

# PASSIVE COOLING CHAMBER (PCC)

Passive Temperature Regulating Battery Enclosures

## Installation Instructions

(Applicable to all front door models)

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**Read and understand these instructions completely before beginning installation. If you have any questions please call Electrical Technologies & Supply, Inc. at 303-462-0317.**

### 1. SAFETY INSTRUCTIONS

- A. Secure the Passive Cooling Chamber to the mounting pad before installing batteries. Confirm the locations of the anchoring bolts before installing.
- B. Extending drawers loaded with batteries can cause an unsecured Passive Cooling Chamber to tip over, causing serious equipment damage, personnel injury and/or death.
- C. When opening the doors be certain that the windguard safety latches are fully engaged.
- D. Use only potable quality water in the cooling system.  
**Never add antifreeze or other chemicals.** They will impair Passive Cooling Chamber performance.
- E. Only qualified personnel should perform Battery installation and other electrical work.
- F. Temperature and / or current limiting chargers are recommended. Temperature and / or current limiting safety cut-offs are also recommended.
- G. Never block or obstruct the hydrogen vent. Blockage could result in potentially explosive hydrogen concentrations inside the Passive Cooling Chamber.

H. Never approach or open a Passive Cooling Chamber with an open flame or lit cigarette, cigar, etc. The cabinet should be treated as though it contains potentially explosive hydrogen gas.

H. **Do not move or lift the Passive Cooling Chamber loaded with batteries or water installed. The enclosure is not designed for the additional weight.**

## 2. GENERAL INFORMATION

A. Installing and servicing the Passive Cooling Chamber requires only standard hand tools.

B. Other equipment manufacturer's instructions should be referred to where applicable. They have precedence except where the Passive Cooling Chamber itself is specifically described herein.

## 3. PASSIVE COOLING CHAMBER DESCRIPTION

A. The Passive Cooling Chamber Temperature Regulating Enclosure protects batteries from the extremes of heat and cold at remote outdoor sites. It can extend battery life 200% to 400% compared to unprotected battery enclosures.

B. They are constructed of 14-gauge galvanized steel, with an aluminum top and painted with a 2-step polyurethane paint system for long term durability in severe climates. The inside surfaces are insulated with 3 inches of extruded polystyrene foam. (R-15)

C. Hinged front door access is fitted with a three-point lockable latch. Doors are fitted with safety wind guards.

D. The passive cooling system uses no electricity. It consists of a water reservoir inside the enclosure, a plenum radiator lid, and connection hoses between the two.

E. Battery Passive Cooling Chambers are equipped with a passive hydrogen vent designed to rid the enclosure of explosive hydrogen gas, which is generated when batteries are charged. The vent is fitted on the right side of the enclosure near the top and is covered by a wind baffle / weather shield. The vent readily exhausts hydrogen rich air but stifles convection and unwanted heat loss or gain.

## 4. PASSIVE COOLING CHAMBER OPERATION

A. Summer Passive Cooling - The water reservoir is a heat sink which absorbs heat from the environment and from battery charging. At night, when ambient temperature cools, warm water within the tank rises by convection to the plenum lid and radiates heat to the cold night sky. Cool water falls to the tank below. This thermosiphoning continues throughout the night. In the morning as the lid warms, circulation stops, leaving chilled water in the water reservoir to absorb another day of heat.

B. Winter Freeze Protection - When water temperature falls below 39 °F, all circulation stops. The thermal mass of the water and the latent heat of fusion if it freezes protect the batteries from sub freezing temperatures for several days depending on the climate and severity of the cold spell. In

cold climates, an optional thermostatically controlled electric heater is recommended.

## 5. SITE PLANNING AND PREPARATION

- A. Avoid placing the Passive Cooling Chamber close to external heat sources.
- B. Allow for adequate workspace around the Passive Cooling Chamber, particularly in front and at the conduit access.
- C. Access doors must have sufficient space for full 120° swing to insure the full engagement of the windguard safety latch.
- D. For optimum performance, avoid overhanging structures and shade from trees that would prevent a clear view of the sky.
- E. The Passive Cooling Chamber mounting surface must be level and able to support the weight of the Passive Cooling Chamber, water, and batteries. Poured-in-place concrete or pre-cast pads are recommended for mounting.

## 6. FOUNDATION

A poured in place concrete slab, concrete piers, or engineered precast concrete pad are all an acceptable Passive Cooling Chamber mounting platforms.

Poured in place slabs are to be a minimum 4" thick with a 6" wide turn down at the perimeter and be at least 8" deep or below the frost line which ever is greater. The concrete must be at least a 3,000-psi and be reinforced with 6 x 6/ 10-10-wire mesh and rebar as required. The base stand has holes fastening to the foundation. A minimum 1/2" diameter cast in

place or drilled, anchor bolt is recommended. The enclosure must be securely attached to the foundation to avoid cabinet tipping when battery trays are extended. Use all mounting holes provided. The mounting pad should extend beyond the cabinet footprint at least 6" on the sides and back. A 3 to 4 ft. apron on the front access side will provide a convenient work area.

## 7. SETTING THE PASSIVE COOLING CHAMBER

- A. Remove the shipping crate and inspect the Passive Cooling Chamber for shipping damage. **You must immediately file any damage claims directly with the freight carrier.**
- B. Check that the Passive Cooling Chamber has the following item stored inside.
  - 1. A funnel with a short clear vinyl hose and fitting for filling the cooling system.Contact Electrical Technologies if the filling funnel is missing.
- C. **Do not install batteries or charge the cooling system with water until the enclosure is mounted and secured to the pad.**
- D. Remove the bolts holding the Passive Cooling Chamber to the pallet. Some models incorporate lifting ears for crane placement and some have forklift pockets in the base frame. Place the Passive Cooling Chamber on the mounting surface. Check the exact measurement required for the anchor bolts before installing the anchors permanently. Be certain the anchor bolts are long enough

to fully penetrate the mounting hole and for full nut engagement.

- E. The Enclosure must be installed level front to back and left to right. Check that the doors align and close properly. Shim the base stand as needed to adjust the door alignment.

## 8. CHARGING THE COOLING SYSTEM

- A. Remove the lid plug by using the appropriate size wrench.  
**Failure to remove the plug lid will prevent proper filling and pressurization which could rupture the system and void the warranty.**
- B. The clear vinyl hose on the internal cooling reservoir, mounted behind the battery shelves, is used for filling.

Several methods can be used for filling.

Funnel Method– Remove the lid plug. Connect the funnel with fitting to the water tank fill hose. Hang the funnel from the lid plug opening. Pour water into the funnel. Fill the water tank, hoses and plenum lid until water overflows through the lid plug.

Pressurized Tap Water Method – Remove the lid plug. Connect a garden hose to a faucet. Use a male to male hose adapter to connect the fill hose to the garden hose. **Use low pressure and volume.** Slowly fill the tank. Filling the tank too quickly could cause the system to rupture. Flow resistance will increase as water rises through the hoses into the plenum lid. Continue filling until water overflows the lid.

Pump Method – A small, low pressure, 12VDC pump can be used to transfer water from a bucket or barrel. Pump model #1P811, available from W. W. Grainger, works well. It is low pressure (339 gph @ 1ft. head), but still has the capacity to quickly fill the system. The pump can be fitted with a male garden hose thread fitting. A washing machine supply hose with two female hose fittings can be used to connect the pump to the fill hose on the tank. Electric extension leads added to the pump fitted with alligator clips works well to connect to a 12V automotive or similar battery. Be sure to observe correct polarity for pump operation. The pump is submersible and will transfer water from a bucket or drum.

- C. **Use only potable quality water. Do not add antifreeze. Antifreeze or other additives could prevent proper operation of Passive Cooling Chamber.**
- D. When the system is full, lift the fill hose above the Passive Cooling Chamber and disconnect the fitting. Lower the hose to purge any air bubbles and cap it off. Coil the hose and stow it out of the way on top of the tank.
- E. After filling, squeeze or shake the clear vinyl hoses that connect the tank to the lid to remove any air bubbles. Gently thump the radiator lid of the Passive Cooling Chamber to dislodge any remaining air bubble. Top off the system filling it through the lid plug hole.
- F. Replace the bolt using high quality thread tap to prevent possible water leaks. Tighten to compress the seal. Store

the hexagonal wrench in its holder inside the Passive Cooling Chamber. Check the system for leaks. Filling is complete.

## 9. CONDUIT AND ELECTRICAL CONNECTION

- A. Only qualified personnel should perform electrical work.
- B. **The Passive Cooling Chamber must be grounded before applying any power to the unit. All Passive Cooling Chambers are provided with internal and external grounding points.** Conduit access into the Passive Cooling Chamber is through threaded female pipe fittings on either or both ends of the enclosure. Typically, the larger fitting is for DC wiring and the smaller one for A/C accessories such as a heater. Cut or drill a hole through the insulation to provide cable access. Make the hole as small as practical. The cable entrance must be sealed for safe and efficient operation.
- C. Use the appropriate size and type of conduit to connect to the Passive Cooling Chamber enclosure following all codes and best practices.
- D. Battery Wiring  
Size the battery cabling according to the load and battery capacity to minimize voltage drop. If the batteries are installed on a pull-out tray, flexible copper weld cable with rubber insulation will work well and offers minimal resistance to tray extension and retraction. Tie the cable to the rack to avoid possible interference with the tray slide mechanism.

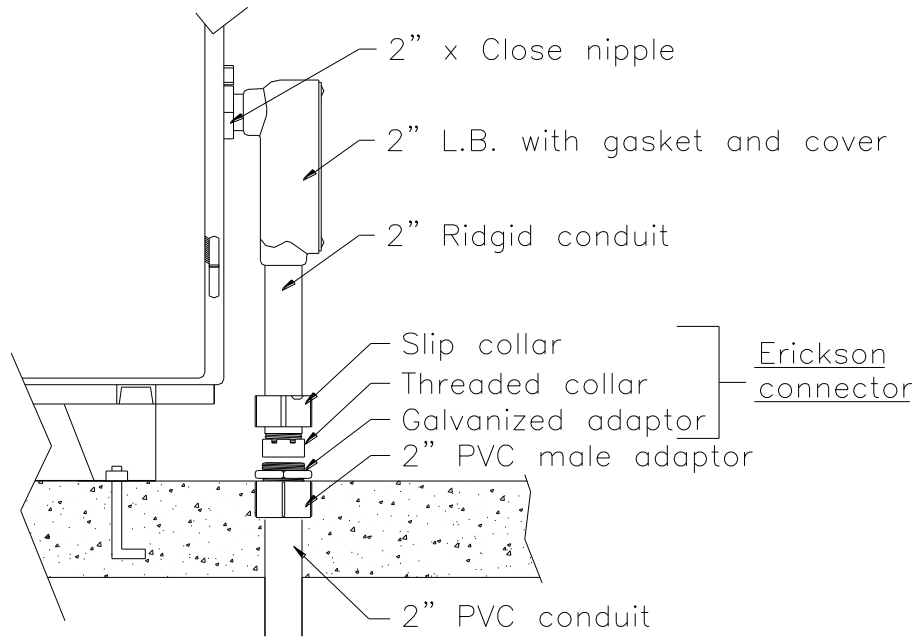
- E. Grounding  
2- hole, 1/4" dia., 1.75" O.C ground landings are providing at the lower right and left rear sides of the Passive Cooling Chamber cabinet. Use this landing to ground the cabinet to the system "halo" ground. Follow all codes and trade practices.
- F. Temperature Compensation  
This feature, when available, should be extended to the batteries in the Passive Cooling Chamber enclosure. Most sensors require a single pair, 22 ga. cable. If the sensor(s) are fitted with a modular plug, the most effective method for connection is an extension cord with matching terminations. If there are no plugs, cable may be spliced in.
- G. Optional Door Alarm Switch  
A "pull to cheat" alarm switch is an available option. When fitted, this feature should be extended to the RTU and wired into its alarm system. Use 22 ga. single pair cable. The switch can be wired for NO or NC contacts.
- H. Battery Installation  
Install and connect batteries following the manufacturer's specifications and instructions. Each pullout battery tray is designed to hold 1850-lbs. maximum weight. Extend only one battery tray at a time. Maximize airspace between batteries for cooling. Always install batteries from the bottom up to maintain maximum enclosure stability.

## 10. PASSIVE COOLING CHAMBER MAINTENANCE

- A. Visit the Passive Cooling Chamber 30 days after installation.

- B. Inspect the interior and exterior appearance and condition of the cabinet, including the batteries and all electrical connections. Make any adjustments as required.
- C. Use the appropriate wrench to remove the lid plug bolt. The system may gulp some air. This is common, as the plastic tank will relax with time. If necessary, add water to the lid and fill to overflowing. Replace and tighten the lid bolt using high quality thread tape.
- D. Inspect the Passive Cooling Chamber for rust or corrosion. Any rust spots should be cleaned and touched up with a matching paint, such as Rust Oleum, primer and paint.
- E. Inspect the hydrogen vent for physical integrity. Be sure that the filter screen is clean and unobstructed. If it is damaged, clogged, or worn, it should be fixed, cleaned, or replaced.
- F. Inspect the Passive Cooling Chamber at least once a year, preferably at the start of the cooling season. Follow the instructions outlined above. If you have any questions, contact Electrical Technologies, Passive Cooling Chamber Division at 1-303-462-0317.

### Diagram A



### Diagram B

