Tranquility® Large Water-to-Water (TMW) Series Models 360 - 840

Commercial EarthPure® Water-to-Water Water-Source Heat Pumps - 60Hz

Installation, Operation & Maintenance

97B0090N01

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CLIMATEMASTER®

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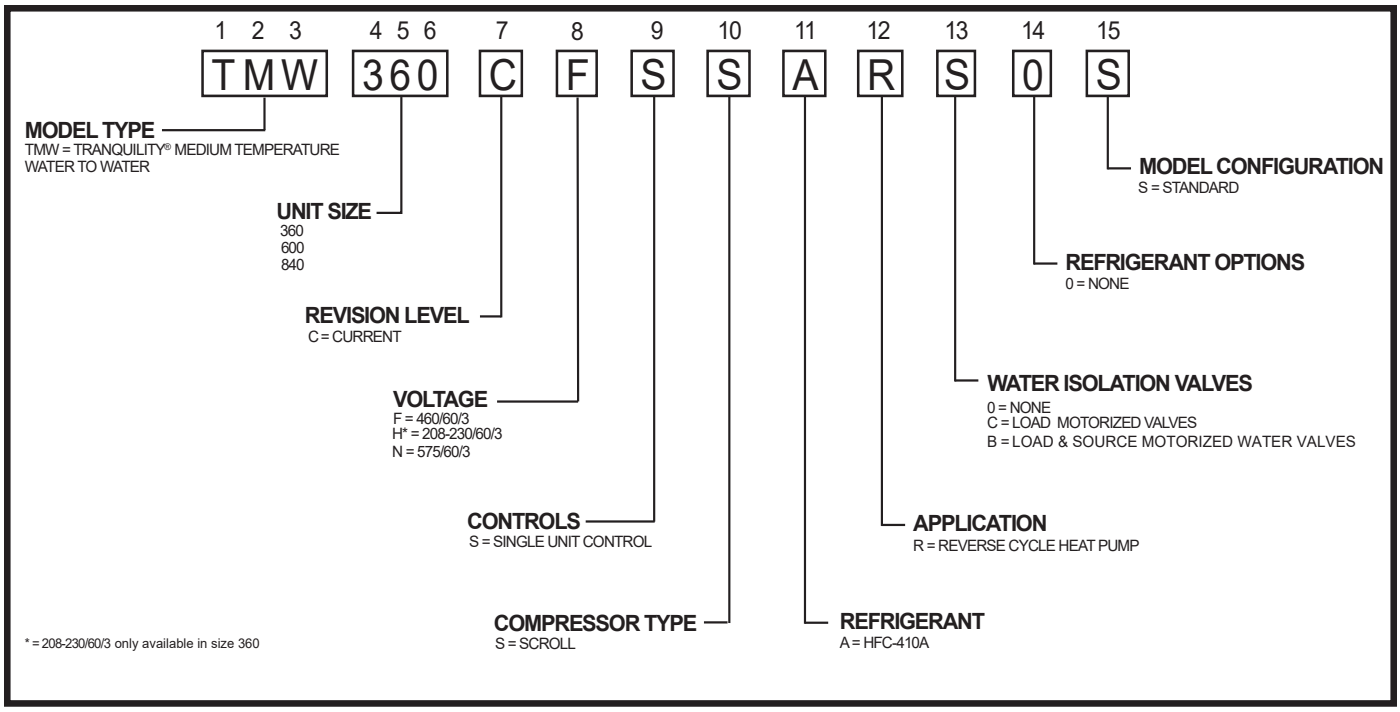
Model Nomenclature



General Information

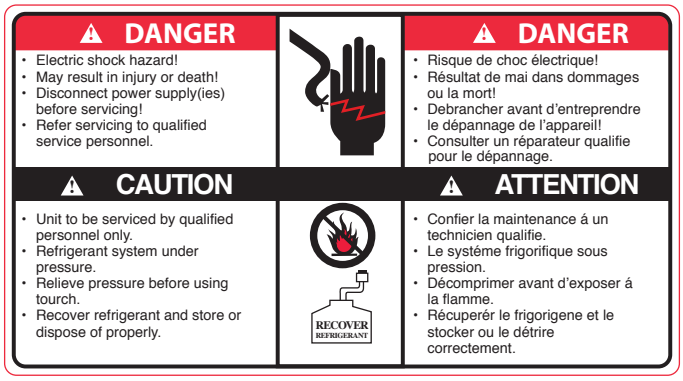
Safety
Warnings, cautions, and notices appear throughout this manual. Read these items carefully before attempting any installation, service, or troubleshooting of the equipment.

DANGER: Indicates an immediate hazardous situation, which if not avoided will result in death or serious injury. DANGER labels on unit access panels must be observed.

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

CAUTION: Indicates a potentially hazardous situation or an unsafe practice, which if not avoided could result in minor or moderate injury or product or property damage.

NOTICE: Notification of installation, operation, or maintenance information, which is important, but which is not hazard-related.



⚠ WARNING! ⚠

WARNING! To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state, and federal proficiency requirements.

⚠ WARNING! ⚠

WARNING! All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

⚠ WARNING! ⚠

WARNING! The installation of water-source heat pumps and all associated components, parts, and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

⚠ CAUTION! ⚠

CAUTION! To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. The mechanical components and filters can quickly become clogged with construction dirt and debris, which may cause system damage and void product warranty.

General Information, Cont'd.

Inspection - Upon receipt of the equipment, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the carton or crating of each unit, and inspect each unit for damage. Assure the carrier makes proper notation of any shortages or damage on all copies of the freight bill and completes a common carrier inspection report. Concealed damage not discovered during unloading must be reported to the carrier within 15 days of receipt of shipment. If not filed within 15 days, the freight company can deny the claim without recourse. Note: It is the responsibility of the purchaser to file all necessary claims with the carrier. Notify the ClimateMaster Traffic Department of all damage within fifteen (15) days of shipment.

Storage - Equipment should be stored in its original packaging in a clean, dry area. Store units in an upright position at all times. Do not stack.

Unit Protection - Cover units on the job site with either shipping packaging, vinyl film, or an equivalent protective covering. Cap the open ends of pipes stored on the job site. In areas where painting, plastering, and/or spraying has not been completed, all due precautions must be taken to avoid physical damage to the units and contamination by foreign material. Physical damage and contamination may prevent proper start-up and may result in costly equipment clean-up.

Examine all pipes, fittings, and valves before installing any of the system components. Remove any dirt or trash found in or on these components.

Pre-Installation - Installation, Operation, and Maintenance instructions are provided with each unit. The installation site chosen should include adequate service clearance around the unit. Before unit start-up, read all manuals and become familiar with the unit and its operation. Thoroughly check the system before operation.
Prepare units for installation as follows:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Keep the cabinet covered with the shipping packaging until installation is complete and all plastering, painting, etc. is finished.
3. Verify refrigerant tubing is free of kinks or dents and that it does not touch other unit components.

⚠ CAUTION! ⚠

CAUTION! All three phase scroll compressors must have direction of rotation verified at start-up. Verification is achieved by checking compressor Amp draw. Amp draw will be substantially lower compared to nameplate values. Additionally, reverse rotation results in an elevated sound level compared to correct rotation. Reverse rotation will result in compressor internal overload trip within several minutes. Verify compressor type before proceeding.

⚠ CAUTION! ⚠

CAUTION! DO NOT store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life. Always move and store units in an upright position. Tilting units on their sides will cause equipment damage.

⚠ CAUTION! ⚠

CAUTION! CUT HAZARD - Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing heat pumps.

4. Do not apply power to compressors until startup. Verify isolation switches (at bottom of low voltage section) are off.
5. **Verify I/O Flex 6126 board has jumper set to 5 Vac. See Wire Diagram.**

Handling - Carefully remove the unit's packaging. The steel base cut-outs provide maneuverability by forklift or pallet jack into its final position (See Rigging and Lifting Procedures).

Rigging and Lifting - Each unit should be lifted by using a pallet jack or fork lift in base slots. If it is necessary to utilize a crane for rigging or lifting, use lifting straps and spreader bars.

Unit Physical Data

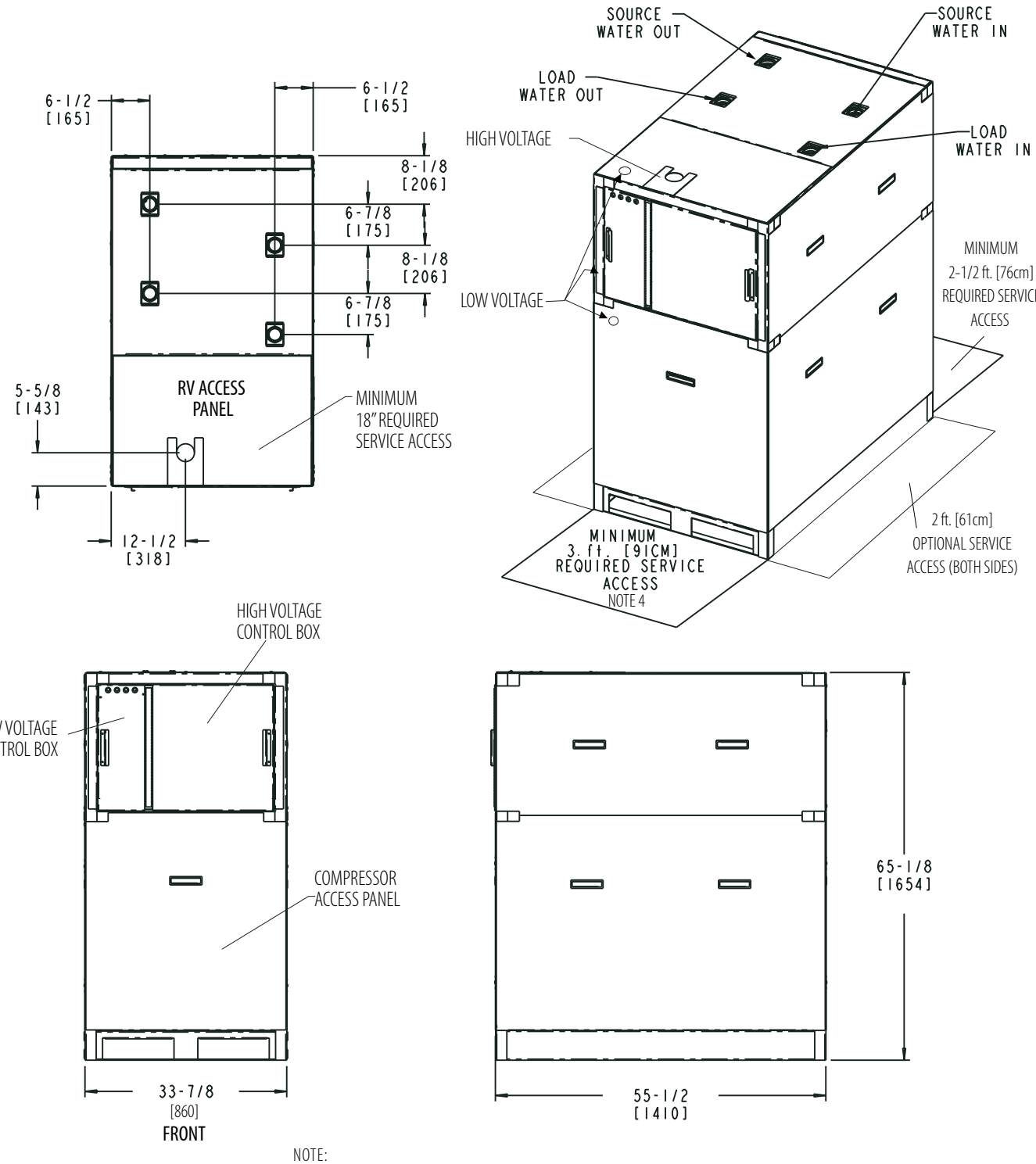
Model	TMW360	TMW600	TMW840
Compressor (qty)	Scroll (2)	Scroll (2)	Scroll (2)
Compressor Oil Type	POE	PVE	PVE
Factory Charge HFC-410A (lbs) [kg] / circuit	15 [6.8]	27.5 [12.5]	33.8 [15.4]
Indoor / Load Water connection sizes FPT (in)	2	2-1/2	2-1/2
Outdoor / Source Water connection size FPT (in)	2	2-1/2	2-1/2
Weight - Operating (lbs) [kg]	1400 [635]	2055 [932]	2305 [1042]
Weight - Shipping (lbs) [kg]	1325 [601]	1925 [873]	2175 [983]
Water Volume (Source)			
Gallons [Liters]	4.7 [17.8]	8.3 [31.4]	9.5 [36]
Water Volume (Load)			
Gallons [Liters]	4.4 [16.7]	7.3 [27.6]	8.5 [32.2]

Unit Maximum Water Working Pressure	
Options	**Max Working Pressure PSIG [kPa]**
Base Unit	300 [2,068]
Motorized Valves	300 [2,068]

Unit Corner Weights (lbs) [kg]

Model	Left Front	Left Rear	Right Front	Right Rear
TMW360	345 [156]	350 [159]	275 [125]	355 [161]
TMW600	492 [223]	500 [227]	400 [181]	533 [242]
TMW840	557 [252]	565 [255]	452 [204]	601 [271]

Unit Dimensional Data



NOTE:

1. DIMENSIONS SHOWN IN INCHES AND [MILLIMETERS].
2. TMW360 WATER CONNECTIONS ARE 2" FPT.
3. TMW600 AND 840 WATER CONNECTIONS ARE 2.5" FPT.
4. FOR MULTIPLE UNITS PLACED SIDE BY SIDE. ALLOW SUFFICIENT SPACE FRONT OR BACK TO REMOVE UNIT.

Unit Installation

TMW Unit Location - These units are not designed for unconditioned indoor or outdoor installation. Locate the unit in an INDOOR dry, conditioned air (see Operational Limits Table - 5) area that allows enough space for service personnel to remove access panels and to perform typical maintenance or repairs in the future.

The installation of water-source heat pump units and all associated components, parts and accessories which make up the installation must be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the Installing Contractor to determine and comply with ALL applicable codes and regulations.

ClimateMaster recommends locking down the TMW to a concrete base or to three 4" field supplied base rails that can support the unit weight. Base pan has 6 bolt holes for securing to base or rail.

Note: If springs or vibration isolation pads are used, size and weight distribution must be determined by a qualified structural engineer.

Recommended service clearances are 36 inch (91 cm) at front, 30 inch (76 cm) at rear, and 18 inch (46 cm) above. Optional service clearances 24 inch (61 cm) each side. Provide sufficient room to make water and electrical connections. Access panel screws are for shipping and may be removed prior to setting the unit. These units are not approved for outdoor installation and, therefore, must be installed inside the structure being conditioned.

Note: Do not apply power to compressors until startup. Verify isolation switches (at bottom of low voltage section) are off.

The Load side should have a minimum capacity of 6 gallons per ton of cooling ouput capacity to prevent compressor short cycling.

Piping Installation

Installation of Supply and Return Piping for Load and Source

Follow these piping guidelines.

1. Install a drain valve at the base of each supply and return riser to facilitate system flushing.
2. Install shut-off / balancing valves and unions at each unit to permit unit removal and for servicing.
3. Install shut off valves to isolate strainers.
4. **Install 60 mesh strainers on unit inlet for both Source and Load.** Recommend basket strainer on Source.
5. Select the proper hose length to allow slack between connection points. Hoses may vary in length by +2% to -4% under pressure.
6. Exceeding the minimum bend radius may cause the hose to collapse which reduces water flow rate. Install an angle adapter to avoid sharp bends in the hose when the radius falls below the required minimum and causes a slight kink.
7. Install (4) petes ports, install on both Source and Load inlets and outlets.
8. Both Load and Source must adhere to Water Quality Standards. See Table 1.

⚠ WARNING! ⚠

WARNING! Piping must comply with all applicable codes.

⚠ WARNING! ⚠

WARNING! Do not bend or kink supply lines or hoses.

Insulation is not required on loop water piping except where the piping runs through unheated areas or outside the building or when the loop water temperature is below the minimum expected dew point of the pipe ambient temperature. Insulation is required if loop water temperature drops below the dew point.

Pipe joint compound is not necessary when Teflon threaded tape is pre-applied to hose assemblies or when flared-end connections are used. If pipe joint compound is preferred, use compound only in small amounts on the pipe threads of the fitting adapters. Prevent sealant from reaching the flared surfaces of the joint.

Note: When antifreeze is used in the loop, assure that any Teflon® tape or pipe joint compound used is compatible.

Maximum allowable torque for brass fittings is 30 ft-lbs [41 N-m]. If a torque wrench is not available, tighten finger-tight plus one quarter turn. Tighten steel fittings as necessary.

Optional pressure-rated hose assemblies designed specifically for use with ClimateMaster units are available. Similar hoses can be obtained from alternate suppliers. Supply and return hoses are fitted with swivel-joint fittings at one end to prevent kinking during installation.

Refer to Figure 1 for an illustration of a Supply/Return Hose Kit. Male adapters secure hose assemblies to the unit. Install hose assemblies properly and check them regularly to avoid system failure and reduced service life.

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, or Polyvinylether, commonly known as PVE oil, are synthetic oils used in many refrigeration systems including those with HFC-410A refrigerant. POE, or PVE oil, if it ever comes in contact with PVC or CPVS piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

⚠ CAUTION! ⚠

CAUTION! Corrosive system water requires corrosion resistant fittings and hoses and possibly water treatment.

Figure 1: Supply/Return Hose Kit

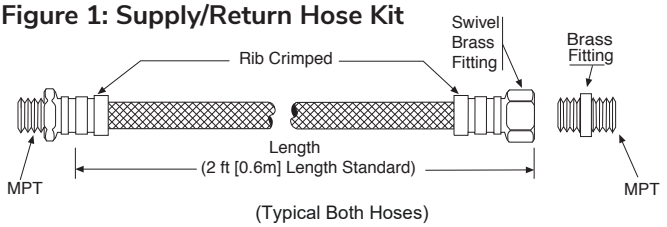
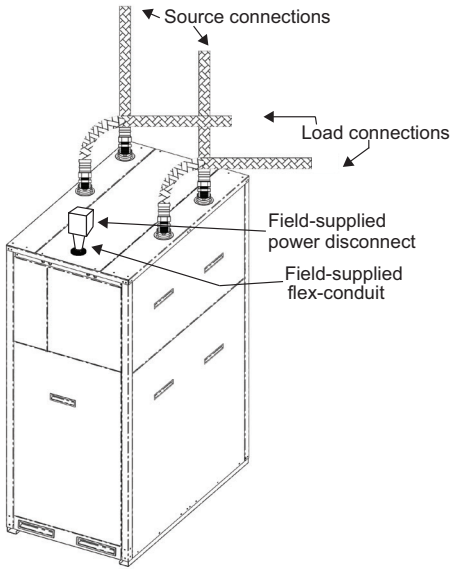


Figure 2: Connection Locations



Load Plumbing Installation

TMW Unit Load Plumbing - The applications are too varied to describe in this document. However, some basic guidelines will be presented. Much of the discussions on water loop applications would be valid for the load plumbing discussion as well. All plumbing must conform to local codes with the following considerations:

Active portion of loop requires 6 gallons of water per ton of unit(s) capacity, see figure 3. Must use storage/buffer tank if needed.

Wide temperature variation applications such as heating/cooling coils:

- Employ piping materials that are rated for the maximum temperature and pressure combination. This excludes PVC for most heating applications.
- Ensure that load water flow in high temperature heating applications is at least 3 gpm per ton [3.9 l/m per kW] to improve performance and reduce nuisance high pressure faults.
- DO NOT employ plastic to metal threaded joints
- Utilize a pressure tank and air separator vent system to equalize pressure and remove air.

Swimming Pool Hot Tub Applications:

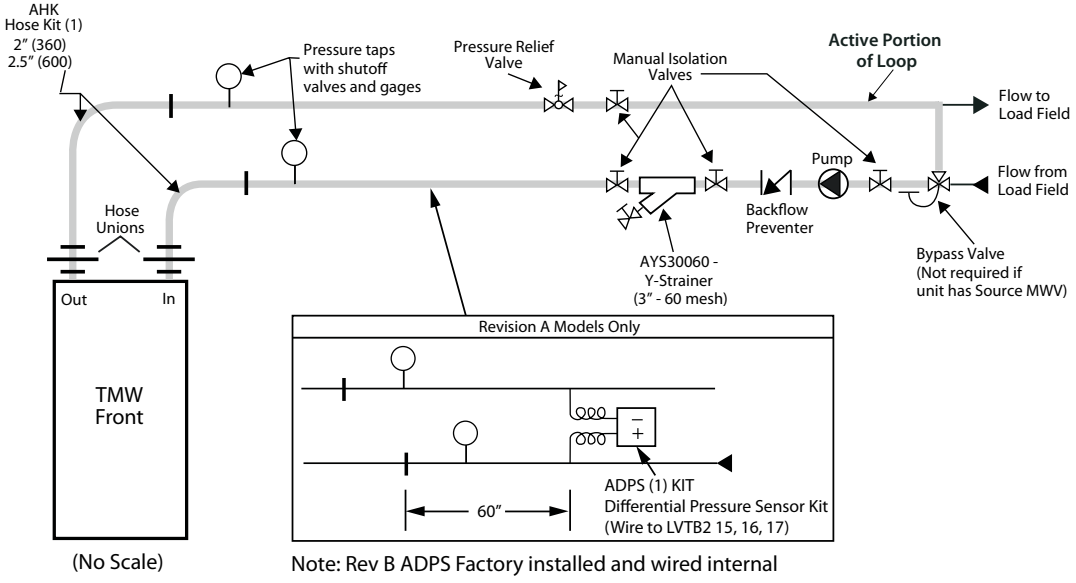
- Load exchanger should be isolated with secondary heat exchanger constructed of anti-corrosion material for chlorine/bromine fluid applications.

Potable Water Applications:

- Load exchanger should be isolated with secondary heat exchanger.
- Ensure load water flow in high temperature heating applications is at least 3 gpm per ton to improve performance and reduce nuissance to high pressure faults.

Note: The manufacturer strongly recommends all piping connections, both internal and external to the unit, be pressure tested by an appropriate method prior to any finishing of the interior space or before access to all connections is limited. Test pressure may not exceed the maximum allowable pressure for the unit and all components within the water system. The manufacturer will not be responsible or liable for damages from water leaks due to inadequate or lack of a pressurized leak test, or damages caused by exceeding the maximum pressure rating during installation.

Figure 3: Load Water System (Not all components of system shown. See engineering specifications and drawings)



WATER TEMPERATURE REQUIREMENTS

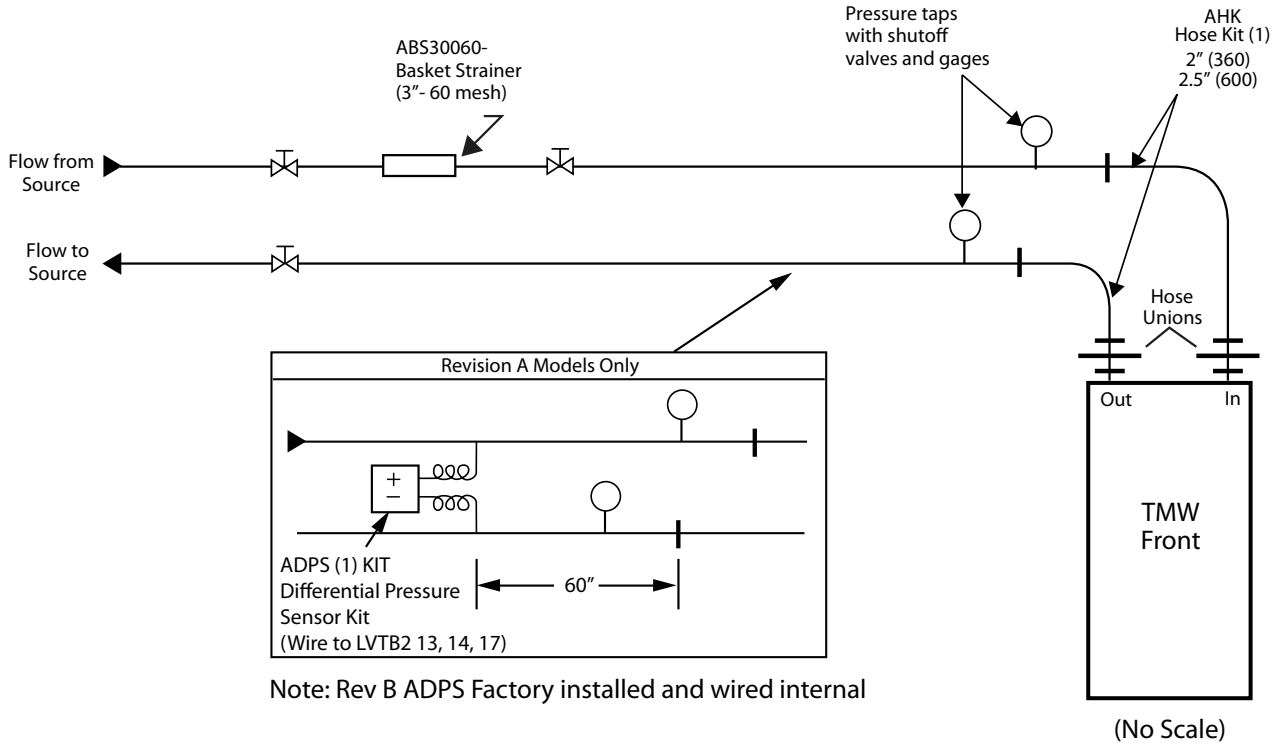
Cooling Water Temperature - Unit is designed for a leaving water temperature range from 40°F to 62°F. TMW360-840 units can operate safely in this range without the need of special controls or glycol additives. Leaving water temperatures below 40°F can result in evaporator suction temperatures below the freezing point of water. Therefore, a glycol solution additive is required that will protect the evaporator from freeze ups at lower operating suction temperatures. The full range of leaving fluid temperature using glycol is 24°F to 62°F.

Water-Loop Heat Pump Applications

Commercial systems typically include a number of units plumbed to a common piping system. Any unit plumbing maintenance work can introduce air into the piping system, therefore air elimination equipment is a major portion of the mechanical room plumbing. In piping systems expected to utilize water temperatures below 50°F [10°C], 1/2" [13mm] closed cell insulation is required on all piping surfaces to eliminate condensation. Metal to plastic threaded joints should never be employed due to their tendency to leak over time. Teflon tape thread sealant is recommended for NPT water connections (commercial class) to minimize internal fouling of the heat exchanger. Do not overtighten connections and route piping so as not to interfere with service or maintenance access. Hose kits are available from ClimateMaster for connection between the TMW Series and the piping system. The piping system should be flushed to remove dirt, piping chips, and other foreign material prior to operation. See Piping System Cleaning and Flushing Procedures later in this document. The flow rate is usually set between 2.25 gpm and 3 gpm per ton [2.9 l/m and 4.5 l/m per kW] of cooling capacity. ClimateMaster recommends 2.5 gpm per ton [3.2 l/m per kW] for most applications of water loop heat pumps. To insure proper maintenance and servicing, P/T ports are imperative for temperature and flow verification, as well as performance checks.

Cooling Tower/Boiler Systems typically utilize a common loop maintained 60-90°F [16-32°C]. The use of a closed circuit evaporative cooling tower with a secondary heat exchanger between the tower and the water loop is recommended. If an open type cooling tower is used continuously, chemical treatment and filtering will be necessary.

Figure 4: Source Water System (Not all components of system shown. See engineering specifications and drawings).



Note: Rev B ADPS Factory installed and wired internal

(No Scale)

Ground-Water Heat Pump Applications

Shut off valves should be included for ease of servicing. Unit has internal flush valves to allow alkaline flushing of just the heat exchanger. Pressure temperature plugs should be used so that flow and temperature can be measured. Supply and return water piping materials should be limited to copper, PE, or similar material. PVC or CPVC should never be used as they are incompatible with the POE and PVE oils used in HFC-410A products and piping system failure and property damage may result.

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, or Polyvinylether, commonly known as PVE oil, are synthetic oils used in many refrigeration systems including those with HFC-410A refrigerant. POE, or PVE oil, if it ever comes in contact with PVC or CPVS piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

Water quantity should be plentiful and of good quality. Consult Table 3 for water quality guidelines. The unit has stainless steel braze plate heat exchangers. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, a closed loop system is recommended. It is mandatory to install an intermediate heat exchanger to isolate an open loop from the heat pump loop on open well systems. Heat exchangers may over time lose heat exchange capabilities due to a build up of mineral deposits inside. These can be cleaned only by a qualified service mechanic as acid and special pumping equipment are required.

In areas with extremely hard water, the owner should be informed that the intermediate heat exchanger may require occasional flushing. Use a 2% phosphoric or sulfamic acid solution, on the unit side and manufacturer's recommendation on ground water side.

Expansion Tank and Pump - Use a closed, bladder-type expansion tank to minimize mineral formation due to air exposure. The expansion tank should be sized to handle at least one minute run time of the pump to prevent premature pump failure using its drawdown capacity rating. Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways depending on local building codes; i.e. recharge well, storm sewer, drain field, adjacent stream or pond, etc. Most local codes forbid the use of sanitary sewer for disposal. Consult your local building and zoning department to assure compliance in your area.

Water Control Valve - Note the placement of the water control valve. Always maintain water pressure in the heat exchanger by placing water control valves at the outlet of the unit to prevent mineral precipitation. Slow opening and closing valves are recommended to reduce water hammer. If water hammer persists, a mini-expansion tank can be mounted on the piping to help absorb the excess hammer shock. Ensure that the total 'VA' draw of any field-supplied valve can be supplied by the unit transformer.

Flow Regulation - Flow regulation can be accomplished by two methods. First, most water control valves have a built in flow adjustment. By measuring the pressure drop through the unit heat exchanger, flow rate can be determined and compared to Table 2. Since the pressure is constantly varying, two pressure gauges might be needed. Simply adjust the water control valve until the desired flow of 1.5 to 2 gpm per ton is achieved. Secondly, a flow control device may be installed. The devices are typically an orifice of plastic material that is designed to allow a specified flow rate. These are mounted on the outlet of the water control valve. On occasion, these valves can produce a velocity noise that can be reduced by applying some back pressure. This is accomplished by slightly closing the leaving isolation valve of the well water setup.

Table 1

Model	Flow GPM	Pressure Drop PSI (FT)
TMW360	45	1.2 (2.7)
	68	2.4 (5.6)
	90	4.2 (9.6)
TMW600	75	1.7 (3.9)
	113	3.6 (8.3)
	150	6.3 (14.5)
TMW840	105	2.7 (6.2)
	158	6.0 (13.7)
	210	10.4 (23.7)

Ground-Loop Heat Pump Applications

⚠ CAUTION! ⚠

CAUTION! The following instructions represent industry accepted installation practices for Closed Loop Earth Coupled Heat Pump Systems. They are provided to assist the contractor in installing trouble free ground loops. These instructions are recommendations only. State and Local Codes MUST be followed and installation MUST conform to ALL applicable Codes. It is the responsibility of the Installing contractor to determine and comply with ALL applicable Codes and Regulations.

Pre-Installation - Prior to installation, locate and mark all existing underground utilities, piping, etc. Install loops for new construction before sidewalks, patios, driveways, and other construction has begun. During construction, accurately mark all ground loop piping on the plot plan as an aid in avoiding potential future damage to the installation.

Antifreeze - In areas where minimum entering loop temperatures drop below 40°F [5°C] or where piping will be routed through areas subject to freezing, anti-freeze is needed. Alcohols and glycols are commonly used as antifreezes, however your local sales manager should be consulted for the antifreeze best suited to your area. Low temperature protection should be maintained to 15°F [9°C] below the lowest expected entering loop temperature. For example, if 30°F [-1°C] is the minimum expected entering loop temperature, the leaving loop temperature would be 25 to 22°F [-4 to -6°C] and low temperature protection should be at 15°F [-10°C] e.g. 30°F - 15°F = 15°F [-1°C - 9°C = -10°C]. All alcohols should be premixed and pumped from a reservoir outside of the building when possible or introduced under water level to prevent fuming. Initially calculate the total volume of fluid in the piping system. Then use the percentage by volume shown in Table 3 for the amount of antifreeze. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

Table 2: Antifreeze Percentages by Volume

Type	Minimum Temperature for Low Temperature Protection			
	10°F [-12.2°C]	15°F [-9.4°C]	20°F [-6.7°C]	25°F [-3.9°C]
Methanol	25%	21%	16%	10%
100% USP Food Grade Propylene Glycol	38%	25%	22%	15%
Ethanol	29%	25%	20%	14%

* Must not be denatured with any petroleum based product

Piping Installation - All earth loop piping materials should be limited to only polyethylene fusion for inground sections of the loop. Galvanized or steel fitting should not be used at any time due to their tendency to corrode. All plastic to metal threaded fittings should be avoided due to their potential to leak in earth coupled applications and a flanged fitting substituted. P/T plugs should be used so that flow can be measured using the pressure drop of the unit heat exchanger in lieu of other flow measurement means. Earth loop temperatures can range between 25 to 110°F [-4 to 43°C], and 2.25 to 3 gpm of flow per ton [2.9 l/m to 3.9 l/m per kW] of cooling capacity is recommended in these applications. Upon completion of the ground loop piping, pressure test the loop to assure a leak free system. Horizontal Systems: Test individual loops as installed. Test entire system when all loops are assembled. Vertical U-Bends and Pond Loop Systems: Test Vertical U-bends and pond loop assemblies prior to installation with a test pressure of at least 100 psi [689 kPa].

Flushing the Earth Loop - Upon completion of system installation and testing, flush the system to remove all foreign objects and purge to remove all air. Flush the loop first with the unit isolated to avoid flushing debris from the loop into the unit heat exchanger.

Water Control Valve - Note the placement of the water control valve. Always maintain water pressure in the heat exchanger by installing water control valves at the source out of the unit to prevent mineral precipitation. Position water high pressure switch between unit and valve. Pilot operated or slow closing valves are recommended to reduce water hammer. If water hammer persists, a mini-expansion tank can be mounted on the piping to help absorb the excess hammer shock. Insure that the total 'VA' draw of the valve can be supplied by the unit transformer. For instance, some slow closing valves can draw up to 35VA. This can overload smaller transformers depending on the other controls employed. A typical pilot operated solenoid valve draws approximately 15VA.

Flow Regulation - Install on source in of unit. Flow regulation can be accomplished by two methods. First, most water control valves have a built in flow adjustment. By measuring the pressure drop through the unit heat exchanger, flow rate can be determined and compared to Table 2. Since the pressure is constantly varying, two pressure gauges might be needed. Simply adjust the water control valve until the desired flow of 2.5 to 3 gpm per ton [2.0 to 2.6 l/m per kW] is achieved. Secondly, a flow control device may be installed. The devices are typically an orifice of plastic material that is designed to allow a specified flow rate. These are mounted on the outlet of the water control valve. On occasion, these valves can produce a velocity noise that can be reduced by applying some back pressure. This is accomplished by slightly closing the leaving isolation valve of the well water setup.

Water Quality Standards

Table 3: Water Quality Standards

Clean water is essential to the performance and life span of water source heat pumps. Contaminants, chemicals, and minerals all have the potential to cause damage to the water heat heat exchanger if not treated properly. All closed water loop systems should undergo water quality testing and be maintained to the water quality standards listed in this table.

CLIMATEMASTER WATER QUALITY STANDARDS

For Closed-Loop and Open-Loop Systems

				Heat Exchanger Type			
				Closed Loop Recirculating	Open Loop, Tower, Ground Source Well		
	Description	Symbol	Units	All Heat Exchanger Types	COAXIAL HX Copper Tube in Tube	COAXIAL HX Cupronickel	Brazed Plate HX 316 SS
Scaling Potential	pH - Chilled Water <85°F			7.0 to 9.0	7.0 to 9.0	7.0 to 9.0	7.0 to 9.0
	pH - Heated Water >85°F			8.0 to 10.0	8.0 to 10.0	8.0 to 10.0	8.0 to 10.0
	Alkalinity	($HCO3^-$)	ppm - $CaCO_3$ equiv.	50 to 500	50 to 500	50 to 500	50 to 500
	Calcium	(Ca)	ppm	<100	<100	<100	<100
	Magnesium	(Mg)	ppm	<100	<100	<100	<100
	Total Hardness	(CaCO3)	ppm - CaCO3 equiv.	30 to 150	150 to 450	150 to 450	150 to 450
	Langelier Saturation Index	LSI		-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5
	Ryznar Stability Index	RSI		6.5 to 8.0	6.5 to 8.0	6.5 to 8.0	6.5 to 8.0
Corrosion Prevention	Total Dissolved Solids	(TDS)	ppm - $CaCO_3$ equiv.	<1000	<1000	<1000	<1500
	Sulfate	(SO_4^{2-})	ppm	<200	<200	<200	<200
	Nitrate	(NO_3^-)	ppm	<100	<100	<100	<100
	Chlorine (free)	(Cl)	ppm	<0.5	<0.5	<0.5	<0.5
	Chloride (water < 80°F)	(Cl^-)	ppm	<20	<20	<150	<150
	Chloride (water > 120°F)		ppm	<20	<20	<125	<125
	Hydrogen Sulfide[α]	(H_2S)	ppb	<0.5	<0.5	<0.5	<0.5
	Carbon Dioxide	(CO_2)	ppm	0	<50	10 to 50	10 to 50
	Iron Oxide	(Fe)	ppm	<1.0	<1.0	<1.0	<0.2
	Manganese	(Mn)	ppm	< 0.4	<0.4	<0.4	<0.4
	Ammonia	(NH_3)	ppm	<0.05	<0.1	<0.1	<0.1
	Chloramine	(NH_2CL)	ppm	0	0	0	0
Fouling & Biological	Iron Bacteria		cells/mL	0	0	0	0
	Slime Forming Bacteria		cells/mL	0	0	0	0
	Sulfate reducing bacteria		cells/mL	0	0	0	0
	Suspended Solids[β]	(TSS)	ppm	<10	<10	<10	<10
Electrolysis All HX types	Earth Ground Resistance[χ]		Ohms	0	Consult NEC & local electrical codes for grounding requirements		
	Electrolysis Voltage[δ]		mV	<300	Measure voltage internal water loop to HP ground		
	Leakage Current[δ]		mA	<15	Measure current in water loop pipe		

Building Primary Electrical Ground to unit, must meet local diameter and penetration length requirements

Do not connect heat pump to steel pipe unless dissimilar materials are separated by using Di-electric unions. Galvanic corrosion of heat pump water pipe will occur.

Water Quality Standards, Cont'd.

1. The ClimateMaster Water Quality Table provides water quality requirements for coaxial & brazed plate heat exchangers.
2. The water must be evaluated by an independent testing facility comparing site samples against this Table. When water properties are outside of these parameters, the water must either be treated by a professional water treatment specialist to bring the water quality within the boundaries of this specification, or an external secondary heat exchanger must be used to isolate the heat pump water system from the unsuitable water. Failure to do so will void the warranty of the heat pump system and will limit liability for damage caused by leaks or system failure.
3. Regular sampling, testing and treatment of the water is necessary to assure that the water quality remains within acceptable levels thereby allowing the heat pump to operate at optimum levels.
4. If closed-loop systems are turned off for extended periods, water samples must be tested prior to operating the system.
5. For optimal performance, it is recommended that the closed-loop piping systems are initially filled with de-ionized water.
6. Well water with chemistry outside of these boundaries, and salt water or brackish water requires an external secondary heat exchanger. Surface/Pond water should not be used.
7. If water temperature is expected to fall below 40°F, antifreeze is required. Refer to the heat pump IOM for the correct solution ratios to prevent freezing.

Strainer / Filter Sizing			
Mesh Size	Particle Size		
	Microns	MM	Inch
20	840	0.840	0.0340
30	533	0.533	0.0210
60	250	0.250	0.0100
100	149	0.149	0.0060
150	100	0.100	0.0040
200	74	0.074	0.0029

ppm = parts per million
ppb = parts per billion

α Hydrogen Sulfide has an odor of rotten eggs. If one detects this smell, a test for H2S must be performed. If H2S is detected above the limit indicated, remediation is necessary (Consult with your Water Testing/Treatment Professional) or a secondary heat exchanger is required using appropriate materials as recommended by the heat exchanger supplier.

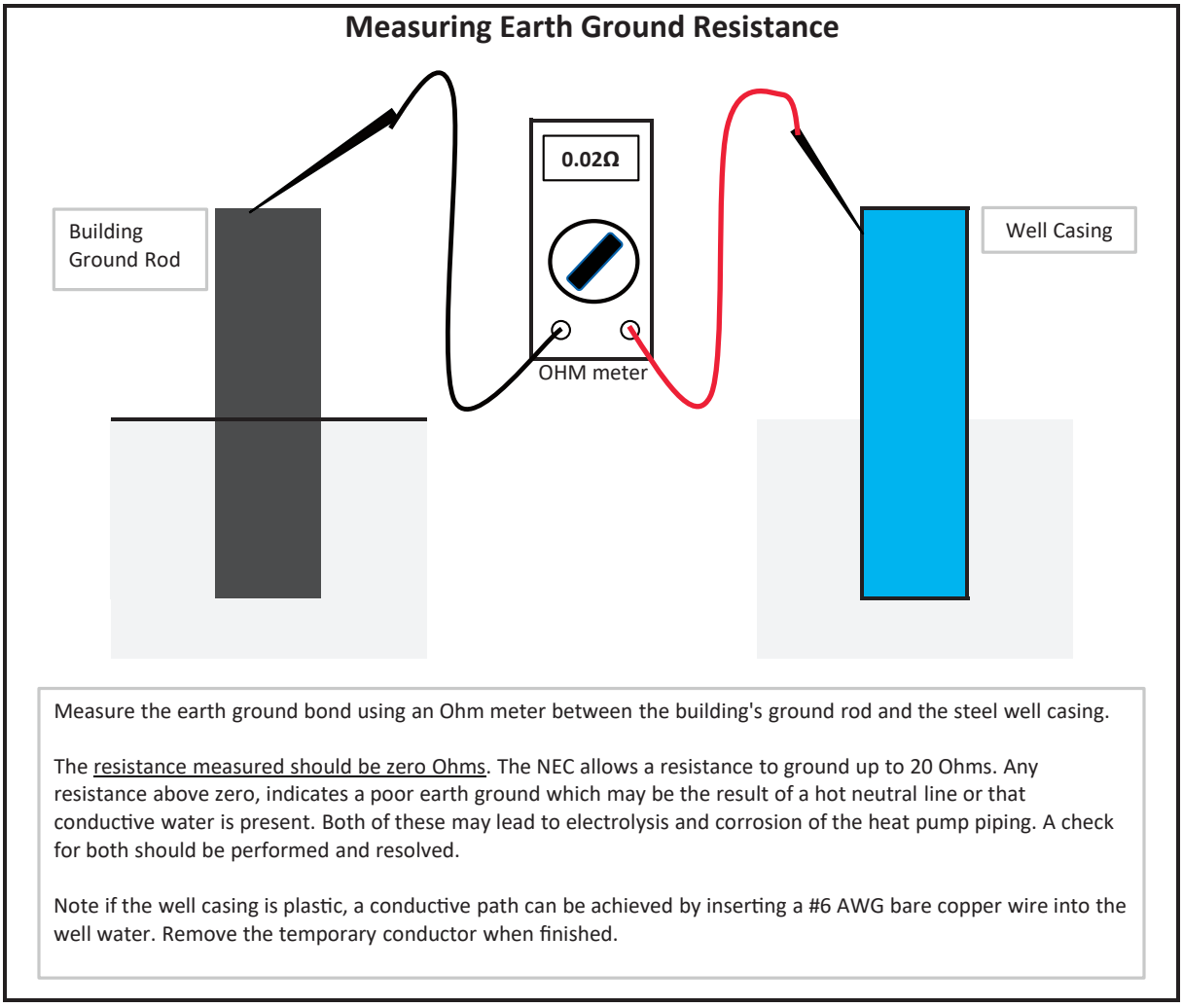
β Suspended solids and particulates must be filtered to prevent fouling and failure of heat exchangers. Strainers or particulate filters must be installed to provide a maximum particle size of 600 micron (0.60 mm, 0.023 in.) using a 20 to 30 mesh screen size. When a loop is installed in areas with fine material such as sand or clay, further filtration is required to a maximum of 100 micron. Refer to the Strainer / Filter Sizing Chart to capture the particle sizes encountered on the site.

χ An electrical grounding system using a dedicated ground rod meeting NEC and Local Electrical codes must be installed. Building Ground must not be connected the WSHP piping system or other plumbing pipes.

δ Refer to IOM for instructions on measuring resistance and leakage currents within water loops.

Do not use PVC pipe for water loop (compressor POE oil and glycols damage PVC) use of HDPE pipe is recommended.

Water Quality Standards, Cont'd.



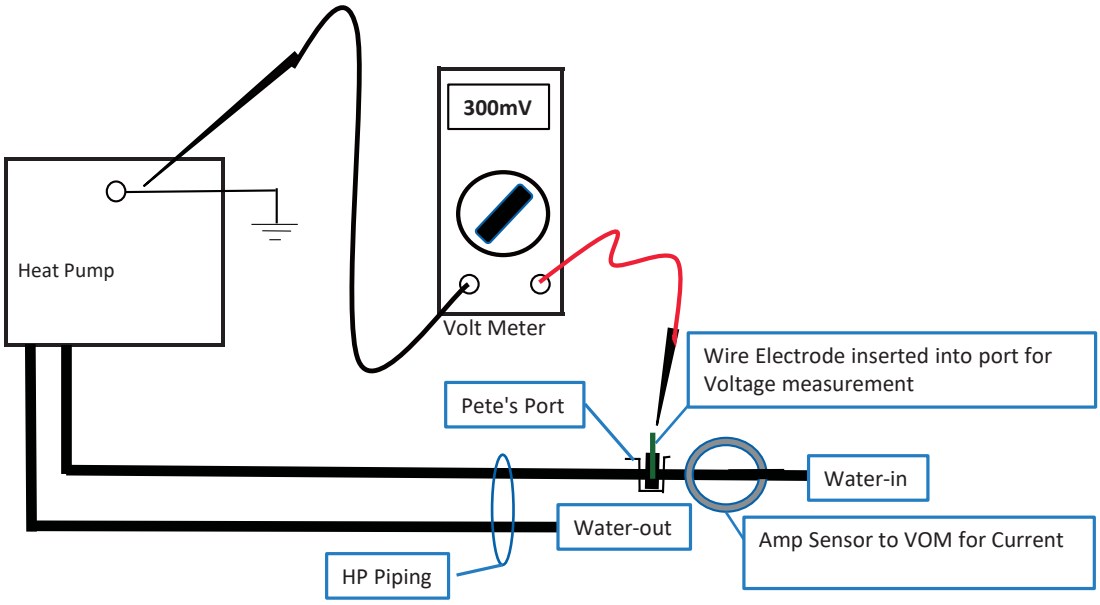
Measure the earth ground bond using an Ohm meter between the building's ground rod and the steel well casing.

The resistance measured should be zero Ohms. The NEC allows a resistance to ground up to 20 Ohms. Any resistance above zero, indicates a poor earth ground which may be the result of a hot neutral line or that conductive water is present. Both of these may lead to electrolysis and corrosion of the heat pump piping. A check for both should be performed and resolved.

Note if the well casing is plastic, a conductive path can be achieved by inserting a #6 AWG bare copper wire into the well water. Remove the temporary conductor when finished.

Water Quality Standards, Cont'd.

Measuring Electrolysis Voltage and Current



Measure the electrolysis voltage using a volt meter between the heat pump ground and a #14 AWG solid copper wire electrode inserted into the water using a Pete's style access port.
The HP must be operating and the water stream flowing.

The voltage measured should be less than300mV (0.300 V). If higher than 500mV electrolysis will occur and corrosion will result.

If voltage is measured, the cause is a high resistance earth ground or current on the neutral conductor. Remedial measures should be performed.

Measure the current flowing through the piping system by using an amp clamp probe on the water-in line. The HP must be operating and the water stream flowing.

There should be zero amps measured. If current is present, there is leakage current to the plumbing system and it must be rectified to prevent pipe corrosion.

Electrical – Line Voltage

⚠ CAUTION! ⚠

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

⚠ WARNING! ⚠

WARNING! To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.

General Line Voltage Wiring - Be sure the available power is the same voltage and phase as that shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever is applicable.

TMW Power Connection - Line voltage connection is made by connecting the incoming line voltage wires to L1, L2, and L3 on power distribution block. Consult electrical data table 4 for correct fuse size.

208 Volt Operation - All 208-230 Volt units are factory wired for 208 Volt. The transformers may be switched to 230V operation as illustrated on the wiring diagram by switching the Red wire from H2 to H3 terminal on the transformer.

All field installed wiring, including electrical ground, must comply with the National Electrical Code as well as all applicable local codes.

Refer to the unit wiring diagrams for fuse sizes and a schematic of the field connections which must be made by the installing (or electrical) contractor.

Electrical Connection - The compliance of the installation to relevant local and national codes is the responsibility of the installer. Before carrying out any electrical work, confirm that the main supply is isolated. The installer must ensure that the correct electrical drawing is available. Before power is applied to the system, the wiring should be visually inspected for loose connections or frayed terminal connections. All control wiring should follow wiring instructions supplied in the project submittal package.

Consult the unit wiring diagram located on the inside of the compressor access panel to ensure proper electrical hookup. All final electrical connections must be made with a length of flexible conduit to minimize vibration and sound transmission to the building.

Incoming Power Wiring - The power for all units is taken from a suitable fused disconnect power supply within the main panel and the electrical service enters the individual units through the top into the units control panel enclosure. Proper grounding is mandatory. The power supply shall be in compliance with all local and national codes.

Table 4: TMW Large Electrical Data

Model	Voltage Code	Voltage	Voltage Min/ Max	Compressor			Total Unit FLA	Min Circuit Amps	Max UL/CSA HACR
				Qty	RLA (EA)	LRA (EA)			
TMW360	H	208-230/60/3	187/254	2	56.4	425	113	127	175
	F	460/60/3	414/506	2	25.5	173	51	57	80
	N	575/60/3	518/633	2	20.4	128	41	46	60
TMW600	F	460/60/3	414/506	2	42.8	272	86	96	125
	N	575/60/3	518/633	2	34.3	238	69	77	110
TMW840	F	460/60/3	414/506	2	56.2	310	112	126	175
	N	575/60/3	518/633	2	45.0	239	90	101	125

HACR circuit breaker in the US and Canada only

Electrical – Line Voltage, Cont'd.

⚠ SAFETY WARNING! ⚠

WARNING! High voltage is used to operate this equipment. Failure to observe standard electrical safety procedures may result in serious injury. Only persons qualified and / or properly trained should attempt to install, operate and maintain this equipment. These units come fully charged with refrigerant. Installation, and start – up should be accomplished by technicians who are fully certified to handle refrigerants, as required by 40 CRF Part 82, subpart F of the Recycling and Emissions Reduction Act. Scroll compressors are used in this equipment. Phase verification is required for proper rotation direction. Incorrect rotation will result in elevated sound and internal overload trip failure.

Proper Voltage Balance - Occasionally, in three phase circuits, a voltage imbalance occurs between phases. It is not recommended to operate equipment when an imbalance greater that 2% occurs. This causes motors to run at high temperatures and may affect their longevity. The following example describes how to calculate the average voltage of the three phases to see if the imbalance is greater than 2%.

Example:
Line one = 226v Line two = 230v Line three = 228v
The average is: 226+230+228 = 228v

Next, $\frac{100(228-226)}{228} = 0.9\%$

The voltage imbalance of the three phase circuit is 0.9%. This is well under the 2% range.

Electrical – Line Voltage, Cont'd.

DDC Control Wiring - Control wiring cannot be installed in the same conduit as line voltage wiring or with wires that switch highly inductive loads such as contactor and relay coils. All wiring shall be in compliance with all local and national codes.

Electrical Phase Sequencing - Proper clockwise rotation for scroll compressor motors is important to prevent damaging the compressors. ClimateMaster recommends the use of a phase sequence indicating instrument following the manufactures directions. Another alternative would be to "bump test" the compressors one at a time with pressure gauges attached to the high and low gauge ports of the compressors to check for proper rotation. Energize the compressor for a few seconds to ensure the discharge pressure gauge increases significantly. If the discharge pressure does not increase, proper rotation is reversed. Compressor rotation can be reversed by opening the main electrical disconnect and switching any two of the main power supply leads feeding that compressor's contactor.

Low Voltage Knockouts are provided on top, sides, or front of unit. Run wires into low voltage section. Connect to terminal strips per wire diagram.

⚠ ATTENTION INSTALLER! ⚠
3 Phase Scroll Compressor Units

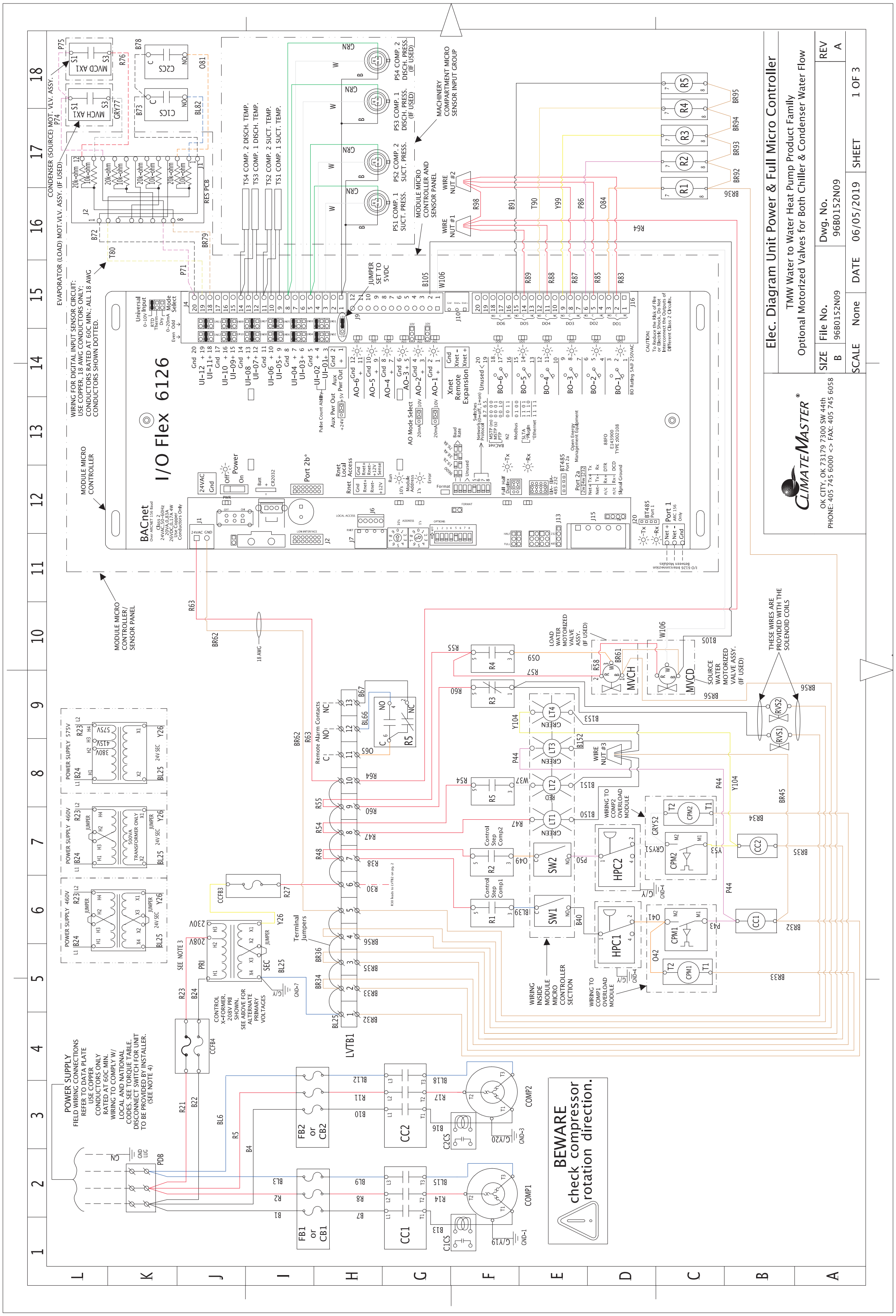
• If this unit uses a 3 Phase Scroll Compressor, the following instructions MUST BE followed:
- Unit power supply MUST BE wired in the proper sequence to avoid damage to the 3 Phase Scroll Compressor;
- Scroll Compressors with INCORRECT rotation show the following characteristics:
  1) High sound level;
  2) High suction pressure and low discharge pressure;
  3) Low current draw.
- If any of the three above characteristics exist, swap two of the three supply wires at the disconnect/fuse block and recheck compressor for incorrect rotation.

Wiring Diagram Matrix

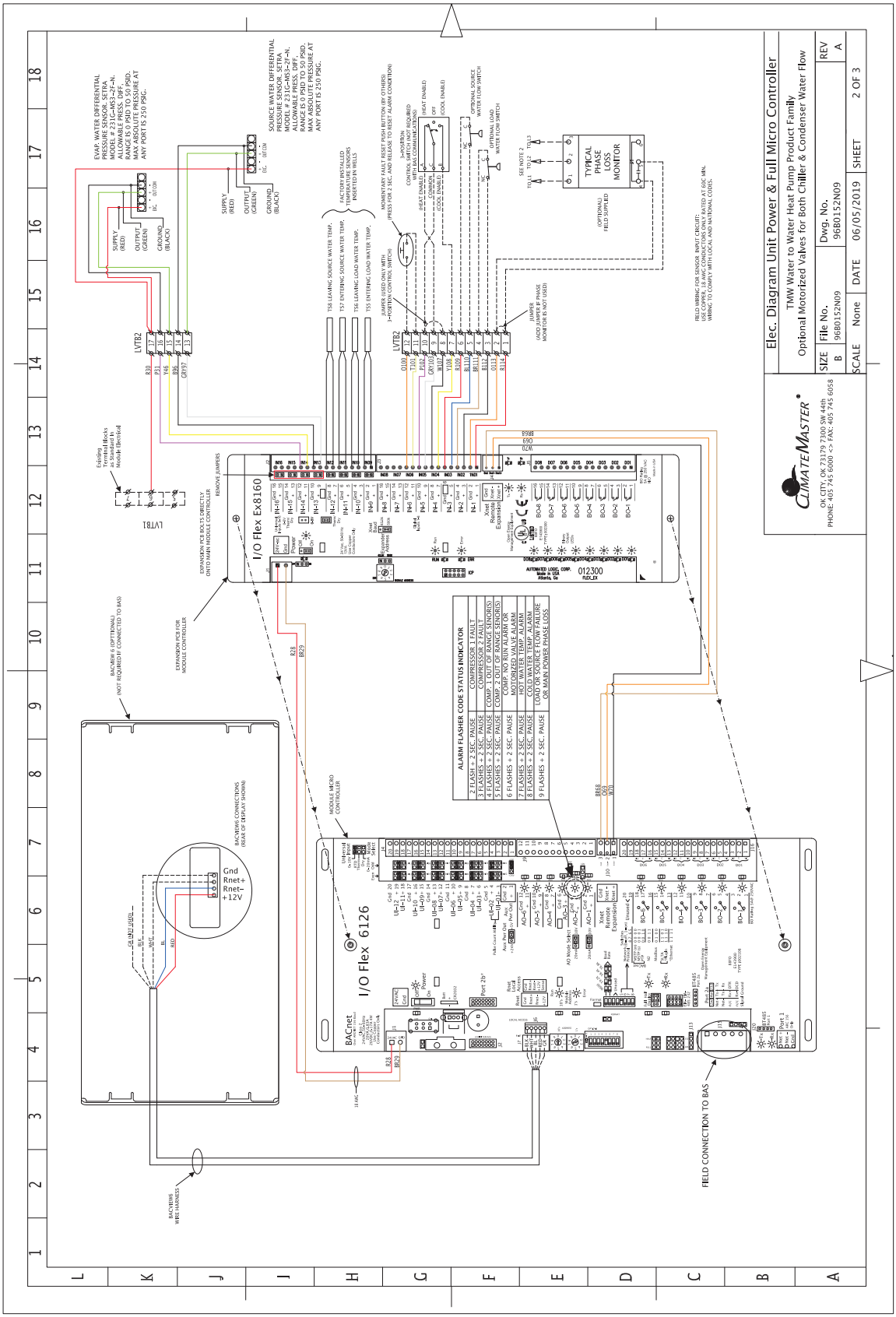
All diagrams can be located online at climatemaster.com/commercial/literature/wiring-diagrams using the part numbers below.

Model	Refrigerant	Wiring Diagram Part Number	Electrical	Agency
360-840	EarthPure® HFC-410A	96B152N09	208-230/60/3 460/60/3 575/60/3	UL

Typical Wiring Diagram



Typical Wiring Diagram, Cont'd.



Tranquility® Large Water-to-Water (TMW) Series

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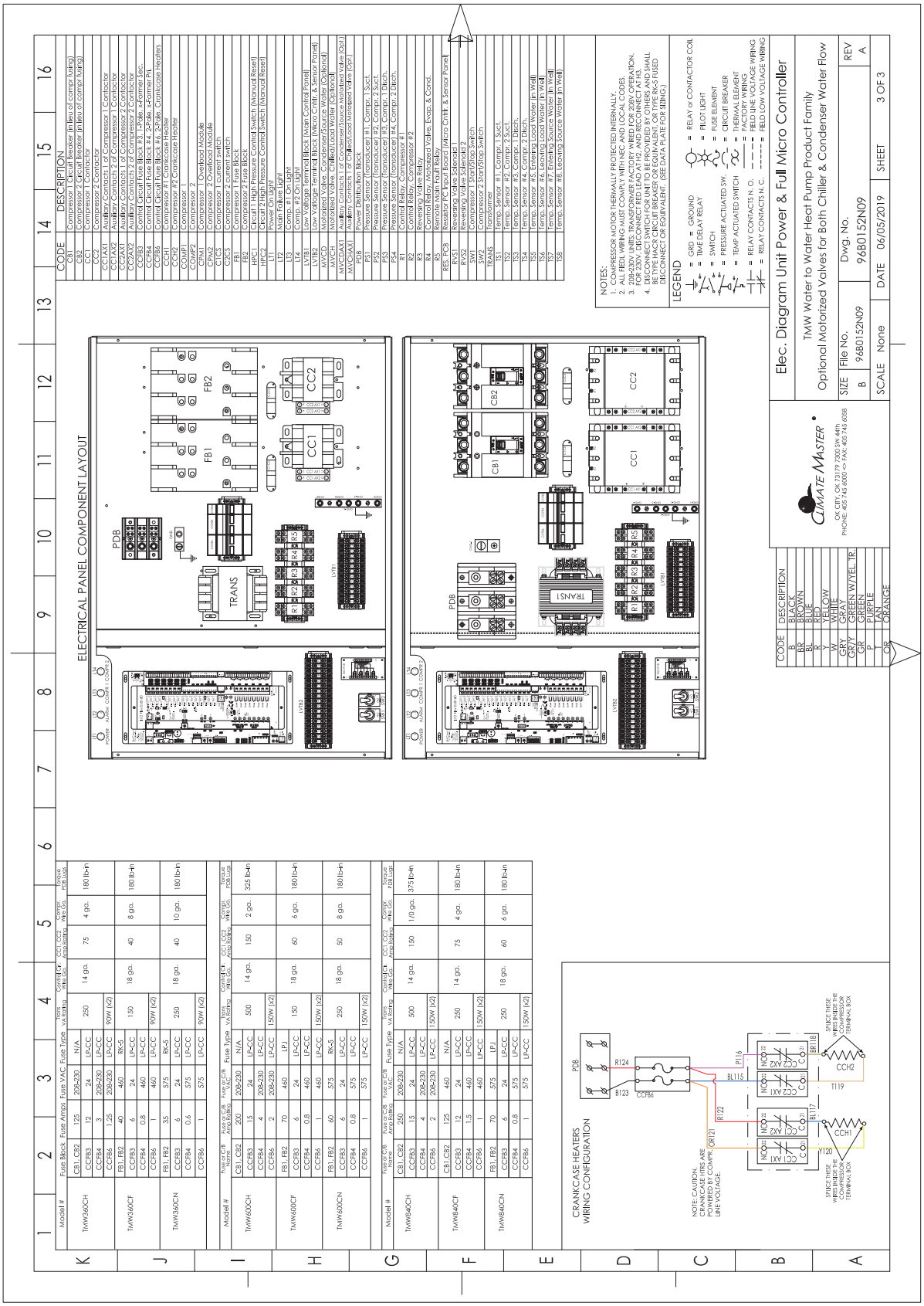
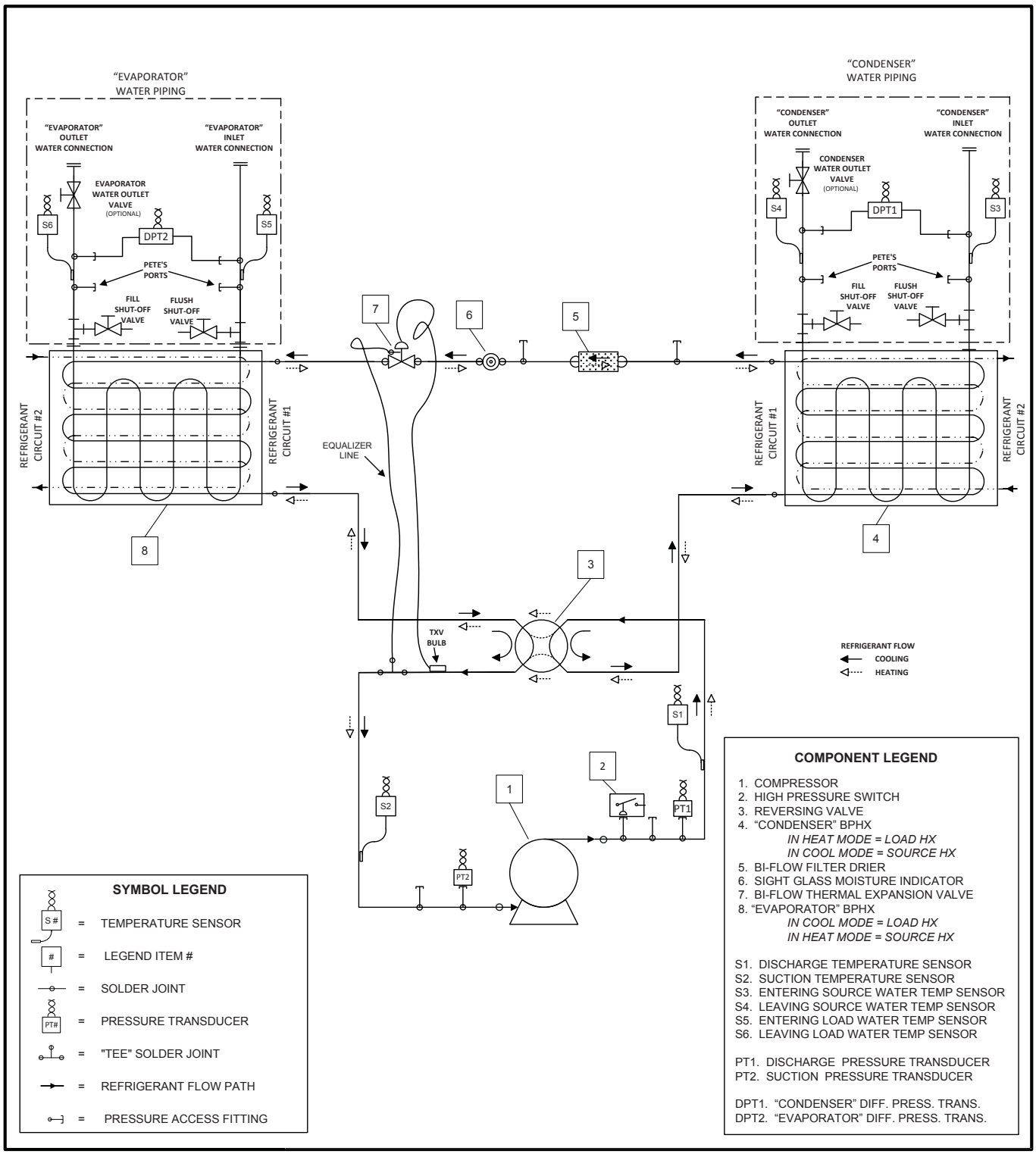
Typical Wiring Diagram, Cont'd.



Refrigeration Circuit Diagram



Heat Exchangers

Draining - When performing standard maintenance procedures such as flushing a heat exchanger, it will be necessary to close off each heat exchanger. This can easily be done if factory mounted water isolation valves are provided. Access to a floor drain is helpful when performing standard maintenance procedures.

Back Washing - It may become evident from the recorded weekly log data that the performance of the TMW is gradually degrading. This could be due to a buildup of debris or sludge obstructing the free passage of flow through the heat exchangers. This debris can be removed by a back washing process, which involves the introduction of a forced, violent, backwards flow through the heat exchanger, using a carefully formulated flushing solution. To be effective, this back flow should be slightly higher than the normal flow, and in the opposite direction. The difficulties and practicality of this method depends on the back wash pumping system itself. Another method would be to back flush each heat exchanger using city water as opposed to system water (see Figure 5 – City Water Cleaning Arrangement). The back washing procedure is accomplished by isolating each individual heat exchanger and introducing the city water using a connection hose to the ¾" service port to flow in an opposite direction from the normal heat exchanger flow direction. On the opposite ¾" service port, connect a drain hose to run to a suitable floor drain. Continue back flow until all debris is removed.

Chemical Clean In Place Washing Without Water Isolation Valves - Chemical Clean in place washing will typically provide the best debris removal, even from severely clogged heat exchangers. The cleaning tank, pump and pump strainer should be arranged in the manner shown in Figure 6 - In Place Cleaning Arrangement. The flow of the cleaning is arranged in the opposite flow to the normal operational direction. Connection points are provided using the 3/4" service ports at each heat exchanger. The cleaning solution used can be either a detergent or hot water to remove particles and simple cleaning. If correct water treatment has been implemented this should provide adequate cleaning for most situations. The solution can be pumped through the heat exchangers and allowed to "soak" for a time and then pumped again.

⚠ CAUTION! ⚠

CAUTION! Do not chemically clean heat exchangers with chloride based solutions.

Figure 5: City Water Cleaning Arrangement

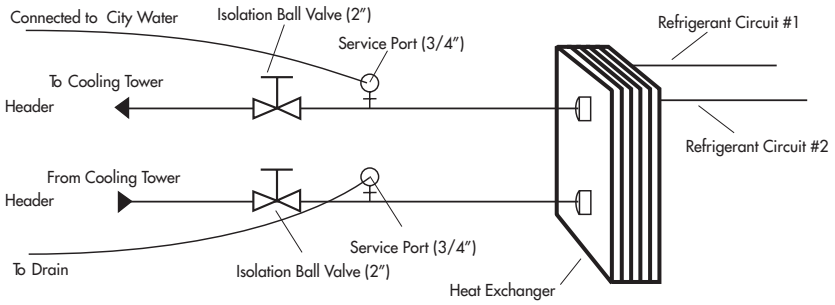
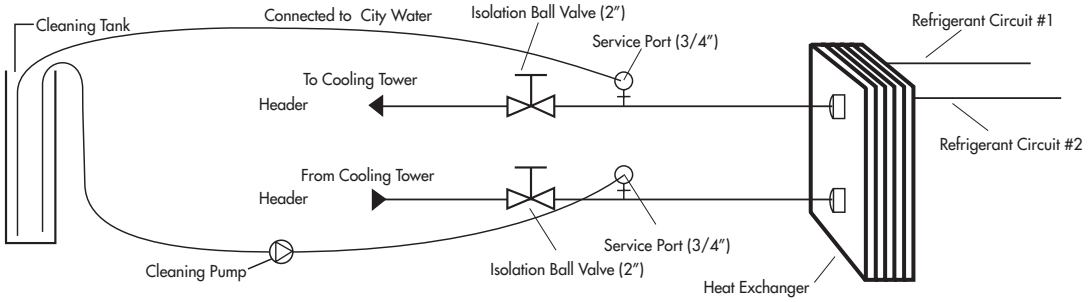


Figure 6: In Place Cleaning Arrangement



Control System

The Control System provides leaving chilled and hot water liquid temperature control algorithms which maintain precise temperature control for heating and cooling applications. A compressor run time equalization sequence is given to ensure even distribution of compressor run time. Unit power consumption is minimized by indexing the most efficient stages of cooling, optimizing heat transfer surface.

The controls are two separate boards; the IO FLEX6126 and EX8160 expander board. The controls govern all significant events, timing, Load and Source water flows and compressor staging, providing operator interface for all levels of setting and retrieving data.

The controller directly senses the control parameters that govern the unit operation, such as Load and Source entering and leaving temperatures, Load and Source water flows, both compressors' winding temperatures, suction and discharge temperatures and pressures.

Controller Connections and Settings - Before wiring to, setting or changing the hardware address, make sure the controller power is off. The controller only reads the address when the unit is turned on.

The controller has two rotary switches for assigning the module's hardware address. One switch corresponds to the "tens" digit and the second switch corresponds to the "ones" digit, allowing for hardware-based addresses of 02 to 99. For example, if the unit's address is two, set the tens switch to zero and the ones switch to two, as shown in Figure 7. The station ID for each MS/TP node must be unique on a MS/TP segment. The rotary address switches are used to set this unique ID.

Set the communication BAUD rate with DIPS 1 and 2, see figure 7. 9600, 19.2K, 38.4K, or 76.8K available.

Set the protocol with DIPS 5, 7, and 8, see figure 7. MSTP, N2, and Modbus are available.

Field Component Connections to the Controller - Field integration is simplified by the use of the following minimum input devices:

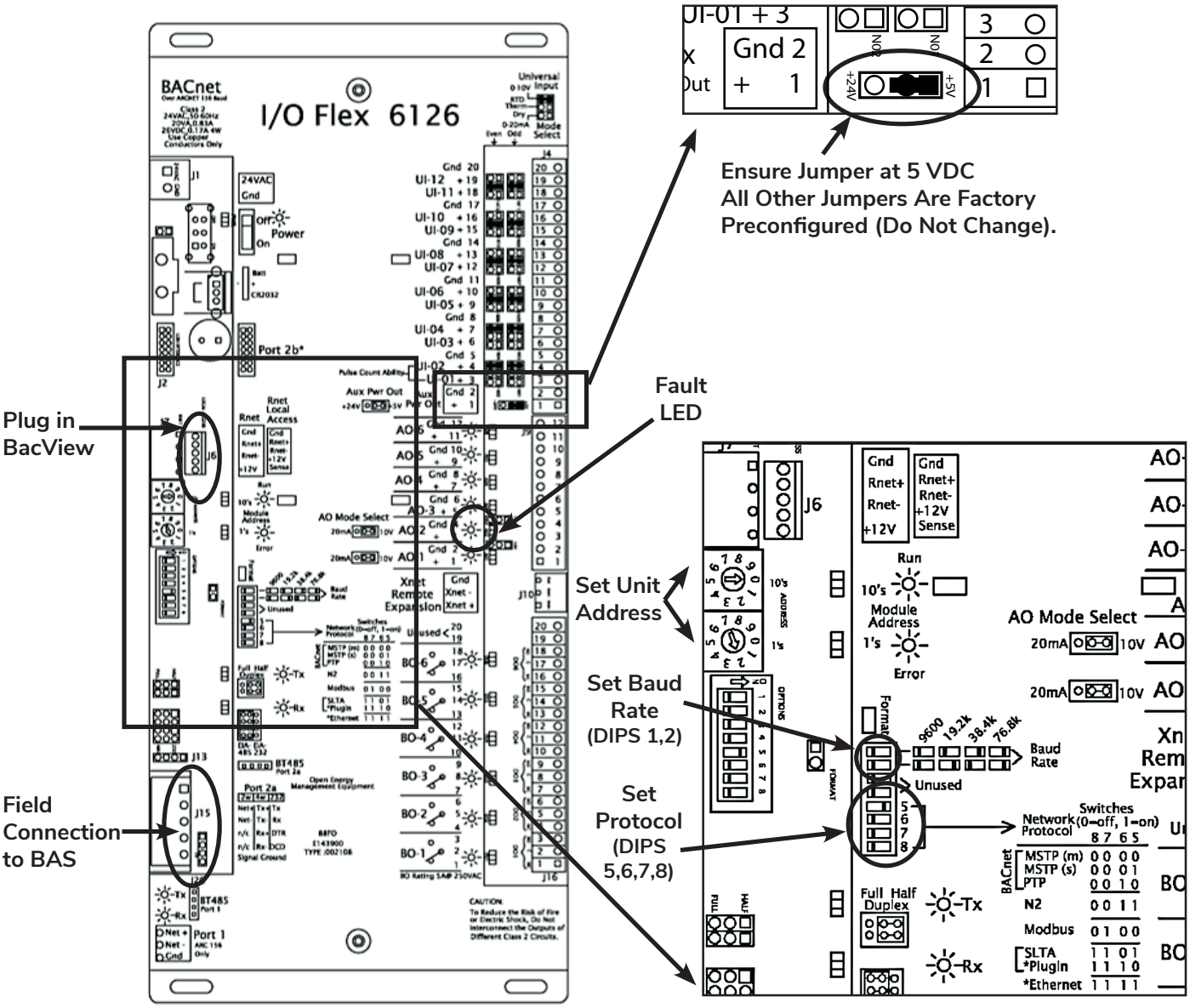
- A remote OFF, HEAT, COOL input for scheduling is required for unit operation. (not required if BAS is used) Connect 3 wires to 7, 9, 10 plus add jumper between 8 and 10.
- Voltage/phase monitor (phase loss/phase reversal, brown-out/black-out device) is recommended for unit operation. (If not used, add jumper wire, connect between 1 and 2 at LVTB2, see wire diagram.)
- BAS or BacView6 (one per site).
- Optional fault reset switch can be connected between 11 and 12 at LVTB2, see wire diagram.

Control System, Cont'd.

Alarm Codes - I/O FLEX6126 Board has LED near AO-2 that will flash alarm code.

1. Compressor 1 Fault. (2 Flashes)
2. Compressor 2 Fault. (3 Flashes)
3. Compressor 1 Out of Range Sensor. (4 Flashes)
4. Compressor 2 Out of Range Sensor. (5 Flashes)
5. Compressor No Run Alarm or Motorized Valve Alarm. (6 Flashes)
6. Hot Water Temperature Alarm. (7 Flashes)
7. Cold Water Temperature Alarm. (8 Flashes)
8. Load or Source flow failure or main power phase loss. (9 Flashes)

Figure 7: Controller Connections and Settings



Control System, Cont'd.

BACView6 Interface - The BACView6 offers an easy-to-use operator interface keypad (Figure 8) which includes a four-line by 40 character, back-lit LCD display panel, which is easy to navigate using logically grouped menus. This enables the user to access important information concerning setpoints, active temperatures, pressures, operating modes, alarm conditions, unit scheduling, servicing, diagnostics and more.

See Figure 9 - 14 for the screen menus.

Figure 8

Figure 9: Hierarchy Menu

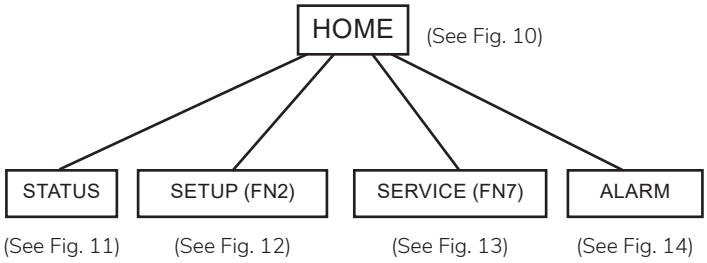
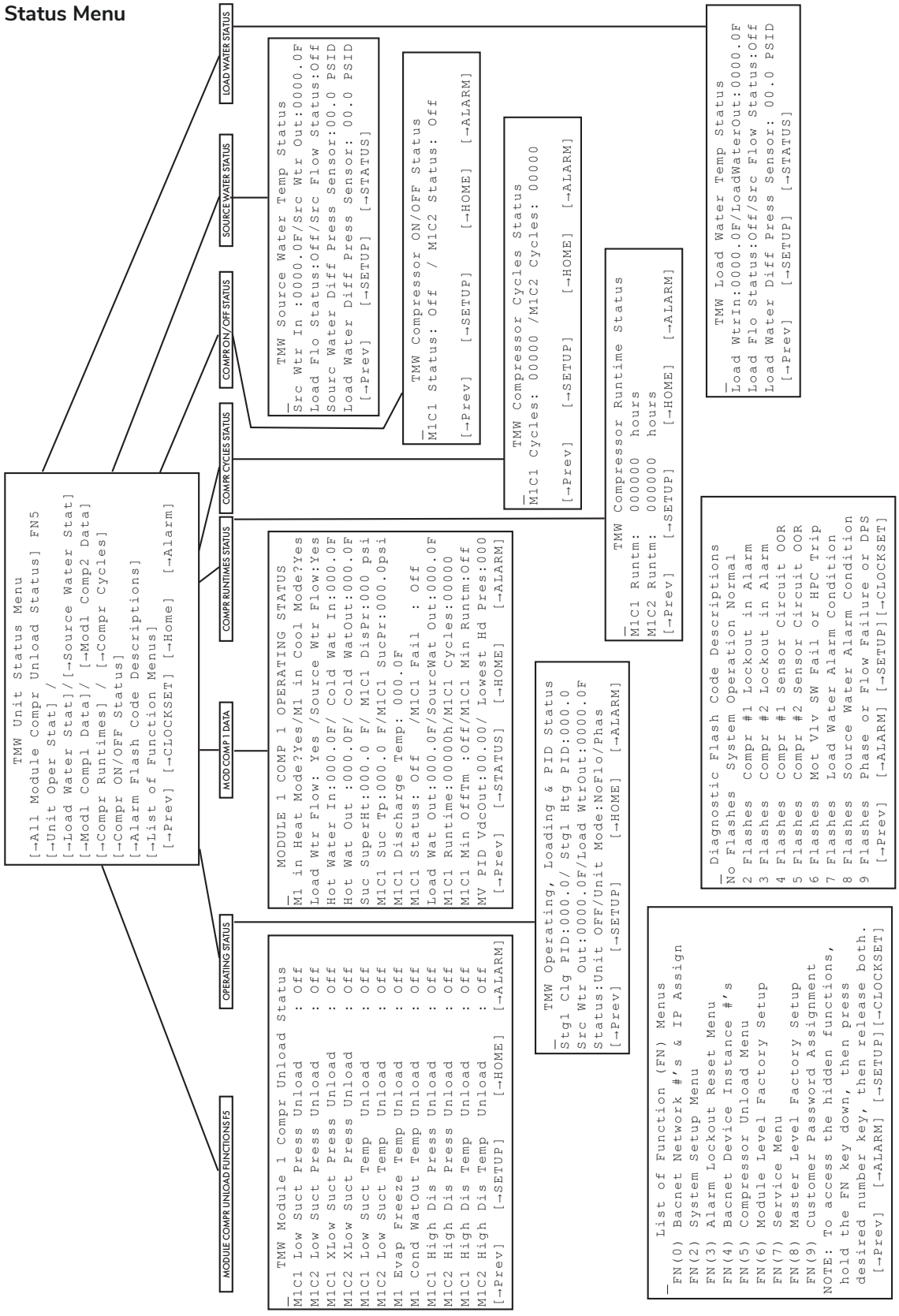


Figure 10: Home Screen

```
Sourc Water In:0000.0F / Tot Stg On: 00
Sourc WaterOut:0000.0F/Tot Cool Stg: 00
Load Water In:0000.0F /Tot Heat Stg: 00
Load WaterOut:0000.0F/
Load Wtr Flow: Yes /Source Wtr Flow:Yes
Unit Status:  Off /UnitMode:No Flo/Phas
[→ STATUS] [→SETUP] [→SERVICE] [→ALARM]
```

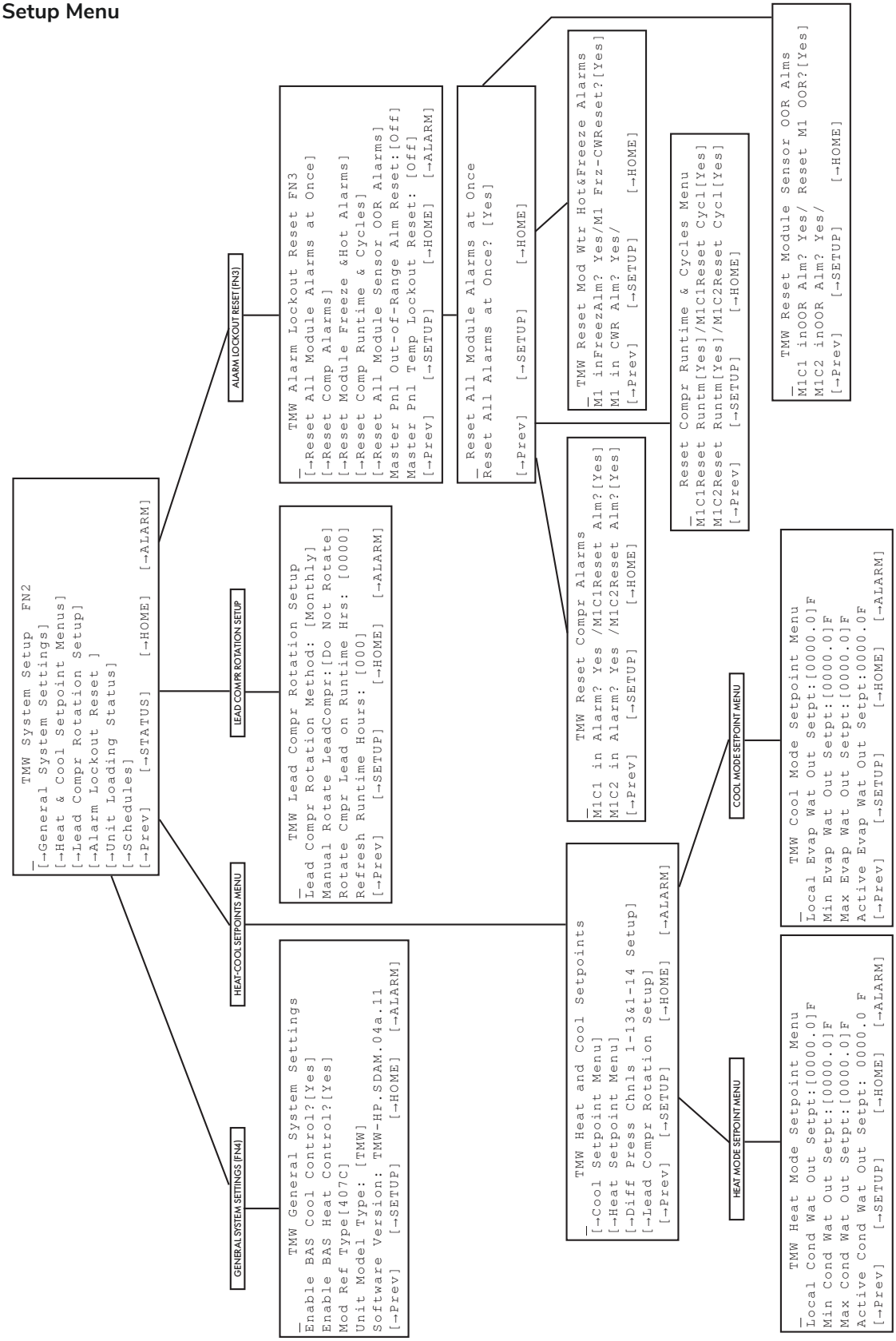
Control System, Cont'd.

Figure 11: Status Menu



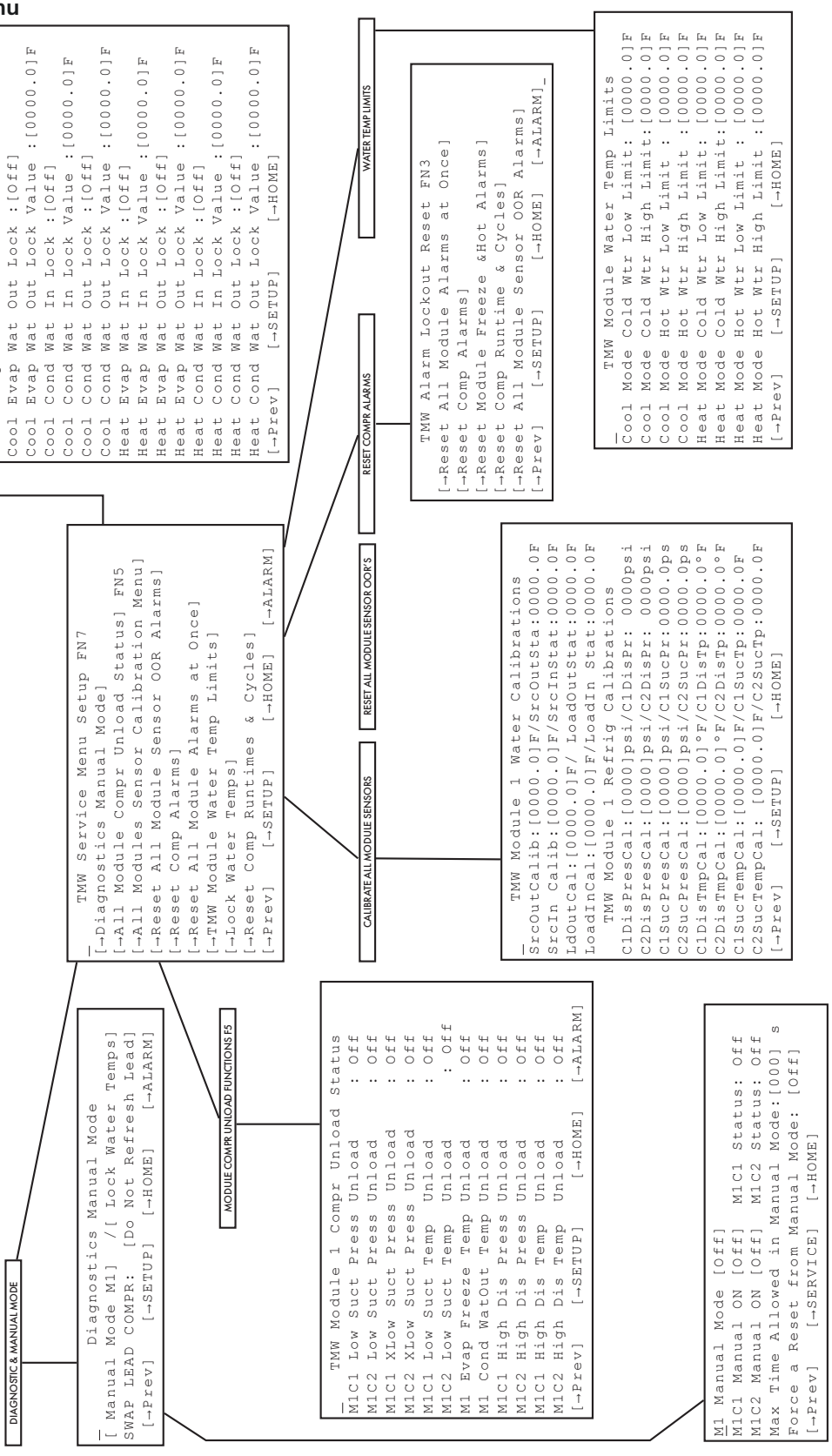
Control System, Cont'd.

Figure 12: Setup Menu



Control System, Cont'd.

Figure 13: Service Menu



Control System, Cont'd.

Figure 14: Alarm Screen (FN+3 resets the alarm)

```
                EVENT HISTORY (100 MOST RECENT)

====================ACTIVE ALARMS====================
NONE IN BUFFER.
====================ACTIVE FAULTS====================
NONE IN BUFFER.
================RETURNED-TO-NORMAL (RTN)================
NONE IN BUFFER.
================MANUALLY CLEARED (CLR)==================
NONE IN BUFFER.
   [- -> PREV]
```

Operating Unit with BacView6
Connect to I/O FLEX6126 at J6 with cable BACView6A. When power is first applied to the BACView6 a 45 second initialization period will occur. The display will show the home screen (Figure 10). Various display screens are accessible by several methods. From the "Home" screen, you are easily guided to the main menu listings for the following categories by pressing one of the four menu buttons: Status, Setup, Service, Alarm.

At the end of this delay, the first compressor will start and after a 5 minute timeout, the display will change to the default screen. (Figure 15)

Figure 15: Default Screen

```
_       ClimateMaster Model TMW
   Date: MM/DD/YYYY  Time: HH:MM AM
Sourc WtrOut:0000.0F/LoadWtrOut:0000.0F
        press any key to continue
```

Setup Menu - System operation is determined by the values assigned to the system variables, as predominantly found in the Setup menu (Figure 12). The Setup menu lists a series of sub-menus:

- General System Settings
- Heating and Cooling Setpoint Menus
- Lead Compressor Rotation Setup
- Alarm Lockout Reset (or FN + 3)

These variables are initially assigned a default value. For most applications, these values will provide optimum results. Once these values have been set, they are put in permanent memory and will remain, even when all power is removed from the TMW.

Service Menu - TMW service and limits can be checked (figure 13)

Sub-menus

- Diagnostic and manual mode
- Compressor unload functions F5
- Calibrate sensors
- Reset sensor OOR's
- Reset compressor alarms
- Water temperature limits
- Lock water temperatures

Alarm Menu - Up to 100 of the most recent occurrences stored with date and time. Access to this log is available through the keypad. (Figure 14)

Chilled Water Flow Sensor - There is a differential pressure sensor, which measures and displays pressure drops across the entering and leaving water. If the differential pressure drops below a predetermined setting for a fixed period of time, after the unit receives a "RUN" input signal, the unit will not be allowed to run and a water flow alarm condition is displayed. The alarm condition must be resolved, flow re-established, and a minimum pressure differential acknowledged by the differential pressure sensor. The alarm clears automatically (the alarm condition is logged for retention in the most recent 100 alarms) which constitutes an "OK to RUN" status.

Control System, Cont'd.

Condenser Water Flow Sensor - There is a differential pressure sensor, which measures and displays pressure drops across the condenser water main headers. If the differential pressure drops below a predetermined setting for a fixed period of time after the unit receives a "RUN" input signal, the unit will not be allowed to run, and a Source water flow alarm condition is displayed. This alarm condition must be resolved and flow re-established, and a minimum pressure differential acknowledged by the differential pressure sensor. The alarm clears automatically; however, the alarm condition is logged for permanent retention of the most recent 100 alarms. This will constitute an "OK to RUN" status. Alternatively, the controller can configure to accept a differential pressure sensor indicating proper Source water flow (refer to the wiring diagram), set to differential pressure sensor.

Alarm Output - The relay output contact is closed whenever there is an active latching or non-latching alarm condition present relative to a fault parameter.

TMW Status Output - The relay output contact is closed whenever all input signals to the unit are present and normal, indicating the requirement for the unit to operate when able.

Control System Optional Features

Building Automation System (BAS) Interface - Internal operational information is available where the TMW is to be integrated into a building system and monitored by the equipment of a controls manufacturer. Available protocols built into the Control System as standard are:

- BACnet over MSTP
- MODBUS
- N2

Compressor Unloading - Compressor unloading routines are programmed into the controller. When any one of the compressor control parameters approaches a pre-limit condition, the Control System executes appropriate compressor unloading commands to avoid compressor lockout, thus maximizing the unit on time.

Compressor Minimum Off Delay - When a compressor is turned off, the compressor will remain off for this period of time.

Compressor Minimum On Delay - When a compressor is turned on, the compressor will remain on for this period of time. This time can be cut short if an alarm condition is predicted.

ALARM FUNCTIONS OF THE CONTROL SYSTEM

High Pressure Cutout - This requires resetting at both the TMW manual reset high pressure control switch and at the Controller's software reset to resume operation See Setup Menu for Alarm Menu display or press FN+3.

Low Pressure Cutout - This requires resetting at the Controller to resume operation.See page 5 Setup Menu for Alarm Menu display or press FN+3.

Compressor Thermal Protector Fault - This would occur if the motor protector sensed an overload trip in the compressor motor. It would also occur if any component in the motor protector circuit failed to open. This requires resetting at the Controller. See Setup Menu for Alarm Menu display or press FN+3.

Low Suction Temperature - During operation, should this temperature drop to 28ºF, the compressor will shut down. This requires resetting at the Controller after the temperature has risen above 33ºF. See Setup Menu for Alarm Menu display or press FN+3.

High Discharge Temperature - During operation, should this temperature rise above 225ºF, the compressor will shut down. This requires resetting at the Controller after the temperature has cooled to below 175ºF. See Setup Menu for Alarm Menu display or press FN+3.

Low Leaving Chilled Water Temperature - Below 36ºF
Evaporator freeze protection requires resetting at the Controller after the temperature has risen to 40ºF See Setup Menu for Alarm Menu display or press FN+3.

High Leaving Condenser Water Temperature - Above 140ºF
This requires resetting at the Controller after the temperature has fallen below 135ºF. See Setup Menu for Alarm Menu display or press FN+3.

Communications Error - This signifies a loss of communication between any TMW controller and the BAS or BACView6.

Miscellaneous Alarm Functions of the Control System

- Loss of flow through the evaporator
- Loss of flow through the condenser
- Electrical voltage/phase failure
- Temperature Sensor "Out-of-Range" error detects when an open or shorted sensor condition exists.

Control Sequence of Operation from BAS

A. Heat Pump Module #1 Startup in Cool Mode:

1. Ensure all "local" binary inputs at the heat pump are in the open state for the following points:
   - "dig_cool_enable_1", (B1:4);
   - "dig_heat_enable_1", (B1:5);
2. Adjust the cool leaving target by writing to the following point, "cool_temp_stp_1". Valid adjustment values are from 42 to 62 in deg. F.
3. Command the BBV point (BV:53), "heat_enable_bas_1" to the "OFF" or "0" position".
4. Command the BBV point (BV:52), "cool_enable_bas_1" to the "ON" or "1" position.
5. The above four steps (1 through 4) will signal to open the motorized valves inside the module to allow for water flow to both the load and source loops. When the motorized valve(s) aux. switches detect the valve(s) are opened, (when the BBV point (BV: 107), "mot_valve_status_1" is in the "ON" or "1" state), then start the load and source water pumps for the heat pump module.
6. When load flow is established, the BBV point (BV:9), "load_flow_1" will show in the "ON" or "1" state.
7. When source flow is established, the BBV point (BV:73), "source_flow_1" will show in the "ON" or "1" state.
8. When #8 and #9 above are both "ON", the combined flow point (BV:38), "flow_1" will show in the "ON" or "1" state.
9. When the following conditions are all met:
   - all inlet and outlet load and source water temperatures are within acceptable limits;
   - the heat mode is not currently commanded ON;
   - the phase monitor detects normal operation,;
   - the delay before a change in heat mode to cool mode has expired, or when BBV point (BV:23), "clg_ok_1" will show in the "ON" or "1" state;
10. Then you will see the BBV point (BV:21), "run_cool_1" will show in the "ON" or "1" state.
11. Finally, the 100-digit, Cool PID routine will then begin counting, and you will see the AV point, (AV:634), "stg1_clg_pid_1" count up from 0. When the count reaches 50, the lead compressor will turn "ON", and when the count reaches 100, the lag compressor will turn ON.

B. Heat Pump Module #1 Startup in Heat Mode:

1. Ensure all "local" binary inputs at the heat pump are in the open state for the following points:
   - "dig_cool_enable_1", (B1:4);
   - "dig_heat_enable_1", (B1:5);
2. Adjust the heat leaving target by writing to the following point, "heat_temp_stp_1". Valid adjustment values are from 80 to 135 in deg. F.
3. Command the BBV point (BV:52), "cool_enable_bas_1" to the "OFF" or "0" position".
4. Command the BBV point (BV:53), "heat_enable_bas_1" to the "ON" or "1" position.
5. The above four steps (1 through 4) will signal to open the motorized valves inside the module to allow for water flow to both the load and source loops. When the motorized valve(s) aux. switches detect the valve(s) are opened, (when the BBV point (BV: 107), "mot_valve_status_1" is in the "ON" or "1" state), then start the load and source water pumps for the heat pump module.
6. When load flow is established, the BBV point (BV:9), "load_flow_1" will show in the "ON" or "1" state.
7. When source flow is established, the BBV point (BV:73), "source_flow_1" will show in the "ON" or "1" state.
8. When #8 and #9 above are both "ON", the combined flow point (BV:38), "flow_1" will show in the "ON" or "1" state.
9. When the following conditions are all met:
   - all inlet and outlet load and source water temperatures are within acceptable limits;
   - the heat mode is not currently commanded ON;
   - the phase monitor detects normal operation,;
   - the delay before a change in cool mode to heat mode has expired, or when BBV point (BV:70), "htg_ok_1" will show in the "ON" or "1" state;
10. Then you will see the BBV point (BV:22), "run_heat_1" will show in the "ON" or "1" state.
11. Finally, the 100-digit, Heat PID routine will then begin counting, and you will see the AV point, (AV:635), "stg1_htg_pid_1" count up from 0. When the count reaches 50, the lead compressor will turn "ON", and when the count reaches 100, the lag compressor will turn ON.

BACnet, Modbus, N2 Points List

Name	Note	BACnet MSTP							Modbus			N2	
		Object Name	Value	Type	Object ID	Exp: Num	I/O Type	Device ID	Read Only	Object Type	Register	Type	ID
C1-C2 Status Inputs	1	c1-2_inputs_1	-60.2	BAI	AI:1	0:12	Thermistor	DEV:2460xx	✔	float value	40001	analog in	1
C1 Discharge Pressure	1	c1_disch_pres_1	128.4	BAI	AI:2	0:03	0-5 Volt	DEV:2460xx	✔	float value	40003	analog in	2
C1 Discharge Temp	1	c1_disch_temp_1	76.9 °F	BAI	AI:3	0:07	Thermistor	DEV:2460xx	✔	float value	40005	analog in	3
C1 Suction Pressure	1	c1_suc_pres_1	130.6	BAI	AI:4	0:01	0-5 Volt	DEV:2460xx	✔	float value	40007	analog in	4
C1 Suction Temp	1	c1_suct_temp_1	77.0 °F	BAI	AI:5	0:05	Thermistor	DEV:2460xx	✔	float value	40009	analog in	5
C2 Discharge Pressure	1	c2_disch_pres_1	-3.7	BAI	AI:6	0:04	0-5 Volt	DEV:2460xx	✔	float value	40011	analog in	6
C2 Discharge Temp	1	c2_disch_temp_1	77.3 °F	BAI	AI:7	0:08	Thermistor	DEV:2460xx	✔	float value	40013	analog in	7
Load Inlet Temp Cool Mode	1	load_in_temp_cool_1	77.3 °F	BAI	AI:8	1:09	Thermistor	DEV:2460xx	✔	float value	40027	analog in	14
C2 Suction Pressure	1	c2_suc_pres_1	130.6	BAI	AI:9	0:02	0-5 Volt	DEV:2460xx	✔	float value	40015	analog in	8
C2 Suction Temp	1	c2_suct_temp_1	77.4 °F	BAI	AI:10	0:06	Thermistor	DEV:2460xx	✔	float value	40017	analog in	9
Load Inlet Temp Heat Mode	1	load_in_temp_heat_1	77.3 °F	BAI	AI:11	1:09	Thermistor	DEV:2460xx	✔	float value	40029	analog in	15
Load Outlet Temp Cool Mode	1	load_out_temp_cool_1	42.2 °F	BAI	AI:12	1:10	Thermistor	DEV:2460xx	✔	float value	40031	analog in	16
Mot Valve Status Inputs	1	valve_in_1	99.2	BAI	AI:13	0:11	Thermistor	DEV:2460xx	✔	float value	40047	analog in	24
Load Outlet Temp Heat Mode	1	load_out_temp_heat_1	42.2 °F	BAI	AI:14	1:10	Thermistor	DEV:2460xx	✔	float value	40033	analog in	17
Diff Press Hi Range Load Flow 0-5VDC	1	diff_pr_hi_range_load_010_1	15.23	BAI	AI:15	1:14	0-5 Volt	DEV:2460xx	✔	float value	40019	analog in	10
Diff Press Hi Range Source Flow 0-5VDC	1	diff_pr_hi_range_source_010_1	15.23	BAI	AI:16	1:13	0-5 Volt	DEV:2460xx	✔	float value	40021	analog in	11
Diff Press Low Range Load Flow 0-5VDC	1	diff_pr_load_010_1	5.07	BAI	AI:17	1:14	0-5 Volt	DEV:2460xx					
Diff Press Low Range Source Flow 0-5VDC	1	diff_pr_source_010_1	5.07	BAI	AI:18	1:13	0-5 Volt	DEV:2460xx					
Source Inlet Temp Cool Mode	1	src_in_temp_cool_1	77.3 °F	BAI	AI:19	1:11	Thermistor	DEV:2460xx	✔	float value	40039	analog in	20
Source Inlet Temp Heat Mode	1	src_in_temp_heat_1	77.3 °F	BAI	AI:20	1:11	Thermistor	DEV:2460xx	✔	float value	40041	analog in	21
Source Outlet Temp Cool Mode	1	src_out_temp_cool_1	105.5 °F	BAI	AI:21	1:12	Thermistor	DEV:2460xx	✔	float value	40043	analog in	22
Source Outlet Temp Heat Mode	1	src_out_temp_heat_1	105.5 °F	BAI	AI:22	1:12	Thermistor	DEV:2460xx	✔	float value	40045	analog in	23
Remote Cool Setpoint 0-10VDC	1	rem_chw_stp_010_1	7.7	BAI	AI:23	1:15	0-10 Volt	DEV:2460xx	✔	float value	40035	analog in	18
Remote Heat Setpoint 0-10VDC	1	rem_cw_stp_010_1	7.8	BAI	AI:25	1:16	0-10 Volt	DEV:2460xx	✔	float value	40037	analog in	19
Phase Input OK	1	phase_in_ok_1	On	BBI	BI:1	1:01	Binary Input	DEV:2460xx	✔	discrete in	10008	binary in	6
Load Water Flow Switch	1	ld_water_flow_1	Off	BBI	BI:2	1:02	Universal Input	DEV:2460xx	✔	discrete in	10007	binary in	5
Source Water Flow Switch	1	src_water_flow_1	Off	BBI	BI:3	1:03	Universal Input	DEV:2460xx	✔	discrete in	10010	binary in	8
Digital Input Cool Enable	1	dig_cool_enable_1	Off	BBI	BI:4	1:04	Universal Input	DEV:2460xx					
Digital Input Heat Enable	1	dig_heat_enable_1	Off	BBI	BI:5	1:05	Universal Input	DEV:2460xx					
Reset All Alarms	1	reset_all_alrm_1	Off	BBI	BI:7	1:06	Universal Input	DEV:2460xx	✔	discrete in	10009	binary in	7
Source Cond Mot Valve AO	1	cnd_vlv_ao_1	4.80%	BAO	AO:1	0:01	Electrical 0-10 Volt	DEV:2460xx		float value	40051	analog out	2
Alarm Flash Code AO	1	alm_flash_code_ao_1	0.00%	BAO	AO:2	0:02	Electrical 0-10 Volt	DEV:2460xx		float value	40049	analog out	1
Cool Reversing Valve S/S	1	cool_rev_vlv_bo_1	On	BBO	BO:1	0:03	Relay / Triac Output	DEV:2460xx		discrete in	10014	binary out	5
Chiller Status	1	chlr_stat_1	On	BBO	BO:2	0:06	Relay / Triac Output	DEV:2460xx		discrete in	10003	binary out	2
Comp 1 S/S	1	comp_1_ss_bo_1	Off	BBO	BO:3	0:01	Relay / Triac Output	DEV:2460xx		discrete in	10012	binary out	3
Comp 2 S/S	1	comp_2_ss_bo_1	Off	BBO	BO:4	0:02	Relay / Triac Output	DEV:2460xx		discrete in	10013	binary out	4
Load Mot Vlv S/S	1	load_vlv_ss_bo_1	On	BBO	BO:5	0:04	Relay / Triac Output	DEV:2460xx		discrete in	10015	binary out	6
Alarm	1	o245_1	Off	BBO	BO:6	0:05	Relay / Triac Output	DEV:2460xx		discrete in	10002	binary out	1
# Cool Comp Requested	2	cool_comp_req_1	0.0	BAV	AV:3			DEV:2460xx	✔	float value	40059	data float	3
# Heat Comp Requested	2	heat_comp_req_1	0.0	BAV	AV:4			DEV:2460xx	✔	float value	40061	data float	4
Active Cool Setpoint	2	cool_stp_stat_1	44.0 °F	BAV	AV:5			DEV:2460xx	✔	float value	40063	data float	5
Active Heat Setpoint	2	heat_stp_stat_1	120.0 °F	BAV	AV:6			DEV:2460xx	✔	float value	40065	data float	6
C1 Disch Pressure Status	2	c1_disch_pres_stat_1	128.4	BAV	AV:7			DEV:2460xx	✔	float value	40069	data float	8
C1 Discharge Temp Status	2	c1_disch_temp_stat_1	76.9	BAV	AV:9			DEV:2460xx	✔	float value	40093	data float	11
Cond Mot Valve PID I-gain		cdmv_i_gain_1	0.01	BAV	AV:14			DEV:2460xx		float value	40147	data float	48
C1 Suction Pressure Status	2	c1_suc_pres_stat_1	130.7	BAV	AV:16			DEV:2460xx	✔	float value	40103	data float	14
C1 Suction Temp Status	2	c1_suct_temp_stat_1	77.0	BAV	AV:19			DEV:2460xx	✔	float value	40107	data float	16
C2 Discharge Pressure Status	2	c2_disch_pres_stat_1	-3.9	BAV	AV:20			DEV:2460xx	✔	float value	40109	data float	17
Cond Mot Valve PID Min Percent		cdmv_pid_mnpct_1	35.0	BAV	AV:22			DEV:2460xx		float value	40171	data float	50
Cond Mot Valve PID P-gain		cdmv_p_gain_1	2.0	BAV	AV:23			DEV:2460xx		float value	40175	data float	52
Cond In Temp Status		cond_in_tmp_stat_1	77.3 °F	BAV	AV:26			DEV:2460xx	✔	float value	40211	data float	76
Cond Wtr Inlet Temp Status	2	cond_in_temp_stat_1	77.3	BAV	AV:29			DEV:2460xx	✔	float value	40209	data float	74
Alarm Flash Code number	2	alarm_code_1	1.0	BAV	AV:31			DEV:2460xx	✔	float value	40067	data float	7
Cool Mode PID Deadband1		clg_db1_1	1.0	BAV	AV:32			DEV:2460xx		float value	40073	data float	18
Cool Mode PID Fall Rate		clg_fall_1	40.0	BAV	AV:35			DEV:2460xx		float value	40079	data float	21
Cool Mode PID I-gain		clg_i_gain_1	0.8	BAV	AV:38			DEV:2460xx		float value	40085	data float	24
Cool Mode PID P-gain		clg_p_gain_1	16.0	BAV	AV:40			DEV:2460xx		float value	40089	data float	26
Cool Mode PID Rise Rate		clg_rise_1	10.0 sec	BAV	AV:41			DEV:2460xx		float value	40091	data float	27
Cond Wtr Outlet Temp Status	2	cond_out_temp_stat_1	105.5	BAV	AV:42			DEV:2460xx	✔	float value	40213	data float	77
C2 Discharge Temp Status	2	c2_disch_temp_stat_1	77.3	BAV	AV:43			DEV:2460xx	✔	float value	40113	data float	31
Cool Mode Evap Wtr Low Alm Temp		cool_evap_lo_tmp_1	38.0	BAV	AV:44			DEV:2460xx		float value	40245	data float	97
Cool Mode Cond Wtr Hi Alm Temp		cool_high_cond_tmp_1	140.0	BAV	AV:45			DEV:2460xx		float value	40249	data float	99
Cool Mode Evap Wtr Hi Alm Temp		cool_hi_evap_tmp_1	90.0	BAV	AV:47			DEV:2460xx		float value	40251	data float	100

Note 1: Indicates Physical Inputs/Outputs to/from Master Controller.
Note 2: Indicates Recommended Status Indication of important parameters.
Note 3: Indicates Command Inputs from Bacview/BAS system.
Note 4: Indicates Customer Alarm Reset Functions from Bacview/BAS System.
Note 5: Indicates all System Alarms possible.

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BACnet, Modbus, N2 Points List, Cont'd.

Name	Note	BACnet MSTP							Modbus			N2	
		Object Name	Value	Type	Object ID	Exp: Num	I/O Type	Device ID	Read Only	Object Type	Register	Type	ID
Cool Mode Low Cond Alarm Temp		cool_lo_cond_tmp_1	40.0	BAV	AV:48			DEV:2460xx		float value	40257	data float	103
Load Water Header Diff Pressure	2	diff_press_ld_1	15.23	BAV	AV:49			DEV:2460xx	✔	float value	40279	data float	108
Evap Mot Vlv PID Deadband		evmv_pid_db_1	0.0	BAV	AV:50			DEV:2460xx		float value	40299	data float	124
Evap Mot Valve PID I-gain		evmv_i_gain_1	0.01	BAV	AV:52			DEV:2460xx		float value	40303	data float	126
Evap Mot Valve PID Min Percent		evmv_pid_mnpct_1	35.0	BAV	AV:54			DEV:2460xx		float value	40307	data float	128
Evap Mot Valve PID P-gain		evmv_p_gain_1	2.0	BAV	AV:55			DEV:2460xx		float value	40311	data float	130
Evap Mot Valve PID Ramp		evmv_pid_ramp_1	1.0	BAV	AV:56			DEV:2460xx		float value	40313	data float	131
Source Water Header Diff Pressure	2	diff_press_src_1	15.23	BAV	AV:57			DEV:2460xx	✔	float value	40283	data float	109
High Suction Press Alm Sp 410a		mod_high_suct_press_sp_410_1	155.0	BAV	AV:63			DEV:2460xx		float value	40385	data float	166
Heat Mode PID Deadband1		htg_db1_1	1.0	BAV	AV:64			DEV:2460xx		float value	40151	data float	57
Heat Mode PID Fall Rate		htg_fall_1	40.0	BAV	AV:67			DEV:2460xx		float value	40157	data float	60
Heat Mode PID I-gain		htg_i_gain_1	0.8	BAV	AV:70			DEV:2460xx		float value	40163	data float	63
Heat Mode PID P-gain		htg_p_gain_1	16.0	BAV	AV:72			DEV:2460xx		float value	40167	data float	65
Heat Mode PID Rise Rate		htg_rise_1	10.0 sec	BAV	AV:73			DEV:2460xx		float value	40169	data float	66
COND Out Temp Status		cond_out_tmp_stat_1	105.5	BAV	AV:75			DEV:2460xx	✔	float value	40215	data float	78
Evap Wtr Inlet Temp Status	2	evap_in_temp_stat_1	77.3	BAV	AV:76			DEV:2460xx	✔	float value	40285	data float	110
Low Discharge Press Sp 410a		mod_lo_disch_press_sp_410_1	265.0	BAV	AV:78			DEV:2460xx		float value	40409	data float	178
EVAP Out Temp Status		evap_out_stat_1	41.9	BAV	AV:80			DEV:2460xx	✔	float value	40293	data float	120
Max Allowed Time in Manual Mode		man_mode_time_1	900.0	BAV	AV:81			DEV:2460xx		float value	40411	data float	179
Cool Mode Max Water Out Setpoint	2	max_cool_load_stp_1	62.0 °F	BAV	AV:82			DEV:2460xx		float value	40413	data float	180
Cool Mode Outlet Water Setpoint	2	cool_temp_stp_1	44.0 °F	BAV	AV:83			DEV:2460xx		float value	40277	data float	107
Heat Mode Evap Wtr Low Alm Temp		heat_evap_lo_tmp_1	38.0	BAV	AV:84			DEV:2460xx		float value	40355	data float	151
C2 Suction Pressure Status	2	c2_suc_pres_stat_1	130.7	BAV	AV:86			DEV:2460xx	✔	float value	40119	data float	34
Cool Mode Min Water Out Setpoint		min_cool_load_stp_1	40.0 °F	BAV	AV:87			DEV:2460xx		float value	40417	data float	182
Heat Mode Outlet Water Setpoint	2	heat_temp_stp_1	120.0 °F	BAV	AV:88			DEV:2460xx		float value	40371	data float	159
Compr Min Off-Cycle Delay		mod_cmpr_off_delay_1	220.0	BAV	AV:89			DEV:2460xx		float value	40423	data float	185
Compr Min Run Time		mod_cmpr_min_run_1	90.0	BAV	AV:90			DEV:2460xx		float value	40425	data float	186
Module Default Head Pressure		mod_default_hp_1	200.0	BAV	AV:93			DEV:2460xx	✔	float value	40121	data float	32
Module Default SP		mod_default_sp_1	125.0	BAV	AV:94			DEV:2460xx		float value	40125	data float	33
Cool Low Suction Press Alrm Sp 410a		mod_cool_lo_suc_press_sp_410_1	92.0	BAV	AV:98			DEV:2460xx		float value	40267	data float	105
Heat Mode Cond Wtr Hi Alm Temp		heat_high_cond_tmp_1	140.0	BAV	AV:99			DEV:2460xx		float value	40359	data float	153
Hi Compr Discharge Press Alarm Stp		mod_hi_disch_press_sp_1	560.0	BAV	AV:100			DEV:2460xx	✔	float value	40443	data float	195
Hi Compr Discharge Alarm Temp		mod_hi_disch_tmp_1	225.0	BAV	AV:101			DEV:2460xx		float value	40445	data float	196
Cool Mode Low Suction Alarm Temp		cool_lo_suct_tmp_1	32.0	BAV	AV:104			DEV:2460xx		float value	40275	data float	106
Heat Mode Evap Wtr Hi Alm Temp		heat_hi_evap_tmp_1	90.0	BAV	AV:105			DEV:2460xx		float value	40361	data float	154
C2 Suction Temp Status	2	c2_suct_temp_stat_1	77.4	BAV	AV:107			DEV:2460xx	✔	float value	40123	data float	36
Heat Mode Cond Wtr Low Alm Temp		heat_lo_cond_tmp_1	40.0	BAV	AV:110			DEV:2460xx		float value	40363	data float	155
High Compr Suction Pressure Stp		mod_high_suct_press_sp_1	155.0	BAV	AV:111			DEV:2460xx	✔	float value	40451	data float	199
Low Compr Discharge Pressure Stp		mod_lo_disch_press_sp_1	265.0	BAV	AV:112			DEV:2460xx	✔	float value	40453	data float	200
Extra-Low Suction Pressure Alarm Stp		mod_low_low_press_sp_1	5.0	BAV	AV:113			DEV:2460xx		float value	40455	data float	201
Time Delay Before Low Suction Pressure Alm		mod_lo_suc_psi_delay_1	60.0	BAV	AV:114			DEV:2460xx		float value	40457	data float	202
Load Water In Temp Status	2	load_in_tmp_stat_1	77.3	BAV	AV:118			DEV:2460xx	✔	float value	40393	data float	170
Num of Comp ON	2	comp_on_1	0.0	BAV	AV:121			DEV:2460xx	✔	float value	40273	data float	119
Num of Failed Comp	2	failed_comp_1	0.0	BAV	AV:123			DEV:2460xx	✔	float value	40281	data float	122
Low Suction Pressure Alarm Stp		mod_low_press_sp_1	92.0	BAV	AV:124			DEV:2460xx	✔	float value	40465	data float	206
Low Compr Suction Alarm Temp		mod_lo_suction_tmp_1	38.0	BAV	AV:125			DEV:2460xx		float value	40467	data float	207
Module Start-Up Delay		mod_startup_delay_1	60.0 sec	BAV	AV:135			DEV:2460xx		float value	40483	data float	215
Heat Mode Max Water Out Setpoint	2	max_heat_temp_stp_1	135.0 °F	BAV	AV:137			DEV:2460xx		float value	40415	data float	181
Heat Mode Min Water Out Setpoint		min_heat_temp_stp_1	75.0 °F	BAV	AV:138			DEV:2460xx		float value	40419	data float	183
Cool Mode Remote Water Out Setpoint		rem_cool_stp_stat_1	62.0 °F	BAV	AV:139			DEV:2460xx	✔	float value	40493	data float	220
Heat Mode Remote Water Out Setpoint		rem_heat_stp_stat_1	135.0 °F	BAV	AV:140			DEV:2460xx	✔	float value	40495	data float	221
C1 Saturated Suction Temp	2	c1_suc_sat_tmp_1	45.4	BAV	AV:141			DEV:2460xx					

Note 1: Indicates Physical Inputs/Outputs to/from Master Controller.
Note 2: Indicates Recommended Status Indication of important parameters.
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Note 5: Indicates all System Alarms possible.

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BACnet, Modbus, N2 Points List, Cont'd.

Name	Note	BACnet MSTP							Modbus			N2	
		Object Name	Value	Type	Object ID	Exp: Num	I/O Type	Device ID	Read Only	Object Type	Register	Type	ID
C1 Suction Superheat	2	c1_suc_superheat_1	31.6 °F	BAV	AV:142			DEV:2460xx					
Heat Low Suction Press Alm Sp 410a		mod_heat_lo_suc_press_sp_410_1	92.0	BAV	AV:145			DEV:2460xx		float value	40367	data float	157
Load Water Out Temp Status	2	load_out_tmp_stat_1	42.2	BAV	AV:146			DEV:2460xx	✔	float value	40397	data float	172
Heat Mode Low Suction Alm Temp		heat_lo_suct_tmp_1	32.0	BAV	AV:147			DEV:2460xx		float value	40369	data float	158
Load Water Header Low Diff Alm Pressure	2	lo_ld_diff_pr_1	1.5	BAV	AV:148			DEV:2460xx		float value	40399	data float	173
Source Water Header Low Diff Alm Pressure	2	lo_src_diff_pr_1	1.5	BAV	AV:149			DEV:2460xx		float value	40401	data float	174
Cool Mode Low Suction Press Alm Stp		mod_cool_low_press_sp_1	92.0	BAV	AV:150			DEV:2460xx	✔	float value	40429	data float	188
Heat Mode Low Suction Press Alarm Stp		mod_heat_low_press_sp_1	92.0	BAV	AV:152			DEV:2460xx	✔	float value	40441	data float	194
Reset Alarm DELAY		reset_alm_delay_1	10.0	BAV	AV:153			DEV:2460xx		float value	40497	data float	222
Source Wtr In Temp Status	2	source_in_tmp_stat_1	77.3	BAV	AV:154			DEV:2460xx	✔	float value	40505	data float	226
Source Wtr Out Temp Status	2	source_out_tmp_stat_1	105.5	BAV	AV:156			DEV:2460xx	✔	float value	40511	data float	229
Evap In Temp Status		evap_in_tmp_stat_1	77.3	BAV	AV:157			DEV:2460xx	✔	float value	40287	data float	112
Evap Wtr Outlet Temp Status	2	evap_out_temp_stat_1	41.9	BAV	AV:158			DEV:2460xx	✔	float value	40289	data float	114
Num of Stages ON		stages_on_1	0.0	BAV	AV:185			DEV:2460xx	✔	float value	40129	data float	37
Actual Low Diff Press Trip Load	2	act_lo_diff_press_ld_1	2.0 °F	BAV	AV:186			DEV:2460xx	✔	float value	40023	data float	1
Actual Low Diff Press Trip Source	2	act_lo_diff_press_src_1	3.9 °F	BAV	AV:187			DEV:2460xx	✔	float value	40025	data float	2
C1 Comp Cycle Count	2	c1_comp_cyc_count_1	0.0	BAV	AV:188			DEV:2460xx		float value	40071	data float	9
C2 Comp Cycle Count	2	c2_comp_cyc_count_1	0.0	BAV	AV:189			DEV:2460xx		float value	40077	data float	10
Diff Pressure Trip Multiplier		diff_pr_trip_mult_1	0.6	BAV	AV:190			DEV:2460xx		float value	40087	data float	15
Estimated Kw Per Ton		est_kw_per_ton_1	1.0896169 °F	BAV	AV:191			DEV:2460xx	✔	float value	40095	data float	19
Estimated Tons		est_tons_1	46.08453 °F	BAV	AV:192			DEV:2460xx	✔	float value	40097	data float	20
Estimated Watts		est_watts_1	50214.48 °F	BAV	AV:193			DEV:2460xx	✔	float value	40099	data float	22
Load Water Diff Pr Cali Point		ldpsi_cali_point_1	0.0	BAV	AV:194			DEV:2460xx		float value	40101	data float	23
Max Delta Temp- Load	2	max_delta_temp_ld_1	10.0	BAV	AV:195			DEV:2460xx		float value	40111	data float	28
Max Delta Temp- Source	2	max_delta_temp_src_1	10.0	BAV	AV:196			DEV:2460xx		float value	40115	data float	29
Num 32.5 Ton Comps Req Stg1		num65t1req_1	0.0	BAV	AV:197			DEV:2460xx	✔	float value	40127	data float	35
C2 Saturated Suction Temp		c2_suc_sat_tmp_1	45.4	BAV	AV:200			DEV:2460xx	✔	float value	40137	data float	43
PID Differential Factor	2	pid_diff_fact_1	5.0	BAV	AV:201			DEV:2460xx		float value	40131	data float	38
Source Water Diff Pr Cali Point		srcpsi_cali_point_1	0.0	BAV	AV:202			DEV:2460xx		float value	40133	data float	39
Default HP Using High Head Pressure		mod_defaulthp_usehihp_1	200.0	BAV	AV:203			DEV:2460xx		float value	40081	data float	12
Default HP Using Low Head Pressure		mod_defaulthp_uselowhp_1	350.0	BAV	AV:204			DEV:2460xx		float value	40083	data float	13
C2 Suction Superheat	2	c2_suc_superheat_1	32.0 °F	BAV	AV:447			DEV:2460xx	✔	float value	40139	data float	44
Cool Mode Setpoint Offset		cool_stp_with_offset_1	44.0	BAV	AV:581			DEV:2460xx	✔	float value	40189	data float	67
Comp 1 Cycles	2	c1_cycles_1	0.0	BAV	AV:583			DEV:2460xx	✔	float value	40193	data float	69
Comp 1 Runtime	2	c1_runtime_1	2.215	BAV	AV:584			DEV:2460xx	✔	float value	40195	data float	70
Comp 2 Cycles	2	c2_cycles_1	0.0	BAV	AV:585			DEV:2460xx	✔	float value	40205	data float	71
Comp 2 Runtime	2	c2_runtime_1	2.1	BAV	AV:586			DEV:2460xx	✔	float value	40207	data float	72
Cool Mode Setpoint Offset		cool_stp_offset_1	0.0	BAV	AV:588			DEV:2460xx		float value	40253	data float	101
Heating Setpoint Offset		heat_stp_offset_1	0.0	BAV	AV:589			DEV:2460xx		float value	40255	data float	102
Heat Mode Setpoint Offset		heat_stp_with_offset_1	120.0	BAV	AV:609			DEV:2460xx	✔	float value	40387	data float	167
Max Cool Ramp Rate		max_cool_ramp_rate_1	10.0	BAV	AV:615			DEV:2460xx		float value	40105	data float	25
Maximum Heat Ramp Rate		max_heat_ramp_rate_1	10.0	BAV	AV:616			DEV:2460xx		float value	40117	data float	30
Num of Cooling Comp Requested	2	clg_comp_req_1	0.0	BAV	AV:627			DEV:2460xx	✔	float value	40487	data float	217
Num of Heating Comp Requested	2	htg_comp_req_1	0.0	BAV	AV:628			DEV:2460xx	✔	float value	40489	data float	218
Time Interval Before Compr Runtime Refresh		runtime_refresh_1	84.0 hr	BAV	AV:631			DEV:2460xx		float value	40499	data float	223
Source Mot Valve PID Out %		source_mv_pidout_1	4.8	BAV	AV:633			DEV:2460xx	✔	float value	40507	data float	227
Cool Mode PID Count	2	stg1_clg_pid_1	0.0	BAV	AV:634			DEV:2460xx	✔	float value	40317	data float	140
Heat Mode PID Count	2	stg1_htg_pid_1	0.0	BAV	AV:635			DEV:2460xx	✔	float value	40319	data float	141
Step PID Value for 65T	2	step_pid_65t_1	50.0	BAV	AV:638			DEV:2460xx	✔	float value	40135	data float	40
C1 Cycles Reset	4	c1_cycles_reset_1	Off	BBV	BV:1			DEV:2460xx		discrete out	1	binary out	7
System Run Command Status		run_1	On	BBV	BV:2			DEV:2460xx	✔	discrete in	10023	binary in	21
C1 Hi Discharge Pressure Unload		c1_hi_dis_psi_unld_1	Off	BBV	BV:3			DEV:2460xx	✔	discrete in	10018	binary in	12
C1 Hi Discharge Temp Unload		c1_hi_dis_tmp_unld_1	Off	BBV	BV:4			DEV:2460xx	✔	discrete in	10021	binary in	13
C1 Extra-Low Suction Pressure Unload		c1_lolo_suc_psi_unld_1	Off	BBV	BV:5			DEV:2460xx	✔	discrete in	10022	binary in	14
C1 Low Suction Pressure Unload		c1_lo_suc_psi_unld_1	Off	BBV	BV:6			DEV:2460xx	✔	discrete in	10025	binary in	15
Alarm Status Output	2	alarm_bo_1	Off	BBV	BV:7			DEV:2460xx	✔	discrete in	10004	binary in	2
Cool Mode Enable Input		cool_enable_1	On	BBV	BV:8			DEV:2460xx	✔	discrete in	10016	binary in	10

Note 1: Indicates Physical Inputs/Outputs to/from Master Controller.
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Note 4: Indicates Customer Alarm Reset Functions from Bacview/BAS System.
Note 5: Indicates all System Alarms possible.

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BACnet, Modbus, N2 Points List, Cont'd.

Name	Note	BACnet MSTP							Modbus			N2	
		Object Name	Value	Type	Object ID	Exp: Num	I/O Type	Device ID	Read Only	Object Type	Register	Type	ID
Load Water Flow Switch Status	2	load_flow_1	On	BBV	BV:9			DEV:2460xx	✔	discrete in	10049	binary in	43
C1 Low Suction Temp Unload		c1_lo_suc_tmp_unld_1	Off	BBV	BV:10			DEV:2460xx	✔	discrete in	10028	binary in	16
C1 Runtime Reset	4	reset_c1_rtim_1	No	BBV	BV:12			DEV:2460xx		discrete out	3	binary out	9
C2 Cycles Reset	4	c2_cycles_reset_1	Off	BBV	BV:13			DEV:2460xx		discrete out	4	binary out	10
C2 Hi Discharge Pressure Unload		c2_hi_dis_psi_unld_1	Off	BBV	BV:14			DEV:2460xx	✔	discrete in	10029	binary in	19
C2 Hi Discharge Temp Unload		c2_hi_dis_tmp_unld_1	Off	BBV	BV:15			DEV:2460xx	✔	discrete in	10030	binary in	20
C2 Extra-Low Suction Pressure Unload		c2_lolo_suc_psi_unld_1	Off	BBV	BV:16			DEV:2460xx	✔	discrete in	10031	binary in	23
C2 Low Suction Pressure Unload		c2_lo_suc_psi_unld_1	Off	BBV	BV:17			DEV:2460xx	✔	discrete in	10006	binary in	4
C2 Low SuctionTemp Unload		c2_lo_suc_tmp_unld_1	Off	BBV	BV:18			DEV:2460xx	✔	discrete in	10011	binary in	9
C2 Manual Mode Lock On		c2_manual_1	Off	BBV	BV:19			DEV:2460xx		discrete out	5	binary out	11
C2 Runtime Reset	4	reset_c2_rtim_1	No	BBV	BV:20			DEV:2460xx		discrete out	6	binary out	12
Cool Mode Run Command Status		run_cool_1	On	BBV	BV:21			DEV:2460xx	✔	discrete in	10019	binary in	17
Heat Mode Run Command Status		run_heat_1	Off	BBV	BV:22			DEV:2460xx	✔	discrete in	10020	binary in	18
Cool Mode OK to Run		clg_ok_1	On	BBV	BV:23			DEV:2460xx	✔	discrete in	10024	binary in	22
Compr 1 Fail Status	2	comp1_fail_1	Off	BBV	BV:24			DEV:2460xx	✔	discrete in	10026	binary in	24
Comp 1 High Go Command		comp_1h_go_1	Off	BBV	BV:25			DEV:2460xx		discrete out	7	binary out	13
Compr 1 Min Runtime Status		cmpr1_min_run_1	Off	BBV	BV:26			DEV:2460xx	✔	discrete in	10027	binary in	25
Compr 1 Off Delay Status		cmpr1_delay_on_1	On	BBV	BV:27			DEV:2460xx	✔	discrete in	10032	binary in	26
Compr 1 Start/Stop	2	comp_1_ss_1	Off	BBV	BV:29			DEV:2460xx	✔	discrete in	10033	binary in	27
Compr 1 Sensor Out-O-Range		comp1_oor_1	Off	BBV	BV:31			DEV:2460xx	✔	discrete in	10034	binary in	28
Compr 1 Run Status		comp1_status_1	Off	BBV	BV:32			DEV:2460xx	✔	discrete in	10035	binary in	29
Compr 2 Min Runtime Status		cmpr2_min_run_1	Off	BBV	BV:33			DEV:2460xx	✔	discrete in	10036	binary in	30
Compr 2 Off Delay Status		cmpr2_delay_on_1	On	BBV	BV:34			DEV:2460xx	✔	discrete in	10037	binary in	31
Compr 2 Start/Stop	2	comp_2_ss_1	Off	BBV	BV:36			DEV:2460xx	✔	discrete in	10038	binary in	32
Compr 2 Sensor Out-Of-Range		comp2_oor_1	Off	BBV	BV:37			DEV:2460xx	✔	discrete in	10039	binary in	33
All Water Flows Status	2	flow_1	On	BBV	BV:38			DEV:2460xx	✔	discrete in	10045	binary in	39
Heat Mode Enable Input		heat_enable_1	Off	BBV	BV:39			DEV:2460xx	✔	discrete in	10017	binary in	11
Cool Mode Status		cool_mode_1	On	BBV	BV:40			DEV:2460xx	✔	discrete in	10043	binary in	37
Heat Mode Run Status		heat_mode_1	Off	BBV	BV:41			DEV:2460xx	✔	discrete in	10047	binary in	41
Cond Water Out Sensor Available Command		mod_cwr_avail_1	On	BBV	BV:44			DEV:2460xx		discrete out	22	binary out	28
Cond Water Out Enable High Temp Limit		mod_chs_hi_enable_1	On	BBV	BV:45			DEV:2460xx		discrete out	23	binary out	29
Cond Water Out Enable Low Temp Limit		mod_cwr_lo_enable_1	On	BBV	BV:46			DEV:2460xx		discrete out	24	binary out	30
Compr Discharge Pressure Available Command		mod_disch_psi_avail_1	On	BBV	BV:47			DEV:2460xx		discrete out	25	binary out	31
Compr Discharge Temp Available Command		mod_disch_tmp_avail_1	On	BBV	BV:48			DEV:2460xx		discrete out	26	binary out	32
Compr Suction Pressure Available Command		mod_suc_psi_avail_1	On	BBV	BV:50			DEV:2460xx		discrete out	27	binary out	33
Compr Suction Temp Avalable Command		mod_suc_tmp_avail_1	On	BBV	BV:51			DEV:2460xx		discrete out	28	binary out	34
Cool Enable BAS Command	3	cool_enable_bas_1	On	BBV	BV:52			DEV:2460xx		discrete out	8	binary out	14
Heat Enable BAS Command	3	heat_enable_bas_1	Off	BBV	BV:53			DEV:2460xx		discrete out	10	binary out	16
COOL BIN RESET	4	cool_bin_reset_1	Off	BBV	BV:54			DEV:2460xx		discrete out	2	binary out	8
Unit Status	2	unit_status_1	On	BBV	BV:55			DEV:2460xx	✔	discrete in	10068		
Use Water Hdr Diff Press Flow Sensors	3	use_diff_pr_flow_sens_1	Yes	BBV	BV:56			DEV:2460xx		discrete out	11		
Use Hi Range Water Hdr Diff Press Flow Sensors	3	use_hi_range_diff_pr_sens_1	Yes	BBV	BV:57			DEV:2460xx		discrete out	12		
Compr 2 Run Status		comp2_status_1	Off	BBV	BV:58			DEV:2460xx	✔	discrete in	10040	binary in	34
Compr 2 Fail Status	2	comp2_fail_1	Off	BBV	BV:59			DEV:2460xx	✔	discrete in	10041	binary in	35
Compressor New Lead 1		newcmplead1_1	Off	BBV	BV:60			DEV:2460xx	✔	discrete in	10042	binary in	36
Fix Mot Valves as Open Command		fix_open_mod_1	Off	BBV	BV:61			DEV:2460xx		discrete out	9	binary out	15
Load Mot Valve Start/Stop		load_mv_ss_1	On	BBV	BV:62			DEV:2460xx	✔	discrete in	10050	binary in	44
HEAT BIN RESET	4	heat_bin_reset_1	Off	BBV	BV:63			DEV:2460xx		discrete out	13	binary out	19
Cond Wtr Inlet Hi Temp Alarm	5	cond_in_hi_tmp_alm_1	Normal	BALM	BV:64			DEV:2460xx	✔	discrete in	10092	binary in	86
Hi Cond Wtr Out Temp Unload		cwr_trg_unld_1	Off	BBV	BV:65			DEV:2460xx	✔	discrete in	10044	binary in	38
Cond Wtr Inlet Lo Temp Alarm	5	cond_in_lo_tmp_alm_1	Normal	BALM	BV:66			DEV:2460xx	✔	discrete in	10093	binary in	87
Reset Alarm Timeout		reset_alm_timeout_1	Off	BBV	BV:67			DEV:2460xx	✔	discrete in	10063	binary in	57
Load Mot Valve Aux Switch Status		load_vlv_status_1	On	BBV	BV:68			DEV:2460xx	✔	discrete in	10051	binary in	45
Low Evap Water Out Temp Unload		freeze_trg_unld_1	Off	BBV	BV:69			DEV:2460xx	✔	discrete in	10046	binary in	40
Heat Mode OK to Run		htg_ok_1	Off	BBV	BV:70			DEV:2460xx	✔	discrete in	10048	binary in	42
Cond Water Inlet Temp Out-Of-Range Alarm	5	cond_in_oor_1	Off	BALM	BV:71			DEV:2460xx	✔	discrete in	10089	binary in	83

Note 1: Indicates Physical Inputs/Outputs to/from Master Controller.
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Note 4: Indicates Customer Alarm Reset Functions from Bacview/BAS System.
Note 5: Indicates all System Alarms possible.

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BACnet, Modbus, N2 Points List, Cont'd.

Name	Note	BACnet MSTP							Modbus			N2	
		Object Name	Value	Type	Object ID	Exp: Num	I/O Type	Device ID	Read Only	Object Type	Register	Type	ID
Source Water Flow Switch Status	2	src_flow_1	On	BBV	BV:73			DEV:2460xx	✔	discrete in	10054	binary in	48
Compr1 Lead Status		m01c1lead_1	On	BBV	BV:74			DEV:2460xx	✔	discrete in	10052	binary in	46
Reset All Alarm	4	reset_all_1	No	BBV	BV:75			DEV:2460xx		discrete out	29	binary out	35
Compr2 Lead Status		m01c2lead_1	Off	BBV	BV:76			DEV:2460xx	✔	discrete in	10053	binary in	47
Use Pre-Calc Diff Pr Cutout	3	use_pre_calc_dif_pr_setpt_1	Yes	BBV	BV:77			DEV:2460xx		discrete out	15	binary out	21
Use Hi Head Pressure Compr for Low HP Ctrl	3	use_hi_hp_comp_1	Yes	BBV	BV:78			DEV:2460xx		discrete out	14	binary out	20
Manually Refresh Lead Compr		man_refr_cmplead_1	Do Not Refresh Lead	BBV	BV:79			DEV:2460xx		discrete out	21	binary out	27
C1 Discharge Temp Out-Of-Range Alarm	5	c1t1_oor_1	Off	BALM	BV:81			DEV:2460xx	✔	discrete in	10069	binary in	63
C1 Suction Temp Out-Of-Range Alarm	5	c1t2_oor_1	Off	BALM	BV:82			DEV:2460xx	✔	discrete in	10072	binary in	66
Cond Water Outlet Temp Out-Of-Range Alarm	5	cond_out_oor_1	Off	BALM	BV:83			DEV:2460xx	✔	discrete in	10091	binary in	85
Evap Wtr Inlet Hi Temp Alarm	5	evap_in_hi_tmp_alm_1	Normal	BALM	BV:84			DEV:2460xx	✔	discrete in	10098	binary in	92
Evap Wtr Inlet Low Temp Alarm	5	evap_in_lo_tmp_alm_1	Normal	BALM	BV:85			DEV:2460xx	✔	discrete in	10099	binary in	93
C2 Discharge Temp Out-Of-Range Alarm	5	c2t1_oor_1	Off	BALM	BV:86			DEV:2460xx	✔	discrete in	10073	binary in	67
C2 Suction Temp Out-Of-Range Alarm	5	c2t2_oor_1	Off	BALM	BV:87			DEV:2460xx	✔	discrete in	10076	binary in	70
No Flow Alarm	5	no_flow_1	Off	BALM	BV:88			DEV:2460xx	✔	discrete in	10104	binary in	98
Load Water Diff Pressure Out-Of-Range Alarm	5	ld_dif_pr_oor_1	Off	BALM	BV:89			DEV:2460xx	✔	discrete in	10102	binary in	96
Phase Alarm	5	phase_alarm_1	Off	BALM	BV:90			DEV:2460xx	✔	discrete in	10105	binary in	99
Evap Water Inlet Temp Out-Of-Range Alarm	5	evap_in_oor_1	Off	BALM	BV:91			DEV:2460xx	✔	discrete in	10095	binary in	89
Evap Water Outlet Out-Of-Range Alarm	5	evap_out_oor_1	Off	BALM	BV:92			DEV:2460xx	✔	discrete in	10097	binary in	91
Cond Water Outlet Hi Temp Alarm	5	cd_wtr_out_hi_alm_1	Normal	BALM	BV:97			DEV:2460xx	✔	discrete in	10100	binary in	94
Evap Water Outlet Hi Temp Alarm	5	ev_wtr_out_hi_alm_1	Normal	BALM	BV:98			DEV:2460xx	✔	discrete in	10101	binary in	95
Cond Water Outlet Low Temp Alarm	5	cd_wtr_out_lo_alm_1	Off	BALM	BV:99			DEV:2460xx	✔	discrete in	10103	binary in	97
No Modules Available Alarm	5	nomodsavail_1	Off	BALM	BV:100			DEV:2460xx					
Source Water Diff Pressure Out-Of-Range Alarm	5	src_dif_pr_oor_1	Off	BALM	BV:101			DEV:2460xx	✔	discrete in	10106	binary in	100
Module Failure Mot Valve		mod_fail_mot_vlv_1	Off	BBV	BV:102			DEV:2460xx	✔	discrete in	10056	binary in	50
Module Failure Water Out Temp		mod_fail_wat_out_1	Off	BBV	BV:103			DEV:2460xx	✔	discrete in	10057	binary in	51
Manual Heat Mode Command		reset_manheatmode_1	Off	BBV	BV:104			DEV:2460xx	✔	discrete in	10058		
Module Here		module_here_1	On	BBV	BV:105			DEV:2460xx	✔	discrete in	10059	binary in	52
Module Ok		module_ok_1	On	BBV	BV:106			DEV:2460xx	✔	discrete in	10060	binary in	53
Mot Vlv Aux Sw Status		mot_vlv_status_1	On	BBV	BV:107			DEV:2460xx		discrete out	32	binary in	54
Reset Force Man Mode Terminate	4	reset_forceman_1	No	BBV	BV:108			DEV:2460xx	✔	discrete in	10062	binary out	38
Request to Run Status		m2457_1	On	BBV	BV:109			DEV:2460xx		discrete out	30	binary in	56
Reset C1 Alarms	4	reset_c1_alrm_1	No	BBV	BV:110			DEV:2460xx		discrete out	31	binary out	36
Reset C2 Alarms	4	reset_c2_alrm_1	No	BBV	BV:111			DEV:2460xx		discrete out	33	binary out	37
Reset Freeze or Hot Wtr Alm or Mot Valve Alarm	4	reset_freeze_1	No	BBV	BV:112			DEV:2460xx	✔	discrete in	10064	binary out	39
Reversing Valve		reversing_vlv_1	On	BBV	BV:113			DEV:2460xx		discrete out	34	binary in	58
Reset Sensor Out-Of-Range Alarm	4	reset_oorsl_1	No	BBV	BV:114			DEV:2460xx	✔	discrete in	10065	binary out	40
Compr OK to Stage Down		stagedn_ok_1	Off	BBV	BV:115			DEV:2460xx	✔	discrete in	10066	binary in	59
Compr OK to Stage Up		stageup_ok_1	On	BBV	BV:116			DEV:2460xx	✔	discrete in	10067	binary in	60
Module OK after Startup Delay		startup_ok_1	On	BBV	BV:117			DEV:2460xx	✔	discrete in	10070	binary in	61
Source Mot Valve Aux Switch Status		source_vlv_status_1	On	BBV	BV:122			DEV:2460xx	✔	discrete in	10071	binary in	49
Phase Loss Status		phasestat_1	On	BBV	BV:235			DEV:2460xx	✔	discrete in	10061	binary in	55
C1 Discharge Pressure Out- Of-Range Alarm	5	c1p1_oor_1	Off	BALM	BV:118			DEV:2460xx	✔	discrete in	10074	binary in	64
C1 Suction Pressure Out-Of-Range Alarm	5	c1p2_oor_1	Off	BALM	BV:119			DEV:2460xx	✔	discrete in	10075	binary in	65
C2 Discharge Pressure Out-Of-Range Alarm	5	c2p1_oor_1	Off	BALM	BV:120			DEV:2460xx	✔	discrete in	10055	binary in	68
C2 Suction Pressure Out-Of-Range Alarm	5	c2p2_oor_1	Off	BALM	BV:121			DEV:2460xx				binary in	68
Compressor 1 Excessive Pump Downs	5	c1_ex_pump_dns_1	Off	BALM	BV:123			DEV:2460xx					
Compr1 High Discharge Temp Alarm	5	c1_hi_disch_tmp_1	Off	BALM	BV:127			DEV:2460xx	✔	discrete in	10077	binary in	71

Note 1: Indicates Physical Inputs/Outputs to/from Master Controller.
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Note 5: Indicates all System Alarms possible.

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BACnet, Modbus, N2 Points List, Cont'd.

Name	Note	BACnet MSTP							Modbus			N2	
		Object Name	Value	Type	Object ID	Exp: Num	I/O Type	Device ID	Read Only	Object Type	Register	Type	ID
Compr1 High Discharge Pressure Alarm	5	c1_hi_pres_alm_1	Off	BALM	BV:128			DEV:2460xx	✔	discrete in	10078	binary in	72
Compr1 Extra-Low Suction Pressure Alarm	5	c1_lolo_suc_pres_alm_1	Off	BALM	BV:129			DEV:2460xx	✔	discrete in	10079	binary in	73
Compr1 Low Suction Pressure Alarm	5	c1_low_suc_pres_alm_1	Off	BALM	BV:130			DEV:2460xx	✔	discrete in	10080	binary in	74
Compressor 1 Low Suction Superheat	5	c1_low_suc_supht_1	Off	BALM	BV:131			DEV:2460xx					
Compr1 Low Suction Temp Alarm	5	c1_lo_suc_tmp_1	Off	BALM	BV:132			DEV:2460xx	✔	discrete in	10081	binary in	75
Compr1 No-Run Alarm	5	c1_no_run_1	Off	BALM	BV:136			DEV:2460xx	✔	discrete in	10082	binary in	76
Compressor 2 Excess Pump Downs	5	c2_ex_pump_dns_1	Off	BALM	BV:141			DEV:2460xx					
Compr2 High Discharge Temp Alarm	5	c2_hi_disch_tmp_1	Off	BALM	BV:181			DEV:2460xx	✔	discrete in	10083	binary in	77
Compr2 High Discharge Pressure Alarm	5	c2_hi_pres_alm_1	Off	BALM	BV:182			DEV:2460xx	✔	discrete in	10084	binary in	78
Compr2 Extra-Low Suction Pressure Alarm	5	c2_lolo_suc_pres_alm_1	Off	BALM	BV:196			DEV:2460xx	✔	discrete in	10085	binary in	79
Compr2 Low Suction Pressure Alarm	5	c2_low_suc_pres_alm_1	Off	BALM	BV:210			DEV:2460xx	✔	discrete in	10086	binary in	80
Compressor 2 Low Suction Superheat	5	c2_low_suc_supht_1	Off	BALM	BV:211			DEV:2460xx					
Compr2 Low Suction Temp Alarm	5	c2_lo_suc_tmp_1	Off	BALM	BV:212			DEV:2460xx	✔	discrete in	10087	binary in	81
Compr2 NO-Run Alarm	5	c2_no_run_1	Off	BALM	BV:213			DEV:2460xx	✔	discrete in	10088	binary in	82
Cond Water Motorized Valve Status Alarm	5	cond_vlv_al_1	Off	BALM	BV:215			DEV:2460xx	✔	discrete in	10090	binary in	84
Evap Water Outlet Low Temp Alarm	5	freeze_trg_1	Normal	BALM	BV:218			DEV:2460xx	✔	discrete in	10094	binary in	88
Evap Water Motorized Valve Status Alarm	5	evap_vlv_al_1	Off	BALM	BV:219			DEV:2460xx	✔	discrete in	10096	binary in	90
Superheat Notice	3	dis_suct_superht_1	Off	BALM	BV:226			DEV:2460xx					
Chiller Model Type		chiller_model_type_1	TMW600	BMSV	MSV:1			DEV:2460xx		unsigned int	40055	data int	3
Compr Runtime Refresh Method Selector		refresh_cmplead_method_1	Runtime	BMSV	MSV:2			DEV:2460xx		unsigned int	40076	data int	8
Remote Cool Trg AI Type- None or 0-5VDC		an_inp15_typ_1	NONE	BMSV	MSV:3			DEV:2460xx		unsigned int	40053	data int	1
Remote Heat Trg AI Type- None or 0-5VDC		an_inp16_typ_1	NONE	BMSV	MSV:4			DEV:2460xx		unsigned int	40054	data int	2
Compr Refrigerant Type	3	mod_comp_ref_type_1	410a	BMSV	MSV:5			DEV:2460xx		unsigned int	40058	data int	6
Motorized Valve Options	3	mot_vlv_opt_1	MVCONDEVAP	BMSV	MSV:6			DEV:2460xx		unsigned int	40075	data int	7
Unit Operating Mode Status		unit_mode_1	Normal Run	BMSV	MSV:7			DEV:2460xx	✔	unsigned int	30001	data int	9
Remote Cool Mode Setpoint AI Chnl 1-15		inp_15_point_type_1	NONE	BMSV	MSV:8			DEV:2460xx		unsigned int	40056	data int	4
Remote Heat Mode Setpoint AI Chnl 1-16		inp_16_point_type_1	NONE	BMSV	MSV:9			DEV:2460xx		unsigned int	40057	data int	5

Note 1: Indicates Physical Inputs/Outputs to/from Master Controller.
Note 2: Indicates Recommended Status Indication of important parameters.
Note 3: Indicates Command Inputs from Bacview/BAS system.
Note 4: Indicates Customer Alarm Reset Functions from Bacview/BAS System.
Note 5: Indicates all System Alarms possible.

Unit Commissioning & Operating Conditions

Environment -This unit is designed for indoor installation only. Do not install in an area subject to freezing or where humidity levels can cause cabinet condensation.

Power Supply - A voltage variation of +/- 10% of nameplate utilization voltage is acceptable.

Operation and performance is primarily dependent upon water temperatures, water flow rates and ambient air temperature. This water to water heat pump is capable of operating over a wide temperature range and with flow rates of between 1.5 GPM (.1 l/s) and 3 GPM (.19 l/s) per ton, however usually no more than one of these factors may be at a minimum or maximum level at a time.

The commissioning table indicates water temperatures which are suitable for initial unit commissioning in an environment where the flow rate and water temperature is not yet stable and to avoid nuisance shut down of the units freeze and refrigerant pressure safeties.

The operating table indicates the maximum and minimum ranges of the unit.

For more specific unit performance reference the product catalog, the submittal data sheets or contact your supplier for assistance.

BUILDING COMMISSIONING		
	Cooling	**Heating**
Unit Size	360/600/840	360/600/840
Source Min/Max	80/125 ºF	50/70 ºF
Load Min/Max	50/70 ºF	80/125 ºF
Ambient Min/Max	45/104 ºF	39/85 ºF
BUILDING OPERATING		
	Cooling	**Heating**
Unit Size	360/600/840	360/600/840
Source Min/Max	60/120 ºF	30/70 ºF
Load Min/Max	30/70 ºF	60/120 ºF
Ambient Min/Max	45/104 ºF	39/85 ºF

Piping System, Cleaning & Flushing

Cleaning by flushing water through the Load and Source piping system, **bypassing unit**, is the single most important step to ensure proper start-up and continued efficient operation of the system. Proper maintenance of strainers and checking pH are also as important.

Follow the instructions below to properly clean and flush the system:

1. Verify electrical power to the unit is disconnected.
2. Install the system with the supply hose connected directly to the return riser valve. Use a single length of flexible hose.
3. Open all air vents. Fill the system with the water. DO NOT allow system to overflow. Bleed all air from the system. Pressurize and check the system for leaks and repair appropriately.
4. Verify all strainers are in place. Start the pumps, and systematically check each vent to ensure all air is bled from the system.
5. Verify make-up water is available. Adjust make-up water appropriately to replace the air which was bled from the system. Check and adjust the water/air level in the expansion tank.
6. If possible, raise the Source loop temperature to approximately 85ºF (29ºC). Open the a drain at the lowest point in the system. Adjust the make-up water replacement rate to equal the rate of bleed.
7. Refill the system and add phosporic or sulfamic acid for a 2% solution. If possible, raise the Source loop temperature to approximately 100°F [38°C]. Circulate the solution for a minimum of 8 to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if desired.
8. When the cleaning process is complete, remove the short-circuited hoses. Reconnect the hoses to the proper supply, and return connections to each of the units. Refill the system and bleed off all air.
9. Test the system pH with litmus paper. The system water should be slightly alkaline (pH 7.0-9.0). Add chemicals, as appropriate, to maintain acidity levels
10. When the system is successfully cleaned, flushed, refilled and bled, check the main system panels, safety cutouts and alarms. Set the controls to properly maintain loop temperatures.

⚠ CAUTION! ⚠

CAUTION! DO NOT use 'stop leak' or any similar chemical agent in this system. Addition of these chemicals to the loop water will foul the system and inhibit unit operation.

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, or Polyvinylether, commonly known as PVE oil, are synthetic oils used in many refrigeration systems including those with HFC-410A refrigerant. POE, or PVE oil, if it ever comes in contact with PVC or CPVS piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

Pre-Start Up Procedures

⚠ WARNING! ⚠

WARNING! Do Not operate compressors for pre-start check.

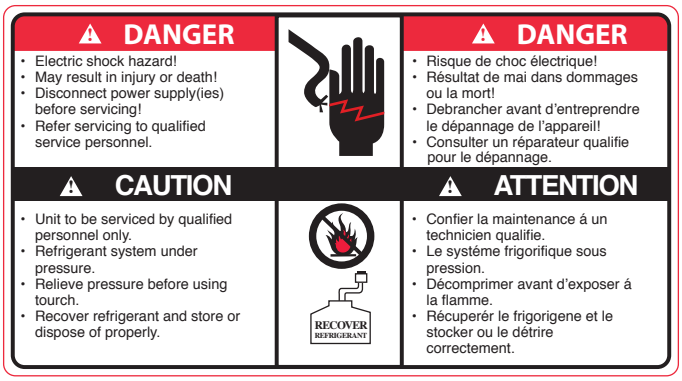
Verify BACview6 and cable are available (required for start up).

Prior to unit start up, there are certain essential checks which must be completed. Failure to carry out these checks could result in damage to the TMW voiding the warranty.

Assembly - ClimateMaster recommends locking down the unit to a concrete base or to three 4" base mounting rails using the six bolt holes provided in each base pan. Confirm that bolts have been properly tightened during installation.

Electrical - It is imperative to turn off the main electrical power supply and follow proper lock-out, tag-out procedures prior to servicing any of the TMW electrical components. The following procedures can be performed only after the electrical power is confirmed to be off:

1. The installation must be inspected and approved by the respective agent and be in compliance with all local and national electrical codes.
2. Check and tighten as required all electrical terminal connections. Utilize any lock-out/ tag-out procedures required for your project location when performing this operation. If no procedure exists take all precautions necessary to prevent the power from being turned on. A systematic tightening of all terminals inside the electrical control panel should be carried out. This will include the compressor motor terminals, which would require removal of the compressor terminal cover. Check connections at each safety and every termination in the panel.
3. Low voltage wiring can enter top, left hand side, or front. Control wires should be #18 AWG minimum up to 50 feet, #16 AWG minimum up to 100 feet, rated at 60°C minimum. Tag wire inside control box with component it is coming from.
4. All field connections should be checked for tightness.
5. Check all fuses for proper sizing as indicated on the data plate and/or the electrical diagram on the inside door of the electrical panel.
6. Verify line voltage is within acceptable range, see electrical table 4.



7. 208/230 model, verify transformer is wired to correct TAP, shipped for 208V, rewire if needed.
8. Verify I/O Flex 6126 board has jumper set to 5Vac. See Wire Diagram.
9. Verify proper installation of the factory installed water pressure differential flow sensors.
10. Verify BAS and or BACview6
11. If phase monitor is not used make sure jumper wire is connected, LVTB2 - 1 and 2 (See wire diagram).

Refrigeration

1. Refrigerant piping and components should be inspected for damage.
2. Place refrigerant gauges on the discharge and suction access ports of each refrigerant circuit to ensure a refrigerant charge is present.
3. Confirm the settings on all pressure switches.

Note: The manufacturer strongly recommends all piping connections, both internal and external to the unit, be pressure tested by an appropriate method prior to any finishing of the interior space or before access to all connections is limited. Test pressure may not exceed the maximum allowable pressure for the unit and all components within the water system. The manufacturer will not be responsible or liable for damages from water leaks due to inadequate or lack of a pressurized leak test, or damages caused by exceeding the maximum pressure rating during installation.

Pre-Start Up Procedures, Cont'd.

Water System

1. Confirm that leak testing has been carried out.
2. Confirm that the system has been flushed and is clean.
3. Confirm that the results of both Load and Source water analysis does not conflict with the acceptable constituent ppm levels as indicated in Water Quality Table 1.
4. Confirm that appropriate water analysis has been conducted and treated if required by the end-user or facility manager.
5. Confirm that necessary water treatment systems are in place with both the Load and Source water systems. pH should be 7-9.
6. Confirm that both the Load and Source circulating pumps are operational and water is flowing through both exchangers. (Manually open any motorized valve).
7. Shut entering water valve and blow out some water to check for particles or coloration from suspended particles. Record the pressure differential across the load and source heat exchangers, measured at the Pete's ports.
8. Confirm correct water flow rates through the Source and Load. Compare the measured differential pressures with the predicted flow rates to ensure proper correlation to the flow results.
9. Confirm entering water temperature is within operating limits in table 5.
10. Confirm installation of **mandatory** field installed Source and Load water strainers with **minimum** of 60 mesh screens.
11. Cooling Tower/Boiler: Check equipment for proper setpoints and operation.
12. Standby Pumps: Verify the standby pump is properly installed and in operating condition.

Pre-start form - complete all information and send to ClimateMaster. Keep a copy for your records.

⚠ WARNING! ⚠

WARNING! To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless antifreeze is added to system water. Heat exchangers never fully drain by themselves and will freeze unless winterized with antifreeze.

Pre-Start Up Check List

⚠ NOTICE! ⚠

RECOMMEND FACTORY START UP
Requires chiller start up experience and knowledge of service tool - ABACVIEW6

Project Name:_____ **Phone No.**_____
Project Address:_____ **Date:**_____
_____ **Sales Order:**_____
_____ **Quantity of TMWs:**_____

⚠ WARNING! ⚠

WARNING! Only trained, qualified personnel should install and or service ClimateMaster equipment.

⚠ IMPORTANT! ⚠

Verify both compressor switches in low voltage control box are "OFF". Do not operate compressor during pre start checks.

	YES	NO
1. I have read the Installation Manual. All Pre-start up procedures and checks are complete? (Installation, Operation, & Maintenance Manual is available at climatemaster.com.	___	___
2. Are units installed properly "per all codes and installation manual"?	___	___
3. Is there a 60-mesh strainer on Source and Load inlet water?	___	___
4. Is Source water system filled and flushed? (See "Filling the Water System" in I.O.M.)	___	___
5. Is Load water system filled, flushed and all air purged from the system? (All air must be purged from system prior to startup. See "Filling the Water System" in I.O.M.)	___	___
6. Are proof of flow devices installed on Load and Source?	___	___
7. Are all pumps tested, and operational?	___	___
8. Are required Load GPM's (verified by pressure differential) supplied to the unit?	___	___
9. Are required Source GPM's (verified by pressure differential) being provided to the unit?	___	___
10. Is there water presently circulating through the unit?	___	___
11. Is water within quality parameter table? (Refer to table 1 on page 12.)	___	___
12. Was water treated if results indicated treatment required?	___	___
13. Verified power suppy agrees with unit nameplate?	___	___
14. Is power and communication wiring complete to each unit?	___	___
15. Verify that wiring and devices meet with approved electrical submittal drawings?	___	___
16. Electrical power available to run multiple compressors at start-up?	___	___
17. Is there a BACView6?	___	___
18. If TMW is connected to BAS, what is protocol?_____		

If you answered "No" to any question above, provide the line reference number and the date of scheduled completion below. Please note, all conditions must be complete prior to ClimateMaster approval.

_____

_____

This form must be completed and submitted to ClimateMaster, a minimum of three (3) weeks prior to final scheduling of any Start-up. Email customerservice@climatemaster.com or fax 405-745-2006.

Note: If any of the above items are not complete at time of start-up, backcharges will be assessed for additional costs.

Number of TMW units that I am requesting optional paid factory start-up_____
Will there be additional start-ups required for this project_____
Contractor Name:_____
Address:_____ _____
_____ **(Authorized Signature)**
Phone No._____ **Date:**_____

Unit Start Up Procedures

Phase Check Procedure

1. Turn compressor selector switches inside the TMW control panel (low voltage side) to the off position.
2. Ensure the correct fuses are installed in the control transformer fuse blocks. Turn on the power. The "Power" light should be on.
3. Connect BACView6 to I/O flex board at J6 (see wire diagram E-4).
4. Override the Controller's DDC outputs to the compressors. Within the "Service Menu" of the BACView6 index to the "Diagnostics Manual Mode" section to engage the compressors individually for startup purposes. Index to the "M1 Manual Mode" prompt so the cursor is at the "Off" prompt to the right. Press "Enter". Use the increment key so the "Off" prompt changes to "On" and then press "Enter", or press the "OK" key. Index down to the "MC1 Manual Mode On" prompt so the cursor is at the "Off" prompt to the right. Press "Enter". Use the increment key so the "Off" prompt changes to "On" and then press "Enter", or press the "OK" key. Inside the low voltage control section (left-most control door),turn the Compressor 1 switch ON to bump compressor 1 and check for proper rotation using pressure gauges. Once this is complete and correct rotation is verified, turn the compressor 1 switch off and reverse the manual mode for M1C1 compressor so it is "Off" by similar prompts as outlined above. Use this same technique to manually override the M1C2 compressor to the "On" state. Turn on the switch marked "Compressor 2" to bump the compressor and verify that circuit 2 compressor has correct rotation. **Always use proper electrical safety precautions.**
5. Slowly close the Load water inlet isolating valve and note that the pressure differential flow sensor stops the machine. Note the flow rate at which this occurs. If too much flow is lost before unit is stopped, reset switch setting. The pressure differential flow sensor should be set so the unit shuts down when the flow rate to each water circuit drops below 60% of rated AHRI full load conditions (indicating a 10°F temperature change through the Load heat exchanger).
6. Slowly close the source water inlet isolating valve and note that the pressure differential flow sensor stops the unit. Note the flow rate at which this occurs. If too much flow is lost before unit is stopped, reset switch setting. The pressure differential flow sensor should be set so the unit shuts down when the flow rate to each Source water circuit drops below 25% of rated AHRI full load conditions (indicating a 10°F temperature change through the Source heat exchanger).
7. Repeat the tests of all other safety interlocks which may be connected.
8. The antifreeze temperature sensor at the Load outlet should be set to stop the compressors from operating when the leaving chilled water temperature drops below 36°F.

⚠ WARNING! ⚠

WARNING! To avoid possible injury or death due to electric shock, open the power supply disconnect switch and secure it in an open position during installation.

⚠ CAUTION! ⚠

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

⚠ WARNING! ⚠

WARNING! This unit contains HFC-(R410A), an azeotropic mixture of R-32 (Difluoromethane) and R-125 (Pentafluoroethane). DO NOT VENT HFC-(R410A) to the atmosphere. The U.S. Clean Air Act requires the recovery of any residual refrigerant. Do not use R-22 service equipment or components on R410A systems.

Unit Start Up Procedures, Cont'd.

⚠ WARNING! ⚠

WARNING! When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with energized equipment.

Unit Start Up (Continued)

1. Built into the logic of the ClimateMaster DDC Controller is an anti-short cycle timer which will prevent the compressors from re-starting immediately following a compressor shutdown.
2. If the chilled water temperature is above the normal operating level (greater than 90°F), all load should be removed from the chilled water system and the suction temperature should be monitored to prevent high current draw.
3. If the Source water temperature is below the normal operating level (less that 60°F), ensure that the Source water temperature control is in the correct position.
4. When all temperatures are within operating limits, all high and low pressure safety switches should be tested for each refrigeration system.
5. The Source temperature controller should be checked. Once stable conditions have been achieved, the refrigeration system's high and low pressures, compressor amp draw, voltage input level, and water system temperatures and pressures should be logged for each unit module separately.
6. **Check that oil level is between 1/3 and 1/2 of the sight glass.**
7. The action of the controller should be checked for correct operation and control.

Adjusting Unit Charge and TXV's Using Superheat and Subcooling Method - Due to varying installation conditions/applications and to optimize performance, proper refrigerant charge and TXV adjustment must be confirmed.

⚠ WARNING! ⚠

WARNING! Verify ALL water controls are open and allow water flow prior to engaging the compressor. Freezing of the brazed plate heat exchangers or water lines will permanently damage the heat pump.

After checking compressor rotation, choose a circuit to be tested first. Connect test equipment to monitor the suction Line and Liquid Line temperatures simultaneously. Place a manifold gauge set on the suction line and liquid line. Start the compressor. As long as the suction pressure is high enough to prevent the low pressure switch from tripping, run compressor.

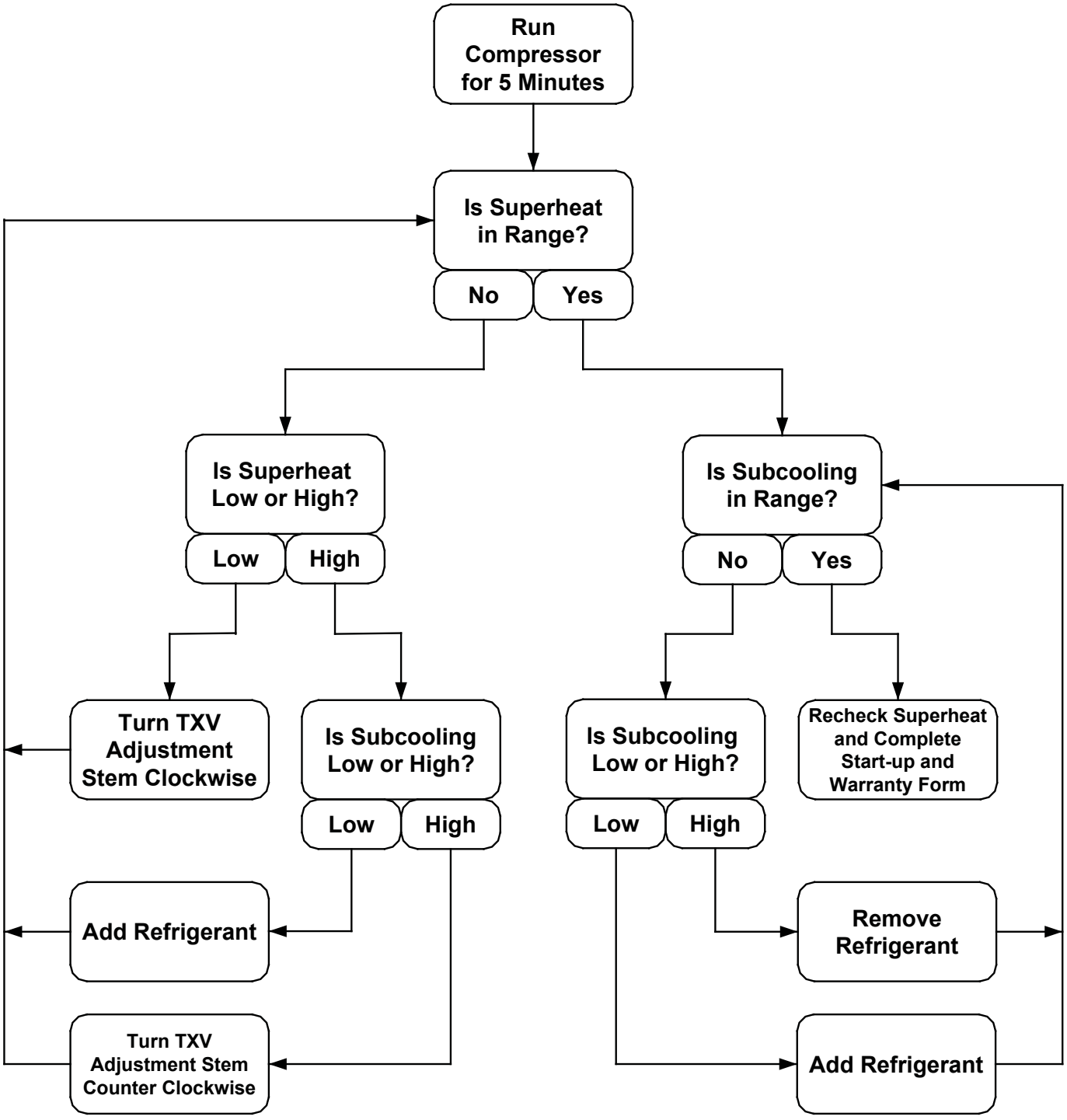
After compressor runs at least five minutes, verify proper superheat by subtracting the saturated evaporative temperature from the suction line temperature. The saturated evaporative temperature is found by converting the suction pressure reading on the manifold gauge, to the related temperature. Proper superheat temperature range is 6-12°F. If superheat is low, this may indicate that TXV is overfeeding. To adjust the TXV, turn the adjustment stem clockwise. This will cause the superheat to rise. Wait five minutes before checking results of adjustment. Repeat until desired superheat is achieved.

After verifying proper superheat, then verify proper subcooling. This is accomplished by subtracting liquid line temperature from the saturated condensing temperature. Saturated condensing temperature is found by converting the liquid line pressure reading on the manifold gauge, to the related temperature. Normal subcooling temperature range, at the condenser, is 5-15°F BUT for total accuracy please follow the charge recommendations found in the selection program. If subcooling is too low, then refrigerant must be added to the system. Add charge and wait five minutes before checking results. If subcooling is too high, then refrigerant must be removed from the system.

⚠ CAUTION! ⚠

CAUTION! Do not charge to achieve subcooling temperature when the TXV is overfeeding. If the TXV is overfeeding, readings may still indicate low subcooling and low superheat, but circuit may not be undercharged.

Unit Start Up Procedures, Cont'd.



All start up paperwork and documentation must be submitted to ClimateMaster. Future warranty claims cannot be processed without a completed Start Up and Warranty Registration form on file (See pages 54-56).

Operation & Maintenance

Maintaining a Daily Log

Date:_____
Unit No._____
Technician _____

	Sun.	Mon.	Tue.	Wed.	Thur.	Fri.	Sat.
Load Water Entering Temperature							
Load Water Leaving Temperature							
Source Water Entering Temperature							
Load Water Pressure Drop							
Source Water Pressure Drop							
Faults							

Pressure and Temperature Log

A log of temperatures and pressures should be taken regularly. Periodically conduct a visual inspection of the unit to identify problems before they reach the point of failure. As with any mechanical system, it is necessary to conduct a series of checks to the TMW unit to confirm correct operation.

Daily

- A daily operational log should be kept.
- Perform visual inspection.
- Record entering and leaving Load water and Source water temperatures and pressures.
- Note any problems that may exist and immediately plan for further investigation. If repair is necessary, schedule for earliest possible date.
- Properly document all data taken.

Weekly

- Perform visual inspection.
- Properly document all data taken.
- Note any problems that may exist. Immediately plan for further investigation. If repair is necessary, schedule for earliest possible date.
- Review daily log from previous week.

Quarterly

- Check controller operating parameters and setpoints.
- Check temperature drop/rise on each individual heat exchanger.*
- Check compressor oil level.
- Check compressor oil color.
- Check water flow rates and pressure drops across Load and Source heat exchangers.
- Properly document all data taken.

* The temperature drop/rise on a fully loaded (both compressors) heat exchanger is generally 10°F. If only one compressor is running the temperature drop/rise will be approximately 5°F. Some projects are designed to have a higher temperature drop on either the Load or the Source depending on application. Consult log sheet for your project for these values. If the temperature drop/rise is greater than the design, your heat exchanger may need to be back flushed or the strainer may need to be cleaned.

Annual

- Back flush all heat exchangers. If fouling is suspected use only ClimateMaster recommended descalers (see Chemical Clean In Place Washing).
- Remove and clean all waterside strainers.
- Manually operate all waterside isolation valves, if provided, on each module.
- Check all electrical connections for tightness.
- Perform leak check on all refrigerant circuits.
- Check all header piping couplings for tightness.
- Check oil level and color on each compressor.
- Check and test all refrigerant safeties for proper operation.
- Check all peripheral systems for proper operation.
- Verify setpoints, sensors, and general control configuration.
- Properly document all data taken.

Operation & Maintenance, Cont'd.

Chemical Clean in Place Washing with Water Isolation Valves - Chemical Clean in place washing will typically provide the best debris removal, even from severely clogged heat exchangers. The cleaning tank, pump and pump strainer should be arranged in the manner shown in Figure 6 - In Place Cleaning Arrangement. The flow of the cleaning is arranged in the opposite flow to the normal operational direction. Connection points are provided using the ¾" service ports at each heat exchanger. The cleaning solution used can be either a detergent or hot water to remove particles and simple cleaning. If correct water treatment has been implemented this should provide adequate cleaning for most situations. The solution can be pumped through the heat exchangers and allowed to soak for a time and then pumped again. If it is required to remove carbonates, then an acidic wash should be used. A 2% solution of phosphoric or sulfamic acid in pure water is generally acceptable. These acid solutions should only be allowed to circulate within the heat exchanger for 10 to 15 minutes, followed by a thorough pure water flush for 10 to 15 minutes. **Hydrochloric or sulfuric acids must not be used.** In any case, consult the chemical supplier to establish the correct handling process.

Once the washing is complete, the solution should be flushed out completely by pumping clean, fresh water through the unit. To achieve a reasonable level of dilution, it may be required to change the water several times. After cleaning, the water quality and water treatment should be confirmed.

Operational Limitations

Table 5

Voltage Limitations			Compressor Operating Limitations	TMW
The following voltage limitations are absolute and operation beyond these limitations may cause serious damage to the compressor.			Maximum Compression Ratio	5.7:1
			Minimum Operating Pressure Differential (PSI)	85
			Maximum Operating Pressure Differential (PSI)	475
			Minimum Discharge Pressure (PSIG)	215
			Maximum Discharge Pressure (PSIG)	590
			Minimum Suction Pressure (No Glycol) (PSIG)	105
			Minimum Suction Pressure (With Glycol) (PSIG)	70
			Maximum Suction Pressure (PSIG)	175
			Maximum Discharge Temperature (ºF)	265
			Minimum Subcooling (ºF)	5
			Maximum Subcooling (ºF)	15
Nominal Voltage	**Minimum Voltage**	**Maximum Voltage**	Minimum Superheat at Compressor (ºF)	6
208/230/3/60	187	253	Maximum Superheat at Compressor (ºF)	12
460/3/60	414	506	Maximum Oil Temperature (Max) (ºF)	200
575/3/60	518	632	Maximum Saturation Discharge Temperature (ºF)	145

Water Flow Data		TMW360	TMW600	TMW840
Minimum Load Water Flow (GPM)		45	75	105
Maximum Load Water Flow (GPM)		90	150	210
Minimum Source Water Flow (GPM)		45	75	105
Maximum Source Water Flow (GPM)		90	150	210
Minimum Leaving Load Water Temperature (No Glycol) (ºF)	C	40	40	40
Minimum Leaving Load Water Temperature (with Glycol) (ºF)	C	20	20	20
Maximum Leaving Load Water Temperature (ºF)	C	62	62	62
	H	135	135	135
Minimum Load Water Differential Temperature (ºF)		5	5.4	5.9
Maximum Load Water Differential Temperature (ºF)		20	20	20
Minimum Entering Source Water Temperature (ºF)	C	60	60	60
	H (with Glycol)	30	30	30
Minimum Source Water Differential Temperature (ºF)		6.5	6.9	7.2
Maximum Source Water Differential Temperature (ºF)		30	30	30
Maximum Leaving Source Water Temperature (ºF)	C	135	135	135
	H	62	62	62
Equipment Room Data				
Minimum Equipment Room Ambient Temperature (ºF)		55	55	55
Maximum Equipment Room Ambient Temperature (ºF)		104	104	104

C=Cooling, H=Heating

Compressor Information

Compressor Information - The compressors used in the ClimateMaster heat pumps are scroll compressors. They are highly efficient and extremely reliable. However, the information contained in this manual will be useful for their care.

Compressor Rotation - All scroll-type machines are unidirectional and will only compress in one direction. Operating in the reverse rotation can be destructive and will be indicated by a load operating noise together with a lack of compression.

Compressor Lubrication - The compressor operates on a sealed system and oil can only be lost if leak occurs. There are few cases when oil will need to be added to a machine in normal operation.

Oil Type - The oil in TMW scroll compressors is either polyester type oil, (POE), or polyvinylester oil (PVE), and is intended for R-410A refrigerant use. All refrigerant oils require special handling and should be protected from contamination. They are extremely hygroscopic and will absorb moisture rapidly from the air. It is strongly recommended to store and dispense all refrigerant oil from sealed metal cans.

Oil Type	Models
POE	TMW 360 TMW 600 REV A
PVE	TMW 600 REV B TMW 840

Oil Levels - The oil level in the compressor should be checked with the compressor running. The compressor oil level may vary during operation and particularly on the start-up. The normal operating compressor oil level should be between 1/3 and 1/2 of the sight glass. During operation a certain amount of oil maybe carried out into the refrigerant system. The system has been designed to allow the oil to return back to the compressor. If the level in the sight glass falls, it may be due to the operating conditions and enough time should be given to allow the oil to return before more oil is added. This could take up to 6 hours of operation. The compressor should not be allowed to operate with oil level less than 1/8 of the sight glass for an extended period of time. (Longer than 4-6 hours).

Adding Oil - The compressor must never be run in a vacuum. A suitable hydraulic pump should be used to add oil and reserved for this process. Oil should only be added to a compressor while it is operating to observe valid oil sight glass levels. Oil is pressure-injected either into a gauge connection on the suction line or injected into the oil process port at the bottom of the compressor housing. Only enough oil should be added to raise the level above the sight glass point.

Refrigeration System Recharging

Refrigeration System Recharging - Conforming to local and national codes is the responsibility of the service technician or installing contractor. The service technician should be familiar with the following codes:

- ASHRAE Standard Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1978
- American National Standard Code for Pressure Piping, ANSI B31.5-1974

Factory Tested - ClimateMaster units have been pressure-tested, evacuated and fully charged and run tested at design water flow rates prior to shipment. In the unlikely event that a refrigerant leak is detected at start-up, the following guidelines should be consulted before reprocessing the refrigeration systems.

Refrigerant System Recharging - Debris and moisture can enter copper tubing in a matter of minutes. All tubing, coil connections, or any refrigerant containing portions should be temporarily capped or sealed to keep contaminants to a minimum. Filter driers should be opened just prior to brazing into the system to prevent moisture infiltration whenever possible.

After all of the repairs have been made to the refrigeration system, a pressure test using refrigerant and nitrogen should be performed. Pressurize the system with dry nitrogen to 20 psi and check for any obvious leaks. If no leaks are present introduce a "trace" amount of refrigerant to the system (raise system pressure to 30-40 psi). With a dry nitrogen tank equipped with a regulator set to 150 psi, continue to pressurize the system to 150 psi. Using a leak detector, carefully check the system for any remaining leaks. If the system is free of leaks you may release the pressure.

Evacuating the System - The compressors should never be run while the system is in a vacuum. This could cause immediate failure to the compressors. After the system has been leak tested and sealed, any moisture that entered the system should be dehydrated and removed. While the pressure is reduced under a vacuum, the boiling point of moisture trapped inside the lines is reduced also. A pressure of .0095 PSIA, or 500 microns absolute pressure or better must be reached and sustained for several hours in order for the system to be considered free from moisture. It is necessary to use a micron meter equipped with an absolute pressure gauge (or transducer) to take this reading. ClimateMaster recommends the double evacuation process to ensure the proper removal of moisture and contaminants from the refrigeration system. After the initial vacuum is reached and held on the system, allow dry nitrogen back into the system until the pressure reaches zero PSIG or slightly higher. Then, repeat the entire evacuation process described above. The evacuation process is considered complete ONLY after a successful "blank-off" test is performed. A "blank-off" test is defined as: a) pulling a vacuum level less than 500 microns on the system and holding it for several hours; b) record the vacuum level in the system in microns, then close off the vacuum pump from the system for 15 minutes, and continue to monitor the micron level inside the refrigeration system; c) if the vacuum level inside the system does NOT rise more than 400 microns above the recorded vacuum level at the start of the 15 minute period, then the evacuation process is complete. If the vacuum level rises more than 400 microns in 15 minutes, then continue to evacuate the system for 1-2 hours, and then repeat a "blank-off" test.

Recharging the System - After all repairs have been completed, the system has been leak tested, and proper vacuum pressures have been reached and maintained, refrigerant may be recharged into the system. With a known weight of refrigerant in the cylinder, use the gage manifold set to connect the cylinder's liquid charging port to the charging access port near the refrigerant liquid line valve. Open the compressor suction and discharge line valves. Gradually meter the appropriate weight of liquid refrigerant into the condenser side of the system first, until no additional refrigerant can be dispensed. Accurate refrigerant charge per circuit may be found in the Physical Data information on page 6. Then continue the charging process by filling the evaporator side of the system with refrigerant. Close the refrigerant cylinder charging port, close all gage manifold ports and start the compressor. Be careful when continuing to charge the balance of the refrigerant, constantly maintaining a positive compressor suction pressure (>25 PSIG) at all times.

⚠ WARNING! ⚠

WARNING! To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state and federal proficiency requirements.

⚠ WARNING! ⚠

WARNING! All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state and federal statutes for the recovery and disposal of refrigerants.

⚠ WARNING! ⚠

WARNING! If a compressor is removed from this unit, system refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, the refrigerant lines of the compressor must be sealed after it is removed.

Sequence of Operation

Generic Interface - TMW shall be enabled locally via field-installed selector switch or from enable/disable contact by Building Automation System (BAS). Pumps for Load and Source water supply shall be started by others. When proof of flow is established in both the Load and Source water lines, the TMW shall start. The "Chilled Water Supply" (CHWS) temperature sensor (TS1), located in the discharge line, shall be used to cycle compressor stages sequentially to maintain setpoint of 44°F (adjustable from the LED Display/Keypad of the BACView6, or remotely through a BAS communications protocol (e.g. BACnet, Modbus or N2).

TMW will be disabled until "Chilled Water Return" (CHWR) temperature sensor is below 90°F and "Source Water Supply" (SWS) temperature sensor is above 60°F.

Each unit has 2 compressors. Stage 1 compressors shall be started first on lead week and stage 2 compressors shall be started first on lag weeks to equalize run hours between compressors 1 and 2 of the modules automatically.

The compressor with most run time will de-energize as the setpoint is satisfied, and compressor with least run time will energize as additional capacity is required.

If a fault is detected the compressor will be disabled and displayed on the DDC Controller LED display. (Faults must be manually reset at the unit by momentary contact between 11 and 12 on terminal block LVTB2).

The Unit Status and Run Time in hours for each compressor can be displayed on the BACView6. Common Alarm contact and Unit Status contact is provided at the panel.

Factory Installed Options

FACTORY INSTALLED OPTIONS

Water Isolation Valves and Flush Ports - Water isolation valves provide isolation to the unit for maintenance and cleaning of load and source heat exchangers. Optional motorized valves includes ¾" fill and flush valves.

Motorized source water valve provide head pressure regulation for low entering condenser water temperature applications (less than 60°F), in cooling. This is required for units intended for both heating and cooling, optional for other applications. Motorized Load water valve is optional, would be required for variable speed pumping.

FIELD INSTALLED OPTIONS

Strainer Installation Instructions

1. Ensure all machined surfaces are free of defects and that the inside of the strainer is free of foreign objects.
2. The strainer should be installed so that the drain connection is pointed downwards.
3. For flanged end strainers the flange bolting should be tightened gradually in a back and forth clockwise motion. Threaded end strainers should use an appropriate sealant.
4. Once installed increase line pressure gradually and check for leakage around joints.
5. If the strainer is supplied with a start-up screen monitor pressure drop carefully.
6. Isolation valves should be installed for ease of maintenance of strainers.

IMPORTANT: Ultimate responsibility for strainer and material selection rest with the end-user or facility manager, as only the end-user or facility manager knows the particular application and operating parameters to which the strainer will be subjected. ClimateMaster recommends basket type for Source side.

Strainer Removal Instructions

Y Type Strainers:

1. Drain piping.
2. Vent line to relieve pressure.
3. Loosen flange bolts (flanged ends).
4. Secure necessary lifting equipment to strainer assembly.
5. Remove inlet/outlet flange bolts (flanged end), or unthread (threaded ends) and carefully remove strainer.
6. Tighten cover. The strainer is ready for line start-up.

Basket Type Strainers

1. Drain Piping.
2. Vent line to relieve pressure.
3. Loosen cover and open to access basket.
4. Remove, clean and replace basket in original position. **(Note: In some instances a high pressure water jet or steam may be required for effective cleaning).**
5. Inspect cover gasket for damage. If necessary replace. **(Note: If spiral wound gaskets have been used, they must be replaced and cannot be used again).**
6. Tighten cover. The strainer is ready for line start-up.

Maintenance Instructions - For maximum efficiency determine the length of time it takes for the pressure drop to double that in the clean condition. Once the pressure drop reaches an unacceptable value, shut down line and follow the Strainer Removal Instructions above.

A pressure gauge installed before and after the strainer in-line will indicate pressure loss due to clogging and may be used to determine when cleaning is required.

Troubleshooting Guides and Diagnostic Techniques - After pressurizing inspect cover and other joints for leakage. Gasket replacement or cover tightening is necessary if leakage occurs. If the required filtration is not taking place, ensure the screen is installed in the correct position, and that the screen is mounted flush to the upper and lower seating surfaces.

⚠ CAUTION! ⚠

CAUTION! Prior to dismantling the strainer for cleaning, it is imperative that the strainer assembly is isolated and completely de-pressurized.

⚠ CAUTION! ⚠

CAUTION! Caution should be taken due to possible emission of process material from piping. Always ensure no line pressure exists when opening cover

Troubleshooting Guide

Unit Will Not Start	
Possible Cause	**Remedy**
Power off	Check main disconnect switch
Main Line open	Check main fuses
Incorrect wiring	Check the wiring diagram
Loose terminals/connections	Tighten the terminal connections
Control Circuit open	Check interlocks with auxiliary
Improper phasing of main power	Change any two of three phases of main power
Compressor Hums but Does Not Start	
Possible Cause	**Remedy**
Low voltage	Check at main power entry and power entry at unit (consult power company if low)
Phase Loss	Check power wiring and fuses
Compressor Runs but Does Not Cool or Heat	
Possible Cause	**Remedy**
Improper phasing of main power	Switch any two of three phases of main power
Compressor Cuts Out on Low Pressure Safety Control	
Possible Cause	**Remedy**
Main water valve closed or restricted	Open valve to full open position
Water isolation valves, if provided, closed or restricted	Open valves to full open position
Low water flow	Check water pump operation
Low water flow	Check water flow through the unit
Refrigerant shortage	Check for leaks - add refrigerant
Fouled Load brazed plate heat exchanger	Clean-in-place heat exchanger. See section on heat exchangers.
Restriction in liquid line	Plugged liquid line drier - replace liquid line drier
Expansion valve clogged or inoperative	Repair/Replace the expansion valve
Low discharge pressure	Raise and control discharge pressure within design limits
Load water temperature too cold or hot	Check water temperature setpoint
Improper Load water circulation	Use an ample sized cleanable strainer in the water circuit; make certain the strainer is clean to ensure full flow of water (strainer screen must be 60 mesh minimum)
Faulty suction pressure transducer	Verify transducer calibration using a calibrated manifold gauge and replace if defective.
Wrong suction pressure cutout setpoint	Verify suction pressure cutout setpoint to be set equal to the corresponding leaving chilled solution freeze temperature equivalent pressure on a PT chart. (i.e. if the solution freeze point is 32°F the equivalent pressure setpoint will be 101 PSIG)
Compressor Cycles on High Pressure Control	
Possible Cause	**Remedy**
Main Source water valve closed or restricted	Open valve to full open position
Source water isolation valves, if provided, closed or restricted	Open valves to full open position
Water regulating valve incorrectly set or defective	Reset or replace
Compressor discharge valve partially closed	Open valve to full open position
Non-condensable gases in hydronic system	Purge non-condensable gases from bleed valve on condenser or at bleed valve of the building condenser water system
Overcharge of refrigerant	Purge refrigerant from system while in operation until the first sign of bubbles are shown in the sight glass. Add back refrigerant just until bubbles clear.
Source water temperature high	Check water supply temperature against requirements; if cooling tower is used check spray nozzles on cooling tower
Improper condenser water circulation	Use an ample sized cleanable strainer in the condenser water circuit; make certain the strainer is clean to ensure full flow of condenser water (strainer screen must be 60 mesh minimum)
Insufficient water flow through the Source	Check water flow through condenser against design requirements
Fouled Source brazed plate heat exchanger	Clean-in-place heat exchanger as described on page 32
Defective high pressure switch	Replace high pressure switch
Causes and Prevention of Freeze-Up	
Possible Cause	**Prevention**
Improper charging	Charge per data plate information, located on the unit, following the Superheat and Subcooling procedure described on page 27.
Improper Load water circulation	Use an ample sized cleanable strainer in the chilled water circuit; make certain the strainer is clean to ensure full flow and velocity of chilled water (strainer screen must be 60 mesh minimum). It may sometimes be necessary to treat the water to prevent formation of deposits.
Not draining for winter shutdown	When the system is shut down for the winter, remove the drain plugs, and drain the cooler. Blow out remaining water with air.
Faulty leaving Load water solution temperature sensor	Verify sensor calibration using a calibrated thermometer and replace if defective.
Wrong freeze-up protection temperature setpoint	Verify leaving chilled solution freeze protection temperature setpoint to be set at 8°F above solution freeze point.

Start-Up Form

Commissioning Report, Tranquility® TMW 360/600/840 Heat Pumps
Pg. 1

Installation Check List			
	Installation Manual read and understood		Tighten/Check all wiring connections
	Verify Power Supply Matches Data Plate		Check for internal Damage
	Verify Proper compressor rotation		Verify Water Flow & GPM
	Verify Flow device safety shuts off at 25% or less		Verify 60 Mesh Strainers are Installed and Clean
	Verify Low Limit, Low pressure, and High pressure safeties		
	Verify Flow device safety shuts off at 25% or less		Verify Low Limit, Low Pressure, and High pressure safeties

Compressor Operation							
	Warm Weather Operation (Cooling Mode)				Cold Weather Operation (Heating mode)			
	Compressor 1		Compressor 2		Compressor 1		Compressor 2	
Voltage @ Compressor Contactor during operation.	T1-T2		T1-T2		T1-T2		T1-T2	
	T2-T3		T2-T3		T2-T3		T2-T3	
	T1-T3		T1-T3		T1-T3		T1-T3	
Voltage @ Compressor to ground	L1		L1		L1		L1	
	L2		L2		L2		L2	
	L3		L3		L3		L3	
Compressor Amps	L1		L1		L1		L1	
	L2		L2		L2		L2	
	L3		L3		L3		L3	
Transformer Voltage								
Refrigerant Discharge Pressure		Psig		Psig		Psig		Psig
Liquid Line Temperature		ºF		ºF		ºF		ºF
Sub-cooling		ºF		ºF		ºF		ºF
Refrigerant Suction Pressure		Psig		Psig		Psig		Psig
Suction Line Temperature		ºF		ºF		ºF		ºF
Superheat		ºF		ºF		ºF		ºF
Evaporator EWT / LWTΔT °F		ºF		ºF		ºF		ºF
Condenser EWT / LWTΔT °F		ºF		ºF		ºF		ºF
EvaporatorΔP		ΔP						
CondenserΔP		ΔP						
Oil Level Sight glass	F 3/4 1/2 E		F 3/4 1/2 E		F 3/4 1/2 E		F 3/4 1/2 E	

Start-Up Form, Cont'd.

Commissioning Report, Tranquility® TMW 360/600 Heat Pumps
Pg. 2

Water System						
Water Pipe Sizing			”	Loop Type		
GPM Through Load Side		ºF	ºF	GPM Through Source Side	ºF	ºF
Cooling ΔT / Heating ΔT				Cooling ΔT / Heating ΔT		
Antifreeze	Type			60 Mesh Strainers Installed		
	%					
AFR Installed				GPM AFR Installed		
Has water been tested?				Has water been treated if needed?		

Notes:

Refrigeration Troubleshooting Form

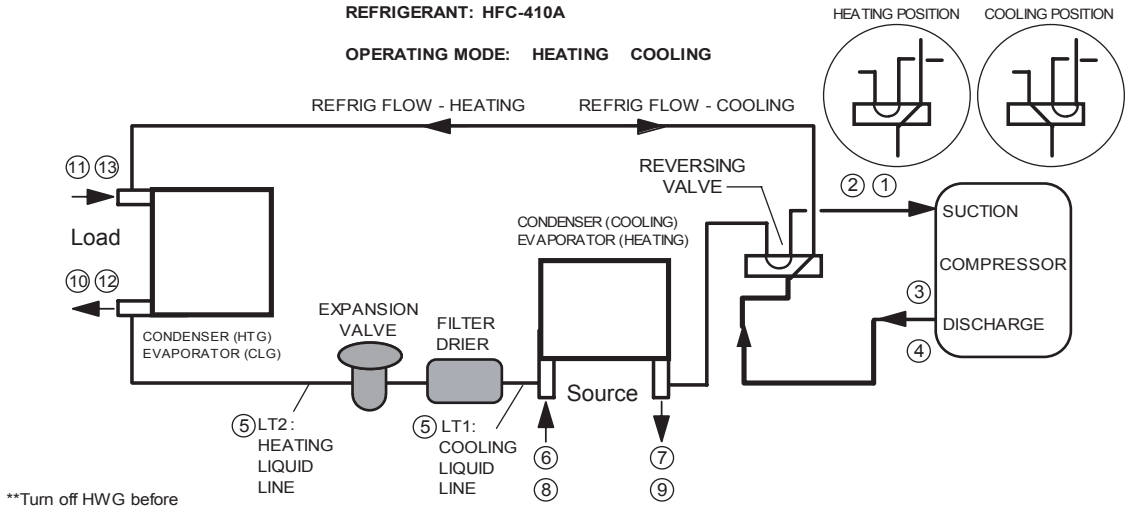
CLIMATEMASTER
Geothermal Heating & Cooling Systems

Water-to-Water Units

Customer: _____ Loop Type: _____ Startup Date: _____

Model #: _____ Serial #: _____ Antifreeze Type & %: _____

Complaint: _____



**Turn off HWG before troubleshooting.

		CIRCUIT 1		CIRCUIT 2		
	Description	Heating	Cooling	Heating	Cooling	Notes
	Voltage					
	Compressor Amps					
1	Suction Temp					
2	Suction Press					
2a	Saturation Temp					
2b	Superheat					
3	Discharge Temp					
4	Discharge Press					
4a	Saturation Temp					
4b	Subcooling					
5	Liquid Line Temp					
6	Source Water In Tmp					
7	Source Water Out Tmp			Temp Diff.=		
8	Source Water In Pres					
9	Source Water Out Pres					
9a	Press Drop					
9b	Flow Rate GPM [l/s]					
10	Load Water In Temp					
11	Load Water Out Temp			Temp Diff.=		
12	Load Water In Pres					
13	Load Water Out Pres					
13a	Press Drop					
13b	Flow Rate GPM [l/s]					

Heat of Extraction (Absorption) or Heat of Rejection:
HE or HR =
_____Flow Rate x _____Temp. Diff x _____Fluid Factor

Fluid Factor: (for Btuh)	Fluid Factor: (for kW)
500 (Water); 485 (Antifreeze)	4.18 (Water); 4.05 (Antifreeze)

Warranty (U.S. & Canada)

CLIMATE MASTER, INC.
LIMITED EXPRESS WARRANTY/ LIMITATION OF REMEDIES AND LIABILITY

It is expressly understood that unless a statement is specifically identified as a warranty, statements made by Climate Master, Inc., a Delaware corporation, ("CM") or its representatives, relating to CM's products, whether oral, written or contained in any sales literature, catalog or any other agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely CM's opinion or commendation of CM's products.

EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF CM'S PRODUCTS. CM MAKES NO WARRANTY AGAINST LATENT DEFECTS. CM MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.

GRANT OF LIMITED EXPRESS WARRANTY
CM warrants CM products purchased and retained in the United States of America and Canada to be free from defects in material and workmanship under normal use and maintenance as follows: (1) All complete air conditioning, heating and/or heat pump units built or sold by CM for twelve (12) months from date of unit start up or eighteen (18) months from date of shipment (from factory), whichever comes first; (2) Repair and replacement parts, which are not supplied under warranty, for nintey (90) days from date of shipment (from factory). All parts must be returned to CM's factory in Oklahoma City, Oklahoma, freight prepaid, no later than sixty (60) days after the date of the failure of the part; if CM determines the part to be defective and within CM's Limited Express Warranty, CM shall, when such part has been either replaced or repaired, return such to a factory recognized dealer, contractor or service organization, F.O.B. CM's factory, Oklahoma City, Oklahoma, freight prepaid. The warranty on any parts repaired or replaced under warranty expires at the end of the original warranty period.

This warranty does not cover and does not apply to: (1) Air filters, fuses, refrigerant, fluids, oil; (2) Products relocated after initial installation; (3) Any portion or component of any system that is not supplied by CM, regardless of the cause of the failure of such portion or component; (4) Products on which the unit identification tags or labels have been removed or defaced; (5) Products on which payment to CM is or has been in default; (6) Products which have defects or damage which result from improper installation, wiring, electrical imbalance characteristics or maintenance; or are caused by accident, misuse or abuse, fire, flood, alteration or misapplication of the product; (7) Products which have defects or damage which result from a contaminated or corrosive air or liquid supply, operation at abnormal temperatures, or unauthorized opening of refrigerant circuit; (8) Mold, fungus or bacteria damages; (9) Products subjected to corrosion or abrasion; (10) Products manufactured or supplied by others; (11) Products which have been subjected to misuse, negligence or accidents; (12) Products which have been operated in a manner contrary to CM's printed instructions; or (13) Products which have defects, damage or insufficient performance as a result of insufficient or incorrect system design or the improper application of CM's products.

CM is not responsible for: (1) The costs of any fluids, refrigerant or other system components, or associated labor to repair or replace the same, which is incurred as a result of a defective part covered by CM's Limited Express Warranty; (2) The costs of labor, refrigerant, materials or service incurred in removal of the defective part, or in obtaining and replacing the new or repaired part; or, (3) Transportation costs of the defective part from the installation site to CM or of the return of any part not covered by CM's Limited Express Warranty.

Limitation: This Limited Express Warranty is given in lieu of all other warranties. If, notwithstanding the disclaimers contained herein, it is determined that other warranties exist, any such warranties, including without limitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited to the duration of the Limited Express Warranty.

LIMITATION OF REMEDIES
In the event of a breach of the Limited Express Warranty, CM will only be obligated at CM's option to repair the failed part or unit or to furnish a new or rebuilt part or unit in exchange for the part or unit which has failed. If after written notice to CM's factory in Oklahoma City, Oklahoma of each defect, malfunction or other failure and a reasonable number of attempts by CM to correct the defect, malfunction or other failure and the remedy fails of its essential purpose, CM shall refund the purchase price paid to CM in exchange for the return of the sold good(s). Said refund shall be the maximum liability of CM. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR THEIR PURCHASER AGAINST CM FOR BREACH OF CONTRACT, FOR THE BREACH OF ANY WARRANTY OR FOR CM'S NEGLIGENCE OR IN STRICT LIABILITY.**

LIMITATION OF LIABILITY
CM shall have no liability for any damages if CM's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to: any war, civil unrest, government restrictions or restraints, strikes or work stoppages, fire, flood, accident, shortages of transportation, fuel, material, or labor, acts of God or any other reason beyond the sole control of CM. **CM EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE IN CONTRACT, FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, OR IN TORT, WHETHER FOR CM's NEGLIGENCE OR AS STRICT LIABILITY.**

OBTAINING WARRANTY PERFORMANCE
Normally, the contractor or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any CM recognized dealer, contractor or service organization. If assistance is required in obtaining warranty performance, write or call:

Climate Master, Inc. • Customer Service • 7300 S.W. 44th Street • Oklahoma City, Oklahoma 73179 (405) 745-6000

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

Please refer to the CM Installation, Operation and Maintenance Manual for operating and maintenance instructions.

Rev.: 11/09

LC083

Notes:

Tranquility® Large Water-to-Water (TMW) Series

Rev.: November 29, 2021

Revision History

Date:	Item:	Action:
11/29/21	Pg 29-33	Updated Courier Font on BACview Menues
10/05/21	All	Removed LON Controls
10/01/21	Pgs 14-17	Updated Water Quality Standards
9/11/20	Pg. 17-21	Updated Wiring Diagram Matrix, All 3 Typical Wiring Diagrams, and Refrigerant Circuit Diagram
8/11/20	Pg 21, 23, 29,30	Updated Refrigerant Circuit Diagram with “Pressure Sensors”, updated various text
7/28/20	Pg 3, 6, 14	Updated Decoder, Physical Data, and “H” voltage option for sizes 600 & 840 - Removed from Electrical Data
6/12/20	Pg 55	Updated Start-Up Form, Removed Warranty Form
5/28/20	Pg 3	Updated Digit 13 on Decoder
5/6/20	Pages 3, 9, 39, 42, 54	Changed Decoder from Rev B to Rev C, Revised Table Headings
6/14/16	Pages 4, 22, 24	Added additional buffer tank information and BACview6 needed for start up.
04/15/16	Text	Update
12/12/12	Unit Physical Data Table	Added Compressor Oil Type
	POE & PVE Oil Warning	Added
08/21/12	ALL	Added TMW 840 and Misc. Revisions
11/14/11	Dimensional Data Unit Commissioning & Building Operating Conditions	Updated
08/09/11	Unit Maximum Working Water Pressure	Updated to Reflect New Safeties
07/01/11	Control System Information	Added
	Start-up Form	Revised
04/29/11	Created	

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