

Where everyday's a Sun day...™

Installation Manual

ENE ACDC12

Solar Mini-Split Heat Pump System



Please read this installation manual completely before installing the product. If the power cord is damaged, replacement must be performed by authorized personnel only. Installation work must be performed in accordance with the NEC and local codes. You should contact a licensed service technician for installation, repair, or maintenance. Improper installation could damage the system and/or void the warranty and could result in injury, death, or property damage.

Last Updated 5/13/13

CONTENTS

1. Safety Precautions	. 1
1.1 Notice to Owner/Installer	. 1
1.2 Warning	. 2
1.3 Caution	. 3
2. Dimensions	. 5
2.1 Indoor Air Handler	5
2.2 Indoor Air Handler Installation Plate	. 6
2.3 Outdoor Condenser	. 6
3. Installation	. 7
3.1 Included Accessories	. 7
3.2 Recommended Tools	. 7
3.3 Selecting Installation Location	. 7
3.4 Indoor Air Handler Installation	. 9
3.5 Outdoor Condenser Installation	11
3.6 Refrigerant Tube Connection	12
3.7 Electrical Work	13
3.8 Evacuation & Refrigerant	15
4. Testing	17
5. Solar Photovoltaic Module	18
5.1 General Precautions	18
5.2 Safety Precautions	20
5.3 Selecting the Modules Location	21
5.4 Mounting the Modules	22
5.5 General Installation	24
5.6 Electrical Installation	25
5.7 Grounding Principals	30
6. Disclaimer of Liability	32

1. Safety Precautions

- Read the following SAFETY PRECAUTIONS carefully before installation.
- Incorrect installation may cause injury, death, or damage.

• Before installing or using your solar heat pump mini-split, please print and read this manual carefully and keep it for future reference.

1.1 Notice to Owner/Installer:

This unit is designed for easy installation by an experienced person. It is legal for a homeowner to install it, however we highly recommend using a licensed HVAC technician for installation.

Legal Information About Self-Installing R410A Heat Pump Mini-Split Systems

Can a homeowner install this system?

Yes, a homeowner with a vacuum pump, proper training, and equipment can install this unit. Unless you are experienced with installing a heat pump mini-split we recommend you hire a professional installer. The person who installs the system must do all work in compliance with local building and electrical codes.

Are there any restrictions on the purchase of R410A refrigerants?

R410a is not an ozone-depleting substance. At this time the purchase of R410a refrigerant is not restricted in the US. There is no technician certification requirement for those that purchase HFC refrigerants, such as R-410a or R-134a. If you are not licensed, some local HVAC supply companies may refuse to sell you R410a based on a misunderstanding of the law, or because they wish to discourage homeowners from working on their own systems.

Are there any restrictions on the use of R410A refrigerants?

Yes, it is illegal to knowingly vent or release these refrigerants. The venting prohibition applies to R410a, and all other HFC refrigerants, just as it does for ozone-depleting refrigerants like R-22.

Is EPA technician certification required to service R410A systems?

No, at this time EPA technician certification is not required in order to service R-410a systems.

Source: <u>http://www.epa.gov/ozone/title6/phaseout/technicians_contractors_faq.html</u>

Please pay attention to the following indications.

A WARNING This symbol indicates the possibility of death or serious injury.

A CAUTION This symbol indicates the possibility of injury or damage to property.

1.2 📥 Warning

 Engage a properly trained person for installation. Do not install, remove, repair, or reinstall the unit by yourself (customer) to prevent the risk of fire, electrical shock, explosion, or injury. Only allow a qualified person to install this unit.

• Install according to these installation instructions. If installation is defective, you may experience water damage, electrical shock, or fire.

• Use the included accessories and specified parts for installation.

• For electrical work, follow the local electrical codes and these installation instructions. Electrical work must be installed by a licensed electrician. Be sure to use the correct rating and main circuit for the model to be installed.

• Use a dedicated circuit. If electrical circuit capacity or electrical work is not proper, it can cause electrical shock or fire.

• Wiring routing must be properly arranged so that control board cover is fixed properly. If control board cover is not fixed properly, it will cause heat-up at connection point of terminal causing fire or electrical shock.

 Use the specified cable and connect tightly, clamping the cable so that the cable cannot come loose. A loose connection may cause sparks, overheating, fire, or damage the system.

• Do not modify the length of the power supply cord or use extension cord, and do not share the circuit with other electrical appliances, to avoid fire or electrical shock.

• Do not place anything on the power cable to avoid fire or electrical shock.

 Do not plug or unplug the power supply plug during operation to avoid fire or electrical shock.

• Do not place a heater or other appliance near the power cable to avoid fire or electrical shock.

 Do not allow water to run into electrical parts, it may cause fire, failure of product, or electrical shock.

Always ground the product to avoid fire or electrical shock.

• When installing the refrigerant tubing connection, make sure not to let any substance other than the specified refrigerant go into refrigeration tube. Otherwise, it may cause lower capacity, abnormally high pressure in the refrigeration cycle, explosion, or injury.

• Do not install the unit in a location where leakage of flammable gas may occur.

• Do not store or use flammable gas or combustible products near the unit.

• When flammable gas leaks, turn off the gas and open a window for ventilation before you turn the product on.

• Ventilate the product from time to time when operating it together with a stove etc. to eliminate the risk of fire or electrical shock.

• Turn the main power off when cleaning or maintaining the product to eliminate the risk of fire or electrical shock.

• Do not open the inlet grill of the product during operation to eliminate the risk of fire or electrical shock.

• Do not touch the product with wet hands to eliminate the risk of fire or electrical shock.

• Do not insert hands or other objects through air inlet or outlet while product is operating.

• Do not drink the water drained from the product.

• Replace all batteries in the remote control with new ones of the same type. Do not mix old and new batteries or different types of batteries.

1.3 📥 CAUTION

 Select a proper location for indoor and outdoor unit making sure the location can support the weight of the unit.

• Be sure the installation area does not deteriorate with age. If the base collapses,

the air conditioner could fall with it, causing property damage, product failure, and personal injury.

• Do not install the product where it will be exposed to sea wind (salt spray) directly. It may cause corrosion on the product. Corrosion, particularly on the condenser and evaporator fins, could cause product malfunction or inefficient operation.

• Take care to ensure that nobody could step on or fall onto the outdoor unit. This could result in personal injury and product damage.

• Keep level even when installing the product. It can avoid vibration and water leakage.

• Use two or more people to lift and transport the product.

 Use caution when unpacking and installing the product. Sharp edges could cause injury, be especially careful of the case edges and the fins on the condenser and evaporator.

• This equipment must be installed with DC ground-fault protection (NEC 2005, Article 690.5) Refer to grounding section in this manual.

• Install drainage line descried in the installation instructions. If drainage is not proper, water may accumulate and cause damage.

Always check for gas (refrigerant) leakage after installation or repair of product.
Low refrigerant levels may cause failure of product.

• If strange sounds or smoke comes from product, turn the breaker off or disconnect the power supply cable.

Do not use the product in a tightly closed space for a long time. Oxygen deficiency could occur.

- Do not block the inlet or outlet of air flow.
- Do not step on or put anything on the product. (outdoor units)

• Do not let the air conditioner run for a long time when humidity is very high and a door or a window is left open.

• Do not use the product for special purposes, such as preserving foods, works of

art etc. It is a consumer air conditioner, not a precision refrigerant system. There is risk of damage or loss of property.

• When the product is not being used for a long time, disconnect the power supply plug or turn off the breaker. This is risk of product damage or failure, or unintended operation.

• Do not expose the skin directly to cool air for long time. (Do not sit in the draft).

• The air conditioner is not intended for use by young children without supervision.

• Young children should be supervised to ensure that they do not play with the air conditioner.

• Do not touch the metal parts of the product when removing the air filter. They are very sharp.

• Always insert the filter securely. Clean the filter periodically if necessary. A dirty filter reduces the efficiency of the air conditioner and could cause product malfunction or damage.

• Use a soft cloth to clean. Do not use harsh detergents, solvents, etc. or damage to the plastic parts of the product could occur.

2. Dimensions

2.1 Indoor Air Handler



Model W		D	Н
ENE ACDC12 35.43"		6.3"	11.22"

2.2 Indoor Air Handler Installation Plate



Model	R	L	Н	Dimension of installation hole
ENE ACDC12	6"	6"	2"	2.5"

2.3 Outdoor Condenser





Model	W	D	Н	W1	А	В
ENE ACDC12ODU	29.9"	11.22"	23.23"	32.4"	20.87"	11.42"

3. Installation

3.1 Included Accessories

Number	Accessory	Qty
1	Indoor Air Handler Mounting Bracket	1
2	Plastic Wall Anchor	6
3	Self-tapping Screw A (ST3.9x25)	6
4 Duct Seal		1
5 Plastic Passage Port with Ring		1
6 Condensation hose wrap		2 (Rolls)
7 Remote Controller with Batteries		1
8 (Optional part)	8 (Optional part) Self-tapping Screw B (ST2.9x10)	
9 (Optional Part)	Remote Controller Holder	1

3.2 Recommedned Tools

Level Gauage	Hex Wrench 4mm
Screwdriver	Leak Detector
Electric Drill	Vacuum pump
Hole Saw Bit	Gaugage Manifold
Flaring Tool	Users Manual
Torque Wrench	Thermometer
Adjustable Wrench	Multi-meter
Tape Measure	Pipe Cutter
Stud Finder	Refrigerant Scale
9/16 Socket	Nitrogen

3.3 Selecting Installation Location

Select an installation location which is rigid and strong enough to support or hold the indoor air handler (21 lbs). Select a location for easy maintenance. Read completely, then follow step by step.

<u> Caution</u>

Refer to **3.6 Refrigerant Tube Connection** to see minimum and maximum tubing lengths before choosing your indoor air handler and outdoor condenser locations.

Indoor Air Handler

- Do not expose the indoor unit to heat or steam.
- Select a place where there are no obstacles in front of or around the unit (Figure 1).
- Make sure that condensation drainage tube can be conveniently routed away.
- Do not install near a doorway.
- Ensure the spaces indicated by arrows from the wall, ceiling or other obstacles.
- A place where noise prevention is taken into consideration.
- Minimum of 3ft. from a TV or electronic instrument.
- There should not be any direct sunlight on the indoor unit, sunlight may fade the color of the unit.



Outdoor Condenser

- If an awning is built over the outdoor condenser it must be done in a way that does not block air flow to the unit (Figure 2).
- Keep the spaces indicated by arrows from wall or other obstacles (Figure 3).
- Do not place animals and plants in the path of the air inlet or outlet.
- Take the outdoor condenser weight (95 lbs) into account and select a place where noise, vibration, and hot air discharged will not be an issue.
- Do not install in a location exposed to flammable gas.
- Do not install high frequency machines such as a welding machine near the unit.



Figure 2



Rooftop Installation

• If the outdoor condenser is installed on a roof structure, be sure to level the unit. Ensure the roof structure and anchoring method are adequate for the unit location. Consult local codes regarding rooftop mounting.

3.4 Indoor Air Handler Installation

- Fit the installation bracket horizontally on structural parts of the wall with spaces around installation bracket. (See Figure 4 & 5)
- 2. If the wall is made of brick, concrete, or the like, use #8 anchor screws of the appropriate size.
- 3. Fit the installation bracket on the wall with six (6) anchor screws.

Note:

Fit the installation bracket and drill holes in the wall according to the wall structure and corresponding mounting points on the installation bracket.





Correct orientation of

Figure 4

or more to wall

installation bracket

Model	R	L	h	Installation hole
ENE ACDC12	6"	6"	2"	2.5"
LINE ACDUIZ	0	0	2	2.5

Model	W	Н
ENE ACDC12	35.43"	11.22"

Drill a hole in the wall

- Determine hole positions according to the diagram detailed in Figure 5. Drill one (1) hole (2 ¹/₂") slanting slightly to outdoor side (Figure 6).
- 2. Always use wall hole conduit when drilling metal grid, metal plate, or the like.



Figure 6

Condensation Tube Installation

- Run the drain hose sloping downward. Do not install drain hose as illustrated in Figure 7.
- 2. When connecting extension drain hose, insulate the connecting part of extension drain hose with a shield pipe, do not let the drain hose slack.

Caution Use a stud finder to locate studs to prevent unnecessary damage to the wall.

Indoor Air Handler Installation

- 1. Pass the piping through the hole in the wall.
- 2. Put the upper claw at the back of the indoor air handler on the upper hook of the installation bracket, move the indoor air handler from side to side to see that it is securely hooked (see Figure 9 & 10).
- 3. Piping can easily be made by lifting the indoor air handler with a cushioning material between the indoor air handler and the wall. Remove material after it is not needed.
- 4.Push the lower part of the indoor air handler on the wall, then move the indoor air handler from side to side, up and down to check if it is hooked securely.

Piping and wrapping

Bundle the tubing, connection cable, and drain hose with tape securely, evenly as shown in Figure 11.

 Because the condensed water from the rear of the indoor unit is collected in the drain pan to be piped out of room, do not put anything else in the drain pan.





Do not put the end of

drain hose into water

Do not block water flow by a rise

Figure 7









📤 Caution

- Connect the indoor unit first, then the outdoor unit.
- Do not allow the piping to drain out from the back of the indoor air handler.
- Be careful not to let the drain hose slack.
- Make sure to insulate the tubing.
- Be sure that the drain hose is located at the lowest side of the bundle. Locating at the upper side can cause drain pan to overflow inside the unit.
- Never wrap the power wire along with control cable.
- Run the drain hose sloped downward to drain out the condensed water smoothly.

3.5 Outdoor Condenser Installation

- Install the outdoor condenser on a rigid base to prevent increasing noise level and vibration.
- Anchor the outdoor unit with bolts and nuts on a concrete or rigid mount. (Figure 12)
- Determine the air outlet direction where the discharged air is not blocked. In the case that the installation site is exposed to strong wind, make sure the fan is operating properly by putting the unit lengthwise along the wall or using dust or shield plates especially in windy areas, install the condenser to prevent the admission of wind. (Figure 13)
- If using a suspending installation, the installation bracket should follow the technique required in the installation bracket diagram.
- The installation wall should be solid brick, concrete or the same intensity construction, or actions to reinforce, damping supporting should be taken. The connection between bracket and wall, bracket and the outdoor condenser should be firm, stable and reliable.
- Be sure there are no obstacles which block air flow.



Figure 12



Figure 13

Drain Joint Installation

- If a drain elbow is used, the unit should be placed on a stand which is taller than 1.5".
- Fit the seal into the drain elbow, then insert the drain joint into the base pan hole of the outdoor unit, rotate 90 degrees to securely assemble. Connect the drain joint with the extension drain hose (locally purchased), to allow the water to drain from the outdoor unit during heating mode. (Figure 14)

3.6 Refrigerant Tube Connection

A: Cut the Pipes

- 1. Use the piping kit accessory or pipes purchased locally.
- 2. Measure the distance between the indoor air handler and the outdoor condenser.
- 3. Cut the pipes a little longer than the measured distance.

<u> Caution</u>

- Minimum length required is 10 FT to minimize vibration and excessive noise
- Maximum length is 65 FT
- Maximum elevation is 26 FT Note: Oil trap must be used when elevation reaches 15-20 FT
- 4. Pipes must be insulated independently.

B: Burr Removal

- 1. Completely remove all burrs from the cut cross section of pipe/tube.
- 2. Put the end of the copper tube/ pipe in a downward direction as you remove burrs in order to avoid dropping burrs into the tubing. (Figure 15)

C: Putting Nut On

Remove flare nuts attached to indoor and outdoor unit, then put them on pipe/tube





Figure 15

having completed burr removal. (not possible to put them on after flaring work). (Figure 16)

D: Flaring Work

▲ **Caution** Main cause for refrigerant leakage is due to defect in the flaring work. Be sure to follow specific flaring tool instructions when flaring the copper tubing.

Firmly hold the copper pipe into the flaring tool (Figure 17) and flare until the cone is properly formed.

E: Tightening Connection

- Align the center of the pipes. (Figure 18)
- Sufficiently tighten the flare nut with fingers, and then tighten it with a wrench and torque wrench as shown in Fig 19 & 20.

Caution Excessive torque can break the nut.



Outer Diameter	Torque	Additional Torque
1⁄4"	11.06 Ft. Lbs.	11.8 Ft. Lbs.
1/2"	25.80 Ft. Lbs.	26.55 Ft. Lbs.

3.7 Electrical Work

Figure 20

Electrical safety regulations for the initial installation

- If there is an unsafe power supply, the technician should refuse to install the heat pump mini-split and explain to the client what the problem is.
- Power voltage should be in range of 90%~110% of rated voltage.
- Ground Fault Protection must be provided, see page 30 for more details.
- Refer to the Electrical Connection Diagram located on the panel of the outdoor unit to connect wires.
- All wiring must comply with local and national electrical codes and be installed by licensed electricians.
- An individual branch circuit and single receptacle used only for this heat pump mini-split must be available.

• The cable size and the current of the fuse or switch are determined by the maximum current indicated on the nameplate which is located on the side panel of the unit. Please refer to the nameplate before selecting the cable, fuse, and disconnect.

Connect the cable to the indoor air handler

Note: Before performing any electrical work, turn off the main power to the system.

- 1. The front panel should be removed before connecting the cable between inside and outside.
- 2. Push the front panel up straight, then open it to an angle of 20 degrees (Figure 21 & 22). To take down the front panel, you should unsnap the two bottom clips then release the two lock levers on the back of the panel (Figure 23), then lift it upward.
- 3. After taking down the front panel, remove the electrical box cover by loosening the screw. (Figure 24)
- 4. Release the coupler plugs connected with the front display panel. (Figure 25)
- Connecting cable between indoor air handler and outdoor condenser shall be approved neoprene sheathed flexible cord, type designation H07RN-F or heavier cord. Ensure the color of wires of outdoor condenser and the indoor air handler are the same. (Figure 26)
- Wrap the cables not connected with terminals with insulation tape so that they will not touch any electrical components. Secure the cable onto the control board with the cord clamp. Connect the coupler plugs connected with the front display panel. (Figure 27a)



- Reinstall the electrical box cover, keep the white band just under the groove as shown in Figure 27a and curve the cable into the groove. Make sure the cable connected with LED display window is fixed by the electrical box cover after installation. (Figure 27b)
- Reinstall the front panel by connecting the two lock levers and then snapping the bottom clips into position. Slide the front panel down back into its original position.

Connect the cable to the outdoor condenser

- 1. Remove the electrical control board cover from the outdoor unit by loosening the screw as shown in Figure 28.
- Connect the cables to the terminals as identified with their respective locations. (Figure 26)
- 3. Secure the cable onto the control board with the cord clamp.
- 4. To prevent the ingress of water, form a loop of the connective cable as illustrated in the installation diagram of indoor and outdoor units.





Cable connected with Band LED display window

Figure 27a

Figure 27b



Figure 28

5. Insulate unused cords (conductors) with PVC-tape, so they do not touch any electrical or metal parts.

3.8 Evacuation & Refrigerant

- The tubing between the indoor air handler and the outdoor condenser must be leak tested and evacuated to remove any moisture and non-condensable material from the system.
- Air and moisture in the refrigerant system have undesirable effects as indicated below:
 - Pressure in the system rises.
 - Operating current rises.
 - Cooling or heating efficiency drops.
 - Moisture in the refrigerant circuit may freeze and block capillary tubing.
 - Water may lead to corrosion of parts in the refrigeration system.

Vacuum Pump Preparation

Check that each tube (both liquid and gas side tubes) between the indoor air handler and the outdoor condenser have been properly connected and all wiring for the test run has been completed. Remove the service and stem valve caps. Note that both the liquid and the gas side stem valves on the outdoor condenser are kept closed at this stage.

Evacuation

(For method of using a manifold valve, refer to its operational manual.)

- 1. Completely tighten the flare nuts, A, B, C, D. (Figure 29)
- Connect the manifold valve charge hose to a charge port of the low-pressure valve on the gas pipe side. (Figure 30)
- 3. Connect the charge hose connection to the vacuum pump. (Figure 30)
- 4. Fully open the LOW valve of the manifold valve. (Figure 30)
- 5. Operate the vacuum pump to evacuate. Check gauge for proper vacuum.
- Run evacuation for 30 minutes or more and check that the vacuum sensor indicates less than 400 microns.
 After the evacuation is complete, fully close the LOW valve of the manifold valve to stop the operation of the vacuum pump.
- 7. Turn the stem of the packed valve B about 45 degrees counter clockwise for 6~7 seconds to purge the line of air, then tighten the flare nut again. Make sure the pressure display in the pressure indicator is a little higher than the atmosphere pressure.
- A Caution in handling the packed valve
 - Open the valve stem until it hits against the stopper. Do not try to open it further.
 - Securely tighten the valve stem cap with a wrench
 - Valve stem cap tightening torque (See Tightening torque table in







Figure 30

previous page).

- 8. Fully open the packed valve stems B and A. (Figure 31)
- 9. Securely tighten the caps onto the packed valve. (Figure 31)

Note:

 The standard precharge in the outdoor condenser will provide up to 23 Ft of refrigerant tubing. If a larger than 23 Ft length of refrigerant tubing has been used, additional refrigerant must be weighed and added into the system precisely at .215 oz/ft. (See pressure chart below when adding refrigerant)





Figure 31

	ODT IDT	57°/53°F	47°/43°F	37°/33°F	27°/23°F	17°/13°F
PSI	55°F	439	413	367	330	302
PSI	65°F	471	435	386	368	339
PSI	75°F	489	457	403	381	362

 Make sure the refrigerant is added into the heat pump mini-split in a liquid form.

📤 Caution

Please contact a licensed HVAC Representative if you are unaware of how to add refrigerant because if this step is not done correctly and precisely your system could result in failure.

4. Testing

Perform the safety check after completing the installation:

- 1. Check that both gas (big) and liquid (small) valves are fully open, counter clockwise.
- 2. Press the on/off button on the remote controller to turn the unit on.
- 3. Use the remote button to select COOL, HEAT, AUTO and FAN to check all of the functions.
- 4. When the ambient is too low (lower than 63°F), the unit cannot be

controlled by the remote controller to run in cooling mode, manual operation must be used. Manual operation is only used when the remote controller is disabled or maintenance is necessary. Press the manual control button once on the right side of the panel frame to select the AUTO function, press twice to select the Cool function, and the unit will operate under the Forced mode. (Figure 32)



Manual Control Button Figure 32

5. Solar Photovoltaic Installation

5. Run this test for 30 minutes while monitoring the temperature.

- This guide contains information regarding the installation and safe handling of solar photovoltaic modules. All instructions should be read and understood before attempting to install. If there are any questions please contact EarthNet Energy or a dealer near you for further explanation. The installer should conform to all the safety precautions listed in this guide when installing the modules. Local codes should also be followed in such installations.
- Before installing a solar photovoltaic system, the installer should become familiar with the mechanical and electrical requirements for such a system. Keep this guide in a safe place for future reference (care, maintenance and in case of sale or disposal of the modules at the end of its useful life).

5.1 General Precautions

Caution

Installing solar photovoltaic systems may require specialized skills and knowledge. Installation should be performed only by qualified persons.

📤 Caution

The installer should assume the risk of all injury that might occur during installation, including without limitation, the risk of electric shock.

All modules come with a permanently attached junction box and #12 AWG terminated in Multi-Contact PV-KBT4 (female) or PV-KST4 (male) connectors.

• The solar photovoltaic electrical energy production system must comply with the following table for suggested current and voltage specifications:

Maximum power voltage (W)	≤ 700W
Optimum operating voltage (Vmp)	≤ DC32V
Optimum operating voltage (Vmp)	≤ DC20V
Open-circuit voltage (voc)	≤ DC42V
Short-circuit current (Isc)	≤ DC25A
Maximum power current	≤ DC20A

📤 Caution

One individual module may generate DC voltages greater than 30 volts when exposed to direct sunlight. Contact with a DC voltage of 30V or more is potentially hazardous. Electrical joints such as the wire terminal will cause sparks, burning or deadly electric shock. Please do not touch such terminals directly under any circumstances. (Figure 33)

📤 Caution

- When disconnecting wires from a photovoltaic module that is exposed to sunlight, an electric arc may result. Such arcs may cause burns, combustion and may otherwise create problems. Therefore, be extremely careful!
- Photovoltaic solar modules convert light energy to direct-current electrical energy. They are designed for outdoor use. Modules may be ground mounted, mounted on rooftops, vehicles, or boats.
 Proper design of support structures is the responsibility of the system designer and installer. Proper use of mounting holes is suggested in a following paragraph.
- Do not attempt to disassemble the module, and do not remove any attached nameplates or components.
- Do not apply paint or adhesive to



Figure 33



module top surface.

• Do not use mirrors or other magnifiers to artificially concentrate sunlight on the module.

5.2 Safety Precautions

- When installing the system, abide with all local, regional and national statutory regulations.
- Obtain a building permit where necessary. Abide with any local and national regulations when mounting on vehicles or boats.
- When installing the solar modules or repairing the heat pump mini-split, ensure the circuit breaker on the solar panel of the outdoor condenser is in the "OFF" state (push the switch to OFF position). (Figure 37)
- Solar modules produce electrical energy when light strikes on their front surface. The DC voltage may exceed 30V. If modules are connected in series, the total voltage is equal to the sum of the individual module voltages. If modules are connected in parallel, the total current is equal to the sum of individual module currents. (Figure 38)

📤 Warning

Do Not Connect in Series. It must be a Parallel Connection.

- Keep children well away from the system while transporting and installing mechanical and electrical components.
- Completely cover the module with a solid material like a blanket during





Figure 37

Figure 36



Figure 38



20

installation to keep electricity from being generated. Do not touch the components or the ends of live wires.

- Do not wear metallic rings, watchbands, ear, nose, lip rings or other metallic devices while installing or troubleshooting photovoltaic systems.
- Use only insulated tools that are approved for working on electrical installations.
- Only perform installation in dry conditions.
- Abide with the safety regulations for all other components used in the system, including wiring and cables, connectors, charging regulators, inverters, storage batteries and rechargeable batteries, etc.
- Use only equipment, connectors, wiring and support frames suitable for use in solar electric systems. Always use the same type of module within a particular photovoltaic system.



Figure 44

- The module frame must be properly grounded. The grounding wire must be properly fastened to the module frame to assure good electrical contact. Use the recommended type, or an equivalent, connector for this wire.
- Under normal outdoor conditions the module will produce current and voltages that are different than those listed in the data sheet. Data sheet values are values expected at standard test conditions. Accordingly, during system design, values of short-circuit current (lsc) and open-circuit voltage (Voc) marked on UL series modules should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor amperage, fuse size and size of controls connected to the module or system output.
- The hole in the back of the module frame is used to drain the water, do not block it.

5.3 Selecting the Modules Location

 Select a suitable place for installation of the module. The module should not be shaded at any time of the day.

- The module should be facing due south in northern latitudes and due north in southern latitudes for best power production.
- For detailed information on the best elevation tilt angle for the installation, please consult with the solar photovoltaic system supplier.
- Do not use module near the place where flammable gas may be generated or collected.
- Always observe the instructions and safety precautions included with the support frame to be used with module.
- Never attempt to drill holes in the glass surface of the module, it will void the warranty.
- Do not drill additional mounting holes in the frame of the modules, it will void the warranty.
- Modules must be securely attached to the mounting structure using four mounting points for normal installation. If additional mounting points are also used.
- The support frame must be made of durable, corrosion-resistant and UV-resistant material.
- The heat expansion and cold contraction of the support frame should have no affect on its usage or performance.

5.4 Mounting the Modules

- Module mounting must use the pre-drilled mounting holes in the frame.
- The most common mounting is achieved by mounting the module using the four symmetry points closed to the inner side on the module frame.
- If excessive wind or snow loads are expected, all eight mounting holes must be used.
- If you want to install the module without using the pre-drilled mounting holes in the frame, please consult with the supplier.



Figure 45



Figure 46

Ground Mount

- When installing a module on a pole, • choose a pole and module mounting structure that will withstand anticipated winds for the area. The pole must have a solid foundation.
- Select the height of the mounting system to prevent the lowest edge of the module from being covered by snow for a long time in winter in areas that experience heavy snowfalls. In addition, assure the lowest portion of the module is placed high enough so that it is not shaded by plants or trees or damaged by sand and stone driven by wind.

Roof Mount

- When installing a module on a roof or building, ensure that it is securely fastened and cannot fall as a result of wind or snow loads.
- When installing the module on a roof or building, do so in calm winds. Installing a module during strong winds may cause accidents.
- Provide adequate ventilation under • the modules for cooling (2 inch minimum air space between module and mounting surface).
- When installing modules on a roof, ensure that the roof construction is suitable. In addition, any roof penetration required to mount the module must be properly sealed to prevent leaks. In some cases, a special support frame may be necessary.
- The roof installation of solar modules may affect the fireproofing of the house construction, so it is





Figure 48





Figure 50

necessary to use an earth ground fault circuit breaker. Any improper installation may cause accidental injuries.

Wall Mount

- When installing on a wall mount, be sure the modules are mounted high enough to avoid any shading by plants or trees and any damage from sand and stone driven by the wind.
- Be sure the construction of the wall is durable and stable for the modules to be mounted on.
- Any penetrations that are made to the wall to mount the modules must be sealed to prevent leaks.

5.5 General Installation

- Do not install in rainy weather, it may cause insulation failure due to moisture, and there is a risk of electric shock.
- Do not attempt to lift the module by grasping the module's junction box while moving.
- Do not stand or step on module.
- Do not throw the module or drop anything on the module.
- Do not place any heavy objects on the module. Do not set the module down hard on any surface. Do not scratch or break the glass.





5.6 Electrical Installation

- Do not use modules of different configurations in the same system.
- The solar photovoltaic array consists of modules connected in parallel, no more than 3 modules can be used in parallel. Modules in parallel can increase the output current of the solar photovoltaic system, especially for applications requiring high currents, low voltages. If modules are connected in parallel, the total voltage is equal to the sum of individual voltages.





- All modules come with a permanently attached junction box with fitted cables.
- The junction box is part of the panel itself, please contact the manufacturer if there is any problem with module.
- If modules used in solar photovoltaic system are not the specified brand of the manufacturer, it must comply with the electrical requirement. The cross section area of the cable and the capacity of the connector must be selected to suit the maximum system short circuit current, otherwise the cable and connector will be overheated under large current.
- Modules connected in parallel must use a designated switch junction box, please contact the supplier for purchasing. The maximum current of the solar photovoltaic system and the maximum current and voltage capacity of the joints and connective cables should be considered during installation.
- Connection method A: Extension cables will be needed in the 3 panel configuration connecting the J-box cables to the combiner box. (Figure 57)



Figure 57

If you want to connect the photovoltaic modules by using the cables purchased by yourself, the following requirements must be complied:

- Cable installation should comply with all local regional and national regulations.
- In some countries, an individual circuit breaker used between the solar panel and the heat pump mini-split must be installed. Select a circuit breaker in accordance with local regulations and rated current more than 30A.
- During the cable installation process, you need to distinguish the positive pole and negative pole. Reverse connection may cause permanent damage to the heat pump mini-split.
- Use qualified photovoltaic cables only.
- The cable can resist UV rays and climate of rapid change.
- The rated voltage of the cable is more than 600V.
- The cross section area of the cable depends on the maximum short circuit current and the length of wire.
- Be very careful when installing the cable at extremely low temperatures.
- The wire should be as short as possible to reduce the energy consumption.
- When the modules are connected in parallel, cables must be securely fastened on the support frame which is used for mounting the modules to avoid wire slack.
- Do not attach the cable on the sharp edge of the frames.
- Attention to the minimum bending radius of the wire.
- Do not unplug the connector when the power is on.
- The protecting sheath must be used on the cable if there is a possibility for animals or children to touch it.



Figure 58



Figure 59





Figure 62

• The manufacturer of the solar photovoltaic system can supply cables suitable for use in solar electric systems.

If you want to use the connector purchased by yourself, the following requirements must be complied:

- Use only connector special designed for solar electric systems.
- Use the recommended or specified tools when installing the connectors.

Wiring the Combiner Box



Wiring the DC Disconnect



Combiner Box

Ground From Outdoor Condenser

Caution

- 1. Never fail to have an individual power circuit specifically for the heat pump mini-split. As for the method of wiring, be guided by the circuit diagram posted on the inside of control cover.
- 2. The screws which fasten the wiring in the electrical box are liable to come loose from vibrations which the unit is subjected to during the course of transportation. Check them and make sure that they are all tightly fastened. (If they are loose, it could cause the wires to burn out.)
- 3. Specifications of power source.
- 4. Confirm that electrical capacity is sufficient.
- 5. Check that the starting voltage is maintained at more than 90 percent of the rated voltage marked on the nameplate.
- 6. Confirm that the cable thickness is as specified in the power source specification.
- 7. Always install a GFI circuit breaker in a wet or moist area.
- 8. The following could cause a voltage drop.
- 9. The means for disconnection from a power supply shall be incorporated in the fixed wiring and have an air gap contact separation of at least .12 inch in each active (phase) conductors.

5.7 Grounding Principals

- Equipment grounding provides protection from shock caused by a ground fault and • is required for all PV systems by the NEC. A ground fault occurs when a current-carrying conductor comes into contact with the frame or chassis of the faulty appliance or an electrical box. A person who touches the frame or chassis of the faulty appliance will complete the circuit and receive a shock. The frame or chassis is deliberately wired to a grounding electrode by an equipment grounding electrode conductor. The wire does not normally carry current except in the event of a ground fault. The grounding conductor must be continuous, connecting every non-current carrying metal part of the installation to ground. It must bond or connect to every metal electrical box, equipment chassis, and photovoltaic panel mounting. The grounding wire is never fused, switched, or interrupted in any way. When metal conduit or armored cable is used, a separate equipment ground is not usually necessary since the conduit itself acts as the continuous conductor in lieu of the grounding wire. Grounding wires are still needed to connect appliance frames to the conduit.
- The module frame must be properly grounded. The grounding wire must be properly fastened to the module frame to assure good electrical contact.
- If the support frame is made of metal, the surface of the frame must be electroplated and have excellent conductivity. The grounding wire must be properly fastened to the support frame.
- There are two pre-drilled mounting holes in the frame, used to install the grounding

cable. Each module should connect with the grounding cable.

• We recommend the closed lug when grounding. First insert the ground cable into the jack of the closed lug, then insert the stainless steel bolt (M3) into the tab of the lug, the grounding hole on the frame and finally a nut to secure the entire assembly. The spring washer is required in order to prevent screw loosening and cause improper grounding.



Figure 63

• The grounding resistance must be less than 10 ohms.

Ground-fault protection

• Roof-mounted DC PV arrays located on dwellings must be provided with DC ground-fault protection (NEC 2005, Article 690.5) Ground-fault protection isolates the grounded conductor (in DC, this is the negative wire) from ground under ground-fault conditions.

Size of equipment grounding conductor

• The size of the equipment grounding wire can be as large as the current carrying conductors, both positive and negative wires, but not smaller than specified in NEC 2005, table 250.122.



Grounding Diagram

6. Disclaimer of Liability

Because the use of this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) product are beyond our control, we do not take any responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance. No responsibility is assumed by us for any infringement of patents or other rights of third parties, which may result by using the PV product. No license is granted by modification or otherwise under any patent or patent rights. The information in this manual is based on company's knowledge and experience and is believed to be reliable; but such information including product specification (without limitations) and suggestions do not constitute a warranty, expressed or implied. We reserve the right to change the manual, the PV product, the specifications, or product data sheets without prior notice.