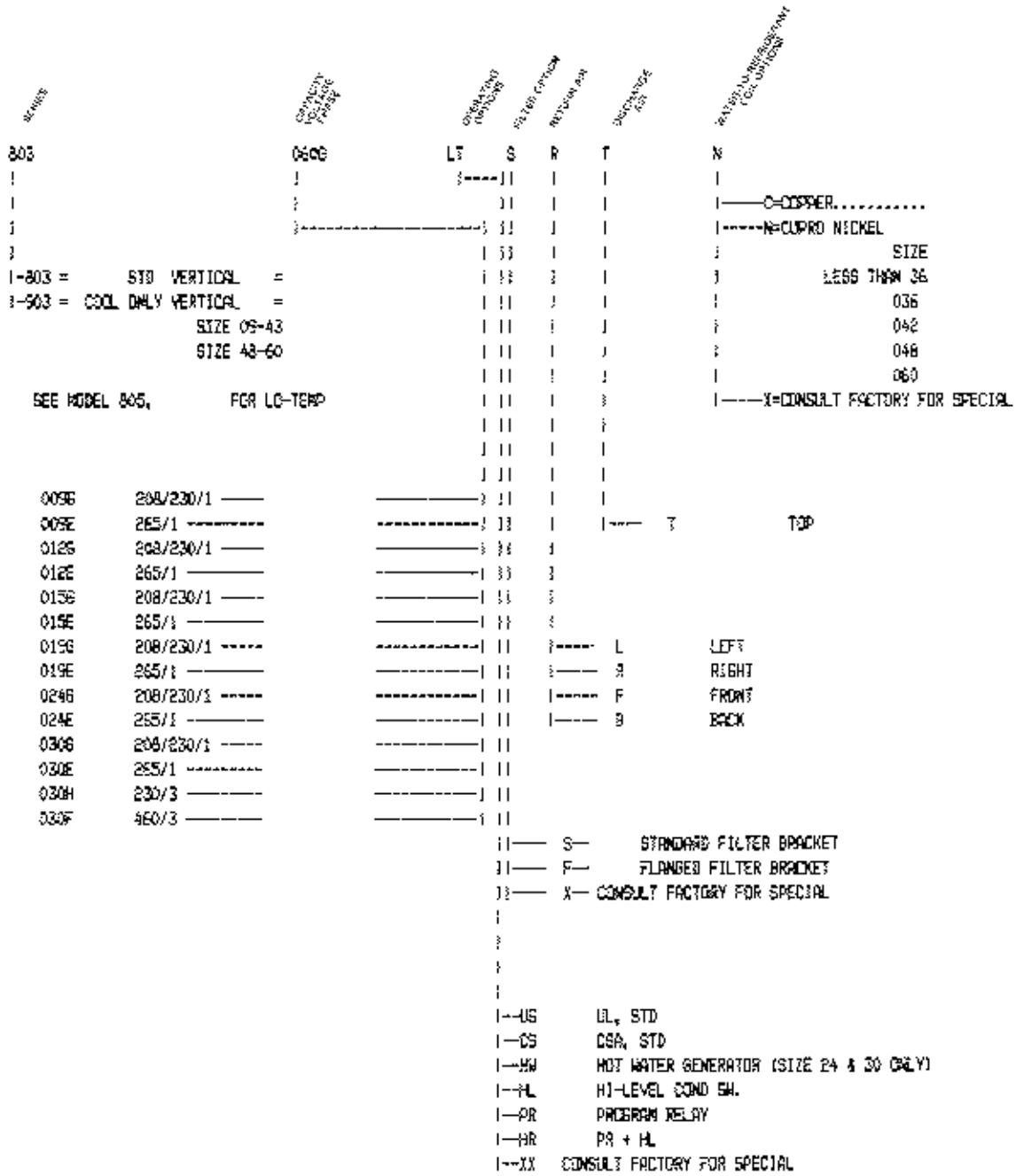
Unit Model Number Description

Climate Master products are identified by multiple-character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code used with 803 units is provided below. Its use will enable the owner/operator, installing contractor(s), and service engineer(s) to define the operation, components, and appropriate accessories for a particular unit.

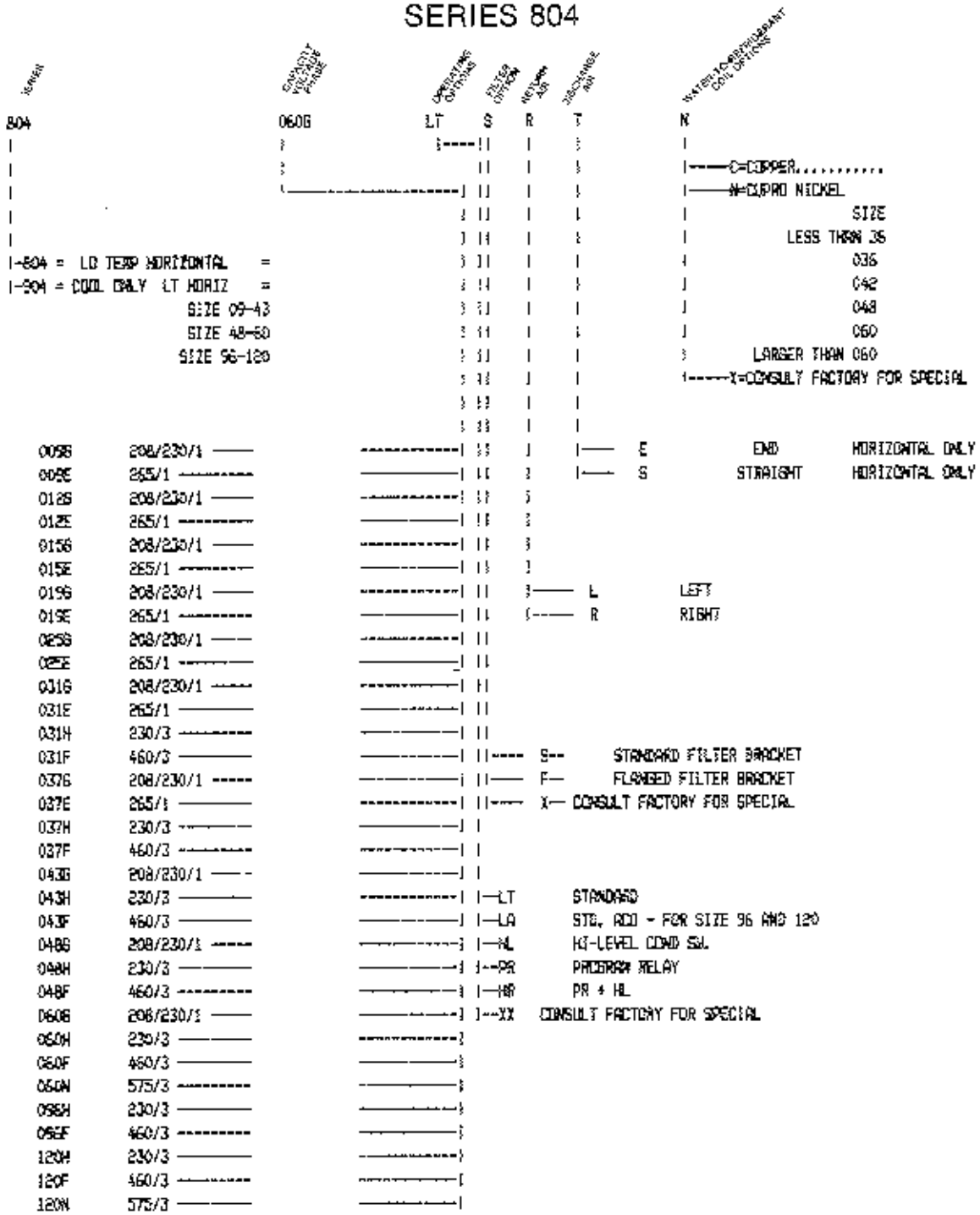
VERTICAL WATER-TO-AIR HEAT PUMPS
SERIES 803



Unit Model Number Description

Climate Master products are identified by multiple-character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code used with 804 units is provided below. Its use will enable the owner/operator, installing contractor(s), and service engineer(s) to define the operation, components, and appropriate accessories for a particular unit.

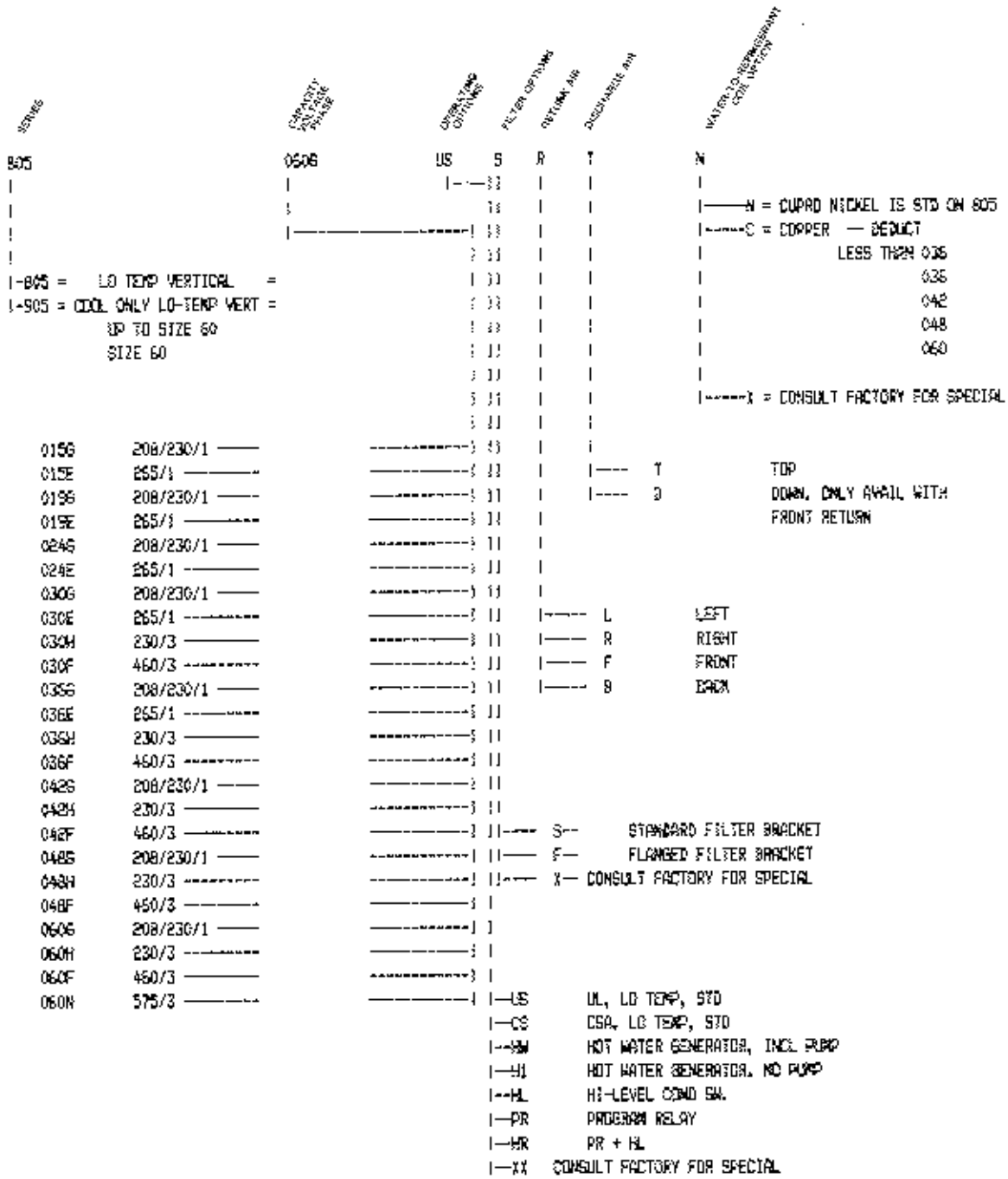
LO-TEMP
HORIZONTAL WATER-TO-AIR HEAT PUMPS
SERIES 804



Unit Model Number Description

Climate Master products are identified by multiple-character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code used with 805 units is provided below. Its use will enable the owner/operator, installing contractor(s), and service engineer(s) to define the operation, components, and appropriate accessories for a particular unit.

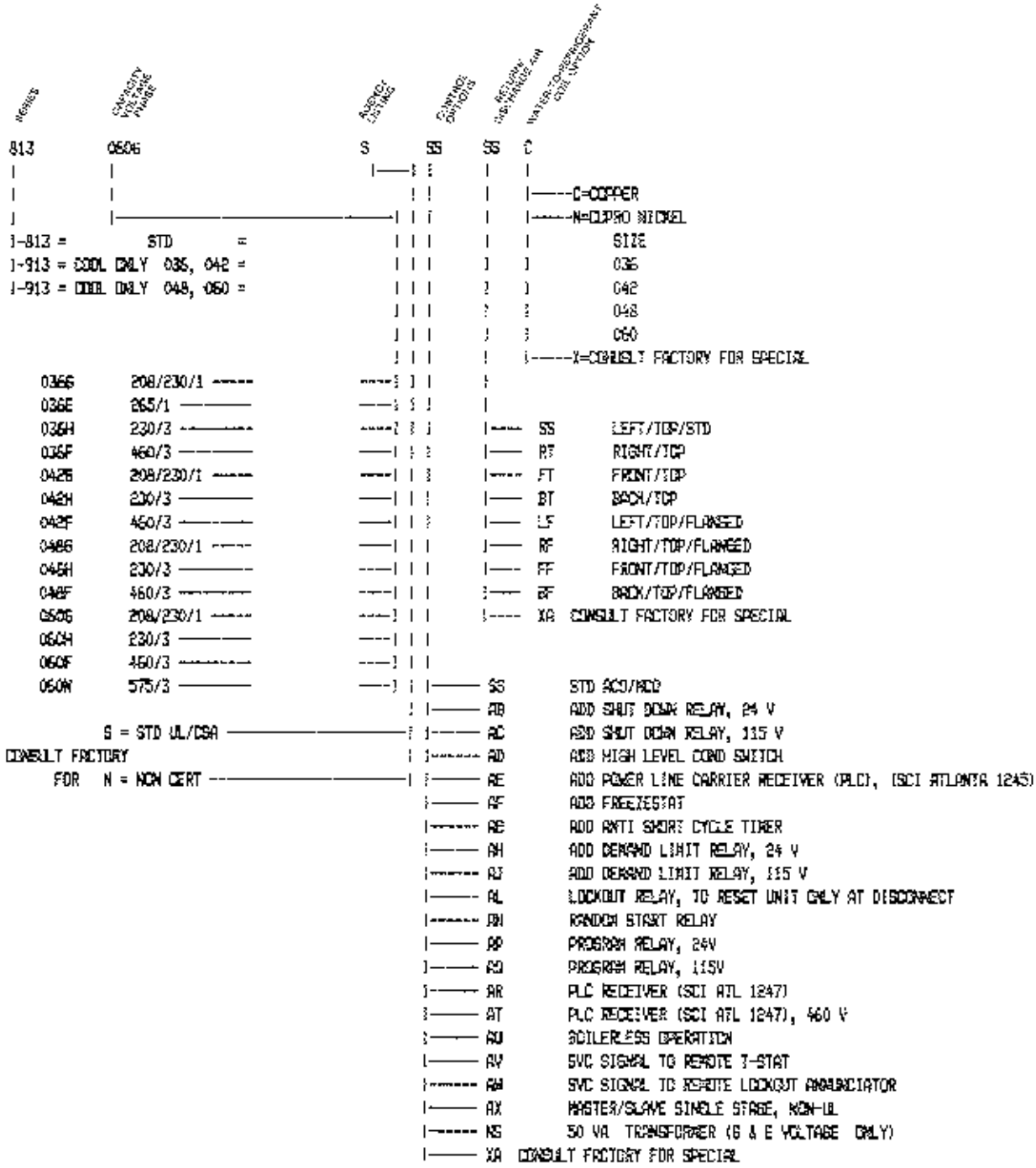
VERTICAL
GEO-THERMAL WATER-TO-AIR HEAT PUMPS
SERIES 805



Unit Model Number Description

Climate Master products are identified by multiple-character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code used with 813 units is provided below. Its use will enable the owner/operator, installing contractor(s), and service engineer(s) to define the operation, components, and appropriate accessories for a particular unit.

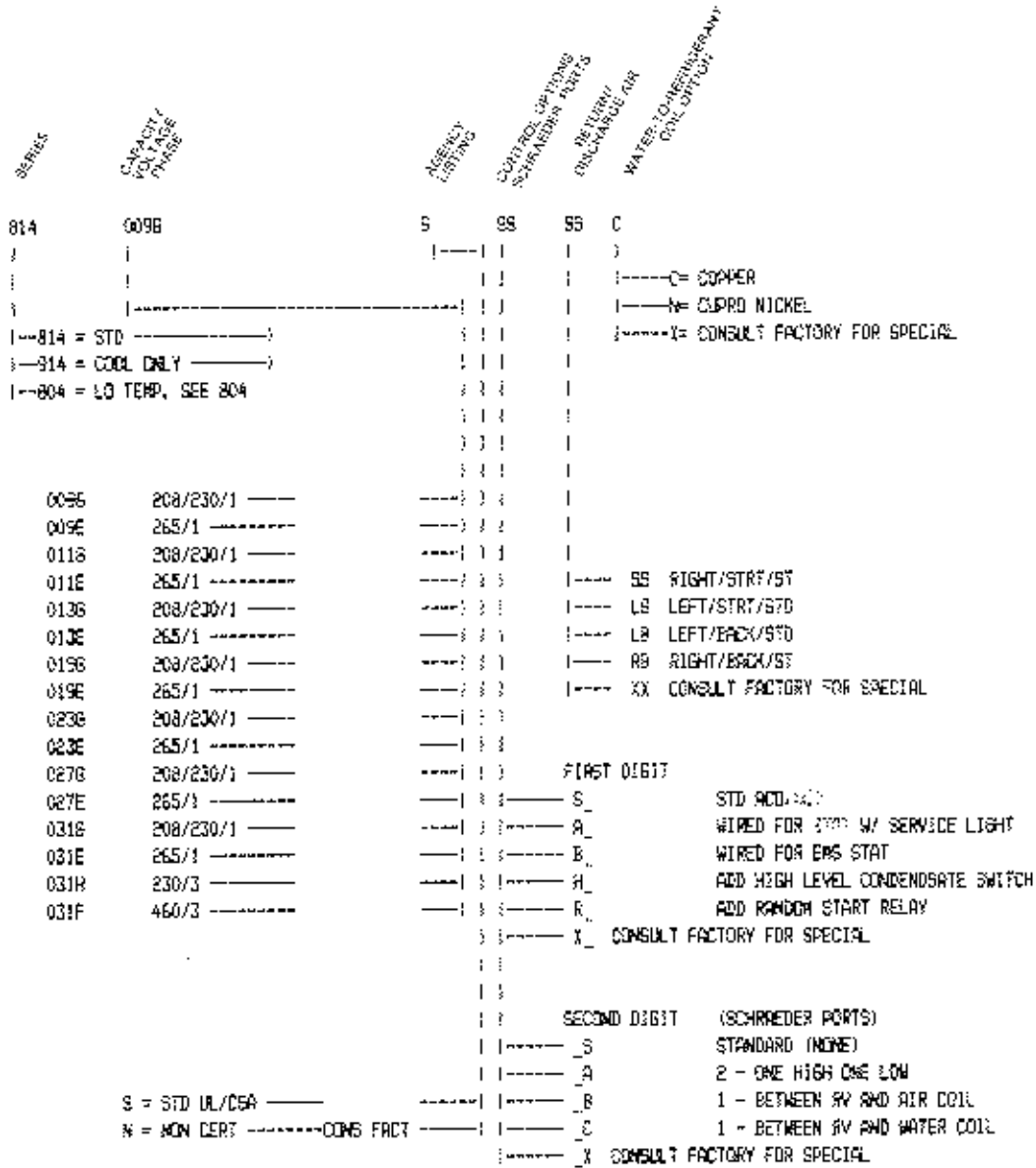
VERTICAL WATER-TO-AIR HEAT PUMPS
SERIES 813



Unit Model Number Description

Climate Master products are identified by multiple-character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code used with 814 units is provided below. Its use will enable the owner/operator, installing contractor(s), and service engineer(s) to define the operation, components, and appropriate accessories for a particular unit.

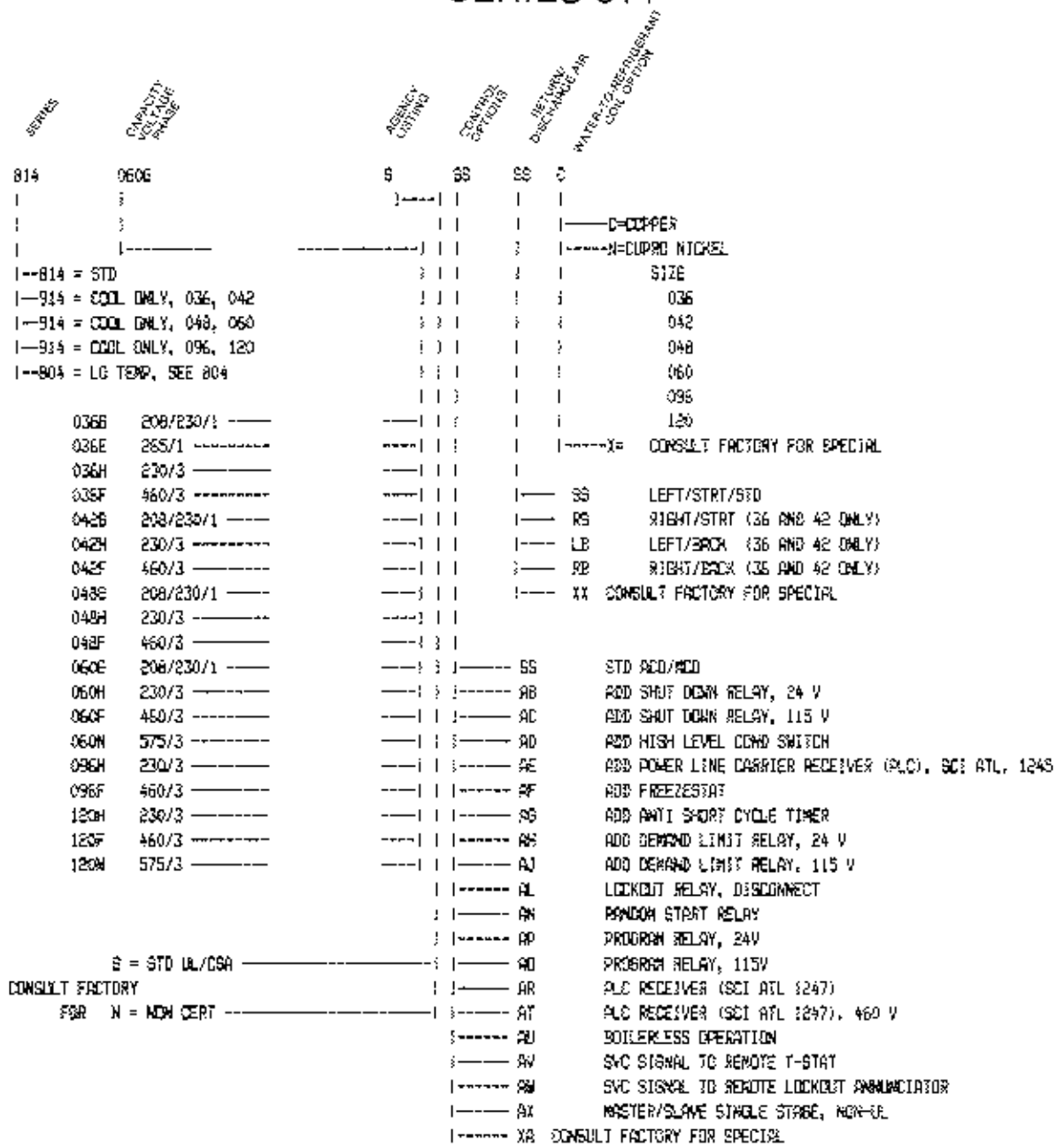
HORIZONTAL WATER-TO-AIR HEAT PUMPS
SERIES 814



Unit Model Number Description

Climate Master products are identified by multiple-character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code used with 814 units is provided below. Its use will enable the owner/operator, installing contractor(s), and service engineer(s) to define the operation, components, and appropriate accessories for a particular unit.

HORIZONTAL WATER-TO-AIR HEAT PUMPS
SERIES 814



General Information

Climate Master Horizontal and Vertical Heat Pump units are decentralized room terminals designed for field connection to a simple, closed-circuit piping loop within the building.

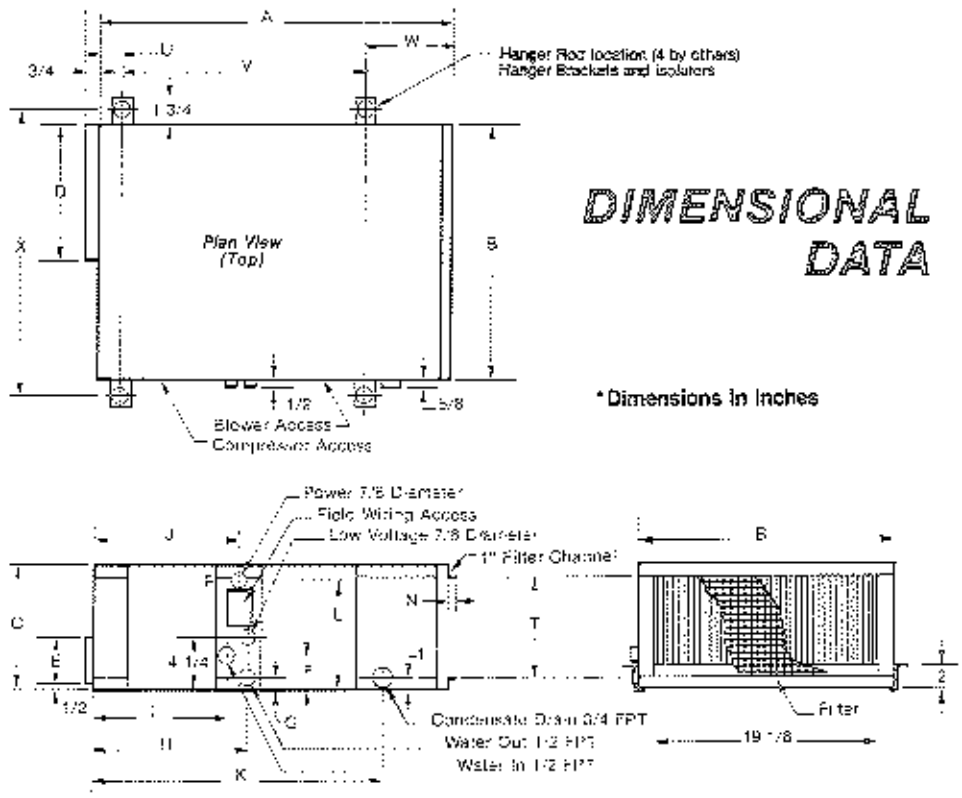
Horizontal units--which range from 9,000 to 120,000 Btuh in size--are designed for overhead installation, but can be installed on any level surface strong enough to support their weight. Typically, these units are suspended within a hung ceiling or overhead plenum, and are connected to one or more discharge registers with acoustically-lined ductwork.

Ranging from 9,000 to 120,000 Btuh in size, Vertical units are designed for installation in a floor-level closet or small mechanical room. Acoustically-lined ductwork is typically used to connect the unit to a series of discharge registers or light fixture air troffers.

CAUTION: Do NOT apply units in locations subject to temperature extremes (e.g., attics, garages, rooftops, etc.). The temperature, humidity and/or corrosive conditions which are often present under these circumstances can greatly inhibit performance, reliability, and service life.

Unit dimensions are provided in Figures 1 through 16; electrical data is included in the "Installation" section of this manual. General information about these units--including filter size, refrigerant charge, etc.--is provided in Tables 1A,1B, 2, 3 and 4.

HORIZONTAL SIZE 009/011/013



DIMENSIONAL DATA

*Dimensions in Inches

Figure 1

SIZE	A	B	C	D	E	F	G	H	I	J
009,011,013	31½	2_	10 ⅞	12	4 ⅞	2 ⅝	⅞	13 13/16	12 ⅞	13 ⅛
019,023,027,031	41	25	16	12½	9¾	4	7½	1	—	19
SIZE	K	L	N	P	T	U	V	W	X	Y
009,011,013	26¼	9 ⅞	½	⅞	9 ⅛	1¾	22 13/16	7 11/16	24	—
019,023,027,031	7	7½	⅝	⅞	14	1⅝	31¾	7⅛	27	¾

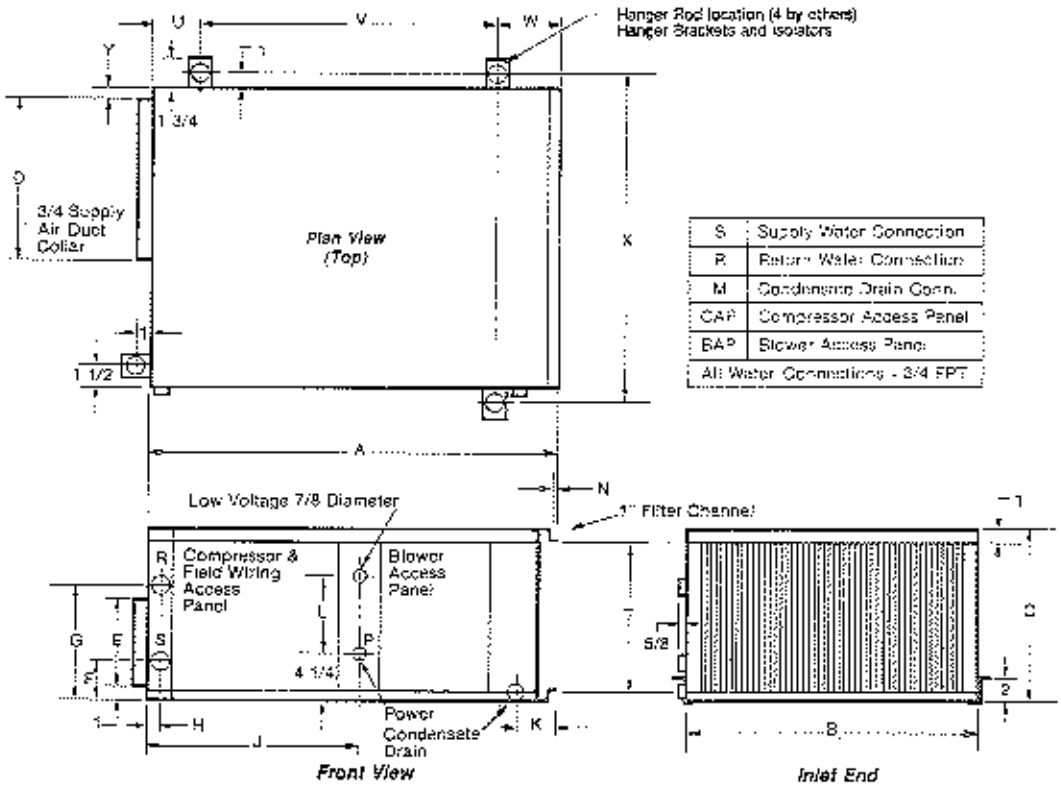
Revised 11/86

*Dimensions in Inches

HORIZONTAL

SIZE 019/023/027/031

DIMENSIONAL DATA



SIZE	A	B	C	D	E	F	G	H	I	J
009,011,013	31½	22	10 7/8	12	4 3/8	2 5/8	7/8	13 13/16	12 7/16	13 1/8
019,023,027,031	41	25	16	12½	9¾	4	7½	1	—	19

SIZE	K	L	N	P	T	U	V	W	X	Y
009,011,013	26¼	9 5/8	½	7/8	9 1/8	1¾	22 23/64	7 11/64	24	—
019,023,027,031	7	7½	9/16	7/8	14	1⅜	31½	7½	27	¾

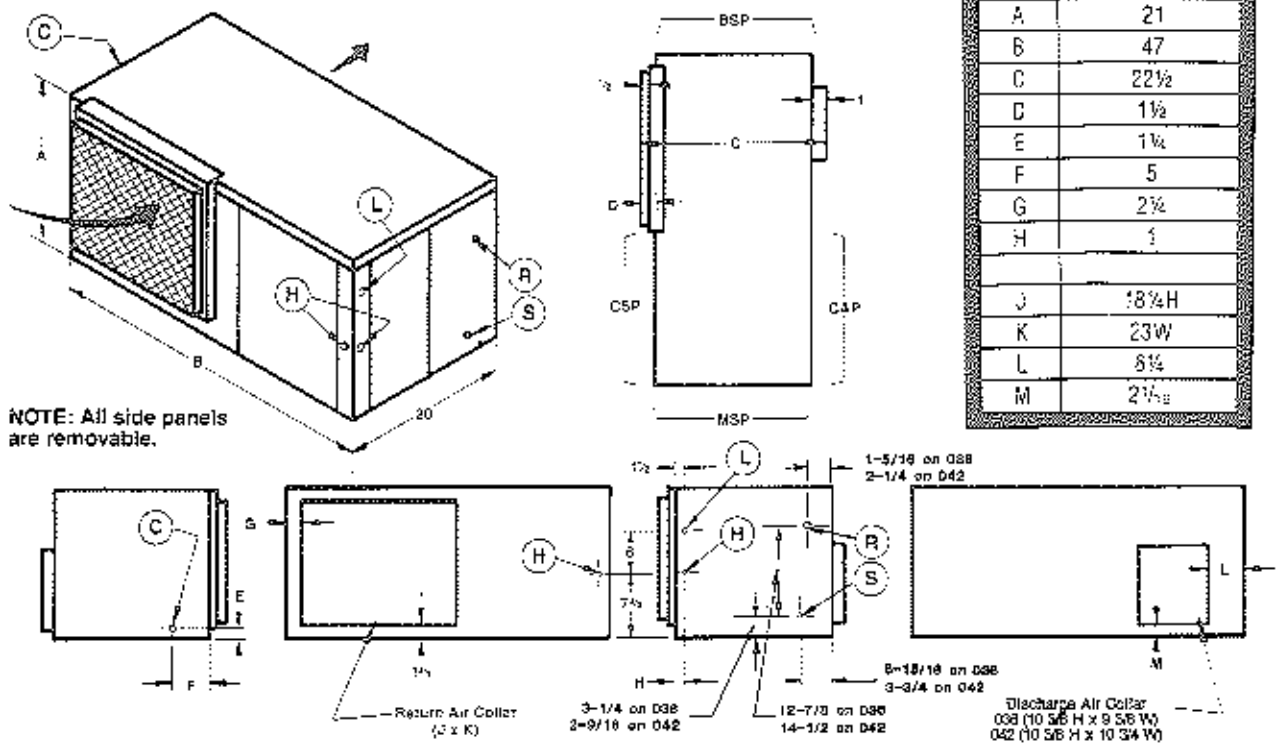
Revised 11/86

*Dimensions in Inches

Figure 2

HORIZONTAL
SIZE 036/042

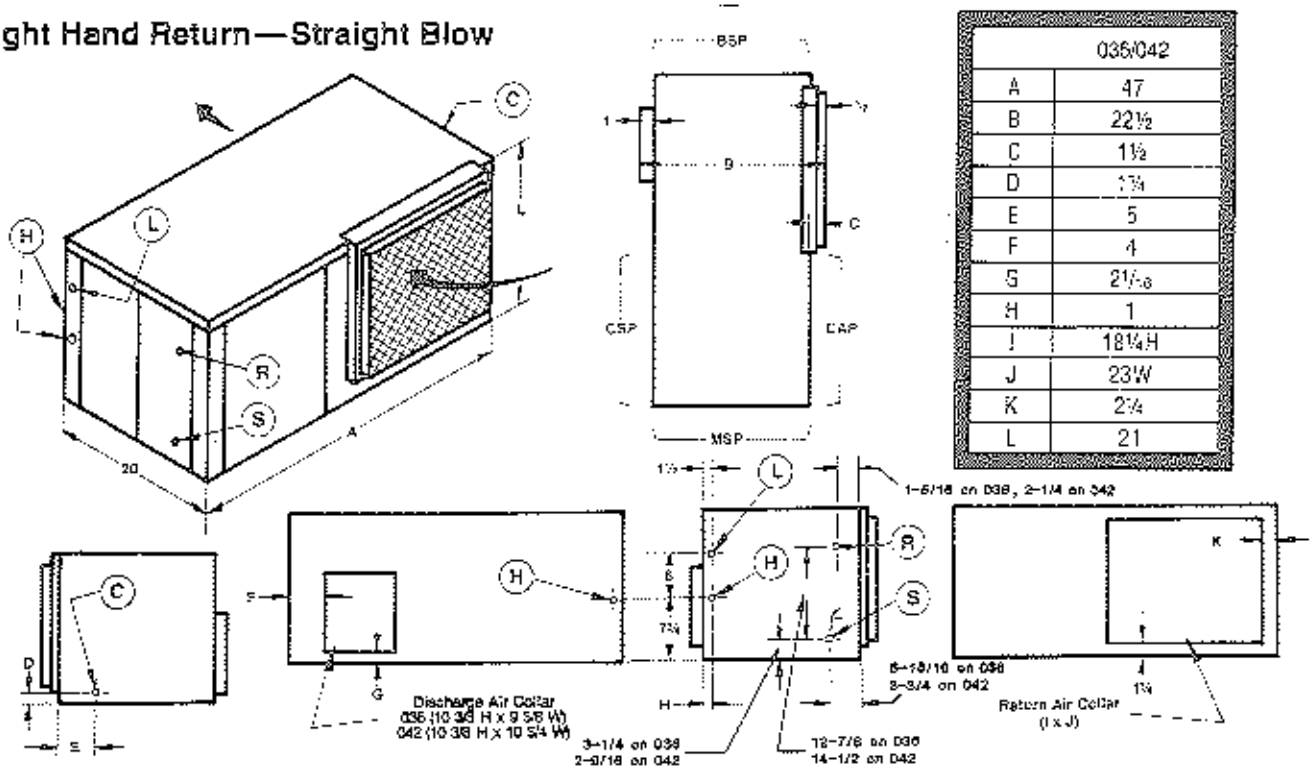
Left Hand Return—Straight Blow



NOTE: All side panels are removable.

	038/042
A	21
B	47
C	22½
D	1½
E	1¼
F	5
G	2¼
H	1
J	18¼H
K	23W
L	6¼
M	2⅛

Right Hand Return—Straight Blow



	038/042
A	47
B	22½
C	1½
D	1¾
E	5
F	4
G	2⅛
H	1
I	18¼H
J	23W
K	2¼
L	21

NOTE: All side panels are removable.

*Dimensions in Inches

Service Access

MSP—Main Service Panel—High & Low Voltage Connection. Controls. Service Trouble Shooting. Compressor/Condenser Replacement.

BSP—Blower Service Panel—Access to Blower Assembly; Condensate Pan & Air Coil Inspection.

CSP—Compressor Service Panel—Facilitates Compressor Replacement.

CAP—Condenser Access Panel—Facilitates Condenser Coil Replacement.

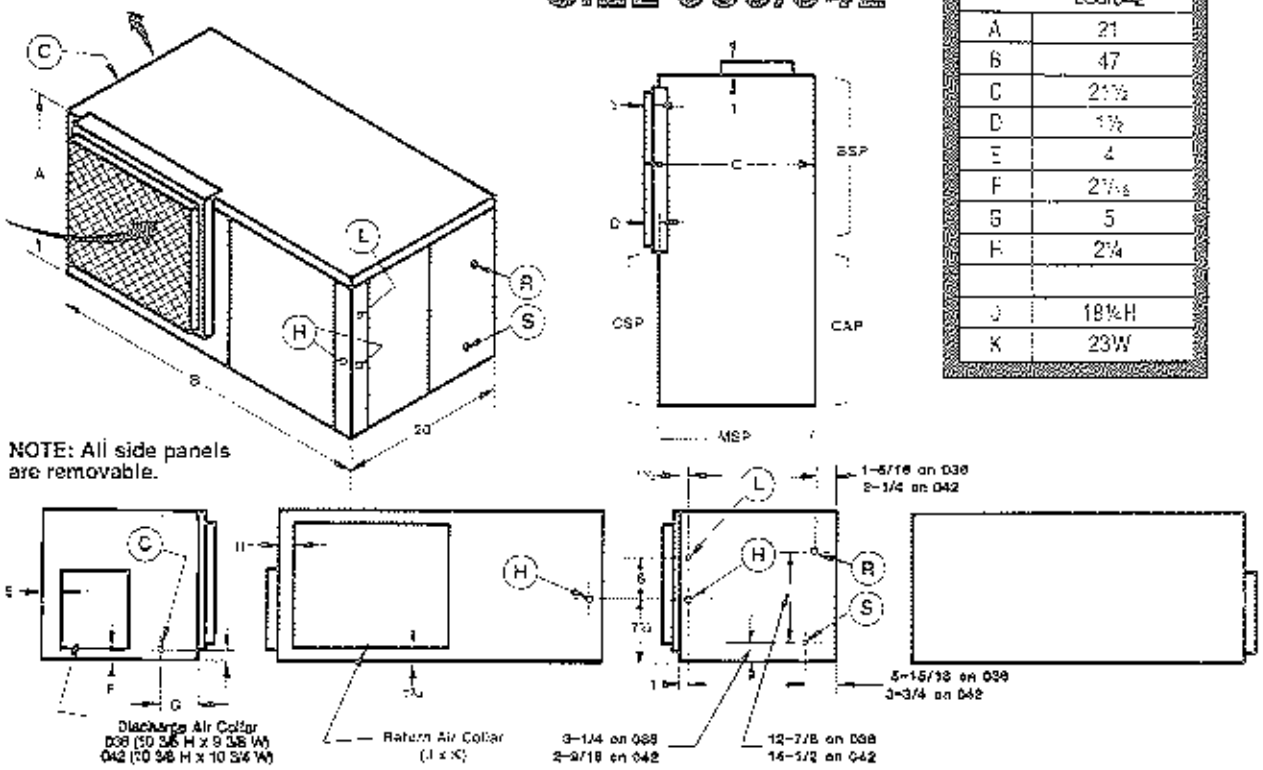
Figure 3

HORIZONTAL

Left Hand Return—End Blow

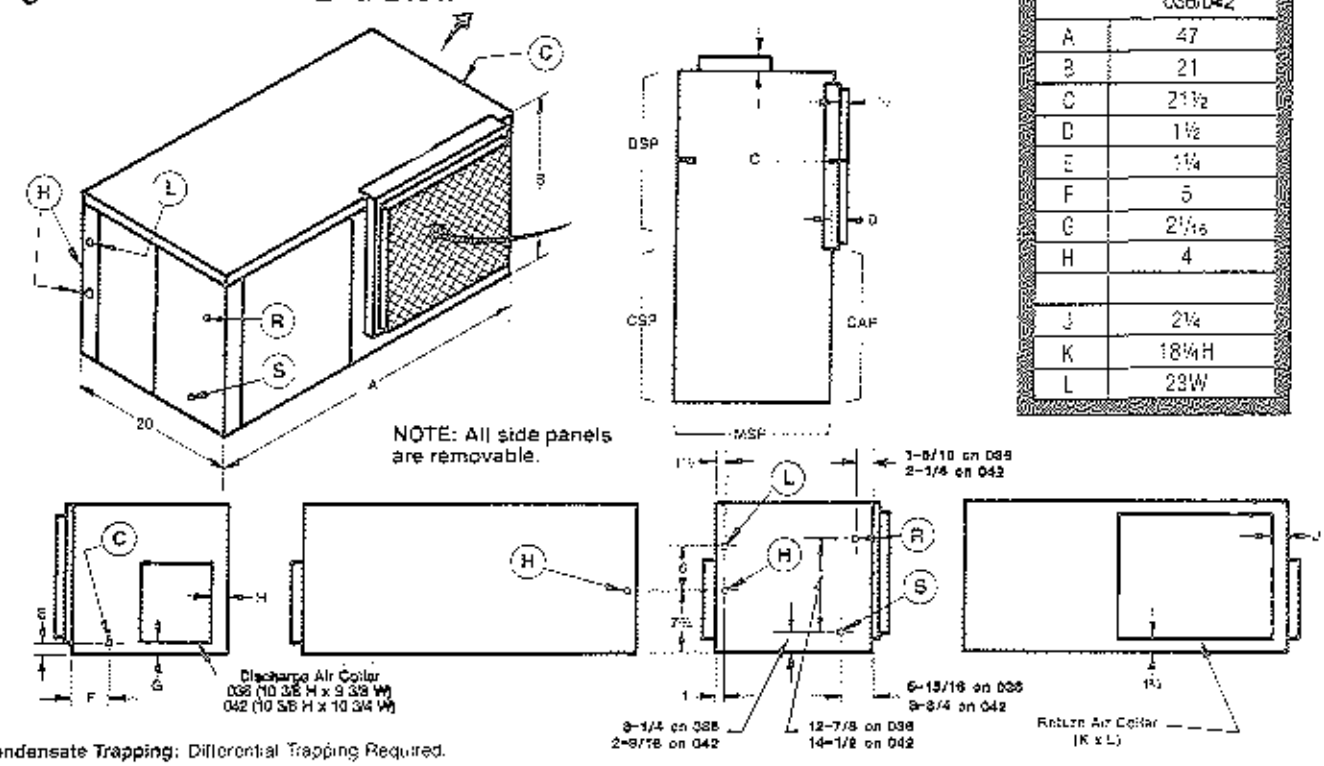
SIZE 036/042

	036/042
A	21
B	47
C	21½
D	1½
E	4
F	2⅛
G	5
H	2¼
J	18¼H
K	23W



Right Hand Return—End Blow

	036/042
A	47
B	21
C	21½
D	1½
E	1¼
F	5
G	2⅛
H	4
J	2¼
K	18¼H
L	23W



Condensate Trapping: Differential Trapping Required.

Filter Size: 036 and 042 Models: 20 x 25 x 1 (1 Req.)

Filter Access: Left or Right Side

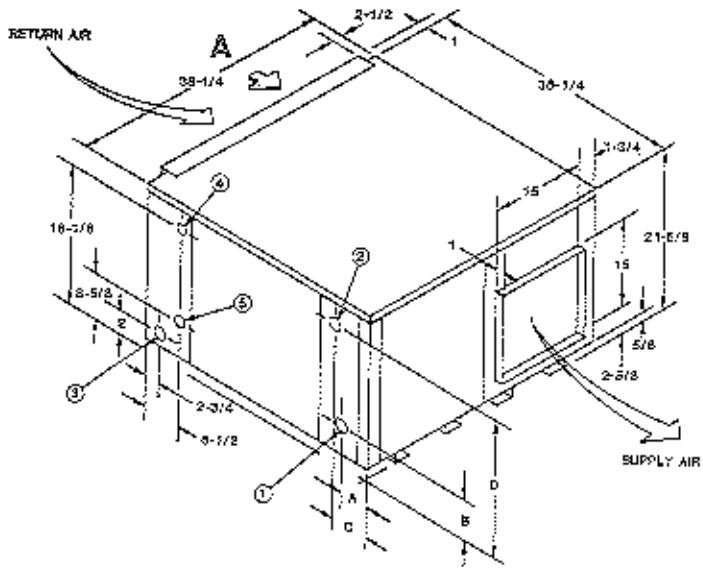
Ⓢ Ⓡ —¾ FPT—Supply & Return Water Connections
Ⓒ —¾ FPT—Condensate Connection
Ⓗ —Hi Voltage—1⅛—⅞—Combination Knockout (Optional Location On Side)
Ⓛ —Lo Voltage—⅞ Dia.

*Dimensions in Inches

Figure 4

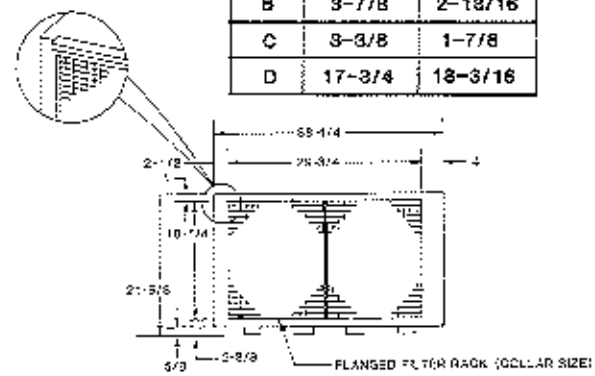
HORIZONTAL

SIZE 048/060



LEGEND	048	060
1. WATER INLET	1 F.P.T.	1 F.P.T.
2. WATER OUTLET	1 F.P.T.	1 F.P.T.
3. CONDENSATE DRAIN	3/4 F.P.T.	3/4 F.P.T.
4. LOW VOLTAGE ACCESS	1/2 DIA.	1/2 DIA.
5. HIGH VOLTAGE ACCESS	7/8 DIA.	7/8 DIA.

DIM	048	060
A	4-7/8	5-1/8
B	3-7/8	2-13/16
C	3-3/8	1-7/8
D	17-3/4	18-3/16



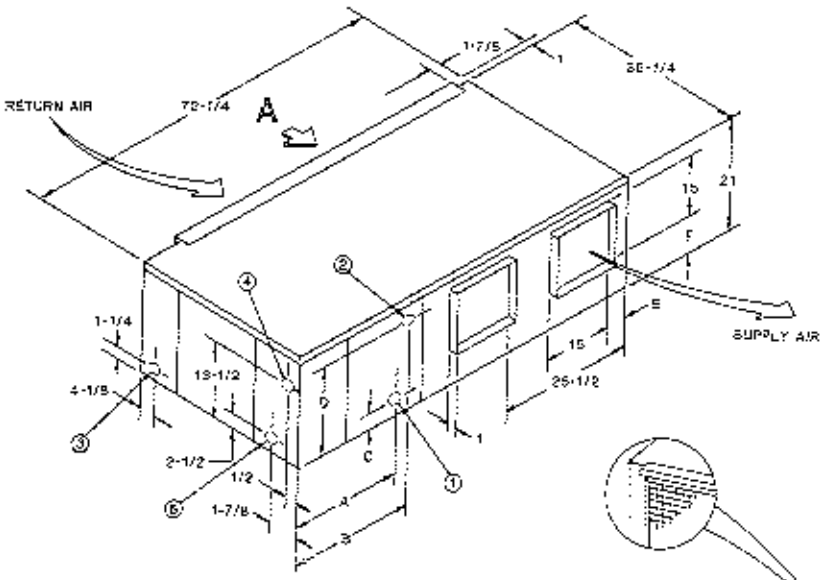
NOTE: ENDS OF DUCT COLLAR ARE OPEN FOR FILTER REMOVAL
FILTER SIZE - 16 x 20 x 1 - 10 RECD.

VIEW AT "A"

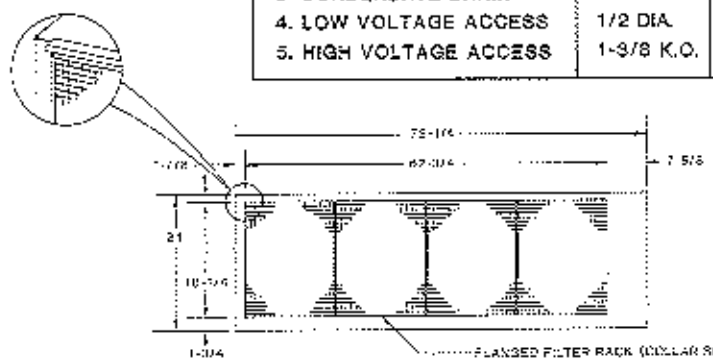
Figure 5

SIZE 096/120

DIM	096	120
A	18-1/4	14-3/4
B	18-1/4	21-3/4
C	3-1/4	3-3/8
D	14-3/8	17-5/8
E	3-1/4	2-5/8
F	3-1/4	4-1/4



LEGEND	096	120
1. WATER INLET	1 F.P.T.	1-1/4 F.P.T.
2. WATER OUTLET	1 F.P.T.	1-1/4 F.P.T.
3 CONDENSATE DRAIN	3/4 F.P.T.	3/4 F.P.T.
4. LOW VOLTAGE ACCESS	1/2 DIA.	1/2 DIA.
5. HIGH VOLTAGE ACCESS	1-3/8 K.O.	1-3/8 K.O.



NOTE: ENDS OF DUCT COLLAR ARE OPEN FOR FILTER REMOVAL
FILTER SIZE - 16 x 20 x 1 - 14 RECD.

VIEW AT "A"

*Dimensions in Inches

Figure 6

Table 1A
General Horizontal Unit Data

Physical Characteristic	009	011	013	019	023	027	031
Blower:							
Motor Horsepower	1/12	1/12	1/10	1/8	1/5	1/5	1/3
Wheel Size (D"xW") In.		6 3/4x6 1/2		7 5/8x7		9x7	
Filter Size	10x22	10x22	10x22	16x25	16x25	16x25	16x25
Unit Weight (Lbs.):							
Shipping	130	135	140	205	220	235	245
Operating	120	125	130	175	195	205	215
Ref.-to-Air Heat Exchanger:							
Face Area (Sq. Ft.)	1.33	1.33	1.33	2.26	2.26	2.26	2.26
No. of Rows Deep	3	3	3	3	4	4	4
Copper Tube Size (OD In.)	3/8	3/8	3/8	3/8	3/8	3/8	3/8
No. of Fins/Inch	12	12	12	12	12	12	12
Refrig. Charge (R-22)/CKT.	17	16	18	27	34	32	38

Table 1B
General Horizontal Unit Data

Physical Characteristic	036	042	048	060	096	120
Blower:						
Motor Horsepower	1/2	1/2	3/4	1	1 1/2	2
Wheel Size (D" x W")In.	9x7	9x8	10x10	12x10	(2)10x10	(2)12x10
Filter Size	20x25	20x25	(2)16x20	(2)16x20	(4)16x20	(4)16x20
Unit Weight (Lbs.):						
Shipping	235	240	300	357	665	675
Operating	225	230	290	347	645	655
Ref.-to-Air Heat Exchanger:						
Face Area (Sq. Ft.)	1.7	2.6	4.0	4.0	8.33	8.33
No. of Rows Deep	2	3	2	3	2	3
Copper Tube Size (OD In.)	3/8	3/8	3/8	3/8	3/8	3/8
No. of Fins/Inch	14	12	14	14	14	14
Refrig. Charge (R-22)/CKT.	34	46	48	91	48	91

HORIZONTAL
BLOWER PERFORMANCE CHART

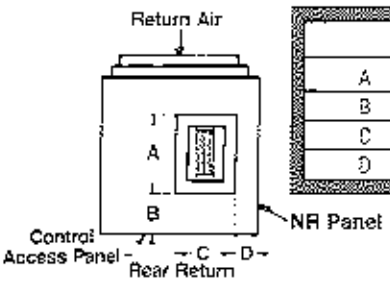
TABLE 2

With wet coil and clean filter

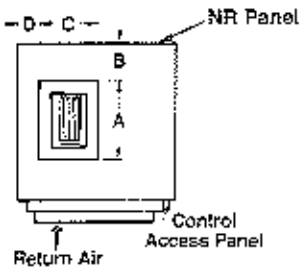
Size	Fan Speed	CFM at External Static Pressure I.W.G.									Minimum CFM
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	
003	High	420	340	290							290
	Low	380	305	—							
011	High	420	340	290							290
	Low	380	305	—							
013	High	475	455	425							395
	Low	415	395	—							
019	High	780	750	710	660						640
	Low	700	650	640	—						
023	High	920	880	750							660
	Low	800	740	660							
027	High	990	930	870	820						770
	Low	870	820	770	—						
031	High	1140	1080	980							990
	Low	1100	1010	930							
036	High	1500	1420	1340	1250	1170	1080				1000
	Medium	1360	1310	1250	1190	1110	1000				
	Low	1290	1240	1190	1120	1030	—				
042	High	1620	1545	1465	1375	1275					1190
	Medium	1475	1415	1340	1270	1190					
	Low	1385	1335	1275	1205	—					
048	High	2130	2050	1960	1860	1750	1630				1400
	Medium	1960	1900	1810	1720	1620	1520				
	Low	1810	1730	1650	1570	1490	1400				
060	High	2200	2140	2080	2010	1940	1860	—			1700
	Medium	2110	2050	2000	1940	1870	1800	—			
	Low	2060	2000	1940	1880	1820	1760	1700			
096	Closed	—	—	4200	4040	3880	3700	3500	3270	3040	2800
	1 Turn	—	4150	4000	3840	3650	3450	3220	2980	—	
	2 Turns	4100	3960	3800	3600	3400	3200	2940	—	—	
	3 Turns	3940	3770	3580	3380	3140	2890	—	—	—	
	4 Turns	3760	3590	3370	3090	2800	—	—	—	—	
	5 Turns	3540	3340	3090	2800	—	—	—	—	—	
120	Closed	—	—	—	—	4400	4230	4035	3850	3660	3400
	1 Turn	—	—	—	4360	4160	3990	3830	3660	—	
	2 Turns	—	—	4240	4060	3900	3740	3590	—	—	
	3 Turns	—	4190	4010	3860	3710	3560	3400	—	—	
	4 Turns	4150	3980	3820	3670	3520	—	—	—	—	
	5 Turns	3920	3770	3610	3400	—	—	—	—	—	

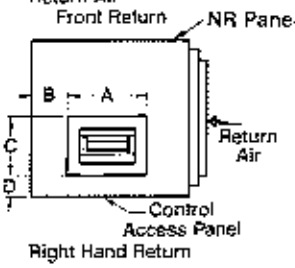
VERTICAL

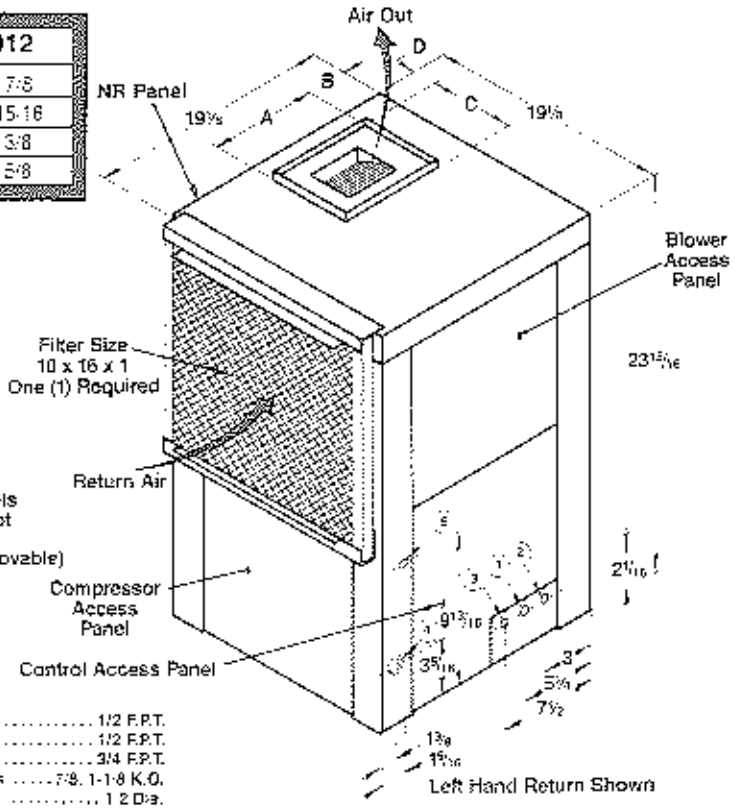
SIZE 009/012



	009	012
A	9 7/8	8 7/8
B	3 13/16	3 15/16
C	7	7 3/8
D	1 13/16	1 5/8







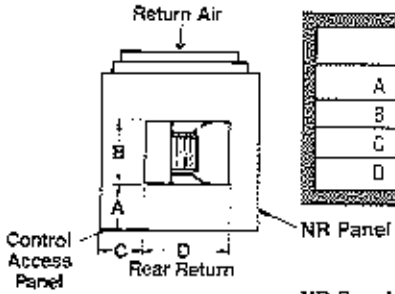
NOTE: All side panels are removable except those identified by NR panel (Non-Removable)

Return Air Duct Size
9" H x 15 1/8" W

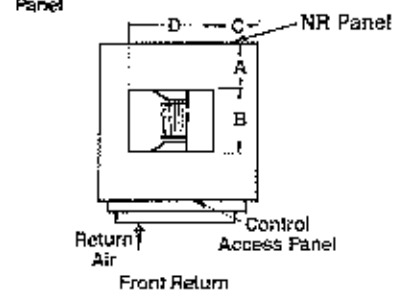
Legend:
1. Water Inlet ..... 1/2 F.P.T.
2. Water Outlet ..... 1/2 F.P.T.
3. Condensate Drain ..... 3/4 F.P.T.
4. High Voltage Access ..... 7/8, 1-1/8 K.O.
5. Low Voltage Access ..... 1 2 Dia.

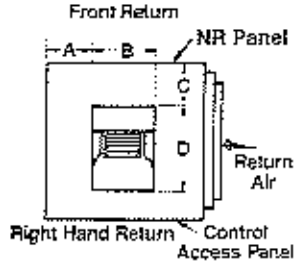
Figure 7

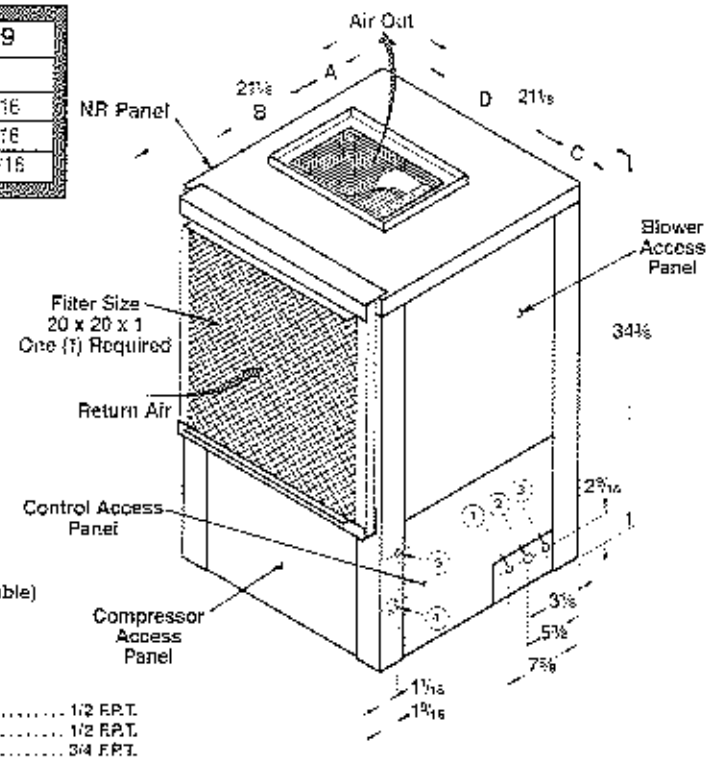
SIZE 015/019



	015	019
A	5 1 2	6
B	7 5/8	9 1/16
C	9 1/4	5 9/16
D	10 1/8	12 9/16







NOTE: All side panels are removable except those identified by NR panel (Non-Removable)

Return Air Duct Size
18 3/4" H x 18 1/8" W

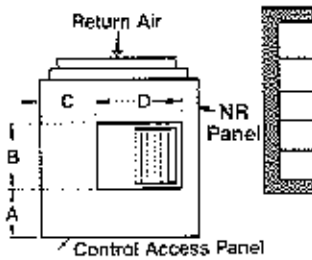
Legend:
1. Water Inlet ..... 1/2 F.P.T.
2. Water Outlet ..... 1/2 F.P.T.
3. Condensate Drain ..... 3/4 F.P.T.
4. High Voltage Access ..... 7/8, 1-1/8 K.O.
5. Low Voltage Access ..... 1/2 Dia.

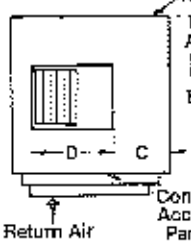
Figure 8

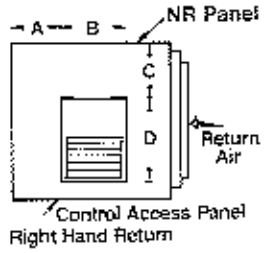
*Dimensions in Inches

VERTICAL

SIZE 024/030







	024	030
A	5 3/4	6 1/4
B	11 11/16	10 1/2
C	7 7/16	8 7/16
D	12 11/16	13 1/2

NOTE: All side panels are removable except those identified by NR panel (Non-Removable)

Return Air Duct Size
18 3/4" H x 18 1/8" W

Legend:
1. Water Inlet ..... 3/4 F.P.T.
2. Water Outlet ..... 3/4 F.P.T.
3. Condensate Drain ..... 3/4 F.P.T.
4. High Voltage Access ..... 7/8, 1-1/8 K.O.
5. Low Voltage Access ..... 1/2 Dia.

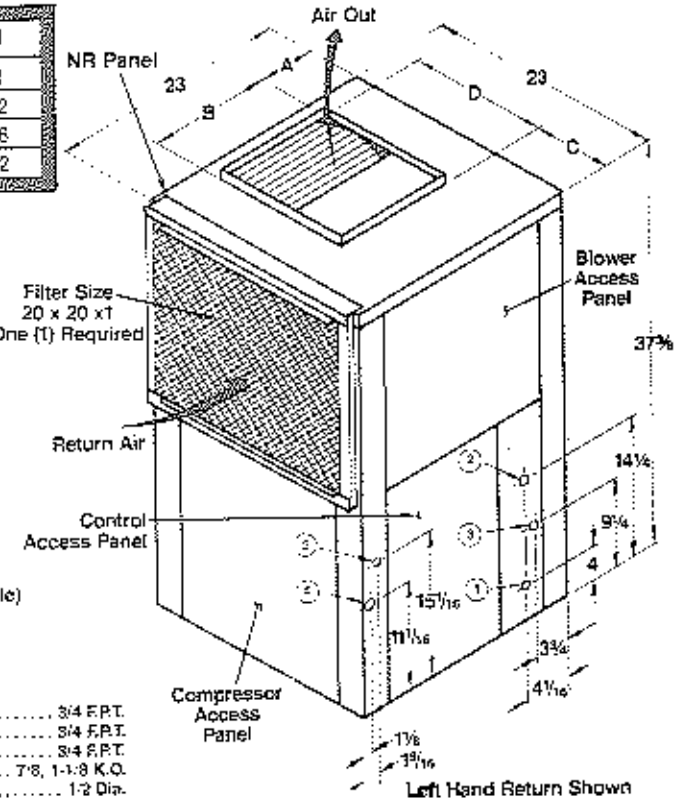
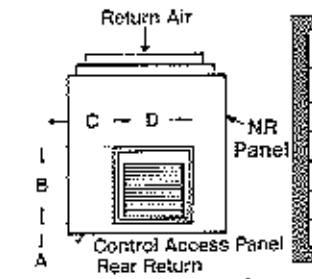
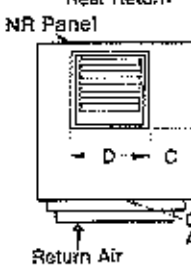
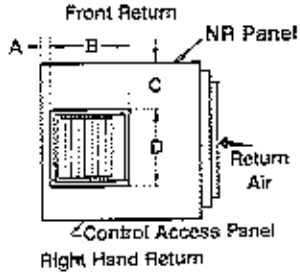


Figure 9

SIZE 036/042







	036	042
A	4 1/4	1 3/4
B	12 5/8	13 9/16
C	6 3/4	6
D	1' 5/8	12 13/16
E	13 1/4	14 1/2
F	5 3/8	5 1/2

NOTE: All side panels are removable except those identified by NR panel (Non-Removable)

Return Air Duct Size
23" H x 22" W

Legend:
1. Water Inlet ..... 3/4 F.P.T.
2. Water Outlet ..... 3/4 F.P.T.
3. Condensate Drain ..... 3/4 F.P.T.
4. High Voltage Access ..... 7/8, 1-1/8 K.O.
5. Low Voltage Access ..... 1/2 Dia.

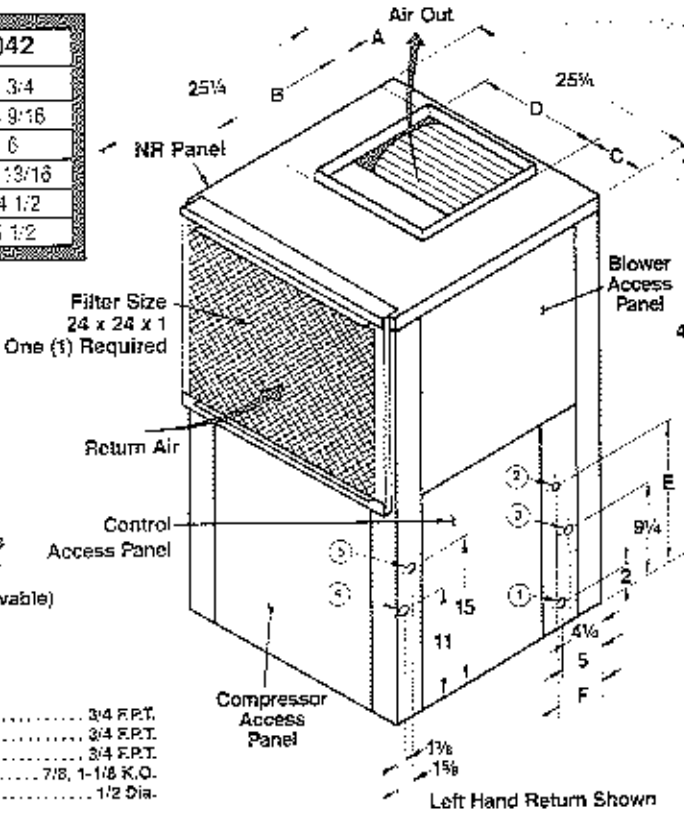
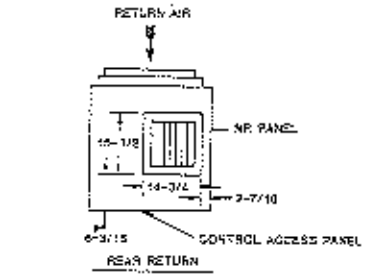


Figure 10

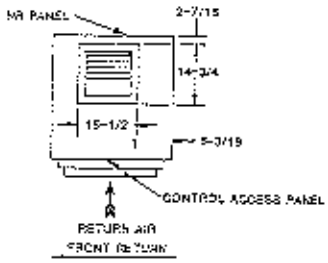
*Dimensions In Inches

VERTICAL

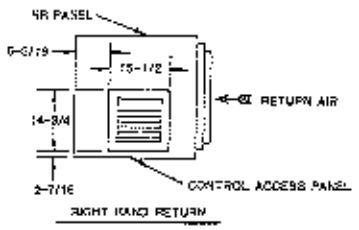
SIZE 048/060



	048	060
A	12-1/2	16-11/16
B	5-3/16	5-13/16
C	5-3/16	5-1/16
D	9-7/16	6-7/16



*Dimensions in inches



NOTE: ALL SIDE PANELS ARE REMOVABLE EXCEPT THOSE IDENTIFIED BY NR PANEL (NON-REMOVABLE)

LEGEND:
1. WATER INLET — — — — — — — 1 FPT
2. WATER OUTLET — — — — — — — 1 FPT
3. CONDENSATE DRAIN — — — — — 3/4 FPT
4. HIGH VOLTAGE ACCESS — 7/8, 1-1/8 KO
5. LOW VOLTAGE ACCESS — — — 7/8 DIA

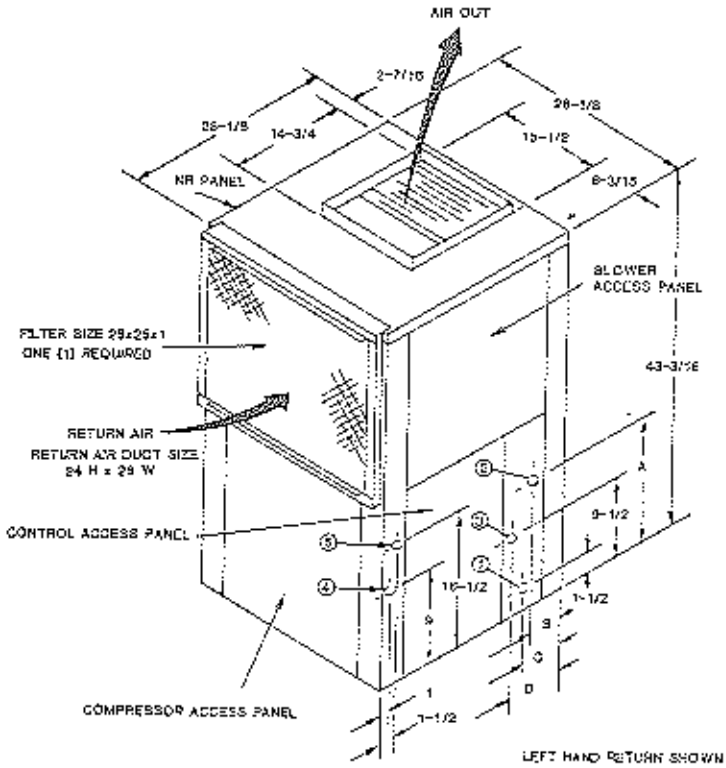


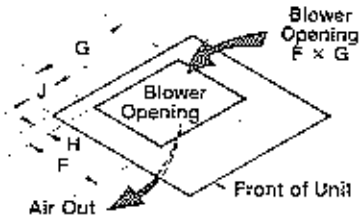
Figure 11

SIZE 024/030/036/042

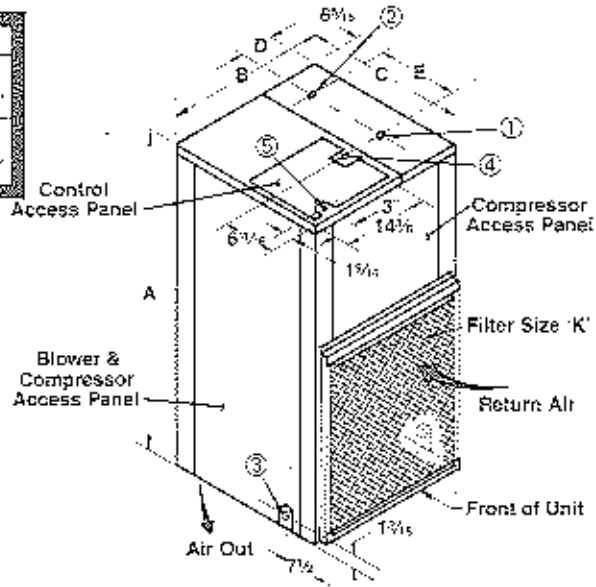
BOTTOM DISCHARGE (DOWN FLOW)

Size	A	B	C	D	E	F	G	H	J	K
024	38⅛	23⅛	23⅛	4⅝	7 1/16	9⅜	10⅜	2	9⅝	(1)
030						8⅜	11⅜	2¾	9⅝	20" × 20" × 1"
036	43¾	25⅝	25⅝	5⅛	9¼	10⅜	9⅜	2½	7⅞	(1)
042					10½	11⅜	10⅜	2½	7¼	24" × 24" × 1"

*Dimensions in inches



NOTE: ONE STYLE AVAILABLE ONLY—Rotate unit on job for left, right, front or back return.



NOTE: All side panels are removable.

Legend:
1. Water Inlet ..... 3/4" F.P.T.
2. Water Outlet ..... 3/4" F.P.T.
3. Condensate Drain ..... 3/4" F.P.T.
4. High Voltage Access ..... 7/8, 1-1/8" K.O.
5. Low Voltage Access ..... 1/2" Dia.

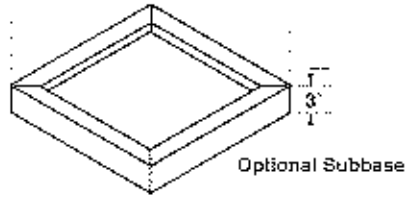


Figure 12

Table 3
General Vertical Unit Data

Physical Characteristic	009	012	015	019	024	030	036
Blower:							
Motor Horsepower	1/20	1/10	1/12	1/6	1/4	1/4	1/2
Wheel Size (D" x W") In.	5 1/2x5	6x4	6x5	9x4	9x7	10x6	9x7
Filter Size	10x16	10x16	20x20	20x20	20x20	20x20	24x24
Unit Weight (Lbs.):							
Shipping	118	123	150	173	210	225	248
Operating	108	113	140	163	200	215	238
Ref.-to-Air Heat Exchanger:							
Face Area (Sq. Ft.)	.97	.97	2.22	2.22	2.50	2.50	1.7
No. of Rows Deep	4	5	3	4	3	4	2
Copper Tube Size (OD In.)	5/16	5/16	5/16	5/16	3/8	3/8	3/8
No. of Fins/Inch	14	14	14	14	13	13	14
Refrig. Charge (R-22)/CKT	16	22	23.5	26	40	54	56

Table 3
General Vertical Unit Data

Physical Characteristic	042	048	060
Blower:			
Motor Horsepower	1/2	3/4	1
Wheel Size (D" x W")In.	9x8	10x10	12x10
Filter Size	24x24	28x25	28x25
Unit Weight (Lbs.):			
Shipping	278	312	339
Operating	268	302	329
Ref.-to-Air Heat Exchanger:			
Face Area (Sq. Ft.)	2.6	4.0	4.0
No. of Rows Deep	3	2	3
Copper Tube Size (OD In.)	3/8	3/8	3/8
No. of Fins/Inch	12	14	14
Refrig. Charge (R-22)/CKT	69	78	75

VERTICAL
BLOWER PERFORMANCE CHART

TABLE 4

With wet coil and clean filter

Size	Fan Speed	CFM at External Static Pressure I.W.G.														Minimum CFM
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	
009	High	356	332	306	254											240
	Medium	330	306	280	250											
	Low	300	280	260	240											
012	High	450	410	406	384	360										320
	Medium	430	412	392	372	350	325									
	Low	410	395	378	356	334	320									
015	High	560	545	528	507	486										460
	Medium	540	528	510	492	473										
	Low	516	507	493	478	460										
019	High	800	760	715	665	600										520
	Medium	700	675	635	600	550										
	Low	650	625	600	560	520										
024	High	1150	1070	970	895	780										620
	Medium	1020	945	860	775	730										
	Low	890	825	760	690	620										
030	High		1165	1100	1035	955	880									805
	Medium	1110	1055	990	930	865	805									
	Low	1020	965	910	850	—	—									
036	High	1500	1420	1340	1250	1170	1080									1000
	Medium	1360	1310	1250	1190	1110	1000									
	Low	1290	1240	1190	1120	1030	—									
042	High	1780	1700	1620	1540	1440	1340									1260
	Medium	1670	1610	1540	1460	1370	1260									
	Low	1540	1500	1450	1400	1330	—									
048	High	2130	2050	1960	1860	1750	1630									1400
	Medium	1980	1900	1810	1720	1620	1520									
	Low	1810	1730	1650	1570	1490	1400									
060	High	2200	2140	2080	2010	1940	1860	—								1700
	Medium	2110	2050	2000	1940	1870	1800	—								
	Low	2060	2000	1940	1880	1820	1760	1700								

CAUTION: Unit should not be operated at CFM below minimum specified above.

Initial Inspection

Be sure to inspect the carton or crating housing each Horizontal and Vertical unit as it is received at the job site and before signing the freight bill. Verify that all items have been received and that there is no visible damage; note any shortages or damage on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damage not discovered until after unloading must be reported to the carrier within 15 days of its receipt.

Unit wiring diagrams and installation/operation/maintenance instructions are provided with each unit. Before unit start-up, be sure to read these manuals to become familiar with the unit and its operation.

Notice that an installation checklist is provided at the end of this manual; it should be completed after all the installation procedures described have been accomplished. A periodic maintenance checklist is provided in the "Maintenance" section to outline recommended maintenance schedules. Do not substitute these checklists for the detailed information found in the appropriate sections of this manual.

In addition, a start-up/inspection log has also been included at the end of this manual to encourage thorough unit checkout at initial start-up.

Storage

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area of the building, or in a warehouse. Units must be stored in an upright position at all times. If carton stacking is necessary, stack units as follows: Horizontal units, maximum 4 high; Vertical units up to and including model 060, 3 high; Vertical units 080 to and including 120; 2 high. Do not remove any equipment from its shipping package until it is needed for installation.

Unit Protection

Once the Horizontal or Vertical units are properly positioned on the job site, they must be covered with either a shipping carton, vinyl film, or an equivalent protective covering; open ends of pipes stored on the job site must be capped. This precaution is especially important in areas where painting, plastering, or spraying of fireproof material and the like is not yet complete. Foreign material that is allowed to accumulate within the units can prevent proper start-up and necessitate costly clean-up operations.

Before installing any of the system components, be sure to examine each pipe, fitting, and valve; remove any dirt found on these components.

Do NOT use these units as a source of heat during construction of the building since the units' filters will quickly fill with construction dirt and debris. (Operating a unit with a clogged filter impairs or prevents unit operation, and–as stated earlier–necessitates costly unit clean-up.) It is strongly recommended that an alternative means of providing temporary heat be used.

Preinstallation

To prepare a Horizontal or Vertical unit for installation, be sure to complete the inspections and instructions listed below:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Do **not** remove the cardboard carton until the unit is ready for installation.
3. Verify that the refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
4. Inspect all electrical connections; connections should be clean and tight at the terminals.

The compressors of all Horizontal and Vertical units are internally spring-mounted. Those equipped with external spring Vibration Isolators must have bolts loosened and shipping clamps removed.

Installation

Location and Access

Horizontal Units

Because Horizontal units are designed for installation above a false ceiling or ceiling plenum, access becomes an extremely important consideration. Be sure that the site chosen for unit installation provides enough clearance to allow easy maintenance or servicing of the unit without necessitating its removal from the ceiling.

A number of guidelines to consider when installing a Horizontal unit are listed below; refer to Figure 17 for an illustration of a typical Horizontal installation.

1. Provide a hinged access door (in concealed-spline or plaster ceilings), or removable tiles (in T-bar or lay-in ceilings).

   The access opening must be large enough to accommodate the service technician as he services the unit (including compressor removal and replacement), and to permit removal of the unit. Refer to Table 5 for overall dimensions of the unit; or see Figures 1 thru 6 for more complete dimensional information.

2. Provide easy access to hanger brackets, water valves and fittings, and screwdriver clearance to access panels, the discharge collar, and all electrical connections.

3. If a return duct is used, be sure to provide a duct slot for filter replacement.

4. To allow removal of the unit do **not** run obstructions (e.g., piping, electrical cable, etc.) under the unit.
5. Minimize obstructions in the conditioned space beneath the unit whenever possible. A manual, portable jack can then be used to lift and support the weight of the unit during installation or servicing. See Figure 18.

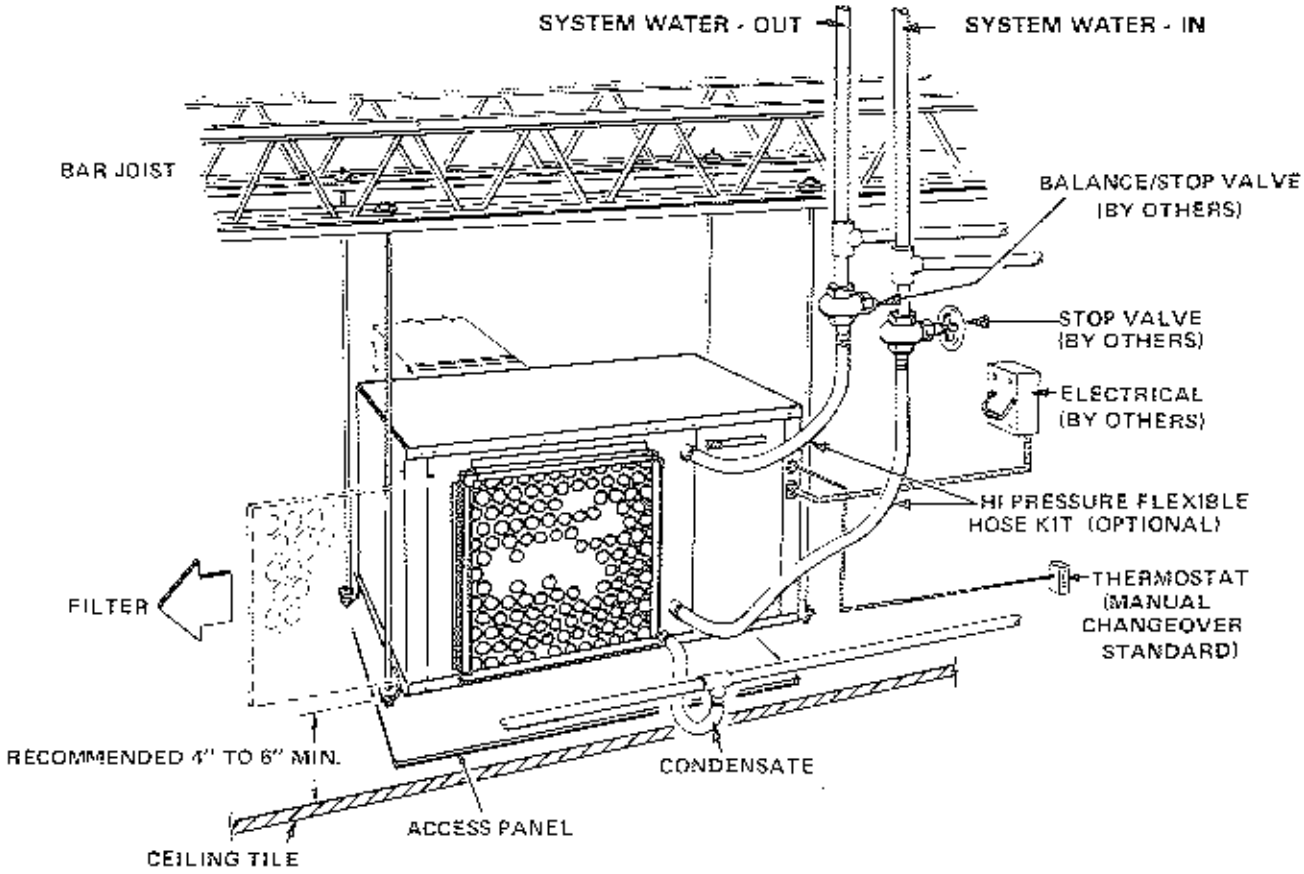
Table 5
Horizontal Unit Dimensions

Unit Size	Dimensions (L x W x H)
009 011 013	31 1/2" x 22" x 10 7/8"
019, 023 027, 031	41" x 25" x 16"
036 042	20" x 47" x 21"
048 060	36 1/4" x 36 1/4" x 21 5/8"
096, 120	72 1/4" x 36 1/4" x 21

*Dimensions in Inches

1. Dimensions shown above do not include duct collar or hanger brackets.
2. Dimension "L" is measured across the front of the unit (i.e., water connection side).

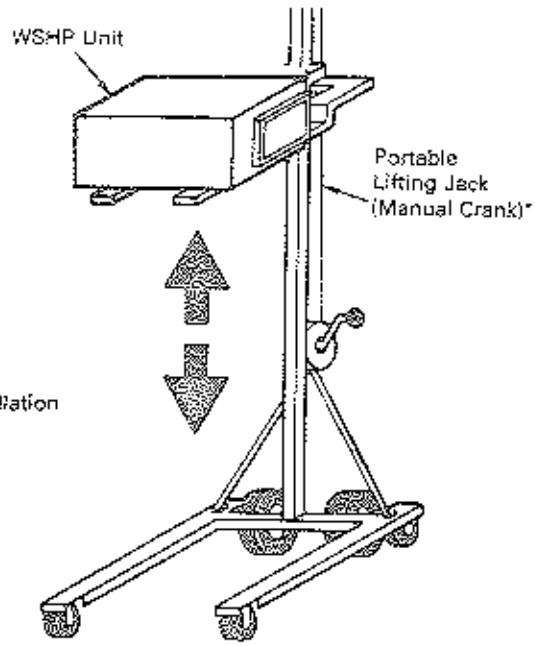
Access Guidelines
(Typical Installation Shown)
Horizontal — Size 009 thru 031



Note: Provide adequate service clearance on access panel side of unit; minimum recommended clearance is 18 inches.
*Optional is a flow meter which is not shown in the above installation.

Figure 17

Lifting Unit with Portable Jack

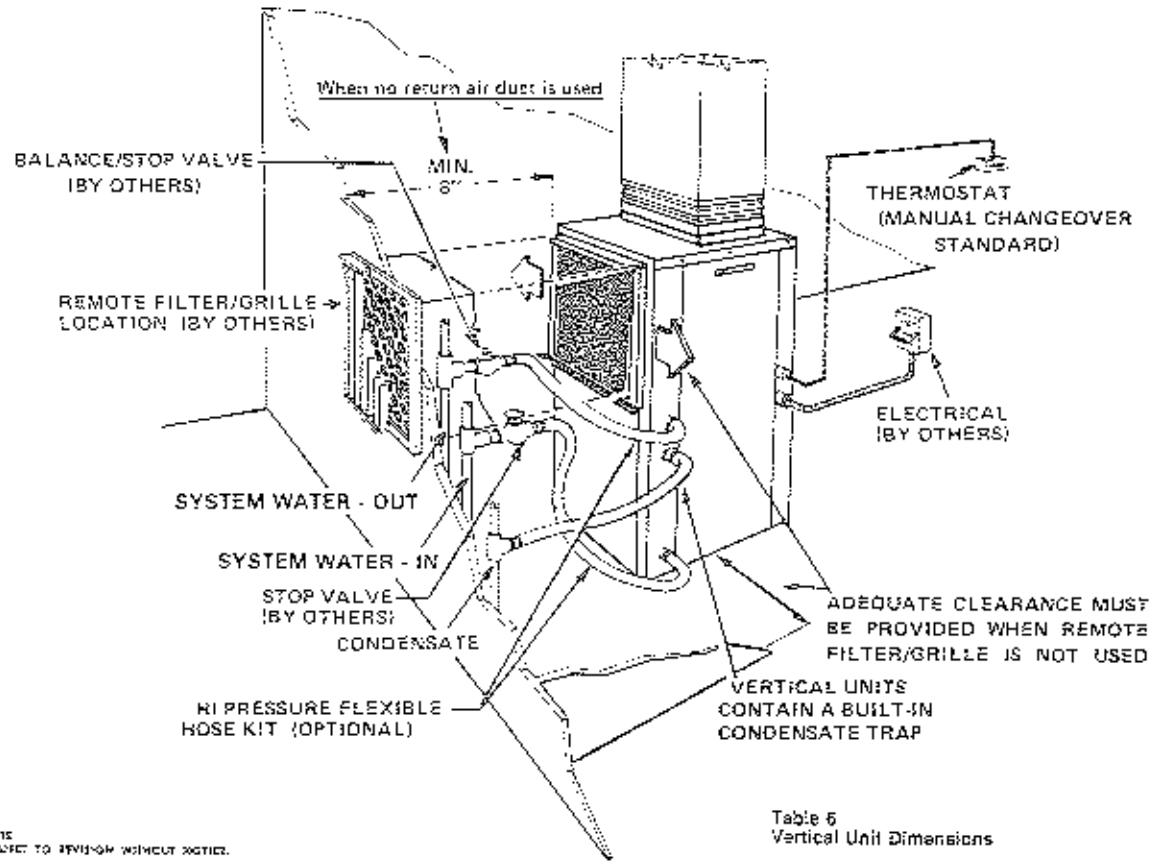


*Used for Unit Installation or Replacement.

Figure 18

Vertical Heat Pump Units

While Vertical units are typically installed in a floor-level closet or a small mechanical room, the unit access guidelines for these units are very similar to those described for Horizontal units. Table 6 provides the overall dimensions of the various sizes of Vertical units; refer to Figure 7 thru 16 for more complete dimensional information, and to Figure 19 for a schematic of a typical Vertical installation.



NOTE
SUBJECT TO REVISION WITHOUT NOTICE.

Figure 19

Table 6
Vertical Unit Dimensions

Unit Size	Dimensions (L x W x H)
009, 012	19 1/16" x 19 7/8" x 33 15/16"
015, 018	21 1/16" x 21 7/8" x 34 3/8"
024, 030	23" x 23" x 37 3/8"
036, 042	25 1/4" x 25 1/4" x 42
048, 060	28 1/8" x 28 1/8" x 45 3/16"
070, 100, 113, 120	29" x 41" x 72 3/4"

Note: Dimensions do not include duct collar.
*Dimensions in inches

Use these guidelines to determine proper Unit placement:

1. Provide adequate clearance for filter replacement and drain pan cleaning. Do **not** allow piping, conduit, etc. to block filter access.
2. Provide sufficient access to allow maintenance and servicing of the fan and fan motor, compressor and coils. (Removal of the entire unit from the closet to accomplish this should not be necessary.)
3. Provide an unobstructed path to enable removal of the unit from the closet or mechanical room.
4. Provide ready access to water valves and fittings, and screwdriver access to unit side panels, discharge collar, and all electrical connections.

Condensate Drain

A drain line must be connected to each heat pump and pitched to allow condensate to flow away from the machine. A trap, illustrated in figure 1 below, must be installed in the condensate line for horizontal model H units to insure free flow of condensate. Other models either do not require a trap for this purpose, or are supplied with the trap installed by the factory within the cabinet. Figure 2 also shows the addition of vertical air vent tubes which are sometimes required at frequent enough intervals to avoid air pockets so that condensate can flow freely through long, nearly horizontal drain lines.

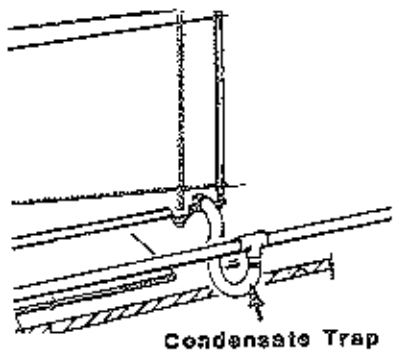


Figure 1-Condensate trap.

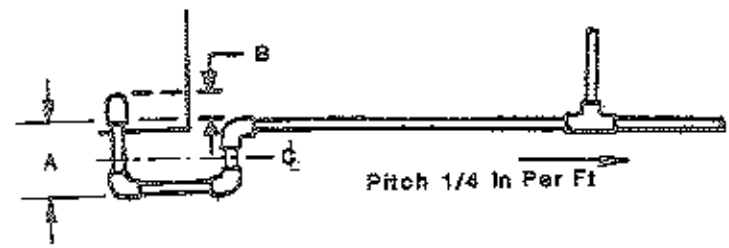


Figure 2-Condensate drain line for horizontal heat pumps.

DIMENSIONS

MODEL NUMBER	A	B
814-009	3/4"	3/4"
814-011	3/4"	3/4"
814-013	3/4"	3/4"
814-019	1	1
814-023	1	1
814-027	1	1
814-031	1	1
814-036	1	1 1/4"
814-042	1	1 1/4"
814-048	1	1 3/4"
814-060	1	1 3/4"
814-096	1	2"
814-120	1	2"

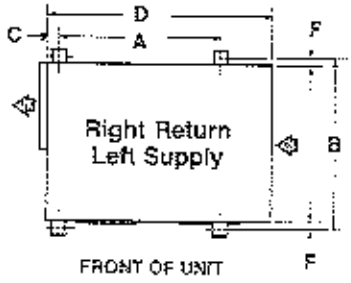
Minimum Dimension

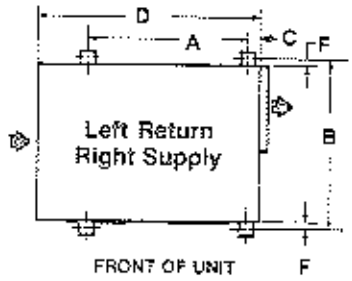
DIMENSIONS

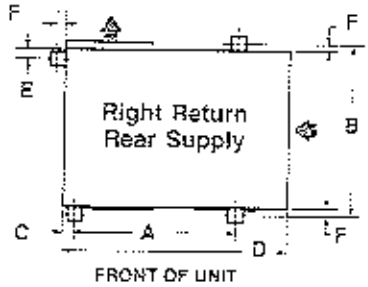
MODEL NUMBER	A	B
803-009	1	2"
803-012	1	2"
803-015	1	2"
803-019	1	2 1/4"
803-024	1	2 1/4"
803-030	1	2 1/4"
813-036	1	2 1/2"
813-042	1	2 1/2"
813-048	1	2 1/2"
813-060	1	2 1/2"

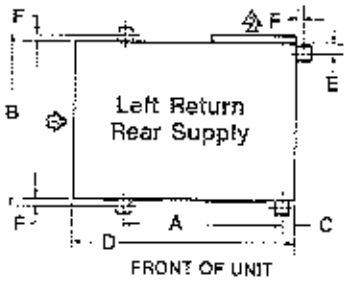
Minimum Dimension

814-009, 011 and 013

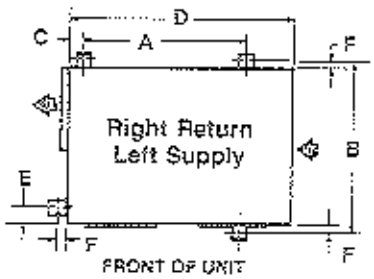


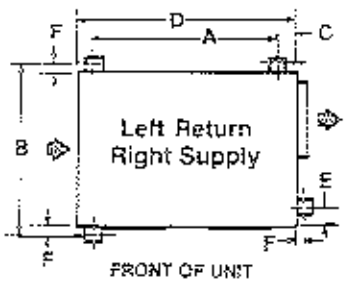


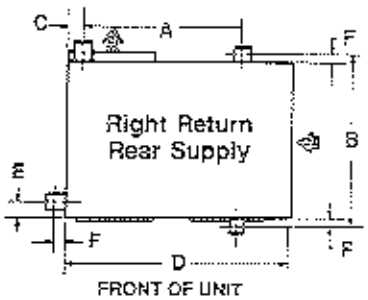


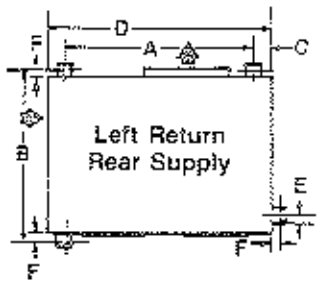


814-019, 023, 027 and 031









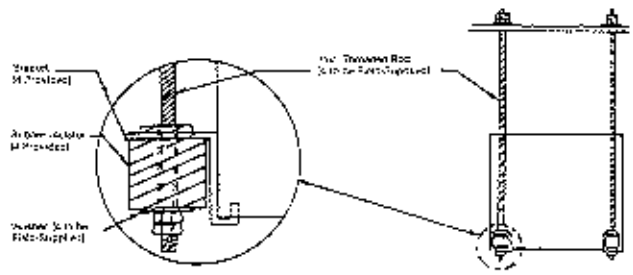
MODEL	DIMENSIONS					
	A	B	C	D	E	F
009, 011, 013	22 29/64	24	1¾	31½	1⅝	1
019, 023, 027 & 031	31¾	27	1⅜	41	1 5/16	1

All dimensions in inches

Revised 11/86

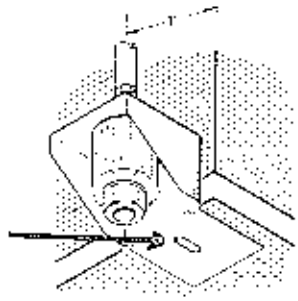
HANGER AND VIBRATION ISOLATION KITS

Horizontal Mounting Brackets
(Used With Horizontal — Size 009 thru 031)



Notes:
1. Each kit is packaged in a plastic bag with the unit, consisting of 4 hangers, 4 vibration isolators, 4 washers and a set of instructions.
2. Total head space required: Unit height + ½ inch + condensate trapping.
3. See unit dimensional drawing for further information.

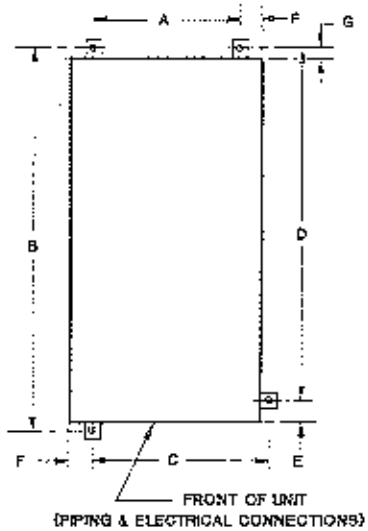
Figure 20A



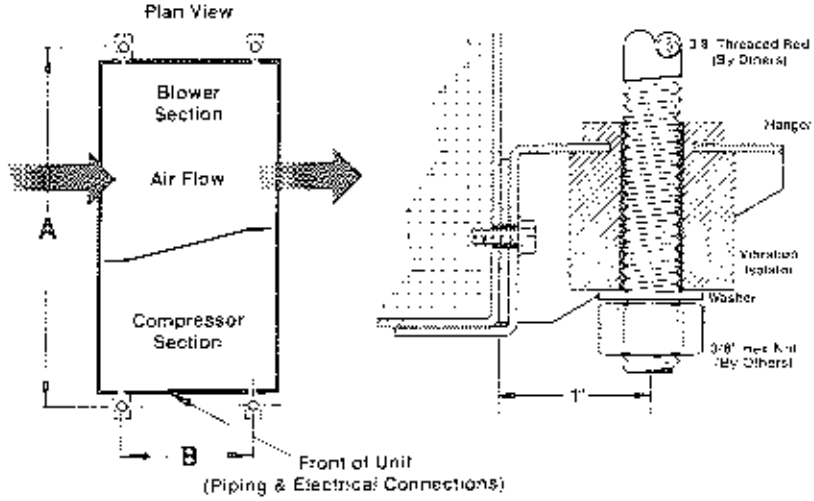
Slot used only for installation of hangers with 096 and 120 models. (Important: Use screws no longer than ½").

Horizontal Mounting Brackets
(Used With Horizontal — Size 036 thru 120)

PLAN VIEW



HANGER ROD LOCATION



MODEL	Dimensions						
	A	B	C	D	E	F	G
036 042	[illegible]	49	[illegible]	[illegible]	1	1	2
048 060	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1

Dimensions		
Model	A	B
036 120	74 1/8	34 1/8

*Dimensions In Inches

Figure 20B

Hanging or Mounting

While horizontal heat pumps may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling or within a soffit using field-supplied, threaded rods to support their weight.

A mounting kit–which includes four mounting brackets and vibration isolators--is shipped inside the blower compartment of the unit. Attach the brackets and isolators to the bottom corners of the unit as shown in Figure 20A or 20B. Then use four field-supplied threaded rods to suspend the unit.

Be sure to follow the clearance guidelines described under "Location and Access". Remember that the unit must not be mounted flush with the floor slab above, but should hang clear and be supported only by the mounting bracket assemblies.

Unit installation within the plenum should provide adequate clearance for filter removal in any one of the four directions possible. On those applications with a return air plenum, a slot for filter removal (i.e., toward the front) must be provided.

Vertical heat pump units are usually installed on the floor or on shelves. To properly isolate the unit, be sure to place a piece of rubber or neoprene under the unit; the pad should extend beyond the edges of the unit, and should be 3/8 to 1/2-inch thick. See Figure 21.

Sound Attenuation
Horizontal Units

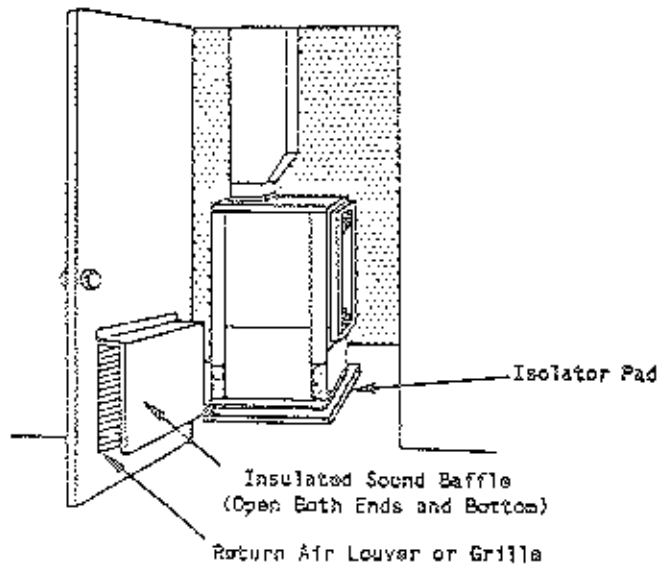
Correct placement of the Horizontal unit can play an important part in minimizing sound problems. Since ductwork is normally applied to these units, this enables the unit to be placed so that the principal sound emission is outside the occupied space in sound-critical applications. A fire damper may be required by the local code if a fire wall is penetrated.

Vertical Units

Because Vertical units are usually in small mechanical rooms or closets (see Figure 21), the location of the unit often serves as the primary means of sound attenuation. Additional measures for reducing sound transmission include the following:

1. Use a sound baffle, as shown in Figure 21, to attenuate line-of-sight sound radiated through the return air grilles.
2. Mount the unit on a rubber or cork isomode pad to minimize vibration transmission to the building structure. (The entire base of the unit–not just the corners–should rest on the pad to ensure adequate isolation.)

Figure 21
Vertical Sound Attenuation



Supply and Return Piping

Besides complying with any applicable codes, system piping should also include the following features:

1. a drain valve at the base of each supply and return riser to enable system flushing at start-up and during routine servicing;

2. shut-off/balancing valves and unions at each unit to permit unit removal for servicing; and,

3. strainers at the inlet of each system circulating pump.
(Shut-off/balancing valves, flow indicators, and drain tees in the supply runout and return at each floor facilitate loop balancing and servicing.)

Insulation is not required on the loop water piping except on those sections that run through unheated areas or outside the building. This is because the loop temperature is normally between 60 and 90 F; therefore, the piping will neither sweat nor suffer heat loss.

Condensate Piping

In most system applications, Horizontal and Vertical units are positioned directly above each other on successive floors, and the condensate risers are located next to the units. A flexible, nonpressure-rated plastic hose is typically used to connect the unit condensate drain connection to the condensate riser. (This condensate hose must be field supplied and installed.) To ensure an unobstructed flow of condensate from the unit to the riser, this hose must be carefully arranged to avoid kinks.

Though the horizontal run of the condensate hose is usually too short to pose any drainage problems, it is important to remember that horizontal runs of condensate line are typically pitched at least one inch for every 10 feet of run in the direction of flow. Low points and unpitched piping cannot be allowed, since dirt will collect in these areas and cause stoppage and overflow.

To ensure proper condensate flow from Horizontal or Vertical units, the contractor must install a condensate trap at each unit, with the top of the trap positioned below the unit condensate drain connection.

Installation of Supply and Return Hoses

Optional pressure-rated hose assemblies designed specifically for use with Horizontal and Vertical units may be ordered though hoses of a similar type can also be obtained from alternate suppliers in the field. In either case, these hoses will provide long life and trouble-free service if they are properly selected, installed and maintained.

Supply and return hoses are fitted with swivel-joint fittings at one end to prevent the hose from twisting; male adapters are provided to secure the hose assemblies to the unit and risers. Refer to Figure 22 for an illustration of the hoses, and to Table 7 for a listing of the hose kits available. Figure 17 illustrates the supply, return and condensate hoses assembled to a Horizontal unit.

CAUTION: Extremely corrosive system water may require use of special corrosion-resistant fittings and hoses. When this condition is encountered, water treatment is required.

Hose assemblies must be installed properly and checked regularly. Improper installation of hose assemblies may cause failure or reduce service life. Because water leaks can cause severe damage to carpeting, furniture, etc., it is extremely important that the installation guidelines provided below be strictly followed to ensure that water leaks do not occur.

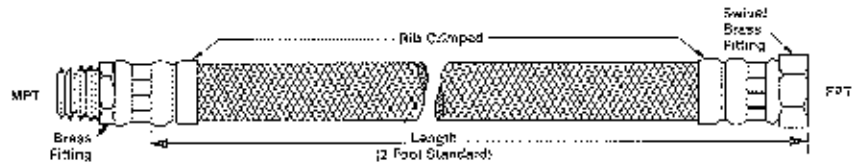


Figure 22
Supply/Return Hose Kit

Table 7
Supply and Return Hose Specifications

Size	Part Number		
	Galvanized Steel	Stainless Steel	Rubber
1/2"	35195150-01	AK5022	AK5002
3/4"	35195150-02	AK7522	AK7502
1"	35195150-03	AK1022	AK1002
1-1/4"	AK1212	AK1222	—

	Sizes and Operating Pressures								
			Galvanized Braid		Stainless Steel Braid		Minimum	Rubber	
I.D.	O.D.	Minimum Bend Radius	Operating Pressure (PSI)	Bursting Pressure (PSI)	Operating Pressure (PSI)	Bursting Pressure (PSI)	Bend Radius	Operating Pressure (PSI)	Bursting Pressure (PSI)
1/2"	23/32"	2-7/8"	300	1200	375	1500	6"	250	1000
3/4"	1-1/8"	4-1/2"	225	900	—	—	—	—	—
1"	1-3/8"	5-1/2"	175	700	—	—	—	—	—
1-1/4"	1-11/16"	6-3/4"	150	600	—	—	—	—	—

To properly select and install the hose assemblies:

1. Select the proper hose length to allow the slack required between connection points. Since the hose may change in length from +2 to −4 percent under the surge of high pressure, it is necessary to provide sufficient slack for expansion and contraction. See Figure 23.

2. Hoses must also be selected to the proper length to ensure that the minimum bend radius is not exceeded. Exceeding the minimum bend radius can cause the hose to collapse, thus reducing the water flow rate, and/or damaging the hose wall construction. A minimum bend radius specification of four inches means that the shortest distance between sections of bent hose cannot be less than eight inches.

   Use the following minimum bend radii when selecting metal hoses:

   1/2-Inch Hose = 2-7/8-Inch Minimum Bend Radius
   3/4-Inch Hose = 4-1/2-Inch Minimum Bend Radius
   1-Inch Hose = 5-1/2-Inch Minimum Bend Radius
   1 1/4 Inch Hose = 6-3/4-Inch Minimum Bend Radius

   Where the radius falls below the required minimum, an angle adapter should be used, as shown in Figure 24, to avoid sharp bends in the hose.

Figure 23
Slack Allowance for Hose Installation

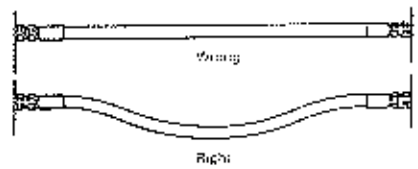
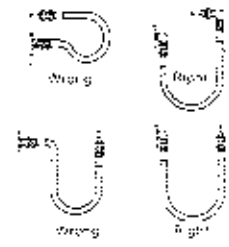


Figure 24
Use of Angle Adapter to Achieve Proper Bend Radius



Note: Bend radius specifications are for hose assemblies stored at temperatures above 40 F (4 C). If hoses have been stored at temperatures below 40 F, the hose will be stiffer than normal. Under these conditions, increase the minimum specified bend radius by 50 percent, and use extreme care to avoid bending the hose.

3. Pipe joint compound is not necessary where Teflon thread tape has been preapplied to hose assemblies, or when flared-end connections are used. In those instances where pipe joint compound is preferred in lieu of tape, use only a small amount on the male pipe threads of the fitting adapters. Be sure to prevent any sealant from reaching the flared surfaces of the joint.

4. Where brass fittings are used, the maximum torque--without damage to the fitting--is 30 foot-pounds. If a torque wrench is not available, use "finger-tight" plus one quarter turn. Tighten steel fittings as necessary.

5. Do not twist hose to avoid damage to the hose wall or rubber compound.

6. Hose connections are completed with the incorporation of combination shut-off/balancing valves at each unit supply and return riser to simplify removal of the unit, as well as proper water flow adjustment.

Electrical Wiring

WARNING: TO AVOID POSSIBLE INJURY OR DEATH DUE TO ELECTRICAL SHOCK, OPEN SUPPLY POWER DISCONNECT SWITCH AND SECURE IT IN THAT POSITION.

CAUTION: Use only copper conductors for field-installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

All field-installed wiring--including the electrical ground--must comply with the National Electrical Code, as well as applicable local codes. In addition, all field wiring must conform to the Class II temperature limitations described in the NEC. Refer to Figure 25 for a schematic of the field connections which must be made by the installing (or electrical) contractor.

To ensure proper electrical hookup, be sure to consult the unit wiring diagram pasted on the inside surface of the electrical access panel. Notice that the 24-volt transformer connection must be modified if the unit nameplate voltage is 208-230 volts, and the actual supply power is 208 volts. Unit electrical data is provided in Tables 8 and 9.

Note: To minimize vibration and sound transmission to the structure, all final unit electrical connections should be made with a length of flexible, rather than rigid, conduit.

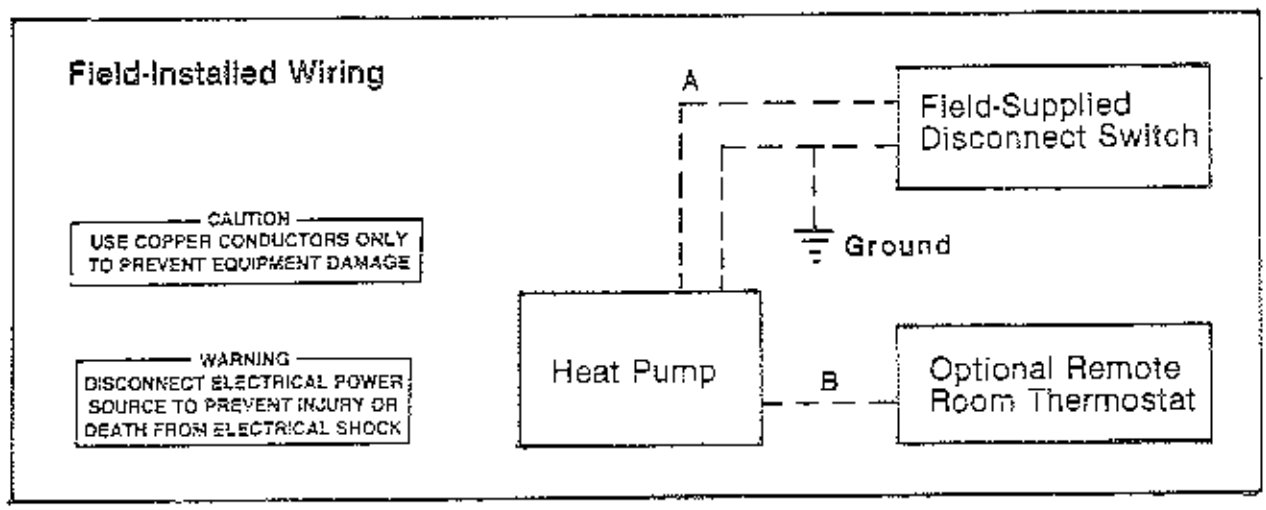


Figure 25

A = Two power wires on single-phase units; three power wires on three-phase units.
B = 1H/1C manual changeover or auto changeover -- 4 wires.
For multiple compressor units and/or other thermostats, see Unit Wiring Diagram

Note: All customer-supplied wiring to ba copper only, and must conform to NEC and local electrical codes. Wiring shown with dashed lines must be field-supplied and -installed.

HORIZONTAL UNITS

ELECTRICAL DATA

Table 8

SIZE	POWER SUPPLY	COMPRESSOR		BLOWER MOTOR		TOTAL FLA	MIN. CIRCUIT AMPACITY	MAX. FUSE SIZE AMPS
		RLA	LRA	HP	FLA			
009	208/230-1-60	3.9	20.0	1/12	0.6	4.5	5.5	15
	265-1-60	3.0	16.0	1/12	0.4	3.4	4.2	15
011	208/230-1-60	4.8	31.0	1/12	0.7	5.5	6.7	15
	265-1-60	3.8	22.9	1/12	0.6	4.4	5.3	15
013	208/230-1-60	5.8	31.0	1/10	0.7	6.5	8.0	15
	265-1-60	4.7	27.0	1/10	0.6	5.3	6.5	15
019	208/230-1-60	8.5	43.3	1/8	0.9	9.4	11.5	20
	265-1-60	7.1	36.0	1/8	0.7	7.8	9.6	15
023	208/230-1-60	10.6	48.0	1/5	1.6	12.2	14.9	25
	265-1-60	9.3	37.0	1/5	0.9	10.3	12.6	20
027	208/230-1-60	11.5	54.0	1/5	1.6	13.1	16.0	25
	265-1-60	10.3	45.0	1/5	1.0	11.3	13.9	20
031	208/230-1-60	15.3	65.0	1/3	2.2	17.5	21.3	35
	265-1-60	13.9	55.0	1/3	1.8	15.7	19.2	30
	208/230-3-60	10.6	60.0	1/3	2.2	12.8	15.5	25
	460-3-60	4.5	28.0	1/3	1.1	5.6	6.8	10
036	208/230-1-60	15.5	78.0	1/2	3.2	18.7	22.6	35
	265-1-60	14.1	73.8	1/2	3.2	17.3	20.8	30
	208/230-3-60	10.6	59.5	1/2	3.2	13.8	16.5	25
	460-3-60	4.6	30.7	1/2	1.8	6.4	7.6	15
042	208/230-1-60	17.6	88.0	1/2	3.2	20.8	25.2	40
	208/230-3-60	11.5	65.1	1/2	3.2	14.7	17.6	25
	460-3-60	5.1	32.8	1/2	1.8	6.9	8.2	15
048	208/230-1-60	21.5	95.4	3/4	5.4	26.9	32.3	50
	208/230-3-60	13.8	82.0	3/4	5.4	19.2	22.7	35
	460-3-60	6.9	41.0	3/4	2.2	9.1	10.9	15
060	208/230-1-60	27.6	125.0	1	5.8	33.4	40.3	60
	208/230-3-60	16.1	90.0	1	5.8	21.9	26.0	40
	460-3-60	7.7	45.0	1	2.6	10.3	12.3	20
096	208/230-3-60	13.8	82.0	1-1/2	5.7	33.3	36.8	50
	460-3-60	6.9	41.0	1-1/2	2.6	16.4	18.6	25
120	208/230-3-60	16.1	90.0	2	7.5	39.7	46.4	60
	460-3-60	7.7	45.0	2	3.4	18.3	22.3	25

NOTE: 096 & 120 DATA PER CIRCUIT REV. 5-86

VERTICAL UNITS

ELECTRICAL DATA

Table 9

SIZE	POWER SUPPLY	COMPRESSOR		BLOWER MOTOR		TOTAL FLA	MIN. CIRCUIT AMPACITY	MAX. FUSE SIZE AMPS
		RLA	LRA	HP	FLA			
009	208/230-1-60	3.3	20.0	1/20	.50	3.8	4.6	15
	265-1-60	2.8	16.0		.50	3.3	4.0	15
012	208/230-1-60	6.3	31.0	1/10	.80	7.1	8.7	15
	265-1-60	4.9	27.0		.81	5.71	6.9	15
015	208/230-1-60	5.9	36.0	1/12	.86	6.76	8.25	15
	265-1-60	5.0	33.0		.82	5.82	7.35	15
019	208/230-1-60	7.6	40.6	1/6	1.5	9.1	11.1	15
	265-1-60	6.0	34.0		1.2	7.2	8.7	15
024	208/230-1-60	11.8	54.0	1/4	1.6	13.4	16.4	25
	265-1-60	9.3	45.0		1.5	10.8	14.4	20
030	208/230-1-60	14.0	65.0	1/4	2.0	16.0	19.5	30
	208/230-3-60	9.2	60.0		2.0	11.2	13.9	20
	265-1-60	11.2	55.0		1.6	12.8	17.2	25
	460-3-60	4.4	28.0		1.0	5.4	6.5	15
036	208/230-1-60	15.5	78.0	1/2	3.2	18.7	23.0	35
	208/230-3-60	10.6	59.5		3.2	13.8	16.7	25
	265-1-60	14.1	73.8		3.2	17.3	21.6	35
	460-3-60	4.6	30.7		1.8	6.4	8.3	15
042	208/230-1-60	17.6	88.0	1/2	3.2	20.8	28.7	45
	208/230-3-60	11.5	65.1		3.2	14.7	19.4	30
	460-3-60	5.1	32.8		1.8	6.9	9.6	15
048	208/230-1-60	21.5	95.4	3/4	5.4	26.9	30.0	45
	208/230-3-60	13.8	82.0		5.4	19.2	23.0	35
	460-3-60	6.9	41.0		2.2	9.1	11.0	15
060	208/230-1-60	27.6	125.0	1	5.8	33.4	39.8	60
	208/230-3-60	16.1	90.0		5.8	21.9	26.4	40
	460-3-60	7.7	45.0		2.6	10.3	12.5	20

COOLING & HEATING CYCLE OPTIMUM PRESSURES & SUPERHEAT

(*Flow Rate Corresponds to Approximately 10° TD on Cooling Cycle & 5 to 6° TD on Heating Cycle)

MODEL 813/814	SYSTEM PARAMETERS			COOLING CYCLE			HEATING CYCLE		
	SUPPLY WATER TEMP °F	WATER FLOW RATE GPM*	AIR FLOW RATE CFM	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	SUPERHEAT °F	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	SUPERHEAT °F
009	60°	2.4	300	72	160	33	71	239	9
	65°	2.4	300	74	169	30	74	241	16
	70°	2.4	300	75	180	27	77	244	23
	75°	2.4	300	77	191	22	80	246	28
	80°	2.4	300	78	205	16	82	248	32
	85°	2.4	300	80	215	7	84	250	35
012	60°	3.3	400	65	150	41	70	250	1
	65°	3.3	400	67	165	38	74	257	2
	70°	3.3	400	70	175	35	77	264	4
	75°	3.3	400	72	187	30	81	270	7
	80°	3.3	400	74	199	23	84	276	11
	85°	3.3	400	76	210	15	87	283	15
015	60°	3.9	500	70	150	37	67	225	11
	65°	3.9	500	73	162	33	69	231	16
	70°	3.9	500	75	175	29	73	237	22
	75°	3.9	500	78	191	24	76	241	27
	80°	3.9	500	80	205	16	79	245	32
	85°	3.9	500	82	218	12	81	248	36
019	60°	5.0	650	67	163	36	64	215	1
	65°	5.0	650	70	173	33	66	222	2
	70°	5.0	650	72	184	30	70	229	5
	75°	5.0	650	75	196	26	74	235	11
	80°	5.0	650	77	209	21	77	240	17
	85°	5.0	650	79	224	16	80	244	24
024	60°	6.4	800	70	150	27	75	255	3
	65°	6.4	800	70	170	23	80	265	7
	70°	6.4	800	73	185	19	85	270	12
	75°	6.4	800	75	195	16	90	275	17
	80°	6.4	800	75	210	14	90	280	21
	85°	6.4	800	75	225	12	90	285	25
030	60°	8.0	1000	65	175	38	70	250	0
	65°	8.0	1000	70	180	32	75	260	2
	70°	8.0	1000	73	190	27	80	265	4
	75°	8.0	1000	75	195	21	85	275	6
	80°	8.0	1000	75	210	16	90	280	10
	85°	8.0	1000	80	220	11	90	285	14

NOTE: Based upon return air temperature—80° DB/67° WB (Cooling Cycle)
70° DB (Heating Cycle)

COOLING & HEATING CYCLE OPTIMUM PRESSURES & SUPERHEAT

(*Flow Rate Corresponds to Approximately 10° TD on Cooling Cycle & 5 to 8° TD on Heating Cycle)

MODEL 813/814	SYSTEM PARAMETERS			COOLING CYCLE			HEATING CYCLE		
	SUPPLY WATER TEMP. °F	WATER FLOW RATE GPM*	AIR FLOW RATE CFM	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	SUPERHEAT °F	SUCTION PRESSURE PSIG	DISCHARGE PRESSURE PSIG	SUPERHEAT °F
036	60°	9.4	1200	66	150	26	65	217	22
	65°	9.4	1200	68	165	24	67	220	25
	70°	9.4	1200	70	177	21	70	225	28
	75°	9.4	1200	72	188	19	72	230	31
	80°	9.4	1200	74	197	16	74	234	35
	85°	9.4	1200	76	206	13	75	258	38
042	60°	10.7	1400	71	85	19	74	231	11
	65°	10.7	1400	73	197	16	76	235	14
	70°	10.7	1400	75	206	13	79	240	17
	75°	10.7	1400	77	215	11	81	245	20
	80°	10.7	1400	79	223	7	83	249	23
	85°	10.7	1400	81	230	5	84	253	25
048	60°	12.6	1700	66	180	27	63	225	24
	65°	12.6	1700	68	192	24	65	230	27
	70°	12.6	1700	70	201	21	67	235	30
	75°	12.6	1700	72	210	18	69	240	33
	80°	12.6	1700	74	218	15	71	245	37
	85°	12.6	1700	76	226	12	73	249	40
060	60°	16.3	2000	66	172	28	68	235	18
	65°	16.3	2000	68	184	25	68	240	21
	70°	16.3	2000	70	193	22	70	245	24
	75°	16.3	2000	72	202	19	72	250	27
	80°	16.3	2000	74	209	16	74	255	30
	85°	16.3	2000	76	217	13	76	259	33
096	60°	25.2	3400	66	180	27	63	225	24
	65°	25.2	3400	68	192	24	65	230	27
	70°	25.2	3400	70	201	21	67	235	30
	75°	25.2	3400	72	210	18	69	240	33
	80°	25.2	3400	74	218	15	71	245	37
	85°	25.2	3400	76	226	12	73	249	40
120	60°	32.6	4000	66	172	27	68	235	18
	65°	32.6	4000	68	184	24	68	240	21
	70°	32.6	4000	70	193	21	67	245	24
	75°	32.6	4000	72	202	18	69	250	27
	80°	32.6	4000	74	209	15	71	255	30
	85°	32.6	4000	76	217	12	73	259	33

NOTE: Based upon return air temperature — 80° DB/67° WB (Cooling Cycle)
70° DB (Heating Cycle)

Installation of Optional Wall-Mounted Thermostat

Two 24-volt thermostat options are available for use with Horizontal and Vertical heat pump units: a single-stage automatic changeover (ACO) thermostat, and a single-stage manual changeover (MCO) thermostat. While more specific installation instructions are provided in the instruction guide which accompanies each thermostat accessory, a field connection diagram (Figure 26) is included here for your convenience. Vendor installation instructions are also shipped with each thermostat.

CAUTION: Zone integrity must be maintained to efficiently control units or groups of units. Unless zones of control are considered and accounted for, adjacent units may operate in heating and cooling modes simultaneously.

In each instance, the low-voltage wiring between the unit terminal block and wall thermostat must be made in compliance with the applicable electrical codes (i.e., NEC and local codes), and completed before the unit is installed. Use of four-wire, color-coded low-voltage cable is recommended. ACO wall thermostats may also require field installation of two jumper wires: one between thermostat Terminals RC and RH, and one between Terminals W2 and Y1. Check the wiring diagram to determine whether or not these jumpers are needed for a specific application.

Recommended wire sizes and lengths for installing the thermostat are provided in Table 10. The total resistance of these low-voltage wires must not exceed 1 ohm; any resistance in excess of 1 ohm may cause the control to malfunction because of the high voltage drop.

Consult the instructional booklet which accompanies each thermostat to determine the recommended heat anticipator setting for Horizontal and Vertical units.

Table 10
Recommended Thermostat Wire Sizes

Wire Size	Max. Wire Length*
22-Gauge	30 Feet
20-Gauge	50 Feet
18-Gauge	75 Feet
16-Gauge	125 Feet
14-Gauge	200 Feet

*Length = Physical distance from thermostat to unit.

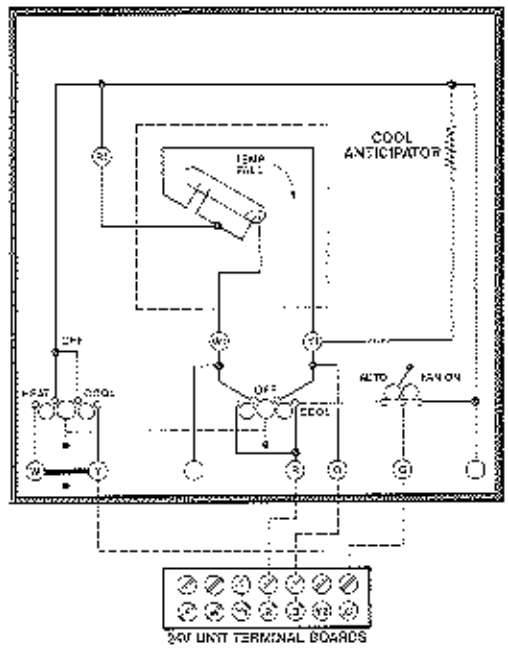
FIELD CONNECTION DIAGRAM
VERTICAL OR HORIZONTAL WATER SOURCE HEAT PUMP

CAUTION
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE

WARNING
DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

SINGLE COMPRESSOR MODELS

24V MANUAL CHANGEOVER THERMOSTAT WIRING



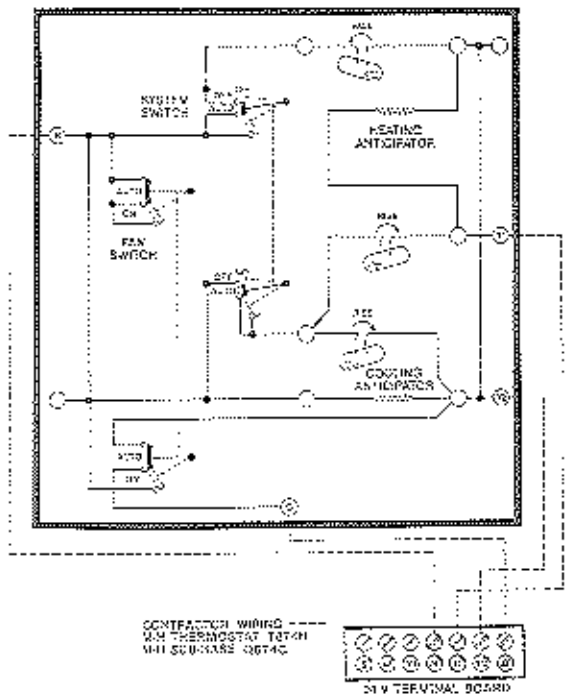
CONTRACTOR WIRING
M-H THERMOSTAT T834A
M-H SUB-BASE Q634G (SPECIAL)
*SPECIAL W TO Y FACTORY JUMPER WIRE IN SUB-BASE

CAUTION
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE

WARNING
DISCONNECT ELECTRICAL POWER SOURCE TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK

SINGLE COMPRESSOR MODELS

24V AUTOMATIC CHANGEOVER THERMOSTAT WIRING



CONTRACTOR WIRING
M-H THERMOSTAT T874H
M-H SUB-BASE Q674C

Figure 26

Start-Up

Preparation for Start-Up

System Cleaning and Flushing

Cleaning and flushing the Water Source Heat Pump System--when correctly done--is the single most important step to ensuring proper start-up and the continued efficient operation of the system.

Carefully follow the instructions provided below to properly clean and flush the system:

WARNING: BEFORE SERVICING THE UNIT, OPEN UNIT DISCONNECT TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

1. Install the system with the supply hose connected directly to the return riser valve; this can be accomplished with a single length of flexible hose, as illustrated in Figure 27.

   Note: Substitute two lengths of flexible hose joined together with a field-supplied, standard NPT coupling and the flare-fitting-to-pipe adapters provided with the hose kit (Figure 27) whenever one length of hose is too short (i.e., the resulting connection would exceed the minimum bend radius of the hose).

2. Verify that electrical power to the units is disconnected, and that the heat rejector is de-energized.

3. Fill the system with water, leaving the air vents open. Watch to see that all of the air is bled from the system; at the same time, prevent any overflow of water. Check the system for leaks and repair appropriately.

4. Check and, adjust the water/air level in the expansion tank.

5. Start the pumps--with the strainers in place--and systematically check each vent to ensure that all of the air is bled from the system. Verify that make-up water is available and adjusted properly to replace the space taken up by the air.

   In addition, make sure that the pumps are adequately bolted down and aligned to prevent damage to the seals and couplings. Again, check for system leaks and repair any that are apparent before proceeding.

6. Set the boiler to raise the loop temperature to approximately 85 F. Open a drain at the lowest point in the system; make sure that the make-up water replacement rate equals the rate of bleed.

   Continue to bleed the system until the water appears clean--or for at least three hours--whichever is longest; then, completely drain the system.

7. Refill the system and add trisodium phosphate in a proportion of approximately one pound per 150 gallons of water. Reset the boiler to raise the loop temperature to about 100 F.

   CAUTION: To avoid possible damage to piping systems constructed of plastic piping, do NOT allow loop temperature to exceed 110 F.

   Circulate the solution for a minimum of eight to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat if necessary. (Many contractors repeat this operation--i.e., filling and dumping--as many as eight times to ensure system water cleanliness.)

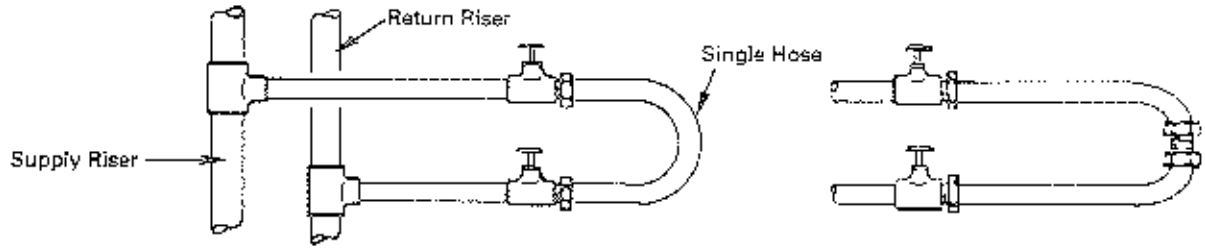
8. Remove the short-circuited hoses, and reconnect them to the proper supply and return connections on each of the units. Then, refill the system and remove all of the air.

   Test the system pH with litmus paper, and leave the system water slightly alkaline (i.e., pH 7.5 to 8.5). If the system continues to be acidic, appropriate chemicals must be added.

   CAUTION: At no time should "Stop-Leak" or any similar chemical agent be used in this system. Addition of such chemicals to the loop water will foul the system and inhibit unit operation.

9. After the system is successfully cleaned and flushed, set up the controls to properly maintain loop temperatures; then, check the main system panels, safety cutouts, and alarms.

Figure 27
Temporary Connection for Flushing System Piping



Alternate Connection Method:
Use standard coupling (field-supplied) and hose adapters to join 2 hoses.

System Checkout

After completing the installation (including system cleaning and flushing) of the Water Source Heat Pump System, a series of system checks and recordings of system parameters must be made. An outline of these system checks is provided below, and covers only the most essential aspects of the system. A much more complete checklist is provided in the "Water Source Heat Pump System Start-Up and Inspection Sheet" found near the end of this manual. The installing contractor should use this form to ensure that the system check out and start-up inspections are conducted properly.

In addition, the installing contractor should also complete the abbreviated "Installation Checklist" at the back of this booklet and return it to the local Sales Office.

[ ] 1. **Voltage Check:** Ensure that voltage is within the utilization range specifications of the unit compressor and fan motor.

[ ] 2. **System Water Temperature:** Ensure that it is within an acceptable range to facilitate start-up; see Table 11. (When conducting this check, be sure to verify the proper heating and cooling setpoints as well.)

[ ] 3. **System Water pH:** Verify that system water exhibits an approximately neutral balance (i.e., a pH of 7.5 or 8.5); this will contribute to the longevity of the hoses and heat exchangers.

[ ] 4. **System Flushing:** Proper system cleaning and flushing is the most important aspect of the start-up procedure for water source heat pump installations. Make sure that the system has been flushed properly, with all supply and return hoses connected end-to-end as illustrated in Figure 27. (This particular method not only facilitates system flushing, but also prevents fouling of the unit heat exchangers by system water.)

Water used in the system must be clear city water with no visible dirt, piping slag, or chemical cleaning agents apparent.

[ ] 5. **Closed-Type Cooling Tower (or Open Tower w/Heat Exchanger):** Required to ensure continued cleanliness of the system water, while providing the means for removing excess heat from the building. Be sure to check equipment for proper temperature set points and operation.

[ ] 6. **Balanced Water Flow Rate to Heat Pump:** Make sure that--as each heat pump unit is installed--the inlet and outlet water temperatures are recorded; refer to the "Heat Pump Start-Up/Inspection Sheet".

This check will eliminate nuisance unit trip-outs resulting from water velocities that are either too low or too high; it can also prevent the occurrence of erosive water flow rates.

[ ] 7. **Standby Pump Installed:** Each system must have a standby pump for proper sequencing and operation.

[ ] 8. **System Controls Operational:** Verify that the system controls are functioning and providing the proper sequencing; this check is necessary to ensure that no catastrophic system failures occur (e.g., frozen cooling towers or heat exchangers, nuisance system shutdowns, etc.).

[ ] 9. **Freeze Protection for Water System:** Be sure that freeze protection is provided for the outdoor portion of the loop water system. Inadequate freeze protection can lead to extremely expensive tower and system piping repairs.

Note: A problem commonly associated with this type of system occurs when it is filled--during construction--for the purpose of cleaning, flushing and testing. After testing is complete and the system is drained, the building is often left without heat during winter conditions. Since the condenser coils never fully drain by themselves, they will freeze unless glycol is added to the system. Be sure to avoid this practice whenever winter conditions prevail.

[ ] 10. **System Water Loop Free of Air:** Verify that all air is removed from the system. (Air in the system will impair unit operation and cause corrosion in the system piping).

[ ] 11. **Unit Filters Clean:** Check to ensure that unit filter is clean; this will contribute to the proper operation of the unit by ensuring adequate airflow across the coil.

Recommends that the contractor install a new filter in each unit before attempting start-up. In addition, use a vacuum to remove any debris or dirt lodged in or on the units.

[ ] 12. **Check Unit Fans for Free Rotation:** Manually rotate fans to make sure that they rotate freely, and that they are secured properly to the fan shaft. Do not oil fan motors on start-up; they were lubricated at the factory.

[ ] 13. **System Control Center Installed:** A system control and alarm panel is a necessity to ensure control of the temperature setpoints for operation of the system's heat rejector and boiler.

Ideally, the panel should also contain condition signals, both audio and visual, to indicate abnormal loop water temperatures or lack of water flow. Indicator lights for the primary and standby loop circulator pumps should also be provided.

[ ] 14. **Miscellaneous:** Note any questionable aspects of the installation.

Table 11
Operating Limits (3)

Constraint	Minimum	Normal	Maximum
Power Supply Voltage: (1)			
208-230/60/1	197	208-230	252
265/60/1	240	265	290
208-230/60/3	187	208-230	252
460/60/3	432	460	504
Entering Air Temperature: (2)			
Wet Bulb (Cooling)	57 F	61-67 F	75 F
Dry Bulb (Heating)	50 F	65-75 F	80 F
Entering Water Temperature:			
Cooling	60 F	80-90 F	95 F
Heating	60 F	65-75 F	95 F
Surrounding Ambient	40 F DB	65 F DB - 67 F WB	70 F WB
Water Pressure (Excluding Hose Kits)	-----	-----------	400 Psig

Notes:

1. Voltage utilization range complies with ARI Standard 110.
2. When using 100 percent outside air as a source of ventilation, a 40 F DB minimum and a 78 F WB are acceptable, but the cabinet may sweat during hot weather.
3. Determination of operating limits is dependent primarily upon 3 factors: (1) return air temperature, (2) water temperature, and (3) ambient temperature. Whenever any one of these factors is at a minimum or maximum level, the other two factors should be at normal levels to ensure proper unit operation.
4. Extreme variations in temperature and humidity, and corrosive water or air will adversely affect unit performance, reliability and service life.

Unit Start-Up

Use the procedure outlined below to initiate proper unit start-up:

1. Adjust all valves to the full open position, and turn on the line power to all heat pump units.

   WARNING: HIGH VOLTAGE IS PRESENT IN SOME AREAS OF THE ELECTRICAL PANELS WITH THE DISCONNECT SWITCH (ES) CLOSED. BE SURE TO EXERCISE CAUTION WHEN WORKING WITH ENERGIZED EQUIPMENT.

2. **Operate each unit first in the cooling cycle.** Room temperature should be in the normal range (i.e., approximately 61 to 67 F, wet bulb). Loop water temperature entering the heat pump should normally be at least 60°F, but not in excess of 95°F. Refer to Table11for more specific information on the operating parameters.

   Note: Three factors determine the operating limits of a unit--(1) return air temperature, (2) water temperature, and (3) ambient temperature. Whenever any one of these factors is at a minimum or maximum level, the other two factors must be at normal levels to ensure proper unit operation.

   a. **For heat pumps equipped with an optional, accessory MCO thermostat,** adjust the thermostat temperature indicator to the lowest setting, and the selector switch to COOL. At this time, both the fan and compressor should run.

      For heat pumps equipped with an optional, accessory ACO thermostat, set the thermostat temperature indicators to the far left position, and the selector switch to AUTO. At this time both the fan and the compressor should run.

   b. Check for cool air delivery at the registers or unit grille a few minutes after the units have begun to operate. List the identification number of any machines that do not function at this time.

   c. Check the elevation and cleanliness of the condensate lines; any dripping could be a sign of a blocked line.

3. **Operate each heat pump in the heating cycle immediately after checking cooling cycle operation.**

   Note: Horizontal and Vertical heat pumps are designed to start heating at a minimum return air temperature of 50 F with a normal water flow rate and ambient temperature.

   a. **If the unit is equipped with an optional, accessory MCO thermostat,** adjust the thermostat temperature indicator to the highest setting and set the selector switch to HEAT; both the fan and the compressor should run.

      If the unit is equipped with an optional, accessory ACO thermostat, set the thermostat temperature indicator levers to the far right position with the selector switch still set on AUTO; both the fan and compressor should run.

   b. Once the unit has begun to run, check for warm air delivery at the registers or unit grille. Again, the installing contractor must list the room identification of any machines that do not function.

4. **If the unit fails to operate, conduct the following checks:**

   a. Check the voltage and current; it should be in accordance with the electrical specifications described on the unit nameplate.

   b. Look for wiring errors; check for loose terminal screws where wire connections have been made on both the line- and low-voltage terminal boards.

   c. Check for dirty filters; a clogged filter will cause the unit's safety cutouts to stop unit operation.

   d. Verify that the supply and return piping is properly connected to the inlet and outlet connections on the unit.

   e. If the fan fails to operate, check to see that the fan wheel turns freely and that it is secured to the shaft. Also, determine whether the fan operates during both the heating and cooling modes.

   f. If the checks described above fail to reveal the problem and the unit still will not operate, be sure to contact a trained service technician to ensure proper diagnosis and repair of the equipment.

Maintenance

Maintenance Procedures

Perform the maintenance procedures outlined below at the intervals indicated.

WARNING: BEFORE SERVICING UNIT, OPEN UNIT DISCONNECT SWITCH TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

[ ] **Inspect filters every three months.**

A regular maintenance schedule is recommended, and the frequency of filter changeouts depends upon the type of occupancy (e.g., hotel, office, school).

CAUTION: To avoid fouled machinery and extensive unit clean-up, do not operate units without filters in place or use as a temporary heat source during construction.

To remove the filter from a Horizontal or Vertical unit, simply slide the filter out of its frame. When installing a new filter, be sure to use the slide-in rails to guide the filter into the proper position. Verify that the airflow arrow found on the top of each filter points toward the unit.

Refer to Tables 1A,1B or 3 as appropriate, to determine the proper filter type and size for each Horizontal or Vertical unit.

[ ] **Check condensate drain pans for algae growth at three-month intervals.**
When algae growth is apparent, consult a water treatment specialist for proper chemical treatment. Typically, the application of an algacide every three months will eliminate algae problems in most locations.

[ ] **Lubricate fan motors annually.**
All heat pumps are fully lubricated when shippped from the factory; do not oil initially.

Use a hand pressure oiler to add ten drops of SAE-20 oil to each of the fan motor oil holes once each year; this is most conveniently done at the time of a filter change.

[ ] **Visually inspect the unit at least once each year.**

When inspecting each Horizontal and Vertical unit, give special attention to the hose assemblies; note any signs of deterioration or cracking, and repair any leaks immediately.

[ ] **Conduct an amperage check annually on the compressor and fan motor.**

Amperage draw on this equipment should not exceed normal full load or rated load amps by more than 10 percent of the values noted on the unit nameplate. Record the values obtained in this check in a log book so that a deteriorating condition in a fan motor or compressor can be detected prior to component failure.

[ ] **Clean the refrigerant coil at least once each year (or more frequently if the unit is located in a "dirty" environment) to help maintain proper unit operating efficiency.**

Safety Control Reset

All heat pumps are furnished with high-pressure and/or low-temperature or low pressure cutouts to prevent the unit from operating at abnormal conditions of temperature or water flow. The high-pressure control used on Horizontal and Vertical units is designed to open its contacts at 380 psig and automatically reclose them at 300 psig, while the contacts of the low pressure switch opens at 35 psi and reclose at 50 psi. A lockout relay is electrically linked with these cutouts, and interrupts unit heating or cooling operation until the machine is reset manually.

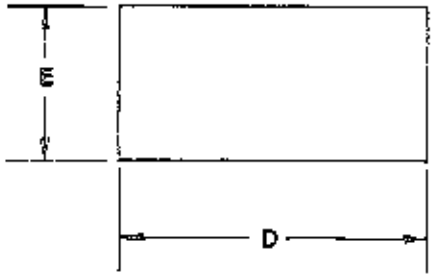
Reset is accomplished by opening and closing the circuit breaker switch, regardless of the position of the control lever(s) on the thermostat.

Note: If the unit must be reset more than twice at normal entering air temperature, be sure to check it for a dirty filter, abnormal entering water temperature, inadequate or excessive water flow, and internal malfunctions.

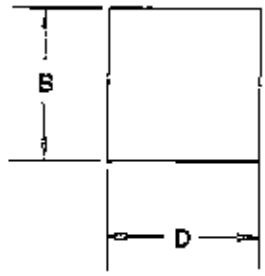
FILTERS

PART NUMBER	WHERE USED	QTY. PER UNIT
	1" FILTERS	
68544401	814 — 048/060	2
	— 096/120	4
	914 — 048/060	2
	— 096/120	4
	804 — 048/060	2
	— 096/120	4
68544402	803 — 015/019/024/030	1
	805 — 015/019/024/030	1
68544405	V160/200/240	4
	814 — 036/042	1
	914 — 036/042	1
	V60/100/113	2
68544417	803 — 009/012	1
	804 — 006/009/012	1
68544418	804 — 015/019/025/031	1
68544419	804 — 037/043	1
68544428	803 — 036/043	1
	813 — 036/043	1
	913 — 036/043	1
68544429	803 — 048/060	1
	813 — 048/060	1
	913 — 048/060	1

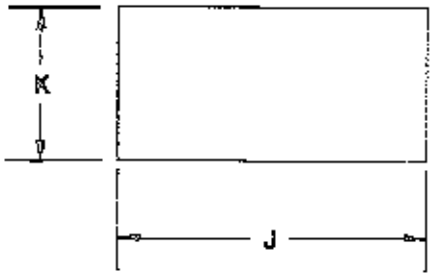
PART NUMBER	WHERE USED	QTY. PER UNIT
	2" FILTERS	
68544420	804 — 048/060	2
	— 096/120	4
	814 — 048/060	2
	— 096/120	4
	914 — 048/060	2
	— 096/120	4
68544421	V60/100/113	2
	V160/200/240	4
	803 — 240/300/360/480	8
	903 — 240/300/360/480	8
	804 — 037/043	1
68544422	803 — 048/060	1
68544423	803 — 009/012	1
	804 — 006/009/012	1
68544424	804 — 015/019	1
68544425	804 — 025/031/037/043	1
	814 — 036/042	1
68544430	803 — 015/019/024/030	1
	2" CLEANABLE FILTERS	
68301705	V160/200/240	4
	803 — 240/300/360/480	8
	903 — 240/300/360/480	8
	V60/100/113	2
	2" DISPOSABLE FILTERS	
68301700	V160/200/240	4
	803 — 240/300/360/480	8
	903 — 240/300/360/480	8
	V60/100/113	2



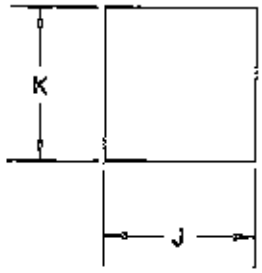
DISCHARGE DUCT COLLAR



DISCHARGE DUCT COLLAR



RETURN DUCT COLLAR



RETURN DUCT COLLAR

DIMENSIONS

MODEL NUMBER	D	E	J	K
814-009	12 1/8"	4 1/4"	22 1/8"	9 1/4"
814-012	12 1/8"	4 1/4"	22 1/8"	9 1/4"
814-018	12 1/8"	4 1/4"	22 1/8"	9 1/4"
814-019	12 5/8"	9 7/8"	25 1/8"	14 1/8"
814-023	12 5/8"	9 7/8"	25 1/8"	14 1/8"
814-027	12 5/8"	9 7/8"	25 1/8"	14 1/8"
814-031	12 5/8"	9 7/8"	25 1/8"	14 1/8"
814-036	9 3/8"	10 3/8"	23"	18 1/4"
814-042	9 3/8"	10 3/8"	23"	18 1/4"
814-048	15 1/8"	15 1/8"	29 3/4"	18 1/4"
814-060	15 1/8"	15 1/8"	29 3/4"	18 1/4"
814-096	15 1/8"*	15 1/8"*	62 3/4"	18 1/4"
814-120	15 1/8"*	15 1/8"*	62 3/4"	18 1/4"

* 2 Discharges Per Unit

MODEL NUMBER	D	B	J	K
803-009	7	9 7/8"	15 1/8"	9"
803-012	7 3/8"	9 7/8"	15 1/8"	9"
803-015	10 1/8"	7 5/8"	18 1/8"	18 3/4"
803-018	12 9/16"	9 1/16"	18 1/8"	18 3/4"
803-024	12 11/16"	11 13/16"	18 1/8"	18 3/4"
803-030	13 1/2"	10 1/2"	18 1/8"	18 3/4"
813-036	11 5/8"	12 5/8"	22"	23"
813-042	12 13/16"	13 9/16"	22"	23"
813-048	14 3/4"	15 1/2"	26"	24"
813-060	14 3/4"	15 1/2"	26"	24"

TROUBLE SHOOTING GUIDE

Trouble	Cause	Cure
Suspected insufficient water flow through condenser	Hand valves in water lines closed, or partially closed.	Open valves.
	Air in water lines	Bleed system at highest point. Loosen return fitting at offending unit to check for air.
	Obstruction in piping due to insufficient initial flushing.	Check in and out water temperature at unit on heating and cooling for normal fall or rise in temperature.
	Water circulating pump not operating.	Repair or replace.
	Plugged strainer in system piping.	Clean strainer.
Blower inoperative	No power	Check supply line Fuses, Circuit Breakers, and be sure the power is on at the conditioner. Voltage to the equipment must be within plus ten or minus five percent of voltage given on data plate, whenever conditioner is running.
	Faulty thermostat or sub-base	Short unit LV terminals R to G confirm if fan runs, repair or replace thermostat sub-base.
	Blower wheel will not turn	Make sure shipping block under blower wheel has been removed and wheel turns freely.
	Faulty capacitor (PSC motors only).	Replace capacitor.
	Loose connections at thermostat or sub-base.	Tighten.
	Loose wire in fan motor wiring.	Tighten.
	Faulty fan relay.	Replace.
	Blower motor failure	Check for open, short or grounded wiring. If confirmed replace motor.
Equipment gives Electrical shock.	Grounded electrical circuit.	Kill the power to the unit and locate with continuity checker, then eliminate.
Circuit breaker trips (or fuses blow) repeatedly.	Grounded Electrical circuit.	Disconnect blower motor leads and compressor motor leads. Check each motor for grounds by placing one probe of continuity checker on motor frame and other on each lead in turn. Replace motor if continuity shown with any lead. If motor checks no ground, locate ground in wiring or other devices, and repair or replace defective part.

Troubleshooting Guide

Trouble	Cause	Cure
Insufficient heating capacity.	Loss of refrigerant charge	Locate leak, repair and recharge or replace conditioner.
	Defective refrigerant reversing valve solenoid.	Replace solenoid.
	Water temperature too high.	Check water supply (should be between 60° & 95°)
	Insufficient air flow through room side coil due to:	
	a) Dirty room side coil.	Clean the coil.
	b) Ice on room side coil.	Turn equipment off to let ice melt (see last two items of #11 below).
	c) Dirty air filter.	Clean or replace.
	d) Obstructed duct or Discharge grilles.	Remove obstruction.
	e) Blower Motor not running.	Check as in No. 2.
	f) Blower Motor not up to speed.	Check for correct voltage.
	g) Blower slipping on motor shaft.	Oil motor if necessary. Adjust Blower Wheel position and tighten set screw.
Insufficient cooling capacity.	Accessory electric heat equipment such as duct heating or draft barrier energized due to improper control setting.	Check controls and determine proper setting.
	Window and doors in room are open.	Close them.
	Water temperature too high or flow too low.	Check for reason and correct.
	Compressor not pumping indicated by:	
	a) Low amperage.	Replace conditioner*
	b) Condenser not warm, evaporator only partially cool, or not at all.	Replace conditioner*
	Insufficient charge of refrigerant indicated by:	
	a) Low amperage	Replace conditioner*
	b) Condenser not warm.	
	c) Compressor locks out on low pressure switch.	Replace conditioner*

Troubleshooting Guide

Trouble	Cause	Cure
Water drips from conditioner.	Condensate drain plugged.	Remove obstructions to water flow.
	Condensate drain runs up hill.	Correct piping.
	Dirty filters.	Clean or replace filter.
	No trap, provided at unit outlet.	Install 1" trap leaving unit.
	Blower Motor not up to speed.	Check for correct voltage. Oil Motor, if necessary.
	Blower loose or incorrectly positioned.	Adjust.
Equipment is is noisy.	Blower rubbing against enclosure.	Adjust fan position on motor shaft or reposition fan motor bracket assembly.
	Blower Motor bearings are dry.	Lubricate with SAE No. 10 oil or replace motor.
	Loose Blower hold-down nuts on motor-bracket assembly.	Align blower assembly and tighten nuts.
	Faulty compressor (broken internal mounting springs).	Replace conditioner*
	Refrigerant absorbed in Compressor oil after extended shut down.	Noise will disappear after equipment runs a while.
	Buzzing relay.	Replace relay.
	Equipment improperly installed.	Make necessary adjustments to components.
	Loose terminal box cover on side of compressor.	Tighten.
	Loose electrical components	Fasten securely.
	Copper tubing vibrating.	Adjust by bending or applying tape.
	Loose sheet metal parts.	Tighten.
Unit vibrates or rattles.	Discharge or suction tube hitting metal surface	Bend and adjust for clearance where hitting.
	Loose or bent blower	Tighten or replace blower.
	Blower motor out of alignment, bent shaft or loose on mounting	Check alignment and tighten mounting. Replace motor if shaft is bent.

Troubleshooting Guide

Trouble	Cause	Cure
Evaporator ices over	Clogged air filter	Check filter. Clean or replace if found too dirty.
	Evaporator blower motor tripping off on overload	Check for overheated evaporator blower motor and tripped overload. Replace motor if necessary.
	Unit operating at too low room temperature	If room temperature drops below 55° F the evaporator may ice over.
	Unit operating at too low water temperature	When unit operates when water too cold it may ice over.
Entire Unit does not run	Blown fuse	Replace fuse or reset circuit breaker. (check for correct fuse).
	Broken or loose wires	Replace or tighten the wires.
	Voltage supply low	If voltage is below minimum voltage specified on dataplate, contact local power company.
	Low voltage circuit	Check 24 volt transformer for burnout or voltage less than 18 volts.
	Thermostat	Set thermostat on "COOL" and lowest temperature setting, unit should run. Set thermostat on "HEAT" and highest temperature setting, unit does run. Set fan on "RUN", fan should run. If unit should not run in all three cases, the thermostat could be wired incorrectly or faulty. To ensure faulty or miswired thermostat, disconnect thermostat wires at unit and jumper between "R", "Y", "G", and "W" terminals and units should run. Replace T-stat with correct T-stat only. A substitute may not work properly.
Blower operates but compressor does not	Compressor overload open	In all cases an "external" or "internal" temperature sensitive compressor overload is used. If the compressor dome is too hot to touch, the overload will not reset until the compressor cools down. If the compressor is cool and the overload does not reset, there may be a defective or open overload. If the overload is external, replace the overload, otherwise replace the compressor.
	Compressor motor grounded	Internal winding grounded to the compressor shell. Replace the compressor. If compressor burnout, install filter dryer at suction line.
	Compressor windings open	Check continuity of the compressor windings with an ohmmeter. If the windings are open, replace the compressor.

Troubleshooting Guide

Trouble	Cause	Cure
Blower runs but compressor does not	Voltage supply low	If voltage is below minimum voltage specified on the dataplate, contact local power company.
	Thermostat	Check setting, calibration and wiring.
	Wiring	Check for loose or broken wires at compressor, capacitor or contactor.
	High or low pressure controls	The unit could be off on the high or low pressure cut out control. Reset the thermostat to "OFF." After a few minutes turn to "COOL." If the compressor runs, unit was off on high or low pressure (see trouble for possible causes). If the unit still fails to run, check for faulty pressure switch by jumping the high and low pressure controls individually.
	Defective lockout relay	Stuck open, does not reset when power is turned off.
	Defective capacitor	Check capacitor, if defective remove, replace and rewire correctly.
	Seized compressor	Try an auxiliary capacitor in parallel with the run capacitor momentarily. If the compressor starts but the problem recurs on starting, install an auxiliary start kit. The hard-start kit is comprised of a recommended start relay and correctly sized capacitor. If the compressor still does not start, replace the compressor.
Unit off on high pressure cut-out control	Discharge pressure too high	On COOLING Cycle: Lack of, or inadequate, water flow. Entering water too warm. Scaled or plugged condenser. On HEATING Cycle: Lack of, or inadequate, air flow. Entering air too hot. Blower inoperative, clogged filter or coil, restrictions in ductwork.
	Refrigerant charge	The unit is overcharged with refrigerant. Bleed off some charge or evacuate and recharge with specified amount of R-22.
	Defective high pressure switch	Stuck open, does not reset, or has defective calibration. A replacement switch is available that attaches to the service port. When it is necessary to replace either of the pressure switches or reversing valve, wrap them with a wet cloth and direct the heat away. Excessive heat can damage them.

Troubleshooting Guide

Trouble	Cause	Cure
Unit off on low pressure cut-out control	Suction pressure too low	On COOLING Cycle: Lack of, or inadequate, air flow. Entering air too cold. Blower inoperative, clogged filter or coil, restrictions in ductwork. On HEATING Cycle: Lack of, or inadequate, water flow. Entering water too cold. Scaled or plugged condenser. When installed in an unconditioned space, (such as a garage) the unit may not start in cool weather, (approximately 50° F). In this case, it may be necessary to start the unit on cooling in cool weather for three to five minutes, then shut off and turn to heat, after one minute shut down. (It may be necessary to repeat this procedure several times, especially when a crankcase heater is not used).
Unit off on high pressure cut-out control	Discharge pressure too high	On COOLING Cycle: Lack of, or inadequate, water flow. Entering water too warm. Scaled or plugged condenser. On HEATING Cycle: Lack of, or inadequate, air flow. Entering air too hot. Blower inoperative, clogged filter or coil, restrictions in ductwork.
	Refrigerant charge	The unit is overcharged with refrigerant. Bleed off some charge or evacuate and recharge with specified amount of R-22.
	Defective high pressure switch	Stuck open, does not reset, or has defective calibration. A replacement switch is available that attaches to the service port. When it is necessary to replace either of the pressure switches or reversing valve, wrap them with a wet cloth and direct the heat away. Excessive heat can damage them.
Unit off on low pressure cut-out control	Suction pressure too low	On COOLING Cycle: Lack of, or inadequate, air flow. Entering air too cold. Blower inoperative, clogged filter or coil, restrictions in ductwork. On HEATING Cycle: Lack of, or inadequate, water flow. Entering water too cold. Scaled or plugged condenser. When installed in an unconditioned space, (such as a garage) the unit may not start in cool weather, (approximately 50° F). In this case, it may be necessary to start the unit on cooling in cool weather for three to five minutes, then shut off and turn to heat, after one minute shut down. (It may be necessary to repeat this procedure several times, especially when a crankcase heater is not used).

Troubleshooting Guide

Trouble	Cause	Cure
Unit off on low pressure cut-out control	Refrigerant charge	The unit is low in charge of refrigerant. Locate leaks, repair, evacuate and recharge with specified amount of R-22.
	Defective low pressure switch	Stuck open, does not reset or has defective calibration. A replacement switch is available that attaches to the service port. When it is necessary to replace the pressure switch wrap it with a wet cloth and direct the heat away, excessive heat can damage the pressure switch.
Unit short cycles	Thermostat	The differential is set too close in the thermostat. Readjust heat anticipator.
	Wiring and controls	Loose connections in the wiring, or control contactors defective.
	Compressor overload	Defective compressor overload, check and replace if necessary. If the compressor runs too hot it may be due to a deficient refrigerant charge.
	Thermostat	Improperly located thermostat (eg. near kitchen, sensing inaccurately the comfort level in living areas).
Water leak	Plugged condensate drain or machine out of level	Condensate drains pick up dirt or algae which can grow, causing the drain outlet to clog and condensate to overflow. Inspect and clean. Check level of the unit and adjust.
Unit heats only	Reversing valve does not shift	The solenoid valve is energized due to miswiring at the unit or the thermostat. The valve is stuck. The thermostat is in the cool position.

* Where the cure is to replace the conditioner: disconnect power supply, thermostat leads, air discharge connection, condensate connection, close water valves, and disconnect water in and out connections. Replace with spare conditioner and reconnect. Open water valves and check operation.

**Note: Before trying to correct the noise determine its cause — Blower or Compressor. Operate the Blower only. If this doesn't cause the noise, the Compressor is the source.

WSHP System Start-Up/Inspection Sheet

Installing Contractor: Use this form to thoroughly check out the system and units before and during start-up.

Job Name _____
Sales Order No. _____
Sales Engineer _____
Sales Office _____
Telephone No. _____

Job Location _____
Installing Contractor _____
Bldg. Maintenance Mgr. _____
Engineer _____

In order to minimize troubleshooting and costly unit and system failures, complete the following checks and data entries before the system is put into full operation:

Loop Water Circuit

☐ Cleaning/Flushing Completed per Specification
Date: _____
Company: _____

☐ Balanced per Specification
Date: _____
Company: _____

☐ Chemical Treatment per Specification
Date: _____
Company: _____

Loop Temperature Control Method

☐ System Panel Installed
Panel Type: _____

Checked for proper operation of:
☐ High Temperature Alarm
☐ Low Temperature Alarm
☐ No Flow Alarm
☐ Pump Sequencing Device
☐ Pump Lead/Lag Feature
☐ Cooling Tower
☐ Boiler

Heat Rejector

☐ Closed-Loop Cooling Tower
Tower Make/Model No.: _____

☐ Full Loop Water Flow thru Tower

Checked for proper operation of:
☐ Closure Dampers
☐ Spray Pump
☐ Fan Motors
☐ Sump Float Valve
☐ Sump Heater
☐ Heat Tape (on Exposed Piping)
☐ Exposed Piping Properly Insulated

☐ Open Tower w/Heat Exchanger
Tower Make/Model No.: _____
Heat Exch. Model No.: _____

☐ Tower Operates Properly
☐ Loop Water Inlet Temp. _____ F
☐ Loop Water Outlet Temp. _____ F
☐ Tower Water Inlet Temp. _____ F
☐ Tower Water Outlet Temp. _____ F

☐ Tower Loop Pumps
Quantity: _____
☐ Automatic Sequencing
☐ Alarms

Boiler

Boiler Type: _____
Boiler Model No.: _____

☐ Operating Control Setpoint: _____ F
(Should be 60 to 70 F)
☐ Hi-Limit Cutout Setpoint: _____ F
(Should be 80 F)
☐ Steps of Heating Checked in Sequence
☐ Checked Line Current to Each Heater Element (Electric Only)

System Main Circulating Pumps

Pump Make/Model No.: _____
Quantity: _____

☐ Automatic Pump Sequencing
☐ No Flow Alarm
☐ Discharge Pressure: _____ psig
☐ Suction Pressure: _____ psig
☐ Flow Rate: _____ GPM

Vibration Isolation:
☐ from Floor
☐ from Piping System

System Piping

☐ Closed Loop

Piping Materials: _____

☐ Thermometer/Aquastats Installed in Loop
☐ Correct Level in Expansion Tank

Air Vents

☐ Installed at Proper Points in System

System Make-Up Water
☐ Automatic
☐ Manual
☐ Chemically Treated

Make-Up Air System

☐ Installed per Specification

Individual Heat Pump Check

Complete this inspection for each unit:

Unit Location: _____
Unit Model No.: _____
Unit Serial No.: _____

☐ Clean Filter
☐ Clean Drain Pan
☐ Condensate Trap Installed

Unit Started in:

☐ Heating Mode ☐ Cooling Mode

☐ Entering Air Temp.:	_____ F
☐ Leaving Air Temp.:	_____ F
☐ Entering Water Temp.:	_____ F
☐ Leaving Water Temp.:	_____ F
☐ Volts (Under Load):	_____ V
☐ Fan Amps:	_____
☐ Compressor Amps:	_____

Comments: _____

Installation Checklist

The following form should be filled out by the installing contractor and returned (To avoid disassembling this manual, simply make a photographic copy of the completed form and send it to the sales office.)

Job Name _____
Sales Order No. _____
Sales Engineer _____
Sales Office _____
Telephone No. _____

Job Location _____
Installing Contractor _____
Engineer _____
Bldg. Maintenance Mgr. _____

Essential Items Checkout

☐ Voltage: _____

☐ System Water pH: _____

☐ Loop Temp. Cooling Setpoint: _____F

☐ Loop Temp. Heating Setpoint: _____F

☐ Loop Water Flushed Clean

☐ Closed-Type Cooling Tower

☐ Water Flow Rate to Heat Pump(s) Balanced

☐ Standby Pump Installed

☐ System Controls Functioning Properly

☐ Outdoor Portion of Water System Protected from Freeze-Up

☐ Loop System Free of Air

☐ Filters Clean

☐ Condensate Traps Installed

☐ Other Conditions Found: _____

ClimateMaster®

A COMBINATION OF CHP CORP. AND
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