Number One Air Conditioning Maker
Carrier
Division of Carrier Corporation
Syracuse, New York

Installation, Start-Up and Service Instructions

38AD
012,014,016

Condensing Units

Air-Cooled — Remote

INSTALLATION

Lifting Unit — Do not sling unskidded unit. Use spreader bars to prevent slings from damaging unit panels. Do not roll unskidded unit on pipes or rollers.

Skid Removal — Remove the 4 bolts holding top frame in place and lift frame from unit.

Remove compressor compartment end panel. Raise and block up compressor end of unit about 10 inches. Remove 4 bolts and nuts, 2 in end corners and 2 where compressor and condenser sections meet. Lower unit. Raise and block opposite end. Remove remaining 2 bolts and nuts.

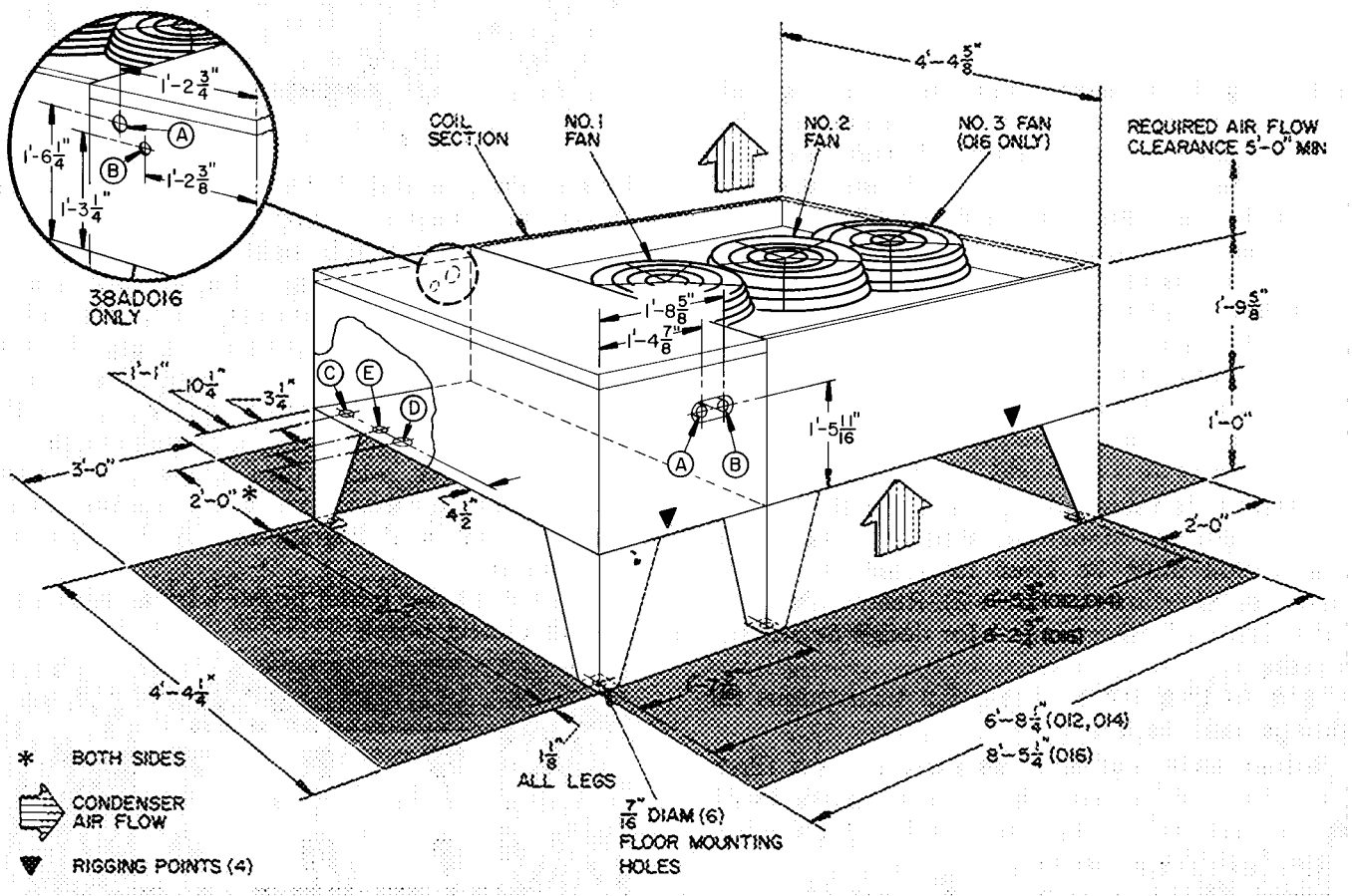
Position Unit so air flow is unrestricted for at least 2 ft on each side, 3 ft on each end, and for at least 5 ft above unit top. See Fig. 1.

Erect Unit using legs attached to unit base skid.

Block up or suspend unit. Bolt leg to each corner of unit. Bolt 2 legs to bottom of unit where compressor and coil sections meet. Lower unit.

Compressor Mounting — As shipped, compressor is held tight by self-locking bolts.

BEFORE STARTING UNIT — Loosen self-locking bolts until the flanged washer is still snug but can be moved sidewise. *Do not remove shipping bolts.*



LEGEND

A — 1-3/8-in. ODF Suction Line Conn. 2-1/2-in. Diam Hole
B — 5/8-in. ODF Liquid Line Conn. 7/8-in. Diam Hole
C — 3/4-in. Thermostat Conn. 7/8-in. Diam Hole
D — 1-1/4-in. Electrical Conn. 1-3/4-in. Diam Hole
E — 3/4-in. Fan Coil Control Wire Conn. 7/8-in. Diam Hole

Certified dimension drawings are available on request.

→ **Fig. 1 — Physical Data and Dimensions**

Table 1 — Physical Data (60-Hz)

UNIT 38AD	012	014	016
OPER WT (lb)	770	805	970
REFRIGERANT	22	22	22
COMPRESSOR	Recip Hermetic 6 Cyl; 1750 Rpm		
Model No.	06DD328	06DD537	06DD537
Oil (pts) Suniso 3GS or Capella BI	10	10	10
Crankcase Htr Watts	75	75	75
Unloader Setting			
Load	70 ± 1 psig	70 ± 1 psig	70 ± 1 psig
Unload	60 ± 2 psig	60 ± 2 psig	60 ± 2 psig
OUTDOOR AIR FANS	Axial Flow; Direct Drive		
No. ...Rpm	2...1085	2 ..1085	3...1120
Diam (in.)	22	22	22
Motor Hp (NEMA)	½	½	½
Nom Cfm Total	8800	8000	13,000
CONDENSER COIL			
Face Area (sq ft)	19 1	19.1	26.2
Storage Cap. (lb)*	17.7	26.5	51
CONTROLS			
Pressurestat Settings			
High Cutout	400 ± 5 psig	400 ± 5 psig	364 ± 5 psig
Cut-In	300 ± 20 psig	300 ± 5 psig	264 ± 15 psig
Low Cutout	29 ± 5 psig	29 ± 5 psig	29 ± 5 psig
Cut-In	64 ± 10 psig	64 ± 10 psig	64 ± 5 psig
Fan-Cycling Thermo.			
No. 2 Opens	60 ± 2 F	60 ± 2 F	70 F
Closes	65 ± 4 F	65 ± 4 F	75 F
No. 3 Opens	–	–	57 F
Closes	–	–	62 F
FUSIBLE PLUG	200 F	200 F	200 F

*Storage capacity is with condenser 80% full of liquid R-22 at 130 F for 38AD012 and 014, and 120 F for 38AD016.

Fan-Cycling Thermostat temperature sensing bulb and coiled capillary are taped to compressor conduit in compressor compartment for shipment. Carefully remove tape and uncoil capillary. Route bulb and capillary behind compressor and out of compressor compartment thru space under right-hand condenser coil. Do not kink or damage capillary or sensing bulb.

Position sensing bulb in inlet airstream. With mounting clamp and hardware provided in parts package, secure sensing bulb to lower tube sheet near compressor so that it does not touch coil fins. Be sure airstream across bulb is unrestricted and that bulb does not receive direct sunlight.

Refrigerant Line Sizes will depend on length of piping required between condensing unit and evaporator. Consideration must be given to liquid lift and to compressor oil return (see Table 2). Refer to Part 3 of Carrier System Design Manual for design details and line sizing.

Refer to Evaporator Installation Instructions for additional information.

Refrigerant Drier and Moisture Indicator — A filter-drier and a liquid-moisture indicator are shipped with unit for field installation (Table 2). Install according to manufacturer's instructions.

Receiver — No receiver is provided with unit. It is recommended that one *not* be used.

Piping Procedure — Do not remove plastic dust plugs from suction and liquid line stub in compressor compartment until piping connections are ready to be made. Pass nitrogen or other inert gas thru piping while brazing, to prevent formation of copper oxide.

Install field-supplied thermostatic expansion valve(s) to evaporator section. If two thermostatic expansion valves are installed for two-step cooling, install field-supplied liquid line solenoid valve ahead of second expansion valve.

Install filter-drier in the common liquid line just ahead of both expansion valves.

Table 2 — Liquid Line Data

UNIT MODEL 38AD	MAX ALLOW. LIQUID LIFT (ft)	LIQUID LINE		
		Max Allow. Press. Drop (psi)	Max Allow. Temp Loss (F)	Filter-Drier and Sight Glass Flare Conn.* (in.)
012	75	7	1.5	⅝
014	50	7	1.5	⅝
016	78	7	1.0	⅝

*Inlet and outlet

Safety Relief — A fusible plug is located on compressor crankcase (Fig. 2). Do not cap this plug.

If local code requires additional safety devices, install them as directed.

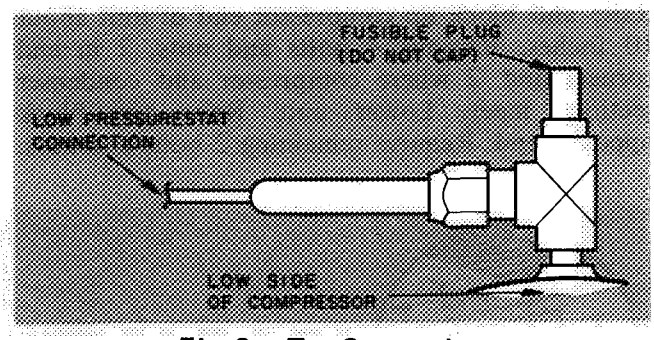


Fig. 2 — Tee Connection

Power Wiring — Unit is factory wired for voltage shown on nameplate. Provide an adequate fused disconnect switch within sight of unit and out of reach of children. Provision for locking switch open (off) is advisable to prevent power from being turned on while unit is being serviced, especially if disconnect is not visible from unit. Disconnect switch, fuses, and field wiring must comply with National Electrical Code and local requirements.

Route power wires thru openings in unit bottom panel to connections in unit control box as shown on unit label diagram and Fig. 3. Unit must be grounded.

Affix crankcase heater power warning sticker to unit disconnect switch.

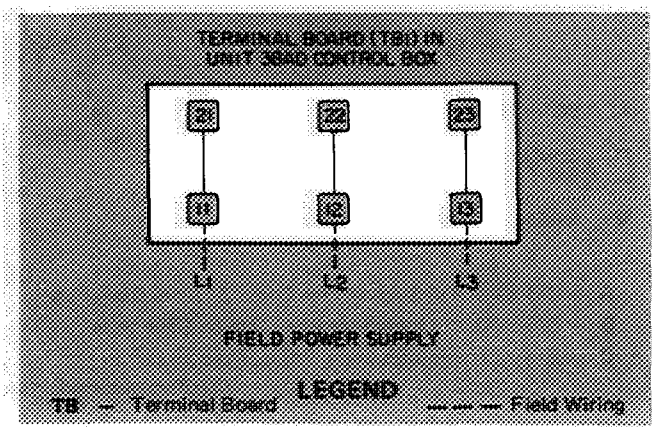


Fig. 3 — Main Power Supply

→ **Table 3 — Electrical Data (60-Hz)**

UNIT MODEL 38AD		V/PH Nom	V/PH Min-Max	MWA	ICF	FU	COMPR FLA	COMPR LRA	FANS FLA (ea)*
012	410	208/3	187-229	68	198	80	49.3	191	3 2
	510	230/3	198-254	62	179	70	44 3	172	3 2
	610	460/3	414-506	31	89	35	22.2	86	1 6
	110	575/3	518-632	24	71	30	17.9	69	1 0
014	400	208/3	187-229	86	184	100	63.6	173/266	3 2
	500	230/3	198-254	78	166	90	57.2	150/240	3 2
	600	460/3	414-506	39	123	45	28 6	120	1 6
	100	575/3	518-632	32	99	35	22.9	96	1.0
016	400	208/3	187-229	86	184	100	64.0	173/266	3 2
	500	230/3	198-254	78	166	90	58.0	150/240	3.2
	600	460/3	414-506	39	123	45	29.0	120	1.6
	100	575/3	518-632	32	99	40	23.0	96	1 0

Values are for part-winding start.

FLA — Full Load Amps
FU — Fuse (max allowable amps; dual element)
ICF — Max Instantaneous Current Flow (during start-up; sum of compressor LRA plus FLA of all other motors in the unit)
LRA — Locked Rotor Amps
MWA — Minimum Wire Amps per NEC
*Units 38AD012 and 014 have two; unit 38AD016 has three.

Control Circuit Wiring — Control voltage is 115 volts. Install a field-supplied 115-volt thermostat with minimum rating of one amp (Fig. 4).

If a 24-volt thermostat assembly is to be used, install Accessory Relay Package 38AD900001 (Fig. 5) above terminal board (TB2) in unit control box. Three field-supplied no. 10 sheet metal screws are required. Control box back panel holes are predrilled.

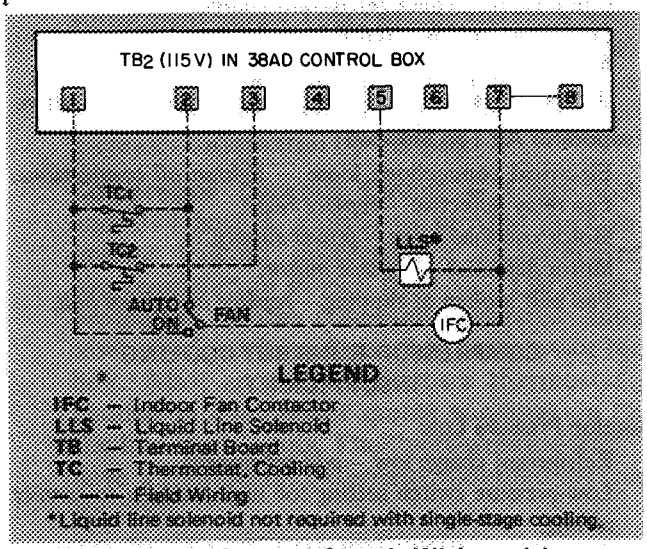


Fig. 4 — Control Circuit Wiring with 115-Volt Accessories

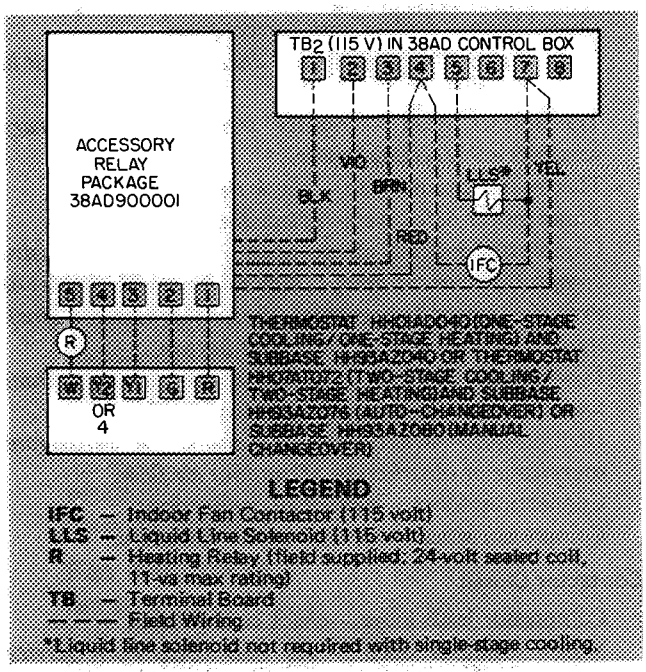
Winter Start Control (if required) — Reset and relocate the unit low pressurestat and install field-supplied defrost thermostat (Carrier part no. 50BB900001).

LOW PRESSURESTAT — Isolate compressor by frontseating discharge and suction service valves. Relieve compressor pressure. Reset the unit low pressurestat to 5 psig. Disconnect the low pressurestat capillary from compressor crankcase and cap the unused 1/4-in. flare fitting on the compressor.

Backseat liquid line service valve to shut service port. Connect the low pressurestat capillary to the liquid line service valve service port. Open service port and compressor service valves.

DEFROST THERMOSTAT — Control is not waterproof or moisture resistant. Protect control against direct contact with moisture or condensation of moisture on switch insulator. Mount control with approximately 2 in. of top of thermostat capillary passing thru lower part of evaporator coil and with remainder of capillary inserted between fins on entering air side of coil. Connect thermostat electrical contacts into indoor cooling thermostat circuit or in series with compressor holding coil.

NOTE: Defrost thermostat must be used on all systems operating with outdoor temperatures below 45 F.

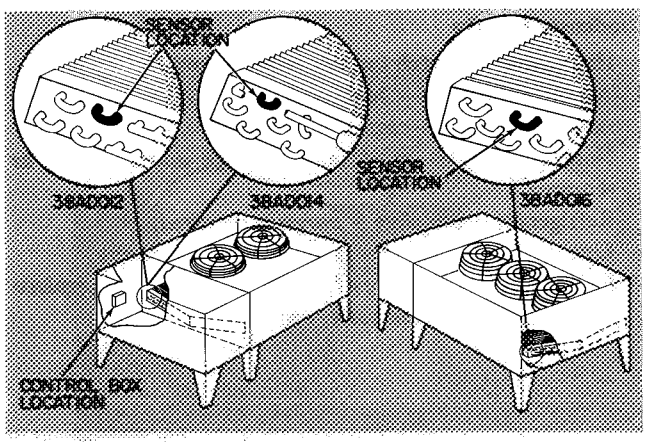


→ **Fig. 5 — Control Circuit with 24-Volt Accessories**

Motormaster® (32 Series) Head Pressure Controller — Refer to Installation Instruction shipped with this accessory plus the following information.

Control box and sensor (thermistor) location is shown in Fig. 6.

Electrical connections are shown in Fig. 7. Refer to unit label diagram as required.



→ **Fig. 6 — Motormaster® Control Box and Sensor Location**

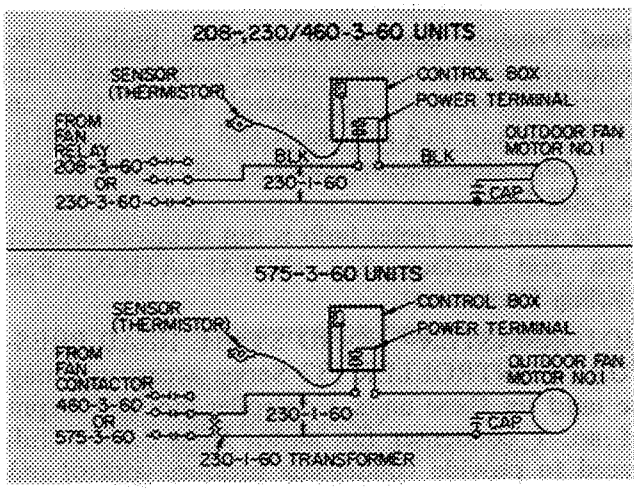


Fig. 7 — Motormaster® Electrical Connections

On 208-, 230- and 460-volt units, outdoor fan motor no. 1 (OFM1) is suitable for use with Motormaster® without modification.

On 575-volt units, install a field-supplied 1 kva transformer (Carrier part no. HT01AH959) and replace 575-volt outdoor fan motor no. 1 with 230-1-60 motor (Carrier part no. HC44VL851 or HC44VE851) and add field-supplied capacitor (Carrier part no. HC96FH007).

INITIAL START-UP

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

Leak Test the entire refrigerant system by the pressure method described in the Carrier Standard Service Techniques Manual, Chapter 1, Section 1-6. Use R-22 at approximately 25 psig backed up with an inert gas to a total pressure not to exceed 245 psig.

Before Starting Unit check the following:

1. Compressor oil level must be at least within sight in each compressor crankcase. 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. Crankcase heater must be firmly locked into the compressor crankcase.

Energize Branch Circuit — *Set room thermostat above ambient.* Close field disconnect switch. Be sure that compressor crankcase heaters are operating. Allow crankcase heaters to operate a minimum of 24 hours before starting unit.

To Start Unit *set room thermostat below ambient.* After starting unit there will be a delay of at least 15 seconds before compressor starts.

To Charge System — Add refrigerant to system using weight method as described in Standard Service Techniques Manual plus the following:

1. Before starting compressor, charge system with initial charge for liquid seal (Table 4).
2. Start condensing and evaporator units and charge to a clear sight glass using Charging by Sight Glass procedure. Restrict air flow thru condenser coil with a sheet of plywood or cardboard to achieve condensing temperature shown in Table 4.
3. Add additional refrigerant vapor as shown in Table 4 to fill subcooler coils using Charging by Weight Procedure.

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

Table 4 — Charging Data (R-22)

UNIT MODEL 38AD	REFRIG CHG (lb)		CONDENSING TEMPERATURE DURING CHARGING (F)
	Initial For Liquid Seal	Sub Cooler*	
012	10	3	130
014	13	2	130
016	14	6	120

*For maximum system capacity without receiver

NOTE:
Values shown do not include charge requirements for cooling coils and system piping

SERVICE

Capacity Control is accomplished by a suction pressure actuated unloader which controls two cylinders. Unloaders are factory set, as shown in Table 1, but may be field adjusted.

CONTROL SET POINT (cylinder load point) is adjustable from 0 to 85 psig. To adjust, turn control set point adjustment nut (Fig. 8) clockwise to its bottom stop. In this position, set point is 85 psig. Then, turn adjustment counterclockwise to desired control set point. Every full turn counterclockwise decreases set point by 7.5 psig.

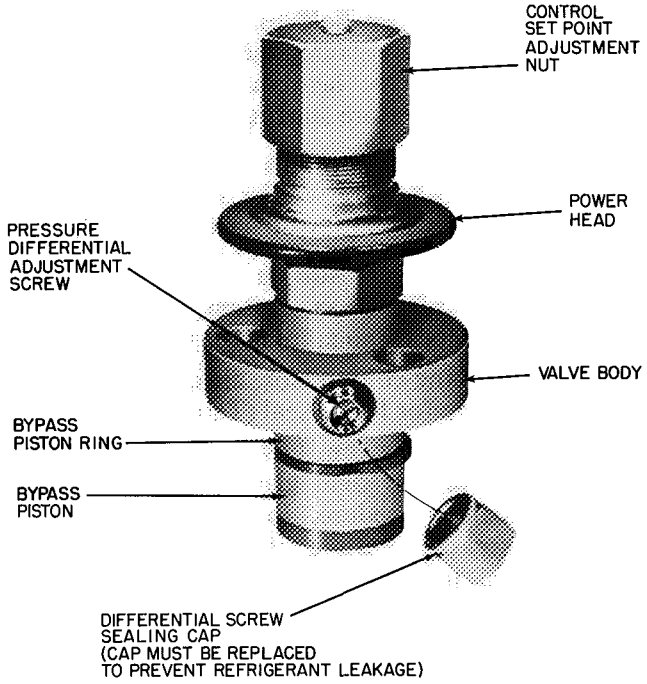


Fig. 8 – Compressor Capacity Control Unloader

PRESSURE DIFFERENTIAL (difference between cylinder load and unload points) is adjustable from 6 to 22 psig. To adjust, turn pressure differential adjustment screw (Fig. 8) counterclockwise to its back stop position. In this position, differential is 6 psig. Then, turn adjustment clockwise to desired pressure differential. Every full turn clockwise increases differential by 1.5 psig.

Compressor Lockout Circuit – Units 38AD012 and 014 have a control to provide positive compressor lockout protection if an overcurrent or overtemperature device trips out. The overcurrent protection devices (thermally actuated, automatic reset overloads) are located in compressor terminal box. Also, an overtemperature thermostat is imbedded in compressor motor windings on "across-the-line start" units. The "part-winding-start" units have a thermostat externally mounted on compressor body.

TO RESTART COMPRESSOR – After determining cause of compressor lockout and performing required corrective action, push reset button on control box door.

The lockout circuit will automatically reset after shutdown due to power failure.

Time Guard Circuit for each compressor provides for a 5-minute delay before restarting compressor after shutdown for any reason. On start-up, the Time Guard Timer causes a delay of 15 seconds after thermostat closes, and fans start before compressor will start. On 38AD012 and 014; 460- and 575-volt units outdoor air fan no. 2 starts up with compressor. On compressor shutdown the timer recycles for 4 minutes 45 seconds. During this time the compressor cannot restart.

Head Pressure Control – A feeler bulb in the condenser inlet airstream senses temperature of air entering condenser to control no. 2 fan on 38AD012 and 014 and no. 2 and 3 on 38AD016. Open and close temperatures of switch are shown in Table 1.

Be sure that feeler bulb is not in direct contact with coil surface. See INSTALLATION, Fan Cycling Thermostat.

MOTORMASTER® SOLID STATE HEAD PRESSURE CONTROLLER (32 Series accessory) may be used on these units. Controller modulates rpm of no. 1 condenser fan motor from zero to full speed to provide condensing pressure control and operation at lower ambient temperatures.

On 460-volt units, install a field-supplied transformer and rewire condenser fan motor no. 1 for 230 volts.

On 575-volt units, install a field-supplied transformer and replace 575-volt motor with 230-volt motor (Carrier part no. HC44VL851 or HC44VE851).

Crankcase Heater prevents refrigerant migration and compressor oil dilution during shutdown whenever compressor is not operating.

Both compressor service valves must be closed whenever crankcase heater is de-energized for more than six hours.

Fan Adjustment – Turn unit power off. Remove fan guard and loosen hub setscrew. Adjust fan until top surface of hub is 3/8 in. below top of venturi rim as shown in Fig. 7. Then, tighten setscrew on flat of motor shaft. Replace rubber hubcap. If rubber hubcap is missing, seal fan hub recess with permagum to prevent hub from rusting to motor shaft.

Lubrication

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

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 the system has been in operation.

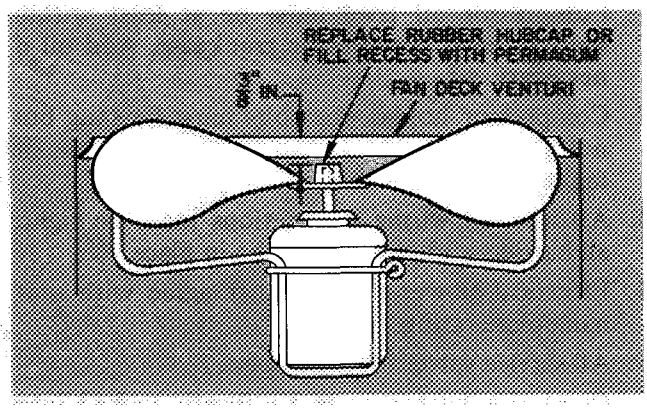


Fig. 9 – Fan Adjustment

To Add or Remove Compressor Oil

1. Pump down compressor to 2 psig and close suction and discharge service valves. Vent remaining pressure in compressor to atmosphere.
2. Add oil thru oil filler connection.
3. To remove oil, remove compressor crankcase oil drain plug.

Refer to Carrier Standard Service Techniques Manual, Chapter 1, for complete instructions on checking, adding or removing compressor oil.

Cleaning Coils – The coils can be cleaned with a vacuum cleaner, washed out with water, blown out with compressed air, or brushed. Fan motors are drip proof but not waterproof.

TROUBLESHOOTING GUIDE

COMPRESSOR DOES NOT RUN

Contactor Open

Power off – *restore power.*
Fuses blown – *replace with correct fuses.*
Control circuit breaker open – *check for short circuit in control wiring.*
Transformer dead – *replace transformer if primary windings are receiving power.*
Thermostat circuit open – *check thermostat setting.*
Timer motor defective – *replace timer.*
Compressor lockout circuit open – *check for excessive compressor current draw (140% FLA max allowable) or excessive motor temperature (motor thermostat opens). After corrective action, press reset button.*
Low-pressure switch open – *check for refrigerant undercharge or obstruction of indoor air flow.*
High-pressure switch open – *check for refrigerant overcharge or obstruction of outdoor air flow.*
Connections loose – *tighten all connections.*
Compressor stuck – *see 06D service literature.*

Contactor Closed

Compressor leads loose – *check connections.*
Motor windings open – *see 06D compressor service literature.*
Single phasing – *replace blown fuse.*

Contactor Closed Then Open

If compressor lockout circuit is open – *see Contactor Open.*
If compressor lockout circuit is closed – *see Compressor Cycles on High- (or Low-) Pressure Switch.*

COMPRESSOR CYCLES ON HIGH-PRESSURE SWITCH

Condenser Fan On

High-pressure switch faulty – *replace switch.*
Air flow restricted – *remove obstruction.*
Air recirculating – *clear airflow area.*
Noncondensables in system – *purge and recharge as required.*
Refrigerant overcharge – *purge as required.*
Line voltage incorrect – *consult power company.*
Refrigerant system restrictions – *check or replace filter-drier, expansion valve, etc.*

Condenser Fan Off

Fan slips on shaft – *tighten fan hub setscrews.*
Motor not running – *check power and capacitor.*
Motor bearings stuck – *replace bearings.*
Motor overload open – *check overload rating. Check for fan blade obstruction.*
Motor burned out – *replace motor.*

COMPRESSOR CYCLES ON LOW-PRESSURE SWITCH

Evaporator Air Fan Running

Filter-drier plugged – *replace filter-drier.*
Expansion valve power head defective – *replace power head.*
Low refrigerant charge – *add charge. Check low-pressure switch setting.*

Air Flow Restricted

Coil iced up – *check refrigerant charge.*
Coil dirty – *clean coil fins.*
Air filter dirty – *clean or replace filters.*
Dampers closed – *check damper operation and position.*

Evaporator Air Fan Stopped

Electrical connections loose – *tighten all connections.*
Fan relay defective – *replace relay.*
Motor overload open – *power supply.*
Motor defective – *replace motor.*
Fan belt broken or slipping – *replace or tighten belt.*

COMPRESSOR RUNS BUT COOLING INSUFFICIENT

Suction Pressure Low

Refrigerant charge low – *add refrigerant.*
Low-pressure switch setting too high – *adjust to correct setting.*
Head pressure low – *check refrigerant charge. Check condenser air fan thermostat settings.*
Air filters dirty – *clean or replace filters.*
Expansion valve power head defective – *replace power head.*
Evaporator coil partially iced – *check low-pressure setting.*
Evaporator air flow restricted – *remove obstruction.*

Suction Pressure High

Compressor valves defective – *see 06D service literature.*
Heat load excessive – *check for open doors or windows.*