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Subject: R22 – R407C Refrigerant Conversion for Bus HVAC Systems

This bulletin describes the procedures for converting a R22 HVAC Bus System to R407C.

A provision of the Montreal Protocol, an agreement signed by the United States, requires that companies manufacturing HVAC equipment using the HCFC refrigerant R22 cannot ship new equipment with R22 beginning 1/1/2010. The purpose of this initiative is to reduce the emissions of ozone depleting substances that also contribute to Global Warming. However, R22 will continue to be produced until the year 2020 to support the servicing of existing equipment. Thermo King has prepared the attached procedures for our customers who wish to convert from the HCFC R22 to the HFC R407C, the direct replacement for R22. Because it was developed specifically to replace R22, the refrigerant R407C has very similar characteristics and requires minimal efforts to make a successful conversion.

In some R22 applications the compressor is fitted with a “remote HPCO switch kit” that eliminates the need for the HPCO to be inserted in the discharge manifold. When the HPCO is installed in the discharge manifold, it is subject to additional heat from the compressor body that may cause the switch to open too soon when R407C is used. By utilizing the “remote HPCO switch kit” the HPCO can operate normally and not be affected by the heat from the compressor body. If your customer is considering a conversion from R22 to R407C, this “remote HPCO switch kit” will need to be installed to ensure proper operation of the system. The bracket assembly is P/N 91-8288. The 1/4” flare fitting with 1/8” NPT (brass body only) is P/N 55-7213. This fitting is installed in place of the HPCO in the discharge manifold and allows the tube on the bracket assembly to be attached. (See the picture on the next page.) If you have questions as to whether this kit is required, or you need additional information, please contact your Regional Bus Service Manager or call the Bus Service representative at Thermo King Corporation.

Note: Older T11 units with R22 refrigerant utilized a condenser coil with a sub-cooling circuit. This condenser design should not affect unit operation after conversion of R22 to R407C in most cases. However, in high ambient climates, this coil design could allow the system to run at a high enough discharge pressure to cause the HPCO to open. If a unit conversion is required for Bus HVAC systems domiciled in high ambient climates, the condenser coil may need to be changed as well. To identify a T11 unit that utilizes a sub-cooling condenser coil, you will notice a line leaving the receiver tank that is routed back to the coil through the sub-cooler. From there, it exits the coil and enters the liquid line at the liquid line filter-drier. See the picture on the next page for clarification. Please consult with your Regional Bus Service Manager or Bus Service representative at Thermo King Corporation before quoting or attempting a conversion in high ambient climates.
R22 – R407C Conversion Procedure:

1. Shut the bus off, chock wheels, shut off bus batteries and verify voltage is not supplied to the Thermo King electrical components.
2. Remove belt guard in front of compressor.
3. Remove suction and discharge compressor service valve caps. Verify service valve stems are in the back seated position.
4. Remove manifold gauge caps from compressor suction and discharge valves.
5. Install manifold gauge set using the proper procedure to prevent contamination.
6. Mid seat the compressor suction and discharge service valve stems.
7. Hook up the recovery/recycle machine and remove the refrigerant charge from the system in an EPA approved recovery/recycle device.
8. After the charge is completely removed, remove the oil drain plug from compressor and drain oil.
9. Remove the suction service valve from compressor
10. Install the compressor oil drain plug.
11. Fill compressor with 2 liters of POE oil (P/N 203-0515) used with R407C systems.
12. Install the suction service valve on compressor using a new gasket.
13. Open the condenser panel.
14. Change the liquid line filter/drier
15. Open the return air grille.
16. Disconnect the liquid line fitting to the expansion valve and remove, inspect, and clean the expansion valve inlet screens.
17. Reinstall the expansion valve inlet screens and tighten fittings.
18. Using the manifold gauge set already installed, pressurize the system with a trace amount of refrigerant and nitrogen to a maximum pressure of 200 psig.
19. Perform a system leak check and repair any leaks.
20. Remove the trace amount of refrigerant and nitrogen from the system.
21. Install another hose at the liquid line and attach to the gauge manifold service hose to allow a “three point evacuation”.
22. Install the service valve stem caps before attempting an evacuation.
23. Perform system evacuation using micron gauge. Evacuate to 500 microns or less and system must remain below 500 microns for 5 minutes.
24. Close the condenser and evaporator panels/covers, tighten hardware.
25. Using the vacuum created by the evacuation procedure, charge the unit by weight with liquid R407C refrigerant through the discharge and liquid lines until the pressure stabilizes.
26. Operate the bus at normal operating conditions and suck the remaining weight of the necessary charge into the unit through the suction service valve. Be sure not to exceed 25psig above the existing suction pressure to prevent liquid slugging the compressor.
27. Operate the air conditioning system for 30 minutes.
28. Shut off the bus.
29. Bypass the low pressure cut out switch.
30. Start the bus and turn on the HVAC system.
31. Perform a compressor pump down by front seating the suction service valve stem.
32. When the suction pressure reaches a vacuum on the low side of the manifold gauge, shut off the bus.
33. Observe the needle on the low pressure gauge. If the needle on the low pressure gauge moves into positive pressure, perform steps 30 through 32 until the needle on the low pressure gauge remains at zero or below. If it rises to zero and stops after several attempts, there may be a leak to atmosphere.
34. Remove the compressor drain plug and drain the oil.
35. Remove the suction service valve from compressor.
36. Install the compressor drain plug.
37. Fill the compressor with 2 liters of POE compressor oil.
38. Install the suction service valve on the compressor, using a new gasket.
39. Change the liquid line filter/drier.
40. Operate the air conditioning system for 30 minutes.
41. Shut off the bus.
42. Bypass the low pressure cut out switch.
43. Start the bus and turn on the HVAC system.
44. Perform a compressor pump down by front seating the suction service valve stem.
45. When the suction pressure reaches a vacuum on the low side of the manifold gauge, shut off the bus.
46. Observe the needle on the low pressure gauge. If the needle on the low pressure gauge moves into positive pressure, perform steps 30 through 32 until the needle on the low pressure gauge remains at zero or below. If it rises to zero and stops after several attempts, there may be a leak to atmosphere.
47. Perform an oil acid test to ensure no acid is in the system. If acid is found, repeat the oil change procedure and remove/replace the filter drier, and run for an additional 2 hours to remove the acid content. Continue changing the oil and changing the filter drier until the oil is not acidic.
48. Fill the compressor with the necessary amount of oil for the system to operate. The oil level should be about ½ up when viewing through the oil level sight glass.
49. Verify the low pressure side of manifold gauge is installed on the suction service port.
50. Pressurize the low side of compressor with trace amount of refrigerant and nitrogen with a maximum pressure of 200psig.
51. Perform a leak check and repair any leaks.
52. Remove the trace amount of refrigerant and nitrogen from the low side of compressor.
53. Install the service valve stems caps before attempting to evacuate the compressor.
54. Perform an evacuation of low side of compressor.
55. Mid seat the compressor suction service valve stem.
56. Reconnect the low pressure cut out switch.
57. Start the bus and turn on the air conditioning system and verify compressor operation.
58. Shut off bus.
59. Perform a gauge removal procedure to remove the gauges from the compressor. Be sure to check that both service valve stems are in the back seated position.
60. Check the packing gland at compressor service valves for leaks, tighten packing gland if required.
61. Install service valve stem caps and manifold gauge port caps at compressor.
62. Install engine/compressor belt guard.
63. Return bus to service.