

Large Rooftop Units Accessory Low Ambient Operation Motormaster® III Control 50/60 Hz

Cancels: New

IIK 551A-240-1
8/1/00

Installation Instructions

Part No. CRMOTOR3003A00

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the operating range of air conditioning systems and permits operation at lower outdoor ambient temperatures.

Table 1 shows the ambient temperature at which units operate.

Table 1 — Minimum Outdoor-Air Operating Temperature Operating Limits — F (C)

UNIT	STANDARD UNIT	UNIT WITH LOW AMBIENT KIT	UNIT WITH MOTORMASTER III CONTROL
Standard Tier Unit — 20 and 25 Tons	40 (4)	25 (-4)	-20 (-29)
High-Tier Unit — 20 Tons	40 (4)	25 (-4)	-20 (-29)

To operate these units below these ambient temperatures, wind baffles and MMIII controls must be added. The MMIII control permits operation of the unit to an ambient temperature of -20 F (-29 C). The MMIII device (Fig. 1) controls the speed of 3-phase fan motors that are compatible with MMIII control. These motors are installed at the factory.

GENERAL

This book contains instructions for the installation, startup, and service of the Motormaster III (MMIII) control on 48/50HJ025, 48/50TJ024 and 028, 551A/581A240, and 559F/579F240 and 300.

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 MMIII control is a motor speed control device which adjusts condenser-fan motor speed in response to declining liquid temperatures. A properly applied MMIII control extends

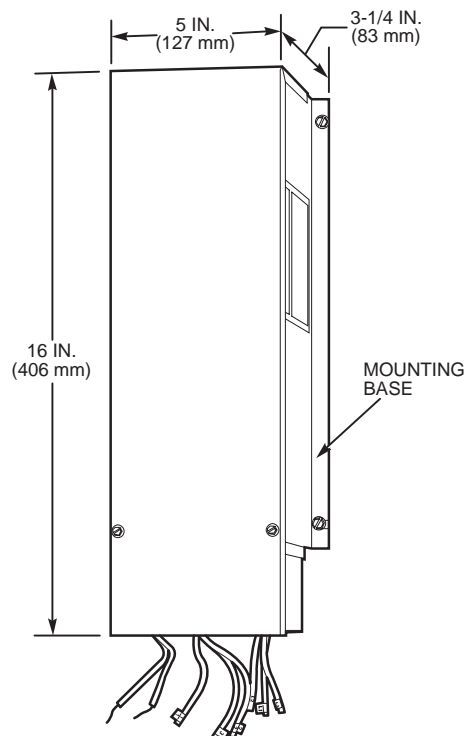


Fig. 1 — Motormaster III Control

See Table 2 for this accessory package contents and Table 3 for applicable voltages and motors. Because the MMIII control is compatible with the factory-installed fan motors, replacement of motor or fan blade is not necessary. Only field wiring of control is required.

⚠ WARNING
To avoid the possibility of electrical shock, be sure all disconnects are open before installing and servicing this accessory.

Table 2 — Motormaster® III Control Package Contents (Part No. CRMOTOR3003A00)

QTY	ITEM	PART NO.
1	Control Assembly	HR46GN001
1	Sensor	30GT412176
4	10AB-16 x 1/2 LG Screw	AL79AU216

Table 3 — Applicable Voltages and Motors

UNIT NAMEPLATE VOLTAGE	MOTOR (FACTORY INSTALLED) PART NO.
208/230-3-60	HD52AK652
460-3-60	HD52AK652
575-3-60*	HD52AK652
380/415-3-50	HD52AK652

*Requires special autotransformer circuit for each Motormaster III control. Two transformers (Part No. HT01AH851) are required for each circuit.

NOTE: Transformers are not included with the accessory package. They must be ordered separately.

BEFORE INSTALLING

Inspect the contents of this accessory package before installing. File a claim with the shipper if you find shipping damage or if a part is missing.

INSTALLATION

Step 1 — Install Wind Baffles — Wind baffles must be field fabricated for all units to ensure proper cooling cycle operation at low-ambient temperatures with MMIII controls. 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 the unit. Screws should be 1/4-in. (6.3 mm) diameter or larger. Drill required screw holes for mounting baffles.

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

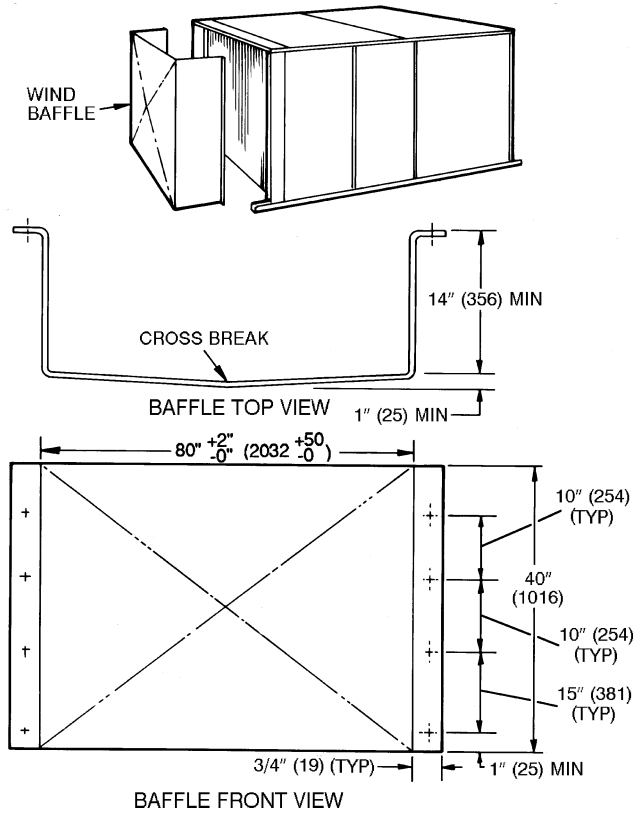
⚠ CAUTION
When installing wind baffle, use care to not damage any tubing on the condenser coil at the hairpin end.

Step 2 — Install Motormaster III Device Control — One MMIII control must be added for each unit. Both outdoor (condenser) fan motors (OFM) are wired to the single control. See Fig. 3 for proper control mounting location.

NOTE: If unit power is supplied through the roof curb and basepan of unit, mount MMIII control on corner post adjacent to conduit running from the basepan to the bottom of the control box.

Use screws provided with the control to mount the control to the partition. Drill required screw holes.

⚠ CAUTION
To avoid damaging components and wiring, use extreme care when drilling screw holes and screwing in screws.



NOTE: Dimensions in () are in mm.

Fig. 2 — Wind Baffle Details

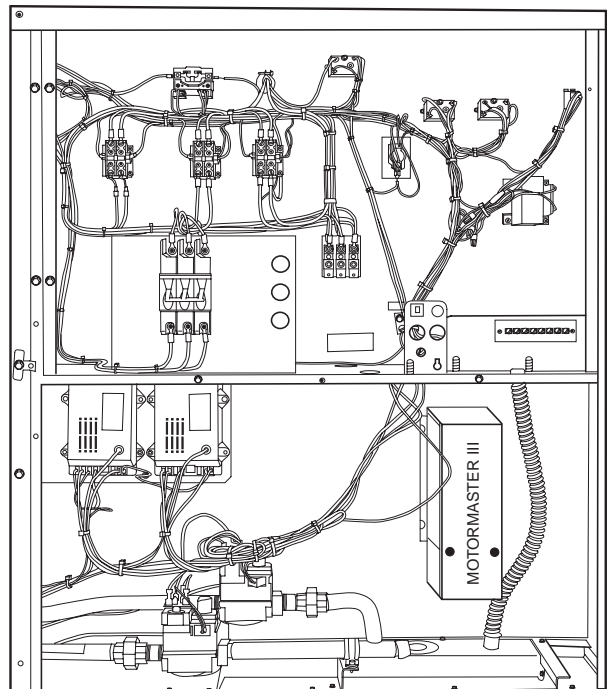


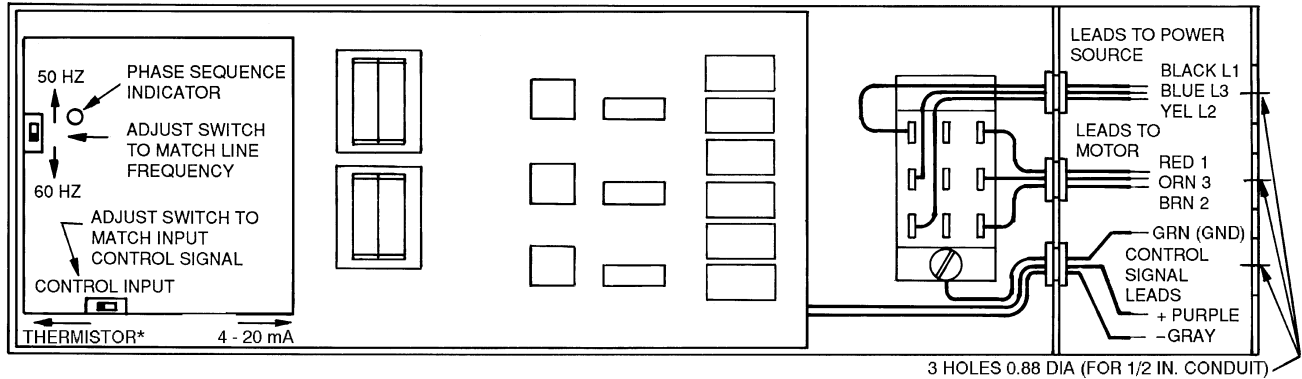
Fig. 3 — Motormaster III Controller Installed (25 Ton, Standard Tier Gas Unit Shown)

Step 3 — Set the Control Signal Selection Switch (Fig. 4)

1. Remove the cover of the MMIII control.
2. Set the switch on the MMIII control board (underneath cover) to accept the thermistor sensor input signal.
3. Set the frequency selection switch to match unit power supply (50 or 60 Hz).
4. Replace the cover.

Step 4 — Install and Wire Sensors — Install the sensor for thermistor input control in the proper location on the condenser coil. See Fig. 5A and 5B. Connect sensor leads to the purple and gray control signal leads on the MMIII control. See Fig. 6 for wire routing.

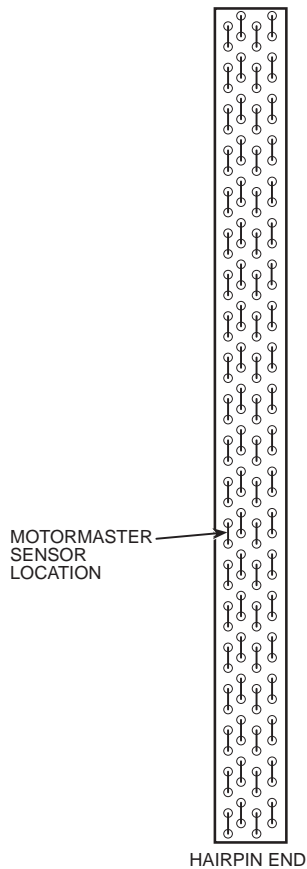
Step 5 — Remove Control Box Panels — Remove the inner and outer access panels to the control box area and the panel to the area to the left of the control box.



LEGEND
GND — Ground

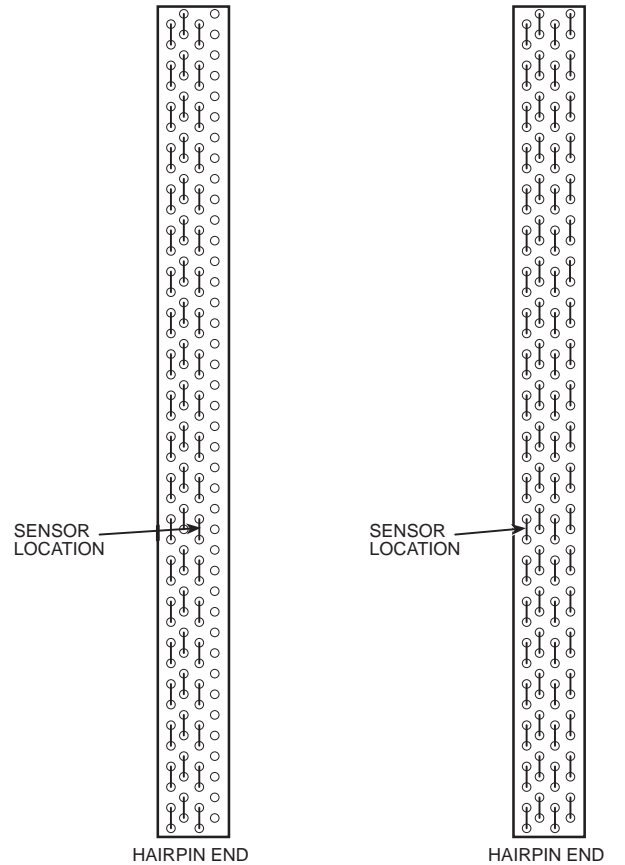
*For thermistor (sensor) signal, move switch to the left.
NOTE: Thermistor is designated in text as "sensor."

Fig. 4 — Motormaster® III Control Signal Selection Switch



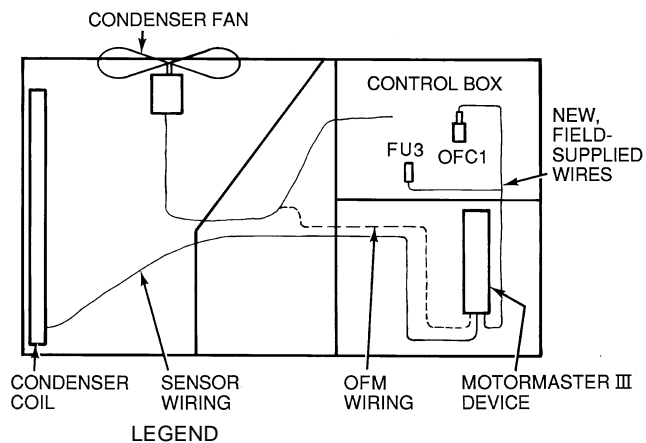
- NOTES:
1. All sensors are located on the eighth hairpin up from the bottom.
 2. Field-installed tubing insulation is required to be installed over the thermostatic expansion valve (TXV) bulb and capillary tube for proper operation at low ambients. Tubing insulation is only required on the portion of suction line located between indoor and outdoor section.

Fig. 5A — Motormaster III Control Sensor Locations — 20 Ton High Tier Units



NOTE: All sensors are located on the eighth hairpin up from the bottom.

Fig. 5B — Motormaster III Control Sensor Locations — 20 and 25 Ton Standard Tier Units



OFM — Outdoor (Condenser) Fan Motor

Fig. 6 — Wire Routing (208/230-V Shown)

Step 6 — Make Motormaster® III Device Electrical Connections

GENERAL

⚠ WARNING

To avoid possibility of electrical shock and personal injury, turn off all power to the unit before making electrical connections. Tag all disconnects to alert others not to turn power on until work is completed.

All necessary field-supplied wires required for wiring the MMIII control into the unit **MUST** be NEC (National Electrical Code) 90° C and a minimum of 10 AWG (American Wire Gage).

Use the knockouts available in the base of the unit control box (see Fig. 7), and provide adequate wire protection and strain relief (field supplied). As an alternate (for 575-v units only), wires can be routed to the transformers with either MMIII or OFM wiring. Be sure to provide a drip loop before wiring enters the transformers to protect against moisture migrating down the wires from the MMIII or OFM wiring.

IMPORTANT: If the unit primary voltage is 575 v, 2 transformers (part no. HT01AH851) **MUST** be used to lower the supply voltage of the MMIII control to 460 v. See unit price pages for ordering information. The transformers can be mounted anywhere outside the control box, but the recommended location is below the control box adjacent to the MMIII device on the unit basepan. Mount transformers **PRIOR** to installing accessory MMIII device wiring.

208/230-V UNITS

1. Remove black and yellow wires from OFM1 and OFM2 that are attached to the outdoor (condenser) fan contactor no. 1 (OFC1) and the blue wires attached to fuse no. 3 (FU3).
2. Pull these leads back out through the entry in the left side of the control box and reinsert them through the partition and into the lower compartment under the control box. See Fig. 6. Use a field-supplied Romex connector for strain relief.
3. Connect field-supplied wire (shown as a black wire in Fig. 8) from OFC1-11 to black lead of the MMIII control.
4. Connect field-supplied wire (shown as a yellow wire in Fig. 8) from OFC1-13 to yellow lead of the MMIII control.

5. Connect field-supplied wire (shown as a blue wire in Fig. 8) from FU3 to the blue lead of the MMIII control.
6. Connect green ground wire from MMIII device securely to cabinet ground. If wire is not long enough, add field-supplied wire.
7. Connect (splice) the black wires from OFM1 and OFM2 to the red wire of the MMIII control. See Fig. 8.
8. Connect (splice) the yellow wires from OFM1 and OFM2 to the brown wire of the MMIII control. See Fig. 8.
9. Connect (splice) the blue wires from OFM1 and OFM2 to the orange wire from the MMIII control. See Fig. 8.
10. Replace and secure panels.

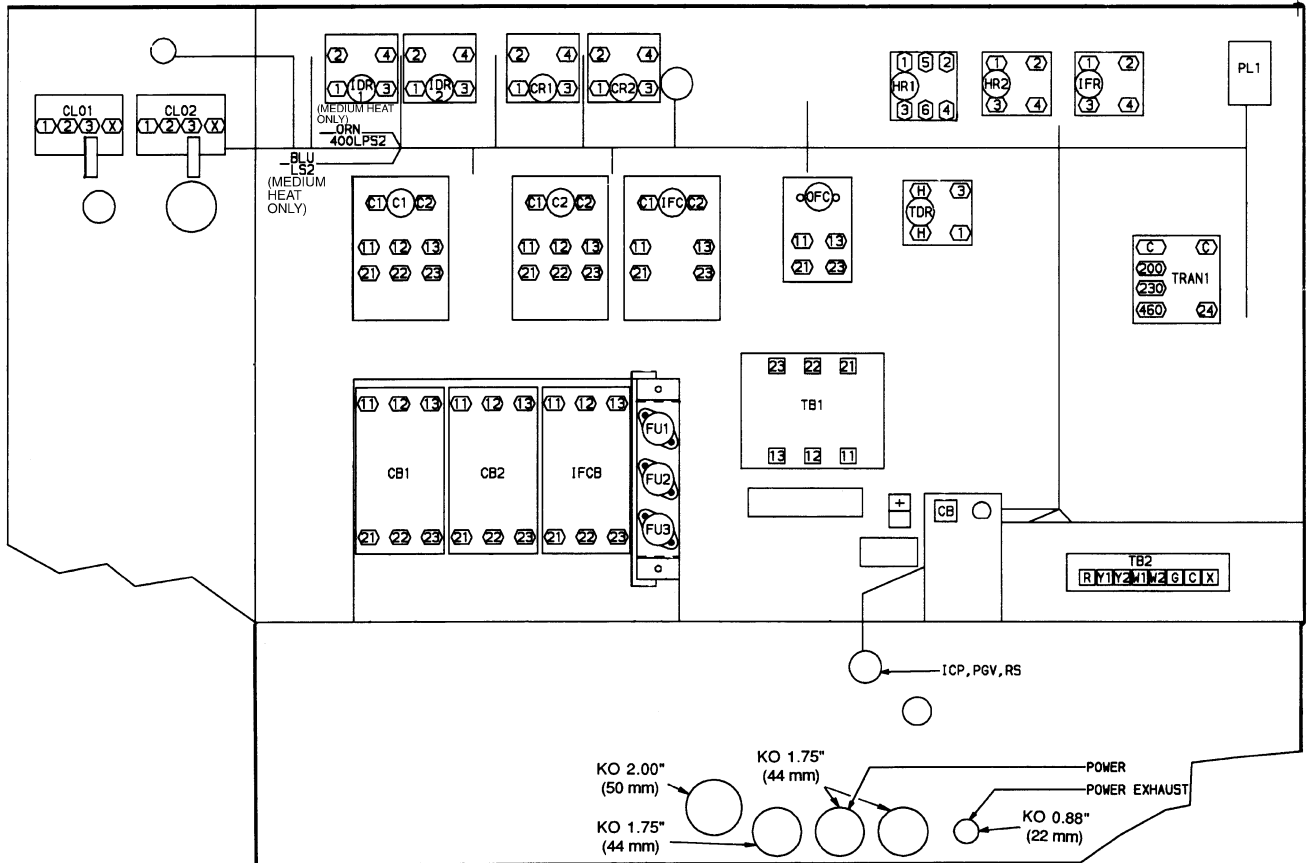
380/415 AND 460-V UNITS

1. Remove the black wires attached at C1 terminal 21 and the yellow wires attached at C1 terminal 22 from OFM1 and OFM2. Remove the blue wires attached at C1 terminal 23 from OFM1 and OFM2.
2. Pull these leads back out through the entry in the left side of the control box and reinsert them through the partition and into the lower compartment under the control box. See Fig. 6. Use a field-supplied Romex connector for strain relief.
3. Connect existing unattached black wires (Step 1) from C1 terminal 21 to the black lead of the MMIII control. See Fig. 9.
4. Connect existing unattached yellow wires (Step 1) from C1 terminal 22 to the yellow lead of the MMIII control. See Fig. 9.
5. Connect existing unattached blue wires (Step 1) from TB1 terminal 23 to the blue lead of the MMIII control. See Fig. 9.
6. Connect green ground wire from MMIII device securely to cabinet ground. If wire is not long enough, use field-supplied wire.
7. Connect (splice) the black wires from OFM1 and OFM2 to the red wire of the MMIII control. See Fig. 9.
8. Connect (splice) the yellow wires from OFM1 and OFM2 to the brown wire of the MMIII control. See Fig. 9.
9. Connect (splice) the blue wires from OFM1 and OFM2 to the orange wire of the MMIII control. See Fig. 9.
10. Replace and secure panels.

575-V UNITS

1. Remove the black, yellow, and blue outdoor (condenser) fan motor (OFM) wires that are attached to contactor no. 1.
2. Pull these leads back out through the entry in the left side of the control box and reinsert them through the partition and into the lower compartment under the control box. See Fig. 6. Use a field-supplied Romex connector for strain relief.
3. Connect a field-supplied wire (shown as orange in Fig. 10) from C1 terminal 11 to TRAN-1 terminal X4.
4. Connect a field-supplied wire (shown as yellow in Fig. 10) from C1 terminal 12 to TRAN-1 terminal H1 and another wire (also shown as yellow in Fig. 10) from C1 terminal 12 to TRAN-2 terminal H1.
5. Connect a field-supplied wire (shown as pink in Fig. 10) from C1 terminal 13 to TRAN-2 terminal X4.
6. Connect a field-supplied wire (shown as black in Fig. 10) from TRAN-1 terminal X1 to MMIII control black lead.

7. Connect a field-supplied wire (shown as yellow in Fig. 10) from TRAN-1 terminal H1 to the yellow lead of the MMIII control along with a field-supplied wire from TRAN-2 terminal H1 (also shown as yellow in Fig. 10).
8. Connect a field-supplied wire (shown as blue in Fig. 10) from TRAN-2 terminal X1 to the blue lead from MMIII control.
9. Run ground wires from both transformers.
10. Connect green ground wire from MMIII device securely to cabinet ground. If wire is not long enough, add field-supplied wire.
11. Connect (splice) the black wires from OFM1 and OFM2 to the red wire of the MMIII control. See Fig. 10.
12. Connect (splice) the yellow wires from OFM1 and OFM2 to the brown wire of the MMIII control. See Fig. 10.
13. Connect (splice) the blue wires from OFM1 and OFM2 to the orange wire of the MMIII control. See Fig. 10.
14. Replace and secure panels.



- LEGEND**
- | | |
|--|---|
| C — Contactor | IFCB — Indoor (Evaporator) Fan Circuit Breaker |
| CB — Circuit Breaker | IFR — Indoor (Evaporator) Fan Relay |
| CLO — Cooling Lockout | KO — Knockout |
| CR — Control Relay | OFC — Outdoor (Condenser) Fan Contactor |
| DU — Dummy Terminal | PL — Plug |
| FU — Fuse | TB — Terminal Block |
| HR — Heater Relay | TDR — Time-Delay Relay |
| IDR — Induced Draft Relay | TRAN — Transformer |
| IFC — Indoor (Evaporator) Fan Contactor | |

Fig. 7 — Power Wiring Access Holes (20 and 25 Ton Standard Tier Gas Unit; 208/230-V Units Shown)

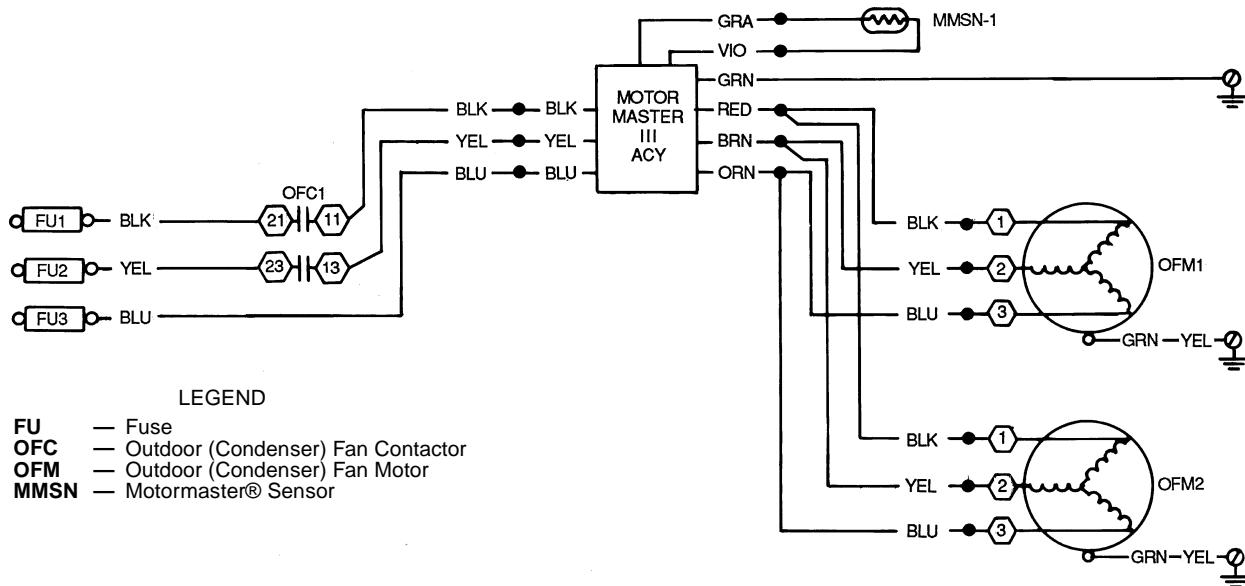


Fig. 8 — Motormaster III Control Wiring — 208/230-3-60 Units

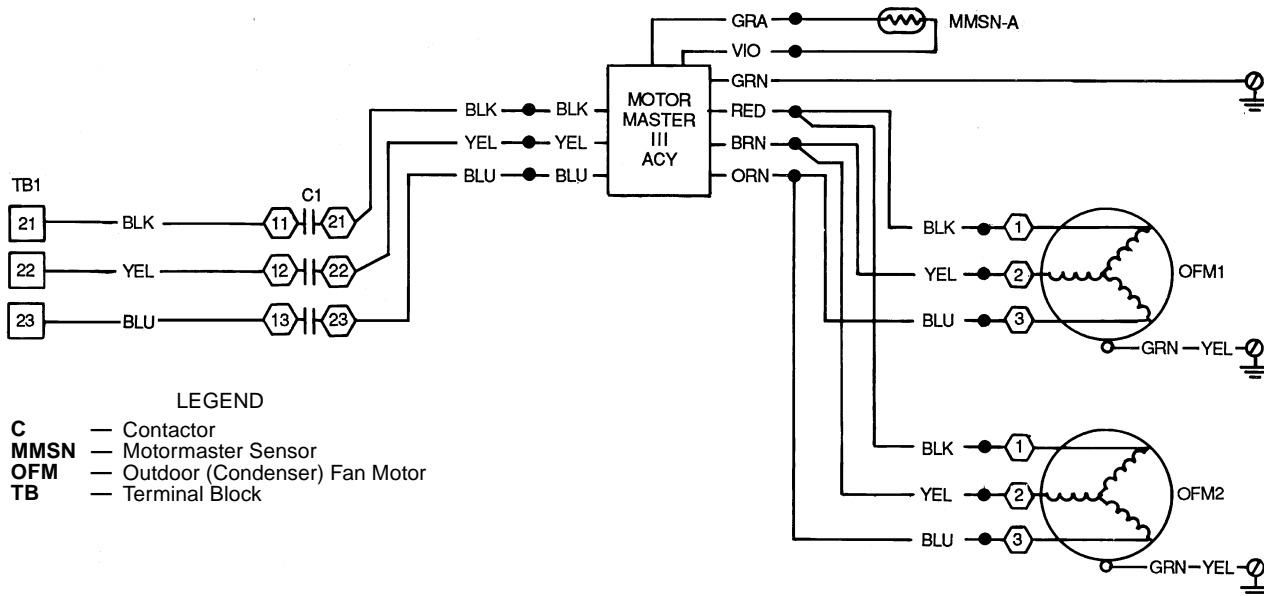


Fig. 9 — Motormaster III Control Wiring — 380/415-3-50 and 460-3-60 Units

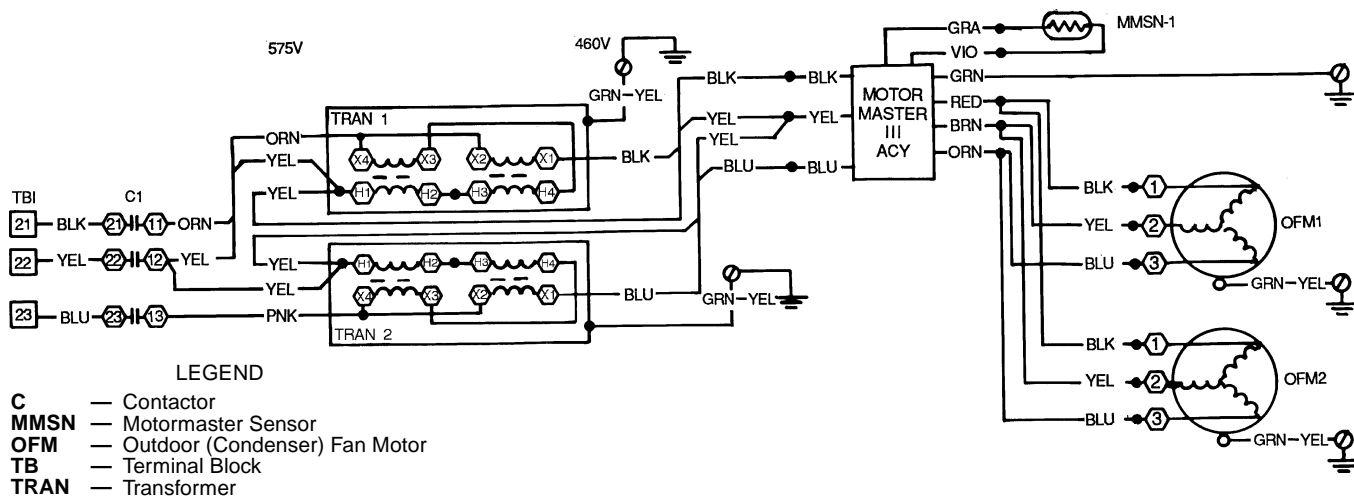


Fig. 10 — Motormaster III Control Wiring — 575-3-60 Units

START-UP

1. When all electrical connections are made, check that they are correct and tight.
2. Check phase indicator light on MMIII control after powering up the unit. The light should be out. If the light is lit, shut off power and reverse L1 (black) and L2 (yellow) power leads.
3. With phasing to the MMIII control correct (Step 2), check for correct rotation of the condenser fans (clockwise). If fan rotation is backwards, shut off power, reverse 2 of the supply power leads (red and orange) between the MMIII control and the condenser fan motors to correct fan rotation.
2. The power frequency switch must be in the correct position for the power supply used and the control input switch must be turned toward the thermistor sensor setting.
3. The only acceptable condenser-fan motor that can be used with MMIII is Carrier part no. HD52AK652. If some other condenser-fan motor is installed, it must be changed to an HD52AK652 motor.
4. A true “root mean square (RMS)” meter is required to accurately read the output from the MMIII controller because of the electronically controlled output voltage.
5. Thermistor sensor lead connections should be carefully rechecked if there is an operational problem. The thermistor characteristics shown in Table 4 apply to 30GT412176. The control operates between 1600 ohms and 5800 ohms. At 1600 ohms, the control output is at full voltage and at 5800 ohms, the output is at minimum or about 10% motor speed.

TROUBLESHOOTING

The MMIII control is an electronic device and does not have many parts that the user can troubleshoot. Check the following potential causes if a problem is discovered:

1. The Motormaster® III control device green ground wire must be securely grounded to the cabinet of the unit to function properly.

Table 4 — 30GT412176 Thermistor Characteristics

TEMPERATURE		RESISTANCE (OHMS)		
°F	°C	Minimum	Typical	Maximum
60	15.5	7000	7750	8550
70	21.1	5300	5900	6500
77	25.0	4500	5000	5500
80	26.7	4175	4650	5100
90	32.2	3300	3650	4000
100	37.8	2600	2875	3180
110	43.3	2050	2275	2525
120	48.9	1650	1850	2050

