GENERAL ELECTRIC

REFRIGERATOR & FREEZER

Hotpoint

TECHNICIAN'S MANUAL

REFRIGERATOR

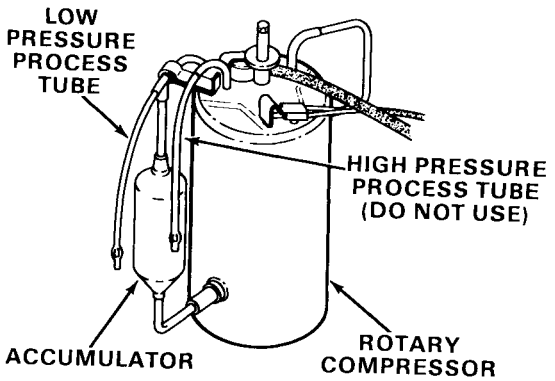
ROTARY COMPRESSOR

PUB. NO. 31-5201

INTRODUCTION

The rotary compressor is relatively simple. It requires fewer parts and is smaller, compared to the previous reciprocating types. It is also more energy efficient.

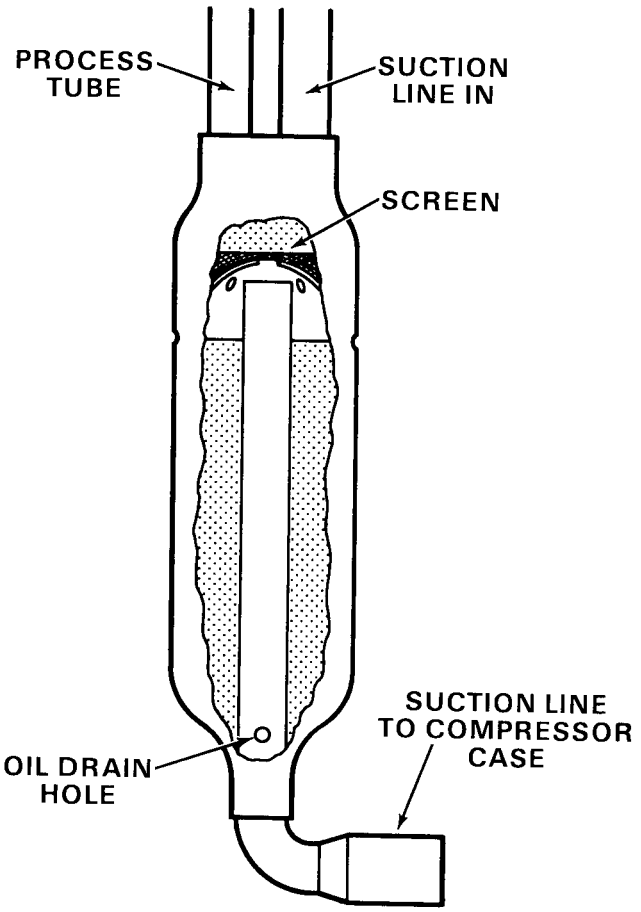
The rotary compressor is mounted vertically in the machine compartment of the refrigerator. The compressor motor terminals are located on the top of the compressor case instead of on the side.
A wiring harness connector plugs directly onto the compressor terminals and is held securely by a spring steel retainer. The Guardette, or motor overload protector, is also mounted to the top of the compressor case. The Guardette is positioned inside a molded plastic housing and is held securely by the opposite end of the spring steel retainer.



ROTARY COMPRESSOR

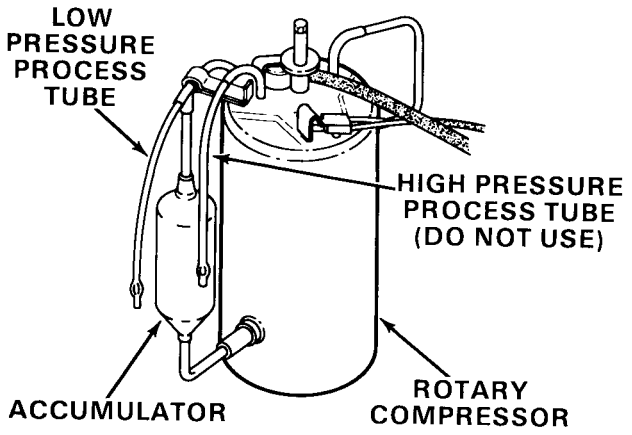
The compressor motor has two windings. A solid state PTCR type relay is connected in series with the start winding. The wiring harness plugs onto the relay. A run capacitor is utilized to improve the efficiency of the compressor motor. The run capacitor is connected to the bottom of the relay. The compressor will start and run without the run capacitor -- but will not run as efficiently. With the run capacitor connected in the circuit, the operating current is reduced by approximately three-quarters of an amp.

An accumulator, mounted vertically at the side of the compressor case, is connected to the inlet port of the compressor. The suction tube and a low pressure process tube are connected to the top of the accumulator. The accumulator consists of an expanded tube with a screen at the top and a trap at the bottom. The purpose of the accumulator is to prevent liquid refrigerant from entering the compressor cylinder which could damage the compressor. Any liquid refrigerant returning from the evaporator, through the suction tube, is dispersed by the screen. Any remaining liquid then accumulates at the bottom where it slowly drains through a small hole in the trap.

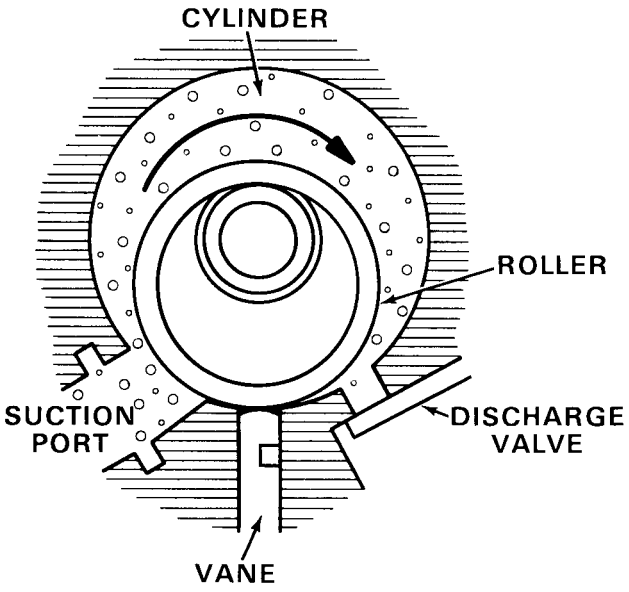


ROTARY COMPRESSOR

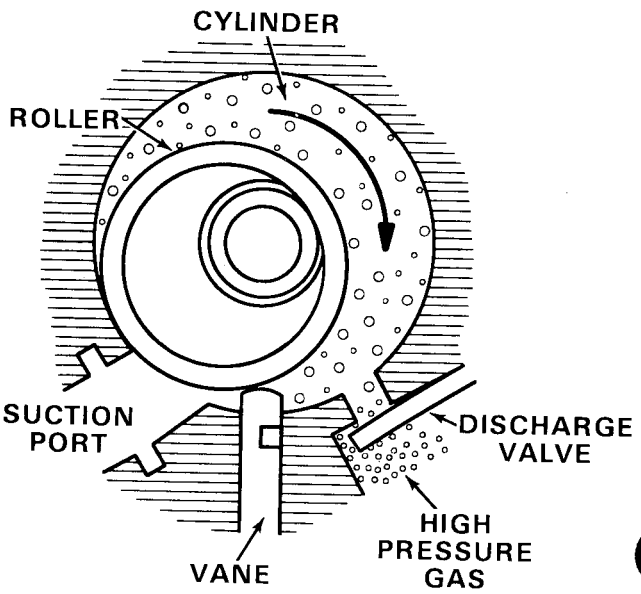
The discharge tube and a high pressure process tube are connected to the top of the compressor case. The compressor case is on the high pressure side of the refrigeration system.



Let's follow a compression cycle of the rotary compressor. At the beginning of the cycle, the spring-loaded vane is fully depressed by the roller. The cylinder is filled with low pressure refrigerant vapor. As rotation progresses, the roller seals off the inlet port and begins to compress the vapor. At the same time, low pressure refrigerant vapor is drawn into the cylinder through the inlet port by the rotating roller. During this time, the discharge valve is held closed by the high pressure inside the compressor case.



As rotation continues, and pressure inside the cylinder exceeds the pressure in the compressor case, the discharge valve is forced open. The hot high pressure vapor then passes into the compressor case.

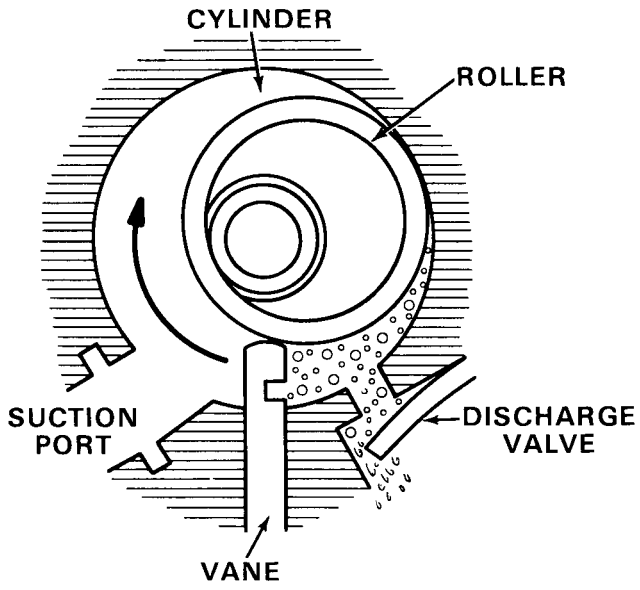


At the 360 degree rotation point, the cylinder has been filled with low pressure refrigerant vapor and is ready to start the compression cycle again.

When a rotary compressor cycles off, oil is forced out of the compressor into the accumulator and suction tube -- until the system pressure partially equalizes. It then gradually returns to the compressor. The back flow of oil will cause the accumulator to become hot shortly after the compressor stops running.

The oil in the compressor serves a dual purpose. It not only lubricates the moving parts of the compressor but, also, acts as a seal between the moving and stationary parts. The oil is stored in the sump at the bottom of the compressor case. A small paddle at the bottom of the compressor shaft forces the oil upward through holes and slots at each bearing surface. Even though the tolerances of the machined parts in a rotary compressor are extremely close, a film of oil separates

ROTARY COMPRESSOR

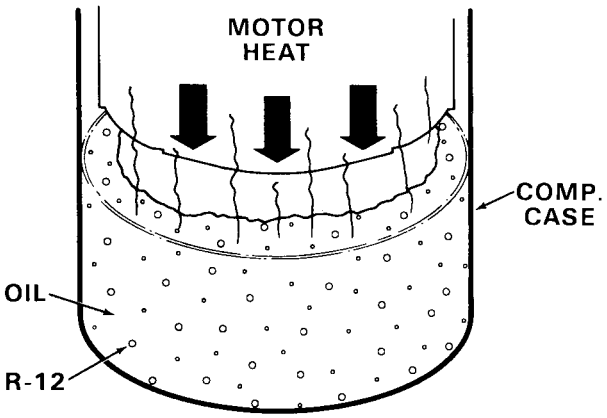


the metal parts. Excessive high side pressure can squeeze the oil out and permit metal-to-metal contact, which will cause the bearing to overheat and fail.

A charasteristic of the rotary compressor is that at cold start up, it may take 30 to 45 minutes before liquid refrigerant begins to enter the evaporator. This delayed reaction is because the refrigerant is saturated in the cold oil, inside the compressor case. The compressor case must be hot to drive the refrigerant out of the oil. Once the compressor has reached operating temperature, the refrigerant becomes available to circulate throughout the refrigerant system. and the system performs normally. The compressor then operates efficiently, without a delayed reaction, during succeeding cycles.

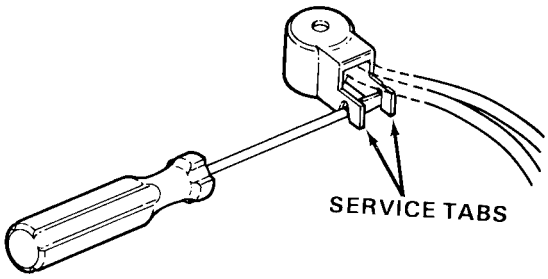
The delayed reaction time of a cool rotary compressor can be reduced by repeatedly cycling the compressor on the Guardette. First connect the power cord and allow the compressor to operate for a couple of minutes.

Then, disconnect the power cord and immediately reconnect it. After several seconds, the Guardette will trip. In the meanwhile, heat from the motor will warm the compressor case. Repeat this process two more times and the compressor should be sufficiently warm to drive the refrigerant from the oil. No more than 3 Guardette trips should be attempted because the Guardette may then remain tripped for an extended length of time.



After the compressor has reached operating temperature, if the power cord is disconnected for any reason, you should wait 3 minutes for the refrigeration system to partially equalize before reconnecting the power cord. This will prevent the Guardette from tripping. Because the Guardette is located on the top of the compressor case, which becomes hot, it could take 45 minutes or more for it to reset -- unless manually cooled.

To manually cool the Guardette: after disconnecting the power cord, insert a blade type screwdriver between the retainer and the Guardette housing to release the retainer. Then, gently pull the wiring harness to extract the Guardette and housing. Remove the housing from the Guardette and allow the Guardette to cool in the room ambient for a few seconds -- until it resets. Never operate the compressor for more than a few seconds without the Guardette properly mounted to the compressor case.

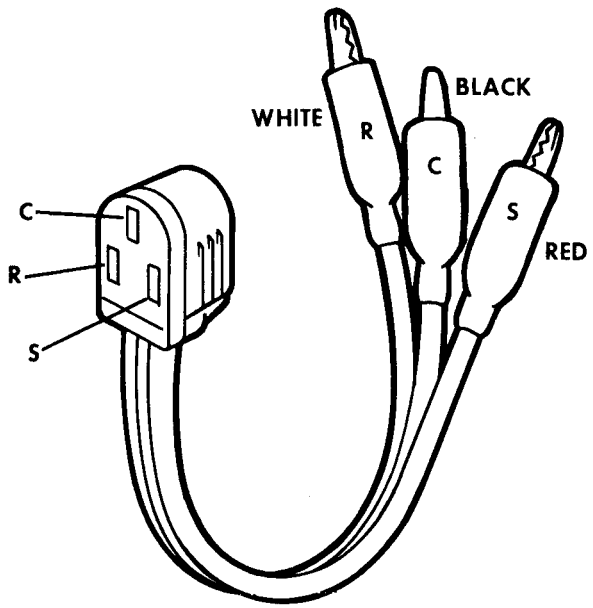


To reinstall the Guardette, place it inside its housing and, with a blade type screwdriver inserted through the housing slots, push it into the retainer until a "click" can be heard. Then, pull gently on the wiring harness to make sure it is properly retained.

DIAGNOSIS

Diagnosis procedures for refrigerators with rotary type compressors are the same as for refrigerators with reciprocating type compressors. If the compressor will run without any unusual noise, it is very unlikely that anything is wrong with the compressor. Look for a cause other than the compressor.

If the compressor will not start, a direct start test can be made of the rotary compressor. Follow the same procedure and use the same test harness and terminal adapter as for reciprocating type compressors. However, care must be taken to properly connect the harness leads to the terminal adapter due to the different orientation of terminals on the rotary compressor.



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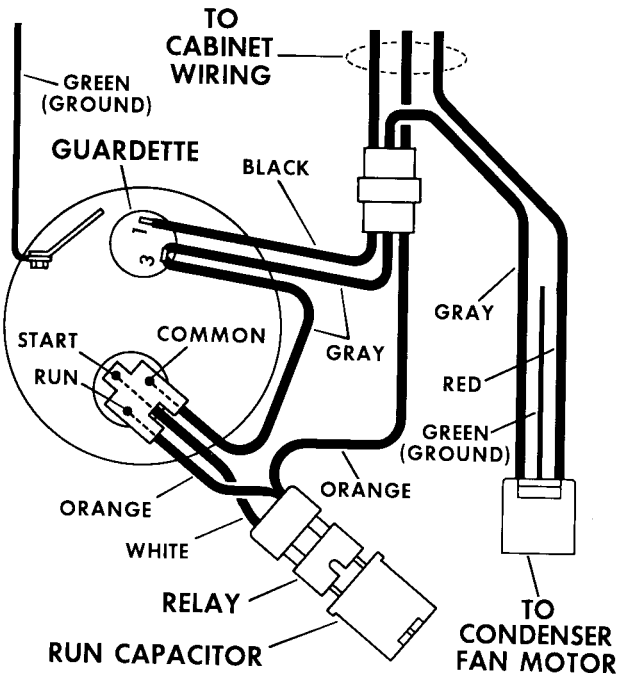
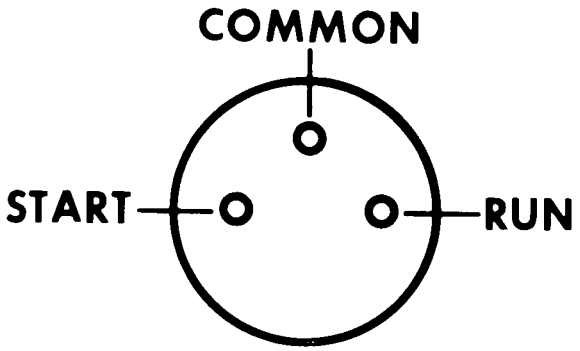
After disconnecting the power cord, remove the vertical bracket and move the horizontal bracket to the left. Then, remove the connector from the compressor terminals and plug the terminal adapter onto the compressor terminals. Next, identify the start, common and run terminals by referring to the machine wiring diagram in the Mini-Manual. Connect the harness leads to the appropriate leads on the terminal adapter. A capacitor should not be used when attempting to direct start the compressor. Connect the test harness to the wall receptacle and immediately depress the momentary start switch. If the compressor does not start within 5 seconds, immediately disconnect the test harness and replace the compressor.

If the compressor runs but no refrigeration occurs, make sure the compressor is hot. Then, check to see if the condenser is hot. If the condenser is hot, look for a cause other than the refrigeration system. If the condenser is cool, check the suction pressure in the refrigeration system. The operating pressures are virtually the same as with reciprocating type compressors.



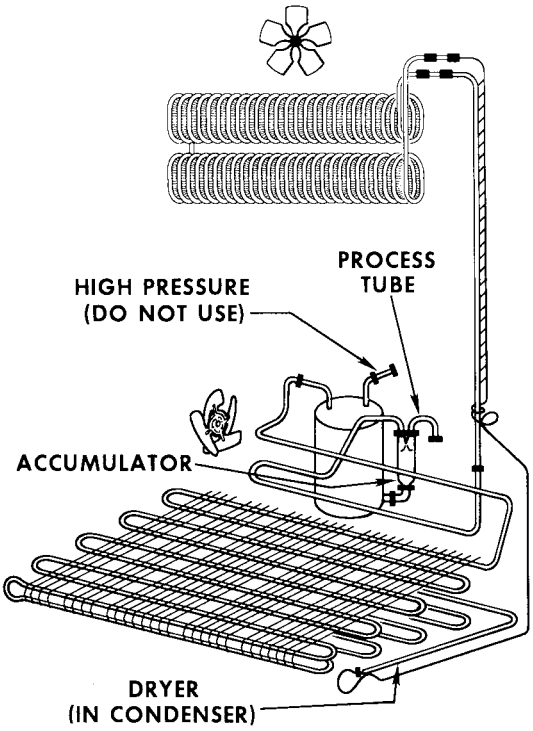


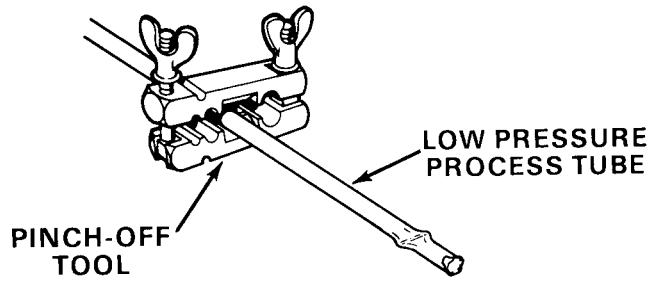
GE & TECUMSEH COMPRESSORS

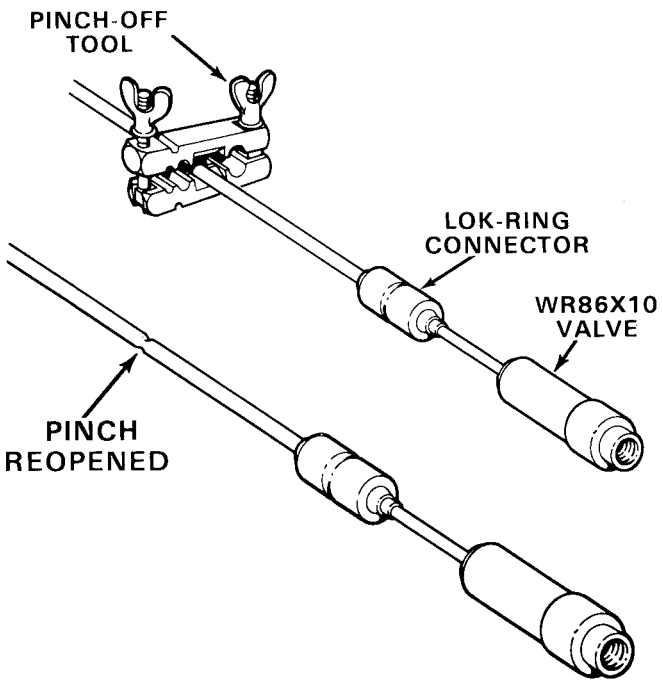
ROTARY COMPRESSOR

Refrigerators produced with rotary compressors do not have a service valve. The recommended method for accessing the refrigeration system is to permanently install a WR86X10 Service Valve on the low pressure process tube extending from the top of the accumulator. To install the valve, without losing refrigerant from the system: pinch the process tube closed, near the accumulator in a location that will permit the tube to be reopened later. Next, cut off the closed end of the tube and install the valve, either with a Lok-Ring connector or by brazing. Then, open the pinched tube. The standard charging valve tool can now be used to access the low pressure side of the refrigeration system. If a self-piercing line-tap valve is used as an alternate method to access the system, it must be removed and the hole in the process tube brazed closed.

When checking the suction pressure of a refrigeration system that has a rotary type compressor, the following points should be remembered:







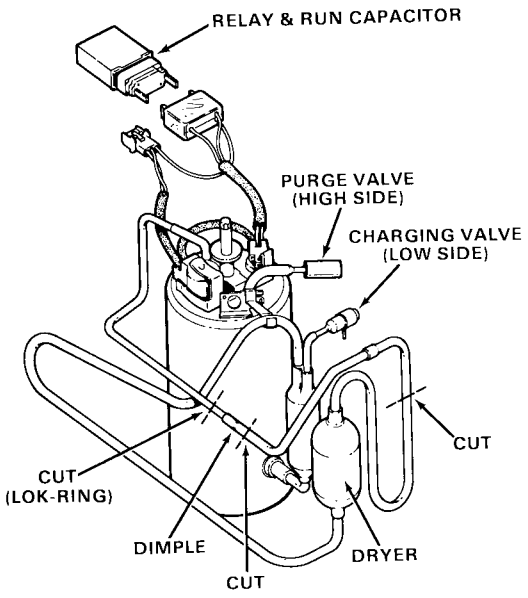
1. Before the compressor is initially started, the equalized pressure will be high -- from 40 to 80 pounds, depending upon the room ambient.
2. At initial start up, the suction pressure will drop to a deep vacuum and slowly return to a positive pressure as the compressor becomes hot.
3. During a normal run cycle, the suction pressure will be approximately 10 to 12 pounds and slowly drop to approximately 0, or a little lower, at which time the temperature control will usually cycle the compressor off.
4. If the suction pressure remains in a deep vacuum, down to 15 to 25 inches, and the compressor is hot, a leak or a restriction should be suspected.
5. If the suction pressure is excessively high, above 20 pounds, while the compressor is running, an overcharge should be suspected.
6. If the compressor has stopped running, the gauge and hose should not be immediately removed to avoid losing oil from the compressor.

COMPONENT REPLACEMENT

When installing a replacement dryer, the same procedure should be followed as on systems that have reciprocating type compressors. However, use only a WR86X83 Dryer which is manufactured to the critical specifications required on systems with rotary compressors. The WR86X83 Dryer supersedes the WR86X2 Dryer and is identical in appearance.

A WR86X83 Dryer should also be used when replacing the Lo-Side. The procedure for replacing the Lo-Side is the same as on systems that have a reciprocating type compressor. However, after disconnecting the power cord, wait at least 10 minutes for the oil to return to the compressor before cutting the tubing. Then, score and break the capillary first -- to slowly release the charge from the sytem.

The replacement Hi-Side includes a dryer preinstalled in the suction tube. This dryer should remain in the suction tube when the Hi-Side is installed. The original dryer should also remain in the system, unless conditions warrant its removal. Thus, only 2 tubing connections are required when replacing the rotary Hi-Side -- one on the suction tube and the other on the discharge tube. These can be made either with Lok-Rings or by brazing. If brazing, always use 45% silver alloy.



A charging valve and a purge valve are also preinstalled on the replacement Hi-Side to facilitate evacuating and charging the system. The replacement Hi-Side includes a wiring harness with a new PTC relay and a new run capacitor. This permits testing the compressor for proper operation before installing the Hi-Side into the system, by connecting a jumper cord to the appropriate terminals of the Hi-Side harness.

To prevent losing oil from the inoperative compressor, when replacing the Hi-Side, release the charge from the system by cutting off the pinched end of the high pressure process tube.

EVACUATION AND CHARGING

The replacement Hi-Side has a small charge of refrigerant to provide a positive internal pressure. The pressure will be released after opening either the charging valve or the purge valve. However, some of the refrigerant will remain saturated in the oil inside the Hi-Side. Accordingly, after the Hi-Side is installed, the compressor should be permitted to run long enough to warm up while purging and evacuating the system. This will drive the remaining refrigerant out of the oil which may otherwise result in overcharging the system.

When charging a refrigeration system that has a rotary compressor, liquid refrigerant should never be permitted to enter the compressor. Such action will likely damage the compressor. As a preventative measure, allow the refrigerant to enter the system slowly. When using premeasured refrigerant cans, allow only vapor to enter the system for the first 10 seconds. Then, after the can becomes cold, the pressure in the can will be significantly reduced so that it may then be inverted. By this time, the remainder of the charge passing through the accumulator will enter the compressor as a vapor.