

Wiring Diagrams

(Including Accessories)
028-044 (50/60 Hz)

WIRING DIAGRAM INDEX

UNIT 38AKS	ELECTRICAL CHARACTERISTICS (V-Ph-Hz)	SCHEMATIC DIAGRAM FIG.	COMPONENT ARRANGEMENT FIG.	LABEL DIAGRAM NO.
028-044	208/230-3-60 460-3-60 575-3-60	1	2	38AK501477
	230-3-50 346-3-50 380-3-60 400-3-50	3	4	38AK501475

Typical Field Wiring — Electronic Programmable Thermostat, Liquid Line Solenoid Valves, and Power Fig. 5
Time Delay Relay Wiring Fig. 6
Hot Gas Bypass Wiring Fig. 7
Motormaster Head Pressure Control Wiring Fig. 10,11,12

NOTE: *Italics* denote 60 Hz export units (not for sale in USA).

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.

OPERATION

IMPORTANT: Before initial start-up and before restarting unit after a prolonged shutdown, compressor crank-case heater should be energized for 24 hours.

Control Module (CM) — The unit control module is located in the control section of the control box. See the Fig. 2 or 4. The CM performs several functions. It has a built-in compressor anti-short-cycle timer which will not allow the compressor to restart until 5 minutes (+90 seconds/–75 seconds) have elapsed since the previous shutdown.

The compressor oil pressure is also monitored through the CM. The unit is allowed to remain operational as long as the oil pressure safety switch (OPS) has not been open for more than 2

minutes after the compressor has started. After start-up, if the OPS is open for more than 2 minutes, the CM shuts down the compressor and places the unit in a lockout condition. The CM activates the fault indication circuit, and the field-supplied unit service lamp is illuminated (if so equipped). The unit cannot be restarted until power is interrupted at the unit, resetting the CM. The 5-minute recycle time is initiated.

The CM also monitors the high-pressure switch (HPS) and compressor thermal protection. If the HPS opens, the CM shuts down the compressor and places the unit in a lockout condition. The CM activates the fault indication circuit, and the field-supplied unit service lamp is illuminated (if so equipped). The unit cannot be restarted until the HPS is reset and until power is interrupted at the unit, resetting the CM. The 5-minute recycle time is initiated.

If the unit shuts down on an automatic reset switch, such as the low-pressure switch (LPS), the compressor is allowed to restart when the switch recloses and the CM anti-short-cycle time has elapsed.

Bypass Relay (BPR) — All units are equipped with a BPR located in the control section of the control box. See Fig. 2 or 4. The BPR provides a 2-minute bypass of the LPS at start-up. Two minutes after the compressor starts, the BPR completes its function and is not longer active in the control circuit until the next restart of the unit.

Time-Delay Relay (TDR) (Standard on 230, 346-3-50) — This solid-state delay-on-make relay is factory set for a 1-second delay. The number 1 DIP switch is set to the ON position, and all the other DIP switches are set to the OFF position. Once the control relay (CR) is energized, the compressor contactor C1 is powered, and the first set of compressor windings is energized. After the 1-second time delay, contactor C1A is powered and the second set of compressor windings is energized (part-wind start).

Sequence of Operation — When the space thermostat calls for cooling, the no. 1 condenser fan and compressor start after CM initial time delay of 3 (+2/–1) seconds. If an optional airflow switch is used, compressor and no. 1 condenser fan do not start until sufficient indoor airflow has closed the switch. After 3 seconds, the compressor starts and the liquid line solenoid valve for solenoid drop control opens. The crankcase heater is deenergized. If the head pressure reaches 260 psig (1792 kPa) the second condenser fan starts. (Fan no. 3 (38AKS044 only) starts if outdoor ambient air rises above 80 F (26.7 C).

If cooling demand is low, suction pressure at the compressor drops. As the pressure drops, the compressor unloads 1 or 2 banks of cylinders as required. If cooling demand is high and 2-stage operation is used, the second stage of the thermostat activates the capacity control liquid line solenoid which activates the second stage evaporator coil. The compressor cylinders load or unload in response to compressor suction pressure to meet evaporator load.

Two minutes after compressor starts, the BPR timer is deenergized and the LPS bypass is deactivated. If the LPS trips during the first 2 minutes of operation, the compressor remains operational. If the LPS trips after 2 minutes, the compressor operation

is interrupted and the compressor cannot restart until the 5-minute CM anti-short cycle timer expires.

As the space cooling load is satisfied, the second stage of the thermostat opens, causing the CM to close the field-supplied capacity control liquid line solenoid valve to deactivate the second stage coil. The compressor adjusts the number of active cylinders to meet the new load. When the space temperature is satisfied, the first stage of the thermostat opens and the control relay and the BPR open. This closes the solenoid drop control valve, preventing refrigerant from migrating to the compressor during the off cycle (solenoid drop refrigerant control). The compressor stops and the crankcase heater is energized. The CM anti-short cycling timer is energized and runs for approximately 5 minutes. During this time, the compressor is not able to restart.

GENERAL — Figures 1-5 show liquid line solenoid valves to incorporate solenoid drop refrigerant control on the condensing units. The power schematics of the label diagrams show 06E triple-voltage compressor wiring and 06E discrete-voltage compressor wiring. A triple-voltage compressor (06E---3--) can be applied on a 208/230-v, 400-v, or 460-v (not available with part winding start) supply system. Discrete-voltage compressors are required for 575-v or 460-v systems requiring part winding start. (Discrete-voltage compressors are special-order items for 460-v units.)

LEGEND (Fig. 1-5)

AFS	— Airflow Switch	OPS	— Oil Pressure Switch
ATS	— Air Temperature Switch	TB	— Terminal Block
BPR	— Bypass Relay	TC	— Thermostat, Cooling
C	— Contactor, Compressor	TDR	— Time-Delay Relay
CB	— Circuit Breaker	TRAN	— Transformer
CH	— Crankcase Heater		Terminal Block Connection
CM	— Control Module		Marked Terminal
CMR	— Control Module Relay		Unmarked Terminal
COMP	— Compressor		Marked Splice
CR	— Control Relay		Unmarked Splice
EQUIP	— Equipment		Factory Wiring
FC	— Fan Contactor		Field Control Wiring
FCPS	— Fan Cycling Pressure Switch		Field Power Wiring
FM	— Fan Motor		Indicates common potential. (Does not represent wiring.)
FU	— Fuse		
GND	— Ground		
HPS	— High-Pressure Switch		
IFC	— Indoor Fan Contactor		
LLSV	— Liquid Line Solenoid Valve		
LPS	— Low-Pressure Switch		
NEC	— National Electrical Code		

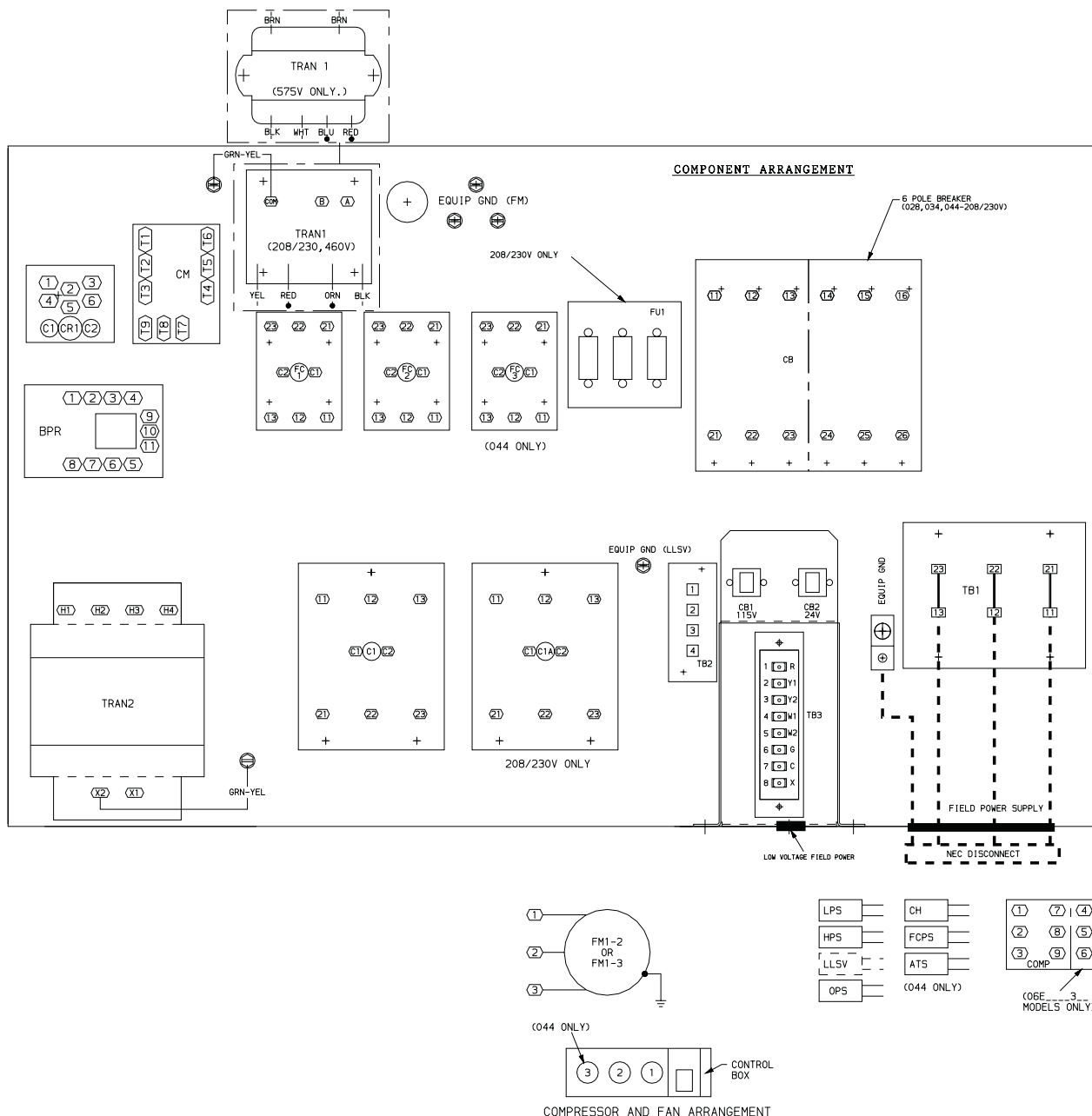
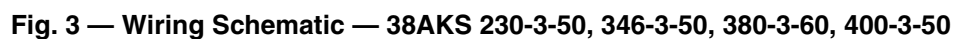


Fig. 2 — Component Arrangement — 38AKS 208/230-3-60, 460-3-60, 575-3-60

NOTES FOR FIG. 1 AND 2

1. Connect TRAN2 to terminal H3 for 230V, H4 for 460V, and H2 for 575V units. If 208/230V units are run with a 208V power supply connect to terminal H2.
2. Connect TRAN1 to ORN lead for 230V, BLK lead for 460V, and WHT lead for 575V units.
3. Compressor & fan motors thermally protected. Three-phase motors protected against primary single phasing conditions.
4. Replacement of original wires must be with Type 90° C wire or its equivalent.
5. Line # indicates location of contacts, 'R/#' signifies single-pole double-throw contacts, # signifies a normally closed contact, # signifies a normally open contact.
6. Factory wiring is in accordance with National Electrical Code (NEC). Field modifications or additions must be in compliance with all applicable codes.
7. Wiring for field power supply must be rated 60° C. Use copper, copper-clad aluminum or aluminum conductors.
8. Terminals G/6, Y2/3 & C/7 of TB3 are for class 2 (24V) field external interlock connections. Class 1 field interlock contacts must have minimum rating of 180 VA, 220V, 50/60 Hz pilot duty. Class 2 field interlock contacts must have minimum rating of 70 VA, 24V, 50/60 Hz pilot duty.
9. Thermostat for standard units:
HH01AD042, HH07AT172 & HH07AT174.
Subbase:
HH93AZ042, HH93AZ176 & HH93AZ180.
Thermostat for BDP units:
P272-2783
Subbase:
P272-1883 & P272-1882.
10. Control module internal illustrated to indicate components orientational sequence. All items illustrated are theoretically represented as internal to component.
11. The factory-supplied LLSV drop control is shipped with the 38AKS unit but field installed at the indoor unit.

TRIPLE VOLTAGE
COMPRESSOR
06E____3__ (400V ONLY)



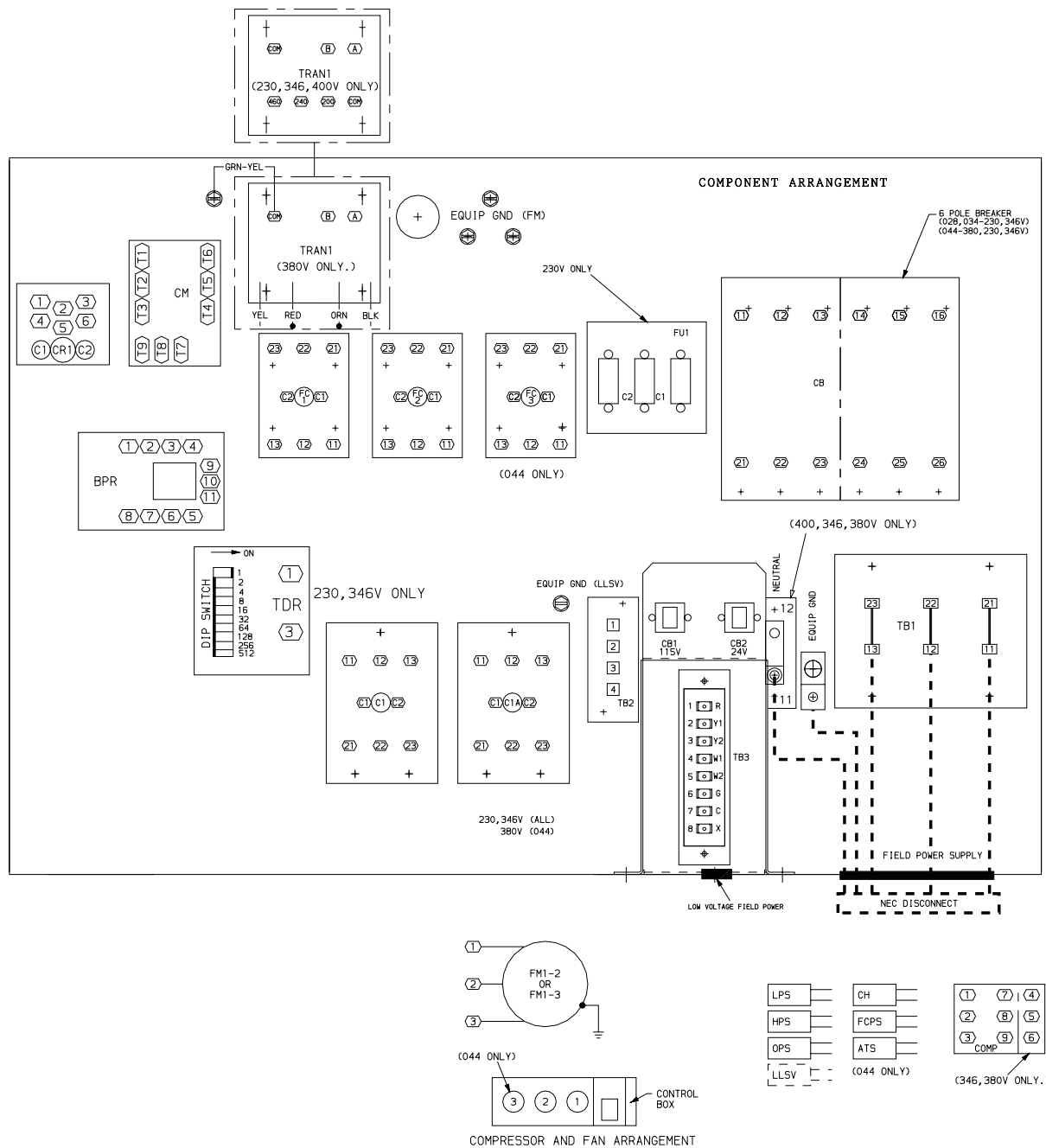


Fig. 4 — Component Arrangement — 38AKS 230-3-50, 346-3-50, 380-3-60, 400-3-50

NOTES FOR FIG. 3 AND 4

1. Connect to TRAN1 240V terminal for 400 and 230V units, 200V terminal for 346V units or ORN lead for 380V units.
2. Compressor & fan motors thermally protected. Three phase motors protected against primary single phasing conditions.
3. Replacement of original wires must be with Type 90° C wire or its equivalent.
4. Line # indicates location of contacts, 「#,#」 signifies single-pole double-throw contacts, # signifies a normally closed contact, # signifies a normally open contact.
5. Factory wiring is in accordance with National Electrical Code (NEC). Field modifications or additions must be in compliance with all applicable codes.
6. Wiring for field power supply must be rated 60° C. Use copper, copper-clad aluminum or aluminum conductors.
7. Terminals G/6, Y2/3 & C/7 of TB3 are for class 2 (24V) field external interlock connections.
Class 1 field interlock contacts must have minimum rating of 180 VA, 220V, 50/60 Hz pilot duty.
Class 2 field interlock contacts must have minimum rating of 70 VA, 24V, 50/60 Hz pilot duty.
8. Thermostat:
HH01AD042, HH07AT172 & HH07AT174.
Subbase:
HH93AZ042, HH93AZ176 & HH93AZ180.
9. Control module internal illustrated to indicate components orientational sequence. All items illustrated are theoretically represented as internal to component.
10. The factory-supplied LLSV drop control is shipped with the 38AKS unit but field installed at the indoor unit.
11. On units with 380V, interchange fan motor connections 1 & 3 to ensure counter clockwise fan rotation.

NOTES:

1. Factory wiring in accordance with the NEC. Any field modifications or additions must be in compliance with all applicable codes.
2. All field interlock contacts must have minimum rating of 180 va pilot duty plus capacity required for field-installed equipment. All field interlock contacts in the 24-v control circuit must have minimum rating of 70 va pilot duty plus capacity required for field-installed equipment.
3. For internal unit wiring, refer to Fig. 1-4 or unit wiring label diagram. Power for TB1 and TB2 follows:

UNIT POWER (V-Ph-Hz)	TB1 POWER (V-Ph-Hz)	TB2 POWER (V-Ph-Hz)
208/230-3-60	24-1-60	115-1-60
460-3-60	24-1-60	220-1-60
575-3-60	24-1-60	220-1-60
380-3-60	24-1-60	220-1-60
230-3-50	24-1-50	220-1-50
346-3-50	24-1-50	220-1-50
400-3-50	24-1-50	220-1-50

4. The following components are not located in the 38AKS unit control box: LLSV1, LLSV2, field control thermostat, AFS, alarm shut-off switch, and alarm or light.

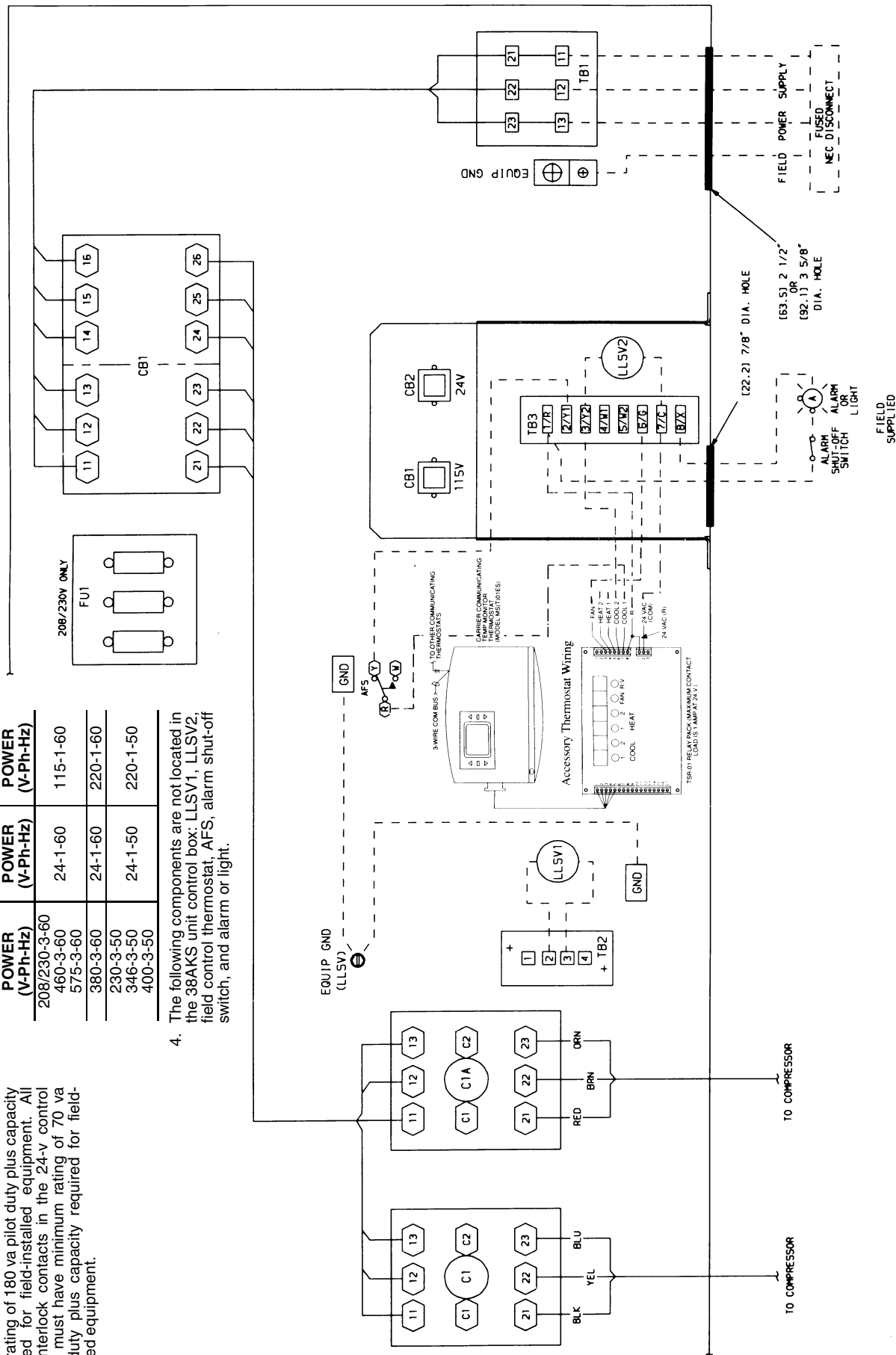


Fig. 5 — Typical Field Wiring — Electronic Arrangement Thermostat, Liquid-Line Solenoid Valves, and Power

Field-Installed Accessories — Ordering numbers for field-installed accessories are listed on product price pages. For field installation of these accessories, see the installation instructions supplied with the accessories, in addition to the following instructions. Refer to the wiring labels for complete unit wiring schematics and location of control box components.

PART WINDING START — Order part number HN67ZA001.

NOTE: All units have standard across-the-line compressor start. The availability of part winding start is shown below:

380, 575 V, 60 Hz units require special order to change circuit breakers and contactors.

460 V, 60 Hz and 400 V, 50 Hz units require special order to change circuit breakers, and contactors and can not use triple voltage compressor.

208/230 V, 60 Hz units can be field modified to part winding start by adding a time delay relay (part no. HN67ZA001).

230, 346 V, 50 Hz units part winding start factory-installed as standard equipment.

Installation — Pre-drilled holes for time delay relay are located in lower left corner or control box, below control relay TR1. Use two no. 6B-20 screws to fasten time delay relay to control box. Remove gray (GRA) wire between C1 terminal of compressor contactor coils C1 and C1A. Wire time delay relay HN67ZA001 between C1 terminal of compressor contactor coils C1 and C1A and install jumper on center terminals. See Fig. 6.

HOT GAS BYPASS (38AKS028-044, 60 Hz and 50 Hz) — Order part number 30GA900161 (115 v) or 30GA900171 (230 v).

See Fig. 1 and install as follows:

Wiring

1. Install a field-supplied relay (Carrier Part Number HN61KK324 or any relay with a 24-v coil and normally closed contacts, rated for 20 va at 125 vac inductive load). Mount relay in the 38AKS control box.
2. **115-v**
 - Add a wire (field-supplied) between TB2 **2** and HGR **4**.
 - Wire one leg of hot gas bypass pilot solenoid to HGR **6**.
 - Run other wire on hot gas pilot solenoid to TB2 **3**.
- 24-v**
 - Connect a field-supplied wire between TB3 **Y2** and the L1 side of HGR coil.
 - Connect a field-supplied wire between TB3 **C** and the L2 side of HGR coil.

Piping

IMPORTANT: When applying Part Numbers 30GA900161 and -171 to split systems, locate the hot gas bypass valve in the condensing unit (NOT at the fan coil). Sweat the pilot solenoid valve directly to the 3/8-in. ODF external equalizer port on the hot gas bypass valve.

LOW AMBIENT HEAD PRESSURE FAN CONTROL (All units with 208/230-3-60 Hz, 460-3-60 Hz and 575-3-60 Hz unit supply systems) — Order part no. 50DJ902801 (208/230-3-60 or 575-3-60, unit voltage) or 50DJ902811 (460-3-60 unit voltage).

For Motormaster® head pressure control operation, 575-v unit requires installation of transformer (Carrier Part No. HT01AH854) not included in accessory package.

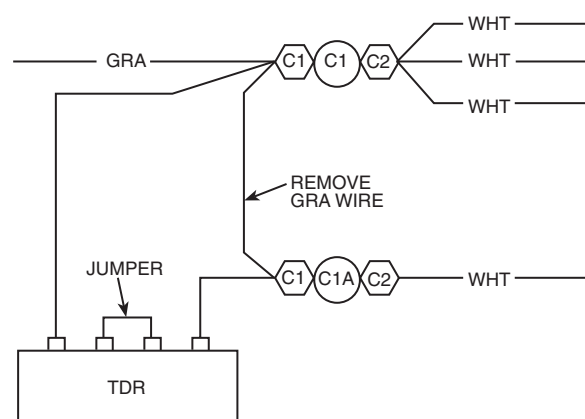
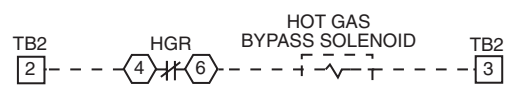
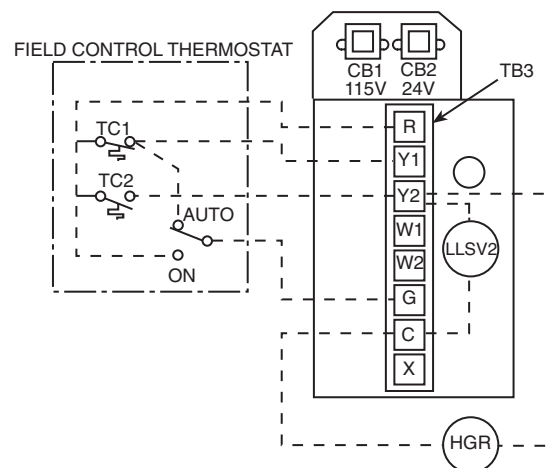


Fig. 6 — Time Delay Relay Wiring



115-V CIRCUIT



24-V CIRCUIT

LEGEND	
CB	— Circuit Breaker
HGR	— Hot Gas Relay
LLSV	— Liquid Line Solenoid Valve
TB	— Terminal Board
TC	— Thermostat, Cooling

Fig. 7 — Hot Gas Bypass Control Wiring Schematics

Note that these installation instructions are for 60 Hz units, but installation procedures for 50 Hz units are similar. See price pages for required parts for 50 Hz Motormaster® applications. Contact Application Engineering if installation assistance is required.

1. Disconnect all power to the unit and open control box.

⚠ WARNING

To avoid possible electrical shock and personal injury, all power to unit must be disconnected before working on unit. Tag all disconnects to alert others unit is being worked on.

2. Remove FM1 (fan motor no. 1) fan guard (see Fig. 8) located next to compressor compartment.
3. Disconnect FM1 wiring in the motor junction box and remove FM1 from unit.
4. Remove fan propeller from FM1 and save. Fan propeller is reinstalled on the speed control motor in Step 16.
5. Place motor mount spacer over FM1 motor mount.
6. Install speed control motor with rainshield (included in package) in place of FM1 removed in Step 3.
7. Because the standard fan motor is 3-phase and the speed control motor is single-phase, it is necessary to add a capacitor. Install the capacitor inside the compressor compartment on the divider panel above the condenser coil.
8. Mount the capacitor upside down (terminals pointing down) seating it with the capacitor boot. Secure using capacitor strap and screws from the Fastener Package (holes must be field drilled). See Fig. 9. To prevent capacitor from slipping down, insert an additional screw through the panel for the capacitor to rest on. See Fig. 9.

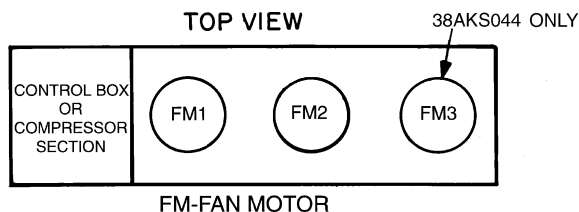
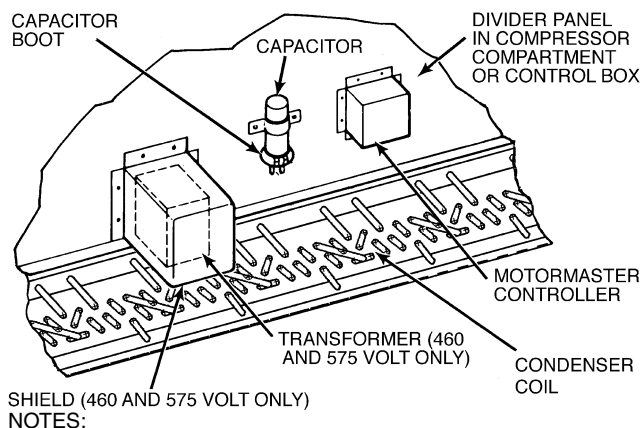


Fig. 8 — Fan Motor Locations



NOTES:

1. Transformer shield is field-supplied (575v transformer part no. HT01AH854 is field-supplied).
2. Exact mounting locations on divider panel for capacitor, Motormaster controller, and transformer are at discretion of installer. There are no wires or obstructions on reverse side of divider panel to interfere with mounting screws.

Fig. 9 — Mounting Motormaster® Control Capacitor, and 460-V or 575-V Transformer

9. Connect yellow wire from terminal 22 on FC1 to the capacitor. See Fig. 10. Run second wire (field supplied) from the same terminal on the capacitor to the yellow wire (T4) in the speed control motor junction box. Connect using wire nut.
10. On the motor, tie the blue (T1) and black (T5) wires in the motor junction box together, using a wirenut. See Fig. 10 for 208/230-V or Fig. 11 for 460 and 575-V.
11. Run field-supplied wire from the other side of the capacitor to the red (T8) wire in the speed control motor junction box. Connect with wire nut.
12. Remove the blue wire running from the standard FM1 to terminal 23 on fan circuit breaker (FCB). If the wire is not physically removed from the unit, be sure it is disconnected from terminal 23 of FCB, with the end wire-nutted and the wire secured to the wire harness in the control box. The motor end of this wire should be securely tied to the motor mount to prevent it from becoming entangled in the propeller fan when the unit is running.

⚠ DANGER

It is important that the wire be disconnected from terminal 23 of FCB, otherwise the wire will be energized. This could result in serious injury or death.

13. Mount the Motormaster controller vertically on the divider panel next to the capacitor. It must be mounted vertically with the leads coming out the bottom. Using the template at the back of these instructions, drill the required 4 mounting holes. Use 4 no. 10 sheet metal screws and star washers provided to attach the controller. The star washers must be used to ensure electrical ground.
14. Connect the black wire from terminal 21 on FC1 to one of the black wires in the Motormaster controller. Use wire nut to connect. See Fig. 10. Run field-supplied wire from the other black wire in the Motormaster controller (connect with wire nut) to the purple wire (P1) in the speed control motor junction box. Use wire nut to connect. See Fig. 10. Replace junction box cover.

⚠ CAUTION

Be sure the wires running to the speed control motor are wire-tied securely to the motor mount, to prevent the wires from becoming entangled in the propeller fan when unit is running.

15. For 460-v and 575-v units, mount and wire transformer (for 575-v, use field-supplied transformer part no. HT01AH854) as follows:
 - a. Mount transformer to the divider panel. See Fig. 9. Drill required mounting holes.
 - b. Connect yellow wire from terminal 22 on FC1 to the primary side of the transformer. See Fig. 11. Connect the black wire from terminal 21 on FC1 to the other primary of the transformer. See Fig. 11.
 - c. Run field-supplied wire from the secondary of the transformer to the capacitor. Run second field-supplied wire to one of the black wires on the controller. See Fig. 11.
 - d. Install field-supplied shield over the transformer. See Fig. 9.



16. Reinstall the fan propeller and fan guard. Ensure that center of propeller is correct distance from top of fan orifice. See Fig. 12.
17. Route the sensor wire from the controller to the sensor location. Secure sensor wire to avoid contact with condenser coil.

⚠ CAUTION

The sensor assembly is fragile. Handle with care.

18. Secure the sensor to the coil return bend, or to cross-over tube for 38AKS044. Use no. 4-40 screw, two plate washers, and nut provided. See Fig. 13. See Fig. 14 for proper return bend for each unit.
19. Coil up excess wire and secure it next to controller.
20. Protect sensor wire from physical damage by installing field-supplied protective material.
21. Replace control box cover.

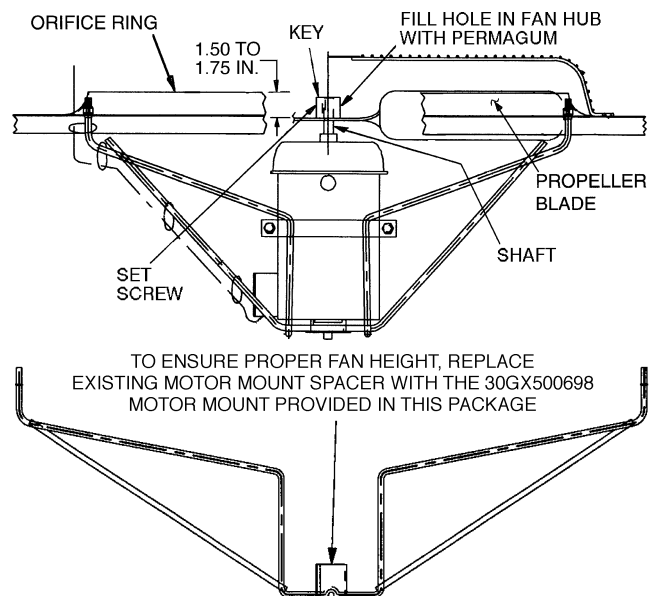


Fig. 12 — Location of Propeller on Motor Shaft from Outside of Orifice Ring

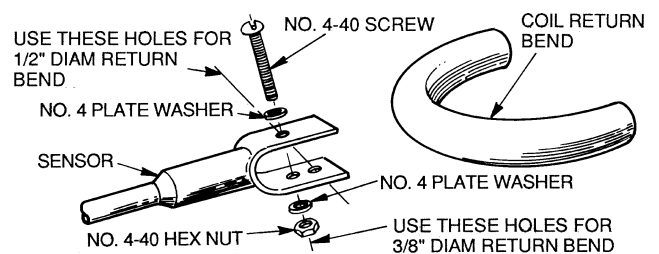


Fig. 13 — Sensor Installation

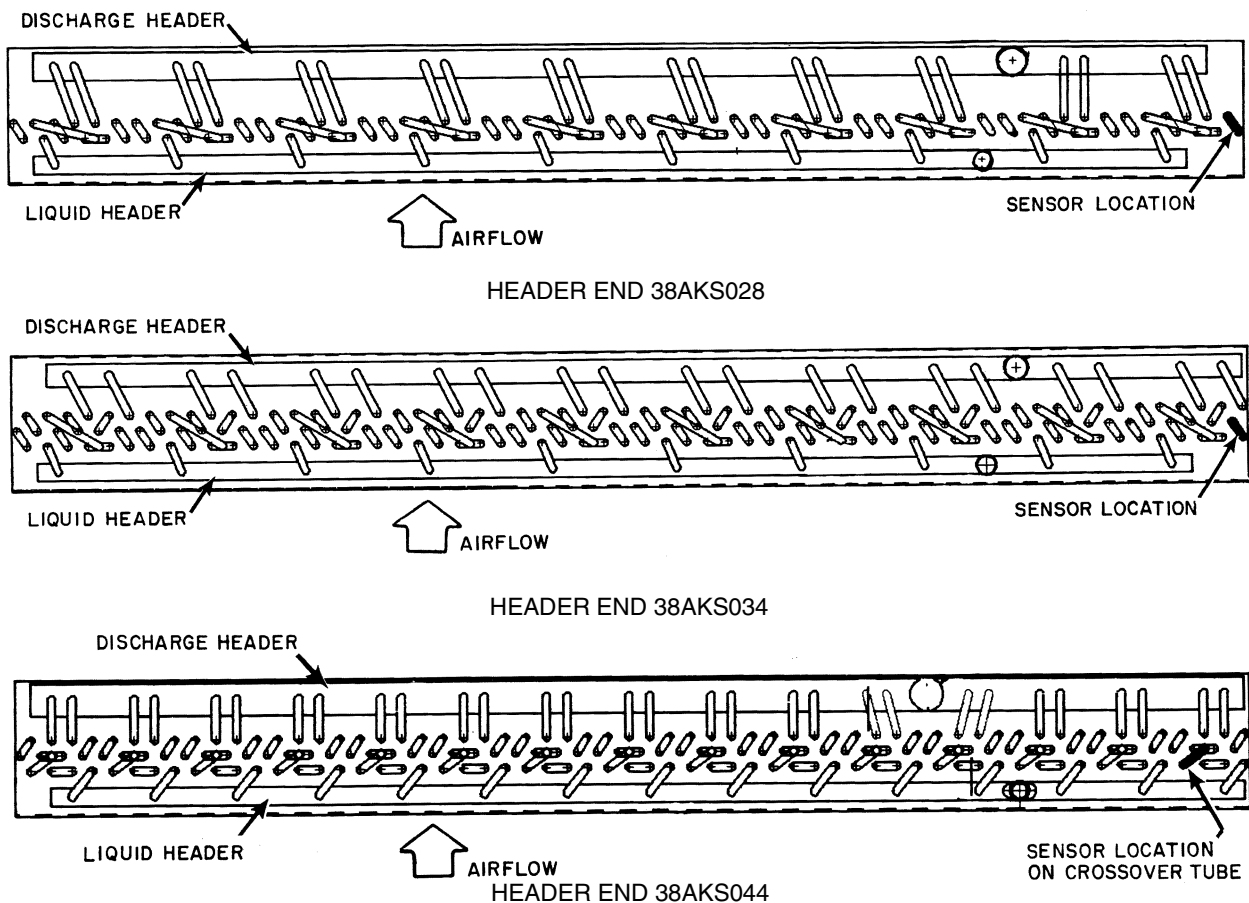


Fig. 14 — Motormaster® Controller Sensor Locations on Condenser Coil Header Ends, 38AKS Units

MOUNTING TEMPLATE FOR MOTORMASTER® CONTROL

CUT ALONG SOLID BORDER LINES TO REMOVE TEMPLATE

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE

