



Wiring Diagrams

Units Produced After January 1996

INDEX

UNIT 38AKS	ELECTRICAL CHARACTERISTICS (V-Ph-Hz)	SCHEMATIC DIAGRAM FIG. NO.	COMPONENT ARRANGEMENT FIG. NO.	LABEL DIAGRAM (On Unit) NO. 38AK
013-024	208/230-3-60	1	2	501206
	380-3-60	1	2	501206
	230-3-50	1	2	501206
	346-3-50*	1	2	501206
	400-3-50	1	2	501206
	460-3-60	3	4	501207
	575-3-60	3	4	501207

*38AKS024 only.

Remote Thermostat Wiring	Fig. 5
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Accessory Transformer Relay Package	Fig. 7
Accessory Winter Start Package	Fig. 8
Motormaster® Control Diagrams	Fig. 9-15

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 mechanics should install, start up, and service this equipment.

When working on the equipment, observe precautions in the literature, tags, stickers, and labels attached to the equipment, and any other safety precautions that apply.

- Follow all safety codes.
- Wear safety glasses and work gloves.
- Use care in handling, rigging, and setting bulky equipment.
- Use care in handling electronic components.



ELECTRIC SHOCK HAZARD

Open all remote disconnects before servicing this equipment.

OPERATING SEQUENCE

Cooling — When the first stage (TC1) of the cooling thermostat closes, the timer starts. After approximately 3 seconds, the timer activates the compressor and fan motor no. 1. When the liquid pressure builds to approximately 260 psig (1793 kPa), fan motor no. 2 is energized.

On demand for additional cooling capacity, the second stage (TC2) of the cooling thermostat closes, energizing a field-supplied liquid line solenoid valve (LLSV), which opens. This increases the suction pressure, causing the compressor to operate at higher capacity.

When fan switch is set at AUTO, the indoor-air fan cycles with the compressor. When the switch is set at CONT, the indoor-air fan runs continuously.

At shutdown, the Time Guard® II timer prevents the compressor from restarting for approximately 5 minutes.

In addition, a field-supplied solenoid valve (locate at fan coil) wired in parallel with the compressor contactor coil, shuts off the liquid line to prevent the refrigerant migration back to the compressor during the off cycle. This valve is recommended for all installations and is mandatory if piping length is over 75 ft (22.9 m) or if liquid line diameter exceeds 5/8 in. (38AKS013, 014) or 7/8 in. (38AKS016, 024). If two liquid line solenoid valves are used, add accessory relay-transformer package 38AE900001 (60 Hz only).

Heating — If heating is desired, a heating/cooling thermostat (See Fig. 5-7) must be supplied. This thermostat energizes a field-supplied relay, which operates heating controls and energizes the indoor-fan relay. When the fan switch is set at AUTO, the indoor-air fan cycles with the heating control. The indoor-air fan runs continuously when the fan switch is set at CONT.

Fan Cycling — Fan cycling is employed for head pressure control. The no. 2 fan responds to liquid line pressure, cycling on at approximately 260 psig (1793 kPa) and off at approximately 126 psig (869 kPa).

Winter Start Control (If Required) — Install Accessory Package 38AE900021. See page 9 for further details.

LEGEND (Fig. 1-5, 14, 15)

C	— Contactor, Compressor	TDR	— Time Delay Relay
CAP	— Capacitor	TGD	— Time Guard® Circuit
CB	— Circuit Breaker	TRAN	— Transformer
CH	— Crankcase Heater	QT	— Quadruple Terminal
COM	— Common		Terminal Block Connection
COMP	— Compressor		Terminal (Unmarked)
CR	— Control Relay		Terminal (Marked)
Du	— Dummy Terminal		Field Splice
Equip Gnd	— Equipment Ground		Splice (Marked)
FCPS	— Fan Cycling Pressure Stat		Factory Wiring
FU	— Fuse		Factory Splice
HD	— Heating Device		Field Control Wiring
HPS	— High-Pressure Switch		Field Power Wiring
IFC	— Indoor-Fan Contactor		To indicate common potential only, not to represent wire.
IP	— Internal Protector		
LLS	— Liquid Line Solenoid		
LLSV	— Liquid Line Solenoid Valve		
LPS	— Low-Pressure Switch		
NEC	— National Electrical Code		
OFC	— Outdoor-Fan Contactor		
OFM	— Outdoor-Fan Motor		
OFR	— Outdoor-Fan Relay		
TB	— Terminal Block		
TC	— Thermostat-Cooling		

NOTES (Fig. 1-4)

1. Fan motor(s) are thermally protected. Compressor motors are protected against primary single-phasing conditions.
2. If any of the original factory installed wire must be replaced, it must be replaced with type 90 C wire or its equivalent.
3. Terminal block 2 (TB2) is for field external control connections, Class 2 wiring:
Supply voltage at TB2 is 24 vac
Maximum power available at TB2 is 31.5 va
4. Field-supplied component ratings:
IFC sealed coil rating (24 vac) 12 va maximum.

For 24-1-50:

LLS sealed coil rating (24 vac) 23 va maximum.

For 24-1-60:

LLS sealed coil rating (24 vac) 18 va maximum.

Minimum thermostat electrical rating is 120 va (5 amp at 24 vac).

Minimum fan switch electrical rating is 60 va (2.5 amp at 24 vac).

If two liquid line solenoid valves are used, add accessory relay transformer package 38AE900001 (60 Hz only).

5. LLS, controlled by TC2, activates one-half of evaporator for capacity control feature.
6. Use copper, copper-clad aluminum, or aluminum conductors for field power supply.
7. Insulate unused lead when changing tap for 208 v use.
8. For field wiring, use 60 C rated wire.

SCHEMATIC

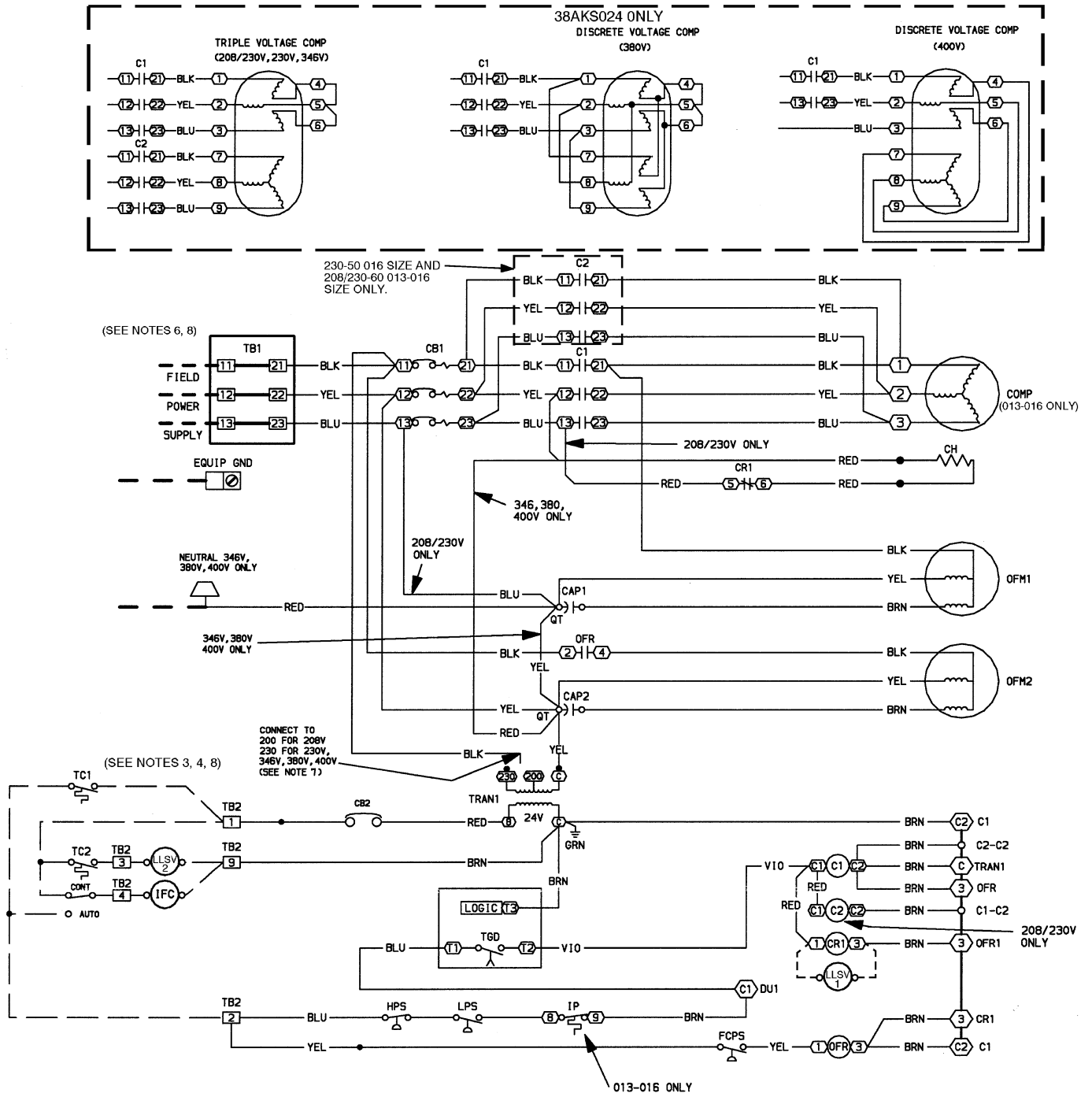


Fig. 1 — Power and Control Circuit Schematics; 208/230, 380-3-60; 230, 346, 400-3-50

COMPONENT ARRANGEMENT

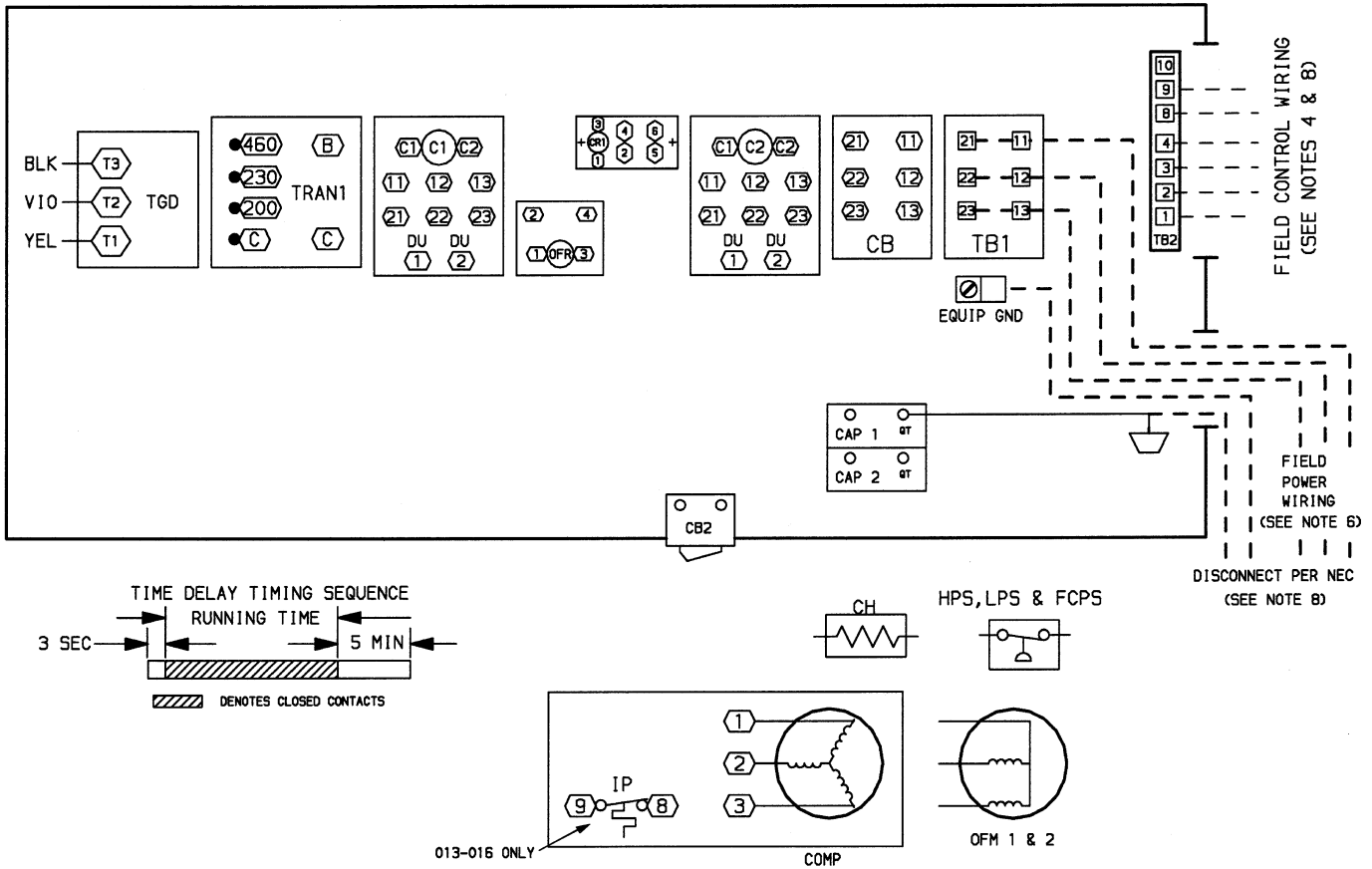


Fig. 2 — Component Arrangement; 208/230, 380-3-60; 230, 346, 400-3-50

SCHEMATIC

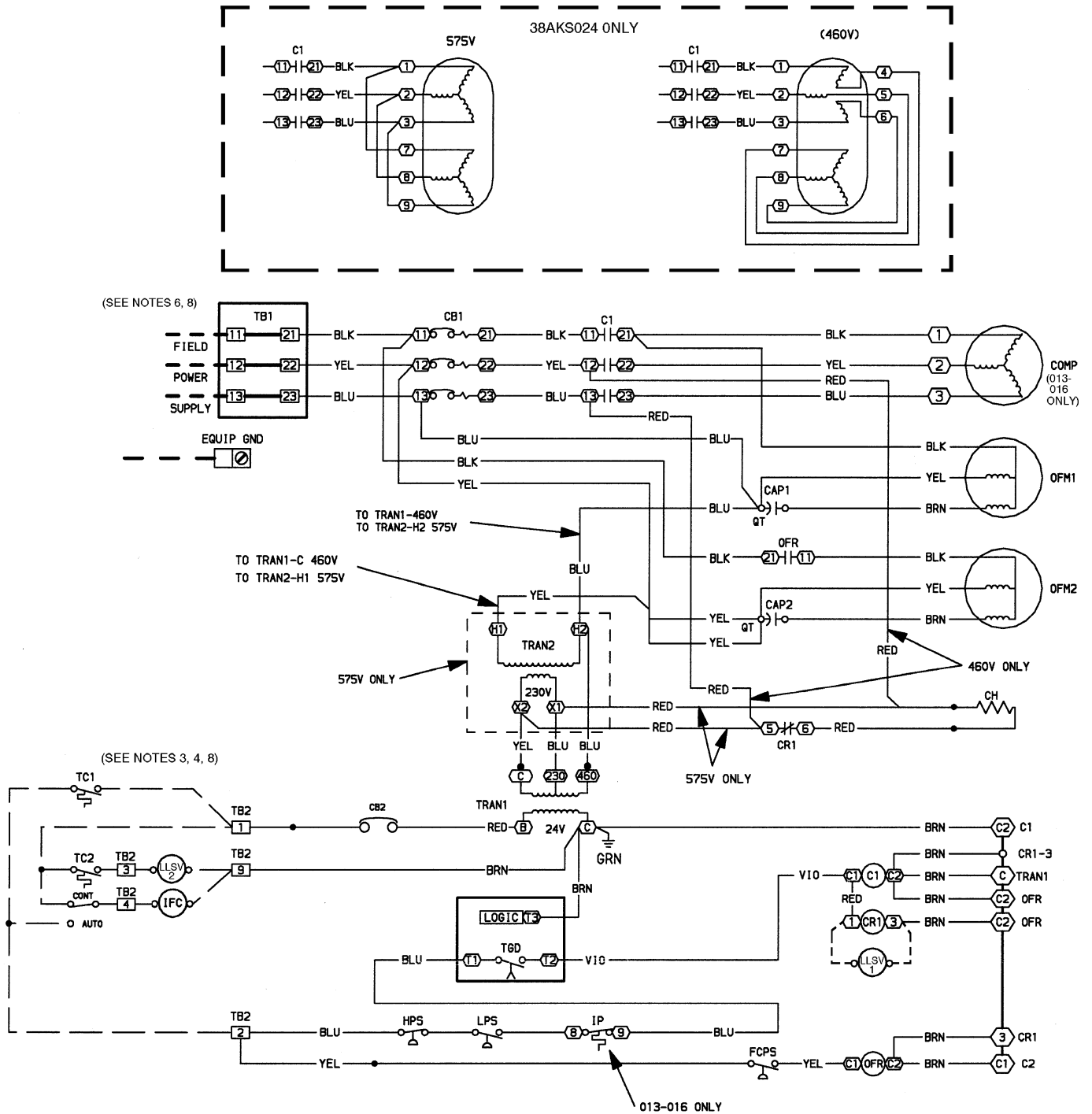


Fig. 3 — Power and Control Circuit Schematics; 460, 575-3-60

COMPONENT ARRANGEMENT

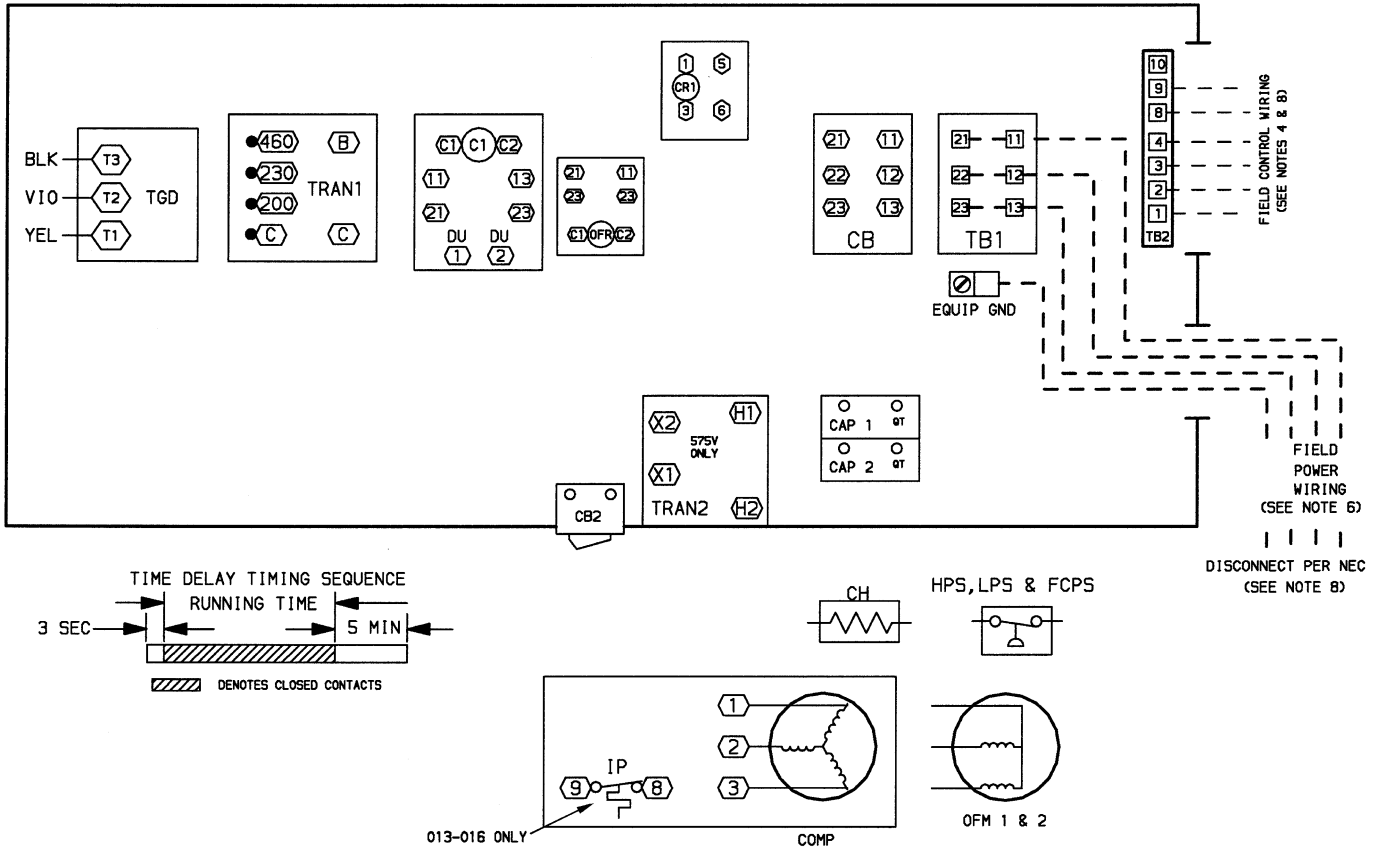
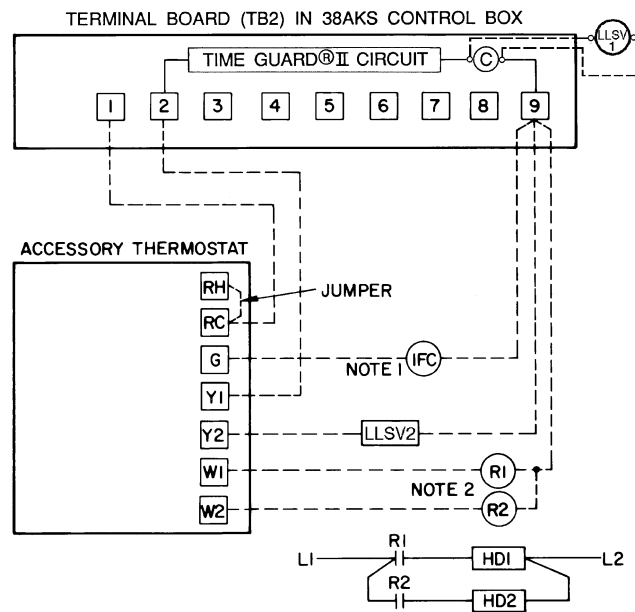


Fig. 4 — Component Arrangement; 460, 575-3-60



NOTES:

1. Combination LLSV2 plus IFC va should not exceed 30 va.
2. Do not exceed 5 va (24 vac) per coil R1.

Use accessory relay-transformer package 38AE900001 if these va values must be exceeded.

**Fig. 5 — Remote Thermostat Wiring;
2-Step Cooling/2-Step Heating**

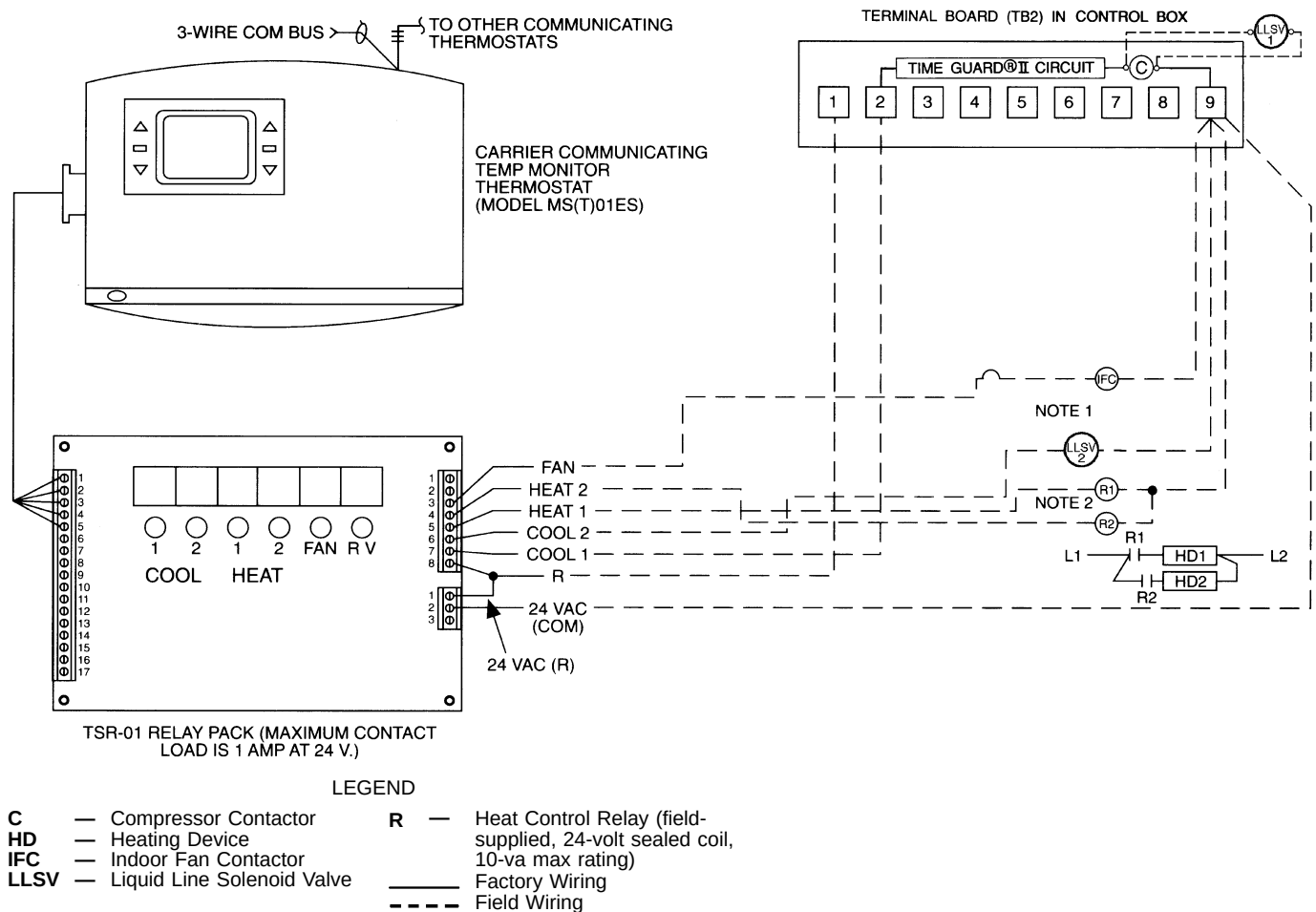


Fig. 6 — Programmable Electronic Thermostat Wiring; 2-Step Cooling/2-Step Heating

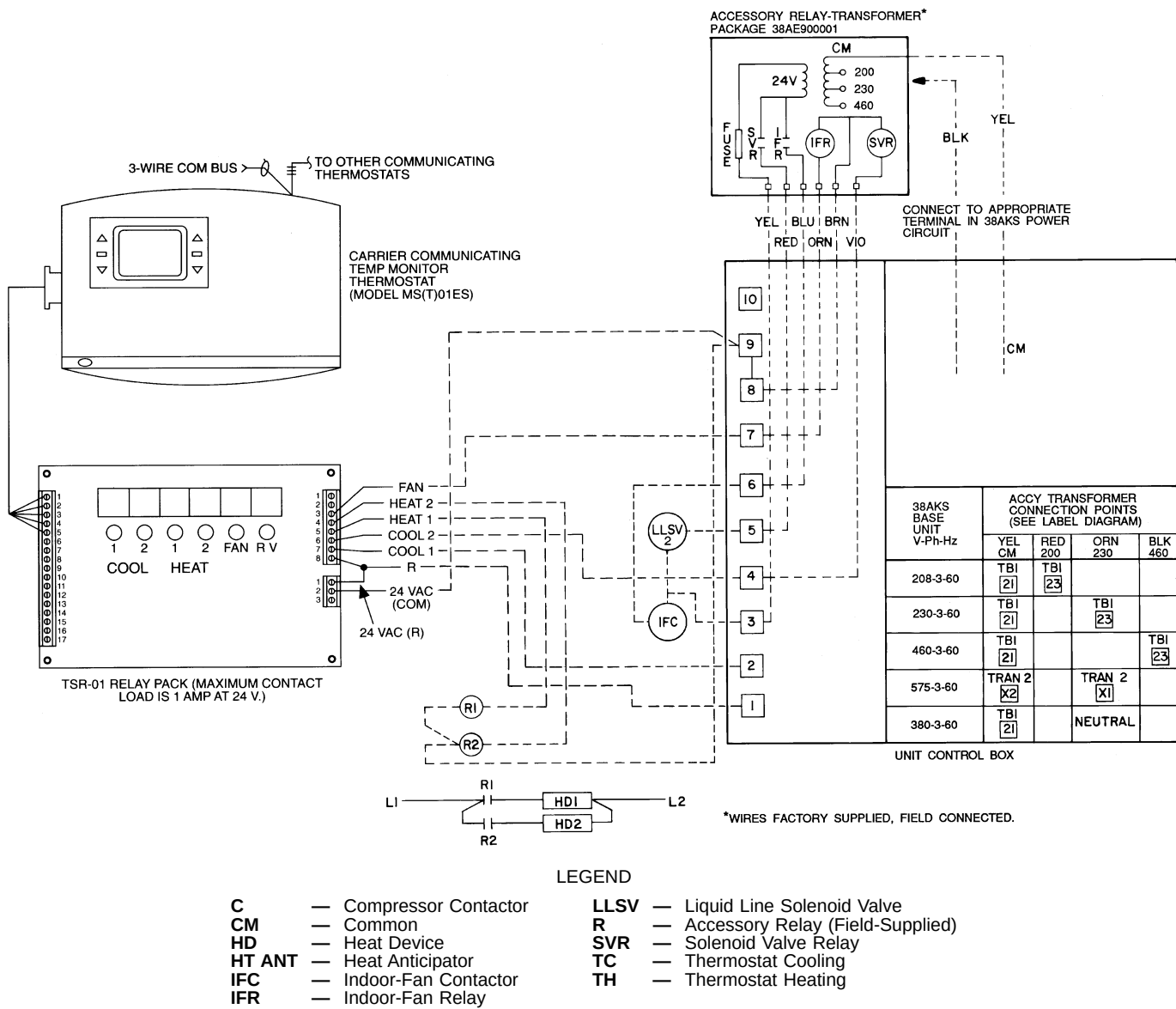


Fig. 7 — Accessory Transformer Relay Package 38AE900001 Wiring (60 Hz Only)

MOTORMASTER® CONTROL (LOW AMBIENT KIT) INSTALLATION

The accessory low-ambient kit contains a fan speed (Motormaster) control device activated by a temperature sensor (Fig. 8). The kit controls condenser fan motor speed in response to the saturated condensing temperature. For outdoor temperatures down to -20°F (-29°C), it maintains the condensing temperature at $100 \pm 10^{\circ}\text{F}$ ($38 \pm 6^{\circ}\text{C}$).

The low-ambient (Motormaster) control consists of a solid-state circuit on a printed circuit board encased in an aluminum extrusion. The control must be fastened to a panel in the unit, and the sensor assembly (Fig. 8) mounted to a return bend on the unit's condenser coil. Parts necessary for mounting control and sensor are included in the kit.

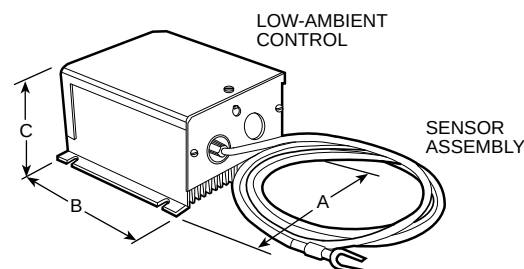
Pre-Installation

DISCONNECT UNIT POWER — To prevent electric shock, open and tag all disconnects before modifying the condensing unit.

INSTALL WINTER START CONTROL — The unit must be modified for winter start control before installing and using the low-ambient kit. Order Winter Start Control accessory no. 38AE900021 and install according to the instructions supplied with the kit. See Fig. 9 for wiring.

FABRICATE AND INSTALL WIND BAFFLES — The 38AKS units equipped with the low-ambient kit require baffles to prevent wind crosscurrents from causing abnormal operation as the fan is modulated. Construct and install wind baffles as shown in Fig. 10.

VERIFY POWER WIRING — Power wiring must comply with NEC (National Electrical Code) and all requirements. Confirm that supply voltage meets minimum voltage specified on the unit's rating plate and that it matches the voltage rating of the low-ambient kit.



KIT NO.	VOLTS	AMPS	A	B	C
32LT900301	All except 460	8.0	5 $\frac{7}{8}$	6 $\frac{3}{16}$	3 $\frac{3}{8}$
32LT900611	460	4.0	5 $\frac{7}{8}$	7 $\frac{3}{8}$	3 $\frac{3}{8}$

Fig. 8 — Low-Ambient (Motormaster) Control and Sensor Assembly

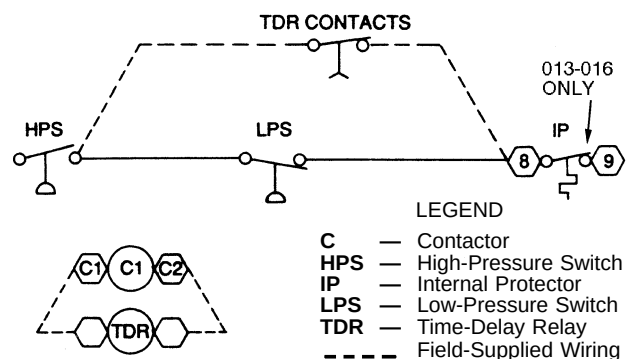
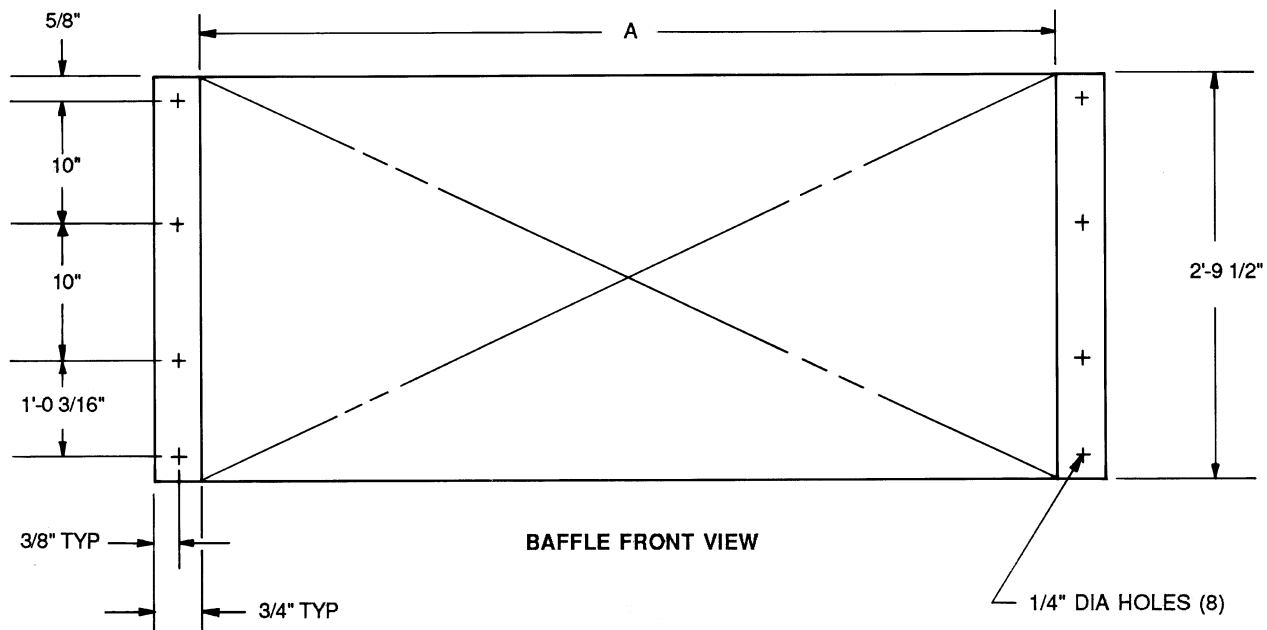
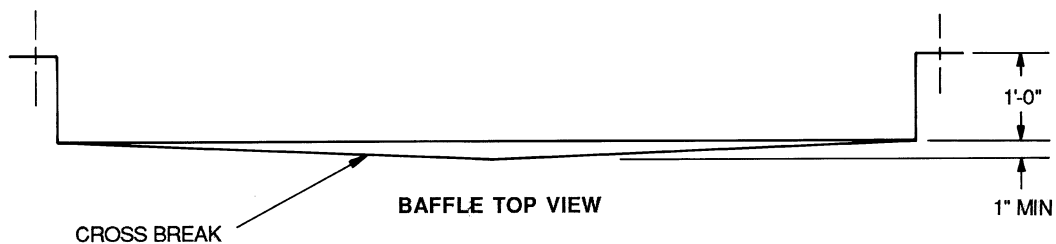
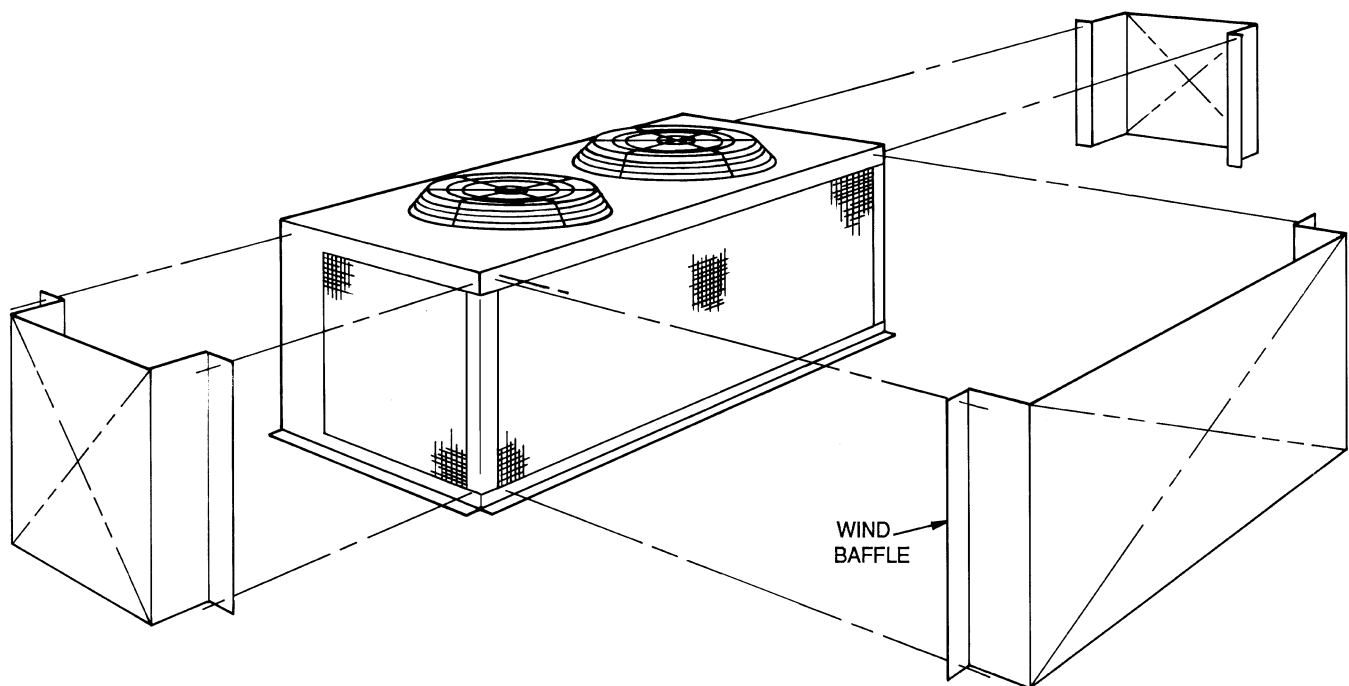


Fig. 9 — Connection Points, Time-Delay Relay, Accessory Winter Start Package 38AE900021



DIMENSIONS (ft-in.)

BAFFLE LOCATIONS	A
Right-Hand Side*	2-5 ¹¹ / ₁₆
Back	5-8 ³ / ₈
Left-Hand Side*	3-0 ⁷ / ₁₆

*As viewed from access panel side.

Fig. 10 — Wind Baffle Details

Installation — After completing the pre-installation steps, proceeds as follows:

MOUNT CONTROL ASSEMBLY

1. See Fig. 11 for the location of the access panel and Motor-master® low-ambient control in the bottom of the unit. Remove the access panel.
2. Using the template supplied in this document, drill pilot holes for mounting the low-ambient control.

⚠ CAUTION

When drilling holes, be careful not to damage return coil bends inside unit.

3. Fasten control to unit with four no. 10 sheet metal screws and star lockwashers provided. Lockwashers are required to ensure electrical ground with condensing unit.

MOUNT SENSOR ASSEMBLY

⚠ CAUTION

The sensor assembly is fragile. Handle with care.

1. See Fig. 12 to determine where to locate sensor on coil return bend. As shown in Fig. 13, fasten sensor to return bend with the supplied screw, plate washers, and nut. See Table 1 for sensor temperature vs resistance values.
2. Coil and secure excess wire inside the unit near the sensor or next to the low ambient control; provide additional protection against abrasion or movement of the wire if necessary.
3. Reinstall the access panel.

Table 1 — Sensor (Thermistor) Temperature vs Resistance

TEMPERATURE		NOMINAL RESISTANCE (Ohms)
F	C	
60	16	7750
70	21	5900
77	25	5000
80	27	4650
90	32	3650
100	38	2875
110	43	2275
120	49	1850

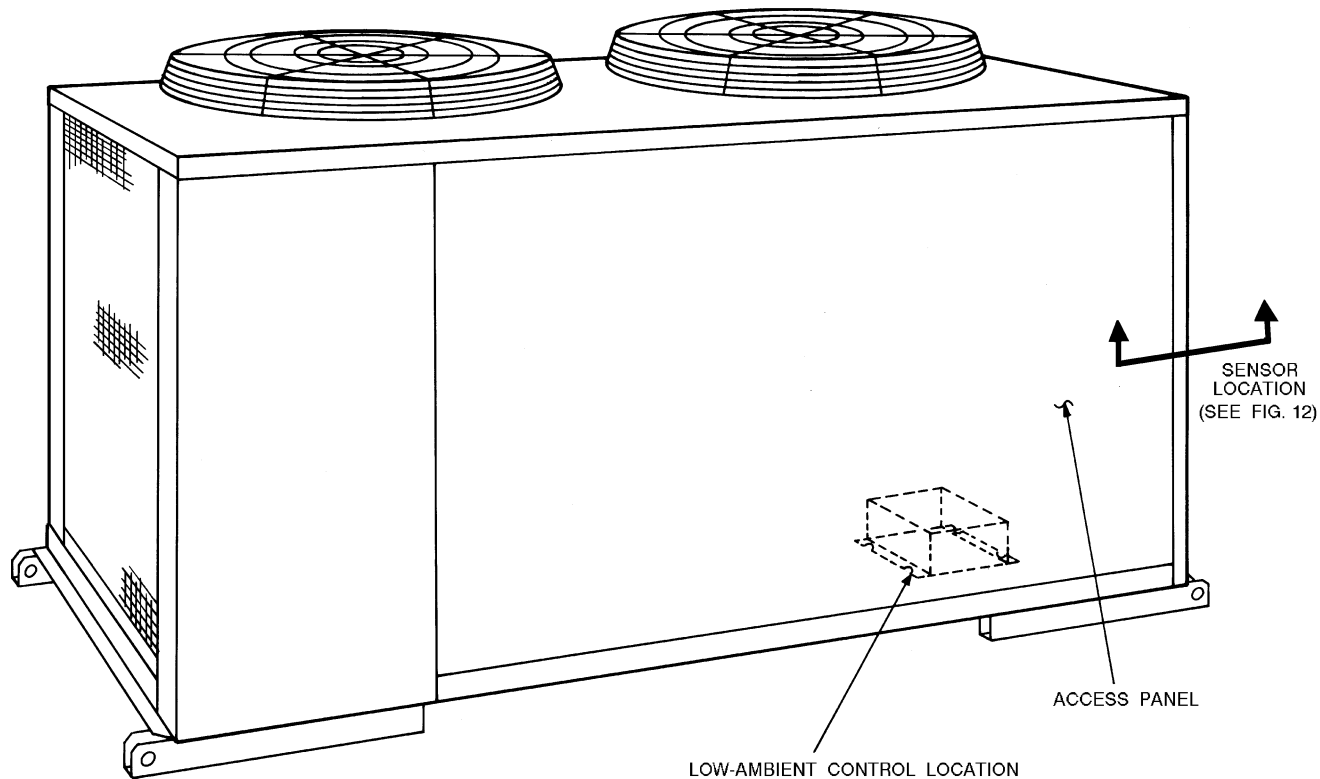


Fig. 11 — Location of Motormaster Low-Ambient Control

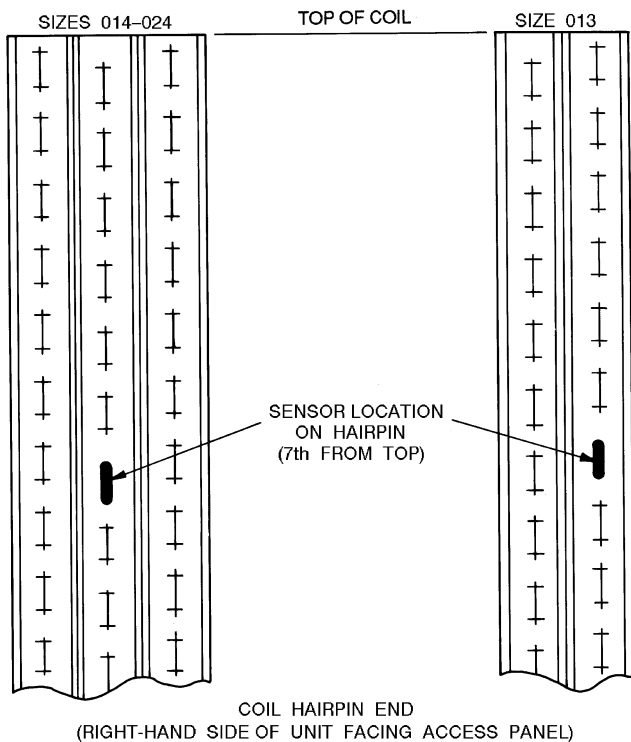


Fig. 12 — Location of Low-Ambient Kit Sensors

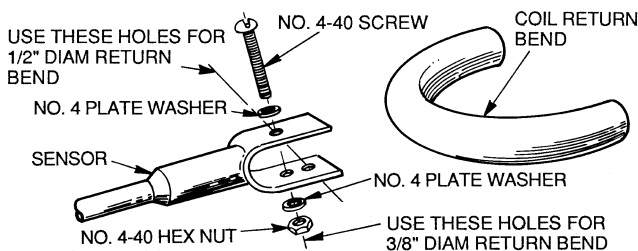


Fig. 13 — Sensor Installation

INSTALL CONTROL POWER WIRING — Wire the Motormaster® low-ambient control to the unit's power circuit as shown in Fig. 14 and 15; refer to the following sections for various unit voltages.

⚠ CAUTION

Wire low-ambient control in series with fan motor.

Power wiring must comply with all local and national requirements. All units except 460-v, 3-ph, 60 Hz use Motormaster control, Carrier Part No. 32LT900301. The 460-v units use Motormaster control, Carrier Part No. 32LT900611.

ALL UNITS EXCEPT 575-3-60 — For these units, without special transformer, wire Motormaster control to condenser fan motor circuit as shown in Fig. 14.

575-3-60 UNITS — The 575-v units require a special field-installed transformer and fan motor. Wire special transformer (part no. HT01AH859) and Motormaster control to special fan motor (part no. HC44VL610) as shown in Fig. 15.

Blue wire from CB1-13 to CAP1 must be reconnected from CB1-13 to TRAN2-H2.

Blue wire from CAP1 to TRAN2-H2 must be reconnected from CAP1 to field-installed transformer.

VERIFY OPERATION — Turn on the unit power and set the thermostat below the ambient room temperature. If the unit is equipped with a Time Guard® II circuit, wait at least 5 minutes.

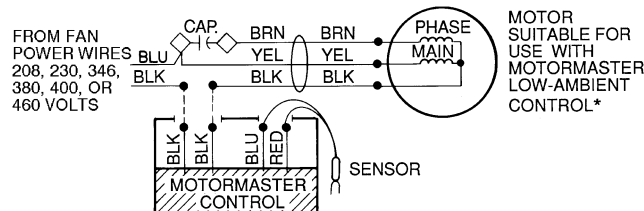
After the compressor starts, the fan speed is modulated according to the condensing temperature and then maintained until the set point is achieved.

If fan motor no. 1 does not start, verify the following conditions and correct as necessary:

- Condensing unit power is on.
- Power is present at fan motor relay contacts (or transformer output when one is installed).
- Sensor wire connections inside the low-ambient control are tight.

If the preceding conditions are met and fan motor no. 1 still does not start, perform corrective procedures or replace components as follows:

- Jumper the power wires (BLK-to-BLK) in the Motormaster control. If the motor does not run, check motor wiring and run capacitor. Replace capacitor and motor if necessary. If the motor runs, ensure the fan motor is wired in series with the control. Refer to Fig. 14.
- If the fan motor runs when connected to the single-phase voltage supply but does not run when connected in series with the Motormaster control, AND the return bend where the sensor is mounted is warm, short the sensor leads (BLU-to-RED). If the motor runs, replace the sensor. If the motor does not run, replace the control and sensor assembly.



*Use control part no. 32LT900301 for all unit voltages except 460 V. Use control part no. 32LT900611 for 460 V units.

Fig. 14 — Motormaster Control Power Wiring for All Units except 575-V

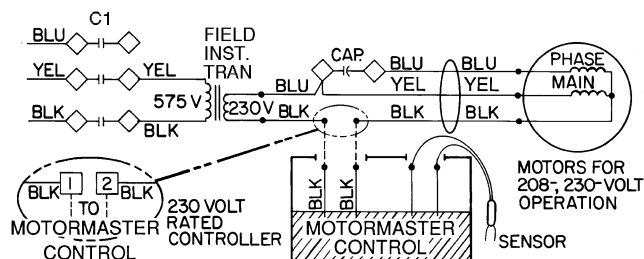


Fig. 15 — Motormaster Control Power Wiring for 575-V Units Using 208/230-V Motors

