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How this Installation Guide is Organized

This guide is divided into three sections:

- Section I provides all the information you need to prepare for installation.
- Section II gives the step-by-step instructions for assembling your SunPack array.
- Section III explains the system-level assembly, along with electrical and hydronic connections.
1. Safety Information

### Safety Symbols

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Safety Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE</td>
<td>Notice</td>
<td>Indicates useful or non-obvious information; helpful tip, or other advisory information.</td>
</tr>
<tr>
<td></td>
<td>Caution</td>
<td>Indicates an activity that requires extra care or caution in order to be performed correctly. Risk of serious injury is low.</td>
</tr>
<tr>
<td></td>
<td>Warning – Burn or Scald Hazard</td>
<td>Indicates the presence of material that may be hot enough to cause burns. In particular, alerts workers to water hot enough to scald</td>
</tr>
<tr>
<td></td>
<td>Warning – Pinch or Crush Hazard</td>
<td>Indicates a heavy object or portion of mechanism that could crush or pinch hands, fingers, or other.</td>
</tr>
<tr>
<td></td>
<td>Warning – Slip or Fall Hazard</td>
<td>Indicates a slip or fall hazard.</td>
</tr>
<tr>
<td></td>
<td>Danger - Electrocution</td>
<td>Indicates the possible presence of potentially-lethal voltages. In particular, alerts users to the fact that with PV equipment, whenever there is light there is potentially-lethal voltage.</td>
</tr>
</tbody>
</table>

The Cogenra Solar SunDeck System is a solar cogeneration system that produces both electricity and hot water. The following hazards are present in the system:

- Risk of electric shock.
- Danger from high voltages and current.
- Moving parts hazards.
- Pinch and crush hazards.
- Risk of eye damage due to exposure of focused sunlight.
- Risk of burns due to hot surfaces.
- Potential for sunburn due to direct exposure to sunlight.
- Potential risk of injuries due to broken glass, metal edges, or other sharp objects.

During normal operations, safety hazards exist due to active high voltages and current present at the photovoltaic array and power inverters. Additionally, hot water scalds could occur. When working near the array, avoid high voltage power and hydronic connections to prevent personal injury.

It is Cogenra Solar’s policy to provide products that have been engineered to protect personnel, customer facilities, and the environment from exposure to hazards when operated, maintained, and serviced in accordance with our product documentation.

In case of emergency, immediately contact 9-1-1 or other emergency service, then render aid.

If you have questions or safety concerns involving Cogenra Solar products or Cogenra Solar equipment, contact your Cogenra Solar account team or the nearest Cogenra Solar field office.
2. Introduction to the SunPack System

2.1. Overview

The SunPack system combines photovoltaic and solar hot water collection to deliver renewable low cost electricity and heat. In traditional solar panels, most of the sun’s energy dissipates as wasted heat. The SunPack System captures this energy in the form of hot water. This cogeneration solar power system employs concentrating mirrors, heat transfer water lines, and control equipment to maximize system efficiency.

Figure 1. SunPack System

A SunPack system consists of an array of SunDeck® modules, an iBOS™ controller, and an inverter. SunPack systems are arranged as two rows of four, five, or six SunDeck modules, for a total of 8, 10, or 12 modules. Each SunPack is a complete, self-contained system.

iBOS

The iBOS system contains the coolant circulation pump for the array, as well as temperature sensors and safety components. It also includes the control electronics for the array. A pump in the iBOS unit draws cool heat-transfer fluid from the tank (not shown) and pumps it ‘down’ one row of SunDeck modules, typically the southern-most unit. The heat-transfer fluid returns via the second row of modules.

Array Tracker

The angle of the mirrors is adjusted throughout the year by the tracking mechanism. A motor turns the tracking driveshaft to tilt the array. The tracker driveshaft and the lead screws are visible in Figure 1; the controller and motor are not visible.

The array tracker consists of a 24 VDC motor, sun sensors, a temperature sensor, and a controller. The system is powered directly via the PV cells, and will track (or de-track) without the need for AC power. (Even when de-tracked, during daylight hours there is enough power from the PV array to drive the tracking motor.)

Inverter
An inverter converts the PV power to AC and supplies it to the grid.

2.2. SunDeck Module

The major components of a single SunDeck module are:

**Receiver** - This is the energy-collection device. It consists of a PV cell bonded to a heat exchanger assembly, and includes hydronic and electrical connections. Coolant flows through passages in the plate to provide hot water.

**Mirrors** - The mirrors are arranged in twelve rows. Each one consists of glass mirrors bonded to a galvanized steel support element.

**Arm & Post** - The primary support structure for the system. The post is bolted to the rack. The arm pivots on the post to provide the tracking function. The straight member of the arm holds the receiver. The curved portion of the arm holds the mirrors. The Arm & Post assembly also includes the gear drive and lead screw for the tracking mechanism.

**Tracking System** - Leadscrews, driveshafts, a drive motor, and a controller work together to keep the mirrors tracked to the sun.

As shown in Figure 3, the system faces the sun, to the right in this example. (In the northern hemisphere, this is toward the south; in the southern hemisphere, it is to the north.) The array of mirrors reflects and concentrates sunlight onto the receivers, which generate both electricity and heat.

When installing SunDeck modules, remember to keep the receiver on the north side of the assembly (in the northern hemisphere) so that the sun strikes the mirrors without being shadowed by the receiver.
2.3. Roof Attachment & Racking System Requirements

The SunPack system is designed for either ground mount or rooftop installation. In either case, the system designer must specify a support system that supports the arm-and-post assemblies at a spacing of 2.752 m (9 ft, 0-3/8 in). Figure 5 shows Cogenra Solar SunPack Arm & Post assemblies attached to a typical racking system. The racking should be installed along the east-west axis. In the illustrations below, the sun side (south side in the northern hemisphere) is to the right.

NOTE

The spacing of the rack elements that support the Arm & Post assemblies is critical. Improper spacing means the receivers and mirrors won’t fit right. The rack should be ‘planar’ – that is, all elements should be true and parallel. The racking does not need to be horizontal, but it must be planar.

Figure 4. Arm & Post Assembly – Detail

The Arm & Post assembly is shown in the as-shipped position in Figure 4. Note that the lead screw is fully retracted. This orientation of the arm is best for initial installation. The mounting base is galvanized steel, and can fit steel pipe sizes from 1.5” to 2.5” and square sections 3”-4” wide.

Figure 5. Cogenra Solar Arm-and-Post Assemblies Mounted on Installed-Supplied Racking

![Figure 5. Cogenra Solar Arm-and-Post Assemblies Mounted on Installed-Supplied Racking](image)
2.4. Tools Needed

- Short digital level or digital angle gauge with magnetic attachment. Must be accurate to 0.2 degrees.
- Bar clamp, one-hand operation, 6-inch (150 mm) capacity
- Cordless drill or driver
- 1/4" socket driver for cordless drill
- 9/16" and 3/4" combination wrenches
- 9/16" socket, 1/4 or 3/8 drive, with handle
- Coarse file
- #2 Phillips screw driver
- Torque wrench
- Tape measure
- Spray lubricant, such as PAM cooking oil
- 32 mm flare wrench or open-end wrench. McMaster-Carr and others carry large flare wrenches.
- 1-5/8" (42 mm) and 1-7/8" (48 mm) open-end wrenches - used to tighten the hydronic connectors. Alternately, an 18-inch (450 mm) adjustable wrench can be used.
- 12" and 6" long Tek screw driver
- Special tracker drive tool; available from Cogenra.
- Chalk line
- DVM
- Glycol freeze-point tester (Misco model 7084VP (°F) or 7064VP (°C) or equivalent)
- Solar irradiance meter (Daystar or equivalent)
- Infrared thermometer (Ryobi, General Tools, Klein, or equivalent).
3. Assembly Procedure Overview

The following pictures show one row being installed. Many installers prefer to install both rows at the same time; because it reduces the amount of back-and-forth. A single row is shown here for clarity.

3.1. Cogenra Solar SunPack – Frame Assembly

Installation begins with the rack. It need not be horizontal, but it must be planar. Chalk lines are snapped to mark the position of the Arm & Post assemblies.

The first Arm & Post assembly is installed and plumbed. The angle of the arm is carefully measured with a digital level.

The second Arm and Post is installed. Before checking it for plumb...

...it is tipped slightly to let the drive shaft be inserted. It is then plumbed, and the arm angle is set to match the first post.

Two cross braces are then installed.

The third Arm & Post assembly is mounted.
Its driveshaft is inserted. All driveshafts should have about 1 mm of end clearance – about the thickness of a credit card.

A cross brace is installed.

The fourth Arm & Post assembly is mounted.

Because this Arm & Post is the middle one, the tracker motor is attached to it.

It gets a different, shorter driveshaft installed.

A cross brace is installed.

The fifth Arm & Post assembly is mounted.
Its driveshaft is inserted.

A cross brace is installed.

The sixth Arm & Post assembly is mounted.

Its driveshaft is inserted.

A cross brace is installed.

The seventh Arm & Post assembly is mounted.

Its driveshaft is inserted.
The last cross brace is installed.

3.2. Receiver Installation

After attaching the receiver brackets to each arm, the first receiver is set in place, but not bolted.

The second receiver is then set in place.

The third receiver is then set in place.

The fourth receiver is then set in place.

The fifth receiver is then set in place.
The sixth receiver is then set in place.
Next, the hydronic connections are made between the receivers.
The receivers are then bolted into place, and the electrical connections made.

3.3. Mirror Installation

The mirror modules have been designed so that mirror joints are staggered, to avoid creating continuous shadows on the receivers. It’s easiest to install mirrors in a serpentine pattern.

Mirror installation begins with a long narrow mirror, placed closest to the corner of the arm. End overhand is checked, and it is snapped into place.

A short narrow mirror is placed in the next module, and snapped into place.

This continues, using short mirrors...

... along the entire row...
... snapping each mirror into place as you go...

![Diagram of mirrors being placed and snapped into place.](image)

Until the end of the row is reached. The overhang is checked, just to be sure.

![Diagram of mirrors being placed and snapped into place.](image)

Next, a long narrow mirror is placed, aligned, and snapped in.

![Diagram of mirrors being placed and snapped into place.](image)

This is followed by...

![Diagram of mirrors being placed and snapped into place.](image)

... short mirrors...

![Diagram of mirrors being placed and snapped into place.](image)

... installed and attached...
... along the second row...

... until the row end is reached.

A long narrow mirror starts the third row...

... and the back-and-forth process continues until all mirrors are installed.

The second row is installed exactly the same way the first row was.
At the end of the array closest to the system-level piping, brackets are installed for the end kit.

The iBOS hydronic system and controller is attached to the brackets.

The SMA inverter is also attached.

The mechanical portion is now complete. Hydronic hoses, PV wiring, and system connections will complete the installation.
Section II  Detailed Assembly Procedure

4. Arm & Post Assembly

Assembly begins with the Arm & Post units.

**NOTE** Correct installation and alignment is critical; if it is not done right, the mirrors and receivers will not fit.

Many install crews prefer to pre-stage these units. Have teams of two workers carry each unit to the place on the racking where it will be installed.

**Step 1.  Mark the Rack for Arm & Post Placement**

It is critically important that the Arm & Post assemblies be properly aligned. This ensures that the receivers and mirrors will fit correctly and easily.

- At each end of the rack, measure and mark for each row of SunDeck modules.
- Using a chalkline, snap a line across the full width of the rack. See Figure 6.

**Figure 6.  Marking Arm & Post Locations**

**Step 2.  Attach the First Arm & Post Assembly**

- Have mounting hardware ready. Two people should lift and carry the Arm & Post assembly to the end of the mounting location closest to where the iBOS will be. This may be either the east end or the west end.
- Attach the Arm & Post assembly to the cross rail on the racking, using U-bolts or other hardware.
- Tighten the mounting hardware just enough to keep the assembly from slipping.
- Using a digital level, make sure the assembly is perfectly plumb, then tighten the mounting hardware. See Figure 8.

**Figure 7.  First Arm & Post, Mounted on Racking**
Step 3. Measure the Collector Support Arm Angle

**NOTE** Just as it is important that all Arm & Post assemblies be perfectly in line, the angle of the arm on each unit must be the same. Otherwise the receivers will not fit.

- Using the digital level, measure the precise angle of the short, straight collector support arm. All of these arms must be at the same angle, or it will be impossible to install the mirrors and other components.

**NOTE** Read and follow the level manufacturer's directions carefully, to insure a good result. In particular, plumb the arm first, then hold the level parallel to the arm.

- Record the angle. It should be approximately 62 degrees. The exact value is not critical, but all Arm & Post assemblies must be the same, within 0.2 degrees.

Figure 8. Checking for Plumb; Determining the Arm Angle

Step 4. Attach the Second Arm & Post Assembly

- Attach a second assembly in the same manner as the first, but do not tighten the bolts.
- Check the angle of the arm to insure it matches the first assembly. Turn the driveshaft coupling to adjust it if required. (A special tool is available for this.)

**NOTE** This is a critical step. The arms must align, or else the installation of the receivers and mirrors will be very difficult.

Step 5. Install the Driveshaft

- Next, tip the second assembly slightly away from the first assembly.
- Place a long driveshaft rod into the gearbox couple on the first assembly, then align it with the second assembly, and straighten the assembly so that the driveshaft engages the gearbox.
- There should be slight clearance at the driveshaft coupler joints; about the thickness of a credit card. If there is not, adjust the position of the second Arm & Post accordingly.
- Check to be sure the assembly is plumb, then tighten the mounting bolts.
Step 6. Attach Cross Braces

- Attach two cross braces, as shown. Insert the bolt in the center of the braces before tightening the four bolts at the ends of the braces.

Figure 9. Dual Cross Braces – First Module Only

---

Step 7. Attach the Third Arm & Post Assembly

- Attach as in Step 4, but use only one cross-brace.

---

Step 8. Determine Position of Tracking Drive Motor Assembly

- The tracking drive motor must be positioned approximately in the middle of the array. The exact position depends on whether there are four, five, or six modules in the row.

Figure 10. Tracker Motor Positions
Step 9. Attach Additional Arm & Post Assemblies

- Continue mounting the Arm & Post assemblies, as in Step 4. When you get to the third or fourth Arm & Post assembly, attach the tracker drive motor assembly, then proceed with installation. Be sure to use a SHORT drive rod for this unit.

Step 10. Attached the Receiver Mounts to the Arm & Post Assemblies

- Attach the receiver brackets as shown, using two 3/8-16 x 2 inch bolts. Make the bolts just finger-tight; you need to be able to wiggle the bracket a little bit.

Figure 11. Receiver Bracket Placement

Step 11. Placing the Receivers

- Figure 12 shows the assembly with the receiver cover removed. You can see how the bracket fits inside the receiver. The receiver cover does NOT need to be removed for normal assembly.
- Two people should carry each receiver into place. The receiver slips over the receiver bracket. DO NOT bolt it into place yet.
- Repeat the receiver installation process for all receiver assemblies.
- Make sure there is a small space between the receivers, as shown in Figure 12. It should be about 3-6 mm (1/8-1/4 in) on average. This allows for thermal expansion.
Step 12. Verify Receiver Orientation

The PV panels which form the bottom of the receiver are asymmetric. Normally, when correctly installed all of the PV panels are oriented the same way, as shown by the wide silver stripe along the outside (south) edge of the receiver. Verify this orientation on each receiver before proceeding.

Step 13. Install Hydronic Connection Tubes

- Examine the hydronic connector tubes before installation. The two ends should be parallel, and the flare (inside the nut) should be free of any damage or dirt. If a tube is damaged or suspect, discard it and use a different tube. See Figure 13. This will insure a good seal.

![Figure 13. Examples of Normal and Damaged Hydronic Connection Tubes](image)

- Install the hydronic connector tube between the receivers. Cogenra recommends the use of a small amount of spray lubricant, such as PAM or silicone, on the threads.
- Tighten the nuts finger-tight, then use a 32 mm open-end wrench to tighten it one-sixth of a turn more. If possible, obtain a flare wrench. Suppliers such as McMaster-Carr carry them.

Step 14. Install the Receiver Bolts

- Install two 3/8-16 x 2 inch bolts into the receiver, as shown in Figure 12. (In the figure, the cover is removed for clarity. You do not need to remove the cover.)
- Torque the bolts to no more than 16 N-m (12 ft-lbs). These bolts are threaded into aluminum and should NOT be overtightened.
Step 15. Ground & Electrical Connections

- All receivers must be grounded, using a 10AWG bare copper wire. This can be done with one long wire and one lug per receiver.
- A bare copper wire can be threaded through the receivers, using an electrician’s fishtape; or a green-insulated copper wire can be used, stripping off a short length to insert in each ground lug.
- Connect the PV modules together by connecting the male and female MC4 connectors.
- At the far end, connect the two MC4 connectors together, then push the wires back into the holes.

Figure 14. Inter-Receiver Hydronic, Electrical, & Ground Connections

Step 16. Mount the Controller

The tracking system logic consists of the sun sensor, the temperature sensor, angle sensors, and the control box. Figure 15 shows an overview of the tracking drive motor (bottom right) and the control electronics (top left) mounted underneath the SunPack array.

- Attach the controller to the arm assembly using four screws. Route the wiring from the controller to the motor and connect it.

Figure 15. Tracking Motor and Control Box
Step 17. Install the Temperature Sensor

There are two temperature sensors per SunPack; one for each row. Each Controller has its own sensor.

- [Figure 16. ‘Hot’ End of SunPack Rows]
  - Temperature Sensors
  - Hot water ‘back’
  - Cool water ‘down’

- [Figure 17. Temperature Sensor Installation Detail]

- [Figure 18. Temperature Sensor Connections in Controller]

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<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>6</td>
<td>Already connected</td>
</tr>
<tr>
<td>5</td>
<td>Already connected</td>
</tr>
<tr>
<td>4</td>
<td>Temp sensor, north row, wire 4</td>
</tr>
<tr>
<td>3</td>
<td>Temp sensor, north row, wire 3</td>
</tr>
<tr>
<td>2</td>
<td>Temp sensor, south row, wire 4</td>
</tr>
<tr>
<td>1</td>
<td>Temp sensor, south row, wire 3</td>
</tr>
</tbody>
</table>
5. Mirror Installation

It’s important to understand the mirror system in order to make mirror installation simple. The mirrors assemblies are similar, but not identical. They have been designed so that the small gaps between mirrors do not form a continuous line when the mirrors are correctly installed.

There are four different types of mirror assemblies:

- Narrow mirrors are installed closer to the receiver (pale orange in Figure 19).
- Wide mirrors are installed further from the receiver (turquoise in Figure 19).
- Long mirrors are staggered across rows to offset the gaps between mirrors. Every row has one long mirror and several short ones; but the long mirrors are at opposite ends of each mirror row.

The short mirrors have two mirror segments that are the same length. The long mirrors have mirror segments of different lengths. This means you need to orient the long mirror segments the right way when installing.

The mirror types and arrangement are shown in Figure 19. Only three SunDeck modules are shown, for space reasons, but the pattern is the same for four, five, and six-module rows.

Note that the long mirror assemblies are long enough to span between adjacent Arm & Post assemblies; the short mirror assemblies are not. For this reason, it’s much easier to begin installing the mirrors with a long mirror assembly.

The mirror assemblies slide into each other and are attached with screws. Figure 20 shows the swaging of the mirror assembly. Note that each mirror assembly consists of a metal back and two mirrors of different lengths. When correctly installed, none of the gaps between mirrors should line up with each other.

Caution

Warning

Before you begin mirror installation, you must make sure that the system stays de-tracked; that is, with the mirrors NOT reflecting sun onto the receivers. An uncooled receiver will be damaged by direct sunlight.

Figure 19. Mirror Arrangement
Installation Sequence

Make sure the Arm & Post assemblies are all aligned at the same angle; this makes it possible to install the mirrors. If for any reason the assemblies are not in this position, move them. Figure 21 shows the installation sequence. Note that it begins at the corner of the arm with a long mirror, and works back and forth along the length of the row; always starting with a long mirror.

Figure 21. Mirror Installation Sequence

Installation begins with a long, narrow mirror. Of the two mirror segments, the long mirror segment is toward the end; the short segment is toward the middle.

The second row goes back to the start; but again it starts with a long narrow mirror, long segment toward the end.

Installation proceeds...
...row by row...

...alternating directions...

...until six narrow rows have been completed.

The seventh row uses the wide mirrors. Again, it begins with a long wide mirror, long segment toward the end.
The second row reverses direction.

Installation continues...

...row by row...

...alternating direction...
...until all twelve rows are installed.

Step 18. Place First Mirror

- Place a long, narrow mirror in the slot closest to the receiver arm. The swaged end should be toward the middle of the row. The location is shown in Figure 21. Do not attach it to anything.

Step 19. Adjust Mirror Overhang

The mirrors must overhang the Arm & Post assembly by a specific amount. If this is not done correctly, the mirrors will be damaged when the array moves.

- Adjust the mirror overhand so that it is 200 mm (7-7/8 in) from the end of the mirror to the vertical surface of the arm. This is shown in Figure 22.
- Using a power screwdriver, insert two self-tapping Tek screws through the holes in the tab on the Arm & Post assembly, and tighten the screws. Do not insert any other screws.

Figure 22. Mirror Overhang Measurement
Step 20. Install Second Mirror

- Place a short narrow mirror in the second position. Slide the swaged connection together.
- The space between mirror ends should be about 2mm. A credit card makes a handy test gauge.
- Join the swaged connection

Step 21. Install All Mirrors in Row

- Continue placing short narrow mirrors, joining them at the swaged end, and attaching them

Step 22. Install First Mirror in Second Row

- Place a narrow, long mirror in the first position of the next section, and align the overhang with the first row.
- Attach the mirror to the Arm & Post assembly.

Step 23. Install Second Mirror in Second Row

- Place a short narrow mirror in the next position in the row, and slide the swage connection together.
- Join the swage, and attach the mirror to the Arm & Post.

Continue the mirror installation process, row by row, until all mirrors have been installed. Remember that the first six rows are narrow, and the last six rows are wide.

Step 24. Install the Angle Sensors

Each Arm & Post assembly has an angle sensor. The controller uses these to detect any misalignment or problem associated with the tracking mechanism. The angle sensors are pre-wired; lay them out so that the connector can reach the control box.

- Attach an angle sensor to each Arm & Post assembly, as shown in Figure 23. The long edge of the sensor body should be parallel to the edge of the cutout in the arm.

Step 25. Attach Angle Sensor Wires to Mirror Backs

- Use Tek screws and cable clamps to secure the angle sensor wires to the back of the mirrors, as shown in Figure 23.

Figure 23. Angle Sensor Location
Section III System-Level Assembly and Connections

6. iBOS and System Connections

Each end of the SunPack array requires a few system-level connections. The ‘Far End’ is the end away from the iBOS; the ‘Near End’ includes the iBOS, inverter, and support structure. Included in the End Kit are:

- Three flexible metal hoses with a ¾” union for the system-level coolant connection. The union has a threaded connection to the hose.
- DC connection cables for use between the array rows and the iBOS.
- Two sets of unistrut brackets.
- Clamps to secure the electrical and water lines.

The iBOS unit contains a junction block for all wiring connections. Wiring instructions are in the Cogenra System Commissioning Guide.

Step 26. Far End Connections

- Install two short Unistrut pieces at each far end, to act as hose supports.
- Thread the supplied braided-steel hoses down through the arms at each row end.
- Connect the hydronic ports on each end module to the hose.
- Use clamps to secure the hose, as shown in Figure 24. Note how the hose has a generous loop, and is routed through the axis on which the arm pivots. This minimizes hose strain during arm movement.
- Connect the two hoses in the middle.
- At the receiver, connect the PV MC4 connects, and push the wires back into the receiver.
Figure 24. Far End Hose Supports and Hose Routing

Step 27. Install the Supports for Plumbing and Wiring

- Install Unistrut segments to the Arm & Post assembly in two places, as shown in Figure 24.

Figure 25. End Kit Unistrut Installation
When complete, the SMA inverter and the Cogenra Solar iBOS unit will look like Figure 26 (rear view).

Figure 26. Inverter and iBOS; ‘Ghost’ Image of Brackets Behind Inverter and iBOS

Step 28. Attaching the Mounting Brackets to the iBOS

You must drill holes in the iBOS to accept the mounting brackets.

- Remove the cover from the iBOS.
- Place the iBOS face-down.
- Using the mounting brackets as a template, drill four holes in the iBOS.
- Attach the mounting brackets to the iBOS with bolts, nuts, and lockwashers.

Step 29. Attaching the Brackets to the Inverter Mounting Plate

A similar mounting process is used for the inverter.

- Attach two brackets to the inverter mounting plate, supplied with the inverter, as shown in Figure 27.
Step 30. Mount the iBOS assembly to the Rack

- Have one person lift the iBOS and bracket assembly into place on the rack.
- The second person secures it to the rack, using a bar clamp, or one Tek-screw on each side, as shown in Figure 28.
- To make the installation more secure, drill through the rack and use a bolt, nut, and lockwasher (not supplied) to secure the iBOS assembly to the rack. Do this for both sides.

Step 31. Mount the Inverter Mounting Plate Assembly to the Rack

- Have one person lift the Inverter Mounting Plate and Bracket assembly into place.
- The second person secure it to the rack with Tek-screws. Bolt it, as in Step 30.
- Attach the inverter to its mounting plate.

When you are done, it should look like Figure 26.
Step 32. Make the Hydronic Connections

- Connect the hydronic lines according to the diagram in Figure 29.
- The expansion tank mounts on its own bracket, and is connected via a flexible hose.
- Note the bare copper overflow pipe (top right). This directs the discharge from the pressure-relief valve to a suitable location.

**Figure 29. Hydronic Connections**
Step 33. Mount the Single-Gang Junction Box

The single-gang junction box is pre-wired with a three-conductor power cable. This cable has connectors pre-installed for use with the PV panel and the ground connection.

- On each row, attach a single-gang junction box to the back of the receiver, at the iBOS end.
- DO NOT connect the PV panel power yet.

Figure 30. Single-Gang Junction Box Mounting

Step 34. Make the Ground Connection

- Connect the array grounding wire (at left in Figure 30) to the green conductor of the heavy power cable, using a wire nut.

Step 35. Ground the Rack

- The rack must be grounded. Connect it to a suitable ground, per local codes.

Step 36. Inspect and Clean

Installation is complete. Carefully inspect the entire assembly for loose or missing fasteners. Pick up all trash.
## Revision History

<table>
<thead>
<tr>
<th>REVISION</th>
<th>DATE</th>
<th>NOTES</th>
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<tbody>
<tr>
<td>1.0</td>
<td>2012-01-17</td>
<td>Initial Release.</td>
</tr>
<tr>
<td>1.01</td>
<td>2012-01-30</td>
<td>Fixed typo, clarified that 32 mm wrench is needed; 1-1/4 in does not fit consistently.</td>
</tr>
<tr>
<td>1.1</td>
<td>2012-02-26</td>
<td>Added temp-sensor to controller wiring. Removed system wiring; that info is now in the commissioning guide.</td>
</tr>
<tr>
<td>1.2NC</td>
<td>2012-03-15</td>
<td>Corrected mis-labeled iBOS hydronic fittings. Added step to check PV cell orientation.</td>
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