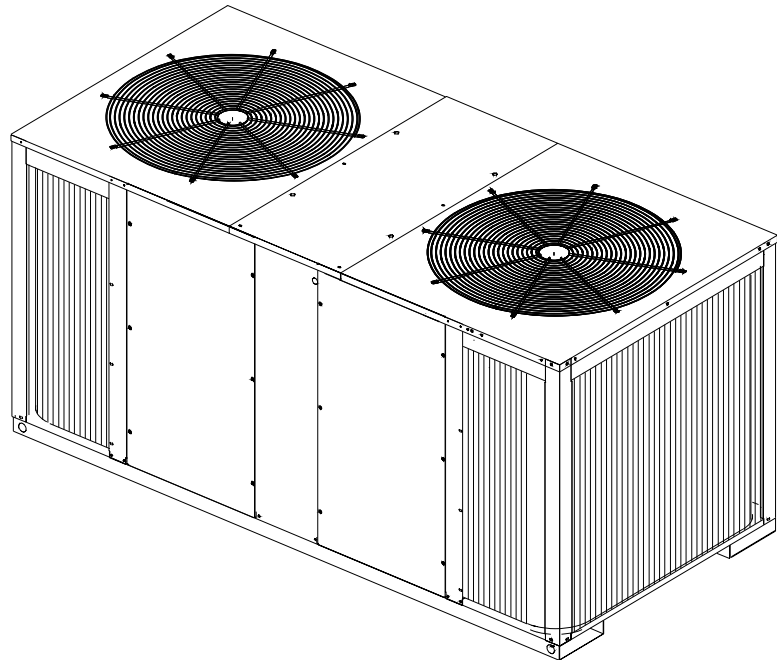


Installation Operation Maintenance

Split System Heat Pump Condensers

7 1/2 - 20 Tons



Models:

(60 Hz)

TWA090A***F
TWA120A***F
TWA180B***F
TWA240B***F

(50 Hz)

TWA075AD**F
TWA100AD**F
TWA155BD**F
TWA200BD**F

Introduction

Literature Change History

TWA-SVX01A-EN (May 2003)
Compressor Changes

Overview of Manual

Note: One copy of this document ships inside the control panel of each unit and is customer property. It must be retained by the unit's maintenance personnel.

This booklet describes proper installation, operation, and maintenance procedures for air cooled systems. By carefully reviewing the information within this manual and following the instructions, the risk of improper operation and/or component damage will be minimized.

It is important that periodic maintenance be performed to help assure trouble free operation. A maintenance schedule is provided at the end of this manual. Should equipment failure occur, contact a qualified service organization with qualified, experienced HVAC technicians to properly diagnose and repair this equipment.

NOTICE:

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.



WARNING – Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION – Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION – Indicates a situation that may result in equipment or property-damage-only accidents.

IMPORTANT NOTE: All phases of this installation must comply with the NATIONAL, STATE & LOCAL CODES. In addition to local codes, the installation must conform with National Electric Code -ANSI/NFPA NO. 70 LATEST REVISION.

Note: Do Not release refrigerant to the atmosphere! If adding or removing refrigerant is required, the service technician must comply with all federal, state, and local laws.

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Model Number Description

Model Number Description

All products are identified by a multiple-character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code is provided below. Its use will enable the owner/operator, installing contractors, and service engineers to define the operation, specific components, and other options for any specific unit.

When ordering replacement parts or requesting service, be sure to refer to the specific model number, serial number, and DL number (if applicable) stamped on the unit nameplate.

Split System Condensing Unit Model Nomenclature

TWA	090	A	1	00	E	A
1 2 3	4 5 6	7	8	9 10	11	12

Digits 1, 2, 3 - Product Type

TWA = Split System Heat Pump
Outdoor Unit

Digits 4, 5, 6 - Nominal Gross Cooling Capacity (MBh)

90 = 90 MBH
120 = 120 MBH
180 = 180 MBH
240 = 240 MBH

Digit 7- Major Development Sequence

Digit 8 - Electrical Characteristics

3 = 208-230/60/3
4 = 460/60/3
W = 575/60/3
D = 380-415/50/3

Digit 9, 10 - Factory - Installed Options

00 = Secondary Capacity and/or
Factory installed Options

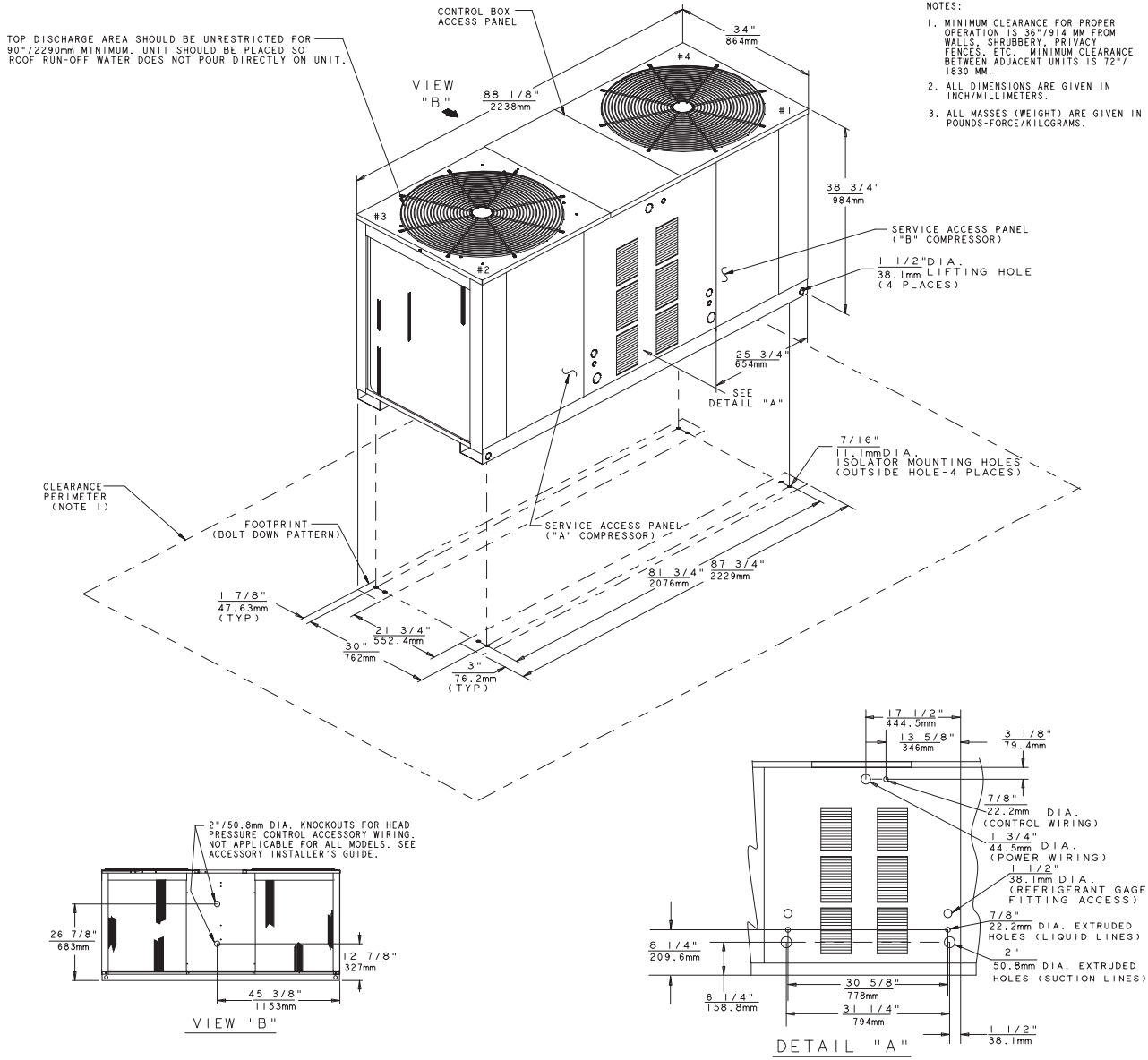
Digit 11- Minor Design Sequence

Digit 12- Service Digit

Unit Dimensions

Figure 3 - TWA155B, TWA180B
Dimensional Data, Connection Locations, Clearances, Corner Weights

MODEL NO.	APPROXIMATE CORNER WEIGHT (MASS)				TOTAL UNIT WEIGHT	TOTAL SHIPPING WEIGHT
	#1	#2	#3	#4		
TWA155B--D,E,F	195 lbs	186 lbs	175 lbs	184 lbs	740 lb	816 lb
TWA180B--D,E,F	88.5 kg	84.4 kg	79.5 kg	83.5 kg	335.6 kg	370.1 kg



- NOTES:**
1. MINIMUM CLEARANCE FOR PROPER OPERATION IS 36"/914 MM FROM WALLS, SHRUBBERY, PRIVACY FENCES, ETC. MINIMUM CLEARANCE BETWEEN ADJACENT UNITS IS 72"/1830 MM.
 2. ALL DIMENSIONS ARE GIVEN IN INCH/MILLIMETERS.
 3. ALL MASSES (WEIGHT) ARE GIVEN IN POUNDS-FORCE/KILOGRAMS.

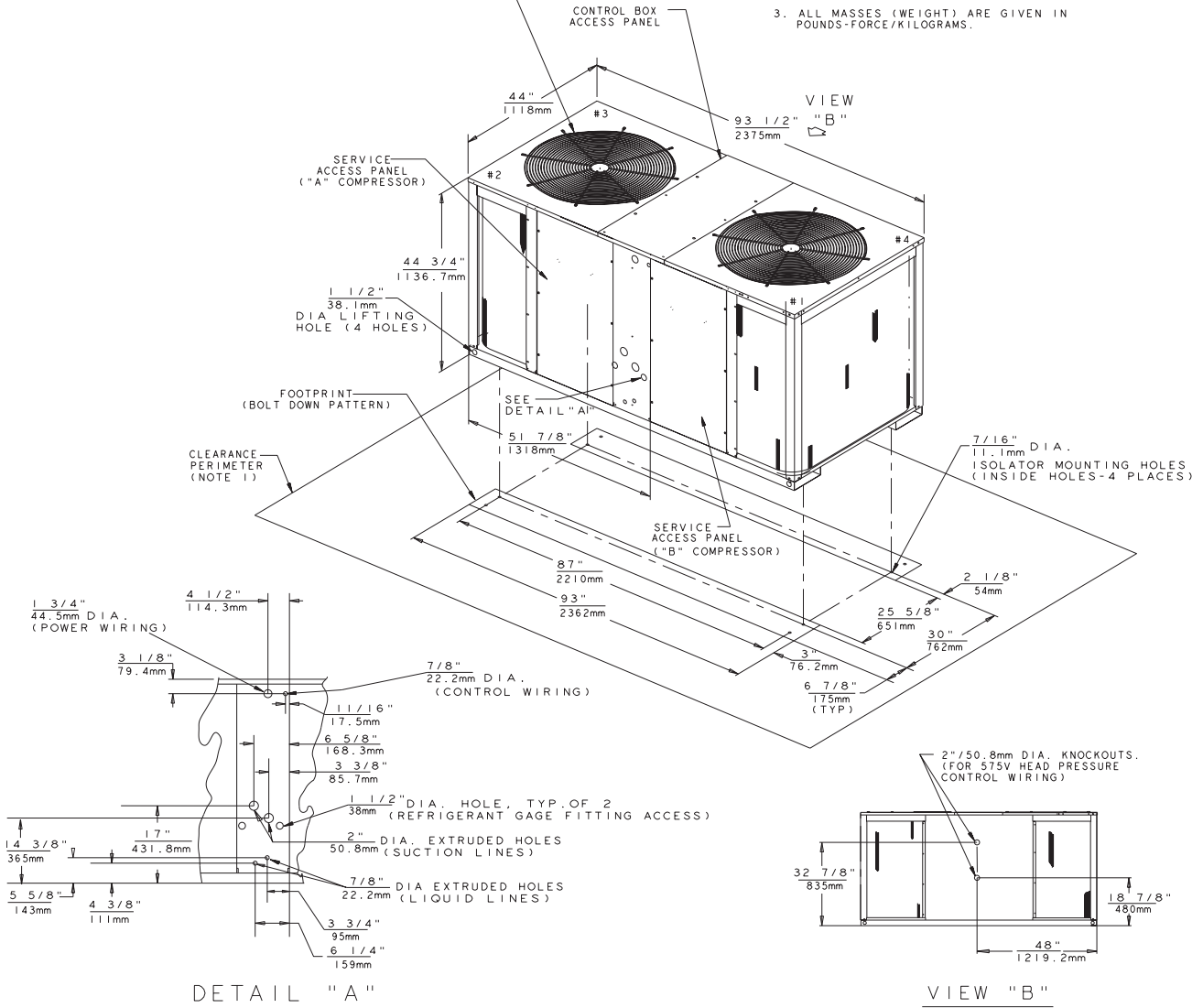
Unit Dimensions

Figure 4 - TWA200B, TWA240B
Dimensional Data, Connection Locations, Clearances, Corner Weights

MODEL NO.	APPROXIMATE CORNER WEIGHT [MASS]				TOTAL UNIT WEIGHT	TOTAL SHIPPING WEIGHT
	#1	#2	#3	#4		
TWA240B---F	253 lbs	250 lbs	173 lbs	173 lbs	849 lb	934 lb
TWA200BD--F	114.9 kg	113.5 kg	78.5 kg	78.5 kg	385.1 kg	423.7 kg

- NOTES:
- MINIMUM CLEARANCE FOR PROPER OPERATION IS 36"/914mm FROM WALLS SHRUBBERY, PRIVACY FENCES ETC. MINIMUM CLEARANCE BETWEEN ADJACENT UNITS IS 72"/1830mm.
 - ALL DIMENSIONS ARE GIVEN IN INCH/MILLIMETERS.
 - ALL MASSES (WEIGHT) ARE GIVEN IN POUNDS-FORCE/KILOGRAMS.

TOP DISCHARGE AREA SHOULD BE UNRESTRICTED FOR 100"/2540mm MINIMUM. UNIT SHOULD BE PLACED SO ROOF RUN-OFF WATER DOES NOT POUR DIRECTLY ON UNIT.



Electrical Data

Table 1 - TWA Unit Electrical Data

Model Number	Electrical Characteristics	Basic Unit Characteristics			Compressor Motor			Outdoor Fan Motor			
		Allowable Voltage Range	Minimum Circuit Ampacity	Maximum Fuse Size	Qty.	Amps		Qty.	HP	Amps	
						RLA	LRA			FLA	LRA
TWA090A3	208-230/60/3	187-254	34.5	50	1	25.1	182.0	1	1/2	3.1	8.1
TWA090A4	460/60/3	414-506	18.1	25	1	13.2	94.9	1	1/2	1.6	3.7
TWA090AW	575/60/3	518-632	14.5	20	1	10.6	70.0	1	1/2	1.2	3.0
TWA075AD	380-415/50/3	380-415	12.6	20	1	8.8	90.0	1	1/2	1.6	3.7
TWA120A3	208-230/60/3	187-254	48.1	70	1	33.7	278.0	1	1	6.0	17.5
TWA120A4	460/60/3	414-506	23.3	35	1	16.5	118.0	1	1	2.7	7.0
TWA120AW	575/60/3	518-632	18.8	25	1	13.4	92.0	1	1	2.0	5.7
TWA100AD	380-415/50/3	380-415	21.3	35	1	14.9	118.0	1	1	2.7	7.0
TWA180B3	208-230/60/3	187-254	62.7	80	2	25.1	182.0	2	1/2	3.1	8.1
TWA180B4	460/60/3	414-506	32.9	45	2	13.2	94.9	2	1/2	1.6	3.7
TWA180BW	575/60/3	518-632	26.3	35	2	10.6	70.0	2	1/2	1.2	3.0
TWA155BD	380-415/50/3	380-415	28.4	35	2	11.2	94.9	2	1/2	1.6	3.7
TWA240B3	208-230/60/3	187-254	87.8	100	2	33.7	278.0	2	1	6.0	17.5
TWA240B4	460/60/3	414-506	42.5	50	2	16.5	118.0	2	1	2.7	7.0
TWA240BW	575/60/3	518-632	34.2	45	2	13.4	92.0	2	1	2.0	5.7
TWA200BD	380-415/50/3	380-415	38.9	50	2	14.9	118.0	2	1	2.7	7.0

Installation

Installation procedures should be performed in the sequence that they appear in this manual. Do not destroy or remove the manual from the unit. The manual should remain weather-protected with the unit until all installation procedures are complete.

Note: It is not the intention of this manual to cover all possible variations in systems that may occur or to provide comprehensive information concerning every possible contingency that may be encountered during an installation. If additional information is required or if specific problems arise that are not fully discussed in this manual, contact your local Sales office.

Note: “Warnings” and “Cautions” appear at appropriate places in this manual. Your personal safety and the proper operation of this machine require that you follow them carefully. The Company assumes no liability for installations or servicing performed by unqualified personnel.

Installation Checklist

An “Installation Checklist” is provided at the end of the installation section of this manual. Use the checklist to verify that all necessary installation procedures have been completed. Do not use the checklist as a substitute for reading the information contained in the manual. Read the entire manual before beginning installation procedures.

Unit Inspection

Inspect material carefully for any shipping damage. If damaged, it must be reported to, and claims made against the transportation company. Compare the information that appears on the unit nameplate with ordering and submittal data to insure the proper unit was shipped. Available power supply must be compatible with electrical characteristics specified on component nameplates. Replace damaged parts with authorized parts only.

Inspection Checklist

To protect against loss due to damage incurred in transit, complete the following checklist upon receipt of the unit.

- Inspect individual pieces of the shipment before accepting the unit. Check for obvious damage to the unit or packing material.
- Inspect the unit for concealed damage before it is stored and as soon as possible after delivery. Concealed damage must be reported within 15 days. If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- Notify the carrier's terminal of damage immediately by phone and by mail. Request an immediate joint inspection of the damage by the carrier and the consignee.

- Notify the sales representative and arrange for repair. Do not repair the unit until the damage is inspected by the carrier's representative.

Initial Leak Test

All TWA units are shipped with a holding charge of nitrogen in each circuit. Remove the compressor access panel(s) shown in Figure 1, Figure 2 or Figure 3. Locate the liquid line or suction line service valve for each circuit. Install gauges to determine if the circuits are still pressurized. If not, the charge has escaped. Repair as required to obtain a leak-free circuit.

Lifting Recommendations

Before preparing the unit for lifting, estimate the approximate center of gravity for lifting safety. Because of placement of internal components, the unit weight may be unevenly distributed. Approximate unit weights are given in Table 2.

Table 2. Total Unit Weight and Corner Weights (lbs)

Model	Total Unit Weight and Corner Weights (lbs)		Corner Weights			
	Shipping Maximum	Net Maximum	#1	#2	#3	#4
TWA090A	390	343	112	89	63	79
TWA075A						
TWA120A	502	443	149	116	78	100
TWA100A						
TWA180B	816	740	195	186	175	184
TWA155B						
TWA240B	934	849	253	250	173	173
TWA200B						

⚠ WARNING: ON-SIGHT LIFTING EQUIPMENT MUST BE CAPABLE OF LIFTING THE UNIT WEIGHT WITH AN ADEQUATE SAFETY FACTOR. THE USE OF UNDER-CAPACITY LIFTING DEVICES MAY RESULT IN SEVERE PERSONAL INJURY OR DEATH AND CAN SERIOUSLY DAMAGE THE UNIT

The crated unit can be moved using a forklift of suitable capacity. For lifting the unit, attach lifting straps or slings securely to the lifting holes at each corner. Use spreader bars to protect the unit casing from damage. Test lift the unit to determine proper balance and stability.

CAUTION: Use spreader bars to prevent lifting straps from damaging the unit. Install bars between lifting straps. This will prevent the straps from crushing the unit cabinet or damaging the unit finish.

Clearances

Provide enough space around the unit to allow unrestricted access to all service points. Refer to Figure 1 and Figure 2 for unit dimensions and minimum required service and free air clearances. Observe the following points to insure proper unit operation.

Installation

- A. Do not install the unit under a low overhang. Condenser discharge must not be restricted. See Figure 1, Figure 2 or Figure 3.

Important: Do not obstruct condenser discharge air. This can result in warm air recirculation through the coil.

- B. Do not locate the unit in a position where runoff water can fall into the fan discharge openings.
- C. Condenser intake air is supplied from three sides of the unit. Adhere to the minimum required clearances given in Figure 1, Figure 2 or Figure 3.

Snow Belt Recommendations

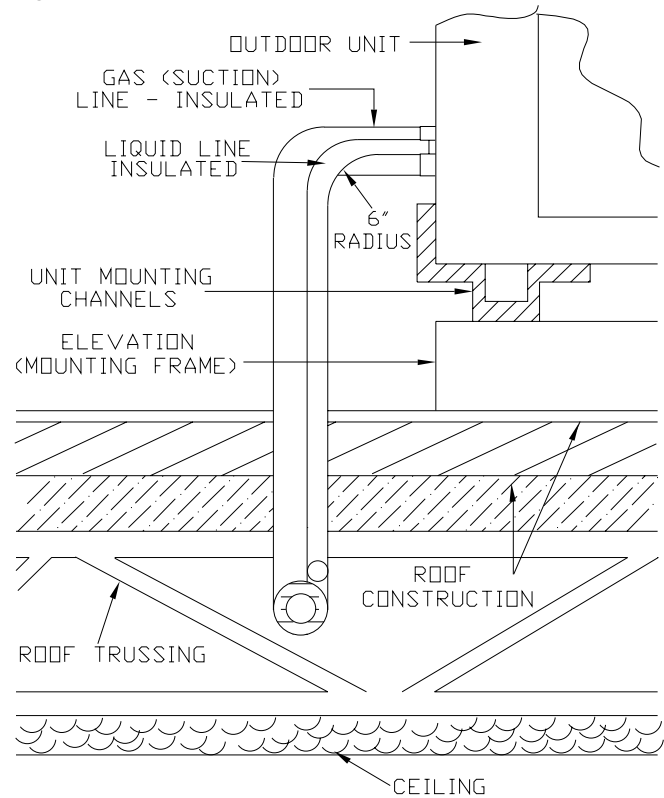
In regions where deep snow is encountered, raise the unit a minimum distance of 8 to 12 inches above the mounting surface. This will reduce the risk of snow blocking the coil and improves runoff of water produced during the defrost cycle. Avoid locating the unit where snow tends to drift. Snow accumulations must be removed from around the unit immediately to prevent drastic efficiency reduction. A snow drift barrier may be constructed around the unit to prevent snow blockage. Clearance between the snow barrier and the unit must comply with the clearances given in Figure 1, Figure 2 or Figure 3.

Unit Mounting

Rooftop Mounting

If the unit will be roof mounted, determine for certain that the structure is strong enough to support the unit and any required accessories. Unit weights are given in Table 2. The unit should be elevated on a level, field fabricated four-inch steel or wood 4" x 4" mounting frame. Complete the frame and secure it into position before lifting the unit to the roof. The mounting frame must support a minimum of three of the unit's four sides and should span roof supports to distribute the load on the roof.

Figure 4 Roof Mounted Unit



⚠ WARNING: Ensure that the roof structure supports are strong enough to support the weight of the unit and any accessories. Failure to do this can result in personal injury or death due to structural failure and can seriously damage the unit and the building.

The following warning complies with State of California law, Proposition 65.

⚠ WARNING: *This product contains fiberglass wool insulation!* Fiberglass dust and ceramic fibers are believed by the state of California to cause cancer through inhalation. Glasswool fibers may also cause respiratory, skin, or eye irritation. See page 13 for precautionary and first aid measures.

Ground Level Mounting

"For ground level installation, the unit base should be adequately supported and hold the unit near level. The installation must meet the guidelines set forth in local codes." The support should extend two inches beyond the unit base channels at all points. The unit and support must be isolated from any adjacent structure to prevent possible noise or vibration problems. Any ground level location must comply with required clearances given in Figure 1, Figure 2 or Figure 3.

Installation

Refrigerant Piping

Structural Preparation

Holes must be made in the structure to run refrigerant lines. For the majority of ground-level installations, the holes can be made in the header that rests on top of the foundation. Alternatively, these holes may also be made in the foundation itself. On roof-mounted units, refrigerant lines should enter the building as close to the unit as possible; preferably within three to four inches of the refrigerant connection on the unit, plus a six-inch (long radius) 90 degree ell entering the building. (See Figure 4)

Refrigerant Piping Guidelines

- A. Maximum recommended line lengths: (per circuit)
- | | |
|---------------------------------|--------|
| Maximum linear length | 80 Ft. |
| (w/o accumulator) | |
| Maximum suction line lift | 60 Ft. |
| Maximum liquid line lift | 60 Ft. |
- B. Maximum allowable pressure drops (R-22):
- | | |
|---------------------------------------|--------|
| Suction line | 6 psi |
| Liquid line (without subcooler) | 35 psi |

Route refrigerant piping for minimum linear length, minimum number of bends and fittings (no reducers) and minimum amount of line exposed to outdoor ambients.

- C. Recommended line sizes:
- | |
|---|
| Suction line - 1 3/8 inch sealed type L refrigerant tubing. |
| Liquid line - 1/2 inch sealed type L refrigerant tubing. |

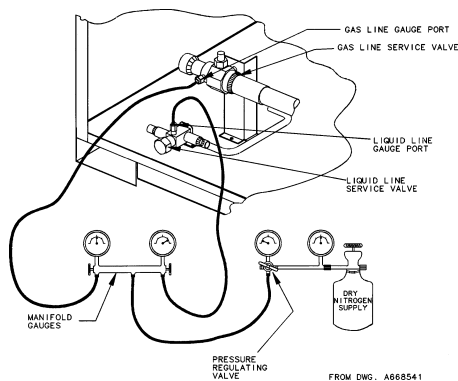
Note: Insulate all refrigerant piping and connections.

Refrigerant Piping Procedures (Outdoor Units)

Each TWA unit ships with a holding charge of dry nitrogen. The nitrogen should be removed and the entire system evacuated (at the proper time) to avoid possible contamination.

1. Remove the compressor service access panel.
2. Locate the liquid and suction line service valves. Check that the piping connection stubs on the valves (Figure 5) line up properly with the holes in the unit cabinet.

Figure 5



3. Remove the refrigerant connection seal caps and open the service valve slowly to release the nitrogen from the unit.

CAUTION: Do not remove the seal caps from refrigerant connections until prepared to braze refrigerant lines to the connections. Excessive exposure to atmosphere may allow moisture or dirt to contaminate the system, damaging valve seals and causing ice formation in system components.

4. Cut, fit and braze tubing, starting at the outdoor unit and work toward the indoor unit.

Note: Use long radius ells for all 90 degree bends.

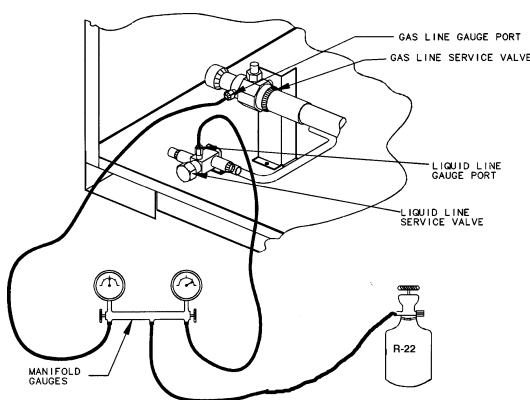
All brazing should be done using a 2 to 8 psig dry nitrogen purge flowing through the pipe being brazed (Figure 5).

CAUTION: Install a regulating valve between the nitrogen source and the gauge manifold (Figure 5). Unregulated pressure can damage system components.

CAUTION: Wet-wrap all valves and protect painted surfaces from excessive heat. Heat can damage system components and the unit finish.

5. Shut off nitrogen supply.
6. Shut off the manifold valve for the line that is connected to the suction line service valve. Disconnect the line from the gauge port on the valve.

Figure 6



Refrigerant Piping Procedure (Indoor Unit)

Once liquid and suction lines are complete to the refrigerant connections on the indoor unit, puncture the seal caps on the indoor unit connection stubs to release the dry nitrogen charge.

Installation

CAUTION: Do not apply heat to remove seal caps until they have been punctured. If seal caps are intact, application of heat may generate excessive pressure in the unit and result in damage to the coil or expansion valve.

1. Remove both seal caps from the indoor unit connection stubs.

CAUTION: Do not remove seal caps until prepared to braze refrigerant lines to the connections. Extended exposure to atmosphere may allow moisture or dirt to contaminate the system, damaging valve seats and causing ice formation in system components.

2. Turn nitrogen supply on. Nitrogen enters thorough liquid line gauge port.
3. Braze the liquid line connections.
4. Open the gauge port on the suction line and then braze the suction line to the connection stub. Nitrogen will bleed out the open gauge port on the suction line.
5. Shut off nitrogen supply.

Leak Check

After the brazing operation of refrigerant lines to both the outdoor and indoor unit is completed, the field brazed connections must be checked for leaks. Pressurize the system through the service valve with dry nitrogen to 200 psi. Use soap bubbles or other leak-checking methods to ensure that all field joints are leak free. If not, release pressure, repair and repeat leak test.

System Evacuation

1. After completion of leak check, evacuate the system.
2. Attach appropriate hoses from manifold gauge to gas and liquid line pressure taps.

Note: Unnecessary switching of hoses can be avoided and complete evacuation of all lines leading to sealed system can be accomplished with manifold center hose and connecting branch hose to a cylinder of R-22 and vacuum pump.

3. Attach center hose of manifold gauges to vacuum pump.
4. Evacuate the system to hold a 350 micron vacuum.
5. Close off valve to vacuum pump and observe the micron gauge. If gauge pressure rises above 500 microns in one (1) minute, then evacuation is incomplete or the system has a leak.
6. If vacuum gauge does not rise above 500 microns in one (1) minute, the evacuation should be complete.

7. With vacuum pump and micron gauge blanked off, open valve on R-22 cylinder and allow refrigerant pressure to build up to about 40 psig.
8. Close valve on the R-22 supply cylinder. Close valves on manifold gauge set and remove refrigerant charging hoses from liquid and gas gauge ports.
9. Leak test the entire system. Using proper procedures and caution, repair any leaks found and repeat the leak test.

Refrigerant Charging Procedure

If charging by weight, refer to refrigerant charges that are given in Table 3. If additional refrigerant is needed because of length of line, calculate the requirement using Table 4. Charge by weight through the gauge port on the liquid line. Once the charge enters the system, backseat (open) the liquid line service valve and disconnect the charging line and replace the cap on the gauge port.

Insulating and Isolating Refrigerant Lines

Insulate the entire suction line with refrigerant piping insulation. Also insulate any portion of the liquid line exposed to temperature extremes. Insulate and isolate liquid and suction lines from each other. Isolate refrigerant lines from the structure and any duct work.

Note: To prevent possible noise or vibration problems, be certain to isolate refrigerant lines from the building.

Table 3 - TWA Refrigerant Charge (R-22)¹

Model Number	Refrigerant Charge
TWA090A	18 lbs. 0.0 oza.
TWA075A	
TWA120A	31 lbs. 8.0 ozs.
TWA100A	
TWA180B	18 lbs. 0.0 ozs. (per circuit)
TWA155B	
TWA240B	22 lbs. 4.0 ozs. (per circuit)
TWA200B	

¹ Sufficient operating charge for outdoor unit and 25 feet of nominally sized refrigerant piping.

Table 4 - Additional Required Refrigerant

Additional Tubing Length	Additional R-22 Required (lbs.)
15 ft.	1 lb. 4 oz.
25 ft.	2 lbs. 1 oz.
32 ft.	2 lbs. 11 oz.
40 ft.	3 lbs. 5 oz.

¹ Based on 1-3/8" dia. Suction line, 1/2" liquid line.

² Add .5 lbs. R-22 for each additional six feet of tubing length over 40 feet.

Installation

Note: For tubing over 40 ft. calculate the additional refrigerant needed, based on notes above.

Gaseous Charging

This procedure is accomplished with the unit operating. Electrical connections must be complete. Do not proceed until the system is ready to operate.

Procedure

1. Connect R-22 drum with gauge manifold to the Schrader valves (pressure taps) on the compressor discharge and suction lines (Figure 6).

Note: The compressor access panel must be installed when the unit is running and being charged. The control box access panel must be removed, and the manifold hoses must be routed through an opening located in the bottom front of the control box. The opening has a pivoted cover plate.

⚠ WARNING: USE EXTREME CAUTION WHILE SERVICING THE UNIT WHEN THE CONTROL BOX ACCESS PANEL IS REMOVED AND POWER IS APPLIED TO THE UNIT. FAILURE TO OBSERVE ALL SAFETY PRECAUTIONS COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

2. Turn on power to the unit. Allow the system to run for five to ten minutes to stabilize operating conditions.
3. Measure airflow across the indoor coil. Compare the measurements with the fan performance data in the Data/Submittal or Service Facts. Once proper airflow is established, observe the suction and head pressure gauges on the gauge manifold. Pressure reading should fall approximately at the points shown by the pressure curves in Service Facts. Add or remove refrigerant (gas only) as required to obtain correct head and suction pressures. Check suction line superheat and condenser subcooling to ensure the unit is operating properly.
4. Disconnect all power to the unit.
5. Remove the charging system from the unit and close the opening in the bottom of the control box with the pivotal cover before attempting to replace access panel.
6. Replace all panels.

Electrical Wiring

TWA field wiring consists of providing power supply to the unit, installing the system indoor thermostat and providing low voltage system interconnecting wiring. Access to electrical connection locations is shown in Figure 1, Figure 2 and Figure 3.

Unit Power Supply

The installer must provide line voltage circuit(s) to the unit main power terminals as shown by the unit wiring diagrams in Service Facts or field wiring. Power supply must include a disconnect switch in a location convenient to the unit. Ground the unit according to local codes and provide flexible conduit if codes require and/or if vibration transmission may cause noise problems.

Important: All wiring must comply with applicable local and national (**NEC**) codes. Type and location of disconnect switches must comply with all applicable codes.

CAUTION: Use copper conductors only. Unit terminals are not designed for use with aluminum conductors. Use of improper wiring materials can result in equipment damage.

⚠ WARNING: OPEN THE ELECTRICAL DISCONNECT SWITCH AND LOCK IN OPEN POSITION TO PREVENT ACCIDENTAL POWER APPLICATION. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK.

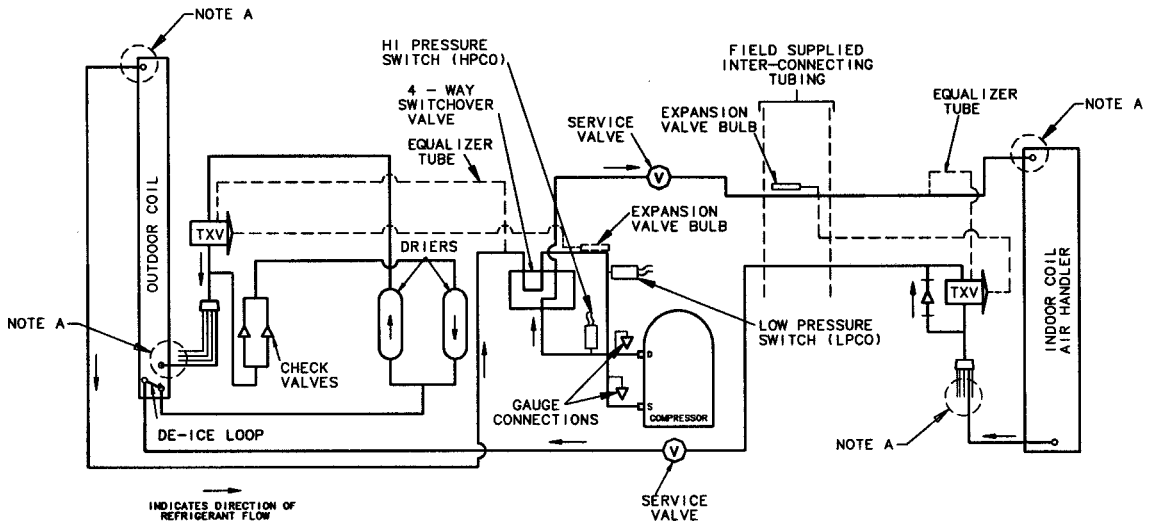
Determine proper wire sizes and unit protective fusing requirements by referring to the unit nameplate and/or the unit Service Facts. Field wiring diagrams for accessories are shipped with the accessory.

Low Voltage Wiring

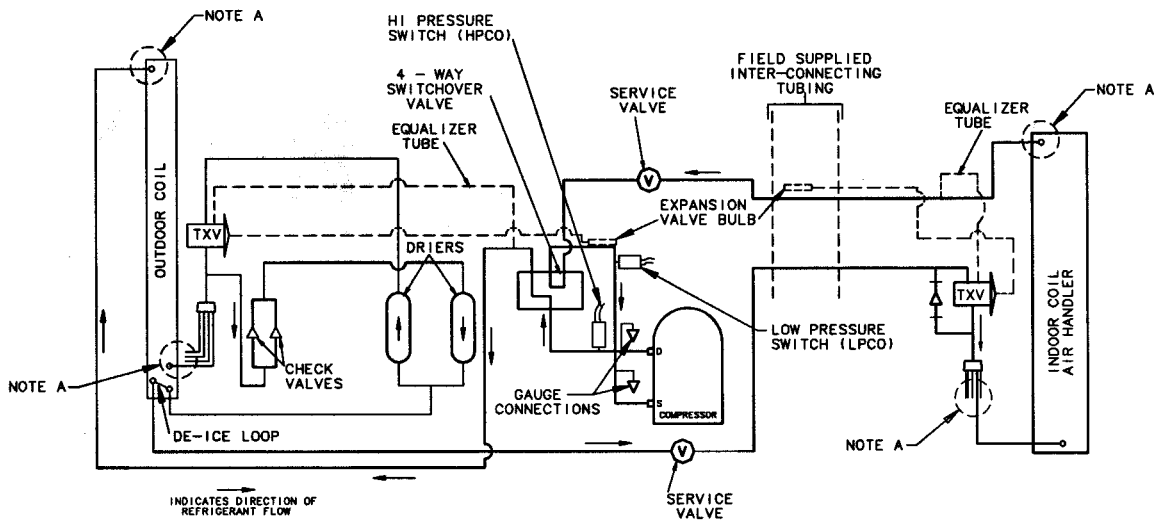
Mount the indoor thermostat in accordance with the thermostat installation instructions. Install color-coded, weather-proof, multi-wire cable according to the Interconnecting Wiring diagrams in the Air Handler IOM.

Installation

Figure 7 - Typical Split System Heat Pump Refrigerant Circuits



HEATING MODE

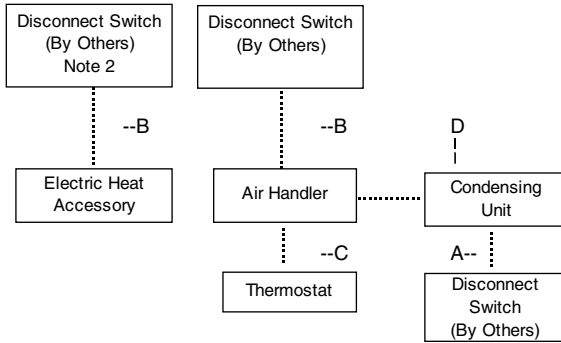


COOLING MODE

NOTE A: ONLY ONE INDOOR & OUTDOOR COIL ENTRY/EXIT CIRCUIT IS SHOWN; ALL MODELS HAVE MULTIPLE ENTRY/EXIT CIRCUITS.

Installation

Figure 8 -Typical Field Wiring



TWA090 & 075A/TWE090 & 075A
TWA120 & 100A/TWE120 & 100A

FIELD WIRING:

A-- 3 POWER WIRES, LINE VOLTAGE

B-- 3 POWER WIRES, LINE VOLTAGE FOR 3 PHASE;
2 WIRES FOR SINGLE PHASE

C-- HEAT PUMP THERMOSTAT: 6 WIRES, 24 VOLTS

-- ELECTRIC HEAT: ADD 2 ADDITIONAL WIRES, 24 VOLTS

D-- 6 WIRES, 24 VOLTS

-- OUTDOOR THERMOSTAT: ADD 1 ADDITIONAL WIRE, 24 VOLTS

-- ELECTRIC HEAT: ADD 1 ADDITIONAL WIRE, 24 VOLTS

Notes:

1. WIRING SHOWN WITH DASHED LINES IS TO BE FURNISHED AND INSTALLED BY THE CUSTOMER. ALL CUSTOMER SUPPLIED WIRING MUST BE COPPER ONLY AND MUST CONFORM TO NEC AND LOCAL ELECTRICAL CODES. CODES MAY REQUIRE LINE OF SIGHT BETWEEN DISCONNECT SWITCH AND UNIT.
2. WHEN ELECTRIC HEATER ACCESSORY IS USED SINGLE POINT POWER ENTRY OR DUAL POINT POWER ENTRY IS FIELD OPTIONAL, SINGLE POINT POWER ENTRY OPTION IS THROUGH ELECTRIC HEATER ONLY.

System Pre-Start Procedure

Safety Controls

Note: All of these controls may not be installed on your unit, check electrical schematic.

Evaporator Defrost Control (EDC)

This control is located in the Air Handler of Split Units. The control's sensing tube is imbedded vertically in the evaporator coil, near the center. This device will stop the compressor if the coil temperature drops below its setting. The indoor air will still circulate across the coil, bringing the temperature of the coil back up to the cut-in temperature of the evaporator defrost control.

Low Pressure Cut-Out (LPCO)

This control's sensor is located in the suction (gas) line, near the compressor. The control will stop the compressor and outdoor fans if suction pressure drops below the Low Pressure Cut-Out setting. Once the suction pressure has returned to normal, the compressor and outdoor fans will cycle back on.

High Pressure Cut-Out (HPCO)

This control's sensor is located in the liquid line. This device will shut off the compressor and the outdoor fan(s) if the discharge pressure exceeds the High Pressure Cut-Out setting. Once the discharge pressure has returned to normal, the compressor will cycle back on.

Internal Overload Protector (IOL)

This device is a current/thermal actuated warp switch, imbedded in the compressor motor windings. It will shut off the compressor if the temperature or current of the compressor motor windings exceeds its design trip temperature.

Note: The IOL will put the compressor back in operation once the compressor motor heat has dropped below the trip setting; however, a check of the refrigerant and electrical system should be made to determine the cause and be corrected.

Installation Checklist

Complete this checklist once the unit is installed to verify that all recommended procedures have been accomplished before starting the system. Do not operate the system until all items covered by this checklist are complete.

- Inspect unit location for proper required service clearances.
- Inspect unit location for proper free air clearances.
- Inspect unit location for secure, level mounting position.

Refrigerant Piping

- Performed initial leak test?
- Connected properly sized and constructed liquid and suction lines to the connection stubs at both the indoor and outdoor units?
- Insulated the entire suction line?
- Insulated portions of liquid line exposed to extremes in temperature?
- Evacuated each refrigerant circuit to 350 microns?
- Charged each circuit with proper amount of R-22?

Electrical Wiring

- Provided unit power wiring (with disconnect) to proper terminals in the unit control section?
- Installed system indoor thermostat?
- Installed system low voltage interconnecting wiring to proper terminals of outdoor unit, indoor unit and system thermostat?

System Start Procedure

Sequence of Operation

Unit Start-Up

Once the unit is properly installed and pre-start procedures are complete, start the unit by turning the System Switch on the indoor thermostat to either HEAT, COOL or AUTO. The system should operate normally.

CAUTION: Ensure the disconnect for the indoor air handler is closed before operating the system. Operating the indoor unit without the indoor fan energized, can cause unit trip-out on high pressure control and/or liquid flood back to the compressor.

General

Operation of the unit is controlled by the HEAT and/or COOL setting in the thermostat. (An optional automatic changeover thermostat, when in the AUTO position, automatically changes to heat or cool cycles with sufficient room temperature change.) The fan switch can be placed in either the ON position, causing continuous indoor fan operation, or the AUTO position causing fan operation to coincide with heating or cooling run cycles. With the disconnect switch in the closed position, current is supplied to the compressor crankcase heater(s) and the control transformer. The outdoor fan relay (ODF) is energized through a continuous 24 volt circuit from the transformer, and controlled through normally closed contacts on the defrost control board (DFC).

Cooling Mode

With the system switch on the thermostat set to COOL, current is supplied from the "R" terminal to the "O" terminal on the low voltage terminal board of the outdoor unit. This energizes the switch-over valve (SOV) and places it in the cooling position. The evaporator defrost relay (EDR) is also energized at this time, opening EDR-1 contacts to allow the evaporator defrost control (EDC) to function while in the cooling mode, and opening EDR-2 contacts to prevent defrost control (DFC) operation while in cooling mode. When the room temperature is 1 ½ degrees above the thermostat setting, a cooling cycle is initiated by closing of the TSC-1 contacts in the thermostat. When closed, these contacts supply power from "R" terminal through TSC-1 to "Y" terminal on the low voltage terminal board of the outdoor unit, which supplies power to the (CC) compressor contactor, (compressor auxiliary relay (CCA) or auxiliary compressor contactor (ACCA) on specific models. This closes the compressor contacts, which starts the compressor and outdoor fan motor. TSC-1 contacts also supply power to the "G" terminal in the thermostat, which energizes the fan relay (F), starting the indoor fan motor (provided the fan switch is in the AUTO position).

On dual circuit units, when second stage cooling is required, "Y2" terminal from the thermostat energizes auxiliary compressor contactor (ACC) which energizes compressor contactor B (CC-B), (ACCB on some models) provided the HPCO and LPCO are closed. An "O" signal for cooling is supplied to the defrost control board (DFC-B) through the evaporator defrost relay (EDR) which was previous energized. This signal causes an output to the switch-over valve (SOV-B), placing it in the cooling mode.

Heating Mode

With the system switch on the thermostat set to the HEAT position, and the room temperature drops approximately 1 ½ degrees below the thermostat setting, a heating cycle is initiated by closing of the TSH-1 contacts. When closed, these contacts supply power from "R" terminal through TSH-1 to "Y" terminal on the low voltage terminal board of the outdoor unit, which supplies power to the (CC) compressor contactor, (compressor auxiliary relay (CCA) or auxiliary compressor contactor (ACCA) on specific models). This closes the compressor contacts, which start the compressor and outdoor fan motor. TSH-1 contacts also provide power to the "G" terminal on the thermostat, which energizes the fan relay (F), starting the indoor fan motor (provided the fan switch is in the AUTO position). While in the normal heating position, "O" terminal, which powers the switch-over valve (SOV) and the evaporator defrost relay (EDR), will remain de-energized by the thermostat. EDR-1 contacts close, bypassing the evaporator defrost control (EDC). EDR-2 contacts close which supply power to the defrost control timer (DFC), allowing it to operate during the heating cycle.

On dual circuit units, when second stage heating is required, "Y2" from the indoor thermostat will energize auxiliary compressor contactor (ACC), which will energize compressor contactor B (CC-B) (ACCB on some models), provided HPCO and LPCO are closed. Control power for the "B" compressor is supplied from the second transformer (TNS-B) which also powers the supplementary heaters through the heat relay (H) when additional heat is required by "W" terminal.

Time Temperature Defrost

During the heating cycle, the outdoor coil may require a defrost cycle which is controlled by the defrost control timer (DFC). It is energized continuously, allowing a defrost cycle every 50, 70 or 90 minutes when the defrost terminator (DT) closes at the appropriate line temperature. The defrost control timer (DFC) opens the circuit to the outdoor fan relay (ODF), and closes a circuit through the timer board which energizes the switch-over valve (SOV), and provides power to the "X2" terminal for supplementary heat placing the unit into the defrost cycle. The compressor will start 30 seconds after the initiation of the defrost cycle. Supplementary heat is brought on to control indoor temperature during defrost. When the liquid line temperature reaches approximately 70 degrees, or a 10 minute timed cycle expires, the defrost control timer (DFC) closes the to the outdoor fan relay (ODF) and opens the circuit to the switch-over valve (SOV) and the "X2" terminal, returning the unit to the heating mode.

On dual circuit units, defrost of each outdoor coil is independent and will occur as required. Low pressure cutout (LPCO) is disabled during defrost.

Note: Do not change from the 70 minute full timing cycle in the Southern U.S. ("sunbelt") areas. In Northern climates, the 50 minute defrost cycle may be needed, especially in areas of frequent snow.

System Start Procedure

Supplementary Heat

The 1st stage of supplementary heat is cycled on when the indoor temperature drops approximately 2 degrees below the thermostat setting. TSH-1 establishes compressor operation through the “Y” terminal. TSH-2 contacts close providing power to the “W” terminal on the indoor thermostat, which supplies power to the supplementary heater control circuit when the auxiliary fan contacts (F-AUX) are closed. Additional supplementary heat or stages of heat may have been added with the use of outdoor thermostats, (not shown on the schematic). If the outdoor temperature falls below the setpoint on the outdoor thermostat, the additional stages of heat will come on. When it rises above the set point, the system will revert back to 2nd stage supplementary heating. As the indoor temperature approaches indoor thermostat set point, TSH-2 contacts will open, shutting off supplementary heat and TSH-1 contacts will remain closed until indoor temperature is satisfied, shutting off the complete system.

Emergency Heat

An emergency heat switch (EMERG) is provided within the thermostat. When placed in the emergency heat position, TSH-1 circuit opens to “Y” terminal and closes to “X2” terminal. Supplementary heat now operates on 1st call for heating. “G” terminal sequence remains unchanged at this point. The outdoor thermostats (if used) are by-passed.

“T” (Thermistor) Circuit

The “T” circuit, used with both the manual and automatic changeover thermostats in conjunction with heat pump applications, is used for anticipation of outdoor condition changes. This thermistor varies the resistance as temperature varies in an inverse proportional relationship. It is located in the outdoor unit on the defrost control timer (DFC) and is in series with a fixed value resistor on the thermostat between “R” and “T” terminals. Should this “T” circuit from the outdoor unit become inoperative, the thermostat could be out of calibration by as much as 6 to 10 degrees. Before attempting to calibrate the thermostat, be sure to check this circuit for proper operation.

Indoor Fan

The evaporator fan is controlled by an ON/AUTO switch on the room thermostat. With the switch positioned at AUTO and the unit operating in the cooling mode, fan operation coincides with the thermostat calling for cooling. If the unit is operating in the heating mode while the fan switch is at AUTO, fan operation coincides with the thermostat calling for heating. When the fan switch is positioned at ON, fan operation is continuous.

Low Outdoor Ambient Cooling

The Evaporator Defrost Control is standard equipment on Air Handlers and will permit low ambient cooling down to 35 degrees F. For cooling operation down to 0 degrees F, use an accessory Head Pressure control on the outdoor unit.

Maintenance

Maintenance

Perform all of the indicated maintenance procedures at the intervals scheduled. This will prolong the life of the unit and reduce the possibility of costly equipment failure.

Monthly

Conduct the following maintenance inspections once per month.

⚠ WARNING: *OPEN AND LOCK UNIT DISCONNECT TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.*

1. Inspect air filters and clean if necessary.
2. Check unit wiring to ensure all connections are tight and that the wiring insulation is intact.
3. Check drain pans and condensate piping to insure they are free of obstacles.
4. Manually rotate the indoor fan to insure proper operation.
5. Inspect the evaporator and condenser coils for dirt and debris. If the coils appear dirty, clean them.
6. With the unit operating in the cooling mode, check the suction and discharge pressures and compare them with Pressure Curve values in unit Service Facts. Record these readings on the "Maintenance Log."
7. Observe indoor fan operation and correct any unusual or excessive vibration. Clean blower wheels as needed.

Annually (Cooling Season)

The following maintenance procedures must be performed at the beginning of each cooling season to insure efficient unit operation.

1. Perform all of the monthly maintenance inspections.
2. With the unit operating, check unit superheat and record the reading in the "Maintenance Log."
3. Remove any accumulation of dust and/or dirt from the unit casing.
4. Remove corrosion from any surface and repaint. Check the gasket around the control panel door to insure it fits correctly and is in good condition to prevent water leakage.
5. Inspect the evaporator fan belt. If it is worn or frayed, replace it.
6. Inspect the control panel wiring to insure that all connections are tight and that the insulation is intact.

Lubricate the indoor fan motor bearing with a non detergent 20-weight oil. (To insure good bearing lubrication, condenser fan motor bearings should be lubricated once every six months.)

Note: Some motors are permanently lubricated.

7. Check refrigerant piping and fittings for leaks.

The following warning complies with State of California law, Proposition 65.

⚠ WARNING: This product contains fiberglass wool insulation! Fiberglass dust and ceramic fibers are believed by the state of California to cause cancer through inhalation. Glasswool fibers may also cause respiratory, skin, or eye irritation.

Precautionary Measures

- * Avoid breathing fiberglass dust.
- * Use a NIOSH approved dust/mist respirator.
- * Avoid contact with the skin or eyes. Wear long-sleeved, loose-fitting clothing, gloves, and eye protection.
- * Wash clothes separately from other clothing: rinse washer thoroughly.
- * Operations such as sawing, blowing, tear-out, and spraying may generate fiber concentrations requiring additional respiratory protection. Use the appropriate NIOSH approved respirator in these situations.

First Aid Measures

Eye Contact - Flush eyes with water to remove dust. If symptoms persist, seek medical attention.

Skin Contact - Wash affected areas gently with soap and warm water after handling.

Warranty

For Commercial Unitary Equipment Rated Under 20 Tons and Related Accessories

Products Covered

This warranty is extended by American Standard Inc., and applies to the following products:

- All packaged and split system air conditioners and heat pumps have a rated capacity of less than 20 tons.
- All packaged combinations gas/electric air conditioners having a rated capacity of less than 20 tons.
- All packaged combination gas/electric air conditioners having a rated capacity of 1 ½ through 5 tons single phase electric power and used for commercial applications. (As used in this warranty, a commercial application is any application where the end purchaser uses the product for other than personal, family or household purposes.)
- All accessories for the above products which are sold by American Standard Inc. and applied in accordance with American Standard Inc. specifications.

Basic Warranty

The warrantor warrants for a period of twelve (12) months from the initial start-up or eighteen (18) months from date of shipment, whichever is sooner, that the products covered by this warranty (1) are free from defects in material and manufacture, and (2) have the capacities and ratings set forth in the warrantor's catalogs and bulletins.

Extended Four-Year Warranty On Compressors

The warrantor warrants for a period of four (4) years commencing twelve (12) months from date of installations or eighteen (18) months from date of shipment, whichever is sooner, that the compressor in any product covered by this warranty (1) is free from defects in material and manufacture, and (2) has the capacities and ratings set forth in the warrantor's catalogs and bulletins.

Extended Four-Year Warranty On Heat Exchangers

The warrantor warrants for a period of four (4) years commencing twelve (12) months from date of installations or eighteen (18) months from date of shipment, whichever is sooner, that the gas-fired heat exchanger in any products covered by this warranty (1) is free from defects in material and manufacture, and (2) has the capacities and ratings set forth in the warrantor's catalogs and bulletins.

Exclusions And Limitations

The warrantor's obligations and liabilities under this warranty are limited to furnishing F.O.B. factory or warehouse at the warrantor-designated shipping point, freight allowed to Buyer's city (or port of export for shipments outside the con-terminous United States) a replacement product or, at the option of the warrantor, parts for the repair of the product not conforming to this warranty and

which have been returned to the warrantor. The warrantor's warranty is conditional on the Customer providing written notice to the warrantor within thirty (30) days of the discovery of the defect. No product shall be returned to the warrantor without the warrantor's written permission. No liability whatever shall attach to warrantor until said products have been fully paid for and then said liability shall be limited to the purchase price of the equipment shown to be defective.

The warranty does not apply to any compressor or gas-fired heat exchanger which has been repaired or altered in such manner as, in the judgement of the warrantor, affects its stability or reliability. This warranty does not cover (1) any heat exchanger which has been fired with an improper type of fuel (2) a heat exchanger which is installed in a beauty parlor, dry cleaning establishment, de-greasing plant or in any corrosive atmosphere; or (3) any heat exchanger which is not shown to be defective by the warrantor's inspection.

This warranty does not cover damage due to accident, abuse, improper use, external causes, freezing, corrosion, erosion or deterioration.

Local transportation, related service labor, air filters, diagnosis calls, refrigerant and related items are not covered.

THE WARRANTY AND LIABILITY SET FORTH HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, WHETHER IN CONTRACT OR IN NEGLIGENCE, EXPRESS OR IMPLIED, IN LAW OR IN FACT, INCLUDING IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY IMPLIED WARRANTIES OTHERWISE ARISING FROM THE COURSE OF DEALING OR TRADE. IN NO EVENT SHALL THE WARRANTOR BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

The warrantor makes certain further warranty protection available on an optional, extra-cost basis. Any further warranty must be in writing. If you wish further help or information concerning this warranty, contact:

American Standard Inc.—Warrantor
2701 Wilma Rudolph Blvd.
Clarksville, TN 37040

Warranty

Commercial Equipment Rated 20 Tons and Larger and Related Accessories

(Parts Only)

PRODUCTS COVERED — This warranty is extended by American Standard Inc., and applies only to commercial equipment rated 20 tons and larger and related accessories purchased and retained for use within the U.S.A. and Canada.

Warrantor warrants for a period of 12 months from initial start-up or 18 months from date of shipment, whichever is less, that the products covered by this warranty (1) are free from defects in material and manufacture, and (2) have the capacities and ratings set forth in catalogs and bulletins; provided, that no warranty is made against corrosion, erosion or deterioration. Warrantor's obligations and liabilities under this warranty are limited to furnishing, F.O.B. factory replacement parts (or equipment at the option of Warrantor) for all Warrantor's products not conforming to this warranty. Warrantor shall not be obligated to pay for the cost of lost refrigerant. No liability whatever shall attach to Warrantor until said products have been paid for and then said liability shall be limited to the purchase price of the equipment shown to be defective.

THE WARRANTY AND LIABILITY SET FORTH HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES AND LIABILITIES, WHETHER IN CONTRACT OR IN NEGLIGENCE, EXPRESS OR IMPLIED, IN LAW OR IN FACT, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE, AND IN NO EVENT SHALL WARRANTOR BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES

Some states do not allow limitations on how long an implied warranty lasts or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

American Standard Inc.—Warrantor
2701 Wilma Rudolph Blvd.
Clarksville, TN 37040
GW-598-4799





Literature Order Number	TWA-SVX01A--EN
File Number	SV-UN-TWA-SVX01A-EN 5/03
Supersedes	New
Stocking Location	Webb Mason

The manufacturer has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.