



# Installation Instructions

Part Numbers: CRLOWAMB033A00 THROUGH CRLOWAMB038A00

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## 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.

## GENERAL

This book contains instructions for the installation, start-up, and service of the Motormaster V (MMV) control on 48/50P030-100 units.

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 (8 kph) and where temperatures drop below 32 F (0° C). 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 or two 3-phase fan motors depending on unit size. Replacement of the 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 the control see Table 1.

See Tables 2-4 for the Motormaster V control accessory package usage and contents. Field wiring of control is required.

**Table 1 — Replacement Motor Part Numbers**

48/50P2,P3,P4,P5 UNIT SIZE	VOLTAGE	ACCESSORY PART NUMBER
035	208/230-3-60	Not Required, Std Unit Motor
	400-3-50, 460-3-60	Not Required, Std Unit Motor
	575-3-60	Not Required, Std Unit Motor
	380-3-60	HD56AK380
030, 040-060	208/230-3-60	HD52AK002
	400-3-50, 460-3-60	HD52AK002
	575-3-60	Not Required, Std Unit Motor
	380-3-60	Not Required, Std Unit Motor
070	208/230-3-60	HD52AK002 (2 Required)
	400-3-50, 460-3-60	HD52AK002 (2 Required)
	575-3-60	Not Required, Std Unit Motor
	380-3-60	Not Required, Std Unit Motor
075-100	208/230-3-60	Not Available
	400-3-50, 460-3-60	HD52AK002 (2 Required)
	575-3-60	Not Required, Std Unit Motor
	380-3-60	Not Available

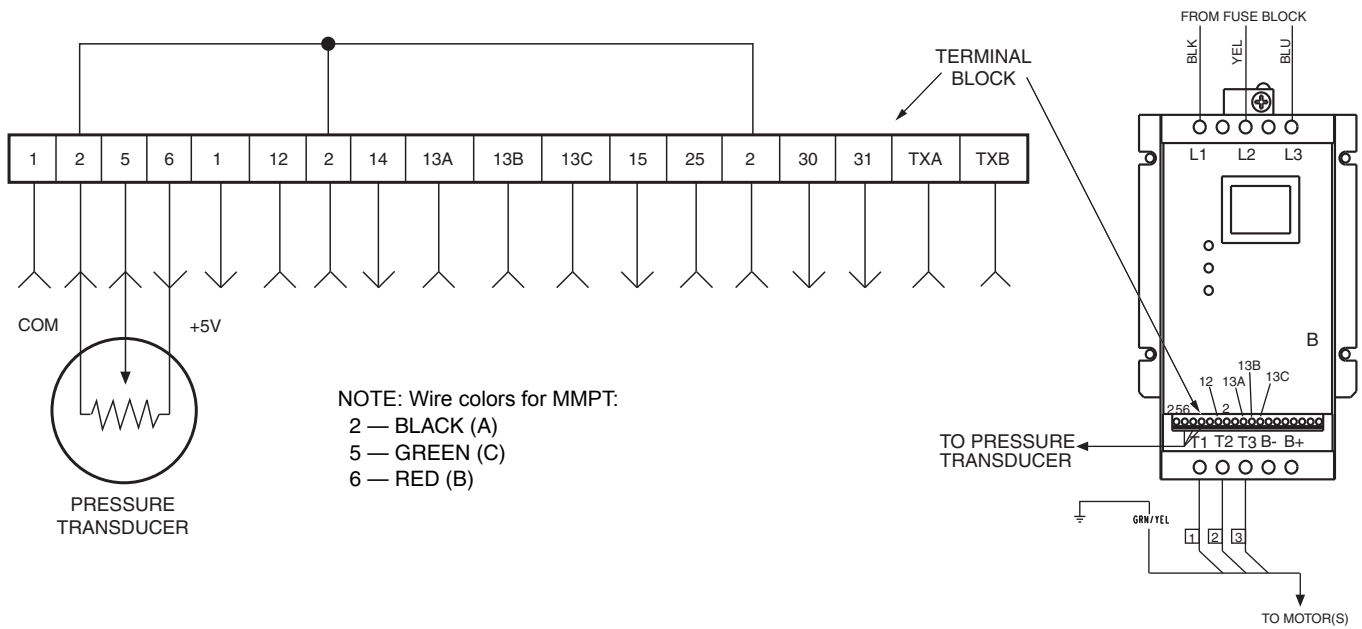


Fig. 1 — Motormaster® V Control

Table 2 — Motormaster® V Control Package Contents — 48/50P030-060 Units

ITEM	CRLOWAMB033A00	CRLOWAMB034A00	CRLOWAMB035A00
Connector (1/2-in.)		HW60EA001	
Connector (1-in.)		HW60HH006	
Controller, 230 V 2 Hp	HR46TN001	—	—
Controller, 460 V 2 Hp	—	HR46TN002	—
Controller, 575 V 2 Hp	—	—	HR46TN003
Enclosure		30RA500381	
Enclosure Cover		30RA500519	
Enclosure Mounting Bracket		50EJ500656	
Fan Relay		HN61KK055	
Relay Base		HN79KK035	
Fuse Block		HY11UT035	
Fuse 15A, KTK-R, Class CC	—	HY10KB151 (3)	HY10KB151 (3)
Fuse 20A, KTK-R, Class CC	HY10KB200 (3)	—	—
Harness Assembly		48ZZ401971	
Harness Assembly		48EJ402454	
Harness Assembly		48ZZ402001	
Label		48ZZ502002	
Transducer		HK05ZZ001	
Transducer Harness		48EJ403240	
Varnish Cloth (Large)		48DA510141	
Varnish Cloth (Small)		38C24601	
Wire Tie		HY76TB123 (12)	
Wire Tie		HY76TB045 (5)	
Wire, 16 Gage 72 in. Long		WHT (1), GRY (1)	

**Table 3 — Motormaster V Control Package Contents — 48/50P070-100 Units**

ITEM	CRLOWAMB036A00	CRLOWAMB037A00	CRLOWAMB038A00
Connector (1/2-in.)		HW60EA001 (2)	
Connector (1-in.)		HW60HH006 (2)	
Controller, 230 V 2 Hp	HR46TN001 (2)	—	—
Controller, 460 V 2 Hp	—	HR46TN002 (2)	—
Controller, 575 V 2 Hp	—	—	HR46TN003 (2)
Enclosure		30RA500381 (2)	
Enclosure Cover		30RA500519 (2)	
Enclosure Mounting Bracket		50EJ500656 (2)	
Fan Relay		HN61KK055 (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		48ZZ401971 (2)	
Harness Assembly		48EJ402454 (2)	
Harness Assembly		48ZZ402001 (2)	
Label		48ZZ502002	
Transducer		HK05ZZ001 (2)	
Transducer Harness		48EJ403240 (2)	
Varnish Cloth (Large)		48DA510141 (2)	
Varnish Cloth (Small)		38C24601 (2)	
Wire Tie		HY76TB123 (6)	
Wire Tie		HY76TB045 (2)	
Wire, 16 Gage 72 in. Long		WHT (2), GRY (2)	

**Table 4 — Motormaster V Control Package Usage**

UNIT	VOLTAGE	ITEM DESCRIPTION
48/50P030-060	208/230	CRLOWAMB033A00
	380, 400, 460	CRLOWAMB034A00
	575	CRLOWAMB035A00
48/50P070-100	208/230	CRLOWAMB036A00
	380, 400, 460	CRLOWAMB037A00
	575	CRLOWAMB038A00

**INSTALLATION**

**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.

**Step 1 — Install Field-Fabricated Wind Baffles**

**⚠ WARNING**

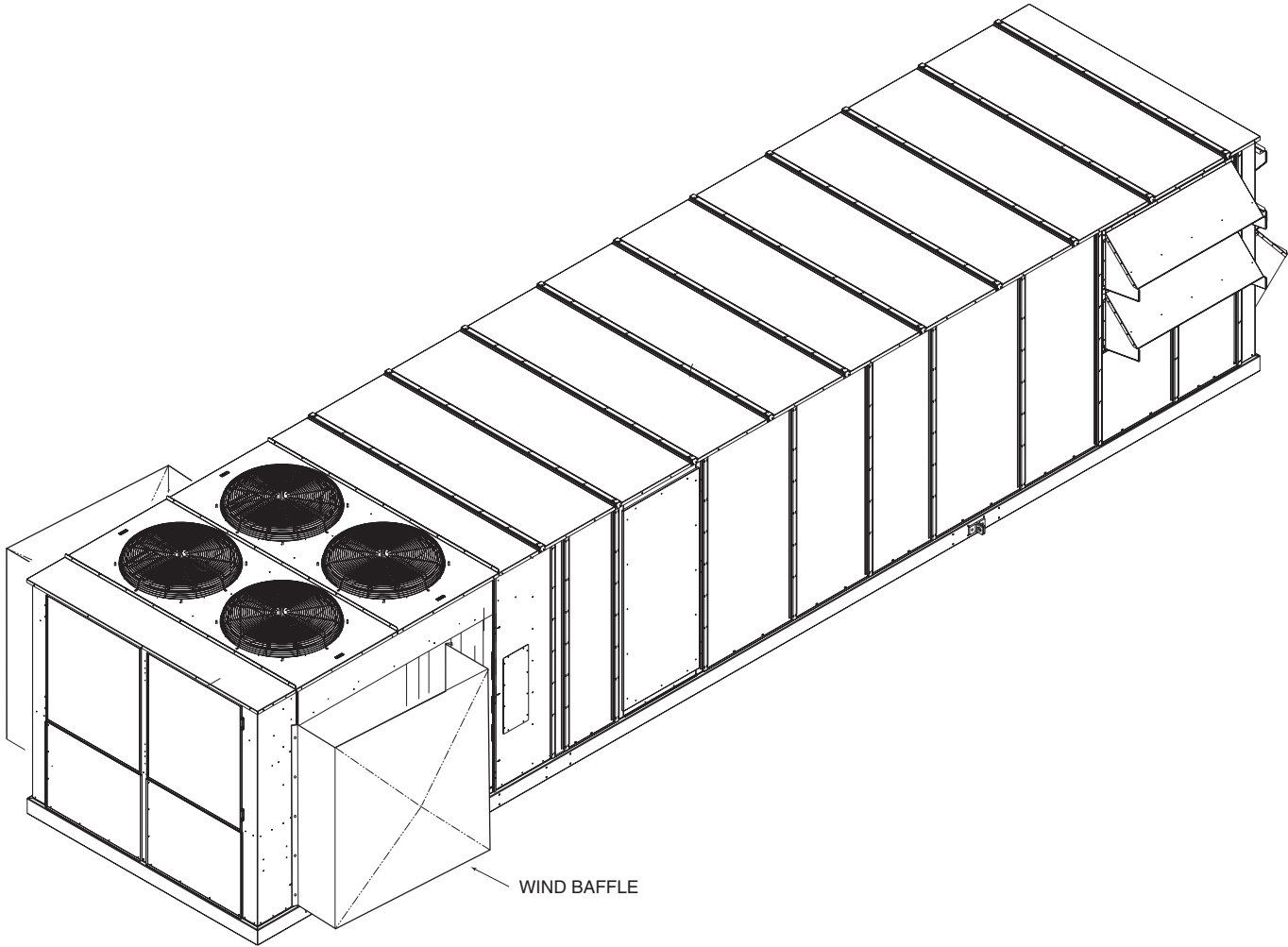
To avoid the possibility of electrical shock, open all disconnects before installing or servicing this accessory.

On size 040-060 units, in areas with prevailing winds of more than 5 mph (8 kph) and where temperatures drop below 32 F (0° C), wind baffles must be field fabricated to ensure

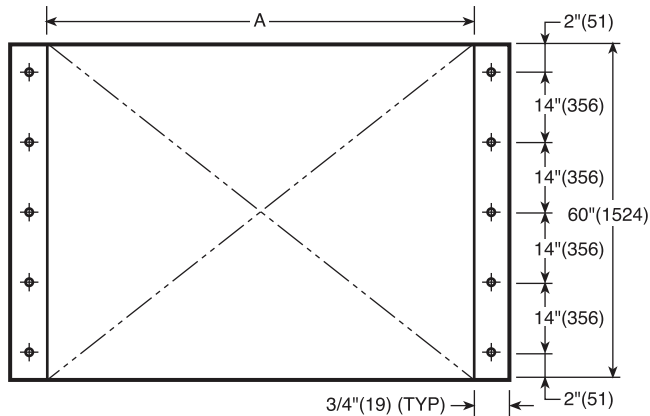
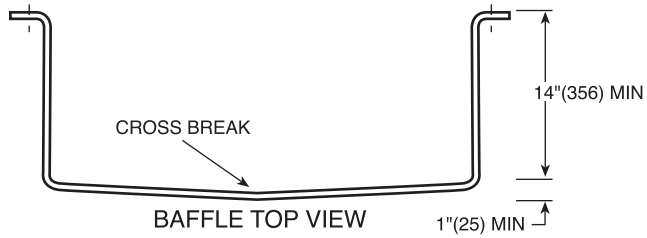
proper cooling cycle operation at low-ambient temperatures with Motormaster V controls. Wind baffles are not needed on size 030, 035, and 070-100 units. See Fig. 2 for baffle details. Use 20-gage (1 mm) galvanized sheet metal, or similar corrosion-resistant material for the baffles. Use field-supplied 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.



BAFFLE INSTALLATION LOCATION (SIZES 050 AND 060 SHOWN)



UNIT SIZE	QUANTITY	DIMENSION "A"	
		in.	mm
030,035	Not Used	—	—
040-060	2	78.125 ± 0.125	1984 ± 3
070-100	Not Used	—	—

NOTE: 48/50P030, 035, and 070-100 units do not require baffles.

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.

48/50P030-060 UNITS — For 48/50P030-035 units, the Motormaster controlled outdoor-fan motor (OFM) is the no. 1 OFM (see Fig. 3). The no. 2 OFM is controlled by the *Comfortlink* head pressure control routine.

For 48/50P040 units, the Motormaster controlled outdoor-fan motor (OFM) is the no. 3 OFM (see Fig. 3). The no. 1 and 2 OFMs are controlled by the *Comfortlink* head pressure control routine.

For 48/50P050-060 units, the Motormaster controlled outdoor-fan motor (OFM) is the no. 1 OFM (see Fig. 3). The no. 2, 3, and 4 OFMs are controlled by the *Comfortlink* head pressure control routine.

Use the following procedure to mount and connect the MMV controllers to these units:

1. Disconnect power to the unit. Lockout and tag power disconnect.
2. Remove control box covers.
3. For size 030-035 units, remove panel from condenser section on OFM 1 side of the unit in order to gain access to the outdoor fan section. See Fig. 4. For size 040-060 units, remove panel above control box as shown in Fig. 5 and 6.
4. Mount accessory fuse block HY11UT035 and fan relay base HN79KK035 inside control box as shown in Fig. 7. Secure components with ½-in. sheet metal screws.
  - a. Insert fuses into fuse blocks and relays into relay bases.
  - b. Install harness 48EJ402454 from load side of CCB (control circuit breaker terminals 21, 22, 23) to line side of MMF (Motormaster V fuse block) as shown in Fig. 8. Note that it may be easier to pick up the load side of CCB from the ¼-in. male quick connect terminals on the line side (terminals 11, 12, 13) of the OFC contactors (see power schematic on control box door).

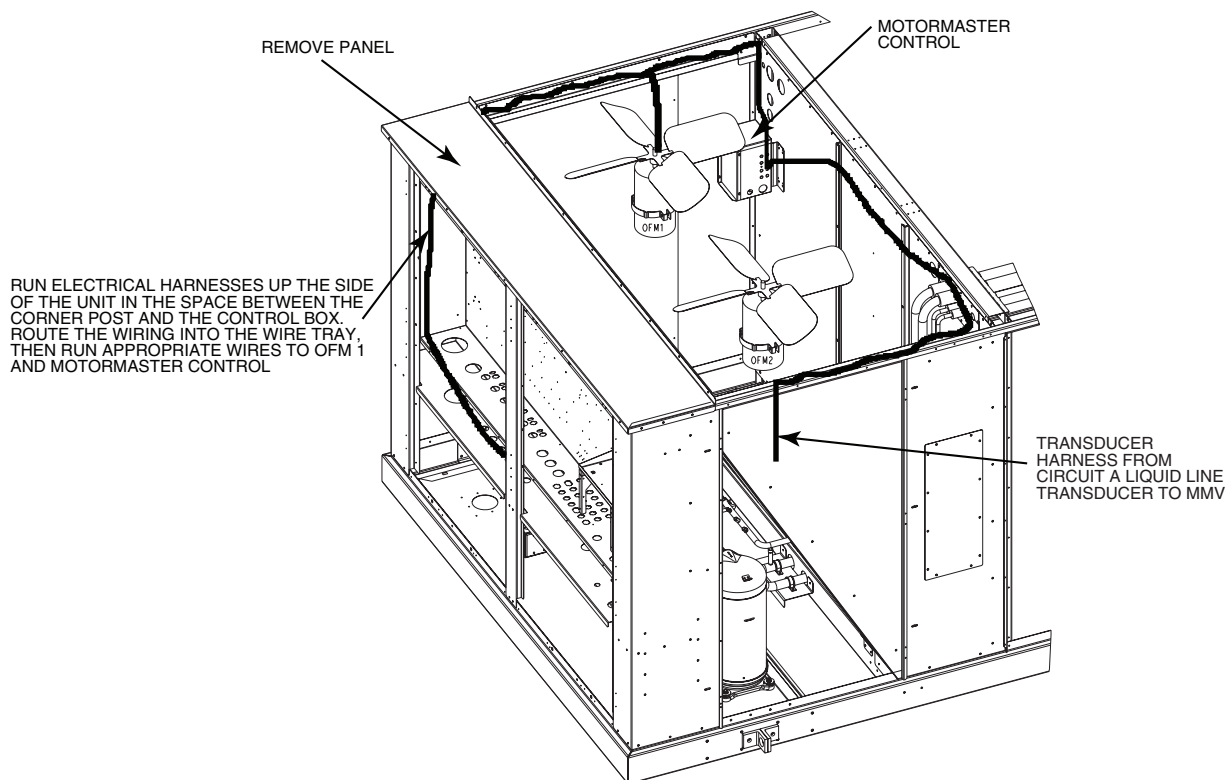
- c. Connect FR (fan relay) coil to OFC1 coil using the 72-in. long 16 gage white and gray wires (stripped end goes to FR) as shown in Fig. 8.
5. Mount the MMV controller enclosure 30RA500381 on the bulkhead of the unit inside the outdoor fan section, as shown in Fig. 4-6, using the mounting brackets 50EJ500656 installed on the enclosure. Remove the enclosure cover and install the ½-in. HW60EA001 and 1-in. HW60HH006 connectors in the holes in the lower right hand side of the enclosure.
  6. Connect transducer HK05ZZ001 to the liquid line service Schrader port of refrigerant Circuit A. Plug transducer cable 48EJ403240 into transducer. Run cable to the MMV enclosure, as shown in Fig. 4-6.

Run MMPT (Motormaster V pressure transducer) cable through ½-in. connector of MMV enclosure (do not tighten connector screws at this time). Connect red, green, and black wires to MMV terminals 6, 5, and 2 as shown in Fig. 8. Terminate drain wire of transducer cables under one of the lower MMV mounting screws.
  7. Make remaining electrical connections to MMV (see Fig. 8).

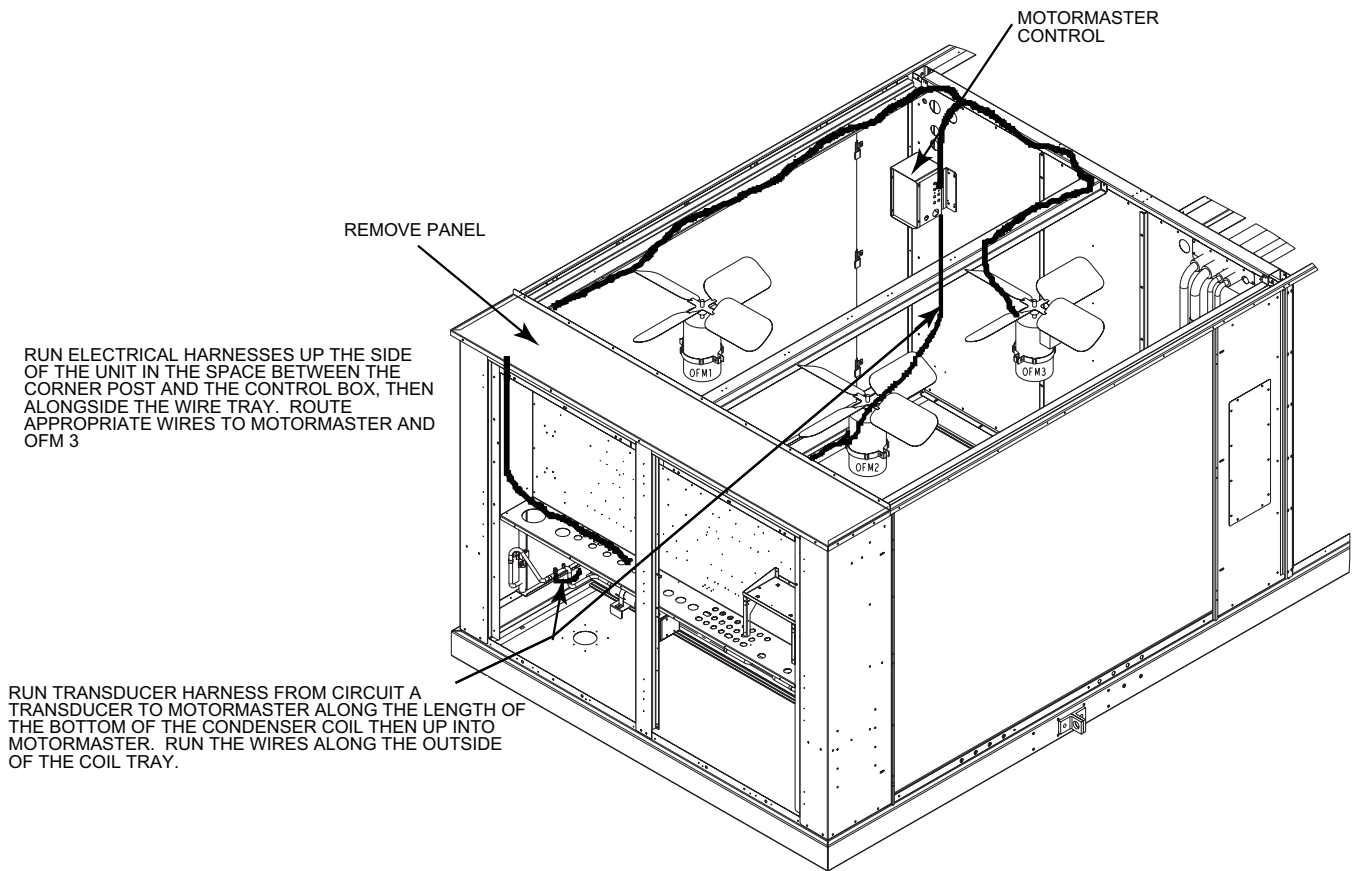
- a. In main control box, disconnect black, red, blue, and green wires from load side (terminals 21, 22, 23) of OFC1 (sizes 030-035, 050-060) contactor or OFC 3 (size 040) (label cable from OFC1 or OFC3 (size 040) as OFM1 or OFM3 (size 040). Pull wires out through the hole in the bottom of the control box and run them up the corner post to the opening of the cable tray on the side of the control box, as shown in Fig. 4-6. Run the cable through the wire tray to the MMV enclosures.
- b. Run the OFM1/OFC3 (040) cable through the 1-in. connector of the MMV enclosure (do not tighten connector screws at this time). Remove ring terminals from black, red, and blue wires and strip insulation back 3/8-in. Connect black, red, and blue wires to MMV terminals T1, T2, and T3. Connect green ground wire to MMV ground screw.
- c. In the main control box connect Motormaster VFD (variable frequency drive) harness 48ZZ401971 to the load side of the MMF (label the opposite end of this harness as MMF). Run the harness along the bottom of the control box and out through the hole that the OFM harness was in. Pull the harness out through the hole in the bottom of the control box and run it through the opening of the cable tray (in the same manner as the OFM harnesses).
- d. Run the MMF cable through 1-in. connector of the MMV enclosure (do not tighten connector screws at this time). Connect L1, L2, and L3 wires to MMV terminals L1, L2, and L3. Connect green ground wire to MMV ground screw. Place 1 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.
- e. In the main control box connect one Motormaster VFD harness 48ZZ402001 to the NO (normally open) contact of the FR (see Fig. 8). Run the harnesses along the bottom of the control box and out through the hole that the OFM harness was in. Pull the harness out through the hole in the bottom of the control box and run it through the opening of the cable (in the same manner as the OFM harness).

UNIT 48/50P	FAN ARRANGEMENT	FAN NO.	NORMAL CONTROL
030,035		1	MMV-A
		2	Controlled by the <i>ComfortLink™</i> head pressure control routine
040		1	Controlled by the <i>ComfortLink</i> head pressure control routine
		2	
		3	MMV-A
050-060		1	MMV-A
		2	Controlled by the <i>ComfortLink</i> head pressure control routine
		3	
		4	
070,075		1	MMV-B
		2	Controlled by the <i>ComfortLink</i> head pressure control routine
		3	MMV-A
		4	Controlled by the <i>ComfortLink</i> head pressure control routine
090,100		1	Controlled by the <i>ComfortLink</i> head pressure control routine
		2	MMV-B
		3	Controlled by the <i>ComfortLink</i> head pressure control routine
		4	
		5	
		6	MMV-A

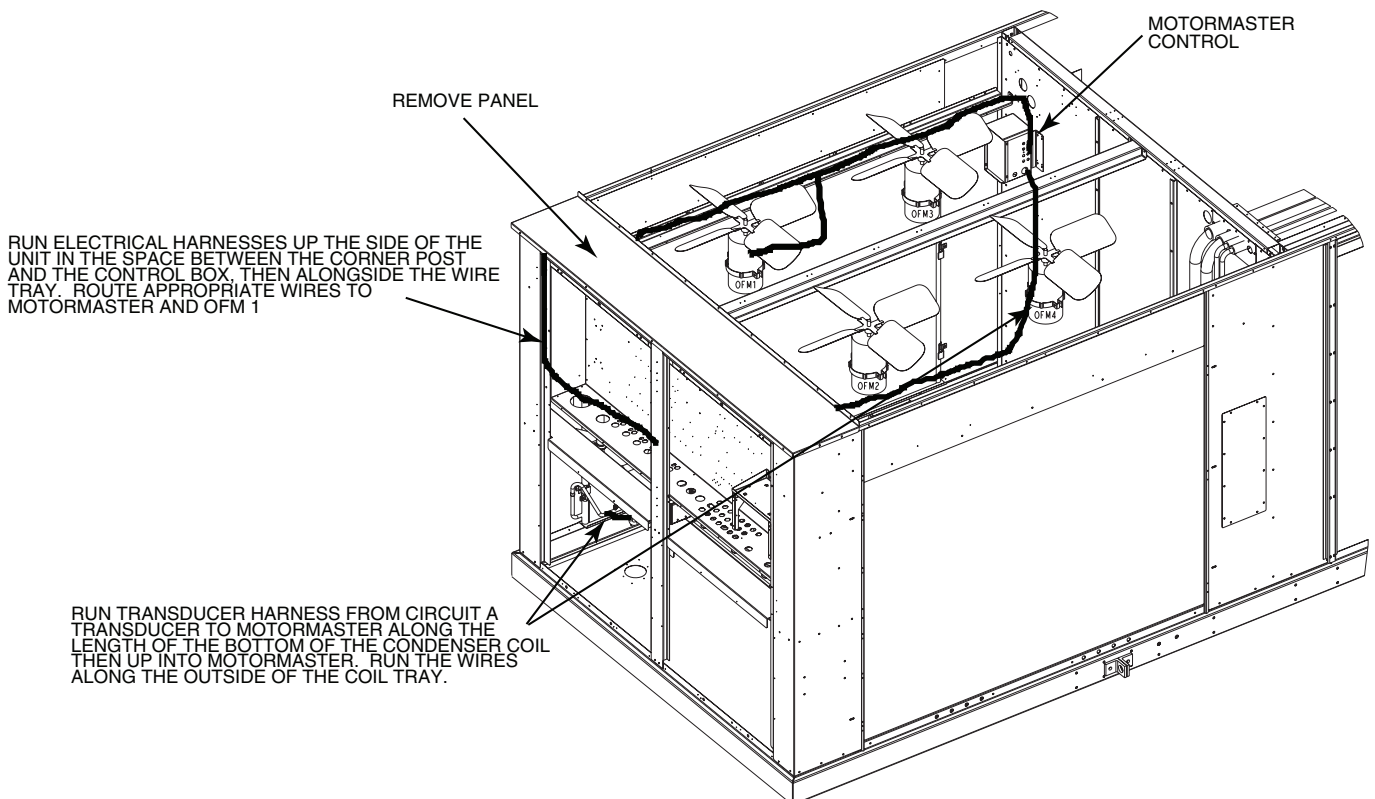
**Fig. 3 — Fan Control**



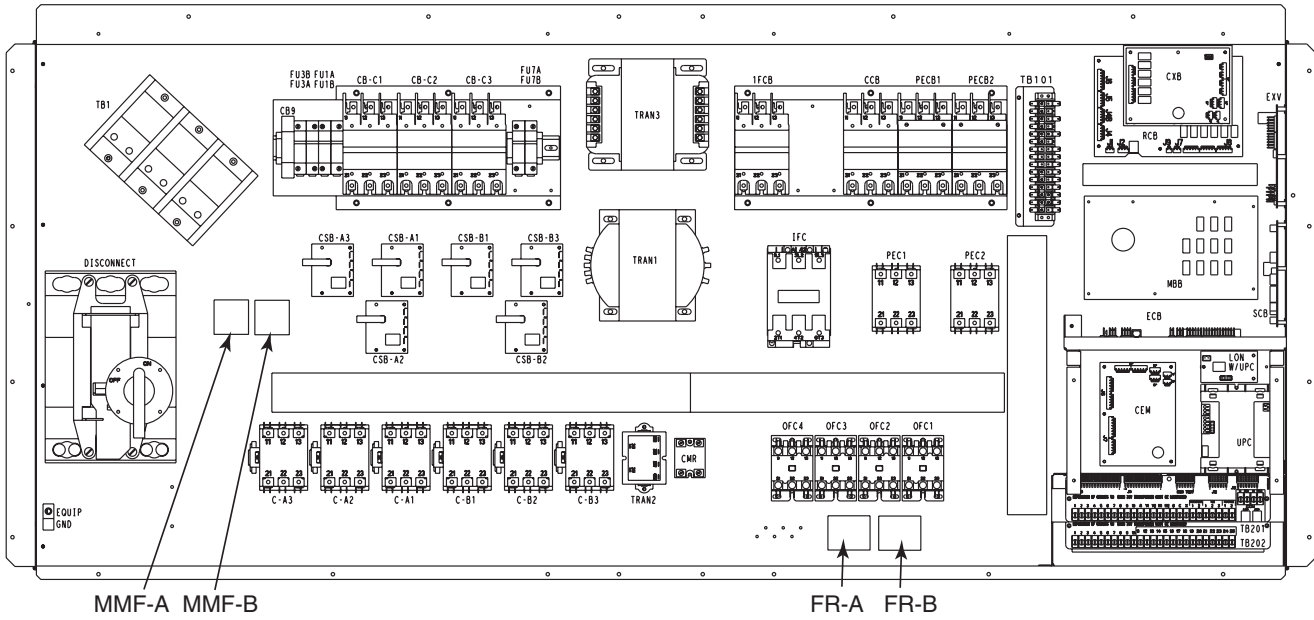
**Fig. 4 — MMV Control Mounting — 48/50P030,035 Units**



**Fig. 5 — MMV Control Mounting — 48/50P040 Units**



**Fig. 6 — MMV Control Mounting — 48/50P050-060 Units**



- LEGEND
- FR — Fan Relay
  - MMF — Motormaster V Fuse Block

Fig. 7 — 48/50P Control Box Details

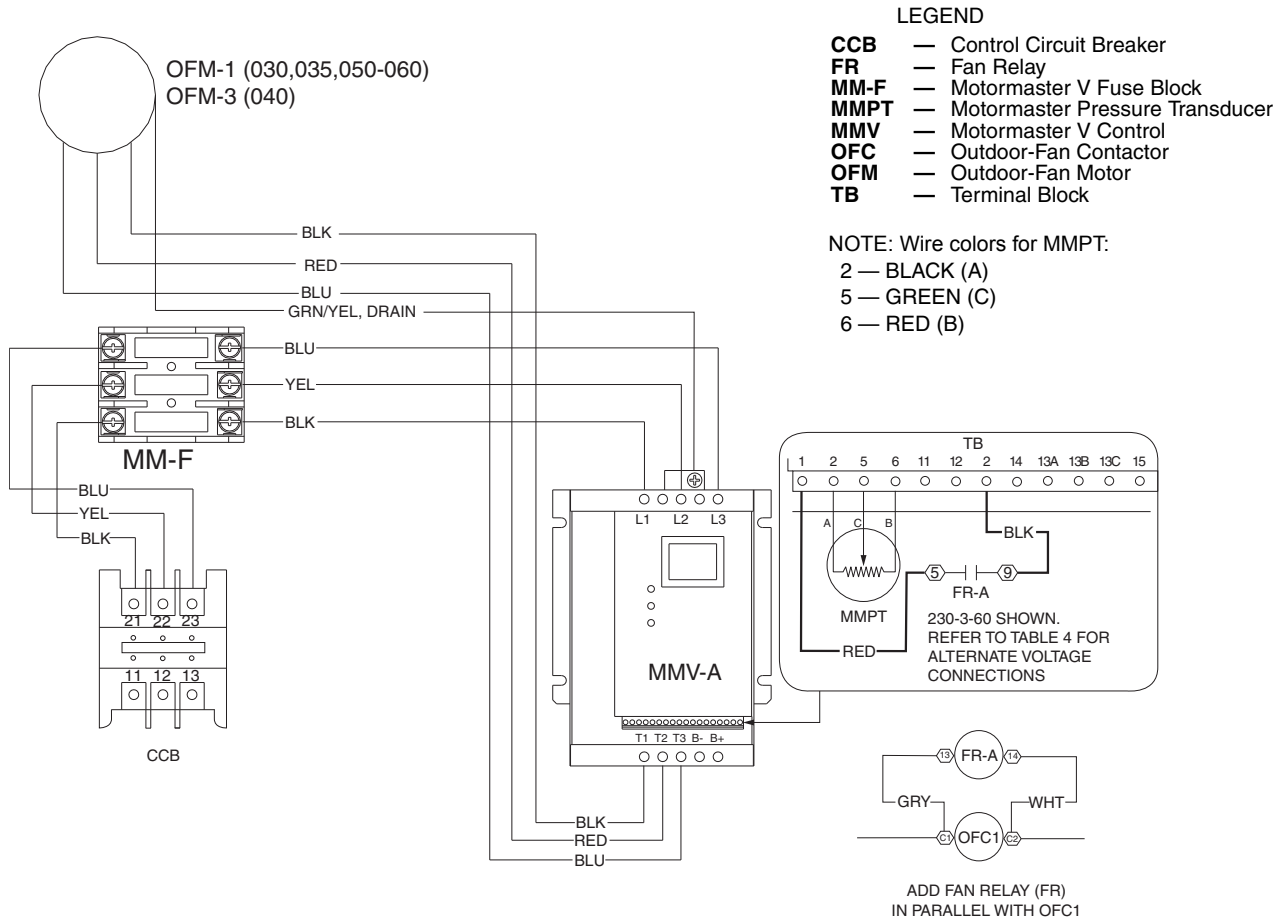


Fig. 8 — Motormaster® V Accessory Wiring — 48/50P030-060 Units



- f. Run the FR cable through the 1/2-in. connector of the MMV enclosure (do not tighten connector screws at this time). Connect black wire to MMV terminal 2 and red wire to MMV 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.
8. Bundle excess wire and dress harnesses with wire ties.
9. Re-attach control box, MMV enclosure, and cable tray covers.

48/50P070-100 UNITS — For 48/50P070-075 units, two Motormaster controls are used to control two independent outdoor-fan motors (OFM). 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 by the *ComfortLink*™ head pressure control routine.

For 48/50P090-100 units, the two Motormaster controls are used to control two independent outdoor-fan motors. The refrigerant circuit-A Motormaster controlled OFM is the no. 6 OFM. The refrigerant circuit-B Motormaster controlled OFM is the no. 2 OFM (see Fig. 3). The no. 1, 3, 4, and 5 OFMs are controlled by the *ComfortLink* head pressure control routine.

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. Remove fan decks to gain access to each circuit's respective Motormaster controlled OFM, as shown in Fig. 9 and 10.
4. 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. 7. Secure components with 1/2-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. 11. Note that it may be easier to pickup the load side of CCB from the 1/4-in. male quick connect terminals on the line side (terminals 11, 12, 13) of the OFC contactors (see power schematic on control box door).

*c. For 070 and 075 units:*

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. 11.

*For 090 and 100 units:*

Connect FR-A coil to OFC3 coil and FR-B coil to OFC2 coil using the 72 in. long 16 gage white and gray wires (stripped end goes to FR) as shown in Fig. 11.

5. Mount the MMV controller enclosures 30RA500381 on the bulkhead, as shown in Fig. 9 (sizes 070 and 075) and Fig. 10. (sizes 090 and 100) 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 1/2-in. HW60EA001 and 1-in. HW60HH006 connectors in the holes in the lower right hand side of the enclosures.

6. Connect transducers HK05ZZ001 to the liquid line service Schrader ports, located under the V-coils 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).
7. 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, as shown in Fig. 9 and 10.
8. Run MMPT-A cable through 1/2-in. connector of MMV-A enclosure, and MMPT-B cable through 1/2-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. 11. Terminate drain wire of transducer cables under one of the lower MMV mounting screws.
9. Make remaining electrical connections to MMV-A and MMV-B (see Fig. 11).

*a. For 070 and 075 units:*

In the 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 up the corner post to the opening of the cable tray on the side of the control box, as shown in Fig. 9. Run the cable through the wire tray to the MMV enclosures.

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-in. Connect black, red, and blue wires to MMV-B terminals T1, T2, and T3. Connect green ground wire to MMV-B ground screw.

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-in. Connect black, red, and blue wires to MMV-A terminals T1, T2, and T3. Connect green ground wire to MMV-B ground screw.

*For 090 and 100 units:*

In Main Control box, disconnect black, red, blue, and green wires from load side (terminals 21, 22, 23) of OFC2 and OFC3 contactors (label cable from OFC2 as OFM2 and cable from OFC3 as OFM3). Pull wires out through the hole in the bottom of the control box and run them up the corner post to the opening of the cable tray on the side of the control box, as shown in Fig. 10. Run the cable through the wire tray to the MMV enclosures.

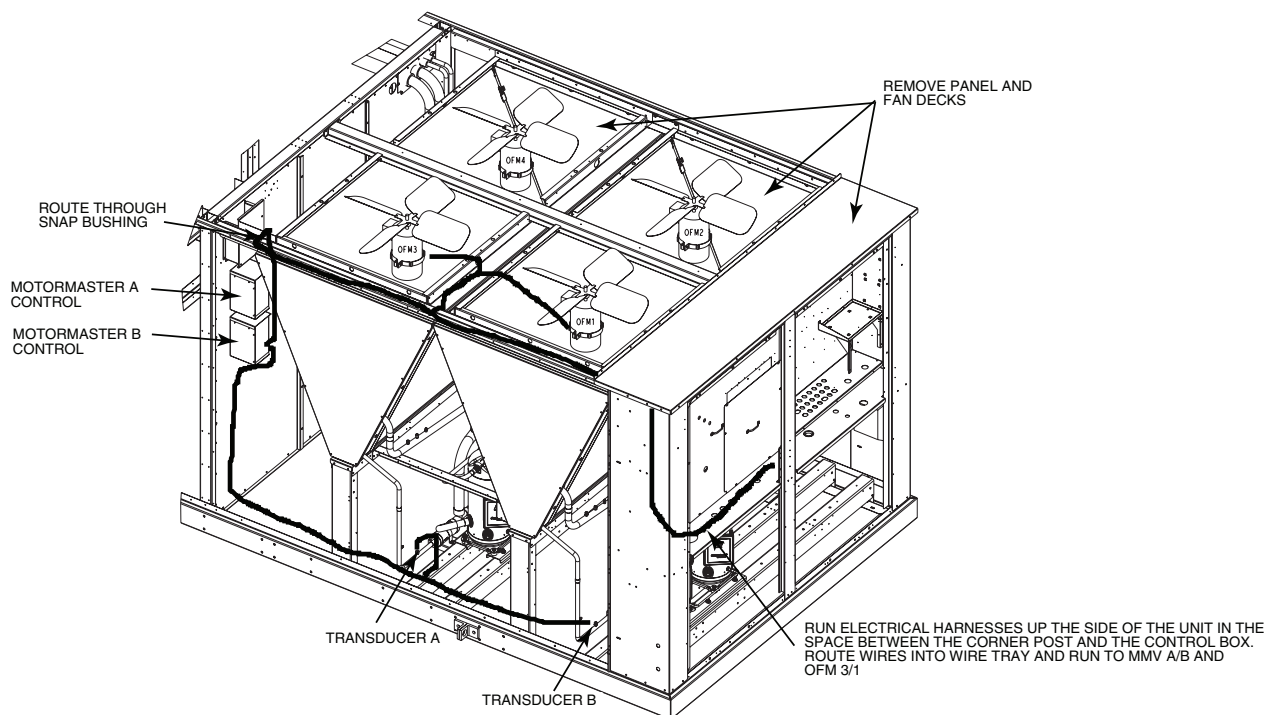
Run the OFM2 cable through the 1-in. connector of the MMV-B enclosure (do not tighten connector screws at this time). Remove ring terminals from black, red, and blue wires and strip insulation back 3/8-in. Connect black, red, and blue wires to MMV-B terminals T1, T2, and T3. Connect green ground wire to MMV-B ground screw.

Run OFM6 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-in. Connect black, red, and blue wires to MMV-A terminals T1, T2, and T3. Connect green ground wire to MMV-B ground screw.

- b. In main control box connect one Motormaster VFD harness 48ZZ401971 to the load side of MMF-A (label the opposite end of this harness as MMF-A) and the other Motormaster VFD harnesses 48ZZ401971 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 (in the same manner as the OFM harnesses).
- c. 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 1 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.
- d. 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.
- e. In Main Control box connect 1 Motormaster VFD (variable frequency drive) harness 48ZZ402001 to the NO (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 48ZZ402001 to the NO 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 (in the same manner as the OFM harnesses).

- f. 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.
  - g. 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.
10. Bundle excess wire and dress harnesses with wire ties.
  11. Reattach control box, MMV enclosure, and cable tray covers.



**Fig. 9 — MMV Control Mounting — 48/50P070,075 Units**

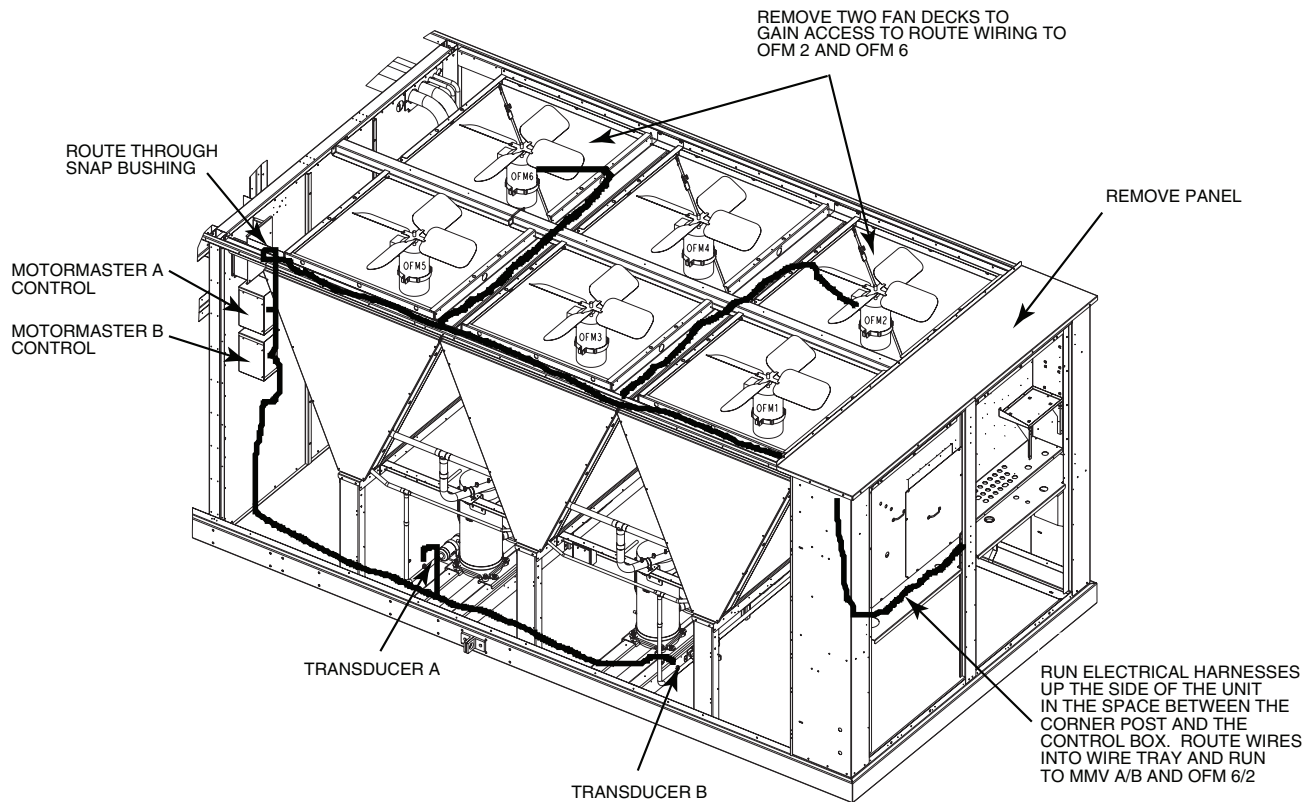


Fig. 10 — MMV Control Mounting — 48/50P090,100 Units

**Step 3 — Configure Motormaster® V Control** — The Motormaster V control is configured for proportional integral (PI) control mode. The Motormaster V varies the condenser fan motor speed to maintain a set point of 320 psig liquid line pressure in response to a 0 to 5 vdc feedback signal from the liquid line pressure transducer. No additional programming is required. See Table 4. 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

The following *ComfortLink* control configurations must be set when using a Motormaster V device:

- **Configuration** → **COOL** → **M.M.** = YES
- **Configuration** → **COOL** → **LLAG** = CIRCUIT A (size 030-060 units only)

**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 line 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.

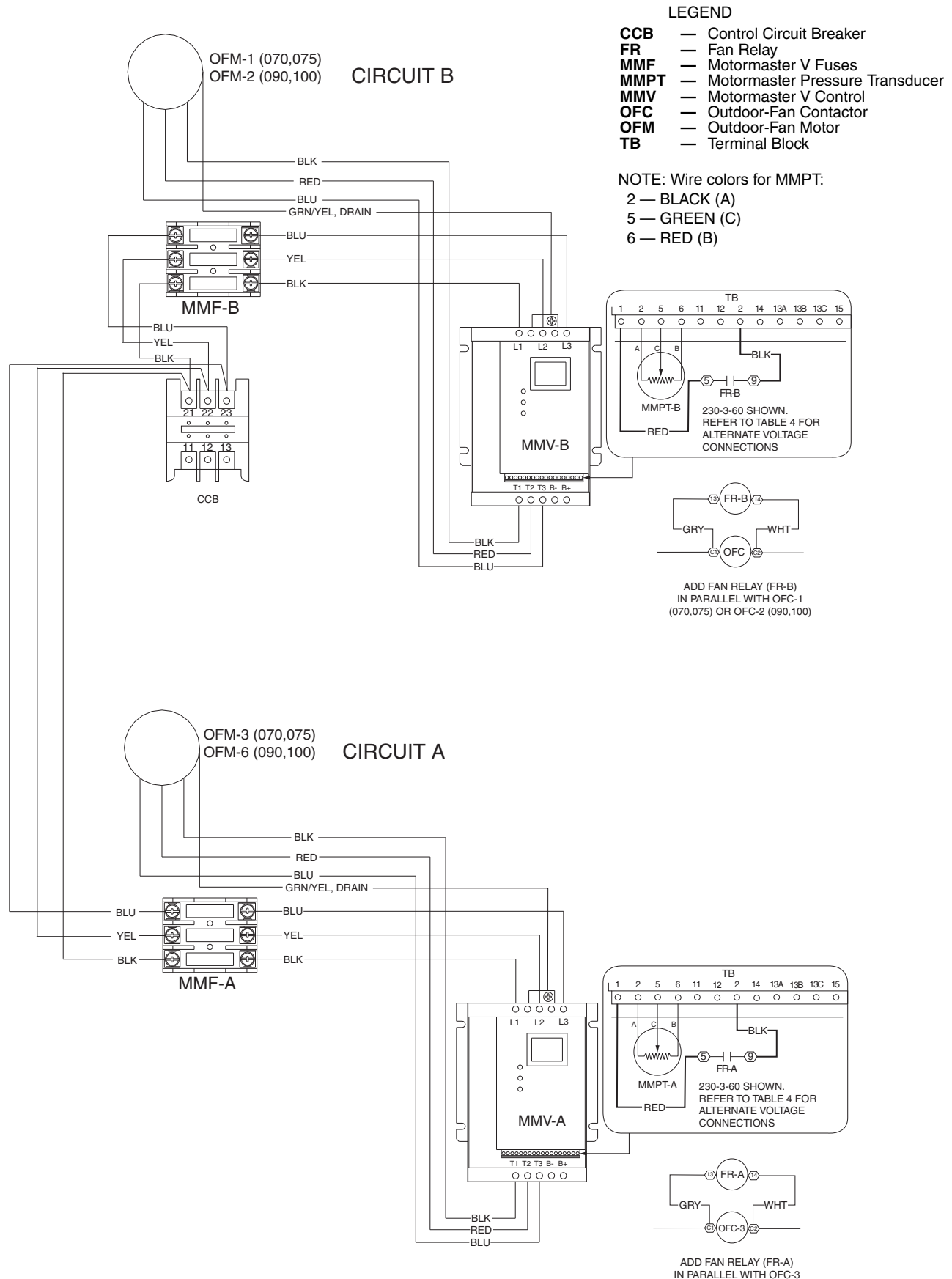
### START-UP

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 320 psig. Above that pressure, the fan should operate at full speed.

For size 030-060 units, 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.

For size 070-100 units, two Motormaster V devices are used, one for each circuit. The circuit A 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 circuit B 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 B.

The pressure transducer(s) are 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.



**Fig. 11 — Motormaster® V Accessory Wiring — 48/50P070-100 Units**

**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.

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.

**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

**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
<b>AF</b>	High Temperature Fault	Automatic	Ambient temperature is too high; Cooling fan has failed (if equipped).	Check cooling fan operation.
<b>CF</b>	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.
<b>cF</b>	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.
<b>F1</b>	EPM Fault	Manual	The EPM is missing or damaged.	Install EPM or replace with new EPM.
<b>F2—F9 Fo</b>	Internal Faults	Manual	The control board has sensed a problem	Consult factory.
<b>GF</b>	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.
<b>HF</b>	High DC Bus Voltage Fault	Automatic	Line voltage is too high; Deceleration rate is too fast; Overhauling load.	Check line voltage — set P01 appropriately.
<b>JF</b>	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.
<b>LF</b>	Low DC Bus Voltage Fault	Automatic	Line voltage is too low.	Check line voltage — set P01 appropriately.
<b>OF</b>	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.
<b>PF</b>	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.
<b>SF</b>	Single-phase Fault	Automatic	Single-phase input power has been applied to a three-phase drive.	Check input power phasing.
<b>Drive displays '---' even though drive should be running</b>	Start Contact is Not Closed	Automatic	Start contact is missing or not functioning.	Check fan relay.
<b>VFD flashes "---" and LCS</b>	Start Contact is Not Closed	Automatic	Start contact not closed.	Check FR for closed contact.
<b>VFD flashes 57 (or 47) and LCS</b>	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





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