HITACHI

SERVICE MANUAL

HYDRO FREE
SERIES





MODELS

HYDRO FREE Low temperature

RWLT-3.0VN1E
RWLT-5.0VN1E
RWLT-10.0VN1E

HYDRO FREE High temperature

RWHT-5.0VNF1E

Cooling & Heating

air

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HITACHI

Contents

General information 1
Control configuration 2
Optional functions 3
Electrical checks of the main parts 4
Servicing 5
Troubleshooting 6
Maintenance notes 7
Electrical and control settings 8

General Index

1. General information 1

1.1 General information 2

1.1.1 General notes 2
1.1.2 Introduction 2
1.1.2.1 Overview of HYDRO FREE system 2
1.1.2.2 Summary of operations 3

1.2 Applied symbols 4

1.3 Norms and Regulations 4

1.4 Product guide 5

1.4.1 Classification of the units 5
1.4.2 Product guide 6
1.4.2.1 HYDRO FREE Low temperature - Indoor unit 6
1.4.2.2 HYDRO FREE High temperature - Indoor unit 6
1.4.3 Accessory code list 7

2. Control configuration 11

2.1 Safety protection and control device 13

2.1.1 HYDRO FREE Low temperature 13
2.1.2 HYDRO FREE High temperature 13

2.2 Space water temperature control 14

2.2.1 Basic function 14
2.2.1.1 Space heating 14
2.2.1.2 Compressor thermo ON/OFF control for space heating & DHW & Swimming Pool 21
2.2.1.3 Compressor thermo ON/OFF control for space cooling 21
2.2.2 Initial Start-up at Low outdoor ambient temperatures 22
2.2.3 Space water temperature control optional functions 23
2.2.3.1 Water ECO offset 23
2.2.3.2 Outdoor temperature compensation control 24
2.2.3.3 Hydraulic separator 24
2.2.3.4 Installation with big buffer tank 25
2.2.3.5 Heating auto ON/OFF 27
2.2.4 Demand ON/OFF 27
2.2.4.1 Demand ON/OFF by an external input signal 27
2.2.4.2 Demand ON/OFF by a room thermostat 27
2.2.4.3 Minimum ON/OFF time between Demand ON/OFF operation 28
2.2.5 Room temperature compensation control 29
2.2.6 Switch OFF space condition by room thermostat 30
2.2.7 Determination of room temperature data 30

2.3 Sanitary Water Operation 31

2.3.1 Enabling operation 31
2.3.2 DHW Tank heater operation 31
2.3.3 DHW temperature setting 31
2.3.4 Maximum set point selected by installer 32
2.3.5 DHW operation mode 32
2.3.6 DHW High Demand mode 32

2.3.7 Heat pump operation for DHW (T_{HPON} & T_{HPOFF}) ... 32
2.3.8 Maximum DHW loading time (T_{DHWMAX}) ... 34
2.3.9 DHW second cycle waiting time ... 34
2.3.10 DHW Electric heater waiting time ... 34
2.3.11 Space heating priority temperature ... 34
2.3.12 DHW compatibility overview ... 35
2.3.13 Optional function for DHW ... 35
2.3.13.1 DHW Antilegionella protection ... 35
2.3.13.2 DHW re-circulation ... 36

2.4 Electric heater for space heating (Optional accessory) ... 37
2.4.1 Heater bivalent point ... 37
2.4.2 Target temperature ... 38
2.4.3 Load factor ... 38
2.4.4 Heater step control ... 38
2.4.5 Heater inter-stage steps control ... 40
2.4.6 Optional functions of electric heater ... 40

2.5 Boiler combination ... 42
2.5.1 Boiler combination for space heating ... 42
2.5.2 Bivalent point ... 42
2.5.3 Use of Boiler + Heater (Only available for RWLT) ... 43
2.5.4 Boiler combination operation modes ... 43
2.5.4.1 Boiler parallel mode combination ... 44
2.5.4.2 Boiler Serial mode combination ... 46

2.6 Swimming pool ... 47

2.7 Solar combinations ... 48

2.8 Water pump control ... 52
2.8.1 Pumps configuration ... 52
2.8.1.1 Standard mode Water pump operation ... 52
2.8.1.2 Economic mode Water pump operation ... 52
2.8.1.3 Recirculation option (Only in Economic mode) ... 53
2.8.1.4 Anti Freeze Control (Winter Operation) ... 53
2.8.2 Water pump 1 PWM control (for 3-5 HP) ... 54
2.8.2.1 Water Pump 1 Control Details ... 54
2.8.2.2 PWM Input signal ... 54
2.8.2.3 PWM feedback signal ... 55
2.8.3 Water pump PWM control (for 10 HP) ... 56
2.8.3.1 PWM input signal ... 56
2.8.3.2 PWM feedback signal ... 56
2.8.3.3 Water flow estimation control ... 57
2.8.3.4 Fixed Water pump PWM speed for space Heating ... 57
2.8.3.5 DHW Water Pump Speed ... 57
2.8.3.6 SWP Water Pump Speed ... 57
2.8.3.7 Pump seizure protection ... 57

3. Optional functions ... 59

3.1 Optional functions by DSW setting ... 60

3.2 Optional functions by Unit controller (PC-ARFWE) ... 62
3.2.1 Optional functions for Space Heating or Space Cooling ... 62

3.2.2 Optional functions for DHW 62
3.2.3 Optional functions for Heat pump 63
3.2.4 Optional functions for Unit controller (PC-ARFWE) 63

3.3 Heat Pump optional functions 64

3.3.1 Smart function 64
3.3.2 Air purge 65
3.3.3 Test run 65

3.4 Optional external input/output configuration signals 66

3.5 Manual operation 68

3.5.1 Function operation 68
3.5.2 7-Segment configuration 68
3.5.3 4~20 mA setting 69
3.5.4 ON/OFF Operation 70

4. Electrical checks of the main parts 71

4.1 Thermistors 72

4.1.1 HYDRO FREE Low temperature 72
4.1.2 HYDRO FREE High temperature 73

4.2 Electronic expansion valve 74

4.3 Water pump 74

5. Servicing 77

5.1 HYDRO FREE Low temperature - RWLT-(3.0-10.0)VN1E 79

5.1.1 First steps for maintenance and servicing 79
5.1.2 Covers 80
5.1.2.1 Removing the Service cover 80
5.1.2.2 Opening the E-box cover 81
5.1.2.3 Opening the E-Box 82
5.1.3 Cycle and hydraulic components 83
5.1.3.1 Access to the cycle and hydraulic parts 83
5.1.3.2 Location of components 83
5.1.3.3 Removing the Manometer 84
5.1.3.4 Removing the Filter plus ball valve 84
5.1.3.5 Removing the Water pump 85
5.1.3.6 Replacing the Air purger 87
5.1.3.7 Replacing the Safety valve 87
5.1.3.8 Removing the Expansion valve 87
5.1.3.9 Replacing the Expansion valve coil 90
5.1.3.10 Removing the Expansion vessel 91
5.1.3.11 Removing the Plate heat exchanger (PHEX) 92
5.1.3.12 Electrical components 96
5.1.3.13 Location of components of the PCB 97
5.1.3.14 Removing the unit controller 97
5.1.3.15 Replacement of the rocker switch 99
5.1.3.16 Replacing thermistors (THM_{WO}, THM_{WI}, THM_{L}, $THM_{G,}$) 100
5.1.3.17 Replacement of fuse (EF1) 101
5.1.3.18 Removing the fuse holder 102
5.1.3.19 Replacement of the terminal board (TB2) 102

5.1.3.20 Replacement of the terminal board (TB1) 103
5.1.3.21 Replacement of relays (AR3) 103
5.1.3.22 Replacement of the PCB 104

5.2 HYDRO FREE High temperature - RWHT-5.0VNF1E 105

5.2.1 Covers 105
5.2.1.1 Removing the Front cover 105
5.2.1.2 Removing the Upper cover 106
5.2.1.3 Removing the Right side cover 106
5.2.1.4 Removing the Left side cover 107
5.2.1.5 Removing the Electrical box cover 108
5.2.1.6 Opening the Electrical box 109
5.2.1.7 Process to clean the filter 109
5.2.2 Location of components 110
5.2.3 Hydraulic components 111
5.2.3.1 Replacement of the manometer 111
5.2.3.2 Removing the Filter plus ball valve 112
5.2.3.3 Replacing the Water pump (WP1) 112
5.2.3.4 Replacement of the Air purger 113
5.2.3.5 Replacement of the Safety valve 113
5.2.3.6 Replacement of the Expansion vessel 114
5.2.4 Cycle components 115
5.2.4.1 Replacement of the compressor 115
5.2.4.2 Replacement of high pressure switch (PSH) 118
5.2.4.3 Replacement of the pressure sensors 119
5.2.4.4 Replacement of solenoid valves coils 120
5.2.4.5 Replacement of solenoid valves 121
5.2.4.6 Replacement of the electronic expansion valve coil (R410A / R134a) 121
5.2.4.7 Replacement of R134a expansion valve 123
5.2.4.8 Replacement of R410A expansion valve 123
5.2.4.9 Replacement of Plate heat exchangers 124
5.2.5 Electrical components 127
5.2.5.1 Removing electrical box components 127
5.2.5.2 Replacing the electrical box 128
5.2.5.3 Replacing thermistors 128
5.2.5.4 Replacing the DIP-IPM (Inverter module) 129
5.2.5.5 Replacing the noise filter (Inverter module) 129

6. Troubleshooting 131

6.1 Initial troubleshooting 132

6.1.1 Power supply failure to the indoor unit and the remote control switch (PC-ARFWE) 132
6.1.2 Abnormal operation of the devices 132

6.2 Normal operation 135

6.2.1 Normal operation display on PCB1 135
6.2.2 Protection control code display 136
6.2.3 Normal operation display at Unit controller 136

6.3 Troubleshooting procedure 137

6.3.1 Alarm code indication on 7 segment 137
6.3.2 Alarm code indication in Unit controller 137
6.3.3 Alarm codes for the indoor units 138
6.3.4 Troubleshooting by alarm code 141

6.4 Troubleshooting in check mode 182
6.4.1 Troubleshooting using the 7 segment display 182
6.5 Checking procedure for main parts 186
6.5.1 Checking procedure for the electronic expansion valve for indoor and outdoor units 186

7. Maintenance notes 187

7.1 General notes 188
7.1.1 Checking the power source and the wiring connection 188
7.1.2 Burnt-out compressor due to an insufficient refrigerant charge 188
7.2 Maintenance work 189
7.2.1 General procedure 189
7.2.2 Descaling (RWLT) 192
7.2.3 Draining 193
7.2.4 Evacuation and refrigerant charge 194
7.3 Service and maintenance record 195
7.4 Service and maintenance record using the 7-segment display 196
7.5 Service and maintenance record by Unit controller 198

8. Electrical and control settings 201

8.1 Terminal board detailed connection 202
8.1.1 HYDRO FREE Low temperature 202
8.1.2 HYDRO FREE High temperature 203
8.1.3 Input terminals (Optional input functions) 206
8.1.4 Output terminals (Optional output functions) 209
8.2 Printed circuit board (PCB) 211
8.2.1 HYDRO FREE Low temperature 211
8.2.2 HYDRO FREE High temperature 212
8.3 Domestic Hot Water Tank accessory 213
8.3.1 Electrical wiring connection 213
8.3.2 Wire size 213
8.3.3 Electric heater 214
8.3.4 General check 214
8.4 Electrical Wiring Diagrams 215
8.4.1 HYDRO FREE Low temperature 215
8.4.2 HYDRO FREE High temperature 216
8.4.3 Mark table 217

1. General information

Index

1.1 General information 2
1.1.1 General notes 2
1.1.2 Introduction 2
1.1.2.1 Overview of HYDRO FREE system 2
1.1.2.2 Summary of operations 3
1.2 Applied symbols 4
1.3 Norms and Regulations 4
1.4 Product guide 5
1.4.1 Classification of the units 5
1.4.2 Product guide 6
1.4.2.1 HYDRO FREE Low temperature - Indoor unit 6
1.4.2.2 HYDRO FREE High temperature - Indoor unit 6
1.4.3 Accessory code list 7

1.1 General information

1.1.1 General notes

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As a result, some of the images or data used to illustrate this document may not refer to specific models. No claims will be accepted based on the data, illustrations and descriptions included in this manual.

No type of modification must be made to the equipment without prior, written authorization from the manufacturer.

This air to water heat pump has been designed for standard water heating for human beings. For use in other applications, please contact your Hitachi dealer or service contractor.

1.1.2 Introduction

Hitachi proudly announces the complete range of air-to-water heat pumps in its award-winning HYDRO FREE range.

HYDRO FREE units produce heating and domestic hot water like any oil or gas boiler, but transforming renewable energy from the outside air into heat. Air to water heat pumps extract the free energy present in the air, which is enough to heat a home up to a comfortable temperature, even on the coldest winter day. Every kW of electricity used to power the heat pump can yield up to more than 5 kW of energy for heating; this provides savings of up to 80% on heating expenses compared to a traditional fossil fuel boiler.

HYDRO FREE series, based on state-of-the-art technology, does not only achieve an outstanding performance in space heating, but it is also provides domestic hot water with high efficiency.

The system is simple to control; its user controller (PC-ARFWE) improves the acclaimed and successful design used with the existing LCD controller, and provides a great deal of functions like: wizard start-up configuration, heat, improved timer, etc.

1.1.2.1 Overview of HYDRO FREE system

The range of HYDRO FREE products is basically divided in two types of system:

- Low temperature system
- High temperature system

◆ Low Temperature range

It consists of one outdoor unit and one indoor unit. The outdoor unit extracts the heat present in the air, increases its refrigerant temperature and transmits it to the water circuit using the plate heat exchanger of the indoor unit, where the heat is taken to radiators (fan-coils), underfloor heating components or both (2nd temperature area).

Three types of indoor unit can be used in heating split systems:

This HYDRO FREE indoor unit is designed for space heating, in wall-mounted installation. It is convenient for installations with low capacity requirements (Well isolated installations, high efficiency radiators...).

High temperature range

This HYDRO FREE is a standalone indoor unit that generates hot water up to 80ºC; the hottest water temperature in the domestic heating market using renewable energy.

The extra innovation in the HYDRO FREE High temperature lies in that it has two compressors, working in a smart cascade system, with two refrigerant cycles (R-410A and R-134a). To maximize seasonal efficiency, the second refrigerant cycle is only operated as a booster, when very high water temperature is required - the rest of the time, only one cycle is used.

The HYDRO FREE High temperature unit is ideal for existing properties, in particular older installations where high water supply temperatures may be required to keep the house warm – as well as for new buildings. It is designed for the replacement of boilers, offering heating and sanitary hot water all year round, without boiler back-up.

1.1.2.2 Summary of operations

Space heating

HYDRO FREE units are factory-supplied ready for space heating operation. Different heating installation configurations can be selected, providing a comfortable atmosphere all year long, even in the coldest climates:

- ***Mono-valent system***
  The air to water heat pump is sized to provide 100% of the heating requirements on the coldest day the year.
- ***Mono-energy system***
  This is the most popular configuration. The air to water heat pump is sized to provide 80% of the heating requirements on the coldest days of the year. An auxiliary electric heater (field supplied) is used to provide the additional heating required on cold days. This option usually results in an ideal balance between installation costs and future energy consumption, as proven by its popularity in colder climates than ours, such as Sweden and Norway.
- ***Alternating Bi-valent system***
  For installations with an existing heating system by boiler and when is needed to heat the supplied water temperature to the circuit up to high temperatures (80ºC), the boiler can be configured to alternate with the air to water heat pump.

Selecting the different configuration types it is possible to adapt the system to all customer requirements, providing a wide application range from the simplest configuration to complete configuration: Radiator, heating floor or both (2nd temperature area).

Domestic hot water production

HYDRO FREE models also give the option of domestic hot water production, allowing the user to benefit from the heat pump’s high efficiency and achieve domestic hot water.

This is made possible by a domestic hot water tank. The domestic hot water tank is an accessory “DHWT-(200/300)S-3.0H2E” can be used for the production of DHW.

1.2 Applied symbols

During normal air to water heat pump system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid damage to the unit, the installation or the building or property.

Situations that pose a risk to the safety of those in the surrounding area or to the unit itself are clearly indicated in this manual.

A series of special symbols are used to clearly identify these situations.

Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

DANGER

- ***The text following this symbol contains information and instructions relating directly to your safety, in addition to hazards or unsafe practices which could result in severe personal injuries or death.***
- ***Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others.***

In the texts following the danger symbol you can also find information on safety procedures during unit installation.

CAUTION

- *The text following this symbol contains information and instructions relating directly to your safety, in addition to hazards or unsafe practices which could result in minor personal injury or product or property damage.*
- *Not taking these instructions into account could lead to minor injuries to you and others.*
- *Not taking these instructions into account could lead to unit damage.*

In the texts following the caution symbol you can also find information on safety procedures during unit installation.

NOTE

- *The text following this symbol contains information or instructions that may be of use or that require a more thorough explanation.*
- *Instructions regarding inspections to be made on unit parts or systems may also be included.*

1.3 Norms and Regulations

Following Regulation EU No.517/2014 on Certain Fluorinated Greenhouse gases, it is mandatory to fill in the label attached to the unit with the total amount of refrigerant charged on the installation.

Do not vent R410A / R134a into the atmosphere: R410A / R134a are fluorinated greenhouse gases covered by the Kyoto protocol global warming potential (GWP): R410A = 2088 , R134a = 1430.

Tn of CO_2 equivalent of fluorinated greenhouse gases contained is calculated by indicated: GWP multiply by Total Charge (in kg) indicated in the product label and divided by 1000.

Appropriate refrigerant

The refrigerant used in each unit is identified on the specification label and manuals of the unit. Hitachi shall not be held liable for any failure, trouble, malfunction or accident caused by units illegally charged with refrigerants other than the specified one.

Consequences of charging non-specified refrigerant

It may cause mechanical failure, malfunction and other accidents. It may cause operational failure of protection and safety devices of air conditioners. It may also cause lubrication failure of the sliding part of the compressor due to deterioration of refrigerant oil.

In particular, hydrocarbon refrigerants (such as propane, R441A, R443A, GF-08, etc.) are not allowed, since these are combustible and may cause major accidents such as fire and explosion in case of improper handling.

Once a non-specified refrigerant has been charged, no further servicing (including draining of refrigerant) shall be performed, even in case of malfunction. Improper handling of refrigerant may be a cause of fire and explosion, and servicing in such cases may be considered an illegal act.

End clients and costumers shall be informed that servicing is not approved, and the installer who charged the nonspecified refrigerant shall be asked to fix the unit.

Hitachi will accept no responsibility for units that have been charged with non-specified refrigerant once.

1.4 Product guide

1.4.1 Classification of the units

◆ Low temperature indoor unit models

Unit type: HYDRO FREE (Split system - Single HYDRO FREE Low temperature (Indoor unit))

	Position-separating hyphen (fixed)					
		Capacity (HP): 3.0, 5.0, 10.0.				
			V: Single phase unit (1~ 230V 50Hz)			
				R410A refrigerant		
					Series 1	
						Made in Europe
RWLT	-	X.X	V	N	1	E

◆ High temperature indoor unit models

Unit type: HYDRO FREE (Split system - Single HYDRO FREE High temperature (Indoor unit))

	Position-separating hyphen (fixed)						
		Capacity (HP): 5.0					
			V: Single phase unit (1~ 230V 50Hz)				
				R-410A refrigerant			
					R-134a refrigerant		
						Series 1	
							Made in Europe
RWHT	-	X.X	V	N	F	1	E

1.4.2 Product guide

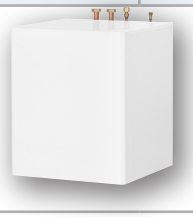
1.4.2.1 HYDRO FREE Low temperature - Indoor unit

1~ 230V 50Hz					
Unit	Code	Unit	Code	Unit	Code
RWLT-3.0VN1E	7E476018	-	-	-	-
		RWLT-5.0VN1E	7E476021	-	-
		-	-	RWLT-10.0VN1E	7E476024
					

NOTE

The PC-ARFWE controller required for the operation of the HYDRO FREE Low temperature is factory supplied in these models.

1.4.2.2 HYDRO FREE High temperature - Indoor unit

1~ 230V 50Hz	
Unit	Code
RWHT-5.0VNF1E	7E484021
	

NOTE

The PC-ARFWE controller required for the operation of the HYDRO FREE High temperature is not factory supplied in these models, and must be ordered as an accessory separately.

Icons description

Icons between brackets mean possible extra operations to the factory-supplied operations (additional accessories, field-supplied accessories or systems can be needed)

: Heating operation

: Domestic hot water (DHW)

: Additional heater (electrical heater accessory or boiler)

: Swimming pool application

: Solar combination

HYDRO FREE compatible

RWLT-(3.0-10.0)VN1E and RWHT-5.0VNF1E are compatible only with the following SET FREE series:

SET FREE Sigma - RAS-FSXN(P/S)E(1)

Air365 Max and Air365 Max Pro - RAS-FSXN(S/P)2E

Set Free mini - RAS-(8-12)FSXNME(1) (DSW3 setting is required)

1.4.3 Accessory code list

◆ Control accessories

Accessory	Name	Code	Figure
PC-ARFWE	Unit controller wired room thermostat (*) (Languages EN/ES/DE/FR/IT/SL/PT)	7E543007	
ATW-RTU-04	Wireless ON/OFF thermostat (Receiver + Room thermostat)	7E543003	
ATW-FCP-01	Unit controller cover	7E549938	

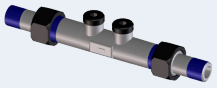
NOTE

(*) The Unit controller is factory supplied for HYDRO FREE Low temperature. The HYDRO FREE High temperature require the unit controller PC-ARFWE that has to be ordered as accessory.

◆ Temperature sensor accessories

Accessory	Name	Code	Figure
ATW-ITS-01	Indoor wired room temperature sensor	7E549932	
ATW-WTS-02Y	Universal water temperature sensor	9E500004	

◆ Water circuit accessories

Accessory	Name	Code	Figure
ATW-2TK-07	2nd zone mixing kit (Wall mounted model)	7E549951	
DHWT-200S-3.0H2E	Domestic hot water tank (200 L)	70544002	
DHWT-300S-3.0H2E	Domestic hot water tank (300 L)	70544003	
ATW-HSK-01	Hydraulic separator	7E549905	
ATW-AQT-01	Aquastat security	7E549907	
ATW-3WV-01	3-way valve (Internal thread and spring return)	7E549906	
ATW-WCV-01	Water check valve	9E500014	
WEH-6E	Water electric heater	90500002	
ATW-DPOV-01	Differential pressure overflow valve	7E549916	

◆ Centralised remote controls (HYDRO FREE control: only ON-OFF is possible, settings other than ON-OFF control are not available)

Name	Description	Code	Figure
PSC-A64GT	Touch screen central station	60291730	
PSC-A32MN	Touch screen central station mini	60291966	
PSC-A64S	Centralised remote control	60291479	
PSC-A16RS	Centralised ON/OFF control	60291484	

◆ Building air conditioning controls (HYDRO FREE control: only ON-OFF is possible, settings other than ON-OFF control are not available)

Name	Description	Code	Figure
CSNET Manager 2 T10	Centralised control with a touch interface of 10 inches which runs CSNET Manager 2 software to control the indoor units.	7E512203	
CSNET Manager 2 T15	Centralised control with a touch interface of 15 inches which runs CSNET Manager 2 software to control the indoor units.	7E512206	
CSNET Manager SL	Centralised control interface screen-less which runs CSNET Manager 2 software to control the indoor units.	7E512204	
CSNET Lite	Centralised control which runs CSNET Lite software to control the indoor units in a small installations.	7E512205	
HC-A64NET	H-LINK gateway used by CSNET Manager 2 to communicate with indoor units (Max. 64 indoor units)	7E512200	

◆ Gateways for building management systems (BMS) controls

Name	Description	Code	Figure
HC-A16MB	Integration with installation with intelligent control (Building Management System) Gateway Interface to MODBUS systems (Maximum 16 indoor units).	7E513210	
HC-A64MB	Integration with installation with intelligent control (Building Management System) Gateway Interface to MODBUS systems (Maximum 64 indoor units).	7E513205	
KNX001 (*)	Integration with installations with intelligent control (BMS) through CSNET WEB. Gateway Interface to KNX systems.	7E512100	
HARC-BX E (A) (*)	Integration with installation with intelligent control (Building Management System) Gateway Interface to LONWORKS systems. (H-LINK I communication) (Maximum 64 units with 8 parameters)	60290874	
HARC-BX E (B) (*)	Integration with installation with intelligent control (Building Management System) Gateway Interface to LONWORKS systems. (H-LINK I communication) (Maximum 32 units with 16 parameters)	60290875	
HI-AC-KNX-16 (*)	Integration with installations with intelligent control (BMS). Gateway Interface to KNX systems.	70513303	
HI-AC-KNX-64 (*)	Integration with installations with intelligent control (BMS). Gateway Interface to KNX systems.	70513304	
HI-AC-BAC-16 (*)	Integration with installations with intelligent control (BMS). Gateway Interface to BACnet systems.	70513100	
HI-AC-BAC-64 (*)	Integration with installations with intelligent control (BMS). Gateway Interface to BACnet systems.	70513101	

NOTA

(*) HYDRO FREE control: only ON-OFF is possible, settings other than ON-OFF control are not available.

2. Control configuration

Index

2.1 Safety protection and control device 13
2.1.1 HYDRO FREE Low temperature 13
2.1.2 HYDRO FREE High temperature 13
2.2 Space water temperature control 14
2.2.1 Basic function 14
2.2.1.1 Space heating 14
2.2.1.2 Compressor thermo ON/OFF control for space heating & DHW & Swimming Pool 21
2.2.1.3 Compressor thermo ON/OFF control for space cooling 21
2.2.2 Initial Start-up at Low outdoor ambient temperatures 22
2.2.3 Space water temperature control optional functions 23
2.2.3.1 Water ECO offset 23
2.2.3.2 Outdoor temperature compensation control 24
2.2.3.3 Hydraulic separator 24
2.2.3.4 Installation with big buffer tank 25
2.2.3.5 Heating auto ON/OFF 27
2.2.4 Demand ON/OFF 27
2.2.4.1 Demand ON/OFF by an external input signal 27
2.2.4.2 Demand ON/OFF by a room thermostat 27
2.2.4.3 Minimum ON/OFF time between Demand ON/OFF operation 28
2.2.5 Room temperature compensation control 29
2.2.6 Switch OFF space condition by room thermostat 30
2.2.7 Determination of room temperature data 30
2.3 Sanitary Water Operation 31
2.3.1 Enabling operation 31
2.3.2 DHW Tank heater operation 31
2.3.3 DHW temperature setting 31
2.3.4 Maximum set point selected by installer 32
2.3.5 DHW operation mode 32
2.3.6 DHW High Demand mode 32
2.3.7 Heat pump operation for DHW (T_{HPON} & T_{HPOFF}) 32
2.3.8 Maximum DHW loading time (T_{DHWMAX}) 34
2.3.9 DHW second cycle waiting time 34
2.3.10 DHW Electric heater waiting time 34
2.3.11 Space heating priority temperature 34
2.3.12 DHW compatibility overview 35
2.3.13 Optional function for DHW 35
2.3.13.1 DHW Antilegionella protection 35
2.3.13.2 DHW re-circulation 36
2.4 Electric heater for space heating (Optional accessory) 37
2.4.1 Heater bivalent point 37
2.4.2 Target temperature 38
2.4.3 Load factor 38
2.4.4 Heater step control 38
2.4.5 Heater inter-stage steps control 40

2.4.6 Optional functions of electric heater 40

2.5 Boiler combination 42

2.5.1 Boiler combination for space heating 42
2.5.2 Bivalent point 42
2.5.3 Use of Boiler + Heater (Only available for RWLT) 43
2.5.4 Boiler combination operation modes 43
2.5.4.1 Boiler parallel mode combination 44
2.5.4.2 Boiler Serial mode combination 46

2.6 Swimming pool 47

2.7 Solar combinations 48

2.8 Water pump control 52

2.8.1 Pumps configuration 52
2.8.1.1 Standard mode Water pump operation 52
2.8.1.2 Economic mode Water pump operation 52
2.8.1.3 Recirculation option (Only in Economic mode) 53
2.8.1.4 Anti Freeze Control (Winter Operation) 53
2.8.2 Water pump 1 PWM control (for 3-5 HP) 54
2.8.2.1 Water Pump 1 Control Details 54
2.8.2.2 PWM Input signal 54
2.8.2.3 PWM feedback signal 55
2.8.3 Water pump PWM control (for 10 HP) 56
2.8.3.1 PWM input signal 56
2.8.3.2 PWM feedback signal 56
2.8.3.3 Water flow estimation control 57
2.8.3.4 Fixed Water pump PWM speed for space Heating 57
2.8.3.5 DHW Water Pump Speed 57
2.8.3.6 SWP Water Pump Speed 57
2.8.3.7 Pump seizure protection 57

2.1 Safety protection and control device

2.1.1 HYDRO FREE Low temperature

MODEL			RWLT-3.0VN1E	RWLT-5.0VN1E	RWLT-10.0VN1E
For water temperature	High temperature protection		+5ºC of maximum water temperature (Heating mode)		
	Freeze temperature protection		-3ºC of minimum water temperature (Cooling mode)		
For refrigerant temperature	Freeze temperature protection				
		Condition 1	Tl<-20ºC (for 30 seconds)		
		Condition 2	Tl<-10 and Two<6 (for 30 seconds) Tin or Two < 2ºC (for 30 seconds)		
For the control circuit	Fuse capacity		5A (Inside PCB)		

2.1.2 HYDRO FREE High temperature

MODEL			RWHT-5.0VNF1E
For Water circulation	Low water pressure switch		Automatic Reset
		Open	0.5 bar
		Close	0.9 bar
	Low water flow control		Water flow control by water pump feedback (Reset manual by alarm)
	Activation		0.5 m^3/h
	Water pump control		Water pump status by feedback control
For water temperature	High temperature protection		+5ºC of maximum water temperature (Heating mode)
	Freeze temperature protection		-3ºC of minimum water temperature (Cooling mode)
For refrigerant temperature	Freeze temperature protection		
		Condition 1	Tl<-20ºC (for 30 seconds)
		Condition 2	Tl<-10 and Two<6 (for 30 seconds) Tin or Two < 2ºC (for 30 seconds)
For the control circuit	Fuse capacity		5A (Inside PCB)
For compressor	Pressure switch		Automatic reset, non adjustable
	High	Cut-out	2.94 MPa -0.05 / 0.15
		Cut-in	2.35 MPa ±0.15
For control	Fuse	1~230 V 50Hz	1 x 50 A
	CCP timer		Non adjustable
	Setting time		3

2.2 Space water temperature control

2.2.1 Basic function

2.2.1.1 Space heating

◆ Main heating configuration

Available system configuration is as follows:

Configuration 1: Direct Circuit (Example of RWLT)

The unit is connectable to only one circuit demand, either high temperature (i.e., radiator or fan coils) or low temperature (radiant floor).

In addition, the unit can be combined with Sanitary tank (with solar kit extension) and with swimming pool.

Water temperature target depends on actual water outlet temperature and calculations by the selected setting mode.

Configuration 2: Direct and mixing circuit (two levels of water outlet temperature) (Example of RWLT)

When the HYDRO FREE range is connected to two different heating circuits, circuit 1 will be direct (high temperature for radiator operation) and circuit 2 will be a mixing circuit in order to have a second temperature control using mixing valve (low temperature for floor heating operation). Additionally, a motorized valve can be added in order to close direct circuit when not in use (see *"3. Optional functions"* chapter). The floor heating loops (circuit 2) require a lower temperature than with fan coils (circuit 1). To get these two water temperature levels, a mixing station is required. This mixing station is controlled using the indoor unit by means of a mixing valve and additional water sensor.

The unit can always be combined with Sanitary tank (with solar kit extension) and with swimming pool.

Water temperature target depends on the maximum heating supply set-points (Target area 1, target area 2).

◆ Selecting space heating configuration

System configuration set according to water type is available from the system configuration menu at unit controller:

System configuration - Space heating - Circuit 1

Description	Default value	Range	Steps	Units
Water calculation mode	Fix	Disabled Point Gradient Fix	-	-

System configuration - Space heating - Circuit 2

Description	Default value	Range	Steps	Units
Water calculation mode	Disabled	Disabled Point Gradient Fix	-	-

◆ Space heating activation conditions

If “Water type heating” is disabled then full space control heating is disabled.

- Space heating mode is activated by any of following events:
  - Space Heating mode selected by user (User interface RUN/STOP button) and
    - Space Heating mode Demand ON by external input (demand ON/OFF), or
    - Space Heating mode Demand ON by intelligent thermostat (demand ON/OFF), or
    - Space Heating mode Demand ON by unit controller timer, or
    - Space Heating mode Demand ON by central operation.
- Space heating mode is disabled if:
  - Domestic Hot Water operation mode is in DHW priority and in load condition.
  - No-load condition is active (all of the activation events are inactive).
  - Unit controller timer or central blocked
  - Tariff function blocked

NOTE

When space heating is not active the HYDRO FREE unit will not request compressor frequency for space heating and, if no other operation mode is active, outdoor unit will receive a Thermo OFF situation.

◆ Water temperature set-point

Each of the 2 water circuits will have an independent water set-point.

Water circuit set-point configuration can be set as follows:

System configuration - Space heating - Circuit 1

Description	Default value	Range	Steps	Units
Water calculation mode	Fix	Disabled Point Gradient Fix	-	-

System configuration - Space heating - Circuit 2

Description	Default value	Range	Steps	Units
Water calculation mode	Disabled	Disabled Point Gradient Fix	-	-

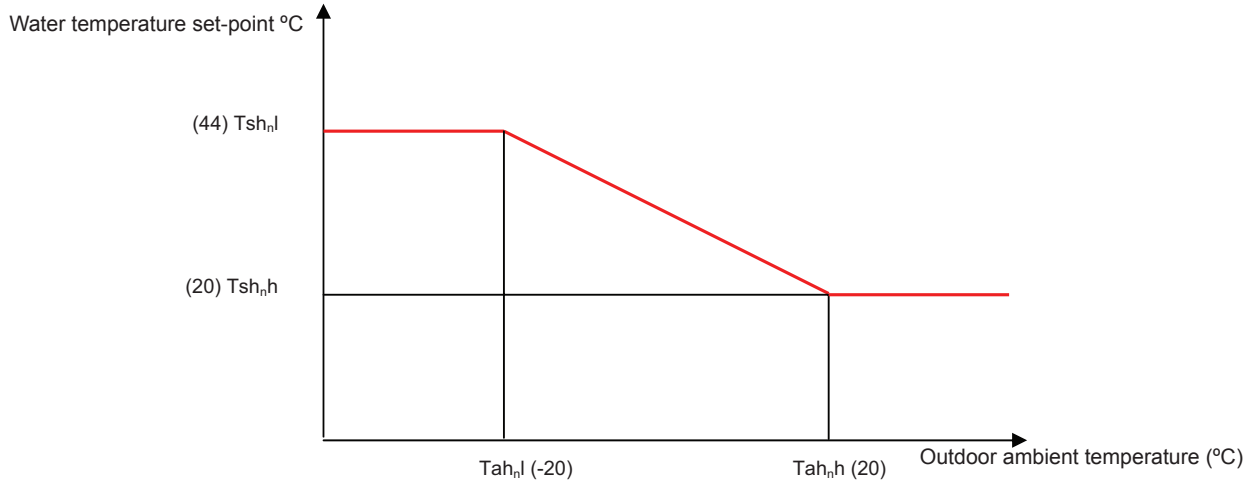
Where:

- Disabled
  - Heating circuit is disabled
- OTC Point
  - Water target is selected by an Outside Temperature Compensated (OTC) control that is defined by 4 different points (Minimum and maximum water outlet temperature vs Minimum and maximum outdoor ambient temperature).
- OTC Gradient
  - Water target is selected by an Outside Temperature compensated (OTC) control that is defined by a different gradient of the curve. The initial point of the curve is always 20ºC-20ºC (Water outlet target 20ºC at outdoor ambient temperature of 20ºC).
- Fix
  - Water target value is defined by a fixed temperature set by the user.

OTC Points: Outside temperature compensated (OTC) control by points

OTC Points system will use average outdoor ambient temperature in order to get the water temperature set-point.

Water set-point will be determined using the following rule:



Where:

Tsh$_n$L: Temperature setting at low ambient temperature

Tsh$_n$H: Temperature setting at high ambient temperature

Tah$_n$L: Low ambient temperature

Tah$_n$H: High ambient temperature

n: water circuit number (n= 1 or 2)

REF	Description	Default Value	Range	Steps	Units
CIRCUIT 1 (Direct circuit)					
Tah$_1$l	Low ambient temperature C1	-20	-20~6	1	ºC
Tah$_1$h	High ambient temperature C1	20	7~25	1	ºC
Tsh$_1$l	Set-point at low ambient temperature C1	A	Tmax$_1$~Tmin$_1$ (*)	1	ºC
Tsh$_1$h	Set-point at high ambient temperature C1	B	Tmax$_1$~Tmin$_1$ (*)	1	ºC
CIRCUIT 2 (Mixed circuit)					
Tah$_2$l	Low ambient temperature C2	-20	-20~6	1	ºC
Tah$_2$h	High ambient temperature C2	20	7~25	1	ºC
Tsh$_2$l	Set-point at low ambient temperature C2	A	Tmax$_2$~Tmin$_2$ (*)	1	ºC
Tsh$_2$h	Set-point at high ambient temperature C2	B	Tmax$_2$~Tmin$_2$ (*)	1	ºC

Code	RWLT	RWHT	Unit
			ºC
A	44	70(*1)	ºC
B	20	20	ºC

NOTE

- *Default value corresponds to Water Rule = 0.6 (Radiant Floor).*
- *(*): Values (Tmaxh$_{1/2}$~Tminh$_{1/2}$) are set by installer in maximum temperature setting configuration.*
- *(*1): In case of complimentary heating activation due to a combination with an auxiliary heater (Boiler or Heater+Boiler), maximum supply temperature range can be set up to 80ºC.*

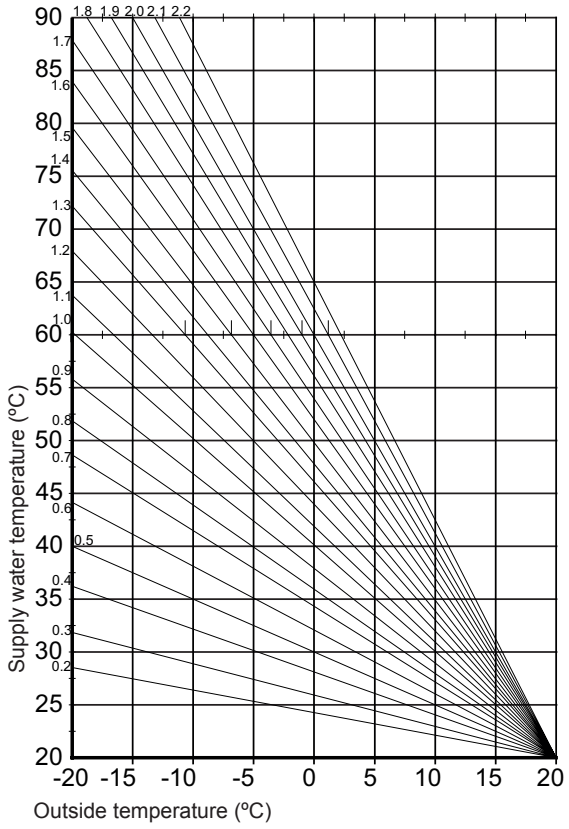
CAUTION

- *It is the installer's responsibility to make sure no unwanted situation occurs (for example: water temperature setting too high into floor heating).*
- *When only circuit 1 is heating, circuit 2 will be fed with water at temperature equal to the target water of circuit 1.*

OTC Gradient: Outside temperature compensated (OTC) control by gradient

Water target is selected by an Outside Temperature compensated (OTC) control that is defined by a different gradient of the curve. The initial point of the curve is always 20ºC-20ºC (Water outlet target 20ºC at outdoor ambient temperature of 20ºC).

The gradient of the heating curve describes the relation between the change in the supply temperature and the change in outside temperature.



Gradient	Water Outlet Target
0.2	-0,2 x Text + 24
0.3	-0,3 x Text + 26
0.4	-0,4 x Text + 28
0.5	-0,5 x Text + 30
0.6	-0,6 x Text + 32
0.7	-0,7 x Text + 34
0.8	-0,8 x Text + 36
0.9	-0,9 x Text + 38
1.0	-1,0 x Text + 40
1.1	-1,1 x Text + 42
1.2	-1,2 x Text + 44
1.3	-1,3 x Text + 46
1.4	-1,4 x Text + 48
1.5	-1,5 x Text + 50
1.6	-1,6 x Text + 52
1.7	-1,7 x Text + 54
1.8	-1,8 x Text + 56
1.9	-1,9 x Text + 58
2.0	-2,0 x Text + 60
2.1	-2.1 x Text + 62
2.2	-2.2 x Text + 64

System Configuration –Space Heating - Circuit 1 – Gradient

Description	Default Value	Range	Steps	Units
Gradient Curve	C	0.2~2.2	0.1	-

System Configuration –Space Heating - Circuit 2 – Gradient

Description	Default Value	Range	Steps	Units
Gradient Curve	0.6	0.2~2.2	0.1	-

Code	RWLT	RWHT	Units
C	0.6	1.4	-

⚠ CAUTION

- *It is the installer's responsibility to make sure no unwanted situation occurs (for example: water temperature setting too high into floor heating)*
- *When only circuit 1 is heating, circuit 2 will be fed with water at temperature equal to the target water of circuit 1.*

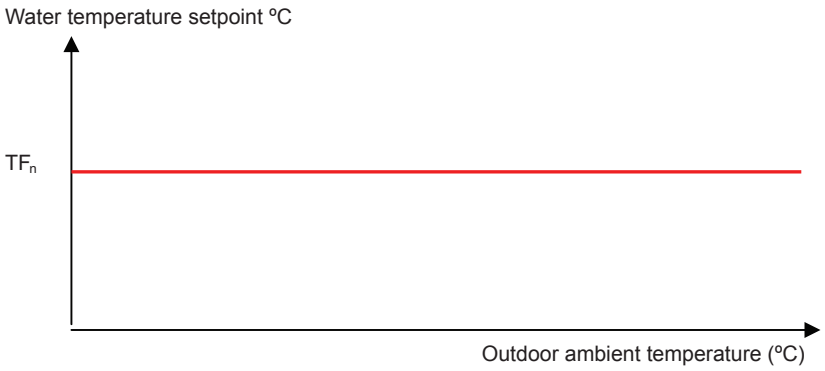
Example:

OTCh1= ***1.1***

Text (Outdoor temperature) = 0ºC → *water outlet target = -1.1x 0 +42* = **42ºC**

Fixed water temperature set-point

Outdoor ambient temperature has no effect on this setting. The user will select a fixed water outlet temperature setpoint.



Where:

TF_n: Fixed temperature setting

n: heating circuit number (n= 1 or 2)

System Configuration –Space Heating - Circuit 1 – Fix

REF	Description	Default Value	Range	Steps	Units
TF1	Fixed temperature C1	D	$Tmax_1$~$Tmin_1$ (*)	1	ºC

System Configuration –Space Heating - Circuit 2 – Fix

REF	Description	Default Value	Range	Steps	Units
TF2	Fixed temperature C2	40	$Tmax_2$~$Tmin_2$ (*)	1	ºC

Code	RWLT	RWHT	Units
D	45	70(*2)	ºC

NOTE

- *(*): Values ($Tmaxh_{1/2}$~$Tminh_{1/2}$) are set by installer.*
- *(*2): Whether R134a compressor is disabled (DSW4, PIN1:ON), default setting is 45ºC.*
- *Water outlet temperature will depend on unit's operational working range.*

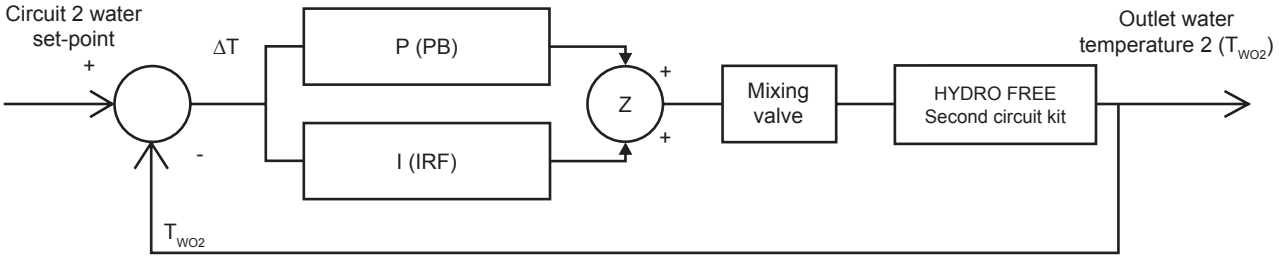
CAUTION

- *It is the installer's responsibility to make sure no unwanted situation occurs (for example: water temperature setting too high into floor heating).*
- *When only circuit 1 is heating, circuit 2 will be fed with water at temperature equal to the target water of circuit 1.*

◆ Second water temperature control

The mixing valve is controlled to maintain the second heating supply temperature at the second heating temperature set-point. The mixing valve position is calculated with a proportional integral action (P+I) control algorithm based on the difference between the heating supply set-point and the heating supply temperature.

The system control then decides how much to open or close the mixing valve to achieve the desired position for the valve.



Where:

PB: Proportional band of mixing valve.

IRF: Integral reset factor of mixing valve.

RTV: Running time factor of mixing valve.

◆ Water set-point priority

When system is in direct + mixed mode and both are active, resultant set-point is always circuit 1 water set-point (direct mode).

NOTE

In theory it should be done as the bigger of the two but in the case of circuit 2 (mixed) being higher than circuit 1 (direct) there would be problems in the circuit 1 (direct). This situation can only result from a bad configuration from installer and must be avoided.

In case of not demand in one of the two circuits, the water target of the circuit with demand has priority, and water target will be calculated for this circuit.

In case of Circuit 1 Demand OFF or OFF, Thermo OFF of Circuit 2 must be done by Two.

System Configuration –Space Heating - Circuit 2 – Mixing valve

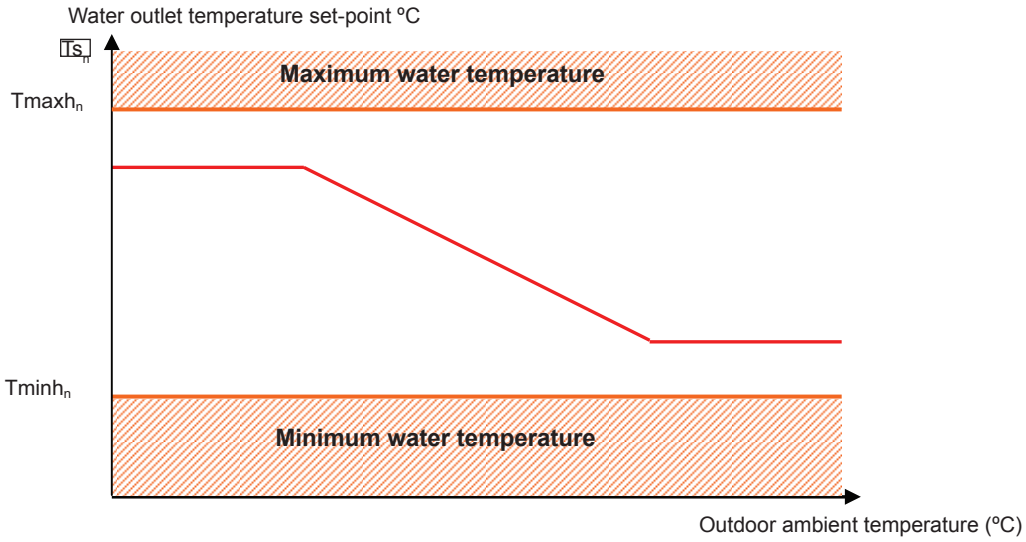
Description	Default Value	Range	Steps	Units
Proportional Band	6.0	0~20	0.2	K
Integral Reset Fact.	2.5	0.0~20	0.1	%
Mixing valve Run Time Factor	140	10~250	10	sec
Over-T offset protection	5	OFF, 3~10	1	ºC

Values are adjusted for the use with the 2nd zone mixing kit accessories ATW-2TK-03 and ATW-2TK-04. It is highly recommended not to change these values.

Over-T offset protection is used in case of a mixing valve malfunction (i.e.: blocked). The protection has no effect in case it is set to OFF. For more information, refer to alarm 73 condition.

◆ Selection of heating circuit minimum/maximum temperature limits by Installer

The installer will limit the Space Heating Temperature Set-point in order to prevent excessively high or low temperatures in the space heating.



Temperature Limit values:

System Configuration –Space Heating - Circuit 1 - Working Limits

Description	Default Value	Range	Steps	Units
Maximum supply temperature	E	35~F	1	ºC
Minimum supply temperature	20	20~34	1	ºC

System Configuration –Space Heating - Circuit 2 - Working Limits

Description	Default Value	Range	Steps	Units
Maximum supply temperature	E	35~F	1	ºC
Minimum supply temperature	20	20~34	1	ºC

NOTE

CODE	RWLT	RWHT	Units
E	45	80 (*2)	ºC
F	45 (*)	80 (*2)	ºC

- *(*): In case of Boiler combination complementary heating activation (Boiler or Boiler + Heater) maximum supply temperature range can be set up to 80ºC.*
- *(*2): If R134 compressor is disabled (DSW4, Pin 1: ON) setting must be 45ºC.*
- *Temperature limits have priority over all other temperature set-point modifications (Room Thermostat, User Selection, etc.), and maximum water temp is limited by unit's operational range.*

CAUTION

Due to the thermal inertia of the system, the real temperature could get up to 5ºC above the maximum set temperature.

2.2.1.2 Compressor thermo ON/OFF control for space heating & DHW & Swimming Pool

◆ **Forced compressor STOP (Thermo-OFF)**

Compressor is forced to stop by thermo-OFF when:

There is a Demand OFF operation or when any of the following conditions is fulfilled:

a. The measured outlet temperature value ≥ Ttwo + 5ºC
b. The outlet water temperature is higher than the maximum range temperature (A)
c. Outlet water temperature is higher than the maximum temperature set by installer (Only in case of space heating)
d. Inlet water temperature ≥ B
e. By an abnormal condition

◆ **Compressor re-operation (Thermo-ON)**

Re-operation of the compressor (Thermo-ON) is activated when:

There is a demand ON operation, and

i. Compressor has stopped for 3 or more minutes
ii. Measured outlet water temperature is less than the target temperature (Ttwo)
iii. Measured inlet water temperature is less than D

NOTE

When the temperature setting is changed during Thermo-Off, the new temperature setting is apllied for i. and iii.

Model	RWLT			RWHT
Unit capacity (HP)	3	5	10	5
A	55	60	60	80
B	53	57	57	77
D	53	57	57	77

2.2.1.3 Compressor thermo ON/OFF control for space cooling

◆ **Forced compressor STOP (Thermo-OFF)**

Compressor is forced to stop by thermo-OFF when:

There is a Demand OFF operation or when any of the following conditions is fulfilled:

a. The measured outlet temperature value ≤ Ttwo - 4ºC
b. The outlet water temperature is less than the maximum water range temperature
c. The water outlet temperature is less than 5ºC
d. There is a Space cooling Demand OFF
e. By an abnormal condition

◆ **Compressor re-operation (Thermo-ON)**

i. Compressor has stopped for 3 or more minutes
ii. Measured outlet water temperature is less than the target temperature (Ttwo)

2.2.2 Initial Start-up at Low outdoor ambient temperatures

NOTE

Only For RWLT & HEATER Not FORCED to OFF (By DSW Setting)

During commissioning and when water temperature is very low, it is important for water to be heated gradually.

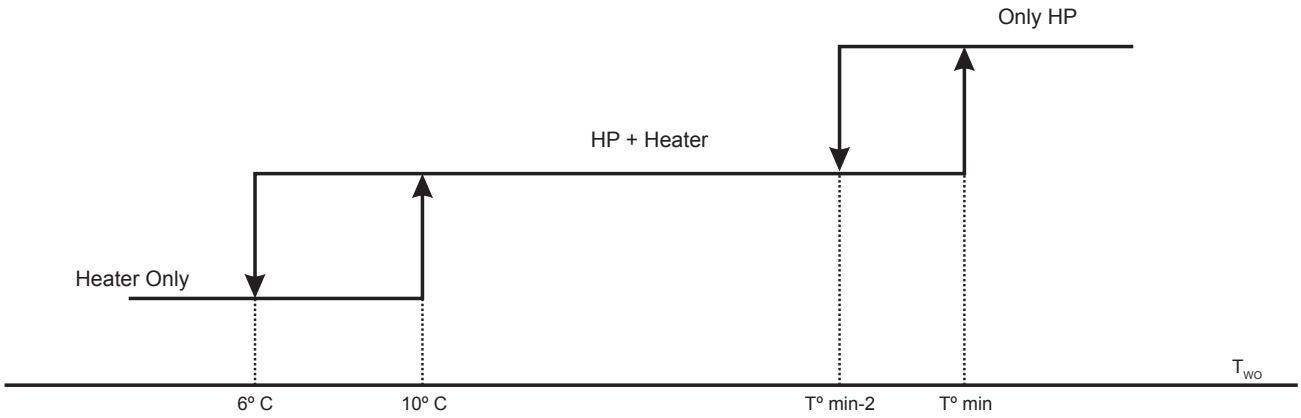
In those conditions, additional function should be used for starting at low water temperature conditions:

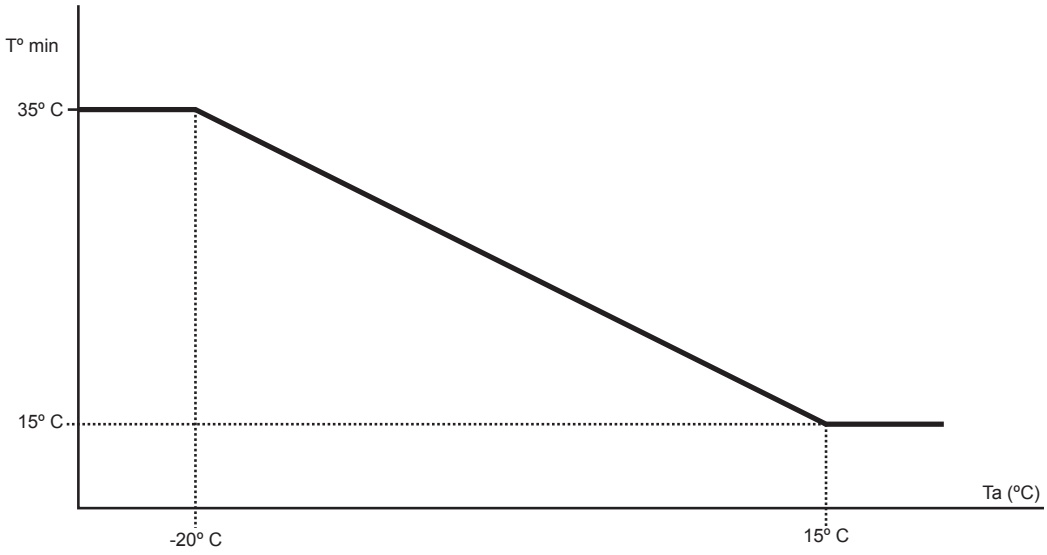
Space Heating at lower water temperatures (approximately 10ºC to 20ºC) and lower outdoor ambient temperatures (<10ºC) can damage the heat pump when defrosting.

As a result, Heating up to 15ºC when outdoor temperature is lower than 6ºC is performed by the Electrical Heater (Optional accessory).

If ambient Tº (instant) > 6ºC → Heating by Heat Pump Only

If ambient Tº (instant) ≤ 6ºC → see graphic below:





NOTE

This condition is not applied if Heater forced OFF by DSW setting & DHW Operation.

CAUTION

In case of Heater Forced OFF (by optional dip switch setting) these condition is not performed and heating is performed by Heat Pump. HITACHI is not responsible for its operation.

2.2.3 Space water temperature control optional functions

2.2.3.1 Water ECO offset

◆ Function

HYDRO FREE allows the use of a reduced offset for water temperature setting. By using this function, current water temperature setting is reduced by the indicated parameter (configurable by unit controller (PC-ARFWE).

System Configuration → Space heating → Circuit 1

Description	Default Value	Range	Steps	Units	RWLT	RWHT
ECO offset Water Set.	3	1~10	1	ºC	○	○

System Configuration → Space heating → Circuit 2

Description	Default Value	Range	Steps	Units	RWLT	RWHT
ECO offset Water Set.	3	1~10	1	ºC	○	○

System Configuration → Space cooling → Circuit 1

Description	Default Value	Range	Steps	Units	RWLT	RWHT
ECO offset Water Set.	3	1~10	1	ºC	○	-

System Configuration → Space cooling → Circuit 2

Description	Default Value	Range	Steps	Units	RWLT	RWHT
ECO offset Water Set.	3	1~10	1	ºC	○	-

◆ Function activation

ECO offset function is active for each circuit by differents options:

- External configurable input (See optional functions chapter)
- Favourite button in Unit controller (PC-ARFWE)
- Schedule or simple timer in Unit controller (PC-ARFWE)
- Central device actions

◆ Function control

Heating

The heating control of the Water offset function is done by the following means

TtwofCn = TtwoOTCn - CnECO

Cooling

TtwofCn = TtwoOTCn + CnECO

Where:

TtwofCn: Final water temperature setting (ºC)

TtwoOTCn: Water temperature setting fixed OTC Control (ºC)

CnECO: Water ECO offset for heating (ºC)

Cn: Circuit numer (n=1; n=2)

NOTE

Only available for water space heating or cooling.

2.2.3.2 Outdoor temperature compensation control

◆ OTC average timer

Average timer corrects the influence of the ambient temperature variations. The weather dependant set point calculation is done on the average outdoor temperature.

The outdoor temperature is averaged over the selected time period. This configuration should be done through the Unit controller (PC-ARFWE).

System Configuration → Heat pump → System

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Outdoor average timer	4	0~24	1	hour	○	-

NOTE

- *When the value is set to 0, there is no outdoor average temperature. The value is a direct value from sensor.*
- *The outdoor temperature average have the same timer both for Circuit 1 and Circuit 2.*

◆ Secondary outdoor sensor accessory

Optional outdoor temperature sensor accessory (ATW-2OS-02) can be directly connected to the controller in case that the heat pump is located in a non-suitable position for this measurement.

HYDRO FREE can use the two outdoor temperature sensors (Outdoor unit ambient temperature and an Auxiliary ambient temperature for both space heating/cooling circuits).

Sensor is selected as auxiliary sensor configuration, as explained later in this chapter.

◆ Configuration of the Outdoor temperature compensation control

Source temperature for average calculation is selectable by DSW5, Pin1 & 2 at start up with the following values:

DSW5		Action
PIN1	PIN2	
OFF	OFF	C1: Outdoor sensor average; C2: Outdor sensor average
OFF	ON	C1: Outdoor sensor average; C2: Auxiliary ambient sensor average
ON	OFF	C1: Auxiliary ambient sensor average; C2: Outdoor sensor average
ON	ON	C1: Auxiliary ambient sensor average; C2: Auxiliary ambient sensor average

Select auxiliary sensor (1, 2 or 3) for second outdoor ambient function.

2.2.3.3 Hydraulic separator

In some installations, water pump of the HYDRO FREE unit is not sized for big heating installations (small water pump). In those cases, a hydraulic separator or buffer tank, as a secondary water pump, has to be used to ensure a proper water pump dimensioning.

The boiler is configured in parallel with the heat pump. A hydraulic separator or buffer tank has to be used to ensure a proper hydraulic balancing. Additional water pump (WP3)and water sensor (Two3) is needed for the boiler combination control (automatically added when Boiler combination is enabled).

This settings should be done through the Unit controller (PC-ARFWE) as explained below:

System Configuration → Heat pump → System

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Hydraulic separator status	Disabled	Disabled/Enabled	-	-	○	○

2.2.3.4 Installation with big buffer tank

Some installations need a big buffer tank in combination with an auxiliary heating system (boiler, pellets, solar panels, etc.). In those cases, the control of the water temperature can be done by an external temperature sensor (Two3) to heat the water of that tank.

This functionality is also used in combination with SG Ready smart function (refer to *"3. Optional functions"*).

For example, the system works for only one zone application.

Using the buffer tank in combination with a boiler, Circuit 1 is working as Circuit 2 in a mixing loop. With this system, the configuration of the Unit controller is like for two circuits:

- Circuit 1: Buffer tank working as Circuit 1
- Circuit 2: Mixing circuit for space heating

NOTE

- *Settings for Circuit 1 must be always higher than for Circuit 2.*
- *User can configure only one thermostat only for circuit 2.*
- *Circuit 1 only works as a buffer tank (ThermoON/OFF mode) .*

Also, it is possible to switch OFF the HYDRO FREE water pump when Thermo OFF condition is active (i.e.: when the buffer tank temperature is reached).

◆ Configuration and parameters for an installation with buffer tank

For an installation to work with a buffer tank the following configuration must be done:

- DSW settings: DSW5, PIN 4: ON is required to enable this function
- Auxiliary sensor: Auxiliary sensor 1, 2 or 3 is needed to be set to Two3
- Output signals: Output signal 1 or 2 should be set to WP3

Additionally, this function should be set through the Unit controller (PC-ARFWE)

System Configuration – Heat Pump – Water Pump Configuration

Description	Default Value	Range	RWLT	RWHT
Stop conditions	Standard	Standard / Thermo OFF	○	○

If water pump changes to Thermo-OFF, water pump 1 is switched off after the buffer tank temperature is achieved. Water pump 3 is always running (except when switch OFF condition).

For example, the system works for 2 zone application: with the buffer tank in combination with a boiler, the Circuit 1 works as a direct circuit (temperature of buffer tank must be the same as for Circuit 1); and circuit 2, using a mixing loop.

According to this example, the Unit controller should be configured as for 2 circuits:

- Circuit 1: Direct circuit for space heating Zone 1
- Circuit 2: Mixing circuit for space heating Zone 2

NOTE

- *Setting of Circuit 1 must be always higher than the setting for circuit 2.*
- *User can configure 2 thermostats for each circuit.*
- *Circuit 1 works as a Direct circuit.*

◆ Main control

The water temperature control is based on:

Water temperature data from circuit 1 and circuit 2 (THM_{WO} and THM_{WO3}).

Example:

- If water temperature settings (Ttwo)= 50ºC, and
- Water outlet temperature (THMwo)= 40ºC, and
- Water outlet temperature (THMwo3)= 35ºC

Unit frequency water temperature control will be done by THMwo

Thermo ON/OFF will occur when THMwo3 gets the set temperature for in Circuit 1

If Circuit 1 is in Demand OFF, unit setting changes to Circuit 2, but mixing valve is used to reduce the temperature stored in the buffer tank.

2.2.3.5 Heating auto ON/OFF

When outside temperature rises, it is not necessary to keep the installation in heating mode. HYDRO FREE system switches the heat to OFF when the daile average outdoor temperature of the previous day rises above the Switch-OFF Temperature.

The variables that the system uses are configured though the Unit controller (PC-ARFWE):

System configuration → Optional functions → Space functions → Heating Auto ON/OFF

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Status	Disable	Disable/Enable	1	-	○	○
Switch-OFF T	22	10~25	1	ºC	○	○
Switch-ON Differential	1	1~3	1	ºC	○	○

The system calculates the average temperature of the last 24 hours.

The system will not check anything until the first 24 hours have passed. After that time, the system will adjust the average with a new sample every 5 minutes and checking the new conditions.

2.2.4 Demand ON/OFF

The space heating demand of the HYDRO FREE unit can be done by different ways:

- Demand ON/OFF by an external input signal (by using the ATW-RTU-04 ON/OFF thermostat)
  - Option 1: Input 1 for both circuit (Circuit 1 & Circuit 2)
  - Option 2: Input n for Circuit 1 and Input n2 for Circuit 2, independently
- Demand ON/OFF operation between Room ambient and Room setting temperature in case of using PC-ARFWE as Room thermostat.
- Demand ON/OFF operation by a Central Device

NOTE

- *"n" is the number according the input (Input1, Input2...etc)*
- *The options for the configuration should be done through the unit controller (PC-ARFWE).*

2.2.4.1 Demand ON/OFF by an external input signal

When the system has the ON/OFF thermostat (ATW-RTU-04) connected to the terminals 13/14 of the Terminal board (input 1, Demand ON/OFF):

- When a closed signal is active in Input 1 there is a Demand ON condition.
- When an Open signal is active in Input 1, there is a Demand OFF condition.

NOTE

The options for the configuration should be done through the unit controller (PC-ARFWE).

2.2.4.2 Demand ON/OFF by a room thermostat

This function is available with the following possible combinations:

- PC-ARFWE (Unit controller) is used as a room thermostat, or
- Central device is used as Air control device
- When the system uses Room temperature sensors + PC-ARFWE (Working as a Unit controller) + Room thermostat

In case of Room thermostat overheat or over cool, the system can switch to Demand OFF (Compressor OFF, Heater OFF) if the Room thermostat temperature (Roff) is higher than the Room temperature set point. In case of ECO pump selected, the water pump also switches to OFF after over-run time.

The parameters used by the system for the control of this function are described below:

Heating:

- If $RT_{Cn} > RS_{Cn} + Roffh_{Cn}$ → Demand OFF condition
- If $RT_{Cn} \leq RS_{Cn}$ → Demand ON condition

The configuration of this function should be done through the Unit controller (PC-ARFWE):

System Configuration → General Options → Room Thermostats → Room Temp Demand OFF → Circuit 1

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Room demand OFF Heat	3	OFF 1~5	1	ºC	○	○

System Configuration → General Options → Room Thermostats → Room Temp Demand OFF → Circuit 2

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Room demand OFF Heat	3	OFF 1~5	1	ºC	○	○

NOTE

To disable the Room demand ON/OFF function, just set to OFF

2.2.4.3 Minimum ON/OFF time between Demand ON/OFF operation

In order to reduce a possible compressor damage, demand ON/OFF cycles can be reduced by the following conditions

- Minimum ON Time: When a Demand ON is enabled, this function applies a minimum of time to be ON.
- Minimum OFF time: This function determines the time that must pass after a Demand OFF.

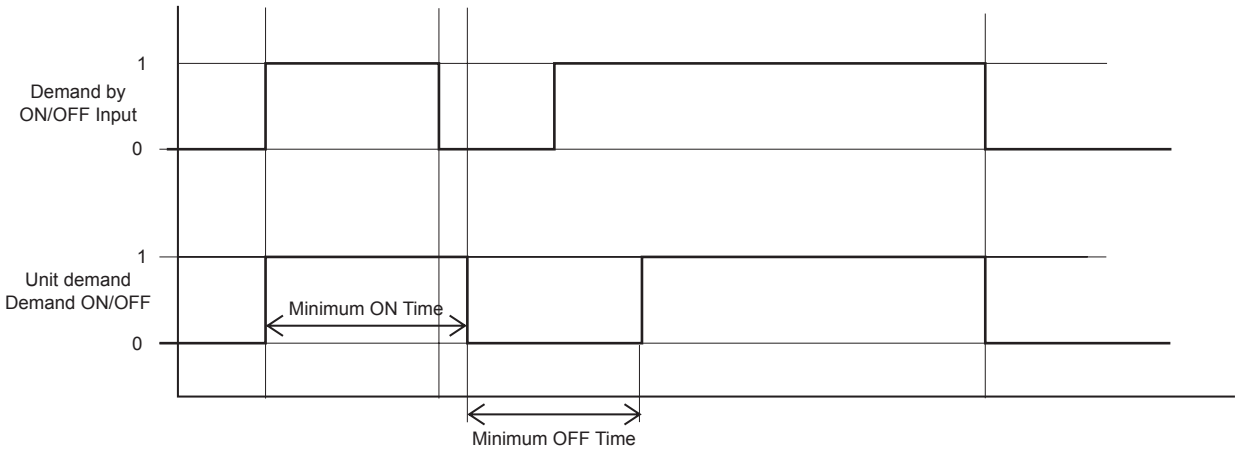
This function can be set through the Unit controller (PC-ARFWE):

System Configuration → Heat pump → system

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Minimum ON Time (Rton)	6	0 ~ 15	1	min	○	○
Minimum OFF Time (Rtoff)	6	0 ~ 15	1	min	○	○

NOTE

- *Time starts counting when a signal is received from an ON/OFF input*
- *If both parameters are set to 0, this function has no effect.*



NOTE

- *It is applied for 2 circuits (same parameters).*
- *Not considering in compressor start.*

2.2.5 Room temperature compensation control

HYDRO FREE allows the use of room temperatures and room temperature settings for both of the circuits (Circuit 1 & 2) in order to compensate the water temperature setting.

This function is available with the following possible combinations:

- PC-ARFWE (Unit controller) is used as a Room thermostat, or
- Central device is used as Air control device
- When the system uses Room temperature sensors + PC-ARFWE (Working as a Unit controller) + Room thermostat
- When water calculation based on OTC Gradient or OTC points (Fix settings are not available for this function)

At different times of the day, according to the time programme in the Room Unit, the room temperature set point will cause a shift of the heating curve up or down to reflect the change in desired room temperature. The change in supply set point due to the room set point is dependent on the value of the outside temperature and the selected heating curve.

When Room compensation is enabled, the calculated supply set point is adjusted according on the difference between the Room temperature and the Room set point in order to reduce the room temperature error. The amount of room influence can be adjusted by the Room temperature compensation factor setting.

To increase or decrease the amount of room compensation, the room compensation factor should be adjusted. A higher value will give more priority to the room temperature error, and a lower value will lead the controller to follow more closely the selected heating curve.

The configuration of this parameter should be done through the Unit controller (PC-ARFWE)

System Configuration → General Options → Room Thermostat application → Compensation Factors → Circuit 1

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Compen.Factor Heat	2	OFF- 1~5	1		○	○
Max Compen.Factor Heat +	10	0-10	1	ºC	○	○
Max Compen.Factor Heat -	-10	-10-0	1	ºC	○	○

System Configuration → General Options → Room Thermostat application → Compensation Factors → Circuit 2

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Compen.Factor Heat	2	OFF- 1~5	1		○	○
Max Compen.Factor Heat +	10	0-10	1	ºC	○	○
Max Compen.Factor Heat -	-10	-10-0	1	ºC	○	○

NOTE

- *To disable Room compensation function, set to OFF*
- *Max Compen Factor (Heat; +/-) sets the maximum value of compensation value (positive or negative) to be adjusted in OTC Setting Control.*

Water temperature set point is calculated as follow:

Heating

- TtwoCn: = Ttwo_OTCn + Rfacthn x (∆Troom)
  - If Rfacthn x (∆Troom2) > Maxfacthpn → Rfacthn x (∆Troom) = Maxfacthpn
  - If Rfacthn x (∆Troom2) < Maxfacthnn → Rfacthn x (∆Troom) = Maxfacthnn

Where:

TtwoCn: Result Water Set-Point for Cn Circuit (ºC);

Ttwo_OTCn: Water Set-Point as calculated by OTC in Cn Circuit (ºC);

∆Troom: Room Temperature Offset = RSC - RTCn.

RSCn = Room set point (ºC);

RTCn = Room temperature (ºC);

Cn: Circuit number (n= 1 Circuit 1; 2= Circuit 2)

NOTE

- *When water calculation is fixed, Room set point influence has no effect.*
- *First 10 minutes after power on Room set point influence has no effect.*

2.2.6 Switch OFF space condition by room thermostat

HYDRO FREE allows the use of Room temperature and Room temperature setting in order to switch OFF the system

This is only available in the following cases:

- PC-ARFWE as Room thermostat
- Central device as Air control

In case of PC-ARFWE as Room Thermostat: By pushing OFF button

2.2.7 Determination of room temperature data

In order to apply for room temperature functions, different room temperature sensors can be used.

- Use from PC-ARFWE Sensors.
- Use from unit Taux sensor as Room temperature sensor.
- Use from central application.

There is a priority of room temperature sensor application for room temperature compensation functions.

1 Use from unit Taux sensor.
2 Use from PC-ARFWE Sensors.
3 Use from central application.

In case of room temperature setting, priority is as follow:

In case of a received data by central, the central setting value is applied in any case. After that, value is only changed if the value from the room thermostat (Wired or Wireless) is a different value than previous one (restored before change by central value).

2.3 Sanitary Water Operation

NOTE

- *If you have an installation with a HYDRO FREE Indoor Unit, with the new software (H-204), connected to a Side Flow Outdoor Unit, following configuration is not required.*
- *If you have an installation with a HYDRO FREE machine, with the new software (H-204), connected to a SIGMA machine, configure Outdoor Unit as follows.*

In case of 3 Hp units and Heating up of DHW tank in summer:

In order to heat up the DHW tank in summer (outdoor air temperature higher than 21ºC), special functions must be activated in the function selection mode of the outdoor unit:

Activation of Release of outdoor air limit (GS):

1 Switch DSW2#5 from OFF to ON in normal mode and with the outdoor unit being stopped.
2 Press PSW2 "▼" to move forward to the next setting item.
3 Select item number 3 (GS).
4 Press PSW2 & PSW3 and change the value from 0 to 3 with PSW1.
5 Press PSW2 & PSW3 to confirm the change.
6 Switching DSW2#5 from ON to OFF or returning to normal mode during operation writes the setting contents to the EEPROM.

2.3.1 Enabling operation

Sanitary water operation should be enabled from the Unit controller (PC-ARFWE)

System Configuration → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Status	Enabled	Disabled / Enabled	-	-	○	○

Sanitary Operation has priority above all other operation modes unless it is specifically stated.

Following constraints are applied:

- When Sanitary Water requires Heat Pump operation all other modes cannot require heat pump operation.
- If Sanitary Water does not require Heat Pump operation, it is stopped or is working with heater only, there is no restriction on the other operation modes.
- Solar application has priority if solar waiting time has not passed.

2.3.2 DHW Tank heater operation

The electric heater of the domestic tank is Disabled factory setting. The configuration for this function should be enabled through the Dip switch of PCB.

Configuration: DSW4 PIN3: ON

2.3.3 DHW temperature setting

Sanitary water operation (both, Heater and Heat pump) is sttoped when:

- DHWT Demand OFF conditions:
  - If TDHW > TDHWS → DHWT Demand OFF Operation

Where:

TDHW: Domestic Hot Water Temperature (ºC)

TDHWS: Setting of Domestic Hot Water Temperature (ºC)

- DHWT Demand ON conditions
  - Operation Mode (High or Standard Demand)
  - Boost operation mode

NOTE

- *In case of RWLT, the heat pump can produce domestic hot water up to 57ºC as a maximum (53ºC for 3.0HP) by itself, but HITACHI recommends to set the temperature of the tank by heat pump only up to 55º C (50ºC for 3.0HP) and keep Thpoff default value. In case of higher setting, the tank's heater must be used to reach the setting temperature (enabled by optional function).*
- *In case of heating up the DHW tank with an outdoor ambient temperature lower than -10ºC and without using the DHW electrical heater, the setting temperature must not exceed the maximum value in the specified continuous working range.*

2.3.4 Maximum set point selected by installer

In order to prevent high hot water in the tank an additional function is added:

System Configuration → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Maximum Setting Tº	55	40~A	1	ºC	○	○

NOTE

CODE	RWLT	RWHT	Units
A	40	75(*)	ºC

(*): 75ºC when tank heater is enabled by DSW4 PIN3: ON or Boiler combination with DHW is Enabled.

2.3.5 DHW operation mode

DHW operation can work on 2 different modes: Standard mode and High Demand mode:

- Standard mode: The heating of the domestic hot water shall be started when water temperature in tank is low enough for Heat Pump to be started. DHW is always started heated by Heat Pump.
- High Demand mode: The heating of the domestic hot water starts when the differential is bigger than T_{DHWON}. It starts with water tank heater only unless water temperature in tank goes below Heat Pump starting temperature.

DHW operation mode should be selected from the Unit controller (PC-ARFWE)

System configuration → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Mode (DHWm)	Standard	Standard / High D	1	-	○	○

2.3.6 DHW High Demand mode

The heating of the domestic hot water starts if the differential is bigger than T_{DHWON}. This function starts only with the heater of the tank unless water temperature inside the tank is below the Heat pump starting temperature.

The differential can be settled through the Unit controller (PC-ARFWE)

System configuration → DHW

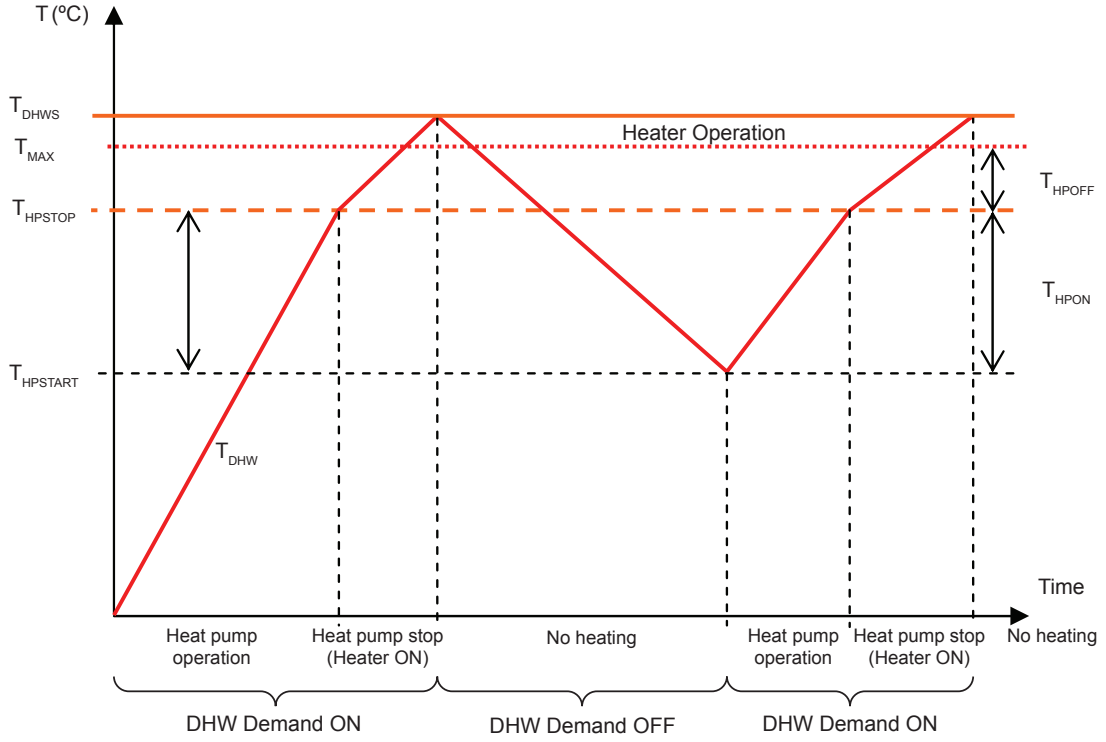
Description	Default Value	Range	Steps	Units	RWLT	RWHT
Differential T	6	2~15	1	ºC	○	○

2.3.7 Heat pump operation for DHW (T_{HPON} & T_{HPOFF})

Heat pump operation for sanitary water is started when T_{DHW} is lower than $T_{HPSTART}$.

Heat pump operation for sanitary water is stopped when T_{DHW} is bigger than T_{HPSTOP}. After this stoppage, unit should continue heating sanitary water tank (if enabled) by means of sanitary tank electric heater until stoppage conditions are met. If heater tank disable (default), tank heating is performed by Heat pump until T_{HPSTOP}.

Control



Where:

T_{DHWS}: DHWT Setting temperature (ºC)

T_{MAX}: Heat pump maximum temperature (defined by unit working range) (ºC)

T_{HPSTOP}: Temperature which the heat pump stop heat the tank

$T_{HPSTART}$: Temperature which the heat pump start to heat the tank

$T_{HPSTART}$ will be limited to equal or lower than 42ºC when ambient temperature (Tamb) > 25ºC

NOTE

The heat pump can produce domestic hot water up to 57ºC as a maximum (53ºC for 3.0HP) by itself, but HITACHI recommends to set the temperature of the tank by heat pump only up to 55ºC (50ºC for 3.0HP) and keep Thpoff default value. In case of higher setting, the tank's heater must be used to reach the setting temperature (enabled by optional function).

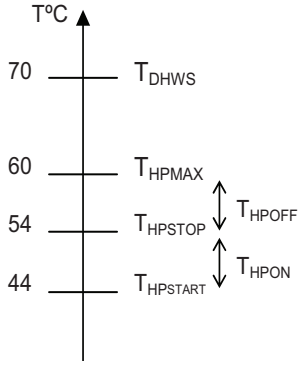
The configuration of this function should be done through the Unit controller (PC-ARFWE)

System configuration → DHW

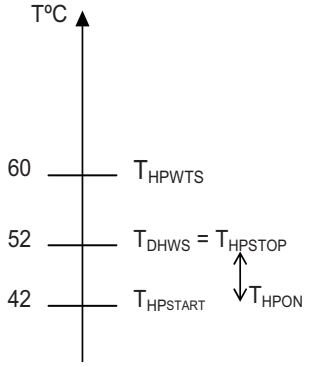
Description	Default Value	Range	Steps	Units	RWLT	RWHT
HP OFF Differential T	5	3~10	1	ºC	○	○
HP ON Differential T	10	5~30	1	ºC	○	○

Example of temperature settings for RWLT

$T_{DHWS} \geq T_{HPMAX} - T_{HPOFF}$



$T_{DHWS} < T_{HPMAX} - T_{HPOFF}$



2.3.8 Maximum DHW loading time (T_{DHWMAX})

This function controls the maximum time that Sanitary Water operation can work using Heat Pump mode. Heater operation is not affected by it.

Maximum DHW heating time can never be applied when DHW Second Cycle Waiting Time ($DHWC_{DHW}$) is disabled (set to 0).

Maximum DHW heating time is applied when:

- System in STANDARD Mode selected
- System in H.SPEED Control mode

Heat pump DHW Demand OFF if:

- Heat Pump Operation Time > T_{DHWMAX}

NOTE

When Heat Pump is stopped by this function, Sanitary Water is still heated by Heater when it is enabled, until other conditions request stoppage

The configuration of this option should be done through the Unit controller (PC-ARFWE)

System configuration → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Maximum Time	45	OFF 5~250	5	min	○	○

2.3.9 DHW second cycle waiting time

This function defines the minimum time between 2 heat pump cycles of domestic hot water

This function is active only when Standard mode is selected

Sanitary water is not active when: Sanitary water OFF Time < cycle time

This function can be configured through the Unit controller (PC-ARFWE)

System configuration → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Cycle Time	1	0~24	1	hour	○	○

2.3.10 DHW Electric heater waiting time

If Heat Pump cannot give enough capacity it will be necessary to start Heater in order to supply additional capacity.

System configuration → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
El.Heater Wait Time (DHW_{EH})	45	OFF- 1~60	1	min	○	○

If DHW_{EH} is set to OFF, then it will be considered that heater only use after $T_{HPSTOP.}$

If DHW_{EH} is set to 1, system assumes that heater is always used when there is a DHW Demand Operation if condition above is applied.

2.3.11 Space heating priority temperature

If Space Heating Priority function is enabled, Heat Pump operation by sanitary mode stops (and continue with heater, if necessary).

This function is only performed if Space Heating can be done. If it is not possible, operation will continue in HSW normally.

System configuration → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Space Priority Status	Disabled	Disabled / Enabled	1	-	○	○
Space Priority T	-5	-20~0	1	ºC	○	○

2.3.12 DHW compatibility overview

	Operation Mode	
	Standard operation	High Demand operation
Operation Control		
$T_{DHW} > T_{DHWS}$	Demand OFF	Demand OFF
$T_{DHW} < (T_{DHWS} – T_{DHWON})$	N.A	Start heater operation
$T_{DHW} < T_{HPSTART}$	Start heat pump operation	Start heat pump operation
$T_{DHW} > T_{HPSTOP}$	Stop heat pump operation, use heater if enabled	Stop heat pump operation, use heater if enabled
$Time_{DHWMAX}$	Yes	No
Cycle time CDHW	Yes	No
Start of EH DHWT (If DSW setting is: ENABLED)	Yes if $T_{DHW} > T_{HPSTOP}$ or EH Wait Time	Yes if $T_{DHW} > T_{HPSTOP}$ or EH Wait Time
EH DHWT Wait time	Yes	Yes

2.3.13 Optional function for DHW

2.3.13.1 DHW Antilegionella protection

In order to help prevent against Legionella in the domestic hot water system, the DHW set point can be raised to a higher than normal temperature. The Legionella protection only makes sense if there is a DHW electric heater to raise the DHW temperature to this high temperature (Except of RWHT).

NOTE

The installer, according to national regulation, must configure this disinfection function field setting

Installers have the following configuration parameters that can be done through the Unit controller (PC-ARFWE):

- Operation Day: day(s) of the week at which the domestic water should be heated.
- Status: defines whether the disinfection function is turned ON (1) or OFF (0).
- Starting time: time of the day at which the domestic water should be heated.
- Setting temperature: high water temperature to be reached.
- Duration: time period defining how long the set point temperature should be maintained.

System configuration → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Status	Disabled	Disabled / Enabled	-	-	○	○
Operation day	Sunday	Daily / Mon ~ Sun	-	day	○	○
Starting Time	01:00	(00:00~ 23:50)	00:10	time		
Setting temperature	70 (*3)	40~A	-	ºC		
Duration	10	10~60	-	min		

NOTE

CODE	RWLT	RWHT	Units
A	40	75(*)	ºC

- *Antilegionella has priority when Smart activation (and configured as “Only DHW Enabled) or Timer DHW*
- *In case of OFF DHWT Operation, Antilegionela is not enabled*
- *DHWset has an offset of 3ºC in order to get a keeping period.*

2.3.13.2 DHW re-circulation

HYDRO FREE units disposes an output for a Domestic Hot Water water pump re-circulation option. By using this output, user can heat all the water inside DHW system when heating DHW by Heat Pump. This output can also be used with Legionella function.

System configuration → Optional functions → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Circuit pump	Disabled	Disabled Enabled Anti-Legionella	-	-	○	○

In Case of Disabled, output is not used.

In case of Enabled, the output is enabled when Domestic Hot Water heat operation (HP or Heater) is active.

In case of Anti-legionella, output must be enabled when Domestic Hot Water for legionella operation (HP or Heater) is enabled.

◆ DHW boost

It is possible to request a one-time heating up of the domestic hot water temperature up to domestic hot water Boost temperature setting.

This can be useful when spontaneous DHWT Demand for one day.

The configuration of this option should be done through the Unit controller (PC-ARFWE).

System configuration → Optional functions → DHW

Description	Default Value	Range	Steps	Units	RWLT	RWHT
DHW Boost	Push	Disabled Push Open Closed	-	-	○	○
Boost setting	50	30 ~ Max set by installer	-	-	○	○

To start a Boost operation, user have 2 options:

- Checking the specified input to be used for Boost and applied depending on the action selected.
- PC-ARFWE Unit controller: Also, it is possible to activate this function through the Unit controller quick action button (Favourite button).

NOTE

If boost is started, it might not be stopped until temperature is reached.

2.4 Electric heater for space heating (Optional accessory)

The electrical heater can be used for emergency operation in case of outdoor unit malfunction. It should be requested as an accessory (WEH-6E).

Model	Heater Capacity	Heater steps	Electrical Heater nominal voltage
WEH-6E	6 kW	3 steps (2/4/6 kW)	1~ 230V 50Hz

Electric Heater will only operate if unit is in Space Heating mode. It will always be disabled in any other mode (Hot Sanitary Water, Swimming Pool mode).

Electric Heater will only operate when Heating Accessory is set to Heater or Heater + Boiler. In the case of Heater + Boiler it will never operate both at the same time. The decision as to how to operate will be made considering ambient temperature.

System Configuration – Complementary Heating

Description	Default Value	Range
Heating source	Only HP	HP only HP + Heater HP + Boiler

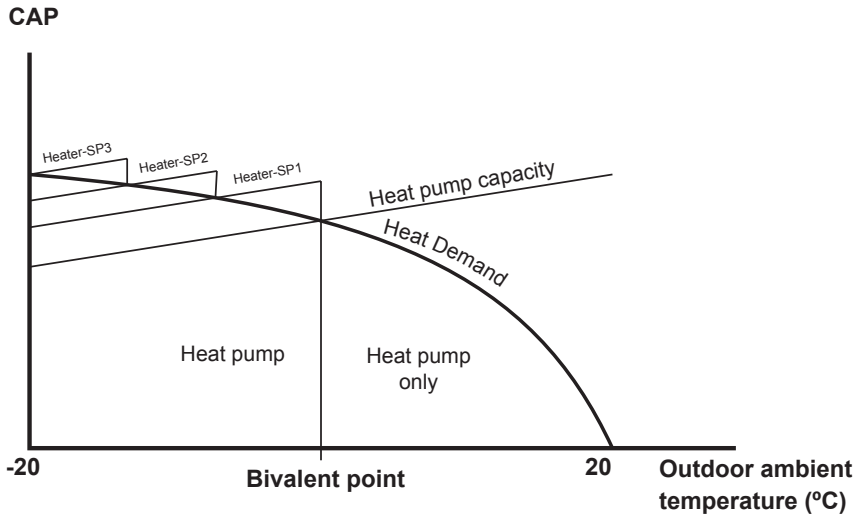
2.4.1 Heater bivalent point

Heater will only be enabled when:

Outdoor Ambient Temperature > Bivalent Point for EH (EHb).

User Variable:

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Bivalent Point For EH	0	-20~20	1	ºC	○	○



2.4.2 Target temperature

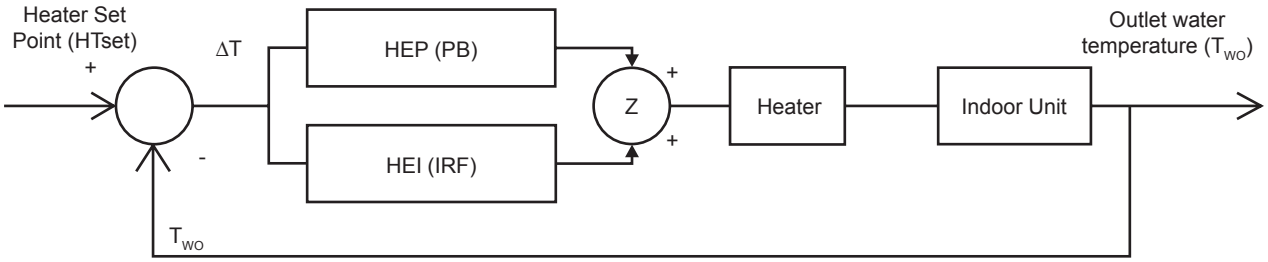
Heater operation is controlled by the heater set point.

System Configuration – Complementary Heating - Electrical Heater

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Supply setting offset	4	0~10	1	K	○	○

2.4.3 Load factor

Load Factor determines the desired heating supplied by heater. Load factor is calculated by a P+I function ranging from 0 to 100%. Actual heater output will be translated from percentage to a 3 step output using hysteresis system.



Where:

HEPB: Proportional band of electric heater.

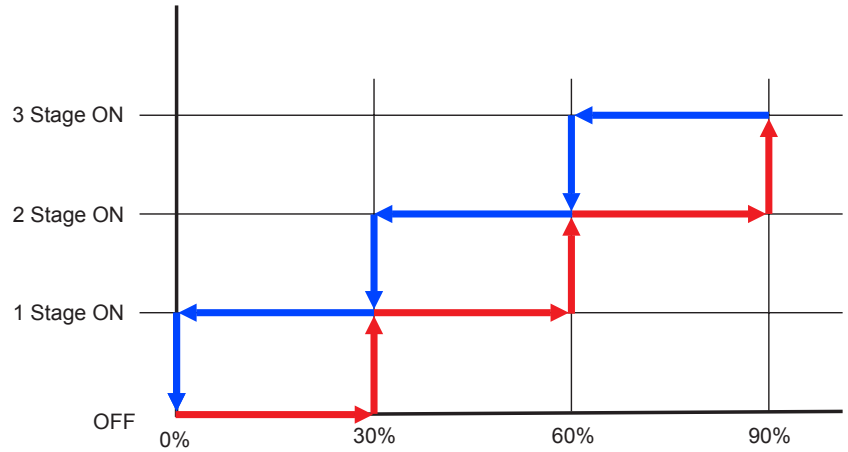
HEIRF: Integral reset factor of electric heater.

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Proportional band	6.0	0~20	0.2	°C/100%	○	○
Reset factor	2.5	0~20	0.1	%°C min	○	○

2.4.4 Heater step control

The desired heating supplied by heater is determined by the Load factor, which is calculated by a P+I function ranging from 0 to 100%. Actual heater output will be translated from percentage to a 3 step output using hysteresis system.

Steps	Power
1	2kW
2	4kW
3	6kW



Step increase conditions

Step increases from 0 (heater OFF) to 1 when Load factor is higher than 30%

Step increases from 1 to 2 when Load factor is higher than 60%

Step increases from 2 to 3 when Load factor is higher than 90%

Step decrease conditions

Step decreases from 3 to 2 when Load factor is lower than 30%

Step decreases from 2 to 1 when Load factor is lower than 60%

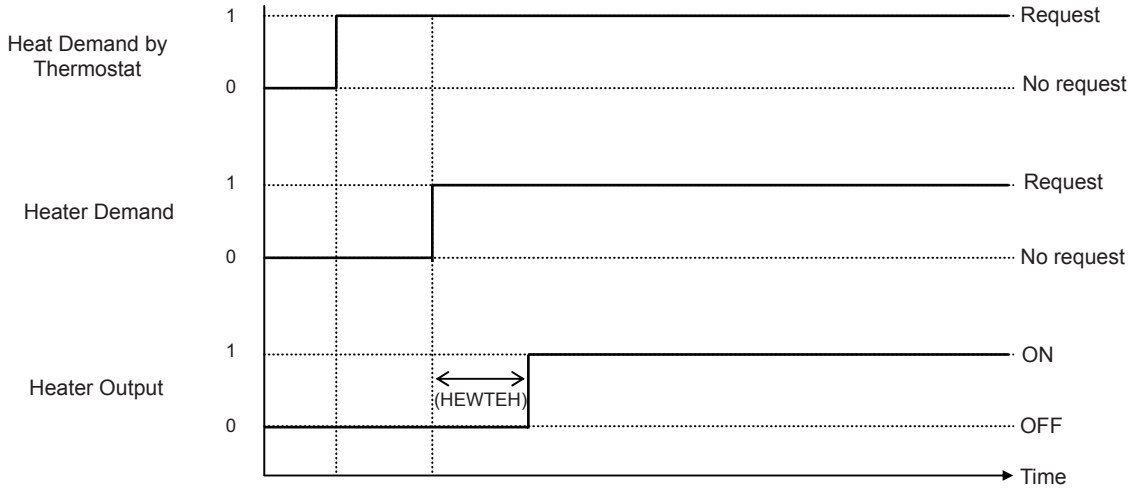
Step decreases from 1 to 0 (heater OFF) when Load factor is 0%

Normal operation will require a maximum increase or decrease of 1 step

◆ Heater waiting time

If Water set-point (Ttwo) ≤ Maximum Heat Pump Operation, Electric Heater is only allowed to operate when more than Waiting Time (HEWTEH) has passed since Heat Pump started.

When Water set-point (Ttwo) > Maximum Heat Pump Operation or when heater needs to operate in emergency mode, Electric Heater operates regardless of Waiting time.

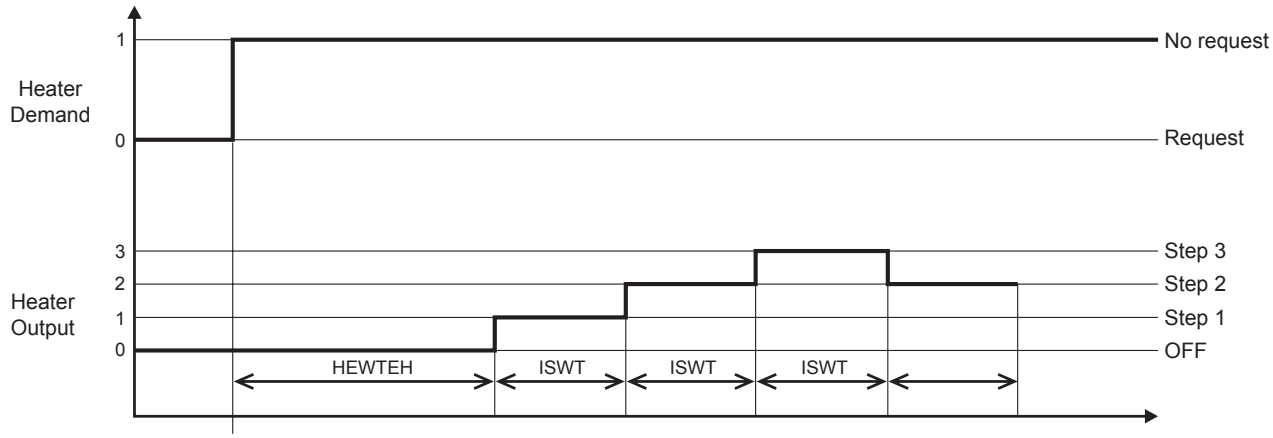


System Configuration – Complementary Heating - Electrical Heater

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Waiting Time	30	5~90	5	min	○	○

2.4.5 Heater inter-stage steps control

After each step increase, further step increases are prohibited during the Inter-Stage Waiting Time (min) (ISWT) to avoid hunting. Step decrease does not have this limitation. Since sampling time is 1 minute, at least 1 minute needs to pass between any step changes.



NOTE

ISWT: Inter Stage Time.
HEWTEH: Waiting time

System Configuration – Complementary Heating - Electrical Heater

Description	Default Value	Range	Steps	Units
Inter Stage Time	5	0~10	1	min

2.4.6 Optional functions of electric heater

- Electrical heater or boiler emergency mode:
  - When user allows emergency mode, heater operates in emergency mode. This configuration allows also DHW emergency operation.
- Heater forced OFF:
  - When user/installer allows heater forced OFF by DSW4-7 ON, All uses of the Heater are forbidden, the configuration by Unit controller has no effect and heater protections (heat at low water temperatures, emergency operation heater…) has no effect.
- One step heater for 3-phase imbalance option:
  - Optional function “One Step Heater for 3-phase unbalance option” explained in *“8. Electrical and control settings”* allows operation of all 3 heater steps to operate at same time.

NOTE

For more information refer to chapter “3. Optional functions” electrical heater or boiler emergency mode.

In the event of outdoor unit failure, the required heating can be provided by an electric heater or by a boiler. This configuration must be activated at the unit controller user’s interface and can be selected from two modes: Automatic mode or Manual mode.

The configuration of this function should be done through the Unit controller:

System Configuration→Heat Pump→Emergency Operation

Description	Default value	Range
Emergency operation	Manual	Manual / Automatic

- Automatic mode: Emergency operation is performed when alarm occurs in the outdoor unit.
- Manual mode: Emergency operation is performed by dip-switch setting.
  - DSW4-4: ON –> Heater/Boiler Emergency enabled
  - DSW4-4: OFF –> Heater/Boiler Emergency disabled

Conditions for activation

- Space heating is enabled.
- Electric Heater or Boiler is allowed by user selection.
- Water temperature (Two/Two3) < Water Temperature target (Ttwo).

Conditions for disabling

When Emergency Heater or Boiler is enabled, water calculation is based on the difference between water outlet (Two) (for Heater) or Water outlet3 (Two3) (for Boiler) and water target (Ttwo).

Conditions for disabling. When any of the following conditions is fulfilled:

a. Measured water outlet temperature value (Two/Two3) ≥ Water outlet temperature target value (Ttwo) + 5ºC.

b. Outlet water temp higher than 2ºC above the maximum water range temperature by installer or higher.

c. Demand OFF.

d. Recovery of outdoor unit alarm (in Automatic mode).

e. DSW4-4: OFF (in Manual mode).

f. Indoor unit alarm.

NOTE

- *Water pump1 (primary) will be activated with electric heater.*
- *Water pump3 will be activated with boiler.*
- *If Heater emergency mode is activated, the DHW heater is also activated for emergency mode.*
- *When emergency operation, the signal from outdoor units has no learned, the ambient temperature is considered at 10ºC (fixed) and water calculation (in case of Point or gradient) has calculated at 10ºC Outdoor temperature. It's recommended to change to fixed water calculation when emergency mode.*
- *In case of auxiliary outdoor ambient sensor enabled, the water calculation is based in this temperature.*
- *When emergency operation is enabled, faulty alarm of OU also keep in PC-ARFWE (alarm number is shown and red button flashes).*

2.5 Boiler combination

◆ Boiler operation

Boiler will only operate if unit is in Space Heating or Hot Sanitary Water modes. It will always be disabled in any other mode (Swimming Pool mode).

HYDRO FREE range must combine with a boiler or an alternative energy supplier.

Operations with a boiler are shown in the following table:

Description	RWLT	RWHT
Space Heating	○	○
DHW Heating	○	○
Swimming Pool	-	-

NOTE

- ○: *Operation possible.*
- *-: Operation not possible.*

2.5.1 Boiler combination for space heating

Boiler will only operate when Heating Accessory is set to Boiler or Heater + Boiler. Boiler and Heater can never work at the same time. The decision as to how to operate is based on ambient temperature and is explained in “Use Boiler + Heater” below.

System protection will always have priority over boiler operation wherever it applies.

System Configuration – Complementary Heating:

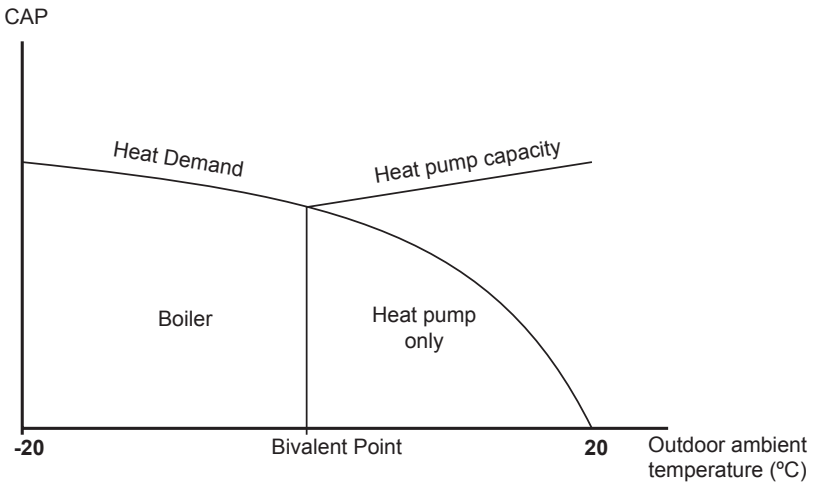
Description	Default Value	Range	Steps	Units	RWLT	RWHT
Heating source	HP Only	HP Only HP + Heater HP + Boiler	-	-	○	○

2.5.2 Bivalent point

Unit should be sized to operate mainly in heat pump mode. Given that capacity is reduced with temperature, it may be desirable for the unit to use boiler accessory only when ambient temperature is low.

Boiler will only be enabled when:

Outdoor Ambient Temperature < Bivalent outdoor temperature for boiler (BB)



System Configuration – Complementary Heating - Boiler:

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Bivalent Point	-5	-20~20	1	ºC	○	○

NOTE

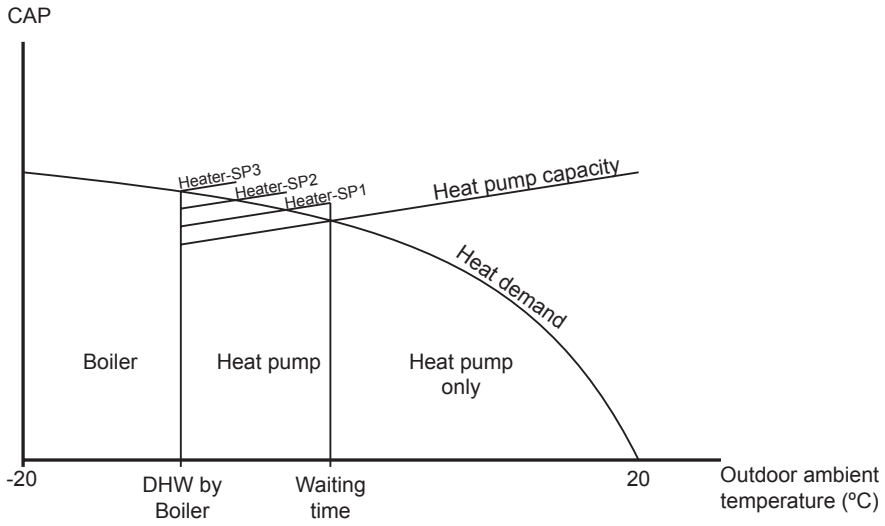
In case the Complementary heating source is set to "HP + Heater + Boiler, Controller must ensure that Bivalent Point of the heater ≤ Bivalent Point of the boiler + 5ºC. For that reason the unit auto increases the Bivalent Point of the heater to keep the 5ºC difference.

2.5.3 Use of Boiler + Heater (Only available for RWLT)

When Boiler + Heater configuration, unit will normally operate with the heat pump. When the systems requires an extra heating that is provided by the heater. Boiler only operates when the temperature is too low for the heat pump.

Boiler or heater are enabled if

- Ambient temperature < Bivalent Point (Heater)→ Heater Demand
- Ambient temperature < Bivalent Point (Boiler)→ Boiler Demand



NOTE

In case of Heater + Boiler configuration, default values are changed as above.

2.5.4 Boiler combination operation modes

HYDRO FREE range, in combination with boiler has two possible combinations

1 Bivalent Parallel (alternative) operation.
2 Bivalent Serial (common) operation.

Configuration should be done through the unit controller:

System Configuration – Complementary Heating - Boiler

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Combination mode	Parallel	Parallel/Serial	-	-	○	○

2.5.4.1 Boiler parallel mode combination

This is a bivalent system where the boiler is configured in parallel with the Heat Pump. A hydraulic separator or buffer tank should be used to ensure proper hydraulic balancing. This system is recommended for retrofit (upgrade) applications where an existing gas/oil boiler is retained to provide the full heating requirements on the coldest days of the year.

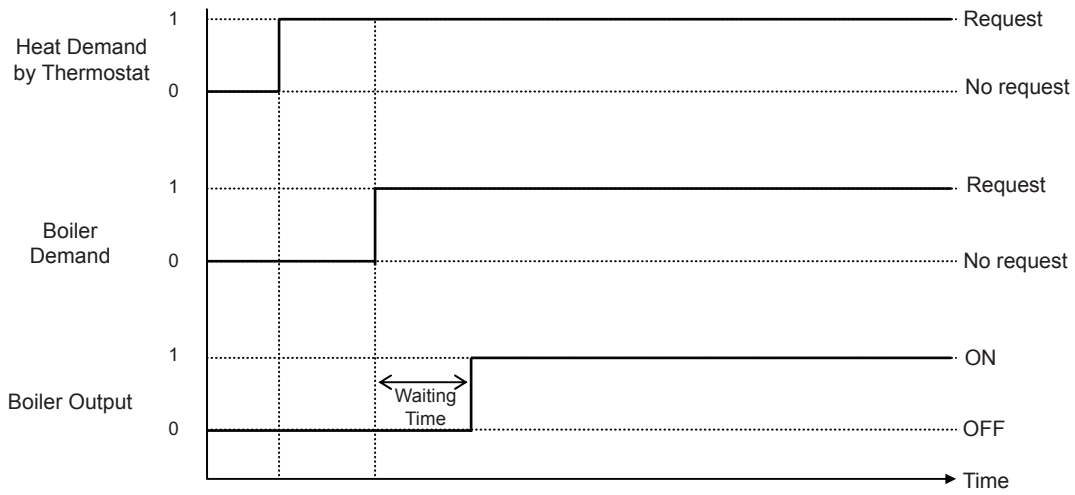
Space heating

Being a parallel system (either Heat Pump or Boiler), water setting will be the same as the water set-point for Heat pump without outdoor unit temperature restrictions but with restrictions of Maximum water temperature by installer.

- Operation conditions to enable boiler:
  - Space Heating operation selected, and
  - Boiler or Boiler + Heater complementary heating selected, and
  - Boiler in parallel mode
  - Ambient temperature < Bivalent Point for Boiler more than Waiting time for boiler. Or, ambient temperature < Boiler bivalent point at unit start.
- Operation conditions to enable boiler operation for DHWT:
  - There is a DHW operation request, and
  - $T_{DHW} < T_{HPSTOP,}$ and
  - Operation time < T_{DHWMAX}, and
  - Boiler operation for the DHW tank is enabled, and
  - Boiler or Boiler + Heater complementary heating is selected, and
  - Boiler is in parallel mode, and
  - Ambient temperature < Boiler Bivalent Point during more than Boiler operation Wait Time for DHW or Ambient temperature < BO Bivalent Point at start

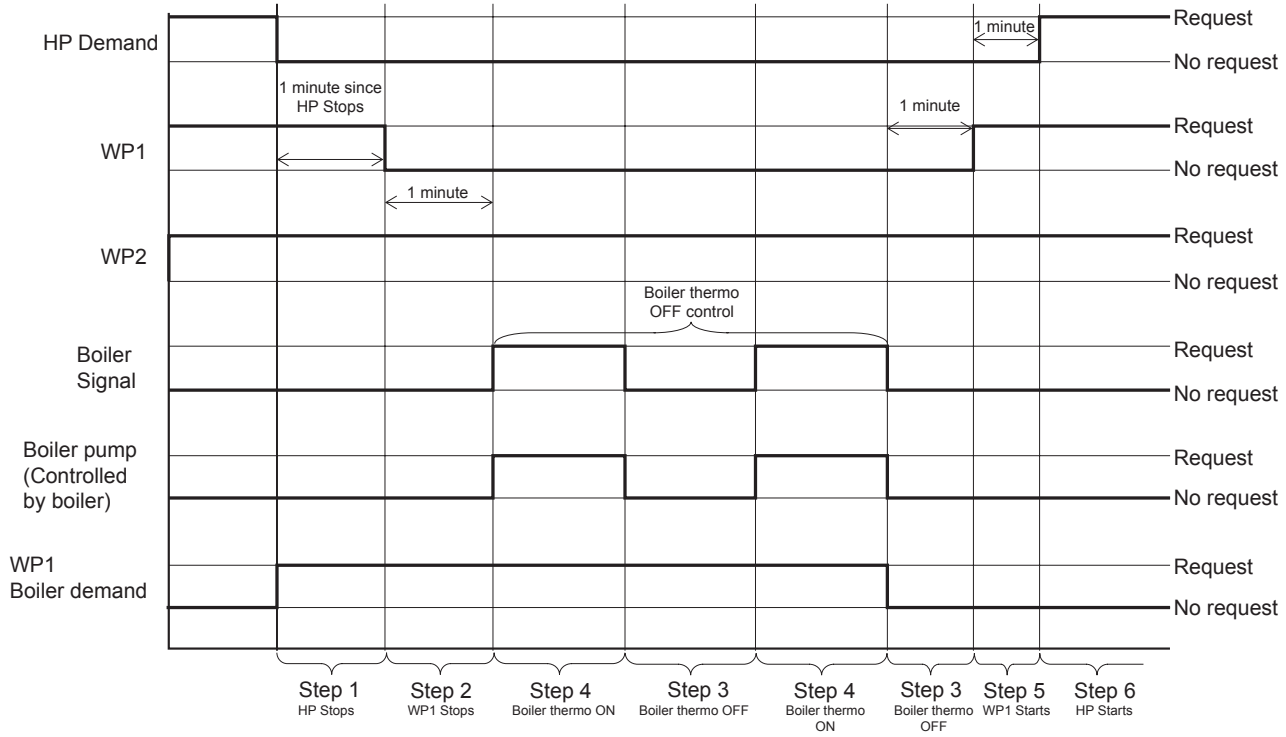
System Configuration – Complementary Heating - Boiler

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Bivalent Point	-5	-20~20	1	ºC	○	○
Combination Mode	Parallel	Parallel/Serial	-	-	○	○
Supply setting Offset	4	0~10	1	ºC	○	○
Waiting Time	30	5~90	5	min	○	○
DHW by boiler	Disabled	Disabled/Enabled	-	-	○	○
Waiting time for DHW	45	OFF, 5~120	5	min	○	○



- Operation conditions under which boiler is not enabled:
  - Demand OFF by Room Thermostat
  - Ambient temperature > Bivalent Point for Boiler more than 10 minutes.

◆ Boiler time chart



DHW heating

Water set-point for DHW is defined to 80ºC.

- Operation conditions to enable boiler:
  - DHW by boiler enable
  - Heat pump operation > Boiler waiting time for DHW.
  - The same conditions as heater enabled conditions.
- Operation conditions under boiler is not enabled:
  - The same conditions under which heater is not enabled.

System Configuration – Complementary Heating - Boiler

Description	Default Value	Range	Steps	Units	RWLT	RWHT
DHW by boiler	Disabled	Disabled/Enable	5	min	○	○
Waiting Time for DHW (min)	45	20~120	5	min	○	○

◆ Boiler THERMO ON/OFF control

Conditions for Thermo ON

Bolier is ON at thermo ON conditions when any of the following conditions is fulfilled:

- Water temperature (T_{WO3}) < Boiler temperature setting (BTSET) - supply set point control offset.
- Space heating is in Demand ON

System Configuration – Complementary Heating - Boiler

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Supply setting offset	4	0~10	1	ºC	○	○

Conditions for Thermo OFF:

Boiler is OFF at Thermo OFF conditions when any of the following conditions is fulfilled:

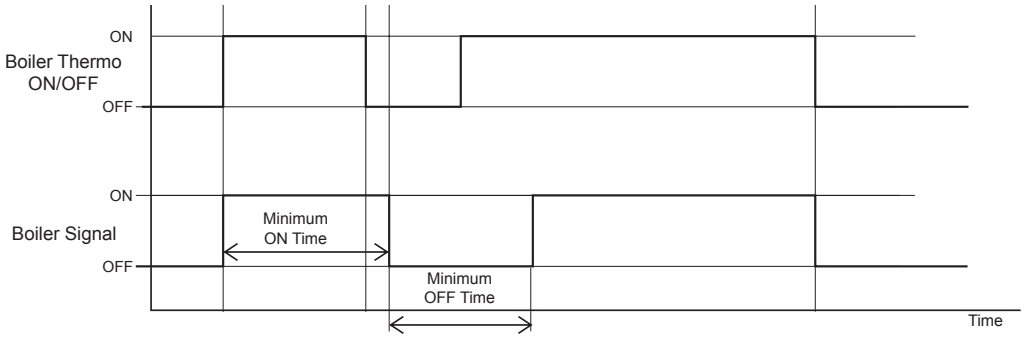
- Measured outlet temperature value (T_{WO3}) ≥ Boiler temperature setting (BTSET) + 5ºC (this condition will stop regardless the minimum on time)
- Outlet water temperature = Maximum water range temperature set by the installer (Tmax) + 2ºC.
- Space heating is in Demand OFF.

When boiler is enabled, water calculation is based in the difference between water outlet temperature (T_{WO3}) and the water target temperature (T_{WO}).

◆ Boiler minimum and maximum times

Boiler can only be stopped after minimum ON time has passed (BOon).

Boiler can only be started after minimum OFF time has passed (BOoff).



System Configuration – Complementary Heating - Boiler

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Minimum ON Time	2	1~30	1	min	○	○
Maximum OFF Time	5	1~30	1	min	○	○

NOTE

Unit protections (Tmax) have priority against "Boiler Minimum ON Time".

2.5.4.2 Boiler Serial mode combination

This is a bivalent system where the boiler is configured in serial with the Heat Pump. A hydraulic separator or buffer tank has to be used to ensure proper hydraulic balancing. This system is also used for retrofit (upgrade) applications, but operates like the mono-energetic system using the gas/oil boiler, similarly to the electric heater, in serial with the heat-pump. The boiler only needs to provide the additional peak load capacity.

◆ Outputs

Serial boiler only actuates against Boiler output signal. It does not affects all other outputs and, therefore, must operate as normal operation.

System Configuration – Complementary Heating - Boiler

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Bivalent point	-5	-20~20	1	ºC	○	○
Combination mode	Parallel	Parallel/Serial	-	-	○	○
Supply setting Offset	4	0~10	1	ºC	○	○
Minimum ON Time	2	1~30	1	min	○	○
Minimum OFF Time	5	1~30	1	min	○	○
Waiting Time	30	5~90	5	min	○	○
DHW by Boiler	Disabled	Disabled/Enabled	-	-	○	○
Wait time for DHW	45	OFF, 5~120	5	min	○	○
Heating source	HP Only	HP Only HP + Heater HP + Boiler	-	-	○	○

◆ Emergency mode

When user allows emergency mode, boiler may operate in emergency mode.

In case of Heater + Boiler combination, Boiler has priority.

2.6 Swimming pool

When the swimming pool operation is required, the swimming pool pump starts to operate given the swimming pool pump feedback. In this situation, the 3-way valve of the DHWT is not activated and the 3-way valve for the swimming pool changes its normal position diverting to the swimming pool heat exchanger, allowing to heat the swimming pool water temperature to a comfortable value.

The swimming pool operation has the lowest priority of the system and only will be possible when space heating and DHWT are not required.

Swimming Pool Function will only be enabled if all the following conditions are fulfilled:

- Swimming pool operation enabled by Unit controller.
- Heat Pump is turned OFF (or Thermo OFF) by any other system (DHW for instance).
- Swimming pool is enabled by swimming pool water pump feedback.

Swimming Pool will start if:

- Swimming Pool Temperature is lower than Swimming Pool Set point Tº -1ºC.

Swimming Pool will stop if:

- Swimming Pool Temperature is higher than Swimming Pool Set point Tº +1ºC.

NOTE

Unit cannot start in Swimming Pool mode if Swimming Pool Pump feedback is not active.

System Configuration – SWP

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Status	Disabled	Disabled / Enabled	1-	-	○	○
Setting temperature	24	24~33	1	ºC	○	○
Offset temperature	15	10~A	1	ºC	○	○

NOTE

CODE	RWLT	RWHT	Units
A	21	56(*)	ºC

(*) If R134a compressor disabled (DSW4#1:ON) setting must be 36ºC

◆ Swimming pool heating by timer

Up to 7 scenes can be created with the entire unit configuration available. These scenes can be assigned to different parts of the day, creating a daily pattern. After that, this pattern can be assigned to each day of the week.

2.7 Solar combinations

◆ Concept

The solar combination will enable you to heat up your domestic water by means of the sun whenever the sun is available.

HYDRO FREE systems allow different configurations to work in combination with solar panels:

- Disabled (default configuration): No solar Kit is installed with HYDRO FREE unit.
- Input demand: Alternative DHW tank operation is done by solar system or HYDRO FREE unit. Solar input can disable DHW operations done by HYDRO FREE unit.
- Total control: HYDRO FREE unit operates as a Solar Control Station and takes the management of the whole system.

System Configuration – Complementary Heating

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Status	Disabled	Disabled Input Demand Total control	-	-	○	○

◆ Solar combination by Input demand

The solar kit is designed to transfer the heat from the solar panels to the domestic hot water tank's heat exchanger and is to be installed in the RWLT system:

Option 1

The solar panels gather heat from the sun. When the temperature of the glycol solution in the solar panel rises above the water temperature in the domestic hot water tank, the pumps from the solar pump station and the solar kit begin operating in order to transfer the heat to the domestic hot water tank's heat exchanger.

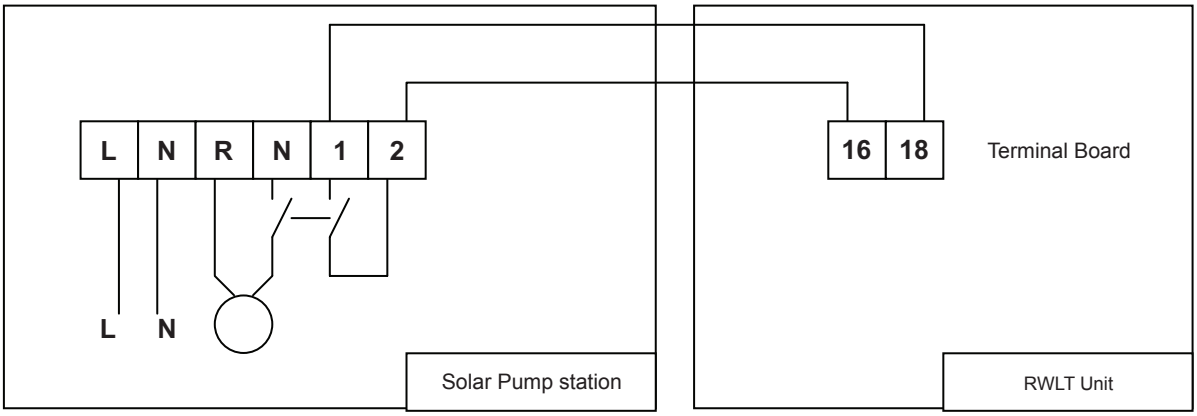
Option 2

The solar panels gather heat from the sun. When the temperature of the glycol solution in the solar panel rises above the water temperature in the domestic hot water tank, solar pump station's pump is switched ON and the solar kit's 3-way valve is diverted to the Sanitary Tank. At the same time the DHW's 3-way valve is switched OFF and the heat pump continues working to heat the space (if necessary).

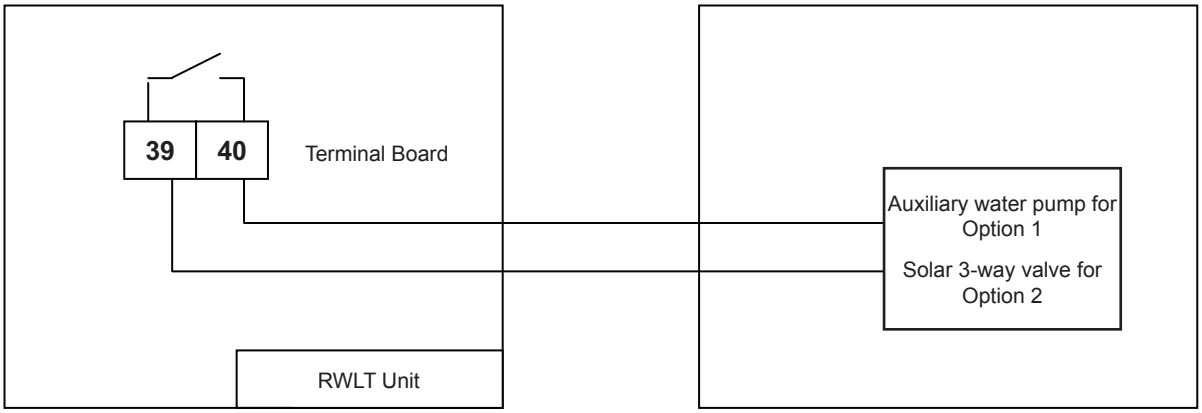
Solar installation requirements

Electrical connection

The solar pump station have an auxiliary contact that closes when the operation station it is working to heat the domestic hot water tank operated.



When solar mode is enabled by the heat pump and the temperature of the glycol solution in the solar panel has risen above the water temperature in the domestic hot water tank, one of the HP's outputs will be switched ON (terminals 39/40).



Solar station control

Solar module operations are performed by an external field supplied Solar Control Unit.

Communication with HYDRO FREE unit is done through the input/output located at the Terminal Board of the HYDRO FREE unit:

- Solar Input: It indicates that Solar Control Unit is ready to operate (there is no alarm, there is enough solar energy available, etc.).
- Solar Output: Solar Pump: It indicates that HYDRO FREE unit is requesting Solar Control Unit to heat DHWT by Solar energy, it is expected for solar water pump to operate.

If the solar pump station has an ON/OFF/AUTO function, make sure to put it on the AUTO function. This means that the pump will switch ON automatically when the solar panel temperature rises enough higher than the domestic hot water tank temperature and switches OFF automatically when the difference between the solar panel and the domestic hot water tank temperature becomes too low.

By default, when the temperature of the solar panel reaches 10°C higher than the domestic hot water tank temperature, the pump of the solar pump station and the pump of the solar kit will start operating.

When the temperature of the solar panel becomes lower than the domestic hot water tank temperature, the pumps from the solar pump station and the solar kit will stop operating.

Whenever the unit is not requesting solar operation, DHWT will operate in normal conditions.

System Configuration – Complementary Heating - Solar

Description	Default Value	Range	Steps	Units	RWLT	RWHT
DHW Hysteresis	10	1 ~ 30	1-	ºC	○	○
DHW Maximum Time	60	30 ~ 240	5	min	○	○

Solar DHW maximum time

HYDRO FREE unit controls the time under solar request and the time since last request was done in order to avoid solar operations when there is not enough solar energy and to avoid excessive switch over of solar request.

HYDRO FREE unit stops after the DHW maximum time has passed and it is not going to start again until DHW maximum time has passed again, as it is explained in the following sections *"Solar start conditions"* and *"Solar stop conditions"*.

Solar start conditions

HYDRO FREE unit starts requesting solar (activates solar pump output) when all of the following conditions are fulfilled:

a. DHWT operation is enabled (including timer).

b. Status is set as "Input demand".

c. Solar input contact is closed (solar control unit is ready to operate).

d. More than DHW Maximum Time has passed since last solar request has finished.

e. $T_{DHWT} < T_{DHWTS}$ - DHW Hysteresis

f. $T_{DHWT} < T_{DHWTMAX}$

Where:

T_{DHWT} = Domestic Hot Water Tank temperature (ºC)

T_{DHWTS} = Domestic Hot Water Tank temperature setting (ºC) (Default 45ºC)

$T_{DHWTMAX}$ = Domestic Hot Water tank maximum supply temperature (ºC) (Default 70ºC)

If conditions are fulfilled, heating DHW by Heat Pump will be switched OFF, and heating will be done by solar station through HYDRO FREE auxiliary output signal. If $T_{DHWT} > T_{DHWTMAX}$ solar station cannot read DHW by tank at maximum allowed temperature and HYDRO FREE auxiliary output will be switched OFF.

Solar stop conditions

HYDRO FREE unit stops requesting solar (deactivates solar pump output) when all of the following conditions are fulfilled:

a. DHWT is not enabled (including timer).

b. Status is not set as “input demand“.

c. Configured DHW maximum time exceeded since solar request begun.

d. Solar input contact is open (solar unit control is not ready to operate).

e. $T_{DHWT} > T_{DHWTS}$

f. $T_{DHWT} > T_{DHWTMAX}$

NOTE

When heating DHW by solar power, DHW Timer has no effect.

◆ Total solar combination

With total solar combination, HYDRO FREE units controls the solar operation for the system, based on different temperatures:

DHWT is heated by either the hot water that comes from the solar panels or the hot water that comes from the heat pump, depending on the solar temperature.

The configuration should be done through the unit controller according to the following variables:

Description	Default Value	Range	Steps	Units	RWLT	RWHT
DHW Maximum time	60	30 ~ 240	5	min	○	○
DHW Max storage T	60	30 ~ 90	1	ºC	○	○
ΔT Connection	10	1 ~ 30	1	ºC	○	○
ΔT Disconnection	5	1 ~ 30	1	ºC	○	○
Panel Minimum T	15	1 ~ 60	1	ºC	○	○
Panel Overheat T	80	80 ~ 120	1	ºC	○	○
Panel antifreeze T	4	-20 ~ 10	1	ºC	○	○

Inputs and outputs

HYDRO FREE units use the following inputs and outputs located at the table board:

- Solar Pump Output: Unit performs solar operation and requires pump operation (this is selectable as “Optional Function”, explained in *“3. Optional functions”*).
- Analogical Input: Solar Panel Sensor. Gives an analogical signal about the temperature of the solar panels (Selectable as “Optional functions”, explained in *“3. Optional functions”*).

DHWT operation

Hot water from solar panels heat DHW tank. During this operation the solar pump output is ON and Heat pump does not heat DHW tank. HYDRO FREE units switches to other operations like space heating, etc.

Solar DHW maximum time

HYDRO FREE unit controls the time under solar request and the time since last request was done in order to avoid solar operations when there is not enough solar energy and to avoid excessive switchover of solar request.

HYDRO FREE unit stops after the DHW maximum time has passed and it is not going to start again until DHW maximum time has passed again, as it is explained in the following sections *"Solar start conditions"* and *"Solar stop conditions"*.

Solar star conditions

HYDRO FREE unit starts requesting solar (activates solar pump output) when all of the following conditions are fulfilled:

a. DHWT operation is enabled (including timer).

b. Status is set as "Total Control".

c. Configured DHW maximum time exceeded since las solar request has finished.

d. Solar panel sensor temperature>T_{DHWT} + ΔT Connection.

e. Solar panel sensor temperature>Panel minimum temperature.

f. T_{DWHT}<T_{DHWMAX} - 5ºC
   - Where: T_{DHWT}: Domestic Hot Water Tank Temperature (ºC)

g. Solar panel sensor temperature < Panel overheat temperature.

Regardless of previous conditions, Solar DHWT starts operation if solar panel sensor temperature reads a lower temperature than the antifreeze panel temperature set through unit controller and the temperature of the DHWT is higher than 7ºC.

Solar stop conditions

HYDRO FREE unit stops requesting solar (deactivates solar pump output) when all of the following conditions are fulfilled:

a. DHWT is disabled (including timer).

b. Status is not set as "Total control".

c. Configured DHW maximum time exceeded since last solar request begun.

d. Solar panel sensor temperature < T_{DHWT} + ΔT Disconnection.

e. Solar panel sensor temperature > Panel minimum temperature.

f. $T_{DHWT} \geq T_{DHWTMAX}$
   - Where: T_{DHWT}: Domestic Hot Water Tank Temperature (ºC)

g. Solar panel sensor temperature > Panel overheat temperature.

Regardless of previous conditions, solar DHW can not stop if the Solar panel temperature is lower than the antifreeze temperature configured plus 2ºC and $T_{DHWT} \geq$ 5ºC.

2.8 Water pump control

2.8.1 Pumps configuration

Pumps control can be set to Standard or Economic mode. This configuration is set using DSW4 PIN5.

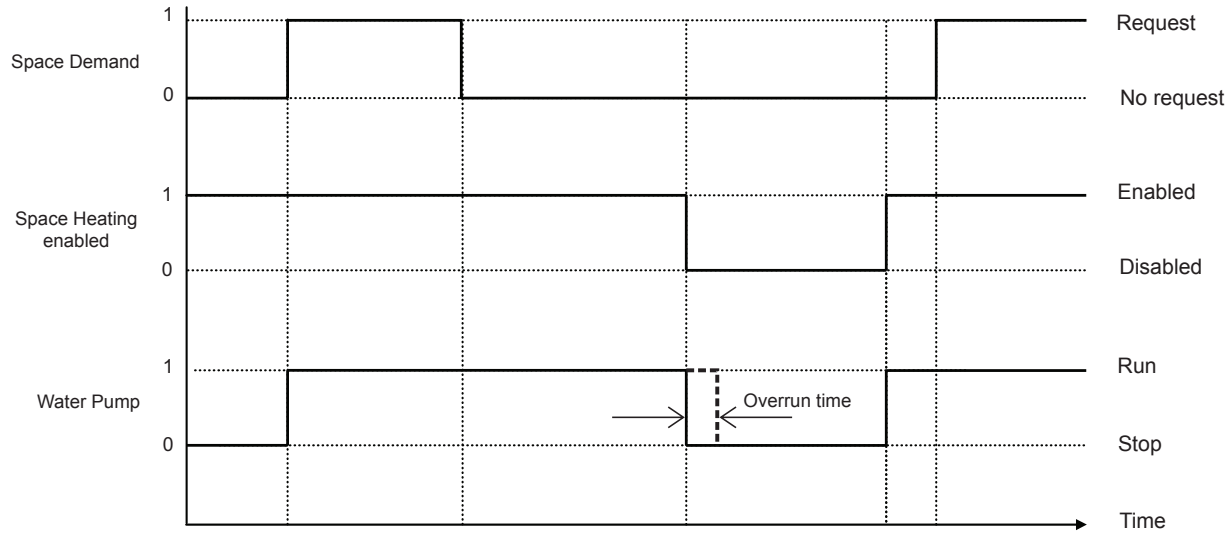
When PIN is OFF, pump is in Standard operation, pump is always in operation when space heating is enabled (Switch ON), so in case of disable space heating (Switch OFF), pump switches OFF and only switches to ON when Domestic Hot water is requested.

When PIN is ON, pump is in Economic operation. This allows the pump to stop when system is stopped (Demand OFF for space heating and no other operation required).

Pump stops when there is an alarm event.

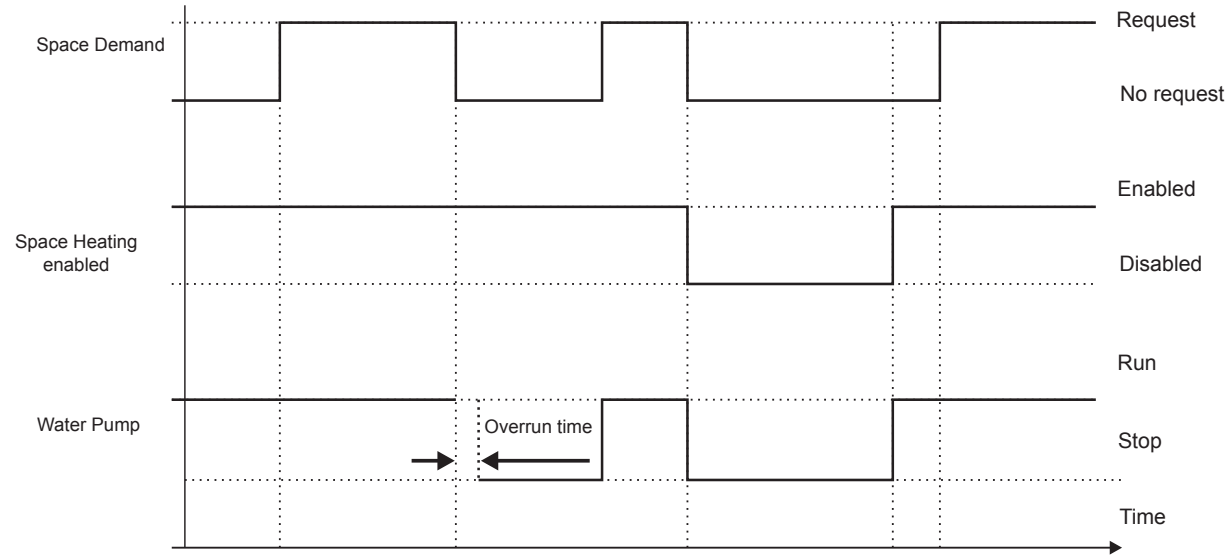
2.8.1.1 Standard mode Water pump operation

When the system is configured in Standard mode (always in operation), water pump works as shown in the graphic below:



2.8.1.2 Economic mode Water pump operation

When the system is configured in Economic mode, water pump works as shown in the graphic below:

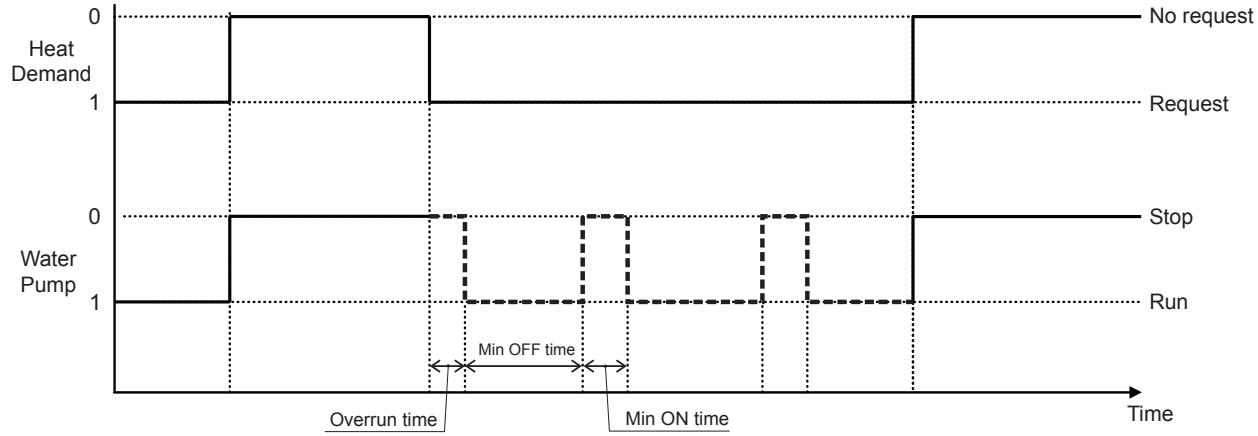


2.8.1.3 Recirculation option (Only in Economic mode)

When recirculation option is enabled, pump (both main and sub) will be operated regularly when they are stopped.

Once main pump is no longer required, it must continue operating during at least WPOvr time is passed since cease of requirement.

Each WPMinf minutes pump will be operated during WPMino minutes. Timer is independent for main and sub pumps



System Configuration → Heat Pump → Water Pump 1 Config

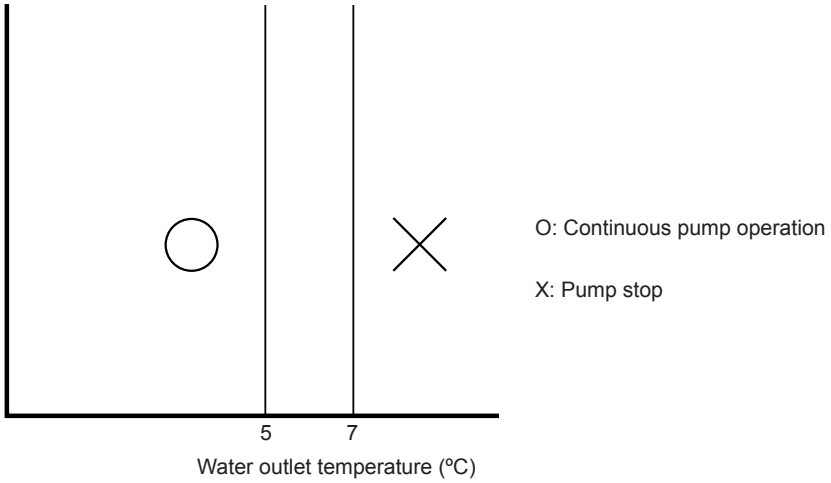
Description	Default Value	Range	Units	RWLT	RWHT
Minimum OFF Time (WPMinf)	40	0~120	min	○	○
Minimum ON Tme (WPMino)	10	0~120	min	○	○
Overrun time (WPOvr)	10	0~120	min	○	○

NOTE

If WPMino or WPMinf are set to 0, recirculation option is disabled.

2.8.1.4 Anti Freeze Control (Winter Operation)

When in operation in winter if the outlet water temperature is 5ºC or lower, and unit remains in Demand OFF Operation (and water pump OFF), operates the water pump to protect the unit and pipes installation from freezing. This control is released when the water outlet temperature becomes 7ºC or higher.



Configuration

When user allows anti-freeze control mode (DSW4 PIN6 ON), pump operates when conditions are fulfilled.

2.8.2 Water pump 1 PWM control (for 3-5 HP)

2.8.2.1 Water Pump 1 Control Details

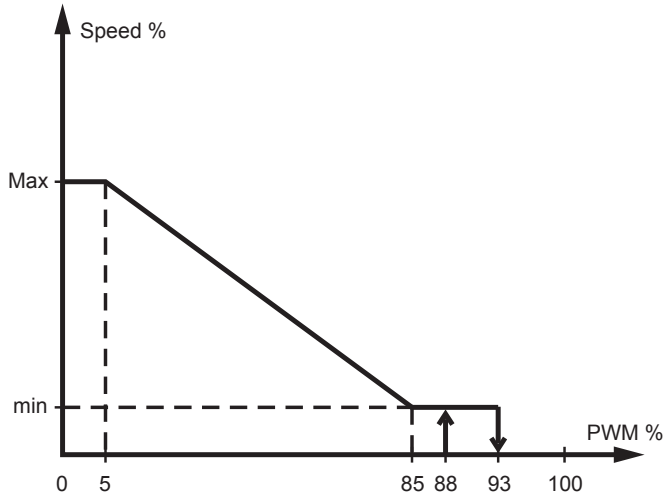
Water Pump can be controlled by PWM output signal (EC Water Pump). Setting of WP1 can be set in 2 optional modes:

- Fixed speed value selected by installer
- Control by ΔTº by Water Inlet and Water Outlet temperature.

2.8.2.2 PWM Input signal

At high PWM signal percentages (duty cycles), a hysteresis prevents the pump from starting and stopping if the input signal fluctuates around the shifting point.

At low PWM signal percentages, the pump speed is high for safety reasons. In case of a cable breakage the pumps work at maximum speed to transfer heat from the primary heat exchanger.



PWM input signal (%)	Pump Action	PP in 7-Segments PCB (%)
<5	The pump runs at maximum speed.	100%
5 - 85	The pump speed decreases linearly from maximum to minimum.	26~99%
85 - 93	The pump runs at minimum speed (Operation)	7~25%
85 - 88	Pumps runs at minimum speed (start-up)	12~15%
93 - 100	Standby.	0~7%

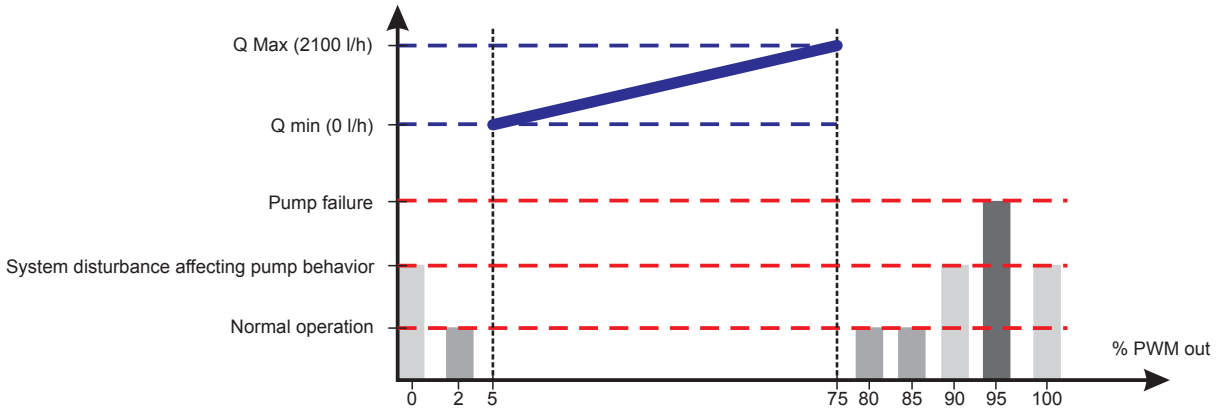
2.8.2.3 PWM feedback signal

Tthe electronics integrated in the pump process direct measurements:

- Rotation speed: n
- Power: P

And is capable to feedback the pump controller with:

- Flow Q = F(n,P, Water Tº) (PWM DC from 5% to 75%) [Water flow will be calculated until PWM > 80%, after value will be 0 and alarm shown]
- Appliance status
- Pump status

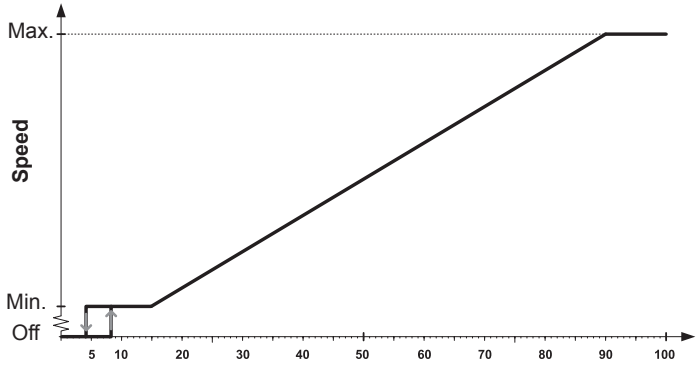


PWM output signal (%) FF in 7-segments PCB(%)	Pump Status	Potential causes
0	Pump PWM interface damaged	iPWM interface in short circuit
2	Standby, pump is ready to run	-
5~75	Pump is running normally, flow information is supplied	-
80	Abnormal running mode: Pump is running but not at optimal performance	Undervoltage 160/170-194 V Self-thermal protection mode
85	Abnormal function mode Pump has stopped but is still functional	Undervoltage <160/170 V Overvoltage >250 V Unexpected external flow
90	Abnormal function mode Pump has stopped but still functional Check the installation setup and the pump	Failure on another component than pump Debris in the installation Bad temperature setup
95	The pump has stopped due to permanent failure	Pump blocked Electric module out of order
100	Problem of iPWM connection	iPWM interface in open circuit.

2.8.3 Water pump PWM control (for 10 HP)

2.8.3.1 PWM input signal

At low PWM signal [%] (duty cycles), a hysteresis prevents the pump from starting and stopping if the input signal fluctuates around the shifting point. Without PWM signal, the pump will stop for safety reasons. If a signal is missing, for example due to cable breakage, the pump will stop to avoid overheating of the solar thermal system.



PWM input signal (%)	Pump Status
≤5	Standby mode: Off
>5 / ≤18	Hysteresis area: On/off
>8 / ≤15	Minimum speed: Min. (pump is running at minimum speed)
>15 / ≤90	Variable speed: Min. to Max.
>90 / ≤100	Maximum speed: Max.

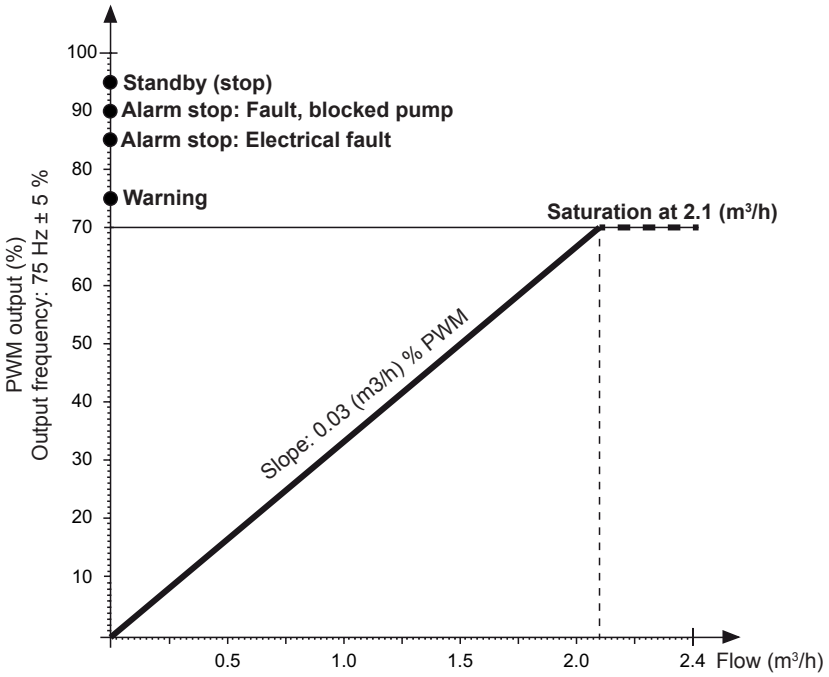
2.8.3.2 PWM feedback signal

◆ Alarms

Alarm output signals are available. Some PWM output signals are dedicated to alarm information. If the supply voltage is measured to a value below 195 V, the output signal is set to 75 %. If, at the same time, the rotor is locked due to deposits in the hydraulics, the output signal is set to 90 %, as this alarm is given a higher priority.

◆ Flow estimation

The PWM feedback signal can be used to measure the flow of the pump.



PWM output (%)	QT (s)	Pump info	DT (s)	Prio.
95	0	if “PMW_in == Standby (STOP)”	0	1
80	30	ALARM_STOP: BLOCKED ERROR	12	2
85	15-30	ALARM_STOP: ELECTRICAL ERROR	1-12	3
80		WARNING: ELECTRONIC HIGH TEMP		4
disable	0	WARNING	0	5
0-70		0,0 - 4 (m³/h) (slope 0,057 (m³/h) / % PWM)		6

2.8.3.3 Water flow estimation control

There is a correction value of estimated water flow due to correction function of temperature, pump housing type and duty point.

For a fixed real flow, pump feedback drops a higher estimated flow at lower temperatures:

- When calculations are performed for a low temperature reference, flow is higher than real when measured at higher temperatures.
- In the opposite way, when calculations are performed at high temperature reference, flow is lower than real when measured at lower water temperatures.

2.8.3.4 Fixed Water pump PWM speed for space Heating

PWM output can be selected by user (See *Unit controller* chapter of the Installation and operation manual of HYDRO FREE units).

The configuration of this function should be done through the Unit controller (PC-ARFWE)

System Configuration → Heat Pump → System

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Space Speed (WPSS)	100	50~100	5	%	○	○

2.8.3.5 DHW Water Pump Speed

This PWM output can be configured by the user (See *Unit controller* chapter of the Installation and operation manual of HYDRO FREE units)

System Configuration → Heat Pump → System

Description	Default Value	Range	Steps	Units	RWLT	RWHT
DHW Speed (WPDS)	100	50~100	5	%	○	○

2.8.3.6 SWP Water Pump Speed

This PWM output can be configured by the user (See *Unit controller* chapter of the Installation and operation manual of HYDRO FREE units).

System Configuration → Heat Pump → System

Description	Default Value	Range	Steps	Units	RWLT	RWHT
SWP Speed (WPWS)	100	50~100	5	%	○	○

2.8.3.7 Pump seizure protection

The pump seizure protection function prevents sticking of components due to long periods of inactivity, by running the components during a short period every week. Mixing valves are fully opened and then fully closed (time depends on runtime parameter).

Pumps are switched-ON for 1 minute.

System Configuration – Heat Pump – System - Seizure Protection

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Status	Disabled	Disabled/Enabled		-	○	○
Operation Day	Monday	Mon ~ Sun	-	day	○	○
Starting Time	01:00	(00:00~23:50)	00:10	time	○	○

NOTE

- *For AC water pump (WP2 and WP3) switch ON the seizure protection for 10 minutes.*
- *For DC water pump (WP1)switch ON the seizure protection at Fixed speed for 10 minutes.*
- *DHW and SWP valve are not included in the seizure protection.*

3. Optional functions

Index

3.1 Optional functions by DSW setting 60

3.2 Optional functions by Unit controller (PC-ARFWE) 62

3.2.1 Optional functions for Space Heating or Space Cooling 62

3.2.2 Optional functions for DHW 62

3.2.3 Optional functions for Heat pump 63

3.2.4 Optional functions for Unit controller (PC-ARFWE) 63

3.3 Heat Pump optional functions 64

3.3.1 Smart function 64

3.3.2 Air purge 65

3.3.3 Test run 65

3.4 Optional external input/output configuration signals 66

3.5 Manual operation 68

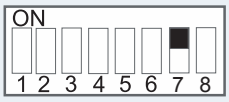
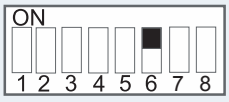
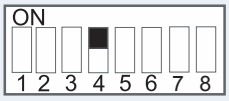
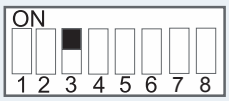
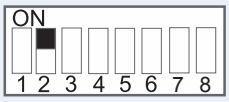
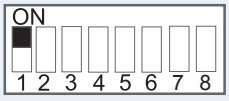
3.5.1 Function operation 68

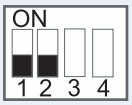
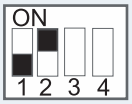
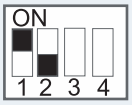
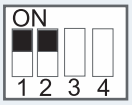
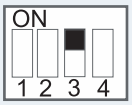
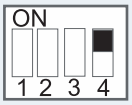
3.5.2 7-Segment configuration 68

3.5.3 4~20 mA setting 69

3.5.4 ON/OFF Operation 70

3.1 Optional functions by DSW setting

Code	Optional function description	Explanation
DSW4#7:ON 	Heating Heater forced OFF	This function forces a permanent OFF of the heater when selecting an installation configuration without the electric heater of the unit
DSW4#6:ON 	Unit and pipes installation freeze protection	This function allows to start water pump in very low conditions.
DSW4#5:ON 	Standard / Economic water pump operation	This function allow to start/stop water pump by Two conditions
DSW4#4:ON 	Emergency Heater operation manual option	In the event of outdoor unit failure, the required heating can be provided by an electric heater or by a boiler.
DSW4#3:ON 	DHW Heater Operation	The electric heater of the domestic hot water tank is disabled by factory setting. This function allows to activate its operation if needed.
DSW4#2:ON 	Open SV1/2 for vacuum and refrigerant R410a recover function (Condition 1) DHW 3 way valve forced ON (Condition 2)	Condition 1: In the process of vacuum and R-410A recovery of RWHT it is very important to supply power to the indoor unit and to activate this function by DSW setting. Thereby, solenoid valves SV1 and SV2 of the indoor unit are opened to allow the operation of vacuum and refrigerant charge inside the indoor unit. It is very important to bring the DSW back to its original position when finishing the whole procedure. Condition 2: When combination with domestic hot water tank, the activation of this function changes the position of the 3-way valve to the DHW operation position, then the unit is forced to work against the heating coil of the DHW tank. This can be used, for example, for a quick water filling of the DHW tank's heating coil.
DSW4#1:ON 	Compressor R134a disabled (RWHT) (Condition 1)	Condition 1 (Only for RWHT): This function disables the compressor for the 2nd cycle (R-134a compressor), so that the unit is forced to operate at medium/low outlet water temperatures (RWLT)

Code	Optional function description	Explanation
DSW5#1:OFF;2#OFF 	C1 : Average OU Sensor C2 : Average OU Sensor	A 2nd outdoor ambient temperature sensor is available as an accessory, in case that the built-in ambient temperature sensor of the outdoor unit cannot provide a reliable temperature measurement to the system because of restraints of the installation location. The preferred sensor for each circuit can be selected by means of DSW setting.
DSW5#1:OFF;2#ON 	C1 : Average OU Sensor C2 : Average Aux Sensor	
DSW5#1:ON;2#OFF 	C1 : Average Aux Sensor C2 : Average OU Sensor	
DSW5#1:ON;2#ON 	C1 : Average Aux Sensor C2 : Average Aux Sensor	
DSW5#3:ON 	4-20mA setting temperature (Only Manual operation)	In case of Manual operation, heating water setting operation can be overridden by external controller using 4~20mA input (CN5). In order to allow override operation a DSW setting must be done, otherwise values selected by 7-segment will be used. When override operation is allowed, external controller decides the target temperature by inputting a 4~20mA value.
DSW5#4:ON 	Use max (Two/Two3) for water control	Some installation needs big buffer tank and in combination with auxiliary heating (boiler, pellets, solar panels. Etc…), the control of the water can be done by external temperature sensor (Two3) to heat this buffer tank. Refer to *"3.5 Manual operation"* chapter.
DSW18#1:OFF; #2:OFF 	High capacity control function: Power start	Cascade cycle enabled to operate at medium water temperatures
DSW18#1:ON; #2:OFF 	High capacity control function: High Power start	Cascade cycle enabled to operate at lower water temperatures
DSW18#1:OFF; #2:ON 	High capacity control function: ECO Power start	Cascade cycle enabled to operate at higher water temperatures
SSW1 	Remote or Local operation (Manual)	Refer to *"3.5 Manual operation"* Chapter
SSW2 	Heat operation in case of Local (Manual)	Refer to *"3.5 Manual operation"* Chapter

3.2 Optional functions by Unit controller (PC-ARFWE)

3.2.1 Optional functions for Space Heating or Space Cooling

Optional function	Explanation	Model
Floor screed drying function (Circuits 1 & 2)	This function is used exclusively for the process of drying screed that has been newly applied to floor heating system. The water temperature set-point follows a predetermined schedule upon activation of the floor screed drying function. For more information refer to Water control chapter	A
Heating Auto ON/OFF	At higher outside temperatures it doesn't make sense to keep heating the building. The RWLT System will switch the heating off when the daily average outdoor temperature of previously day rises above the Summer Switch Auto On/Off Activation Temperature. For more information refer to *"2.2 Space water temperature control"* chapter	A
Outdoor temperature average timer	The average timer corrects the influence of ambient temperature variations. The weather-dependent set point calculation is done on the average outdoor temperature. The outdoor temperature is averaged over the selected time period. For more information refer to *"2.2 Space water temperature control"* chapter	A

3.2.2 Optional functions for DHW

Optional function	Explanation	Model
DHW anti-Legionella protection	A specific setting is available to protect the DHW system against Legionella, which raises up the DHW temperature over the normal DHW tank temperature setting (using the electric heater of the DHW tank and/or the heat pump) on a periodic basis. For more information refer to *"2.3 Sanitary Water Operation"* chapter	A
DHW re-circulation	This function allows the activation of the water pump for the re-circulation of the hot water from the DHW tank by means of the heat pump. This function can also be used with the anti-legionella protection function. For more information refer to *"2.3 Sanitary Water Operation"* chapter	A
DHW boost	With this function enabled, it is possible to request a heating up of the DHW when user requires an instantaneous delivery of DHW. For more information refer to *"2.3 Sanitary Water Operation"* chapter	A
DHW Mode	DHW operation has two different modes, STANDARD Mode and HIGH DEMAND Mode: • STANDARD Mode: The heating of the domestic hot water shall be started when water temperature in tank is low enough for Heat Pump to be started. DHW is always started heated by Heat Pump. • HIGH DEMAND Mode: The heating of the domestic hot water is started if differential is bigger than TDHWON. It will be started with water tank heater only unless water temperature in tank goes below Heat Pump starting temperature. For more information refer to *"2.3 Sanitary Water Operation"* chapter	A
DHW Control	Unit has 2 DHW heating up control modes that are selected by PC-ARFWE: H.EFFICIENCY MODE: Control to keep best efficiency (COP). H.SPEED MODE: Control to heat tank as fast as possible.	A

3.2.3 Optional functions for Heat pump

Optional function	Explanation	Model
Hydraulic separator combination	In some cases, water pump of the HYDRO FREE unit is not sized for big heating installation (small water pump). In this case, a hydraulic separator or buffer tank and secondary water pump has to be used to ensure proper water pump dimensioning. The boiler is configured in parallel with the heat pump. A hydraulic separator or buffer tank has to be used to ensure proper hydraulic balancing. Additional Water pump (WP3) and water sensor (Two3) are needed for boiler combination control (automatic added when Boiler combination is enabled). For more information refer to *"2.2 Space water temperature control"* chapter.	A
Electrical heater or boiler emergency mode	For the use of the electrical heater or boiler in case of outdoor unit fault, additional setting shall be applied into IU setting: Electrical heater emergency can be both automatic or manual switched ON by the user and the configuration must be done from the Unit controller. For more information refer to *"2.4 Electric heater for space heating (Optional accessory)"* chapter.	A
Power meter data control	The measuring of the real power consumption can be done connecting an external power meter. The number of pulses of the power meter is a variable which must be set through the unit controller. By this, every pulse input is added into its corresponding operation mode (Heating, DHW Operation). Two possible options: - One power meter for all installation (IU+OU). - Two separated power meters (one for IU and one for OU). For more information refer to *"3.3 Heat Pump optional functions"* chapter.	A
Capacity data control	Due to usage of Water temperature inlet and outlet + water flow leve, a estimation of capacity can be checked. This screens show the value of kWh for each zone (Heating, DHW, swimming pool and its total) and also let to see the values month by month. For more information refer to *"3.3 Heat Pump optional functions"* chapter.	A
Smart Function	This function can be used to block or limit the heat pump or increase demand due to electricity availability. For more information refer to *"3.3 Heat Pump optional functions"* chapter.	A
Air Purge	Air purge function drives the pump in a way for evacuating air bubbles in the installation. For more information refer to *"3.3 Heat Pump optional functions"* chapter.	A
Unit Test Run	Test run is a working mode used when commissioning the installation. Some settings are made to let the installer an easy job. For more information refer to *"3.3 Heat Pump optional functions"* chapter.	A
Night shift	Night shift operation reduce compressor load in order to reduce environmental noise during night. It can be configured as a daily timer or launched from favourite button. For more information refer to *"3.3 Heat Pump optional functions"* chapter.	A

3.2.4 Optional functions for Unit controller (PC-ARFWE)

Optional function	Explanation	Model
Favourite action	This favourite button has the possibility to customize the action according on system configuration: Holiday Eco/Comfort Timer Night shift DHW Boost	A
UTC Zone	UTC Zone: Europe spans 7 primary time zones (5 of them can be seen on the map in this article, while 2 other zones contain the European part of Kazakhstan and some very eastern territories of European Russia). Most of European countries use daylight saving time and switch to it at the same moment, which is 'harmonise' their summer time adjustment.	A
European summer time	When European summer time is activated, it should change the time when the country / UTC zone is doing it.	A
Holidays	Holidays function is only available for room thermostat view of PC-ARFWE. Holidays let the user specify a date and hour for the Room Setting to be OFF with the configured setting.	A

3.3 Heat Pump optional functions

3.3.1 Smart function

This function can be used to block or limit the heat pump or increase demand due to electricity availability.

System configuration → Optional functions → System → Energy function

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Status	Disabled	Disabled / Enabled	-	-	○	○
Smart Action	HP blocked	(0) HP Block (1) SM. Grid Ready (2) DHW Block (3) DHW Only	-	-	○	○
Trigger Type	Closed	Closed (NC) Open (NO)	-	-	○	○
Start Boiler	Disabled	Disabled / Enabled	-	-	○	○
Start DHW Heater	Disabled	Disabled / Enabled	-	-	○	○

NOTE

- *(0) HP Block: Heat Pump is forbidden in any condition (Space Heating, DHW, Swimming pool) when signal is active*
- *(2) DHW Block: DHW Operation is forbidden when signal is active.*
- *(3) DHW only: Heat pump operation for any condition except DHW is forbidden when signal is active. DHW operation is allowed normally.*
- *(1) SG Ready: The SG Grid is awarded to the heat pump series, the control technology by integrating the individual heat pump allows in a smart grid by using two digital inputs establishing an unidirectional connection and allowed for four different operation modes:*

Item	SG Input 1	SG Input 2	Action	Description
1	Open	Open	Standard HP mode	SG is not activated.
2	Close	Open	External blocking mode	Heat Pump is forbidden in any condition (Space Heating, DHW, Swimming pool) when signal is active in any case
3	Open	Close	Low price mode	Space Heating: Increase Water temperature setting by +5ºC DHW: Increase DHWT Temperature setting by + 7ºC
4	Close	Close	Overcapacity mode	Space Heating: Ttwo=Wcmax (Maximum water temperature) DHW: Tdhws=Tdhwmax (Maximum water temperature)

NOTE

(For (0), (2), (3))

- *If Start Boiler is set to Enabled, boiler operation is forced during action.*
- *If Start DHW Heater is set to Enabled, DHW is enabled to operate but only with heater.*

3.3.2 Air purge

When commissioning and installing the unit, it is very important to remove all air in the water circuit. When the air purge function is running, the pump operates without actual operation of the unit and the remove of air in the water circuit will start.

By air purge mode the unit change automatically the pump speed and the position of the 3-way valve between space heating or domestic hot water heating mode.

NOTE

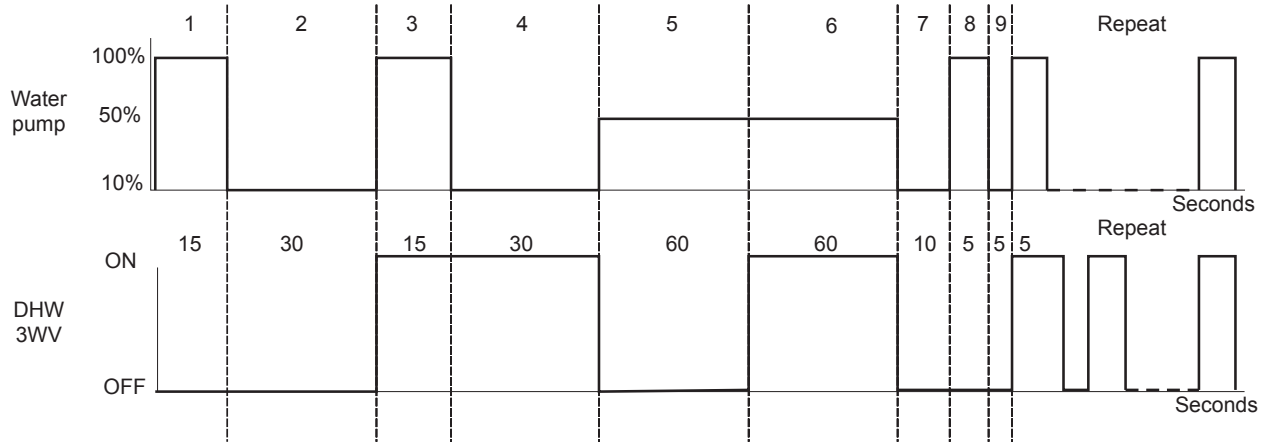
- *The air purge function stops automatically after defined minutes.*
- *Operation with compressor OFF at heating mode.*
- *Heater OFF during air purge operation.*

System Configuration – Heat Pump – System – Test Run → Air Purge

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Duration	00:20	00:20~00:30	00:10	min	○	○

NOTE

- *After finish procedure, unit comes back to normal operation.*
- *Alarms pressure and flow are ignored during this operation.*
- *During air purge operation it is shown as PU in seven segments.*



3.3.3 Test run

Operation with compressor ON at heating mode, fix compressor frequency in test run rated frequency.

Activation should be done both through the Unit controller (PC-ARFWE) selection or through Outdoor unit selection.

Activation through Unit controller (PC-ARFWE).

Commissioning → Unit Test Run

Description	Default Value	Range	Steps	Units	RWLT	RWHT
Duration	00:30	00:30~12:00	00:10	min	○	○
Mode	Heating	Heating	-	-	○	○
Start Test Run	-	-	-	-	○	○

3.4 Optional external input/output configuration signals

The system has 7 input and 4 output optional signals (+ 4 output signals when using accessory). The new HYDRO FREE series allow different ports to be configured for those I/O signals, as well.

The user can configure those input signal to perform different functions from the unit controller. This is briefly explained in the next tables:

Input signals and input ports

Code	Name	Port	Input
i1	Input 1	TB2 #13&14	230 V
i2	Input 2	TB2 #13&15	230 V
i3	Input 3	TB2 #16&17	230 V
i4	Input 4	TB2 #16&18	230 V
i5	Input 5	TB2 #16&19	230 V
i6	Input 6	TB2 #16&20	230 V
i7	Input 7	TB2 #16&21	230 V

Input functions (To be configured from the unit controller)

Function #	Input	Description
0	Disabled	-
1	Demand ON/OFF	Send Demand ON or OFF Operation to Circuit 1 and Circuit 2
2	Smart Act./SG Ready Input 1	This function must be used to block or limit the heat pump when restricted by Electric company. It allows an external Smart switch device to switch off or reduce consumption of the heat pump during time of peak electricity demand. In case of use of Smart Grid Ready application, this input is used as a digital input 2 and allows four different operating modes
3	Swimming pool	When HYDRO FREE model is used to warm the swimming pool water, this input is used as a feedback for swimming pool water pump.
4	Solar	In case of combine HYDRO FREE with solar panels, this input is used as a feedback for solar station ready operation.
5	DHW boost	With this function enabled, it is possible to request a heating up of the DHW when user requires an instantaneous delivery of DHW.
6	Demand ON/OFF C1	Send Demand ON or OFF Operation only to Circuit 1
7	Demand ON/OFF C2	Send Demand ON or OFF Operation only to Circuit 2
8	Forced heating	Forced Heating Demand by input of contact signal from outside
9	ECO mode C1 & C2	Water temperature setting for Circuit 1 and Circuit 2 it is reduced by ECO operation mode (Default 3ºC) by input of contact signal from outside
10	ECO mode C1	Water temperature setting for Circuit 1 it is reduced by ECO operation mode (Default 3ºC) by input of contact signal from outside
11	ECO mode C2	Water temperature setting for Circuit 2 it is reduced by ECO operation mode (Default 3ºC) by input of contact signal from outside
12	Force OFF	Force OFF operation for unit. RCS will continue as normally set but will show indication that operation is forbidden
13	SG Ready Input 2	In case of want to use Smart Grid Ready application, this input is used as a digital input 2 and allow four different operating modes

Output signals and output ports

Code	Name	Port	Output
o1	Output 1	TB2 #34 (N) & 35 (L)	230 V
o2	Output 2	TB2 #34 (N) & 36 (L)	230 V
o3	Output 3	TB2 #37&38	Free voltage signal
o4	Output 4	TB2 #39&40	Free voltage signal
o5	Output 5	CN20 #1-2	12Vdc signal
o6	Output 6	CN21 #1-2	12Vdc signal
o7	Output 7	CN22 #1-2	12Vdc signal
o8	Output 8	CN23 #1-2	12Vdc signal

Output functions (To be configured from the unit controller)

Function #	Output	Description
0	Disabled	
1	3WV SWP	In case of combine HYDRO FREE with swimming pool, this output is used to drive 3 way valve swimming pools.
2	WP3	In case of combine HYDRO FREE with boiler or hydraulic separator, this output is used to drive water pump 3.
3	Boiler combination	In case of combine HYDRO FREE with boiler, this output is used to switch ON it.
4	Solar pump	In case of combine HYDRO FREE with solar panel, this output is used to drive water pump station
5	Alarm signal	Output when an “Alarm Code” is received from Indoor Unit or outdoor unit.
6	Operation signal	Output in case that "Thermo ON" signal in any condition
7	Demand-ON signal circuit 1	Signal is enabled when circuit 1 is operating in Demand-ON
8	Heating signal	Output in case that "Thermo ON" signal in Heating operation
9	DHW signal	Output in case that "Thermo ON" signal in DHW operation
10	Defrost	Output if the operation state of the outdoor unit when is defrosting.
11	DHW re-circulation pump	In case of re-circulation pump enabled for HSW tank
12	Heater combination (RWHT) relay 1	In case of Heater operation for RWHT. Output for Relay 1.
13	Heater combination (RWHT) relay 2	In case of Heater operation for RWHT. Output for Relay 2.

3.5 Manual operation

Manual operation function for HYDRO FREE units will allow operation of units without RCS existence and will be selected by DSW setting on main PCB.

3.5.1 Function operation

Manual operation is selected by using SSW1.

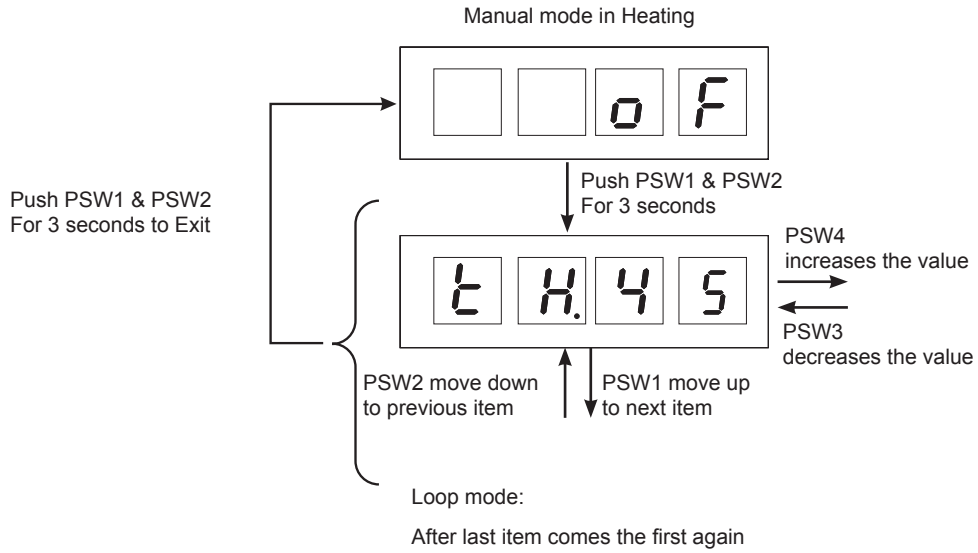
When SSW1 is in “Remote” mode, manual operation is disabled and unit operates using RCS.

When SSW1 is in “Local” mode, manual operation is enabled.

During manual operation, unit will operate normally with following constraints:

- Power to RCS is cut and therefore all communication with RCS are stopped.
- Data which is normally received from RCS, is applied as explained later in this chapter (for example On/Off, Mode, or setting temperature).

3.5.2 7-Segment configuration



Code	7-segment	Description	Default	Range	Steps	Units
HWS	tH.	Heating Water temperature setting	40	20-A	1	ºC
MWPS	FL.	Manual Water Pump Setting	99	40~99	1	%

Code	RWLT		RWHT	Unit
	3 HP	Rest		ºC
A	55	60	80(*)	ºC

NOTE

- *If R134a compressor disabled (DSW4#1:ON) setting must be 60ºC.*
- *Modified values are applied and stored in EEPROM after user exits configuration mode (pressing PSW1 and PSW2 during more than 3 seconds).*

3.5.3 4~20 mA setting

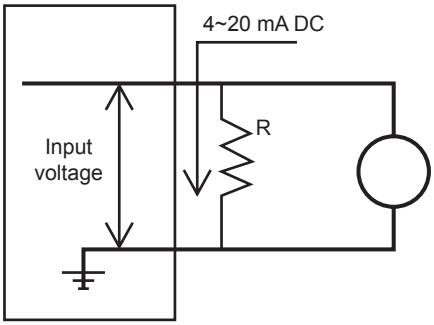
HSW and CSW operation can be overridden by external controller using 4~20mA input (CN5).

In order to allow override operation DSW5#3 must be ON, otherwise values selected by 7-segment will be used.

When override operation is allowed, external controller decides the target temperature by inputting a 4~20mA value current in CN5.

This connector transforms input current to voltage by means of a grounded 240Ω resistor (available as accessory ATW-MAK-01) connected into a terminal board

Unit converts read voltage to setting temperature proportionately.



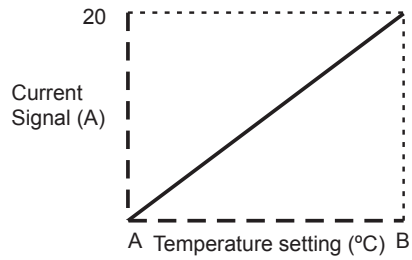
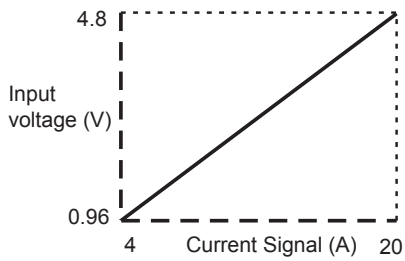


Figure A: Controller side



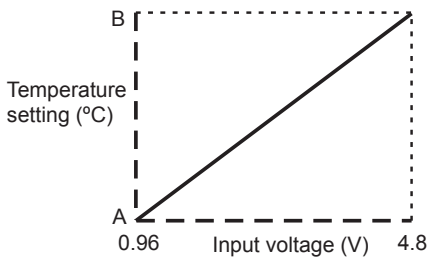


Figure B: Unit side

Code		RWLT	RWHT	Unit
A	Heating	20	20	ºC
B	Heating	60	80	ºC

NOTE

In case of R134a forced compressor off enabled (DSW4#1:ON); setting keep to 80ºC (Installer responsibility)

External controller must calculate current as follows:

$$Current = (Setting - A) \cdot \frac{16}{B - A} + 4$$

Unit will calculate temperature as follows:

$$Setting = (Current - A) \cdot \frac{B - A}{16} + A$$

Where:

Setting: Desired temperature setting in ºC

A: Temperature for minimum current

B: Temperature for maximum current

Current: Current to input in 4~20mA port (Min: 4mA, Max.: 20mA. If calculated value over limit, apply closer limit).

Temperature setting calculation will only be performed once each minute in order to avoid excessive variation.

3.5.4 ON/OFF Operation

On/Off order is given by external input in TB2 Terminals 13 &14 (Input 1).

Operation will be as follows:

- When external input is closed, unit operation will be changed to ON
- When external input is open, unit operation will be changed to OFF

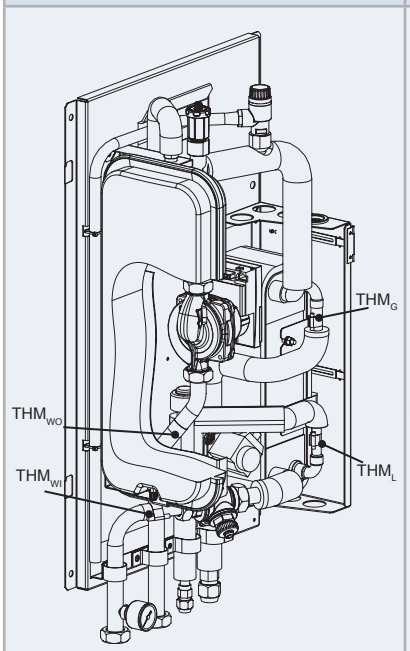
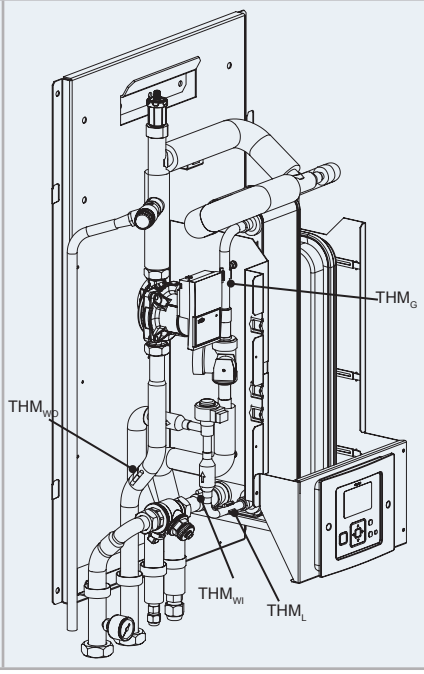
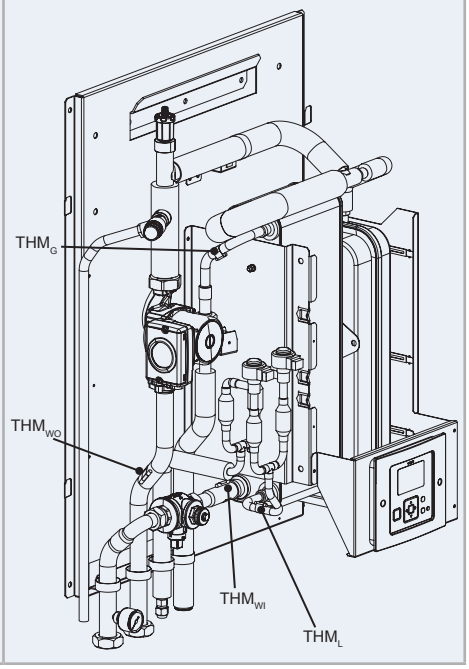
4. Electrical checks of the main parts

Index

4.1 Thermistors 72
4.1.1 HYDRO FREE Low temperature 72
4.1.2 HYDRO FREE High temperature 73
4.2 Electronic expansion valve 74
4.3 Water pump 74

4.1 Thermistors

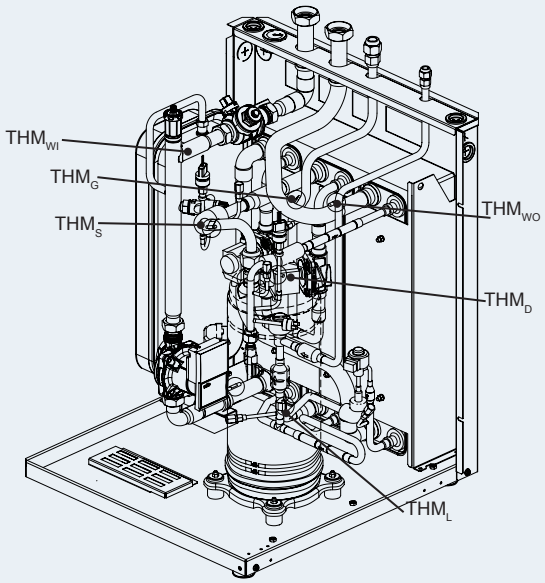
4.1.1 HYDRO FREE Low temperature

RWLT-3.0VN1E	RWLT-5.0VN1E	RWLT-10.0VN1E
		

Thermistor	Description
THM$_L$	Liquid pipe thermistor
THM$_G$	Gas pipe thermistor
THM$_{WI}$	Water inlet thermistor
THM$_{WO}$	Water outlet thermistor

4.1.2 HYDRO FREE High temperature

RWHT-5.0VNF1E



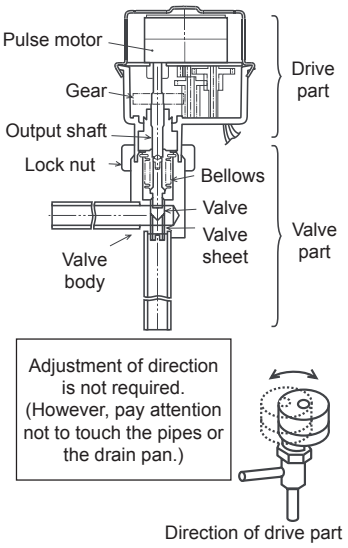
Thermistor	Description
THM$_{L}$	Liquid pipe thermistor
THM$_{G}$	Gas pipe thermistor
THM$_{D}$	Discharge pipe thermistor
THM$_{S}$	Suction pipe thermistor
THM$_{WI}$	Water inlet thermistor
THM$_{WO}$	Water outlet thermistor

Thermistor	Description
THM$_{L}$	Liquid pipe thermistor
THM$_{G}$	Gas pipe thermistor
THM$_{D}$	Discharge pipe thermistor
THM$_{S}$	Suction pipe thermistor

Thermistor	Description
THM$_{WI}$	Water inlet thermistor
THM$_{WO}$	Water outlet thermistor
THM$_{AMB}$	Ambient temperature thermistor
THM8	Thermistor for piping

4.2 Electronic expansion valve

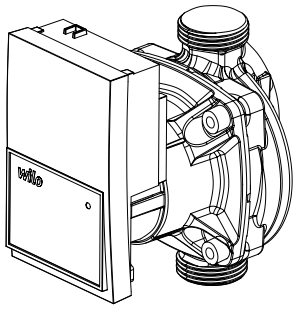
1 Check that the voltage of the valve ranges between 12Vdc±1.2V.
2 Use a multimeter to check the coil resistance (per phase). This ranges between 150 Ω±10% at an ambient temperature of 20ºC.
3 Check the number of pulses per second. This ranges between 100Ω ± 250 pulses per second (the width between pulses is greater than 3 mm) on activating phase 2.
4 Check that the valve flow is reversible.
5 When the valve is fully open and in heating process, check that the temperature of the liquid in the piping increases. If not, this indicates a fault.
6 When the valve is slightly open or fully open, check that the temperature of the freeze protection thermistor is higher than the suction temperature. If not, this indicates a fault.



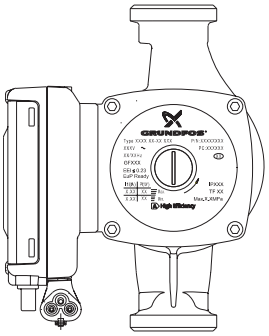
4.3 Water pump

	3 HP	5 HP	10 HP	
Power				
Energy efficiency Index (EEI)	≤ 0.20	≤ 0.21	-	
Max. delivery Head	7.2 m	7.6 m	10.5 m	
Max. Volume flow	3.3 m³/h	4.0 m³/h	5.5 m³/h	
Permitted field of application				
Temperature range for applications at Max. temperature limit values	Of 58ºC = 0 to 100ºC Of 62ºC = 0 to 90ºC Of 66ºC = 0 to 80ºC Of 71ºC = 0 to 70ºC		Ambient (ºC) 0 20 30 35 40 55	Liquid (ºC) -95 (+110) -95 (+110) -95 (+110) +95 +95 +75
Maximum static pressure	PN 6		PN 10	
Electrical Connection				
Mains connection	1~230V +10%-15%, 50/60 Hz (IEC 60038)		1~230V +10%-15%, 45/75 Hz	
Low voltage directive	2006/95/EC Conform			
Protection Class	IPX4D		IPX2D	
Insulation Class	F		H	
Motor data	Yonos PARA			
Speed (rpm) (RS**/7.0iPWM1)	800 / 4660	800/4770		
Power consumption (W)	3-45	4-75		
Current at 1~230 V (A)	0.03 - 0.44	0.4-0.60		

PWM input signal	3.0 HP	5 HP
0	Pump output PWM interface damaged	
2	Stand-by, Pump is ready to run	
5-75	Pump is running normally, flow information is given	
80	Abnormal running mode Pump is running but not optimal performance (External cause)	
85	Abnormal function mode Pump has stopped but still functional (External cause)	
90	Abnormal function mode Pump has stopped but still functional Check installation setup and the pump	
95	Pump stopped due to permanent failure	
100	PWM connection problem	
Signal frequency	75 Hz ±2 Hz	



PWM input signal	10.0 HP
≤10	Maximum speed: Max.
<10/≤84	Variable speed: Min. to Max
>84/≤91	Minimum speed: Min
>91/≤95	Hysteresis area: ON/OFF
>95/≤100	Stand-by mode: OFF



5. Servicing

Index

5.1 HYDRO FREE Low temperature - RWLT-(3.0-10.0)VN1E 79

5.1.1 First steps for maintenance and servicing 79

5.1.2 Covers 80

5.1.2.1 Removing the Service cover 80

5.1.2.2 Opening the E-box cover 81

5.1.2.3 Opening the E-Box 82

5.1.3 Cycle and hydraulic components 83

5.1.3.1 Access to the cycle and hydraulic parts 83

5.1.3.2 Location of components 83

5.1.3.3 Removing the Manometer 84

5.1.3.4 Removing the Filter plus ball valve 84

5.1.3.5 Removing the Water pump 85

5.1.3.6 Replacing the Air purger 87

5.1.3.7 Replacing the Safety valve 87

5.1.3.8 Removing the Expansion valve 87

5.1.3.9 Replacing the Expansion valve coil 90

5.1.3.10 Removing the Expansion vessel 91

5.1.3.11 Removing the Plate heat exchanger (PHEX) 92

5.1.3.12 Electrical components 96

5.1.3.13 Location of components of the PCB 97

5.1.3.14 Removing the unit controller 97

5.1.3.15 Replacement of the rocker switch 99

5.1.3.16 Replacing thermistors (THM_{WO}, THM_{WI}, THM_{L}, $THM_{G,}$) 100

5.1.3.17 Replacement of fuse (EF1) 101

5.1.3.18 Removing the fuse holder 102

5.1.3.19 Replacement of the terminal board (TB2) 102

5.1.3.20 Replacement of the terminal board (TB1) 103

5.1.3.21 Replacement of relays (AR3) 103

5.1.3.22 Replacement of the PCB 104

5.2 HYDRO FREE High temperature - RWHT-5.0VNF1E 105

5.2.1 Covers 105

5.2.1.1 Removing the Front cover 105

5.2.1.2 Removing the Upper cover 106

5.2.1.3 Removing the Right side cover 106

5.2.1.4 Removing the Left side cover 107

5.2.1.5 Removing the Electrical box cover 108

5.2.1.6 Opening the Electrical box 109

5.2.1.7 Process to clean the filter 109

5.2.2 Location of components 110
5.2.3 Hydraulic components 111
5.2.3.1 Replacement of the manometer 111
5.2.3.2 Removing the Filter plus ball valve 112
5.2.3.3 Replacing the Water pump (WP1) 112
5.2.3.4 Replacement of the Air purger 113
5.2.3.5 Replacement of the Safety valve 113
5.2.3.6 Replacement of the Expansion vessel 114
5.2.4 Cycle components 115
5.2.4.1 Replacement of the compressor 115
5.2.4.2 Replacement of high pressure switch (PSH) 118
5.2.4.3 Replacement of the pressure sensors 119
5.2.4.4 Replacement of solenoid valves coils 120
5.2.4.5 Replacement of solenoid valves 121
5.2.4.6 Replacement of the electronic expansion valve coil (R410A / R134a) 121
5.2.4.7 Replacement of R134a expansion valve 123
5.2.4.8 Replacement of R410A expansion valve 123
5.2.4.9 Replacement of Plate heat exchangers 124
5.2.5 Electrical components 127
5.2.5.1 Removing electrical box components 127
5.2.5.2 Replacing the electrical box 128
5.2.5.3 Replacing thermistors 128
5.2.5.4 Replacing the DIP-IPM (Inverter module) 129
5.2.5.5 Replacing the noise filter (Inverter module) 129

5.1 HYDRO FREE Low temperature - RWLT-(3.0-10.0)VN1E

⚠ DANGER

- ***Disconnect the units from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***Wait minimum 10 minutes or more from all power supplies have been turned OFF.***
- ***When handling the electrical box, take care of components. Do not apply excessive force to them, in order to avoid damaging the electrical components.***
- ***In case of replacing Hydraulic parts, drain water from the unit its needed. Close Shutdown valves and open the drain valves.***

⚠ CAUTION

- *In case of replacing refrigerant parts, collect refrigerant to the outdoor unit by pump down procedure.*
- *Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid mixing the water and foreign particles into the refrigerant cycle. After removing refrigerant parts, replace it quickly. If exposed for a long period, seal the liquid pipe and gas pipe.*
- *All refrigerant parts are connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections, if not, oil existing pipe inside may ignite.*
- *When performing brazing work, besides security gloves it is a must to wear convenient eye protection.*
- *In case of blocked or stacked parts, use appropriated tools and eventually lubricants to release them.*
- *In case of sharped edged parts, as covers, use security gloves to avoid getting injured.*
- *Take care with the LCD display of the unit controller while removing the frame.*
- *Pay attention of no falling off the service cover.*
- *Take care when removing service cover; the parts inside the unit could be hot.*

5.1.1 First steps for maintenance and servicing

There are 3 operations installers must do for most of servicing and maintenance procedures:

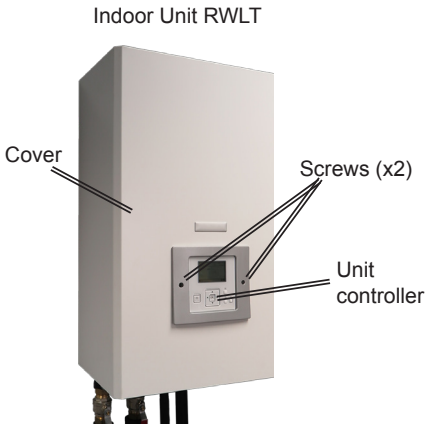
- To remove the unit cover.
- Opening of the E-Box cover. It is needed to have access to the PCB and the other electrical components placed inside the E-Box. Also, it is the first step to get access to the inside of the unit, as it is necessary to open the E-Box and have access to the cycle and hydraulic components of the unit.
- Opening the E-Box: To have access to the cycle and hydraulic components inside the unit.

5.1.2 Covers

5.1.2.1 Removing the Service cover

NOTE

Service cover needs to be removed for most of operations inside the indoor unit.



1 Remove the 2 screws fixing the frame of the unit controller. The screws also fix the cover to the unit.





2 Slide the service cover slightly upward and remove it pulling backwards.

CAUTION

- *Take care with the LCD display of the unit controller while removing the frame.*
- *Pay attention of no falling off the service cover.*



5.1.2.2 Opening the E-box cover

The following operations should be done before proceeding to the opening of the E-box.

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover".*

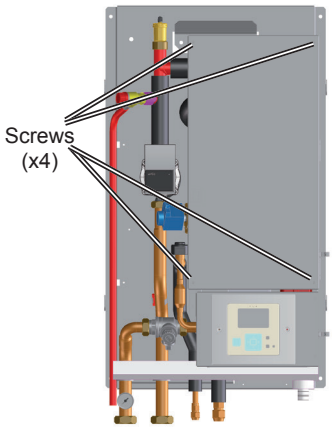
Then,

1 Remove the 2 screws fixing the cover of the E-box

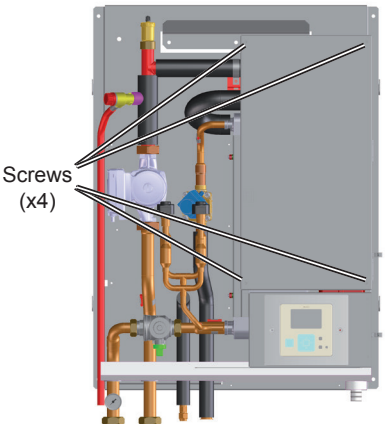
RWLT-3.0VN1E



RWLT-5.0VN1E



RWLT-10.0VN1E



2 Remove the EBox cover

RWLT-3.0VN1E

- From the left side of the E-box cover, gently pull backwards to open the E-box.



RWLT-5.0VN1E

- Simply remove the E-Box cover

RWLT-10.0VN1E

- Simply remove the E-Box cover

⚠ CAUTION

- *Take care with the LCD display of the unit controller while removing the frame.*
- *Pay attention of no falling off the service cover.*

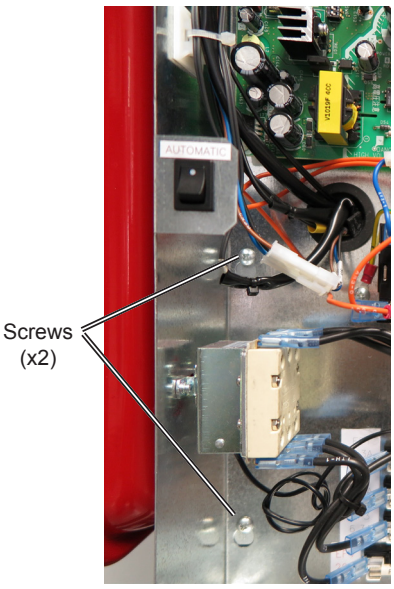
5.1.2.3 Opening the E-Box

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover".*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover".*

Then,

All models

1 Loosen the 2 screws fixing the E-Box.



2 From the left side, gently pull up and then backwards to open the E-box.



5.1.3 Cycle and hydraulic components

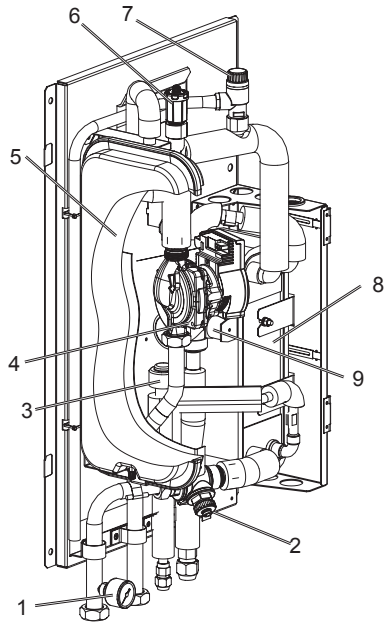
5.1.3.1 Access to the cycle and hydraulic parts

The following operations should be done to have access to the cycle and hydraulic components:

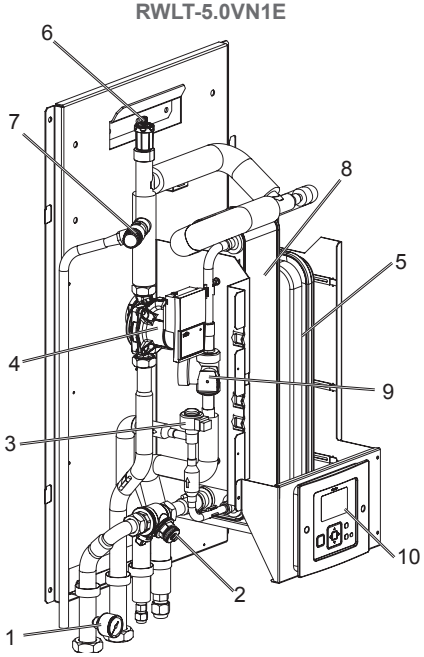
- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover"*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover"*
- Opening of the E-Box as explained in chapter *"5.1.2.3 Opening the E-Box"*

5.1.3.2 Location of components

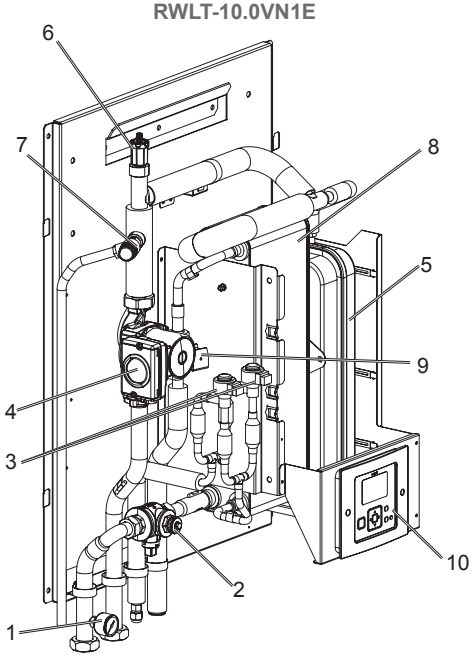
RWLT-3.0VN1E



RWLT-5.0VN1E



RWLT-10.0VN1E



Item	Description
1	Manometer
2	Filter Plus
3	Expansion Valve (3.0-5.0) HP: x1; (10.0) HP: x2)
4	Water pump
5	Expansion vessel

Item	Description
6	Safety valve
7	Air purge
8	Plate heat exchanger
9	Solenoide Valve
10	Unit controller (*)

NOTE

(*): The unit controller of RWLT-3.0VN(1)E is integrated in the E-Box Cover.

5.1.3.3 Removing the Manometer

1 Drain the indoor unit water as explained at section *"Draining operation for RWLT"* in chapter *"7. Maintenance notes"*.

2 Remove front cover and open the E-Box to have access to the inner components.

3 Unscrew manometer capillary joint from the water pipe.



4 Install the new one by performing the procedures described above in reverse way.

NOTE

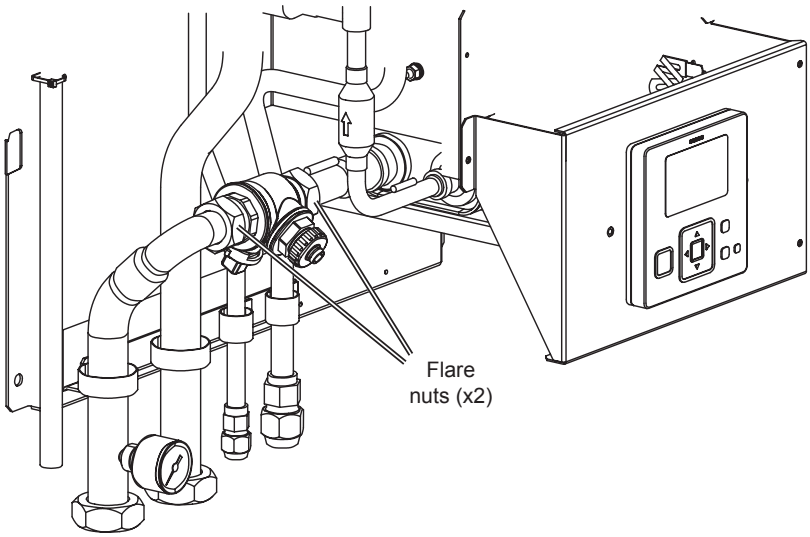
- *Be sure of the position of the manometer.*
- *Apply Teflon to the thread of the manometer port before assembling to avoid leakage.*

5.1.3.4 Removing the Filter plus ball valve

To remove the filter ball the following operations should be done:

1 Drain the indoor unit water as explained at section *"Special note for RWHT refrigerant charge"* in chapter *"7. Maintenance notes"*.

2 Loosen the flare nuts of the filter plus ball valve



NOTE

For further information about the Filter plus ball valve, refer to "6 Filter plus" of "7. Maintenance notes" chapter.

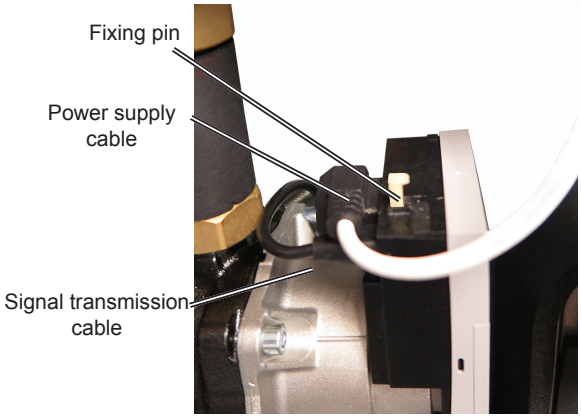
5.1.3.5 Removing the Water pump

To remove the water pump the following operations should be done:

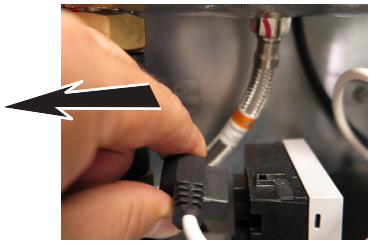
RWLT-(3.0-5.0)VN1E

1 Gently, pull the signal connector from the water pump.

2 Remove the plastic pin fixing the power supply connector of the water pump.

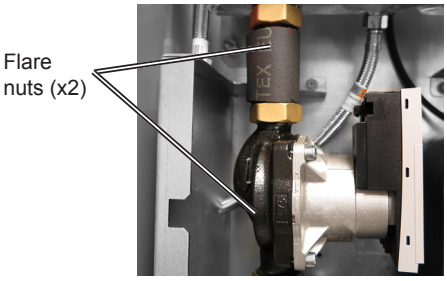


3 Gently, pull the power supply connector from the water pump.



4 Loosen the flare nuts

5 Remove the water pump



NOTE

- *Be sure of the position of the Water pump.*
- *Be careful, do not loose the gaskets of the water pump.*
- *Check the gaskets. If they are damaged, replace them for new ones.*

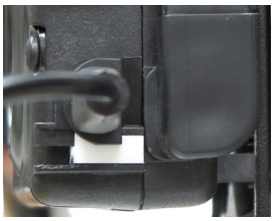
RWLT-10.0VN1E

1 Remove the wiring from the Water pump:
- Remove the Power supply plug connector.
- Remove the Signal cable connector.

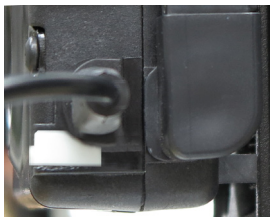
NOTE

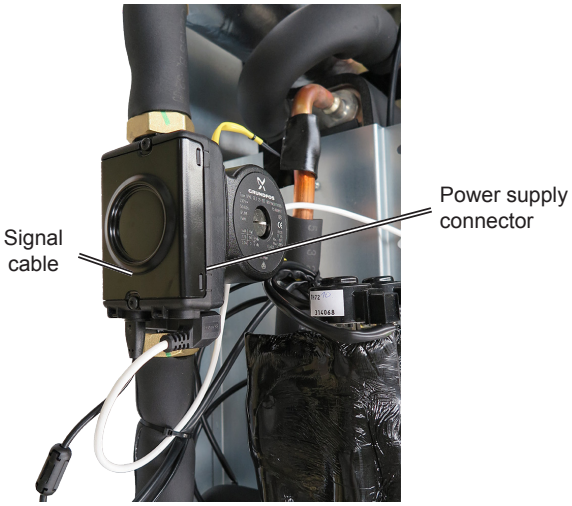
To remove the connector of the signal cable it is necessary to move the fixing slide securing the connector, as it is shown in the picture below.

Locked

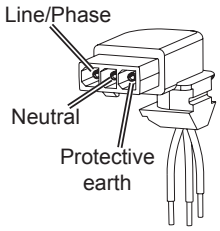


Unlocked

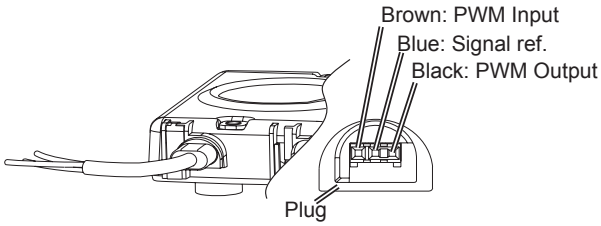




Power supply Cable

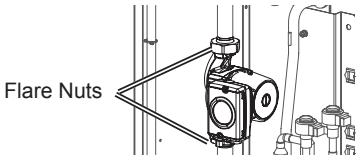


Signal cable



2 Loosen the flare nuts.

3 Remove the water pump.



NOTE

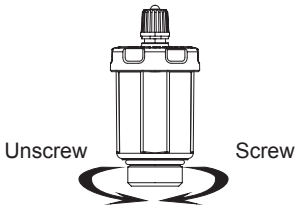
To reassemble the Water pump, proceed in reverse way.

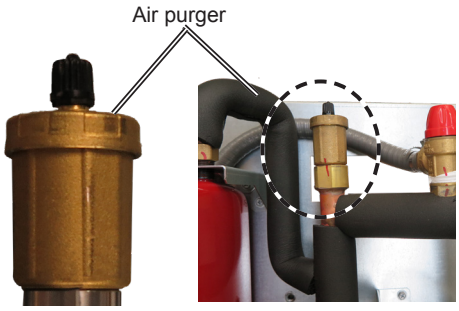
5.1.3.6 Replacing the Air purger

To remove the air purger the following operations should be done:

1 Unscrew the Air purger.

2 Replace the Air purger for a new one.





NOTE

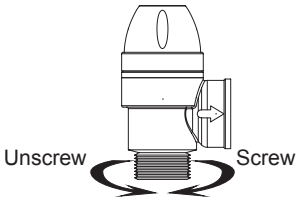
- *Lubricate the Thread of the Air purger when reassembling.*
- *To reassemble the Air purger, proceed in reverse way than disassembling.*

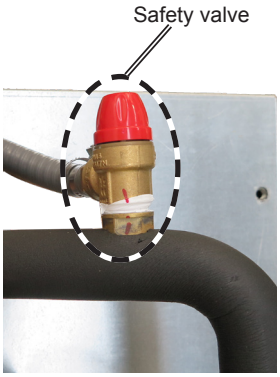
5.1.3.7 Replacing the Safety valve

Proceed as explained below to replace the Safety valve:

1 Loosen the screw of the hose clamp fixing the drain hose

2 Unscrew the Safety valve.







3 Replace the Safety valve for a new one if needed.

NOTE

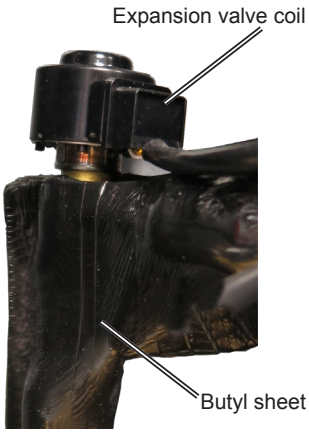
- *Use Teflon tape on the thread to avoid any leakage.*
- *To reassemble the Safety valve proceed in reverse way than disassembling.*

5.1.3.8 Removing the Expansion valve

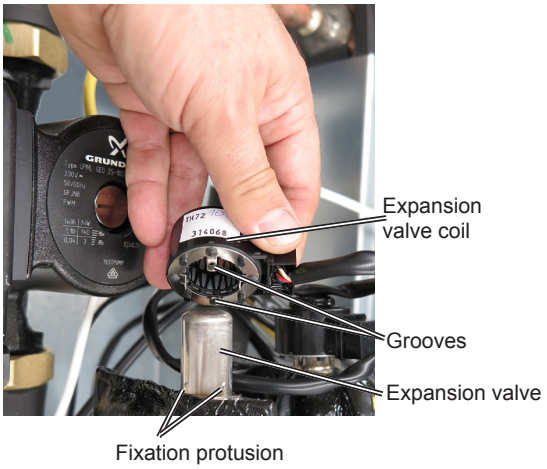
To remove the expansion valve the following operations should be done:

At the expansion valve location,

1 Remove the butyl sheet:
The butyl sheet is adhered around electronic expansion valve and the inlet piping and outlet piping of the electronic expansion valve. Remove the butyl sheet of the surface of the piping.



2 Remove the coil of the expansion valve:
Slightly rotate the coil while pulling it upwards. The coil has a fixation system which comprises a protrusion at the Expansion valve that has to match with the grooves located at the coil. (See the picture beside).



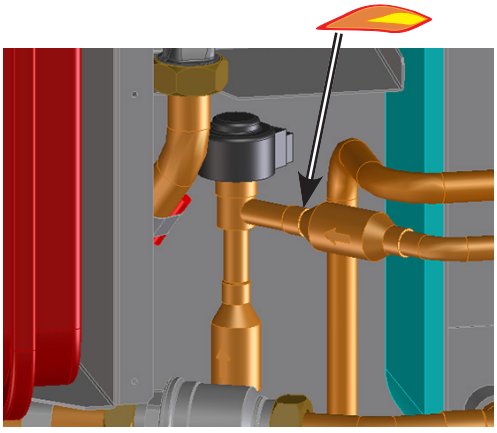
3 Remove the Expansion valve by unbrazing the brazed parts with a blowtorch.

NOTE

RWLT-10.0VN(1)E models have 2 expansion valves rather than only 1 of the RWLT-(3.0-5.0)VN(1)E models. See the illustrations below.

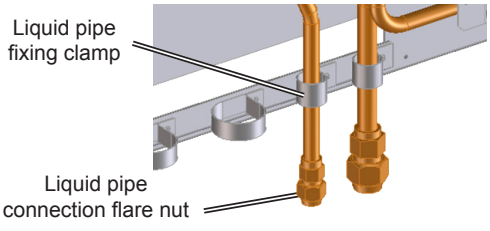
RWLT-(3.0-5.0)VN1E

a. Unbraze the connection between the expansion valve pipe and the strainer.



b. Unscrew the flare nut of the pipe. Unscrew the clamp that fixes the pipe.

c. Remove the Expansion valve assembly. Proceed to desolder the brazed parts and replace the expansion valve for a new one.

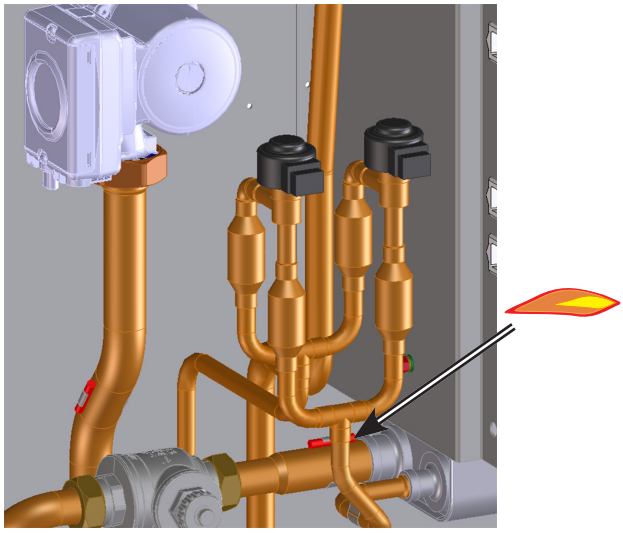


NOTE

To reassemble the Expansion valve proceed in reverse way than disassembling.

RWLT-10.0VN1E

a. Unbraze the pipe.

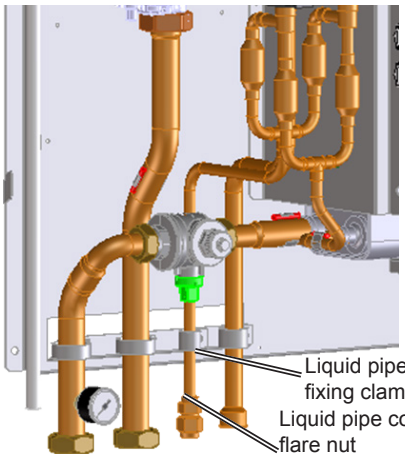


b. Unscrew the flare nut of the pipe. Unscrew the clamp that fixes the pipe.

c. Remove the Expansion valve assembly. Proceed to desolder the brazed parts and replace the expansion valve for a new one.

NOTE

To reassemble the Expansion valve proceed in reverse way than disassembling.

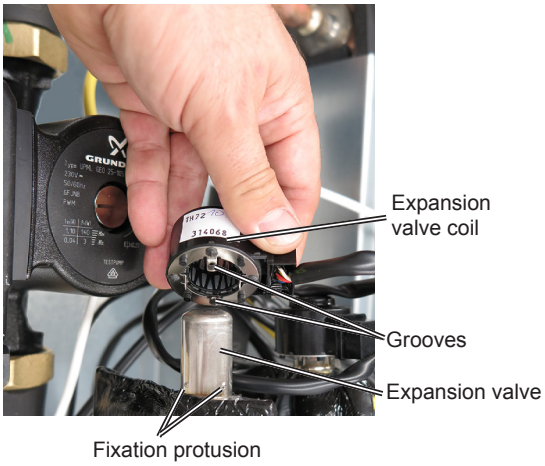


NOTE

During replacement work, pay attention to the separation part and prevent the dust, foreign particle, etc. from entering into the separation part. (The sensitive part of the valve is its mechanical system.)Do not damage the junction part of the valve with the tools.

5.1.3.9 Replacing the Expansion valve coil

1 Remove the coil of the expansion valve:
Slightly rotate the coil while pulling it upwards. The coil has a fixation system which comprises a protrusion at the Expansion valve that has to match with the grooves located at the coil. (See the picture beside).



2 At the Ebox, remove the CN7A connector from the PCB1.

3 Cut all the plastic cord bands fixing the cables of the Expansion valve coil.

4 Replace the Expansion valve and reassemble it in reverse way. Remember to fix the cables, with plastic cord bands, in the same way and position than were before disassembling.

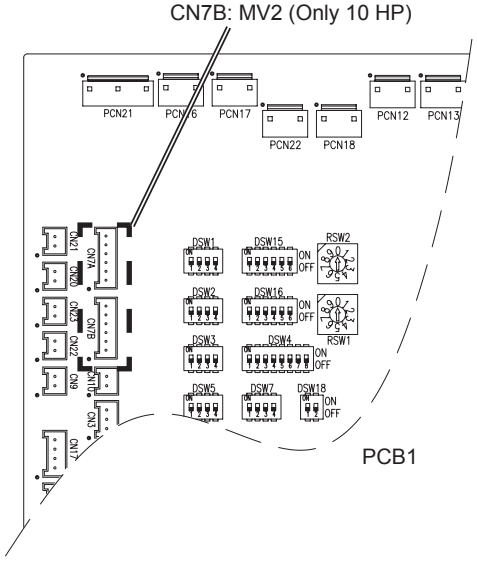
NOTE

- *RWLT-10.0VN1E models have 2 expansion valves:*
- *MV1: Connected to CN7A and MV2: Connected to CN7B.*
- *See the electric diagrams*

Expansion valve coil connections to PCB1:

CN7A: MV1 (All models)

CN7B: MV2 (Only 10 HP)



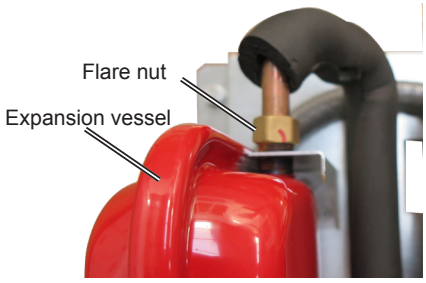
5.1.3.10 Removing the Expansion vessel

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover".*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover".*
- Open the E-Box as explained in chapter *"5.1.2.3 Opening the E-Box".*
- Drain the unit as explained in chapter *"7. Maintenance notes"*, section *"Draining operation for RWLT".*

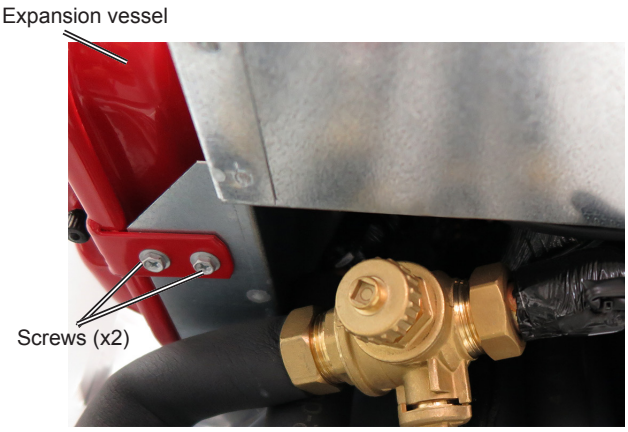
Then,

RWLT-3.0VN1E

1 Unscrew the flare nut at the top of the expansion vessel.

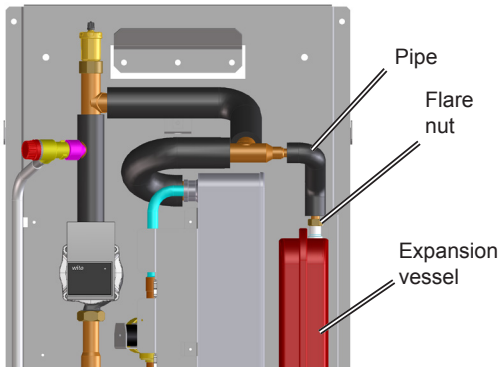


2 Remove the screws fixing the Expansion vessel at its bottom.

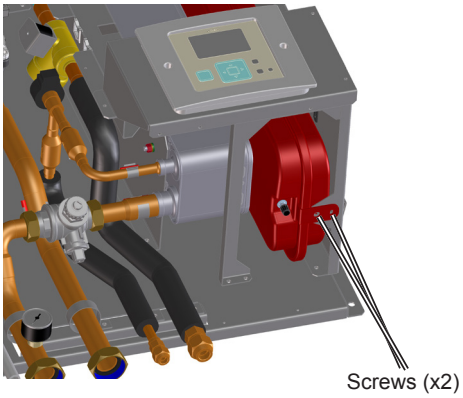


RWLT-(5.0-10.0)VN1E

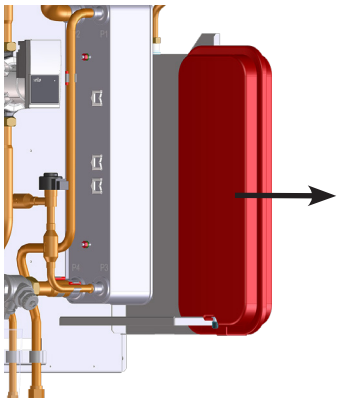
1 Unscrew the flare nut of the pipe at the top of the expansion vessel.



2 Remove the screws fixing the Expansion vessel at its bottom.



3 Softly pull it downwards to remove it from its placement



5.1.3.11 Removing the Plate heat exchanger (PHEX)

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover"*.
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover"*.
- Open the E-Box as explained in chapter *"5.1.2.3 Opening the E-Box"*.
- Drain the unit as explained in chapter *"7. Maintenance notes"*, section *"Draining operation for RWLT"*.
- Collect the refrigerant by Pump down as explained in *"7.2.4 Evacuation and refrigerant charge"* in chapter *"7. Maintenance notes"*.

Then,

RWLT-3.0VN1E

1 Cut all the cord bands attaching all the wires and thermistors

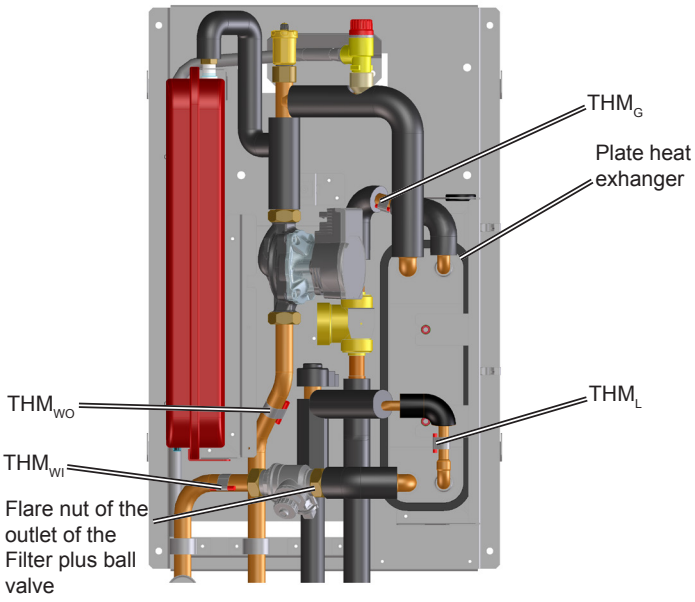
2 Remove the following thermistors THM_{WO}, THM_{WI}, THM_{L} and THM_{G}.

NOTE

To remove the thermistors refer to its relevant instructions in this chapter.

3 Loosen the flare nut attached to the inlet pipe of the Plate heat exchanger.

4 Loosen the flare nut of the outlet of the Filter plus ball valve.



5 Remove the water pump:

a. Disconnect the wires of the water pump as explained in *"5.1.3.5 Removing the Water pump"*

b. Loosen the flare nut (1) connecting the pipe of the Water pump to the air purge.

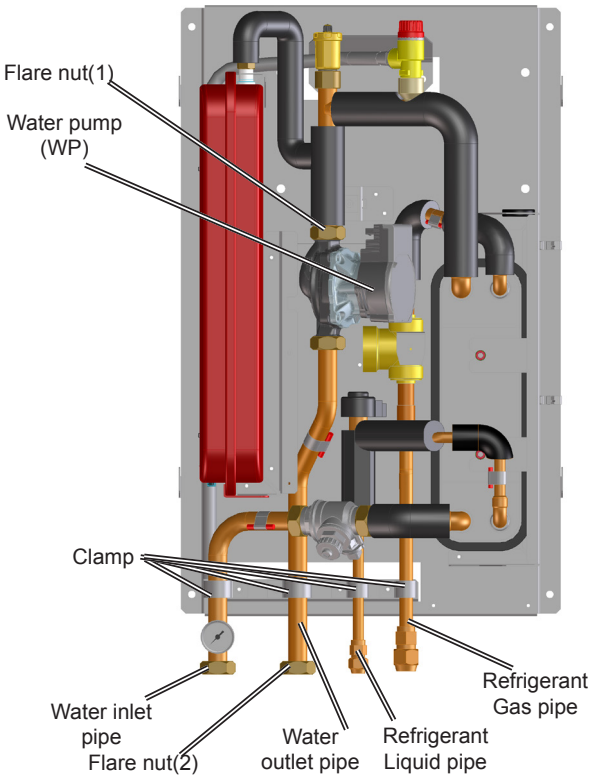
c. Loosen the flare nut (2) connecting the water outlet pipe to the shut-off valve.

d. Remove the metallic clamps fixing the water outlet pipe, the Refrigerant gas pipe and the Refrigerant liquid pipe.

e. Remove the whole assembly (water pump and pipes).

6 Unscrew the flare nuts of the refrigerant pipes (Liquid and Gas).

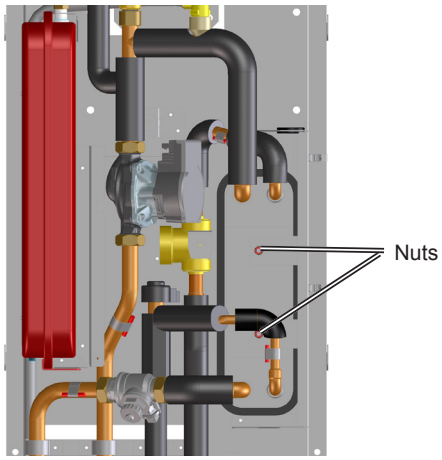
7 Remove the Expansion valve, as explained in *"5.1.3.8 Removing the Expansion valve"*



8 Remove the Plate heat exchanger:
Remove the nuts fixing the Plate heat exchanger and remove it paying attention not to damage any other part of the unit (cables, pipes, gaskets, etc).

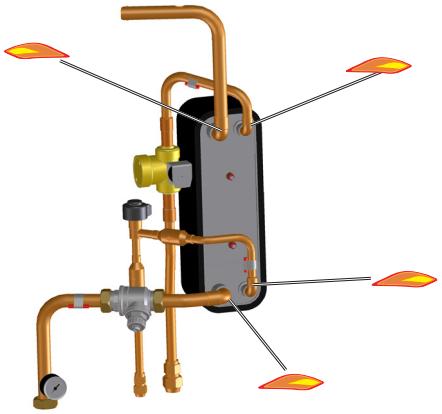
⚠ CAUTION

Be careful when handling the Plate heat exchanger. Pipes and Plate heat exchanger can be extremely hot.



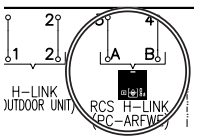
9 Once the Plate heat exchanger is removed, remove all the brazing parts with a blowtorch.

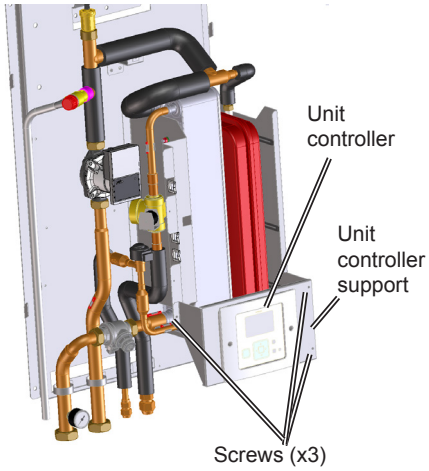
RWLT-3.0VN1E



RWLT-5.0VN1E

1 Disconnect the Unit controller from the table board of the PCB and remove the screws (x3) fixing the Unit controller support.





2 Cut all the cord bands attaching all the wires and thermistors.

3 Remove the following thermistors THM_{WI}, THM_{L} and THM_{G}.

NOTE

To remove the thermistors refer to its relevant instructions in this chapter.

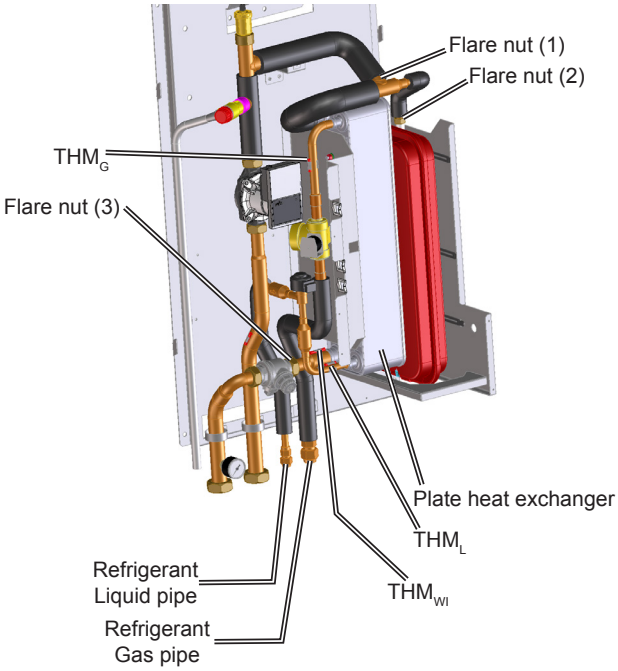
4 Loosen the flare nut attached to the inlet pipe of the Electrical heater (1).

5 Loosen the flare nut of the flexible pipe of the Expansion vessel (2).

6 Loosen the flare nut of the outlet of the Filter plus ball valve (3).

7 Remove the metallic clamps fixing the water outlet pipe, the Refrigerant gas pipe and the Refrigerant liquid pipe.

8 Unscrew the flare nuts of the refrigerant pipes (Liquid and Gas).

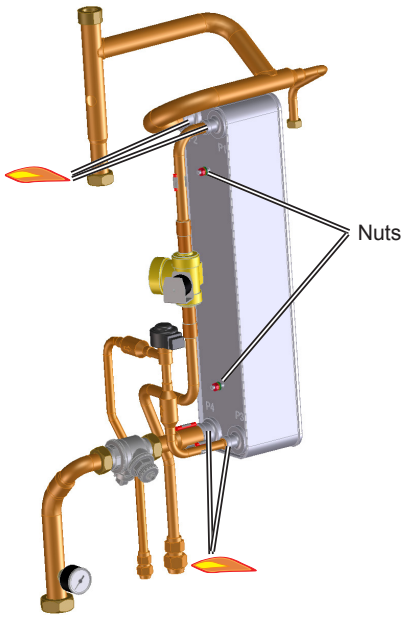


9 Remove the Plate heat exchanger:
Remove the nuts fixing the Plate heat exchanger and remove it paying attention not to damage any other part of the unit (cables, pipes, gaskets, etc).

CAUTION

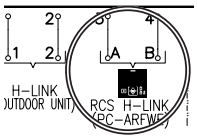
Be careful when handling the Plate heat exchanger. Pipes and Plate heat exchanger can be extremely hot.

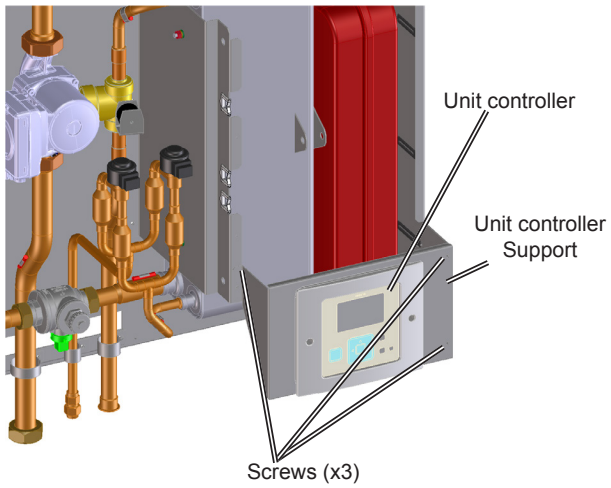
10 Once the Plate heat exchanger is removed, remove all the brazing parts with a blowtorch.



RWLT-10.0VN1E

1 Disconnect the Unit controller from the table board of the PCB and remove the screws (x3) fixing the Unit controller support.





2 Cut all the cord bands attaching all the wires and thermistors

3 Remove the following thermistors THM_{WI}, THM_{L} and $THM_{G.}$

NOTE

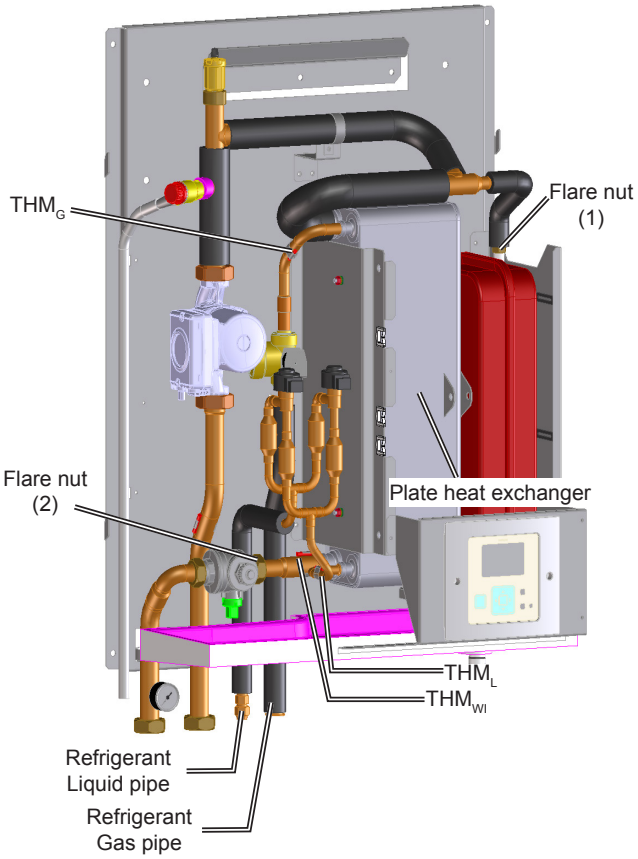
To remove the thermistors refer to the relevant instructions in this chapter.

4 Loosen the flare nut of the flexible pipe of the Expansion vessel (1).

5 Loosen the flare nut of the outlet of the Filter plus ball valve (2).

6 Remove the metallic clamps fixing the water outlet pipe, the Refrigerant gas pipe and the Refrigerant liquid pipe.

7 Unscrew the flare nuts of the refrigerant pipes (Liquid and Gas).

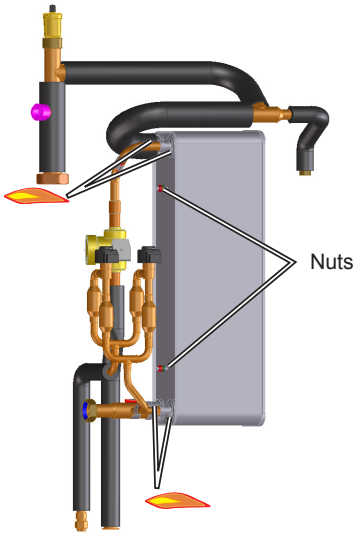


8 Remove the Plate heat exchanger:
Remove the nuts fixing the Plate heat exchanger and remove it paying attention not to damage any other part of the unit (cables, pipes, gaskets, etc).

CAUTION

Be careful when handling the Plate heat exchanger. Pipes and Plate heat exchanger can be extremely hot.

9 Once the Plate heat exchanger is removed, remove all the brazing parts with a blowtorch.



5.1.3.12 Electrical components

DANGER

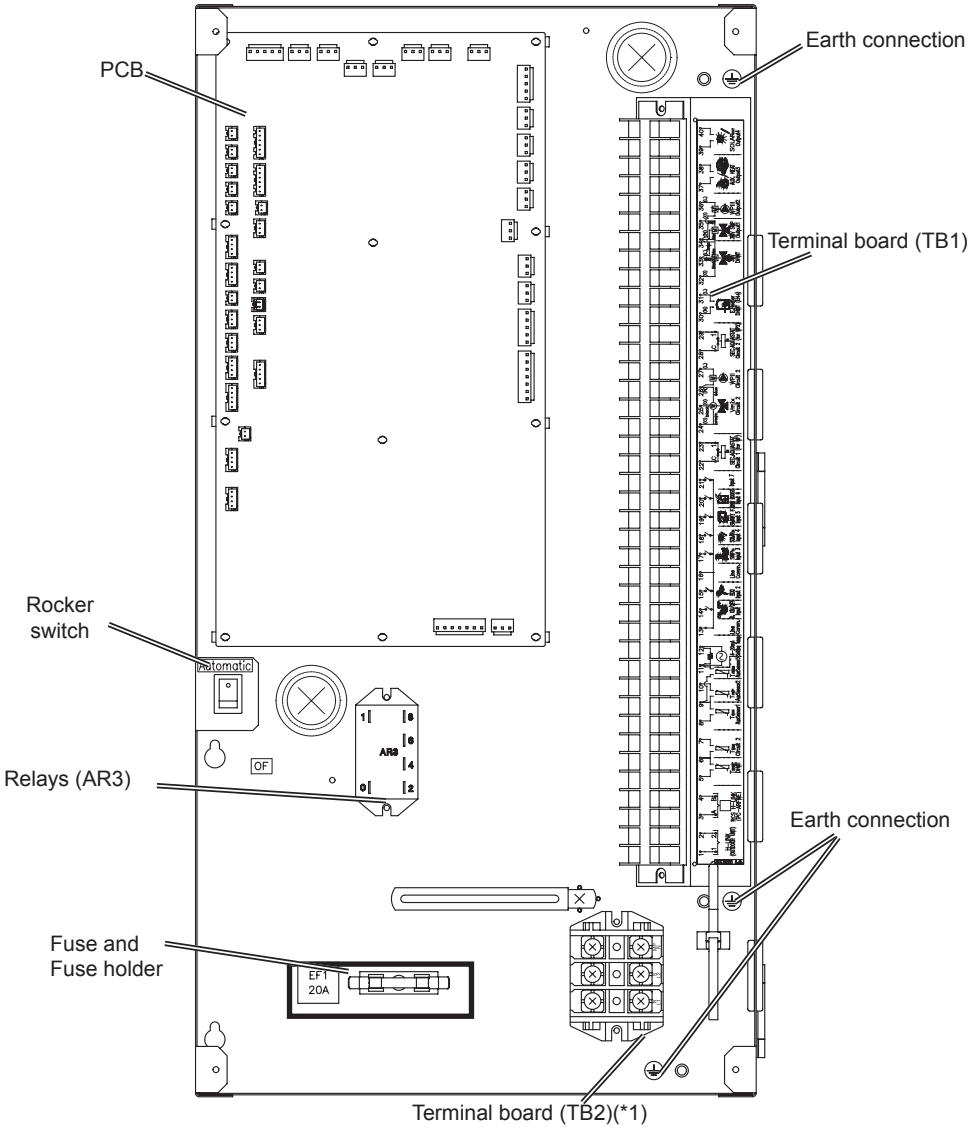
- ***Disconnect the RWLT from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***When handling the electrical box, take care of components. Do not apply excessive force to them, in order to avoid damaging the electrical components.***

CAUTION

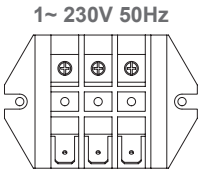
- *When handling the electrical box, take care of components. Do not apply excessive force to them, in order to avoid possible failures and damage to electrical components.*
- *To properly disconnect these components from the PCB, see the "8.4 Electrical Wiring Diagrams" section of "8. Electrical and control settings" chapter of this manual.*
- *Cover the thermistors with the cork tape or pipe insulation according to each location. Both materials are factory supplied. Replace them if damaged during the servicing.*

5.1.3.13 Location of components of the PCB

E-Box



(*1)Terminal board for power supply (TB2)



5.1.3.14 Removing the unit controller

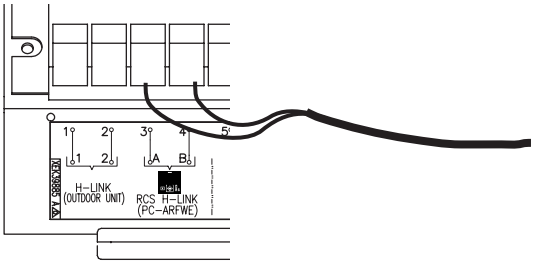
Remove the Service cover as explained in chapter *"5.1.2.1 Removing the Service cover".*

Then,

RWLT-3.0VN1E

1 Open the E-Box cover as explained in *"5.1.2.2 Opening the E-box cover".*

2 Disconnect the cables of the Unit controller connected to the terminals 3 and 4 of the Terminal Board (TB1).



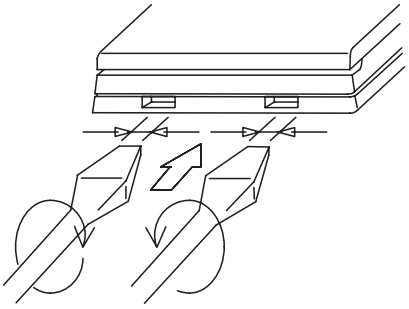


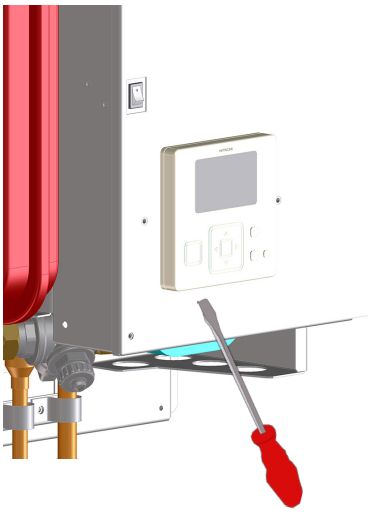
3 Cut the plastic cord bands attaching the PC-ARFWE cables

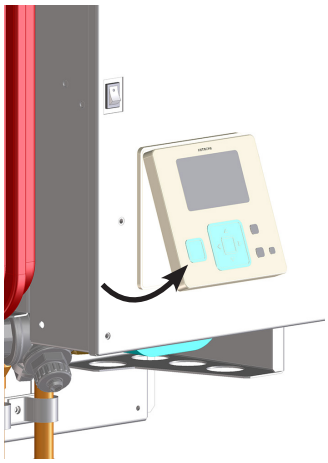
4 Open the Unit controller front cover.

NOTE

Refer to the Instructions manual of the PC-ARFWE Unit controller for more information regarding the opening and disassembling of the device.



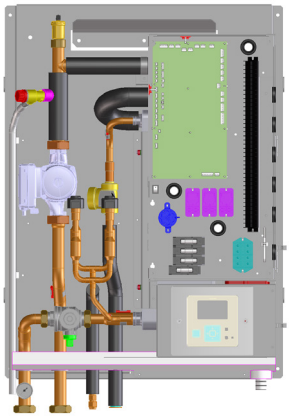




RWLT-5.0VN1E



RWLT-10.0VN1E



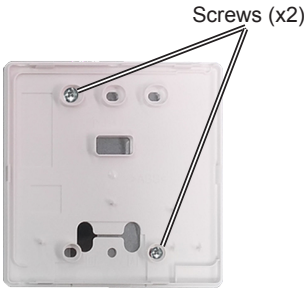
All units

5 Gently pull the harness backwards

6 Remove the screws (x2) fixing the unit controller base to the unit

NOTE

When reassembling, proceed in reverse way than disassembling.

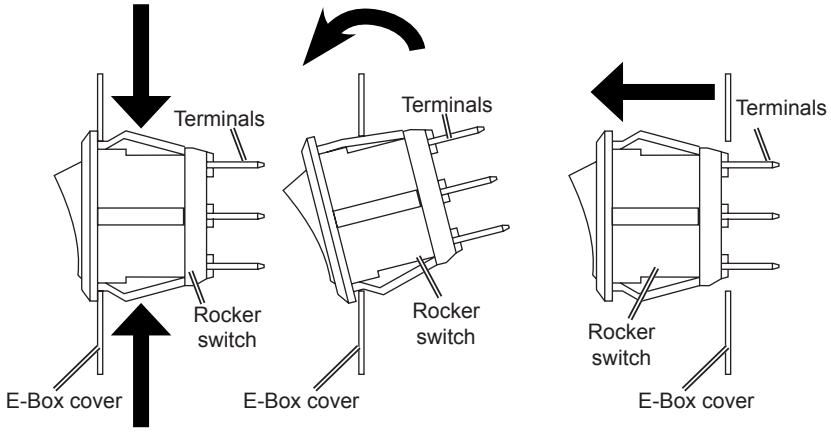


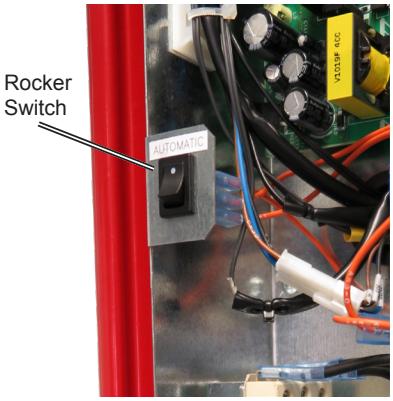
5.1.3.15 Replacement of the rocker switch

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover".*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover".*

1 Disconnect the terminals of the Rocker switch.

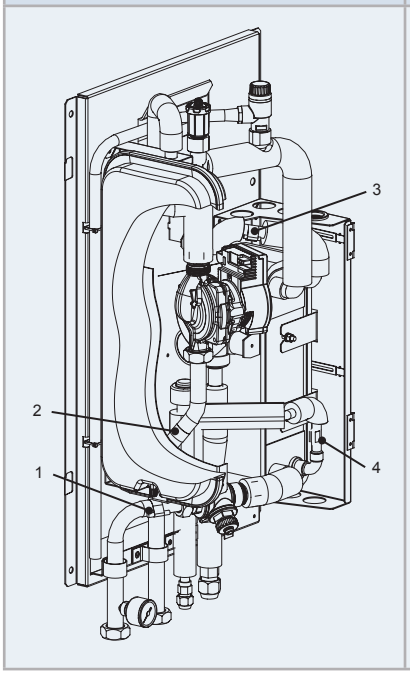
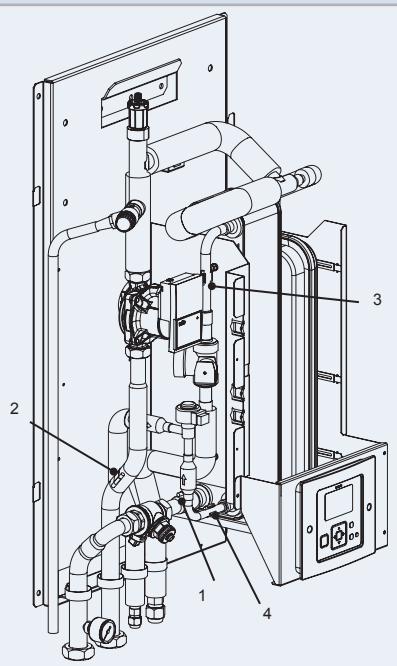
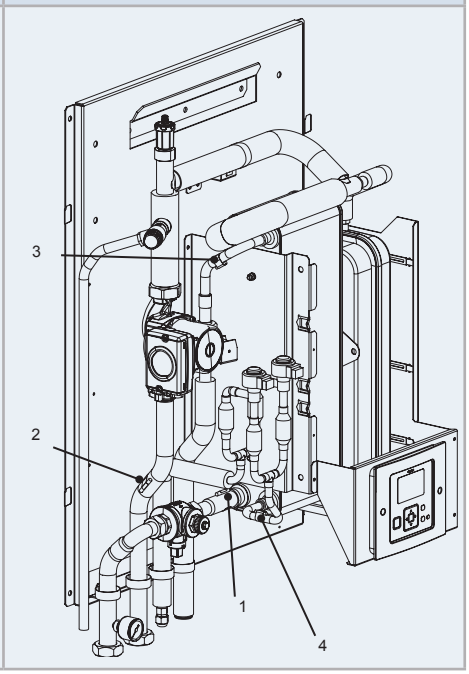
2 From the rear side of the Switch press backwards. (See the pictures below).





5.1.3.16 Replacing thermistors (THM_{WO}, THM_{WI}, THM_{L}, $THM_{G,}$)

- Remove the cover as explained in chapter *""5.1.2.1 Removing the Service cover"*
- Open the E-Box as explained in chapter *"5.1.2.3 Opening the E-Box"*

RWLT-3.0VN1E	RWLT-5.0VN1E	RWLT-10.0VN1E
		

Item	Description	Connector
1	Water inlet pipe thermistor THM_{WI}	CN9
2	Water outlet pipe thermistor THM_{WO}	CN13
3	Gas refrigerant pipe thermistor THM_{G}	CN17

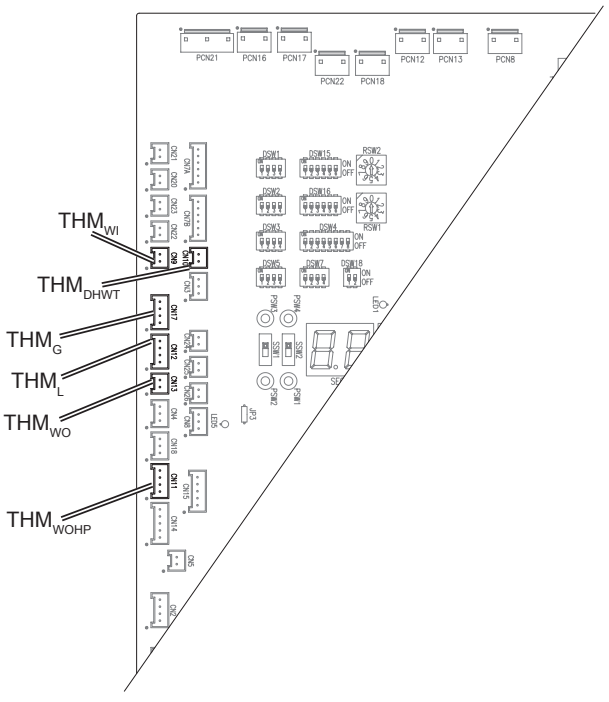
Item	Description	Connector
4	Liquid refrigerant pipe thermistor THM_{L}	CN12
5	Thermistor for DHW tank	CN10

NOTE

Additional Thermistors can be connected to the PCB according to the configuration of the installation. Refer to the Wiring diagram to see where they should be connected.

1 Disconnect the thermistor to be replaced from the correct connector of PCB2.

2 Cut and remove the plastic cord band attached to the thermistor harness.



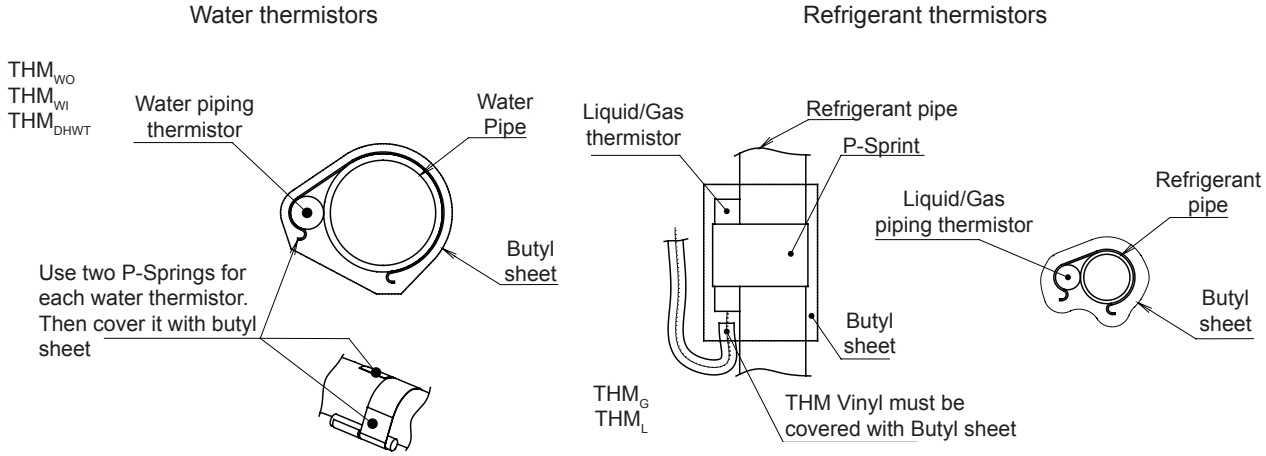
CAUTION

In case of P-Spring deforming, it needs to be replaced.

3 Remove the pipe insulation of thermistor.

4 Remove special clamp that is attached with copper pipe and sensor.

5 Install new thermistor using P-Spring and Butyl Sheet as shown in the following drawing:



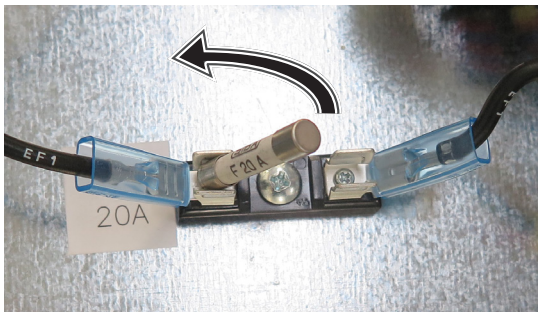
NOTE

When reassembling, install thermistor wire by performing the process in reverse way.

5.1.3.17 Replacement of fuse (EF1)

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover"*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover"*

1 Once the broken fuse is detected, pull it from its placement.



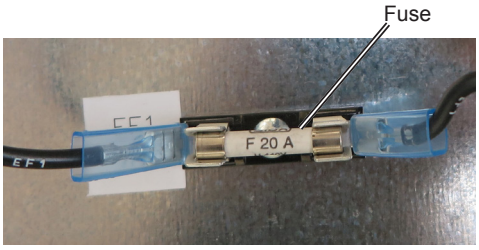


Table of fuses

Fuse	Dimensions (Ø x L) (mm)	RWLT-3.0VN1E	RWLT-5.0VN1E	RWLT-10.0VN1E
EF1	6.35 x 31.8	20 A	20 A	20 A

5.1.3.18 Removing the fuse holder

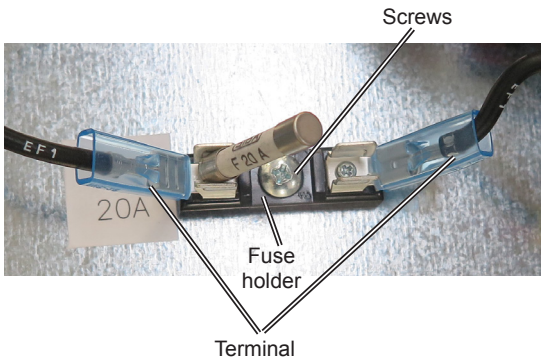
- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover"*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover"*

For those cases where a replacement of the fuse holder is necessary, proceed with the following instructions:

1 Remove the fuse as explained in *"5.1.3.17 Replacement of fuse (EF1)"*
2 Disconnect the cables from the terminals of the fuse holder.
3 Remove the screw fixing the fuse holder and replace it.

NOTE

The reassembling of the fuse should be done in reverse way than disassembling.

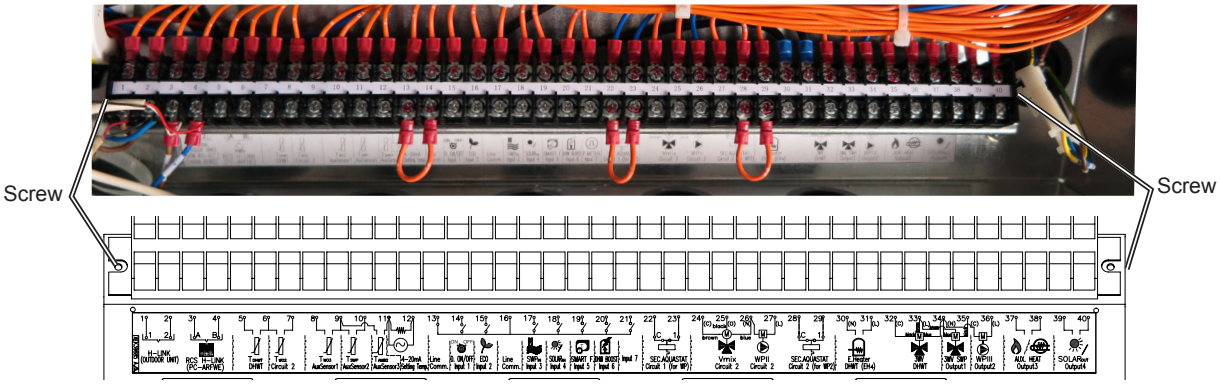


5.1.3.19 Replacement of the terminal board (TB2)

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover"*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover"*

Then,

1 Remove all the cables connected to the terminal board.
2 Remove the screws fixing the Terminal board to the E-Box



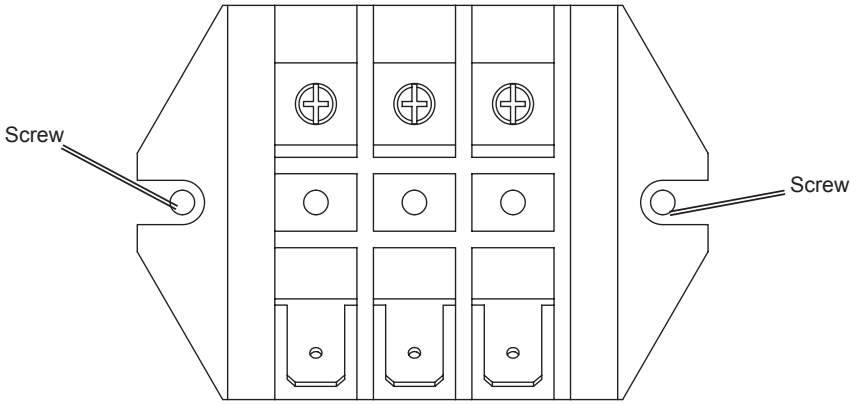
NOTE

Take note of the connections on the PCB. In particular, special connections, bridges, etc. Check the wiring diagram for any doubt you may have. Any incorrect connection may damage the unit.

5.1.3.20 Replacement of the terminal board (TB1)

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover"*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover"*

1 Remove all the cables connected to the terminal board.
2 Remove the screws fixing the Terminal board to the E-Box



5.1.3.21 Replacement of relays (AR3)

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover"*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover"*

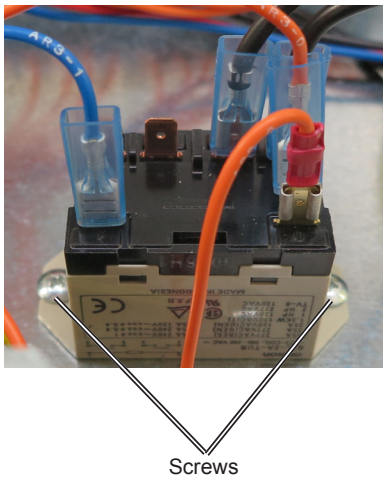
Then,

1 Identify the abnormal relay. Once detected, disconnect the cables.

NOTE

Take note of the connections on the Relays. Check the wiring diagram for any doubt. Any incorrect connection may damage the unit.

2 Remove the screws attaching the relay to the E-Box.

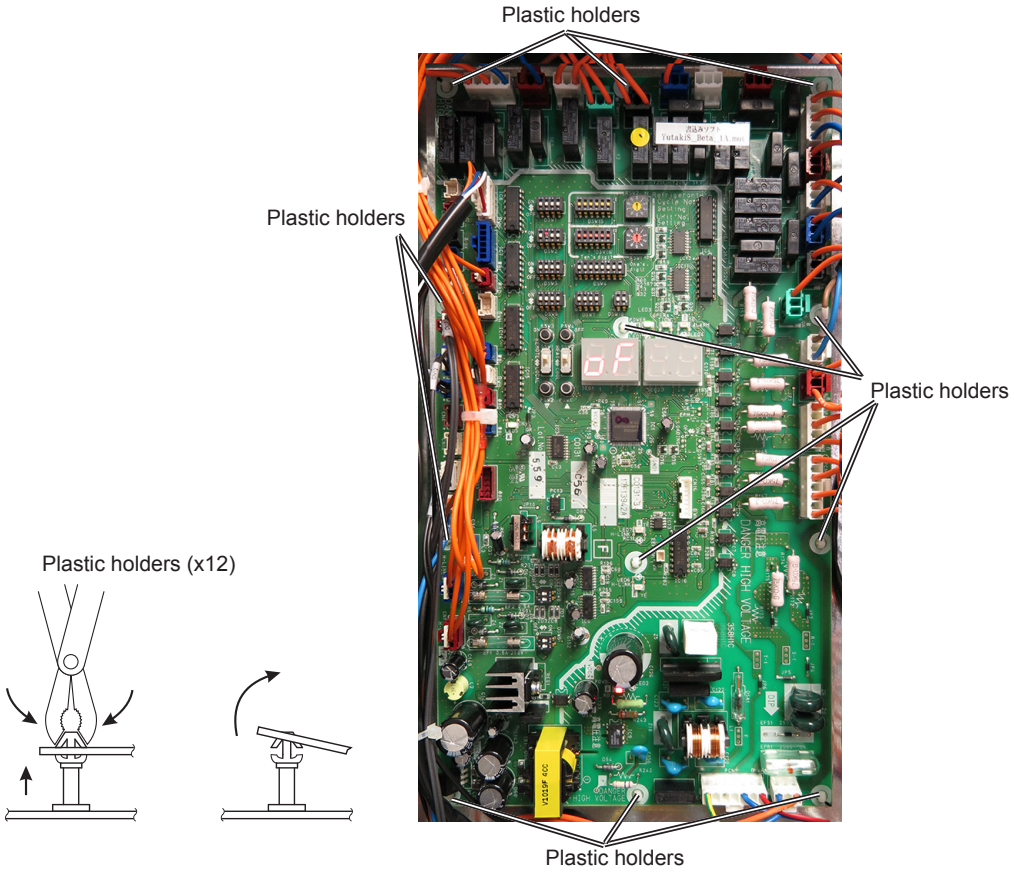


5.1.3.22 Replacement of the PCB

- Remove the cover as explained in chapter *"5.1.2.1 Removing the Service cover"*
- Open the E-Box cover as explained in chapter *"5.1.2.2 Opening the E-box cover".*

Then,

1 Remove all the connectors connected to the PCB.
2 Remove the plastic holders that fix the PCB to the E-Box.



5.2 HYDRO FREE High temperature - RWHT-5.0VNF1E

CAUTION

- Before performing any of the service operations described in this chapter, turn all the main switches off and place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.
- In case of blocked or stacked parts, use appropriated tools and eventually lubricants to release them.
- In case of sharped edged parts, as covers, use security gloves to avoid getting injured.
- When performing brazing work, besides security gloves it is a must to wear convenient eye protection.

5.2.1 Covers

NOTE

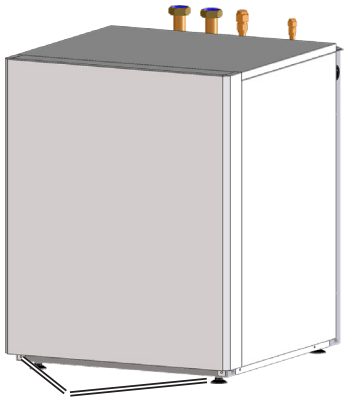
- *Front cover needs to be removed for any task inside the indoor unit.*
- *Back cover no needs to be removed.*
- *Side covers need to be removed for some operations.*

5.2.1.1 Removing the Front cover

To remove the Front cover the following operations should be done:

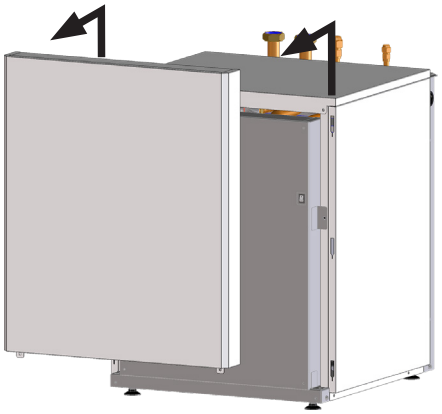
1 Remove the screws (2), fixing the Front cover at both sides at the bottom of the unit





Screws (x2)

2 Pull the Frontal cover upwards and then backwards and remove the cover.



5.2.1.2 Removing the Upper cover

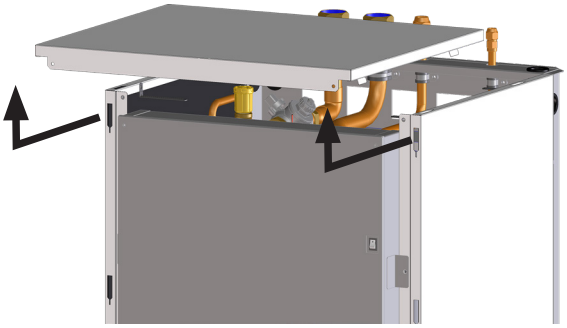
To remove the Upper cover the following operations should be done:

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.

1 Remove the 2 screws fixing the upper cover to the unit



2 Pull the Upper cover backwards , and the pull it up and remove the cover



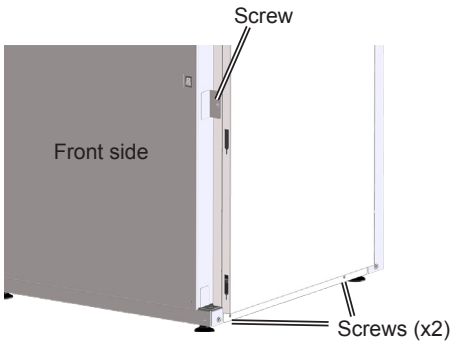
5.2.1.3 Removing the Right side cover

To remove the Right side cover the following operations should be done:

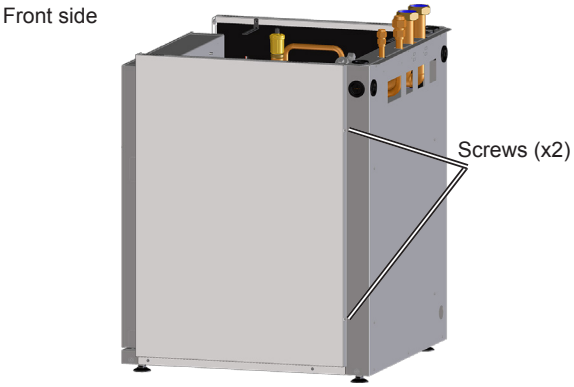
- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.
- Remove the Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*.

1 Remove the screws (x2) at the bottom right side, fixing the Right cover.

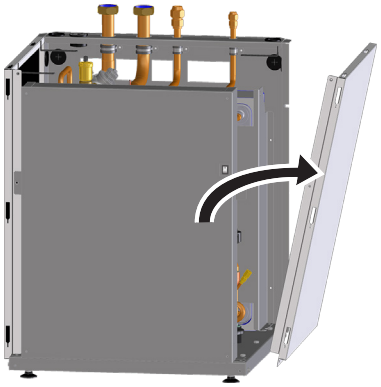
2 Remove the screw which fixes the Electrical box to the Right side cover.



3 Loosen the screws (x2) at the rear side of the unit.



4 Pull the Right cover backwards and remove it.

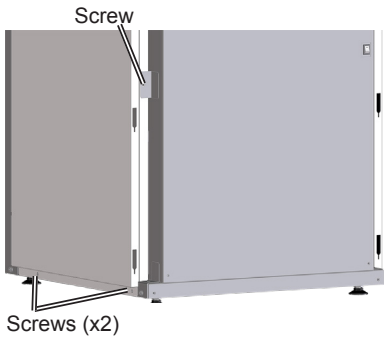


5.2.1.4 Removing the Left side cover

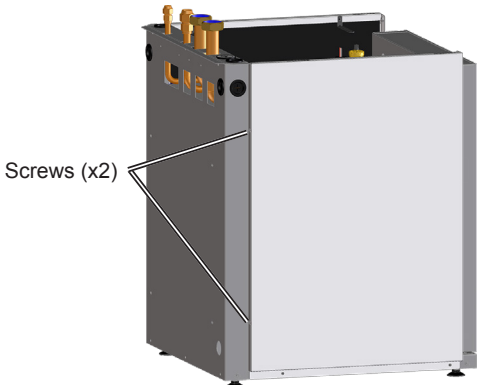
To remove the Left side cover the following operations should be done:

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.
- Remove the Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*.

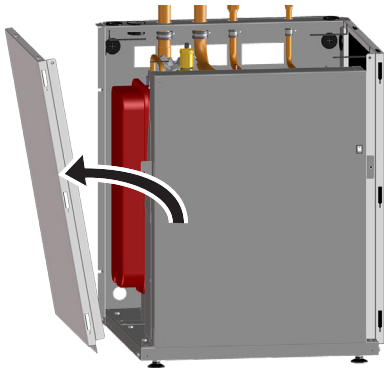
1 Remove the screws (x2) at the bottom right side, fixing the Right cover.
2 Remove the screw which fixes the Electrical box to the right side cover.



3 Loosen the screws (x2) at the rear side of the unit.



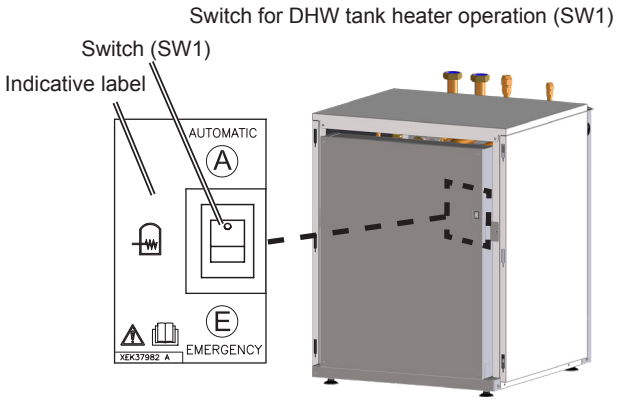
4 Pull the Right cover backwards and remove it.



5.2.1.5 Removing the Electrical box cover

DANGER

- ***Disconnect the unit from the power supply before touching any of the parts in order to avoid an electrical shock.***
- ***Do not touch the switch for DHW tank heater operation when handling the electrical box. Keep the position of this switch in factory setting position ("Automatic" operation).***



To remove the Electrical box cover the following operations should be done:

- Remove the Electrical box cover as explained in *"5.2.1.1 Removing the Front cover"*.

Then,

1 Unscrew the 4 front screws of the electrical box.



2 Pull the EBOX cover and remove it.

NOTE

Take care when removing the EBOX cover as it may fall when the last screw has been removed.



5.2.1.6 Opening the Electrical box

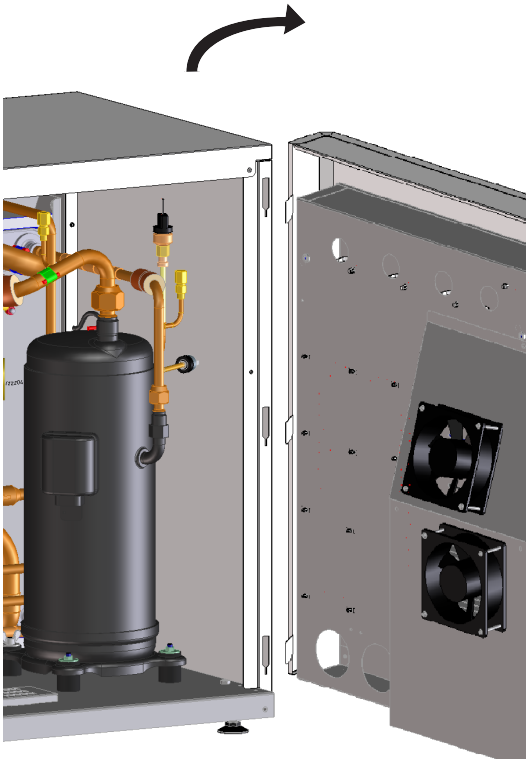
To remove the Electrical box the following operations should be done:

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.
- Remove the EBOX cover as explained in *"5.2.1.5 Removing the Electrical box cover"*.

Then,

1 Unscrew the screws (x4)that fix the electrical box to the unit.

2 Gently, pull the EBOX backwards and, from the left side, give it a 90º turn, so the inside of the Indoor unit is shown.



5.2.1.7 Process to clean the filter

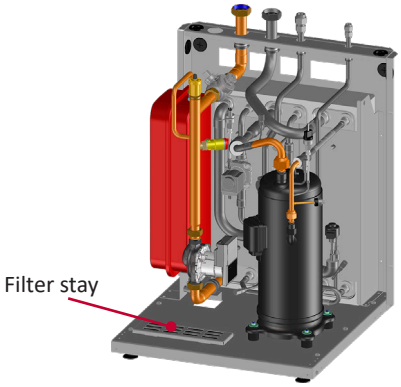
1 Remove the Front cover.

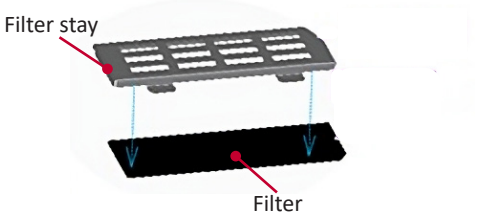
2 Remove the Upper cover.

3 Remove the EBOX cover.

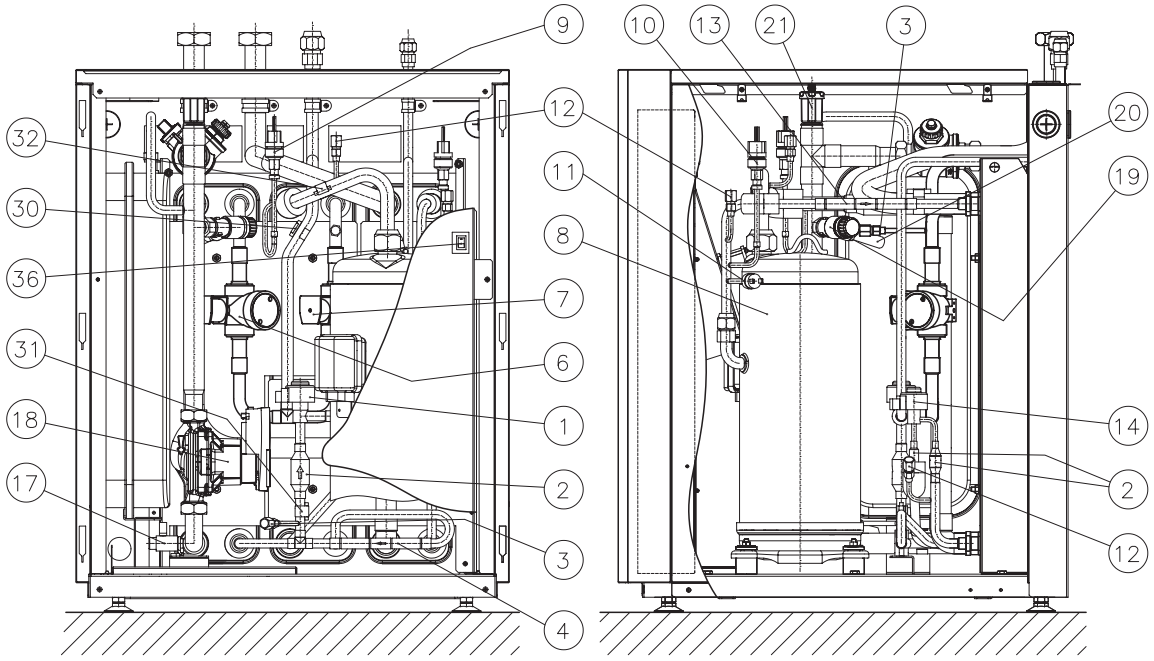
4 Open the electrical box.

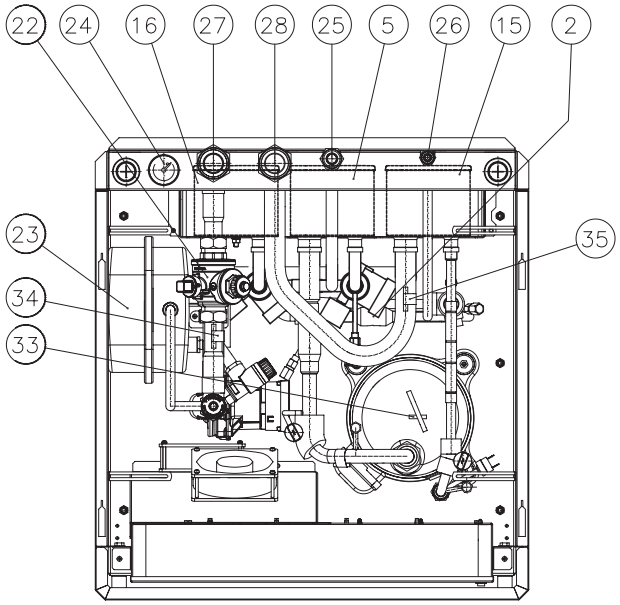
5 Finally, remove filter stay and clean filter (spare part number E04833).

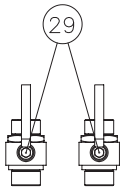




5.2.2 Location of components







Item	Part name
1	Electronic expansion valve (R410A)
2	Refrigerant strainer (x2)
3	Check joint (R410A)
4	Check valve (R410A)
5	Plate heat exchanger (R410A-R134a)
6	Solenoid valve (1 cycle)
7	Solenoid valve (2 cycles)
8	Compressor
9	Low pressure sensor (Ps)
10	High pressure sensor (Pd)
11	High pressure switch (PSH)
12	Check joint (R134a)
13	Check valve (R134a)
14	Electronic expansion valve (R134a)
15	Plate heat exchanger (R134a-H2O)
16	Plate heat exchanger (R410A-H2O)

Item	Part name
17	Water Pressure Port
18	Water Pump
19	Safety valve
20	Drain pipe
21	Air purger
22	Water strainer
23	Expansion vessel 12L
24	Manometer
25	Refrigerant gas pipe - ∅15.88 (5/8”)
26	Refrigerant liquid pipe - ∅9.52 (3/8”)
27	Water inlet pipe - G 1 1/4” female
28	Water outlet pipe - G 1 1/4” female
29	Shutdown valve (Factory supplied)
30	Refrigerant gas pipe thermistor
31	Refrigerant liquid pipe thermistor
32	Compressor suction thermistor
33	Compressor discharge thermistor

Item	Part name
34	Water inlet thermistor
35	Water outlet thermistor
36	Switch for DHW “emergency” operation

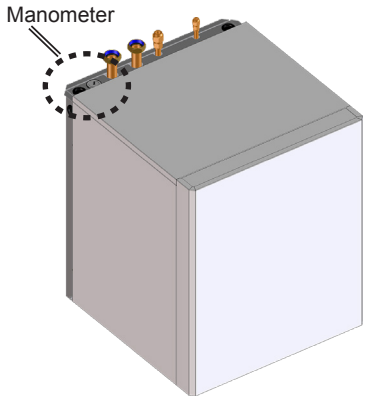
5.2.3 Hydraulic components

DANGER

- ***Disconnect the RWHT from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***Wait minimum 10 minutes or more from all power supplies have been turned OFF.***
- ***In case of replacing Hydraulic parts, drain water from the unit its needed. Close Shutdown valves and open the drain valves.***
- ***Electrical hazard. Risk of electrical shock. Do not touch the electrical components when the LED201 (Red) located on the inverter module is ON in order to avoid electrical shock.***

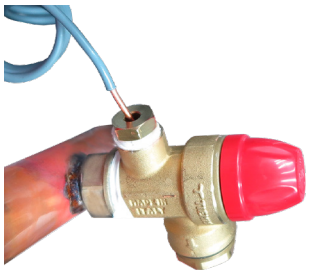
5.2.3.1 Replacement of the manometer

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*.
- Drain the Indoor unit as explained in *"Draining operation for RWHT"* and *"Special note for RWHT refrigerant charge"* in chapter *"7. Maintenance notes"*.



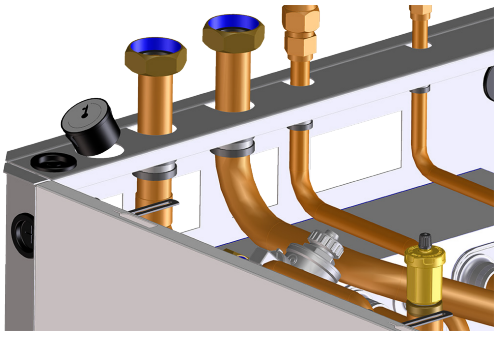
1 Remove the clamps which attach the Manometer capillary pipe with the water pipe.

2 Unscrew the manometer capillary joint from the Safety valve.



3 Press two rings at the rear side of the manometer and remove it passing the capillary through the hole of the steel support.





4 Install the new one by performing the procedures explained above in reverse way.

NOTE

- *Be sure of the position of the manometer.*
- *Apply Teflon to the thread of union before assembling in order to prevent any leakage.*

5.2.3.2 Removing the Filter plus ball valve

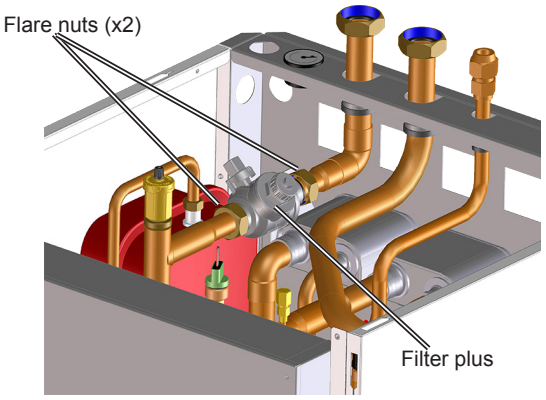
- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*.
- Drain the Indoor unit as explained in *"Draining operation for RWHT"* and *"Special note for RWHT refrigerant charge"* in chapter *"7. Maintenance notes"*.

Then,

1 Loosen the flare nuts of the Filter plus ball valve and remove it.

NOTE

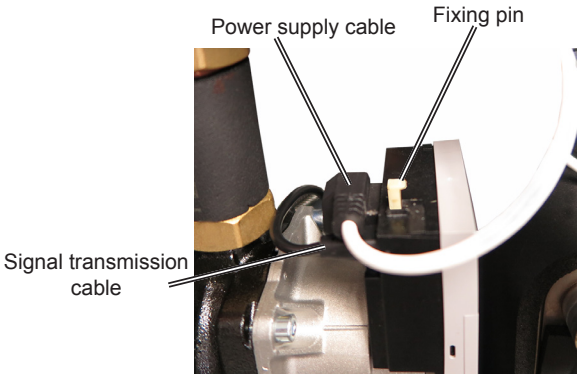
For further information about the Filter plus ball valve, refer to "6 Filter plus" in chapter "7. Maintenance notes".



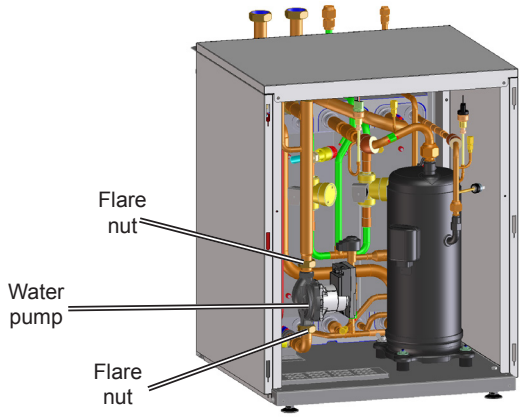
5.2.3.3 Replacing the Water pump (WP1)

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.
- Remove the Electrical box as explained in *"5.2.1.6 Opening the Electrical box"*.
- Drain the Indoor unit as explained in *"Draining operation for RWHT"* and *"Special note for RWHT refrigerant charge"* in chapter *"7. Maintenance notes"*.

1 Disconnect the water pump: Pull the fixing pin upwards to unlock the connectors.
2 Disconnect both connectors:
- Power supply cable connector.
- Signal transmission cable connector.



3 Unscrew the flare nuts that connected to the water pump and remove the water pump.



4 Install the new one by performing the procedures explained above in reverse way.

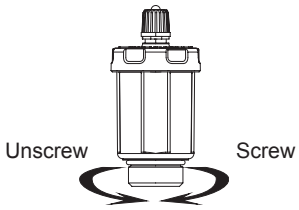
NOTE

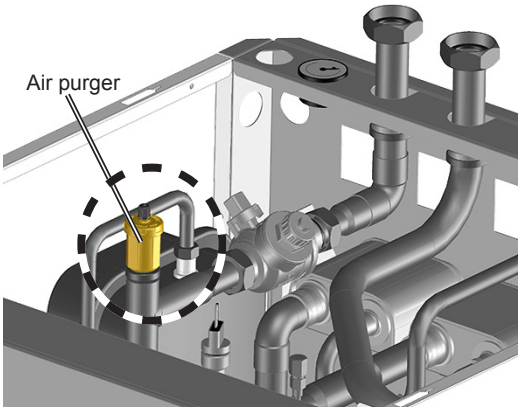
- *Be sure of the position of the water pump.*
- *Be careful, do not lose the gaskets of the water pump.*
- *Check the gaskets. If they are defective, replace them by new ones.*

5.2.3.4 Replacement of the Air purger

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*.
- Drain the Indoor unit as explained in *"Draining operation for RWHT"* and *"Special note for RWHT refrigerant charge"* in chapter *"7. Maintenance notes"*.

1 Unscrew the Air purger
2 Replace the Air purger for a new one





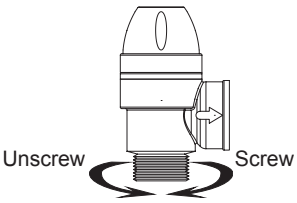
NOTE

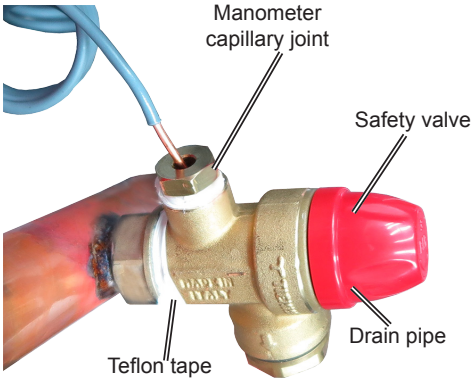
- *Lubricate the Thread of the Air purger when reassembling.*
- *To reassemble the Air purger, proceed in reverse way than disassembling.*

5.2.3.5 Replacement of the Safety valve

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*.
- Drain the Indoor unit as explained in *"Draining operation for RWHT"* and *"Special note for RWHT refrigerant charge"* in chapter *"7. Maintenance notes"*.

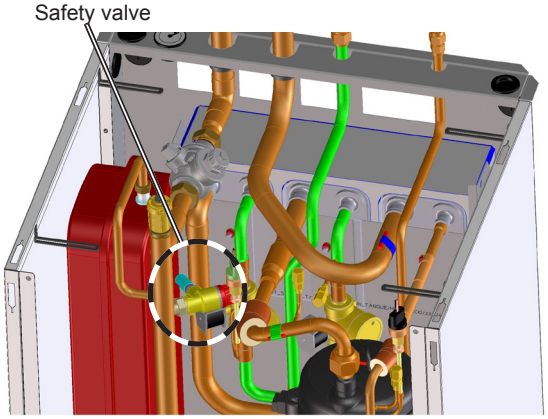
1 Unscrew the manometer capillary joint from the Safety valve.
2 Unscrew the nut of the discharge pipe.
3 Unscrew the Safety valve from the water pipe and remove it.





NOTE

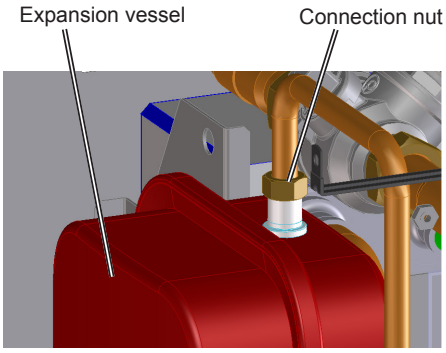
- *Use Teflon tape on the thread to avoid any leakage.*
- *To reassemble the Safety valve proceed in reverse way than disassembling.*



5.2.3.6 Replacement of the Expansion vessel

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*.
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*.
- Open the Electrical box as explained in *"5.2.1.6 Opening the Electrical box"*
- Remove the Left side cover as explained in *"5.2.1.4 Removing the Left side cover"*
- Drain the Indoor unit as explained in *"Draining operation for RWHT"* and *"Special note for RWHT refrigerant charge"* in chapter *"7. Maintenance notes"*.

1 Unscrew the copper pipe connected at the top of the expansion vessel.

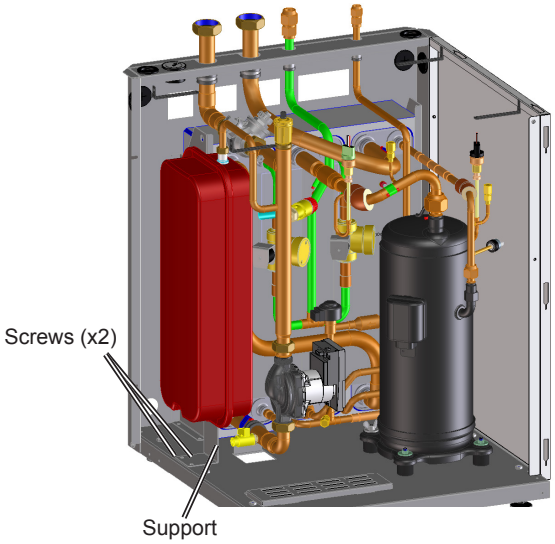


2 Remove the screws of the support of the expansion vessel, which is fix on the base of the unit.

3 Remove the Expansion vessel and proceed to remove the support from the Expansion vessel.

NOTE

Be sure that the expansion vessel is being subjected all the time.

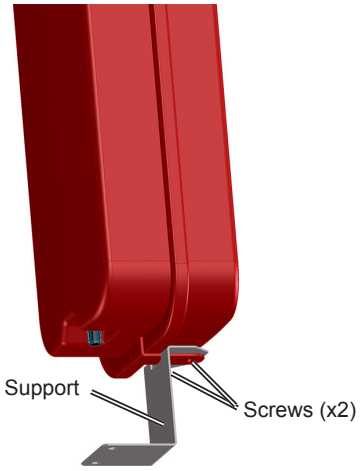


4 Remove the screws (x2) of the support, fix to the Expansion vessel.

5 Install new Expansion vessel by performing the procedures explained above in reverse way.

NOTE

- *Be careful do not lose the gasket of the expansion vessel.*
- *Check the gasket (2), if it is defective, replace by a new one.*



5.2.4 Cycle components

DANGER

- ***Disconnect the RWHT from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***Wait minimum 10 minutes from all power supplies have been turned OFF.***

NOTE

- *To properly disconnect components from the Electrical box, see the "4. Electrical checks of the main parts" chapter of this manual.*
- *In case of replacing Refrigerant parts, in some cases it is needed to drain water from the unit. Close the shutoff valves and open the drain valves.*
- *In case of replacing refrigerant parts, collect if necessary R410A and R134a refrigerant according to the pump down procedures explained in "7.2.4 Evacuation and refrigerant charge" chapter.*
- *Most of refrigerant parts are connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections, if not, oil existing pipe inside may ignite.*
- *Do not expose the refrigerant cycles to the atmosphere for a long period in order to avoid mixing the water and foreign particles into the refrigerant cycle. After removing refrigerant parts, replace it quickly. If exposed for a long period, seal the liquid pipe and gas pipe.*

5.2.4.1 Replacement of the compressor

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.6 Opening the Electrical box"*.

For an easier procedure, it is also recommended to remove the following items.

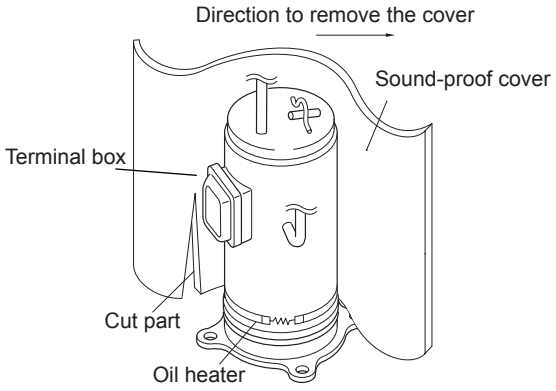
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*.
- Remove the Left side cover as explained in *"5.2.1.4 Removing the Left side cover"*

1 Collect the R134a refrigerant according to *"7.2.4 Evacuation and refrigerant charge"* in chapter *"7. Maintenance notes"*.

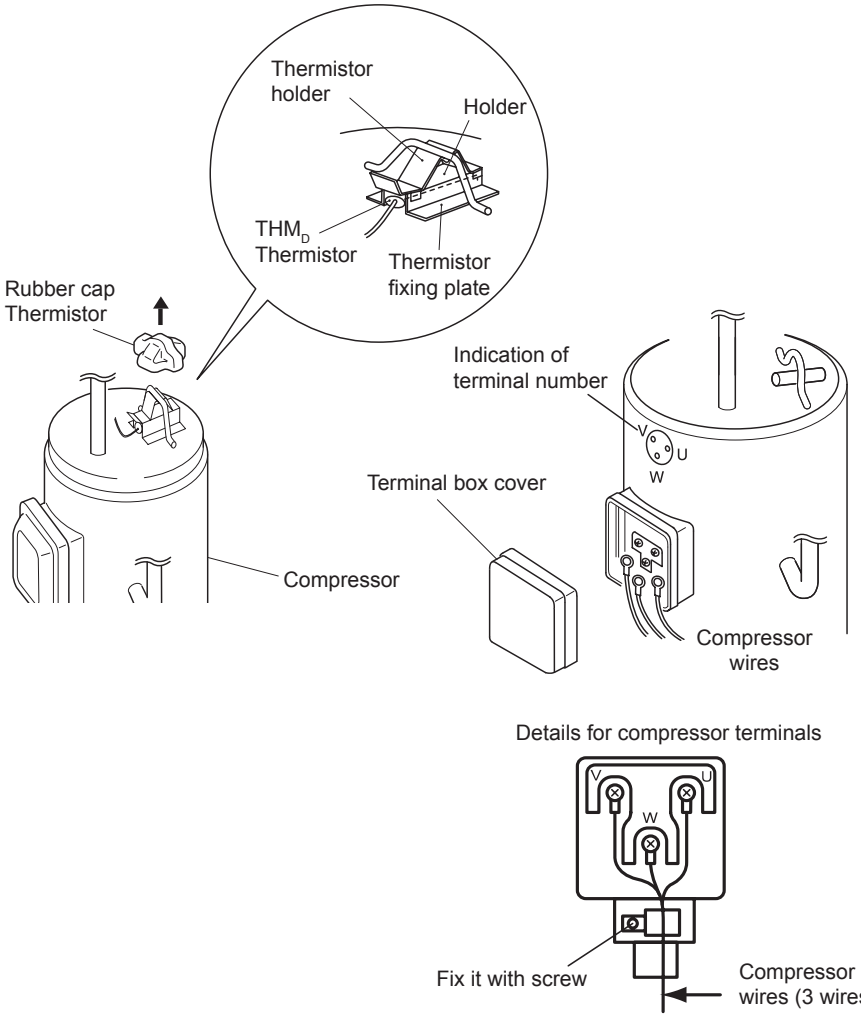
2 Open the sound insulation cover wrapped around the compressor. Remove the terminal box cover of the compressor. Disconnect the compressor wires connected to the terminal box and remove the sound insulation cover.

NOTE

Check and take note of each terminal number and indications for its correct connection at the reassembling process. If wires are connected in incorrect order, it will lead to a compressor failure.



3 Remove the rubber cap and the thermistor (THM_D) on the top of the compressor.

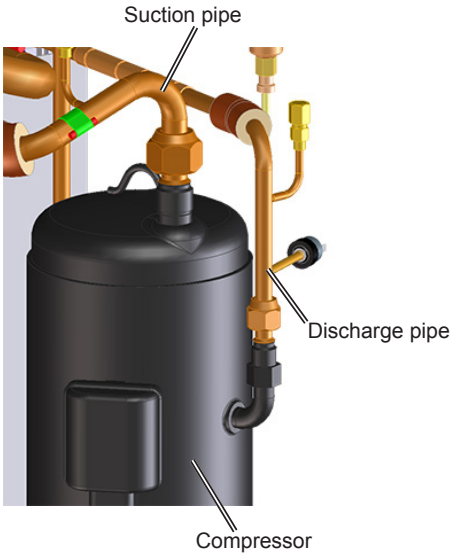


Details for compressor terminals

4 Remove the three (3) crankcase heaters (oil heater on the compressor housing). There are two on the lower part and one on the upper.

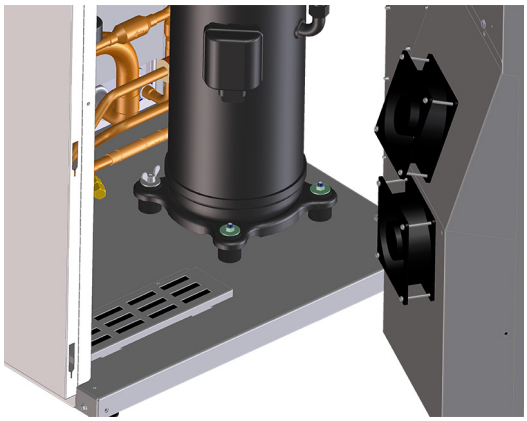


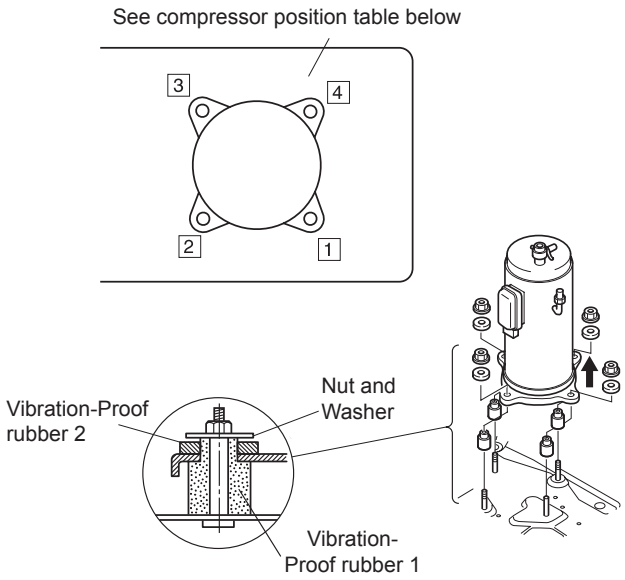
5 Remove the suction pipe and the discharge pipe from the compressor: Loosen the nuts of the pipes connected to the compressor.





6 Remove the four (4) nuts fixing the compressor and remove the compressor from the unit by lifting it. Slightly incline it forward and lift.





Fixation of the compressor to the bottom plate				
Compressor position	1	2	3	4
Vibration-proof rubber 1	○	○	○	○
Vibration-proof rubber 2	○	○	○	○
Nut	○	○	–	○
Wing Nut	–	–	○	–

7 Reassemble the parts in the reverse order of the indicated removing procedures.
- Tighten the screws (U, V and W) for compressor wires with 2.5Nm.
- Fix the lead wire firmly.

NOTE

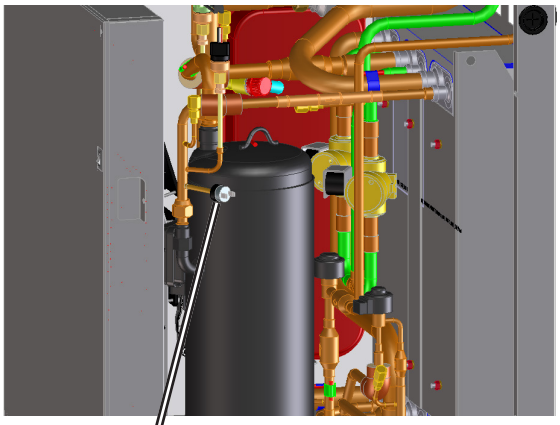
Fix the lead wire for the compressor firmly using a cable tie to avoid the contact between the metal sheet sharp edges and the high temperature piping.

5.2.4.2 Replacement of high pressure switch (PSH)

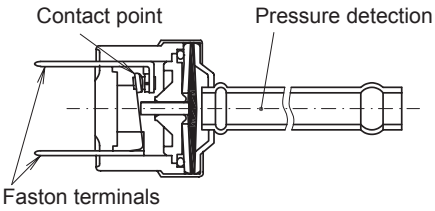
- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*
- Remove the Left side cover as explained in *"5.2.1.4 Removing the Left side cover"*

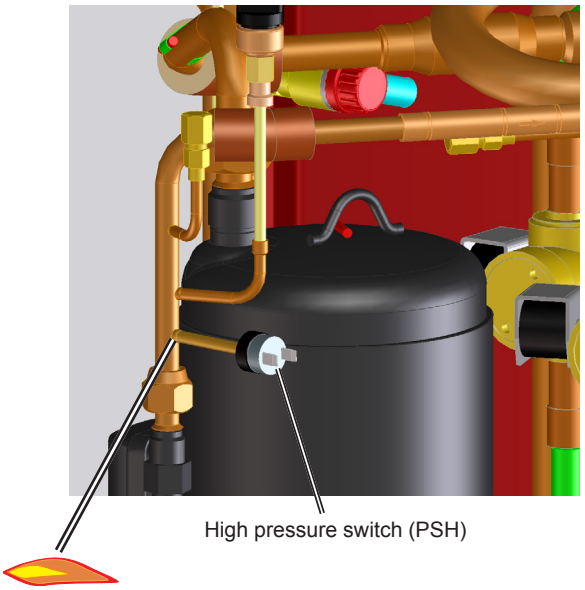
1 Collect the R134a refrigerant according to *"7.2.4 Evacuation and refrigerant charge"* in chapter *"7. Maintenance notes"*.

2 Disconnect the Faston terminals from the pressure switch.



High pressure switch structure





3 Cut the high pressure switch from the brazing neck using a burner.

⚠ CAUTION

Protect the connecting wires and pipe insulation from the brazing flame.

4 Install new one by performing the procedures above in reverse way.

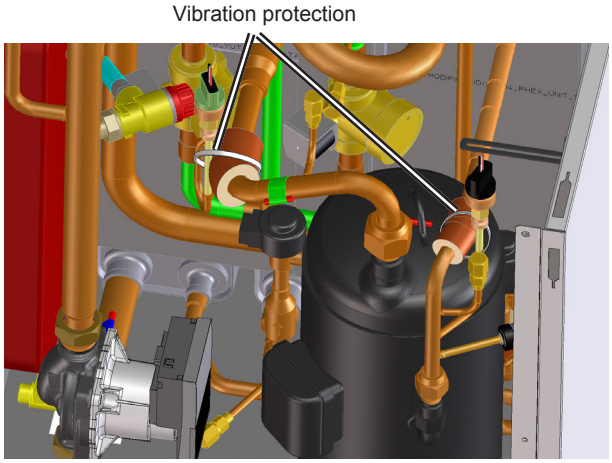
⚠ CAUTION

- *Do not change the high pressure switch locally or change the high pressure cut-out set value locally. If changed, it will cause serious injury or death due to explosion by high pressure.*
- *Do not attempt to turn service valve rod beyond its stop.*

5.2.4.3 Replacement of the pressure sensors

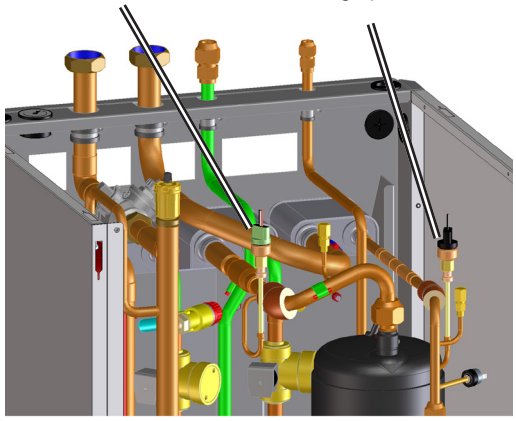
- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*
- Remove the Left side cover as explained in *"5.2.1.4 Removing the Left side cover"*

1 Remove the vibration protection from both pressure sensors:
   - One green (low pressure)
   - One black (high pressure)



2 Remove the pressure sensors:

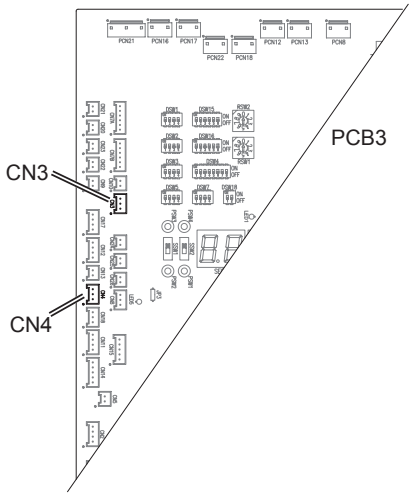
   Prepare two spanners. Hold the fitting with one spanner and loosen the lock nut with another spanner by turning it.



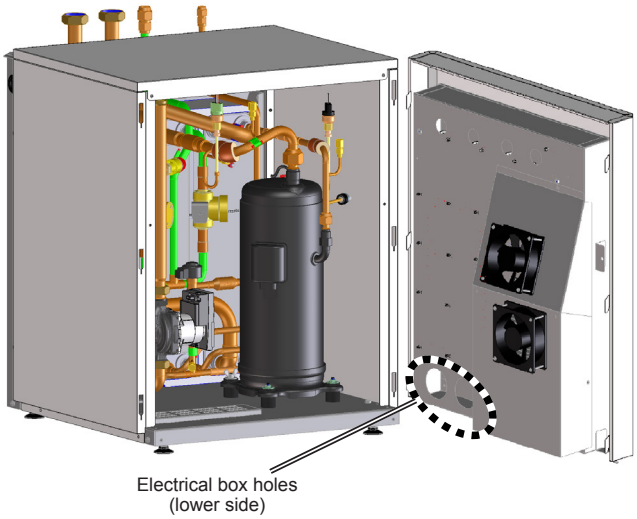
3 Disconnect the R134a pressure sensors from the following PCB connectors:
   - R134a low pressure sensor (Ps): CN3 (PCB)
   - R134a high pressure sensor (Pd): CN4 (PCB)

⚠ CAUTION

Electrical hazard. Risk of electrical shock. Do not touch the electrical components when the LED201 (Red) located on the inverter module is ON in order to avoid electrical shock.



4 Remove all the cables from the various harness lifters and cable ties of the PCB's and then pass the sensor cables to inside the unit through the lower electrical box holes from the electrical box rear side.



5 Replace the sensors by new ones by performing the procedures explained above in reverse way.

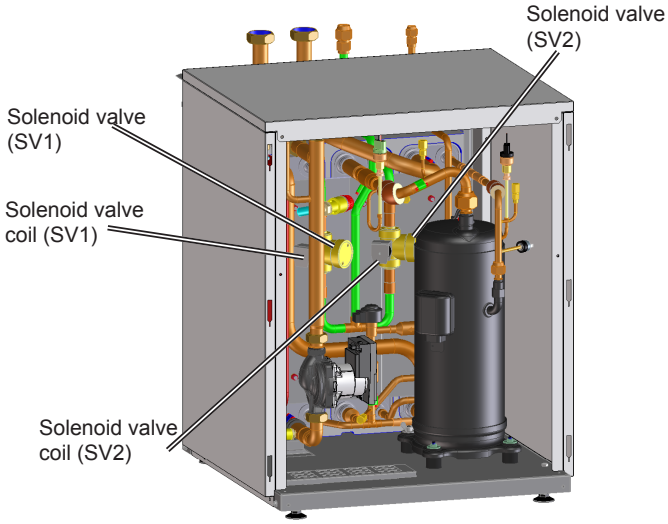
5.2.4.4 Replacement of solenoid valves coils

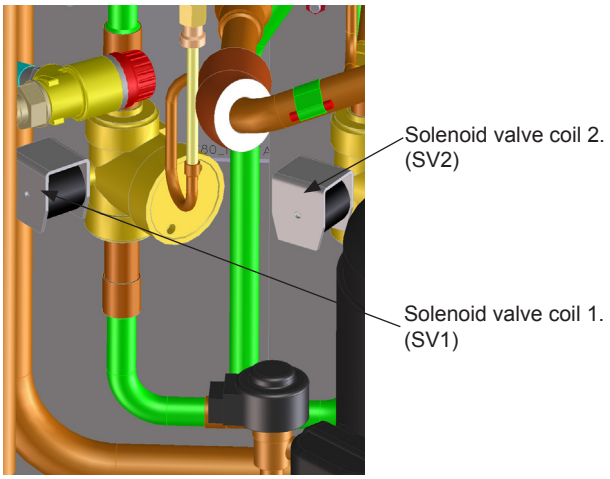
- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.

Additionally, in order to ease this procedure

- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*

1 Remove the solenoid valve coils by pulling them from the solenoid valves



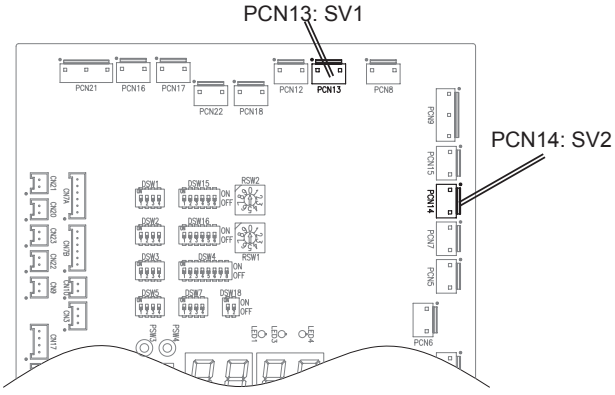


2 At the PCB, disconnect the connectors corresponding to each Solenoid valve coil:

- SV1: PCN13
- SV2: PCN14

⚠ CAUTION

Electrical hazard. Risk of electrical shock. Do not touch the electrical components when the LED201 (Red) located on the inverter module is ON in order to avoid electrical shock.



3 Replace the solenoid valve coils by new ones by performing the procedures above in reverse way.

5.2.4.5 Replacement of solenoid valves

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*

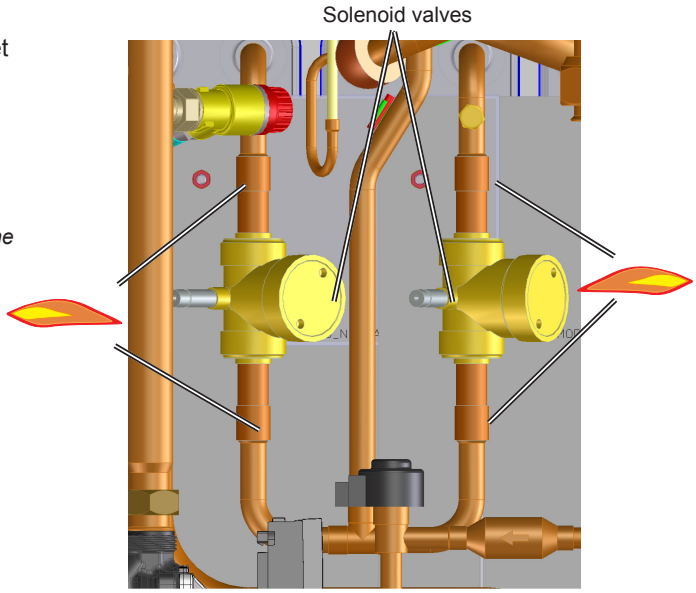
1 Collect the R410A refrigerant according to *"7.2.4 Evacuation and refrigerant charge"* in chapter *"7. Maintenance notes"*.

2 Remove the solenoid valve coils according to the procedure *"5.2.4.4 Replacement of solenoid valves coils"*

3 Remove the brazing as shown in the figure using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the solenoid valve.

CAUTION

Protect the connecting wires and pipe insulation from the brazing flame with a wet cloth.



Front view

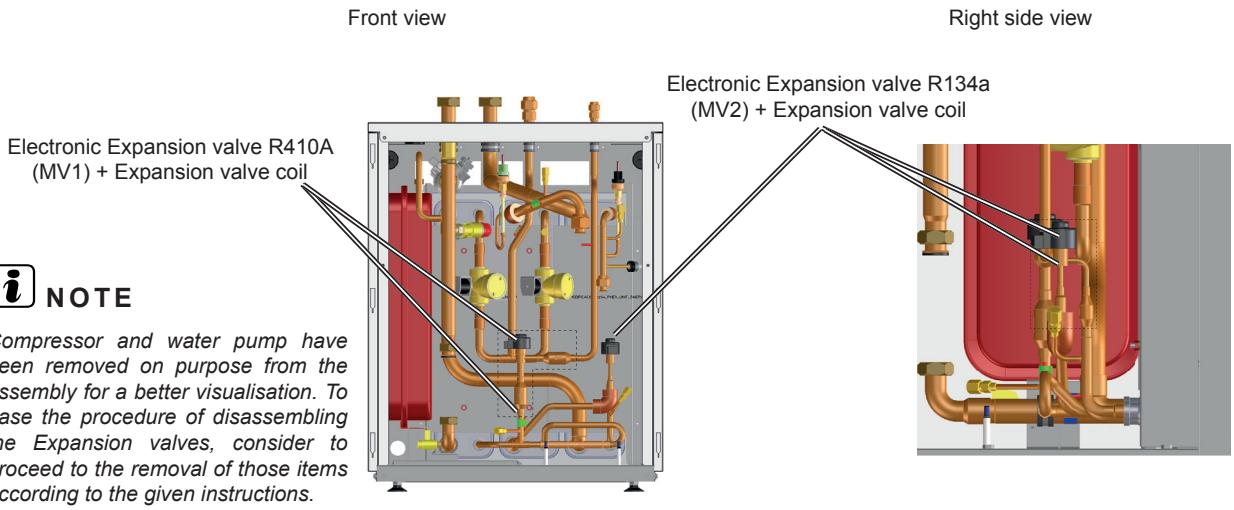
4 Install new ones by performing the procedures above in reverse way.

5.2.4.6 Replacement of the electronic expansion valve coil (R410A / R134a)

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*

CAUTION

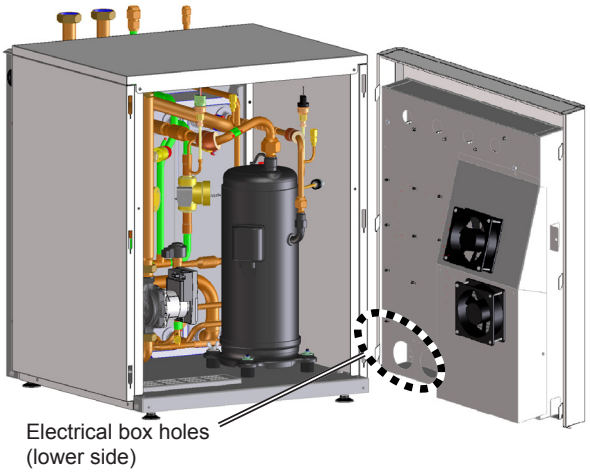
Electrical hazard. Risk of electrical shock. Do not touch the electrical components when the LED201 (Red) located on the inverter module is ON in order to avoid electrical shock.



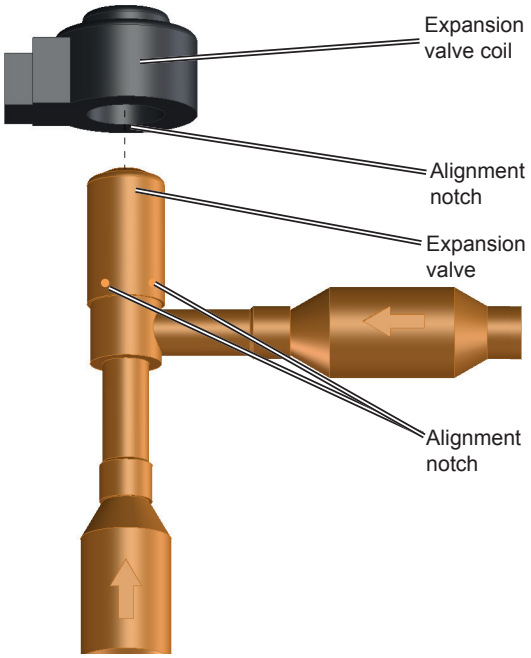
NOTE

Compressor and water pump have been removed on purpose from the assembly for a better visualisation. To ease the procedure of disassembling the Expansion valves, consider to proceed to the removal of those items according to the given instructions.

1 Remove the Expansion valve cable (MV2) from its PCB connector:
   - R410A expansion valve (MV1): CN7A (PCB),
   - R134a expansion valve (MV2): CN7B (PCB3),



2 Hold the electronic expansion valve coil and remove it by pulling it up.



3 Replace the expansion valve coil by new ones by performing the procedures above in reverse way.

5.2.4.7 Replacement of R134a expansion valve

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*
- Collect the R134a refrigerant according to *"7.2.4 Evacuation and refrigerant charge"* in chapter *"7. Maintenance notes"*.

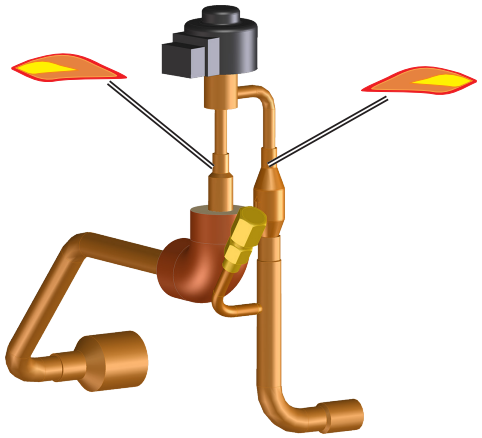
1 Remove refrigerant liquid thermistor (THML) from pipe according to the procedure

2 Remove the R134a expansion valve coil according to the procedure *"5.2.4.6 Replacement of the electronic expansion valve coil (R410A / R134a)"*.

3 Remove the brazing as shown in the figure using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the expansion valve.

⚠ CAUTION

Protect the connecting wires and pipe insulation from the brazing flame.



4 Install new one by performing the procedures above in reverse way.

5.2.4.8 Replacement of R410A expansion valve

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.
- Remove Upper cover as explained in *"5.2.1.2 Removing the Upper cover"*
- Collect the R410A refrigerant according to *"7.2.4 Evacuation and refrigerant charge"* in chapter *"7. Maintenance notes"*.

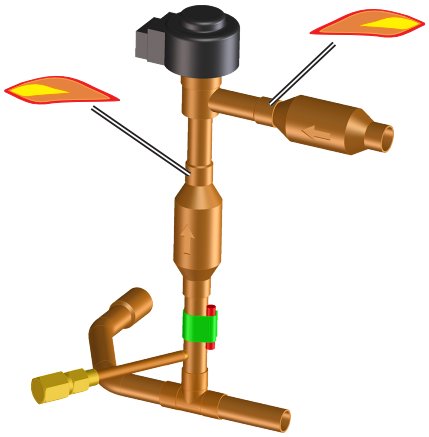
1 Remove refrigerant gas thermistor (THMG) from pipe according to the procedure

2 Remove the R410A expansion valve coil according to the procedure *"5.2.4.6 Replacement of the electronic expansion valve coil (R410A / R134a)"*.

3 Remove the brazing as shown in the figure using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the expansion valve.

⚠ CAUTION

Protect the connecting wires and pipe insulation from the brazing flame.



4 Install new one by performing the procedures above in reverse way.

5.2.4.9 Replacement of Plate heat exchangers

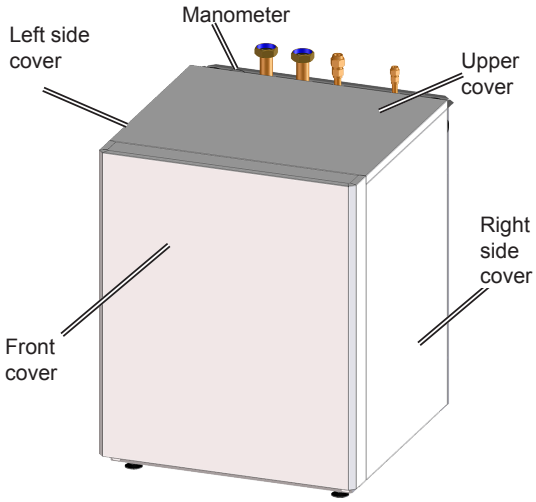
In case that a replacement of any of the Plate heat exchangers is needed, it is recommended to proceed to the removal of all the Plate heat exchangers.

1 Collect the R410A and the R134a refrigerant.

2 Drain the water from the unit.

3 Remove front, left, right and upper service covers.

4 Remove the manometer, as explained in *"5.2.3.1 Replacement of the manometer"*



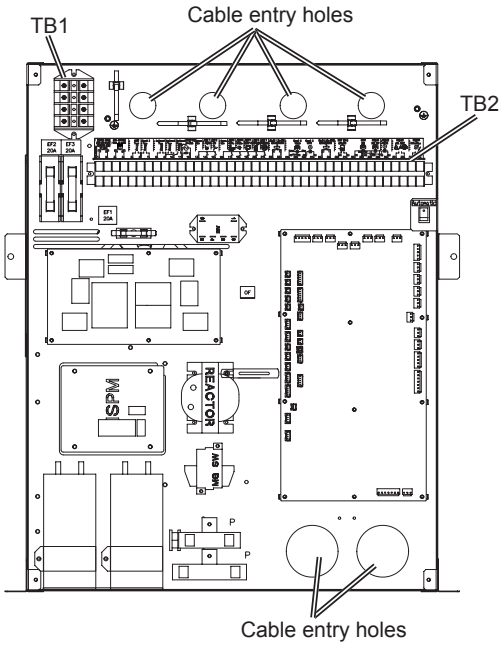
5 Remove the EBox following the next instructions

a. Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.

b. Disconnect the power supply from the TB1

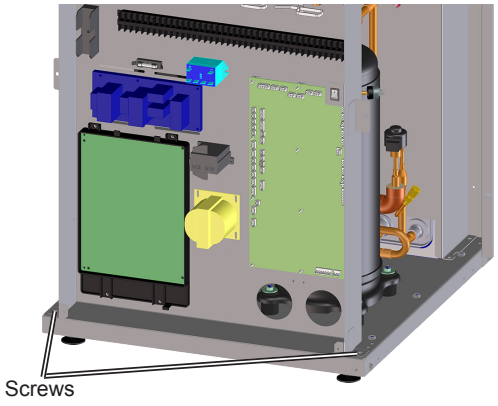
c. At the Terminal board (TB2), disconnect the cables from their terminals. Take note of the position of the cables to avoid possible connection problems when reassembling.

d. At the PCB, disconnect all the connectors. Take note of the position of the cables to avoid possible connection problems when reassembling.



e. Remove the screws fixing the EBox to the unit.

f. Remove the EBOX

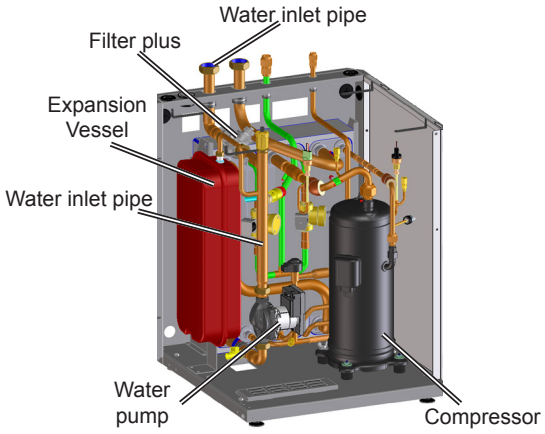


6 Remove the expansion vessel as explained in *"5.2.3.6 Replacement of the Expansion vessel"*

7 Remove the Water inlet pipe.

8 Remove the water pump, as explained in *"5.2.3.3 Replacing the Water pump (WP1)"*

9 Remove the compressor as explained in *"5.2.4.1 Replacement of the compressor"*



10 Remove all the thermistors from their pipes.

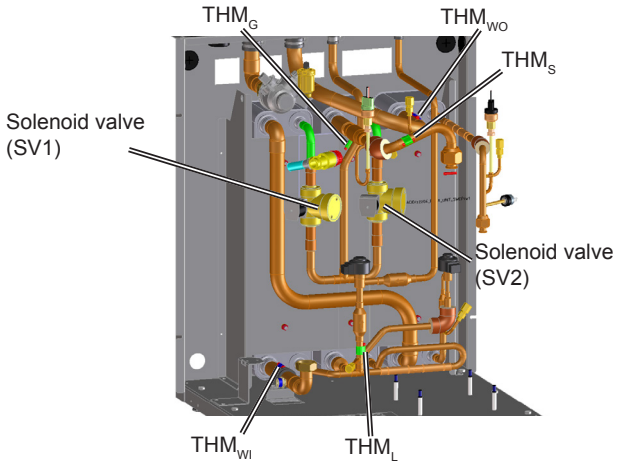
- THM_{WI}: Water inlet pipe thermistor
- THM_{WO}: Water outlet pipe thermistor
- THM_S: Suction pipe thermistor
- THM_G: Refrigerant gas pipe thermistor
- THM_L: Refrigerant liquid pipe thermistor

NOTE

THM_D (Discharge pipe thermistor was already removed when compressor was removed)

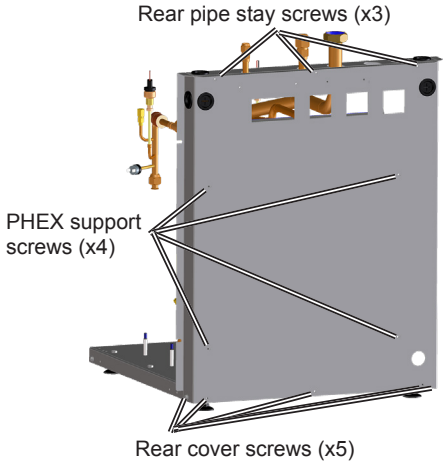
11 Remove the Solenoid valve coils as explained in *"5.2.4.4 Replacement of solenoid valves coils"*

12 Remove the Solenoid valves as explained in *"5.2.4.5 Replacement of solenoid valves"*

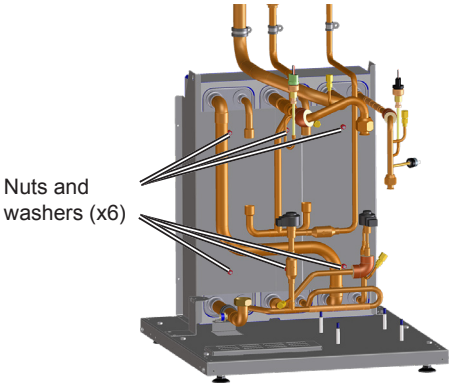


13 From the rear side of the unit:

- Remove the screws (x3) of the Rear pipe stay.
- Remove the screws (x4) fixing the PHEX support.
- Remove the screws (x5) fixing the Rear cover.

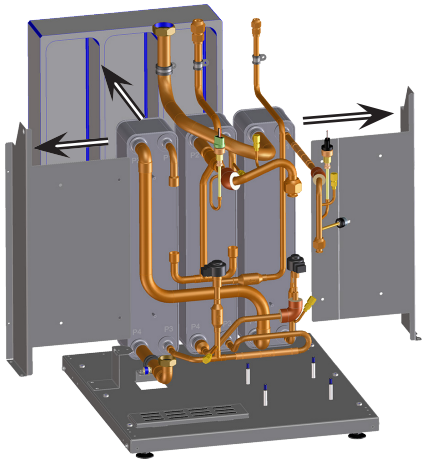


14 Remove the nuts and washers (x6) fixing the 3 PHEX to their supports

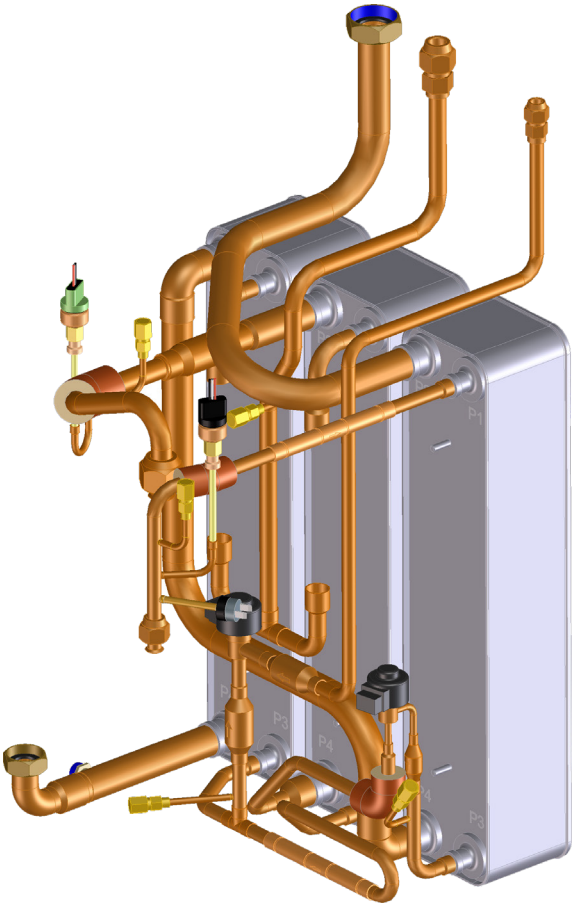


15 Remove the support of the Plate heat exchangers.

16 Remove the insulation covering the 3 Plate heat exchangers.



At this point, remove by unbrazing them, all the pipes connected to the Plate heat exchanger to be replaced.



5.2.5 Electrical components

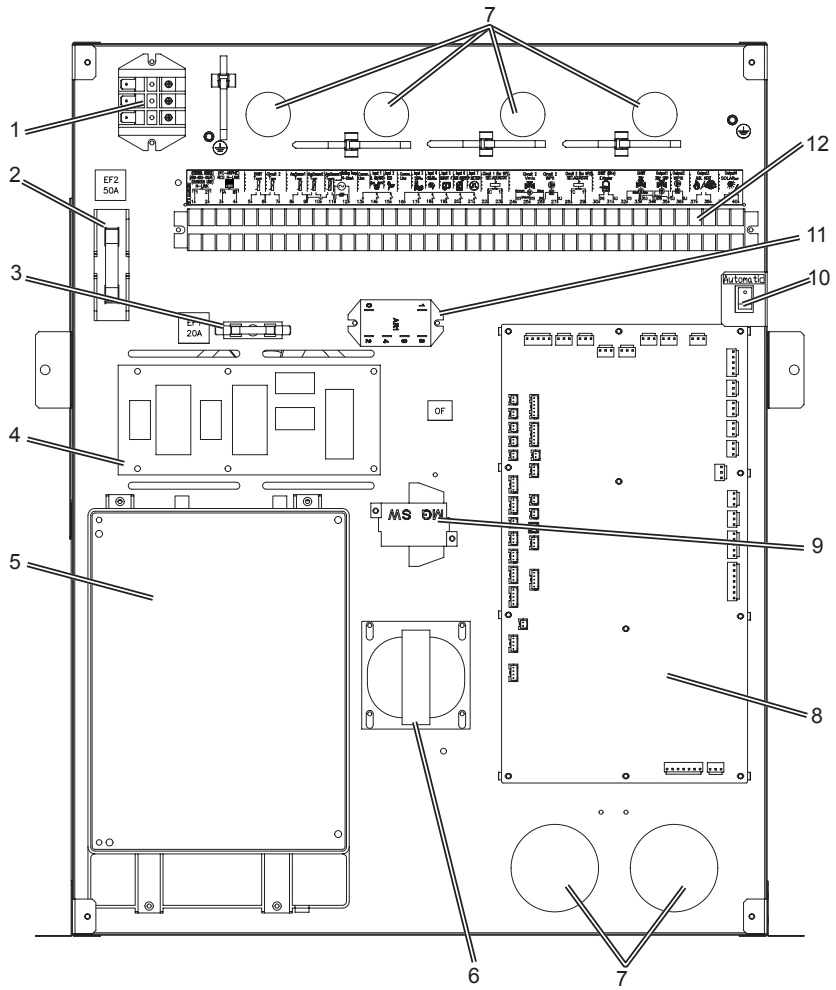
DANGER

- ***Disconnect the RWHT from the power supply before touching any of the parts. Do not touch the electrical box before disconnecting it in order to avoid an electrical shock.***
- ***When handling the electrical box, take care of components. Do not apply excessive force to them, in order to avoid damaging the electrical components.***
- ***Electrical hazard. Risk of electrical shock. Do not touch the electrical components when the LED201 (Red) located on the inverter module is ON in order to avoid electrical shock.***

5.2.5.1 Removing electrical box components

Remove the indoor unit front cover and remove the electrical box cover for accessing to the electrical components following the removing procedure explained in *"5.2.1.1 Removing the Front cover"* and *"5.2.1.5 Removing the Electrical box cover"* section.

◆ **Electrical box components (1~ 230V 50Hz)**



Item	Description
1	Power supply terminal board (TB1)
2	Fuse (EF) 50A
3	Fuse (EF1) 20A
4	Noise filter
5	Inverter FIN
6	Reactor
7	Cable entry holes
8	Printed circuit board (PCB)

Item	Description
9	Magnet switch (MG SW)
10	Rocker switch
11	Relay (AR1)
12	Terminal Board (TB2)

5.2.5.2 Replacing the electrical box

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.
- Remove the Electrical box as explained in *"5.2.4.9 Replacement of Plate heat exchangers"*

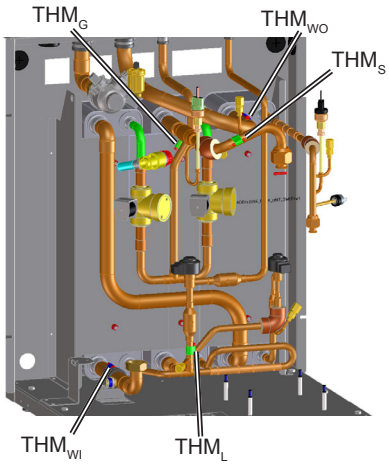
Replace the Ebox with a new one proceeding in reverse way than disassembling.

5.2.5.3 Replacing thermistors

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.

1 Disconnect these components properly from the corresponding connector PCB.

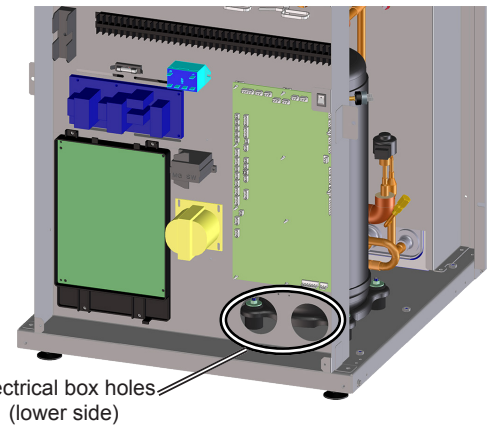
Thermistor	Connector
THM_{WI}	CN9 (PCB)
THM_{WO}	CN13 (PCB)
THM_{L}	CN12 (PCB)
THM_{G}	CN17 (PCB)
THM_{S}	CN11 (PCB)
THM_{D}	CN18 (PCB)
THM_{WO2}	CN24 (PCB)
THM_{AUX1}	CN26 (PCB)
THM_{AUX2}	CN25 (PCB)
THM_{AUX3}	CN5 (PCB)
THM_{DHW}	CN10 (PCB)



2 Take out the thermistor cables through the lower electrical box holes.

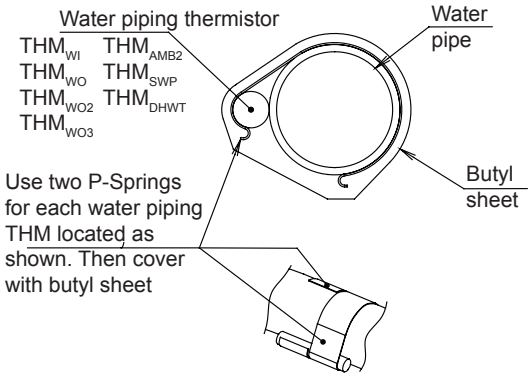
3 Remove the pipe insulation of thermistor.

4 Remove special clamp that is attached with copper pipe and sensor.

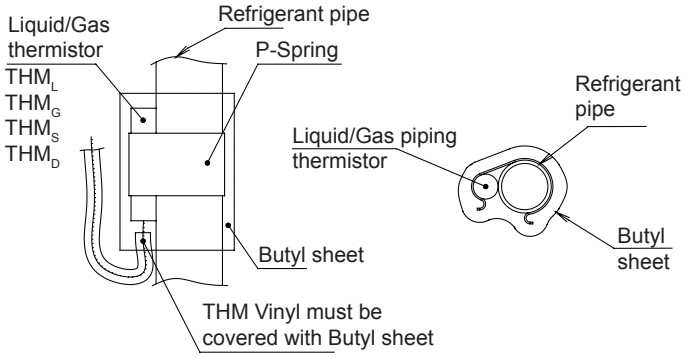


5 Install new thermistor using P-Spring and Butyl Sheet as shown in the following drawing:

Replacing water thermistor



Replacing refrigerant thermistor



⚠ CAUTION

In case of P-Spring deforming, it needs to be replaced.

6 Install thermistor wire by perform the process in reverse.

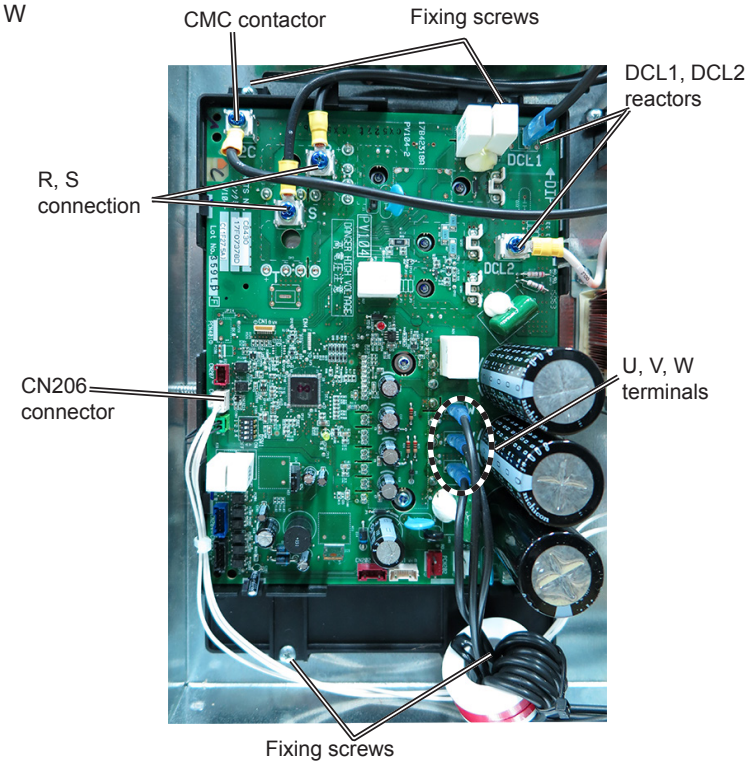
5.2.5.4 Replacing the DIP-IPM (Inverter module)

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.

1 Disconnect all the wirings connected to the module:
   - Disconnect the wirings of the terminals U, V, W
   - Disconnect the wirings of connector CN206
   - Disconnect the wirings of the terminals R, S
   - Disconnect the wirings of reactor DCL1 and DCL2
   - Disconnect the wirings of connector CMC

2 Remove the four fixing screws on the DIP-IPM.

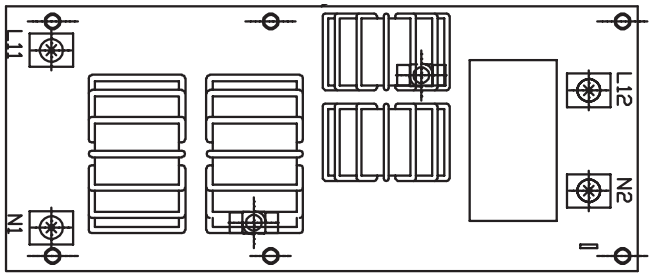
Inverter PCB (DIP-IPM)



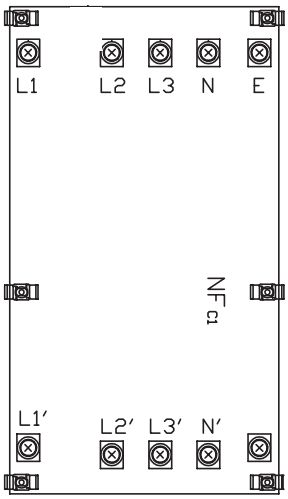
5.2.5.5 Replacing the noise filter (Inverter module)

- Remove the Front cover as explained in *"5.2.1.1 Removing the Front cover"*
- Open the Electrical box as explained in *"5.2.1.5 Removing the Electrical box cover"*.

1 Remove the internal inverter box cover (x5 screws).
2 Disconnect all the wirings connected to the electrical noise filter:
3 Remove the six holders from the inverter module. When reassembling the components, pass those holders again through the holes of the inverter module.



1 Remove the internal inverter box cover (x5 screws).
2 Disconnect all the wirings connected to the electrical noise filter:
3 Remove the six holders from the inverter module. When reassembling the components, pass those holders again through the holes of the inverter module.



6. Troubleshooting

Index

6.1 Initial troubleshooting 132

6.1.1 Power supply failure to the indoor unit and the remote control switch (PC-ARFWE) 132

6.1.2 Abnormal operation of the devices 132

6.2 Normal operation 135

6.2.1 Normal operation display on PCB1 135

6.2.2 Protection control code display 136

6.2.3 Normal operation display at Unit controller 136

6.3 Troubleshooting procedure 137

6.3.1 Alarm code indication on 7 segment 137

6.3.2 Alarm code indication in Unit controller 137

6.3.3 Alarm codes for the indoor units 138

6.3.4 Troubleshooting by alarm code 141

6.4 Troubleshooting in check mode 182

6.4.1 Troubleshooting using the 7 segment display 182

6.5 Checking procedure for main parts 186

6.5.1 Checking procedure for the electronic expansion valve for indoor and outdoor units 186

6.1 Initial troubleshooting

6.1.1 Power supply failure to the indoor unit and the remote control switch (PC-ARFWE)

- The LED and the Unit controller are not indicated.
- Not operated

If the fuses are blown out or a breaker is activated, investigate the cause of the overcurrent and take the necessary action.

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or power is not ON		Measure the voltage by means of the voltmeter	Supply the power
Blown out fuse or activation of the breaker at the power source	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the wires to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
Blown out fuse at the control circuit	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the control circuit to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
Disconnected cable of the remote control switch		Connect the cable	Replace the cable or repair the cable
Insufficient contacting at the connectors of the remote control switch	Insufficient connection or incorrect connection of the indoor unit PCB	Check the connectors	Correctly connect the connector
	Insufficient connection or incorrect connection of the indoor unit PCB in the remote control switch		
Failure of the remote control switch		Check the remote control switch by means of the self-check mode	Replace the remote control switch if it failed
Failure of PCB	Unconnected wires to PCB	Check the connectors	Correctly connect the wires
	Failure of PCB	Check PCB by means of the self-check mode	Replace PCB if it failed
Incorrect wiring connection		Take action according to the procedure explained in *"3.3.3 Test run"* chapter	

6.1.2 Abnormal operation of the devices

Phenomenon	Cause		Check item	Action(Turn OFF the main switch)
No defrost operation mode is available during the heating process or the defrost operation continues	Failure of thermistor for outdoor evaporating temperature during heating	Failure of thermistor	Replace or correctly connect when it is abnormal	
		Disconnected wire of thermistor		
	Failure of 4-way valve	Disconnected 4-way valve coil	Measure the resistance of coil	Replace the 4-way valve
		Incorrect activation of 4-way valve	Enforced power supply	
	Disconnected control wires between indoor unit and outdoor unit		Check the connectors	Correctly connect the wiring
	Failure of the PCB of the indoor unit	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of PCB	Check PCB by means of the self-check mode	Replace PCB when the check mode is not available
	Failure of the PCB of the indoor unit	Disconnected wiring to PCB	Check the connectors	Correctly connect the wiring
		Failure of the PCB	Check PCB by means of the self-check mode	Replace if PCB fails

Phenomenon	Cause		Check item	Action(Turn OFF the main switch)
Insufficient heating process	Indoor heat load is greater than the heating capacity		Calculate the heat load	Replace the unit with a bigger unit
	Excessively low suction pressure	Gas leakage or insufficient refrigerant charge	Measure superheat	Correctly charge the refrigerant after the gas leakage check and repairing
		Excessively small diameter or long piping	Measure the field supplied piping	Use the specified pipes
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogging of IU/OU strainer	Check the temperature difference between the inlet and the outlet of strainer	Replace the strainer for the outdoor unit or the indoor unit
		Clogging of suction piping	Check the temperature difference of each part	Remove the clogging
		Insufficient air flow through the outdoor unit heat exchanger	Is the outdoor unit heat exchanger clogged?	Remove the clogging
			Are there any obstacles at the inlet or the outlet of outdoor unit?	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure a sufficient service area
			Check the speed of the outdoor unit fan	Replace the fan motor
		Excessively low air temperature through the outdoor unit heat exchanger	Check for any short-circuited air to the outdoor unit	Remove the cause of the short-circuited air
		Defrosting is insufficiently completed	Check the thermistor for the defrost operation	Replace the thermistor for the defrost operation
	Excessively high discharge pressure	Excessively charged refrigerant	Check the refrigerant quantity	Correctly charge the refrigerant
		Non-condensate gas in refrigerant cycle	Check the refrigerant quantity	Recharge the refrigerant after the vacuum pumping
		Clogging of the discharge pressure piping	Check for clogging	Remove the clogging
	Malfunction or internal leakage of the 4-way valve		Check the temperature difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Malfunction of the check valve of the outdoor unit		Check the temperature difference at the inlet and the outlet of the check valve	Replace the check valve
	Excessively high suction pressure	Malfunction or internal leakage of 4-way valve	Check the temperature difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Discharge temperature of the indoor unit is unstable		Check the expansion valve of the indoor unit in the same system	Replace the failed expansion valve of the indoor unit

Phenomenon	Cause		Check item	Action(Turn OFF the main switch)
Heating process with an abnormal sound	Foreign particles inside of the fan casing		Visually inspect it	Remove the foreign particles
	Outdoor unit propeller fan is hitting the shroud		Visually inspect it	Adjust the position of the propeller fan
	Abnormal sound from the compressor	Faulty Installation	Check that each part is tightly fixed	Tightly fix each part
		Liquid refrigerant compression	Adjust the suction gas temperature and pressure	Ensure superheat
		Wear or breakage of the internal compressor parts	Abnormal sound from the inside of the compressor	Replace the compressor
		No heating by the oil heater	Check the resistance (oil heater, fuse)	Replace the oil heater or the fuse
	Humming sound from the magnetic conductor		Check the surface of the contacts	Replace the magnetic switch
	Abnormal vibration of the cabinets		Check each fixing screw	Tightly fix each screw
Outdoor fan does not operate when the compressor operates	Obstacle at the outdoor fan		Check the obstacles	Remove the obstacles
	Watching condition for the heating process		Wait for the switching of the 4-way valve (1 ~ 3 minutes)	If the 4-way valve does not switch, check for insufficient refrigerant

6.2 Normal operation

6.2.1 Normal operation display on PCB1

◆ 7-Segment display

	Segment Display		Application Unit	
	SEG 1	SEG 2	RWLT	RWHT
Proceeding initialization (Product software XXX)	H-	CodE	○	○
Auxiliary operation (Mirror)	Au		-	-
Unit OFF - Normal	oF		○	○
Unit OFF - Air Purge		Pu	○	○
Heating – Demand OFF	hE	St	○	○
Heating – Thermo OFF		oF	○	○
Heating – Thermo ON		on	○	○
Heating – Boiler ON (Demand OFF, Thermo OFF, Thermo ON)		bo	○	○
Hot Sanitary Water – Demand OFF	hS	St	○	○
Hot Sanitary Water – Thermo OFF		oF	○	○
Hot Sanitary Water – Thermo ON		on	○	○
Hot Sanitary Water – Boiler Operation (Demand OFF, Thermo OFF, Thermo ON)		bo	○	○
Swimming Pool – Demand OFF	SP	St	○	○
Swimming Pool – Thermo OFF		oF	○	○
Swimming Pool – Thermo ON		on	○	○
Alarm	A.	CodE	○	○
Test Run Heating	tH	---	○	○
Tariff function enabled		tA	○	○
Seizure protection (note code means seizure protection state)	SE	CodE	○	○
Heating operation (Activation of forced compressor frequency control due to low pressure difference: forced down)	HE	P0	X	○
Heating operation (Activation of forced compressor frequency control due to high pressure difference: forced down)		P1	X	○
Heating operation (Activation of forced compressor frequency control due to excessive high discharge pressure: forced down)		P2	X	○
Heating operation (activated of forced compressor frequency control due to high inverter fin temperature: forced down)		P3	X	○
Heating operation: Control for prevention of increase of inverter fin temperature: forced down		P4	X	○
Heating operation: Control for prevention of low pressure decrease: forced down		P6	X	○
Retry operation (by alarm 104)	P-	06	X	○
Retry operation (by alarm 105)		11	X	○
Retry operation (by alarm 102)		12	X	○
Retry operation (by alarm 154,153,152, 155,)		17	X	○
Retry operation (by alarm 132,151,156)		18	-	○

◆ LED indication

Name	Colour	Indication
LED 1	Green	Power indication
LED 2	Red	Power indication
LED 3	Red	Heat pump operation (Thermo ON/OFF)
LED 4	Yellow	Alarm (Flickering with 1 sec interval)
LED 5	Green	Inverter transmission
LED 6	Yellow	H-Link transmission
LED 8	Yellow	H-Link RCS transmission

6.2.2 Protection control code display

In case that a protection control is activated during compressor operation and a restriction is applied to the inverter frequency, the protection control codes shown in the table below are displayed on the 7-segment display.

In case of protection control activated that drives to stop the compressor operation but keeps unit operation, the protection control codes shown in the table below are displayed on the 7-segment dispplay.

Retry operation	Segment Display		Application Unit	
	Seg 1	SEG 2	RWLT	RWHT
Retry operation (by alarm 104)	P-	06	X	○
Retry operation (by alarm 105)		11	X	○
Retry operation (by alarm 102)		12	X	○
Retry operation (by alarm 154,153,152, 155,)		17	X	○
Retry operation (by alarm 132,151,156)		18	X	○

6.2.3 Normal operation display at Unit controller

The Unit controller is an interactive interface that shows all the operation status at real time. At normal operation the unit controller screen shows all the information related to the settings and conditions of the outdoor and indoor unit.

6.3 Troubleshooting procedure

6.3.1 Alarm code indication on 7 segment

The 7 segment at the indoor unit PCB1 will show the alarms from the outdoor unit and the indoor unit.

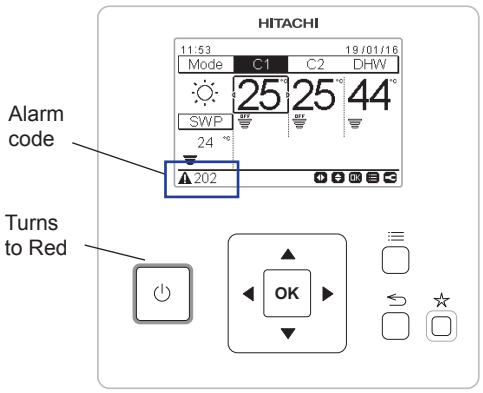
The 7 segment at the outdoor unit PCB shows the alarms from the outdoor unit.

6.3.2 Alarm code indication in Unit controller

When an alarm is activated it will be displayed in the Unit controller screen of the unit controller. A danger symbol ⚠ and the alarm code will be displayed at bottom left of the screen.

The unit screen shows the alarms coming from the outdoor unit, from the indoor unit and also from the unit controller itself (it can happen a problem with the communication between indoor unit and outdoor unit. If that was the case, the unit controller will show an alarm code related to a communication failure between IU and OU.

Unit controller



- Malfunction

  The ALARM (Yellow) LED flashes. The ALARM indicator appears on the liquid crystal display: Contact your HITACHI service supplier.

- Power supply failure

  All displays disappear. If the unit stops due to a power shortage, it will not start again, even though the power comes back on. Carry out the start-up operations again. If the power failure lasts less than 2 seconds, the unit will start again automatically.

- Electrical noise

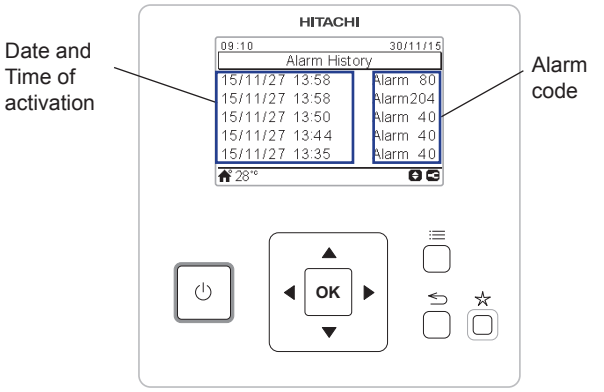
  The display can disappear from the screen and the unit can stop. This is because the microcomputer has been activated to protect the unit from electrical noise.

6

◆ Alarm history

The system keeps the last 20 alarms stored. Each alarm entry has the following data:

- Date: date of activation in yy/mm/dd format.
- Time: the hour and minute of activation
- Alarm code: The alarm code



NOTE

- *An alarm is registered when activated, not during all the time that is shown on the Unit controller screen.*
- *Alarms are registered each time appears. Even if that alarm is deactivated, if appears again, will be registered again.*
- *When an alarm is registered and switches to another alarm, the second one will be registered too.*
- *If a new alarm appears when the list of 20 registered alarms is full, the oldest one will be removed from the list to allow the new one to be in the list.*

In case of being in installer mode, a menu related only to the alarm history window will be displayed by pressing the menu button. 2 options will be shown:

- Delete the selected alarm: It will shown in case of an alarm being selected. It will delete the selected alarm only.
- Clear alarms: Remove all the registered alarms.

6.3.3 Alarm codes for the indoor units

Alarm Code	Retry stop code	LTWM	HTWM	Origin	Detail of Abnormality	Main Factors
3	–	o	o	Transmission	Transmission Alarm (Not outdoor unit detected)	Loose, disconnected, broken or short-circuited connector
11	–	o	o	Indoor	Water inlet thermistor anomally (THMwi)	Loose, disconnected, broken or short-circuited connector
12	–	o	o	Indoor	Water outlet thermistor anomally (THMwo)	Loose, disconnected, broken or short-circuited connector
13	–	o	o	Indoor	Indoor Liquid Pipe Temp Thermistor anomally (THMl)	Loose, disconnected, broken or short-circuited connector
14	–	o	o	Indoor	Indoor Gas Pipe Temp. Thermistor anomally (THMg)	Loose, disconnected, broken or short-circuited connector
15	–	(o)	(o)	Indoor	Water Circuit 2 thermistor anomally (THMwo2)	Loose, disconnected, broken or short-circuited connector
16	–	(o)	(o)	Indoor	Water DHW thermistor anomally (THMdhwt)	Loose, disconnected, broken or short-circuited connector
17	–	(o)	(o)	Indoor	Auxiliary sensor 2 thermistor anomally (THMaux2)	Loose, disconnected, broken or short-circuited connector
18	–	(o)	(o)	Indoor	Auxiliary sensor 1 thermistor anomally (THMaux1)	Loose, disconnected, broken or short-circuited connector
19	–	–	o	Indoor	Suction R134a pipe thermistor anomally (THMs)	Loose, disconnected, broken or short-circuited connector
23	–	–	o	Indoor	Discharge R134a pipe thermistor anomally (THMd)	Loose, disconnected, broken or short-circuited connector
25	–	(o)	(o)	Indoor	Auxiliary sensor 3 thermistor anomally (THMaux3)	Loose, disconnected, broken or short-circuited connector
40	–	o	o	Indoor	Incorrect Unit controller setting	Current Unit controller configuration does not allow proper operation
70	P70	o	o	Indoor	Hydraulic alarm flow & Water Pump malfunction	Water flow is not detected in the hydraulic cycle or Pump defective
73	–	o	o	Indoor	Mixing over-temperature limit protection for Mixed circuit.	Circuit 2 supply temperature > Target temperature + offset
74	P74	o	o	Indoor	Unit over-temperature limit protection	Two > Tmax +5K
75	–	o	o	Indoor	Freeze Protection by Cold water inlet, outlet temperature detection	
76	–	o	o	Indoor	Freeze Protection Stop by indoor liquid temperature thermistor	
80	–	o	o	Indoor- Unit controller	Unit controller - H-Link - RCS transmission error (if no H-LINK, RCS has no power)	No H-Link communication for a continuous period of 1 minute between Indoor and Unit controller. User control by connection wiring (breaking, wiring error, etc.)
81	P81	o	o	Indoor	“Momentary Power interruption” or “Low voltage detected”	
83	P83	o	o	Indoor	Hydraulic alarm pressure	Water pressure is not detected in the hydraulic cycle
100	-	o	o	Indoor -LCD	Compressor protection	"Compressor failure. This alarm code appears when the following alarms 02, 07, 08, 45, 47 occur three times within 6 hours." **NOTE** *This alarm is shown in the outdoor unit with alarm code “EE”.*
101	–	–	o	Indoor	Activation of high pressure switch	
102	P12	–	o	Indoor	Activation of protection control for excessively high pressure	Stop after P12 retry due to discharge pressure Pd ≥ 2.78 MPa continued for 10 seconds.
104	P06	–	o	Indoor	Activation of low control	Stop after P06 retry due to Ps ≤ 0.15 MPa continued for 90 seconds
						Immediate stop with Ps ≤ 0.1 MPa
105	P11	–	o	Indoor	Excessive low pressure difference	Stop after P11 retry due to pressure ratio ε < 1.8 continued for 3 minutes.

Alarm Code	Retry stop code	LTWM	HTWM	Origin	Detail of Abnormality	Main Factors
106	–	–	o	Indoor	Excessive high discharge gas temperature	Td ≥ 120 ºC continued for 10 minutes, Td ≥ 140 ºC continued for 5 seconds
129	–	–	o	Indoor	Failure of discharge gas pressure sensor	Loose, disconnected, broken or short-circuited connector
130	–	-	o	Indoor	Failure of suction gas pressure sensor	Loose, disconnected, broken or short-circuited connector
132	–	-	o	Indoor	Transmission error between Inverter PCB and Main PCB	Described in inverter abnormal stop control
134	–	–	o	Indoor	Abnormality of power supply phase (R134a circuit)	Open phase
135	–	–	o	Indoor	Incorrect PCB Setting	Wrong DSW setting in the case of Co041
151	–	–	o	Indoor	Excessively low voltage or excessively high voltage for the inverter	Described in inverter abnormal stop control
152	–	–	o	Indoor	Abnormal operation of the current sensor	Described in inverter abnormal stop control
153	–	–	o	Indoor	Activation of protection for inverter instantaneous over current	Described in inverter abnormal stop control
154	–	–	o	Indoor	Transistor module protection activation	Described in inverter abnormal stop control
155	–	–	o	Indoor	Increase in the inverter fin temperature or abnormality	Described in inverter abnormal stop control
156	–	–	o	Indoor	Inverter non operation	Described in inverter abnormal stop control
157		–	o	Indoor	Inverter communication abnormality	Described in inverter abnormal stop control
202		(o)	(o)	Indoor	Wrong settings of PC-ARFWE	
203		(o)	(o)	Indoor	Slave PC-ARFWE stops answering to Master PC-ARFWE	Loose, disconnected, broken or short-circuited connector
204		(o)	(o)	Indoor	Indoor unit stops answering to Master PC-ARFWE	Loose, disconnected, broken or short-circuited connector
205		(o)	(o)	Indoor	Central Alarm, no Central message	Loose, disconnected, broken or short-circuited connector

NOTE

(o): Option configurable from Unit controller. This alarm will be displayed if the system has been configured.

o: Default. This alarm will be displayed in the Unit controller.

–: No applicable.

Also refer to the outdoor unit technical documentation for details about alarms shown from outdoor unit 7 segment

◆ Cause of compressor stop

When the compressor stops due any of the factors below, Stop Reason Code (d1 Code) is sent to Indoor Unit.

The Code will be overridden when another Code is sent before it.

Stop reason code	Stop factors	52C1 Process	OU	IU
00	Switch OFF	OFF	o	o
01	Thermo OFF	ON	o	o
02	Alarm	OFF	o	o
03	Freeze protection	ON	o	–
05	Momentary power failure detection in Outdoor unit and reset of the Outdoor PCB micro controller	OFF	o	–
06	Momentary power failure detection in Indoor unit and reset of the indoor PCB micro controller	ON		o
07	Outdoor air temperature and indoor suction temperature for heating (Overload condition)	ON	o	–
	Stop due to outdoor heating temperature lower than -20°C (Low temperature condition)	ON	o	–
10	Demand (external input)	ON	o	–
	Emergency stop (DSW1-4: ON or forced stop input)	OFF	o	–
13	Discharge pressure increase prevention for heating	ON	o	o
15	Gas shortage detection (detected by pipe temperature: gas shortage detection I)	OFF	o	o
	Gas shortage detection (detected by compressor-top temperature: gas shortage detection II)	OFF	o	o
	Compressor-top overheating (Td)	ON	o	o
16	Abnormal decrease of discharge gas superheat degree (TdSH)	ON	o	o
17	Inverter trip (Instantaneous overcurrent, Electronic thermal activation, Current sensor abnormality)	OFF	o	o
18	Inverter trip (Inverter undervoltage, Overvoltage, Transmission error, Microcomputer reset)	OFF	o	o
19	Prevention Control for expansion valve opening deviance	ON	o	o
21	Thermo OFF stop due to oil return control	ON	o	–
	Forced Thermo OFF of simultaneous twin or greater (when other units are Thermo OFF)	ON	o	–
22	Outdoor unit Heat Start Control	OFF	o	–
26	Retry stop due to high pressure decrease abnormality	ON	o	o
28	Cooling discharge temperature control	ON	o	–
35	Refrigerating cycle abnormality (Bad or wrong switch of 4-way valve)	OFF	o	–

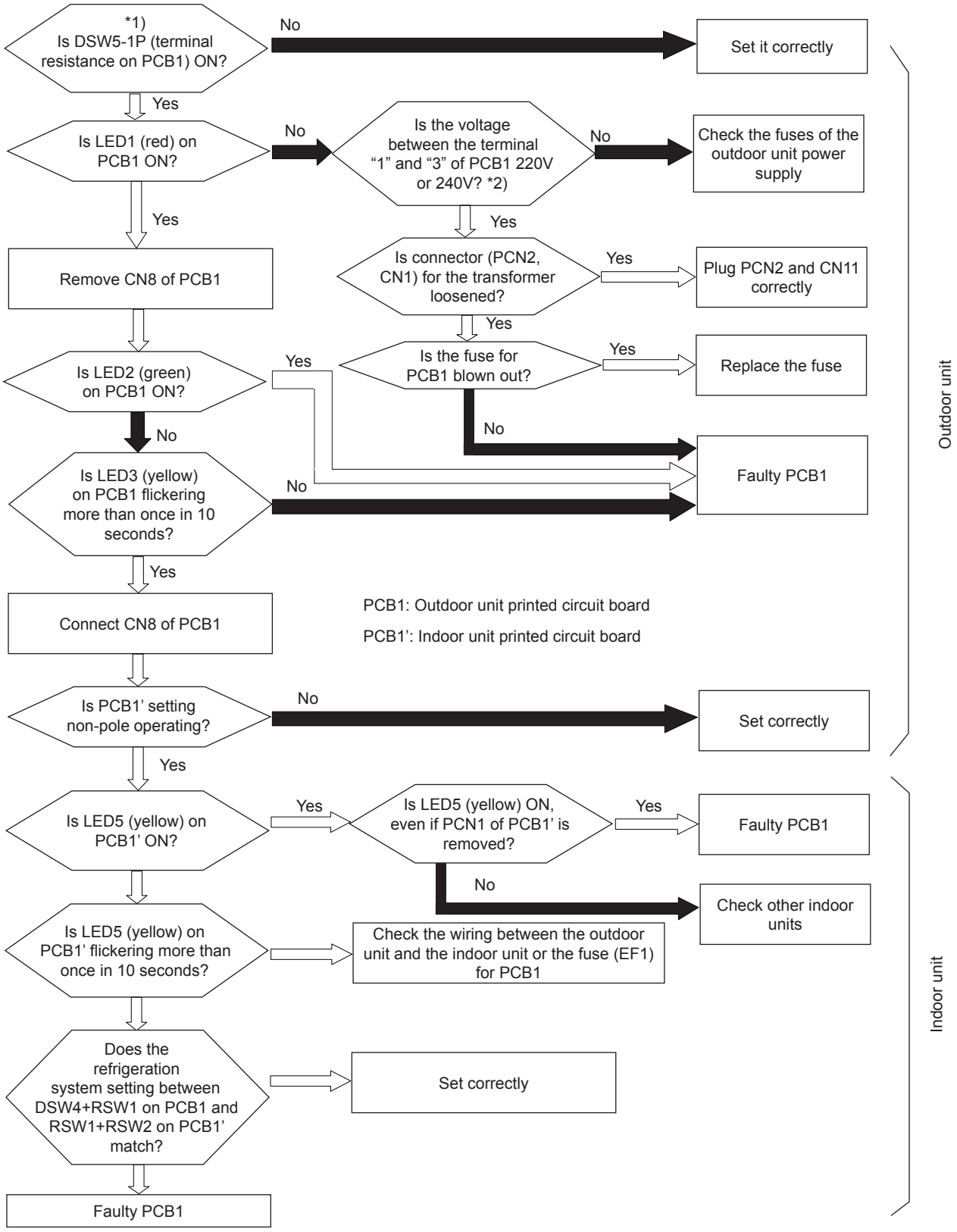
6.3.4 Troubleshooting by alarm code

Alarm code	03	Abnormal transmission between the indoor units and the outdoor unit

Applicable to units	
RWLT	RWHT
–	–

- This alarm is displayed when an abnormal operation is maintained for three minutes after the normal transmission between the indoor units and the outdoor unit. Also, an abnormal operation is maintained for 30 seconds after the micro-computer is automatically reset. The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the outdoor unit.
- Investigate the cause of the overcurrent and take the necessary action when the fuses are blown out or the breaker for the outdoor unit is activated.
- This alarm code may be indicated when the inverter or the fan motor malfunction and the outdoor unit cannot secure the power source (No indication on the 7-segment of outdoor unit PCB). In this case, surely check the inverter, fan motor and the continuity of the fuse on the circuit.

(Refer to the next page)



*1) In case that terminal resistance (DSW5-1P) is OFF when H-Link II connection is performed.

- Set the terminal resistance to ON when CN8 is removed.
- Set the terminal resistance to OFF when CN8 is reconnected.

*2) Check item

Power supply	Faston terminal
1~ 230V 50Hz	Between 1 and 3 of PCN1 on OU PCB

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or power is not ON		Measure the voltage by means of the tester	Supply the power
Blown out fuse for the power source or activation of the outdoor unit breaker	Short-circuit between the wires	Check the insulation material for breaks	Remove the short-circuit and replace the fuse
	Short-circuited wire to ground	Measure the insulation resistance	Remove short-circuit to ground and replace the fuse
	Faulty compressor motor	Measure the resistance between the wires and the insulation resistance	Replace the compressor and the fuse
	Failure of outdoor unit fan motor	Measure resistance between wires and insulation resistance	Replace the outdoor unit fan motor and the fuse
Blown out fuse for control circuit or activation of outdoor unit breaker	Short-circuit between the wires	Check the insulation material for breaks	Remove the short-circuit and replace the fuse
	Short-circuit of the control circuit (to ground)	Measure the insulation resistance	Remove the short-circuit and replace the fuse
	Faulty solenoid coil for the magnetic switch for the compressor motor	Measure the resistance of coil	Replace the magnetic switch and the fuse
	Failure of outdoor unit fan motor	Measure the resistance between the wires and the insulation resistance	Replace the outdoor unit fan motor and fuse
PCB1 Power circuit failure		PCB1 Measure output voltage *1)	Replace PCB1
Disconnected wires insufficient contacting or incorrect connection	Between outdoor unit and indoor unit	Check the continuity of the wires Check for looseness of the connection screws Check the terminal numbers	Replacing wires repairing and tightening the power source wiring for the screws and the correct wiring
	Power source wiring for the screws and the correct wiring outdoor unit		
Faulty PCB (outdoor unit, indoor unit)	Disconnected wires to PCB	Check the connections	Correctly connect the wires
	Faulty PCB	—	Replace PCB if faulty
Incorrect wiring	Disconnected wire; insufficient contacting	Check the continuity and the looseness of connection screws	Replacing wires, repairing and tightening the screws
	Incorrect wiring	Check the terminal numbers	Correctly connect the wires

NOTE

- **1) In the case that the end terminal resistance (DSW5-1) is set to OFF for H-LINK connection, set the end terminal resistance to ON when CN8 is disconnected. Set the end terminal resistance to OFF when CN8 is reconnected.*
- **2) Transmission Setting (SW1)*
- **3)*

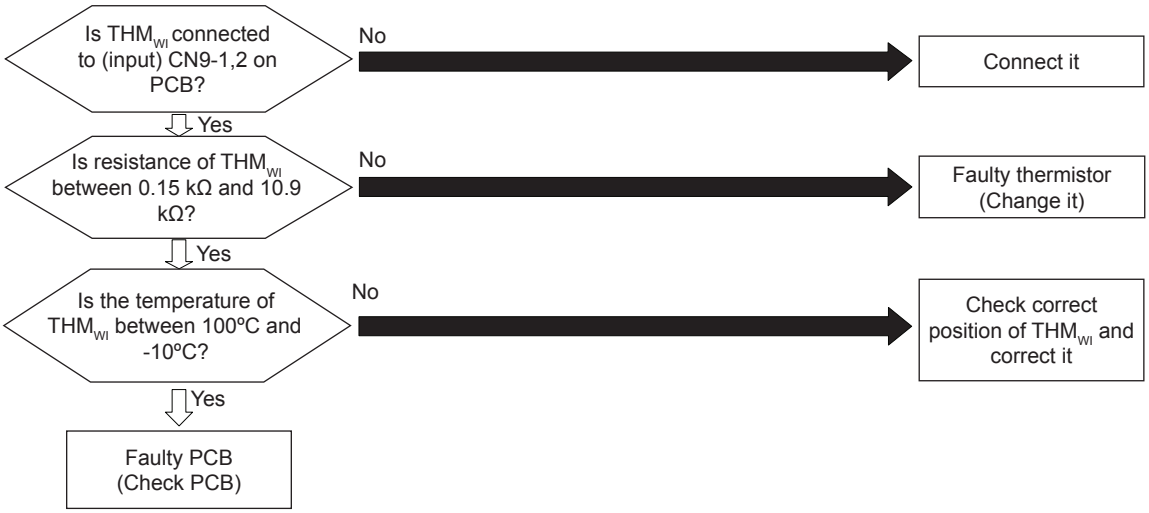
PCB1 output voltage	Voltage
Vcc 12 - GND2	12VDC
Vcc 05 - GND1	5 VDC
Vcc 12 - GND1	12 VDC
Vcc 15 - GND1	15 VDC
Vcc 24 - GND1	24 VDC
Vcc 12T - GND1	12 VDC

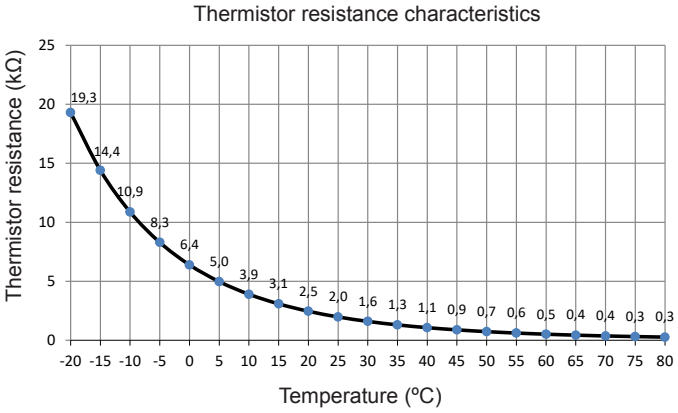
- **4) The rotary switch (RSW2) is not available for indoor units.*

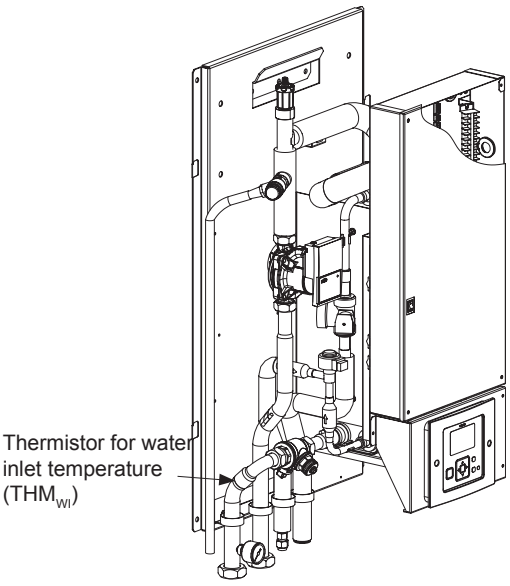
Alarm code	11	Water inlet temperature thermistor (THM_{WI}) abnormality

Applicable to units	
RWLT	RWHT
○	○

- This alarm code is displayed when the thermistor is short-circuited (≥ 100ºC) or cut (≤ -10ºC) during the heating process.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



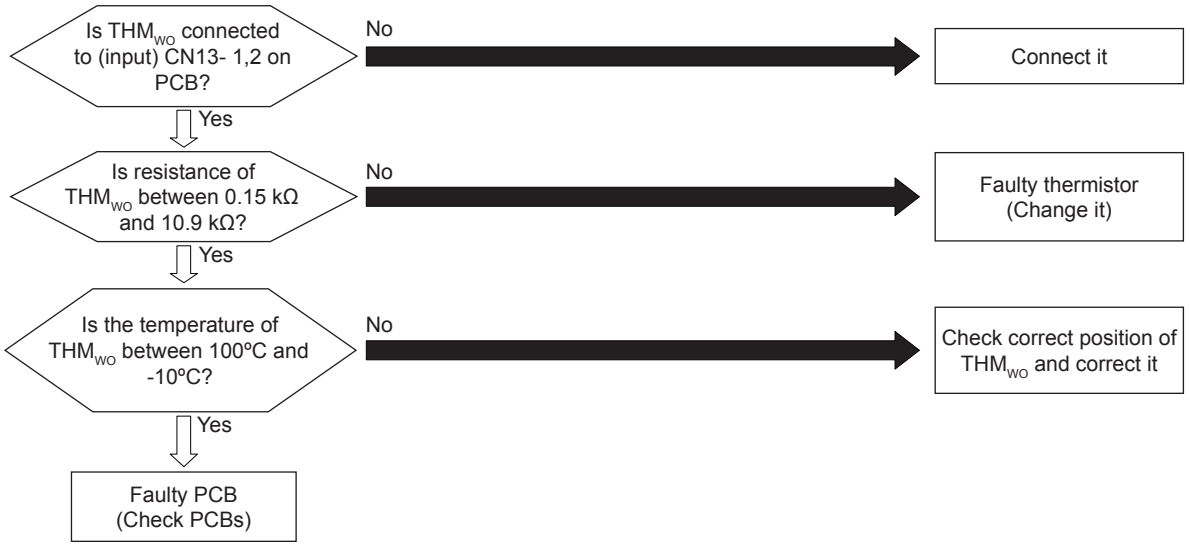


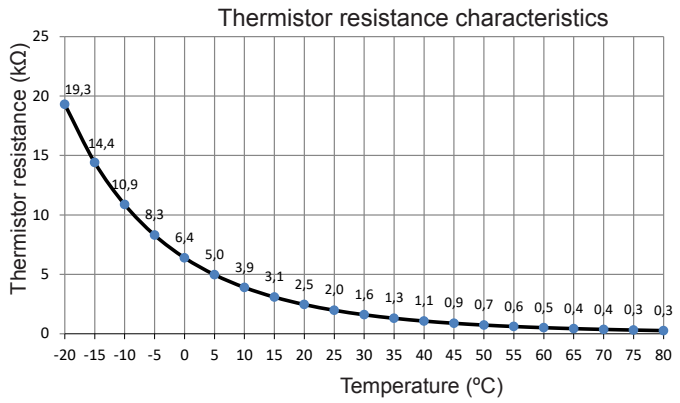


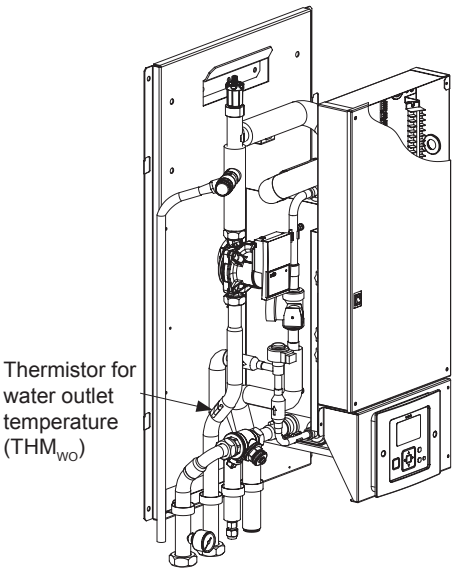
Alarm code	12	Water outlet temperature thermistor (THM_{WO}) abnormality

Applicable to units	
RWLT	RWHT
○	○

- This alarm code is displayed when the thermistor is short-circuited (≥ 100ºC) or cut (≤ -10ºC) during operation process.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm



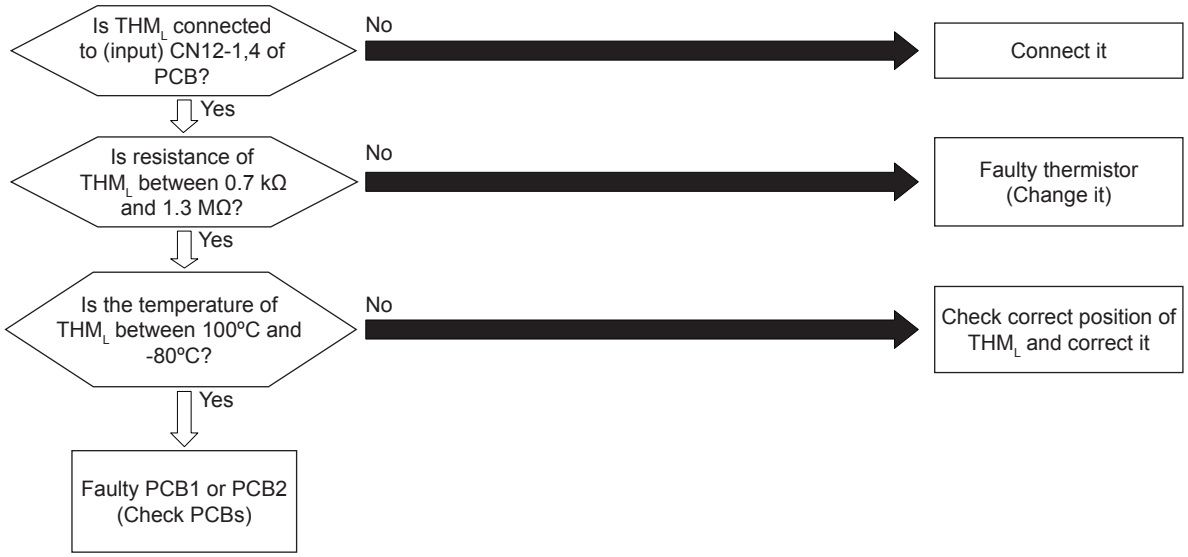


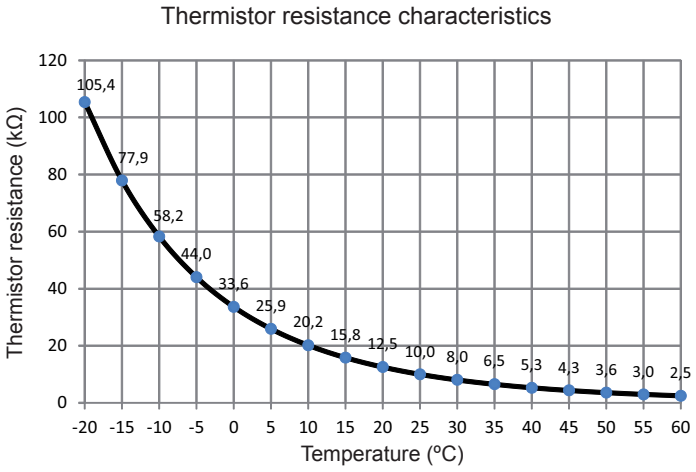


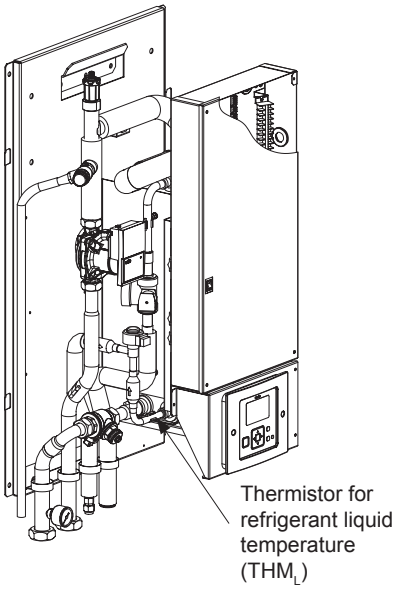
Alarm code	13	Indoor liquid pipe R410A temperature (THM_L) thermistor abnormality

Applicable to units	
RWLT	RWHT
○	○

- This alarm code is displayed when the thermistor is short-circuited (≥ 100ºC) or cut (≤ -80ºC) during operation process.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



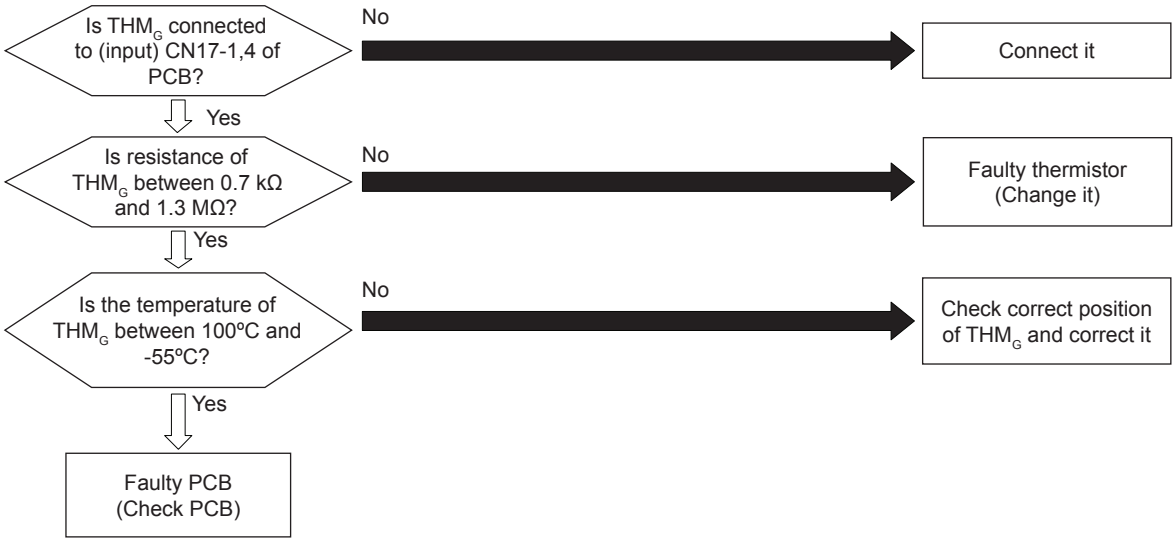


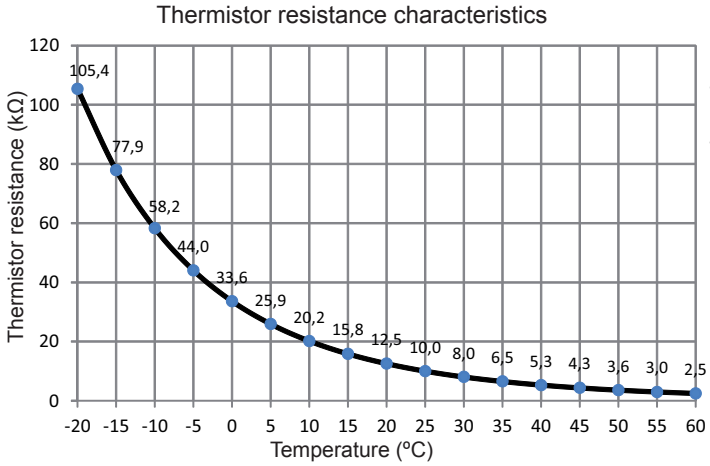


Alarm code	14	Indoor gas pipe R410A temperature (THM_G) thermistor abnormality

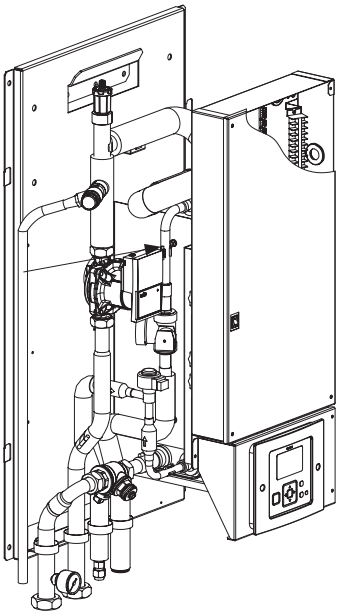
Applicable to units	
RWLT	RWHT
○	○

- This alarm code is displayed when the thermistor is short-circuited (≥ 100ºC) or cut (≤ -55ºC) during operation process.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.





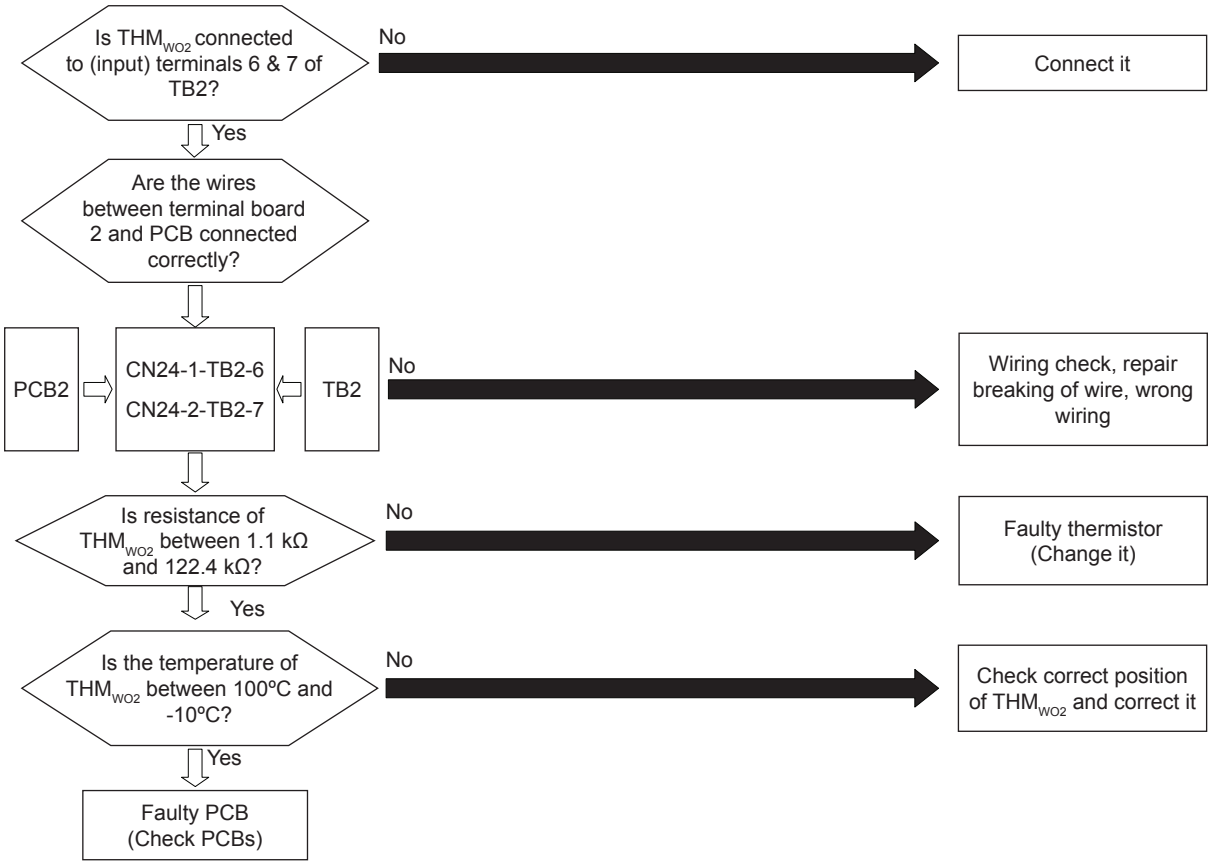
Thermistor for refrigerant gas temperature (THM_G)

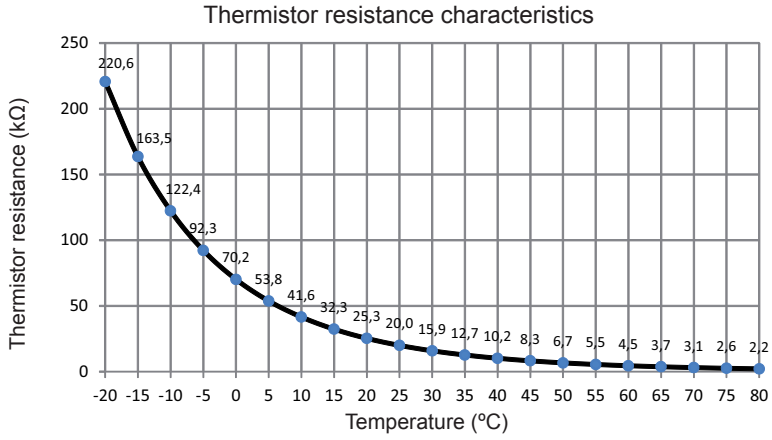


Alarm code	15	Water outlet circuit 2 (mixing circuit) temperature thermistor (THM_{WO2}) abnormality

Applicable to units	
RWLT	RWHT
(○)	(○)

- This alarm code is displayed when the thermistor is short-circuited (≥ 100ºC) or cut (≤ -10ºC) during operation process.
- This alarm forces tall operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

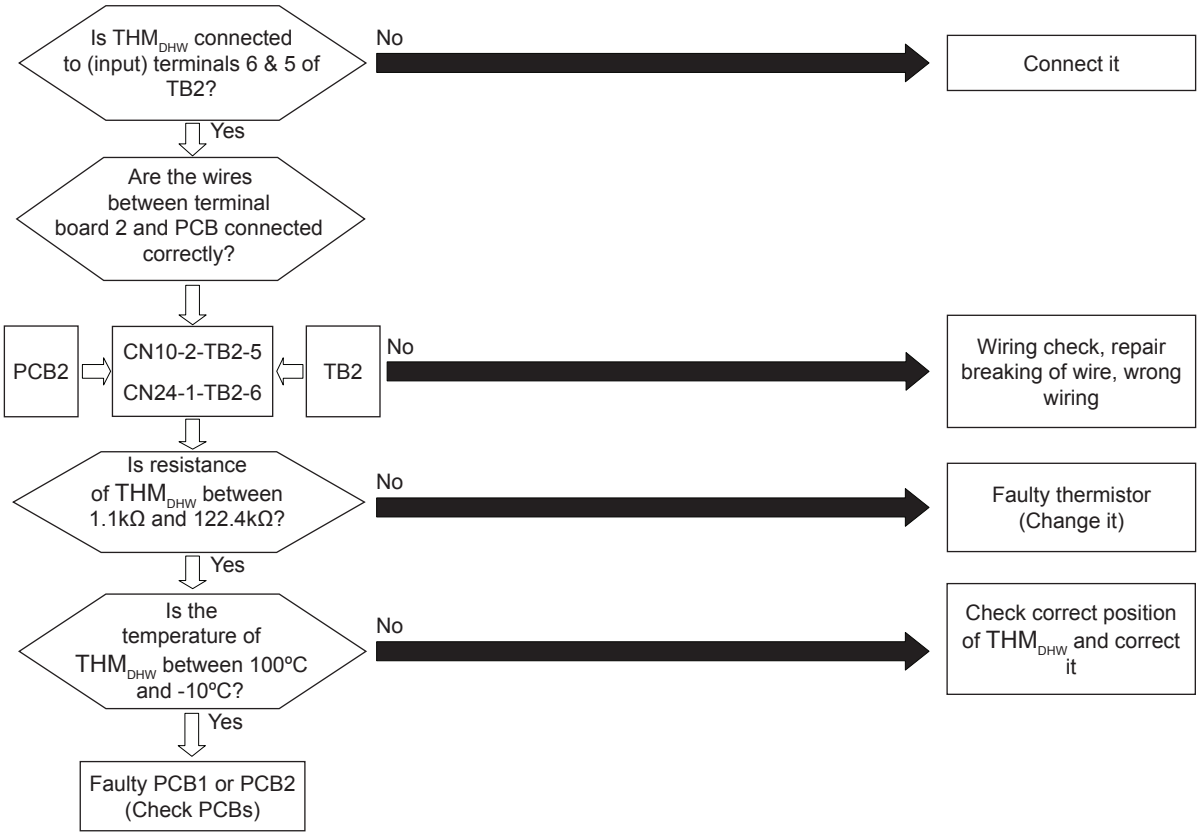


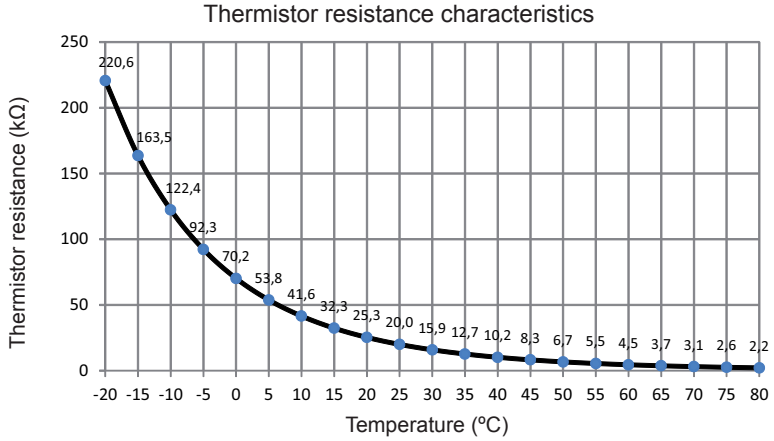


Alarm code	16	Domestic hot water temperature thermistor (THM_{DHW}) abnormality

Applicable to units	
RWLT	RWHT
(○)	(○)

- This alarm code is displayed when the thermistor is short-circuited (greater than 100ºC) or cut (less than -10ºC) when DHW is enabled.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

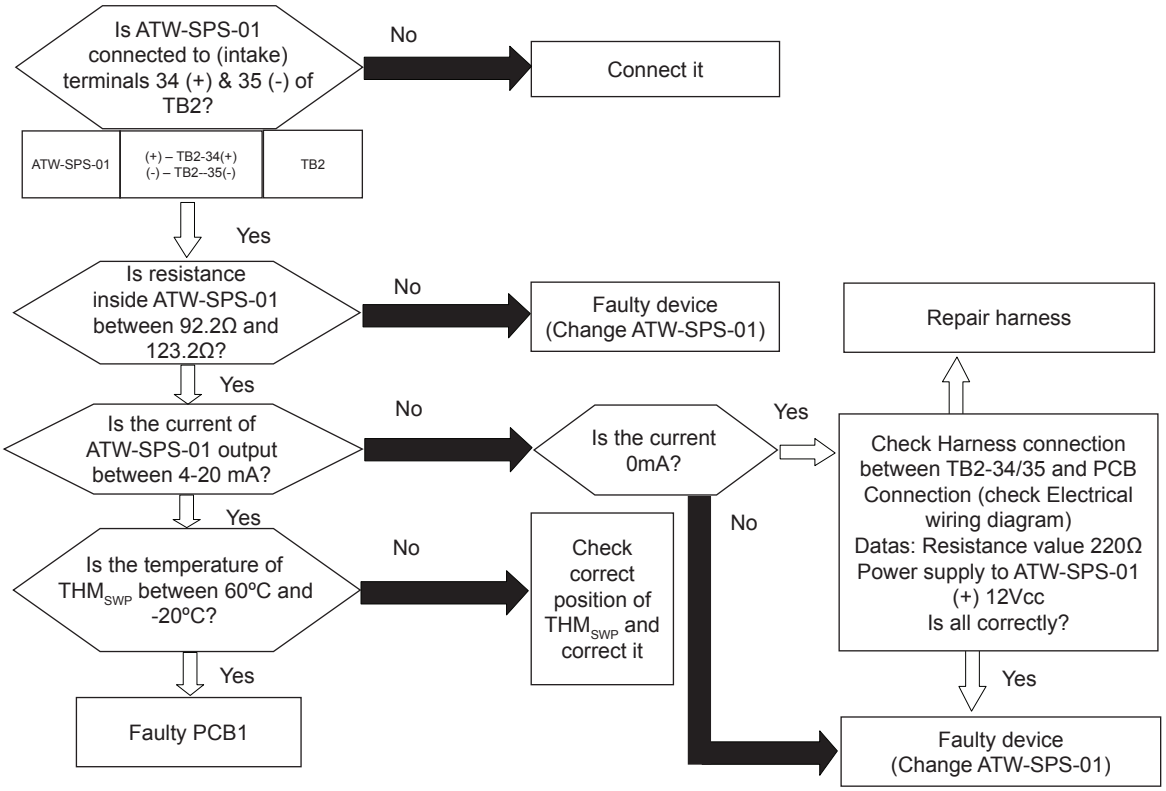




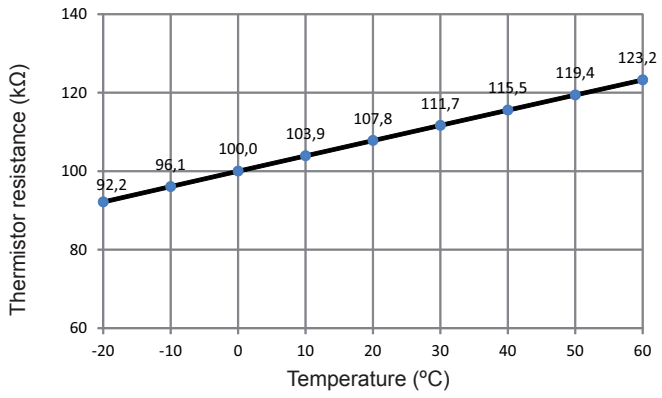
Alarm code	17	Auxiliary temperature sensor 2 (THM_{AUX2}) abnormality

Applicable to units	
RWLT	RWHT
(○)	(○)

- This alarm code is displayed when a sensor abnormality is detected. The detection of abnormality is activated when the read voltage is lower than 0.1V or higher than 4.9V during operation process.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



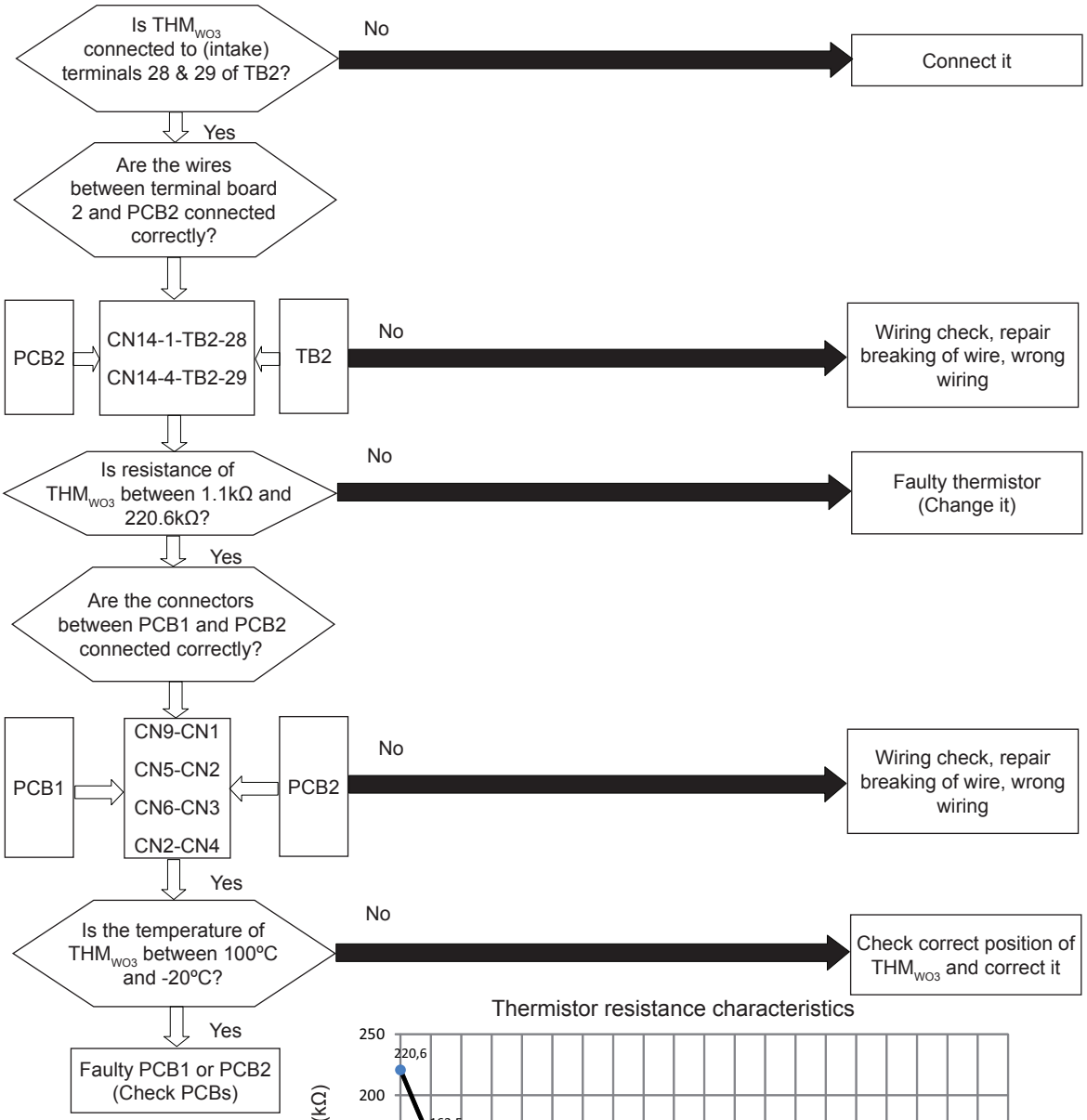
Thermistor resistance characteristics

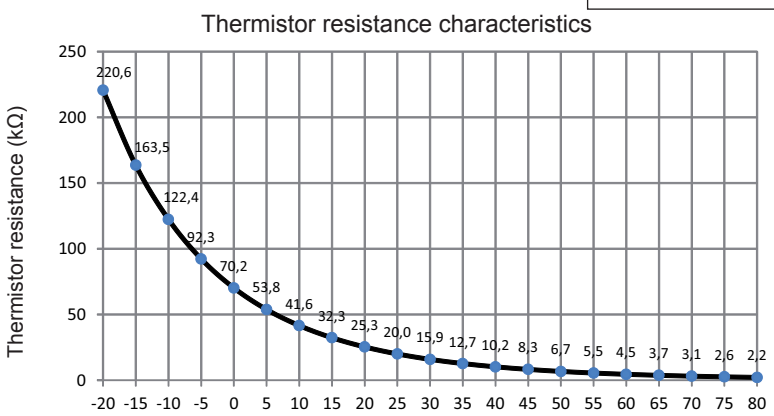


Alarm code	18	Universal sensor

Applicable to units	
RWLT	RWHT
(○)	(○)

- This alarm code is displayed when a sensor abnormality is detected. The detection of abnormality is activated when the read voltage is lower than 0.1V or higher than 4.9V during operation process.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



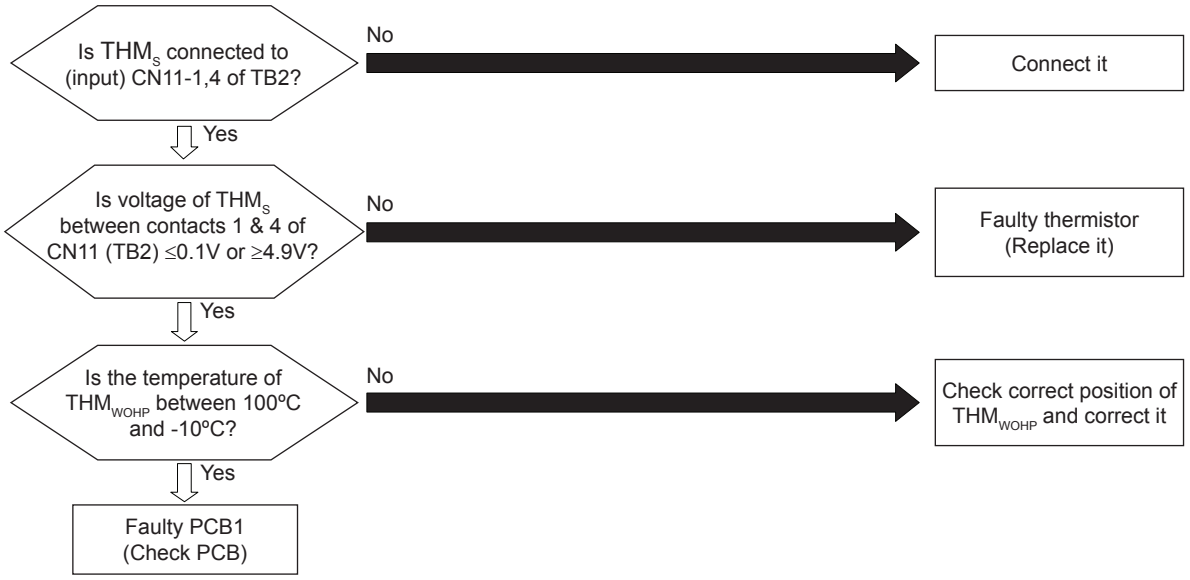


Alarm code	19	Compressor suction temperature thermistor(THM_S) anomally

Applicable to units	
RWLT	RWHT
-	○

Only RWHT

- This alarm code is displayed when a sensor abnormality is detected. The detection of abnormality is activated when the read voltage is lower than 0.1V or higher than 4.9V during operation process.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.

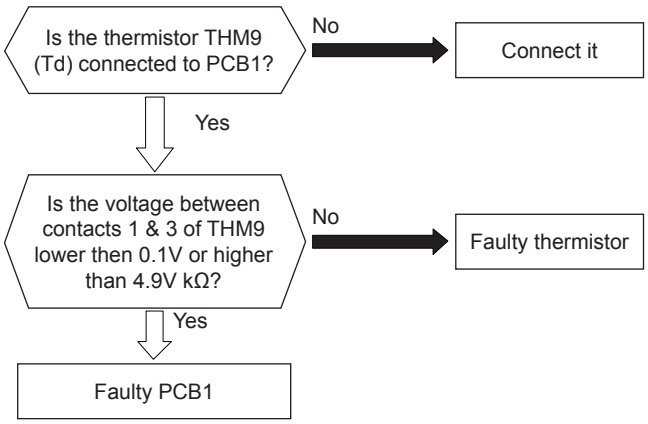


Alarm code	23	Abnormal operation of the thermistor for the discharge gas (Td)(THM9 at PCB).

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

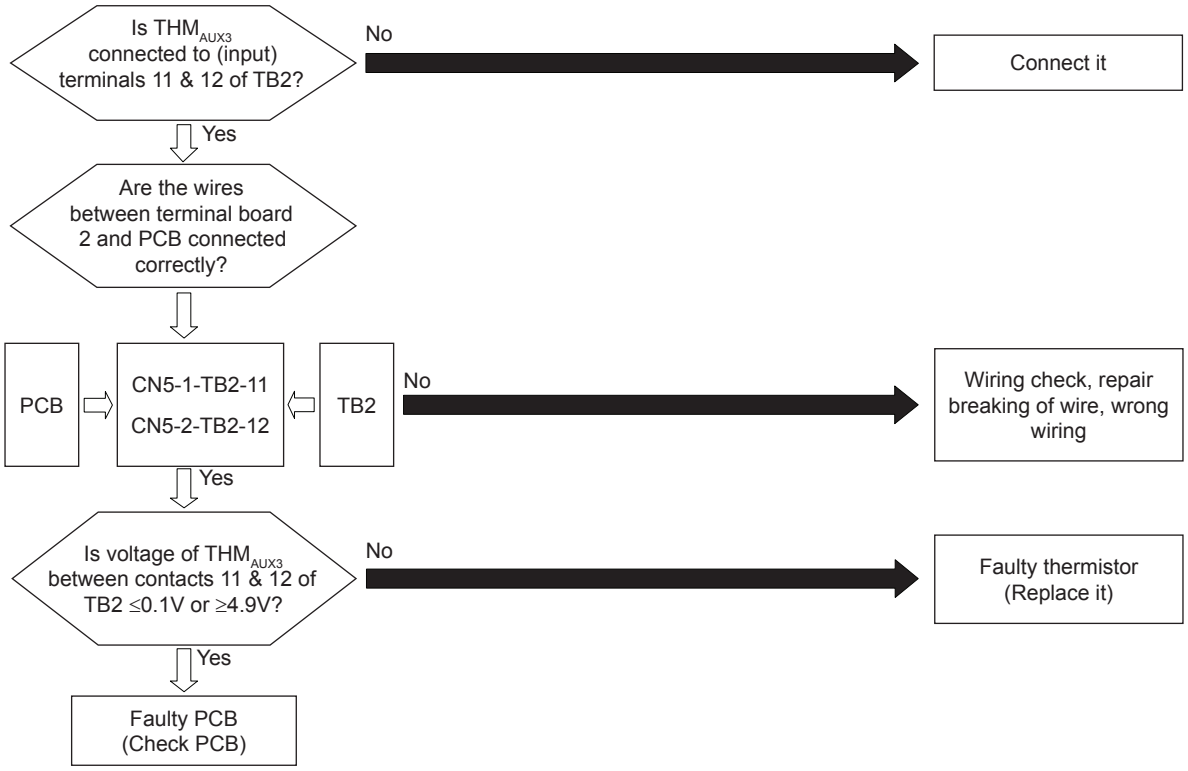
- This alarm code is indicated when the pressure sensor output voltage decreases (less than 0.1V) or increases (more than 4.9V) during the operation.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



Alarm code	25	Auxiliary sensor 3 thermistor anomally (THM_{AUX3})

Applicable to units	
RWLT	RWHT
(○)	(○)

- This alarm code is displayed when a thermistor abnormality is detected. The detection of abnormality is activated when the read voltage is lower than 0.1V or higher than 4.9V during operation process.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



Alarm code	40	Incorrect unit controller setting

Applicable to units	
RWLT	RWHT
○	○

- This alarm is displayed when an abnormal setting of the unit controller is detected after 30 seconds.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- To release the alarm the unit should be stopped or no incorrect setting should be detected.

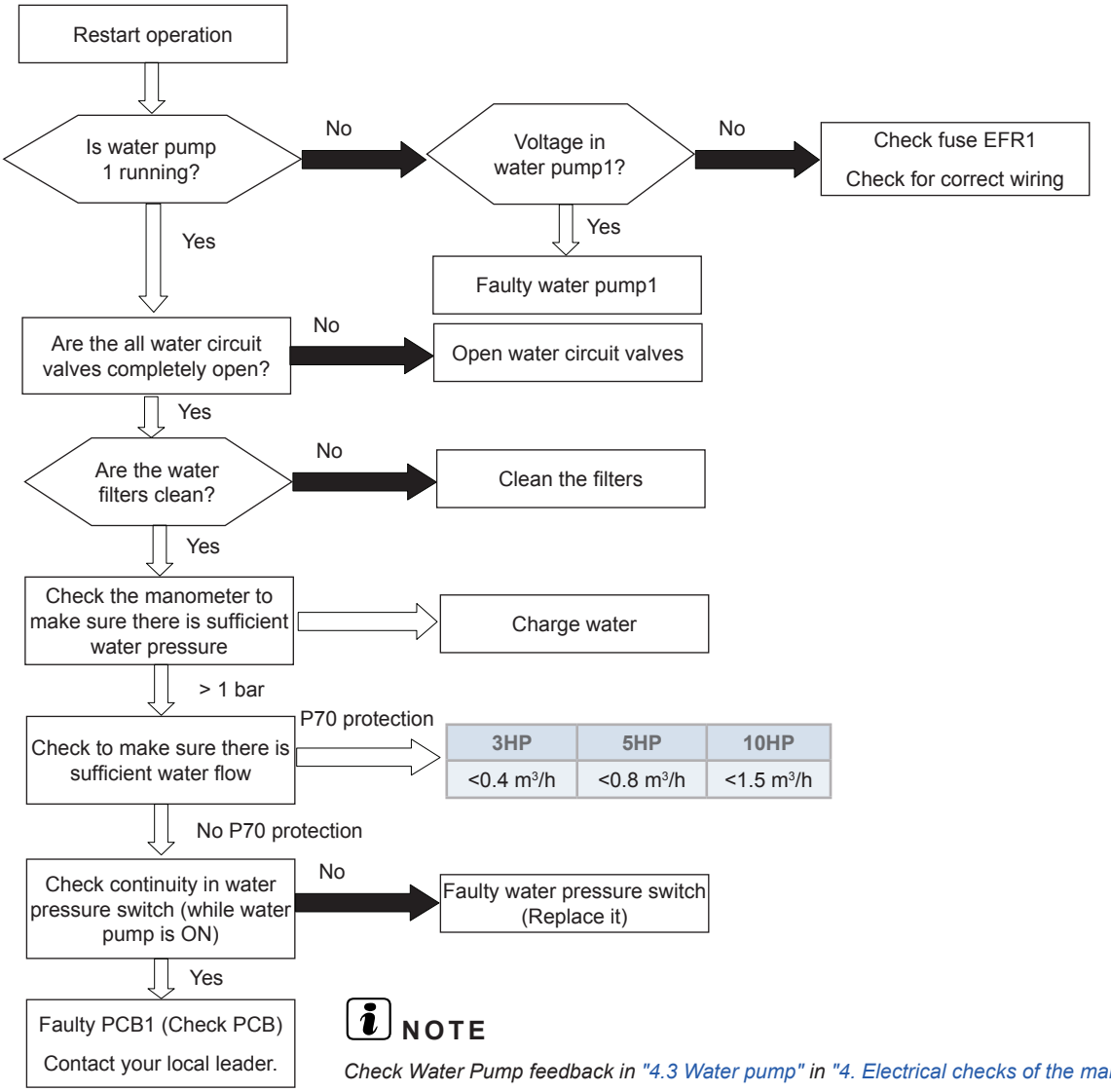
The incorrect settings detected for this alarm to be displayed are explained below:

- T_{WO3} needs to be used and it is not configured. T_{WO3} needs to be used in following conditions:
  - Boiler operation (serial or parallel) is configured.
  - Unit is a RWHT and heater outputs are enabled.
  - DSW5-4 is ON.

Alarm code	70	Hydraulic flow alarm and water pump malfunction

Applicable to units	
RWLT	RWHT
○	○

- This alarm is displayed when there is a low flow abnormality in the hydraulic system for 60 seconds
- The anomaly is detected when there is a pump operation requested and DSW3-2 is OFF.
- This alarm forces all operations to stop (Outdoor & Indoor Units).
- The unit should be stopped to release the alarm.



3HP	5HP	10HP
<0.4 m³/h	<0.8 m³/h	<1.5 m³/h

NOTE

Check Water Pump feedback in "4.3 Water pump" in "4. Electrical checks of the main parts"

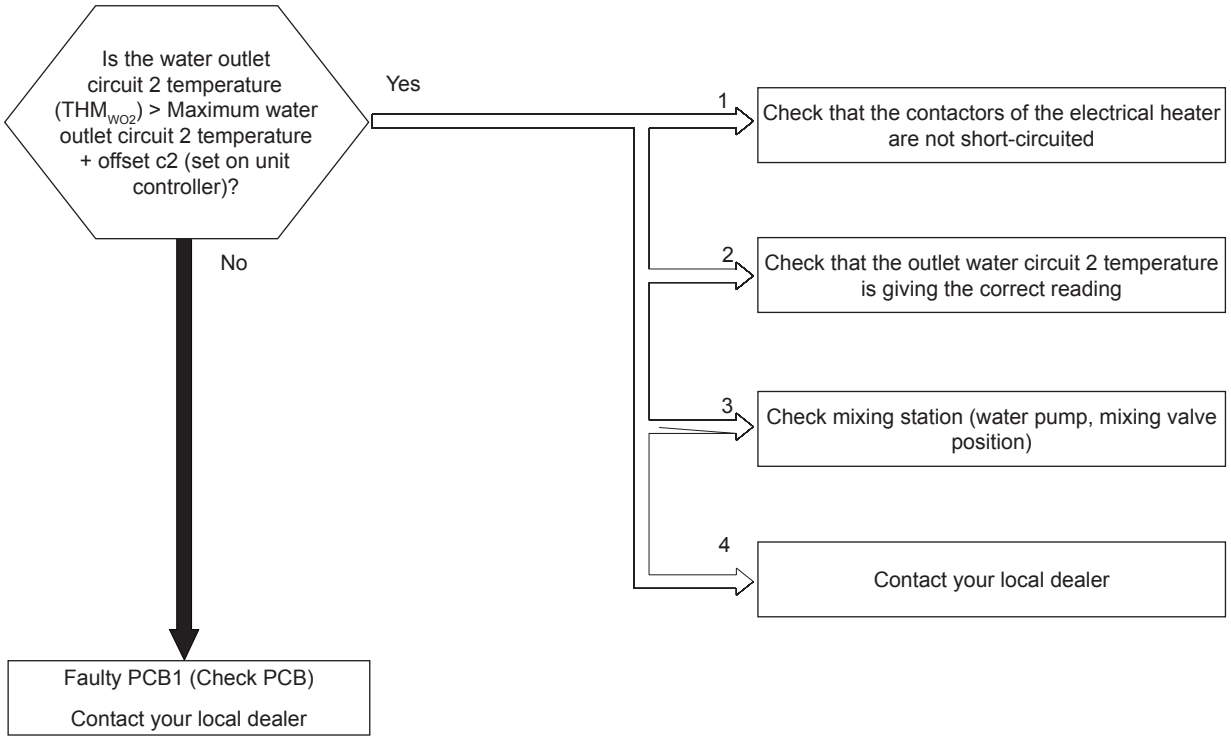
Alarm control procedure:

- Perform retry operation for 1 minute the first time (Seven-segment shows P70) and keep Outdoor and Indoor Unit running (except Electrical Heater). After 1 minute has passed (P70), Switch Stop status OFF for Outdoor and Indoor Units.

Alarm code	73	Mixing overheating limit protection for mixed circuit (Only if circuit 2 is enabled)

Applicable to units	
RWLT	RWHT
○	○

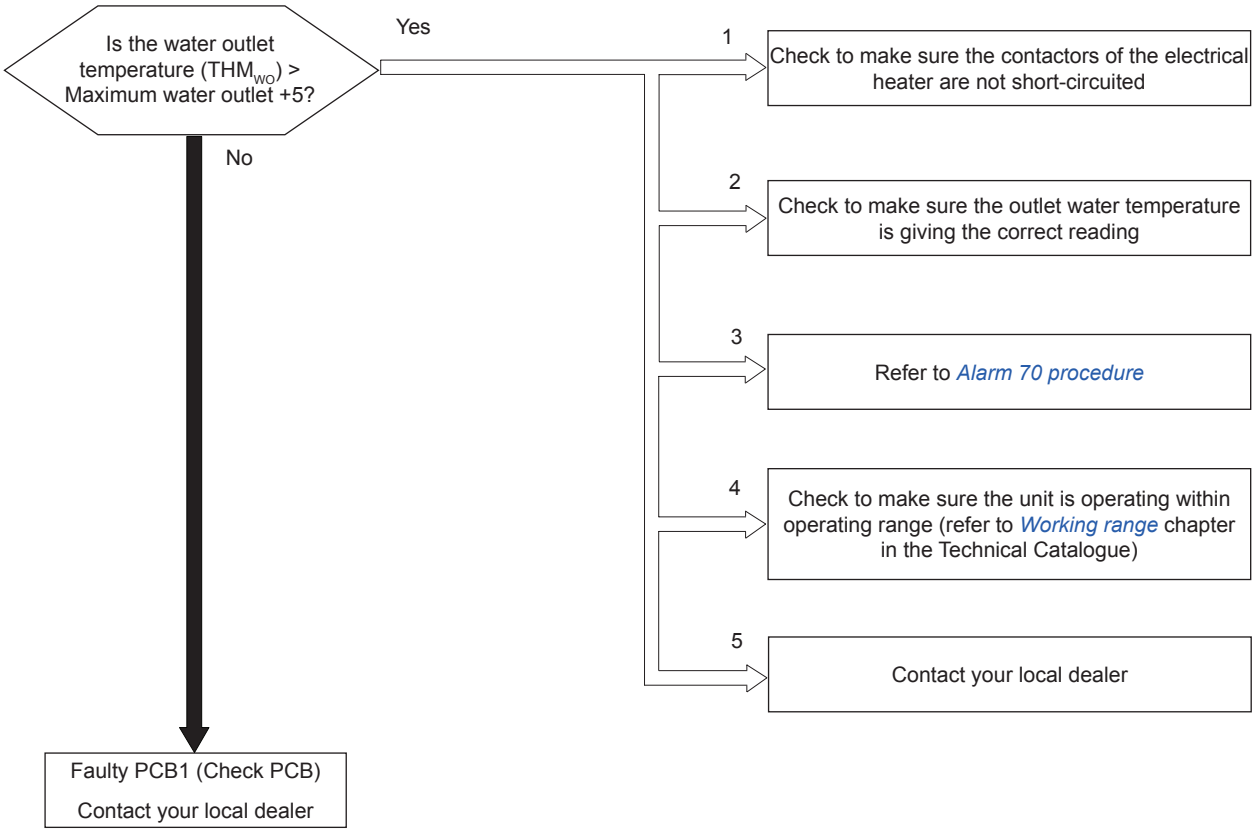
- This alarm code is displayed when temperature of circuit 2 is higher than a determined offset from the maximum water temperature value set for circuit 2 by installer configuration, for 20 seconds.
- This alarm forces all operations to stop, except water pump (Water pump 2 will also be stopped).
- The unit should be stopped to release the alarm.



Alarm code	74	Unit Overheating Limit Protection

Applicable to units	
RWLT	RWHT
○	○

- This alarm code is displayed when water supply temperature (Two) is 5ºC more than maximum water circuit temperature for 20 seconds.
- This alarm forces all operations to stop (Outdoor & Indoor Units), except water pump.
- The unit should be stopped to release the alarm.



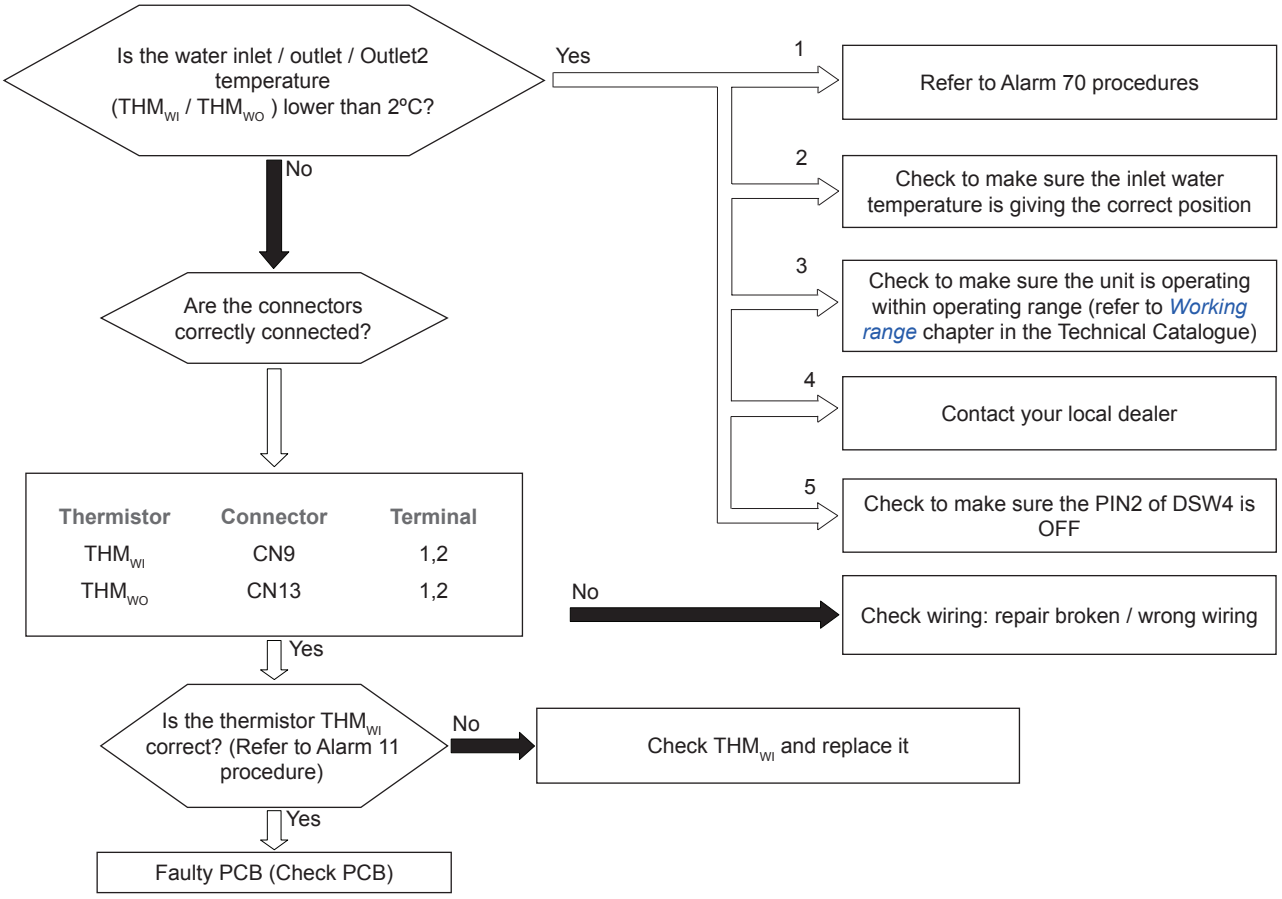
Alarm control procedure:

- Perform retry operation for 6 minutes the first time (Seven-segment shows P74) and keep Outdoor and indoor unit running (except Electrical Heater). After 6 minutes have passed (P74), Switch Stop status OFF for Outdoor and Indoor Units.
  - Switch water pump1 to OFF (if water outlet < 55ºC).
  - Mixing valve closed.

Alarm code	75	Freeze Protection by cold water inlet / outlet temperature detection

Applicable to units	
RWLT	RWHT
○	○

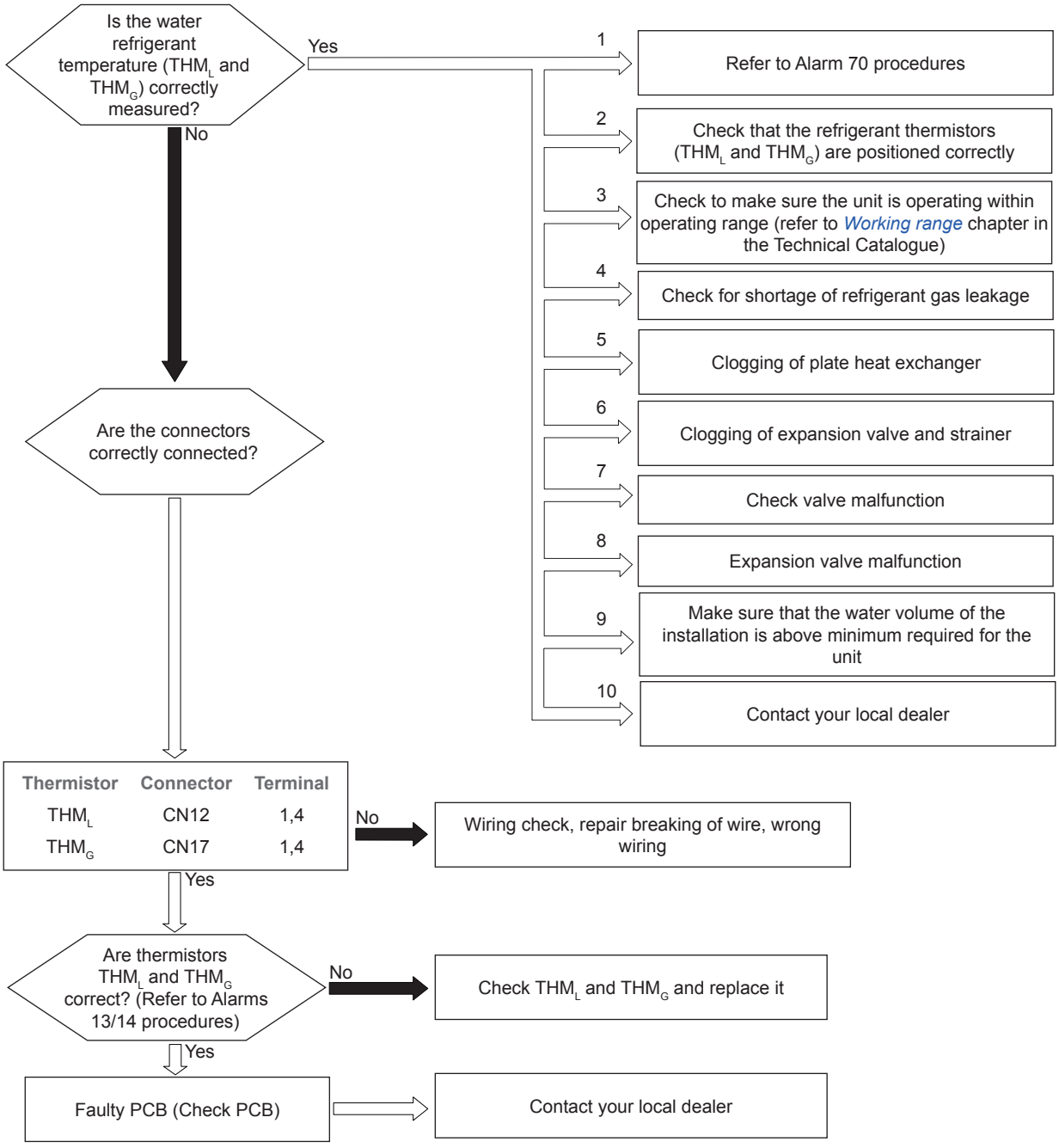
- The alarm code is displayed on the unit controller.
- This alarm code is displayed when the water inlet temperature is ≤ 2ºC during 30 seconds.
- This alarm forces all operations to stop, except water pump.
- The unit should be stopped to release the alarm.
- To release alarm all indoors and outdoors shall be powered OFF.



Alarm code	76	Freeze Protection Stop by indoor liquid temperature thermistor

Applicable to units	
RWLT	RWHT
○	○

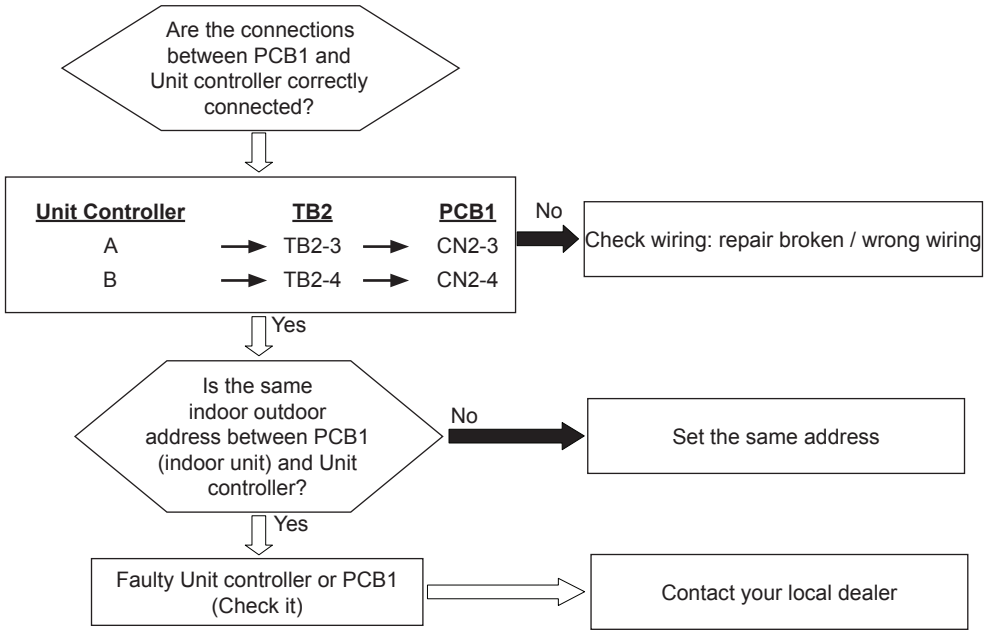
- The alarm code is displayed on the Unit controller.
- This alarm code is displayed when 2 conditions are detected:
  - Condition 1: Gas or Liquid temperature ≤ -10ºC and Two <6ºC, during 30 seconds.
  - Condition 2: Gas or Liquid temperature ≤ -20ºC, during 30 seconds
- This alarm forces all operations to stop, except water pump.
- The unit should be stopped to release the alarm.



Alarm code	80	RCS H-Link communication failure between Indoor unit and Unit controller (PC-ARFWE)

Applicable to units	
RWLT	RWHT
○	○

- The alarm code is displayed on the unit controller when there is no communication between indoor unit PCB and the unit controller for 90 seconds.
- This alarm forces all operations to stop.
- The unit should be stopped to release the alarm.



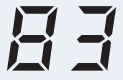
Alarm code		"Momentary power interruption" or "Low voltage detected"

Applicable to units	
RWLT	RWHT
○	○

- This alarm is displayed to indicate a momentary power interruption or a low voltage detected during compressor operation.

A brief power interruption (which may not cause the reset of the microcomputer), may cause, instead, the relay Y52C or the CMC (Contactor for Compressor Motor) to release. Abnormal conditions kept for more than 60 seconds is considered a "Critical power supply problem", since no power is detected but microprocessor is still operating. In this case, Alarm 81 is recorded.

- A power interruption shorter than 2 seconds is considered a "Momentary Power Interruption. In this case, a Control for recovery from "Momentary power interruption is performed.
- A power interruption longer than 3 seconds is considered a "Power failure" and the unit is stopped as a normal stop. In this case no alarm is displayed.
- This alarm forces all operations to stop and force all digital outputs to an OFF state.
- The alarm is released when anomaly conditions are not detected for more than 10 seconds (power restored).

Alarm code		Low pressure anomaly in hydraulic circuit.

Applicable to units	
RWLT	RWHT
○	–

Only RWLT

- This alarm is displayed when a excessive low pressure is detected in the hydraulic circuit for more than 60 seconds and a pump operation is still requested. That does not applies to RWHT units.
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.

Alarm code	100	Compressor protection

This alarm code is displayed when one of the following alarms occurs three times within six hours. If the outdoor unit operates continuously without removing the cause of the alarm, the compressor may be seriously damaged.

Alarm code	Content of abnormality
02	Tripping of protection device in outdoor unit
07	Decrease in discharge gas superheat
08	Increase in discharge gas temperature
41	Cooling overload
42	Heating overload
47	Low pressure decrease protection activating

NOTE

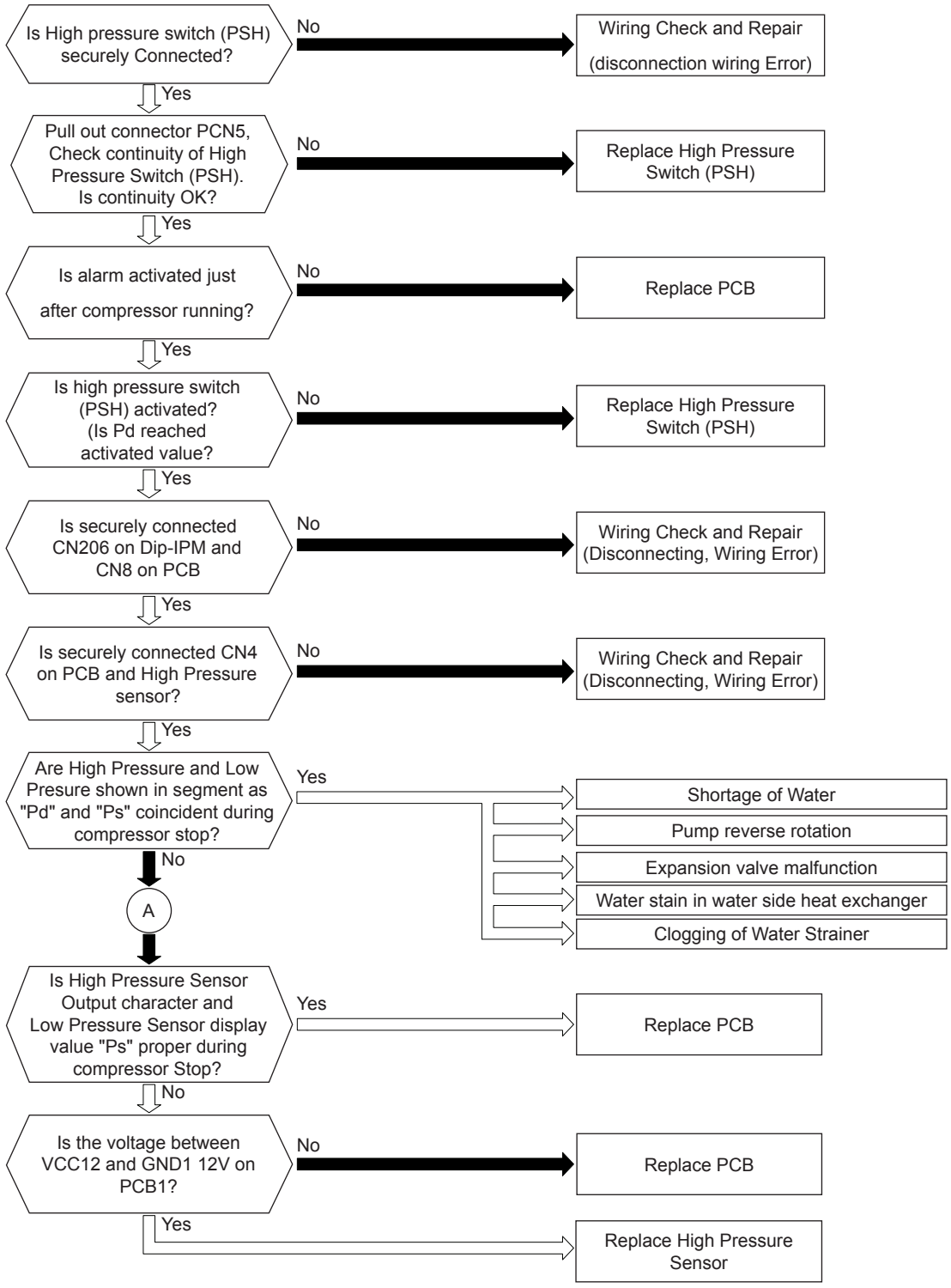
- *You can check these alarms using the check mode 1. Follow the action that is indicated in each alarm chart. You can clear these alarms only by turning OFF the main switch to the system.* **However, you must pay careful attention before starting, because there is a possibility of causing serious damages to the compressors.**
- *This alarm is shown in the outdoor unit with alarm code "EE".*

Alarm code	101	High pressure switch activation control

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm is displayed when there is a constant activation of the high pressure switch activation control.
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.

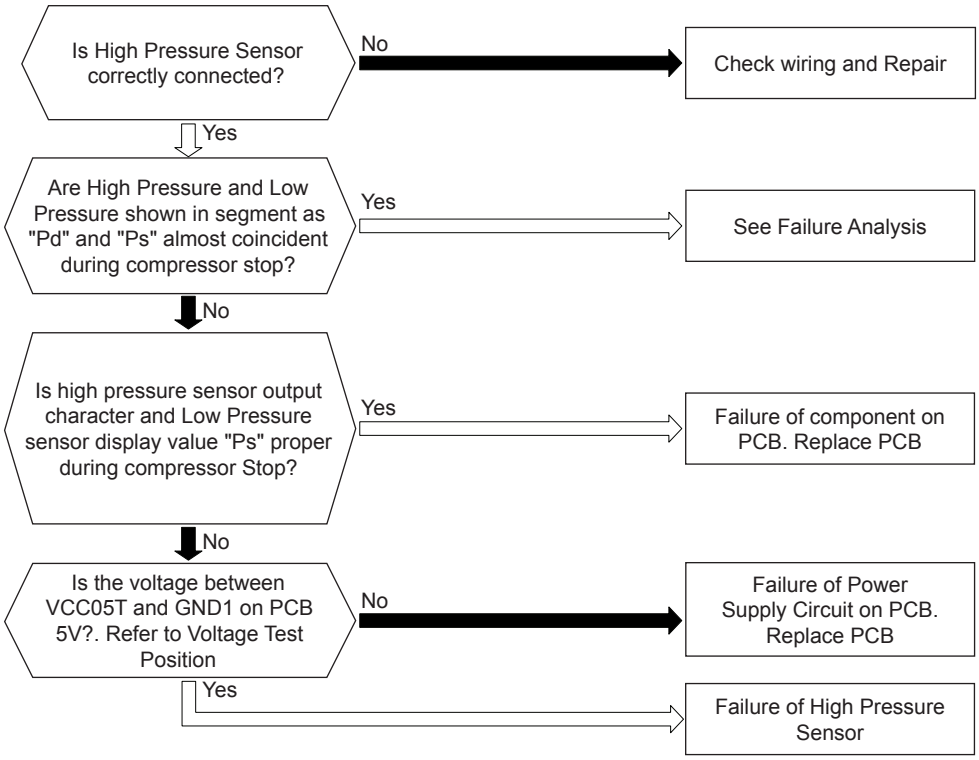


Alarm code	102	Activation of protection control for excessive high pressure

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- During normal operation the Electronic Control stops and restarts automatically after 3 minutes.
- The Stop alarm appears after 3 retries during 30 minutes.
  - This alarm code is displayed when the high pressure (Pd) is incresed to more than 2.78MPa, during 10 seconds.
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.



NOTE

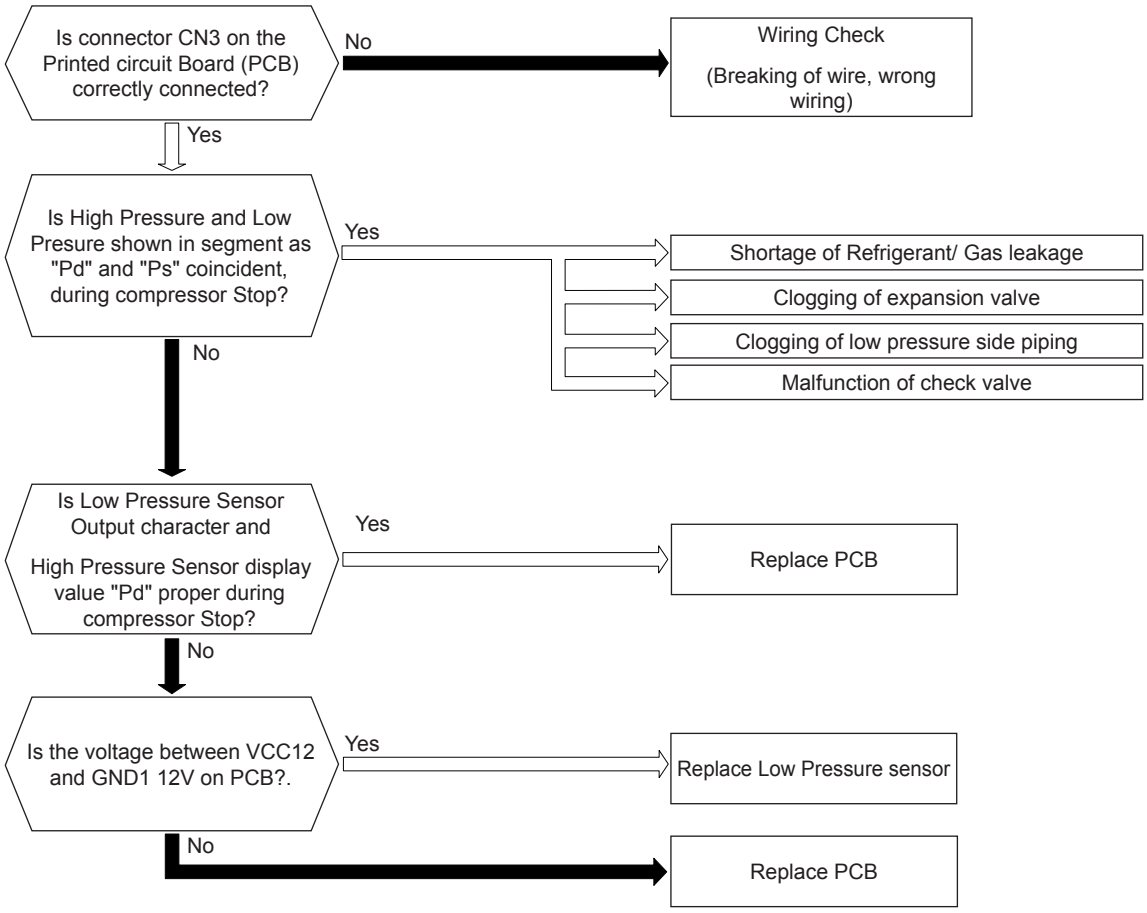
- *In case that the low pressure is higher than 1.6 MPa, segment shows 1.6 MPa.*
- *In this case, connect a pressure gauge to high pressure check joint, check the pressure shown in the gauge.*

Alarm code	104	Activation of protection control for low pressure

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- The electronic control displays the alarm during the operation in heating mode and in the case that this retry occurs 3 times within 30 minutes..
  - In case that the pressure detected by the low pressure sensor continues to be lower than 0.15 MPa for 90 seconds during compressor operation.
  - In case that the pressure detected by the low pressure sensor continues to be lower than 0.10 MPa for 3 continued seconds during 3 minutes after compressor start-up.
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.



NOTE

- *In case that the low pressure is higher than 2.0 MPa, segment shows 2.0 MPa.*
- *In this case, check if the high pressure value "Pd" shown in segment is higher than 1.0 MPa.*

Alarm code	105	Excessive low pressure difference

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- The Stop alarm appears after 3 retries during 30 minutes.
  - This alarm code is displayed when the Pressure Ratio calculated from High Pressure “Pd” and Low Pressure “Ps” is less than 1.8 MPa during 3 minutes.
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.

PCB monitoring position: CN3 and CN4

Retry code: P-11

Calculation Formula for Pressure Ratio:

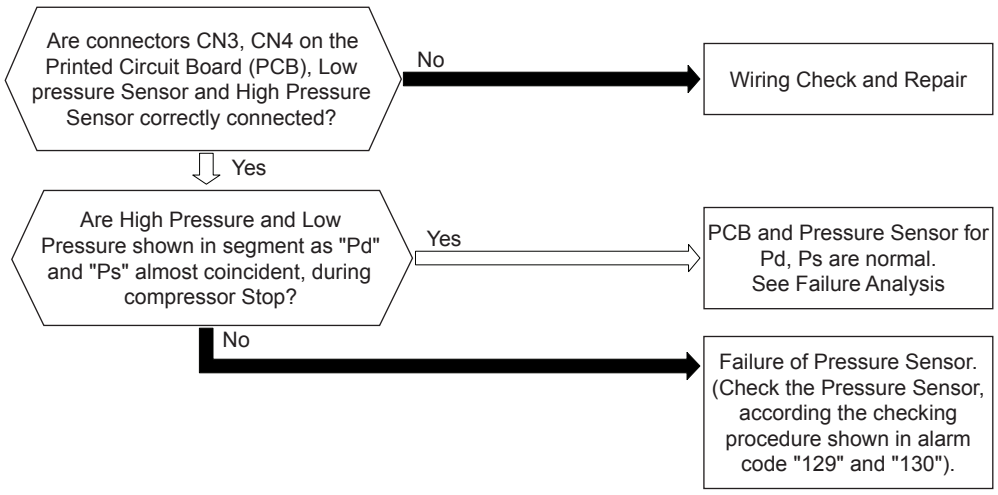
$$\text{Pressure Ratio} = \frac{\text{High Pressure "Pd"} + 0.1}{\text{Low Pressure "Ps"} + 0.1}$$

Example:

Pd= 1.6 MPa

Ps= 0.7 MPa

$$\text{Pressure Ratio} = \frac{1.6 + 0.1}{0.7 + 0.1} = 2.13 \text{ MPa}$$



NOTE

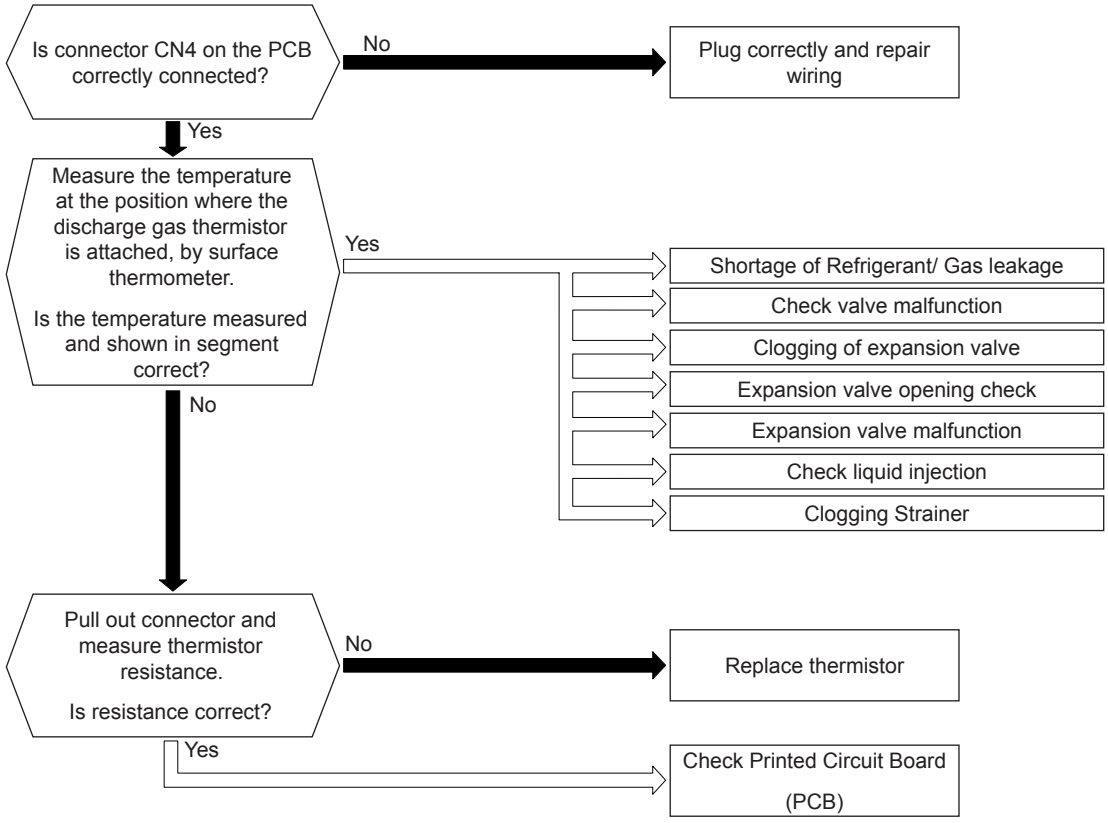
- *In case that the low pressure is higher than 1.6 MPa, segment shows 1.6 MPa.*
- *In this case, connect a pressure gauge to high pressure check joint, check the pressure shown in the gauge.*

Alarm code	106	Excessive high discharge gas temperature

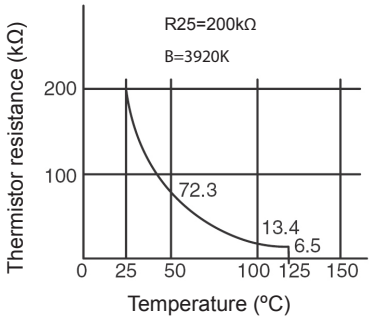
Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm is displayed after a constant detection of an excessively high discharge gas temperature.
- Conditions for detection:
  - The compressor stops in case that the temperature detected by the discharge gas thermistor remains higher than 120ºC for 10 continued minutes
  - The compressor stops in case that the temperature detected by the discharge gas thermistor remains higher than 140ºC for 5 continued minutes.
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.



Measuring the thermistor resistance value:



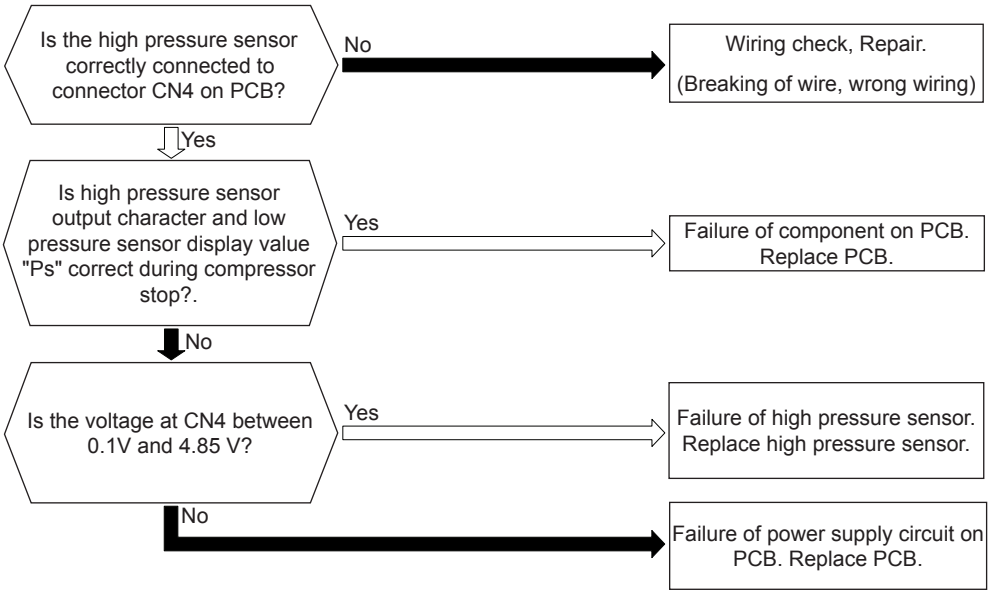
Thermistor resistance characteristics

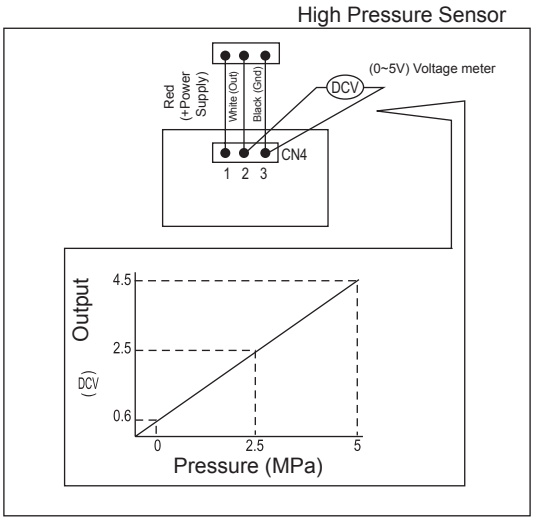
Alarm code	129	Failure of discharge gas pressure sensor

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm code is displayed when there is a constant detection that the thermistor is short circuited, cut or an anomaly has occurred.
- Conditions for anomaly detection:
  - In case that CN4 voltage is lower than 0.1V. (Continually for 3 seeconds).
  - In case that CN4 voltafe is higher than 4.85 V. (Continually for 3 seconds).
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.





NOTE

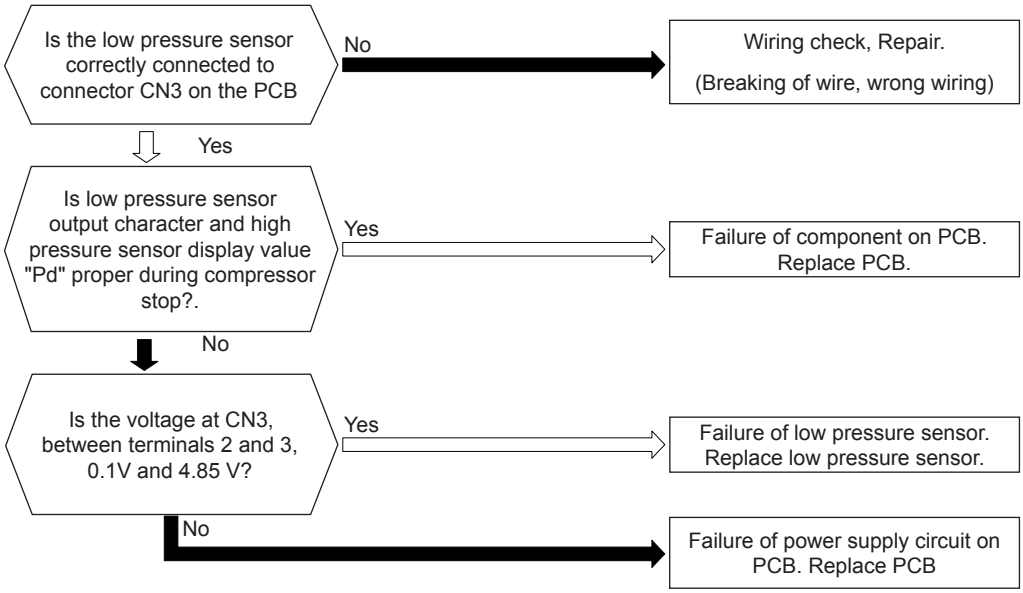
- *In case that the low pressure is higher than 1.6 MPa, segment shows 1.6 MPa.*
- *In this case, connect a pressure gauge to high pressure check joint, check the pressure shown in the gauge.*

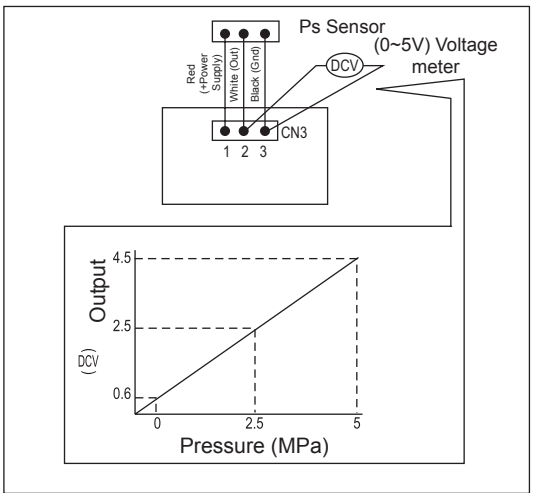
Alarm code	130	Failure of suction gas pressure sensor

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm code is displayed when there is a constant detection that the thermistor is short circuited, cut or an anomaly has occurred.
- Conditions for anomaly detection:
  - In case that CN3 voltage is lower than 0.1V. (Continually for 3 seconds).
  - In case that CN3 voltage is higher than 4.85 V. (Continually for 3 seconds).
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.



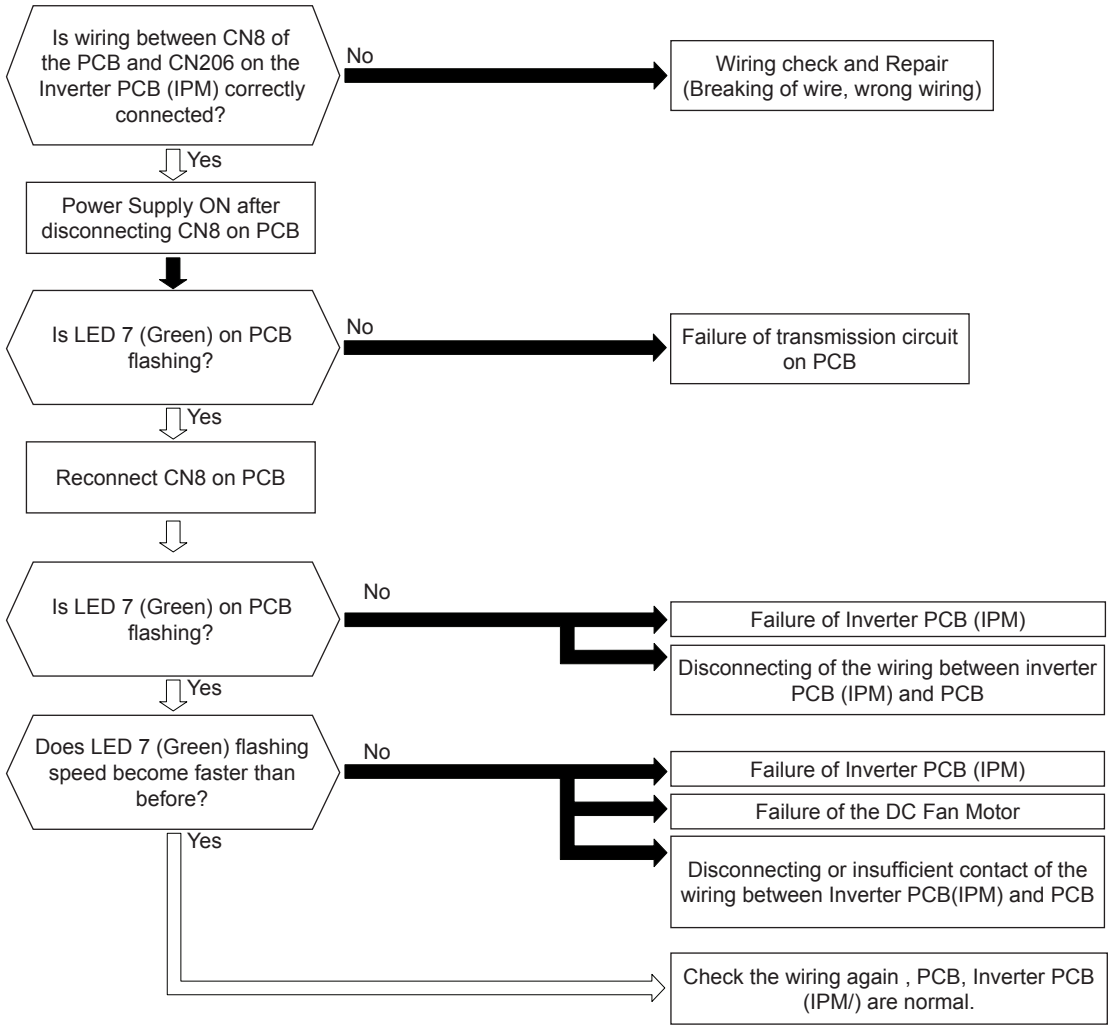


Alarm code	132	Transmission error between Inverter PCB and main PCB

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm code is displayed when the communication between PCB and Inverter (IPM) is not performed correctly or inverter module is not detected during 30 seconds.
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.



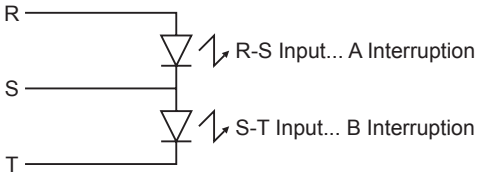
Alarm code	134	Power source phase abnormality control

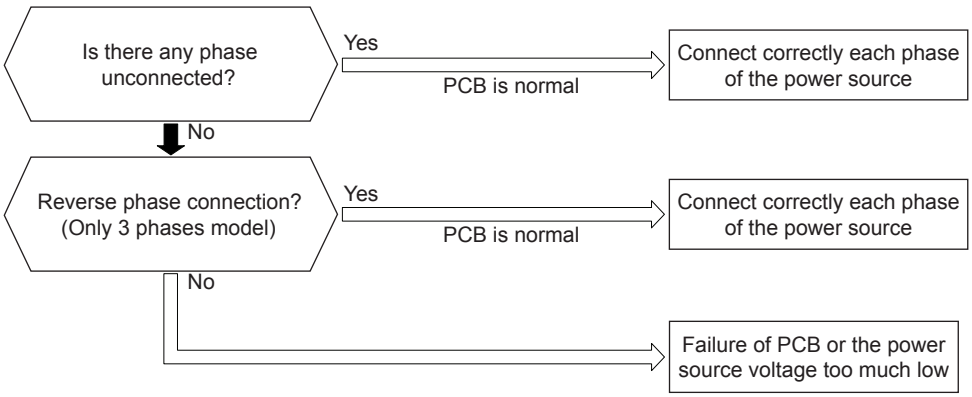
Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm code is displayed when the power source phases are reversely connected or one phase is not connected. (DSW1-1; ON).
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.

In the case of a 3phase, 380V-415V:



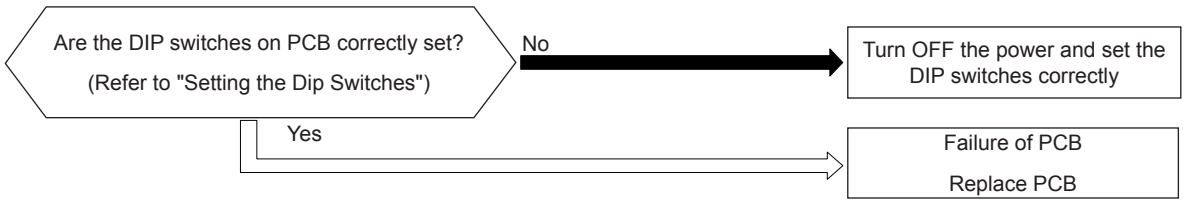


Alarm code	135	Incorrect PCB setting

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm code is displayed when wrong settings are performed in DIP switches of PCB.
- The abnormality conditions must be kept during 3 seconds during indoor unit compressor operation
  - In case that the input signal detected by the inverter does not match with the normal transmission of the upstream control device.
- This alarm forces all operations to stop (Outdoor & Indoor units).
- The unit should be stopped to release the alarm.

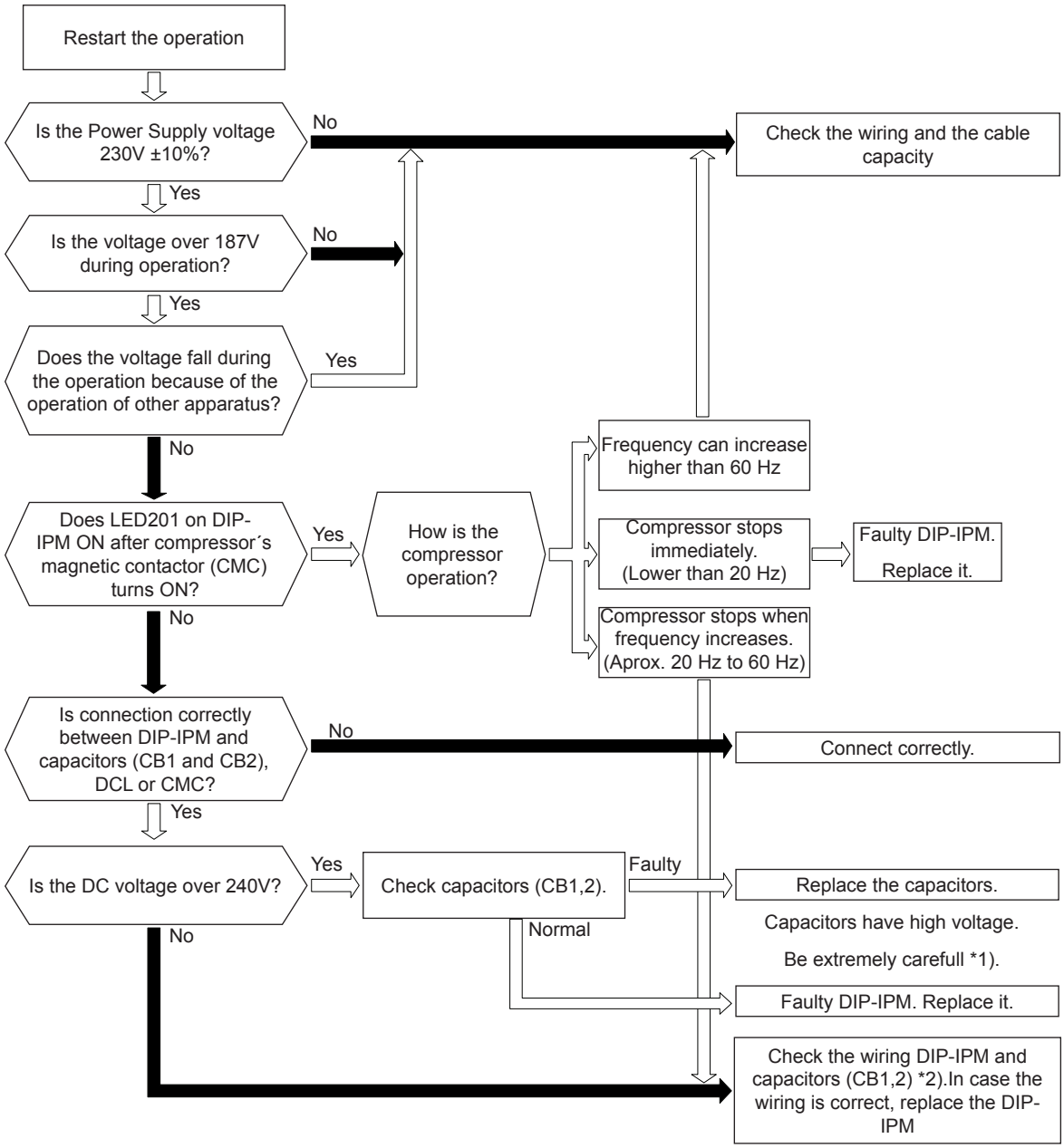


Alarm code	151	Inverter votage abnormality control

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm code is displayed when the voltage between terminal “P” and “N” of DIP-IPM is insufficient and the abnormality conditions are detected 3 times in 30 minutes.
- This alarm forces all operations to stop except the water pump.
- The unit should be stopped to release the alarm.



DANGER

Electrical hazard. Risk of electrical shock. Be extremely carefull because of the high voltage.

Alarm code	152	Abnormal operation of the current sensor

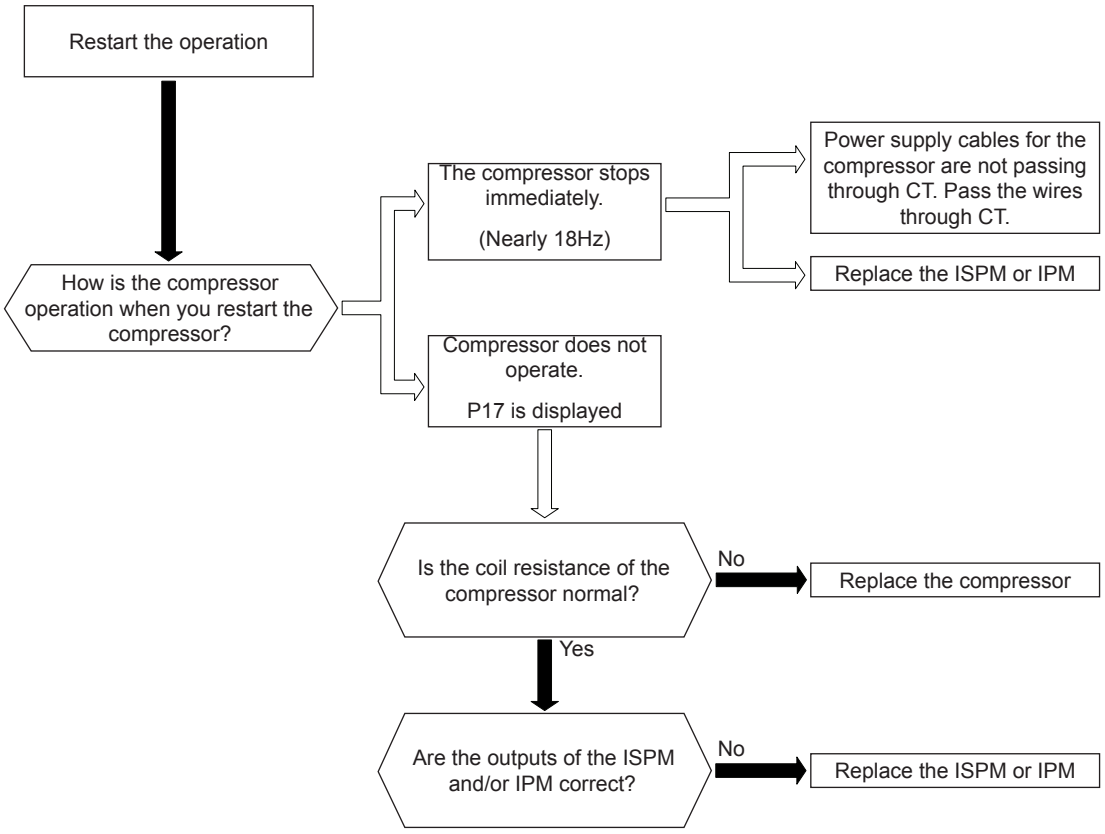
Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- The alarm appears after 3 retries during 30 minutes.
  - This alarm code is displayed when the frequency of the compressor is maintained at 15~18 Hz after the compressor is started, one of the absolute values of the running current at each phase U+, U-, V+ and V- is less than 1.5A (including 1.5A).
- This alarm forces all operations to stop except the water pump.
- The unit should be stopped to release the alarm.

DANGER

Electrical hazard. Risk of electrical shock. Before checking and replacing the inverter parts perform the high voltage discharge procedure by referring to section "6.5 Checking procedure for main parts".



Alarm code	153	Activation of protection for inverter overcurrent (I)

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

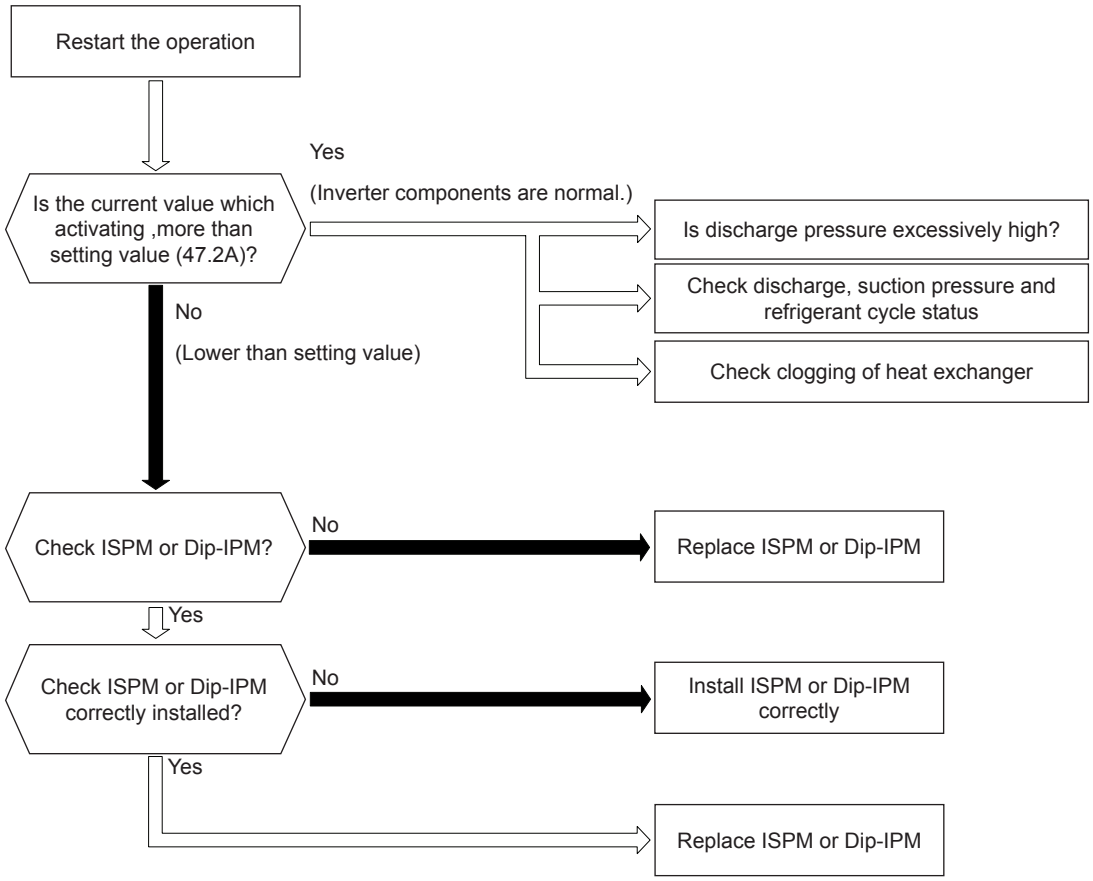
- This alarm is displayed when an unwanted stop of the compressor occurs during an indoor compressor operation
- The compressor stops and restarts automatically in 3 minutes. The alarm appears after 6 retries during 30 minutes.
- This alarm code is displayed when:
  - There is an inverter stop code 2 (Inverter momentary overcurrent; Motor current > 150%)

or

  - There is an inverter stop code 4 (Electronic thermal activation. Rated current by current sensor = 105% for 30 continued seconds or in case that the accumulated time exceeds 3 minutes in a 10-minutes period)
- This alarm forces all operations to stop except the water pump.
- The unit should be stopped to release the alarm.

DANGER

Electrical hazard. Risk of electrical shock. Before checking and replacing the inverter parts perform the high voltage discharge procedure by referring to section "6.5 Checking procedure for main parts".



Alarm code	153	Activation of protection for inverter overcurrent. (II)

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

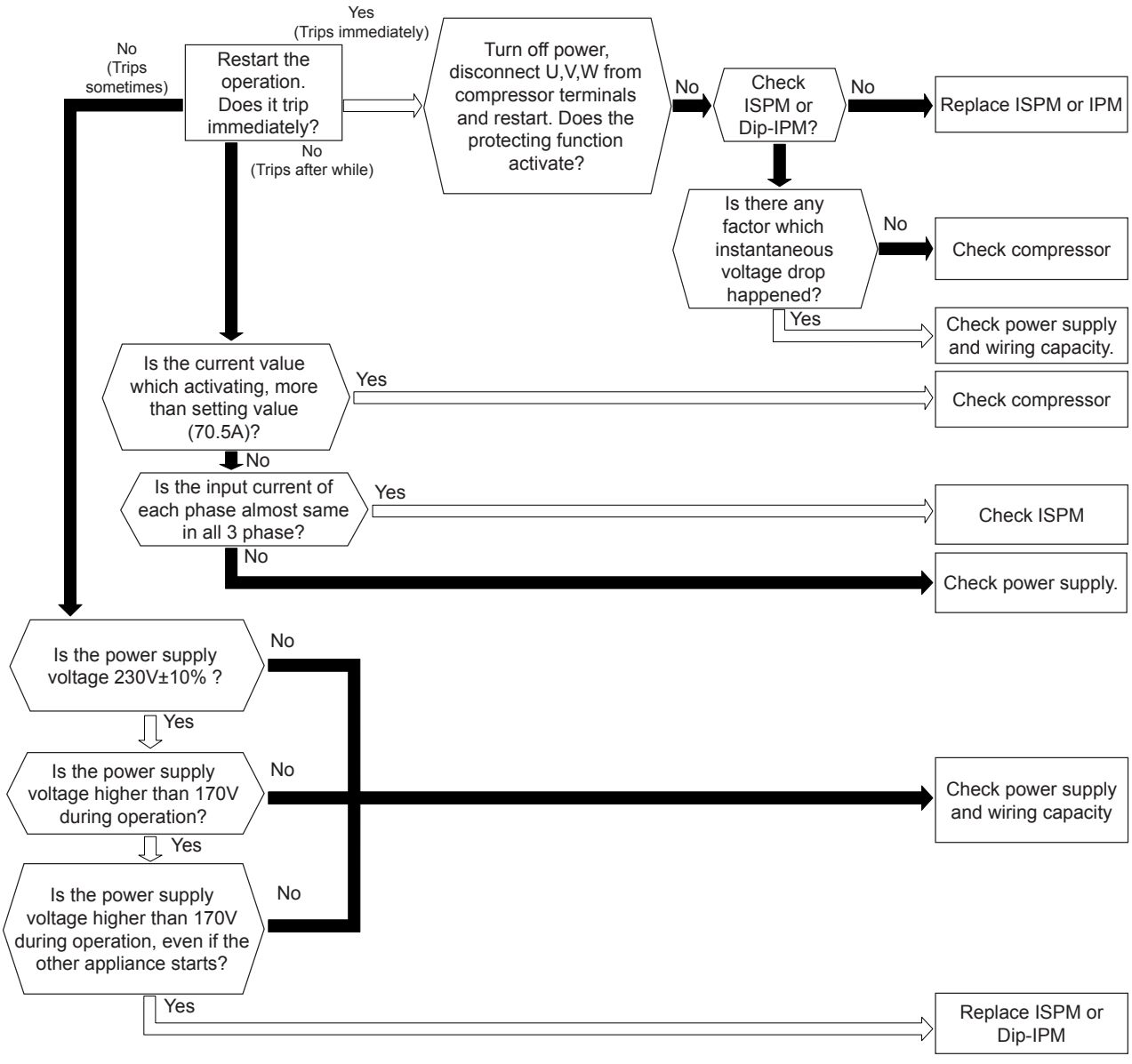
- This alarm is displayed when an unwanted stop of the compressor occurs during an indoor compressor operation
- The compressor stops and restarts automatically in 3 minutes. The alarm appears after 6 retries during 30 minutes.
- This alarm code is displayed when:
  - There is an inverter stop code 2 (Inverter momentary overcurrent; Motor current > 150%)

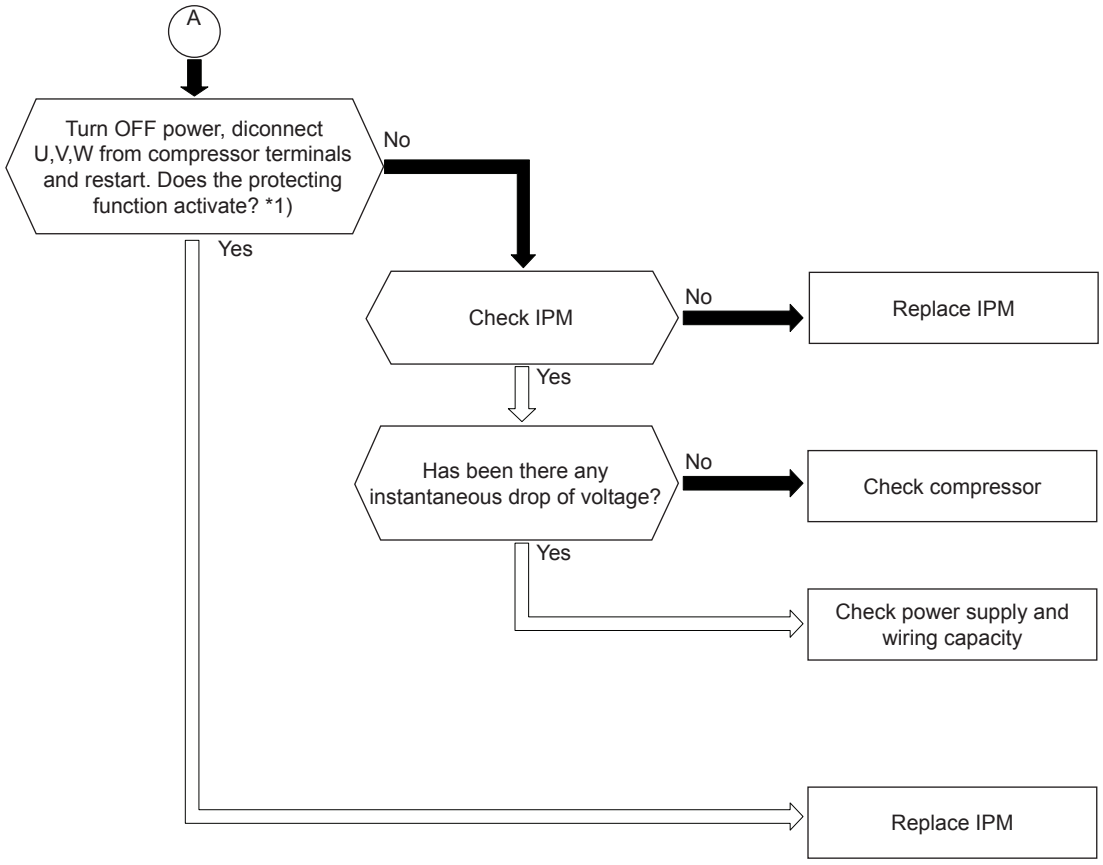
or

  - There is an inverter stop code 4 (Electronic thermal activation. Rated current by current sensor = 105% for 30 continued seconds or in case that the accumulated time exceeds 3 minutes in a 10-minutes period)
- This alarm forces all operations to stop except the water pump.
- The unit should be stopped to release the alarm.

DANGER

Electrical hazard. Risk of electrical shock. Before checking and replacing the inverter parts perform the high voltage discharge procedure by referring to section "6.5 Checking procedure for main parts".





NOTE

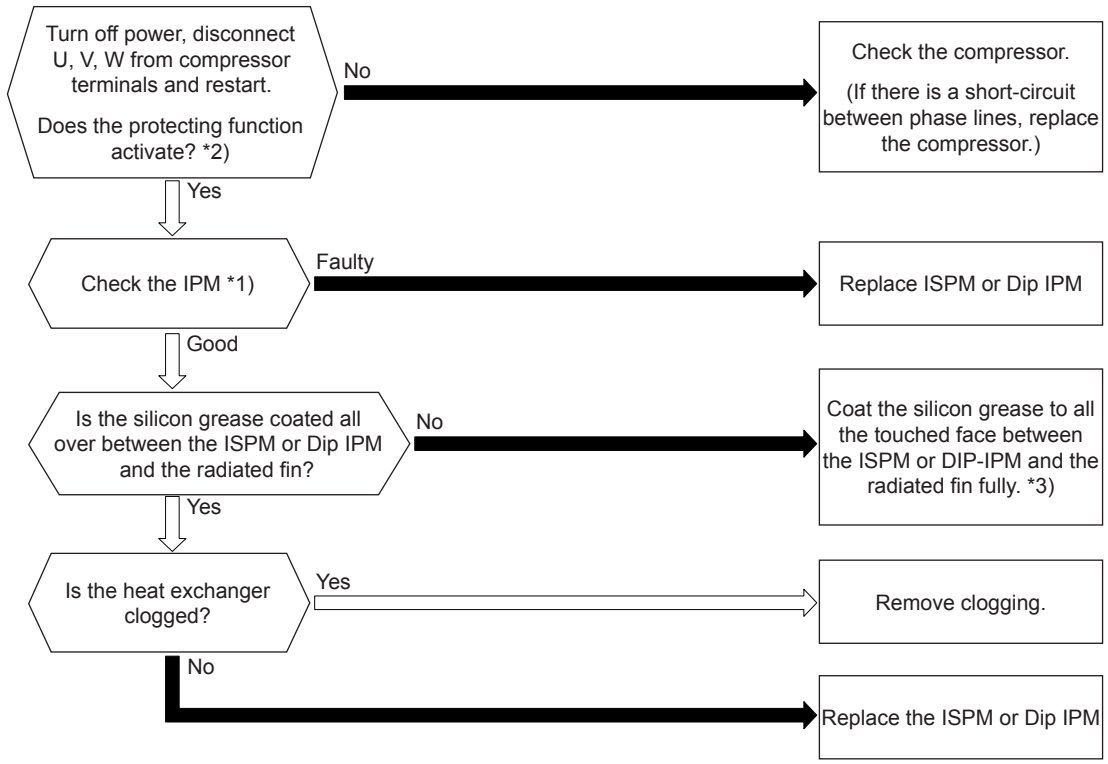
**1): Turn ON the No.1 switch of the DIP switch on ISPM when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the No.1 switch of the DIP switch on ISPM.*

Alarm code	154	Activation of transistor module protection

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm is displayed when an unwanted stop of the compressor occurs during an indoor compressor operation.
- The compressor stops and restarts automatically in 3 minutes. The alarm appears after 3 retries during 30 minutes.
- This alarm code is displayed when:
  - There is a faulty signal from IPM (Overcurrent protection, power voltage drop protection, short circuit protection).
  - There is an earth detection.
  - In case of a synchronism loss detection for 5 times.
- This alarm forces all operations to stop except the water pump.
- The unit should be stopped to release the alarm.

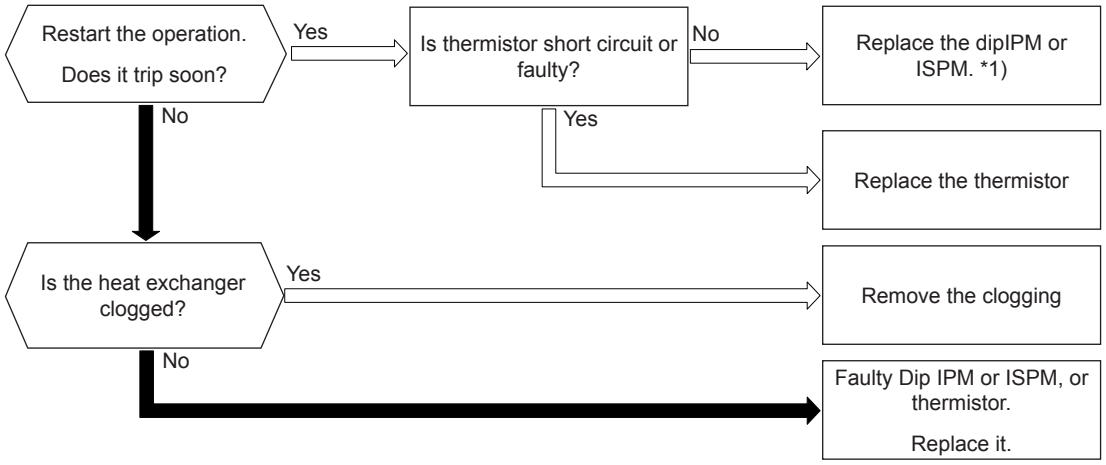


Alarm code	155	Inverter fin thermo abnormality control

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- The compressor stops when the temperature of the thermistor for inverter fin excess 100ºC, and restarts automatically in 3 minuntes.
- The alarm appears after 3 retries during 30 minutes.
- This alarm forces all operations to stop except the water pump.
- The unit should be stopped to release the alarm.



NOTE

1) Perform the high voltage discharge work by referring to the section "6.5 Checking procedure for main parts" before checking and replacing the inverter components.*

Alarm code		Inverter non-operation

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm is displayed when an unwanted stop of the compressor occurs during an indoor compressor operation.
- This alarm is activated when a communication anomaly is detected:
  - During inverter stop
  - During inverter activation
  - During inverter activation when activation of 63H is detected.
  - After finishing a starting control, in case that real frequency received is zero when it should not be zero.
- This alarm forces all operations to stop except the water pump.
- The unit should be stopped to release the alarm.

Alarm code		Other abnormalities.

Applicable to units	
RWLT	RWHT
–	○

Only RWHT

- This alarm is displayed when an unwanted stop of the compressor occurs during an indoor compressor operation. The alarm is activated due to a momentary power failure detected. The reasons of the momentary power failure are explained below:
  - When an error signal from IPM is detected.
  - After a micro controller reset, in case that the frequency order is other than 0Hz or constant data is no being received although constant data is being sent.
  - An open phase detection.
  - Activation of the protection detection device.
  - In case that an anomaly is detected at the protection detection device.
  - A 63H activation is continuously detected.
- This alarm forces all operations to stop except the water pump.
- The unit should be stopped to release the alarm.

Alarm code		Wrong settings of PC-ARFWE

Applicable to units	
RWLT	RWHT
(○)	(○)

- This alarm is displayed when a wrong settings of PC-ARFWE is detected: More than 1 Master, or more than one PC-ARFWE controlling same circuit as Room thermostat).
- Alarm recovery: After a proper configuration of the PC-ARFWE and launching a "Check RT address" from the PC-ARFWE master.

Alarm code	203	Slave PC-ARFWE stops answering to Master PC-ARFWE

Applicable to units	
RWLT	RWHT
(○)	(○)

- This alarm is displayed when a slave PC-ARFWE stops answering to Master PC-ARFWE for more than 3 minutes or when 2 Slave PC-ARFWE are controlling the same circuit.
- Alarm recovery:
  - In case of an alarm detected because of a lost communication, the alarm is recovered when communication is established again.
  - In case of a configuration of 2 thermostats but only 1 is installed, it is required to launch a "Check RT addres" from the PC-ARFWE master.

Alarm code	204	Indoor unit stops answering to Master PC-ARFWE

Applicable to units	
RWLT	RWHT
(○)	(○)

- This alarm is displayed when an indoor unit stops answering to Master PC-ARFWE for more than 3 minutes.
- Alarm recovery: When the communication is established again the alarm is recovered.

Alarm code	205	Central Alarm, no Central message

Applicable to units	
RWLT	RWHT
(○)	(○)

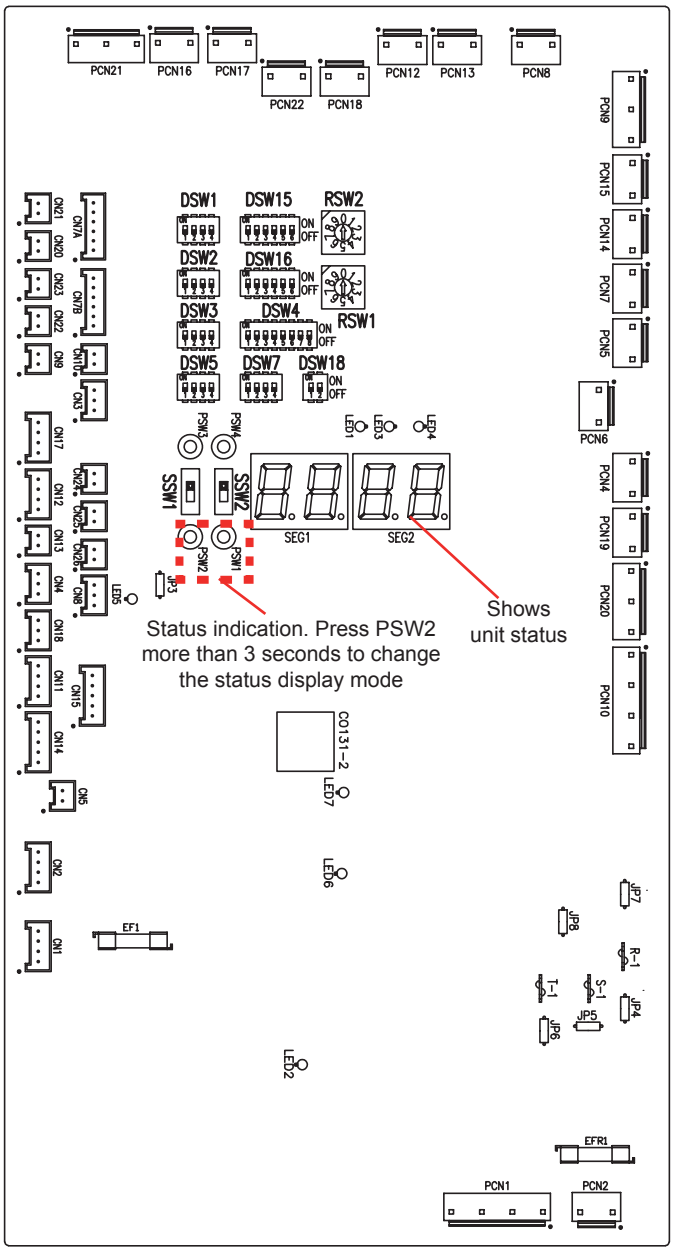
- This alarm is displayed there is no messages from the central for more than 30 seconds.
- Alarm recovery: When the communication is established again the alarm is recovered.

6.4 Troubleshooting in check mode

6.4.1 Troubleshooting using the 7 segment display

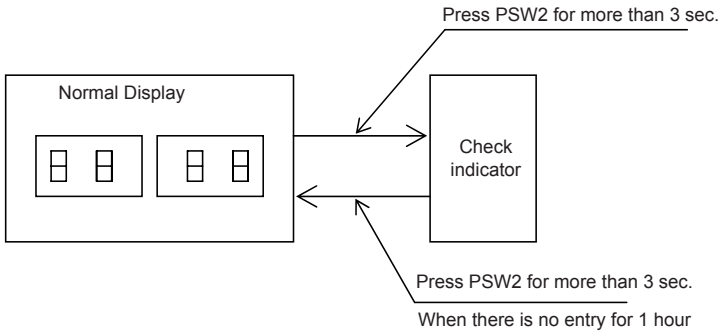
◆ Check indicator function (PCB)

Below is the 7segment position in PCB1:



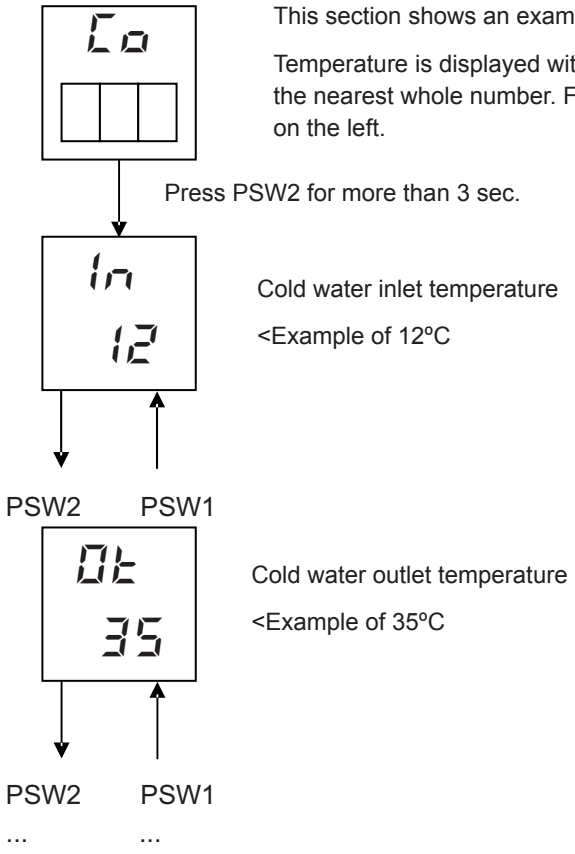
Operating conditions may be checked by 7-segment and push switches (PSW) on the PCB1 in the indoor unit. During checking data, do not touch the electric parts except for the indicated switches because 220-240V is applied to them. Pay attention not to contact the tools with electrical parts. If contacted, electrical parts will be damaged.

Change to check indicator mode to display different items.



This is he procedure to follow to check with the combination of checking switches (▲: PSW2 ▼: PSW1):

- To start checking, press PSW2 switch for more than three seconds.
- To proceed checking, press the PSW2 switch.
- To back to the previous item, press the PSW1 switch.
- To cancel this checking, press the PSW2 switch for more than 3 seconds.



This section shows an example of “check indication”

Temperature is displayed with the number rounded up to the nearest whole number. Fix the minus sign to the box on the left.

Cold water inlet temperature

<Example of 12ºC

Cold water outlet temperature

<Example of 35ºC

◆ Check mode items PCB1

Code Display	Data display	Description
oF hE hS SP AL	St oF on bo 888	Normal operation
tH	88.8	Heat water Temperature Setting (ºC)
tc	88.8	Cold Water Temperature Setting (ºC)
in	88.8	Water Inlet Temperature (THM_{WI}) (ºC)
ot	88.8	Water outlet Temperature (THM_{WO}) (ºC)
o2	88.8	Water outlet Temperature Circuit 2 (THM_{WO2}) (ºC)
A1	88.8	Auxiliary temperature 1 (THMaux1)
oh	88.8	Water outlet Temperature DHW (THM_{DHW}) (ºC)
A2	88.8	Auxiliary temperature 2 (THMaux2)
tA	88.8	Outdoor Unit Ambient Temperature (THM7) (ºC)
A3	88.8	Auxiliary temperature 3 (THMaux3)
t1	88.8	Outdoor Unit Average Ambient Temperature (2 hours) (ºC)
t1.	88.8	Second Outdoor Unit Average Ambient Temperature (2 hours) (ºC)
tG	88.8	Indoor unit refrigerant Gas Temperature (THM_G) (ºC)
tL	88.8	Indoor unit refrigerant Liquid Temperature (THM_L) (ºC)
td	88.8	Discharge GasTemperature R410A (ºC)
td.	88.8	Discharge GasTemperature R134a (ºC) (Only RWHT)
t5	888	Evaporation gas Temperature (R410A) (ºC)
t5.	888	Evaporation gas Temperature (R134a) (ºC) (Only RWHT)
tF	88.8	Inverter Fin temp R134a (Only RWHT)
Pd	8.88	Discharge Pressure R134a (Only RWHT)
P5	8.88	Suction Pressure R134a (Only RWHT)
SH	88.8	TsSH (Super Heat Suction temp R134a) (Only RWHT)
SH.	88.8	TdSH (Super Heat Discharge temp R134a) (Only RWHT)
dF	888	Defrosting
d1	888	Cause of stoppage
it.	888	R134a Inverter stop cause code
h1	888	Inverter Operation frequency (Hz)
h2.	888	Inverter Operation frequency R134a (Only RWHT)
E1	888	Indoor Expansion valve opening (%)
E2	888	Indoor Expansion valve opening R134a (Only RWHT)
Eo	888	Outdoor Expansion valve opening (%)
PP	888	Water Pump (0-100)
FF	888	Water Pump Feedback Frequency (0-100)
FP	8.88	Water flow (m^3/h)
P1	888	Compressor running current (A) (Only RWHT)
di	888	Digital inputs
do	888	Digital outputs
ou	888	Refrigerant Cycle Address
iu	888	Indoor Unit Address

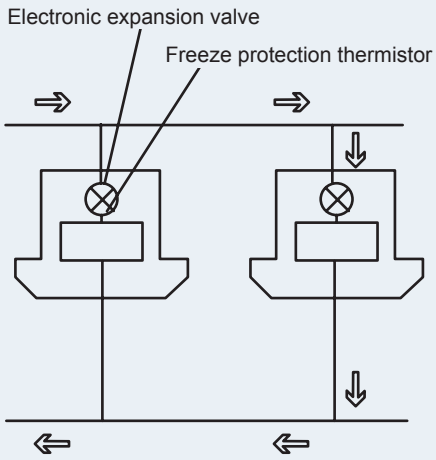
Code Display	Data display	Description
no	888	ROM Nº
Cd	888	Capacity Code
Co	888	Outdoor capacity Code
CP	888	Unit Type (See Table Below)

Indoor & Outdoor Unit Capacity Code

Capacity	Code
3HP	22
5HP	40
10HP	80

6.5 Checking procedure for main parts

6.5.1 Checking procedure for the electronic expansion valve for indoor and outdoor units

<table>
<tr><th></th><th>Indoor unit electronic expansion valve</th><th>Outdoor unit electronic expansion valve</th></tr>
<tr><td>Locked with fully closed</td><td>Check the liquid pipe temperature during the heating process. It is abnormal if the temperature does not increase.</td><td>It is abnormal if the liquid pipe pressure does not increase during the pump down process.</td></tr>
<tr><td>Locked with slightly open</td><td rowspan="2">It is abnormal under the following condition:
The temperature of the freeze protection thermistor becomes lower than the suction air temperature when the unit which is under checking stops and the other units are under the pump down process.
 
</td><td>It is abnormal if the liquid pipe pressure does not increase and the outlet temperature of the expansion valve decreases after the pump down process starts.</td></tr>
<tr><td>Locked with fully open</td><td>It is abnormal under the following conditions: after the heating process for more than 30 minutes, the discharge gas temperature of the compressor is not 10°C higher than the condensing temperature and there is no other faults, such as an excessive charge of refrigerant and others.</td></tr>
</table>

7. Maintenance notes

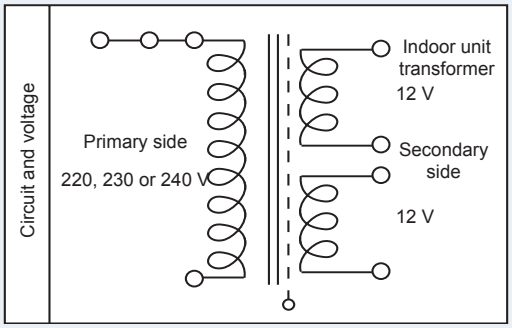
Index

7.1 General notes 188
7.1.1 Checking the power source and the wiring connection 188
7.1.2 Burnt-out compressor due to an insufficient refrigerant charge 188
7.2 Maintenance work 189
7.2.1 General procedure 189
7.2.2 Descaling (RWLT) 192
7.2.3 Draining 193
7.2.4 Evacuation and refrigerant charge 194
7.3 Service and maintenance record 195
7.4 Service and maintenance record using the 7-segment display 196
7.5 Service and maintenance record by Unit controller 198

7.1 General notes

7.1.1 Checking the power source and the wiring connection

Check the following items in the case of abnormal operation:

No.	Check item	Procedure
1	Is the breaker of the fuse cut out?	Check the secondary voltage of the breaker and the fuse by means of a tester.
2	Is the secondary power source on the transformer correct?	Disconnect the secondary side of the transformer and check the voltage by means of a tester. 
3	Is the wiring loosened or incorrectly connected?	Check the wiring connection on the PCB. • Thermistor connectors • Connector of the transformer • Connector of the Unit controller cable • Each connector in a high-voltage circuit Check the connectors according to the **electrical wiring** diagram.

7.1.2 Burnt-out compressor due to an insufficient refrigerant charge

Question and answer for the field work

Example 1: Burnt-out compressor due to an insufficient refrigerant charge	
Phenomenon	After commissioning the alarm code “08” sometimes occurred and the compressors were burnt out after operating for two months.
Cause	The refrigerant piping work was performed during the summer season. The additional refrigerant was not sufficiently charged from the discharge gas side. This insufficient refrigerant charge resulted in the overheating of the discharge gas and the oil deterioration which was finally due to the separated operation despite the alarm code “08”.
Countermeasure	1 The compressor was replaced with a new compressor. 2 The correct refrigerant amount was charged according to the refrigerant piping length.
Remarks	Additional refrigerant charge: Open the liquid stop valves slightly when you charge the additional refrigerant from the check joint of the liquid stop valves (the discharge gas side) during the cooling process. If the liquid stop valve is fully open it is difficult to charge the additional refrigerant. Do not charge the refrigerant from the gas stop valve.

7.2 Maintenance work

CAUTION

- *All inspections and checks of the outdoor unit and indoor unit have to be carried out by a licensed technician and never by the user itself.*
- *Before any inspection and check the unit main power supply has to be switched OFF.*
- *Wait minimum 10 minutes or more from all power supply have been turned OFF.*
- *Take care with the crankcase heater. It could operate even when compressor is OFF.*
- *Take care with the electrical box components. Some of them could remain hot after switch OFF the unit.*

NOTE

All these maintenance operations must be done with appropriate materials and following this manual.

7.2.1 General procedure

To ensure good operation and reliability of the indoor unit its main parts and field wiring have to be checked periodically.

The following checks have to be done by qualified technicians at least once a year:

1 Cabinet
   - Stain: Check for any stain and remove it cleaning if it is the case.
   - Fixing screw: Check for any loosened screw or any lost screw. Tighten the loosened screws and replace the lost screws.
   - Insulation material: Check for any peeled thermal insulator on the indoor part of the covers. Repair the thermal insulator.

2 Water piping connection
   - Leakage: Check there are no water leakages neither in the inlet and outlet water connections (space heating and DHW if used), nor in the main water circuit nor the tank connections. Check all the joints, connections and circuit elements.

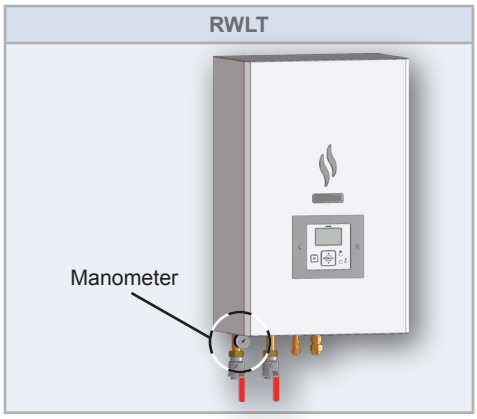
   NOTE
   - *If leakage is detected in the inlet/outlet water connections, repair it and remember to replace the gaskets.*
   - *Pay special attention to the water pipe connection placed over the electrical box.*

3 Water flow and pressure:
   - Water flow:
     - Space heating: Check the water flow (m^3/h) through the unit controller in the “Heat Pump Details” of the “Operation Information” menu.
     - DHW (if used): Check whether the water circulation is correct along all the DHW circuit.
   - Pressure checking:
     - Space heating: Check the water pressure using the manometer in the indoor unit. This value shall be between 1.5 and 2.0 bars approximately (1.8 bars is a proper value).

The manometer is placed at different positions according to each unit model.

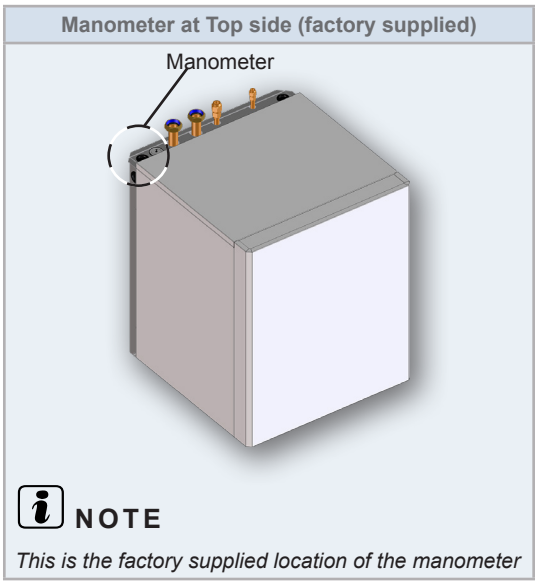
◆ HYDRO FREE Low temperature

In RWLT models, the manometer is installed factory supplied as it is shown:



◆ HYDRO FREE High temperature

RWHT has special configurations for the position of the manometer. While it is factory supplied in only one position (left side), it can be moved by the installer to the right side or to the front of the unit. For example, in case of a wall at the left side or at both sides of the RWHT unit, respectively.



NOTE

- *The water pressure must remain above 1 bar in order to prevent air from entering the circuit, and below 3.0 bars (safety valve opening value).*
- *DHW (if used): Check there is no loss of pressure and ensure that DHW pressure is not higher than 6 bars. Connect a gauge to the DHW drain port for this purpose.*

4 Security water valve for DHW (if used):

- Operation: Check the correct operation of the security water valve (pressure and temperature relief valve) at the DHW inlet connection. Remember that this element must ensure that the following functions are provided: Pressure protection, non-return function, shut-off valve, filling and draining.

5 DHW Tank inspection hatch

The DHW tank has an inspection hatch at the bottom. This hatch allows the inspection of the interior of the tank.

DANGER

Be careful when using this inspection hatch. There are high temperature and high pressure inside the tank. Before open it wait a reasonable time for the water to cool.

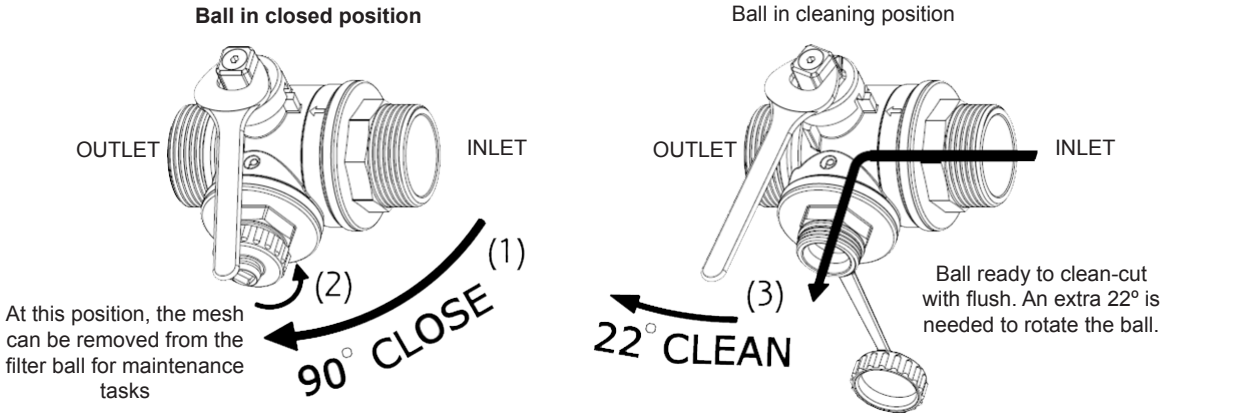
For a safe operation using the inspection hatch, proceed as it is explained in the manual of the specific unit.

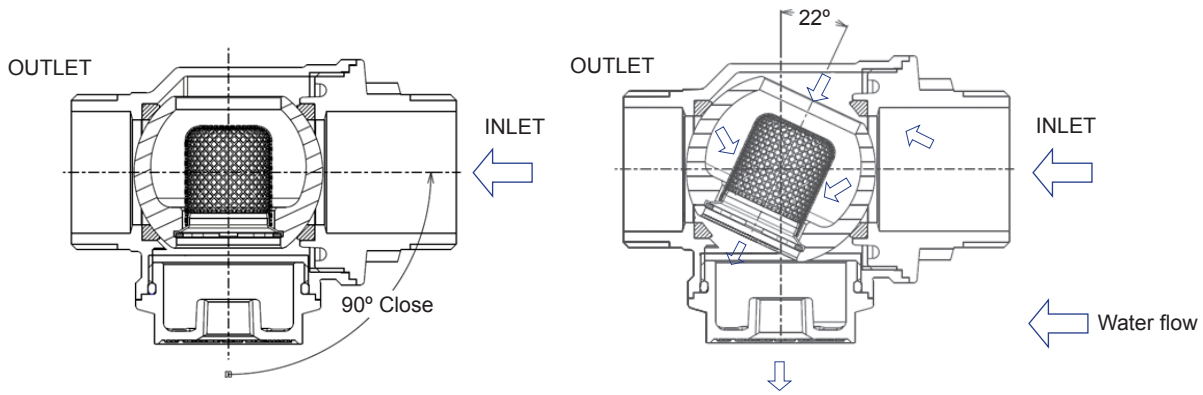
Additional hydraulic elements are necessary in the DHW circuit.

6 Filter plus

The Filter plus valve is an on-off ball valve containing an interchangeable cylindrical filter which is easy to inspect and remove for normal maintenance operations. Normally, Filter plus ball valve it is used as a shut-off valve by turning the handle 90º clockwise (1).

Filter+ ball valve makes the maintenance operations easier. Once the valve is in closed position, open the draining port tap(2) and, by turning the handle up to 22º clockwise, the water from the inlet is guided behind the filter and runs in opposite direction through the draining port(3). The water circuit can be cleaned even under full pressure, avoiding the need to drain the unit prior the cleaning process. After cleaning, simply close the draining port tap(2), and open the valve again.





NOTE

The draining port must be connected to the sewage system by means of a hose or a pipe.

CAUTION

- *Take care when draining the unit. Ensure the connection of the hose or drain pipe in order to avoid water leakage on any electrical component.*
- *The expelled water could be hot and could keep in pressure. Take care with this draining.*

7 Safety valve
- Operation: Check the correct operation of the indoor unit safety valve (pressure relief valve) on the space heating circuit. Open it manually and some water should be expelled by its connected drain pipe.

8 Air purger:
- Excessive air: Check the correct operation of the indoor unit air purger. Turn it twice at least, since there may be air in the water circuit, which needs to be expelled by this air purger.

9 Water pump:
- Pump performance curves: Check as explained in point 3 that water flow and pressure is in accordance with the Pump performance curves.
- Electrical connection: Check the correct connection of the electrical wiring of the water pump. If moisture is detected in the pump surface, revise the water pipes, since a water leakage could have been occurred.

10 Fixing points tightening:
- Check the fixing points of the indoor unit. Check the indoor unit wall support. The indoor unit has to be always in a vertical position.

11 Refrigerant piping connection
- Leakage: Check for the refrigerant leakage at the refrigerant piping connections in the indoor unit. Check the different connections of the plate heat exchanger.

12 Electrical equipment
- Activation: Check for an abnormal activation of the magnetic contactor, the relay, the PCBs and others.
- Line condition: Pay attention to the working voltage, the working amperage and the working phase balance. Check for any faulty contact that is caused by the loosened terminal connections, the oxidized contacts, the foreign matter and other items. Check the electrical insulation resistance.

13 Control device and protection device
- Setting: Do not readjust the setting in the field unless the setting is maintained at a point that is different from the point listed in the Service Manual.

14 Ground wire
- Ground line: Check for the continuity to earth in the main electrical components.

15 Electrical box air filter (RWHT only)

Periodically check the air filter in the electrical box and clean if necessary. Carry out the inspection more frequently depending on the environment and the level of dust in the air where the unit is installed.

7.2.2 Descaling (RWLT)

Water quality and set temperature can affect the scale production and it can deposit on the surface of the plate heat exchanger, restricting the heat exchange and the good operation of the unit.

NOTE

Descaling should be necessary periodically at certain intervals depending on the supplied water quality.

Check the scale level when proceeding maintenance to ensure reliability of the unit.

If necessary, proceed with descaling:

1 Switch OFF the main power supply of the indoor unit.
2 Empty the indoor unit water as explained in “Draining” procedure.
3 Proceed with descaling of the plate heat exchangers.
4 Ensure that the water quality remains compliant with the EU council directive 98/83 EC.

7.2.3 Draining

NOTE

Draining operation is unique for each model. Refer to the instructions detailed below.

◆ **Draining operation for RWLT**

RWLT models have no drain port factory supplied. It must be considered the installation of a drain port after the shut-off valve (factory supplied) and before the water inlet of the unit when proceeding to the installation of the unit.

◆ **Draining operation for RWHT**

To drain the indoor unit follow the next procedure:

1 Switch OFF the main power supply of the indoor unit.
2 Close the 2 shut-off valves (factory-supplied) installed at the space heating connections (Water inlet and outlet connections).
3 Connect a drain pipe to the drain port of the shut-off valves and lead it to the general draining system.
4 Open manually the drain port of the shut-off valves and collect the water into a bucket.
5 Once all the water has been drained, close again the drain port of the shut-off valves and open the main shut-off valve to restart the normal operation.

CAUTION

When draining the indoor unit water from its drain port, the leaved water could be hot and could keep in pressure. Perform the draining procedure carefully.

7.2.4 Evacuation and refrigerant charge

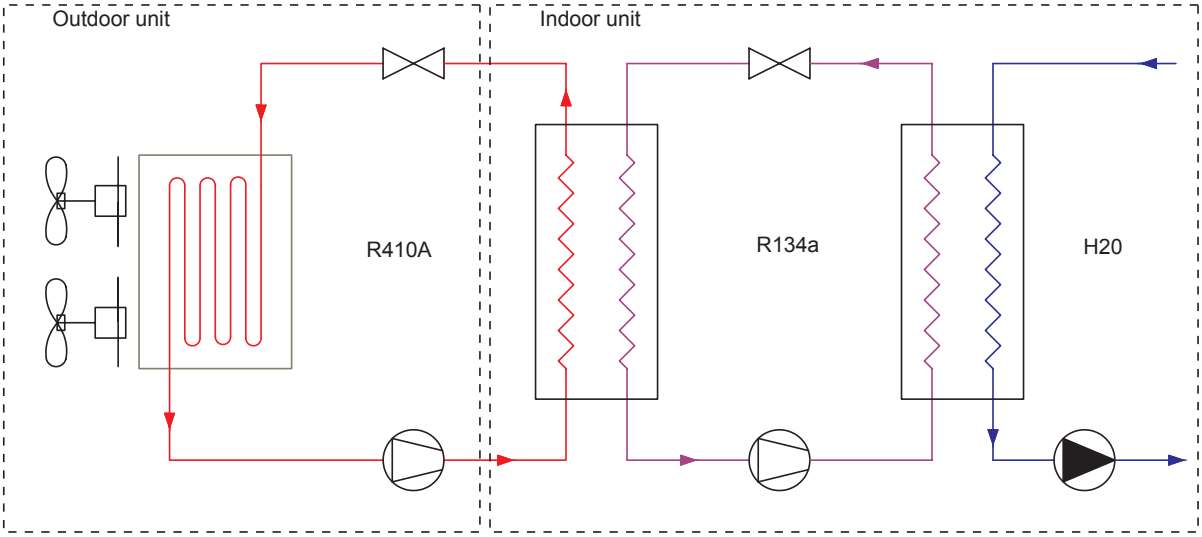
Turn ON the DSW4 PIN2 to simplify the refrigerant recovery work, refrigerant evacuation work, refrigerant charge and air tight test during servicing by fully open the solenoid valve of indoor unit.

NOTE

- *Make sure to cancel this mode after refrigerant recovery work, refrigerant evacuation work, refrigerant charge and air tight test is completed.*
- *Make sure to turn ON the power supply of indoor unit when activate this mode. Expansion valve and solenoid valve are not activated if the units are not supplied with power.*
- *DO NOT activate this mode for the objective other than refrigerant recovery work, refrigerant evacuation work and air tight test. Otherwise, it may cause unit failure because the operation is stopped by different from normal control.*

Special note for RWHT refrigerant charge

The RWHT has two refrigerant circuits. The R410A circuit (1st cycle) works with this refrigerant while the indoor circuit (2nd cycle) works with R134a refrigerant. Piping connections must be performed in the R410A cycle between the outdoor unit and the indoor unit.



- The 1st cycle (R410A) is factory charged with a refrigerant charge amount for 30m of piping length. The maximum refrigerant piping length is 30m so it is not required an additional refrigerant charge.
- The 2nd cycle (R134a) connections are factory installed and refrigerant charged so no piping work or refrigerant charge is needed.

Refrigerant charge before shipment (W_0 (kg))

Unit type	Unit model	W_0 (kg) R410A	W_0 (kg) R134a
Indoor unit	RWHT	-	1.9

NOTE

- *Refer to the outdoor unit Installation and operation manual to charge the R410A refrigerant inside the indoor unit.*
- *Remember to supply power to the indoor unit and switch the DSW1-2 ON of its PCB1. Thereby, solenoid valves SV1 and SV2 of the indoor unit will open to allow the operation of vacuum and refrigerant charge inside the indoor unit. It is very important to remind to switch the DSW1 PIN2 to OFF when finishing the whole procedure.*

CAUTION

- *Appropriate refrigerant*
  - *The refrigerant used in each unit is identified on the specification label and manuals of the unit. HITACHI shall not be held liable for any failure, trouble, malfunction or accident caused by units illegally charged with refrigerants other than the specified one.*
- *Consequences of charging non-specified refrigerant*
  - *It may cause mechanical failure, malfunction and other accidents. It may cause operational failure of protection and safety devices of air conditioners. It may also cause lubrication failure of the sliding part of the compressor due to deterioration of refrigerant oil.*
  - *In particular, hydrocarbon refrigerants (such as propane, R441A, R443A, GF-08, etc.) are not allowed, since these are combustible and may cause major accidents such as fire and explosion in case of improper handling.*
- *Once a non-specified refrigerant has been charged, no further servicing (including draining of refrigerant) shall be performed, even in case of malfunction. Improper handling of refrigerant may be a cause of fire and explosion, and servicing in such cases may be considered an illegal act.*
- *End clients and costumers shall be informed that servicing is not approved, and the installer who charged the non-specified refrigerant shall be asked to fix the unit.*
- *HITACHI will accept no responsibility for units that have been charged with non-specified refrigerant once.*

7.3 Service and maintenance record

Nº	Check item	Action	Judgement	
1	Is the service area sufficient?	—	Yes	No
2	Any heat influence?	—	Yes	No
3	Is the ground wire connected?	—	Yes	No
4	Refrigerant piping.	—	Good	Not Good
5	Water piping.	—	Good	Not Good
6	Fixing the unit	—	Good	Not Good
7	Is there any damage on the outer surface or the internal surface?	—	Yes	No
8	Checking the screw and the bolts.	Tighten if loosened.	Tightened	Not Tightened
9	Tightening the terminal screws.	Tighten all the terminal screws with a Phillips screwdriver.	Tightened	Not Tightened
10	Insulation resistance.	Measure the insulation resistance with an insulation resistance meter and check if it is greather than 3MΩ.	Good	Not Good
11	Does the drain water flow smoothly?	Check the smooth flow by pouring some water.	Good	Not Good
12	Check for a leakage in the heat exchanger.	ditto	Good	Not Good
13	Check for a leakage in the strainers.	ditto	Good	Not Good
14	Check for a leakage in the electronic expansion valve	ditto	Good	Not Good
15	Check for a leakage in the piping.	ditto	Good	Not Good
16	Check for a leakage in the water safety valve.	ditto	Good	Not Good
17	Check for a leakage in the water pump.	ditto	Good	Not Good
18	Voltage among each phase.	Higher than AC220V.	Good	Not Good
19	Vibration and sound.	Check the pump motor.	Good	Not Good
20	Activation of each operation mode.	Check the activation of Space heating/ cooling, DHW and swimming pool and solar panel if the case.	Good	Not Good
21	Water High-pressure cut-out switch.	Check the actual activation value.	Good	Not Good
22	Water flow switch	Check the actual activation value.	Good	Not Good
23	Water manometer.	Check the correct value indication.	Good	Not Good
24	Check the activation of the air purger.	Check by increasing the pressure.	Good	Not Good
25	Check the activation of the drain-up mechanism through the safety valve.	Check the activation during work.	Good	Not Good
26	Water inlet temperature of the indoor unit.	—	(°C)DB	(°C)WB
27	Water outlet temperature of the indoor unit.	—	(°C)DB	(°C)WB
28	Water pressure switch.	—	kg/cm²G	
29	Operating voltage.	—	V	
30	Operating current.	—	A	
31	Instructions to the client about the cleaning method.	—	Done	Not yet
32	Instructions to the client about the operation.	—	Done	Not yet

7.4 Service and maintenance record using the 7-segment display

The displayed contents of the check items shown in the table below are not available for all HYDRO FREE range, and are displayed depending on the horsepower of the outdoor unit, and that classification indicated in brackets at the end of the table.

Customer's name:_____		Date:_____
		HYDRO FREE MOD._____
Operation mode		
Test run start time		
Data collect start time		
Read out data from 7-segment in PCB1		
Protection control code		
Heat water temperature Setting	tH	
Cold Water temperature Setting	tC	
Water Inlet temperature (THM_{WI})	in	
Water outlet temperature (THM_{WO})	ot	
Water outlet temperature circuit 2 (THM_{WO2})	o2	
Auxiliary temperature 1 (THM_{aux1})	A1	
Water outlet temperature DHW (THM_{DHW})	oh	
Auxiliary temperature 2 (THM_{aux2})	A2	
Outdoor unit ambient temperature	tA	
Auxiliary temperature 3 (THM_{aux3})	A3	
Outdoor Unit Average Ambient Temperature (2 hours)	t1	
Second Outdoor Unit Average Ambient Temperature (2 hours)	t1.	
Gas Space heating Temperature (THM_g)	tG	
Liquid Temperature (THM_l)	tL	
Discharge Gas temperature R410A	td	
Discharge Gas temperature R134a (*1)	td.	
Evaporating gas temperature R410A (*1)	tS	
Suction gas temperature R134a (*1)	tS.	
Inverter Fin temperature R134a (*1)	tF	
Discharge Pressure R134a (*1)	Pd	
Suction Pressure R134a (*1)	PS	
TsSH Super Heat Suction temperature R134a (*1)	SH	
Defrosting	dF	
Cause of stoppage R410A Compressor	d1	
Cause of stoppage R134a Compressor (*1)	d1.	
R134a Inverter stop cause code (*1)	it.	
Inverter Operation frequency R410A	h1	
Inverter Operation frequency R134a (*1)	h2.	
Indoor Expansion valve opening R410A	E1	
Indoor Expansion valve opening R134a (*1)	E2	
Outdoor Expansion valve	Eo	
Water Pump (0-100)	PP	
Water Pump Feedback Frequency (0-100)	FF	
Water flow (m^3/h)	FP	
Compressor running current R410A (A)	P1	
Compressor running current R134a (A) (*1)	P1.	
Digital Inputs	di	
Digital Outputs	do	

Customer's name:_____		Date:_____
		HYDRO FREE MOD._____
Refrigerant Cycle Address	oU	
Indoor Unit Address	iU	
ROM Nº	no	
Capacity Code (See Table below 3*)	Cd	
Outdoor Capacity Code (See Table Below 3*)	Co	
Unit Type (See Table Below 3*)	CP	

NOTE

*(*1): Only RWHT*

NOTE

- *OU: Outdoor Unit.*
- *IU: Indoor unit.*
- *(*): Indoor/Outdoor unit capacity code*
- *(*3)*

Unit	Code
RWLT	1
RWHT	20

Capacity	Code
3.0 HP	22
5.0 HP	40
10.0 HP	80

7.5 Service and maintenance record by Unit controller

Sheet for main data checking by Unit controller

Customer's name:_____	**Date:**_____
OU serial Nº	
OU Nº / alarm code	
IU serial Nº	
IU Nº / alarm code	

REF	Access mode	Description	Default Value	Range	Steps	Units
System Operation						
OPSt		Operation Status	OFF	OFF Cool D-OFF Cool T-OFF Cool ON Heat D-OFF Heat T-OFF Heat ON DHW OFF DHW ON SWP OFF SWP ON Alarm XXX (XXX= Code number)	-	-
HPEVI	🔧	Indoor expansion valve opening (%)	-	Variable value	-	%
HPEVI2	🔧	Indoor expansion valve 2 opening (%)(*8)	-	Variable value	-	%
HPEVO	🔧	Outdoor expansion valve opening (%)	-	Variable value	-	%
HPH4	🔧	Inverter operation frequency (R410a)	-	Variable value	-	Hz
HPH42	🔧	Inverter operation frequency (R134a)(*8)		Variable value	-	Hz
HPDEF	🔧	Defrosting	-	Variable value	-	-
HPDI	🔧	Cause of stoppage	-	Variable value	-	-
HPP1	🔧	Compressor running current (R410A)	-	Variable value	-	A
HPP1r134	🔧	Compressor running current (R134a)(*8)	-	Variable value	-	A
PCBFirmware		Indoor PCB Firmware	-	Variable value	-	-
Uspec	🔧	Unit capacity	-	Variable value	-	HP
C2MVP	🔧	Mixing valve position (%)	-	Variable value	-	%
Actual Temperatures						
HPTi	🔧	Water inlet temperature	-	Variable value	-	ºC
HPTo	🔧	Water outlet temperature	-	Variable value	-	ºC
C2Two	🔧	Water outlet temperature C2 (*2)	-	Variable value	-	ºC
DHWt		DHW temperature (*3)	-	Variable value	-	ºC
SWPt		Swimming pool temperature (*4)	-	Variable value	-	ºC
HPTg	🔧	Gas temperature (R410A)	-	Variable value	-	ºC
HPTl	🔧	Liquid temperature (R134a)(*8)	-	Variable value	-	ºC
OPTa	🔧	Outdoor ambient temperature	-	Variable value	-	ºC
OPTa.2	🔧	Second ambient temperature	-	Variable value	-	ºC
OPTav		Outdoor ambient average temperature	-	Variable value	-	ºC
OPTav2.		Second ambient average temperature	-	Variable value	-	ºC
HPTd	🔧	Discharge gas temperature (R410A)	-	Variable value	-	ºC
HPTd2	🔧	Discharge gas temperature (R134a)(*8)	-	Variable value	-	ºC
HPPs	🔧	Suction gas temperature	-	Variable value	-	ºC
C1Rt		Room temperature C1 (*6)	-	Variable value	-	ºC
C2Rt		Room temperature C2 (*2)	-	Variable value	-	ºC
Set Point						
OPst		Water temperature setting	-	Variable value	-	ºC
C1OTCs		Water OTC Setting Temperature (*1)	-	Variable value	-	ºC
C2OTCs		Water OTC Setting Temperature (*1)(*2)	-	Variable value	-	ºC
C1Rt		Room temperature set point C1 (*7)	-	Variable value	-	ºC
C2Rt		Room temperature set point C2 (*2)	-	Variable value	-	ºC
DHWst		DHW temperature set point	-	Variable value	-	ºC
SWPst		SWP temperature set point (*5)	-	Variable value	-	ºC
Alarm History						

🔧: Available only for installer.

NOTE

- *(*1): Water OTC Setting T C1 and C2 will not be shown when Water calculation C1 is disabled.*
- *(*2): It will be shown only when Circuit 2 is enabled and Room thermostat is installed.*
- *(*3): DH Water T° (DHWst) will be only shown when DHW status (DHWs) is enabled.*
- *(*4): Swimming pool T° (SWPt) will be shown only when Swimming pool status (SWP) is enabled.*
- *(*5): SWP T° set point (SWPs) will be shown only when Swimming pool status (SWP) is enabled.*
- *(*6): Room T° C1 (*C1Rt*) will be only shown when Room thermostat is installed.*
- *(*7): Room T° set point C1 (*C1Rs*) will be only shown when Room thermostat is installed.*
- *(*8): Only RWHT.*

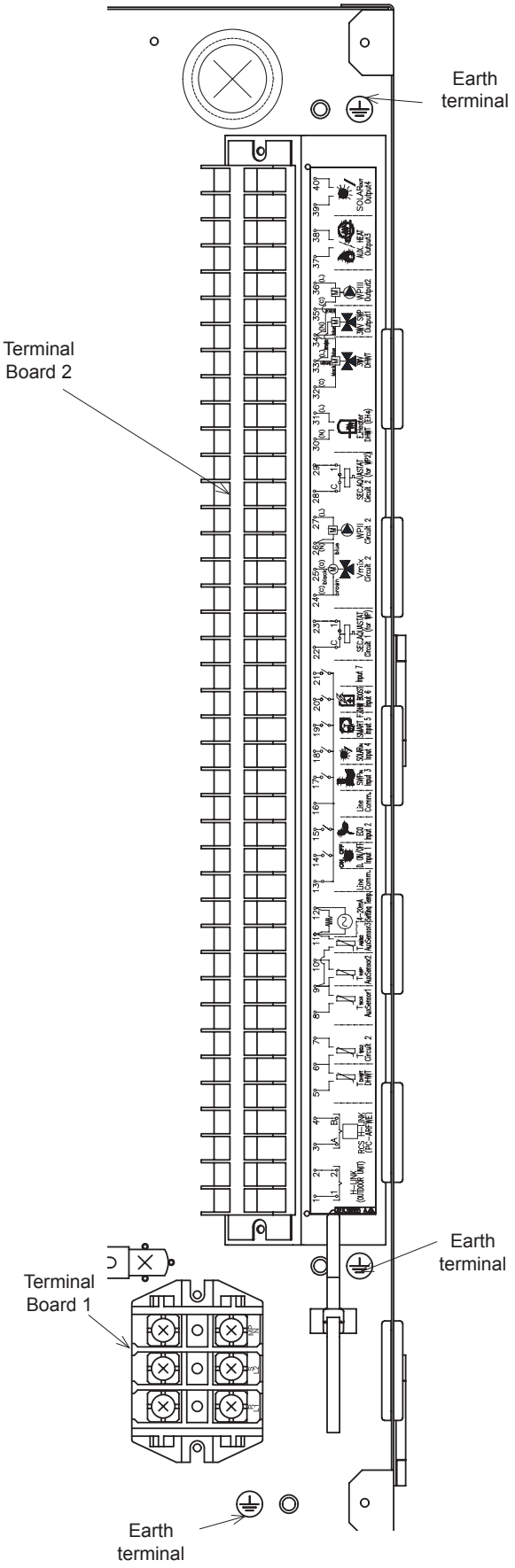
8. Electrical and control settings

Index

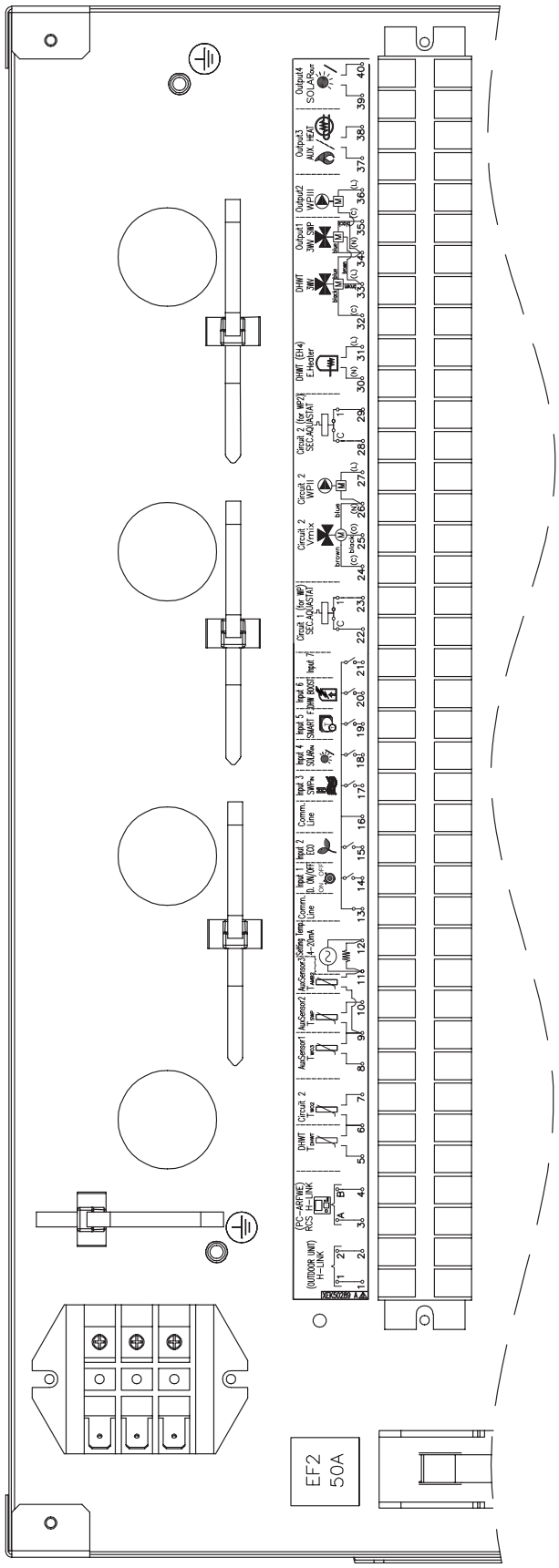
8.1 Terminal board detailed connection 202
8.1.1 HYDRO FREE Low temperature 202
8.1.2 HYDRO FREE High temperature 203
8.1.3 Input terminals (Optional input functions) 206
8.1.4 Output terminals (Optional output functions) 209
8.2 Printed circuit board (PCB) 211
8.2.1 HYDRO FREE Low temperature 211
8.2.2 HYDRO FREE High temperature 212
8.3 Domestic Hot Water Tank accessory 213
8.3.1 Electrical wiring connection 213
8.3.2 Wire size 213
8.3.3 Electric heater 214
8.3.4 General check 214
8.4 Electrical Wiring Diagrams 215
8.4.1 HYDRO FREE Low temperature 215
8.4.2 HYDRO FREE High temperature 216
8.4.3 Mark table 217

8.1 Terminal board detailed connection

8.1.1 HYDRO FREE Low temperature

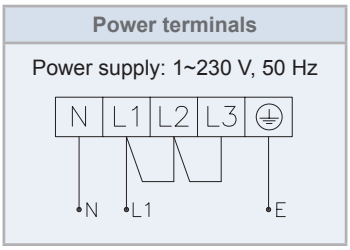


8.1.2 HYDRO FREE High temperature



◆ Main power supply (TB1)

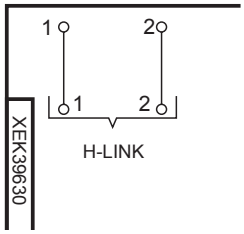
The main power connection is wired to Terminal Board 1 (TB1) as follows:



◆ Indoor commutation cables (TB2)

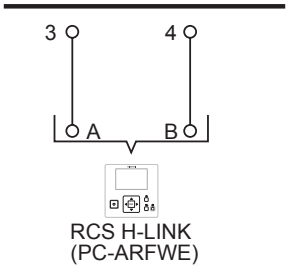
The transmission is wired to terminals 1-2.

The H-LINK II wiring system requires only two transmission cables that connect to the indoor unit to the H-LINK line.



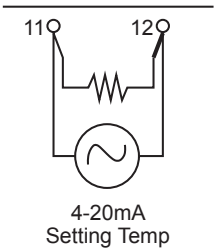
◆ PC-ARFWE connection

In those cases where the unit controller is ordered as a required accessory (RWHT), or those cases where another PC-ARFWE must be connected as a second thermostat, the connections between PC-ARFWE and the indoor unit must be done in terminals 3 and 4, as it is shown in the next picture:



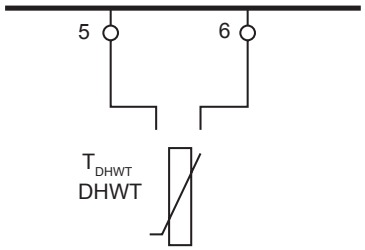
◆ 4-20mA Setting Temperature

It is possible to connect an external controller to the terminals 11 and 12 to provide a manual water temperature setting. The input current (4-20 mA) will be transformed into voltage by means of the ATW-MAK-01 accessory connected to these terminals. Settings in Unit controller and in PCB have to be in Local mode (Enabled manual operation) to enable this function.



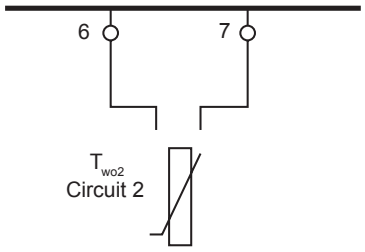
◆ DHWT Thermistor (T_{DHWT})

For those cases in which a tank is installed as accessory, a thermistor must be installed to control the water temperature. The connection for this thermistor must be done between terminals 5 and 6 of the TB2.



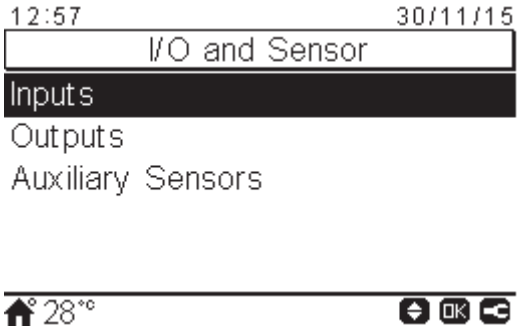
◆ Water outlet thermistor for circuit 2 (T_{WO2})

When the installation is configured with a second circuit the thermistor for the water outlet temperature have to be connected between terminals 6 and 7 of the terminal board 2.



8.1.3 Input terminals (Optional input functions)

Additionally to the factory-set functions, HYDRO FREE series allow to other configurations depending on the needs of the customer. All those inputs are configurable from the “I/O and sensor“ menu of Unit controller are the following:



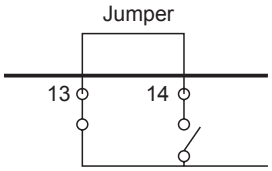
Inputs: Demand ON/OFF, Smart act., Swimming pool input, Solar, Operation mode, DHW boost, Demand ON/OFF C1, Demand ON/FF C2, Forced heating, Forced cooling, ECO mode C1 and C2, ECO mode C1, ECO mode C2, Forced OFF, SG 2.

◆ Optional wireless ON/OFF room thermostat

The heat pump system has been designed to allow the connection of a remote ON/OFF thermostat to effectively control the home temperature. Depending on the room temperature, the thermostat will turn the system to ON or OFF.

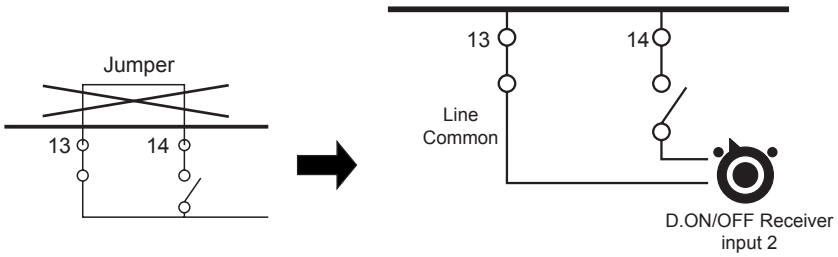
a. If no thermostat is installed

Terminals 13 and 14 are jumped if there is no ON/OFF receiver connected. When no remote thermostat is installed the operating condition for the unit (Thermo ON/OFF) will be controlled by the water calculation”control system.



b. Installation of the ATW-RTU-04

In case of setting an installation with 2 circuits (circuit 1 and circuit 2) and the same demand ON/OFF is used for both of them, remove the jumper between terminals 13 and 14 of the Terminal board 2 and connect the RF receiver as shown in the following picture.



Thermostat requirements:

- Power supply: 230V AC
- Contact voltage: 230V

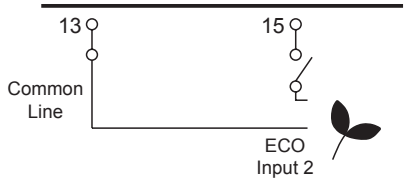
NOTE

- *If wireless intelligent thermostat is selected, optional ON/OFF thermostat has no effect.*
- *Set the configuration in the user’s control. See chapter 8. Unit controller of the Installation and operation manual of HYDRO FREE series for more information.*
- *In case of setting an installation with 2 circuits (Circuit 1 and Circuit 2) with a different Demand ON/OFF used for each of them, refer to “8.1.3 Input terminals (Optional input functions)”*

◆ ECO (Default for input 2)

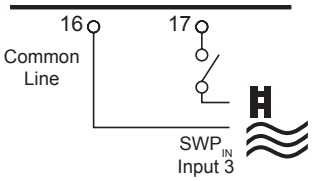
When enabled at Unit controller, both for circuit 1 and Circuit 2, also for heating and cooling, this input switches the unit to the temperature configured.

The input can come from a push button, a thermostat or any other external device with that purpose.



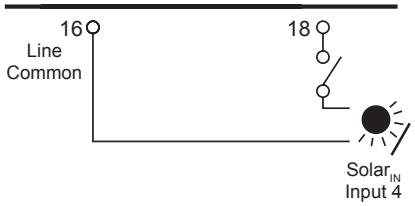
◆ Swimming pool (Default for input 3)

When it is necessary to control the temperature of the swimming pool water, a connection between the heat pump and the corresponding sensor must be done on terminals 16 and 17 at the Terminal board (input 4).



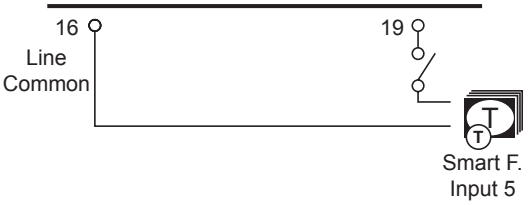
◆ Solar (Default for input 4)

This input comes from a solar panel sensor. The solar combination by input demand allows HSW to be heated by solar system when there is enough solar energy available. The connection of this input signal has to be done between terminals 16 and 18 at TB2.



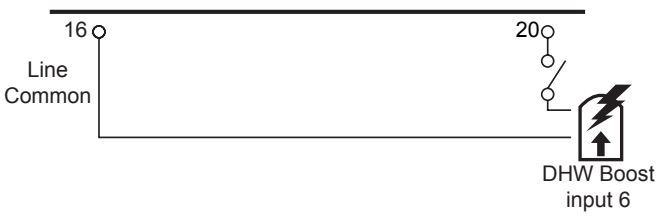
◆ Smart tariff (Default for input 5)

This function can be used to block or limit the heat pump. It allows an external *Smart* switch device to switch off or limit the heat pump during a period of peak electricity demand. Terminals 16 and 19 of the TB2.



◆ DHW boost (Default for input 6)

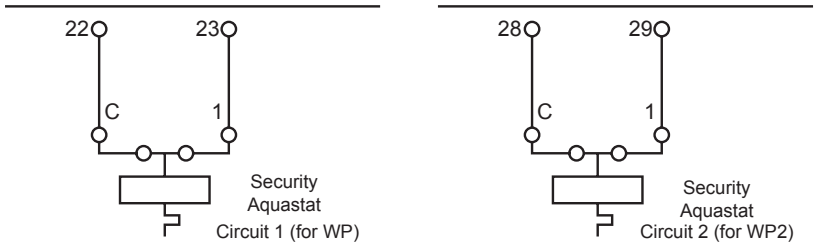
This function allows a request for a one-time heating up of the domestic hot water temperature. The input can be sent by a push button, a NC contact and a NO contact. This input is switched on terminals 16 and 20 of the TB2.



◆ Aquastat for Circuit 1 and circuit 2 (for WP and WP2)

Aquastat is a security accessory to control in order to prevent high water temperature entering into floor system (Circuit 1). This devices must be connected to terminals 22 & 23 for circuit 1 and terminals 28 & 29 for circuit 2.

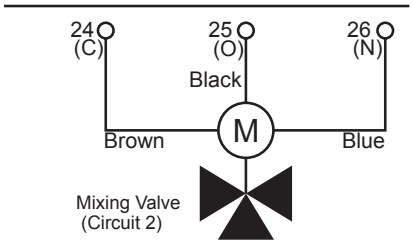
When this devices is enabled (by high temperature) must cut off water pump power in order to stop water flow to heater floor. The water temperature of circuit 1 and circuit 2 usually enabled for the control of the temperature of the radiant floor.



Output terminals (Default output functions)

◆ Mixing valve for Circuit 2

The mixing valve is controlled to maintain the second heating temperature at the second heating temperature set point. The control system decides how much to open or close the mixing valve to achieve the desired position of the valve.



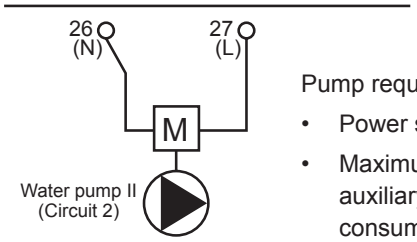
Terminal	Name	Description
24	C	Close
25	O	Open
26	N	Neutral

Valve requirements:

- Power supply: 230V AC 50Hz
- Maximum running current: 100mA

◆ Water pump 2 Circuit 2

In case of a second circuit installation (second temperature level) the secondary pump is the circulating pump for the second heating temperature

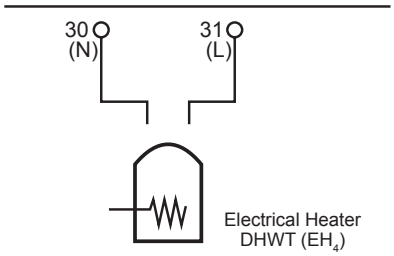


Pump requirements:

- Power supply: 230V AC 50Hz
- Maximum running current: 500mA (An auxiliary relay must be installed in case of high consumption of the water pump).

◆ Electrical heater DHWT output

In those cases where a DHW tank is installed with an electrical heater, the Air to Water heat pump can activate the electric heater of the tank when the heat pump cannot achieve the required DHW temperature by itself.

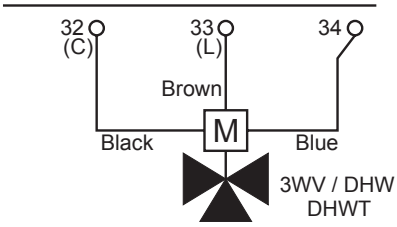


⚠ CAUTION

When using a DHW tank other than those from HITACHI, the maximum connectable heater load is 3 kW (connected to TB2 terminals 30-31).

◆ 3Way valve for DHW tank output

HYDRO FREE units can be used to heat DHW. The signal is used on a 3-way motorized diverting valve and to provide control of supply water flow (water flow for space heating when there is no signal, and water flow for DHW when signal is ON)



Valve requirements:

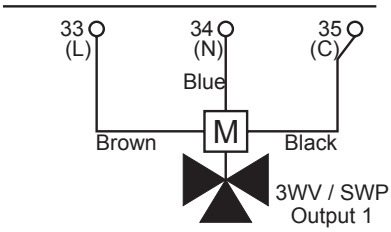
- Power supply: 230V AC 50Hz
- Maximum running current: 100mA

8.1.4 Output terminals (Optional output functions)

◆ 3 Way valve for Swimming pool (Default for Output 1)

HYDRO FREE units can be used to heat the water of a swimming pool. The signal is used on a 3-way motorized diverting valve and to provide control of supply water flow (water flow for space heating when there is no signal, and water flow for swimming pool when signal is ON). This output is available when the function is enabled from the Unit controller.

Using the appropriate wiring, connect the valve cables as shown in the previous picture.

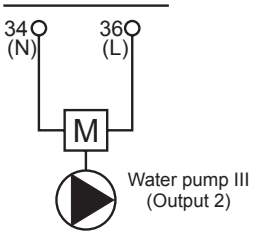


Valve requirements:

- Power supply: 230V AC 50Hz
- Maximum running current: 100mA

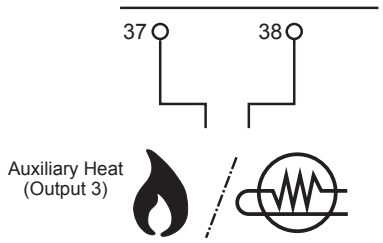
◆ Water pump 3 (Default for Output 2)

When the boiler is configured with the heat pump or needs an additional pump for the system, a hydraulic separator or buffer tank must be used to ensure a correct hydraulic balance.



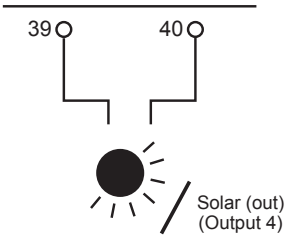
◆ Auxiliary boiler or heater (Default for Output 3)

The auxiliary boiler or heater can be used when the heat pump cannot achieve the require temperature by itself. A water electric heater (as accessory) can be used to provide the additional heating required on coldest days of the year.



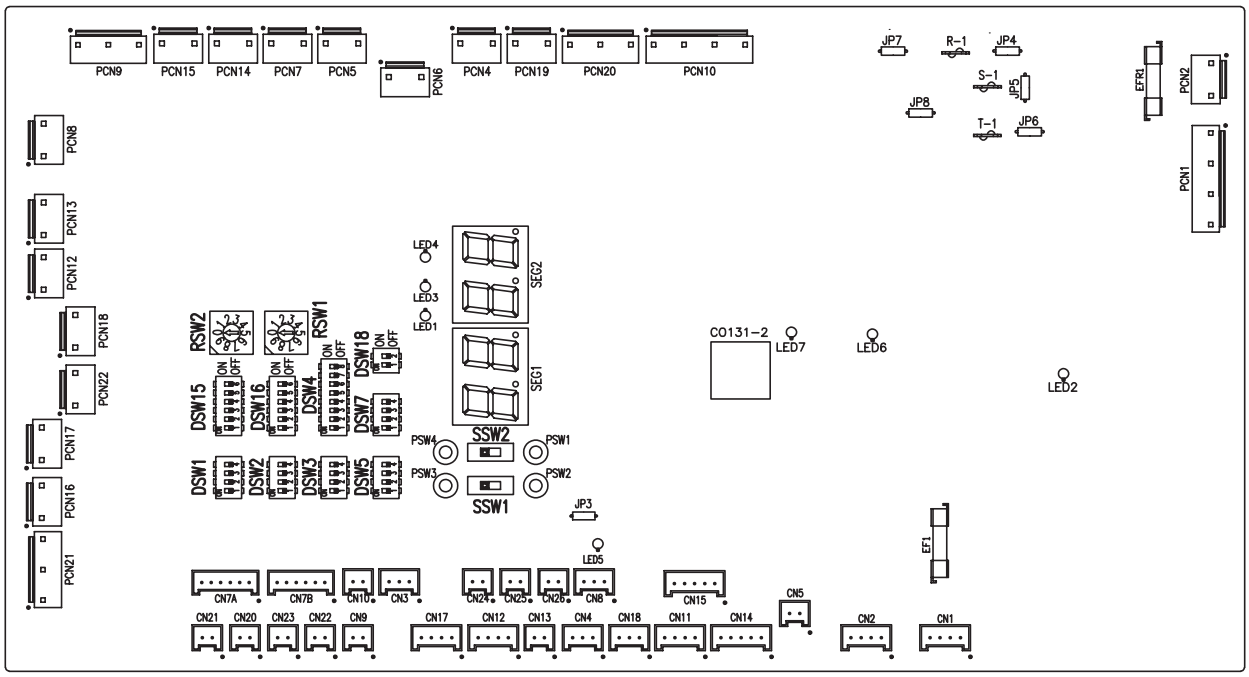
◆ Solar (Default for output 4)

This output is used when solar mode is enabled (from Unit controller) and the temperature in the solar panel rises above the water temperature in the domestic hot water tank (DHWT). Connection between terminals 39 and 40 are switched ON to activate the water pump dedicated to the solar panels combination.



8.2 Printed circuit board (PCB)

8.2.1 HYDRO FREE Low temperature

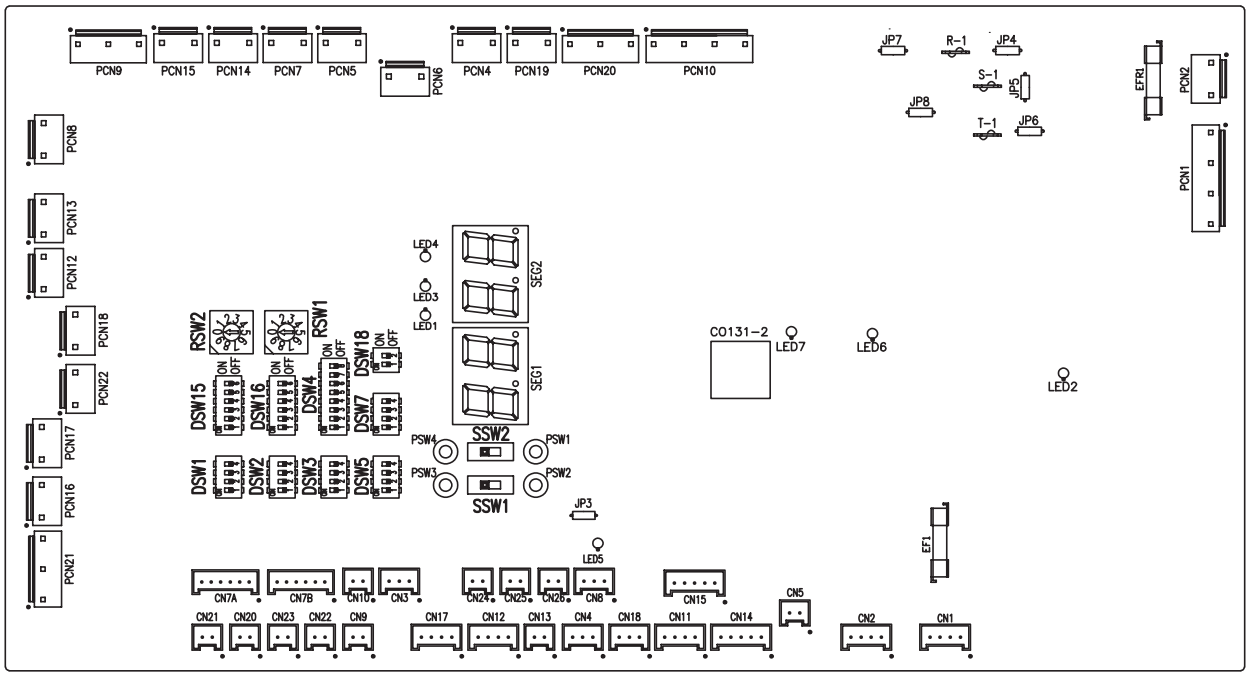


Connector Indications	
Name	Connector Nº
IU-OU-Central communication	CN1
H-Link communication	CN2
Auxiliary sensor / 4-20mA input	CN5
Electronic Expansion Valve	CN7A
Electronic Expansion Valve (Only 10HP)	CN7B
Water inlet temperature input	CN9
DHWT water input	CN10
Liquid pipe temperature input	CN12
Outlet water temperature input	CN13
Water pump output	CN14
Gas pipe temperature input	CN17
Auxiliary outputs signals accessory	CN20/21/22/23
Outlet water temperature input (Circuit 2)	CN24
Auxiliary thermistor input	CN25/26
Power supply	PCN1
Power supply	PCN2
Not used	PCN4
Contactor switch	PCN5
Contactor heater step switch	PCN7/14
3WV	PCN9
Optional input (AD input 230V)	PCN6/10/19/20
Solenoide Valve	PNC13
Water pump 2 output / Aquastat zone 2	PCN15
Waterp pump 1 / Aquastat zone 1	PCN 16
Contactor heater tank (Power)	PCN17
Check mode	PSW1~4

Switch indication		
Function	Name	Connector No.
Operation / Display	Additional setting	DSW1
	Unit capacity setting	DSW2
	Additional setting 1	DSW3
	Additional setting 2	DSW4
	Additional setting 3	DSW5
	Not used (only if available)	DSW6
	Not used	DSW7
	Refrigerant cycle number setting	DSW15
		RSW2
	Unit number setting	DSW16
		RSW1
	Not used	DSW18
	Remote/Local operation	SSW1
	Cool/Heat operation	SSW2

LED indication		
Connector Nº	Color	Indication
LED1	Green	Power Indication
LED2	Red	Power Indication
LED3	Red	Heat pump operation (thermo ON/ OFF)
LED4	Yellow	Alarm (flickering with 1 sec interval)
LED5	Green	Not used
LED6	Yellow	H-Link transmission
LED7	Yellow	H-Link transmission (for unit controller)

8.2.2 HYDRO FREE High temperature



Connector Indications	
Name	**Connector Nº**
IU-OU-Central communication	CN1
H-Link communication	CN2
R134a Suction pressure sensor	CN3
R134a Discharge pressure sensor	CN4
Auxiliary sensor / 4-20mA input	CN5
Electronic Expansion Valve	CN7A
Water inlet temperature input	CN9
DHWT water input	CN10
Suction compressor input	CN11
Liquid pipe temperature input	CN12
Outlet water temperature input	CN13
Water pump output	CN14
Gas pipe temperature input	CN17
Compressor discharge temperature	CN18
Auxiliary outputs signals accessory	CN20/21/22/23
Outlet water temperature input (Circuit 2)	CN24
Auxiliary thermistor input	CN25/26
Power supply	PCN1
Power supply	PCN2
Low water pressure switch	PCN4
High Pressure R134a protection	PCN5
Inverter compressor & E.Fan	PCN7
SV1 (Solenoid valve 1 cycle)	PCN13
SV2 (Solenoid valve 2 cycle)	PCN14
3WV	PCN9
Optional input (AD input 230V)	PCN6/10/19/20
Water pump 2 output / Aquastat zone 2	PCN15
Waterp pump 1 / Aquastat zone 1	PCN 16
Contactor heater tank (Power)	PCN17
Check mode	PSW1~4

Switch indication		
Function	**Name**	**Connector No.**
Operation / Display	Additional setting	DSW1
	Unit capacity setting	DSW2
	Additional setting 1	DSW3
	Additional setting 2	DSW4
	Additional setting 3	DSW5
	Not used (only if available)	DSW6
	Not used	DSW7
	Refrigerant cycle number setting	DSW15
		RSW2
	Unit number setting	DSW16
		RSW1
	Additional setting for capacity control function	DSW18
	Remote/Local operation	SSW1
	Cool/Heat operation	SSW2

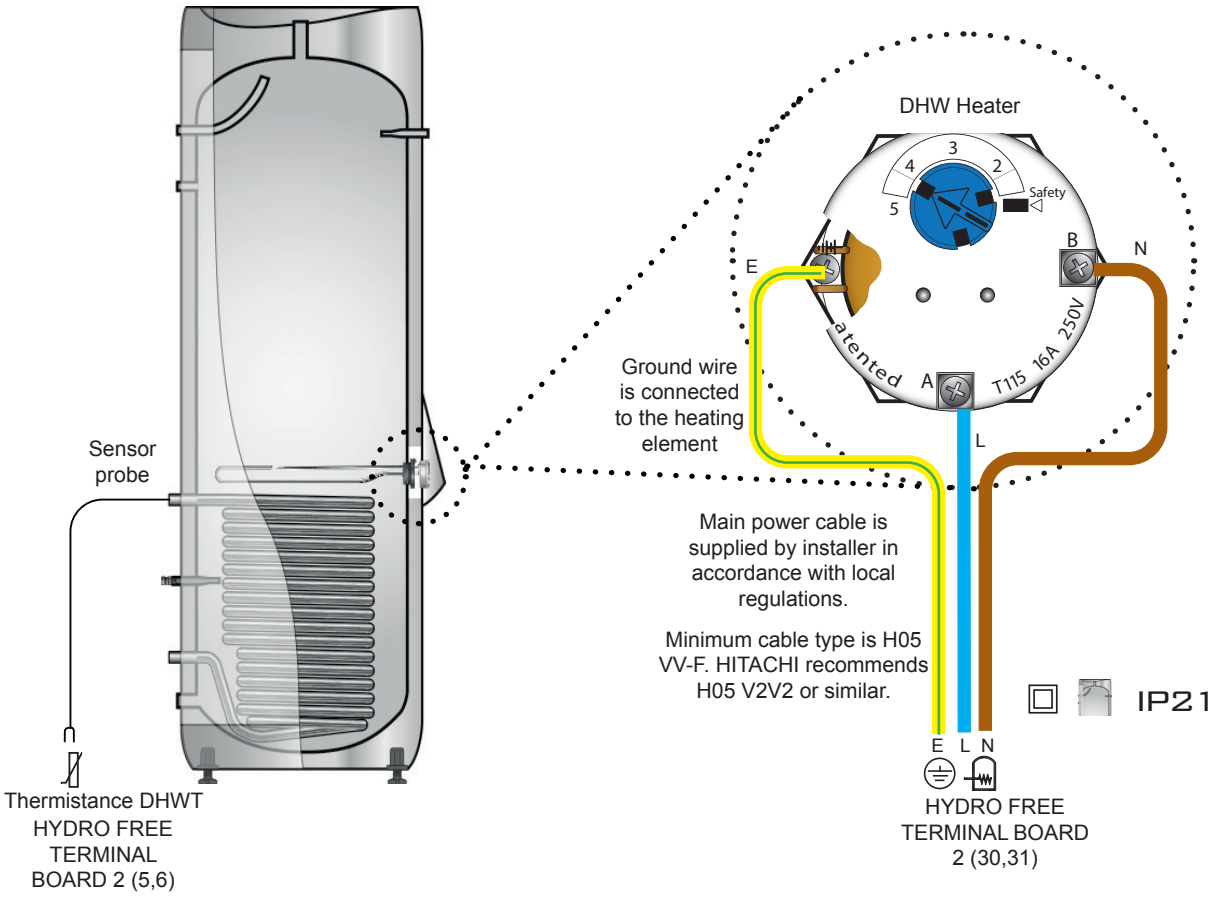
LED indication		
Connector No.	**Color**	**Indication**
LED1	Green	Power Indication
LED2	Red	Power Indication
LED3	Red	Heat pump operation (thermo ON/OFF)
LED4	Yellow	Alarm (flickering with 1 sec interval)
LED5	Green	Inverter transmission
LED6	Yellow	H-Link transmission
LED7	Yellow	H-Link transmission (for unit controller)

8.3 Domestic Hot Water Tank accessory

8.3.1 Electrical wiring connection

The electrical wiring connection between DHWT and HYDRO FREE system is as follows:

Customer connection:



8.3.2 Wire size

- Recommended minimum size for field provided wires:

Model	Power supply	Maximum current (A)	Power supply cable size	Sensor cable size
			EN60335-1	EN60335-1
DHWT	1~ 230V 50Hz	15	2.5 mm²	0.75 mm²

- Type of switches:

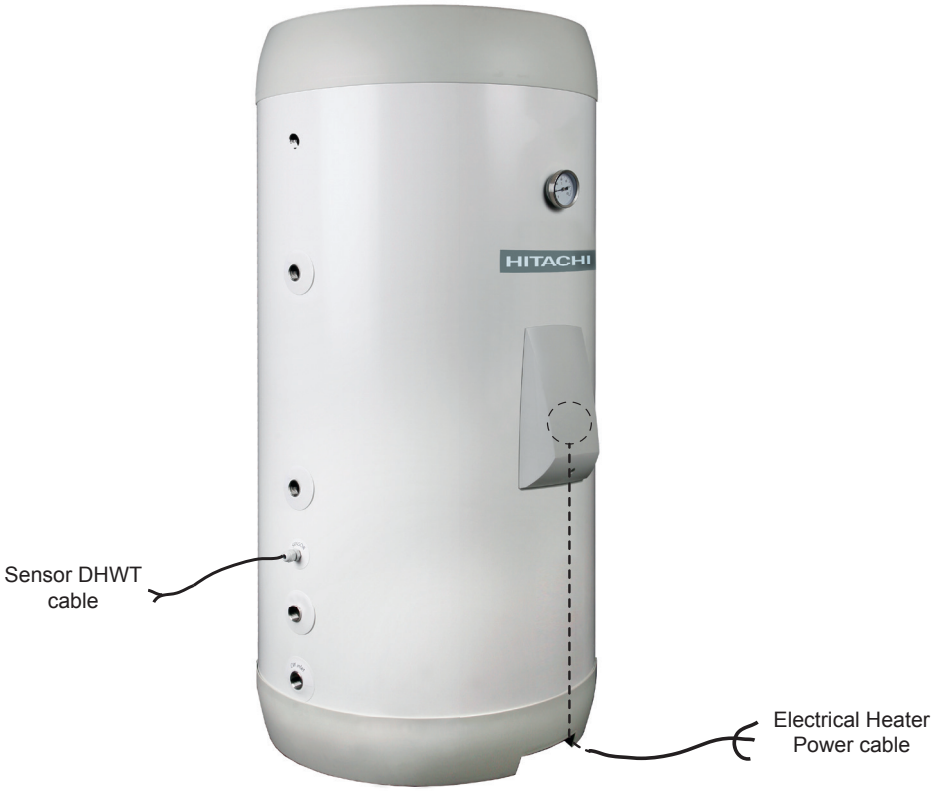
Select the main switches in accordance with the following table:

Model	Power supply	Maximum current (A)	CB (A)	ELB (nº of poles/A/mA)
DHWT	1~ 230V 50Hz	15	20	2/40/30

NOTE

- *CB: Circuit Breaker*
- *ELB: Earth Leakage Breaker*
- *Follow local codes and regulations when selecting field wires, Circuit Breakers and Earth Leakage Breakers.*
- *Use wires which are not lighter than the ordinary polychloroprene sheated flexible cord (code designation H05RN-F).*

◆ **Internal wiring**



8.3.3 Electric heater

The electric heater is made of Incoloy alloy 825 and complies with the European Low Voltage Directive 2006/95/EC.

It comprises a flange that holds three U-Shaped heating elements for 3.0 kW power resistances.

8.3.4 General check

1 Ensure that the field-supplied electrical components (mains power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data indicated. Make sure that they comply with national and regional electrical codes.
2 Electrical connection must be done by professional installer.
3 Check to ensure that the power supply voltage is within +/-10% of the rated voltage.
4 Make ensure that power supply has an impedance low enough to warranty not reduce the starting voltage more than 85% of the rated voltage.
5 Check that the earth wire is securely connected, tagged and locked in accordance with national and local codes.
6 Connect a fuse of specified capacity.
7 Check periodically the electrical connection tightening.

⚠ CAUTION

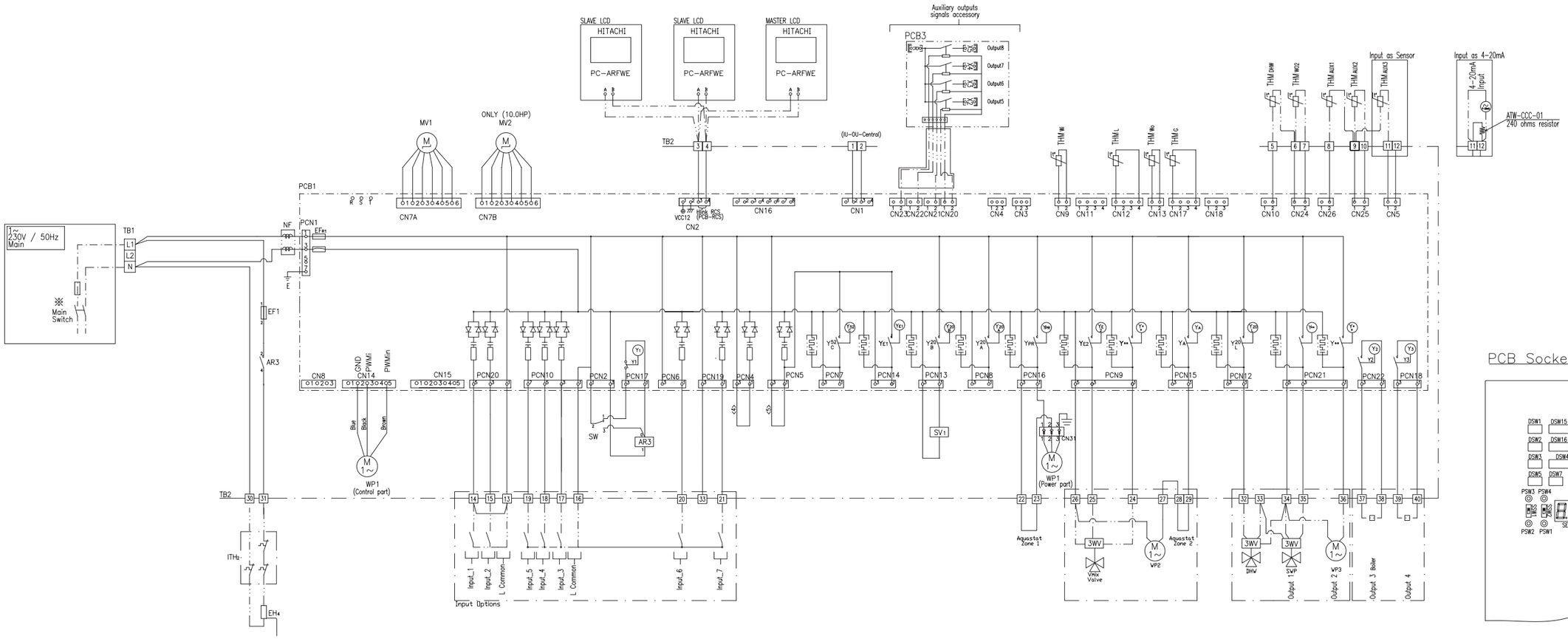
- *Check to ensure that screws for terminal block are tightly tightened.*
- *Protect the wires, drain pipe, electrical parts, from rats or other small animals. If not protected, rats may damage unprotected parts, and at the worst, a fire will occur.*
- *Wrap the accessory packing around the wires to protect the product from any condensed water and insects.*
- *Tightly secure the wires with the cord clamp inside the unit.*
- *Lead the wires avoiding any contact with water piping.*
- *Wrap the accessory packing around the wires from system controller.*

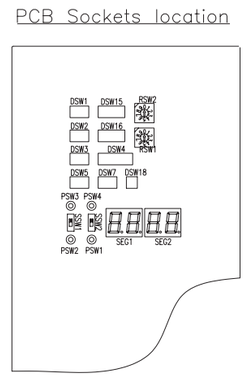
⚠ DANGER

- ***Do not connect or adjust any wiring or connections unless the main power switch is OFF.***
- ***When there are more than one power switch for ON/OFF, check and test to ensure that all are turned OFF.***

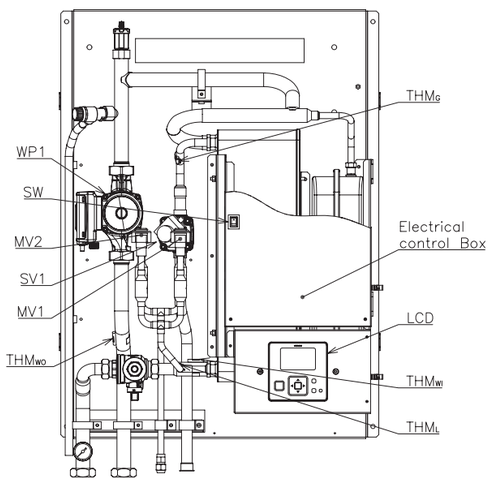
8.4 Electrical Wiring Diagrams

8.4.1 HYDRO FREE Low temperature

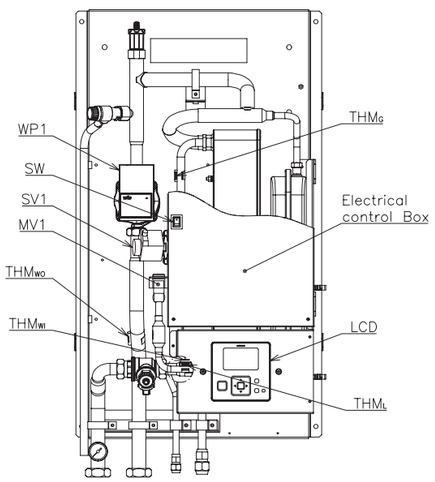




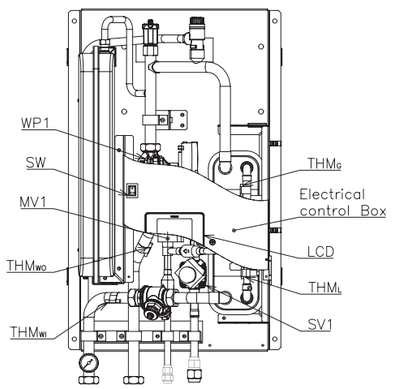
RWLT-10.0VN(1)E



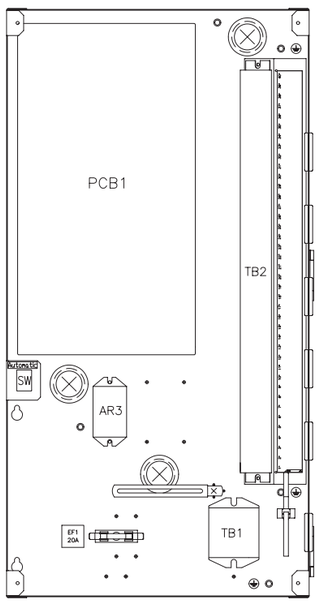
RWLT-5.0VN(1)E



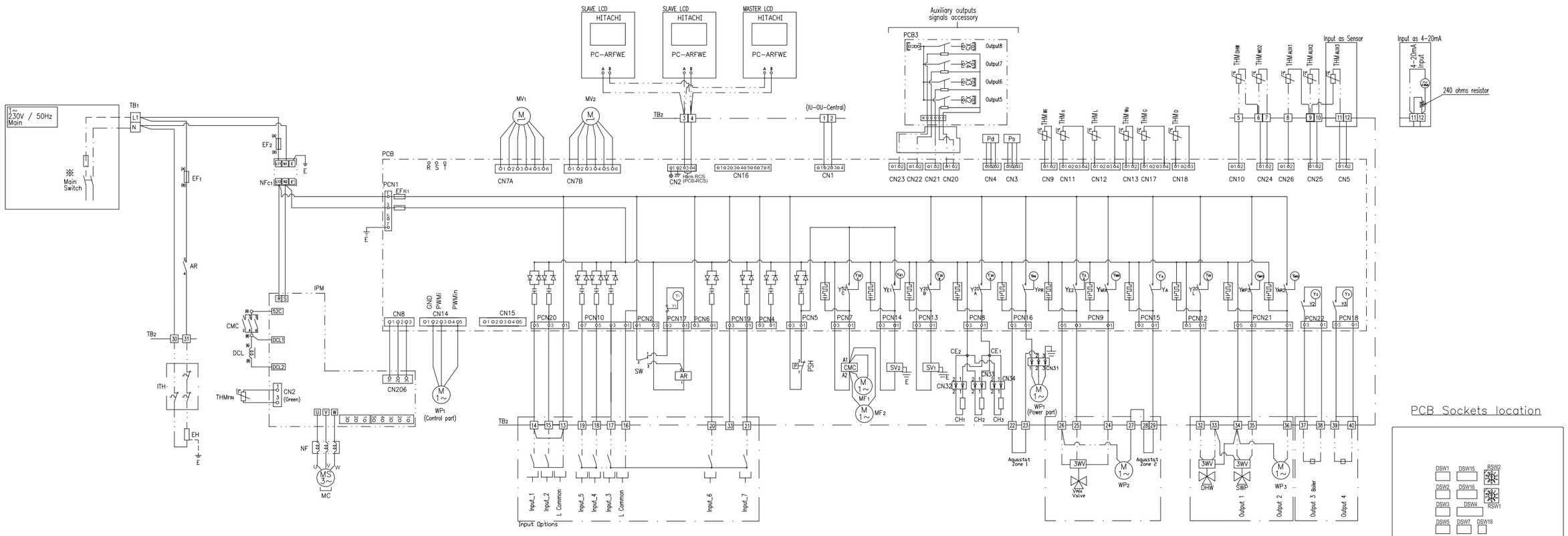
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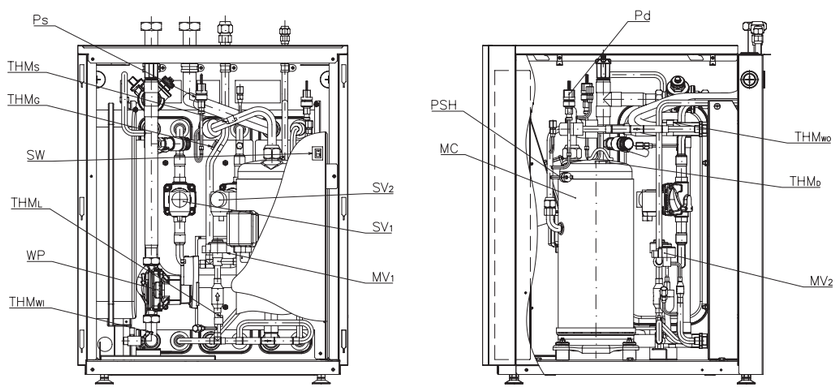
Electrical Control Box



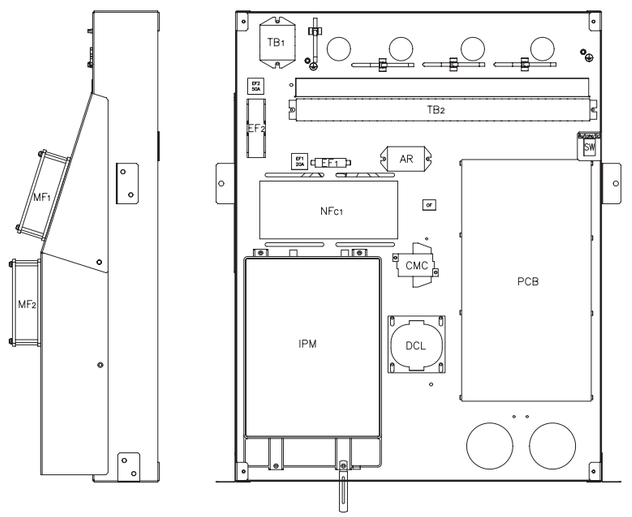
8.4.2 HYDRO FREE High temperature



Model: RWHT-5.0VNF(1)E



Electrical Control Box



8.4.3 Mark table

HYDRO FREE Low temperature

Mark	Part Name
AR_3	Contactor heater tank
CN_{30-31}	Connector
EF_1	Fuse (Heater tank)
EF_{R1}	Fuse (PCB)
CE	Connector
EH	Electric Heater (tank)
LCD	User interface LCD (PC-ARFWE)
$MV_{1,2}$	Micro-computer control exp.valve
NF	Noise filter
PCB	Printed Circuit Board
ITH_2	Thermostat
$TB_{1,2}$	Terminal Board
$WP_{1,2,3}$	Water pumps
$3WV_{DHW}$	3 Way valve for DHW
$3WV_{SWP}$	3 Way valve for SWP
$3WV_{Vmix}$	3 Way valve for Mixing valve
SW	Switch (DHW)
THM_{WI}	Inlet water thermistor
THM_L	Liquid pipe thermistor
THM_{WO}	Outlet water thermistor
THM_G	Gas pipe thermistor
THM_{DHWT}	DHWT water thermistor
THM_{WO2}	Outlet C2 water thermistor
$THM_{AUX1,2,3}$	Auxiliar thermistor
SV1	Solenoid valve
DSW_1	Additional setting (unit type)
DSW_2	Capacity setting
$DSW_{3,4,5,18}$	Additional setting
$DSW_{6,7}$	Not used (only if available)
RSW_1	IU address
RSW_2	Refrigerant address
LED_{1-7}	LEDs indication
$SEG_{1,2}$	Seven segments indication
Y_{52C}	Relay for electrical heater
Y_{E1}	Relay for electrical heater
Y_{20L}	Relay for 3 way valve DHWT
Y_{WP3}	Relay for 3 way valve SWP (output 1)
Y_{MIX}	Relay for mixing valve
Y_{E2}	Relay for mixing valve
Y_A	Relay for water pump 2
Y_{PR}	Relay for water pump 1
Y_{AR2}	Relay for water pump 3 (output 2)
Y_1	Relay for electrical heater tank
Y_2	Relay for output 3 (boiler)
Y_3	Relay for output 4 (solar)
⊣□⊢	Terminals
⊣	Close-end connector
※	Field supplied
_ _ _	Field wiring
———	Earth wiring
———	Factory wiring

HYDRO FREE High temperature

Mark	Part Name
TB_1	Terminal Board (for Power supply)
TB_2	Terminal Board (for Control Circuit)
MC	Motor for compressor
CMC	Contactor for compressor
DCL	Reactor
EF_2	Power fuse for compressor
EF_1	Fuse (Heater tank)
EF_{R1}	Fuse (PCB)
AR	Contactor heater tank
CN_{30-31}	Connector
$CE_{1,2,3}$	Connector
EH	Electric Heater (tank)
LCD	User interface LCD (PC-ARFWE)
PSH	High pressure switch
$MV_{1,2}$	Micro-computer control exp.valve
NF_{c1}	Noise filter (circuit 1)
NF	Ring core
PCB	Printed Circuit Board
IPM	Inverter Module
WP_{1-3}	Water pumps
$3WV_{DHW}$	3 Way valve for DHW
$3WV_{SWP}$	3 Way valve for SWP
$3WV_{Vmix}$	3 Way valve for Mixing valve
SW	Emergency switch (DHW) E.heater
$CH_{1,2,3}$	Oil heater
$SV_{1,2}$	Solenoid Valve
$MF_{1,2}$	Fan inverter E.Box
Pd	High Pressure sensor
Ps	Low Pressure sensor
E	Earth
ITH	Thermostat
THM_{WO}	Outlet water thermistor
THM_{WI}	Inlet water thermistor
THM_D	Discharge gas thermistor
THM_S	Suction gas thermistor
THM_L	Liquid pipe thermistor
THM_G	Gas pipe thermistor
THM_{DHWT}	DHWT water thermistor
THM_{WO2}	Outlet C2 water thermistor
$THM_{AUX1,2,3}$	Auxiliar thermistor
THM_{FIN}	Inverter FIN thermistor
DSW_1	Additional setting (unit type)
DSW_2	Capacity setting
$DSW_{3,4,5,18}$	Additional setting
$DSW_{6,7}$	Not used (only if available)
RSW_1	IU address
RSW_2	Refrigerant address
SSW_1	Remote or Local operation
SSW_2	Cool or heat operation
LED_{1-7}	LEDs indication
$SEG_{1,2}$	Seven segments indication
Y_{52C}	Relay for electrical heater
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Y_{20L}	Relay for 3 way valve DHWT
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Y_{MIX}	Relay for mixing valve
Y_{E2}	Relay for mixing valve
Y_A	Relay for water pump 2
Y_{PR}	Relay for water pump 1
Y_{AR2}	Relay for water pump 3 (output 2)
Y_1	Relay for electrical heater tank
Y_2	Relay for output 3 (boiler)
Y_3	Relay for output 4 (solar)
⊣□⊢	Terminals
⊣	Close-end connector
※	Field supplied
_ _ _	Field wiring
———	Earth wiring
———	Factory wiring

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