

NITE START INSTRUCTIONS

(SUPPLEMENT TO INSTALLATION MANUAL 2.4)

A. INTRODUCTION

These instructions are not a replacement of the Copper Cricket Instruction Manual, but a supplement to it. This Nite-Start method replaces the Sun-Start method in the manual, Section 5.0. This method has been tested many times in the field. But if you have suggestions for making it more efficient, more reliable, or just easier, mark up this copy with your ideas and send it to Eldon Haines at Sage.

1. Overview of the Nite-Start procedure — The Nite Start method replaces the gravity filling, hand evacuation, and in-place de-aeration of the solar liquid of the Sun-Start procedure. The liquid is heated to 160°F in a small tank (the “**Nite Tank**”) and all the air is removed from the liquid by evacuating the Nite Tank. The Copper Cricket, which has been flushed, leak-tested, and re-sealed, is fully evacuated by means of the water jet pump. The hot solar liquid in the Nite Tank is introduced into the Cricket through the Solar Pad heat exchanger. It boils as it enters the vacuum, and the vapor from the boiling liquid sweeps the air from the solar loop. A special “top-up” procedure assures that the Cricket is properly filled. Finally, the Cricket is fully evacuated and sealed up.

It will not matter what the sun conditions are when you Nite-Start, when the sun comes out next, the Cricket will work. But do go back and check your first few systems to be sure you’re getting it right.

2. Assembling the Nite-Start Tank and Vacuum Pump Assembly — Two sets of drawings are provided. The first set shows the Nite-Start Tank and Vacuum Pump Assembly “blown apart” with part names. The part names correspond to the parts list, which will make it easier to buy or order parts for your system. The second set of drawings shows the assembled Nite-Start Tank and Vacuum Pump Assembly with the functional names; these are the names used in this manual to describe the use of the system.

Choose a tank size that suits your needs. A six-gallon tank is easier to carry and will handle all your single Cricket installations. However, filling a Double Cricket will require you to prepare a second tank load in the field. A ten-gallon tank will handle Double Cricket installations, but it weighs over 100 pounds when it is full.

Electrical codes require a heavier 3-prong “twist” plug if the current load is more than 15 amps. The suggested 1000 W element can be used with a standard 3-prong plug. If you want to install a heavier element to speed the heating of the liquid, check with a local code official to see what type of cord, plug, and receptacle you need.

B. DE-AERATE THE SOLAR LIQUID

Refer to the second drawing of the Nite Tank for names of the parts. It is good business to heat and de-aerate the solar liquid in your shop to reduce your liability at your customer's house. Saves time on the job, too.

1. Open the **funnel valve**. Close the **fill valve**. Estimate how much solar liquid you need from Table 1. Add an extra gallon so you'll have plenty. In any case, be sure there is enough liquid to cover the tank's heating element. Prepare 15% methanol solution by pouring methanol and water into the **funnel**: one and 3/4 pints (1.75 pints) of methanol per gallon of water.

Distilled Water	+	Methanol	=	Resulting Solution
4 Gallons		7 Pints		4.8 Gallons
5 Gallons		8-3/4 Pints		6.0 Gallons
6 Gallons		10-1/2 Pints		7.2 Gallons
7 Gallons		12-1/4 Pints		8.4 Gallons
8 Gallons		14 Pints		9.6 Gallons
9 Gallons		15-3/4 Pints		10.8 Gallons
		<u>One Collector</u>		<u>Two Collectors</u>
Collector volume		2.0 gal		4.0 gal
Solar Pad volume		0.4 gal		0.4 gal
3/4" M copper		(1.0 gal / 40 ft pipe)		(1.0 gal / 40 ft pipe)
(or) 1" M copper				(1.0 gal / 25 ft pipe)
Liquid volume		_____		_____
<i>Example:</i> Double Cricket system with 22 ft run, using 1" M.				
				<u>gallons</u>
Two collectors 2 x 2.0 =				4.0
Solar Pad				0.4
2 x 22 ft. x (1.0 gal / 25 ft pipe) =				1.8
Liquid volume				6.2
<u>Extra gallon</u>				<u>1.0</u>
Mix total volume				7.2

2. Plug in the heater (**thermostat** set at 160°F) on the Nite Tank. Make sure the funnel valve is open and the fill valve closed..
3. When the tank temperature reaches about 140°F, attach either the hand vacuum pump or the **jet pump** to the **access valve**. Open the access valve. Evacuate the Nite Tank and close the access valve. Evacuate the tank every 10 minutes and reclose the access valve.
4. When the heater thermostat switches off, check the **tank thermometer** to be sure the liquid has reached about 160°F. Evacuate until the vacuum is constant; the **tank**

vacuum gauge should read between 12 and 18 inches of mercury (in.Hg) vacuum.
Close the access valve.

____ 5. Disconnect the vacuum pump from the tank access valve; disconnect the extension cord from the short 110-volt male plug. Load the Nite Tank for the trip to the site, taking care to keep all valves closed.

C. FILL THE COPPER CRICKET

- _____ 1. Cover the collector if the sun is shining or there is bright haze.
- _____ 2. Remove the 1/4" brass plug from the level port and thread in the **ball valve assembly** (see Figure 15. in Installation Manual 2.4). Attach a plastic hose to the ball valve.
- _____ 3. Connect the **vacuum pump actuator** to the access valve on the back of the collector and open the access valve. The vacuum hose is about 50 ft. long so the jet-pump can stay on the ground. Turn on the water to the jet pump, close the **air inlet valve**, open both vacuum valves, and start evacuating the Cricket.
- _____ 4. Open the funnel valve on the Nite Tank to let air in. Open the **fill valve**, and crack the **fill actuator** open to fill the **fill hose** with liquid. Connect the fill actuator to the access valve on the Solar Pad.
- _____ 5. Close a **vacuum valve** on the **vacuum hose** and confirm that the **static vacuum** in the Cricket is 27 to 29 in.Hg. (Static vacuum is the system vacuum read when the jet-pump is valved off.) Open the vacuum valve.
- _____ 6. Open the fill actuator to begin filling the Cricket. Notice the time. Let the Cricket fill in this condition (jet-pump evacuating the collector; funnel valve, fill valve, and fill actuator open) for 10 minutes.
- _____ 7. After 10 minutes, close the vacuum valve and close the funnel valve on the Nite Tank. Attach a tire pump to the **pressure port** and pressurize the Nite Tank to 20 psi.
- _____ 8. While the Cricket continues to fill, evacuate it by opening the vacuum valve every 3 minutes for 15 seconds to remove any accumulated air. You will know the Cricket is full when the vacuum hose fills with liquid. Also, with the vacuum valve closed, the static vacuum on the vacuum gauges will move from about 20 or 25 in.Hg to about zero. The exact vacuum reading at "full" depends on the pressure in the Nite Tank and the height of the system. Higher Nite Tank pressure and shorter system lead to higher final pressure at "full".
- _____ 9. **Close the access valve on the Solar Pad to prevent liquid from flowing back into the Nite Tank.**
- _____ 10. Let air into the collector using the **air inlet valve**. Open the ball valve on the level port and drain the excess liquid into a gallon jug or the fill bag provided with the Cricket. Be sure air is getting into the Cricket and a full flow is coming out of the ball valve. Drain until no more liquid comes out.

D. TOP-UP THE CRICKET

- _____ 1. Close the ball valve, close the air inlet valve, and open both vacuum valves. Evacuate the system to 27 to 29 in.Hg, and continue evacuating for two full minutes.

- _____ 2. From the gallon jug or fill bag, draw about a half gallon of solar liquid back into the system through the ball valve on the level port. Close the vacuum valve.
- _____ 3. Let air into the collector using the air inlet valve. As in C.9, open the ball valve on the level port and drain the excess liquid into a gallon jug or the fill bag.
- _____ 4. Remove the ball valve assembly; seal the 1/4” plug into the drain port with red silicone sealant (RTV).
- _____ 5. Open the vacuum valve and draw the vacuum to 20-25 in.Hg. Close the vacuum valve. Draw in the “**Right Amount**” of solar liquid through a plastic tube attached to the air inlet valve from a measuring cup or other calibrated container.

Table 2. The “Right Amount”. If the solar liquid were cold, you could fill the system, drain the liquid back out the level port, and be confident the fill was right. But you need hot liquid to get the air out of the liquid and pipes, and hot liquid occupies more space than the same weight of cold liquid. Draining the expanded hot liquid down to the level port lets too much out, so you have to put the “**Right Amount**” back in. Table 1. helps you calculate the liquid volume of the system based on how much pipe you used, and this table helps you calculate the “**Right Amount**” based on the liquid volume. It doesn’t have to be precise, but get it close.

The “**Right amount**” of liquid to add is **3 ounces per gallon of liquid**. In the example in Table 1. the liquid volume was 6.2 gallons.

Multiply		6.2 gallons
times	x	3 ounces / gallon
Equals	=	18.6 ounces

Round to **19 ounces**, The **Right Amount** to add back to the Cricket in section D.5

- _____ 6. Close the air inlet valve, open the vacuum valve, and evacuate the Cricket. Keep evacuating until the vacuum is stable, that is, until further evacuation does not change the static vacuum. Then evacuate for 5 minutes more. Static vacuum should read between 20 and 29 in.Hg with the collector still covered, depending on how hot the liquid is: see the graph on page 3, appendix of Installation Manual 2.4.
- _____ 7. Remove the actuators on both the collector and exchanger. Smear a small amount of red silicone sealant on the access valve threads (not in the stem hole) and screw caps tightly onto the access valves. Replace the 4” cap on collector back. Uncover the collector.
- _____ 8. Release the pressure on the Nite Tank by opening the funnel valve. Load the tank for the trip back to the shop.

E. CHECK YOUR NITE START

For the first two or three installations, do visit the site on a sunny day to confirm a good Nite-Start. Always call your customer later and ask her/him to read the thermometer (Red, Blue, Yellow) and call you to confirm good operation. See the Installation Manual, Section 5.3.M for good operating conditions.