



# Controls, Start-Up, Operation, Service, and Troubleshooting

## SAFETY CONSIDERATIONS

Installing, starting up, and servicing this equipment can be hazardous due to system pressures, electrical components, and equipment location (roof, elevated structures, mechanical rooms, etc.). Only trained, qualified installers and service mechanics should install, start up, and service this equipment.

When working on this equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply. Follow all safety codes. Wear safety glasses and work gloves. Use care in handling, rigging, and setting this equipment, and in handling all electrical components.

### ⚠ WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation and service. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

### ⚠ WARNING

DO NOT VENT refrigerant relief valves within a building. Outlet from relief valves must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigeration and Air Conditioning Engineers) 15 (Safety Code for Mechanical Refrigeration). The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation. Provide adequate ventilation in enclosed or low overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness or death. Misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation. Decomposition products are hazardous.

### ⚠ WARNING

DO NOT attempt to unbraid factory joints when servicing this equipment. Compressor oil is flammable and there is no way to detect how much oil may be in any of the refrigerant lines. Cut lines with a tubing cutter as required when performing service. Use a pan to catch any oil that may come out of the lines and as a gauge for how much oil to add to system. DO NOT re-use compressor oil.

### ⚠ CAUTION

This unit uses a microprocessor-based electronic control system. Do not use jumpers or other tools to short out components, or to bypass or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

### ⚠ CAUTION

To prevent potential damage to heat exchanger, always run fluid through heat exchanger when adding or removing refrigerant charge. Use appropriate brine solutions in cooler fluid loop to prevent the freezing of brazed plate heat exchanger, optional hydronic section and/or interconnecting piping when the equipment is exposed to temperatures below 32 F (0 °C). Proof of flow switch and strainer are factory installed on all models. Do NOT remove power from this chiller during winter shutdown periods without taking precaution to remove all water from heat exchanger and optional hydronic system. Failure to properly protect the system from freezing may constitute abuse and may void warranty.

### ⚠ CAUTION

Compressors and optional hydronic system pumps require specific rotation. Test condenser fan(s) first to ensure proper phasing. Swap any two incoming power leads to correct condenser fan rotation before starting any other motors.

### ⚠ CAUTION

Refrigerant charge must be removed slowly to prevent loss of compressor oil that could result in compressor failure.

# CONTENTS

	Page
<b>SAFETY CONSIDERATIONS</b> .....	1
<b>GENERAL</b> .....	2,3
<b>MAJOR SYSTEM COMPONENTS</b> .....	3,4
General .....	3
Main Base Board (MBB) .....	3
Scrolling Marquee Display .....	3
Energy Management Module (EMM) .....	3
Enable/Off/Remote Contact Switch .....	3
Emergency On/Off Switch .....	3
Board Addresses .....	3
Control Module Communication .....	3
Carrier Comfort Network Interface .....	3
<b>OPERATING DATA</b> .....	4-46
<b>Sensors</b> .....	4
• T1 — COOLER LEAVING FLUID SENSOR	
• T2 — COOLER ENTERING FLUID SENSOR	
• T7,T8 — COMPRESSOR RETURN GAS TEMPERATURE SENSOR (ACCESSORY)	
• T9 — OUTDOOR-AIR TEMPERATURE SENSOR	
• T10 — REMOTE SPACE TEMPERATURE SENSOR OR DUAL LEAVING WATER TEMPERATURE SENSOR	
<b>Energy Management Module</b> .....	17
<b>Loss-of-Cooler Flow Protection</b> .....	17
<b>Thermostatic Expansion Valves (TXV)</b> .....	17
<b>Capacity Control</b> .....	17
• MINUTES LEFT FOR START	
• MINUTES OFF TIME	
• LEAD/LAG DETERMINATION	
• CAPACITY CONTROL OVERRIDES	
<b>Head Pressure Control</b> .....	21
<b>Operation of Machine Based on Control Method and Cooling Set Point Selection Settings</b> .....	22
<b>Cooling Set Point Select</b> .....	22
<b>Marquee Display Usage</b> .....	23
<b>Service Test</b> .....	23
<b>Optional Factory-Installed Hydronic Package</b> .....	24
<b>Cooler Pump Control</b> .....	24
<b>Cooler Pump Sequence of Operation</b> .....	24
<b>Configuring and Operating Dual Chiller Control</b> .....	26
<b>Temperature Reset</b> .....	43
<b>Demand Limit</b> .....	44
• DEMAND LIMIT (2-Stage Switch Controlled)	
• EXTERNALLY POWERED DEMAND LIMIT (4 to 20 mA Controlled)	
• DEMAND LIMIT (CCN Loadshed Controlled)	
<b>Cooling Set Point (4 to 20 mA)</b> .....	45
<b>TROUBLESHOOTING</b> .....	46-57
<b>Complete Unit Stoppage and Restart</b> .....	46
• GENERAL POWER FAILURE	
• UNIT ENABLE-OFF-REMOTE CONTACT SWITCH IS OFF	
• CHILLED FLUID PROOF-OF-FLOW SWITCH OPEN	
• OPEN HIGH-PRESSURE SWITCH(ES)	
• OPEN COMPRESSOR INTERNAL THERMAL PROTECTION	
• OPEN 24-V CONTROL CIRCUIT BREAKERS	
• COOLING LOAD SATISFIED	
• THERMISTOR FAILURE	
• LOW SATURATED SUCTION	
<b>Alarms and Alerts</b> .....	53
<b>SERVICE</b> .....	58-73
<b>Electronic Components</b> .....	58
• CONTROL COMPONENTS	
<b>Compressor Replacement</b> .....	58
<b>Cooler</b> .....	58
• BRAZED-PLATE COOLER HEAT EXCHANGER REPLACEMENT	
• BRAZED-PLATE COOLER HEAT EXCHANGER CLEANING	
<b>Check Oil Charge</b> .....	60

	Page
<b>Condenser Section and Coils</b> .....	60
• COIL CLEANING	
• CLEANING E-COATED COILS	
• CONDENSER SECTION	
<b>Check Refrigerant Feed Components</b> .....	61
• THERMOSTATIC EXPANSION VALVE (TXV)	
• FILTER DRIER	
• MOISTURE-LIQUID INDICATOR	
• MINIMUM LOAD VALVE	
• PRESSURE RELIEF DEVICES	
<b>Compressor and Unit Protective Devices</b> .....	62
• MANUAL STARTER	
• COMPRESSOR INTERNAL THERMAL PROTECTION	
<b>Check Unit Safeties</b> .....	62
• HIGH-PRESSURE SWITCH	
• PRESSURE TRANSDUCERS	
• COOLER FREEZE-UP PROTECTION	
• HEATER CABLE	
• WINTER SHUTDOWN	
<b>Thermistors</b> .....	63
<b>Pressure Transducers</b> .....	63
<b>Flow Sensor</b> .....	63
<b>Strainer</b> .....	68
<b>Motormaster® V Controller</b> .....	68
• GENERAL OPERATION	
• SET POINTS	
• INSTALLATION	
• PROGRAMMING	
• EPM CHIP	
• LIQUID LINE PRESSURE SET POINT ADJUSTMENT	
• LOSS OF CCN COMMUNICATIONS	
• REPLACING DEFECTIVE MODULES	
<b>Hydronic Package</b> .....	73
<b>MAINTENANCE</b> .....	74
<b>Recommended Maintenance Schedule</b> .....	74
<b>PRE-START-UP</b> .....	74
<b>System Check</b> .....	74
<b>START-UP AND OPERATION</b> .....	74-76
<b>Actual Start-Up</b> .....	74
<b>Check Refrigerant Charge</b> .....	75
<b>Operating Limitations</b> .....	75
• TEMPERATURES	
• LOW AMBIENT OPERATION	
• VOLTAGE — ALL UNITS	
<b>OPERATION SEQUENCE</b> .....	76
<b>APPENDIX A — CCN TABLES</b> .....	77-88
<b>APPENDIX B — FACTORY SETTINGS FOR COMPRESSOR, FAN, PUMP AND MANUAL STARTERS</b> .....	89,90
<b>APPENDIX C — BUILDING INTERFACE</b> .....	91,92
<b>START-UP CHECKLIST FOR 30RA LIQUID CHILLER</b> .....	CL-1-CL-8

## GENERAL

This publication contains Controls Start-Up, Service, Operation, and Troubleshooting information for the 30RA AquaSnap® air-cooled chillers. See Table 1. These chillers are equipped with *ComfortLink*™ controls and conventional thermostatic expansion valves (TXVs).

### **▲ WARNING**

This unit uses a microprocessor-based electronic control system. Do not use jumpers or other tools to short out or bypass components or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the board or electrical component.

**Table 1 — Unit Sizes**

UNIT	NOMINAL CAPACITY (TONS) 50/60 Hz
30RA010	10/10
30RA015	14/13
30RA018	16/16
30RA022	22/20
30RA025	24/23
30RA030*	27
30RA032†	30
30RA035	35/34
30RA040*	38
30RA042†	40
30RA045	43/45
30RA050*	47
30RA055*	54

\*60 Hz only.  
†50 Hz only.

## MAJOR SYSTEM COMPONENTS

**General** — The 30RA air-cooled reciprocating chillers contain the *ComfortLink™* electronic control system that controls and monitors all operations of the chiller.

The control system is composed of several components as listed in the sections below. See Fig. 1 and 2 for typical control box drawing. See Fig. 3-6 for control schematics.

**Main Base Board (MBB)** — See Fig. 7. The MBB is the heart of the *ComfortLink* control system. It contains the major portion of operating software and controls the operation of the machine. The MBB continuously monitors input/output channel information received from its inputs and from all other modules. The MBB receives inputs from the discharge and suction pressure transducers and thermistors. See Table 2. The MBB also receives the feedback inputs from each compressor contactor, auxiliary contacts, and other status switches. See Table 3. The MBB also controls several outputs. Relay outputs controlled by the MBB are shown in Table 4. Information is transmitted between modules via a 3-wire communication bus or LEN (Local Equipment Network). The CCN (Carrier Comfort Network) bus is also supported. Connections to both LEN and CCN buses are made at TB3. See Fig. 8.

**Scrolling Marquee Display** — This standard device is the keypad interface used for accessing chiller information, reading sensor values, and testing the chiller. The marquee display is a 4-key, 4-character, 16-segment LED (light-emitting diode) display. Eleven mode LEDs are located on the display as well as an Alarm Status LED. See Marquee Display Usage section on page 23 for further details.

**Energy Management Module (EMM)** — The EMM module is available as a factory-installed option or as a field-installed accessory. The EMM module receives 4 to 20 mA inputs for the leaving fluid temperature reset, cooling set point and demand limit functions. The EMM module also receives the switch inputs for the field-installed 2-stage demand limit and ice done functions. The EMM module communicates the status of all inputs with the MBB, and the MBB adjusts the control point, capacity limit, and other functions according to the inputs received.

**Enable/Off/Remote Contact Switch** — The Enable/Off/Remote Contact switch is a 3-position switch used to control the chiller. When switched to the Enable position the chiller is under its own control. Move the switch to the Off position to shut the chiller down. Move the switch to the Remote Contact position and a field-installed dry contact can be used to start the chiller. The contacts must be capable of handling a 24 vac, 50-mA load. In the Enable and Remote

Contact (dry contacts closed) positions, the chiller is allowed to operate and respond to the scheduling configuration, CCN configuration and set point data. See Fig. 8.

**Emergency On/Off Switch** — The Emergency On/Off switch should only be used when it is required to shut the chiller off immediately. Power to the MBB, EMM, and marquee display is interrupted when this switch is off and all outputs from these modules will be turned off.

**Board Addresses** — The Main Base Board (MBB) has a 3-position Instance jumper that must be set to '1.' All other boards have 4-position DIP switches. All switches are set to 'On' for all boards.

## Control Module Communication

**RED LED** — Proper operation of the control boards can be visually checked by looking at the red status LEDs (light-emitting diodes). When operating correctly, the red status LEDs should be blinking in unison at a rate of once every 2 seconds. If the red LEDs are not blinking in unison, verify that correct power is being supplied to all modules. Be sure that the Main Base Board (MBB) is supplied with the current software. If necessary, reload current software. If the problem still persists, replace the MBB. A red LED that is lit continuously or blinking at a rate of once per second or faster indicates that the board should be replaced.

**GREEN LED** — The MBB has one green LED. The Local Equipment Network (LEN) LED should always be blinking whenever power is on. All other boards have a LEN LED which should be blinking whenever power is on. Check LEN connections for potential communication errors at the board J3 and/or J4 connectors. Communication between modules is accomplished by a 3-wire sensor bus. These 3 wires run in parallel from module to module. The J4 connector on the MBB provides both power and communication directly to the marquee display only.

**YELLOW LED** — The MBB has one yellow LED. The Carrier Comfort Network (CCN) LED will blink during times of network communication.

**Carrier Comfort Network (CCN) Interface** — The 30RA chiller units can be connected to the CCN if desired. The communication bus wiring is a shielded, 3-conductor cable with drain wire and is supplied and installed in the field. See Table 5. The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pins of the system elements on either side of it. This is also required for the negative and signal ground pins of each system element. Wiring connections for CCN should be made at TB3. Consult the CCN Contractor's Manual for further information.

NOTE: Conductors and drain wire must be 20 AWG (American Wire Gage) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon with a minimum operating temperature range of -20 C to 60 C is required. Wire manufactured by Alpha (2413 or 5463), American (A22503), Belden (8772), or Columbia (02525) meets the above mentioned requirements.

It is important when connecting to a CCN communication bus that a color coding scheme be used for the entire network to simplify the installation. It is recommended that red be used for the signal positive, black for the signal negative, and white for the signal ground. Use a similar scheme for cables containing different colored wires.

At each system element, the shields of its communication bus cables must be tied together. If the communication bus is entirely within one building, the resulting continuous shield must be connected to a ground at one point only. If the communication bus cable exits from one building and enters another, the shields must be connected to grounds at the lightning suppressor in each building where the cable enters or exits the building (one point per building only). To connect the unit to the network:

1. Turn off power to the control box.
2. Cut the CCN wire and strip the ends of the red (+), white (ground), and black (-) conductors. (Substitute appropriate colors for different colored cables.)
3. Connect the red wire to (+) terminal on TB3 of the plug, the white wire to COM terminal, and the black wire to the (-) terminal.
4. The RJ14 CCN connector on TB3 can also be used, but is only intended for temporary connection (for example, a laptop computer running Service Tool).

**IMPORTANT:** A shorted CCN bus cable will prevent some routines from running and may prevent the unit from starting. If abnormal conditions occur, unplug the connector. If conditions return to normal, check the CCN connector and cable. Run new cable if necessary. A short in one section of the bus can cause problems with all system elements on the bus.

**Table 2 — Thermistor Designations**

THERMISTOR NO.	PIN CONNECTION POINT	THERMISTOR INPUT
T1	J8-13,14 (MBB)	Cooler Leaving Fluid
T2	J8-11,12 (MBB)	Cooler Entering Fluid
T7	J8-1,2 (MBB)	Circuit A Return Gas Temperature (Accessory)
T8	J8-3,4 (MBB)	Circuit B (032-055 only) Return Gas Temperature (Accessory)
T9	J8-7,8 (MBB)	Outdoor-Air Temperature Sensor
T10	J8-5,6 (MBB) TB5-5,6	Accessory Remote Space Temperature Sensor or Dual LWT Sensor

**LEGEND**

- LWT — Leaving Water Temperature  
 MBB — Main Base Board

**Table 3 — Status Switches**

STATUS SWITCH	PIN CONNECTION POINT
Chilled Water Pump 1	J7-1,2
Chilled Water Pump 2	J7-3,4
Remote On/Off	TB5-9,10
Cooler Flow Switch	J7-9,10
Compressor Fault Signal, A1	J9-11,12
Compressor Fault Signal, A2	J9-5,6
Compressor Fault Signal, B1	J9-8,9
Compressor Fault Signal, B2	J9-2,3

**Table 4 — Output Relays**

RELAY NO.	DESCRIPTION
K1	Energize Compressor A1 (010-030) Energize Compressor A1 and Condenser Fan A1 (032-055)
K2	Energize Compressor B1 and Condenser Fan B1 at Low Speed (032-040) Energize Compressor B1 and Condenser Fan B1 (042-055)
K3	Energize Chilled Water Pump 1 Output
K4	Energize Chilled Water Pump 2 Output
K5	Energize Compressor A2 (all but 010, 015 60Hz)
K6	Energize Compressor B2 (042-055 only)
K7	Alarm Relay
K8	Cooler/Pump Heater
K9	Energize Condenser Fan at Low Speed (010-018) Energize Condenser Fan A1 (022-030) Energize Condenser Fan A2 (032-055)
K10	Energize Condenser Fan at High Speed (010-018) Energize Condenser Fan A2 (022-030) Energize Condenser Fan B1 at High Speed (032-040) Energize Condenser Fan B2 (042-055)
K11	Minimum Load Valve

**Table 5 — CCN Communication Bus Wiring**

MANUFACTURER	PART NO.	
	Regular Wiring	Plenum Wiring
Alpha	1895	—
American	A21451	A48301
Belden	8205	884421
Columbia	D6451	—
Manhattan	M13402	M64430
Quabik	6130	—

**OPERATING DATA**

**Sensors** — The electronic control uses 3 to 6 thermistors to sense temperatures for controlling chiller operation. See Table 2. These sensors are outlined below. Thermistors T1, T2, T9 and accessory suction gas temperatures (T7,T8) are 5 kΩ at 77 F (25 C) and are identical in temperature versus resistance and voltage drop performance. Thermistor T10 is 10 kΩ at 77 F (25 C) and has a different temperature vs. resistance and voltage drop performance. See Thermistors section for temperature-resistance-voltage drop characteristics.

T1 — COOLER LEAVING FLUID SENSOR — On 30RA010-030 sizes, this thermistor is installed in a friction fit well at the bottom of the brazed-plate heat exchanger on the control box side. For 30RA032-055 sizes, this thermistor is installed in a well in the factory-installed leaving fluid piping coming from the bottom of the brazed-plate heat exchanger opposite the control box side.

T2 — COOLER ENTERING FLUID SENSOR — On 30RA010-030 sizes, this thermistor is installed in a friction fit well at the top of the brazed-plate heat exchanger on the control box side. For 30RA032-055 sizes, this thermistor is installed in a well in the factory-installed entering fluid piping coming from the top of the brazed-plate heat exchanger opposite the control box side.

T7,T8 — COMPRESSOR RETURN GAS TEMPERATURE SENSOR (ACCESSORY) — A well for this sensor is factory installed in each circuit's suction line. If desired, a 5 kΩ thermistor (Carrier part number HH79NZ029) can be installed in this well and connected to the Main Base Board as shown in Table 2. Use the Scrolling Marquee display to configure the sensor (Configuration mode, sub-mode OPT1 — enable item RG.EN).

T9 — OUTDOOR-AIR TEMPERATURE SENSOR — This sensor is factory-installed on a bracket at the left side of compressor A1 on 30RA010-030 models. For models 30RA032-055, it is installed behind the panel below the control box center door.

**T10 — REMOTE SPACE TEMPERATURE SENSOR OR DUAL LEAVING WATER TEMPERATURE SENSOR —**

One of two inputs can be connected to TB5-5 and TB5-6. See appropriate sensor below.

**T10 — Remote Space Temperature Sensor** — Sensor T10 (part no. 33ZCT55SPT) is an accessory sensor that is remotely mounted in the controlled space and used for space temperature reset. The sensor should be installed as a wall-mounted thermostat would be (in the conditioned space where it will not be subjected to either a cooling or heating source or direct exposure to sunlight, and 4 to 5 ft above the floor).

Space temperature sensor wires are to be connected to terminals in the unit main control box. The space temperature sensor includes a terminal block (SEN) and a RJ11 female connector. The RJ11 connector is used access into the Carrier Comfort Network (CCN) at the sensor.

To connect the space temperature sensor (Fig. 9):

1. Using a 20 AWG twisted pair conductor cable rated for the application, connect 1 wire of the twisted pair to one SEN terminal and connect the other wire to the other SEN terminal located under the cover of the space temperature sensor.
2. Connect the other ends of the wires to terminals 5 and 6 on TB5 located in the unit control box.

Units on the CCN can be monitored from the space at the sensor through the RJ11 connector, if desired. To wire the RJ11 connector into the CCN (Fig. 10):









**IMPORTANT:** The cable selected for the RJ11 connector wiring **MUST** be identical to the CCN communication bus wire used for the entire network. Refer to Table 5 for acceptable wiring.

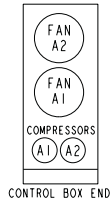
1. Cut the CCN wire and strip ends of the red (+), white (ground), and black (–) conductors. (If another wire color scheme is used, strip ends of appropriate wires.)
2. Insert and secure the red (+) wire to terminal 5 of the space temperature sensor terminal block.
3. Insert and secure the white (ground) wire to terminal 4 of the space temperature sensor.
4. Insert and secure the black (–) wire to terminal 2 of the space temperature sensor.

5. Connect the other end of the communication bus cable to the remainder of the CCN communication bus.

**T10 — Dual Leaving Water Temperature Sensor** — For dual chiller applications (parallel only are supported), connect the dual chiller leaving fluid temperature sensor (5 kΩ thermistor, Carrier part no. HH79NZ029) to the space temperature input of the Master chiller. If space temperature is required for reset applications, connect the sensor to the Slave chiller and configure the slave chiller to broadcast the value to the Master chiller.

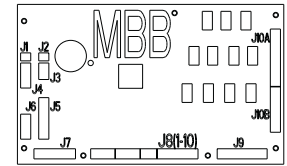
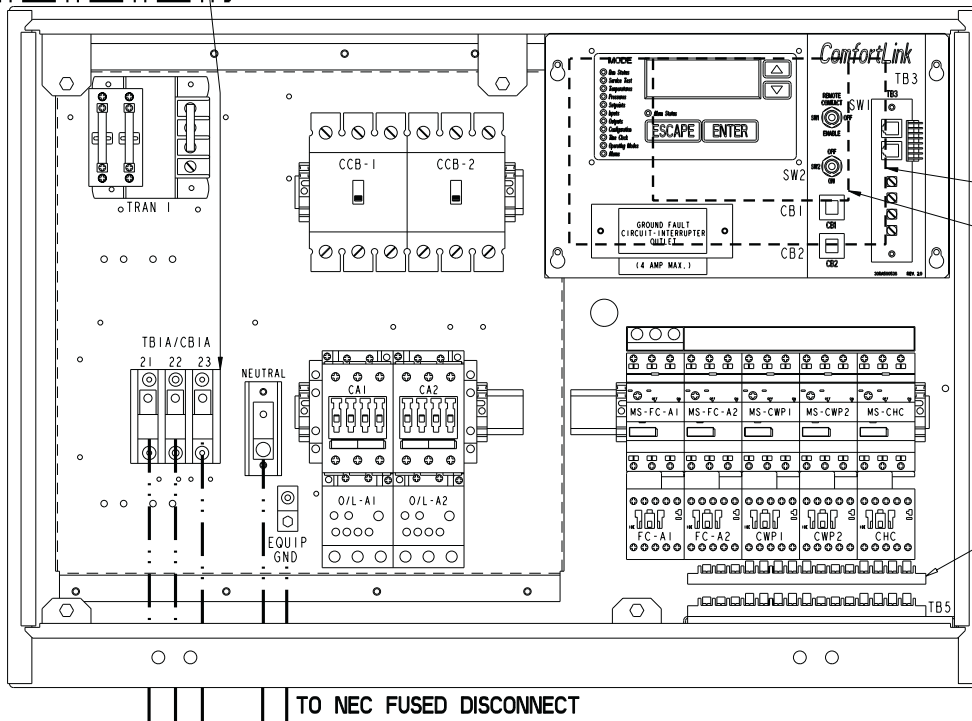
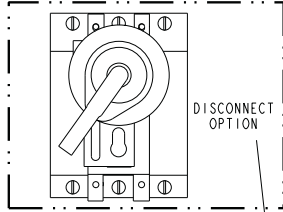
**LEGEND FOR FIG. 1-6**

<b>ALMR</b>	— Alarm Relay
<b>BR</b>	— Boiler Relay
<b>C</b>	— Contactor, Compressor
<b>CB</b>	— Circuit Breaker
<b>CCB</b>	— Compressor Circuit Breaker
<b>CHC</b>	— Cooler/Pump Heater Contactor
<b>COMP</b>	— Compressor
<b>CWFS</b>	— Chilled Water Flow Switch
<b>CWP</b>	— Chilled Water Pump
<b>DPT</b>	— Discharge Pressure Transducer
<b>EMM</b>	— Energy Management
<b>FIOP</b>	— factory Installed Option
<b>FM</b>	— Fan Motor
<b>GND</b>	— Ground
<b>HPS</b>	— High-Pressure Switch
<b>HR</b>	— Heat Relay
<b>ICP</b>	— Inrush Current Protection
<b>IP</b>	— Internal Protection Thermostat
<b>LWT</b>	— Leaving Water Temperature
<b>MBB</b>	— Main Base Board
<b>MLV</b>	— Minimum Load Valve
<b>MS</b>	— Manual Starter
<b>OAT</b>	— Outdoor-Air Thermistor
<b>OL</b>	— Overload
<b>R</b>	— Relay
<b>SPT</b>	— Suction Pressure Transducer
<b>SW</b>	— Switch
<b>T</b>	— Thermistor
<b>TB</b>	— Terminal Block
<b>TNKR</b>	— Storage Tank Heater Relay
<b>TRAN</b>	— Transformer
	Terminal Block
	Terminal (Unmarked)
	Terminal (Marked)
	Splice
	Factory Wiring
	Field Wiring
	Accessory or Option Wiring
	To indicate common potential only; not to represent wiring.

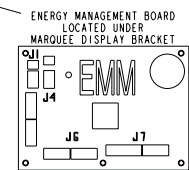


- NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
  2. USE 15°C MIN WIRE FOR FIELD POWER SUPPLY.
  3. ALL COMPRESSOR MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 156% RLA. ALL OTHER MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 40% FLA.
  4. ALL FIELD INTERLOCK CONTACTS MUST HAVE A MIN RATING OF 2 AMPS @ 24VAC SEALED. SEE FIELD INTERLOCK WIRING.
  5. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED - THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.
  6. INTERCHANGE FAN MOTOR CONNECTIONS 1 AND 3 TO ENSURE COUNTER CLOCKWISE FAN ROTATION.
  7. TERMINALS 9 & 10 OF TB5 ARE FOR FIELD CONNECTION OF REMOTE ON-OFF. THE CONTACT MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA TO 20 MA LOAD.
  8. ALARM RELAY MUST BE INSTALLED FOR HEATING/BOILER RELAY OPERATION. DPST RELAY MUST BE USED FOR HEAT RELAY.
  9. FOR 500 SERIES UNIT OPERATION AT 208-3-60V LINE VOLTAGE, TRANT PRIMARY CONNECTIONS MUST BE MOVED TO TERMINALS H3 & H4.

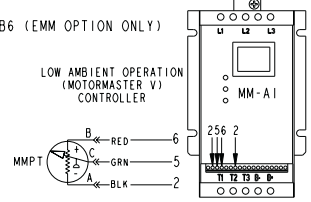
FUSE NUMBER	UNIT VOLTAGE	TRANSFORMER SIZE	REPLACE WITH
FU1 & FU2	380-3-60, 460-3-60, 575-3-60	100VA	FNO-R-3/4
FU3 (24V)	208/230-3-60, 230-3-50, 380/415-3-50		FNO-R-2
FU4 (115V)	380-3-60, 460-3-60, 575-3-60	100VA	FNM-6
FU5 & FU6	208/230-3-60, 230-3-60	500VA	FNM-6
	460-3-60, 575-3-60	500VA	FNO-R-2 1/2
	208/230-3-60, 230-3-60	500VA	FNO-R-3 1/2



MAIN BASE BOARD LOCATED UNDER MARQUEE DISPLAY BRACKET



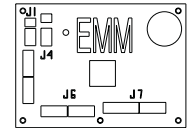
ENERGY MANAGEMENT BOARD LOCATED UNDER MARQUEE DISPLAY BRACKET



LOW AMBIENT OPERATION (MOTORMASTER V) CONTROLLER

TO NEC FUSED DISCONNECT

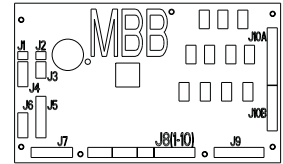
Fig. 1 — Typical Control Box for 30RA010-030 (022-030 Shown)



ENERGY MANAGEMENT BOARD  
LOCATED UNDER  
SCROLLING MARQUEE BRACKET

- NOTES:
- FACTORY WIRING IS IN ACCORDANCE WITH UL 1995 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
  - USE 75°C MIN WIRE FOR FIELD POWER SUPPLY.
  - ALL COMPRESSOR MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 156% FLA. ALL OTHER MANUAL STARTERS "MUST TRIP AMPS" ARE EQUAL TO OR LESS THAN 140% FLA.
  - ALL FIELD INTERLOCK CONTACTS MUST HAVE A MIN RATING OF 2 AMPS @ 24VAC SEALED. SEE FIELD INTERLOCK WIRING.
  - COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED-- THREE PHASE MOTORS PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.
  - INTERCHANGE FAN MOTOR CONNECTIONS 1 AND 3 TO ENSURE COUNTER CLOCKWISE FAN ROTATION.
  - TERMINALS 9 & 10 OF TB5 ARE FOR FIELD CONNECTION OF REMOTE ON-OFF. THE CONTACT MUST BE RATED FOR DRY CIRCUIT APPLICATION CAPABLE OF HANDLING A 5VDC 1 MA TO 20 MA LOAD.
  - ALARM RELAY MUST BE INSTALLED FOR HEATING/BOILER RELAY OPERATION. DPST RELAY MUST BE USED FOR HEAT RELAY.
  - FOR 500 SERIES UNIT OPERATION AT 208-3-60V LINE VOLTAGE, TRAN1 PRIMARY CONNECTIONS MUST BE MOVED TO TERMINALS H3 & H4.

FUSE NUMBER	UNIT VOLTAGE	TRANSFORMER SIZE	REPLACE WITH
FU1 & FU2	380-3-60, 460-3-60, 575-3-60	200VA	FNO-R-1 1/2
FU3	208/230-3-60, 230-3-50, 380/415-3-50	200VA	FNO-R-3
FU4 (24V)	380-3-60, 460-3-60, 575-3-60	200VA	FNM-10
FU4 (115V)	208/230-3-60, 230-3-50, 380/415-3-50	500VA	FNM-6
FU5 & FU6	460-3-60, 575-3-60	500VA	FNO-R-2 1/2
	208/230-3-60, 230-3-60	500VA	FNO-R-3 1/2



MAIN BASE BOARD  
LOCATED UNDER  
SCROLLING MARQUEE  
BRACKET

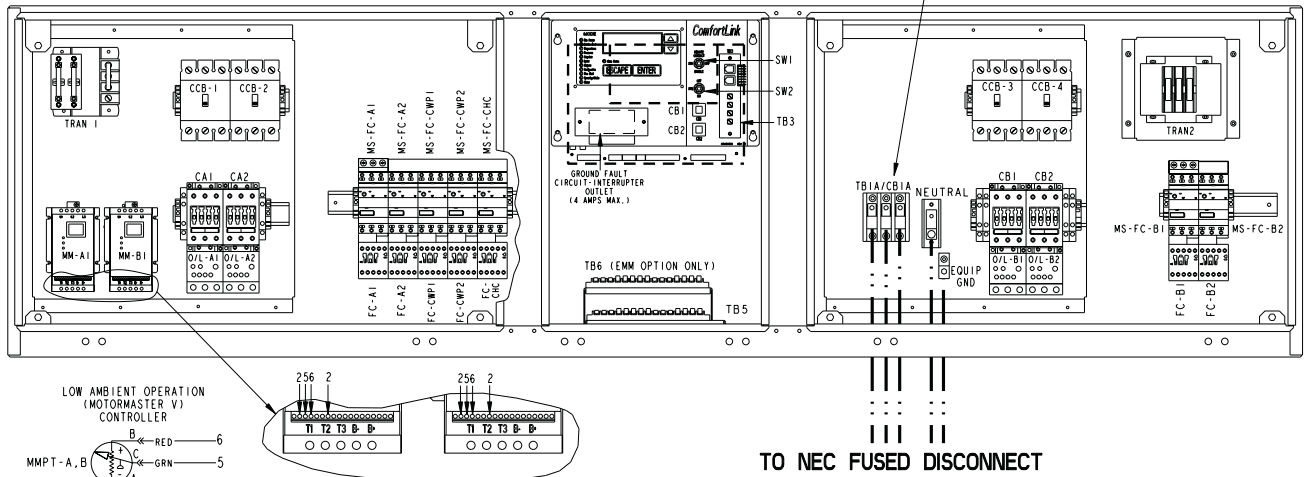


Fig. 2 — Typical Control Box for 30RA032-055 (042-055 Shown)