

OPERATION MANUAL

Air Conditioner

Indoor Unit
CS-E9RKUAW
CS-E12RKUAW
CS-E18RKUAW
CS-E24RKUAW

Destination
USA
Canada



Please file and use this manual together with the service manual for Model No. CU-2E18NBU and CU-5E36QBU, Order No. PHAAM1111120A1 and PAPAMY1312037CE.

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.

PRECAUTION OF LOW TEMPERATURE

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

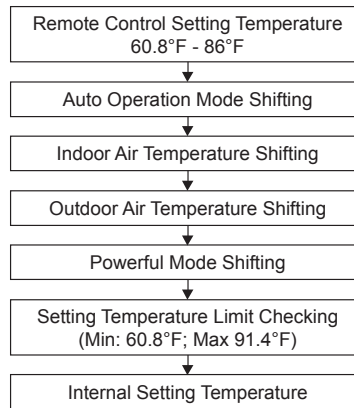
13. Operation Control

13.1 Basic Function

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

13.1.1 Internal Setting Temperature

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



13.1.2 Cooling Operation

13.1.2.1 Thermostat control

- Compressor is OFF when Intake Air Temperature - Internal Setting Temperature < 2.7°F.
- Compressor is ON after waiting for 3 minutes, if the Intake Temperature - Internal Setting Temperature > Compressor OFF point.

13.1.3 Soft Dry Operation

13.1.3.1 Thermostat control

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

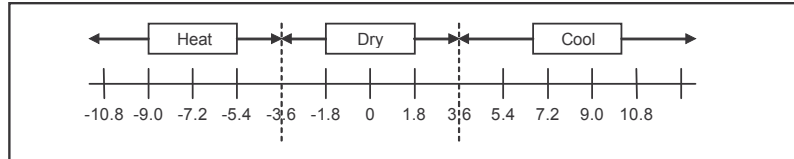
13.1.4 Heating Operation

13.1.4.1 Thermostat control

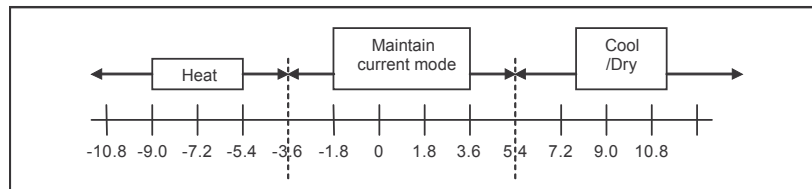
- Compressor is OFF when Intake Temperature - Internal Setting Temperature > 3.6°F.
- Compressor is ON after waiting for 3 minutes, if the Intake Air Temperature - Internal Setting Temperature < Compressor OFF point.

13.1.4.2 Automatic Operation (For Single Split Connection Only)

- 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 $\geq 3.6^{\circ}\text{F}$, COOL mode is decided.
 - If $-3.6^{\circ}\text{F} \leq$ indoor intake temperature - remote control setting temperature $< 3.6^{\circ}\text{F}$, DRY mode is decided.
 - If indoor intake temperature - remote control setting temperature $< -3.6^{\circ}\text{F}$, HEAT mode is decided.



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



13.2 Indoor Fan Speed Control

- Indoor Fan Speed can be set using remote control.

13.2.1 Fan Speed Rotation Chart

Mode	Fan Tap	Application	E9RKUAW	E12RKUAW	E18RKUAW	E24RKUAW
			rpm	rpm	rpm	rpm
COOL	SHi	Pwr Me+	1210	1350	1480	1500
	Hi	Fc, RC	1120	1230	1380	1400
	Me+	RC	1010	1110	1300	1320
	Me	RC	910	1000	1220	1240
	Me-	RC	810	890	1140	1160
	Lo	Fcmin, RC	710	780	1060	1090
	Lo-	QuietLo	610	620	970	1000
	SLo	Dry	550	560	690	690
	SSLo	Auto Cut	540	550	580	580

Mode	Fan Tap	Application	E9RKUAW	E12RKUAW	E18RKUAW	E24RKUAW
			rpm	rpm	rpm	rpm
HEAT	SSH	Pwr Me+	1340	1450	1500	1600
	SHi	Fh, RC	1250	1380	1410	1500
	Me+	RC	1140	1290	1330	1430
	Me	RC	1040	1210	1260	1360
	Me-	RC	930	1120	1190	1290
	Lo	Fhmin, RC	830	1040	1120	1220
	Lo-	QuietLo	730	940	1030	1110
	SLo	Thermo Off, Hot start	570	570	430	430
		SSLo	Thermo Off	560	560	330

13.3 Indoor Fan Motor Operation

13.3.1 Basic Rotation Speed (rpm)

- Manual Fan Speed
[Cooling, Dry]
 - Fan motor's number of rotation is determined according to remote control setting.

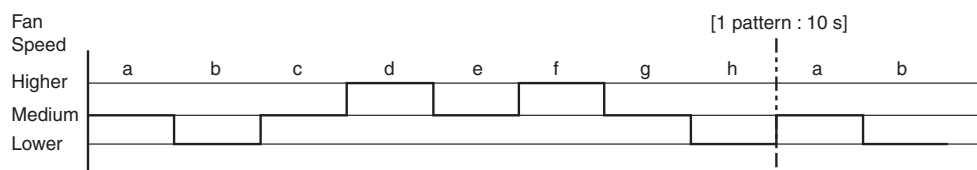
Remote control	○	○	○	○	○
Tab	Hi	Me+	Me	Me-	Lo

[Heating]

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

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

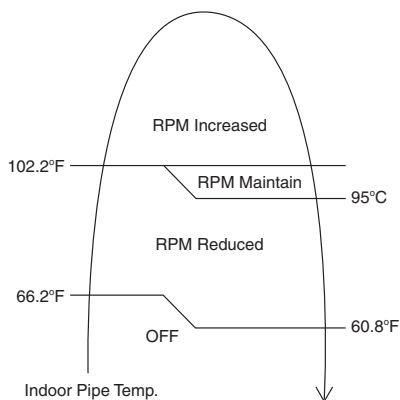
- Auto Fan Speed
[Cooling, Dry]
 - According to room temperature and setting temperature, indoor fan speed is determined automatically.
 - The indoor fan will operate according to pattern below.



- During operation, indoor fan motor may stop due to odor prevention.

[Heating]

- According to indoor pipe temperature, automatic heating fan speed is determined as follows.



- Feedback control
 - Immediately after the fan motor started, feedback control is performed once every second.
 - During fan motor on, if fan motor feedback ≥ 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.

13.4 Outdoor Fan Motor Operation

Outdoor fan motor is operated with fan speed number of rotation. It starts when compressor starts operation and it stops 30 seconds after compressor stops operation.



13.5 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).

13.5.1 Vertical Airflow

13.5.1.1 CU-E9RKUA CU-E12RKUA

Operation Mode	Airflow Direction		Vane angle (°)				
			1	2	3	4	5
Heating	Auto with Heat Exchanger Temperature	A	20				
		B	57				
		C	32				
	Manual		20	32	45	57	68
Cooling	Auto		20 ~ 45				
	Manual		20	26	32	37	45
Soft Dry	Auto		20 ~ 45				
	Manual		20	26	32	37	45

13.5.1.2 CU-E18RKUA CU-E24RKUA

Operation Mode	Airflow Direction		Vane angle (°)				
			1	2	3	4	5
Heating	Auto with Heat Exchanger Temperature	A	20				
		B	45				
		C	32				
	Manual		20	32	45	57	68
Cooling	Auto		20 ~ 45				
	Manual		20	26	32	37	45
Soft Dry	Auto (Anti-Dew Control)		20 ~ 45				
	Manual (Anti-Dew Control)		20	26	32	37	45

- 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. When the air conditioner is stopped using remote control, the vane will shift to close position.
- 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.

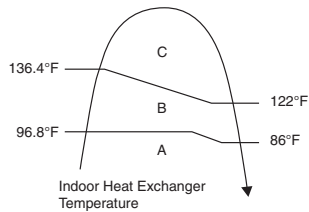


Figure 1

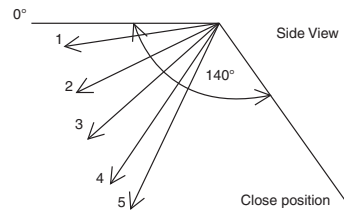


Figure 2

13.5.2 Horizontal Airflow (CU-E9RKUA CU-E12RKUA)

The horizontal airflow direction louvers can be adjusted manually by hand.

13.5.3 Horizontal Airflow (CU-E18RKUA CU-E24RKUA)

- 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.

Operation Mode		Vane Angle (°)
Heating with heat exchanger temperature	A	68 ~ 112
	B	90
Cooling and Soft Stry		68 ~ 112

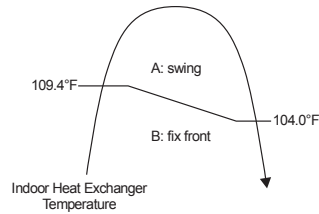


Figure 1

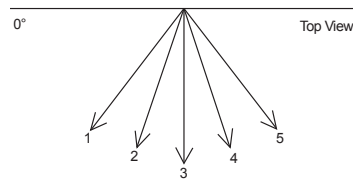


Figure 2

- Manual vertical 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 below:

Pattern	1	2	3	4	5
Airflow Direction Patterns at Remote Control					
Vane Angle (°)	90	68	78	102	112

13.6 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 “Quiet” button at remote control is pressed. Quiet LED illuminates.
 - Quiet operation stop condition
 - When one of the following conditions is satisfied, quiet operation stops:
 - POWERFUL/QUIET button is pressed.
 - Stop by OFF/ON button.
 - OFF Timer activates.
 - POWERFUL/QUIET button is pressed again.
 - 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 ON timer activates, quiet operation maintains.
 - After off, when on back, quiet operation is not memorised.
- Control contents
 - Auto fan speed is change from normal setting to quiet setting of respective fan speed. This is to reduce sound of Hi, Me, Lo for 3dB.
 - Manual fan speed for quiet operation is -1 step from setting fan speed.

13.7 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.
Quiet LED illuminates.
 - Quiet operation stop condition
 - When one of the following conditions is satisfied, quiet operation stops:
 - Stop by OFF/ON button.
 - Timer “off” activates.
 - POWERFUL/QUIET button is pressed again.
 - 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 auto
 - Indoor FM RPM depends on pipe temperature sensor of indoor heat exchanger. Auto fan speed is changed from normal setting to quiet setting of respective fan speed. This is to reduce sound of Hi, Me, Lo for 3dB.
 - Fan speed manual
 - Manual fan speed for quiet operation is -1 step from setting fan speed.

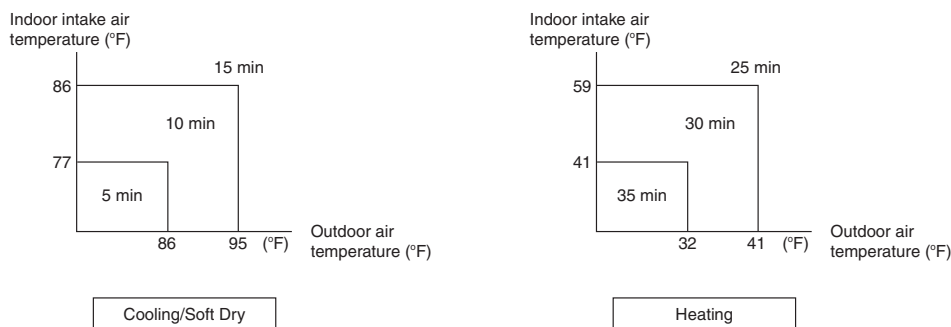
13.8 Powerful Mode Operation

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

13.9 Timer Control

13.9.1 ON Timer Control

- ON Timer can be set using remote control, where the unit with timer set will start operation earlier than the setting time. This is to provide a comfortable environment when reaching the set ON time.
- 60 minutes before the set ON time, indoor (at fan speed of Lo-) and outdoor fan motor start operation 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 operation earlier than the set time as shown below.



13.9.2 OFF Timer Control

- OFF Timer can be set using remote control, the unit with timer set will stop at set time.

13.10 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.

13.11 Indication Panel

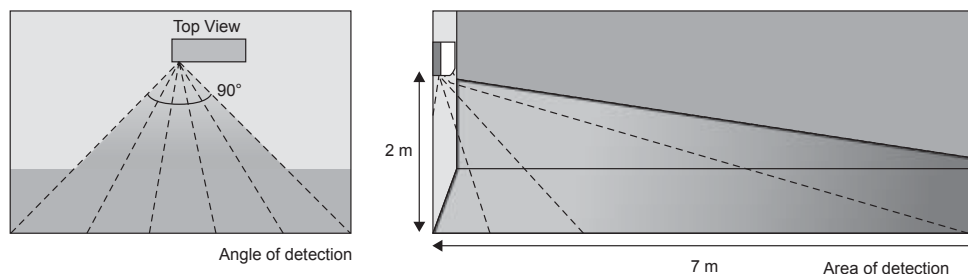
LED	POWER	TIMER	QUIET	POWERFUL	AUTO COMFORT	ECONAVI
Color	Green	Orange	Orange	Orange	Green	Green
Light ON	Operation ON	Timer Setting ON	Quiet Mode ON	Powerful Mode ON	Auto Comfort ON	Econavi Mode ON
Light OFF	Operation OFF	Timer Setting OFF	Quiet Mode OFF	Powerful Mode OFF	Auto Comfort OFF	Econavi Mode 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.

13.12 ECONAVI and AUTO COMFORT Operation

- A Pyroelectric infrared sensor is used to detect injection strength variation of infrared at setting area to determine the presence or absence of human and its activity level. Human detection area is shown in figure below:



- ECONAVI and AUTO COMFORT operation – Human presence/absence detection outlined flow
 - Process infrared sensor output signal
 - Human detection (movement) every 3 seconds.
 - ▼
 - Human detection records
 - Records human detection (movement) result for 30 seconds and determine its activity level i.e. Hi/Lo.
 - ▼
 - Presence / absence detection
 - Compares current and previous human detection result every 30 seconds to determine the presence or absence of human.
 - ▼
 - Presence / absence determination
 - Based on human presence / absence detection, if human presence detection showed within 30 minutes, it is recognised that human is present. If human absence detection showed continuously for more than 30 minutes, it is recognised that no human is present.
- ECONAVI and AUTO COMFORT Sensor abnormality detection
 1. Connector pulled out (disconnected), Wire cut Abnormality (Fix Output at Hi)
 - a. Abnormal judgment start condition.
 - Start from ECONAVI and AUTO COMFORT Sensor power ON, and end after 30 seconds.
 - b. Control content.
 - Judge ECONAVI and AUTO COMFORT Sensor power level every 100ms.
 - c. Abnormal Judgment condition.
 - When ECONAVI and AUTO COMFORT Sensor has continues for 25 seconds Hi level.

2. Circuit Abnormal (Fix Output Lo)
 - a. Abnormal judgment start condition.

After ECONAVI and AUTO COMFORT Sensor unit power ON, and after pressed 70 seconds.
 - b. Control content.

Judge ECONAVI and AUTO COMFORT Sensor power level every 100ms.
 - c. Abnormal Judgment condition.

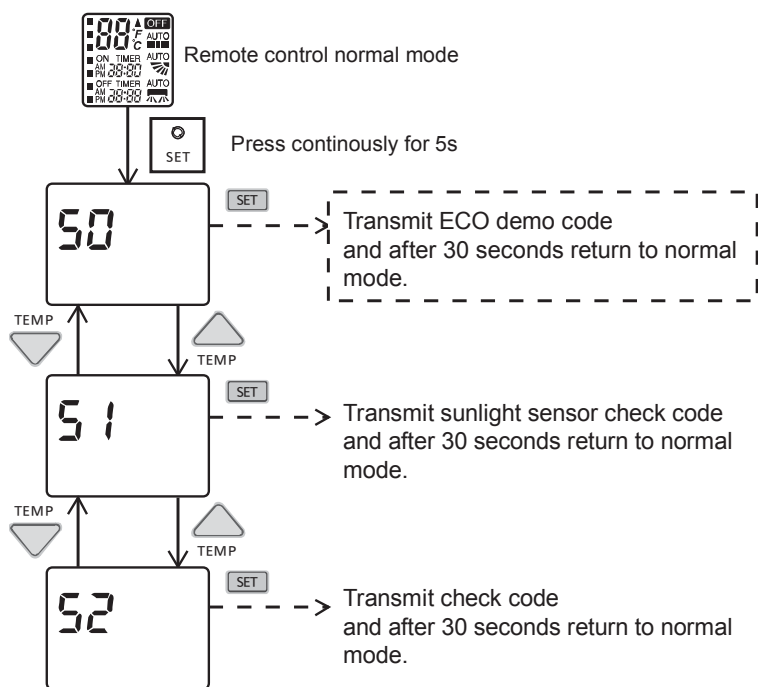
When ECONAVI and AUTO COMFORT Sensor has continues at Lo level for 25 seconds.
3. Abnormal treatment

Any one of the above self-diagnosis result is abnormal

 - Abnormal counter +1 and ECONAVI and AUTO COMFORT Sensor power supply OFF.
 - After ECONAVI and AUTO COMFORT Sensor unit power is OFF for 5 seconds, Retry the ECONAVI and AUTO COMFORT operation.
 - When Abnormal counter reach 4 counts, ECONAVI and AUTO COMFORT sensor abnormality is confirmed.

(Abnormal counter is cleared when sensor power ON and maintain normal for 120 seconds and above or Clear Abnormal counter by power reset)
 - Save ECONAVI and AUTO COMFORT Sensor Abnormality H59 (no Timer LED blinking).
 - ECONAVI & AUTO COMFORT Sensor operation OFF, but ECONAVI and AUTO COMFORT LED maintain ON.
 - The unit still operate as normal.
 - Sensor error counter can be cleared only after power supply reset or AC Reset button on the remote control is pressed.

- ECONAVI and AUTO COMFORT Demo Mode
 - To enable ECO DEMO mode, during unit is OFF (power standby):



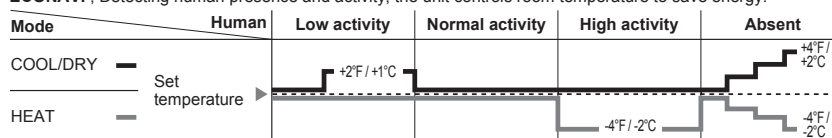
- To disable ECO Demo MODE:
 - Transmit ECO Demo signal again.

Control details:

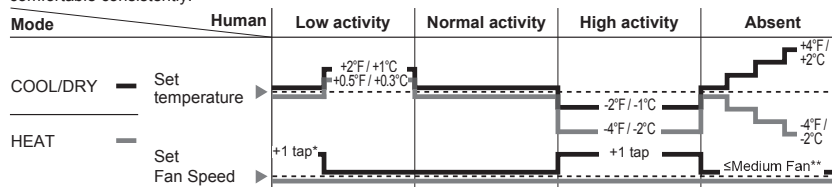
- During ECONAVI and AUTO COMFORT Demo mode, operation LED ON and horizontal vane will set to Auto Swing.
- When Hi activity judge, Fan speed change to Hi Fan and ECONAVI and AUTO COMFORT LED ON.
- When Lo activity judge, Fan speed change to Lo Fan and ECONAVI and AUTO COMFORT LED OFF.
- No setting temperature adjustment.
- During ECONAVI and AUTO COMFORT operation, the internal setting temperature and fan speed are adjusted in order to provide comfort and energy saving.

- ECONAVI Start condition.
 - Press ECONAVI button.
- ECONAVI Stop condition.
 - Press ECONAVI button again.
 - OFF Timer activates.
 - Press OFF/ON button to turn off the air conditioner.
 - Press AUTO OFF/ON button to turn off the air conditioner.
 - Press POWERFUL/QUIET button.
- AUTO COMFORT Start condition.
 - Press AUTO COMFORT button.
- AUTO COMFORT Stop condition.
 - Press AUTO COMFORT button again.
 - OFF Timer activates.
 - Press OFF/ON button to turn off the air conditioner.
 - Press AUTO OFF/ON button to turn off the air conditioner.
 - Press POWERFUL/QUIET button.
- ECONAVI and AUTO COMFORT operation could ON when any of the following conditions is fulfilled:
 - During forced cooling or forced heating operation.
- Power Failure
 - ECONAVI and AUTO COMFORT operation will be resuming after recovered from power failure.
- Timer Operation
 - When unit is turn on by ON Timer and ECONAVI and AUTO COMFORT operation is ON during previous operation before OFF, ECONAVI and AUTO COMFORT operation will not be ON automatically.
 - When unit is turn on by ON Timer and ECONAVI and AUTO COMFORT operation is OFF during previous operation before OFF, ECONAVI and AUTO COMFORT operation will not be ON automatically.
- Other Information
 - ECONAVI and AUTO COMFORT, Powerful, Quiet and Mild Dry Cooling cannot be operated at the same time.
 - ECONAVI and AUTO COMFORT sensor initialized time is 70 seconds from power supplied to ECONAVI and AUTO COMFORT sensor, or 70 seconds from the operation start.
- Setting Temperature and Fan Speed Shift
 - Mono Sensor

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.

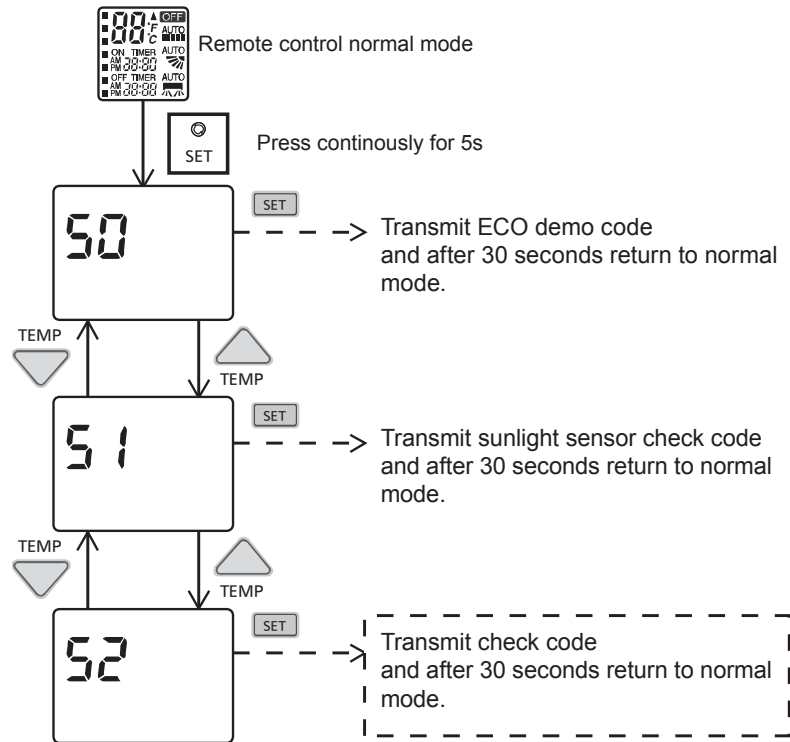


* During low activity, fan speed 1 tap up for first 15 minutes or until set temperature is reached.

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

13.12.1 Human Activity Sensor Check Mode

- To enable Human Activity sensor abnormality check mode, during ECONAVI operation ON:



- 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.

14. Operation Control (For Multi Split Connection)

During multi split connection, indoor unit's operation controls are same with single split connection unless specified in this chapter.

14.1 Cooling operation

14.1.1 Thermostat control

- Capability supply to indoor unit is OFF (Expansion valve closed) when Intake Air Temperature — Internal setting temperature < 28.4°F.
- Capability resume supply to indoor unit after waiting for 3 minutes, if the Intake Air temperature — Internal setting temperature > Capability supply OFF point.

14.2 Soft Dry Operation

14.2.1 Thermostat control

- Capability supply to indoor unit is OFF (Expansion valve closed) when Intake Air Temperature — Internal setting temperature < 26.6°F.
- Capability resume to indoor unit after waiting for 3 minutes, if the Intake Air temperature — Internal setting temperature > Capability supply OFF point.

14.3 Heating Operation

14.3.1 Thermostat control

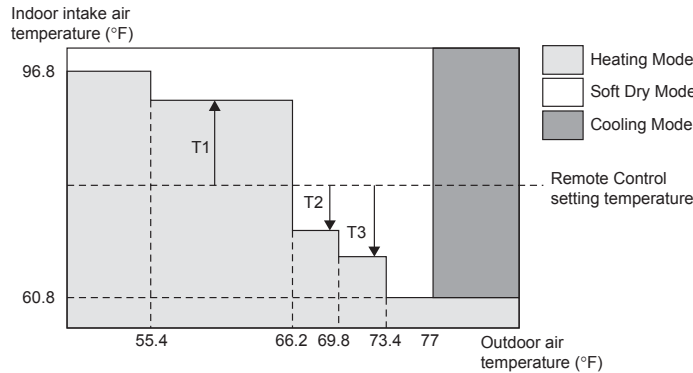
- Capability supply to indoor unit is OFF (Expansion valve closed) when Intake Air Temperature — Internal setting temperature > 33.8°F.
- During this condition, the indoor fan is stopped if compressor is ON.
- Capability resume supply to indoor unit after waiting for 3 minutes, if the Intake Air Temperature — Internal setting temperature < Capability supply OFF point.

14.3.2 Temperature Sampling Control

- Temperature sampling is controlled by outdoor unit where room temperature for all power supply ON indoor unit could be obtained.
- When capability supply to the indoor unit is OFF and the compressor is ON during heating operation, the indoor fan motor is stopped. During this condition, 15 seconds after sampling signal from outdoor unit is received, the indoor fan start operation at low fan speed.
- However, within first 4 minutes of capability stopped supply to the indoor unit, even sampling signal is received, the sampling control is cancelled.

14.4 Automatic Operation (For Multi Split Connection Only)

- This mode can be set using remote control and the operation is decided by remote control setting temperature, remote control operation mode, indoor intake and outdoor air temperature.
- During operation mode judgment, indoor fan motor (with speed of -Lo) and outdoor fan motor are running for 30 seconds to detect the indoor intake and outdoor air temperature. The operation mode is decided based on below chart.



- Every 180 minutes, the indoor and outdoor temperature is judge. Based on remote control setting temperature, the value of T1 will increase up to 50°F, T2 will decrease by 37.4°F and T3 will decrease up to 46.4°F.

14.5 Indoor Fan Motor Operation

14.5.1 Residual Heat Removal Control

- To prevent high pressure at indoor unit, when heating mode thermostat-off condition or power supply OFF, indoor fan continue to operate at controlled fan speed for maximum 30 seconds then stop.

14.6 Powerful Mode Operation

- When the power mode is selected, the internal setting temperature will shift lower up to 39.2°F for Cooling/Soft Dry or higher up to 42.8°F for heating than remote control setting temperature, the powerful operation continue until user cancel the Powerful operation by pressing powerful button again.

14.7 Auto restart control

- When the power supply is cut off during the operation of air conditioner, the compressor will re-operate between three to four minutes (10 patterns to be selected randomly) after power resume.
- During multi split connection, Indoor unit will resume previous mode, include unit standby mode.

14.8 Indication Panel

LED	POWER	TIMER	QUIET	POWERFUL	AUTO COMFORT	ECONAVI
Color	Green	Orange	Orange	Orange	Green	Green
Light ON	Operation ON	Timer Setting ON	Quiet Mode ON	Powerful Mode ON	Auto Comfort ON	Econavi Mode ON
Light OFF	Operation OFF	Timer Setting OFF	Quiet Mode OFF	Powerful Mode OFF	Auto Comfort OFF	Econavi Mode OFF

Note:

- If POWER LED is blinking (0.5 second ON, 0.5 second OFF), the possible operation of the unit are during Indoor Residual Heat Removal, Hot Start, during Deice operation, operation mode judgment, or ON timer sampling.
- If POWER LED is blinking (2.5 seconds ON, 0.5 second OFF), the unit is in standby mode.
- If TIMER LED is blinking, there is an abnormality operation occurs.