



Installation Instructions

Part No: 30RA-900---024, 30RA-900---025, 30RA-900---026, 30RA-900---027,
 30RA-900---028, and 30RA-900---029

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GENERAL

This book contains instructions for the installation and start-up of the Motormaster V electronic low ambient control on chiller models 30RA010-055.

This control varies condenser fan speed based on liquid pressure. The control is a Variable Frequency Drive (VFD) and is only compatible with motors rated for use with VFDs. The accompanying pressure transducer has a 0 to 5 vdc output over a -40 to 460 psi range. The VFD provides a 5 vdc supply voltage for the transducer.

This system is a reverse acting, proportional-integral (PI) control. The VFD will vary the motor speed to drive the liquid line pressure to the set point. At higher ambient temperatures, the fan will go to full speed (60 Hz or 50 Hz depending on model) and remain there since it can not go fast enough to bring the pressure down to the set point. When the VFD is at full speed, it acts just like a fixed speed fan.

When the ambient air temperature drops, a fan running at full speed draws too much air across the condenser coil to maintain a minimum condensing pressure/temperature. In these conditions, the VFD will slow down and begin to maintain a set point.

Operating modes are configured for R-22 with a set point of approximately 200 psig on the liquid line as configured by the start command jumper.

NOTE: The drive is phase insensitive in regard to incoming line voltage. This means that the VFD will operate with any phase sequence of the incoming three-phase power.

The standard outdoor-air temperature limitation of the AquaSnap chillers is 45 F (7.2 C) (sizes 010-018) and 32 F (0° C) (sizes 022-055).

The Motormaster V electronic control low ambient operation kit can be used to extend the system operation down to -20 F (28 C).

SAFETY CONSIDERATIONS

▲ WARNING

Be sure power to equipment is shut off before performing maintenance or service.

Installing, starting up, and servicing air-conditioning equipment can be hazardous due to system pressures, electrical components and equipment location.

Only trained, qualified installers and service technicians should install, start up, and service this equipment.

When working on air-conditioning equipment, observe pre-cautions in the literature and on tags, stickers, and labels attached to the equipment.

Follow all safety codes. Wear safety glasses and work gloves. Use care in handling equipment.

PREINSTALLATION

Inspect the contents of the accessory package before installing. File a claim with the shipper if you find shipping damage or contact your Carrier representative if any parts are missing. See Tables 1A and 1B for kit package contents.

INSTALLATION

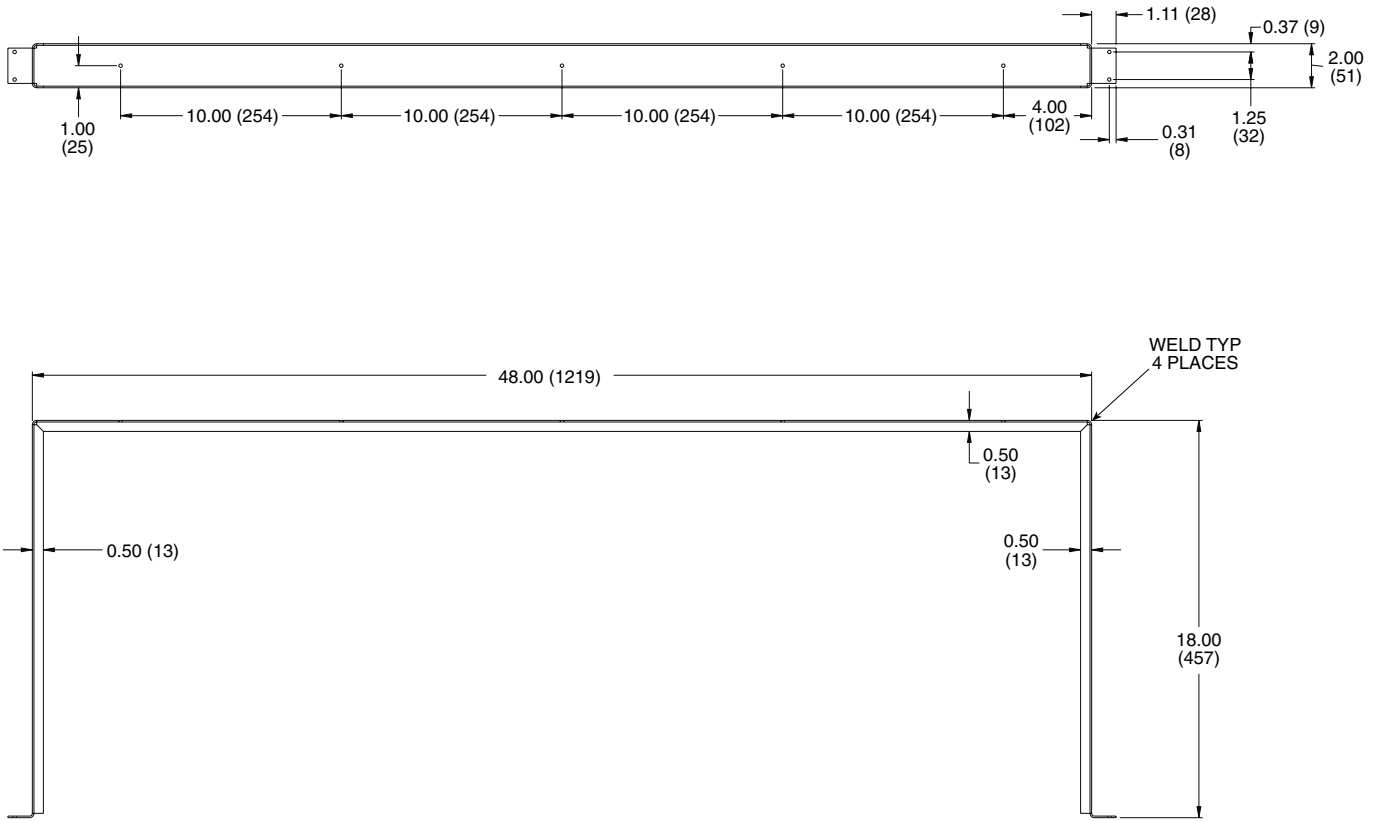
Install Wind Baffles and Brackets — Wind baffles and brackets must be field fabricated and installed for all units to ensure proper operation at low-ambient temperatures with Motormaster V electronic controller. Unit sizes 010-030 require one baffle, sizes 032-055 require two baffles. See Fig. 1 and 2 for the sizes and details of brackets and baffles required. See Fig. 3 and 4 for brackets and baffles location.

Use 14-gage galvanized sheet metal or similar corrosion-resistant material for the brackets and 20-gage for the baffles.

Use field-supplied screws to attach baffles and brackets to unit. Screws should be 1/4 in. (6.3 mm) diameter or larger. Drill required screw holes for mounting brackets and baffles.

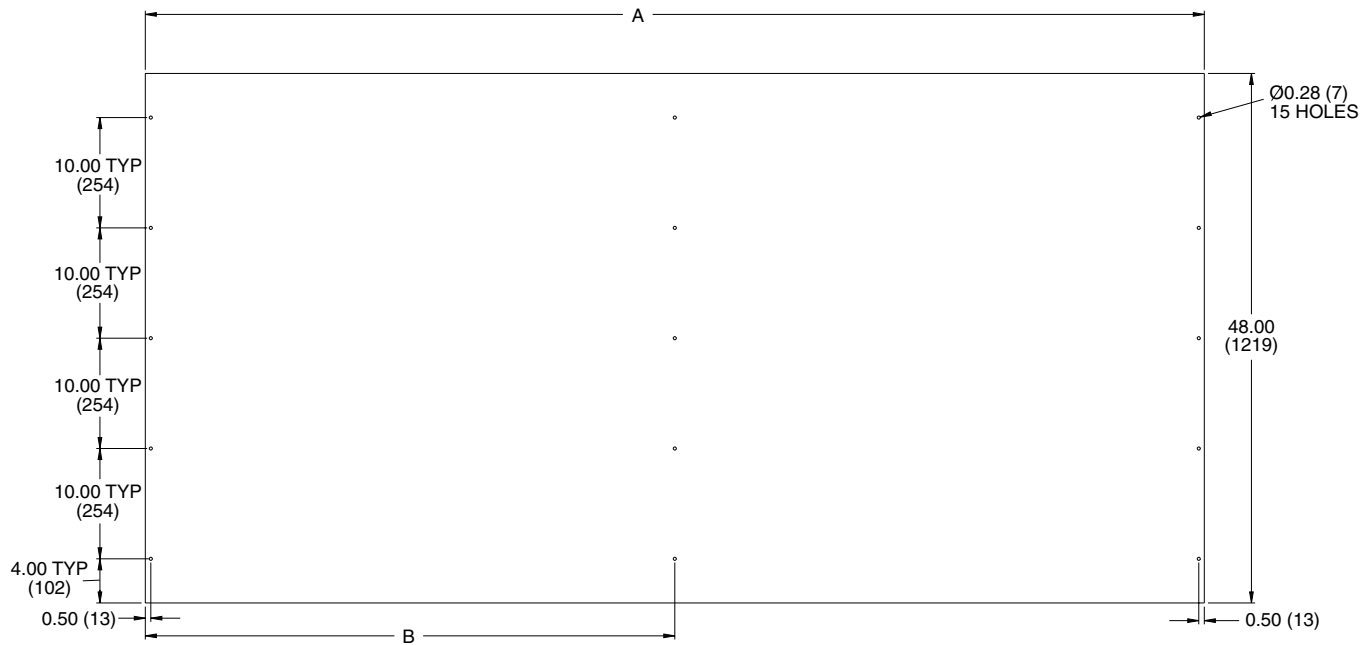
▲ CAUTION

To avoid damage to refrigerant coils and electronic components, use extreme care when drilling screw holes and attaching fasteners.



Dimensions given in inches (mm).

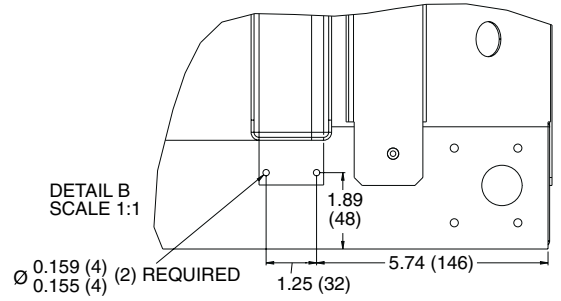
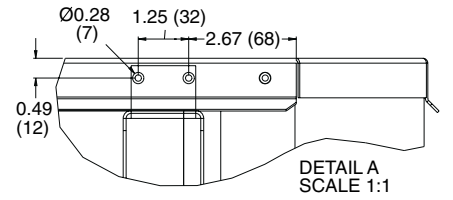
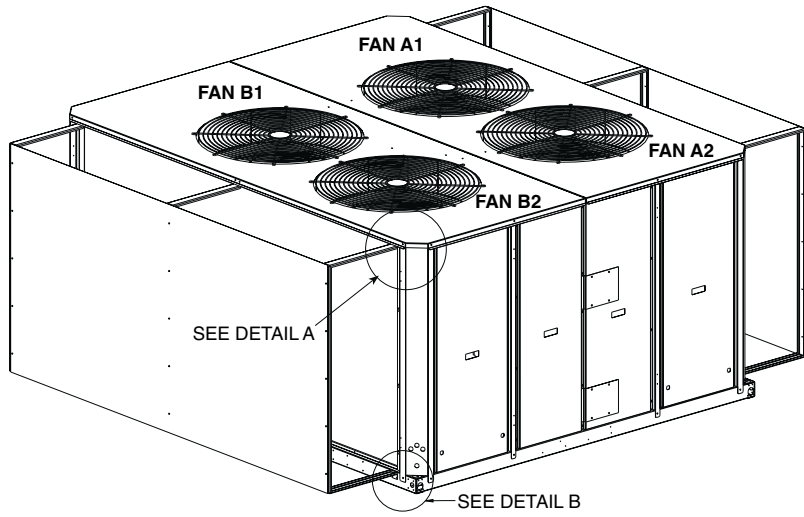
Fig. 1 — Bracket Dimensions



Dimensions given in inches (mm).

UNIT SIZE	DIM A	DIM B
30RAN010-018, 30RAN032-040 (circuit B side)	68.92 (1751)	34.46 (875)
30RAN022-030, 30RAN032-040 (circuit A side) 30RAN042-055 (circuit A and B side)	96.00 (2438)	48.00 (1291)

Fig. 2 — Baffle Dimensions



NOTE: Dimensions in inches (mm).

Fig. 3 — Typical Baffle Location Sizes 032-055 (042-055 Shown)

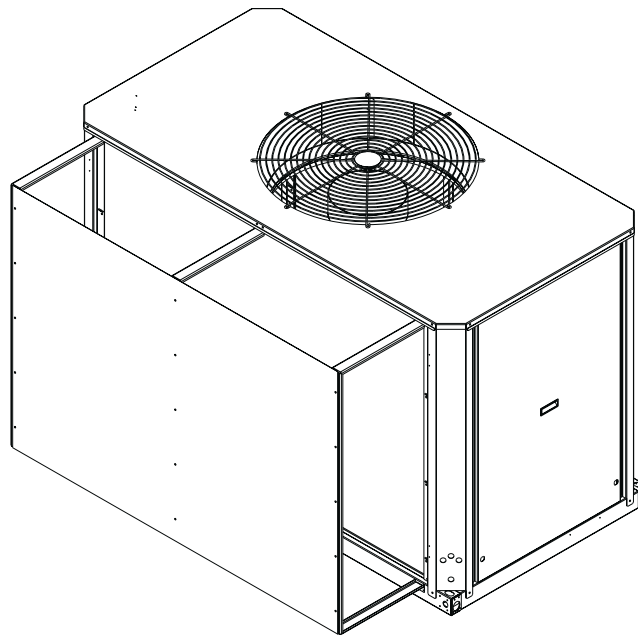


Fig. 4 — Baffle Location (Sizes 010-030)

Table 1A — Package Contents of Motormaster® V Control for 30RA010-030

UNIT 30RA VOLTAGES	MOTORMASTER V ACCESSORY PART NO.	QTY	ITEM DESCRIPTION	ITEM PART NO.
208/230 V (60 Hz) 230 V (50 Hz)	30RA-900---024	1	Transducer	HK05YZ007
		8	Screw (8-18x ¹ / ₂ LG. Pan Head)	—
		2	Contactora (Auxiliary)	3RH19212DE11
		4	18 AWG, 18 in. Long Wire Asy	—
		3	10 AWG, 20 in. Long Wire Asy	—
		1	Fuse Block	CHCC3
		3	Fuse (30 AMP Class CC)	HY10KB300
		1	Control Asy (Motormaster V 230V) The Control Assembly contains: 1 — Controller, P/N HR46TN004 1 — Box, Remote 4 — Screw (8-18x ¹ / ₂ LG. Pan Head) 1 — Transducer Cable Asy, P/N 30RA400698 1 — 18 AWG, 4 in. Long Wire Asy 1 — Power Plug Asy, P/N 30RA402016 1 — Motor Plug Asy, P/N 30RA400777 1 — Cover 1 — Jumper Plug Asy, P/N 30RA401220 1 — Start Signal Cable Asy, P/N 30RA402008 1 — Motor Cable Asy, P/N 30RA400707	30RA402010
380/415/460 V 60 and 50 Hz	30RA-900---025	1	Transducer	HK05YZ007
		8	Screw (8-18x ¹ / ₂ LG. Pan Head)	—
		2	Contactora (Auxiliary)	3RH19212DE11
		4	18 AWG, 18 in. Long Wire Asy	—
		3	12 AWG, 20 in. Long Wire Asy	—
		1	Fuse Block	CHCC3
		3	Fuse (20 AMP Class CC)	HY10KB200
		1	Control Asy (Motormaster V 460V) The Control Assembly contains: 1 — Controller, P/N HR46TN005 1 — Box, Remote 4 — Screw (8-18x ¹ / ₂ LG. Pan Head) 1 — Transducer Cable Asy, P/N 30RA400698 1 — 18 AWG, 4 in. Long Wire Asy 1 — Power Plug Asy, P/N 30RA402016 1 — Motor Plug Asy, P/N 30RA400777 1 — Cover 1 — Jumper Plug Asy, P/N 30RA401220 1 — Start Signal Cable Asy, P/N 30RA402008 1 — Motor Cable Asy, P/N 30RA400707	30RA402011
575 V, 60 Hz	30RA-900---026	1	Transducer	HK05YZ007
		8	Screw (8-18x ¹ / ₂ LG. Pan Head)	—
		2	Contactora (Auxiliary)	3RH19212DE11
		4	18 AWG, 18 in. Long Wire Asy	—
		3	12 AWG, 20 in. Long Wire Asy	—
		1	Fuse Block	CHCC3
		3	Fuse (15 AMP Class CC)	HY10KB151
		1	Control Asy (Motormaster V 575V) The Control Assembly contains: 1 — Controller, P/N HR46TN006 1 — Box, Remote 4 — Screw (8-18x ¹ / ₂ LG. Pan Head) 1 — Transducer Cable Asy, P/N 30RA400698 1 — 18 AWG, 4 in. Long Wire Asy 1 — Power Plug Asy, P/N 30RA402016 1 — Motor Plug Asy, P/N 30RA400777 1 — Cover 1 — Jumper Plug Asy, P/N 30RA401220 1 — Start Signal Cable Asy, P/N 30RA402008 1 — Motor Cable Asy, P/N 30RA400707	30RA402012

Table 1B — Package Contents of Motormaster® V Control for 30RA032-055

UNIT 30RA VOLTAGES	MOTORMASTER V ACCESSORY PART NO.	QTY	ITEM DESCRIPTION	ITEM PART NO.
208/230 V (60 Hz) 230 V (50 Hz)	30RA-900---027	2	Transducer	HK05YZ007
		8	Screw (8-18x1/2 LG. Pan Head)	—
		4	Contactora (Auxiliary)	3RH19212DE11
		1	Pad, Bottom (Motormaster V)	30RA500580
		1	Pad, Top (Motormaster V)	30RA500582
		6	18 AWG, 18 in. Long Wire Asy	—
		2	18 AWG, 70 in. Long Wire Asy	—
		3	12 AWG, 50 in. Long Wire Asy	—
		3	12 AWG, 40 in. Long Wire Asy	—
		2	Fuse Block	CHCC3
		3	Fuse, Circuit A (15 AMP Class CC)	HY10LF014
		3	Fuse, Circuit B (30 AMP Class CC)	HY10KB300
		1	Control Asy (Motormaster V 230V) The Control Assembly contains: 1 — Controller, P/N HR46TN001 1 — Transducer Cable Asy, P/N 30RA400709 1 — Power Plug Asy, P/N 30RA402018 1 — Motor Plug Asy, P/N 30RA401347	30RA400690
		1	Control Asy (Motormaster V 230V) The Control Assembly contains: 1 — Controller, P/N HR46TN004 1 — Transducer Cable Asy, P/N 30RA400708 1 — Power Plug Asy, P/N 30RA402017 1 — Motor Plug Asy, P/N 30RA401389	30RA402053
		380/415/460 V 60 Hz and 50 Hz	30RA-900---028	2
8	Screw (8-18x1/2 LG. Pan Head)			—
4	Contactora (Auxiliary)			3RH19212DE11
1	Pad, Bottom (Motormaster V)			30RA500580
1	Pad, Top (Motormaster V)			30RA500582
6	18 AWG, 18 in. Long Wire Asy			—
2	18 AWG, 70 in. Long Wire Asy			—
3	12 AWG, 50 in. Long Wire Asy			—
3	12 AWG, 40 in. Long Wire Asy			—
2	Fuse Block			CHCC3
3	Fuse, Circuit A (15 AMP Class CC)			HY10LF014
3	Fuse, Circuit B (20 AMP Class CC)			HY10KB200
1	Control Asy (Motormaster V 460V) The Control Assembly contains: 1 — Controller, P/N HR46TN002 1 — Transducer Cable Asy, P/N 30RA400709 1 — Power Plug Asy, P/N 30RA402018 1 — Motor Plug Asy, P/N 30RA401347			30RA400691
1	Control Asy (Motormaster V 460V) The Control Assembly contains: 1 — Controller, P/N HR46TN005 1 — Transducer Cable Asy, P/N 30RA400708 1 — Power Plug Asy, P/N 30RA402017 1 — Motor Plug Asy, P/N 30RA401389			30RA402054
575 V (60 Hz)	30RA-900---029			2
		8	Screw (8-18x1/2 LG. Pan Head)	—
		4	Contactora (Auxiliary)	3RH19212DE11
		1	Pad, Bottom (Motormaster V)	30RA500580
		1	Pad, Top (Motormaster V)	30RA500582
		6	18 AWG, 18 in. Long Wire Asy	—
		2	18 AWG, 70 in. Long Wire Asy	—
		3	12 AWG, 50 in. Long Wire Asy	—
		3	12 AWG, 40 in. Long Wire Asy	—
		2	Fuse Block	CHCC3
		3	Fuse, Circuit A (15 AMP Class CC)	HY10LF014
		3	Fuse, Circuit B (15 AMP Class CC)	HY10KB151
		1	Control Asy (Motormaster V 575V) The Control Assembly contains: 1 — Controller, P/N HR46TN003 1 — Transducer Cable Asy, P/N 30RA400709 1 — Power Plug Asy, P/N 30RA402018 1 — Motor Plug Asy, P/N 30RA401347	30RA400692
		1	Control Asy (Motormaster V 575V) The Control Assembly contains: 1 — Controller, P/N HR46TN006 1 — Transducer Cable Asy, P/N 30RA400708 1 — Power Plug Asy, P/N 30RA402017 1 — Motor Plug Asy, P/N 30RA401389	30RA402055

Control Mounting

30RA010-030 — Mount the Motormaster® V (MMV) electronic control on the fan deck leg using the four screws provided as shown in Fig. 5.

30RA032-055 — Mount the MMV electronic controls on the left side of the control panel using the eight screws provided. Use 2 Hp MMV controller (HR4TN001,2,3) for circuit A and 5 Hp MMV controller (HR46TN004,5,6) for circuit B.

30RA010-055 — Mount the fuse block on DIN rail next to the fan contactors. Mount auxiliary contacts to side of compressor contactor. Auxiliary contacts must be against contactor, they cannot be stacked on existing auxiliary contacts. On units with two compressor contactors side by side, separate contactors and put auxiliary contacts in center. If this is required, install new wires for contactor powered with bus bar. All field wiring must comply with NEC and all local codes and requirements. Size wire based on MCA (minimum circuit amps) on the unit informative plate.

Control Wiring

⚠ CAUTION

DO NOT connect incoming AC power to the output terminal T1, T2, and T3! Severe damage to the drive will result.

⚠ WARNING

Hazard of electrical shock! Wait three minutes after disconnecting incoming power before servicing drive. Capacitors retain charge after power is removed.

⚠ CAUTION

DO NOT route the pressure transducer cable(s) or control wiring with any of the power wiring. Bundling the power and transducer wires together can potentially cause interference and cause the drive to operate improperly.

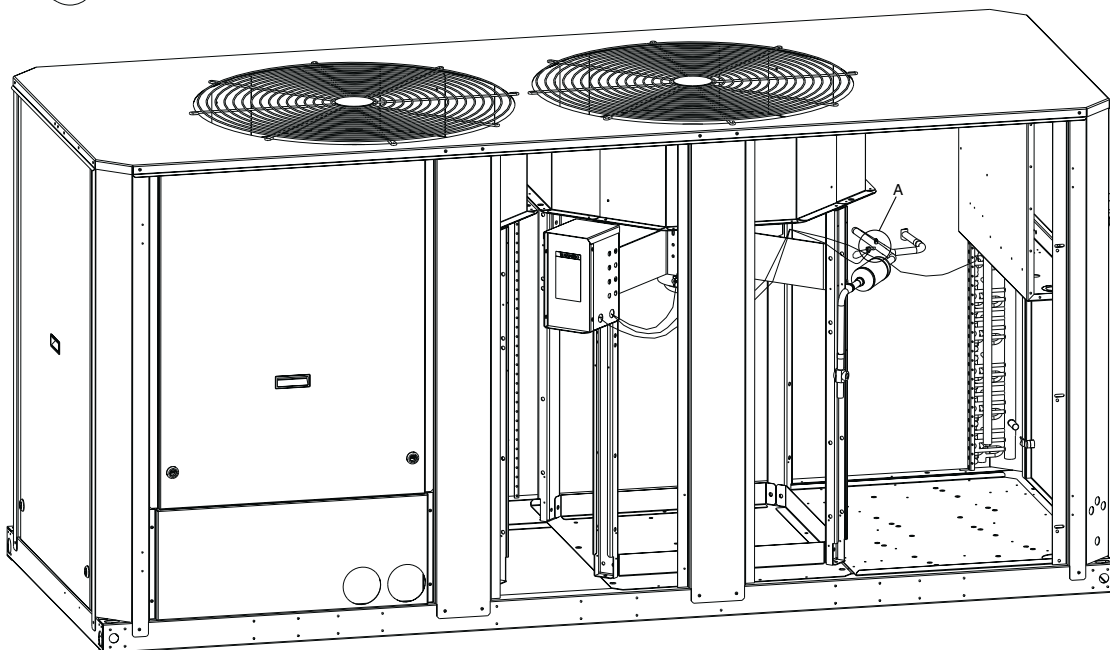
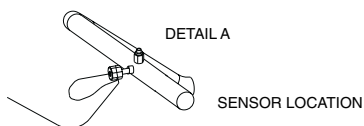


Fig. 5 — Typical Control Mounting Location for Sizes 010-030 (Sizes 022-030 Shown)

30RA010-018: TWO-SPEED MOTOR (See Fig. 6)

1. Unplug the high-speed motor cable at the contactor FC-HS. Remove this cable from the control panel and connect it to the MMV output plug at the bottom right of the MMV accessory. Verify that the wires from this plug are connected to the T1, T2 and T3 output terminals of the drive.
2. Install (3) 12 ga wires from TB1A to the top of fuse block FU7.
3. Remove wires from FC-HS T1, T2, and T3 and attach to the bottom of fuse block FU7.
4. Route the MMV power supply cable from the side of the accessory into the control panel and connect the plug to the bottom of the fuse block.
5. Remove the low speed motor cable. Unplug cable from the contactor FC-LS and from the motor (low speed connection, right side of motor, cable no. 1). This cable will not be used.
6. Route the accessory motor cable assembly from the shorting plug at the bottom left of the Motormaster® V (MMV) controller to the motor. Connect cable to the low speed connector on the right side of the motor.
7. Install the pressure transducer on the 1/4-in. flare fitting on the liquid line. See Fig. 5. For future service, it is recommended that a tee be installed on the liquid line Schrader valve before installing the transducer.
8. Plug the transducer connector from the side of the MMV controller into the pressure transducer.
9. Insert fuses into FU7. Refer to Table 1A for correct fuse size.

30RA022-030: SINGLE SPEED MOTOR (See Fig. 7)

1. Install (3) 12 ga wires from TB1A to the top of fuse block FU7.
2. Remove wires from FC-1 T1, T2, and T3 and attach to the bottom of fuse block FU7.
3. Route the MMV power supply cable from the side of the accessory into the control panel and connect the plug to the bottom of fuse block FU7.

- Unplug the A1 motor cable at the contactor FC-A1. Remove this cable from the control panel and connect it to the output plug at the bottom right of the MMV. Verify that the wires from this plug are connected to the T1, T2 and T3 output terminals of the drive.

NOTE: Do NOT make any connection to the shorting plug on the MMV controller for these sizes. The accessory motor cable assembly is not used for these sizes.

- Install the pressure transducer on the 1/4-in. flare fitting on the liquid line. See Fig. 5. For future service, it is recommended that a tee be installed on the liquid line Schrader valve before installing the transducer.
- Plug the transducer connector from the side of the MMV controller into the pressure transducer.
- Insert fuses into FU7. Refer to Table 1A for correct fuse size.

30RA032-055:

Circuit A: 30RA032-055 (See Fig. 8)

- Unplug the A1 motor cable from the contactor FC-A1. Using the accessory A1 motor cable (30RA401347), connect the stripped leads marked 1, 2 and 3 to the MM-A1 drive output terminals marked T1, T2, and T3. Route the plug end of this cable over to the FC-A1 contactor and connect it to the A1 motor plug.
- Install (3) 12 ga wires from TB1A to the top of fuse block FU7.
- Remove wires from FCA-1 T1, T2, and T3 and attach to the bottom of fuse block FU7.
- Using the accessory A1 power cable (30RA402018), connect the stripped leads marked 1, 2 and 3 to the MM-A1 drive input terminals marked L1, L2, and L3. Route the other end of the cable to the bottom of fuse block FU7 and connect.
- Install the pressure transducer on the 1/4-in. flare fitting on the Circuit A liquid line. See Fig. 9. For future service, it is recommended that a tee be installed on the liquid line Schrader valve before installing the transducer.
- Route the transducer connector cable out the bottom of the control panel and plug it into the pressure transducer.
- Insert fuses for circuit A into FU7 and fuses for circuit B into FU8. Refer to Table 1B for correct fuse size.

Circuit B: 30RA032-040 (See Fig. 8)

- Unplug the motor cable from the high-speed contactor FC-HS. Using the B1 motor cable in the accessory (30RA401389), connect the stripped leads marked 1, 2 and 3 to the MM-B1 drive output terminals marked T1, T2, and T3. Route the plug end of this cable over to the

FC-HS contactor and connect it to the B1 high-speed motor plug.

- Install (3) 12 ga wires from TB1A to the top of fuse block FU8.
- Remove wires from FC-HS T1, T2, and T3 and attach to FU8 T1, T2 and T3.
- Using the B1 power cable in the accessory (30RA402017), connect the stripped leads marked 1, 2 and 3 to the MM-B1 drive input terminals marked L1, L2, and L3. Route the cable to fuse block FU8 and connect it to the bottom of the fuse block.
- Unplug the low speed motor cable from the contactor FC-LS. Remove the plug from this cable. Strip and wire nut the black, white and red leads together. Connect the ground wire to the control panel back.
- Install the pressure transducer on the 1/4-in. flare fitting on the Circuit B liquid line. See Fig. 9. For future service, it is recommended that a tee be installed on the liquid line Schrader valve before installing the transducer.
- Route the transducer connector cable out the bottom of the control panel and plug it into the pressure transducer.
- Insert fuses for circuit A into FU7 and fuses for circuit B into FU8. Refer to Table 1B for correct fuse size.

Circuit B: 30RA042-055 (See Fig. 10)

- Unplug the motor cable from the B1 motor at the contactor FC-B1. Using the B1 motor cable in the accessory (30RA401389), connect the stripped leads marked 1, 2 and 3 to the drive output terminals marked T1, T2, and T3. Route the plug end of this cable over to the FC-B1 contactor and connect it to the B1 motor plug.
- Install (3) 12 ga wires from TB1A to the top of fuse block FU8.
- Remove wires from FCB-1 T1, T2, and T3 and attach to the bottom of fuse block FU8.
- Using the B1 power cable in the accessory (30RA402017), connect the stripped leads marked 1, 2 and 3 to the MM-B1 drive input terminals marked L1, L2, and L3. Route the cable to fuse block FU8 and connect it to the bottom of the fuse block.
- Install the pressure transducer on the 1/4-in. flare fitting on the Circuit B liquid line. See Fig. 9. For future service, it is recommended that a tee be installed on the liquid line Schrader valve before installing the transducer.
- Route the transducer connector cable out the bottom of the control panel and plug it into the pressure transducer.
- Insert fuses for circuit A into FU7 and fuses for circuit B into FU8. Refer to Table 1B for correct fuse size.

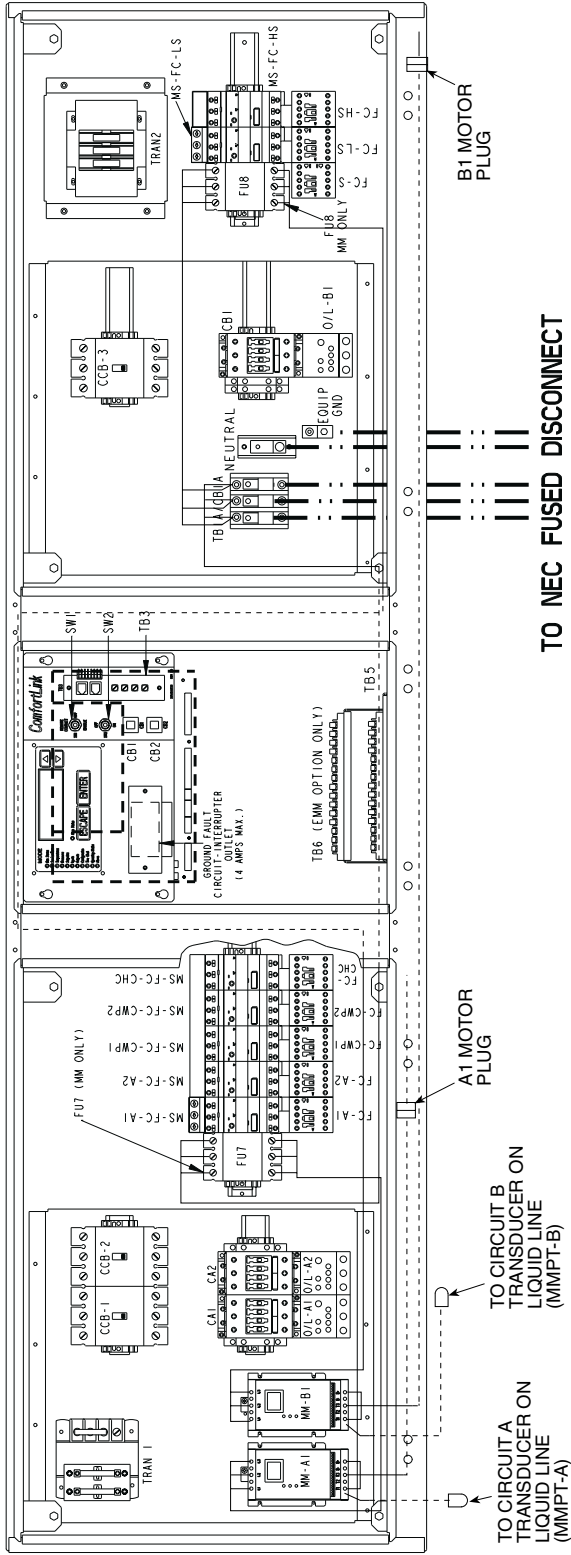


Fig. 8 — 30RA032-040 Motor Control Wiring

See Legend on page 10.

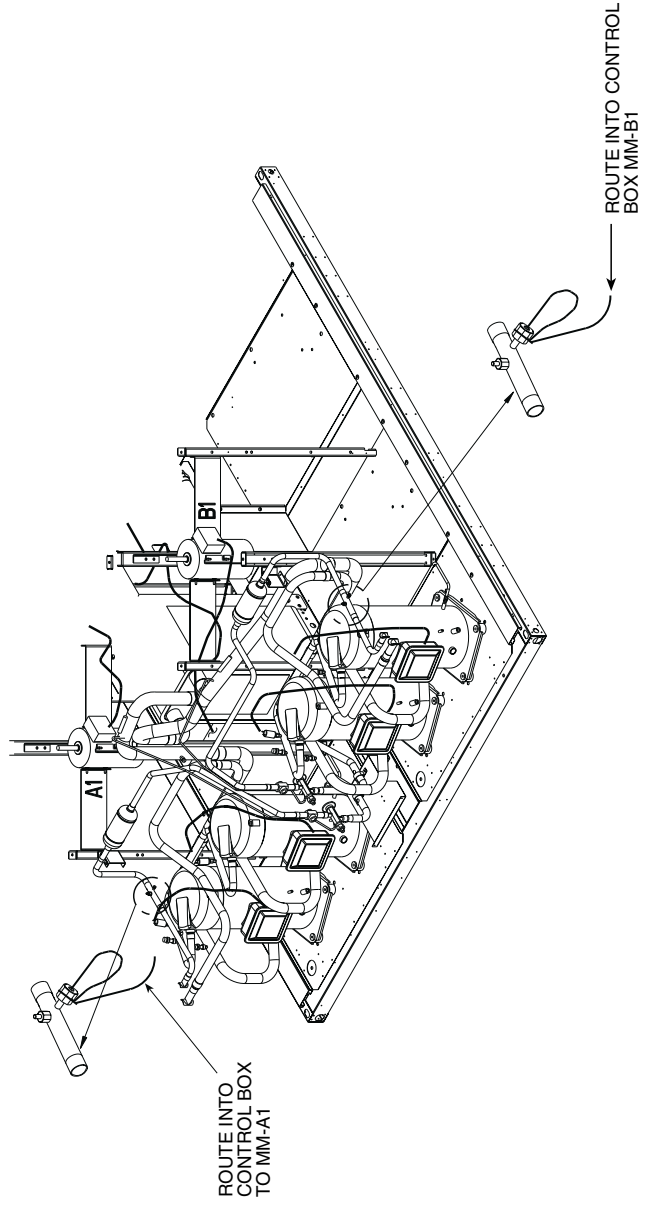


Fig. 9 — Pressure Transducer Location (30RA032-055)

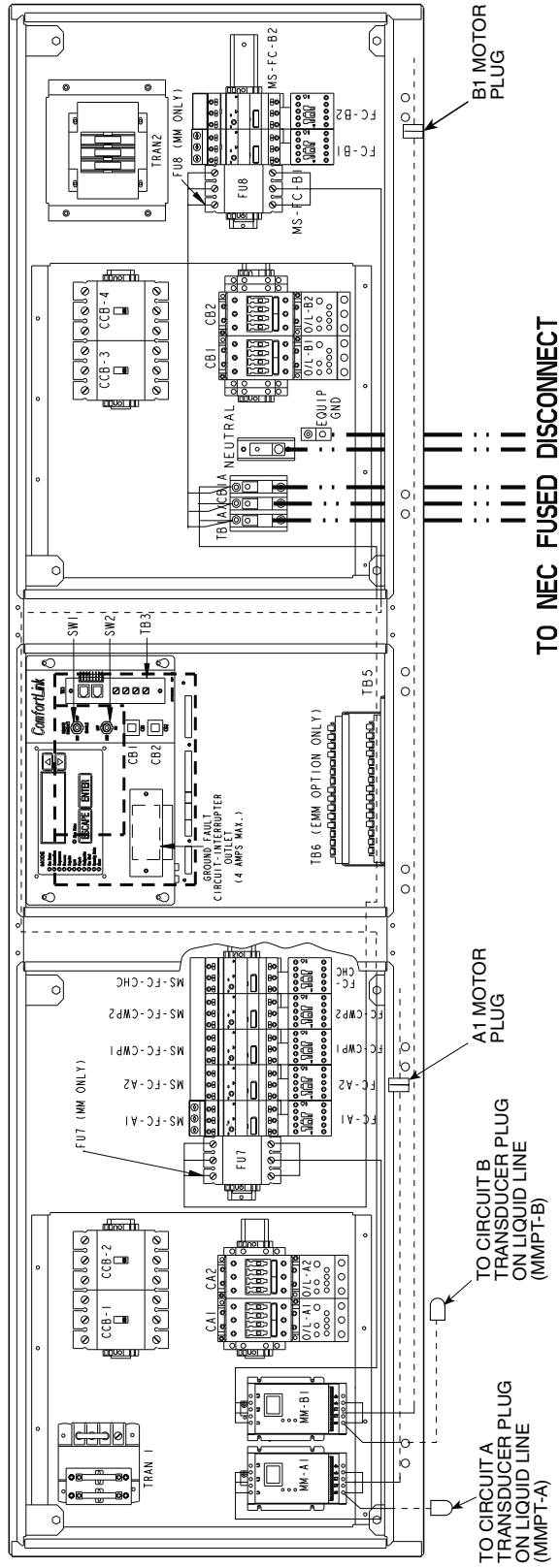


Fig. 10 — 30RA042-055 Motor Control Wiring

LEGEND (Fig. 6-8 and 10)

- | | | | |
|--------------|------------------------------|-------------|---------------------------------|
| C | Contactor, Compressor | MM | Motormaster® Controller |
| CB | Circuit Breaker | MMPT | Motormaster Pressure Transducer |
| CCB | Compressor Circuit Breaker | MMV | Motormaster V Controller |
| CHC | Cooler Pump Heater Contactor | MS | Manual Starter |
| CWP | Chilled Water Pump | NEC | National Electrical Code |
| EMM | Energy Management Module | O/L | Overload |
| EQUIP | Equipment | SW | Switch |
| FC | Fan Contactor | TB | Terminal Block |
| FU | Fuse | TRAN | Transformer |
| GND | Ground | — | Factory Wiring |
| HS | High Speed | --- | Field Control Wiring |
| LS | Low Speed | ---- | Field Power Wiring |

Wire the Auxiliary Contacts — Depending on the unit nameplate voltage, wire the auxiliary contacts to the terminal board on the Motormaster® V control as listed in Table 2. See Fig. 11.

Table 2 — Auxiliary Contact Wiring

UNIT VOLTAGE	MOTORMASTER® V CONTROL PART NUMBER	AUXILIARY CONTACT CONNECTION
208-3-60	HR46TN001, HR46TN004	13A — 2
230-3-60	HR46TN001, HR46TN004	1 — 2
380-3-60	HR46TN002, HR46TN005	13A — 2
460-3-60	HR46TN002, HR46TN005	1 — 2
575-3-60	HR46TN003, HR46TN006	1 — 2
230-3-50	HR46TN001, HR46TN004	13B — 2
380-3-50	HR46TN002, HR46TN005	13C — 2
415-3-50	HR46TN002, HR46TN005	13C — 2

Configure Unit for Motormaster V Electronic Control Operation — The unit must be configured for the Motormaster V electronic control operation. Use the Scrolling Marquee display to configure the system as following:

1. Set the Enable/Off/Remote switch to OFF position.
2. Press the **ESCAPE** key until the screen is blank and use the arrow key to select the Configuration mode LED.
3. Press **ENTER** key, then use **▼** key to select the sub-mode 'OPT1', then press **ENTER** key.
4. Press **▼** until 'MMR.S' displayed.
5. Press **ENTER** key twice. The words 'PASS' and 'WORD' will flash.
6. Press 1 1 1 1 then **ENTER** key so that 'NO' flashes.
7. Use arrow keys to change to 'YES' and press **ENTER** key.
8. Return the Enable/Off/Remote switch to the proper position.

The chiller is now configured for Motormaster control.

Test the Motormaster V Electronic Control Option Output — Follow the instructions given in the Controls Start-Up, and Troubleshooting Guide to verify proper operation of Motormaster V electronic control and the outdoor-fan motors.

When the system calls for a compressor, the auxiliary contact will be closed to start the Motormaster V electronic control. The LED will display the speed of the motor. The display range will be 8 to 50 Hz for 50 Hz units and 8 to 60 Hz for 60 Hz units.

The Motormaster V control will start the condenser fan when the compressor engages. The control will adjust the fan speed to maintain approximately 200 psig liquid line pressure. Above that pressure, the fan should operate at full speed.

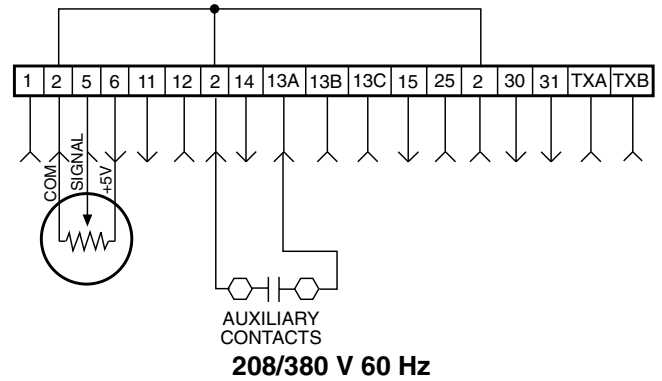
To test the control and motor, in the TEST mode, run any compressor in each circuit. The Motormaster V electronic control adjusts the fan speed based on the liquid pressure input.

START-UP

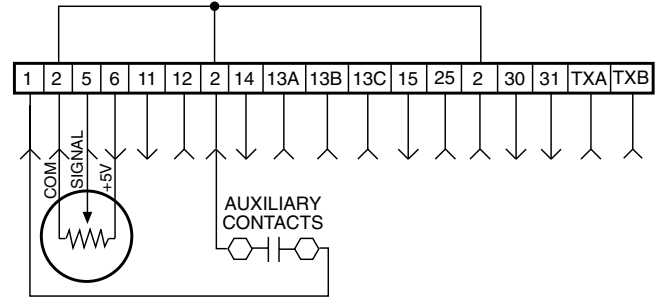
Low Ambient Application Notes

FREEZE PROTECTION — Corrosion inhibited antifreeze solution for the chilled water loop must be added to protect the system to temperatures 15 F (9 C) below the lowest expected outdoor temperature.

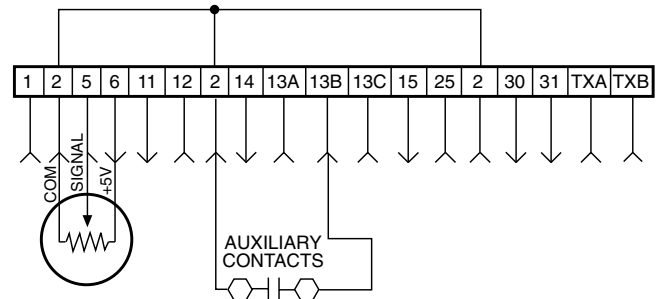
LOW AMBIENT CYCLING — Widely varying cooling loads are often encountered during low ambient operation. To minimize compressor cycling as a result of these conditions, provide sufficient volume in the chilled fluid loop, adding a



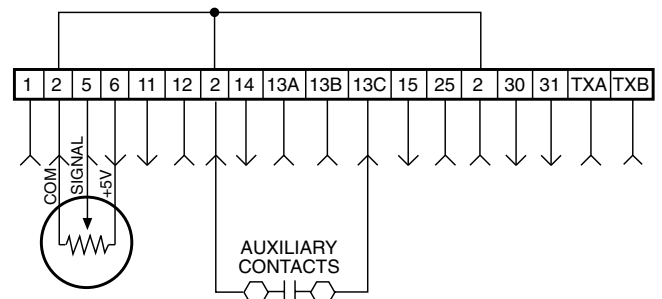
208/380 V 60 Hz



230/460/575 V 60 Hz



230 V 50 Hz



380/415 V 50 Hz

Fig. 11 — Pressure Transducer and Start Command Configuration Jumper Wiring

properly baffled storage tank to the system if necessary. At least 6 gal per ton (6.5 L per kW) of refrigeration is recommended for a moderate system load.

ONE-FAN CIRCUITS — The fan is equipped with a two-speed motor. *ComfortLink™* controls call for high speed operation when a compressor is engaged. The *Motormaster® V* device controls the fan speed to maintain the minimum head pressure set point.

TWO-FAN CIRCUITS — The first fan will be controlled by *Motormaster V* electronic control to maintain the minimum discharge pressure.

The second fan is regulated by the *ComfortLink* control to cycle between 156 and 243 psig discharge pressure.

Motormaster V Control — The *Motormaster V* electronic control uses a 0 to 5 vdc signal input from a pressure transducer attached to the liquid line gage port on each circuit. The pressure transducer is connected to terminals 2, 5 and 6 on the controller (see Fig. 12). The controller is factory configured and requires no field programming. If drive does not function properly, the information provided below and Tables 3 and 4 can be used to troubleshoot the drive.

CAUTION

If input power has not been applied to the drive for a period of time exceeding three years (due to storage, etc.), the electrolytic DC bus capacitors within the drive can change internally, resulting in excessive leakage current. This can result in premature failure of the capacitors if the drive is operated after such a long period of inactivity or storage. In order to reform the capacitors and prepare the drive for operation after a long period of inactivity, apply input power to the drive for 8 hours prior to actually operating the motor. Before attempting to operate the drive or the motor, be sure all procedures pertaining to installation and wiring have been properly followed.

CAUTION

DO NOT connect incoming AC power to output terminals T1, T2, and T3! Severe damage to the drive will result. Do not continuously cycle input power to the drive more than once every two minutes. Damage to the drive will result.

WARNING

Hazard of electrical shock! Wait three minutes after disconnecting incoming power before servicing drive. Capacitors retain charge after power is removed. Drive assembly includes externally mounted current limiting resistors. Use extreme caution when servicing the drive.

WARNING

When configured as shown below, this equipment is designed to start when it receives line power and the start jumper is closed. Ensure that all personnel are clear of fans and guards are installed before applying power.

CAUTION

It is strongly recommended that the user NOT change any programming without consulting Carrier service personnel. Unit damage may occur from improper programming.

Motormaster V electronic control is configured according to the inputs provided. No additional programming is necessary.

The drive can display 71 program parameters. Parameters 50-71 are monitor functions and cannot be changed. The remainder of the parameters can be changed after entering a password.

To enter password and change program values:

1. Press **Mode** button.
2. Display reads “00” and the upper right decimal point blinks (see Fig. 12). This will activate the PASSWORD prompt (if the password has not been disabled).
3. Use the ▲ and ▼ buttons to scroll to the password value (the factory default password is “111”) and press the **Mode** button. Once the correct password value is entered, the display will read “P01”, which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu (P01 is the first parameter).

NOTE: If the display flashes “Er”, the password was incorrect, and the process to enter the password must be repeated.

4. Press **Mode** to display present parameter setting. Upper right decimal point blinks.

Use the ▲ and ▼ buttons to scroll to the desired parameter number.

Once the desired parameter number is found, press the Mode button to display the present parameter setting. The upper right-hand decimal point will begin blinking, indicating that the present parameter setting is being displayed, and that it can be changed by using the up and down buttons. Use ▲ and ▼ to change setting. Press **Mode** to store new setting.

Pressing the **Mode** button will store the new setting and also exit the PROGRAM mode. To change another parameter, press

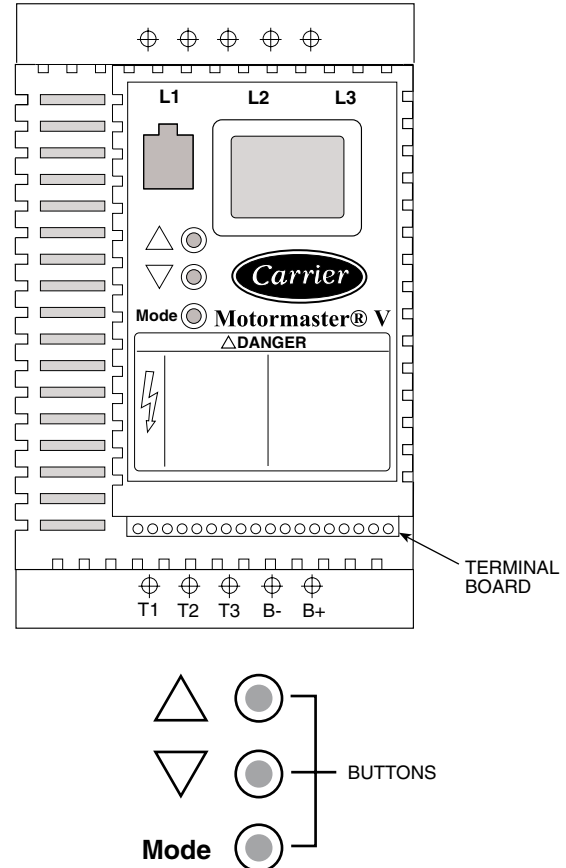


Fig. 12 — Mode Buttons and Mode Display

the **Mode** button again to re-enter the PROGRAM mode (the parameter menu will be accessed at the parameter that was last viewed or changed before exiting). If the **Mode** button is pressed within two minutes of exiting the PROGRAM mode, the password is not required access the parameters. After two minutes, the password must be entered in order to access the parameters again.

To change password: first enter the current password then change parameter P44 to the desired password.

LIQUID LINE PRESSURE SET POINT ADJUSTMENT — Adjusting the set point is not recommended due to possible interaction with other head pressure software algorithms or controls. For single fan units or situations where the set point must be changed, the set point is found in P34. A higher value will result in a higher liquid line set point. Example: Increasing the set point from 24.0 to 25.0 will increase the liquid line pressure by approximately 10 psi.

FAULT CODES — The drive is programmed to automatically restart after a fault and will attempt to restart three times after a fault (the drive will not restart after CF, cF, GF, F1, F2-F9, or Fo faults). If all three restart attempts are unsuccessful, the drive will trip into FAULT LOCKOUT (LC), which requires a manual reset.

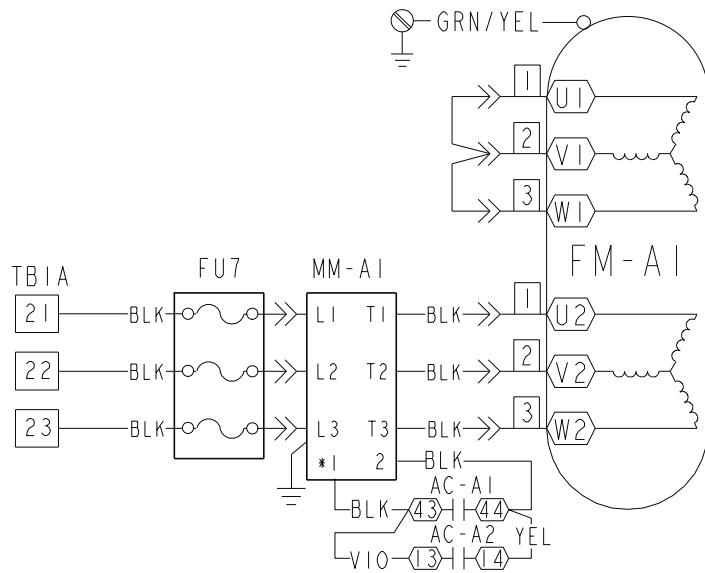
MANUAL RESET — If fault condition has been removed, cycle power to the chiller to reset the VFD.

TROUBLESHOOTING

Troubleshooting the Motormaster® V control requires a combination of observing system operation and VFD information. Refer to Fig. 13-16 for the low ambient wiring diagrams. The drive provides 2 kinds of troubleshooting modes: a status matrix using the 3-digit display (P57, P58) and real time monitoring of key inputs and outputs. The collective group is displayed through parameters 50-71 and all values are read-only. The key read-only outputs are:

- **P50: FAULT HISTORY** — Last 8 faults
- **P51: SOFTWARE version**
- **P52: DC BUS VOLTAGE** — in percent of nominal. Usually rated input voltage x 1.4
- **P53: MOTOR VOLTAGE** — in percent of rated output voltage
- **P54: LOAD** — in percent of drives rated output current rating
- **P55: VDC INPUT** — in percent of maximum input: 100 will indicate full scale which is 5 v
- **P56: 4-20 mA INPUT** — in percent of maximum input. 20% = 4 mA, 100% = 20 mA

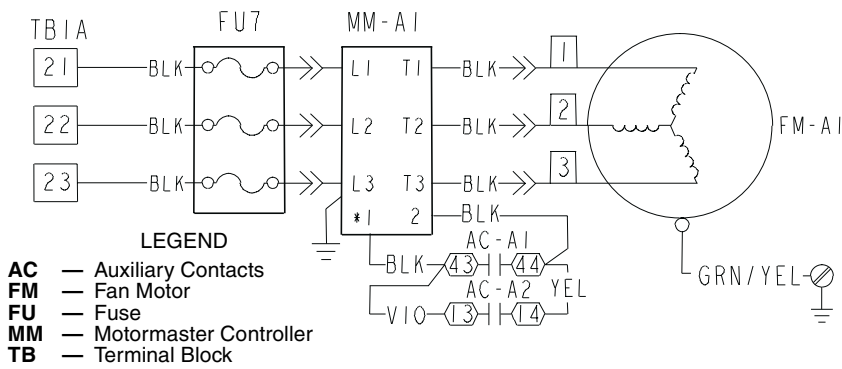
Refer to Tables 3 and 4 for more troubleshooting information.



* MM SIGNAL CONNECTION		
TB	VOLTAGE	HZ
1	230/460/575	60
13A	208/380	60
13B	230	50
13C	380/415	50

- LEGEND**
- AC** — Auxiliary Contacts
 - FM** — Fan Motor
 - FU** — Fuse
 - MM** — Motormaster® Controller
 - TB** — Terminal Block

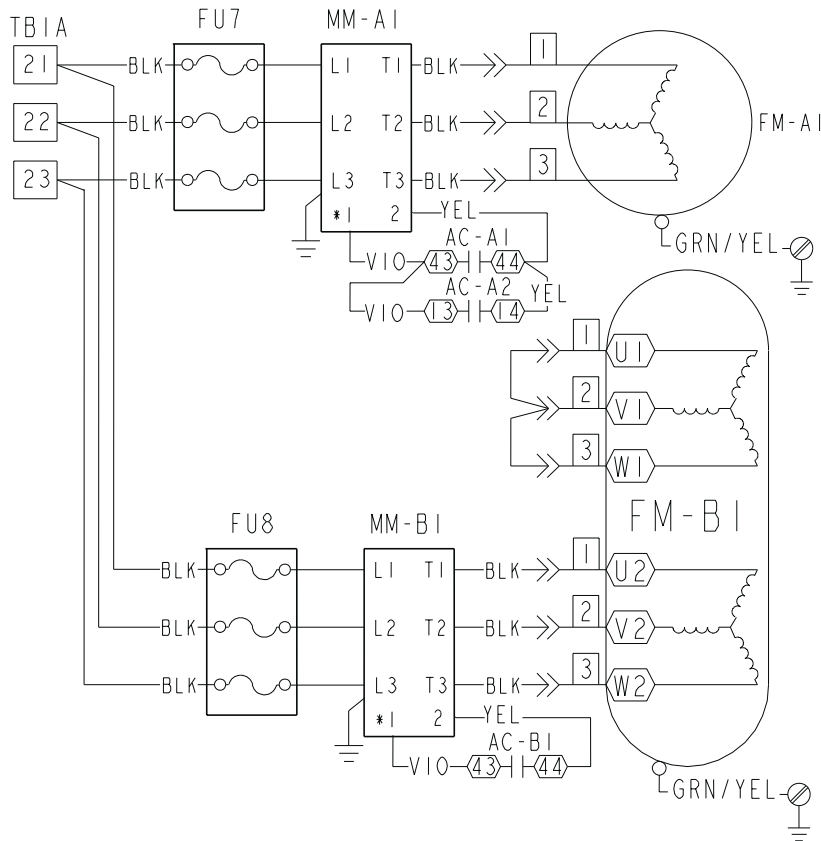
Fig. 13 — 30RA010-018 Low Ambient Operation



* MM SIGNAL CONNECTION		
TB	VOLTAGE	HZ
1	230/460/575	60
13A	208/380	60
13B	230	50
13C	380/415	50

- LEGEND**
- AC** — Auxiliary Contacts
 - FM** — Fan Motor
 - FU** — Fuse
 - MM** — Motormaster Controller
 - TB** — Terminal Block

Fig. 14 — 30RA022-030 Low Ambient Operation

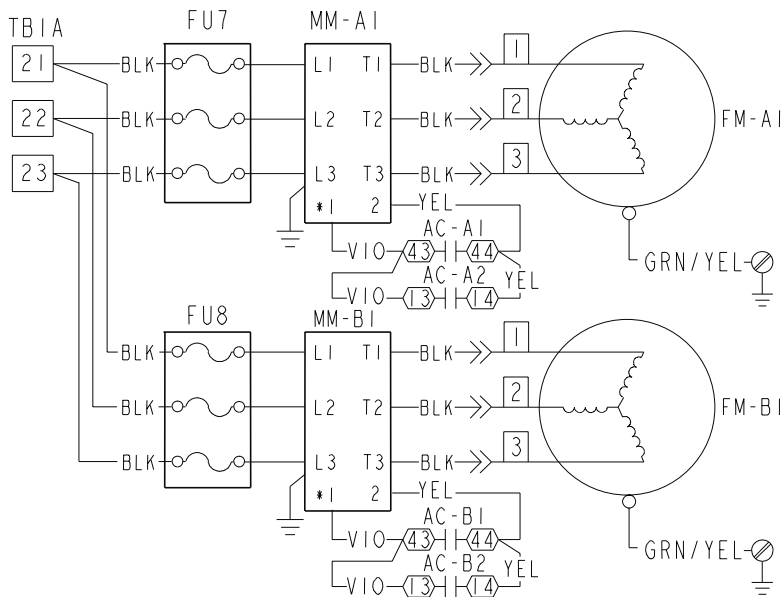


* MM SIGNAL CONNECTION		
TB	VOLTAGE	HZ
1	230/460/575	60
13A	208/380	60
13B	230	50
13C	380/415	50

LEGEND

AC — Auxiliary Contacts
FM — Fan Motor
FU — Fuse
MM — Motormaster® Controller
TB — Terminal Block

Fig. 15 — 30RA032-040 Low Ambient Operation



* MM SIGNAL CONNECTION		
TB	VOLTAGE	HZ
1	230/460/575	60
13A	208/380	60
13B	230	50
13C	380/415	50

LEGEND

AC — Auxiliary Contacts
FM — Fan Motor
FU — Fuse
MM — Motormaster Controller
TB — Terminal Block

Fig. 16 — 30RA042-055 Low Ambient Operation

Table 3 — Status Indication

FAULT CODE	FAULT NAME	DESCRIPTION*
CL	CURRENT LIMIT	The output has exceeded the CURRENT LIMIT setting (Parameter 25) and the drive is reducing the output frequency to reduce the output current. If the drive remains in CURRENT LIMIT for too long, it can trip into a CURRENT OVERLOAD fault (PF).
Er	ERROR	Invalid data has been entered.
GE	GE	“GE” will be displayed if an attempt is made to change the OEM default settings when the drive is operating in the OEM mode (see Parameter 48).
LC	FAULT LOCKOUT	Failed three restart attempts. Requires a manual reset.
SP	START PENDING	“SP” blinks during interval between restart attempts.

*For additional information on changing Program Parameters refer to the Controls, Start-Up, Operation, Service, and Troubleshooting Guide.

Table 4 — Fault Codes

FAULT CODE	DESCRIPTION	SOLUTION*
AF	High Temperature Fault: Ambient temperature is too high; Cooling fan has failed (if equipped).	Check cooling fan operation
CF	Control Fault: A blank EPM, or an EPM with corrupted data has been installed.	Perform a factory reset using Parameter 48 — PROGRAM SELECTION.
cF	Incompatibility Fault: An EPM with an incompatible parameter version has been installed.	Either remove the EPM or perform a factory reset (Parameter 48) to change the parameter version of the EPM to match the parameter version of the drive.
GF	Data Fault: User data and OEM defaults in the EPM are corrupted.	Restore factory defaults P48, see section above. If that does not work, replace EPM.
HF	High DC Bus Voltage Fault: Line voltage is too high; Deceleration rate is too fast; Overhauling load.	Check line voltage — set P01 appropriately
JF	Serial Fault: The watchdog timer has timed out, indicating that the serial link has been lost.	Check serial connection (computer) Check settings for P15 Check settings in communication software to match P15
LF	Low DC Bus Voltage Fault: Line voltage is too low.	Check line voltage — set P01 appropriately
OF	Output Transistor Fault: Phase to phase or phase to ground short circuit on the output; Failed output transistor; Boost settings are too high; Acceleration rate is too fast.	Reduce boost or increase acceleration values. If unsuccessful, replace drive.
PF	Current Overload Fault: VFD is undersized for the application; Mechanical problem with the driven equipment.	Check line voltage — set P01 appropriately Check for dirty coils Check for motor bearing failure
SF	Single-phase Fault: Single-phase input power has been applied to a three-phase drive.	Check input power phasing
F1	EPM Fault: The EPM is missing or damaged.	
F2-F9, Fo	Internal Faults: The control board has sensed a problem	Consult factory
Drive display = 60.0 even though it is cold outside and it should be running slower	Feedback signal is above set point	Check for proper set point Check liquid line pressure
Drive display = ‘---’ even though drive should be running	Start jumper is missing	Check auxiliary contact and connections.
Drive display = 8.0 even though fan should be running faster	Feedback signal is below set point and fan is at minimum speed	Check for proper set point Check liquid line pressure
VFD flashes 57 (60 Hz units), 47 (50 Hz units) and LCS	Feedback or speed signal lost. Drive will operate at 57/47 Hz until reset or loss of start command. Resetting requires cycling start command (or power).	In stand alone mode: Check transducer wiring and feedback voltage. Feedback voltage displayed on P-69. Pin 6 should be 5 v output. Pin 5 (feedback) should be somewhere between 0 and 5v.
VFD not slowing down even though liquid line pressure is below set point.	Faulty pressure transducer output.	Check VDC signal between TB5 and TB2. Should be in range of 0.5 v to 4.5 v.

LEGEND

- EPM — Electronic Programming Module
- LCS — Loss of Control Signal
- OEM — Original Equipment Manufacturer

*For additional information on changing Program Parameters refer to the Controls, Start-Up, Operation, Service, and Troubleshooting Guide.