

Weathermaster III Dual-Compressor Heat Pump

(Outdoor Coil Section; Indoor Compressor Section)

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SAFETY CONSIDERATIONS

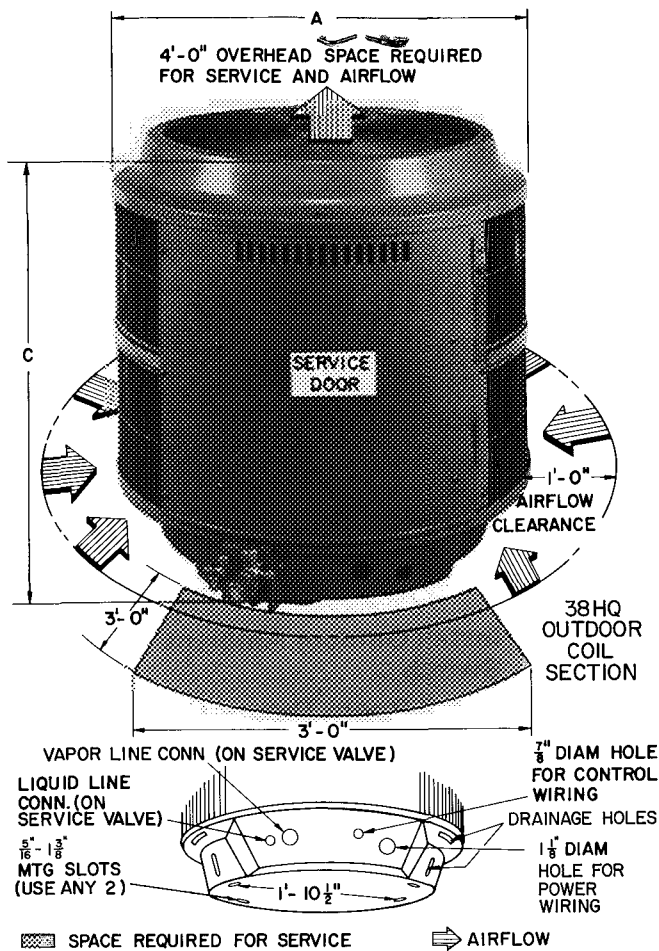
Installation and servicing of air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service air conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit

and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available for all brazing operations.

WARNING: Before performing service or maintenance operations on system, turn off main power switches to indoor unit and outdoor unit. Turn off accessory heater power switch if applicable. Electrical shock could cause personal injury.

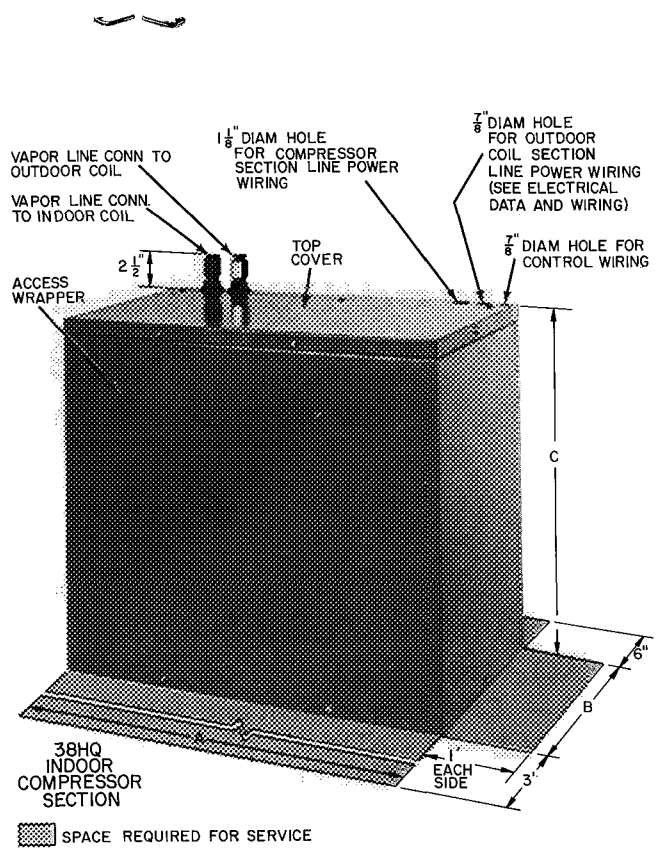


Certified dimension drawings available on request

Fig. 1 — Dimensions and Connections, 38HQ Outdoor Coil Section (Table 2)

Table 1 — Carrier-Approved 38HQ Weathermaster III Dual-Compressor Heat Pump Systems

INDOOR COMPRESSOR SECTION	OUTDOOR COIL SECTION	INDOOR FAN/COIL
38HQ227	38HQ940	40FS160/28VQ036
38HQ234	38HQ960	40FS200/28VQ042



Certified dimension drawings available on request

Fig. 2 — Dimensions and Connections, 38HQ Indoor Compressor Section (Table 2)

Table 2 — Physical Data

INDOOR COMPR SECTION		38HQ227	38HQ234
Operating Wt (lbs)		205	225
Dimensions (ft-in.)			
Width	A	2-2-3/32	
Depth	B	1-4-3/16	
Height	C	1-11-1/8 (add 3/4-in for Refrigerant Fittings)	
Compressor	no. 1	MD2713GM (46)	MD3413GM (46)
(Oil Recharge, oz)	no. 2	MD3413GM (46)	MD3413GM (46)
AccuRater Size (in.)			
Indoor		no 6 (0670)	no 7 (0760)
Outdoor		no 3 (.0550)*	no 5 (0635)
Refrig Conn (in.)		3/4	3/4
OUTDOOR COIL SECTION		38HQ940	38HQ960
Operating Wt (lb)		107	125
Dimensions (ft-in.)			
Diameter	A	2-5-1/4	2-5-1/4
Unit Height	B	2- 8	3- 8
Coil Height	C	1-11	2-11
Refrig Conn			
Vapor (in., ODF)		3/4, Compatible Fitting	
Liquid (in., ODF)		3/8, Flare Fitting	

*Piston size shown is shipped with section. Remove factory-installed piston; replace with size shown per text

Table 3 — Heater Airflow Data

INDOOR COMPRESSOR SECTION	HEATER SIZE	MINIMUM ALLOWABLE	
		Airflow (cfm)	Fan Speed
38HQ227	8 thru 20 kw (40FQ916010 thru 090)	1150	Low
38HQ234	10 thru 25 kw (40FQ920060 thru 150)	1550	Low

Table 4 — Accessories

PART NO.	DESCRIPTION						
38CQ900102	Six 38CQ900081 Low-voltage Honeywell Thermostat (HH07AT071) and Thermostat Subbase (HH93AZ073) with automatic changeover						
38CQ900122	Six 38CQ900111 Low-voltage Honeywell Thermostat (HH07AT071) and Thermostat Subbase (HH93AZ075) with manual changeover						
38CQ900132	Six 38CQ900091 Liquid Line Filter-Drier						
38CQ900152	Six 38CQ900141 Solid State Time Guard (24 v)						
38CQ900172	Six HH22AG110 Optimizer Control						
38HQ900011	Hot Shot Heat Reclaim Device						
38HQ900002	Six 38HQ900001 Outdoor Thermostat						
38RQ900012	Six 38RQ900001 Emergency Heat Relay						
38CQ900072	Six 38CQ900061 two-packs. Flare (3/8-in) to compatible (3/8-in) couplings						
38RQ900072	Six 38RQ900061 Heat Pump Stand for Outdoor Coil Section						
	TUBING						
TUBING PACKAGE	Length (ft)	Liquid		Suction*			COMPR SECTION
		O.D. (in.)	Tube End O.D. (in.)	O.D. (in.)	Tube End O.D. (in.)		
					Evap	Cond	
38GC900071	10	3/8	3/8	3/4	3/4	3/4	38HQ227
38GC900081	18	3/8	3/8	3/4	3/4	3/4	
38GC900091	25	3/8	3/8	3/4	3/4	3/4	
38GC900101	35	3/8	3/8	3/4	3/4	3/4	
38GC900111	50	3/8	3/8	3/4	3/4	3/4	
		1-1/8 in O.D. Suction Tube, Field Supplied					38HQ234

*Suction line is insulated and has a 90° bend at one end

INSTALLATION

Step 1 — Check Equipment and Jobsite

UNPACKAGE UNITS — Move units to final location. Slide units from cartons taking special care not to damage service valves, compatible fittings or grilles. Check unit model numbers. *Use only Carrier-approved unit combinations in system.* See Table 1.

INSPECT EQUIPMENT — File claim with shipping company if shipment is damaged or incomplete. **COMPLETE OR CONSIDER SYSTEM REQUIREMENTS** before installing the 38HQ units.

Consult local building codes and National Electrical Code (NEC) for special installation requirements.

When installing units, allow sufficient space for airflow clearance (outdoor unit), wiring, refrigerant piping and servicing unit. Position outdoor unit so water or ice from roof cannot drop directly on top

of unit. *Maximum allowable vertical distance between indoor and outdoor sections is 50 feet. It is strongly recommended that 38HQ units be used with only Carrier-approved indoor sections (see Table 1).*

Outdoor Coil Section — Make provision for condensate drainage and defrost water disposal whether unit is installed on ground, roof or off-the-wall platform. Outdoor unit must be elevated 12 in. to 18 in. in areas of heavy snowfall. (Ensure unit basepan drainage holes are not blocked. See Fig. 1.) See Step 2, Install Outdoor Coil Section for details. Roof installation method for 38HQ depends on building construction and special requirements of local codes. Make sure roof can support unit weight.

Indoor Compressor Section — Locate unit in basement, garage or utility room. Indoor locations within the living space are not recommended. Basement installations also require careful planning to avoid areas directly under bedrooms, living rooms, etc.

Insert felt isolation pad (factory supplied) between unit and a level rigid mounting base to absorb vibration. Isolate interconnecting tubing from framing and ductwork or where tubing runs thru stud spaces, enclosed ceilings or pipe chases. Use isolation type hanger, Fig. 3, since rigid fastening will transmit pulsation to structure creating objectionable sound.

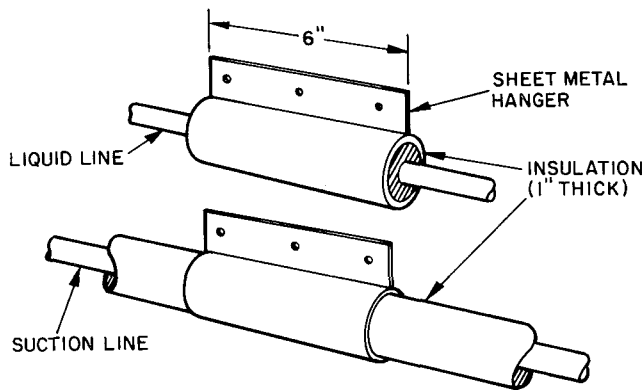


Fig. 3 — Refrigerant Line Hangers

System Refrigerant Control consists of factory-installed bypass-type AccuRater™ devices located as shown in Fig. 15. These metering devices include a replaceable orifice piston that is calibrated to regulate refrigerant flow. Piston data is given in Table 2. In some instances, the factory-installed piston must be replaced by a factory-supplied replacement piston. Where required, substitute pistons as described in Step 5 and as indicated on tags attached to system AccuRater devices.

Step 2 — Install Outdoor Coil Section

ON THE GROUND — Use a solid, level concrete pad as shown in Fig. 4. Position unit so that coil drainage holes in basepan overhang the pad. (See Fig. 1 for drainage hole locations.) Be sure pad does not obstruct drainage holes (water drains from holes during heating and defrost cycles). Attach unit to pad with 1/4-in. mounting bolts. Any 2 holes in unit basepan may be used to fasten unit to pad.

Construct round, 24-in. diameter 6-in. thick pad a minimum of 6 in. above grade to provide clearance under holes for drainage and ice build-up. In areas where prolonged subfreezing temperatures or snows occur: increase clearance by using accessory heat pump stand to support unit 12 to 18 in. off concrete base. See Fig. 4. Be sure stand does not obstruct coil drainage holes. Avoid mounting unit in prevailing winds to minimize effect on defrost performance. Construct wind break if necessary. Extend a 12-in. gravel apron around pad for condensate and defrost water drainage field.

Provide support bracket from structure or other solid support to outdoor unit to give stability. Since it is lightweight, the outdoor section may be

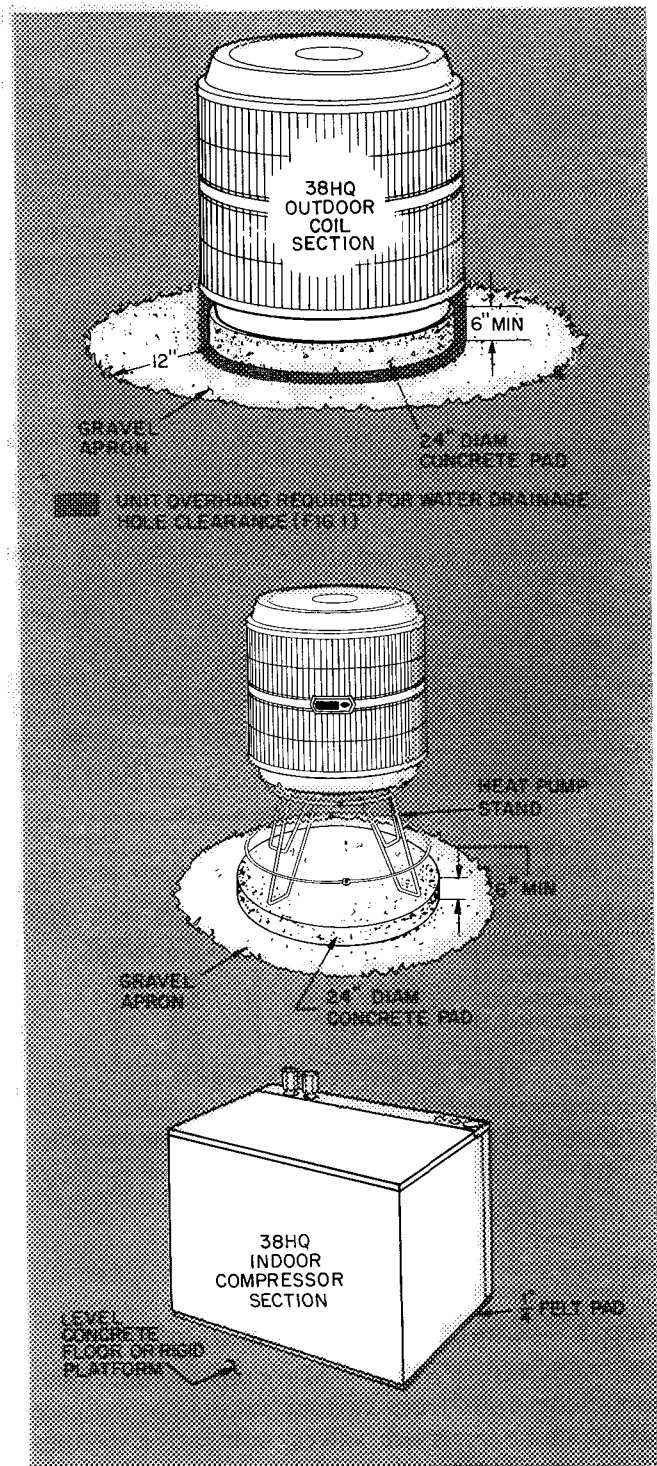


Fig. 4 — Unit Support Details

mounted on a platform attached to or built out from structure. Construct platform using drainage and clearance recommendations above. Locate and construct platform to avoid possible transfer of unit vibration to structure. See Table 2 for unit weight.

ON THE ROOF: Install a level platform or frame to support unit. Elevate unit for proper clearance as previously described for on-the-ground installation. Plan roof design and water drainage to prevent unit from sitting in water. Flash all roof openings to prevent leaks.

Step 3 — Install Indoor Compressor Section on a level, rigid, solid platform or concrete floor. Do not install in a living area.

CAUTION: Compressor section is heavy. Use care when handling.

Insert 1/4-in. asphalt-impregnated felt pad (supplied) between unit basepan and mounting surface to provide full unit support and vibration attenuation. (Do not use vibration isolators under corners of basepan.)

Step 4 — Install Indoor Fan-Coil and Electric Heater as described in Installation Instructions supplied with this equipment. Install and connect thermostats and other controls as described in the steps that follow.

Step 5 — Make Piping Connections — The 38HQ sections may be connected to indoor fan-coil using Carrier accessory tubing packages or field-supplied tubing of refrigerant grade. See Table 2 for unit piping connection types, sizes and line size recommendations and Table 4 for accessory tubing sizes. Maximum allowable system liquid line length is 100 feet. Maximum vapor line length from compressor section to indoor coil is 50 feet. Maximum vapor line length from compressor section to outdoor coil is 50 feet.

When other than 25 ft of interconnecting piping is used, follow special requirements described in Refrigerant Charging. Do not use less than 10 ft of vapor or liquid line.

Do not use damaged or contaminated tubing. Always evacuate or purge indoor coil, compressor section and tubing system. When purging, use field-supplied refrigerant, not unit refrigerant.

When making tubing connections, be sure to provide clearance at unit for electrical connections. Follow tubing isolation recommendations described previously.

REPLACE THE ACCURATER™ REFRIGERANT CONTROL PISTON(S) before connecting refrigerant lines as applicable. Refer to tags attached to AccuRater device. Replacement pistons are shipped with compressor section and are to be installed as directed on tag. Replacement procedure, briefly described below, is detailed on tag. Also, see AccuRater Servicing for additional information.

When connecting indoor compressor section 38HQ227 to outdoor coil section 38HQ940, remove no. 4 piston from outdoor coil AccuRater device; replace with no. 3 piston. Attach AccuRater identification sticker to unit (replacing existing sticker, if any).

CONNECT REFRIGERANT LINES to fittings on indoor and outdoor sections, Fig. 1, 2 and 5. Indoor compressor section has 2 Compatible Fitting vapor line connections. Outdoor and indoor fan-coil sections have Compatible Fitting vapor line connection and liquid line flare connection.

Flare and connect liquid line from outdoor coil section to indoor fan-coil unit. It is not necessary to flare system liquid line if an accessory flare-to-

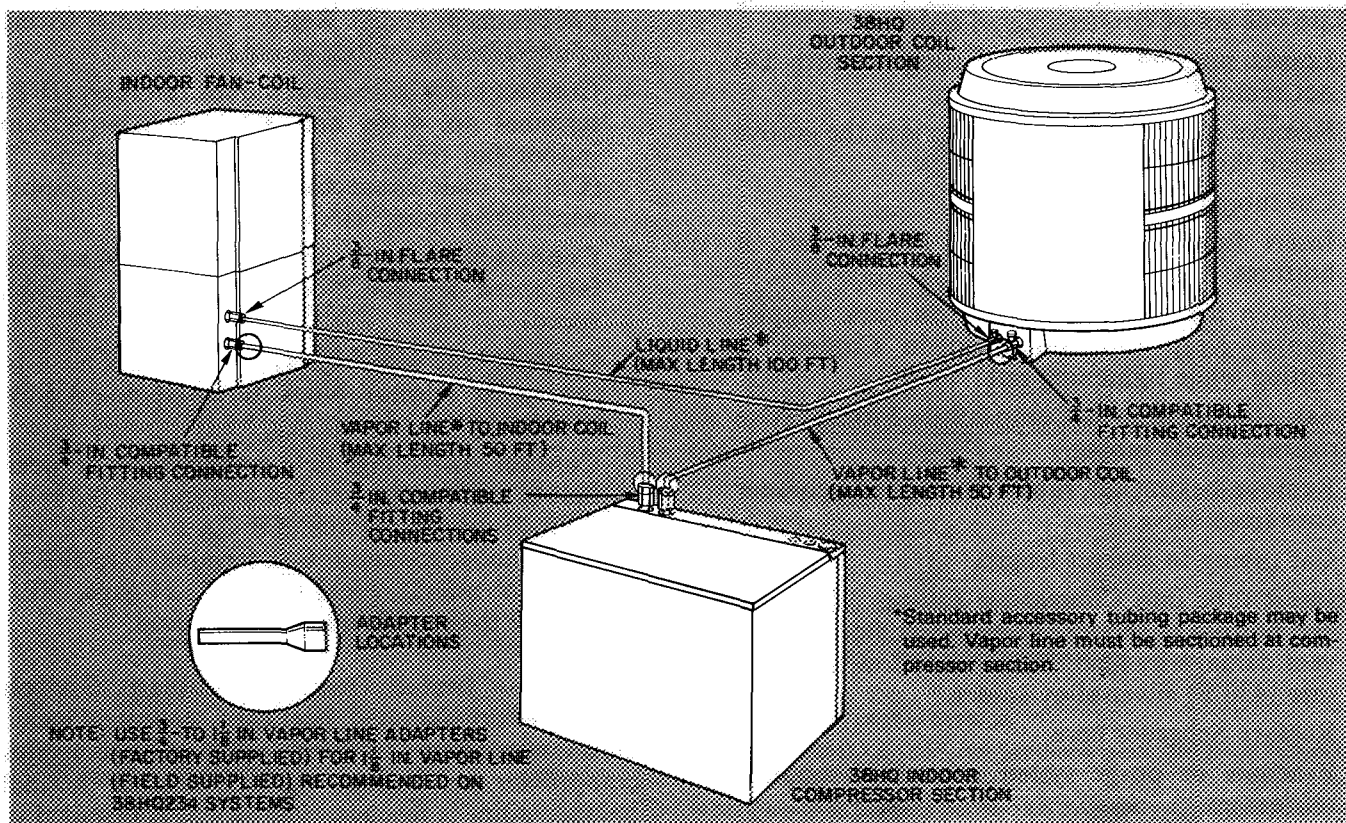


Fig. 5 — Refrigerant Piping Connections

Compatible Fitting coupler is used for liquid line connection. See accessory coupler, Fig. 6.

Connect vapor line from outdoor coil section to indoor compressor section, and from compressor section to indoor fan-coil. Section vapor line as required (Fig. 5). Use correct compressor section vapor line connection to indoor and outdoor coils. Unit Compatible Fittings permit mechanical or sweat connection as described below.

When a 1-1/8 in. field-supplied vapor line is used on 38HQ234, four field-supplied 3/4-in. to 1-1/8 in. vapor line adapters must be provided.

CAUTION: Make solder joints to adapters before making vapor line connections to compressor section compatible fittings. Vertical arrangement of fittings may allow solder or chips to drop into reversing valve, thus causing a malfunction.

Use a back-up wrench when making mechanical connections at compressor section to avoid twisting internal tubing to the reversing valve.

Insulate Refrigerant Lines — After making tubing connections, the compressor section fittings must be insulated. Butt the Armaflex tubing insulation (provided in tubing package) against the Compatible Fittings. Secure the insulation with Prestite or an equivalent material which provides both adhesion and insulation. Also wrap the Compatible Fittings with Prestite to prevent sweating.

Mechanical Connection-to-Compatible Fitting (Mate one set of connections at a time.)

1. Loosen nut on Compatible Fitting one turn. Do not remove.
2. Remove plug and be sure O-ring is in the groove inside the Compatible Fitting.
3. Cut tubing to correct length.
4. Insert tube into Compatible Fitting until it bottoms.
5. Tighten nut until it bottoms on back coupler flange. Keep tube bottomed in Compatible Fitting while tightening nut.

Sweat Connection-to-Compatible Fitting (Use refrigerant grade tubing.)

1. Remove locking nut, rubber O-ring and Schrader core from valve.
2. Cut tubing to correct length.
3. Insert tube into Compatible Fitting. Wrap top and bottom of service valves in wet cloth to prevent damage by heat. Solder with low temperature (430 F) silver alloy solder.
4. Replace Schrader core.
5. Evacuate or purge system with field-supplied refrigerant.

Accessory Flare-to-Compatible Fitting Coupler is shown in Fig. 6. Attach flare nut on coupler to flare

fitting on unit liquid line connection. Connect liquid line to Compatible Fitting using mechanical or sweat connection. When mechanical connection is made, use 2 wrenches to tighten Compatible Fitting nut — one to hold coupler and one to tighten nut.

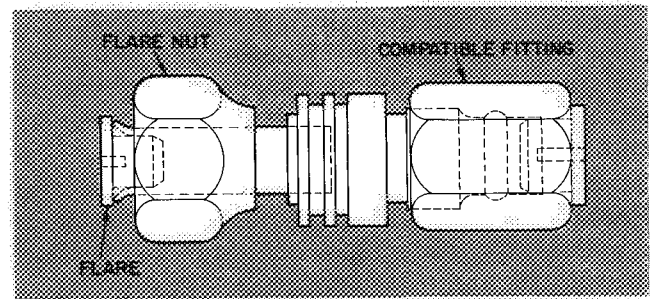


Fig. 6 — Accessory Coupler

Step 6 — Install Fan Control Package (factory supplied; packaged separately inside indoor compressor section) — This control, consisting of a transformer and a relay, provides high-speed fan operation when both compressors are energized. Refer to connection diagram in Fig. 7 for wiring details. Install control as follows:

1. Remove factory-installed transformer from indoor fan-coil unit electric heater package. Refer to 40FS service instructions as required.
2. Install fan control package in upper right-hand corner of the 40FS.
3. Route wires from controls to heater package thru knockouts provided. Restore transformer wiring connections including ground wire.
4. Connect black wire from indoor fan relay (IFR) terminal no. 4 (or no. 6) to black wire from indoor fan relay no. 2 (IFR-2) terminal no. 3. (Cut off male connector from IFR wire; supply wire nut to splice wires.)
5. Connect black wire from IFR-2 terminal no. 6 to fan speed selector block terminal no. 1 (high speed).
6. Connect blue wire from IFR-2 terminal no. 1 to fan speed selector block terminal no. 3 (low speed).
7. Connect low-voltage field control wires between indoor compressor section and indoor fan relay (IFR-2) orange pigtailed (TB OA to OFR-2, terminal no. 4; contactor C-2, terminal C to IFR-2, terminal no. 5). Field-supplied, 24-gauge, NEC Class 2 thermostat wire may be used.

Step 7 — Install Outdoor Ambient Switch (OA) (factory-supplied; packaged separately inside indoor compressor section) — This switch activates compressor no. 2 when the first heating thermal balance point is reached. The switch is installed in the same manner as the outdoor thermostat (step 8), except refer to Fig. 7 for correct wiring.

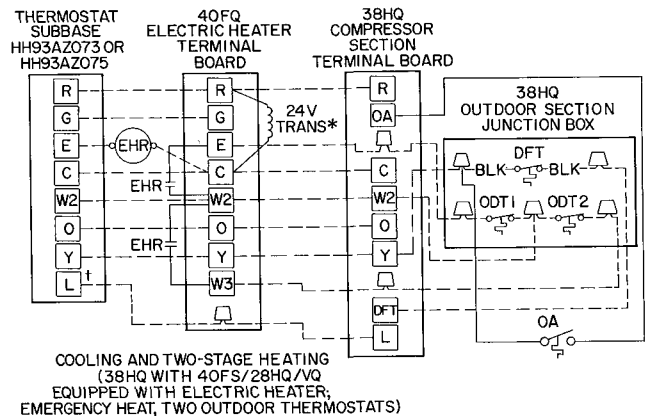
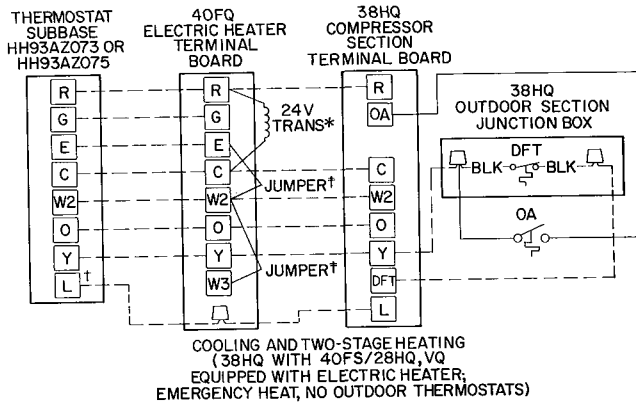
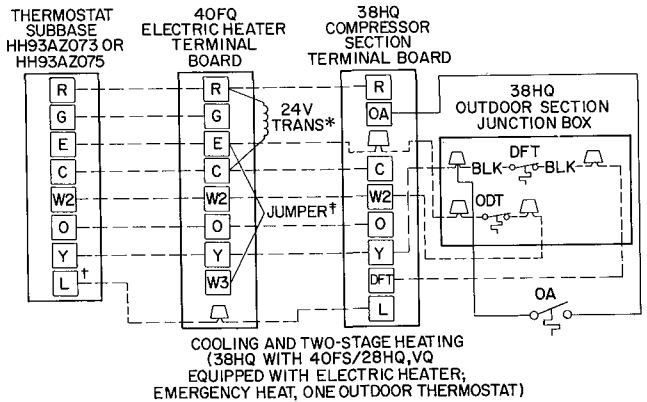
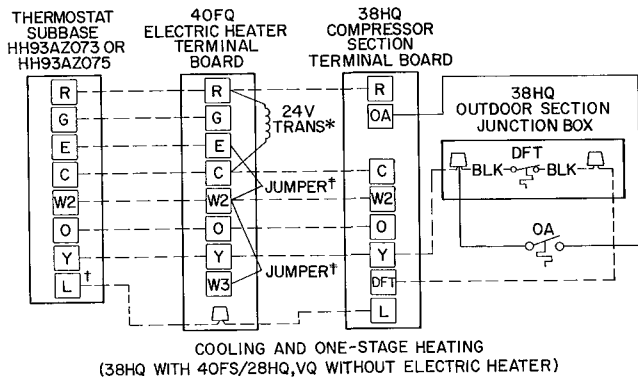
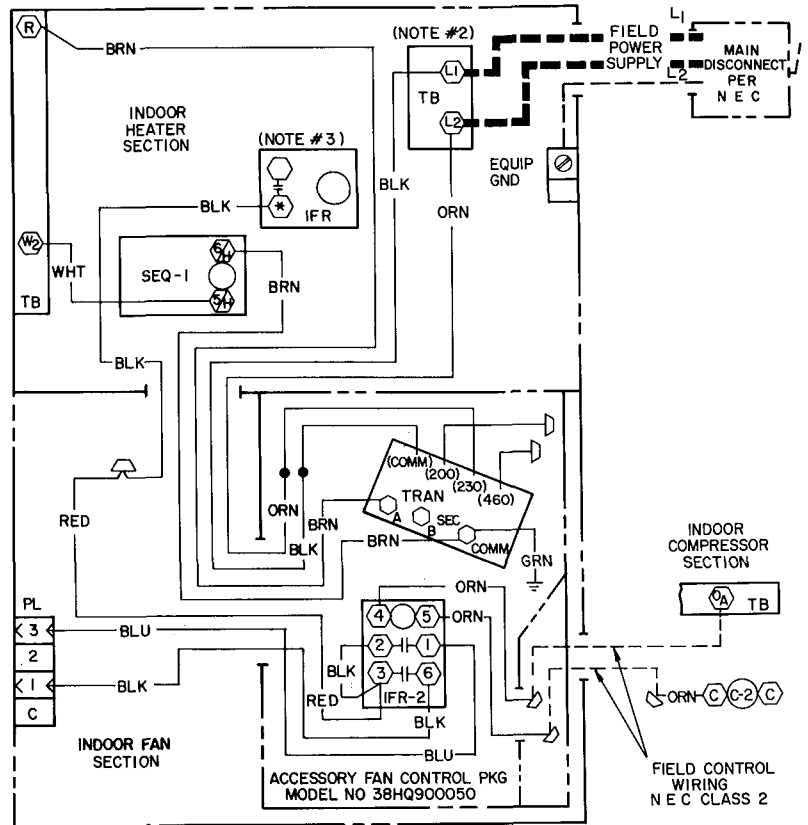
FAN CONTROL PACKAGE

LEGEND

- C-2 — Contactor
- IFR — Indoor Fan Relay
- PL — Plug, Fan
- SEQ — Sequencer
- TB — Terminal Board
- Tran — Transformer
- — Junction
- ⬡ — Component Connection (Marked)
- ⌒ — Field Splice
- — Field Power Wiring
- - - - Field Ground Wiring
- · - · - Field Control Wiring

NOTES:

- 1 Use copper conductors only.
- 2 May be terminal board or fuse block depending on heater model used
- 3 Will be terminal no 4 on 40FQ916 models, and terminal no 6 on 40FQ920 models



- DFT — Defrost Thermostat
- EHR — Emergency Heat Relay
- OA — Outdoor Ambient Switch
- ODT — Outdoor Thermostat
- — Factory Wiring
- - - - Field Wiring

*Transformer (75 va) located in fan control package

†Terminal L is identified as terminal X on some former thermostats (Required for system malfunction warning indicator on compressor section)

‡Remove 1 or both factory-installed jumpers (connection B) when installing outdoor thermostats (ODT) shown in connections C and D

Fig. 7 — Control Circuit Connections

Attach one lead to compressor terminal board connection OA. Connect other lead to line side of defrost thermostat.

Set switch at temperature of first thermal balance point (heating). This balance point is provided by CLIC load estimating program. Further adjustments can be made following operating experience.

Step 8 — Install Room Thermostat, Outdoor Thermostat(s) and Emergency Heat Relay —

Follow Installation Instructions shipped with these accessories plus the instructions in the sections that follow. Connect as described in step 9.

INDOOR THERMOSTAT — Use only Carrier indoor thermostat and subbase as shown in Table 4. Set heat anticipator settings according to Table 5. These settings may be changed slightly to provide a greater degree of comfort for certain installations.

Table 5 — Thermostat Heat Anticipator Settings

INDOOR COMPR SECTION	OUTDOOR COIL SECTION	INDOOR UNIT WITH ELECTRIC HTR	HTR KW	ANTICIPATOR SETTINGS	
				First Stage	Second Stage
38HQ227	38HQ940	40FS160 with 40FQ916010 thru 090	8 thru 20	Fixed	16
38HQ234	38HQ960	40FS200 with 40FQ920060 thru 150	10 thru 25	Fixed	49

OUTDOOR THERMOSTAT ACCESSORY provides adjustable outdoor control of accessory electric heater (used on indoor fan-coil). This thermostat closes on a drop in outdoor temperature. It energizes a stage of electric heat when the outdoor temperature setting is reached, provided the room thermostat is on the second stage of heating. One outdoor thermostat is recommended for each stage of electric heat after the first stage. Connect as described in Step 9. Set the outdoor thermostats progressively lower for each stage. *Refer to heat load of building and unit capacity to determine the correct outdoor thermostat settings.* Locate maximum of 2 outdoor thermostats in control voltage

section of outdoor coil section junction box. Fasten in place with sheet metal screws.

EMERGENCY HEAT RELAY — This accessory is required when 2 or more outdoor thermostats are used. It is automatically energized by the manually-operated emergency heat switch in the indoor thermostat subbase. The indoor thermostat locks out the compressor and the relay bypasses the outdoor thermostats for electric heater operation during heat pump shutdown. When one outdoor thermostat is used, an emergency heat relay is not required. The emergency heat switch in the indoor thermostat subbase bypasses the outdoor thermostat, locks out the compressor and activates the electric heater.

Install emergency heat relay in a convenient location on indoor unit. Attach with sheet metal screw. Connect relay as shown in Fig. 7.

Step 9 — Make Electrical Connections — Install field wiring in accordance with local and national fire, safety and electrical codes. Be sure voltage to units is within $\pm 10\%$ of voltage indicated on nameplate. Contact local power company for correction of improper line voltage.

Do not connect power wiring to service entrance until all connections are made and checked.

Operation of units on improper line voltage constitutes abuse and is not covered by Carrier warranty.

When making electrical connections, provide clearance at unit for refrigerant piping connections. See Table 6 for recommended wire and fuse sizes. Line power connections and control circuit connections are shown in Fig. 7 and 8.

Route line and control power wiring for 38HQ outdoor coil from connections in the 38HQ indoor compressor section. Use 14-ga (minimum) line power wire size to outdoor coil section when total wire length connecting compressor section to coil is under 25 feet. If over 25 ft, use same wire size as compressor section branch circuit.

Table 6 — Electrical Data

INDOOR COMPR SECTION	OUTDOOR COIL SECTION	VOLTAGE				COMPR 1		COMPR 2		OFM (FLA)	BRANCH CIRCUIT							
		Nom 1-Ph 60-Hz	Operating*		LRA	RLA	LRA	RLA	Power Wire				Gnd Wire Size† (AWG)		Min Ckt Amps	Max Fuse Amps**		
			Max	Min					Min Size (AWG)		Max Ft		ICS	OCS				
									ICS		OCS	ICS					OCS	
38HQ227	38HQ940	230	254	207	72	17	88	17 8	1 5	6	14†	55	25†	10	14†	40 8	50	
38HQ234	38HQ960	230	254	207	88	20	94	21 2	2 3	4	14†	75	25†	10	14†	48 8	60	

- FLA — Full Load Amps
- ICS — Indoor Compressor Section
- LRA — Locked Rotor Amps
- OCS — Outdoor Coil Section
- OFM — Outdoor Fan Motor
- RLA — Rated Load Amps

*Permissible limits of the voltage range (for limited period of time) at which the units will operate satisfactorily

†Outdoor coil section wiring — for 25 ft wire run or less, use

minimum 14 AWG size wire. For longer wire run use same size as supply to compressor section

†Required when using nonmetallic conduit

**Maximum dual element fuse size

NOTES:

1 All units have 24-v control circuit which requires external power source

2 Copper wire size table based on 60C. Use copper or copper-clad aluminum wire to indoor section; copper wire only to outdoor section. Use latest National Electrical Code for wire sizing

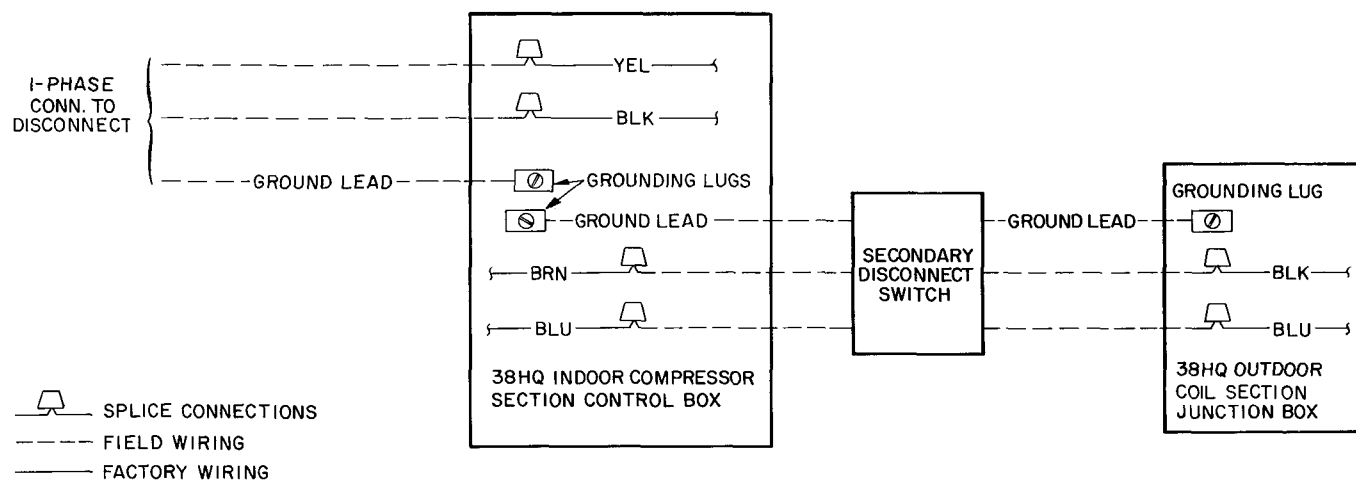


Fig. 8 — Line Power Connections

INSTALL A BRANCH CIRCUIT DISCONNECT PER N.E.C. of adequate size to handle compressor section starting current. Provide a *separate disconnect switch* for outdoor coil section. Provide a separate disconnect for indoor fan-coil and for each accessory electric heater circuit as required. (See Indoor Unit and Electric Heater Installation, Start-Up and Service Instructions.) Locate disconnect(s) within sight of and readily accessible to the units, per section 440-14 of National Electrical Code (NEC).

ROUTE LINE POWER LEADS INTO COMPRESSOR SECTION — Extend lead from disconnect per N.E.C. thru 1-1/8 in. hole provided in compressor section top panel (Fig. 2) and into control box. Extend line power leads for outdoor coil section thru 7/8-in. hole provided in compressor section top panel and into control box.

CONNECT GROUND LEADS AND POWER WIRES — Connect ground leads to the ground lug in control box for safety. Splice compressor section line power leads to yellow and black pigtails, and outdoor coil section power leads to brown and blue pigtails. Use wire nuts and tape at each splice connection as shown in Fig. 8.

CONNECT POWER LEADS FROM INDOOR COMPRESSOR SECTION TO OUTDOOR COIL SECTION thru secondary disconnect switch. From this disconnect switch extend leads thru hole provided in outdoor coil section basepan (Fig. 1) and into line voltage section of junction box, Fig. 14. Splice leads to black and blue pigtails with wire nuts.

CONNECT CONTROL WIRING (24-v) — Extend wiring thru 7/8-in. grommeted hole in compressor section top panel (Fig. 2), and to control wiring terminal board on side of control box. Connect leads to terminal board as shown in Fig. 7. Extend and connect control wiring from compressor section to outdoor coil section as required. Make splice connections in low-voltage section of coil junction box.

Use indoor fan-coil transformer as 24-v supply for system. Be sure fan control package is installed as described in Step 6. Package contains 75-va transformer of adequate capacity to handle system current.

INITIAL START-UP

The compressors in the indoor compressor section are equipped with crankcase heaters. It is recommended that the heaters be energized a minimum of 24 hours before starting the system. To energize crankcase heaters only, set the thermostat at OFF position and turn on main power to compressor section.

To Start System — (Be sure crankcase heaters have been energized for 24 hours.) Adjust the thermostat as follows:

1. Set selector switch at OFF.
2. Turn on main disconnect switch(es) to indoor and outdoor units.
3. Set fan switch as desired (ON or AUTO.).
4. Set thermostat dial at desired temperature.
5. Set selector switch at HEAT or COOL.

Check system refrigerant charge. See Service — Refrigerant Charging.

SEQUENCE OF OPERATION

Fan Switch at AUTO. Position, Thermostat at ON Position (Crankcase heater is on as soon as the field power supply is on.)

THERMOSTAT CALLS FOR COOLING

1. First-stage cooling thermostat (Co) closes and the reversing valve solenoid (RVS) is energized. The RVS actuates the reversing valve and switches the system to cooling.
2. Second-stage cooling thermostat (C1) closes. If the low-pressure switch (LPS) is closed, compressor contactor (C) is energized and compres-

sor no. 1 starts. At the same time, the outdoor fan motor (OFM) starts and the defrost timer (DT) is energized although it is not functional in the cooling mode; the indoor fan relay (IFR) is energized and the indoor fan motor (IFM) starts. Compressor no. 2 does not run in COOL mode.

When the second stage of cooling is satisfied, C1 opens. The compressor stops; the indoor and outdoor fans stop; DT is de-energized. When the controlled temperature drops approximately 1 F below the cooling set point, Co opens. RVS is de-energized and the reversing valve switches to heating (normal position). The unit is shut down except for the two compressor crankcase heaters, which remain on as long as the field power supply is on.

THERMOSTAT CALLS FOR HEATING (The reversing valve is de-energized, in heating position.)

1. First stage heating thermostat (H1) closes. Compressor contactor no. 1 (C1) is energized and compressor starts; outdoor fan motor (OFM) starts; defrost timer (DT) is energized. Indoor fan relay (IFR) is energized and indoor fan motor (IFM) starts. When the outdoor ambient switch (OA) closes (at first thermal balance point), compressor contactor no. 2 (C2) is energized and compressor no. 2 starts. Compressor no. 1 and compressor no. 2 operate simultaneously as long as OA is closed. The crankcase heaters are de-energized when both compressors are running.
2. Second-stage heating thermostat (H2) closes and activates the first accessory heater element sequencer thru indoor thermostat terminal W2. The first-stage electric heater element is energized immediately and the other heater elements are energized at regular intervals thru the sequencers.

Separate outdoor thermostats may be used to energize the second sequencer and bring on additional heater elements if more incremental heat control is desired.

When the second stage of heating is satisfied, H2 opens and the electric heater(s) shuts off. When the first stage of heating is satisfied, H1 opens and the unit shuts down, except for the compressor crankcase heater, which remains on as long as the field power supply is on.

Unit Controls and Safety Devices

HIGH-PRESSURE RELIEF VALVE is located in compressor. Relief valve opens at a pressure differential of approximately 500 psi between suction (low side) and discharge (high side) to allow pressure equalization.

INTERNAL CURRENT AND TEMPERATURE SENSITIVE OVERLOAD resets automatically when internal compressor motor temperature drops to a safe level (overloads may require up to 45 minutes to reset). When an internal overload is suspected of being open, check by using an ohmmeter or con-

tinuity tester. If necessary, refer to Carrier Standard Service Techniques Manual, Chapter 2, Electrical, for complete instructions.

LOW-PRESSURE SWITCH is located in compressor section on suction line between reversing valve and accumulator. Provides loss-of-charge protection by shutting compressor off if suction pressure drops below setting. Low-pressure switch settings are: open, 5 ± 3 psig; close, 20 ± 5 psig.

CRANKCASE HEATERS are activated by a relay. Heaters derive power from contactor no. 2 and are energized when compressors are off or when only one compressor is functioning.

The heater keeps the crankcase warm during the off cycle and thus prevents dilution of the oil with the refrigerant, assures good lubrication, and prevents loss of oil from crankcase during start-up.

If the electrical disconnect switch to the compressor section has been off for an extended period of time, the crankcase heater should be energized for 24 hours before starting the compressor.

SIGNAL-LOC™ SYSTEM MALFUNCTION WARNING INDICATOR AND LOCKOUT — Indoor compressor section is equipped with a solid-state warning logic circuit that protects the system. In case of a malfunction (compressors do not operate due to safety device cutout), emergency heat light on thermostat comes on and compressors are prevented from restarting. Compressors can be restarted after resetting thermostat (turn thermostat off then on). If either compressor malfunctions, both will be locked out (prevented from restarting).

The emergency heat light goes out when compressors are restarted or when indoor thermostat is satisfied. If the light does not stay out after two or three attempts to restart, check for cause of malfunction.

DEFROST CONTROL, consisting of a defrost timer, defrost thermostat and defrost relay, interrupts normal system heating operation every 90 minutes to defrost outdoor coil, *if the coil saturated suction temperature indicates freezing temperatures*. Defrost control simultaneously stops outdoor fan, energizes reversing valve solenoid to return system to cooling cycle (outdoor coil as condenser, indoor fan-coil unit as evaporator), and activates accessory electric heater.

For the heat pump to defrost, 2 conditions are necessary:

1. Defrost timer contacts must be closed.
2. Refrigerant temperature from outdoor unit must be cold enough to cause defrost thermostat contacts to close. Contacts close at $27 (\pm 4)$ F.

Every 90 minutes of elapsed running time, the defrost timer contacts close for 10 seconds. If the defrost thermostat contacts are closed, the unit defrosts. The defrost timer limits defrosting period to 10 minutes. Normally the frost is removed and the

defrost thermostat contacts will open to terminate defrosting before 10 minutes have elapsed. The defrost thermostat contacts open at 80 (\pm 6) F liquid refrigerant temperature. When defrosting is terminated, the outdoor fan motor is energized and the reversing valve solenoid is de-energized returning unit to heating cycle.

If the defrost thermostat contacts are open, (no need for defrost cycle), system operates for another 90-minute interval before attempting another defrost cycle.

SERVICE

Heat Pump Circuits shown in Fig. 9 are refrigerant flow diagrams for heating and cooling cycles.

Refrigerant Charging — Each indoor compressor section is shipped with a vapor holding charge; outdoor coil section contains partial system charge as shown in Table 7. Add refrigerant to system so that total required charge is attained as described below. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants for additional information.

Adjust system charge for refrigerant line lengths and diameters that differ from 25 ft and 3/8-in. O.D. (liquid line), respectively, using refrigerant weights

Table 7 — Service Data

SYSTEM	38HQ227	38HQ234
Indoor Compr Section		
Outdoor Coil Section	38HQ940	38HQ960
Fan	Propeller, Direct Drive	
Cfm	3100	3600
Rpm	1015	1080
Diam (in.)	20	20
Motor Hp	1/5	1/4
Factory Charge (lbs, R-22)	7.1	10.0
Total Req'd Charge (lbs, R-22)	9.2	11.0
Additional Charge Req'd (lbs)	2.1	1.0

shown in table below. (Twenty-five feet of 3/8-in. O.D. tubing contains 14.4 oz of R-22.) Add R-22 charge to system if liquid line is over 25 ft; remove charge if liquid line is shorter than 25 feet.

LIQUID LINE DIAM (in.)	OUNCES OF R-22/FT LENGTH OF LIQUID LINE
3/8	58
5/16	36
1/4	21

When recharging is necessary during heating or cooling season, weigh in total charge indicated in Table 7. (Charge must be weighed in during heating season.) Remove any refrigerant remaining in system before recharging. If system has lost complete

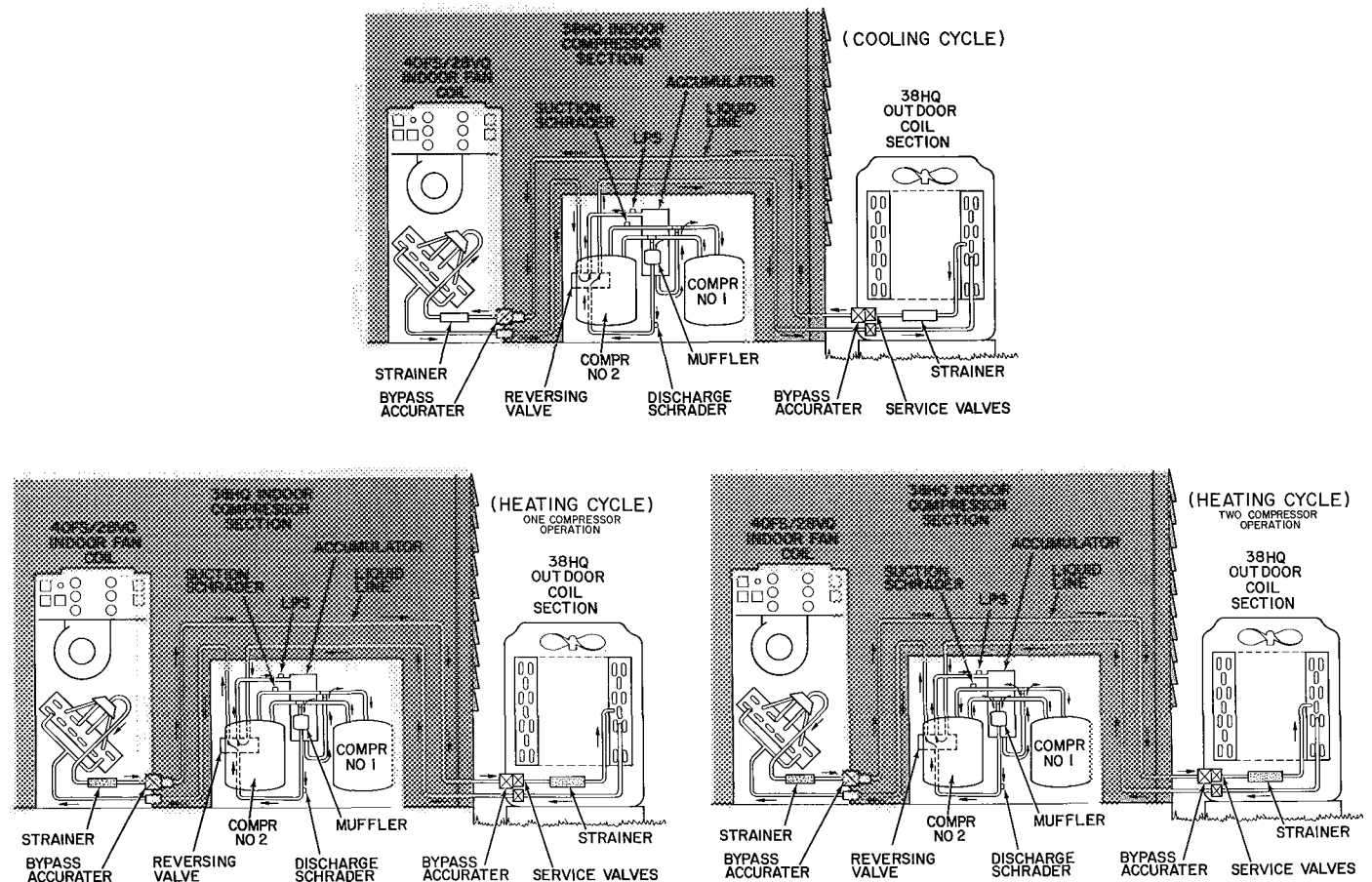


Fig. 9 — Refrigerant Flow Diagrams

charge, evacuate system to 500 microns (29.7 in. vacuum) before recharging. Service port connections are provided on indoor compressor unit suction and discharge lines for evacuation and charging. (See Fig. 14 for service port location.) Dial-a-charge charging cylinder is an accurate device used to recharge systems by weight. The cylinders are available at refrigeration supply firms.

TO CHECK AND/OR ADJUST CHARGE DURING COOLING SEASON — Use correct Cooling Cycle Charging Chart (Fig. 10 and 11) and follow charging chart usage method below.

TO CHECK SYSTEM OPERATION DURING HEATING CYCLE — Use correct Heating Cycle Operation Check Chart (Fig. 12 and 13). These charts indicate whether a correct relationship exists between system operating pressures and air temperatures entering indoor and outdoor units. If pressure and temperature lines do not intersect on chart, the system refrigerant charge may not be correct or other system abnormalities may exist. Do not use Operation Check Charts to adjust refrigerant charge. Weigh charge into system.

USING COOLING CYCLE CHARGING CHARTS

1. Operate unit a minimum of 10 minutes before checking charge, and after each charge adjustment.

2. Measure suction pressure by attaching a gage to indoor unit suction service port. (See Fig. 14 for correct service port location.)
3. Measure outdoor air dry-bulb temperature entering outdoor coil. Use a service thermometer.
4. Using a sling psychrometer, measure wet-bulb temperature of air entering indoor fan-coil unit.
5. Refer to correct Charging Chart. Locate on curves where outdoor air dry-bulb and indoor air wet-bulb temperature lines intersect.
6. From intersect point, project vertically downward to chart suction pressure line. Compare chart suction pressure to unit suction pressure (Step 2).
7. If unit suction pressure is lower than chart pressure, add refrigerant to system until chart pressure is reached. If unit suction pressure is higher than chart pressure, remove refrigerant until chart pressure is reached.

Temporary Capacitance Boost — If necessary, see Carrier Standard Service Techniques Manual, Chapter 2, Electrical, for details.

WARNING: Capacitance boost is to be performed by trained personnel only. Improper procedure could cause personal injury.

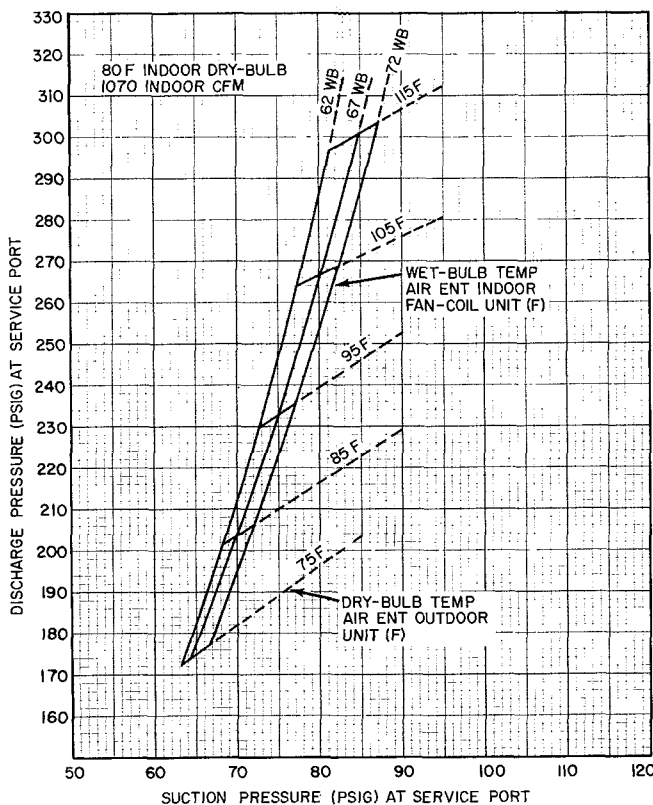


Fig. 10 — 38HQ227/38HQ940 with 28VQ036/40FS160 Cooling Cycle Charging Chart

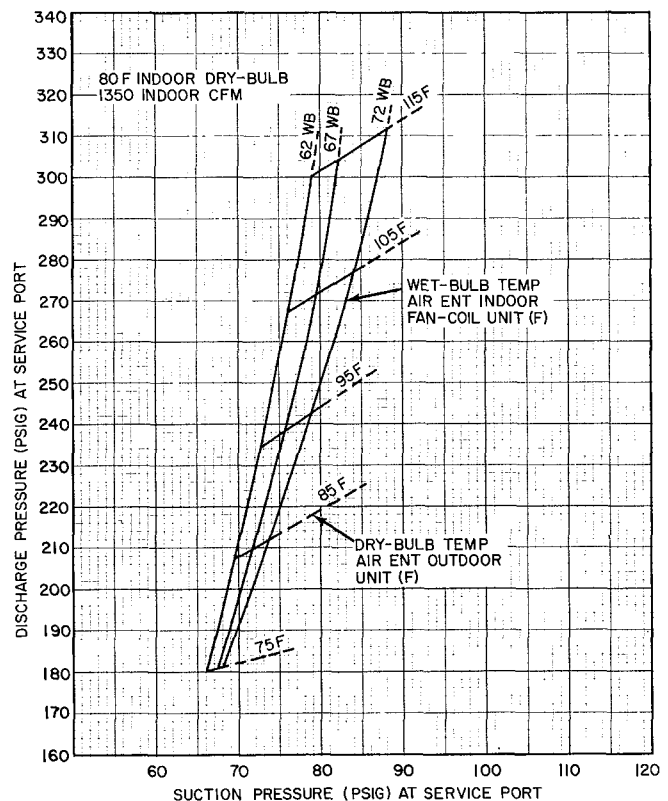


Fig. 11 — 38HQ234/38HQ960 with 28VQ042/40FS200 Cooling Cycle Charging Chart

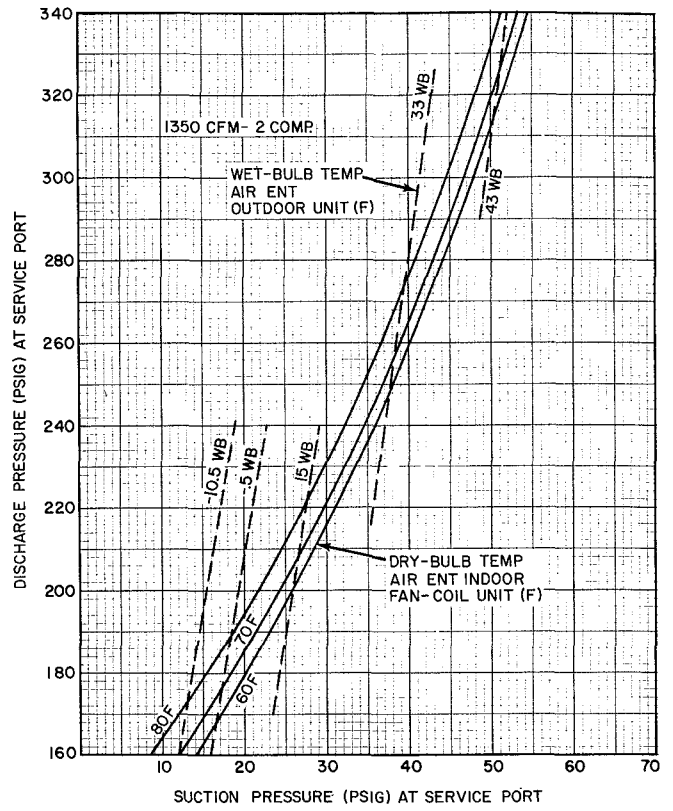
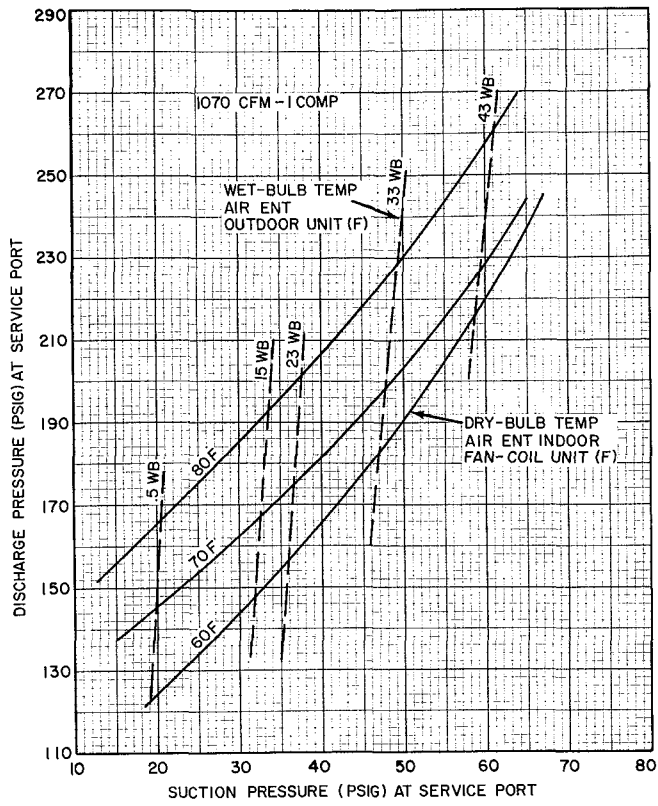


Fig. 12 — 38HQ227/38HQ940 with 28VQ36/40FS160 Heating Cycle Operation Check Charts

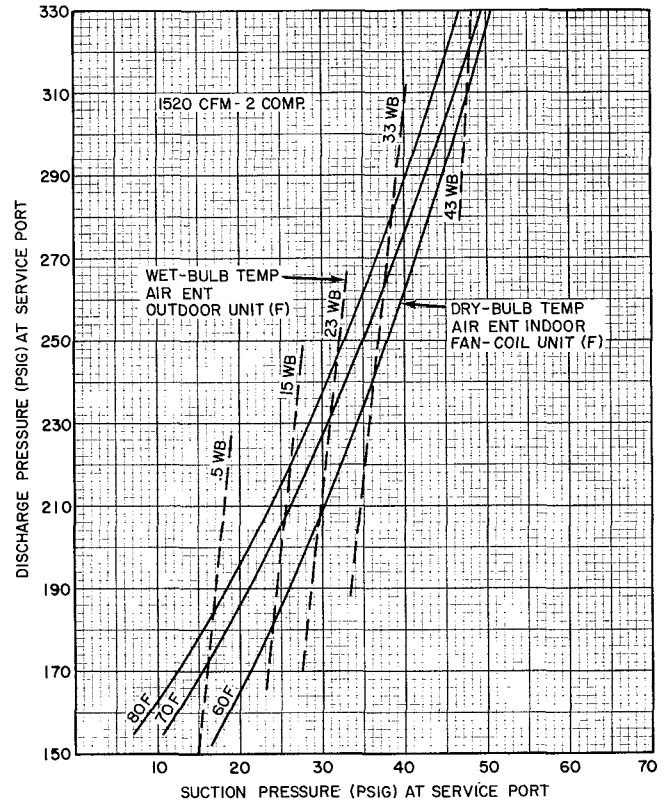
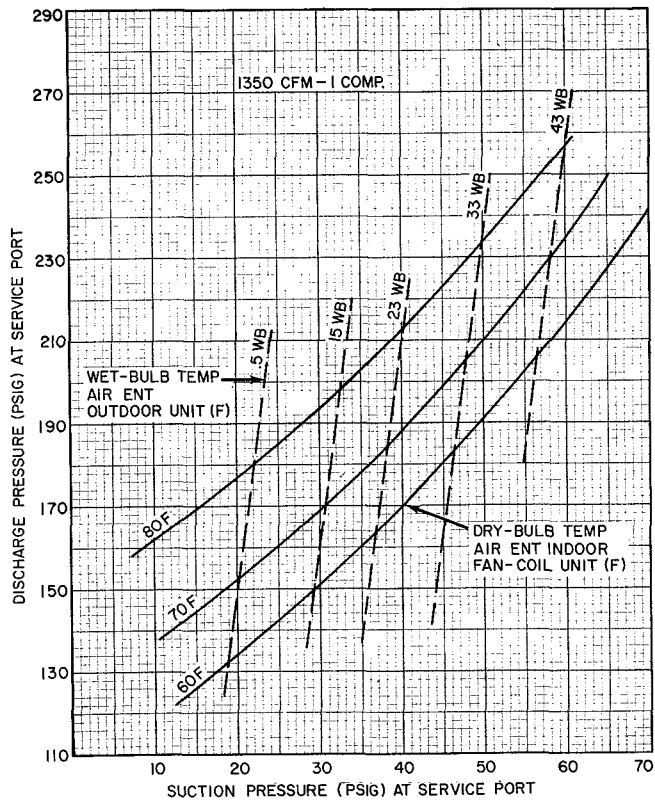


Fig. 13 — 38HQ234/38HQ960 with 28VQ042/40FS200 Heating Cycle Operation Check Charts

Compressor Removal — See Table 2 for compressor information; Fig. 14 for component location. *Shut off power to unit.* Remove refrigerant from system using refrigerant removal methods described in Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants.

Follow safety codes, and wear safety glasses and work gloves. Have quenching cloth available.

If either compressor fails due to motor burnout, it is necessary to replace both compressors. Since both compressors use common oil, one compressor burnout contaminates both compressors.

1. Remove unit top cover and front access wrapper.
2. Remove compressor terminal box cover, disconnect and remove compressor power leads.
3. Using a tubing cutter, cut suction and discharge lines at convenient place near compressor for easy reassembly to new compressor with copper slip couplings.
4. Disconnect equalizer tube from compressor shell.
5. Remove crankcase heater from compressor base.
6. Remove compressor hold-down bolts. Lift out compressor.
7. Carefully unbraid suction and discharge line piping stubs from compressor. If oil vapor in piping stubs ignites, use quenching cloth.

CAUTION: Muffler may contain quantity of oil

8. Braze piping stubs (removed in step 7) onto new compressor.
9. Clean system. Add new liquid line heat pump filter-drier as described below.
10. Install new compressor in unit. Braze suction and discharge lines to compressor piping stubs (at points where cut, step 3) using field-supplied copper couplings. Reconnect equalizer tube. Teflon O-ring in fitting is reusable. Torque fitting to 30-40 ft-lb. Ensure compressor hold-down bolts are in place. Connect wiring.
11. Evacuate and recharge system.

Lubrication — Compressor contains factory oil charge. Replace oil when lost. See Table 2 for oil recharge. If necessary, refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants, pages 1-21, for oil recharging procedure. Use Carrier PP33-1, Texaco Capella B or Suniso 3G oil.

Filter-Drier — Install *accessory* heat pump filter-drier (Table 4) in system liquid line when refrigerant system is opened for service as described under Compressor Removal. Position drier in liquid line at convenient location.

Pumpdown Procedure (Cooling Cycle) — The 38HQ units may be pumped down in order to make repairs on low side of system without losing complete refrigerant charge.

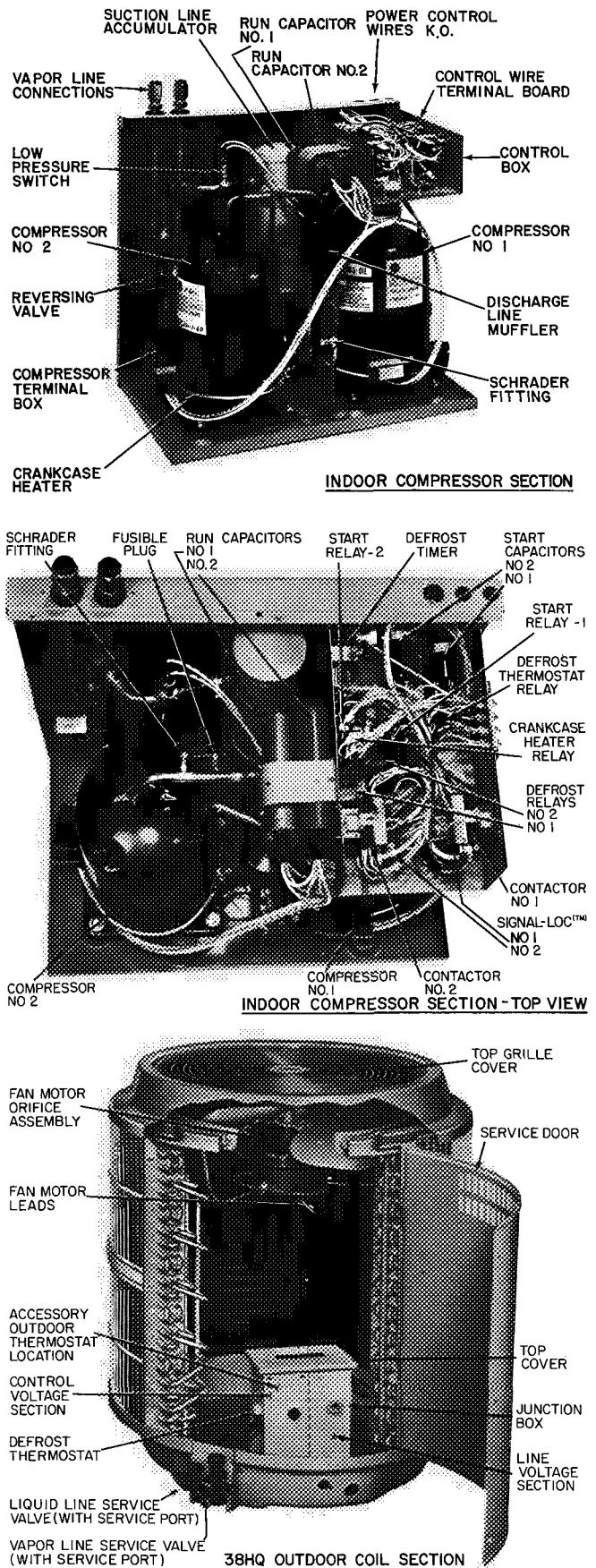


Fig. 14 — Component Location

1. Attach pressure gage to suction service port.
2. Frontseat the liquid line valve on the outdoor coil section.
3. Start system and run until suction pressure reaches 5 psig (see Caution) or low-pressure switch opens.
4. Shut off system. Frontseat vapor line valve on outdoor coil section.
5. Vent remaining pressure.

CAUTION: Outdoor coil section can hold only total refrigerant charge shown in Table 7. Additional refrigerant may cause units to relieve pressure thru internal pressure relief valve (indicated by a sudden rise of suction pressure) before suction pressure reaches 5 psig or low-pressure switch opens. If this occurs, shut off unit immediately, frontseat vapor valve and vent remaining pressure.

AccuRater™ (Bypass Type) Servicing — See Fig. 15 for bypass-type AccuRater components. The piston has a refrigerant metering orifice thru it. The retainer forms a stop for the piston in the refrigerant bypass mode, and a sealing surface for liquid line flare connection. To check, clean or replace piston:

1. Shut off power to unit.
2. Pump unit down using Pumpdown Procedure described previously.
3. Remove liquid line flare connection from AccuRater.
4. Pull retainer out of body being careful not to scratch flare sealing surface. If retainer does not pull out easily, carefully use locking pliers to remove retainer.
5. Slide piston out by inserting a small, soft wire thru metering orifice (18-gage thermostat wire). See that metering orifice, sealing surface around piston cones and fluted portion of piston are not damaged.
6. Clean piston refrigerant metering orifice.

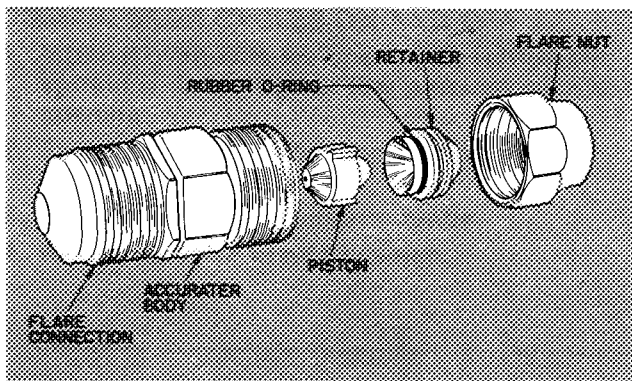


Fig. 15 — AccuRater™ (Bypass Type) Components

7. Replace retainer O-ring before reassembling bypass-type AccuRater. Carrier O-ring part no. is 99CC501052.

Liquid Line Strainer (protects AccuRater) made of wire mesh is located in the liquid line inside indoor fan-coil unit behind liquid line service valve (Fig. 9). Liquid line is belled and sweat connected where strainer is located. If strainer is plugged, unsweat belled liquid line connection and replace strainer.

Compatible Fitting Repair

LEAKING MECHANICAL CONNECTION — Frontseat outdoor section service valves and relieve refrigerant pressure in tubing and compressor section. Back off locknut from Carrier Compatible Fitting onto tube. Cut fitting between threads and seal ring bead as shown in Fig. 17. Remove tubing section remaining in threaded portion of fitting. Discard locknut.

Clean, flux and insert new tube end into remaining portion of Carrier Compatible Fitting. *Wrap valve base (outdoor unit) in wet cloth.* Heat and apply low-temperature solder (430 F).

LEAKING SWEAT CONNECTION — Frontseat service valves and relieve refrigerant pressure in tubing. Clean and flux area around leak and apply low-temperature solder (430 F).

Evacuate or purge indoor fan-coil, compressor section and tubing system. Add refrigerant charge as described in Service, Refrigerant Charging.

LEAKING FLARE CONNECTION — Cut and reflare 3/8-in. system liquid line.

MAINTENANCE

CAUTION: Before performing recommended maintenance be sure main power switch to unit is turned off.

OUTDOOR FAN MOTOR BEARINGS are pre-lubricated for 3 years heavy duty or 5 years normal duty. When lubrication is necessary, it should be lubricated in a motor repair shop.

Outdoor Coil Cleaning — *Ensure power to unit is shut off.* Clean the outdoor unit coil with water at the beginning of every cooling season or more often if required. Use ordinary garden hose at a pressure high enough to clean efficiently. For best results, unscrew and remove unit top cover (grille).

Insert hose nozzle between fan blades and spray coil fins from inside-to-outside the unit. If unit has a double-row coil, loosen screws to separate coils, carefully pull outer row of coils away slightly from inner row. Do not strain coil tubing connections. Flush dirt toward outside of both coils. Flush dirt from basepan by spraying water thru top of unit. Avoid splashing mud on coil or water on fan motor. Make sure that water drainage holes under outdoor coil are not obstructed.

Outdoor Fan Adjustment — Required fan position is shown in Fig. 16. Adjust fan by loosening setscrews and moving fan blades up or down.

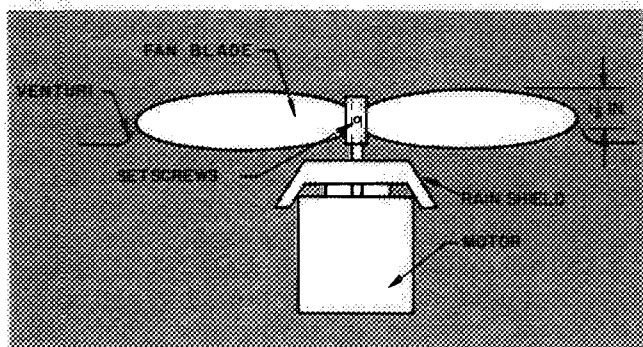


Fig. 16 — Condenser Fan Position

FAN MOTOR REMOVAL

1. Shut off power to outdoor coil.
2. Remove top cover (grille). Open or remove service door. Remove junction box cover.
3. Disconnect fan motor leads in line-voltage section of junction box. See Fig. 14.

4. Remove fan from motor shaft by loosening setscrews and pulling upward on fan hub.
5. Remove bolt holding fan motor to motor mounting bracket. Remove motor with wiring thru top of unit.

To replace motor: place motor on motor mounting bracket and retighten bolt.

Before replacing metal fan, be sure rain shield (Fig. 16) is in place on motor shaft.

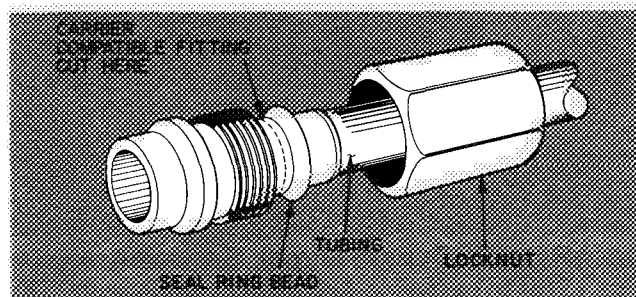


Fig. 17 — Carrier Compatible Fitting

TROUBLESHOOTING GUIDE — COOLING

SYMPTOM AND PROBABLE CAUSE	PROBABLE REMEDY
<p>COMPRESSOR WILL NOT RUN OR SHUTS OFF — WILL NOT RESTART</p> <p>Contactor open</p> <ol style="list-style-type: none"> 1. Burned out transformer, open thermostat circuit, open overload. 2. Power supply interrupted. 3. Power circuit is open due to loose electrical connection, open compressor safety device. Contactor or coil defective. 4. Signal-Loc™ malfunction. 	<ol style="list-style-type: none"> 1. Check control circuit component and wiring. Refer to unit label diagram, check all safety devices. Refer to Standard Service Techniques Manual, Chapter 2, Electrical. 2. Check for blown fuses or tripped circuit breakers. 3. Check power wire connection for tightness. Check compressor internal thermostat, overloads (see label diagram). Check contactor, replace if defective. 4. Check wire connections. Check continuity thru terminals 2 and 3. Check to see if power wire has been routed thru current loop.
<p>Contactor Closed, or Closes then Opens</p> <ol style="list-style-type: none"> 1. Compressor power is out, compressor motor is burned out or internal overloads are open. Timer circuit (clock or switch) is faulty. 2. Compressor stuck. 3. Control circuit open due to faulty low-voltage transformer or defective control circuit compartment. 	<ol style="list-style-type: none"> 1. Check main power supply and wiring. Refer to Electrical Data table and label diagram. Check defrost timer circuit relay. Check defrost control contacts. Replace defective controls. 2. Check start capacitor. Check compressor motor windings. 3. Review label diagrams. Check control power wires, connections. Check control transformer power output (24 v). Check remote control center contacts and temperature settings.
<p>COMPRESSOR RUNS BUT COOLING IS INSUFFICIENT</p> <ol style="list-style-type: none"> 1. Low suction pressure or incorrect superheat. 2. Restricted airflow due to dirty filters, duct obstruction or indoor coil icing. Refrigerant system obstructed. Filter-drier obstructed or refrigerant flow is insufficient. 3. High suction pressure/low head pressure due to open internal pressure relief, defective compressor valves or faulty reversing valve. 4. High suction pressure/low superheat (compressor may be flooding). 	<ol style="list-style-type: none"> 1. Check Refrigerant Charging procedure, charging charts. Check AccuRater™ for proper piston. 2. Check indoor air system for obstructions — dirty filters, ductwork debris, improper fan speed. Expansion valve or AccuRater improperly sized. 3. Check Carrier Compressor Service Manual for compressor repair procedures. See Compressor Removal. Check reversing valve solenoid operation and valve seats. 4. Check refrigerant flow device. Check that maximum elevation between indoor and outdoor units is not too great. Check refrigerant charge.
<p>COMPRESSOR CYCLES ON AND OFF</p> <ol style="list-style-type: none"> 1. Internal overloads are opening or refrigerant system is dirty. High or low pressure switch is opening. 2. Faulty timer or defrost control operation. Run capacitor faulty. 3. Fan motors operate intermittently. 4. Reversing valve in mid-position. 	<ol style="list-style-type: none"> 1. Check refrigerant system for noncondensables, or improper charge. See Refrigerant Charging. Check for airflow obstructions. See Coil Cleaning. 2. Check timer or defrost control relays and contacts. Replace fan capacitor. 3. Check motor leads and overloads. 4. Check reversing valve solenoid. See label diagram. Check that dirt in refrigerant system does not cause valve to "hang up."

TROUBLESHOOTING GUIDE — HEATING

SYMPTOM AND PROBABLE CAUSE	PROBABLE REMEDY
<p>NO HEATING (Compressor Will Not Run)</p> <ol style="list-style-type: none"> 1. Main power circuit open due to faulty power supply. 2. Control power circuit open or faulty. 3. Defrost control malfunctioning. 4. Signal-Loc™ malfunction. 	<ol style="list-style-type: none"> 1. Check power supply, main power wire connections, fuses. See Electrical Data. 2. Check low voltage transformer, remote control center, control relay and contacts, timer relay and motor, compressor overloads and pressurestats for faulty operation. Review component headings in Service section. Check unit label diagram(s). 3. Check Defrost control procedure to be sure defrost thermostat and relay are operational. 4. Check wire connections. Check continuity thru terminals 2 and 3. Check to see if power wire has been routed thru current loop.
<p>INSUFFICIENT HEATING (Compressor Runs or Cycles)</p> <ol style="list-style-type: none"> 1. Low suction and low head pressure due to coil obstruction in airflow or refrigerant circuit. 2. High suction, low superheat. 3. Frozen outdoor coil. 4. Accessory electric resistance heaters not operating. 5. High suction, low head pressures (caused by refrigerant system or indoor fan problem). 6. Low suction, high head pressures (may be accompanied by low airflow at air outlets). 7. Compressor no. 2 fails to start due to failure of outdoor thermostat. 	<ol style="list-style-type: none"> 1. Check coil for obstruction (dirt, debris). Check that outdoor air fan is correctly positioned and turns freely. Review fan clearance requirements and coil cleaning procedure. Check liquid line drier, AccuRater. 2. Check refrigerant flow device. Check refrigerant charge. 3. Check fan operation, coil cleanliness. Check defrost control circuit. Check refrigerant charge (use Charging Charts and/or Operational Check Charts). 4. Check heater power supply, outdoor thermostats and their settings. Check that heater elements are not broken. 5. Reversing valve may be leaking or "hung-up". Check valve and its solenoid for correct operation. Replace if suspect. Indoor fan motor capacitor may be defective. Replace capacitor. Fan may be cycling on overloads. Check overloads, loose terminal connections. Fan motor may be burned out. Check and replace or lubricate. See Fan Adjustment. Replace or repair motor or fan as necessary. 6. Check for restricted refrigerant system component. Check Heating Operational Check charts to detect even charge. Check system for non-condensables. Refer to Standard Service Techniques Manual, Chapter 1, Refrigerants. 7. Check outdoor ambient switch. Switch should be closed when ambient is below switch set point.

For replacement items use Carrier Specified Parts.

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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