: 01707 276100 (Heating Department 01707 278666)
Manchester Office: 0161 866 6080
Birmingham Office: 0121 741 2800
Bristol Office: 01454 202050
Wakefield Office: 0870 330 0347
Orpington Office: 01689 881030
Livingston Office: 01506 444960
North London Office: 01707 282480

For pre sales technical support please call your local office

INTRODUCTION

Any water distribution and central heating installation must comply with the relevant recommendation of the current version of the Regulations and British Standards listed below:-

Building Regulations
I.E.E. Requirements for Electrical Installations (BS7671)
Water Regulations
Manual Handling Operations Regulations

British Standards BS6798, BS5449, BS5546, BS5440:1, BS5440:2, CP331:3, BS6700, BS7593 and BS7671.
Health and Safety Document No 635

Only Mitsubishi Electric Accredited Installers (AI) should install the Ecodan system. Mitsubishi Electric's notes must not be taken as overriding statutory obligations.

When installing unvented hot water systems, section G3 of the building regulations should be adhered to. An annual inspection would also be required to ensure safe, long term operation.

The information in this manual is provided to assist generally in the selection of equipment. The responsibility for the selection and specification of the equipment must however remain that of the installer and any designers or consultants concerned with the design and installation.

Please note: Mitsubishi Electric do not therefore accept any responsibility for matters of design, selection or specification or for the effectiveness of an installation containing one of our products unless we have been specifically requested to do so.

All goods are sold subject to our Conditions of Sale.

Important Note - Included in the AEI introduction pack is the Mitsubishi Electric homeowners 3 year guarantee registration card. Please use this card to register within 30 days of commissioning or occupation (if new build), and ensure the homeowner benefits from Mitsubishi Electric's 3 year guarantee for the Ecodan air source heat pump. This needs to be completed by both the Accredited Ecodan Installer and the current homeowner (or signature of developer if new build). The registration card is free post and is logged by our warranty department. In the unlikely event of failure of the Ecodan air source heat pump, return of the card ensures that the homeowner's warranty claim is hassle free. For additional supplies of the 3 year guarantee card please contact our Heating department on 01707 278666.

PLEASE NOTE - If you do not complete and return the registration card the product will only be under warranty for 12 months.

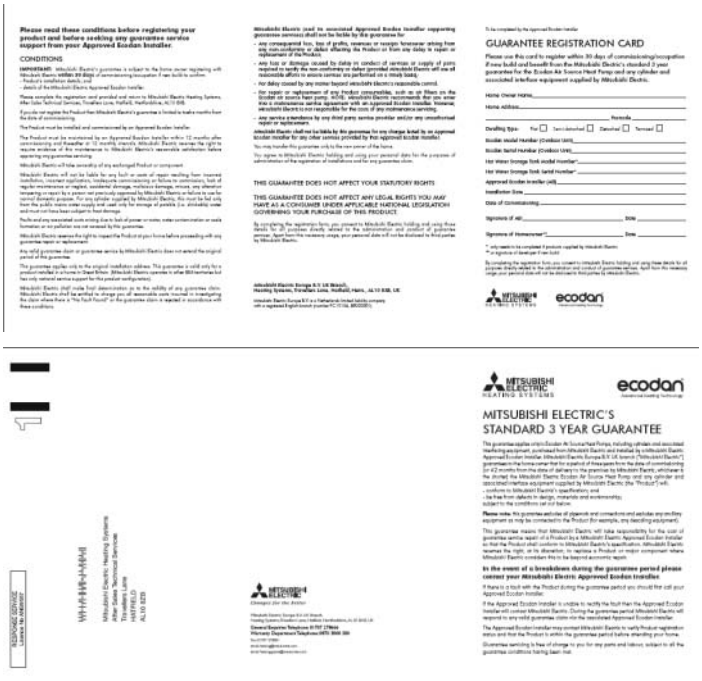


Fig. 1.1

Checklist for Ecodan

This checklist has been created to help you understand the differences from other types of heating systems you may have installed. We suggest you use this checklist as a helpful summary of the main differences over conventional heating systems, but you will also need to understand and comply with all of the technical details contained within this document to ensure a successful installation. For further assistance please contact Mitsubishi Electric's Technical Support Helpline on 0870 3000 300.

Primary System Circuit

- It is very important that the primary system is cleansed using a suitable cleansing agent such as Fernox F3 or Sentinel X300; to ensure that any flux residues / installation debris is removed.
- The Ecodan and external connecting pipework require protection against freezing. For this reason a combined anti-freeze and inhibitor product such as Fernox HP-5c or Alphi-11(see pages 54 & 55) or Sentinel R600 (see page 56) must be used in the correct quantity.
- All primary pipework on flow and return between the Ecodan unit and cylinder should be insulated with Armaflex or similar. Weather protection should be added to all outdoor pipework. Flexible connection pipes (supplied) MUST be fitted between the outdoor unit and primary rigid pipework on both the flow and the return.
- The Fernox Boiler Buddy should be fitted internally on the return pipe (from the Ecodan) to help protect the heat pump from any heating system contamination and provide an ongoing visual indication of the system water condition.

Interconnection Between Ecodan and Flow Temperature Controller 2 (FTC2)

- A 2 core signal cable is needed between the internal FTC2 and the external Ecodan unit . This cable should be of 1 to 1.5mm² and is NOT supplied with the package.

Radiator System Circuit

- As the Ecodan generates lower temperatures than a conventional boiler the radiators should have been designed to suit the lower mean temperature. These need to be calculated using the design tool supplied on the AEI training course or using other appropriate methods.

Retrofit Situations

- The heat exchanger in the Ecodan should be protected from particulate contaminates in the water circuit. When fitting in a retrofit situation the existing radiator circuit MUST be chemically cleaned and thoroughly flushed before installation.

Supplied Parts

Boiler Buddy and TF1

Ecodan Air Source Heat Pump (see page 10 for pictures of each model)

Flexible Pipes (x2)

Flow Temperature Controller 2

Flow Setter Valve

Fig. 1.2

INTRODUCTION

Heat Pump System Overview

The Ecodan air source heat pump extracts thermal energy from the outside air and transfers this into a property in the form of hot water as a conventional heating system does.

Due to the outputs available, domestic hot water always takes priority over space heating. The Flow Temperature Controller 2 (FTC2) targets a preset cylinder target temperature on the TH5 sensor within the cylinder pocket and communicates with the Ecodan until this temperature is achieved.

A high flow temperature is required in hot water heating to raise the domestic hot water store then the temperature is reduced in space heating to increase the efficiency. See page 50 for recommended settings and commissioning procedure.

Mounted in the rear of the Ecodan is an outside temperature compensation sensor. This will modulate the flow temperature in space heating mode (according to the ambient temperature) to increase the efficiencies of the system. Due to the lower flow temperatures provided by the Ecodan air source heat pump, radiators need to be sized in accordance with this, compared to that of conventional boiler systems. In retrofit situations where old panel type radiators are fitted it may be possible to keep the same physical size of radiator and simply upgrade to more efficient double panel/double convector type radiators.

Two heating zones can be connected to the Ecodan system in the same way as a conventional heating system. When the system is installed and commissioned the control equipment will automatically switch between hot water and heating modes as and when required.

Each of the Ecodan models require sufficient primary flow rate for adequate operation. Due to the large resistances caused by the plate heat exchanger in the Ecodan, two domestic circulating pumps in series to produce the required flow rates. These pumps must be set to the same speed or damage to the system may occur. Pipe diameters will need to increase on the PUHZ-HW140VHA(2) / YHA(2) models to assist in reducing the resistance, required flow rates are listed on table 1.1 (page 10).

A flow setter valve is supplied with each system to give an indication of the actual flow rate achieved. It should be installed on the common flow or return pipe work to the Ecodan. Details of this can be found on page 15 of this manual.

Automatic air vents must be installed at the highest point of the primary system. The slightest amount of air in the system can reduce efficiencies and even cause the Ecodan to fault.

The primary loop must contain an antifreeze concentration (in accordance with the manufacturers recommended quantities) to avoid possible freezing during periods when the appliance is not being operated. It is recommended that a dual inhibitor anti-freeze is used. For information on the Fernox Protectors HP-5c and Alphi-11 see pages 54 and 55 or Sentinel R600 on page 56.

To comply with this requirement the hardness of the mains water should be checked by the installer and if necessary the optional factory fitted in-line scale inhibitor should be specified at the time of order for hardness.

To optimise running costs it is advisable the homeowners seeks the cheapest possible electricity tariff and that weather compensation is set up correctly on commissioning. An internet search facility like www.uswitch.com will be able to help with electricity tariffs.

How a heat pump works

The heat pump essentially works the same way as your refrigerator but in reverse.

The Ecodan is hermetically sealed (no refrigeration piping involved) with R410A refrigerant. The cycle it completes to produce heat is known as the vapour-compression refrigeration cycle:

The first phase begins with the refrigerant being cold and at low pressure.

Step 1 The refrigerant within the circuit is **compressed** as it passes through the **compressor.** It becomes a hot highly pressurised gas. The temperature also rises typically to 60°C.

Step 2 The refrigerant is then **condensed** as it passes across a plate **heat exchanger**. Having a cooler side to the heat exchanger it decreases the temperature, so it changes the property of the refrigerant from a gas to a liquid.

Step 3 The refrigerant as a cold liquid still has a high pressure. For **expansion** to occur it passes through an **expansion valve**. The pressure drops but it is still a cold liquid.

Step 4 The final stage of the cycle is when the refrigerant passes into the **evaporator** and **evaporates**. It is at this point when some of the free heat energy in the outside air is absorbed by the refrigerant.

It is only the refrigerant that is being passed through this cycle; the water is heated up by the plate heat exchanger. The cooler water extracts energy from the hotter refrigerant, i.e. the water is heated as it passes across the plate heat exchanger. This water flows towards the heating system and hot water storage tank, where its energy is used to provide domestic hot water and space heating.

Boiling points:

The refrigerant used within the cycle has a different boiling point to water, which boils (turns from liquid to gas) at 100°C. This is only true at atmospheric pressure. When the pressure increases so does the boiling temperature; decrease the pressure and boiling temperature drops. Liquid turns to gas at a lower temperature. The boiling point changes when the pressure changes. Refrigerants have different properties to water and have much lower boiling temperatures. During the fourth stage of the cycle the outside ambient temperature is much hotter than the temperature of the refrigerant and will heat it.

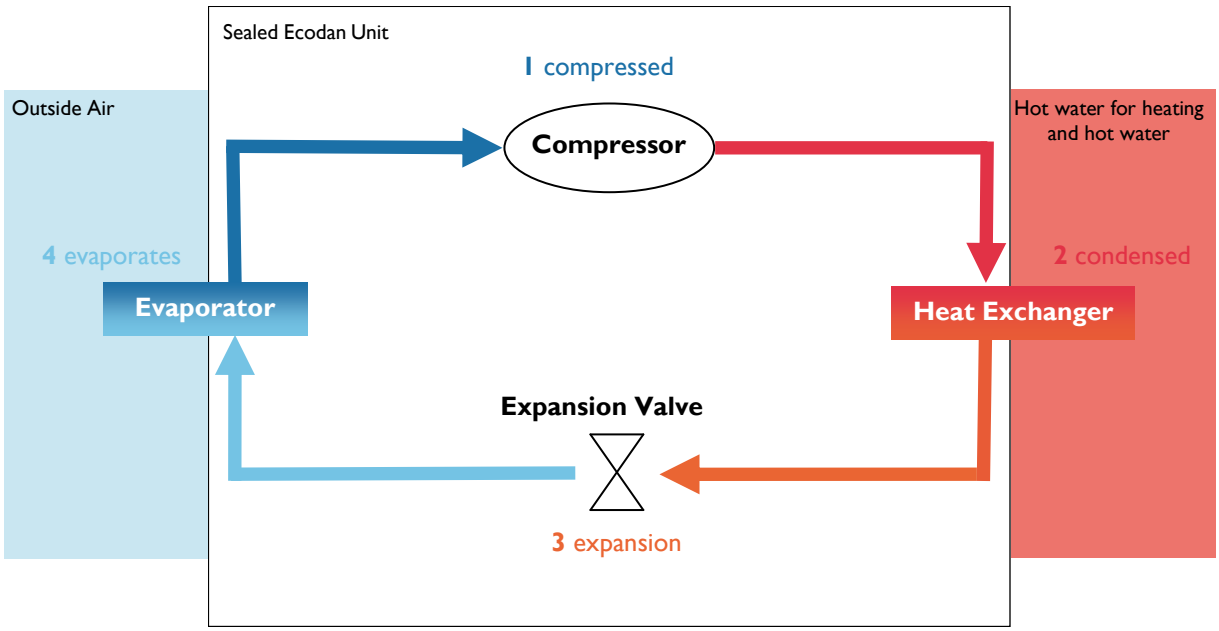


Fig. 1.3

INTRODUCTION

Ecodan Air Source Heat Pump

- Must be mounted external to the property in a suitable location with a minimum distance of 300mm from the nearest wall at the rear of the unit. For minimum distances on any side of the Ecodan refer to page 23. The unit should never be enclosed.
- Cold air is blown from the front of the unit - it should be positioned in a location where this will not cause a nuisance. The air needs to circulate freely around the unit, the efficiency of the Ecodan will be hampered if warmer air cannot enter the rear of the unit.
- It should be mounted on anti-vibration mounts, these are NOT provided with the equipment.
- The anti-vibration flexible hoses should be fitted to the flow /return pipe-work.
- Condensate water may be produced which will drain away from the unit. It is suggested that a gravel filled channel as a soak away, or a similar arrangement to suit the location is installed to overcome this.
- An optional drainage kit may be purchased should condensate need to be disposed of in a main drain as opposed to a soak away type arrangement.
- The internal and external flow and return pipework **must** be insulated and waterproofed externally to prevent freezing.
- All pipework should be insulated, any heat losses here will result in lower coefficient of performance (COP).
- An external temperature sensor is positioned at the rear of the Ecodan. Care should be taken to ensure this is not placed in direct sunlight.

TECHNICAL DATA

Model		PUHZ-W50VHA-BS	PUHZ-W85VHA(2)-BS	PUHZ-HW140VHA(2)-BS /PUHZ-HW140YHA(2)-BS
Dimensions (mm)	Width	950	950	1020
	Depth	330+30*	330+30*	330+30*
	Height	740	943	1350
Weight (kg)		64	77	134 / 148
Airflow (m^3/min)		50	55	100
Nominal sound level (dBA)		45 ◊	48 ◊	53 ◊
Low noise mode (dBA) @ 7°C		40	42	46
Guaranteed operating range	(Outdoor)	- 15 ~ +35°C	- 20 ~ +35°C	- 25 ~ +35°C
Electrical supply		220-240v, 50Hz	220-240v, 50Hz	220-240v, 50Hz / 380-415v, 50Hz
Phase		Single	Single	Single / 3 Phase
Running current (A) [Max]		5.4 [13]	10.3 [23]	14.9 [35] / 5.1 [13]
Starting current (A)		5	5	5
Fuse Rating (MCB sizes BS EN 60947-2) (A)		16	25	40 / 16
Heating A2/W35	Capacity (kW)	5.0	8.5	14
(Eco label)	COP	3.13	2.95 *(3.17)*	2.69 *(3.11)*
(Eco label)	Power Input (kW)	1.6	2.88 *(2.68)*	5.21 *(4.52)*
	Nominal Flow Rate (L/min)	14.3	25.8	40.1
Heating A7/W35	Capacity (kW)	5.0	9.0	14.0
(Eco label)	COP	4.1	3.85 *(4.18)*	4.19 *(4.25)*
(Eco label)	Power Input (kW)	1.22	2.34 *(2.15)*	3.34 *(3.31)*
	Nominal Flow Rate (L/min)	14.3	25.8	40.1
Primary Flow Rate	Maximum (L/min)	14.3	25.8	40.1
	Minimum (L/min)	6.5	10	17.9

* Grille
◊ At distance of 1m from the outdoor unit
Eco label models denoted by **(2)** after product code

Table 1.1

5kW Unit

Fig. 1.4

8.5kW Unit

Fig. 1.5

14kW Unit

Fig. 1.6

For cylinder requirements see table 1.2 (page 15).

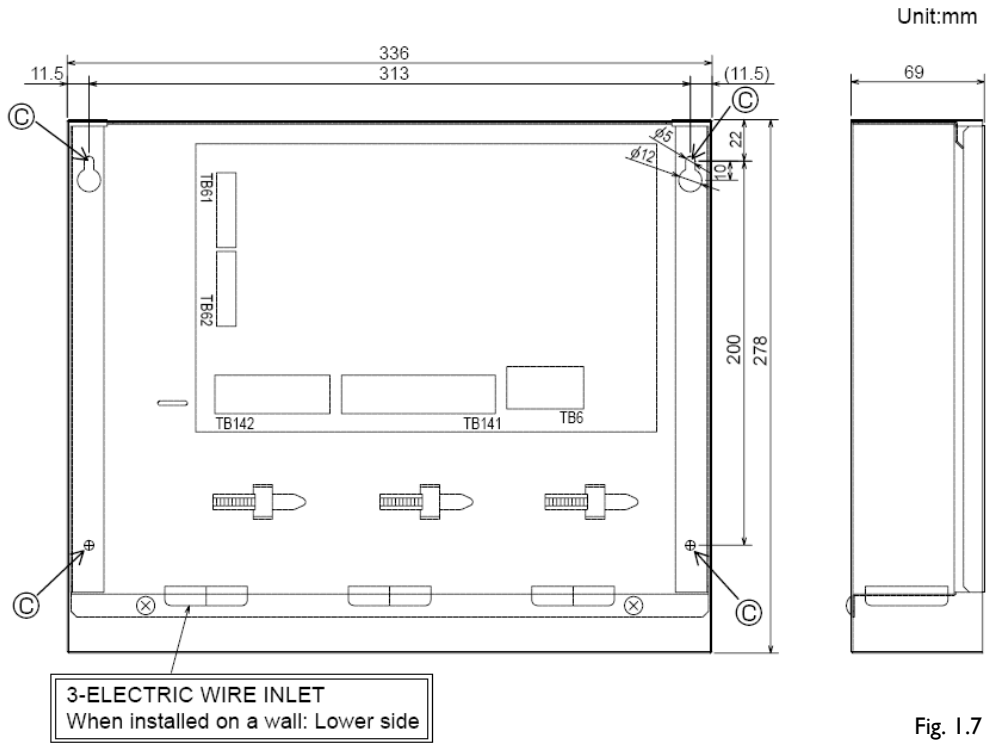
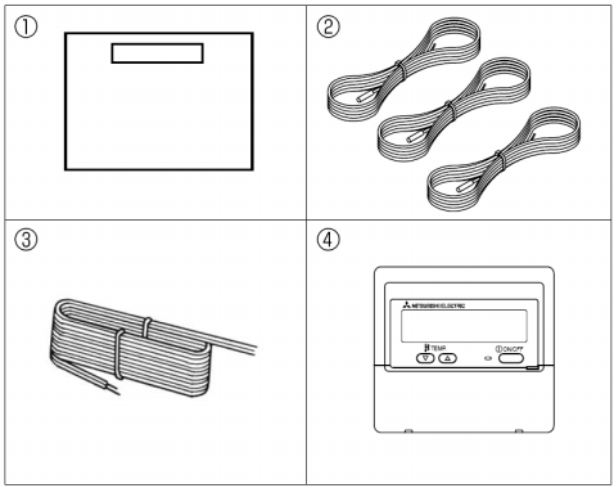


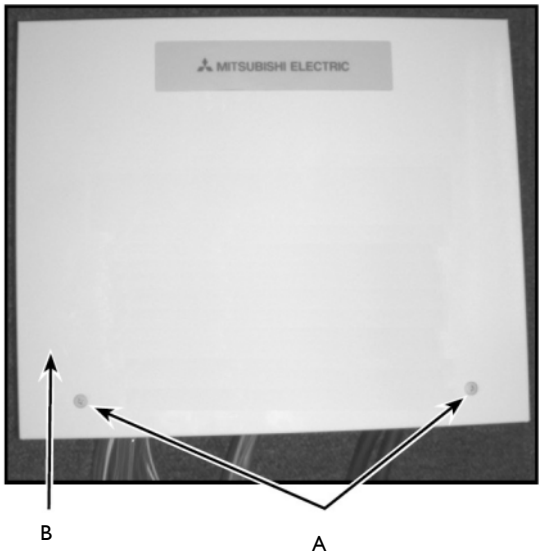
Fig. 1.7



For full installation instructions on installing FTC2 refer to pages 29-40.

The FTC2 unit should be supplied with the following parts
1. FTC2 unit x 1
2. Thermistor x 2 (TH1 Red Cable & TH5 Black Cable)
3. Remote controller cable (5m) x 1
4. Remote controller x 1

Fig. 1.8



A. FTC2 case screws
B. FTC2 case
C. FTC2 mounting holes

Fig. 1.9

Pipe Work Schematic Single Zone

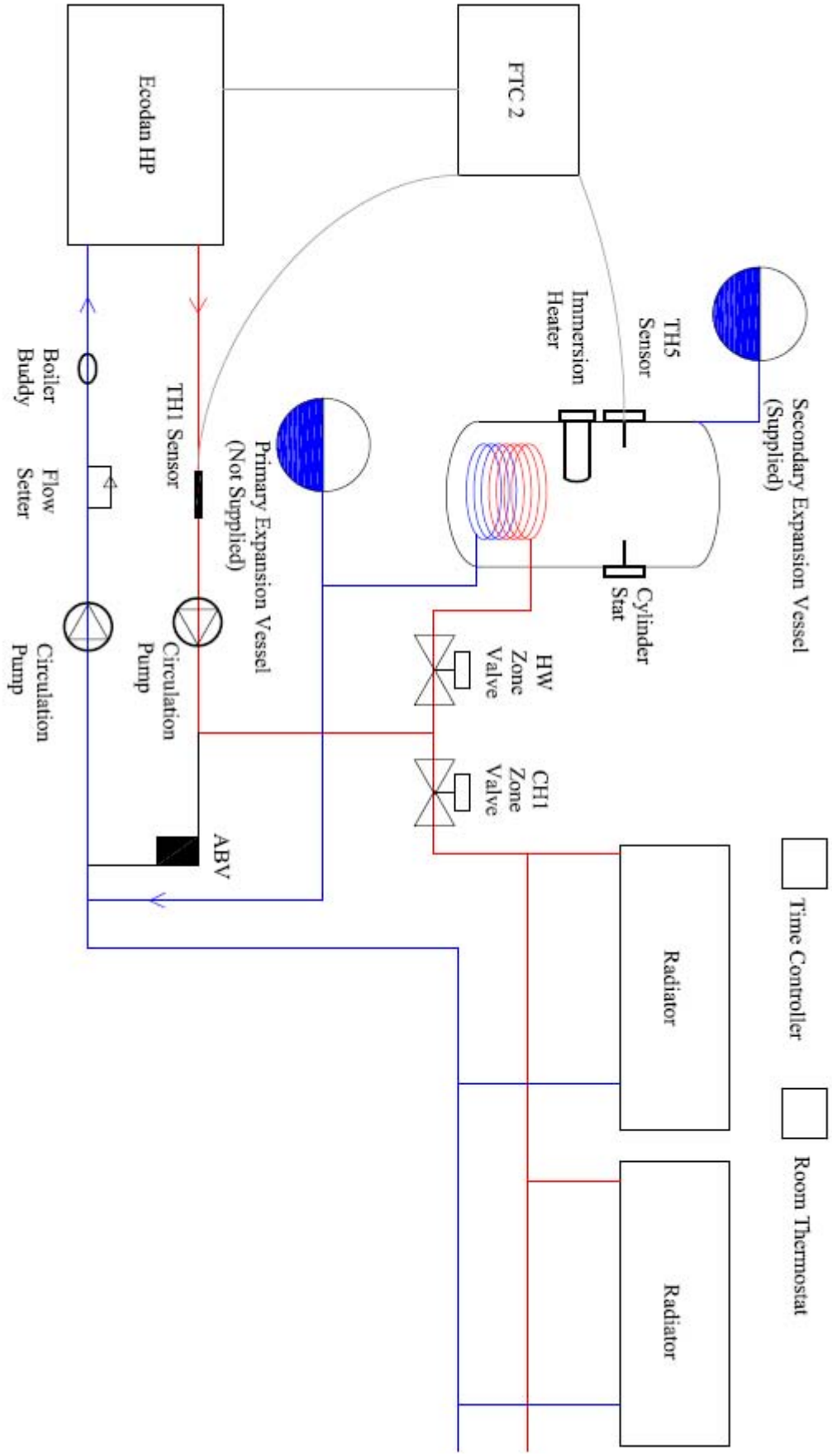


Fig. 2.0

Pipe Work Schematic Twin Zone

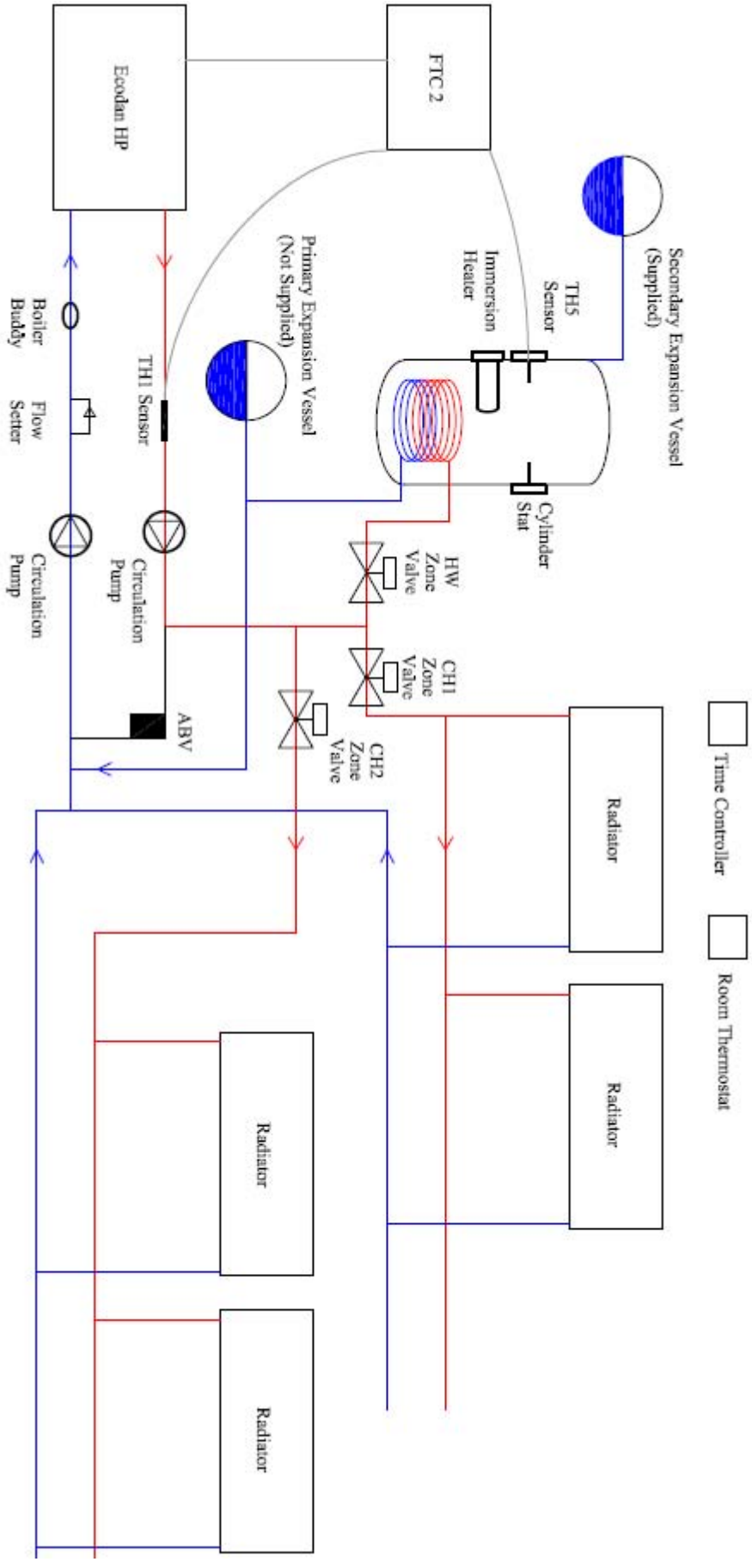


Fig. 2.1

INSTALLATION

Model Selection Data

General

When checking the suitability of the Ecodan it is recommended that heat loss calculations are completed for the external building fabric plus the ventilation losses, as set out in BS5449:1990. The output of the Ecodan should then be chosen to meet this demand. Under-sizing of the unit will not provide adequate heat through the coldest days, while over-sizing will cause the Ecodan to cycle and work inefficiently.

The Ecodan unit has been designed to be incorporated into a conventional heating system, either a vented or unvented domestic hot water store is required to supply water for showers, sinks etc.

When the Ecodan system is being used to supply domestic hot water, a hot water storage appliance will be required. The cylinder capacity required needs to be calculated in the correct way set out in BS 6700 / NHBC for storage cylinders. The cylinder requirements are listed on pages 16 and 21.

Electricity Supply

A mains supply rated to suit the capacity of the Ecodan is required, this must have a means of isolation within one metre of the appliance itself. The circuit and heat pump should be protected by a 30mA rated RCD. This appliance **MUST BE EARTHED.**

All external wiring to the appliance must be in accordance with the latest I.E.E. wiring regulations and any local regulations which may apply.

The appliance shall be supplied from a suitably rated double pole isolator with a contact separation of at least 3mm in both poles.

In the event of an electrical fault after installation of the appliance, electrical checks must be carried out i.e. Earth Continuity, Short Circuit, Polarity and Resistance to Earth. The Ecodan **MUST BE DISCONNECTED BEFORE** these tests are carried out.

Interconnecting cable for FTC2 no longer carries 240V potential so does not need earth or switching through an isolator.

Care should be taken not to run communication cables (flow sensor, remote controller cable) close to or with mains 240 volt cables in order to reduce interference.

Control equipment (pumps, zone valves, thermostats etc) must have a separate circuit from the Ecodan system and should be protected by the required fuse rating.

Flow Temperature Controller Location

The flow temperature controller should be mounted in a dry area using the mounting holes pre-fabricated in the steel casing. It is usually installed in an airing cupboard or in a loft space close to the control equipment. The TH5 sensor will need to record a cylinder temperature so should not be further than five metres from the flow temperature controller. For full installation instructions on installing FTC2 refer to pages 29-40.

Ecodan System Design

Fernox Boiler Buddy and TF1

A Fernox Boiler Buddy is provided with the package, this **must** be fitted internally on the return circuit as close to the Ecodan as possible. It should be installed fully in accordance with the manufacturers instructions on pages 57 - 59.

Flow Setter Valve

A flow setter valve is provided with the package to give an indication of the water flow rate through the primary pipework. Each model of Ecodan has a minimum and a maximum flow rate shown in table 1.2 on the following page, which must be achieved for the system to operate correctly.

The valve can be installed in either the flow or return pipework to the Ecodan. A flow rate indication can then be taken from the bottom of the float.

Anti-Vibration Equipment

Flexible hoses are supplied with the Ecodan package and should be installed to connect the Ecodan to the system pipework, do not over tighten joints and always use the washers provided. Anti-vibration mountings (i.e. Tico-pad) should be installed under the mountings of the heat pump to prevent excessive vibration.

Automatic Bypass Valve

On Ecodan systems an automatic bypass valve will only be required when TRV's are fitted to radiators in the circuit as the pumps are operated by auxiliary contacts in the 2 – port zone valves and there is no pump overrun function. It should be positioned between the flow and return of the site installed primary pipe work when required.

Any automatic bypass valve fitted should be setup correctly at commissioning stage to suit the heating system. Failure to do this correctly can have a detrimental effect on the efficiencies of the heat pump system.

Installation

Ecodan Primary Circuit

The Ecodan primary circuit must be unvented due to the concentration of anti-freeze required in the pipework. Flexible hoses are supplied with the package which should be installed to connect the Ecodan to the system pipework to prevent resonance into the fabric of a property. The flow pipe from the Ecodan should be connected to the top connection of the external plate heat exchanger. All primary pipework from the Ecodan to the cylinder should be fully installed using Armaflex or similar. All joints should be taped and either weather-wrapped or put into trunking.

Central Heating Circuits

These should be sized in the normal way to suit the flow and return temperatures for the required system. Balancing of a radiator circuit is essential to achieve the best performance from an Ecodan.

If the Ecodan is being fitted to an existing heating system, this **must** be thoroughly flushed/cleaned before the appliance is installed.

Plastic Pipework

Plastic pipework can be used internally as long as it is recommended by the manufacturer and installed in accordance with their recommendations. Barrier type plastic pipework should always be used for these systems. It is important to ensure that if the system is installed using plastic pipework, it is designed and sized using the characteristics for plastic pipework.

Cylinder Specification

As a rule of thumb for the average household application the following combinations can be used, however please note these are for guidance only and must be checked by the designer and installer beforehand.

To achieve good system efficiencies higher flow rates are recommended. Using a larger cylinder than recommended will not cause the system to malfunction but will affect the efficiency of the system. A small heat pump having to heat up a large cylinder will take longer than necessary and will effect the homeowners running costs.

Due to the low flow temperatures supplied by the Ecodan the type of domestic hot water cylinder used in conjunction should meet a certain criteria to achieve the best possible performance and efficiencies.

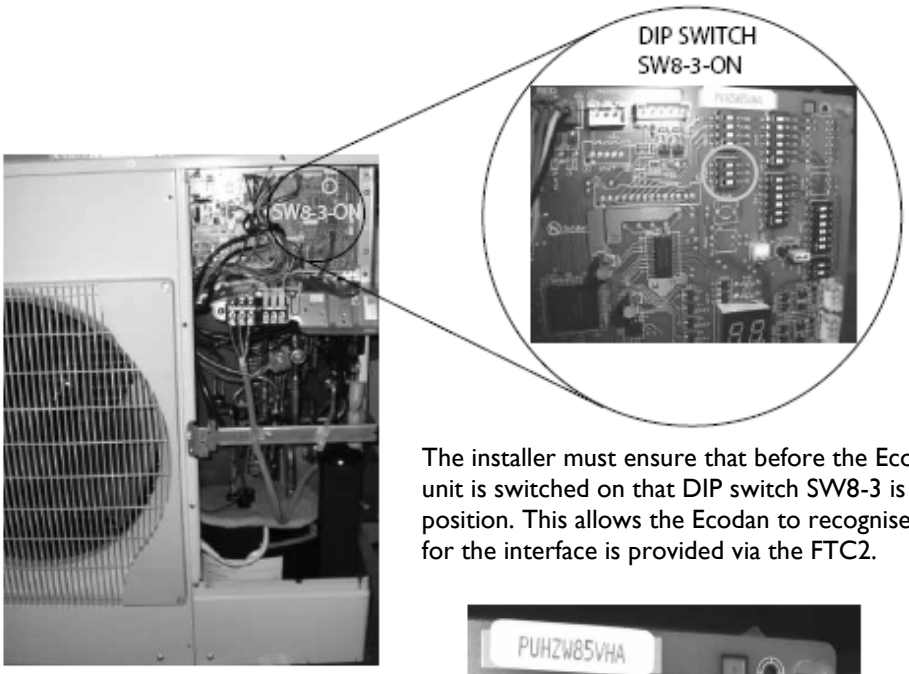
Ecodan Unit		PUHZ-W50VHA-BS	PUHZ-W85VHA(2)- BS	PUHZ-HW140VHA(2)-BS
System Requirements	Circulating Pumps*	2 x 15/50	2 x 15/50	2 x 15/60
	Minimum Flow Rate	6.5 l/m	10 l/m	17.9 l/m
	Maximum Flow Rate	14.3 l/m	25.8 l/m	40 l/m
	Pipework	22mm	22mm	28mm
Cylinder Requirements	Minimum coil surface area	2m²	3m²	3m²
	Material	Copper	Copper	Copper
	Capacity**	Up to 180 L	Up to 210 L	Up to 300 L

Table 1.2

*Pump sizes will vary with application, these are general guideline sizes only.

**General guideline sizes giving acceptable heat up times with the respective unit and providing the property with adequate hot water storage.

Electrical Connection to Ecodan



The installer must ensure that before the Ecodan outdoor unit is switched on that DIP switch SW8-3 is set to the on position. This allows the Ecodan to recognise that power for the interface is provided via the FTC2.

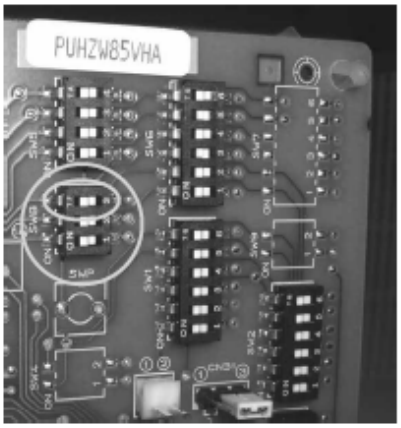


Fig. 2.2

Electrical Work

All electrical work should be completed as recommended in the relevant Ecodan installation guide supplied with the heat pump.

Notes:

1. Wiring size must comply with the applicable local and national codes.
2. Power supply cables and the cables between Interface unit/Flow Temperature Controller and outdoor unit shall not be lighter than polychloroprene sheathed flexible cables. (Design 60245 IEC 57)
3. Be sure to connect the cables between Interface unit/Flow Temperature Controller and outdoor unit directly to the units (no intermediate connections are allowed). Intermediate connections may result in communication errors. If water enters at the intermediate connection point, it may cause insufficient insulation to ground or a poor electrical contact . (If an intermediate connection is necessary, be sure to take measures to prevent water from entering the cables.)
4. Install an earth longer than other cables.

WIRING DIAGRAMS

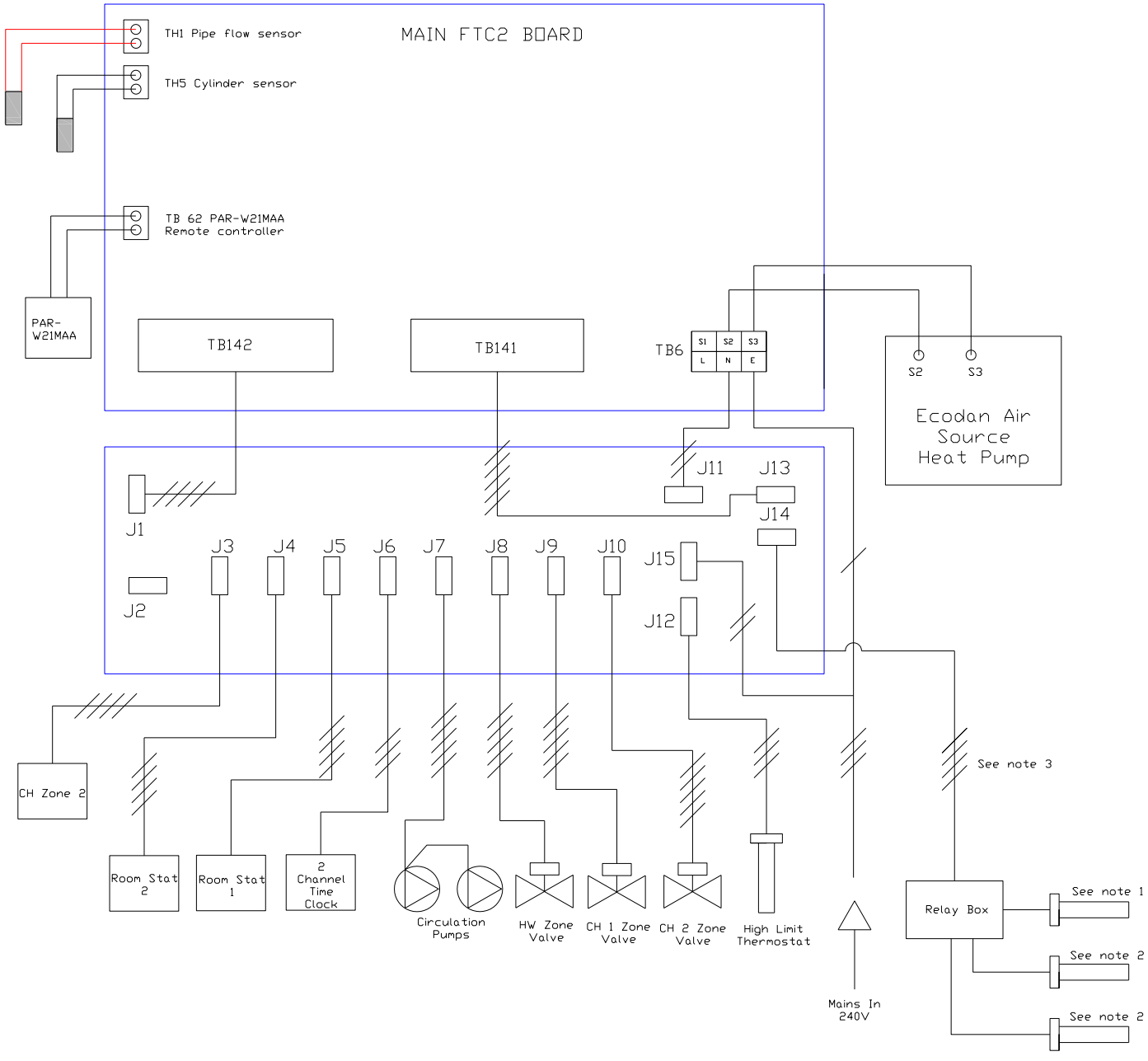
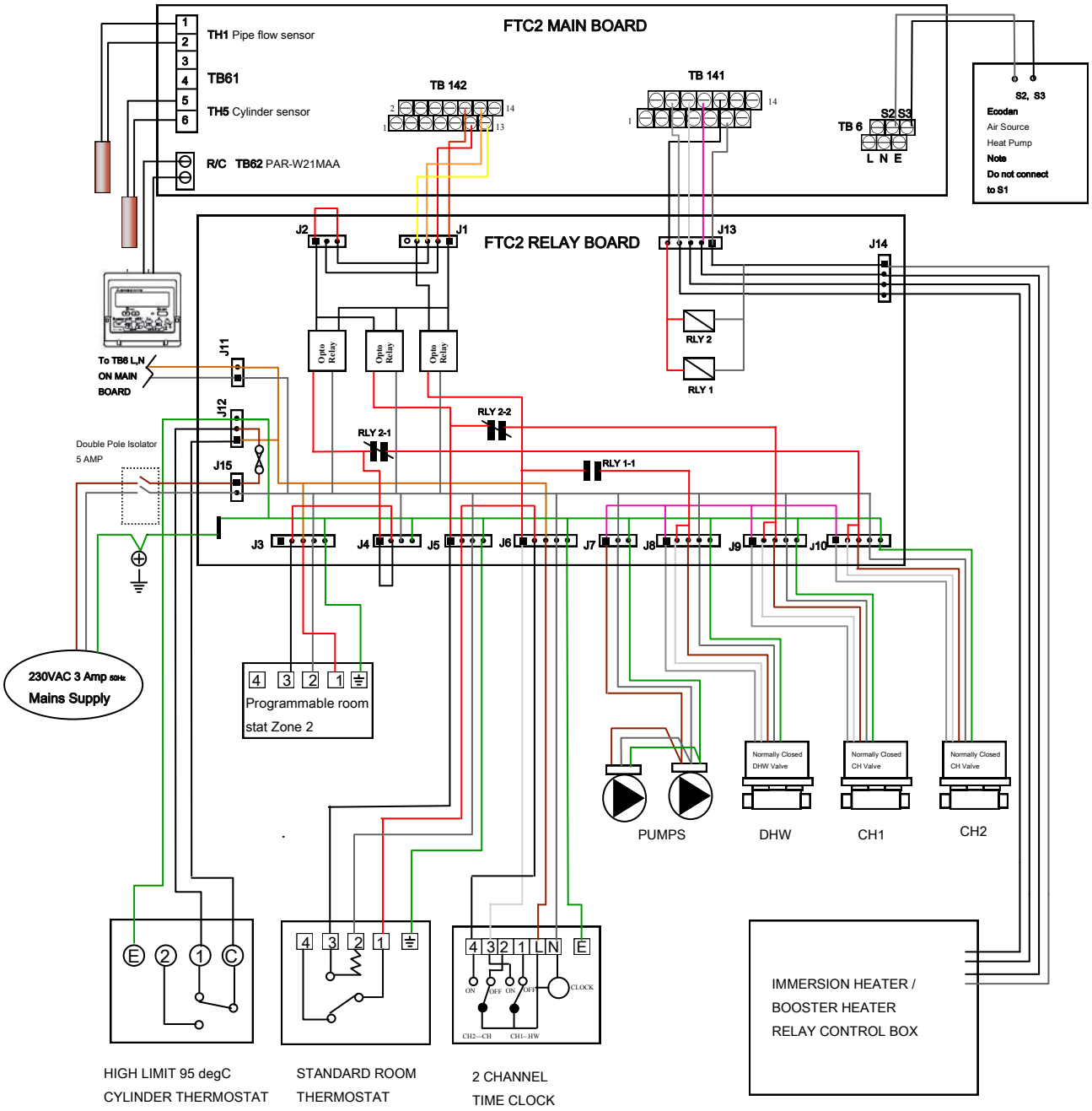


Fig. 2.3

Note 1 - Optional relay box 1 is for use with 1 x 3kW immersion heater

Note 2 - Optional relay box 2 is for use with 1 x 3kW immersion heater or 1 x 3kW boost heater

Note 3 - Interconnecting cable number of cores will vary dependant on which appliances are specified



Notes:	J ref	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
2 Channel time clock	J6	DHW	CH1	L	N	E
Time Switch Zone2	J3		CH2	L	N	E
Room Stat Zone 1	J5	S/L	L	N	E	
Room Stat Zone 2	J4	S/L	L	N	E	
Hot Water Valve	J8	S1	S2	L	N	E
Heating Valve 1	J9	S1	S2	L	N	E
Heating Valve 2	J10	S1	S2	L	N	E
Pump	J7	L	N	E		
Mains Power In	J15	L	N			
Tank over temp	J12	S1	S2	E	Short Pins 1-2 = heating only or vented cylinder systems	
Heat Eco-Heat	J2	Short Pins 1-3 = Eco-heat , Short Pins 1-2 = Boost Heat				
Immersion/Boost	J14	N	Imm.Heat	Boost 2	Boost 1	

Pin numbers, Square Pin = Pin1

Fig. 2.4

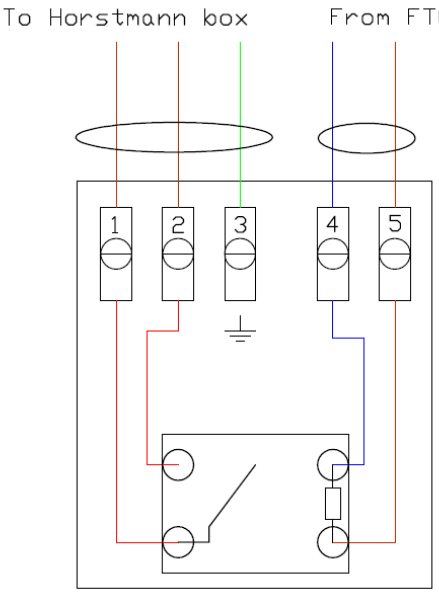
Electrical Connection

Immersion Heater Function

FTC2 has the capability to directly control the immersion heater used for periodic pasteurisation of the domestic hot water storage cylinder. The cylinder target temperature and the immersion heater frequency are selectable via DIP switch settings as displayed later in this manual (page 37). Switching of the immersion heater is performed by a separate relay box, this in turn energises a Horstmann® electronic boost control module which has the ability to override the specified FTC2 immersion heater control method in the unlikely event of a failure. The FTC2 can also be used with this setup to control inline boost heaters should this function be required.

Alternatively the immersion heater may be controlled separately. If direct control is not required then DIP switch SW1- 4 should be turned OFF and the immersion can then be controlled via its own weekly timer as with FTC1.

Relay Box Wiring Diagram



1. L_{out} to L_{out}
2. L_{in} to L_{in}
3. Earth
4. Neutral
5. L_{in}

Fig. 2.5

Horstmann® Electronic Boost Control Module Wiring Diagram

N in	=	NEUTRAL in
N out	=	NEUTRAL out to appliance
L in	=	LIVE in
L out	=	LIVE out to appliance

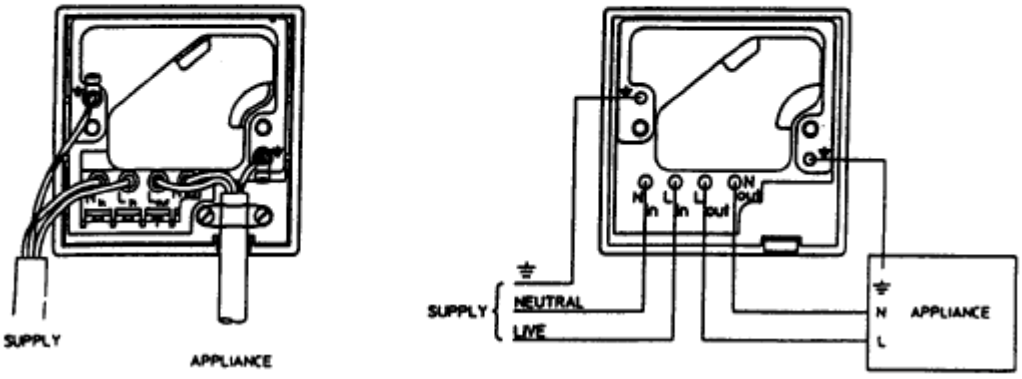


Fig. 2.6

Electrical Connection

Boost Heat Switch

The boost heat function (Plug J2) gives the option for higher flow temperatures to be constantly targeted as opposed to weather compensated heating (Eco Heat). A standard two way switch or time clock should be wired to the boost heat terminals on the FTC2. If the Ecodan system is switched off for a sustained period of time and the property cools down, the boost switch will override the economical low flow temperatures of "Heating ECO" and target a high pre-set temperature to raise the property to its design temperature in a shorter period of time. "Heating ECO" should be re-selected when the design temperature is reached to make use of the systems high efficiencies.

TH1 Flow Sensor

A flow thermistor and cable is supplied with the FTC2 package. The sensor should be fixed and insulated to common flow pipe from the Ecodan. The purpose of the thermistor is to allow the Ecodan to modulate its output dependant upon the operation mode and the required load of the property. It does this by achieving preset flow temperatures programmed through the PAR-W21MAA remote controller.

TH5 Tank Temperature Sensor

The cylinder thermistor must be mounted inside a cylinder pocket and should NOT be externally mounted to the cylinder otherwise incorrect readings may be obtained for the actual cylinder temperature

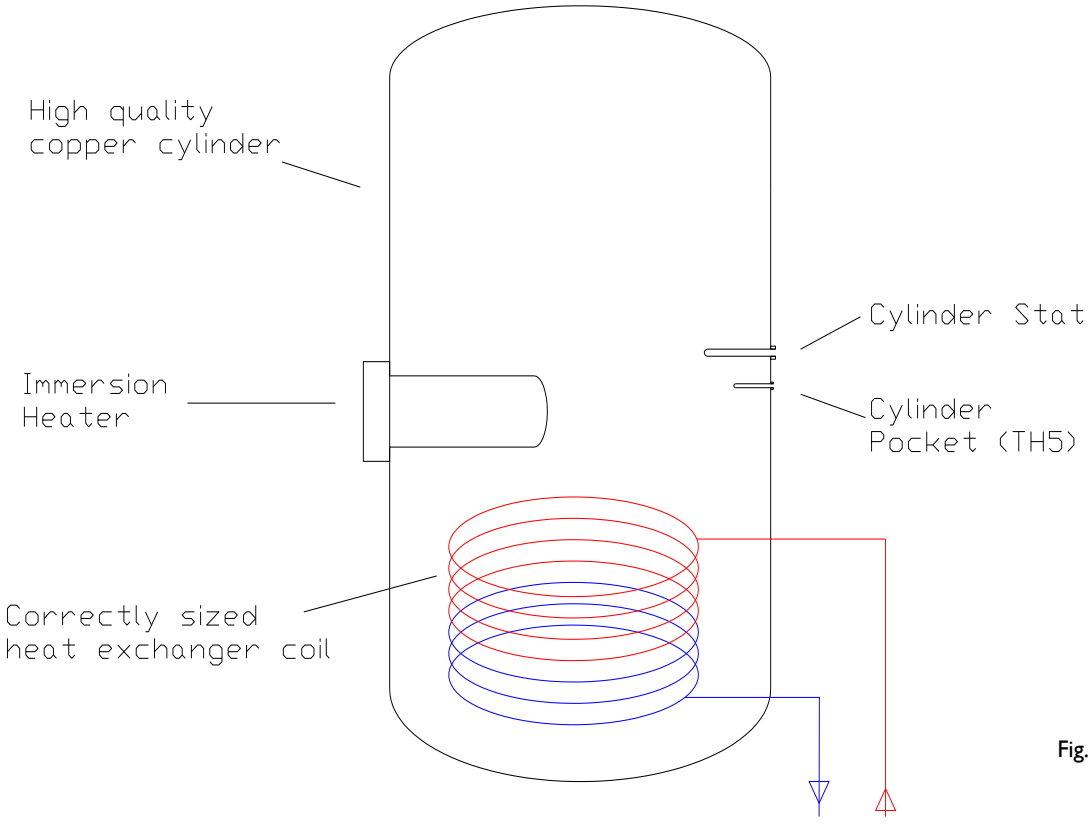


Fig. 2.7

Note

For 5kW models coil surface area should be 2m^2 and for 8.5kW and 14kW models coil surface area should be 3m^2 The cylinder pocket should be mounted 1/3 to 1/2 way up the cylinder and should be of suitable size to accept the TH5 sensor.

Electrical Connection

PAR-W21MAA Remote Controller

The PAR-W21MAA controller is supplied with the FTC2(PAR-IF031B-E) package. Its primary function is as a commissioning tool to set the target flow temperatures for central heating mode and to set the cylinder target temperature for hot water mode. To adjust all functions see pages 41 - 50. It has a display which shows the target and actual flow temperatures as well as the operating mode.

If the system is ever in a fault condition, a two digit code will flash on this controller and the operation light will flash repeatedly.

The controller should be wired as shown in Fig. 2.4 and care should be taken not to run the control cable with mains voltage cables.

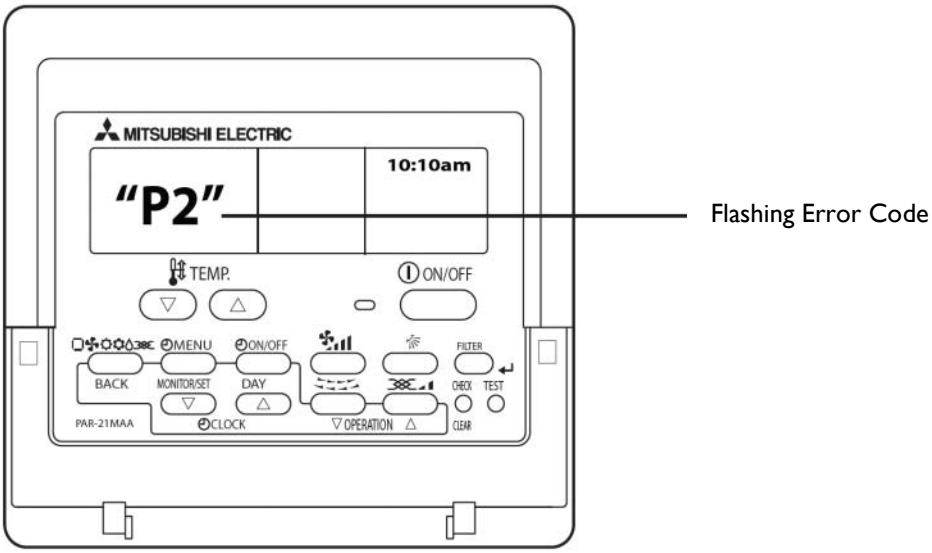


Fig 2.8

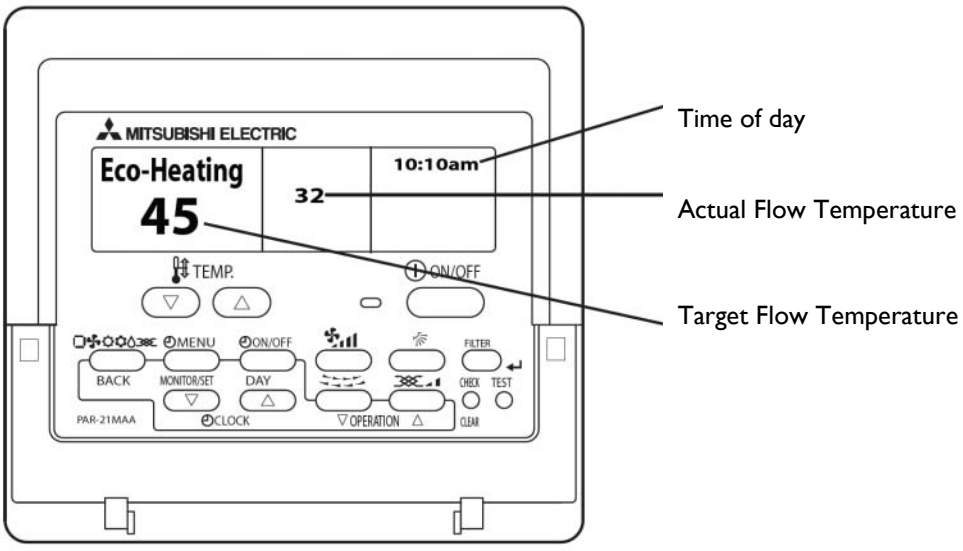


Fig 2.9

Location Requirements

Minimum Requirements for location of Ecodan. Figures stated are in mm's, figures in brackets are for PUHZ-HW140 YHA(2)-BS/VHA(2)-BS units.

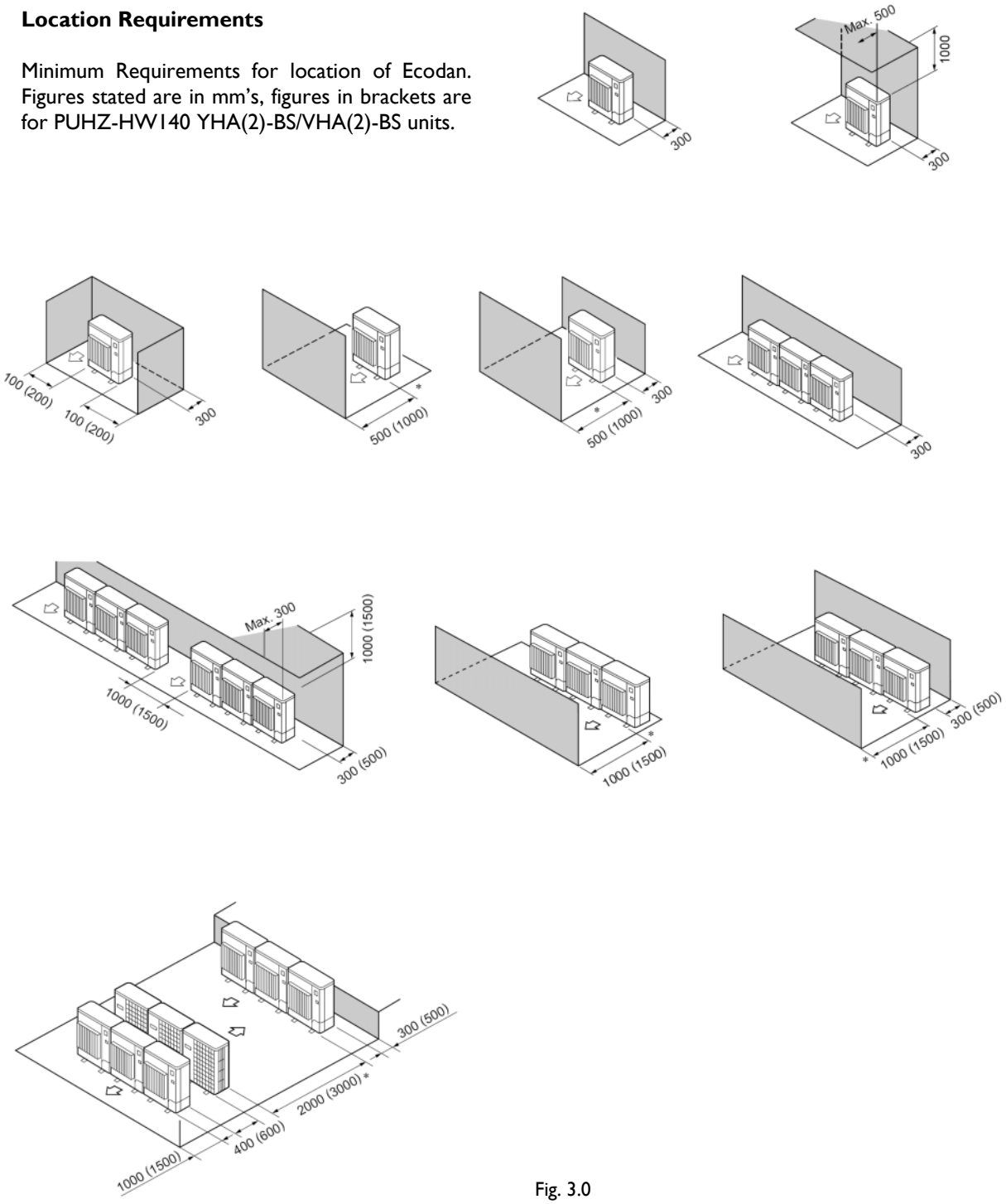


Fig. 3.0

Ecodan Installation Manual

Safety Precautions

⚠ WARNING:
Precautions that must be observed to prevent injuries or death.

⚠ CAUTION:
Precautions that must be observed to prevent damages to the unit.

After installation, perform the test run to ensure normal operation. Then explain to your customer the "Safety Precautions" use and maintenance of the unit based on the information in the Operation Manual.

⏚ Indicates a part which must be grounded

⚠ WARNING:
Carefully read the labels attached to the unit.

⚠ WARNING:

- The unit must not be installed by the user. Ask an Accredited Installer or an authorized technician to install the unit. If the unit is installed improperly, water leakage, electric shock or fire may be caused.
- The unit must be installed according to the instructions in order to minimize the risk of damages by earthquake or strong winds. An improperly installed unit may fall down and cause damages or injuries.
- The unit must be securely installed on a structure that can sustain its weight. If the unit is mounted on an unstable structure, it may fall down and cause damage or injury.
- All electric work must be performed by a qualified technician according to local regulations and the instructions given in this manual. The units must be powered by dedicated power lines and the correct voltage and circuit breakers must be used. Power lines with insufficient capacity or incorrect electrical work may results in electric shock or fire.
- Only the specified cables can be used for wiring, Connections must be made securely without tension on the terminals. If cables are connected or installed improperly, it may result in overheating or fire.
- Terminal block cover panel of the outdoor unit must be firmly fixed. If the cover panel is mounted improperly, dust and moisture may enter the unit, and it may cause electric shock or fire.
- Make sure to use accessories authorized by Mitsubishi Electric and ask an Accredited Installer or authorized technician to install them. If accessories are improperly installed, it may cause water leakage, electric shock or fire.
- Do not remodel the unit. Consult an Accredited Installer for repairs. If alterations or repairs are not performed correctly, it may cause water leakage, electric shock or fire.
- The user should never attempt to repair the unit or transfer it to another location. If the unit is installed improperly, it may cause water leakage, electric shock or fire. If the Ecodan needs to be repaired or moved, ask an authorized technician.
- After installation has been completed, make sure that refrigerant does not leak. If refrigerant leaks and comes into contact with a flame, poisonous gases will be released.
- Use clean water which meets water quality standards. The deterioration of water quality may result in the system breakdown or water leakage.
- Never use anything other than water as a medium. It may cause a fire or an explosion.
- Do not use heated water that is produced by the Ecodan directly for drinking or cooking. There is a risk to damage your health. There is also a risk that installing the water heat exchanger may corrode if the necessary water quality for the air to water heat pump system cannot be maintained. If you wish to use the heated or cooled water from the heat pump for these purposes, take measures such as to isolate the second heat exchanger within the water piping system.

BEFORE INSTALLATION

⚠ CAUTION:

- Do not use the unit in an unusual environment. If the heat pump is installed exposed to steam, volatile oil (including machine oil), sulphuric gas, exposed to briny air, or covered with snow, the performance can be significantly reduced and the internal parts can be damaged.
- Do not install the unit where combustible gas accumulates around the unit, it may cause fire or explosion.
- The outdoor unit produces condensate during the heating operation. Make sure to provide drainage

The outdoor unit produces condensate during the heating operation. Make sure to provide drainage

around the outdoor unit if such condensate is likely to cause problems such as freezing over in cold weather.

- When installing the unit within the grounds of a hospital or a building where communication equipment is installed, you may need to take measures to reduce noise and electronic interference. Inverters, home appliances, high-frequency medical equipment and radio communications equipment can cause the air to water heat pump to malfunction or to breakdown. At the same time, the noise and electronic interference from the air to water heat pump unit may disturb the proper operation of medical equipment, and communications equipment.

BEFORE INSTALLATION (RELOCATION)

⚠ CAUTION:

- Be very careful when moving units. The unit must be carried by at least 2 people, as it weighs 50kg or more. Do not hold the packaging bands. Wear protective gloves to unpack and to move or install it, in order to prevent hands being injured by fins or the edges of other parts.
- Be sure to safely dispose of the packaging materials. Packaging materials, such as nails and other metal or wooden parts may cause injuries.
- The base of the outdoor unit must be periodically checked to ensure it is not loose, cracked or damaged. If such defects are left untreated the unit may fall down and cause damage or injuries.
- Do not wash the heat pump unit. You may receive an electric shock.

BEFORE ELECTRIC WORK

⚠ CAUTION:

- Be sure to install a circuit breaker. If it is not installed, there may be a risk of electric shock.
- For the power lines, use standard cables of sufficient capacity. Otherwise, it may cause a short circuit, overheating or fire.
- When installing the power lines, do not apply tension to the cables. The cables may be cut or overheated resulting in a fire.
- Make sure to ground the unit. Do not connect the ground wire to gas or water pipes, lightning rods, or telephone grounding lines. If the unit is not properly grounded, there may be a risk of electric shock.
- Make sure to use circuit breakers (ground fault interrupted, isolating switch (+B fuse), and moulded case circuit breaker) with the specified capacity. If the circuit breaker capacity is larger than the specified capacity, breakdown or fire may result.

BEFORE STARTING THE TEST RUN

⚠ CAUTION:

- Turn on the main power switch more than 12 hours before starting operation. Starting operation immediately after turning on the power switch can severely damage the internal parts. Keep the main power switch turned on during the operating period.
- Before starting operation, check that all panels, guards and other protective parts are correctly installed. Make sure not to get injured by touching rotating, hot or high voltage parts.
- Do not touch any switch with wet hands. There may be a risk of an electric shock.
- Do not touch the refrigerant pipes with bare hands while the unit is running. The refrigerant pipes can be hot or cold depending on the condition of the flowing refrigerant. There may be a risk of burns or frostbite.
- After stopping operation, make sure to wait at least five minutes before turning off the main power. Otherwise, it may cause water leakage or breakdown.

Installation Location

CHOOSING THE OUTDOOR UNIT INSTALLATION LOCATION

- Select a location where the noise emitted by the unit does not disturb neighbours.
- Select a location where easy wiring and pipe access to the power source is available.
- Avoid locations where combustible gases leak, are produced, flow, or accumulate.
- Note that condensate water may be produced by the unit during operation.
- Select a level location that can bear the weight and vibration of the unit.
- Avoid locations where the units can be covered with snow. In areas where heavy snow fall is anticipated, special precautions must be taken to prevent the snow from blocking the air intake such as install the unit

at a higher position or installing a hood on the air intake. This can reduce the airflow and the unit may not operate properly.

- Avoid locations where the unit is exposed to oil, steam or sulphuric gas.
- Make sure to hold the handles to transport the unit. Do not hold the base of the unit, as there is a risk that hands or fingers may be trapped.

WINDY LOCATION INSTALLATION:

When installing the outdoor unit on a rooftop or other location where the unit is exposed to strong wind, do not face the air outlet of the unit directly into the winds. Strong wind entering the air outlet may impede the normal airflow and it may result in a malfunction.

The following (Fig.3.1) shows three examples of precautions against strong winds.

1. Face the air outlet towards the nearest available wall keeping about 50cm distance
2. Install an operational air guide if the unit is installed in a location where strong winds such as a typhoon , etc, may directly blow to the air outlet.
3. Position the unit so that the outlet air can blow at a right angle to the seasonal wind direction, if possible.

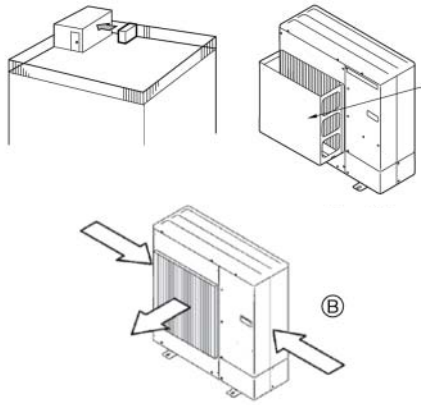


Fig. 3.1

NECESSARY SPACE TO INSTALL:

When installing a single outdoor unit (refer to page 23)

When installing multiple outdoor units (refer to page 23)

Foundation Specification	
Foundation bolt	M10 (3/8")
Thickness of concrete	120mm
Length of bolt	70mm
Weight-bearing capacity	320kg

Table 1.3

Installation Procedure

Be sure to install the unit on a solid, level surface to prevent rattling noises during operation.

- Make sure that the length of the foundation bolt is within 30mm from the surface of the base.
- Secure the base of the unit firmly with 4 M10 foundation bolts in solid locations.

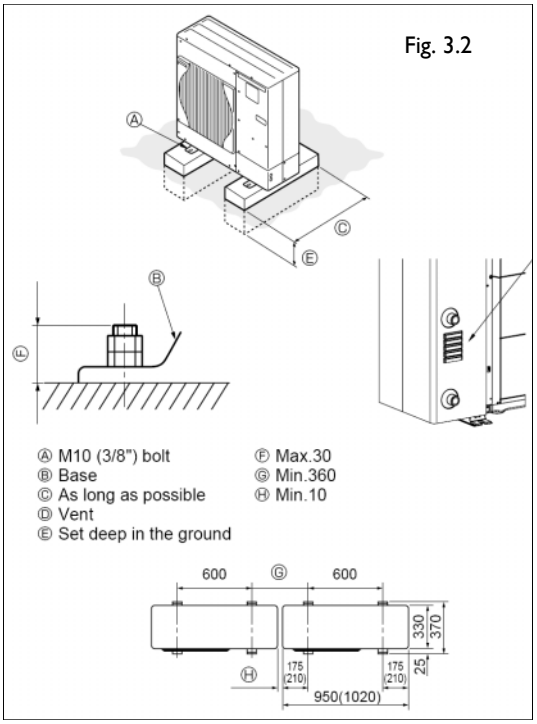
INSTALLING THE OUTDOOR UNIT:

- Do not block the vent. If the vent is blocked, operation will be hindered and the unit may breakdown.
- If additional fixation of the unit is necessary, use the installation holes on the back of the unit to attach wires, etc, with self-tapping screws (Ø5 x 15mm or less).

⚠ WARNING:

- The unit must be securely installed on a structure that can sustain its weight. If the unit is mounted on an unstable structure, it may fall down and cause damage or injuries.
- The unit must be installed according to the instructions in order to minimise the risk of damage by earthquakes, typhoons, or strong winds. An improperly installed unit may fall down and cause damage or injuries.

Fig. 3.2



Optional parts name	Model name
Drain socket	PAC-SG61DS-E
Drain pan for 50/85	PAC-SG64DP-E

Table 1.4

Drainage Piping Work

Outdoor unit pipe connection

When drain piping is necessary, use the drain socket or the drain pan (option)

*There is no optional drain pan for the PUHZ-HW140VHA(2)-BS/ YHA(2)-BS.

Water Piping Work

WATER PIPING CONNECTION:

- Connect the water pipes to the outlet and inlet pipes (ISO 228/1-G1B)
- Inlet and outlet pipes position is shown on Fig 3.3
- Install the hydraulic filter at the water intake
- Maximum allowance torque at the water piping connection is 50N/m
- Check if water leaks after installation
- Inlet water gauge pressure must be between 0-0.3MPa
- Use the inlet water of higher than 5°C and lower than 55°C

Note: The water velocity in pipes should be kept within certain limits of the material to avoid erosion, corrosion and excessive noise generation. Be aware, and take care of velocities in small pipes, bends and similar obstructions that can exceed the values above.
E.g. Copper : 1.5m/s

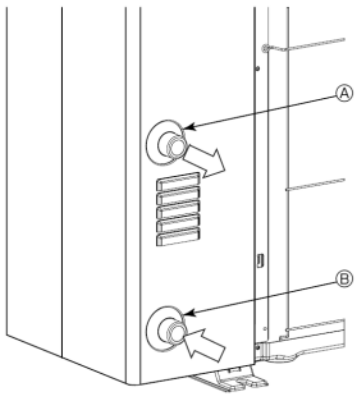


Fig. 3.3

WATER QUALITY CONDITION:

- The water in a system should be clean and with a pH value of 6.5-8.0
- The following are the maximum values:
  - Calcium: 100mg/L
  - Chlorine: 100mg/L
  - Iron/Manganese: 0.5mg/L

Note: Make sure to perform the frozen prevention measure for water pipe system. (Water piping insulation, back-up pump system, using of a certain % ethylene glycol instead of normal water). Insulate the water piping properly. The performance can be poor if the insulation is insufficient.

⚠ WARNING
The outlet water temperature can reach 60°C at maximum, do not touch the water piping directly with bare hands.

Outdoor unit model			PUHZ-W50VHA	PUHZ-W85VHA (2)-BS	PUHZ-HW140VHA (2)-BS	PUHZ-HW140YHA (2)-BS
Outdoor unit power supply			~/N (single), 50Hz, 230V	~/N (single), 50Hz, 230V	~/N (single), 50Hz, 230V	3N (3 phase), 50Hz, 415V
Outdoor unit Circuit Breaker Capacity		*1	16 A	25 A	40 A	16 A
Wiring Wire No. x size (mm^2)	Outdoor unit power supply, earth		3 x Min. 1.5	3 x Min. 4	3 x Min. 6	5 x Min. 1.5
	Flow temp. controller– outdoor unit	*2	2 x 1.5 (polar)	2 x 1.5 (polar)	2 x 1.5 (polar)	2 x 1.5 (polar)
	Remote controller—Interface unit/ Flow temp. controller		2 x 0.3 (non-polar)	2 x 0.3 (non-polar)	2 x 0.3 (non-polar)	2 x 0.3 (non-polar)
Circuit rating	Outdoor unit L-N (single) Outdoor unit L1-N, L2-N, L3-N (3 phase)	*3	AC 230 V	AC 230 V	AC 230 V	AC 230 V
	Interface unit/Flow temp. controller-outdoor unit S2-S3	*3	DC 24 V	DC 24 V	DC 24 V	DC 24 V
	Remote controller-Interface unit/Flow temp. controller	*3	DC 12 V	DC 12 V	DC 12 V	DC 12 V

Table 1.5

*1 A breaker with at least 3.0mm contact separation in each poles shall be provided. Use earth leakage breaker (NV).
*2 Max. 80m
*3 The figures are NOT always against the ground.
S3 terminal has DC 24V against S2 terminal.

Notes

1. Wiring size must comply with the applicable local and national codes.
2. Power supply cables and the cables between Interface unit/Flow Temperature Controller and outdoor unit shall not be lighter than polychloroprene sheathed flexible cables (Design 60245 IEC 57)
3. Be sure to connect the cables between Interface unit/Flow Temperature Controller and outdoor unit directly to the units (no intermediate connections are allowed). Intermediate connections may result in communication errors. If water enters at the intermediate connection point, it may cause insufficient insulation to ground or a poor electrical contact. (If an intermediate connection is necessary, be sure to take measures to prevent water from entering the cables.)
4. Install an earth longer than other cables.

⚠ WARNING:
In case of A-control wiring, there is high voltage potential on the S3 terminal caused by electrical circuit design that has no electrical insulation between power line and communication signal line. Therefore, please turn on the main power when servicing.

FTC2 Installation Manual

Safety Precautions

⚠ WARNING:
Precautions that must be observed to prevent injuries or death.

⚠ CAUTION:
Precautions that must be observed to prevent damages to the unit.

After installation, perform the test run to ensure normal operation. Then explain to your customer the safety precautions, use and maintenance of the unit based on the information in the operation manual.

⏚ Indicates a part which must be grounded

⚠ WARNING:
Carefully read the labels attached to the unit.

⚠ WARNING:

- All electric work must be performed by a qualified technician according to local regulations and the instructions given in this manual. The units must be powered by dedicated power lines and the correct voltage and circuit breakers must be used. Power lines with insufficient capacity or incorrect electrical work may result in electric shock or fire.
- Only the specified cables can be used for wiring, Connections must be made securely without tension on the terminals. If cables are connected or installed improperly, it may result in overheating or fire.
- Terminal block cover panel of the outdoor unit must be firmly fixed. If the cover panel is mounted improperly, dust and moisture may enter the unit, and it may cause electric shock or fire.
- Make sure to use accessories authorised by Mitsubishi Electric and ask an Accredited Installer or authorised technician to install them. If accessories are improperly installed, it may cause water leakage, electric shock or fire.
- Do not remodel the unit. Consult an Accredited Installer for repairs. If alterations or repairs are not performed correctly, it may cause water leakage, electric shock or fire.
- The user should never attempt to repair the unit or transfer it to another location. If the unit is installed improperly, it may cause water leakage, electric shock or fire. If the FTC2 needs to be repaired or moved, ask an authorised technician.

BEFORE INSTALLATION

⚠ CAUTION:

- Do not install the FTC2 unit in an outdoor location as it is designed for indoor installation only. Otherwise electric shock or breakdown may be caused by water, wind or dust.
- Do not use the unit in an unusual environment. If the FTC2 unit is installed or exposed to steam or volatile oil (including machine oil), or sulphuric gas, or exposed to briny air, the internal parts can be damaged.
- Do not install the unit where combustible gases may leak, be produced, flow or accumulate. If combustible gas accumulates around the unit, it may cause fire or explosion.
- Do not wash the FTC2 unit. You may receive an electric shock.

BEFORE ELECTRIC WORK

⚠ CAUTION:

- Be sure to install a circuit breaker. If it is not installed, there may be a risk of an electric shock.
- For power lines, use standard cables of sufficient capacity. Otherwise, it may cause a short circuit, overheating, or fire.
- When installing power lines, do apply tension to the cables. The cables may be cut or overheat, resulting in a fire.
- Make sure to ground the unit. Do not connect the ground wire to gas or water pipes, lightning rods, or telephone grounding lines. If the unit is not properly grounded, there may be a risk of electric shock.
- Make sure to use circuit breakers (ground fault interrupter, isolating switch (+B fuse), and moulded case circuit breaker) with the specified capacity. If the circuit breaker capacity is larger than the specified capacity, breakdown or fire may result.

BEFORE STARTING THE TEST RUN

⚠ CAUTION:

- Turn on the main power switch of the outdoor unit more than 12 hours before starting operation. Starting operation immediately after turning on the power switch can severely damage the internal parts. Keep the main power switch turned on during the operation period.
- Before starting operation, check that all protective parts are correctly installed. Make sure not to get injured by touching high voltage parts.

- Do not touch any switch with wet hands. There may be a risk of an electric shock.
- After stopping operation, make sure to wait at least 5 minutes before turning off the main power. Otherwise, it may cause breakdown.

ELECTRIC BOOSTER AND IMMERSION HEATERS

⚠ WARNING:

- FTC2 has signal outputs for the booster heater however it can not isolate power to them in the event of overheating. All electrical heaters used on the water circuit must have:

  Cut-out mechanism to prevent overheating or a thermostat to prevent overheating

CHOOSING THE FTC2 UNIT INSTALLATION LOCATION

- Do not install the FTC2 in outdoor location as it is designed for indoor installation only. The FTC2 circuit board and casing are not waterproof.
- Avoid locations where the heat unit is exposed to direct sunlight or other sources of heat.
- Select a location where easy wiring access to the power source is available.
- Avoid locations where combustible gases may leak, be produced, flow or accumulate.
- Select a level location that can bear the weight and vibration of the unit.
- Avoid locations where the unit is exposed to oil, steam, or sulphuric gas.
- Do not install in a location that is hot or humid for long periods of time.

The FTC2 unit should be supplied with the following parts
1. FTC2 unit x 1
2. Thermistor x 2 (TH1 Red Cable & TH5 Black Cable)
3. Remote controller cable (5m) x 1
4. Remote controller x 1

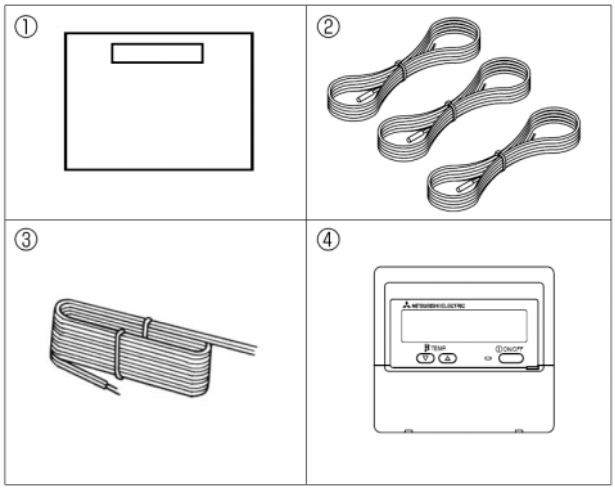


Fig. 3.4

INSTALLING THE FTC2 UNIT

Remove 2 screws from FTC2 unit and remove the cover. Install the 4 screws into the 4 holes.

A Screw
B Cover
C Hole for installation

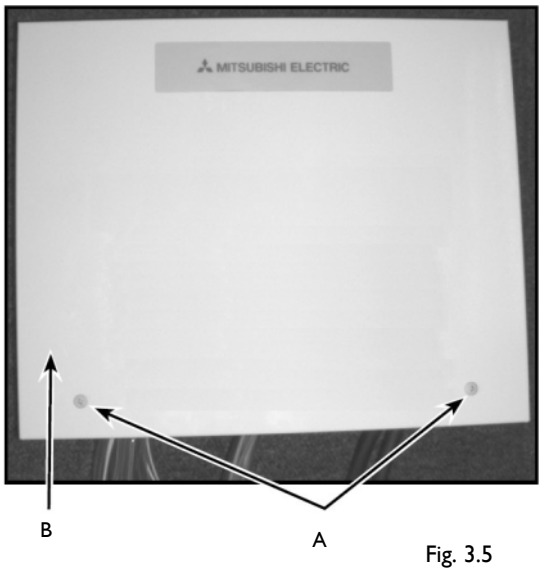


Fig. 3.5

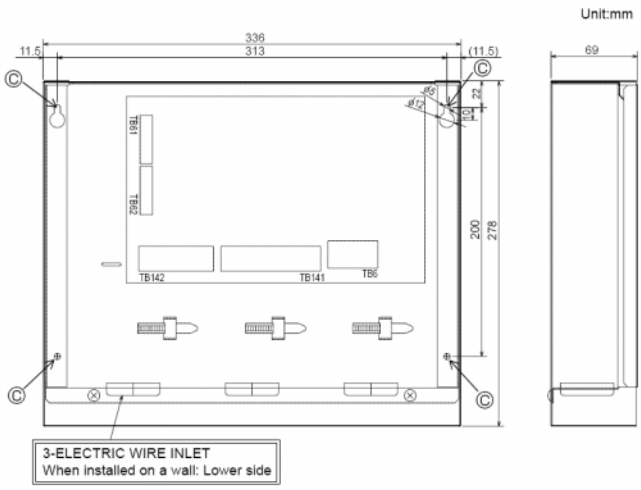


Fig. 3.6

INSTALLATION: FTC2

Connecting the wired remote controller

CONNECTING THE WIRED REMOTE CONTROLLER TO FTC2
Connect the wired remote controller cable to 5 and 6 on the terminal block (TB62) on the FTC2 controller. Fig. 4.3
Wire No. x size (mm²) : 2 x 0.3 (non-polar)
The 5m wire is attached as an accessory. Max. 500m
Wiring size must comply with the applicable local and national codes.
Circuit rating: DC12V
Circuit rating is NOT always against the ground.

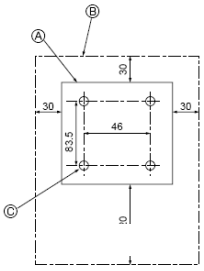


Fig. 4-1

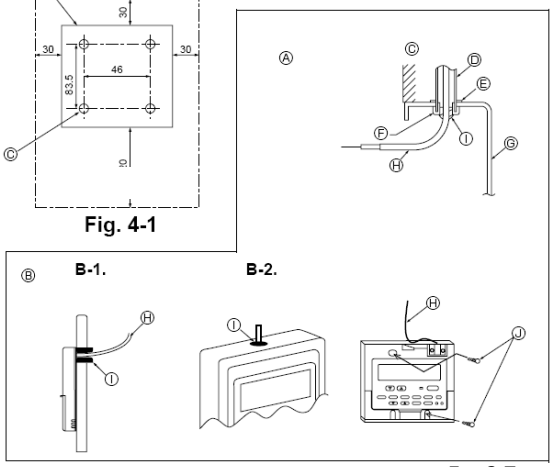


Fig. 3.7

FOR WIRED REMOTE CONTROLLER
Installing procedures
Obtain the following parts:

- 2 piece switch box
- Thin copper conduit tube
- Lock nuts and bushings

A remote controller profile
B Required clearances surrounding the remote controller
C Installation pitch

Seal the entrance for the remote controller with putty to prevent possible liquids entering or insects.
A For installation in the switch box
B For direct installation on the wall, select one of the following:

Prepare a hole through the wall to pass the remote controller cable (in order to take out the remote controller cable from the back), then seal the hole with putty.
Take out the remote controller cable through the cut-out upper case, then seal the out-out notch with putty.

B-1 To lead the remote controller cable from the back of the controller.
B-2 To take out the remote controller cable through the upper portion.

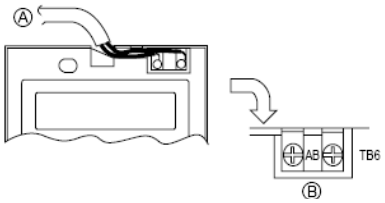


Fig. 3.8

C Wall	G Switch box
D Conduit	H Remote controller cable
E Lock nut	I Seal with putty
F Bushing	J Wood screw

WIRING SPECIFICATION OF EXTERNAL INPUT
Locally supplied parts

Connecting thermistor cables

CONNECTING THERMISTOR CABLE (TH1)
Connect the thermistor for the actual flow water temperature to 1 and 2 on the terminal block (TB61) on the FTC2 controller. When the thermistor cables are too long, cut them at the appropriate length. Do not bend them in the FTC2 unit. Thermistor contacts are non polar.

Thermistor position
Put TH1 on water piping (water outlet side) after booster heater. Be sure to attach the TH1 where it detects flow temperature (water outlet side) correctly.

Thermistor position
TH2 sensor is not required for packaged type system as it is used to monitor refrigerant pipe temperature on split type systems.

CONNECTING THERMISTOR CABLE (TH5)
Connect the thermistor for the actual domestic hot water cylinder temperature to 5 and 6 on the terminal block (TB61) on the FTC2 controller. When the thermistor cables are too long, cut them at the appropriate length. Do not bend them in the FTC2 unit.

Thermistor position
Put the TH5 on the domestic hot water cylinder. It should be positioned inside the cylinder pocket

Caution: Do not route the thermistor cables together with power cables. The sensor part of the thermistor should be installed where the user can not touch it; (separated by the supplementary insulation from where user may touch).

Item	Name	Model and specification
External input function	External input signal wire	Use sheathed vinyl coated cord or cable. Max. 10m Wire type: CV, CVS or equivalent Wire size: Stranded wire 0.5mm² to 1.25mm² Solid wire: Ø0.65mm to Ø1.2mm
	Switch	Non-voltage "a" contact signals, Remote switch: minimum applicable load DC 12V, 1mA

Table 1.6

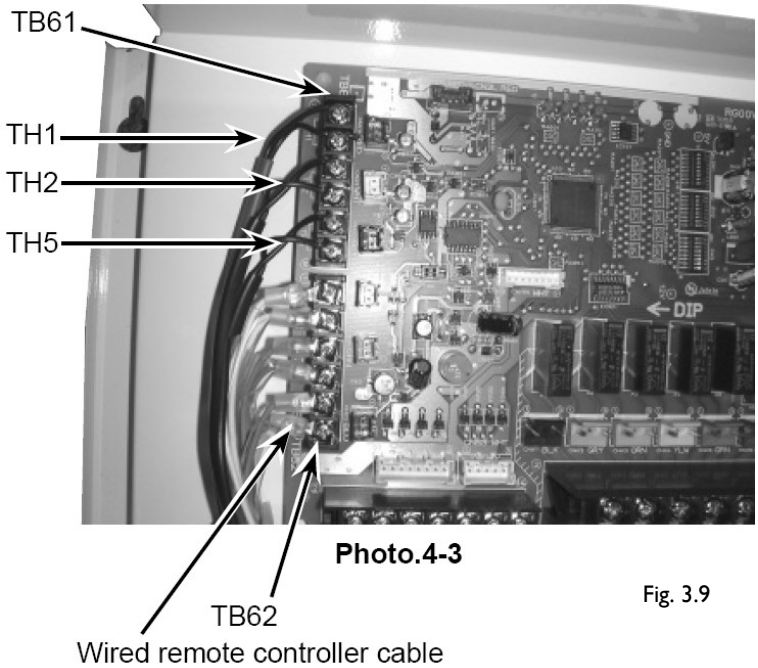


Photo.4-3

Fig. 3.9

Type	DHW tank	TH1	TH2	TH5
Packaged Type	Present	O	X	O
	Absent	O	X	X

Table 1.7

O: Necessary. Connect the thermistor
X: Not necessary: The thermistor is not required, do not connect

Domestic hot water (DHW) off condition
Domestic hot water can be selected in 2 ways

Pattern 1.
An external input or remote controller is used to switch to domestic hot water mode.
Domestic hot water pattern 1 will turn off when the domestic hot water tank reaches set temperature consecutively for 1 minute. Then the Ecodan will turn off.

Pattern 2.
Automatic change over mode or an external input (e.g. Local timer—signal received must last > 5 seconds) is used to switch to domestic hot water mode.
Domestic hot water pattern 2 will switch off under the following conditions:
A) The domestic hot water tank reaches set temperature THW consecutively for 1 minute
B) The system has been in domestic hot water mode consecutively for Htime (minutes)

System operation status at start-up	Htime (minutes)
• First power-on • First starting up after initial filling up • TH5 <25°C (tank temperature is low)	300
Others	180

As shown in the table, Htime becomes longer when the water temperature in the tank is low. This is to delay the operation switchover to Heating mode.

Table 1.8

Domestic Hot Water Heating Procedure
The heating of domestic hot water tank is done in 2 stages, firstly the "Heat pump phase" followed by the "Electric heater phase"

HEAT PUMP PHASE
The heat pump phase for domestic hot water mode, is used when the temperature difference between tank set temperature and TH5 is either 10°C or 20°C (ΔTH)

SW2-1	Operation
OFF	ΔTH = 10°C
ON	ΔTH = 20°C

Table 1.9

Usually with inverter type outdoor unit, the operation frequency is reduced as it approaches the set temperature to keep it constant. In domestic hot water mode, the co-efficient of performance gets worse and operating times become longer if the operation frequency is reduced. Therefore in domestic hot water mode, the frequency shall be controlled by the FTC2, not the outdoor unit.

ΔTH selected using Dip SW2-1
The heat pump will turn off or revert to heating when:
Tank temperature (TH5) > domestic hot water set temperature consecutively for 1 minute.

Heat pump operation
The heat pump will be controlled directly by the FTC2 while in domestic hot water mode. The operational characteristics can be selected using Dip SW2-2

Option 1—COP priority mode
In this mode Ecodan will heat the water over a slightly longer period of time with a controlled frequency, improving the COP. The result of this will be a more economical domestic hot water heat up.

Option 2—Speed priority mode
In this mode the heat pump will run at maximum frequency during DHW heat up. The result of this will be a reduced time to heat the tank but also a reduction in COP and so an increase in energy consumption.

SW 2-2	Operation
OFF	COP Priority mode: Operation frequency is controlled to have higher COP.
ON	Speed priority mode: Heat pump unit runs at the maximum frequency to reduce operational time.

Table 2.0

There is a 30 second delay in the Ecodan start to ensure the water circulation pump starts running before the Ecodan. When the Ecodan unit stops running, the pump will stop at the same time in order to avoid the tank releasing the internal heat.

HEATER SETTING

Set Dip SW1-4 according to whether the system has an Immersion heater.

Table 2.1

SW 1-4	Setting
OFF	Without immersion heater
ON	With immersion heater

Set Dip SW1-5 according to the location of Booster heater.

Table 2.2

SW 1-5	Setting
OFF	For both domestic hot water and heating
ON	For heating only or without booster heater

Summary: Heater setting

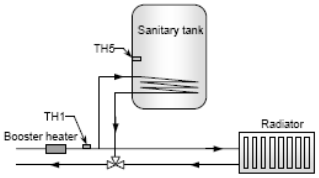
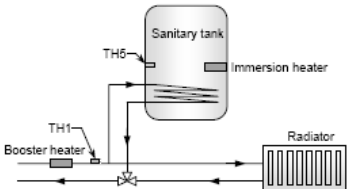
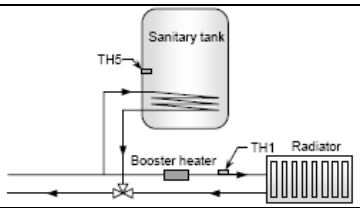
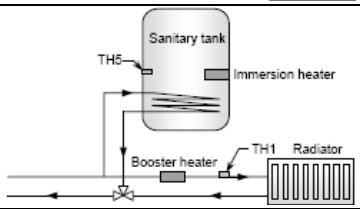
SW 1-4 Immersion heater	SW 1-5 Booster heater position	Diagram
OFF (without immersion heater)	OFF (For both DHW and heating)	
ON (with immersion heater)	OFF (For both DHW and heating)	
OFF (without immersion heater)	ON (For heating only)	
ON (with immersion heater)	ON (for heating only)	

Table 2.3

THERMISTOR SETTING

Set Dip SW 1-3 according to whether the system has a domestic hot water tank. When Dip SW 1-3 is ON, domestic hot water mode is NOT available Set Dip SW1-6 according to the Ecodan type.

SW 1-3	Setting	Notes
OFF	With DHW tank	Necessary to connect TH5
ON	Without DHW tank	NOT necessary to connect TH5

Table 2.4

SW 1-6	Setting	Notes
ON	Packaged type	NOT necessary to connect TH5

Table 2.5

Electrical heater phase in Domestic Hot Water mode

1) HEAT PUMP UNIT
Heat pump unit operation changes according to the Dip SW setting.

Heat pump unit keeps running with the following switch setting. Electrical heater phase TYPE A.
SW1-5 OFF (Booster heater: for both DHW and Heating)

Heat pump unit stays in thermo OFF with the following switch setting. Electrical heater phase TYPE B.
SW1-4 ON (Immersion heater exits) and
SW1-5 ON (Booster heater: for Heating only) and
SW2-7 OFF (Immersion heater is in use)

2) WATER CIRCULATION PUMP
Water circulation pump operation changes according to the Dip SW setting.

Water circulation pump is switched to ON with the following switch setting. Electrical heater phase TYPE A.
SW1-5 OFF (Booster heater: for both DHW and Heating)
Once the booster heaters are ON, water circulation pump keeps running for 1 minute after the Booster heaters are OFF.

Water circulation pump is switched to ON with the following switch setting. Electrical heater phase TYPE B.
SW1-4 ON (Immersion heater exists) and
SW1-5 ON (Booster heater: for Heating only) and
SW2-7 OFF (Immersion heater is in use).

3) 3-PORT VALVE (2 x 2 Port Valves)
3-port valve operation changes according to the Dip SW setting.

3-port valve is switched ON with the following switch setting. Electrical heater phase TYPE A.
SW1-5 OFF (Booster heater: for both DHW and Heating)

Once the Booster heaters are ON, 3-port valve remains ON for 1 minute after the Booster heaters are switched OFF.

3-port valve is switched OFF with the following switch setting. Electrical heater phase TYPE B.
SW1-4 ON (Immersion heater exists) and
SW1-5 ON (Booster heater: for heating only) and
SW2-7 OFF (Immersion heater is in use).

4) BOOSTER HEATER 1 (optional)
Booster heater 1 is switched ON with the following switch setting. SW1-5 OFF (Booster heater: for both DHW and Heating). The heater will not operate unless there has been an insufficient rise in flow temperature for the first 40 minutes. Electrical heater phase TYPE A.

5) BOOSTER HEATER 2 (optional)
Booster heater 2 is switched ON with the following switch setting. SW1-5 OFF (Booster heater: for both DHW and Heating). The heater will not operate unless there has been an insufficient rise in flow temperature for 30 minutes after boost heater 1 has been energised. Electrical heater phase TYPE A.

6) IMMERSION HEATER
Immersion heater 1 is switched ON with the following switch setting. SW1-4 ON (Immersion heater exists) and SW2-7 OFF (Immersion heater is in use). Electrical heater phase TYPE A and TYPE B.

INSTALLATION: FTC2

Heating and Heating ECO mode.
Choice of either Heating or Heating ECO mode is made using the PAR-W21MAA or local controller. Both modes uses the Ecodan to heat the water to the set point (THE) and then allow for the use of Booster heaters if present on the heating circuit to raise the space heating flow temperature (TH1) if needed, however radiators should ideally be sized for lower flow temperatures in order to maximise system performance. There is a 1 minute delay before the Ecodan starts, so that the water circulation pump starts running earlier than the Ecodan.

Legionella Prevention Mode
It is recommended that sanitary hot water stored in tanks is heated periodically to 60°C or above for the prevention of legionella. In legionella prevention mode, the system runs to let the temperature in the domestic hot water tank (TH5) reach TLP °C. The temperature TLP can be set using Dip SW2-6. Provision for legionella prevention should be made in order to comply with the relevant regulations.

The 65°C setting can NOT be selected when there is no heater in the domestic hot water circuit, Dip SW settings as follows:
SW1-4 OFF and SW1-5 ON

START CONDITION AND FINISH CONDITIONS
How often the legionella prevention operation is activated by using Dip SW2-4 and 2-5.

Emergency (electric heater only) mode
Emergency mode is available in case of Ecodan's failure. In this mode, only electric heater operates as a heat source. Ecodan comes first in any operation mode, except in Emergency mode In the Emergency mode, the heater is switched ON without operating the Ecodan. If there are not electric heaters in the circuit "Emergency mode" can not operate.

Emergency mode can be activated when the system has external input (IN1) or if Dip SW3-7 is manually switched to ON.

START CONDITION
Emergency mode will start when one of the following conditions is met;
A) The system has external input (IN1) *this can be energised by shorting terminals 1&2*
B) SW3-7 is ON

Automatic change over mode
When a system includes a domestic hot water tank and a space heating requirement automatic change over mode should be selected. Selection is made with Dip SW1-8. If the system does not include a DHW tank Dip SW1-3 is ON and Automatic change over mode is invalid. It is possible to control the domestic hot water with a time clock (as with FTC1) by turning automatic change over mode off.

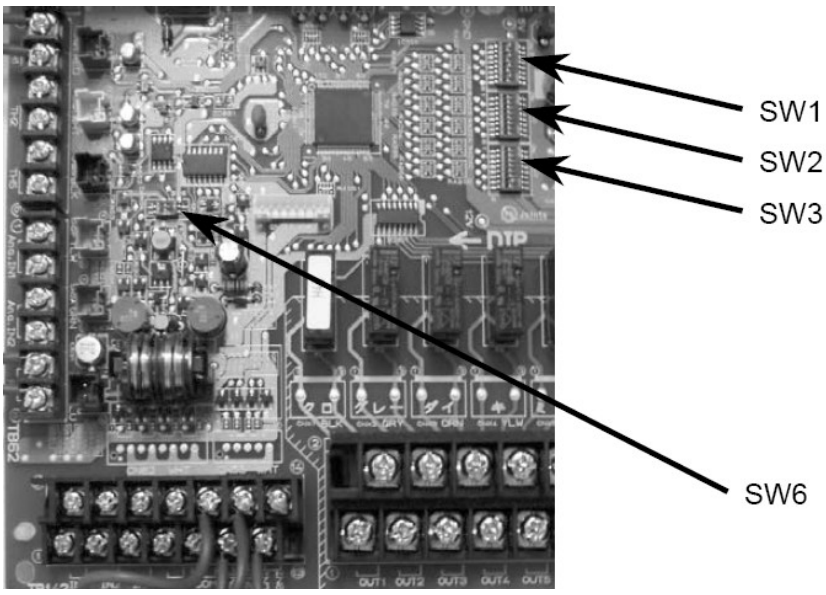


Fig. 4.0

Switch setting of FTC2
The functionality of the Ecodan is determined by the setting of the dip switches from SW1 to SW3, and SW6 found on the FTC2 controller, a summary of switch settings is shown on the next page.

Altering the factory DIP switch settings may compromise the units functionality unless their effects are fully understood.

<table>
<tr><th colspan="2">Dip switch</th><th>Factory Setting</th><th>Function</th><th>OFF</th><th>ON</th></tr>
<tr><td rowspan="2">SW1</td><td>SW1-1</td><td>ON</td><td rowspan="2">System Select</td><td colspan="2" rowspan="2">
<table>
<tr><th>SW1-1</th><th>SW1-2</th><th>ON/OFF Input</th><th>Change mode Input</th><th>Change Temp. Input</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Remote controller</td><td>Remote controller</td><td>Remote controller</td></tr>
<tr><td>ON</td><td>OFF</td><td colspan="2">External input</td><td>Remote controller</td></tr>
<tr><td>OFF</td><td>ON</td><td>Analogue input (4-20m/ A.1-5V)</td><td>External input</td><td>Analogue input (4-20mA/ 1-5V)</td></tr>
<tr><td>ON</td><td>ON</td><td colspan="2">External input</td><td>Analogue input (0-10V)</td></tr>
</table>
</td></tr>
<tr><td>SW1-2</td><td>OFF</td></tr>
<tr><td></td><td>SW1-3</td><td>OFF</td><td>Domestic Hot Water tank</td><td>With DHW tank</td><td>Without DHW tank</td></tr>
<tr><td></td><td>SW1-4</td><td>ON</td><td>Immersion heater</td><td>Without Immersion heater</td><td>With Immersion heater</td></tr>
<tr><td></td><td>SW1-5</td><td>ON</td><td>Booster heater position</td><td>For both DHW and Heating</td><td>For Heating only or without Booster heater</td></tr>
<tr><td></td><td>SW1-6</td><td>ON</td><td>Connected Ecodan type</td><td>Split type*</td><td>Packaged type</td></tr>
<tr><td></td><td>SW1-7</td><td>OFF</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td></td><td>SW1-8</td><td>OFF</td><td>Automatic change over mode</td><td>With Automatic change over mode</td><td>Without Automatic change over mode</td></tr>
<tr><td rowspan="2">SW2</td><td>SW2-1</td><td>OFF</td><td>Thermo differential in DHW mode</td><td>10°C</td><td>20°C</td></tr>
<tr><td></td><td>SW2-2</td><td>ON</td><td>Ecodan control in DHW mode</td><td>COP priority mode</td><td>Speed priority mode</td></tr>
<tr><td></td><td>SW2-3</td><td>OFF</td><td>Water circulation pump in Heating mode</td><td>Always ON</td><td>Off 5 minutes after Ecodan stops.</td></tr>
<tr><td></td><td>SW2-4</td><td>ON</td><td rowspan="2">Legionella prevention mode select</td><td colspan="2" rowspan="2">
<table>
<tr><th>SW2-4</th><th>SW2-5</th><th>Operation</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Activate every DHW operation</td></tr>
<tr><td>ON</td><td>OFF</td><td>Activate every “15 times” DWH operations</td></tr>
<tr><td>OFF</td><td>ON</td><td>Activate every “150 times” DHW operations</td></tr>
<tr><td>ON</td><td>ON</td><td>Activate by external input signal (IN2)</td></tr>
</table>
</td></tr>
<tr><td></td><td>SW2-5</td><td>OFF</td></tr>
<tr><td></td><td>SW2-6</td><td>ON</td><td>Set temperature in Legionella prevention mode</td><td>60°C</td><td>65°C</td></tr>
<tr><td></td><td>SW2-7</td><td>OFF</td><td>Immersion heater usage in DHW mode</td><td>In use</td><td>Not in use</td></tr>
<tr><td></td><td>SW2-8</td><td>ON</td><td>Booster heater usage in Heating mode</td><td>In use</td><td>Not in use</td></tr>
<tr><td rowspan="8">SW3</td><td>SW3-1</td><td>OFF</td><td>3-port valve control during defrost in Heating mode</td><td>OFF (Heating circuit)</td><td>ON (Domestic Hot Water circuit)</td></tr>
<tr><td>SW3-2</td><td>OFF</td><td>Pump control for Initial filling up</td><td>OFF</td><td>ON</td></tr>
<tr><td>SW3-3</td><td>OFF</td><td>3-port valve control for Initial filling up</td><td>OFF</td><td>ON</td></tr>
<tr><td>SW3-4</td><td>OFF</td><td>External input (Analogue IN1) logic change</td><td>Comp. OFF at short</td><td>Comp. OFF at open</td></tr>
<tr><td>SW3-5</td><td>OFF</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>SW3-6</td><td>OFF</td><td>External input (IN3) logic change</td><td>Comp. OFF at short</td><td>Comp. OFF at open</td></tr>
<tr><td>SW3-7</td><td>OFF</td><td>Emergency (electric heater only) mode</td><td>Normal operation</td><td>Emergency (electric heater only mode)</td></tr>
<tr><td>SW3-8</td><td>OFF</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">SW6</td><td>SW6-1</td><td>OFF</td><td rowspan="2">Analogue input setting</td><td colspan="2" rowspan="2">
<table>
<tr><th>SW6-1</th><th>SW6-2</th><th>Analogue input setting</th></tr>
<tr><td>OFF</td><td>OFF</td><td>0-10V or Analogue input is not in use</td></tr>
<tr><td>ON</td><td>OFF</td><td>-</td></tr>
<tr><td>OFF</td><td>ON</td><td>1-5V</td></tr>
<tr><td>ON</td><td>ON</td><td>4-20mA</td></tr>
</table>
</td></tr>
<tr><td>SW6-2</td><td>OFF</td></tr>
</table>

** Split type not available*

Table 2.5

Flow chart for Automatic change over mode:

When switching operation mode, Domestic Hot Water always has the priority.

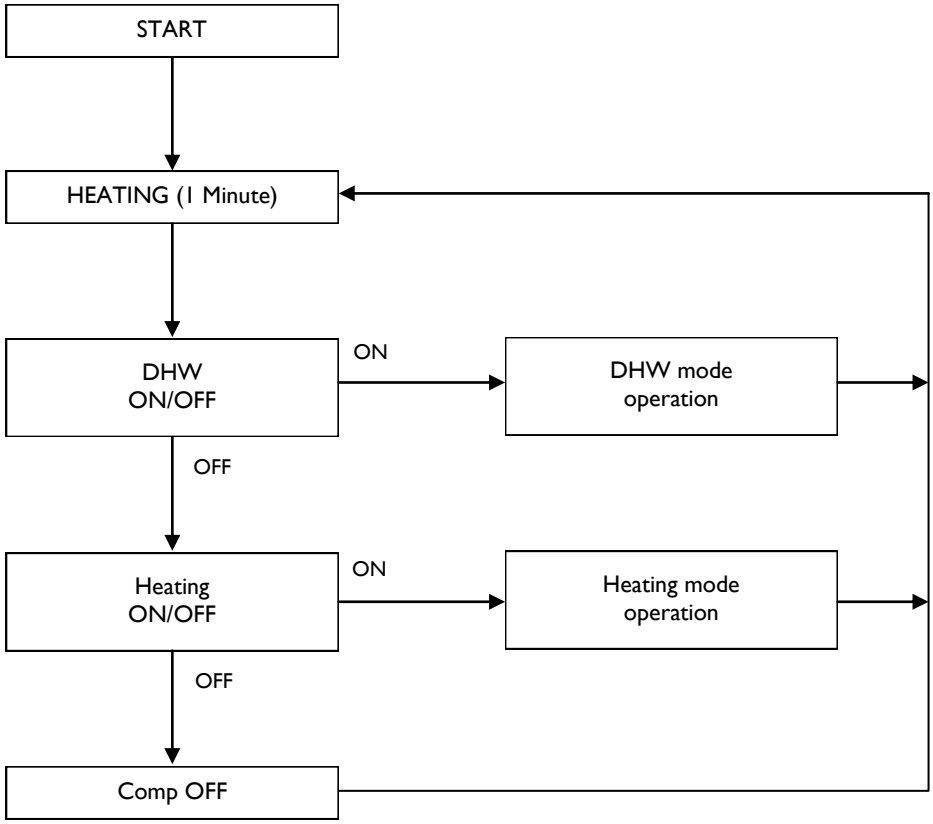


Fig 4.1

Heating mode is carried out at least 1 minute before switching for domestic hot water mode. This is to allow users to change settings in heating mode.

Before Test Run: Check
After completing the installation and the wiring and piping of the local application and outdoor units, check for refrigeration leakage, looseness in the power supply or control wiring, wrong polarity, and disconnection of one phase in the supply. Use a 500-volt megohmmeter to check that the resistance between the power supply terminals and ground is at least 1.0MΩ.

⚠ Warning:
Do not use the system if the insulation resistance is less than 1.0MΩ
⚠ Caution:
Do not carry out this test on the control wiring (low voltage circuit) terminals.

SELF-CHECK

Check code	Symptom
P1	Flow water (TH1) sensor error
P2	Refrigerant liquid pipe (TH2) sensor error
P6	Freezing/Overheating protection operation
P9	Actual tank temperature (TH5) sensor error
Fb	FTC2 unit control system error (memory error, etc)
EO~E5	Signal transmission failure between remote controller and FTC2
E6~EF	Signal transmission failure between outdoor unit and FTC2.
- - - -	No trouble generated in the past
FFFF	No corresponding unit
U*, F*	Outdoor unit failure, Refer to the outdoor unit wiring diagram.

Table. 2.6

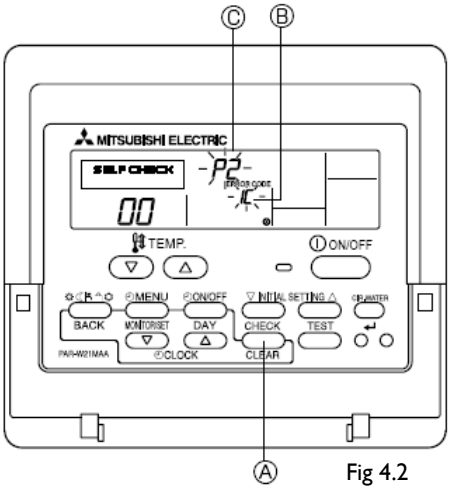


Fig 4.2

A CHECK button
B IC: FTC2 unit
OC: Outdoor unit
D Check code

1. Turn on the power

LED 1 (Power for microcomputer)	Indicates whether control power is supplied. Make sure that this LED is always lit.
LED 2(Power for remote controller)	Indicates whether power is supplied to the remote controller. This LED lights only in the case of the FTC2 unit which is connected to the outdoor unit refrigerant address "0"
LED 3 (Communication between FTC2 and outdoor unit)	Indicates states of communication between FTC2 and outdoor unit. Make sure that this LED is always blinking.
LED 4 for maintenance	-
LED 5 for maintenance	-

Table 2.7

2. Press [CHECK] button twice
3. Press [CHECK] button twice to finish self-check
For description of each LED(LED1~5) provided on the FTC2, refer to the following table

SW3-2	Operation
OFF	Water circulation pump is OFF
ON	Water circulation pump is ON. (It is switched OFF after 60 minutes consecutive operation.)

Table 2.8

INITIAL FILLING-UP
When the system is installed, the whole circuit must be filled with water. At this stage, water circulation pump and zone valves will be operated individually.

Water circulation pump operates according to Dip SW3-2 setting.

Recycling and unit disposal

This symbol mark is for EU countries only. This symbol mark is according to the directive 2002/96/EC Article 10 Information for users and Annex IV.

Your Mitsubishi Electric product is designed and manufactured with high quality material and components which can be recycled and reused. This symbol means that electrical and electronic equipment, at their end-of-life, should be disposed of separately from your household waste. Please dispose of this equipment at your local community waste collection/recycling centre. In the European Union there are separate collection systems for used electrical and electronic product. Please help us to conserve the environment we live in.

⚠ SAFETY PRECAUTIONS WARNING

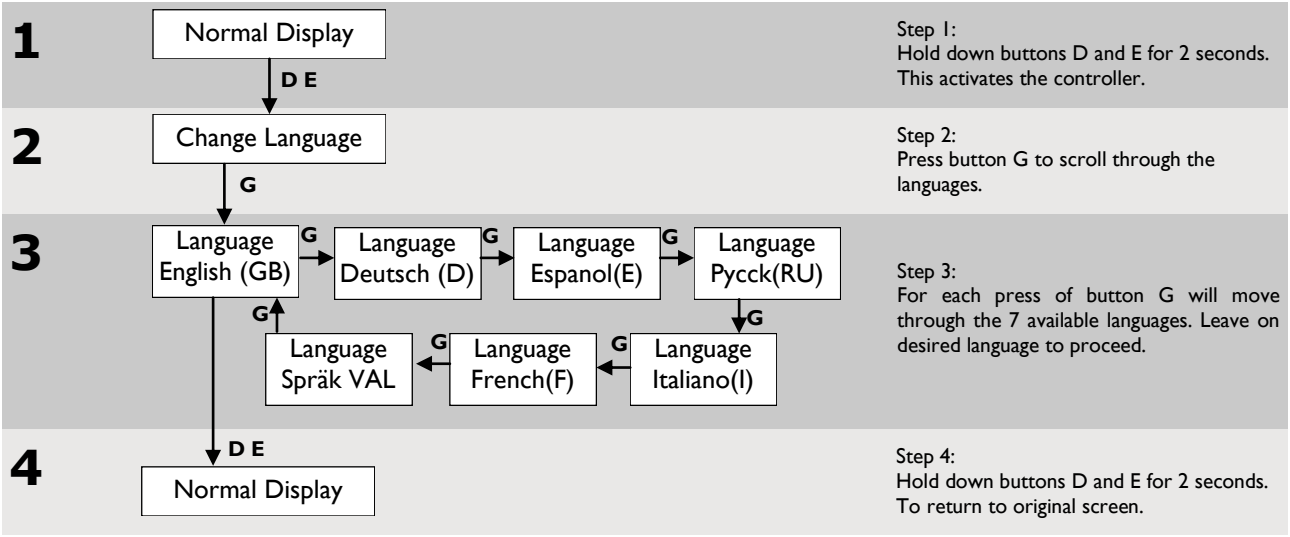
- For appliances not accessible to the general public.
- The unit must not be installed by the end-user. Ask an Accredited Installer to install the unit. If the unit is installed improperly, water leakage, electric shock or fire may result.
- Do not stand on, or place any items on the unit.
- Do not splash water over the unit and do not touch the unit with wet hands. An electric shock may result.
- Do not spray combustible gas close to the unit. Fire may result.
- Do not place a gas heater or any other open-flame appliances where it will be exposed to the air discharged from the unit. Incomplete combustion may result.
- Do not remove the front panel or the fan guard from the outdoor unit when it is running.
- If any abnormal noise or vibrations occur, stop operation, turn off the power switch and contact your installer.
- Never insert fingers, sticks, etc into the intakes or outlets.
- If odd smells are detected stop using the unit, turn off the power switch and contact your installer. Otherwise, a breakdown, electric shock or fire may result.
- This unit is not intended for use by children without supervision.

⚠ CAUTION

- Do not use any sharp object to push the buttons, as this may damage the remote controller.
- Never block or cover the indoor or outdoor unit's intakes or outlets.

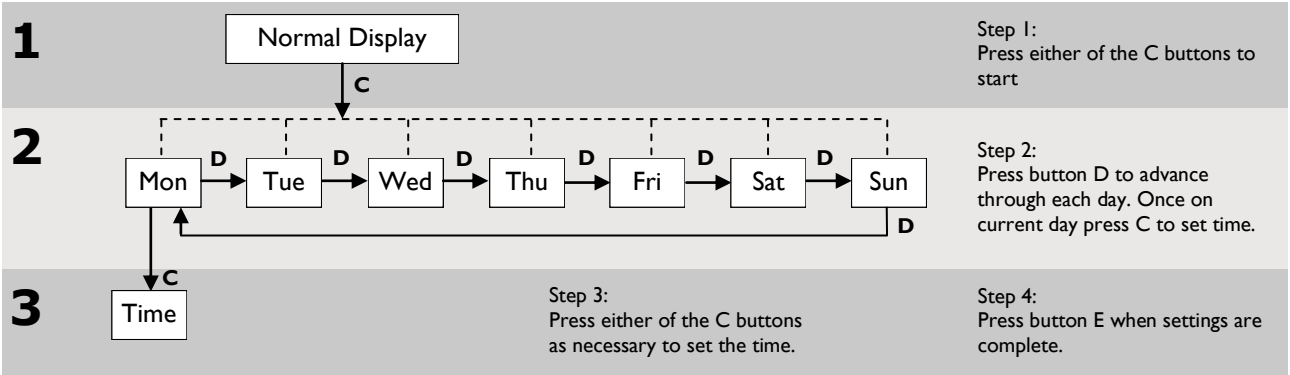
Change Language

The initial language setting is English. If you require to change this, follow the 4 steps below. The instructions in this guide use English for the annotated displays, whatever language is selected the sequence combination of the buttons will not alter.



Setting day of the week and time

The day and time will run from the day the system is switched on. To change these settings please following instructions.



As you hold the C button down, the time (displayed at 1) will increment first in one minute intervals, then in ten minute intervals, and then in one hour intervals. This works in either direction.

"PLEASE WAIT" message is displayed for approximately 3 minutes when power is supplied to the FTC2 unit or when the unit is recovering from a power failure.

"NOT AVAILABLE" message is displayed if a button is pressed to operate a function that the FTC2 unit does not have, or a function that is not available due to the setting.

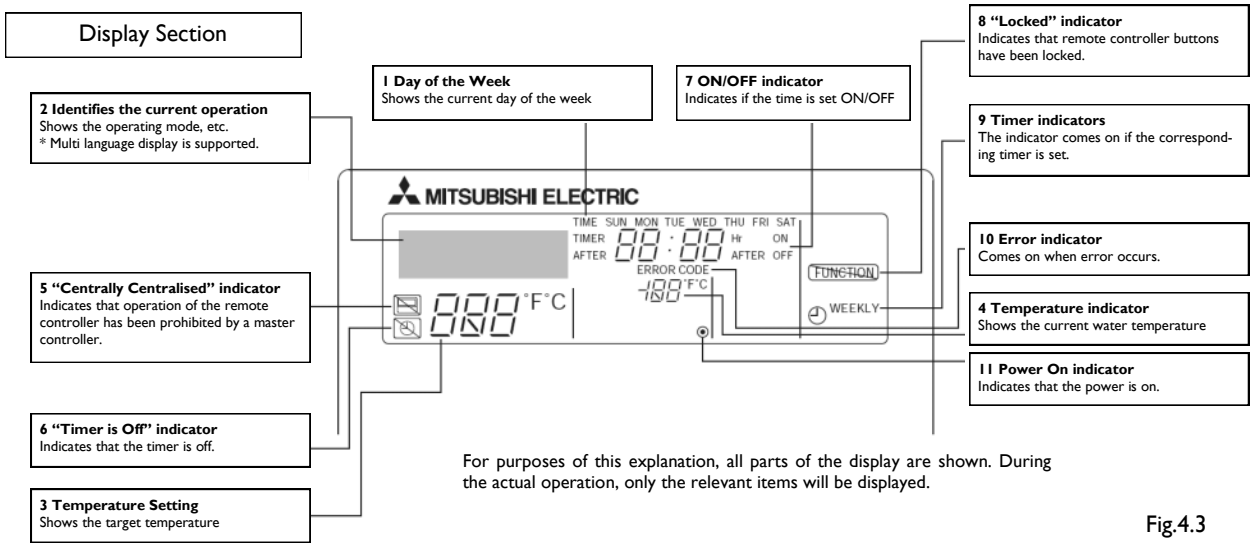
At this stage the controller has only been used for basic settings, there are still further functions that require setting-up.

Throughout the system set-up buttons on the controller are referenced by letters and displays by numbers ; this key can be found on page 41

System Set-up Procedure

Controller: PAR-W21MAA

The PAR-W21 controller is used to optimise the running of the system, set-up the heating parameters and select the available modes. It should not be used for timing purposes, instead use the 2 channel time clock. Listed below are all the available buttons and displays on the LCD screen. The following pages explain the setting up of the functions for the Ecodan.



For purposes of this explanation, all parts of the display are shown. During the actual operation, only the relevant items will be displayed.

Fig.4.3

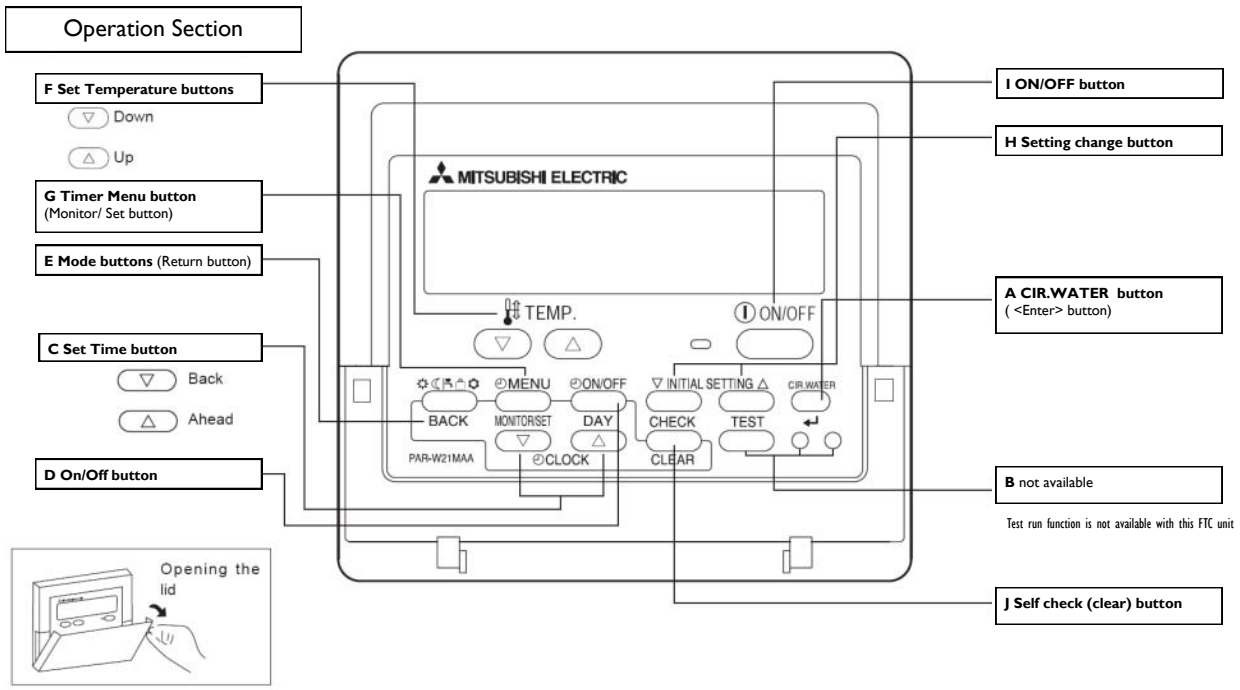
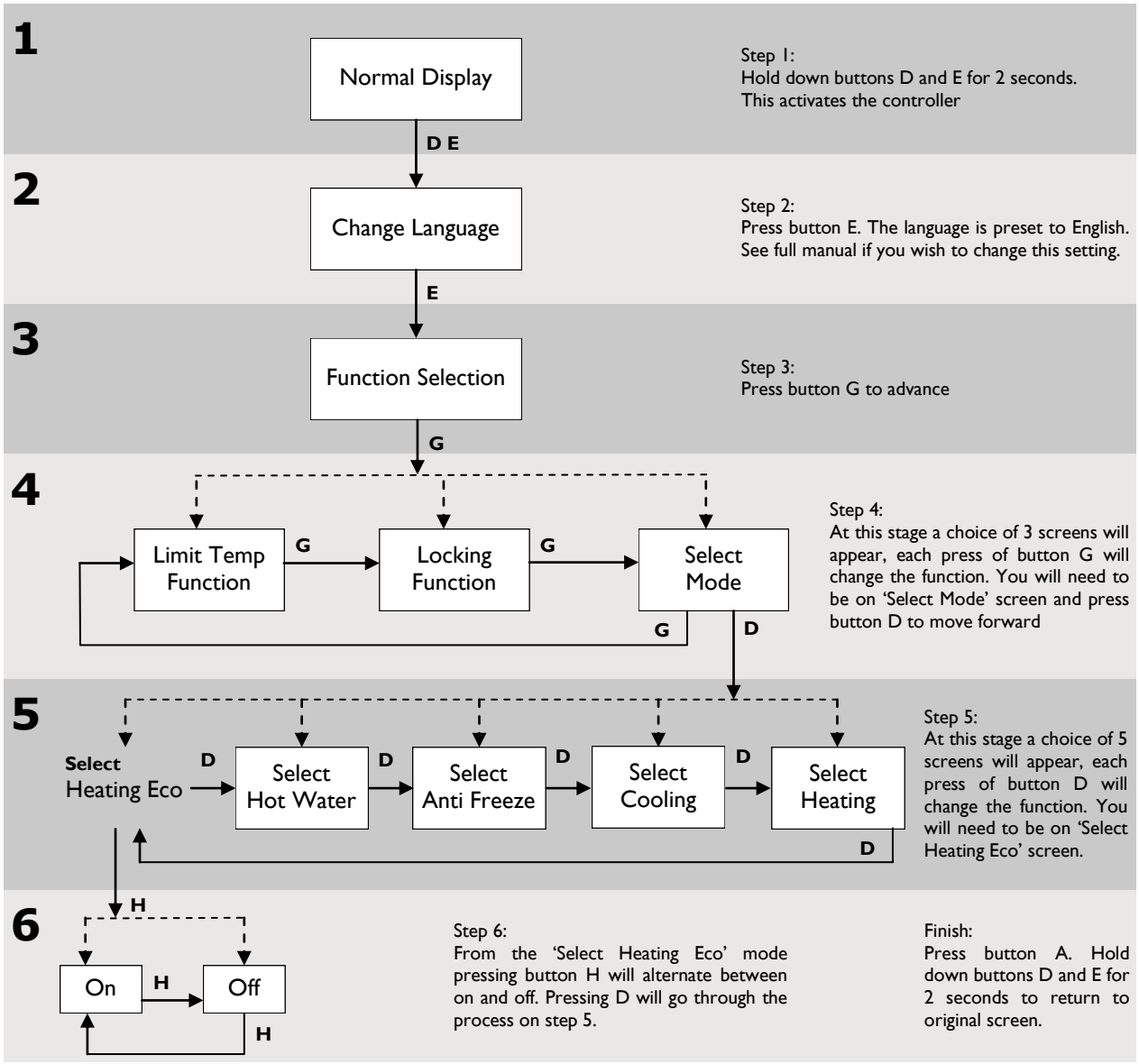


Fig. 4.4

This icon is shown with the corresponding target temperature determined by DIP SW2-6 before the system is due to perform an immersion heater cycle.

Heating Set-up (Heating ECO Mode)

Whilst heating a property Heating ECO is the recommended mode to use instead of just the heating mode. Using this will enable the Ecodan to run more efficiently. This function sets the target temperature depending on the outdoor temperature, weather compensation is explained on page 46.

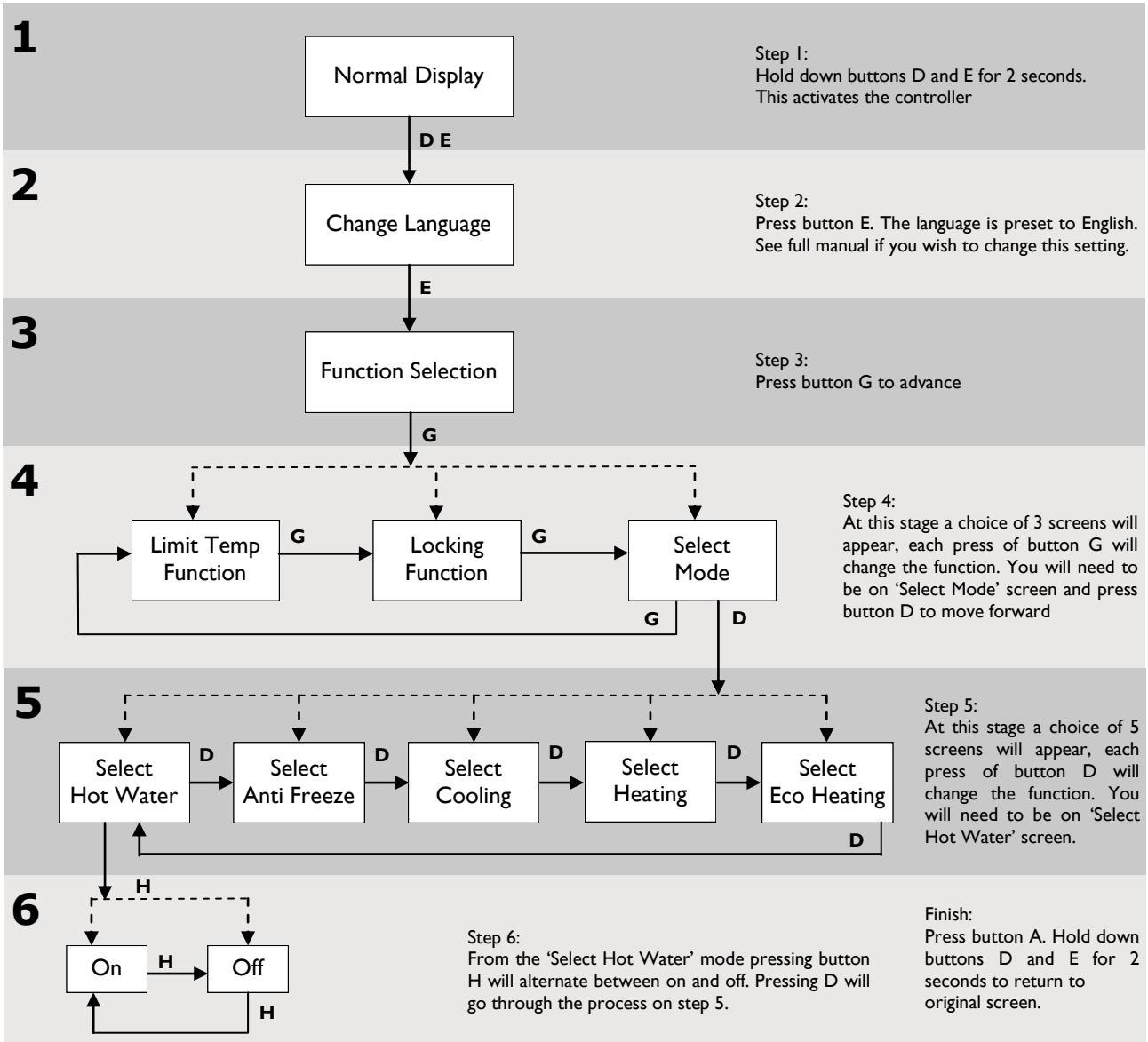


When setting up the controller, pressing button A must be used to memorize the settings.

Throughout the system set-up buttons on the controller are referenced by letters and displays by numbers ; this key can be found on page 41

Hot water set-up

To set-up hot water uses a similar process to that of the 'Heating ECO' mode. The first four steps are the same, then the activation of the hot water mode is required. Hot water temperatures can not be changed dependent on the outdoor conditions, they will remain constant. The factory settings for the flow temperature is 50°C but this should be increased to 55°C.



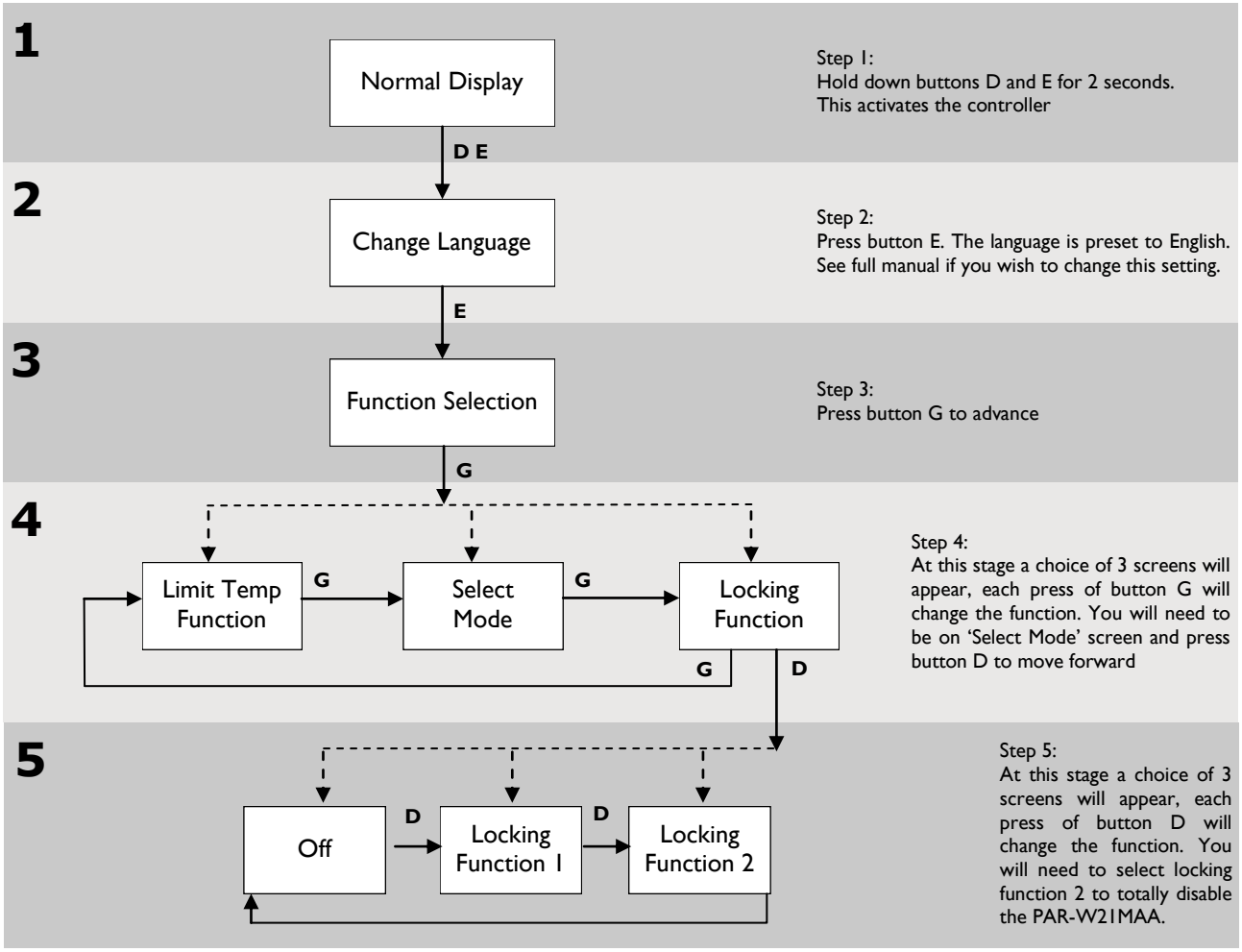
PAR-W21MAA Hot Water mode	Factory Settings	Recommended Settings
	50°C	55°C

Table 2.9

Throughout the system set-up buttons on the controller are referenced by letters and displays by numbers ; this key can be found on page 41

Locking Function

To ensure that the Ecodan is only operated by signals from the two channel programmer it is necessary to undertake the following procedure and lock the controller as part of the commissioning stage. When this function is activated it is not possible to unnecessarily operate the Ecodan when there is no demand for either central heating or hot water.



Finish:
Press button A. Hold down buttons D and E for 2 seconds to return to original screen.

PAR-W21MAA Hot Water mode	Factory Settings	Recommended Settings
	50°C	55°C

Table 2.9

Throughout the system set-up buttons on the controller are referenced by letters and displays by numbers ; this key can be found on page 41

Weather compensation:

These are used for variable operating conditions. At cooler outdoor temperatures the flow temperature will be hotter; while warmer outdoor temperatures provide very little heating. A cut-off temperature will not provide any heating. These set parameters create a "weather compensation curve" that dictate the required flow temperatures. This function is only available when Heating ECO mode is activated, this is a far more efficient way to operate Ecodan.

The recommended settings are listed within table below.

PAR-W21MAA: Recommended Settings (Heating Eco mode)		Factory Settings		Example Settings	
		Ambient	Flow	Ambient	Flow
Low-ambient (No.1)	Under-floor	-10°C	38°C	-2°C	40°C
	Radiator			-2°C	45°C
High-ambient (No.2)	Under-floor	17°C	25°C	15°C	30°C
	Radiator			15°C	35°C

Table 3.0

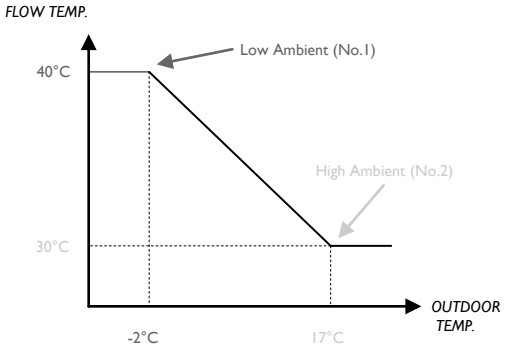


Fig.4.5

Higher efficiencies hence lower running costs are achieved with lower flow temperatures.

The temperatures should be set by the commissioning engineer in accordance with the system design and the buildings thermal properties.

Heat Emitters (Radiators/Under-floor heating)

Please note that heat pumps provide lower flow temperatures to radiators than a conventional gas boiler. Rather than the radiators turning on/off locally as with a gas boiler, heat pumps provide a more consistent lower flow temperature which allows for more efficiency and greater comfort.

Please note the temperature given are for guidance only. The flow temperatures required will vary on the construction of the radiators or under-floor heating system as well as the heat load of the room/house. The installer should set-up the system to these temperatures but they can be altered later on if required. Fine tuning of the operating conditions of the Ecodan unit can reduce your energy bills, dropping just the flow temperature 1°C can make a difference to the bill.

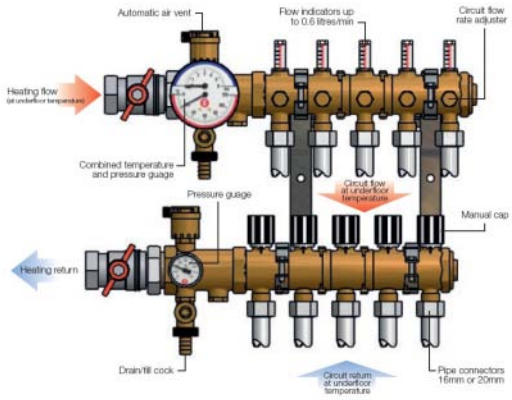
** To avoid damage to timber floors it is advised to check with underfloor heating manufacturers flow temperatures.*

Throughout the system set-up buttons on the controller are referenced by letters and displays by numbers ; this key can be found on page 41

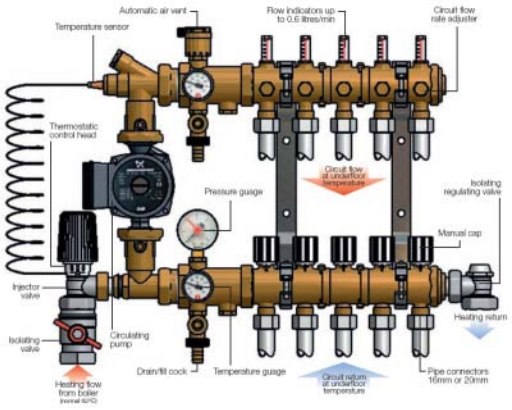
Underfloor heating

Heat pumps provide lower flow temperatures than traditional gas fired boilers, this means that the installation conditions and heat emitters need to be managed carefully. These lower flow temperatures suit the conditions required for under-floor heating systems and if installed and designed correctly can deliver a more comfortable, consistent temperature whilst also increasing the efficiency. Some points to note when designing the installation are :

- Room by room thermostats ensure adequate control in all rooms
- Temperature difference across the flow and return should be less than 10°C (5°C for the Ecodan)
- Use of night-set back instead of turning the system to off, reduces the desired temperatures by around 3-4°C from their daytime levels if desired
- However, response times from underfloor heating are much slower than radiators and therefore the property will take longer to heat up making this type of system less suitable for timed heating cycles
- Any additional radiators should be sized on the flow temperatures used for the under-floor heating, this negates the need for mixing valves, which are detrimental to the efficiency



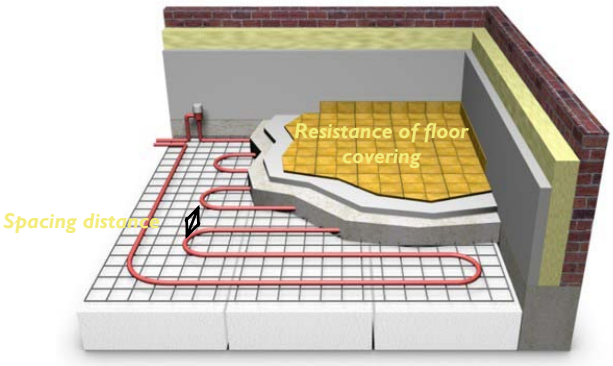
Flow temperature set for under-floor



Flow temperature too high, mixing valve required

When specifying under-floor heating there are some important factors to be aware of, as rectifying mistakes will be costly if not impossible.

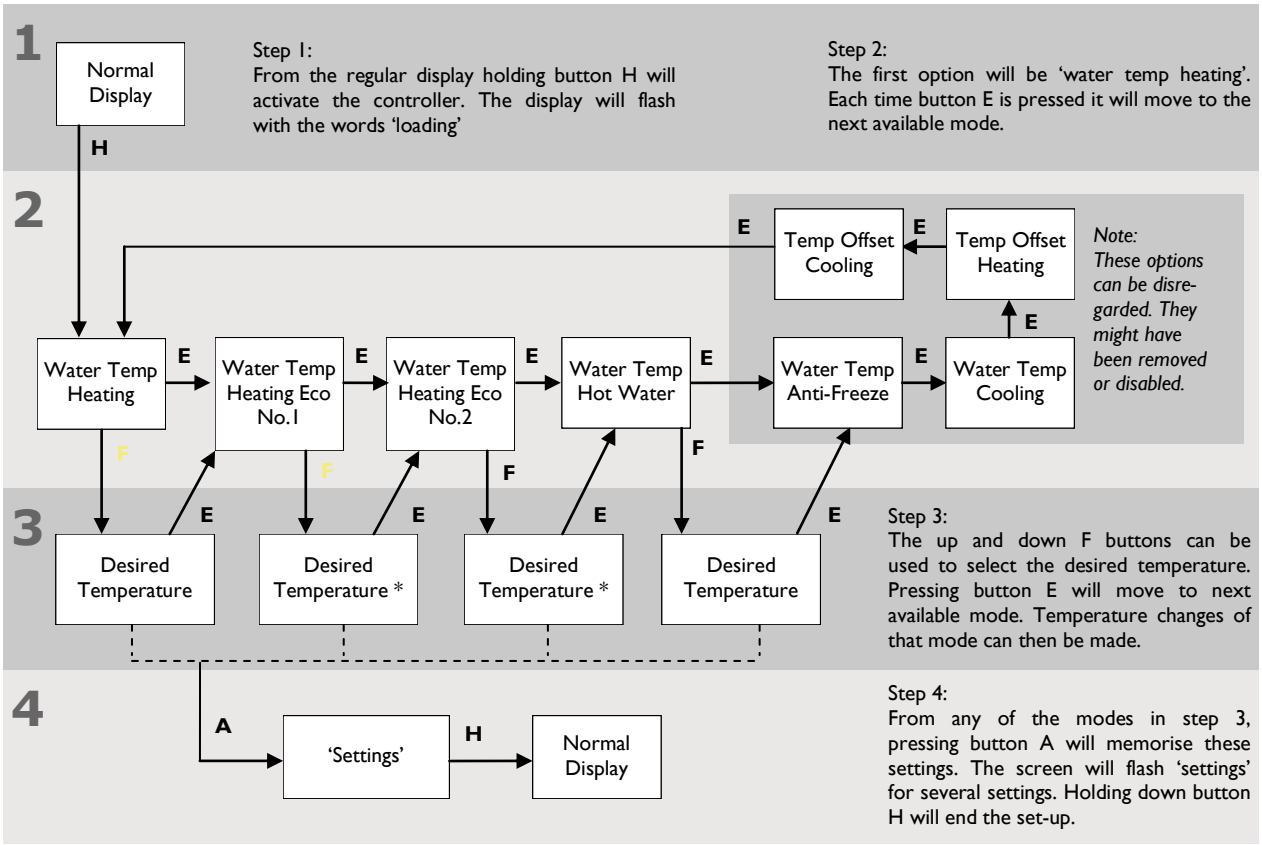
- Bad placement of thermostats, where they are affected by external sources of heat or cold temperatures will lead to poor temperature control.
- Under-floor heating circuits can produce high pressure losses. The pumps provided in our packaged systems are capable of providing the necessary flow rates on averagely sized primary circuits, but with the inclusion of under-floor circuits additional pumps will probably be necessary and potentially a low loss header to ensure the flow rates remain high across the heat pump.
- The output (W/m^2)of under-floor heating is primarily affected by 4 things: pipe diameter, length of circuit, spacing between pipe centres, resistance of floor coverings. If these factors are not considered at the design stage then the output may not be sufficient at the desired flow temperature negating the benefits of using under-floor heating systems.



Floor covering	Floor covering resistance	Mean water temp	Output @200mm spacing W/m²	Output @300mm spacing W/m²
Tile	0.00	35°c	68	52
Carpet (light duty)	0.10	35°c	44	36
Floorboards	0.15	35°c	38	32

Inserting desired temperatures

Once the required modes have been activated the required temperatures need to be inserted, this is a separate process that can be completed using the following steps. The recommended settings for "Heating ECO" can be found on page 46 and "Hot Water" page 44.



There are a selection of modes on the controller that the end user can choose for set-up purposes; please note that some of these may have been removed or disabled for use with the Ecodan unit. From the normal display it will always skip progress to 'water temp heating', each press of button E will skip to the next available mode. When setting up the controller, pressing button A must be used to memorize the settings.

How to lock the Buttons

While holding down the button A, press and hold down the button I for 2 seconds. The "Locked" indication appears on the screen (display 8), indicating that the lock is now engaged.

If locking has been disabled in Function Selection of remote controller, the screen will display the "Not Available" message when you press the buttons as described above. If you press a locked button, the "Locked" indication (display 8) will blink on the display.

How to Unlock the Buttons

1. While holding down the button A press and hold down the button I for 2 seconds—so that the "Locked" indication disappears from the screen (display 8)

Fig. 4.6

Throughout the system set-up buttons on the controller are referenced by letters and displays by numbers ; this key can be found on page 41

Error Codes Indication

If the ON lamp and display 10 are both blinking: This means that the Ecodan is out of order and operation has been stopped (and cannot resume). Take note of the indicated unit number and error code, then switch off the power to the Ecodan and call your installer.

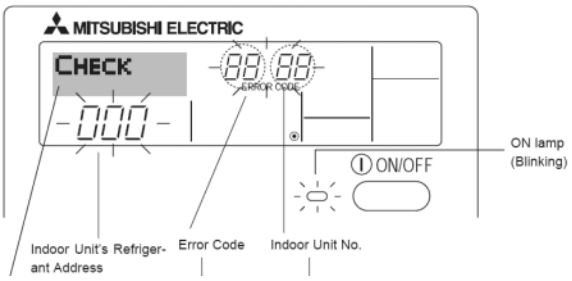


Fig. 4.7

If you have entered contact number to be called in the event of a problem, the screen displays this number. (You can set this up under Function Selection of remote controller).

Alternating Display

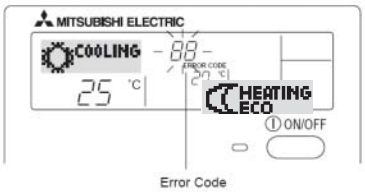


Fig. 4.8

When the Check Button is pressed:

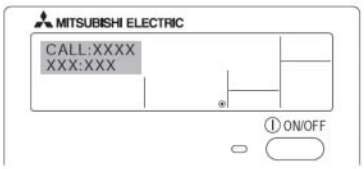


Fig. 4.9

If only the display 10 is blinking (while the ON lamp remains lit): Operation is continuing, but there may be a problem with the system. In this case, you should note down the error code and then call your installer for advice.

If you have entered contact number to be called in the event of a problem, push the button J to display it on the screen.

Display

The PAR-W21MAA has many different functions that control the performance of the Ecodan. Below are the symbols and displays used for each function.

Waiting for start-up		PLEASE WAIT
Operational Mode	Heating	HEATING
	Heating ECO	HEATING ECO
	Hot water	HOT WATER
	Anti-freeze	ANTI-FREEZE
	Stand by (Hot adjust)	STAND BY
	Defrost	DEFROST
Not in use button		NOT AVAILABLE
Check (Error)		CHECK
Test run		TEST RUN
Self check		SELF CHECK
Change language		CHANGE LANGUAGE
Language selection		LANGUAGE ENGLISH(GB)
Display change		DISP MODE SETTING
Temperature display °C/°F setting		TEMP MODE °C/°F

Table 3.1

Water temperature display		WATER TEMP DISP SELECT
Function selection		FUNCTION SELECTION
Operation function limit setting		LOCKING FUNCTION
Mode Skip setting		SELECT MODE
Mode skip	Heating	SELECT HEATING
	Heating ECO	SELECT HEATING ECO
	Hot water	SELECT HOT WATER
	Anti-freeze	SELECT ANTI-FREEZE
	Cooling	SELECT COOLING
Temperature range limit setting		LIMIT TEMP FUNCTION
Temperature range limit setting mode	Hot water	LIMIT TEMP HOT WATER
	Anti-freeze	LIMIT TEMP ANTI-FREEZE
	Cooling	LIMIT TEMP COOLING
Mode selection		MODE SELECTION
Use of clock setting		CLOCK
Setting the day of the week and time		TIME SET ↵:ENTER
Loading		LOADING...

Throughout the system set-up buttons on the controller are referenced by letters and displays by numbers ; this key can be found on page 41

System Commissioning Procedure

Ensure that anti-freeze and inhibitor is added to the primary loop at a concentration as recommended by the manufacturer, all pipework must be fully insulated between tank and outdoor unit. The outdoor unit should be left in standby for 12 hours before first time start up to prime the compressor.

Once the above period is over, turn on the power to the control equipment and initiate a constant demand for both hot water and heating modes through the 2 channel time clock, make sure the room thermostat is up fully and the cylinder sensor (TH5) is inserted into the pocket and the target temperature is programmed to no more than 55°C.

Check that the hot-water zone valve is the only one energised and the system circulators are running. With the circulating pumps running check the flow rate on the flow setter valve falls within the requirements for the model shown in table 1.1 (page 10). The PAR-W21MAA controller should at this point indicate hot-water heating in the top left as shown in Fig.5.0 It should also show the current cylinder temperature as a small figure in the centre and the cylinder target temperature to the left Fig. 5.1in hot water heating this should have been set to 55°C as detailed in the previous section.

As the flow from the heat pump raises in temperature the actual cylinder temperature will slowly increase until it meets the target. Hot-water heating will NOT cease until the cylinder sensor temperature is satisfied.

Once the cylinder thermostat is satisfied make a note of the time period the heat pump has taken to recover the whole cylinder. At this point the hot-water mode indication on the PAR-W21MAA remote will change to "Heating ECO" and a lower target flow will be indicated dependent on the ambient temperature Fig. 5.2. To override this for commissioning purposes the boost heat switch can be turned ON to target a higher flow temperature. Typically the heating temperature to be targeted in this mode will be 50°C to 55°C. With heating mode initiated, using the setter valve, check the flow rates are in the required band for the heat pump model.

The heating system must be correctly balanced to ensure correct flow through every radiator. If the system has two heating zones check that both zone valves operate independently.

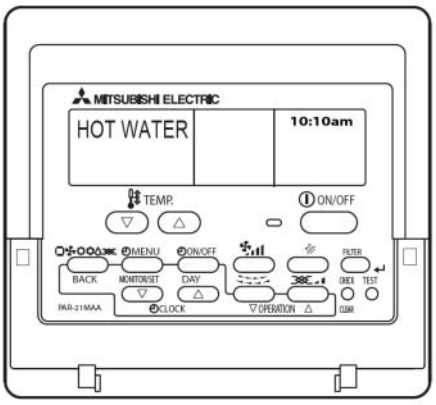


Fig. 5.0

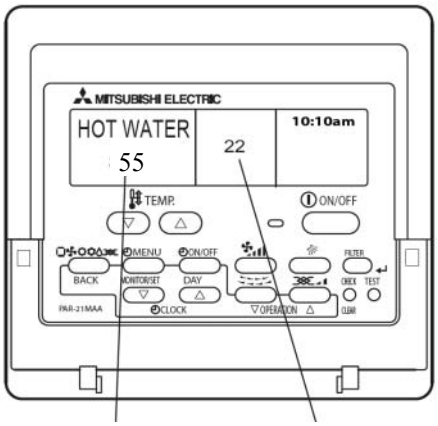


Fig. 5.1

Target Cylinder Temperature (Not to Exceed 55°C)

Actual Temperature

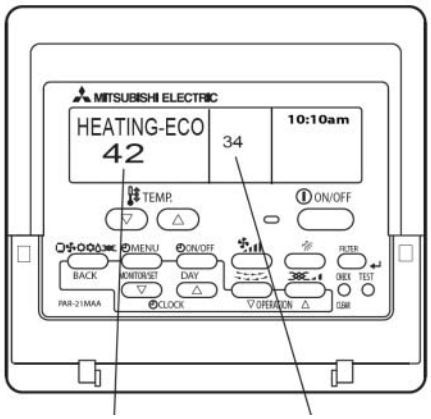


Fig. 5.2

Target Temperature

Actual Temperature

Time Clock Operation Patterns

The Ecodan system incorporates hot water demand priority this means that if there is a demand for both modes hot water will always occur before space heating.

Due to this the periods at which hot water and space heating are programmed to operate are extremely important. The hot water heat up times should be programmed to occur during periods when space heating is not required, this is usually the early hours of the morning and early afternoon. However the FTC2 system will automatically replenish the cylinder when it falls below a certain temperature, this is determined by DIP switch settings SW2-1. Automatic replenishment occurs when the immersed cylinder sensor reads a temperature drop of either 10°C or 20°C.

Using the hot water recovery time period taken during the commissioning stage ON and OFF times **must** be programmed by the commissioning engineer into the 2 channel time-clock, for example if the cylinder took 1 hour to reach 55°C then the hot water ON time should be for example 3.00am and the OFF should be 4.15am leaving a 15 minutes additional buffer. After this OFF time space heating will be allowed to operate as required.

Important Note - If the hot water demand is left ON continuous operation rather than being time-clocked to switch OFF then the homeowner may experience unnecessary high running costs.

Economical Time Clock Patterns & Flow Temperatures

To gain the full benefits from the Ecodan system the target flow temperatures and time-clock patterns need to be configured to suit the actual property demands.

The most economical way of operating the system is to have it running at the lowest flow temperature possible to suit the properties thermal losses.
To do this the heating demand from the time clock should be left constantly operational and the flow temperatures should be reduced to a point where the property is maintained at the design temperature (usually 21°C) without being switched ON and OFF from the room thermostat or TRV's. 7-day timer clocks with night time set-back can also offer good system efficiencies.

Important Note - If the heating demand is left on continuous operation and the target flow temperatures are not reduced to their lowest possible then the homeowner may experience unnecessarily high running costs.

Example time-clock patterns

Below is an example of a standard time clock pattern please note this is for reference only as the inputted times should suit the site environment and the homeowners preferences.

Heating mode - continuous operation with reduced flow temperatures

Hot water mode - 3.00am ON

4.15am OFF

2.00pm ON

3.15pm OFF

Time clock pattern set-up

Each channel on the time clock should be programmed to meet the demands of the home occupier in the most efficient way.

For example:
If a homeowner wakes up in the morning and wants a shower at 7am and the property takes an hour to raise to the required room temperature then both channels should be set to 5am as the cylinder will take approximately 1 hour to achieve temperature before switching to space heating.

If they don't require hot water again until later in the evening then the time clock should be programmed to heat up approximately one hour prior. This is the most efficient pattern to use rather than maintaining a high storage temperature constantly.

The most appropriate and cost effective electricity tariff to suit the systems usage should always be sought.

Domestic hot water immersion heater

As the Ecodan can recover a domestic hot water cylinder to 55°C precautions should be made to raise the temperature to 60°C or 65°C dependant on DIP SW2-6 periodically for pasteurisation.

This is carried out automatically with the immersion heater energised via a relay box which in turn is powered by FTC2. The frequency of the immersion heaters occurrence is determined by DIP switch settings SW2-4 and SW2 -5. Please note the larger the temperature rise completed by the immersion heater and the more frequently it occurs the less efficient the system becomes.

Service & Maintenance

The Ecodan must be maintained on an annual basis. A maintenance check sheet is supplied to all Accredited Ecodan Installers who attend the training.

The basic requirements are:

- Clean the outdoor heat exchanger
- Visual inspection for oil or leaks
- Check the integrity of the pipework insulation
- Check for loose electrical connections
- Check compressor operating current
- Check and record compressor operating period number of ON/OFF's and running current

Basic Troubleshooting

Below is a list of basic problems and actions.
For a full list of Ecodan fault codes, synopsis and remedial actions please consult the relevant service manual available to download from www.mitsubishielectric.co.uk/domesticheating

Water does not heat well	• Clean the filter of water piping. (Flow is reduced when the filter is dirty or clogged.) • Check the temperature adjustment and adjust the set temperature. • Make sure that there is plenty of space around the outdoor unit.
Water or vapour is emitted from the outdoor unit	• During the heating mode, water may form and drip from the heat exchanger of the outdoor unit. • During the defrosting mode, water on the heat exchanger of the outdoor unit—evaporates and water vapour may be emitted.
The operation indicator does not appear in the remote controller display	• Turn on the power switch. Will appear in the remote controller display.
When restarting the outdoor unit soon after stopping it, it does not operate even though there is a demand from the control equipment	• Wait approximately 3 minutes. (Operation has stopped to protect the outdoor unit.)
"PLEASE WAIT" appears in the remote controller display	• The initial settings are being performed. Wait approximately 3 minutes. • If the remote controller is not only for FTC, change it.
An error code appears in the remote controller display	• The protection devices have operated to protect the FTC and outdoor unit. • Consult the error code section of the relevant service manual or call the technical support helpline on 0870 3000 300 for assistance.

Table 5.3

For troubleshooting issues regarding the cylinder please consult the installation/service manual of the relevant manufacturer's manual.

Fernox Protector HP-5c

- Concentrated heat transfer fluid suitable for use in Air Source Heat Pumps and underfloor heating systems
- Frost protection from -4°C to -14°C
- Protects against corrosion, limescale and bacterial contamination
- Non-toxic
- Compatible with all materials commonly found in a heat pump and underfloor heating systems
- pH stable

Product Uses

Fernox HP-5c is a concentrated heat transfer fluid capable of frost protection from -4°C to -14°C especially formulated for use in Air Source Heat Pumps and underfloor heating circuits. Fernox HP-5c also provides long term protection from damage caused by corrosion, limescale and bacteria and maintains a stable pH across a range of operational temperatures. Fernox HP-5c is compatible with all materials commonly used in heat pumps and under-floor heating systems.

Physical Properties

Composition:	An aqueous solution of monopropylene glycol with specifically formulated inhibitors, stabilisers and biocides
Odour	Characteristic
Form	Liquid
Appearance	Clear, blue liquid
Density	1.03-1.05
pH	6 - 7

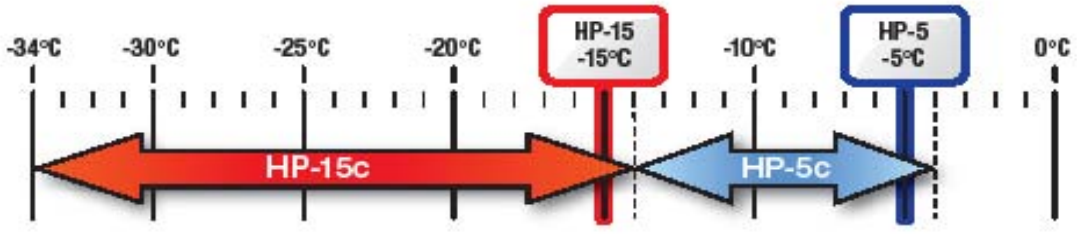
Table . 3.1

Application and Dosage

Dilute before use with mains water. In order to ensure adequate corrosion and biocidal protection, the minimum "in-use" concentration of the product is 10%. Maximum "in-use" concentration is 30%. Upon dilution Fernox HP-5C will provide frost protection according to the table below..

Concentration	10%	20%	30%
Frost Protection	-4°C	-9°C	-14°C

Frost protection level can be checked using a Fernox Refractometer. Existing heating systems should be cleaned of sludge and limescale deposits with a suitable Fernox Heat Pump Cleaner before adding Fernox HP-5c.



Sentinel R600

Thermal Fluid for Air Source Heat Pump systems:

- Effectively controls corrosion and scale
- Suitable for all metals including aluminium
- Effective frost protection
- Low toxicity
- Manufactured under a quality system conforming to ISO9001
- Easy to handle

Application

Sentinel R600 is a multi-purpose inhibited anti-freeze formulated to prevent corrosion and scale in Air Source Heat Pump systems including those containing aluminium components. If minimum levels are maintained the product ensures a permanent protection and does not need to be replaced. Sentinel R600 is suitable for use in all waters, both hard and soft. The low toxicity formulation is a clear blue liquid which is easy to handle and dose.

Dosing and feeding

The dosage of the Sentinel R600 will depend on the level of frost protection required. One 20 litre pail of Sentinel R600 added to a typical Air Source Heat Pump system will provide the minimum concentration of corrosion and scale inhibitor and also protection from freezing down to approximately –10°C. Two 20 litre pails will provide protection to –30°C. Further information is available upon request.

If there is any doubt above the volume of the system the degree of frost protection achieved by dosing the Sentinel R600 can be checked by using the FrostCheck Test Kit. For best results, it is recommended that systems are cleansed and flushed; new systems and those up to 6 months old with Sentinel X300, existing systems with Sentinel X300, existing systems with Sentinel X400 or Sentinel X800 Jetflo.

To ensure the system is sanitised before the introduction of Sentinel R600 it is advisable to add 1 litre of Sentinel R700 Santiser and Biocide during the initial fill of the system with water to prevent the development of bacteria and fungi and their associated problems. Circulate the system for 30 minutes to ensure complete distribution through the whole system.

Physical Properties

Appearance	Clear blue liquid
Odour	Mild slightly sweet
Specific gravity	1.03 (20°C)
pH in aqueous solution (5%)	7.3 (approx)

Thermal Fluid	A solution of inorganic and organic corrosion and scale inhibitors in propylene glycol.
Health hazards	Not for use in potable water systems. Not considered hazardous to health
Handling	Avoid contact with skin and eyes. Keep out of reach of animals and children. Wash out empty container thoroughly with water before disposal.
Storage	Keep container tightly closed. Store in cool, well ventilated area.
Spillage	Flush spillage with plenty of water and wash to waste. On soil: Absorb on to inert material and dispose of according to Controlled Waste Regulations.
Fire/ Explosion Risks	Non-flammable. Oxides of carbon and nitrogen evolved in fire.
First Aid	Skin Exposure: Wash immediately with plenty of water. Eye Exposure: Rinse immediately with plenty of water. Seek medical attention. Ingestion: Rinse mouth with water. Do NOT induce vomiting. Seek medical attention.

Table. 3.3

Fernox Boiler Buddy

Designed to complement Fernox's extensive range of chemical water treatment products, the Boiler Buddy is a premium quality in-line, high efficiency magnetic filter with patented flux plates developed for use in Formula 1 motor racing. Unlike other conventional or magnetic filters, Boiler Buddy not only traps magnetite to sub-micron levels, it does so without restricting the water flow, even when full. Boiler Buddy also offers a unique opportunity for condition monitoring of the system. Its transparent housing enables the build-up of debris to be observed; acting as an early warning sign of inherent problems which might result in pumps or valves seizing and ultimate system failure.

Fig. 5.4

Application

The Boiler Buddy can be connected directly to **22mm** copper pipework using conventional pump connectors (it is also compatible with **15mm** with the appropriate adapter. Boiler Buddy can be installed vertically or horizontally. The unit is designed to slot into the space provided after removing a circulator pump when fitting a condensing boiler into an existing system (ideally it should be fitted on the return close to the boiler itself.) The off-set inlet and outlet ports enable Boiler Buddy to be fitted flush against a wall in existing pipework. System cleaning can be undertaken when a Boiler Buddy is installed by simply isolating and removing the unit at the connection points and power flushing across the connections.

How to install a Boiler Buddy

Boiler Buddy has a transparent body casing so that the build-up of contamination on the core can be observed in service. It has been designed to be fitted where it can be inspected and removed for cleaning and should be installed in the central heating return line as close to the boiler as possible. There are a variety of installations but in general the open-vented system and the sealed system are typical.

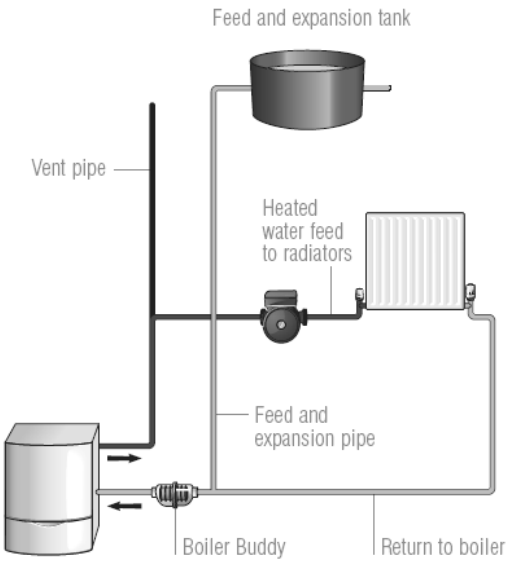


Fig. 5.5

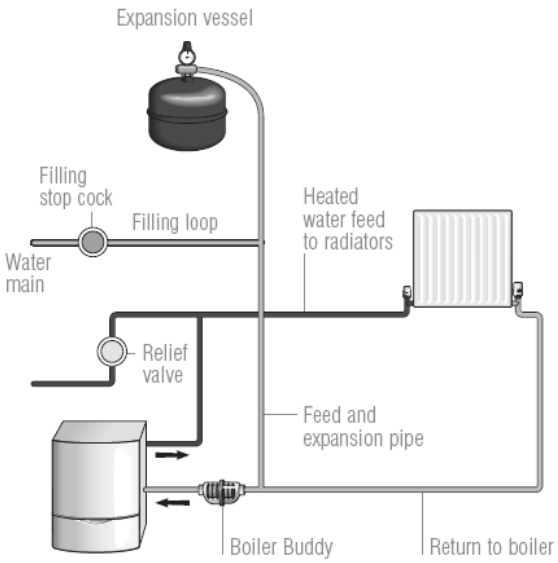


Fig. 5.6

Points to consider

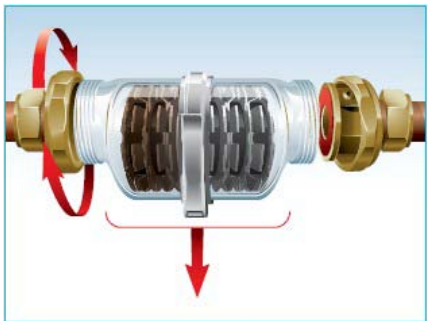
- When selecting a position to install a Boiler Buddy beware of electrical connections in the vicinity, as these will be hazardous if they come into contact with water.
- Install the Boiler Buddy with both an upstream and downstream servicing valve.
- Boiler Buddy is designed for use with standard 11/2" BSP x 22 mm pump servicing valves (on a 15 mm system we recommend fitting 22 to 15 mm reducing sets instead of three 22mm olive in the pump servicing valves).
- Boiler Buddy has a face-to-face dimension of 130 mm.
- If standard pump servicing valves are used, a total space of 250 mm is required for installation.
- During installation ensure that all copper or plastic swarf is removed from joints and does not enter the water pipework. If soldered joints are being used to construct the pipework, ensure solder or flux is wiped away to avoid corroding plastic parts. Do **NOT** undertake any soldering while the Boiler Buddy is in the pipework. Boiler Buddy **MUST** be removed before soldering any joints.
- Once installed, secure the tamper-proof tag to avoid accidental opening. The tag must be replaced after cleaning the core. Complete the Boiler Buddy installation sticker and apply to the boiler.
- Run the system and check for leaks.

After Installation

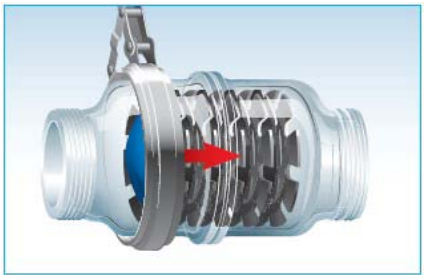
- The Boiler Buddy has no moving parts and needs no adjustment once in service.
- The body casing is transparent so that build-up of contamination can be observed.
- It is normal for the magnet nearest the inlet of the Boiler Buddy to become full first. Once this is full the next magnet will clog up followed by the next and so on. The Boiler Buddy has six magnets, we recommend cleaning the core when three magnets become full.
- It is recommended the Boiler Buddy is inspected and cleaned annually.
- Boiler Buddy is designed to last the life of the central heating system. More frequent cleaning of the core is an indication that the system has not been treated correctly with Fernox Protectors, Restorers and Cleansers.

How to service and clean a Boiler Buddy

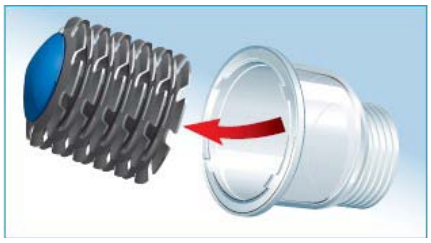
Before removing the Boiler Buddy, place a container underneath the pipework to retain any water that may drip.
1. Isolate the Boiler Buddy from the system, by simply closing the quarter turn valves on the pump service connector.
2. Once the Boiler Buddy has been isolated it can be removed. Undo the two 11/2" BSP union nuts. Once these have been fully unscrewed the Boiler Buddy can be pulled out between the two flat faces. The two fibre washers may stick to the flat surface and tear on removal of the Boiler Buddy, this is normal.



3. Cut off the tamper-proof tag.
4. Open the latch on the body clamp and slide off the complete clamp over one end of the body.



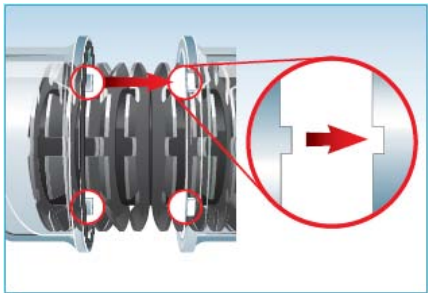
5. Pull the two halves apart.



6. Remove the ‘o’ ring.
7. Remove the complete core.
8. To clean the core either use a stiff brush or hold under running water perpendicular to the core (ensure that any magnetite is disposed of safely).

9. Wipe clean the inside surface of each half of the body casing. Once the core has been cleaned the Boiler Buddy can be reassembled.

10. Place the clean core into the cleaned body casing.
11. Place the new ‘o’ ring into position in the groove.
12. Place the other body half over the ‘o’ ring; there are locator pins to help the correct alignment of the two parts.



13. Once the body is assembled, place the body clamp over the flange and push the lever on the latch to the secured position.
14. Pass the replacement tamper-proof tag through the slot in the latch ensuring that it also passes through the bridge on the latch. This will guard against accidental opening of the clamp.
15. Using two new fibre washers place the Boiler Buddy back into the pipework between the two (pump) servicing valves.
16. Tighten the union nuts until finger tight, after which use a spanner to tighten 1.8th of a turn or until secure.
⚠ CAUTION: The body casing is a plastic part and will fail if excessive force is used.
17. The servicing valves can be opened and flow of water will be observed through the Boiler Buddy.
18. Run the heating system and check for leaks.

Spare parts

The Boiler Buddy is designed to last the life of the heating system. The following spare parts are available from Fernox:

✓ ‘O’ ring
✓ Tamper-proof tag
✓ Spare clamp
✓ Spare core

ENGINEERS FORMS

Commissioning Report

SITE ADDRESS			
INSTALLING CONTRACTOR		SITE NUMBER	
COMMISSIONING ENGINEER		AEI CERTIFICATE NO.	
COMMISSIONING DATE		EQUIPMENT PURCHASED FROM	
SYSTEM REFERENCE			
LOCATION			

BEFORE RUNNING THE SYSTEM, CARRY OUT A FULL PRE-COMMISSIONING CHECK OF THE FOLLOWING POINTS
• Add suitable antifreeze concentration in accordance with manufacturers' recommendations • Check air charge is in expansion vessels • Pressurise primary circuit to approximately 1.5 bar • Open all isolating valves • Release ALL air from the system using the bleed valves on the cylinder and vent at the highest point of the system. Before bleeding the air from the system the zone valves should be manually opened to prevent air lock and possible damage of the circulating pumps.

COMMISSIONING ENGINEERS COMMENTS AND POINTS FOR ATTENTION

COMMISSIONING ENGINEERS SIGNATURE

Table 3.4

Pre-Commissioning System and Installation Check List

No	SYSTEM AND INSTALLATION STATUS				REMARKS	NOTES
1	INSTALLATION LOCATION	OUTDOOR UNIT				
		INDOOR UNIT				
2	MAINTENANCE AND ACCESS TO REMOVE COVERS	OUTDOOR UNIT	GOOD	POOR		
		CYLINDER/ INDOOR UNIT	GOOD	POOR		
3	SPACE AVAILABLE FOR AIR FLOW	OUTDOOR UNIT	GOOD	POOR		
4	TOTAL PIPING LENGTH	OUTDOOR TO INDOOR		M		
5	HEIGHT DIFFERENCE	OUTDOOR TO INDOOR		M		
6	STANDARD OF PIPEWORK		GOOD	POOR		
7	STANDARD OF INSULATION		GOOD	POOR		
8	STANDARD OF ELECTICAL INSTALLATION		GOOD	POOR		
9	ACCESS TO REMOVE ELECTRICAL COVERS		GOOD	POOR		
10	CONNECTION OF MAINS POWER SOURCE	OUTDOOR UNIT ELECTRIC CABLE	GOOD	POOR		W50-16A/ 1.6mm W85-25A/ 4mm HW140-40A/ 6mm
			TYPE			
			SIZE			
		INDOOR UNITS ELECTRIC CABLE	GOOD	POOR		
			TYPE			
			SIZE			
11	CONNECTION OF CONTROL WIRING	OUTDOOR	GOOD	POOR		
		INDOOR	GOOD	POOR		
		CABLE TYPE 1.5mm 3 CORE	YES			
12	CONNECTION OF OPTIONS		GOOD	POOR		
13	ANTI-FREEZES ADDED TO SYSTEM (25% CONCENTRATION)		YES			
14	CHECK AIR CHARGE IS IN EXPANSION VESSELS		YES			
15	PRESSURISE PRIMARY CIRCUIT TO APPROXIMATELY 1.50 BAR		YES			
16	RELEASE AIR FROM SYSTEM		YES			

OUTDOOR UNIT OPERATION STATUS						
17	OUTDOOR UNIT MODEL No.			SERIAL No.		
18	POWER SOURCE (v)	L-N	L-E	E-N		
19	VIBRATION / NOISE	COMPRESSOR			GOOD	POOR
		FAN			GOOD	POOR
20	UNIT MOUNTED ON ANTI-VIBRATION (TICO) PADS AND SECURELY FIXED				YES	
21	PROVISIONS MADE FOR CONDENSATE REMOVEABLE				YES	

NOTE: IF POOR OS ANSWERED TO ANY OF THE ABOVE IT SHOULD BE RECTIFIED DURING THE COMMISSSIONING STAGE

NOTES AND COMMENTS

Table 3.5

Maintenance Sheet

Contractors Name		**Engineers Name**	
Site Name		**Site Number**	
Cylinder Maintenance			

Mechanical Tasks	**Frequency**	**Records / Notes**
1. With the water supply turned off, remove the screen from the strainer in the combination inlet valve and clean off any dirt	Major Visit	
2.With the water supply turned off and the hot water taps open, check the expansion vessel charge pressure and top up as necessary	Major Visit	
3. With the water supply turned on, open the temperature relief valve and then the expansion valve to check unrestricted discharge into tundish. Check valves for freedom of movement and confirm that the water stops and both valves reseat correctly. Check at a full bore discharge from either valve that there is no back up or discharge over the tundish.	Major Visit	
4. Check that the correct outlet pressure is being maintained by the pressure reducing valve by recording the pressure at the terminal fitting or the tapping provided on the combination inlet valve.	Major Visit	
5. Clean flow regulators (or restrictor/aerators) on each terminal fitting tap// shower as applicable. Check for correct flow rate at terminal fittings.	Major Visit	
6.If necessary de-scale the heat exchangers immersion/heaters in hard water areas.	Major Visit	
7. Check and clean the Boiler Buddy.	Major Visit	
8. Open the primary/heating system safety valve and check that it discharges safely.	Major Visit	
9. Drop the primary/heating system pressure to zero—check and if necessary top up the air side of the expansion vessel.	Major Visit	
10. Check and if necessary top up the concentration of the heating system Inhibitor.	Major Visit	
11. Re-establish the primary/heating system pressure and disconnect the filling loop.	Major Visit	
12. Check the primary/heating system pressure does not rise above 2.5 bar and the safety valve does not drip when the system is at full temperature.	Major Visit	
13. Check and release any air from the primary/heating systems.	Major Visit	
Electrical Tasks		
1. Visually inspect, checking for the presence of supplementary bonding and that it is being maintained.	Major Visit	
2. Check correct rating and type of fuse is fitted on the electrical supply.	Major Visit	
Controller Tasks		
1. Check for the correct operation and temperature setting of the thermostats.	Major Visit	
2. Check the operation of the motorised valves.	Major Visit	

Table 3.6

Maintenance Sheet

Ecodan Maintenance			
Model Number		**Serial Number**	

Mechanical Tasks	Frequency	Records / Notes
1. Inspect and clean heat exchanger.	Major Visit	
2. Visually for signs of oil leaks which may indicate a refrigerant leak (check for leaks if necessary).	Major Visit	
3. Check integrity of water pipe work and lagging.	Major Visit	
4. Check all electrical connections including mains isolator.	Major Visit	
5. Check unit operation voltage and record.	Major Visit	

Table 3.7

On completion check that the whole system is working satisfactorily.

Frequency of Visits:
Major Visit– Once per year
Mitsubishi Electric recommends that the frequency of maintenance visits to be a maximum of 12 months between inspections.
Frequency of maintenance may increase dependent upon the equipment environment and local water conditions e.g. hard water, scale forming, water containing a high proportion of solids.
Failure to maintain the system to the above minimum recommendations could result in the warranty becoming null and void.

MITSUBISHI ELECTRIC

Changes for the Better

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