

Installation, Start-Up and Service Instructions

Piping Package No. 40RR900271

NOTE: Read and become familiar with these instructions before beginning installation.

SAFETY CONSIDERATIONS

Installing and servicing air-conditioning equipment can be hazardous due to system pressures and electrical components. Only trained and qualified service personnel should install or service air-conditioning equipment. When working on air-conditioning equipment, observe the precautions provided in literature, and on tags and labels attached to the unit.

⚠ WARNING

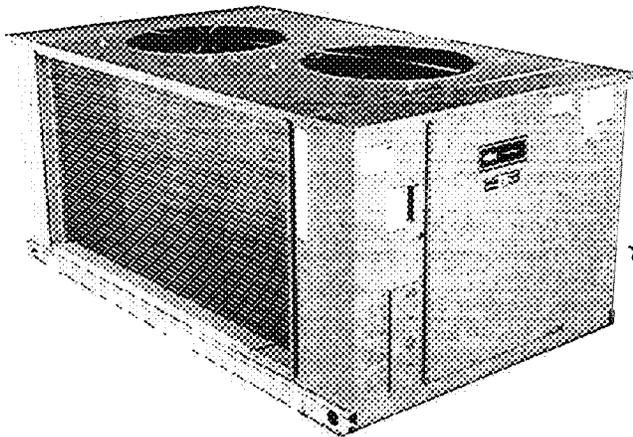
Electrical shock can cause personal injury or death. Before beginning any modification or installation of this package, be sure the main electrical disconnect is in the off position. Ensure power is disconnected to the fan coil unit. On some systems both the fan coil and the outdoor unit may be on the same disconnect. Tag the disconnect switch with a suitable warning label.

GENERAL

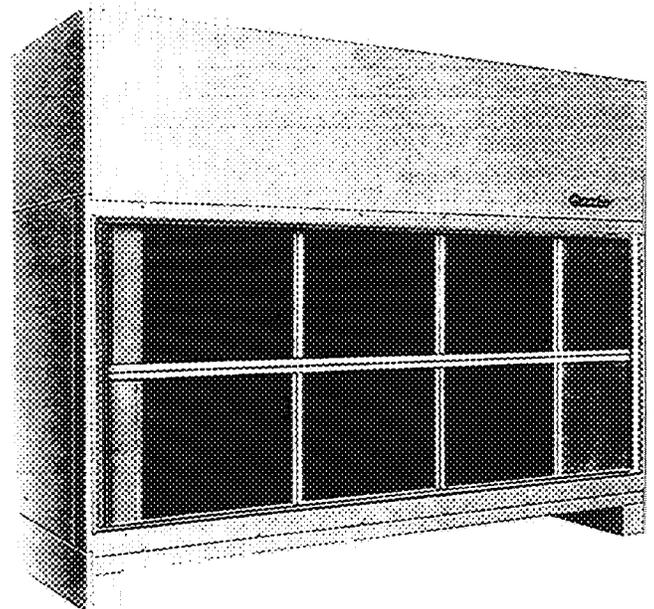
The accessory heat pump piping package is designed for use with the Carrier 38QP024 heat pump (outdoor section) in combination with the 40RR024 fan coil unit (indoor section) (see Fig. 1).

Special accessories are available for electrical control of this system. Electric heaters for the 40RR024 are a field-installed accessory. Ensure that all material required for installation is available at the jobsite, including the 38QP024 outdoor section, the 40RR024 indoor section, piping package, electrical control package, and 40RT electric heater packages. The Sporlan part no. G8 nozzle is used for both the upper (circuit no. 2) and lower (circuit no. 1) coil sections of the indoor unit. Nozzles are shipped as standard parts of the factory-installed 40RR distributor. Distributor sizes are as follows:

COIL SECTION	DISTRIBUTOR SIZE (in. OD)
Upper (Ckt 2)	7/8
Lower (Ckt 1)	7/8



OUTDOOR SECTION
38QP024



INDOOR SECTION
40RR024

Fig. 1 — 38QP024/40RR024 Heat Pump System

Accessories

PIPING PACKAGE — Contains check valves, thermostatic expansion valves (TXV's), receiver, filter driers, and tubing to connect the indoor coils for heat pump service.

THERMOSTAT HH07AT172 (HH07AT162 For Use on Celsius Scale) — Used with subbase HH93AZ174, is a 2-stage cool/2-stage heat thermostat with automatic changeover and a lockout light. There is no provision for emergency heat.

THERMOSTAT HH07AT172 (HH07AT162 For Use on Celsius Scale) — Used with subbase HH93AZ177, is a 2-stage cool/2-stage heat thermostat. This combination has all the features of HH07AT172 (HH07AT162)/HH93AZ174 plus a provision for emergency heat.

SEQUENCER PACKAGE — Can be used with this system when unloaders are added to the compressor(s). (Unloading can be applied in the cooling cycle only. *Unloading can never be applied in the heating cycle.*) The sequencer has 4-stage cooling capability.

ELECTRIC HEATERS — May be used with the 40RR indoor unit (see Table 1). Use a maximum of four 20-kW (at 240 v) or 21.8-kW (at 480 v) electric heater assemblies.

ELECTRIC HEATER CONTROL PACKAGE 40RT900081 — Provides control for up to 3 stages of electric heat when used with outdoor-air thermostat(s). Package must be used whenever 40RT electric heaters are utilized. If a fourth stage of electric heat is used, an additional field-supplied heater control relay is necessary. This relay must have a 24-v coil with 230-v contacts. Outdoor thermostats (part no. HH22QA040) are recommended for staging electric heaters.

Table 1 — Unit 40RR Accessory Electric Heaters

PART NO.	ELECTRIC HEATER (3 PHASE 50/60 Hz)		
	Rated Voltage	kW	FLA
40RT-900-101	240	20.0	48.0
40RT-900-111	480	21.8	26.0

LEGEND

FLA — Full Load Amps

NOTES:

1. A maximum of 4 electric heaters can be used with the 40RR024 unit.
2. Electric heaters are not UL (Underwriters' Laboratories) listed for the 38QP/40RR heat pump.

WATTAGE MULTIPLICATION FACTORS

Heater Voltage Rating	Actual Heater Voltage (3 Phase, 50/60 Hz)	Multiplication Factor
240	200	0.69
	208	0.75
	220	0.84
	230	0.92
	240	1.00
480	380	0.63
	400	0.69
	415	0.75
	440	0.84
	460	0.92
	480	1.00

Example: 20.0 kW (at 240 v) heater on 230 v
 = 20.0 (0.92 multiplication factor)
 = 18.4 kW capacity at 230 v

INSTALLATION

Step 1 — Perform Outdoor and Indoor Unit Installation — Follow the installation instructions provided with each outdoor and indoor unit. See Table 2 for maximum vertical elevation between the indoor and outdoor sections.

Table 2 — Maximum Vertical Separation

SYSTEM	HEIGHT OF INDOOR UNIT			
	Above Outdoor Unit		Below Outdoor Unit	
	ft	m	ft	m
40RR024/38QP024, 60 Hz, Ckt 1 and 2	59	18.0	59	18.0
40RR024/38QP024, 50 Hz, Ckt 1 and 2	58	17.7	58	17.7

Step 2 — Size Piping Lines — Employ one of the following methods to size interconnecting refrigerant piping between the 38QP and the 40RR:

1. Use the pipe sizes shown in Refrigerant (R-22) Charge and Piping Selection table in the 38QP installation instructions (*when not using field-installed accessory unloaders*).
2. Use the Carrier System Design Manual, Part 3, Piping Design (*when using field-installed accessory unloaders*).
3. Use the piping sizing portion of the Carrier E20-II computer program (*when using field-installed accessory unloaders*).

NOTE: Liquid line solenoid valves are not required; they are factory-installed on the 38QP.

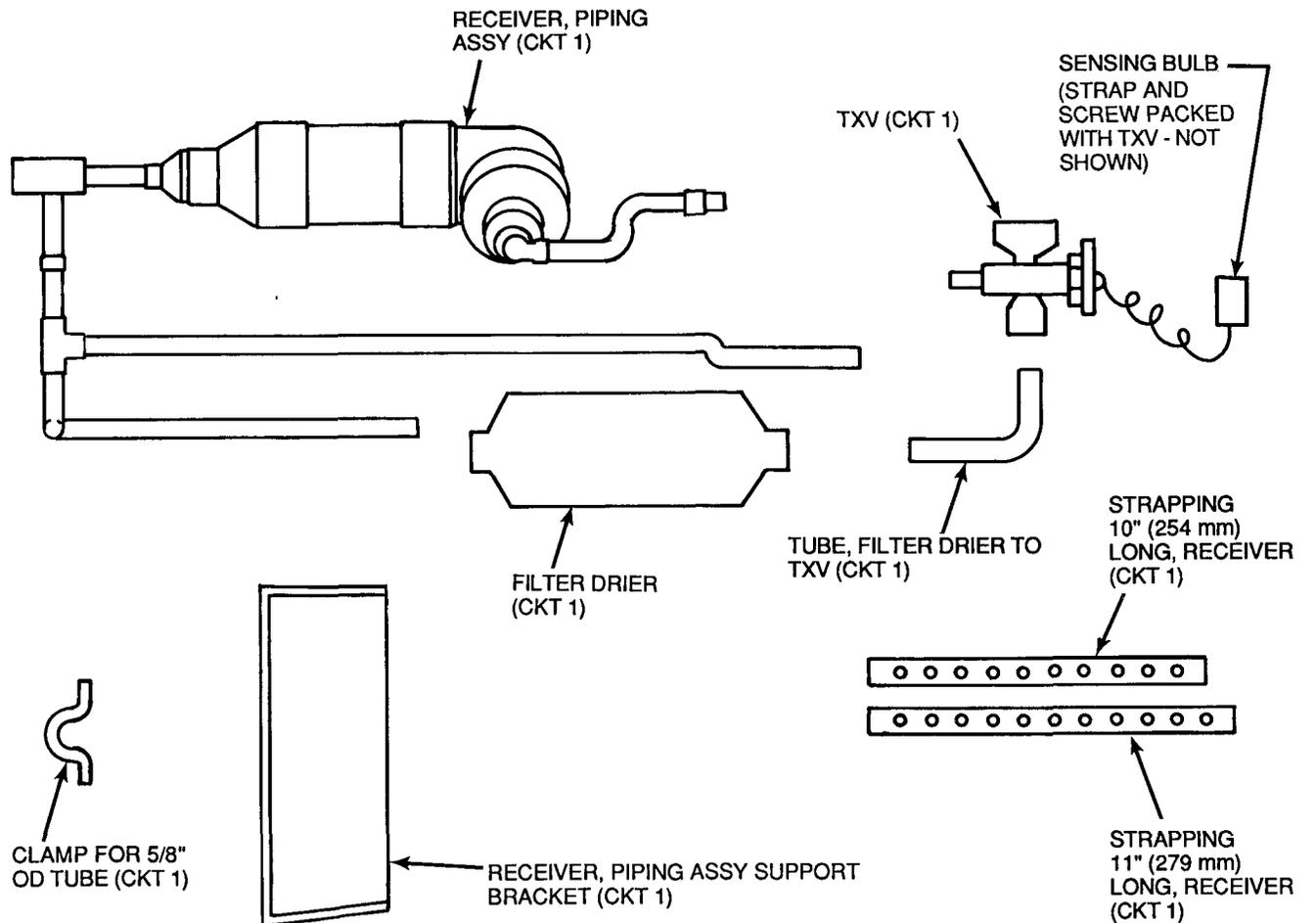
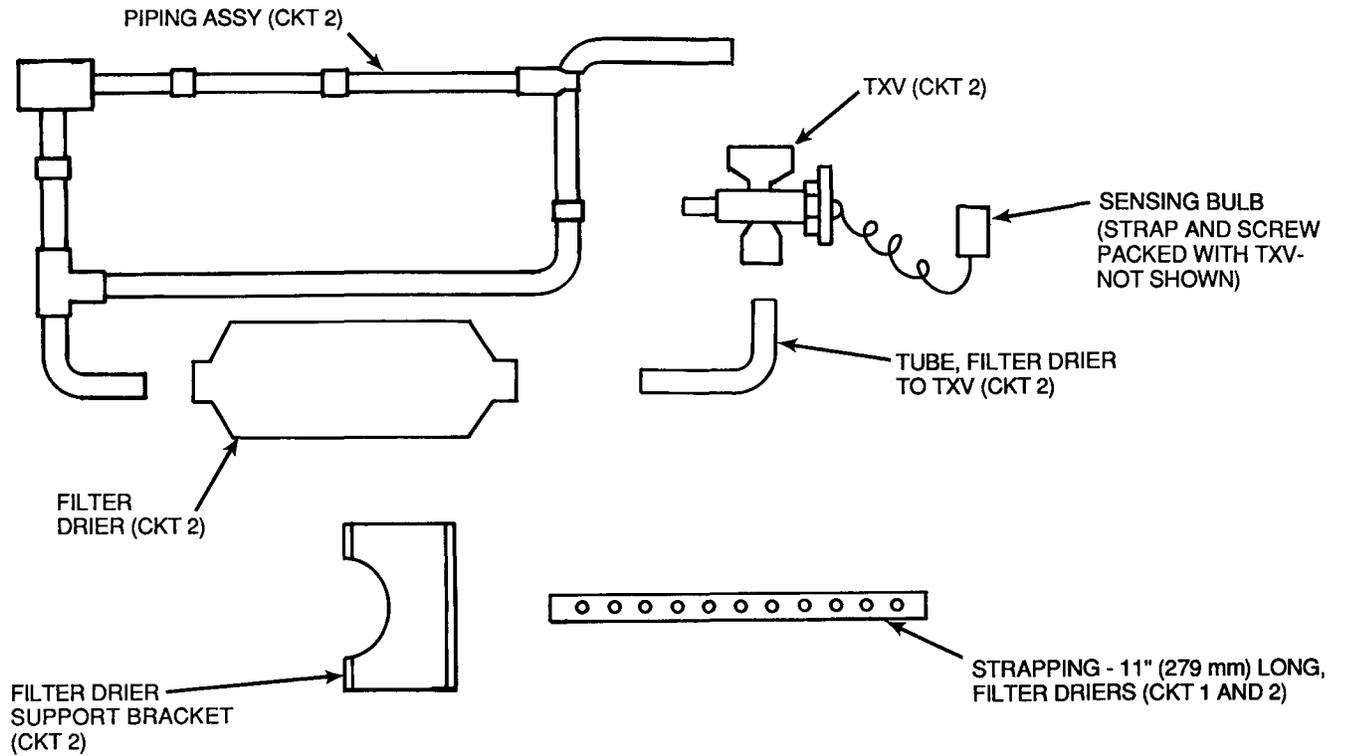
Step 3 — Check Contents of Piping Package

— Install heat pump piping package to convert indoor coil for heat pump service. Table 3 lists the contents of the piping package. Figure 2 shows the contents of the piping package in the approximate order in which they are installed.

Table 3 — Heat Pump Piping Package Contents

DESCRIPTION	QUANTITY
Receiver, Piping Assy (Ckt 1)	1
Piping Assy (Ckt 2)	1
Filter Drier (Ckt 1 and 2)	2
Receiver, Piping Assy Support Bracket (Ckt 1)	1
Filter Drier Support Bracket (Ckt 2)	1
TXV (Thermostatic Expansion Valve) (Ckt 1 and 2)	2
Screw, Receiver Strap*	1
Screws, No. 10 for Filter Drier Strap (4) 5/8" Tube Clamp (2), Filter Drier Support Bracket (2)*	8
Tube, Filter Drier to TXV (Ckt 1)	1
Tube, Filter Drier to TXV (Ckt 2)	1
Strapping, 11" Long for Filter Driers (Ckt 1 and 2)	2
Strapping, 10" Long for Receiver (Ckt 1)	1
Clamp for 5/8" OD Tube (Ckt 1)	1
Installation Instructions*	1
Strap for TXV Sensor†	2
Screw and Nut for TXV Strap†	2

*Items are included in a packet which accompanies piping package.
 †Items are packed together with TXV.



LEGEND

TXV - Thermostatic Expansion Valve

NOTE: Items listed in Table 1 and not shown on Fig 2 are included in packaging which accompanies piping package.

Fig. 2 - Heat Pump Piping Package Contents in Approximate Order of Installation

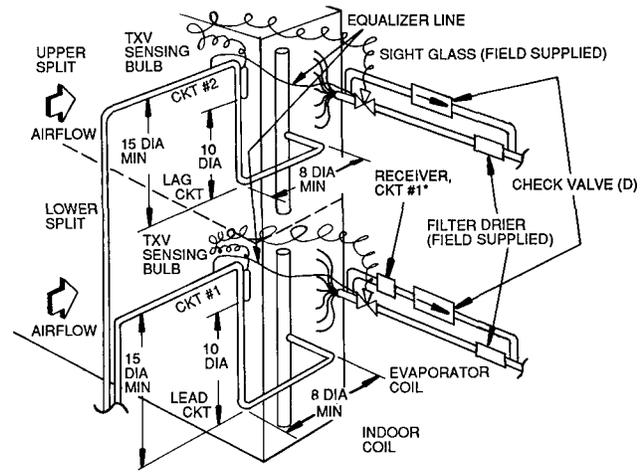
Step 4 – Install Piping Package — Install parts of piping package as shown in Fig. 3.

CONNECT LIQUID AND VAPOR LINES — Run liquid and vapor lines separately between the 38QP and the 40RR units, because the 38QP has dual independent refrigerant circuits. A label on the 38QP corner post identifies the circuits.

CONNECT EQUALIZER LINE TO EACH THERMOSTATIC EXPANSION VALVE (TXV) — (See Fig. 4.) Install a fitting for suction pressure readings near the indoor section to allow for TXV superheat adjustments. (A fitting can be installed in the equalizer line for this purpose.)

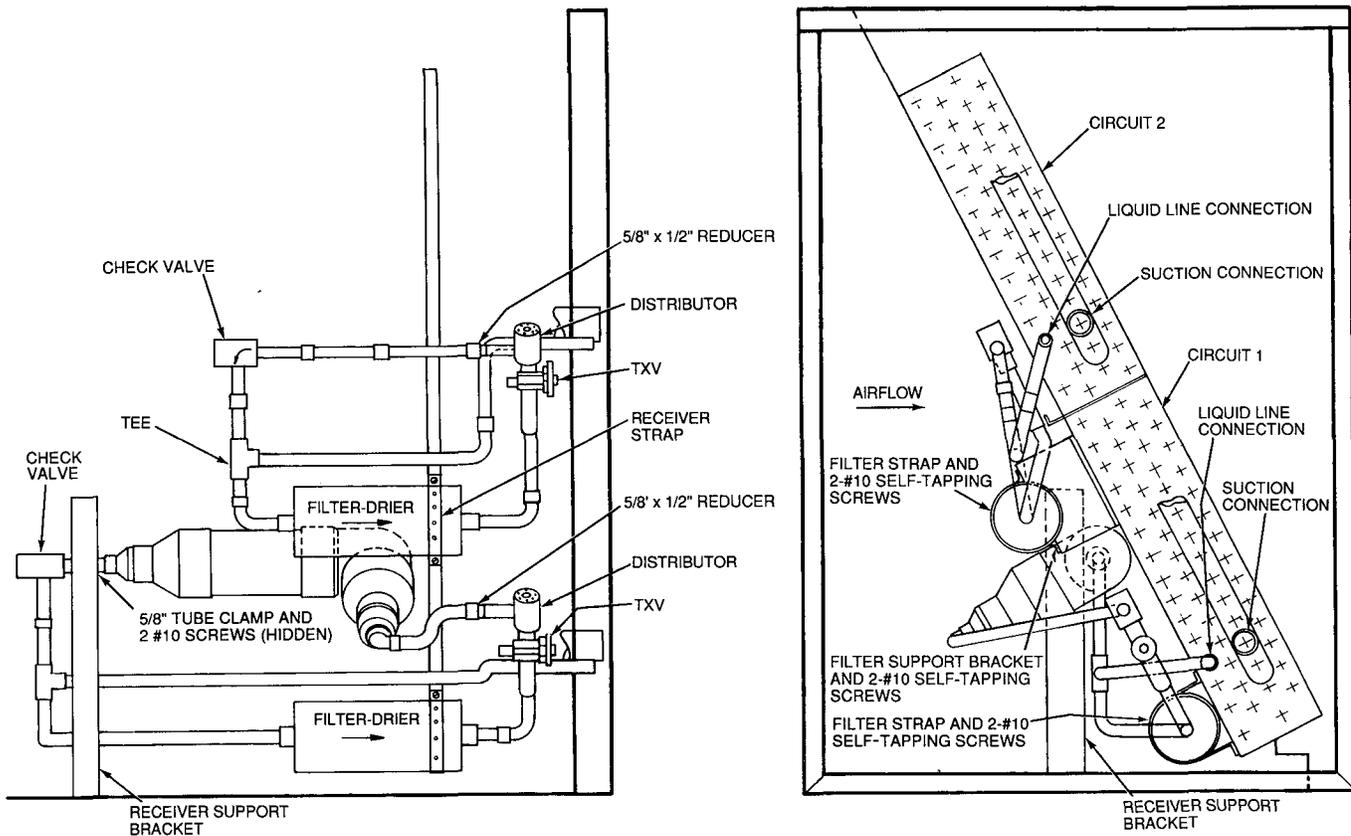
MOUNT TXV SENSING BULB — Locate TXV sensing bulb on the suction line as shown in Fig. 4. *Do not attach bulb to suction manifold (header).* Locate bulb on a vertical riser where possible. If a horizontal location is necessary, secure the bulb at approximately 4 o'clock or 8 o'clock position. (See Fig. 5.)

Step 5 – Connect Power Wiring — All wiring must comply with local and National Electrical Code requirements. See the installation instructions with each indoor and outdoor unit for recommended wire and fuse sizes. See 38QP wiring book for wiring diagrams and Table 4 for 40RR wire MCA (minimum circuit amps) and MOC (maximum overcurrent protection). Perform charging instructions per installation instructions provided with the outdoor unit.



*40RR024 Only.

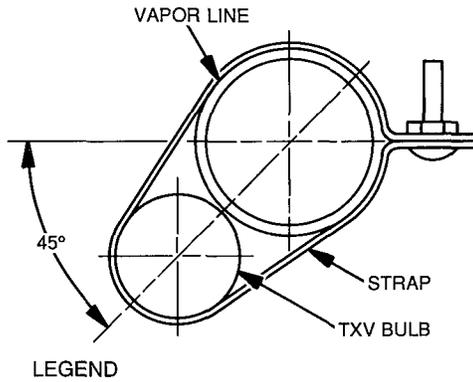
Fig. 4 – Equalizer Line and TXV Sensing Bulb Locations



TXV — Thermostatic Expansion Valve

NOTE: Cut distributor side outlet tube to 1-5/16 in. (33.3 mm) length from OD of distributor.

Fig. 3 – Unit 40RR Piping Arrangement



LEGEND
TXV — Thermostatic Expansion Valve
 NOTE: The 8 o'clock position is shown above
Fig. 5 — TXV Feeler Bulb Locations

Step 6 — Make TXV Adjustments.

▲ CAUTION
 Wait 30 minutes between TXV adjustments to avoid excessive superheat.

Make TXV adjustments on 40RR after installation of piping package, verifying 10° F superheat.

Table 4 — Unit 40RR Electrical Data

UNIT	V*-PH-HZ	VOLTAGE LIMITS	FAN MOTOR		POWER SUPPLY	
			Hp	FLA	MCA	MOCP (Amps)
40RR 024	208-3-60	180-220	3	10.8	13 2	15
	230-3-60	207-253	3	10.1	11.5	15
	460-3-60†	416-528		5.0	5 8	

LEGEND
FLA — Full Load Amps
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection

*Motors are designed for satisfactory operation at ± 10% of nominal voltages shown. Voltages should not exceed the limits shown in the "Voltage Limits" column.

†Motors must be field wired for 460 v in accordance with directions on nameplate of motor.

NOTE: Fan motors are field supplied on unit 40RR024 (575 v) and on 50-Hz units.

START-UP

Evacuate and Dehydrate — Evacuate and dehydrate entire refrigerant system as shown in General Training Air Conditioning (GTAC) II, Module 4, System Dehydration.

▲ WARNING
 To prevent personal injury, wear safety glasses and gloves when handling refrigerant. Do not overcharge system — this can cause compressor flooding. Never charge liquid into the low-pressure side of the system. During charging or removal of refrigerant, be sure indoor fan system is operating.

Preliminary Charge — Refer to GTAC II, Module 5, Charging, Recovery, Recycling, and Reclamation for charging methods and procedures. Charge system per Table 1 in GTAC II by the liquid charging method and charging by weight procedure.

Charge System (Cooling Only) — Refer to GTAC II, Module 5, Charging, Recovery, Recycling, and Reclamation, and the following procedure.

NOTE: Because this split system uses TXV's in the heating cycle, refrigerant charge can be adjusted during heating operation. When properly charged, the 40RR has approximately 32° F of state point subcooling leaving circuits no. 1 and 2 from the indoor coil in the heating cycle. Use charging chart on unit to complete charging (in cooling cycle only).

NOTE: Use refrigerant R-22 only.

NOTE: Since the 38QP unit contains 2 refrigeration circuits, both circuits must be charged separately.

To charge system:

1. Regulate valve at refrigerant (R-22) tank to maintain suction pressure at 80 psig (551.6 kPa) while charging. Charge with vapor only at suction side of unit.

NOTE: Do not depend on sight glass when charging unit; use charging charts which are attached to the inside of each compressor access panel.

2. Measure line temperature close to the liquid service valve, and measure the pressure at the Schrader port on the liquid line service valve. Plot point on the charging chart. If point is above the line, add charge. If point is below the line, remove and reclaim charge until operating point falls on the curve.

3. Allow system to operate for 20 minutes. Take temperature and pressure reading at liquid service valve and check values with the charging chart.

4. Record final installed system charge in ink on unit nameplate.

CHECK OIL CHARGE — Allow system to run for approximately 20 minutes. Stop system and check compressor oil level. Ten pints is the proper oil charge amount for a 6D compressor. Add oil only if necessary to bring oil into view in sight glass. Use only Carrier-approved compressor oil:

- Petroleum Specialties Cryol 150A
- Texaco, Inc. Capella WF32
- Witco Chemical Corp. Sunisco 3GS

IMPORTANT: Do not reuse drained compressor oil or oil that has been exposed to atmosphere. Procedures for adding oil are given in GTAC II, Module 5, Charging, Recovery, Recycling, and Reclamation. To remove oil: shut system off; isolate the compressor; remove and reclaim the refrigerant in the compressor; remove the compressor oil drain plug.

SEQUENCE OF OPERATION

General — The heat pump contains 2 independent refrigeration circuits. Each circuit has its own set of independent controls, compressor, liquid line solenoid valve, reversing valve, crankcase heater, TXV, and accumulator.

Circuit breakers provide overcurrent protection for compressors (in both heating and cooling modes). These require manual reset at the 38QP unit control box. The oil pressure safety and crankcase heater also require reset at the outdoor unit.

Cooling

NOTE: When power is supplied to a system that is off, crankcase heaters are energized. The reversing valve may or may not be energized depending on mode of operation (heating or cooling) when thermostat was previously satisfied.

The following cooling operating sequence has both heat pump circuits connected to a single, 2-circuit fan coil. The system is controlled by a single 2-stage heat/2-stage cool thermostat.

When the thermostat calls for first-stage cooling (TC1 closed), the indoor-fan motor starts immediately. Compressor no. 1 and outdoor fan no. 1 start after 3 seconds and before 5 minutes depending on the length of time system is off after thermostat was previously satisfied. (This time process is effective because of the 5-minute Time Guard® II circuit.) The reversing valve solenoid (RVS1) deenergizes, causing the reversing valve to shift to the cooling position. The crankcase heater is off when the compressor is operating. The liquid line solenoid valve in circuit no. 1 opens, allowing refrigerant to flow.

When the thermostat calls for second-stage cooling (TC2 closed), compressor no. 2 and outdoor fan no. 2 start. The reversing valve solenoid (RVS2) is deenergized, causing the reversing valve to shift to the cooling position. The liquid line solenoid in circuit no. 2 opens, allowing refrigerant flow in circuit no. 2.

When the second stage of thermostat is satisfied (TC2), compressor no. 2 shuts off and outdoor-fan motor no. 2 shuts off. When the first stage of thermostat is satisfied, compressor no. 1, outdoor fan no. 1, and indoor fan shut off. The liquid line solenoid valve closes in each refrigeration circuit when the corresponding compressor shuts off. The reversing valves do not shift but remain in the cooling position until there is a call for heating.

The unit is equipped with a no-dump reversing valve logic. When the unit is in the cooling mode, the reversing valve remains in cooling mode position until the thermostat calls for heating. Conversely, when the unit is in the heating mode, the reversing valve remains in heating mode position until the thermostat calls for cooling.

NOTE: If a malfunction occurs, causing the high-pressure switch (HPS), compressor overtemperature (COTP) safety, or loss-of-charge switch (LCS) to open, the compressor in the affected circuit is locked out by a Cycle-LOC™ circuit. This causes the Signal-LOC™ warning light to come on at the thermostat subbase. The remaining refrigeration circuit continues to operate. The RVS remains deenergized on the inactive circuit so reversing valve does not shift. These safeties are reset by adjusting the thermostat up to open TC1 and TC2, or by momentarily switching thermostat subbase to OFF position. If the compressor oil pressure is lost, or if oil pressure fails to build on start-up on either refrigeration circuit, an oil-pressure safety switch shuts off the affected compressor. The switch must be reset manually at the unit.

IMPORTANT: Do not reset more than once! If oil pressure switch trips, determine cause and correct. Do not bypass oil pressure safety switch.

The crankcase heaters are in an electrical lockout circuit. If a crankcase heater is defective, the compressor is locked off. The compressor remains off until the crankcase heater is replaced. This lockout circuit cannot be reset by adjusting the thermostat.

Heating

NOTE: When power is supplied to a system that is off, the crankcase heaters are energized. The reversing valve may or may not be energized depending on mode of operation (heating or cooling) when the thermostat was previously satisfied.

The following heating operating sequence has both heat pump circuits connected to a single, 2-circuit fan coil. The system is controlled by a single 2-stage heat/2-stage cool thermostat.

When the thermostat calls for heating (TH1 closed), the indoor-fan motor starts. Compressor no. 1 and outdoor fan no. 1 start after 3 seconds and before 5 minutes depending on the length of time system is off after thermostat is satisfied. (The time process is effective because of the 5-minute Time Guard II circuit.) The liquid line solenoid valve for circuit no. 1 opens when compressor no. 1 operates and closes when compressor no. 1 is off. The reversing valve in circuit no. 1 shifts (RVS1 energized) for heating operation. When the thermostat for second stage of heating closes (TH2), compressor no. 2 and outdoor fan no. 2 start, liquid line solenoid no. 2 opens, and reversing valve in circuit no. 2 shifts (RVS2 energized).

When thermostat TH2 is satisfied, compressor no. 2 shuts off, liquid line solenoid no. 2 closes, and outdoor fan no. 2 shuts off. When thermostat TH1 is satisfied, compressor no. 1, outdoor-fan motor no. 1, and indoor-fan motor shut off, and liquid line solenoid valve no. 1 closes. The reversing valves remain in the heating position until there is a call for cooling.

If either circuit is locked out, the electric heater (if installed) will be energized as long as the thermostat continues to call for heat.

Defrost — An outdoor coil temperature of 28 F (-2 C) triggers operation of the defrost timer logic on either circuit so that defrost becomes automatic with a time sequence, adjustable at 30, 50, or 90 minutes. As long as the outdoor coil temperature remains below 28 F (-2 C), defrost occurs every 30, 50, or 90 minutes on that circuit depending on the time selected. When defrost is initiated, the heat pump reverts to a modified cooling mode of operation (the outdoor fan for the affected circuit shuts off). This modified cooling mode utilizes heat rejection from the refrigerant to melt any ice or frost on the outdoor coil. When defrost is initiated on circuit no. 1, RVS1 is energized and shifts the reversing valve on this circuit. If defrost is *not* called for on circuit no. 2, this circuit continues to run in heating until enough frost or ice is built up on the coil to initiate defrost. Circuits no. 1 and no. 2 reversing valves shift independently of one another, because the coil temperatures are sensed independently. (TDF1 [thermistors, defrost 1] is attached to circuit no. 1, and TDF2 is attached to circuit no. 2.)

Defrost for circuits no. 1 and no. 2 is also terminated independently. When temperature of either outdoor coil reaches 68 F (20 C) or length of defrost time exceeds 10 minutes, the reversing valve on that circuit shifts back to heating mode of operation and the outdoor fan on that circuit restarts.

NOTE: If a malfunction occurs, causing the HPS, COTP, or LCS to open, the compressor in the affected circuit is locked out by a Cycle-LOC™ circuit. This causes a Signal-LOC™ warning light to come on at the subbase. The remaining refrigeration circuit continues to operate. The RVS remains energized so reversing valve does not shift. Signal-LOC device resets by adjusting thermostat down to open TH1 and TH2, or by momentarily switching thermostat subbase to the OFF position. If compressor oil pressure is lost or if oil pressure fails to build on start-up on either refrigeration circuit, an oil-pressure safety switch shuts off the affected compressor. The switch must be reset manually at the unit.

IMPORTANT: Do not reset more than once! If oil pressure switch trips, determine cause and correct. Do not bypass oil pressure safety switch.

If crankcase heater is defective, the compressor in the affected circuit is locked off. The circuit remains off until the crankcase heater is replaced.