

Hillphoenix

A DOVER COMPANY

REPAIRING LEAKS ON R-290 SELF-CONTAINED DISPLAY CASES

MIDA 3X3, 4X4, and 4X8

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Preparations for Repairing R-290 Refrigerant Leaks on R-290 Self-Contained Display Cases

Leak Repair Preliminary Notes

- All R-290 condensing units should be clearly labeled.
- All Hillphoenix R-290 self-contained cases are equipped with a capillary tube (cap tube)
- Type-metering device and are critically charged refrigeration systems. Therefore, anytime there is a leak found on a critical charged system, the refrigerant must be removed before the leak is repaired, and then after the repair is completed, the refrigerant charge must be weighed into the system.
- Before beginning the repair, make sure all the necessary tools required to perform the job are readily available.
- The system should never be opened to the atmosphere for more than 15 minutes to help prevent moisture from entering the system.
 - Change out the drier after any time that the system has been opened to the atmosphere.
 - Then make sure to pull a 500-micron vacuum.
- The repair detailed in this procedure is to repair a leak on an R-290 refrigeration condensing unit.

Tools required for repairing R-290 self-contained case refrigerant leaks

- Vacuum pump
- Micron digital gauge scaled to below 500 microns
- Pinch-off tool
- Small tubing cutter
- Fire extinguisher
- Refrigeration manifold with shut-off valve and the shortest hoses available (preferably 6")
- Warning sign/placard – work area and hazardous material
- Temporary piercing valve
- Refrigerant grade R-290 (may be purchased at local refrigeration wholesale house)
- Hand-held combustible gas detector
- Refrigerant scale for weighing in the refrigerant charge
- Small, portable copper pipe brazing set-up

- Oxygen-free, dry nitrogen with flow regulator
- Refrigerant tank adaptor
- Required safety equipment (PPE, safety glasses, gloves, liquid leak detector or soap bubbles, a fan for work area ventilation)

Step-by-Step Procedure for Repairing a Leak on an R-290 Self-Contained Case

1. **Ensure** that the work area is well ventilated. Use a fan to further dissipate any vented R-290.
2. Turn on the combustible gas detector and set it in front of the work area. Allow time for the combustible gas detector to warm up and self-calibrate.

Ensure that the gas detector continues operating in front of the work area until all work has been completed.

3. All required Personal Protective Equipment (PPE), such as safety glasses, gloves, etc. should be worn.

Also, an applicable “propane hazard” placard should be prominently displayed near the work area.

4. Remove all power from the unit/case (unplug, disconnect, etc.).
5. Remove the cover panels from all four sides of the bottom base of the case to allow completely unobstructed and easy access to the condensing unit.
6. Remove the case deck pans to allow access the evaporator (coil) in order to check for leaks.
7. Use an electronic combustible gas detector and/or soap bubbles to check for leaks.

Do **not** use any leak test dyes when working on an R-290 refrigeration system. If there is still gas in the system as indicated by a combustible gas detector and/or soap bubbles, start with either the condenser or evaporator and then check each brazed fitting and/or mechanical connection until you are able to identify the source of the leak.

The best way to pinpoint a leak is to spray soap bubbles on the suspected area of the leak and notice if any bubbles form. Dawn[™] dish-washing liquid and water is a good soap solution for detecting R-290 leaks.

8. If a leak has resulted in a full loss of refrigerant, charge the unit with oxygen-free dry nitrogen and a trace gas (not exceeding 150 psig), then continue searching for the source of the leak with an electronic leak detector and/or soap bubbles.

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9. Once the leak has been located, remove all of the propane from the system by installing two (2) temporary piercing (access) valves to the unit. These provide temporary access to the gas contained in the unit.

Install the piercing valves on both the high side and the low side processing tubes. Note that the processing tube will be painted red and will be located on the compressor.

Note: the combustible gas detector may alarm at this point, indicating the presence of any residual propane gas in that part of the system.

10. After installing the piercing valves, connect a manifold gauge using the shortest hose possible (preferably 6”).

Note: the combustible gas detector may again temporarily sound an alarm at this time.

11. Remove the refrigerant from the system by slowly opening both the high and the low-side ports on the manifold gauge.

The combustible gas detector may sound an alarm during the venting process. If/when it does sound an alarm, discontinue venting the R-290 refrigerant, and allow the gas to dissipate into the surrounding air. Wait a few minutes until the reading on the gas detector and recommence venting ensuring that the reading on gas detector does not exceed the safe level of 39 ppm.

Repeat the above step of venting the R-290 refrigerant by opening the manifold gauge ports. As before, continue to vent the refrigerant until the gas detector alarm sounds, allow the refrigerant to a safe level of 39 ppm and then continue venting.

Perform these steps until the entire charge of the R-290 refrigerant is purged from the system.

12. Follow standard brazing procedures to repair the leak if it is on a brazed fitting or joint.

If the leak is in the condenser or the evaporator and cannot be repaired, then the component **must** be replaced.

13. Cut the suction line using a set of tubing cutters at a point as close to the compressor or evaporator as possible.

14. Cut the discharge line at a point as close to the compressor or evaporator as possible.

15. Unbolt and remove the compressor or evaporator.

16. Set the new compressor or evaporator and bolt in place.

17. Make sure the suction and discharge lines that were cut loose have been deburred, cleaned and set into place before pulling the plugs on the new compressor.

Taking these actions will help to reduce the amount of time the unit is open to the atmosphere. It is important to limit how long the system is open due to the hygroscopic (moisture-absorbing) nature of the POE oil used in this system.

18. Flow oxygen-free, dry nitrogen through the system for two (2) minutes before beginning to braze. Doing so is necessary whenever brazing on an R-290 refrigeration system
19. **Continue** to flow dry nitrogen through the system for the entire duration of the brazing process. (Hillphoenix recommends that the nitrogen flow regulator be set to 3 to 5 psig.)
20. Once the brazing is complete and the lines have cooled, charge the system with 200 psig of nitrogen.
21. **Carefully** and thoroughly leak-check the lines with either a liquid leak detector or soap bubbles (look for the formation of bubbles).
22. Once the system has been rechecked for leaks, vent the nitrogen pressure down to approximately 2 psig to prevent moisture from entering the system.
23. Reconnect the manifold gauge by:
 - Attaching the suction hose to the process tube with the shortest possible hose (preferably 6")
 - Attaching the center charging hose to the vacuum pump
 - Attaching the liquid hose to the micron gauge
24. Pull a minimum 500-micron vacuum on the entire system (condensing unit and evaporator). Make certain that there is **only** clean oil in the vacuum pump.
25. Connect the R-290 tank adapter to the R-290 (boxed) tank.
 - Place the refrigerant back in the box and place the box on a refrigeration scale.
 - Connect the charging hose to the tank and open the tank and make sure you purge the charging hose of all air.
26. If the system did not take the full charge (as listed on the case data plate) by weight, turn on the compressor and run the case for one (1) minute.
27. Add more R-290 into the suction port until the unit is fully charged.
28. Close the valve on the refrigerant tank and the hose. Allow the system to run and verify that the system is operating properly.
29. Once the system is up and running, any refrigerant remaining in the high-side hose must be removed. Use the pinch-off tool to pinch closed the high side processing tube. Then, open both the high-side gauge and the low-side gauge.

Doing this will bleed the R-290 from the high side to the low side once the pressures have equalized.

30. Close both sides of the manifold gauge. Remove the temporary access port from the low-side processing tube by cutting the process tube between the access port and the pinch-off tool with tubing cutters.

Do this by cutting the process tube between the access port and the pinch-off tool.

Note: The combustible gas detector may alarm at this point.

31. With the access port cut out, pinch the processing tube closed.
Once the combustible gas detector stops alarming (going off), check the processing tube for any residual R-290 that may be leaking past the pinched-off tool.
32. Braze the pinch-off tube completely closed. Once the tube has cooled, remove the pinch-off tool and check the braze joint.

Now, repeat these same procedural steps as detailed above here for the suction side processing tube.