

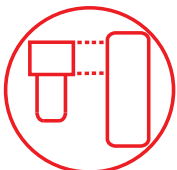
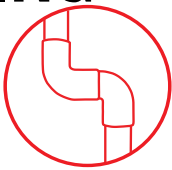
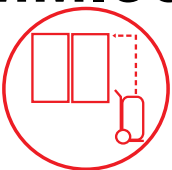
HPAK SYSTEMS

CLOSE LOOP
SYSTEM

**FOR 1-8
COLLECTORS**



TABLE OF CONTENTS

1. PREPARATIONS	3-10
2. HPAK INSTALLATION	11-14
	
3. PIPING	15-17
	
4. COMMISSIONING	18-22
	
5. O & M	22
	
6. NOTES	23-24
7. WARRANTY	25
8. SRCC OG-300 LABEL SET	26-27
9. OG-300 CERTIFICATION PAGE	28-29

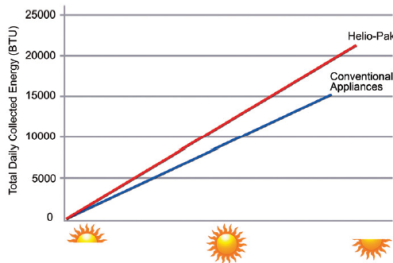
HELIO-PAK HEAT-TRANSFER APPLIANCE

Redesigned in 2021 the Helio-Pak (HPAK) is a closed-loop heat transfer appliance streamlined to provide a compact and reliable solution to solar hot water systems. The HPAK excels when it comes to quick installation, longevity, and performance in extreme weather conditions. In under 35 lb, this appliance comes factory assembled with all the necessary components to start building your hot water system.

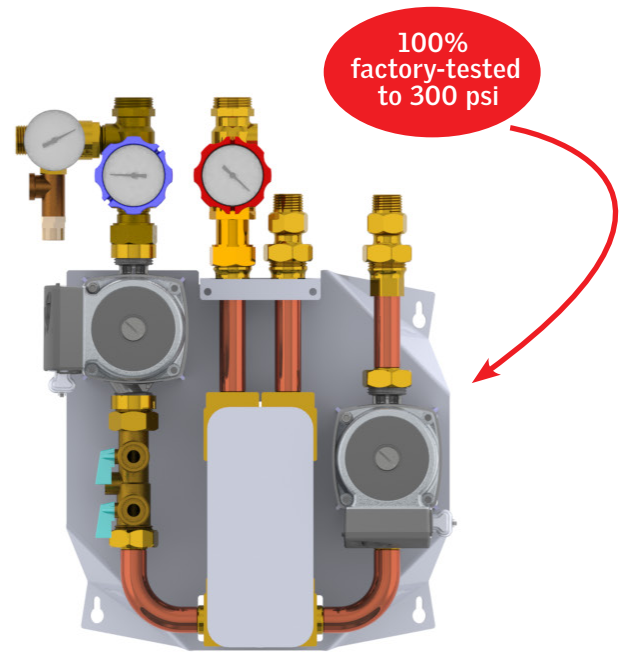
A major benefit the Helio-Pak provides is that it can attach directly onto the hot water tank. As a result, under certain conditions, the HPAK can be mounted onto a pre-existing water tank thereby reducing costs.

Features

- Heat exchanger surface promotes maximum heat generation
- Superior heat transfer via counterflow design
- 25% more efficient than conventional internal heat exchangers
- Under certain conditions, can mount to existing tank
- "Plug & Play" installation
- Viewable heat exchanger leak detection
- Two sizes available for differing loads



Helio-Pak vs. Conventional Heat-Transfer Appliance



HELIO-PAK PRO UPGRADE

The Helio-Pak Pro (with pre-installed Delta-T Pro controller) further enhances the residential solar hot water system, with the addition of user-friendly customizable settings, remote navigation, and expanded system performance data.

Features

- Remote Wi-Fi/ethernet system navigation
- BTU metering (When used w/ flow meter)
- Stored energy data (BTU, °F, GPM)
- Adjustable user settings
- Vacation mode

TECHNICAL SPECIFICATIONS

Solar loop connections DHW Connections

Expansion tank connection

Pressure relief valve

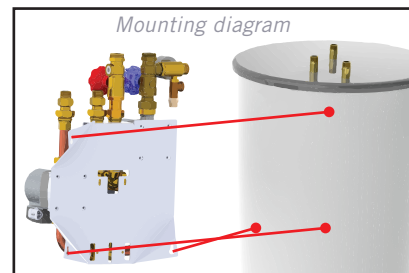
Combo valves include a gravity break (to prevent thermosiphoning at night), check valve, ball valve, and thermometer

Valve for convenient and quick filling of the system

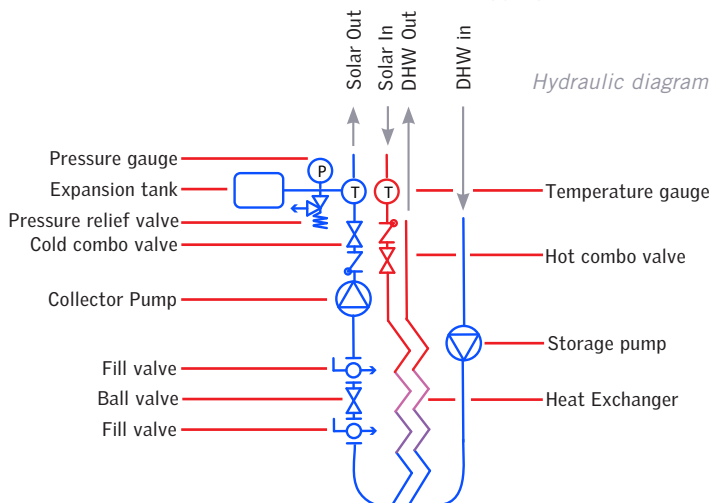
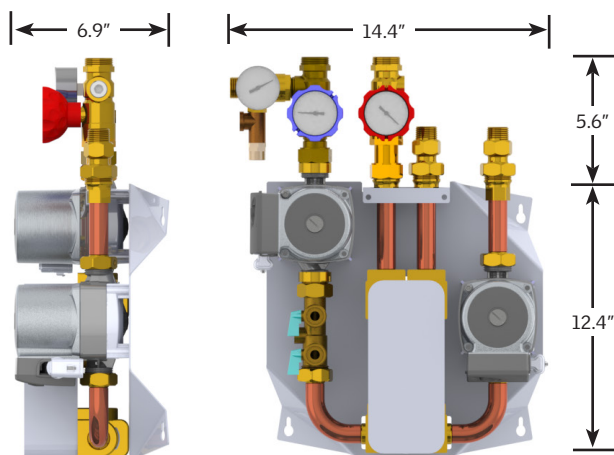
Flat plate heat exchanger

Included controller monitors and regulates the system

Flow Sensor
(add-on for HPAK Pro model only)



The HPAK mounts easily to the hot water tank with 3 self-tapping screws (included)



MODEL	HPAK 116 000	HPAK 116 001	HPAK 148 000	HPAK 148 001*
Heat transfer rate (BTU / hour ¹)	16,000	16,000	24,000 - 48,000	24,000 - 48,000
Recommended Flow Rate ² (Gallons per Minute)	3	3	4 - 9	4 - 9
Max Collector Surface Area (ft ²)	96	96	321	321
Recommended Pump Speed (Energy Use)	1 (60W)	1 (60W)	2(90W) - 3(110W)	2(90W) - 3(110W)
Max Piping Resistance ³ (ft of Water)	2	2	7	7
Weight (lbs)	35	35	35	35
Expansion Tank	2 gal.	2 gal.	5 gal.	5 gal.
Voltage	120 VAC, 60 Hz	120 VAC, 60 Hz	120 VAC, 60 Hz	220 VAC, 50 Hz
Controller Type	Standard	Pro	Standard	Pro

¹ - At full sun and 20° log mean temperature differential ² - With max collector surface area installed ³ - With recommended pump speed

PTLS 000 005 042308

Heliodyne, Inc. • 4910 Seaport Avenue • Richmond, CA 94804
T: 510.237.9614 • F: 510.237.7018 www.heliodyne.com
Information and Support: info@heliodyne.com

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SOLAR HOT WATER

Power Supply Protection for Delta-T Pro

Voltage spikes, current surges, and noise can occur in a building's AC power supply once a month or hundreds of times a day. They can arrive from the grid or be generated inside the building by fluorescent lighting, electric motors, HVAC equipment and office machines.

If a sufficiently strong power surge is supplied to the Delta-T Pro, it may be subject to data loss, settings resetting to their default, network disconnection, or general failure. For this reason Heliodyne requires installing a surge suppressor between the Delta-T Pro and a power source. If a controller is installed without surge protection and experiences a failure due to a surge event, warranty coverage will be denied on the basis of improper installation.

A variety of surge suppressors are available. Some surge suppressors include a circuit breaker for overcurrent protection, which is different from power surges. Overcurrent is a condition where equipment draws more current than its rating, such a ground fault or short circuit. Typically, overcurrent events happen on the consumer's side of the power supply, whereas power surges happen on the utility side of the power supply.

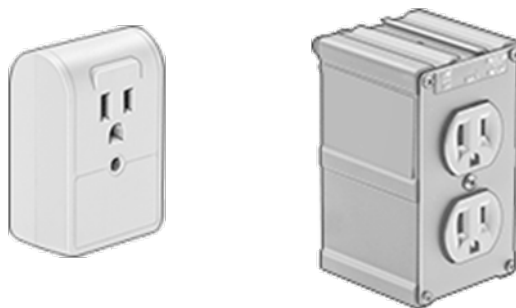
If a surge suppressor is selected that does not provide a separate circuit breaker, there is no interruption to the power supply when the protection activates or the suppressor reaches the end of its lifetime.

For more detailed surge suppression selection, follow these guidelines:

- 1) UL 1449 Voltage Protection Rating: Type 3
- 2) ANSI/IEEE C62.XX Compliant (where applicable)
- 3) Joule Rating: 600 Joules minimum

A surge suppression device meeting the above guidelines will protect the controller and connected devices from supply side surge events.

For convenience, Heliodyne offers some off-the-shelf surge suppressors that are selected to provide a basic level of protection. Please contact your Heliodyne salesperson for more information.



1. PREPARATIONS

1.0. General Notes

Your solar water heating system uses a circulation pump that circulates a propylene glycol heat transfer fluid throughout the system to protect the collectors and piping from freezing, prevents corrosion of system components, and keeps scale deposits from forming that could reduce the performance of the system. Proper maintenance of the propylene glycol in the system can protect the solar water heating system to minus 50°F.

1.0.0. Safety Guidelines

Carefully review all instructions in this manual for installation and use. Do not modify Gobi Collectors or Helio-Pak under any circumstances; use only as designed. Under normal operation your Heliodyne solar system will operate in the temperature range of -50°F to 325°F, with system pressure up to 150 psi. This manual and its content are integral parts of both the Helio-Pak and Gobi Solar Collector warranties. Noncompliance with these guidelines will void all warranties.

Follow all local building codes and regulations, as well as these industry accepted guidelines and standards:

IAPMO USEC, UBC, UPC
ASHRAE Solar Energy Equipment
NFPA 70 National Electric Code
ASCE 7-05 Minimum Design Loads for Buildings and Other Structures

Select an installation location that is easily accessible for maintenance and servicing.

Building materials adjacent to solar equipment shall not be exposed to elevated temperatures which could accelerate their deterioration.

1.0.1. Collector Storage and Handling

- Keep collectors covered when storing or filling.
- Avoid lifting collectors by the headers. Take care not to scratch the tempered solar glass; follow the glass breakage guidelines at the end of this manual in case of breakage.
- Gobi collectors nest and lock into each other for horizontal transportation. Do not transport Gobi upside down or standing on a side.

1.0.2. Collector Installation

Make a site visit prior to installation to verify adequate installation conditions:

- Collector sun exposure, especially during crucial solar hours of 10AM – 3PM. Take into consideration deciduous tree shading, structures, chimneys, etc.
- Use a minimum tilt of 10° in mild areas and 30° in areas with snow.
- Orient collectors within 20° of true South (in North latitudes); use internet maps rather than compass readings for verification.
- Ideal collector tilt for hot water production is equal to site latitude. For space heating combination systems, use tilt equal to latitude plus 15°. Heliodyne recommends a standard of 35° for hot water and 45° for space heating, regardless of location. Use racks only when necessary, as variation up to 15° can have only small effects on performance.
- Avoid banking of snow and ice below or on the collectors.
- Never mount Gobi collectors horizontally in a drainback system. (HPAK is always used in a closed loop system.)

- Heliodyne recommends 6-12" of metal flex tubing before any rigid copper lines to allow for thermal expansion in the copper tubing.
- Only copper, stainless steel or black pipe allowed. Plastic or Pex piping should not be used.

1.0.3. Minimum Heat Storage

A minimum of 1.5 – 2.0 gallons of liquid heat storage per square foot of Gobi collector (e.g., 60 – 80 gallons per Gobi 410) is recommended.

Minimize stagnation (no load, no flow) conditions on peak output days by using appropriate system sizing and maximizing year round usage. For design assistance, contact Heliodyne.

Ensure the backup heating capacity is properly sized to produce hot water for installation site on days of little or no solar energy production. Use only ASHRAE 90.2 compliant storage tanks and heaters with R-16 or higher.

1.0.4. Equipment for Installation

For a complete and functional SHW system, ensure the following equipment is ready for installation at the job site:

- Gobi Solar Collectors
- Rack or Flush mount hardware kit
- Appropriate roof penetration hardware and sealant
- Copper tubing, type M or L for collector / heat transfer appliance connections, adapters, elbows and fittings.
- 96/4 Tin/Silver solder
- Use only rubber type insulation (Armaflex); 1/2" wall / R2.6l minimum
- UV resistant covering or coating for outdoor exposed insulation
- Helio-Pak heat transfer appliance (HPAK)
- Isolation valves, tempering valve, air vent
- Storage tank with adequate volume for collectors installed (1.5-2gal/ft² collector area)
- Connections for storage tank (flexible or otherwise)
- Dyn-O-Flo HD high temperature propylene glycol or equal (-50°F to 325°F + 6% inhib)
- Pipe hangers or supports installed per code requirement installed without compromising any insulation.
- High temp. ball valve before air vent

WARNING! The approved HPAK solar loop heat transfer fluid is DYN-O-FLO HD Propylene Glycol. The substitution of any other heat transfer fluid may cause irreparable damage and/or create a safety hazard.

1.0.5. Tools

Heliodyne collectors and heat transfer appliances do not require any special tools. Never use plumbing wrenches on hex connections. Always tighten the bolts rather than the nuts. Aside from using the standard plumbing tools (torch, pipe cutter, etc.) the following tools and sizes are used in Heliodyne equipment:

- 9/16" wrench / socket for 3/8"- 16 bolts and nuts
- 3/4" wrench / socket for 1/2" - 13 hanger bolts and nuts
- Adjustable hex wrench for 1.25" thru 1.875" hex sizes
- Phillips screw driver (for tank sensor installation)
- 1/4" drill bit for 3/8" lag screws
- 3/8" drill bit for 1/2" lag screws

heliodyne
 SOLAR HOT WATER

1.0. General Notes (continued)

1.0.6. Safety Equipment

Working on rooftops and other elevated sites, as well as working with open flames can be dangerous; use extreme caution and follow all local codes and good safety practices when installing. Protection against auto-ignition of combustibles - Combustible materials used in solar equipment and adjacent structures shall not be exposed to an elevated temperature that could cause ignition. Heliodyne is not responsible for job safety nor any accidents that may occur, and always recommends the use of: safety glasses, roof harness, scaffolding rather than ladders, and the use of solder only in well ventilated areas.

1.0.7. Heliodyne OG-300 Certified Systems and SRCC Numbers

Installers: circle OG-300 system installed (if applicable). NOTE: visit www.solar-rating.org for full certification specifications and diagrams. All Heliodyne solar systems listed below, and their components, are pre-engineered and designed to operate within the design temperatures and pressures required for the proper operation of the systems, and with the heat transfer fluids specified. All components are designed to operate at the design flow rates as shown in §1.2, and are designed to withstand thermal shock, which could be caused by power failures.

HPAK, SINGLE TANK SYSTEMS WITH ELECTRIC BACKUP

MODEL NUMBER	GOBI SIZE	GOBI QTY	SOLAR (GAL)	AUX (GAL)	SRCC NUMBER	SEF
HPAK 016 1 410 G 80 ACS	4X10	1	80	N/A	2009034B	2.40
HPAK 016 2 406 G 80 ACS	4X6	2	80	N/A	2009034L	3.70

HPAK, DUAL TANK SYSTEMS WITH GAS BACKUP

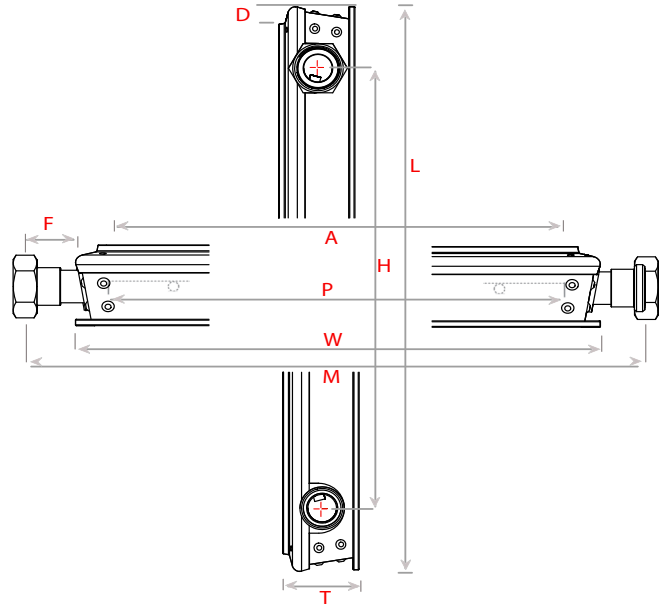
MODEL NUMBER	GOBI SIZE	GOBI QTY	SOLAR (GAL)	AUX (GAL)	SRCC NUMBER	SEF
HPAK 016 1 410 G 80 ACD Z	4X10	1	80	N/A	2011141B	1.10
HPAK 016 2 406 G 80 ACD Z	4X6	2	80	N/A	2009036H	1.30

HPAK, SINGLE TANK SYSTEMS WITH GAS TANKLESS BACKUP

MODEL NUMBER	GOBI SIZE	GOBI QTY	SOLAR (GAL)	AUX (GAL)	SRCC NUMBER	SEF
HPAK 016 1 410 G 80 ACS F	4X10	1	80	N/A	2010136G	2.00
HPAK 016 2 406 G 80 ACS F	4X6	2	80	N/A	2010136E	3.20

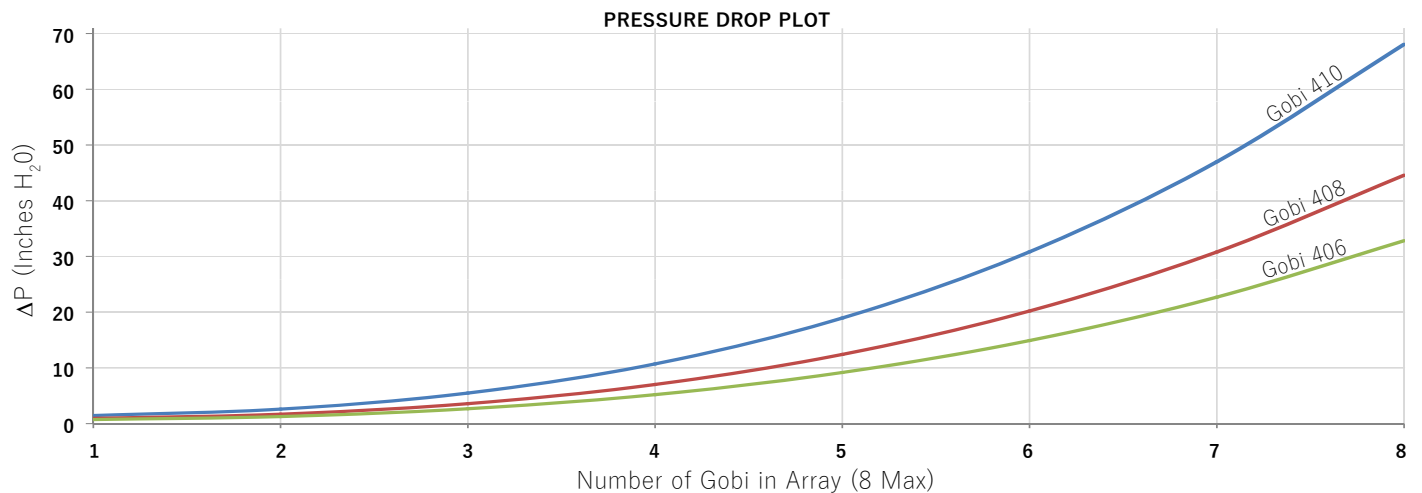
1.1. Technical Specifications for Gobi

DIM	DESCRIPTION		GOBI 406	GOBI 408	GOBI 410
L	Length		81.56	97.56	121.56
W	Width		47.56		
T	Thickness		2.75		
H	Header Length		76.88	92.88	116.88
M	Header Width		50.25		
A	Aperture Length	inch	79.25	95.25	119.25
	Aperture Width		45.25		
P	Plate Length		78.0	94.0	118.0
	Plate Width		46.25		
D	Flashing Base		0.61		
F	Flashing Header		1.93		
L x W	Gross Area	ft ²	26.94	32.22	40.15
A _L x A _W	Net Area	ft ²	24.90	29.93	37.47
g	Dry Weight	lb.	74	102	127
G	Full Weight	lb.	80	108	135
V	Volume	Gal.	0.6	0.7	0.8
-	Max Pressure	PSI	150 (10 Bar)		
-	Test Pressure	PSI	300 (20 Bar)		
-	Stag. Temp.	°F	397.6 (203 °C)		



1.2. Flow and Pressure Loss¹

RECOMMENDED DESIGN FLOW RATES WITH GLYCOL ²		
GOBI 406	GOBI 408	GOBI 410
0.85 Gal / min	1.0 Gal / min	1.25 Gal / min

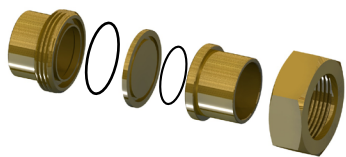
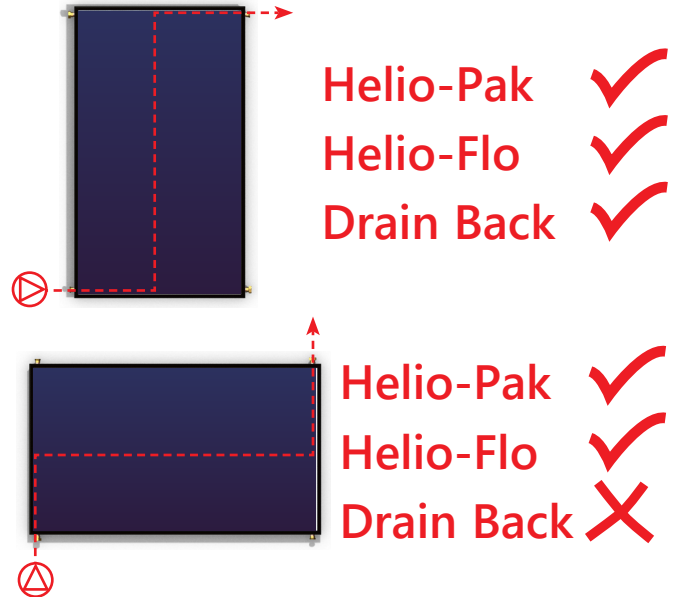


¹ Losses calculated at recommended Gobi design flow rates for 50/50 propylene glycol / water solution.

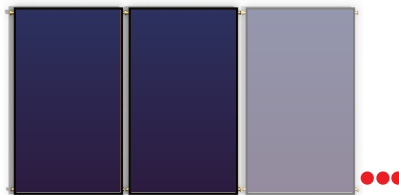
² Minimum flow rates shown. Do not exceed recommended flow rates by more than (3) times.

1.3. Gobi Orientation and Plumbing

Collectors shall be installed maintaining the tilt and azimuth within the design conditions indicated below. The location and orientation of the collectors shall be such that they are not shaded by external obstructions or mutual shadowing during the period from 10:00 a.m. to 3:00 p.m.



→ 2x



OR

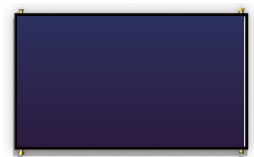
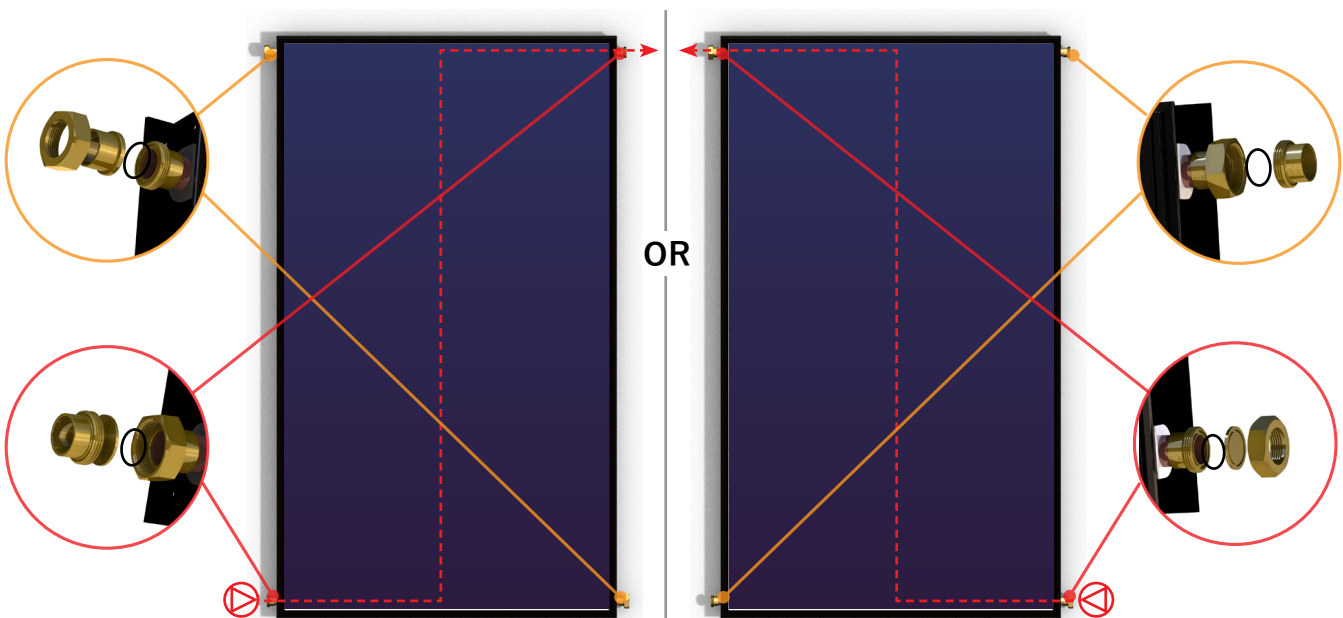


Figure 1.3.-1 DOS-Disc Assembly (p/n:

Figure 1.3.-2 Two DOS-Discs Per Vertical

Figure 1.3.-3 Two DOS-Discs Per Horizontal Collector



1.3.1 The Dyn-O-Seal Combo Fitting for Gobi

The Dyn-O-Seal combo fitting, air vent, and ball valve kit allow for connecting an air vent and sensors solderlessly to the hot return of a Gobi collector array.

The Dyn-O-Seal combo fitting (ZZZZ 007 000) includes:

- Two 1/2" NPT ports
- Immersion well sensor with 1/2" threaded well*
- Hex key*

*DO NOT OVER-TIGHTEN SENSOR IN WELL. OVER-TIGHTENING CAN DAMAGE SENSOR



The Ball Valve Kit (ZZZZ 000 008) includes:

- 420F rated ball valve
- 1/2" brass 90 degree elbow
- Hex key*

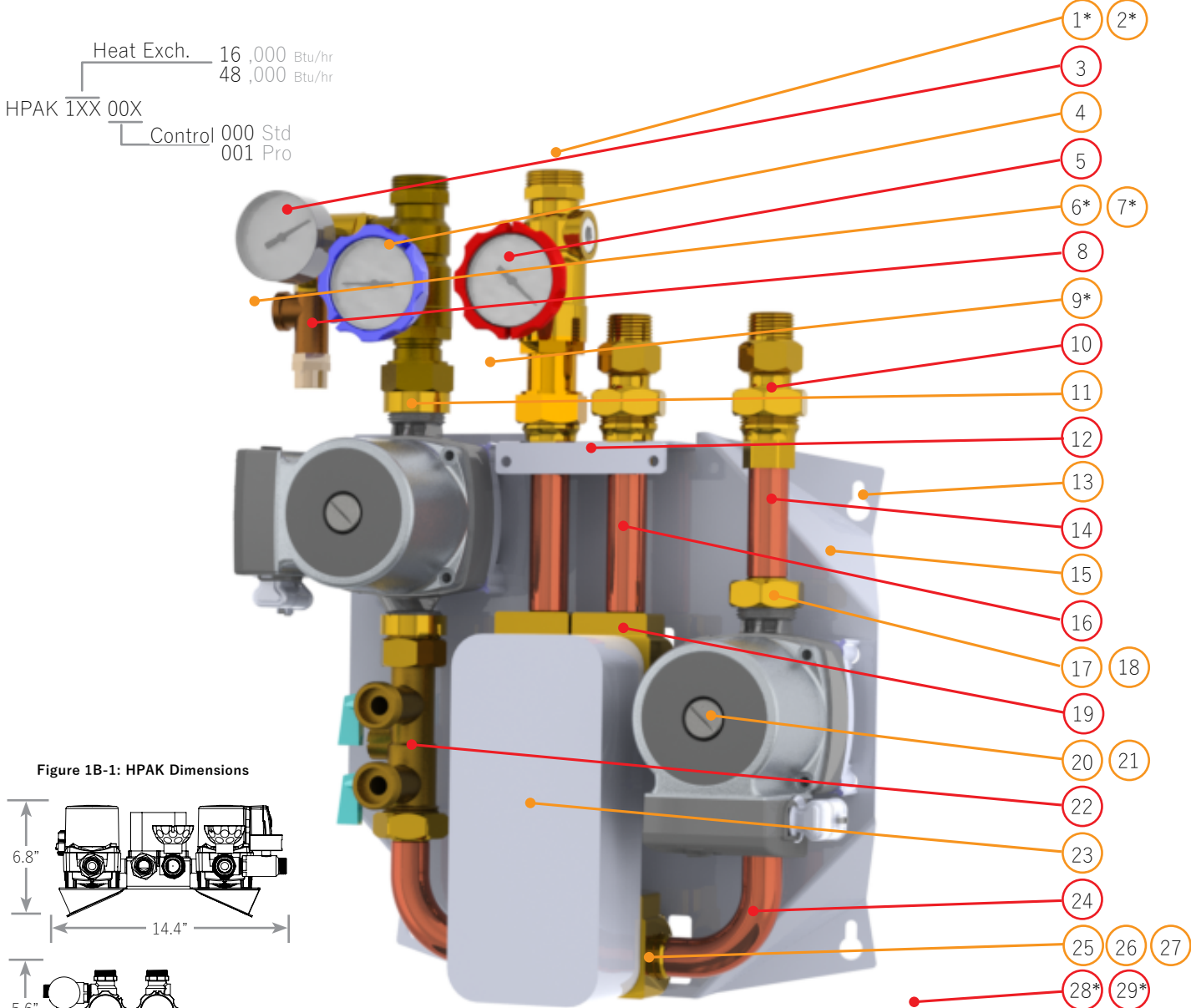


The 360F rated Air Vent (ZZZZ 000 019) is to be installed off the elbow, oriented straight up. This vent is for use only when purging air from collectors during commissioning. The ball valve allows for isolation of air vent once system has reached optimal pressure and has all air removed from collectors.



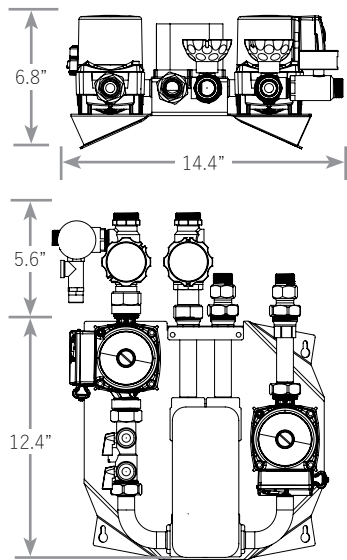
1.4. Helio-Pak Heat Transfer Appliance HPAK

Insulated solar hot water system, closed loop glycol / water, double wall heat exchanger with visual leak detection, control and sensors, filling valve and hot / cold temperature and pressure indication.



Heat Exch. 16,000 Btu/hr
48,000 Btu/hr
HPAK 1XX 00X
Control 000 Std
001 Pro

Figure 1B-1: HPAK Dimensions



1.5. Technical Specifications

Maximum Operating Conditions	150 psig / 275 °F
Heat Transfer Fluid	40-50% Dyn-O-Flo HD and Water
Solar Loop Connections	Sweat fittings for 3/4" Type M or L Copper,
Domestic Water Connections	3/4" Male NPT Fittings
Pressure Relief	Barbed Hose Connection (For 1/4" ID Hose)
Gaskets	Viton/FKM
Domestic Water Contact Material	Type M or L composite (Pump)
Thermal Conductivity	0.25 Btu-in / hr-ft².°F (0.036 W/m-K)

*Not pictured

1.6. HPAK Replacement Parts

1.6.0. HPAK Spare Parts Table

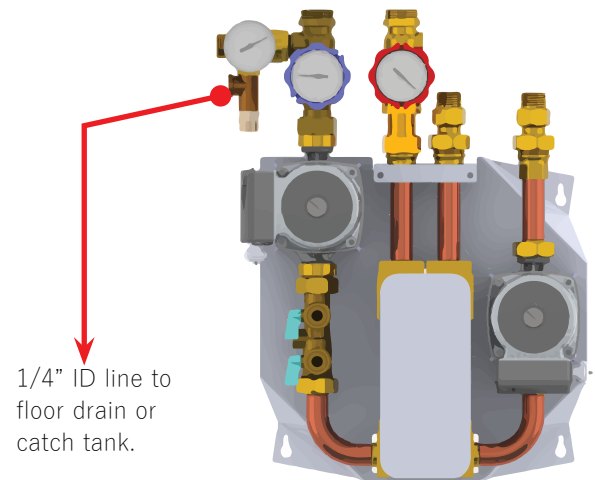
ITEM	PART NUMBER	DESCRIPTION	QUANTITY
1	21743	DOS flange combo valve fitting	2
2	21729	DOS nut combo valve fitting	2
3	21214	Back entry pressure gauge, 1-200 psig	1
4	23047NL	Cold combination valve: check & ball valves, temperature gauge	1
5	23046NL	Hot combination valve: check & ball valve, temperature gauge	1
6	23365	4.5-gallon expansion tank	1
7	23031	19L expansion tank*	1*
8	23001	150 psig, 1/4" NPT pressure only relief valve	1
9	23029	10 kOhm Thermistor	1
10	23655	1" NPSM nut	3
11	21856	Gasket	6
12	23702	Spacing bracket	1
13	21194	1/4 - 20 x 1" Self-tapping screws for tank mount	3
14	23670	Heat exchanger connection to 1" NPSM	2
15	25349	Mounting bracket	1
16	23674	3/4" nut mounting flange to 1" NPSM tube	1
17	23656	1" G nut for flange	2
18	21451	Gasket for pump thread adapter	4
19	23639	Heat Exchanger connection block with top port connections	1
20	23098	Grundfos circulation pump 15-78	2
21	23109	Grundfos circulation pump 15-78	2**
22	23092	Filling combination valve	1
23	23657	Double wall 20 plate brazed plate Heat Exchanger with visual leak detection	1
24	23677	Elbow tube assembly	2
25	23638	Heat Exchanger connection block with side port connections	1
26	25361	O-Ring 2 mm Wide, 21 mm ID	8
27	25354	O-Ring 2.5 mm Wide, 23 mm ID	4
28	40229	Controller assembly standard	1
29	40238	Controller assembly pro*	1*
Optional Equipment (Not Included in HPAK Package)			
30	23020	Tempering valve, 3/4" sweat	1
31	23021	Air vent for filling, 1/2" Male NPT	1
32	23025	Sensor wire	-
33	23040	Dyn-O-Flo HD propylene glycol concentrate	-
34	23023	Tank bypass valve	1
35	50082	Grundfos vortex flow and temperature sensor, (included for Pro models only)	-
3	50290	Ball valve kit for isolation and maintainence	-

*Available for pro models only

2.6. Connect the PRV to Hose for Drain

The PRV comes with a barbed hose fitting on the HPAK, to attached a 1/4" ID hose for funneling glycol to a bucket or drain, in the rare even of release. Since this is not part of a pressurized system, there is no need to use expensive copper; PEX or other high temperature suitable plastics are okay here only. Check with local plumbing codes if copper is required.

In the event of a pressure release, contact Heliodyne to discuss expansion tank sizing.



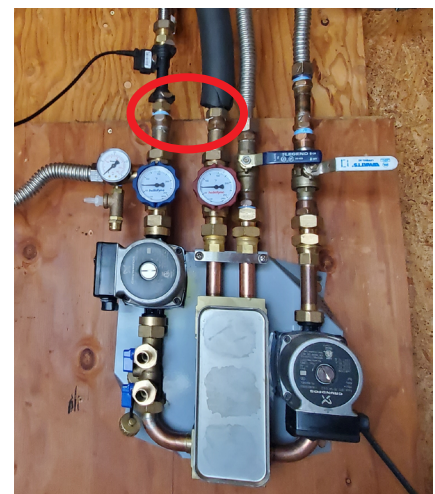
2.7. Helio-Pak Water Loop Connections

The Helio-Pak water loop connections are 3/4" NPT fittings. Copper piping or corrugated stainless-steel flextube can be used to connect the Helio-pak water connections to the top of the solar storage tank. Be sure to connect the piping such that the HPAK takes suction from the cold, or long diptube, and returns water to the to the hot, or short diptube. In other words, the HPAK should always pull cold water from the bottom of the tank and return the solar heated water to the top portion of the tank.



2.8. Helio-Pak Solar Loop Connections

The Helio-Pak solar loop connections will require 3/4" copper sweat fittings. Copper piping or corrugated stainless-steel solar flextube can be used to connect the Helio-pak solar loop connections to the solar collectors on the roof. If using corrugated flex tubing, refer to the Solar FlexTube Installation Guidelines for further instructions and for information on any adaptor components required.



1.6.1. Tempering Valve

Your Heliodyne solar system may be provided with a tempering valve set to 120° F to prevent scalding; the solar storage may reach 180° F. Some areas may require a rated Anti-Scald valve.

Item

28

For dual tank systems with an electric or gas backup tank, the tempering valve should be installed after the tank. For instantaneous water heaters as backup, consult the manufacturer for the recommended method of tempering or bypass of solar heated water into the heater.

1.6.2. System Overheat Protection and Operation of Pressure Relief Valve and Expansion Tank

The HPAK comes with a pre-installed pressure relief valve, nonadjustable and pre-set at 150 psig. A 1/4" barbed hose fitting is supplied for routing relief fluid to a drain or retaining vessel.

8

All of the system components provided with your Heliodyne solar system are suitable to operate within the design pressure and temperature range for this system. In addition, the system comes with a pre-sized bladder type expansion tank, which is suitable to accommodate the thermal contraction and expansion of the systems heat transfer fluid across the design temperature range.

With these safety precautions, and high temperature Dyn-O-Flo HD propylene glycol, the system can stagnate for short periods. If extended periods (2 weeks or more) are expected, install a Delta-T Pro with the proper vacation setting. Additionally, the system should never have less than 1.5 gallons of storage for each square foot of collector surface area. If the system is to be in stagnation conditions more than 2 weeks at a time, the collectors should be covered or drained.

6

7

1.6.3. Operation of Combo Valves

The combo valves are integrated ball valves with temperature gauges. The blue or 'cold' combo valve also has an integrated check valve to prevent system thermosyphoning. Cracking pressure (minimum fluid flow pressure) of the internal check valve is 0.30 psi. The valves can be operated by turning the plastic handles clockwise, with note taken of the position of the slots on the handles, indicating valve position as pictured in figures 1.6.3.-1 – 3 below.

4

5

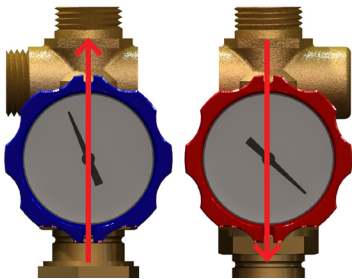


Figure 1.6.3.-1: Ball Valves Open
(Operation Position)

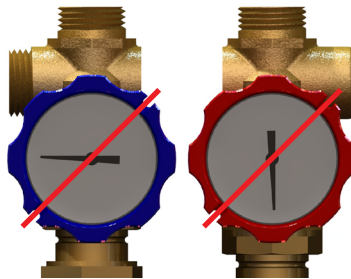


Figure 1.6.3.-2: Check Valves Open
(Fluid Servicing)

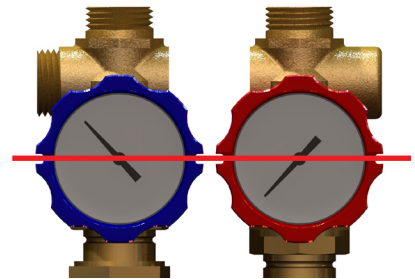


Figure 1.6.3.-3: Ball Valves Closed
(HPAK Servicing)

1.6.4. Operation of Filling Valve

The filling valve integrates three gate valves into one. The green handles operate the inlet and outlet of the valve, while the drain fitting on the side enables either filling or system operation. Always fill the system in the direction of the flow path.

If not using a Heliodyne filling station, hose adapters are available.

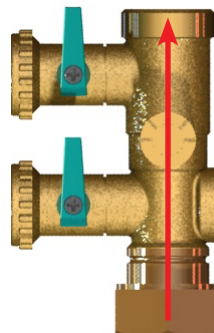


Figure 1.6.4.-1: Drain Fitting Closed
(Operation Position)

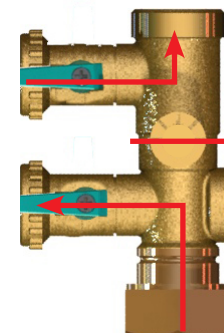


Figure 1.6.4.-2: Drain Fitting Open
(Fluid Servicing)

22

1.6.5. Solar Control and HPAK electrical

THE ELECTRICAL INSTALLATION SHOULD BE PERFORMED BY AN AUTHORIZED PROFESSIONAL. FOLLOW ALL LOCAL REGULATIONS AND CODES WHEN INSTALLING WIRE, FUSES, GROUNDING, ETC. PROTECT THE HPAK FROM OVERCURRENT. BEFORE ANY ELECTRICAL WORK IS DONE, ENSURE THE HPAK LINE CORD IS DISCONNECTED FROM THE ELECTRICAL SOURCE.

Item

26

27

All HPAK 000, 001 and 002 models come with the basic internal electrical wiring already completed. For simple DHW operation, the installer only needs to plug in the HPAK line cord into a nearby surge protected, 10A, 120 VAC, 60 Hz grounded wall outlet and wire the storage and collector sensor appropriately. The control comes pre-wired with two sensor lines. Use 22 AWG or larger cable if the sensor lines need to be extended. Connect the sensors to wire using non-metal wirenuts, or other corrosion resistant connection method. Ensure the control high limit is set at or below the tank manufacturer's recommended limit. HPAK 116 and 148 Pro models comes in either WiFi or Ethernet.

If attaching additional sensors or wiring, such as for the Pro models, remove the top cover for the electrical box and make the appropriate connections. See the Delta-T or Delta-T Pro manual for controller installation.

1.6.6. Flow Sensor: 001 and 002 Models

The HPAK Pro models can add a digital vortex flow and temperature sensor kit with field wiring to the Delta-T Pro controller. No adjustment is necessary. Please see the Delta-T Pro Manual for information on digital sensor operation.

33

1.6.7. 3-Speed Pump Operation

The DHW and collector circulation pumps are identical composite volute pumps; they come pre-set at speed 2. Depending on Gobi surface area installed, the speed may need to be adjusted by rotating variable speed dial to 1 (low), 2 (med), or 3 (high) located on the side of the pump. Use Table 1.6.7.-1 for pipe size, collector surface and speed reference. Table 1.6.7.-2 shows the pump performance.

HPAK HEAT EXCHANGER	148	148	148	148
Recommended Flow Rate (GPM)	3	4	6	9
Max Gobi Surface Area (Ft ²)	96	144	192	321
Recommended Pump Speed	1	2	2	3
Max Piping Resistance (Ft H ₂ O)	2	5	6	7

Table 1.6.7.-1: HPAK Piping Recommendations



20

21

Figure 1.6.7.-1: Grundfos UPS 15-78 CIL2

UPS 15-78 CIL2 Power Ratings:
Speed 1: 80 Watts
Speed 2: 114 Watts
Speed 3: 132 Watts

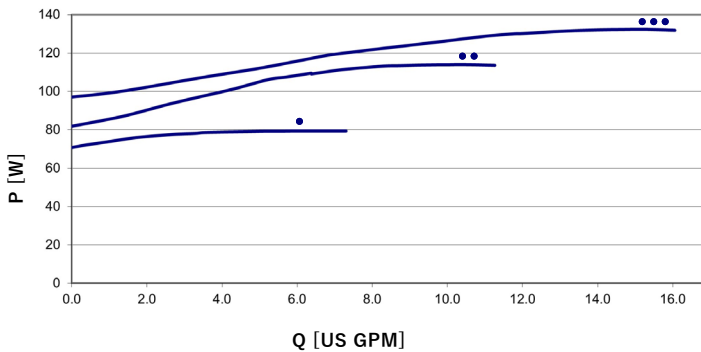
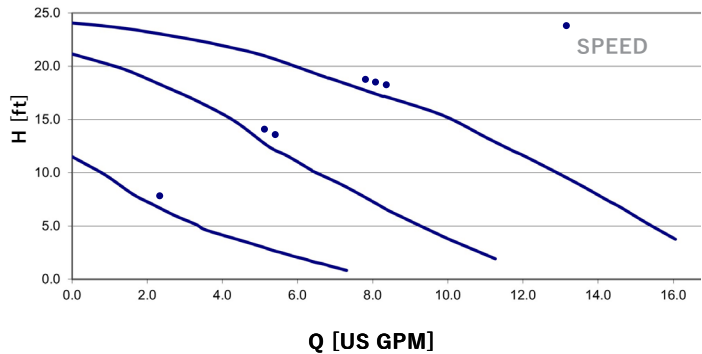


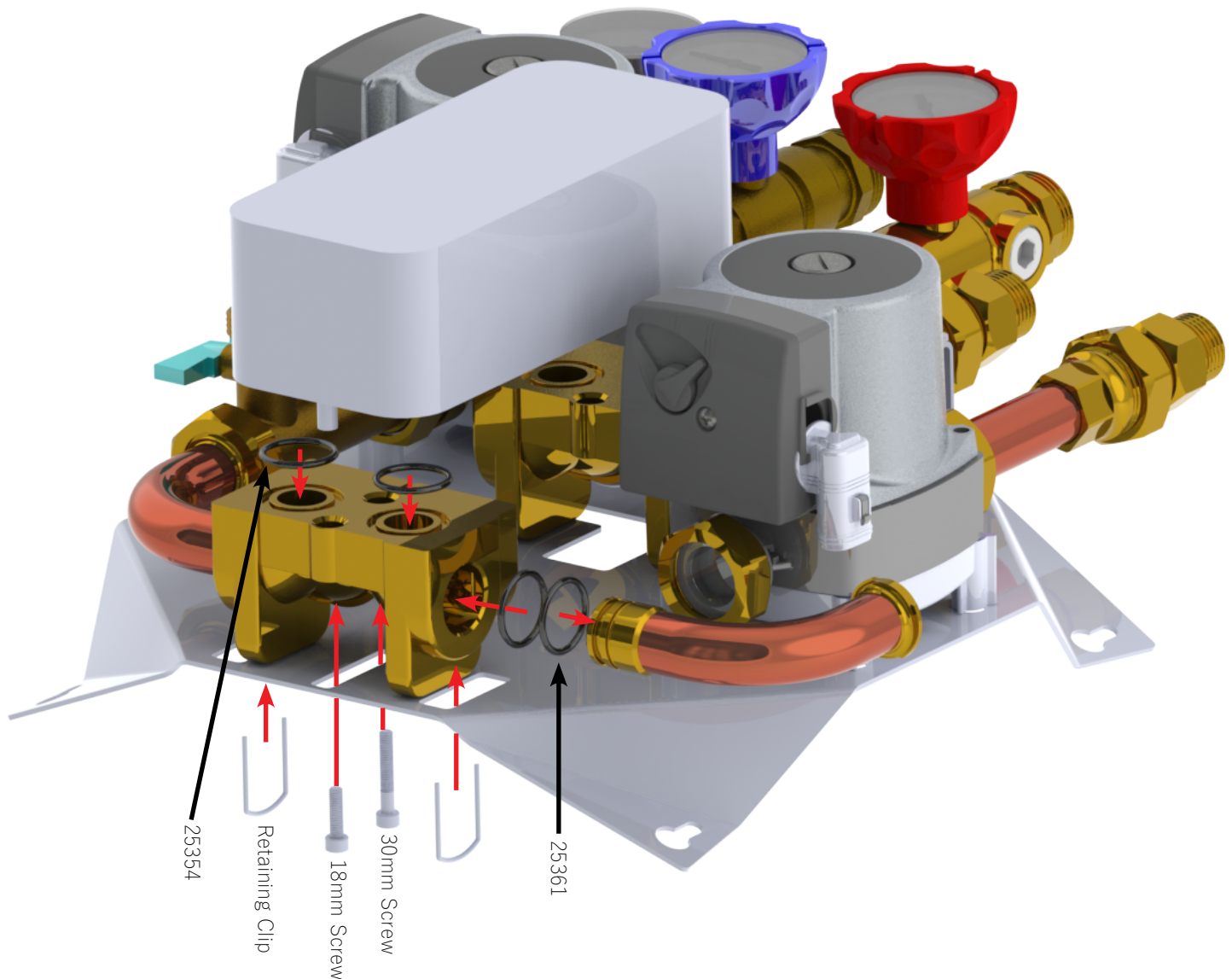
Table 1.6.7.-3: UPS 15-78 CIL2 Performance

1.6.8. - O ring installation

Over time your o-rings may deteriorate and need to be replaced. Contact a Heliodyne representative to purchase replacement o-rings or get information on where to purchase them.

The process for replacing o-rings is identical for both heat exchanger connection blocks. To begin you must remove the HPAK from whatever it is mounted to in order to access the back of the system. Alternatively to only replace the o-rings on the elbow tube assembly side you can just remove the retaining clips. To remove the elbow tube assembly take a flat head screw driver and release the retaining clip in the connection block. Pull the elbow tube from the block and remove the o-ring (25361) from the groove in the elbow tube and the o-ring from inside of the connection block. Replace these with the new o-rings and slide the elbow tube assembly into the connection block securing with the retaining clip. Use food grade grease to lubricate outside of elbow tube o-ring and use caution when inserting into the heat exchanger connection block, taking care to not cut o-ring on retaining clip groove.

The o-rings (25354) located between the heat exchanger and connection block are a different size from the ones used for the elbow tube. To replace these o-rings you must remove the four screws located at the back of the connection block using a 4mm allen wrench. Remove and replace the four o-rings located on the groove in the connection block. Place the heat exchanger back on the connection blocks and screw in the heat exchanger making sure that the 30mm and 18mm screws are in their corresponding positions.



2. HELIO-PAK INSTALLATION

2.0. Helio-Pak Connections and Hydraulic

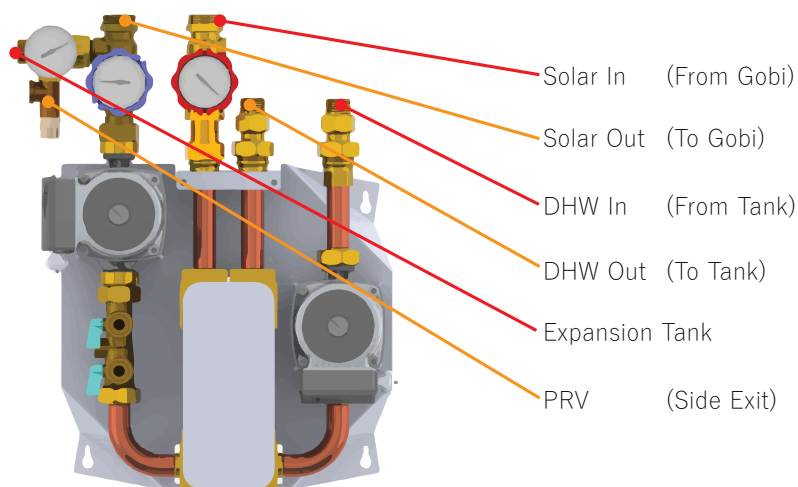


Figure 2.0.-1: HPAK Connections

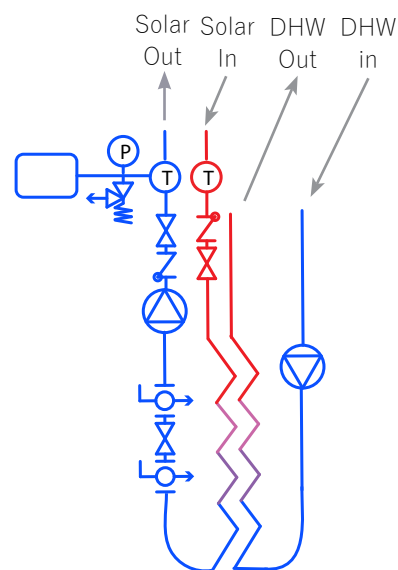


Figure 2.0.-2: HPAK Hydraulic

2.0.1. Installing Additional Insulation Jacket to Solar Storage Tank

Additional insulation jacket (e.g. Heliodyne PN 23505) further reduces standby heat loss from the storage tank. Wrap around the storage tank with the jacket, with top edge aligned with top of tank. Leave space for the installed HPAK and pipes. Secure the vertical seam of the jacket with tapes and use additional piece of insulation to cover the top of the tank and secure seam with tapes, ensuring the tank outer surface is covered with the insulation blanket as shown in Figure 2.0.1-1.

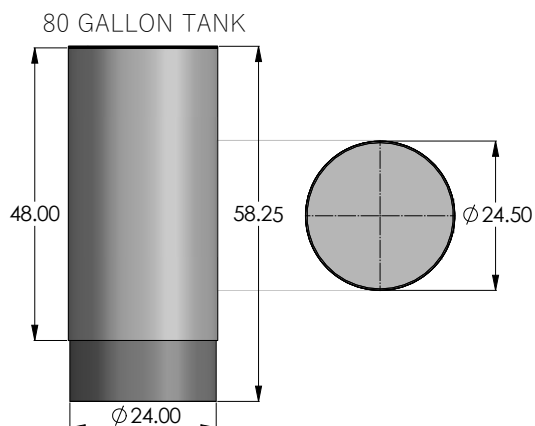


Figure 2.0.1-1: Solar Storage Insulation Jacket Installation Front and Top Views

2.1. Tank Orientation

If using a Helio-Tank for installation, orient the proper solar connections in line with the HPAK connections to eliminate piping. On all tanks: ensure proper dip tube length by inspection.

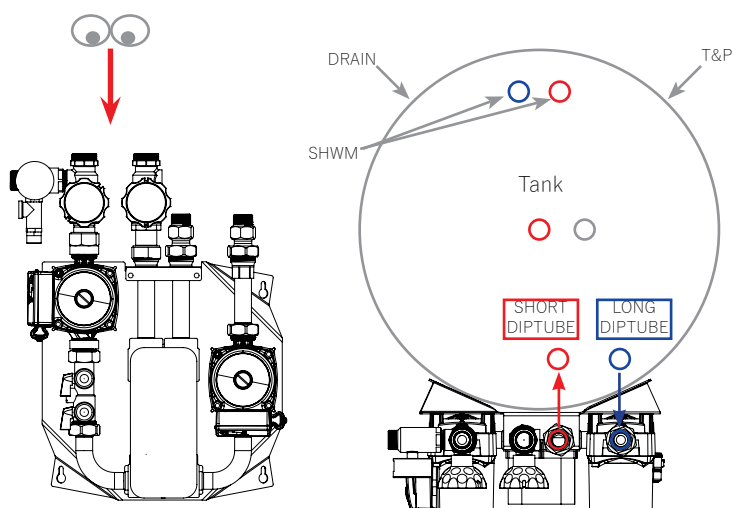


Figure 2.1.-1: HPAK and Tank Connections

2.2. Plumbing Multiple Tanks

If using multiple tanks to achieve proper storage ratio, always use reverse return plumbing with the cold lines the longest, to ensure least heat loss, and that each tank gets the same amount of circulation. For tanks connect all 2" side ports for increased layering and higher performance.

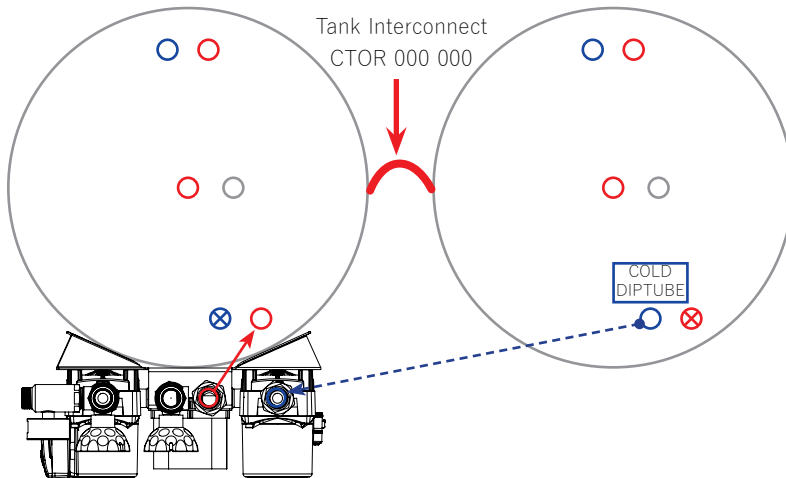


Figure 2.2.-1: HPAK with Multiple Tanks

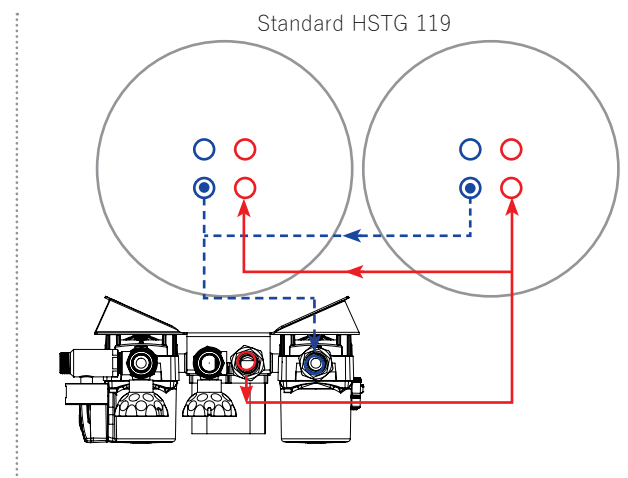


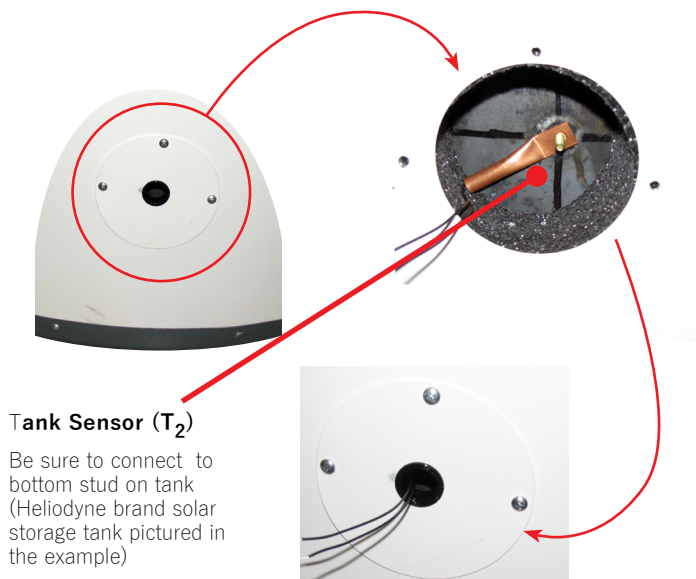
Figure 2.2.-2: HPAK with Multiple Standard Solar Tanks

2.3. Sensor Installation

HPAK's come with the necessary sensors pre-wired into the control; for more information see the separate control manual. The controls require at least one tank sensor: on the bottom of the storage tank; the top tank sensor is optional. Most solar storage tanks have a stud near the bottom for placement. If a specific area is not available, attach to a metal drain, disconnected lower element, or use the cold in for lower tank sensor; use the hot out for a top tank sensor. The collector sensor must go on the outlet header of the array.

For Pro models: the energy production is default set to calculate via the collector outlet sensor and the flow meter temperature and flow sensor. For greater accuracy, install an additional thermistor sensor just above the inlet to the heat exchanger and connect to T4 at the Delta-T Pro.

2.3.0. Storage Sensor Panel Removal and Installation



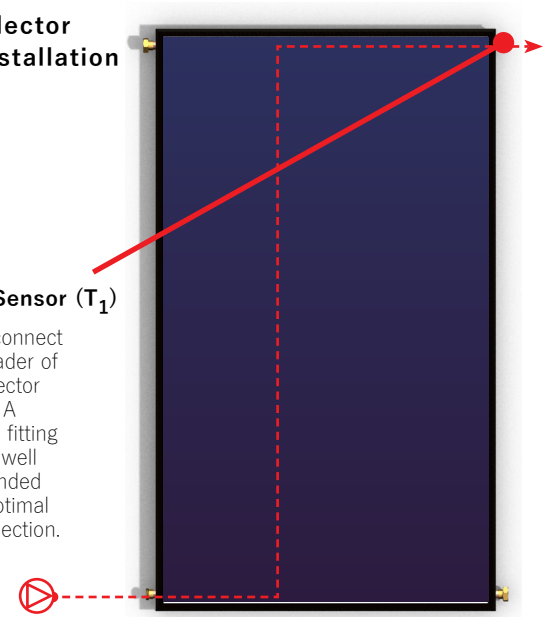
Tank Sensor (T_2)

Be sure to connect to bottom stud on tank (Heliodyne brand solar storage tank pictured in the example)

2.3.1. Collector Sensor Installation

Collector Sensor (T_1)

Be sure to connect to outlet header of the last collector in the array. A DOS combo fitting with sensor well is recommended to ensure optimal sensor connection.



2.4. Helio-Pak Tank Mounting

Choose the mounting location for the HPAK. Using the mounting bracket measure and level a spot 6" down from the desired position of the top of the HPAK. With the 3 self-tapping screws provided with the HPAK; Use mounting holes to screw bracket onto a tank or wall. Align the top and bottom lugs on the bracket with the top and bottom mating holes on tank/wall and hang. Pull the HPAK down to lock in the lugs with the surface.

NOTE: For single gas tank systems with side ports, mount the HPAK as per section 3.2.1

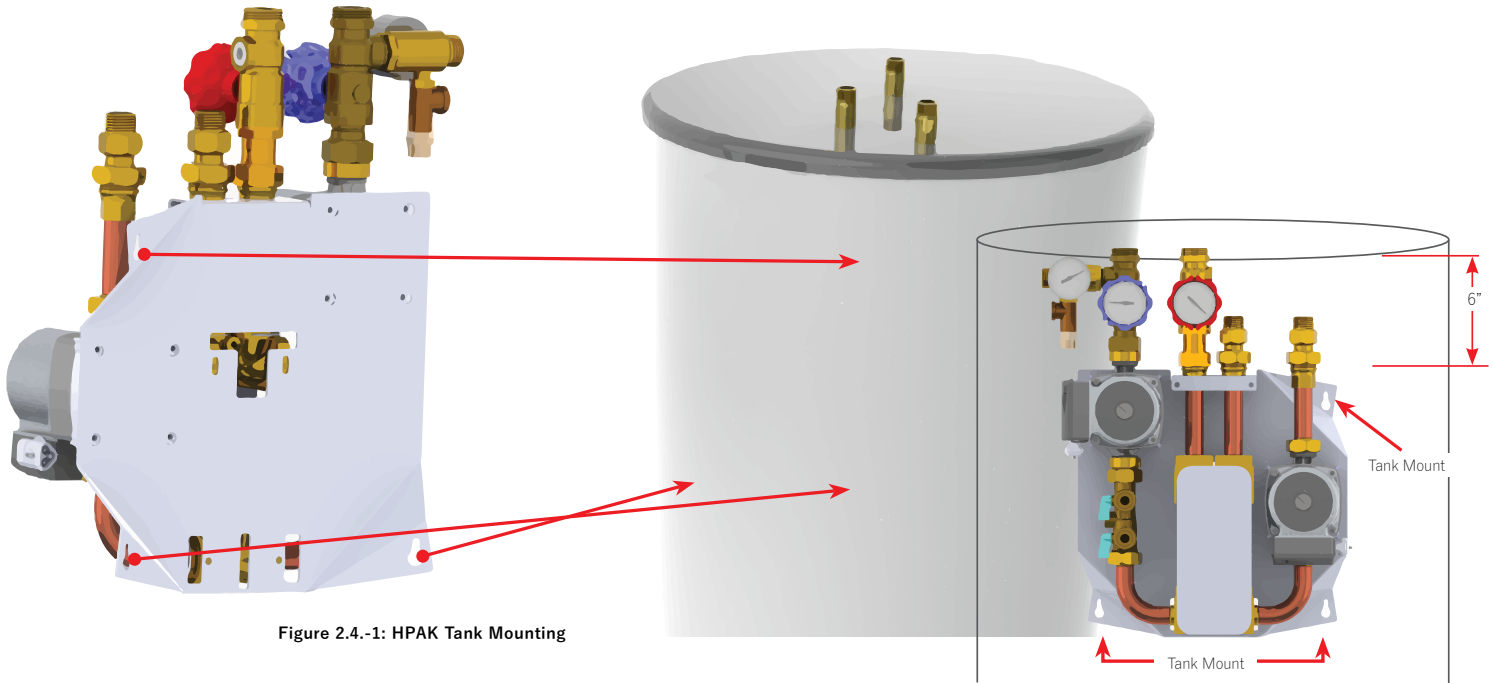
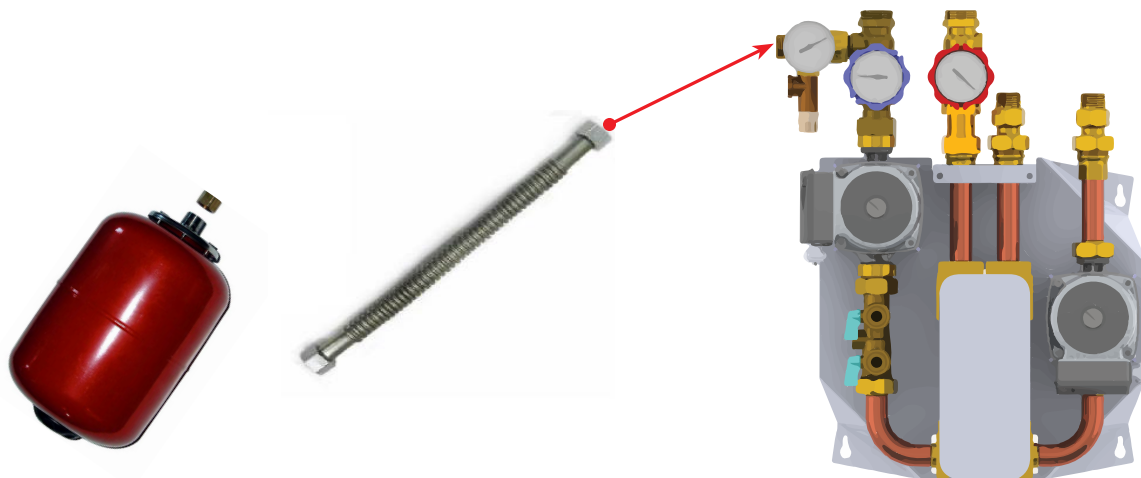


Figure 2.4.-1: HPAK Tank Mounting

2.5. Expansion Tank Mounting

Helio-Paks come with a pre-sized expansion tank of bladder type pre-charged to 25 PSI. If the shipped expansion tank volume is less than 1/5th of the total collector system fluid volume, contact Heliodyne to purchase the appropriate additional expansion.

Use flex hose provided to connect the expansion tank to the HPAK. Apply pipe tape the the threads of both connection to ensure a watertight seal. Secure the expansion tank to the storage tank or wall. The orientation of the bladder type tanks does not matter; any location is acceptable.



3. PIPING

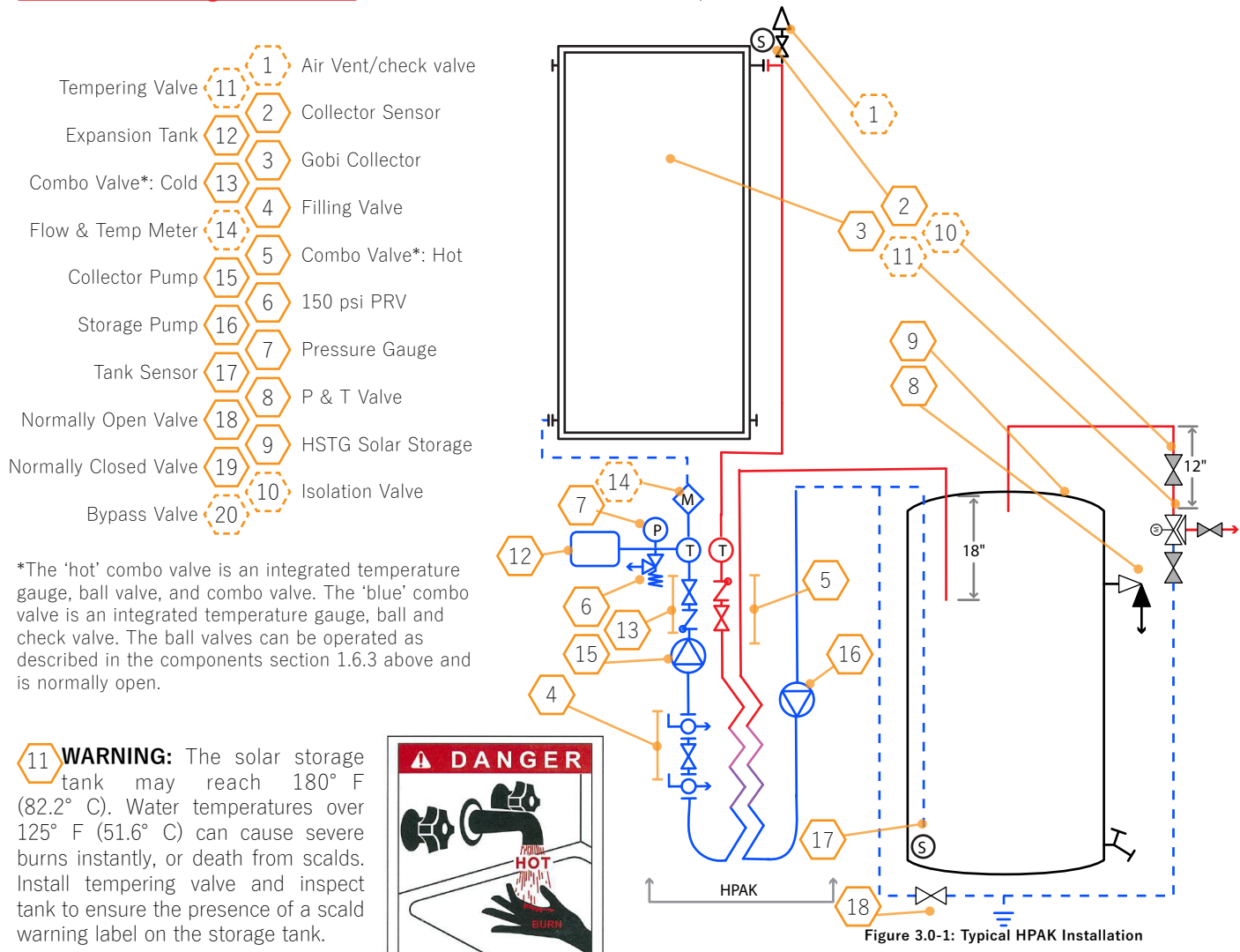
3.0. Connect the HPAK to the Tank

All plumbing must be allowed for thermal expansion so no stress is applied on the HPAK interior plumbing. All plumbing is required to be adequately supported so no weight is applied to the HPAK interior plumbing. Penetrations of the building through which piping or wiring is passed shall not reduce or impair the function of the enclosure. Penetrations through walls, roof, or other surfaces shall be made in accordance with applicable codes and also by practices recommended by the National Roofing Contractors Association. When penetrations are required in structural members to accompany passage of solar components, those modified structural members shall comply with local building codes.

Insulate all exposed solar loop and potable water connections and piping with insulation having a minimum R value of R2.6.. The ¾" cold water supply line to the solar storage tank must be insulated with a minimum ¾" pipe insulation to a minimum distance of 5' up stream of the storage tank, or to the wall if closer than 5'. All piping must be supported at a maximum interval of 10' at a pitch suitable for draining and the piping supports must not crimp or compress the insulation. To enable backup heat during solar system maintenance, isolation and shut off valves must be installed as recommended in installation schematics below. Use dielectric unions when connecting piping to the storage tank nipples. All exterior insulation must be protected from UV exposure and moisture.

In tanks that have only three connections on the top, it is possible to share the cold connection between the tank cold inlet, HPAK tank cold feed, and cold supply to a tempering valve. This requires that the HPAK cold suction is located next to the tank inlet and that a check valve is used to prevent back flow from the HPAK into the tempering valve cold water supply.

When using the Helio-Tank, the DHW Cold is shared with the HPAK Cold. **NEVER share the hot DHW and HPAK return line to prevent cold water entering the hot line.** Ensure that the HPAK return has a dip tube in the tank as shown.



3.1 Different Tank Schematics

All Heliodyne solar water heating systems are designed to provide adequate backup water heating, for periods when solar hot water production is low. Based on your system model, refer to page 4 of this manual, backup hot water may be provided by internal electrical elements, an underfired gas burner, auxiliary gas or electric tank, or auxiliary tankless electric or gas water heater. All methods of backup utilized with Heliodyne systems utilize backup heat sources that are listed and labled by an accredited listing organization.

If your tank is not here, contact Heliodyne with questions. Refer to the valve descriptions on the previous page. In accordance with SRCC standard OG-300, all piping and valves must be labeled. Attach the waterproofed labels from the template provided with this manual to the appropriate components.

NOTE: For single tank electric systems: disconnect lower element for proper operation.

NOTE: For single tank gas systems: tanks with electric pilot and HP Pro ONLY

NOTE: In Canada, the tank must be CSA approved and all plumbing fittings must comply with CSA B.125. All CSA system tanks must have a Scald warning label.

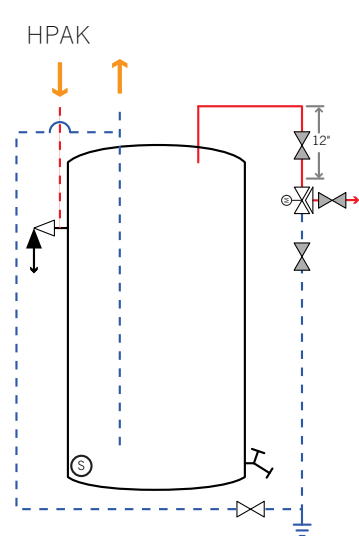


Figure 3.1-1: Single Standard Tank

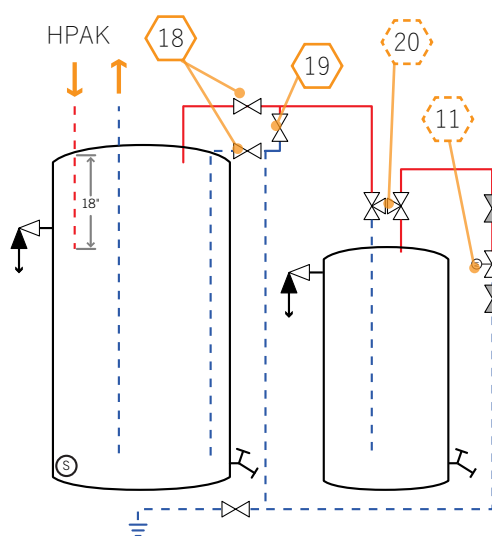


Figure 3.1-2: Dual Tank: Electric Backup

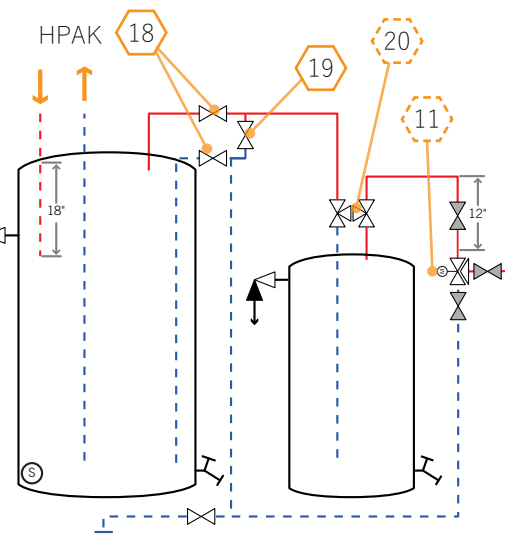


Figure 3.1-3: Dual Tank: Gas Backup

3.1.0. Solar heating with Tankless Water Heaters

For systems with Tankless or On-Demand Water Heaters, solar pre-heated water can potentially overheat the internal gas water heater components. For this reason Heliodyne recommends using a Mixing Valve prior to entry into the On-Demand Unit, to mix down the solar heated water to the maximum temperature limit of the gas heater.

Connect the solar storage tank top ports as per tank manual for normal DHW applications

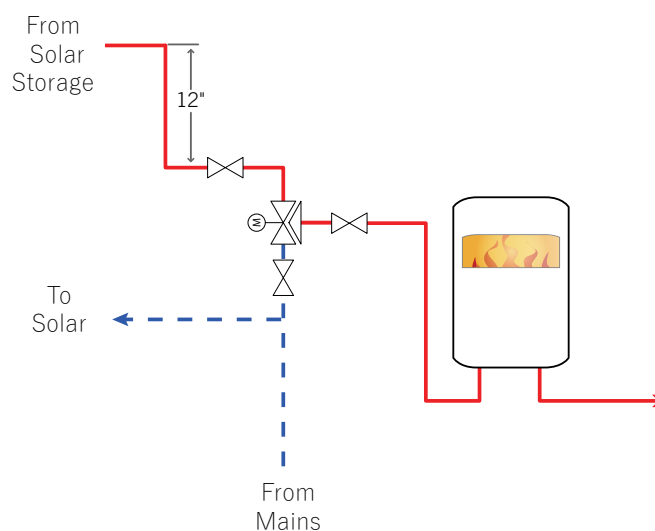


Figure 3.1-4: Flow Thru Connection

3.2 Single Gas Tank Systems with Electric Ignition Pilot Light.

Heliodyne Delta-T Pro controllers have built in logic to control an electric-ignition pilot light for single gas tank systems, allowing their use for the first time with solar thermal collectors. The solar thermal controller will override the gas tank ignition if there is abundant solar energy. For more information on the controller logic, refer to Delta-T Pro manual.

The following are requirements for single gas tank usage:

1. Storage tank must have an Electric Ignition Pilot Light
2. Solar Thermal Controller must be a HPAK Pro Model.
3. An additional temperature sensor is required at the top of the storage tank.
For HPAK Pro systems, this extra sensor can be a RTD Thermistor sensor (T3).

3.2.1. Gas-Fired Tank with Side Ports:

The preferred method of plumbing will use tank side ports. Plumb the HPAK cold suction line into cold inlet, the HPAK hot return to the top side port. Install a check valve on the cold inlet prior to the HPAK suction line, which will ensure proper flow to the anti-scalding valve.

WARNING: No check valve on the cold groundwater line prior to the HPAK cold suction connection may cause severe burns at hot water fixtures.

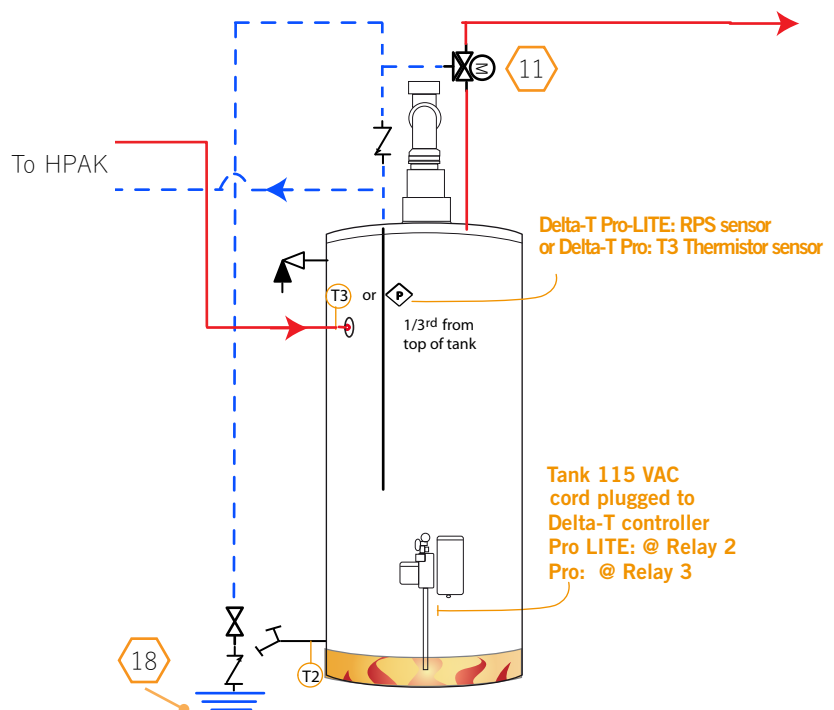


Figure 3.2-1: HPAK PRO with side-port
Electric-Ignition Gas Tank

3.2.2. Valve Block Kit Installation

Though not required when installing an HPAK, Heliodyne offers a SRCC compliant valve block kit for use with single tank systems. Refer to the Valve Block Kit manual for more information on its function.

NOTE: If installing a valve block kit, be sure to follow its HPAK mounting instructions as they differ from this manual's HPAK mounting instructions.



4. COMMISSIONING

4.0. Pressure Test and Clean Collector Loop

Before filling the collector loop with Dyn-O-Flo HD glycol solution, flush and pressure test the collector loop with water to check for soldering leaks. Rinse system with 1-2% TSP solution:

WARNING: Collectors must be cool or covered to prevent damage during charging

1. Cover the collectors to prevent heating, or commence the fill at night when collectors are cool.
2. Remove the expansion tank and cap off the exposed HPAK expansion tank port.
3. Open all Air Vents.
4. Connect the HPAK fill valve position #2 (see figure 4.0-1) to a site mains supply hose or filling station supply hose.
5. Connect the HPAK fill valve position #3 to a return hose which can drain into a bucket or floor drain.
6. Turn fill valve #1 so the slot is horizontal.
7. Flush then fill the collector loop with water forcing fluid in through fill port #2 and returning from fill port #3.
8. Close fill ports #2 and #3 to pressurize loop up to mains pressure (60 – 80 psig.) and check for leaks.
9. Purge air out of the HPAK pumps windings as per section 4.2. After a minute of purging, re-install pump screwcap until snug.

WARNING! DO NOT OVERTIGHTEN

10. Drain system to a bucket or drain until the water comes out clean.
11. Reinstall expansion tank to the HPAK connection port.
12. For the final fill of the system, monitor the pressure gauge for drops in pressure, inspect all joints. Turn the collector loop pump on ONLY after pumps have been purged as in section 4.2. If the loop is drained, proceed to section 4.3 once the system is ready for final filling.

4.1. Calculate System Fluid Volume and Necessary Glycol Concentration

Find the total fluid capacity by adding in the volume of the collectors, HPAK and supply and return lines. With the total volume, use the equation below to find out necessary gallons of glycol. Glycol concentration should be 40 – 60% for proper inhibitor concentration, regardless of required freeze protection. A higher concentration than is required for freeze protection is recommended in case of errors in fluid calculation. Dyn-O-Flo HD propylene glycol is the recommended heat transfer liquid; the substitution of any other heat-transfer fluid can cause irreparable damage and/or create health and safety hazards. Use mineral spring water or good quality tap water and only fill system when collectors are cold.

$$\text{Gallons of Dyn-O-Flo HD} = \text{Desired Concentration (\%)} * \text{Total System Fluid (gal.)} / 100$$

SYSTEM COMPONENT	FLUID CAPACITY (GAL.)
GOBI 406 001 & 002	0.60
GOBI 408 001 & 002	0.70
GOBI 410 001 & 002	0.80
HPAK 016 000 & 001	0.80
HPAK 024 000 & 001	0.95
HPAK 032 000 & 001	1.00
HPAK 048 000 & 001	1.25

ASTM B88 COPPER TUBING	GALLONS / 100'
Type M 1/2" (5/8" OD)	1.32
Type M 3/4" (7/8" OD)	2.68
Type M 1" (1-1/8" OD)	4.54
Type M 1-1/4" (1-3/8" OD)	6.80
Type M 1-1/2" (1-5/8" OD)	9.51
Type M 2" (2-1/8" OD)	16.5

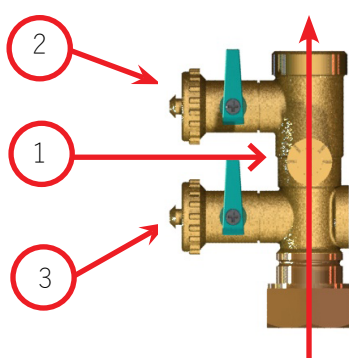


Figure 4.0-1: Drain Fitting Open
(Operation Position)

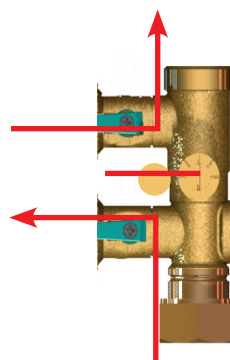


Figure 4.0-2: Drain Fitting Closed
(Fluid Servicing)

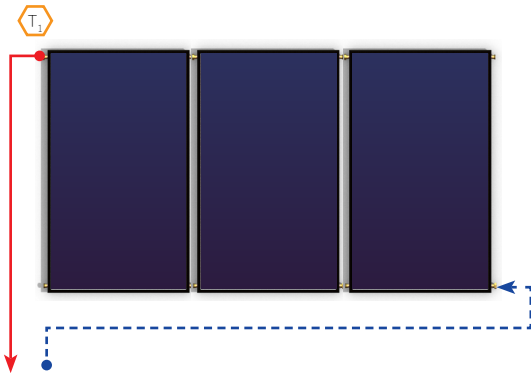
4.2. Gobi Collector Plumbing and Sensor Installation

Use only Heliodyne flexible stainless steel flextubes or copper piping on the collector loop, solder copper to appropriate conditions in technical specifications. Always plumb in reverse return with the longest line the cold, or use automatic balancing valves. Insulate piping for least losses; use rubber based insulation with environment protection or Solar Flex Tube from Heliodyne.

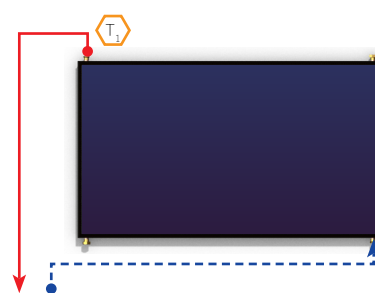
Gobi collectors can be put in portrait arrays of up to eight. Install bleed vents for filling at local high points. The collector array temperature sensor must be installed in the locations shown below, indicated by T_1 for the various array configurations. The temperature sensor, and all other systems sensors, and wiring shall be protected from environmental influence such as wind, moisture, temperature or other factors which may alter their intended sensing function.

When installing piping and sensor wires, all penetrations through fire-rated assemblies etc. shall not reduce the building's fire resistance required by local codes, ordinances and applicable standards.

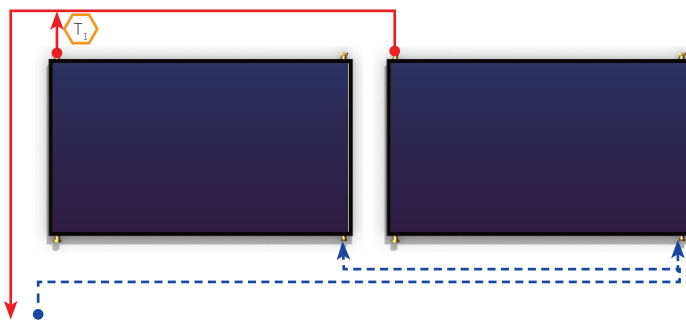
4.2.0. Portrait Single Collector or Array



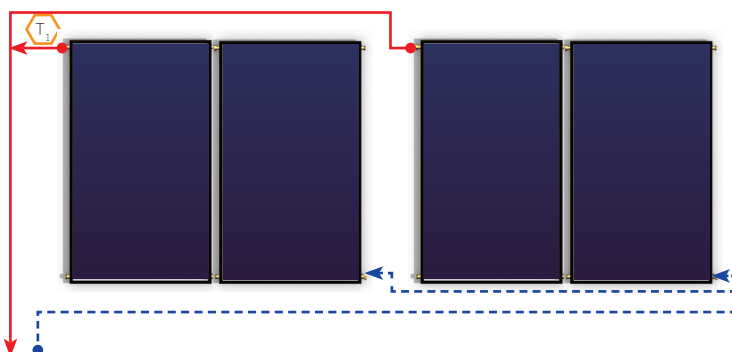
4.2.1. Single Horizontal Collector



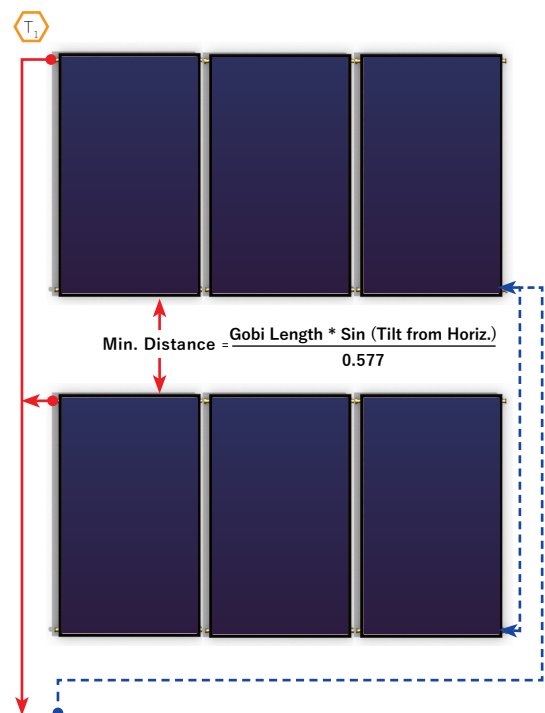
4.2.2. Multiple Horizontal Collectors



4.2.3. Multiple Horizontally Aligned Portrait Arrays



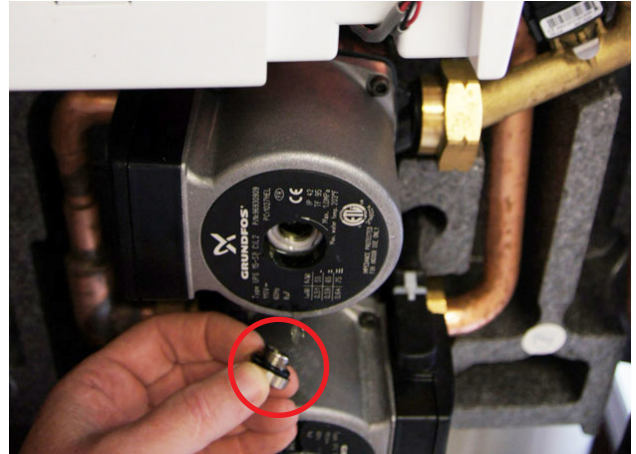
4.2.4. Multiple Vertically Aligned Portrait



4.3. Pump Venting

After the clean water flushing procedure, during the pressure test and before charging the solar collector loop with glycol, remove the center screw/air vent in the pump faceplate on both pumps on the HPAKs to purge out trapped air (see image to the right). If this is not done before glycol charging, then make sure to do this after the systems are charged with glycol, prior to starting the glycol and potable water pumps.

The operating fluid lubricates the interior of the HPAK pumps. It is extremely important to vent the pumps prior to energizing, to lubricate the pumps bushings. **Failure to vent air from the pump housing will cause pump damage and failure.**



4.4. Fill System

WARNING: Ensure that there is enough excess glycol/water mixture in the filling station container at all times to prevent the fill pump from sucking air into the collector loop. This normally requires at least two gallons of glycol/water mixture in addition to the quantity required to fill the solar system.

Heliodyne strongly recommends use of a fill pump station. At a minimum, you should use a 1/2 hp pump capable of developing at least 85 psi shutoff head.

The system can be filled easily with a filling pump. If using a Fill Station, consult the Filling Station manual for proper operation. Take care to use mineral spring water or good quality water and only fill the system when the collectors are cold. It is important to charge the collectors only when they are cold. If you cannot charge early in the morning, before the sun has started heating the collectors, collectors must be covered to prevent heating during charging. See installation notes at the end of this manual for water requirements. Install air vents or bleed vents at the high points in the system to help rid the system of air during filling only. If using any type of automatic air vent, close vent after filling is complete as vents are not suitable for glycol systems, or systems without continuously replaced fluids.

Use a high-temperature ball valve between the collector outlet and air vent, to allow for removal of the air vent after purging of all air is complete. The high-temperature ball valve will also help protect the air vent from high temperatures associated with stagnation if the air vent is not removed post commissioning.

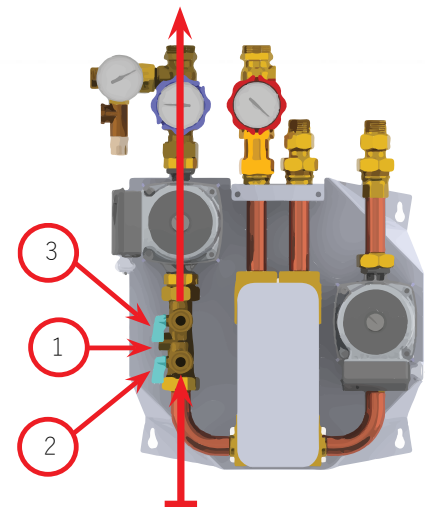


Figure 4.4-1: Fill port flow connections

1. Open all air vents at the collector array outlets.
2. If using multiple arrays, close all array inlet and outlet isolations except for the array furthest from the HPAK(s)
3. For a system with multiple HPAKs, close all HPAK ball valves except for the HPAK you are connecting the fill pump to.
4. Connect fill pump supply hose to fill port # 3 at right, and return hose to fill port # 2. Turn valve #1 so slot is horizontal, forcing return fluid out of 2. Turn on pump to begin filling.
5. After fluid begins to return back into tank from 2, open next set of array inlet and outlet valves to fill the array.
6. Continue to open all array inlets and outlets until all arrays are full.
7. After fluid begins to come back out of return hose from port #2 without any air bubbles, pressurize the system to 40-60 PSI and then close fill port #3.
8. Return fill valve #1 to vertical.
9. Turn off pump.
10. If using multiple HPAKs, move fill pump and hoses to the next HPAK. Connect fill supply hose to port #3 and return hose to #2. Open fill valves #3 and #2, turn valve #1 to horizontal position.
11. Turn on fill pump and open up the HPAK combination valves to fill the HPAK internals.

4.4. Fill System (continued)

12. Once steady stream comes back from fill return line, close off fill valves #2 and #3, return valve #1 to vertical position and turn off pump.
13. At the last HPAK station: once fluid begins to come back out of return hose, close off valve at fill port #2 and open fill port #1, KEEPING VALVE #3 OPEN. System will pressurize rapidly; monitor gauge and close off valve at fill port #3 once system pressure reaches 40 – 60 psi.
14. Turn off fill pump.
15. If using multiple HPAKs, check to make sure all HPAK pressure gauges are recording the same pressure
16. Close off any bleed or air vents and run system throughout the day. Verify HPAK pumps are vented as per section 4.2 prior to plugging in the HPAK. Check after a day cycle to ensure the cold pressure of the system is above 30 psig when cold. If further pressurization is necessary, hook up pump supply to 3, turn pump on, open valve and pressurize back up.

For manual fill, pour in proper glycol and water mixture with a funnel into the top unused header connection of Gobi. Pressurize with house water using the valve at position 3; follow pressure guidelines as above. Hose nipples are provided, pre-set into the foam next to the fill valve. Heliodyne highly recommends only filling with a pump station.

4.5. Fill System: Potable Water Side

Connect the HPAK potable supply and return connections to the storage tank. Next, 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.

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. On the HPAK lower pump, unscrew the center screw/air vent in the pump faceplate to purge the pump as described in section 4.2. Replace the center screw in the pump being careful not to damage the O-ring from over tightening.

After the potable piping system is pressurized inspect the piping system carefully for leaks.

4.6. System Startup and Testing:

Plug in the HPAK device 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

- After the system is filled, it is normal for the initial pressure to drop slightly as air comes out of solution. Check pressure gauge on side of HPAK reads greater than 30 psig when cold. If further pressurization is necessary, hook up a pump supply to fill port #3, turn pump on, open valve #3 and pressurize system to above 30 psig.

Check Collector and Water pumps for proper operation.

- With proper operation, the hot or red gauge should read 10-20° F hotter than the blue gauge.
- With a temperature difference greater than 20° F, set the pump speeds to a higher level. 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 HPAK pump front ports if necessary. Unplug HPAK from wall prior to purging air from pumps. Follow filling guidelines for re-pressurization if needed.
- No temperature difference could mean a flow failure. Ensure all valves aligned correctly and check for pump operation. Consult section 6.0 of the HPAK Manual for more troubleshooting steps.

Check the control and sensors

- Ensure the sensors are giving proper readings by either viewing the computer software for the Delta-T Pro, or using a multi meter to measure thermistor resistance. See the control manual for further details.
- Check wiring to ensure it is undamaged and continuous.

System Shutdown.

- If the operation checks cannot be met, or a problem is discovered in the solar system, shut down the HPAK by unplugging it from the wall. 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.

5. O&M

5.0. Annual Operational Checks and Troubleshooting

Every year the solar system should be checked to ensure optimal performance; these annual checks performed by a qualified professional should not take the place of good operation overview by the systems owner.

Annually or more often, the following should be verified:

5.0.0. Check collector and water side pumps for operation

- With proper operation, the hot or red gauge should read 10-20° F hotter than the blue gauge.
- If the blue gauge is higher than the red gauge, the system is indicating that there is no flow. If this is the case, then there may be air locks in either or both the glycol loop and potable water lines. To remedy this, open the air vent/center screws on both pumps by turning 1.5 turns, leaving them to vent for up to a minute, to remove additional air, and then carefully tighten them down, taking care not to overtighten which could damage the gaskets on the pumps
- With a temperature difference greater than 20° F, set the pump speeds to a higher level. For a difference less than 10° F, set the pump speeds to a lower level.
- Loud operation or squealing means air in the system, follow filling guidelines for re-pressurization.
- No temperature difference could mean a pump failure, test pump supply voltage at pump electrical box, listen and feel for OP.
- No temperature difference could also mean a diptube wasn't installed correctly, or at the right length. Review tank schematics in this manual for proper length.
- The hot and cold ball valves could be turned incorrectly; ensure the slots on the top and bottom of the plastic red or blue colored handle are aligned vertically.
- The filling valve bypass could be turned incorrectly; ensure the slot aligns vertically.

5.0.1. Check pressure gauge

- Pressure gauge on HPAK should be no less than 30 psig when system is cold. Follow filling guidelines for re-pressurization.
- Inspect system for leaks.

5.0.2. Check expansion tank pressure

- The expansion tanks have a shraeder valve (like a bicycle tube valve) for pressurization; it should be charged with approximately 25 psig.

5.0.3. Check the glycol color, concentration and pH.

- Heliodyne has glycol testing kits that perform the required analysis. Review the data sheet for Dyn-O-Flo HD in this manual for proper levels.
- Glycol should be a bright green color; anything else needs to be replaced. Use only Dyn-O-Flo HD or equivalent.

5.0.4. Check the control and sensors

- Ensure the sensors are giving proper readings by either viewing the software in the Delta-T Pro, or using a multimeter to measure resistance. See the control manual for further details.
- Check wiring to ensure it is undamaged and continuous.

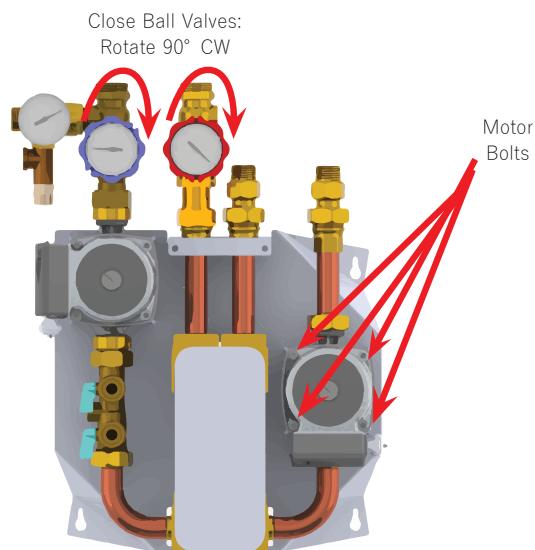
5.1. Maintenance

To replace parts on the HPAK, close the hot and cold ball valves for servicing equipment underneath them such as pump, heat exchanger, flow sensor, etc. For servicing PRV, pressure gauge, expansion tank or collectors and piping, the system should be drained in the direction of flow via the fill valve. If the fluid is good, drain it to a bucket for reuse. Estimated time per component: 1-2 hours.

To replace any of the combo valves, unscrew appropriate valve, and replace gasket with valve; torque connections to 30 lb-ft. Estimated time per component: 2 hours.

To service a pump, the motor housing only needs replacing, as volutes have no moving parts. Disconnect electricity from HPAK, then disconnect the pump wiring with the spring clamps. Unscrew the two allen-keyed bolts and replace motor and electrical connections. Torque bolts to 80 lb-in. Estimated time per component: 2 hours.

To service the controller, disconnect the electricity from the unit and remove the box housing, unplug all connections and power wiring, and replace the board. After reinstalling a new controller, test operation by turning the control on manually. Estimated time per component: 1 hour.



6. HEAT TRANSFER FLUID NOTES

6.0. General Dyn-O-Flo HD Notes

Dyn-O-Flo HD is a 100% concentrate inhibited propylene glycol and is recommended for use in applications where low acute oral toxicity is important or where incidental contact with drinking water is possible. Extra strength corrosion inhibitors in the HD fluid are formulated for high temperature use, resulting in reduced maintenance and longer inhibitor life in most applications. Freeze tolerance limits are based upon an assumed set of environmental conditions.

6.0.0. Use Directions

- Do not use full strength.
- Recommended concentration is 40 – 60%, suitable for ambient temperatures above -60 °F.
- Extended periods of cold weather, including ambient temperatures above the specified limit, may cause freezing in exposed parts of the system. It is the owner's responsibility to protect the system in accordance with the Supplier's instructions if the air temperature is anticipated to approach the specified freeze tolerance limit.
- Dilute with good quality soft water. If the tap water has more than 25 ppm of chloride or sulfate ions, or more than 50 ppm of calcium or magnesium, use mountain spring water.
- Do not use zinc or galvanized components in contact with the fluid.
- System preparation: Flush thoroughly with water (use 1 – 2% TSP) and circulate without adding heat, before introducing the operating fluid.
- Fluid Introduction: Please see the Helio-Pak systems Manuals for filling, venting and priming.
- Maintenance: The fluid should be checked periodically for pH, which should not drop below 8, and reserve alkalinity, which should stay greater than zero at all times.
- Flush thoroughly before replacing with new mix.

6.0.1. Specifications

- **Propylene Glycol:** 94%
- **Inhibitor Concentration by Weight:** 6%, inhibitors and water
- **Color:** Fluorescent yellow
- **Reserve Alkalinity:** 15 mL
- **Specific Gravity:** 1.053 – 1.063
- **Service Temperature Range:** -50 to 325 °F
- **Freezing Point:** -60 °F
- **Boiling Point:** 320 °F
- **Flash Point:** 214 °F
- **Auto Ignition Temperature:** 700 °F

6.0.2. Values at 50% Concentration

The listed values are typical of a 50% by volume aqueous solution, within the specified service temperature range and should not be regarded as specifications.

- **pH:** 9.0 – 10.7
- **Viscosity:** 0.40 to 95.97 Cps
- **Specific Heat:** 0.758 to 0.965 BTU / lb °F
- **Vapor Pressure:** 1.1 to 82.4 psia

6.0.3. Emergency First Aid

While essentially non-irritating, absorbing or toxic, Dyn-O-Flo HD heat transfer fluid should be kept away from children and be treated with care. In case of physical contact, follow these directions:

- **Eyes:** Flush with plenty of water
- **Skin:** Wash off with flowing water
- **Ingestion:** Induce vomiting and consult a physician
- **Inhalation:** Remove to fresh air, consult physician.

Notice to Physician: No specific antidote. Supportive care based on judgment of physician.

6.0.4. Handling

- **Exposure Guidelines:** Propylene glycol: AIHA WEEL is 50 ppm total, 10 mg / m³ aerosol only.
- **Ventilation:** Good general ventilation is sufficient for most conditions.

- **Respiratory Protection:** No respiratory protection should be needed.
- **Skin Protection:** For brief contact, no precautions other than cleaning of body and covering. Use impervious gloves when prolonged or frequently repeated contact occurs.
- **Eye Protection:** Use safety glasses.
- **Spills:** Cover with absorbent material, soak up and seep into bag.
- **Disposal:** Discharge into sanitary sewers only with the explicit pre-approval of the local waste water facility. Any disposal practice must be in compliance with federal, state, provincial and local laws and regulations. Check with the appropriate agencies.

6.0.5. Maintenance

The glycol / water mix should be tested periodically for freeze protection and pH. Empty the system and flush thoroughly before replacing with a fresh mix when the pH drops below 8, or reserve alkalinity approaches zero.

6.0.6. System Fluid Information

Always use copper tubing for collector supply and return connections. Black iron pipe can also be used, with proper dielectrics. Never use galvanized pipe or plastic based products, such as PEX.

Use only Dyn-O-Flo HD or similar heat transfer fluid with good quality water mixture: min 40% HD mixture, max 60% HD mixture. Substitution of any other heat-transfer fluid may cause irreparable damage and create a health and safety hazard. Do not use distilled water.

Rinse system with 1 – 2% mixture of trisodium phosphate and water. Remove the expansion tank for testing only, and pressure test system with water before filling.

Maintain minimum operating pressure of 30 psig when system is cold to avoid pump cavitation. If using an air vent during filling, ensure it is closed during system operation.

6.0.7. Safety Precautions

Follow all local codes and regulations. Work should only be performed on the HPAK and system when it is disconnected from the power supply.

When creating and repairing roof penetrations, ensure final seal disallows any unwanted animal or creature intrusion, and the integrity of the structure is not compromised. Penetrations through fire-rated assemblies must not reduce fire resistance capacity below code. Ensure building materials adjacent to solar components are not exposed to elevated temperatures.

6.0.8. Components

Always install a tempering valve, or rated anti-scald valve, after the solar storage tank. Route the pressure relief port on the HPAK to avoid accidental scalding in case of release.

Place the HPAK and tank in a non-freezing environment.

Solder suitable for 400° F and 150 psig must be used: 96/4 Tin / Silver is recommended.

6.0.9. Description Of Product and Operation

The HPAK is a fully automatic solar energy heat transfer appliance. The controller senses the collector and storage temperatures and powers both circulation pumps when the collector has achieved enough temperature over the solar storage tank. See the Delta-T and Delta-T Pro manuals for full descriptions of operation and functions.

6.0.10. Commissioning

After the system is filled, it is normal for the initial pressure to drop as air comes out of solution. Repressurize the system to ensure at least 30 psig when cold.

6.1 Installer Notes

This page is set aside for Installer Notes on the System:

INSTALLER NAME/COMPANY:

ADDRESS:

Phone:

Email:

INSTALLATION DATE:

COMMISSIONING DATE:

HEAT TRANSFER FLUID TYPE
AND CONCENTRATION:

OTHER:

7. WARRANTY

7.0. Warranty

HELIODYNE, provides the following limited warranty against defects in materials and workmanship for purchased goods delivered after 11/01/2012. This warranty applies to the first retail buyer and to any subsequent owners. Product shall be free from defects in material and workmanship, malfunctions and failure to perform, under normal use, service and maintenance, provided that said products have been installed in accordance with HELIODYNE's Installation Instructions. The warranty term for each product shall begin on the date of purchase and remain active for the period of time as specified and applicable for each individual product.

Heliodyne Solar Collectors

- Ten (10) year limited warranty (parts only, no labor, no shipping) from date of purchase.

Heliodyne Heat Transfer Appliances

- Five (5) year limited warranty (parts only, no labor, no shipping) from date of purchase when installed with HELIODYNE Collectors.
- Three (3) year limited warranty (parts only, no labor, no shipping) on Integrated Electronics (such as controller, pumps, sensors, etc.)
- In the event that the Product is installed with another brand of collector, or any equipment other than HELIODYNE collectors, then the period of time shall be one (1) year from date of purchase for Product and Electronics.

Heliodyne Solar Tanks

- Six (6) year limited warranty (parts only, no labor, no shipping) from date of purchase.

The DELTA-T Products

- Three (3) year limited warranty (parts only, no labor, no shipping) from the date of purchase.

In the event that evidence cannot be provided to indicate the date of purchase, then the warranty period shall begin on the date the product was manufactured.

Objects are warranted at HELIODYNE's discretion by repair of the object of purchase or replacement of defective parts, exchange or reduction of price. The right of the contractor to convert objects is ceded by common consent. Replaced parts become the property of HELIODYNE. Wages and costs spent on shipping, installation and disassembly must be covered by the client. This provision similarly applies to all warranty agreements. It is at HELIODYNE's discretion to replace defective goods with similar, faultless goods. In this case, any rights to cancel the agreement cease. The client expressly waives the right for it and its legal successors to assert claims for damages or loss of profit (including without limitation special, indirect, loss of use, contingent, or consequential damages) due to defects or nonconformity in the purchased good. The warranty set forth above constitutes the sole and exclusive remedy against HELIODYNE for the furnishing of any nonconforming or defective goods. THE ABOVE WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE.

If the Product contains a defect that cannot be repaired after a reasonable number of attempts to do so, you, the buyer, may elect either a refund of its purchase price, or a replacement without charge.

A replacement may consist of a new or factory rebuilt product of at least the same quality. The providing of replacement products or components shall not extend the original warranty period. Claims on warranty will only be admitted and considered if they are announced in writing immediately after the defect was first noticed. Oral communication or communication by telephone is not sufficient. To obtain service on the Product, notify Heliodyne Customer Service by email at sales@heliodyne.com, or by letter to 4910 Seaport Ave., Richmond, CA, 94804. Provide proof of purchase and date.

Should service be requested and no defect found in the Product, then a reasonable charge will be made for the service.

In no event shall HELIODYNE be liable for the following:

- Conditions resulting from a defect in a component or part that does not make up the HELIODYNE Product.
- Conditions resulting from a significant departure from Heliodyne's Installation Instructions.
- Conditions resulting from any misuse, abuse, negligence, weather damage, accident or alteration.
- Consequential damages such as: damage to your property, loss of time, inconvenience or loss of use of the Product or any incidental expenses resulting from any breach of the express warranty. Conditions that may occur in the normal operation of the Product shall not be invoked by HELIODYNE to reduce or defeat the coverage of this warranty.

HELIODYNE's liability under this warranty shall be in lieu of all warranties of fitness and in lieu of all warranties of merchantability. Heliodyne shall not be liable for any incidental or consequential damages covered by a defective product. The maximum liability under this warranty shall not exceed the contract price of the Product. Some states do not allow the exclusion or limitations of incidental or consequential damages, and some states do not allow limitations on implied warranties, such as that of fitness and of merchantability. Therefore the above exclusions and limitations do not apply to you.

The warranty excludes damage caused by force majeure and malfunction that are due to improper assembly, and/or product installation. HELIODYNE is not liable for possible costs resulting from defects. In order for HELIODYNE to accept liability:

- Installation must have been carried out by a licensed specialized company (heating contractor or plumber) following the version of installation instructions in force;
- HELIODYNE or its representative was given the opportunity to check complaints on site immediately after any defect occurred;
- Confirmation exists that the system was commissioned properly and that the system was checked and maintenance was performed annually by a specialized company licensed for this purpose. The warranty agreed by HELIODYNE is only valid for their clients.

This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. Unless otherwise explicitly agreed in writing, it is understood that these are the only written warranties given by HELIODYNE, and HELIODYNE neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with the Product.

8. SRCC OG-300 LABEL SET

8.0. Instructions

The following labels must be attached to the relevant valves in the system in order for it to be considered OG-300 compliant. This page should be laminated, each label cut from it, punched in the margin at the right hand side and affixed to the appropriate valve with a wire tie, plastic ties are inappropriate due to high operating temperatures. Failure to affix these labels will void the SRCC OG-300 system certification (Refer to pages 7-8 for placement).

Valve 7 solar loop PRV valve (Warning)

Valve 7 is normally closed during operation . It is set to open at system pressures above 150 psi to protect the solar loop components from overpressurization. Heat transfer fluid may be discharged at high temperature and/or pressure.

Valve 14 collector array isolation valve

Valve 14 is normally open during operation . It is closed to isolate the storage tank from the collector array should the storage tank need servicing or replacing.

Valve 15 collector array isolation valve

Valve 15 is normally open during operation. It is closed to isolate the storage tank from the collector array should the storage tank need servicing or replacing.

Valve 16 collector array fill/drain valve (Warning hot)

Valve 16 is normally closed. When open, it is used to charge and drain the solar collector loop piping.

The heat transfer fluid used in this system is Dyn-O-Flo HD propylene glycol. It must be handled and disposed of in accordance with the dow chemical company material safety data sheet. A copy of the msds has been provided with your installation manual. No other fluid shall be used that would change the original classification of this system. Unauthorized alterations to this system could result in a hazardous health condition.

Be extremely careful when draining this fluid. It may be discharged at a very high temperature and/or pressure.

Valve 16 collector array fill/drain valve

This solar water heating system utilizes a double wall heat exchanger suitable for use with AWWA class II heat transfer fluids. Please consult section 6 of your installation manual for specific heat transfer fluid requirements, freeze tolerance information and fluid handling requirements.

A 40% - 60% concentration of Dyn-O-Flo HD (AWWA class II propylene glycol) and distilled water can protect your solar system to temperatures as low as -60° F. Lower concentrations of Dyn-O-Flo HD and distilled water will provide a lower level of freeze protection.

No other fluid shall be used that would change the original classification of this system. Unauthorized alterations to this system could result in hazardous health conditions.

Valve 18 solar tank bypass valve (solar tank cold water inlet)

Valve 18 (solar tank cold water inlet) is normally open during operation. When closed in conjunction with closing Valve 18 (solar tank hot water outlet) and opening Valve 19, it will isolate the solar tank for replacement or maintenance.

Valve 18 solar tank bypass valve (solar tank hot water outlet)

Valve 18 (solar tank cold water outlet) is normally open during operation. When closed in conjunction with closing Valve 18 (solar tank hot water inlet) and opening Valve 19, it will isolate the solar tank for replacement or maintenance.

Valve 19 solar tank bypass valve

Valve 19 is normally closed during operation. When open in conjunction with closing Valve 18 (solar tank hot water outlet) and closing Valve 18 (solar tank cold water inlet), it will isolate the solar tank for replacement or maintenance.

9. OG-300 CERTIFICATION PAGE

9.0. Instructions

The following table is a list of SRCC OG-300 compliant Heliodyne systems. The solar system installer is to indicate (circle, check, etc.) the system that was actually installed. This page is to remain inside of the installation or operational manual supplied with the system.

	This product certified by: Solar Rating & Certification Corporation™ www.Solar-Rating.org 	Heliodyne, Inc. 4910 Seaport Avenue Richmond, CA 94804 USA
Solar Energy Factor (SEF _D)	SRCC Cert. No.	Model No.
1.10 2.40 2.00 1.30 3.70 3.20	2011141B 2009034B 2010136G 2009036H 2009034L 2010136E	HPAK 016 1 410 G 80 ACD Z HPAK 016 1 410 G 80 ACS HPAK 016 1 410 G 80 ACS F HPAK 016 2 406 G 80 ACD Z HPAK 016 2 406 G 80 ACS HPAK 016 2 406 G 80 ACS F
The installed system is marked above		