

## 4 Assembling The Steel Solar Rack

The following is a list of safety situations likely to be found during the assembly of your Steel Solar Rack system along with general safety recommendations regarding prevention.

### *Protecting Yourself and Those Around You*

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#### **WARNING**

*Keep children and pets at a safe distance from the work area and be certain they are under care of a responsible adult.*

*Follow manufacturers' recommendations for the use of tools at all times.*

*Do not attempt to assemble this unit without the assistance of another person.*

*Always wear appropriate protective clothing for the task when in the construction area.*

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#### **DANGER**

*Call 811 ( Dig Safe) before attempting to dig for Micro Tube burial.*

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## 4A: About The Steel Solar Rack

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The Sunward Steel Solar Rack is a durable powder-coated frame that goes together easily, positions the Solar Collectors at the proper angle, and is very heavily built to withstand the elements.

Your Solar Rack can be found on our shipping crate in the box labeled "Steel Solar Rack". This box will also contain the Earth Anchors and the rod to drive them into the ground. The rack does not require any concrete footings but we do recommend the feet of the rack be mounted on concrete blocks (*not provided*).

The following pages will give you step-by-step instructions for assembling your Solar Rack, mounting the Solar Collectors and connecting the Micro-Tubing. These activities should take you and a helper approximately 2 hours to complete.



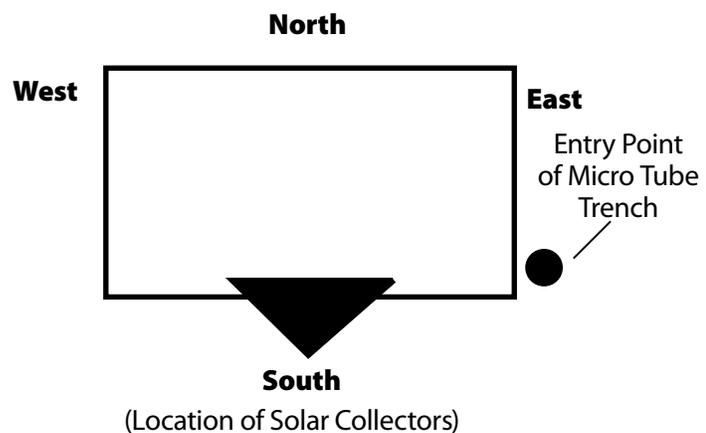
## 4B: Orientation

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Find a location for your Solar Rack. Your preliminary site assessment will have indicated the proper compass orientation for maximum Solar Collector exposure. If you have not had a site assessment, please visit the FREE consultation page on our web sit. Generally, the orientation should be within 45° either side of due South.



**South**



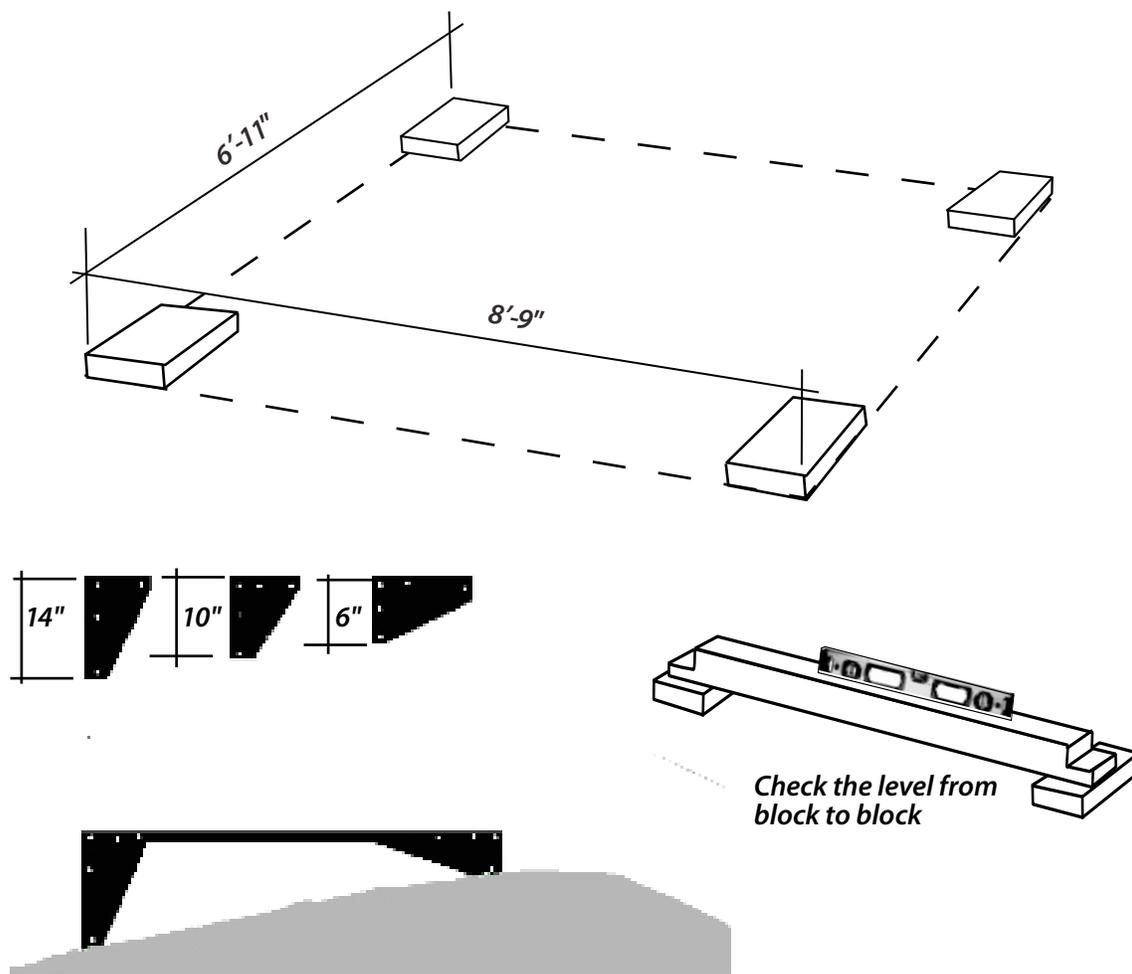
## 4C: Site Preparation

1. Sunward recommends the use of four cement blocks to support the rack. These are not included in the parts supplied, but are readily available at your local lumber yard or hardware store. Common sizes for the solid blocks are 8" wide X 16" in length. Thickness ranges from 2" to 4".

The overall dimensions of the assembled Solar Rack are 8'-1/2" x 6'- 3-1/2". If using cement blocks, use a level and shovel to get them to sit as level as possible. Cut back the sod and compact the blocks firmly to the ground. The blocks will sit in an 8'-9" x 6'-11" rectangle with the longer dimension making up the North and South ends of the rectangle.

2. The Ground does not have to be exactly level thanks to the Universal Leveling Foot Supports (Part No. 274011). The Supports can be oriented in three heights to accommodate various slopes.

FIGURE 16



## 4D: Frame Assembly

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The frame is made up of several components. Please review the illustration below to become familiar with the assembly before starting.

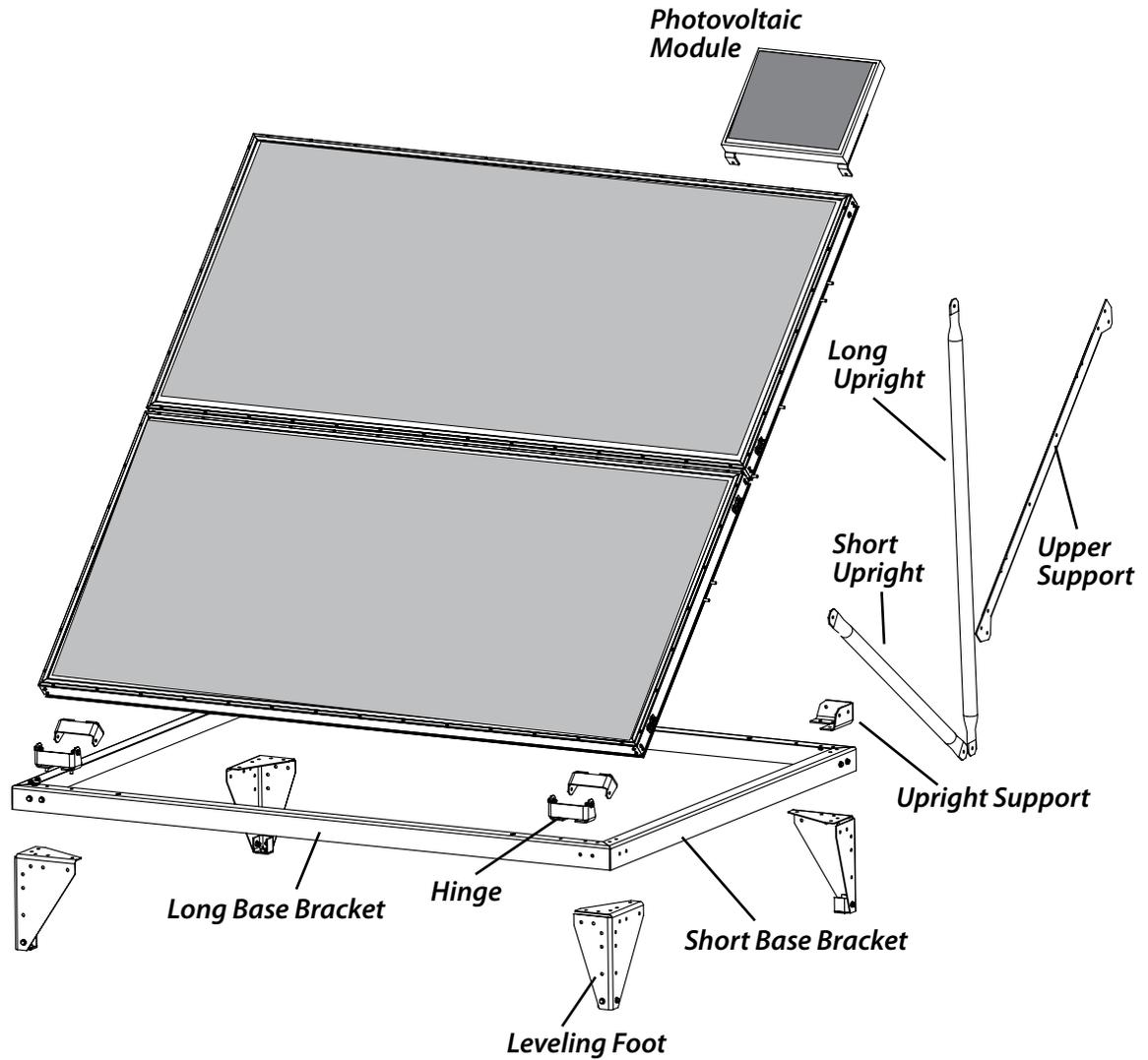


FIGURE 17

1. Locate the four (4) Leveling Foot Supports and four (4) Leveling Foot Brackets and assemble the orientation required using 2 Bolts, 2 Flat Washers and 2 Lock Nuts. Repeat for the other three (3) Leveling Foot Support / Bracket Assemblies.
2. Locate a Long Base Bracket. Starting at the south east corner and work clockwise (SE/SW/NW/NE), assemble a Leveling Foot Support to the Long Base Bracket using a Bolt, Flat Washer and Lock Nut.
3. Locate the two (2) Long Base Brackets, these will be the South and North faces of the frame. Locate the two (2) Short Base Brackets, these will be the East and West faces of the frame.
4. Bolt them together using the assembled Leveling Foot Support. Use the orientation needed for proper leveling. Bolt only in the horizontal, side holes. (Vertical bolting through the tops of the Base Brackets will be completed when additional parts are connected).
5. Repeat from corner to corner working in one direction. Long Base Brackets on the North and South, Short Base brackets on the East and West.

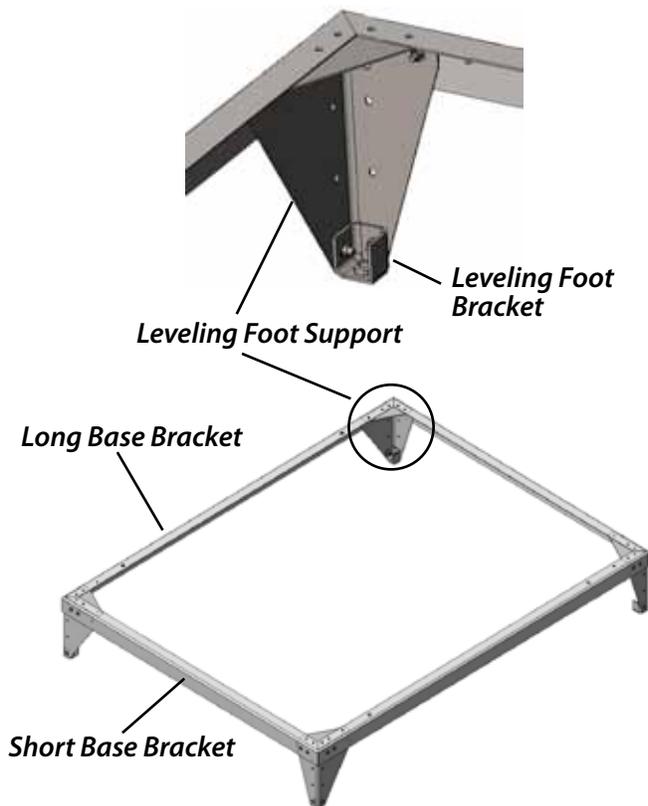


FIGURE 18

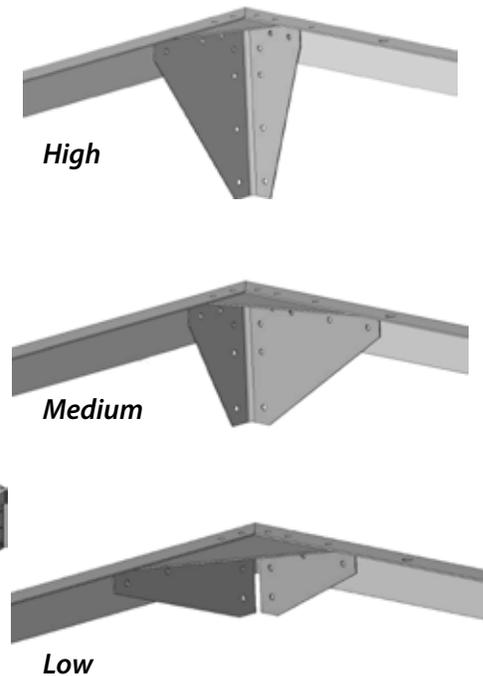
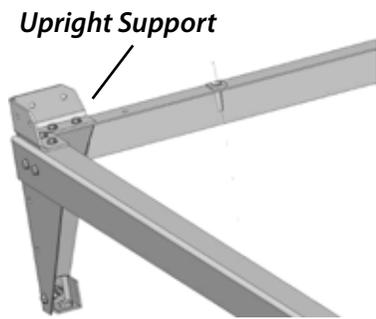
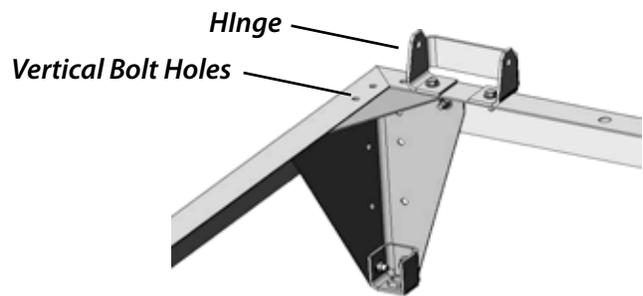


FIGURE 19

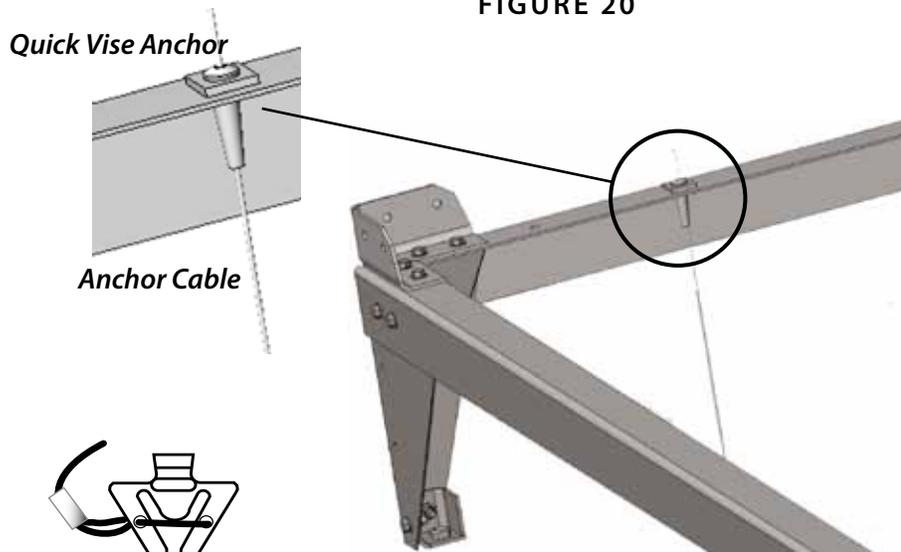
6. Attach Hinges to the SE and SW corners of the frame as illustrated in Figure 20.
7. Attach the Upright Supports to the NE and NW corners of the frame as in Figure 21.
8. Bolt vertically through all remaining bolt holes on the top edge of the Frame.
- 9.. It is now time to secure the frame to the ground. Drive the Ground Anchor 18" deep if possible, directly below where that hole will be located when the frame is in position. Remove the Drive Rod and insert the Quick Vise into the hole.
11. Feed the Cable through the bottom of the Quick Vise Anchor and pull it up tight through the vise grip with pliers.



**FIGURE 21**



**FIGURE 20**



**FIGURE 22**



**Ground Anchor**

**! WARNING**

Always use gloves when working with the Copper Ports and Collector Panels that have been exposed to the Sun

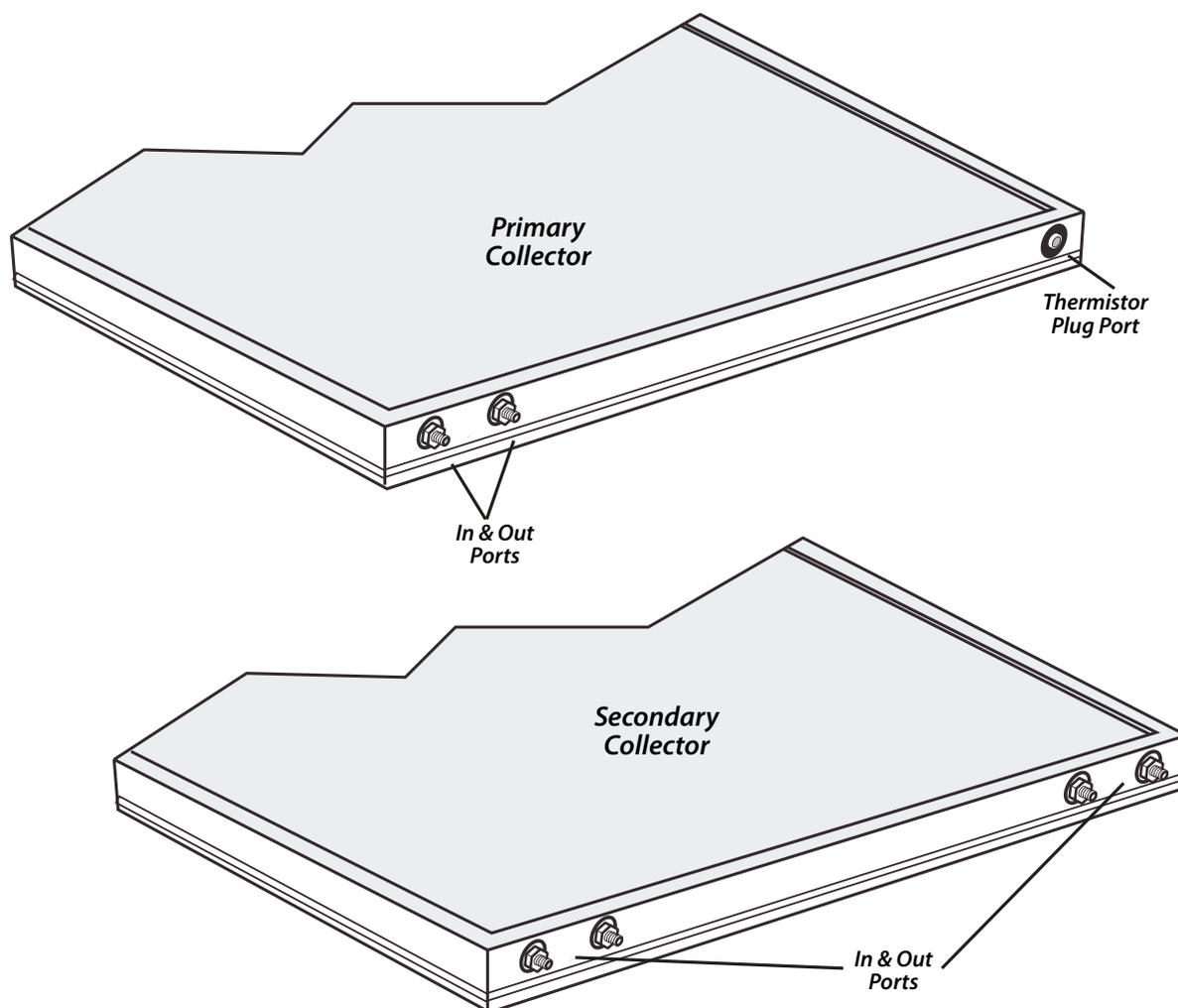
**! WARNING**

Do not attempt to install the Collector without another person as an assistant.

*TIP: The collectors will quickly heat up in sunlight. Keep the Collectors in the cardboard shipping containers until ready for installation.*

### 4E: Types of Solar Collectors

There are two types of Solar Collectors: Primary and Secondary. A Primary Collector has IN and OUT Ports and a Thermistor Plug Port. A Secondary Collector will have two sets of IN and OUT Ports.

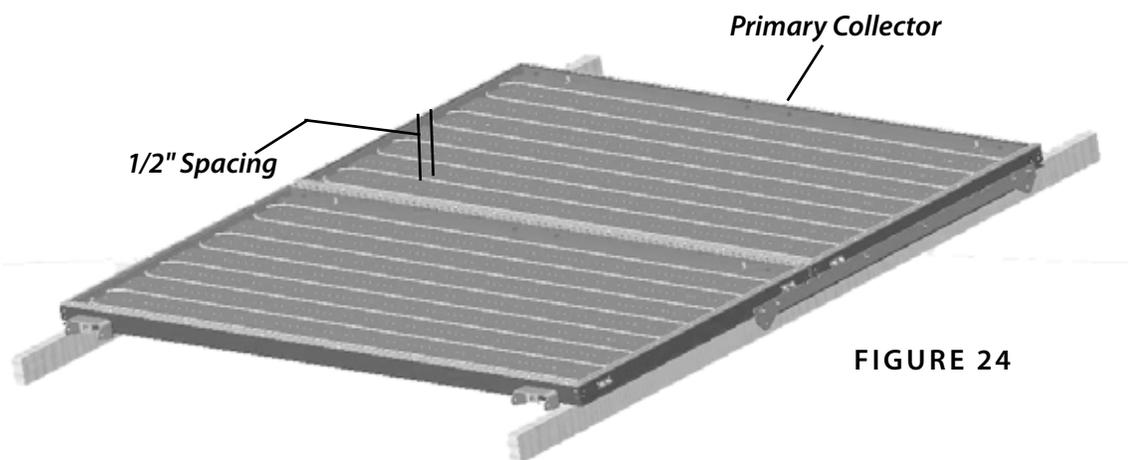
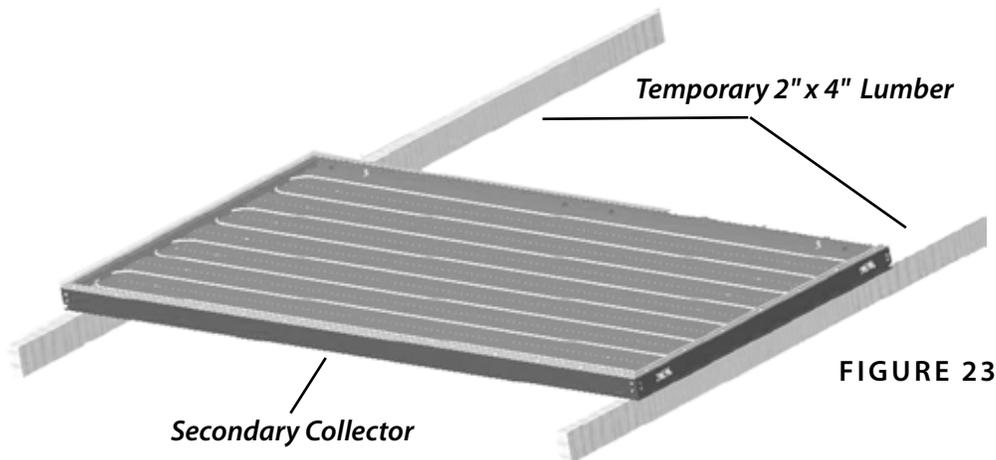


## 4F: Mounting the Collectors

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It is now time to prepare for mounting the collectors.

1. Place two (2) 8 ft. 2" x 4" pieces of lumber centered on the Long base Brackets of the assembled Solar Rack Base. (**Figure 23**).
2. Remove the Secondary Collector from its box and place it on top of the lumber with the Ports oriented to the East as illustrated. (**Figure 24**).
3. Remove the Primary Collector from its box and place it on the lumber above the the Secondary Collector with the Ports facing East. Space the Collectors approximately 1/2" apart. (*About the width of a Hex Head Bolt head*).



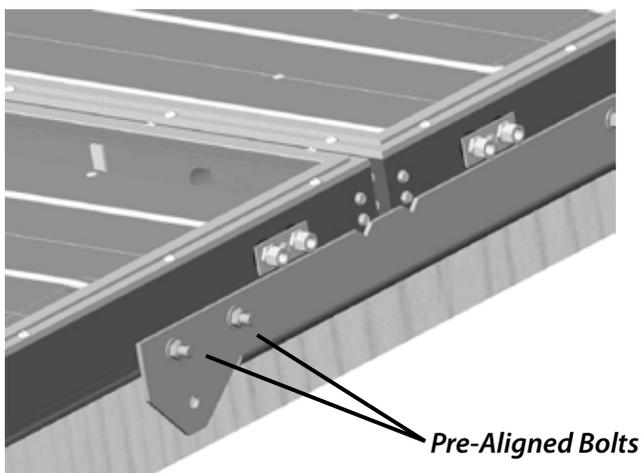
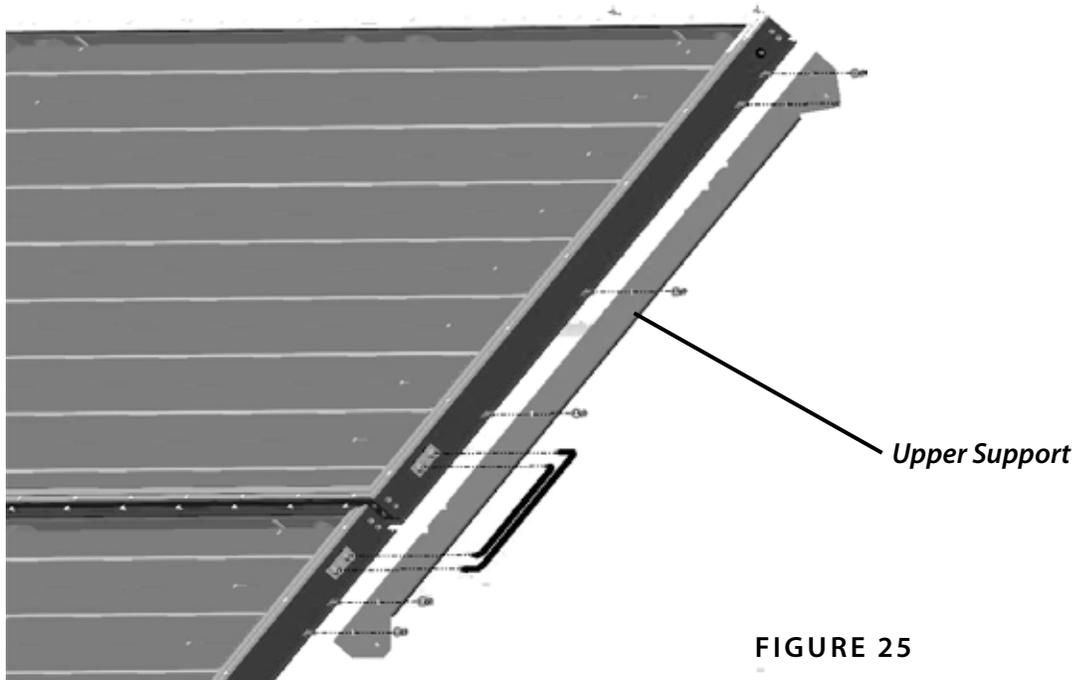
## Collectors continued

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- Slide two (2) Hex Bolts into the side bolt track of the Secondary Collector, and four (4) Hex Bolts into the side bolt track of the Primary Collector. Connect the two Collectors using Upper Supports as shown in Figure 25.

*TIP: Pre-aligning the bolts with the holes in the Upper Supports will save time.*

- Install Flat Washers and Lock Nuts. Tighten securely.
- Repeat steps 3&4 for the opposite side.



## Collectors continued

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- Slide the two (2) pieces of 2"x4" lumber off of the South Long Base Bracket.
- Slide two bolts into the lower Bolt Track and attach the Hinge to the bottom of the Secondary Collector with a Flat Washer and Locknut on each Bolt. Do not tighten the Nuts. Make certain the Collector is centered on the Frame. Align the Hinge with the Hinge Bracket previously attached to Solar Rack. Tighten each Lock Nut.

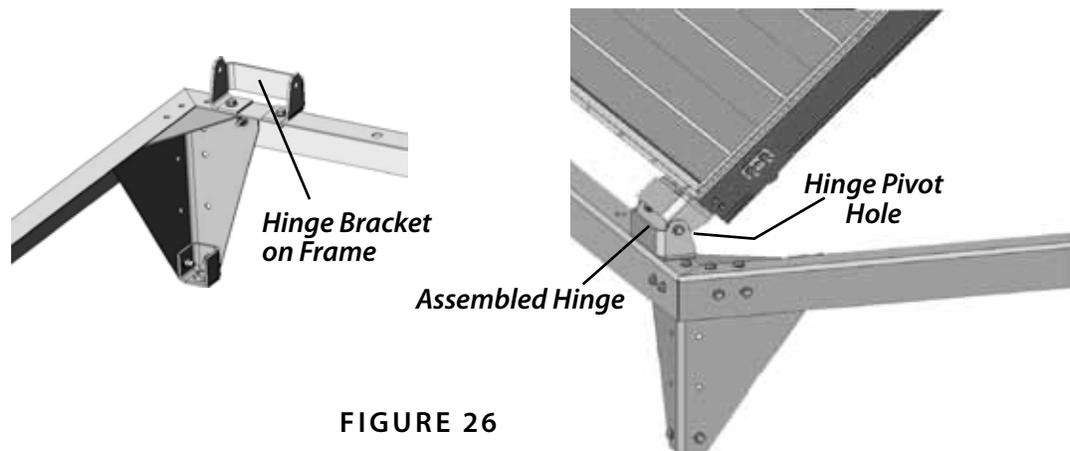


FIGURE 26

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**⚠ CAUTION**

*Have assistance to hold, support and move the Collectors when aligning the hinges.*

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- Install two bolts in the Hinge Pivot Holes to create a hinge. Install Flat Washers and Lock Nuts. Do the same for the other side. ***Make certain they are secure, but do not tighten at this time.*** This will allow the Collector Assembly to pivot when the Collectors are raised.



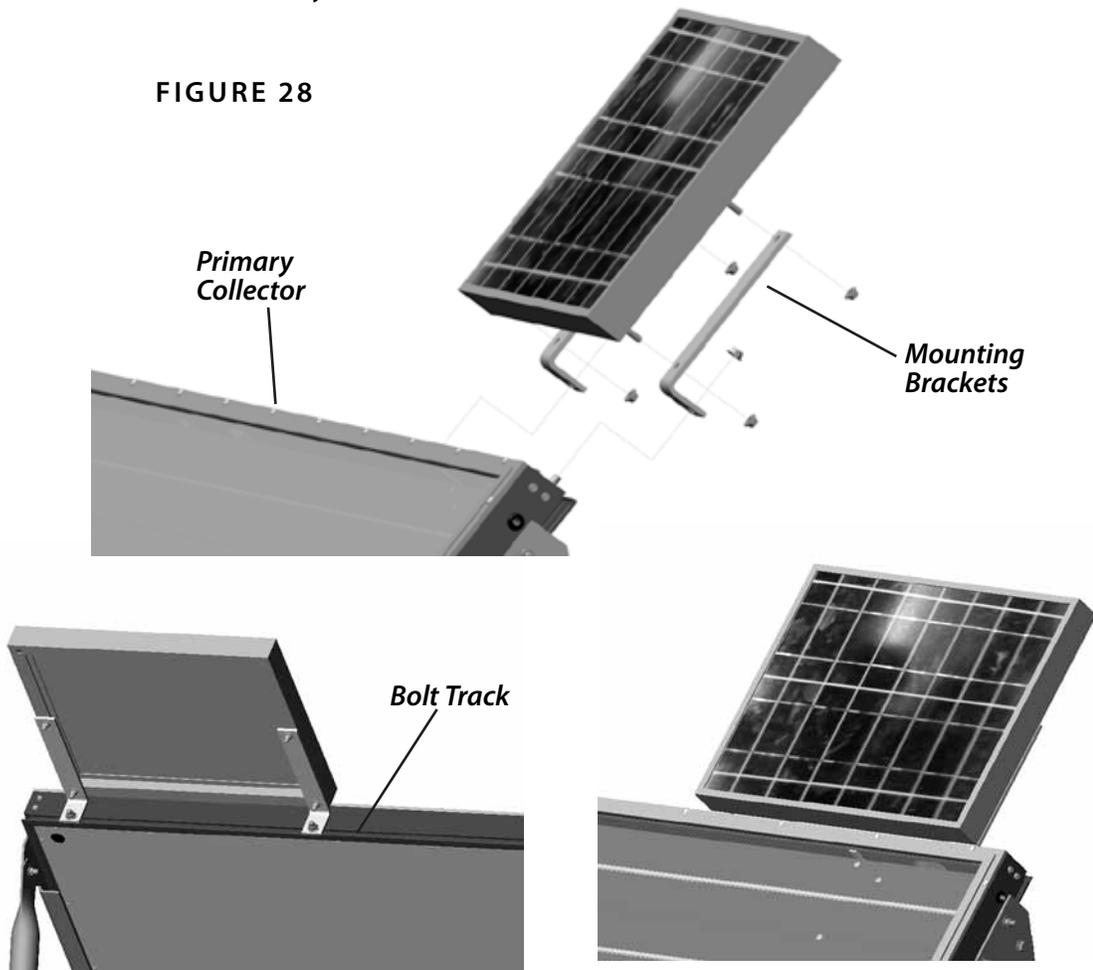
## 4G: Installing the Photovoltaic Module

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The 20W Photovoltaic Module is mounted to the Primary Collector and powers the SUNWARD Solar Pump.

1. Attach the two Mounting Brackets to the bottom of the Photovoltaic Module using the provided 5/16" Bolts, Flat Washers and Lock Nuts.
2. Insert two (2) 3/8" Bolts into the Top Collector channel.
3. Position the Photovoltaic Module as close to the top right hand corner of the Primary Solar Collector as possible as shown.
4. Align the Bolts with the Mounting Bracket holes and place the Module on the Bolts.
5. Apply a Flat Washer and Lock Nut to both Bolts and securely tighten the assembly.

FIGURE 28



## 4H: Connecting the Thermistor Wire and Power Cable

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These wires will be bundled with the Micro-Tubing.

1. Insert the end of the Thermistor wire into the Thermistor Port Terminal on the side of the Primary Collector, (the upper Collector if using two (2) Collectors), The wire should go in approximately 6-8".
2. Apply a liberal amount of silicon sealant provided on the Port terminal. Coil the excess Thermistor Wire and secure it loosely with a Zip Tie at the Photovoltaic Module.

## 4I: Installing the Micro Tube Connection between Collectors

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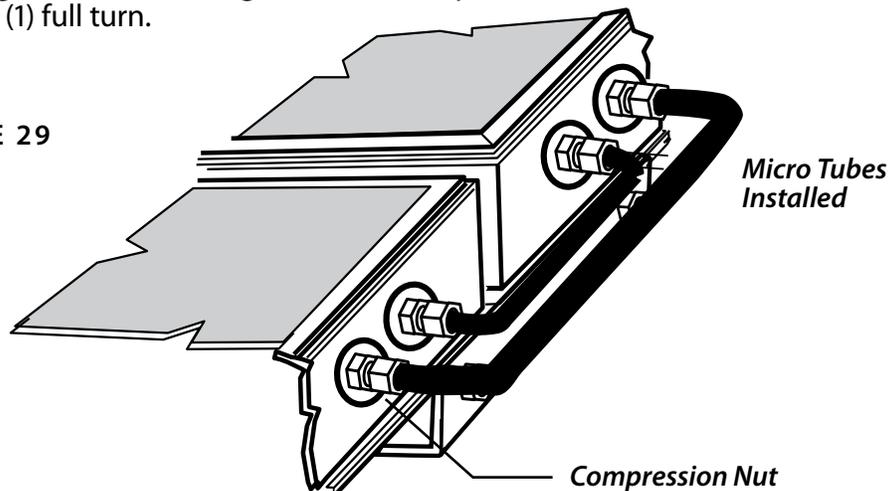
### **! CAUTION**

*Over tightening the Micro Tube connections can damage the Body Fitting on the Collector panels.*

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1. Remove the four (4) orange Caps from the Fittings on the Collectors.
2. Insert the two (2) insulated copper Micro-Tubes into the Solar Collector Ports .  
  
*TIP: Micro Tubing can be gently manipulated to align with Ports.*
3. Turn the 3/8" Compression Nut on each Fitting Body until finger tight.
4. Using a 5/8" Wrench, tighten each Compression Nut one (1) full turn.

FIGURE 29



## 4I: Running the Micro-Tubing & Cable

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The SUNWARD Micro-Tubing will be used to connect the Solar Collectors to the Heat Exchanger. The Micro-Tubing is well insulated and housed in a 3 inch flexible conduit ready for direct burial.

Bundled with the Micro-Tubing in the Flexible Conduit is the Cable from the Photovoltaic Module and the Thermistor for connection to the Solar Pump.

Try to minimize the number of connections for the Micro-Tubing. Only use Compression Fittings of the type supplied for all Micro Tube connections, following the general procedures and precautions as outlined below.

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**⚠ CAUTION** Use a Pipe Cutter to cut the tubing. This will leave clean, smooth edge. Hacksaw cuts will leave a rough, jagged finish that will cause leakage.

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- Avoid distorting the tubing with pliers or gripping tools.
- Only install Compression Fittings on straight areas of tubing. Always allow 1-1/2" to 2" of straight tubing on either side of the fitting.
- Do not install Compression Fittings in areas of movement or vibration.

**NOTE:** Should minor leakage occur at a Fitting, a simple tightening of the Compression Nut will usually be sufficient to stop the leak. Use two wrenches to tighten the Compression Fitting.

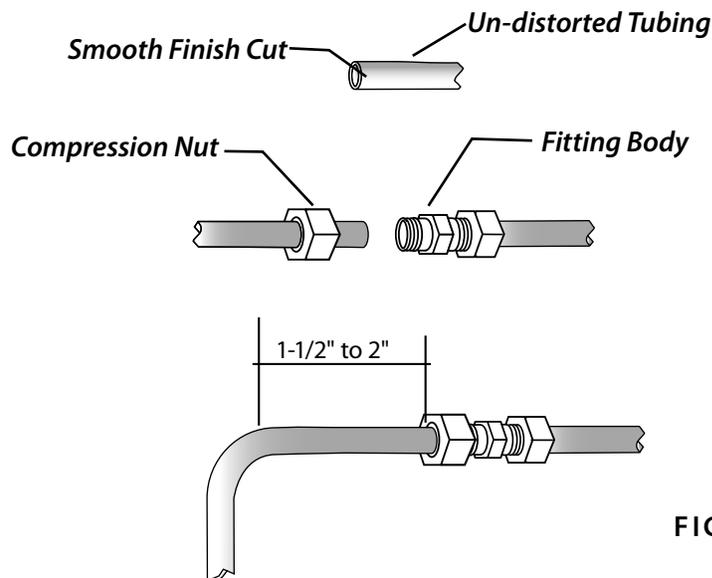


FIGURE 30

## 4J: Burying the Micro Tubing

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**⚠ DANGER** Notify "Dig Safe" before digging. All utilities should be located and identified prior to any trench making activity. Failure to do so can result in serious injuries.

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**⚠ CAUTION** Trenches must be a minimum of 18 inches deep and deeper in areas of traffic. Check your local building codes to be certain you are in compliance.

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It is recommended that the Burial Kit Conduit come out of the ground outside of the frame where it will be protected from damage by means of Conduit. Use a Tube Bender to avoid kinking.

1. The South East corner of your Site location should be no further than 95 feet from the house for the 100 foot Burial Kit or 45 feet for the 50 foot Burial Kit as indicated in your Site Analysis.
2. Locate and mark the penetration point on your house.

*TIP: Spray paint or mark with flags, as straight a line as possible from the ground mount location to the house penetration location.*

3. Dig a trench of proper depth from the house to the site. The trench should terminate as close as possible to the South East corner of the Frame and the house penetration location to insure a clean entry.

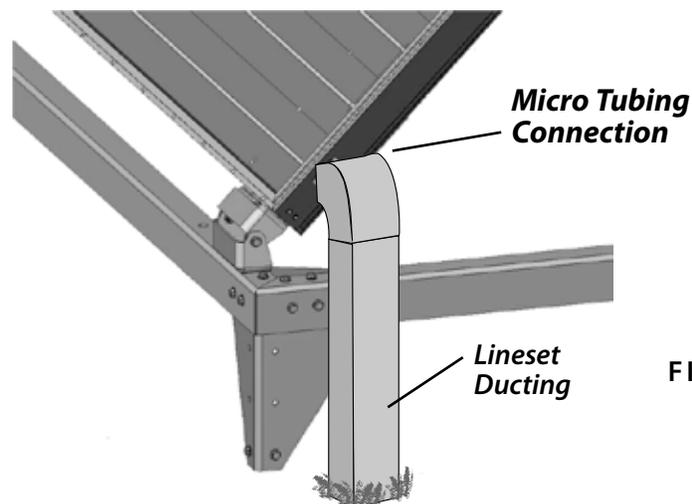


FIGURE 31

**⚠ CAUTION** Remove all rocks and sharp objects from the trench before installing the Conduit.

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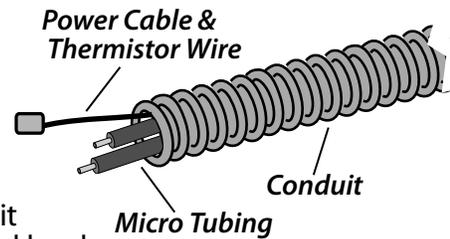
## Burying continued

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- Place the coiled Burial Kit next to the entry point of the house. With the coiled Power Cable facing the house, unroll the Burial Kit beside the trench.

**TIP:** Leave an extra 5 foot length to compensate for any errors or changes.

- Lay the Bundle in the trench.
- Bury the bundle making certain there are no sharp objects or large rocks resting against the Conduit. Holes in the Conduit will reduce the efficiency of the system.



- Measure and cut off the excess Burial Kit at Solar Collector end. The Conduit should terminate 2 inches above the ground level. Leave enough copper to reach the two Ports of the Collectors.

**NOTE:** Be certain not to cut the Power cable when cutting and removing the excess Burial Kit.

FIGURE 32

**TIP:** Use a Utility Knife with the blade setting at the shortest length to cut the Conduit.

- Install the 3"x2" Couplers on both ends of the Conduit.

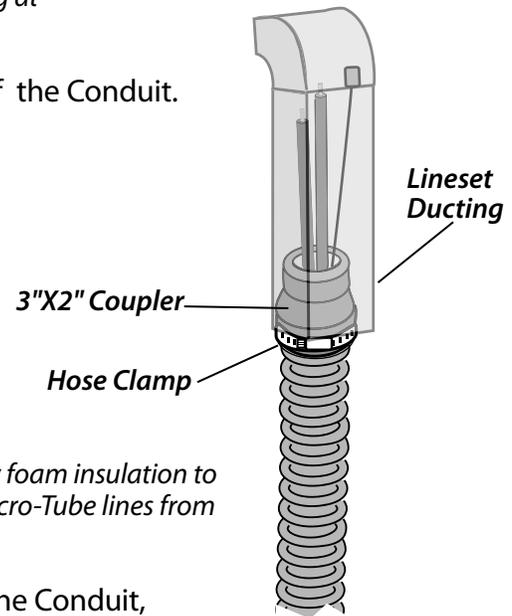
**TIP:** Stretch the wide end of the Coupler for an easier fit on the Conduit.

- Tighten the Hose Clamp on the Coupler to make a water-tight seal.

**NOTE:** Do not over tighten the Clamp. This can distort the Conduit and cause water leakage.

**TIP:** Fill the end of the Burial Kit with spray foam insulation to increase its efficiency and protect the Micro-Tube lines from water or debris penetration.

- To keep debris and water from entering the Conduit, cover the end with a plastic bag until ready to make the Micro Tube connections and Conduit installation.



#### **4K: Connecting the Micro-Tube Lines to the Heat Exchanger**

- 1) With a 5/8" wrench, remove the plugs from both ports on the Heat Exchanger.
- 2) Install a provided compression nut on each port until finger tight.
- 3) Insert the 3/8 copper of the Micro-Tubing into a fitting on the Heat Exchanger until it bottoms out.
- 4) Using a 5/8" wrench, tighten the nut 1 full turn.
- 5) Repeat steps 3 and 4 for the opposing Micro-tube line.

**NOTE:** Be certain that the 3/8 copper has not been warped or burred before inserting it into a fitting. If warped or burred, re-cut the Tubing with a pipe cutter.

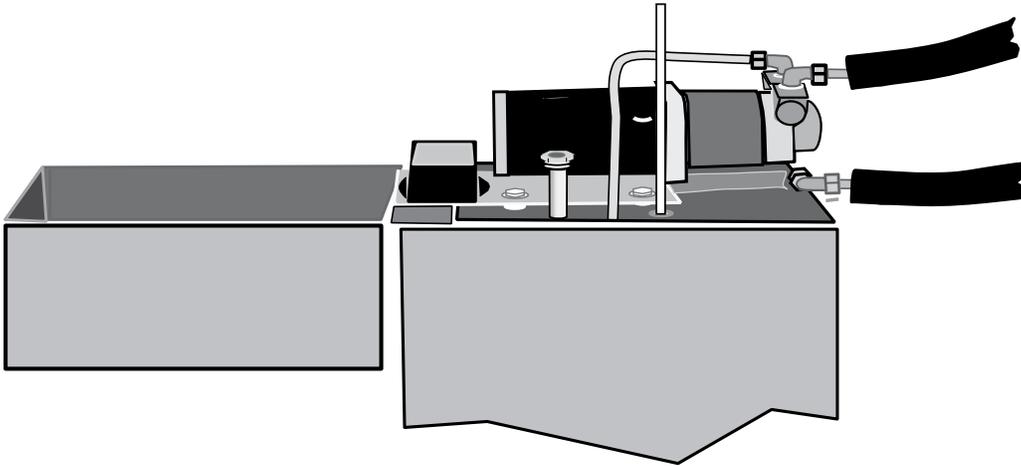


FIGURE 33