HWY/VWY SERIES

Installation Operation and Maintenance Manual

Water Source Heat Pumps

CONTENTS **PAGE**

WARNING: READ SAFE OPERATION RULES AND MANUAL CAREFULLY

SAFE OPERATING RULES

Please take a few minutes to read our instructions before you install and use your heat pump/air conditioner. This will help you obtain the full value from your heat pump/air conditioner. It will also help you avoid any needless service costs that result from causes we cannot control and cannot cover in our warranty.

Follow these rules and the instructions carefully. Failure to do so could cause a malfunction of the heat pump/air conditioner, resulting in injury, death and/or property damage.

Check local codes and utility standards. The installation must comply with their rules. Always shut off electric power before making unit connections or removing any panels.

During installation or servicing, be extremely careful to avoid injury. Components may have sharp edges or protrusions which can cut you. Tubing and compressor contain high pressure refrigerant—they must not be exposed to high temperature or be punctured.

Form #0527I-1054 Rev. A (0501)
Supersedes Form #0527I-1054 (0300)

SAFETY LABELING AND SIGNAL WORDS

Danger, Warning and Caution
The signal words **DANGER, WARNING** and **CAUTION** are used to identify levels of hazard seriousness. The signal word **DANGER** is only used on product labels to signify an immediate hazard. The signal words **WARNING** and **CAUTION** will be used on product labels and throughout this manual and other manuals that may apply to the product.

Signal Words

DANGER – Immediate hazards which **WILL** result in severe personal injury or death.

WARNING – Hazards or unsafe practices which **COULD** result in severe personal injury or death.

CAUTION – Hazards or unsafe practices which **COULD** result in minor personal injury or product or property damage.

Signal Words in Manuals
The signal word **WARNING** is used throughout this manual in the following manner:

WARNING

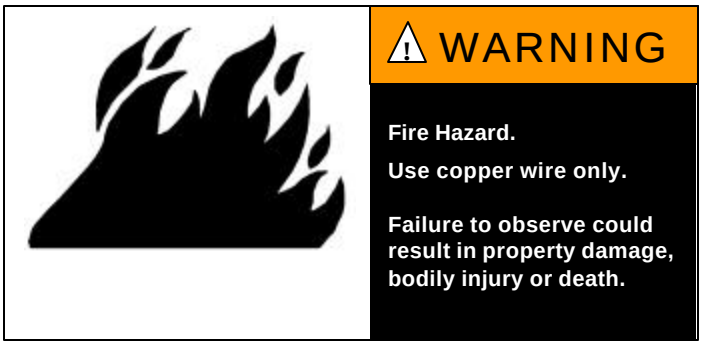
The signal word **CAUTION** is used throughout this manual in the following manner:

CAUTION

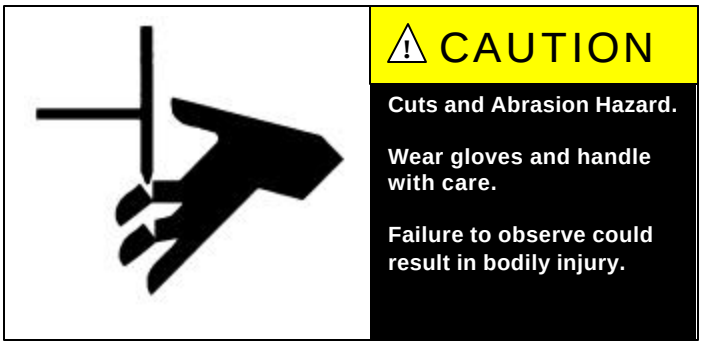
Product Labeling
Signal words are used in combination with colors and/or pictures on product labels. Following are examples of product labels with explanations of the colors used.

Danger Label
White lettering on a black background except the word **DANGER** which is white with a red background.

Warning Label
White lettering on a black background except the word **WARNING** which is white with an orange background.



Caution Label
White lettering on a black background except the word **CAUTION** which is white with a yellow background.



TRANSPORTATION and STORAGE

Upon receipt of the equipment, check carton for visible damage. Make a notation on the shipper's delivery ticket before signing. If there is any evidence of rough handling, the cartons should be opened at once to check for concealed damage. If any damage is found, notify the carrier within 48 hours to establish your claim and request their inspection and a report. The Warranty Claims Department should then be contacted.

Do not stand or transport the machines on end. For storing, each carton is marked with "up" arrows. In the event that elevator transfer makes upended positioning unavoidable, absolutely insure that the machine is in the normal upright position for at least 24 hours before operating.

Temporary storage at the job site must be indoors, completely shielded from rain, snow, etc. High or low temperatures naturally associated with weather patterns will not harm the conditioners. Excessively high temperatures of 140°F (60°C) may deteriorate certain plastic materials and cause permanent damage.

INSTALLING THE EQUIPMENT

General

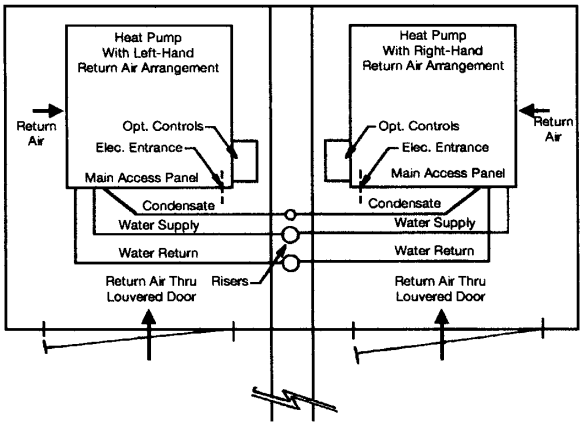
1. To prevent damage, this equipment should not be operated for supplementary heating and cooling during the construction period.
2. Inspect the carton for any specific tagging numbers as requested by the installing contractor. At this time the voltage, phase and capacity should be checked against the plans.
3. Check the unit size against the plans to be sure that the unit will be installed in the correct location.
4. Before installation, check the available space dimensions versus the dimensions of the unit.
5. Pay attention to the location and routing of water piping, and electrical wiring. The locations of these items are clearly marked on submittal drawings. These units are available with either right hand or left hand return air when facing the water and electrical connection side. Right hand return air is standard and is supplied unless otherwise specified
6. The installing contractor will find it beneficial to confer with piping, sheet metal, ceiling and electrical foremen together before installing any heat pump/conditioners.
7. We recommend that the contractor cover the conditioners with plastic film to protect the machines during finishing of the building. This is important if spraying fireproofing material on bar joists, sandblasting, spray painting and plastering operations have not been completed. If plastic film is not available, the shipping carton may be modified to cover the units during construction.

Unit location

1. Locate the unit in an area that allows for easy removal of the filter and access panels, and has enough space for service personnel to perform maintenance or repair.
2. The contractor should make sure that access has been provided including clearance for duct collars and fittings at water and electrical connections.
3. Allow adequate room around the unit for a condensate trap.
4. The VWY 12 thru 60 units can be installed "free standing" in an equipment room; however, closet installations are more common for small vertical type units. Generally, the unit is located in the corner of a closet with the nonducted return air facing 90° to the door and the major access panels facing the door as in Figure 1A. Alternatively, the unit can have a ducted return air with the opening facing the door and the major access panels facing 90° to the door as in Figure1B.

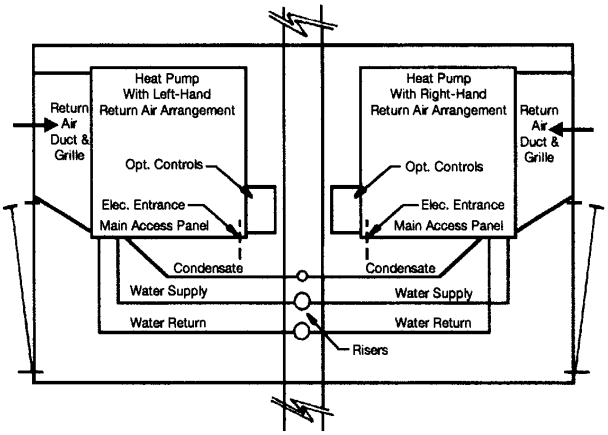
Typical Closet Installation with Ducted Return

Figure 1 A.



Typical Closet Installation with Louver Door Return

Figure 1 B.



MOUNTING HWY HORIZONTAL UNITS:

5. While horizontal units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. The rods are usually attached to the unit corners by hanger bracket kits (P/N 0760Y-0503). (See Figure #2). The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions for details.

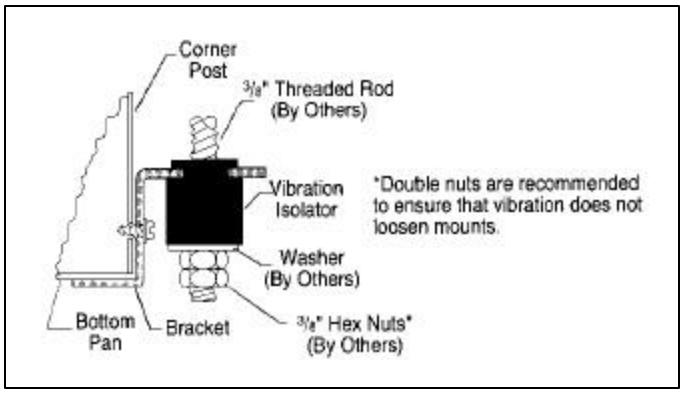


Figure 2

Units larger than six tons include an integral angle iron frame with mounting holes present. Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan if required by code, should be at least four inches larger than the bottom of the heat pump. Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc.

Some applications require an attic floor installation of the horizontal unit. In this case the unit should be set in a full size secondary drain pan on top of a vibration absorbing pad. The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing material. In both cases, a 3/4" drain connected to this secondary pan should be run to an eave at a location that will be noticeable. If the unit is located in a crawl space, the bottom of the unit must be at least 4" above grade to prevent flooding of the electrical parts due to heavy rains.

6. Before placing the unit, consider the location of condenser water lines in and out, and of the condensate drain line. Consider the accessibility and location of electrical service. Be sure the unit sits on solid floor, preferably concrete. It is better to put the unit flat on the concrete floor, on a thin rubber or carpet pad. **Do not use vibration pads under the four corners** this can allow the unit base to act like a drum and transmit noise.
7. If optional field installed controls are required, space must be provided for the enclosure to mount around the corner from the electrical entrances. Do not locate the side of the unit too close to a wall. See Figures 1A and 1B.
8. Do not locate the unit so that a return air grille is right next to the unit. This can allow blower sound to be transmitted through the return air grille, and can cause objectionable sound levels in the occupied room. It is better not to allow a direct straight line from the filter to the return grille, but to have at least one turn to help muffle the sound.
9. The VWY 12 thru 60 series is not designed for attic installation. If it is installed over an occupied space, be sure to install a secondary drain pan under the complete unit, as required by local codes. This pan must have its own drain line.
10. A secondary drain pan is always good insurance against water damage when the unit is installed in an unconditioned space, or in a utility room or closet without a floor drain. A drained secondary drain pan should always be a job requirement if not covered by code.
11. The unit may also be installed in the garage, but only if the garage will not be exposed to freezing temperatures in the winter, and if local codes permit installation in an unconditioned area.
12. Normal unit sound level must be considered when unit location is next to sleeping areas. Sound attenuation may be required. The unit is designed to be installed within the conditioned space, and that may be in a closet or utility room if adequate clearance is allowed for servicing. Most service work can be performed from the front of the unit, (side with water and electrical connections) If necessary

MOUNTING THE VWY UNITS

13. This unit contains a complete pressurized refrigeration system as well as associated electrical components required for operation. It should be installed and serviced by trained and qualified installation and service personnel. The unit is shipped from the factory as an integral unit. Model sizes cannot be separated without opening the hermetic refrigeration circuit. If the unit must be separated to facilitate installation, ensure that the refrigerant charge is recovered as required by Federal Statutes. Filter and filter racks and duct flanges are shipped in the condenser section of the unit for field installation.

    To ensure the units efficiency, serviceability and longevity, proper placement and environmental conditions must be considered prior to installation. Install the unit on a level, solid surface, preferably concrete. Compressors are mounted on rubber feet and therefore should not require insulation pads to prevent possible vibration from entering the building structure. Consider space requirements depending on unit size, floor strength, and location of water supply and disposal, space for servicing equipment and removal of air filter.

CONDENSATE DRAIN HWY UNITS

A drain line must be connected to the heat pump and pitched away from the unit a minimum of 1/8" per foot to allow the condensate to flow away from the unit. This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to insure free condensate flow. (Units are not internally trapped). A vertical air vent is sometimes required to avoid air pockets. (See Figure #3). The length of the trap depends on the amount of positive or negative pressure on the drain pan.

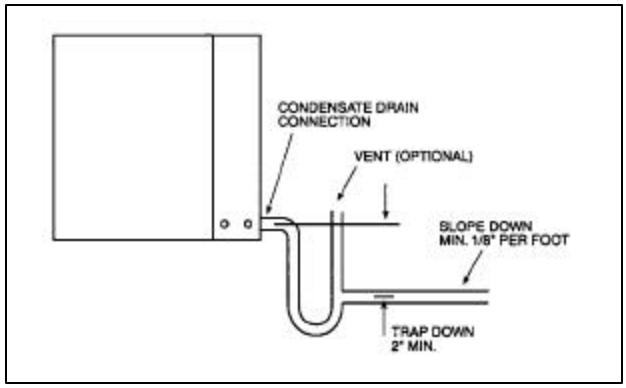


Figure 3

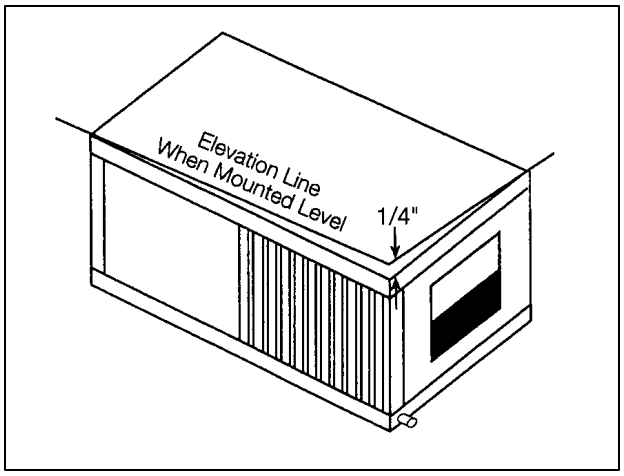


Figure 4

CONDENSATE DRAIN VWY UNITS

Before installing the unit, consider the location of the IN and OUT condenser water lines and condensate drain line and ensure that the unit is installed on a level, solid surface. Allow adequate room around the unit for a condensate trap. Do not operate the unit without a minimum 30 primed trap on drain line to prevent air passage between connections or to the atmosphere. To install the condensate drain, connect it to the pipe outlet as shown below. The air handler section is provided with a condensate connection on each end of the unit. Connect either end to the drain and plug the other end. If the unit is located in an unconditioned area, insulate the drain line. Remember to install drains in accordance with local plumbing codes.

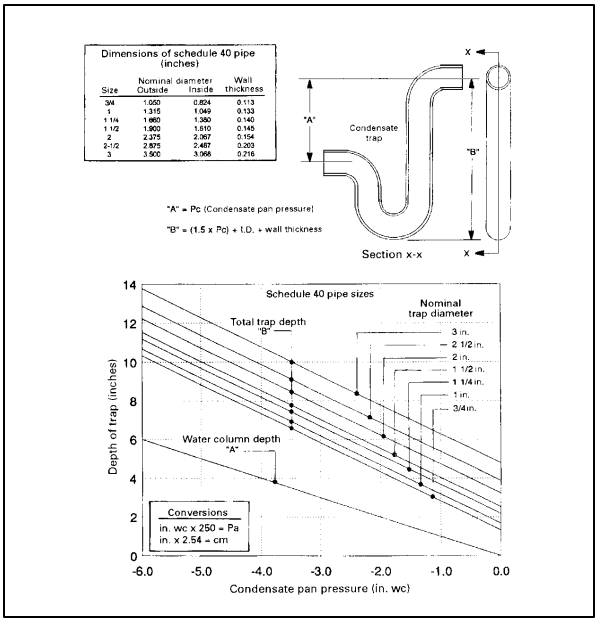


Figure 5

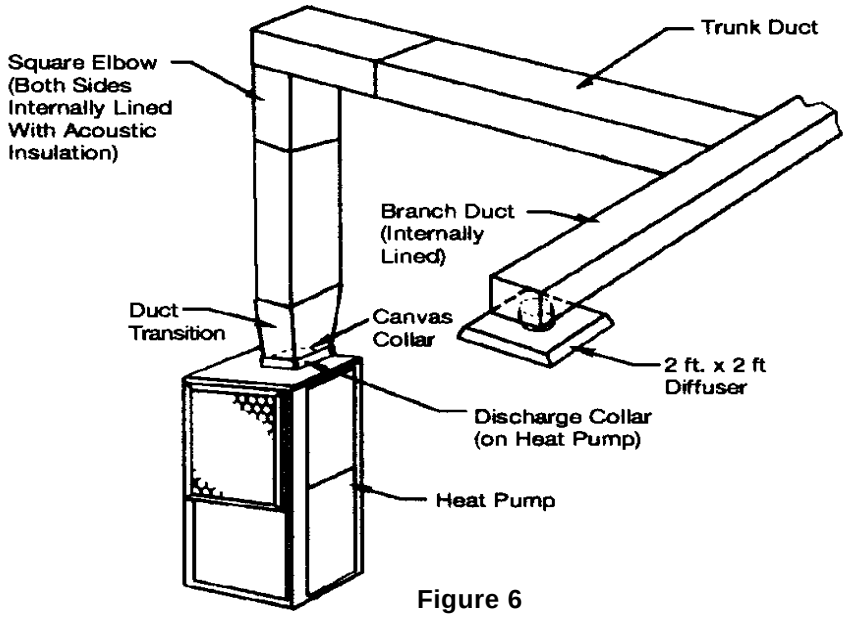


Figure 6

DUCTWORK and ATTENUATION

All ductwork should conform to industry standards of good practice as described in ASHRAE Systems Guide.

The discharge duct system will normally consist of a flexible connector at the unit, a noninsulated transition piece to the full duct size, a short run of duct, an elbow without vanes, and a trunk duct teeing into a branch circuit with discharge diffusers as shown in Figure 6. The transition piece must not have an angle greater than 30°or severe loss of air performance can result. Do not connect the full duct size to the unit without using a transition piece down to the size of the discharge collar on the unit. With metal duct material, the sides only of the elbow and entire branch duct should be internally lined with acoustic insulation for sound attenuation. Glass fiber duct board material is more absorbing and may permit omission of the flexible connector.

The ductwork should be laid out so that there is no line of sight between the conditioner discharge and the distribution diffusers. Return air ducts can be brought in through a wall grille and then to the unit. The return duct system will normally consist of a flexible connector at the unit and a trunk duct to the return air grille. With metal duct material, the return air duct should be internally lined with acoustic insulation for sound attenuation. Glass fiber duct board material is more absorbing and may permit omission of the flexible connector.

Do not use sheet metal screws directly into the unit cabinet for connection of supply or return air ductwork, especially return air ductwork which can puncture the drain pan or the air coil.

DUCT FLANGE and FILTER RACK ASSEMBLY

To ensure the units efficiency, serviceability and longevity, proper placement and environmental conditions must be considered prior to installation. Install the unit on a level, solid surface, preferably concrete. Compressors are mounted on rubber feet and therefore should not require insulation pads to prevent possible vibration from entering the building structure. Consider space requirements depending on unit size, floor strength, location of water supply and disposal, space for servicing equipment and removal of air filter

Provide sufficient room to make water, electrical and duct connections. The contractor should make sure that access has been provided including clearance for duct collars and fittings at water and electrical connections. Consider the accessibility and location of electrical service.

Locate the service access panels on the ends of the unit. There must be a 2ft MINIMUM service clearance on both ends and in the front. This will allow enough space for service personnel to perform maintenance or repairs.

Inspect the unit and shipping carton for any specific tag numbers as requested by the installing contractor. Check the voltage, phase and capacity against the plans.

Pay attention to the location and routing of water piping and electrical wiring marked on the submittal drawings. These models are designed for water piping entry through either side.

The installing contractor will find it beneficial to confer with piping, sheet metal, ceiling and electrical foremen prior to installing any conditioners.

If applicable, during the finishing/refurbishing of a building, cover the conditioner(s) with plastic film to protect the unit. This will prevent any fireproofing material, sandblasting, spray painting and plastering operations from damaging the unit.

ELECTRICAL CONNECTIONS

Electrical connections should be made through the conduit openings located in the electrical control box of the unit. Connect low voltage thermostat wires to the low voltage terminal board. To locate the contact terminals for line voltage connections, refer to the wiring diagram in the control box cover of the unit. Line voltage terminals may be located on the contactor, a separate terminal board, or in the external box, depending on the unit model.

CAUTION

All unit connections require copper wire only. Do not use aluminum wires on the terminals of this unit.

If using accessory electric heaters for installation in the ductwork, fuse them separately in accordance with the National Electric Code and Local codes and requirements.

Disconnect Switches

Most local codes have requirements regarding disconnect switches. Check the codes in your area to determine if a disconnect switch is required within sight of the unit.

Voltage Levels

Abnormally high or low voltage can damage the unit. During normal operation, ensure that voltage is within 10% of the nameplate rating. If the voltage runs consistently 10% higher or lower, contact your power company to correct and/or regulate the voltage level.

The disconnect switch must be turned to the "ON" position to provide power to unit. Once it is established that supply voltage will be maintained within the Utilization Range under all system conditions; check and calculate the phase balance condition. Calculate Percent Voltage Unbalance as follows:

$$\text{Percent Voltage Unbalance} = 100X \frac{\text{Maximum Voltage Deviation From Average Voltage}}{\text{Average Voltage}}$$

EXAMPLE — With voltage of 220, 215 and 210

Average voltage = 220 + 215 + 210

= 645 ÷ 3 = 215

Maximum voltage deviation from

Average voltage = 220 – 215 = 5

$$\text{Percent Voltage} = \frac{100 \times 5}{215} = \frac{500}{215} = 2.3\%$$

Percent voltage unbalance must not exceed (2%) two percent

Voltage Levels Continued

Contact Power Company if phase unbalance exceeds 2%. A means of disconnecting power from the unit must be placed adjacent to the unit in accordance with national electrical code or local codes. Aluminum power wire is not recommended.

Ventilation Air

Outside air may be required for ventilation. The temperature of the ventilation air must be controlled so that mixture of outside air and return air entering the conditioner does not exceed application limits. It is also general practice to close off the ventilation air system during unoccupied periods (night setback).

The ventilation air system is generally a separate building subsystem with distribution ductwork. Simple introduction of the outside air into each return air plenum chamber reasonably close to the conditioner air inlet is not only adequate, but recommended. Do not duct outside air directly to the conditioner inlet. Provide sufficient distance for thorough mixing of outside and return air.

Since filter is furnished with unit, external static pressure values as shown on pages 8-9 are available for ductwork and grilles. All ductwork must be installed according to local codes, industry standard practices and requirements. Ducts passing through unconditioned spaces must be insulated, in accordance with local codes when applicable. Do not fasten ductwork to any side of blower housing extension. See blower mounting for blower service removal. Return and supply connections are shown on the dimensional drawings.

On systems with sheet metal ductwork, be sure to install a flexible connector between the supply duct and the unit and the return duct and the unit, to prevent any vibration transmission from the unit to the duct

See tables on page 8-9 for airflow at various external static pressure values.

Heat pumps are very sensitive to reduced airflow on the heating cycle. Reduced air flow results in high compressor head pressures, inefficient operation and possible nuisance trips of the high pressure control. Always design for full airflow on heat pumps, and insist on frequent filter cleaning.

See Specifications Data table on page 8-9 for rated CFM.

EVAPORATOR BLOWER PERFORMANCE FOR VWY

BLOWER PERFORMANCE (CFM)

Available External Static Pressure (In.H_2O) including allowance for wet coil and 1" filter													
Model	**Fan Speed**	**.10**	**.20**	**.30**	**.40**	**.50**	**.60**	**.70**	**.80**	**.90**	**1.0**	**1.1**	**1.2**
VWY012	**HIGH**	425	410	390	370	350	325	300	—	—	—	—	—
	MEDIUM	410	395	375	355	330	305	—	—	—	—	—	—
	LOW	385	370	350	330	305	—	—	—	—	—	—	—
VWY018	**HIGH**	770	700	680	650	610	570	530	—	—	—	—	—
	MEDIUM	670	650	615	570	530	—	—	—	—	—	—	—
	LOW	560	520	510	—	—	—	—	—	—	—	—	—
VWY024	**HIGH**	900	850	800	760	710	690	680	670	—	—	—	—
	MEDIUM	750	720	690	670	—	—	—	—	—	—	—	—
	LOW	670	—	—			—	—	—	—	—	—	—
VWY030	**HIGH**	1250	1170	1120	1070	940	830	740	650	—	—	—	—
	MEDIUM	1050	980	920	830	760	700	—	—	—	—	—	—
	LOW	975	910	870	740	640	—	—	—	—	—	—	—
VWY036	**HIGH**	1500	1440	1370	1290	1210	1120	1000	900	—	—	—	—
	MEDIUM	1410	1350	1290	1220	1150	1060	900	—	—	—	—	—
	LOW	1290	1250	1200	1150	1080	100	—	—	—	—	—	—
VWY042	**HIGH**	1780	1680	1580	1470	1350	1160	920	730	—	—	—	—
	MEDIUM	1680	1570	1500	1370	1230	1010	880	600	—	—	—	—
	LOW	1570	1500	1410	1320	1170	940	800	—	—	—	—	—
VWY048	**HIGH**	2160	2090	2030	1960	1870	1800	1730	1680	1640	1600	1550	1500
	MEDIUM	2110	2040	1990	1910	1820	1760	1690	1630	1600	—	—	—
	LOW	2060	1990	1950	1860	1760	1710	1640	—	—	—	—	—
VWY054	**HIGH**	2160	2090	2030	1960	1870	1800	1730	1680	1640	1600	1550	1500
	MEDIUM	2110	2040	1990	1910	1820	1760	1690	1630	1600	—	—	—
	LOW	2060	1990	1950	1860	1760	1710	1640	—	—	—	—	—
VWY060	**HIGH**	2160	2090	2030	1960	1870	1800	1730	1680	1640	1600	1550	1500
	MEDIUM	2110	2040	1990	1910	1820	1760	1690	1630	1600	—	—	—
	LOW	2060	1990	1950	1860	1760	1710	1640	—	—	—	—	—
HWY072	**HIGH**												
	MEDIUM										—	—	—
	LOW								—	—	—	—	—

Notes: 1. Tables can be interpolated but not extrapolated.

BLOWER PERFORMANCE FOR HWY

BLOWER PERFORMANCE (CFM)

Available External Static Pressure (In.H_2O) including allowance for wet coil and 1" filter													
Model	**Fan Speed**	**.10**	**.20**	**.30**	**.40**	**.50**	**.60**	**.70**	**.80**	**.90**	**1.0**	**1.1**	**1.2**
HWY007	**HIGH**	410	380	350	315	280	210	—	—	—	—	—	—
	MEDIUM	390	360	330	300	260	—	—	—	—	—	—	—
	LOW	370	340	295	250	—	—	—	—	—	—	—	—
HWY009	**HIGH**	410	380	350	315	280	210	—	—	—	—	—	—
	MEDIUM	390	360	330	300	260	—	—	—	—	—	—	—
	LOW	370	340	295	250	—	—	—	—	—	—	—	—
HWY012	**HIGH**	425	410	390	370	350	325	300	—	—	—	—	—
	MEDIUM	410	395	375	355	330	305	—	—	—	—	—	—
	LOW	385	370	350	330	305	—	—	—	—	—	—	—
HWY015	**HIGH**	540	515	490	460	430	390	340	—	—	—	—	—
	MEDIUM	410	400	390	380	360	330	—	—	—	—	—	—
	LOW	300	290	280	—	—	—	—	—	—	—	—	—
HWY018	**HIGH**	770	700	680	650	610	570	530	—	—	—	—	—
	MEDIUM	670	650	615	570	530	—	—	—	—	—	—	—
	LOW	560	520	510	—	—	—	—	—	—	—	—	—
HWY024	**HIGH**	900	850	800	760	710	690	680	670	—	—	—	—
	MEDIUM	750	720	690	670	—	—	—	—	—	—	—	—
	LOW	670	—	—	—	—	—	—	—	—	—	—	—
HWY030	**HIGH**	1,400	1,380	1,300	1,240	1,180	1,100	1,020	930	—	—	—	—
	MEDIUM	1,290	1,260	1,200	1,150	1,100	1,030	950	—	—	—	—	—
	LOW	1,160	1,130	1090	1,050	1,000	940	850	—	—	—	—	—
HWY036	**HIGH**	1,500	1,440	1,370	1,290	1,210	1,120	1,000	900	—	—	—	—
	MEDIUM	1,410	1,350	1,290	1,220	1,150	1,060	900	—	—	—	—	—
	LOW	1,290	1,250	120	1,150	1,080	1,000	—	—	—	—	—	—
HWY042	**HIGH**	1,780	1,680	1,580	1,470	1,350	1,160	920	730	—	—	—	—
	MEDIUM	1,680	1,570	1,500	1,370	1,230	1,010	880	600	—	—	—	—
	LOW	1,570	1,500	1,410	1,320	1,170	940	800	—	—	—	—	—
HWY048	**HIGH**	2,160	2,090	2,030	1,960	1,870	1,800	1,730	1,680	1,640	1,600	1,550	1,500
	MEDIUM	2,110	2,040	1,990	1,910	1,820	1,760	1,690	1,630	1,600	—	—	—
	LOW	2,060	1,990	1,950	1,860	1,760	1,710	1,640	—	—	—	—	—
HWY060	**HIGH**	2,160	2,090	2,030	1,960	1,870	1,800	1,730	1,680	1,640	1,600	1,550	1,500
	MEDIUM	2,110	2,040	1,990	1,910	1,820	1,760	1,690	1,630	1,600	—	—	—
	LOW	2,060	1,990	1,950	1,860	1,760	1,710	1,640	—	—	—	—	—

Notes: 1. Tables can be interpolated but not extrapolated.

BLOWER PERFORMANCE FOR HWY072

HWY072 – External Static Pressure – Inches H_2O														
	0.10		**0.30**		**0.05**		**0.70**		**0.90**		**1.10**		—	—
CFM	**RPM**	**BPH**	**RPM**	**BHP**	**RPM**	**BHP**	**RPM**	**BNP**	**RPM**	**BHP**	**RPM**	**BHP**	—	—
1900	800	0.45	870	0.50	940	0.60	1000	0.65	1060	0.71	1130	0.75	—	—
2000	830	0.50	900	0.68	970	0.65	1030	0.70	1090	0.80	1150	0.83	—	—
2100	890	0.60	960	0.68	1025	0.78	1080	0.83	1150	0.90	1210	0.95	—	—
2200	920	0.70	990	0.77	1050	0.85	1110	0.92	1180	0.97	1230	1.10	—	—
2300	960	0.76	1020	0.83	1080	0.92	1130	1.00	1190	1.10	1250	1.17	—	—
2400	980	0.83	1040	0.94	1100	1.00	1160	1.10	1220	1.17	1280	1.25	—	—
2500	1010	0.92	1070	1.05	1130	1.14	1180	1.20	1240	1.30	1290	1.40	—	—
2600	1030	1.07	1100	1.13	1150	1.20	1210	1.30	1250	1.40	1310	1.45	—	—
2700	1070	1.15	1130	1.25	1180	1.33	1240	1.40	1280	1.50	1340	1.60	—	—

BLOWER PERFORMANCE FOR HWY096 and HWY120

HWY096 – External Static Pressure – Inches H_2O														
	0.10		0.30		0.05		0.70		0.90		1.10		—	—
CFM	RPM	BPH	RPM	BHP	RPM	BHP	RPM	BNP	RPM	BHP	RPM	BHP	—	—
3100	970	1.3	1029	1.4	1087	1.5	1143	1.7	1197	1.8	1249	1.9	—	—
3200	973	1.3	1033	1.5	1090	1.6	1145	1.7	1198	1.9	1250	2.0	—	—
3300	978	1.4	1036	1.5	1092	1.7	1147	1.8	1200	2.0	1251	2.1	—	—
3400	982	1.5	1040	1.6	1096	1.8	1149	1.9	1201	2.1	1252	2.2	—	—
3500	987	1.5	1044	1.7	1099	1.8	1152	2.0	1204	2.1	1254	2.3	—	—
3600	992	1.6	1048	1.8	1103	1.9	1155	2.1	1206	2.2	1256	2.4	—	—
3700	998	1.7	1053	1.9	1107	2.0	1159	2.2	1209	2.3	1258	2.5	—	—
3800	1003	1.8	1058	1.9	1111	2.1	1163	2.3	1212	2.4	1261	2.6	—	—
3900	1009	1.9	1063	2.0	1116	2.2	1167	2.3	1216	2.5	1264	2.7	—	—

HWY120 – External Static Pressure – Inches H_2O														
	0.10		0.30		0.05		0.70		0.90		1.10		—	—
CFM	RPM	BPH	RPM	BHP	RPM	BHP	RPM	BNP	RPM	BHP	RPM	BHP	—	—
3700	1039	1.8	1094	2.0	1146	2.1	1197	2.3	1246	2.4	1295	2.6	—	—
3800	1045	1.9	1098	2.1	1150	2.2	1200	2.4	1250	2.5	1297	2.7	—	—
3900	1050	2.0	1103	2.1	1154	2.3	1204	2.5	1252	2.6	1300	2.8	—	—
4000	1056	2.1	1108	2.2	1159	2.4	1208	2.6	1256	2.7	1302	2.9	—	—
4100	1062	2.2	1113	2.3	1163	2.5	1212	2.7	1260	2.9	1306	3.1	—	—
4200	1069	2.3	1119	2.4	1168	2.6	1217	2.9	1263	3.1	1309	3.2	—	—
4300	1075	2.4	1125	2.5	1174	2.7	1221	3.1	1268	3.2	1313	3.3	—	—
4400	1082	2.5	1131	2.7	1179	2.8	1226	3.2	1272	3.3	1317	3.4	—	—

BLOWER MOUNTING

CAUTION — Make sure that all blower to cabinet retaining screws or straps are removed prior to installation. **DO NOT** fasten ductwork to any side of the blower extension.

The blower housing is mounted to the blower top with two reverse bend channels on each side. By raising the blower assembly from the bottom by approximately one inch, a screwdriver blade or other flat object can be placed between the two channels on one side allowing the blower assembly to lower into the evaporator compartment. Lifting the assembly again separates the channels on the rear side, permitting the blower assembly to be removed for servicing after the wires are disconnected.

To replace, simply line up the blower housing with the discharge opening in the top panel and. push up until the channels both snap into place. Lower the assembly and reconnect the wires.

FAN SPEED ADJUSTMENT MODEL HWY072 THRU HWY120

Adjust the adjustable pulley for the correct cfm and the correct belt tension. The evaporator and condenser blower pulley alignment and adjustment is factory set for standard RPM. The blower RPM may require adjustment dependant upon job site conditions. If blower adjustments are necessary, select the appropriate RPM for the application from the Blower Performance Table on page 8 and make adjustments as follows:

1. Loosen belt tension by adjusting the fan motor slide base.
2. Loosen the moveable flange setscrew(s) with a hex wrench.
3. Adjust the pulley size by rotating the adjustable flange on the threaded hub. Fan speed will increase when the adjustable flange is adjusted toward the fixed flange. Fan speed will decrease when the adjustable flange is adjusted away from the fixed flange.
4. Once the adjustable pulley has been open or closed the required number of turns, tighten the moveable flange set screw(s) onto the flat surface of the pulley hub.
5. Re-alignment of the pulleys should be made with a straight edge when the fan pulley is loose on the motor shaft. After re-alignment of pulleys, be certain that pulley set screw(s) are tightened onto the blower shaft flat. Belt tension can be re-adjusted by moving the motor slide base forward or backward as required to provide belt tension of 2/3 inch depression per foot of belt span between pulleys
   a) Ensure the unit is off at the electrical disconnect switch
   b) Remove evaporator top panel.
   c) Loosen and remove the evaporator blower belts.
   d) Remove vertical struts from blower housing.
   e) Remove blower panel from the front of the evaporator section **with blower assembly attached**.
4. Position the blower panel in the unit's top. Secure the blower panel to the unit with sheet metal screws. Tighten all of the panel screws
5. Align screw holes and reinstall the vertical blower housing supports with sheet metal screws in existing holes.
6. Reinstall, realign and adjust the evaporator blowerbelts.

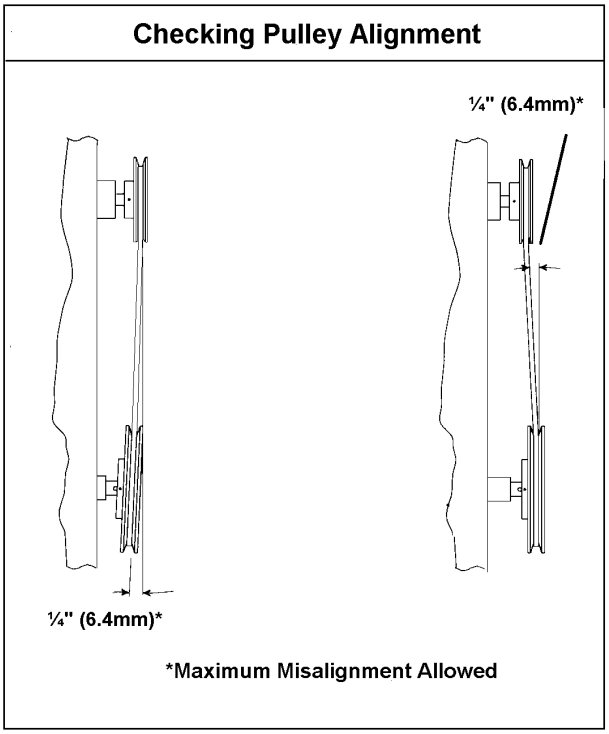


Figure 7

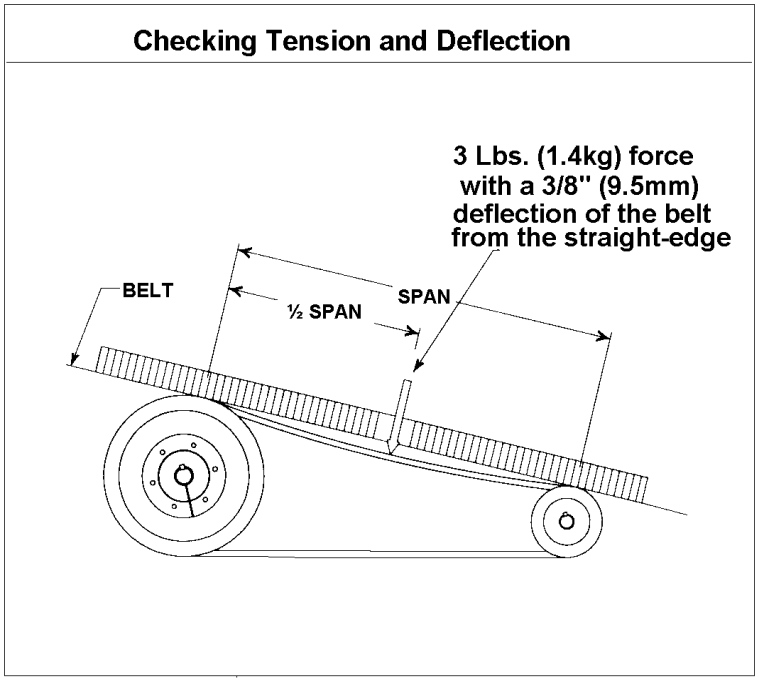


Figure 8

WATER FLOW REQUIREMENTS

Units used on closed loop systems do not require water valves. If there is an adequate supply of constant temperature, non-scaling water at 55°F or above, most water systems will not use water control valves. Water valves may be used to furnish more precise water flow on both heating and cooling cycles, increasing or decreasing flow as required to maintain unit operating pressures at design levels. The cooling control valve operates to maintain proper compressor discharge pressure on the cooling cycle. The heating control valve operates to maintain correct compressor suction pressure on the heating cycle. Install both valves with the flow direction arrow on the valve body pointing in the direction of water flow to the unit heat exchanger. Attach both refrigerant pressure capillaries with a special valve (field supplied) to the unit. To connect the two water regulating valve capillary tubes, a brass tee is required and must be field supplied. Remember to follow all local plumbing codes when connecting water lines.

NOTE: Water valves add to the total pressure head of a system and increases the required pumping power. This could possibly reduce the systems overall efficiency and performance and should be contemplated prior to installation. See the Manufacturer's Pressure Drop Data.

WATER REGULATING VALVES:

Care must be taken when connecting the capillary tubing from the valve assemblies to the unit refrigeration tubing if water regulating valves are used. The refrigeration circuit connection is normally the unit service access Schrader type valve. To connect to this valve, a pin depressing refrigeration tee is required and must be field supplied.

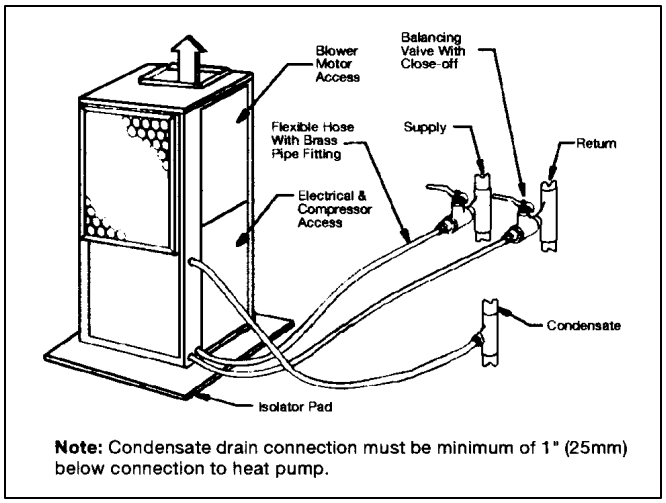
Set the water regulating valves as follows: The cooling valve functions to maintain discharge pressure at the desired level. Follow all valve instructions and adjust it to maintain the discharge pressure given in the Cooling Performance Table on each individual specification sheet.

The heating valve functions to maintain desired suction pressure on heating. Follow all reverse acting heating valve instructions and adjust it to maintain the suction pressure given in the Heating Performance Table on each individual specification sheet.

To Measure Water Flow:

To measure water pressure attach an appropriate pressure measuring instrument at the inlet and outlet pressure taps on each water connection.

Applicable ARI standards states that a rated flow gives a 10 degree F water temperature rise on the cooling cycle, at rated CFM, 80°F dry bulb and 67°F wet bulb across the evaporator coil. For most closed loop applications, the recommended flow rate will vary depending on outdoor design wet-bulb temperature.



Note: Condensate drain connection must be minimum of 1" (25mm) below connection to heat pump.

Figure 9

CONDENSER WATER FLOW DATA
HWY

Model	Design Δ T*	GPM	Pressure Drop	
			PSI	FT. HD.
007	8°	2.1	2.1	4.9
	10°	1.9	1.7	3.9
	12°	1.6	1.2	2.7
	14°	1.4	0.9	2.0
	16°	1.2	0.6	1.4
	20°	0.9	0.4	0.9
009	8°	2.8	3.6	8.4
	10°	2.5	3.5	8.1
	12°	2.2	2.0	4.7
	14°	1.9	1.4	3.3
	16°	1.6	0.9	2.1
	20°	1.3	0.5	1.2
012	8°	3.4	6.5	15.0
	10°	3.0	5.3	12.2
	12°	2.6	3.6	8.2
	14°	2.2	2.5	5.7
	16°	1.8	1.6	3.7
	20°	1.5	1.0	2.3
015	8°	3.4	6.5	15.0
	10°	3.0	5.3	12.2
	12°	2.6	3.6	8.2
	14°	2.2	2.5	5.7
	16°	1.8	1.6	3.7
	20°	1.5	1.0	2.3
018	8°	5.5	11.2	25.9
	10°	4.9	8.7	20.1
	12°	4.3	6.7	15.4
	14°	3.6	4.8	11.1
	16°	3.0	3.3	7.5
	20°	2.4	2.0	4.6
024	8°	6.7	6.2	14.2
	10°	6.0	5.1	11.8
	12°	5.3	3.7	8.6
	14°	4.6	2.6	6.1
	16°	3.7	1.7	4.0
	20°	3.0	1.1	2.5
030	8°	10.2	4.6	10.5
	10°	8.1	3.1	7.1
	12°	6.8	2.2	5.0
	14°	5.8	1.7	3.9
	16°	5.1	1.4	3.3
	20°	4.0	0.9	2.1
036	8°	10.6	7.2	24.4
	10°	8.6	4.7	17.7
	12°	7.1	3.1	11.9
	14°	6.1	2.3	8.7
	16°	5.3	2.0	6.7
	20°	4.3	1.2	4.9

Model	Design Δ T*	GPM	Pressure Drop	
			PSI	FT. HD.
042	8°	13.6	10.6	14.0
	10°	10.9	7.7	9.0
	12°	9.1	5.2	6.3
	14°	7.8	3.8	4.6
	16°	6.8	2.9	3.5
	20°	5.5	2.1	2.3
048	8°	15.4	6.1	21.9
	10°	12.3	3.9	14.0
	12°	10.3	2.7	9.7
	14°	8.8	2.0	7.2
	16°	7.7	1.5	5.5
	20°	6.2	1.0	3.5
060	8°	19.4	9.5	21.9
	10°	15.5	6.1	14.0
	12°	12.9	4.2	9.7
	14°	11.1	3.1	7.2
	16°	9.7	2.4	5.5
	20°	7.8	1.5	3.5
072	8°	22.7	5.2	12.0
	10°	18.0	3.5	8.0
	12°	15.0	2.6	6.0
	14°	12.8	2.0	4.5
	16°	11.4	1.5	3.5
	20°	9.0	1.1	2.5
096	8°	32.2	8.4	19.2
	10°	26.0	5.7	13.1
	12°	21.7	4.6	10.6
	14°	18.6	2.9	6.6
	16°	16.1	1.9	4.4
	20°	12.9	1.0	2.3
120	8°	34.8	9.4	21.6
	10°	28.0	6.5	14.9
	12°	23.2	4.6	10.6
	14°	19.3	3.1	7.2
	16°	17.4	2.4	5.5
	20°	13.8	1.1	2.5

CONDENSER WATER FLOW DATA
VWY

MODEL	Design ΔT*	GPM	Pressure Drop	
			PSI	FT. HD.
012	8°	3.4	6.5	15.0
	10°	3.0	5.3	12.2
	12°	2.6	3.6	8.2
	14°	2.2	2.5	5.7
	16°	1.8	1.6	3.7
	20°	1.5	1.0	2.3
018	8°	5.5	11.2	25.9
	10°	4.9	8.7	20.1
	12°	4.3	6.7	15.4
	14°	3.6	4.8	11.1
	16°	3.0	3.3	7.5
	20°	2.4	2.0	4.6
024	8°	6.7	6.2	14.2
	10°	6.0	5.1	11.8
	12°	5.3	3.7	8.6
	14°	4.6	2.6	6.1
	16°	3.7	1.7	4.0
	20°	3.0	1.1	2.5
030	8°	10.2	4.6	10.5
	10°	8.1	3.1	7.1
	12°	6.8	2.2	5.0
	14°	5.8	1.7	3.9
	16°	5.1	1.4	3.3
	20°	4.0	0.9	2.1
036	8°	10.6	7.2	24.4
	10°	8.6	4.7	17.7
	12°	7.1	3.1	11.9
	14°	6.1	2.3	8.7
	16°	5.3	2.0	6.7
	20°	4.3	1.2	4.9
042	8°	13.6	10.6	14.0
	10°	10.9	7.7	9.0
	12°	9.1	5.2	6.3
	14°	7.8	3.8	4.6
	16°	6.8	2.9	3.5
	20°	5.5	2.1	2.3
048	8°	15.4	6.1	21.9
	10°	12.3	3.9	14.0
	12°	10.3	2.7	9.7
	14°	8.8	2.0	7.2
	16°	7.7	1.5	5.5
	20°	6.2	1.0	3.5
054	8°	19.4	9.5	21.9
	10°	15.5	6.1	14.0
	12°	12.9	4.2	9.7
	14°	11.1	3.1	7.2
	16°	9.7	2.4	5.5
	20°	7.8	1.5	3.5

MODEL	Design ΔT*	GPM	Pressure Drop	
			PSI	FT. HD.
060	8°	19.4	9.5	21.9
	10°	15.5	6.1	14.0
	12°	12.9	4.2	9.7
	14°	11.1	3.1	7.2
	16°	9.7	2.4	5.5
	20°	7.8	1.5	3.5
072	8°	22.7	5.2	12.0
	10°	18.0	3.5	8.0
	12°	15.0	2.6	6.0
	14°	12.8	2.0	4.5
	16°	11.4	1.5	3.5
	20°	9.0	1.1	2.5

PIPING AND WATER CONNECTIONS

1. It is recommended to connect all units to the supply and return piping in a two-pipe reverse return configuration. A reverse return system is inherently self-balancing and requires only trim balancing where multiple quantities of units with different flow and pressure drop characteristics are connected to the same loop. To check for proper water balance, take a differential temperature reading across the water connections. To insure proper water flow, the differential should be 10°F (5°C) to 14°F (8°C). A direct return system may also work acceptably, but proper water flow balancing is more difficult to achieve and maintain.
2. The piping can be steel, copper or PVC connected to a field supplied, copper adapter brazed to the unit water circuit.
3. Connect supply and return runouts to the unit with short lengths of high pressure flexible hose for sound attenuation. One end of the hose should have a swivel fitting to facilitate removal for service. Hard piping can also be brought directly to the unit, although it is not recommended because of possible sound transmission to the conditioned space. The hard piping must have unions to facilitate unit removal.
4. Supply and return shutoff valves are required at each conditioner. The return valve is used for balancing and should have a “memory stop” so that it can always be closed off, but only reopened to the proper position for the flow required.
5. Units should not be connected to the supply and return piping until the water system has been completely cleaned and flushed. After cleaning and flushing, the initial connection should have all valves wide open in preparation for water system flushing.
6. Condensate piping can be steel, copper or PVC. Each unit is supplied with a 3/4" FPT.
7. The condensate disposal piping must have a trap and the piping must be pitched away from the unit no less than 1/4" inch per foot (21mm per meter). Generally, the condensate trap is made of PVC threaded into the unit. See Figure 3. A piece of vinyl hose from the trap to the drain line is used for simple removal. A complete copper or PVC condensate system can also be used. Union fittings in the copper lines should be applied to facilitate removal.
8. No point in the drain system may be above the drain connection of any unit.
9. Do not install automatic flow controlled devices prior to system cleaning and flushing.
10. A high point of the piping system must be vented.
11. Check local codes to determine if dielectric fittings are required.

Cleaning and Flushing System

1. Clean and flush the water circulating system of all construction dirt and debris prior to operating any conditioner. If the conditioners are equipped with water, electric or pressure operated shutoff valves, the supply and return runouts must be connected together at each conditioner location. This will prevent the introduction of dirt into the unit. Additionally, pressure operated valves only open when the compressor is operating.

Piping short circuit for loop cleaning

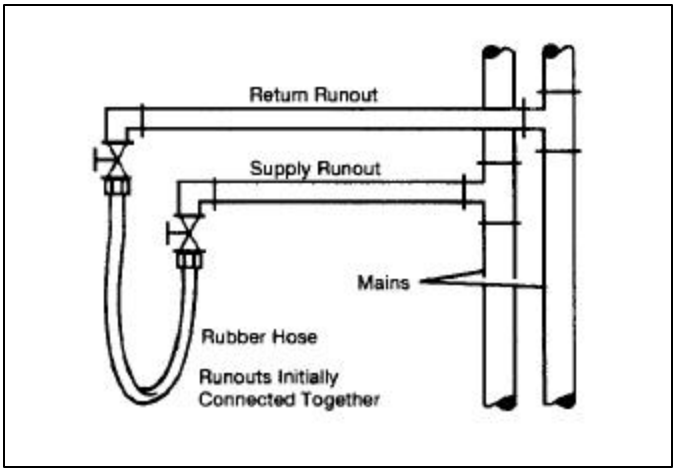


Figure 10

2. Fill the system at the city water makeup connection with all air vents open. After filling, vents should be closed. The contractor should start main circulator with the pressure reducing valve makeup open. To ensure circulation through all components of the system, check vents in sequence to bleed off any trapped air. Make sure the power to the heat rejecter unit is off, and that the supplementary heat control is set at 80°F (27°C). With the water circulating, the contractor should check and repair any leaks in the piping. Open the drains at the lowest point(s) in the system for initial flush and blow-down and make sure the city water fill valves are set to make up water at the same rate. Check the pressure gauge at pump suction and manually adjust the makeup to hold the same positive steady pressure both before and after opening the drain valves. Continue to flush for at least two hours, or longer if required, until clear, clean drain water is seen.
3. Since many states and localities have banned the introduction of phosphates into their sewage systems, such as Trisodium Phosphate, a deaning agent used during the flushing process, it is recommended to simply flush with warm 80°F (27°C) water for a longer period of time.
4. Make sure the supplemental heater and circulator pump are shut off. Open all drains and vents to completely drain down the system. Connect the short circuited supply and return runouts to the conditioner supply and return connections.Teflon tape is recommended over pipe dope for pipe thread connections. Do not use sealers at the swivel flare connections of hoses.

5. Refill the system with clean water. Test the litmus paper for acidity, and treat as required to leave the water slightly alkaline (pH 7.5 to 8.5). The specified percentage of antifreeze may also be added at this time. Use commercial grade antifreeze designed for HVAC systems only. Do not use automotive grade antifreeze.
6. Set the system control and alarm panel heat add setpoint to 70°F (21°C) and the heat rejection setpoint to 85°F (29°C). Supply power to all motors and start the circulating pumps. After full flow has been established through all components, including the heat rejecter (regardless of season), and air vented and loop temperatures stabilized, each of the conditioners will be ready for check, test and start-up and for air and water balancing.

COOLING TOWER WITH BOILER APPLICATION

During the cooling operation, heated water is rejected into the closed loop water piping and circulated through the cooling tower. The cooling tower provides evaporative cooling to this heated water.

During the heating operation, the chilled water from the unit picks up heat from the closed loop water piping. However, in most applications a boiler is required to heat the water to maintain a high enough water temperature. The cooling tower must maintain water temperatures of 55°F to 95°F.

Some important considerations when using a closed loop system are:

1. Pressure and temperature ports are recommended in both supply and return lines for balancing the system.
2. Accurately set the water flow by measuring the pressure drop across the heat exchanger. Refer to page 13 & 17 for water flow and pressure drop information.
3. In case of emergency service requirements, ball valves in the water piping will isolate the unit from the closed loop water piping to the tower.
4. Never leave the water piping exposed because water lines will freeze.
5. Flush all field piping (both supply and return) before connecting to the unit. All air must be eliminated from the closed loop.
6. Chemical water treatment is necessary on open cooling towers to ensure the water is free of corrosive minerals and calcium build up.
7. On closed loop systems, an initial chemical treatment of the system is advised to prevent bacteria growth.

SYSTEM CHECKOUT:

After completing the installation, and before energizing the unit, the following system checks should be made:

- Verify that the supply voltage to the heat pump is in accordance with the nameplate ratings.
- Make sure that all electrical connections are tight and secure.
- Check the electrical fusing and wiring for the correct size.
- Verify that the low voltage wiring between the thermostat and the unit is correct.
- Verify that the water piping is complete and direction is correct.
- Check that the water flow is correct, and adjust if necessary.
- Check the blower for free rotation, and that it is secured to the shaft.
- Verify that vibration isolation has been provided.
- Unit is serviceable. Be certain that all access panels are secured in place.

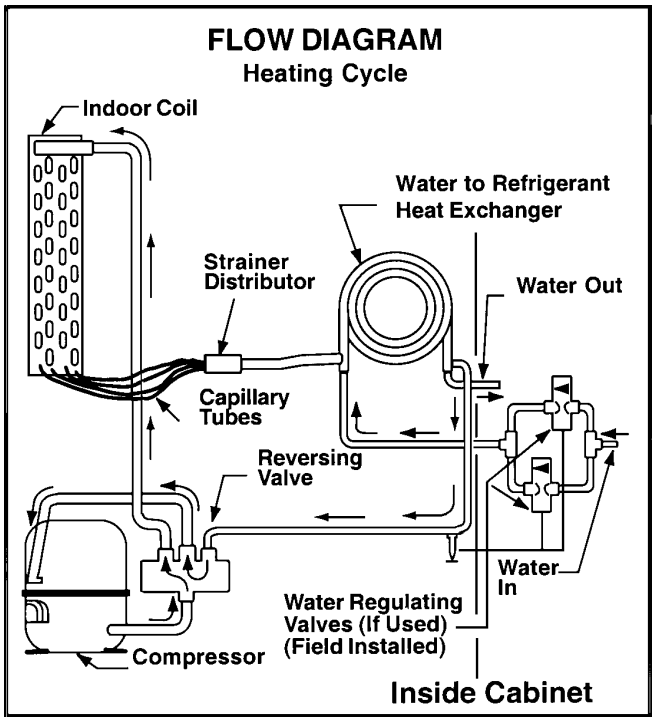
THERMOSTAT

The low voltage thermostat should be located on an inside wall approximately 5 feet above the floor where it will not be subject to drafts, sun exposure, or heat from electrical fixtures or appliances. The thermostat should be located as close as possible to the return air. The hole in the wall behind the thermostat should be just large enough for the wire to pass through. If the hole is larger, seal or patch the hole.

Follow the thermostat manufacturer's instructions enclosed with the thermostat for general installation procedures, such as leveling the thermostat, setting the heat anticipator and calibration. See wiring diagram on page 21 for field wiring connections

.

WATER CONNECTIONS



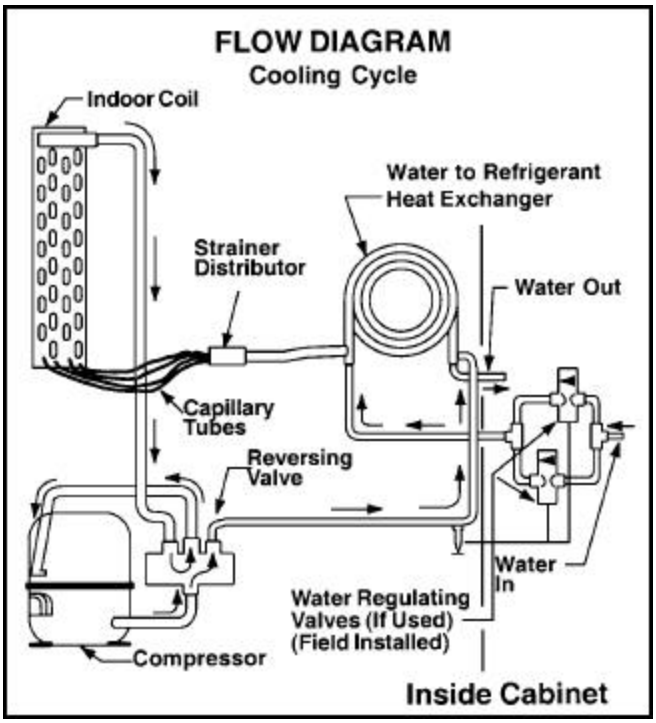


Figure 11

VWY PERFORMANCE DATA

COOLING									HEATING							
				Heat	Suction Pressure		Discharge Pressure					Heat	Suction Pressure		Discharge Pressure	
Model	EWT °F	GPM	LWT °F	Reject Btuh	Min	Max	Min	Max	EWT °F	GPM	LWT °F	Absorb Btuh	Min	Max	Min	Max
VWY012	55°	1.5	73.4	13.710	72	82	143	163	55°	2.6	47.8	9.380	60	70	184	204
		2.2	67.7	13,960	70	80	138	158		3.0	48.7	9,480	61	71	185	205
		3.0	64.6	14,310	72	82	135	155		3.4	49.4	9,550	61	71	185	205
	65°	1.5	83.2	13,630	73	83	171	191	70°	2.6	60.9	11,760	78	88	199	219
		2.2	77.7	13,950	76	86	164	184		3.0	62.0	11,890	79	89	200	220
		3.0	74.5	14,240	71	81	156	176		3.4	62.9	11,960	80	90	200	220
	75°	2.6	85.7	13,790	73	83	195	215	80°	2.2	68.6	12,520	90	100	209	229
		3.0	84.4	14.070	74	84	195	215		2.6	70.2	12.710	92	102	210	230
		3.4	83.4	14.190	72	82	190	210		3.0	71.5	12.740	93	103	211	231
	85°	2.6	95.6	13.770	75	85	211	231								
		3.0	94.4	14,000	73	83	209	229								
		3.4	93.4	14,230	75	85	208	228								
	95°	2.6	105.2	13,200	75	85	255	275								
		3.0	103.9	13,250	76	86	255	275								
		3.4	103.4	14,150	76	86	254	274								
VWY018	55°	2.4	73.8	22.450	75	85	141	161	55°	4.3	47.8	15.450	60	70	199	219
		3.6	67.6	22,670	75	85	137	157		4.9	48.6	15,630	61	71	200	220
		4.9	64.3	22,790	75	85	131	151		5.5	49.2	15,780	61	71	200	220
	65°	2.4	83.9	22,590	77	87	170	190	70°	4.3	61.0	19,300	78	88	216	236
		3.6	77.6	22,620	76	86	159	179		4.9	62.0	19,530	80	90	217	237
		4.9	74.3	22,730	76	86	153	173		5.5	62.8	19,770	80	90	218	238
	75°	4.3	85.5	22,460	77	87	179	199	80°	3.6	68.8	20,140	90	100	227	247
		4.9	84.2	22.500	77	87	177	197		4.3	70.4	20.610	92	102	229	249
		5.5	83.2	22.560	77	87	176	196		4.9	71.5	20.820	94	104	230	250
	85°	4.3	95.3	21.980	78	88	207	227								
		4.9	94.0	22,010	78	88	204	224								
		5.5	93.0	22,040	78	88	203	223								
	95°	4.3	104.7	20,820	80	90	236	256								
		4.9	103.5	20,820	80	90	234	254								
		5.5	102.6	20,890	80	90	233	253								
VWY024	55°	3.0	75.4	30.420	57	67	156	176	55°	5.3	47.8	18.990	57	67	201	221
		4.6	68.5	31,000	77	87	151	171		6.0	48.6	19,180	57	67	202	222
		6.0	65.5	31,240	77	87	146	166		6.7	49.0	19,960	60	70	205	225
	65°	3.0	85.2	30,170	80	90	185	205	70°	5.3	61.0	23,810	73	83	219	239
		4.6	78.4	30,770	79	89	172	192		6.0	62.0	24,020	74	84	220	240
		6.0	75.4	31,060	79	89	167	187		6.7	62.5	25,060	78	88	225	245
	75°	5.3	86.7	30,780	80	90	193	213	80°	4.6	69.1	24,970	85	95	231	251
		6.0	85.3	30.890	80	90	191	211		5.3	70.4	25.330	86	96	233	253
		6.7	84.3	31.160	80	90	183	203		6.0	71.4	25.590	88	98	234	254
	85°	5.3	96.4	30.090	82	92	219	239								
		6.0	95.1	30,200	82	92	217	237								
		6.7	94.1	30,470	81	91	209	229								
	95°	5.3	105.8	28,480	84	94	248	268								
		6.0	104.6	28,550	84	94	246	266								
		6.7	103.6	28,810	83	93	238	258								
VWY030	55°	4.0	76.1	42.040	59	69	148	168	55°	6.8	47.6	25.160	59	69	233	253
		5.8	69.7	42.500	70	80	145	165		8.1	48.7	25.520	60	70	234	254
		8.1	65.6	42.850	70	80	138	158		10.2	49.9	25.850	61	71	236	256
	65°	4.0	85.8	41.390	72	82	179	199	70°	6.8	60.8	31.110	76	86	258	278
		5.8	79.5	41.960	72	82	168	188		8.1	62.2	31.620	78	88	260	280
		8.1	75.5	42.290	71	81	161	181		10.2	63.7	32.170	79	89	262	282
	75°	6.8	87.2	41.280	73	83	188	208	80°	5.8	69.0	31.770	88	98	274	294
		8.1	85.3	41.440	73	83	185	205		6.8	70.5	32.320	90	100	276	296
		10.2	83.2	41.610	72	82	181	201		8.1	71.1	35.770	91	101	278	298
	85°	6.8	96.9	40.130	74	84	215	235								
		8.1	95.0	40.300	74	84	212	232								
		10.2	93.0	40.480	74	84	209	229								
	95°	6.8	106.5	38.910	76	86	245	265								
		8.1	104.7	39.070	76	86	242	262								
		10.2	102.7	39.250	76	86	238	258								

VWY PERFORMANCE DATA Continued

COOLING									HEATING							
Model	EWT °F	GPM	LWT °F	Heat Reject Btuh	Suction Pressure Min	Suction Pressure Max	Discharge Pressure Min	Discharge Pressure Max	EWT °F	GPM	LWT °F	Heat Absorb Btuh	Suction Pressure Min	Suction Pressure Max	Discharge Pressure Min	Discharge Pressure Max
VWY036	55°	4.3	75.7	44.390	77	87	153	173	55°	7.1	47.5	26.590	58	68	208	228
		6.1	69.8	45,020	77	87	149	169		8.6	48.7	27,040	59	69	209	229
		8.6	65.6	45,420	77	87	142	162		10.6	49.8	27,380	60	70	210	230
	65°	4.3	85.7	44,220	79	89	183	203	70°	7.1	60.6	33,300	75	85	228	248
		6.1	79.7	44,740	78	88	171	191		8.6	62.1	33,850	76	86	230	250
		8.6	75.5	45,170	78	88	164	184		10.6	63.5	34,390	78	88	231	251
	75°	7.1	87.6	44,670	80	90	192	212	80°	6.1	68.6	34,700	86	96	241	261
		8.6	85.5	44.890	80	90	188	208		7.1	70.0	35.190	87	97	243	263
		10.6	83.5	45.090	79	89	185	205		8.6	71.6	35.860	89	99	245	265
	85°	7.1	97.0	42.540	81	91	219	239								
		8.6	95.0	42,800	81	91	215	235								
		10.6	93.1	42,990	81	91	212	232								
	95°	7.1	106.6	41,160	83	93	249	269								
		8.6	104.7	41,380	83	93	245	265								
		10.6	102.9	41,570	83	93	242	262								
VWY042	55°	5.5	74.9	54.560	75	85	161	181	55°	9.1	47.9	32.190	54	64	209	229
		7.8	69.2	55,340	75	85	157	177		10.9	49.0	32,650	55	65	210	230
		10.9	65.3	55,890	75	85	151	171		13.6	50.1	33,130	56	66	211	231
	65°	5.5	84.9	54,490	77	87	190	210	70°	9.1	61.1	40,370	70	80	228	248
		7.8	79.2	55,170	76	86	179	199		10.9	62.5	40,950	71	81	230	250
		10.9	75.3	55,700	76	86	172	192		13.6	63.9	41,490	72	82	231	251
	75°	9.1	87.2	55,160	78	88	201	221	80°	7.8	69.1	42,400	81	91	241	261
		10.9	85.2	55.420	78	88	197	217		9.1	70.5	43.020	82	92	242	262
		13.6	83.2	55.630	78	88	193	213		10.9	72.0	43.600	84	94	244	264
	85°	9.1	96.9	53.950	80	90	227	247								
		10.9	95.0	54,210	80	90	224	244								
		13.6	93.1	54,530	80	90	221	241								
	95°	9.1	106.3	51,020	82	92	257	277								
		10.9	104.4	51,230	81	91	254	274								
		13.6	102.6	51,530	81	91	250	270								
VWY048	55°	6.2	75.3	62.660	73	83	158	178	55°	10.3	47.7	37.640	54	64	204	224
		8.8	69.5	63,600	73	83	154	174		12.3	48.8	38,200	55	65	205	225
		12.3	65.5	64,230	73	83	147	167		15.4	49.9	38,830	56	66	207	227
	65°	6.2	85.3	62,600	76	86	188	208	70°	10.3	60.8	47,080	70	80	223	243
		8.8	79.5	63,360	75	85	176	196		12.3	62.2	47,840	72	82	225	245
		12.3	75.4	64,010	74	84	169	189		15.4	63.7	48,550	73	83	226	246
	75°	10.3	87.4	63,490	76	86	197	217	80°	8.8	68.7	49,400	81	91	235	255
		12.3	85.4	63.790	76	86	194	214		10.3	70.2	50.190	83	93	237	257
		15.4	83.4	64.170	76	86	190	210		12.3	71.7	50.980	84	94	259	259
	85°	10.3	97.1	62.110	78	88	224	244								
		12.3	95.2	62,400	78	88	220	240								
		15.4	93.2	62,780	78	88	217	237								
	95°	10.3	106.5	58,910	80	90	254	274								
		12.3	104.7	59,120	80	90	250	270								
		15.4	102.8	59,480	80	90	246	266								
VWY054	55°	6.9	75.8	71.380	75	85	152	172	55°	11.6	47.8	41.510	53	63	211	231
		9.9	69.6	72,200	75	85	149	169		13.5	48.7	42,060	54	64	212	232
		13.5	65.8	72,630	75	85	143	163		17.3	50.1	42,640	55	65	214	234
	65°	6.9	85.4	70,270	76	86	181	201	70°	11.6	61.3	50,410	71	81	229	249
		9.9	79.4	70,830	76	86	170	190		13.5	62.4	51,200	72	82	231	251
		13.5	75.6	71,340	75	85	164	184		17.3	64.0	52,000	74	84	232	252
	75°	11.6	87.1	70,030	77	87	191	211	80°	9.9	68.7	55,670	82	92	241	261
		13.5	85.4	70.200	76	86	188	208		11.6	70.2	56.360	84	94	243	263
		17.3	83.2	70.470	76	86	184	204		13.5	71.5	57.360	86	96	244	264
	85°	11.6	97.0	69.280	78	88	218	238								
		13.5	95.3	69,340	78	88	215	235								
		17.3	93.1	69,540	78	88	211	231								
	95°	11.6	106.8	68,190	79	89	248	268								
		13.5	105.2	68,320	79	89	245	265								
		17.3	103.0	68,570	79	89	241	261								

VWY PERFORMANCE DATA Continued

COOLING									HEATING							
Model	EWT °F	GPM	LWT °F	Heat Reject Btuh	Suction Pressure Min	Suction Pressure Max	Discharge Pressure Min	Discharge Pressure Max	EWT F°	GPM	LWT F°	Heat Absorb Btuh	Suction Pressure Min	Suction Pressure Max	Discharge Pressure Min	Discharge Pressure Max
VWY060	55°	7.8	75.0	77.510	73	83	154	174	55°	12.9	47.4	48.870	52	62	215	235
		11.1	69.1	78,020	72	82	151	171		15.5	48.6	49,540	53	63	216	236
		15.5	65.2	78,460	72	82	144	164		19.4	49.8	50,190	54	64	217	237
	65°	7.8	84.9	77,260	74	84	183	203	70°	12.9	60.5	61,120	69	79	233	253
		11.1	79.1	77,940	74	84	173	193		15.5	62.0	61,870	70	80	234	254
		15.5	75.1	78,340	73	83	166	186		19.4	63.5	62,800	71	81	236	256
	75°	12.9	87.1	77,770	74	84	194	214	80°	11.1	68.4	64,350	80	90	245	265
		15.5	85.1	77.980	74	84	191	211		12.9	69.9	65.170	81	91	247	267
		19.4	83.1	78.090	74	84	187	207		15.5	71.4	66.020	83	93	249	269
	85°	12.9	96.9	76.240	76	86	222	242								
		15.5	94.9	76,350	75	85	218	238								
		19.4	92.9	76,480	75	85	215	235								
	95°	12.9	106.2	72,240	77	87	253	273								
		15.5	104.4	72,380	77	87	249	269								
		19.4	102.5	72,600	77	87	245	265								
VWY072	55°	9.0	77.3	99.890	71	81	154	174	55°	15.0	47.3	57.340	55	65	208	228
		12.8	70.8	100,800	71	81	151	171		18.0	48.5	58,000	56	66	209	229
		18.0	66.3	101,360	71	81	145	165		22.7	49.8	59,150	57	67	210	230
	65°	9.0	86.8	979,30	72	82	185	205	70°	15.0	60.7	69,380	72	82	227	247
		12.8	80.5	988,30	72	82	174	194		18.0	62.2	70,220	73	83	228	248
		18.0	76.1	992,90	72	82	168	188		22.7	63.7	71,690	75	85	230	250
	75°	15.0	88.0	971,00	73	83	196	216	80°	12.8	68.0	76,810	84	94	240	260
		18.0	85.9	973.60	73	83	193	213		15.0	69.6	77.790	85	95	241	261
		22.7	83.6	977.10	73	83	189	209		18.0	71.2	78.500	86	96	243	263
	85°	15.0	97.8	952.70	74	84	225	245								
		18.0	95.7	954,80	74	84	222	242								
		22.7	93.5	95740	74	84	217	237								
	95°	15.0	107.5	936,70	75	85	256	276								
		18.0	105.5	938,40	75	85	254	274								
		22.7	103.3	940,40	75	85	249	269								

EWT — Entering Water Temperature

LWT — Leaving Water Temperature

HWY PERFORMANCE DATA

COOLING									HEATING							
				Heat	Suction Pressure		Discharge Pressure					Heat	Suction Pressure		Discharge Pressure	
Model	EWT °F	GPM	LWT °F	Reject Btuh	Min	Max	Min	Max	EWT °F	GPM	LWT °F	Absorb Btuh	Min	Max	Min	Max
HWY007	55°	0.9	76.4	9.600	77	87	151	171	55°	1.6	47.3	6.100	64	74	190	210
		1.4	69.2	9,900	75	85	138	158		1.9	48.4	6,200	65	75	191	211
		1.9	65.6	10,000	75	85	133	153		2.1	49.0	6,300	66	76	192	212
	65°	0.9	86.2	9,500	78	88	172	192	70°	1.6	60.3	7,700	83	93	207	227
		1.4	79.1	9,800	77	87	160	180		1.9	61.8	7,800	85	95	209	229
		1.9	75.5	9,900	77	87	154	174		2.1	62.4	7,900	86	96	209	229
	75°	1.6	87.3	9,800	79	89	180	200	80°	1.4	68.2	8,200	96	106	217	237
		1.9	85.5	9.900	79	89	177	197		1.6	69.6	8.300	98	108	219	239
		2.1	84.5	9.900	79	89	175	195		1.9	71.0	8.500	100	110	221	241
	85°	1.6	87.0	9.600	81	91	205	225								
		1.9	85.3	9,700	82	92	203	223								
		2.1	84.3	9,700	81	91	201	221								
	95°	1.6	86.4	9,100	84	94	233	253								
		1.9	84.7	9,200	84	94	231	251								
		2.1	83.9	9,300	84	94	229	249								
HWY009	55°	1.3	73.4	11.900	61	71	155	175	55°	2.2	47.5	8.200	61	71	205	225
		1.9	67.8	12.100	66	76	145	165		2.5	48.3	8.300	62	72	206	226
		2.5	64.8	12.200	66	76	140	160		2.8	49.1	8.200	60	70	205	225
	65°	1.3	83.2	11.800	69	79	177	197	70°	2.2	60.6	10.300	79	89	225	245
		1.9	77.7	12.000	68	78	167	187		2.5	61.6	10.400	80	90	226	246
		2.5	74.7	12.100	68	78	162	182		2.8	62.5	10.400	79	89	225	245
	75°	2.2	86.0	12.100	70	80	189	209	80°	1.9	68.5	10.900	90	100	236	256
		2.5	84.7	12.100	70	80	186	206		2.2	70.0	11.000	92	102	238	258
		2.8	83.7	12.200	70	80	185	205		2.5	71.1	11.100	94	104	240	260
	85°	2.2	85.7	11.700	72	82	215	235								
		2.5	84.5	11.800	72	82	213	233								
		2.8	83.5	11.900	72	82	211	231								
	95°	2.2	85.0	11.000	74	84	244	264								
		2.5	83.9	11.100	74	84	242	262								
		2.8	83.0	11.200	74	84	240	260								
HWY012	55°	1.5	75.2	15.100	53	63	160	180	55°	2.6	47.4	9.900	53	63	201	221
		2.2	69.0	15,300	66	76	156	176		3.0	48.3	10,000	54	64	203	223
		3.0	65.3	15,400	66	76	150	170		3.4	48.9	10,300	55	65	203	223
	65°	1.5	85.3	15,200	58	68	181	201	70°	2.6	60.5	12,300	69	79	221	241
		2.2	79.0	15,300	63	73	175	195		3.0	61.6	12,500	71	81	223	243
		3.0	75.3	15,400	49	59	154	174		3.4	62.6	12,600	72	82	224	244
	75°	2.6	86.7	15,200	61	71	195	215	80°	2.2	68.2	12,900	80	90	233	253
		3.0	85.3	15.400	74	84	204	224		2.6	69.9	13.100	82	92	236	256
		3.4	84.2	15.500	64	74	190	210		3.0	71.1	13.300	83	93	238	258
	85°	2.6	86.4	14.800	61	71	218	238								
		3.0	85.1	15,100	69	79	221	241								
		3.4	84.0	15,200	69	79	219	239								
	95°	2.6	86.0	14,200	68	78	253	273								
		3.0	84.6	14,300	66	76	249	269								
		3.4	83.5	14,400	66	76	247	267								
HWY018	55°	2.4	75.7	24.740	76	86	138	158	55°	4.3	47.5	16.110	60	70	193	213
		3.6	69.0	25,040	76	86	134	154		4.9	48.3	16,300	61	71	194	214
		4.9	65.3	25,230	76	86	128	148		5.5	49.0	16,460	62	72	195	215
	65°	2.4	85.6	24,650	77	87	167	187	70°	4.3	60.7	20,020	79	89	210	230
		3.6	78.9	24,970	77	87	155	175		4.9	61.7	20,250	80	90	211	231
		4.9	75.3	25,140	77	87	150	170		5.5	62.5	20,440	81	91	212	232
	75°	4.3	86.6	24,830	78	88	179	199	80°	3.6	68.3	20,940	91	101	221	241
		4.9	85.2	24.900	78	88	177	197		4.3	70.0	21.410	93	103	222	242
		5.5	84.1	24.930	77	87	175	195		4.9	71.1	21.640	94	104	224	244
	85°	4.3	96.4	24.310	79	89	202	222								
		4.9	95.0	24,420	79	89	200	220								
		5.5	93.9	24,420	79	89	197	217								
	95°	4.3	105.7	22,910	80	90	231	251								
		4.9	104.4	22.950	80	90	228	248								
		5.5	103.4	22.990	80	90	226	246								

HWY PERFORMANCE DATA Continued

COOLING									HEATING							
				Heat	Suction Pressure		Discharge Pressure					Heat	Suction Pressure		Discharge Pressure	
Model	EWT °F	GPM	LWT °F	Reject Btuh	Min	Max	Min	Max	EWT °F	GPM	LWT °F	Absorb Btuh	Min	Max	Min	Max
HWY024	55°	3.0	75.4	30.420	57	67	156	176	55°	5.3	47.8	18.990	57	67	201	221
		4.6	68.5	31,000	77	87	151	171		6.0	48.6	19,180	57	67	202	222
		6.0	65.5	31,240	77	87	146	166		6.7	49.0	19,960	60	70	205	225
	65°	3.0	85.2	30,170	80	90	185	205	70°	5.3	61.0	23,810	73	83	219	239
		4.6	78.4	30,770	79	89	172	192		6.0	62.0	24,020	74	84	220	240
		6.0	75.4	31,060	79	89	167	187		6.7	62.5	25,060	78	88	225	245
	75°	5.3	86.7	30,780	80	90	193	213	80°	4.6	69.1	24,970	85	95	231	251
		6.0	85.3	30.890	80	90	191	211		5.3	70.4	25.330	86	96	233	253
		6.7	84.3	31.160	80	90	183	203		6.0	71.4	25.590	88	98	234	254
	85°	5.3	96.4	30.090	82	92	219	239								
		6.0	95.1	30,200	82	92	217	237								
		6.7	94.1	30,470	81	91	209	229								
	95°	5.3	105.8	28,480	84	94	248	268								
		6.0	104.6	28,550	84	94	246	266								
		6.7	103.6	28,810	83	93	238	258								
HWY030	55°	4.0	75.6	41.110	59	69	148	168	55°	6.8	47.4	25.810	59	69	233	253
		5.8	69.4	41,560	70	80	145	165		8.1	48.5	26,180	60	70	234	254
		8.1	65.4	41,900	70	80	138	158		10.2	49.8	26,520	61	71	236	256
	65°	4.0	20.5	40,850	72	82	179	199	70°	6.8	60.5	32,160	76	86	258	278
		5.8	14.3	41,410	72	82	168	188		8.1	61.9	32,680	78	88	260	280
		8.1	10.3	41,740	71	81	161	181		10.2	63.5	33,260	79	89	262	282
	75°	6.8	12.2	41,320	73	83	188	208	80°	5.8	68.3	33,740	88	98	274	294
		8.1	10.3	41.480	73	83	185	205		6.8	69.9	34.320	90	100	276	296
		10.2	8.2	41.650	72	82	181	201		8.1	71.4	34.880	91	101	278	298
	85°	6.8	11.9	40.290	74	84	215	235								
		8.1	10.0	40,460	74	84	212	232								
		10.2	8.0	40,640	74	84	209	229								
	95°	6.8	11.2	37,990	76	86	245	265								
		8.1	9.5	38.150	76	86	242	262								
		10.2	7.5	38.330	76	86	238	258								
HWY036	55°	4.3	75.7	44.390	77	87	153	173	55°	7.1	47.5	26.590	58	68	208	228
		6.1	69.8	45,020	77	87	149	169		8.6	48.7	27,040	59	69	209	229
		8.6	65.6	45,420	77	87	142	162		10.6	49.8	27,380	60	70	210	230
	65°	4.3	85.7	44,220	79	89	183	203	70°	7.1	60.6	33,300	75	85	228	248
		6.1	79.7	44,740	78	88	171	191		8.6	62.1	33,850	76	86	230	250
		8.6	75.5	45,170	78	88	164	184		10.6	63.5	34,390	78	88	231	251
	75°	7.1	87.6	44,670	80	90	192	212	80°	6.1	68.6	34,700	86	96	241	261
		8.6	85.5	44.890	80	90	188	208		7.1	70.0	35.190	87	97	243	263
		10.6	83.5	45.090	79	89	185	205		8.6	71.6	35.860	89	99	245	265
	85°	7.1	97.0	42.540	81	91	219	239								
		8.6	95.0	42,800	81	91	215	235								
		10.6	93.1	42,990	81	91	212	232								
	95°	7.1	106.6	41,160	83	93	249	269								
		8.6	104.7	41.380	83	93	245	265								
		10.6	102.9	41.570	83	93	242	262								
HWY042	55°	5.5	74.9	54.560	75	85	161	181	55°	9.1	47.9	32.190	54	64	209	229
		7.8	69.2	55,340	75	85	157	177		10.9	49.0	32,650	55	65	210	230
		10.9	65.3	55,890	75	85	151	171		13.6	50.1	33,130	56	66	211	231
	65°	5.5	84.9	54,490	77	87	190	210	70°	9.1	61.1	40,370	70	80	228	248
		7.8	79.2	55,170	76	86	179	199		10.9	62.5	40,950	71	81	230	250
		10.9	75.3	55,700	76	86	172	192		13.6	63.9	41,490	72	82	231	251
	75°	9.1	87.2	55,160	78	88	201	221	80°	7.8	69.1	42,400	81	91	241	261
		10.9	85.2	55.420	78	88	197	217		9.1	70.5	43.020	82	92	242	262
		13.6	83.2	55.630	78	88	193	213		10.9	72.0	43.600	84	94	244	264
	85°	9.1	96.9	53.950	80	90	227	247								
		10.9	95.0	54,210	80	90	224	244								
		13.6	93.1	54,530	80	90	221	241								
	95°	9.1	106.3	51,020	82	92	257	277								
		10.9	104.4	51.230	81	91	254	274								
		13.6	102.6	51.530	81	91	250	270								

HWY PERFORMANCE DATA Continued

COOLING									HEATING							
				Heat	Suction Pressure		Discharge Pressure					Heat	Suction Pressure		Discharge Pressure	
Model	EWT °F	GPM	LWT °F	Reject Btuh	Min	Max	Min	Max	EWT °F	GPM	LWT °F	Absorb Btuh	Min	Max	Min	Max
HWY048	55°	6.2	75.3	62.660	73	83	158	178	55°	10.3	47.7	37.640	54	64	204	224
		8.8	69.5	63,600	73	83	154	174		12.3	48.8	38,200	55	65	205	225
		12.3	65.5	64,230	73	83	147	167		15.4	49.9	38,830	56	66	207	227
	65°	6.2	85.3	62,600	76	86	188	208	70°	10.3	60.8	47,080	70	80	223	243
		8.8	79.5	63,360	75	85	176	196		12.3	62.2	47,840	72	82	225	245
		12.3	75.4	64,010	74	84	169	189		15.4	63.7	48,550	73	83	226	246
	75°	10.3	87.4	63,490	76	86	197	217	80°	8.8	68.7	49,400	81	91	235	255
		12.3	85.4	63.790	76	86	194	214		10.3	70.2	50.190	83	93	237	257
		15.4	83.4	64.170	76	86	190	210		12.3	71.7	50.980	84	94	259	259
	85°	10.3	97.1	62.110	78	88	224	244								
		12.3	95.2	62,400	78	88	220	240								
		15.4	93.2	62,780	78	88	217	237								
	95°	10.3	106.5	58,910	80	90	254	274								
		12.3	104.7	59.120	80	90	250	270								
		15.4	102.8	59.480	80	90	246	266								
HWY060	55°	7.8	75.0	77.510	73	83	154	174	55°	12.9	47.4	48.870	52	62	215	235
		11.1	69.1	78,020	72	82	151	171		15.5	48.6	49,540	53	63	216	236
		15.5	65.2	78,460	72	82	144	164		19.4	49.8	50,190	54	64	217	237
	65°	7.8	84.9	77,260	74	84	183	203	70°	12.9	60.5	61,120	69	79	233	253
		11.1	79.1	77,940	74	84	173	193		15.5	62.0	61,870	70	80	234	254
		15.5	75.1	78,340	73	83	166	186		19.4	63.5	62,800	71	81	236	256
	75°	12.9	87.1	77,770	74	84	194	214	80°	11.1	68.4	64,350	80	90	245	265
		15.5	85.1	77.980	74	84	191	211		12.9	69.9	65.170	81	91	247	267
		19.4	83.1	78.090	74	84	187	207		15.5	71.4	66.020	83	93	249	269
	85°	12.9	96.9	76.240	76	86	222	242								
		15.5	94.9	76,350	75	85	218	238								
		19.4	92.9	76,480	75	85	215	235								
	95°	12.9	106.2	72,240	77	87	253	273								
		15.5	104.4	72.380	77	87	249	269								
		19.4	102.5	72.600	77	87	245	265								
HWY072	55°	9.0	77.3	99.890	71	81	154	174	55°	15.0	47.3	57.340	55	65	208	228
		12.8	70.8	100,800	71	81	151	171		18.0	48.5	58,000	56	66	209	229
		18.0	66.3	101,360	71	81	145	165		22.7	49.8	59,150	57	67	210	230
	65°	9.0	86.8	979,30	72	82	185	205	70°	15.0	60.7	69,380	72	82	227	247
		12.8	80.5	988,30	72	82	174	194		18.0	62.2	70,220	73	83	228	248
		18.0	76.1	992,90	72	82	168	188		22.7	63.7	71,690	75	85	230	250
	75°	15.0	88.0	971,00	73	83	196	216	80°	12.8	68.0	76,810	84	94	240	260
		18.0	85.9	973.60	73	83	193	213		15.0	69.6	77.790	85	95	241	261
		22.7	83.6	977.10	73	83	189	209		18.0	71.2	78.500	86	96	243	263
	85°	15.0	97.8	952.70	74	84	225	245								
		18.0	95.7	954,80	74	84	222	242								
		22.7	93.5	95740	74	84	217	237								
	95°	15.0	107.5	936,70	75	85	256	276								
		18.0	105.5	938.40	75	85	254	274								
		22.7	103.3	940.40	75	85	249	269								

HWY PERFORMANCE DATA Continued

COOLING									HEATING							
				Heat	Suction Pressure		Discharge Pressure					Heat	Suction Pressure		Discharge Pressure	
Model	EWT °F	GPM	LWT °F	Reject Btuh	Min	Max	Min	Max	EWT °F	GPM	LWT °F	Absorb Btuh	Min	Max	Min	Max
HWY096	55°	12.9	75.6	132.320	66	76	141	161	55°	21.7	48.0	75.780	59	69	255	275
		18.6	69.4	133.670	66	76	138	158		26.0	49.1	76.400	60	70	256	276
		26.0	65.4	134.540	66	76	132	152		32.2	50.2	77.300	61	71	257	277
	65°	12.9	85.1	129.440	67	77	170	190	70°	21.7	61.4	92.770	78	88	276	296
		18.6	79.1	130.710	67	77	160	180		26.0	62.8	93.770	79	89	278	298
		26.0	75.2	131.540	66	76	153	173		32.2	64.0	95.520	81	91	280	300
	75°	21.7	86.9	128.330	68	78	180	200	80°	18.6	68.8	103.380	90	100	290	310
		26.0	84.9	128.670	68	78	177	197		21.7	70.3	104.680	92	102	292	312
		32.2	83.0	129.010	67	77	174	194		26.0	71.8	105.880	94	104	294	314
	85°	21.7	86.6	125.580	69	79	207	227								
		26.0	84.7	125.900	69	79	203	223								
		32.2	82.9	126.220	69	79	200	220								
	95°	21.7	86.4	123.070	70	80	236	256								
		26.0	84.5	123.360	70	80	232	252								
		32.2	82.7	123.650	70	80	229	249								
HWY120	55°	13.8	77.0	150.890	69	79	154	174	55°	23.2	47.7	84.040	55	65	255	275
		19.3	70.8	152,250	69	79	151	171		28.0	48.9	85,160	56	66	257	277
		28.0	66.0	153,310	69	79	144	164		34.8	50.0	86,350	57	67	258	278
	65°	13.8	86.5	148,020	71	81	185	205	70°	23.2	61.0	103,550	73	83	275	295
		19.3	80.5	149,270	70	80	174	194		28.0	62.5	105,050	75	85	277	297
		28.0	75.8	150,230	70	80	166	186		34.8	63.9	106,330	76	86	278	298
	75°	23.2	87.7	146,860	71	81	195	215	80°	19.3	68.1	114,730	85	95	287	307
		28.0	85.6	147.250	71	81	192	212		23.2	69.9	116.870	87	97	290	310
		34.8	83.5	147.610	71	81	188	208		28.0	71.5	118.530	89	99	292	312
	85°	23.2	87.5	144.060	72	82	223	243								
		28.0	85.4	144,400	72	82	220	240								
		34.8	83.3	144,700	72	82	216	236								
	95°	23.2	87.3	141,580	73	83	255	275								
		28.0	85.2	141,830	73	83	251	271								
		34.8	83.2	142,040	73	83	248	268								

EWT — Entering Water Temperature

LWT — Leaving Water Temperature

ELECTRICAL SERVICE REQUIRED

Model HWY		Compressor		Evaporator Blower Motor		Min. Circ. Amp.	Max.T.D. Fuse or
	Power	RLA	LRA	HP	FLA	MCA*	HACR CIR. BKR.
007	115-1-60	6.6	29.8	1/10	2.2	10.5	15.0
	208/230-1-60	3.1	15.9	1/10	.96	4.8	15.0
	265-1-60	2.9	12.3	1/10	.85	4.5	15.0
009	115-1-60	8.3	40.0	1/10	2.2	12.6	20.0
	208/230-1-60	4.0	20.0	1/10	.96	6.0	15.0
	265-1-60	3.3	16.0	1/10	.85	5.0	15.0
012	115-1-60	8.9	50.0	1/10	2.2	13.0	20.0
	208/230-1-60	5.0	31.0	1/10	.96	7.2	15.0
	265-1-60	4.0	22.9	1/10	.85	5.9	15.0
015	208/230-1-60	6.8	31.2	1/10	.96	9.5	15.0
	265-1-60	5.8	27.0	1/10	.85	8.1	15.0
018	208/230-1-60	9.0	48.0	1/4	1.8	13.1	20.0
	265-1-60	7.7	42.0	1/4	1.6	11.2	15.0
024	208/230-1-60	9.4	49.0	1/4	1.8	13.6	20.0
	265-1-60	8.2	44.0	1/4	1.6	11.9	20.0
030	208/230-1-60	14.1	73.0	1/2	4.4	22.1	35.0
	208/230-3-60	9.7	68.0	1/2	4.4	16.6	25.0
	265-1-60	12.8	72.0	1/2	3.3	19.3	30.0
	460-3-60	5.1	36.0	1/2	1.8	8.2	15.0
036	208/230-1-60	14.1	73.0	1/2	4.4	22.3	35.0
	208/230-3-60	9.7	68.0	1/2	4.4	16.5	25.0
	265-1-60	12.8	72.0	1/2	2.3	18.3	30.0
	460-3-60	5.1	36.0	1/2	2.0	8.3	15.0
042	208/230-1-60	16.2	96.0	3/4	5.5	25.8	40.0
	208/230-3-60	10.3	75.0	3/4	5.5	18.4	25.0
	460-3-60	5.6	40.0	3/4	2.5	9.5	15.0
	575-3-60	4.9	31.0	3/4	2.6	8.1	15.0
048	208/230-1-60	19.3	102.0	3/4	5.5	29.7	45.0
	208/230-3-60	12.9	91.0	3/4	5.5	21.7	30.0
	460-3-60	6.4	42.0	3/4	2.5	10.5	15.0
	575-3-60	5.2	39.0	3/4	2.6	9.1	15.0
060	208/230-1-60	25.1	169.0	3/4	5.2	36.6	60.0
	208/230-3-60	17.4	123.0	3/4	5.2	26.9	40.0
	460-3-60	7.5	49.5	3/4	2.5	11.9	17.5
	575-3-60	6.6	49.4	3/4	2.3	10.6	15.0
072	208/230-3-60	20.0	156.0	1	3.6	28.9	40.0
	460-3-60	9.0	70.0	1	1.8	13.1	20.0
	208/230-3-60	20.0	156.0	1 1/2	4.6	29.6	40.0
	460-3-60	9.0	70.0	1 1/2	2.3	13.6	20.0
096	208/230-3-60	32.1	195.0	2	6.2	47.0	70.0
	460-3-60	16.4	95.0	2	3.1	24.0	40.0
	208/230-3-60	32.1	195.0	3	8.0	49.0	80.0
	460-3-60	16.4	95.0	3	4.0	25.0	40.0
120	208/230-3-60	33.6	225.0	3	8.0	50.0	80.0
	460-3-60	17.3	114.0	3	4.0	30.0	45.0
	208/230-3-60	33.6	225.0	5	13.4	56.0	80.0
	460-3-60	17.3	114.0	5	6.7	29.0	45.0

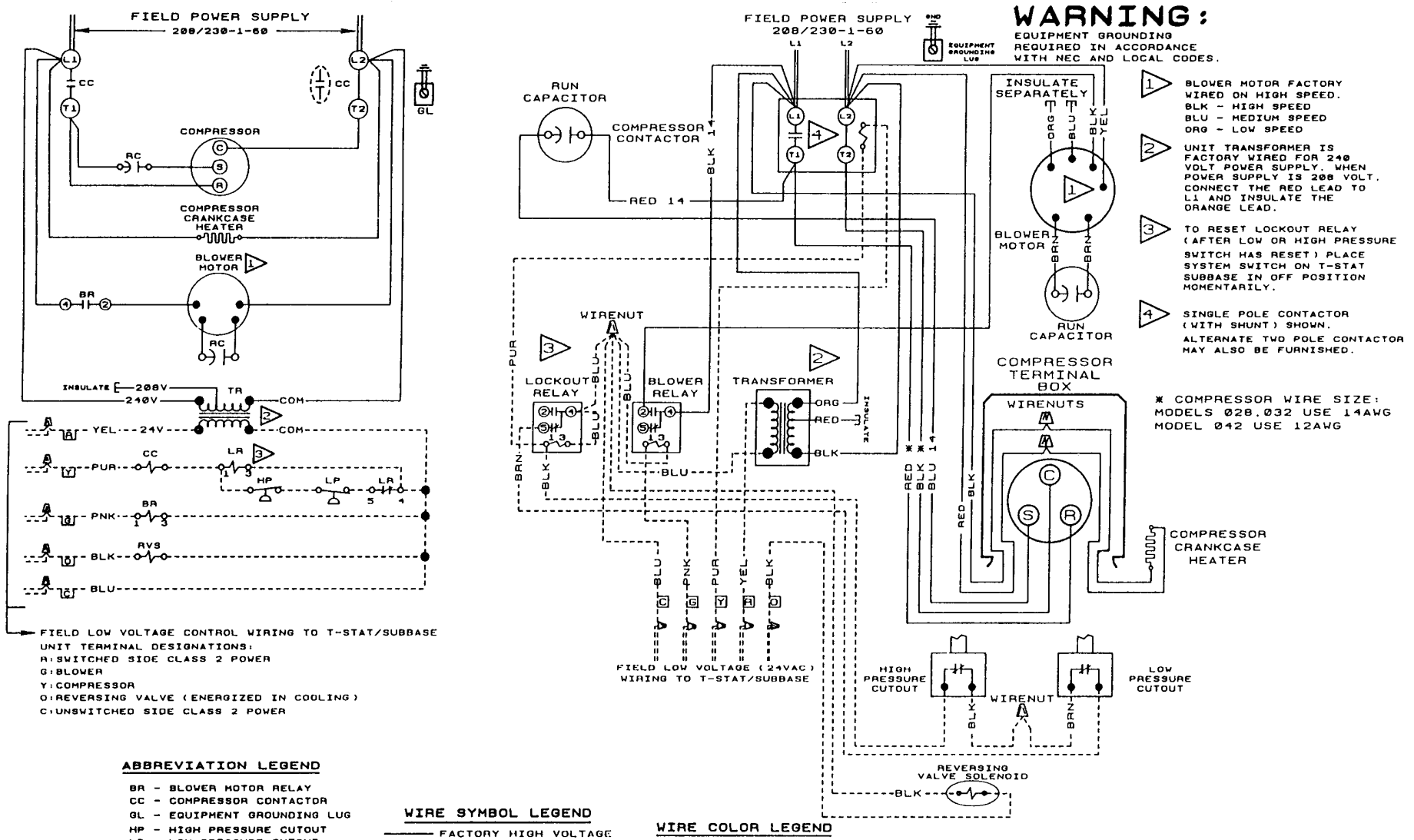
RLA — Rated Load Amps **FLA — Full Load Amps**
LRA — Locked Rotor Amps **MCA — Min. Circuit Ampacity**

ELECTRICAL SERVICE REQUIRED

Models VWY		Compressor		Evaporator Blower Motor		Min. Circ. Amp.	Max.T.D. Fuse or
	Power	RLA	LRA	HP	FLA	MCA*	HACR CIR. BKR.
012	208/230-1-60 265-1-60	4.5 3.4	20.0 18.6	1/10 1/10	.96 .85	6.6 5.1	10.0 15.0
018	208/230-1-60 265-1-60	7.1 5.6	38.0 32.0	1/4 1/4	2.0 1.6	10.9 8.6	15.0 15.0
024	208/230-1-60 265-1-60	9.4 8.3	49.0 44.0	1/4 1/4	2.0 1.6	13.8 12.0	20.0 20.0
030	208/230-1-60 208/230-3-60	14.2 8.7	73.0 68.0	1/4 1/4	2.0 2.0	19.8 12.9	30.0 20.0
036	208/230-1-60 208/230-3-60	14.2 8.7	73.0 68.0	1/2 1/2	4.4 4.4	22.3 15.3	35.0 20.0
042	208/230-1-60 208/230-3-60 460-3-60	16.6 10.3 4.7	96.0 75.0 40.0	1/2 1/2 1/2	4.4 4.4 1.8	25.2 17.3 7.7	40.0 25.0 15.0
048	208/230-1-60 208/230-3-60 4603-60	19.3 12.9 6.4	102.0 91.0 42.0	3/4 3/4 3/4	5.5 5.5 2.8	29.7 21.6 10.8	45.0 30.0 15.0
054	208/230-1-60 208/230-3-60 460-3-60	23.6 16.4 7.9	132.0 91.0 50.0	3/4 3/4 3/4	5.5 5.5 2.8	35.0 26.0 12.7	50.0 40.0 20.0
060	208/230-1-60 208/230-3-60 460-3-60	25.1 17.4 7.5	169.0 123.0 49.5	3/4 3/4 3/4	5.5 5.5 2.8	36.9 27.3 12.2	60.0 40.0 15.0
072	208/230-3-60 460-3-60 208/230-3-60 460-3-60	20.0 9.0 20.0 9.0	156.0 70.0 156.0 70.0	1 1 1 1/2 1 1/2	3.6 1.8 4.6 2.3	28.9 13.1 29.6 13.6	40.0 20.0 40.0 20.0

RLA — Rated Load Amps **FLA — Full Load Amps**
LRA — Locked Rotor Amps **MCA — Min. Circuit Ampacity**

TYPICAL WIRING DIAGRAM



ABBREVIATION LEGEND

BR - BLOWER MOTOR RELAY
CC - COMPRESSOR CONTACTOR
GL - EQUIPMENT GROUNDING LUG
HP - HIGH PRESSURE CUTOUT
LP - LOW PRESSURE CUTOUT
LR - LOCKOUT RELAY
RC - RUN CAPACITOR
RVS- REVERSING VALVE
TR - TRANSFORMER

WIRE SYMBOL LEGEND

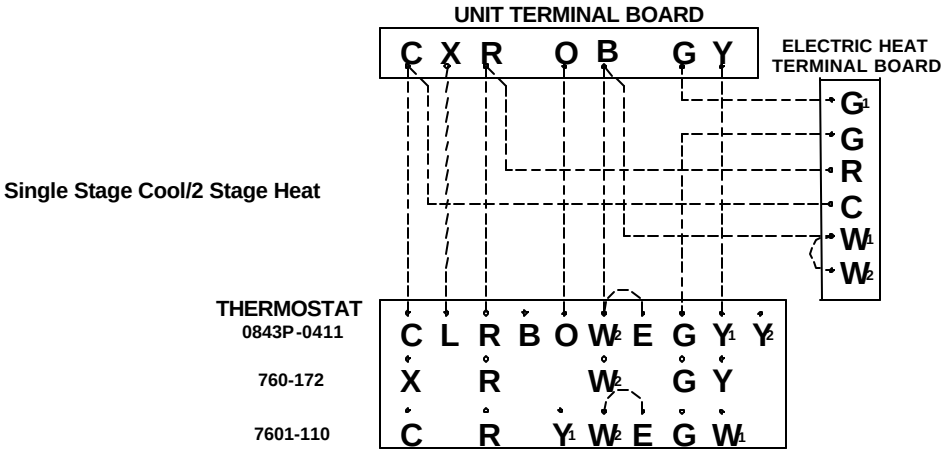
——— FACTORY HIGH VOLTAGE
- - - - - - FACTORY LOW VOLTAGE
═══ FIELD HIGH VOLTAGE
═ ═ ═ ═ FIELD LOW VOLTAGE
WIRE NUT

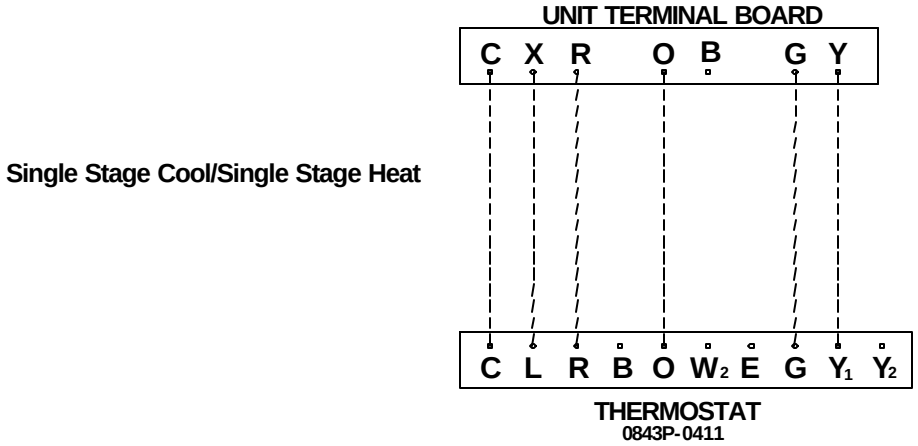
WIRE COLOR LEGEND

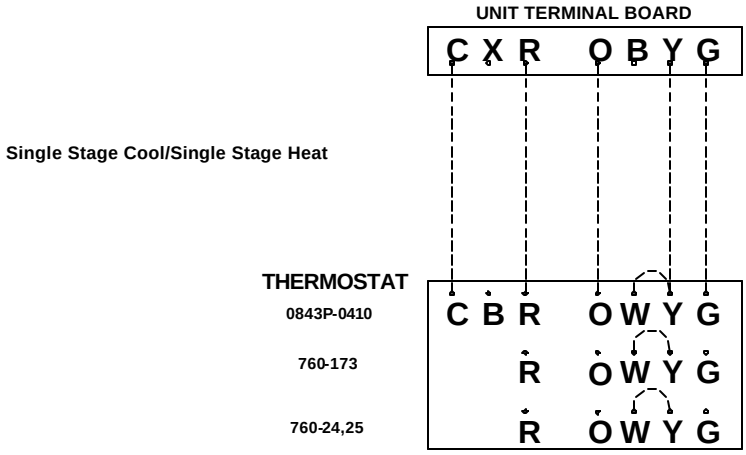
BLK: BLACK	PNK: PINK
BLU: BLUE	PUR: PURPLE
BRN: BROWN	RED: RED
GRN: GREEN	WHT: WHITE
ORG: ORANGE	YEL: YELLOW

LOW VOLTAGE THERMOSTAT CONNECTIONS

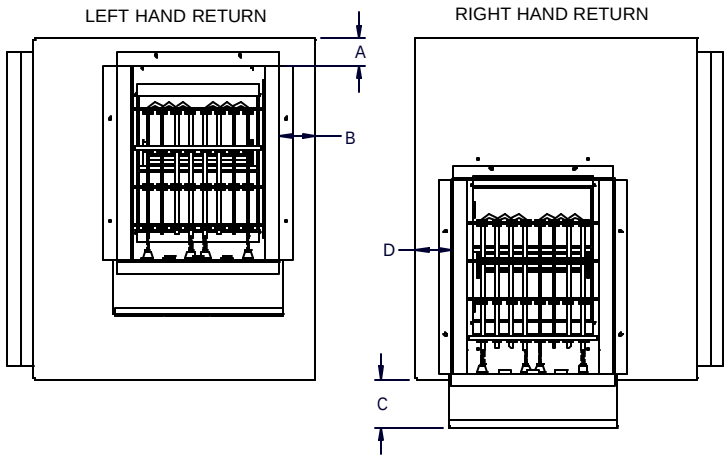
TYPICAL FIELD WIRING CONNECTIONS



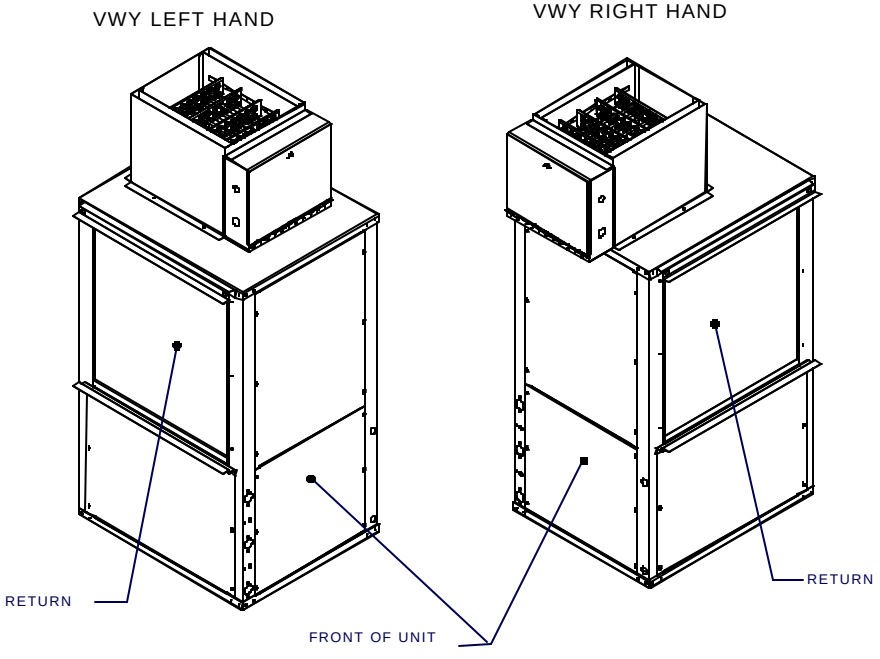




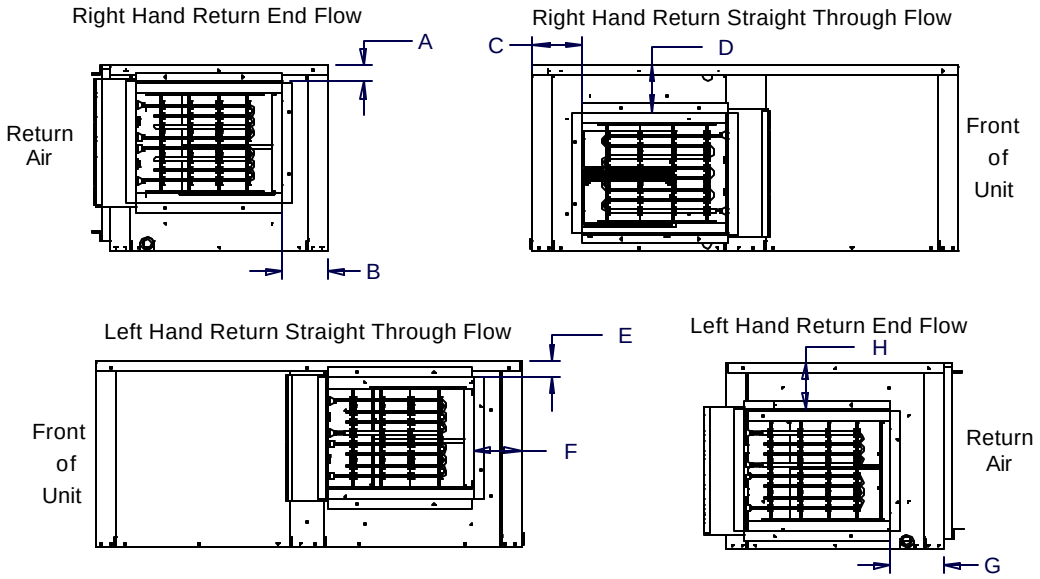
HEATER DIMENSIONS



HEATER	DIM	MODEL NUMBER					
		018	024	030	036	042	048-060
3.75/5.0 KW	A	2 7/8	2 7/8	2 7/8	4 3/8	3 5/8	5
	B	3 3/4	3 3/4	3	2 3/4	2 3/4	3 1/8
	C	5 1/2	5 1/2	5 1/2	4	3 7/8	1
	D	3 3/4	3 3/4	3	2 3/4	2 3/4	3 1/8
7.5/10.0 KW	A	-	-	1/2	2	1 1/4	2 1/2
	B	-	-	3	2 3/4	2 3/4	3 1/8
	C	-	-	5 1/8	3 5/8	2 1/2	1
	D	-	-	3	2 3/4	2 3/4	3 1/8
11.25/15.0 KW	A	-	-	-	-	2	2
	B	-	-	-	-	2 3/4	3 1/8
	C	-	-	-	-	2 3/4	0
	D	-	-	-	-	2 3/4	3 1/8
15.0/20.0 KW	A	-	-	-	-	-	2 3/4
	B	-	-	-	-	-	3 1/8
	C	-	-	-	-	-	1 1/2
	D	-	-	-	-	-	3 1/8



Electric Heat Locating Dimensions Horizontal Units



HEATER	DIM	MODEL NUMBER					
		018	024	030	036	042	048-060
3.75/5.0 KW	A	1 5/8	1 7/8	1 1/4	2 1/2	1	2 1/2
	B	4 1/2	5	5	4 5/8	3 1/4	12 3/8
	C	4 1/2	5	7	11	10	5 1/2
	D	3	4 3/4	4 3/4	4 3/4	4 3/4	6 1/8
	E	1 5/8	1 7/8	1 1/2	2 1/8	1 7/8	2 1/2
	F	4 1/2	5	7	11	10	5 1/2
	G	5	4 3/4	7	5 3/8	4 1/2	12 1/2
	H	3	4 3/4	5 1/8	4 1/4	4 3/4	6 1/8
7.5/10.0 KW	A	-	-	1 1/4	2 1/2	1	2 1/2
	B	-	-	5	4 5/8	3 1/4	12 3/8
	C	-	-	7	11	10	5 1/2
	D	-	-	4 3/4	4 3/4	4 3/4	6 1/8
	E	-	-	1 1/2	2 1/8	1 7/8	2 1/2
	F	-	-	7	11	10	5 1/2
	G	-	-	7	5 3/8	4 1/2	12 1/2
	H	-	-	5 1/8	4 1/4	4 3/4	6 1/8
11.25/15.0 KW	A	-	-	-	-	1	3
	B	-	-	-	-	2 3/4	12
	C	-	-	-	-	9 1/2	6
	D	-	-	-	-	4 3/4	6
	E	-	-	-	-	1 7/8	3
	F	-	-	-	-	9 1/2	5 1/2
	G	-	-	-	-	4	12 1/2
	H	-	-	-	-	4 3/4	6 1/8
15.0/20.0 KW	A	-	-	-	-	-	2 1/2
	B	-	-	-	-	-	12 3/8
	C	-	-	-	-	-	5 1/2
	D	-	-	-	-	-	6 1/8
	E	-	-	-	-	-	2 1/2
	F	-	-	-	-	-	5 1/2
	G	-	-	-	-	-	12 1/2
	H	-	-	-	-	-	6 1/8

START-UP INSTRUCTIONS

THE FOLLOWING STEPS ARE OFFERED AS A GENERAL GUIDE TO START-UP

1. Check the blower to ensure it turns free without rubbing and tighten the setscrew on the shaft.

2. Ensure water piping connections are complete and leak tested.

3. Before turning power on to the unit, ascertain that the thermostat switch is in the OFF position. Then, turn power on to the unit. All HWY and VWY units incorporate crankcase heat and should be allowed to warm up the compressor for about 12 hours before unit operation.

4. With a voltmeter, check to see that the unit is receiving rated voltage. If voltage is 10% high or low, consult the Power Company.

5. Check to see that the air filters are clean and properly positioned.

6. Verify that the blower is running in the proper direction. If it is incorrect, reverse two phase leads at the disconnect switch.

7. Ensure that the water flow to the unit and the water temperature rise is correct.

8. Install suction and discharge line gauges on the compressor. Note; this step is only necessary if capacity is in question. See Capacity Check.

9. Turn the thermostat Fan Switch to the ON position. The indoor blower should operate. Observe that airflow is present. Check the various supply grills in each room, to be sure they are open and properly directed. See that the airflow seems correct, and that no duct dampers are closed to restrict airflow.

10. After being satisfied that airflow is adequate, turn the temperature setting on the thermostat as high as it will go. Then, turn the System Switch to COOL. The compressor should not come on yet. Then, slowly turn the temperature setting down until the thermostat contacts make, calling for cooling. The compressor and water pump should now come on. Check to see that they are operating correctly, with a cold compressor suction line. Let the unit run for long enough to balance out and steady the pressures

12. Check pressure readings on the suction and discharge gauges. Not until room temperature conditions have been brought closer to normal can you check pressures closer. With rated airflow and return air temperatures of about 80 deg. d.b., 67 deg. w.b., pressures should be approximately as indicated in the tables on page 19.

At above conditions the suction line super heat must be 10°F. above saturated temperature.

Depending upon return air conditions and airflow, the temperature drop across the evaporator should be from 14° to 20°.

13. After checking the cooling operation, turn the thermostat to the off position for at least 4 minutes. Then, turn the temperature setting to as low as it will go. Switch to the HEAT position. Then, gradually raise the temperature setting until the compressor comes on. See that the unit is providing heat. The unit cannot be properly checked for pressures, etc., on heating until the heating season has started, and indoor conditions are in the normal range of 70 degrees dry bulb. If you have correct operation in cooling, the heating operation should be satisfactory. Do not run the unit too long in heating with high return air temperatures. Return at the beginning of the heating season to check the operation.

CAPACITY CHECK

The Performance Data Table on page 13 and 17 will assist in checking water flow; it is good practice to install a pressure temperature plugs in both the water-in and water-out lines, in order to check water temperatures. The Performance Data Table also includes heat rejection rate.

14. With room return air of 70 degrees dry bulb, on the heating cycle, pressures should be approximately as indicated in the heating table.

A high temperature rise across the evaporator would usually indicate low airflow, due to duct design, grills closed, dampers closed, or dirty filters.

15. With an ampmeter, check to see that the unit is drawing approximately rated current.as shown on serial plate.

16. Finally, before leaving the job, check to see that all unit panels are on and correctly positioned, and that the unit seems to be operating normally. Instruct the owner in the operation of the thermostat and advise him that rapid cycling can cause the unit to trip on its overload. Check to see that water flow is unrestricted. Check to see that the pump cycles correctly.

IN GENERAL, PRESSURES WILL RESPOND TO CHANGING CONDITIONS AS FOLLOWS:

Return air temp low
Reduced suction pressure

Low evaporator air flow
Reduced suction pressure

Loss of refrigerant charge
Reduced suction pressure and
Reduced discharge pressure

Reduced water flow
Increased discharge pressure

Restriction in capillary tubes
Reduced suction pressure and
Increased discharge pressure

Reduced entering water temp.
Reduced discharged and
Slight reduced suction pressure

Refrigerant overcharge
Increased discharge pressure
Cold compressor crankcase

GENERAL SERVICE GUIDE

Should a major problem develop, refer to the following information for possible cause and corrective steps:

SYMPTOM	POSSIBLE CAUSE	POSSIBLE REMEDY
Fan and compressor will not run.	1. Check for blown fuse or if circuit breaker is open. Check electrical circuits and motor windings for shorts or grounds. 2. Check if wires are loose/broken. 3. Check if supply voltage is too low. 4. Check if control system is faulty.	1a. Replace fuse or reset circuit breakers after fault is corrected. 2a. Replace or tighten wires. 3a. Consult the power company. 4a. Check thermostat for correct wiring and check 24 volt transformer for burnout. Call dealer or factory for advice**.**
Fan is operating, but the compressor is not working.	1. Check capacitor. 2. Check if wires are loose/broken. 3. Check if high pressure tripped due to plugged condenser, lack of condenser water, too warm condenser water, inadequate airflow due to dirty filters, coil or fan motor failure. 4. Check if low temperature switch tripped due to plugged condenser, lack of condenser water, too warm condenser water, inadequate airflow due to dirty filters, coil or fan motor failure. 5. Check thermostat setting, calibration and wiring. 6. Check if the compressor overload protection is open. If the compressor dome is hot, the overload will not reset until cooled down. 7. Check if the compressor motor is grounded to the compressor shell. 8. Check if the compressor winding is open. Check continuity with the ohmmeter.	2a. Replace or tighten wires. 6a. If the overload is external, replace it. If the overload is internal, replace the compressor. 7a. If the compressor motor is grounded to the compressor shell, replace it. 8a. If the winding is open, replace the compressor.
Compressor attempts to start, but doesn't.	1. Check the capacitor. 2. Check for defective compressor by making resistance check on winding. 3. Check run capacitor	
Compressor is running in short cycles.	1. Check the thermostat mounting and location. 2. Check all relays, relaying and contacts. 3. Check the run capacitor. 4. Check the high pressure switch. 5. Check the low temperature switch. See if the reversing valve has shifted to either side.	

GENERAL SERVICE GUIDE Continued

SYMPTOM	POSSIBLE CAUSE	POSSIBLE REMEDY
System has insufficient cooling and/or heating.	1. Check the thermostat for improper location. 2. Airflow may be insufficient. 3. If the unit heats, check the reversing valve coil. 4. Check the capillary tubes for possible refrigerant flow restriction. 5. Check for water flow restriction.	 2a. Check and clean the filter. 3a. Replace the reversing valve if it is defective.
The unit is noisy while operating.	1. Check the thermostat for improper location. 2. Check if the fan wheel is bent. 3. Check if the fan wheel on the shaft is loose. 4. Make sure the compressor is floating free on the isolator mounts. 5. Check if the tubing is touching the compressor. 6. Check screws on panel. 7. Check for chattering or humming in the contact relays due to low voltage or a defective holding coil. 8. Check the water balance for proper flow rate.	1a. Adjust for clearance if necessary. 2a. Replace the fan wheel if it is bent. 3a. Tighten the fan wheel on the shaft if it is loose. 5a. Readjust the tubing, if necessary, by bending slightly. 6a. Tighten screws if necessary. 7a. Replace component if defective.

PRESSURE CUT OUT TRIP ON COLD START UP

Under some conditions on the heating cycle, the low pressure cutout will trip and cause the unit to lock out on its special safety lockout circuit. This generally happens when the unit is installed in a cold space, and can be aggravated by cold water temperatures, failure of the pump to deliver water quickly enough, low water flow, air in water coil, or a combination of these reasons.

Follow These Precautions:

Install the unit only in space that will not fall below 65°F. If the space is too cold, and if the unit has been shut down and allowed to soak out to the cold temperature, the crankcase heater may not be sufficient to allow the compressor to start normally.

Always operate the unit with all panels on.

If a water storage tank is used, the water may drop to a cold temperature during the night, when the unit is turned off. Then, upon trying to start, the unit sees abnormally cold ground water and the suction pressure dips low enough to trip the safety control. Insulate the storage tank, or move it to a warmer location. Water lines may also need to be insulated.

If the water pump does not deliver the water quickly enough, it may be losing its prime. Have the pump and check valve inspected and verify that there is no air in the water lines. If problems still persist, install a time delay to be sure water flow is established before compressor starts. If a water line solenoid is used, make sure it is installed in the water discharge line.

If low water flow is suspected, have it checked and set at the minimum shown for water temperature available and the unit installed.

REMEMBER — The keys to prompt starting on the heating cycle are:

1. **Warm Unit (Min. 65°F.)**
2. **Adequate water flow**
3. **Water as warm as possible (Min. 55°F.)**
4. **Compressor compartment panels tight**

A Cold Weather Start Kit #809-573 is available for this problem.

TROUBLE DIAGNOSIS

Always remember that the first thing to check is the room thermostat itself. See that the thermostat switches are in the correct position. Turn the unit off at the thermostat, let it stay off for five minutes, and then methodically turn things back on. Follow the start-up procedure on page 22. See what components operate properly and which do not. For example, if you turn the fan switch on but the fan doesn't start when the Y cooling bulb makes contact, then you know trouble may lie in the compressor contactor, in the safety controls, or somewhere else in the Y circuit controlling the compressor.

MAINTENANCE PROCEDURES

Proper, regular scheduled maintenance is important to ensure the most efficient operation and longest life for your equipment. The following points are to serve as a general guide. Always consult with your air conditioning contractor with regard to the specific requirements of your own installation.

Filters – Check the air filters once each month. Wash or change as required. Do not operate these units without air filters.

Bearings – Only sealed bearings are used in the evaporator blower motors. Therefore, lubrication is not required.

Paint Finish – Paint is an electrodeposition paint process, giving a durable finish. If paint lifting or peeling occurs, scrape and sand the effected area and touch up with paint obtained from the factory for this purpose.

Water System – The pump should be checked whenever filters are cleaned, to assure that it is operating normally.

Condenser- coils should be checked yearly for liming or clogging. Clogged condenser coils lead to high head pressure and inefficient operation. If condenser coil is limed, acid treatment may be necessary.

Refrigerant Pressure – Check only if the system is not performing to capacity and waterflow, airflow, has been verified and correct. These should be checked only by a competent service contractor.

Contactor Points – Check contactor points twice a year to be sure they are not burned or pitted as a result of low voltage, lightning strikes, or other electrical difficulties.

Condensate Drains – Always check to see that condensate is draining properly from the unit, whenever you check the filters.

Evaporator Blower – Be alert for any noise that would indicate blower wheels loose or motors failing.

Condensate Drain Pan – Every 6 months, clean and flush evaporator condensate drain pan

Evaporator Blower Belts – Check bianually for correct tension. Worn or cracked belts should be replaced. Belts with multiple belt drives should be replaced with "matched sets".

CHECK, TEST AND START FORM

GENERAL INFORMATION **DATE** _____

Customer Name _____ **Dealer Name** _____

Address _____ **Address** _____

_____ _____

ST, Zip _____ **ST, Zip** _____

Phone # _____ **Phone #** _____

PRODUCT INFORMATION

Unit Model # _____

Unit Serial # _____

Application: ◢ **Ground Source** ◢ **Ground Water** ◢ **Tower/Boiler**

– **Other** _____

UNIT FUNCTION

Voltage _____ **Amperage** _____ **Phase** _____

Indoor Entering Air Temperature _____ **DB** _____ **WB**

Indoor Leaving Air Temperature _____ **DB** _____ **WB**

Outdoor Air Temperature _____ **DB** _____ **WB**

Design Duct ESP _____ **"WC**

Speed Tap **High** _____ **Med. High** _____ **Med. Low** _____

Design CFM _____

Entering Fluid Temperature _____ **°F**

Leaving Fluid Temperature _____ **°F**

Fluid Temperature Difference (TD) _____ **°F**

Entering Fluid Pressure _____ **Ft Hd or PSIG** [Note: 1 PSIG=2.31 Ft Hd]

Leaving Fluid Pressure _____ **Ft Hd or PSIG**

Fluid Pressure Difference (PD) _____ **Ft Hd or PSIG**

H_A or H_R = 500 x TD x GPMs

for Antifreeze solution = 485 x TD x GPM

Calculation _____ (500) x _____ (TD) x _____ (GPM) = _____ (H_A or H_R)

NOTES