Operation and Installation Manual for HP-6 thru HP-20 Split Heat Pump Packages

5-15



Outdoor Condensing Unit



Indoor Evaporator DX
Heat Exchanger Package

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⚠ SAFETY WARNING

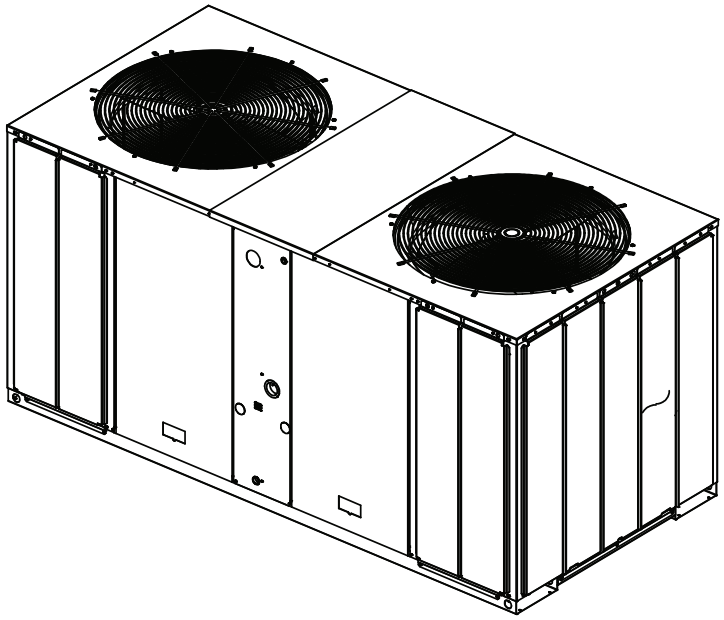
Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

Building Environments for Life

Aqua Logic Heat Pump Split Package Installation Operation Maintenance

Trane Split System Heat Pump Condensers

7.5-20 Tons (R-410A)



Model Numbers
(60 Hz)
TWA090D***A
TWA120D***A
TWA180E* * *A
TWA240E* * *A

Februay 2014

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠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, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.
All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all Personal Protective Equipment (PPE) recommended for the work being undertaken. ALWAYS refer to appropriate MSDS sheets and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate MSDS sheets and OSHA guidelines for information on allowable personal exposure levels, proper respiratory protection and handling recommendations.**
- **If there is a risk of arc or flash, technicians MUST put on all Personal Protective Equipment (PPE) in accordance with NFPA 70E or other country-specific requirements for arc flash protection, PRIOR to servicing the unit.**

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⚠ WARNING

Refrigerant under High Pressure!

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage.

System contains oil and refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

⚠ WARNING

R-410A Refrigerant under Higher Pressure than R-22!

Failure to use proper equipment or components as described below, could result in equipment failing and possibly exploding, which could result in death, serious injury, or equipment damage.

The units described in this manual use R-410A refrigerant which operates at higher pressures than R-22. Use ONLY R-410A rated service equipment or components with these units. For specific handling concerns with R-410A, please contact your local Trane representative.

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Revision History

Removed warranty chapter, updated with running edits.

Model Number Description

Outdoor Trane Heat Pump Condenser

TWA	**240**	**E**	**3**	**00**	*	*
123	**456**	**7**	**8**	**910**	**11**	**12**

TWA	**201**	**E**	**3**	**00**	*	*
123	**456**	**7**	**8**	**910**	**11**	**12**

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. 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.

DIGITS 1 - 3: Product Type

TWA = Split System Heat Pump

DIGITS 4 - 6: Nominal Gross Cooling Capacity (MBh)

061 = 5 Tons (50Hz)
076 = 6.25 Tons (50Hz)
101 = 8.33 Tons (50Hz)
156 = 13.0 Tons (50Hz)
201 = 16.7 Tons (50Hz)
090 = 7.5 Tons (60Hz)
120 = 10 Tons (60Hz)
180 = 15 Tons (60Hz)
240 = 20 Tons (60Hz)

DIGIT 7: Major Development Sequence

D = Single Compressor, Single Circuit
E = Dual Compressor, Dual Circuit

DIGIT 8: Electrical Characteristics

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

DIGITS 9 - 10: Factory Installed Options

00 = Packed Stock
0R = ReliaTel, no LCI Board
0T = ReliaTel, no LCI Board with Black Epoxy Coated Coil
0U = ReliaTel, with LCI Board
0W = ReliaTel, with LCI Board and Black Epoxy Coated Coil
HR = Hail Guard with ReliaTel, no LCI Board
HT = Hail Guard with ReliaTel, no LCI Board with Black Epoxy Coated Coil
HU = Hail Guard with ReliaTel, with LCI Board
HW = Hail Guard with ReliaTel, with LCI Board and Black Epoxy Coated Coil

DIGITS 11: Minor Design Sequence

* = Current Design Sequence[1]

DIGITS 12: Service Digit

* = Current Design Sequence[1]

1. * = *sequential alpha character*

General Information

This manual 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. Should equipment failure occur, contact a qualified service organization with qualified, experienced HVAC technicians to properly diagnose and repair this equipment.

Important: *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.*

Any individual installing, maintaining, or servicing this equipment must be properly trained, licensed and qualified.

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.*

Use the "Installation Checklist" provided In this manual 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 Description

These condensers come with single and dual compressor options. Single compressor outdoor units feature a single refrigeration circuitry, requiring only one set of refrigerant lines. Dual compressor/dual circuit models give true stand-by protection; if one compressor fails, the second will automatically start-up. Also, the first compressor can be serviced without shutting down the unit since the refrigerant circuits are independent. During light load conditions, only one compressor will operate to save energy.

Pre-Installation

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 ensure 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.

Testing for Leaks

All units are shipped with a holding charge of nitrogen in each circuit and should be leak tested before installation.

1. Remove the access panel.
2. Locate the liquid line or suction line access valve for each circuit.
3. Install gauges to determine if the circuits are still pressurized. If not, the charge has escaped and should be repaired as required to obtain a leak-free circuit.

Lifting Recommendations

⚠ WARNING

Improper Unit Lift!

Failure to properly lift unit could result in unit dropping and possibly crushing operator/ technician which could result in death or serious injury, and equipment or property-only damage. Test lift unit approximately 24 inches to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

NOTICE

Equipment Damage!

Use spreader bars to prevent straps from damaging the unit. Install the bars between lifting straps, both underneath the unit and above the unit to prevent the straps from crushing the unit cabinet or damaging the finish.

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. See "Weights" for approximate unit weights.

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 (see unit drawings in "Weights"). Use spreader bars to protect the unit casing from damage. Test lift the unit to determine proper balance and stability.

Clearances

Provide enough space around the unit to allow unrestricted access to all service points. Refer to the "Dimensional Data" for unit dimensions and minimum required service and free air clearances. Observe the following points to ensure proper unit operation.

1. Do not install the unit under a low overhang. Condenser discharge must not be restricted—refer to notes in "Dimensional Data drawings."

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

2. Do not locate the unit in a position where runoff water can fall into the fan discharge openings.
3. Condenser intake air is supplied from three or four sides of the unit. Adhere to the minimum required clearances given in unit dimensional drawings (see "Dimensional Data").

Unit Mounting

⚠ WARNING

Mounting Integrity!

Failure to follow instruction below could result in death or serious injury or possible equipment or property-only damage.

Ensure the roof structure supports are strong enough to support the weight of the unit and any accessories.

Structural Preparation

NOTICE

Roof Damage!

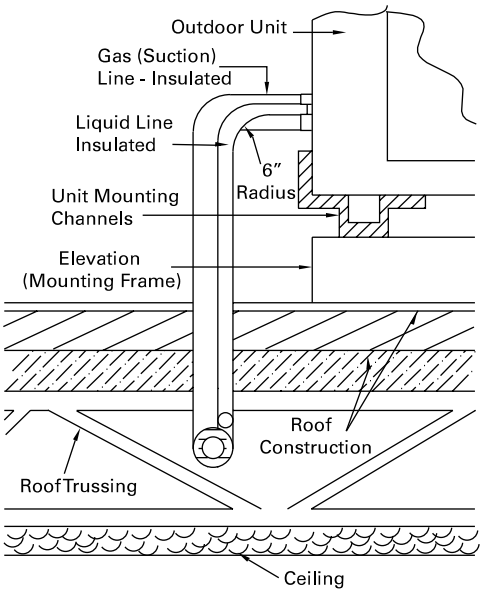
System contains oil and refrigerant under high pressure. Roofs should be protected from exposure to oils and refrigerant in the system. If rooftop is not protected, damage to the roof may occur.

Important: *Refer to local building codes for proper installation. All installation must comply with local building codes.*

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, see "Weights". 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 1. Roof mounted unit



Ground Level Mounting

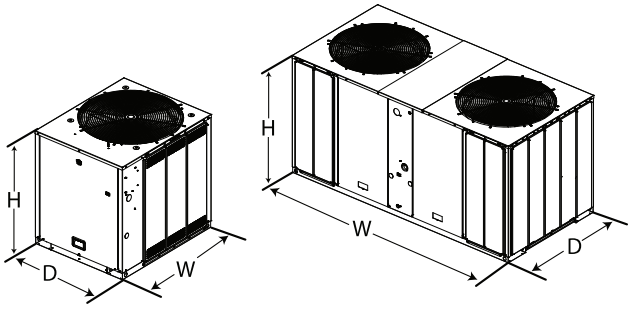
For ground level installation, the unit base should be adequately supported and hold the unit near level. The installation must meet the guidelines set forth in local codes. The support should extend two inches beyond the unit base channels at all points. The unit and support must be isolated from any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

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 "Dimensional Data drawings."

Dimensional Data

Figure 2. Height, width and depth measurements



	H - in. (mm)	W - in. (mm)	D - in. (mm)
TWA090	39.125 (993.8)	42.125 (1070)	36 (914.4)
TWA120	39.125 (993.8)	52.125 (1324)	40 (1016)
TWA180, 240	45.125 (1146.1)	52.125 (1324)	40 (1016)

Figure 3. 7.5 ton heat pump, single compressor

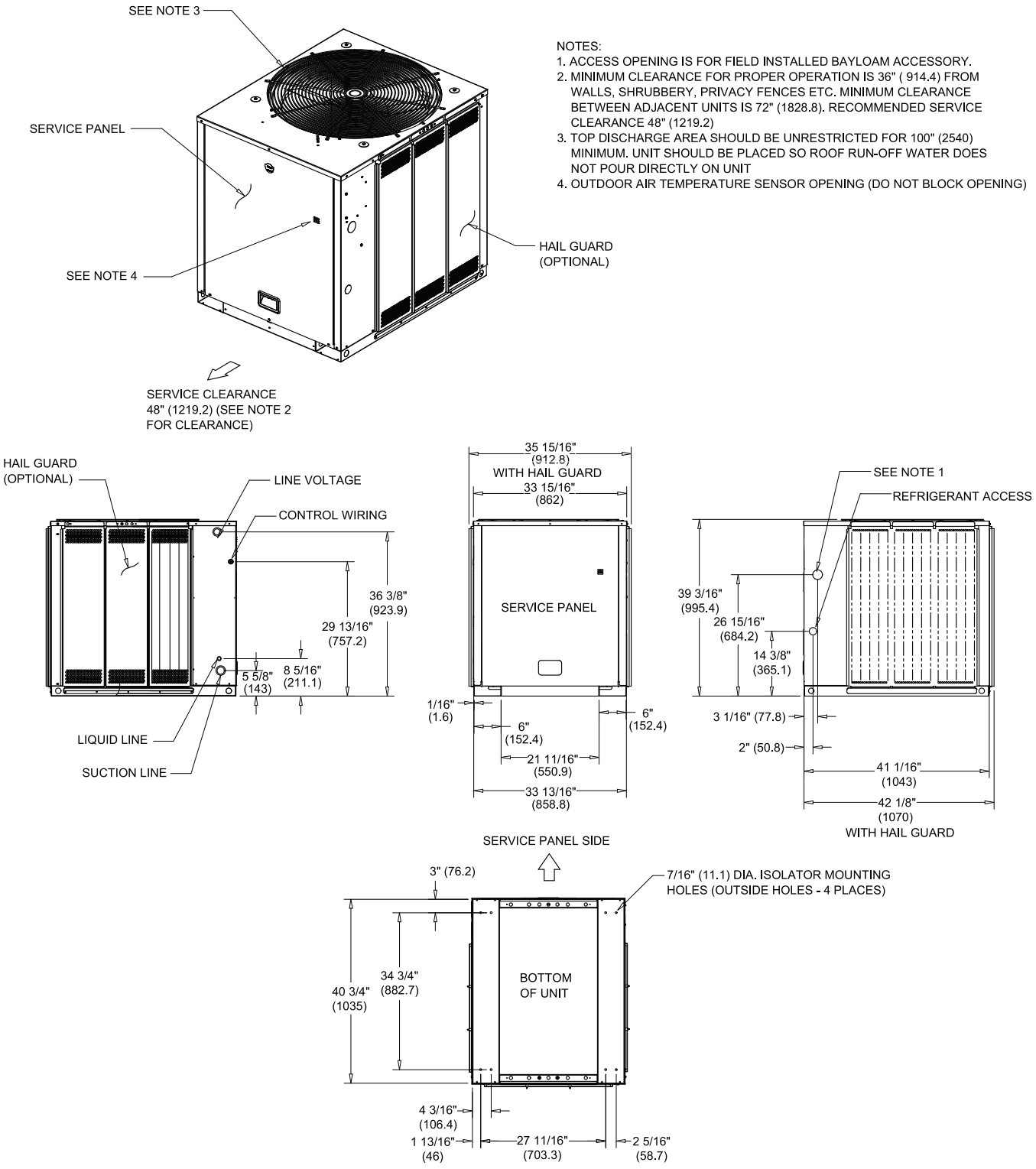
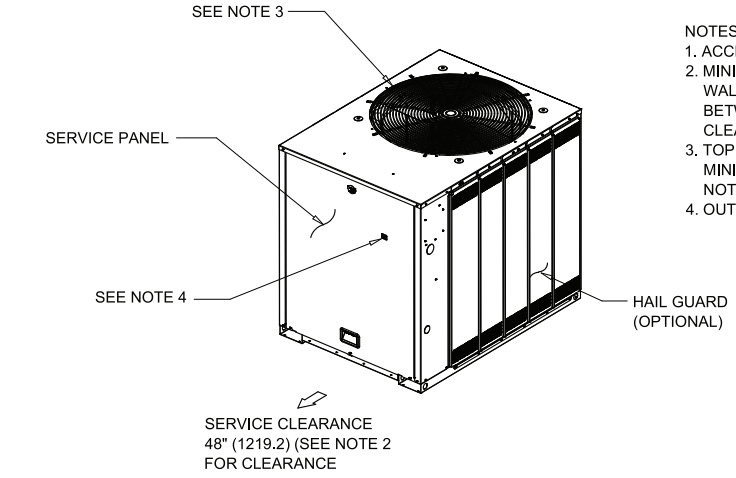


Figure 4. 10 ton heat pump, single compressor



NOTES:
1. ACCESS OPENING IS FOR FIELD INSTALLED BAYLOAM ACCESSORY.
2. MINIMUM CLEARANCE FOR PROPER OPERATION IS 36" (914.4) FROM WALLS, SHRUBBERY, PRIVACY FENCES ETC. MINIMUM CLEARANCE BETWEEN ADJACENT UNITS IS 72" (1828.8). RECOMMENDED SERVICE CLEARANCE 48" (1219.2)
3. TOP DISCHARGE AREA SHOULD BE UNRESTRICTED FOR 100" (2540) MINIMUM. UNIT SHOULD BE PLACED SO ROOF RUN-OFF WATER DOES NOT POUR DIRECTLY ON UNIT
4. OUTDOOR AIR TEMPERATURE SENSOR OPENING (DO NOT BLOCK OPENING)

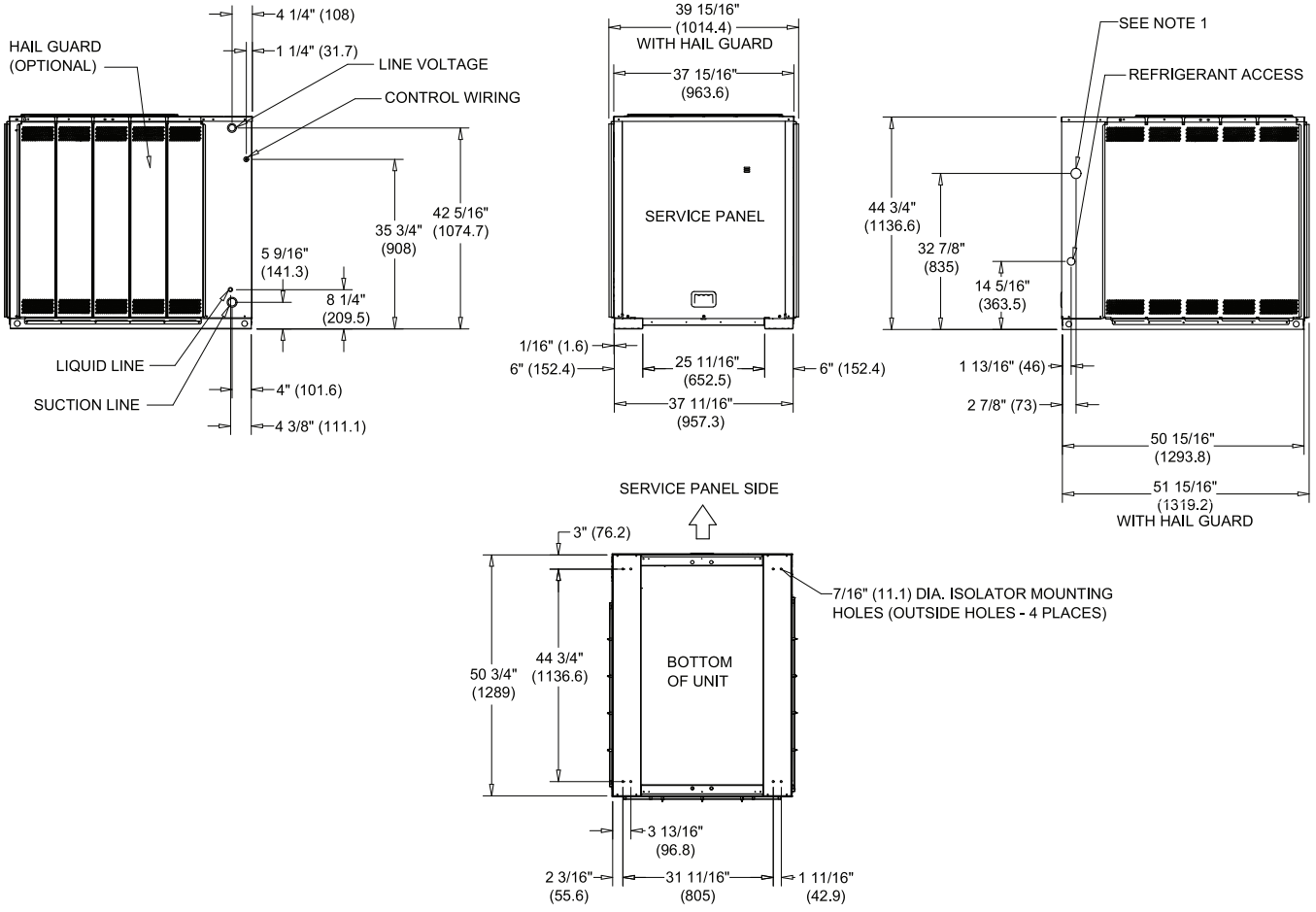
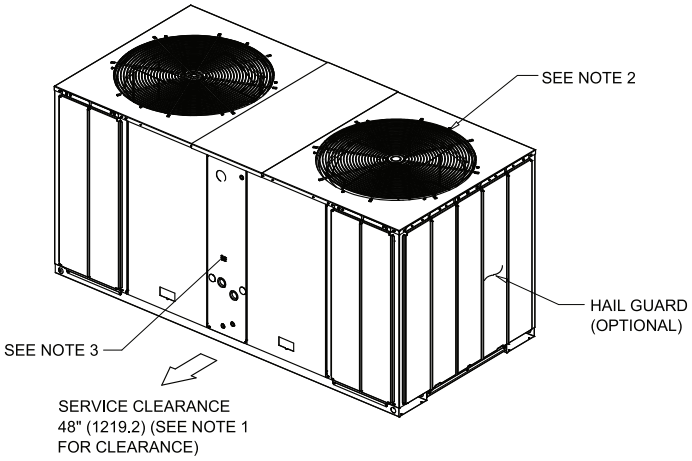
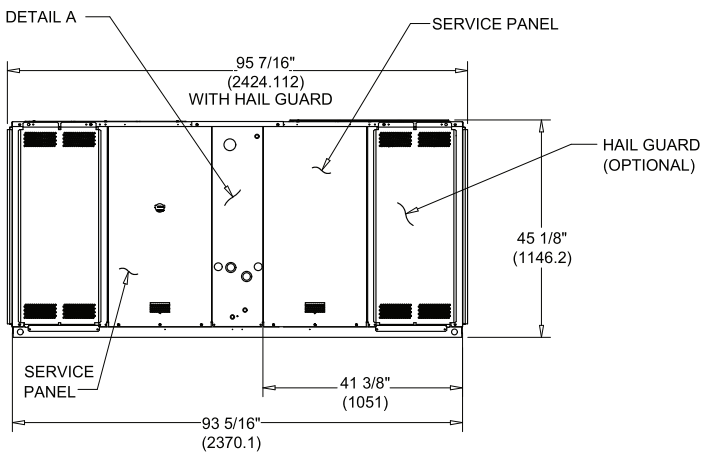
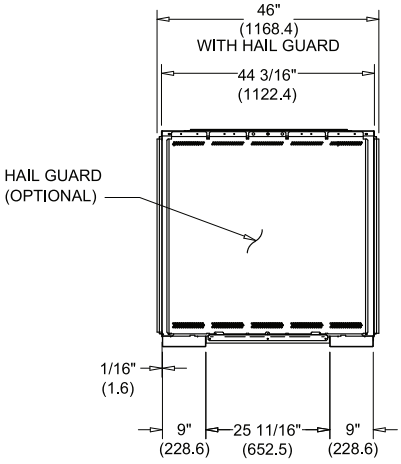


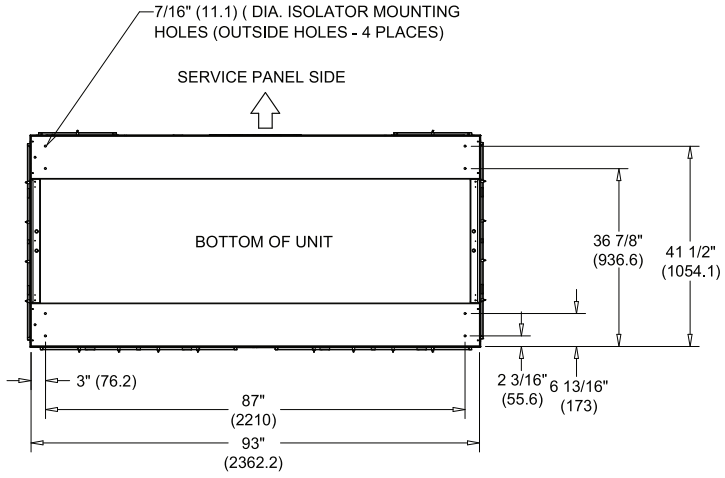
Figure 5. 15, 20 ton heat pump, dual compressor

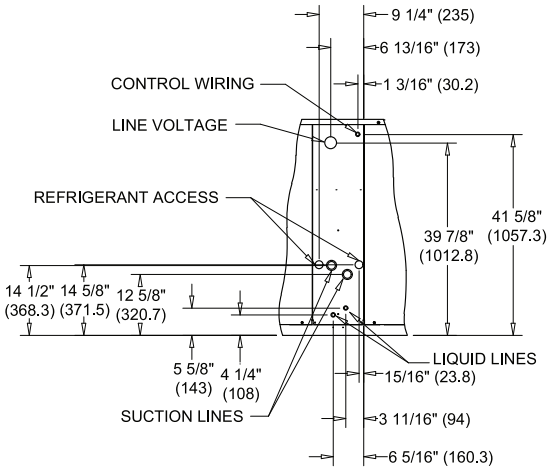


NOTES:
1. MINIMUM CLEARANCE FOR PROPER OPERATION IS 36" (914.4) FROM WALLS, SHRUBBERY, PRIVACY FENCES ETC. MINIMUM CLEARANCE BETWEEN ADJACENT UNITS IS 72" (1829). RECOMMENDED SERVICE CLEARANCE 48" (1219.2)
2. TOP DISCHARGE AREA SHOULD BE UNRESTRICTED FOR 100" (2540) MINIMUM. UNIT SHOULD BE PLACED SO ROOF RUN-OFF WATER DOES NOT POUR DIRECTLY ON UNIT
3. OUTDOOR AIR TEMPERATURE SENSOR OPENING (DO NOT BLOCK OPENING).









FRONT DETAIL A
DIMENSIONAL DETAIL

Weights

Heat Pump Condenser

Table 1. TWA unit and corner weights — lbs (60 Hz)

Tons	Model No.	Shipping Max (lbs)	Net Max (lbs)	Corner Weights			
				1	2	3	4
7.5	TWA090D	394	340	117	86	58	79
10	TWA120D	509	438	127	121	72	118
15	TWA180E	898	765	202	192	181	190
20	TWA240E	981	848	254	266	147	181

Figure 6. TWA090 and TWA120

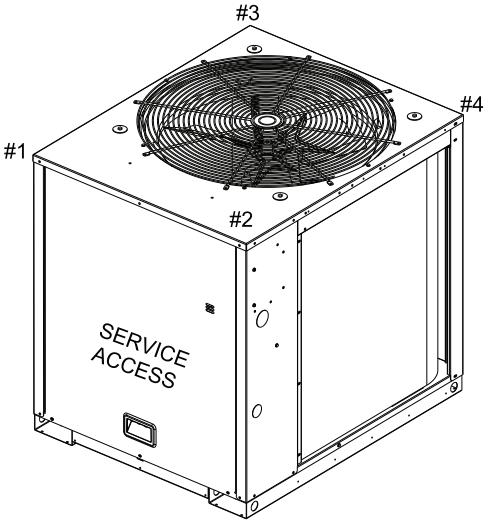
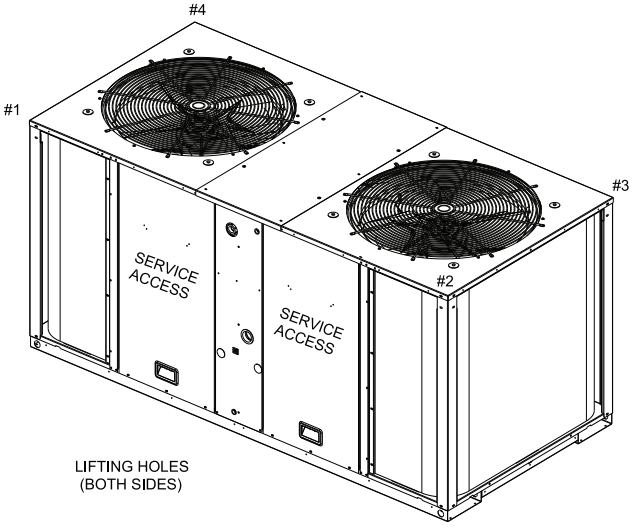


Figure 7. TWA180 and TWA240



Installation

Refrigerant Piping Guidelines

Figure 8. Allowable elevation difference: Cooling only TTA *above* indoor unit

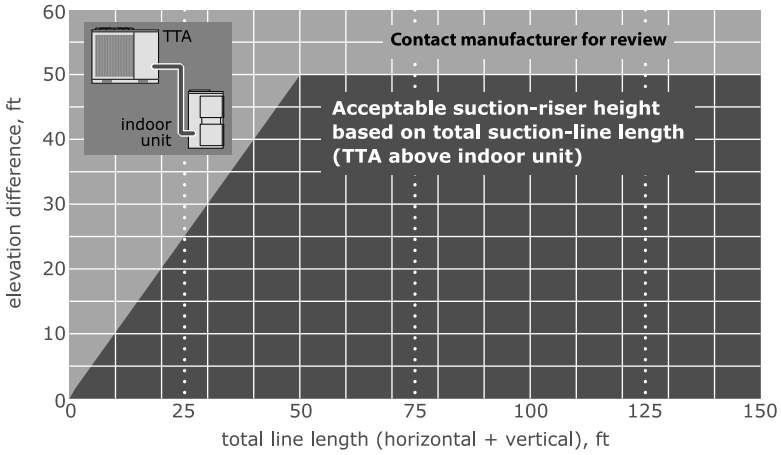
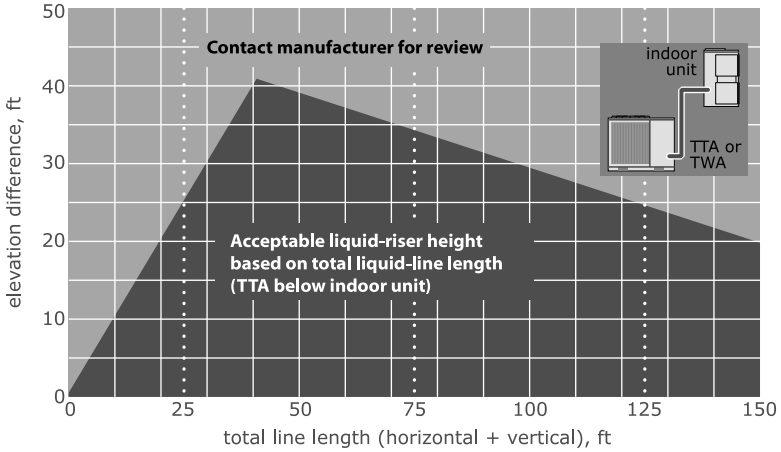


Figure 9. Allowable elevation difference: TTA *below* indoor unit



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

Refrigerant Piping Procedures (Outdoor Units)

⚠ WARNING

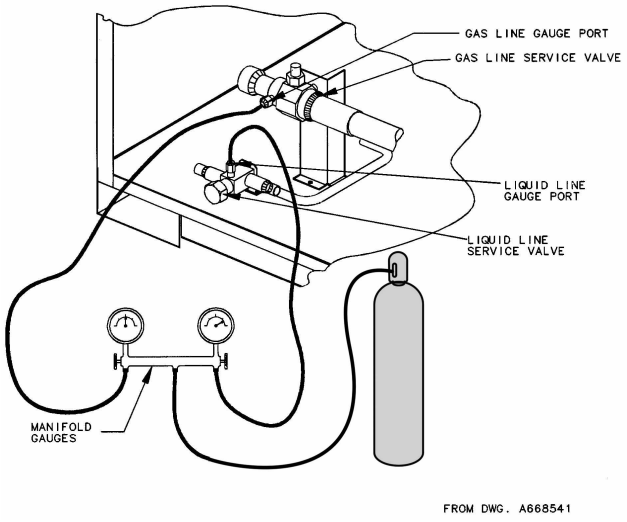
R-410A Refrigerant under Higher Pressure than R-22!

Failure to use proper equipment or components as described below, could result in equipment failing and possibly exploding, which could result in death, serious injury, or equipment damage.
The units described in this manual use R-410A refrigerant which operates at higher pressures than R-22. Use ONLY R-410A rated service equipment or components with these units. For specific handling concerns with R-410A, please contact your local Trane representative.

Each TTA 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 10.) line up properly with the holes in the unit cabinet.

Figure 10. Outdoor units - refrigerant piping (with dry nitrogen)



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

NOTICE

System Component Damage!

Do not remove the seal caps from refrigerant connections, or open the service valves until prepared to braze refrigerant lines to the connections. Excessive exposure to atmosphere (> 5 min.) may allow moisture or dirt to contaminate the system, damaging valve seals and causing ice formation in system components.

⚠ WARNING

Hazard of Explosion and Deadly Gases!

Failure to follow all proper safe refrigerant handling practices could result in death or serious injury.
Never solder, braze or weld on refrigerant lines or any unit components that are above atmospheric pressure or where refrigerant may be present. Always remove refrigerant by following the guidelines established by the EPA Federal Clean Air Act or other state or local codes as appropriate. After refrigerant removal, use dry nitrogen to bring system back to atmospheric pressure before opening system for repairs. Mixtures of refrigerants and air under pressure may become combustible in the presence of an ignition source leading to an explosion. Excessive heat from soldering, brazing or welding with refrigerant vapors present can form highly toxic gases and extremely corrosive acids.

4. Cut, fit and braze tubing, starting at the outdoor unit and work toward the indoor unit. See recommended tube sizes, Table 4.

   Note: *Use long radius ells for all 90° bends.*

   All brazing should be done using a 2 to 3 psig dry nitrogen purge flowing through the pipe being brazed, see Figure 10.

NOTICE

System Component Damage!

Install a regulating valve between the nitrogen source and the gauge manifold. Unregulated pressure can damage system components.

NOTICE

System Component Damage!

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. 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.

Refrigerant Piping Procedures (Indoor Unit)

Once liquid and suction lines are complete to the refrigerant connections on the indoor unit, remove the gauge port core(s) on the indoor unit connection stubs to release the dry nitrogen charge.

NOTICE

Unit Damage!

Do not apply heat to remove seal caps until the gauge port cores have been removed. 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.

NOTICE

Unit Damage!

Do not remove the seal caps from refrigerant connections, or open the service valves until prepared to braze refrigerant lines to the connections. Due to the high hygroscopic properties of the R-410A oil, excessive exposure to atmosphere will allow moisture to contaminate the system, damaging the compressor.

2. Turn on nitrogen supply. Nitrogen enters through the 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

⚠ WARNING

Hazard of Explosion!

Failure to follow these recommendations could result in death or serious injury or equipment or property-only damage.

Use only dry nitrogen with a pressure regulator for pressurizing unit. Do not use acetylene, oxygen or compressed air or mixtures containing them for pressure testing. Do not use mixtures of a hydrogen containing refrigerant and air above atmospheric pressure for pressure testing as they may become flammable and could result in an explosion. Refrigerant, when used as a trace gas should only be mixed with dry nitrogen for pressurizing units.

⚠ WARNING

Hazard of Explosion!

Failure to follow recommended safe leak test procedures could result in death or serious injury or equipment or property-only-damage.

Never use an open flame to detect gas leaks. Use a leak test solution for leak testing.

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-410A and vacuum pump.*
3. Attach center hose of manifold gauges to vacuum pump.

NOTICE

Operating Under Vacuum!

Do not operate or apply power to the compressor while under a vacuum. Failure to follow these instructions will result in compressor failure.

4. Evacuate the system to hold a 500 micron vacuum.
5. Close off valve to vacuum pump and observe the micron gauge. If gauge pressure rises above 500 microns in one minute, then evacuation is incomplete or the system has a leak.
6. If vacuum gauge does not rise above 500 microns in 10 minutes, the evacuation should be complete.

NOTICE

Equipment Damage!

Charge with access port on the liquid line service valve only.

7. With vacuum pump and micron gauge blanked off, open valve on R-410A cylinder and allow refrigerant pressure to build up to about 80 psig.
8. Close valve on the R-410A 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, as described in the previous section, repair any leaks found and repeat the leak test.

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.

Important:

1. *To prevent possible noise or vibration problems, be certain to isolate refrigerant lines from the building.*
2. *All suction and hot gas bypass piping (if installed) should be insulated from the termination in the air handler to the condensing unit cabinet entry. Failure to do so can cause condensate drip off and performance degradation.*
3. *Prior to starting a unit, it is advisable to have the approved oils available in the event oil needs to be added to the system.*

NOTICE

Equipment Damage!

This is POE oil, which readily absorbs moisture. Always use new oil and never leave containers open to atmosphere while not in use.

Table 3. TWA approved oils

Unit Model Number	Approved Oils
TWA061, TWA073, TWA076, TWA090, TWA101, TWA120, TWA156, TWA180, TWA201, TWA240	Trane Oil Part Number OIL00094 (1 quart container)

For units equipped with compressors containing site glasses, the oil level must be visible through the sight glass when the compressor is running under stabilized conditions and a few minutes after the compressor has stopped.

Refrigerant Charging Procedure

If charging by weight, refer to Table 4, for starting change. If refrigerant adjustments are needed because of length of line, refer to "Charging Charts and Superheat,"

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.

Notes:

- *R-410A should only be charged in the liquid state.*
- *When possible, always charge the refrigerant into the liquid line of the unit.*
- *If the entire charge can't be charged into the liquid line, the balance of the unit charge can be metered through a charging manifold set as liquid — preferably through a schrader valve into the suction line to the compressor — only while the compressor is running.*
- *Check and adjust superheat using Table 9 then re-check charging charts to determine if charge corrections are necessary.*

NOTICE

Equipment Damage!

Never charge liquid refrigerant into the suction line of the unit with the compressor off.

Figure 11. Outdoor units - refrigerant piping

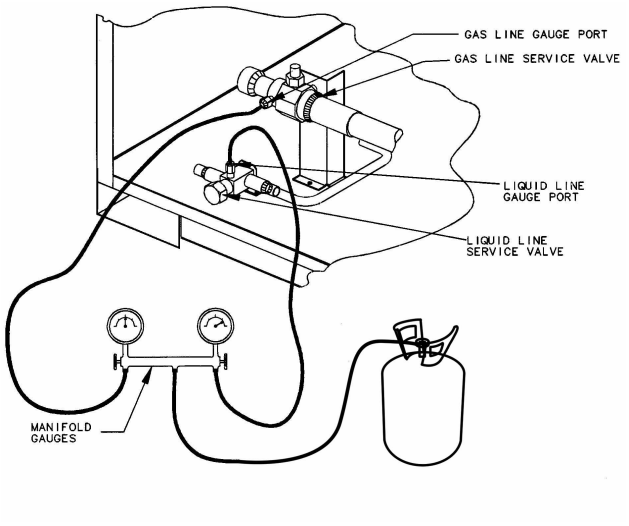


Table 4. Estimated charge levels at ARI rated line lengths (25 feet)

Matched Set	Refrigerant Charge		Per Circuit	
	Circuit 1	Circuit 2	Liquid Line Diameter	Vapor Line Diameter
TWA090D w/HX-90DX	20.6	NA	0.625 (5/8″)	1.375 (1 3/8″)
TWA120D w/HX-120DX	27.9	NA	0.5 (1/2″)	1.375 (1 3/8″)
TWA180E w/HX-180DXD	22.9	24.2	0.5 (1/2″)	1.375 (1 3/8″)
TWA240E w/HX-240DX	23.5	23.5	0.625 (5/8″)	1.375 (1 3/8″)

Note: On 7.5 and 10 ton units use the next size larger evaporator for water 55 F and below.

Liquid Charging

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

Note: *The compressor access panel must be installed when the unit is running and being charged. Manifold hoses must be routed through refrigerant gauge access hole(s). See "Dimensional Data," for specific locations.*

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

1. Turn on power to the unit. Allow the system to run for 15 minutes to stabilize operating conditions.
2. 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, compare discharge pressure and liquid temperature to the "Charging Charts."
   Add or remove refrigerant (liquid only) as required to obtain correct discharge pressure and liquid temperature.
3. Check suction line superheat and condenser sub-cooling to ensure the unit is operating properly.
4. Disconnect all power to the unit.

Important: *If the unit is charged and left without power until a later date, the crankcase heater should be energized for a minimum of 8 hours prior to powering the compressor(s).*

⚠ WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.

For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN.

5. Remove the charging system from the unit.
6. Replace all panels.

Electrical Wiring

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state electrical codes.

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 "Dimensional Data," p. 10. 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.

Unit Power Supply

The installer must provide line voltage circuit(s) to the unit main power terminals as shown by the unit wiring diagrams (available through e-Library or by contacting a local sales office) 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.*

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state electrical codes.

NOTICE

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as unit terminals are not designed to accept other types of conductors.

Refrigerant Circuit

Figure 16. Typical split system heat pump - cooling - refrigerant circuit

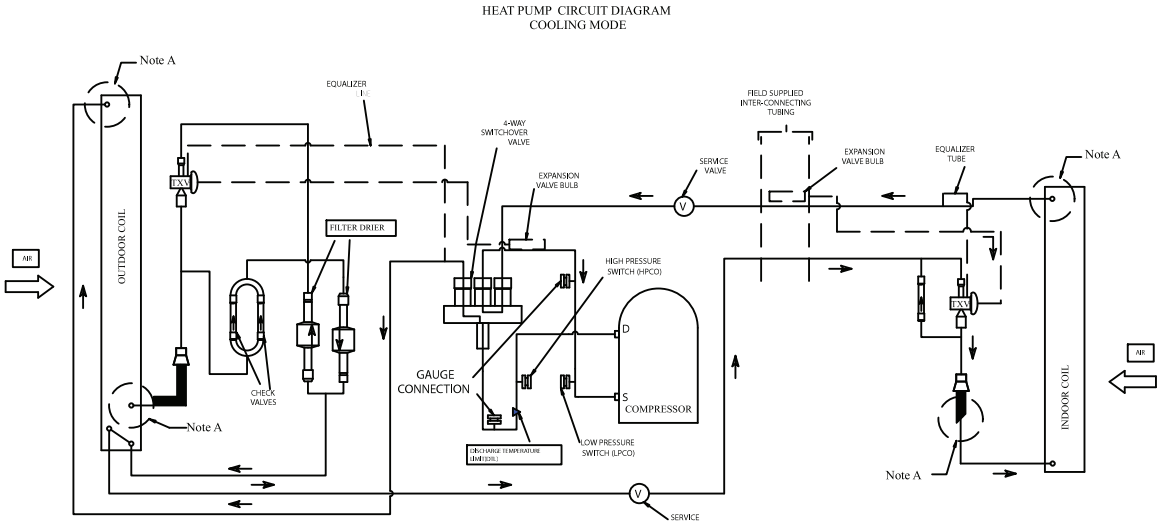
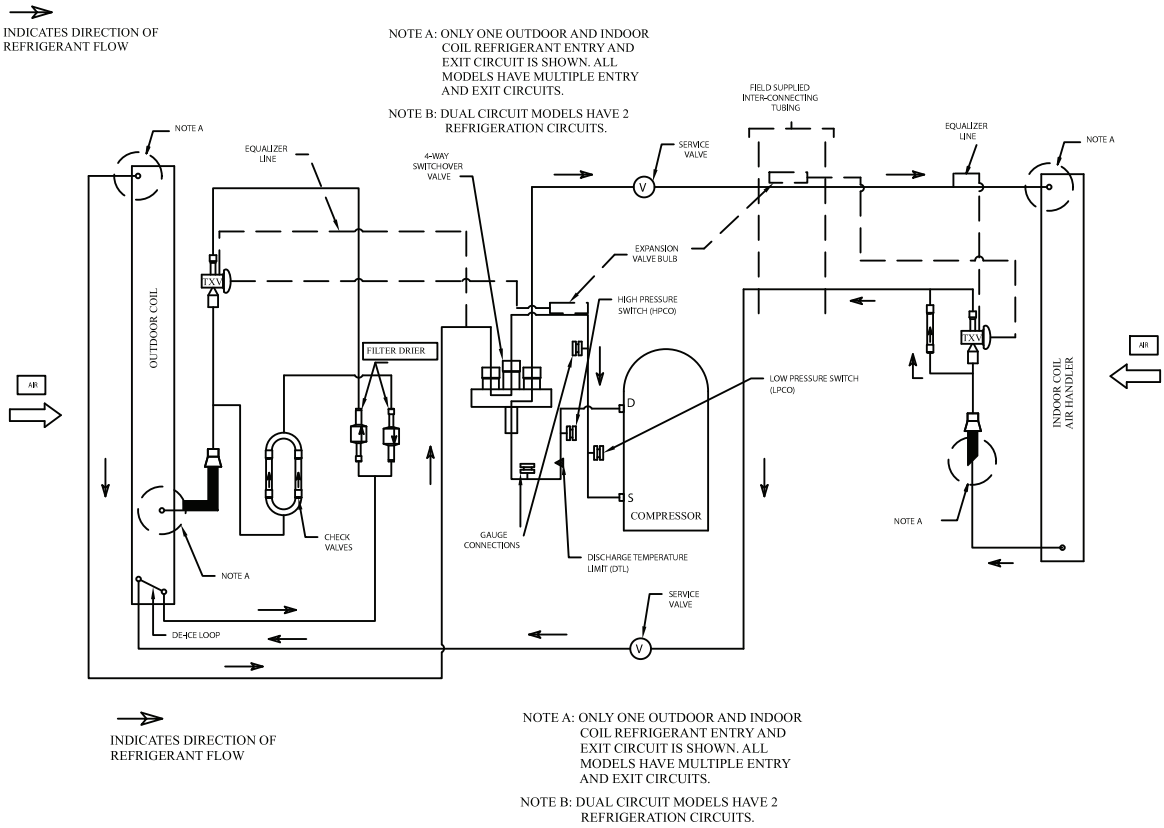
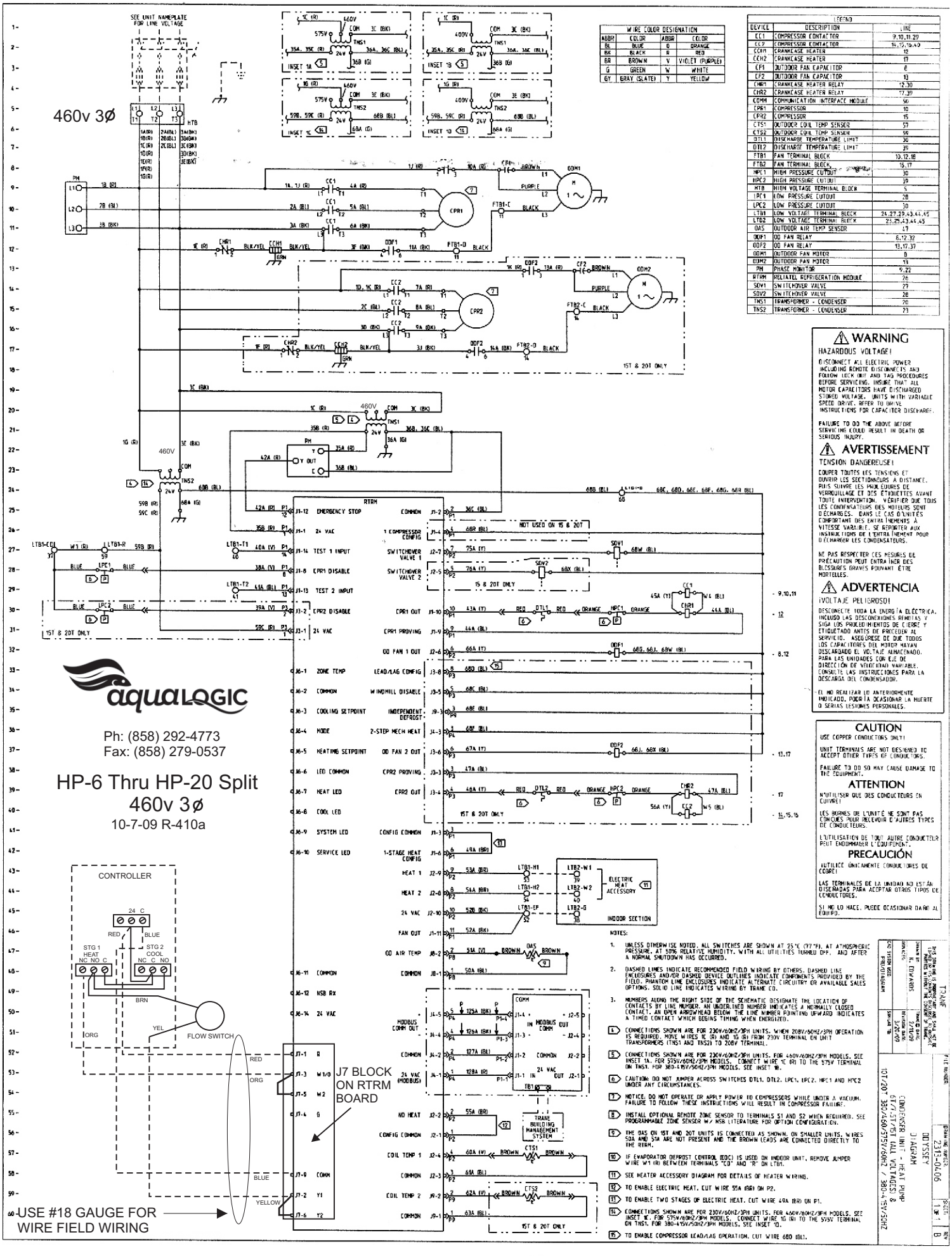


Figure 17. Typical split system heat pump - heating - refrigerant circuit





WIRE COLOR DESIGNATION			
ABBR	COLOR	ABBR	COLOR
BL	BLUE	O	ORANGE
BK	BLACK	R	RED
BR	BROWN	V	VIOLET (PURPLE)
G	GREEN	W	WHITE
GY	GRAY (SLATE)	Y	YELLOW

LEGEND		
DEVICE	DESCRIPTION	LINE
CC1	COMPRESSOR CONTACTOR	9,10,11,29
CC2	COMPRESSOR CONTACTOR	14,15,16,40
CCH1	CRANKCASE HEATER	12
CCH2	CRANKCASE HEATER	17
CF1	OUTDOOR FAN CAPACITOR	8
CF2	OUTDOOR FAN CAPACITOR	13
CHR1	CRANKCASE HEATER RELAY	12,30
CHR2	CRANKCASE HEATER RELAY	17,39
COMM	COMMUNICATION INTERFACE MODULE	50
CPR1	COMPRESSOR	10
CPR2	COMPRESSOR	15
CTS1	OUTDOOR COIL TEMP SENSER	57
CTS2	OUTDOOR COIL TEMP SENSER	59
DTL1	DISCHARGE TEMPERATURE LIMIT	30
DTL2	DISCHARGE TEMPERATURE LIMIT	35
FTB1	FAN TERMINAL BLOCK	10,12,18
FTB2	FAN TERMINAL BLOCK	15,17
HPC1	HIGH PRESSURE CUTOUT	30
HPC2	HIGH PRESSURE CUTOUT	35
HTB	HIGH VOLTAGE TERMINAL BLOCK	5
LPC1	LOW PRESSURE CUTOUT	28
LPC2	LOW PRESSURE CUTOUT	30
LTB1	LOW VOLTAGE TERMINAL BLOCK	24,27,29,43,44,45
LTB2	LOW VOLTAGE TERMINAL BLOCK	23,25,43,44,45
OAS	OUTDOOR AIR TEMP SENSOR	47
ODF1	OD FAN RELAY	8,12,32
ODF2	OD FAN RELAY	13,17,37
ODM1	OUTDOOR FAN MOTOR	8
ODM2	OUTDOOR FAN MOTOR	13
PM	PHASE MONITOR	9,22
RTRM	RELIATEL REFRIGERATION MODULE	26
SDV1	SWITCHOVER VALVE	27
SDV2	SWITCHOVER VALVE	28
TNS1	TRANSFORMER - CONDENSER	20
TNS2	TRANSFORMER - CONDENSER	23

⚠ WARNING

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE.

FAILURE TO DO THE ABOVE BEFORE SERVICING COULD RESULT IN DEATH OR SERIOUS INJURY.

⚠ AVERTISSEMENT

TENSION DANGEREUSE!

COUPER TOUTES LES TENSIONS ET OUVRIR LES SECTIONNEURS À DISTANCE. PUIS SUIVRE LES PROCEDURES DE VERROUILLAGE ET DES ÉTIQUETTES AVANT TOUTE INTERVENTION. VÉRIFIER QUE TOUS LES CONDENSATEURS DES MOTEURS SONT DÉCHARGÉS. DANS LE CAS D'UNITÉS COMPORTANT DES ENTRAÎNEMENTS À VITESSE VARIABLE, SE REPORTER AUX INSTRUCTIONS DE L'ENTRAÎNEMENT POUR DÉCHARGER LES CONDENSATEURS.

NE PAS RESPECTER CES MESURES DE PRÉCAUTION PEUT ENTRAÎNER DES BLESSURES GRAVES POUVANT ÊTRE MORTELLES.

⚠ ADVERTENCIA

¡VOLTAJE PELIGROSO!

DESCONECTE TODA LA ENERGÍA ELÉCTRICA, INCLUSO LAS DESCONEXIONES REMOTAS Y SIGA LOS PROCEDIMIENTOS DE CIERRE Y ETIQUETADO ANTES DE PROCEDER AL SERVICIO. ASEGÚRESE DE QUE TODOS LOS CAPACITORES DEL MOTOR HAYAN DESCARGADO EL VOLTAJE ALMACENADO. PARA LAS UNIDADES CON EJE DE DIRECCIÓN DE VELOCIDAD VARIABLE, CONSULTE LAS INSTRUCCIONES PARA LA DESCARGA DEL CONDENSADOR.

EL NO REALIZAR LO ANTERIORMENTE INDICADO, PODRÍA OCASIONAR LA MUERTE O SERIAS LESIONES PERSONALES.

CAUTION

USE COPPER CONDUCTORS ONLY!

UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.

FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

ATTENTION

N'UTILISER QUE DES CONDUCTEURS EN CUIVRE!

LES BORNES DE L'UNITÉ NE SONT PAS CONÇUES POUR RECEVOIR D'AUTRES TYPES DE CONDUCTEURS.

L'UTILISATION DE TOUT AUTRE CONDUCTEUR PEUT ENDOMMAGER L'ÉQUIPEMENT.

PRECAUCIÓN

¡UTILICE ÚNICAMENTE CONDUCTORES DE COBRE!

LAS TERMINALES DE LA UNIDAD NO ESTÁN DISEÑADAS PARA ACEPTAR OTROS TIPOS DE CONDUCTORES.

SI NO LO HACE, PUEDE OCASIONAR DAÑO AL EQUIPO.

aquaLOGIC

Ph: (858) 292-4773
Fax: (858) 279-0537

HP-6 Thru HP-20 Split
460v 3ø
10-7-09 R-410a

NOTES:

1. UNLESS OTHERWISE NOTED, ALL SWITCHES ARE SHOWN AT 25°C (77°F), AT ATMOSPHERIC PRESSURE, AT 50% RELATIVE HUMIDITY, WITH ALL UTILITIES TURNED OFF, AND AFTER A NORMAL SHUTDOWN HAS OCCURRED.
2. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. DASHED LINE ENCLOSURES AND/OR DASHED DEVICE OUTLINES INDICATE COMPONENTS PROVIDED BY THE FIELD. PHANTOM LINE ENCLOSURES INDICATE ALTERNATE CIRCUITRY OR AVAILABLE SALES OPTIONS. SOLID LINE INDICATES WIRING BY TRANE CO.
3. NUMBERS ALONG THE RIGHT SIDE OF THE SCHEMATIC DESIGNATE THE LOCATION OF CONTACTS BY LINE NUMBER. AN UNDERLINED NUMBER INDICATES A NORMALLY CLOSED CONTACT. AN OPEN ARROWHEAD BELOW THE LINE NUMBER POINTING UPWARD INDICATES A TIMED CONTACT WHICH BEGINS TIMING WHEN ENERGIZED.
4. CONNECTIONS SHOWN ARE FOR 230V/60HZ/3PH UNITS. WHEN 208V/60HZ/3PH OPERATION IS REQUIRED, MOVE WIRES 1K (R) AND 1G (R) FROM 230V TERMINAL ON UNIT TRANSFORMERS (TNS1 AND TNS2) TO 208V TERMINAL.
5. CONNECTIONS SHOWN ARE FOR 230V/60HZ/3PH UNITS. FOR 460V/60HZ/3PH MODELS, SEE INSET 1A. FOR 575V/60HZ/3PH MODELS, CONNECT WIRE 1C (R) TO THE 575V TERMINAL ON TNS1. FOR 380-415V/50HZ/3PH MODELS, SEE INSET 1B.
6. CAUTION: DO NOT JUMPER ACROSS SWITCHES DTL1, DTL2, LPC1, LPC2, HPC1 AND HPC2 UNDER ANY CIRCUMSTANCES.
7. NOTICE: DO NOT OPERATE OR APPLY POWER TO COMPRESSORS WHILE UNDER A VACUUM. FAILURE TO FOLLOW THESE INSTRUCTIONS WILL RESULT IN COMPRESSOR FAILURE.
8. INSTALL OPTIONAL REMOTE ZONE SENSOR TO TERMINALS 51 AND 52 WHEN REQUIRED. SEE PROGRAMMABLE ZONE SENSOR W/ NSB LITERATURE FOR OPTION CONFIGURATION.
9. THE OAS ON 1ST AND 2DT UNITS IS CONNECTED AS SHOWN. ON SMALLER UNITS, WIRES 50A AND 51A ARE NOT PRESENT AND THE BROWN LEADS ARE CONNECTED DIRECTLY TO THE RTRM.
10. IF EVAPORATOR DEFROST CONTROL (EDC) IS USED ON INDOOR UNIT, REMOVE JUMPER WIRE W1 (R) BETWEEN TERMINALS "EO" AND "R" ON LTB1.
11. SEE HEATER ACCESSORY DIAGRAM FOR DETAILS OF HEATER WIRING.
12. TO ENABLE ELECTRIC HEAT, CUT WIRE 55A (BR) ON P2.
13. TO ENABLE TWO STAGES OF ELECTRIC HEAT, CUT WIRE 49A (BR) ON P1.
14. CONNECTIONS SHOWN ARE FOR 230V/60HZ/3PH UNITS. FOR 460V/60HZ/3PH MODELS, SEE INSET 1C. FOR 575V/60HZ/3PH MODELS, CONNECT WIRE 1G (R) TO THE 575V TERMINAL ON TNS1. FOR 380-415V/50HZ/3PH MODELS, SEE INSET 1D.
15. TO ENABLE COMPRESSOR LEAD/LAG OPERATION, CUT WIRE 68D (BL).

DRAWN BY:	T.RANF
DATE:	2/11/99
CHECKED BY:	K. EDWARDS
DATE:	2/11/99
DRAWING NUMBER:	2313-0406
SHEET NO.	1 OF 1
REV.	B

CONDENSER UNIT - HEAT PUMP
DIAGRAM
DD(YSSY
1S1,2DT 380/460/575V/60HZ / 380-415V/50HZ

Electrical Data

Table 5. Electrical characteristics — compressor and condenser fan motors — heat pumps — 60 Hz

Tons	Unit Model Number	Compressor Motor					Condenser Fan Motor				
		No.	Volts	Phase	Amps		No.	Volts	Phase	Amps	
					RLA (Ea.)	LRA (Ea.)				FLA (Ea.)	LRA (Ea.)
7.5	TWA090D3	1	208-230	3	25	164	1	208-230	1	3.1	8.1
	TWA090D4	1	460	3	13	100	1	460	1	1.6	3.8
	TWA090DK	1	380	3	14.3	94.3	1	380	1	2.7	7
	TWA090DW	1	575	3	10.8	78	1	575	1	1.2	3
10	TWA120D3	1	208-230	3	30.1	225	1	208-230	1	5	14.4
	TWA120D4	1	460	3	16.7	114	1	460	1	2.5	5.8
	TWA120DK	1	380	3	24.4	145	1	380	1	3.4	7.8
	TWA120DW	1	575	3	12.3	80	1	575	1	2	5.1
15	TWA180E3	2	208-230	3	25	164	2	208-230	1	5	14.4
	TWA180E4	2	460	3	12.6	100	2	460	1	2.5	5.8
	TWA180EK	2	380	3	14.3	94.3	2	380	1	3.4	7.8
	TWA180EW	2	575	3	10.4	78	2	575	1	2	5.1
20	TWA240E3	2	208-230	3	33.8	239	2	208-230	1	5	14.4
	TWA240E4	2	460	3	18	125	2	460	1	2.5	5.8
	TWA240EK	2	380	3	24.4	145	2	380	1	3.4	7.8
	TWA240EW	2	575	3	13.7	80	2	575	1	2	5.1

Table 6. Unit wiring — heat pumps — 60 Hz

Tons	Unit Model Number	Unit Operating Voltage Range	Minimum Circuit Ampacity	Maximum Fuse or HACR Circuit Breaker Size
7.5	TWA090D3	187-253	34.4	45
	TWA090D4	414-506	17.9	25
	TWA090DK	342-418	20.6	25
	TWA090DW	518-632	14.7	20
10	TWA120D3	187-253	42.6	60
	TWA120D4	414-506	23.4	30
	TWA120DK	342-418	33.9	45
	TWA120DW	518-632	17.4	25
15	TWA180E3	187-253	66.3	80
	TWA180E4	414-506	33.4	40
	TWA180EK	342-418	39.0	45
	TWA180EW	518-632	27.4	30

Table 6. Unit wiring — heat pumps — 60 Hz

Tons	Unit Model Number	Unit Operating Voltage Range	Minimum Circuit Ampacity	Maximum Fuse or HACR Circuit Breaker Size
20	TWA240E3	187-253	86.1	100
	TWA240E4	414-506	45.5	50
	TWA240EK	342-418	61.8	70
	TWA240EW	518-632	34.8	40

Note: HACR type circuit breaker per NEC.

Charging Charts and Superheat

Figure 24. TWA090D Cooling

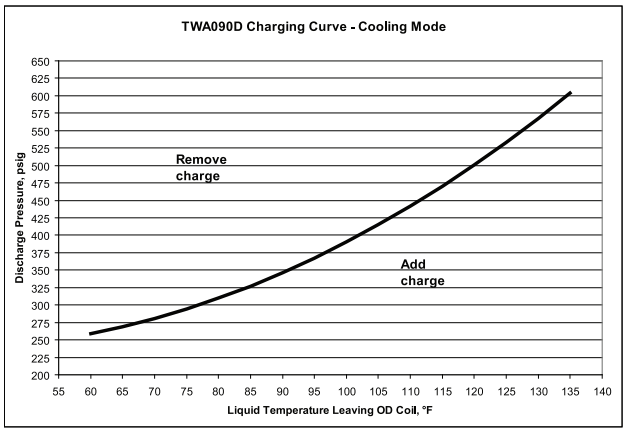


Figure 25. TWA090D Heating

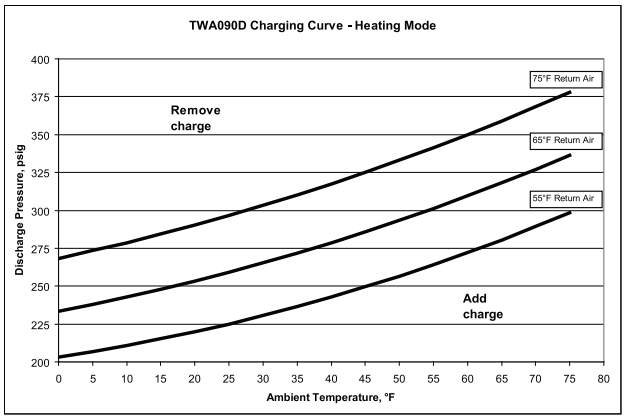


Figure 28. TWA120D Cooling

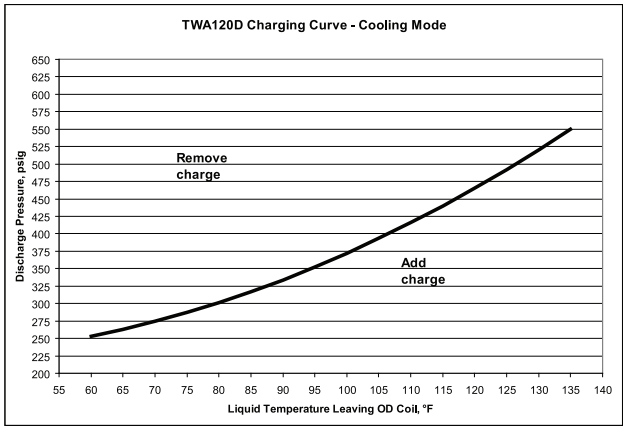


Figure 29. TWA120D Heating

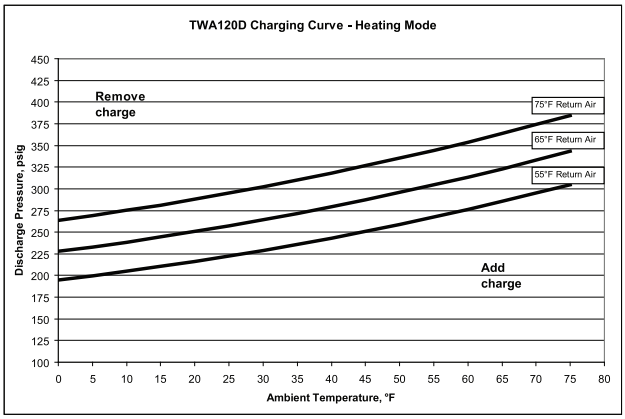


Figure 32. TWA180E Cooling

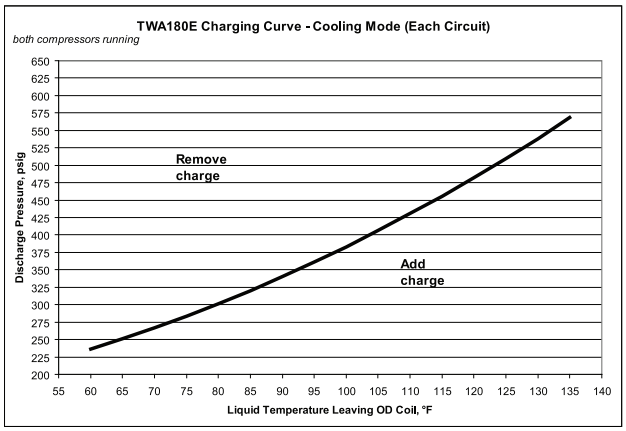


Figure 33. TWA180E Heating

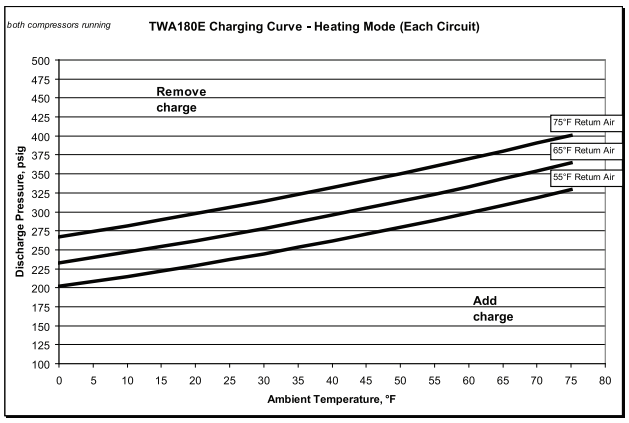


Figure 36. TWA240E Cooling

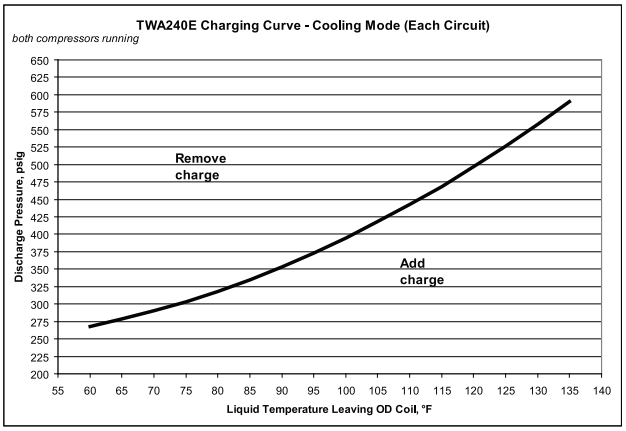


Figure 37. TWA240E Heating

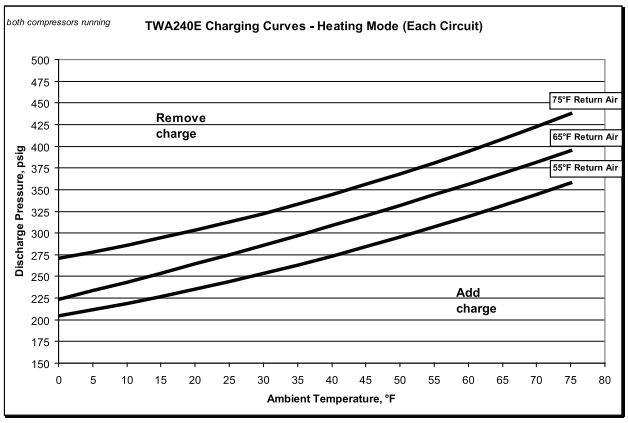


Table 9. TWA superheat with matched indoor HX evoporator

Condenser	HX Evaporator	*Cooling Superheat		*Heating Superheat	
		Circuit 1	Circuit 2	Circuit 1	Circuit 2
TWA090D	HX-90DXHP	4-6	—	15.7	—
TWA120D	HX-120DXHP	4-6	—	13.1	—
TWA180E	HX-180DXHP	6-10	6-10	12.2	12.2
TWA240E	HX-240DXHP	6-10	6-10	11.4	11.4

Notes:

1. An adjustable TXV is provided for each circuit in the TWA models. If the application causes the superheat to deviate from the values shown above by more than 1 degree - after the system has achieved steady state - the TXV should be adjusted to provide the values shown as measured at the compressor.
2. The values given above have been tested and are approved for the matched sets shown. If an alternate combination is used, an expansion device should be used that provides 16-20°F degrees of superheat measured at the compressor.
3. Check and adjust superheat using this table, then compare with charging chart to determine if charge corrections are necessary.

* Super heat can vary due to water flow rate through evaporator.

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

- ☐ Properly sized/constructed liquid and suction lines connected to stubs at both the indoor and outdoor units?
- ☐ Insulated the entire suction line?
- ☐ Insulated portions of liquid line exposed to extremes in temperature?
- ☐ Performed initial leak test?
- ☐ Evacuated each refrigerant circuit to 500 microns?
- ☐ Charged each circuit with proper amount of R-410A?

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?

Pre-Start

Control Circuit Features

Note: *Not all of these features may be required for your unit, check electrical schematic.*

Discharge Temperature Limit (DTL)

The control's sensor is located on the discharge line. This device will shut off the compressor and the outdoor fan(s) if the discharge temperature exceeds the DTL setting. Once the discharge temperature has returned to normal, the compressor will cycle back on.

Low Pressure Cut-Out (LPCO)

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

⚠ WARNING

Prevent Injury!

Due to agency safety requirements, no schrader core is to be installed beneath the HPCO. Removal of the HPCO without evacuating the system charge could cause injury and release of refrigerant.

Internal Overload Protector (IOL)

This device is embedded in the compressor. It will shut off the compressor if the discharge temperature of the compressor 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 systems should be made to determine the cause and be corrected.*

Maintenance

⚠ WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.

For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN.

NOTICE

Operating Under Vacuum!

Do not operate or apply power to the compressor while under a vacuum. Failure to follow these instructions will result in compressor failure.

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.

- ☐ Check unit wiring to ensure all connections are tight and that the wiring insulation is intact.
- ☐ Inspect the condenser coils for dirt and debris. If the coils appear dirty, clean them.
- ☐ 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".

Annually

The following maintenance procedures must be performed once a year to ensure efficient unit operation.

- ☐ Perform all of the monthly maintenance inspections.
- ☐ With the unit operating, check unit superheat and record the reading in the "Maintenance Log".
- ☐ Remove any accumulation of dust and/or dirt from the unit casing.
- ☐ Remove corrosion from any surface and repaint. Check the gasket around the control panel door to ensure it fits correctly and is in good condition to prevent water leakage.
- ☐ Inspect the control panel wiring to ensure that all connections are tight and that the insulation is intact.

  Note: *Condenser fan motors are permanently lubricated.*
- ☐ Check refrigerant piping and fittings for leaks
- ☐ Inspect the condenser coils for dirt and debris. If the coils appear dirty, clean them.

Coil Cleaning

Regular coil maintenance, including annual cleaning-enhances the unit's operating efficiency by minimizing:

- compressor head pressure and amperage draw
- water carryover
- fan brake horsepower
- static pressure losses

At least once each year — or more often if the unit is located in a "dirty" environment — clean the coil using the instructions outlined below. Be sure to follow these instructions as closely as possible to avoid damaging the coils. To clean refrigerant coils, use a soft brush and a sprayer. Contact your local Parts Center for appropriate detergents.

1. Remove enough panels from the unit to gain safe access to coil.
2. Straighten any bent coil fins with a fin comb.
3. Remove loose dirt and debris from both sides of the coil with a soft brush.
4. Mix the detergent with water according to the manufacturer's instructions. If desired, heat the solution to 150° F maximum to improve its cleansing capability.
5. Pour the cleaning solution into the sprayer.
6. Spray the leaving-airflow side of the coil first; then spray the opposite side of the coil. Allow the cleaning solution to stand on the coil for five minutes.
7. Rinse both sides of the coil with cool, clean water.
8. Inspect both sides of the coil; if it still appears to be dirty, repeat Step 7 and 8.
9. Reinstall all of the components and panels removed in Step 1; then restore power to the unit.
10. Using a fin comb, straighten any coil fins that were inadvertently bent during the cleaning process.

Maintenance Log

Date	Ambient Temp. (°F)	oor HX Evaporator		Compressor				Superheat (°F) (at compressor)		Subcooling (°F) (at service valve)	
		at r	at r t t p	Suction Pressure		Discharge Pressure					
				(C1)	(C2)	(C1)	(C2)	Circuit #1	Circuit #2	Circuit #1	Circuit #2

Note: *Perform each inspection once per month (during cooling season) while unit is operating*

HEAT EXCHANGER CLEANING
IMPORTANT SAFETY INSTRUCTIONS

WARNING:

SAVE THESE INSTRUCTIONS!!!

To guard against injury, basic safety precautions should be observed including the following:

- **DO** read and follow all safety instructions.
- **DO** read and observe all the notices in this instruction sheet.
- **DO** make sure unit is mounted securely before operating.
- **DO** carefully examine this unit after installation.
- **DO NOT** allow water to freeze in unit. Severe damage may result.
- **DO NOT** store unit in extremely hot or cold areas. Damage may result.
- **DO NOT** exceed the maximum rating of 40-psi for this unit or serious damage may result.
- **DO NOT** perform bleach [organic removal] flush with muriatic acid [mineral removal] at the same time. The resultant poisonous gas can be extremely dangerous or deadly.

Heat Exchanger Cleaning:

NOTE:

The heat exchanger should be cleaned approximately every 12 months or as needed to allow proper proformace. On some models this process may be done without removal of the heat exchanger shell. (i.e., water flushing system)

WARNING:

When using bleach and acid special care should be observed.
Always wear hand, eye and body protection. Use rubber gloves.

DO NOT pour acid or bleach into the water. **DO** pour water into acid or bleach solution.
DO NOT perform acid and bleach flushing at the same time. The gas generated by the mixture is poisonous and can result in serious injury or death.

To remove organic deposits from titanium tube bundle without removing the shell:

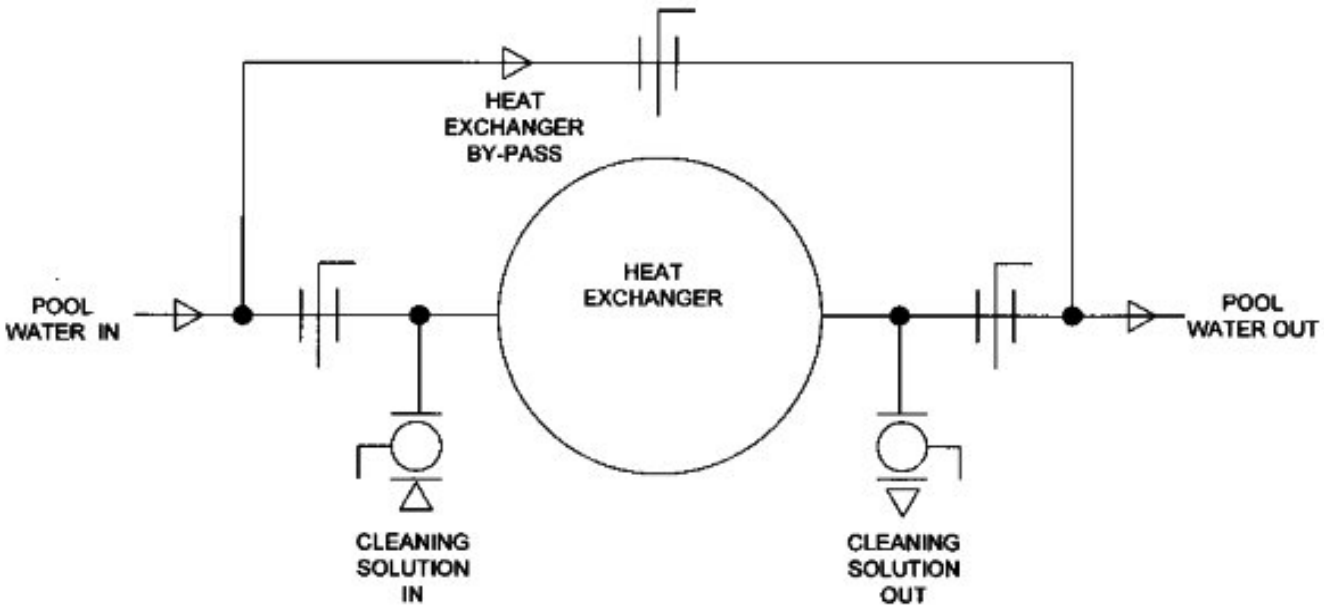
- Isolate the heat exchanger. (see drawing below)
- Mix 1 part bleach to 3 parts distilled water in five gallon bucket or larger container.
- Circulate via pump the solution through heat exchanger for approximately one to two hours or as needed.
- Thoroughly rinse heat exchanger with clean water.

To remove mineral deposits from titanium tube bundle:

Use the same steps as above, but use muriatic acid instead of bleach. Be sure to follow the muriatic acid manufacturer's instructions for use and safety.

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MODEL TR115DN 2 STAGE CONTROLLER PROGRAMMING

STEP	ANNUCIATOR	DESCRIPTION	DISPLAY
1	**F** or **C**	Fahrenheit or Celsius Scale	**F**
2	**S1** (blinking)	Stage 1 Setpoint Temperature	**S1** **77**
3	**DIF1** (blinking)	Stage 1 Differential Temperature	**DIF1** **1**
4	**C1/H1**	Stage 1 Heating Mode	**H1**
5	**S2** (blinking)	Stage 2 Setpoint Temperature	**77** **S2**
6	**DIF2** (blinking)	Stage 2 Differential Temperature	**1** **DIF2**
7	**C2/H2**	Stage 2 Cooling Mode	**C2**



Liquid Crystal Display (LCD)

The LCD display provides a constant readout of the sensor temperature and indicates if the output relay is energized. When the **S1 or S2** annuciator is constantly illuminated during operation, the relay is energized. The display is also used in conjunction with the keypad to allow the user to adjust the setpoint temperature, differential and heating /cooling modes.

Programming Steps and Display

The control can be programmed in four simple steps using the LCD display and the three keys on the face of the control. (See photo for display and keys.)

NOTE: Stage 1 must be set for heat mode and Stage 2 for cool mode for correct operation.

1. To start programming, press the **SET** key once to access the Fahrenheit/Celsius mode. The display will show the current status, either **F** for degrees Fahrenheit or **C** for degrees Celsius. Then press either the up ⇧ arrow or down ⇩ arrow key to toggle between the **F** or **C** designation.
2. Press the **SET** key again to access the heat mode setpoint temperature. The LCD will display the current setpoint temperature and the **S1** annuciator will be blinking to indicate that the control is in the setpoint mode. Press either the up ⇧ key to increase or down ⇩ key to decrease the setpoint to the desired temperature.
3. Press the **SET** key again to access the heat mode differential temperature. The LCD will display the current differential and the **DIF 1** annuciator will be blinking to indicate that the control is in the differential mode. Then press either up ⇧ key to increase or the down ⇩ key to decrease the differential to the desired setting (minimum 1˚F, maximum 30˚F).
4. Press the **SET** key again to select heat mode. The LCD will display the current mode: **C1 or H1.** Then press either up ⇧ key to increase or the down ⇩ key to select the correct Stage 1 mode. Stage 1 **MUST** be in the **H1** mode for correct operation.
5. Press the **SET** key again to access the chill mode setpoint temperature. The LCD will display the current chill setpoint temperature and the **S2** annuciator will be blinking to indicate that the control is in the setpoint mode. Then press either the up ⇧ key to increase or down ⇩ key to decrease the setpoint to the desired temperature. **S1** and **S2** should both be set for the same temperature.
6. Press the SET key again to access the chill mode differential temperature. The LCD will display the current differential and the **DIF 2** annuciator will be blinking to indicate that the control is in the differential mode. Then press either up ⇧ key to increase or the down ⇩ key to decrease the differential to the desired setting (minimum 1˚F, maximum 30˚F). **DIF1** and **DIF2** should both be set to the same value for best results.
7. Press the **SET** key again to access the heating mode. The LCD will display the current mode: **C2 or H2** . Stage 2 **MUST** be in the **C2** mode for correct operation.
8. Press the **SET** key again to exit programming mode. Controller will display current water temperature.

Controller will automatically drop out of “program mode” and return to “operating mode” 30 seconds after last key press.

Troubleshooting Controller Error Messages:

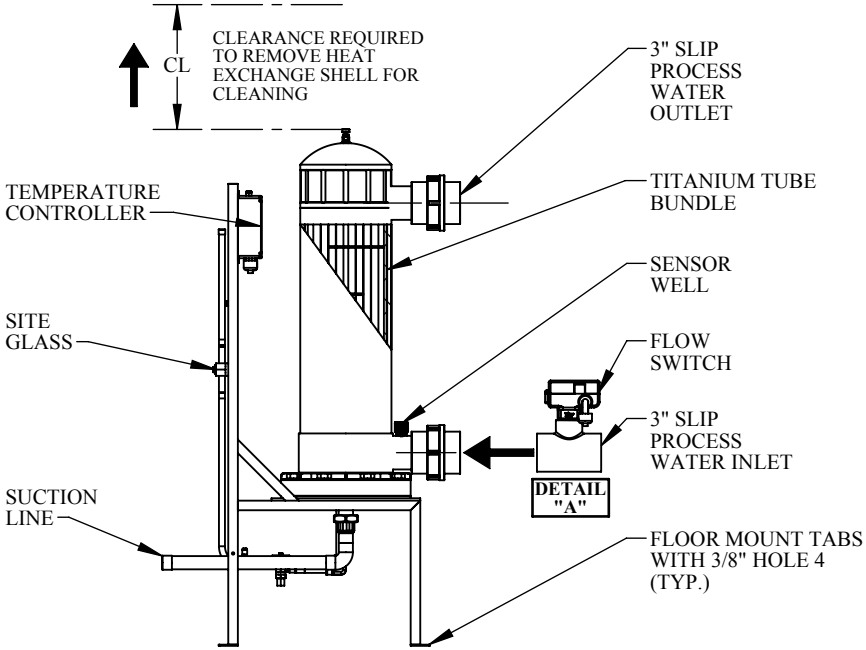
Display Messages

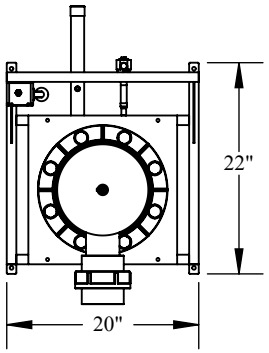
- **E1** - Appears when the up ⇧ or down ⇩key is pressed when not in the programming mode.
  To correct: If the E1 message appears even when no keys are being pressed, replace the control.
- **E2** - Appears if the control settings are not properly stored in memory.
  To correct: Check all settings and correct if necessary.
- **EP** - Appears when the probe and or flow switch is open , shorted or sensing a temperature that is out of range.
  To correct: Check to see if the sensed temperature is out of range. If not , check for probe damage by comparing it to a known ambient temperature between -30˚F and 220˚F. Replace the probe is necessary. Also, check for proper water flow through heater. If water flow is correct, flow switch.
- **EE** - Appears if the EEPROM data has been corrupted.
  To correct: This condition cannot be field repaired. Replace the control.
- **CL** - Appears if calibration mode has been entered.
  To correct: Remove power to the control for least five seconds. Reapply power. If the **CL** message still appears, replace the control.

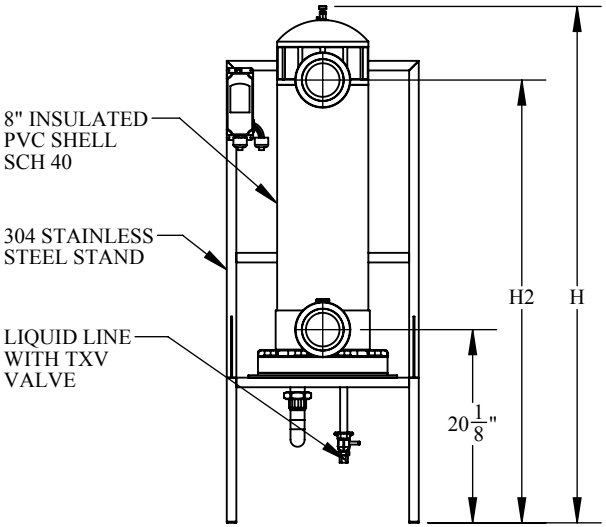
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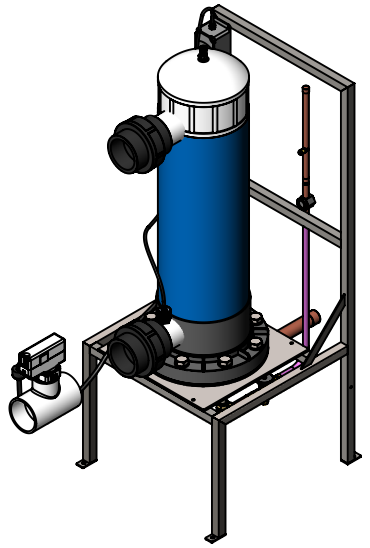
HX-90-DXHP THRU HX-240-DXHP SPECIFICATION

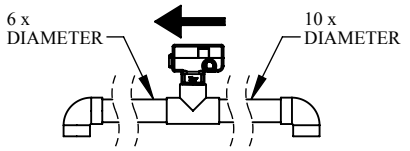
FOR INDOOR FRESH AND SALT WATER
APPLICATIONS











**** IMPORTANT!**
·DETAIL "A"
· FLOW SWITCH MUST BE FIELD INSTALLED HORIZONTALLY WITH NO LESS THAN 10 TIMES THE DIAMETER OF STRAIGHT PIPE ON THE INLET SIDE AND NO LESS THAN 6 TIMES THE DIAMETER ON THE OUTLET SIDE.

HEAT EXCHANGER SPECIFICATIONS								
MODEL NO.	**TONS**	****NOMINAL BTUH / KW**	**REFRIGERANT CONNECTION NO. OF CIRCUITS INLET / OUTLET (ODF)**	**WATER FLOW RATE (GPM)**	**H**	**H2**	**CL**	**SHIPPING DIMENSIONS (IN.)**
HX-90-DXHP	7.5	90K / 28	1 @ 5/8" / 1 3/8"	100 / 180	52"	46"	36"	57 x 35 x 25
HX-120-DXHP	10	120K / 35	1 @ 5/8" / 1 3/8"	100 / 180	62"	56"	46"	67 x 35 x 25
HX-150-DXHP	12.5	150K / 43.9	2 @ 1/2" / 1 1/8"	100 / 180	68"	62"	56"	73 x 35 x 25
HX-180-DXHP	15	180K / 51.2	1 @ 5/8" / 1 5/8"	100 / 180	80"	74"	64"	85 x 35 x 25
HX-240-DXHP	20	240K / 65.3	2 @ 1/2" / 1 3/8"	100 / 180	92"	86"	76"	97 x 35 x 25

NOTES:
· WATER INLET TEMPERATURE: MAX 90 °F. MINIMUM 40 °F.
· FOR WATER TEMPERATURE BELOW 55 °F USE THE NEXT LARGER HEAT EXCHANGER.
· FOR TEMPERATURES BELOW 50 F, USE LOW AMBIENT DISCHARGE HEAD PRESSURE FAN CONTROL.
· 50 PSI MAXIMUM WATER PRESSURE AND 500 PSI MAXIMUM REFRIGERANT PRESSURE.
· OUTDOOR MATCHED CONDENSING UNITS ALSO AVAILABLE.
· ALL DIMENSIONS ARE A APPROXIMATE AND MAY CHANGE AT ANY TIME.
· FIELD WIRING: INSTALL 24V 18/4 AWG WIRE FROM OUTDOOR CONDENSING UNIT TO THE CONTROLLER ON INDOOR HEAT EXCHANGER.
· MODELS HX-150-DXHP AND HX-180-DXHP COME STANDARD WITH DUAL CIRCUITS.
· MODELS HX-120-DXHP AND HX-180-DXHP ARE AVAILABLE WITH DUAL REFRIGERANT CIRCUITS UPON REQUEST.

**NOMINAL BTUH BASED ON R-410A REFRIGERANT, 45°F SUCTION TEMPERATURE, 100°F LIQUID TEMPERATURE, AND 8-10°F SUPER HEAT.

*MINIMUM FLOW RATE AT 65 F AND ABOVE. AT 65 F AND BELOW 120 GPM MINIMUM.

OPTIONS:
· SCH 80 SHELL CONSTRUCTION.
· 316 STAINLESS STEEL STAND AND HARDWARE.

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DRAWING #	SHEET TITLE
PDF-0041	HX-90-DXHP THRU HX-240-DXHP SPECIFICATIONS

DESCRIPTION				
DIRECT EXPANSION HEAT EXCHANGERS				
DRAWN BY	**DATE**	**REVISION**	**SCALE**	**SHEET #**
ARNALDO GUZMAN	5/20/2015		1:20	1 OF 1

Building Environments for Life

WATER FLOWSWITCH

AQUA LOGIC - 2” & 3” Water Flow switch Models FS-2 & FS-3

2/21/14



Specifications:

- Model FS-2 & 3, 25 AMP, Set Point ON is adjustable from 30 GPM and up. Will Switch Motors Up to 1 HP, 125 VAC & 2 HP, 250 VAC
- 1/2" Electrical Conduit Connection
- Standard 2” & 3" PVC Slip Fittings
- Line Pressure to 100 PSI
- Temperature to 110°F Continuous
- Wetted Surfaces - PVC, Polypropylene & Titanium
- **Good for both Saltwater and Freshwater applications.**

Typical Uses Include:

Equipment Protection:

- Chillers
- Heaters
- Solar Systems
- Pumps

Water Treatment:

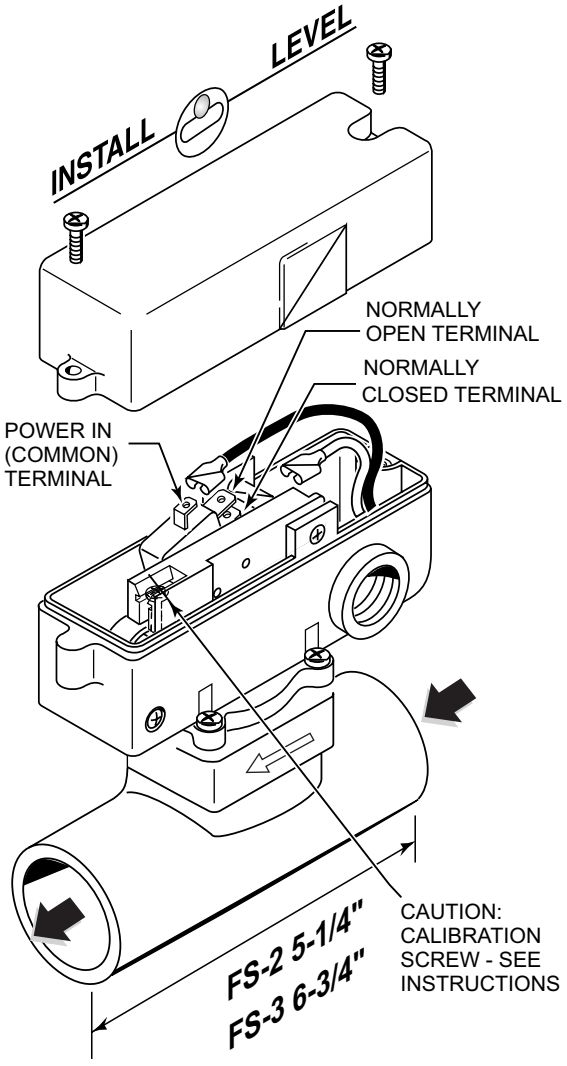
- Ozone Generators
- Ultraviolet Systems

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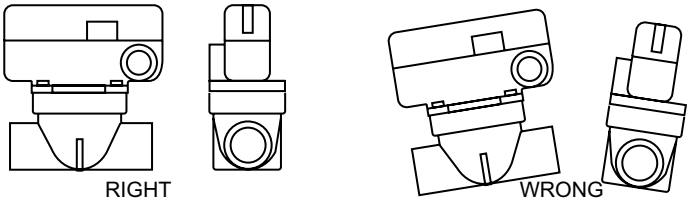
I N S T R U C T I O N S

MODELS FS-2 & FS-3



SWITCH INSTALLATION:

1. Inspect Flowswitch for any damage that may have occurred during shipping.
2. Note the water flow marking on the Flowswitch housing.
3. For proper operation the Flowswitch must be mounted horizontally and level with at least **10 times the diameter of straight pipe on the water inlet and 3 times the diameter on the water outlet.**



4. Use the Flowswitch in filtered liquids only - to prevent foreign objects from interfering with the Flowswitch operation.
5. Install filter or strainer before Flowswitch to prevent the risk of sand and/or debris from interfering with the Flowswitch operation.
6. Caution when cementing Flowswitch into plumbing system - PVC cement must not enter the inlet port and cause interference with Flowswitch operation.
7. Use an IAPMO, NSF, or ASTM approved or listed PVC cement and follow manufacturers instructions for use.

ELECTRICAL CONNECTION:

Note: Do not use rigid conduit.

8. A 1/2 Inch threaded socket is provided to accept either a cord restraint or flex conduit. You must check and use local and/or national electric codes for your application.
9. Remove cover by unscrewing the two cover screws.
10. Use push-on "Quick Connect" (0.032 X 0.250) connectors to attach wires to the switch terminals (USE stranded, not soild wire).
11. Route all wires on the top side of the switch to prevent wires from interfering with the switch operation.
12. Replace cover and hand tighten the two cover screws.
13. CAUTION Never connect a ground or neutral wire to the switch terminal or terminals. This will cause the switch to be damaged and possible fire hazard.

NOTE: N.O. = Normally Open (LOAD) Terminal. Connect to power IN on device to be switched if you want this device to be energized when water flows through the Flowswitch at its set point.

FACTORY SETTINGS:

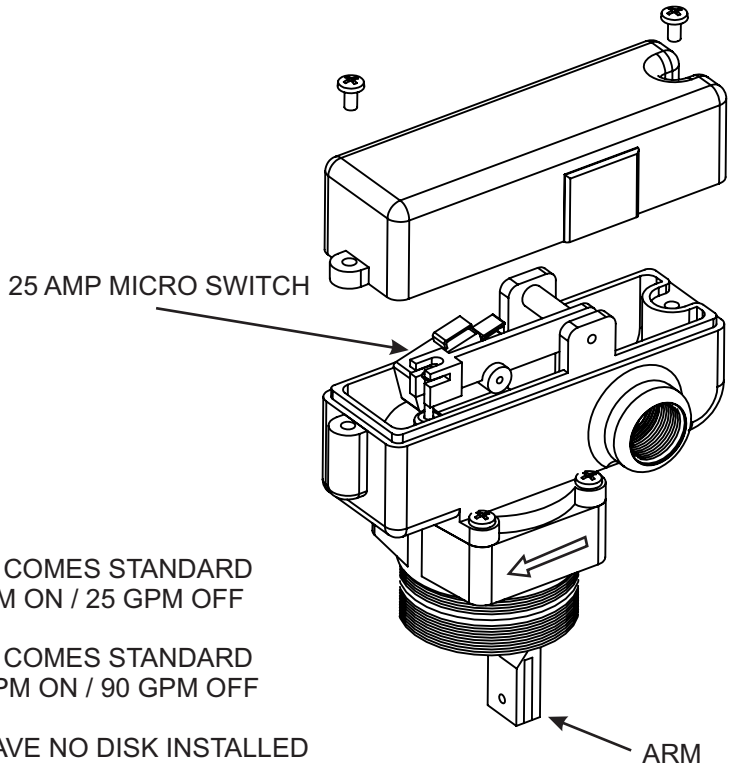
The 3” flow switches are factory set at 100 GPM turn on and ~90 GPM turn off point. The 2” flow switch are factory set at 35 GPM on and ~25 GPM turn off point.

CAUTION: Do not screw the calibration screw down - this may cause the flowswitch to stick in the ON position.

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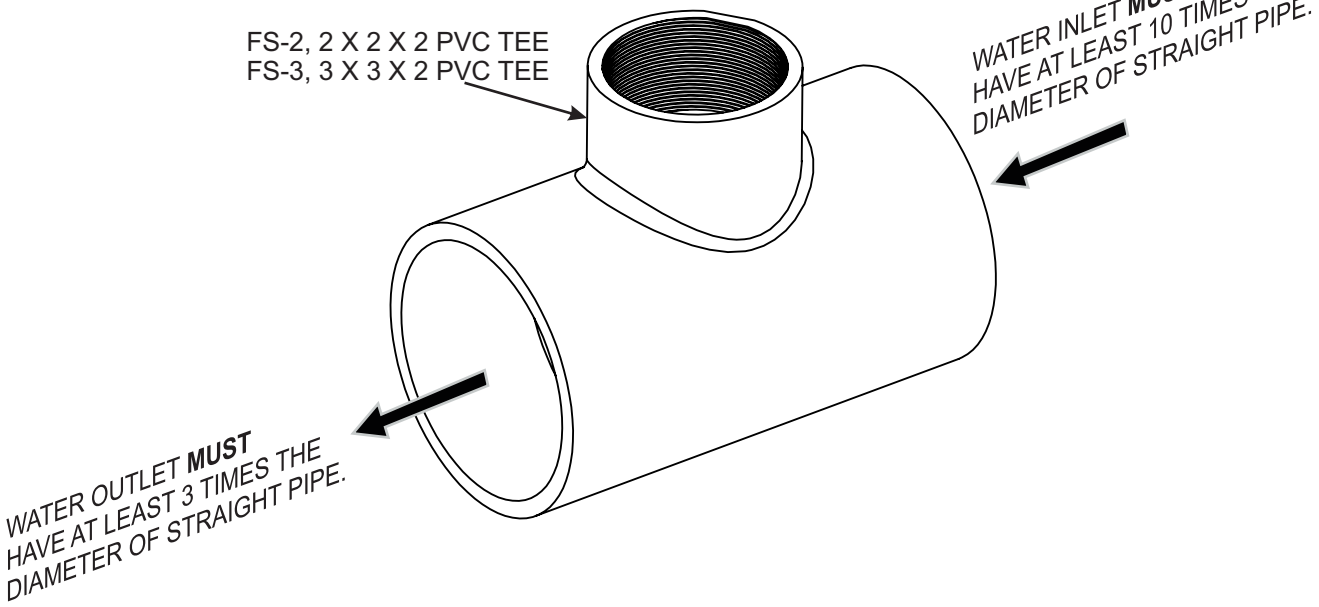
FS-2 and FS-3 PARTS



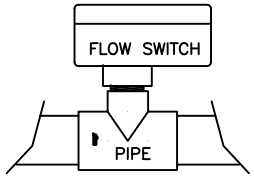
NOTE: FS-2 FLOW SWITCH COMES STANDARD
PRESET FOR 30 GPM ON / 25 GPM OFF

FS-3 FLOW SWITCH COMES STANDARD
PRESET FOR 100 GPM ON / 90 GPM OFF

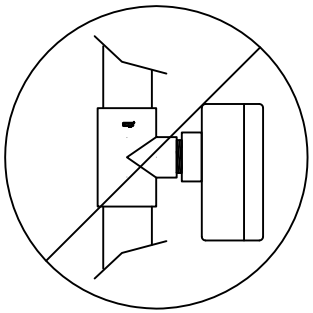
BOTH SWITCHES HAVE NO DISK INSTALLED
ON THE ARM.



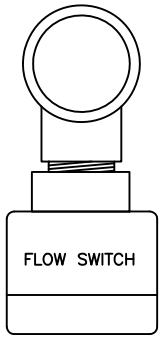
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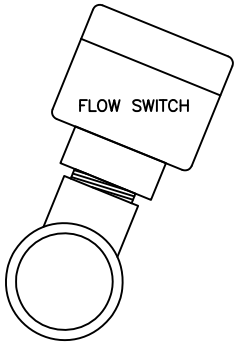
YES



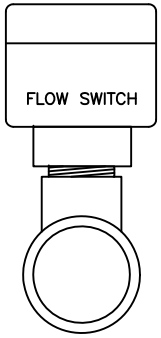
DO NOT MOUNT VERTICALLY



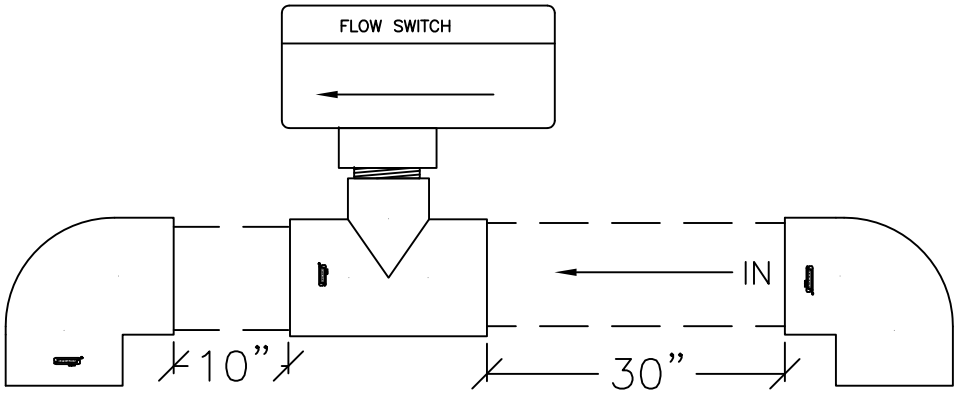
NO



NO



YES



INSTALLATION NOTE:

"FLOW CONTROL" FLOW SWITCH AND TEE FITTING IS FIELD INSTALLED ON TOP OF A HORIZONTAL STRAIGHT PIPE WITH NO LESS THAN 30" OF STRAIGHT ON THE INLET SIDE AND NO LESS THAN 10 INCHES ON THE OUTLET SIDE

TITLE	FLOW SWITCH PLUMBING NOTE	PROJECT	FLOW SWITCH	FILE	C:\AutoCad Files\Controls\3in Flow Switch Plumbing Note 4-24-13.dwg	DRAWING NO	FS-01	EDITED	9/30/2014	SCALE	1:1	aquaLOGIC®
		CLIENT	AQUA LOGIC INC			DRAWN BY	CEPPS	CREATED	4/24/2013	PAGE	1 of 1	AQUA LOGIC, INC 8268 CLAIREMONT MESA BLVD. SAN DIEGO, CA. 92111

ICM450

Programmable Three Phase Voltage Monitor with 25-Fault Memory

Protects motors from premature failure and burnouts



Installation, Operation & Application Guide

For more information on our complete range of American-made products – plus wiring diagrams, troubleshooting tips and more, visit us at **www.icmcontrols.com**

Specification

Input
- **Line Voltage:** Universal, 190-630 VAC
- **Frequency:** 50-60 Hz
- **Load Side Monitoring:** Optional
- **Control Voltage:** 18-240 VAC
- **Frequency:** 50-60 Hz

Output
- **Type:** Relay, SPDT
- **Voltage Range:** 240VAC @ 10A maximum
- **Frequency:** 50-60 Hz

Control Operating Temperature
- **Operating Temperature:** -40ºF to +167ºF (-40ºC to +75ºC)
- **Storage Temperature:** -40ºF to +185ºF (-40ºC to +80ºC)

LCD Operating Temperature
- **Operating Temperature:** -4ºF to +167ºF (-20ºC to +75ºC)

Mechanical
- **Mounting:** Surface mount using (2) #8 screws
- **Terminations:** Screw terminals
- **Weight:** 12 ounces (341 grams)

Dimensions
- 6 1/2" L, 4 1/4" W, 1 3/8" H (16.5 cm. L, 10.8 cm. W, 3.5 cm. H)

Parameters

Phase Unbalance Protection
- **Voltage Unbalance:** 2-20% adjustable

Over/Under Voltage Protection
- **Under Voltage:** 2-25% adjustable
- **Over Voltage:** 2-25% adjustable

Phase Loss Protection
- **Phase Loss Condition:** Equals 25% of nominal for any given phase; system will shut down and a fault will be recorded should this occur

Delay on Break Timer
- **Control Voltage:** 18-240 VAC
- **Time Delay:** 0 to 10 minutes adjustable

Fault Interrogation Delay
- **Time Delay:** 0 to 15 seconds adjustable
- Provides a delay between fault detection and system shutdown - helps to eliminate nuisance trips or unnecessary shutdowns

Caution

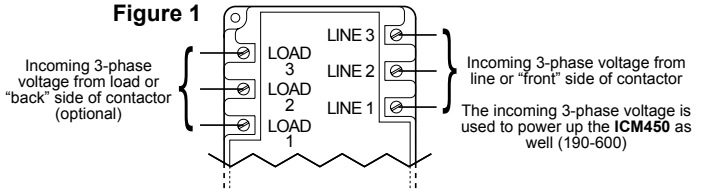
Installation of the ICM450 shall be performed by trained technicians only. Adhere to all local and national electric codes.

Disconnect all power to the system before making any connections.

Installation

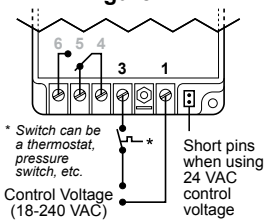
1. Using (2) #8 screws, mount the **ICM450** in a cool, dry, easily accessible location in the control panel.
2. Connect voltage as shown in Figure 1 (below). Leave existing line and load side connections intact on the contactor.
3. Load side monitoring is optional (unit may be used to monitor line side only). Wire the contactor and optional control voltage monitoring as in Figures 2 and 3 (below).
   ⁂ **Note:** *Load/line wire must be rated for 3-phase voltage rating, 20ga minimum.*
4. Upon application of power, the **ICM450** will be on line and will begin to monitor the system.

Figure 1



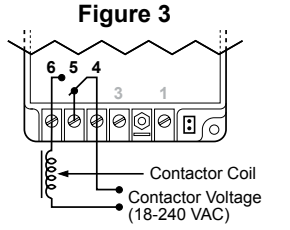
- Terminals 1 and 3 are the control signal input terminals
- "Control Mode" is turned ON or OFF in setup
- With "Control Mode" set to "ON," there must be a voltage present on terminals 1 and 3 for the relay output terminals 4 and 6 to close; this voltage can be supplied from a thermostat, pressure switch, etc.
- When the voltage on these terminals is re-applied, the unit will not re-energize until the delay on break (0-10 minutes) time has elapsed
- Use of terminals 1 and 3 is optional; they will be ignored if the "Control Mode" is set to "OFF"

Figure 2



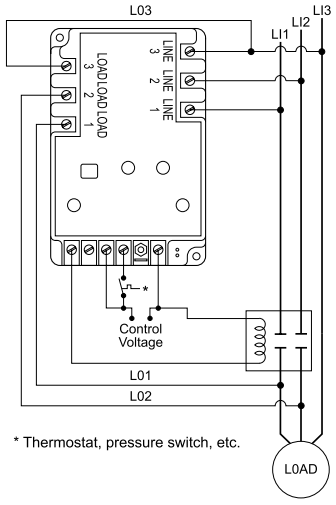
- Terminals 4 and 6 are "dry," normally open contacts
- Terminals 4 and 6 are closed when power is within specifications
- Terminals 4 and 6 open when there is a fault condition
- Terminals 4 and 6 open when there is a loss of the control signal with "Control Mode" set to "ON"

Figure 3

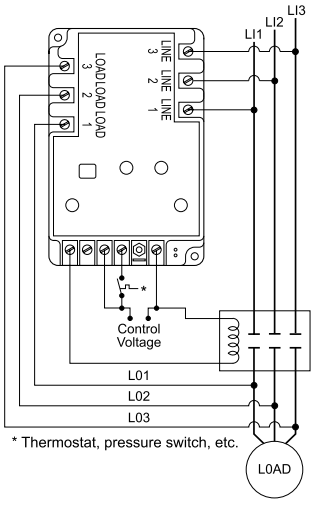


ICM450 Wiring Diagrams

2-Pole Contactor



3-Pole Contactor



Setting the Parameters

1. Press the green SETUP button to enter Setup mode. Setup LED will light.
2. Use the ∨ and ∧ arrows to change user parameters.
3. Scroll through setup by pressing and releasing the SETUP button.
4. When the last parameter has been set, the phase average will be displayed and the Setup LED will automatically turn OFF.

Button Functions

Press arrows to scroll through and select user parameter settings in Setup mode. HOLD down for fast edit.	Press to enter Setup mode and select user parameters.	Hold for voltage display a → b, b → c, a → c (simultaneously).	Press to read faults. Hold for 5 seconds to clear faults and reset memory.

Parameter	Description	Range	Default	Recommended
Line Voltage	Average phase to phase line voltage	190-600	208	Nameplate Voltage
Delay On Break	Amount of time between the load de-energizing and re-energizing	0-10 minutes	.1 minute	4 minutes**
Fault Interrogation	Amount of time before the load de-energizes due to a non-critical fault*	0-15 seconds	15 seconds	7-8 seconds**
% Over/Under Voltage	Maximum/minimum phase to phase average voltage, respectively	2-25%	20%	12-15%**
% Phase Unbalance	Amount of allowable voltage unbalance	2-20%	20%	4-5%**
Reset Mode	AUTO or number of times the load can be re-energized after a load side fault before a manual reset is necessary ⁂ **Note:** *When monitoring line side only, the reset mode will always be AUTO*	AUTO, 0-10	AUTO	AUTO
Control Mode	With control mode set to OFF, the load will energize if no 3- phase fault conditions exist; with control mode ON, the load will energize if no fault conditions exist and control voltage is present at terminals 1 and 3 of the **ICM450**	ON or OFF	ON	Based on wiring

* Non-critical faults are faults such as High/Low Voltage and Phase Unbalance. Critical faults, such as Phase Loss and Phase Reversal, have a fault interrogation of under 2 seconds and it is not user adjustable.

** For best recommendations, consult manufacturer of equipment.

Fault Conditions

Press and release fault button to scroll through all saved faults.

⁂ **Note:** *For initial setup, press and hold FAULT for 5 seconds to remove any previously stored faults.*

Fault	Problem	Corrective Action
Back Phase Loss	Not all three of the phases on the load side are present	1. Re-energize the contactor. 2. If the fault reappears after the load energizes: a. Turn all power OFF b. Check all load side connections c. Check the contacts of the contactor for debris or excess carbon.
Back Phase Rev	Loads 1, 2, or 3 are not in sequence (not 120º phase shifted)	1. Turn OFF all power. 2. Swap any 2 phases on the load side of the **ICM450** only (example: swap load 1 and load 2) * 3. Re-apply power.
Back Phase Unbalance	A voltage unbalance between the three load phases exceeds the unbalance setpoint	1. Press the **READ** button to observe the present load voltages. Check system for unbalance cause. 2. Increase the fault interrogation time if necessary. 3. Increase the percent unbalance setting if necessary.
Front Over Voltage	Average phase-phase voltage exceeds the maximum percentage	1. Check system for over-voltage cause. 2. Increase the percent over-voltage setting if necessary. 3. Increase the fault interrogation time if necessary.
Front Phase Loss	Not all three of the phases on the line side are present	1. Press and hold the **READ** button on the phase monitor or use an AC voltmeter to carefully measure all three phase-phase line voltages (***example:*** Line 1 ➔ Line 2, Line 2 ➔ Line 3, Line 3 ➔ Line 1). 2. Repair the missing phase.
Front Phase Reversal	Lines 1, 2, or 3 are not in sequence (not 120º phase shifted)	1. Turn OFF all power. 2. Swap any 2 phases on the line side of the **ICM450** (example: swap Line 1 and Line 2)* 3. Re-apply power.
Front Phase Unbalance	A voltage unbalance between the three line phases exceeds the unbalance setpoint	1. Press the **READ** button to observe the present load voltages. Check system for unbalance cause. 2. Increase the fault interrogation time if necessary. 3. Increase the percent unbalance setting if necessary.
Front Under Voltage	Average phase-phase voltage is below the minimum percentage	1. Check system for under-voltage cause. 2. Increase the percent under-voltage setting if necessary. 3. Increase the fault interrogation time if necessary.

* **Only** swap phases during initial setup, **not** after the **ICM450** has been in operation without errors.

Troubleshooting

Problem	LCD Readout	LED Status	Corrective Action
Load will not energize	Phase Avgerage	All LEDs Off	Confirm that the control input (terminals 1 & 3) is properly connected and configured
Load will not energize	Phase Avgerage	Load LED Off, Fault LED blinking	Press **FAULT** once to observe the current fault; correct the condition of the first fault that appears (see Fault Conditions above, for a list of corrective actions)
Fault LED blinks repeatedly while load is energized	Phase Avgerage	Fault LED Blinking, Load LED On	Indicates there are faults saved in the memory, press **FAULT** rapidly to scroll through saved faults; to clear the faults, press and hold **FAULT** for more than 5 seconds
Load will not de-energize when control voltage is OFF	Phase Avgerage	Load LED On, Control LED Off	The control mode setting is OFF; press **SETUP** to get to the control mode. Press ^ to set the control mode ON
Setup LED is on while load is being energized	Anything Other Than Phase Avgerage	Setup LED On, Load LED On	To exit the setup mode, press either **READ** or **FAULT**
Load will not energize	Reset	Fault LED Blinking	Unit in lockout; maximum number of retries in manual reset mode has been reached; to reset unit, press **FAULT** and hold for more than 5 seconds
Load turns ON and OFF repeatedly	Readout is Irrelevant	Fault LED Blinking	Fix load side fault; press **FAULT** to observe condition; the delay on break period may be too short; press **SETUP** to enter the delay on break mode; press ^ to lengthen the delay

ONE-YEAR LIMITED WARRANTY

The Seller warrants its products against defects in material or workmanship for a period of one (1) year from the date of manufacture. The liability of the Seller is limited, at its option, to repair, replace or issue a non-case credit for the purchase prices of the goods which are provided to be defective. The warranty and remedies set forth herein do not apply to any goods or parts thereof which have been subjected to misuse including any use or application in violation of the Seller's instructions, neglect, tampering, improper storage, incorrect installation or servicing not performed by the Seller. In order to permit the Seller to properly administer the warranty, the Buyer shall: 1) Notify the Seller promptly of any claim, submitting date code information or any other pertinent data as requested by the Seller. 2) Permit the Seller to inspect and test the product claimed to be defective. Items claimed to be defective and are determined by Seller to be non-defective are subject to a $30.00 per hour inspection fee. This warranty constitutes the Seller's sole liability hereunder and is in lieu of any other warranty expressed, implied or statutory. Unless otherwise stated in writing, Seller makes no warranty that the goods depicted or described herein are fit for any particular purpose.

ICM CONTROLS™

Patent No. 424,953

7313 William Barry Blvd., North Syracuse, NY 13212

(**Toll Free**) 800-365-5525 (**Phone**) 315-233-5266 (**Fax**) 315-233-5276

www.icmcontrols.com

Imbalance Voltage Tolerance in %
(% IMBALANCE flashes). The value may be adjusted by pressing the up and down arrows.

Lockout Time in seconds
(SECONDS flashes). The value may be adjusted by pressing the up and down arrows. (This is the delay on break timer value)

Delay time in seconds
(DELAY SECONDS flashes). The value may be adjusted by pressing the up and down arrows. This is the Random Start Delay value. (This is a delay on make timer)

Response time in seconds and tenths of seconds (RESP. SECONDS flashes) The value may be adjusted by pressing the up and down arrows. This is the time that a fault is allowed before shutdown occurs.

Control mode
(ON OFF AUTO flashes) The value may be adjusted to OFF (load will not turn on), ON (load will turn on whenever there are no faults and the timers are finished) and AUTO (load will turn on when there is a control input).

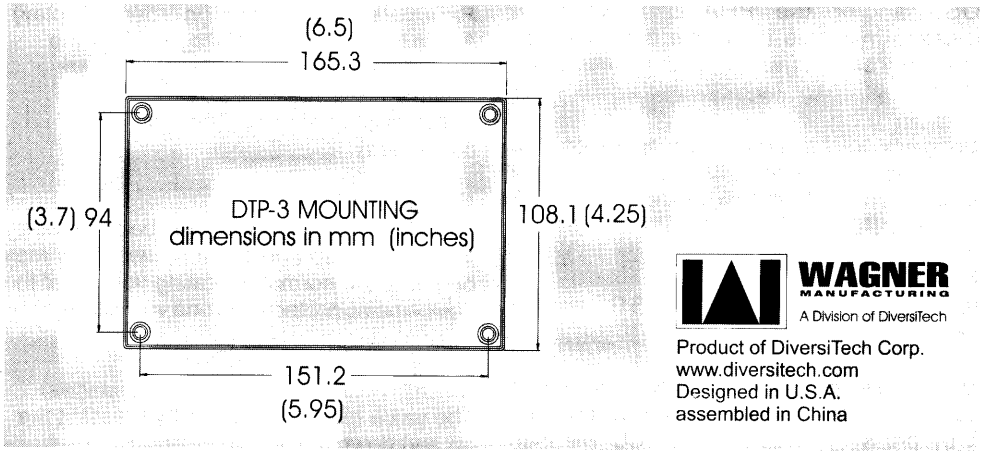
Contactor fault monitor mode
(CONTACTOR FAULT flashes) This option allows you to monitor the contactor and lock it out if the line voltage and load side varies by more than 5 volts. Pressing the up or down arrows selects off (default) or on. The load side of the contactor must be connected to the load terminals of the DTP-3 to use this option.

Display of fault memories
(MEM flashes) Pressing up or down displays the past fault conditions that took your unit off line. The first 25 faults are recorded. The top number displayed represents the fault memory. The middle number represents the total number of faults that have occurred since the fault memory was cleared.
To clear the memory, press and hold the up and down keys until the display is cleared.

Notes
If you press SELECT and do not change a parameter by pressing the up or down arrow keys, the DTP-3 automatically returns to displaying the line voltage in a few seconds.

The new settings are saved in permanent memory when the display returns to displaying the line voltage. The new settings may be verified by pressing the select button to sequence through the various parameters.

To prevent tripping on a 1 volt change, the DTP-3 automatically calculates cut-in voltages for return from undervoltage conditions. The cut-out voltage is always based on the user voltage and tolerance settings, while the cut-in voltage is 3% closer to the nominal voltage setting. This quality is sometimes referred to as hysterisis. This is to help reduce oscillation that may occur on weak power distribution systems. When the load is switched off due to undervoltage, the line voltage will increase. Without the hystersis, the monitor would switch the load back on, the line voltage would again drop, and cause a continuous on-off-on cycling.



WAGNER MANUFACTURING
A Division of DiversiTech

Product of DiversiTech Corp.
www.diversitech.com
Designed in U.S.A.
assembled in China

DTP-3
Digital Three Phase

Motor Protector / Power Monitor

Installation and Operation Instructions

WAGNER

KEY FEATURES

- ✓ Digital voltmeter displays instantaneous line voltage for all 3 phase pairs
- ✓ Contactor load side monitor checks for contactor closure
- ✓ One button contactor load side voltage measurement
- ✓ Automatic voltage tester adjusts from 160 to 600 volts
- ✓ Adjustable response timer (0.1 to 20 sec.) prevents nuisance tripping
- ✓ Adjustable delay on break (DOB) timer (0 to 720 sec.) prevents rapid re-starts
- ✓ Adjustable timer (0 to 30 sec.) allows sequencing of multiple units
- ✓ Off, Auto, On settings for operation with or without control inputs
- ✓ Selectable contactor test. Opens contactor if any one of 3 circuits fail
- ✓ Digital display makes for easy viewing and operation
- ✓ Fault memory records up to 25 fault causes

SPECIFICATIONS

✓ Voltmeter:	70 to 650 Volts: simultaneous display of AB BC CA voltages
✓ Accuracy	+ / - 2% of indicated average voltage
✓ Tolerance Limits:	6 to 18%
✓ Imbalance:	2 to 25%
✓ Response Timer:	0.1 to 20 seconds
✓ DOB Timer:	0 to 720 seconds
✓ Delay Timer:	0 to 30 seconds
✓ Contactor Test	Contactor opens and remains locked out if voltage difference is 5 volt for any phase pair.
✓ Output Relay:	10 Amps, 250 VAC resistive, single-pole/double-throw
✓ Control Input:	18 to 250 VAC with anticipator load for 24 volt thermostats

OVERVIEW

The DTP-3 Line Voltage Monitor provides continuous monitoring of the power and control signals used to operate any three phase load. Protected devices can include motors, pumps, fans, compressors and other devices.

The DTP-3 protects these devices by keeping a constant watch over the supplied voltage, and when the voltage goes outside of a voltage and tolerance that you select, the DTP-3 opens its control relay.

The time required to respond to the out-of-tolerance conditions is user adjustable and may be set for shorter times for sensitive devices or longer times to help eliminate nuisance tripping.

Each of the three line voltage pairs are checked for voltage level and phase to phase balance. Further testing of the system includes contactor-load-side monitoring. When enabled, the load side monitor checks the contactor for closure. If the contactor load side voltage does not match the line side voltage to 5 volts within 0.5 seconds after the control relay closes, the control relay is opened and remains locked out until power to the DTP-3 is cycled off and on.

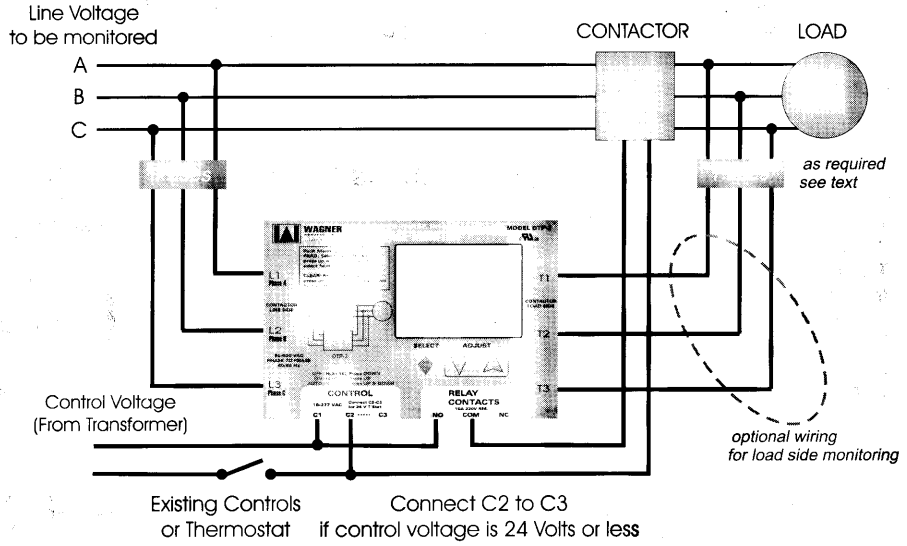
Additionally, phase rotation is tested. If the rotation is reversed, operation of the output relay is inhibited.

If any of the limits that you set are exceeded, the response timer will begin counting. You also have the flexibility to set the response timer -- a short time may be desired for a quick response or a long time may be desired to avoid nuisance tripping. If the voltage

remains outside the tolerance after the response time has elapsed, the DTP-3 will turn off its output relay and protect your device.

When the DTP-3's relay opens, the delay timer starts. This timer keeps track of the time since the output was turned off and prevents the protected equipment from restarting too soon. The delay is also user adjustable. It is particularly useful for the protection of compressors, where an attempted rapid restart can cause a stalled condition and motor burnout.

Typical Wiring Diagram



ALWAYS USE EXTREME CAUTION WHEN INSTALLING OR ADJUSTING EQUIPMENT UTILIZING HAZARDOUS VOLTAGES !

DISCONNECT ALL POWER BEFORE STARTING THE INSTALLATION OF THE DTP-3

INSTALLATION

Installation of the DTP-3 is simple and straight forward.

MOUNTING

Select a cool, dry location for the mounting of the DTP-3. Keep in mind that the front of the unit has the operator controls and the digital display. The front of the DTP-3 should be clear of obstructions and allow easy access to the control buttons. A suitable location may be in the control enclosure, near the motor starter or compressor contactor.

The DTP-3 should be mounted on a metal surface with four #8 sheet metal screws. Mounting on a metal surface helps dissipate heat and shield the DTP-3 from nearby equipment radiation.

WIRING

If the voltage being monitored is tapped from a high current source, branch circuit protection (fuse or circuit breaker as described in the National Electric Code) should be provided. Since the current drawn by the DTP-3 is a fraction of an Amp, the branch protection can be selected for the wire type used. Typically, fuses rated at 1 Amp will provide the required protection. If the load side monitor option is utilized, it's wiring must also be current limited.

PINOUT DESCRIPTION

L1, L2 and L3

Connect the voltage being monitored to the DTP-3's L1, L2, and L3 terminals. This voltage will also power the DTP-3 and should come from a source such as the line side of the contactor being controlled.

T1, T2 and T3

If your application requires contactor load side monitoring, you should connect the contactor load side to the DTP-3's T1, T2 and T3 terminals. Note that the load side monitoring should also include the required fusing to meet the branch circuit protection requirements of the National Electric Code or locale equivalent. If installed, the contactor fault option should be set to "ON".

NC, NO and COM

These terminals connect to the relay output. The relay closes when the line voltage is within the selected tolerance, the control voltage is on and the delay timer has expired. Typically you would connect the COM and NO terminals in series with the control circuit, motor starter or contactor coil.

C1, C2 and C3

Connect a control voltage to C1 and C2. The DTP-3 responds to voltage between 18 and 250 Volts and draws only a fraction of an Amp. An internal anticipator load is provided by connecting C2 to C3 to allow the use of a 24 Volt thermostat. Be sure to only connect C3 for 24 Volt or lower operation.

SETUP

The DTP-3 may be setup at a shop or other location prior to installation by simply applying power to any of the three line-side phase pairs. The DTP-3 will power up on single phase power and allow the setting of user parameters prior to installation in a three phase system.
After completing the installation (or for stand-alone setup), apply power to the DTP-3. The DTP-3 display will show a brief display test followed by the firmware revision number. The DTP-3 will then indicate the remaining time on any active timers. If the timers are expired the incoming line voltage will be displayed. The OVERVOLTAGE, UNDERVOLTAGE, PHASE LOSS and/or the PHASE REVERSAL indicators may also be visible depending on the factory settings versus your incoming line voltage.

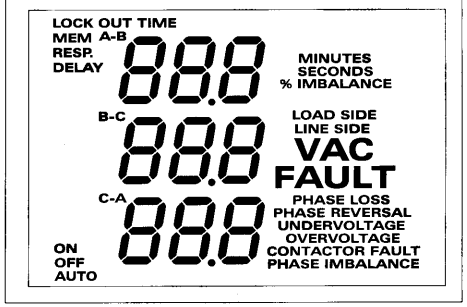
During any point in the DTP-3's operation, you may read the incoming voltage by pressing the SELECT button to return to the AB BC CA voltmeter. (Normal Display)

THE DISPLAY

The display normally shows the AB BC and CA line voltages.

If the unit is waiting on a timer, that timer will be displayed. The timer display may be switched off by pressing SELECT. The LCD will then

The DTP3's
LCD DISPLAY



display the normal AB BC CA voltage pairs.

Pressing the SELECT button once shows the contactor load side voltages. (if the load side option is connected) The display automatically returns to the display of line side voltage after a few seconds.

Press the Select button to step through the parameters. As you step through the parameters, the selected parameter will flash. Use the up and down arrow keys to adjust to the desired operating value.

Line side voltage
Load side voltage
Voltage set point
Under/over voltage tolerance in %
Imbalance voltage tolerance in %
Lockout time in seconds
Delay time in seconds
Response time in seconds
Control mode
Contactor fault monitor
Fault Memory Display

Parameters adjustment (in order of display)
Active display of *Line Voltage* (this is the default normal display)

Active display of *Load Side Voltage* (if connected)

Voltage Set Point
(VAC Flashes) The value may be adjusted by pressing the up and down arrows. This may be set to the normal operating voltage of the device being protected in one volt increments.

Under/over Voltage Tolerance in %
(UNDERVOLTAGE/OVERVOLTAGE flashes) The value may be adjusted by pressing the up and down arrows.

SPLIT CHILLER AND HEAT PUMP
LIMITED WARRANTY TERMS
(PLEASE READ CAREFULLY)**:**

Effective 1 / 2015

Limited Warranty

Aqua Logic, Inc will be supplying the outdoor condensing unit and indoor heat exchanger. The installing contractor will warrantee and be responsible for sizing and providing the refrigeration line set, connection of the outdoor condensing unit to the indoor heat exchanger, charging with refrigerant and startup of the system.

The outdoor condensing unit has a **one (1) year** parts and **90 day** labor warranty. An extended five year parts and labor warranty is available for an additional charge. This must be added at the time of purchase.

Indoor heat exchanger (evaporator) has a **one (1)** year parts only warranty.

The limited warranty covers only the parts and labor based upon Aqua Logic service cost and Aqua Logic is not liable for field repair work without prior written or verbal agreement with Repair Authorization (RA) number with a fixed maximum charge.

On split chiller and heat pump installations, Aqua Logic will not warranty refrigerate components and copper lines between condenser and heat exchanger.

The warranty applies only to the original purchaser and is not transferable.

The warranty covers only the repair or replacement of Aqua Logic products and is limited to Aqua Logic's cost of defective parts.

Once Aqua Logic determines that the defect is due to parts or workmanship and that the product is under warranty, Aqua logic will repair or replace the product solely at their discretion.

Our warranty does not include the following:

- Damage caused by freezing, inadequate or no water flow.
- Damage caused by improper installation or maintenance by user or their agent.
- Damage caused due to misapplication of the product.
- Damage caused by corrosion, abuse, accident, alteration or improper use.
- Damage caused by flood, fire, earthquake, tornado or other acts of God.
- Damage caused by electrical spikes, surges, brownouts or improper voltage or amperage.
- Damage caused by failure of any third party equipment (ie., controller, pump, etc.)
- Incidental damage to other equipment, property or livestock.
- Damage caused by a refrigeration technician in the field with poor installation technique ie., incorrect refrigerant copper line size between condensing unit and heat exchanger, bad brazed copper joints and dirty copper lines.

In the event of a defect or failure of the product, immediately contact Aqua logic for assistance. Aqua Logic will at their discretion:

- Provide user-replaceable parts to restore the unit to proper operation.

Aqua Logic®, Inc.
9558 Camino Ruiz • San Diego, CA 92126
Tel: (858) 292-4773 • Fax: (858) 279- 0537 • Email: info@aqualogicinc.com • www.aqualogicinc.com

- Provide a Repair Authorization (RA) number with a specified dollar limit for a qualified technician to provide a field repair.
- Provide a Return Authorization (RA) number to return the unit with original packaging to Aqua Logic, Inc., 9558 Camino Ruiz, San Diego, CA 92126 by prepaid freight. You need to include the serial number as well as proof of purchase and /or a copy of the original bill of sale along with the RA number. COD shipments will be refused

TRANE EXTENDED 5 YEAR PARTS AND LABOR WARRANTY

Aqua Logic Air Cooled Chillers and Heat Pumps 2 thru 20 tons

5/2015

When you purchase our chillers and heat pumps that use a TRANE condensing unit they come with a standard one (1) year parts and 90 day labor warranty. The compressor has a limited warranty for five (5) years. **The extended warranty must be purchased at the time the customer places the order for the unit.**

The parts warranty begins when the standard one (1) year warranty expires and provides replacement parts in the event of failure due to defects in material or manufacture.

The labor warranty covers the cost of Trane-affiliated commercial service labor to replace parts and / or refrigerant in the event of failure due to defects in material or manufacture.

Conditions and Exclusions:

Extended warranties are available for purchase before the ship date of the applicable equipment.

Warranty exclusions are as follows:

- Equipment repaired or altered in a manner which causes or materially contributes to the claimed defect (in the judgment of Trane)
- Corrosion, erosion or deterioration
- Damage due to accident, abuse, external causes (including controls), or freezing
- Crane Charges, nuisance calls, freight, and additional labor resulting from problem access areas
- Any damage caused by failure to perform Trane-recommended maintenance

The extended warranties are conditioned upon the equipment operating under normal use and service. Trane equipment should be installed following the space guidelines published in product literature.

Replacements parts are to be obtained through a Trane parts center. Only a Trane warranty agent may perform warranted repairs under the labor warranty.

In no event shall Trane be liable for any special, consequential or incidental damages no matter under what legal theory advanced. Trane makes no other warranty express or implied.

In the event of a discrepancy with Trane literature, Trane extended warranty certificate terms a conditions shall prevail.

Aqua Logic®, Inc.
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Tel: (858) 292-4773 • Fax: (858) 279- 0537 • Email: info@aqualogicinc.com • www.aqualogicinc.com