SUPERSEDED BY 38AC-3SI 4/75

Heat Pump - Outdoor Unit

Table 1 — Physical Data

UNIT 38AC	012	016
OPERATING WEIGHT (lb)	890	1010
REFRIGERANT	500	22
Operating Charge (lb)*	36	45
COMPRESSOR	Recip Hermetic; 1750 Rpm	
Model	06DA337	06DA537
Cylinders	6	6
Oil (pts)	10	10
Crankcase Heater (watts)	75	75
OUTDOOR FANS	Propeller; Direct Drive	
Number	2	3
Rpm; 60-Hertz	1120	1120
Diameter (in.)	22	22
Motor hp	½	½
Cfm	8800	13,000
OUTDOOR COIL	Plate Fins; 13 Per Inch; 3-Row	
Face Area (sq ft)	18 4	26 2
Capacity (lb)†	32	51
PRESSURESTAT		
High {Cutout (psig)	320	364
High {Cut-in (psig)	245	264
Low {Cutout (psig)	17	29
Low {Cut-in (psig)	42	54
Liquid Line		
Cutout (psig)	5	
Cut-in (psig)	15	
THERMOSTAT		
Defrost {Opens (F)	65 ± 3	
Defrost {Closes (F)	45 ± 3	
Discharge line {Opens (F)	272	
Discharge line {Closes (F)	178	
Fan Cycling		
No. 2 {Opens (F)	60	70
No. 2 {Closes (F)	65	75
No. 3 {Opens (F)	–	57
No. 3 {Closes (F)	–	62

*Approximate charge with 25 feet of interconnecting piping Use appropriate charging charts for actual charging of unit

†Refrigerant storage capacity at 120 F condensing temperature with condenser 80 percent full of liquid

INITIAL START-UP

Evacuate and Dehydrate the entire refrigerant system by either of the methods described in Carrier Standard Service Techniques Manual.

Leak Test entire refrigerant system by Pressure Method described in Carrier Standard Service Techniques Manual. Use refrigerant specified for unit at approximately 25 psig backed up with an inert gas to a total pressure not to exceed 250 psig.

Before Starting Unit, check the following:

1. Compressor oil level must be at least within sight in compressor oil sight glass. Add oil if necessary.
2. Compressor hold-down bolts must be snug but not tight. Refer to installation instructions or tag on compressor foot.
3. All internal wiring connections must be tight; all barriers and covers must be in place.
4. Electrical power source must agree with unit nameplate rating.
5. All service valves must be open.
6. Fan cycling thermostat (head pressure control) sensing bulb must be in air flow under fan no. 1.
7. Crankcase heater must be firmly locked into compressor crankcase.

Energize Branch Circuit — Close field disconnect switch to energize compressor crankcase heater. Make sure room thermostat is set in a manner to prevent unit(s) from starting at this time.

Heating/Cooling Thermostat (HH03AT064) has an adjustable heat anticipator for both first- and second-stage heating circuits.

SETTINGS — Set adjustment lever for first-stage anticipator at 0.24 (left-hand side). Set adjustment lever for second-stage anticipator (right-hand side) as follows:

One Strip Heater — 0.21
Two Strip Heaters — 0.42
Three Strip Heaters — 0.63

Outdoor Thermostat — Refer to 40RT strip heater Installation Instructions for details on adjustments of this thermostat (if used).

To Start Unit — After compressor crankcase heater has been on for at least 3 hours set room thermostat so unit will start on desired cycle.

On initial start of 38AC016, unit should be run for 20 minutes on heating cycle so any contaminants will be collected in larger drier.

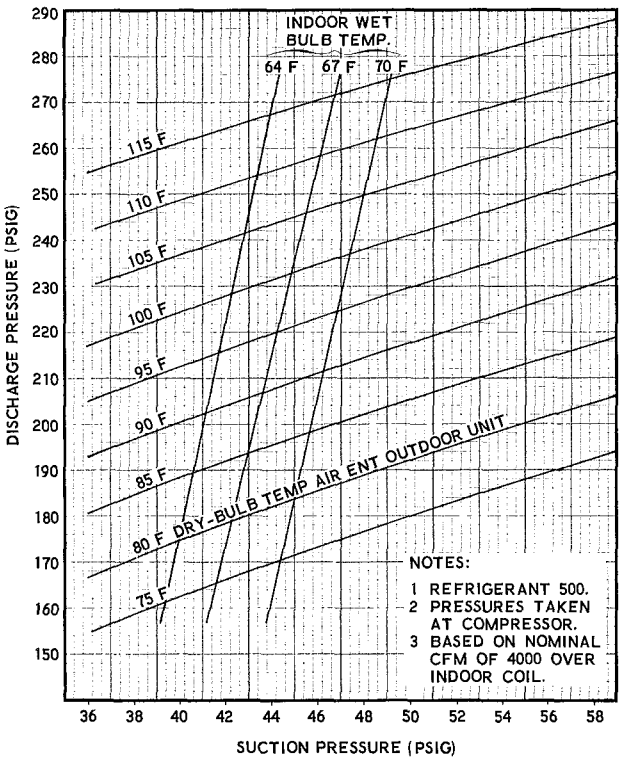
HEATING — Place thermostat selector to "Heat" and set temperature selector above room ambient.

COOLING — Place thermostat selector to "Cool" and set temperature selector below room ambient.

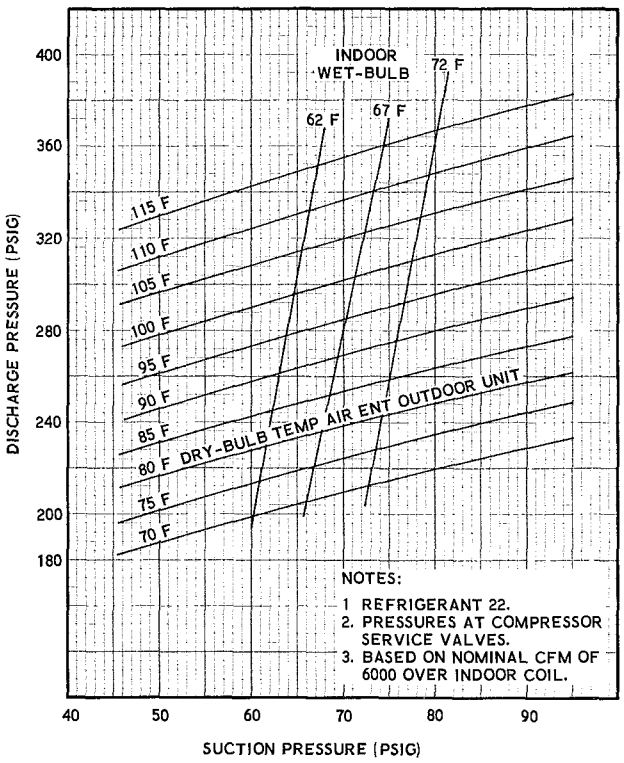
To Charge System — Refer to Carrier Standard Service Techniques Manual, Chapter 1, for charging methods and procedures mentioned below. Refer to charging charts as applicable.

1. Be sure to use the correct refrigerant (see charging chart).
2. Regulate refrigerant drum valve to maintain suction pressure at 49 psig on 38AC012 and 80 psig on 38AC016 while charging.

COOLING CYCLE

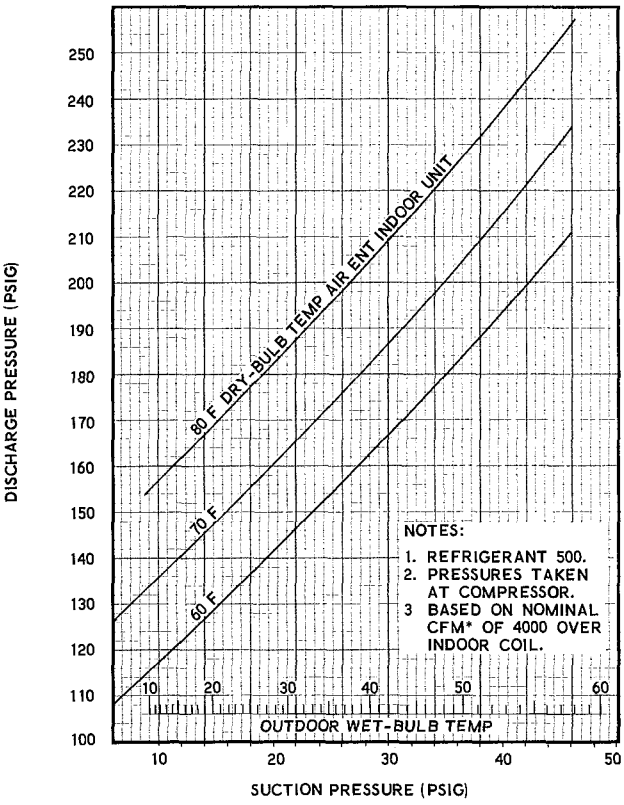


38AC012 with 40RT012 Indoor Unit

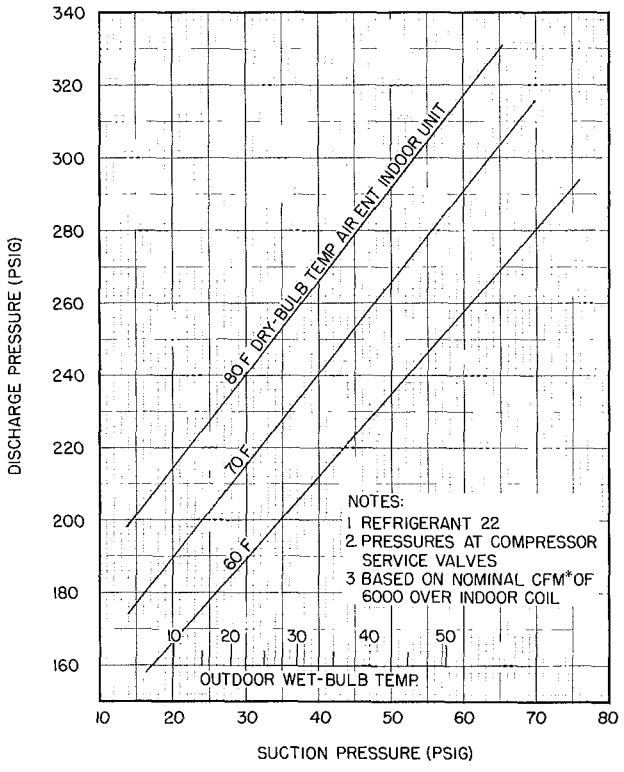


38AC016 with 40RT016 Indoor Unit

HEATING CYCLE



38AC012 with 40RT012 Indoor Unit



38AC016 with 40RT016 Indoor Unit

*Minimum cfm that will allow the units to operate at 80 F indoor return air and 65 F wb outdoor air on heating cycle. Higher air quantities increase operating efficiency of system and reduce operating costs

Fig. 1 - Charging Charts

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

3. Allow system to operate for about 20 minutes. Take temperature and pressure readings and check values with the charging chart.

After Charging System, 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. If oil is added, run unit for additional 10 minutes. Stop unit and check oil level. If level is again low, add oil only after determining that piping system is designed for proper oil return and that system is not leaking oil. Check operation of all safety controls. Replace all service panels. Be sure that control panel door is closed tightly.

SERVICE

Defrost Control, consisting of a defrost timer and a defrost thermostat, interrupts normal system heating operation if enough frost forms on outdoor coil to impair overall unit performance. Defrost control simultaneously stops outdoor fans and de-energizes reversing valve solenoid to return system to cooling cycle (outdoor unit as condenser; indoor unit as evaporator). Defrost cycle is 90 minutes for 38AC012 and 60 minutes for 38AC016.

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

1. Defrost timer contacts must be closed.
2. Refrigerant temperature from outdoor unit must be cold enough (43± 3 F) to cause defrost thermostat contacts to close.

Liquid Line Low-Pressure Control (LLP) is connected in liquid line to work with compressor internal thermostat and discharge thermostat to provide loss-of-charge protection during the heating cycle. Control is mounted in control box.

With a high side leak, pressure gradually decreases until low pressure control stops the compressor.

With a low side leak there will always be some pressure in the liquid line. However, compressor motor temperature will increase because of insufficient suction gas cooling. This causes internal thermostat or discharge line thermostat to actuate and stop compressor. When compressor stops, system pressure equalizes and contacts on pressure control open. The compressor cannot restart until leak is repaired and system recharged.

Low-Pressure Control (LP) is a single-pole switch connected into the refrigerant system at compressor suction connection and into 24-volt control circuit. Control provides loss-of-charge protection and freeze-up protection during cooling cycle and is inoperative during heating cycle. See Table 1 for pressure settings.

Head Pressure Control (Fan-Cycling Thermostat) – A feeler bulb in the outdoor coil inlet airstream senses temperature of air entering coil to control no. 2 fan on 38AC012 and no. 2 and 3 fans on 38AC016. Open and close temperatures are shown in Table 1.

Accessory Motormaster™ head pressure control for no. 1 fan (if used) allows operation at lower ambients. See accessory instructions.

Time Guard Circuit for compressor causes a 5-minute delay before restarting compressor after shutdown for any reason. On starting, the Time Guard Timer causes a delay of 15 seconds after thermostat closes before compressor will start. On compressor shutdown, the timer recycles for 4 minutes 45 seconds. During this time the compressor cannot restart.

Safety Relief – A rupture disc in the accumulator and a relief valve in the compressor provides pressure relief under abnormal temperature and pressure conditions.

Electric Resistance Crankcase Heater is inserted into the compressor crankcase. It is operated from the normally closed contacts of the holding relay and is automatically energized when the compressor stops. This heater keeps crankcase warm to prevent oil dilution by refrigerant and ensures good lubrication and minimizes loss of oil during start-up.

If power to unit has been off for an extended period of time, energize crankcase heater at least 3 hours prior to starting compressor.

Compressor Section – Remove top and end panel for access to this section. Additional access to expansion valve, distributor and coil piping is available by removing inboard fan, motor-support panel assembly and coil end baffle between compressor section and coil section. Remove fan and motor-support panel assembly by removing six sheet metal screws, three cap screws and disconnecting fan cable at control box. Then remove coil end baffle.

Fan Adjustment – Turn unit power off. Remove fan guard and loosen fan hub setscrew. Adjust fan until surface of hub is 3/8 in. below top of venturi rim as shown in Fig. 3. Then, tighten setscrew on flat of motor shaft. Seal fan hub recess with permagum to prevent hub from rusting to motor shaft.

Lubrication

OUTDOOR FAN MOTORS have sealed bearings. No provisions are made for lubrication.

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.

To Add or Remove Compressor Oil – Refer to Carrier Standard Service Techniques Manual, Chapter 1.

38AC016 WITH 40RT016

Heating Cycle

1. Hot gas from compressor flows thru muffler to reversing valve
2. Hot gas is directed to header on indoor coils. In these coils hot gas is condensed to a liquid This liquid flows out thru feeder tubes to the distributors where it passes thru the side outlet TXV B and B_1 are closed because of high equalizing pressure
3. Liquid flows thru check valve C proceeding to outdoor unit.
4. Liquid flows thru filter-drier, TXV (A), distributor, and feeder tubes into outdoor coil where it is evaporated into a vapor (Entire outdoor coil is an evaporative surface during this cycle)
5. Cool vapor from outdoor coil subcooler is pulled thru check valve A and meets with gas flowing from remainder of outdoor coil (check valve B closed).
6. Cool vapor flows thru reversing valve where it is directed to accumulator and into compressor suction valve to repeat cycle.

Cooling Cycle

1. Hot gas from compressor flows thru muffler to reversing valve
2. Hot gas is directed to header on outdoor coil (check valve A closed)
3. Header directs hot gas to individual coil circuits where it is condensed to liquid.
4. Liquid out of outdoor coil makes 180 degree turn in distributor and flows thru tubes to and thru subcooler. TXV (A) is closed because of high equalizing pressure.
5. Subcooled liquid flows thru check valve B and toward indoor unit
6. Liquid continues thru filter-drier, expansion valve B and B_1 into distributors and into indoor coils Check valve C is closed.
7. Cool vapor flows out of indoor coil back to reversing valve where it is directed to accumulator and then to compressor suction valve to repeat cycle.

38AC012 WITH 40RT012

These combinations follow the same basic diagram with two exceptions

There is only one coil on the indoor unit and therefore only one expansion valve. Also the 40RT012 is provided with a subcooling coil which performs two functions

On heating cycle it is full of liquid which tends to balance the refrigerant charge while providing subcooling.

On cooling cycle a check valve prevents liquid refrigerant from entering the subcooler coil; this portion has vapor only.

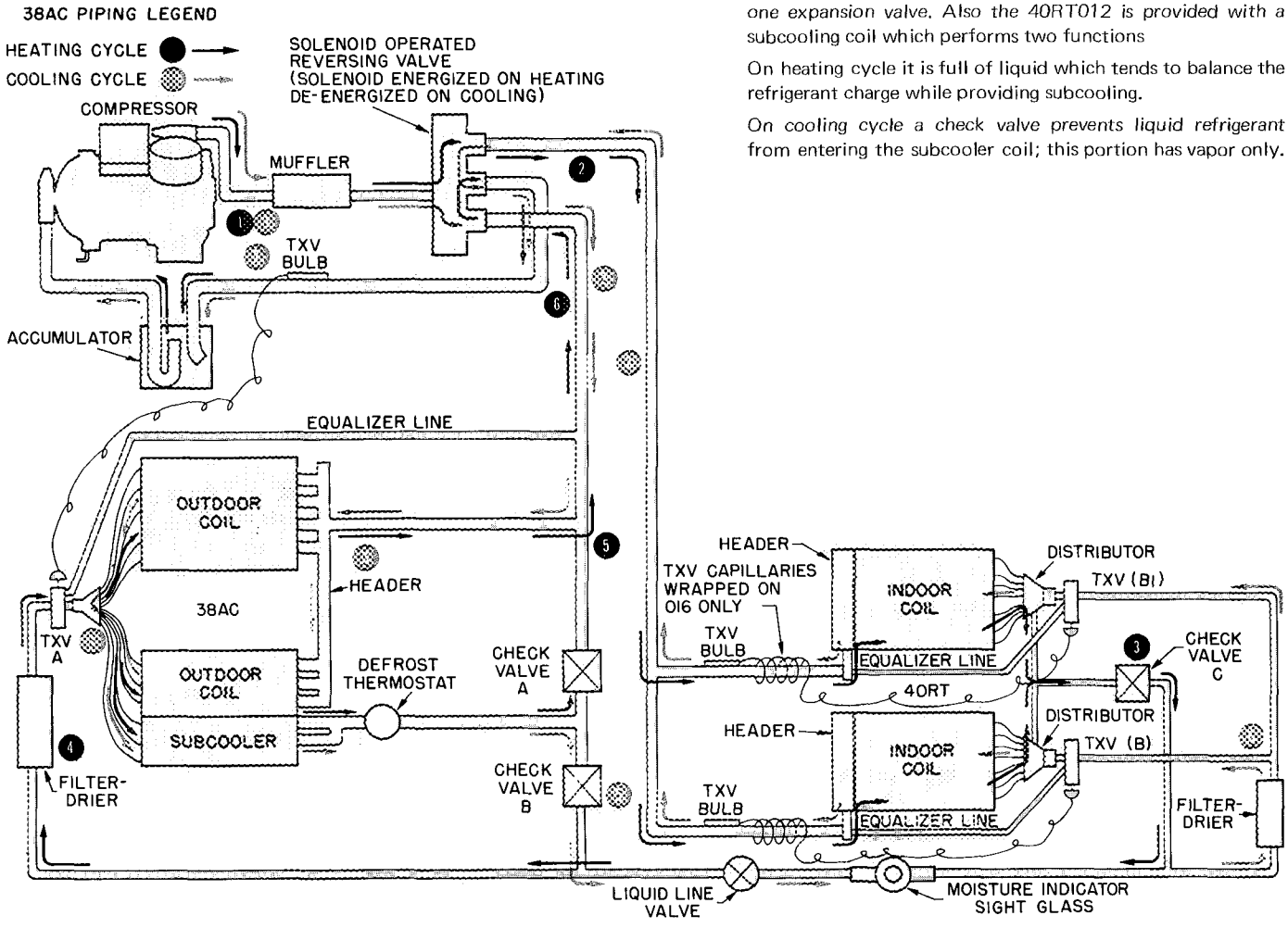


Fig. 2 – Heat Pump Cycle (Heating and Cooling)

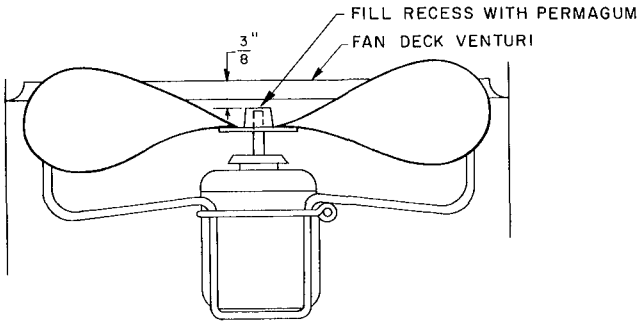


Fig. 3 – Fan Adjustment

Table 2 – Electrical Data (3-Ph, 60-Hz)

UNIT MODEL		VOLTS	NDSV	WSA	ICF	FU	COMPR FLA	COMPR LRA	FANS* FLA (ea)
38AC 012	430	208	208	72 6	197 6	80	50 0	191	3 2
	550	230	220-240	65 5	178 6	75	45 0	172	3.2
	640	460	440-480	30 9	89.5	35	22.2	86	1.6
38AC 016	430	208	208	90 1	273 6	100	64 0	266	3 2
	540	230	220-230	81 7	249 8	90	58 0	240	3 2
	640	460	440-480	39 3	125 7	45	29.0	120	1 6

FLA – Full Load Amps
FU – Fuse (max allowable amps; dual element)
ICF – Maximum Instantaneous Current Flow (during start-up; sum of LRA for compressor plus FLA for all other motors in the unit)
LRA – Locked Rotor Amps
NDSV – Nominal Distribution System Voltage (Application Range) Motors and controls will operate satisfactorily 10 percent above and 10 percent below NDSV
WSA – Wire Sizing Amps per NEC Tables 310-12 thru 310-15 Values are sums of 125 percent of FLA of compressor plus FLA of all other motors in the unit
*Unit 38AC012 has two; Unit 38AC016 has three

TROUBLESHOOTING GUIDE

HEATING AND COOLING CYCLE

Compressor Will Not Run (Contactor Open)

Power off – *restore power.*

Transformer defective – *replace transformer.*

Thermostat defective – *clean or replace thermostat.*

Control relay defective – *clean contacts or replace coil.*

Compressor contactor defective – *clean contacts or replace coil.*

Holding relay defective – *clean contacts or replace coil.*

Timer motor or switch defective – *replace timer.*

Electrical connections loose – *check and tighten all electrical connections*

Pressurestat open – *check setting or replace if defective.*

Reversing valve relay defective – *replace relay.*

Compressor Will Not Run (Contactor Closed)

Disconnect switch open or fuse(s) blown – *restore power or replace fuses.*

Compressor leads loose – *tighten connections.*

Compressor motor windings open – *replace compressor motor.*

Compressor seized – *check compressor bearings.*

Compressor Cycles on Protective Device

Compressor is hot – *replace broken valves or head gaskets. Check reversing valve positioning.*

Overload defective – *replace overload.*

Line voltage outside allowable limits or 3-phase imbalance – *request assistance from power company.*

High load condition – *check system charge and/or purge noncondensables.*

Compressor Cycles on High Pressure Switch

Refrigerant overcharge – *purge until charge is correct. See charging chart*

Noncondensables in system – *purge and recharge.*

Discharge line restricted – *remove restriction.*

Reversing valve damaged – *replace or repair reversing valve.*

Fan cycling on overload – *check fan motor capacitor, fan motor compressor leads or fan relay.*

Filter or coils dirty – *clean or replace filter. Clean coils.*

HEATING CYCLE (INSUFFICIENT HEATING)

Compressor Runs (Low Suction and Low Head Pressure; Outdoor Fan Stopped)

Defrost relay defective – *replace relay.*

Outdoor fan motor leads loose – *tighten motor connections*

Fan motor protection open – *replace motor.*

Fan motor burned out – *replace motor.*

Compressor Runs (Low Suction and Low Head Pressure; Outdoor Fan Running)

Suction valve partially closed – *open valve.*

Filter-drier restricted – *replace filter-drier.*

Expansion valve restricted or clogged – *replace expansion valve and filter-drier.*

Indoor check valve defective – *replace check valve.*

System undercharged – *add refrigerant; see charging chart.*

Outdoor coil dirty – *clean coil.*

Outdoor coil heavily frosted – *check defrost circuit electrical connections. Check physical contact between defrost thermostat sensing bulb and liquid line. Replace defrost relay, defrost thermostat, defrost timer or reversing valve.*

Compressor Runs (High Suction Pressure and Low Superheat)

Compressor flooding – *check position and/or seal of outdoor check valve. Check expansion valve operation.*

Outdoor check valve leaking or backwards – *replace check valve.*

Outdoor expansion valve stuck open – *replace expansion valve.*

Electric Resistance Strip Heater Not Operating

Outdoor thermostat defective – *check capillary tubing for pinches Check to be sure sensing bulb senses true outdoor temperature.*

Outdoor thermostat set too low – *reset thermostat.*

Heater relay or contactor defective – *replace relay or contactor*

Fuses blown – *replace fuses*

Fuse link open – *replace fuse link.*

Heater element broken – *replace element.*

Overtemperature thermostat defective or open – *replace overtemperature thermostat or check air flow over heater element enclosure.*

Defective room thermostat second stage – *replace thermostat assembly.*

COOLING CYCLE (INSUFFICIENT COOLING)

Compressor Cycles on High Pressure Switch

Outdoor air restricted or recirculating – *clean debris from coils or fans Remove shrubbery or foliage. Install baffles to improve air flow.*

Outdoor fan stopped – *check fan power, operation of fan relay or defrost relay. Replace defective or damaged parts.*

Compressor Cycles on Low Pressure Switch (Indoor Fan Stopped)

Indoor fan motor or relay defective – *replace motor or relay. Check motor protection.*

Electrical connections loose – *check and tighten all connections.*

Fan belt slips or is broken – *adjust belt tension or replace belt.*

Compressor Cycles on Low Pressure Switch (Indoor Fan Running)

Indoor air coil iced up – *check expansion valve and refrigerant charge.*

Refrigerant charge low – *add charge; see charging chart.*

Expansion valve closed or plugged – *clean or replace expansion valve.*

Filter-drier restricted – *replace filter-drier.*

Outdoor check valve restricted or backwards – *replace check valve.*

Compressor Runs (Low Suction Pressure)

Coil frosted – *clean or replace air filter.*

Ducts restricted – *clean ductwork.*

Dampers partially closed – *adjust dampers correctly.*

Refrigerant charge low – *add charge; see charging chart.*

Liquid line restricted – *replace filter-drier if restricted. Replace expansion valve power element if defective. Replace outdoor check valve if stuck.*

Compressor Runs (High Suction; Low Head Pressure)

Reversing valve hung up or leaks internally – *replace reversing valve.*

Compressor valves or head gasket defective – *replace valves or gasket.*

Compressor Runs (High Suction Pressure; Low Superheat)

Compressor flooding – *check position and/or seal of indoor check valve. Check expansion valve operation.*

Indoor expansion valve stuck open – *replace expansion valve.*