HFC-134a REFRIGERANT SERVICE INFORMATION

The Pro Series sealed systems contain HFC-134a refrigerant. This section provides general rules for working with 134a, and procedures to be followed while servicing the sealed system. This is followed by diagrams illustrating sealed system operation, then model-specific refrigerant flow diagrams.

⚠ CAUTION

134a refrigerant requires Synthetic Ester oil in the compressor, and does not tolerate contamination from other refrigerants, moisture, petroleum-based lubricants, silicone lubricants, cleaning compounds, rust inhibitors, leak detection dyes, or any other type of additive.

General Rules for Working with 134a Refrigerant

- Use equipment dedicated to 134a sealed system service only.
- Use only 134a refrigerant for back-flushing and sweep charging.
- Always replace the filter-drier when servicing the sealed system.
- The filter-drier must be cut from the sealed system. Never un-braze the drier as the heat will drive moisture back into the sealed system.
- Do not leave sealed system nor replacement compressor open to the atmosphere for more than 10 minutes.
- When the rubber plugs are pulled from the service compressor, a release of pressure should be heard. If no release of pressure is heard, do not use the compressor.
- Use ONLY virgin 134a refrigerant when recharging the sealed system.

PRO SERIES SEALED SYSTEM REPAIR PROCEDURES

Problem	Service Procedures
Non-Operating, Inefficient, Noisy Compressor *(**NOTE**: To check for a non-operating compressor, a hard start kit can be used)*	a. Capture refrigerant b. Replace Compressor c. Replace filter-drier d. Evacuate or sweep charge system ***NOTE:*** *If evacuating refrigerator sealed system, unit must be evacuated from the low & high sides due to refrigerant valve. If sweep charging refrigerator sealed system, refrigerant valve must be energized during procedure. (See **Diagnostics 4) Activate Zone** in Section 3)* e. Recharge system with Virgin 134a refrigerant
High Side leak	a. Capture refrigerant b. Repair leak c. Replace filter-drier d. Evacuate or sweep charge system ***NOTE:*** *If evacuating refrigerator sealed system, unit must be evacuated from the low & high sides due to refrigerant valve. If sweep charging refrigerator sealed system, refrigerant valve must be energized during procedure. (See **Diagnostics 4) Activate Zone** in Section 3)* e. Recharge system with Virgin 134a refrigerant
Low Side Leak	a. Capture refrigerant b. Repair leak (if at solder joint) or replace part c. Back flush high side of sealed system d. If all refrigerant has escaped and system is in a vacuum, replace compressor e. Replace filter-drier f. Evacuate or sweep charge system ***NOTE:*** *If evacuating refrigerator sealed system, unit must be evacuated from the low & high sides due to refrigerant valve. If sweep charging refrigerator sealed system, refrigerant valve must be energized during procedure. (See **Diagnostics 4) Activate Zone** in Section 3)* g. Recharge system with Virgin 134a refrigerant
Contaminated Sealed System *Examples:* > *Burned out compressor* > *Excessive moisture from leak in condensate loop or in low side* > *Plugged capillary tube*	a. Capture refrigerant b. Repair leak (if at solder joint) or replace part c. Back flush high side of sealed system d. Replace compressor e. Replace filter-drier f. Replace heat exchanger if cap tube is clogged g. Install a low side drier on suction tube h. Evacuate or sweep charge sealed system ***NOTE:*** *If evacuating refrigerator sealed system, unit must be evacuated from the low & high sides due to refrigerant valve. If sweep charging refrigerator sealed system, refrigerant valve must be energized during procedure. (See **Diagnostics 4) Activate Zone** in Section 3)* i. Recharge with Virgin 134a refrigerant
Restriction *(**NOTE**: If restriction is due to sealed system being contaminated, see Contaminated Sealed System above.)*	a. Capture refrigerant b. Locate and remove restriction or locate and replace part c. Back flush high side of sealed system d. Replace filter-drier e. Evacuate or sweep charge system ***NOTE:*** *If evacuating refrigerator sealed system, unit must be evacuated from the low & high sides due to refrigerant valve. If sweep charging refrigerator sealed system, refrigerant valve must be energized during procedure. (See **Diagnostics 4) Activate Zone** in Section 3)* f Recharge system with Virgin 134a refrigerant.
Overcharge	a. Capture refrigerant b. Replace filter-drier c. Evacuate or sweep charge system ***NOTE:*** *If evacuating refrigerator sealed system, unit must be evacuated from the low & high sides due to refrigerant valve. If sweep charging refrigerator sealed system, refrigerant valve must be energized during procedure. (See **Diagnostics 4) Activate Zone** in Section 3)* d. Recharge system with Virgin 134a refrigerant

FREEZER SEALED SYSTEM OPERATION

The following six diagrams illustrate a 648PRO freezer sealed system. The components are listed in order of refrigerant flow, with an explanation of their fundamental role as part of a sealed system.

(1) - Compressor (Figure 4-1)
The compressor creates a high side and low side pressure difference in the sealed system by compressing the refrigerant gas, thus raising the pressure and temperature. The compressor pushes this high-pressure/high-heat gas through the discharge tube to the condenser.

(2) - Condenser (Figure 4-2)
The high-pressure/high-heat gas travels through the condenser, where the heat is dissipated by cooler air being drawn over the condenser tubing by the condenser fan. This changes the gas into a high-pressure/warm liquid that is then routed through the door gasket seat heater loop to prevent sweating, and through the drain pan heater loop to help evaporate water in the drain pan. The high-pressure/high-heat gas then enters the high-side filter-drier.

(3) - High-Side Filter-Drier (Figure 4-3)
The high-pressure/warm liquid travels through the high-side filter-drier, which removes moisture from the refrigerant before it enters the capillary tube.

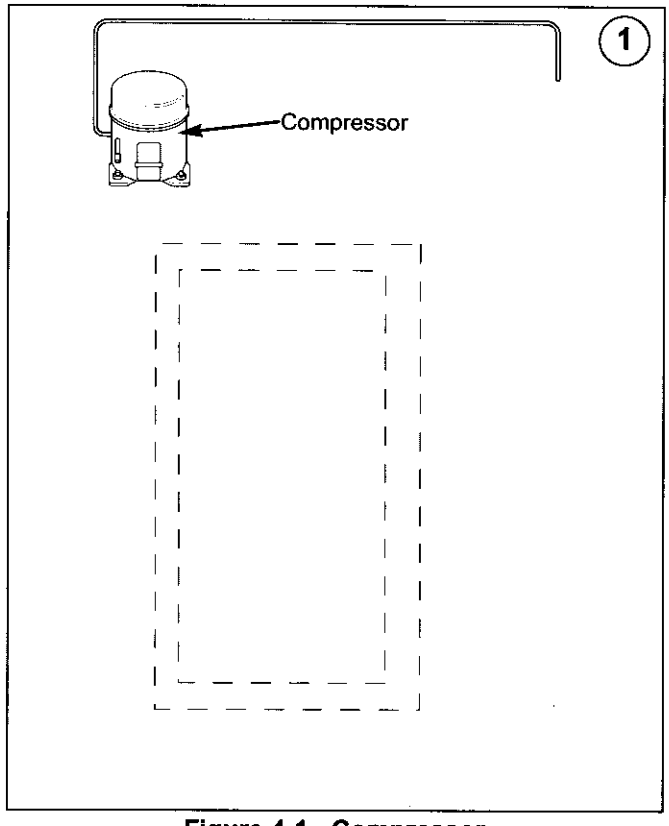

Figure 4-1. Compressor

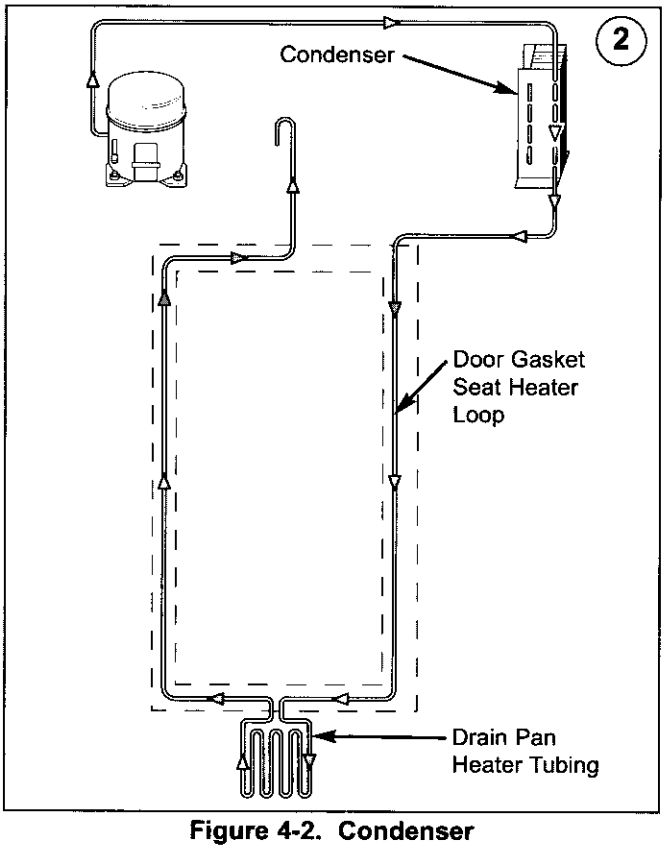

Figure 4-2. Condenser

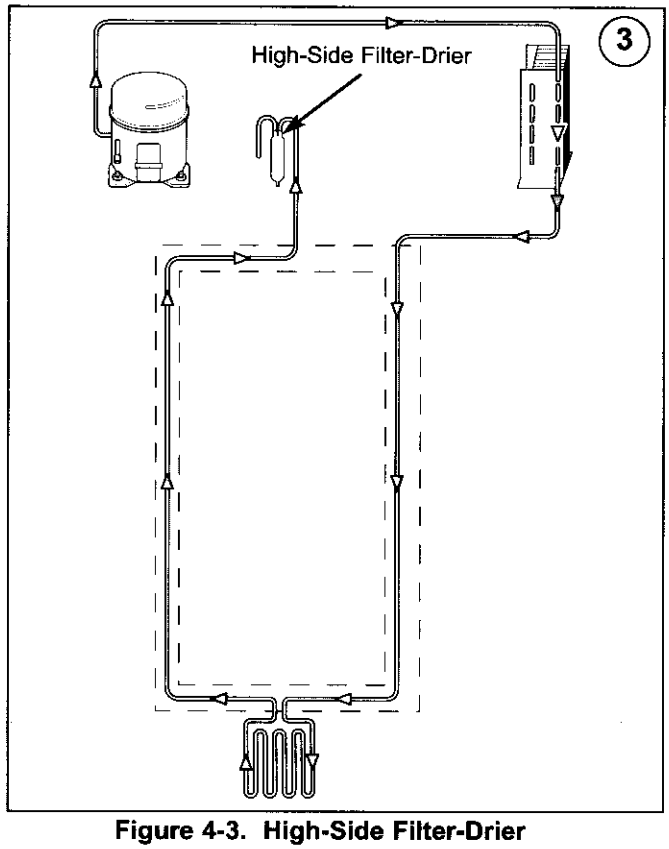

Figure 4-3. High-Side Filter-Drier

(4) - Capillary Tube (Part of Heat Exchanger) (Fig. 4-4)
The high-pressure/warm liquid refrigerant travels through the long skinny capillary tube which is attached to the suction tube (these two tubes soldered together create the heat exchanger). As the high-pressure/warm liquid refrigerant travels through the capillary tube it gives up heat to the cool refrigerant gas traveling through the suction tube and the pressure drops, so it is a low-pressure/cool liquid before it enters the evaporator.

(5) - Evaporator (Figure 4-5)
As the low-pressure/cool liquid refrigerant enters the evaporator, it vaporizes. This is caused by a dramatic pressure change which occurs when the refrigerant enters the larger diameter evaporator tubing from the smaller diameter capillary tubing. This vapor travels through the evaporator absorbing heat from the compartment, gradually converting the vapor to a cool gas. This cool gas then enters the suction tube.

(6) - Suction Tube (& Heat Exchanger) (Figure 4-6)
The cool gas travels through the suction tube which is attached to the capillary tube (as mentioned earlier, these two tubes soldered together create the heat exchanger). As this cool refrigerant gas travels through the suction tube it absorbs heat from the warm liquid refrigerant traveling through the capillary tube, making it a luke warm gas. The lukewarm refrigerant gas returns to the compressor where the process begins again.

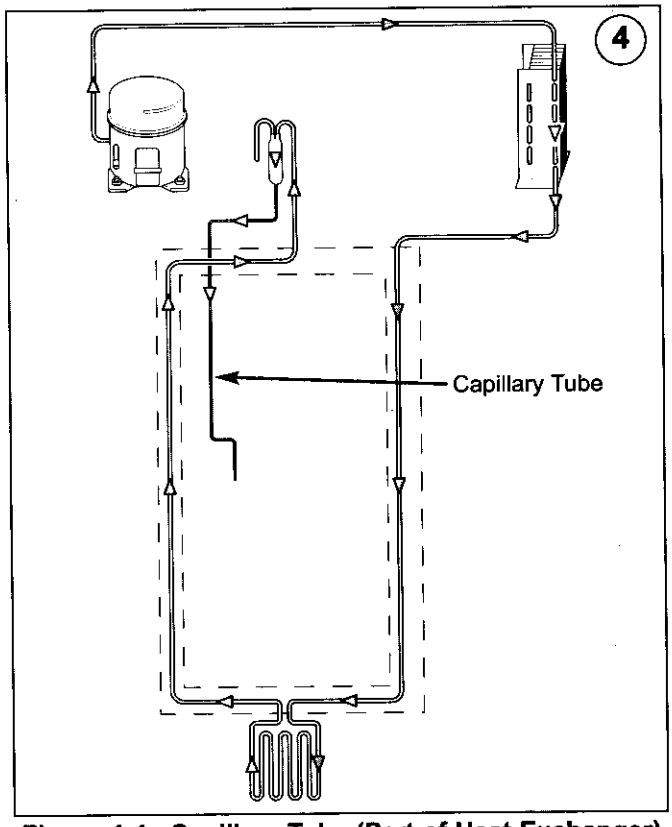

Figure 4-4. Capillary Tube (Part of Heat Exchanger)

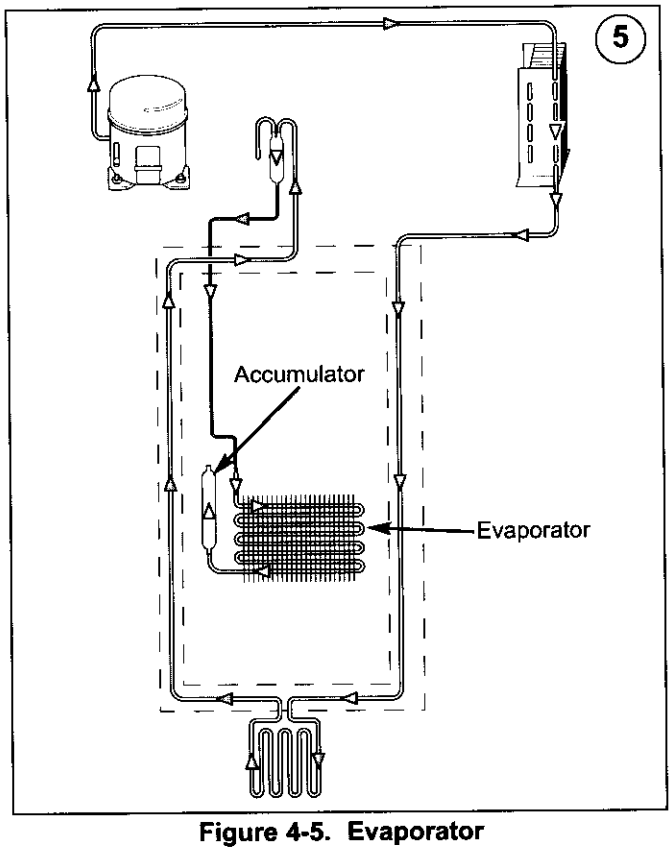

Figure 4-5. Evaporator

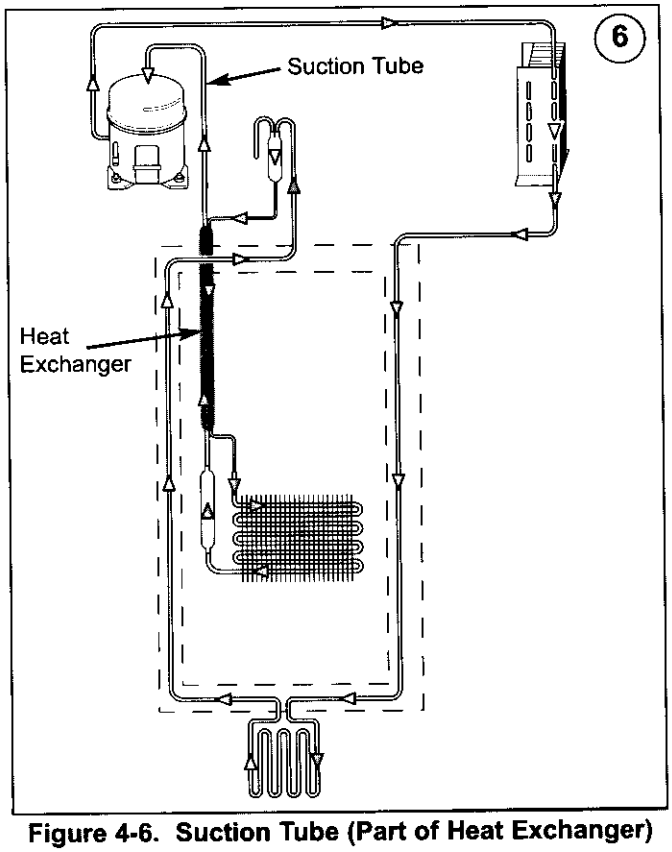

Figure 4-6. Suction Tube (Part of Heat Exchanger)

REFRIGERATOR SEALED SYSTEM OPERATION

The following six diagrams illustrate a 648PRO refrigerator sealed system. The components are listed in order of refrigerant flow, with an explanation of their fundamental role as part of a sealed system.

(1) - Compressor (Figure 4-7)
The compressor creates a high and low side pressure difference in the sealed system by compressing the refrigerant gas, raising its pressure and temperature. The compressor pushes the high-pressure/high-heat gas through the heater loop in the mullion to prevent sweat, then to the condenser.

(2A) - Condenser (Figure 4-8)
The high-pressure/high-heat gas travels through the condenser, where the heat is dissipated by cooler air being drawn over the condenser tubing by the condenser fan. This changes the gas into a high-pressure/warm liquid that then enters the high-side filter-drier.

(2B) - Filter-Drier (Figure 4-8)
The high-pressure/warm liquid travels through the high-side filter-drier, which removes moisture from the refrigerant before it enters the dual refrigerant valve.

(3) - Dual Refrigerant Valve (Figure 4-9)
A Tubing T-connection that is part of the dual refrigerant valve has a bead inside. This bead is forced to one side or the other of the T-connection, depending on the electrical signal from the control board to the valve solenoid. When the bead is to one side of the T-connection, that side is closed, the other side is open. The open side allows the high-pressure warm liquid to the appropriate capillary tube.

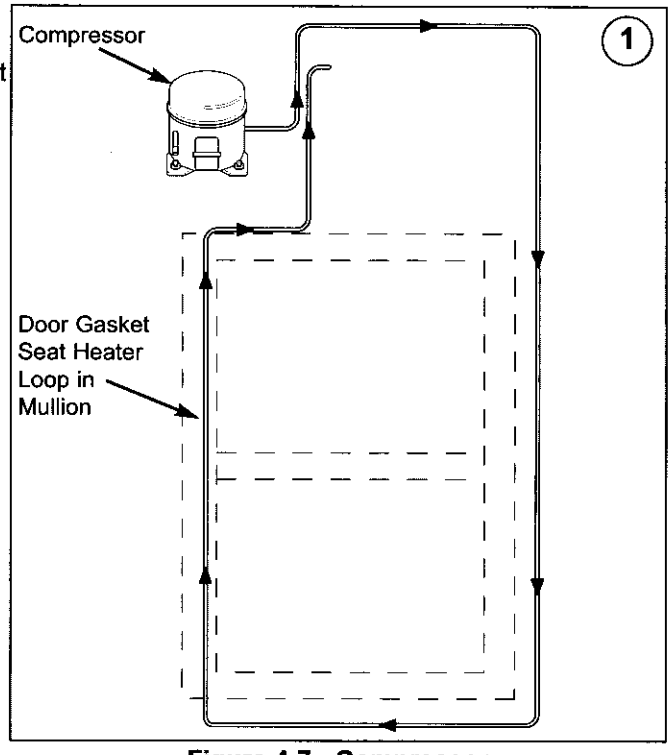

Figure 4-7. Compressor

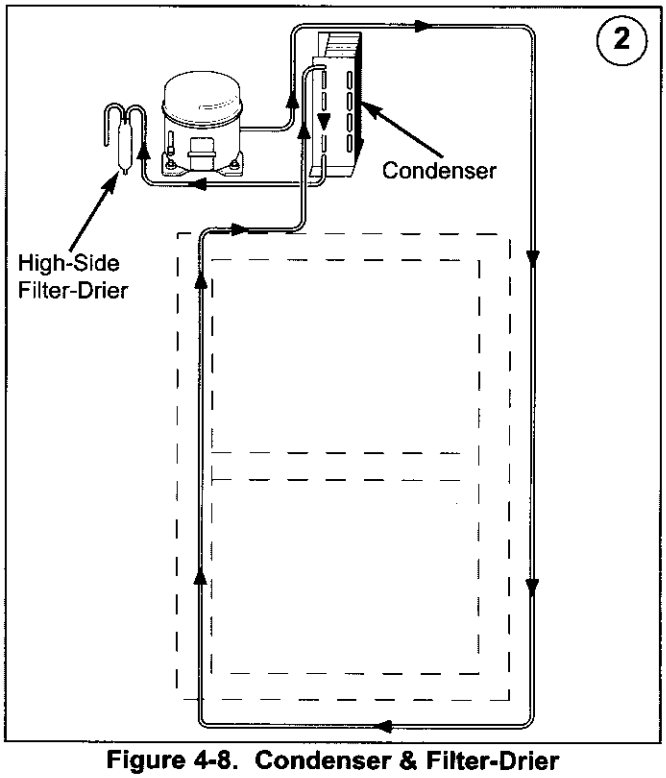

Figure 4-8. Condenser & Filter-Drier

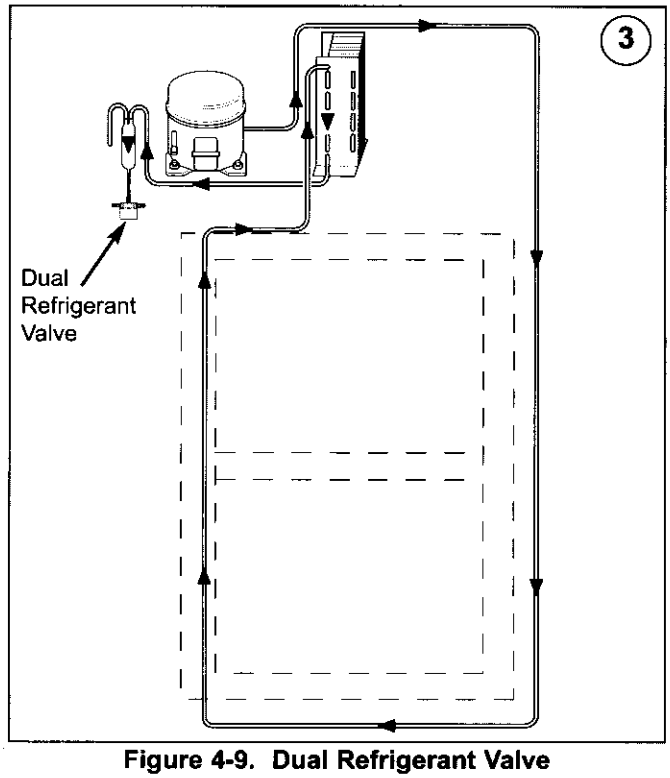

Figure 4-9. Dual Refrigerant Valve

(4) - Capillary Tube(s) (Figure 4-10)

The high-pressure/warm liquid refrigerant travels through the long skinny capillary tube which is attached to the suction tube (these two tubes soldered together create the heat exchanger). As the high-pressure/warm liquid refrigerant travels through the capillary tube it gives up heat to the cool refrigerant gas traveling through the suction tube and the pressure drops, so it is a low-pressure/cool liquid before it enters the evaporator.

(5) - Evaporator(s) (Figure 4-11)

As the low-pressure/cool liquid refrigerant enters the evaporator, it vaporizes. This is caused by a dramatic pressure change which occurs when the refrigerant enters the larger diameter evaporator tubing from the smaller diameter capillary tubing. This vapor travels through the evaporator absorbing heat from the compartment, gradually converting the vapor to a cool gas. This cool gas then enters the suction tube.

(6) - Suction Tube(s) & Heat Exchanger(s) (Figure 4-12)

The cool gas travels through the suction tube which is soldered to the capillary tube *(as mentioned earlier, these two tubes soldered together create the heat exchanger)*. As this cool refrigerant gas travels through the suction tube it absorbs heat from the warm liquid refrigerant traveling through the capillary tube, making it a luke warm gas. *(There is a suction tube "T" connection that diverts the two separate suction tubes from the evaporators to one suction tube that enters the compressor.)* The lukewarm refrigerant gas is pulled back to the compressor (via vacuum force), where the process begins again.

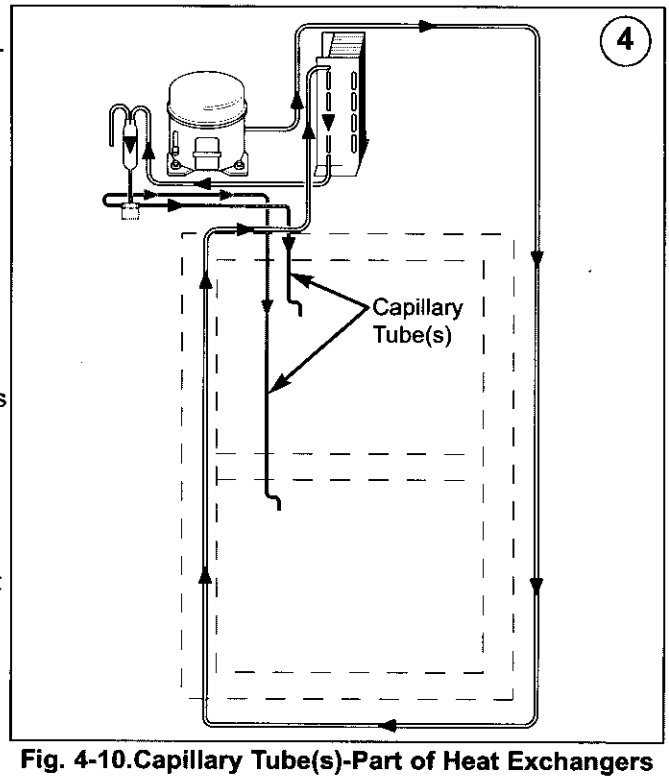

Fig. 4-10.Capillary Tube(s)-Part of Heat Exchangers

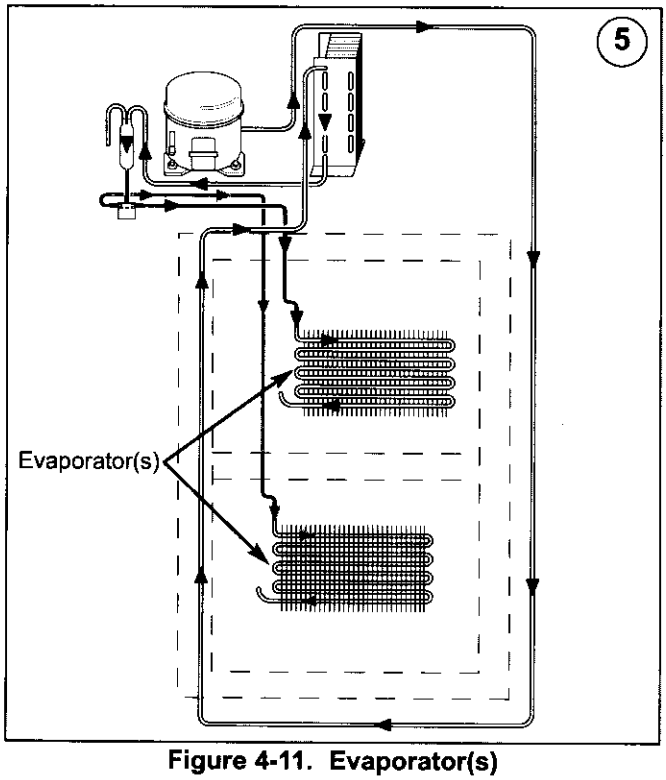

Figure 4-11. Evaporator(s)

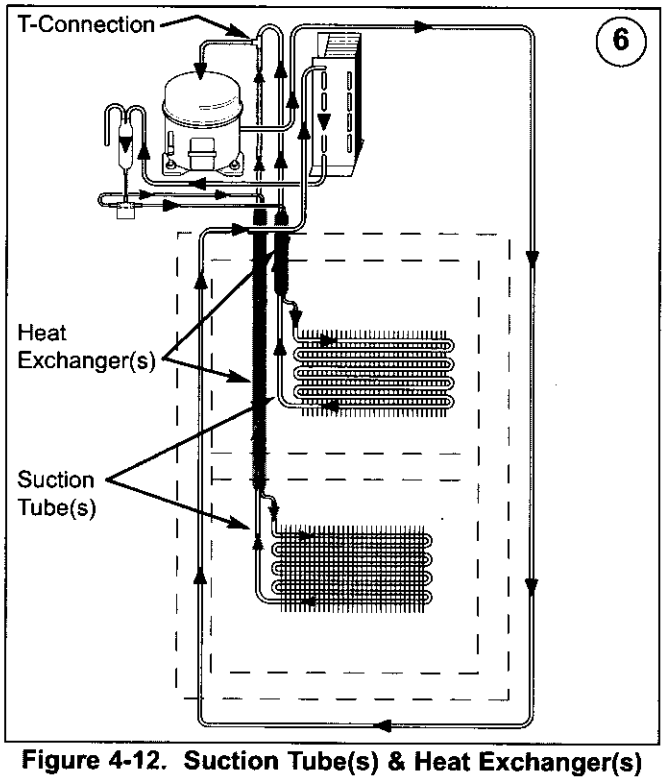

Figure 4-12. Suction Tube(s) & Heat Exchanger(s)

REFRIGERANT FLOW DIAGRAMS

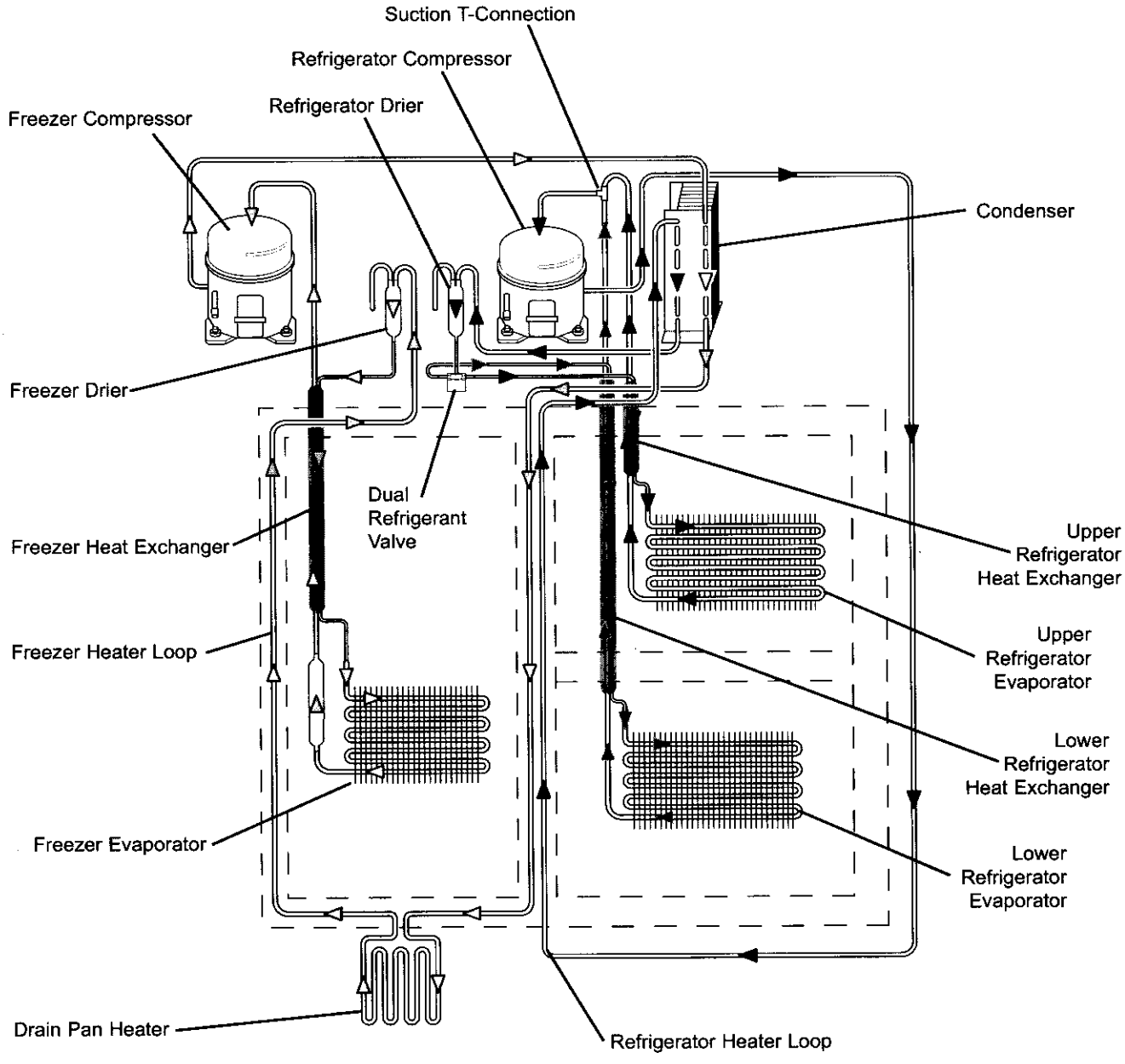

Figure 4-13. Models 648PRO Refrigerant Flow