



Installation Instructions

Part Numbers: CRLOWAMB018A00 THROUGH CRLOWAMB026A00

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GENERAL

This book contains instructions for the installation, start-up, and service of the Motormaster V (MMV) control on 48/50A020-060 units.

SAFETY CONSIDERATIONS

Installation, start-up, and servicing of this equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.).

Only trained, qualified installers and service technicians 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 may apply.

WARNING

Open all remote disconnects before servicing this equipment. Electrical shock could result in personal injury.

INTRODUCTION

The Motormaster V control is a motor speed control device which adjusts condenser fan motor speed in response to varying liquid refrigerant pressure. A properly applied Motormaster V control extends the operating range of air-conditioning systems and permits operation at lower outdoor ambient temperatures.

To operate these units at very low ambient temperatures, Motormaster V controls (Fig. 1) must be added. Field-fabricated and installed wind baffles are also required for units in areas with prevailing winds of more than 5 mph and where temperatures drop below 32 F. The Motormaster V control permits operation of the unit to an ambient temperature of -20 F (-29 C). The control regulates the speed of one 3-phase fan motor (2 fans for 40 to 60 ton units) that is compatible with the control. Replacement of fan motor on most units is not necessary since the control is compatible with the factory-installed fan motors. To verify that unit fan motors are compatible with control see Table 1.

See Tables 2A-2C and 3 for the Motormaster V control accessory package usage and contents. Field wiring of control is required.

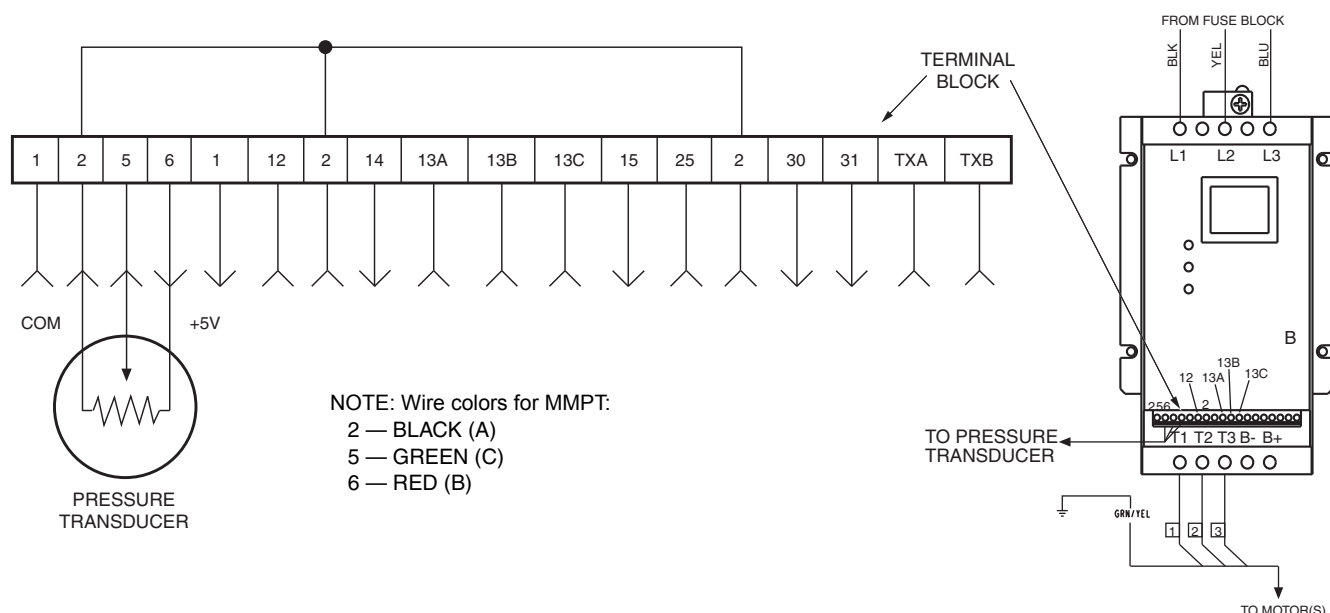


Fig. 1 — Motormaster® V Control

Table 1 — Applicable Voltages and Motors

VOLTAGE	COMPATIBLE MOTOR	
	Sizes 020-051 and 060 with RTPF	Size 060 with MCHX
208/230-3-60	HD52AK654, HD52AK002	00PPG000007207A
400-3-50, 460-3-60		00PPG000007208A
575-3-60	HD52GE576, HD52GE577	00PPG000007209A
380-3-60	HD52GE381, HD52GE382	00PPG000007210A

Table 2A — Motormaster® V Control Package Contents — 48/50AJ,AK,AW,AY020-060 Units (R-22)

ITEM	CRLOWAMB018A00	CRLOWAMB019A00	CRLOWAMB020A00
Controller, 230 V 5 Hp	HR46TN004	—	—
Controller, 460 V 5 Hp	—	HR46TN005	—
Controller, 575 V 5 Hp	—	—	HR46TN006
Fan Relay	HN61KK035		
Relay Base	HN79KK035		
Fuse Block	HY11UT035		
Fuse 15A, KTK-R, Class CC	—	—	HY10KB151 (3)
Fuse 20A, KTK-R, Class CC	—	HY10KB200 (3)	—
Fuse 30A, KTK-R, Class CC	HY10KB300 (3)	—	—
Harness Assembly	48EJ403106 (2)		
Harness Assembly	48EJ402454		
Harness Assembly	48EJ402298		
Label	48EJ503269		
Transducer	HK05YZ007		
Transducer Harness	48EJ403240		
Wire Tie	HY76TB123 (5)		
Wire Tie	HY76TB171 (2)		
Wire, 16 Gage 72 in. Long	WHT (1), GRY (1)		
Wire, 16 Gage 240 in. Long	RED (1), YEL (1)		

Table 2B — Motormaster V Control Package Contents — 48/50A2,A3,A4,A5020-050 Units (R-410A) and 48/50A2,A3,A4,A5060 RTPF Units (R-22)

ITEM	CRLOWAMB021A00	CRLOWAMB022A00	CRLOWAMB023A00
Controller, 230 V 5 Hp	HR46TN004	—	—
Controller, 460 V 5 Hp	—	HR46TN005	—
Controller, 575 V 5 Hp	—	—	HR46TN006
Fan Relay	HN61KK035		
Relay Base	HN79KK035		
Fuse Block	HY11UT035		
Fuse 15A, KTK-R, Class CC	—	—	HY10KB151 (3)
Fuse 20A, KTK-R, Class CC	—	HY10KB200 (3)	—
Fuse 30A, KTK-R, Class CC	HY10KB300 (3)	—	—
Harness Assembly	48EJ403106 (2)		
Harness Assembly	48EJ402454		
Harness Assembly	48EJ402298		
Label	48EJ503269		
Transducer	HK05ZZ001		
Transducer Harness	48EJ403240		
Wire Tie	HY76TB123 (5)		
Wire Tie	HY76TB171 (2)		
Wire, 16 Gage 72 in. Long	WHT (1), GRY (1)		
Wire, 16 Gage 240 in. Long	RED (1), YEL (1)		

Table 2C — Motormaster® V Control Package Contents — 48/50A2,A3,A4,A5060 MCHX Units (R-410A)

ITEM	CRLOWAMB024A00	CRLOWAMB025A00	CRLOWAMB026A00
Controller, 230 V 2 Hp	HR46TN001 (2)	—	—
Controller, 460 V 2 Hp	—	HR46TN002 (2)	—
Controller, 575 V 2 Hp	—	—	HR46TN003 (2)
Enclosure	30RA500381		
Enclosure Cover	30RA500519		
Enclosure Mounting Bracket	50EJ500656		
Fan Relay	HN61KK035 (2)		
Relay Base	HN79KK035 (2)		
Fuse Block	HY11UT035 (2)		
Fuse 15A, KTK-R, Class CC	—	HY10KB151 (6)	HY10KB151 (6)
Fuse 20A, KTK-R, Class CC	HY10KB200 (6)	—	—
Harness Assembly	48EJ400657 (2)		
Harness Assembly	48EJ402454 (2)		
Harness Assembly	48EJ400658 (2)		
Label	48EJ500564		
Transducer	HK05ZZ001 (2)		
Transducer Harness	48EJ403240 (2)		
Wire Tie	HY76TB123 (5)		
Wire Tie	HY76TB171 (2)		
Wire, 16 Gage 72 in. Long	WHT (2), GRY (2)		
1/2-in. Connector	HW60EA001 (2)		
1-in. Connector	HW60HH006 (2)		
Small Varnish Cloth	38C24601 (2)		
Large Varnish Cloth	48DA510141 (2)		

Table 3 — Motormaster V Control Package Usage

UNIT	VOLTAGE	ITEM DESCRIPTION
48/50AJ,AK,AW,AY020-060	208/230	CRLOWAMB018A00
	380, 400, 460	CRLOWAMB019A00
	575	CRLOWAMB020A00
48/50A2,A3,A4,A5020-050 and 48/50A2,A3,A4,A5060 RTPF	208/230	CRLOWAMB021A00
	380, 460	CRLOWAMB022A00
	575	CRLOWAMB023A00
48/50A2,A3,A4,A5060 MCHX	208/230	CRLOWAMB024A00
	380, 460	CRLOWAMB025A00
	575	CRLOWAMB026A00

LEGEND

MCHX — Microchannel Heat Exchanger
RTPF — Round Tube Plate Fin Heat Exchanger

Pre-Installation — Inspect the contents of this accessory package before installing. File a claim with the shipper if there is shipping damage or if a part is missing.

INSTALLATION

Step 1 — Install Field-Fabricated Wind Baffles

WARNING

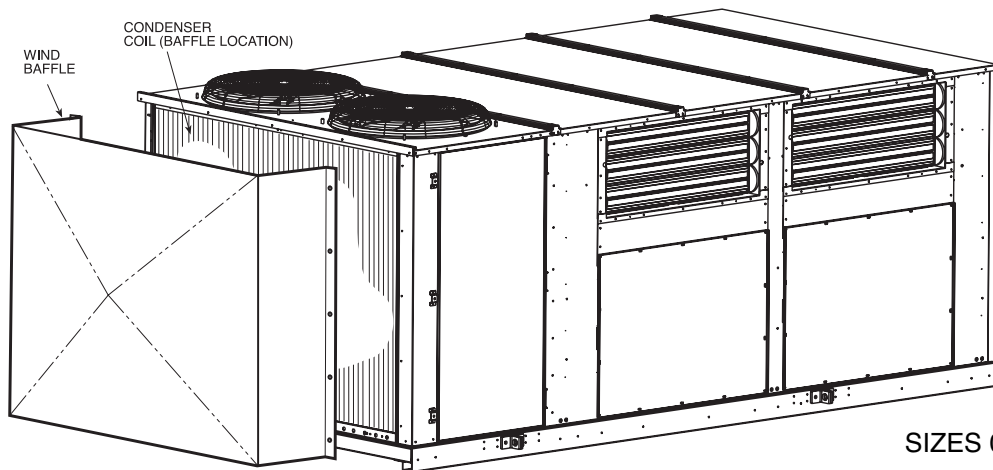
To avoid the possibility of electrical shock, open all disconnects before installing or servicing this accessory.

In areas with prevailing winds of more than 5 mph and where temperatures drop below 32 F, wind baffles must be field

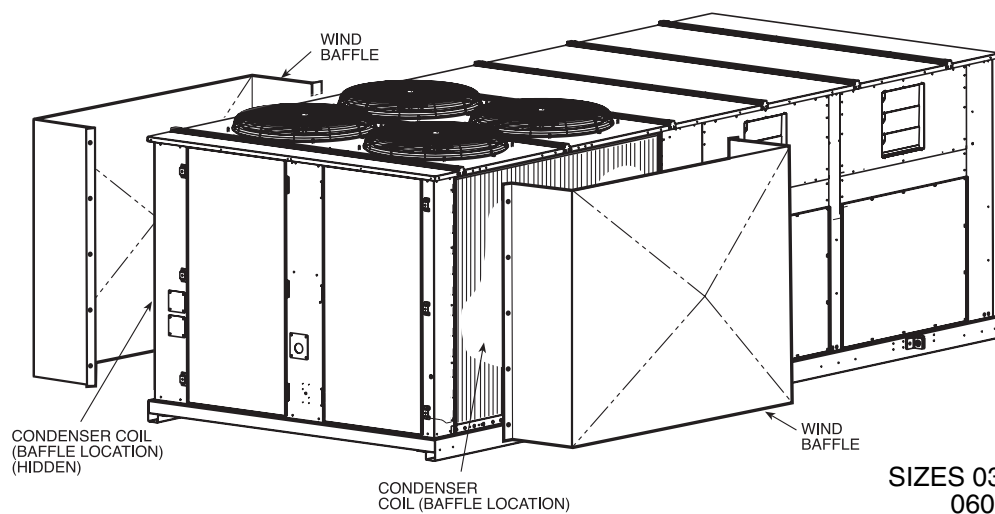
fabricated to ensure proper cooling cycle operation at low-ambient temperatures with Motormaster V controls, not needed on size 060 units with MCHX (Microchannel heat exchangers). See Fig. 2 for baffle details. Use 20-gage (1 mm) galvanized sheet metal, or similar corrosion-resistant material for the baffles. Use field-supplied screws to attach baffles to unit. Screws should be 1/4-in. (6.3 mm) diameter or larger. Screws should not be more than 1/2 inch in length. Drill required screw holes for mounting baffles.

CAUTION

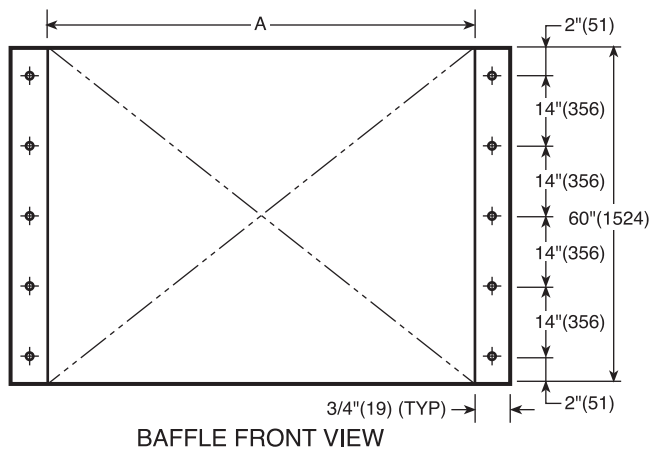
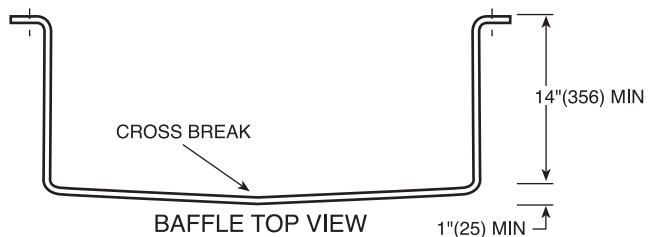
To avoid damage to refrigerant coils, electrical components, and wiring use extreme care when drilling screw holes and screwing in fasteners.



SIZES 020-035



SIZES 036-050 AND
060 RTPF



UNIT SIZE	QUANTITY	DIMENSION "A"	
		in.	mm
020-035	1	78.125 ± 0.125	1984 ± 3
036-050	2	78.125 ± 0.125	1984 ± 3
051,060	2	118 ± 0.125	2997 ± 3

NOTE: 48/50A2,A3,A4,A5060 units with MCHX do not require baffles.

LEGEND
MCHX — Microchannel Heat Exchanger
RTPF — Round Tube Plate Fin Heat Exchanger

Fig. 2 — Wind Baffle Details

Step 2 — Mounting and Electrical Connections for Motormaster® V Control

⚠ WARNING

To avoid possibility of electric shock and personal injury, open and tag all electrical disconnects before installing or servicing unit.

⚠ WARNING

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

⚠ CAUTION

To avoid damage to the small terminals on the Motormaster V control, use care when tightening the compression terminals and use the proper size screwdriver.

⚠ CAUTION

DO NOT connect incoming AC power to Motormaster V output terminals T1, T2, and T3. Severe damage to the control will result.

For 48/50A2,A3,A4,A5,AJ,AK,AW,AY020-035 units, the Motormaster controlled outdoor-fan motor (OFM) is the no. 1 OFM (see Fig. 3). The no. 2 OFM is controlled to shut off at 55 F and on at 65 F outdoor-air temperature and does NOT need to be changed out.

For 48/50A2,A3,A4,A5,AJ,AK,AW,AY036-050 units, the Motormaster controlled outdoor-fan motors (OFMs) are the no. 1 and 2 OFM (see Fig. 3). The no. 3 and 4 OFMs are controlled to shut off at 55 F and on at 65 F outdoor-air temperature and do NOT need to be changed out.

For 48/50AJ,AK,AW,AY051 AND 060 and 48/50A2,A3,A4,A5060 RTPF units, the Motormaster controlled outdoor-fan motors (OFM) are the no. 1 and 2 OFM (see Fig. 3). The no. 3, 4, 5, and 6 OFM are controlled to shut off at 55 F and on at 65 F outdoor-air temperature and do NOT need to be changed out.

For 48/50A2,A3,A4,A5060 MCHX units, the Motormaster controlled outdoor-fan motors (OFM) are the no. 1 and 3 OFM (see Fig. 3). The no. 2 and 4 OFM are controlled to shut off at 55 F and on at 65 F outdoor-air temperature and do NOT need to be changed out.

48/50AJ,AK,AW,AY020-060 UNITS AND 48/50A2,A3,A4,A5020-050 AND 060 RTPF UNITS — Use the following procedure to mount and connect the MMV control to these units.

1. Disconnect power to the unit. Lockout and tag power disconnect.
2. Remove control box covers.
3. Mount accessory fuse block and fan relay base inside control box as shown in Fig. 4. Secure components with 1/2-in. sheet metal screws.
4. Insert fuses into fuse block and the relay into the relay base.

5. Install MMV on or near the bulkhead of the indoor section.
 - a. For installation on units with ACH550 or S9 VFD (variable frequency drive) see Fig. 5.
 - b. For installation on 25 Hp 575-v units with E3 VFD see Fig. 6.
 - c. For installation on 30 or 40 Hp 575-v units with E3 VFD see Fig. 7.
6. Make electrical connections to MMV controls (see Fig 8 and 9).
 - a. Connect black, yellow and blue wires of harness 48EJ402298 to MMV terminals L1, L2 and L3.
 - b. For unit sizes 020-035, remove ring terminals from black, red and blue wires of harness 48EJ403106 and strip insulation back 1/4-inch. Connect black, red and blue wires to MMV terminals T1, T2 and T3. Connect GRD (ground) wire to MMV ground screw.
For unit sizes 036-060, remove ring terminals from black, red and blue wires of the existing OFM wire harnesses and strip insulation back 1/2-inch. Attach 16 gage black, red and blue field-supplied wires to the corresponding colors of both OFM harnesses with a wire nut. Connect black, red and blue wires to MMV terminals T1, T2 and T3. Connect GRD wire to MMV ground screw.
 - c. Connect wires A (BLACK), C (GREEN), and B (RED) of wire harness 48EJ403240 to terminals 2, 5 and 6 on the MMV terminal block.
 - d. Connect the 240 in. long red 16 gage wire to terminal 1, 13A, or 13C on the MMV terminal board. See Table 4 for correct wiring.
 - e. Connect the 240 in. long yellow 16 gage wire to terminal 2 on the MMV terminal board.
7. Disconnect outdoor-fan motor(s).
 - a. For unit sizes 020-035, remove outdoor-fan motor no. 1 (OFM1) leads from outdoor-fan contactor no. 1 (OFC1). See Fig. 8.
 - b. For unit sizes 036-060, remove outdoor-fan motor no. 1 and 2 (OFM1 and OFM2) leads from outdoor-fan contactor no. 1 (OFC1). See Fig. 9.
 - c. Disconnect OFM harness from motor(s) and discard harness(es).
8. Install harness 48EJ402454 from the load side of the CCB (control circuit breaker) to the fuse block.
9. Route all wires connected to MMV control through the bulkhead. Route the transducer harness separately from the rest to avoid electrical interference.
10. Make OFM connections for harness 48EJ403106, fuse block connections for harness 48EJ402298, and fan relay connections using the 40 in. long 16 gage red and yellow wires.
11. Connect FR (fan relay) coil to OFC1 coil using the 72 in. long 16 gage white and gray wires (stripped end goes to FR).
12. Connect transducer HK05YZ007 to the liquid line service Schrader port for circuit A.
 - a. For 48/50A020-035: The top circuit is circuit A.
 - b. For 48/50A036-060: Facing the control box, circuit A will be on the left hand side.
13. Connect transducer harness 48EJ403240 to transducer.
14. Bundle excess wire and dress harnesses with wire ties.
15. Reattach control box covers.

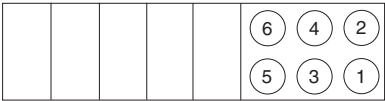
UNIT 48/50A2,A3,A4,A5, AJ,AK,AW,AY	FAN ARRANGEMENT	FAN NO.	NORMAL CONTROL
020-035		1	MMV
		2	Shut OFF at 55 F and turn ON at 65 F outdoor-air temperature
036-050		1	MMV
		2	
		3	Shut OFF at 55 F and turn ON at 65 F outdoor-air temperature
		4	
051,060 RTPF		1	MMV
		2	
		3	
		4	Shut OFF at 55 F and turn ON at 65 F outdoor-air temperature
		5	
		6	
060 MCHX		1	MMV-B
		2	Shut OFF at 55 F and turn ON at 65 F outdoor-air temperature
		3	MMV-A
		4	Shut OFF at 55 F and turn ON at 65 F outdoor-air temperature

Fig. 3 — Fan Control

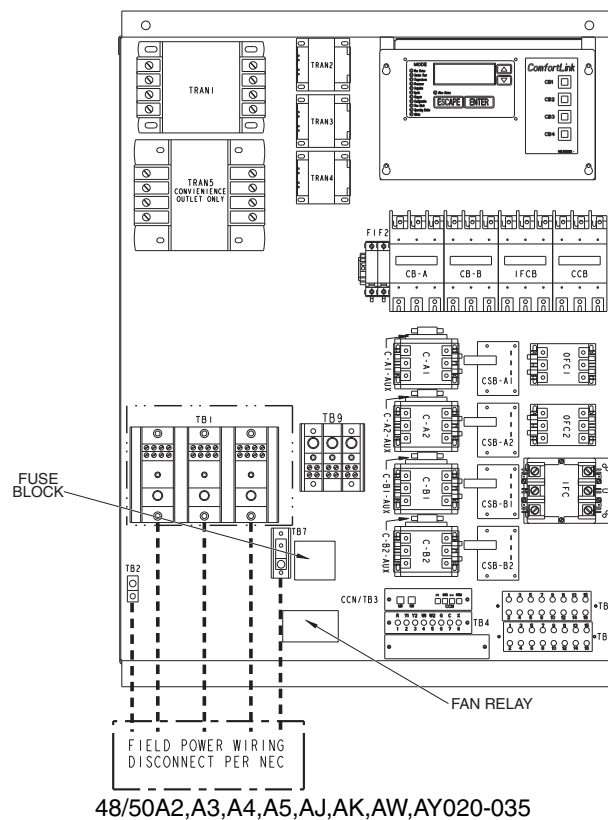


Fig. 4 — Fuse Block and Fan Relay Mounting

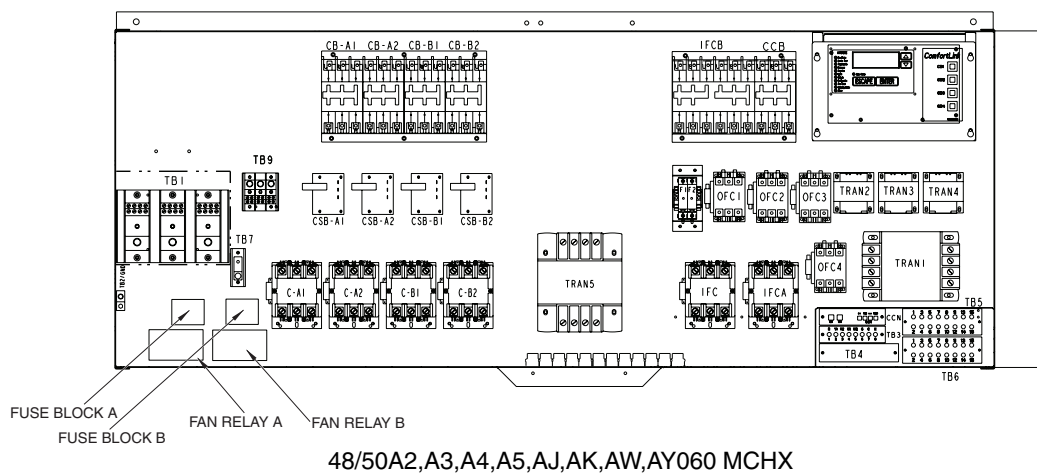
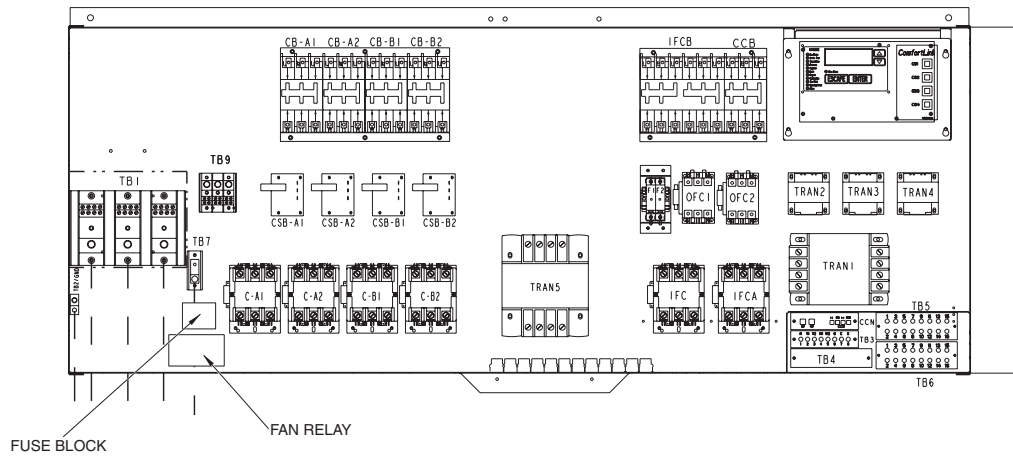


Fig. 4 — Fuse Block and Fan Relay Mounting (cont)

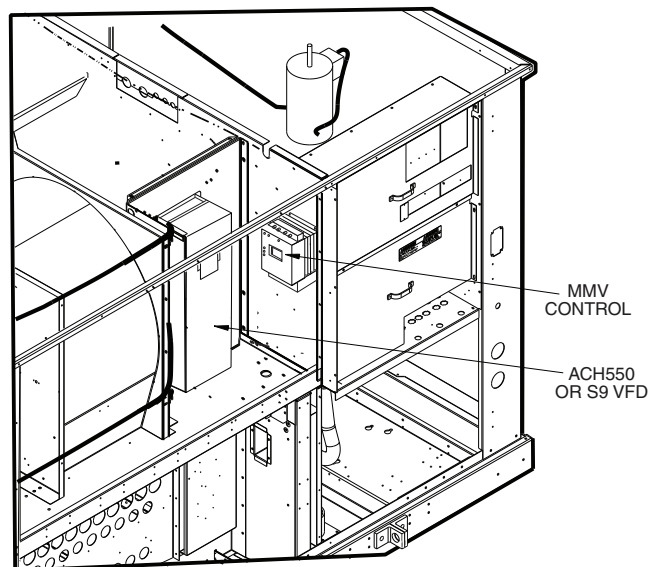


Fig. 5 — MMV Control Mounting with ACH550 or S9 VFD

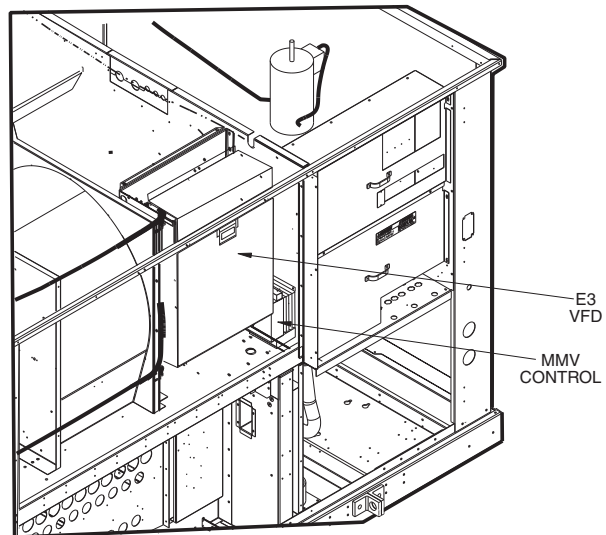


Fig. 6 — MMV Control Mounting with 25 Hp 575-v E3 VFD

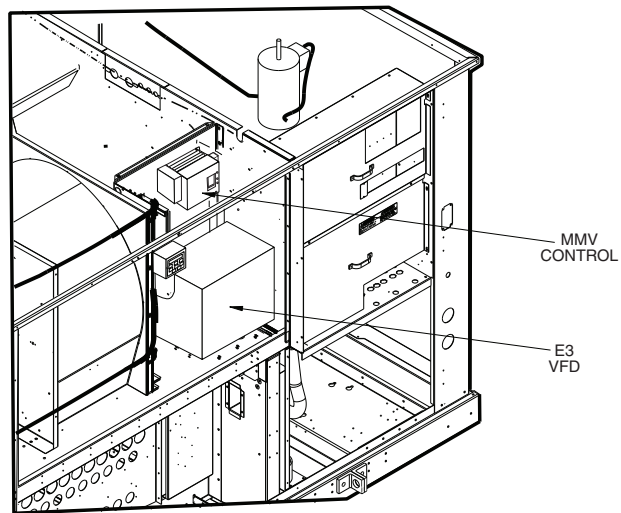


Fig. 7 — MMV Control Mounting with 30 or 40 Hp 575-v E3 VFD

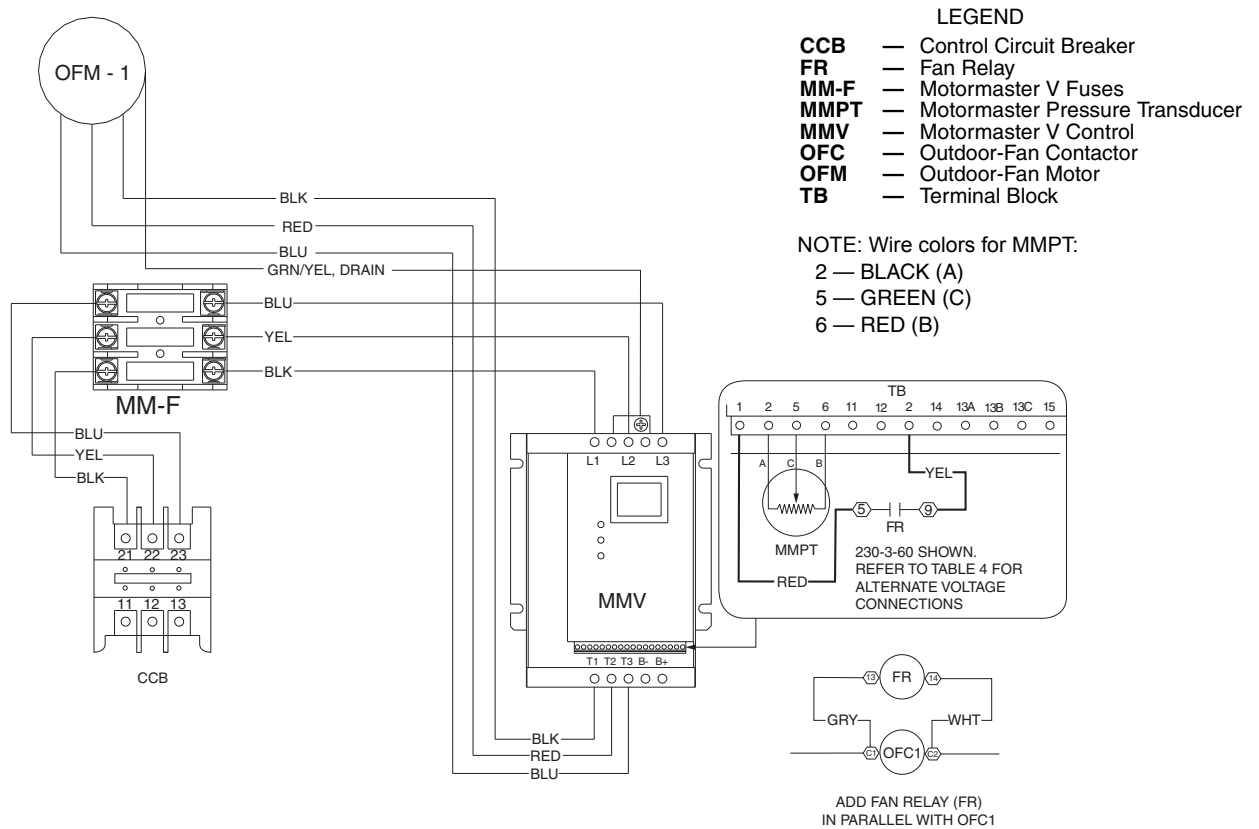


Fig. 8 — Motormaster® V Accessory Wiring — 48/50A2,A3,A4,A5,AJ,AK,AW,AY020-035 Units

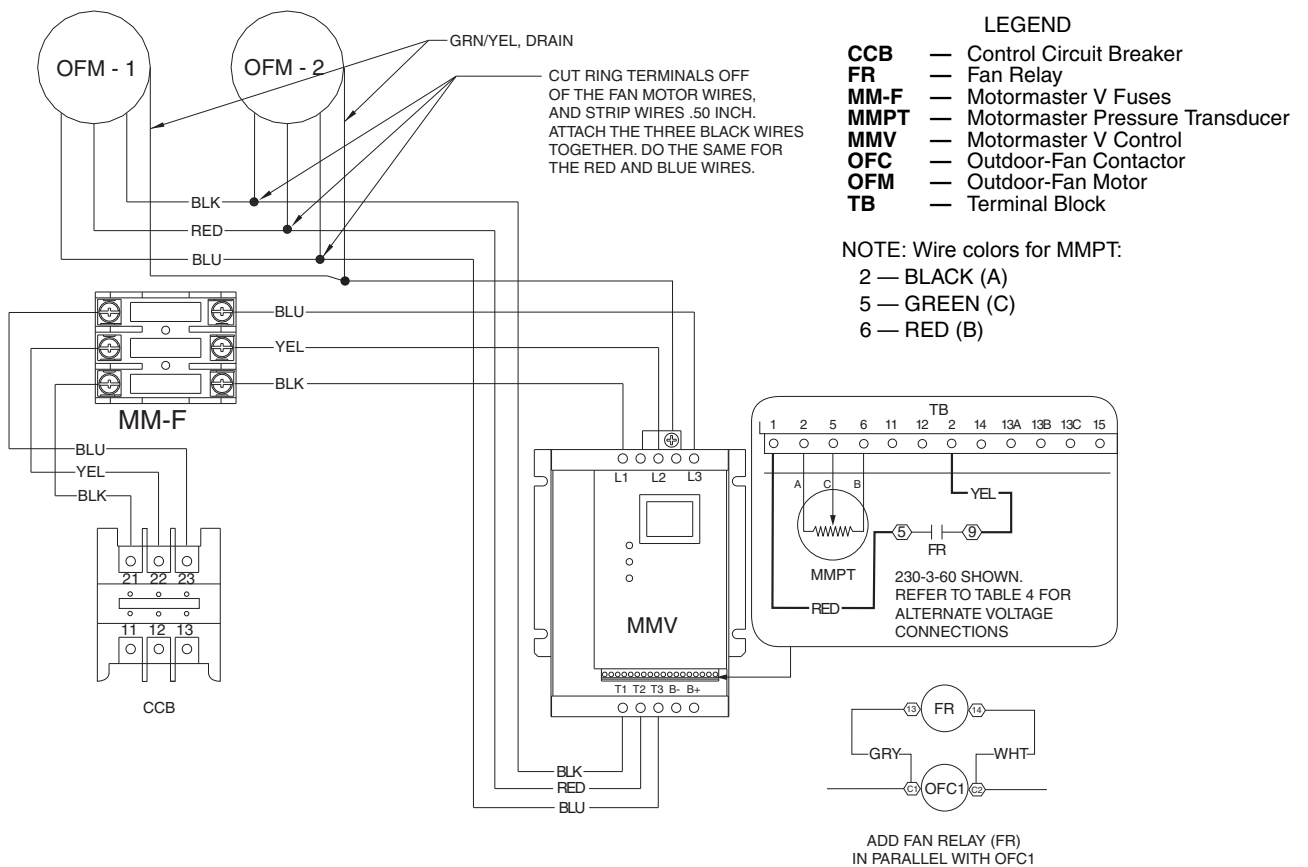


Fig. 9 — Motormaster V Accessory Wiring — 48/50A2,A3,A4,A5,AJ,AK,AW,AY036-050 Units and 48/50A2,A3,A4,A5060 RTPF Units

48/50A2,A3,A4,A5060 MCHX UNITS — Two Motormaster® controls are used to control two independent outdoor-fan motors. The refrigerant circuit A Motormaster controlled OFM is the no. 3 OFM. The refrigerant circuit B Motormaster controlled OFM is the no. 1 OFM (see Fig. 3). The no. 2 and 4 OFMs are controlled to shutoff at 55 F and on at 65 F outdoor-air temperature. All OFMs in this unit are compatible with the Motormaster control and do NOT need to be changed out.

Use the following procedure to mount and connect the MMV controllers to this unit:

1. Disconnect power to the unit. Lockout and tag power disconnect.
2. Remove control box covers.
3. Mount accessory fuse blocks HY11UT035 (label 1 as MMF-A and the other as MMF-B) and fan relay bases HN79KK035 (label 1 as FR-A and the other as FR-B) inside control box as shown in Fig. 4. Secure components with ½-in. sheet metal screws.
 - a. Insert fuses into fuse blocks and relays into relay bases.
 - b. Install harnesses 48EJ402454 from load side of CCB (control circuit breaker terminals 21, 22, 23) to line side of MMF-A and MMF-B fuse blocks as shown in Fig. 10. Note that it may be easier to pick up the load side of CCB (control circuit breaker) from the ¼-in. male quick connect terminals on the line side (terminals 11, 12, 13) of the OFCs (outdoor fan contactors). See power schematic on control box door.
 - c. Connect FR-A coil to OFC3 coil and FR-B coil to OFC1 coil using the 72 in. long 16 gage white and gray wires (stripped end goes to FR) as shown in Fig. 10.
4. Mount the MMV controller enclosures 30RA500381 on the inside of the unit corner post, as shown in Fig. 11, using the mounting brackets 50EJ500656 installed on the enclosures (label 1 as MMV-A and the other as MMV-B). Remove the enclosure covers and install the ½-in. HW60EA001 and 1-in. HW60HH006 connectors in the holes in the lower right hand side of the enclosures.
5. Connect transducers HK05ZZ001 to the liquid line service Schrader ports, located under the V-coil of the condenser fan sections, of refrigerant circuit A and B. Circuit A is the one closest to the indoor fan motor section, and circuit B is the one closest to the control box, (label circuit A transducer as MMPT-A and circuit B transducer as MMPT-B).
6. Plug transducer cables 48EJ403240 into transducers (label stripped end of circuit A cable as MMPT-A and the stripped end of circuit B cable as MMPT-B). Run cables along inside of unit base rail and up the corner post to the MMV enclosures.
7. Run MMPT-A cable through ½-in. connector of MMV-A enclosure, and MMPT-B cable through ½-in. connector of MMV-B enclosure (do not tighten connector screws at this time). Connect red, green, and black wires to MMV-A and MMV-B terminals 6, 5, and 2 as shown in Fig. 10. Terminate drain wire of transducer cables under one of the lower MMV mounting screws.
8. Make remaining electrical connections to MMV-A and MMV-B (see Fig. 10).
 - a. In main control box, disconnect black, red, blue, and green wires from load side (terminals 21, 22, 23) of OFC1 and OFC3 contactors (label cable from OFC1 as OFM1 and cable from OFC3 as OFM3). Pull wires out through the hole in the bottom of the control box and run them through the opening of the cable tray on the back of the control

box (where existing transducer cables come out). Route wires along bottom edge of back of control box and up the corner post to the MMV enclosures.

- b. Run the OFM1 cable through the 1-in. connector of the MMV-B enclosure (do not tighten connector screws at this time). Remove ring terminals from black, red, and blue wires and strip insulation back 3/8-inch. Connect black, red, and blue wires to MMV-B terminals T1, T2, and T3. Connect green ground wire to MMV-B ground screw.
- c. Run OFM3 cable through 1-in. connector of MMV-A enclosure (do not tighten connector screws at this time). Remove ring terminals from black, red, and blue wires and strip insulation back 3/8-inch. Connect black, red, and blue wires to MMV-A terminals T1, T2, and T3. Connect green ground wire to MMV-B ground screw.
- d. In main control box connect 1 Motormaster® VFD harness 50EJ400657 to the load side of MMF-A (label the opposite end of this harness as MMF-A) and the other Motormaster VFD harnesses 50EJ400657 to the load side of MMF-B (label the opposite end of this harness as MMF-B). Run the harnesses along the bottom of the control box and out through the hole that the OFM harnesses were in. Pull the harnesses out through the hole in the bottom of the control box and run them through the opening of the cable tray on the back of the control box (in the same manner as the OFM harnesses).
- e. Run the MMF-A cable through 1-in connector of MMV-A enclosure (do not tighten connector screws at this time). Connect L1, L2, and L3 wires to MMV-A terminals L1, L2, and L3. Connect green ground wire to MMV-A ground screw. Place one large varnish cloth 48DA510141 around both cables at the point they enter the 1-in. connector. Tighten down connector screws being careful not to damage the cables.
- f. Run the MMF-B cable through 1-in. connector of MMV-B enclosure (do not tighten connector screws at this time). Connect L1, L2, and L3 wires to MMV-B terminals L1, L2, and L3. Connect green ground wire to MMV-B ground screw. Place the other large varnish cloth 48DA510141 around both cables at the point they enter the 1-in. connector. Tighten down connector screws being careful not to damage the cables.
- g. In main control box connect 1 Motormaster VFD (variable frequency drive) harness 50EJ400658 to the N.O. (normally open) contact of FR-A (see Fig. 11) (label the opposite end of this harness as FR-A) and the other Motormaster VFD harness 50EJ400658 to the N.O. contact of FR-B (label the opposite end of this harness as FR-B) Run the harnesses along the bottom of the control box and out through the hole that the OFM harnesses were in. Pull the harnesses out through the hole in the bottom of the control box and run them through the opening of the cable tray on the back of the control box (in the same manner as the OFM harnesses).
- h. Run the FR-A cable through the 1/2-in. connector of the MMV-A enclosure (do not tighten connector screws at this time). Connect black wire to MMV-A terminal 2 and red wire to MMV-A terminal 1, 13A, or 13C (see Table 4). Place 1 small varnish cloth 38C24601 around both cables at the point they enter the 1/2-in. connector. Tighten down connector screws being careful not to damage the cables.

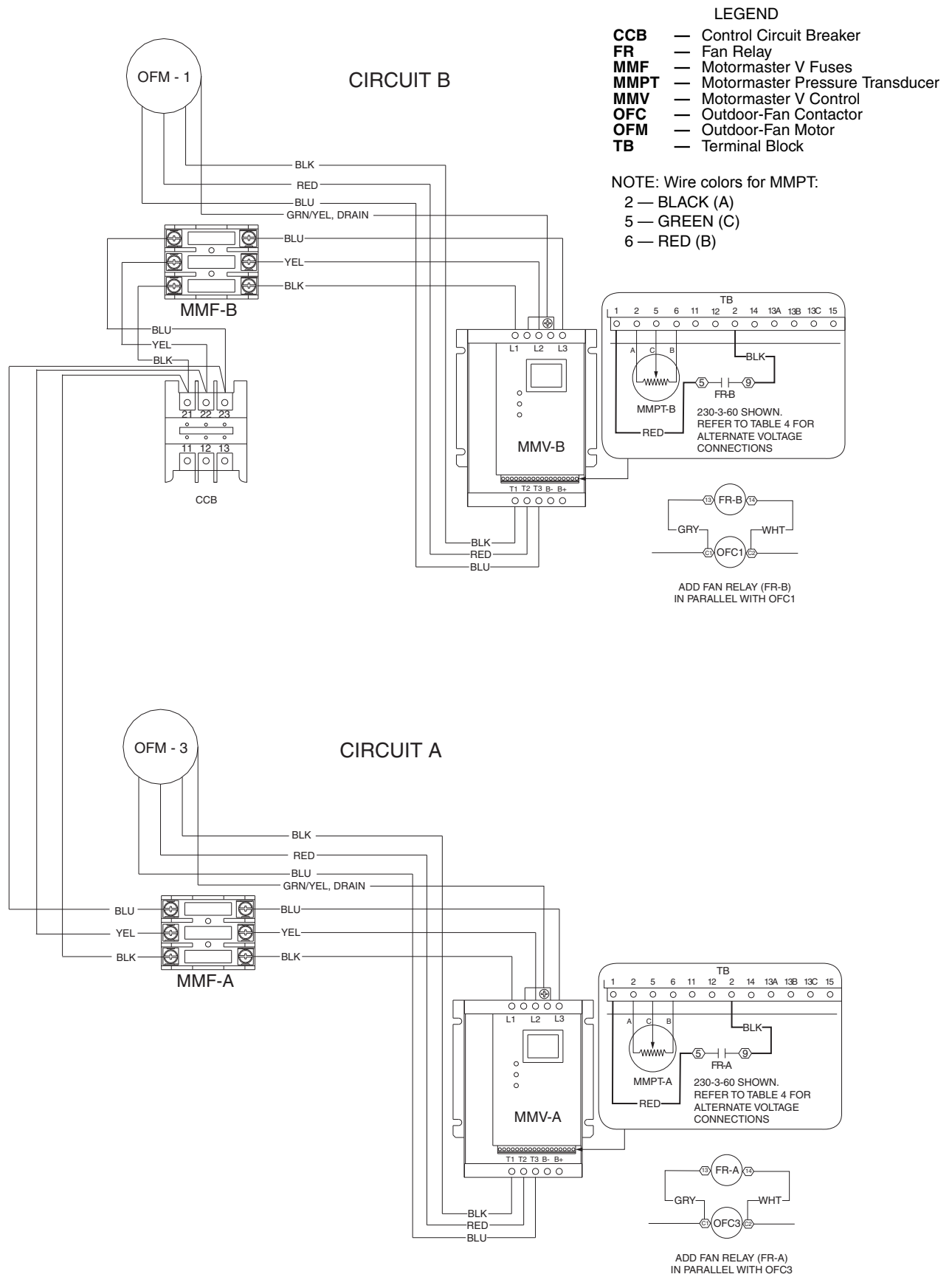


Fig. 10 — Motormaster V Accessory Wiring — 48/50A2,A3,A4,A5060 MCHX Units

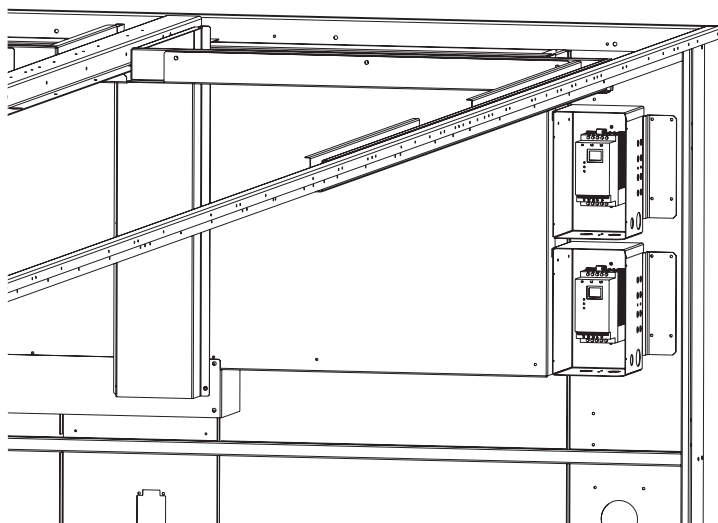


Fig. 11 — MMV Control Mounting with 48/50A2,A3,A4,A5060 MCHX Units

- i. Run the FR-B cable through the 1/2-in. connector of the MMV-B enclosure (do not tighten connector screws at this time). Connect black wire to MMV-B terminal 2 and red wire to MMV-B terminal 1, 13A, or 13C (see Table 4). Place the other small varnish cloth 38C24601 around both cables at the point they enter the 1/2-in. connector. Tighten down connector screws being careful not to damage the cables.
9. Bundle excess wire and dress harnesses with wire ties.
10. Reattach control box, MMV enclosure, and cable tray covers.

Step 3 — Configure Motormaster® V Control

The Motormaster V control is configured for an operation mode of internal PI (pressure independent) control and 0 to 5V feedback by installing the start contactor according to Table 4. No additional programming is required. Note that the pressure transducer must be attached for proper configuration.

Table 4 — Configuration Table

NOMINAL VOLTAGE (V-Ph-Hz)	MODE	CONTROL INPUT (Pin 5)	START CONTACTS
230-3-60 460-3-60 575-3-60	1	Internal PI control, 0-5V feedback	TB 1,2
208-3-60 380-3-60	2		TB 13A,2
400-3-50	4		TB 13C,2

Step 4 — Test Motormaster V Control — To test the control and motor in the test mode, run compressor no. 1. The Motormaster V electronic control adjusts the fan speed based on the liquid pressure input. Ensure that fans are rotating clockwise (as viewed from above). If rotation is backward, lock out all power then swap 2 leads AFTER the Motormaster V control.

START-UP

The Motormaster V electronic control will be powered up as long as unit voltage is present. When the system calls for cooling, the fan relay will be energized to initiate the start-up

sequence for the Motormaster V electronic control. The LED (light-emitting diode) will display the speed of the motor. The display range will be 8 to 60 Hz. The Motormaster V electronic 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 for R-22 units and 320 psig for R-410A units. Above that pressure, the fan should operate at full speed.

The Motormaster V control uses a 0 to 5 vdc signal input from a pressure transducer attached to the liquid line service valve gage port on circuit A. The pressure transducer is connected to terminals 2, 5 and 6 on the controller. The controller is configured by jumper wires and sensor input types. No field programming is required. If controller does not function properly, the information provided below can be used to program and troubleshoot the drive.

Drive Programming — Table 5 shows all program parameters for each of the operating modes. Refer to Troubleshooting section before attempting to change programming in the Motormaster V control.

⚠ CAUTION

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

TO ENTER PASSWORD AND CHANGE PROGRAM VALUES:

1. Press MODE.
2. The display will read “00” and the upper right-hand decimal point will be blinking. This will activate the PASSWORD prompt (if the password has not been disabled).
3. Use the UP and DOWN 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.

Table 5 — Program Parameters for the Operating Mode

PARAMETERS	DESCRIPTION	MODE 1	MODE 2	MODE 4
P01	Line Voltage: 01 = low line, 02 = high line	01	02	02
P02	Carrier Freq: 01 = 4 kHz, 02 = 6 kHz, 03 = 8 kHz	01	01	01
P03	Startup mode: flying restart	06	06	06
P04	Stop mode: coast to stop	01	01	01
P05	Standard Speed source: 01 = keypad, 04 = 4-20mA (NO PI), 05 = R22 or R410A, 06 = R134a	05	05	05
P06	TB-14 output: 01 = none	01	01	01
P08	TB-30 output: 01 = none	01	01	01
P09	TB-31 Output: 01 = none	01	01	01
P10	TB-13A function sel: 01 = none	01	01	01
P11	TB-13B function sel: 01 = none	01	01	01
P12	TB-13C function sel: 01 = none	01	01	01
P13	TB-15 output: 01 = none	01	01	01
P14	Control: 01 = Terminal strip	01	01	01
P15	Serial link: 02 = enabled 9600,8,N,2 with timer	02	02	02
P16	Units editing: 02 = whole units	02	02	02
P17	Rotation: 01 = forward only, 03 = reverse only	01	01	01
P19	Acceleration time: 20 sec	20	20	20
P20	Deceleration time: 10 sec	10	10	10
P21	DC brake time: 0	0	0	0
P22	DC BRAKE VOLTAGE 0%	0	0	0
P23	Min freq = 8 Hz ~ 100 – 160 rpm	8	8	8
P24	Max freq	60	60	50
P25	Current limit: (%)	125	110	110
P26	Motor overload: 100	100	100	100
P27	Base freq: 60 or 50 Hz	60	60	50
P28	Fixed boost: 0.5% at low frequencies	0.5	0.5	0.5
P29	Accel boost: 0%	0	0	0
P30	Slip compensation: 0%	0	0	0
P31	Preset spd #1: speed if loss of control signal	57	57	47
P32	Preset spd #2: 0	0	0	0
P33	Preset spd #3: 0	0	0	0
P34	Preset spd 4 default — R22 setpoint. TB12-2 open	24.0	24.0	24.0
P35	Preset spd 5 default — R134a setpoint. TB12-2 closed	12.6	12.6	12.6
P36	Preset spd 6 default	0	0	0
P37	Preset spd 7 default	0	0	0
P38	Skip bandwidth	0	0	0
P39	Speed scaling	0	0	0
P40	Frequency scaling 50 or 60 Hz	60	60	50
P41	Load scaling: default (not used so NA)	200	200	200
P42	Accel/decel #2: default (not used so NA)	60	60	60
P43	Serial address	1	1	1
P44	Password:111	111	111	111
P45	Speed at min signal: 8 Hz; used when PID mode is disabled and 4-20 mA input is at 4 mA	8	8	8
P46	Speed at max feedback: 60 or 50 Hz. Used when PID disabled and 4-20 mA input is at 20 mA	60	60	50
P47	Clear history? 01 = maintain. (set to 02 to clear)	01	01	01
P48	Program selection: Program 1 – 12	01	02	04
P61	PI Mode: 05 = reverse, 0-5V, 01 = no PID	05	05	05
P62	Min feedback = 0 (0V * 10)	0	0	0
P63	Max feedback = 50 (5V * 10)	50	50	50
P64	Proportional gain = 3.5%	3.5	3.5	3.5
P65	Integral gain = .2	.2	.2	.2
P66	PI accel/decel (setpoint change filter) = 10	10	10	10
P67	Min alarm	0	0	0
P68	Max alarm	0	0	0

LEGEND

NA — Not Applicable
PI — Proportional Integral
PID — Proportional Integral Derivative

4. Press MODE to display present parameter setting. The upper right decimal point blinks. Use UP and DOWN buttons to scroll to the desired parameter number.
5. 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. Use the UP and DOWN buttons to change setting. Press MODE to store new setting.
6. Press MODE to store the new setting and also exit the PROGRAM mode. To change another parameter, press 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 to access the parameters.
7. After two minutes, the password must be entered in order to access the parameters again.

TO CHANGE PASSWORD — Enter the current password then change P44 to the desired password.

TO RESET FACTORY DEFAULTS — To recognize a factory reset, the MMV controller must see a change in P48.

1. Cycle power from Motormaster® V control.
2. Enter PROGRAM mode by entering password.
3. Scroll to P48 by using UP and DOWN buttons and then press MODE. One of the 12 mode numbers will appear. (Modes 1, 2 and 4 are used for these units.)
4. Restore factory defaults by changing the value in P48 using UP and DOWN buttons and then storing the value by pressing MODE.
5. Press MODE again to re-display the value of P48.
6. Change the value of P48 to the desired factory default mode (see Table 5) using UP and DOWN buttons then press MODE. The Motormaster V control is now restored to factory settings.

TROUBLESHOOTING

Troubleshooting the Motormaster V control requires a combination of observing system operation and VFD display information.

If the liquid line pressure is above the set point and the VFD is running at full speed, this is a normal condition. The fan **CANNOT** go any faster to maintain set point.

If the VFD is not slowing down even though liquid line pressure is below set point, the VFD could be set for manual control or the control may be receiving faulty pressure transducer output. Corrective action would include:

- Check that VDC signal between TB5 and TB2 is between 0.5 v and 4.5 v.
- Restore VFD to automatic control.
- Change parameter P05 back to correct value shown in Table 5.

The MMV control also provides real time monitoring of key inputs and outputs. The collective group is displayed through parameters P50 to P56 and all values are read only. These values can be accessed without entering a password.

Press MODE twice and P50 will appear.

Press MODE again to display value.

To scroll to P51-P56 from P50, use UP and DOWN buttons then press MODE to display the value.

- **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
- **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

NOTE: The Motormaster V transducer is attached to circuit A. If circuit A compressor power is interrupted (overload, high pressure cutout, etc.) the outdoor fans will operate at a reduced speed resulting from erroneous low pressure readings. This process may cause a high pressure safety cutout on circuit B compressor. If only circuit B is capable of operating for a temporary period of time because of a circuit A problem, the transducer will have to be moved to the circuit B service port until circuit A can be repaired. Once the problem is repaired, move the transducer back to circuit A for proper unit operation.

Fault Lockout — If a fault lockout (LC) has occurred, view the fault history in P50 to find the last fault. Once P50 is displayed, use the arrow buttons to scroll through the last 8 faults. Any current faults or fault codes from the fault history can be analyzed using Table 6.

TO DISABLE AUTOMATIC CONTROL MODE AND ENTER MANUAL SPEED CONTROL:

1. Change P05 to '01- keypad'.
2. Push UP and DOWN arrow button to set manual speed.
3. Set P05 to proper value to restore automatic control according to Table 5.

TO PROVIDE MANUAL START/STOP CONTROL — With power removed from VFD, remove start command jumper and install a switch between the appropriate start terminals as required in Table 4.

EPM Chip — The drive uses a electronic programming module (EPM) chip to store the program parameters. This is an EEPROM memory chip and is accessible from the front of the VFD. It should not be removed with power applied to the VFD.

Loss of CCN Communications — Carrier Comfort Network® (CCN) communications with external control systems can be affected by high frequency electrical noise generated by the Motormaster V control. Ensure unit is well grounded to eliminate ground currents along communication lines.

If communications are lost only while Motormaster V control is in operation, order a signal isolator (CEAS420876-2) and power supplies (CEAS221045-01, 2 required) for the CCN communication line.

Table 6 — 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.

CODE	DESCRIPTION	RESET METHOD	PROBABLE CAUSE	CORRECTIVE ACTION
AF	High Temperature Fault	Automatic	Ambient temperature is too high; Cooling fan has failed (if equipped).	Check cooling fan operation.
CF	Control Fault	Manual	A blank EPM, or an EPM with corrupted data has been installed.	Perform a factory reset using Parameter 48 – PROGRAM SELECTION. See Drive Programming section.
cF	Incompatibility Fault	Manual	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.
F1	EPM Fault	Manual	The EPM is missing or damaged.	Install EPM or replace with new EPM.
F2—F9 Fo	Internal Faults	Manual	The control board has sensed a problem	Consult factory.
GF	Data Fault	Manual	User data and Carrier defaults in the EPM are corrupted.	Restore factory defaults by toggling P48 to another mode. Then set P48 to desired mode to restore all defaults for that mode. See Drive Programming section. If that does not work, replace EPM.
HF	High DC Bus Voltage Fault	Automatic	Line voltage is too high; Deceleration rate is too fast; Overhauling load.	Check line voltage — set P01 appropriately.
JF	Serial Fault	Automatic	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	Automatic	Line voltage is too low.	Check line voltage — set P01 appropriately.
OF	Output Transistor Fault	Automatic	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	Automatic	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	Automatic	Single-phase input power has been applied to a three-phase drive.	Check input power phasing.
Drive displays '---' even though drive should be running	Start Contact is Not Closed	Automatic	Start contact is missing or not functioning.	Check fan relay.
VFD flashes "---" and LCS	Start Contact is Not Closed	Automatic	Start contact not closed.	Check FR for closed contact.
VFD flashes 57 (or 47) and LCS	Speed Signal Lost	Automatic	Speed signal lost. Drive will operate at 57 (or 47) Hz until reset or loss of start command. Resetting requires cycling start command (or power).	Transducer signal lost. Check VDC signal between TB5 and TB2. Should be in range of 0.5V to 4.5V. 5VDC output should be present between TB6 and TB2.

LEGEND

EPM — Electronic Programming Module
FR — Fan Relay
LCS — Loss of Control Signal
TB — Terminal Block
VFD — Variable Frequency Drive

