Technical Publications
Litho U.S.A.

INSTALLATION INSTRUCTIONS

⚠WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer, service agency or the gas supplier

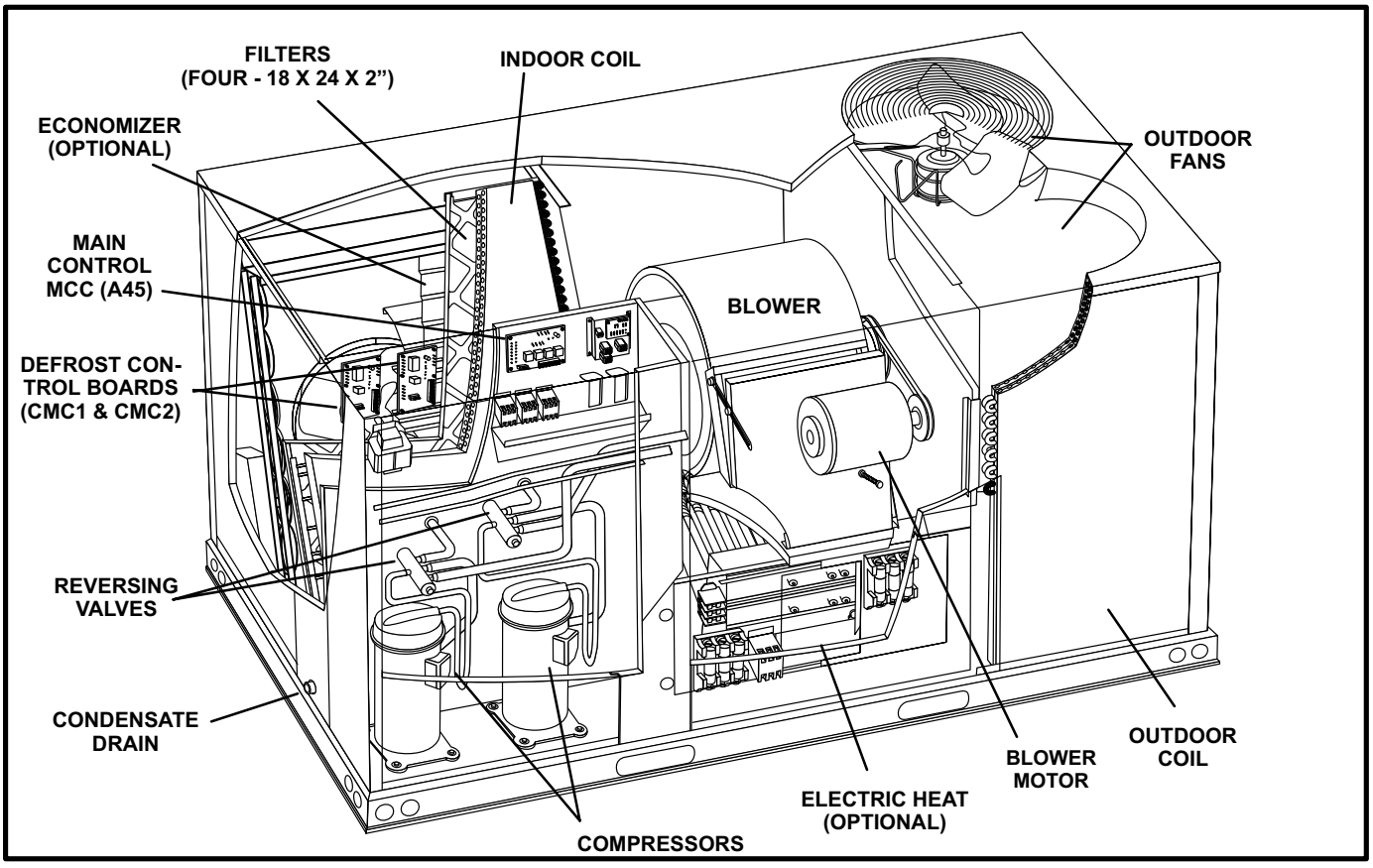
RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

THA090 (7-1/2 TON)
THA102 (8-1/2 TON)
THA120 (10 TON)
THA150 (12 TON)

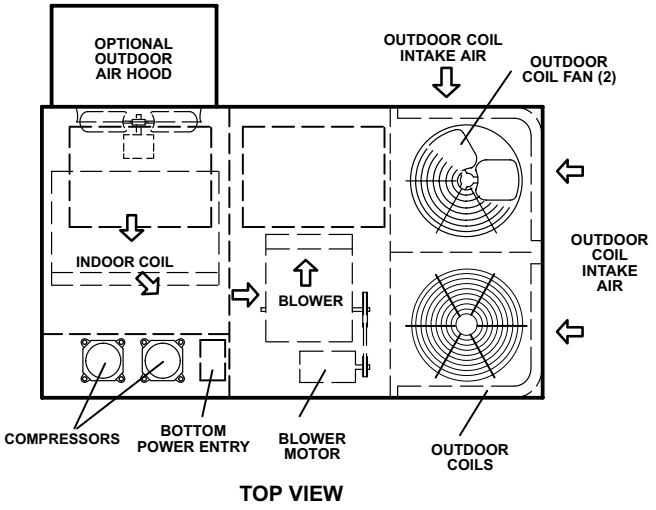
HEAT PUMP PACKAGED UNITS
505,199M
10/2006
Supersedes 4/2006

Table Of Contents

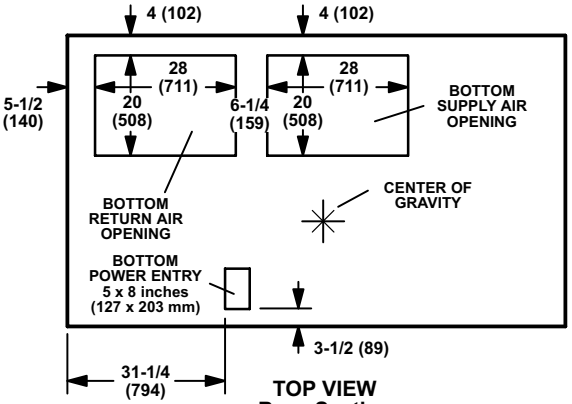
THA090, 102, 120 & 150 PARTS ARRANGEMENT



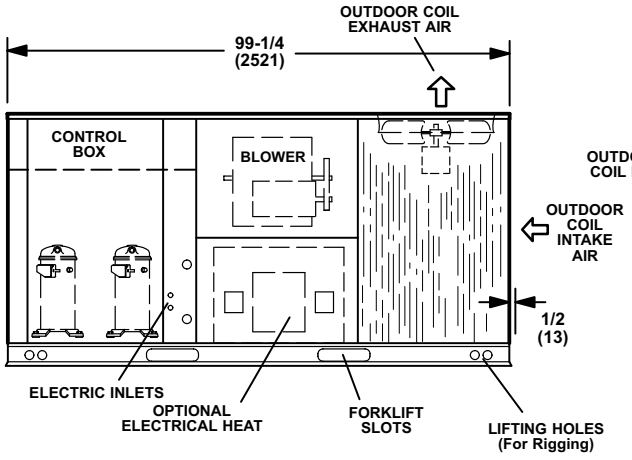
THA090, 102, 120, & 150 DIMENSIONS



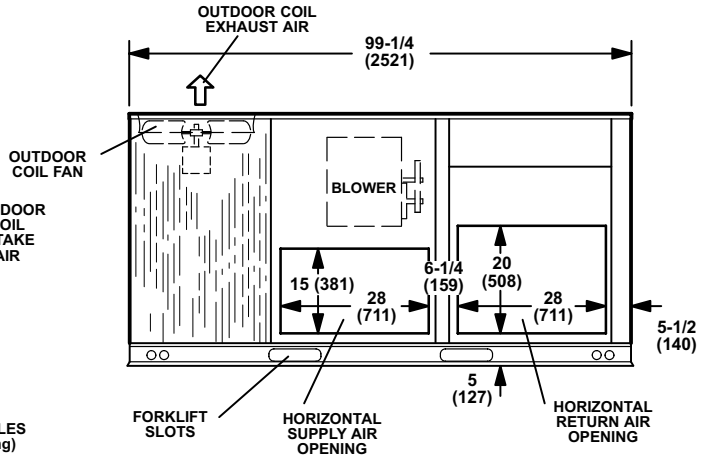
TOP VIEW



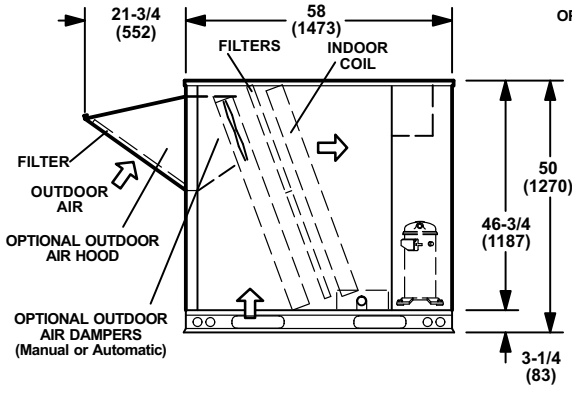
TOP VIEW
Base Section



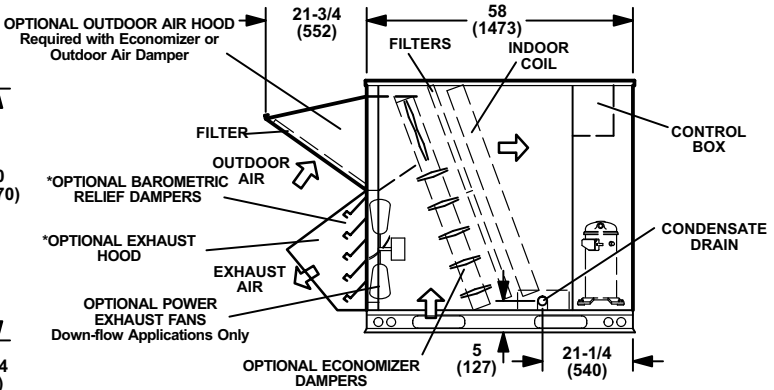
SIDE VIEW



SIDE VIEW (Horizontal Openings)



END VIEW
(Outdoor Air Dampers)



END VIEW
(Economizer/Barometric Relief/Power Exhaust)

*NOTE — Installed in Return Air Duct for Horizontal Applications.

Shipping and Packing List

Package 1 of 1 contains:

1- Assembled unit

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

General

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

Availability of units and options varies by brand.

Requirements

The THA unit is ETL/CSA certified for outdoor installations only at the clearances to combustible materials listed on unit nameplate and in figure 1.

Installation of THA heat pumps must conform with standards in National Fire Protection Association (NFPA) "Standard for Installation of Air Conditioning and Ventilating Systems NFPA No. 90A," "Standard for Installation of Residence Type Warm Air Heating and Air conditioning Systems NFPA No. 90B," local municipal building codes and manufacturer's installation instructions.

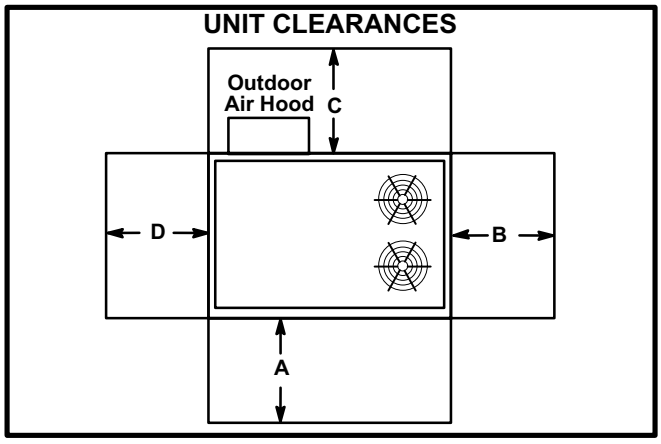


FIGURE 1

[1]Unit Clearance	A in.(mm)	B in.(mm)	C in.(mm)	D in.(mm)	Top Clearance
Service Clearance	60 (1524)	36 (914)	36 (914)	36 (914)	Unob-structed
Minimum Opera-tion Clearance	36 (914)	36 (914)	36 (914)	36 (914)	Unob-structed

Note - Entire perimeter of unit base requires support when elevated above mounting surface.

[1] **Service Clearance** - Required for removal of serviceable parts.
Minimum Operation Clearance - Required clearance for proper unit operation.

The National Electric Code (ANSI/NFPA No. 70-1984) is available from:

National Fire Protection Association
1 Batterymarch Park
PO Box 9101
Quincy, MA 02269-9101

The THA unit is ETL/CSA certified as a heat pump with cooling and with or without auxiliary electric heat for non-residential use only at the clearances to combustible materials as listed on the unit nameplate and in figure 1.

Installation of ETL/CSA certified units must conform with current standard C273.5 "Installation Requirements for Heat Pumps" and applicable local codes. Authorities having jurisdiction should be consulted before installation.

Use of this unit as a construction heater or air conditioner is not recommended during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

If this unit has been used for heating or cooling of buildings or structures under construction, the following conditions must be met or the warranty will be void:

- A room thermostat must control the unit. The use of fixed jumpers that will provide continuous heating or cooling is not allowed.
- A pre-filter must be installed at the entry to the return air duct.
- The return air duct must be provided and sealed to the unit.
- Return air temperature range between 55°F (13°C) and 80°F (27°C) must be maintained.
- Air filters must be replaced and pre-filter must be removed upon construction completion.
- The unit components, duct system, air filters and evaporator coil must be thoroughly cleaned following final construction clean-up.
- The unit operating conditions (including airflow, cooling operation, and heating operation) must be verified according to these installation instructions.

⚠WARNING

Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off electrical power to unit before performing any maintenance or servicing operations on the unit.

⚠CAUTION

Danger of sharp metallic edges. Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.

⚠IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.

Unit Support

NOTE - Securely fasten roof frame to roof per local codes.

A-Downflow Discharge Application

Roof Mounting with LARMF10/15

1- The LARMF10/15 roof mounting frame must be installed, flashed and sealed in accordance with the instructions provided with the frame.

2- The LARMF10/15 roof mounting frame should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.

3- Duct must be attached to the roof mounting frame and not to the unit; supply and return plenums must be installed before setting the unit.

Installer's Roof Mounting Frame

Many types of roof frames can be used to install the unit, depending upon different roof structures. Items to keep in mind when using the building frame or supports are:

1- The unit base is fully enclosed and insulated, so an enclosed frame is not required.

2- The frames or supports must be constructed with non-combustible materials and should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.

3- Frame or supports must be high enough to prevent any form of moisture from entering unit. Recommended minimum frame height is 14" (356mm).

4- Duct must be attached to the roof mounting frame and not to the unit. Supply and return plenums must be installed before setting the unit.

5- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

NOTE-When installing unit on a combustible surface for downflow discharge applications, the LARMF10/15 roof mounting frame is required.

B-Horizontal Discharge Applications

1- Units installed in horizontal airflow applications must use a horizontal conversion kit.

2- Specified installation clearances must be maintained when installing units. Refer to figure 1.

3- Top of support slab should be at least 4" (102mm) above the finished grade and located so no run-off water from higher ground can collect around the unit.

4- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

Duct Connection

All exterior ducts, joints, and openings in roof or building walls must be insulated and weatherproofed with flashing and sealing compounds in accordance with applicable codes. Any duct passing through an unconditioned space must be insulated.

⚠ CAUTION

In downflow applications, do not drill or punch holes in base of unit. Leaking in roof may occur if unit base is punctured.

Rigging Unit For Lifting

1- Detach wooden base protection before rigging.

2- Connect rigging to the unit base using both holes in each corner. See figure 2.

3- All panels must be in place for rigging.

4- Place field-provided H-style pick in place just above top edge of unit. Frame must be of adequate strength and length. (H-style pick prevents damage to unit.)

UNIT	WEIGHT*	
	LBS.	KG.
090, 102	1390	631
120, 150	1440	653

*Maximum weight with all available installed accessories.

Lifting Point Should Be Directly Above Center Of Gravity.

CAUTION: DO NOT WALK ON UNIT.

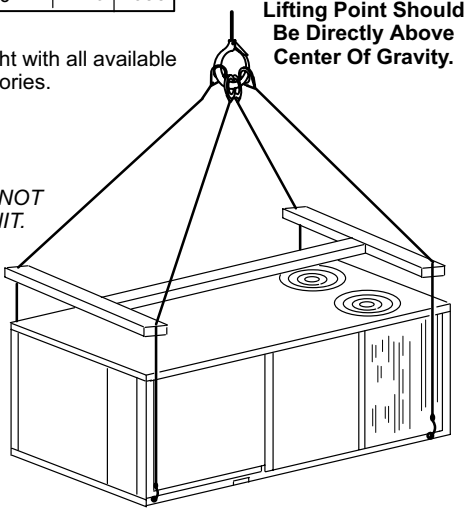


FIGURE 2

Condensate Drains

Remove cap and make drain connection to the 1" N.P.T. drain nipple provided on unit. A trap must be installed between drain connection and an open vent for proper condensate removal. See figure 3. It is sometimes acceptable to drain condensate onto the roof or grade; however, a tee should be fitted to the trap to direct condensate downward. The condensate line must be vented. Check local codes concerning condensate disposal. Refer to pages 1 and 2 for condensate drain location.

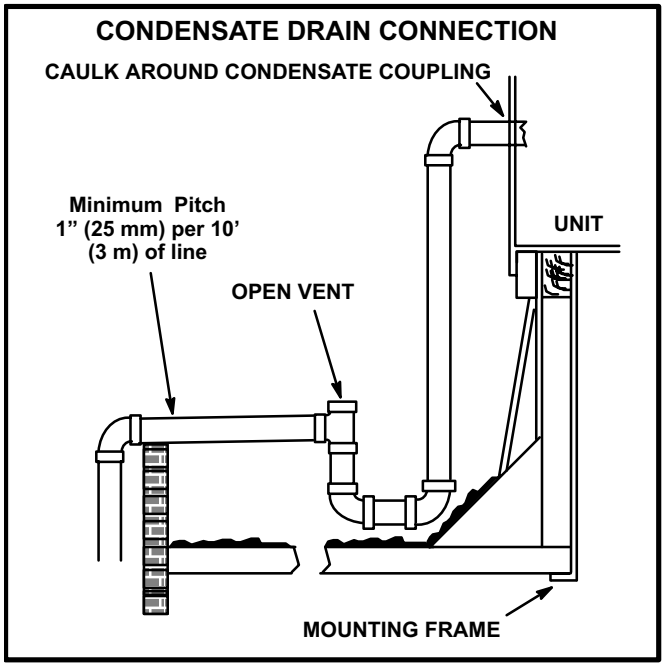


FIGURE 3

Electrical Connections

POWER SUPPLY

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram. Figure 5 shows a typical unit wiring diagram.

Refer to unit nameplate for minimum circuit ampacity and maximum fuse size.

1- 230,460,575 volt units are factory wired. **For 208V supply**, disconnect the orange wire (230V) at all control power transformer(s). Reconnect the red wire (208V). Tape the exposed end of the 230V orange wire.

2- Route power through the bottom power entry area and connect to L1, L2, and L3 on the top of K2 in control area. Route power to TB2 on units equipped with electric heat. Secure power wiring with factory-installed wire ties provided in control box. See unit wiring diagram.

CONTROL WIRING

A-Thermostat Location

Room thermostat mounts vertically on a standard 2” X 4” handy box or on any non-conductive flat surface.

Locate thermostat approximately 5 feet (1524 mm) above the floor in an area with good air circulation at average temperature. Avoid locating the room thermostat where it might be affected by:

-drafts or dead spots behind doors and in corners

-hot or cold air from ducts

-radiant heat from sun or appliances

-concealed pipes and chimneys

IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring. Use wire ties located to the left of the MCC board (A45) to secure thermostat cable.

B-Control Wiring

1- Route thermostat cable or wires from subbase to unit control box (refer to unit dimensions to locate bottom and side power entry).

Use18 AWG wire for all applications using remotely installed electro-mechanical and electronic thermostats.

2- Install thermostat assembly in accordance with instructions provided with thermostat.

3- Connect thermostat wiring to TB1 terminal on MCC (A45) control board as shown in figure 4 for electro-mechanical and electronic thermostats. If using other temperature control devices or energy management systems see instructions and wiring diagram provided by manufacturer.

IMPORTANT-Terminal connections at the wall plate or subbase must be made securely. Loose control wire connections may allow unit to operate but not with proper response to room demand.

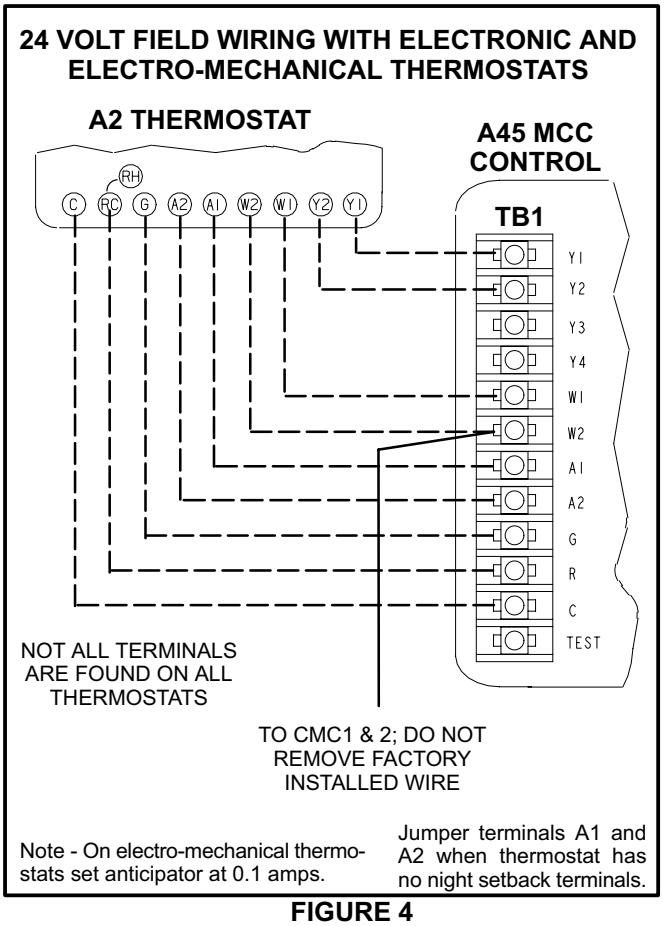
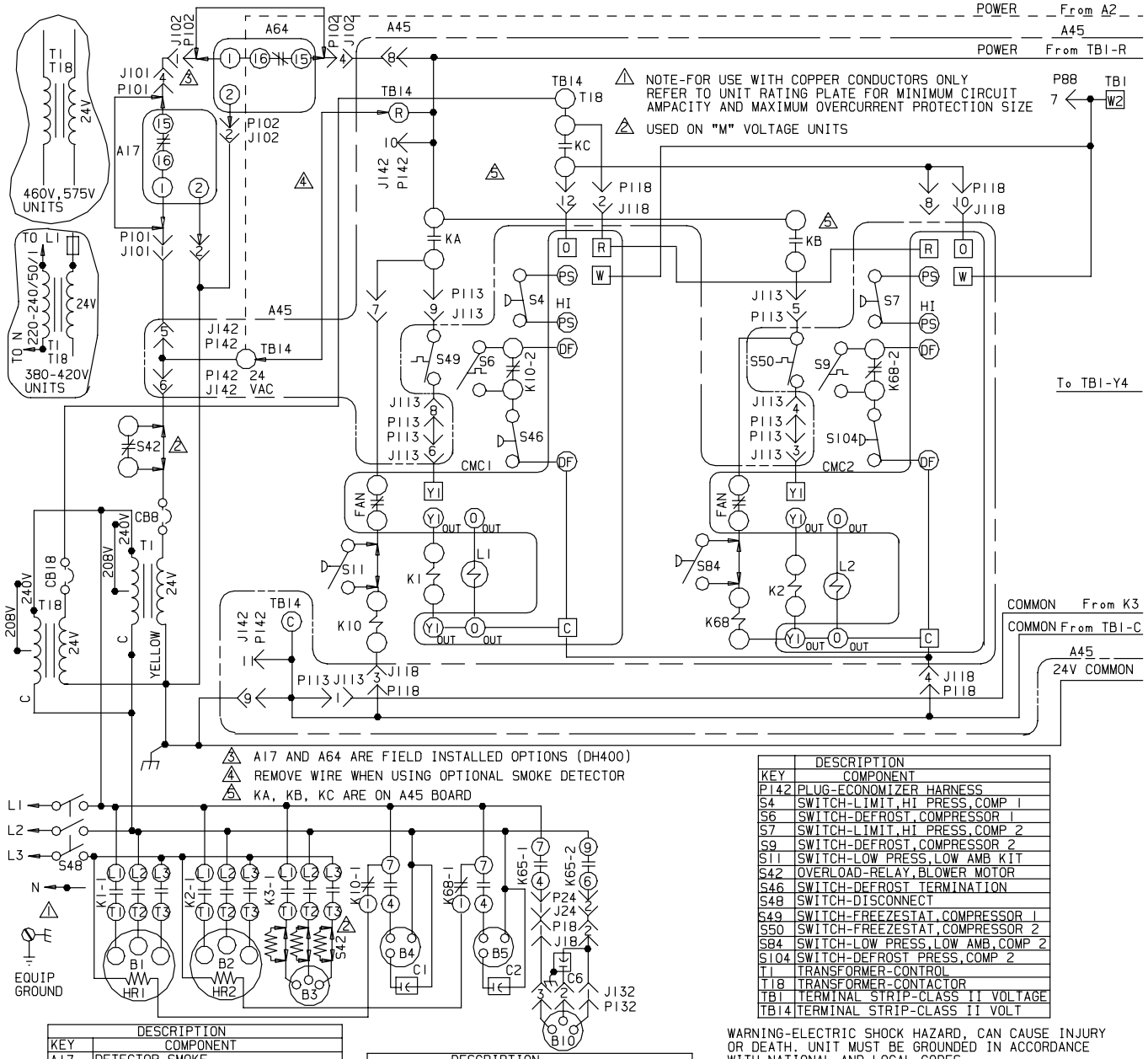


FIGURE 4

TYPICAL THA UNIT WIRING SCHEMATIC



KEY	DESCRIPTION COMPONENT
P142	PLUG-ECONOMIZER HARNESS
S4	SWITCH-LIMIT,HI PRESS,COMP 1
S6	SWITCH-DEFROST,COMPRESSOR 1
S7	SWITCH-LIMIT,HI PRESS,COMP 2
S9	SWITCH-DEFROST,COMPRESSOR 2
S11	SWITCH-LOW PRESS,LOW AMB KIT
S42	OVERLOAD-RELAY,BLOWER MOTOR
S46	SWITCH-DEFROST TERMINATION
S48	SWITCH-DISCONNECT
S49	SWITCH-FREEZESTAT,COMPRESSOR 1
S50	SWITCH-FREEZESTAT,COMPRESSOR 2
S84	SWITCH-LOW PRESS,LOW AMB,COMP 2
S104	SWITCH-DEFROST PRESS,COMP 2
T1	TRANSFORMER-CONTROL
T18	TRANSFORMER-CONTACTOR
TB1	TERMINAL STRIP-CLASS II VOLTAGE
TB14	TERMINAL STRIP-CLASS II VOLT

KEY	DESCRIPTION COMPONENT
A17	DETECTOR-SMOKE
A45	CONTROL-MODULE
A64	DETECTOR-SMOKE,SUPPLY AIR
B1	COMPRESSOR 1
B2	COMPRESSOR 2
B3	MOTOR-BLOWER
B4	MOTOR-OUTDOOR FAN 1
B5	MOTOR-OUTDOOR FAN 2
B10	MOTOR-EXHAUST FAN 1
C1	CAPACITOR-OUTDOOR FAN 1
C2	CAPACITOR-OUTDOOR FAN 2
C6	CAPACITOR-EXHAUST FAN 1
CB8	CIRCUIT BREAKER-TRANS T1
CB18	CIRCUIT BREAKER-TRANS T18
CMC1	TIMER-DEFROST,COMP 1
CMC2	TIMER-DEFROST,COMP 2
HR1	HEATER-COMPRESSOR 1
HR2	HEATER-COMPRESSOR 2
J18	JACK-EXHAUST FAN COMPT
J24	JACK-EXHAUST FAN
J101	JACK-SMOKE DETECTOR,RETURN AIR
J102	JACK-SMOKE DETECTOR,SUPPLY AIR

KEY	DESCRIPTION COMPONENT
J113	JACK-BLOWER & COOL 1 CONT
J118	JACK-COMPRESSOR 3 & 4 CONTROL
J132	JACK-BLOWER,EXHAUST FAN MTR
J142	JACK-ECONOMIZER HARNESS
K1,-1	CONTACTOR-COMPRESSOR 1
K2,-1	CONTACTOR-COMPRESSOR 2
K3-1	RELAY/CONTACTOR-BLOWER
K10,-1,2	RELAY-OUTDOOR FAN 1
K65-1,2	RELAY-EXHAUST FAN
K68,-1	RELAY-OUTDOOR FAN 2
L1	VALVE-REVERSING 1
L2	VALVE-REVERSING 2
P18	PLUG-EXHAUST FAN COMPT
P24	PLUG-EXHAUST FAN
P88	PLUG-HEAT CONTROL
P101	PLUG-SMOKE DETECTOR,RETURN AIR
P102	PLUG-SMOKE DETECTOR,SUPPLY AIR
P113	PLUG-BLOWER,COOL 1 CONTROL
P118	PLUG-COMPRESSOR 3 & 4 CONTROL
P132	PLUG-BIO EXHAUST FAN MOTOR

WARNING-ELECTRIC SHOCK HAZARD, CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES

NOTE-IF ANY WIRE IN THIS APPLIANCE IS REPLACED, IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING, INSULATION THICKNESS AND TERMINATION

DISCONNECT ALL POWER BEFORE SERVICING

DESIGNATES OPTIONAL WIRING

CLASS II FIELD WIRING

WIRING DIAGRAM	2/05
HEAT PUMP-PACKAGED	
THA-090,102,120,150-1-G,J,M,Y	
HEAT PUMP SECTION B4	
Supersedes Form No.	New Form No. 534.479W

FIGURE 5

Unit Power-Up

A-General

1- Make sure that unit is installed in accordance with the installation instructions and applicable codes.

2- Inspect all electrical wiring, both field and factory installed, for loose connections. Tighten as required.

3- Check to ensure that refrigerant lines do not rub against the cabinet or against other refrigerant lines.

4- Check voltage at K2 contactor. Voltage must be within range listed on nameplate. If not, consult power company and have voltage condition corrected before starting unit.

5- Make sure filters are in place before start-up.

B-MCC (A45) Control Board

1- Make sure there is no heating, cooling, or blower demand from thermostat. Apply power to unit.

2- Locate green heartbeat LED on MCC board. See figure 6. LED should flash slowly to indicate normal operation. Refer to table 1 if the heartbeat LED is not flashing normally.

TABLE 1
MCC HEARTBEAT LED STATUS

LED	Indicates	Action
Off	No power to board.	Check field wiring. If problem persists refer to service manual.
On	Processor error.	Press MCC pushbutton and hold for three seconds to re-set processor.*
Flashing Slowly	Normal.	None.
Flashing Rapidly	Invalid unit DIP switch selected.	Make sure switches are set correctly. Refer to figure 7.
Flashing Rapidly	Simultaneous heat and cool demands.	Check thermostat and wiring.

*Press pushbutton and immediately release to override the 4-minute compressor minimum run time.

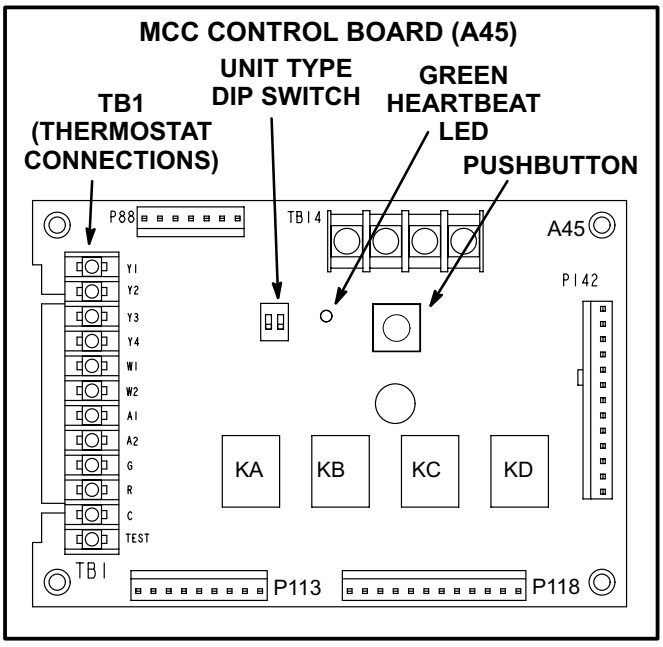


FIGURE 6

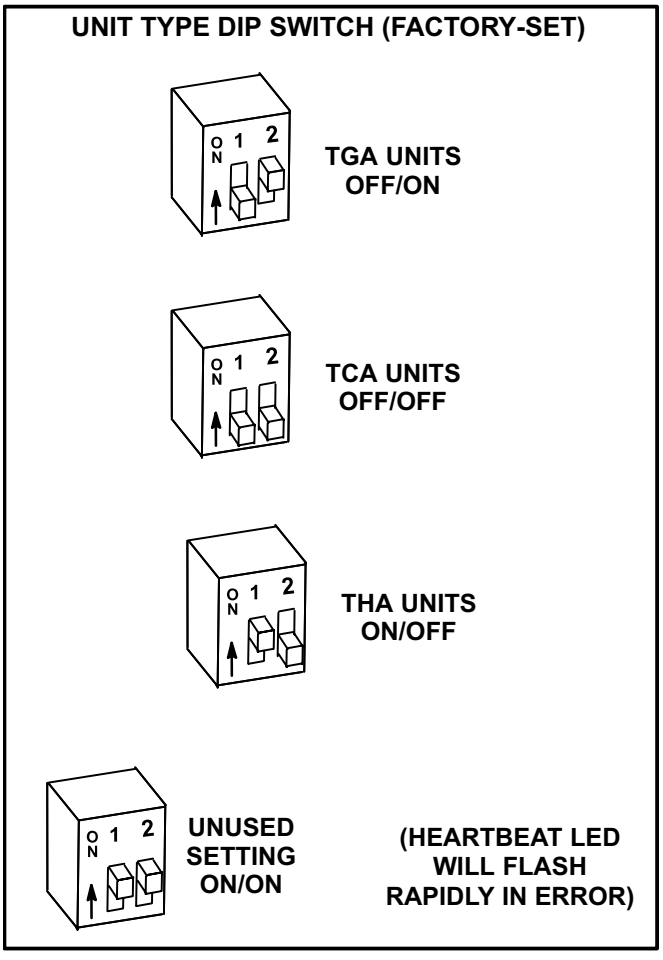


FIGURE 7

Blower Operation and Adjustments

A-Blower Operation

1- Set thermostat or temperature control device fan switch to **AUTO** or **ON.** With fan switch in **ON** position, blower will operate continuously. With fan switch in **AUTO** position, the blower will cycle with demand.

2- Blower and entire unit will be off when thermostat or temperature control device system switch is in **OFF** position.

B-Blower Access

The blower assembly is secured to a sliding base which allows the entire assembly to be pulled out of the unit. See figure 9.

1- Remove the clamp which secures the blower wiring to the blower motor base.

2- Remove and retain screws on either side of sliding base. Pull base toward outside of unit.

3- Slide base back into original position when finished servicing. Replace the clamp and blower wiring in the previous location on the blower motor base.

C-Determining Unit CFM

1- The following measurements must be made with a dry indoor coil and with air filters in place. Run blower without a cooling demand. Measure the indoor blower shaft RPM.

2- With all access panels in place, measure static pressure external to unit (from supply to return).

3- Referring to table 3, use static pressure and RPM readings to determine unit CFM. Use table 4 when installing units with any of the optional accessories listed.

4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 9. Do not exceed minimum and maximum number of pulley turns as shown in table 2.

TABLE 2
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT

Belt	Minimum Turns Open	Maximum Turns Open
A Section	No minimum	5
B Section	1*	6

*No minimum number of turns open when B belt is used on pulleys 6” O.D. or larger.

D-Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat into grooves. Make sure blower and motor pulley are aligned as shown in figure 8.

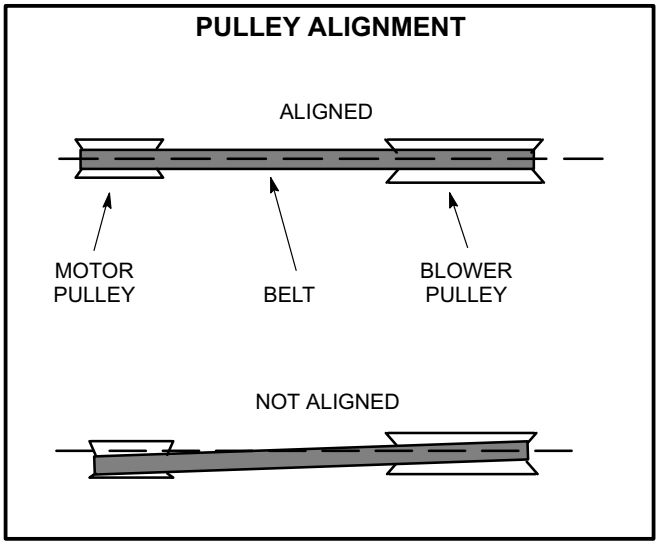


FIGURE 8

1- Loosen four bolts securing motor base to mounting frame. See figure 9.

2- *To increase belt tension -*
Turn adjusting bolt to the right, or clockwise, to move the motor outward and tighten the belt. This increases the distance between the blower motor and the blower housing.

To loosen belt tension -
Turn the adjusting bolt to the left, or counterclockwise to loosen belt tension.

3- Tighten two bolts on motor pulley side.

IMPORTANT - Align top edges of blower motor base and mounting frame base parallel before tightening two bolts on the oTher side of base. Motor shaft and blower shaft must be parallel.

4- Tighten two bolts on other side of base.

BLOWER ASSEMBLY

TO INCREASE BELT TENSION

1-Loosen four bolts securing motor base to mounting frame.

2-Turn adjusting bolt to the right, or clockwise, to move the motor outward and tighten the belt.

3-Tighten two bolts on motor pulley side.

IMPORTANT - Align top edges of blower motor base and mounting frame base parallel before tightening two bolts on the other side of base. Motor shaft and blower shaft must be parallel.

4-Tighten two bolts on other side of base.

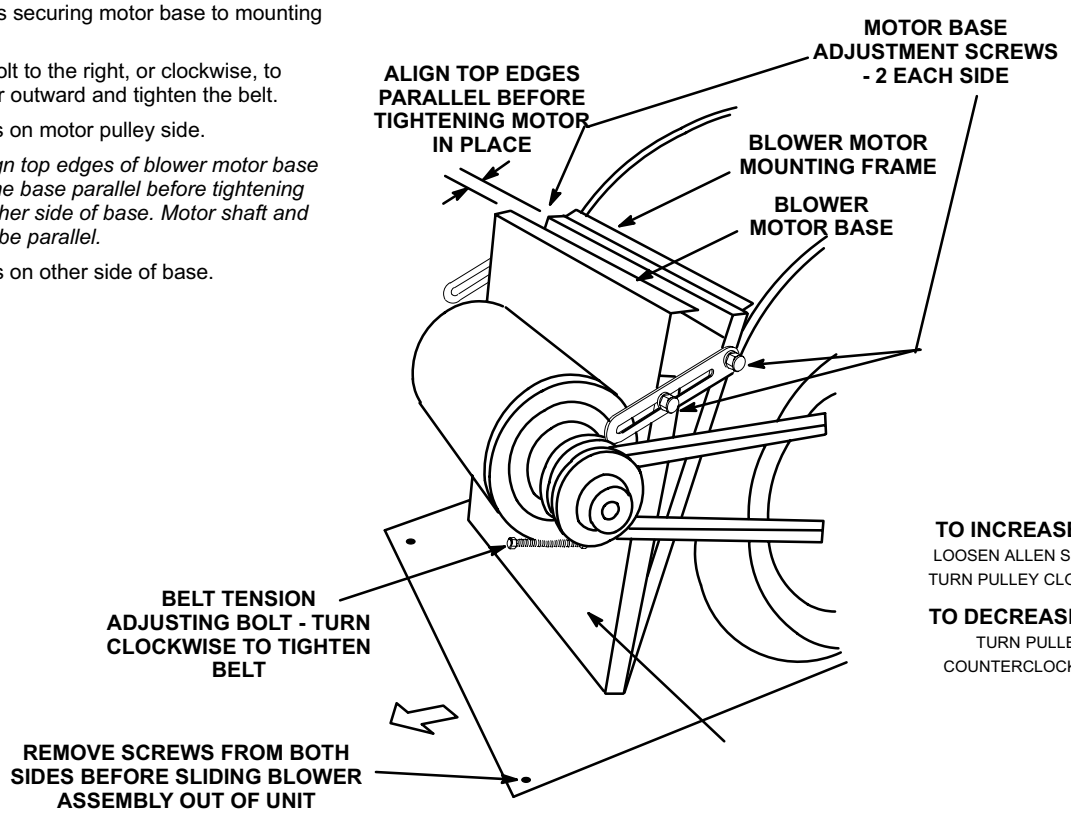


FIGURE 9

E-Check Belt Tension

Overtensioning belts shortens belt and bearing life. Check belt tension as follows:

1- Measure span length X. See figure 10.

2- Apply perpendicular force to center of span (X) with enough pressure to deflect belt 1/64" for every inch of span length or 1.5mm per 100mm of span length.

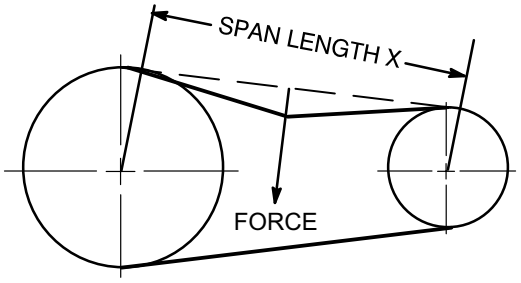
Example: Deflection distance of a 40" span would be 40/64" or 5/8".

Example: Deflection distance of a 400mm span would be 6mm.

3- Measure belt deflection force. For a used belt, the deflection force should be 5 lbs. (35kPa) . A new belt deflection force should be 7 lbs. (48kPa).

A force below these values indicates and undertensioned belt. A force above these values indicates an overtensioned belt.

MEASURE BELT TENSION



DEFLECTION 1/64" PER INCH OF SPAN OR 1.5mm PER 100mm OF SPAN

FIGURE 10

F-Field-Furnished Blower Drives

For field-furnished blower drives, use tables 3 and 4 to determine BHP and RPM required. Reference table 5 to determine the drive number and table 6 to determine the manufacturer's model number.

TABLE 3
THA BASE UNIT BLOWER PERFORMANCE

BLOWER TABLE INCLUDES RESISTANCE FOR <u>BASE UNIT ONLY</u> WITH DRY INDOOR COIL & AIR FILTERS IN PLACE.
FOR ALL UNITS ADD:

1 - Wet indoor coil air resistance of selected unit.
2 - Any factory installed options air resistance (heat section, economizer, etc.)
3 - Any field installed accessories air resistance (duct resistance, diffuser, etc.)

Then determine from blower table blower motor output and drive required.
See table 5 for wet coil and option/accessory air resistance data.

MINIMUM AIR VOLUME REQUIRED FOR USE WITH OPTIONAL ELECTRIC HEAT

THA090 & 102 requires 3000 cfm (1415 L/s) minimum air with electric heat.
THA120 & 150 models require 4000 cfm (1890 L/s) minimum air with electric heat.

BOLD ITALIC INDICATES FIELD FURNISHED DRIVE

Air Volume cfm (L/s)	Total Static Pressure - in. w.g. (Pa)																			
	.20 (50)		.40 (100)		.60 (150)		.80 (200)		1.00 (250)		1.20 (300)		1.40 (350)		1.60 (400)		1.80 (450)		2.00 (495)		2.20 (545)		2.40 (595)		2.60 (645)	
	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)	RPM	BHP (kW)
2250 (1060)	***455***	***0.30 (0.22)***	***555***	***0.45 (0.34)***	***640***	***0.60 (0.45)***	720	0.80 (0.60)	790	1.00 (0.75)	855	1.20 (0.90)	915	1.40 (1.04)	975	1.60 (1.19)	1030	1.85 (1.38)	1080	2.05 (1.53)	1130	2.30 (1.72)	1175	2.55 (1.90)	1220	2.80 (2.09)
2500 (1180)	***475***	***0.40 (0.30)***	***575***	***0.55 (0.41)***	***660***	***0.70 (0.52)***	735	0.90 (0.67)	805	1.10 (0.82)	870	1.30 (0.97)	930	1.55 (1.16)	985	1.75 (1.31)	1040	2.00 (1.49)	1090	2.25 (1.68)	1140	2.50 (1.87)	1185	2.75 (2.05)	1230	3.00 (2.24)
2750 (1300)	***495***	***0.45 (0.34)***	***595***	***0.65 (0.48)***	***675***	***0.85 (0.63)***	750	1.05 (0.78)	820	1.25 (0.93)	885	1.45 (1.08)	940	1.70 (1.27)	995	1.90 (1.42)	1050	2.20 (1.64)	1100	2.45 (1.83)	1145	2.65 (1.98)	1195	2.95 (2.20)	1240	3.25 (2.42)
3000 (1415)	***525***	***0.55 (0.41)***	***615***	***0.75 (0.56)***	695	0.95 (0.71)	770	1.20 (0.90)	835	1.40 (1.04)	895	1.60 (1.19)	955	1.85 (1.38)	1010	2.10 (1.57)	1060	2.35 (1.75)	1110	2.65 (1.98)	1160	2.90 (2.16)	1205	3.20 (2.39)	1250	3.45 (2.57)
3250 (1535)	***550***	***0.65 (0.48)***	***640***	***0.90 (0.67)***	715	1.10 (0.82)	790	1.35 (1.01)	855	1.60 (1.19)	915	1.80 (1.34)	970	2.05 (1.53)	1025	2.35 (1.75)	1075	2.60 (1.94)	1125	2.85 (2.13)	1170	3.15 (2.35)	1215	3.40 (2.54)	1260	3.70 (2.76)
3500 (1650)	***580***	***0.80 (0.60)***	***665***	***1.05 (0.78)***	740	1.25 (0.93)	810	1.50 (1.12)	870	1.75 (1.31)	930	2.00 (1.49)	985	2.25 (1.68)	1040	2.55 (1.90)	1090	2.85 (2.13)	1135	3.10 (2.31)	1185	3.40 (2.54)	1230	3.70 (2.76)	1270	4.00 (2.98)
3750 (1770)	***605***	***0.95 (0.71)***	690	1.20 (0.90)	760	1.45 (1.08)	830	1.70 (1.27)	890	1.95 (1.45)	950	2.25 (1.68)	1005	2.50 (1.87)	1055	2.80 (2.09)	1105	3.10 (2.31)	1150	3.35 (2.50)	1195	3.65 (2.72)	1240	3.95 (2.95)	1285	4.30 (3.21)
4000 (1890)	***635***	***1.10 (0.82)***	715	1.40 (1.04)	785	1.65 (1.23)	850	1.90 (1.42)	910	2.20 (1.64)	965	2.45 (1.83)	1020	2.75 (2.05)	1070	3.05 (2.28)	1120	3.35 (2.50)	1165	3.65 (2.72)	1210	3.95 (2.95)	1255	4.30 (3.21)	1295	4.60 (3.43)
4250 (2005)	***665***	***1.30 (0.97)***	740	1.60 (1.19)	810	1.85 (1.38)	870	2.15 (1.60)	930	2.45 (1.83)	985	2.75 (2.05)	1040	3.05 (2.28)	1090	3.35 (2.50)	1135	3.65 (2.72)	1185	4.00 (2.98)	1225	4.30 (3.21)	1270	4.65 (3.47)	1310	4.95 (3.69)
4500 (2125)	695	1.50 (1.12)	770	1.80 (1.34)	835	2.10 (1.57)	895	2.40 (1.79)	955	2.70 (2.01)	1005	3.00 (2.24)	1060	3.35 (2.50)	1105	3.65 (2.72)	1155	4.00 (2.98)	1200	4.30 (3.21)	1245	4.65 (3.47)	1285	5.00 (3.73)	1325	5.30 (3.95)
4750 (2240)	725	1.75 (1.31)	795	2.05 (1.53)	860	2.40 (1.79)	920	2.70 (2.01)	975	3.00 (2.24)	1030	3.35 (2.50)	1080	3.65 (2.72)	1125	3.95 (2.95)	1175	4.35 (3.25)	1215	4.65 (3.47)	1260	5.00 (3.73)	1300	5.35 (3.99)	1340	5.70 (4.25)
5000 (2360)	760	2.05 (1.53)	825	2.35 (1.75)	885	2.65 (1.98)	945	3.00 (2.24)	1000	3.35 (2.50)	1050	3.65 (2.72)	1100	4.00 (2.98)	1145	4.35 (3.25)	1190	4.70 (3.51)	1235	5.05 (3.77)	1280	5.45 (4.07)	----		----	
5250 (2475)	790	2.30 (1.72)	855	2.65 (1.98)	910	2.95 (2.20)	970	3.35 (2.50)	1020	3.65 (2.72)	1070	4.00 (2.98)	1120	4.35 (3.25)	1165	4.70 (3.51)	1210	5.10 (3.80)	1255	5.45 (4.07)	----		----		----	
5500 (2595)	820	2.60 (1.94)	880	2.95 (2.20)	940	3.30 (2.46)	995	3.70 (2.76)	1045	4.05 (3.02)	1095	4.40 (3.28)	1145	4.80 (3.58)	1190	5.15 (3.84)	1230	5.50 (4.10)	----		----		----		----	
5750 (2715)	850	2.95 (2.20)	910	3.30 (2.46)	965	3.70 (2.76)	1020	4.05 (3.02)	1070	4.45 (3.32)	1120	4.80 (3.58)	1165	5.20 (3.88)	1210	5.60 (4.18)	----		----		----		----		----	
6000 (2830)	885	3.35 (2.50)	940	3.70 (2.76)	995	4.10 (3.06)	1045	4.45 (3.32)	1095	4.85 (3.62)	1145	5.25 (3.92)	1190	5.65 (4.21)	----		----		----		----		----		----	

Heating Start-Up

1- Set thermostat or temperature control device to initiate a first-stage heating demand.

A first-stage heating demand (W1) will energize compressors 1 and 2. Both outdoor fans are energized with a W1 demand.

Note - L1 and L2 reversing valves are de-energized in the heating mode.

THA Units With Optional Electric Heat -

An increased heating demand (W2) will energize electric heat. Electric heat is also energized during the defrost cycle (W1) to maintain discharge air temperature.

TABLE 4
OPTIONAL ACCESSORY AIR RESISTANCE

Air Volume		Wet Indoor Coil		Electric Heat	Economizer
cfm	L/s	090S, 102S	120S, 150S		
2250	1060	.06 (15)	.10 (25)	.01 (2)	.035 (9)
2500	1180	.08 (20)	.12 (30)	.01 (2)	.04 (10)
2750	1300	.09 (22)	.14 (35)	.01 (2)	.045 (11)
3000	1415	.10 (25)	.16 (40)	.02 (5)	.05 (12)
3250	1535	.11 (27)	.19 (47)	.02 (5)	.06 (15)
3500	1650	.13 (32)	.21 (52)	.03 (7)	.07 (17)
3750	1770	.14 (35)	.23 (57)	.03 (7)	.075 (19)
4000	1890	.16 (40)	.26 (65)	.04 (10)	.08 (20)
4250	2005	.17 (42)	.28 (70)	.04 (10)	.09 (22)
4500	2125	.18 (45)	.31 (77)	.05 (12)	.10 (25)
4750	2240	.20 (50)	.33 (82)	.05 (12)	.11 (27)
5000	2360	.22 (55)	.36 (90)	.06 (15)	.12 (30)
5250	2475	.24 (60)	.39 (97)	.06 (15)	.13 (32)
5500	2595	.26 (65)	.42 (104)	.07 (17)	.14 (35)
5750	2715	.28 (70)	.45 (112)	.07 (17)	.15 (37)
6000	2830	.30 (75)	.68 (169)	.08 (20)	.16 (40)

TABLE 5
DRIVE KIT SPECIFICATIONS

Motor		RPM Range											
hp	kW	Drive1		Drive 2		Drive 3		Drive 4		Drive 5		Drive 6	
		60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz
2	1.5	680-940	560-775	- - -	- - -	850-1130	700-930	- - -	- - -	- - -	917-1152	- - -	- - -
3 Std.	2.2	680-940	- - -	- - -	- - -	850-1130	- - -	- - -	740-925	1105-1410	- - -	- - -	915-1150
5	3.7	- - -	- - -	- - -	- - -	- - -	- - -	895-1120	740-925	- - -	- - -	1110-1395	915-1150

TABLE 6
MANUFACTURER'S NUMBERS

DRIVE NO.	DRIVE COMPONENTS					
	ADJUSTABLE SHEAVE		FIXED SHEAVE		BELT	
	BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.
1	1VP40X7/8	79J0301	AK69x1	37L4701	AX46	31K7101
2	1VP44x1-1/8	36C0701	BK85x1	49K4101	BX52	P-8-8094
3	1VP44x7/8	53J9601	AK64x1	12L2501	AX46	31K7101
4	1VP60x1-1/8	41C1301	BK95x1	79J2701	BX56	P-8-10082
5	1VP50x7/8	P-8-2187	AK59x1	31K6801	AX46	31K7101
6	1VP60x1-1/8	41C1301	BK77x1	49K4001	BX53	49K3801

Cooling Start-Up

⚠IMPORTANT

If unit is equipped with a crankcase heater. Make sure heater is energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.

A-Start-Up

1- Set thermostat or temperature control device fan switch to **AUTO** or **ON.** Set thermostat or temperature control device to initiate a first-stage cooling demand.

A first-stage Y1 cooling demand will energize L1 reversing valve solenoid and compressor 1. An increased cooling demand Y2 will initiate L2 reversing valve solenoid and compressor 2.

Units With Optional Economizer -
The optional economizer will start on a first stage (Y1) cooling demand when outdoor air enthalpy is suitable. An increased cooling demand (Y2) will energize compressors 1.

2- Refrigerant circuits are factory charged with HCFC-22 refrigerant. See unit rating plate for correct amount of charge.

3- Units contain two refrigerant circuits or systems. See figure 11.

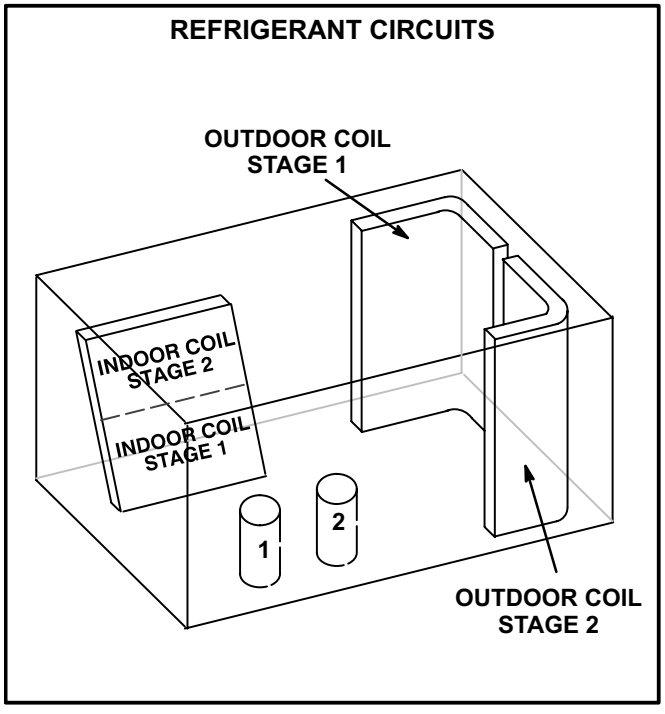


FIGURE 11

B-Refrigerant Charge and Check

WARNING-Do not exceed nameplate charge under any condition.

This unit is factory charged and should require no further adjustment. If the system requires charge, ***reclaim the charge, evacuate the system,*** and ***add required nameplate charge.***

*NOTE - System charging is not recommended below 60°F (15°C). In temperatures below 60°F (15°C) , the charge **must** be weighed into the system.*

If weighing facilities are not available, or to check the charge, use the following procedure:

1- Attach gauge manifolds and operate unit in cooling mode until system stabilizes (approximately five minutes).

2- Check each system separately with all stages operating.

3- Use a thermometer to accurately measure the outdoor ambient temperature.

4- Apply the outdoor temperature to tables 7 through 10 to determine normal operating pressures.

5- Compare the normal operating pressures to the pressures obtained from the gauges. Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system. **Correct any system problems before proceeding.**

TABLE 7
THA090S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suct. ±5 psig
65°F	150	77	146	76
75°F	180	82	178	77
85°F	210	83	210	79
95°F	240	84	242	81
105°F	270	85	277	83
115°F	300	86	310	85

TABLE 8
THA102S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dls. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suc. ±5 psig
65°F	156	77	154	77
75°F	185	78	185	78
85°F	215	80	216	79
95°F	244	81	247	80
105°F	273	82	277	82
115°F	303	83	309	83

TABLE 9
THA120S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suct. ±5 psig
65°F	166	77	166	75
75°F	196	78	196	76
85°F	228	80	228	78
95°F	260	82	260	79
105°F	290	84	290	81
115°F	321	85	321	82

TABLE 10
THA150S NORMAL OPERATING PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis. ±10 psig	Suct. ±5 psig	Dis. ±10 psig	Suct. ±5 psig
65°F	169	66	182	69
75°F	196	71	212	74
85°F	226	75	244	76
95°F	258	77	277	78
105°F	293	80	314	79
115°F	331	81	352	80

6- If discharge pressure is high, remove refrigerant from the system. If discharge pressure is low, add refrigerant to the system.
   - Add or remove charge in increments.
   - Allow the system to stabilize each time refrigerant is added or removed.

7- Use the following approach method along with the normal operating pressures to confirm readings.

C-Charge Verification - Approach Method

8- Using the same thermometer, compare liquid temperature to outdoor ambient temperature.

   Approach Temperature = Liquid temperature minus ambient temperature.

9- Approach temperature should match values in table 3. An approach temperature greater than value shown indicates an undercharge. An approach temperature less than value shown indicates an overcharge.

10- Do not use the approach method if system pressures do not match pressures in tables 7 through 10. The approach method is not valid for grossly over or undercharged systems.

TABLE 11
APPROACH TEMPERATURE

Unit	Liquid Temp. Minus Ambient Temp.	
	1st Stage	2nd Stage
090S	7°F ± 1 (3.9°C ± 0.5)	8°F ± 1 (4.4°C ± 0.5)
102S	10°F ± 1 (5.6°C ± 0.5)	8°F ± 1 (4.4°C ± 0.5)
120S	9°F ± 1 (5°C ± 0.5)	11°F ± 1 (6.1°C ± 0.5)
150S	13°F ± 1 (7.2°C ± 0.5)	13°F ± 1 (7.2°C ± 0.5)

D-Compressor Controls

1- High Pressure Switches (S4, S7)
Compressor circuits are protected by a high pressure switch which cuts out at 410 psig ± 10 psig (2825 kPa ± 70 kPa).

2- Freezestats (S49, S50)
Switches de-energize compressors when indoor coil temperature falls below 29°F (-2°C) to prevent coil freeze-up. Switches reset when indoor coil temperature reaches 58°F (15°C).

3- Defrost Switches (S6, S9)
Defrost switches close to initiate defrost when liquid line temperature falls to 35°F (1.7°C). The defrost switch is located on the liquid line between the outdoor expansion valve and the distributor

4- Defrost Termination Switches (S46, S104)
Defrost pressure switches open to terminate defrost when suction (discharge pressure during cooling and defrost) pressure reaches 275 psig (1096 kPa).

5- Defrost Controls (CMC1, CMC2)
Defrost is liquid line temperature initiated and operates for 14 minutes unless terminated by suction line pressure drop.

When the liquid line temperature drops below 35°F, the defrost switch closes and signals the **defrost control** that a defrost cycle is needed. If the defrost switch is still closed after 60 minutes (default), a defrost cycle begins and operates for 14 minutes. The defrost pressure switch can terminate the defrost cycle before the 14 minutes elapses if suction pressure reaches 275 ± 10 psi.

Electric heat is energized during defrost to maintain discharge air temperature.

Defrost Control Board

The defrost thermostat, defrost pressure switch and the defrost control work together to ensure that the heat pump outdoor coil does not ice excessively during the heating mode.

Compressor Accumulated Run-Time Interval

The defrost control will not energize a defrost cycle unless the unit has been operating in heating mode for an accumulated 60 minutes (default). The run time interval can be changed by moving the jumper on the CMC board timing pins. See figure 12.

The defrost interval can be adjusted to 30, 60, or 90 minutes. The defrost timing jumper is factory-installed to provide a 60-minute defrost interval. If the timing selector jumper is not in place, the control defaults to a 90-minute defrost interval.

Note - When adjusting timing pins, set both CMC1 and CMC2 defrost controls to the same defrost interval.

Defrost Test Option

A TEST option is provided for troubleshooting. The TEST mode may be started any time the unit is in the heating mode and the defrost thermostat is closed or jumpered**.** If the timing jumper is in the TEST position at power-up, the defrost control will ignore the test pins. When the jumper is placed across the TEST pins for two seconds, the control will enter the defrost mode. If the jumper is removed before an additional 5-second period has elapsed (7 seconds total), the unit will remain in defrost mode until the defrost pressure switch opens or 14 minutes have passed. If the jumper is not removed until after the additional 5-second period has elapsed, the defrost will terminate and the test option will not function again until the jumper is removed and re-applied.

Diagnostic LEDs

The defrost board uses two LEDs for diagnostics. The LEDs flash a sequence according to the condition.

TABLE 12

Defrost Control Board Diagnostic LED		
Indicates	**LED 1**	**LED 2**
Normal operation / power to board	Synchronized Flash with LED 2	Synchronized Flash with LED 1
Board failure / no power	Off	Off
Board failure	On	On
Pressure switch open	Flash	On

DEFROST CONTROL BOARD CMC1 AND CMC2

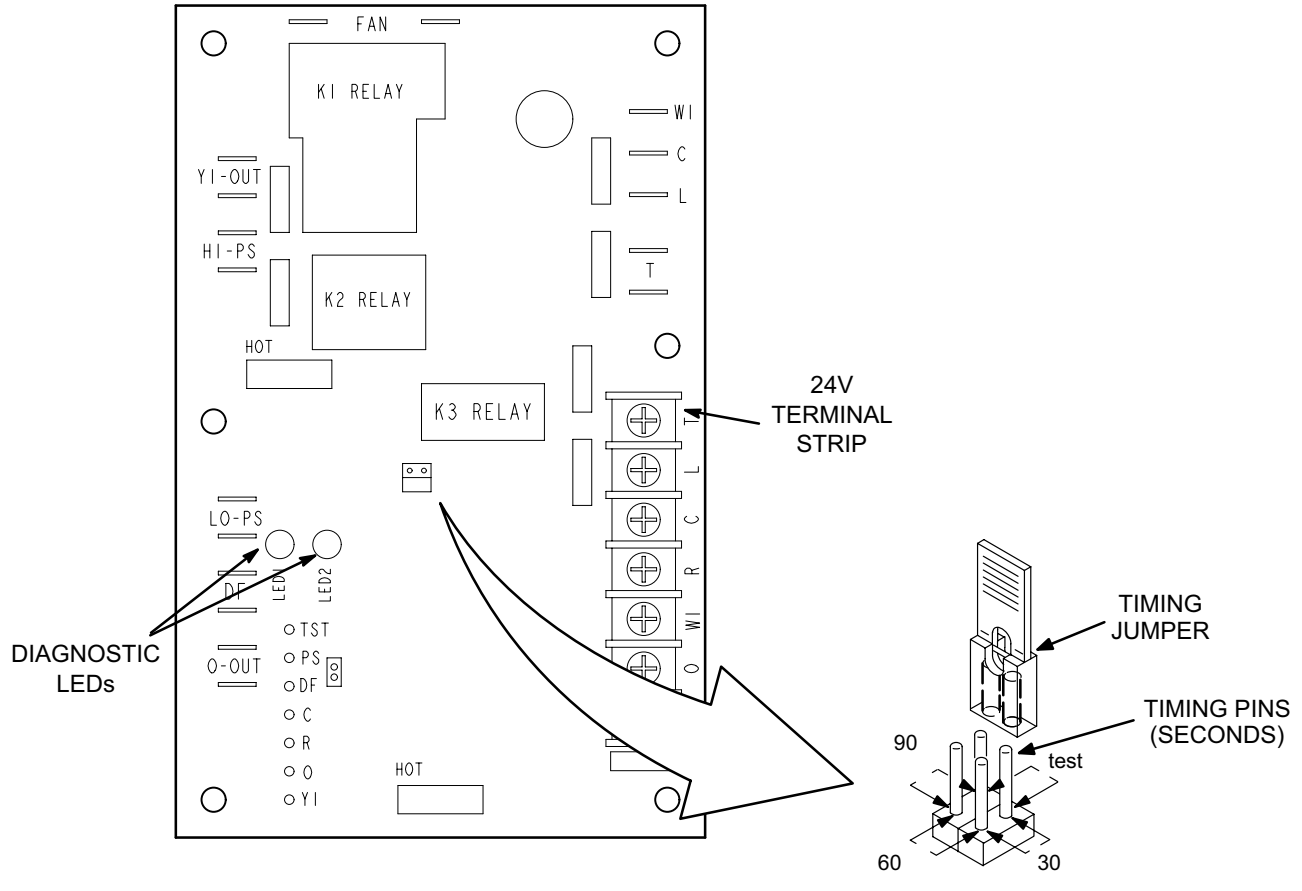


FIGURE 12

Service

The unit should be inspected once a year by a qualified service technician.

⚠WARNING

Product contains fiberglass wool.
Disturbing the insulation in this product during installation, maintenance, or repair will expose you to fiberglass wool. Breathing this may cause lung cancer. (Fiberglass wool is known to the State of California to cause cancer.)
Fiberglass wool may also cause respiratory, skin, and eye irritation.
To reduce exposure to this substance or for further information, consult material safety data sheets available from address shown on unit nameplate or contact your supervisor.

⚠CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

A-Lubrication

All motors are lubricated at the factory. No further lubrication is required.

B-Filters

Units are equipped with four 18 X 24 X 2" filters. Filters should be checked and replaced when necessary with filters of like kind and size. Take note of air flow direction marking on filter frame when reinstalling filters. See figure 13.

NOTE-Filters must be U.L.C. certified or equivalent for use in Canada.

C-Supply Air Blower Wheel

Annually inspect supply air blower wheel for accumulated dirt or dust. Turn off power before attempting to remove access panel or to clean blower wheel.

D-Indoor Coil

Inspect and clean coil at beginning of each cooling and heating season. Clean using mild detergent or commercial coil cleanser. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet.

E-Outdoor Coil

Clean condenser coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season.

Condenser coils are made of two formed slabs. Dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 14. Flush coils with water following cleaning.

F-Filter Drier

The unit is equipped with a biflow filter drier. if replacement is necessary, order another of like design.

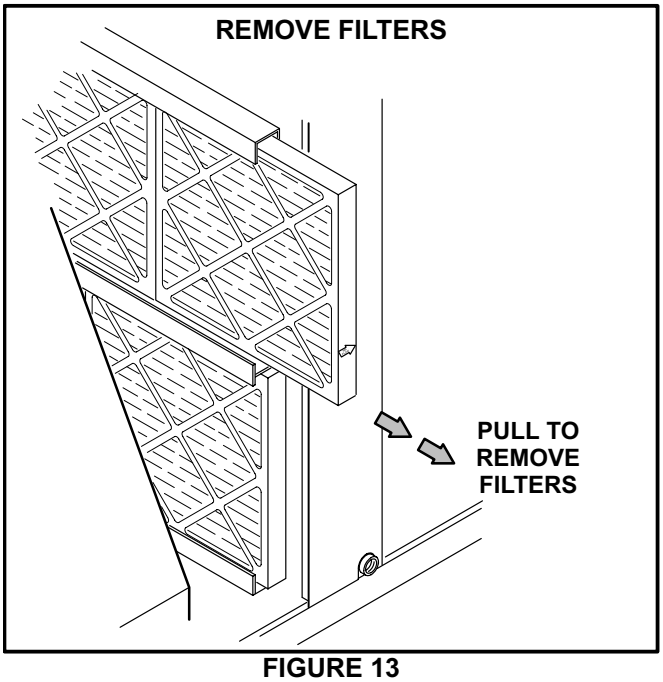
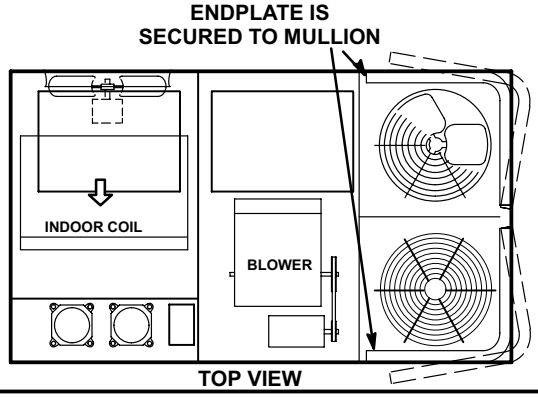


FIGURE 13

CLEAN CONDENSER COIL



1- Remove screws securing coil end plate to mullion.
2- Remove clips connecting coils slabs and separate slabs 3-4" (76-102mm).
3- Clean coils with detergent or commercial coil cleaner.
4- Rinse thoroughly with water and reassemble.

FIGURE 14