

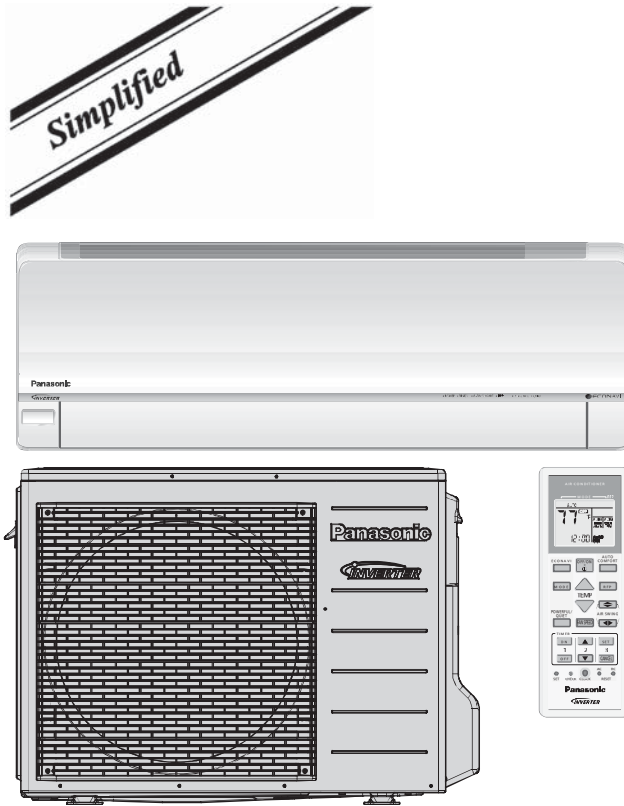
# OPERATION MANUAL

## Air Conditioner

Indoor Unit  
CS-XE15SKUA

Outdoor Unit  
CU-XE15SKUA


Destination  
U.S.A.  
Canada



### WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the products dealt with in this service information by anyone else could result in serious injury or death.

### IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety. These parts are marked by  in the Schematic Diagrams, Circuit Board Diagrams, Exploded Views and Replacement Parts List. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire or other hazards. Do not modify the original design without permission of manufacturer.



### PRECAUTION OF LOW TEMPERATURE

In order to avoid frostbite, be assured of no refrigerant leakage during the installation or repairing of refrigerant circuit.

# Panasonic<sup>®</sup>

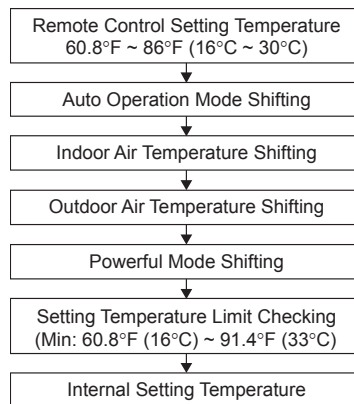
## 12. Operation Control

### 12.1 Basic Function

Inverter control, which equipped with a microcomputer in determining the most suitable operating mode as time passes, automatically adjusts output power for maximum comfort always. In order to achieve the suitable operating mode, the microcomputer maintains the set temperature by measuring the temperature of the environment and performing temperature shifting. The compressor at outdoor unit is operating following the frequency instructed by the microcomputer at indoor unit that judging the condition according to internal setting temperature and intake air temperature.

#### 12.1.1 Internal Setting Temperature

Once the operation starts, remote control setting temperature will be taken as base value for temperature shifting processes. These shifting processes are depending on the air conditioner settings and the operation environment. The final shifted value will be used as internal setting temperature and it is updated continuously whenever the electrical power is supplied to the unit.



#### 12.1.2 Cooling Operation

##### 12.1.2.1 Thermostat control

- Compressor is OFF when Intake Air Temperature - Internal Setting Temperature < -2.7°F (-1.5°C) continue for 3 minutes.
- When compressor is OFF (Thermostat OFF) and AUTO FAN is set, the fan will stop periodically.
- Compressor is ON after waiting for 3 minutes, if the Intake Air Temperature - Internal Setting Temperature > Compressor OFF point.

#### 12.1.3 Soft Dry Operation

##### 12.1.3.1 Thermostat control

- Compressor is OFF when Intake Air Temperature - Internal Setting Temperature < -3.6°F (-2.0°C) continue for 3 minutes.
- When compressor is OFF (Thermostat OFF) and AUTO FAN is set, the fan will stop periodically.
- Compressor is ON after waiting for 3 minutes, if the Intake Air Temperature - Internal Setting Temperature > Compressor OFF point.

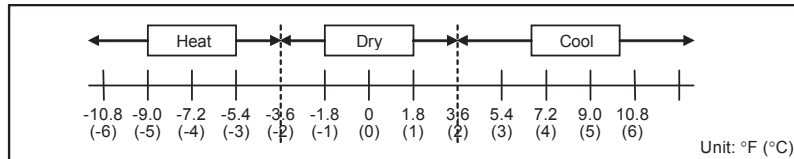
#### 12.1.4 Heating Operation

##### 12.1.4.1 Thermostat control

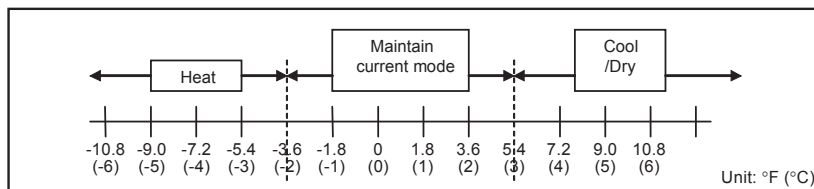
- Compressor is OFF when Intake Air Temperature - Internal Setting Temperature > +3.6°F (+2.0°C) continue for 3 minutes.
- Compressor is ON after waiting for 3 minutes, if the Intake Air Temperature - Internal Setting Temperature < Compressor OFF point.

### 12.1.5 Automatic Operation

- This mode can be set using remote control and the operation is decided by remote control setting temperature, remote control operation mode and indoor intake air temperature.
- During operation mode judgment, indoor fan motor (with speed of Lo-) is running for 30 seconds to detect the indoor intake air temperature.
- Every 10 minutes, the indoor temperature is judged.
- For the 1st judgment
  - If indoor intake temperature - remote control setting temperature  $\geq 3.6^{\circ}\text{F}$  ( $2^{\circ}\text{C}$ ), COOL mode is decided.
  - If  $-3.6^{\circ}\text{F}$  ( $-2^{\circ}\text{C}$ )  $\leq$  indoor intake temperature - remote control setting temperature  $< 3.6^{\circ}\text{F}$  ( $2^{\circ}\text{C}$ ), DRY mode is decided.
  - If indoor intake temperature - remote control setting temperature  $< -3.6^{\circ}\text{F}$  ( $-2^{\circ}\text{C}$ ), HEAT mode is decided.



- For the 2nd judgment onwards
  - If indoor intake temperature - remote control setting temperature  $\geq 5.4^{\circ}\text{F}$  ( $3^{\circ}\text{C}$ ), if previous operate in DRY mode, then continue in DRY mode. otherwise COOL mode is decided.
  - If  $-3.6^{\circ}\text{F}$  ( $-2^{\circ}\text{C}$ )  $\leq$  indoor intake temperature - remote control setting temperature  $< 5.4^{\circ}\text{F}$  ( $3^{\circ}\text{C}$ ), maintain with previous mode.
  - If indoor intake temperature - remote control setting temperature  $< -3.6^{\circ}\text{F}$  ( $-2^{\circ}\text{C}$ ), HEAT mode is decided.



### 12.1.6 Fan Operation

- Fan Operation is used to circulate air in a room.
- During operation, indoor fan run continuously but outdoor fan and compressor stop.
- Temperature setting is not applicable.

## 12.2 Indoor Fan Motor Operation

### 12.2.1 Basic Rotation Speed (rpm)

#### A. Basic Rotation Speed (rpm)

i. Manual Fan Speed

[Cooling, Dry]

- Fan motor's number of rotation is determined according to remote control setting.

Remote control	○	○	○	○	○
Tab	Hi	Me+	Me	Me-	Lo

[Heating]

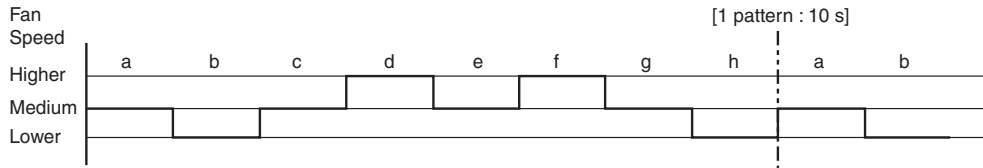
- Fan motor's number of rotation is determined according to remote control setting.

Remote control	○	○	○	○	○
Tab	SHi	Me+	Me	Me-	Lo

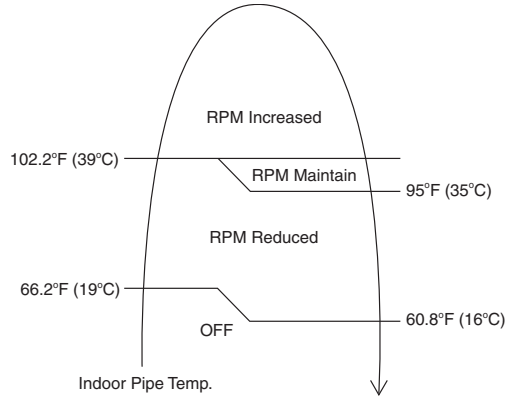
ii. Auto Fan Speed

[Cooling, Dry]

- According to room temperature and setting temperature, indoor fan speed is determined automatically.
- When set temperature is not achieved, the indoor fan will operate according to pattern below.



- When set temperature achieved, the indoor fan speed will be fixed. When thermostat off, the fan stop periodically.
- [Heating]
- According to indoor pipe temperature, automatic heating fan speed is determined as follows.

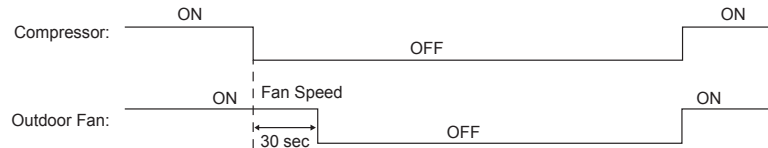


**B. Feedback control**

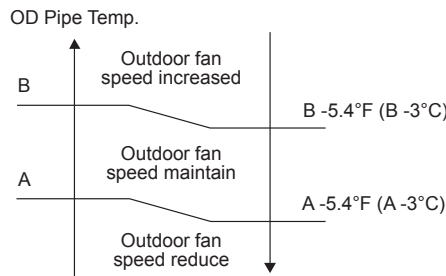
- Immediately after the fan motor started, feedback control is performed once every second.
- During fan motor on, if fan motor feedback  $\geq 2550$  rpm or  $< 50$  rpm continue for 10 seconds, then fan motor error counter increase, fan motor is then stop and restart. If the fan motor counter becomes 7 times, then H19 - fan motor error is detected. Operation stops and cannot on back.

**12.3 Outdoor Fan Motor Operation**

- It starts when compressor starts operation and it stops 30 seconds after compressor stops operation.

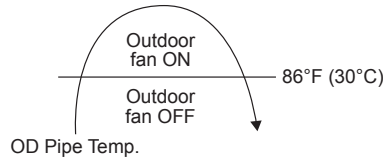


- During cooling operation, and outdoor ambient temperature is below 46.4°F (8°C), outdoor fan speed will be controlled according to outdoor piping temperature as following:



	OD Pipe Temperature
A	78.8°F (26°C)
B	91.4°F (33°C)

- During above condition, when indoor heat exchanger temperature is below 41°F (5°C), the outdoor fan will stop according to outdoor piping temperature as following:



## 12.4 Airflow Direction

- There are two types of airflow, vertical airflow (directed by horizontal vane) and horizontal airflow (directed by vertical vanes).
- Control of airflow direction can be automatic (angles of direction is determined by operation mode, heat exchanger temperature and intake air temperature) and manual (angles of direction can be adjusted using remote control).

### 12.4.1 Vertical Airflow

Operation Mode	Airflow Direction		Upper Vane Angle (°)					Lower Vane Angle (°)				
			1	2	3	4	5	1	2	3	4	5
Heating	Auto with Heat Exchanger Temperature	A	25					17				
		B	55					37				
		C	25					17				
	Summer House		55					37				
	Manual		20	45	55	65	70	17	27	37	47	56
Cooling	Auto		45 ~ 70					2 ~ 39				
	Manual		20	25	50	55	70	2	7	17	27	39
Soft Dry	Auto		45 ~ 70					2 ~ 39				
	Manual		20	25	50	55	70	2	7	17	27	39

1. Automatic vertical airflow direction can be set using remote control; the vane swings up and down within the angles as stated above. For heating mode operation, the angle of the vane depends on the indoor heat exchanger temperature as Figure 1 below. It does not swing during fan motor stop. When the air conditioner is stopped using remote control, the vane will shift to close position.
2. Manual vertical airflow direction can be set using remote control; the angles of the vane are as stated above and the positions of the vane are as Figure 2 below. When the air conditioner is stopped using remote control, the vane will shift to close position.

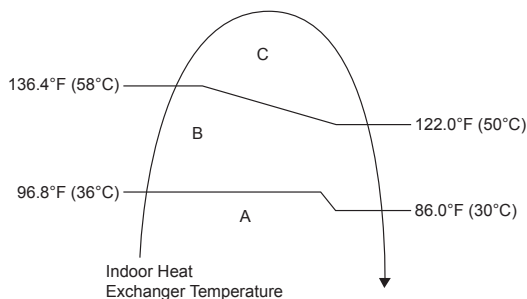


Figure 1

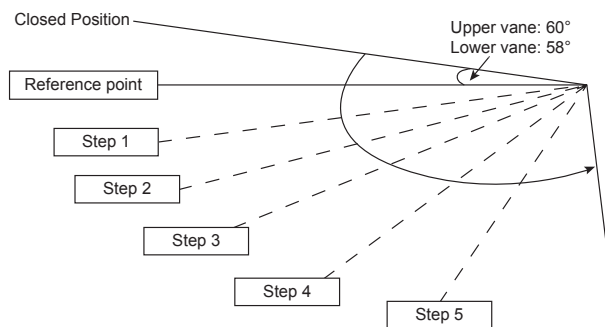


Figure 2

## 12.4.2 Horizontal Airflow

- Automatic horizontal airflow direction can be set using remote control; the vane swings left and right within the angles as stated below. For heating mode operation, the angle of the vane depends on the indoor heat exchanger temperature as Figure 1 below. It does not swing during fan motor stop.

Operation Mode		Vane Angle (°)
Heating, with heat exchanger temperature	A	65 ~115
	B	90
Cooling and soft dry		65 ~115

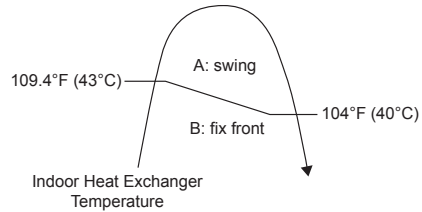


Figure 1

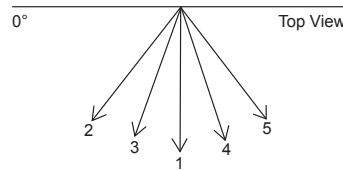


Figure 2

- Manual horizontal airflow direction can be set using remote control; the angles of the vane are as stated below and the positions of the vane are as Figure 2 above.

Pattern	1	2	3	4	5
Airflow Direction Patterns at Remote Control					
Vane Angle (°)	90	65	77.5	102.5	115

## 12.5 Quiet operation (Cooling Mode/Cooling area of Dry Mode)

- Purpose
  - To provide quiet cooling operation compare to normal operation.
- Control condition
  - Quiet operation start condition
    - When "POWERFUL/QUIET" button at remote control is pressed twice. POWERFUL/QUIET LED illuminates.
  - Quiet operation stop condition
    - When one of the following conditions is satisfied, quiet operation stops:
      - POWERFUL/QUIET button is pressed again.
      - Stop by OFF/ON switch.
      - Timer "off" activates.
      - AUTO COMFORT button is pressed.
      - ECONAVI button is pressed.
    - When quiet operation is stopped, operation is shifted to normal operation with previous setting.
    - When fan speed is changed, quiet operation is shifted to quiet operation of the new fan speed.
    - When operation mode is changed, quiet operation is shifted to quiet operation of the new mode.
    - During quiet operation, if timer "on" activates, quiet operation maintains.
    - After off, when on back, quiet operation is not memorised.
- Control contents
  - Fan speed is changed from normal setting to quiet setting of respective fan speed. Fan speed for quiet operation is reduced from setting fan speed.

## 12.6 Quiet Operation (Heating)

- Purpose
  - To provide quiet heating operation compare to normal operation.
- Control condition
  - Quiet operation start condition
    - When "POWERFUL/QUIET" button at remote control is pressed. POWERFUL/QUIET LED illuminates.

- Quiet operation stop condition
  - When one of the following conditions is satisfied, quiet operation stops:
    - POWERFUL/QUIET button is pressed again.
    - Stop by OFF/ON switch.
    - Timer “off” activates.
    - AUTO COMFORT button is pressed.
    - ECONAVI button is pressed.
  - When quiet operation is stopped, operation is shifted to normal operation with previous setting.
  - When fan speed is changed, quiet operation is shifted to quiet operation of the new fan speed.
  - When operation mode is changed, quiet operation is shifted to quiet operation of the new mode, except fan mode only.
  - During quiet operation, if timer “on” activates, quiet operation maintains.
  - After off, when on back, quiet operation is not memorised.
- Control contents
  - Fan speed manual
    - Fan speed is changed from normal setting to quiet setting of respective fan speed.
    - Fan speed for quiet operation is reduced from setting fan speed.
  - Fan Speed Auto
    - Indoor FM RPM depends on pipe temp sensor of indoor heat exchanger.

## 12.7 Powerful Mode Operation

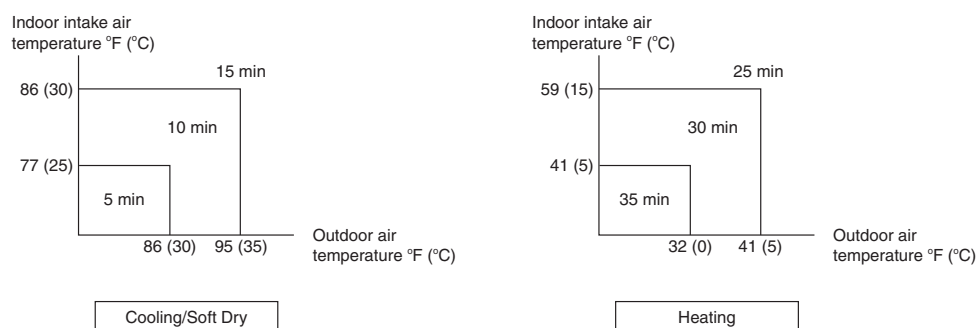
- When the powerful mode is selected, the internal setting temperature will shift lower up to 3.6°F (2°C) (for Cooling/Soft Dry) or higher up to 6.3°F (3.5°C) (for Heating) than remote control setting temperature for 20 minutes to achieve the setting temperature quickly.

## 12.8 Timer Control

- There are 2 sets of ON and OFF timer available to turn the unit ON or OFF at different preset time.
- If more than one timer had been set, the upcoming timer will be displayed and will activate in sequence.

### 12.8.1 ON Timer Control

- ON timer 1 and ON timer 2 can be set using remote control, the unit with timer set will start operate earlier than the setting time.  
This is to provide a comfortable environment when reaching the set ON time.
- 60 minutes before the set time, indoor (at fan speed of Lo-) and outdoor fan motor start operate for 30 seconds to determine the indoor intake air temperature and outdoor air temperature in order to judge the operation starting time.
- From the above judgment, the decided operation will start operate earlier than the set time as shown below.



### 12.8.2 OFF Timer Control

OFF timer 1 and OFF timer 2 can be set using remote control, the unit with timer set will stop operate at set time.

## 12.9 Auto Restart Control

- When the power supply is cut off during the operation of air conditioner, the compressor will re-operate within three to four minutes (there are 10 patterns between 2 minutes 58 seconds and 3 minutes 52 seconds to be selected randomly) after power supply resumes.
- This type of control is not applicable during ON/OFF Timer setting.
- This control can be omitted by open the circuit of JP1 at indoor unit printed circuit board.

## 12.10 Indication Panel

LED	POWER	TIMER	POWERFUL/QUIET	RFP	ECONAVI	AUTO COMFORT
Color	Green	Orange	Orange	Green	Green	Green
Light ON	Operation ON	Timer Setting ON	POWERFUL/QUIET Mode ON	RFP ON	ECONAVI ON	AUTO COMFORT ON
Light OFF	Operation OFF	Timer Setting OFF	POWERFUL/QUIET Mode OFF	RFP OFF	ECONAVI OFF	AUTO COMFORT OFF

Note:

- If POWER LED is blinking, the possible operation of the unit are Hot Start, during Deice operation, operation mode judgment, or ON timer sampling.
- If Timer LED is blinking, there is an abnormality operation occurs.

## 12.11 Room Freeze Protection Function (RFP) Operation

- When the RFP is selected, the unit will operate the fan at high speed for proper room temperature monitoring. When the sensor detects that the room temperature has dropped below 46°F / 8°C, the compressor/heat pump operation begins.
- When the room temperature reaches 50°F / 10°C, the unit shuts off, then will repeat continuously if the temperature drops below 46°F / 8°C again.

### <Disclaimer>

This function may not be performed if the unit is not energized, or under a certain condition that unit is unable to operate such as in protection mode. Please consult with the HVAC installers or professional for details.

- The Room Freeze Protection function (RFP) cannot be used unless the unit is energized and set into the RFP mode.
- In the advent of a power failure this mode will not function. During the RFP mode, POWERFUL OPERATION, QUIET OPERATION and FAN SPEED selection are all disabled. Please consult with your HVAC installer or professional for more details.

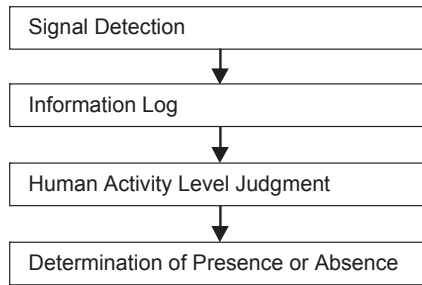
## 12.12 AUTO COMFORT and ECONAVI Operation

- Area of human availability, activity level and absent is judged based on pulses by using 2 infrared sensors. The internal setting temperature shift, fan speed and horizontal airflow direction are adjusted in order to provide comfort environment while maintain the energy saving level.
- AUTO COMFORT start condition:
  - When AUTO COMFORT button is pressed.
- AUTO COMFORT stop conditions:
  - When AUTO COMFORT button is pressed again.
  - When unit is OFF by OFF/ON button.
  - When unit is OFF when OFF TIMER activates.
  - When unit is OFF by AUTO OFF/ON button at indoor unit.
  - When POWERFUL, QUIET operation activates.
  - When AIR SWING ◀▶ button is pressed.
- ECONAVI start condition:
  - When ECONAVI button is pressed.
- ECONAVI stop conditions:
  - When ECONAVI button is pressed again.
  - When unit is OFF by OFF/ON button.
  - When unit is OFF when OFF TIMER activates.
  - When unit is OFF by AUTO OFF/ON button at indoor unit.
  - When POWERFUL, QUIET operation activates.
  - When AIR SWING ◀▶ button is pressed.

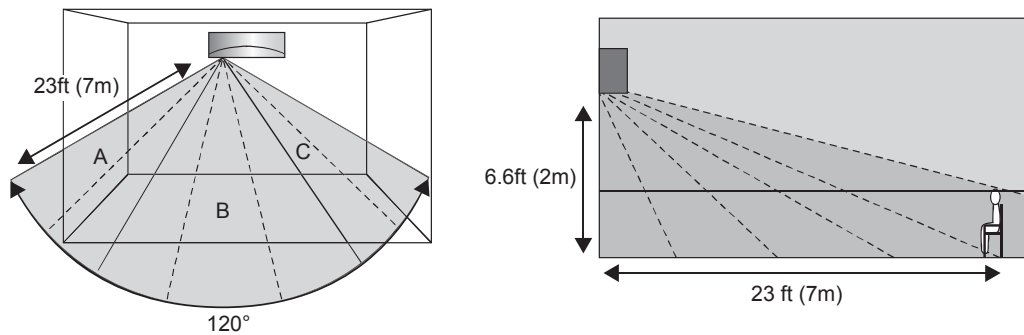


### 12.12.1 Human Activity Sensor

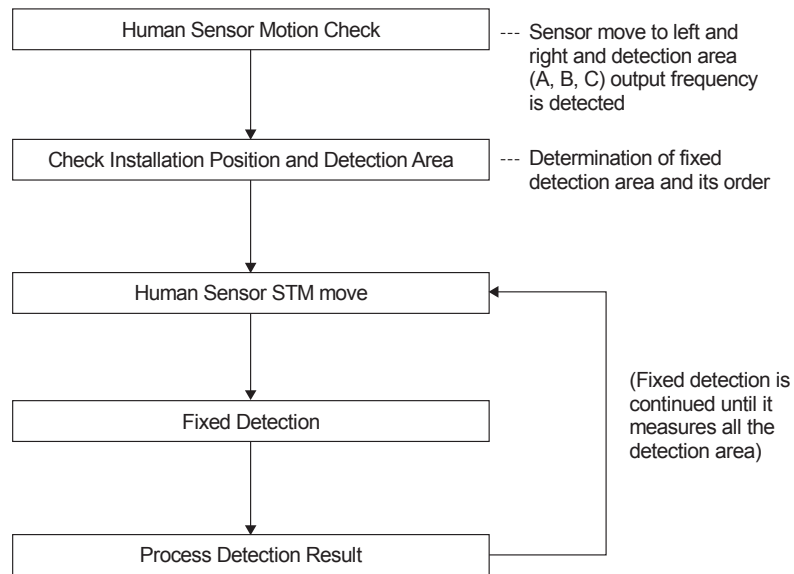
- Area of human availability, activity level and absent is judged based on pulses by using infrared sensor. The internal setting temperature shift, fan speed and horizontal airflow direction are adjusted in order to provide comfort environment while maintain the energy saving level.
- Human activity judgment is as following:



#### 12.12.1.1 Signal Detection



- Presumption flow of human position.
  - Detection outline.



#### 12.12.1.2 Information Log

- The signal from Infrared sensors will be log to human activity database for further analysis.

#### 12.12.1.3 Human Activity Level Judgment

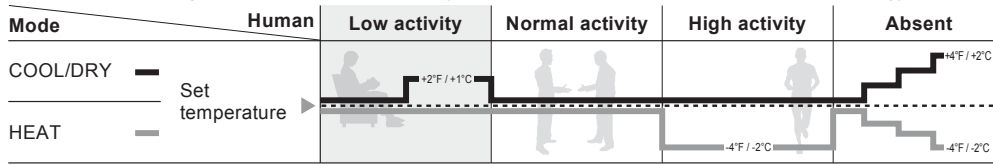
- Human Activity Level is judged based on the frequency of pulses detected by the infrared sensors within a timeframe. The activity level will be categorized into High, Normal, Low level.
- When a pulse is detected within this timeframe, the status of human presence is judged.
- When there is no signal detection continues for 40 minutes or more, the status of human absence is judged.

### 12.12.1.4 Determination of Presence or Absence

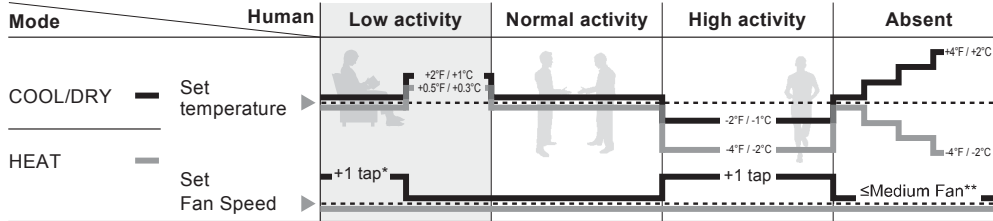
- Human presence status shall be determined based on the human presence status of each area.
- When all area has been detected absent for more than 40 minutes then it will judge as absence.

### 12.12.1.5 Setting Temperature and Fan Speed Shift

**ECONAVI** ; Detecting human presence and activity, the unit controls room temperature to save energy.



**AUTO COMFORT** ; Detecting human presence and activity, the unit controls room temperature to keep human comfortable consistently.

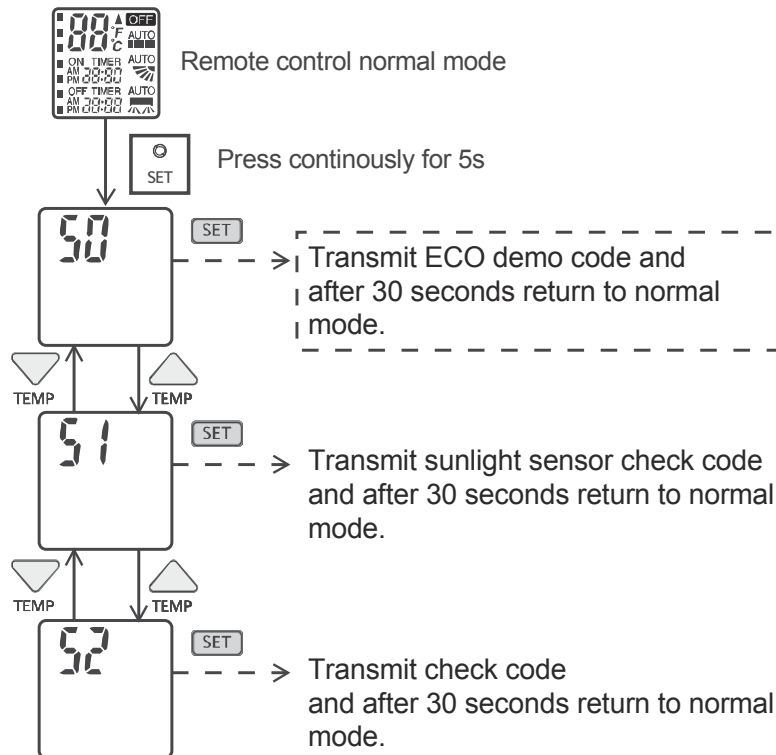


\* During low activity, fan speed 1 tap up for first 15 minutes or until set temperature is reached.

\*\* During human absence, maximum fan speed for COOL/DRY mode is medium fan.

### 12.12.1.6 ECONAVI and AUTO COMFORT Demo Mode

- To enable ECO DEMO mode:



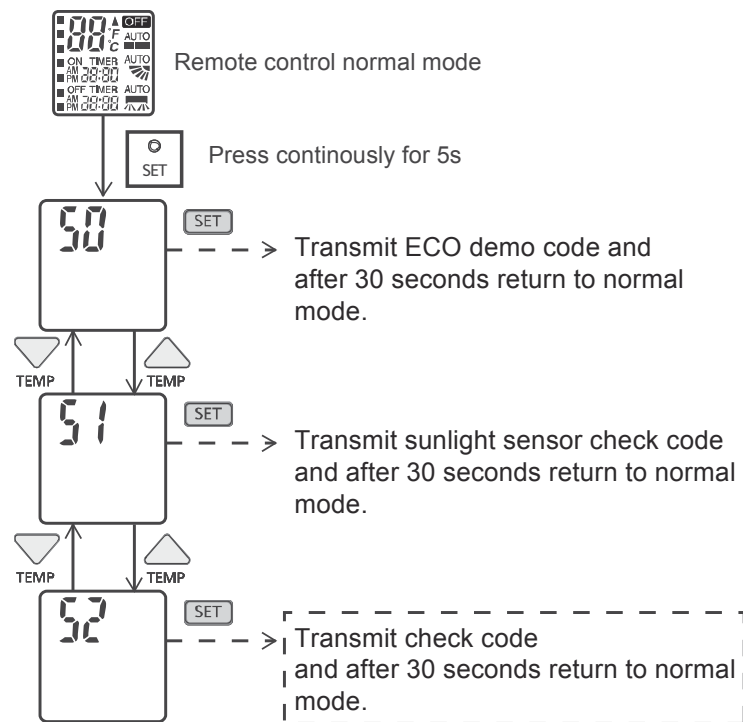
- To disable ECO Demo MODE:
  - Transmit ECO Demo signal again.

### 12.12.1.7 Human Activity Sensor Abnormality

- Abnormality detection:
  - Connector disconnection / Wire cut abnormality
    - Sensor judge Hi level continuously for 25 seconds
  - Circuit abnormality
    - 70 seconds after power ON, if human activity sensor judge Lo level continuously for 25 seconds
- Error Code judgment
  - When abnormality happened, internal counter increase by 1 time.
  - Human activity sensor power OFF, retry after 5 seconds.
  - When the human activity sensor maintains normal condition for 120 seconds, the counter reset or AC reset.
  - When abnormality counter reached 4 times, H59 occurred – No TIMER indicator blinking.
- When error code happened, the unit is able to operate without AUTO COMFORT / ECONAVI.

### 12.12.1.8 Human Activity Sensor Check Mode

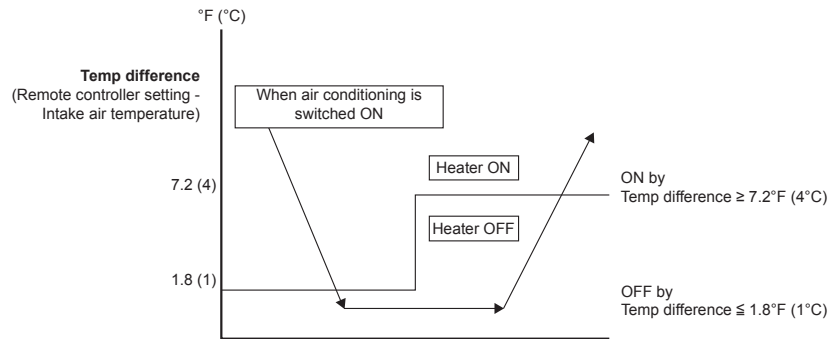
- To enable human activity sensor abnormality check mode:



- During ECONAVI is ON, when CHECK signal received, if either sensors has abnormality, the 4 times abnormality counter is ignored, ECONAVI Indicator will blink immediately and error code is memorized.
- The unit could operate without ECONAVI or AUTO COMFORT.
- The ECONAVI indicator blinking could be cancelled by pressing ECONAVI button again.
- If the human activity sensor has no abnormality, the CHECK process will end and continue with normal operation.

## 12.13 Electric Heater Control 1

- Starting condition
  - When all condition (1+2+3+4+5+6+7) are fulfilled.
    - Operation ON
    - Indoor Heating mode
    - Thermostat ON
    - Temperature different control



Example:

- a. When air conditioning is switch ON,  
 Remote controller setting =  $82.4^{\circ}\text{F}$  ( $28^{\circ}\text{C}$ )  
 Intake air temperature =  $78.8^{\circ}\text{F}$  ( $26^{\circ}\text{C}$ )  
 Temp difference =  $82.4^{\circ}\text{F}$  ( $28^{\circ}\text{C}$ ) -  $78.8^{\circ}\text{F}$  ( $26^{\circ}\text{C}$ ) =  $3.6^{\circ}\text{F}$  ( $2^{\circ}\text{C}$ )

**Heater ON**

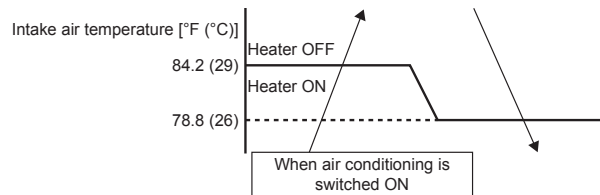
- b. After a while when  
 Remote controller setting =  $82.4^{\circ}\text{F}$  ( $28^{\circ}\text{C}$ )  
 Intake air temperature =  $80.6^{\circ}\text{F}$  ( $27^{\circ}\text{C}$ )  
 Temp difference =  $82.4^{\circ}\text{F}$  ( $28^{\circ}\text{C}$ ) -  $80.6^{\circ}\text{F}$  ( $27^{\circ}\text{C}$ ) =  $1.8^{\circ}\text{F}$  ( $1^{\circ}\text{C}$ )

**Heater OFF**

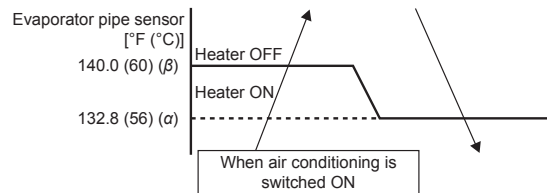
- c. After a while when  
 Temp difference  $\geq 7.2^{\circ}\text{F}$  ( $4^{\circ}\text{C}$ )

**Heater ON**

- Intake air temperature control



- Evaporator pipe sensor control



- Indoor Fan speed  $\geq$  Lo Fan

• Control content

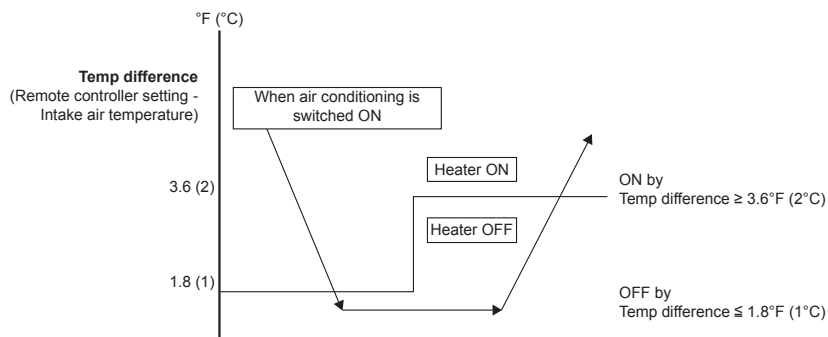
- Electric heater will be switch ON when all condition for starting condition fulfilled.
- Once Electric heater switched ON, It will operate at least 3 minutes.

## 12.14 Electric Heater Control 2

- During Error happened, air conditioning unit will stop operation, TIMER LED will blink and indoor vane closed.
- Electric heater can be switch ON when fullfill the starting condition as follow except 2 errors.
  - H14 (Indoor intake air temperature sensor abnormality)
  - H19 (Indoor fan motor mechanism lock)
- Starting condition
 

When all condition (1+2+3+4) are fulfilled.

  - Operation ON
  - Indoor Heating mode
  - Error happened Except error H14 and H19
  - Temperature different control



- Control content
  - Indoor unit will start operate when receive operation ON signal from remote controller.
  - Indoor fan speed
    - For error



- Other errors
      - minimum fan speed = Lo Fan
  - Once Electric heater switched ON, It will operate at least 3 minutes.

## 12.15 Base Pan Heater Control

- Specification:
  - Power: 100 W
  - Voltage: 230 V
- Purpose:
  - To control base pan heater cable operation to melt ice on base pan during heating operation
- Starting conditions:
  - When outdoor air temperature less than or same 41.0°F (5°C) and A/C operation is heating
- Control contents:
  - Power supply to base pan heater is ON
- Cancel conditions:
  - When outdoor air temperature exceeds entry condition by 35.6°F (2°C) after deice OR
  - When operation is not at heating mode

## 13. Protection Control

### 13.1 Protection Control For All Operations

#### 13.1.1 Restart Control (Time Delay Safety Control)

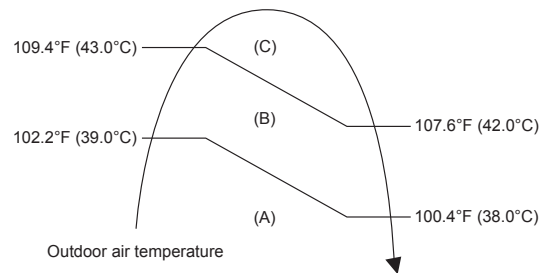
- The Compressor will not turn on within 3 minutes from the moment operation stops, although the unit is turned on again by pressing OFF/ON button at remote control within this period.
- This control is not applicable if the power supply is cut off and on again.
- This phenomenon is to balance the pressure inside the refrigerant cycle.

#### 13.1.2 Total Running Current

- 1 When the outdoor unit total running current (AC) exceeds X value, the frequency instructed for compressor operation will be decreased.
- 2 If the running current does not exceed X value for 5 seconds, the frequency instructed will be increased.
- 3 However, if total outdoor unit running current exceeds Y value, compressor will be stopped immediately for 3 minutes.

Model	XE15SKUA	
	X (A)	Y (A)
Cooling / Soft Dry (A)	10.98	14.74
Cooling / Soft Dry (B)	8.77	14.74
Heating	11.95	14.74
Cooling / Soft Dry (C)	8.77	14.74

- 4 The first 30 minutes of cooling operation, (A) will be applied.

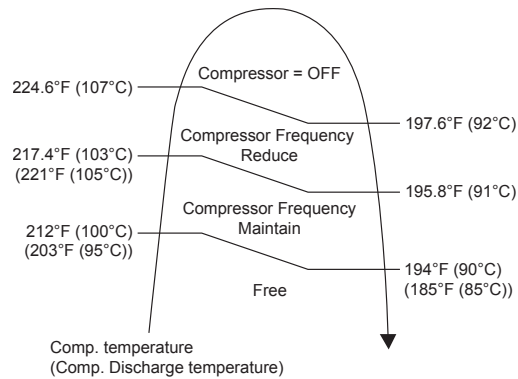


#### 13.1.3 IPM (Power transistor) Prevention Control

- Overheating Prevention Control
  - 1 When the IPM temperature rises to 248°F (120°C), compressor operation will stop immediately.
  - 2 Compressor operation restarts after 3 minutes the temperature decreases to 230°F (110°C).
  - 3 If this condition repeats continuously 4 times within 20 minutes, timer LED will be blinking ("F96" is indicated).
- DC Peak Current Control
  - 1 When electric current to IPM exceeds set value of 16.0 ±2.0A, the compressor will stop operate. Then, operation will restart after 3 minutes.
  - 2 If the set value is exceeded again more than 30 seconds after the compressor starts, the operation will restart after 1 minute.
  - 3 If the set value exceeded again within 30 seconds after the compressor starts, the operation will restart after 1 minute. If this condition repeats continuously for 7 times, all indoor and outdoor relays will be cut off, timer LED will be blinking ("F99" is indicated).

### 13.1.4 Compressor Overheating Prevention Control

- Instructed frequency for compressor operation will be regulated by compressor discharge temperature. The changes of frequency are as below.
- If compressor discharge temperature exceeds 224.6°F (107°C), compressor will be stopped, occurs 4 times per 20 minutes, timer LED will be blinking. (“F97” is indicated.)



### 13.1.5 Low Pressure Prevention Control (Gas Leakage Detection)

- Control start conditions
  - For 5 minutes, the compressor continuously operates and outdoor total current is between 0.75A and 0.95A.
  - During Cooling and Soft Dry operations:  
Indoor suction temperature - indoor piping temperature is below 7.2°F (4°C).
  - During Heating operations :  
Indoor piping temperature - indoor suction is under 9°F (5°C).
- Control contents
  - Compressor stops (and restart after 3 minutes).
  - If the conditions above happen 2 times within 20 minutes, the unit will:
    - Stop operation
    - Timer LED blinks and “F91” indicated.

### 13.1.6 Low Frequency Protection Control 1

- When the compressor operate at frequency lower than 24 Hz continued for 20 minutes, the operation frequency will be changed to 23 Hz for 2 minutes.

### 13.1.7 Low Frequency Protection Control 2

- When all the below conditions comply, the compressor frequency will change to lower frequency.

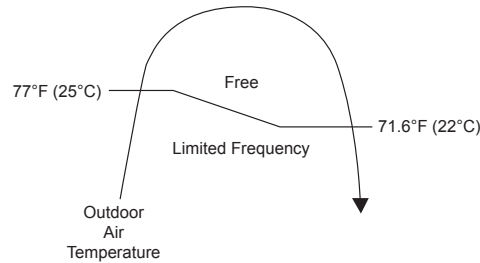
Temperature, T, for:	Cooling/Soft Dry	Heating
Indoor intake air (°C)	T < 14 or T ≥ 30	T < 14 or T ≥ 28
Outdoor air (°C)	T < 13 or T ≥ 38	T < 4 or T ≥ 24
Indoor heat exchanger (°C)	T < 30	T ≥ 0

Temperature, T, for:	Cooling/Soft Dry	Heating
Indoor intake air (°F)	T < 57.2 or T ≥ 86.0	T < 57.2 or T ≥ 82.4
Outdoor air (°F)	T < 55.4 or T ≥ 100.4	T < 39.2 or T ≥ 75.2
Indoor heat exchanger (°F)	T < 86.0	T ≥ 32.0

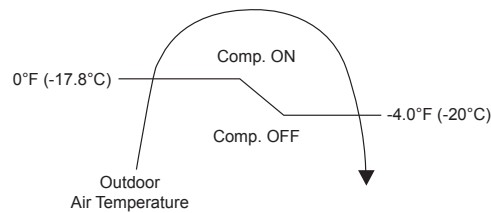
## 13.2 Protection Control For Cooling & Soft Dry Operation

### 13.2.1 Outdoor Air Temperature Control

- The compressor operating frequency is regulated in accordance to the outdoor air temperature as shown in the diagram below.
- This control will begin 1 minute after the compressor starts.
- Compressor frequency will adjust base on outdoor air temperature.



- The compressor will be stopped to avoid compressor overloading.



### 13.2.2 Cooling Overload Control

- Detects the Outdoor pipe temperature and carry out below restriction/limitation (Limit the compressor Operation frequency).
- The compressor stop if outdoor pipe temperature exceeds 141.8°F (61°C).
- If the compressor stops 4 times in 20 minutes, Timer LED blinking (F95 indicated: outdoor high pressure rise protection).

### 13.2.3 Freeze Prevention Control 1

- When indoor heat exchanger temperature is lower than 32°F (0°C) continuously for 6 minutes, compressor will stop operating.
- Compressor will resume its operation 3 minutes after the indoor heat exchanger is higher than 41°F (5°C).
- At the same time, indoor fan speed will be higher than during its normal operation.
- If indoor heat exchanger temperature is higher than 41°F (5°C) for 5 minutes, the fan speed will return to its normal operation.

### 13.2.4 Freeze Prevention Control 2

- Control start conditions
  - During Cooling operation and soft dry operation
    - During thermo OFF condition, indoor intake temperature is less than 50°F (10°C) or
    - Compressor stops for freeze prevention control
  - Either one of the conditions above occurs 5 times in 60 minutes.
- Control contents
  - Operation stops
  - Timer LED blinks and "H99" indicated



### 13.2.5 Dew Prevention Control 1

- To prevent dew formation at indoor unit discharge area.
- This control will be activated if:
  - Outdoor air temperature and Indoor pipe temperature judgment by microcontroller is fulfilled.
  - When Cooling or Dry mode is operated more than 20 minutes or more.
- This control stopped if:
  - Compressor stopped.
  - Remote control setting changed (fan speed / temperature).
  - Outdoor air temperature and indoor intake temperature changed.
- Fan speed will be adjusted accordingly in this control.

### 13.2.6 Odor Cut Control

- To reduce the odor released from the unit.
  - Start Condition
    - AUTO FAN Speed is selected during COOL or DRY operation.
    - During freeze prevention control and timer preliminary operation, this control is not applicable.
  - Control content
    - Depends on compressor conditions:
      1. Compressor OFF → Compressor ON.  
The indoor unit fan stops temporarily and then starts to blow at minimum airflow for 30 seconds.
      2. Compressor ON → Compressor OFF.  
The indoor unit fan stops for 90 seconds and then blows at minimum airflow for 20 seconds.

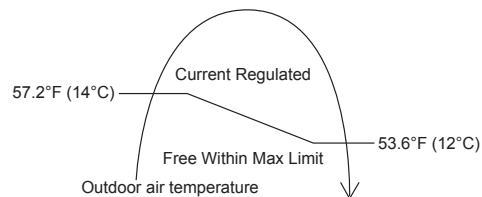
## 13.3 Protection Control For Heating Operation

### 13.3.1 Intake Air Temperature Control

Compressor will operate at limited freq., if indoor intake air temperature is 86°F (30°C) or above.

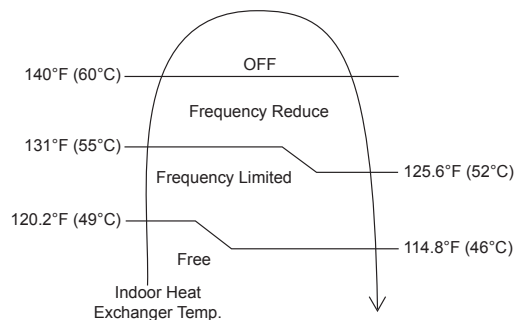
### 13.3.2 Outdoor Air Temperature Control

- The Max current value is regulated when the outdoor air temperature rise above 57.2°F (14°C) in order to avoid compressor overloading.



### 13.3.3 Overload Protection Control

- The compressor operating frequency is regulated in accordance to indoor heat exchanger temperature as shown below.
- If the heat exchanger temperature exceeds 140°F (60°C), compressor will stop.



### 13.3.4 Low Temperature Compressor Oil Return Control

- In heating operation, if the outdoor temperature falls below 14°F (-10°C) when compressor starts, the compressor frequency will be regulated up to 600 seconds.

### **13.3.5 Cold Draught Prevention Control**

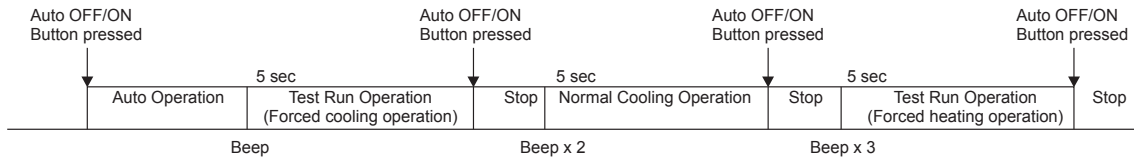
- When indoor pipe temperature is low, cold draught operation starts where indoor fan speed will be reduced.

### **13.3.6 Deice Operation**

- When outdoor pipe temperature and outdoor air temperature is low, deice operation start where indoor fan motor and outdoor fan motor stop and operation LED blinks.

# 14. Servicing Mode

## 14.1 Auto OFF/ON Button



### 1 AUTO OPERATION MODE

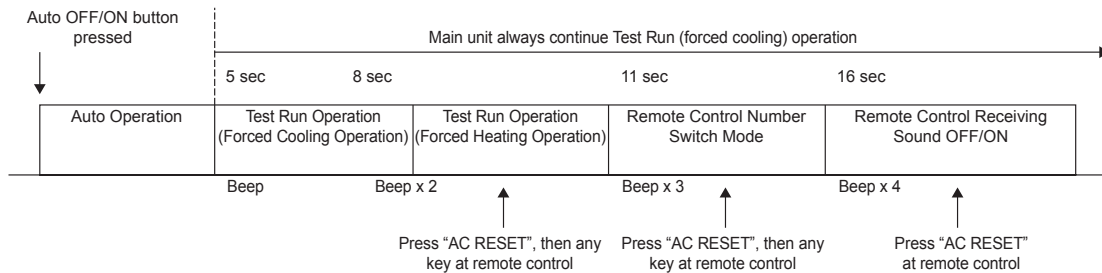
The Auto operation will be activated immediately once the Auto OFF/ON button is pressed. This operation can be used to operate air conditioner with limited function if remote control is misplaced or malfunction.

### 2 TEST RUN OPERATION (FOR PUMP DOWN/SERVICING PURPOSE)

The Test Run operation will be activated if the Auto OFF/ON button is pressed continuously for more than 5 seconds. A “beep” sound will heard at the fifth seconds, in order to identify the starting of Test Run operation (Forced cooling operation). Within 5 minutes after Forced cooling operation start, the Auto OFF/ON button is pressed for more than 5 seconds. A 2 “beep” sounds will heard at the fifth seconds, in order to identify the starting of Normal cooling operation.

Within 5 minutes after Normal cooling operation start, the Auto OFF/ON button is pressed for more than 5 seconds. A 3 “beep” sounds will be heard at the fifth seconds, in order to identify the starting of Forced heating operation.

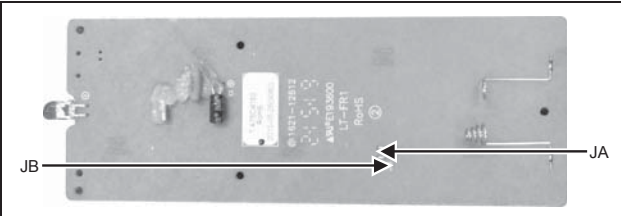
The Auto OFF/ON button may be used together with remote control to set / change the advance setting of air conditioner operation.



### 3 REMOTE CONTROL NUMBER SWITCH MODE

The Remote Control Number Switch Mode will be activated if the Auto OFF/ON button is pressed continuously for more than 11 seconds (3 “beep” sounds will occur at 11th seconds to identify the Remote Control Number Switch Mode is in standby condition) and press “AC RESET” button and then press any button at remote control to transmit and store the desired transmission code to the EEPROM.

There are 4 types of remote control transmission code could be selected and stored in EEPROM of indoor unit. The indoor unit will only operate when received signal with same transmission code from remote control. This could prevent signal interference when there are 2 or more indoor units installed nearby together. To change remote control transmission code, short or open jumpers at the remote control printed circuit board.



Remote Control Printed Circuit Board		
Jumper A (JA)	Jumper B (JB)	Remote Control No.
Short	Open	A (Default)
Open	Open	B
Short	Short	C
Open	Short	D

- During Remote Control Number Switch Mode, press any button at remote control to transmit and store the transmission code to the EEPROM.

#### 4 REMOTE CONTROL RECEIVING SOUND OFF/ON MODE

The Remote Control Receiving Sound OFF/ON Mode will be activated if the Auto OFF/ON button is pressed continuously for more than 16 seconds (4 “beep” sounds will occur at 16th seconds to identify the Remote Control Receiving Sound Off/On Mode is in standby condition) and press “AC Reset” button at remote control.

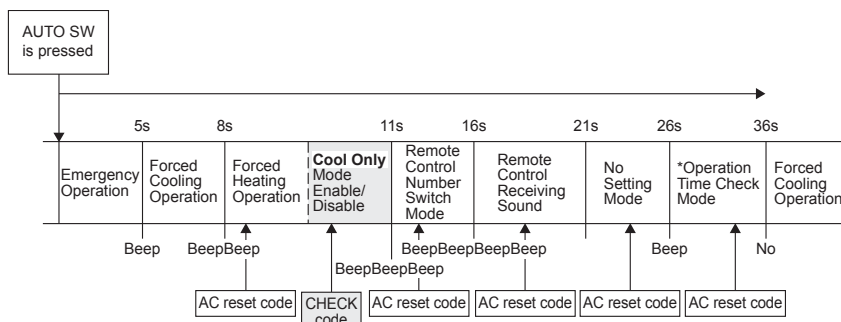
Press “Auto OFF/ON button” to toggle remote control receiving sound.

- Short “beep”: Turn OFF remote control receiving sound.
- Long “beep”: Turn ON remote control receiving sound.

After Auto OFF/ON Button is pressed, the 20 seconds counter for Remote Control Receiving Sound OFF/ON Mode is restarted.

## 14.2 Cooling Only Operation

### 14.2.1 How to activate and deactivate Cooling Only Operation



The default setting is "Cool Only" mode disable.

- To enable the "Cool Only" mode, press the AUTO OFF/ON SW for more than 8s and less than 11s, “Beep Beep” sound will be heard, then release the AUTO OFF/ON SW and press remote controller CHECK button. A short “Beep” sound will be heard. “Cool Only” mode is now enable.
- To disable the "Cool Only" mode, press the AUTO OFF/ON SW for more than 8s and less than 11s, “Beep Beep” sound will be heard, then release the AUTO OFF/ON SW and press remote controller CHECK button. A long “Beep” sound will be heard. “Cool Only” mode is now disable.

### 14.2.2 Operation mode during Cooling Only Operation

The table below shows the operation mode comparison when cooling only operation mode activated and deactivated.

Operation mode	Cooling Only Operation Mode Activated	Cooling Only Operation Mode Deactivated
AUTO	After 30s sampling, regardless of indoor intake or outdoor intake temperature judgement, the unit will run Cooling or DRY operation.	After 30s sampling, the unit will judge the operation mode base on remote controller temperature setting and Indoor Intake Sensor (New Auto Mode) or Outdoor Intake Sensor (Old Auto Mode)
HEAT	The unit will stop and Power LED blinking.	The unit will run Heating operation.
COOL	The unit will run Cooling operation.	The unit will run Cooling operation.
DRY	The unit will run DRY operation.	The unit will run Dry operation.
Force Heating	The unit will run Force Cooling operation.	The unit will run Force Heating operation.
AUTO (with Timer)	The unit will turn ON by the timer and run Auto Operation. After 30s sampling, regardless of indoor intake or outdoor intake temperature judgement, the unit will run Cooling or DRY operation.	The unit will turn ON by the timer and run Auto Operation. After 30s sampling, the unit will judge the operation mode base on remote controller temperature setting and Indoor Intake Sensor (New Auto Mode) or Outdoor Intake Sensor (Old Auto Mode)
HEAT (with Timer)	The unit will not turn ON by the Timer. Power LED blinking.	The unit will turn ON by the timer and run Heating Operation.
COOL (with Timer)	The unit will turn ON by the Timer and run Cooling operation.	The unit will turn ON by the timer and run Cooling Operation.
DRY (with Timer)	The unit will turn ON by the Timer and run DRY operation.	The unit will turn ON by the timer and run Cooling Dry Operation.

\*\* Power LED blinking = 2.5s ON, 0.5s OFF

## 14.3 Remote Control Button

### 14.3.1 SET Button

- To check remote control transmission code and store the transmission code to EEPROM:
  - Press “Set” button by using pointer.
  - Press “Timer Set” button until a “beep” sound is heard as confirmation of transmission code changed.
- To limit set temperature range for COOL & DRY, HEAT mode.
  - Press “Set” button by using pointer.
  - Press TEMP increment or decrement button to choose No. 3.
  - Press Timer increment or decrement button to select desired temperature low limit of set temperature for COOL & DRY mode.
  - Press Timer Set button to confirm low limit selection.
  - Press TEMP increment or decrement button to choose No. 4.
  - Press Timer decrement or increment button to select desired temperature high limit of set temperature for COOL & DRY mode.
  - Press Timer Set button to confirm high limit selection.
  - Press TEMP increment or decrement button to choose No. 5.
  - Press Timer increment or decrement button to select desired temperature low limit of set temperature for HEAT mode.
  - Press Timer Set button to confirm low limit selection.
  - Press TEMP increment or decrement button to choose No. 6.
  - Press Timer decrement or increment button to select desired temperature high limit of set temperature for HEAT mode.
  - Press Timer Set button to confirm high limit selection.
  - LCD returns to original display if remote control does not operate for 30 seconds or press Timer Cancel button.

### 14.3.2 RESET (RC)

- To clear and restore the remote control setting to factory default.
  - Press once to clear the memory.

### 14.3.3 RESET (AC)

- To restore the unit's setting to factory default.
  - Press once to restore the unit's setting.

### 14.3.4 TIMER ▲

- To change indoor unit indicator's LED intensity.
  - Press continuously for 5 seconds.

### 14.3.5 TIMER ▼

- To change remote control display from Degree Celsius (°C) to Degree Fahrenheit (°F).
  - Press continuously for 10 seconds.