Solar Thermal System
Commissioning and Startup Sequence:

Initial Flush of System:

	Check off Solar Loop:	Check off DHW Loop:
- Verify proper valve lineup (valves aligned to fill entire loop with liquid)		
- Cover the collectors to prevent heating, or commence the fill at night when collectors are cool. **WARNING! Collectors must be cool or covered to prevent damage during charging**		
- Isolate expansion tank		
- Open all air vents		
- Connect the fill valve to a site mains supply hose or filling station supply hose.		
- Connect the drain valve to a return hose which can drain into a bucket or floor drain.		
- Close ball valve between fill and drain valve to direct flow through loop		
- Flush then fill the collector loop with water forcing fluid in through fill port and returning from drain port. **NOTE: 1-2% TSP solution can be added to flushing fluid to aid in removal of debris in pipes.** **WARNING! Flush to allow clean water to enter pumps and heat exchangers. Backwards fill may cause damage to pump internals or clog the heat exchanger.**		
- Drain system to a bucket or drain until the water comes out clean.		

Initial Pressure Test/Leak Detection Test

- Close fill port and drain port to pressurize loop up to mains pressure (60 – 80 psig) and check for leaks. Monitor the pressure gauge for drops in pressure, inspect all joints		

Final Fill of DHW Loop and Storage Tanks: Checkoff:

- Verify loop has passed pressure test and flushing sequence.	
- Connect a potable water supply hose, or open the cold groundwater main supply valve to begin to fill the tank with water.	
- Provide a way for air to escape from the solar tank, such as through a tank air vent. **Best Practice: Filling the solar tank with potable water may take as much as ½ hour. While the solar tank is filling flush, pressure test and charge the collector loop.**	
- During the fill sequence, prime the DHE loop pump if the pump is not self-priming. **WARNING! Failure to prime pumps can result in pump damage due to air lock.**	
- After the solar storage tank is full, close the tank's air vent. If possible vent air from any high points in the potable supply piping.	
- After the potable piping system is pressurized inspect the piping system carefully for leaks.	

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Final Fill Of Solar Loop: Checkoff:

- Verify loop has passed pressure test and flush	
- Verify collectors are covered or system is filled at night **WARNING! Collectors must be cool or covered to prevent damage during charging**	
- Open all air vents at the collector array outlets.	
- If using glycol, set up fill port and drain port hoses into on-site fill containers. Either pre-mix glycol in one large container, or if using drums, alternate glycol drum, water drum, then 50% glycol water until system is full and pressurized.	
- If using multiple arrays, close all array inlet and outlet isolations except for the array furthest from the mechanical room.	
- Open isolation valve to expansion tank.	
- Connect fill pump supply hose to fill port and return hose to drain port. Turn the ball valve in-between these two ports to shut to direct flow through the loop.	
- Turn on pump to begin filling. **NOTE: During fill sequence, cycle open and shut the expansion tank isolation valve a few times to force solar fluid to enter tank.**	
- After fluid begins to return back into the fill container from drain port without any air bubbles, open next set of collector array inlet and outlet valves to fill the array.	
- Continue to open all array inlets and outlets until all arrays are full.	
- During Fill sequence, prime solar loop pump if pump is not self-priming. **WARNING! Failure to prime pumps can result in pump damage due to air lock.**	
- After fluid begins to come back out of return hose from the return port without any air bubbles, pressurize the system to 40-60 PSI and then close the drain and fill ports.	
- Turn off fill pump.	
- Return the isolation valve between the fill and drain ports to open.	
- Monitor the pressure gauge for drops in pressure, inspect all joints for leaks	
- Close all air vents and associated ball valves that isolate them.	

System Startup and Testing: Plug in the Solar Thermal Controller and switch the Controller to AUTO operation to startup the solar system.   To ensure proper operation of the Solar Thermal System, perform the following checks during the first days of operation when both the glycol loop and water loop are filled:

Check system pressure	Pass / Fail
After the system is filled, it is normal for the initial pressure to drop slightly as air comes out of solution. Check solar loop pressure gauge to ensure pressure remains greater than 30 psig when cold. If further pressurization is necessary, hook up a pump or mains supply to the fill port and pressurize above 30 PSIg If pressure continues to drop when pumps are not running, check for leaks in system piping.	Notes/Signoff:

Check Collector Loop and Water Loop Pumps for proper operation.	Pass / Fail
With proper operation, the temperature drop across the heat exchanger should be 10-20°F With a temperature difference greater than 20°F, set the pump speeds to a higher level if possible. For a difference less than 10°F, set the pump speeds to a lower level. Flow sounds, loud operation or squealing means air in the system. Purge air through air vents and through pump priming vents If necessary. Unplug solar controller from wall prior to purging air from pumps. Follow filling guidelines for re-pressurization if needed. No temperature difference across the heat exchanger could mean a flow failure. Ensure all valves aligned correctly and check for pump operation.	Notes/Signoff:

Check the control and sensors	Pass / Fail
Ensure the sensors are giving proper readings by either viewing the computer software for the Delta-T Pro controller, or using a multi-meter to measure thermistor resistance. See the control manual for further details. Check electrical wiring to ensure it is undamaged and continuous. Check for proper communication and operation within BAS or Internet network systems. See control manual for further details.	Notes/Signoff:

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System Shutdown	Check off :
If the operation checks cannot be met, or a problem is discovered in the solar system, shut down the solar system:	
- Unplug the Delta-T Controller	
- Cover the collectors if they are to remain full to protect against stagnation conditions. Avoid any prolonged length of time that the heat-transfer fluid can remain in the system without any attention and the collectors uncovered.	

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