TRANE®
AIR CONDITIONING

SERVICE LITERATURE FILE INFORMATION
DIVISION TAB - TRANE REFRIGERATION PRODUCTS
PRODUCT TAB - LIQUID CHILLERS-CENTRIFUGAL CenTraVac
MODEL TAB - Model CVAC-Heat Recovery
LITERATURE ITEM - Installation

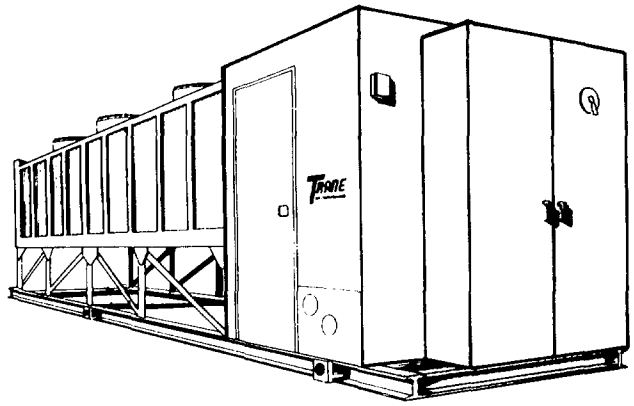
LITERATURE FILE NO.

CVAC-IN-2

INSTALLATION

Since The Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified experienced technicians.

AUGUST, 1979



HEAT RECOVERY AIR COOLED CENTRAVAC®

LIQUID CHILLERS CENTRIFUGAL

EXTENDED CAPACITY
HIGH EFFICIENCY
HIGH AMBIENT

MODELS
CVAC-013
CVAC-016
CVAC-018
CVAC-021
CVAC-027
CVAC-032

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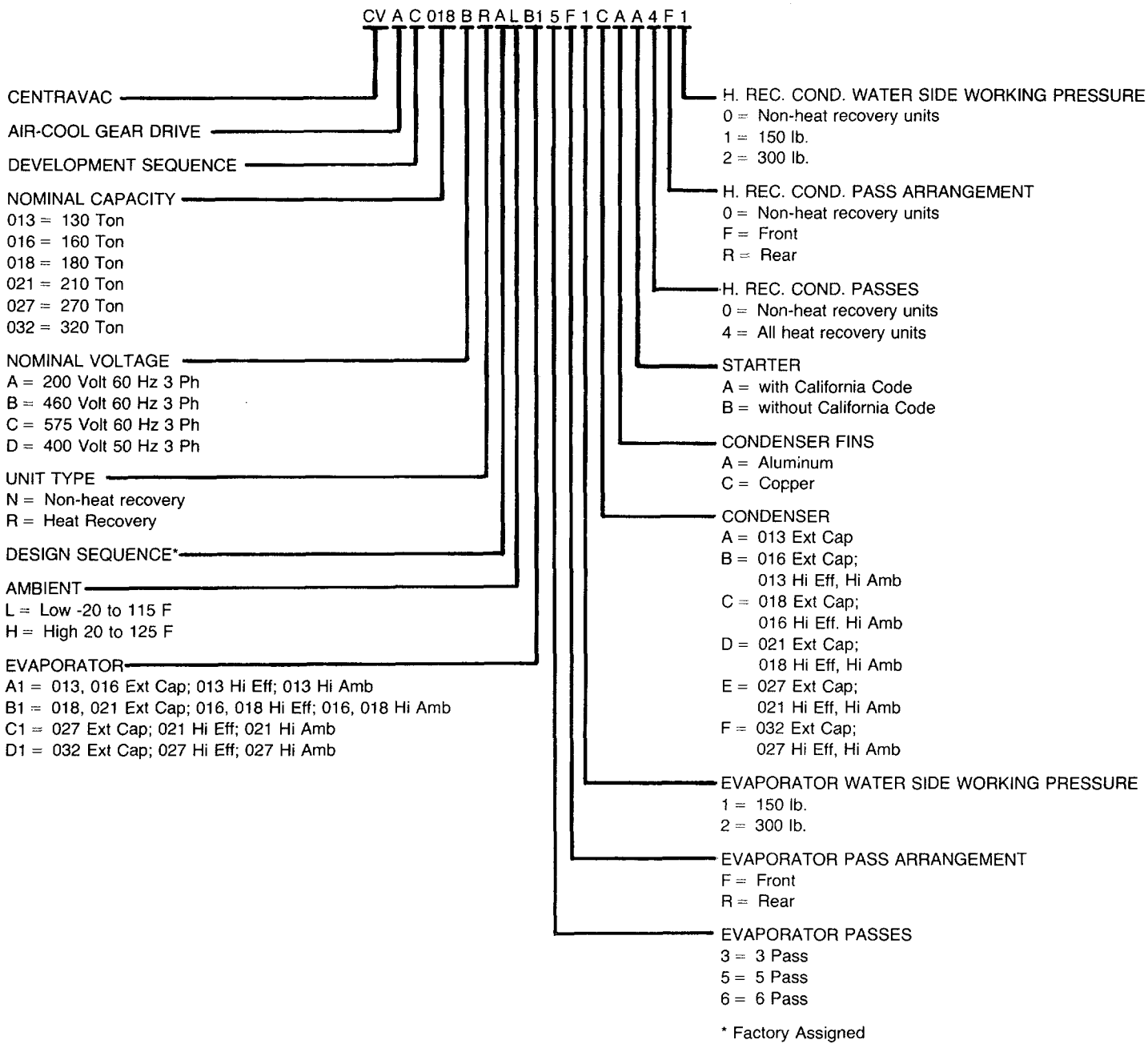
COMMERCIAL AIR CONDITIONING DIVISION
LA CROSSE, WISCONSIN 54601
PRINTED IN U.S.A.

MODEL NOMENCLATURE



* Factory Assigned

UNIT MODEL NUMBER DESCRIPTION

Following is a description of the CVAC Heat Recovery Air Cooled CenTraVac model number. Each CVAC has on its nameplate a 22 digit model number. With this model number and the descriptive diagram the major components may be identified. Other important information is also included. For example, in the 12th and 13th digit places the letters B1 are found. By following the correct line it is noted that if the evaporator is the B1 type, it is used on 180 and 210 ton Extended Capacity units, and on the 160 and 180 ton High Efficiency and High Ambient units. This numbering system will aid not only in ordering the correct parts but also in servicing the Heat Recovery Air Cooled CenTraVac. Familiarization with the model number is good standard operating procedure.

UNIT SHIPMENT

The Model CVAC Heat Recovery Air Cooled CenTraVac is shipped as a single outdoor package which is completely factory-assembled, piped, wired and charged with refrigerant. It includes a compressor, evaporator, heat recovery condenser, air-cooled condenser, starter and weathertight equipment room, all mounted on a continuous structural steel base. Protective panels are placed over the outside of the condenser coil for protection during shipping and must be removed once the unit has been set in place. The only field connections required are external control circuitry, system water piping and electrical power supply. Instructions for making these field connections are included in this manual.

Figures 1 through 6 illustrate the units and give dimensional information for these machines. Application of the information given in these figures and subsequent figures and tables is based on the nominal size of the unit, the type of evaporator and the type of condenser used. Cross reference the unit model number found on the unit nameplate with the unit model number description found on Page 2 to determine which figure or table applies to the unit being installed.

A loose parts box is shipped with the unit and is strapped to a center support under the unit. This box contains the following items:

12 Gallons oil
1 Set Lifting Components

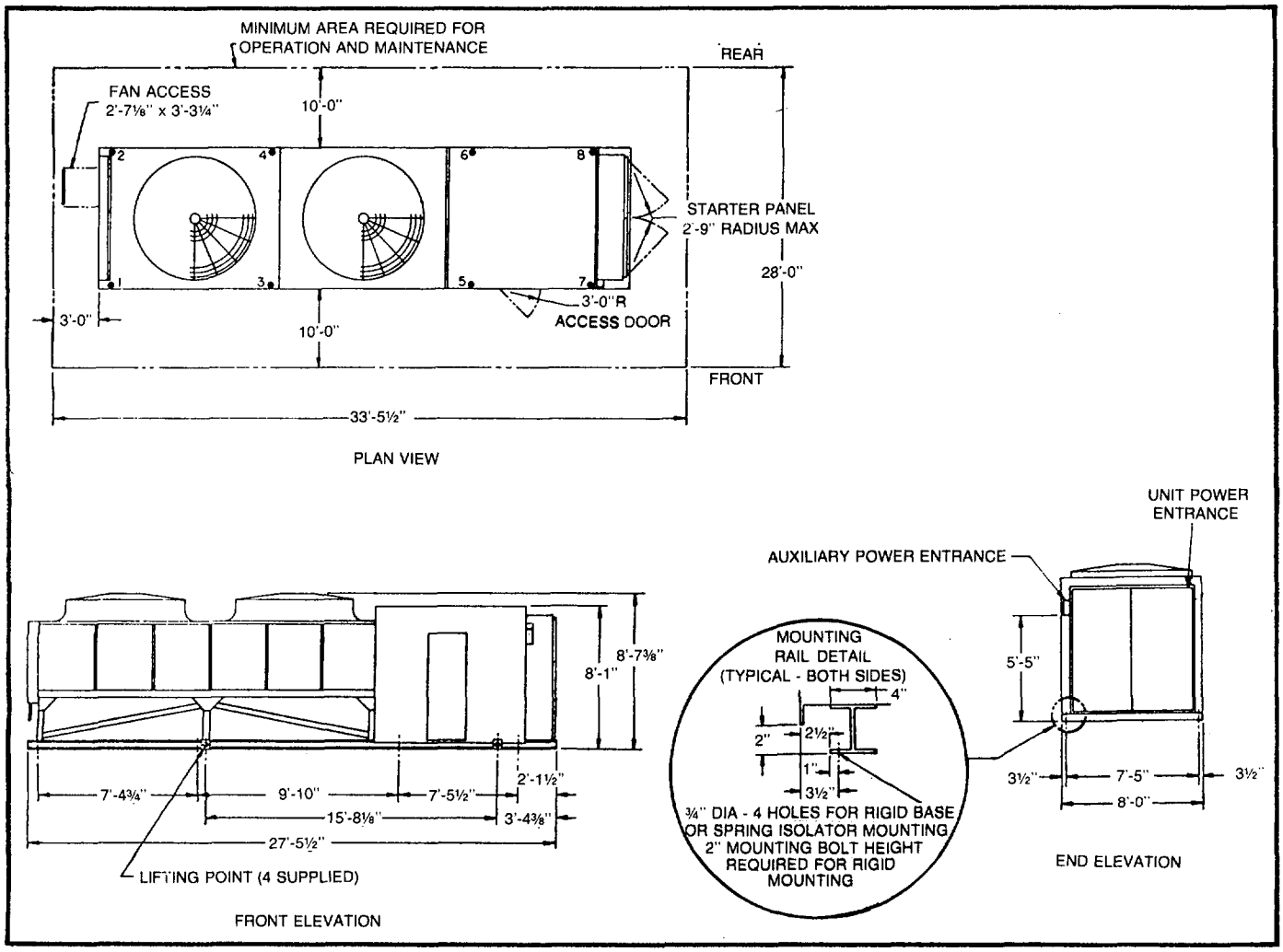


FIGURE 1 - Unit Dimension For: CVAC-013 with A1 Evaporator and A Condenser

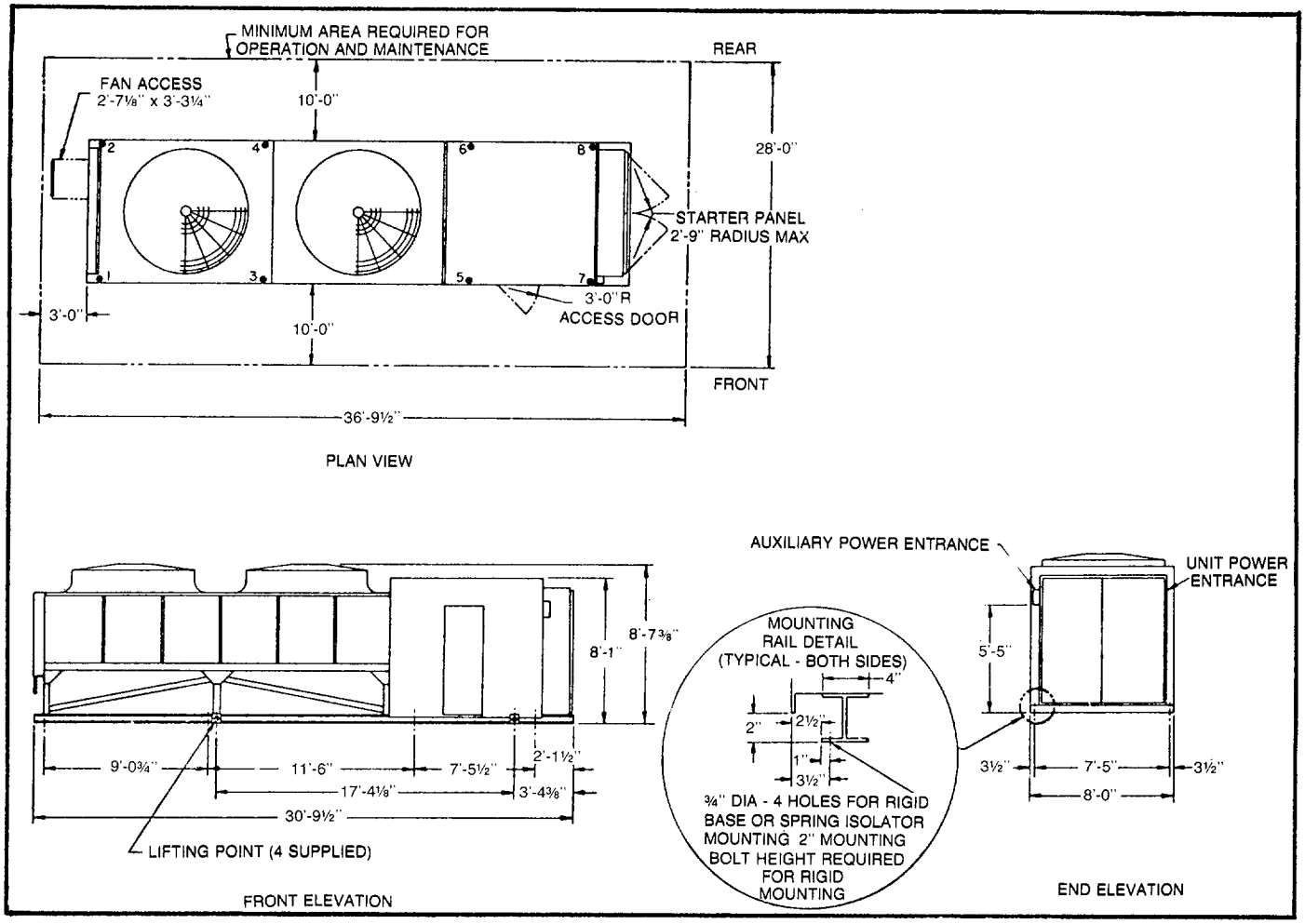


FIGURE 2 - Unit Dimensions For: CVAC-013 with A1 Evaporator and B Condenser CVAC016 with A1 Evaporator and B Condenser

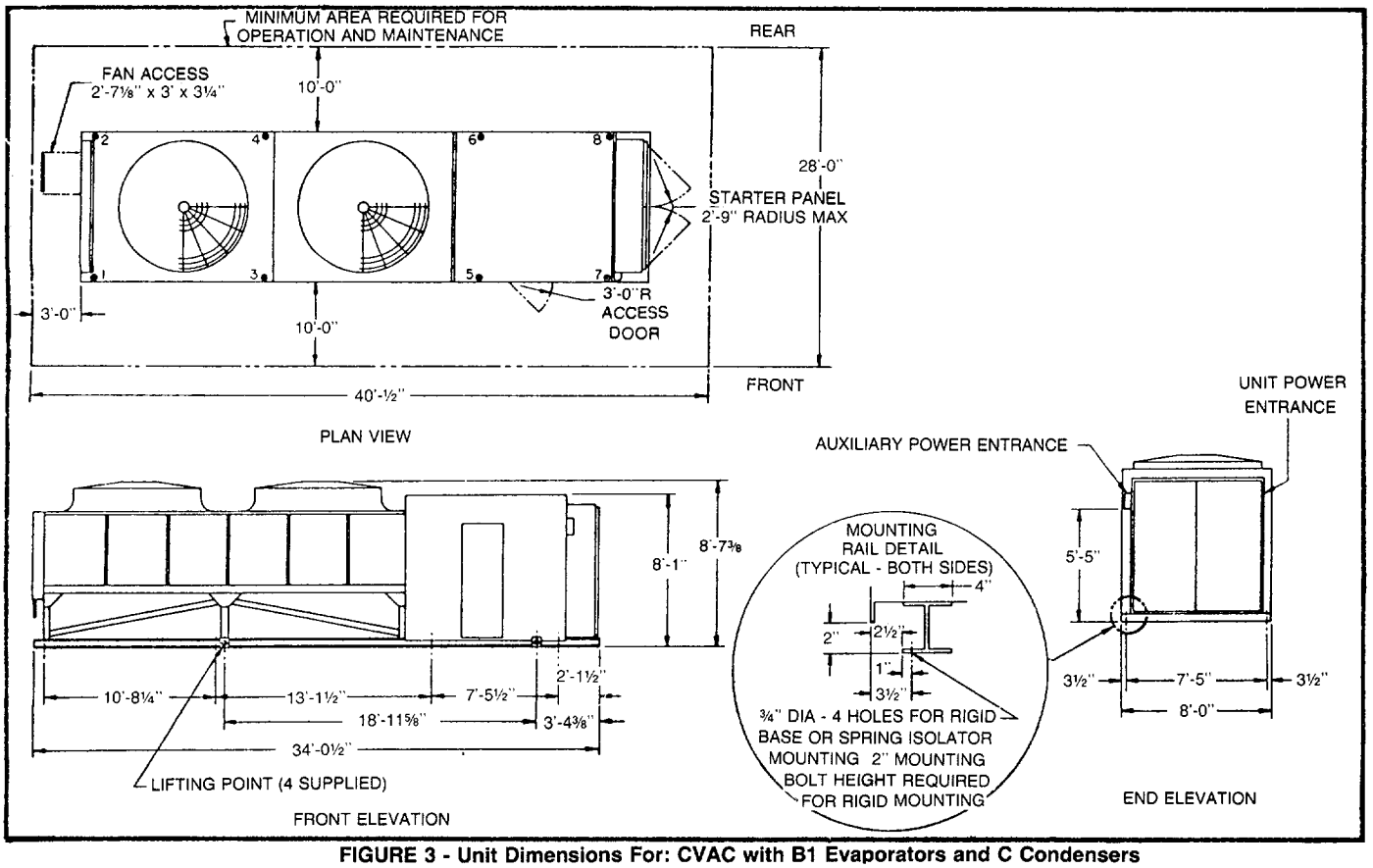


FIGURE 3 - Unit Dimensions For: CVAC with B1 Evaporators and C Condensers

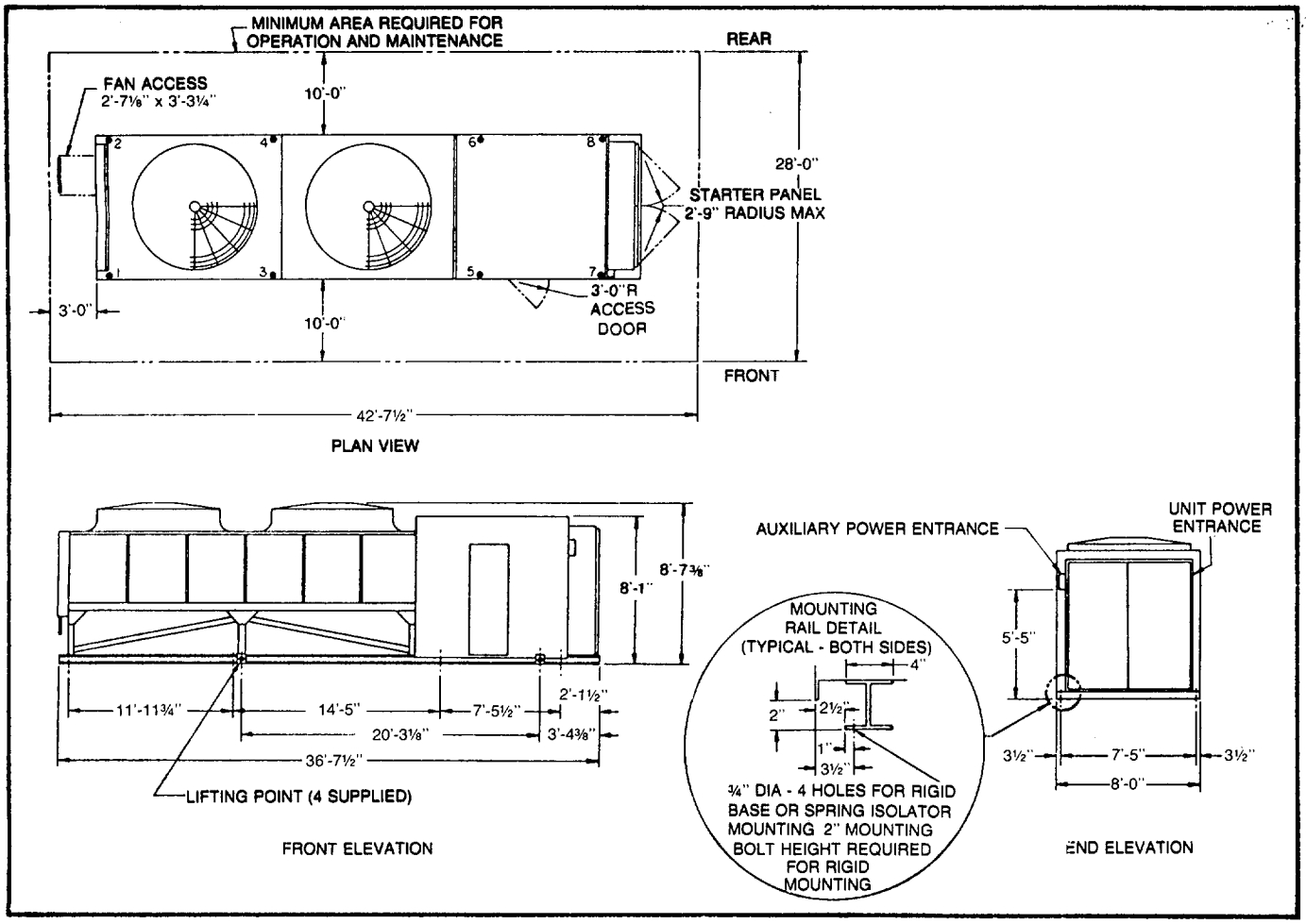


FIGURE 4 - Unit Dimensions For: CVAC-018 with B1 Evaporators and D Condensers CVAC 021 with B1 Evaporators and D Condensers

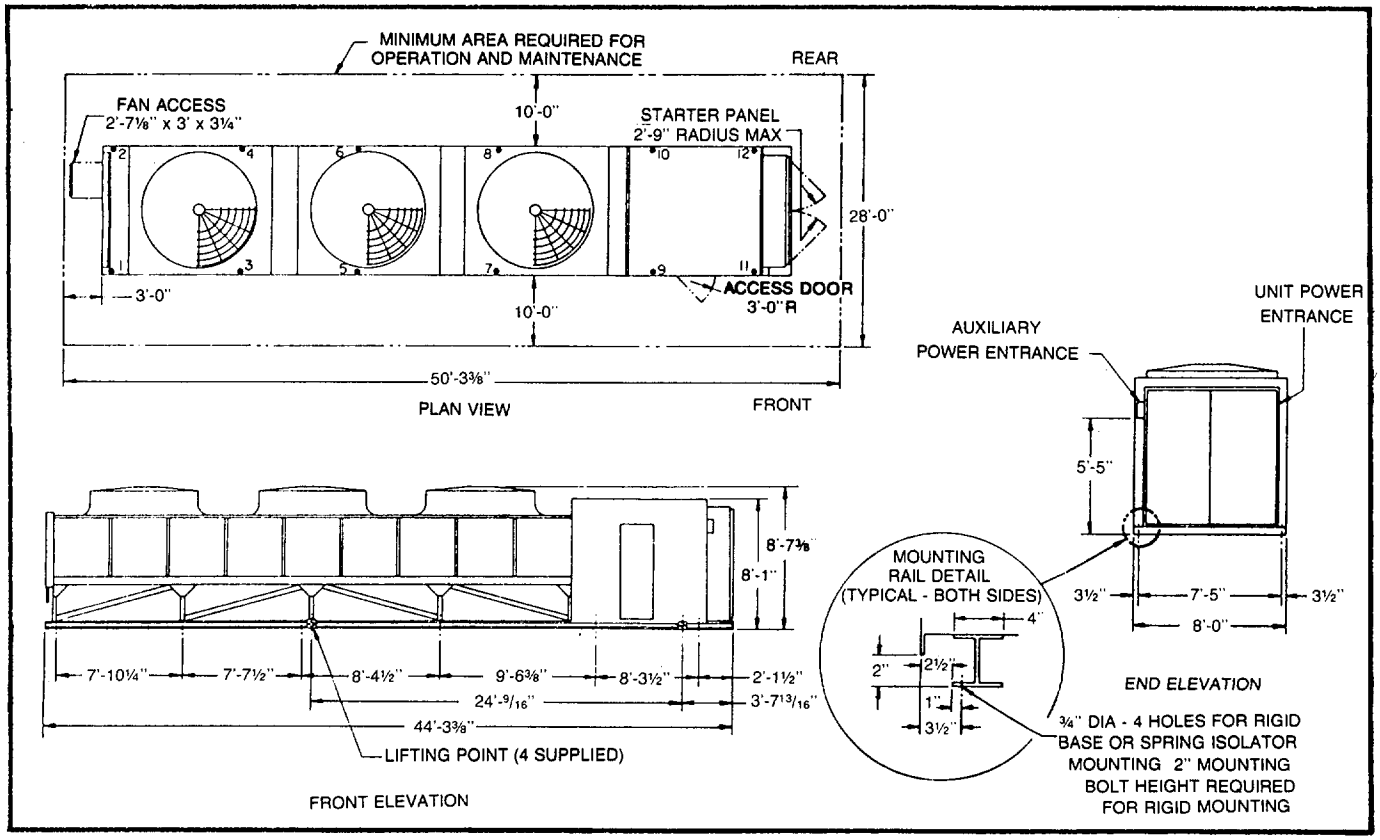


FIGURE 5 - Unit Dimensions For: CVAC-021 with C1 Evaporators and E Condensers CVAC-027 with C1 Evaporators and E Condensers

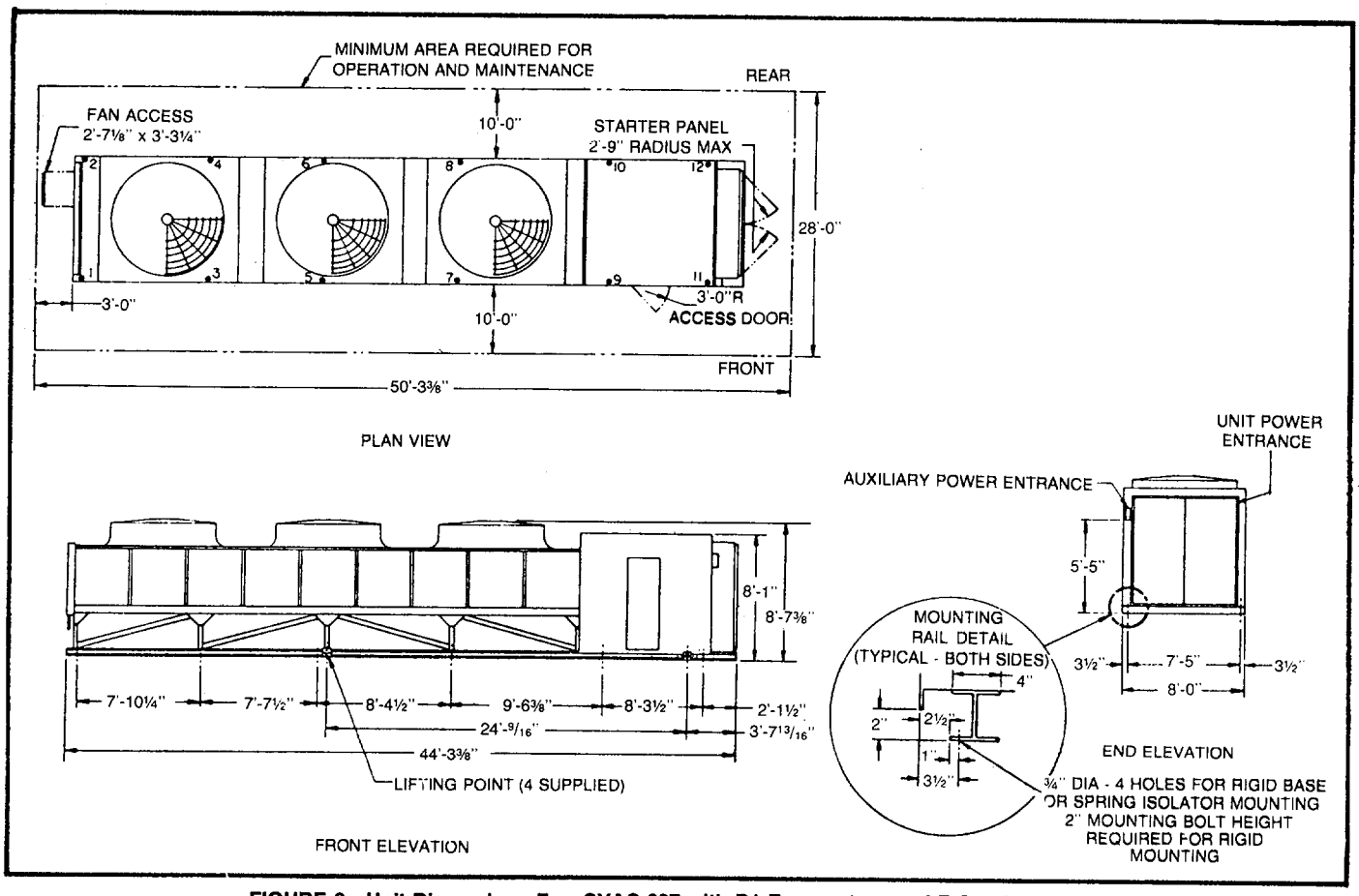


FIGURE 6 - Unit Dimensions For: CVAC-027 with D1 Evaporators and F Condensers
CVAC-032 with D1 Evaporators and F Condensers

FLOW ARRANGEMENTS

Evaporator

Three chilled liquid flow arrangements are available for the Heat Recovery Air Cooled CenTraVac evaporator. There are six-pass, five-pass and three-pass evaporators available. When installing the unit, pumps and piping must be sized to provide the proper flow rate to the unit. Table 1 lists the evaporator flow rate requirements in terms of minimum gallons per minute and maximum gallons per minute.

NOTE: The front of the evaporator is the door side of the equipment room.

Six-pass evaporators have same side connections for return and supply chilled liquid. Either front or rear connections are available with six-pass evaporators.

The five-pass and three-pass evaporators have opposite side connections for the return and supply chilled liquid. With five passes, the inlet must be specified as front or rear on the order.

On the six-pass and five-pass flow arrangements the inlet to the evaporator is always the lower connection and the outlet to the cooling load is always the top connection.

Either connection may be used as the inlet to the evaporator in three-pass evaporators since both connections are at the same height.

Figures 7, 8 and 9 represent different pass arrangements.

TABLE 1 - Evaporator Flow Rate Requirements

Evap Type	6-Pass		5-Pass		3-Pass	
	Min GPM	Max GPM	Min GPM	Max GPM	Min GPM	Max GPM
A1	130	392	155	471	376	832
B1	174	527	209	632	503	1113
C1	220	668	265	800	630	1394
D1	260	788	312	945	752	1664

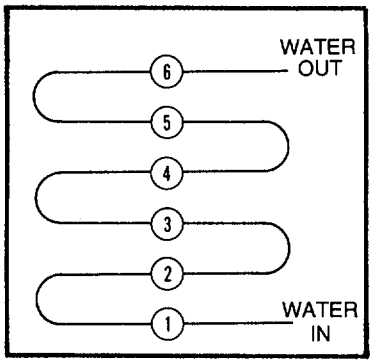


FIGURE 7 - Six-Pass Arrangement

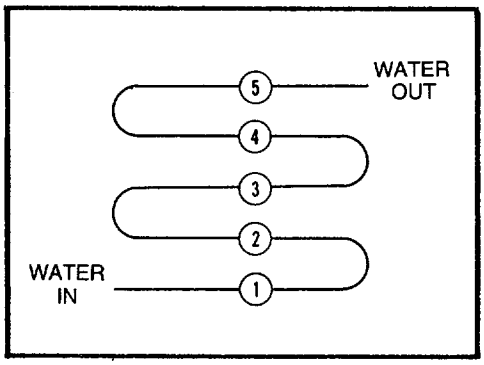


FIGURE 8 - Five-Pass Arrangement

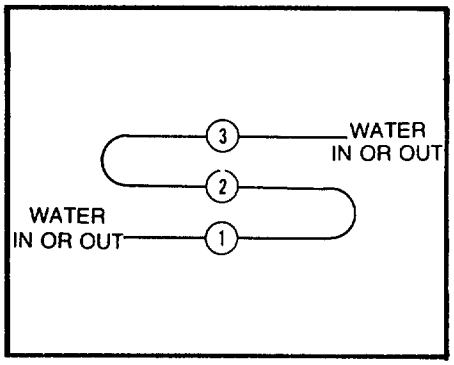


FIGURE 9 - Three-Pass Arrangement

Heat Recovery Condenser

The heat recovery condensers used on the Heat Recovery Air Cooled CenTraVac are of four-pass design. This pass arrangement has same side connections and is available with either front or rear connections. The front connection of the heat recovery condenser is the door side of the equipment room. The inlet to the heat recovery condenser is the lower connection and the outlet is the top connection. Piping and pumps must supply the proper liquid flow rates. Table 2 lists flow rate requirements.

Figure 10 illustrates the pass arrangement.

NOTE: It is the responsibility of the installing contractor to flush out all piping before connecting to the evaporator or heat recovery condenser. Debris left in the piping will cause equipment mal-performance and heat transfer problems due to plugging of tubes or tube erosion on the water side.

TABLE 2 - Heat Recovery Condenser Flow Requirements

Condenser Type	Minimum GPM	Maximum GPM
A	111	420
B	134	507
C	156	589
D	178	673
E	221	837
F	266	1009

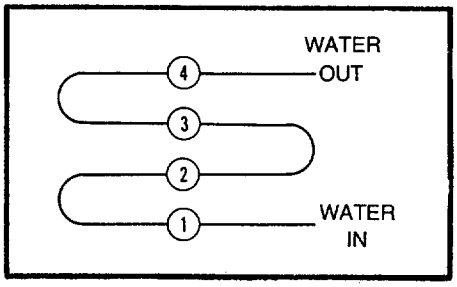


FIGURE 10 - Heat Recovery Condenser Pass Arrangement

WATER PASS ARRANGEMENTS AND DIMENSIONS

Figures 11 through 28 illustrate the different pass arrangements and dimensions. The dimensions given are to be used in bringing water piping to the evaporator and heat recovery condenser. Consult the unit nameplate and the unit model number description on Page 2 of this manual for correct unit identification. This is important to insuring the correct system piping arrangements and connections.

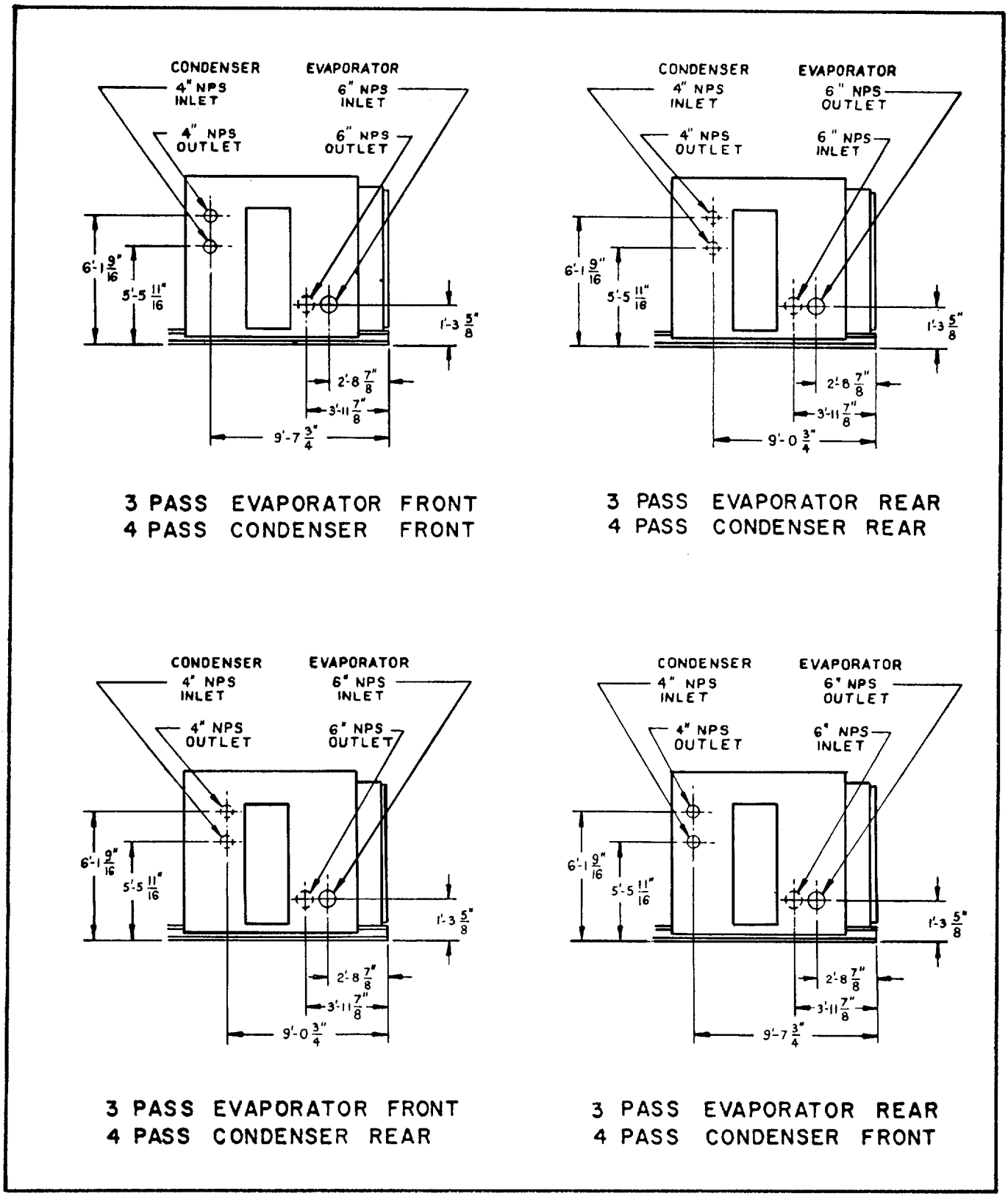


FIGURE 11 - Water Pass Arrangements and Dimensions, CVAC-013-A1-A

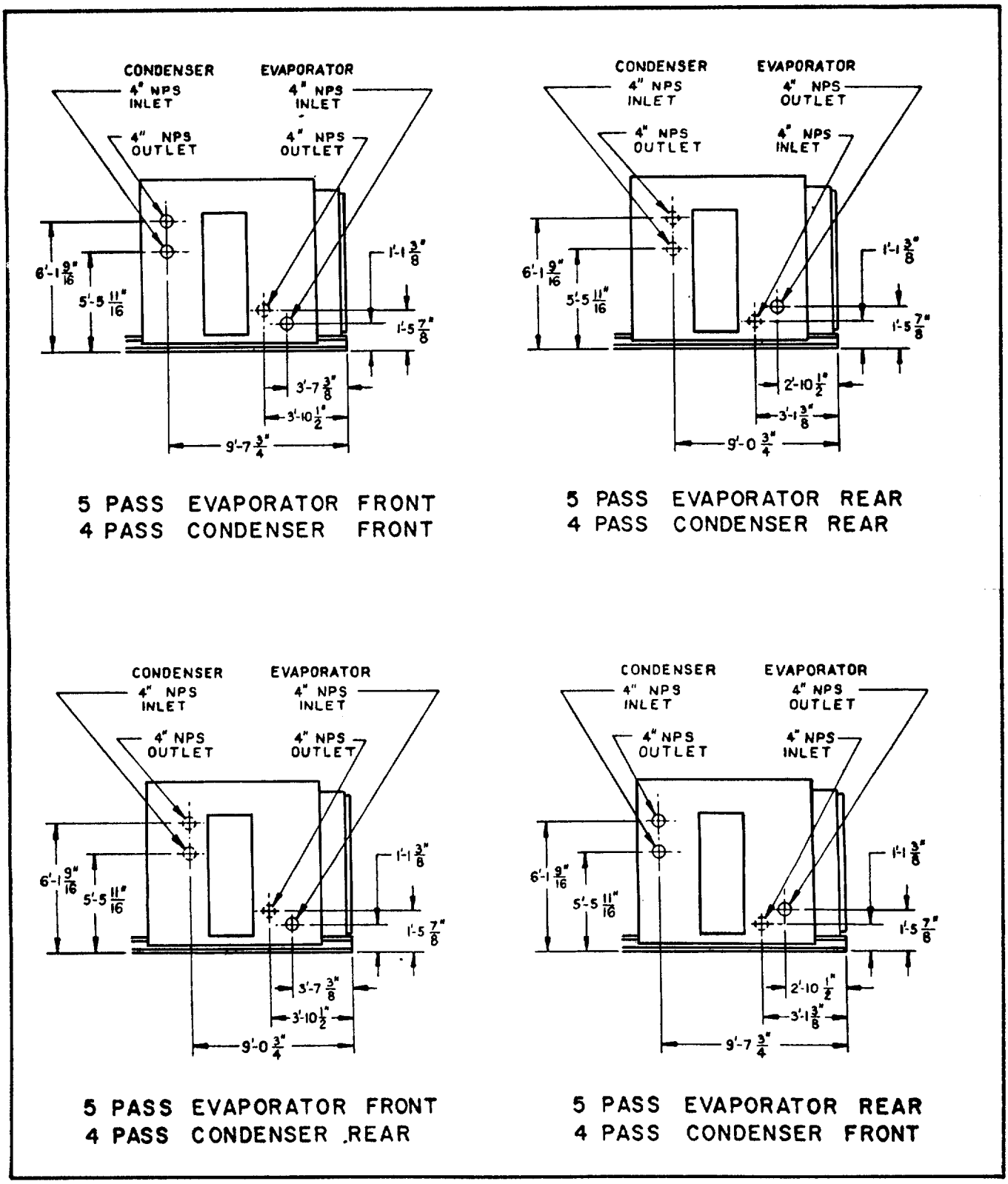
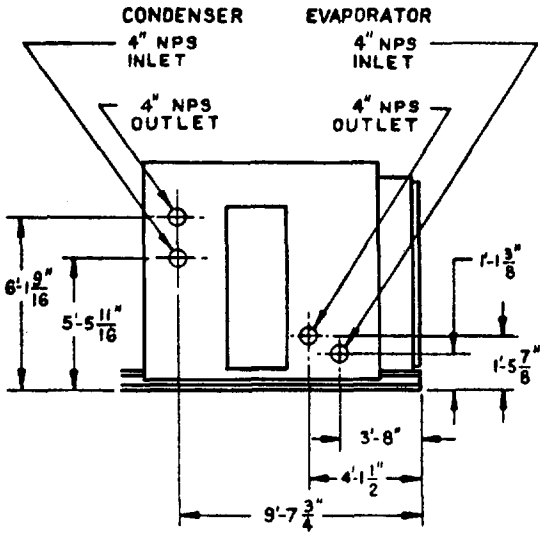
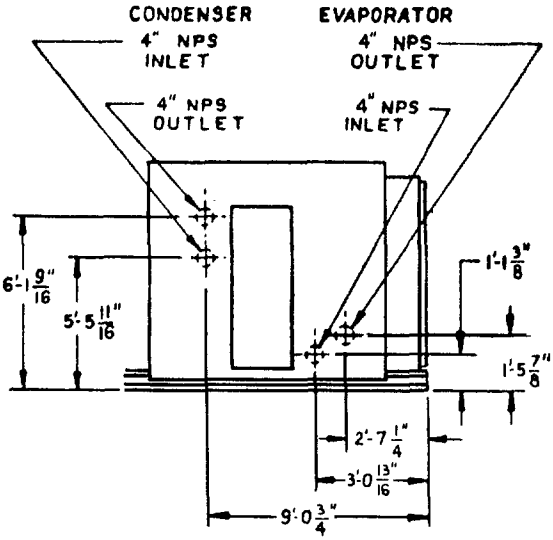


FIGURE 12 - Water Pass Arrangements and Dimensions, CVAC-013-A1-A



6 PASS EVAPORATOR FRONT
4 PASS CONDENSER FRONT



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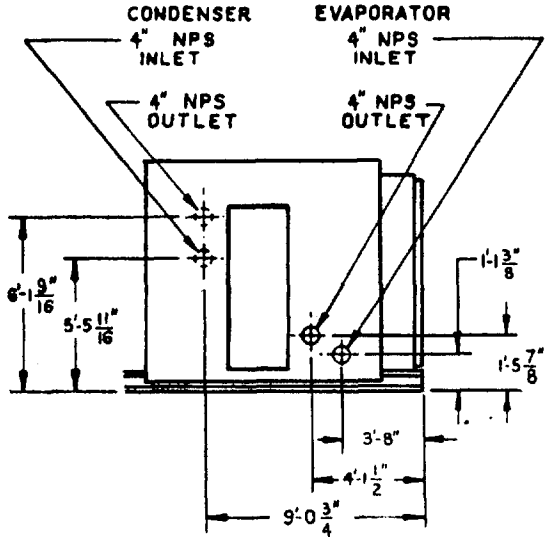
4 PASS CONDENSER REAR



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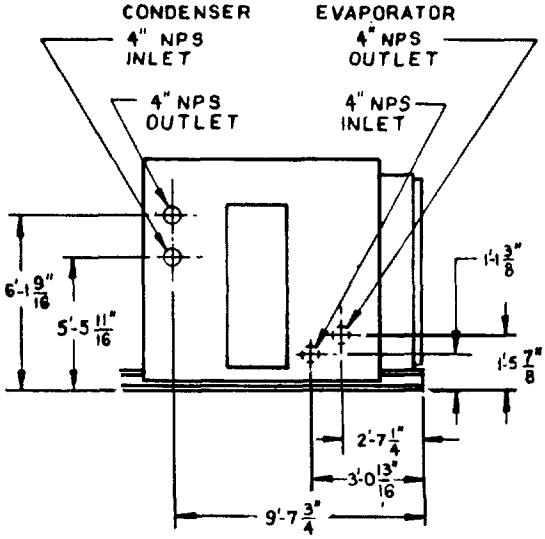


6 PASS EVAPORATOR REAR
4 PASS CONDENSER FRONT

FIGURE 13 - Water Pass Arrangements and Dimensions, CVAC-013-A1-A

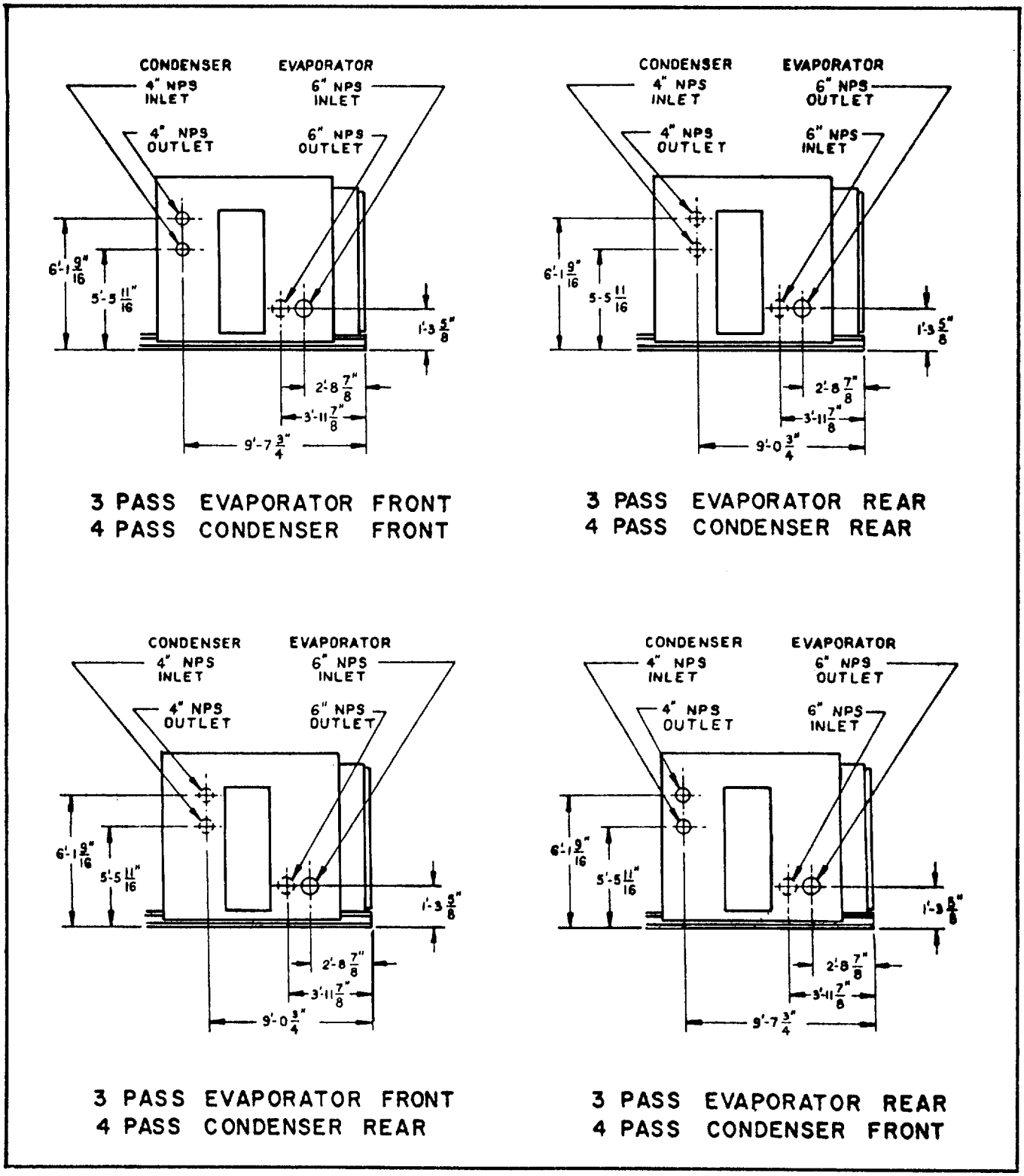


FIGURE 14 - Water Pass Arrangements and Dimensions, CVAC-013-A1-B, CVAC-016-A1-B

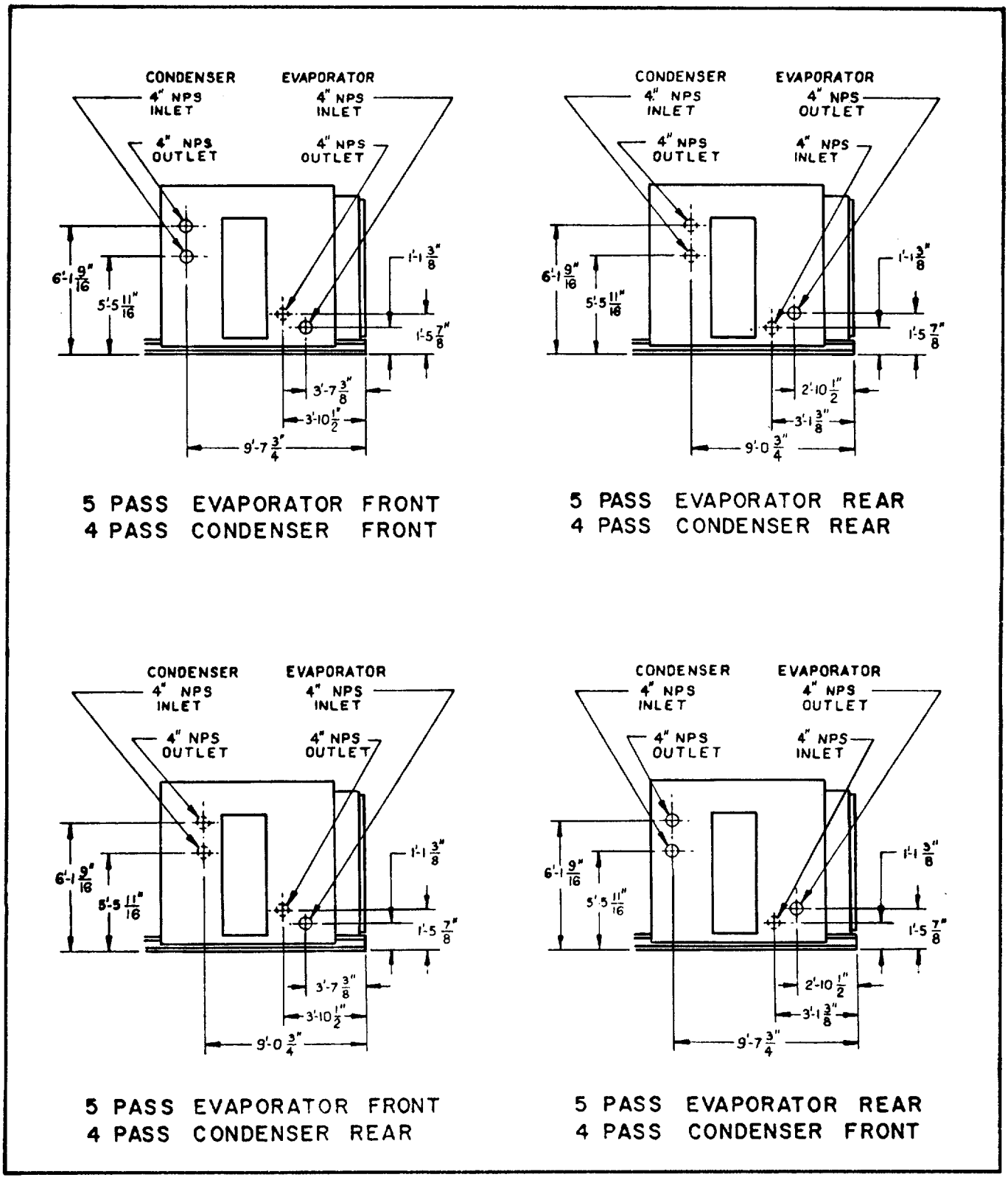


FIGURE 15 - Water Pass Arrangements and Dimensions, CVAC-013-A1-B, CVAC-016-A1-B

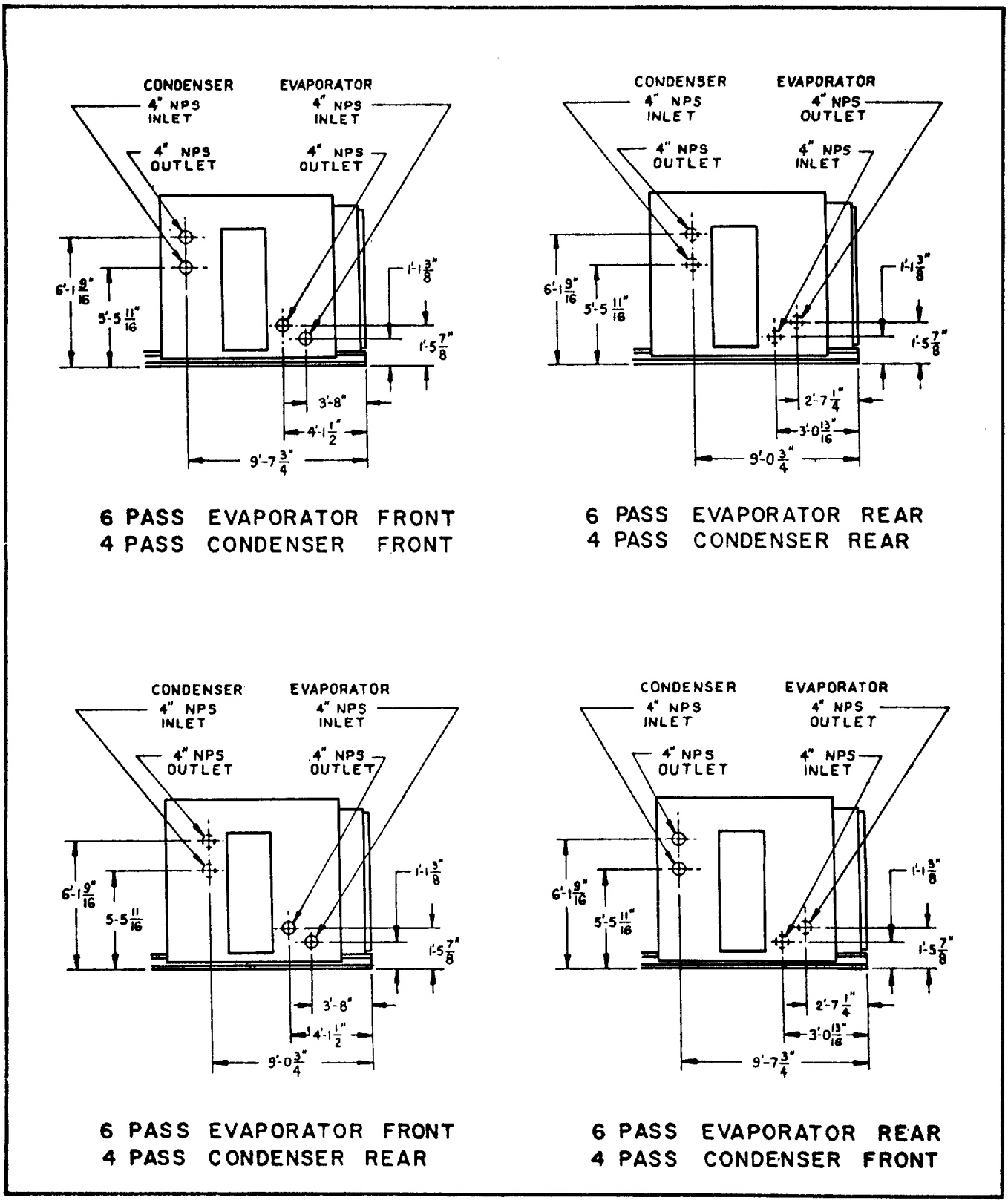
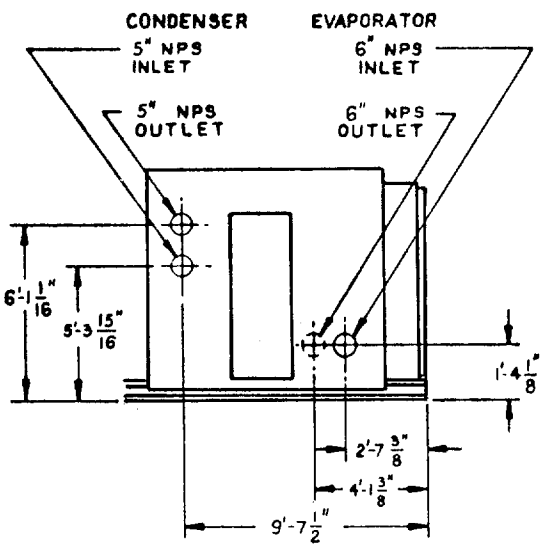


FIGURE 16 - Water Pass Arrangements and Dimensions, CVAC-013-A1-B, CVAC-016-A1-B



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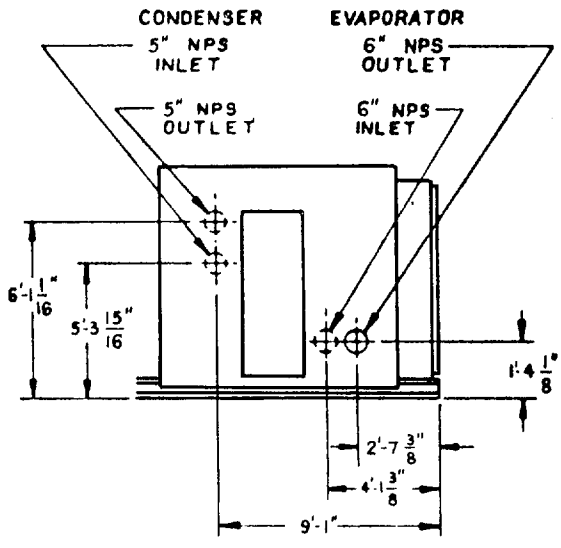

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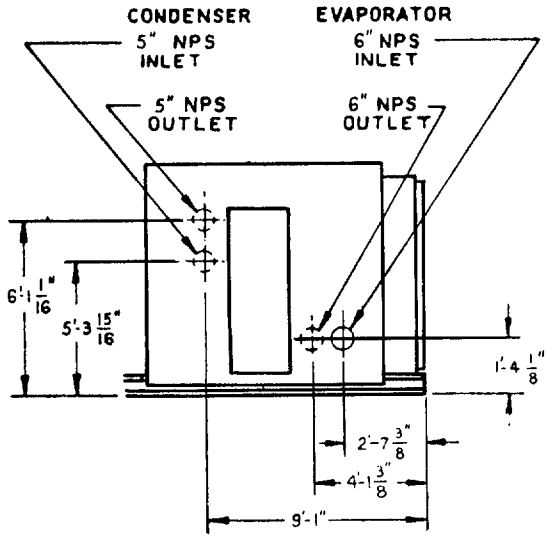
4 PASS CONDENSER REAR



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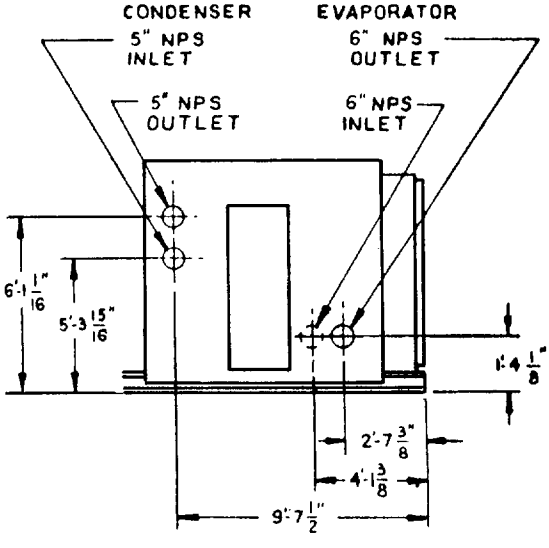

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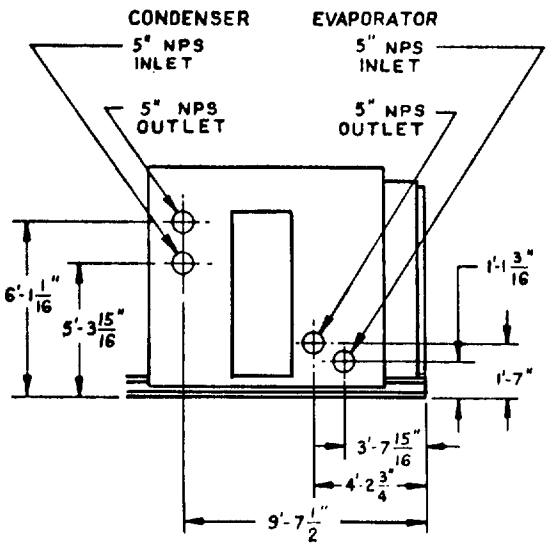
FIGURE 17 - Water Pass Arrangements and Dimensions, CVAC-016-B1-C, CVAC-018-B1-C



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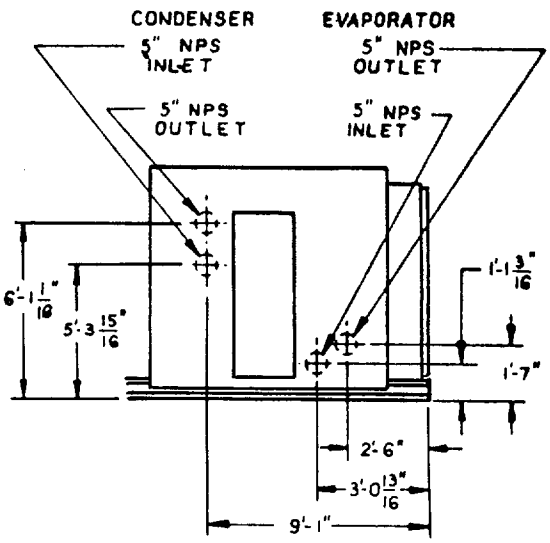

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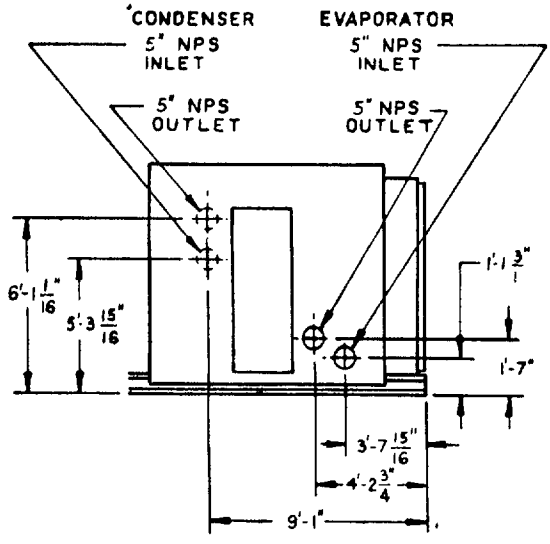

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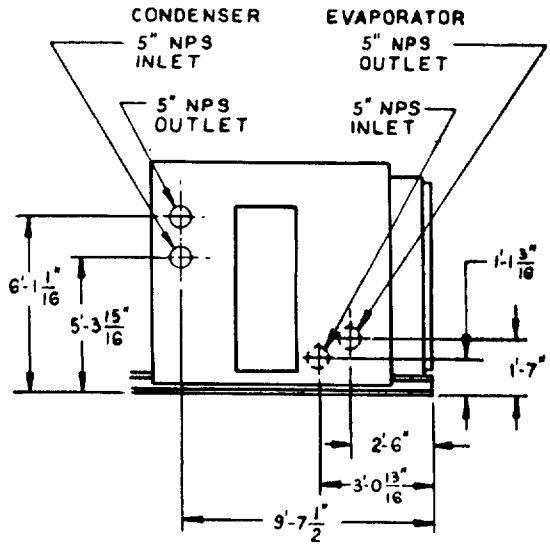

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FIGURE 18 - Water Pass Arrangements and Dimensions, CVAC-016-B1-C, CVAC-018-B1-C

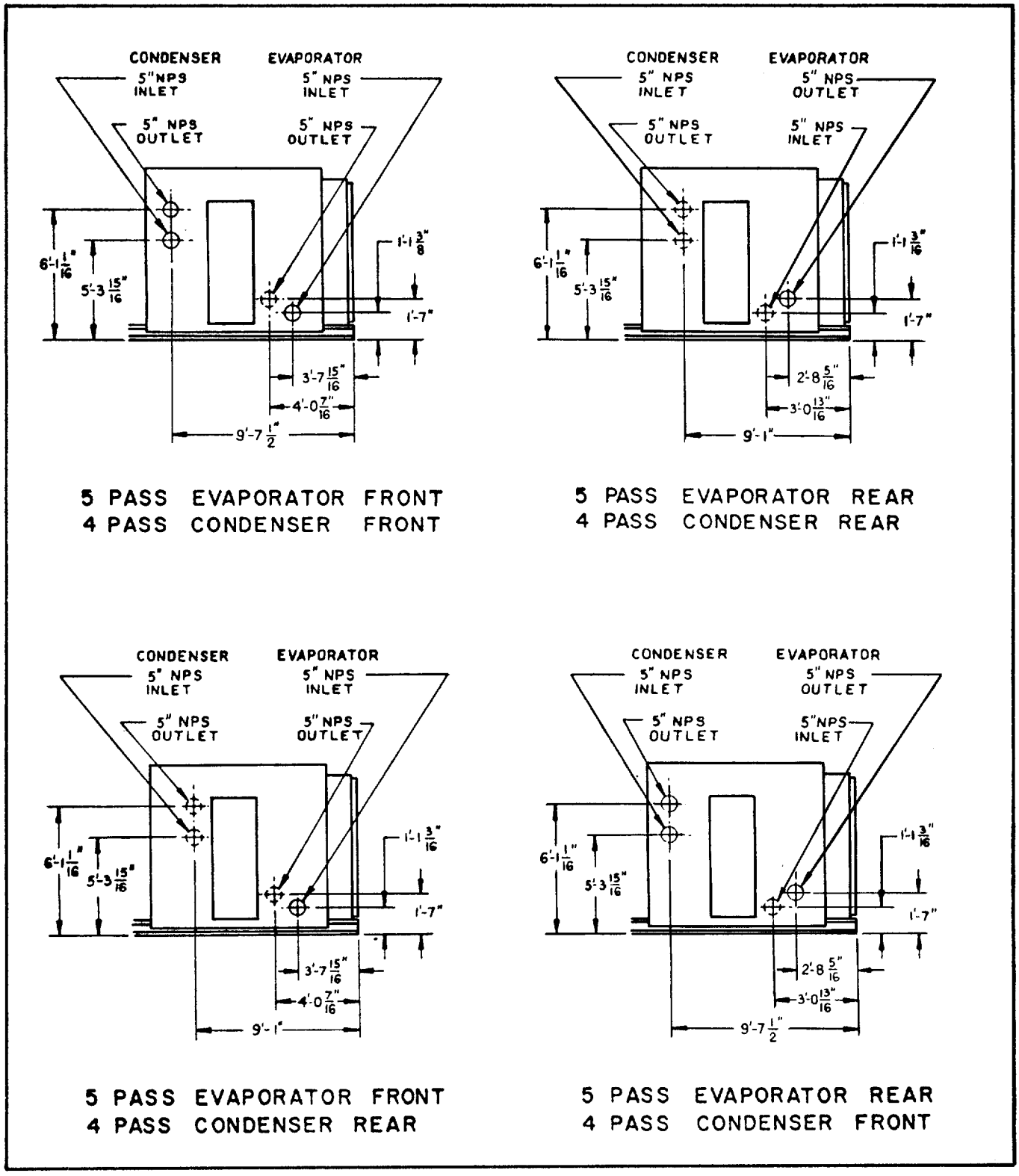


FIGURE 19 - Water Pass Arrangements and Dimensions, CVAC-016-B1-C, CVAC-018-B1-C

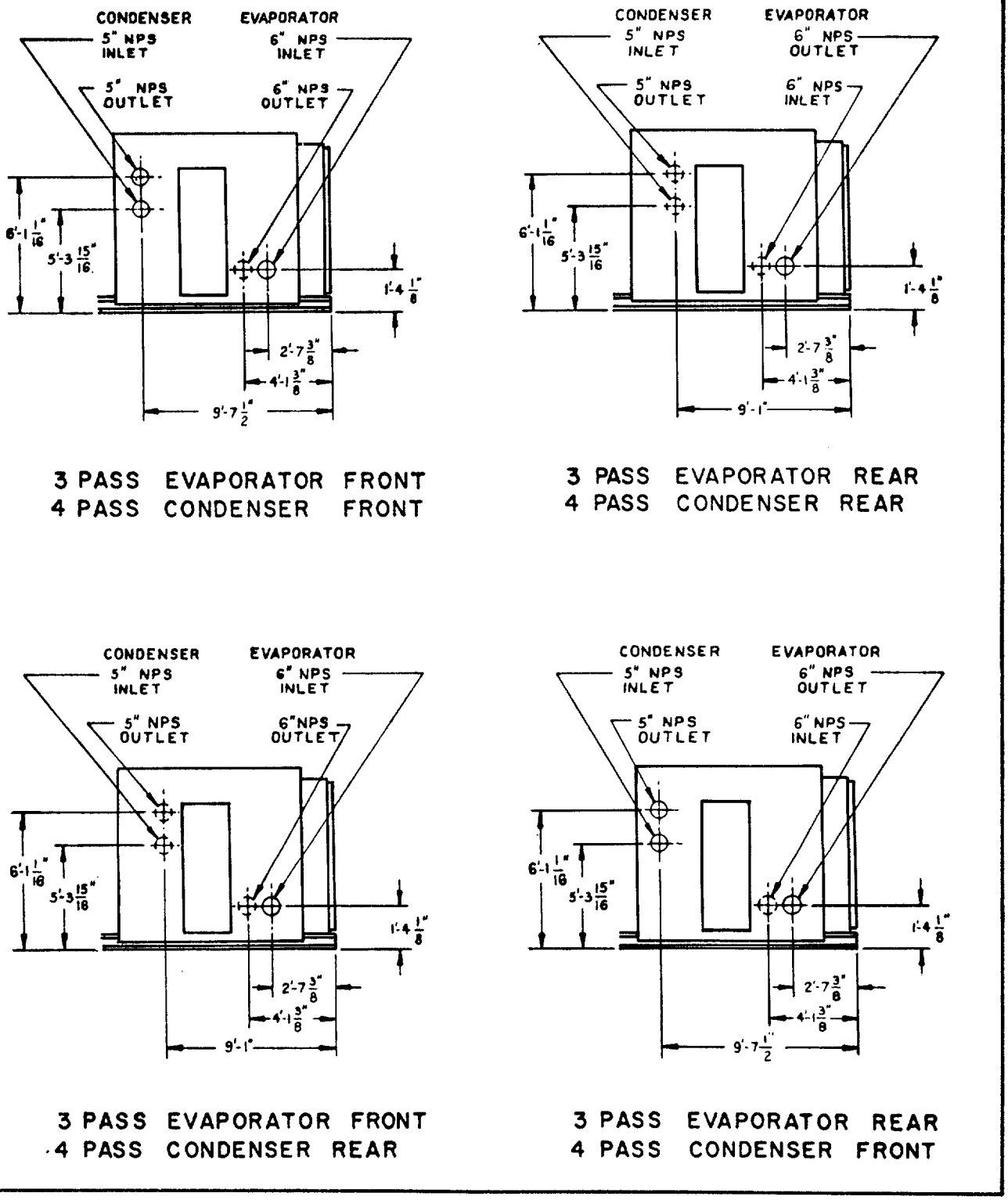


FIGURE 20 - Water Pass Arrangements and Dimensions, CVAC-018-B1-C, CVAC-021-B1-D

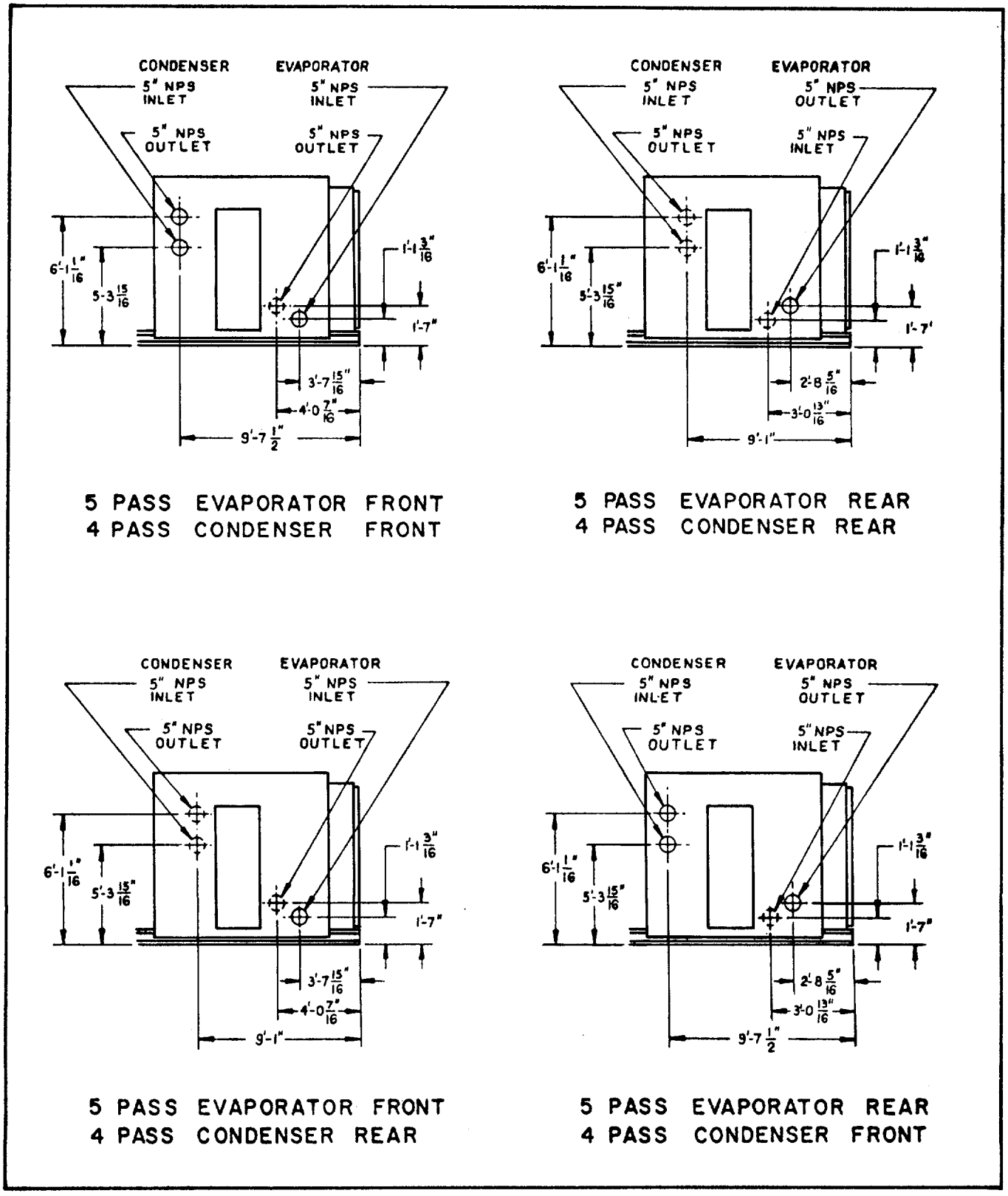
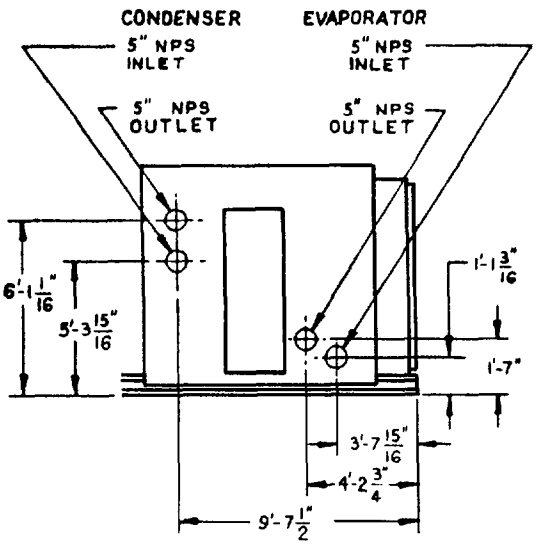


FIGURE 21 - Water Pass Arrangements and Dimensions, CVAC-018-B1-D, CVAC-021-B1-D



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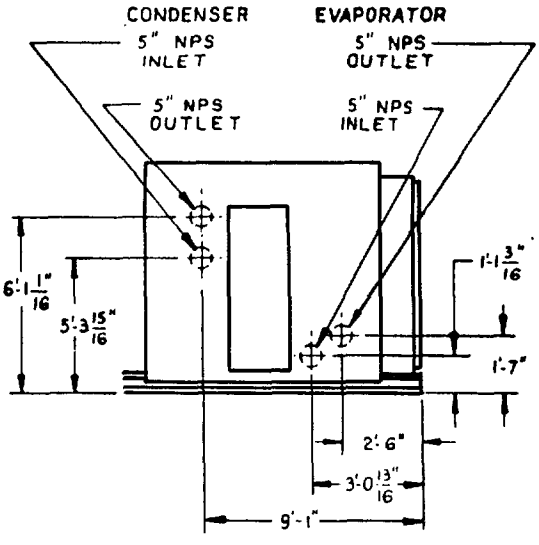

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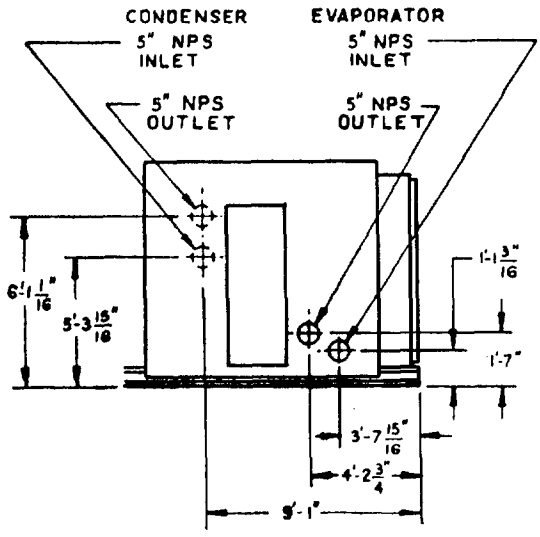

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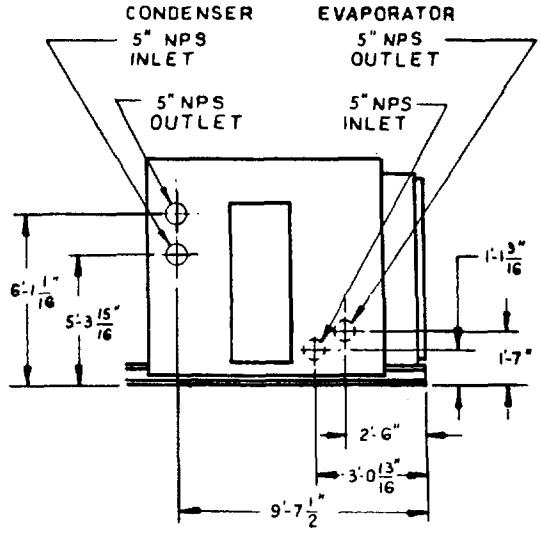

6 PASS EVAPORATOR REAR
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FIGURE 22 - Water Pass Arrangements and Dimensions, CVAC-018-B1-D, CVAC-021-B1-D

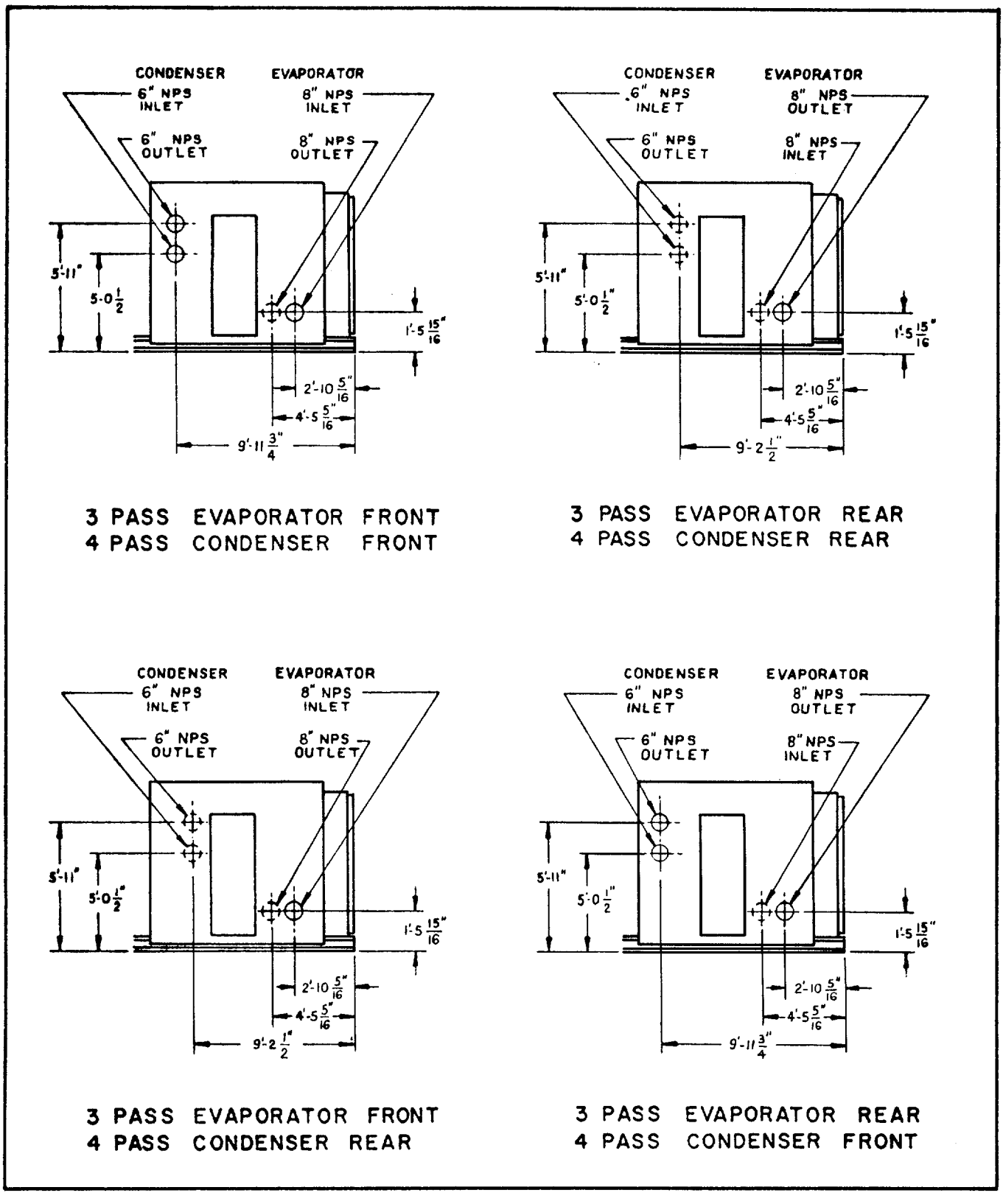
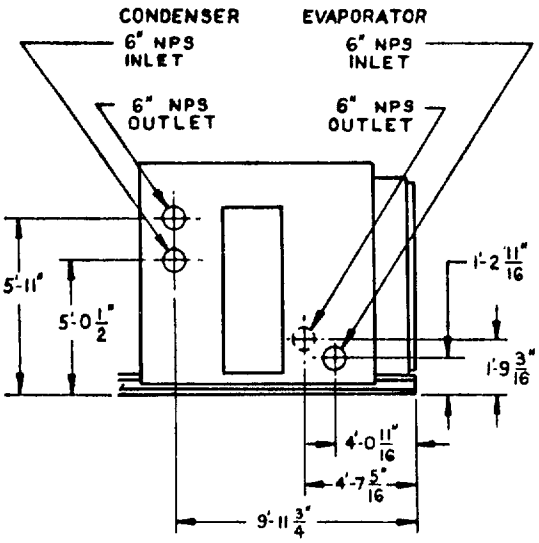


FIGURE 23 - Water Pass Arrangements and Dimensions, CVAC-021-C1-E, CVAC-027-C1-E



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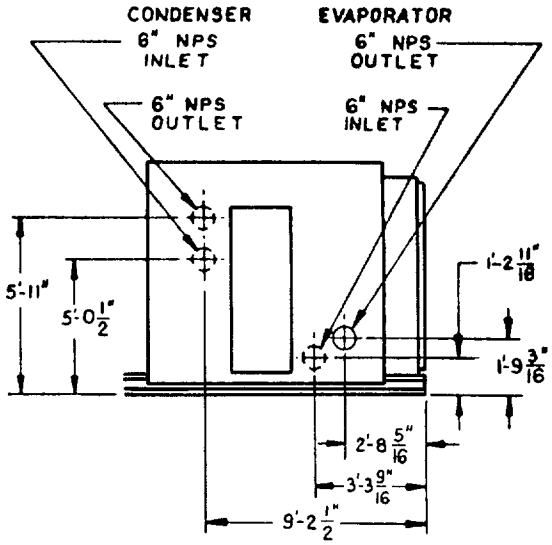

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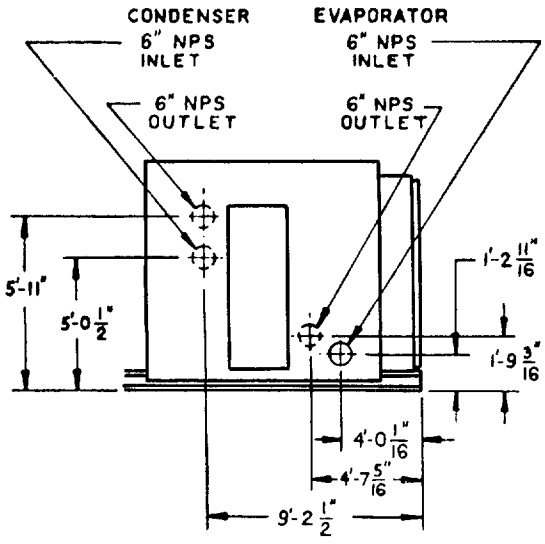

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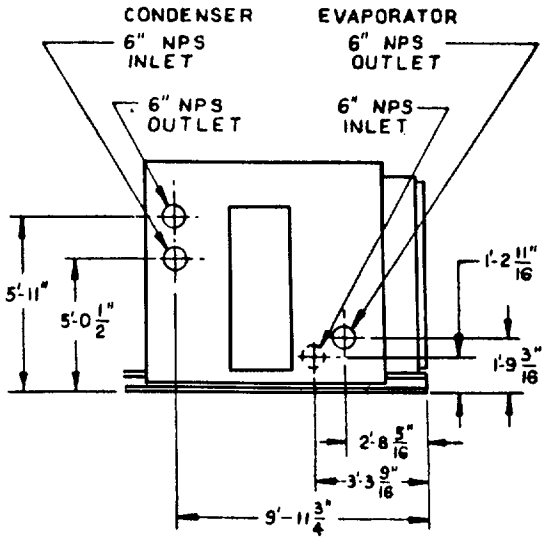

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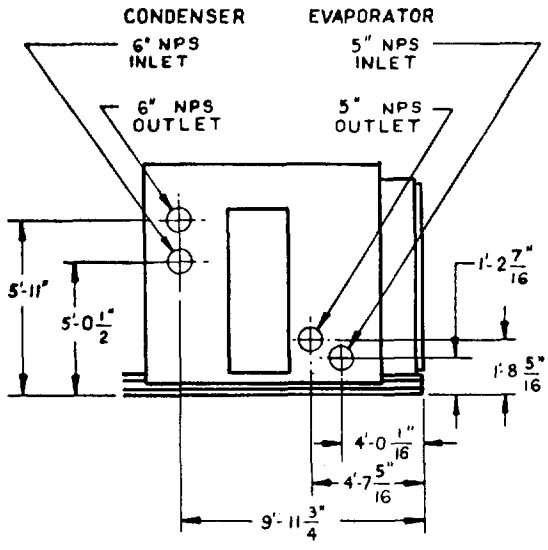
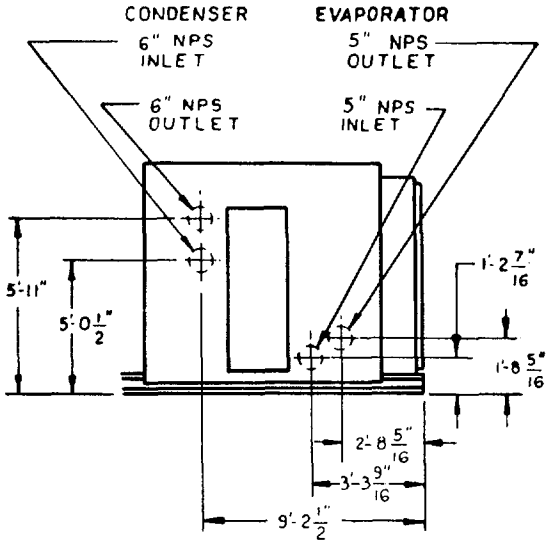
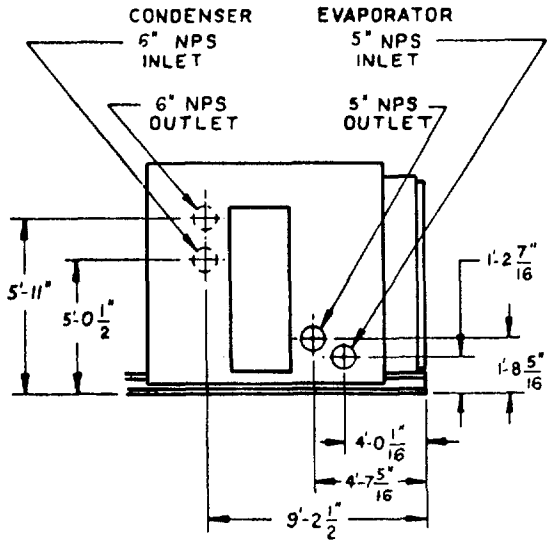
FIGURE 24 - Water Pass Arrangements and Dimensions, CVAC-021,C1-E, CVAC-027-C1-E



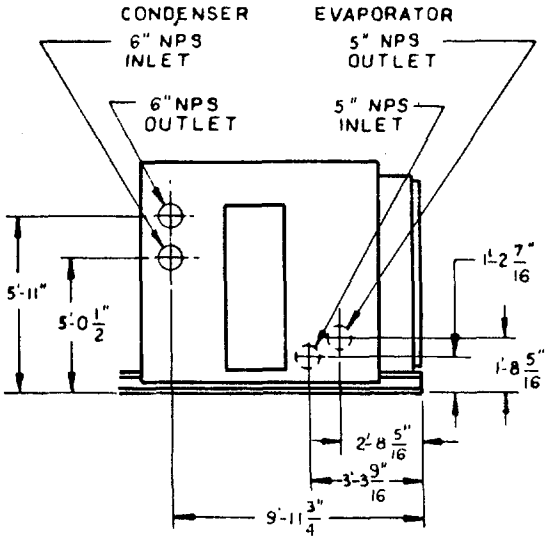
6 PASS EVAPORATOR FRONT
4 PASS CONDENSER FRONT



6 PASS EVAPORATOR REAR
4 PASS CONDENSER REAR



6 PASS EVAPORATOR FRONT
4 PASS CONDENSER REAR



6 PASS EVAPORATOR REAR
4 PASS CONDENSER FRONT

FIGURE 25 - Water Pass Arrangements and Dimensions, CVAC-021-C1-E, CVAC-027-C1-E

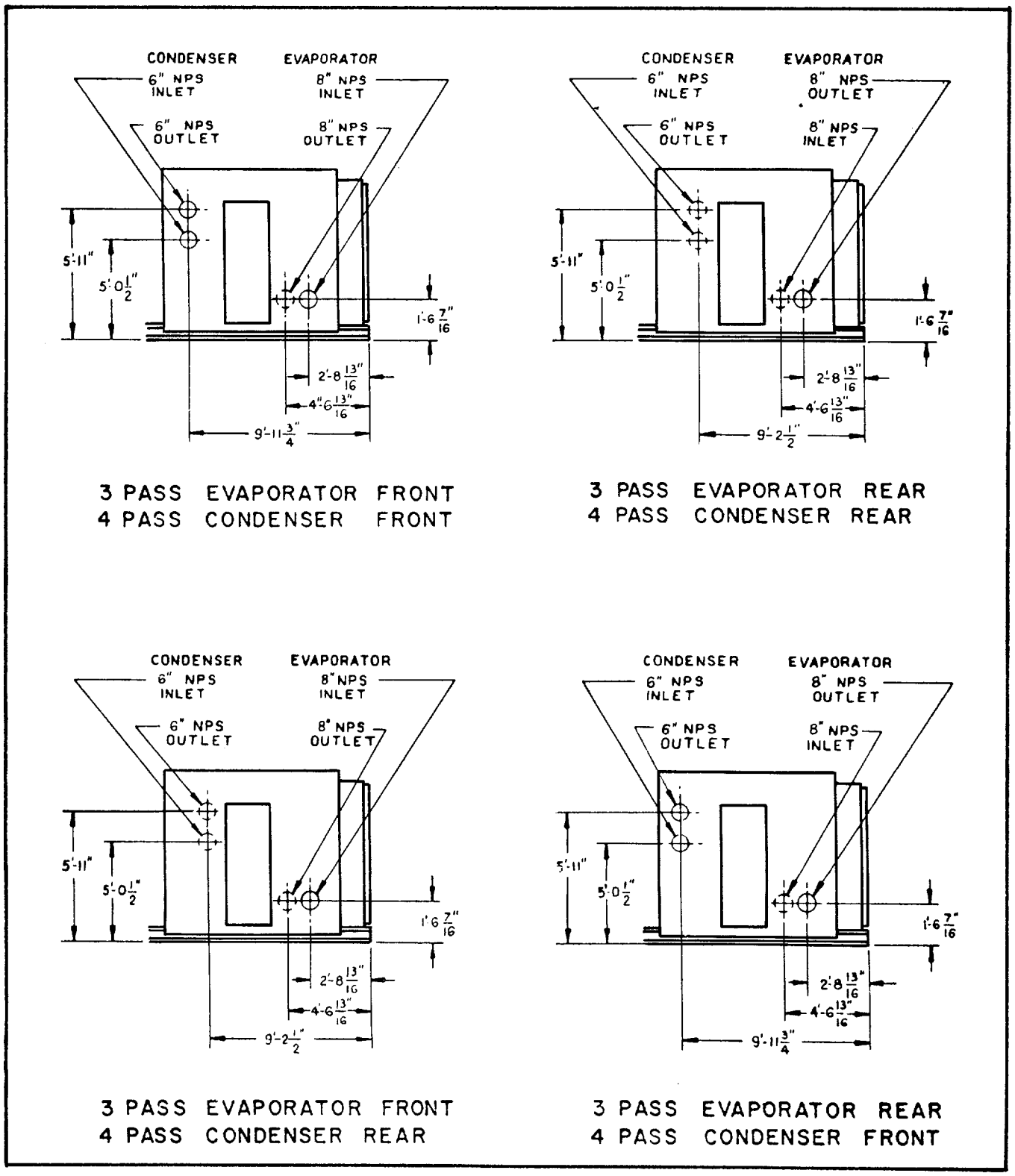


FIGURE 26 - Water Pass Arrangements and Dimensions, CVAC-027-D1-F, CVAC-032-D1-F

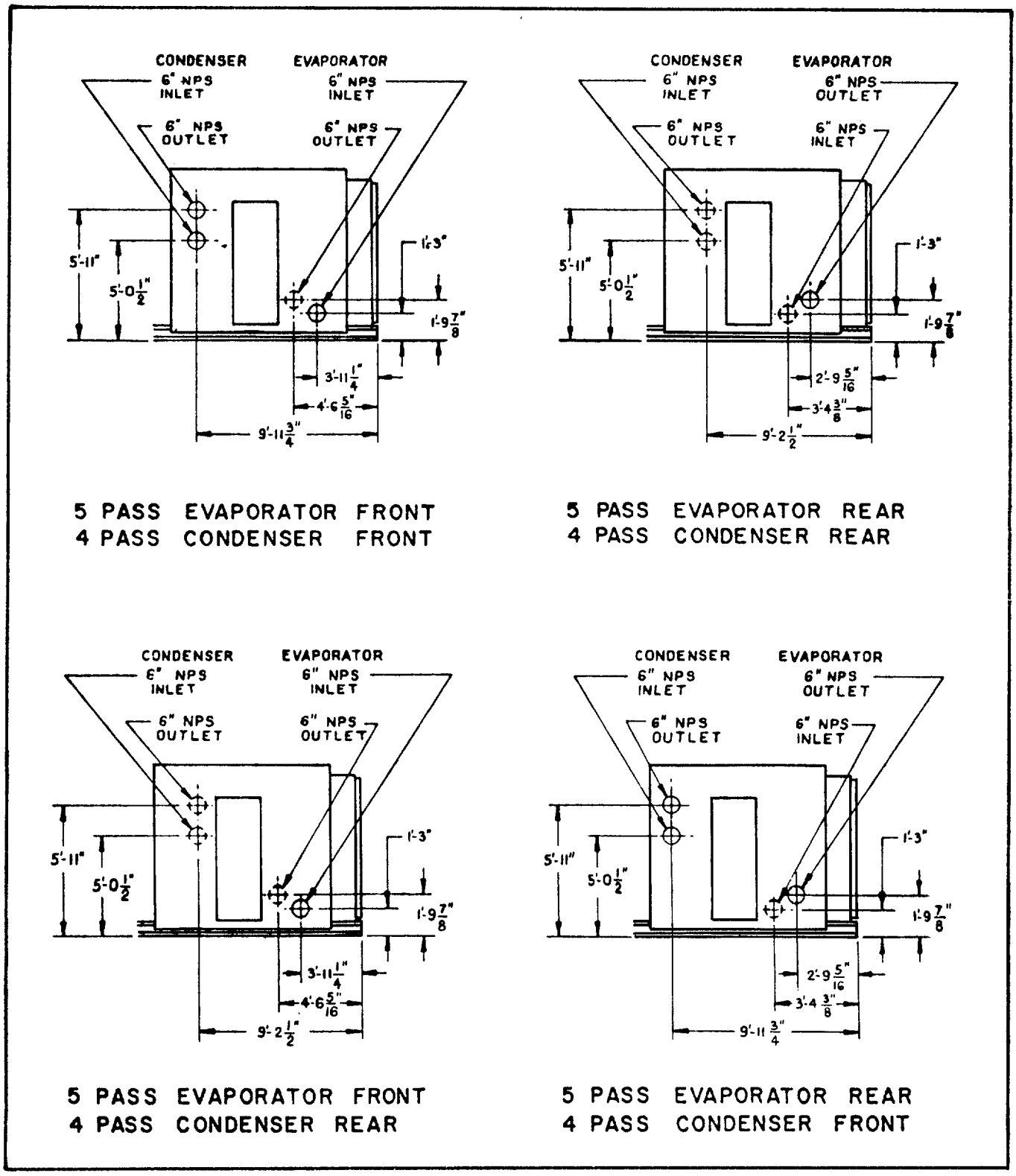


FIGURE 27 - Water Pass Arrangements and Dimensions, CVAC-027-D1-F, CVAC-032-D1-F

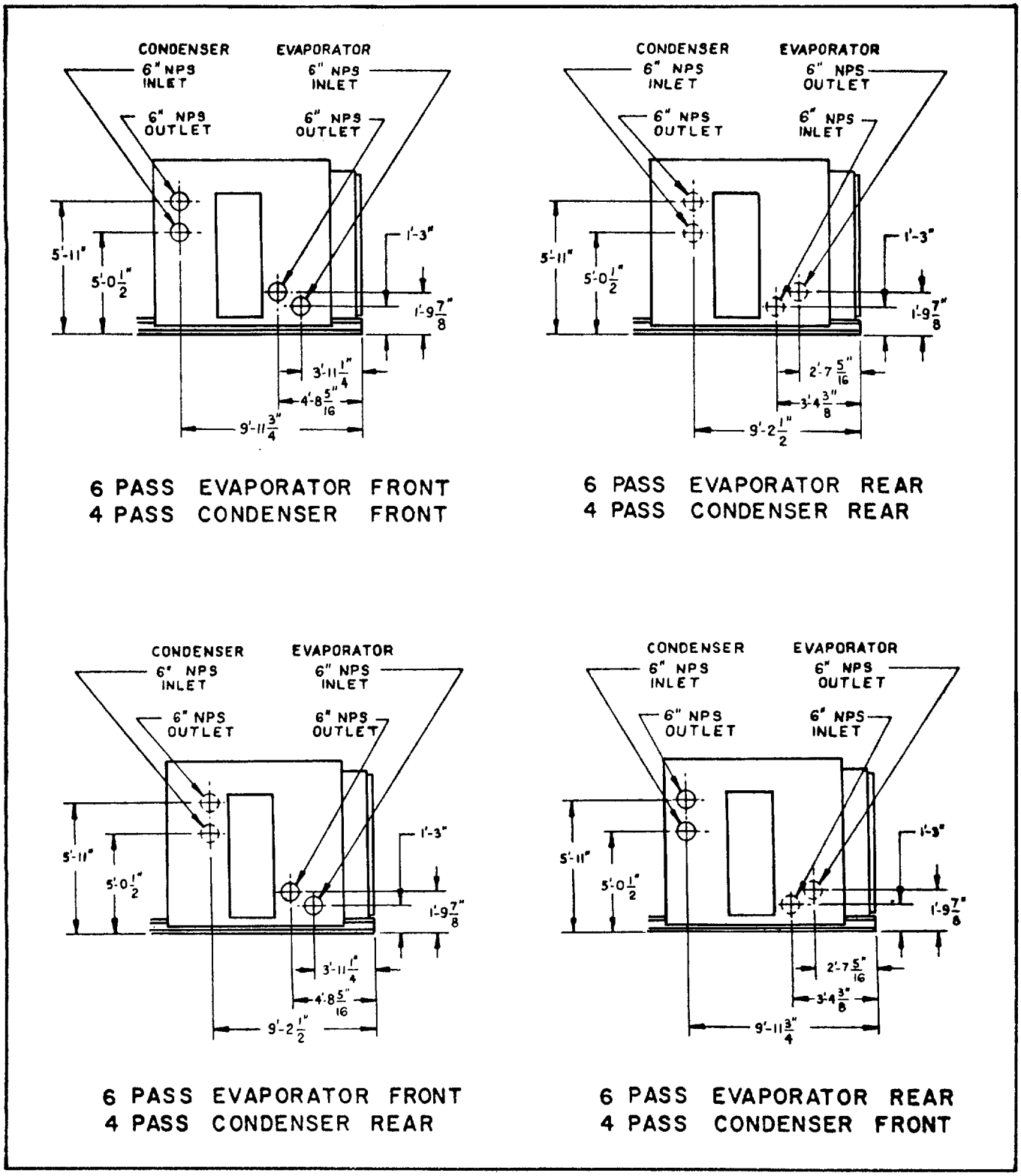


FIGURE 28 - Water Pass Arrangements and Dimensions, CVAC-027-D1-F, CVAC-032-D1-F

UNIT WEIGHTS

Table 3 gives total unit weights. The weights given include refrigerant and oil charges as shipped. The weight of water in the evaporator and heat recovery condenser is not included. Note that those units which utilize copper fins in the air-cooled condenser are heavier than units with aluminum fins.

TABLE 3 - Unit Weights (Shipping and Operating)

Unit	Weight (lbs.) Aluminum Fins	Weight (lbs.) Copper Fins
CVAC-013-A1-A (Extended Capacity)	18,600	19,600
CVAC-013-A1-B (High Efficiency)	19,800	21,000
CVAC-013-A1-B (High Ambient)	19,800	21,000
CVAC-016-A1-B (Extended Capacity)	19,800	21,000
CVAC-016-B1-C (High Efficiency)	22,050	23,450
CVAC-016-B1-C (High Ambient)	22,050	23,450
CVAC-018-B1-C (Extended Capacity)	22,050	23,450
CVAC-018-B1-D (High Efficiency)	23,150	24,750
CVAC-018-B1-D (High Ambient)	23,150	24,750
CVAC-021-B1-D (Extended Capacity)	23,150	24,750
CVAC-021-C1-E (High Efficiency)	29,700	31,700
CVAC-021-C1-E (High Ambient)	29,700	31,700
CVAC-027-C1-E (Extended Capacity)	29,700	31,700
CVAC-027-D1-F (High Efficiency)	34,100	36,980
CVAC-027-D1-F (High Ambient)	34,100	36,980
CVAC-032-D1-F (Extended Capacity)	34,100	36,980

FOUNDATION RECOMMENDATIONS

Unless set on a roof, it is recommended that the Model CVAC Heat Recovery Air-Cooled CenTraVac be set on a concrete foundation. The concrete slab and the properly prepared sub-grade should be flat and level to within ¼". It should be of sufficient strength to support the concentrated weight of the unit, the connecting water piping filled with water, and the refrigerant and oil charge weight. CVAC shipping and operating weights are given in Table 3, Page 26. Note that units with copper fins in the air-cooled condenser section are heavier. When installed on a concrete foundation, the weight of the foundation should be no less than 1½ times the weight of the entire unit including piping with water, and oil and refrigerant charges. It is recommended that the unit be anchored to the concrete on ground level installations. When spring isolators are used, the unit must be anchored to the isolators and the isolators anchored to the roof structure or concrete slab.

Heat Recovery Air Cooled CenTraVacs with two air-cooled condenser fans are provided with eight ¾" mounting holes in the bottom of the 4" x 4" steel beams on the bottom of the unit. The positions of the mounting holes are illustrated in Figures 1 through 6. CVAC units with three air-cooled condenser fans are provided with twelve ¾" mounting holes. Tables 4 through 9 and Figures 29 and 30 give weight distribution data at each of the mounting locations. Tables 4 through 9 also indicate the type isolator to be used at each point. The different isolator types are illustrated in Figures 31 through 34.

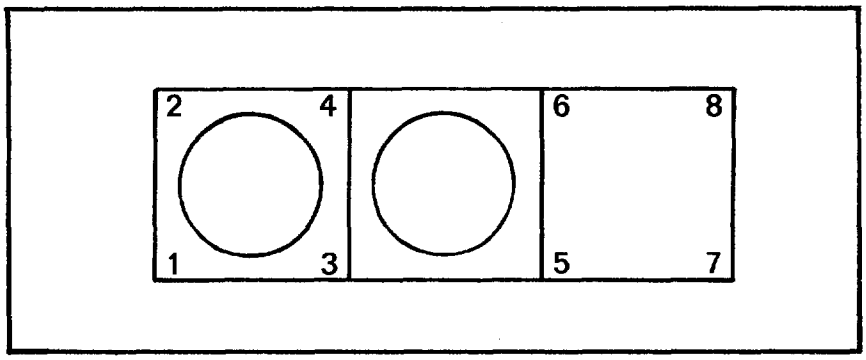


FIGURE 29 - Heat Recovery Air Cooled CenTraVac Weight Distribution Points (Units with Two Air-Cooled Condenser Fans)

TABLE 4 - Weight Distribution (Lbs.) and Isolator Recommendations

Model			
Size	Evap	CDS	
013	A1	A	Extended Capacity

	Point Numbers							
	1	2	3	4	5	6	7	8
Weight(AL)	850	850	1595	1595	2539	2539	3815	4845
Isolator	CP-1-31	CP-1-31	CP-2-31	CP-2-31	CP-4-27	CP-4-27	CP-4-31	CP-7-28
Weight(CU)	945	945	1785	1785	2634	2634	3815	4845
Isolator	CP-1-31	CP-1-31	CP-2-31	CP-2-31	CP-4-27	CP-4-27	CP-4-31	CP-7-28

TABLE 5 - Weight Distribution (Lbs.) and Isolator Recommendations

Model			
Size	Evap	CDS	
013	A1	B	High Efficiency
013	A1	B	High Ambient
016	A1	B	Extended Capacity

	Point Numbers							
	1	2	3	4	5	6	7	8
Weight(AL)	954	954	1823	1823	2653	2653	3940	5000
Isolator	CP-2-27	CP-2-27	CP-2-32	CP-2-32	CP-4-28	CP-4-28	CP-4-32	CP-7-28
Weight(CU)	1069	1069	2053	2053	2768	2768	3940	5000
Isolator	CP-2-27	CP-2-27	CP-2-32	CP-2-32	CP-4-28	CP-4-28	CP-4-32	CP-7-28

TABLE 6 - Weight Distribution (Lbs.) and Isolator Recommendations

Model			
Size	Evap	CDS	
016	B1	C	High Efficiency
016	B1	C	High Ambient
018	B1	C	Extended Capacity

	Point Numbers							
	1	2	3	4	5	6	7	8
Weight(AL)	1065	1065	2055	2055	2965	2965	4370	5510
Isolator	CP-2-27	CP-2-27	CP-4-27	CP-4-27	CP-4-28	CP-4-28	CP-4-32	CP-7-28
Weight(CU)	1195	1195	2315	2315	3095	3095	4370	5510
Isolator	CP-2-27	CP-2-27	CP-4-27	CP-4-27	CP-4-28	CP-4-28	CP-4-32	CP-7-28

TABLE 7 - Weight Distribution (Lbs.) and Isolator Recommendations

Model			
Size	Evap	CDS	
018	B1	D	High Efficiency
018	B1	D	High Ambient
021	B1	D	Extended Capacity

	Point Numbers							
	1	2	3	4	5	6	7	8
Weight(AL)	1157	1157	2240	2240	3108	3108	4490	5650
Isolator	CP-2-28	CP-2-28	CP-4-27	CP-4-27	CP-4-31	CP-4-31	CP-4-32	CP-7-31
Weight(CU)	1307	1307	2540	2540	3258	3258	4490	5650
Isolator	CP-2-28	CP-2-28	CP-4-27	CP-4-27	CP-4-31	CP-4-31	CP-4-32	CP-7-31

TABLE 8 - Weight Distribution (Lbs.) and Isolator Recommendations

Model			
Size	Evap	CDS	
021	C1	E	High Efficiency
021	C1	E	High Ambient
027	C1	E	Extended Capacity

	Point Numbers											
	1	2	3	4	5	6	7	8	9	10	11	12
Weight(AL)	805	805	1530	1530	1530	1530	1530	1530	3505	3505	5300	6600
Isolator	CP-2-26	CP-2-26	CP-2-31	CP-2-31	CP-2-31	CP-2-31	CP-2-31	CP-2-31	CP-4-31	CP-4-31	CP-7-28	CP-7-31
Weight(CU)	900	900	1720	1720	1720	1720	1720	1720	3600	3600	5300	6600
Isolator	CP-2-26	CP-2-26	CP-2-31	CP-2-31	CP-2-31	CP-2-31	CP-2-31	CP-2-31	CP-4-31	CP-4-31	CP-7-28	CP-7-31

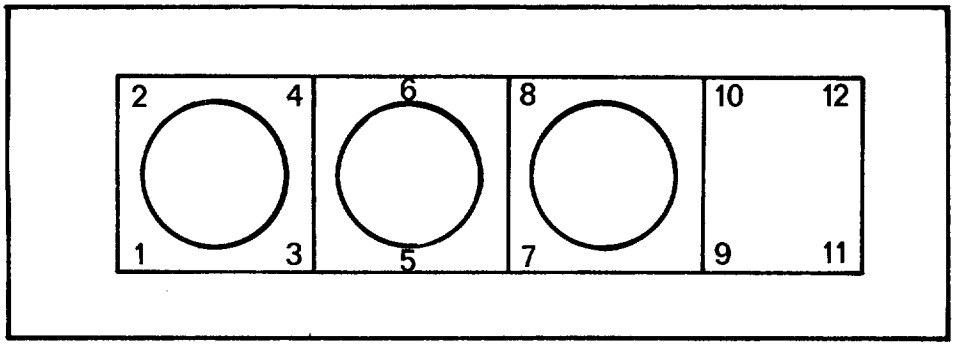
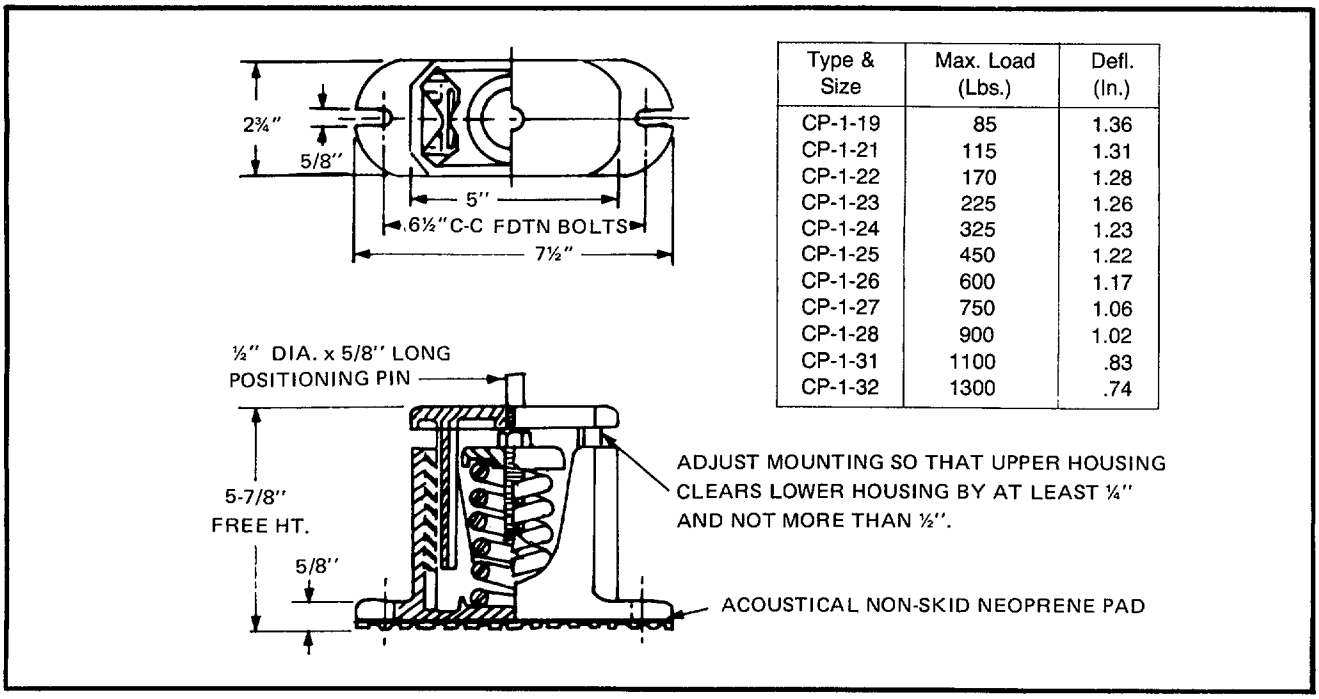


FIGURE 30 - Heat Recovery Air Cooled CenTraVac Weight Distribution Points (Units with Three Air-Cooled Condenser Fans)

TABLE 9 - Weight Distribution (Lbs.) and Isolator Recommendations

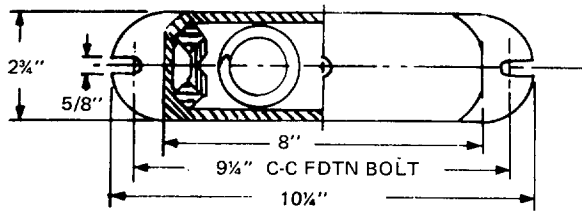
Model			
Size	Evap	CDS	
027	D1	F	High Efficiency
027	D1	F	High Ambient
032	D1	F	Extended Capacity

	Point Numbers											
	1	2	3	4	5	6	7	8	9	10	11	12
Weight(AL)	987	987	1908	1908	1908	1908	1908	1908	3539	3539	6050	7550
Isolator	CP-2-27	CP-2-27	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-4-31	CP-4-31	CP-7-31	CP-7-32
Weight(AL)	1112	1112	2158	2158	2158	2158	2158	2158	3664	3664	6050	7550
Isolator	CP-2-27	CP-2-27	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-2-32	CP-4-31	CP-4-31	CP-7-31	CP-7-32



Type & Size	Max. Load (Lbs.)	Defl. (In.)
CP-1-19	85	1.36
CP-1-21	115	1.31
CP-1-22	170	1.28
CP-1-23	225	1.26
CP-1-24	325	1.23
CP-1-25	450	1.22
CP-1-26	600	1.17
CP-1-27	750	1.06
CP-1-28	900	1.02
CP-1-31	1100	.83
CP-1-32	1300	.74

FIGURE 31 - Spring Isolator, Type CP-1



Type & Size	Max. Load (Lbs.)	Defl. (In.)
CP-2-25	900	1.22
CP-2-26	1200	1.17
CP-2-27	1500	1.06
CP-2-28	1800	1.02
CP-2-31	2200	.83
CP-2-32	2600	.74

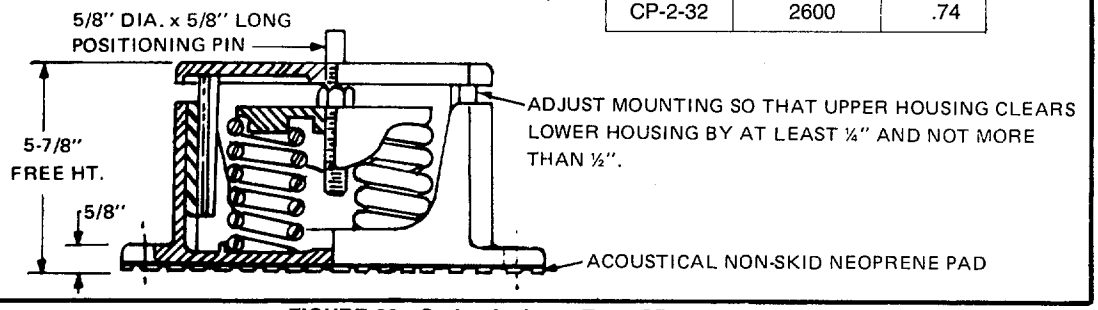
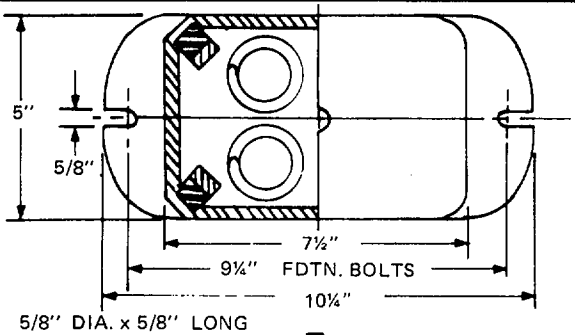


FIGURE 32 - Spring Isolator, Type CP-2



Type & Size	Max. Load (Lbs.)	Defl. (In.)
CP-4-25	1800	1.22
CP-4-26	2400	1.17
CP-4-27	3000	1.06
CP-4-28	3600	1.02
CP-4-31	4400	.83
CP-4-32	5200	.74

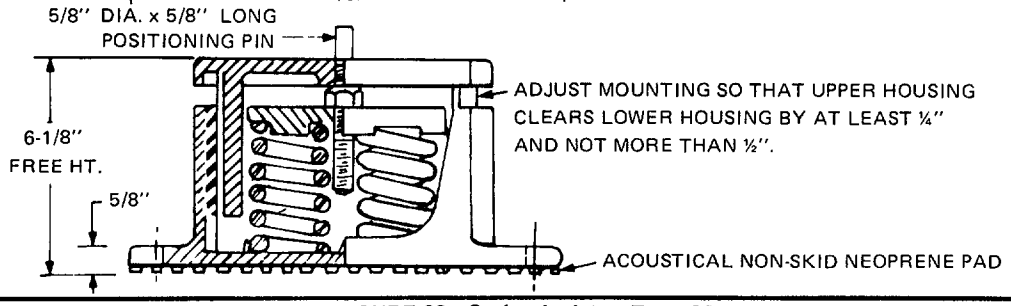
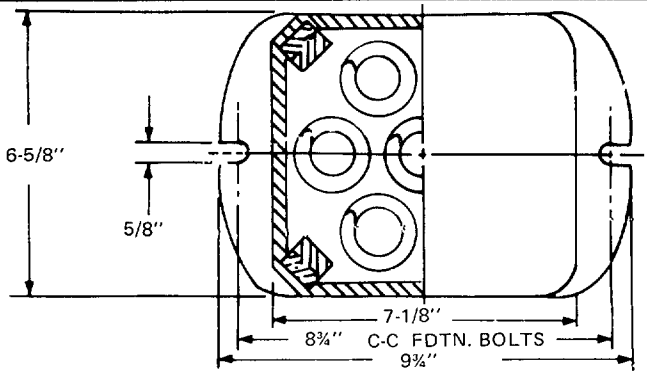


FIGURE 33 - Spring Isolator, Type CP-4



Type & Size	Max. Load (Lbs.)	Defl. (In.)
CP-7-25	3150	1.22
CP-7-26	4200	1.17
CP-7-27	5250	1.06
CP-7-28	6300	1.02
CP-7-31	7700	.83
CP-7-32	9100	.74

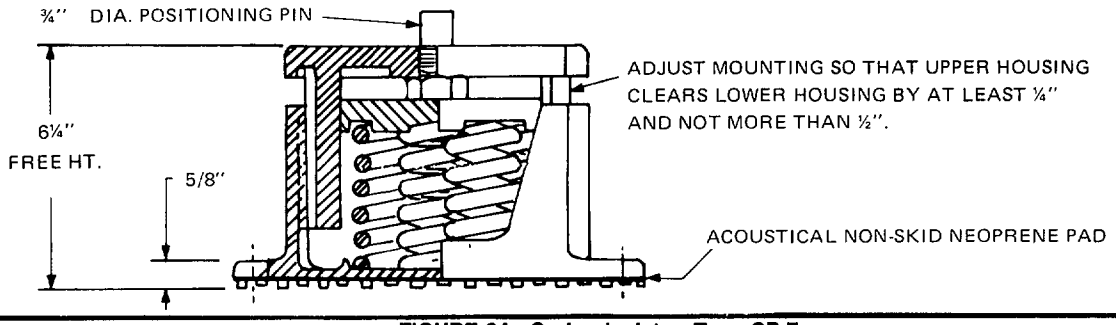


FIGURE 34 - Spring Isolator, Type CP-7

UNIT LOCATION AND CLEARANCES

The Heat Recovery Air-Cooled CenTraVac should be located where the air-cooled condenser air will flow, without obstruction, through the coil and away from the fan discharge. Do not place the unit under an overhang which could cause recirculation of the hot discharge air from the air-cooled condenser. See Figure 36 for recommendations regarding mounting in a well. It is important that in this situation the fan discharge is above the top of the well.

If the unit must be placed near a wall or other obstruction which will hinder proper air flow, sufficient clearance must be maintained between the unit and the obstruction. Allow at least 10 feet at both sides of the air-cooled condenser coil. If the installation includes two units side by side, clearance between the coils of the units must be at least 20 feet. See Figure 35.

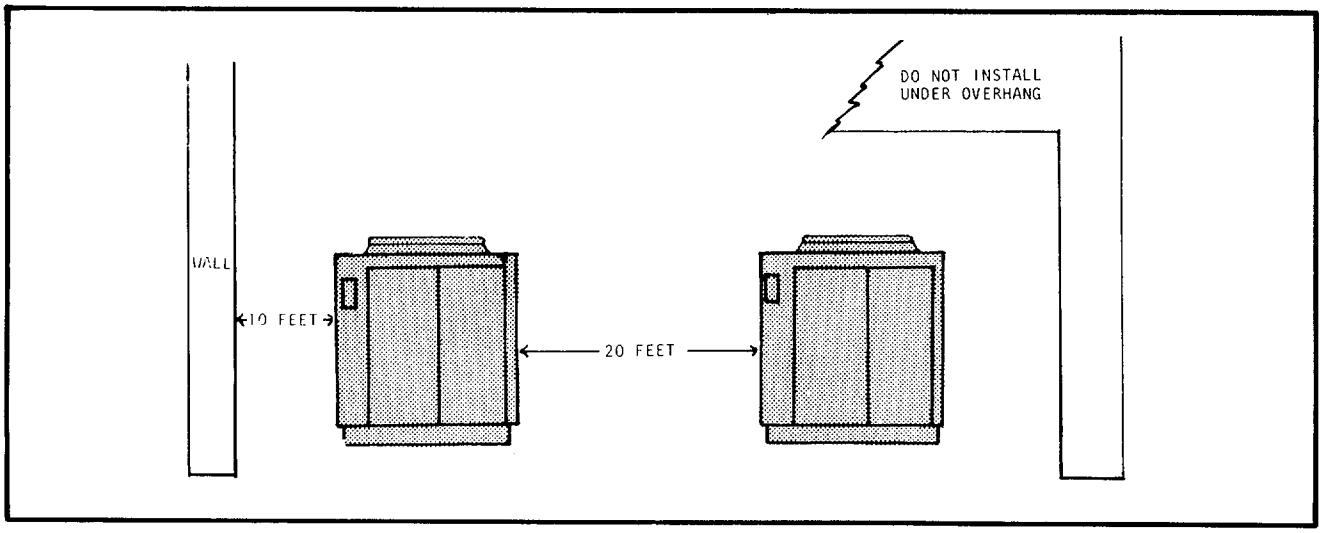


FIGURE 35 - Clearances Between Units and Obstructions

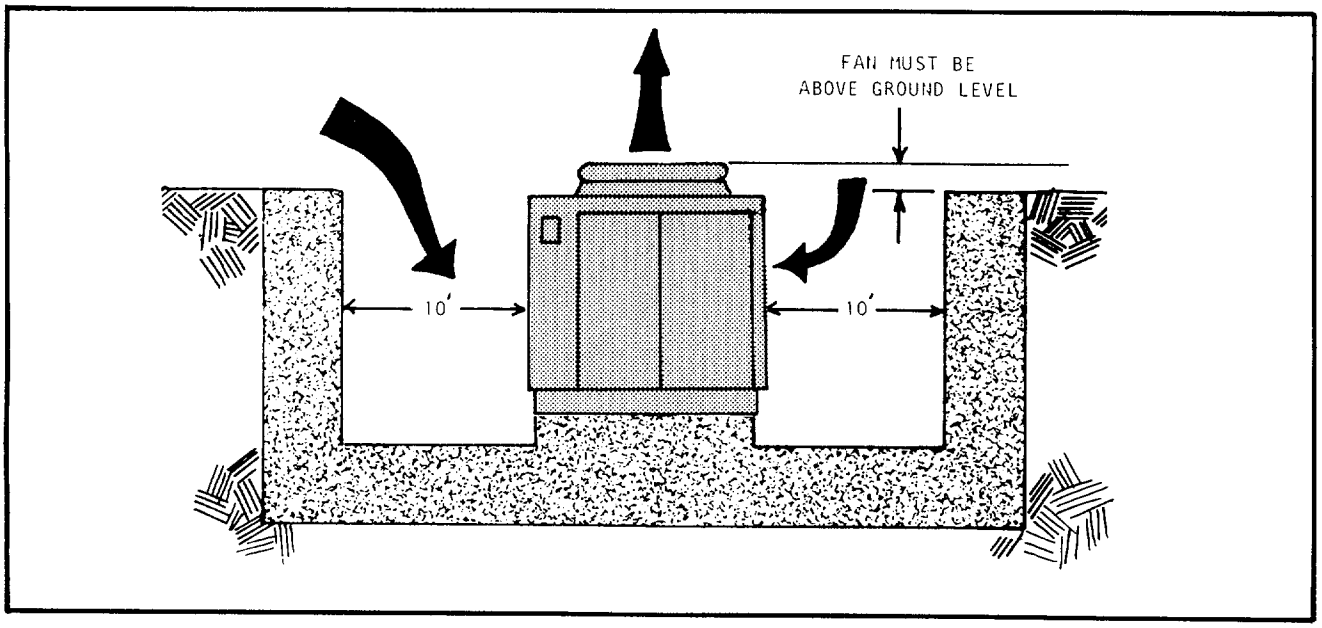


FIGURE 36 - Unit Installed In a Well or Walled Enclosure

RIGGING

Four lifting points are built into the unit, and the lifting pins are shipped in the loose parts box. Install lifting pins in each of the four lifting points built into the base of the unit. See Figure 37.

Assemble the lifting hardware as shown in Figure 37. The slings, spreader bar and 2x4's are to be provided by the rigger.

See Table 10 which gives sling lengths and loads for rigging and lifting purposes. The sling lengths given are consistent with the center of gravity as indicated by dimensions A and B from Figure 37. The recommended sling lengths allow proper clearance between the spreader bar and the upper surfaces of the Heat Recovery Air Cooled CenTraVac.

The minimum rated load capacity (vertical) of each sling shall be no less than the maximum sling load given for each unit in Table 10. The lifting capacity of the spreader bar shall be no less than the maximum unit weight as given in Table 10.

Wood 2x4's should be provided and used solely for the purpose of preventing scraping of the unit.

The position of the unit may vary plus or minus ten degrees from horizontal during lifting, depending on the weight of optional equipment included with the unit and the location of the refrigerant charge within the unit.

CAUTION: The Model CVAC Heat Recovery Air-Cooled CenTraVac must be lifted with the utmost care. Avoid shock loads by lifting slowly and evenly.

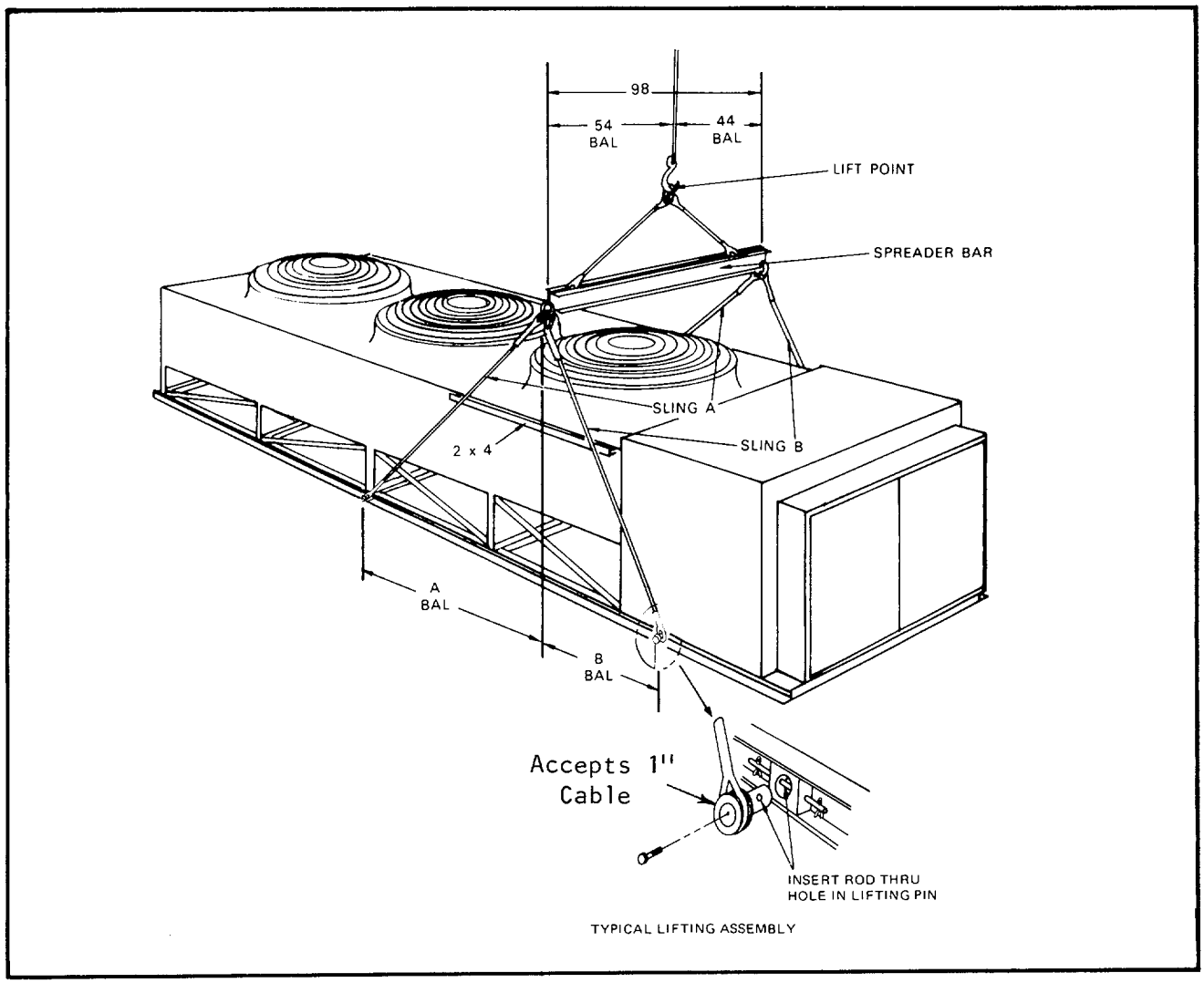


FIGURE 37 - Rigging and Lifting the Heat Recovery Air Cooled CenTraVac

TABLE 10 - Rigging and Lifting Data (See Figure 37)

Model Number Description and Digit No.					"A" Bal (Inches)	"B" Bal (Inches)	Length Sling #1 (Feet)	Length Sling #2 (Feet)	Max. Sling Load (Tons)	Max. Unit Weight (Lbs.)
Unit Size 5-6-7	Digit 9	Amb. Digit 11	Evap. Digit 12-13	Cond. Digit 17						
013	R	L	A1	A	102.00	85.00	13.5	12	5.0	19,600
016	R	L	A1	B	111.00	96.00	14	13	5.5	21,000
013	R	L	A1	B						
013	R	H	A1	B						
018	R	L	B1	C	122.00	104.00	15	13.5	5.0	23,450
016	R	L	B1	C						
016	R	H	B1	C						
021	R	L	B1	D	126.00	116.00	15	14	6.0	24,750
018	R	L	B1	D						
018	R	H	B1	D						
027	R	L	C1	E	146.00	142.00	16	15.5	6.5	31,700
021	R	L	C1	E						
021	R	H	C1	E						
032	R	L	D1	F	144.00	144.00	16	16	7.0	36,980
027	R	L	D1	F						
027	R	H	D1	F						

CHILLED WATER PIPING

Three chilled liquid flow arrangements are available for the Heat Recovery Air Cooled CenTraVac evaporator. They are six-pass, five-pass and three-pass arrangements.

NOTE: The front of the evaporator is on the door side of the equipment room. Six-pass evaporators have same side connections for return and supply chilled liquid. Either front or rear connections are available with six-pass evaporators.

The five-pass and three-pass evaporators have opposite side connections for the return and supply chilled liquid.

On the six-pass and five-pass flow arrangements the inlet to the evaporator is always the lower connection and the outlet to the cooling load is always the top connection. Either connection may be used as the inlet with three-pass evaporators.

Pressure gauge ports and two thermometer wells are required for proper machine trimming. The temperature control transmitter (Figure 38) must be installed in the leaving chilled water piping. As illustrated in Figure 39 the transmitter functions best when installed in the first elbow leaving the chiller. The chilled water demand switch (S3) bulb should be located in the entering evaporator water piping. Water pressure drop curves are listed in the sales catalog DS-CTV11. For proper performance of the machine, pressure drop must be set up according to the sales order write-up. The required vapor-proof flow switch (S5) should be installed at least 2½ pipe diameters from an elbow or construction. Figure 39 illustrates chilled liquid supply and return piping as well as heat recovery condenser piping.

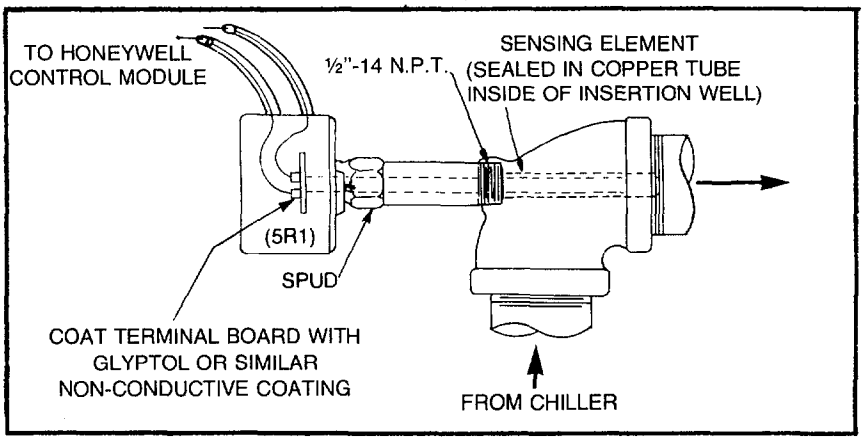


FIGURE 38 - Temperature Control Transmitter

WATER TREATMENT

The use of untreated or improperly treated water in a CenTraVac may result in scaling, erosion, corrosion, algae or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what treatment, if any, is advisable. The Trane Company assumes no responsibility for equipment failures which are the result of untreated or improperly treated water.

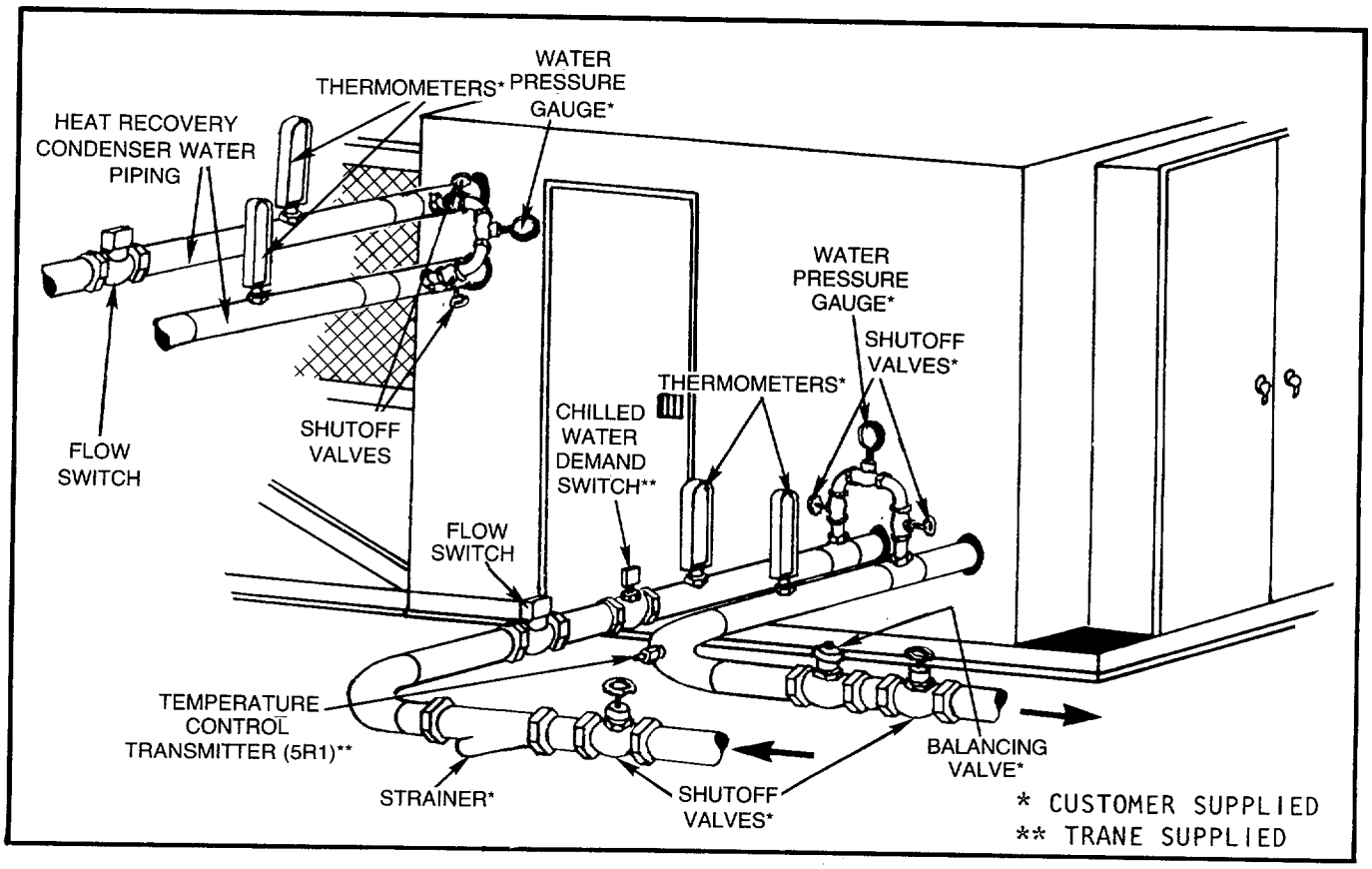


FIGURE 39 - Chilled Water and Heat Recovery Water Piping

LOW AMBIENT RECOMMENDATIONS

The following recommendations are made and must be followed if the CVAC Heat Recovery Air Cooled CenTraVac is to be installed where ambient conditions of below 40 F may be expected.

1. All clearances in the equipment room through which water piping enters the unit should be entirely sealed.
2. All water piping to and from the unit must be adequately freeze-protected. This should include insulation and heat tape, if required. This will prevent the possibility of freezing any water in the pipes leading to or from the evaporator and heat recovery condenser.
3. If a unit will be shutdown for the winter and temperatures of 40 F or less will be experienced at least one of the following recommendations should be carried out:
   a. The water should be completely drained from the water system.
   b. An ethylene-glycol solution should be added to the water circuits to adequately protect the unit to the minimum temperature expected.
   c. The water pumps should be operated continuously, by thermostat, whenever the ambient temperature is below 40 F and the evaporator water temperature should be logged each day to confirm that it is above freezing. Also, it should be confirmed that the electric unit heater(s) in the equipment room is operating properly.
4. If a unit will be operated during the winter and temperatures of less than 40 F will be experienced, either "a" or "b", following should be carried out and "c" must be carried out.
   a. An ethylene-glycol solution should be added to the water circuits to adequately protect the unit down to the minimum temperature expected.
   b. The water pumps should be operated continuously.
   c. The evaporator water temperature should be logged each day to confirm that it is above freezing. Also, it should be confirmed that the electric unit heater(s) in the equipment room is operating properly.
5. To provide freeze protection in the event of power failure the unit should be equipped in at least one of the following ways.
   a. An ethylene-glycol solution should be added to the water circuits to adequately protect the unit down to the minimum temperature expected.
   b. An alternate emergency power source to provide power to the unit heater(s) in the machine, and to provide power to the water pumps should be provided. The water pumps should be operated continuously.
6. The water pumps must not be used to start or stop the unit if the ambient temperature is 40 F or lower.
7. The water pumps must operate for at least 30 minutes following unit shutdown when the ambient temperature is 40 F or below. See "Chilled Water Pump Interlock" page 42.
8. The water pumps must be on a separate, but interlocked electrical circuit.

WIRING RECOMMENDATIONS

Field completed wiring must be in accordance with all applicable codes and ordinances. The connection terminals on Trane equipment are designed for use with copper conductors per UL and NEC guidelines. The use of aluminum conductors is not recommended due to the possibility of galvanic corrosion as discussed in Engineering Bulletin MSCR-40.

Minimum conductor size is determined by minimum circuit ampacity and conductors should be sized according to NEC guidelines. Figure 40 illustrates the interconnecting wiring to be completed by the installing contractor. Figure 41 is a schematic drawing of the complete CVAC Heat Recovery electrical system. Table 11 includes electrical data. Table 12 provides electrical connection data.

TABLE 11 - Electrical Data

	UNIT CHARACTERISTICS[1]					COMPRESSOR				CONDENSER FAN MOTORS			
MODEL	RATED VOLTAGE	HZ	VOLTAGE UTILIZATION RANGE	MIN. CKT AMP.[2]	REC. DUAL ELEMENT FUSE[3]	NAMEPLATE RATED LOAD AMPS	LOCKED ROTOR AMPS[4]	FULL LOAD KW	HP	NO.	NAMEPLATE FULL LOAD AMPS EACH	ACTUAL KW EACH	HP
CVAC-013	200	60	180-220	842	1000	593	3560	182	260	2	48.3	8.3	15
Extended	400	50	360-440	426	500	300	1860	182	260	2	24.0	8.3	15
Capacity	460	60	414-506	365	450	257	1643	182	260	2	21.0	8.3	15
	575	60	517-632	293	350	206	1360	182	260	2	17.0	8.3	15
CVAC-016	200	60	180-220	906	1200	644	3560	208	260	2	48.3	9.9	15
Extended	400	50	360-440	457	600	325	1860	208	260	2	24.0	9.9	15
Capacity	460	60	414-506	394	450	280	1643	208	260	2	21.0	9.9	15
	575	60	517-632	316	400	224	1360	208	260	2	17.0	9.9	15
CVAC-018	200	60	180-220	1060	1200	745	4270	230	290	2	62.1	12.5	20
Extended	400	50	360-440	534	600	375	2071	230	290	2	31.5	12.5	20
Capacity	460	60	414-506	461	600	324	1945	230	290	2	27.0	12.5	20
	575	60	517-632	370	450	259	1600	230	290	2	22.0	12.5	20
CVAC-021	200	60	180-220	1210	1600	865	5200	266	330	2	62.1	15.5	20
Extended	400	50	360-440	593	700	422	2560	266	330	2	31.5	15.5	20
Capacity	460	60	414-506	526	600	376	2130	266	330	2	27.0	15.5	20
	575	60	517-632	422	500	301	1625	266	330	2	22.0	15.5	20
CVAC-027	200	60	180-220	1431	1600	1025	6210	325	410	3	48.3	11.5	15
Extended	400	50	360-440	733	1000	527	3005	325	410	3	24.0	11.5	15
Capacity	460	60	414-506	634	800	455	2500	325	410	3	21.0	11.5	15
	575	60	517-632	508	600	364	1980	325	410	3	17.0	11.5	15
CVAC-032	200	60	180-220	1653	2000	1140	7060	368	470	3	62.1	13.5	20
Extended	400	50	360-440	841	1000	595	3560	368	470	3	31.5	13.5	20
Capacity	460	60	414-506	726	1000	514	3080	368	470	3	27.0	13.5	20
	575	60	517-632	582	700	411	2460	368	470	3	22.0	13.5	20
CVAC-013	200	60	180-220	842	1000	593	3560	182	260	2	48.3	9.9	15
High	400	50	360-440	426	500	300	1860	182	260	2	24.0	9.9	15
Efficiency	460	60	414-506	365	450	257	1643	182	260	2	21.0	9.9	15
	575	60	517-632	293	350	206	1360	182	260	2	17.0	9.9	15
CVAC-016	200	60	180-220	934	1200	644	3560	208	260	2	62.1	12.5	20
High	400	50	360-440	472	600	325	1860	208	260	2	31.5	12.5	20
Efficiency	460	60	414-506	406	500	280	1643	208	260	2	27.0	12.5	20
	575	60	517-632	326	400	224	1360	208	260	2	22.0	12.5	20
CVAC-018	200	60	180-220	1060	1200	745	4270	230	290	2	62.1	15.5	20
High	400	50	360-440	534	600	375	2071	230	290	2	31.5	15.5	20
Efficiency	460	60	414-506	461	600	324	1945	230	290	2	27.0	15.5	20
	575	60	517-632	370	450	259	1600	230	290	2	22.0	15.5	20

1. Unit Characteristics refer to entire unit main power supply. All unit amps include power for oil pump and controls.
   All models require separate source 230 volt single phase 3-wire supply as follows:

VOLTAGE	MINIMUM CIRCUIT AMPACITY	RECOMMENDED TIME DELAY FUSE
230	60	60

2. Minimum Circuit Ampacity per NEC 440-33.
3. Recommended Dual Element Fuse sized at approximately 150 percent of compressor rated load amps.
4. Locked Rotor Amps in Delta Connection.

TABLE 11 - Electrical Data Continued

	UNIT CHARACTERISTICS[1]					COMPRESSOR				CONDENSER FAN MOTORS			
MODEL	RATED VOLTAGE	HZ	VOLTAGE UTILIZATION RANGE	MIN. CKT AMP.[2]	REC. DUAL ELEMENT FUSE[3]	NAMEPLATE RATED LOAD AMPS	LOCKED ROTOR AMPS[4]	FULL LOAD KW	HP	NO.	NAMEPLATE FULL LOAD AMPS EACH	ACTUAL KW EACH	HP
CVAC-021	200	60	180-220	1231	1600	865	5200	266	330	3	48.3	11.5	15
High	400	50	360-440	602	700	422	2560	266	330	3	24.0	11.5	15
Efficiency	460	60	414-506	535	600	376	2130	266	330	3	21.0	11.5	15
	575	60	517-632	429	500	301	1625	266	330	3	17.0	11.5	15
CVAC-027	200	60	180-220	1472	2000	1025	6210	325	410	3	62.1	13.5	20
High	400	50	360-440	756	1000	527	3005	325	410	3	31.5	13.5	20
Efficiency	460	60	414-506	652	800	455	2500	325	410	3	27.0	13.5	20
	575	60	517-632	523	600	364	1980	325	410	3	22.0	13.5	20
CVAC-013	200	60	180-220	906	1200	644	3560	208	260	2	48.3	9.9	15
High	400	50	360-440	457	600	325	1860	208	260	2	24.0	9.9	15
Ambient	460	60	414-506	394	450	280	1643	208	260	2	21.0	9.9	15
	575	60	517-632	316	400	224	1360	208	260	2	17.0	9.9	15
CVAC-016	200	60	180-220	1060	1200	745	4270	230	290	2	62.1	12.5	20
High	400	50	360-440	534	600	375	2071	230	290	2	31.5	12.5	20
Ambient	460	60	414-506	461	600	324	1945	230	290	2	27.0	12.5	20
	575	60	517-632	370	450	259	1600	230	290	2	22.0	12.5	20
CVAC-018	200	60	180-220	1210	1600	865	5200	266	330	2	62.1	15.5	20
High	400	50	360-440	593	700	422	2560	266	330	2	31.5	15.5	20
Ambient	460	60	414-506	526	600	376	2130	266	330	2	27.0	15.5	20
	575	60	517-632	422	500	301	1625	266	330	2	22.0	15.5	20
CVAC-021	200	60	180-220	1231	1600	865	5200	266	330	3	48.3	11.5	15
High	400	50	360-440	602	700	422	2560	266	330	3	24.0	11.5	15
Ambient	460	60	414-506	535	600	376	2130	266	330	3	21.0	11.5	15
	575	60	517-632	429	500	301	1625	266	330	3	17.0	11.5	15
CVAC-027	200	60	180-220	1653	2000	1140	7060	368	470	3	62.1	13.5	20
High	400	50	360-440	841	1000	595	3560	368	470	3	31.5	13.5	20
Ambient	460	60	414-506	726	1000	514	3080	368	470	3	27.0	13.5	20
	575	60	517-632	582	700	411	2460	368	470	3	22.0	13.5	20

1. Unit Characteristics refer to entire unit main power supply. All unit amps include power for oil pump and controls. All models require separate source 230 volt single phase 3-wire supply as follows:

VOLTAGE	MINIMUM CIRCUIT AMPACITY	RECOMMENDED TIME DELAY FUSE
230	60	60

2. Minimum Circuit Ampacity per NEC 440-33.
3. Recommended Dual Element Fuse sized at approximately 150 percent of compressor rated load amps.
4. Locked Rotor Amps in Delta Connection.

POWER SUPPLY CIRCUIT DESCRIPTION

Refer to Figures 40 and 41.

Circuit Number One

Circuit number one (auxiliary power) must be 230 volt, 3 wire, single phase of 60 amp capacity. This circuit supplies power for the space heaters, oil sump heater, convenience outlet and enclosure light. To provide added low ambient temperature protection, the space heaters are 6 Kw in capacity. This circuit also supplies power to the oil sump heater. To prevent excessive refrigerant absorption by the oil this must be a separate power source which must remain energized at all times after the oil is charged into the oil sump. Voltage variations must be limited to plus or minus 10%.

Circuit Number Two

The number two circuit is the three phase power circuit connected to the line side of the main circuit breaker. This circuit provides power to the CenTraVac compressor. This power supply must be a C-B-A (terminal sequence) phase rotation. The power supply limits are plus or minus 10% from the specified voltage. Figure 42 illustrates the starter panel on the end of the unit.

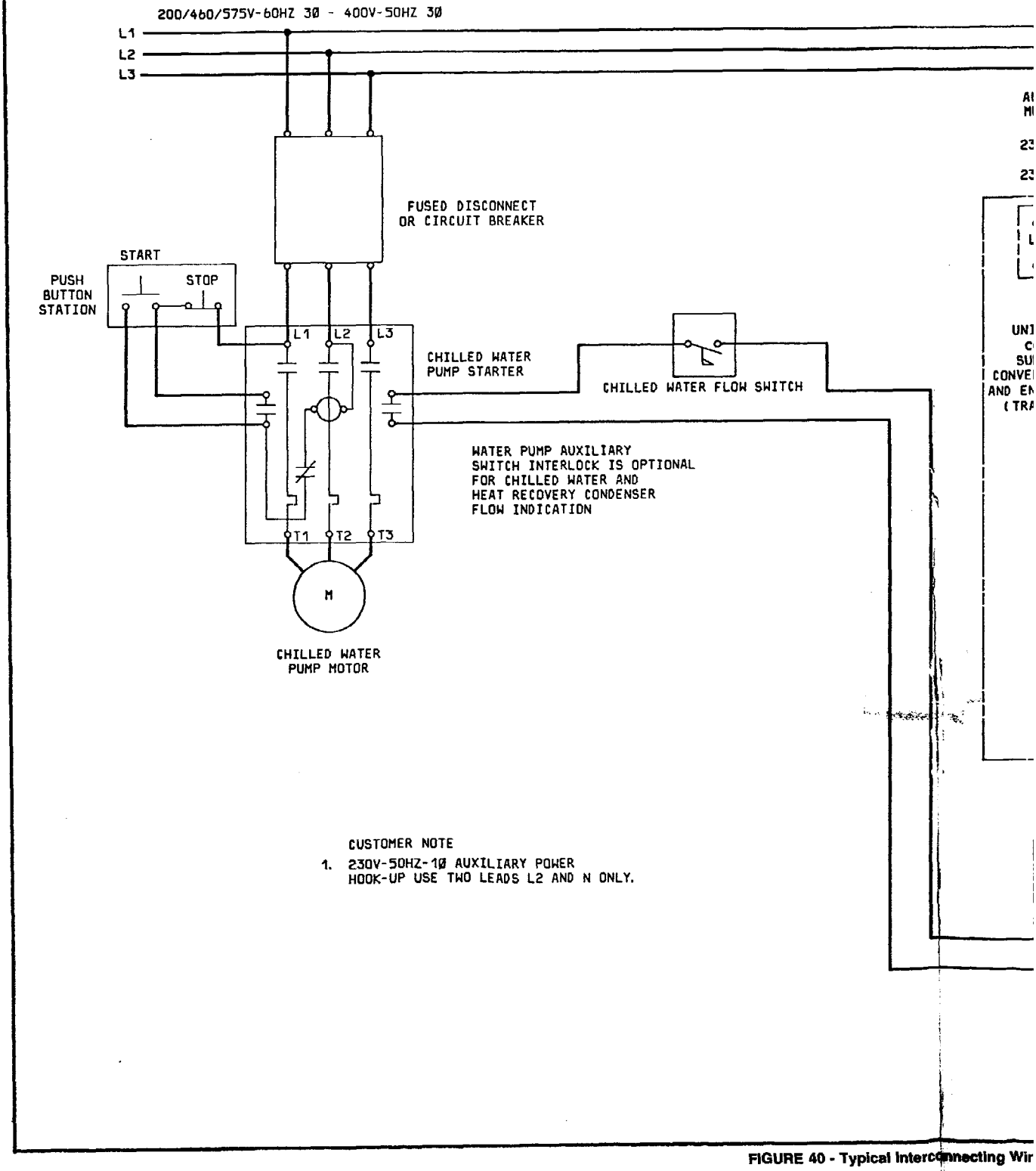
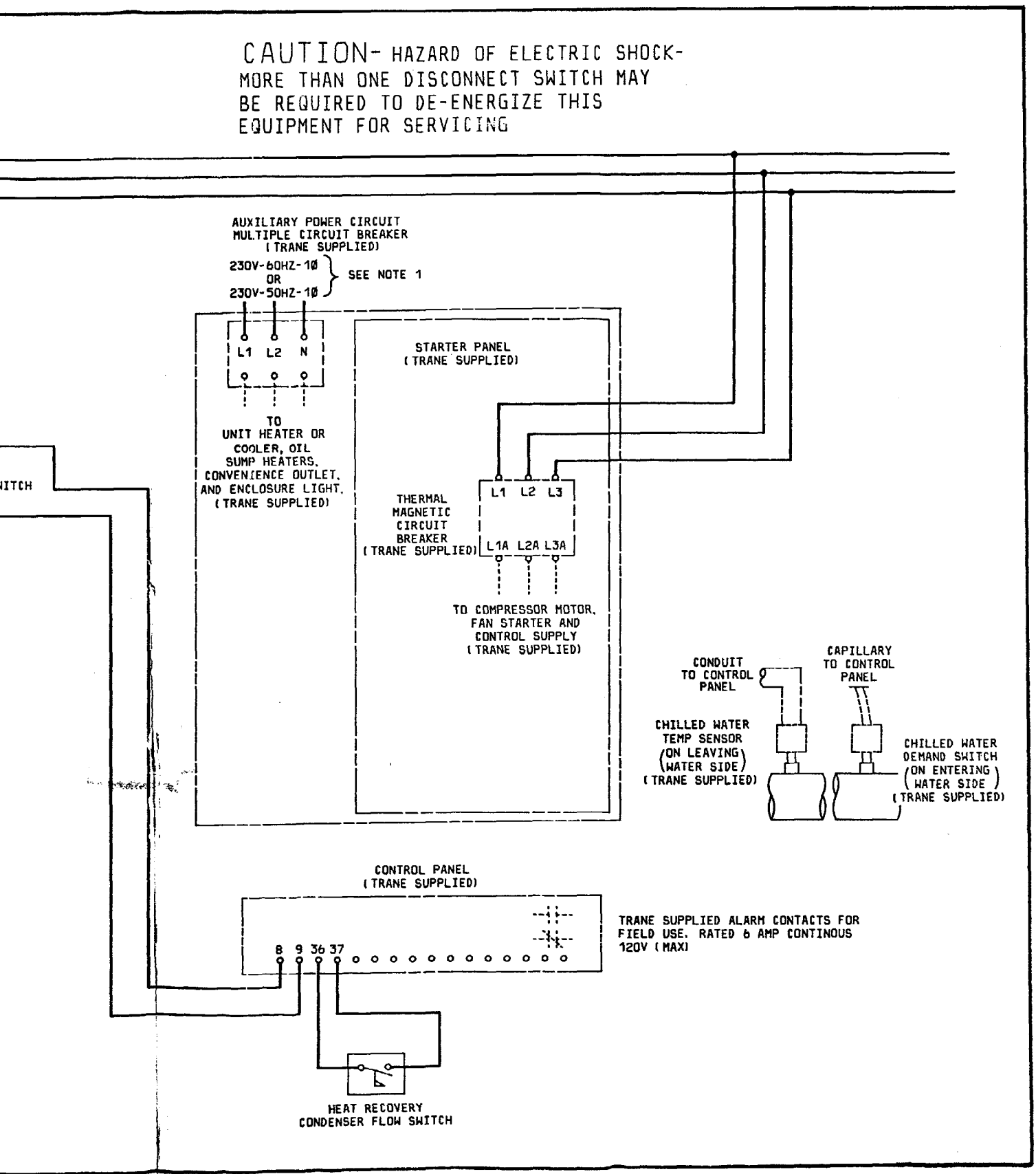


FIGURE 40 - Typical Interconnecting Wir



GURE 40 - Typical Interconnecting Wiring Diagram

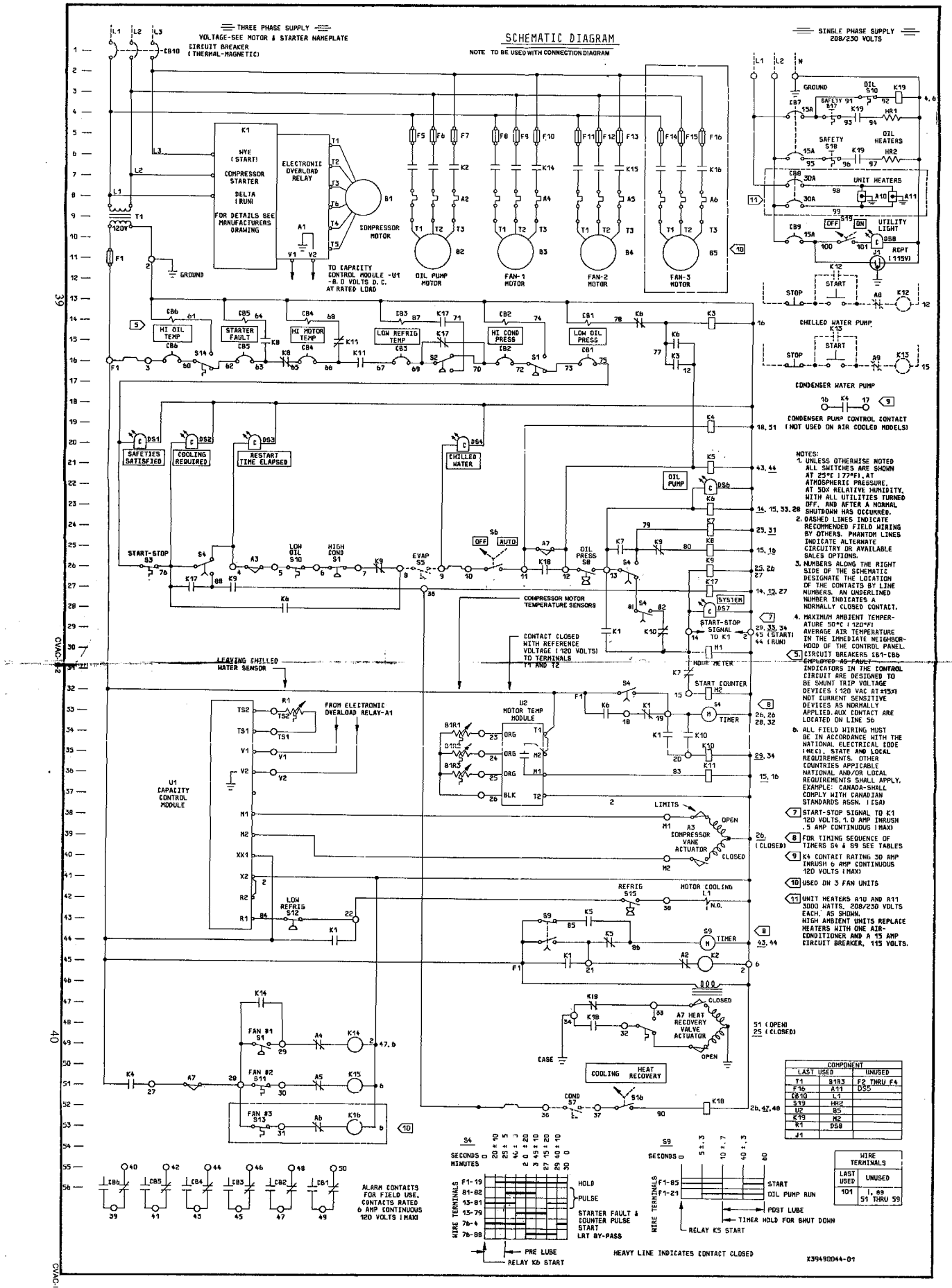


FIGURE 41 - Typical Line Wiring Diagram

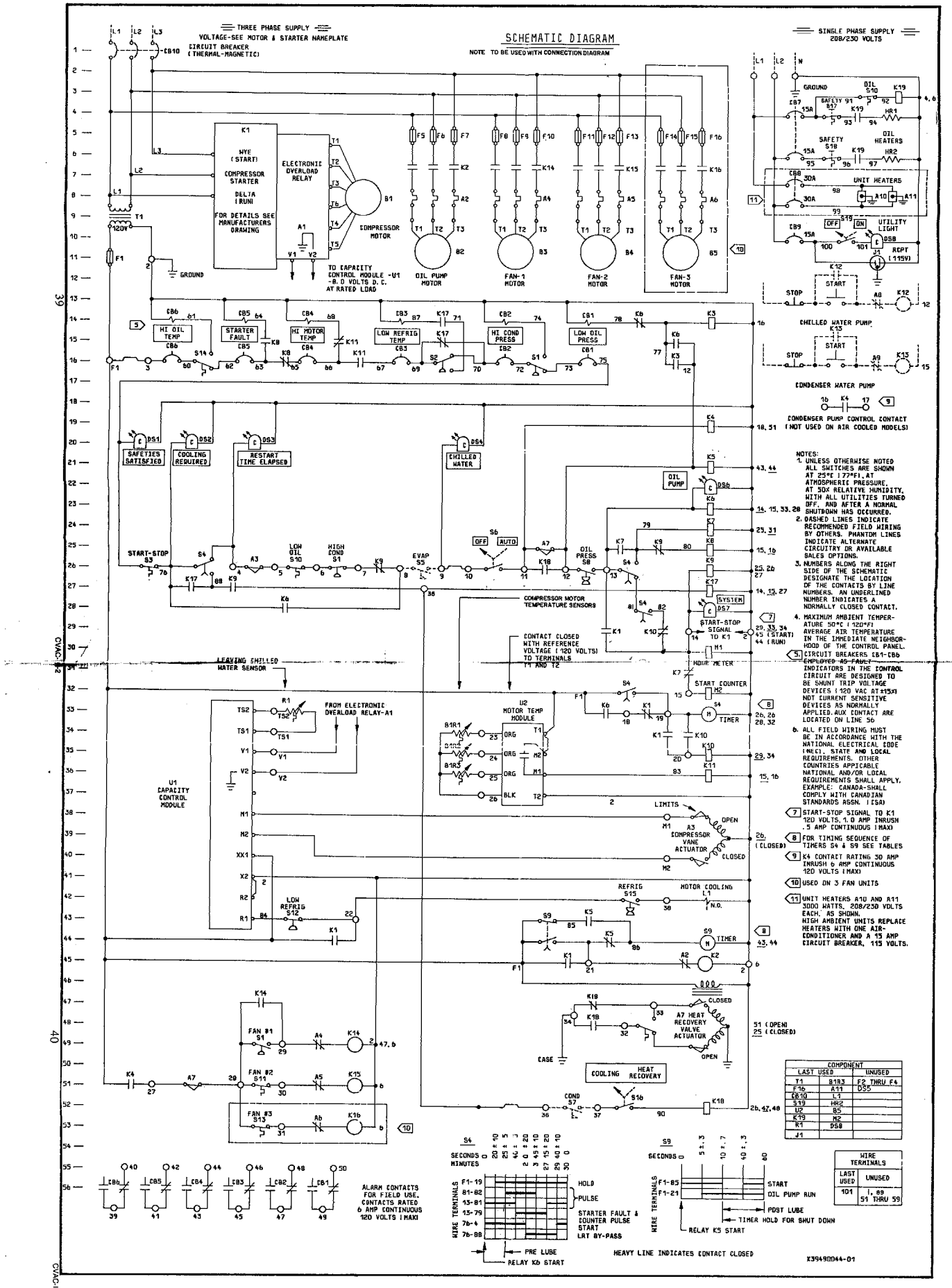
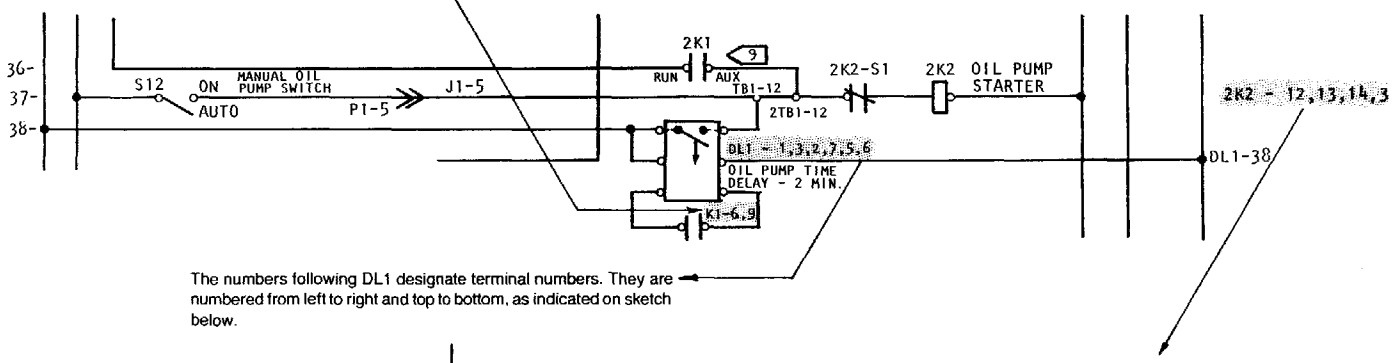


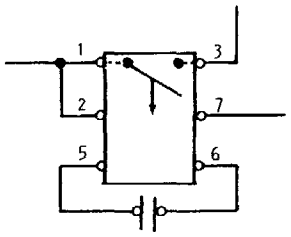
FIGURE 41 - Typical Line Wiring Diagram

DESCRIPTION OF AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) DRAWING SYSTEM

The designation K1-6, 9 refers to a pair of relay contacts connected to Terminals 6 and 9 of Relay K1.



The numbers following DL1 designate terminal numbers. They are numbered from left to right and top to bottom, as indicated on sketch below.



The designation 2K2-12, 13, 14, 34 refers to the fact that the oil pump starter coil (2K2) has normally open contacts on lines 12, 13, 14 and 34, found on the left side of the diagram. If the designation were 2K2-16, 24 it would signify a normally closed contact on Line 16 and a normally open contact on Line 24.

TABLE 12 - Electrical Connection Data[1]

MODEL	Rated Voltage	Conductors HZ	Conductors Per Phase	Conductor Size Range Minimum[2]	Conductor Size Range Maximum[3]
CVAC-013	200	60	4	4/0	500 MCM
Extended Capacity	400	50	2	250 MCM	500 MCM
High Efficiency	460	60	2	3/0	250 MCM
	575	60	1	250 MCM	500 MCM
CVAC-013	200	60	4	4/0	500 MCM
High Ambient	400	50	3	3/0	400 MCM
CVAC-016	460	60	2	3/0	250 MCM
Extended Capacity	575	60	2	3/0	250 MCM
High Efficiency					
CVAC-016	200	60	4	4/0	500 MCM
High Ambient	400	50	3	3/0	400 MCM
CVAC-018	460	60	2	250 MCM	500 MCM
Extended Capacity	575	60	2	3/0	250 MCM
High Efficiency					
CVAC-018	200	60	4	4/0	500 MCM
High Ambient	400	50	3	3/0	400 MCM
CVAC-021	460	60	2	250 MCM	500 MCM
Extended Capacity	575	60	2	250 MCM	500 MCM
High Efficiency					
High Ambient					
CVAC-027	200	60	4	500 MCM	600 MCM
Extended Capacity	400	50	3	3/0	400 MCM
High Efficiency	460	60	3	3/0	400 MCM
	575	60	2	250 MCM	500 MCM
CVAC-027	200	60	4	500 MCM	600 MCM
High Ambient	400	50	4	4/0	500 MCM
CVAC-032	460	60	3	3/0	400 MCM
Extended Capacity	575	60	2	250 MCM	500 MCM

1. Connection terminals on Trane equipment are designed for use with copper conductors per UL and NEC guidelines. We do not recommend the use of aluminum conductors due to the possibility of galvanic corrosion as discussed in EB MSCR-40.
2. Minimum conductor size determined by minimum circuit ampacity and conductor sizing per NEC guidelines.
3. Maximum conductor size determined by physical size of lug.

CHILLED WATER PUMP INTERLOCK

When the Heat Recovery Air Cooled CenTraVac is to be operated at ambient temperatures below 40 F, an interlocking timer must be used to insure the chilled water pump operates for at least thirty minutes after compressor shut-down. This is to prevent freeze-up of the tubes due to boil-off of refrigerant in the flooded evaporator. See Figures 44 and 45 for wiring reference.

POWER WIRING

Figure 42 illustrates power wiring arrangements and shows the proper phase relationship in each conduit leading to the unit. There must be equal phase representation in each conduit.

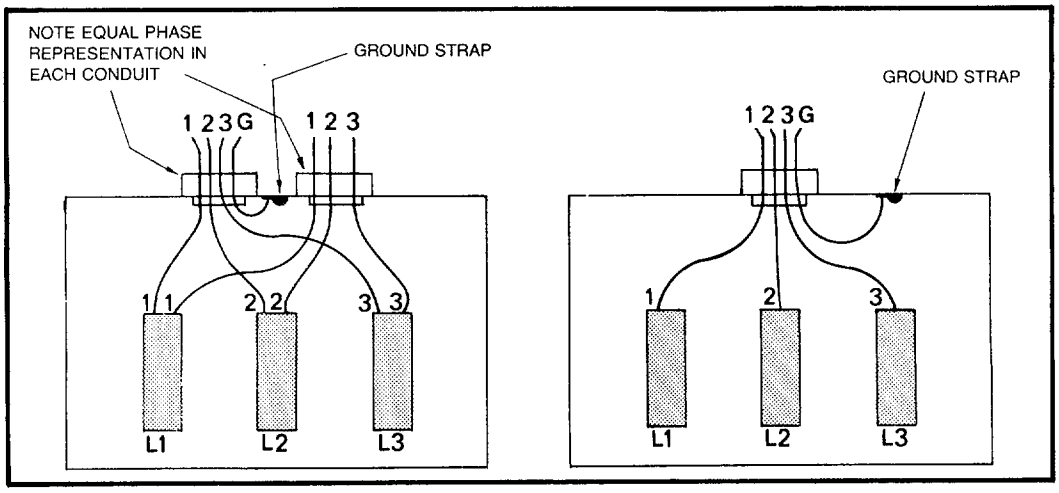


FIGURE 42 - Power Wiring Arrangements

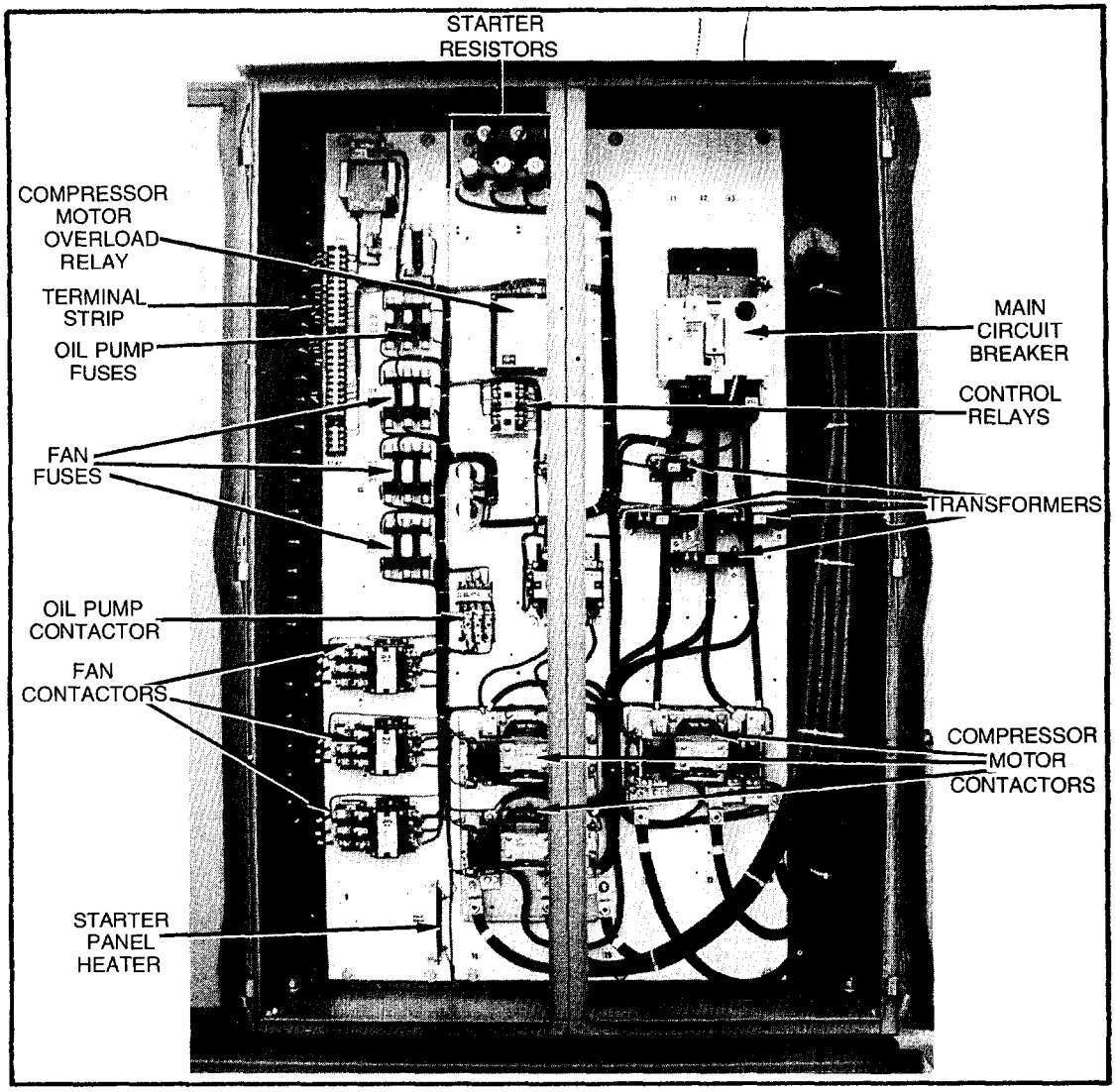


FIGURE 43 - Unit Starter Panel

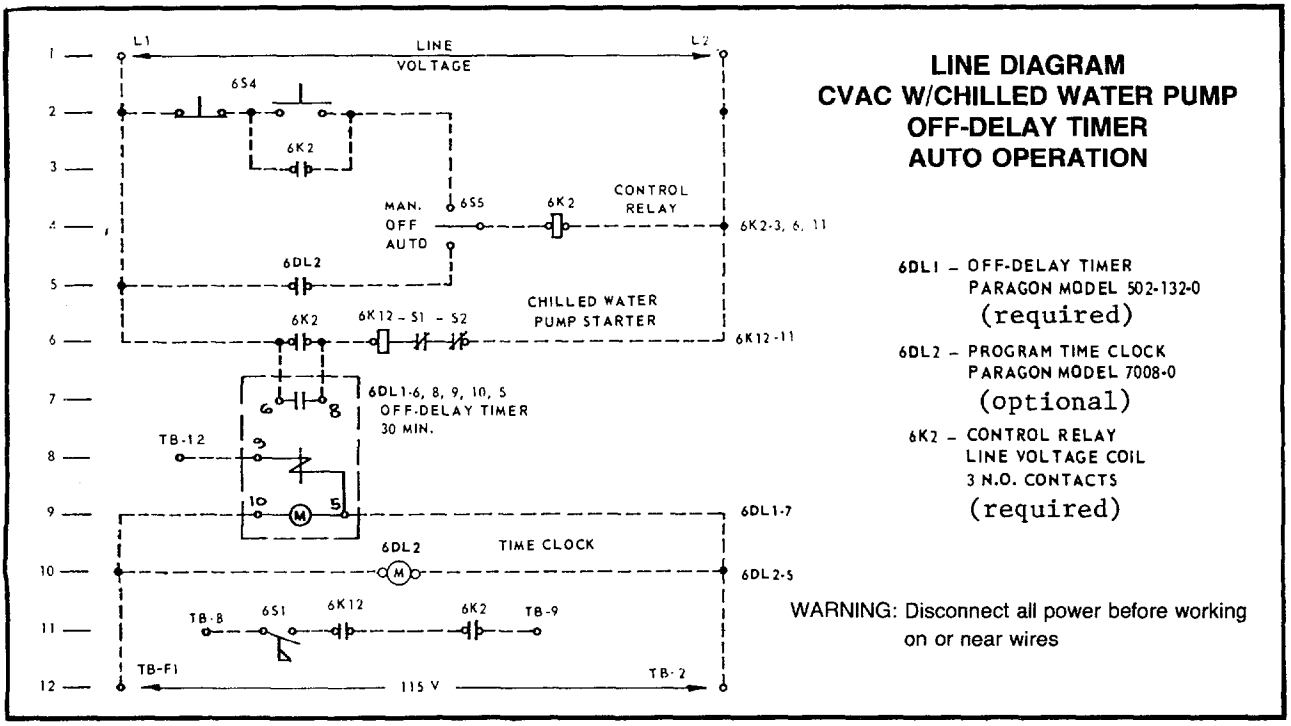


FIGURE 44 - Chilled Water Interlock Line Diagram

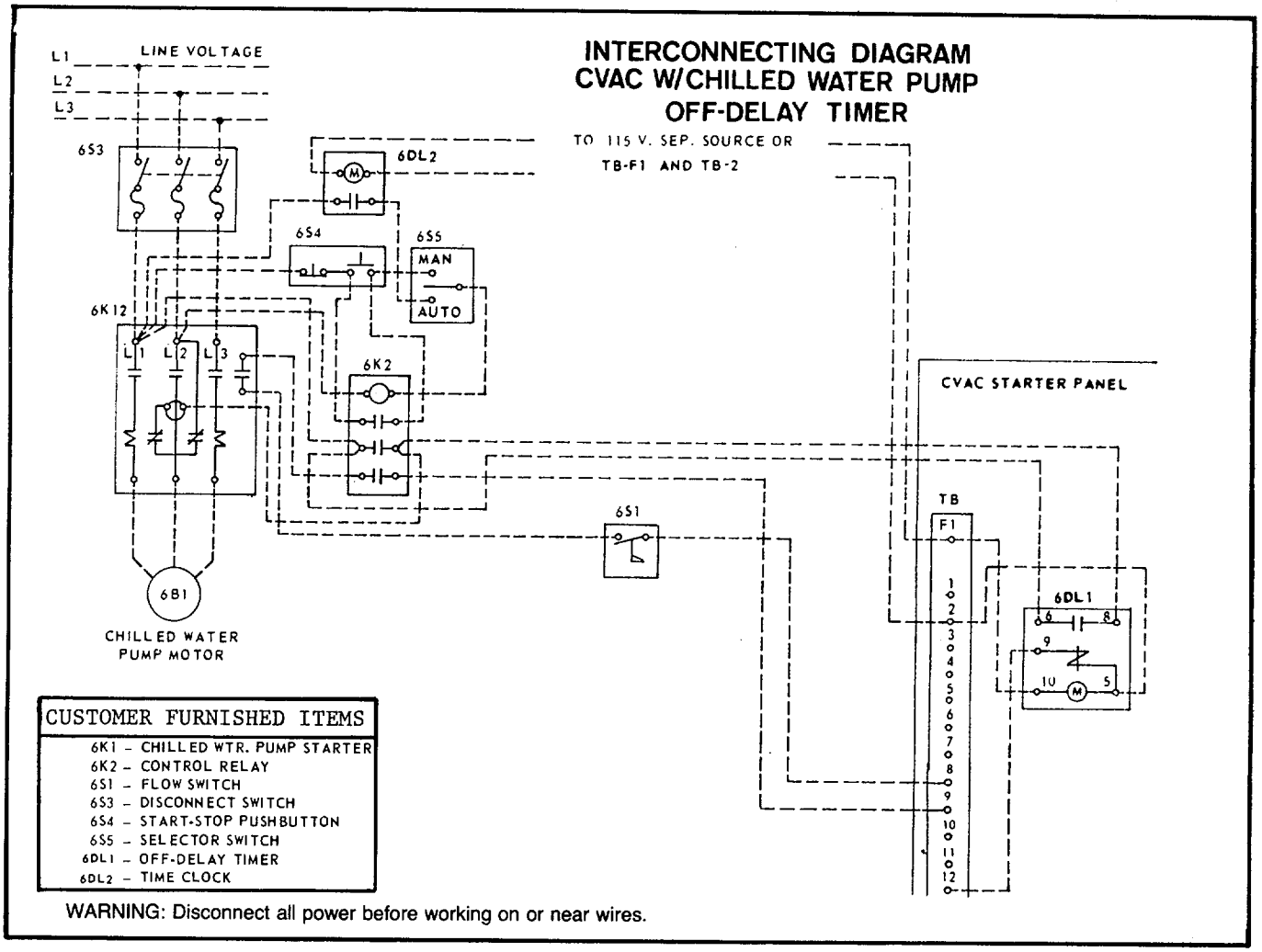


FIGURE 45 - Chilled Water Interlock Interconnecting Wiring

FANS AND FAN DRIVES

Prior to startup, check all fan drives for belt tightness and free rotation. That is, 6.5 to 8.5 pounds pressure at 5/8" deflection using a Browning Belt Tension gauge. The tension should again be checked and set after a week of operation. See Figure 46.

The sheave hub retaining bolts and key set screws must be checked for tightness. Check the fan for proper scroll position and the hub bolts for tightness. See Figure 47.

WARNING: Disconnect all power before working on or near fan drives to avoid inadvertent startup and potential personal injury.

INITIAL START-UP

All phases of the initial start-up are to be conducted under supervision of an authorized Trane Service Engineer. Upon near completion of the installation, the Air Cooled CenTraVac Check Sheet and Request for Serviceman, (Form No. 27.08-4) which is attached to this literature, must be completed in advance to allow scheduling of the start-up as close the the requested date as possible.

This form should then be mailed to the local Trane Service Agency.

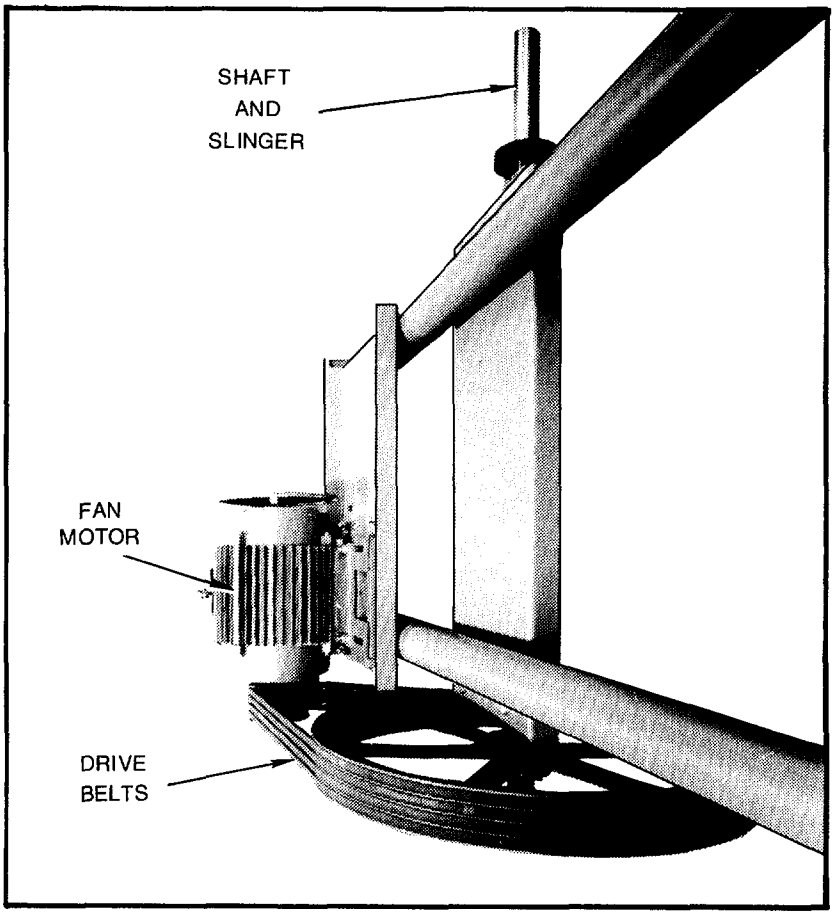


FIGURE 46 - Fan Assembly

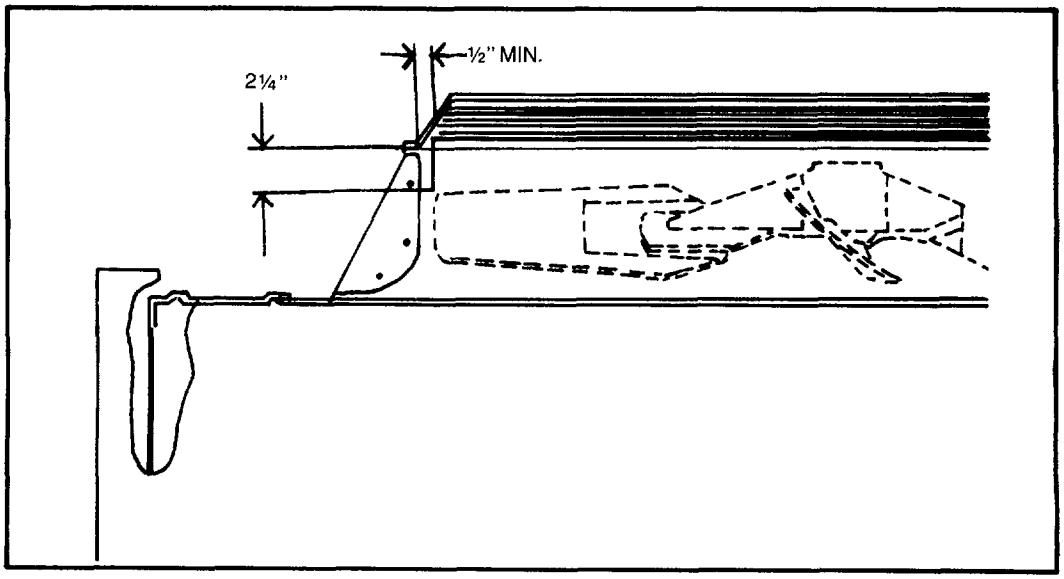


FIGURE 47 - Checking Scroll Position

TRANE AIR CONDITIONING

HEAT RECOVERY AIR COOLED CENTRAVAC CHECK SHEET AND REQUEST FOR SERVICEMAN

TO: _____ TRANE SERVICE AGENCY

_____

PROJECT NAME: _____

The following items are being installed and will be completed by: _____

1. CVAC in place and leveled and anchored per instructions . . . . . ☐

2. Pipeline
   Chilled water pipeline connected to and filled:
   Evaporator . . . . . ☐
   Air Handling Units . . . . . ☐
   Pumps . . . . . ☐
   Water Cooled Condenser Water Piping . . . . . ☐

3. Wiring
   Circuit No. 1 complete and power available . . . . . ☐
   Circuit No. 2 complete and power available . . . . . ☐
   Interlocking control wiring complete . . . . . ☐

4. All necessary gauges, thermometers and sensor wells installed . . . . . ☐

5. All coil protector covers removed . . . . . ☐

6. System can be operated under load conditions . . . . . ☐

7. Owners representative available for operators instructions . . . . . ☐

In accordance with your quotation and our Purchase Order Number _____, we will therefore require your serviceman on the job by * _____.

This is to certify that the CenTraVac(s) has been properly and completely installed and the applicable items listed above have been completed.

Additional time required to complete the start-up and adjustment due to incompleteness of the installation will be invoiced at prevailing rates.

Check list completed by _____

_____

_____

Signed _____

Dated _____

*Advance notification is required to allow scheduling of the start-up as close to the requested start-up date as possible.