Airwell

# Service Manual

## VAR Series

| Unit Description |
| --- |
| Consol VAR 9 R410A |

**REFRIGERANT**

**R410A**

**COOLING ONLY**
**Heating (by an heating element)**

**AUGUST – 2008**

SM VAR 1-A.1 GB

**CONTENT**

# LIST OF EFFECTIVE PAGES

**Note:** Changes in the pages are indicated by a “Revision#” in the footer of each effected page (when none indicates no changes in the relevant page). All pages in the following list represent effected/ non effected pages divided by chapters.

Dates of issue for original and changed pages are:

Original ..... 0 ..... May 2006

Total number of pages in this publication is 54 consisting of the following:

| Page No. | Revision No. # | | Page No. | Revision No. # | | Page No. | Revision No. # |
|---|---|---|---|---|---|---|---|



- Zero in this column indicates an original page.

*Due to constant improvements please note that the data on this service manual can be modified with out notice.
**Photos are not contractual

# Table of Contents

# 1. INTRODUCTION

## 1.1 General

The new **VAR** consule unit is an ST (cooling only) and RH (Heating by electrical element) model.

The new **VAR** consule is available as LED display types, featuring esthetic design, compact dimensions, and low noise operation.

## 1.2 Main Features

The **VAR** series benefits from the most advanced technological innovations, namely:

- R410A models
- Microprocessor control.
- Back curve centrifugal fan , allowing low noise level operation.
- Easy installation and service.
- Compact dimensions.

## 1.3 Filtration

The console VAR series presents several types of air filters:

- Easily accessible, and re-usable pre-filters (mesh)
- Carbon and electrostatic filter (optional)

## 1.4 Control

The microprocessor indoor controller, supplied as standard, provide complete operating function and programming. For further details please refer to the Operation Manual, Appendix A.

## 1.5 Inbox Documentation

Each unit is supplied with its own installation and operation manuals.

# 2. PRODUCT DATA SHEET

## 2.1 Model: VAR 9 ST/RH

| Model (Indoor & Outdoor) Unit | | | | VAR 9 ST/RH | | |
|---|---|---|---|---|---|---|
| **Characteristics** | | | **Units** | **Cooling** | **Heating (by heater)** | |
| Capacity (1) | | | Btu/hr | 8530 | - | |
| | | | kW | 2.5 | - | |
| Power input (1) | | | kW | 0.92 | 2x0.75 | |
| COP (1) | | | W/W | 2.61 | - | |
| Energy efficiency class | | | | A | - | |
| Power supply | | | V/ Ph /Hz | 230 / 50 / 1 | | |
| Rated current | | | A | 4.2 | 6.7 | |
| Starting current | | | A | 18.7 | | |
| Circuit breaker rating | | | A | 10 | | |
| INDOOR | Fan type & quantity | | | Centrifugal x 1 | | |
| | Fan speeds | H/ M/ L | RPM | 940 / 845 / 760 | | |
| | Air flow | H/ M/ L | m³/hr | 400 / 360 / 315 | | |
| | Sound pressure level (2) | H/ M/ L | dB(A) | 47 / 44 / 42 | | |
| | Sound power level | H/ M/ L | dB(A) | 56 / 53 / 51 | | |
| | Moisture removal | | L/hr | 1 | | |
| | Condensate drain tube I.D | | mm | 9 | | |
| | Dimensions | W/ H / D | mm | 1110 | 382 | 240 |
| | Weight | | kg | 42 | | |
| | Package dimensions | W/ H / D | mm | 1160 | 460 | 335 |
| | Packaged weight | | kg | 45 | | |
| | Units per pallet | | Units | 12 | | |
| | Stacking height | | Units | 2 | | |
| OUTDOOR | Refrigerant control | | | Capillary | | |
| | Compressor type, model | | | Rotary | | |
| | Fan type & quantity | | | Centrifugal x 1 | | |
| | Fan speeds | H | RPM | 1300 | | |
| | Air flow | H | m³/hr | 358 | | |
| | Refrigerant type | | | R410A | | |
| | Refrigerant charge | | kg | 0.66 | | |
| Operation control type | | | | Touch panel | | |
| Heating elements | | | kW | 2x0.75 | | |
| Others | | | | | | |

(1) Rating conditions in accordance to ISO 5151 and ISO 13253 (for ducted units).
(2) Sound pressure level measured at 1-meter distance from unit.

# 3. RATING CONDITIONS

Rating conditions in accordance with ISO 5151 and ISO 13253 (for ducted units).

**Cooling:**

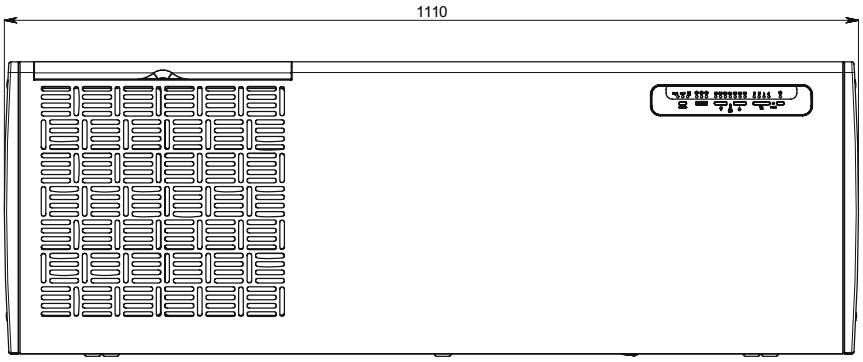
Indoor: 27°C DB 19°C WB
Outdoor: 35 °C DB

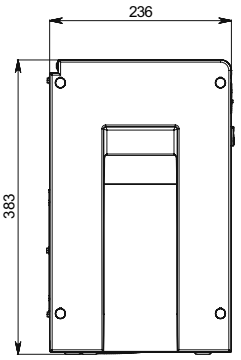
## 3.1 Operating Limits

| | | Indoor | Outdoor |
|---|---|---|---|
| **Cooling** | Upper limit | 32°C DB 23°C WB | 43°C DB |
| | Lower limit | 21°C DB 15°C WB | 21°C DB |
| **Voltage** | 1PH | 208 – 243 V | |

# 4. OUTLINE DIMENSIONS

## 4.1 Model: VAR 9 ST/RH



# 5. PERFORMANCE DATA & PRESSURE CURVES

## 5.1 Model: VAR 9 ST/RH

### 5.1.1 Cooling Capacity (kW) Cooling Mode

**230V : Indoor Fan at High Speed.**

| Entering Air DB OD Coil(°C) | Data | Entering Air WB/DB ID Coil(°C) | | | | |
|---|---|---|---|---|---|---|
| | | 15/21 | 17/24 | 19/27 | 21/29 | 23/32 |
| 15 | TC | 2.66 | 2.75 | 2.82 | 2.88 | 2.93 |
| | SC | 1.72 | 1.80 | 1.87 | 1.91 | 1.95 |
| | PI | 0.69 | 0.69 | 0.69 | 0.69 | 0.70 |
| 20 | TC | 2.57 | 2.71 | 2.79 | 2.86 | 2.92 |
| | SC | 1.69 | 1.78 | 1.86 | 1.91 | 1.94 |
| | PI | 0.75 | 0.75 | 0.75 | 0.76 | 0.76 |
| 25 | TC | 2.43 | 2.63 | 2.76 | 2.84 | 2.91 |
| | SC | 1.65 | 1.75 | 1.84 | 1.89 | 1.93 |
| | PI | 0.81 | 0.81 | 0.82 | 0.82 | 0.83 |
| 30 | TC | 2.27 | 2.48 | 2.67 | 2.77 | 2.85 |
| | SC | 1.59 | 1.69 | 1.80 | 1.85 | 1.89 |
| | PI | 0.87 | 0.88 | 0.89 | 0.90 | 0.91 |
| 35 | TC | 2.11 | 2.28 | **2.52** | 2.65 | 2.77 |
| | SC | 1.52 | 1.63 | **1.76** | 1.81 | 1.85 |
| | PI | 0.94 | 0.95 | **0.97** | 0.98 | 0.98 |
| 40 | TC | 1.91 | 2.08 | 2.27 | 2.49 | 2.61 |
| | SC | 1.43 | 1.54 | 1.67 | 1.72 | 1.75 |
| | PI | 1.01 | 1.03 | 1.05 | 1.06 | 1.07 |

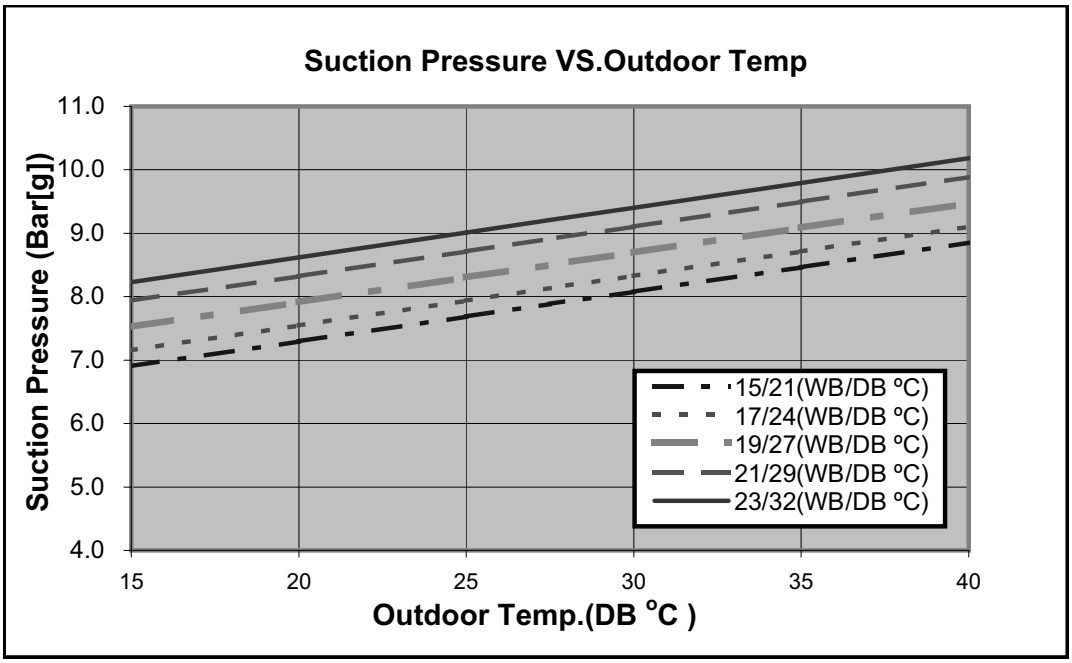
**LEGEND**

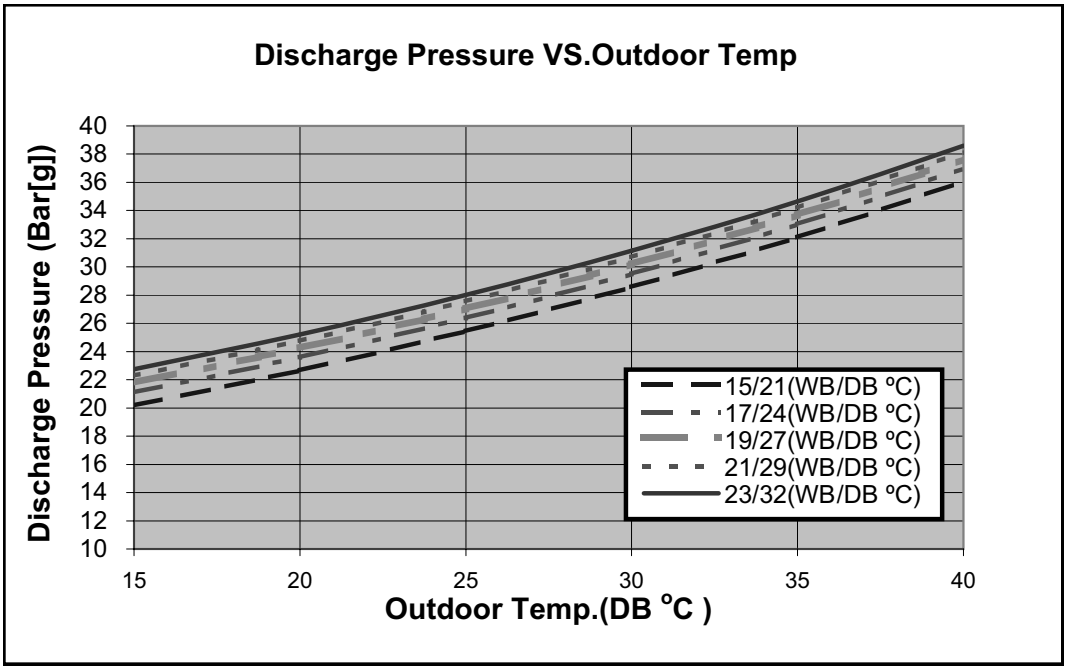
TC – Total Cooling Capacity, (kW)
SC – Sensible Capacity, (kW)
PI – Power Input, kW
WB – Wet Bulb Temp., (°C)
DB – Dry Bulb Temp., (°C)
ID – Indoor
OD – Outd
OU – Outdoor

(1) Marked area is below standard operating limits.

## 5.2 Pressure Curves

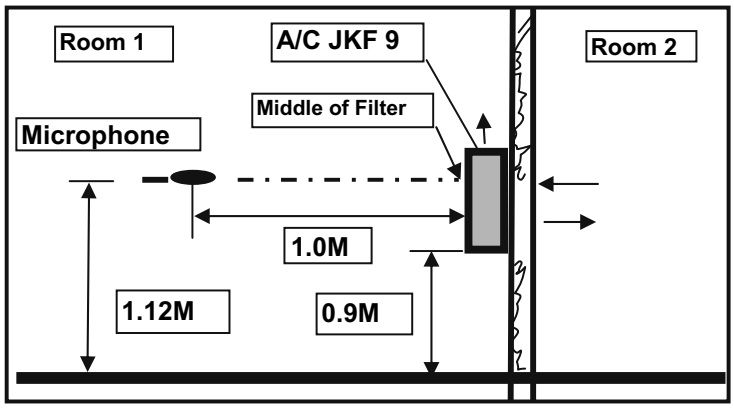
### 5.2.1 Cooling



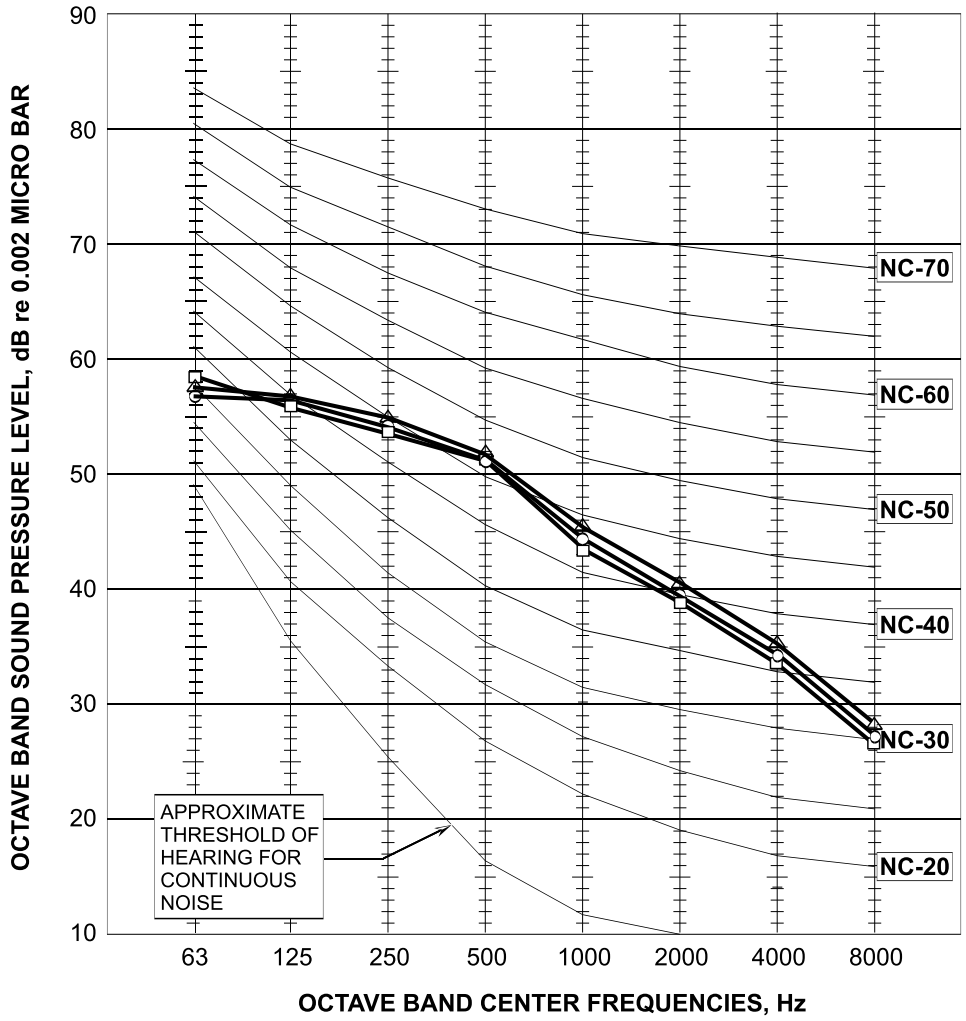



# 6. SOUND LEVEL CHARACTERISTICS

## 6.1 Sound Pressure Level




## 6.2 Sound Pressure Level Spectrum




| FAN SPEED | LINE |
|---|---|
| HI | ▲ |
| ME | ○ |
| LO | □ |

# 7. ELECTRICAL DATA

## 7.1 Single Phase Units

| MODEL | Console 9 |
|---|---|
| Power Supply | 1PH-230V-50Hz |
| Max Current, A | 6 |
| Circuit Breaker,A | 10 |
| Power Supply Wiring (No. X Cross Section, $mm^2$ ) | 3x1.5 |
| *Interconnecting Cable RC Model (No. X Cross Section, $mm^2$) | N/A |
| *Interconnecting Cable ST Model (No. X Cross Section, $mm^2$) | N/A |

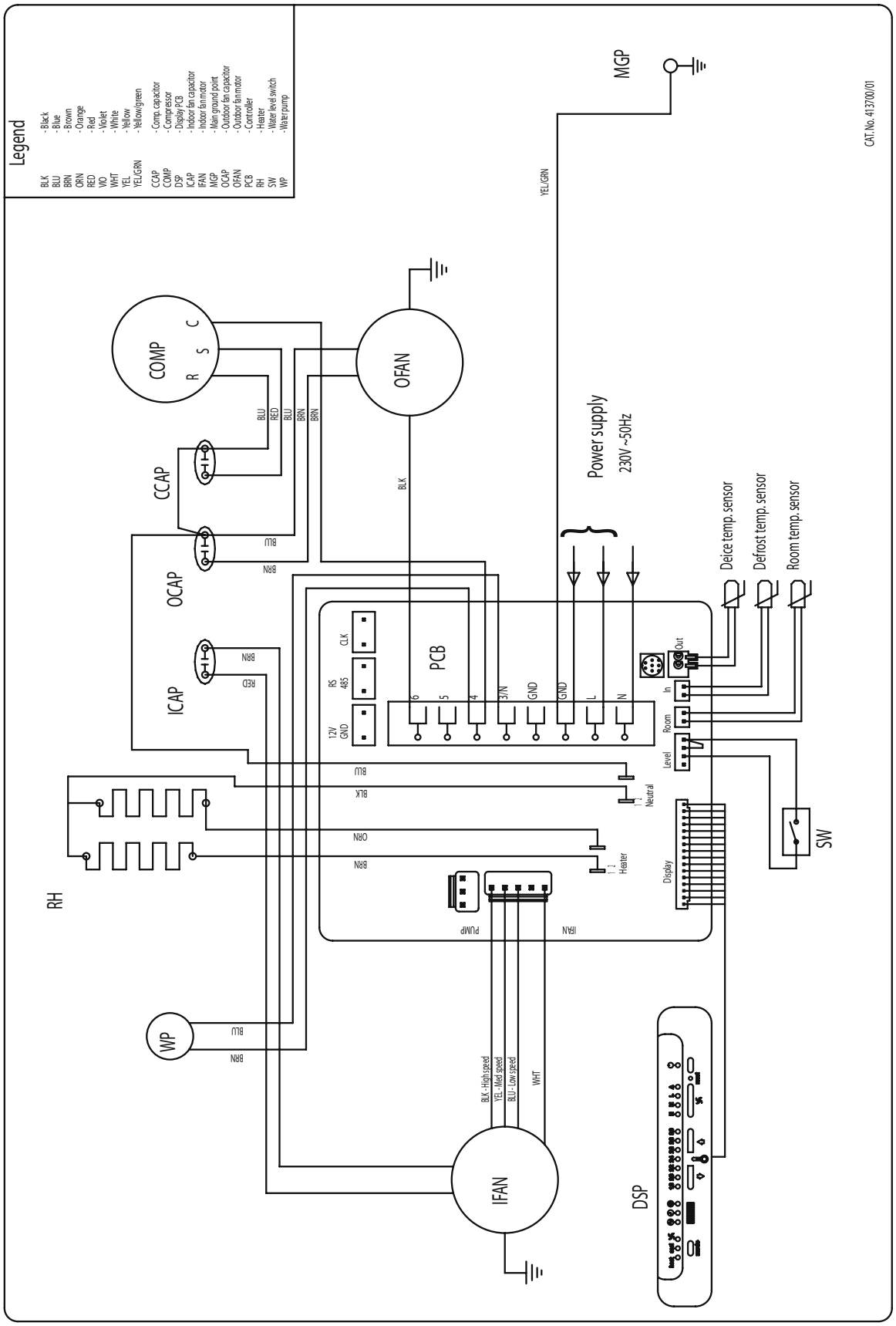
*Already connected on factory as standard

***NOTE***

***Power wiring cord should comply with local lows and electrical regulations requirements.***

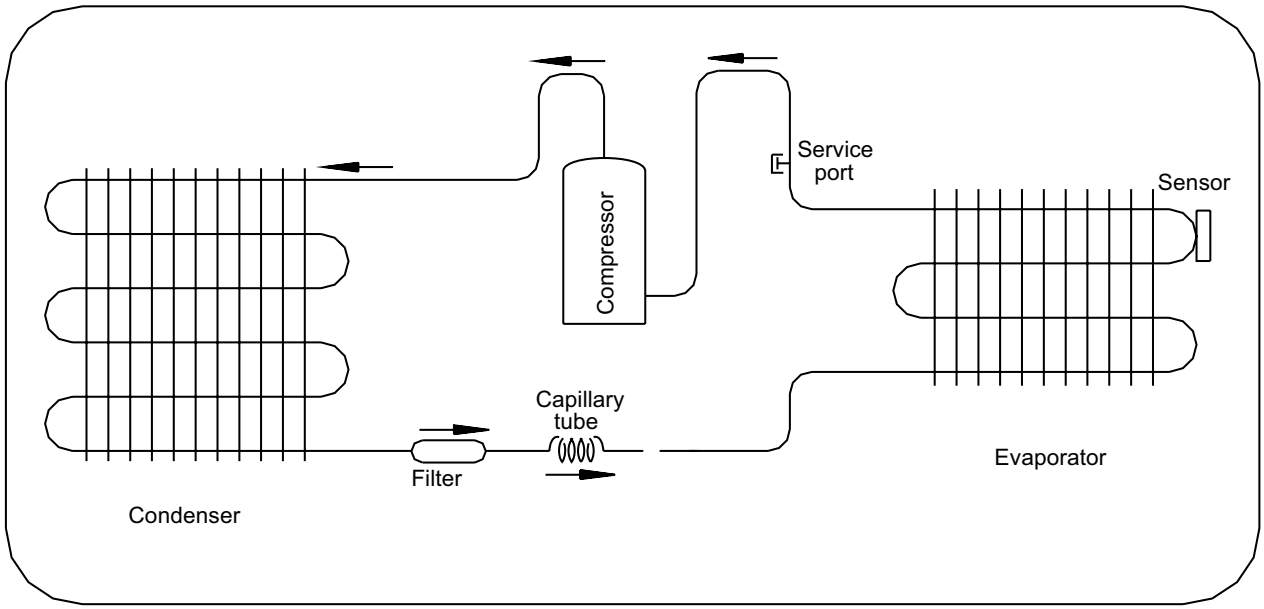
# 8. WIRING DIAGRAMS

## 8.1 Model: VAR 9 ST/RH



# 9. REFRIGERATION DIAGRAMS

## 9.1 VAR 9 ST/RH Cooling Only



# 10. TROUBLESHOOTING

| No. | SYMPTOM | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|---|
| 1 | Power supply indicator (Red LED) does not light up. | No power supply. | Check power supply. If power supply is OK, check display and display wiring, if OK, replace PCB. |
| 2 | Indoor fan does not start (Green LED lights up). | 1. PCB problem<br>2. Capacitor<br>3. Fan motor | 1. Switch to HIGH speed and check indoor FAN motor voltage to be higher then 198VAC, please also make sure ther is no obstical jamming the fan in this case remove it.<br>In case that the voltage is it's significanly lower replace PCB.<br>2. In case the fan is not blocked and the voltage is ok Replace the indoor fan capacitor<br>3. If it still want run replace the indoor fan motor |
| 3 | Indoor fan works when unit is OFF. | PCB problem. | Replace controller. |
| 4 | Compressor does not start. | Electronics control problem or protection. | Perform diagnostics, and follow the actions described below. |
| 5 | Compressor stops during operation and Green LED remains on. | 1.OK temperature is in set point<br>2.Electronic control or power supply problem. | 1.OK<br>2. Perform diagnostics, and follow the actions described below. |
| 6 | Compressor is ON but outdoor fan does not work. | 1. OK, unit is in High pressure protection<br>2. PCB Problem or outdoor fan capacitor/ motor. | 1. OK<br>2. Switch unit to COOL mode, HIGH speed with 16°C set point (cooling) . Check outdoor motor power supply voltage to be higher than 198 VAC. If OK replace capacitor, if it still wont run replace motor.<br>In case the voltage is lower then 198 VAC replace and the main poer supply is higher replace PCB. |

| | | | |
|---|---|---|---|
| 7 | All components are operating properly but no cooling. | Refrigerant leak. | Check refrigeration system. |
| 8 | All components are operating properly but no heating. | Control problem or Heater problem. | Check heaters power supply if higher than 198 VAC. If OK replace heaters, if heaters power supply if lower than 198 VAC replace PCB. |
| 9 | One of the protections is activated and compressor is stopped with no apparent reason. | Control problem or refrigeration system problem. | Perform diagnostics to detect active protection, and take action accordingly. |
| 10 | Water leakage from indoor unit. | Indoor unit drainage tube is blocked. | Check and open drainage tube. |
| 11 | Filter LED comes ON after 512 hours of operation | Indication time to clean the air filter | clean air-filter. Press the RESET button. |

# 11. CONTROL SYSTEM

## 11.1 Electronic Control

### 11.1.1 Introduction

The electronic control information is designed for service applications, and is common to the following groups of air-conditioners:

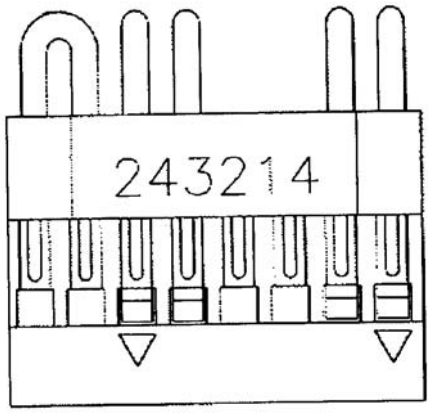
- **ST/RC** group -Cooling only / cooling and heating by heat pump.
- **SH group** -Cooling and heating by heat pump and supplementary heater.
- **RH group** -Cooling, heating by heaters only.

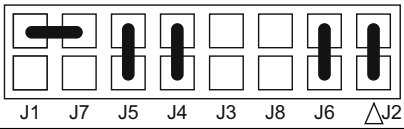
### 11.1.2 Model Plug Settings

Before installation, make sure to set the model plug conforming to the suitable group.

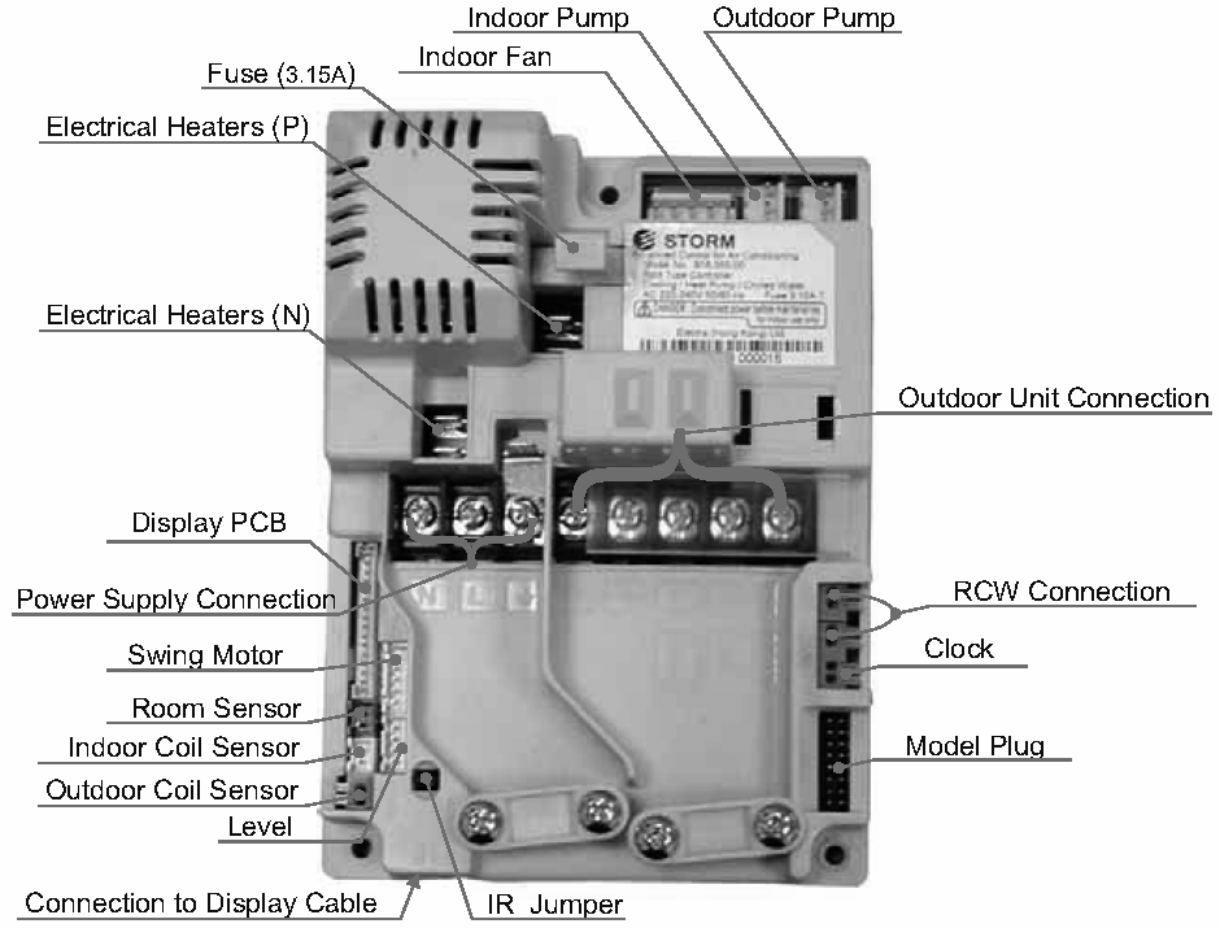
| **GROUP** | **J6** Setting | **J2** Setting |
|---|---|---|
| ST / RC | Open | Open |
| SH | Closed | Open |
| RH | Closed | Closed |

**Model Plug**

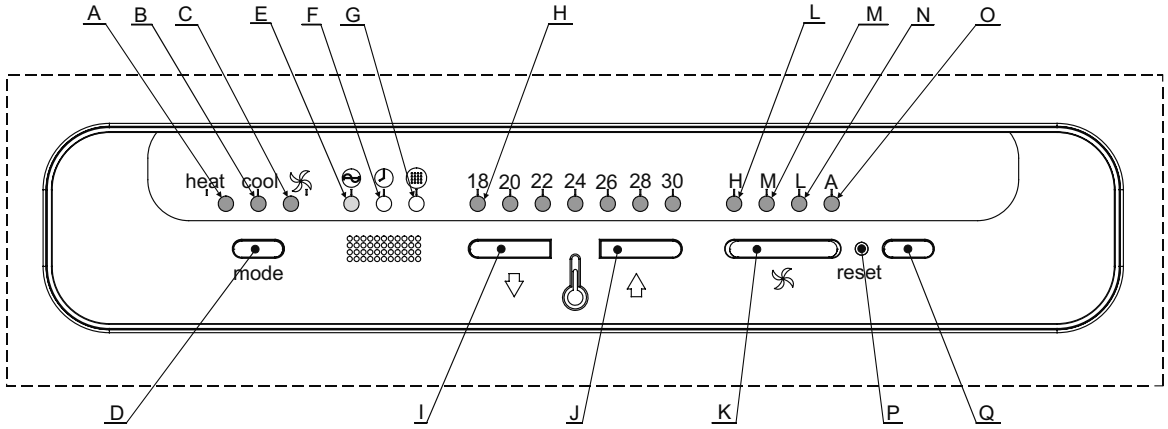



| Group | location of the jumpers |
|---|---|
| **VAR RH** |  |

### 11.1.4 Main PCB Controller



### 11.1.5 Display Board :LEXAN




### 11.1.6 Display Board : Assembly


### 11.1.7 Legend :

**A) HEATING**
Lights on during operation. Heating and filtration of the air in the room. Sustainment of required ambient temperature.

**B) COOLING**
Lights on during operation. Cooling, dehumidification and filtration of the air in the room. Sustainment of required ambient temperature.

**C) VENTILATION**
Lights on during operation. The unit is running in ventilation mode only.

**D) MODE Button**
Pressing the button changes unit function between COOL – HEAT – FAN.

**E) POWER**
Lights on as soon as the unit is energized.

**F) PROGRAMMING**
Comes on during operation. Flashes to indicate that the remote control signal has been received and stored in the memory (applicable with remote control only).

**G) FILTER**
Comes on when the air filter needs to be cleaned. After cleaning and re-installation of the filter, the system must be reset (RESET button).

**H) TEMPERATURE**
Set temperature display
18 lights - 18ºC
18 & 20 lights - 19ºC
20 lights - 20ºC

**I) TEMPERATURE SET DECREASE**
Each pressing decreases set temperature by º1C.

**J) TEMPERATURE SET INCREASE**
Each pressing increases set temperature by º1C.

**K) FAN**
Each pressing changes fan speed MEDIUM – LOW – AUTO.

**L) FAN**
H – High speed

**M) FAN**
M – Medium speed

**N) FAN**
L – Low speed

**O) FAN**
A – Automatic

**P) RESET**
Press to switch off the indicator light and activate the filter function, after cleaning and re-installing the filter. Press to cancel the audible warning.

**Q) ON/OFF**
Unit On/Off button.

## 11.2 Control Function

### 11.2.1 Abbreviations

AC - Alternate Current
A/C - Air-Conditioner
ANY - ON or OFF status
CLOCK - ON/OFF Operation Input, (dry contact)
COMP - Compressor
CPU - Central Processing Unit
CTV - Compensation Temperature Value
HE - Heating Element
HPC - High Pressure Control
H/W - Hardware
ICP - Indoor Condensation Pump
ICT - Indoor Coil Temperature (RT2) sensor
IF, IFAN - Indoor Fan
IR - Infrared
LEVEL1 - Normal Water Level
LEVEL2/3 - Medium/High Waterlevel
LEVEL4 - Overflow Level
Max - Maximum
Min - Minimum
min - Minute (time)
NA - Not Applicable
OCP - Outdoor Condensation Pump
OCT - Outdoor Coil Temperature (RT3) sensor
OF, OFAN - Outdoor Fan
OPER - Operate
Para. - Paragraph
RAT - Return Air Temperature (RT1) sensor
RC - Reverse Cycle (Heat Pump)
R/C - Remote Control
RCT - Remote Control Temperature
RH - Resistance Heater
RT - Room Temperature (i.e. RCT in IFEEL mode, RAT otherwise)
RV - Reversing Valve
SB, STBY - Stand-By
sec - Second (time)
Sect - Section
SH - Supplementary Heater
SPT - Set Point Temperature
ST - Standard (Model with Cooling Only)
S/W - Software
TEMP - Temperature
W/O - Without
$\Delta T$ - The difference between SPT and RT.
in Heat Mode: $\Delta T = SPT - RT$
in Cool/Dry/Fan Mode: $\Delta T = RT - SPT$

## 11.3 General Functions

### 11.3.1 COMP Operation

a. For each Mode including POWER OFF & SB, a Min time delay of 3 min before COMP restarting, excluding DEICING Mode (see para. 14.12.2).

b. The Min operation time of COMP under different operating conditions is:

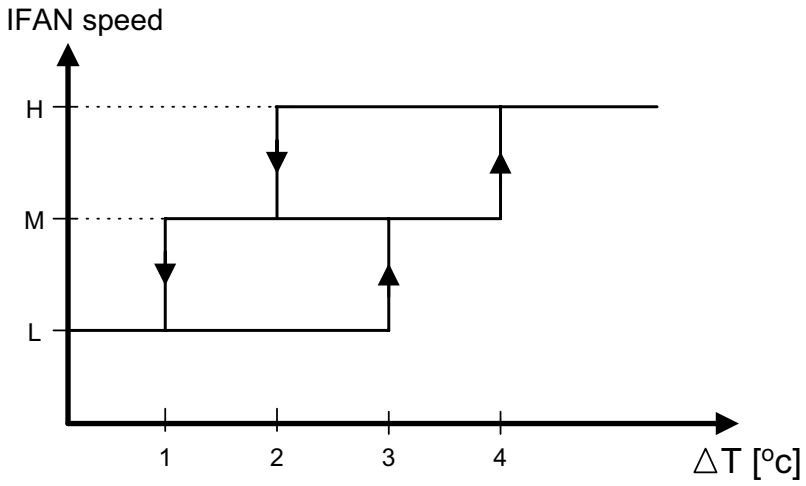
| Operation Mode | Min Operation Time of COMP |
|---|---|
| Heat, Cool, HP protection or Auto Modes | 3 min. |
| Fan, Dry, Overflow, Protection Modes, or Mode Change | Ignored |

### 11.3.2 IFAN operation

a. Min time interval between IFAN speed change in AUTOFAN Mode is 30 sec.

b. Min time interval between IFAN speed change in H/M/L Mode is 1 sec.

c. IFAN speed in Heat/Cool AUTOFAN Mode is determined according to the following chart:




Where in Heat Mode: $\Delta T = SPT - RT$
in Cool Mode: $\Delta T = RT - SPT$

### 11.3.3 OFAN Operation

Min time interval between OFAN ON/OFF state changes is 30 sec.

### 11.3.4 HE Operation

a. Min Heaters ON or OFF time is 30 sec.

b. Heaters can never be in operation while IFAN is OFF.

c. In RH group, HE-1 and HE-2 will be activated only when COMP is not operating, except in Dry Mode.

### 11.3.5 Protections

a. High pressure protection is applicable to all operating modes.

b. Deicing control is valid in Heat and Auto Heat Modes only.

c. Defrosting control is valid in Dry, Cool, and Auto Cool Modes.

### 11.3.6 Thermistors Operation

a. Return air Temp. is detected by RAT in normal Mode, or by RCT (R/C sensor) in I-FEEL Mode.

b. Indoor Coil Temp. is detected by ICT.

c. Outdoor Coil Temp. is detected by OCT.

d. Definition of thermistor faults:

1) Thermistor is disconnected - the thermistor reading is below – 30$^{O}$C.

2) Thermistor is shorted - the thermistor reading is above 75$^{O}$C.

3) Thermistor Temp reading doesn't change -

a) This test is performed only once after a unit is switched from OFF/STBY to operation. At the first occurrence of 10 min continuous COMP operation, the current ICT are compared with those when the COMP was switched from OFF to ON 10 min before. If the $\Delta$T is less than 3$^{O}$C, the thermistor is regarded as defective.

b) The ICT no-change error can be disabled together by connecting a 4.7k$\Omega$ resistor (5%) to the ICT connector. These resistors are equivalent to a thermistor 48+/-1$^{O}$C.

e. Cases for disabling ICT thermistor disconnected detection:

1) The detection of thermistor faults a. and b. above is disabled when Deicer Protection is started. The detection will be enabled again only after (1) the deicing is completed, and (2) COMP has been restarted and operated for 30 sec.

2) When all the following conditions are fulfilled:

a) 4.7k$\Omega$ resistor is connected to the OCT.

b) IFAN is OFF.

c) Compressor is ON.

d) ICT < -30 (disconnected).

### 11.3.7 RV Fault

This test is applied only in compressor units where 4.7kΩ resistor is not connected to the OCT.
The test is performed every time the unit is switched from OFF/STBY to OPER in Heat mode or changes operation mode from COOL/DRY to HEAT or (this applies also in AUTO COOL/HEAT mode).
If ICT is lower than 35°C at the time of mode change, then at the first occurrence of 15 min continuous COMP operation, ICT is compared with ICT reading when the COMP was switched from OFF to ON 15 min before. RV fault is defined when ICT decreases more than 5°C.
In this case, the COMP will stop and the SB LED will blink. The fault is reset after switching to SB or after mode change.

### 11.3.8 General Features

a. Allowed (control target) range for RAT is SPT +/-1ºC.

b. Whenever the unit is changed from COOL/DRY/STBY mode to HEAT mode or vice versa, the procedures below are followed:
Stop COMP for 3 min → Change RV state → Start COMP if necessary.

## 11.4 Cooling Mode

### 11.4.1 Cooling Mode – General

a. Mode Definition

Mode: COOL, AUTO (at Cooling)

Temp: Selected desired temperature.

Fan: HIGH, MED, LOW, AUTO.

Timer: Any

I-FEEL: ON or OFF

b. Room Temperature, RT, is detected by:

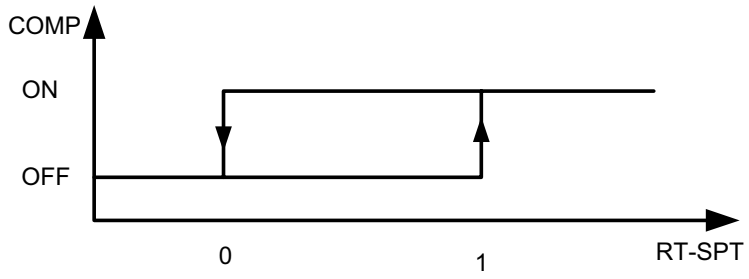
- RAT in normal operation, or
- RCT (R/C sensor) in I-FEEL mode.

c. Indoor Coil Temp is detected by ICT.

d. Outdoor Coil Temp is detected by OCT.

### 11.4.2 Control Functions

a. COMP Operation




b. OFAN Operation

- In normal operation OFAN operates together with the COMP.

c. IFAN Operation

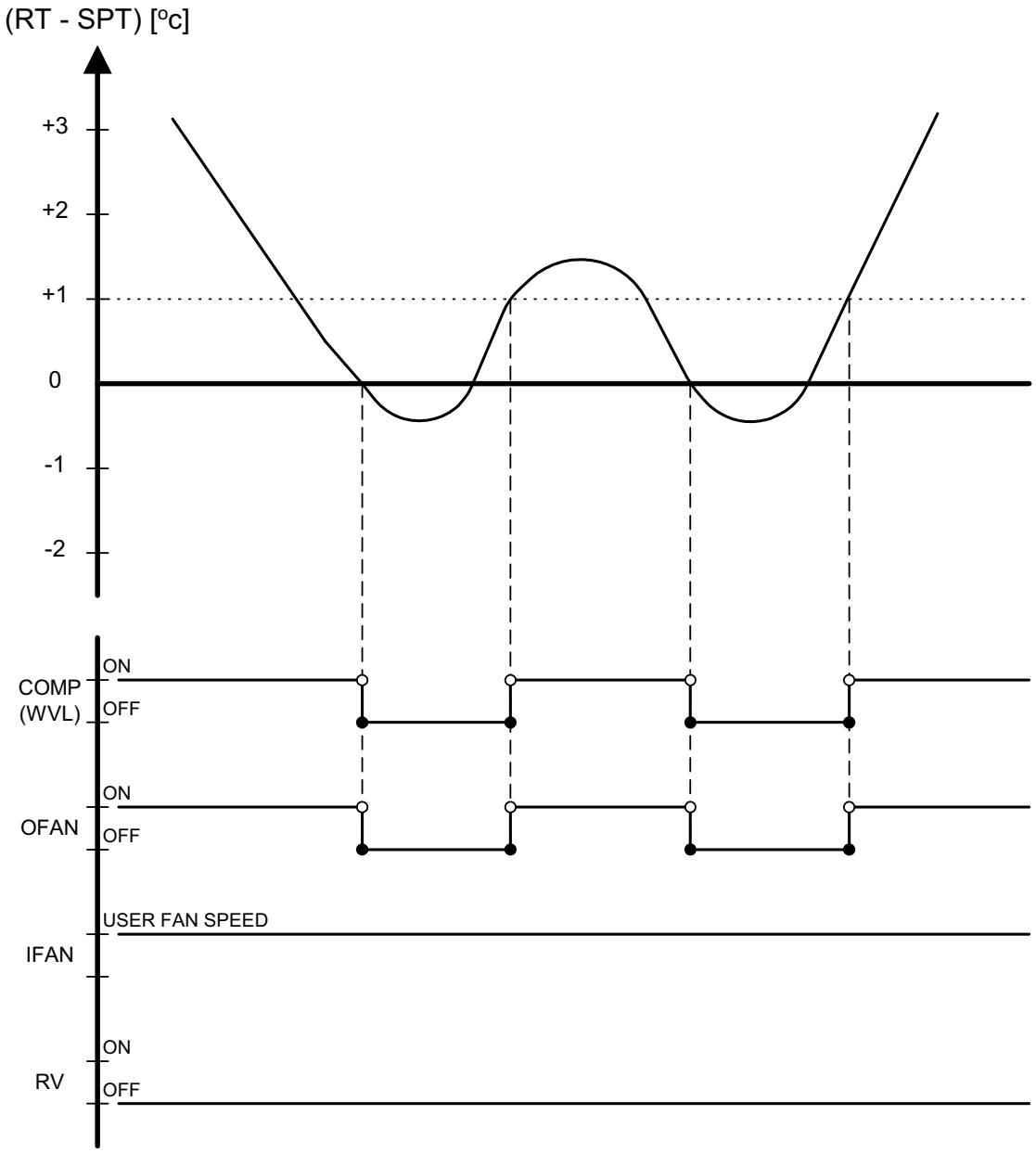
- IFAN will operate in ANY speed regardless the ICT or COMP state.
- IFAN speed will be determined according to user selection or AUTO-FAN logic

d. RV and HEATERS outputs

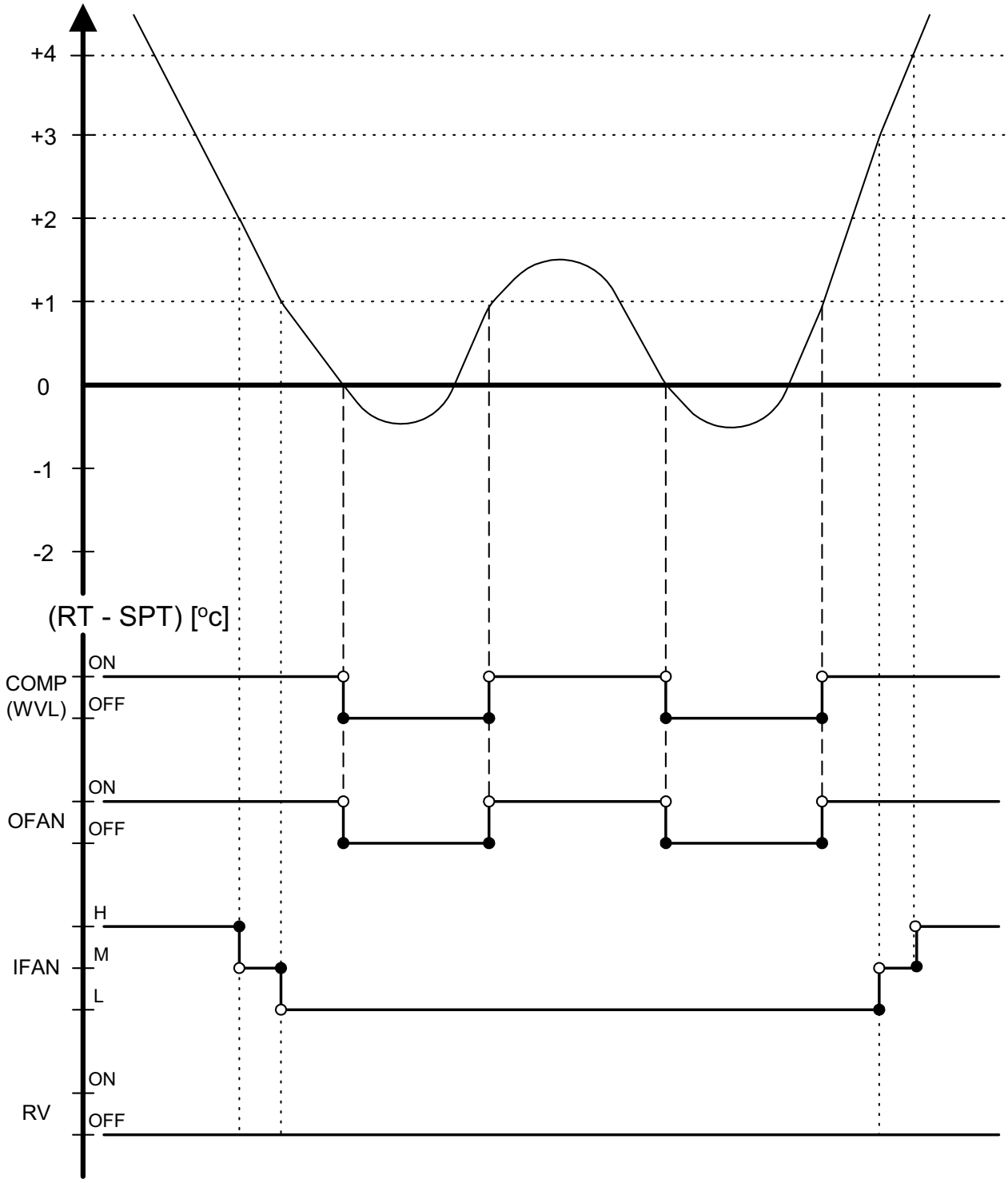
- RV and HEATERS are in OFF state in COOL mode.

### 11.4.3 Sequence Diagrams

a. Maintaining room temp at desired level by comparing RT and SPT with user defined IFAN speed.



b. Maintaining room temp at desired level by comparing RT and SPT with AUTO-IFAN.



## 11.5 Heating Mode

### 11.5.1 Heating Mode - General

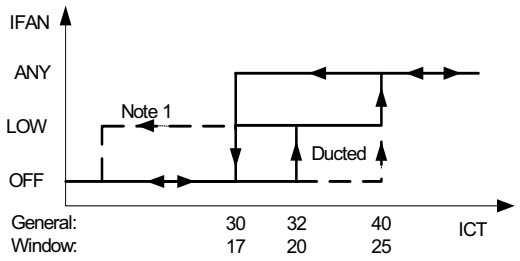
a. Compensation Procedure
When I-FEEL is OFF during HEAT mode: RT= RAT – CTV.
When I-FEEL is ON during HEAT mode: RT= RCT.

| Type of Indoor | CTV |
|---|---|
| Wall Mounted | +3 °C |
| Mobiles / Floor Ceiling | +0 °C |
| Square /Window | +2 °C |
| Ducted | +4 °C |
| Cassettes | +4 °C |

No compensation will be activated in Forced operation modes

b. IFAN operation rules for RC and SH groups:

1) As a general rule for **RC and SH groups,** IFAN will be switched ON according to the following graph:




***NOTE 1***

**When COMP is ON (except WAX Model), IFAN will change from LOW to OFF either when:**

a) ICT<28 and IFAN is on for 5 min or longer.

Or,

b) ICT<20

***NOTE 2***

**When ICT is faulty:**
**When the compressor switches from OFF to ON (excluding deicing), IFAN will be on in ANY speed.**
**When the compressor switches from ON to OFF, the IFAN will change to LOW speed for 30 seconds and then it will be off.**

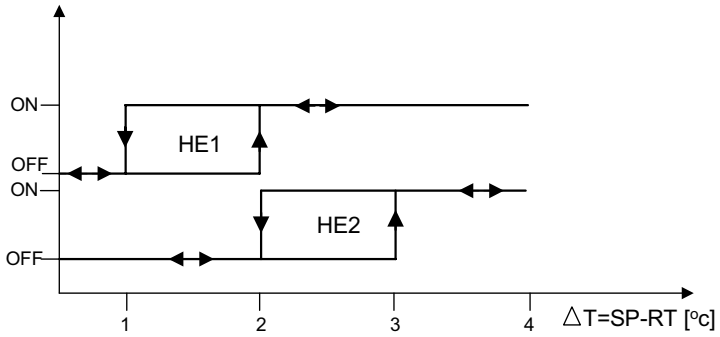
2) In SH or RC group, IFAN will operate for Min 30 sec according to 1) above after HEs are turned off, where in a case it has to be OFF, it will be forced to LOW speed.

c. IFAN operation rules for RH group

1) In RH group, IFAN starts when HE starts. When HE switches to OFF, IFAN switches to LOW for 30 sec and then stops.

d. Heaters operation rules for RC and SH groups:

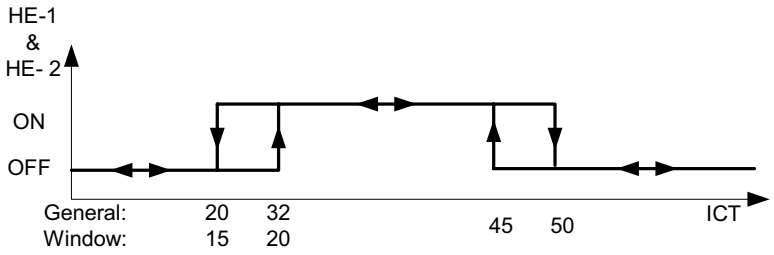
1) For both RC and SH groups, Heaters versus ΔT is as follows:




2) Operation rules for Heaters in RC group:

a) Heaters can be enabled only if IFAN is ON.

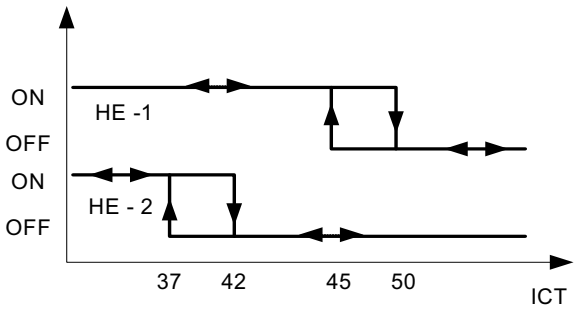
b) Heaters will operate according to ΔT **and** the following graph:




3) Rules for Heaters operation in SH group:

a) When heaters are to be ON and IFAN is to be OFF according to d. 1) above, IFAN will be forced to LOW speed.

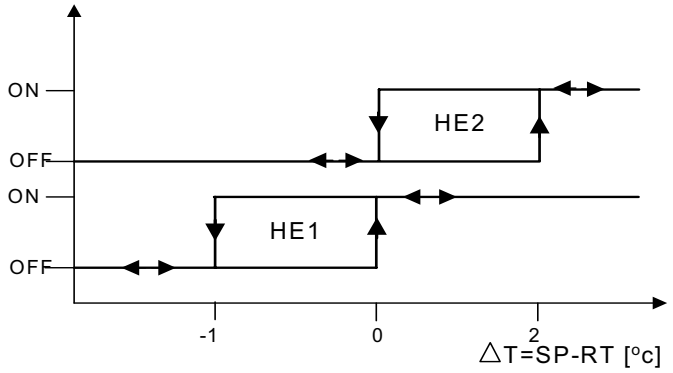
b) Heaters will operate according to ΔT and the following graph:




4) For both RC and SH groups, excluding deicing, HE1 and HE2 can be ON only when the compressor is ON.

e. Heaters operation rules for RH groups:

1) In RH group, HE operation is according to the difference between RAT and SPT.



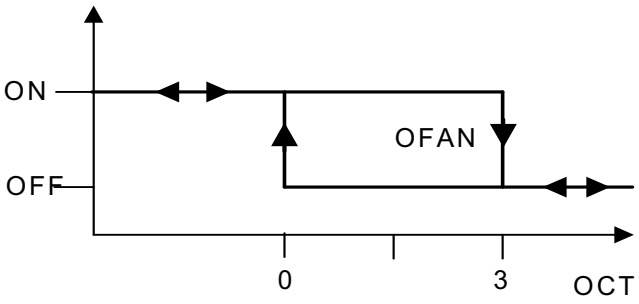

f. OFAN Operation for RC and SH groups

1) As a general rule for RC and SH groups, excluding protection modes, OFAN starts with the compressor.

2) When OFAN is ON it will operate according to the following conditions:

a) OFAN operates together with the compressor.

b) When $(RT \geq SPT - 2)\ and\ ICT \geq 50$ and the 4.7kΩ resistor is not connected to the OCT, OFAN will operate according to the following curve:



## 11.6 Heating, RC or SH Group

Mode: HEAT, AUTO (at heating)

Temp: Selected desired temperature

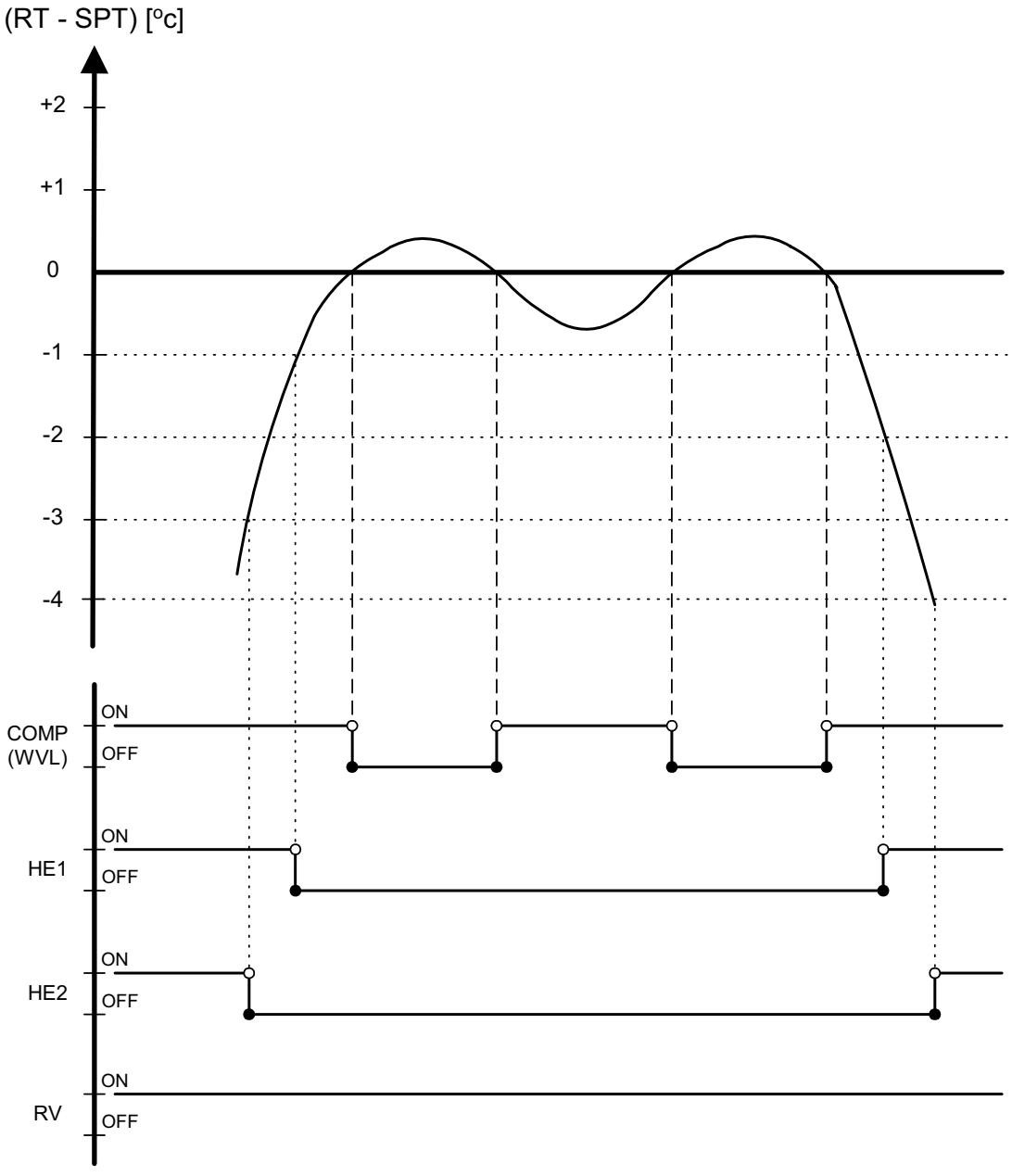
Fan: HIGH, MED, LOW

Timer: Any

I-FEEL: ON or OFF

### 11.6.1 Sequence Diagram

Maintains room temp. at desired level by comparing RAT or RCT to SPT.



## 11.7 Heating, RC or SH Group with Autofan

Mode: HEAT, AUTO (at heating)

Temp: Selected desired temperature

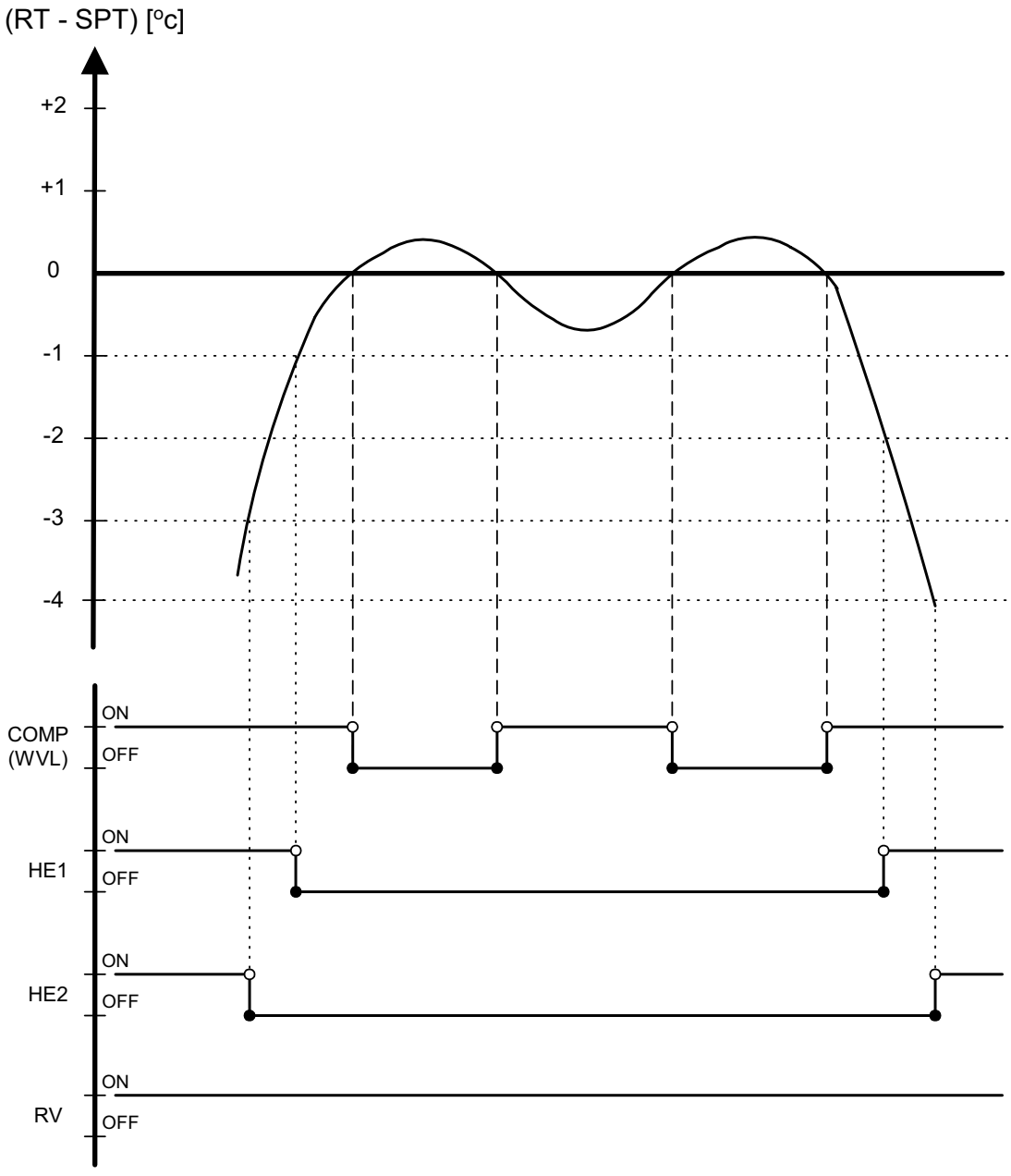
Fan: AUTO

Timer: Any

I-FEEL: ON or OFF

### 11.7.1 Sequence Diagram

Maintains room temp at desired level by controlling COMP, IFAN and OFAN.



## 11.8 Heating, RH Group

Mode: HEAT, AUTO (at Heating)

Temp: Selected desired temperature

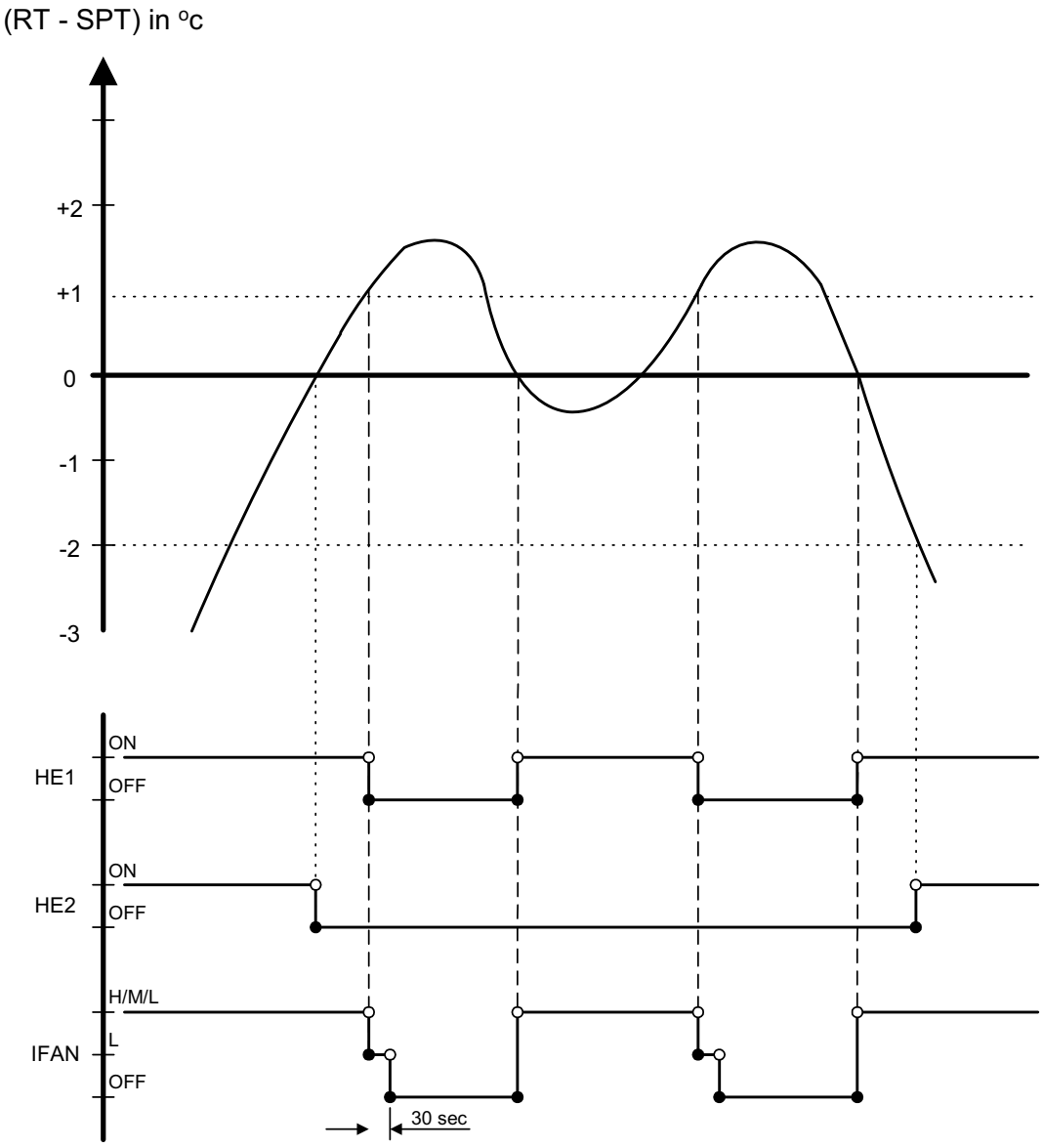
Fan: HIGH, MED, LOW

Timer: Any

I-FEEL: ON or OFF

### 11.8.1 Sequence Diagram

Maintains room temp at desired level by controlling Heating Elements: HE1 or HE2.



## 11.9 Heating, RH Group, with AUTOFAN

Mode: HEAT, AUTO (at Heating)

Temp: Selected desired temperature

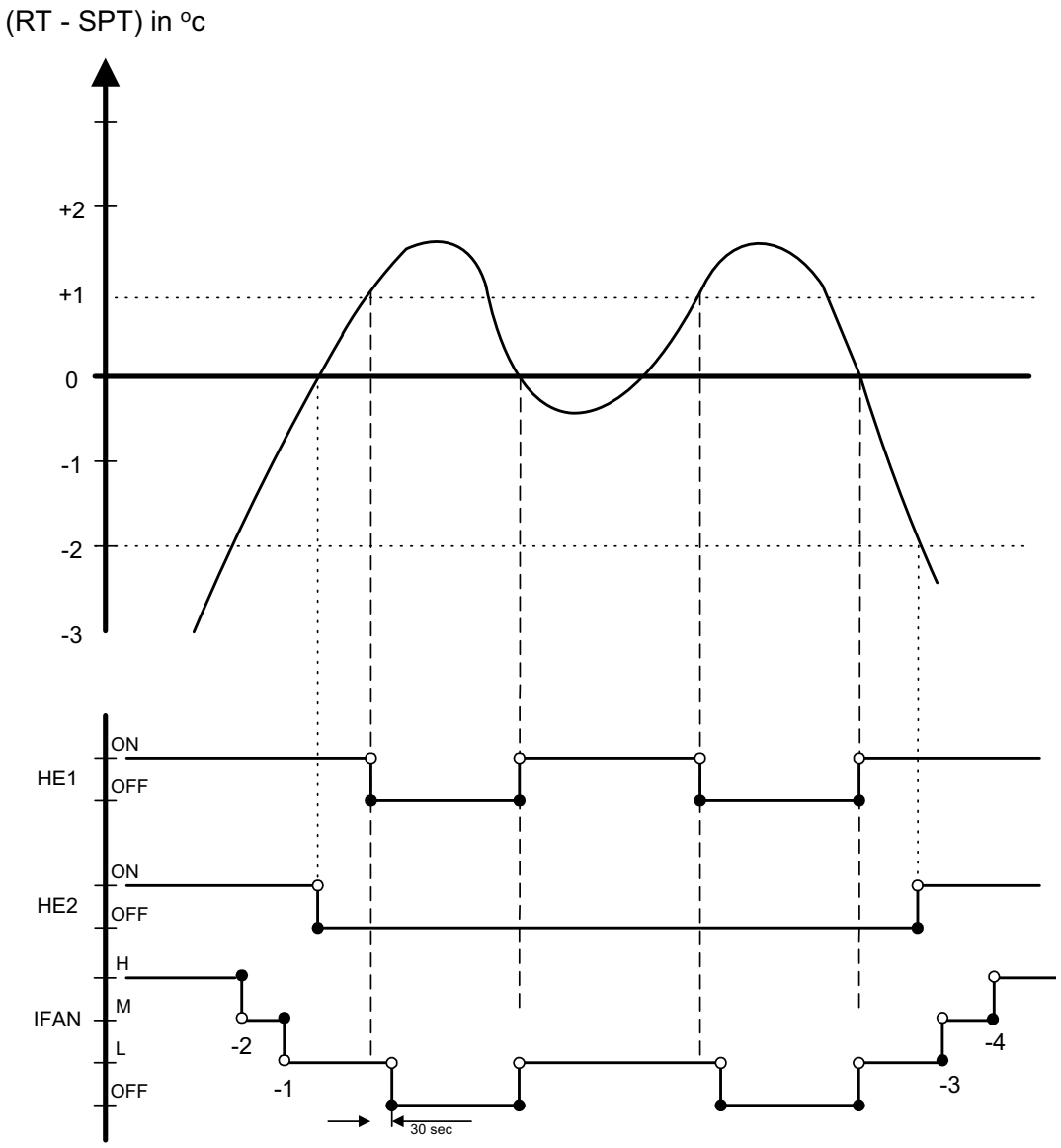
Fan: AUTO

Timer: Any

I-FEEL: ON or OFF

### 11.9.1 Sequence Diagram

Maintains room temp. at desired level by controlling the 2-Stage Electric Heaters.



## 11.10 Automatic Cooling or Heating

### 11.10.1 Automatic Cooling or Heating - General

The AUTO Mode is for models with compressor and the WVL-RH only. The WVL-ST, RC and SH units do not work in AUTO Mode.

a. Mode Definition

Mode: AUTO

Temp: Selected desired temperature

Fan: Any

Timer: Any

I-FEEL: ON or OFF

b. Switching-temperature between Cooling and Heating is SPT $\pm$ 3$^{O}$C.

c. When the AUTO Mode is started with SPT +/-0 $^{O}$C, the unit will not select Auto Heat or Auto Cool mode immediately. Instead, the unit will be in a temporary FAN Mode with IFAN operating at low speed. The proper Auto Heat mode or Auto Cool will be started whenever the RT reaches SPT-1$^{O}$C or SPT+1$^{O}$C respectively.

d. For RC & SH units, Mode change between Auto Heat & Auto Cool Modes is possible only after the COMP has been OFF during the last T minutes.

| Mode Change | Time, T |
|---|---|
| Auto Cool to Auto Heat | 3 min |
| Auto Heat to Auto Cool | 4 min |

e. For RH and WVL-RH units, Mode change between Auto Heat & Auto Cool Modes is possible after the COMP/HEs have been OFF during the last T minutes.

| Mode Change | Time, T |
|---|---|
| Auto Cool to Auto Heat | COMP off for 3 min |
| Auto Heat to Auto Cool | HEs off for 3 min |

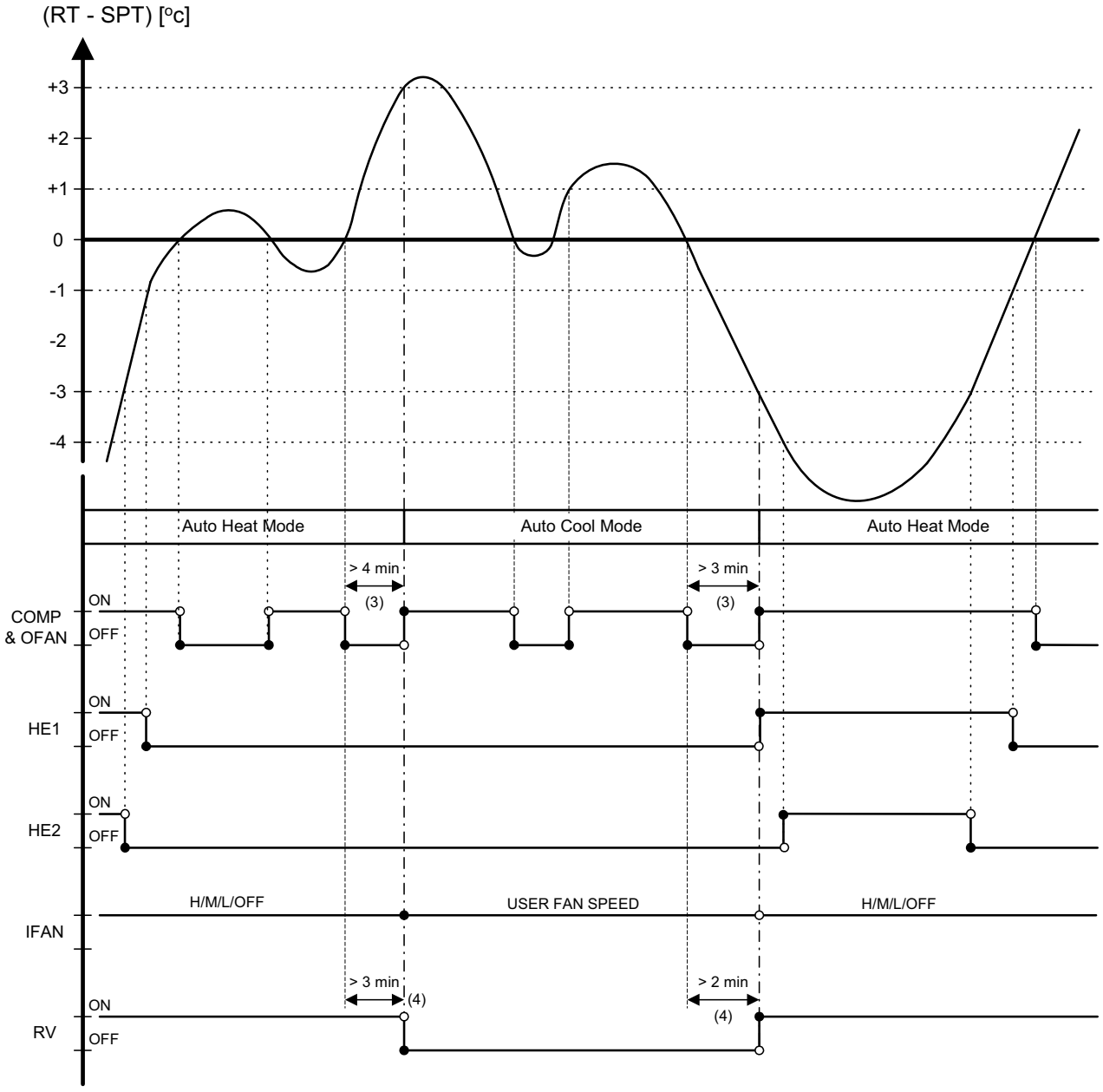
f. When unit is changed form Cool/Dry Mode to Auto Mode, the unit will continue to operate in (Auto) Cool Mode until the conditions for switching from Auto Cool to Auto Heat are satisfied.

Similarly, when unit is changed from Heat Mode to Auto Mode, the unit will continue to operate in (Auto) Heat Mode until the conditions for switching from Auto Heat to Auto Cool are satisfied.

### 11.10.2 Sequence Diagrams

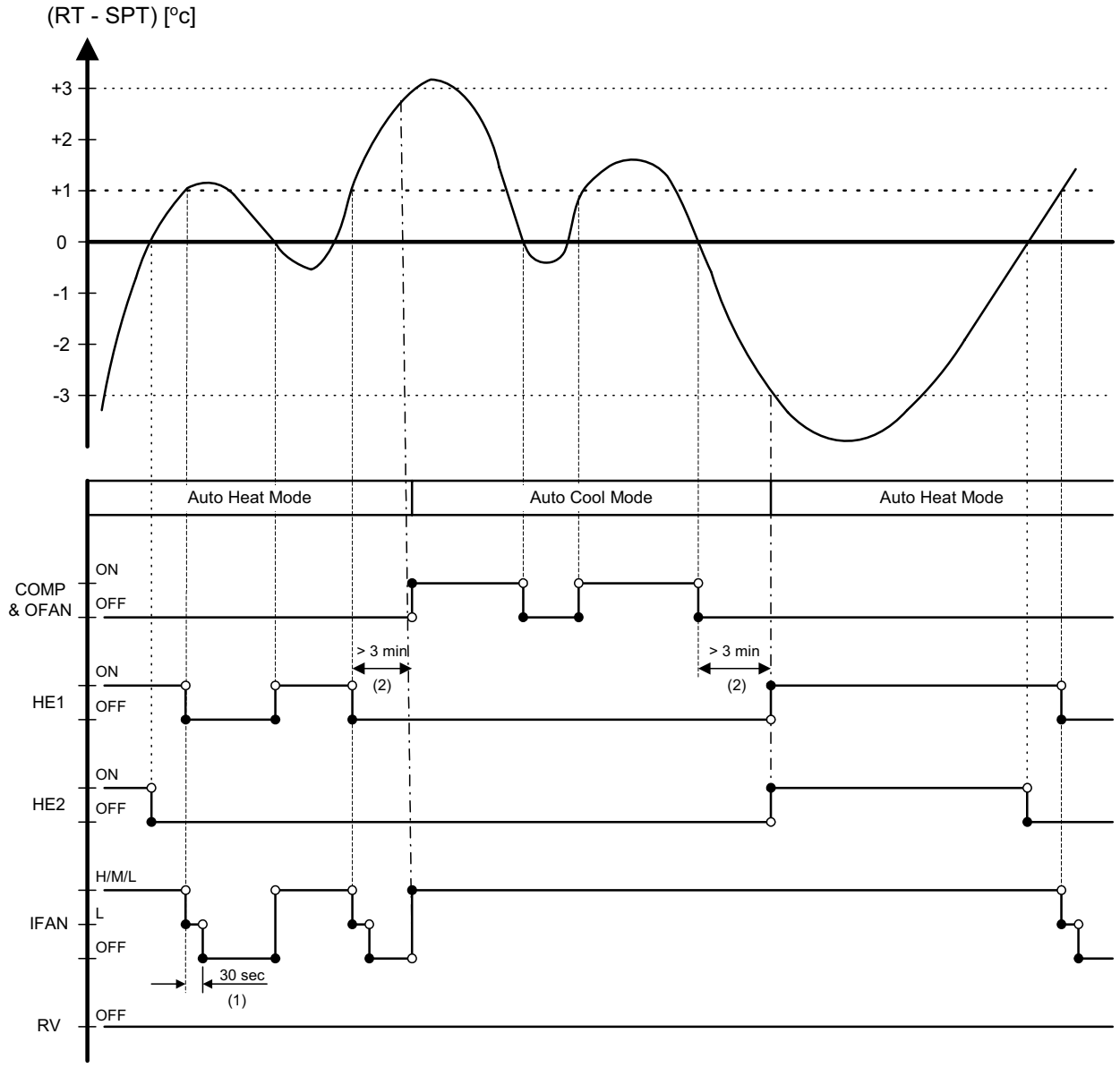
a. Auto Cooling or Heating, RC or SH Groups

Maintains room temp. at desired level by selecting between cooling and heating modes.



b. Auto Cooling or Heating RH Group

Maintains room temp. at desired level by selecting between Cooling or Heating Modes.

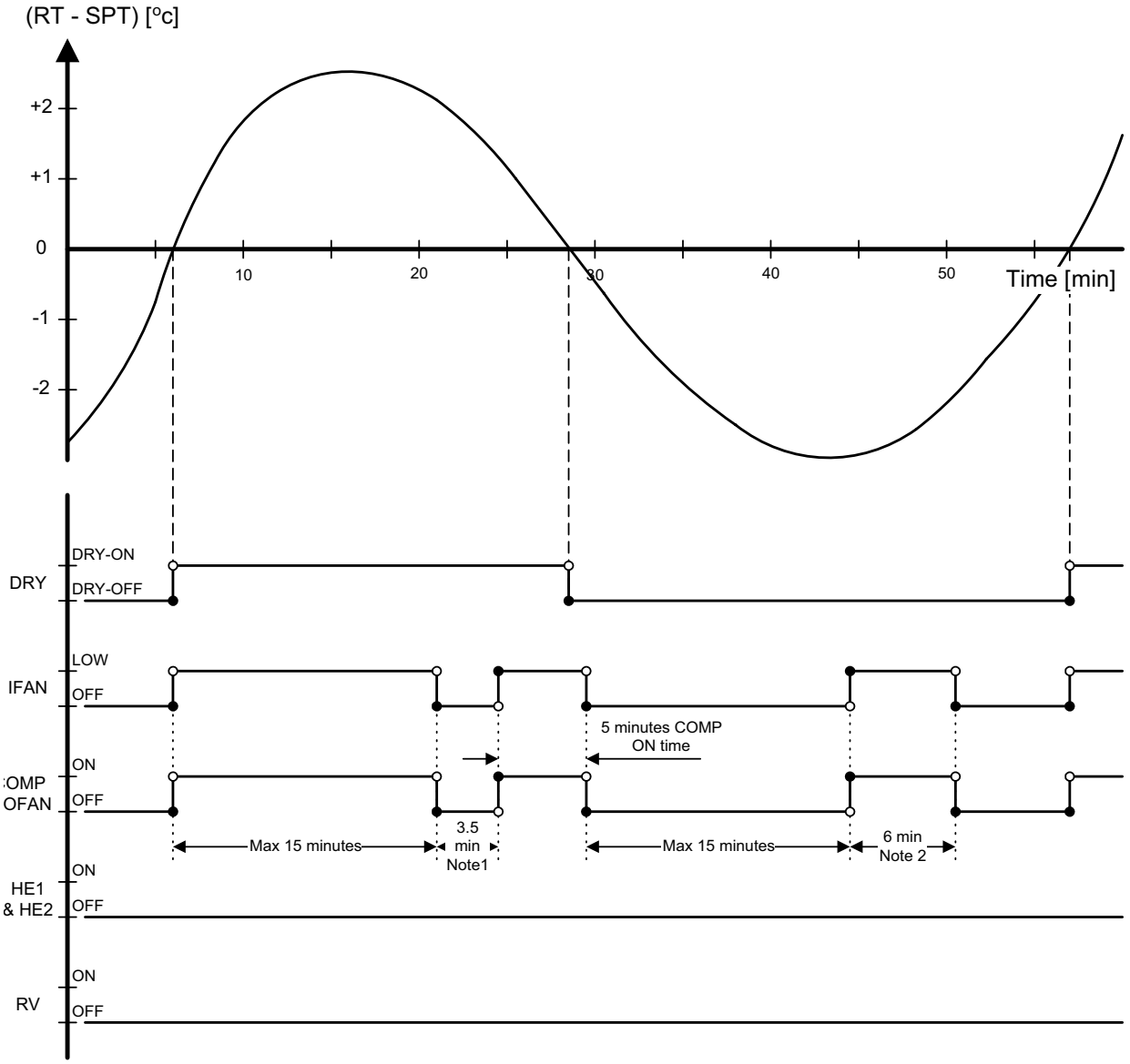



## 11.11 Dry Mode

### 11.11.1 Dry, ST or RC Group or P2000 Model with Any Group Settings

Mode: DRY
Temp: Selected desired temperature
Fan: LOW (automatically selected by software)
Timer: Any
I-FEEL: Any

Control function
Reduce room humidity with minimum temp. fluctuations by operating in Cool Mode with LOW speed IFAN.




***NOTES***

1. **When DRY is ON, the COMP is forced OFF for 3.5 min (longer than the 3 min Min COMP- OFF time) after every 15 min of continuous COMP operation.**
2. **When DRY is OFF, the COMP is forced ON for 6 min (longer than the 3 min Min COMP- ON time) after every 15 min of continuous COMP OFF time.**
3. **When DRY is changed from ON to OFF or vice versa, the limits mentioned in (1) & (2) are ignored. The COMP operation is only controlled by the 3 min Min OFF time and 1 min Min ON time.**
4. **In DRY Mode, IFAN is LOW when COMP is ON, and is OFF when COMP is OFF.**
5. **HEs are always OFF in DRY Mode.**

## 11.11.2 DRY, SH or RH group

Mode: DRY

Temp: Selected desired temperature

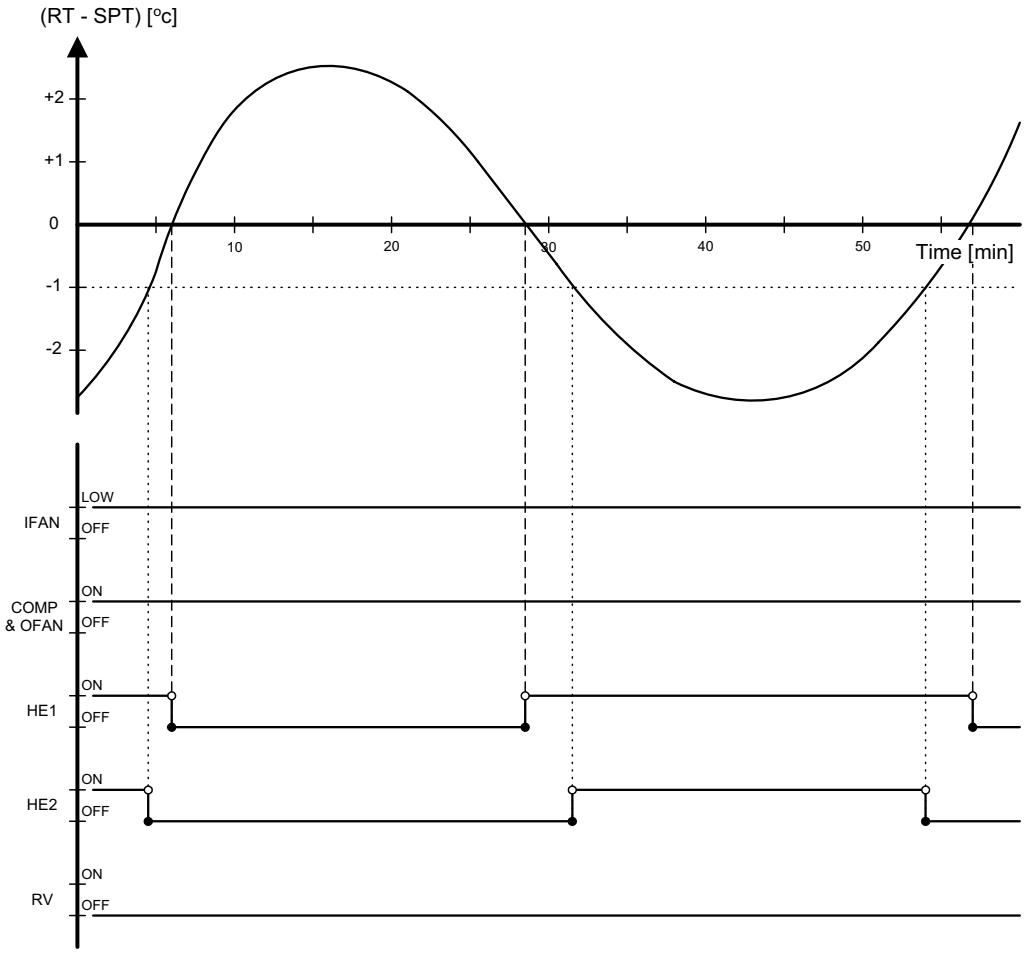
Fan: LOW (automatically selected by software)

Timer: Any

I-FEEL: Any

Control function

Reduces room humidity with minimum temp. fluctuations by operating in Cool Mode with LOW speed IFAN and HE.



# 11.12 Protection

## 11.12.1 Cooling Mode Protections

a. Indoor Coil Defrost

Mode: COOLING, DRY, AUTO

Temp: Selected desired temp.

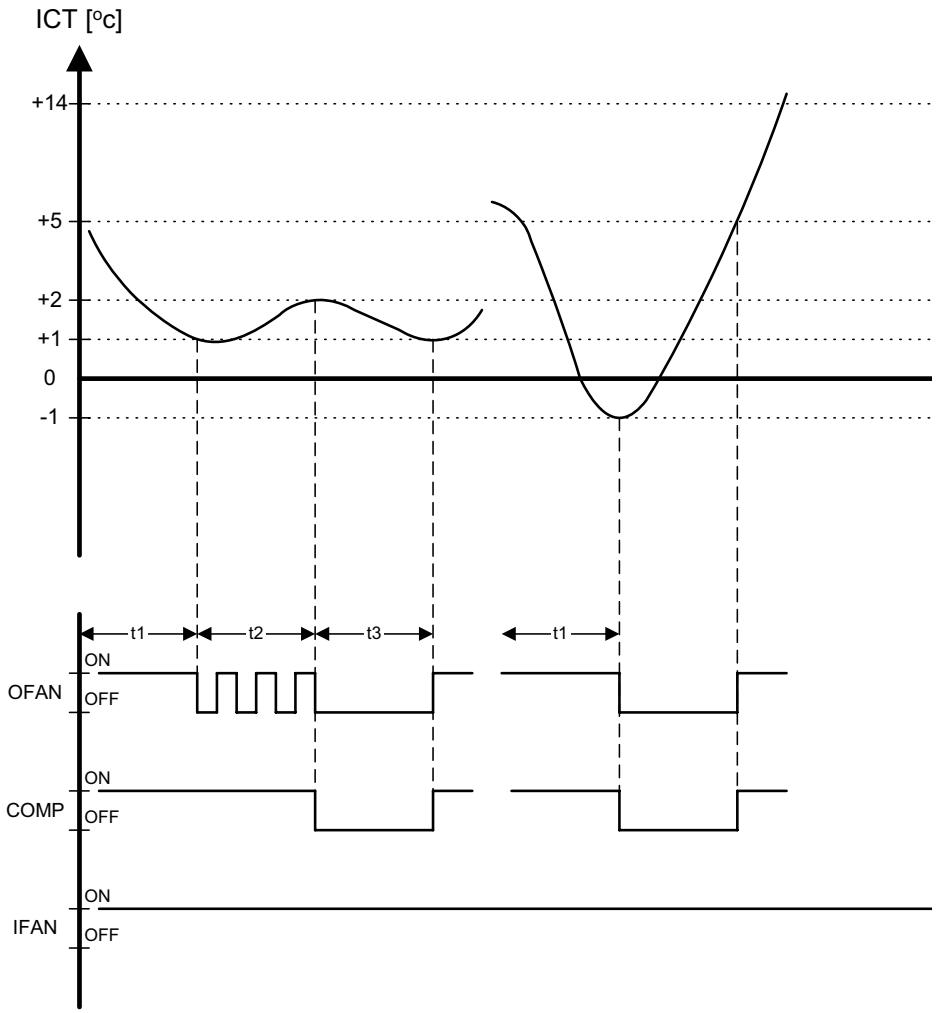
Fan: Any

Timer: Any

I-FEEL: ON or OFF

Control Function

Protects the indoor coil from ice formation at low ambient temperatures.




t1 = 5 min minimum for each COMP starting.
t2 = OFAN cycling (alternate between ON and OFF every 30 sec) for 20 min maximum.
t3 = COMP and OFAN stops for 10 min minimum.

b. High Pressure Protection

Mode: (AUTO) COOLING or DRY

Temp: Selected desired temperature

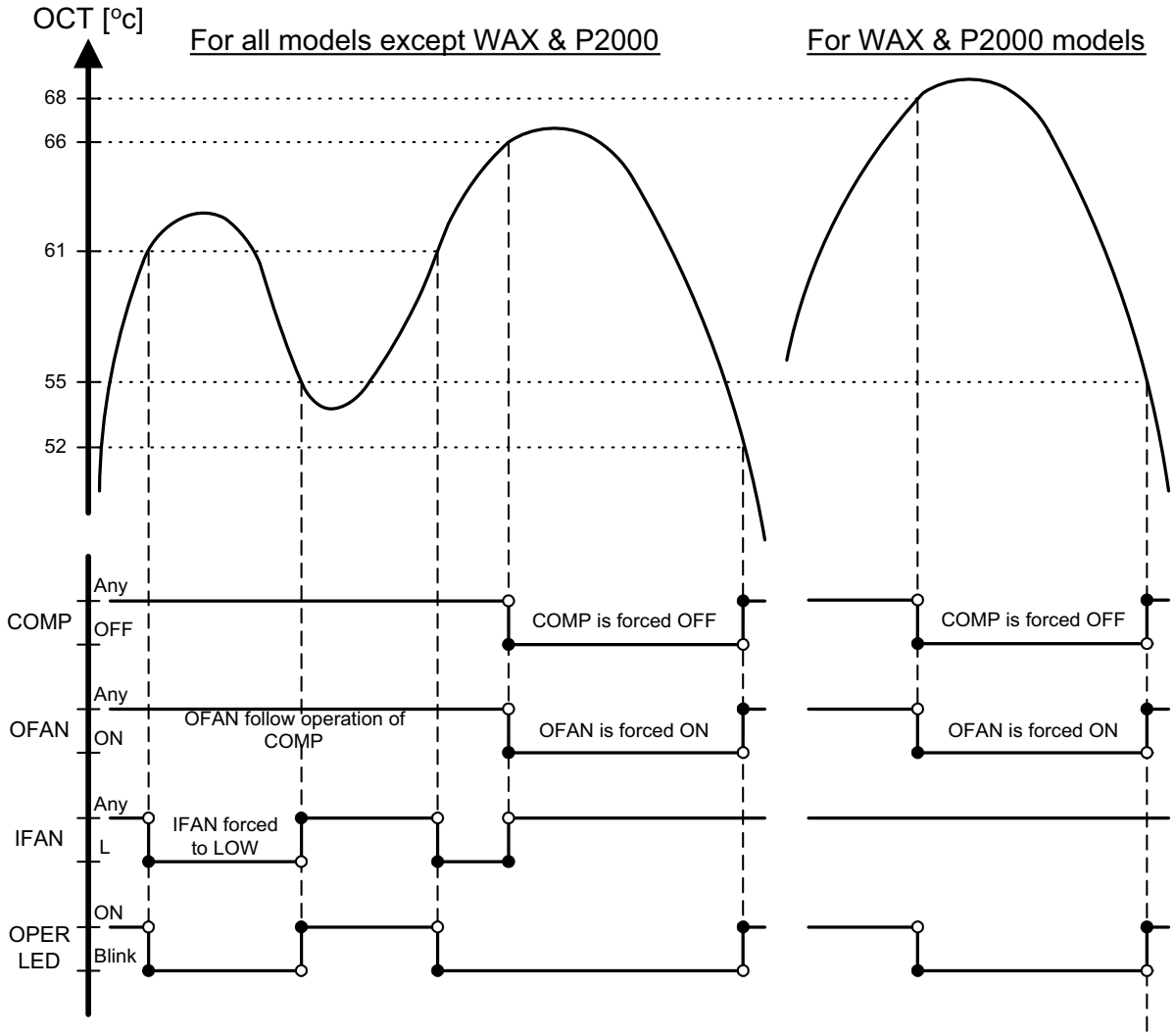
Fan: Any

Timer: Any

I-FEEL: ON or OFF

Control Function

To protect the COMP from the high pressure build-up in the outdoor coil during normal cooling operation, by switching OFF the IFAN and COMP.




***NOTE***

**The ICT is also monitored during COOL and DRY modes, in case the RV control circuit is faulty. Whenever ICT reaches 70°C, which indicates a high pressure in the indoor coil, the COMP will be forced OFF automatically. The COMP can be turned ON again only after the ICT is under 70°C again and after the 3 min COMP ON delay time. The OPER LED will not blink in this case.**

### 11.12.2 Heating Mode Protections

a. Outdoor Coil Deicing (excluding RH Group)

Mode: HEATING, AUTO (at heating)

Temp: Selected desired temperature

Fan: Any

Timer: Any

I-FEEL: Any

Control function

To protect the outdoor coil from ice formation by controlling COMP & RV operation.

1) Deicer Activation Algorithm

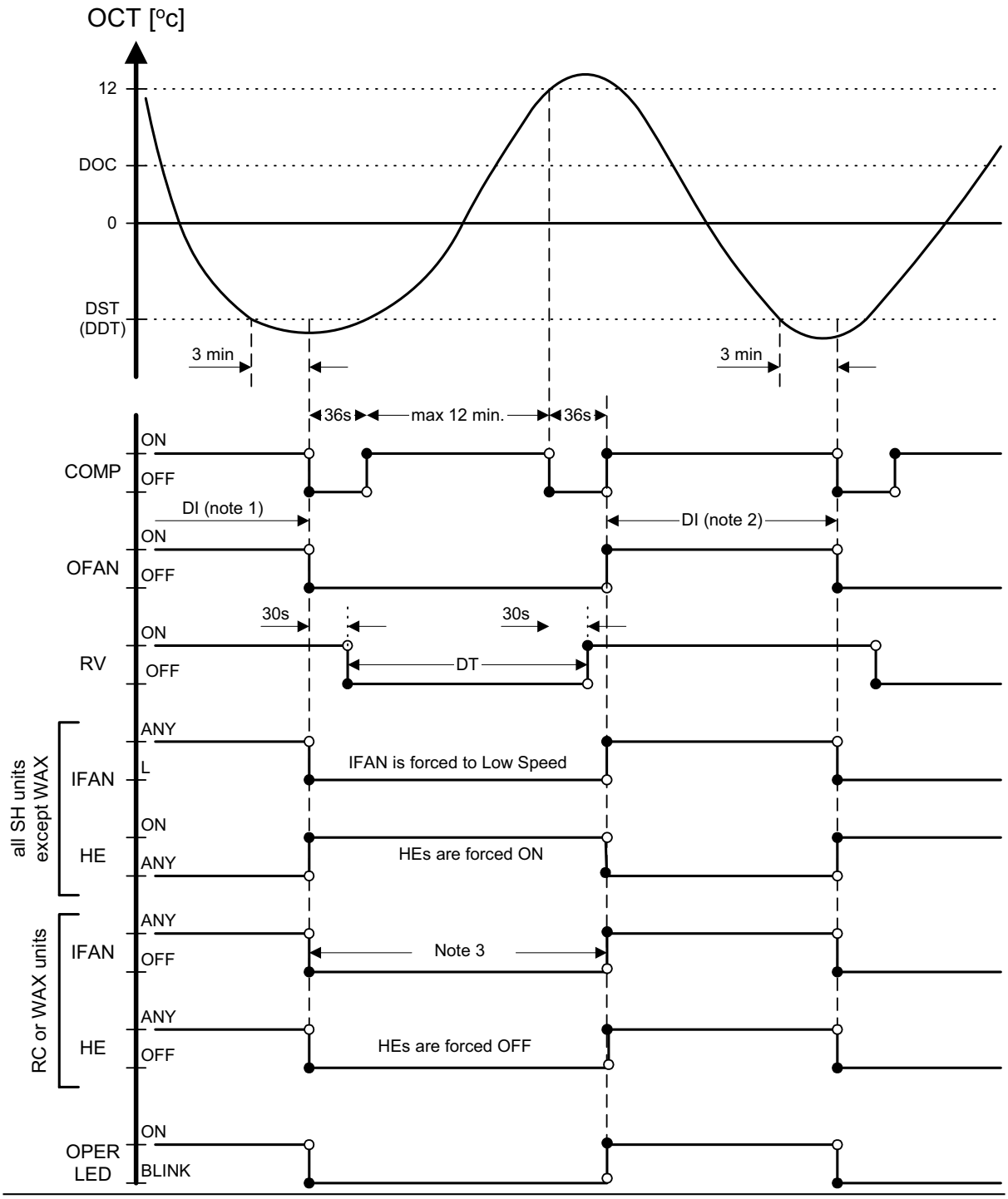
a) Static deicer threshold is -5°C

b) Dynamic deicer threshold changes of 3°C in 3 minutes in the OCT temperature

c) In first COMP activation (after SB or OFF), if OCT < 0°C, min time to first deicer is 10 min else 40 min.

d) In a case of reading 3 successive OCT values below –10°C and previously 3 successive OCT values of 43°C (4.7 K) , the unit will activate deicing procedure.

2) Deicing procedure




***NOTES***

1. **In the following Deicing cycles, the time interval between two Deicing cycles activation is between 30 to 80 min.**
2. **For RC group, IFAN is forced OFF.**
3. **For SH group, HEs are forced ON and IFAN is forced to operate at LOW speed, regardless of the ICT and difference between RAT & SPT.**
4. **When jumper J7 is set, the DST value is -2°C.**

b. High Pressure Protection (excluding RH Group)

Mode: (AUTO) HEATING

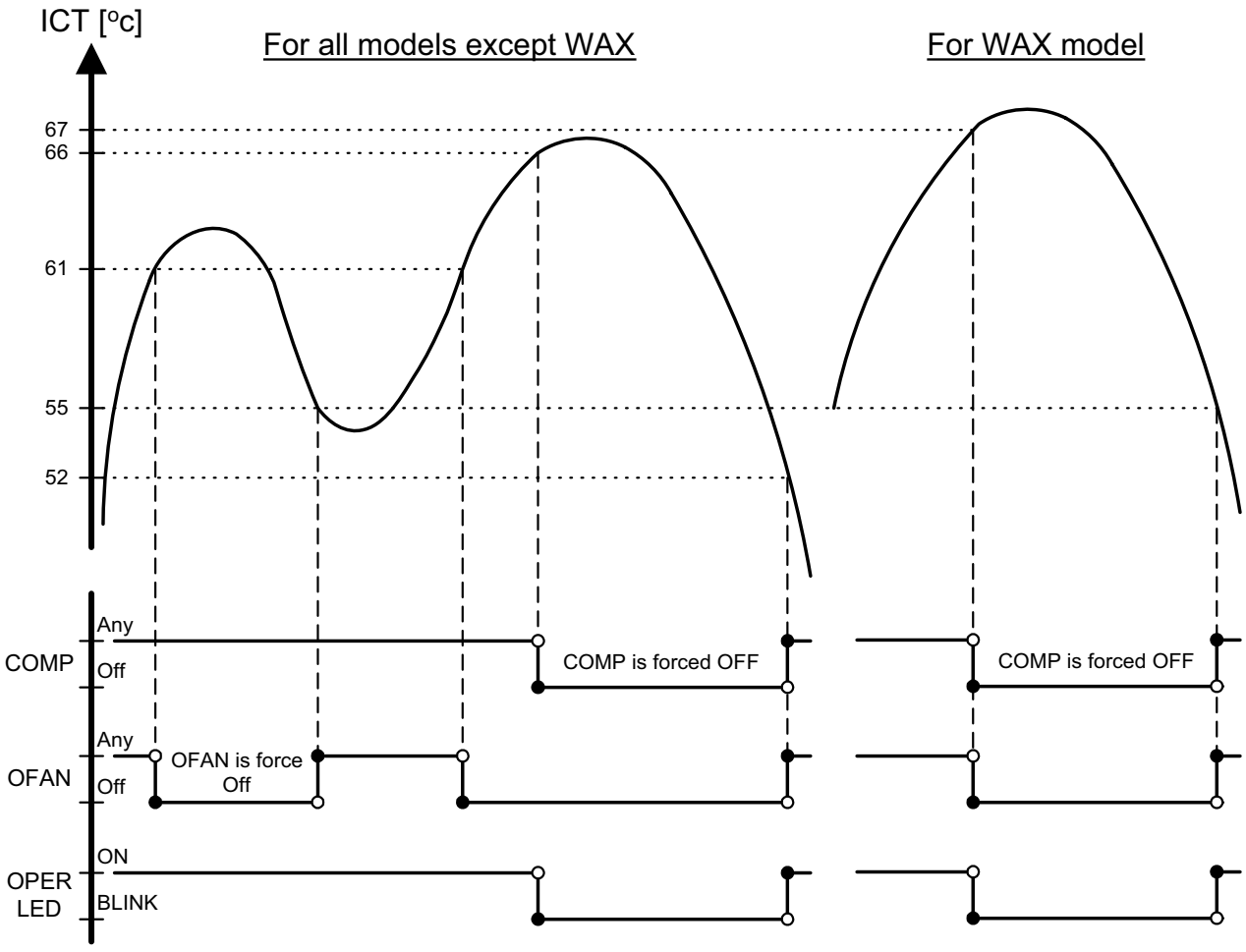
Fan: Any

Timer: Any

I-FEEL: ON or OFF

Control Function

Protects the compressor from high pressure by switching OFF the OFAN and COMP.

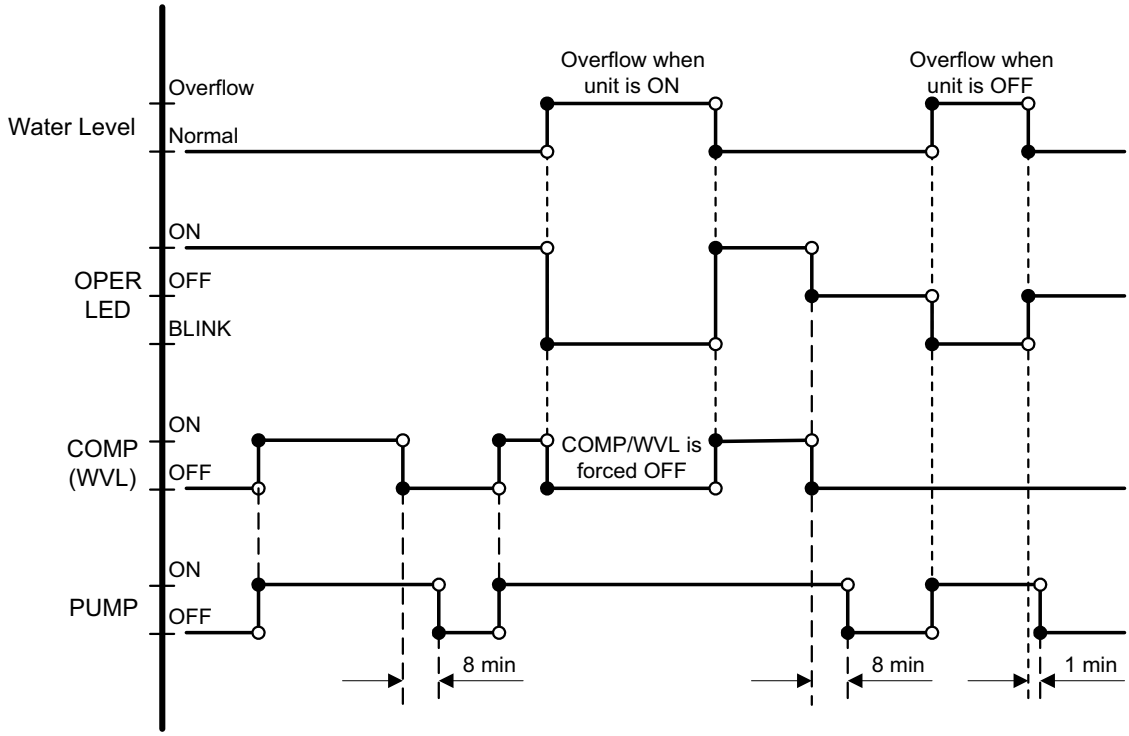


### 11.12.3 Condensation Pump (ECC/K model)

Mode: Cool, Dry, Auto
Temp: Selected desired temperature
Fan: Any
Timer: Any
I FEEL: Any

Control function:

Prevent Condensed water from Overflowing.




Notes:

1. The switch used for water level detection is closed under normal condition, and is open when water overflow.
2. For the NEC version of MCU, the "Over Flow" & “Normal” condition are indicated by logic “0” & “1” at the LEVEL4 input pin respectively.
3. For the Fujitsu version of MCU, the "Over Flow" & “Normal” condition are indicated by logic “1” & “0” at the LEVEL4 input pin respectively.
4. The “Overflow” condition can activate the water pump in SB and operating modes.

## 11.13 Forced Operation (Excluding PRX & PXD Models)

a. Forced operation allows units to start, stop and operate in cooling or heating in preset temp. according to the following table:

| Forced Operation Mode | Pre-set Temp for : MBX, P2000, PX Models | Pre-set Temp for : FCD, RWK ,ELD, ECC, WAX, WNX, WMN Models |
|---|---|---|
| Cooling | 20 ºC | 22 ºC |
| Heating | 25 ºC | 28 ºC |

***NOTES***

1. **While under the forced operation, the temperature compensation schedule is disabled.**
2. **The forced operation is activated when the mode button on the Display Board is used to switch the unit to COOL or HEAT mode.**
3. **The IFAN is always set to Autofan Speed in forced operation.**

Temp: Set – desired temperature selected

Fan: Any

Timer: Interact with Sleep Timer

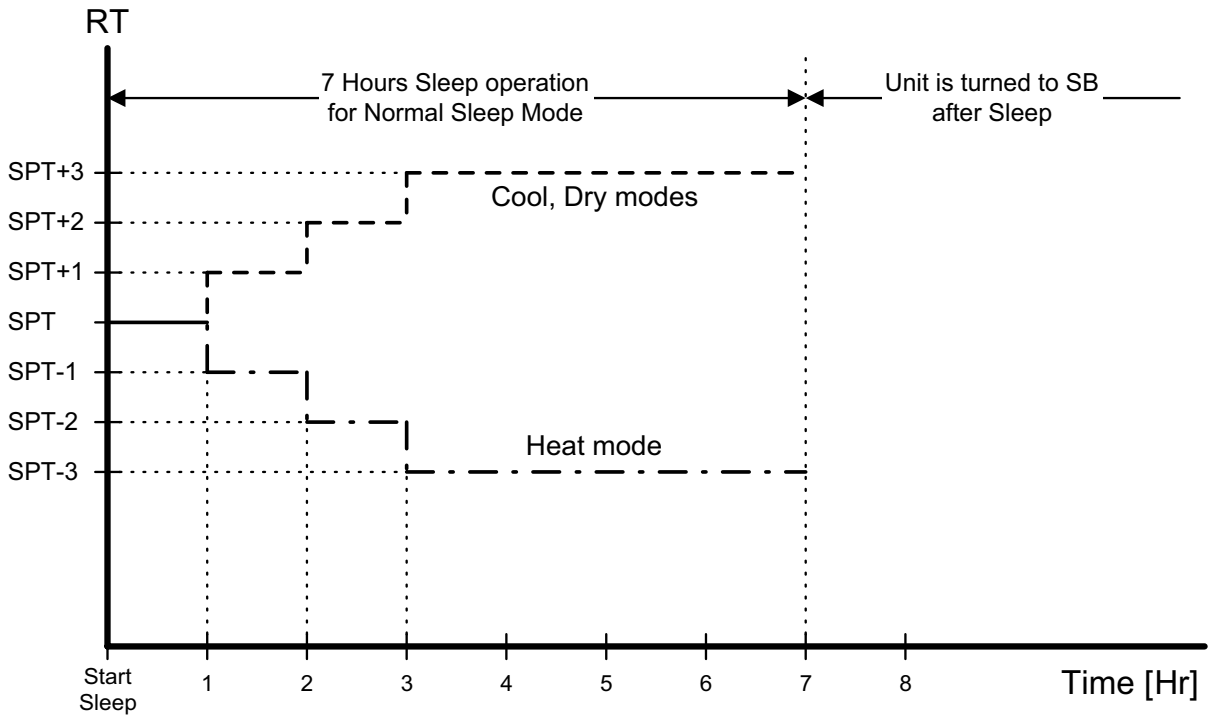
I-FEEL: ON or OFF

The Sleep mode is activated by using the SLEEP button on the R/C. In Sleep Mode, the unit will automatically adjust the SPT to turn up/down the room temperature (RT) gradually to provide maximum comfort for the sleeping user.

Sleep is treated as TIMER function. Therefore, the TIMER LED is activated similar to TIMER function.

## 11.14 SPT Adjustment in Sleep Mode

- In COOL, AUTO COOL or DRY modes, the SPT adjustment is positive (from 0 to +3°C).
- In HEAT or AUTO HEAT modes, the SPT adjustment is negative (from 0 to -3°C).
- In other modes, there is no SPT adjustment.
- The SPT adjustment is cancelled when the Sleep mode is cancelled.




***NOTE***

**If OFF-timer is active, the unit may go to SB before or after 7 hours of sleep operation.**

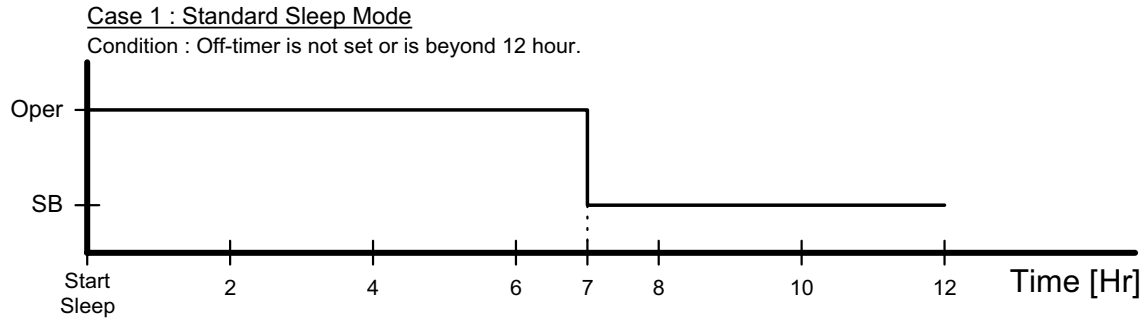
### 11.14.1 Time Adjustment in SLEEP Mode

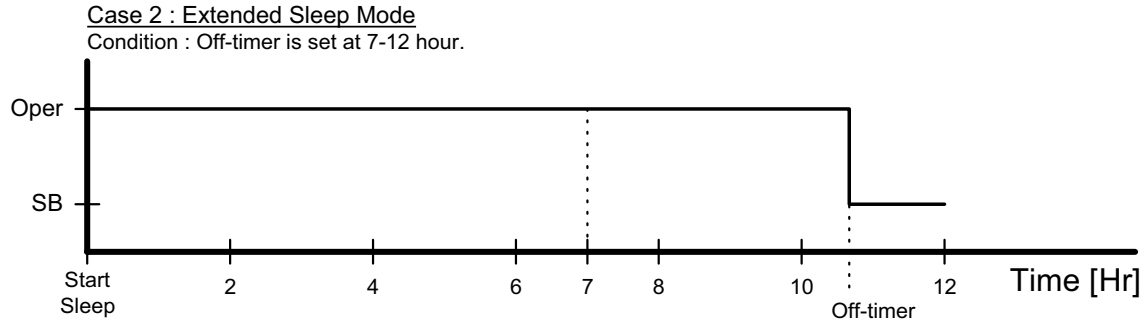
In 10V4, the user can make use of the Off-Timer to extend the Sleep Time from 7 hours to 12 hour (max). The operation of the new “Extended Sleep Mode” is illustrated by the graphs below.

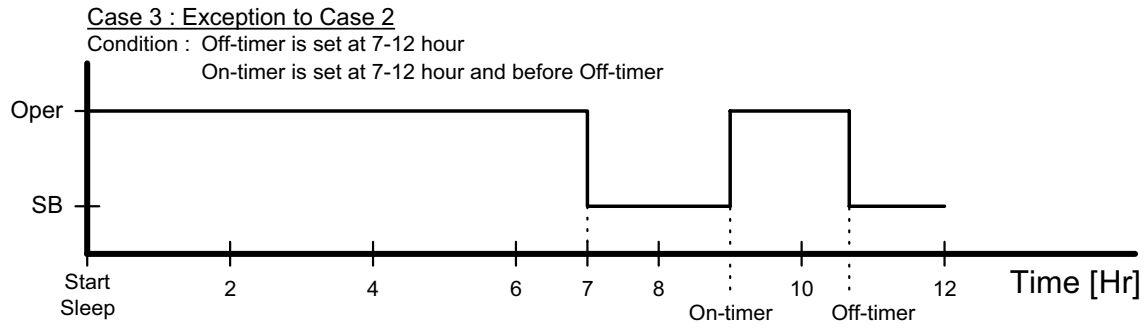
Case 1 is the Standard Sleep Mode, which is the only sleep mode in the previous version of MCU. The A/C unit simply works for 7 hours, then goes to SB.

Case 2 is the new Extended Sleep Mode. If an active Off-Timer is set to turn off the A/C between 7-12 hour, relative to the starting of Sleep, the Sleep time is extended. And, instead of going to SB at the 7th hour, the A/C will work until reaching the Off-time.

Case 3 is an exception to case 2. The Sleep Mode will not be extended to the Off-Time when the Off-Timer is preceded by an On-Timer, which is also between 7-12 hour.



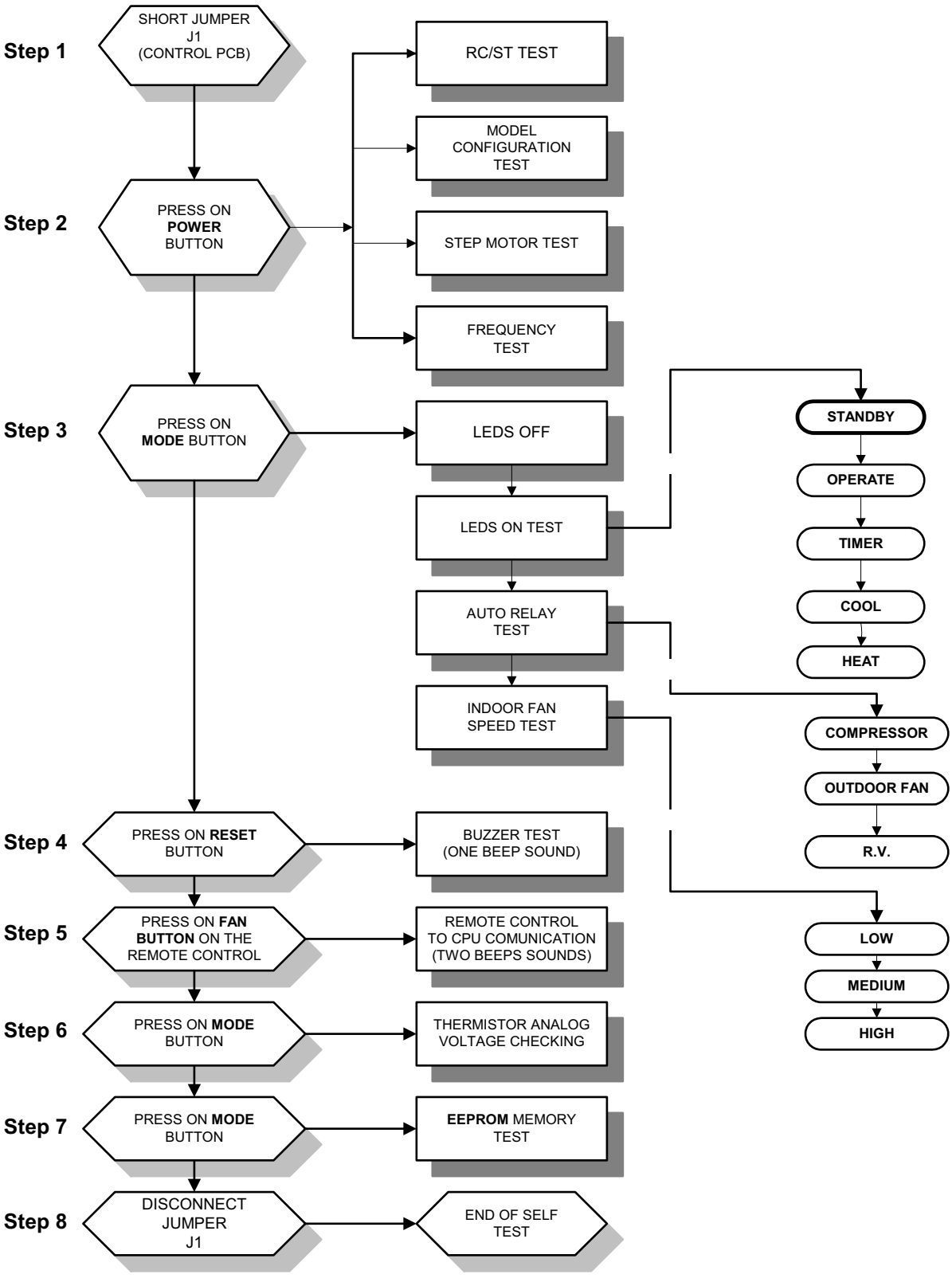



## 11.15 Controller Self-Test Procedure

### 11.15.1 By Shorting Test Jumper J1

**SELF-TEST FLOW CHART**

FOR CONTROLLER (VERSION 4V5 OR HIGHER)



### 11.15.2 By Remote Control Settings:

a. STEP 1: TURNING ON THE POWER.
Turn ON the power, make sure that the unit is in operation.

b. STEP 2 : ENABLE SELF-TEST MODE

1) Use the remote control to send the first settings to display / indoor unit HEAT mode, HIGH IFAN, set temperature to 16 ºC**,** no I-FEEL Sleep or any other timer settings are needed.

2) Cover the IR transmitter components in the remote control so that it will not transmit the signals to the indoor unit display.

3) Use the remote control to send the second settings to display / indoor unit COOL mode, LOW IFAN, no I-FEEL Sleep or any other timer settings.

4) Uncover the remote control IR transmitter and change the temperature settings. If the display/indoor unit receive the settings properly the following steps will start:

c. STEP 3: MODEL SETTING CONFIRMATION

1) The STAND-BY and COOL LEDS will indicate the operation mode as follows:

| OPERATION MODE | STAND-BY LED | COOL LED |
|---|---|---|
| ST | ON | OFF |
| RC | OFF | OFF |
| SH | OFF | ON |
| RH | ON | ON |

2) Testing the Model configuration. Selected by the COMP, STAND-BY, TIMER LEDS and FILTER will indicate the model configuration as follows (the relevant line for this manual is highlighted):

| MODEL | COMP | OPERATE LED | TIMER LED | FILTER LED |
|---|---|---|---|---|
| WNG | ON | OFF | OFF | OFF |
| MBX | ON | OFF | OFF | ON |
| WNX | ON | OFF | ON | OFF |
| PRX | ON | ON | OFF | OFF |
| WMN1 | ON | ON | OFF | ON |
| EMD/LS | ON | ON | ON | OFF |
| ECC-K | ON | ON | ON | ON |
| WMN 4 | OFF | OFF | ON | OFF |
| PXD/ | OFF | OFF | ON | ON |
| WMN 2/WHX | OFF | ON | OFF | ON |
| WMN 3 | OFF | ON | ON | ON |

In this term the step motor will turn to HOME POSITION.

d. STEP 3: AUTO LED WALK TEST.

1) All the LEDS will turn OFF.

2) All the LEDS will turn ON for 1 second one by one in the following sequence:

STAND-BY ⇨ OPERATE ⇨ TIMER ⇨ FILTER ⇨ COOL ⇨ HEAT.

3) In PRX all the LEDS will turn ON for 1 second one by one in the following sequence : 18 °c ⇨ 20 °c ⇨ 22 °c ⇨ 24 °c ⇨ 26 °c ⇨ 28 °c ⇨ 30 °c ⇨ High IFAN ⇨ Auto IFAN ⇨ Med IFAN ⇨ Low IFAN ⇨ STAND-BY⇨ TIMER ⇨ FILTER ⇨COOL⇨ HEAT.

e. STEP 4: AUTO REALY WALK TEST:

All relays will energize one by one in the following sequence:

COMPRESSOR ⇨ OUTDOOR FAN⇨R. V. ⇨ HEATER 1 ⇨ HEATER 2 ⇨ INDOOR WATER PUMP ⇨ SWING or OUTDOOR WATER PUMP ⇨ INDOOR FAN: LOW ⇨ MID ⇨ HIGH.

When the relay walk test is completed, the next test will start automatically.

f. STEP 5: FREQUENCY TESTING:

If the frequency measuring process fails the COOL LED will turn ON. In order to move to the next step, press ON/OFF button on the remote control.

g. STEP 6: INPUT TEST.

The test purpose is to check the analog real time indicators (thermistors, LEVEL and clock) according to the table below.

| LED Indicator | Condition for LED to be ON |
|---|---|
| STBY LED | Room thermistor ≠ 25°c |
| OPER LED | Indoor coil thermistor ≠ 25°c |
| TIMER LED | Outdoor coil thermistor ≠ 25°c |
| FILTER LED | Clock |
| COOL LED | LEVEL 2&3 |
| HEAT LED | LEVEL 4 |

h. STEP 7: TIMING RESET TEST (WATCH DOG).

The test purpose is to verify that the CPU rise time after power failure is between 1 to 3 sec, test results are indicated on the LEDS : STAND-BY,OPER, TIMER and FILTER turning ON one by one.

The results of the test are coded as follows:

Pass condition:

1 sec - STAND-BY and OPER are turned ON

2 sec - STAND-BY, OPER and TIMER are turned ON

Fail condition:

0 sec - STAND-BY is turned ON

3 sec - STAND-BY, OPER, TIMER and FILTER are turned ON

When the timing reset test is completed, the next test will start automatically.

i. STEP 8: MEMORY TEST (EEPROM)

The test purpose is to check if the memory is functioning correctly. The test result is reported by using the STAND-BY and FILTER LEDS:

| LED Indicator | Condition for LED to be ON |
|---|---|
| STAND-BY LED | Test passed |
| FILTER LED | Test failed |

AT THIS POINT THE SELF-TEST IS COMPLETED.

In order to terminate Self-Test mode the User can change the unit setting from COOL Mode, LOW FAN to COOL Mode, MED FAN or to wait without using the remote control for 60 sec.

**Values of Sensors Temperature VS. Voltage (DC)**

| Temp. (°C) | Voltage (V) | Temp. (°C) | Voltage (V) | Temp. (°C) | Voltage (V) | Temp. (°C) | Voltage (V) |
|---|---|---|---|---|---|---|---|
| -20 | 4,554 | 2 | 3.744 | 24 | 2.555 | 46 | 1.487 |
| -19 | 4,529 | 3 | 3.695 | 25 | 2.5 | 47 | 1.447 |
| -18 | 4,502 | 4 | 3.646 | 26 | 2.445 | 48 | 1.409 |
| -17 | 4,475 | 5 | 3.595 | 27 | 2.391 | 49 | 1.371 |
| -16 | 4.446 | 6 | 3.544 | 28 | 2.338 | 50 | 1.334 |
| -15 | 4.417 | 7 | 3.492 | 29 | 2.284 | 51 | 1.298 |
| -14 | 4.386 | 8 | 3.439 | 30 | 2.232 | 52 | 1.263 |
| -13 | 4.354 | 9 | 3.386 | 31 | 2.18 | 53 | 1.228 |
| -12 | 4.322 | 10 | 3.332 | 32 | 2.128 | 54 | 1.195 |
| -11 | 4.287 | 11 | 3.278 | 33 | 2.077 | 55 | 1.162 |
| -10 | 4.252 | 12 | 3.223 | 34 | 2.027 | 56 | 1.13 |
| -9 | 4.216 | 13 | 3.168 | 35 | 1.978 | 57 | 1.099 |
| -8 | 4.178 | 14 | 3.113 | 36 | 1.929 | 58 | 1.069 |
| -7 | 4.14 | 15 | 3.058 | 37 | 1.881 | 59 | 1.04 |
| -6 | 4.1 | 16 | 3.002 | 38 | 1.834 | 60 | 1.011 |
| -5 | 4.059 | 17 | 2.946 | 39 | 1.798 | 61 | 0.983 |
| -4 | 4.017 | 18 | 2.89 | 40 | 1.742 | 62 | 0.956 |
| -3 | 3.974 | 19 | 2.833 | 41 | 1.698 | 63 | 0.929 |
| -2 | 3.93 | 20 | 2.777 | 42 | 1.654 | 64 | 0.904 |
| -1 | 3.885 | 21 | 2.722 | 43 | 1.611 | 65 | 0.879 |
| 0 | 3.839 | 22 | 2.666 | 44 | 1.569 | 66 | 0.854 |
| 1 | 3.792 | 23 | 2.61 | 45 | 1.527 | 67 | 0.831 |

## 11.16 System Diagnostics

Pressing Mode button for 5-10 seconds in SB or any other operation mode will activate the DIAGNOSTICS mode, acknowledged by 3 short beeps and lighting of COOL and HEAT LEDs.
In DIAGNOSTICS mode, system failures will be indicated by the blinking of HEAT & COOL LEDs.
The coding method is as follows:

- HEAT LED blinks 5 times in 5 seconds, and then turns off for the next 5 seconds.
- COOL LED blinks during the same 5 seconds according to the following table:

| No. | Problem | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | RT1 is disconnected | ○ | ● | ● | ● | ● |
| 2 | RT1 is shorted | ○ | ● | ● | ● | ○ |
| 3 | RV fault | ○ | ● | ● | ○ | ● |
| 4 | RT2 is disconnected | ● | ○ | ● | ● | ● |
| 5 | RT2 is shorted | ● | ○ | ● | ● | ○ |
| 6 | (Reserved) | ● | ○ | ● | ○ | ● |
| 7 | RT2 temp reading doesn't change | ● | ○ | ● | ○ | ○ |
| 8 | RT3 is disconnected | ● | ● | ○ | ● | ● |
| 9 | RT3 is shorted | ● | ● | ○ | ● | ○ |
| 10 | (Reserved) | ● | ● | ○ | ○ | ● |
| 11 | RT3 temp reading doesn't change | ● | ● | ○ | ○ | ○ |
| 12 | RT2 & RT3 temp reading doesn't change | ● | ○ | ○ | ○ | ○ |

**LEGEND**

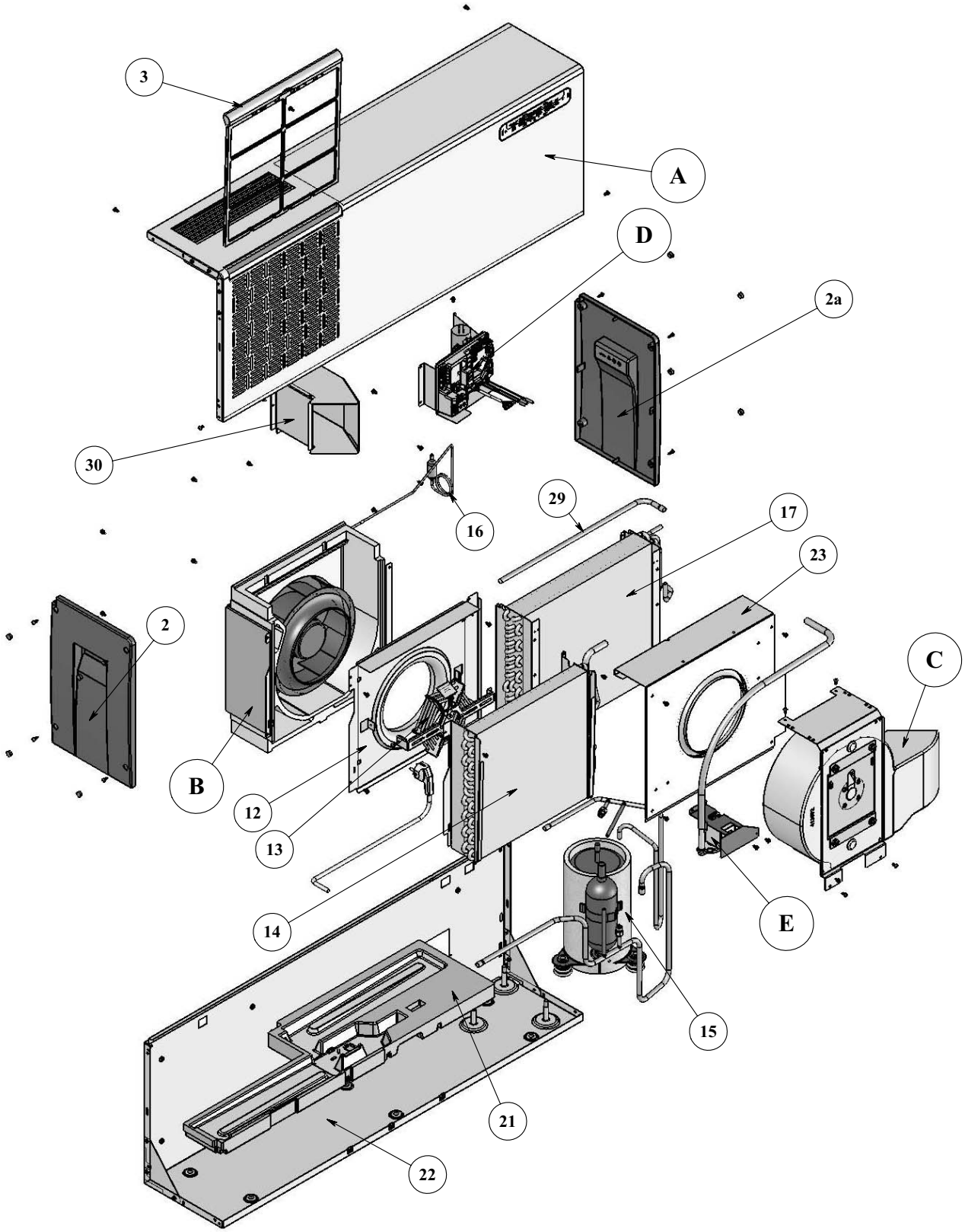
○ - ON, ● - OFF

***NOTES***

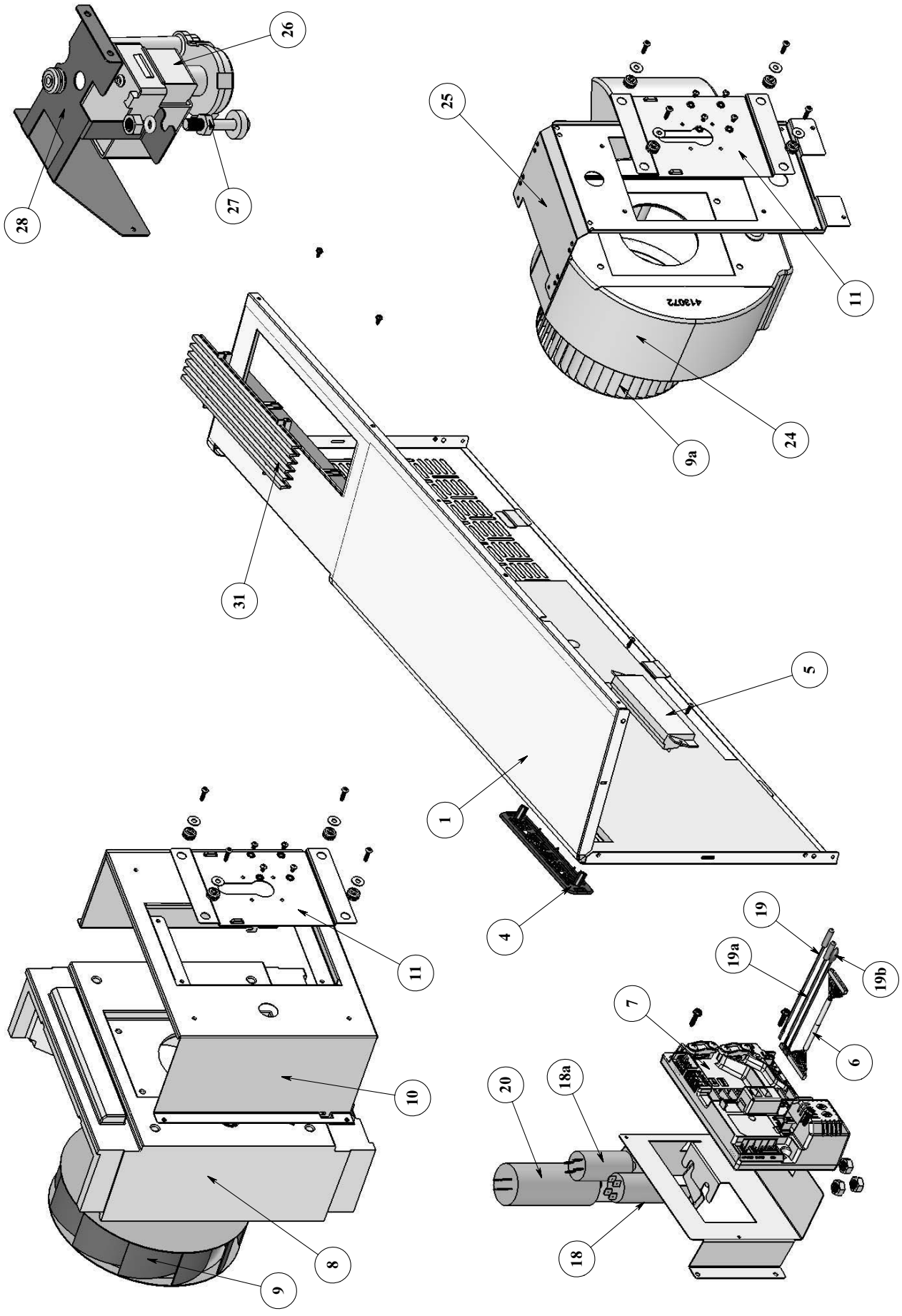
1. **If faults occur in more than one thermistor (except case number 12 in table above), only one fault will be indicated according to the following order: RT3, RT2, RT1.**
2. **A/C will return to normal mode when sending a command by the R/C during system DIAGNOSTICS mode. If the command from the R/C contains a Group ID, the ID will become the new Group ID of the ELCON unit.**

# 12. EXPLODED VIEWS AND SPARE PARTS LISTS

## 12.1 Model: VAR 9 ST/RH



## 12.2 Model: VAR 9 ST/RH (page 2)



## 12.3 Model: VAR 9 ST/RH

| No. | Item Code | Item Desc | Quantity |
|---|---|---|---|
| 1 | 413060 | Enclosure assy VAR | 1 |
| 2 | 413084 | Side panel L insulated VAR | 1 |
| 3 | 413052 | AIR FILTER EL10 VAR | 1 |
| 4 | 413039 | Display assy VAR | 1 |
| 5 | 234213 | DISPLAY BOX PXD RoHS | 1 |
| 6 | 435504 | FLAT CABLE 16 L450 WMN 35 | 1 |
| 7 | 438794 | STORM 1 CONTROLLER (RoHS) | 1 |
| 8 | 413071 | Evap fan housing | 1 |
| 9 | 413110 | Centrefugal backward fan motor D250 VAR | 1 |
| 10 | 413003 | Evap motor support | 1 |
| 11 | 413007 | Motor support | 1 |
| 12 | 413086 | Evap air inlet inulated panel | 1 |
| 13 | 413161 | Heater assy VAR | 1 |
| 14 | 413100 | Evap coil | 1 |
| 14 | 413150 | COMPRESSOR GK113PAN | 1 |
| 15 | 413087 | Compressore insulated | 1 |
| 16 | 413511 | Cappilary assy R410A VAR | 1 |
| 17 | 413200 | Cond coil | 1 |
| 18 | 442029 | Capacitor 1mF 425V 30000h P1/P | 1 |
| 19 | 413710 | THERMISTOR WTH CAP L470 | 1 |
| 20 | 442012 | CAPACITOR 30mF 400V P1/P2 | 1 |
| 21 | 413065 | Evap cond drain pan assy | 1 |
| 22 | 413088 | Back panel insulated | 1 |
| 23 | 413089 | Cond air inlet insulated panel | 1 |
| 24 | 413072 | Cond fan housing | 1 |
| 25 | 413008 | Cond fan support | 1 |
| 26 | 413171 | WATER PUMP VAR | 1 |
| 27 | 413170 | VAR OVER FLOW SWITCH | 1 |
| 28 | 413015 | Water pump support | 1 |
| 29 | 413215 | Water sprinkler tube | 1 |
| 30 | 413028 | Dacted hose VAR | 1 |
| 31 | 413180 | Air discharge grill VAR | 1 |
| 18a | 442017 | CAPACITOR 3mF 400V P1/P2 | 1 |
| 19a | 413712 | THERMISTOR+CAP WITH CONNECTOR L950 | 1 |
| 19b | 413711 | THERMISTOR WITH CONNECTOR L780 | 1 |
| 2a | 413085 | Side panel R insulated VAR | 1 |
| 9a | 413210 | Centrefugal fan motor D200 VAR | 1 |

# APPENDIX A

## INSTALLATION AND OPERATION MANUAL

► **INSTALLATION AND OPERATION MANUAL VAR 9 ST/RH**