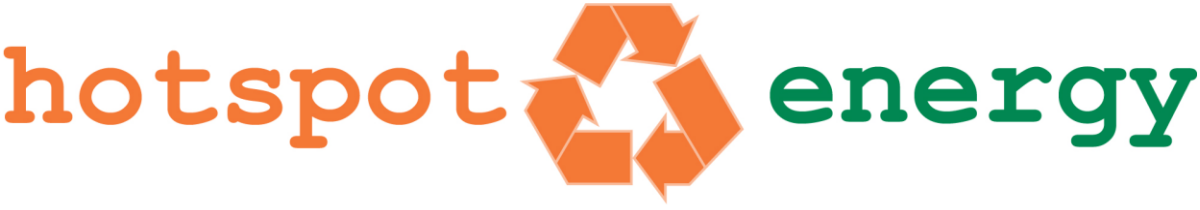


DC4812VRF
Installation Guide

Version 1.4

Notice To Owner/Installer

This unit is designed for 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. **There is high-voltage DC power used inside and outside of the unit. There are capacitors inside the unit that may contain dangerous levels of power even after the unit has been disconnected from its power source.** The power must be disconnected and all of the capacitors must be discharged before servicing the system.

Legal Information About Self-Installing R-410A Air Conditioners
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 air conditioners 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?

R-410A is not an ozone-depleting substance. At this time the purchase of R-410A 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: http://www.epa.gov/ozone/title6/phaseout/technicians_contractors_faq.html

HotSpot recommends that only a licensed air conditioning contractor be allowed to install or service this unit.

WARNING!

This unit uses high voltage DC power. There are multiple capacitors within the unit that may contain dangerous power, even after the power supply has been disconnected.

Capacitors MUST BE DISCHARGED before servicing any electrical components of this unit!

Refer any installation or service to a qualified professional. HVAC professionals can contact HotSpot for downloadable service manual.

DC4812VRF DC Air Conditioner Installation Guide
Table of Contents

SAFETY PRECAUTIONS

Please read this installation manual completely before installing the product. If the power cable is damaged, replacement work shall be performed by authorized personnel only. Installation must be performed in accordance with the NEC and CEC by authorized personnel only. All the pictures in the instructions are for explanation purposes only. The actual shape may vary. Contact an authorized service technician for repair, maintenance or installation of this unit. This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance. The design and specifications are subject to change without prior notice for product improvement. Consult with the sales agency or manufacturer for details.

WARNING

Strictly adhere to the instructions in this manual. If the installation manual is not followed, it may cause water leakage, electrical shock, fire, death. Use the attached accessories parts and specified parts for the installation, otherwise, it will cause the unit to fail, water leakage, electrical shock, and possibly fire. Install at a suitable and firm location which is able to withstand the units weight. If the unit is mounted on an approved bracket, unit may drop and cause injury. For electrical work, follow all local and national wiring codes and these installation instructions. Use the proper size and type of cable and connect it tightly, clamp the cable so that no external force will be present on the terminal. If the connection or fitting is not tight, it may heat-up or could cause a fire at the connection. Wire routing must be properly arranged so that control board cover is properly fitted. If control board cover is not fitted perfectly, it may cause the connection to heat up and could cause a fire or electrical shock. When installing the line set, take care not to let moisture or foreign substances other than the specified refrigerant go into refrigeration cycle. Otherwise, it will cause lower capacity, abnormal high pressure in the refrigeration cycle, possible explosion and injury.

This equipment must be grounded and installed according to the NEC. It may cause electrical shock or damage to the system if not grounded properly.

Do not install the unit in a location where leakage of flammable gas may occur. If flammable gas leaks and accumulates near the unit, it may cause a fire or explosion.

This unit produces condensate. Install the drain piping as mentioned in the installation instructions. If drainage is not correct, water may enter the room and cause damage.

This unit uses high voltage DC power. There are multiple capacitors within the unit that may contain dangerous power, even after the power supply has been disconnected.

Refer any service to a qualified professional. See the DC4812VRF SERVICE MANUAL for service information.

Capacitors MUST BE DISCHARGED before servicing any electrical components of this system!

Batteries: Make sure to follow the NEC and instructions provided by the battery manufacturer when wiring, connecting, and grounding the battery plant.

Charge Controllers: Make sure to follow the NEC and instructions provided by the manufacturer.

Solar Array: Follow the NEC and manufacturers instructions for mounting, connecting, and grounding solar power components.

SELECT THE BEST LOCATION

Indoor unit

There should not be any heat source or steam near the unit. There should not be any obstacles blocking the air circulation. Choose a location where air flow is good. Choose a location where condensate drainage can be easily done and where noise prevention is taken into consideration. Do not install the unit near the en trance or exit of the room. Ensure the clearances indicated by arrows, from the wall, ceiling, fence or other obstacles. See figure 1. There should not be any direct sunlight on the indoor unit. If unavoidable, sunlight prevention should be taken into consideration.

Outdoor unit

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 not be any animals or plants near the unit which could be affected by hot air discharged. Ensure the clearances indicated by arrows, from the wall, ceiling, fence or other obstacles. See figure 2

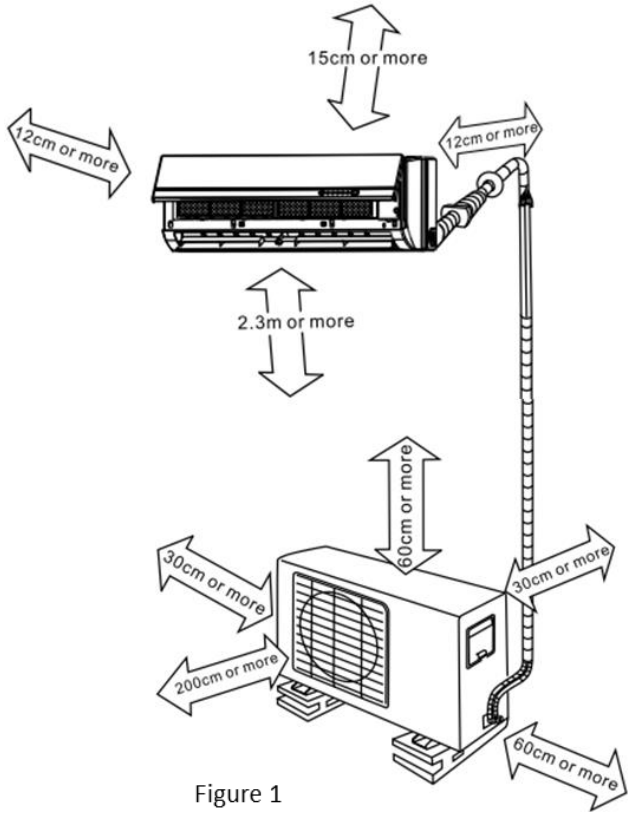


Figure 1

Do not place any obstacles on the unit that may interfere with the discharged air flow.

1	Installation Plate			1
2	Clip Anchor			5-8 Depending on the model
3	Self-tapping Screw AST 3.9 x 25			5-8 Depending on the model
4	Seal			1
5	Drain Joint(For cooling & heating models only)			1
6	Line Set	Liquid side	6.35 mm 1/4 "	Parts you must purchase.
		Gas Side	9.52 mm 1/2 "	Parts you must purchase.
7	Control Cable	Refer to page 11 for control cable details		Parts you must purchase.
8	Remote controller			1
9	Self-tapping Screw B ST2.9x10			2 Optional Parts
10	Remote controller holder			1 Optional Parts

Placement of the outdoor unit

Anchor the outdoor unit with a bolt and nut 10 or 8 tightly and horizontally on a concrete or rigid mount.
NOTE: Install the outdoor unit according to the dimension as indicated below:
Outdoor Unit Dimensions (760 x 590 x 285) mm

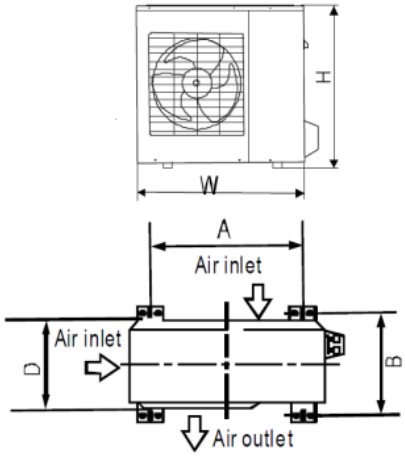


Figure 2

FITTING THE INSTALLATION PLATE

NOTE:
Fitting The Installation Plate
Ensure that the mounting wall is strong and solid enough to prevent vibration.

1. Fit the installation plate horizontally on structural parts of the wall with spaces around the installation plate. See figure 3
2. If the wall is made of brick, concrete or the like, drill eight (8) 5mm diameter holes in the wall and insert anchor clips for appropriate mounting screws.
3. Fit the installation plate on the wall with eight (8) type A screws.

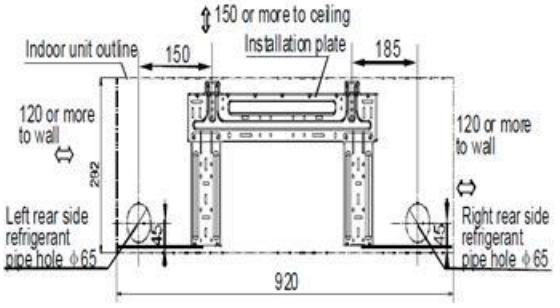


Figure 3

Fit the Installation Plate and drill holes in the wall according to the wall structure and corresponding mounting points on the installation plate. The installation plate is provided with the machine. (Dimensions are in mm unless otherwise stated)
For correct orientation of Installation plate see figure 4.

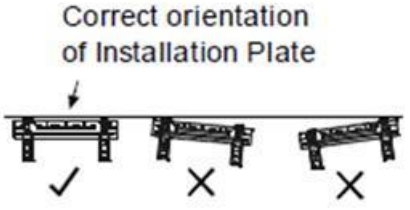


Figure 4

DRILL A HOLE IN THE WALL

1. Determine left and right side hole positions according to the installation plate. The hole center is obtained by measuring the distance as shown in the diagram figure
2. Drill the piping plate hole with 65mm hole saw drill bit.
3. Drill the piping hole at either the right or the left side. The hole should be slightly slanted to the outdoor side for condensate water drainage.
See figure 5
4 Always use conduit when drilling through metal grid, metal plate or the like.

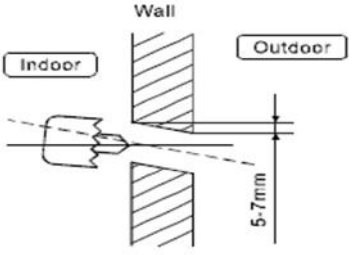


Figure 5

CONNECTIVE PIPE AND DRAINAGE INSTALLATION

DRAINAGE

1. Run the drain hose sloping downward. Do not install the drain hose as illustrated in figure 6
2. When connecting the extension drain hose, seal the connecting part of extension drain hose with water proof tape, do not let the drain hose slack.

Connect the indoor unit first, then the outdoor unit.

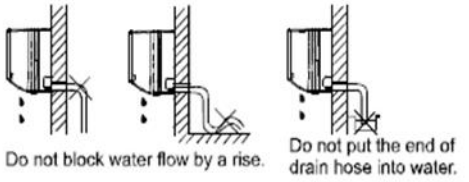


Figure 6

CONNECTIVE PIPE INSTALLATION

1. For the left- hand and right-hand piping, remove the pipe cover from the side panel.
2. For the rear-right-hand and rear-left –hand piping, install the piping as shown in figure 7.
3. Bundle the tubing, connecting cable, and drain hose securely with tape, evenly, as shown in figure 8, on the right. Because the condensed water from rear of the indoor unit is gathered in a reservoir and is piped out of room, do not put anything else in the reservoir.

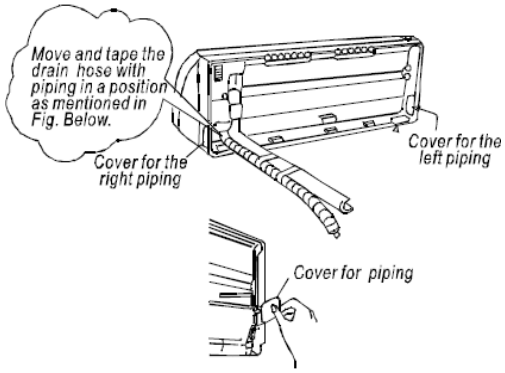


Figure 7

CAUTION

Connect the indoor unit first, then the outdoor unit. Do not allow the piping to hang out from the back of the indoor unit.

Be careful not to let the drain hose slack. Use insulation such as Armaflex to insulate the line set. Be sure that the drain hose is located at the lowest side of the bundle. See figure 8.

If drain hose is located at the upper side it can cause drain tray to overflow inside the unit. Never intercross or wind the power wire with any other wiring. Run the drain hose sloped downward to drain out the condensed water smoothly.

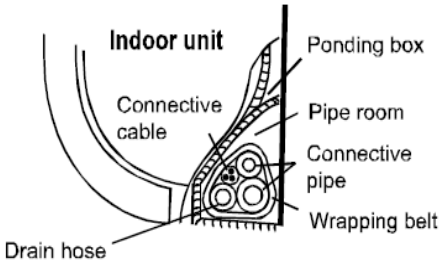


Figure 8

INDOOR UNIT INSTALLATION

1. Pass the piping through the hole in the wall. See figure 9.
2. Hook the indoor unit onto the upper portion of installation plate (Engage the indoor unit with the upper edge of the installation plate). Ensure the hooks are properly seated on the installation plate by moving it in left and right motions.
3. Piping can be made by easy by supporting the indoor unit with a cushioning material between the indoor unit and the wall. Remove it after finishing the piping. See figure 10
4. Press the lower left and right side of the unit against the installation plate until hooks engages with their slots.

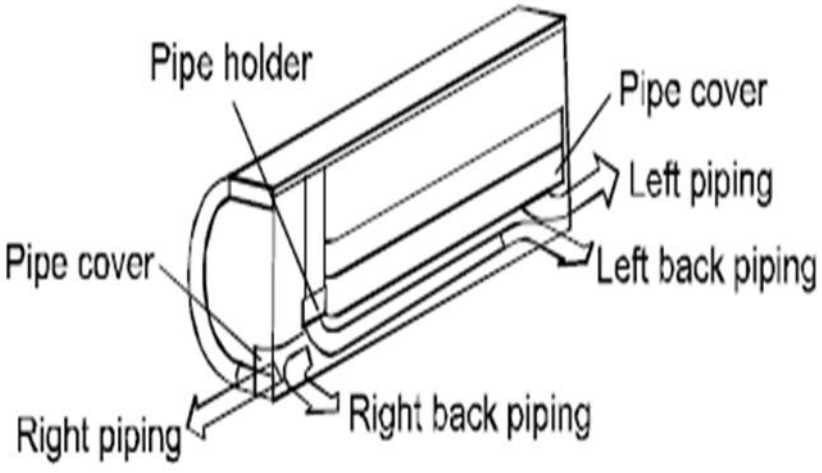


Figure 9

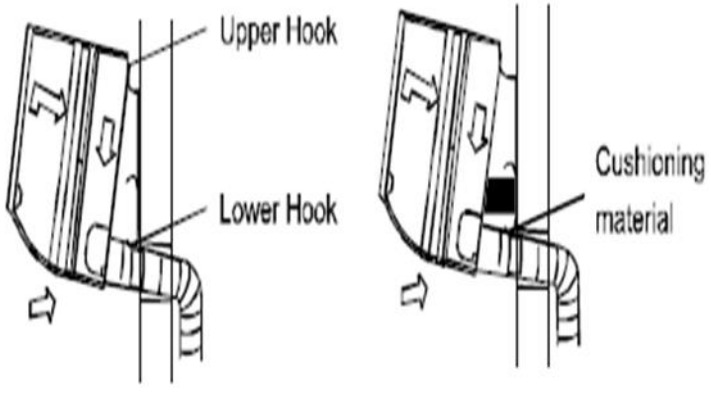


Figure 10

CONNECTING POWER CABLES

ELECTRICAL WORK

MAKE SURE TO USE SHIELDED WIRE FOR WIRING THE COMMUNICATIONS CABLE BETWEEN INDOOR AND OUTDOOR UNIT

The following is a general guide. FOLLOW NEC FOR ALL WIRING.

1. If there is a safety problem with installing the 48 VDC AC unit, the technician should refuse to install the air conditioner and explain to the customer that the problem must be resolved before continuing the installation.
2. Power voltage should be in the range of 46v to 58v DC.
3. Ensure the air conditioner, panels, charging system, and batteries are properly grounded.
4. All components shall be installed in accordance with National Electrical Code.
5. Do not install the air conditioner in a wet room such as a bath room or laundry room.
6. A disconnection capability must exist on or between the charge controller and battery bank. A DC rated disconnect should be used between the battery bank and the AC unit in accordance with the NEC.
7. Keep the unit at least 36” away from combustible materials.
8. Refer to the Electrical Connection Diagram located on the panel of the indoor & outdoor unit to connect the wires. All wiring must comply with local and national electrical codes and be installed by a qualified electrician.

MINIMUM WIRE SIZE (AWG: American Wire Gauge)

You can use a voltage drop calculator to determine the minimum AWG based on the voltage , amps, and distance. There is a wire size/voltage drop calculator at http://www.calculator.net/voltage-drop-calculator.html

Allowable Voltage Drop (%): The percentage of voltage drop acceptable. This is typically allowed to be 5% or lower in ELV systems. HotSpot recommends <3% voltage drop.

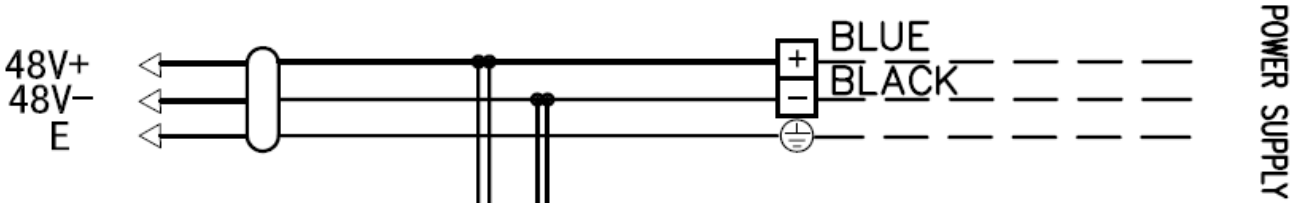
Rated Current : Per AS4509.2 as "The maximum 30 minute average of apparent power or DC power consumption (measured in volt-amperes for AC and watts for DC)". We calculate based on the maximum current that the cable is to carry.

ELV System Voltage: The nominal system voltage is 48 volts for the HotSpot DC4812VRF DC air conditioner. The nominal system voltage for the PV/charge controller configuration will depend on the string sizing. HotSpot assumes PV string voltage of 100v for its AWG recommendations.

FOLLOW THE NEC AND USE THE GUIDE ON PAGE 11 FOR PROPER AWG SIZING.

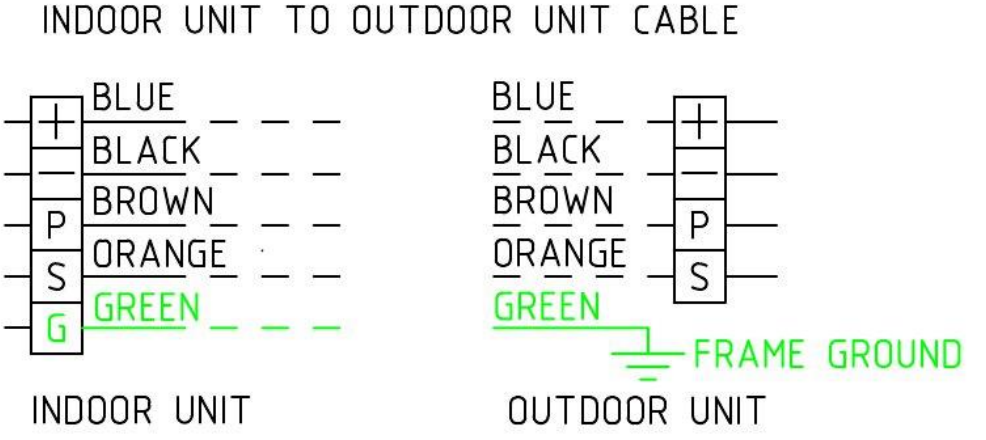
AWG Wire Gauge Sizing Guide
For DC4812VRF Air Conditioner

Connect 48v DC power from batteries to terminals as shown below. “E” refers to Earth Ground.



DC4812VRF Air Conditioner Minimum Wire Gauge Sizing Chart for Connecting Outdoor Power							
Distance	10 ft.	20 ft.	30 ft.	40 ft.	50 ft.	75 ft.	100 ft.
HotSpot Recommended AWG	**AWG**	**AWG**	**AWG**	**AWG**	**AWG**	**AWG**	**AWG**
Solar PV to Charge Controller	12	12	12	12	12	10	10
Charge Controller to Batteries	12	10	NA	NA	NA	NA	NA
Batteries to ODU	10	10	10	10	8	7	6

Connect outdoor unit (ODU) (below, left) to indoor unit (IDU) (below, right) as shown below:



DC4812VRF Air Conditioner Minimum Wire Gauge Sizing for Connecting ODU to IDU						
Distance	10 ft.	20 ft.	30 ft.	40 ft.	50 ft.	75 ft.
HotSpot Recommended AWG	**AWG**	**AWG**	**AWG**	**AWG**	**AWG**	**AWG**
Connections Marked "+" & "-"	14	14	14	14	12	12
Connections Marked "P"	14	14	14	14	12	12
Connections Marked "S" Shielded!	14	14	14	14	12	12
Ground Wire Connection	14	14	14	14	12	12

Connecting To The Indoor Unit

NOTE:
Before performing any electrical work, turn off the main power to the system AND MAKE SURE ALL CAPACITORS ARE DISCHARGED.

1. The (5) five inside connecting cables can be connected without removing the front grille.
2. The 5 connecting power cable s must be sized correctly, see page 11.
3. Lift the indoor unit panel up, remove the electrical box cover by loosening the screw.
4. Ensure the color code of the indoor unit wire terminals match the outdoor unit terminal numbers and the wiring diagram.
5. Wrap any 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 cable clamp.

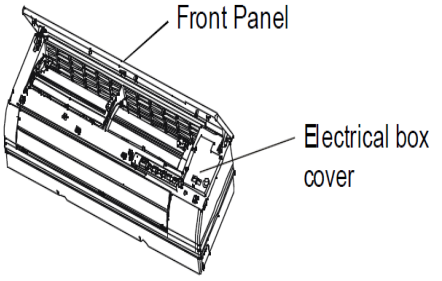


Figure 11

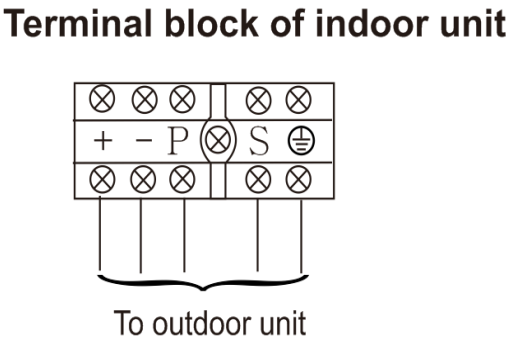


Figure 12

OUTDOOR INSTALLATION PRECAUTION

Install the outdoor unit on a rigid base to prevent excess noise and vibration.

Determine the air inlet and outlet direction, be sure that the flow of air is not blocked.

In the case that the installation site is exposed to strong winds such as the ocean front, make sure the fan can operate properly by putting the unit lengthwise along the wall or using a dust or wind shield. See figure 13.

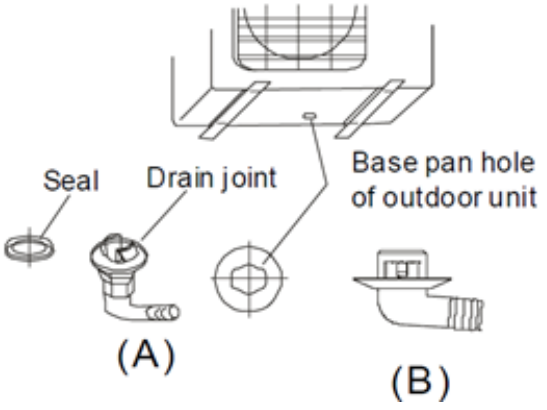
If using an installation bracket, the installation bracket should be installed according to the installation bracket diagram. The installation wall should be solid brick, concrete or similar level of construction, or actions to reinforce the supporting bracket should be taken. The connection between the bracket and wall, and the bracket and the air conditioner should be firm, stable and reliable. Be sure there are no obstacles which can block the flow of air.

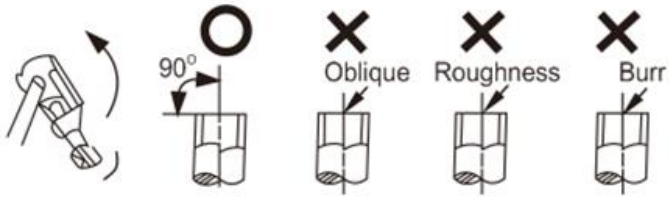
Figure 13

DRAIN JOINT INSTALLATION

NOTE: The drain joint may differ slightly from the diagram. For the drain joint with the seal, Fig. A, first fit the seal onto the drain joint, then, insert the drain joint into the base pan hole of outdoor unit. Rotate it 90 degrees to secure it in place.

To install drain joint as shown in Fig. B, insert the drain joint into the base pan hole of outdoor unit until it remains fixed with a clicking sound. Connect the drain joint with an extension drain hose (Locally purchased), in case of water draining off the outdoor unit during the heating or cooling mode.

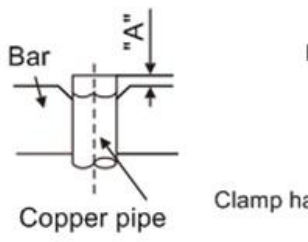


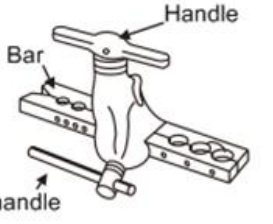


REFRIGERANT PIPE CONNECTION

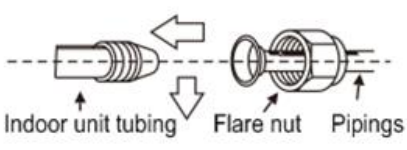
Flaring

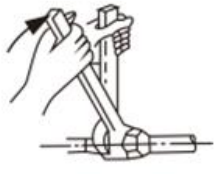
1. Cut a pipe with a pipe cutter.
2.Remove flare nuts attached to the indoor and out door units. Slide them over the end of the pipes after removing burs from the pipes, and flare the pipe.
3.Firmly hold copper pipe in a die in the dimensions shown in the table below.





Outer diam.	A(mm)	
	Max.	Min.
6.35mm or 1/4 “	1.3	0.7
12.7mm or 1/2 “	1.8	1.0





Tightening connection

Align pipes to be connected. Sufficiently tighten the flare nut with fingers, and then tighten it with a torque wrench as shown. Be careful - excessive torque can break or damage the nut.

Outer diam.	Tightening torque(N.cm)	Additional tightening torque(N.cm)
6.35mm or 1/4”	1500(153kgf.cm)	1600(163kgf.cm)
12.7mm or 1/2”	3500(357kgf.cm	3600(367kgf.cm)

Use proper torque to ensure a good seal.
Do not over-tighten.

CONNECT THE CABLE TO THE OUTDOOR UNIT

1. Remove the electrical control board cover from the outdoor unit by loosening the screw. See figure 17.
2. Connect the connective cables to the terminals as identified with their respective matched numbers on the terminal block of indoor and outdoor units. See figure 18.
3. Secure the cable onto the control board with the plastic cable 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.
5. Insulate unused cords (conductors) with PVC-tape so they do not touch any electrical or metal parts.

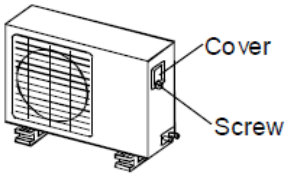


Figure 17

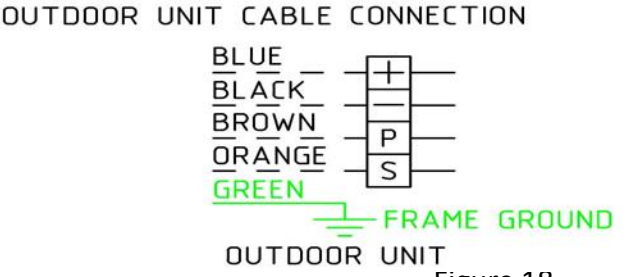


Figure 18

48v DC ONLY
DO NOT CONNECT
AC POWER
TO THIS SYSTEM

Outdoor unit connects to 48v DC Power only.
Use cable AWG sized per distance calculations (see page 11.)

AIR PURGING AND TEST OPERATION

Note: Line set pipe length will affect the capacity and energy efficiency of the unit. The nominal efficiency is tested basing on the pipe length of 7.5 meters.

Air purging

Air and moisture in the refrigerant system have undesirable effects and can damage the system. Therefore, the indoor unit and tubing between the indoor and outdoor unit must be leak tested and evacuated to remove any non-condensables and moisture from the system.

Check that each tube (both liquid and gas side tubes) between the indoor and outdoor units have been properly connected and all wiring for the test run has been completed. Make sure to properly evacuate the system using a vacuum pump.

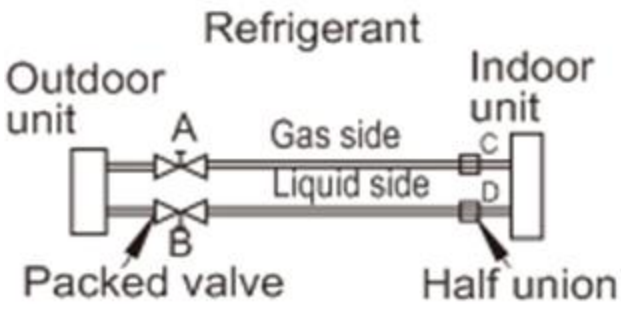
Pipe length and refrigerant amount:

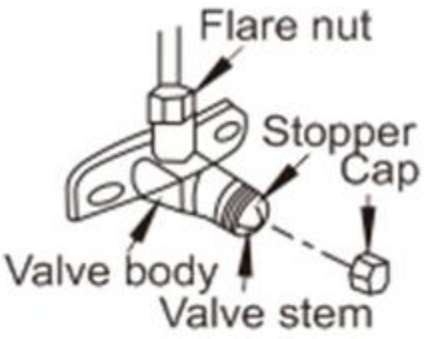
Connective pipe length	Air purging method	Additional amount of refrigerant to be charged	
Less than 7.5m	Use vacuum pump	----------	
More than 7.5m	Use vacuum pump	Liquid side:6.35mm R410A: (Pipe length-7.5)x20g/m	Liquid side:|9.52mm: R410A: (Pipe length-7.5)x40g/m

Figure 19

Caution

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 proper size wrench. See Tightening torque table.





Using the Vacuum Pump

FOLLOW THE INSTRUCTIONS INCLUDED WITH THE VACUUM PUMP. MAKE SURE YOU HAVE PROPER R410A FITTINGS

1.Completely tighten the flare nuts, A, B, C, D, connect the manifold valve charge hose to a charge port of the packed valve on the gas pipe side.
2.Connect the charge hose to the vacuum pump.
3. Fully open the Lo handle of the manifold valve.
4.Operate the vacuum pump to evacuate. After starting evacuation, slightly loose the flare nut of the packed valve on the gas pipe side and check that the air is entering. (Operation noise of the vacuum pump changes and a compound meter indicates 0 instead of minus)
5. After the evacuation is complete, fully close the Lo handle of the manifold valve and stop the operation of the vacuum pump. Make evacuation for 15 minutes or more and check that the compound meter indicates -76cmHg(-1.0x10 Pa). See figure 21
6. Turn the stem of the packed valve B about 45 counterclockwise for 6~7 seconds after noticing gas coming out, then tighten the flare nut again. Make sure the pressure display in the pressure indicator is a little higher than the atmosphere pressure.
7. Remove the charge hose from the Low pressure charge hose.
8. Fully open the packed valve stems B and A.
9. Securely tighten the cap of the packed valve.

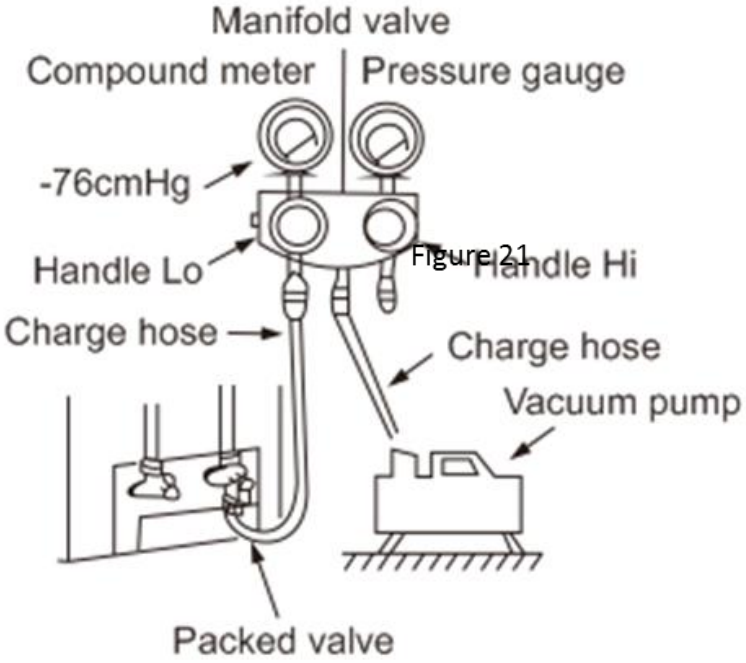
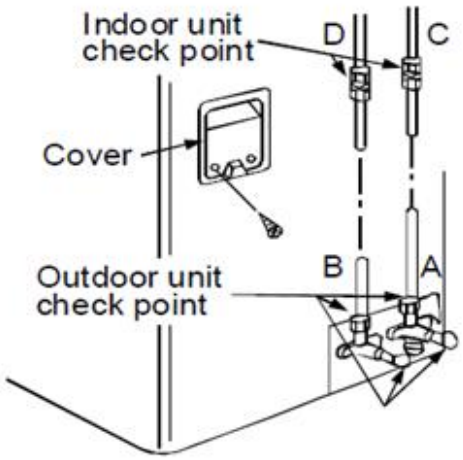


Figure 21

Figure 20

Safety and leakage check
Performed after charging the unit

1.Soap and water method:
Apply a soapy water or a liquid neutral detergent on the indoor unit connections and outdoor unit connections with a soft brush. If bubbles come out, it indicates a leak.



Caution
A: Lo packed valve
B: Hi packed valve
C and D are at the ends of the indoor unit connection.

Running Test
Perform test operation after completing gas leak check at the flare nut connections, and perform electrical safety check.

Check that all tubing and wiring have been properly connected.

Check that the gas and liquid side service valves are fully open.

1. Connect the power, press the ON/OFF button on the remote controller to turn the unit on.

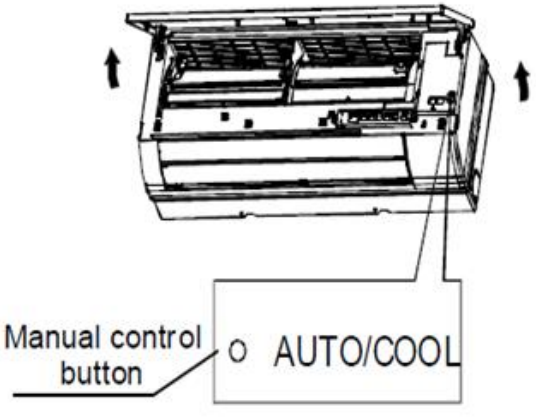
2. Use the MODE button to select COOL, HEAT, AUTO and FAN to check if all the functions work well.

3. When the ambient temperature is too low(lower than 17 C), the unit cannot be controlled by the remote controller to run at cooling mode, manual operation can be used Manual operation is used only when the remote controller is disable or maintenance necessary.

Hold the panel sides and lift the panel up to an angle until it remains fixed with a clicking sound.

Press the Manual control button to select the AUTO or COOL, the unit will operate under Forced AUTO or COOL mode (see User Manual for details).

4. The test operation should last about 30 minutes.



Recharging the DC4812VRF

All DC4812VRF units are shipped from the factory fully charged for a lineset length up to 25 ft. However, if the unit was shipped via air freight, due to air safety regulations the R410a will have been removed and replaced with a low pressure nitrogen charge. If you need to recharge an uncharged unit for this or other reason, the following instructions are provided.

Evacuation

Air and moisture in the refrigerant system have undesirable effects as indicated below:

- Damage to compressor and valves
- 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.

The indoor unit and tubing between the indoor and outdoor unit must be leak tested and evacuated to remove any non-condensables and moisture from the system before charging with R410A Freon.

Evacuation with vacuum pump

- Preparation

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

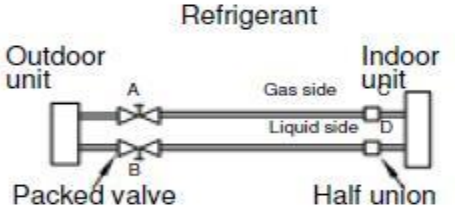


Fig.59

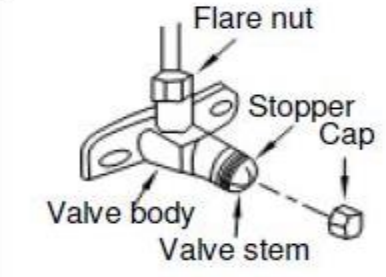


Fig.60

Completely tighten the flare nuts, A, B, C, D. Figure 59

1. Using a R410A 1/4"M x 5/16"F Swivel Adapter, connect the manifold valve charge hose, (blue hose) to the charge port of the low-pressure valve on the gas pipe side.

Use caution when handling the packed valve!

2. Open the valve stem until it hits against the stopper. Do not try to open it further. Replace and securely tighten the valve stem cap with a wrench. Figure 60

Recharging (cont'd)

3. Connect the yellow hose connection to the vacuum pump, red hose is not used.

4. Fully open the Blue valve of the manifold valve.

5. Operate the vacuum pump to evacuate. Check the gauge for proper vacuum.

6. Run evacuation for 30 minutes or more and check that the vacuum meter indicates -76cmHg (-1x105Pa).

   After the evacuation is complete, fully close the LOW valve of the manifold valve and stop the operation of the vacuum pump. Disconnect the yellow hose from the vacuum pump and connect it to the charging tank. Figure 62

7. Open the charging tank valve and place it on a digital scale inverted. Purge the manifold with gas, reset the digital scale and weigh in 1600g of Freon.

   If filling slows down, turn unit on and set to high cool to complete the charging. Disconnect the blue hose and replace the service caps

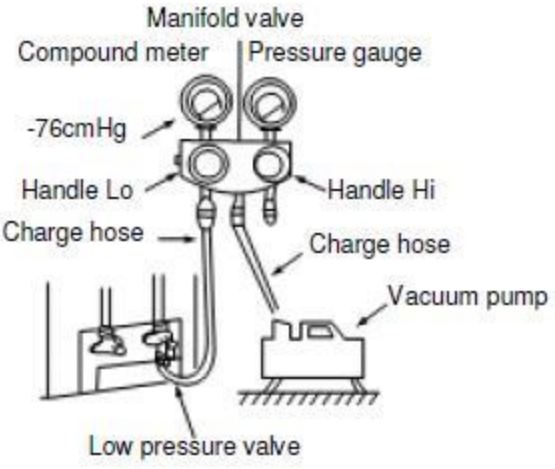


Fig.61

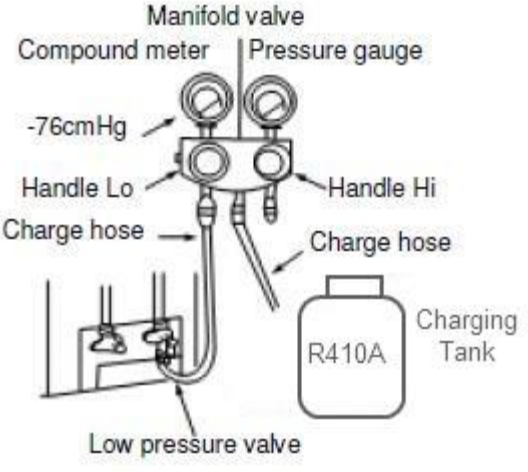
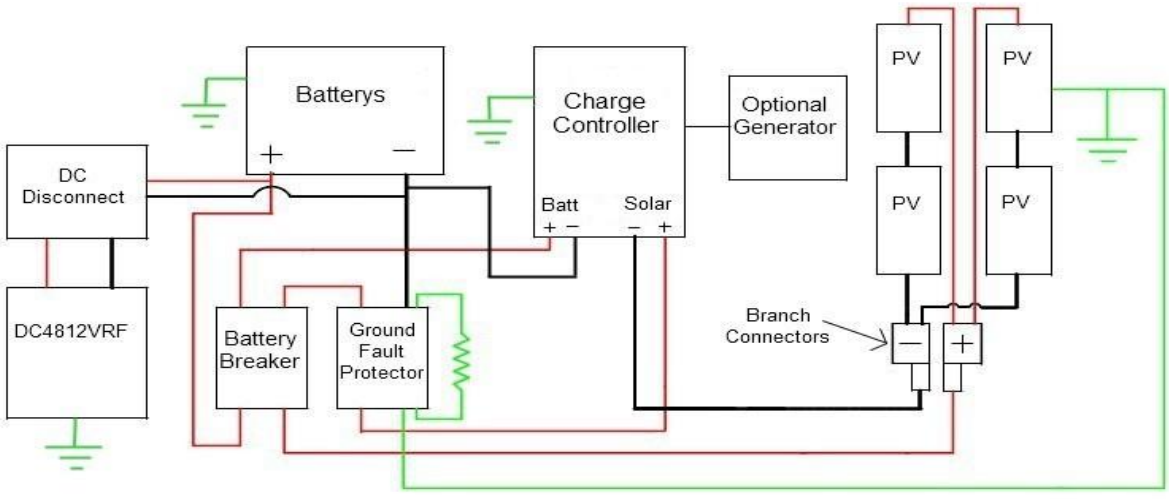


Figure 62

DC4812VRF Typical System Topology
Outdoor Electrical Connections



Charge Controller: Warning: Charge controllers have a maximum Voltage

HotSpot recommends and may have provided a charge controller from Morningstar: Tristar TS-45, Tristar TS-MPPT-45 or TS-MPPT-60. Information on using, installing and/or configuring these units is available for download from www.morningstarcorp.com Regardless of the brand charge controller used, please follow the charge controller manufacturers recommended procedures. Always use a string sizer to properly configure the PV panel wiring to supply the proper voltage. Failure to do so could cause electrical shock, damaged equipment, and void the warranty.

http://www.morningstarcorp.com/string-calculator/

The instructions in this document are only guidelines, consult the manufacturers documents for the official information.

DPW P6 Assembly Instructions:

http://www.dpwsolar.com/index.php/applications/commercial/9-commercial/16-power-rail-mounting-system-prm

DPW P6 and P8 WEEB Instructions:

http://www.we-llc.com/references/installation-manuals

Batteries:

We recommend deep-cycle batteries from Trojan or other major manufacturer. You can use 6, 8,12 or 24 volt batteries as long as they are wired for 48 volts. HotSpot does not provide batteries. Please source your batteries from a reputable supplier and rely only upon the installation and use instructions provided by the battery manufacturer.

PV Solar Panels:

Solar panels must be connected per NEC and per the PV manufacturers instructions and wired according to the charge controller requirements. Mounting and grounding must follow the NEC and the instructions provided by the manufacturers of the panels, mounting & grounding hardware, etc.

Ground Fault Protector (GFDI)

Note this is to be a GFDI device designed to protect equipment and is not a safety device. It is NOT a GFCI. It will not protect from electric shock to a person. **Use of a GFDI actually increases the safety risk and therefore must be labeled accordingly.** Reference model MNEPV80 80A Din Rail Breaker & MNDC-GFP 63 amp Ground fault protector or similar. This is an installer-provided part.

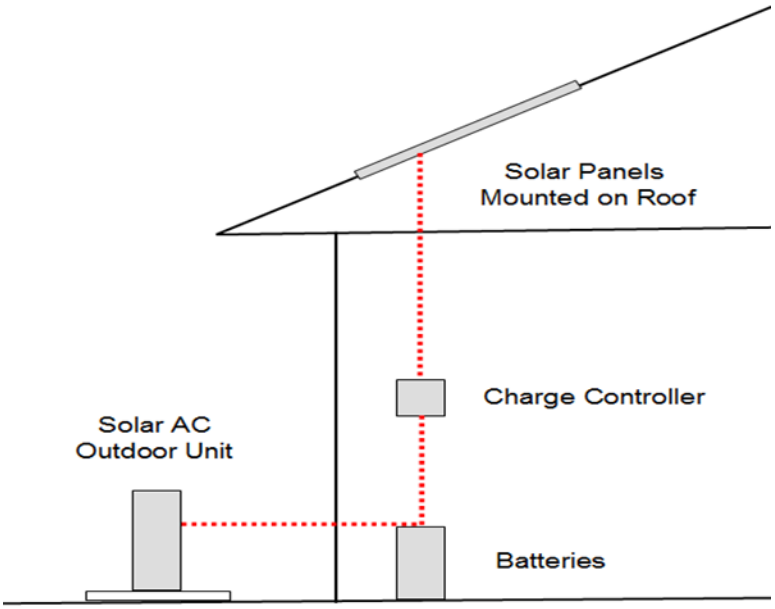
Code Requirements

All installations must comply with national and local electrical codes; professional installation is recommended.
NEC requires ground fault protection for residential PV installations. For more information, see NEC 690.5.

• The GFDI meets the requirements of the 2008 NEC section 690.5 (A) through (C)
to reduce fire hazards when wired according to the wiring diagram contained in these instructions.

• All power production from PV array charge controllers ceases when the breakers trip and remove their connection to the batteries.

Battery Connections & System Overview



Battery Bank Placement

The battery bank should be placed as close to the load as possible. If the battery bank is placed outside, be sure to use a vented, water proof enclosure.

•Disconnect all wiring to and from the battery bank before maintenance or cleaning to reduce the risk of fire, shock or explosion.

•Always remove the negative terminal from the battery before servicing.

•Use caution when using a metal tool near the batteries to prevent shorts, sparks, and possible explosions.

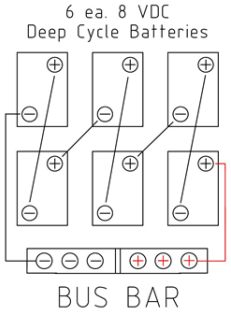
•Keep all battery terminals clean and corrosion free.

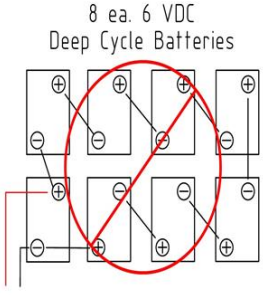
•Do not attempt to charge a frozen battery.

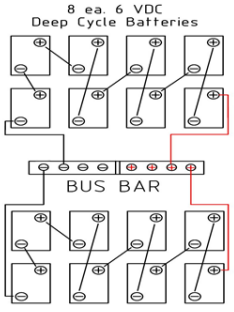
•Always install a means of disconnect on the outside of the enclosure.

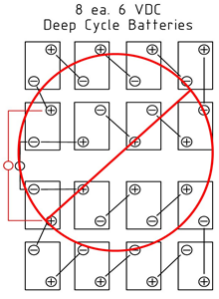
Battery Configuration Overview

Always use a bus bar and ring terminals to connect the charge controller and load to the battery bank to prevent corrosion. Terminal corrosion will cause charging problems. Never connect the positive and negative to the same battery. Bus bars, ring terminals and grounding equipment is provided by the installer. Here are some examples:









NOTE: The Installation of a battery bank should be done by a licensed Electrician in accordance with the NEC, and must comply with state and local standards and codes. The manufacturer accepts no responsibility for failure to follow the applicable standards and codes.

It is very important that the wire you choose is large enough to carry the amount of current from your charge sources, batteries and loads or you will experience a substantial loss of energy. Undersized wire can lead to heat build up in the wire which could lead to failure of the wire and the possibility of fire and/or injury.

The closer you can get your charge controller to the batteries, and the batteries to the load, the better. The longer the cable run, the larger the wire must be in order to prevent large voltage drops due to the resistance of the wire.

Battery Interconnect Wiring

For most battery interconnect wiring using 6 or 8 batteries, no cables should be longer than 48” and we would recommend 8 AWG wire. For 12 or 16 batteries interconnected we recommend no cables longer that 72” and use 6 AWG wire.

Locating the Modules / Mechanical Installation

Select a suitable place for installation of the module. No parts of any of the module should 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.

In general, for year-round usage the best elevation tilt angle for the installation will be equal to the latitude. For example if your latitude is 20 degrees, this should also be the tilt angle.

Do not use module near where flammable gas may be generated or collected.

General Cautions

Installing solar photovoltaic systems may require specialized skills and knowledge. Installation should be performed only by qualified installers. All modules (if ordered from HotSpot) come with a permanently attached junction box and #12 AWG terminated in Multi-Contact (MC4) PV-KBT4 (female) or PV-KST4 (male) connectors.

The installer should assume the risk of all injury that might occur during installation, including without limitation, the risk of electric shock. One individual module may generate DC voltages greater than 50 volts when exposed to direct sunlight. Contact with a DC voltage of 50V or more is extremely hazardous. Electrical joints such as the wire terminal could cause sparks, burning or deadly electric shock. Please do not touch such terminals directly under any circumstances. Make sure panel is covered completely to prevent it from producing electricity.

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 into direct-current electrical energy. They are designed for outdoor use. Modules may be ground mounted, mounted on rooftops, or on a wall assuming you have obtained the proper mounting hardware. Proper design of support structures is the responsibility of the system designer and installer.

Do not attempt to disassemble the module, and do not remove any attached nameplates or components.

Do not apply paint or adhesive to module top surface. Do not use mirrors or other magnifiers to artificially concentrate sunlight on the module.

When installing the system, abide with all local, regional and national statutory regulations. Obtain a building permit where necessary. When installing the solar modules or repairing the air conditioner, ensure the circuit breaker on the solar panel array is in the "OFF" state.

Solar modules produce electrical energy when light strikes the front of the panel. The DC voltage may exceed 30-50VDC. If the modules are connected in series, the total voltage is equal to the sum of the individual module voltages. If the modules are connected in parallel, the total current is equal to the sum of the individual module current.

Keep children well away from the system while transporting and installing mechanical and electrical components. Completely cover the modules with a solid material like a blanket during installation to keep electricity from being generated. Do not touch the components or the bare ends of the wires.

Do not wear metallic rings, watchbands, ear, nose, lip rings or other metallic jewelry 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. 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 all grounding points.

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 (Isc) 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.

Charge Controller

You may have been provided a Morningstar charge controller as part of your DC4812VRF order. If so, the following instructions should be followed. If you have a different charge controller please use the manufacturers instructions for connecting and using it.

If you are using a Morningstar charge controller, following are the basic instruction for the MPPT and PWM controllers. Please make sure to download the full Morningstar manual and follow it. If there is any discrepancy between the HotSpot instructions and the Morningstar instructions, follow the Morningstar instructions or call HotSpot technical support with any questions.

TRISTAR MPPT

Solar System Controller

Please refer to the instructions provided by the charge controller manufacturer. Following is an overview and installation tips.

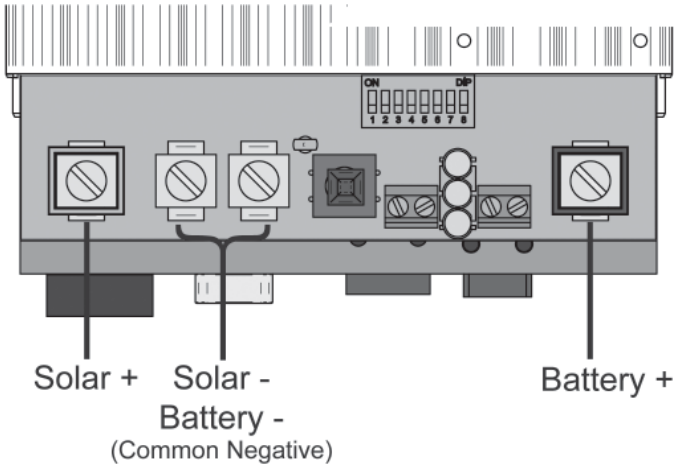


Figure 3-7. Power terminal locations

WARNING: *Be sure that the battery connection is made with correct polarity. Turn on the battery breaker/disconnect and measure the voltage on the open battery wires BEFORE connecting to the TriStar MPPT. Disconnect the battery breaker/disconnect before wiring to the controller.*

Please download and read the TRISTAR MPPT Operators Manual before proceeding.

http://www.morningstarcorp.com/en/support/item.cfm?ItemId=414

Connect the four (4) power conductors shown in figure 3-7 above in the following steps:

1. Confirm that the system input and output disconnect switches are both turned off before connecting the power wires to the controller. There are no disconnect switches inside the TriStar MPPT.

2. Provide for strain relief if the bottom knockouts are used and conduit is not used.

3. Pull the wires into the wiring box. The Remote Temperature Sensor and Battery Sense wires can be inside the conduit with the power conductors. It is easier to pull the RTS and Sense wires before the power cables.

4. Connect the Battery + (positive) wire to the Battery + terminal on the TriStar MPPT. The Battery + terminal has a red cover.

5. Connect the Battery - (negative) wire to one of the Common Negative terminals on the TriStar MPPT.

WARNING: *Be certain that the solar connection is made with correct polarity. Turn on the solar array breaker/disconnect and measure the voltage on the open wires BEFORE connecting to the TriStar MPPT. Disconnect the solar breaker/disconnect before wiring to the controller.*

6. Connect the Solar + (positive) wire to the Solar + terminal on the TriStar MPPT. The Solar + terminal has a yellow cover.

7. Connect the Solar - (negative) wire to one of the Common Negative terminals on the TriStar MPPT. Torque all four (4) power terminals to 50 in-lbs. (5.65 Nm)

POWER UP

WARNING: *Connecting the solar array or battery connection with reverse polarity will permanently damage the TriStar MPPT.*

•Confirm that the Solar and Battery polarities are correct.
•Turn the battery disconnect switch on first. Observe that the LED's indicate a successful start-up. (LED's blink Green - Yellow - Red in one cycle)
•Note that a battery must be connected to the TriStar MPPT to start and operate the controller. The controller will not operate only from solar input.
•Turn the solar disconnect on. If the solar array is in full sunlight, the TriStar MPPT will begin charging. If an optional TriStar Meter is installed, charging current will be reported along with charging state.

General Installation

Cable installation should comply with all local regional and national regulations. In most countries, a ground fault protection device (GFDI) must be installed between the solar panel and air conditioner.

Select a GFDI in accordance with local regulations. The electrician must identify the positive pole and negative pole. Reverse connection may cause permanent damage to the system.

Use qualified photovoltaic cables only. The cable can resist UV rays and rapid climate change. The rated voltage of the cable should be 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 temperature. It is recommended to use the cable of cross section area of 4mm or greater, and the wire should be as short as possible to reduce the energy consumption.

Detailed Installation Instructions:

If you ordered your mounting hardware from somewhere other than HotSpot Energy, consult with your supplier for detailed instructions If HotSpot Energy provided the hardware, it will be from DPW. Please download and follow the appropriate detailed instructions.

DPW P6 Assembly Instructions:
http://www.dpwsolar.com/index.php/applications/commercial/9-commercial/16-power-rail-mounting-system-prm
DPW P6 and P8 WEEB Instructions:
http://www.we-llc.com/references/installation-manuals

WEEB Washers are designed to bond solar PV panels to mounting structures. The washers are made of 304 stainless steel and have teeth that embed into the aluminum mounting structure to form a gas tight electrical connection.

Used as an alternative to grounding each panel with grounding lugs and ground wire., WEEBs do not ground the mounting structure to earth ground, only the panel to the frame. A ground wire must be run to each row of rails and grounded with a ground rod or the main service ground.

AC Backup & Generator Start Function

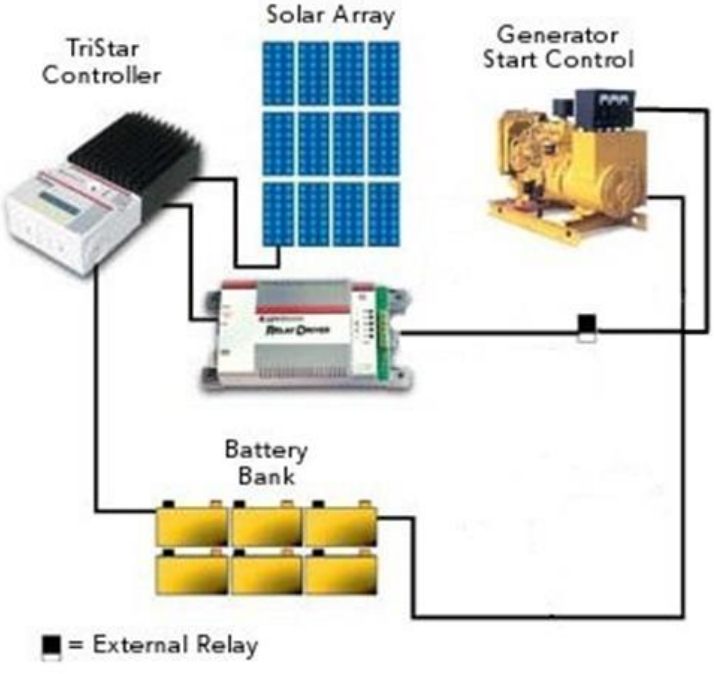
Configure one or more channels to control a generator. With the flexible parameters of this Function, the user can control 1, 2, or 3-wire schemes. Refer to the generator documentation for required signals, timing, and operating specifications.

This section provides a brief setup overview. Refer to the Relay Driver GenStart Supplement for detailed wiring and configuration details.

The document is available on the Morningstar website at:
http://www.morningstarcorp.com/en/support/library/RD.IOM.Operators_Manual.01.EN.pdf

WARNING: Remote generator control should only be configured and installed by experienced professionals.

WARNING: Incorrect configuration or incorrect installation may result in personal injury, death, or damage to the generator and/or other system components.



CAUTION: Configure the Relay Driver first before wiring the generator control