Carrier
HEATING & COOLING

38AQ024,028,034
Heat Pump — Outdoor Units

Installation, Start-Up and Service Instructions

SAFETY CONSIDERATIONS

Installing, starting-up and servicing this equipment can be hazardous due to system pressures, electrical components and location of equipment (roofs, elevated structures, etc.).

Only trained, qualified installers and service mechanics should install, start-up and service this equipment.

Untrained personnel can perform basic maintenance functions, such as cleaning coils, filters and replacing filters. All other operations should be performed by trained service personnel.

When working on equipment, observe precautions in the literature and on tags, stickers and labels attached to the equipment.

- Follow all safety codes
- Wear safety glasses and work gloves Keep quenching cloth and fire extinguisher nearby.
- Use care in handling, rigging and setting bulky equipment.

⚠ WARNING

To avoid electric shock and personal injury, be sure power to equipment is shut off before performing maintenance or service.

INSTALLATION

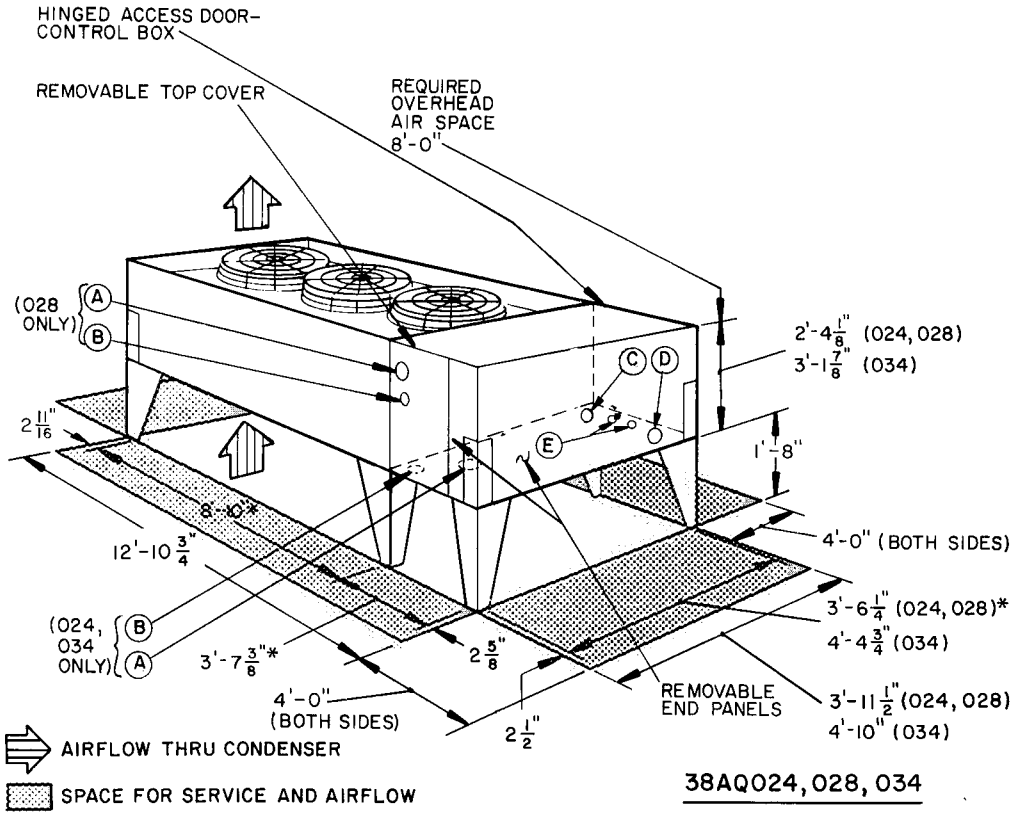
IMPORTANT: Follow unit location, clearances and piping requirements in this booklet carefully to enhance system efficiency, and to avoid system failure Read entire booklet before starting installation.

Step 1 — Complete Pre-Installation Checks

INSPECT SHIPMENT — Immediately file claim with shipping company if shipment is damaged or incomplete.

CONSIDER SYSTEM REQUIREMENTS

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



*Measurements between mounting holes

Certified dimension drawings available upon request

LEGEND
(38AQ024,028,034)

- **A** — 2½-in. Diam K O for Suction Line
- **B** — 1¾-in. Diam K.O. for Liquid Line (024,034) 1½-in. Diam K.O. for Liquid Line (028)
- **C** — ⅞-in. Diam K O. for Control Power
- **D** — 3⅝-in Diam K O for Unit Power
- **E** — Two ⅞-in Diam K O. for Defrost Interlock Wiring

Fig. 1 — Dimensions

Book 1 | Tab 5a | PC 111 | Catalog No 533-846 | Printed in U S A | Form 38AQ-9SI | Pg 1 | 1-89 | Replaces: 38AQ-5SI

For replacement items use Carrier Specified Parts

- Allow sufficient space for airflow clearance, wiring, refrigerant piping and servicing unit. See Fig. 1.
- Locate unit so that condenser airflow is unrestricted on all sides and above.
- Unit has legs for mounting on level pad. See Fig. 2 and Table 1 for weight distribution based on recommended support points.

  NOTE: If vibration isolators are required for a particular installation, use the data in Table 1 and Fig. 2 to make proper selection.

Step 2 — Rig and Locate the Unit

⚠ CAUTION

Be sure unit panels are securely in place prior to rigging. Be careful rigging, handling and installing unit. Improper unit location can cause system malfunction and material damage.

RIGGING — Lift units at points 3, 4, 7, 8 (Fig. 2). Use eyebolts and washers supplied in parts package. *Do not sling unskidded unit.* Skidded unit may be slung provided sling does not contact sides of unit. While unit is on skid, it can be rolled or dragged.

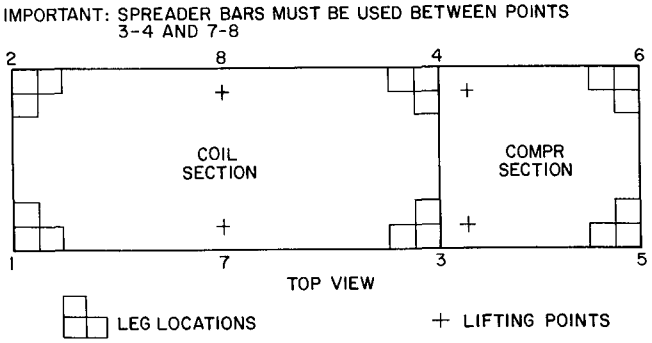


Fig. 2 — Weight Distribution

PLACING UNIT — Place unit so that airflow is unrestricted above. Provide clearance around the unit as shown in Fig. 1. Remove 6 hold-down bolts, releasing skid. The legs are attached to base skid.

Block up or suspend unit. With bolts supplied, secure legs (see Fig. 5) to unit (1, 2, 3, 4, 5 and 6 in Fig. 2 and Table 1).

Table 1 — Weights

UNIT 38AQ	TOTAL	WEIGHT (lb) Leg Location					
		1	2	3	4	5	6
024	2040	204	204	670	670	146	146
028	2160	203	203	592	642	235	285
034	2500	286	286	834	834	130	130

The unit may be mounted on a full pad or on raised supports at each leg. Weight distribution shown in Fig. 2 will determine type of support required. Bolt unit securely to pad or supports when positioned and leveled.

Step 3 — Mount Compressor

COMPRESSOR MOUNTING — As shipped, the compressor is held down by special self-locking bolts and lockwashers. After unit is installed, remove self-locking bolts one at a time and reassemble with flanged washers and neoprene snubbers as shown in Fig. 4. The flanged washers and neoprene snubbers are shipped in a cloth bag tied to one of the compressor feet. Tighten all 4 bolts, then loosen each until the flanged washer can be moved sideways with finger pressure.

Step 4 — Complete Refrigerant Piping Connections

SIZE REFRIGERANT LINES — Consider length of piping required between outdoor and indoor units, amount of liquid lift and compressor oil return. Refer to Part 3 of Carrier System Design Manual for line sizing information. Refer to indoor unit installation instructions for additional information.

→ Maximum liquid line length is 100 feet. Carefully determine the minimum expected unit capacity and size interconnecting lines accordingly. For low load conditions, determine if there is a need for double suction risers per Carrier System Design Manual. Consider vapor line as hot gas line. Consider line sizes for heating as well as cooling capacities.

⚠ CAUTION

Piping must be properly sized and installed for the system to operate efficiently.

→ FILTER DRIERS — 38AQ units have factory-installed filter driers. It is not necessary to add filter drier and check valve arrangements in interconnecting piping. It is recommended that a field-supplied liquid moisture indicator be installed in liquid line. Indoor units provide filter driers with heat pump piping packages, for field installation. Refer to indoor unit installation instructions for details.

Complete refrigerant piping from indoor coil to outdoor coil before opening liquid and suction lines at the heat pump unit. See Table 3 for proper refrigerant charge and piping selection data.

PROVIDE SAFETY RELIEF — A fusible plug is located on the liquid line before the liquid valve and on top of the accumulator (Fig. 3). DO NOT CAP THIS PLUG. If local code requires additional safety devices, install as directed.

HEAD PRESSURE CONTROL — Fan cycling for head pressure control is a standard offering but functions in cooling mode only. The no. 2 fan cycles as a function of liquid pressure sensed by fan cycling pressure switch (FCPS). Fan no. 3 cycles as a function of outdoor air temperature through the action of the air temperature switch (ATS). See Table 2 for settings. These switches are automatically bypassed in heating mode. Table 4 shows minimum outdoor ambient temperatures at which units will operate and provide full cooling capacity.

RECEIVER — No receiver is provided with the unit; it is recommended that one *not* be used.

PIPING PROCEDURE — Do not remove caps from vapor and liquid line stubs in compressor compartment until piping connections are ready to be made. Pass nitrogen or other inert gas through piping while brazing, to prevent formation of copper oxide.

Install thermostatic expansion valves in liquid line ahead of each indoor coil section.

SUCTION PIPING AT INDOOR COIL AND TXV BULB LOCATION — The purpose of these recommendations is to achieve good mixing of refrigerant leaving indoor coil suction header for proper sensing by the TXV bulb.

1. A minimum of two 90° elbows must be installed upstream of the expansion valve bulb location.
2. The TXV sensing bulb should be located on a vertical riser where possible. If a horizontal location is necessary, secure the bulb at approximately the 4 o'clock position.
3. Size suction line from indoor coil through the riser for high velocity. Enter suction pipe sizing charts in the Carrier System Design Manual at design tons and equivalent length (for 2 F loss). If reading falls between 2 sizes on chart, choose the smaller pipe size.

   Suction piping for the high velocity section should be selected for about 0.5 F friction loss. If a 2 F loss is allowed for the entire suction line, 1.5 F is left for the balance of the suction line and it should be sized on that basis. Check that high-velocity sizing is adequate for oil return up the riser.

When the compressor is below indoor coil, the riser at indoor coil does not have to extend as high as the top level. After a 15 diameter riser has been provided, suction line may elbow down immediately.

Table 2 — Physical Data

UNIT 38AQ	024	028	034
OPERATING WEIGHT (lb)	2040	2160	2500
REFRIGERANT		R-22	
Operating Charge (lb)*	55	61	71
COMPRESSOR			
Model No	06E2250	06E6265	06E2275
Cylinders	4	6	6
Oil (pts)	14	19	19
Crankcase Heater (watts)		180	
OUTDOOR AIR FANS			
Number		3	
Rpm; 60-Hertz		1140 (3-Ph); 1075 (Single-Phase)	
Diameter (in)	26	30	30
Motor Hp	3/4	1	1
Cfm	15 000	24 000	24 000
Kilowatts	3 4	3 4	3 6
OUTDOOR COIL			
Rows Deep . Fins/Inch		3 15	
Face Area (sq ft)	35 4	39 0	49 6
Storage Capacity (lb)†	70	77	99
CONTROLS			
High Press Switch (HPS)			
Cutout (psig)		426 ± 7	
Cut-in (psig)		320 ±20	
Loss-of-Charge Switch (LCS) — Liquid Line			
Cutout (psig)		5 ±3	
Cut-in (psig)		20 ±5	

UNIT 38AQ	024	028	034
CONTROLS (cont)			
Fan Cycling Press Switch (FCPS) — No 2 Fan Cycling			
Opens (psig)		126 ±4	
Closes (psig)		257 $^{+15}_{-0}$	
THERMOSTAT			
Defrost Thermostat (DFT)			
Opens (F)		65 ±5	
Closes (F)		28 ±3	
Fan Cycling Thermostat (ATS) — No 3 Fan Cycling			
Opens (F)		70 ±3	
Closes (F)		83 max	
FUSIBLE PLUG SETTING			
Liquid Line (F)		210 ±10	
Accumulator (F)		170 ±10	
→ OIL PRESS SAFETY SWITCH (OPS)			
Set Point (psig)		9	
Differential (psig)		2 8	

*Approximate charge with 25 ft of interconnecting piping Use appropriate charging charts for actual charging of unit
†Refrigerant storage capacity at 120 F condensing temperature with condenser 80% full of liquid

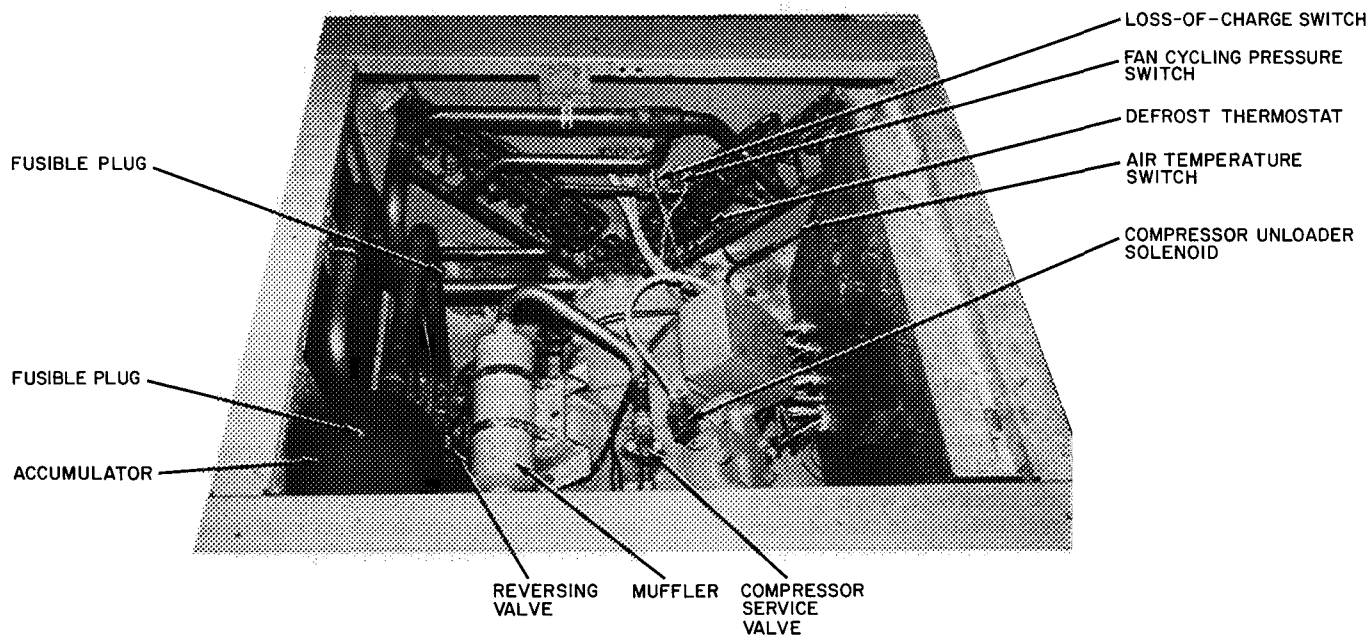


Fig. 3 — Component Locations

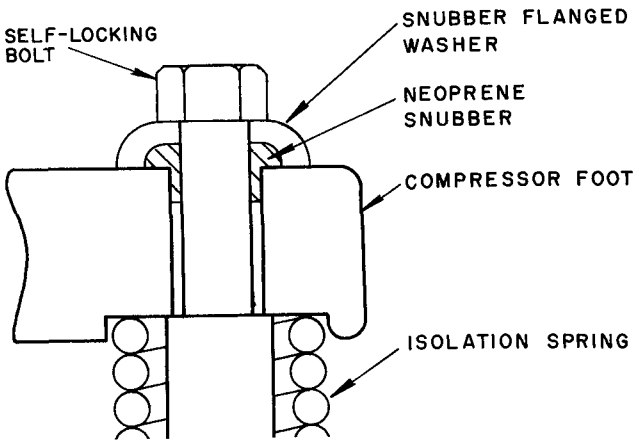
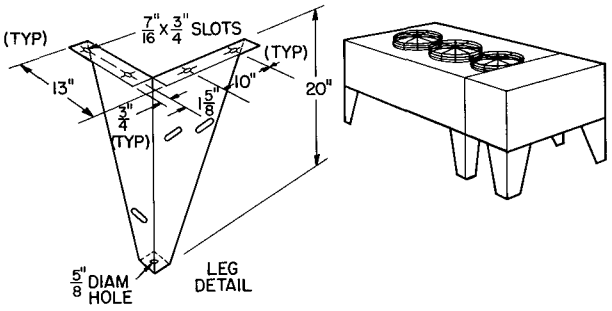


Fig. 4 — Compressor Mounting



NOTES
1 For mounting dimensions, see Fig 1.
2 Parts package contains all fasteners required for assembling 20-in. legs to unit

Fig. 5 — Mounting Legs for 38AQ Units

Step 5 — Make Electrical Connections

POWER SUPPLY — Electrical characteristics of available power supply must agree with nameplate rating. Supply voltage must be within tolerances shown in Table 6. See Fig. 6 for System Label Diagram. Phase unbalance must not exceed 2%. *Operation of unit on improper supply voltage or with excessive phase unbalance constitutes abuse and is not covered by Carrier Warranty.*

POWER WIRING — All power wiring must comply with applicable local requirements and National Electrical Codes. Install a field-supplied branch circuit disconnect switch of a type that can be locked OFF or OPEN. Run power wires from disconnect switch through unit power opening (D on Fig 1) and connect to terminal block just inside opening. See Table 5 for maximum allowable wire size.

Power terminal block is in the control box. Remove outer panel and #10 screw on the door. Swing door open, remove screws on barrier panel and remove barrier panel. Replace barrier panel when power wiring is completed.

Condenser fans must rotate clockwise when viewed from above. If necessary, correct direction of fan rotation by reversing any 2 power input wires at disconnect switch.

Affix crankcase heater decal to unit disconnect switch.

CONTROL CIRCUIT WIRING — *Internal control voltage on 38AQ units is both 115-volts and 24-volts. All control circuit wiring must comply with applicable local and national codes.* Route remote control wiring to unit control box through control opening (C on Fig. 1) and connect to control terminal block inside the control box. All external control wiring is 24-volt, NEC Class 2.

→ SAIL SWITCH — It is highly recommended that an indoor airflow switch (field installed) be installed and interlocked with the outdoor unit, to prevent the outdoor unit from operating in the event of indoor airflow failure (example: broken fan belt). Operation of compressor with no indoor airflow causes compressor to operate in a vacuum which can damage bearing surfaces. Therefore, install a field-supplied sail switch in the supply air ductwork of the mating indoor fan coil unit, and wire to outdoor unit. See Fig 7.

Table 3 — Refrigerant (R-22) Charge and Piping Selection Data

OUTDOOR UNIT 38AQ	LENGTH OF PIPING (ft)*					
	0-25		26-60		61-100†	
	Line Size (in. O.D.)					
	L	V	L	V	L	V
024	5/8	1 3/8	7/8	1 5/8	7/8	1 5/8
028	5/8	1 5/8	7/8	1 5/8	7/8	2 1/8
034	5/8	1 5/8	7/8	2 1/8	7/8	2 1/8
	Approximate System Charge (lb)‡					
024	55		58		75	
028	61		65		83	
034	71		79		93	

L — Liquid Line V — Vapor Line

*Approximately 4 elbows assumed in determining pipe sizes
†**Maximum length of interconnecting piping is 100 feet.**
‡Approximate system charge is for estimating only It includes charge requirements for one outdoor unit, matching indoor coil, and interconnecting piping System should be charged in accordance with installation instructions

→ NOTE Maximum liquid line size is 7/8-in OD Maximum R-22 system charge is 85 lb (024), 95 lb (028), 105 lb (034)

Table 4 — Minimum Outdoor Air Operating Temperature

UNIT 38AQ	COMPR CAP. (%)	COND TEMP (F)	MINIMUM OUTDOOR TEMPERATURE (F)*	
			Std Unit	32LT Motormaster®
024	100	90	28	-20
	50	80	41	-20
028	100	90	34	-20
	67	80	37	-20
034	100	90	30	-20
	67	80	33	-20

*Applies to cooling mode of operation only

Table 5 — Maximum Allowable Field Wire Sizes

UNIT 38AQ	VOLTS (60-Hz)	WIRE SIZE	CONN.
024,028,034	208/230	6 AWG to 350 MCM	TB
	460, 575	14 AWG to 2/0	

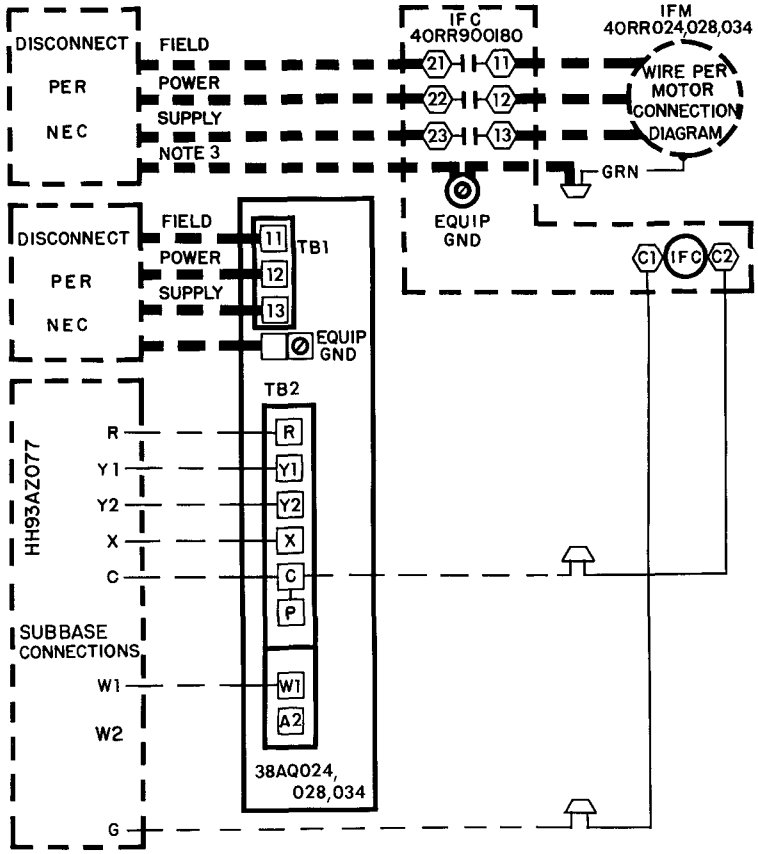
TB — Terminal Block (with integral compression terminal)

Table 6 — Electrical Data (3 Phase, 60 Hz)

UNIT							COMPRESSOR			FANS				
38AQ	Model	Volts			MCA	MOCP	RLA	LRA	MTA	Total	Kw (total)	FLA (ea)		
		Nameplate	Supplied*									No. 1	No 2	No. 3
			Min	Max										
024	510	208/230	187	253	103	175	76 0	345	53‡	3	3 4	4 5	4 6	4 6
	600	460	414	508	51	80	36 0	173	50†			1 9	1 9	1 9
	100	575	518	632	41	60	28 6	120	40†			1 6	1.6	1.6
028	510	208/230	187	253	145	225	100 0	446	70‡	3	3 4	6 2	6 6	6 6
	600	460	414	508	69	110	48 0	223	33‡			3 0	3 0	3 0
	100	575	518	632	62	100	43.4	164	61†			2.5	2.5	2.5
034	510	208/230	187	253	170	250	120 0	506	84‡	3	3 6	6 2	6 6	6 6
	600	460	414	508	72	110	50 0	253	35‡			3 0	3 0	3 0
	100	575	518	632	64	100	45 0	176	63†			2 5	2 5	2 5

FLA — Full Load Amps (fan motors)
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps Complies with NEC Section 430-24
MOCP — Maximum Overcurrent Protection (fuse only)
MTA — Must Trip Amps (circuit breaker)
NEC — National Electric Code
RLA — Rated Load Amps (compressor)

*Units are suitable for use on electrical systems where voltage supplied to the unit terminals is not below or above the listed limits
†3-Pole circuit breaker
‡6-Pole circuit breaker



LEGEND

Equip Gnd — Equipment Ground
IFC — Indoor Fan Contactor
IFM — Indoor Fan Motor
TB — Terminal Block (Board)

NOTES
1 This diagram applies to the following systems. 40RR024 with 38AQ 024, 40RR028 with 38AQ028 and 40RR034 with 38AQ034.
2. For wiring details of components, see schematic in each component
3 Use copper conductors only for IFM wiring

Fig. 6 — System Label Diagram; 38AQ024,028,034

NOTES
1 Locate blue wire between [1] on TB2B and terminal 7 of CR3 and cut
2 Splice airflow switch (AFS) (field supplied) contact wires (field provided) to 2 ends of cut blue wire as depicted

AFS — Airflow switch (sail switch)
——— Factory Wiring
– – – Field Wiring

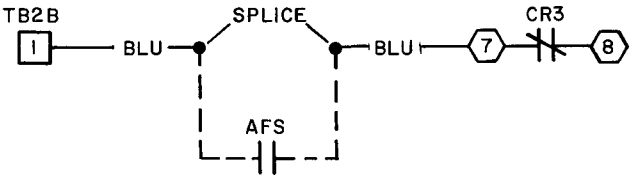


Fig. 7 — Field Wiring for Airflow Switch, 38AQ024, 028 or 034/40RR

START-UP

Before Starting Unit, check the following:

1. Compressor oil level must be visible in the compressor oil sight glass. Add oil if necessary. (See Oil Charge.)
2. Compressor hold-down bolts must be snug but not tight.
3. All internal wiring connections must be tight; all barriers and covers must be in place.
4. Electrical power sources must agree with unit nameplate rating.
5. All service valves must be open.
6. Crankcase heater must be firmly locked into compressor crankcase. Crankcase heater is inserted at the factory with thermal conductive grease.

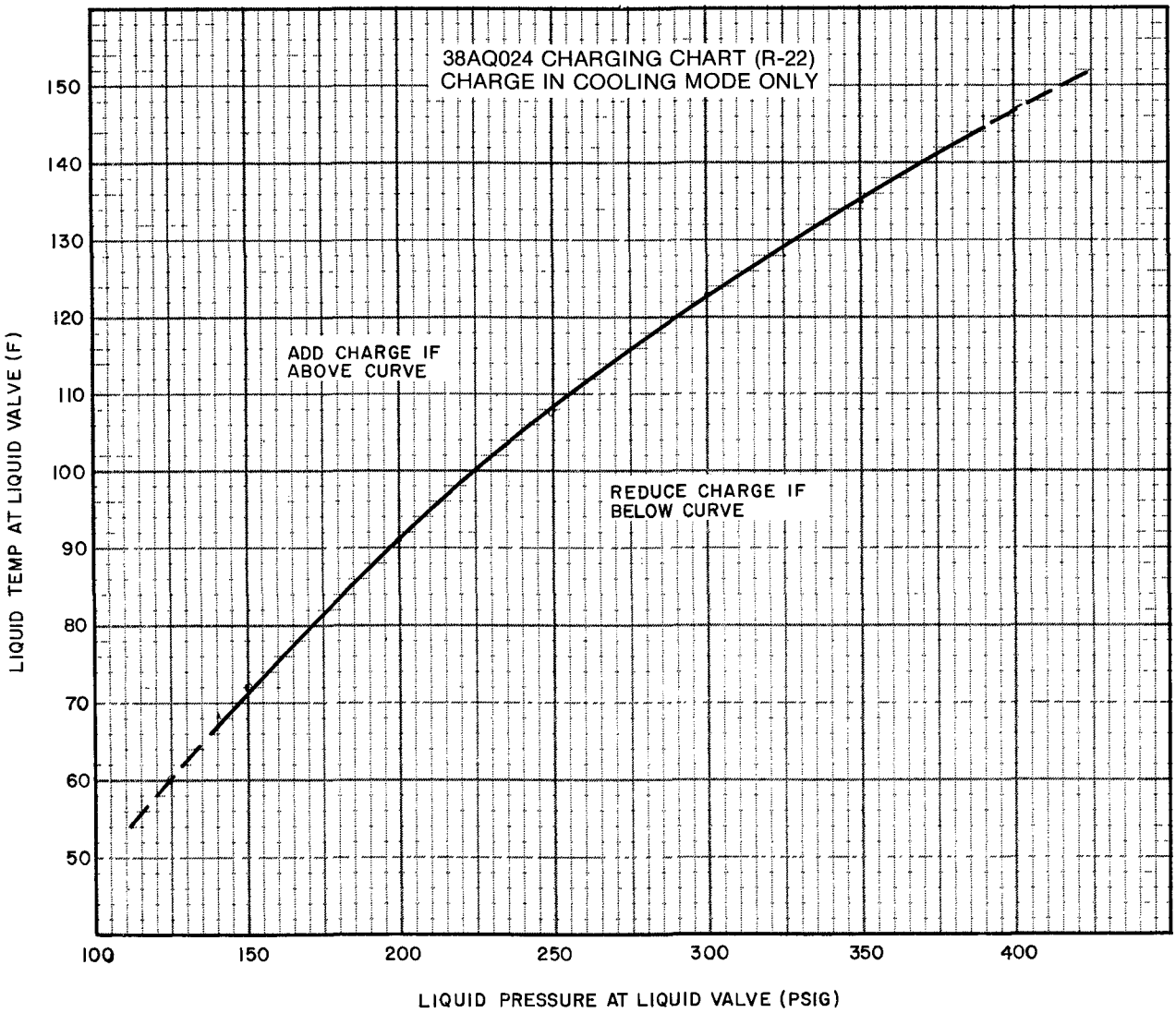
Evacuate and Dehydrate entire refrigerant system as described in the Carrier Standard Service Techniques Manual, Chapter 1, Section 1-7.

Leak Test entire refrigerant system by the pressure method described in the Carrier Standard Service Techniques Manual, Chapter 1, Section 1-6. Use refrigerant specified for unit at approximately 25 psig backed up with an inert gas to a total pressure not to exceed 200 psig.

Energize Branch Circuit — Close field disconnect switch to energize compressor crankcase heater. Set room thermostat to prevent unit(s) from starting at this time.

Heating/Cooling Thermostat (HH07AT072) has an adjustable heat anticipator for both first- and second-stage heating circuits.

SETTINGS — Set adjustment lever for first-stage anticipator at 0.79 (left-hand side). Set adjustment lever for second-stage anticipator at 0.42 (right-hand side).



NOTES:
1 All 3 outdoor fans must be operating
2 To be used with approved 40RR combinations only
3 Applies to all approved combinations

Fig. 8 — Cooling Cycle Charging Chart, 40RR/38AQ024

To Charge System — Refer to Carrier Standard Service Techniques Manual, Chapter 1 and the procedures described below. Use Fig. 8 for charging any 40RR/38AQ024 combination; Fig. 9 for charging any 40RR/38AQ028 combination; and Fig. 10 for charging any 40RR/38AQ034 combination.

⚠ CAUTION

Charge unit in cooling mode only. Charging unit in heating mode could result in overcharging.

1. Use Refrigerant R-22 only.
2. Regulate refrigerant drum valve to maintain suction pressure at 80 psig while charging. Charge with vapor only at suction side of unit.

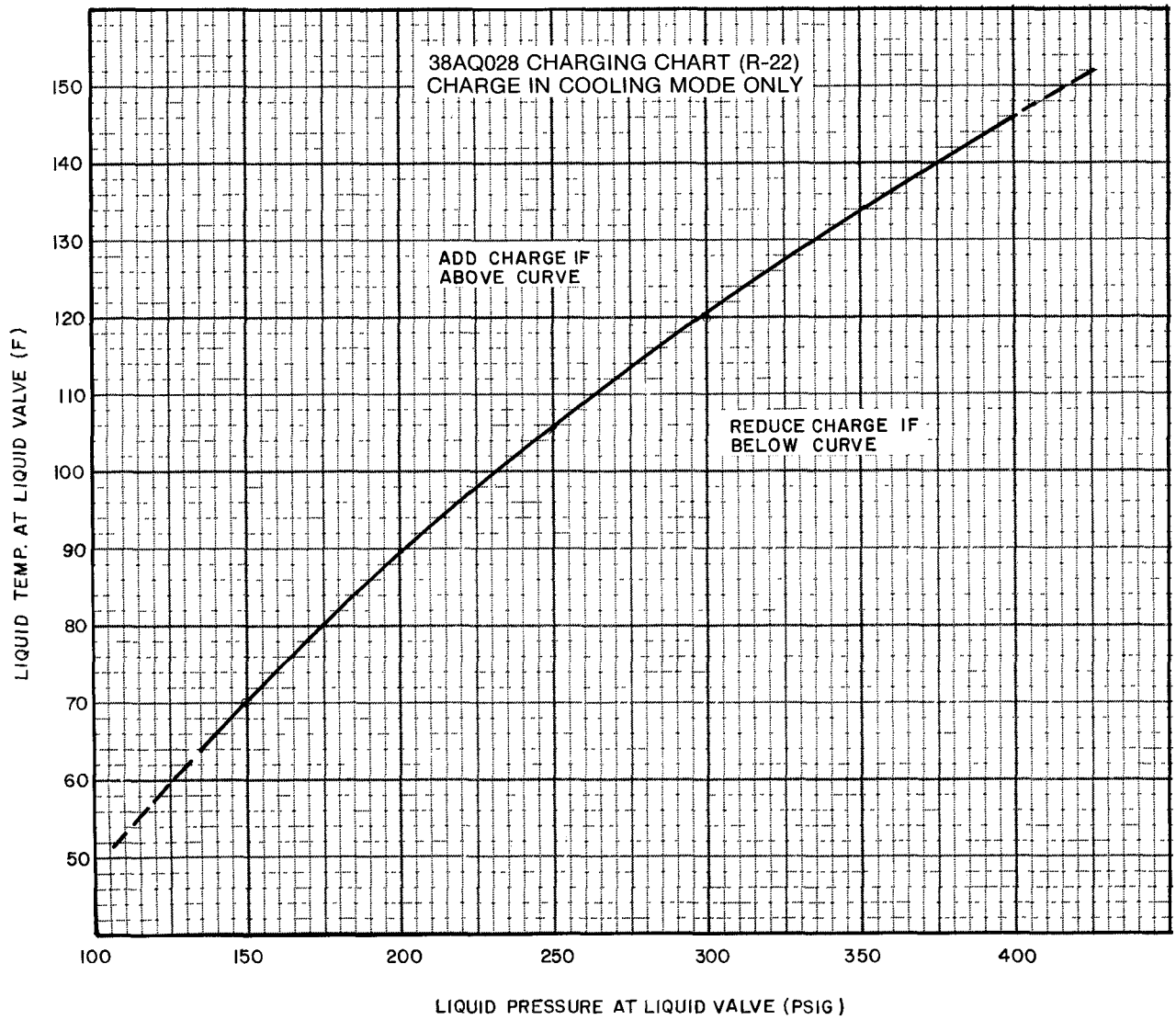
NOTE: Do not depend on sight glass when charging unit. Use charging chart.

3. Allow system to operate for 20 minutes. Take temperature and pressure readings at liquid service valve and check values with the charging chart.
4. Measure liquid line temperature close to the liquid service valve, and 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 charge until operating point falls on the line.
5. Record final refrigerant charge on unit nameplate.

To Start Unit — After compressor crankcase heater has been on for at least 24 hours, set room thermostat so unit will start on desired mode.

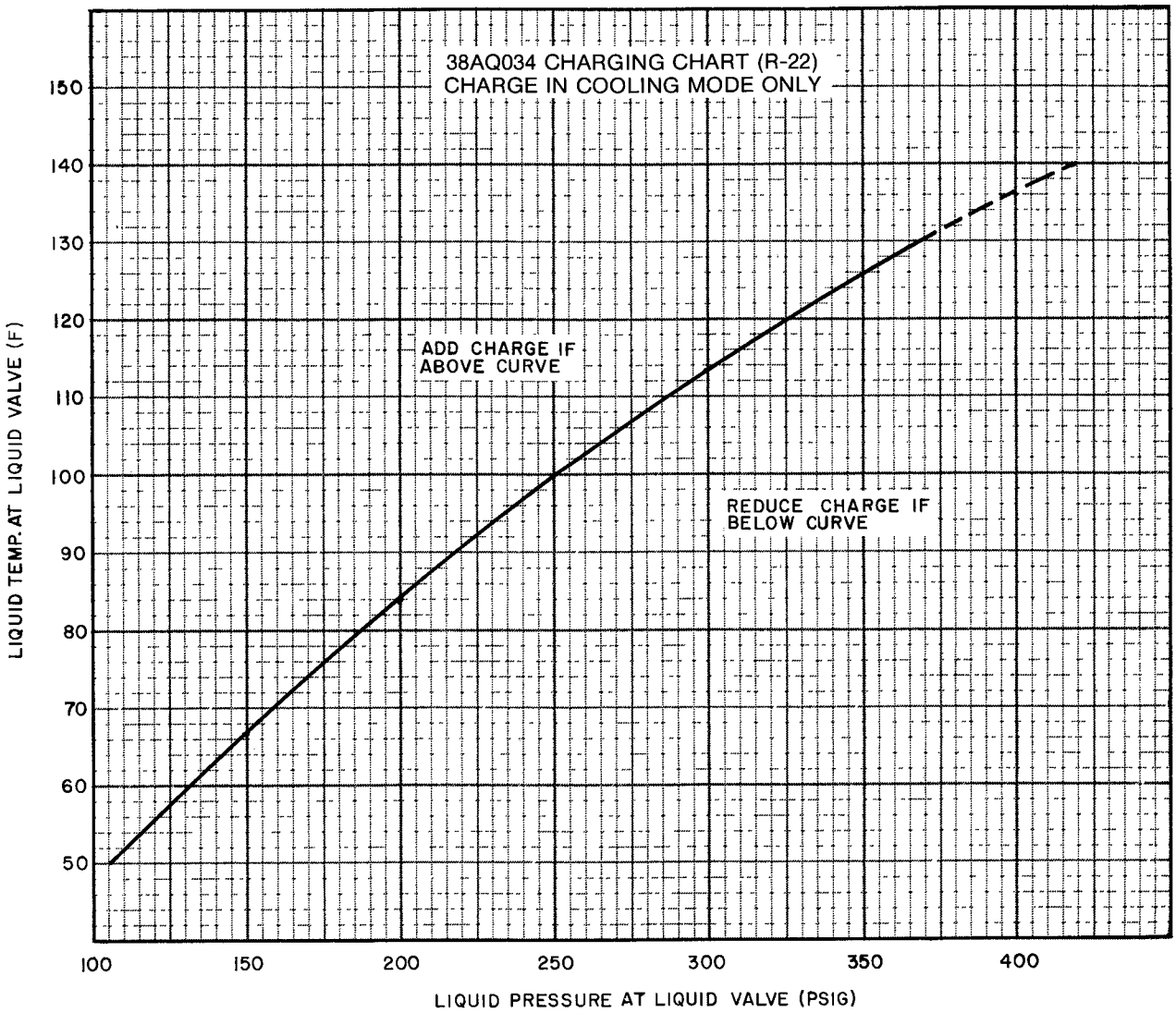
HEATING — Place thermostat selector at HEAT and set temperature selector above room ambient.

COOLING — Place thermostat selector at COOL and set temperature selector below room ambient.



NOTES:
1. All 3 outdoor fans must be operating
2. To be used with approved 40RR combinations only.
3. Applies to all approved combinations

Fig. 9 — Cooling Cycle Charging Chart, 40RR/38AQ028



NOTES
1 All 3 outdoor fans must be operating
2 To be used with approved 40RR combinations only
3. Applies to all approved combinations.

Fig. 10 — Cooling Cycle Charging Chart, 40RR/38AQ034

Oil Charge (Table 1) — Allow unit to run for about 20 minutes. Stop unit and check compressor oil level. Add oil only if necessary to bring oil into view in sight glass. *Use only Carrier-approved compressor oil.* Approved oils are:

Suniso 3GS
Capella B1
DuPont Synthetic
Refrigeration Oil (150 SSU only)
Zerol 150 (synthetic)

Do not reuse drained oil or use any oil that has been exposed to atmosphere. Procedures for adding or removing oil are given in Carrier Standard Service Techniques Manual,Chapter 1, Refrigerants.

If oil is added, run unit for additional 10 minutes. Stop unit and check oil level. If level is still low, add oil *only after* determining that piping system is designed for proper oil return and that the system is not leaking oil.

Check Operation of all safety controls. Replace all service panels. *Be sure that control panel cover is closed tightly.*

Capacity Control is by one electrically actuated unloader which controls 2 cylinders. Unloader does not require field adjustment.

Compressor Motor Protection

CIRCUIT BREAKER — A manual reset calibrated-trip magnetic circuit breaker protects the compressor against overcurrent. Do not bypass connections to increase size of breaker for any reason If trouble occurs, determine cause and correct before resetting the breaker. Circuit breaker Must Trip Amps (MTA) are listed in Table 6, Electrical Data.

DISCHARGE GAS THERMOSTAT — A sensor in the discharge gas of the compressor reacts to excessively high discharge gas temperature and shuts off compressor.The high temperature of discharge gas is a direct indication of an overtemperature condition in compressor motor.

CRANKCASE HEATER — The compressor has an electric heater located in the bottom cover, held in place by a clip. Heater must be tight to prevent backing out (heater will burn out if exposed to air). The heater is wired into compressor control circuit through a relay to energize only when compressor shuts off. This keeps the oil at a temperature that will prevent excessive absorption of refrigerant during shutdown periods. Crankcase heater is located in a lockout circuit. If crankcase heater is defective, the compressor locks off Heat pump remains off until corrective action is taken. This lockout circuit cannot be reset by adjusting the thermostat.

Crankcase heater should be energized at all times when unit is not running except during prolonged shutdown or during servicing. In these cases, heater should be energized for 24 hours before unit is restarted.

Fan Motor Protection — Fan motors are inherently protected, grouped on a single circuit breaker.

Fan Adjustment — When replacing a fan, adjust fan until top surface of hub plate is below top of orifice ring as indicated in Fig 11. Then, tighten both setscrews, located over the keyway of fan hub of motor shaft. Seal recessed area of fan hub bore with Permagum to prevent rusting.

Head Pressure Control reduces condensing capacity under low-ambient conditions. For intermediate season operation, fan cycling is employed. Fan no. 2 is cycled by pressure control, with the pressure sensor located in the liquid line. Fan no. 3 is cycled by an air temperature thermostat (see Table 2).

Liquid Line Solenoid Valve closes when compressor is off, and opens when compressor is on. The valve minimizes refrigerant migration during heat pump OFF cycle, protecting against flooded starts.

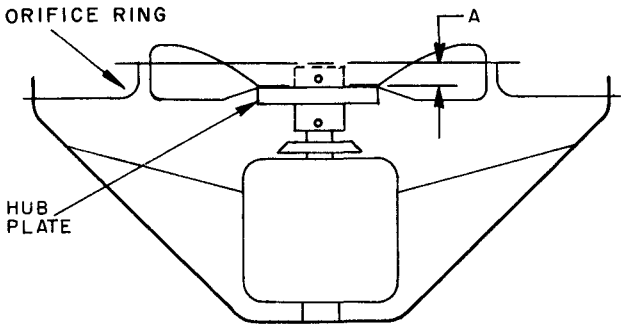
Accumulator Oil Return is external. The accumulator drains through an extenal port at bottom of accumulator. The port feeds an orifice which regulates the rate of oil and refrigerant returned to the compressor. The orifice is removable and cleanable when the system does not contain refrigerant. The oil return mechanism also contains a solenoid valve that opens when compressor is ON, and closes when compressor is OFF. The oil return solenoid does not allow liquid refrigerant to drain from the accumulator during the heat pump OFF cycle, protecting the compressor against flooded starts.

Lubrication

FAN MOTORS — Fan motors have permanently lubricated bearings. No provisions for lubrication are made.

COMPRESSOR — The compressor has its own oil supply. Loss of oil due to a leak in the system should be the only reason for adding oil after system has been in operation.

Coil Cleaning — Clean coils with a vacuum cleaner, fresh water, compressed air or a bristle brush (not wire). Set up coil cleaning as part of a planned maintenance schedule when units are installed in corrosive environments. Wash all accumulations of dirt from coil in these applications. Keep condenser coil drain holes free of dirt and debris to ensure adequate coil drainage.



UNIT 38AQ	DIMENSION A (in.)	
	Center Fan	End Fan
024	3/4	3/4
028 034	1 9/16	2 3/4

Fig. 11 — Fan Adjustment

OPERATING SEQUENCE

(Refer to wiring diagrams in 38AQ wiring booklet)

Standby (OFF) Mode — During the standby or OFF mode, crankcase heater is energized. Reversing valve may or may not be energized depending on mode of operation (heating or cooling) when thermostat is satisfied.

COOLING — When thermostat calls for first-stage cooling (TC1 closed), indoor fan motor starts immediately. Compressor and outdoor fans start between 3 seconds and 5 minutes depending on length of time unit is off after thermostat is satisfied, due to 5-minute Time Guard® II circuit. Outdoor fan motors nos. 2 and 3 may or may not operate depending on position of fan cycling pressure switch (FCPS) and air temperature switch (ATS). The reversing valve solenoid (RVS) becomes de-energized causing reversing valve to shift to cooling position. Crankcase heater is off. Liquid line and accumulator oil return solenoid valves open, allowing refrigerant and oil flow.

Defrost Timer does not operate during cooling mode. When thermostat calls for second-stage cooling (TC2 closed), unloader is de-energized causing compressor to run fully loaded.

If a malfunction occurs, causing high-pressure switch (HPS) discharge gas thermostat (DGT) or loss-of-charge switch (LCS) to open, compressor and outdoor fans stop and are locked out by a Signal-Loc circuit, and a warning light comes on at the thermostat. RVS remains de-energized so reversing valve does not shift. These safeties reset by adjusting thermostat up to open TC1 and TC2, or by momentarily switching subbase to OFF position. When thermostat is satisfied (TC1 open), compressor, indoor fan motors shut off. Liquid line and accumulator oil return solenoid valves close. Reversing valve does not shift, but remains in cooling position until there is a call for heating. If compressor oil pressure is lost, or if oil pressure fails to build on start-up, an oil pressure safety switch shuts down unit. Switch must be manually reset at the unit. DO NOT RESET MORE THAN ONCE! If oil pressure switch trips, determine cause and correct. DO NOT JUMPER OIL PRESSURE SAFETY SWITCH!

Crankcase Heater is in a lockout circuit. If crankcase heater is defective, compressor is locked off. The heat pump remains off until corrective action is taken. This lockout circuit cannot be reset by adjusting the thermostat.

Unit is equipped with a no-dump reversing valve circuit. When unit is in cooling mode, reversing valve remains in cooling mode position until thermostat calls for heating. When unit is in heating mode, reversing valve remains in heating mode position until thermostat calls for cooling.

HEATING — When thermostat calls for heating (TH1 closed), indoor fan motor starts. Compressor and outdoor fans start between 3 seconds and 5 minutes depending on length of time unit is off after thermostat is satisfied, due to 5-minute Time Guard II circuit. Liquid line and accumulator oil return solenoid valves open when compressor operates, and close when compressor is OFF. Compressor always runs fully loaded in the heating mode. All 3 outdoor fans also run during heating mode. Reversing Valve Solenoid (RVS) shifts for heating operation at start-up.

Defrost Timer runs continuously during heating mode. Crankcase heater is off whenever compressor is on. If a malfunction occurs, causing high-pressure switch (HPS), discharge gas thermostat (DGT) or loss-of-charge switch (LCS) to open, compressor and outdoor fan motors stop and are locked out by a Signal-LOC circuit, and a warning light appears on the thermostat. RVS remains energized so reversing valve does not shift. Reset lockout system by adjusting thermostat down to open TH1 and TH2, or by momentarily switching subbase to the OFF position. If compressor oil pressure is lost or if oil pressure fails to build on start-up, an oil pressure safety switch shuts down unit. Switch must be manually reset at the unit. DO NOT RESET MORE THAN ONCE! If oil pressure switch trips, determine cause and correct. DO NOT JUMPER OIL PRESSURE SAFETY SWITCH!

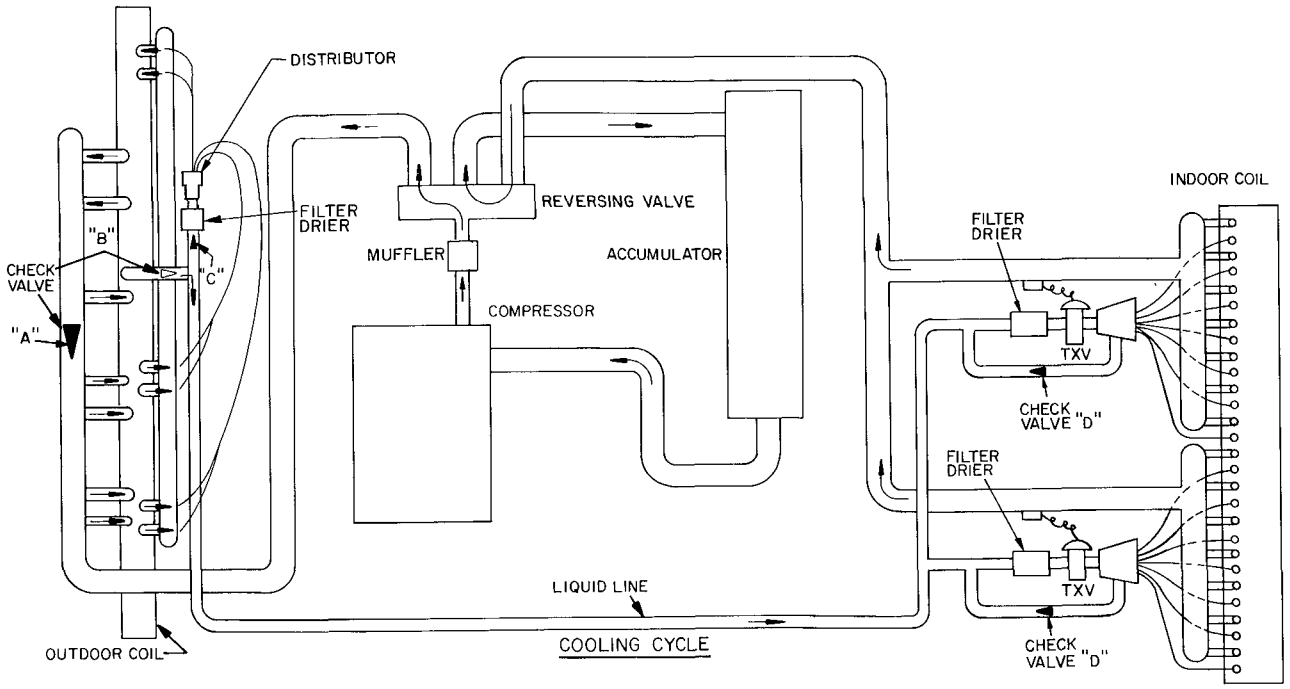
Crankcase Heater is in a lockout circuit. If crankcase heater is defective, compressor is locked off. The heat pump remains off until corrective action is taken. This lockout circuit cannot be reset by adjusting the thermostat. When thermostat is satisfied (TH1 opens), compressor, indoor fan motor and outdoor fan motors shut off. Reversing valve remains in heating mode until thermostat calls for cooling.

If outdoor ambient temperature is above approximately 45 F, defrost thermostat (DFT) senses outdoor coil temperature is above 28 F, and prevents start of any defrost cycle. When outdoor ambient temperature is below approximately 45 F, DFT senses outdoor coil temperature is below 28 F and allows defrost circuitry to be energized every 60 minutes. When this occurs, reversing valve switches back to cooling position and outdoor fans shut off. Defrost is terminated when liquid refrigerant becomes warm enough to open defrost thermostat. Defrost timer limits length of each defrost cycle to a maximum of 10 minutes.

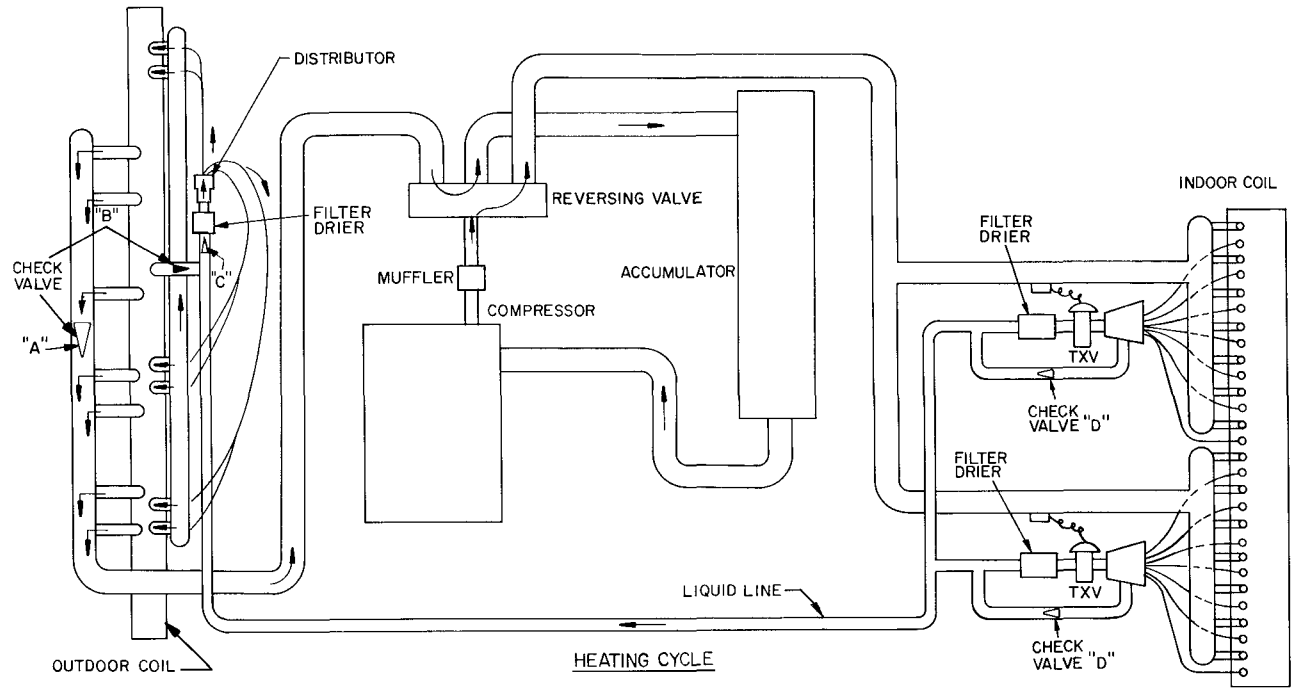
Two defrost interlock relays are provided for use on systems having more than one 38AQ unit. When any 38AQ unit is in defrost mode, up to 2 additional 38AQ units can be prevented from defrosting by temporarily stopping their defrost timer motors until defrost on another unit is completed.

Compressor and outdoor fan motor overcurrent protection is achieved with circuit breakers (heating and cooling modes). These require manual reset at the outdoor unit control box.

Refer to Fig. 12 for typical 38AQ heat pump refrigerant circuit operation.



1 Hot gas from compressor flows through the 4-way valve and is directed to the outdoor coil header At the header it is condensed and subcooled through converging circuits Refrigerant leaves the outdoor coil by way of the check valve to the liquid line
2 The refrigerant then flows through the filter drier and feeds the indoor coil by way of capillary tubes on each circuit
3 Each circuit evaporates the refrigerant and the circuits are combined in the indoor coil header
4 The refrigerant then flows through the 4-way valve, accumulator and back to the compressor.

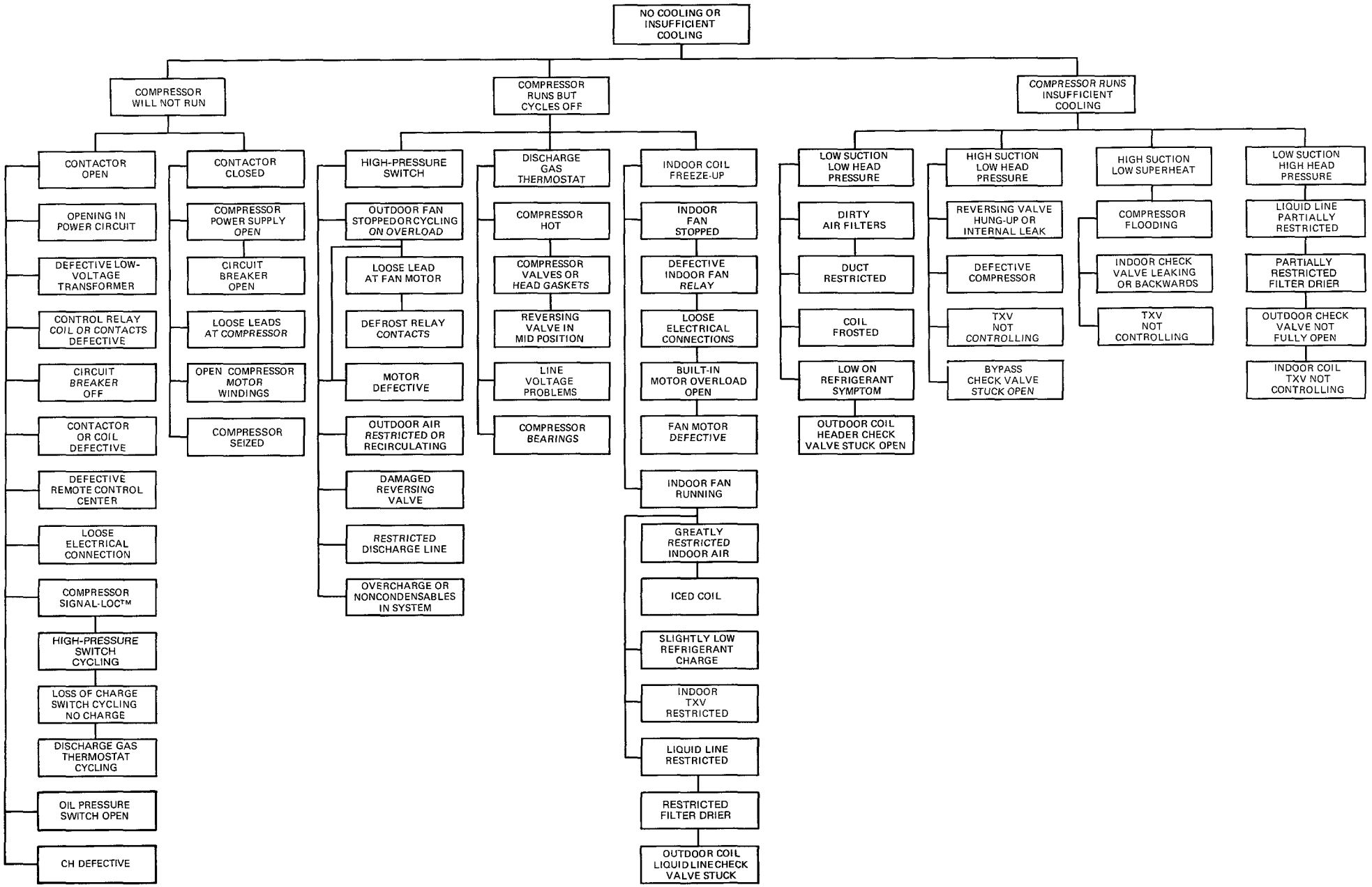


1 Hot gas from compressor flows through the 4-way valve and is directed to the indoor coil header At the header it is condensed and directed through subcooling circuits and out the indoor coil check valve to the liquid line. (The TXV's stop the refrigerant flow during the heating cycle)
2 The refrigerant then feeds the outdoor coil by way of a strainer and then through capillary tubes on each circuit
3. Each circuit evaporates the refrigerant and the circuits are combined in the outdoor header with some of the circuits flowing through the check valve
4 The refrigerant then flows through the 4-way valve, accumulator and back to the compressor

NOTES:
1 Check valves are designated "A" through "D "
2. Illustrations are typical and do not portray exact coil circuiting
3 Check valve positions: Δ open, ▲ closed.
4 Only one outdoor coil is shown above The 38AQ024,028 and 034 have 2 coils plus 2 of each check valve shown above

Fig. 12 — Typical Heat Pump Operation

TROUBLESHOOTING CHART, COOLING CYCLE



TROUBLESHOOTING CHART, HEATING CYCLE