Product Catalog

Air-Cooled Chillers

Manhattan™ Gen II — 15 to 80 Nominal Tons
SuperMod™ — 20 to 40 Nominal Tons

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Introduction

Design and manufacturing excellence make Trane a leader in the air-cooled chiller marketplace. This tradition of using excellence to meet market demands is illustrated with the Trane Manhattan Gen II and SuperMod line of air-cooled chillers. These modular chillers offer true redundancy and simplified service and as with any modular, they are easy to expand.

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Features and Benefits

Manhattan Gen II

- Dual R-410A refrigeration circuits on each chiller module.
- Hermetic scroll compressor on each refrigeration circuit with Rotalock service valves, crankcase heater, solid-state overload protection, and in-line circuit breaker.
- Dual circuit, brazed plate evaporator in each chiller module.
- Heat Pump and Split System configurations available.

SuperMod

- Single R-410A refrigerant circuit in each module.
- Hermetically sealed variable speed and fixed speed scroll tandem compressor set, each with oil level sight glass, in-line circuit breaker and solid-state overload protection.
- Variable speed package containing a brushless permanent-magnet compressor motor and variable speed AC motor drive.
- Variable speed drive (VSD) scroll compressor shall provide smooth and efficient operation from 40 Hz to 110 Hz for close temperature control.
- Electronic expansion valve.
- Single circuit, brazed plate evaporator in each chiller module.

Both

- Fine mesh strainer.
- Thermal dispersion flow switch.
- Electronic and manual isolation valves on each evaporator branch line to permit service isolation of the flow switch, strainer, and evaporator.
- Individual strainer serviceability while balance of chiller system remains operational.
- Aluminum finned /copper tube condenser coils.
- ECM type, refrigeration pressure-controlled, variable speed fan/motor assemblies for quiet operation.
- Variable speed fan condenser head pressure control for 0°F ambient operation.
- Single point power supply to a load distribution panel containing a circuit breaker for each chiller module for electrical service isolation and branch circuit overload protection.
- Phase monitor on the power supply to protect against low voltage, phase unbalance, phase loss, and phase reversal conditions.
- Roll grooved header pipe connections.
- 3/4 inch Insulation on each evaporator, fluid piping, and components.
- Galvanized sheet metal frames, powder-coated with an oven-baked finish.
- Primary microprocessor controller provides current alarm status, alarm logging of the previous 200 alarms, fluid temperatures for each module, refrigeration pressure on each refrigeration circuit, compressor run hours, current status display, remote on/off, and general alarm contacts.
- Distributed secondary microprocessor controller on each secondary module to allow continued operation should there be a failure of the primary microprocessor controller. (Only applicable when one or more secondary modules are required.)
- 7–inch touchscreen graphical interface display installed on the primary module of the chiller system.
- Free-cooling and Heat Recovery configurations available.

Application Consideration

Proper application considerations must be taken into account when sizing, selecting, and installing Trane modular chillers. Improper application can impact system performance and unit and system reliability. Deviations from these recommendations should be reviewed with your local sales representative.

Definitions of Terms

These terms will be capitalized to signify they are defined terms and can be referenced by the reader.

Automatic Isolation Valve: Two-position valve that automatically opens when a Module is enabled to run by the Chiller Bank Controller. Trane modular chillers have the option for factory installed flow isolation valves on each individual module’s heat exchanger. That includes the evaporator, condenser and geothermal (on PolyTherm™ Heat Pump models) heat exchangers.

Chiller Bank: All the factory components that make up a Modular Chiller. It includes at a minimum all the refrigeration Modules, and as installed may include accessary modules for pumps, expansion tanks, buffer tanks, glycol feeders, free cooling, etc. This may sometimes be used synonymously with Modular Chiller or the more generic term chiller.

Chiller Bank Controller: The module unit controller that coordinates the operation of all individual Modules to achieve the desired system operation. Each Module in the Chiller Bank has its own unit controller that manages that module’s operation and communicates with the Chiller Bank Controller. The module unit controller for the first Module in the Chiller Bank typically functions as the Chiller Bank Controller. In networking terms the Chiller Bank Controller is the primary controller and the other module unit controllers are secondary controllers.

Design Operating Capacity: The full load cooling or heating capacity required to meet the load.

Lead/Lag Sequence: The staging order of either the Modules within a Chiller Bank or the staging order of the compressors within a specific Module. On a regular basis this sequence affects the order of equipment operation to equalize runtime and account for failed components. The Chiller Bank Controller manages the Lead/Lag Sequence order of the Modules and the individual Modules’ unit controller manages the Lead/Lag Sequence order of its compressors.

Module: The individual segments of refrigeration or accessories that make up a Modular Chiller. A Module is a self-contained cooling/heating unit that typically includes refrigeration compressors, heat exchangers (i.e. evaporator, condenser, etc.), unit controls and power electricals, as well as other components that may be required to enable the module operation. There are optional types of accessary Modules that enable the operation of the Chiller Bank in specific systems; examples of this special type of Module include: pumps, expansion tanks, buffer tanks, glycol feeders, free cooling, etc.

Modular Chiller: A cooling and/or heating unit typically consisting of two or more refrigeration Modules and accessory Modules assembled together to create a Chiller Bank. Modular Chillers are normally characterized by their field assembled nature whereby individual Modules are shipped separately to the job site and assembled together with integral interconnecting valves, piping, and controls with a single power connection to create the complete chiller.

Modular Chiller System: The complete chilled water and/or hot water system that has its cooling/heating loads met by a Modular Chiller. It would include the Modular Chiller, piping, pumps, tanks, valves, cooling tower(s) or dry cooler(s), system controls and other such components required for the specific system configuration.

Packaged Chiller: A cooling and/or heating unit consisting of one refrigeration unit typically characterized by a larger unit design capacity than an individual Module in a Modular Chiller. Multiple Packaged Chillers are normally installed in a system using field provided interconnecting valves, piping, and controls.

Packaged Chiller System: The complete chilled water and/or hot water system that has its cooling/heating loads met by one or more Packaged Chillers. It would include the Packaged Chiller(s), piping, pumps, tanks, valves, cooling tower(s) or dry cooler(s), system controls and other such components required for the specific system configuration.

Water Treatment

The use of untreated or improperly treated water may result in scaling, corrosion, and algae or slime buildup in the chiller brazed plate evaporators and condensers and associated piping and components. This will adversely affect heat transfer between the water and brazed plate heat exchangers and may lead to premature chiller piping and/or component failure. Below are the fluid quality guidelines for heat exchanger scaling and corrosion management. Algae and slime buildup is managed with microbiological control agents.

Element/Compound/Property	Value/Unit
pH	7.5 – 9.0
Conductivity	< 500 µS/cm
Total Hardness	4.5 – 8.5 dH°
Free Chlorine	< 1.0 ppm
Ammonia (NH_3)	< 0.5 ppm
Sulphate (SO_4^{2-})	< 100 ppm
Hydrogen Carbonate (HCO_3-)	60 – 200 ppm
(HCO_3-)/(SO_4^{2-})	> 1.5
(Ca+Mg)/(HCO_3-)	> 0.5
Chloride (Cl-)	< 200 ppm

Salt and brackish water is not recommended for use in water-cooled chillers. Trane recommends using a qualified water treatment specialist to assist in establishing a proper water treatment program.

.Foreign matter in the chilled water system can also foul the chiller system piping, brazed plate heat exchangers, and strainers thereby increasing pressure drop and reducing fluid flow. A 40-mesh screen strainer must be installed in each water/liquid system piping inlet for proper filtration and protection of the heat exchangers. It is important to thoroughly flush all piping in the hydronic system before making the final piping connections to the chiller system. See the Trane Modular Chiller Installation, Operation, and Maintenance manual for proper system flushing procedures.

Effect of Altitude on Capacity

At elevations substantially above sea level, the decreased air density will decrease condenser capacity and, therefore, unit capacity and efficiency.

Ambient Limitation

Trane modular chillers are designed for year-round operation over a range of ambient temperatures.

- Ambient temperatures from 0°F to 105°F are standard.
- Ambient temperatures from 0°F to -20°F require flooded condenser head pressure control or integral free cooling coils.
- Ambient temperatures above 105°F must have an oversized condenser; over sized condensers are not available for 40 ton and 80 ton module sizes.

Hydronic System Fluid Volume

Adequate fluid volume is an important system design consideration because it provides for stable chilled fluid temperature control and limits unacceptable short cycling of compressors.

The chiller's system temperature control sensors are located in field install, Trane provided, spool pieces on the supply (outlet) fluid pipe and return (entering) fluid pipe. The system temperature sensors dictate when compressors energize and de-energize in relation to the temperature setpoint. This location allows the building piping to act as a buffer to slow the rate of change of the system water temperature. If there is not sufficient fluid volume in the system to provide an adequate buffer, temperature control will be erratic, and the compressor will cycle excessively.

For Trane modular chillers in typical comfort cooling applications, the minimum hydronic system volume should be 25 times the smallest refrigeration circuitcapacity in the Chiller Bank– or the smallest unloading step. For example, if the smallest refrigerant circuit is 15 tons without a compressor VFD, the minimum hydronic volume would be 25 x 15 = 375 gallons. For systems with a rapidly changing load profile, the volume should be increased.

If the installed system volume does not meet the above recommendations, one or more of the following considerations are necessary to reduce the rate of change of the return water temperature and/or allow for greater refrigeration circuit unloading.

- A volume buffer tank located in the return water piping.
- Larger system supply and return header piping (which also reduces system pressure drop and pump energy use).
- A variable speed drive to one or more compressors in the chiller system for closer temperature control and unloading.
- A digital scroll compressor to one or more refrigeration circuits in the chiller system for closer temperature control and unloading (for chiller modules 30 tons and smaller).

Variable Flow

Trane Modular Chillers are designed to work in many common system configurations including: primary/secondary (P/S or decoupled), variable primary / variable secondary (VP/VS), and variable primary flow (VPF) systems. Contact your Trane sales representative for the Trane Modular Chillers in Variable Primary Flow Chilled Water Systems Application Guide for details on variable flow applications.

Variable flow systems, those with 2-way control valves controlling AHU coils are popular, and/or required by codes because of their energy efficient operating characteristics. VPF systems in particular are favored for having a single set of pumps thus reducing first cost. VP/VS system configurations are growing in popularity for their stability of operation and potential pumping energy savings depending on the chiller characteristics.

Distribution pump speed is typically controlled to maintain a target differential pressure (DP) at a specific point in the system (at the most remote equipment user). The distribution system flow is a function of coil 2-way control valve operation and pump speed. The range of flow allowed by the chiller is a function of the module’s fluid heat exchanger selection and the number of active Modules. Independent of the distribution system flow the chiller’s flow must be maintained within a safe operating range. In VPF systems this is typically accomplished through control of a minimum flow bypass valve. In VP/VS systems chiller flow is controlled through primary (chiller) pump speed control.

Trane Modular Chillers have several available options that enable or enhance variable fluid flow operation.

The optional Automatic Isolation Valves per module heat exchanger stops flow through a Module when its compressors are cycled off reducing the total flow required by the chiller. When increased capacity is required dictating the operation of another Module the valve to the additional Module is opened to allow for compressor operation. The Chiller Bank Controller signals the BAS /pumping control system the number of active Modules to enable the proper control of chiller flow.

Pump Modules with various hydronic specialties are optionally available. The pumping Modules include sequences compatible with various system configurations including VPF.

Heat Pump

A typical HVAC system has a cooling requirement in the summer and shoulder seasons and a heating requirement in the winter and shoulder seasons. A modular air-source heat pump system is well suited to this cyclic cooling and heating demand. The heat pump system can be sized for the greater of the cooling demand or heating demand. When the smaller of the demands is operating, not all modules function thereby saving energy costs and improving efficiency. This also allows for the non-operating modules to be on reserve should any of the modules require servicing.

When the HVAC system demand switches between heating and cooling the heat pump mode is switched and the reversing valve in each functioning Module reverses the refrigerant cycle to produce the required heating or cooling supply. The air-source heat pump unit does not simultaneously heat and cool. It only produces either heating or cooling at any moment in time depending on the commanded mode of operation. The ambient air surrounding the unit provides for the heat source/sink and units are typically located outdoors. When operating in heating mode in low temperature moist climates frost may form on the outdoor coils. The units will periodically defrost the outdoor coils by reversing the refrigerant cycle for a period of time. Modules are sequentially defrosted to minimize the impact to heating capacity. The defrost cycle must be taken into account when sizing the hydronic system volume to ensure heating supply capacity.

Heat Recovery

Unlike a heat pump, a heat recovery unit does not have reversible refrigeration circuits. Heat recovery applications primarily control to a supply heating temperature and typically recover/ source energy from the HVAC system chilled water loop for heating use. There must be a cooling load to satisfy a heating load and vice versa. The recovered energy is delivered to the water heating loop by diverting the compressor refrigerant discharge into a water-cooled heat exchanger instead of into the air-cooled condenser.

Integrated Free Cooling

The free cooling option delivers optimal performance by minimizing compressor operation when outdoor air temperatures are low enough to assist in cooling the chilled fluid loop.

The integrated chiller fluid-based free-cooling system consists in a set of coils, installed in the same frame as the condenser coils of the chiller refrigerant circuit. Free-cooling coils are installed in series ahead of the evaporator. A set of water regulating valves modulate flow, and allow the coils to be by-passed when ambient temperatures are no longer favorable for free-cooling operation.

Free-cooling coils will be all aluminum, flat radiator design type, with low air pressure drop to avoid fan performance degradation.

Freeze Avoidance

Important: *If a chiller is located in a climate which rarely sees freezing ambient temperatures, the chiller can still experience freezing conditions due to refrigerant migration.*

Model Number Descriptions

Digit 1— Brand

T = Trane

Digit 2 — Model Series

P = Process and Modular Series

Digit 3, 4, 5 — Condenser Type

ACH = Air-Cooled, Horizontal Air Flow
ACV = Air-Cooled, Vertical Air Flow
ACR = Air-Cooled Remote Condenser
WCC = Water-Cooled Condenser

Digit 6 — Chilled Water System

P = Recirculating System, Tank and Pump
M = Single Pass Chiller Unit, no Tank and Pump

Digit 7 — Cabinet Type

H = Horizontal Low Profile
V = Vertical Upright

Digit 8, 9, 10, 11— Chiller Capacity

0030 = 3 Ton Capacity
0300 = 30 Ton Capacity

Digit 12 — Refrigeration Circuits

D = Dual Independent Refrigeration Circuits
S = Single Refrigeration Circuit
R = Redundant Refrigeration
T = Tandem Compressors Set in Single Circuit

Digit 13 — Voltage

1 = 208/230/60/1
2 = 460/60/1
3 = 208/230/60/3
4 = 460/60/3
5 = 575/60/3
7 =380/50/3

Digit 14, 15 — Chiller Application

MM = Modular

Digit 16, 17 — Voltage

VS = Variable Speed
VS1 = Variable Speed (1 Compressor)
VS2 = Variable Speed (2 Compressors)
DS = Digital Scroll
DS1 = Digital Scroll (1 Compressor)
DS2 =Digital Scroll (2 Compressors)
HP = Heat Pump
HR = Heat Recovery
HR-3HX = PolyTherm (Water-Cooled)
HR-3HX = EcoTherm (Air-Cooled)
FC = Integral Free Cooling

General Data

Table 1. Air-Cooled Manhattan Gen II modules (460/3/60 Voltage)

Capacity (Tons)	15	20	25	30	40	50	60	80
Compressor								
Type	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL	SCROLL
Quantity	2	2	2	2	2	2	2	2
Evaporator								
Type	BRAZED PLATE	BRAZED PLATE	BRAZED PLATE	BRAZED PLATE	BRAZED PLATE	BRAZED PLATE	BRAZED PLATE	BRAZED PLATE
Quantity	1	1	1	1	1	1	1	1
Fluid Volume (gal)	1.4	1.8	2.3	2.5	4.0	5.0	7.5	7.2
Refrigerant	R410-A	R410-A	R410-A	R410-A	R410-A	R410-A	R410-A	R410-A
Number of Circuits (Qty)	DUAL	DUAL	DUAL	DUAL	DUAL	DUAL	DUAL	DUAL
Charge (lbs/circuit)	20	27	33	40	53	67	80	106
Condenser Fans								
Motor Type	EC	EC	EC	EC	EC	EC	EC	EC
HP	1.4	1.4	2.5	2.5	4.2	2.5	2.5	4.2
Fan Type	AXIAL	AXIAL	AXIAL	AXIAL	AXIAL	AXIAL	AXIAL	AXIAL
Fan Material	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic
Air Flow (cfm/module)	14000	14000	21000	21000	23000	42000	42000	46000
Condenser Coils								
Fin Material	ALUMINUM	ALUMINUM	ALUMINUM	ALUMINUM	ALUMINUM	ALUMINUM	ALUMINUM	ALUMINUM
Fin/in (FPI)	12	12	16	16	12	16	16	12
Tube Material	COPPER	COPPER	COPPER	COPPER	COPPER	COPPER	COPPER	COPPER
Tube Diameter (mm)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)
Number of Rows	4	4	3	3	4	3	3	4
Coil Dimensions (in.)	30 x 70	30 x 70	36 x 88	36 x 89	40 x 88	36 x 88	36 x 89	40 x 88
Coil Quantity	2	2	2	2	2	4	4	4
Dimensions / Weights								
Width (in.)	33.0	33.0	39.5	39.5	48.0	78.5	78.5	96.0
Depth (in.)	76	76	95	95	95	95	95	95
Height (in.)	76.0	76.0	87.0	87.0	87.5	93.5	93.5	94.0
Weight (lbs)	1800	1800	2500	2500	3000	5000	5000	6000

Table 2. Air-Cooled SuperMod modules (460/3/60 Voltage)

Capacity (Tons)	**20**	**25**	**30**	**40**
Compressor				
Type	TANDEM SCROLL	TANDEM SCROLL	TANDEM SCROLL	TANDEM SCROLL
Quantity	1 SET	1 SET	1 SET	1 SET
Evaporator				
Type	BRAZED PLATE	BRAZED PLATE	BRAZED PLATE	BRAZED PLATE
Quantity	1	1	1	1
Fluid Volume (gal)	2.0	2.5	2.8	4.0
Refrigerant	R-410A	R-410A	R-410A	R-410A
Number of Circuits (Qty)	SINGLE	SINGLE	SINGLE	SINGLE
Charge (lbs/crkt)	44	56	62	84
Condenser Fans				
Motor Type	EC	EC	EC	EC
HP	1.4	2.5	2.5	4.2
Fan Type	AXIAL	AXIAL	AXIAL	AXIAL
Fan Material	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic	Aluminum sheet insert, sprayed with PP plastic
Air Flow (cfm/module)	14000	21000	21000	23000
Condenser Coils				
Fin Material	ALUMINUM	ALUMINUM	ALUMINUM	ALUMINUM
Fin/in (FPI)	12	16	16	12
Tube Material	COPPER	COPPER	COPPER	COPPER
Tube Diameter (mm)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)
Number of Rows	4	3	3	4
Coil Dimensions (in.)	30 X 70	36 X 88	36 X 88	40 X 88
Coil Quantity	2	2	2	2
Dimensions / Weights				
Dimensions (W x D x H)	33″ x 76″ x 76″	39.25″ x 95″ x 87″	39.25″ x 95″ x 87″	48″ x 95″ x 87.5″
Weight (lbs)	1600	1800	1850	2050

Controls

Carel c.pCO OEM Controller

Air-cooled modular chiller models use Carel c.pCO series microprocessor controllers to monitor and report critical operating parameters. A primary controller is used to control and coordinate the functioning of all the modules that make up the chiller unit. For units consisting of more than a single chiller, each module has its own controller.

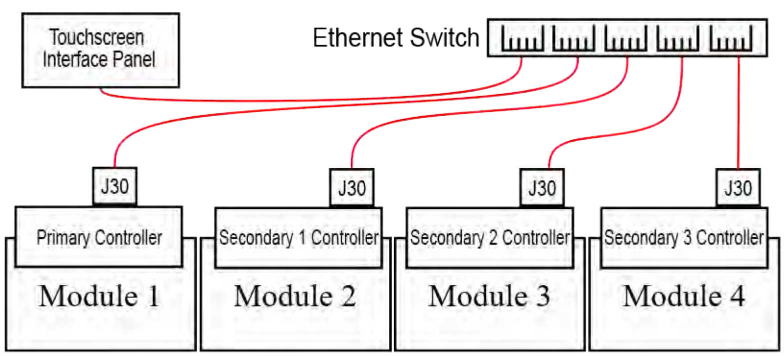
Primary/Secondary Operation

The distributed microprocessor control system enables all secondary modules to operate independently in the event that the primary microprocessor controller fails. All chiller safeties including temperature set point, refrigerant pressures, and freeze protection are preserved. In a normal configuration, a secondary microprocessor controls the single module to which it is dedicated.The secondary controller monitors key performance parameters for its module and sends real-time information to the primary controller. The primary microprocessor controller monitors the performance of the modular chiller system, activating and deactivating modules as needed to maintain the leaving water temperature for the chiller.

Stand-Alone Operation

Besides running as a primary/secondary, modules can also operate in stand-alone mode . Any or each module switches to stand-alone mode if the system-controlled cooling and/or heating temperature sensor has failed or if the primary/secondary communication has been lost. When in "stand-alone mode", each module runs independently and controls cooling and/or heating temperature based on its local temperature sensors. Stand-alone is fail-safe mode rather than an intended mode. Thus, modules will operate temporarily in this mode until normal primary/ secondary operation is recovered.

Typical Controller Network



Controller Functions

All essential control information and operator actions are read and responded to using the touch-screen interface panel. The touch-screen interface panel is connected to the primary microprocessor controller and is the only way to access many primary controller functions. The microprocessor shall provide the following minimum functions and alarms:

- Adjustable fluid temperature set point
- Multiple stage compressor control, including compressor rotation to provide even compressor usage and wear.
- High and low fluid temperature alarm set points
- Water inlet and outlet temperature
- Suction and discharge refrigeration pressures
- Compressor run status

- Current alarm status
- Alarm logging
- Demand load
- Compressor run hours
- Remote start stop input
- Dry contact for general alarm

Controller Key Features

Fast Data Exchange

Ethernet-based communication between c.pCOs and HMI allows for a fast data exchange and instantaneous touchscreen-to-c.pCO response (less than 0.5 seconds).

Temperature Reset Logic

Temperature Reset logic allows the system to adapt to load variation by automatically adjusting temperature setpoint based on the amount of load.

Adaptive Temperature Control

Adaptive temperature control is based on the temperature change rate - an enhanced temperature control algorithm. In addition to the main temperature control algorithm, the adaptive temperature control can force or hold compressor staging by tracking controlled temperature change rate and predict chiller demand trends. Also, variable speed compressor applications allow for uninterrupted compressor operation at low loads, therefore, excessive compressor on/off cycling is avoided to ensure smooth temperature control.

EXOR eSmart07 Touch-Screen HMI

The standard EXOR eSmart touch-screen interface panel provided with the Carel c.pCO controller features a 7–inch touch-screen, allowing access to all operational inputs and outputs. The interface screen is the primary means for the operator that allows to monitor and modify functions involving temperatures, pressures, set points, alarms, operating schedules, and elapsed operating hours.

HMI Key Features

- 7–inch TFT color display, dimmable LED backlight
- 800 x 480 pixel (WVGA) resolution, 64K colors
- Resistive touch-screen
- Alarm logging of the previous 2000 alarms with time and date of each occurrence
- Chiller bank setpoints can be saved and restored in one click
- Ethernet port
- USB port

HMI Operator Control

The touchscreen interface panel is ready to use when it is connected to the Ethernet switch and chiller power is on. This touchscreen interface panel can be located within proximity of the primary microprocessor controller. When connected to the Ethernet switch, the touchscreen interface panel displays current, real-time, information about the chiller, as well as the status of critical parameters within each module of the chiller.

Optional Remote Monitoring

This option allows a user to perform remote management and monitor and adjust on-site operation data such as pressures, temperatures, time delays, alarm and fault information, trending, troubleshooting, preventive maintenance, and data analysis.

Optional Building Management System (BMS)

The c.pCO controller can communicate with the building management systems, which include flexible control for chiller plants. These building management systems can control the operation of all functions of the control system including: chiller enable/disable; compressor run status; pump controls; system evaporator and condenser temperatures; adjustment of all system set points; review and resetting of all non-active faults; interrogation and display of all sensor faults. Trane can undertake full responsibility for optimized automation and energy management for the entire chiller plant.

There are 5 BMS communication options:

1. BACnet® MS/TP. Connection through built-in BMS2 port
2. BACnet IP. BACnet router is used
3. Modbus™ RTU. Connection through built-in BMS2 port
4. Modbus IP. Modbus router is used
5. LonWorks®. LonWorks router is used

Electrical Data

Table 3. Manhanttan Gen II A/C

Unit Size	Rated Voltage[a]	Compressor Data					Condenser Fan Data			Chiller Data		
		Compr Qty	RLA		LRA		Qty[b]	HP	FLA	FLA	MCA	MOP
			Circuit 1	Circuit 2	Circuit 1	Circuit 2						
15	208/60/3	2	35.1	35.1	195	195	2	1.4	2.5	90.1	109	125
	230/60/3	2	28.2	28.2	195	195	2	1.4	2.3	76.4	78	100
	460/60/3	2	12.6	12.6	95	95	2	1.4	1.5	35.2	39	50
	575/60/3	2	11.1	11.1	80	80	2	1.4	1.2	30.1	30	50
20	208/60/3	2	41.2	41.2	239	300	2	1.4	2.5	102.3	123	150
	230/60/3	2	33.7	33.7	239	300	2	1.4	2.3	87.4	90	125
	460/60/3	2	15.4	15.4	125	150	2	1.4	1.5	40.7	45	60
	575/60/3	2	12.8	12.8	80	109	2	1.4	1.2	33.5	35	50
25	208/60/3	2	50.6	50.6	300	300	2	2.5	6.6	112.5	124	175
	230/60/3	2	39.5	39.5	300	300	2	2.5	6.0	90.4	101	150
	460/60/3	2	19.6	19.6	150	150	2	2.5	3.0	45.2	51	70
	575/60/3	2	15.2	15.2	109	109	2	2.5	2.4	35.2	40	60
30	208/60/3	2	63.6	63.6	340	340	2	2.5	6.6	138.6	153	200
	230/60/3	2	51.3	51.3	340	340	2	2.5	6.0	114.0	127	175
	460/60/3	2	25.5	25.5	173	173	2	2.5	3.0	57.0	64	90
	575/60/3	2	19.9	19.9	132	132	2	2.5	2.4	44.6	50	70
40	208/60/3	2	73.6	73.6	538	538	2	4.2	8.1	159.2	176	250
	230/60/3	2	61.6	61.6	538	538	2	4.2	7.3	135.1	151	200
	460/60/3	2	29.9	29.9	229	229	2	4.2	3.7	67.6	76	110
	575/60/3	2	23.3	23.3	180	180	2	4.2	3.0	52.7	59	80
50	208/60/3	2	93.6	93.6	605	605	4	2.5	6.6	210.0	231	300
	230/60/3	2	72.5	72.5	605	605	4	2.5	6.0	167.7	186	250
	460/60/3	2	36.0	36.0	320	320	4	2.5	3.0	83.9	93	125
	575/60/3	2	27.8	27.8	250	250	4	2.5	2.4	65.1	73	100
60	208/60/3	2	119.5	119.5	599	599	4	2.5	6.6	261.7	289	400
	230/60/3	2	95.6	95.6	599	599	4	2.5	6.0	214.0	238	350
	460/60/3	2	47.5	47.5	310	310	4	2.5	3.0	107.0	119	175
	575/60/3	2	37.0	37.0	239	239	4	2.5	2.4	83.6	94	125
80	208/60/3	2	144.0	144.0	943	943	4	4.2	8.1	328.0	363	500
	230/60/3	2	119.5	119.5	943	943	4	4.2	7.3	279.0	310	450
	460/60/3	2	59.8	59.8	408	408	4	4.2	3.7	139.5	155	225
	575/60/3	2	46.5	46.5	357	357	4	4.2	3.0	108.9	122	175

(a) Voltage Utilization Range: +/- 10% of Rated voltage (use range): 208/60/3 (180-220), 230/60/3 (208-254), 460/60/3 (414-506), 575/60/3 (516-633)
(b) Values are shown as circuit 1/circuit 2

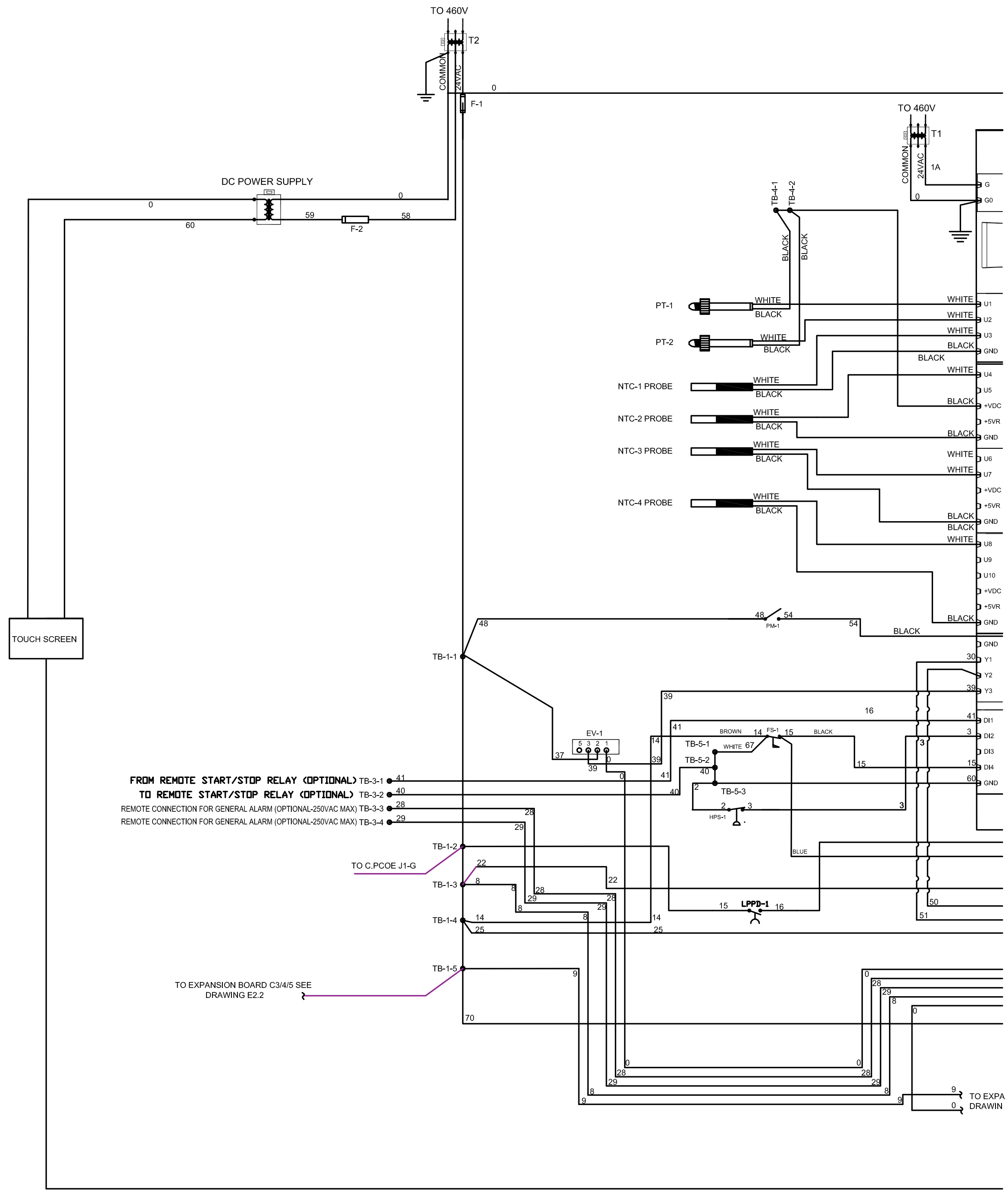
Table 4. SuperMod A/C

Unit Size	Rated Voltage[a]	Compressor Data			Condenser Fan Data			Chiller Data		
		Compr Qty	RLA Tandem Compr Set	LRA Tandem Compr Set	Qty[b]	HP	FLA	FLA	MCA	MOP
20	208/60/3	2	72.3	20 + 195	2	1.4	2.5	92.3	101	125
	230/60/3	2	52.6	20 + 195	2	1.4	2.3	72.6	81	110
	460/60/3	2	26.3	10 + 95	2	1.4	1.5	36.3	41	60
	575/60/3	2	20.1	10 + 80	2	1.4	1.2	28.1	32	50
25	208/60/3	2	94.4	30 + 300	2	2.5	6.6	105.8	118	175
	230/60/3	2	73.4	30 + 300	2	2.5	6.0	84.8	96	150
	460/60/3	2	36.4	15 + 150	2	2.5	3.0	42.4	48	70
	575/60/3	2	28.2	15 + 109	2	2.5	2.4	33.0	38	60
30	208/60/3	2	115.5	30 + 340	2	2.5	6.6	126.9	141	200
	230/60/3	2	92.5	30 + 340	2	2.5	6.0	103.9	116	175
	460/60/3	2	46.0	15 + 173	2	2.5	3.0	52.0	58	80
	575/60/3	2	35.8	15 + 132	2	2.5	2.4	40.6	46	70
40	208/60/3	2	–	–	2	-	-	–	–	–
	230/60/3	2	–	–	2	-	-	–	–	–
	460/60/3	2	59.3	15 + 320	2	4.2	3.7	67.1	76	110
	575/60/3	2	–	–	2	-	-	–	–	–

(a) Voltage Utilization Range: +/- 10% of Rated voltage (use range): 208/60/3 (180-220), 230/60/3 (208-254), 460/60/3 (414-506), 575/60/3 (516-633)
(b) Values are shown as circuit 1/circuit 2

Electrical Connections

Figure 1. Manhattan Gen II



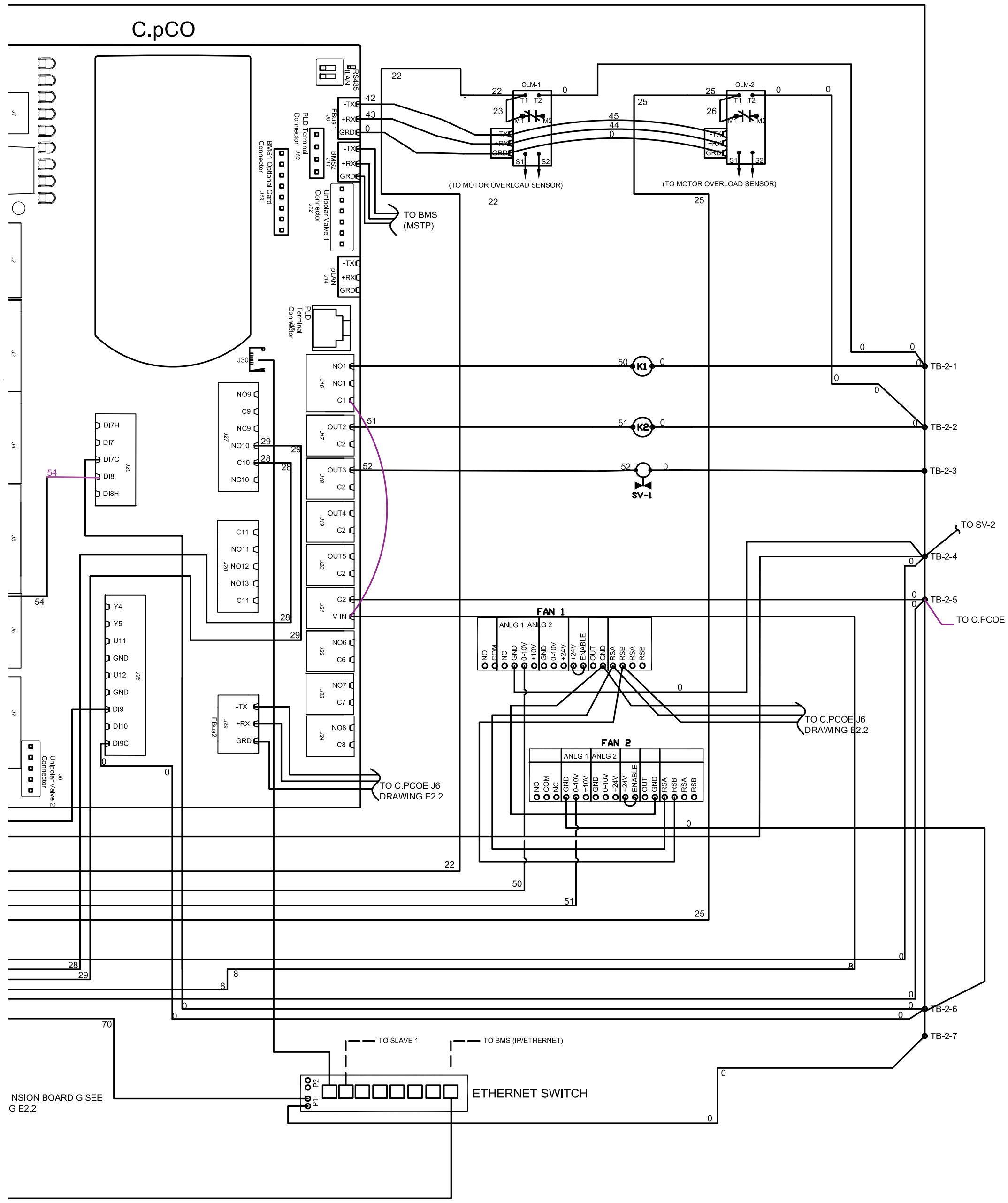

C.pCO
OLM-1
OLM-2
(TO MOTOR OVERLOAD SENSOR)
(TO MOTOR OVERLOAD SENSOR)
TO BMS (MSTP)
K1
K2
SV-1
TO SV-2
TB-2-1
TB-2-2
TB-2-3
TB-2-4
TB-2-5
TB-2-6
TB-2-7
TO C.PCOE
FAN 1
FAN 2
TO C.PCOE J6 DRAWING E2.2
TO C.PCOE J6 DRAWING E2.2
TO SLAVE 1
TO BMS (IP/ETHERNET)
ETHERNET SWITCH
NSION BOARD G SEE
G E2.2

Figure 2. Manhattan Gen II high voltage

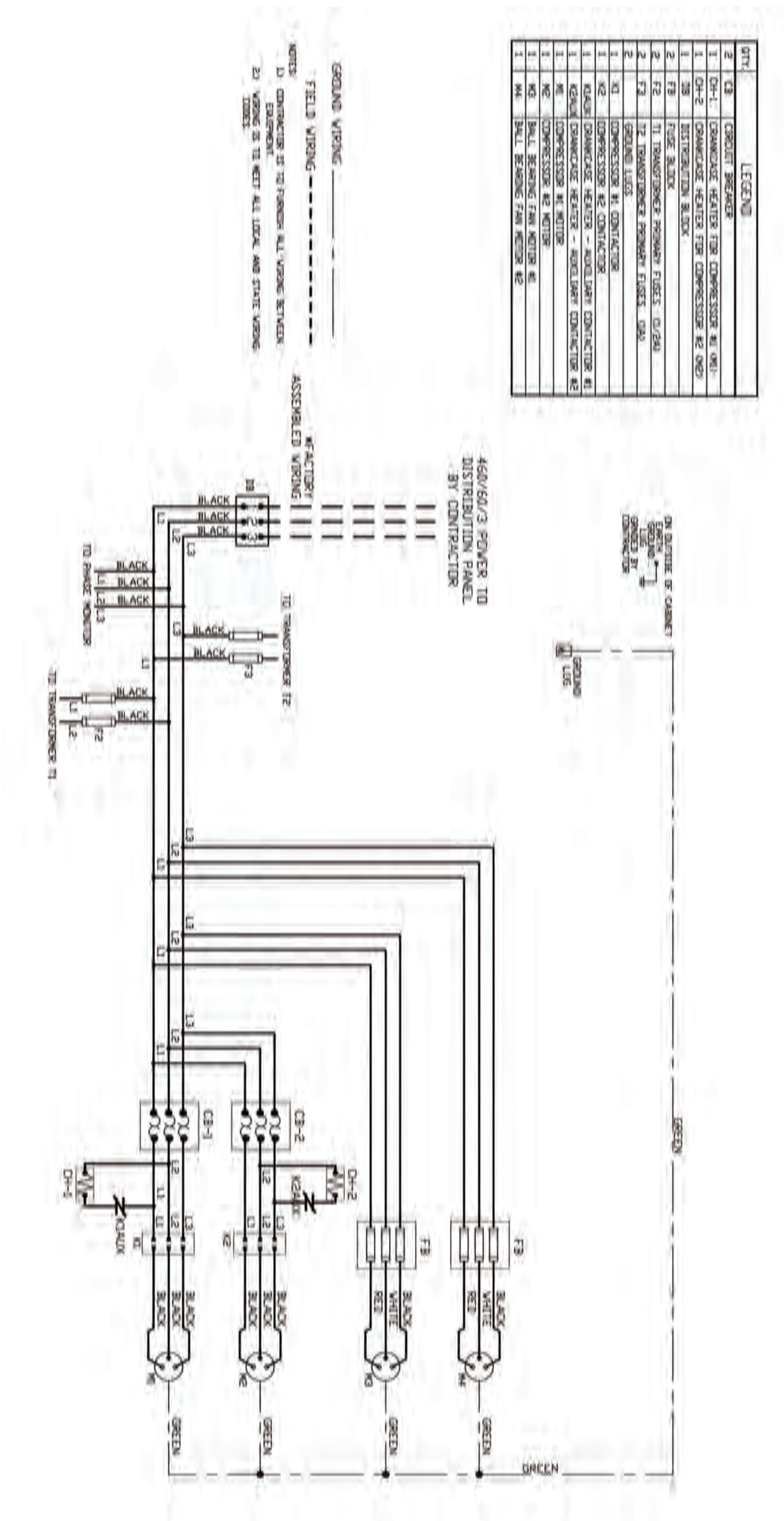


Figure 3. Manhattan Gen II expansion board

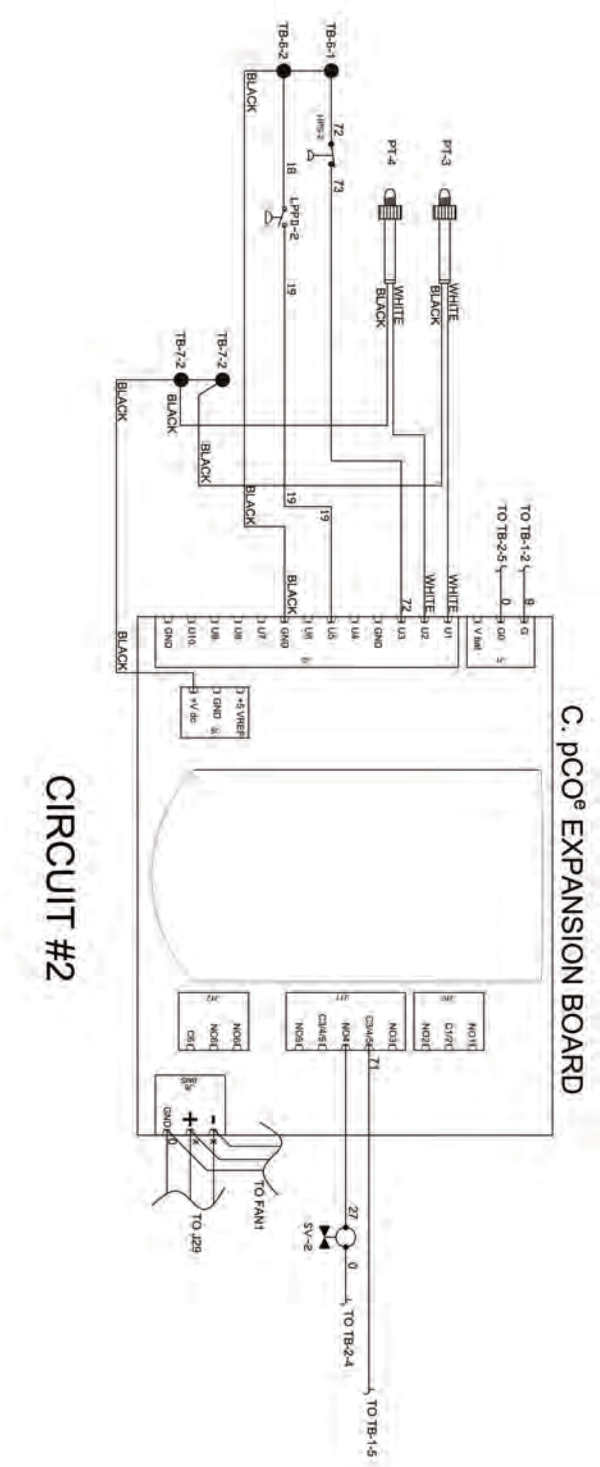


Figure 4. Manhattan Gen II primary electrical schematic

QTY.	LEGEND	
1	EV-1	ELECTRONIC ISOLATION VALVE
1	F-1	FUSE (10A)
1	FS-1	FLOW SWITCH – CLOSES ON FLOW INCREASE
1	HPS-1	HIGH PRESSURE SAFETY SWITCH CIRCUIT #1 – OPENS ON HIGH PRESSURE
1	HPS-2	HIGH PRESSURE SAFETY SWITCH CIRCUIT #2 – OPENS ON HIGH PRESSURE
1	K1	COMPRESSOR #1 CONTACTOR
1	K2	COMPRESSOR #2 CONTACTOR
1	LPPD-1	LOW PRESSURE PUMPDOWN – CIRCUIT #1
1	LPPD-2	LOW PRESSURE PUMPDOWN – CIRCUIT #2
1	NTC-1	TEMPERATURE SENSOR – ENTERING WATER TEMPERATURE
1	NTC-2	TEMPERATURE SENSOR – LEAVING WATER TEMPERATURE
1	NTC-3	TEMPERATURE SENSOR – SYSTEM ENTERING WATER TEMPERATURE
1	NTC-4	TEMPERATURE SENSOR – SYSTEM LEAVING WATER TEMPERATURE
1	OLM-1	COMPRESSOR #1 OVERLOAD MODULE
1	OLM-2	COMPRESSOR #2 OVERLOAD MODULE
1	PLC	C.PCO PROGRAMMABLE LOGIC CONTROLLER
1	PM	PHASE MONITOR
1	PT-1	4-20 mA OUTPUT PRESSURE TRANSMITTER – LOW PRESSURE CIRCUIT #1
1	PT-2	4-20 mA OUTPUT PRESSURE TRANSMITTER – HIGH PRESSURE CIRCUIT #1
1	PT-3	4-20 mA OUTPUT PRESSURE TRANSMITTER – LOW PRESSURE CIRCUIT #2
1	PT-4	4-20 mA OUTPUT PRESSURE TRANSMITTER – HIGH PRESSURE CIRCUIT #2
1	S1	COMPRESSOR CIRCUIT #1 CONTROL SWITCH
1	S2	COMPRESSOR CIRCUIT #2 CONTROL SWITCH
1	SV-1	LIQUID LINE SOLENOID VALVE CIRCUIT #1
1	SV-2	LIQUID LINE SOLENOID VALVE CIRCUIT #2
1	T1	460 V PRIMARY, 24 V SECONDARY – 50 VA TRANSFORMER
1	T2	460 V PRIMARY, 24 V SECONDARY – 150 VA TRANSFORMER
1	TB-1	CHILLER – 24V AC TERMINAL BLOCK
1	TB-2	CHILLER – COMMON TERMINAL BLOCK
1	TB-3	CUSTOMER CONNECTION TERMINAL BLOCK
1	TB-4	24V DC TERMINAL BLOCK
1	TB-5	GROUND TERMINAL BLOCK C.PCO
1	TB-6	GROUND TERMINAL BLOCK C.PCOE
1	TB-7	24V DC TERMINAL BLOCK C.PCOE

NOTES:

1. CONTRACTOR IS TO FURNISH ALL WIRING BETWEEN EQUIPMENT.
2. WIRING IS TO MEET ALL LOCAL AND STATE WIRING CODES.

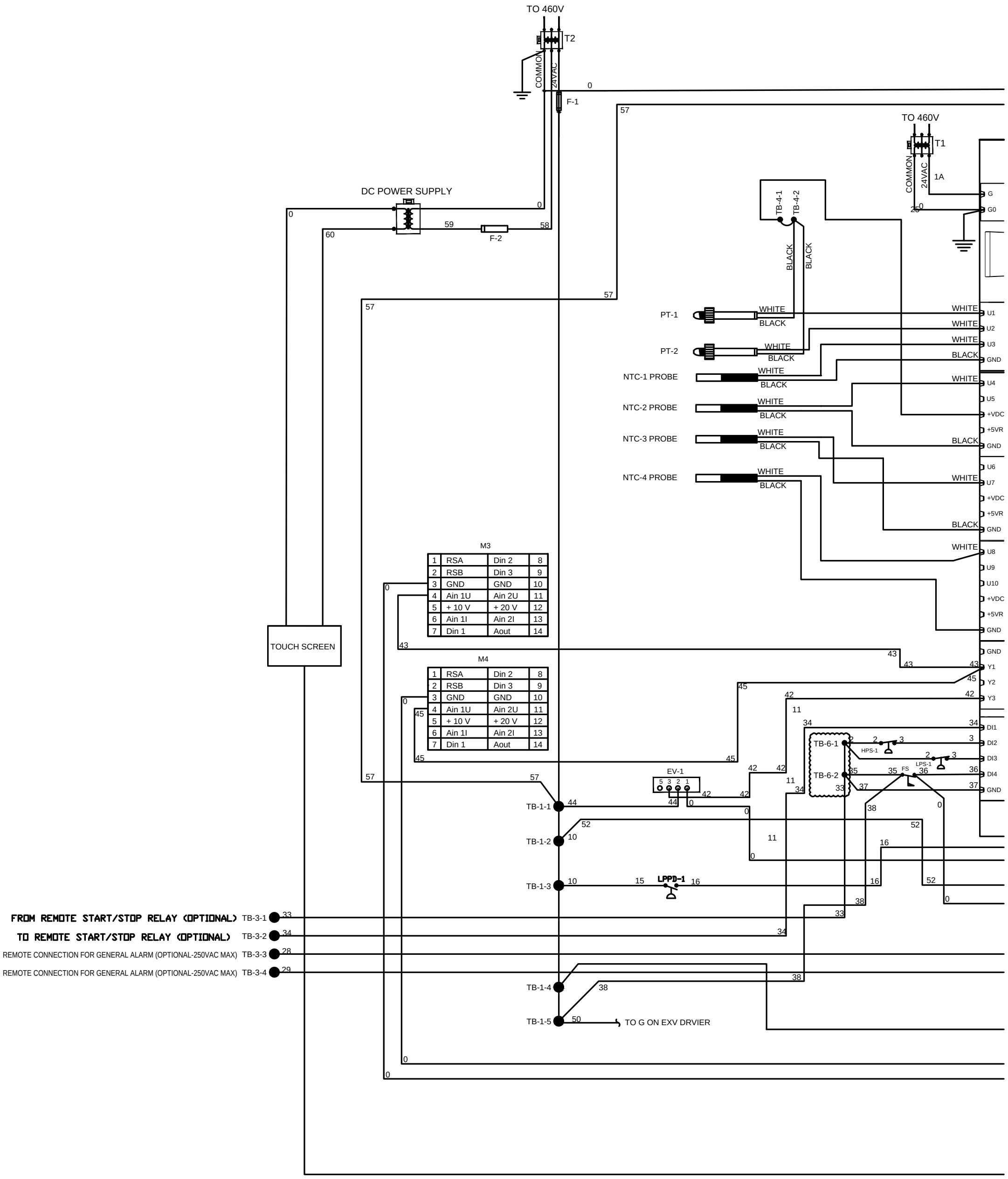
* MINIMUM 18 AWG SHIELDED WIRE WITH A MAXIMUM OF 300 FEET RUN BY CONTRACTOR; 16 AWG SHIELDED WIRE FOR RUNS BETWEEN 300 - 500 FEET.

24V POWER ——————

FIELD WIRING — — — (6 WIRE PHONE CORD)

COMMON ——————

Figure 5. SuperMod PLC



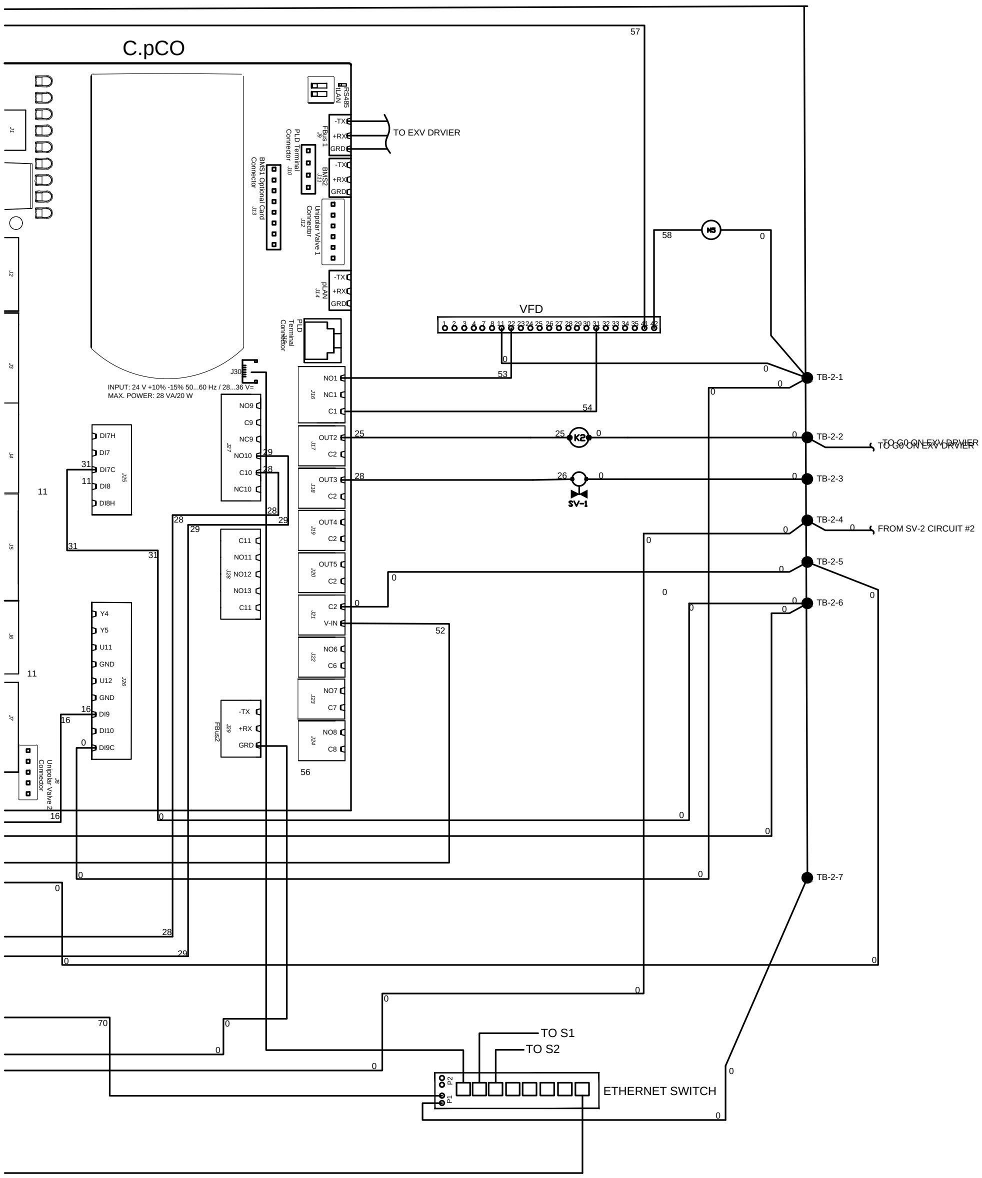

C.pCO
TO EXV DRVIER
INPUT: 24 V +10% -15% 50...60 Hz / 28...36 V=
MAX. POWER: 28 VA/20 W
VFD
SV-1
TB-2-1
TB-2-2
TO G0 ON EXV DRVIER
TB-2-3
TB-2-4
FROM SV-2 CIRCUIT #2
TB-2-5
TB-2-6
TB-2-7
TO S1
TO S2
ETHERNET SWITCH

Figure 6. SuperMod high voltage

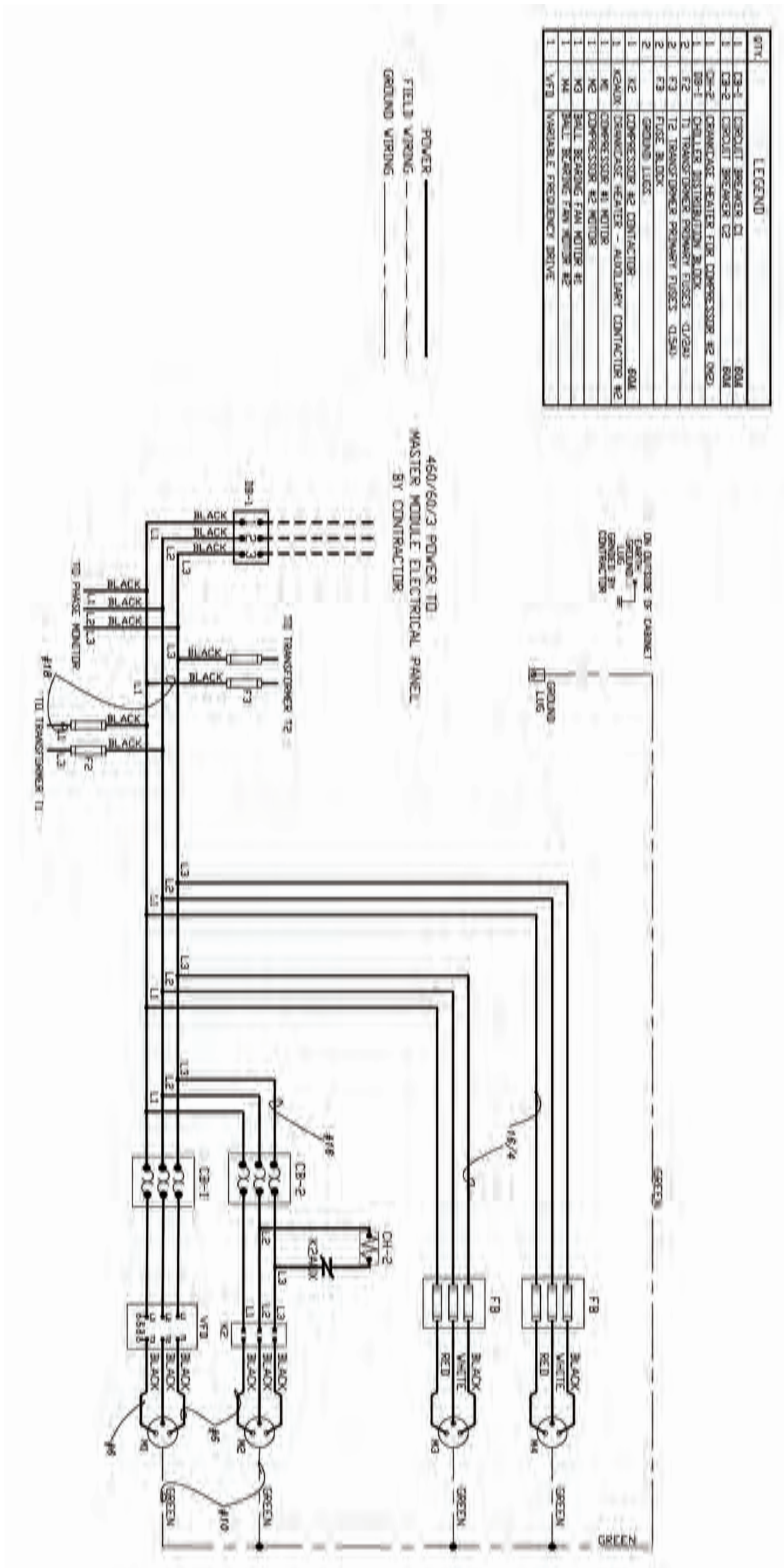


Figure 7. SuperMod expansion valve

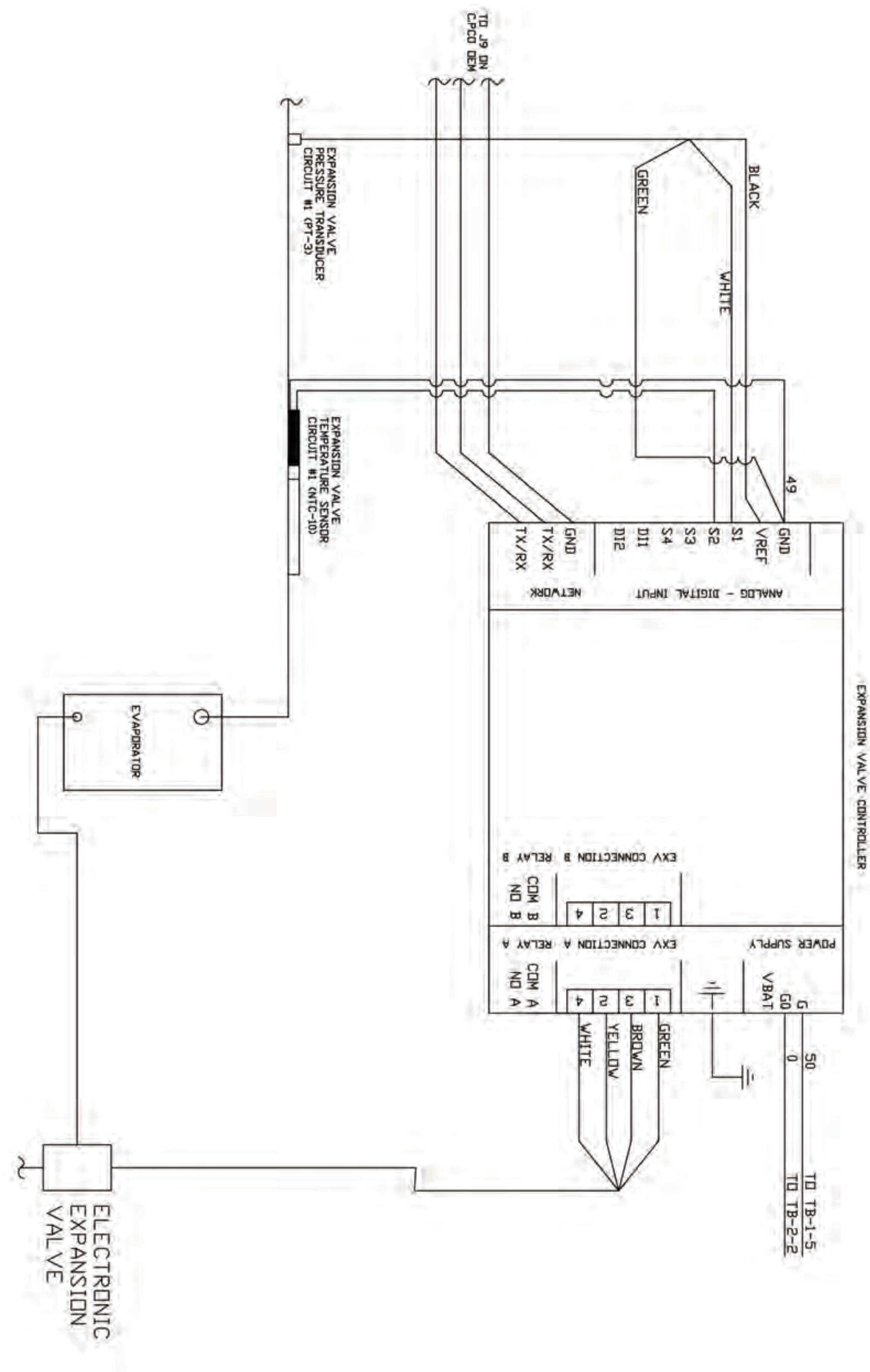


Figure 8. SuperMod primary electrical schematic

QTY.		LEGEND
1	EVC-1	EXPANSION VALVE CONTROLLER CIRCUIT #1
1	EV-1	ELECTRONIC MODULATING VALVE (EVAPORATOR)
1	DV-1	REFRIGERATION DIVERTING VALVE
1	F-1	FUSE (10A)
1	FS	FLOW SWITCH (EVAPORATOR)- CLOSES ON FLOW INCREASE
1	HPS-1	HIGH PRESSURE SAFETY SWITCH CIRCUIT #1 - OPENS ON HIGH PRESSURE
1	K2	COMPRESSOR #2 CONTACTOR
1	LPPD-1	LOW PRESSURE PUMPDOWN - CIRCUIT #1
1	LPS	LOW PRESSURE SAFETY
1	M5	ELECTRICAL BOX FAN MOTOR
1	NTC-1	TEMPERATURE SENSOR - EVAPORATOR ENTERING WATER TEMPERATURE
1	NTC-2	TEMPERATURE SENSOR - EVAPORATOR LEAVING WATER TEMPERATURE
1	NTC-3	TEMPERATURE SENSOR - SYSTEM CHILLED ENTERING WATER TEMPERATURE
1	NTC-4	TEMPERATURE SENSOR - SYSTEM CHILLED LEAVING WATER TEMPERATURE
1	NTC-10	EXV SUCTION TEMPERATURE SENSOR
1	OLM-1	COMPRESSOR #1 OVERLOAD
1	OLM-2	COMPRESSOR #2 OVERLOAD
1	PLC	C.PCO OEM PROGRAMMABLE LOGIC CONTROLLER
1	PM	PHASE MONITOR
1	PT-1	4-20 mA OUTPUT PRESSURE TRANSMITTER - LOW PRESSURE CIRCUIT #1
1	PT-2	4-20 mA OUTPUT PRESSURE TRANSMITTER - HIGH PRESSURE CIRCUIT #1
1	PT-3	EXV SUCTION PRESSURE TRANSDUCER
1	SV-1	LIQUID LINE SOLENOID VALVE CIRCUIT #1
1	T1	460 V PRIMARY, 24 V SECONDARY - 50 VA TRANSFORMER
1	T2	460 V PRIMARY, 24 V SECONDARY - 150 VA TRANSFORMER
1	TB-1	CHILLER - 24V AC TERMINAL BLOCK
1	TB-2	CHILLER - COMMON TERMINAL BLOCK
1	TB-3	CUSTOMER CONNECTION TERMINAL BLOCK
1	TB-4	24V DC TERMINAL BLOCK
1	TB-5	TERMINAL BLOCK - ELECTRONIC EXPANSION VALVE
1	TB-6	TERMINAL BLOCK - GROUND
1	VFD	VARIABLE FREQUENCY DRIVE

NOTE:

1. WIRING IS TO MEET ALL LOCAL AND STATE WIRING CODES.

* MINIMUM 18 AWG SHIELDED WIRE WITH A MAXIMUM OF 300 FEET RUN BY CONTRACTOR; 16 AWG SHIELDED WIRE FOR RUNS BETWEEN 300 - 500 FEET.

24V POWER ————

FIELD WIRING — — — — (6 WIRE PHONE CORD)

COMMON ————

Units Dimensions and Weights

Figure 9. Standard unit (15 to 40 tons)

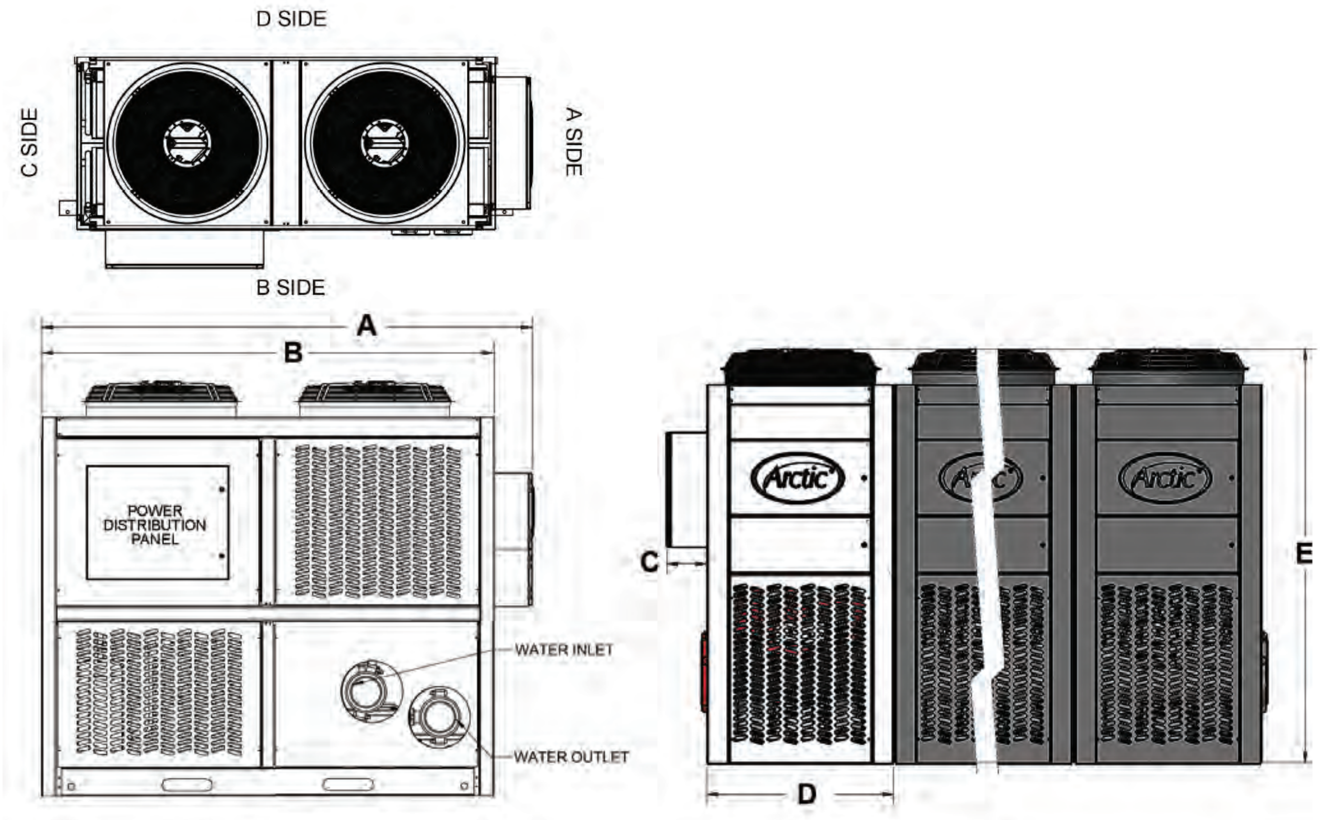


Table 5. tandard unit (15 to 40 tons)

Dim	Units	Unit Sizes and Weights Per Module								
		Manhattan Gen II					SuperMod			
		15 Tons	20 Tons	25 Tons	30 Tons	40 Tons	20 Tons	25 Tons	30 Tons	40 Tons
A	inch	84	84	103	103	103	84	103	103	103
B		76	76	95	95	95	76	95	95	95
C		8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
D		33	33	39.25	39.25	48	33	39.25	39.25	48
E		76	76	87	87	87.5	76	87	87	87.5
Wt	lbs	1800	1800	2500	2500	3000	1600	1800	1850	2050

Figure 10. Standard unit (50 to 80 tons)

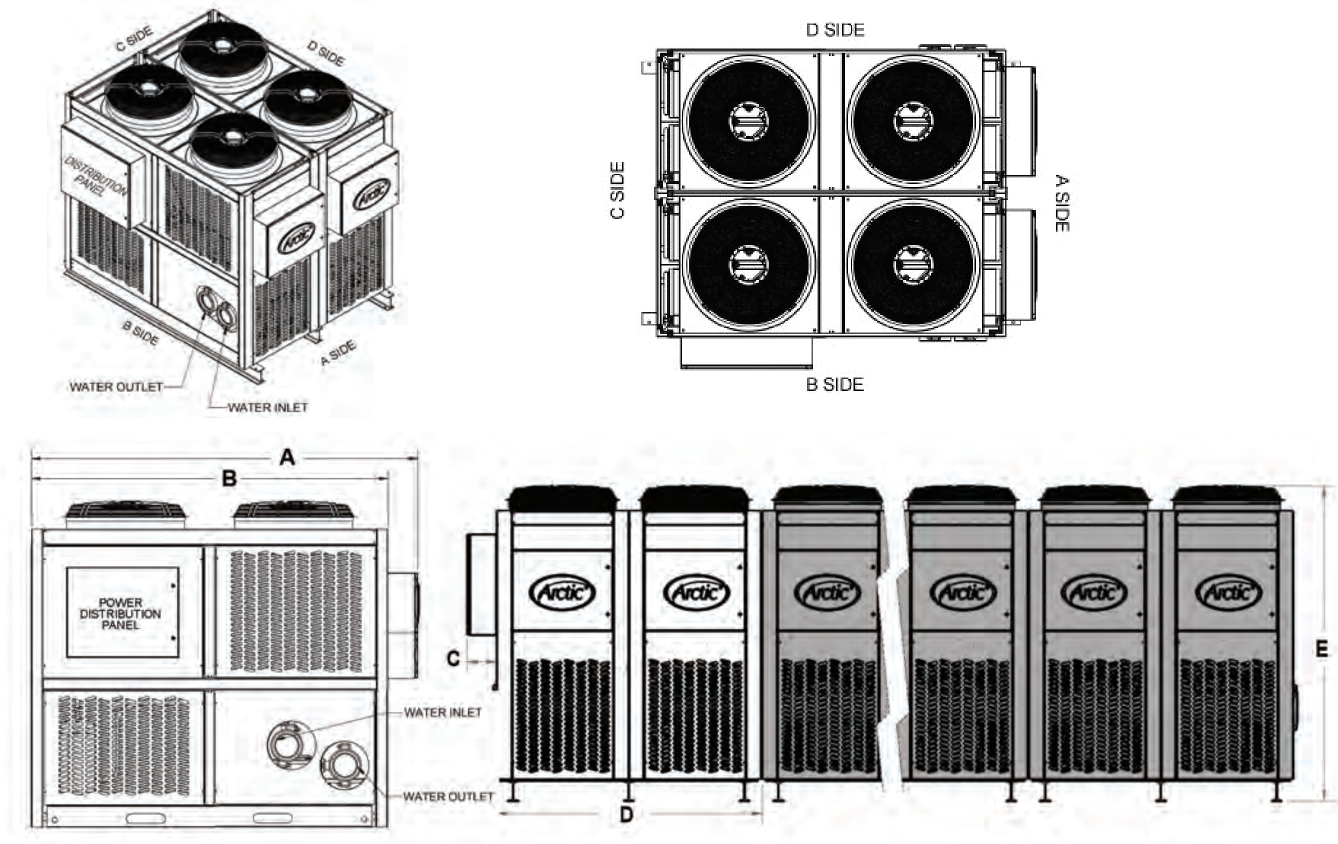
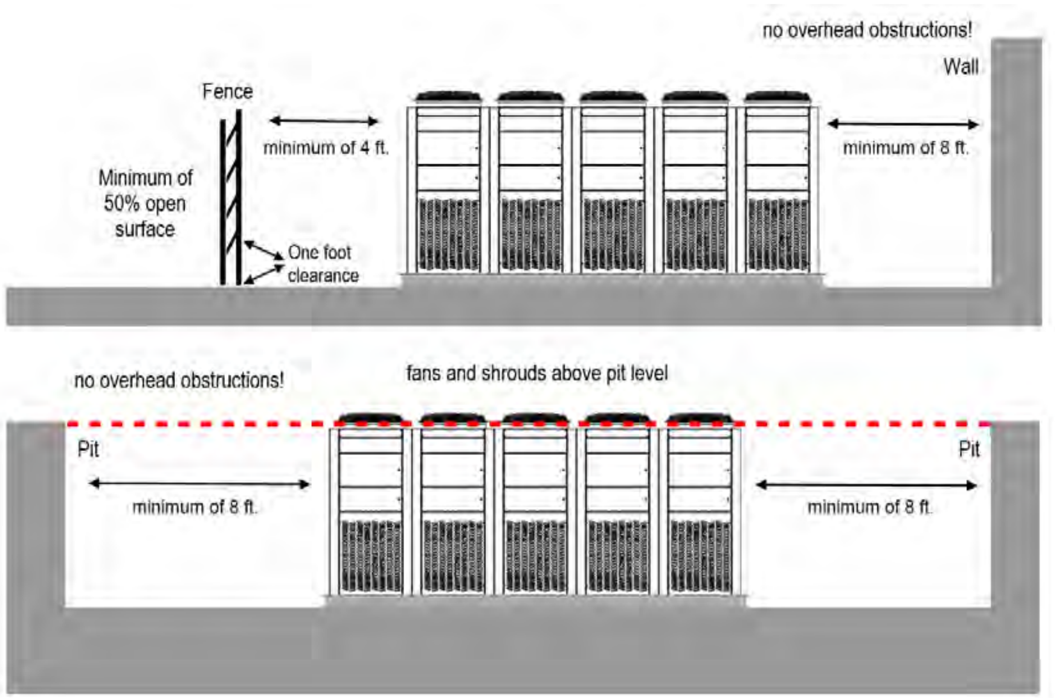


Table 6. Standard unit (50 to 80 tons)

Dim	Unit	Unit Sizes and Weights Per Module		
		Manhattan Gen II		
		50 Tons	60 Tons	80 Tons
A	inch	103	103	103
B		95	95	95
C		8.5	8.5	8.5
D		78.5	78.5	96
E		93.5	93.5	94
Wt	lbs	5000	5000	6000

Service Clearance

Figure 11. Service clearance



Mechanical Specifications

General

The air-cooled modular chiller system shall consist of individual chiller modules that are assembled on site. Each chiller module shall be completely factory wired and tested prior to shipment. Each module shall include a compressor, evaporator, air cooled condenser, and controls. Controls shall be designed on a distributed primary control system that allows the primary microprocessor to operate remaining secondary modules in the event of a malfunction of any secondary controller. The controls shall also be designed to allow each individual secondary microprocessor to operate on its own temperature sensor if there is a failure of the primary microprocessor.

Certified AHRI Performance

Trane air-cooled chillers are rated within the scope of the Air-Conditioning, Heating and Refrigeration Institute (AHRI) Certification Program and display the AHRI Certified® mark as a visual confirmation of conformance to the certification sections of AHRI Standard 550/590 (I-P) and ANSI/AHRI Standard 551/591 (SI).

Refrigeration Circuits

The **Manhattan Gen II** Chiller uses dual independent refrigeration circuits in each module using hermetically sealed scroll compressors each with Rotalock connections, oil level sight glass, suction gas-cooled motor with solid-state sensors in the windings for overload protection, and circuit breaker protection. There shall be two independent compressors and refrigerant circuits per module. Compressors shall be mounted to the formed sheet metal frame with rubber-in-shear vibration isolators.

The **SuperMod** Chiller uses a hermetically sealed tandem scroll compressor set with a true variable speed lead compressor motor and a fixed speed lag compressor. The tandem set shall include an oil level sight glass, suction gas-cooled motor with solid-state sensors in the windings for overload protection, and in-line circuit breaker protection. There shall be two compressors per tandem set and one refrigerant circuit per module. Compressors shall be mounted to the formed sheet metal frame with rubber-in-shear vibration isolators.

Evaporator

The **Manhattan Gen II** chiller uses a dual circuit, brazed plate evaporator on each module constructed of 316 stainless steel plates and copper brazing. The supply and return fluid piping connections to each evaporator shall include an electronic and a manual isolation valve to allow servicing of each module individually while the remaining modules continue to operate, and to allow for variable flow. The fluid connections to each evaporator shall use roll grooved couplings for service convenience and ease of installation. Each evaporator shall be insulated with ¾ inch closed cell insulation. The maximum working pressure shall be 650 psi. Evaporator piping fluid velocity shall not exceed 10 fps at any point in the system.

The **SuperMod** chiller uses a brazed plate, single circuit evaporator in each module constructed of 316 stainless steel plates and copper brazing. The supply and return fluid piping connections to each of the evaporator shall include an electronic and a manual isolation valve to allow servicing of each module individually while the remaining modules continue to operate, and to allow for variable flow. The fluid connections to each evaporator shall use roll grooved couplings for service convenience and ease of installation. Evaporators shall be insulated with ¾ inch closed cell insulation.

Condenser and Fans

The air-cooled condenser coils have aluminum fins mechanically bonded to copper tubes with integral subcooling circuits. The coils shall be sized to provide full heat of rejection at a maximum 25°F temperature difference between the condensing temperature and ambient air temperature at jobsite elevation above sea level. The coils shall be factory tested to a minimum of 600 psig.

The condenser fan motors shall be maintenance free, high efficient Electronically Commutated Motors (ECM) with energy reduction capabilities of up to 35%. The fan motors shall vary speed to maintain the refrigeration head pressure.

Compressor

The **Manhattan Gen II** chiller uses a hermetically sealed, scroll compressor on each refrigeration circuit. The Copeland scroll compressor is a state-of-the-art compressor with relay and overload monitoring capabilities designed to accommodate liquids (both oil and refrigerant) without causing compressor damage.

The **SuperMod** chiller uses a tandem set of fixed speed and variable speed compressors by Copeland. The variable speed compressor is the latest development by Copeland using brushless permanent magnet motors.

The Copeland compressor uses CoreSense technology as a sensor to unlock advanced capabilities such as protection, diagnostics, communication, and verification. Technicians can make faster, more accurate decisions resulting in improved compressor performance and reliability.

Variable Speed Drive (SuperMod)

SuperMod's tandem variable speed compressors also include the Emerson Copeland Scroll EVC1150B/1185B Variable Frequency Drive (VFD) which delivers maximum machine performance with sensorless permanent magnet motor control, for dynamic and efficient machine operation. The drive is designed to control a compressor in one of two modes. The analog / digital control mode and the Modbus control mode.

Unit Controls

The primary chiller module shall incorporate the primary microprocessor controller. The primary microprocessor shall communicate with the remaining secondary microprocessors in each module via a local network communications protocol. The primary microprocessor shall include a phase monitor to protect against low voltage, phase unbalance, phase loss, and phase reversal conditions. The primary controller shall read all analog and fault port values from all secondary module controllers and shall pass these values to the Building Automation System via BACnet®, Modbus™ or LonWorks® protocols.

Each chiller control system shall include operational switches for each compressor; high- and low-pressure transmitters to provide indication of refrigeration pressures in each circuit; high and low refrigeration pressure alarms including shutting shut down the faulty compressor(s); anti-short cycling compressor timers; minimum compressor run timers; connection to Building Automation System (if required).

Carel c.pCO Controller

The chillers employ a Carel c.pCO all-digital data control system which is assigned to all primary and secondary modules to control and report key system settings and indicators. Key features include: Processes all communications, IOs, and executes programs in tens of milliseconds; Online debugging for prompt programming code troubleshooting; Includes 3 serial ports, 2 ethernet ports and 1 USB port.

EXOR eSmart07 HMI

An operator 7–inch touch screen interface panel with graphical display shall be installed on the primary module to allow chiller operation monitoring, adjustment of user set points, and alarm monitoring. Key features include:

- Resistive touchscreen
- Remote monitoring and control with primary-secondary functionality

- Wide selection of communication drivers available with multiple-driver communication capability
- Data display in numerical, text, bar graph, analog gauges, and graphic image formats

Options

Application Options

Heat Recovery Operation

The modular heat recovery chiller system is equipped with a brazed plate condenser in each module each with, a thermal dispersion flow switch plus valves and controls for heat recovery operation.

Heat Pump Operation (Manhattan Gen II Only)

The modular chiller/heat pump system is equipped with a brazed plate heat exchanger for use as an evaporator and condenser in each module. Each fluid branch line includes a thermal dispersion flow switch and fine mesh strainer as well as an electronic and thermal expansion valve. Each refrigeration circuit includes a reversing valve and controls for heat pump operation.

Split System (Manhattan Gen II Only)

Each module shall include a compressor, evaporator, and controls plus a remote outdoor air-cooled condenser. The remote condenser shall be shipped complete with a nitrogen charge. Service valves with access ports allow for pressure testing and evacuation of field installed refrigeration piping. Each condenser shall have its own power supply to a non-fused disconnect switch.

Digital Scroll Compressor (Manhattan Gen II Only)

A digital scroll compressor can be included on the lead compressor or both compressors or the lead of the lead module only for efficient part load operation and close load matching.

Shell and Tube Evaporator (Manhattan Gen II Only)

The chiller can be equipped with a compact shell and tube evaporator on each module that has low susceptibility for fouling compared to the standard brazed plate. The fluid connections to the evaporator shall use roll grooved couplings and neoprene gasket, for service convenience and ease of installation and shall be insulated with ¾ inch closed cell insulation.

Variable Speed Drive on Lead Scroll Compressor (Manhattan Gen II Only)

The lead chiller module or all chiller modules can have a variable speed drive (VSD) on the lead scroll compressor and standard scroll compressor on the lag circuit. The VSD scroll compressor shall provide smooth and efficient operation from 45 Hz to 65 Hz for close temperature control. This part load operation shall lower the compressor condensing temperatures thereby lowering power consumption during variable load or low cooling load demands.

Electronic Isolation Valve

Each evaporator branch line includes a manual inlet and an electronic discharge butterfly valve that only allows system flow to each active module to match the cooling requirements of the system. By isolating individual modules that are not operating, the hydronic system can have variable primary flow. The valves shall be the slow opening type to minimize the sudden change in flow to the previously active modules. The valves shall have a minimum opening cycle time of 90 seconds between the fully closed and open position and shall have roll grooved connections. The valves shall have a minimum close off pressure of not less than 75 psi and shall be rated for a maximum working pressure of 250 psi. The actuators shall be rated for 24 Vac.

Tank and Pump Module

A tank and pump module shall contain:

- Dual lead/lag redundant 3600 RPM cast iron bronze fitted centrifugal pumps each sized to provide the design flow rate at the design pressure head.
- Discharge check valves and suction and discharge isolation valves.

- Discharge pressure gauge.
- Microprocessor controller with automatic lead/lag switching of pumps on time and failure.
- Roll grooved pipe connections.
- 30-gallon diaphragm expansion tank.
- Glycol make up tank with charging pump (for glycol fluid hydronic systems).
- Power distribution panel with single point power supply. Panel is mounted on the tank and pump module and contains a circuit breaker for each module for branch circuit overload protection. A phase monitor is installed in the electrical panel of the primary module for protection against low voltage, phase imbalance, phase loss, and phase reversal.

Optional:

- Variable frequency drive and TEFC premium efficient pump motor for varying each pump speed and flow rate for variable primary flow systems.
- Suction diffuser/strainer on each pump inlet.
- Sealed stainless steel reservoir that includes a liquid level sight glass with isolation valves, manual tank fill, and a low-level cut-out to prevent pump operation in low level conditions, relief valve and vacuum vent and enclosed with 3/4 inch closed cell insulation.

Pump Module

- Dual lead/lag redundant cast iron bronze fitted centrifugal pumps each sized to provide the design flow rate at the design pressure head.
- Discharge check valves and suction and discharge isolation valves.
- Discharge pressure gauge.
- Microprocessor controller with automatic lead/lag switching of pumps on time and failure Roll grooved pipe connections.
- Power distribution panel with single point power supply. Panel is mounted on the tank and pump module and contains a circuit breaker for each module for branch circuit overload protection. A phase monitor is installed in the electrical panel of the primary module for protection against low voltage, phase imbalance, phase loss, and phase reversal.

Optional:

- Variable frequency drive and TEFC premium efficient pump motor for varying each pump speed and flow rate for variable primary flow systems.
- Suction diffuser/strainer on each pump inlet.

Low Ambient Operation

Integral Free Cooling

Aluminum fins mechanically bonded to fluid filled copper tubes can be installed integral to the chiller module for partial and full free cooling. Fin spacing shall not exceed 16 fpi. The coils are designed to provide partial free cooling starting at an ambient temperature 5° below the chilled fluid temperature entering the chiller system. The tubes and headers shall be sized for a maximum velocity of no more than 7 ft/sec. Brass Turbuspirals shall be installed within the coil tubes to increase the amount of turbulence in the fluid flow thereby increasing the rate of heat transfer.

Included is a 3-way, 2-position valve to divert the system fluid to the free cooling coils when the ambient temperature falls 5° F below the chilled fluid temperature entering the chiller system to begin partial free cooling. This temperature set point shall be clearly displayed via a digital LCD display and is field adjustable. The valve actuator is housed in a NEMA 3R weather resistant enclosure. The module piping shall include isolation valves on all three ports to allow the 3-way valve to be removed from the piping for service and replaced without shutting down the system.

Flooded Condenser (Manhattan Gen II Only)

Flooded condenser head pressure control is used to allow operation in ambient temperatures down to -20° F (typical). This option uses a larger charge of refrigerant with a refrigerant receiver to fill the condenser coil with up to 80% of liquid refrigerant such that it effectively reduces the condenser capacity. Flooded condenser head pressure control uses a head pressure control valve on each circuit to store excess refrigerant in the liquid refrigerant receiver during warmer ambient temperatures when the condenser coil is not flooded. These features provide a means for the chiller module to maintain minimum suction and head pressures during low ambient operation.

Refrigerant Liquid Receivers (Manhattan Gen II Only)

A refrigerant receiver shall be included on each refrigeration circuit for flooded condenser head pressure control. Each shall be sized to accommodate the required system pump down capacity. The receivers shall be provided with Rotalock service valves for service isolation. A pressure relief valve rated at 600 psi shall be installed on the refrigerant receiver and piped to the outside of the chiller cabinet. Heat tracing can be provided on the receivers for chillers located in northern environments to keep the refrigerant temperature warm during off cycles to prevent low pressure trips when a compressor starts.

Heat Tracing

This option allows for either the evaporator only or all wetted components to be protected against freezing by installing self-regulating heat trace cable. The heat trace cable is UL listed and CSA certified and consists of two 16 AWG nickel-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature along its length. The heat trace cable shall have a heat output of 8 watts per ft. The cable must be powered by a 120/60/1 circuit provided by others.

Electrical Options

Fused or Non-Fused Disconnect Switch

Systems are optionally equipped with a panel-mounted fused or non-fused disconnect switch installed on the power distribution panel. Alternatively, the disconnect can be installed on each module’s high power electrical panel if the chiller has power supplied directly to each individual module. Fused disconnect switches provide 65,000 amps SCCR protection.

Power Distribution Panel

A single electrical power supply feeds a power distribution panel. The panel is mounted on the primary module or lead-free cooling module or tank and pump module (if equipped) and contains a circuit breaker for each module for branch circuit overload protection.

NEMA 4X Electrical Panels

NEMA 4X stainless steel electrical panels provide protection for electrical equipment in harsh, corrosive, indoor or outdoor environments. The panel ensures protection against corrosion, dust, water, windblown rain, and ice.

Control Options

BMS Integration

The primary microprocessor controller shall provide communications to the building management system. The system shall interface with the BMS via BACnet® MS/TP or BACnet IP/Ethernet, Modbus™ or LonWorks®. All functions of the control system shall be accessible from the BMS including: Chiller enable/disable; Compressor run status; Pump controls; System evaporator and condenser temperatures; Adjustment of all system set points; Review and resetting of all non-active faults; Interrogation and display of all sensor faults.

Remote Monitoring

This option allows a user to perform remote management and monitor and adjust on-site operation data such as pressures, temperatures, time delays, alarm and fault information, trending, troubleshooting, preventive maintenance, and data analysis.

Sound Options

AxiTop Fan Diffuser

Each fan may contain a diffuser that shall improve the efficiency and reduce the noise of the ECM fans. By increasing the fan efficiency, the motor speed can be reduced thereby lowering the sound pressure.

Compressor Wraps

Absorbs compressor sound, dampens vibration and shock, and is weather resistant.

Other Options

Copper Finned Condenser

For corrosive or harsh coastal environments, condenser coils can be offered with all copper fin construction instead of aluminum. Copper has better corrosion resistance than aluminum. The copper tubes are mechanically expanded into the fin collars providing a permanent metal-to-metal bond for efficient heat transfer.

Epoxy Coated Condenser

An epoxy coated condenser is corrosion resistant and will provide increased condenser longevity.

Stainless Steel Cabinet Enclosure

Stainless steel sheet metal panels are available for corrosion resistance and shall be easily removable for servicing via stainless steel fasteners and retaining clips.

Trane - by Trane Technologies (NYSE: TT), a global innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

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