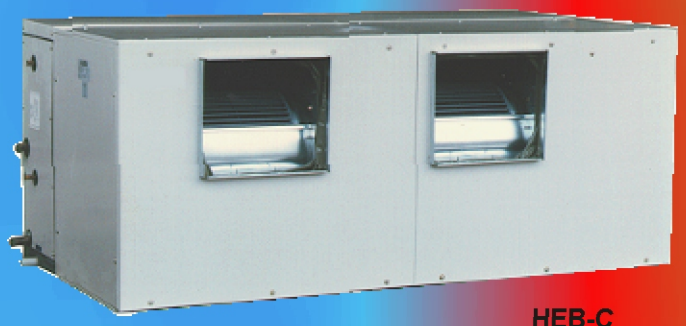
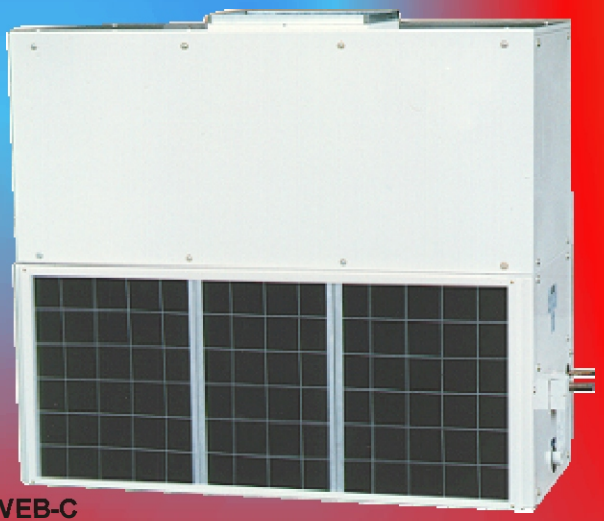
INSTALLATION, OPERATION & MAINTENANCE MANUAL



HEB-C



VEB-C

ACCS

Form No: MM0305B

DUNHAM-BUSH®

Products That Perform . . .By People Who Care

VEB C-FB

Air - Cooled Split System

Air Conditioner with Scroll Compressors

50/60Hz
R22 / R407C

- **COOLING**
- **HEAT PUMP**

TABLE OF CONTENTS

DESCRIPTION PAGE NO

1.0 INTRODUCTION

The air-cooled split system air conditioner is designed, matched, manufactured and tested and ready for installation when it reached the site. The evaporator unit consists mainly of a direct expansion evaporator coil(s) with factory package thermal expansion valve, to be coupled with air cooled condenser unit consisting of scroll compressor(s) and large heat rejection condenser coil with integral subcooling circuit(s). Factory standard units also incorporate important safety and operating controls which includes manual reset high and low pressure cutout and compressor motor protectors for each compressor(s).

Every Dunham-Bush air-cooled split air-conditioner has been carefully and intelligently designed, manufactured and tested. It is also subject to stringent quality control and accurately tested as a final verification of reliability. If it is correctly installed, operated and maintained, it will provide many years of satisfactory and efficient performance.

These instructions are general in nature and are for standard units only. Non-standard units may vary in some respects from these instructions to suit particular applications.

2.0 GENERAL INFORMATION

2.1 RECEIVING, INSPECTION AND PACKAGING

As soon as the unit is received, it should be inspected if there is any damage during transit. Make a separate written request if there is any damage on the carrier's delivery order. Also, the unit should be inspected for any missing or short shipped components. Standard items and accessories that come with the unit are:

2.1.1 AIR-COOLED CONDENSING UNITS (ACCS)

1.) Compressor(s) c/w rubber grommet.
2.) Condenser coil(s)
3.) Condenser fan(s)- Refer to physical data for sizes and quantity.
4.) Condenser's fan motor(s)- Refer to physical data for horsepower and quantity.
5.) Fan grille.
6.) Shut off valves.
7.) Reversing valve, check valve suction accumulator and compressor crankcase heater (standard for heat pump only).
8.) Optional accessories (if any).
    a.) Factory wired starter board.
    b.) Compressor time relay delay.
    c.) Sight glass(es), filter drier(s).
    d.) Copper fins.
    e.) Oil separator(s), suction accumulator(s) and hot gas by pass(es).
    f.) Pressure gauge(s).

2.1.2 EVAPORATOR BLOWER UNITS (HEB-C / VEB-C)

1.) Blower(s) c/w rubber grommet.
2.) Evaporator coil.
3.) Thermal expansion valve(s) and distributor(s).
4.) Bearings and shaft.
5.) Optional accessories.
    a.) Motor, drive package and filters.
    b.) Thermostat.
    c.) Discharge plenum and return air grille.
    d.) Hot water heating coils.
    e.) Electric heaters.

2.2 RIGGING AND UNCRATING

Each unit has been tested, inspected and properly packed or crated prior to delivery. It is very important that precaution is taken in handing the units by the installers, movers and riggers. Lift with slings under the units with a forklift. When lifting with slings, use spreader bars across the top of the unit to prevent any damage to the frame and panels. Rigging should be done in a manner to avoid any severe strain or stress on the unit which will scratch the paint works and damage the panels and framework. Avoid possible surface damage by not removing the packaging material until the unit is at or near the final location and soon to be installed. Check the weight of the unit before rigging. Try to place the rigging cable such that the weight is evenly distributed.

2.0 GENERAL INFORMATION

2.3 LIMITATIONS

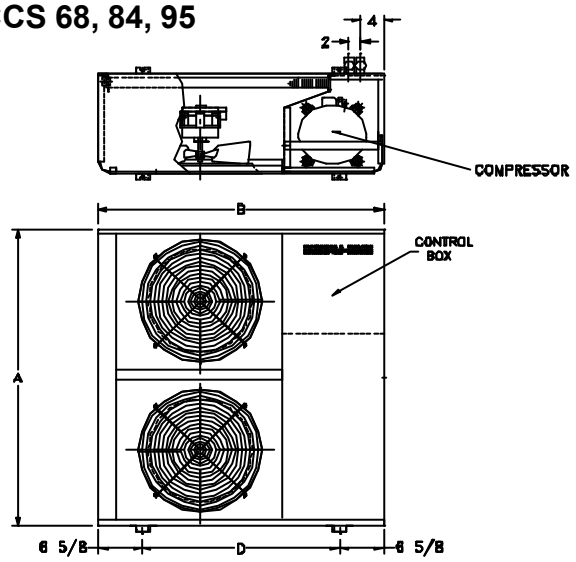
1.) Avoid low return air temperature on evaporator coil which might cause condensate to freeze up the surface of the evaporator coil.
2.) Avoid moisture carry over and excessive noise, limit evaporator coil face velocity to 600 fpm.
3.) Unit must be operated on the correct electrical supply as specified on unit name plate. Voltage limitation for compressor(s) and fan motor must be observed.
4.) Avoid low return air temperature on the condensing coil which might cause low discharge pressure (heat pump unit is equipped with fan cycling to maintain the head pressure).

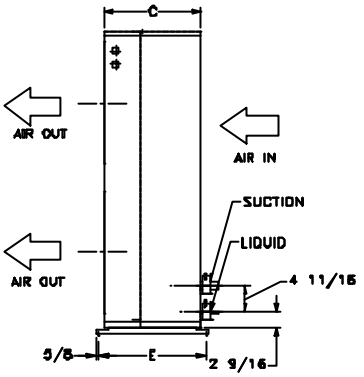
2.4 PHYSICAL DIMENSION

2.4.1. AIR COOLED CONDENSING UNITS

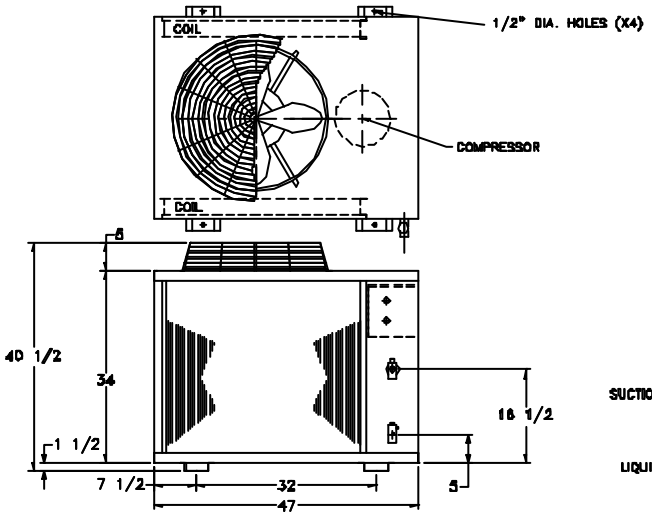
ACCS 68, 84, 95

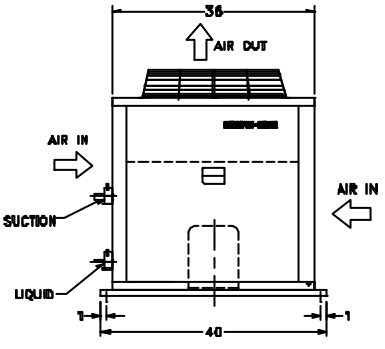
MODEL	A	B	C	D	E
ACCS 68	46 1/2	42 11/16	14 3/8	29 7/16	15 3/4
ACCS 84	48 1/2	44 3/8	19 5/16	35 1/4	20 7/8
ACCS 95	48 1/2	44 3/8	19 5/16	35 1/4	20 7/8





ACCS 108, 125, 145



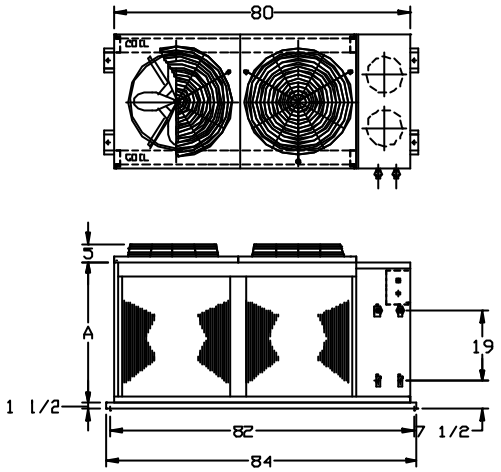


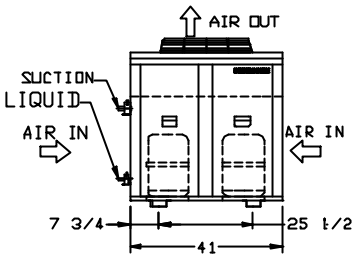
Note : All dimensions are in inches.

2.0 GENERAL INFORMATION

ACCS 160, 190, 220, 250, 285

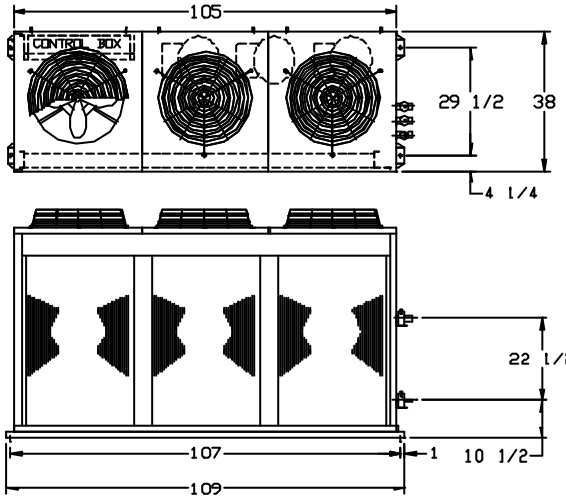
MODEL	
ACCS 160	39
ACCS 190	39
ACCS 220	33 1/2
ACCS 250	33 1/2
ACCS 285	43 1/2

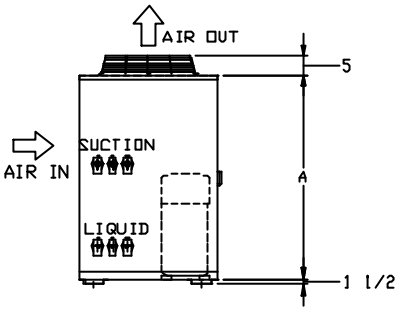




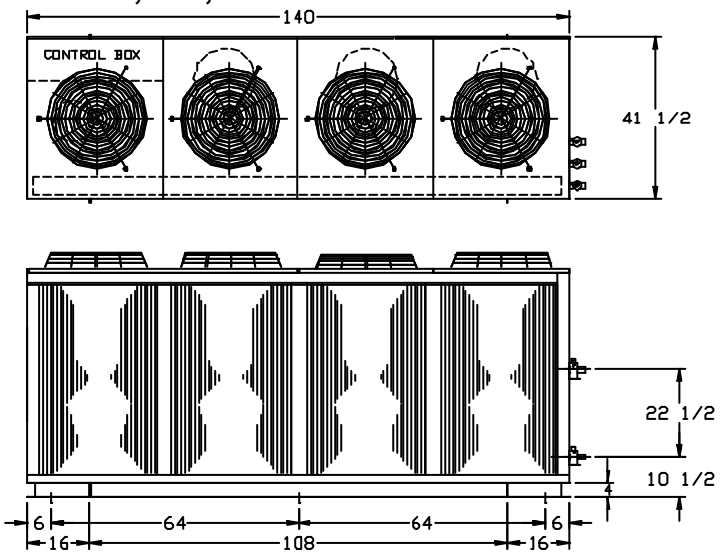
ACCS 320, 380, 445

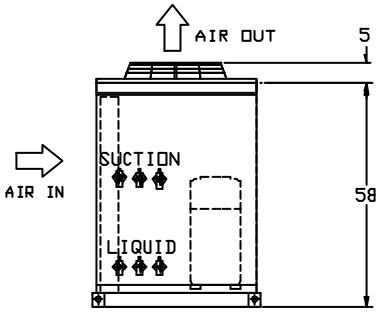
MODEL	A
ACCS 320	48
ACCS 380	56
ACCS 445	56





ACCS 480, 510, 570

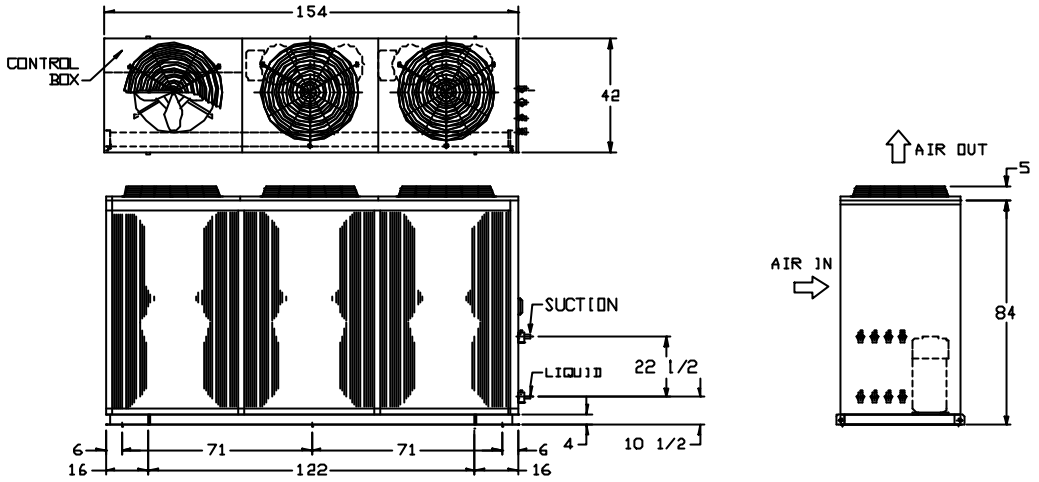




Note : All dimensions are in inches.

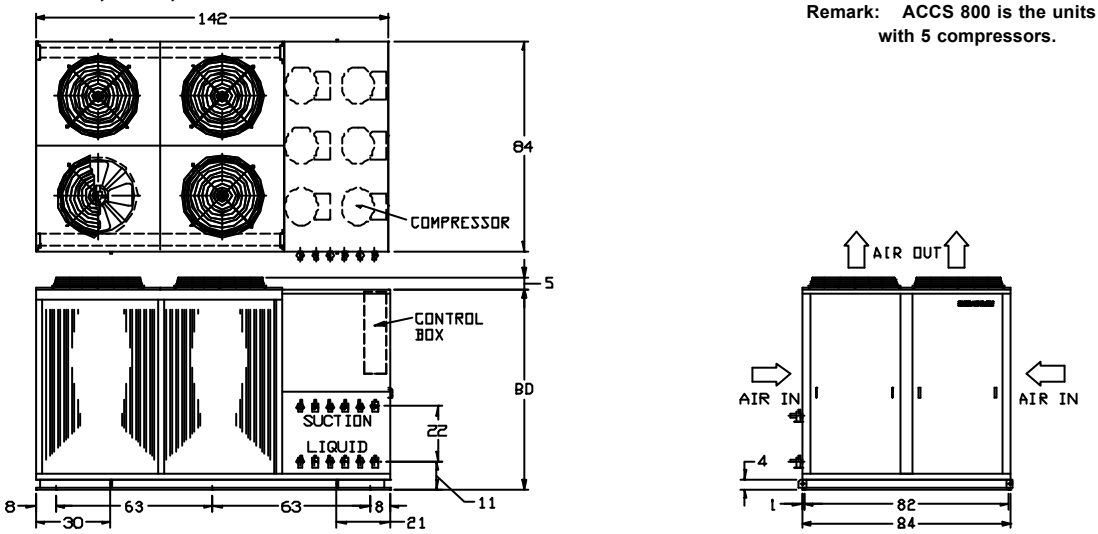
2.0 GENERAL INFORMATION

ACCS 640, 700, 760



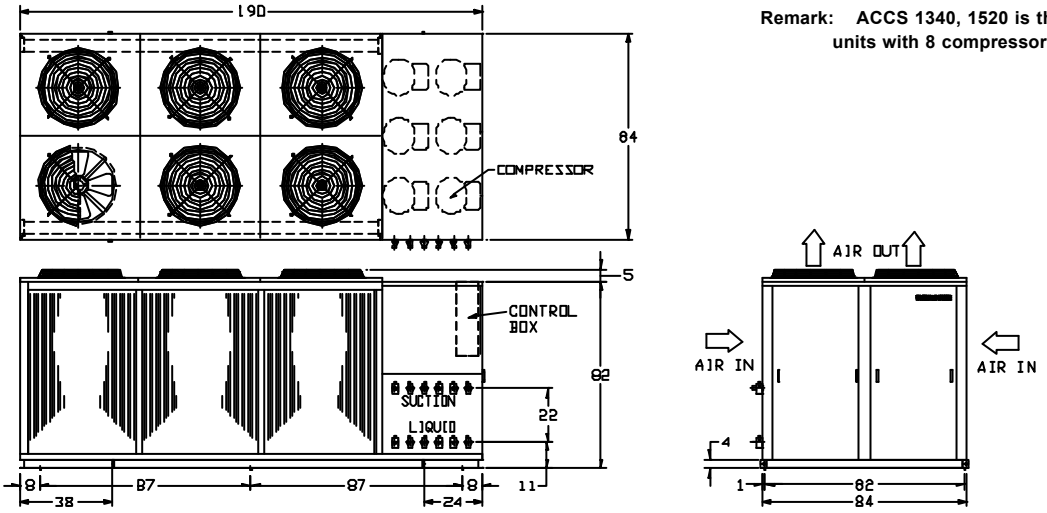
ACCS 800, 890, 960

Remark: ACCS 800 is the units with 5 compressors.



ACCS 1020, 1140, 1340, 1520

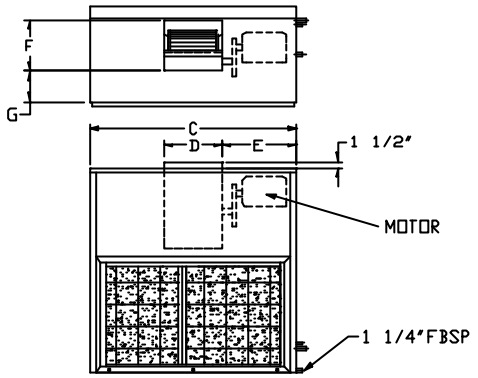
Remark: ACCS 1340, 1520 is the units with 8 compressors.

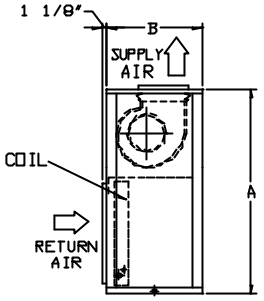


Note: All dimensions are in inches.

2.4.2 Evaporator Units (Vertical Casing Type – VEB-C)

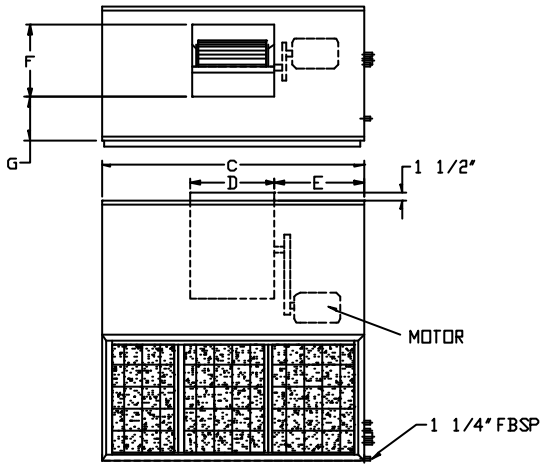
VEB 68C, 84C, 95C

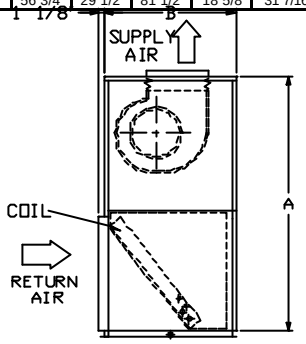




MODEL VEB	A	B	C	D	E	F	G
68C	54	20	44	13	15 1/2	11 3/8	7 1/8
84C	54	20	44	13	15 1/2	11 3/8	7 1/8
95C	55 3/4	24 1/2	48	15 5/8	21 1/2	13 1/2	9 1/2

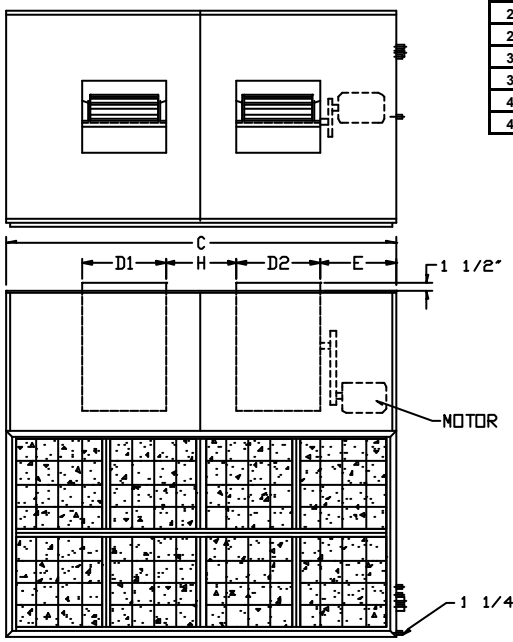
VEB 108C, 125C, 145C, 160C, 190C, 220C

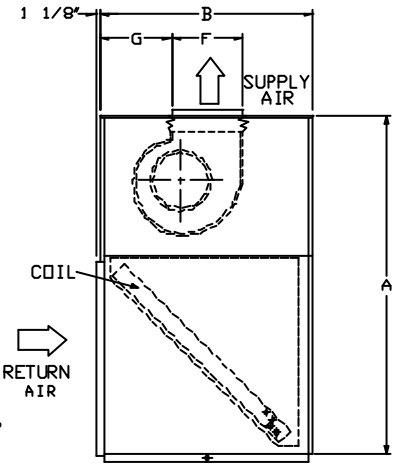




MODEL VEB	A	B	C	D	E	F	G
108C	50 3/4	26 1/2	52	15 5/8	21 1/2	13 1/2	9 1/2
125C	50 3/4	26 1/2	58 1/2	15 5/8	21 7/16	13 1/2	9 1/2
145C	50 3/4	26 1/2	58 1/2	15 5/8	21 7/16	13 1/2	9 1/2
160C	56 3/4	29 1/2	58 1/2	18 5/8	24 7/8	16	10
190C	56 3/4	29 1/2	58 1/2	18 5/8	24 7/8	16	10
220C	56 3/4	29 1/2	81 1/2	18 5/8	31 7/16	16	10

VEB 250C, 285C, 320C, 380C, 445C, 480C





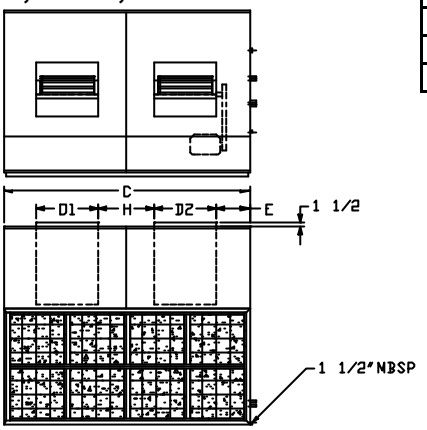
MODEL VEB	A	B	C	D1	D2	E	F	G	H
250C	56 3/4	29 1/2	81 1/2	14 11/16	14 11/16	20 1/4	16	10	11 5/8
285C	65 3/4	29 1/2	87 1/2	14 11/16	14 11/16	27 7/8	16	10	11 5/8
320C	65 3/4	29 1/2	87 1/2	14 11/16	14 11/16	27 7/8	16	10	11 5/8
380C	65 3/4	36 1/2	87 1/2	14 11/16	14 11/16	27 7/8	16	17	11 5/8
445C	76 1/4	47 1/2	87 1/2	18 5/8	18 5/8	17 9/16	16	28	15 1/8
480C	76 1/4	47 1/2	87 1/2	18 5/8	18 5/8	17 9/16	16	28	15 1/8

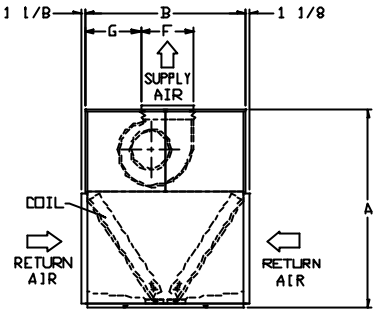
Notes. : 1.) All dimensions are in inches.
2.) Units shown are right hand piping connection.

2.0 GENERAL INFORMATION

VEB 510C, 570C, 640C

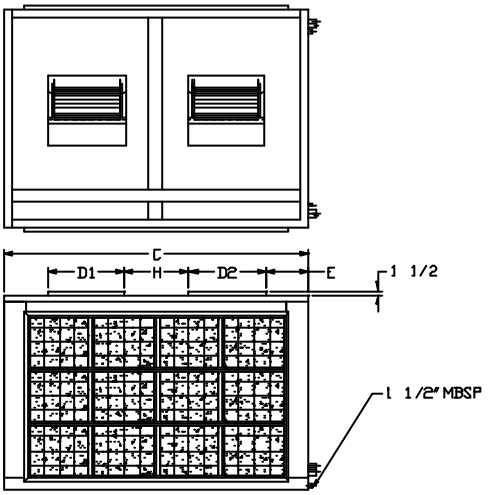
MODEL VEB	A	B	C	D1	D2	E	F	G	H
510C	68 3/4	57 1/2	87 1/2	22	22	12 3/4	19	32	18
570C	68 3/4	57 1/2	87 1/2	22	22	12 3/4	19	32	18
640C	68 3/4	57 1/2	87 1/2	22	22	12 3/4	19	32	18

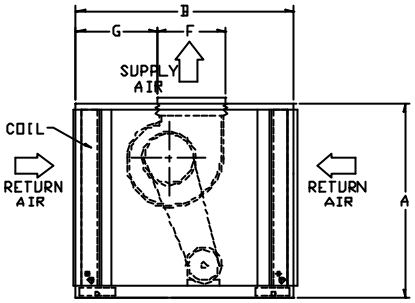




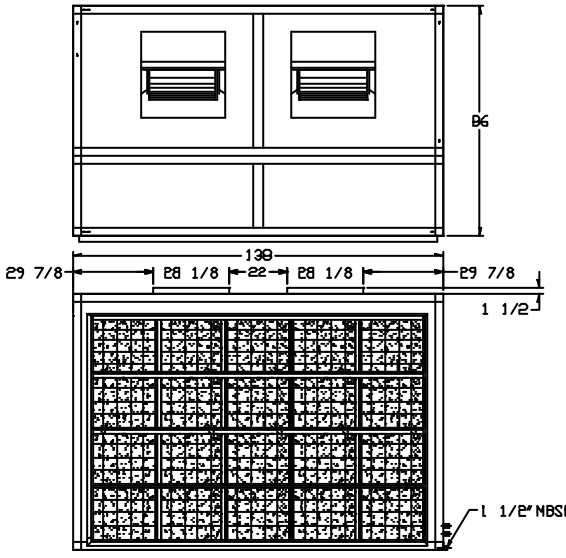
VEB 700C, 760C, 800C, 890C, 960C, 1020C, 1140C

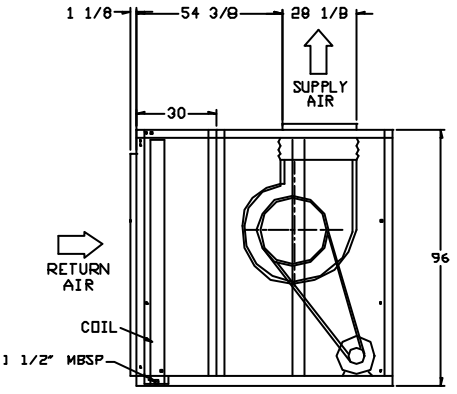
MODEL VEB	A	B	C	D1	D2	E	F	G	H
700C	65	70	108	22	22	23	19	31 1/8	18
760C	65	70	108	22	22	23	19	31 1/8	18
800C	65	78	108	25 1/8	25 1/8	19 1/32	25 1/8	31 1/8	19 11/16
890C	73	78	108	25 1/8	25 1/8	19 1/32	25 1/8	31 1/8	19 11/16
960C	73	78	108	25 1/8	25 1/8	19 1/32	25 1/8	31 1/8	19 11/16
1020C	73	78	108	28 1/8	28 1/8	14 7/8	28 1/8	31 1/8	22
1140C	73	78	108	28 1/8	28 1/8	14 7/8	28 1/8	31 1/8	22





VEB 1340C, 1520C

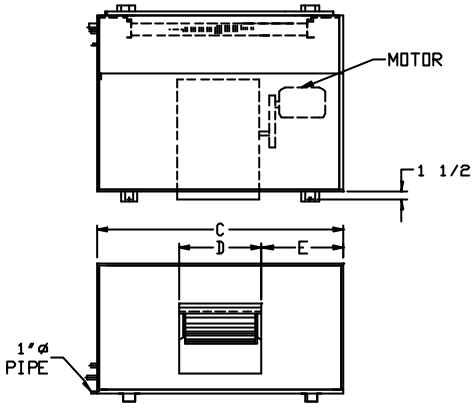


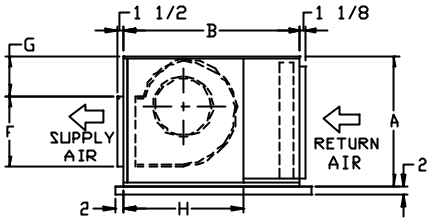


Notes. : 1.) All dimensions are in inches.
2.) Units shown are right hand piping connection.

2.4.3 Evaporator Units (Horizontal Casing Type – HEB-C)

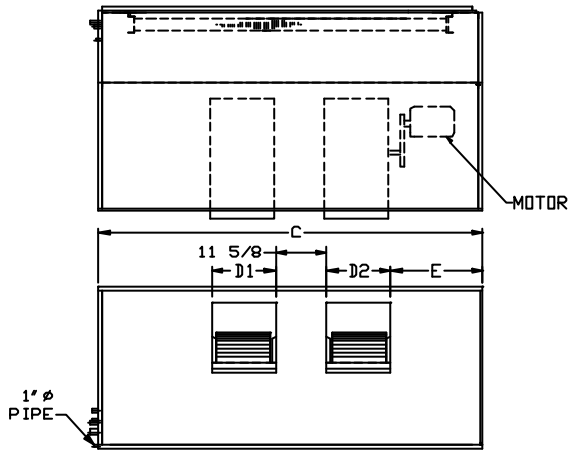
HEB 68C,84C, 95C,108C,125C,145C,160C,190C,220C

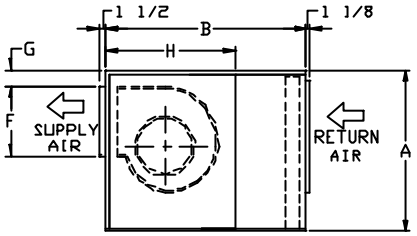




MODEL HEB	A	B	C	D	E	F	G	H
68C	23	30	46	13	16 1/2	11 3/8	7	19
84C	23	30	46	13	16 1/2	11 3/8	7	19
95C	27	33	50	16	21 1/4	13 1/2	8	22
108C	27	33	50	16	21 1/4	13 1/2	8	22
125C	27	33	56	16	21 1/4	13 1/2	8	22
145C	27	33	56	16	21 1/4	13 1/2	8	22
160C	29	40	58	18 1/2	24 3/8	16	8 1/4	27
190C	29	40	58	18 1/2	24 3/8	16	8 1/4	27
220C	29	40 3/4	81 1/2	18 1/2	31 1/2	16	8 1/4	27

HEB 250C, 285C, 320C, 380C





MODEL HEB	A	B	C	D1	D2	E	F	G	H
250C	29	40 3/4	81 1/2	14 11/16	14 11/16	25	16	2 5/8	27
285C	36	45 1/2	87 1/2	14 11/16	14 11/16	27	16	3 1/2	29 1/2
320C	36	45 1/2	87 1/2	14 11/16	14 11/16	27	16	3 1/2	29 1/2
380C	38 3/4	45 1/2	87 1/2	14 11/16	14 11/16	27	16	3 1/2	29 1/2

Notes. : 1.) All dimensions are in inches.
2.) Units shown are right hand piping connection.

2.4.4 Free Blow Type Evaporator Blower Unit

VEB 68C-FB, 84C-FB, 95C-FB, 108C-FB, 125C-FB, 145C-FB, 160C-FB, 190C-FB, 220C-FB

For Access To Internal Components

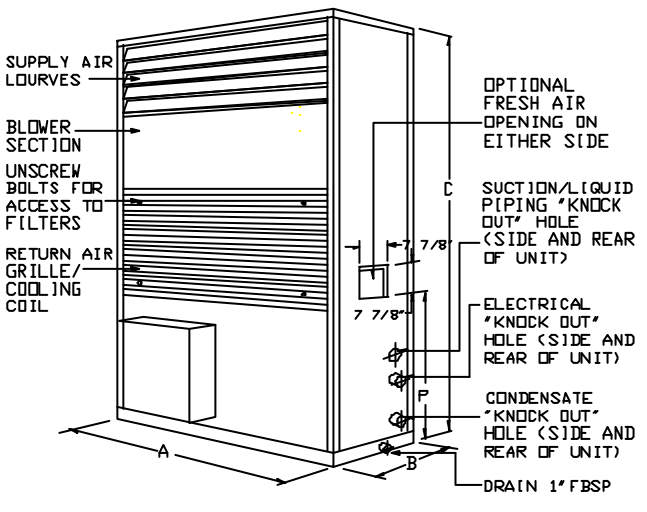
1.) Unscrew bolts at return air grille, remove grille and access to filters and coil.

2.) Unscrew bolts for blower section panel push panel up and remove panel for access to blower and drive assembly.

3.) Unscrew bolts for bottom panel, push panel up and access to compressor(s), condenser(s) and controls.

Model VEB	A	B	*C	P
68C-FB	48	22	79	29
84C-FB	48	22	79	29
95C-FB	48	22	79	29
108C-FB	56	24	81	29
125C-FB	61	24	81	29
145C-FB	61	24	81	29
160C-FB	61	28	86	29
190C-FB	72	28	86	33
220C-FB	72	28	86	33

* Add 10" to the units height if autotransformer are required.



3.0 INSTALLATION

3.1 CONDENSING UNITS INSTALLATION

In installing the condensing units, considerations should be given to the following:

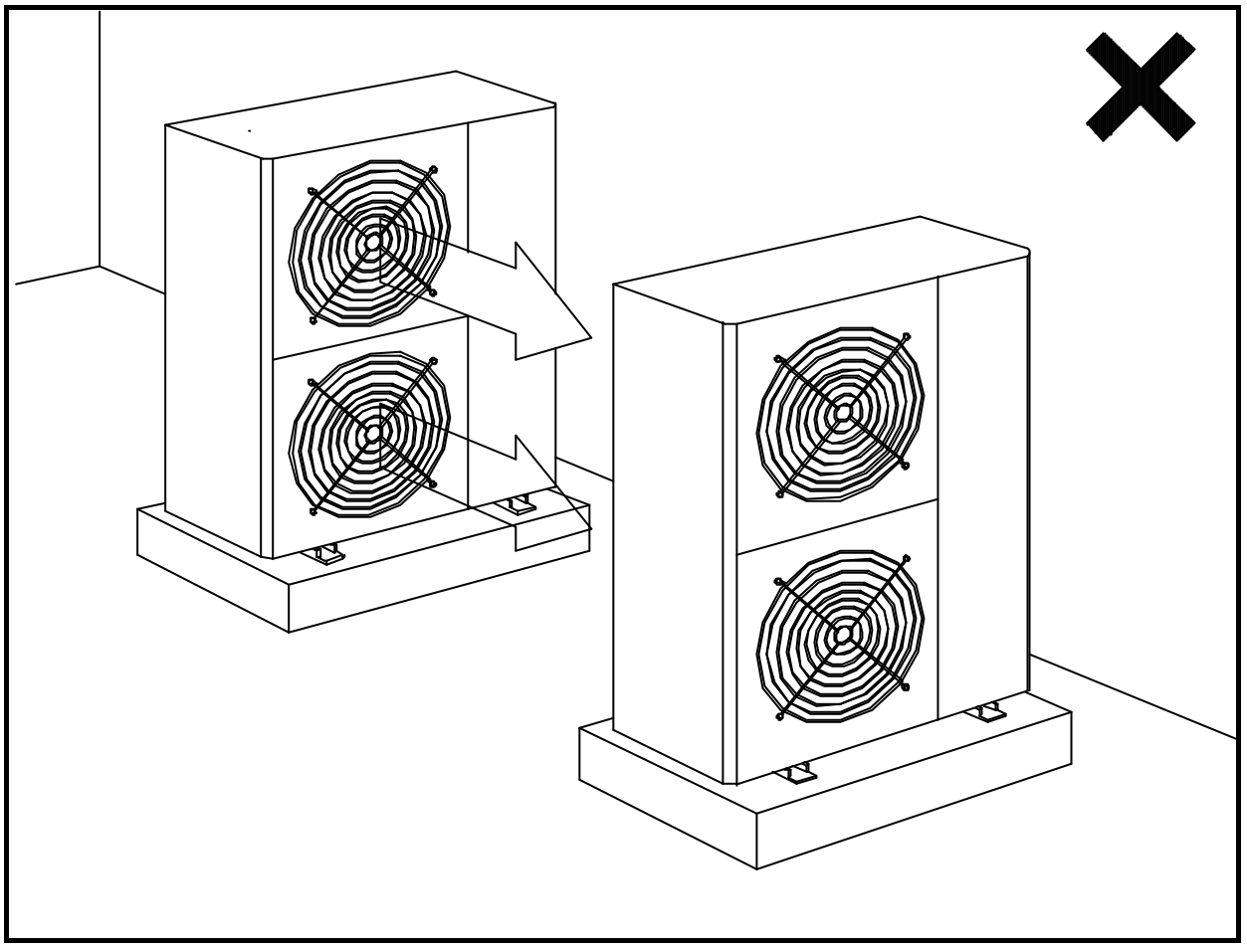
1.) Installed outside the building.

2.) Strong foundation to withstand the unit's weight and vibration. If the base was not leveled, use concrete blocks as base. It is also suggestable to provide rubber pad to isolate the units vibration.

3.) Sufficient space for wiring and maintenance.

4.) Location where air is allowed to circulate. If installing two units together, make sure that the discharge air from one unit were not circuited by the other unit. (Figure 3.1.)

FIGURE 3.1: INSTALLING TWO UNITS TOGETHER



5.) Location where there is no direct heat such as near a generator. This is because if the entering air temperature is high, then the unit will operate at high condensing temperature and subsequently trip on high pressure (during cooling mode).

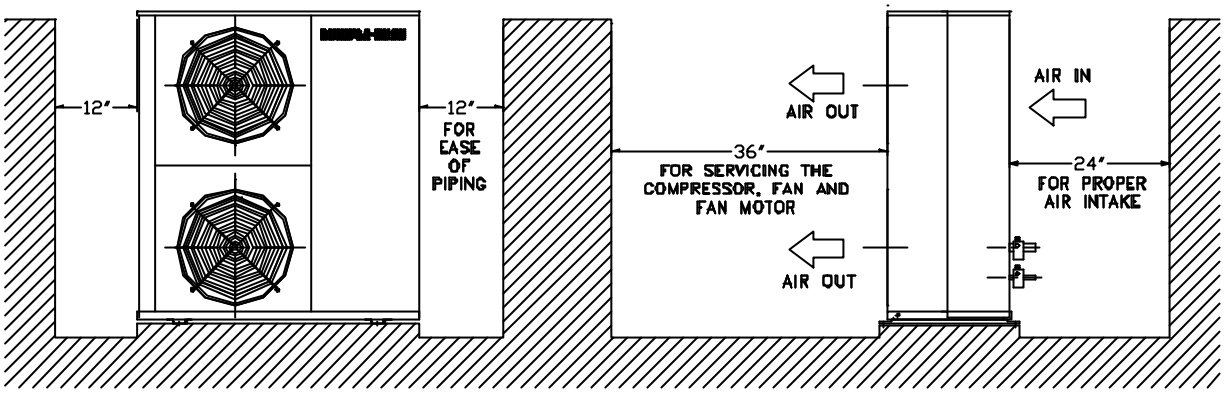
6.) Location where the unit is not exposed to oily area, salty atmosphere, and sulphide gaseous area.

Note: Condenser fans are of the propeller type and not suitable for use with ductwork.

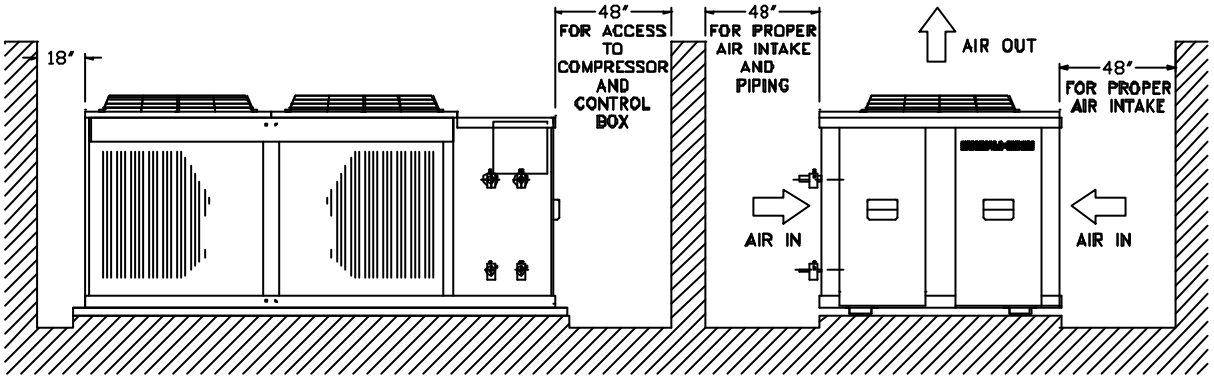
3.0 INSTALLATION

3.2 AIR-COOLED CONDENSING UNITS CLEARANCE

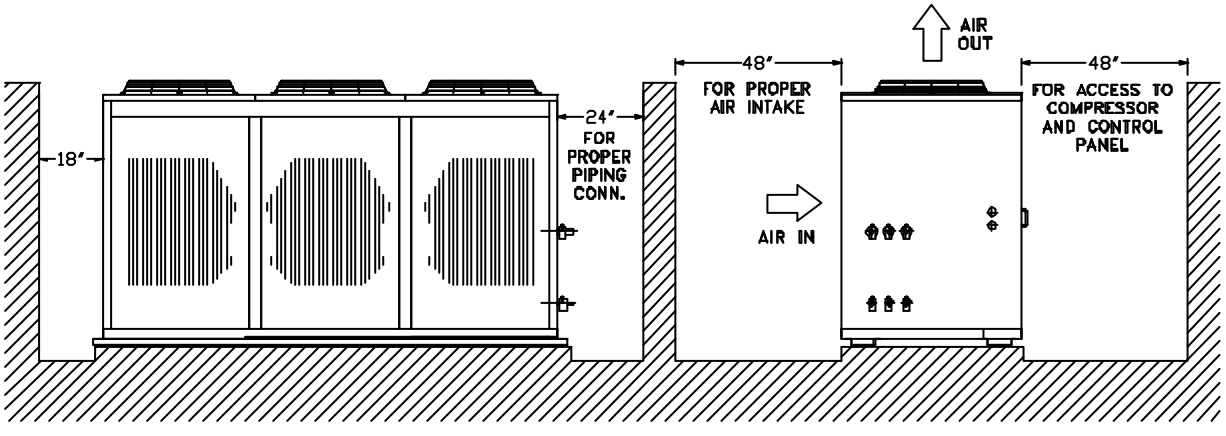
MODELS: ACCS 68, 84, 95



MODELS: ACCS 108, 125, 145, 160, 190, 220, 250, 285, 800, 890, 960, 1020, 1140, 1340, 1520



MODELS: ACC 320, 380, 445, 480, 510, 570, 640, 700, 760

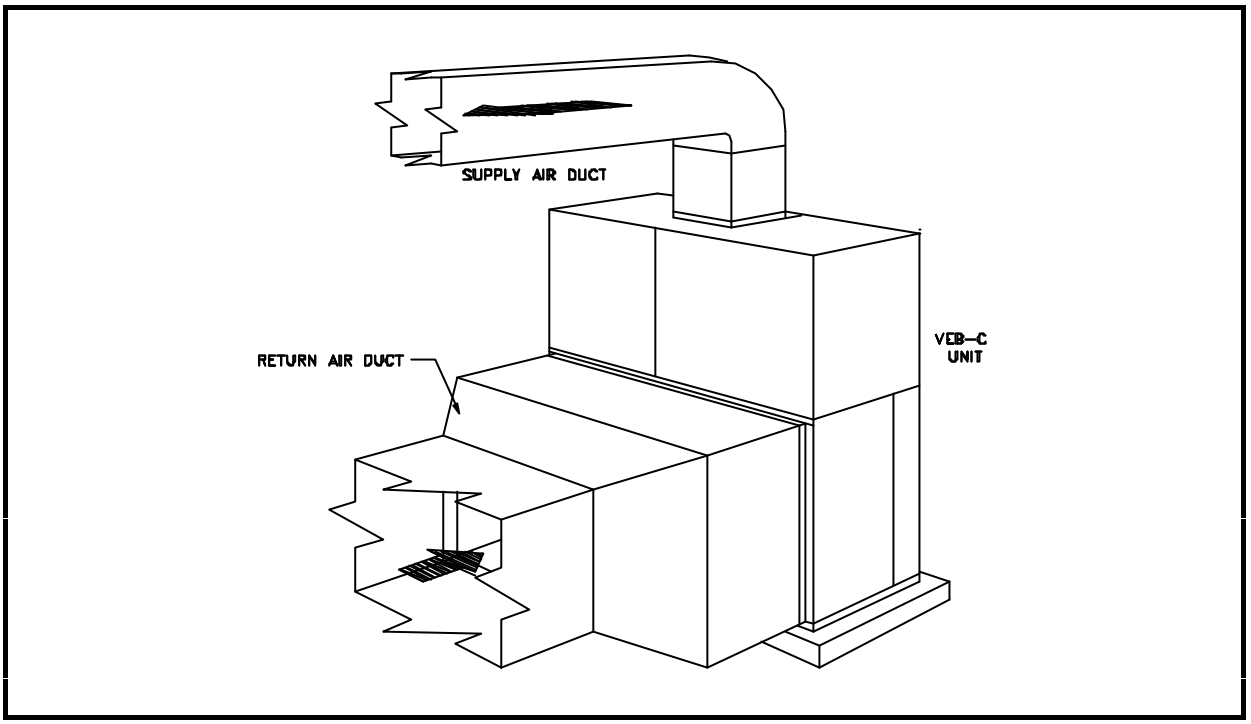


Note: All dimensions are in inches.

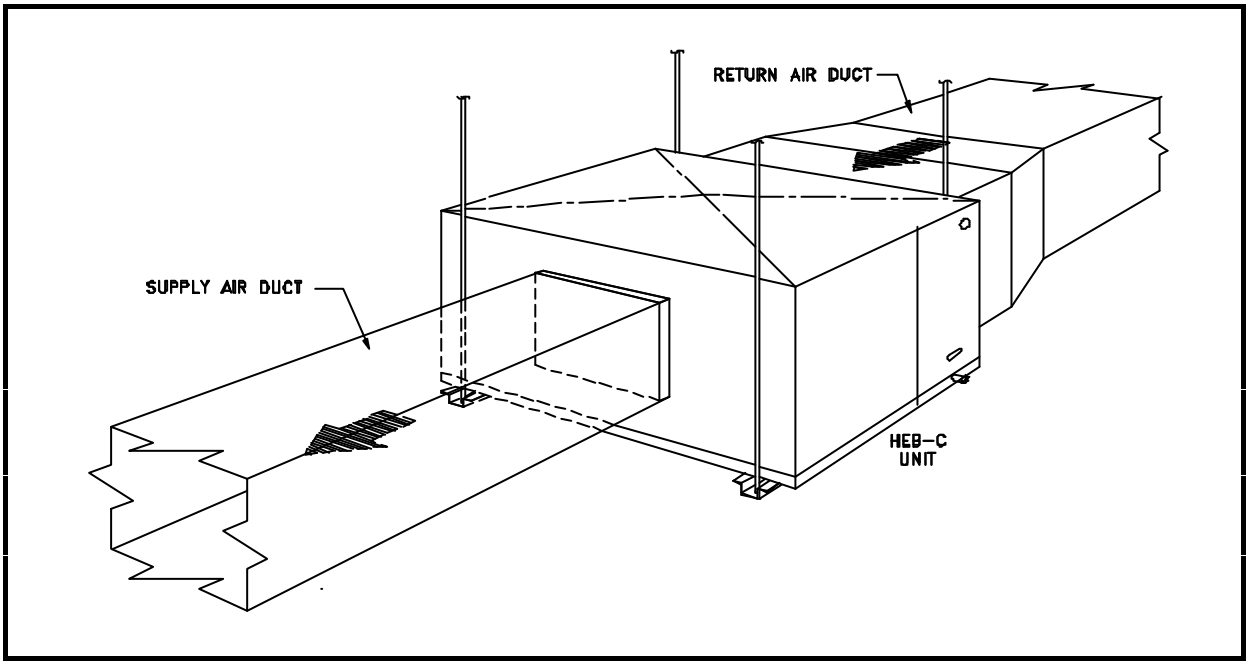
3.0 INSTALLATION

3.3 EVAPORATOR BLOWER UNITS INSTALLATION

3.3.1 TYPICAL VEB-C DUCTING SYSTEM



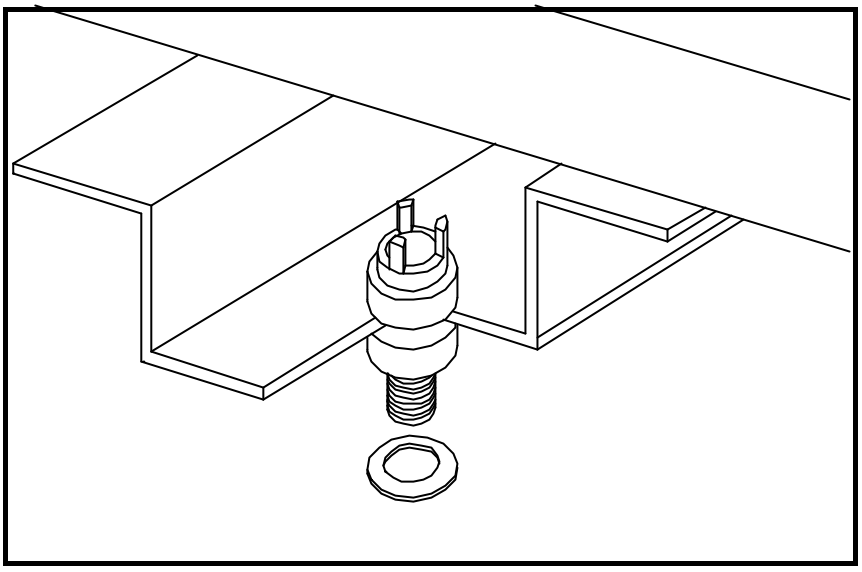
3.3.2 TYPICAL HEB-C DUCTING SYSTEM



Leave the unit in its packaging until it reaches the final destination. This unit is designed for indoor installation only. In installing the unit, these suggestions should be given consideration so that the unit will operate with optimum capacity and also to ease the installation and future services.

3.0 INSTALLATION

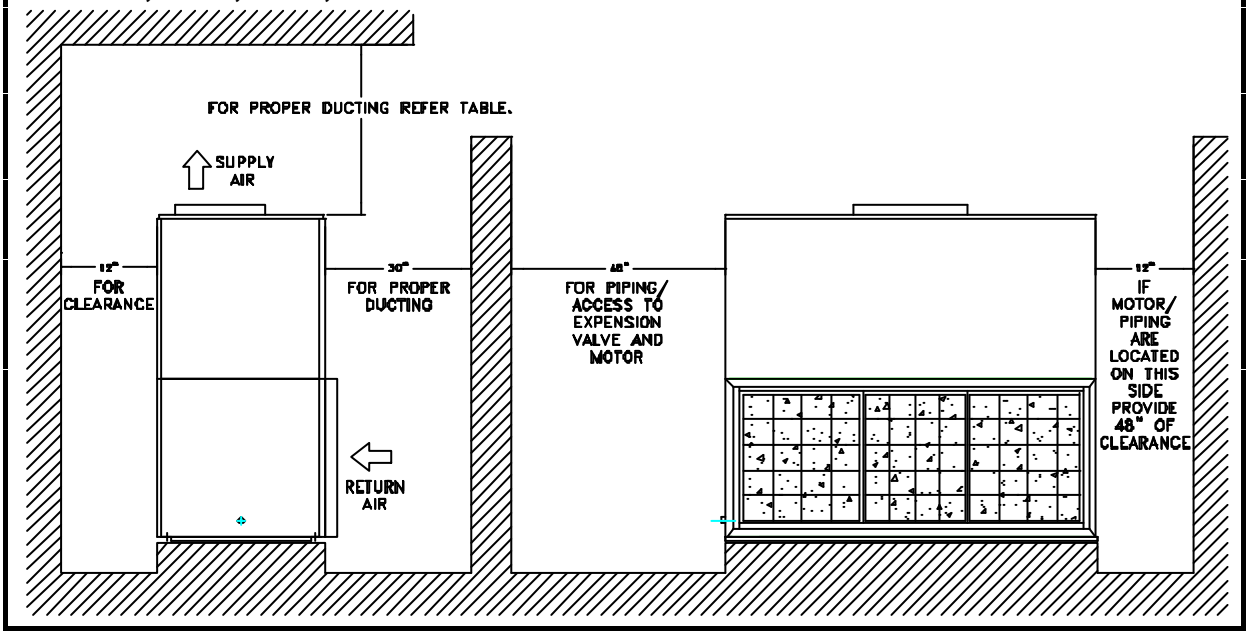
1.) Location that can withstand the unit's weight.
   a.) Sometimes it is necessary to reinforce the ceiling with crossbeam or framework.
   b.) Use suspension bolts to install the unit and make sure the bolts can withstand the weight distribution.
2.) Location that minimize the drain piping and field piping distance.
3.) Location that minimize the ducting length.
4.) Location where there is no direct heat and air is allowed to circulate.
5.) It is suggestable to place the unit higher than the floor level, for ease of drain piping. The base should be 100mm higher and leveled. Fix the unit to the base with anchor bolts. It is also suggestable to place vibrating isolation component between the unit and the base.
6.) Check the levelness of the ceiling using a level gauge.



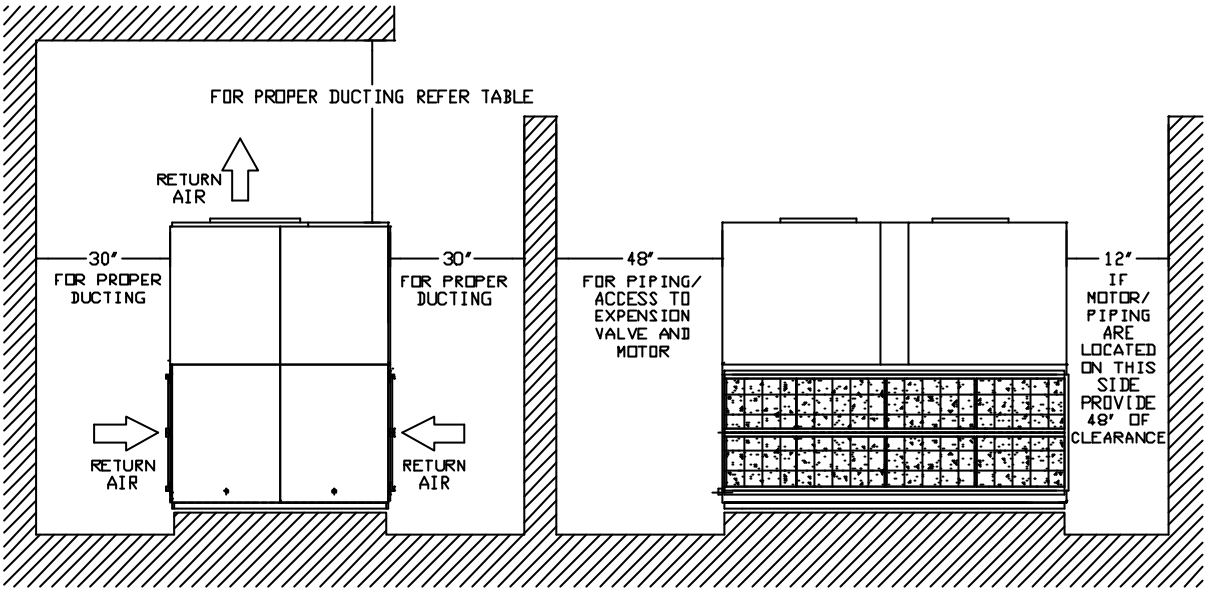
3.4 EVAPORATOR BLOWER UNITS CLEARANCE

3.4.1. VERTICAL CASING TYPE- VEB-C

a.) MODELS: VEB 68C, 84C, 95C, 108C, 125C, 145C, 160C, 190C, 220C, 250C, 285C, 320C, 380C, 445C, 480C

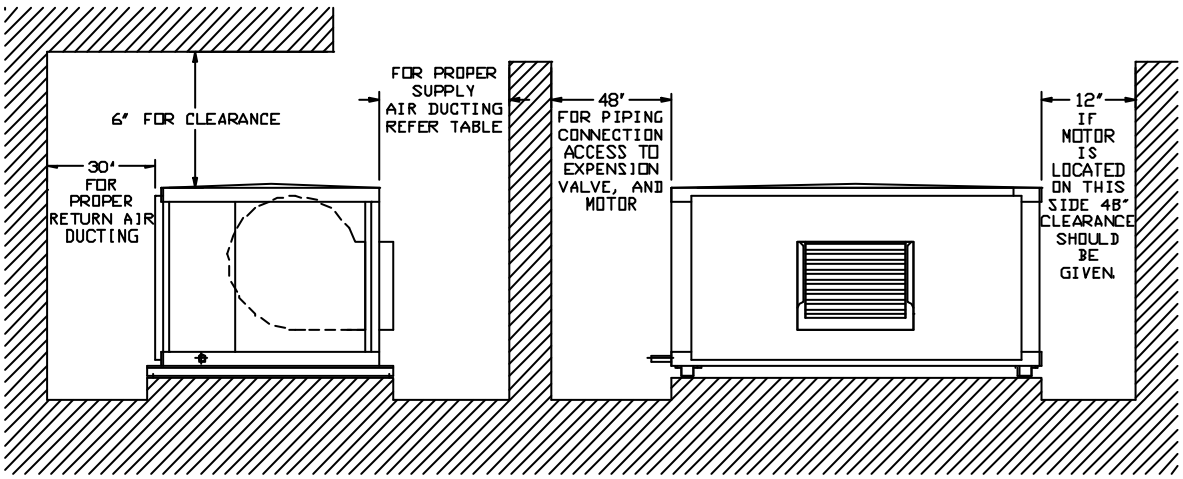


b.) MODELS: VEB 510C, 570C, 640C, 700C, 760C, 800C, 890C, 960C, 1020C, 1140C 1340C, 1520C



3.4.2. HORIZONTAL CASING TYPE- HEB

MODELS: HEB 68C, 84C, 95C, 108C, 125C, 145C, 160C, 190C, 220C, 250C, 285C, 320C, 380C



3.5 DUCT CONNECTIONS

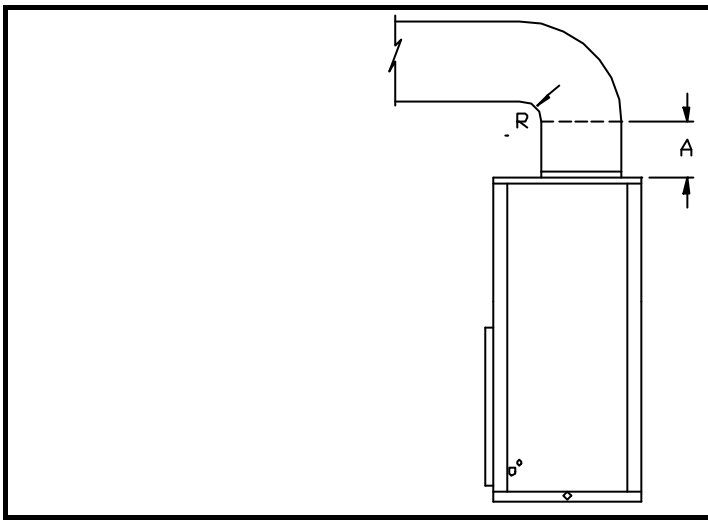
All ducts shall be made according to local and/ or national codes and also with good duct installation practice. Minimize static losses by limiting the number of bends.

Suspended duct work with flexible hangers shall not be fastened directly to the unit.

A length of straight duct shall be installed as per Figure 3.5. This is to ensure uniform flow of discharge air. If an elbow need to be installed, then it shall be 1.5 of equivalent duct diameter. (Equivalent duct Ø= $(4ab/\pi)^{0.5}$).

Please refer to AMCA standard for proper ducting installation/ guidelines.

FIGURE 3.5: SUGGESTED METHOD FOR CONNECTING SUPPLY DUCT

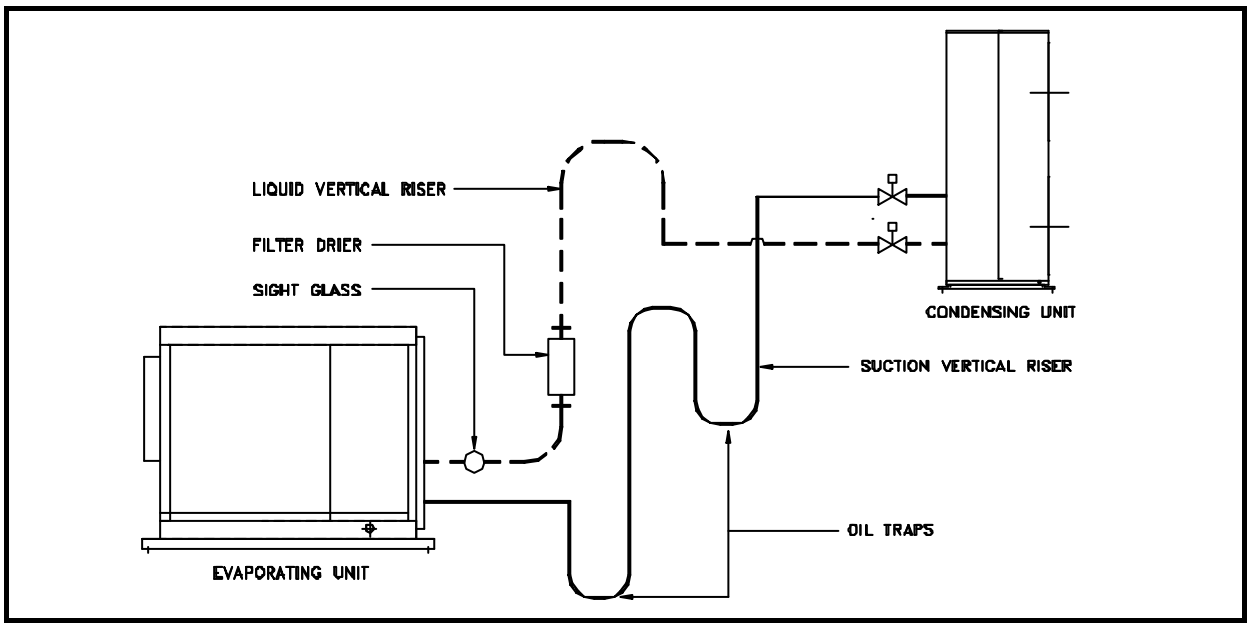


Model	A	R
68 - 125	40	25
160 - 760	60	35
800 - 1520	80	50

Note: Transition element shall not be greater than 15° for converging elements nor greater 7° for diverging element.

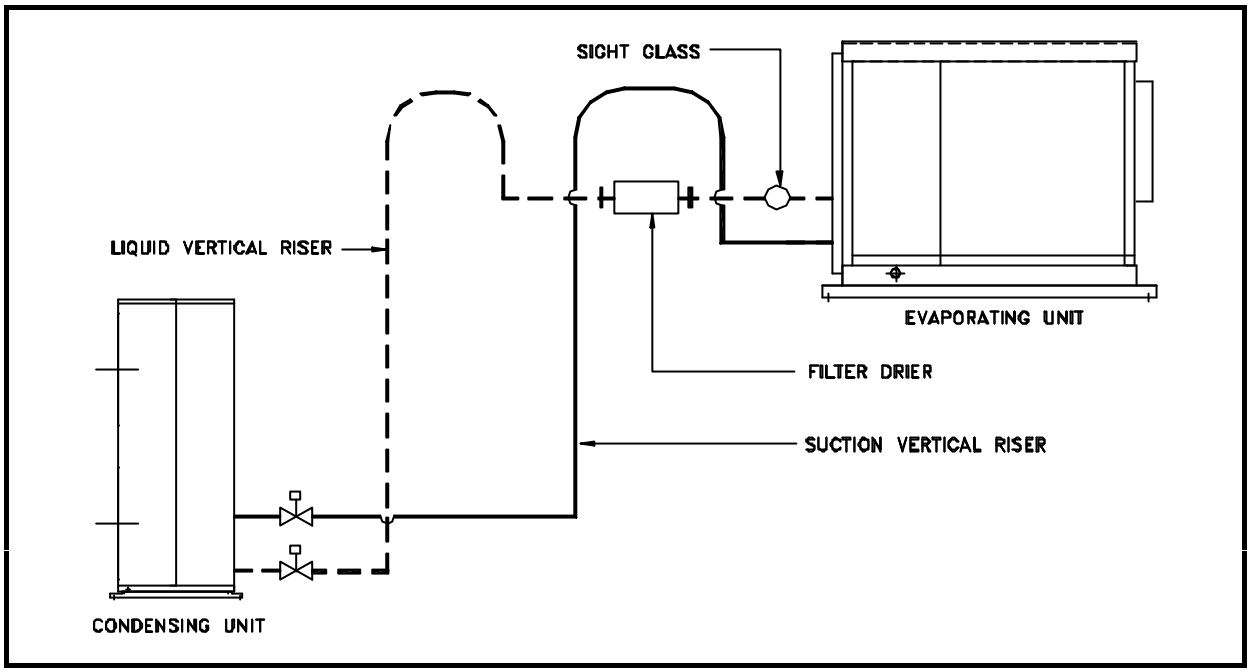
3.6 FIELD PIPING

1.) COMPRESSOR (CONDENSING UNIT) IS ABOVE THE EVAPORATING UNIT.



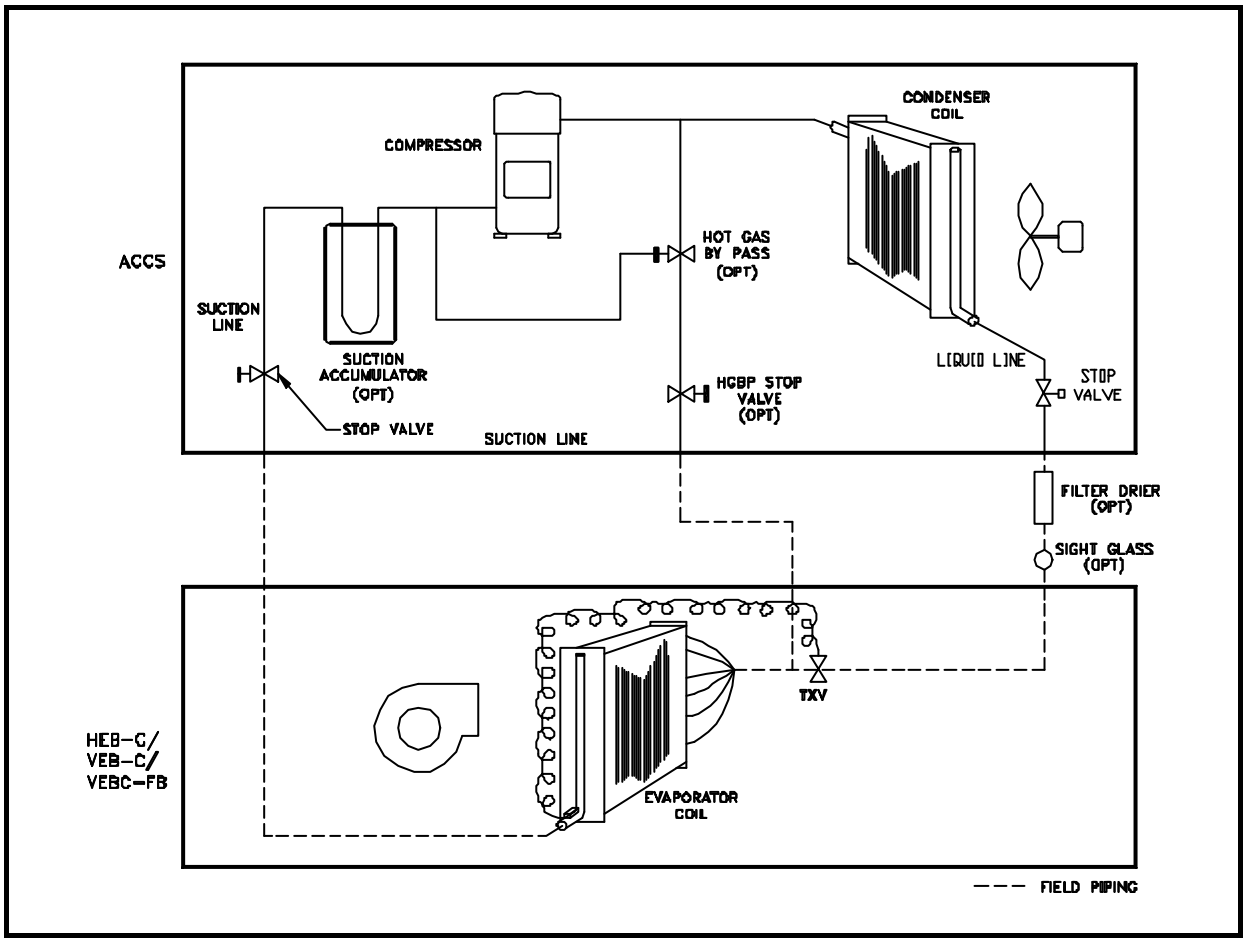
3.0 INSTALLATION

2.) EVAPORATING IS ABOVE THE COMPRESSOR.

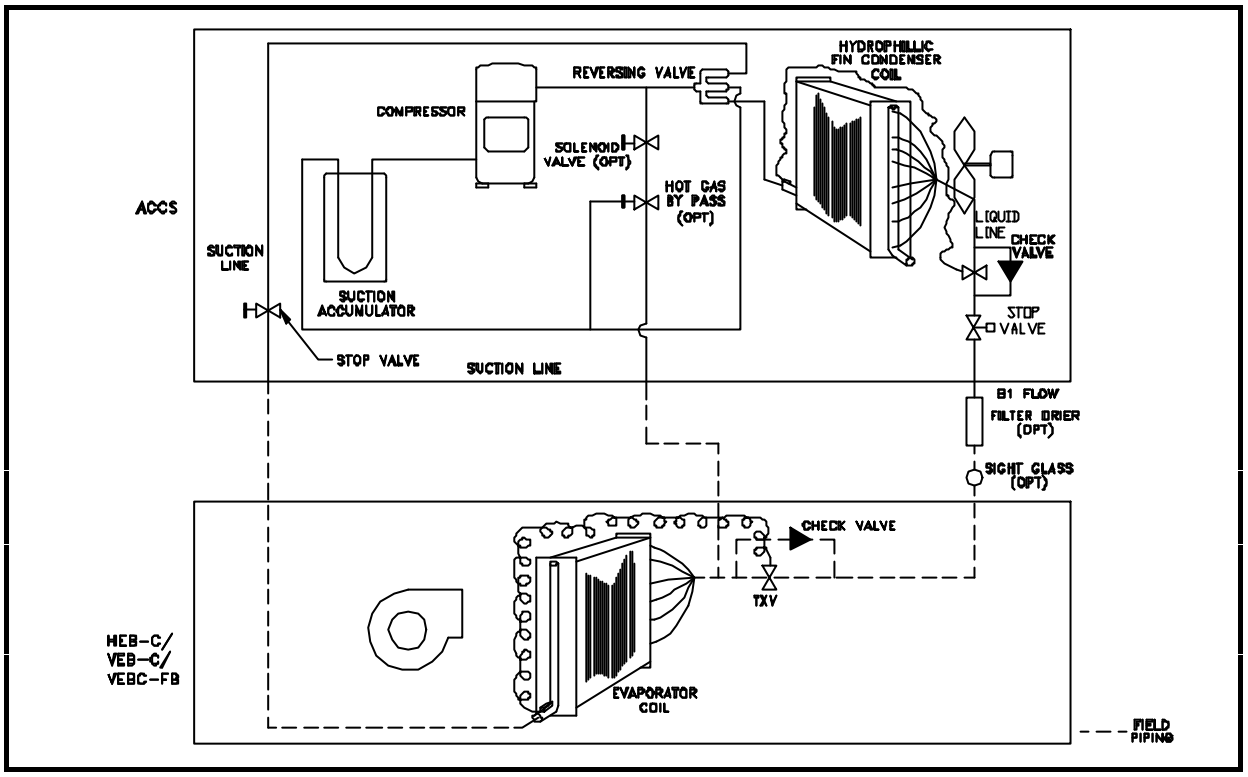


Note : Traps should be provided for every 20 ft of vertical riser for proper oil movement.

3a.) TYPICAL PIPING SCHEMATIC (WITH OPTIONAL ACCESSORY AS INDICATED)



3b.) TYPICAL PIPING SCHEMATIC – HEAT PUMP (WITH OPTIONAL ACCESSORY AS INDICATED)



3.7 REFRIGERANT PIPING

1.) Prior to connecting the tubes, make sure to apply blind caps or water proof tape to prevent dust or water from getting into the tubes.

2.) Horizontal discharge and suction lines should be sloped in the direction of flow at a rate of 1" for every 20' in order to aid oil drainage. If there is a vertical riser of more than 5' on the suction line, there should be a trap at the bottom. For long suction vertical riser, additional trap is recommended for each 20' of riser to insure proper oil return.

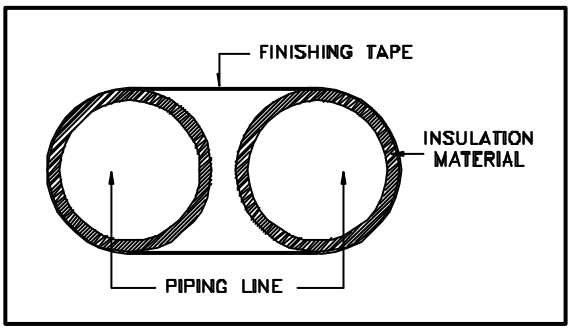
3.) The suction and liquid line should be sized according to the manufacturers standard.

4.) Minimize the exposure time to atmosphere during brazing.

5.) Drain pipe size should be the same or bigger than the existing pipe. The pipe should be installed in downward slope so that water is drained by gravity. A trap must be provided on the pipe so that condensate will drain and not overflowing the drain pan. In addition, upon start-up, the water will not be sucked by the blower. In addition, the evaporator coil is located before the intake of the centrifugal blowers and operates below atmospheric pressure. Thus, to compensate for this pressure differential, a trap is required.

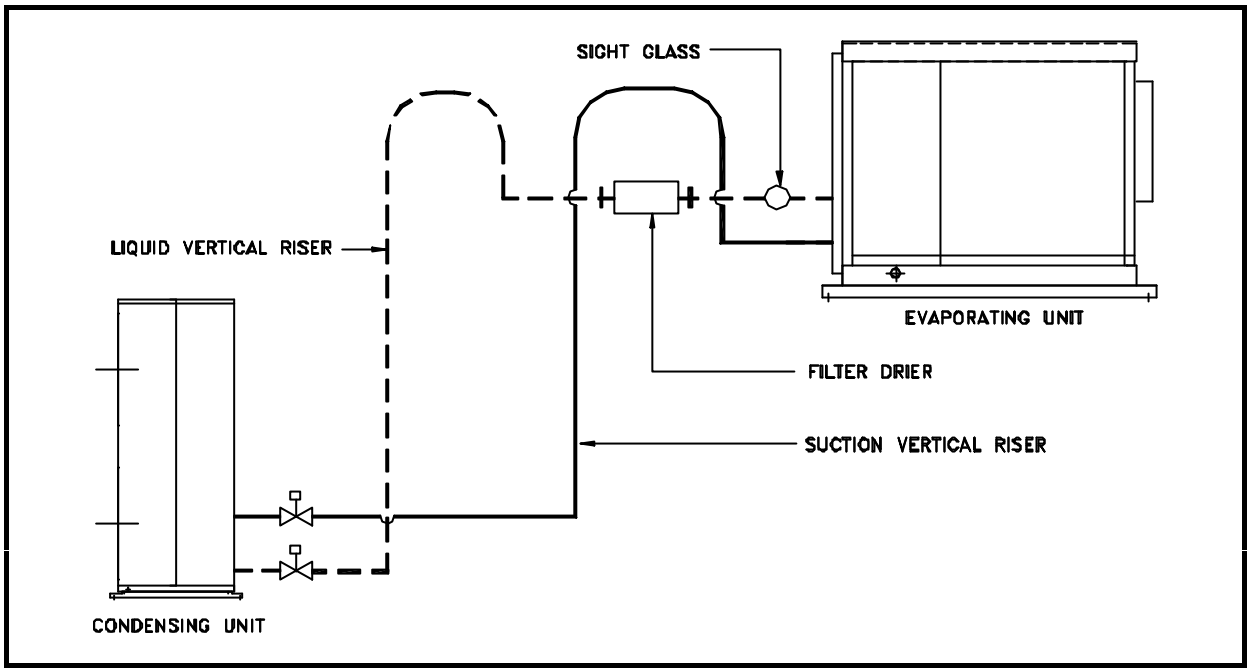
6.) Suction line must be insulated to prevent condensation. It is also suggestable to insulate the liquid line. Insulating these line will prevent unnecessary heat losses/ gains.

7.) This unit is designed to run up to 75 feet and below. For length exceeding 75 feet, consult factory for assistance (piping size need to be changed and oil need to be added.).



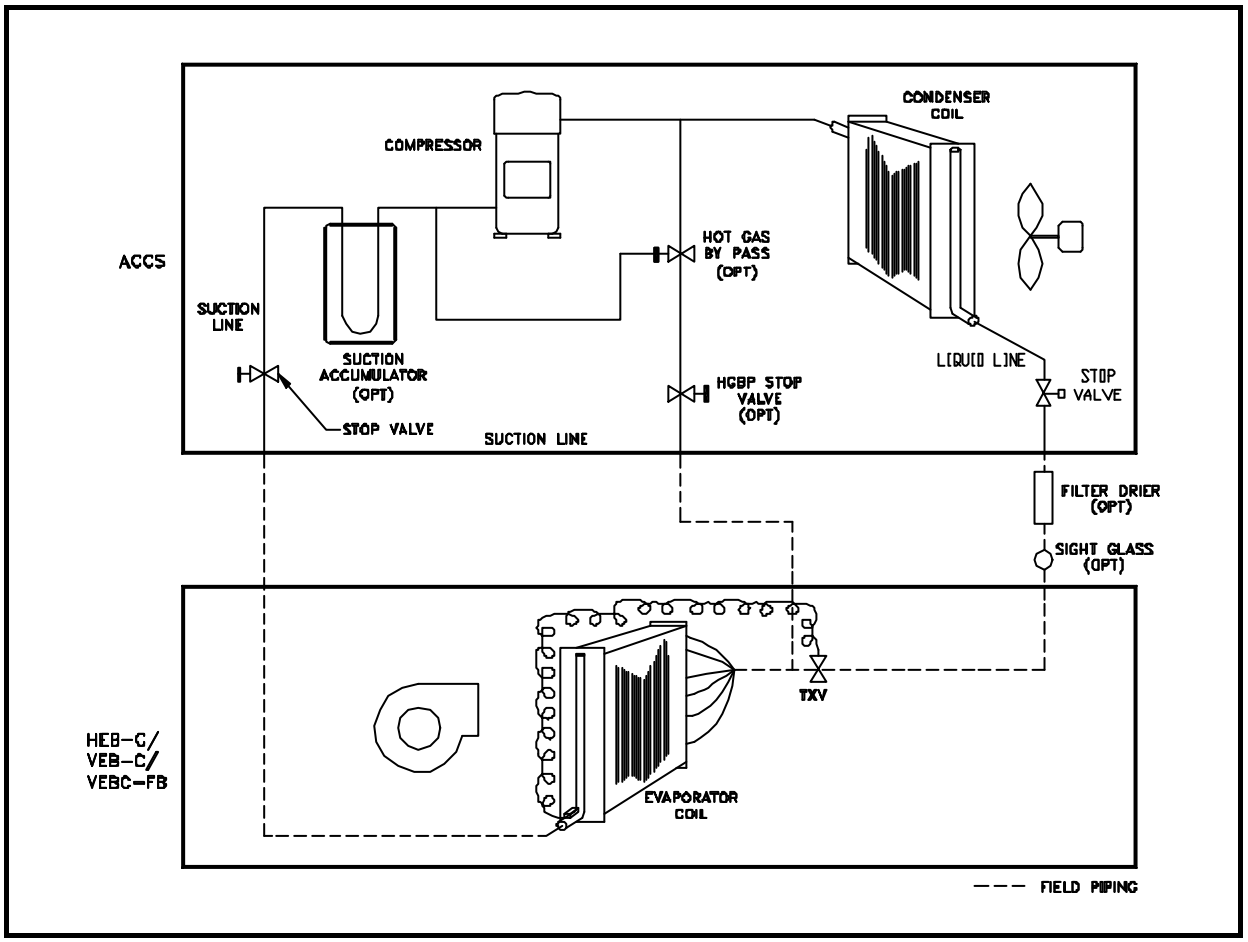
3.0 INSTALLATION

2.) EVAPORATING IS ABOVE THE COMPRESSOR.



Note : Traps should be provided for every 20 ft of vertical riser for proper oil movement.

3a.) TYPICAL PIPING SCHEMATIC (WITH OPTIONAL ACCESSORY AS INDICATED)



3.0 INSTALLATION

3.8 LEAK TEST (SYSTEM PRESSURE TEST)

1.) Leak test pressure is at 200 psig. Disconnect or shut off all devices which may be damaged by 200 psig test pressure.

2.) Open all valves in system so that entire system can be pressurized and connect refrigerant cylinder to charging connection.

3.) Charge in freon vapor to the system until 50 psig and then pressurize with dry nitrogen until 200 psig. Stop charging gas if noise of escaping gas is heard. Skip to sequence (6.)

Caution: Always use inert gas such as nitrogen for testing. Never use other gases such as Oxygen or acetylene which may be inflammable.

4.) With pressure at 200 psig, shut off the valve connecting nitrogen cylinder to the system. Disconnect nitrogen cylinder and leave pressure gauge indicating 200 psig connected to system.

5.) With halide torch or electronic leak detector, leak check every valve, joint, pressure control, coils and headers. Mark every leak and record down as remarks.

6.) When all leaks have been found, blow off charge through tube to outside to prevent refrigerant accumulation around the system.

7.) Repair all leaks (check off on your remarks): If rebrazing is required, feed nitrogen through into the system at slightly excessive pressure (leave system open and make sure nitrogen flows through).

8.) After repairing leaks, re-check as per procedure 1 through 7.

9.) When system tight after leak test, keep pressurized at 200 psig and hold for 12 hours. Full in pressure should be negligible (some may be due to temperature change only.)

10.) When system is tight, proceed with vacuum test and dehydration.

3.9 VACUUM TEST AND DEHYDRATION

The purpose of evacuation is to evacuate the system when it is known or suspected that the system has been exposed to atmosphere, and there is a possibility that moisture has entered the system.

1.) Blow-off charge or pump down the R-22.

2.) Connect vacuum pump the liquid line valve and carefully check the unit piping to ensure all passages are open. (NEVER USE SYSTEM COMPRESSOR TO EVACUATE).

3.) Start vacuum pump operation and pull vacuum to about 2 to 2.5 mm Hg absolute pressure. During evacuation the pressure may remain steady for sometime at about 0.5 inch or 12 mm Hg absolute pressure. This is caused by moisture evaporating in the system. This "boiling off" or "evaporation period" last about the same period of time as it took from initial start to reach this point.

4.) When the "boiling off" period lasts longer that indicated under 3, break vacuum with R-22 or nitrogen gas to sweep moisture out and evacuate and dryer shells, etc., up to a temperature of 100°F.

5.) Break vacuum with R-22 or nitrogen gas until pressure is 0 psig.

6.) Re-evacuate to 1 mm Hg absolute pressure.

7.) Disconnect vacuum pump and leave system standing for 6 hours. There should be no change in vacuum during this period. If there is a change repeat 1 to 7.

3.0 INSTALLATION

3.10 INSTALLATION OF DRIERS OR SIGHT GLASS

1.) Break vacuum with nitrogen.

2.) When permanently brazed drier or sight glass is used, open one valve on system to atmosphere while maintaining slight nitrogen flow.

3.) When flare connected drier or sight glass is used, use similar procedure as under 2. However, no valve need to be left open to atmosphere.

4.) When replaceable dryer core is used follow procedure as under 3. Insert drier core(s). Tighten cap screws.

5.) Re-evacuate system to 1 mm Hg absolute.

3.11 CHARGING

1.) Connect refrigerant cylinder through charging connection to charging valve.

2.) Loosen flare nut on other end of charging connection and blow air out with refrigerant. Tighten flare nut on charging connection.

3.) Weight refrigerant cylinder.

4.) Open charging valve and charge in refrigerant vapor through suction access valve until about 150 psig. Switch to liquid line access valve and charge in liquid refrigerant. Continue charging with liquid refrigerant until clear glass is observed.

5.) Shut off refrigerant charging valve but keep connected. Check charging valve flare nut for leak. Check and record down discharge and suction pressure. If more than one system to be charged, follow procedure 1 through 4 for each system. After all the systems have been done up to step 4, proceed with 5 and 6.

6.) Shut off the system (compressor, fans, pumps) and leave for 24 hours.

3.12 LUBRICATION

The scroll compressor use mineral oil for the SM and ZR compressors and POE (Polyol ester) oil for SZ compressors. The condenser fan used a direct-drive permanent split capacitor motor. The motor should be lubricated with 30 to 40 drops of SAE # 20 non-detergent oil as follows depending on service:

LIGHT DUTY -After 25,000 operating hours.

NORMAL DUTY -Annually after three years or 8,000 operating hours.

HEAVY DUTY -Annually after one year or at least every 1500 operating hours.

CAUTION: DO NOT OVER OIL

3.13 SENSING BULB LOCATION

1.) Sensing bulb is not installed for the evaporator unit due to limited space and for precautionary reasons.

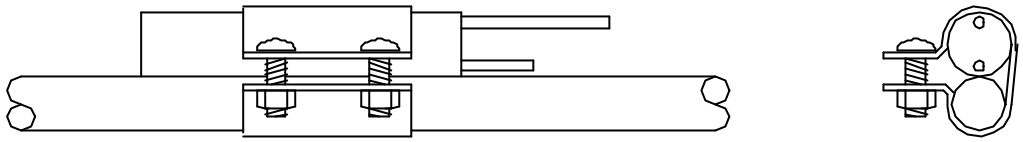
2.) The sensing bulb should be attached to a horizontal suction line at the evaporator outlet.

3.) If more than one TXV is used on evaporator sections, make sure that the sensing bulb of each valve is applied to the suction line of the evaporator fed by that valve.

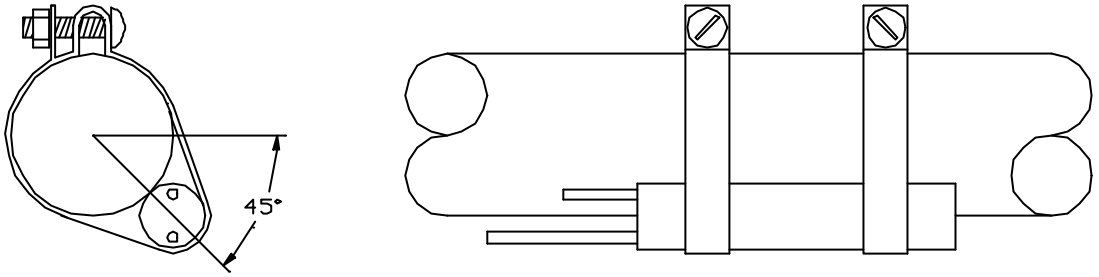
4.) On suction lines 7/8" OD and larger, it is recommended that the bulb be installed at 4 or 8 o'clock on the side of the horizontal line and parallel with respect to the direction of flow. On smaller lines, the bulb should be mounted on the top of the line. See Figure 3.13.

FIGURE 3.13: REMOTE BULB

1. Remote Bulb Small Suction Line (Smaller Than 7/8")



2. Remote Bulb On large Suction Line (7/8" and Larger)



5.) For good thermal contact, the bulb should be securely fastened with two bulb straps to a clean, straight section of the suction line. It should be insulated with cork tape to prevent the effect of surrounding environment.

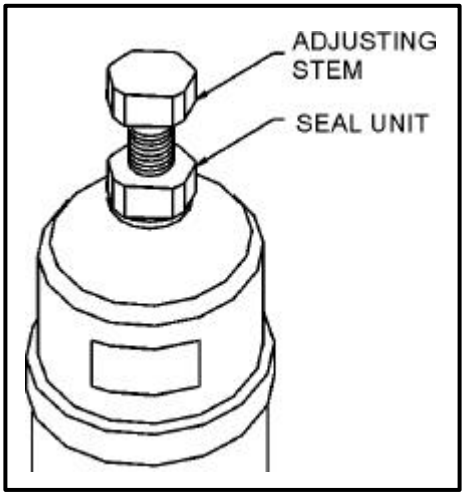
3.14 EXTERNAL EQUALIZER CONNECTION

The equalizer connection should be made at a point that will most accurately reflect the pressure existing in the suction line at the bulb location. Generally, the connection is as close to bulb as on the downstream side.

3.15 HOT GAS BYPASS

The purpose of the hot gas by pass is to create artificial load in the system by means of injecting hot gas into the inlet of the distributor. This would prevent the suction pressure from falling below the desired settings and thus causing frequent compressor cycling. The valve is pressure actuated, where it allows the discharge gas to bypass if the downstream pressure is below the setting. The setting could be changed by adjusting the stem on the valve body. To set the pressure, loose the seal nut as shown below and turn the adjusting stem clockwise to raise the pressure or counter clockwise to lower the pressure. One turn of the stem equals to 16psig. The adjustment range for the valve is between 10" hg to 120psig.

It is important that the setting to be performed under actual operating condition, i.e. under minimal system load conditions so that it could maintain the minimum desired suction pressure. Hot gas flow could be detected by listening the gas flowing through the valve or by touching the outlet pipe.



3.0 INSTALLATION

3.16 TIGHTENING OF BEARING SET SCREW

Apply one or two drops of thread locked 243 to the engagement area of set screws before tightening the bearings according to the recommended torque.

Bearing Model	Tightening Torque
UC 201 - 205	5.1
UC 206	6.4
UC 207	7.5
UC 208 - UC 210	10.1
UC 307	12.7
UC 212	21.6
UC 308 - UC 309	25.5
UC 310 - UC 314	38.2

3.17 TIGHTENING OF PULLEY SET SCREW

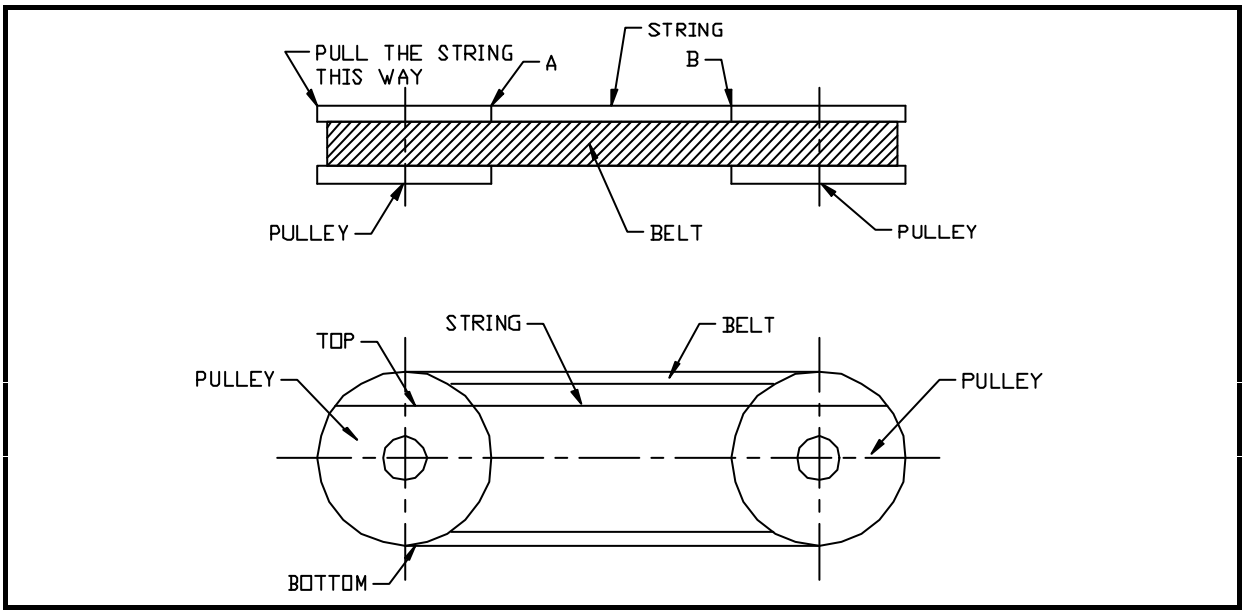
Apply one or two drops of thread locked 243 to the engagement area of set screws before tightening the pulleys according to the recommended torque.

Set Screw Size	Tightening Torque
5/16	13
3/8	26

3.18 PULLEY ALIGNMENT

1.) Insert one end of the string inside the gap between belt and pulley.
2.) Rotate the pulley so that string is clipped between the pulley and the belt.
3.) Pull the other end of the string as per figure below.

FIGURE 3.18:

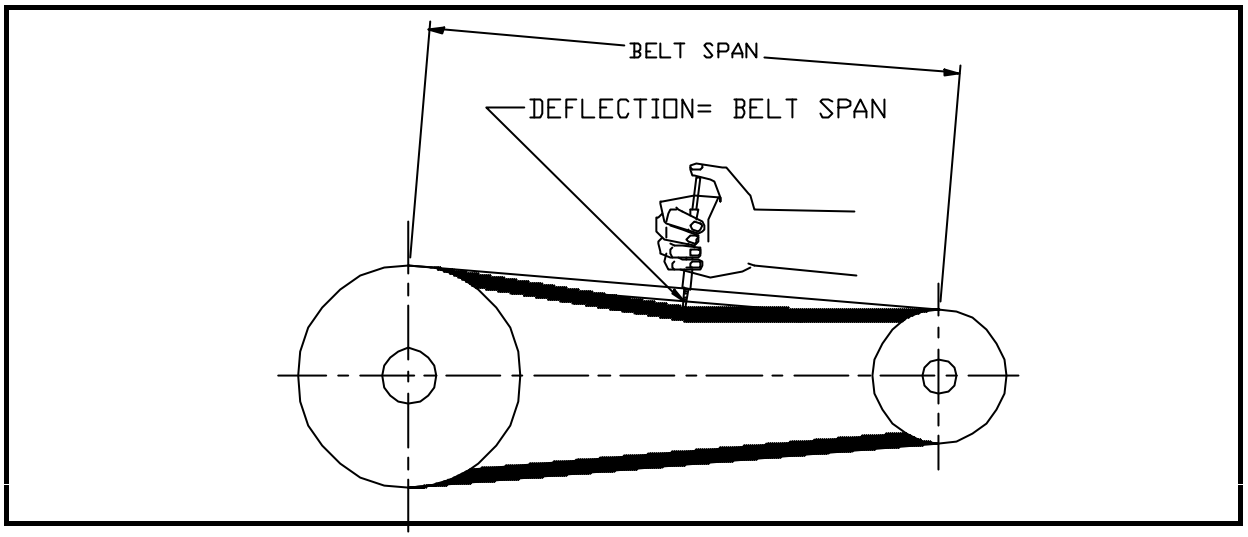


4.) Inspect for any gap between the string and pulley at A and B.
5.) If find any gap then adjust either pulley to make the gap as small as possible.
6.) Repeat steps 1, 2, 3, 4 and 5 for bottom of the same side, top and bottom of the other side. (As shown as Figure 3.18)

3.19 BELT TENSION INSPECTION GUIDE

1.) Measure the belt span (See Figure 3.19).

FIGURE 3.19: BELT SPAN



2.) Position of the "O" ring on the span scale at the measure belt.

3.) Set the "O" ring on the deflection force scale to zero.

4.) Place the tension meter squarely on the belt at the belt span. Apply a force on the plunger and perpendicular to the belt span until the bottom of the "O" ring even the top of the next belt or with the bottom of a straight edge laid across the sheaves.

5.) Remove the tension meter and read the force applied from the bottom of the "O" ring on the deflection force scale.

6.) Compare the force you have applied with the values in Table 3.19a and 3.19b.

Note: A new drive should be tensioned to the higher value. After the drive has been running for 30 minutes, the tension should be checked and readjust to the higher value, if necessary.

Table 3.19a:

Belt Span Lt (cm)	Deflection Td (cm)
25 – 30 31 – 36 37 – 42	0.4 0.5 0.6
43 – 48 49 – 54 55 – 60	0.7 0.8 0.9
61 – 66 67 – 72 55 – 60	1.0 1.1 1.2
79 – 84 85 – 90 91 – 96	1.3 1.4 1.5
97 – 102 103 – 108 109 - 114	1.6 1.7 1.8

Table 3.19b:

Belt Type	Small Pulley Diameter (Inch.)	Maximum Deflection (Kg)
A	3.0 – 5.5	1.0 – 1.5
B	5.0 – 8.0	2.0 – 3.1
C	8.0 – 16.0	4.1 – 6.1

4.0 OPERATION

4.1 PHASE ROTATION

If during initial start up the compressor does not build up pressure, noise is abnormally loud and power consumption is minimal, then there is a possibility that the unit is operating at reverse rotation. Shut down the power and connect phase to the proper terminals.

4.2 CYCLE LIMIT RATE

Each compressors must not be cycle on-off for more than 12 times per hour. The higher number of starts per hour will reduce the life of the compressor. Thus, it is suggested that anti short cycle timer is provided in the system.

4.3 FAN CYCLING (HEAT PUMP)

During cooling only, the head pressure control would allow the unit to operate at lower ambient temperature by building up the discharge pressure through cycling of fans (for single fan unit, this is achievable by reducing the fan speed). If there is demand for cooling. The unit would run on cooling until the manual charge over is set to heating. Please observe the lowest ambient for cooling mode.

4.4 DEFROST CYCLE (HEAT PUMP)

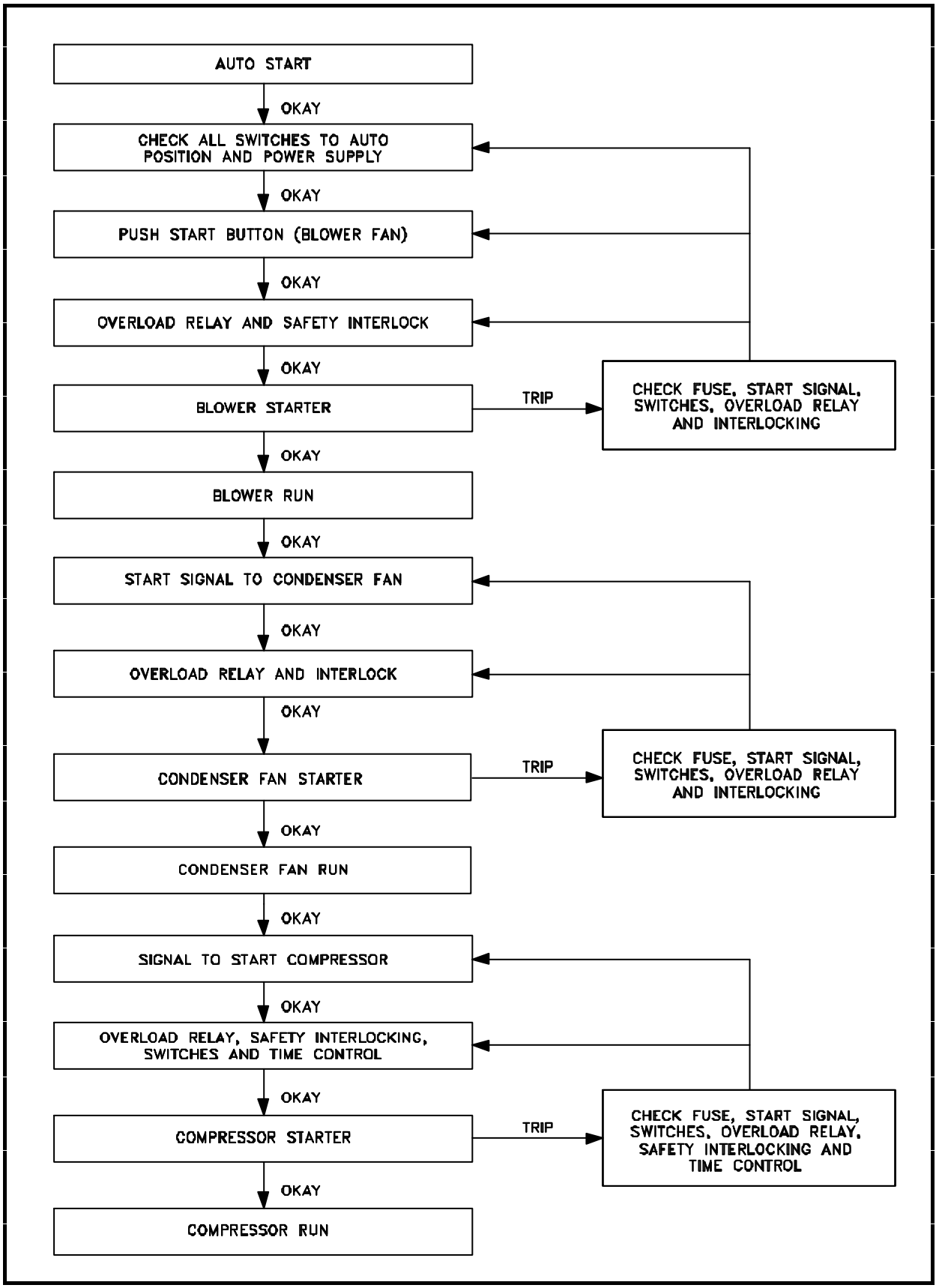
During heating, a defrost controller would initiate the defrost cycle once there is demand for it. The sensor from the controller would sense the suction pressure and if the pressure is lower then the preset value, Then a signal would be sent to the control panel which then relay the signal to the reversing valve to reverse the cycle. Now, the outdoor coil would be discharging hot air and defrosting the ice on the fins surface. The standard factory set timer for the defrost cycle is 10 minutes which could be adjusted according to the site condition.

4.5 CRANKCASE HEATER (HEAT PUMP)

Refrigerant tend to migrate to colder section of the unit. During winter, the compressor compartment is at lower temperature than the evaporator and thus refrigerant tend to accumulate in the compressor compartment. Connect power source to the unit a few hours prior to compressor start up so that the refrigerant would be forced out of the compressor compartment. It is good practice to let the crankcase heater to be energized continuously, independent of compressor operation.

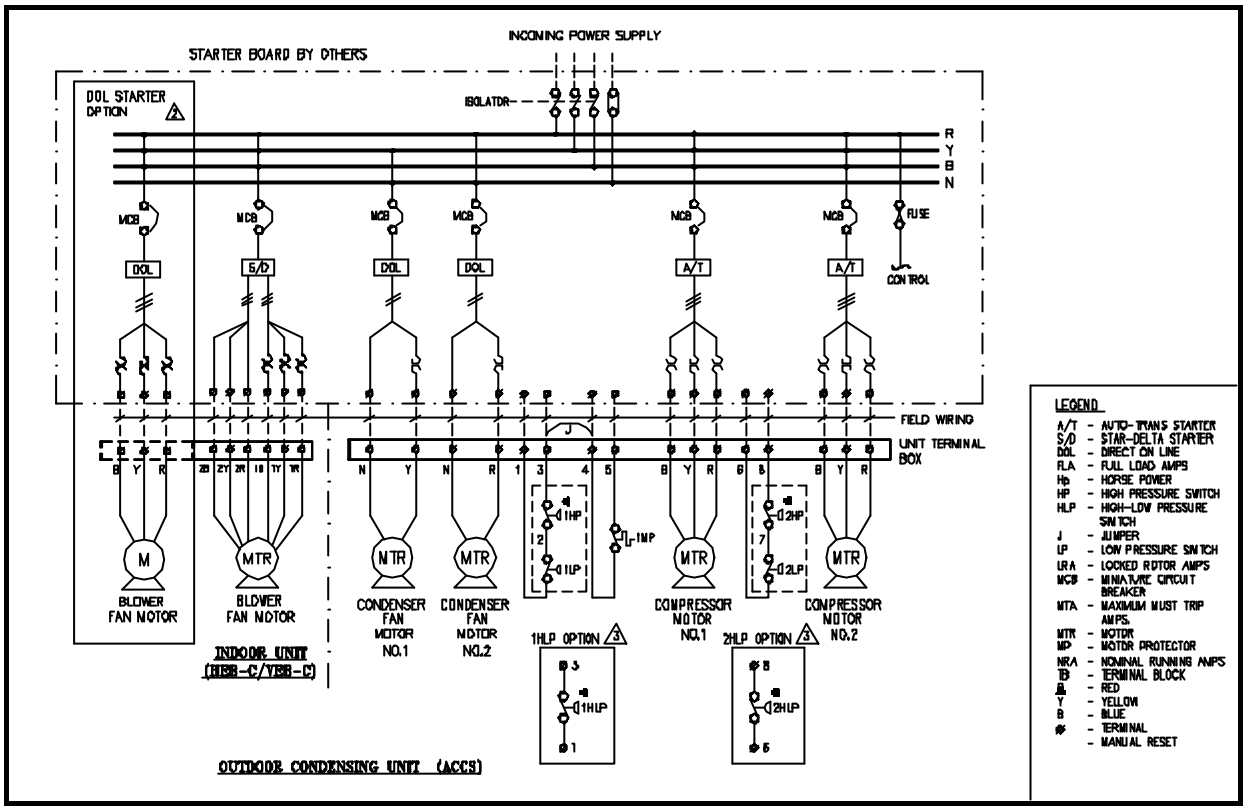
4.0 OPERATION

4.6 TYPICAL OPERATING SEQUENCE



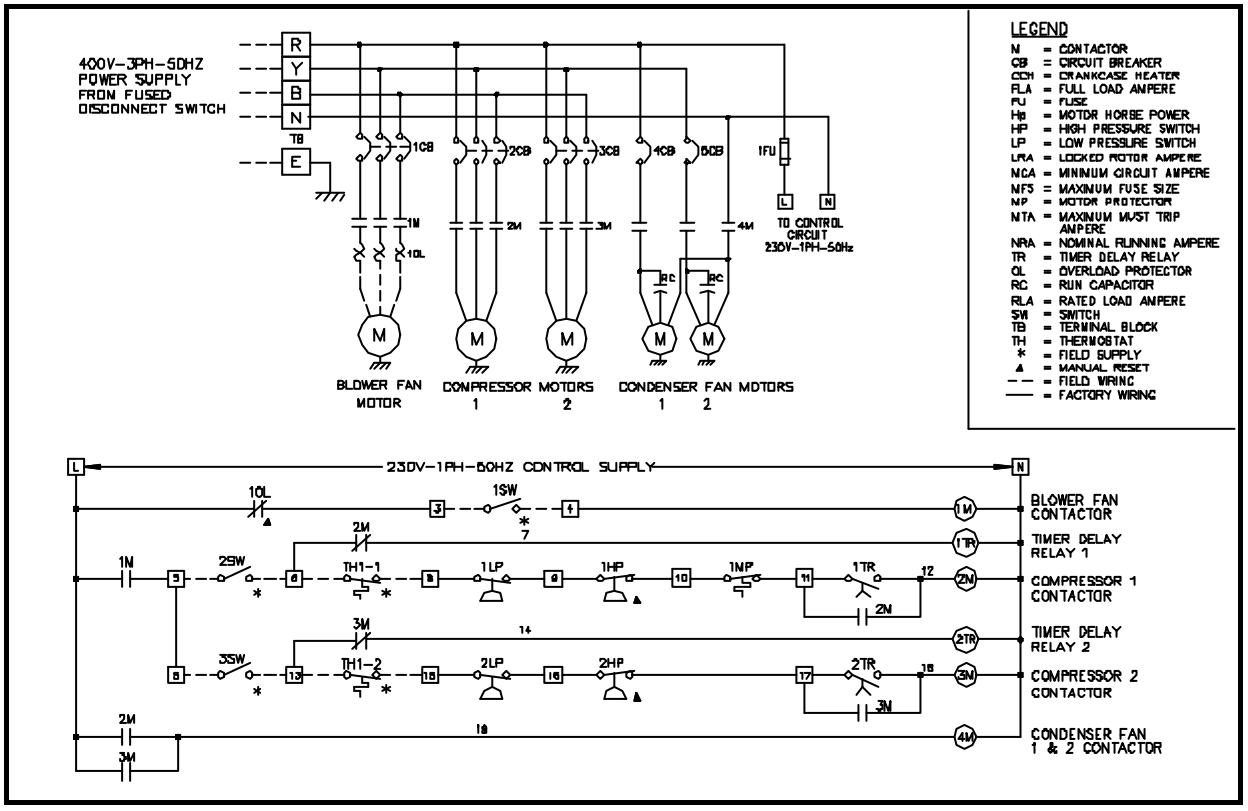
4.0 OPERATION

4.7 TYPICAL WIRING SCHEMATIC WITHOUT STARTER-50Hz



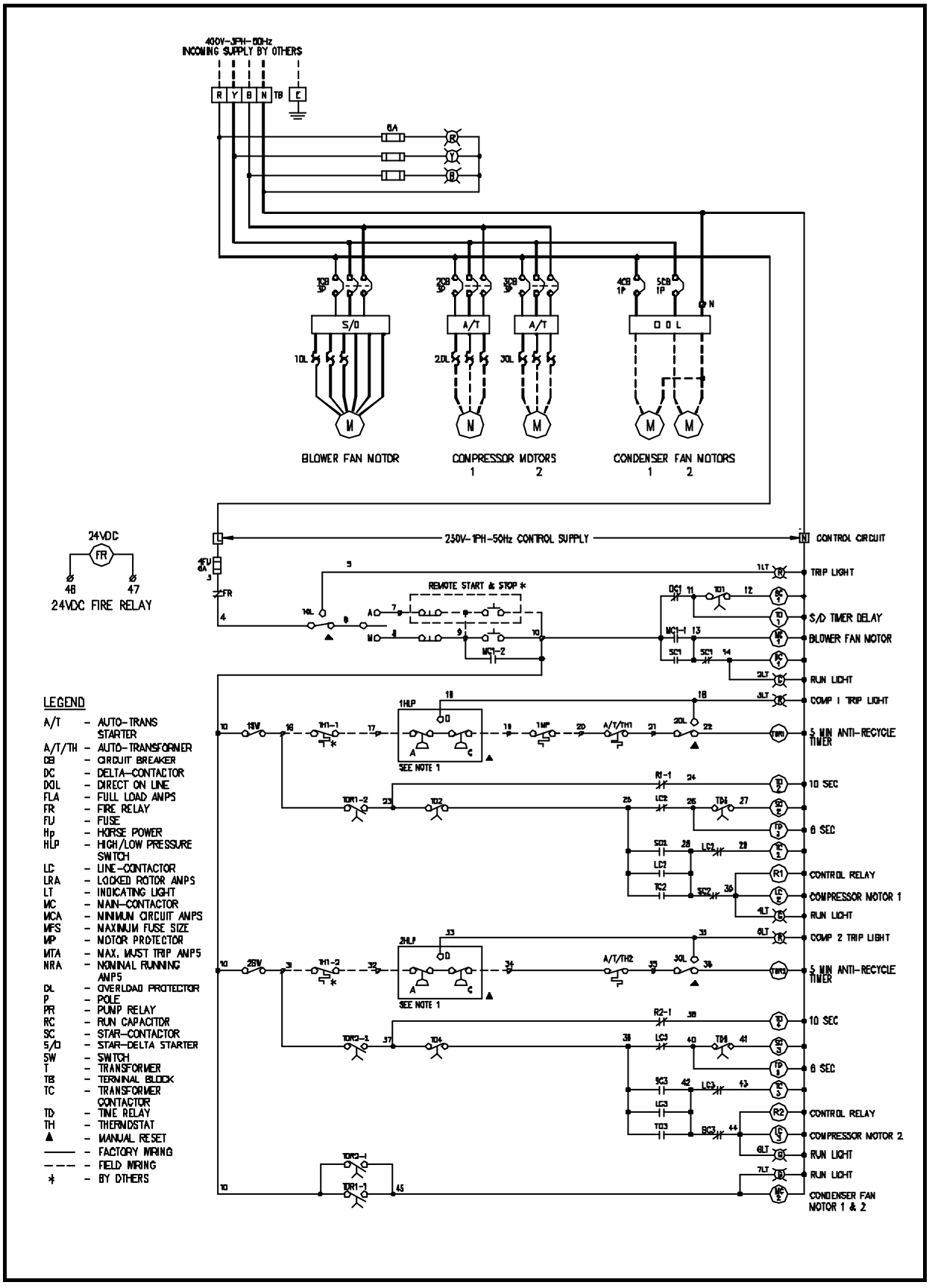
4.8 TYPICAL WIRING SCHEMATIC WITH DOL

50Hz



4.0 OPERATION

4.9 TYPICAL WIRING SCHEMATIC WITH AUTOTRANS 50Hz



5.0 MAINTENANCE

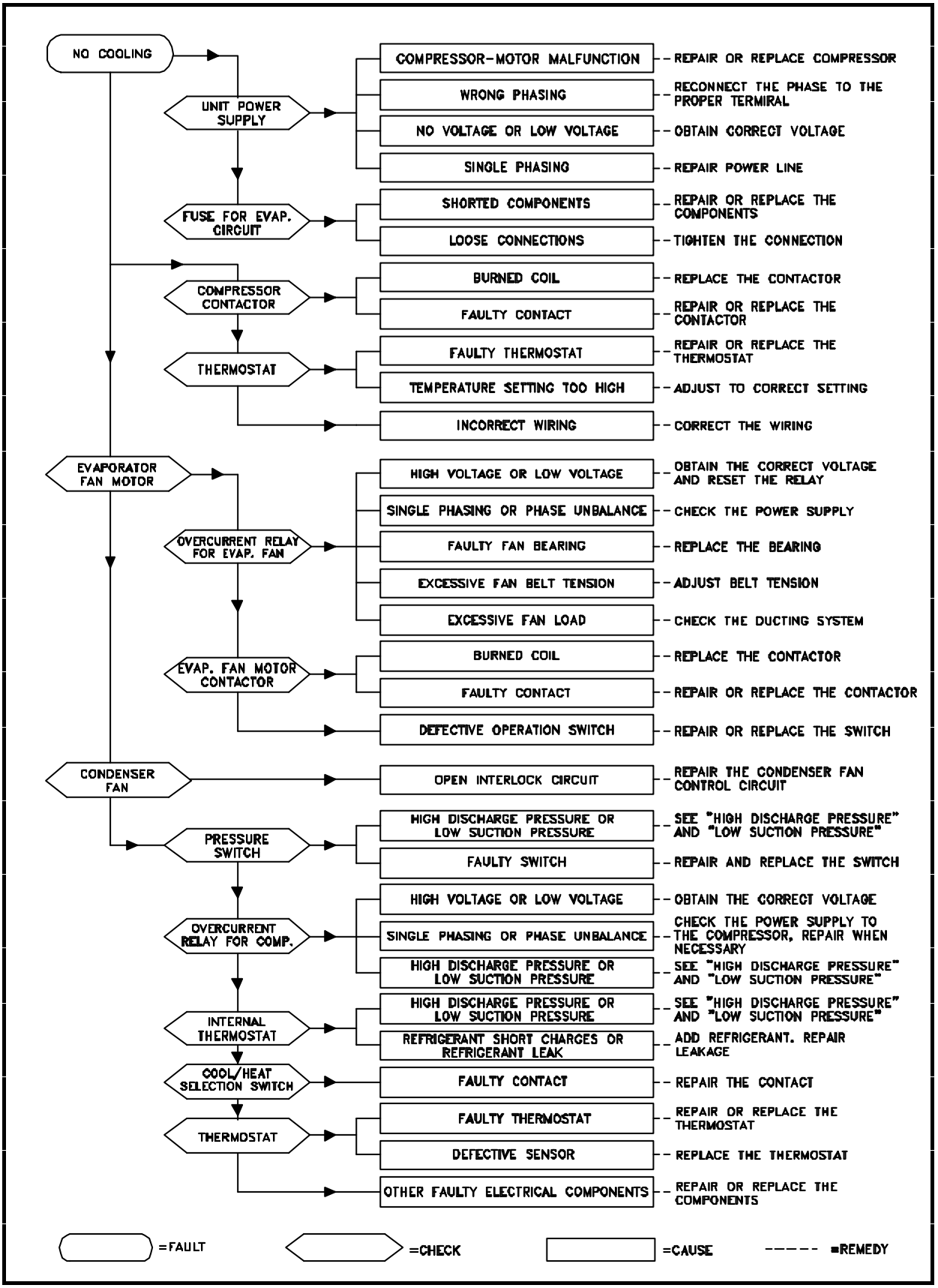
5.1 MAINTENANCE

These units are designed to provide years of services with minimum maintenance. Nonetheless, it is a good practice to carry out regular inspection and checking to ensure the unit's optimum performance.

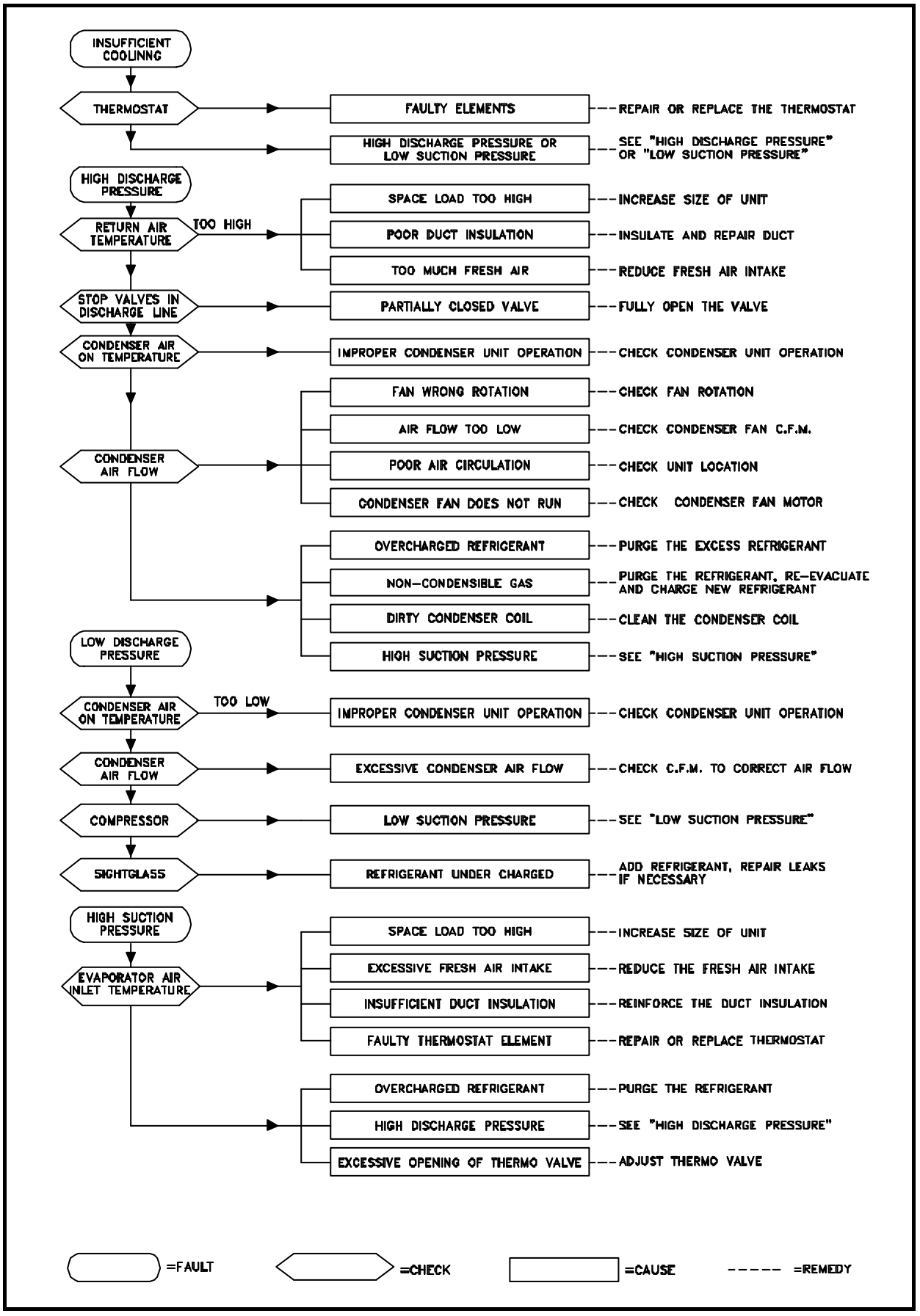
ITEM	MAINTENANCE PROCEDURE	RECOMMENDED SCHEDULE
Air Filters	1. Washable type. 2. Clean with a vacuum cleaner or tapped lightly and then wash in luke warm water (below 40°C). 3. Make sure the filter is dry.	Once a month or depending upon the condition of the circulated air.
Belt	1. Check the tension and alignment. 2. Move the motor if the belt is loose.	Once every six months.
Pulley	1. Make sure the set screws are properly tightened and there is no crack on the pulley.	Once every six months.
Blower	1. Turn the blower manually. It should run smoothly and there is no excessive bearing noise.	Once every six months.
Bearing and Shaft	1. Check for evidence of wear.	Once a year.
Bolts, Screws and Nuts.	1. Tighten any loose components.	Once a year.
Coil	1. Check and remove clogged item between fins.	Once a year.
Paint	1. Check any evidence of corrosion.	Once a year.
Compressor	1. Check if there is any leakage.	Every six months.
Electrical	1. Check voltage, current and wiring. 2. Check connections.	Every two months.
Drain Pan and Pipe	1. Pour some water into the drain pan and let the water run through. If the pipe is clogged, remove the dirt.	Every six months.

5.0 MAINTENANCE

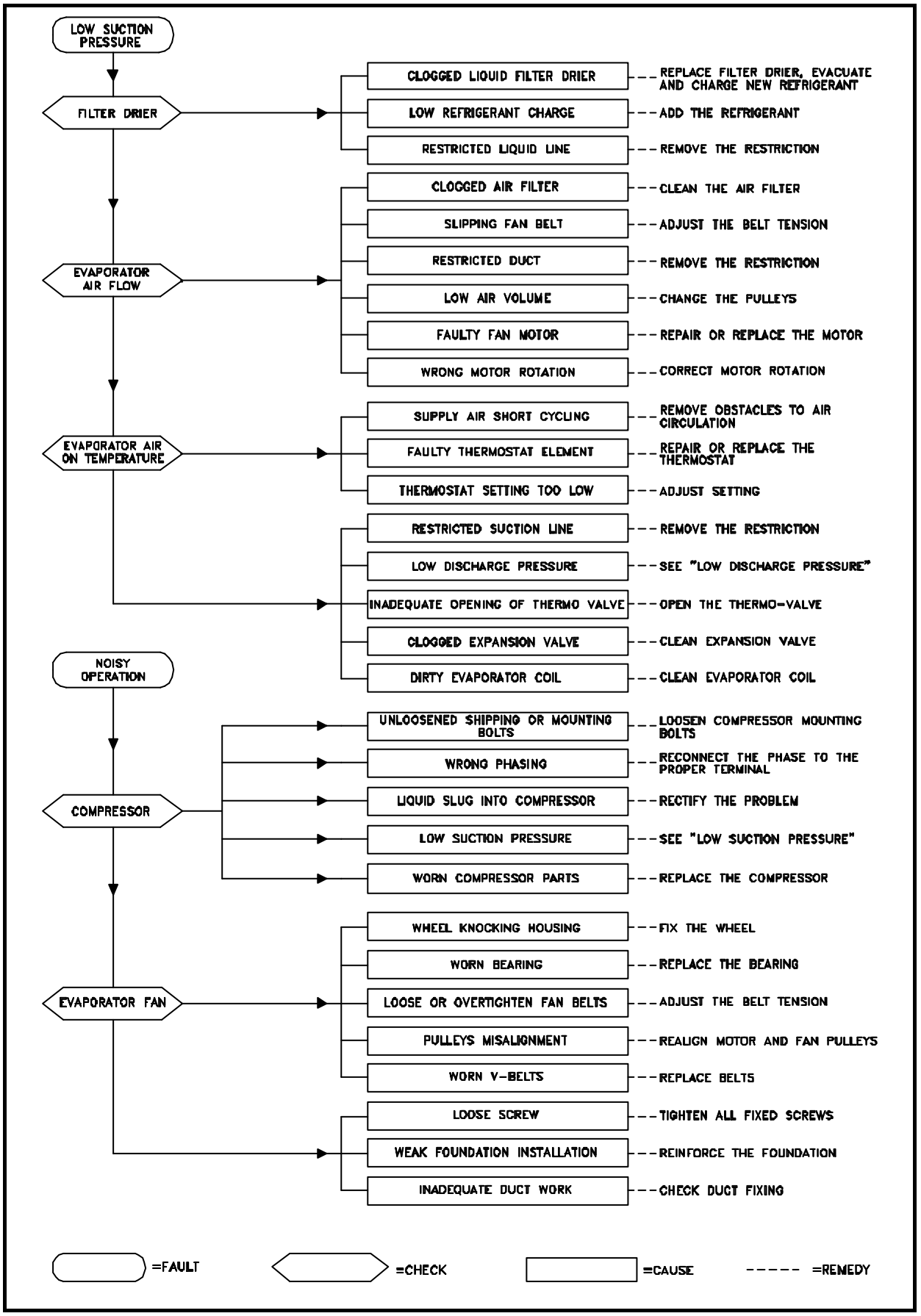
5.2 TROUBLE SHOOTING CHART



5.0 MAINTENANCE



5.0 MAINTENANCE



5.0 MAINTENANCE

5.3 SAMPLE LOG SHEET

SHEET NO.....

DUNHAM-BUSH AIR COOLED SPLIT UNIT

UNIT MODEL NO. .....UNIT NO.....VOLTS:.....Hz.....

UNIT SERIAL NO. .....

START UP : DATE.....TIME.....

DATE									
TIME									
COMPRESSOR NO.									
SUCTION PRESSURE	1.								
	2.								
	3.								
	4.								
SUCTION TEMPERATURE	1.								
	2.								
	3.								
	4.								
DISCHARGE PRESSURE	1.								
	2.								
	3.								
	4.								
DISCHARGE TEMPERATURE	1.								
	2.								
	3.								
	4.								
DISCHARGE SUPERHEAT (DISC. TEMP.-SAT. DISCH.)	1.								
	2.								
	3.								
	4.								
SUCTION SUPERHEAT (SAT. SUCT .- SUC. TEMP)	1.								
	2.								
	3.								
	4.								
RETURN AIR TEMPERATURE – DB/WB									
SUPPLY AIR TEMPERATURE – DB/WB									
AIR VOLUME									
AMBIENT AIR TEMPERATURE									
OFF CONDENSER AIR TEMPERATURE									
COMPRESSOR AMPS	1.								
	2.								
	3.								
	4.								
CONDENSER FAN AMPS									
EVAPORATOR FAN AMPS									
VOLTS									

This log sheet is provided as a recommendation of the readings that should be taken on a periodic basis. The actual readings taken and the frequency will depend upon the units application, hours of use, etc. This type of information can prove very useful in preventing and/ or solving problems that might occur during the life of the unit.

MANUFACTURER RESERVES THE RIGHT TO CHANGE SPECIFICATION OR DESIGN AT ANY TIME WITHOUT PRIOR NOTICE.

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