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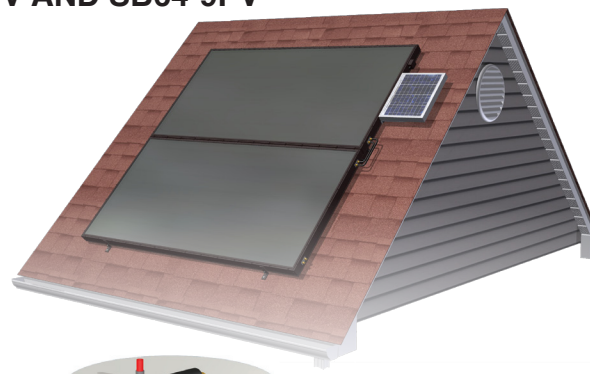
Solar Boiler™

INSTALLATION MANUAL FOR MODELS: SB32-9PV AND SB64-9PV



WARNING

The approved heat transfer fluid is 40% Propylene Glycol USP and 60% distilled water. The substituion of any other heat transfer fluid can cause irreparable damage and create a health and safety hazard.

The Solar Boiler™ module conatins 3.75 liters (1 US gallon) of heat transfer fluid when full.

The installation of the Solar Boiler™ system should be installed by a qualified technician.

Assemblies and materials shall meet requirements of the applicable codes and Standards for fire safety.

Solar Boiler™

SB32-9PV and SB64-9PV Solar Boiler™ System Components

Congratulations on the purchase on your new Solar Boiler™ system by Thermo Dynamics Ltd. The Solar Boiler™ is the newest and most advanced concept in residential solar domestic water heating systems.

This manual outlines all of the steps necessary for a quick trouble free installation. Read the entire manual carefully before any installation attempt is made.

Be sure to follow all local codes when installing the Solar boiler system.

Solar Collectors
S Series (Micro-Flo®)

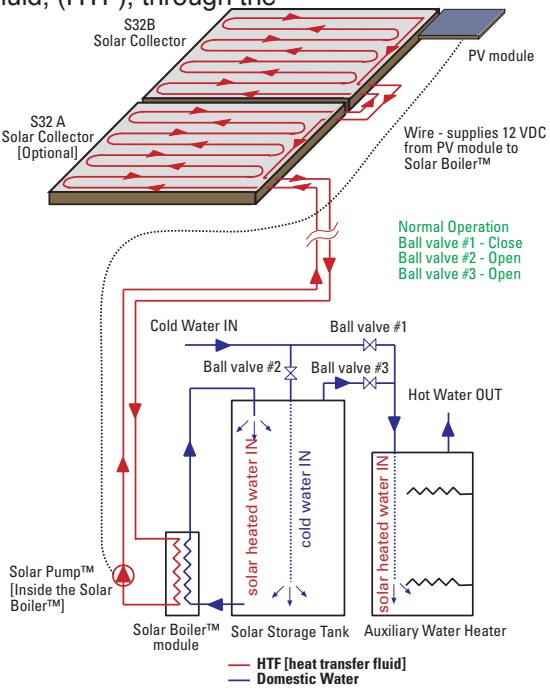
Solar Boiler™ module
Solar Storage Tank

A 270 liter, (60 IG) Storage tank is required for the installation and is included. In Canada, the tank must be CSA approved and all plumbing fittings must comply with CSA B.125

Quantity	System	Model	Description
1	SB64-9PV only	S32A-P	4' x 8' S Series Serpenitne Collector, "A", 4 ports
1	SB32-9PV SB64-9PV	S32B-P	4' x 8' S Series Serpentine Collector, "B", 2 ports
1	SB32-9PV SB64-9PV	SBM13DC	Solar Boiler Module - Solar Pump (complete with Delta-T Booster II and temp sensors) - Heat Exchanger - Expansion Tank - Glycol Resevoir (Complete with 4 liters of glycol) - Glycol inlet/outlet ports - Water inlet/outlet ports
1	SB32-9PV SB64-9PV	PV20	Photovoltaic Module, 20 Watt
1	SB32-9PV only	K1050	Serpentine Collector Mounting Kit (for 1 S Series - mounts flush to roof)
1	SB64 9PV only	K1055	Serpentine Collector Mounting Kit (for 2 S Series - mounts flush to roof)
1	SB32-9PV SB64-9PV	K1060	Photovoltaic mounting kit (mounts to Serpentine Collector)
1	SB32-9PV SB64-9PV	K2030-50	Copper Tube Kit (3/8" Copper tube, 2 x 50 ft, Insulation, 100 ft, 18/4 LVT wire, 60 ft
1	SB32-9PV SB64-9PV	GLYUSM	Propylene Glcyol USP, (mixed 40% glycol 60% water), 4 liters
1	SB32-9PV SB64-9PV	TG270SB	Solar Storage Tank

How the Solar Boiler™ Works

- Solar collectors absorb sunlight and convert it to heat.
- When there is sufficient sunlight, the photovoltaic module produces electricity and turns the pump.
- The pump circulates heat transfer fluid, (HTF), through the solar collectors.
- Heat is transferred to the HTF in the solar collector.
- The HTF is returned to the heat exchanger in the Solar Boiler™ module.
- The heat is transferred to the water which circulates naturally to the top of the solar storage tank.
- Solar heated water is stored in the solar storage tank until water is drawn from the auxiliary tank (in this case an electric water heater).
- As hot water is drawn from the electric water heater it is replaced with solar heated water.
- The electric heaters increase the temperature of the solar heated water, if necessary.
- The electrical energy required to heat water is significantly less when water is preheated by the solar water heater.
- In this manner, the solar water heater saves electrical energy.



NOTE:
The Solar Boiler™ is designed to shut off when a temperature of 70°C (158°F) is attained in the solar storage tank.

The heat transfer fluid is a 40/60 % by volume mixture of Propylene Glycol USP and distilled water. The Solar Boiler™ module contains 3.75 liters (1 US gallon) of heat transfer fluid. An additional 3.75 liters (1 US gallon) is supplied with the system for filling the system during start up.

The maximum safe working pressure of the heat transfer fluid is 60 psi, (410 kPa).

The Solar Boiler™ system is inherently grounded through copper piping connected to the main water supply. Ensure that household ground is adequately electrically grounded.

System and Installer Details

Installer	
Address	
Tel:	
Fax	
Email:	

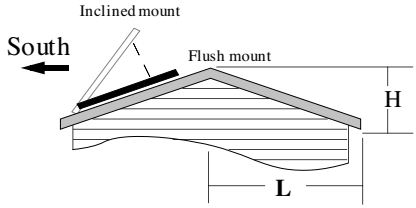
System Details	
Solar Boiler Model	
Solar Collector Serial#(s)	
Solar Boiler Serial#	
Storage Tank Serial#	
Orientation E or W of South	
Collector Slope	
Collector Mount (Flush or Inclined)	

Solar Collector Location

Micro-Flo® solar collectors are designed to work with the Solar Boiler™ module and other Micro-Flo® systems.

Locate the solar collectors on the roof of your home that is oriented true south or as close as possible. There are no major losses up to 45° east or west of true south. If your orientation is not in this range, consider a ground mounting system. The solar collectors are to be installed such that they are not shaded for at least 5-6 hours during the middle of the day.

The recommended slope is equal to the local latitude plus or minus 10°. For example, Halifax, Nova Scotia is at a latitude of 45°. Therefore the recommended collector slope for a home located in or near Halifax is between 35° and 55°. For effective snow removal in the winter a slope of at least 45° is recommended.



To calculate the slope of your roof, measure the dimensions “H” and “L” as shown in the figure. Calculate the quantity H/L and compare it to the table to determine if an inclined mount is required.

Angle	H/L	Rise/Run
14°	0.25	3/12
18°	0.33	4/12
23°	0.42	5/12
27°	0.50	6/12
34°	0.67	8/12
45°	1.0	12/12

Inclined Mount

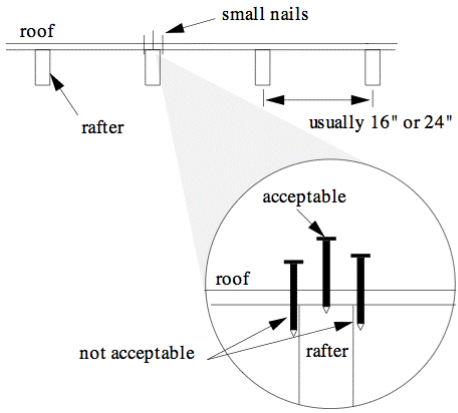
The inclined mounting kit allows the collectors to pivot in the front and uses aluminum channel to support the solar collector at the rear. Instructions are provided with the rack mount kit.

1 – Locating Roof Rafters

Locate the rafters directly under the solar collectors, and at least 8” from the ends of the solar collectors. In the case of 4’ x 8’ solar collectors and 24” rafter spacing, the clips should be mounted six feet apart (that is, one foot from the edge of the collector).

To find the center of the rafters, lift the shingle and use small nails to find the two edges of the rafter.

Drill a 1/4” pilot hole in the rafter for each of the front mounting clips.



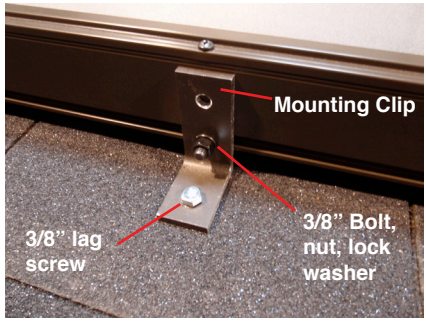
2 – Flush Mounting Micro-Flo® Solar Collectors

Fill the holes with silicon sealant and secure the two front clips to the roof using lag bolts. Seal the perimeter of each mounting clip base with silicon.

Take the “A” solar collector and slide two 3/8” bolts in the bolt track.

Loosely fasten these bolts to the bottom hole of the front mounting clips using a lock washer and nut.

Center the solar collector so that the spacing from the end of the solar collector to the mounting clip is equal on both ends. The solar collector ports must be on the right hand corner of the solar collector when, viewed from below.



3 – Optional Second Solar Collector

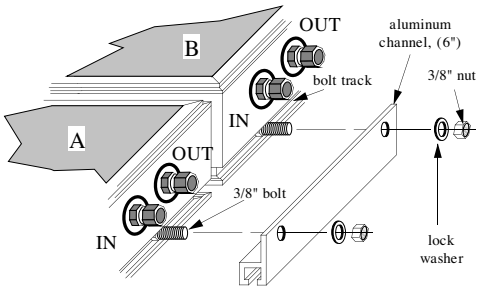
If you have a two solar collector system, place the B solar collector above the A solar collector. Make sure that the ports are on the right hand side.

Using the aluminum channel, fasten collector B to A as shown in the figure.

Fasten the upper mounting clips (not shown) to the top of the collector(s), and use lag bolts to secure them to the rafters in the same manner as for solar collector A.

Tighten all nuts that secure the collector(s) to the mounting clips.

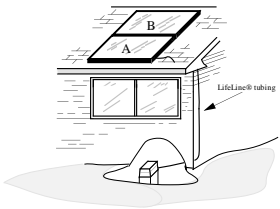
Silicon seal all roof attachments.

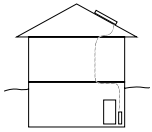


4 – Copper Tube Kit Installation

The copper tube kit is used to connect the Solar Boiler™ module to the solar collectors.

All of the copper tubing should be sleeved with the insulation provided. The insulation is Elastomeric Expanded Closed Cell with a 0.5” thickness. Mark one copper tube at both ends with tape to identify the supply and return lines.





Run the copper tube and PV Sensor wire (LVT 18/4) to the solar collectors via an unused space or closet. If the bundle is run outside along the house, sleeve it in a plastic conduit such as down spout. Note: All copper tube installed in the horizontal position must slope down 1/4" for every horizontal foot. Secure the Copper tube at intervals of 6 feet with clamps. Use caution when bending the tube to avoid kinking.

5 – Copper Tube at Solar Collectors

The copper tube roof penetration is made adjacent to the “A” collector for the SB64-9PV system and the “B” collector for a SB32-9PV system.

Make a roof penetration at a position 8" - 10" horizontally away from the “A”, (“B”) collector bottom ports. A 3/8” hole for each tube and the wire is sufficient.

Pass about 2 feet of Copper tube through the roof penetration from below. Clamp the copper tube to the truss. Do not crimp the copper tube.

Seal the roof penetration with silicon sealant.

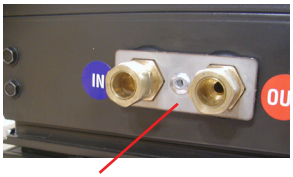
If the copper tube has been installed on the outside of the house, a roof penetration is not necessary. Simply bend the tubing bundle around the soffit and up to the solar collectors

6 – Copper Tube Connection to Collector

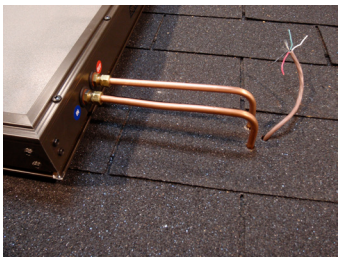
Connect the 3/8" copper tube to the "IN" (blue) port using a 5/8" and 11/16” wrench. Be sure to hold the bulkhead union from moving during this process. Connect the other 3/8" copper tube to the "OUT" (red) port.

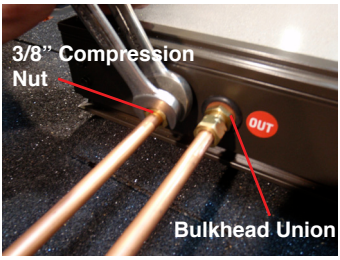
IMPORTANT: The 11/16” wrench is required to prevent the bulkhead union from rotating while turning the nut with the 5/8” wrench.

As of January 2010, S Series collectors are equipped with Bulkhead Union locking plates. This eliminates the need for an 11/16” wrench.



Bulkhead Union Locking Plate



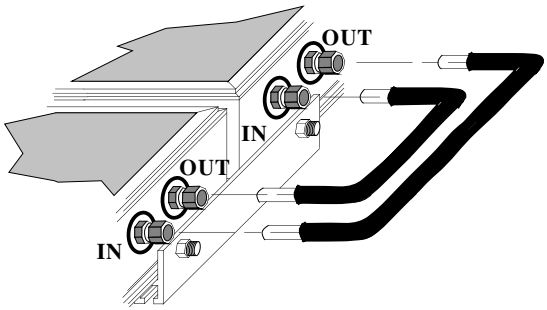


7 – Connection Between Collector A and B

Place the 3/8" compression nuts on the fitting body finger tight.

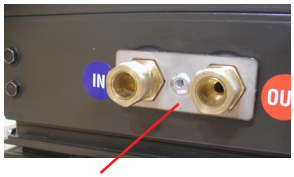
Insert the copper tubes into the ports as shown, until they bottom out.

Using a 5/8" and a 11/16" wrench, tighten the nuts one full turn.



IMPORTANT: The 11/16" wrench is required to prevent the fitting body from rotating while turning the nut with the 5/8" wrench.

As of January 2010, S Series collectors are equipped with Bulkhead Union locking plates. This eliminates the need for an 11/16" wrench.



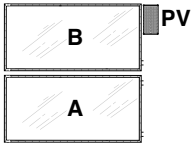
Bulkhead Union Locking Plate

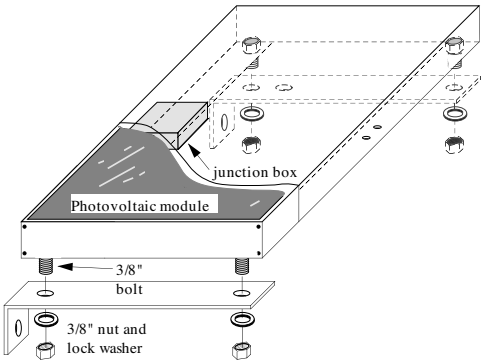
8 – Preparing the Photovoltaic Module

Attach the two large aluminum brackets to the photovoltaic module using the 3/8" bolts, nuts, and lock washers supplied. Make sure that the junction box on the back of the PV panel is at the top.

Make sure both aluminum angle brackets are securely fastened to the photovoltaic module.

Grounding: The photovoltaic module is inherently grounded through the mounting hardware attached to the solar collectors.





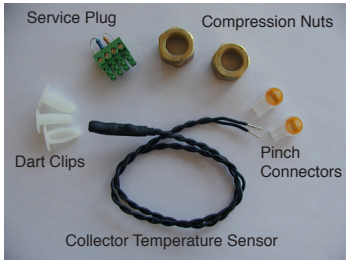
9 – Wiring the Photovoltaic Module and Collector Sensor

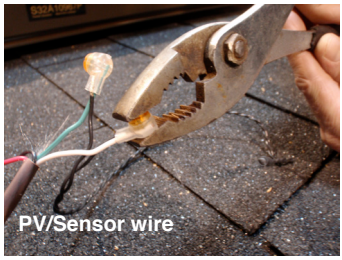
Open the junction box located on the photo-volatic module, and note the positive terminal marked "+" and the negative terminal marked "-".

Drill 2 small holes and insert the 18/4 LVT wire in the box. Connect the “RED” to “+” terminal and the “BLACK” to “-” terminal.

If your “B” solar collector is equipped with a sensor enclosure as pictured in step 10a, pro-ceed to step 10a.

Feed the white and green wires out of the junction box and connect them to the collector sensor using pinch connectors supplied.





10 – Locating the Photovoltaic Module

Locate the photovoltaic module as shown in the diagram, along the port side of the “B” collector. Using the 3/8" bolts, washer, and nuts, attach the photovoltaic module to the "B" collector bolt track as shown in the diagram. Ensure that all the nuts are tightened securely in order to provide proper grounding of the PV module.

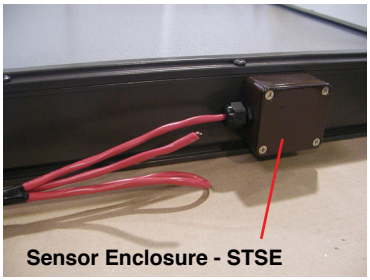
Insert the temperature sensor into the “B” collector. It should go in about 6 to 8 inches. Seal with silicon.

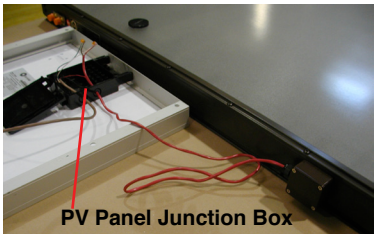
Using the connectors provided, crimp the sensor wires to the green and white wires.

10 a – Temperature Sensor Enclosure (some models)

As of May 2010, some models of the S32B-P solar collector are equipped with a temperature sensor enclosure. A picture is shown to the right.

The temperature sensor has been installed in the solar collector and is located in the sensor enclosure. The wire coming from the sensor enclosure goes to the PV panel junction box.

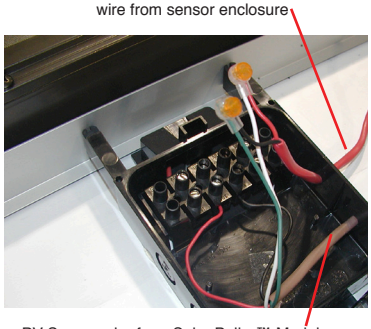


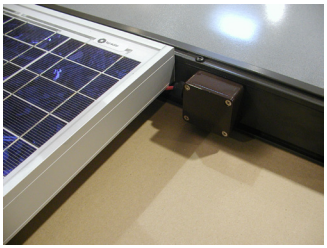


10 b – Wiring the Photovoltaic Module and Collector Sensor

Using the pinch connectors provided, connect the green and white leads from the PV sensor cable, to the wire leads from the sensor enclosure. Polarity is not important.

Close the PV panel junction box and mount the PV panel as shown in the picture to the right.





11 – Setting Up the Solar Boiler™ Module

Place the Solar Boiler™ module and solar storage tank next to your auxiliary water heater.

Attach the Solar Boiler™ module to the solar storage tank using the unions provided.

Tighten unions.

The solar storage tank is connected in series with the auxiliary heater.

Connect the cold water line to the cold water inlet of the solar storage tank.

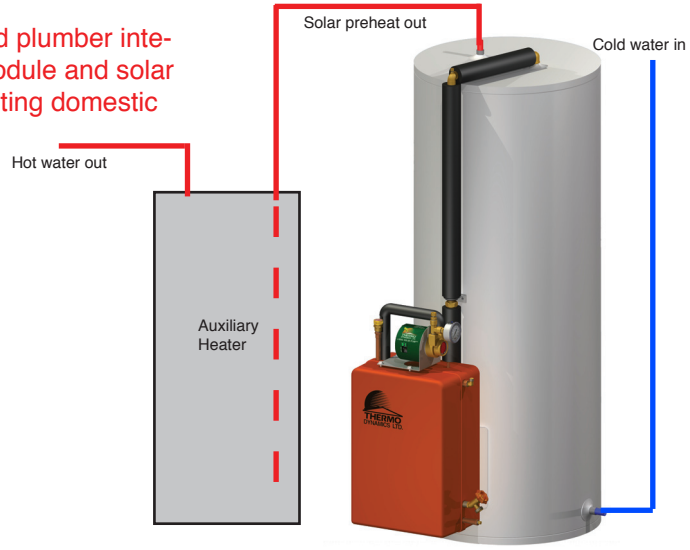
Connect the top hot oulet to the cold inlet of your auxiliary heater.

Steps 13 and 14 explain how to install an optional isolation bypass.

12 – Setting Up the Solar Boiler™ Module, (Top Connections)

Plumb the TPRV to a drain.

(We recommend a licensed plumber integrate the Solar Boiler™ module and solar storage tank with your existing domestic wate system.)

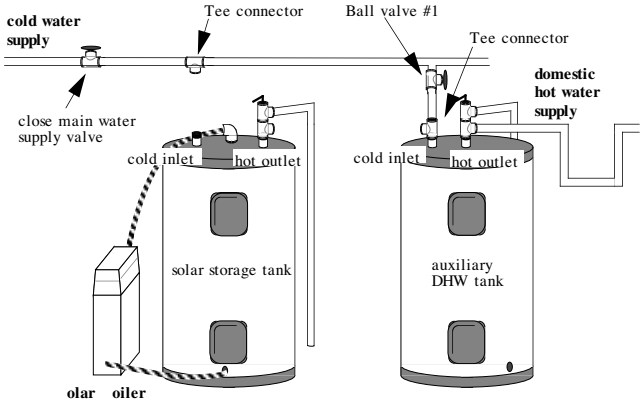


13 – Isolation Bypass Preparation (Optioanl)

Close the main cold water supply valve to the existing water heater.

Install two copper tees and a ball valve #1 as shown in the diagram. Label this ball valve: BALL VALVE #1.

Insulate all hot water pipes and the 5 feet of cold pipe leading to the solar storage tank. All insulation should be Elastomeric Expanded Closed Cell with a minimum thickness of 0.5”

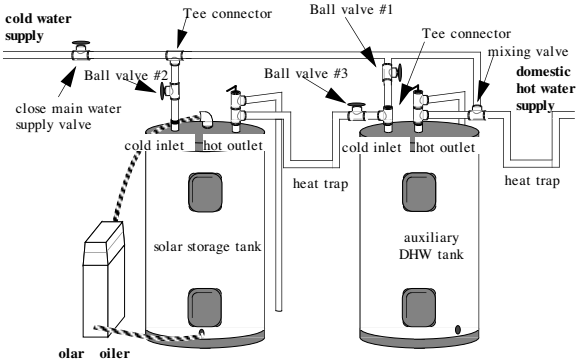


14 – Isolation Bypass connection (Optional)

Connect the main cold water supply to the cold inlet of the solar preheat tank. Install a ball valve in this line. Label this valve: BALL VALVE #2.

Connect the hot outlet of the solar storage tank to the cold water supply of the existing water heater. Install a ball valve in this line, and label it: BALL VALVE #3.
Install two heat traps as shown in the diagram to minimize heat loss from the solar storage tank. Please note that the domestic hot water supply line must have a mixing valve installed as shown in the diagram.

Insulate all hot water pipes.



or ormal solar operatio

- Ball valve #1 - close
- Ball valve #2 - open
- Ball valve #3 - open

For normal solar operation, the valves should be opened or closed as shown in the diagram.

15 – Solar Boiler™ Copper Tube Connections

The Solar Boiler ™ module is prefilled with heat transfer fluid.

Carefully remove the plugs from the brass fittings and retain. Replace with the 3/8" compression nuts provided. Turn the nuts on until finger tight.

Insert the marked copper tube in the fitting located on the pump until it bottoms. Using two wrenches, one on the fitting body and one on the nut, tighten the nut one full turn.

Repeat the above proceedure for the other copper tube.

IMPORTANT: Do not overtighten the nuts. Overtighten could cause a leaky connection and/or cracked nuts.

Ensure that the household cold water main is adequately electrically grounded

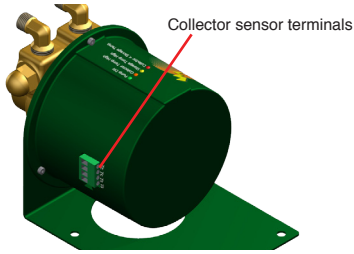
16 – Solar Boiler™ PV and Sensor connections

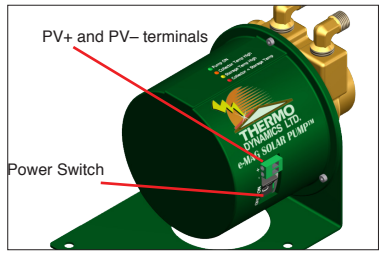
Ensure that the power switch is in the "OFF" position.

Connect the "WHITE" and "GREEN" sensors wires to the terminals marked "Tc".

The "Ts" terminals are for the storage sensor located in the Solar Boiler™ module and is factory installed.

Feed the "RED and "BLACK" wires to the "PV+" and "PV–" terminals. Connect the "BLACK" wire to the "PV–" terminal. Connect the "RED" wire to the "PV+" terminal.





Caution: Never connect any other sources of electricity to the eMAG Solar Pump™. A 12 VDC power supply may be connected directly to the motor wires, ORANGE = "+" and BLUE = "–"

17 – Filling Solar Storage Tank

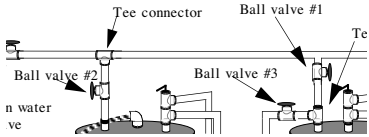
Pressurize the solar storage tank by opening the main cold water supply valve and a hot water tap (near the Solar Boiler™ if possible).

As the solar storage tank fills with water, air will escape through the open hot water tap. Check for leaks.

When the solar storage tank is full, close the hot water tap.

If an isolation bypass is installed, ensure that the solar isolation bypass valves are in the correct positions as indicated in step 14.

Ball Valve #1 - CLOSE
Ball Valve #2 - OPEN
Ball Valve #3 - OPEN



Carefully open the air vent at the top of the solar storage tank to allow air to escape from the Solar Boiler™ module.

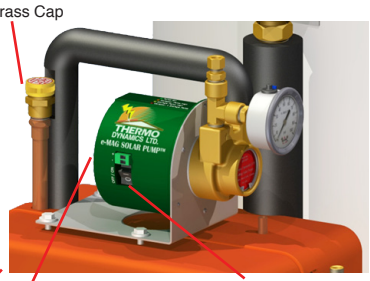
18 – Solar Boiler Start Up

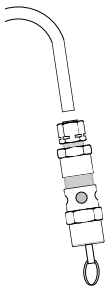
Remove the pressure relief valve and brass cap from the Solar Boiler module. Some fluid may be visible.

Remove the “Sensor Plug” from the eMAG Solar Pump and replace it with the “Service Plug” and turn the switch “ON”

If there is sufficient sunlight, the pump will begin operation. Initial start up of the system should be done with sufficient sunlight to ensure proper operation.

You will hear air bubbling in the Solar Boiler unit. This is normal.





The Solar Boiler™ module contains 3.75 liters (1 USG) of HTF. An additional 3.75 liters (1 USG) is provided to top up the system. Once filled, an SB32-9PV or SB64-9PV Solar Boiler™ system contains 4 – 6 liters (1.1 – 1.6 USG) of HFT

19 – Solar Boiler™ Start Up (continued)

Place a container under the vent tube. Using a funnel, SLOWLY pour the supplied heat transfer fluid into the Solar Boiler™ unit until fluid comes out of the vent tube. When the fluid stops coming out of the vent tube, replace the pressure relief valve and the brass cap, remove the "Service Plug" and replace with the "Sensor Plug".

Check for leaks at all copper tube connections. If a leak is observed, tighten the nut 1/4 turn. Remember to use two wrenches, one on the fitting body and one on the nut.

Caution: Never open the fill tube while the Solar Boiler is hot. Scalding fluid may spray. Always relieve the pressure in the Solar Boiler™ with the pressure relief valve before opening the fill tube.

20 – Solar Boiler Normal Operation

- The eMAG Solar Pump™ will turn ON when the Collector sensor measures 3°C higher than the Storage sensor.
- The eMAG Solar Pump™ will turn OFF when the Collector sensor drops in temperature so that it measures 1 degree higher than the Storage sensor.
- The Storage High temperature set-point is factory set to 70°C (158°F).
- The Collector High temperature set-point is 112°C (234°F).
- The Storage Low temperature set-point is -3°C (27°F).
- There is 3°C (5.4°F) of hysteresis for all setpoints, meaning that once a set-point has been reached, that temperature must fall by 3°C before the controller will turn ON again.

21 – eMAG Solar Pump™ LED's

The following describes the conditions required to illuminate each particular LED:
(Delta T refers to the difference in temperature between the collector temperature and the storage temperature.)

- RED: low delta T; Collector sensor open circuit.

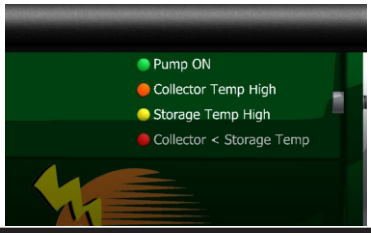
- YELLOW: Storage temperature HIGH; Storage sensor short circuit.

- AMBER: Collector temperature HIGH; Collector sensor short circuit.

- GREEN (ON): the Collector temperature is sufficiently greater than the Storage sensor. System should be running. However, if there is insufficient sunlight, the LED may be "ON" yet the pump will not be turning.

No LEDs will be illuminated when:

- The power switch is in the OFF position,
- There is no power from the PV panel (no sunshine),
- The Storage sensor is open circuited,
- The Storage sensor measures -3°C or less.

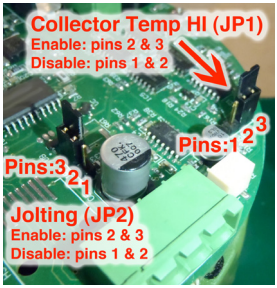


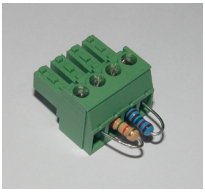
22 – eMAG Solar Pump™ Fuse and Service Plug

The eMAG Solar Pump™ has one internal fuse, size 5 x 20mm. Rated 4A, 250 VDC.

Should the fuse need replacement, it must be replaced with an equivalent rated fuse.

All eMAG Solar Pumps™ are shipped with "Jolting" enabled. It is normal to hear the eMAG Solar Pump™ pulse during start up and under low light conditions.

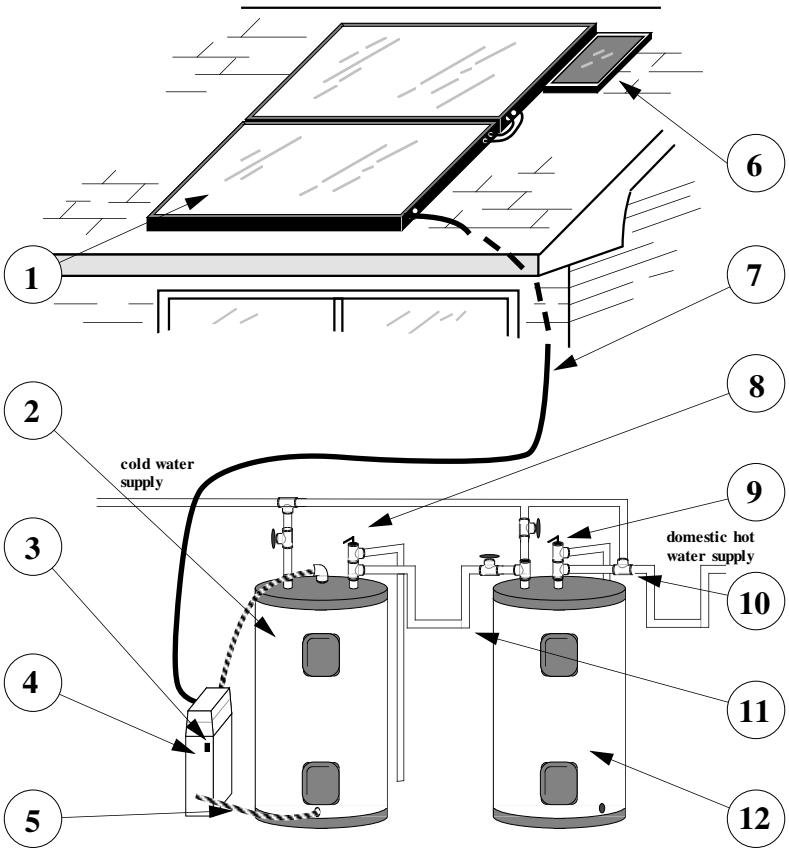




Service Plug - The "Service Plug" provided is used to override the eMAG Solar Pump™ temperature controls.

The "Service Plug" should only be used for commissioning and servicing the Solar Boiler™ System.

System Components



1. S Series (Micro-Flo®) solar collector(s)
2. Solar Storage Tank
3. eMAG Solar Pump™ (inside the cover of the Solar Boiler)
4. Solar Boiler™ Module
5. 3/4” Hard Copper Tube
6. Photovoltaic Module, 20 Wp
7. Copper Tube Kit, 3/8” with 3/4” wall insulation and 16/4 wire
8. Solar isolation and bypass valves
9. Temperature-pressure relief valves
10. Mixing Valve (recommended, not supplied)
11. Heat Traps
12. Auxiliary Water Heater

Operating Restrictions and Maintenance

Do not use the Solar Boiler™ system to heat any treated water system, such as pools, directly.

Use the proper mixture and quantity of propylene glycol USP and distilled water for freeze protection. DO NOT use automotive antifreeze, recreational vehicle anti-freeze, ethylene glycol, or other poisonous fluids. Thermo Dynamics recommends a mixture of 40% Propylene Glycol USP and 60% distilled water for use as the heat transfer fluid.

The maximum safe working pressure of the Solar Boiler™ system is 60 psi (410 kPa)

System Maintenance

- Solar Collector Glass:
  In some areas the glass plate of the collectors may require cleaning once a year with an industrial cleaning product. In areas where air pollution is severe, more frequent cleaning may be required.

- Back Flushing the Heat Exchanger: (see page 26)
  The Solar Boiler™ heat exchanger should be flushed with clean water ever 6 months. First, close the valve at the bottom of the solar storage tank near the 1/2” brass tee that connects the tank to the Solar Boiler™. Second, connect a hose to the drain bib at the bottom tank tee, and place the free end in a drain. Open the drain bib and allow water to flow for a few minutes. This will remove residue from the Solar Boiler™ heat exchanger.

- Reservoir Fluid Level:
  The fluid level in the Solar Boiler™ reservoir should be checked every year. Instructions for this procedure are part of the refilling instructions. (see page 22)

- Heat Transfer Fluid (HTF):
  The HTF should checked annually. If the HTF is very dark in colour and has a strong odour, it should be replaced. The extracted HTF should be disposed of at your local Environmental Disposal Depot.

  The pH and freeze protection capability of the HTF should be checked annually. The pH should not be less than 6. Contact your installer or Thermo Dynamics Ltd.

  With proper system operation and maintenance, the HTF should last between 4 and 15 years without replacement.

Repairs and Energy Saving Tips

If any of the components of the Solar Boiler™ or Micro-Flo® solar collectors are damaged, your local dealer or Thermo Dynamics Ltd. should be advised before any repair is attempted.

In the case of broken glass, we recommend the use of an industrial vacuum cleaner to remove all glass fragments from the collector and surrounding area. Cover the collector with a sheet of plywood to protect the absorber plate until a replacement glazing is obtained. Disconnect the wires from the photovoltaic module to the Solar Boiler™ and contact your local dealer or Thermo Dynamics Ltd.

The Solar Boiler™ should be repaired by a qualified solar technician. In some cases it may be necessary to disconnect the Solar Boiler™ for factory repair. Your local solar dealer or Thermo Dynamics should be notified before you attempt disconnection.

Energy Saving Tips

There are several ways to increase the performance of your Solar Boiler™ and to reduce hot water heating costs. Here are a few tips on getting the most from your water heating system.

- Add an insulating blanket to your electric water heater.*
- Add an insulating blanket to your solar storage tank.*
- Install low flow shower heads.
- Use warm water instead of hot when washing clothes.
- Insulate exposed hot water pipe where possible.*
- Minimize hot water use on overcast days.
- Use solar heated water as it is collected. If possible, postpone consumption of hot water to mid-morning or noon on a sunny day.
- Lower the thermostat setting of your electric water heater from 60°C (140°F) to 50°C (122°F). This should only be done by a qualified technician.

* Available from Thermo Dynamics Ltd.
Insulating tank blankets should be minimum 2” fibre-glass with foil backing. Exposed water pipes should be insulated with minimum 0.5” Elastomeric Expanded Closed Cell insulation.

Troubleshooting Guide

PROBLEM	COMPONENT	CAUSE	ACTION REQUIRED
Solar Boiler™ stays "OFF"	Potovoltaic Module	snow covered	- remove snow or allow to melt
		module is in the shade	- check to see if there are any removable obstructions shading the module
		loose wire connections	- check all wire connections - measure resistance to make sure that there is not an infinite resistance - measure voltage of module on a bright sunny day (approx. 17 VDC)
	Delta-T Booster II	defective	- contact dealer ot Thermo Dynamics to replace Delta T Booster II
		All LED's "OFF"	- insufficient sunlight to turn pump. Wait for sufficient light, ensure there is no shadow on the PV module
		Orange LED "ON"	- solar collector too hot. Wait for collector to cool
		Amber LED "ON"	- storage tank has reached high limit.
		Red LED "ON"	- collector temperature less than storage tank temeprature.
	Pump	pump is seized	- turn pump shaft to check that it is turning freely
	Motor	defective motor	- replace with new motor
	Sensors	loose wire connections	- check wire connections
		defective sensor	- measure resistance of sensors and reference chart in the back of manual. -replace sensor
Fluid Leaks	Solar Collectors	Copper tube connections	- use two wrenches to tighten the nut 1/4 turn
	Solar Boiler™	Copper tube connections	- use two wrenches to tighten the nut 1/4 turn
		pump housing	- replace pump. contact dealer or Thermo Dynamics Ltd. for assistance
		heat exchanger	- contact dealer or Thermo Dynamics for assistance
	Solar Storage Tank	fittings	- tank may require replacement,contact dealer or Thermo Dynamics
Solar heat transfer fluid not "hot" on bright sunny day	Pump/Motor	loose or defective wire connections	- have a technician repair or replace as required - remove pump to verify that motor is turning freely
	Pump	pump is seized	- turn pump shaft by hand to see that it is turning freely - have pump repaired or peplaced
	Motor	defective motor	replace with new motor and reattach pump
	Pump	pump very hot and fluid cool (turning but not circulating)	-check fluid level add fluid as required (see technical note attached to installation manual) -disconnect photovoltaic module and contact dealer or Thermo Dynamics

Troubleshooting Guide

PROBLEM	COMPONENT	CAUSE	ACTION REQUIRED
No Heat Transfer to Water on bright sunny day	Solar Boiler™ connections to top and bottom of solar storage tank	air trapped near top of tank connection	-open cap at top ot tank connection about 1/2 turn to allow air to escape (DO NOT REMOVE CAP)
		ball valve closed on cold inlet pipe to Solar Boiler™	- open ball valve. The handle should be parallel to the valve body.
	Delta T Booster II	All LED's are "OFF"	- wait for sufficient sunlight - make sure power switch is "ON"
		Orange, Amber, or Red LED "ON"	- wait for condition to stop
	Pump/Motor	pump very hot and fluid cool	- check fluid level and add fluid as required - turn Solar Boiler ™ "OFF" and contact Thermo Dynamics
Pump/Motor Unusually Noisy	Solar Boiler™ Cover	cover of Solar Boiler™ is resting against the motor or pump	- adjust cover
	Solar Boiler™ module	low fluid level in resevoir	- turn Solar Boiler™ OFF and wait for it to cool. Open brass cap and check fluid level with wooden dowel.

Solar Boiler Heat Transfer Fluid Draining Instrcutions

Your Solar Boiler™ is precharged with HFT (heat transfer fluid) which is a mixture of Propylene Glycol USP and distilled water (40/60 by volume). In the event that you should have to drain and/or refill the Solar Boiler™, follow these instructions to ensure proper system operation.

Draining the HTF (heat transfer fluid)

The HTF should never be drained during system operation. HTF should only be drained in the morning before system start up, or at least one hour after system shut down in the evening. This is to ensure that the HTF is not excessivily hot.

- Turn the Solar Boiler off using the switch located on the eMAG Solar Pump™.
- Relieve pressure by opening the pressure relief valve at the rear of the Solar Boiler™ module. Caution: Fluid may be HOT.
- Locate the HTF drain plug at the bottom of the Solar Boiler™ module
- To drain the fluid in the Solar Boiler™ module, place a container (minimum 4 liter capacity) under the drain of the Solar Boiler™ module. Using two wrenches, remove the drain plug. Open the fill cap to allow air to enter the module. To remove the fluid from the solar collectors, you will need to operate the eMAG Solar Pump™ using the service power supply (available from Thermo Dynamics Ltd.). Do not turn the system ON again until the Solar Boiler™ is refilled.

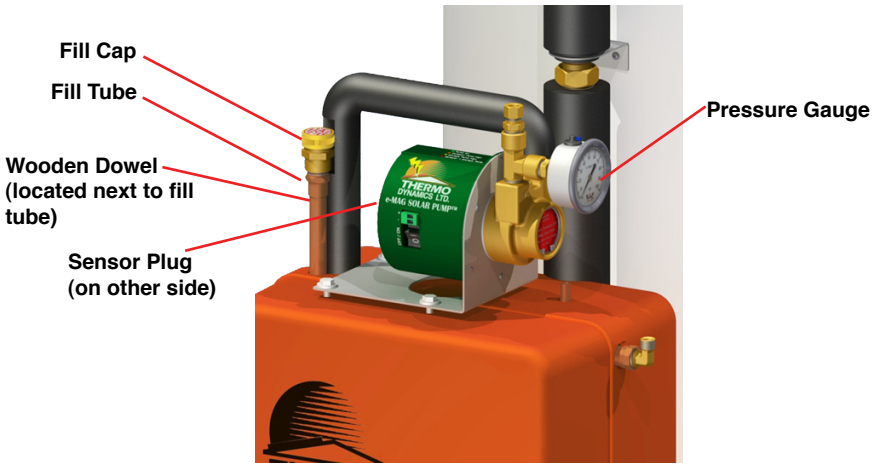
HTF Drain Plug

- The system is now drained. To refill the Solar Boiler™, follow the instructions listed on page 22.
- Replace the brass cap on the fill tube and hand tighten. Replace the pressure relief valve on the vent tube at the back of the Solar Boiler. Turn the Solar Boiler™ ON using the switch on the eMAG Solar Pump™.

The extracted HTF should be disposed of at your local Environmental Disposal Depot.

Solar Boiler Heat Transfer Fluid Refilling Instrcutions

- Turn the Solar Boiler™ OFF using the switch located on the eMAG Solar Pump™.
- Locate and remove the pressure relief valve attached to the vent tube at the back of the unit. Caution: Fluid may be HOT
- Locate the fill tube at the side of the unit and remove the brass cap from the fill tube. Caution: Fluid may be HOT. Using the wooden dowel provided check the fluid level in the reservoir. This level should be about 8 - 12" on the dowel. If the level is low contact your dealer or Thermo Dynamics Ltd. before continuing.
- If the fluid level is low inspect the system for signs of leakage. Inspect all visible fittings on the Solar Boiler™ and the connections at the solar collector on the roof. Also inspect under the Solar Boiler™ case for signs of HTF on the floor. The HTF, Propylene glycol USP, is very slippery and dries very slowly and will remain on surfaces for an extended period of time.
- The recommended heat transfer fluid is a 40/60 mixture by volume of Propylene Glycol USP and distilled water. Fluid should be added to the Solar Boiler with a funnel to prevent spillage. When adding fluid, follow the steps 18 and 19 on pages 13 and 14.
- The required volume of the HTF to fully refill the system is 4 – 6 liters (1.1 – 1.6USG)



Material Safety Data Sheet for Propylene Glcyol USP

The HTF (heat transfer fluid) used in this Solar Boiler™ system is a mixture of Propylene Glycol, USP and distilled water (40/60)% by volume.

The following is a brief outline of the Material Safety Data Sheet for Propylene Glycol, USP. For more information, contact Univar, reference MSDS: L1173.

Product ID: NR05363
CAS Registration #: 57-55-6
Product Name: Propylene Glycol USP/EP
Product Supplier: Univar
9800 Van Horne Way
Richmond
British Columbia
V6X-1W5
Tel: 1-866-686-4827
24-Hour Emergency Telephone # (CANUTEC): (613) 996-6666

1. Ingredients:
(% w/w, unless otherwise noted)
Propylene glycol CAS# 000057-55-6 99.8%

2. Environmental and Disposal Information:
Action to take for Spills/Leaks: Cover with absorbent material, soak up and sweep into bag.
Disposal method: Incinerate or bury away from water supplies in accor dance with local regulations.

3. Health Hazard Data:

EYE: May cause slight transient eye irritation. Corneal injury is unlikely. Vapour or mist may cause eye irritation.

SKIN CONTACT: Essentially nonirritating to skin on prolonged contact. Repeated exposure may cause slight flaking, tenderness, and softening of skin.

SKIN ABSORPTION: A single prolonged skin exposure is not likely to result in absorption of harmful amounts.

INGESTION: Single dose oral toxicity is extremely low. No hazards antici pated from ingestion incidental to industrial exposure.

Material Safety Data Sheet for Propylene Glcyol USP continued

INHALATION: A single prolonged (hours) inhalation exposure is not likely to cause adverse effects. Mist may irritate nose and throat.

Chronic Effects of Exposure: Repeated excessive ingestion may cause central nervous system effects.

4. First Aid:

EYES: Irrigate immediately with water for at least 5 minutes.

SKIN: Wash off in flowing water or shower.

INGESTION: No adverse effects anticipated by this route of exposure.

INHALATION: No adverse effects anticipated by this route of exposure.

NOTE TO PHYSICIAN:
No specific antidote. Supportive care. Treatment based on judgement of the physician in response to reactions of the patient.

5. Handling and Storage:

Handling: Product shipped/handled hot can cause thermal burns. Product handled hot may require additional ventilation or local exhaust. Spills of these organic liquids on hot fibrous insulations my lead to lowering of the autoignition temperature possibly resulting in spontaneous combustion.

Storage: Store in a cool dry place. Keep away from direct sunlight or strong incandescent light. Keep containers tightly closed. Protect against moisture. Store in the following material(s): Stainless steel. Aluminum. Plasite 3066 lined container. 316 Stainless steel. Opaque HDPE plastic container. Product has a shelf life of 24 months. The maximum storage temperature is 40°C.

More information available at:
www.univarcanada.com

Download the full Material Safety Data Sheet # NR05363 at:
www.thermo-dynamics.com/pdfiles/MSDS/Prop_Glycol_USP_EP_msds.pdf

Solar Boiler™ Service Log

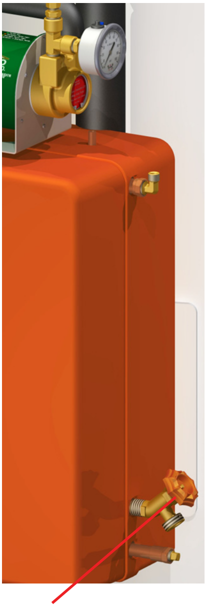
To ensure optimum performance from your Solar Boiler™, Thermo Dynamics Ltd. recommends that the system is back flushed at least every 6 months. This service log must be kept up to date. Failure to do so will render the warranty null and void.

Back Flushing Procedure.

- Connect a hose to the drain bib at the bottom of the Solar Boiler™, and place the free end in a drain.

Open hose bib and run until water runs clear

Closr hose bib.



Hose bib

Date:____________ **Technician**__________ **Back Flush**_________

Comments____

Date:____________ **Technician**__________ **Back Flush**_________

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Comments____

Temperature vs Resistance Chart for 10 kohm thermistors

Measure the resistance of your collector or storage sensor and compare to the chart below. Ensure that the corresponding temperature is correct.

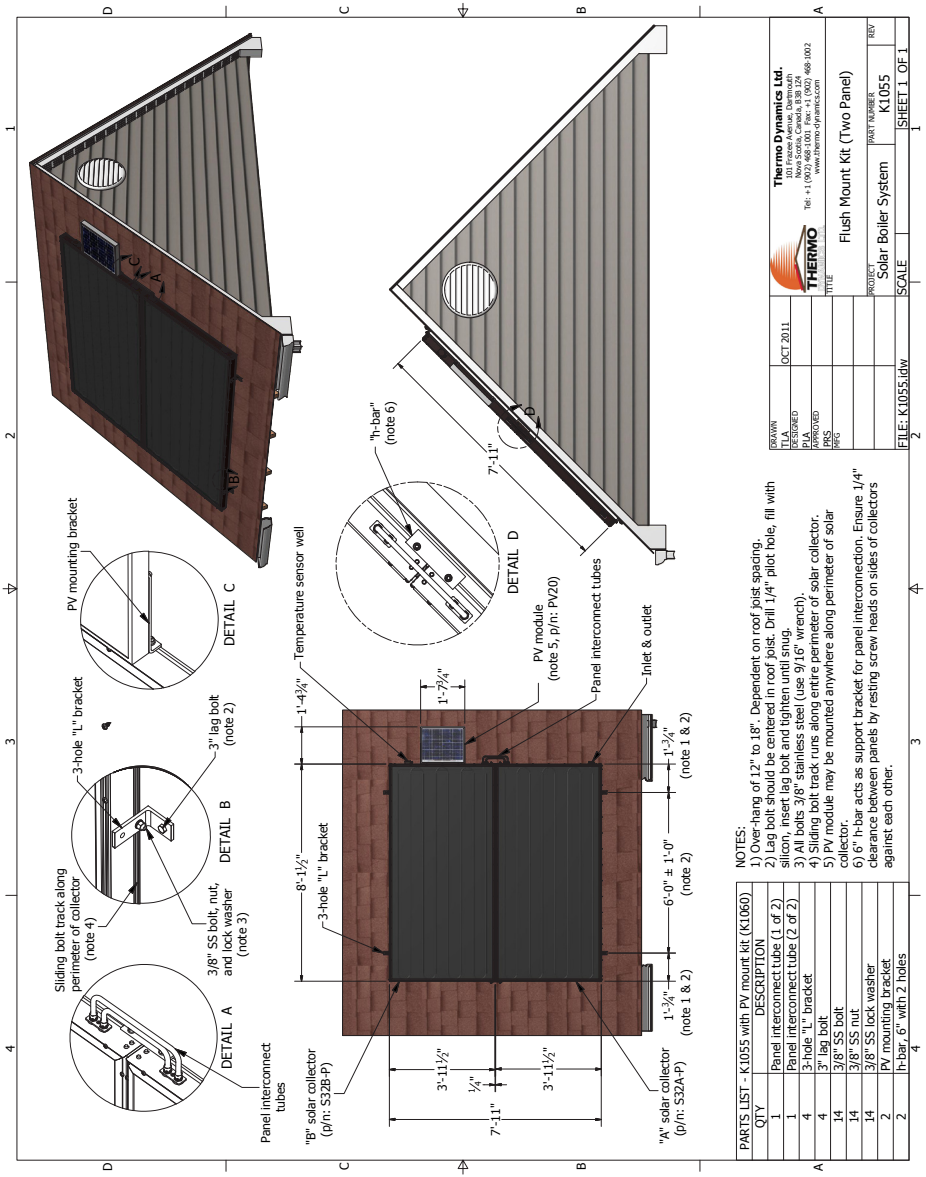
Replace inaccurate sensors if necessary.

Temperature vs. Resistance Chart
Thermistor @ 25°C

°F	°C	Ohms Resistance 10K
OPEN		**INFINITE**
32	0	32,630
41	5	25,380
50	10	19,890
59	15	15,710
68	20	12,490
77	25	10,000
86	30	8,057
95	35	6,531
104	40	5,326
113	45	4,368
122	50	3,601
131	55	2,985
140	60	2,487
149	65	2,082
158	70	1,751
176	80	1,255
194	90	917
212	100	680
SHORT		**NONE**

NOTES

Solar Collector Flush Mount Detail



PARTS LIST - K1055 with PV mount kit (K1060)	
QTY	DESCRIPTION
1	Panel interconnect tube (1 of 2)
1	Panel interconnect tube (2 of 2)
4	3-hole "L" bracket
4	3" lag bolt
14	3/8" SS bolt
14	3/8" SS nut
14	3/8" SS lock washer
2	PV mounting bracket
2	h-bar, 6" with 2 holes

NOTES:
1) Over-hang of 12" to 18". Dependent on roof joist spacing.
2) Lag bolt should be centered in roof joist. Drill 1/4" pilot hole, fill with silicon, insert lag bolt and tighten until snug.
3) All bolts 3/8" stainless steel (use 9/16" wrench).
4) Sliding bolt track runs along entire perimeter of solar collector.
5) PV module may be mounted anywhere along perimeter of solar collector.
6) 6" h-bar acts as support bracket for panel interconnection. Ensure 1/4" clearance between panels by resting screw heads on sides of collectors against each other.

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TLA	OCT 2011	
DESIGNED		
PLA		
APPROVED		
PRS		
MPG		

Thermo Dynamics Ltd.
10 Craze Avenue, Dartmouth
Nova Scotia, Canada, B3B 1Z4
Tel: + 1 (902) 468-3001 Fax: + 1 (902) 468-1002
www.thermo-dynamics.com

THERMO

TITLE: Flush Mount Kit (Two Panel)

PROJECT: Solar Boiler System

PART NUMBER: K1055

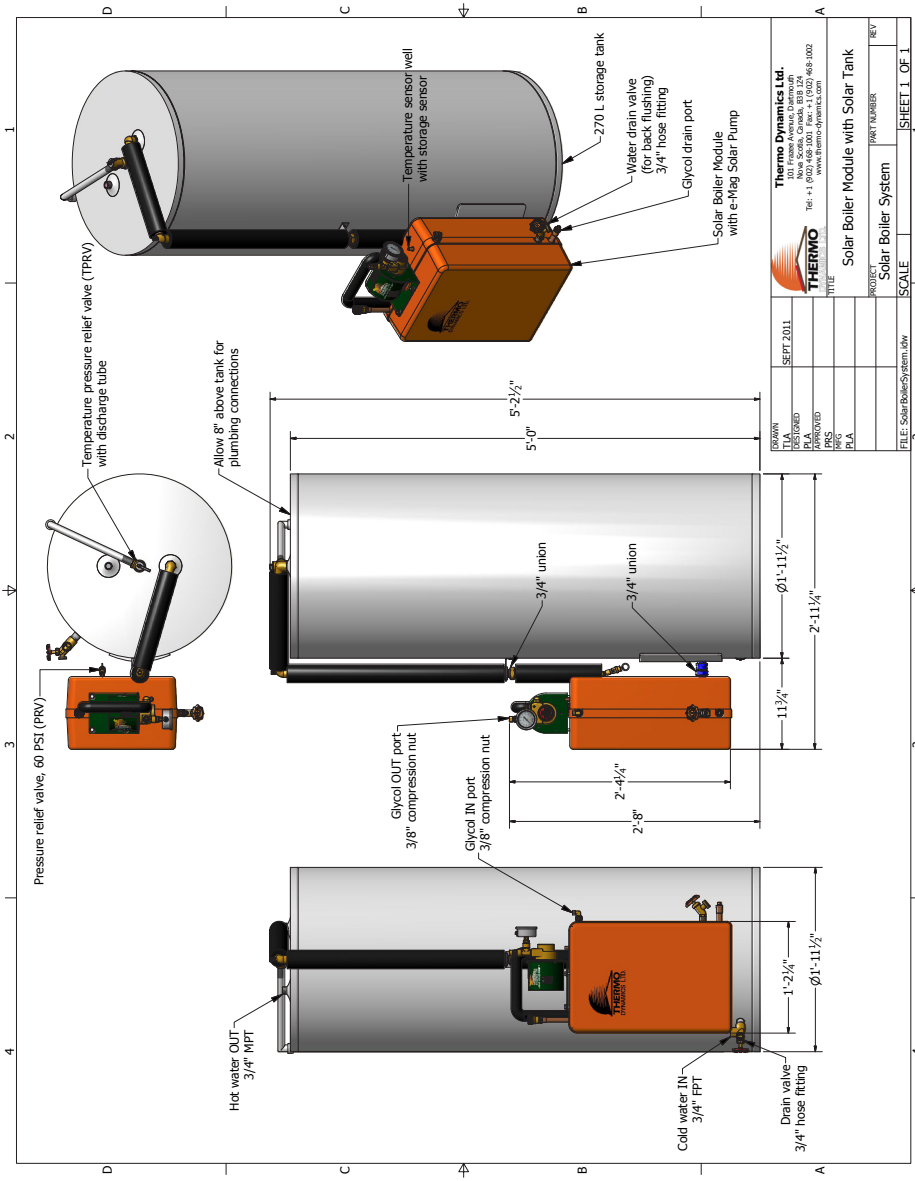
REV:

FILE: K1055.idw

SCALE:

SHEET 1 OF 1

Solar Boiler™ Module and Solar Tank Detail



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solarinfo@thermo-dynamics.com

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