Technical Guide

2004
Ductless Split Air Conditioner

Panasonic Services Company

National Training

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⚠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 product or products dealt with in this service information by anyone else could result in serious injury or death.

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Introduction

The primary objective of this guide is to provide you with a thorough understanding of the fundamentals of the Panasonic split air-conditioning and heat pump system.
Installation instructions, metering devices, refrigerant recovery techniques, theory on basic refrigeration cycle and the function of each component are explained.

Safety precautions

Please comply with Federal Laws, which prohibit the release of environmentally harmful refrigerants into the environment during the maintenance, service, installation or disposal of air conditioning equipment.

Contact Information

To inquire about product features, product warranties, operation, catalogs and spec sheets, sales locations or service locations, call: **866-292-7292.**
(Select option 2 to speak to a person familiar with split air conditioners)

Open 365 days a year
Hours of Operation: Mon.-Fri.: 9am - 9pm
Sat.-Sun.: 10am - 7pm

Service Policy

For a copy of the service policy log on into our website.

http://www.panasonic.com/splitac

Warranty

All components of Split Air Conditioner, except the compressor and the remote controller have a 1year warranty. The compressor has 5 year and the remote control has 90 days.

Tech Support

Hotline
1-800-572-2672
Normally when you call this number for tech support you will have to provide an access code and an account number, but when you are calling for help with a Split Air Conditioner, just say that you need help with Split Air Conditioner and help will be provided to you without an account number.
Note: this number is not for customers, it is strictly for repair man/installers.

Split Air Conditioner Website

http://www.panasonic.com/splitac

Login into our website is absolutely free, passwords and pin codes are not necessary. You will find information about our Split Air Conditioners.
Besides explanation of all the features, you will also find a list of frequently asked questions, Installation instructions, operating instructions, service manuals, service policy, warranty and parts information.

Description

This type of air conditioner is comprised of two units, the indoor unit and the outdoor unit. These 2 units are connected to each other without ducts, but by means of small copper tubing.

The condenser (outdoor unit) is placed outside of the building. It delivers the coolant to the evaporator via copper tubing that enters the building through a small opening in the wall.

Figure 1

The evaporator (indoor unit) is installed on the wall in the room that is to be cooled. It intakes the warm air in the room, cools it by passing it through a heat exchanger, and dispenses the cooled (and filtered) air back into the room.

Figure 2

Like central systems, the split air conditioners have 4 main components: a compressor, a condenser, an evaporator and a fan. Some units operate as heat pumps and provide both summer cooling and winter heating. The noisy compressor and condenser are housed as one unit and located outdoors. The quiet cross flow fan and the evaporator unit are indoors, located in the area to be cooled. A conduit, which houses the power cable, refrigerant tubing, suction tubing, and condensate drain, links the outdoor and indoor units.

Models Available

	CAPACITY BTU/HR	INDOOR UNIT	OUTDOOR UNIT	VOLTAGE
COOLING ACTION	9,000	CS-C9CKPG	CU-C9CKP6G	115 Volts
	12,000	CS-C12CKPG	CU-C12CKP6G	115 Volts
	18,000	CS-C18BKP	CU-C18BKP	230 Volts
	24,000	CS-C24BKP	CU-C24BKP	230 Volts
	28,000	CS-C28CKU	CU-C28CKU	230 Volts
COOLING ACTION COMBINED WITH HEAT PUMP	8,200C/ 9,200H	CS-A9CKPG	CU-A9CKP6G	115 Volts
	12,000C/ 13,500H	CS-A12CKPG	CU-A12CKP6G	115 Volts
	17,000C/ 18,300H	CS-A18CKPG	CU-A18CKP6G	230 Volts
	24,000C/ 28,000H	CS-A24CKPG	CU-C24CKP6G	230 Volts

Capacity	Horse power (HP)	Tons
9,000	1 HP	.75 tons
12,000	1.5 HP	1 ton
18,000	2 HP	1.5 tons
24,000	2.5 HP	2 tons
28,000	3 HP	2.25 tons

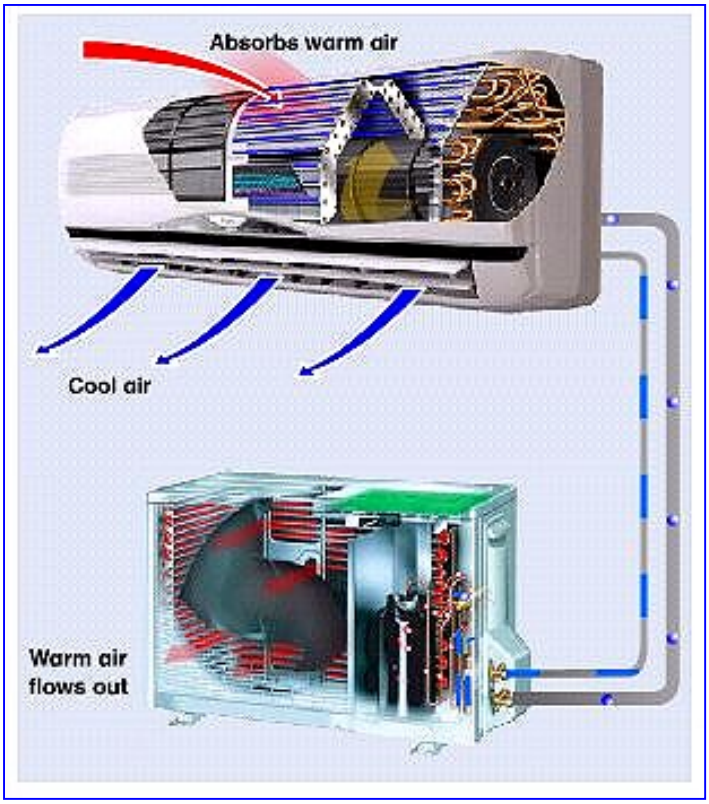
British thermal units (BTU)
Is the amount of heat required to raise the temperature of one pound (0.45 kg) of water 1 degree Fahrenheit (0.56 degrees Celsius).
1 ''ton'' = 12,000 BTU
1 KW Kilowatt (1000 watts) = 3400 BTUs per hour

specifications

Model (60Hz)			CS-C9CKPG (CU-C9CKP6G)	CS-C12CKPG (CU-C12CKP6G)	CS-A9CKPG (CU-A9CKP6G)	CS-A12CKPG (CU-A12CKP6G)	CS-C18BKP (CU-C18BKP6)		CS-C24BKP (CU-C24BKP6)		CS-A18CKPG (CU-A18CKP6G)		CS-A24CKPG (CU-A24CKP6G)	
Cooling Capacity		Btu/h	8,800	12,300	8,200	12,000	17,700	17,700	23,200	23,200	16,900	17,000	24,000	24,000
SEER			12.4	11.2	10.8	10.6	10.3		10.0		10.0		10.0	
Heating Capacity		Btu/h	—	—	9,200	13,500	—	—	—	—	18,100	18,300	27,600	28,000
HSPF			—	—	8.0	7.4	—	—	—	—	6.8		6.8	
Electrical Data	Voltage	V	115	115	115	115	208	230	208	230	208	230	208	230
	Running Current	A	7.2	10.3	7.4 6.7	10.6 10.5	8.5	7.9	13.1	12.1	8.5 8.5	7.9 7.9	12.5 13.5	11.6 12.5
	Power Input	W	790	1,160	810 730	1,200 1,190	1,740	1,780	2,640	2,680	1,720 1,720	1,760 1,760	2,550 2,750	2,600 2,800
Noise — Sound Pressure Level	Indoor (Hi / Lo)	dB(A)	36 / 26	39 / 29	36 / 26 38 / 28	39 / 29 40 / 29	42 / 37	42 / 37	46 / 40	46 / 40	44 / 38 43 / 38	44 / 38 43 / 38	50 / 45	50 / 45
	Outdoor (Hi)	dB(A)	49	49	49 49	49 49	54	56	59	61	52 53	55 56	58	59
Moisture Removal		Pints/h	1.7	3.0	1.5	2.7	4.2		6.6		4.0		6.5	
Air Circulation (Indoor/Hi)		Dry CFM	310	340	310 350	340 360	470		533		480 512		590 610	
Dimensions (Outdoor Unit)	Height	inch	10-13/16 (21-1/4)	10-13/16 (21-1/4)	10-13/16 (21-1/4)	10-13/16 (21-1/4)	10-13/16 (26-31/32)		10-13/16 (26-31/32)		10-13/16 (26-31/32)		10-13/16 (29-17/32)	
	Width	inch	31-15/32 (30-23/32)	31-15/32 (30-23/32)	31-15/32 (30-23/32)	31-15/32 (30-23/32)	39-9/32 (31-1/2)		39-9/32 (31-1/2)		39-9/32 (31-1/2)		39-9/32 (34-7/16)	
	Depth	inch	8-9/32 (11-3/8)	8-9/32 (11-3/8)	8-9/32 (11-3/8)	8-9/32 (11-3/8)	8-9/32 (11-13/16)		8-9/32 (11-13/16)		8-9/32 (11-13/16)		8-9/32 (13-19/32)	
Net Weight (Outdoor Unit)		lbs.	20 (64)	20 (73)	20 (68)	20 (77)	24 (106)		24 (133)		24 (117)		26 (139)	
Refrigerant Pipe Diameter	Liquid Side	mm inch	6.35 1/4	6.35 1/4	6.35 1/4	6.35 1/4	6.35 1/4		6.35 1/4		6.35 1/4		6.35 1/4	
	Gas Side	mm inch	9.52 3/8	12.70 1/2	9.52 3/8	12.70 1/2	12.70 1/2		15.88 5/8		12.70 1/2		15.88 5/8	
Pipe Extension	Minimum Pipe Length	ft	9.8	9.8	9.8	9.8	9.8		9.8		9.8		9.8	
	Maximum Pipe Length*	ft	32.8	49.2	32.8	49.2	82.0		82.0		82.0		82.0	

Principle of Refrigeration Cycle

Heat is extracted from the room by passing indoor air across a refrigerant coil in the indoor unit. The refrigerant in the system absorbs the excess heat and recycles it with the compressor and condenser in the outdoor air conditioner unit. A fan blows outside air over the hot coil, transferring heat from the refrigerant to the outdoor air. The cooling cycle continues until the indoor temperature reaches the thermostat setting.



This is a diagram of the refrigeration cycle during cooling operation

The Refrigeration Cycle uses the following parts/components.

1. **Compressor** (High Pressure type)
It receives refrigerant (gas suction) from Accumulator and compress it to make high pressure and high temperature gas for the Condenser.

2. **Condenser** (Outdoor Heat- Exchanger)
Release heat from high pressure and high temperature refrigerant gas into the atmosphere, to liquefy refrigerant.

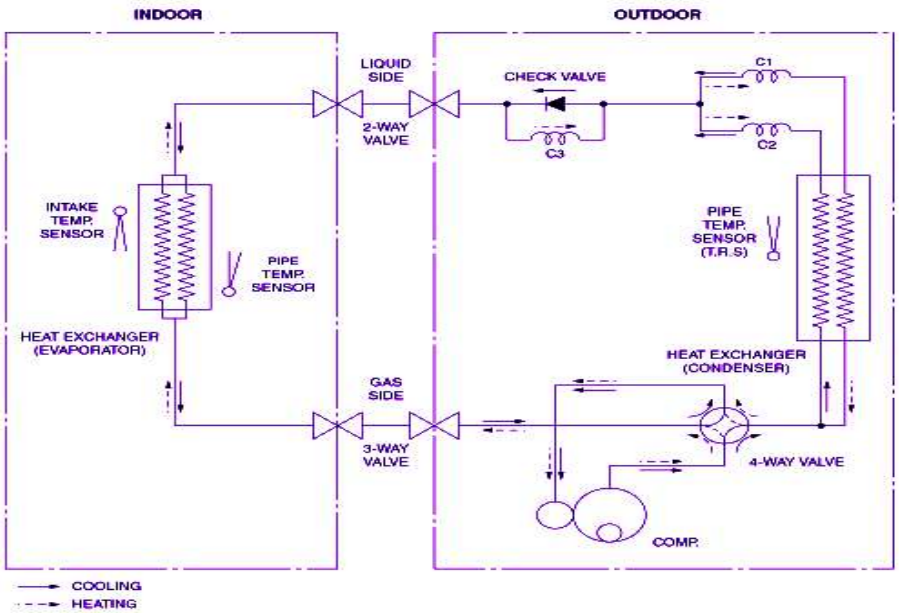
3. **Capillary Tube** (Expansion Valve)
Supply sufficient amount of liquid refrigerant to evaporator. Reduce pressure to vaporized liquid for evaporator.

4. Liquid Side Piping
Liquid refrigerant flows from capillary tube Evaporator through copper pipe.

5. **Evaporator** (Indoor Heat-Exchanger)
Absorb heat from the room through vaporizing process of refrigerant.

6. Gas Side Piping
Refrigerant gas flows from Evaporator to Accumulator through cooper pipe.

7. Accumulator
Separate refrigerant gas from liquid. (Accumulate liquid refrigerant to vaporize it from compression process).



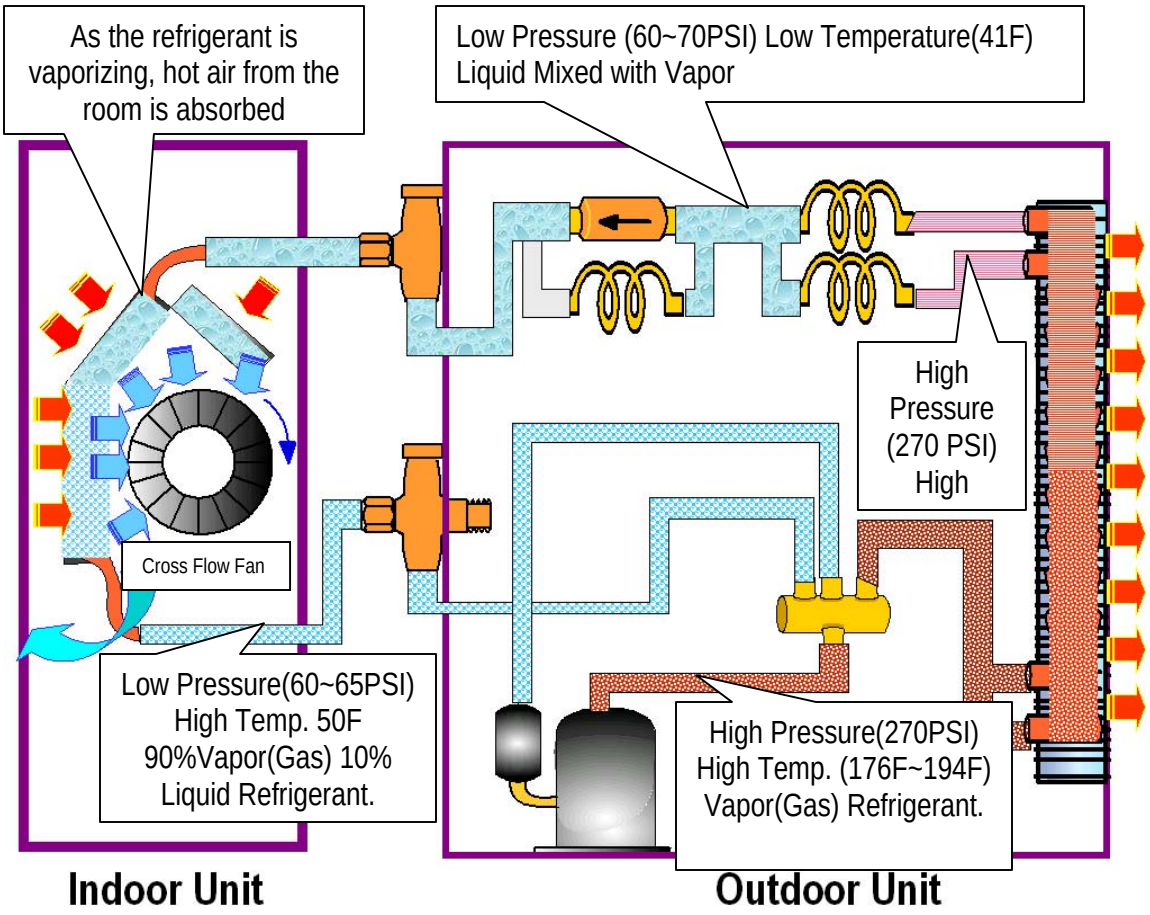

As the refrigerant is vaporizing, hot air from the room is absorbed
Low Pressure (60~70PSI) Low Temperature(41F) Liquid Mixed with Vapor
High Pressure (270 PSI) High
Cross Flow Fan
Low Pressure(60~65PSI) High Temp. 50F 90%Vapor(Gas) 10% Liquid Refrigerant.
High Pressure(270PSI) High Temp. (176F~194F) Vapor(Gas) Refrigerant.
Indoor Unit
Outdoor Unit

Figure 3

Evaporator (Heat Exchanger)
The evaporator is the system component that actually does the cooling of the space or product. Therefore, it is a very important component. It may be defined as a device that absorbs heat into the refrigeration system and it is located in the area to be cooled. The heat is absorbed because of the latent heat of the refrigerant's vaporization.

The liquid refrigerant inside the heat exchanger comes into contact with warm room air, causing it to evaporate; in other words, it absorbs heat from surrounding air. The warm room air is drawn in by a fan, cooled, and sent back into the room.

The vapors move into the suction line. The accumulator holds any refrigerant which has not vaporized, the prevents liquid refrigerant from flowing into the suction line. To facilitate evaporation of the refrigerant, cooper tubing with high thermal conductivity is used. The cooper tubing is surrounded by thin fins increase the surface are which comes in contact with the room air.

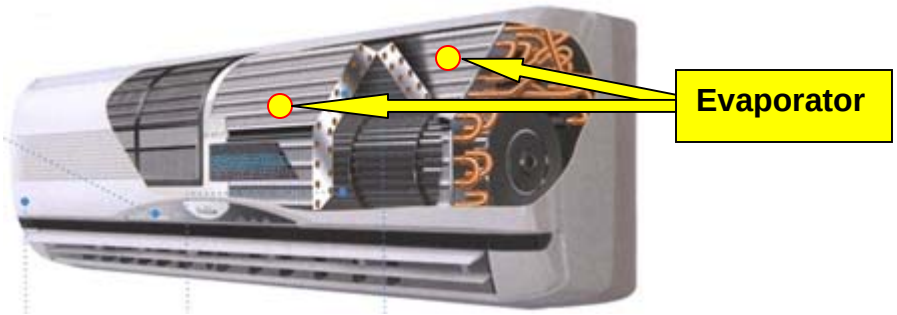


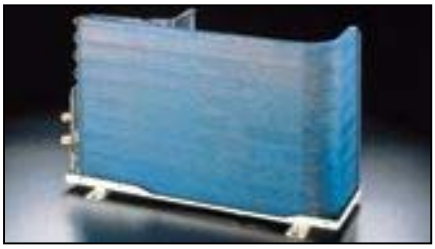
Figure 4

Compressor
The compressor is generally considered to be heart of the system. The purpose of the compressor is to compress and circulate the refrigerant from component to component.

The compressor draws the refrigerant vapor from the evaporator, lowering the pressure in the evaporator. The refrigerant can the boil and absorbs heat at the desired operating pressure and temperature. The compressor then causes an increase in the refrigerant pressure and causes the refrigerant to flow to the condenser. It is the compressing action on the vapor that causes the refrigerant pressure to have a saturation temperature. This saturation temperature is higher than the temperature of the medium used to cool the condenser and condense the refrigerant.

Figure 5

Condenser
When the refrigerant is discharged from the compressor it is hot, superheated vapor. It is ready to give up the heat that it collected in the evaporator, and also the heat gained during the compression process, to the medium used to cool the condenser. The purpose of the condenser is to remove the heat from hot discharge gas and change it to liquid.



During this cooling process, the sensible heat must first be removed from the vapor by the condenser-cooling medium, lowering its temperature until it has reached the condensing temperature. The latent heat of condensation is then removed from the vapor, changing it to a liquid (condenses). In later model condensing units, extra rows are added to the condenser coil so that the liquid refrigerant can be cooled below the condensing temperature (sub cooled). Sub cooling is an essential part of any increase the overall efficiency of the unit by reducing flash gas at the flow control device.

Condenser theory dictates that the amount of heat given up by the refrigerant in the condenser must always equal the amount of heat gained by the cooling medium.

Capillary Tube.
The capillary tube is a small diameter tube used to feed the refrigerant into the evaporator. Here the pressure of the liquid refrigerant is lowered, causing it to become more volatile. The liquid refrigerant is forced to go through this narrow tube before it reaches the evaporator. The energy loss passing through this tube causes the refrigerant to drop from high pressure to low pressure.

Because the pressure is suddenly lowered, some of the refrigerant is converted into vapor while the remaining liquid is cooled, serving to lower the temperature of the previously warm refrigerant. Thus, as the liquid refrigerant flows through the capillary tube, it becomes lower in pressure and temperature, and more volatile.

Capillary tubes need an uncontaminated environment. If the small diameter tube becomes clogged, the refrigerant process will stop. In most installations, a filter-drier is installed just ahead of the capillary tube to remove moisture, keep dirt and metal from entering the refrigerant flow control.

Indoor Features

Removable, Washable Panel

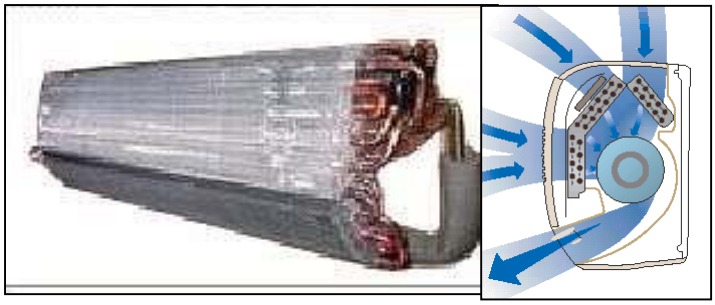
- The front panel is easy to keep clean.
- It removes quickly in one simple step and can be washed in water.

Cross-Flow Fan

The excellent air flow path is due to the exceptionally wide 90 mm diameter of our cross flow fan. This maintains super quiet operation while the increased
airflow sends clean, comfortable air to every corner of the room.

Double-Bend Heat Exchanger

This structure gives the heat exchanger a large surface area for higher efficiency. With 15 rows of copper piping, the double-bend heat exchanger helps to ensure the air the unit takes in will be cooled or heated, resulting in high heat exchange efficiency.

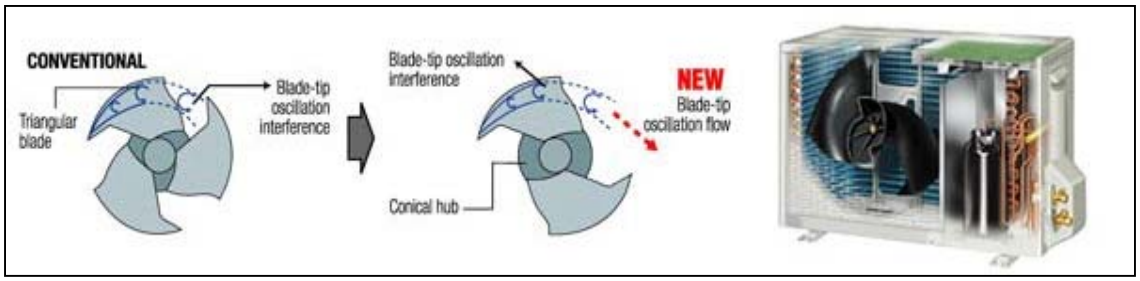


Outdoor Features

2-Wing Fan

The new 2-Wing Fan makes the outdoor unit even quieter by suppressing airflow noise, and improves efficiency by pulling in more air.

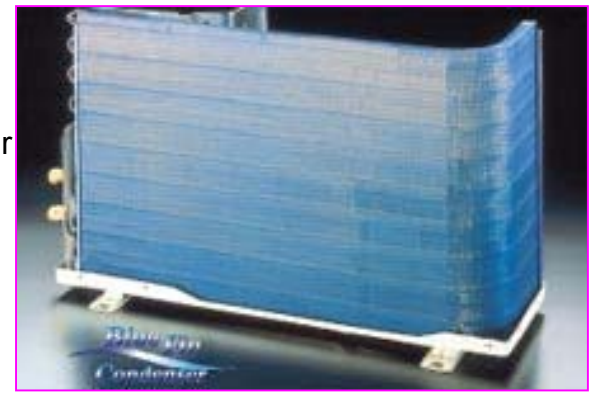
Applicable Models: CU-C9CKP6G/A9CKP6G/C12CKP6G/A12CKP6G.



Anti-Corrosion Condenser (Blue Coated)

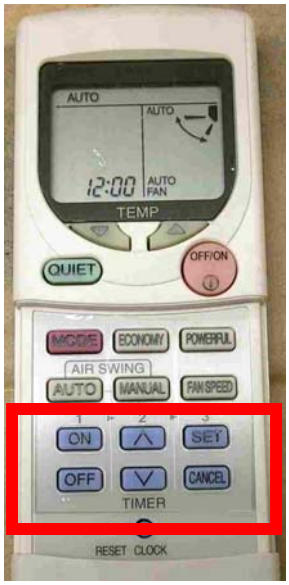
Condensers can take a beating from exposure to salty air, rain and other corrosive factors.

Panasonic has lengthened the life of our condensers with our new anti-rust coating.



Common Features

Conveniences



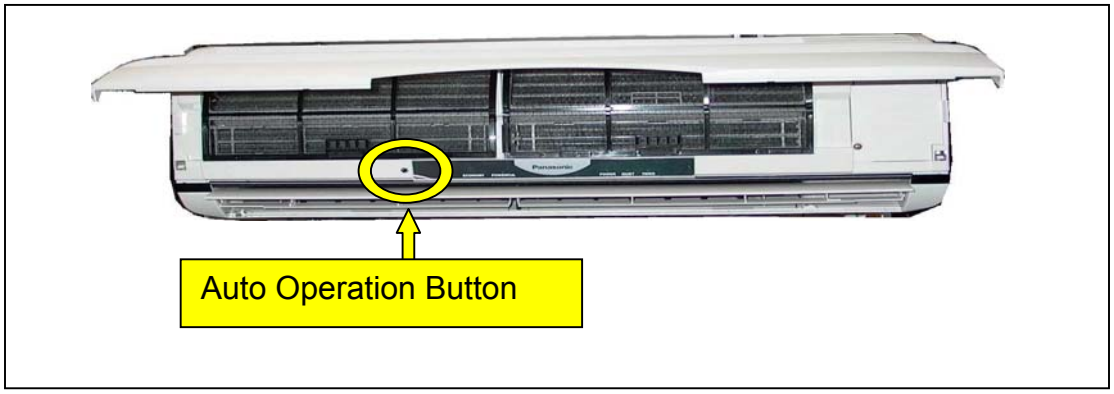
24-Hour On/Off Real Setting Timer
When using this feature, make sure that the current time is correct. The timer cannot be set if the time display is flashing.
When the ON – Timer is set, operation will start before the actual time. This way the set temperature will be reached at the set time.

- For cooling models, it starts 15 minutes in advance in cool, soft dry and auto.
- For heat pump models, it starts 15 minutes in advance in cool and soft dry modes, and it starts 30 minutes in advance in heat and auto modes.

Remote Control Self-illuminating Button
Luminous buttons make it easier to find and use the remote control even in the dark

Automatic Operation Mode

If the remote control fails to function or has been misplaced, press the Auto Operation button to start the Automatic operation.
The Automatic operation will be activated immediately once the Auto operation button is pressed. However, the temperature cannot be adjusted when in this mode.
Note: The power indicator on the indoor unit will blink until the operation mode is selected automatically.
To cancel this operation, press the Auto Operation button once more.



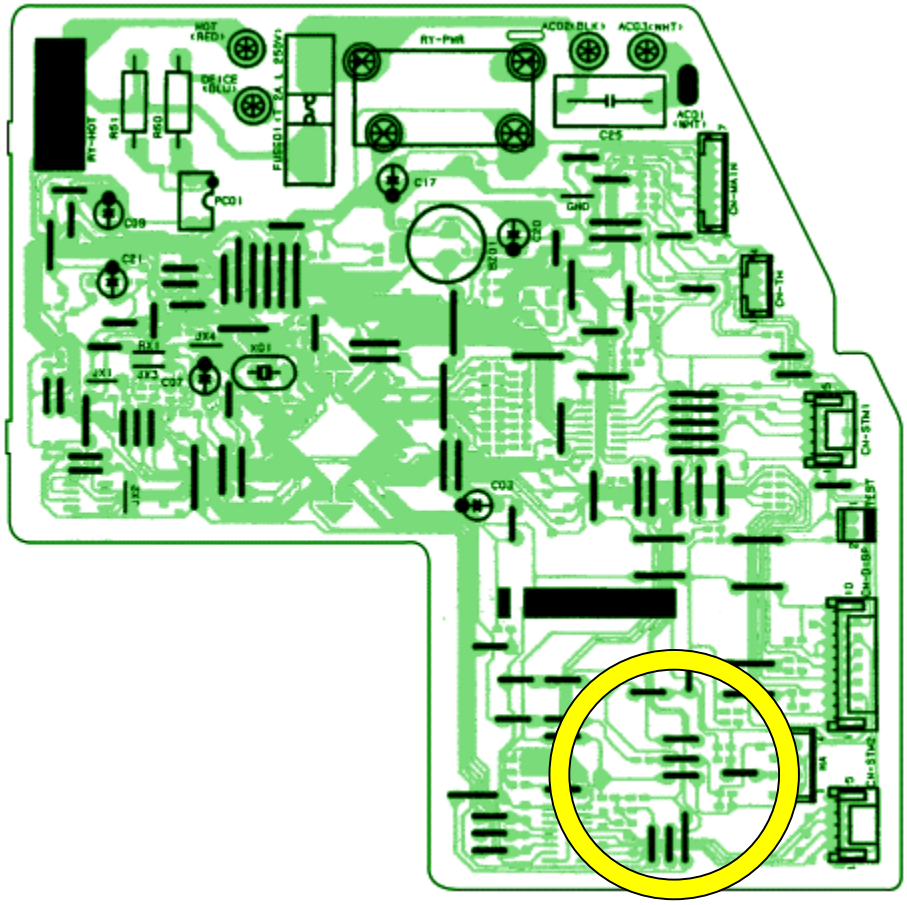
Auto Restart (Reset)
Random auto restart after power failure for safety restart operation
If there is a power failure, operation will be automatically restarted after 3 to 4 minutes when the power is resumed.

It will start with previous operation mode and airflow direction.

Restart time is decided randomly using 4 parameter.

1. Intake air temperature.
2. Setting temperature.
3. Fan speed.
4. Air Swing Blade position.

Auto Restart Control is not available when Timer or Sleep Mode is set.
This control can be omitted by open the circuit of JX2.



JX2

Filters

Air Purifying Filter (2)

- Trap dust, pollen, tobacco smoke and tiny particles
- Prevent the growth of bacteria and viruses trapped
- Clean every 2 weeks (Vacuum, wash and dry)

Solar Refreshing Deodorizing Filter (2)

- Charcoal filter that helps to remove unpleasant odor from the air.
- To regenerate its deodorizing effect, just vacuum and place it in direct sunlight for approximately 6 hours every six months.
- This filter normally lasts 3 years

Programmable modes

Powerful Mode

This mode is used to reach the desired temperature quickly.
In powerful mode, the unit automatically points the airflow flap down 10 degrees. In cooling mode, it sets the temperature 5.4 degrees lower than the original set temperature and sets fan speed to super high (Shi) for cooling and SLo for soft dry.
In heating mode, it sets the temperature 5.4 degrees higher than the original set temperature and sets fan speed to automatic. By using these automatic settings, your room will be cool or warm in approximately 15 minutes, and then the Split Air Conditioner will return to your original settings.
During this mode, the powerful mode indicator (orange) on the indoor unit will light up.

Economy Mode

This mode is used when the room has reached your desired temperature.
In economy mode, the indoor unit's airflow flap will automatically be set to auto air-swing, temperature set to 0.9 degrees higher than the original set temperature for cooling and 0.9 degree lower than the original set temperature for heating, and the fan speed is set at Super Low for cooling mode and automatic for heating mode. This mode is best used when you feel comfortable with the current room condition and want to save energy by reducing the electrical power consumption.
During this mode, the powerful mode indicator (green) on the indoor unit will light up.

Dry Mode

This mode provides a very gentle cooling operation prior to dehumidification. It does not lower the room temperature.
This dehumidifies the air while gently cooling the room without lowering the temperature too much. When it starts operating, it gently cools and dehumidifies, until the room temperature becomes one degree lower than the set temperature.

At first, the indoor fan operates at low fan speed, then it automatically switches on and off every six minutes to prevent over-cooling.
This is an extremely convenient function when the humidity is high.

Quiet Mode Auto-Control (C9/A9, C12/A12)
This feature is used to provide quiet operation. Just press the QUIET button on the remote control and the air flow sound will reduced during operation by 3 dB. People can actually feel the noise level been reduced to half just by lowering the sound level 3 dB down.

This table shows the normal sound level During cooling and heating modes. These levels are considered to be the lowest fan noise.

Fan Mode	Cooling	Heating
Hi	36dB	38dB
Low	26dB	28dB

Sleep Mode Auto-Control (C18/A18, C24/A24, C28)
This feature is used to prevent the room from getting too hot or cold while you are sleeping.
The sleep shift operation starts, when the room temperature reaches the setting temperature or after 1 hour of operation.
During cooling and soft dry, the setting temperature will be raised by 0.9 °F at the start of operation and by 0.9 °F one hour later.
The airflow volume will automatically change to Lo fan speed.

During heating mode, the setting temperature will be decrease by 3.6 °F at the start of operation and by 5.4 °F one hour later.

Sleep Mode operation time is 8 hours, the operation will be stop after 8 hour.
When used together with the Timer, the Timer has priority.

Fan Mode or Circulation Operation Mode (Cooling Models Only)
This feature is useful for deodorizing control.
When the intake air temperature or temperature near the ceiling, reaches the set temperature, the Fan Mode (Air circulation mode) starts at low airflow volume.
The fan stops when the temperature drops to 3.6°F below the set temperature.

Hot Start Control (Heat Pump Models Only)
This feature is used to prevent cold air to be blown into the room at the beginning of heating operation when the temperature of the indoor heat exchanger is below 86°F.
The indoor fan stops until the indoor heat exchanger reaches 86°F. Hot start is completed when indoor the exchanger rises to 102.2°F or over 4 min.

Anti Cold Draft Control
This feature is used to prevent cold draft in heating mode operation when the indoor heat exchanger temperature is low during the compressor off (thermal off) period.

Other features

Airflow Direction Control - Vertical & Horizontal (C18/A18, C24/A24, C28)
The indoor units have adjustable airflow control for up & down or left & right airflows. There are 5 patterns and an auto setting for each.

Extended Pipe Length:

Model	Piping Size		Common Length (Feet)	Max Elevation (Feet)	Max. Piping Length (Feet)	Additional Refrigerant
	Gas	Liquid				
CS-A9CKPG	3/8	1/4	24.6	16.4	32.8	0.11 oz/ft (10 g/m)
CS-A12CKPG	1/2	1/4	24.6	16.4	49.2	0.11 oz/ft (10 g/m)
CS-C18BKP	1/2	1/4	24.6	65.6	82	0.22 oz/ft (20 g/m)
CS-C24BKP	5/8	1/4	24.6	65.6	82	0.33 oz/ft (30g/m)
CS-C28CKU	3/4	3/8	24.6	65.6	98.4	0.33 oz/ft (30g/m)

These Units are delivered with enough refrigerant for an installation of approximately 24.6 feet distance between the Indoor unit and the outdoor unit
CS-A18CKPG - Refrigerant amount- 54.4oz.
CS-A24CKPG - Refrigerant amount- 62.8oz.

Compressor Reverse Rotation Protection Control
This is used to protect the compressor from reverse rotation when there is an instantaneous power failure while the unit is working hard.

Overload Protector
Compressor inner protector.

60 Secs. Forced Operation Control
Once the compressor is activated, it does not stop within the first 60 secs. However, it stops immediately with the remote control stop signal.

Outdoor Fan Operation Control

- 6-pole induction motor (2 speed).
- For Cooling or Soft Dry operation
  Hi-speed ..... When outdoor temperature reaches to 31°C (87.8°F).
  Lo-speed..... When outdoor temperature reaches to 29°C (84.2°F).
- For Heating operation
  Hi-speed ..... When outdoor temperature reaches to 13.5°C (56.3°F).
  Lo-speed..... When outdoor temperature reaches to 15.5°C (59.9°F).
- For Over-heating Protection, the Fan is switched ON or OFF depending on the piping temperature and the outdoor temperature.

Deice Control

To prevent frosting at outdoor heat exchanger during Heating Operation.

4-Way Valve Control

When the unit is switched to "OFF" during Heating Operation, 4-way valve stays at Heating position for 5 minutes.

Low Ambient Temperature Control

To protect air conditioner from damage under the low outdoor ambient temperature < -12°C (10.4°F).

Anti-Freezing Control

This feature is used to prevent the indoor heat exchanger from freezing up. (Cooling and Soft Dry)

Deicing Control

Deice starts to prevent frosting at outdoor heat exchanger during heating mode.

Normal Deicing

Deice operation detection commences when heating operation starts or 60 minutes after previous deice operation. If the outdoor piping temperature drops to 24.8°F for 50 sec. continuously while the compressor is in operation, de-ice will start. (There is no detection when the Outdoor Fan stops.)
De-ice will operate for 12 minutes maximum or until the outdoor temperature reaches 4^0C (39.2^0F), then the DE-ICE will end.
When the TRS senses that the pipe temp raises to 4^0C (39.2^0F) before the max deice operation of 12 minutes, the TRS switch will open.
The DEICE operation will not end immediately as there is a time delay.

Deicing ends when:

- 12 minutes after deicing operation starts;
- The outdoor piping temperature rises to about 53.6°F.
- After deicing operation, compressor stops for 30 seconds and 4-way valve stays at cooling position for 10 seconds.

Overload Deicing

During heating operation, de-icing starts when the outdoor Fan OFF period (due to overload control) is accumulated up to 60 minutes and after the compressor starts for 1 minutes.

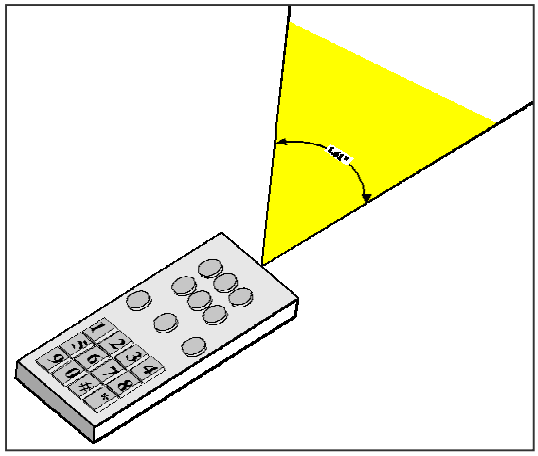
Anti-dew Formation Control (Cooling & Soft Dry)

The purpose of this feature is to prevent dew formation on indoor unit air discharge area.

When the following conditions occur for 30 minutes continuously, anti-dew formation is controlled by changing the indoor fan speed to low (Lo+):

- Indoor intake air temperature is more than 75.2°F and less than 86°F.
- Remote Control setting temperature is less than 77°F.
- Compressor is on.
- Cooling operation mode.
- The Indoor Fan motor operates at Low fan speed.

Remote Control

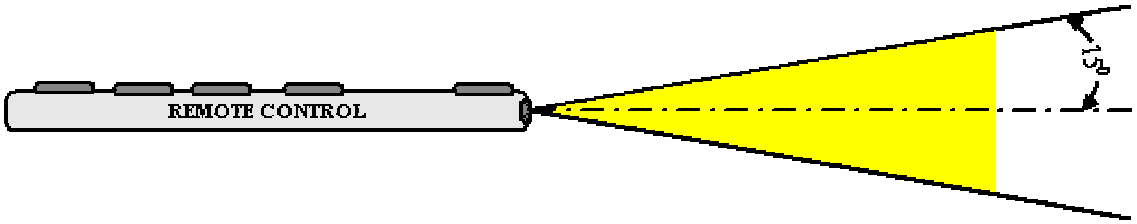


The Remote control has all the buttons needed to operate the air conditioner. It has a range of approximately 10 meters or 32.8 feet, and its signal covers an angle of 15 degrees above its transmission point.

Notes:

To turn-on or cancel the remote control signal receiving sound on the Indoor Unit Press and hold the AUTO OFF/ON button on the indoor unit for 10 seconds. A repeated beeping sound will alert you.

Press continuously for 5s or < 10s to operate Test Run/Pump down. A “Beep” sound will be heard in 5 second. (Used when test running or servicing.)



Automatic Operation

If the remote control fails to function or has been misplaced, press the Auto Operation button to start the Automatic operation.

The Automatic operation will be activated immediately once the Auto operation button is pressed. However, the temperature cannot be adjusted when in this mode.

Note: The power indicator on the indoor unit will blink until the operation mode is selected automatically.

To cancel this operation, press the Auto Operation button once more.

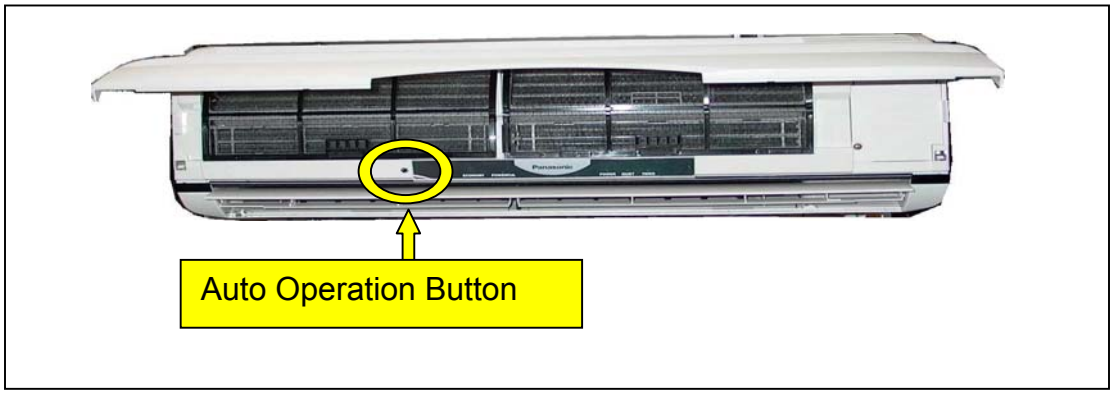
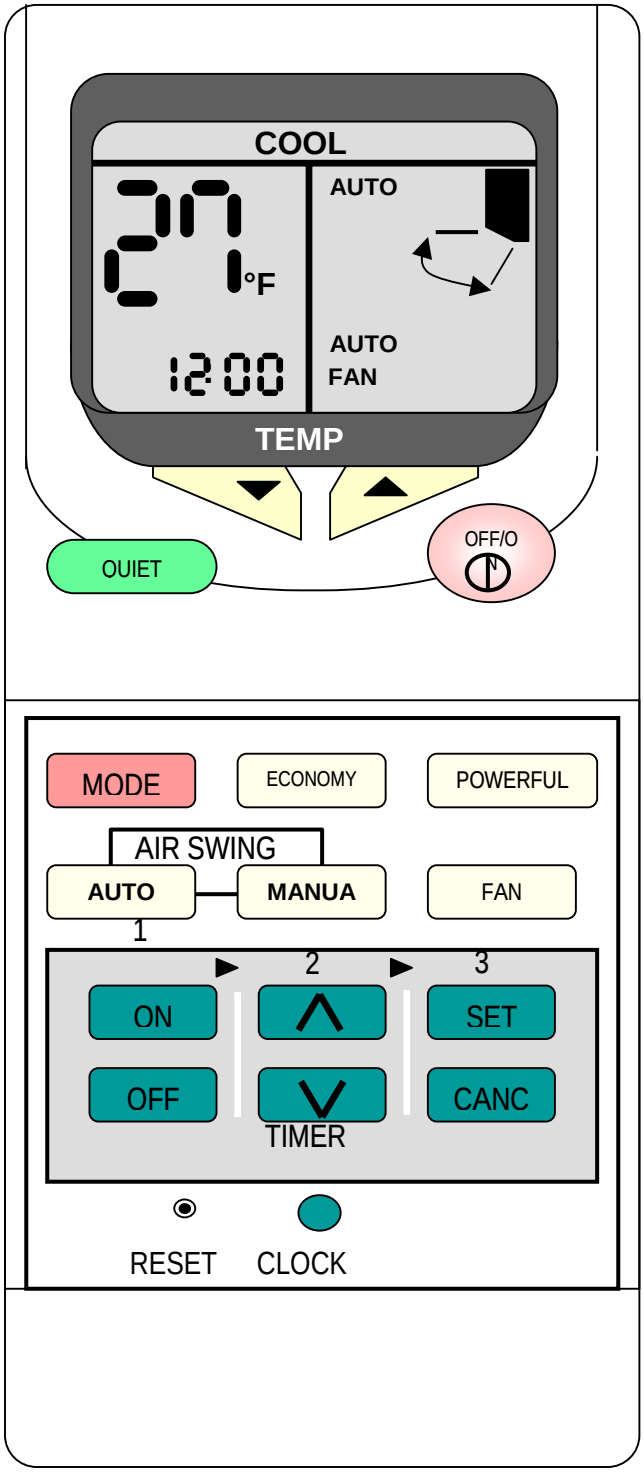


Figure 6

Remote Control



Remote Control Reset

When the batteries are replaced or installed for the first time, all the indications will blink and the Remote Control might not work.
To correct this problem, remove the cover locate the “Reset” button and press it.

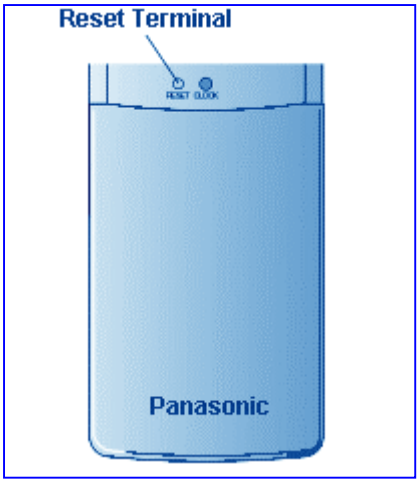


Figure 7

How to change the Remote Control Transmission code

To prevent operating errors caused by using two Remote Controls when two or more indoor units are installed in the same room, cut the jumper wire J-A in the Remote Control and also cut the jumper wire JX4 located in the indoor unit’s PCB.

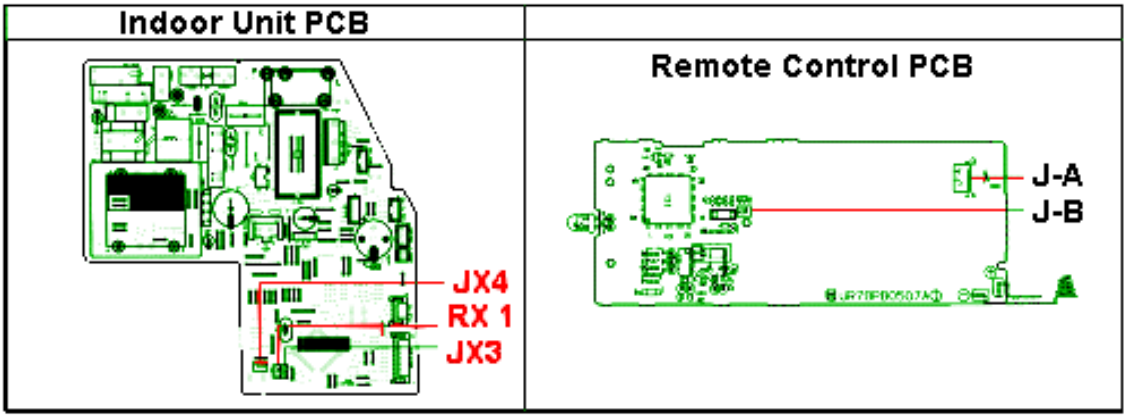


Figure 8

Note: It is possible to select from 4 types of transmission codes including the one used by the factory when unit is shipped out.

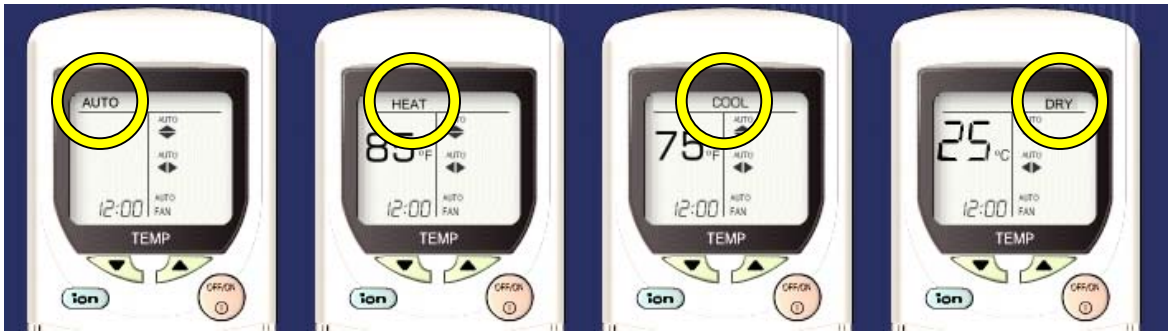
	Remote Control PCB		Indoor Unit PCB			Note
	J-A	J-B	JX3	JX4	RX 1	
1	SHORT	OPEN	SHORT	SHORT	-	At Delivery
2	OPEN	OPEN	SHORT	OPEN	-	
3	SHORT	SHORT	OPEN	OPEN	10K	
4	OPEN	SHORT	SHORT	OPEN	10K	

Operation Mode Selection for units with heat pump

In a Panasonic Split Air Conditioner with a heat pump, you can select between 4 different modes: Cooling Mode, Soft Dry Mode, Heating Mode and Automatic Mode.

What is a ”Heat Pump” air conditioning system?

It is a standard cooling air conditioning system but additional controls and valves (4way valve) allow the normal cooling operation to completely reverse on demand. This makes the normal indoor cooling section a very powerful, safe and economical heater, and the outside section that would have dissipated the heat becomes the cooling section. A totally ideal arrangement that allows the air conditioning to act as both cooler or heater and therefore allows the systems full use throughout the year.



Cooling Operation Mode

This mode is used to set the room temperature at your preference cooling level
Note: During cooling mode, the lower the setting temperature, and the higher the outside temperature, the lower the cooling capacity becomes. The cooling capacity also decreases as the airflow volume becomes lower. Accordingly cool air will not fully circulate throughout the room.
It is normal for the outdoor unit to emit water or steam when the unit is set to cooling mode because moisture in the air condenses into water on the cool surface of the outdoor unit piping. That causes dripping

Soft Dry Operation Mode

This mode provides a very gentle cooling operation prior to dehumidification. It does not lower the room temperature.
This dehumidifies the air while gently cooling the room without lowering the temperature too much. When it starts operating, it gently cools and dehumidifies, until the room temperature becomes one degree lower than the set temperature. At first, the indoor fan operates at low fan speed then it automatically switches on and off every six minutes to prevent over-cooling.
This is an extremely convenient function when the humidity is high.

It is normal for the outdoor unit to emit water or steam when the unit is set to soft dry mode because moisture in the air condenses into water on the cool surface of the outdoor unit piping. That causes dripping

How Your Air Conditioner Dehumidifies the Air

As the warm intake air passes over the evaporator coil, it is quickly cooled and can no longer hold as much moisture as it did at a higher temperature. The excess moisture condenses on the outside of the coils and is carried away through a drain. The process is similar to what happens when moisture condenses on the outside of a glass of ice water on a hot, humid day.

Heating Operation Mode

This mode is used when you want to set the room temperature at a higher level using the Remote Control.

The higher the setting temperature, and the colder the outside temperature, the lower the heating capacity becomes. Heating capacity also decreases as the airflow volume becomes lower. Accordingly, the warm air will not fully circulate throughout the room. However, the temperature of the air blown will be higher.
It is necessary to periodically carry out defrosting when the outside temperature drops to approximately -4° C (**24.8°F**) or below. This is because frost will collect on the outdoor heat exchanger. Defrosting results in a temporary halt of the heating operation.
In order to prevent cooling effect during heating operation, the indoor fan may run at “ON” and “OFF” operations.
When the outdoor ambient temperature falls, the unit heating capacity might be reduced.

Automatic Operation Mode

Auto operation mode means the operation mode will be decided automatically upon completion of room temperature judgment.

During this mode, the indoor temperature is sensed in order to select the optimum mode.

When this mode is selected, the indoor fan operates at Slo fan speed for 25 seconds to sense the intake air temperature and determine the 1st operation mode. If the indoor intake air temperature is less than **60.8° F**, heating mode will immediately start. **Note:** The set temperature it's not displayed on the remote control display during Auto operation, it will display **Hi** (for high), **blank** (for standard) and **Lo** (for low)

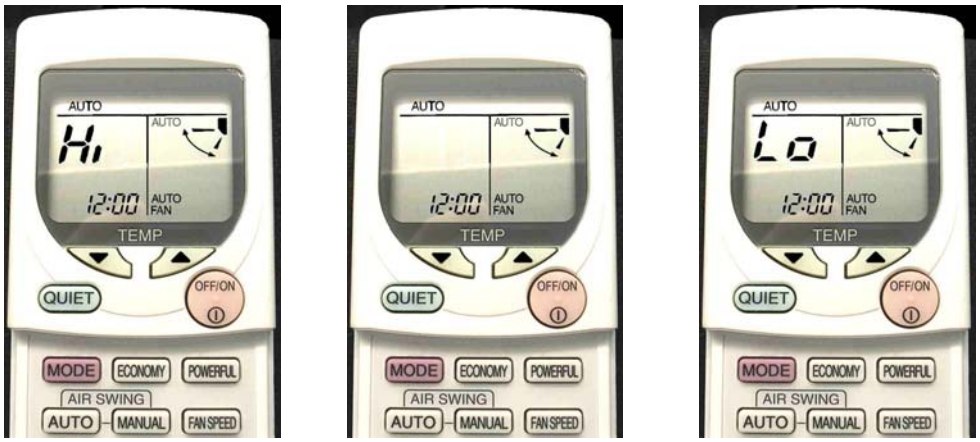


Figure 9

Operation Mode Selection for units without a heat pump

You can select between 4 different modes: Automatic Mode, Cooling Mode, Soft Dry Mode and Fan Mode (Air Circulation Mode).

Automatic Mode

How does the air conditioner determine which mode it should go into?
In order to select in which mode to start operating, the indoor fan rotates at Slo fan speed for 20 seconds to sense the intake air temperature. According to the temperature detected, the unit will decide if it needs to start in cooling mode or soft dry mode.
If the temperature detected is 73.4°F or higher, the unit will start in cooling mode and if it is below 73,4°F, it will start in soft dry mode.
Note: in some of our literatures they refer to this temperature (73.4°F) as the "Mode Judging Temperature".
The standard setting temperature for cooling mode is 77°F, and 71.6°F for soft dry mode.
If by using these settings the room temperature is a little colder than what you desire, then open the jumper JX1 located at the indoor unit PCB to increase the mode judging temperature and the standard setting temperature by 3.6°F.

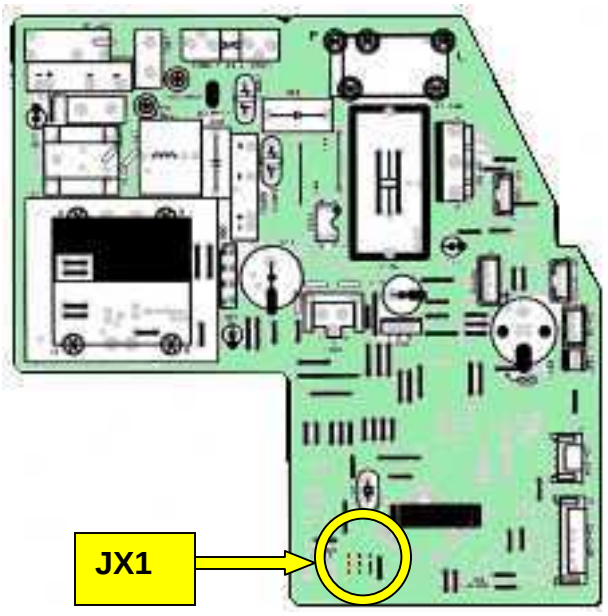


Figure 10

During Automatic Mode, you can adjust the room temperature by switching between high, standard and low.

- **Higher**
  Setting the unit to “Hi” does not mean a discharge of higher volume of cold air or faster indoor fan’s rotation, it means that the standard set temperature is increased by 3.6^{o} F. (from 77^{o} F to 80.6^{o}F in cooling mode and from 71.6^{o}F to 75.2^{o}F in soft dry mode) to make the room warmer.
- **Standard**
  When the unit is set to standard, the room temperature is kept at 77^{o}F in cooling mode and at 71.6^{o}F in soft dry mode.
- **Lower**
  Setting the unit to “Lo” will lower the room temperature by 3.6^{o}F (from 77^{o}F to 73.4^{o}F in cooling mode and from 71.6^{o}F to 68^{o}F in soft dry mode).

Cooling Mode
This mode is used to set the room temperature at your preference cooling level
Soft Dry Mode
This mode provides a very gentle cooling operation prior to dehumidification. It does not lower the room temperature.
This dehumidifies the air while gently cooling the room without lowering the temperature too much. When it starts operating, it gently cools and dehumidifies, until the room temperature becomes one degree lower than the set temperature. At first, the indoor fan operates at low fan speed, then it automatically switches on and off every six minutes to prevent over-cooling.
This is an extremely convenient function when the humidity is high.

Fan mode (Air Circulation Mode)
The purpose of this mode is to circulate the air inside the room. It's normally used in 4 season's country and useful when the heater is used. The fan will rotate at Low speed when the room temperature is warm and the fan will turn off when room temperature is cold.
This feature is useful for deodorizing control.
When the intake air temperature or temperature near the ceiling, reaches the set temperature, the Fan Mode (Air circulation mode) starts at low airflow volume. The fan stops when the temperature drops to 3.6°F below the set temperature.

Installation

Please read “SAFETY PRECAUTIONS” listed in service manuals very carefully before installation.
All electrical work must be done by a licensed electrician.
Be sure to use the correct rating of the power plug and main circuit for the model to be installed.

Determine which unit is appropriate for your needs
First calculate the amount of cooling load needed for your room. Then, choose the appropriate Panasonic split air conditioner model for cooling comfort.

A comfortable Room may have temperatures of **69.8 - 78.8 degrees Fahrenhei**t with 20 to 50% relative humidity.
The heat removal load of an AC should be calculated precisely for every room because a lower capacity AC will not cool the room, and a higher capacity AC will make the room humid.
Insulation properties of walls, roof and floor Direction of walls (west-facing walls get hotter than south-facing walls) Number of people in the room Number of windows, type of glass Electric appliances such as lights, fans, TV, refrigerators or Computers

There are different ways to determine which split air conditioner is suitable for your needs.

Use the following chart to find the appropriate size air conditioner to use:
Area to be cooled / capacity (Btu/hr)
100 to 150 square feet = 5,000
150 to 250 square feet = 6,000
250 to 300 square feet = 7,000
300 to 350 square feet = 8,000
350 to 400 square feet = 9,000
400 to 450 square feet = 10,000
450 to 550 square feet = 12,000
550 to 700 square feet = 14,000
700 to 1000 square feet = 18,000
If the room is heavily shaded, reduce needed capacity by 10%.
If the room receives a lot of direct sun, increase needed capacity by 10%.
Add 600 Btu/hr for each person in the room if there are more than two people.
If the unit is for a kitchen, increase the capacity by 4,000 to 6,000 Btu/hr

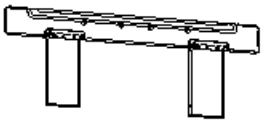
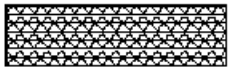
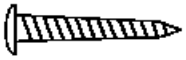
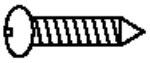
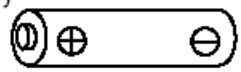
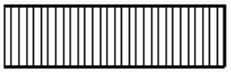
Estimation of Air Conditioner's Horse Power
You can also find a horsepower calculation table on the Internet.
http://macg.panasonic.com.my/Service/Domestic/General/Calculate/index.asp

Estimating Cooling Load

INSTRUCTIONS a) Calculate value of each step and enter the result into the value column. b) Multiply value (V) by factor (F) that corresponds with the typical temperature of your location. c) Enter the result in the last column.	Value (V)	Factor (F) Outside Temperature °F		V x F (BTU/h)
		Up to 95	Over 95	
1. Floor area – WIDTH x LENGTH (ft.)	800	2.5	6.0	4800
2. Room volume – WIDTH x LENGTH x HEIGHT (ft.)	6400	0.6	0.6	3840
3. Windows **exposed** to sun – Sum of WIDTH x LENGTH (ft.)	32	72.0	81.5	2608
4. Windows **not exposed** to sun – Sum of WIDTH x LENGTH (ft.)	32	13.0	23.0	736
5. Wall **exposed** to sun – WIDTH x HEIGHT (ft.)	320	12.0	17.5	5600
6. Other **exterior** walls (if any) – Sum of WIDTH x HEIGHT (ft.)	160	7.5	15.0	2400
7. **Interior** walls – Sum of WIDTH x HEIGHT (ft.)	480	3.5	7.0	3360
8. Ceiling (living space above) – WIDTH x LENGTH (ft.) – Enter 0 if not applicable		2.5	6.0	
9. Ceiling (uninsulated attic above) – WIDTH x LENGTH (ft.) – Enter 0 if not applicable		9.0	13.0	
10. Ceiling (insulated attic above) – WIDTH x LENGTH (ft.) – Enter 0 if not applicable	800	3.0	4.0	3200
11. Number of people that **typically occupy** the room	7	600		4200
10. Total wattage of lights and electrical equipment in the room (W)	4300	3		12900
Total Estimated Cooling Load (add values in the right column)				43,644

Figure 11

Installation parts provided

No.	Accessories part	Qty.	No.	Accessories part	Qty.
1	Installation plate 	1	6	Solar refreshing deodorizing filter 	1
2	Installation plate fixing screw 	6	7	Remote control holder 	1
3	Remote control 	1	8	Remote control holder fixing screw 	2
4	Battery 	2	9	Drain elbow (A7BK, A9BK, A12BK) 	1
5	Air purifying filter 	1			

Tips on How to Select the Best location to install the Indoor Unit

- Make sure that the wall where the Split Air conditioner will be installed is strong and solid enough to prevent vibration during operation.
- There should be no heat source or steam near the unit.
- There should be no obstacles blocking the air circulation.
- Find a place where air circulation in the room is good, where drainage can be easily done.
- Take noise prevention into consideration.
- Do not install the unit near the doorway.
- Install at specified distance away from walls, ceiling, fence or other obstacles.
- Consider using anchor bolts for concrete wall installation

Tool & Test equipment for Split Air conditioner

Tools	Installation	Servicing	Remarks
Flare Tool	*	*	
Swaging Tool	*	*	
Piper cutter	*	*	
Vacuum pump	*	*	
Charging cylinder	*	*	
Manifold gauge with hoses	*	*	
Reamer	*	*	
Torque wrench 1/4 inch	*	*	
Torque wrench 3/8 inch	*	*	
Torque wrench 1/2 inch	*	*	
Torque wrench 5/8 inch	*	*	
Hexagonal wrench 4mm	*	*	
Measuring tape	*	*	
Level	*	*	
Electric drill	*		
Drill core	*		
Drill bit	*		
Adjustable spanner	*	*	
Driver set	*	*	
Knife	*	*	
Pliers	*	*	
Long nose pliers	*	*	
Box spanner set		*	
Pipe bender 1/4 inch	*		
Pipe bender 3/8 inch	*		
Pipe bender 1/2 inch	*		
Pipe bender 5/ 8 inch	*		
Gas leakage detector	*		
Refrigerant R22	*	*	
Refrigerant reclaiming equipment	*	*	
Thermometer	*	*	
Insulation tester	*	*	
Multi-meter	*	*	
Clamp meter	*	*	
Brazing equipment		*	
Soldering iron		*	
Solder		*	
Solder sucker	*	*	
Torch (Flashlight)	*	*	
Lamp	*	*	
Ladder	*	*	
Hack saw	*	*	
Fin straighter		*	
Pressurized water washing machine		*	
Oscilloscope		*	

Plate Installation

There are 2 types of installation plates:

Model Number	Measurement	Plate Part Number
CS-C9CKPG, CS-A9CKPG, CS-C12CKPG, CS-A12CKPG	26.28 inch X 10 inch	CWH36K1006
CS-C18BKP, CS-A18CKPG, CS-C24BKP, CS-A24 CKPG CS-C28CKK	34.60 inch X 10 inch	CWH36K1007

Mount the installation plate on the wall with at list 5 screws.

- Make sure the plate is leveled horizontally.
- Recommended installation height for indoor unit shall be at least 7.5ft (2.3 m).

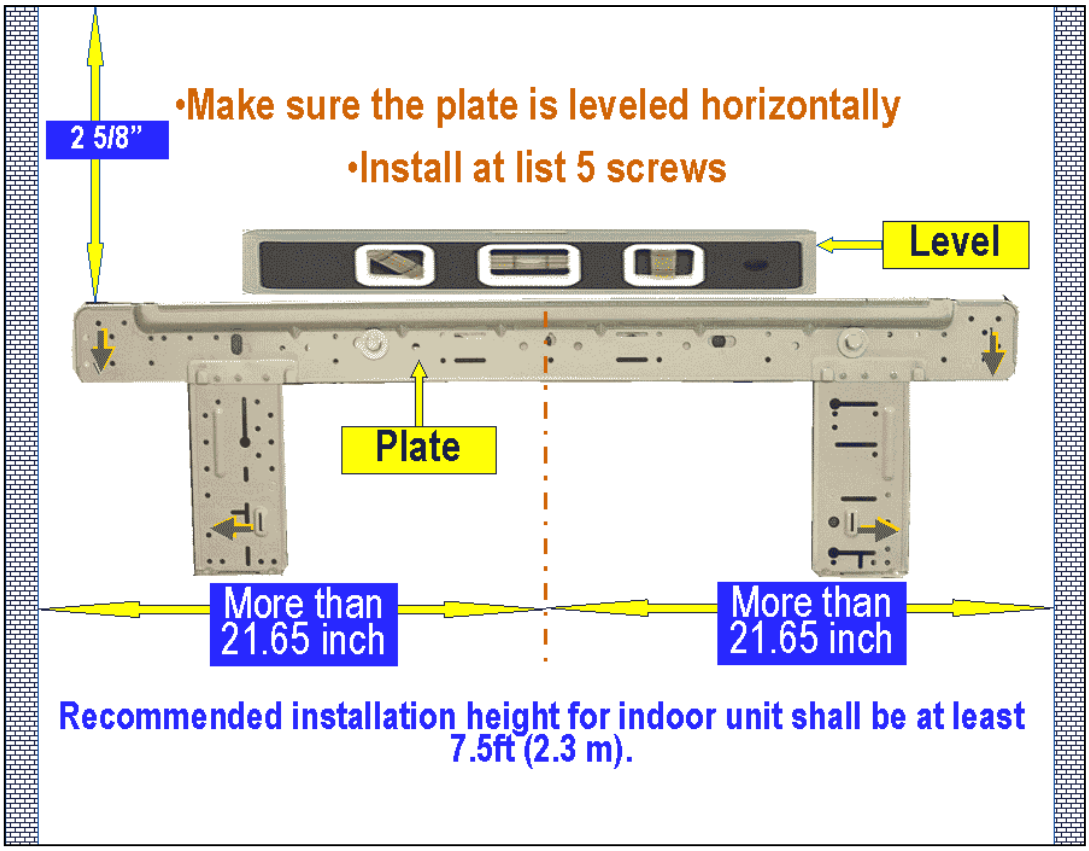


Figure 12

Indoor Unit installation

You can choose between 6 different types of piping set up; 4 with the piping running below or along side the indoor unit and 2 rear the piping installation.

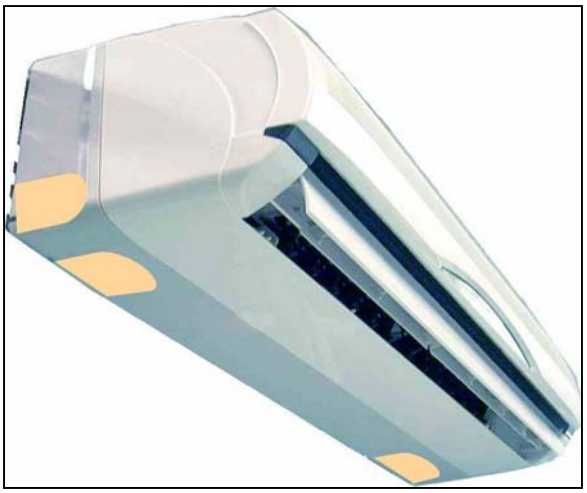
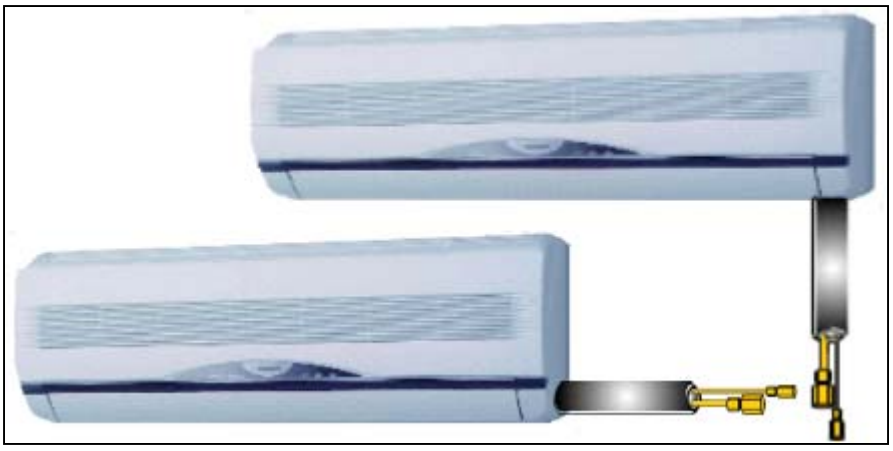
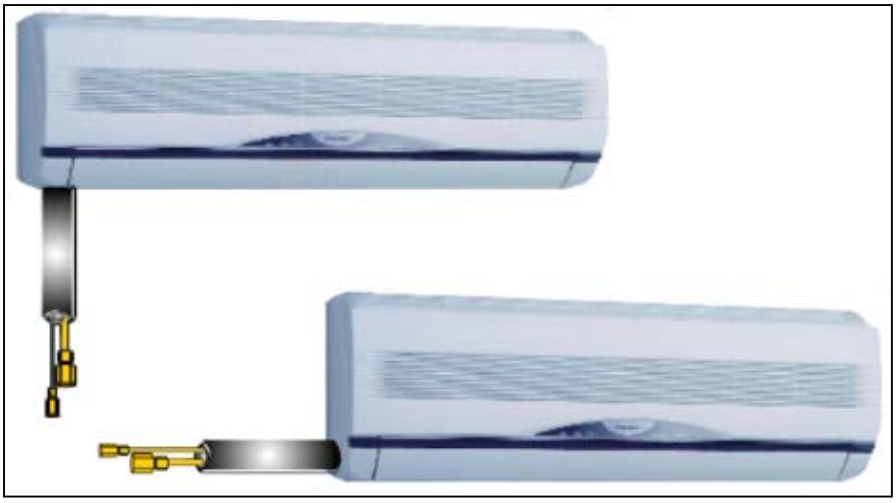


Figure 13

Left/Right piping and bottom piping

For side piping installation, adjust the piping slightly downward in order to prevent backflow from the drain hose. The drain hose and drain cap are originally set up for right side installation. For left side installation, switch the drain hose and the drain cap to the other side



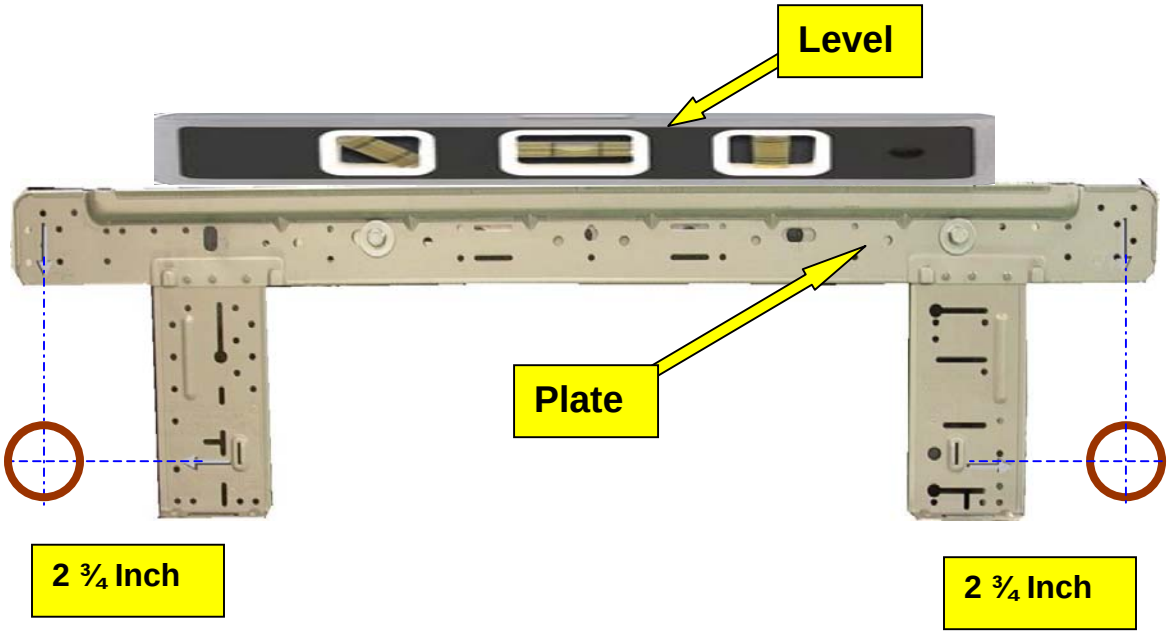


For right rear piping

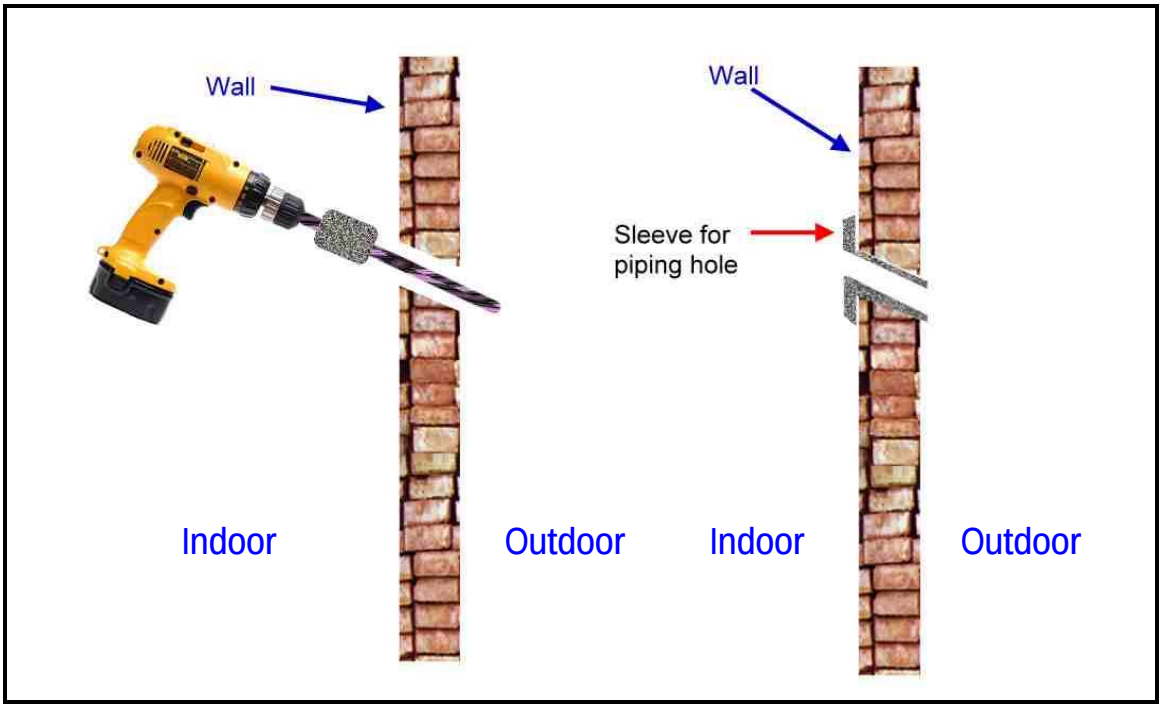
- Pull out the outdoor piping
- Install the indoor unit
- Secure the indoor unit
- Insert the connecting wire.

For left rear piping

Drill the piping hole at either the right or the left



The hole should be slightly slanted towards the outer side



1. Insert the piping sleeve to the hole.
2. Fix the bushing to the sleeve.
3. Cut the sleeve until it extrudes about 0.59 inch from the wall.
4. Finish by sealing the sleeve with putty or caulking compound at the final stage.

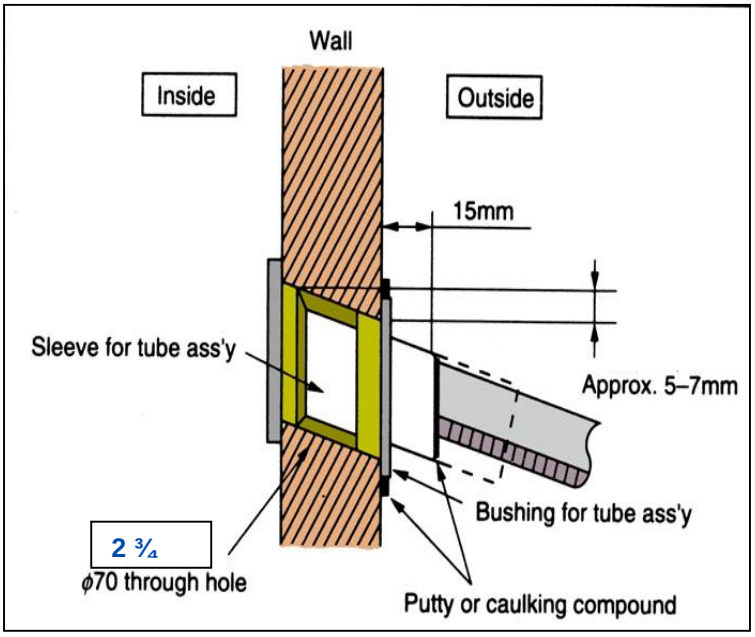
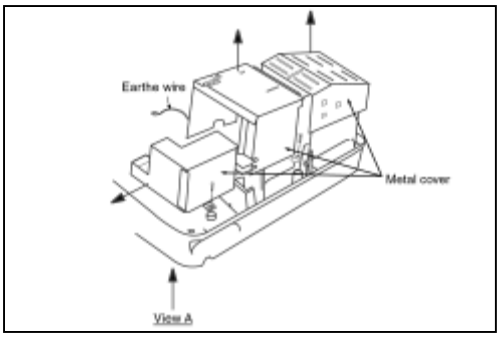
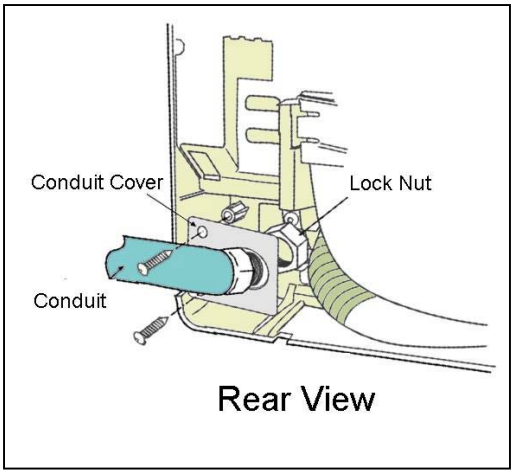


Figure 14

Indoor Unit Electrical Wiring

1. Remove the control board metal cover.

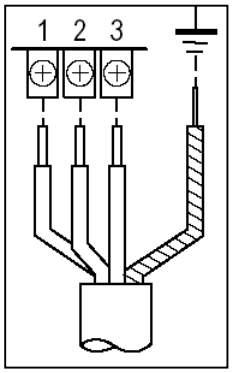




2. Unscrew the conduit cover & fix the conduit connector to the conduit cover with a lock nut, then secure it against chassis.

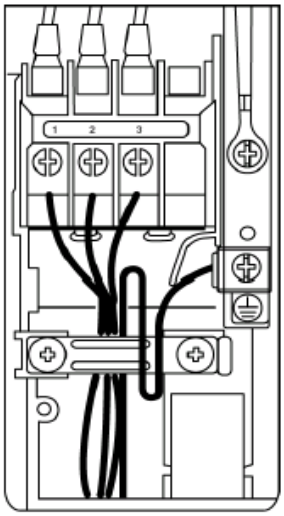
3. Connecting between indoor unit and outdoor unit should be UL listed or CSA approved.

   - 4 × AWG16 wire for models with cooling action only.
   - 6 × AWG16 wire for models with Heat Pump.
   - Ensure the color of wires of outdoor unit and the terminal numbers are the same as the indoor's respectively.
   - Earth lead wire should be longer than the other lead wires in case the cord slips out from the anchorage.
   - Secure the wire onto the control board with the holder (clamper).

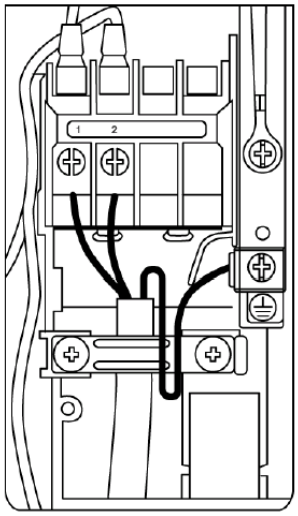


4. Complete the wiring connection and re-install the metal cover.

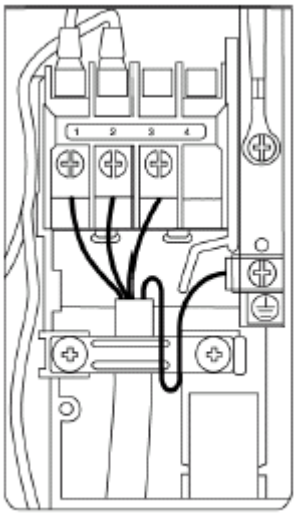
UL listed or CSA approved 4 × AWG16 wire.



C9CKPG, C12CKPG

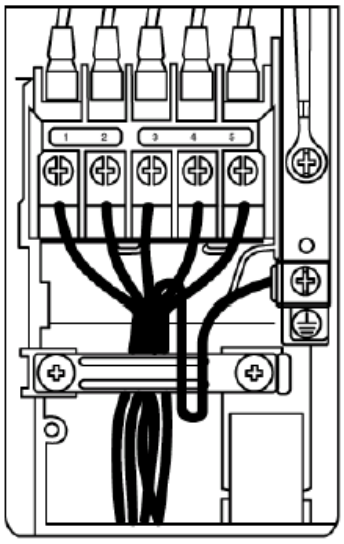


C18BKP, C24BKP

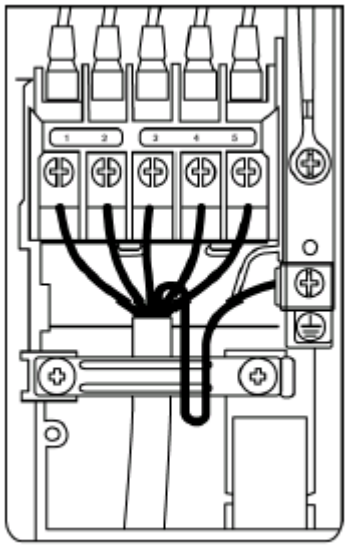


C28CK

UL listed or CSA approved 6 × AWG16 wire



A9CKPG, A12CKPG



A18CKPG

A24CKPG

Figure 15

Installation of Purifying Filters

1. Open the front panel.
2. Remove the air filters.
3. Put air purifying filters (left) and solar refreshing deodorizing filter (right) into place as shown in illustration below.

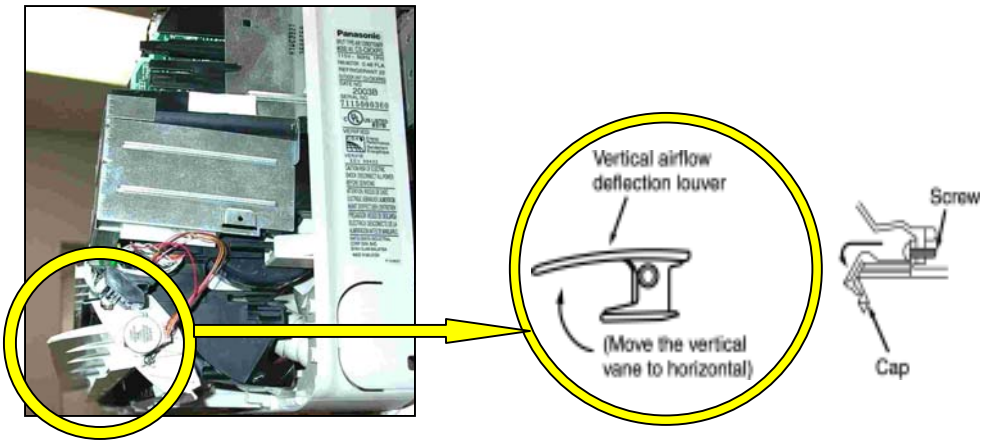
Figure 16

How to Remove the Front Grille

Please follow the steps below to take out front grille if necessary such as when servicing.

1. Set the vertical airflow direction louver to the horizontal position.
2. Slide down the three caps on the front grille as shown in the illustration below, and then remove the three mounting screws.
3. Pull the lower section of the front grille towards you to remove the front grille.

When reinstalling the front grille, first set the vertical airflow direction louver to the horizontal position and then carry out above steps 2 - 3 in the reverse order.

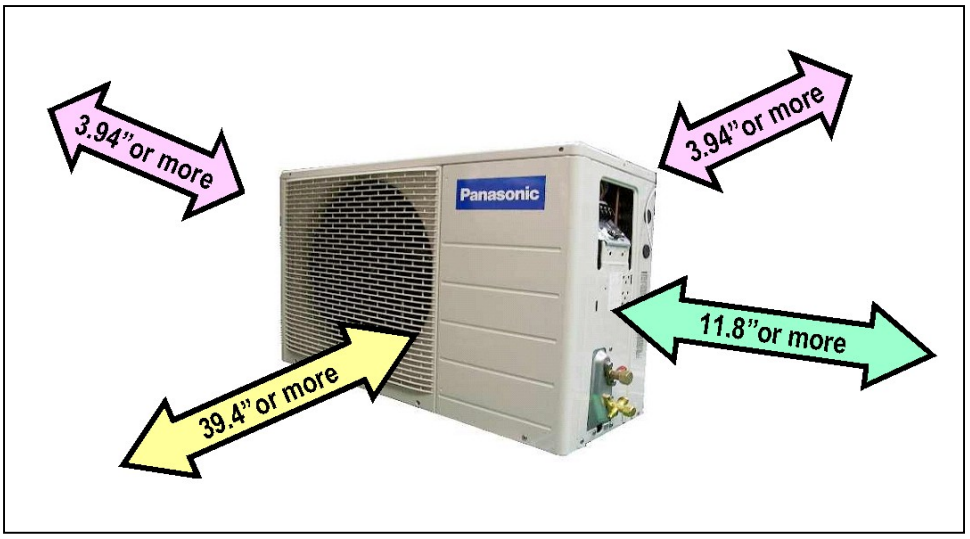


Indoor Unit Side View

Outdoor Unit Installation

Select The Best Location

- If an awning is built over the unit to prevent direct sunlight or rain, be careful that heat radiation from the condenser is not obstructed.
- There should be no animal or plant, which could be affected by hot air discharged.
- Stay within specified distance from wall, ceiling, fence or other obstacles.



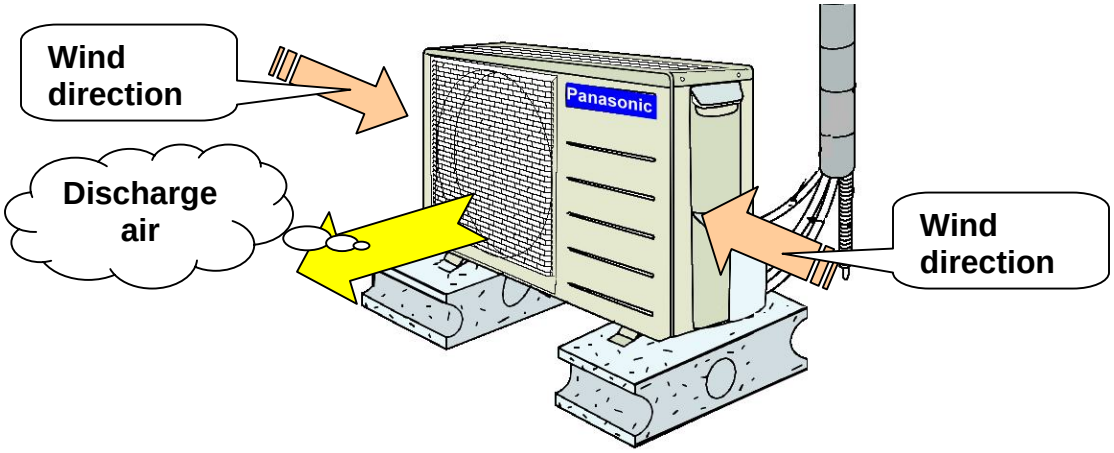
- Do not place any obstacles, which may cause a short circuit of the discharged air.
- If piping length is over 24.6ft (7.5m), additional refrigerant should be added

Model	Piping Size		Common Length (Feet)	Max Elevation (Feet)	Max. Piping Length (Feet)	Additional Refrigerant
	Gas	Liquid				
CS-A9CKPG	3/8	1/4	24.6	16.4	32.8	0.11 oz/ft (10 g/m)
CS-A12CKPG	1/2	1/4	24.6	16.4	49.2	0.11 oz/ft (10 g/m)
CS-C18BKP	1/2	1/4	24.6	65.6	82	0.22 oz/ft (20 g/m)
CS-C24BKP	5/8	1/4	24.6	65.6	82	0.33 oz/ft (30g/m)
CS-C28CKU	3/4	3/8	24.6	65.6	98.4	0.33 oz/ft (30g/m)

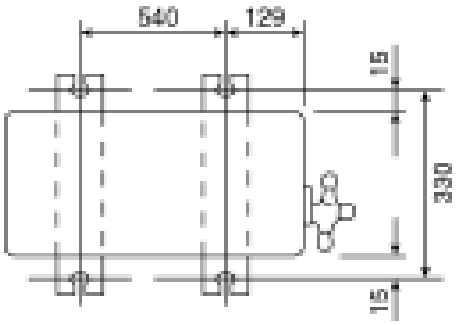
- Select a location from which noise emitted by the unit will not inconvenience neighbors.
- Select a location permitting easy wiring and pipe access to the power source and indoor unit.
- Select a level location that can bear the weight and vibration of the unit.

- Avoid locations where the unit can be covered by snow. In areas where heavy snowfall is anticipated, special precautions such as raising the installation location or installing a hood on the air intake must be taken to prevent the snow from blocking the air intake or blowing directly against it. This can reduce the airflow and a malfunction may result.
- Windy location installation
  When installing the outdoor unit on a rooftop or other location unprotected from the wind, situate the air outlet of the unit so that it is not directly exposed to strong winds.
  Strong wind entering the air outlet may impede the normal airflow and a malfunction may result.

  Position the unit so that the discharged air blows perpendicularly to the seasonal wind direction, if possible.



After selecting the best location, start installation.
Fix the unit on concrete or rigid frame firmly and horizontally by bolt nut. (ø10 mm).
When installing at roof, please consider strong wind and earthquake. Please fasten the installation stand firmly with bolt or nails.



Connecting The Piping To Indoor Unit
Flare should be done after inserting flare nut (locate at joint portion of tube assembly) onto the copper pipe.

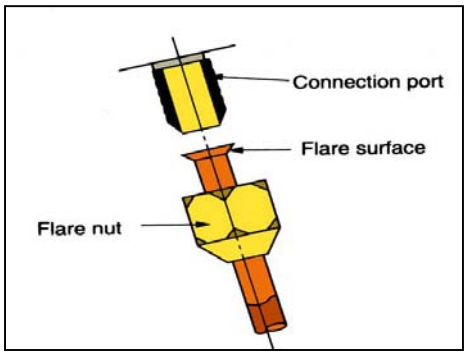
1. Pipes must be connected starting from the indoor unit.

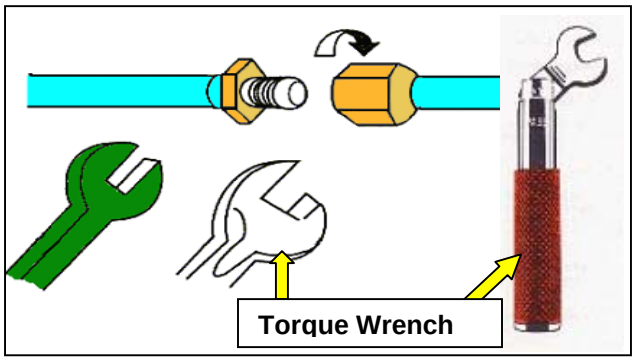
2. Align the center of piping and sufficiently tighten the flare nut with fingers.

   Tip: Apply a thin layer of refrigerant oil to the pipe and joint seating surface before tightening flare nut.

3. Further tighten the flare nut with torque wrench in specified torque as stated in the table.

Note: Use two wrenches to tighten piping connections.





Capacity	Pipe Diameter	Torque			Torque Wrench Part Number
All	All models ¼ - Liquid. (Except 28,000 BTU)	18 Nm	1.8kgm	13.2lbf.ft	EA723B
28,000 BTU	3/8 Liquid	42 Nm	4.2kgm	31lbf.ft	EA723B
9,000 BTU	3/8 - Gas	42 Nm	4.2kgm	31lbf.ft	EA723B
12,000 BTU	½ - Gas	55 Nm	5.5kgm	40.5lbf.ft	EA723L
18,000 BTU	½ - Gas	55 Nm	5.5kgm	40.5lbf.ft	EA723L
24,000 BTU	5/8 - Gas	65 Nm	6.5kgm	47.9lbf.ft	EA723O
28,000 BTU	¾ - Gas	100 Nm	10.2kgm	73.7lbf.ft	-

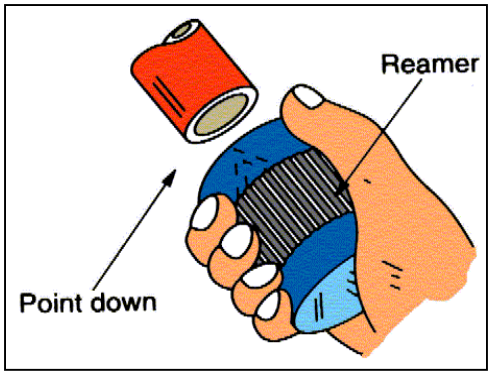
Nm = Newton meter
kgm = Kilogram-force meter
lbf.ft = Foot pound-force

Connecting The Piping To Outdoor Unit

1. Decide the pipe length and then cut it by using a pipe cutter.

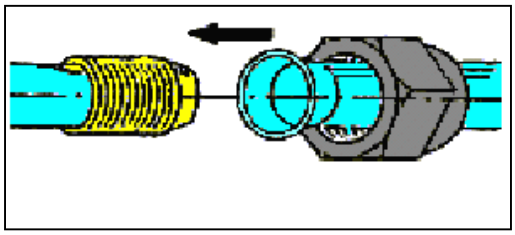
2. Turn the piping end down to avoid the metal powder entering the pipe.

3. Remove burrs from the cut edge using a reamer. If burrs are not removed, gas leakage will occur.

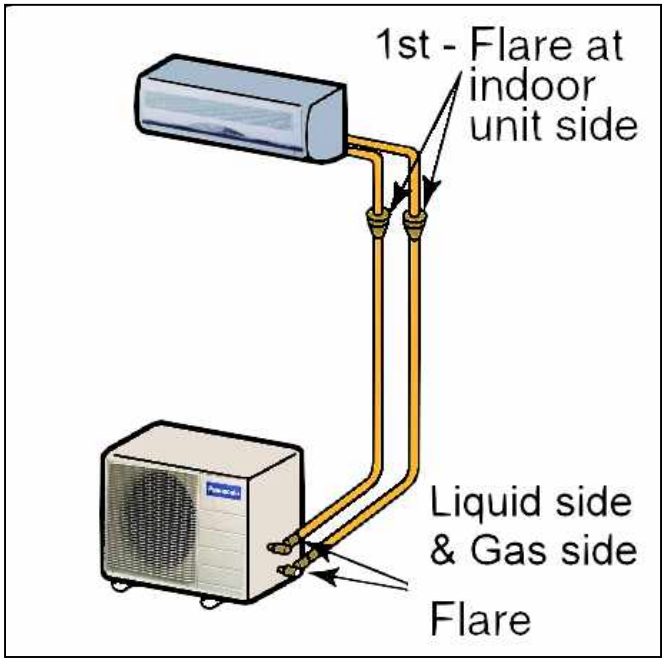


4. Flare should be done after inserting the flare nut (located at valve) onto the copper pipe.

5. Align center of piping with the valves and then tighten with torque wrench to the specified torque.

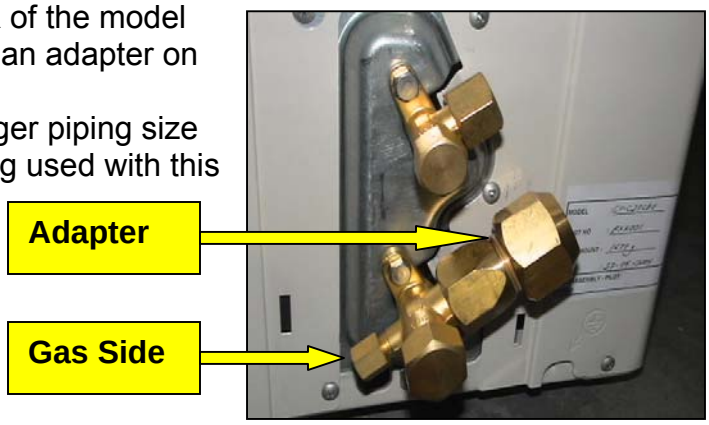


Tip: Apply a thin layer of refrigerant oil to the pipe and joint seating surface before tightening the flare nut.



CS-C28CKU

In order to increase the SEER of the model CS-C28CKU, we have added an adapter on the gas side 3-way valve.
This will allow the use of a larger piping size of ¾", instead of the 5/8" piping used with this valve.



Connecting The Gas Side Piping to the Outdoor Unit (CS-C28CKU)

When connecting the gas side pipe to the outdoor unit, refer to the following table for the tightening torque. If the nuts are over tightened, it may cause the flares to break or leak.

Flare Nut	Fastening Torque
A	47.9lbf.ft (6.5kgm)
B	73.7lbf.ft (10.2kgm)

When tightening the flare nut B with the torque wrench, ensure that the flare nut A is being locked with a spanner.

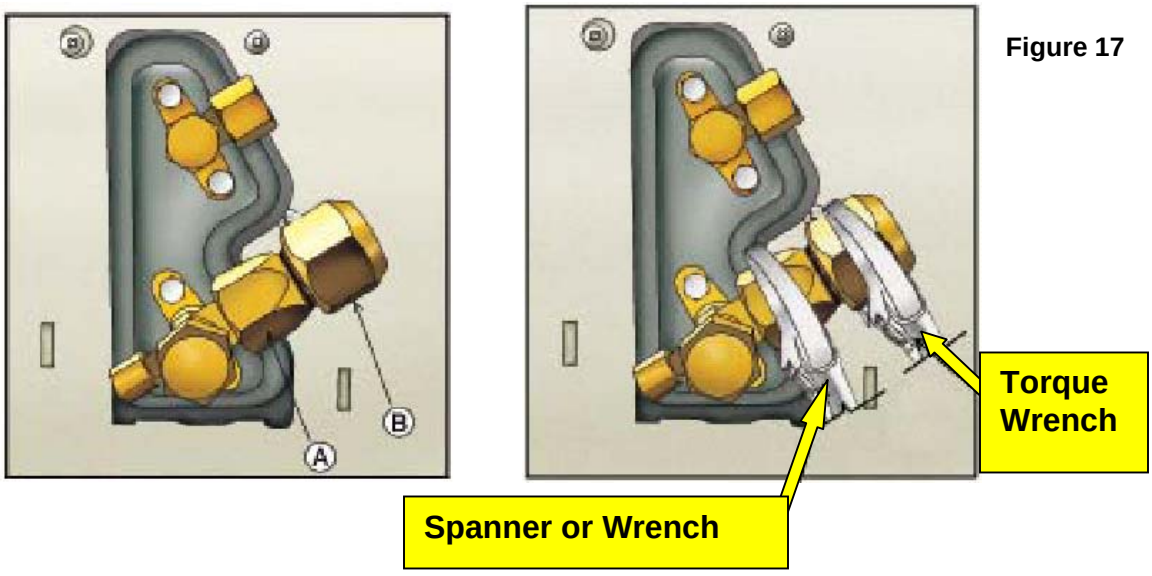


Figure 17

Equipment Evacuation (CS-A9/CS-C9CKPG, CS-A12/CS-C12CKPG, CS-A24CKPG and CS-C28CKU)

When installing a split air conditioner, be sure to evacuate the air inside the indoor unit and pipes in the following procedure.

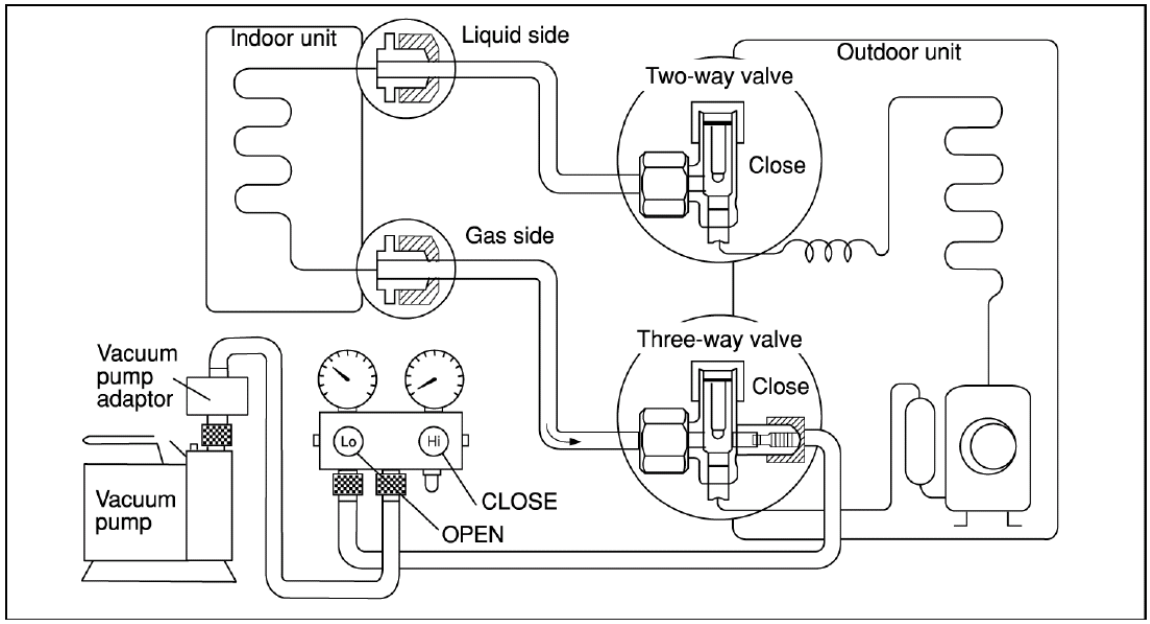


Figure 18

1. Connect the charging hose with a pushpin to the Low and High side of a charging set and the service port of the 3-way valve.
   Be sure to connect the end of the charging hose with the pushpin to the service port.
2. Connect the center hose of the charging set to a vacuum pump.
3. Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 cm Hg (0 M Pa) to **29.92 In Hg** (-76 cm Hg, -0.1 M Pa). Then evacuate the air approximately ten minutes.
4. Close the Low side valve of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.
   Note: be sure to follow this procedure in order to avoid refrigerant gas leakage.
5. Disconnect the charging hose from the vacuum pump and from the service port of the 3-way valve.
6. Tighten the service port caps of the 3-way valve at a torque of 18 Nm with a torque wrench.
7. Remove the valve caps of both of the 2-way valve and 3-way valve. Position both of the valves to “OPEN” using a hexagonal wrench (4 mm).
8. Mount valve caps onto the 2-way valve and the 3-way valve.
   Be sure to check for gas leakage.

Note: Evacuation speed depends on the equipment size, the ambient temperature, the suction line size and quantity of moisture on the lines.

Equipment Evacuation (CS-A18CKPG, CS-C18BKP, CS-C24BKP)
When installing an air conditioner, be sure to evacuate the air inside the indoor unit and pipes in the following procedure.

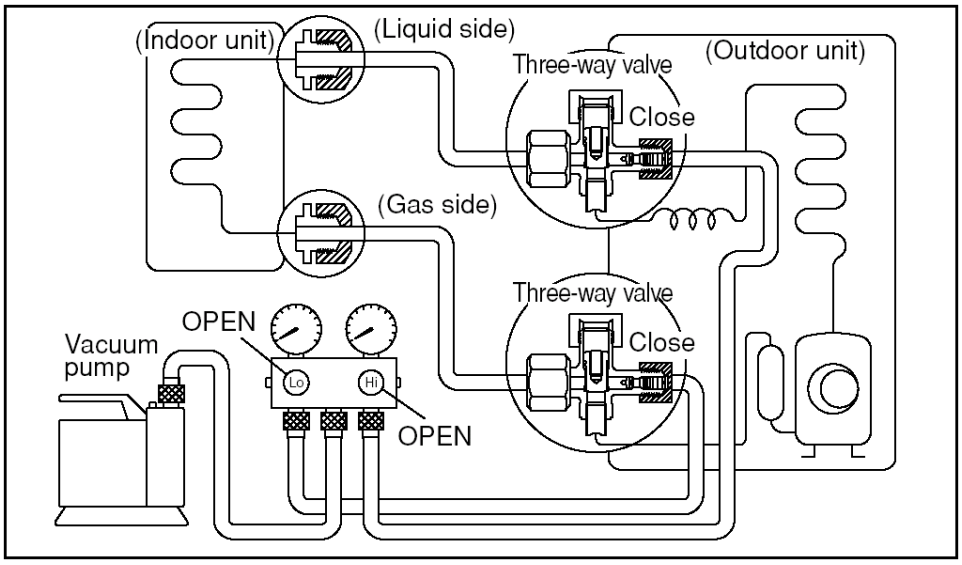
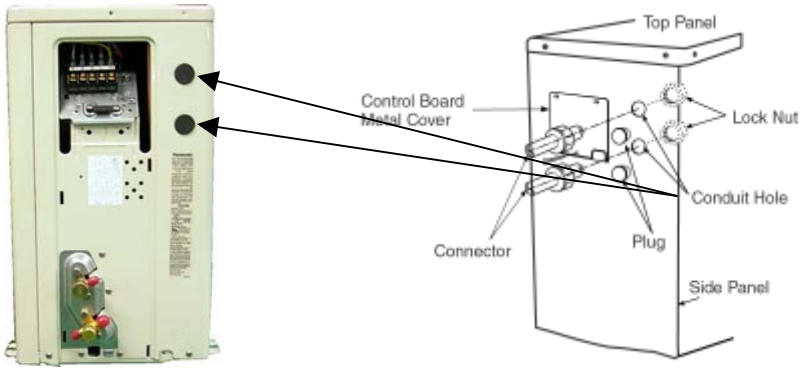


Figure 19

1. Connect the charging hose with a pushpin to the Low and High side of a charging set and the service port of the 3-way valve.
   Be sure to connect the end of the charging hose with the pushpin to the service port.
2. Connect the center hose of the charging set to a vacuum pump.
3. Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 cm Hg (0 M Pa) to **29.92 In Hg** (-76 cm Hg, -0.1 M Pa). Then evacuate the air approximately ten minutes.
4. Close the valve of both the Low and High sides of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.
   Note: be sure to follow this procedure in order to avoid refrigerant gas leakage.
5. Disconnect the charging hose from the vacuum pump and from the service port of the 3-way valve.
6. Tighten the service port caps of the 3-way valve at a torque of 18 Nm with a torque wrench.
7. Remove the valve caps of both of the 2-way valve and 3-way valve. Position both of the valves to “OPEN” using a hexagonal wrench (4 mm).
8. Mount valve caps onto the 2-way valve and the 3-way valve.
   Be sure to check for gas leakage.

Note: Evacuation speed depends on the equipment size, the ambient temperature, the suction line size and quantity of moisture on the lines.

Outdoor Unit Electrical Wiring



1. Remove Top Panel.
2. Remove Control Board Cover.
3. Remove rubber plugs.
4. Secure the conduit connector to the conduit hole with lock nut.
5. Secure the wire onto the control board with the holder (clamper).
6. Wire connection to the power supply (115/230V 60 Hz) through circuit breaker.

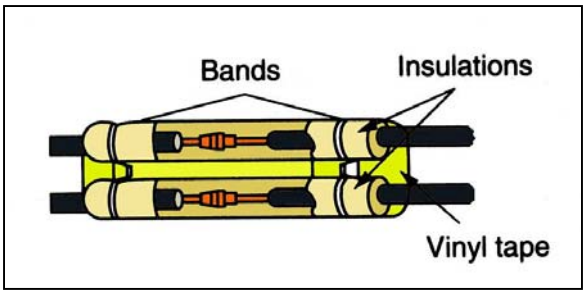
Unit Size	Voltage	Circuit Breaker Capacity
9,000 BTU 12,000 BTU	115 V.	15 Amp.
18,000 BTU 24,000 BTU	230 V.	20 Amp.

7. Connect the UL listed or CSA approved wires (AWG12) to the terminal board, and connect the other end of the wires to circuit breaker.

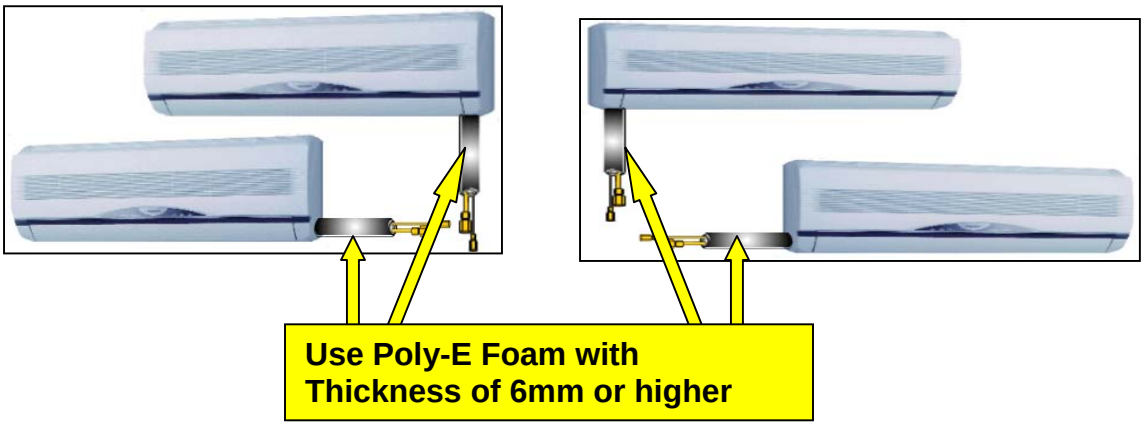
8. Re-install the control board cover and the top panel.

Pipe Insulation

Please carry out insulation at pipe connection portion as mentioned in Indoor/Outdoor Unit Installation Diagram. Please wrap the insulated piping end to prevent water from going inside the piping.



For side and bottom piping installation where it's necessary to run the drain hose and the connecting pipes inside the room (where dew may form), it is recommended to increase the thickness of the insulation. Use POLY-E FOAM with thickness of 6mm or above.



Disposal of Outdoor Unit Drain Water

When a drain elbow is attached to the bottom plate of the outdoor unit, the unit should be placed on a stand taller than 3 cm (1.18 in).

If the unit is used in an area where temperature falls below 0°C (32°F) for 2 or 3 days in succession, it is recommended not to use a drain elbow, for the drain water freezes and the fan will not rotate.

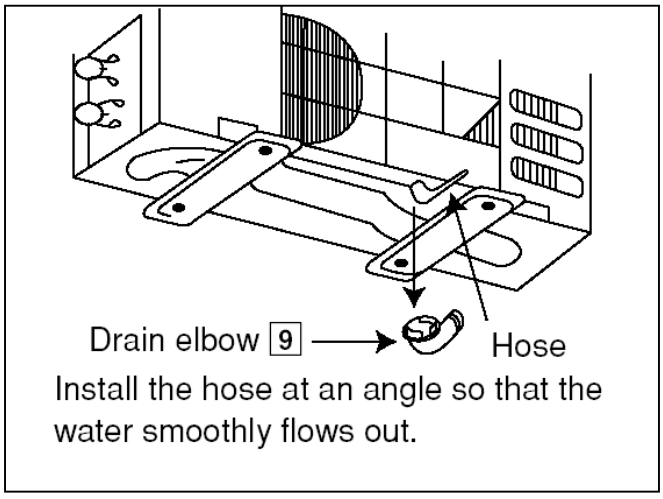


Figure 20

Drainage Check

1. Open front panel and remove air filters. (Drainage checking can be carried out without removing the front grille.)
2. Pour water into the drain tray-Styrofoam and check that it drains correctly.

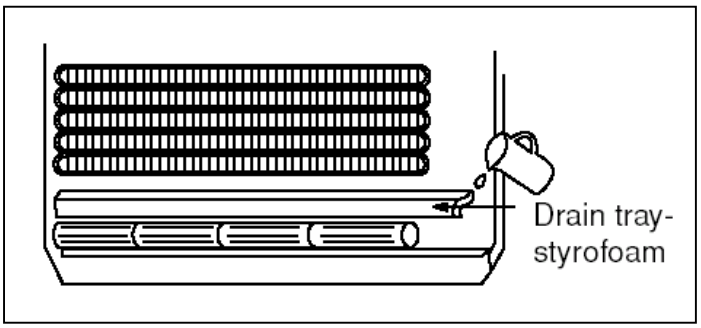


Figure 21

Performance Evaluation

1. Operate the unit at cooling operation mode for fifteen minutes or more.
2. Measure the temperature of the intake and discharge air.
3. Ensure the difference between the intake temperature and the discharge is more than 14.4°F.

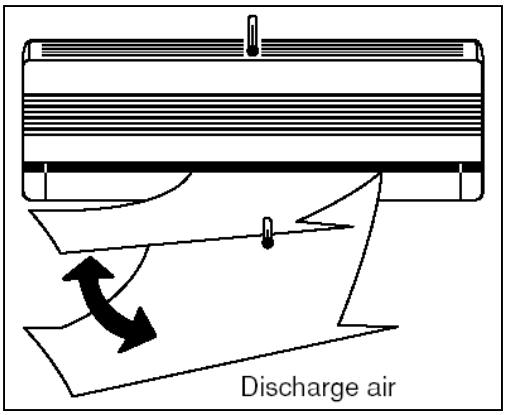


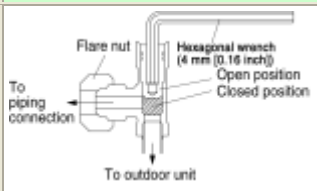
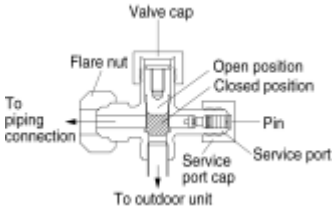
Figure 22

Check Items

- Is there any gas leakage at flare nut connections?
- Has the heat insulation been carried out at flare nut connection?
- Is the connecting wire being fixed to terminal board firmly?
- Is the connecting wire being clamped firmly?
- Is the drainage OK?
  (Refer to “Check the drainage” section)
- Is the earth wire connection properly done?
- Is the indoor unit properly hooked to the installation plate?
- Is the power supply voltage complied with rated value?
- Is there any abnormal sound?
- Is the cooling operation normal?
- Is the thermostat operation normal?

- Is the remote control’s LCD operation normal?
- Is the air-purifying filter installed?

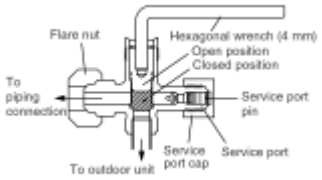
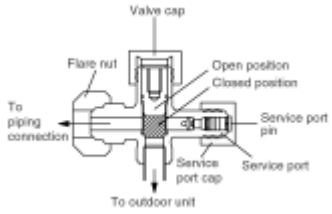
Use this table for models (CS-A9/CS-C9CKPG, CS-A12/CS-C12CKPG, CS-A24CKPG and CS-C28CKU)

	2-way Valve (Liquid Side)	3-way Valve (Gas Side)	
			
Works	Shaft Position	Shaft Position	Service Port
Shipping	Close	Close	Close
	(With valve cap)	(With valve cap)	(With cap)
Evacuation	Close	Close	Open
(Installation and	(Counter-Clockwise)	(Clockwise)	(Push-pin)
Re-installation)			
Operation	Open	Open	Close
	(With valve cap)	(With valve cap)	(With cap)
Pumping down	Close	Open	Open
(Transferring)	(Clockwise)	(Counter-Clockwise)	(Connected manifold gauge)
Evacuation	Open	Open	Open
(Servicing)			With vacuum pump
Gas charging	Open	Open	Open
(Servicing)			(With charging cylinder)
Pressure check			Open
(Servicing)	Open	Open	(Connected manifold

			gauge)
Gas releasing			Open
(Servicing)	Open	Open	(Connected manifold gauge)

Figure 23

Use this table for models **CS- CS-A18CKPG, CS-C18BKP and CS-C24BKP**

	3-way Valve (Liquid Side)		3-way Valve (Gas Side)	
				
Works	Shaft Position	Service Port	Shaft Position	Service Port
Shipping	Closed	Closed	Closed	Close
	(With valve cap)	(With cap)	(With valve cap)	(With cap)
(Installation and	Closed	Open	Closed	Open
Re-installation)	(Clockwise)	(Connected manifold	(Clockwise)	(Push-pin)
		gauge w/charging cylinder)		
Operation	Open	Closed	Open	Closed
	(With valve cap)	(With cap)	(With valve cap)	(With cap)
Pumping down	Closed	Closed	Open	Open
(Transferring)	(Clockwise)	(With cap)	(Counter-Clockwise)	(Connected manifold gauge)
Evacuation	Open	Open	Open	Open
(Servicing)	(Counter-clockwise)	(Connected manifold gauge)	(Counter-clockwise)	(Connected manifold gauge)

Gas charging	Open	Open	Open	Open
(Servicing)	(Counter-clockwise)	(Connected manifold gauge)	(Counter-clockwise)	(Connected manifold gauge)
Pressure check	Open	Closed	Open	Open
(Servicing)	(Counter-clockwise)	(With cap)	(Counter-clockwise)	(Connected manifold gauge)
Gas releasing	Open	Open	Open	Open
(Servicing)	(Counter-clockwise)	(Connected manifold gauge)	(Counter-clockwise)	(Connected manifold gauge)

Pumping down (CS-A9/CS-C9CKPG, CS-A12/CS-C12CKPG, CS-A24CKPG and CS-C28CKU)

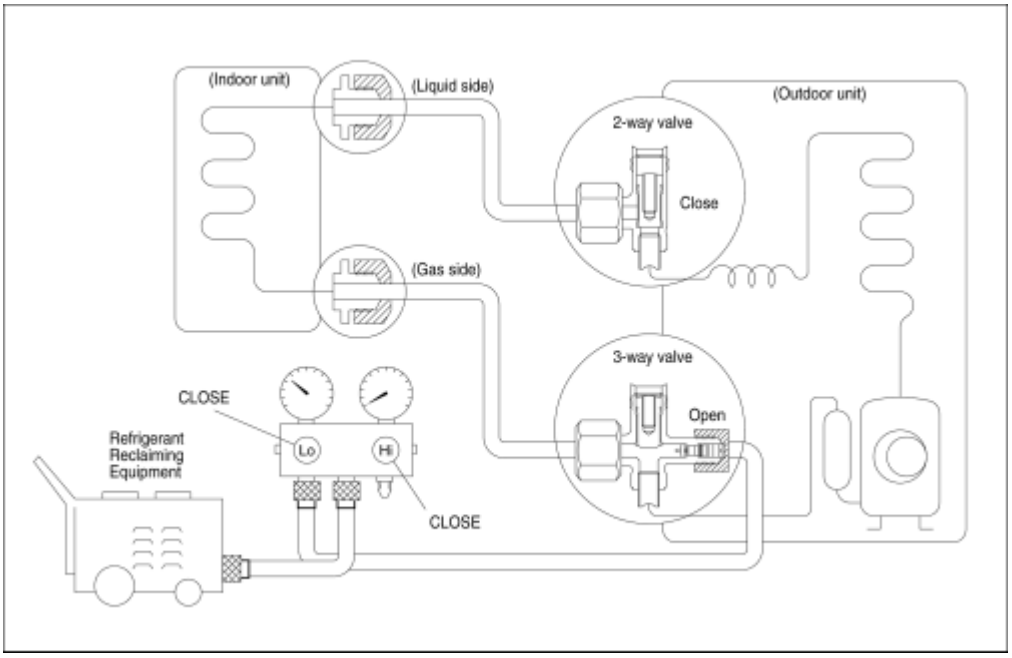


Figure 24

Procedure:

1. Confirm that both the 2-way and 3-way valves are set to the opened position.
   - Remove the valve stem caps and confirm that the valve stems are in the opened position.
   - Be sure to use a hexagonal wrench to operate the valve stems.
2. Operate the unit for 10 to 15 minutes.
3. Stop operation and wait for 3 minutes, then connect the charge set to the service port of the 3-way valve.
4. Connect the charge hose with the push - pin to the Gas service port.
5. Open the low-pressure valve on the charge set slightly to purge air from the charge hose.
6. Set the 2-way valve to the closed position.
7. Operate the air conditioner at the cooling cycle and stop it when the gauge indicates 0 M Pa (0 kg/cm2G).
   If the unit cannot be operated at the cooling condition (weather is rather cool), simply press the pumping down button so that the unit can be operated.

8. Immediately set the 3-way valve to the closed position. Do this quickly so that the gauge ends up indicating 0.1 M Pa (1 kg/cm2G) to 0.3 M Pa (3 kg/cm2G).

9. Use refrigerant reclaiming equipment to collect refrigerant from indoor unit and pipes.
10. Disconnect the charge set, and mount the 2-way and 3-way valve's stem caps and the service port caps.
    - Use a torque wrench to tighten the service port cap to a torque of 18 Nm.
    - Be sure to check for gas leakage.

11. Disconnect pipes from indoor unit and outdoor unit.

Pumping down (CS-A18CKPG, CS-C18BKP, CS-C24BKP)

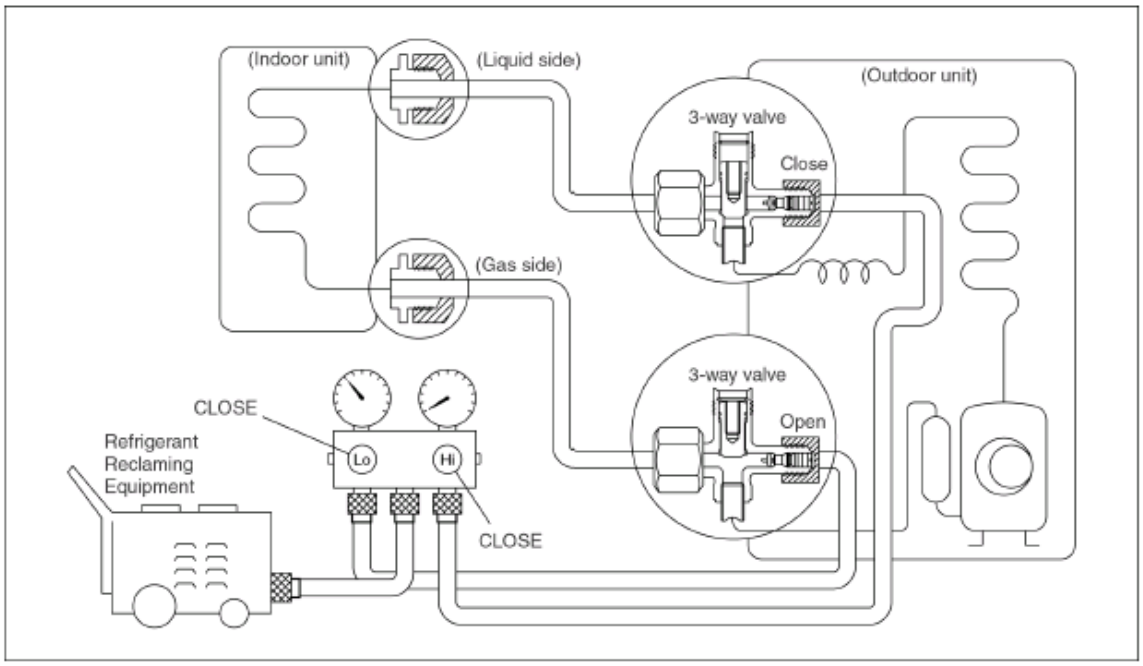


Figure 25

Procedure:

1. Confirm that both the 3-way valves are set to the open position.
2. Remove the valve caps and confirm that the valve caps are in the raised position.
3. Be sure to use a hexagonal wrench to operate the valve stems.
4. Operate the unit for 10 to 15 minutes.
5. Stop operation and wait for 3 minutes, then connect the manifold gauge to the service port of the 3-way valve as shown above.
6. Connect the manifold gauge to the gas side service port.
7. Open the low pressure side valve of manifold gauge slightly to purge air from the charge hose.
8. Set the liquid side (High side) 3-way valve to the close position.

9. Operate the air conditioner at the cooling cycle and stop it when the gauge indicates 0.1 M Pa.
10.
11. If the unit cannot be operated at the cooling (weather is rather cool), press the Pump Down switch on the Indoor unit so that the unit can be operated.
12. Immediately set the gas side (Low side) 3-way valve to the close position. Note: Do this quickly so that the gauge ends up indicating 0.1 0.3 M Pa.
13. Disconnect the manifold gauge, and mount both the 3-way valve's caps and the service port caps.
14. Use torque wrench to tighten the service port nut to a torque of 18 Nm.
15. Be sure to check for gas leakage.

Evacuation of Re-installation (CS-A9/CS-C9CKPG, CS-A12/CS-C12CKPG, CS-A24CKPG and CS-C28CKU)

(Re-installation)

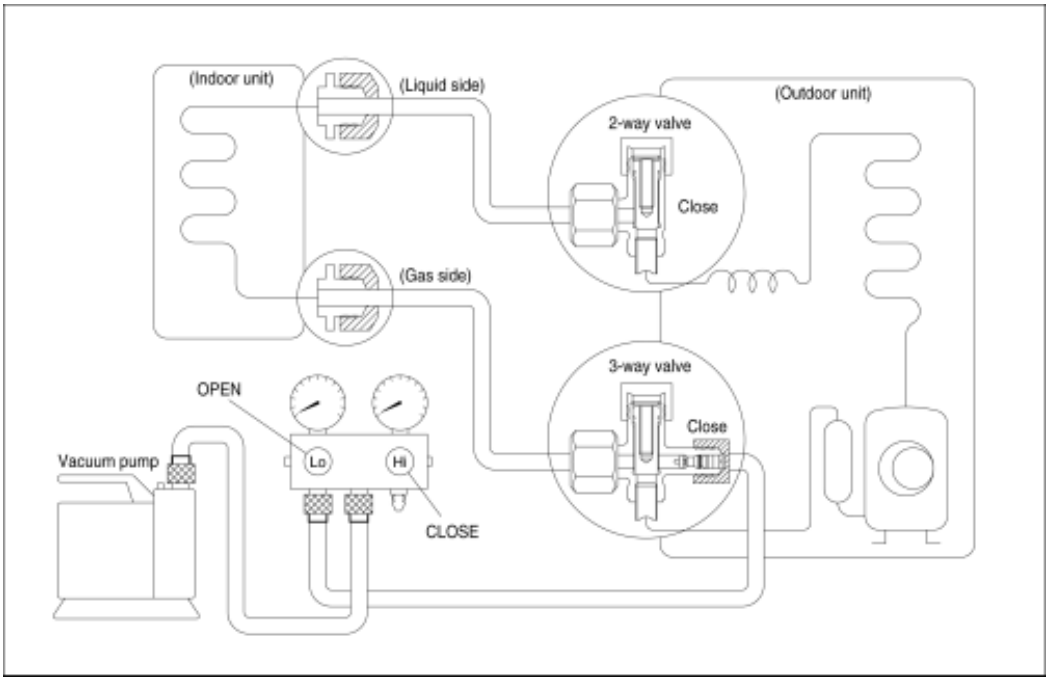


Figure 26

1. Connect a charging hose with a push pin to the Low side of a charging set and the service port of the 3-way valve.
   Be sure to connect the end of the charging hose with the push pin to the service port.
2. Connect the center hose of the charging set to a vacuum pump.
3. Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 M Pa (0 cm Hg) to -0.1 M Pa **(29.92 In Hg)**, (-76 cm Hg). Then evacuate the air for approximately ten minutes.
4. Close the Low side valve of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately five minutes.
   BE SURE TO TAKE THIS PROCEDURE IN ORDER TO AVOID GAS LEAKAGE.
5. Disconnect the charging hose from the vacuum pump.
6. Charge the pipes and indoor unit with gas refrigerant from 3-way valve service port, and then discharge the refrigerant until low side (gas side) gauge needle indicates 0.3 M Pa (3 kg/cm2).
7. Tighten the service port cap at a torque of 18 Nm with a torque wrench.
8. Remove the valve caps of the 2-way valve and the 3-way valve. Position both of the valves to “open” using a 4 mm hexagonal wrench.
9. Mount the valve caps onto the 2-way and 3-way valves.
   BE SURE TO USE REFRIGERANT RECLAIMING EQUIPMENT WHILE DISCHARGING THE REFRIGERANT.

Purge the air from the charge set's center hose.
Be sure to check for gas leakage.

Evacuation of Re-installation (CS-A18CKPG, CS-C18BKP, CS-C24BKP)
(Re-installation)
When reinstalling an air conditioner, be sure to evacuate the air inside the indoor unit and pipes. If air remains in the indoor unit and refrigeration pipes, it will affect the compressor, reduce to cooling capacity, and could lead to a malfunction.

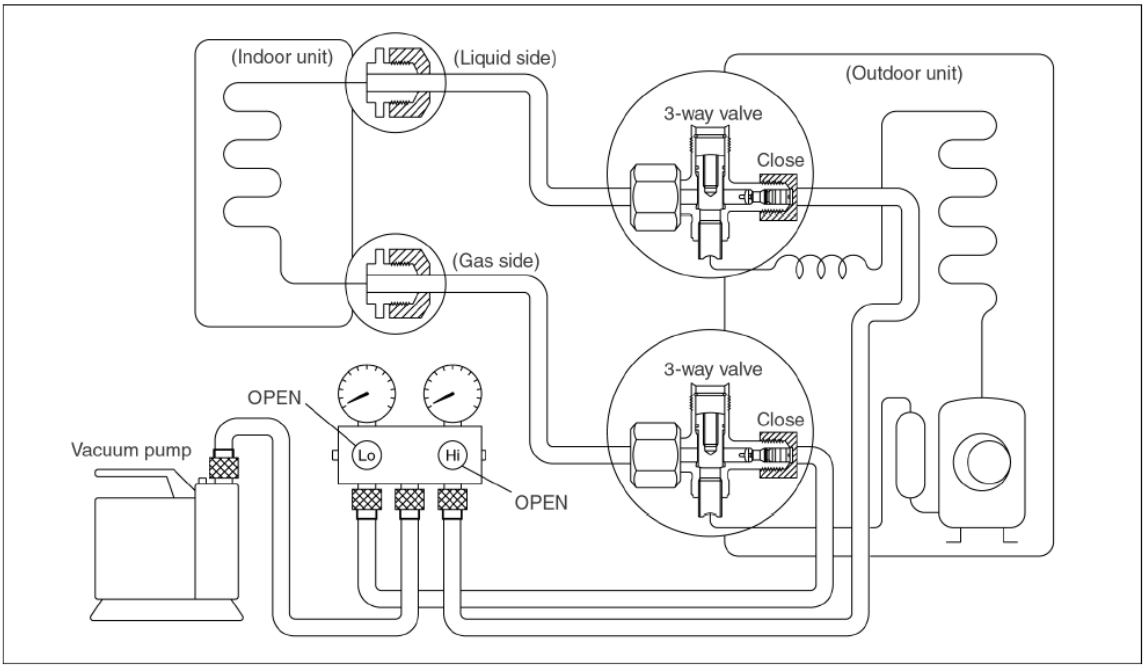


Figure 27

Procedure:

1. Connect a charging hose with a push pin to the Low and High sides of a charging set and the service port of the 3-way valve.
   Be sure to connect the end of the charging hose with the push pin to the service port.
2. Connect the center hose of the charging set to a vacuum pump.
3. Turn on the power switch of the vacuum pump and make sure that the needle in the gauge moves from 0 cm Hg (0 M Pa) to -76 cm Hg **(29.92 In Hg),** (-0.1 M Pa). Then evacuate the air for approximately 10 minutes.
4. Close the valve of both Low side and High side of the charging set and turn off the vacuum pump. Make sure that the needle in the gauge does not move after approximately 5 minutes.
   BE SURE TO TAKE THIS PROCEDURE IN ORDER TO AVOID REFRIGERANT GAS LEAKAGE.
5. Disconnect the charging hose from the vacuum pump.

6. Charge the pipes and indoor unit with gas refrigerant from High (liquid) side 3-way valve service port and then discharge the refrigerant until the Low (gas) side gauge needle indicates 3 kg/cm_2 (0.3 M Pa).
   BE SURE TO USE REFRIGERANT RECLAIMING EQUIPMENT WHILE DISCHARGING THE REFRIGERANT.
7. Purge the air from the charge set's center hose.
   Be sure to check for gas leakage.

Caution
If gauge needle does not move from 0 cm Hg (0 M Pa) to -76 cm Hg **(29.92 In Hg)**, (-0.1 M Pa) in step (3) above, take the following measures:
If the leaks stop when the piping connections are tightened further, continue working from step 3.
If the leaks do not stop when the connections are retightened, repair the location of the leak.

8. Tighten the service port caps of both the 3-way valves at a torque of 18 Nm with a torque wrench.
9. Remove the valve caps of both the 3-way valves and position both of the valves to "open" using a 4mm [0.16 inch]) hexagonal wrench.
10. Mount valve caps onto the 3-way valves.

Balance refrigerant of the 2-way, 3-way valves (CS-A9/CS-C9CKPG, CS-A12/CS-C12CKPG, CS-A24CKPG and CS-C28CKU)
(Lack of refrigerant in the refrigeration cycle)

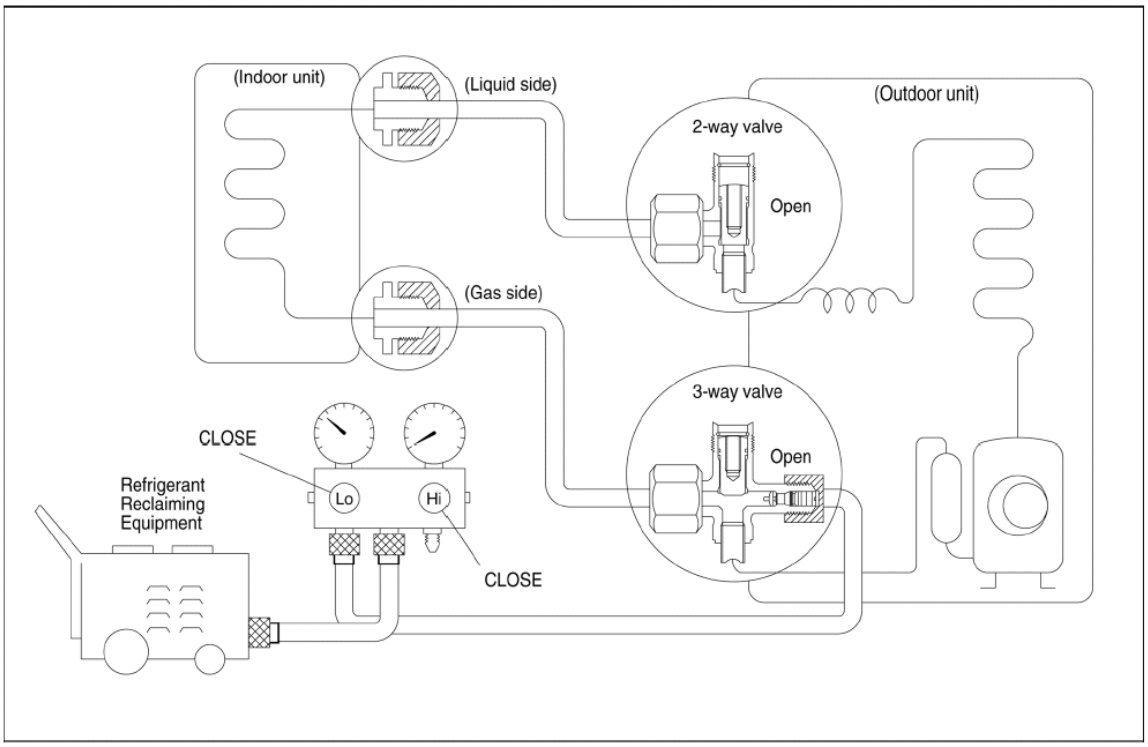


Figure 28

Procedure:

1. Confirm that both the 2-way and 3-way valves are set to the open position.
2. Connect the charge set to the 3-way valve's service port.
   Leave the valve on the charge set closed.
   Connect the charge hose with the push-pin to the service port.
3. Connect the charge set's center hose to refrigerant reclaiming equipment.
4. Purge the air from charge hose.
5. Open the valve (Low side) on the charge set and discharge the refrigerant until the gauge indicates 0.05 M Pa (0.5 kg/cm2G) to 0.1 M Pa (1 kg/cm2G).
   If there is no air in the refrigeration cycle (the pressure when the air conditioner is not running is higher than 0.1 M Pa (1 kg/cm2G), discharge the refrigerant until the gauge indicates 0.05 M Pa (0.5 km/cm2G) to 0.1 M Pa (1 kg/cm2G). If this is the case, it will not be necessary to do an evacuation.
   Discharge the refrigerant gradually; if it is discharged too suddenly, the refrigeration oil will also be discharged.
6. Turn on refrigerant reclaiming equipment.

Balance refrigerant of the 3-way valves (CS-A18CKPG, CS-C18BKP, CS-C24BKP)

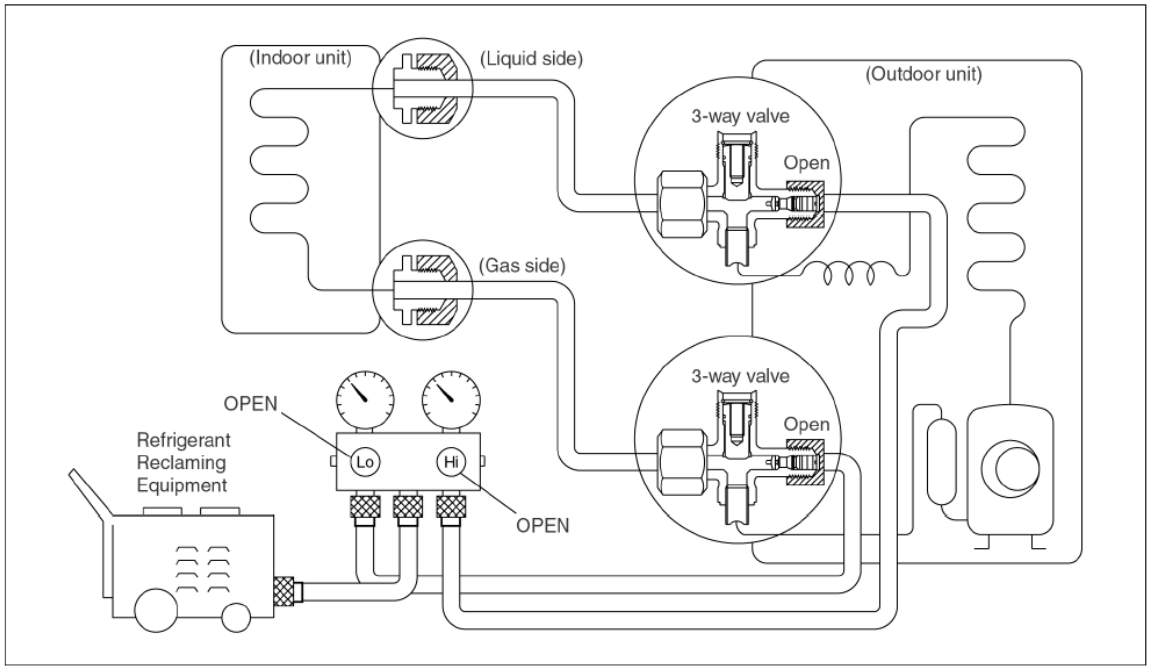


Figure 29

Procedure:

1. Confirm that both the 3-way valves are set to the open position.
2. Connect the manifold gauge to the Low (gas) side 3-way valve's port.
3. Leave the valve on the manifold gauge closed.
4. Connect the manifold gauge to the service port.
5. Open the valves (Low side) on the manifold gauge and discharge the refrigerant until the gauge indicates 0.1 M Pa.
6. If there is no air in the refrigeration cycle [the pressure when the air conditioner is not running is higher than 0.1 M Pa]. If this is the case, it will not be necessary to do an evacuation.
7. Discharge the refrigerant gradually; if it is discharged too suddenly, the refrigeration oil will also be discharged.

Evacuation (CS-A9/CS-C9CKPG, CS-A12/CS-C12CKPG, CS-A24CKPG and CS-C28CKU)

(No refrigerant in the refrigeration cycle)

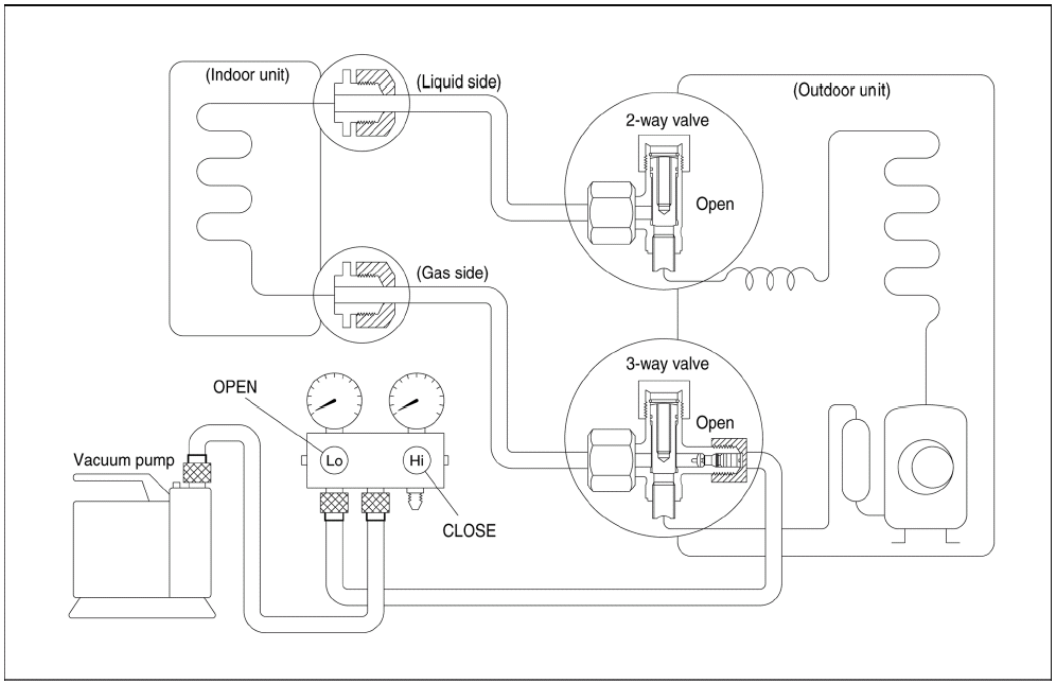


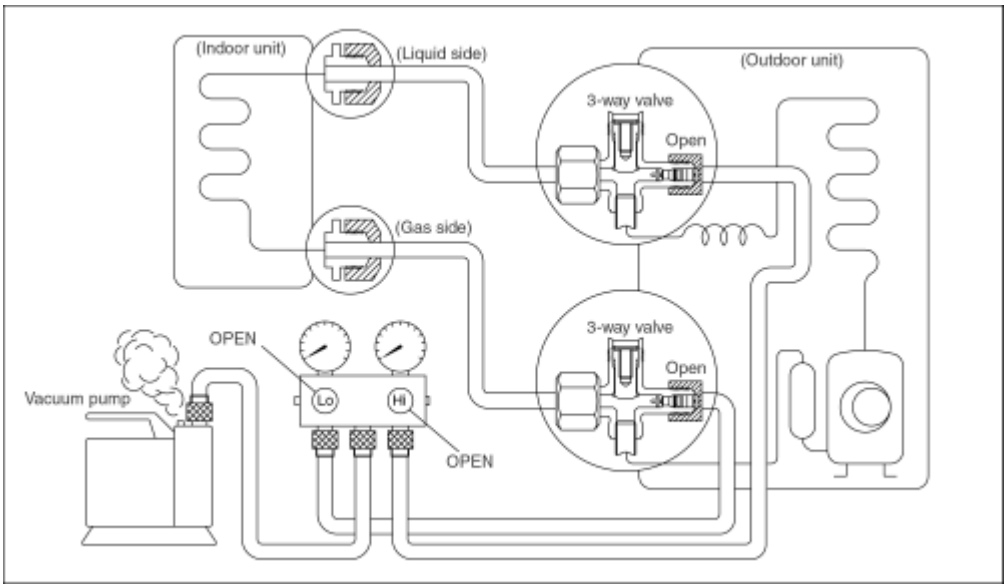
Figure 30

Procedure:

1. Connect the vacuum pump to the charge set's center hose.
2. Do Evacuation for approximately one hour.
   Confirm that the gauge needle has moved toward -0.1 M Pa **(29.92 In Hg),** (-76 cm Hg) [vacuum of 4 mmHg or less.]
3. Close the valve (Low side) on the charge set, turn off the vacuum pump, and confirm that the gauge needle does not move (approximately 5 minutes after turning off the vacuum pump).
4. Disconnect the charge hose from the vacuum pump.
   Vacuum pump oil
   If the vacuum pump oil becomes dirty or depleted, replenish as needed.

Evacuation (CS-A18CKPG, CS-C18BKP, CS-C24BKP)

(No refrigerant in the refrigeration cycle)



Procedure:

1. Connect the vacuum pump to the manifold gauge's center hose.
2. Do evacuation for approximately one hour.
3. Confirm that the gauge needle has moved toward -0.01 M Pa.
4. Close the valve (Low side) on the manifold gauge, turn off the vacuum pump, and confirm that the gauge needle does not move (approximately 5 minutes after turning off the vacuum pump).
5. Disconnect the manifold gauge from the vacuum pump.
6. If the vacuum pump oil becomes dirty or depleted, replenish as needed.

Gas charging (CS-A9/CS-C9CKPG, CS-A12/CS-C12CKPG, CS-A24CKPG and CS-C28CKU)

(After Evacuation)

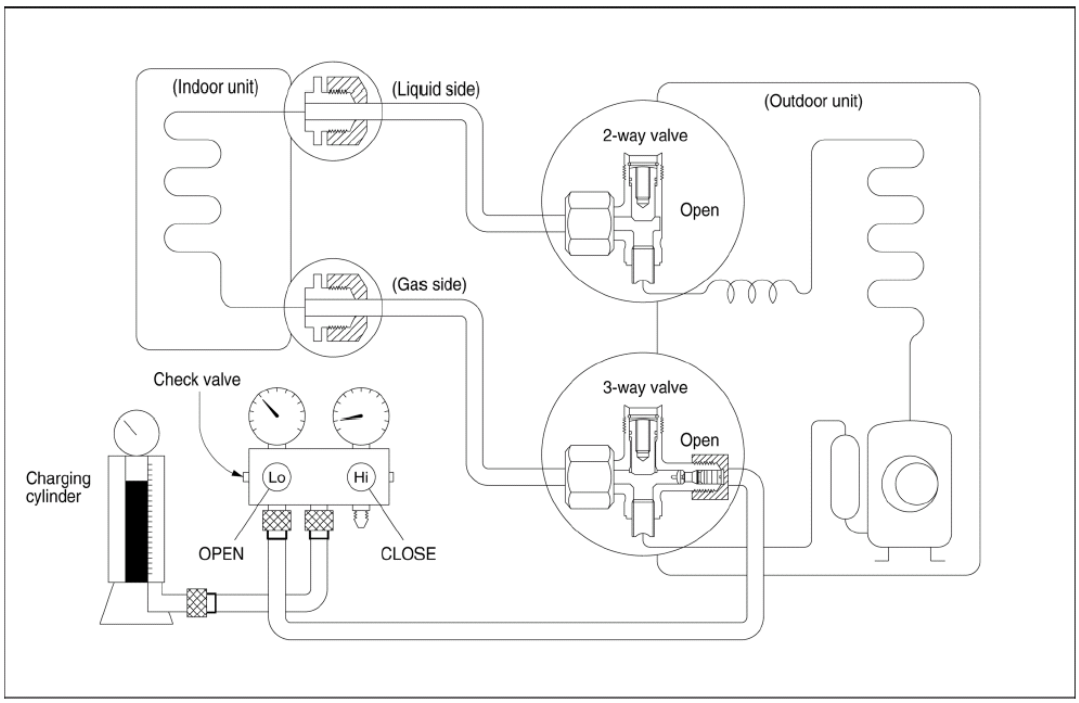


Figure 31

Procedure:

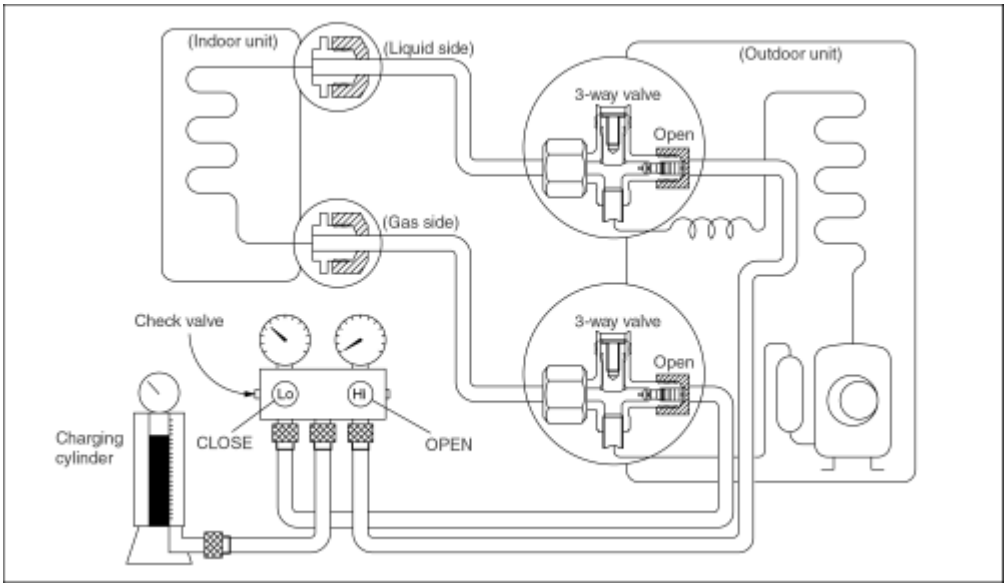
1. Connect the charge hose to the charging cylinder.
   Connect the charge hose, which was previously connected to the vacuum pump, to the valve at the bottom of the cylinder.
2. Purge the air from the charge hose.
   Open the valve at the bottom of the cylinder and press the check valve on the charge set to purge the air (be careful of the liquid refrigerant).
3. Open the valve (Low side) on the charge-set and charge the system with liquid refrigerant.
   If the system cannot be charged with the specified amount of refrigerant, it can be charged with a little at a time (approximately 150 g each time) while operating the air conditioner in the cooling cycle; however, one time is not sufficient, wait approximately 1 minute and then repeat the procedure.

Note: This procedure is different from previous procedures.
Because you are charging with liquid refrigerant from the gas side, absolutely do no attempt to charge with large amount of liquid refrigerant while operating the air conditioner.

4. Immediately disconnect the charge hose from the 3-way valve's service port.
   Stopping partway will allow the refrigerant to be discharged.
   If the system has been charged with liquid refrigerant while operating the air conditioner, turn off the air conditioner before disconnecting the hose.
5. Mount the valve stem caps and the service port cap.
   Use torque wrench to tighten the service port cap to a torque of 18 Nm.

Gas charging (CS-A18CKPG, CS-C18BKP, CS-C24BKP)

(After Evacuation)



Procedure:

1. Connect the charge hose to the gas-charging cylinder.
2. Connect the charge hose previously disconnected from the vacuum pump to the valve at the bottom of the cylinder.
3. Open the valve at the bottom of the cylinder and press the check valve on the charge set to purge the air. (Be careful of the liquid refrigerant). The procedure is the same if using a gas cylinder.
4. Open the valve (Low side) on the charge-set and charge the system with liquid refrigerant.
5. If the system cannot be charged with the specified amount of refrigerant, it can be charged with a little at a time (approximately 150g each time) while operating the air conditioner in the cooling cycle; however, one time is not sufficient, wait approximately 1 minute and then repeat the procedure (pumping down-pin).
6. Immediately disconnect the charge hose from the 3-way valve's service port.
7. Stopping partway will allow the refrigerant to be discharged.
8. If the system has been charged with liquid refrigerant while operating the air conditioner, turn off the air conditioner before disconnecting the hose.
9. Mount the valve caps and the service port caps.
10. Use a torque wrench to tighten the service port nut.
11. Be sure to check for gas leakage.

Troubleshooting Guide

Refrigeration cycle system

In order to diagnose malfunctions, make sure that there are no electrical problems before inspecting the refrigeration cycle. Such problems include insufficient insulation, problem with the power source, malfunction of the compressor and the fan.

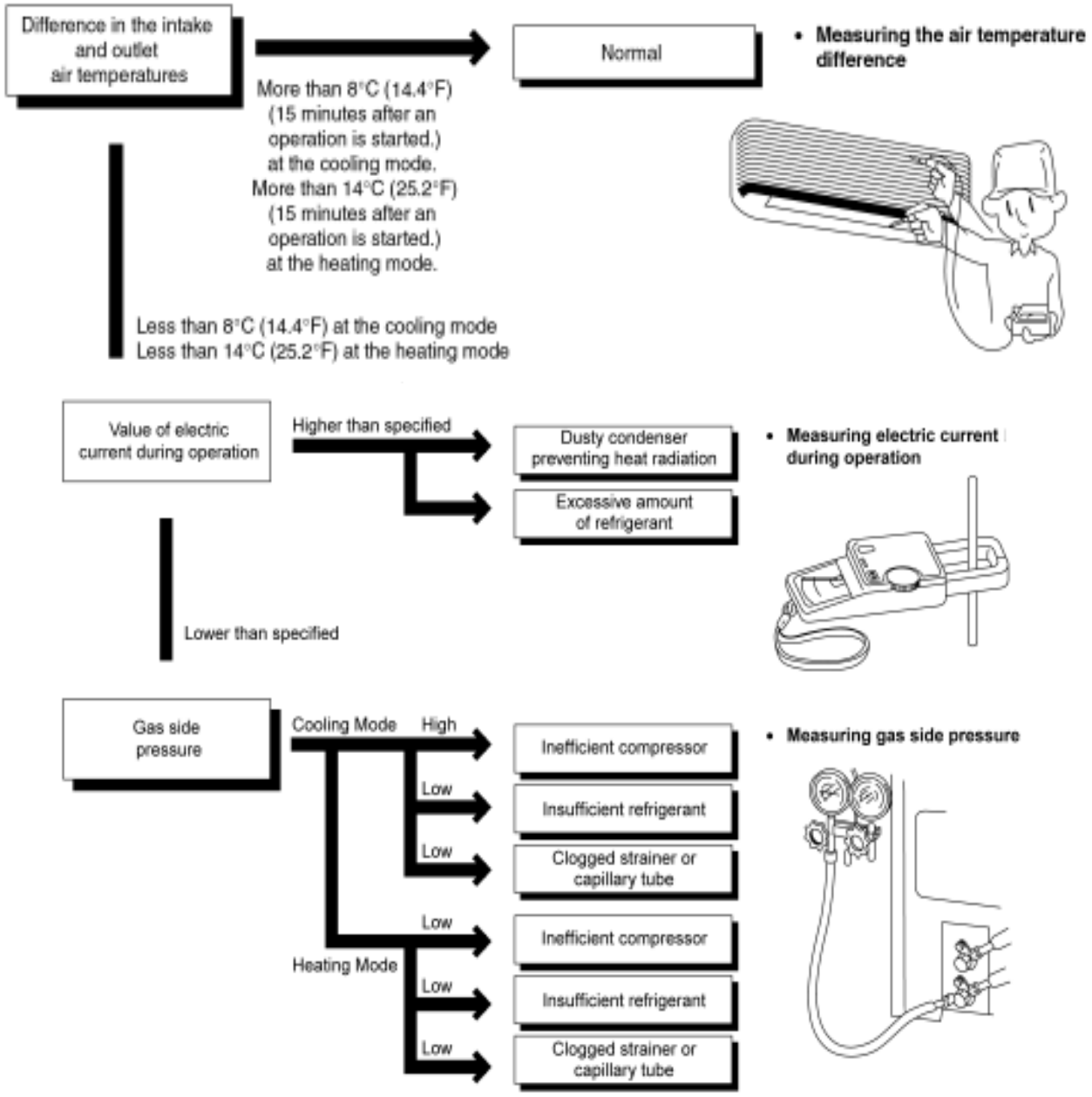
The normal outlet air temperature and pressure of the refrigeration cycle depends on various conditions. The standard values for them are shown in the table below.

Normal pressure and outlet air temperature (standard)

Mode	Gas Pressure			Outlet Air Temperature
Cooling Mode	0.4~0.6Mpa	4~6 kg/cm^{2}G	56.8 ~85.3 PSI	53.6° F ~ 60.8° F
Heating Mode	1.5~2.1Mpa	15~21 kg/ cm^{2}G	213.3~298.7 PSI	96.8° ~ 113° F

Kg/cm^{2}G = Kilogram-force/square centimeter
PSI = Pound-Force/Square inch

Condition: Indoor fan speed; High
Outdoor temperature 95° F for cooling mode
Outdoor temperature 44.6° F for heating mode


Difference in the intake and outlet air temperatures
Normal
More than 8°C (14.4°F) (15 minutes after an operation is started.) at the cooling mode.
More than 14°C (25.2°F) (15 minutes after an operation is started.) at the heating mode.
Less than 8°C (14.4°F) at the cooling mode
Less than 14°C (25.2°F) at the heating mode
• Measuring the air temperature difference
Value of electric current during operation
Higher than specified
Dusty condenser preventing heat radiation
Excessive amount of refrigerant
Lower than specified
• Measuring electric current during operation
Gas side pressure
Cooling Mode
High
Low
Low
Inefficient compressor
Insufficient refrigerant
Clogged strainer or capillary tube
Heating Mode
Low
Low
Low
Inefficient compressor
Insufficient refrigerant
Clogged strainer or capillary tube
• Measuring gas side pressure

Relationship between the condition of the air conditioner and pressure and electric current

	Cooling Mode			Heating Mode		
Condition of the air conditioner	Low Pressure	High Pressure	Electric current during operation	Low Pressure	High Pressure	Electric current during operation
Insufficient refrigerant (gas leakage)	↘	↘	↘	↘	↘	↘
Clogged capillary tube or Strainer	↘	↘	↘	↘	↘	↘
Short circuit in the indoor unit	↘	↘	↘	↗	↗	↗
Heat radiation deficiency of the outdoor unit	↗	↗	↗	↘	↘	↘
Inefficient compression	↗	↘	↘	↗	↘	↘

Carry out the measurements of pressure, electric current, and temperature fifteen minutes after an operation is started.

Diagnosis methods of a malfunction of a compressor and 4-way valve

Nature of fault	Symptom
	Electric current during operation becomes approximately 20% lower than the normal value.
Insufficient compressing of a compressor	The discharge tube of the compressor becomes abnormally hot (normally 70 to 90°C).
	The difference between high pressure and low pressure becomes almost zero.
	Electric current reaches a high level abnormally, and the value exceeds the limit of an ammeter. In some cases, a breaker turns off.
Locked compressor	
	The compressor has a humming sound.
	Electric current during operation becomes approximately 80% lower than the normal value.
Insufficient switches of the 4-way valve	
	The temperature different between from the discharge tube to the 4-way valve and from suction tube to the 4-way valve becomes almost zero.

Figure 32

Service Notes.
1 kilowatt hour = 3,412.14148 Btu
http://www.onlineconversion.com/energy.htm
1 Millimeters = 0.03937 Inches
0 degree Celsius = 32 degree Fahrenheit

2 degree Celsius = 35.6 degree Fahrenheit
10 degree Celsius = 50 degree Fahrenheit

Refrigerant Amount

These Units are delivered with enough refrigerant for an installation of approximately 24.6 feet distance between the Indoor unit and the outdoor unit.

CS-A18CKPG - Refrigerant amount- 54.4oz
CS-A24CKPG - Refrigerant amount- 62.8oz

FAN SPEED	CSC9CKPG	CSA9CKPG	CSC12CKPG	CSA12CKPG	CSC18CKPG	CSA18CKPG	CSC24CKPG	CSA24CKPG
LOW (COOL)	220	220	240	250	400	410	440	480
LOW (HEAT)		240		260		438		534
MED (COOL)	250	260	290	300	430	455	490	550
MED (HEAT)		270		300		455		550
HI (COOL)	310	310	340	340	470	480	530	590
HI (HEAT)		350		360		512		610
SHI (COOL)	340	340	350	350	490	512	550	610
SHI (HEAT)		350		350		512		N/A

Model	Piping Size (Inch)		Common Length (Feet)	Max Elevation (Feet)	Max. Piping Length (Feet)	Additional Refrigerant
	Gas	Liquid				
CS-A9CKPG	3/8	1/4	24.6	16.4	32.8	0.11 oz/ft (10 g/m)
CS-A12CKPG	1/2	1/4	24.6	16.4	49.2	0.11 oz/ft (10 g/m)
CS-C18BKP	1/2	1/4	24.6	65.6	82	0.22 oz/ft (20 g/m)
CS-C24BKP	5/8	1/4	24.6	65.6	82	0.33 oz/ft (30g/m)
CS-C28CKU						

Glossary

AFUE

Stands for Annual Fuel Utilization Efficiency. This number represents how efficiently a furnace converts fuel to energy. The higher the rating, the more fuel-efficient the furnace is. Percentage of fuel used for heating.

Air Handler

The portion of your air conditioner or heating system that forces air through your home's ductwork.

BTU

Stands for British Thermal Units. This number indicates the amount of heat it takes to raise one pound of water one degree Fahrenheit. The higher the BTU rating, the larger the heating capacity of the furnace or air conditioner. Homes are measured to determine the number of BTUs required from a heating or cooling system.

Capacity

Heating and cooling equipment capacities are measured in BTUs. How much heat can the air conditioning unit remove?

Carbon Monoxide

A colorless, odorless, highly poisonous gas produced when carbon burns without sufficient air nearby.

CFM

Stands for Cubic Feet per Minute. A measurement of airflow that indicates how many cubic feet of air pass by a stationary point in one minute. The higher the number, the more air is being forced through the system.

Compressor

The Compressor is the most important piece of a heating or cooling system. Located in the outdoor unit, the compressor is responsible for pumping refrigerant throughout the system.

Condenser Coil

The outdoor portion of a heating or cooling system that either releases or collects heat from the outside air, depending on the time of year. The Condenser Coil is connected directly to the home's Air Handler and is also known as the Outdoor Coil.

Damper

A movable plate that controls airflow through a ductwork system. Dampers are used to direct air to the areas of the home that need it most.

Ductwork

Hollow pipes used to transfer air from the Air Handler to the air vents throughout your home. Ductwork is one of the most important components of a home heating and cooling system.

Evaporator Coil

This is where refrigerant evaporates as it removes heat from the air that is passed over it. The Evaporator Coil is located in the indoor unit and is also referred to as the Indoor Coil.

FAQ

Stands for Frequently Asked Question. Also refers to a list of Frequently Asked Questions.

Heat Exchanger

The part of a furnace that transfers heat to nearby air. That air is then distributed through the Ductwork throughout your home.

Heat Pump

A heating and air conditioning unit that heats or cools by moving heat.

HSPF

Stands for Heating Seasonal Performance Factor. Indicates how efficiently a Heat Pump is working. A higher number means the unit works more efficiently. Most new units have ratings from 7.0 to 9.4.

Humidifier

A component that adds moisture to the air before it is distributed by the Ductwork throughout the house.

HVAC

Stands for Heating, Ventilation, and Air Conditioning.

Indoor Coil

See: Evaporator Coil

Outdoor Coil

See: Condenser Coil

Refrigerant

A chemical that cools air as it evaporates. Air conditioning systems use Refrigerant in the Evaporator Coil to cool air as it passes by.

Refrigerant Lines

Two copper lines that connect the Condenser (Outdoor) Coil to the Evaporator (Indoor) Coil.

SEER

Stands for Seasonal Energy Efficiency Ratio. An efficiency measurement that is similar to Miles Per Gallon for cars. The higher this number, the more energy efficient they system is. New units have SEER ratings from 10 to 17 BTUs per watt.

Single Package

One outdoor unit that contains both a heating and a cooling system.

Split System

A combination heat pump or air conditioner with indoor components such as a furnace or blower coil. To maximize effectiveness, Split Systems should be matched.

Thermostat

A device that allows you to control the temperature inside your home by telling the heating or cooling system how much air to produce.

Zoning

The dividing of a home into different areas each with their own heating and cooling properties. For example, you might prefer to have the kitchen area of your home be slightly cool, while at the same time keeping the temperature in the bedrooms warmer.