

Installation Instructions

Part No. 38AE900031 (60 Hz, 115 Volt)

Part No. 38AE900003 (50 Hz, 230 Volt)

Air-Cooled Condensing Units (38AH) Variable Air Volume (VAV) Air-Handling Units (39 Series)

SAFETY CONSIDERATIONS

Installing and servicing air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install or service air-conditioning equipment.

Untrained personnel can perform basic maintenance, such as cleaning and replacing filters. All other operations should be performed by trained service personnel. When working on air conditioning equipment, observe precautions in literature and on tags and labels attached to unit.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available.

WARNING

Before installing or servicing unit, turn off main power to system. There may be more than one disconnect switch. Turn off accessory heater power if applicable. Electrical shock can cause personal injury.

CONTENTS

	Page
SAFETY CONSIDERATIONS	1
GENERAL	1,2
INSTALLATION	2-12
Examine Package Contents	2
Mounting	2
Wiring	6
CONTROLLER FUNCTIONS AND CONFIGURATION	13-18
SEQUENCE OF OPERATION	19

GENERAL

The ModuPanel VAV (variable air volume) controller (see Fig. 1) allows split systems with 38AH condensing units and 39 Series air handlers to achieve a constant discharge-air temperature with changing load conditions. The ModuPanel controller is more effective than mechanical step controllers that provide constant air temperature only at full load conditions. The ModuPanel control can only be used with condensing units that are wired at the factory for VAV control.

This book contains ModuPanel installation and application information. For additional information, refer to 38AH Wiring Diagram books.

The ModuPanel controller can manage the following features:

- economizer
- night set-back
- morning warm-up
- perimeter heating
- 7-day time clock

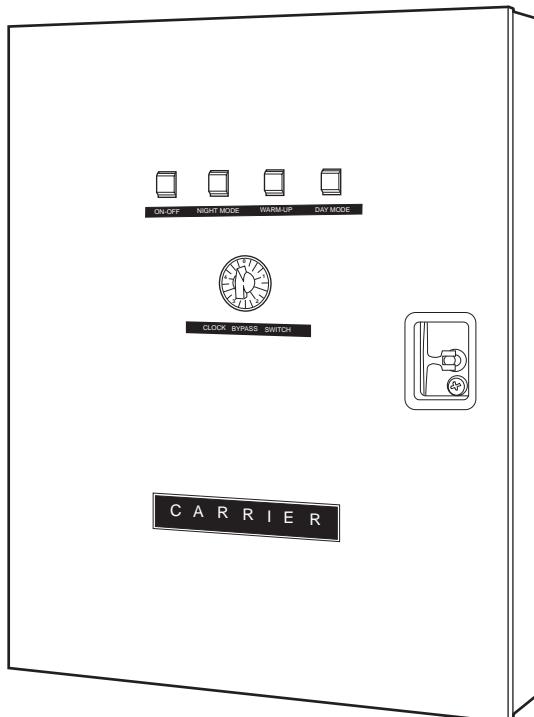


Fig. 1 — ModuPanel VAV Split System Controller

The ModuPanel™ controller's main component is a discharge-air control that modulates an economizer and sequences the mechanical stages of cooling. The discharge-air control has 3 manually adjustable control knobs:

Set point regulates the leaving-air temperature.

Reset prevents space overcooling by automatically resetting the discharge-air temperature higher during periods of light load conditions. The rest knob is adjustable within a range of 5 F to 20 F (3 C to 11 C).

Control band ensures system stability by establishing a temperature range centered around the discharge-air set point. At temperature variations of at least ± 1 F (0.6 C) outside the control band setting, stages of cooling will cycle on or off as required. Each stage of cooling has a minimum on/off time of 4 minutes. (Each stage must be on for at least 4 minutes before it can be turned off. It must then stay off at least 4 minutes before it can be restarted.)

The ModuPanel controller also has a 5-hour clock bypass switch which provides for system operation during hours when the building is normally unoccupied.

INSTALLATION

⚠ WARNING

Turn off all electrical power before installing the ModuPanel controller.

The standard components of the ModuPanel controller are as follows:

- control box with hinged cover and locking latch
- discharge-air control (10-step microprocessor control and satellite)
- discharge-air sensor

See Fig. 2 for component locations in the control box. Note that the discharge-air sensor is supplied loose in the control box for field installation elsewhere. Factory- and field-installed controller accessories are also available.

Examine Package Contents — Check the accessory for missing or damaged parts. If damage is found, file a claim with the shipping agency immediately. If any item is missing, notify your Carrier representative.

Mounting

CONTROL BOX — When mounting the ModuPanel control box, ensure that controls and connections are readily accessible for servicing. See Fig. 2 and 3.

1. Locate the control box indoors, on or near the air-handling unit.

2. Insert 4 field-supplied $\frac{3}{8}$ -in. bolts through mounting holes provided and mount control box. See Fig. 3 for location of mounting holes.

DISCHARGE-AIR SENSOR — The discharge-air sensor is placed inside the ModuPanel control box at the factory and must be field installed. The sensor monitors supply-air duct temperature. Mount sensor directly on duct wall (standard) or through an outlet box (optional). See Fig. 4.

Duct Wall Mounting

1. Cut a $\frac{1}{2}$ -in. (13 mm) diameter hole in duct wall.
2. Insert sensing tube so that flange rests against duct wall.
3. Use flange to mark locations of pilot holes for mounting screws. Drill pilot holes.
4. Fasten sensing tube to duct wall with 2 field-supplied sheet metal screws.
5. Using $\frac{1}{4}$ -in. quick-connect terminals, connect sensing tube to system wiring. Route system wiring to control panel terminal board strip. Connect system wiring from discharge air sensor to terminals **[19]** and **[20]** on terminal board. See Fig. 5 and 6.

Outlet Box Mounting (Optional)

1. Cut a $\frac{3}{4}$ -in. (19 mm) diameter hole in duct.
2. Remove center back knockout for $\frac{1}{2}$ -in. conduit from a standard 2-in. by 4-in. vertical outlet box. Place outlet box over the hole in duct.
3. Place sensing tube through knockout with flange flat against outlet box.
4. Use flange to mark locations of pilot holes for mounting screws. Drill pilot holes through outlet box and duct wall.
5. Fasten sensor and outlet box to duct wall with 2 field-supplied sheet metal screws.
6. Connect sensor to system wiring using $\frac{1}{4}$ -in. quick-connect terminals. Run system wiring through outlet box side knockout and fit with a connector and locknut. Route system wiring to control panel terminal strip as shown in Fig. 5 and 6.
7. Fasten a blank faceplate to outlet box.

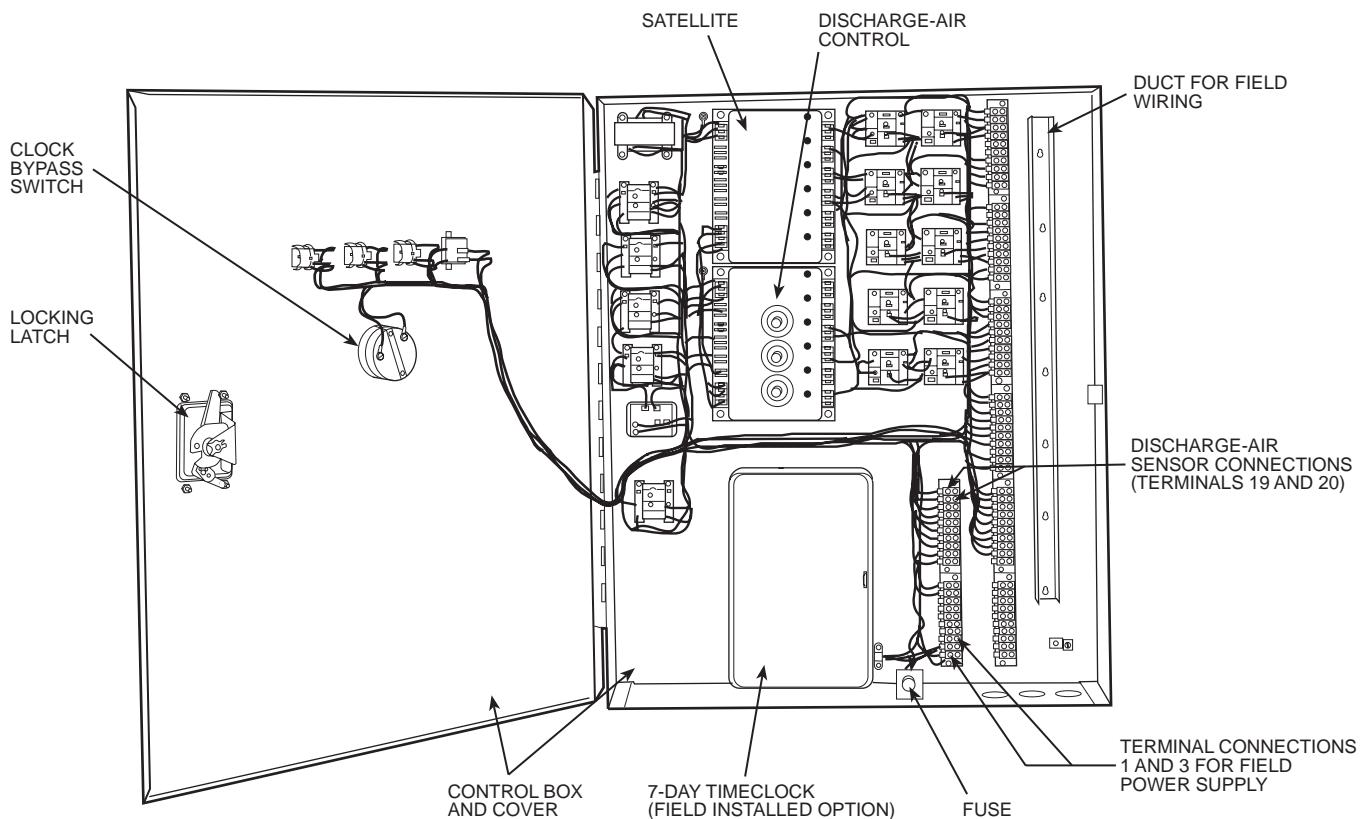
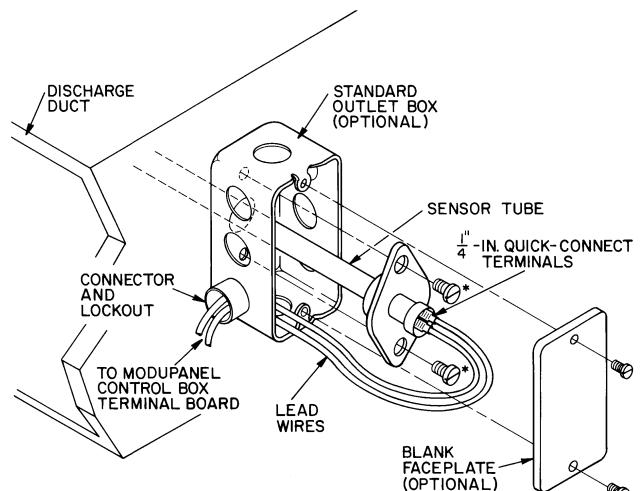
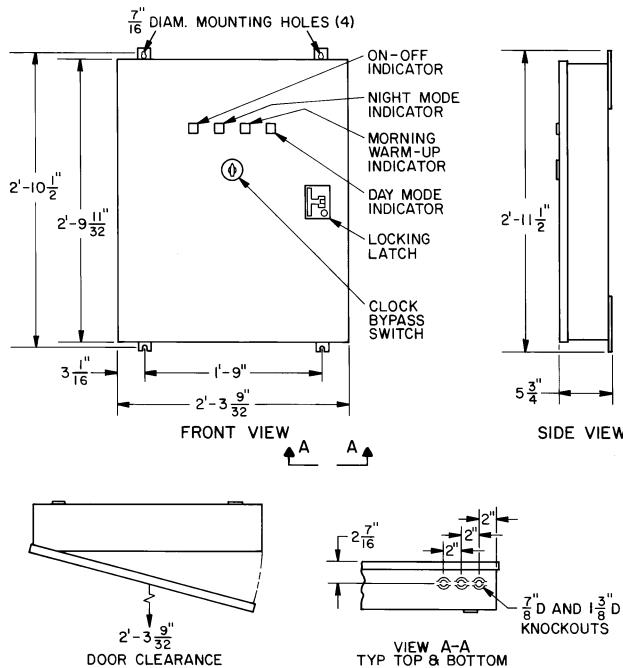


Fig. 2 — Control Box and Components



*Screws are field supplied.

NOTE: Standard sensor mounting is directly to duct wall without outlet box.

Fig. 4 — Discharge-Air Sensor Mounting

LEGEND

TYP — Typical

NOTES:

1. Control box weighs approximately 110 lb (50 kg).
2. Factory wiring is in accordance with NEC (National Electrical Code) (U.S.A. Standard). Any modifications or additions must be in compliance with all applicable codes.

Fig. 3 — System Control Box Mounting

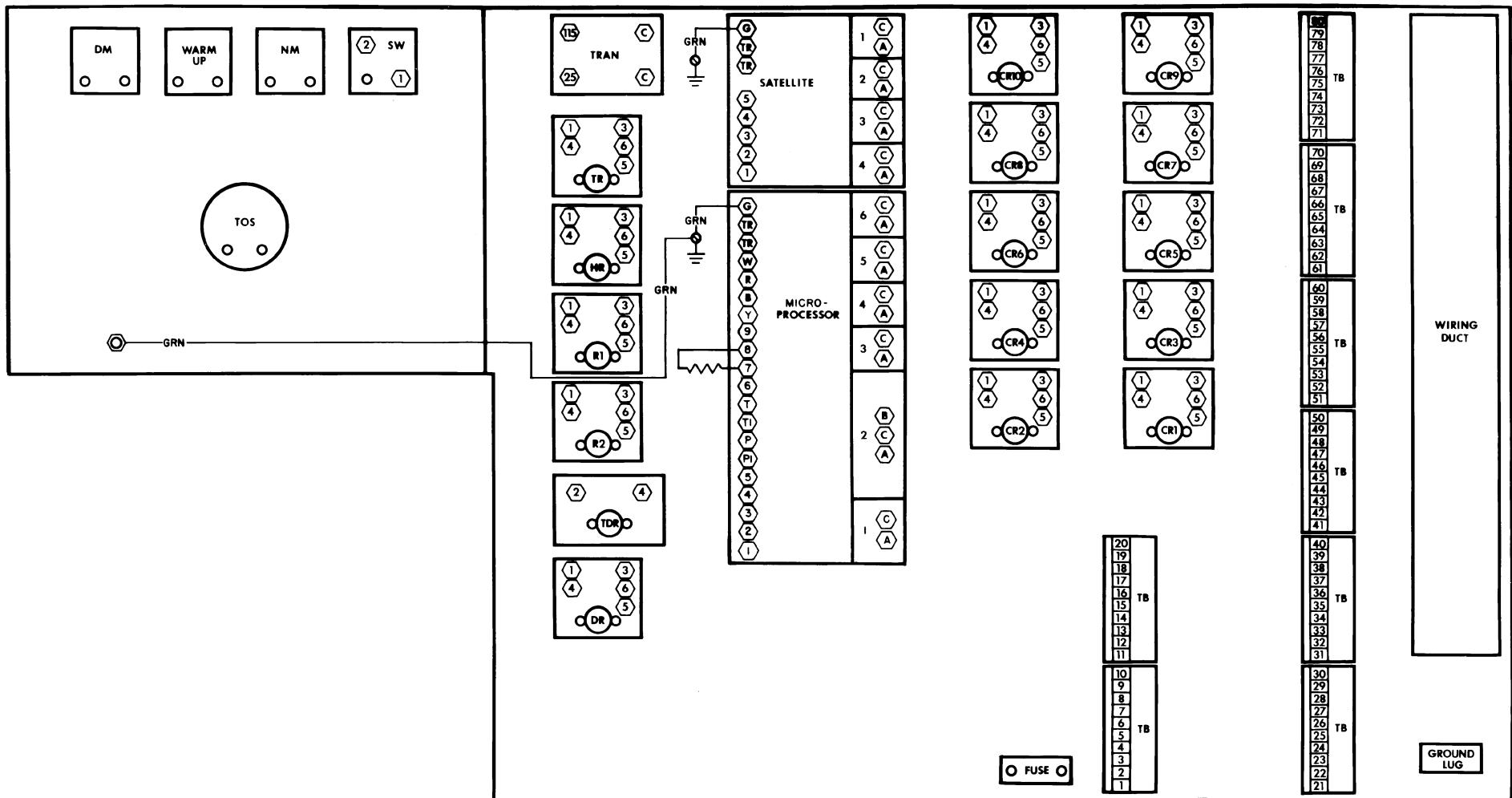


Fig. 5 — Label Diagram, Component Arrangement; ModuPanel™ Controller

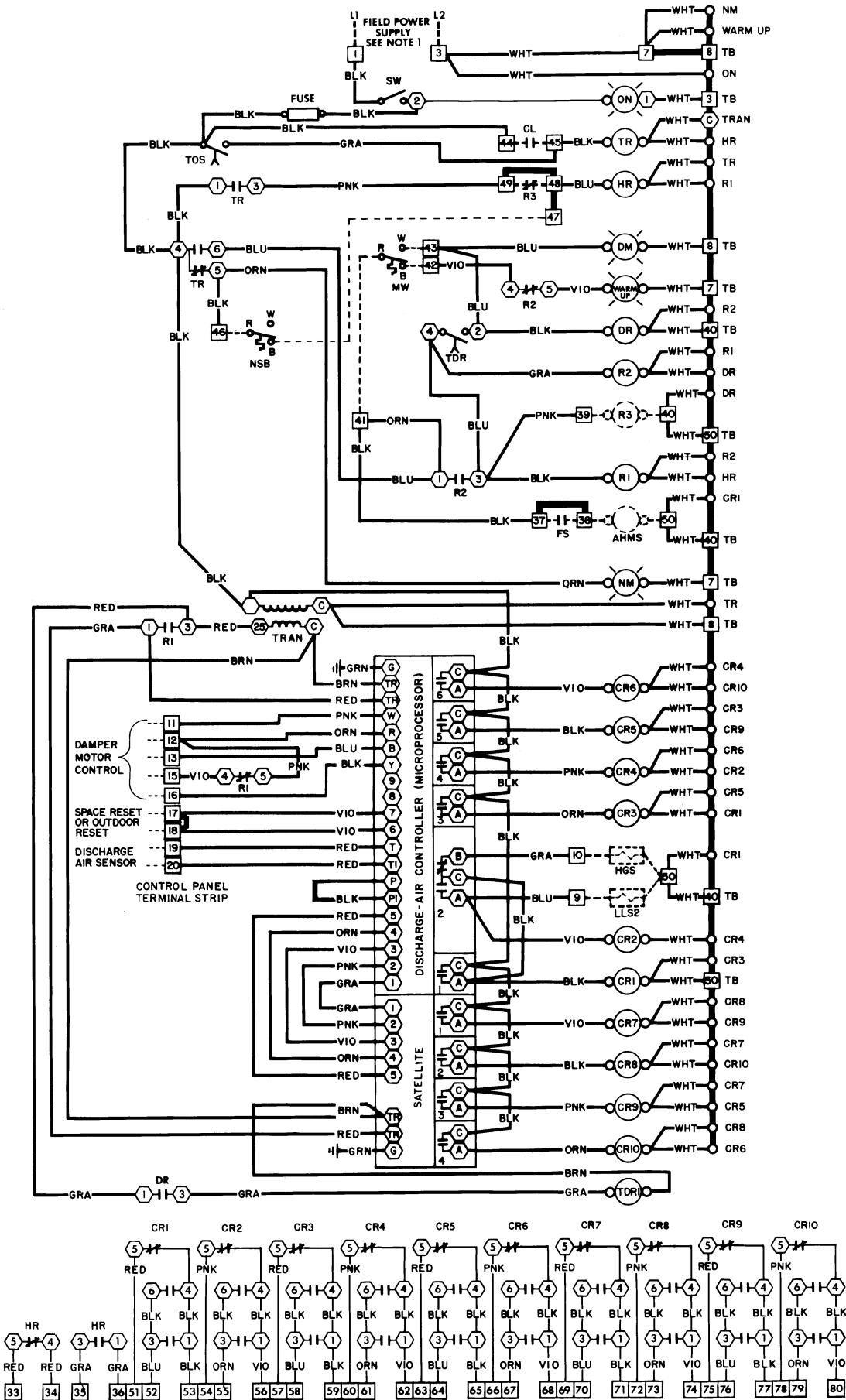


Fig. 6 — Label Diagram, Schematic; ModuPanel™ Controller

LEGEND AND NOTES (Fig. 5 and 6)

LEGEND

AHMS	— Air-Handler Motor Starter
CL	— Clock
CR	— Control Relay
DM	— Day Mode
DR	— Delay Relay
FS	— Fire Stat
HGS	— Hot Gas Solenoid
HR	— Heating Relay
LLS	— Liquid Line Solenoid
MW	— Morning Warm-Up
NEC	— National Electrical Code (U.S.A. Standard)
NM	— Night Mode
NSB	— Night Setback Thermostat
R	— Relay
SW	— Switch
TB	— Terminal Block

TDR	— Time-Delay Relay
TOS	— Timer Override Switch
TR	— Timer Relay
TRAN	— Transformer
	Terminal Block
	Terminal (Unmarked)
	Terminal (Marked)
	Factory Wiring
	Field Wiring
	To include common potential only, not to represent wire.

NOTES:

1. Control circuit power is as follows:

PART NO.	NOMINAL V-Ph-Hz	DISCONNECT	FUSE
38AE900031	115-1-60	10 amps	8 amps
38AE900003	230-1-50	5 amps	5 amps

Power is supplied through a field-supplied fused disconnect per NEC or applicable local codes. Connect to terminals and of terminal block. Connect grounded side to terminal . Fuse size is for internal fuse provided in control circuit.

2. Factory wiring is in accordance with NEC (National Electrical Code) (U.S.A.). Any modifications or additions must be in compliance with all applicable local codes.
3. Use only copper, copper-clad aluminum, or aluminum conductors for field supply.

Wiring — Refer to Fig. 5 and 6 for complete ModuPanel™ controller wiring. Refer to Fig. 7-12 for system wiring including ModuPanel controller, 38AH Series condensing unit, and air handler.

Control circuit power for ModuPanel control box must be through a field-supplied fused disconnect. For Part No. 38AE900031, provide 10-amp fused disconnect per NEC (National Electrical Code, U.S.A. Standard). For Part No. 38AE900003 (230 v, 1 ph, 50 Hz), provide disconnect per local codes. If a disconnect is provided, use a 5-amp fused disconnect. Connect circuit power to terminals and of terminal block. Grounded side should be connected to terminal . See Fig. 5 and 6.

NOTE: A factory-installed 600-ohm resistor is connected between terminals and of the discharge-air control. See Fig. 5 or 6 or the label diagram located on the inside cover of the condensing unit control box. The resistor provides the discharge-air control with 6 stages of cooling. If the system being installed has more than or fewer than 6 stages of cooling, the resistor must be changed according to the information in Table 1.

4. Field-supplied component electrical ratings: Control transformer provides maximum of 30 va for HGS, R3, AHMS, and LLS (maximum sealed coil rating at nominal control circuit voltage). The FS, CL, and R3 contacts must be pilot duty. When FS contacts are installed, remove jumper between terminals and of terminal block.
5. Remove jumper between points and of terminal block if outdoor reset is used.
6. When economizer is not used, jumper terminals and on microprocessor with a 510-ohm resistor.
7. To set number of controlled stages, a 600-ohm resistor is installed across terminals and of microprocessor. The 600-ohm resistor provides microprocessor with 6 stages of cooling. If system being installed has more than or fewer than 6 stages of cooling, the resistor must be changed according to value shown in Table 1.

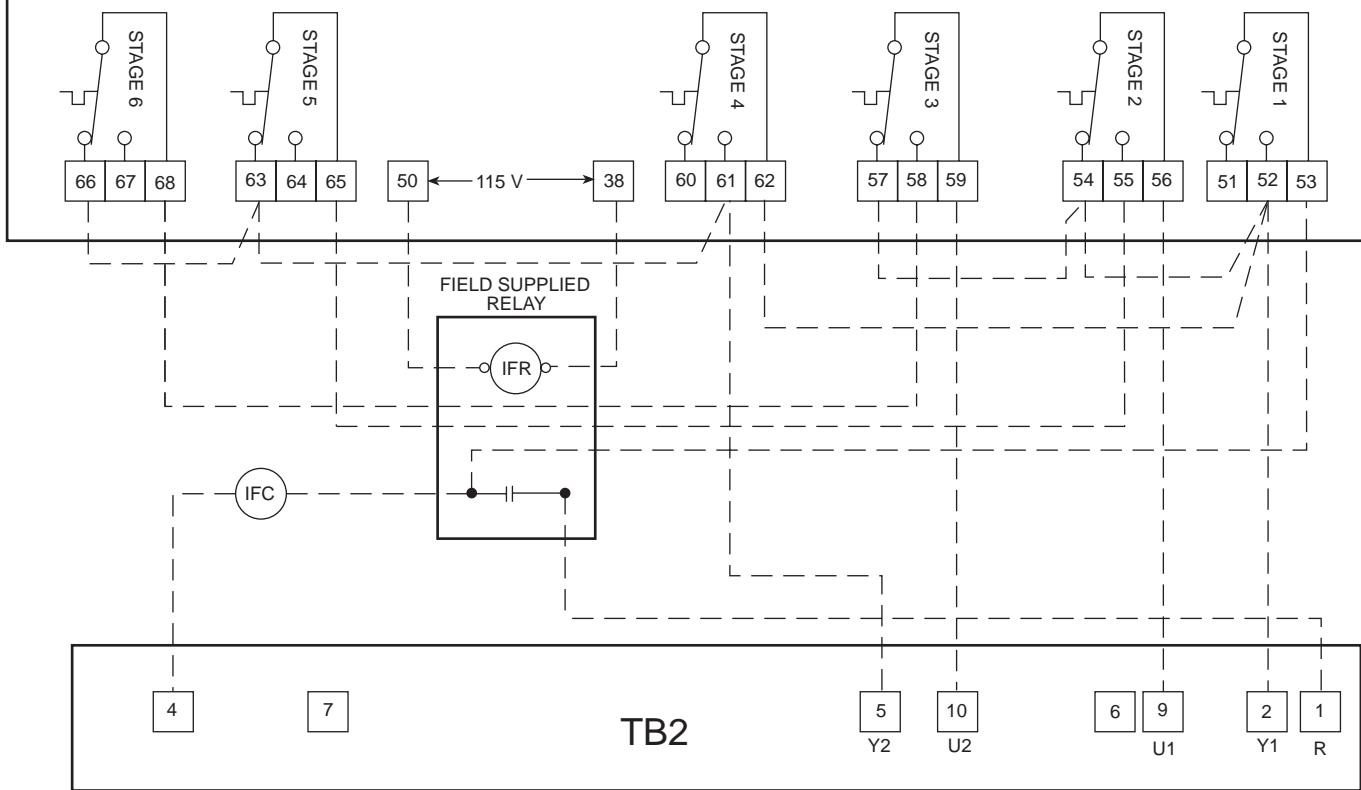
Various controller features and accessories may require additional wiring modifications. See the Controller Functions and Configuration section for further details.

Table 1 — Resistor Values for Microprocessor Stage Control

NUMBER OF STAGES	RESISTOR VALUE (ohms)*
1	100
2	200
3	301
4	402
5	499
6	600
7	698
8	806
9	909
10	1000

*Resistors are 1/8 watt resistors ±1% tolerance.

MODUPANEL ACCESSORY



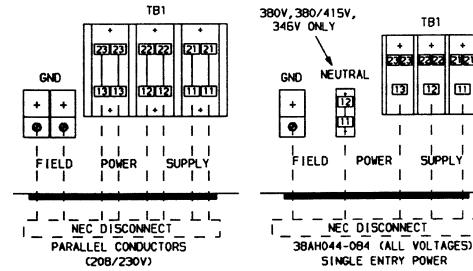
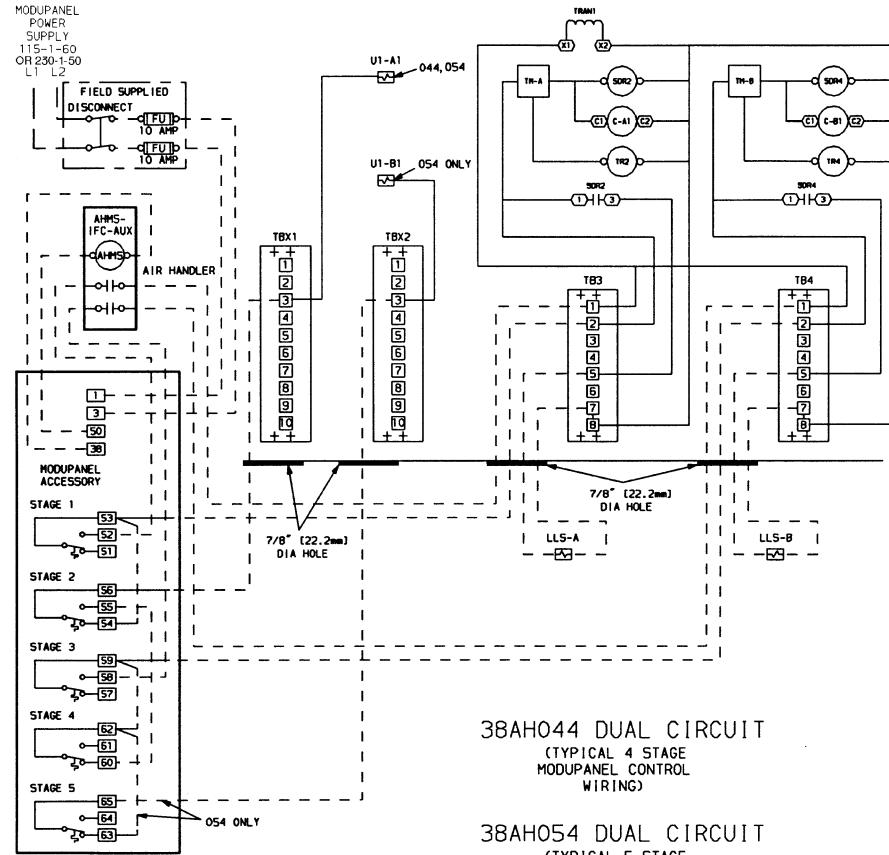
LEGEND

- IFR** — Indoor-Fan Relay
- TB** — Terminal Block
- Terminal Block Connection
- Field Accessory Wiring
- Factory Wiring

NOTES:

1. Factory wiring is in accordance with National Electrical Code (NEC) (U.S.A. standard). Field modifications or additions must be in compliance with all applicable codes.
2. Terminal block is for external field control connections. Control connections are to be class 2 wiring.
3. Replacement of factory wires must be with type 105 C wire or its equivalent.

Fig. 7 — Typical System Wiring — ModuPanel™ Controller with 38AH024-034 Dual Circuit Condensing Unit and Air Handler

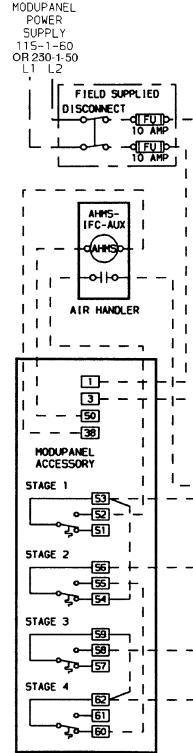


NOTES:

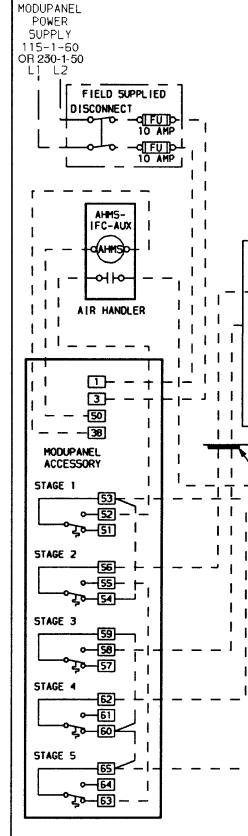
1. Factory wiring is in accordance with NEC (U.S.A. Standard); field modifications or additions must be in compliance with all applicable codes.
2. Wiring for field power supply must be rated 75 C minimum. Use copper, copper-clad aluminum, or aluminum conductors. Maximum incoming wire size for each terminal block is 500 kcmil.
3. Terminal blocks TB3 and TB4 are for external field control connections. Control connections are to be class 1 wiring.
4. Field-supplied components (IFC, LLS-A, and LLS-B) must have a maximum sealed coil rating of 30 va each (.25 amp at 120 vac, .13 amp at 230 vac). AHMS IFC-AUX must have a minimum pilot duty rating of 200 va (1.7 amps at 120 vac, 0.9 amps at 230 vac) each.
5. Replacement of factory wires must be with type 105 C wire or its equivalent.
6. Field-supplied liquid line solenoid valves installed at the evaporator are required on all units.
7. Units have 175 va of power available for field-installed accessories.

LEGEND	
AHMS	— Air Handler Motor Starter
AUX	— Auxilliary
C	— Compressor Contactor
FU	— Fuse
GND	— Equipment Ground
IFC	— Indoor Fan Control
kcmil	— Thousand Circular Mils
LLS	— Liquid Line Solenoid
NEC	— National Electrical Code (U.S.A. Standard)
SDR	— Solenoid Drop Relay
TB	— Terminal Block
TBX	— Terminal Block for Variable Air Volume Units
TR	— Timer Relay
TRAN	— Transformer
U	— Unloader Solenoid
—	— Factory Wiring
—	— Field Wiring

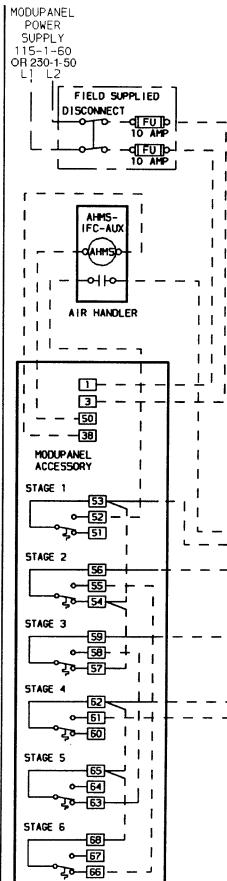
Fig. 8 — Typical System Wiring ModuPanel™ Controller With 38AH044-084 Dual-Circuit Unit and Air Handler



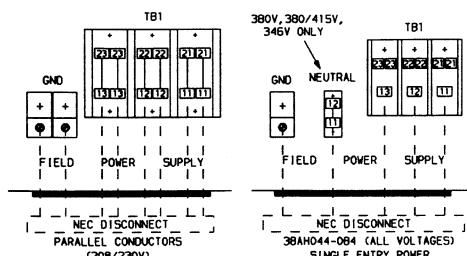
38AH044 SINGLE CIRCUIT
(TYPICAL 4 STAGE
MODUPANEL CONTROL
WIRING)



38AH054 SINGLE CIRCUIT
(TYPICAL 5 STAGE
MODUPANEL CONTROL
WIRING)



38AH064-084 SINGLE CIRCUIT
(TYPICAL 6 STAGE
MODUPANEL CONTROL
WIRING)



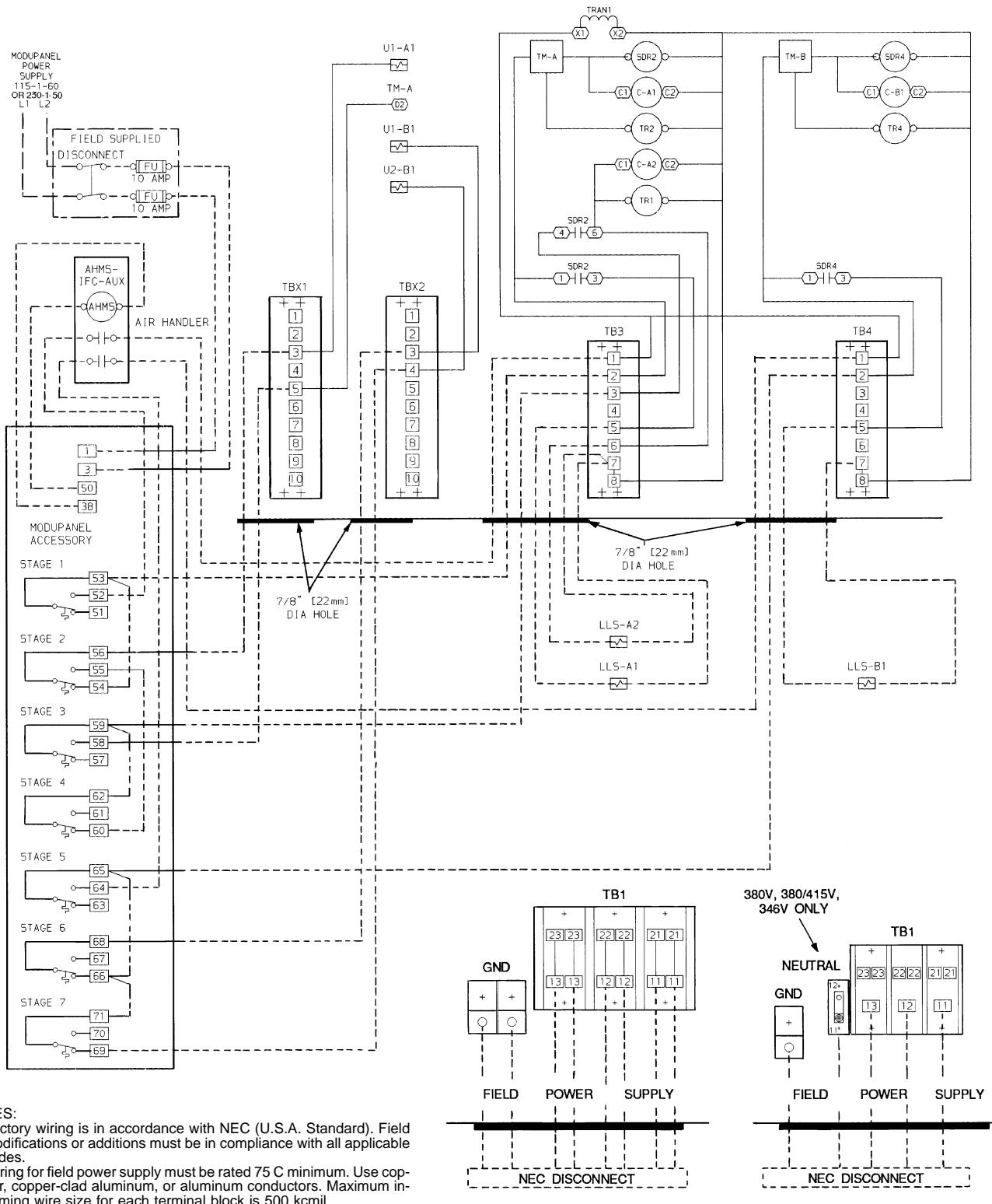
NOTES:

1. Factory wiring is in accordance with NEC (U.S.A. Standard); field modifications or additions must be in compliance with all applicable codes.
2. Wiring for field power supply must be rated 75 C minimum. Use copper, copper-clad aluminum, or aluminum conductors. Maximum incoming wire size for each terminal block is 500 kcmil.
3. Terminal blocks TB3 and TB4 are for external field control connections. Control connections are to be class 1 wiring.
4. Field-supplied components (IFC, LLS-A, and LLS-B) must have a maximum sealed coil rating of 30 va each (0.25 amp at 120 vac, 13 amp at 230 vac). AHMS IFC-AUX must have a minimum pilot duty rating of 400 va each (3.4 amps at 120 vac, 1.8 amps at 230 vac) each.
5. Replacement of factory wires must be with type 105 C wire or its equivalent.
6. Field-supplied liquid line solenoid valves installed at the evaporator are required on all units.
7. Control has 175 va of power available for field-installed accessories.

Fig. 9 — Typical System Wiring — ModuPanel™ Controller With 38AH044-084 Optional Single-Circuit Unit and Air Handler

LEGEND

AHMS	Air Handler Motor Starter
AUX	Auxilliary
C	Compressor Contactor
FU	Fuse
GND	Equipment Ground
IFC	Indoor Fan Control
kcmil	Thousand Circular Mils
LLS	Liquid Line Solenoid
NEC	National Electrical Code (U.S.A. Standard)
SDR	Solenoid Drop Relay
TB	Terminal Block
TBX	Terminal Block for Variable Air Volume Units
TR	Timer Relay
TRAN	Transformer
U	Unloader Solenoid
—	Factory Wiring
- - -	Field Wiring



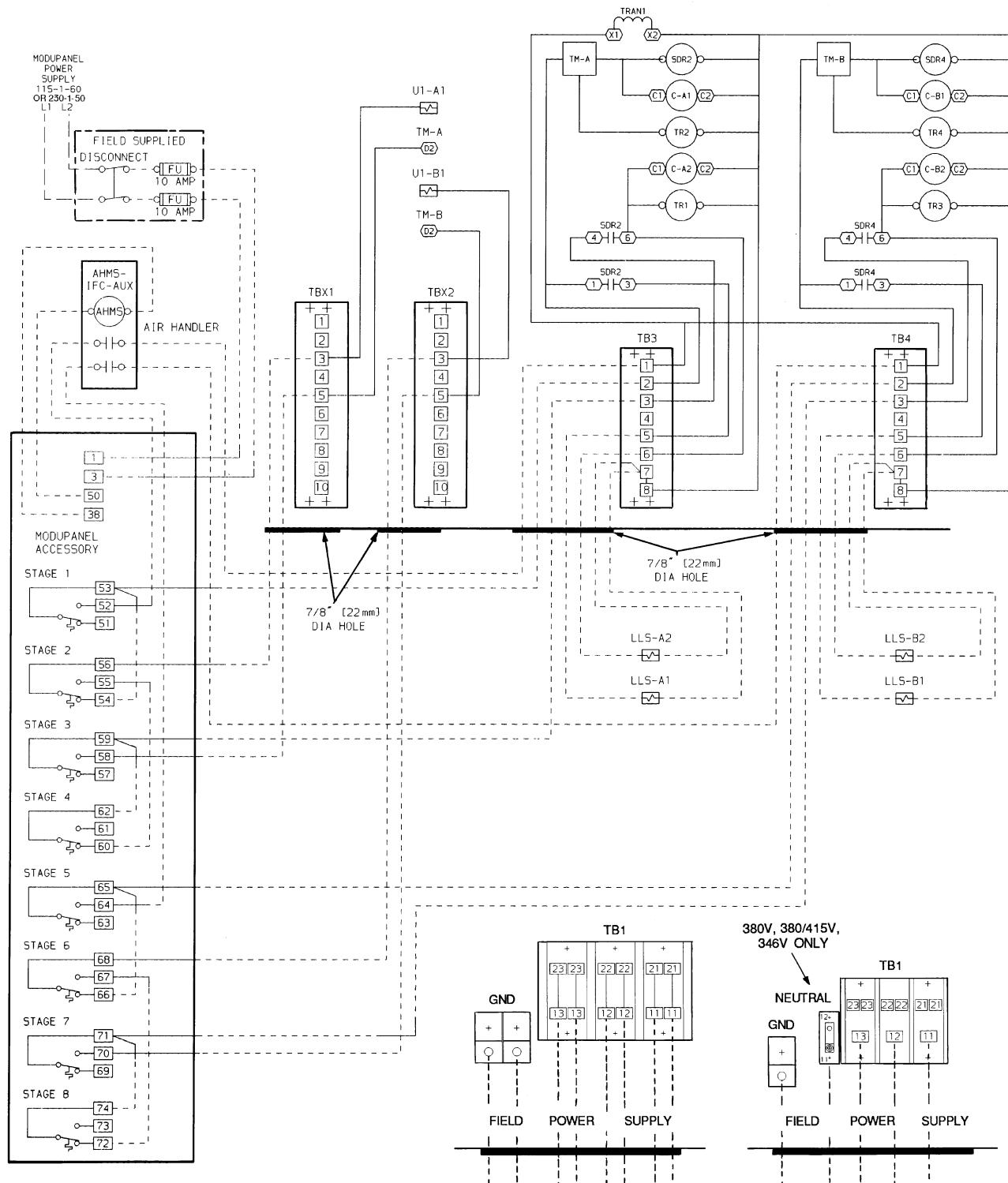
(208/230V)
PARALLEL CONDUCTORS

(ALL VOLTAGES)
SINGLE-ENTRY POWER

LEGEND

AHMS	— Air Handler Motor Starter	SDR	— Solenoid Drop Relay
AUX	— Auxiliary	TB	— Terminal Block
C	— Compressor Contactor	TBX	— Terminal Block for Variable Air Volume Units
FU	— Fuse	TM	— Timer Motor
GND	— Equipment Ground	TR	— Timer Relay
IFC	— Indoor Fan Control	TRAN	— Transformer
kcmil	— Thousand Circular Mils	U	— Unloader Solenoid
LLS	— Liquid Line Solenoid	—	— Factory Wiring
NEC	— National Electrical Code (U.S.A. Standard)	—	— Field Wiring

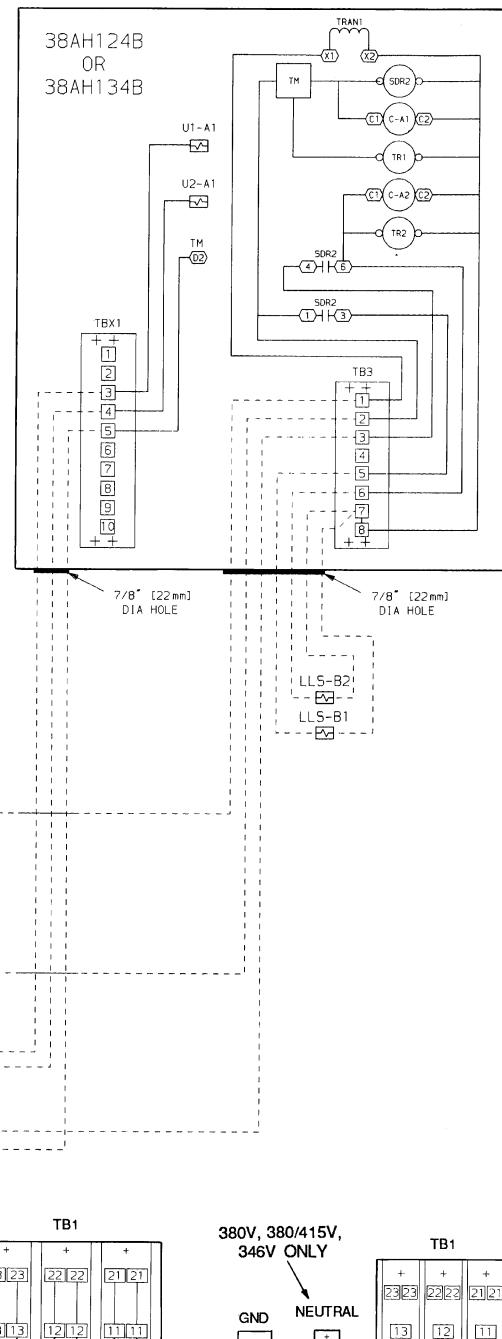
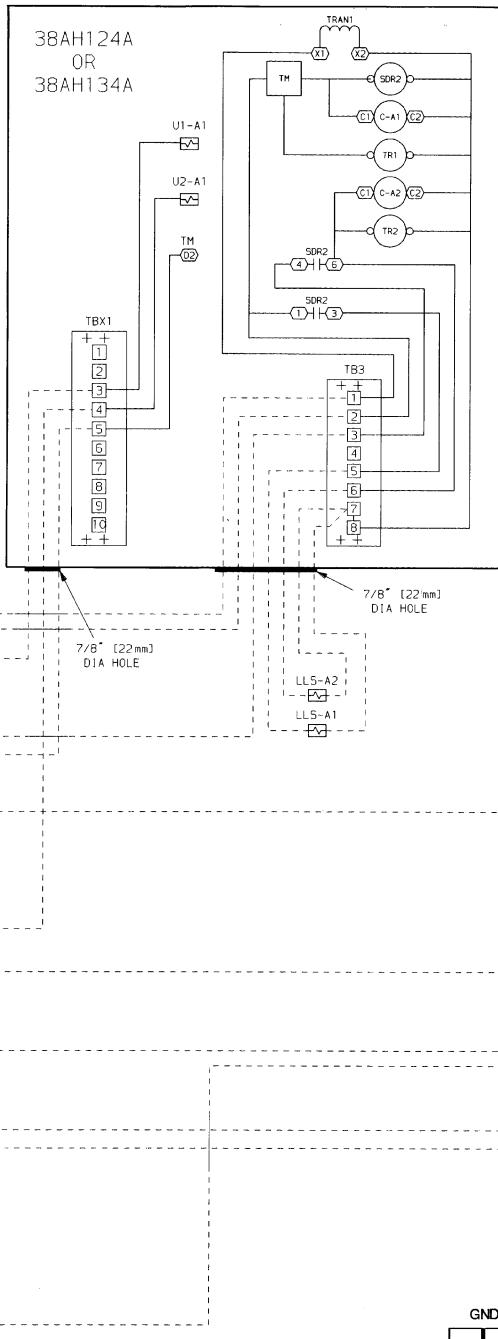
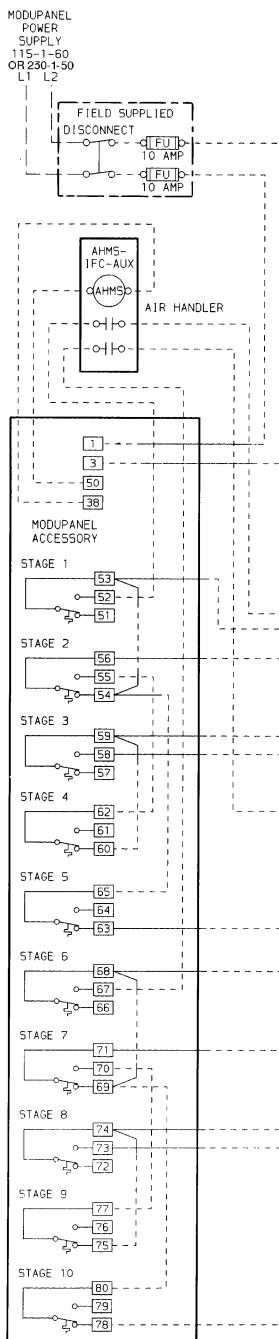
Fig. 10 — Typical System Wiring — ModuPanel™ Controller with 38AH094 Dual-Circuit Condensing Unit and Air Handler



NOTES:

1. Factory wiring is in accordance with NEC (U.S.A. Standard). Field modifications or additions must be in compliance with all applicable codes.
2. Wiring for field power supply must be rated 75 C minimum. Use copper, copper-clad aluminum, or aluminum conductors. Maximum incoming wire size for each terminal block is 500 kcmil.
3. Terminal blocks TB3, TB4, TBX1, and TBX2 are for external field control connections. Control connections are to be class 1 wiring.
4. Field-supplied components (IFC, LLS-A1, A2, B1, and B2) must have a maximum sealed coil rating of 30 va each (0.25 amp at 120 vac, 0.13 amp at 230 vac). AHMS IFC-AUX contact must have minimum pilot duty rating of 325 va each (3.1 amps at 120 vac, 1.6 amps at 230 vac).
5. Replacement of factory wires must be with type 105 C wire or its equivalent.
6. Field-supplied liquid line solenoid valves installed at the evaporator are required on all units.
7. Units have 35 va of power available for field-installed accessories.

Fig. 11 — Typical System Wiring — ModuPanel™ Controller with 38AH104 Dual-Circuit Condensing Unit and Air Handler



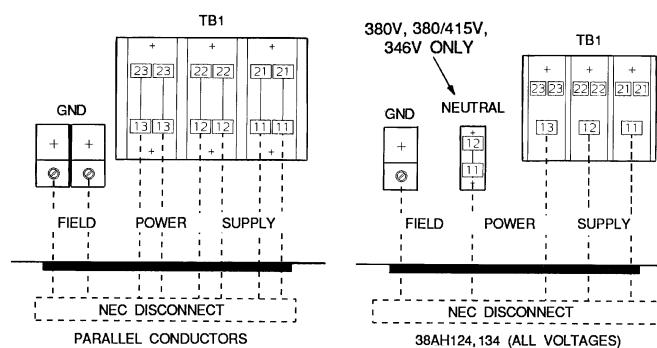
NOTES:

1. Factory wiring is in accordance with NEC (U.S.A. Standard). Field modifications or additions must be in compliance with all applicable codes.
2. Wiring for field power supply must be rated 75°C minimum. Use copper, copper-clad aluminum, or aluminum conductors. Maximum incoming wire size for each terminal block is 500 kcmil.
3. Terminal blocks TB3 and TBX1 are for external field control connections. Control connections are to be class 1 wiring.
4. Field-supplied components (IFC, LLS-A1, and A2) must have a maximum sealed coil rating of 30 va each (0.25 amp at 120 vac, 0.13 amp at 230 vac). AHMS IFC-AUX contact must have minimum pilot duty rating of 400 va each (3.4 amps at 120 vac, 1.8 amps at 230 vac).
5. Replacement of factory wires must be with type 105°C wire or its equivalent.
6. Field-supplied liquid line solenoid valves installed at the evaporator are required on all units.
7. Units have 175 va of power available for field-installed accessories.

AHMS	— Air Handler Motor Starter
AUX	— Auxiliary
C	— Compressor Contactor
FU	— Fuse
GND	— Equipment Ground
IFC	— Indoor Fan Control
kcmil	— Thousand Circular Mils
LLS	— Liquid Line Solenoid
NEC	— National Electrical Code (U.S.A. Standard)

LEGEND

SDR	— Solenoid Drop Relay
TB	— Terminal Block
TBX	— Terminal Block for Variable Air Volume Units
TM	— Timer Motor
TR	— Timer Relay
TRAN	— Transformer
U	— Unloader Solenoid
<hr/>	— Factory Wiring
<hr/>	— Field Wiring



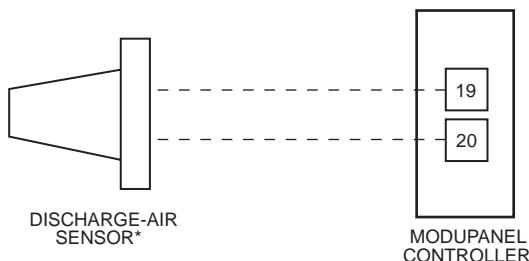
38AH124, 134 (ALL VOLTAGES)
DUAL POINT MAIN POWER ENTRY

Fig. 12 — Typical System Wiring — ModuPanel™ Controller with 38AH124 or 134 Dual-Circuit Condensing Unit and Air Handler

CONTROLLER FUNCTIONS AND CONFIGURATION

Discharge-Air Set Point Range — Set point range is from 40 F to 90 F (4 C to 32 C) plus 6 standard capacity control stages. Satellite usage provides 4 additional control stages for up to 10 stages of refrigeration control. If the desired number of capacity control stages is more or less than the standard 6 stages, change the resistor installed between microprocessor terminals $\textcircled{7}$ and $\textcircled{8}$ to a resistor with a different value. Refer to Table 1 for resistor values by stage. The varying resistance values prevent the ModuPanel™ controller from trying to stage capacity steps that do not exist.

Figure 13 illustrates the control wiring required for the discharge-air temperature sensor. To remotely control the discharge-air temperature, an accessory potentiometer remote set point is available. See Fig. 14. Refer to Table 2 for component part number.



*Honeywell Part No. C7100.

Fig. 13 — Discharge Air Sensor Connection

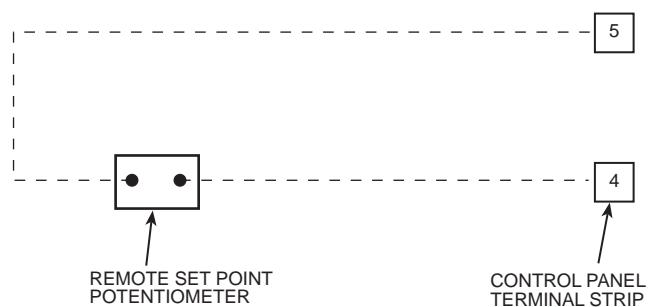


Fig. 14 — Remote Set Point Potentiometer Connection Details

Table 2 — Accessory Components for ModuPanel Control Box

ACCESSORY COMPONENTS	CARRIER PART NUMBER	HONEYWELL PART NUMBER
Outside-Air Changeover Enthalpy Control	HH57AC076*	H205A1061
Minimum Position Potentiometer	—	Q209A1030
Remote Potentiometer For Reset†	HT24AA025	S963B1037
Indoor Reset Sensor	—	T7047C1025
Outdoor Reset Sensor	—	C7031G1016
Economizer Motors	—	M975, M955 or M954
Seven-Day Clock	HK24FU060	S60050100
Morning Warm-Up, Return-Air Thermostat	HH22AG102	T675
Night Setback Thermostat	—	T6051
Remote Set-Point Potentiometer	—	S963B1078

*Requires switching relays, Carrier Part No. HN61KK040 for 24 v and HN61KK041 for 115 v.

†Used only with indoor reset sensor.

Adjustable Control Band for Maintaining Discharge-Air Temperature — Control band range is from ± 1 F to ± 8 F (± 0.6 C to ± 4 C) and permits matching the control system with the number of available control stages. On systems with few capacity stages, use a wide band setting to prevent excessive compressor cycling. On systems with many capacity stages, use a narrower control band to provide better temperature control. Table 3 lists the recommended minimum control band setting for each system according to condensing unit model.

Within the control band, the microprocessor cycles the active stage to maintain the discharge-air temperature. The *active* stage is defined as the last stage of refrigeration to be energized.

Should the discharge-air temperature rise or fall ± 1 F (± 0.6 C) outside the control band, the active stage immediately cycles on or off. If the discharge-air temperature remains at ± 1 F (± 0.6 C) within control band, the active stage cycles every 4 minutes. If the discharge-air temperature exceeds the ± 1 F (± 0.6 C) band, the last active stage locks on or off and the succeeding stage becomes the active cycling stage.

Table 3 — Recommended Minimum Control Band Settings, Discharge Air Temperature

UNIT 38AH	TEMPERATURE	
	F	C
024-084	6	3.3
094-134	4	2.2

ECONOMIZER OPERATION FULLY INTEGRATED WITH REFRIGERATION SYSTEM — Fully integrated economizer operation results in simultaneous operation of both economizer and compressor when required. As shown in Fig. 15 and 16, accessory economizer motors, outside-air changeover enthalpy control, and minimum position potentiometer are required for this application. See Table 2 for accessory part numbers.

NOTE: If economizer function is not used, connect a 510-ohm resistor between terminals 16 on the control panel terminal strip and 9 on microprocessor.

The economizer is enthalpy controlled for optimum performance. If outside-air conditions are unsatisfactory, the microprocessor bypasses the economizer cycle and immediately energizes mechanical cooling.

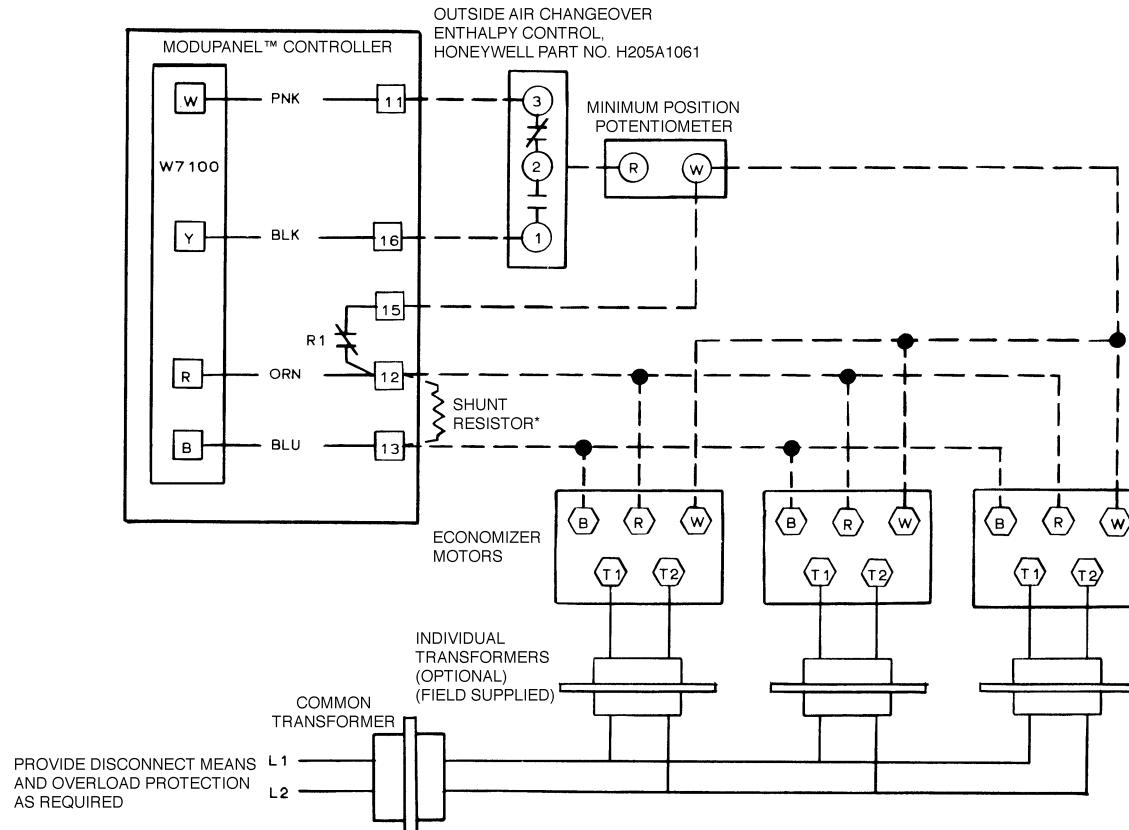
During economizer operation, the desired discharge-air temperature setting is automatically reduced by the amount equal to 50% of the control band setting. For example, if the desired discharge-air temperature is 55 F (13 C) and the control band is set at 4 F (2 C), the economizer then controls to

a discharge-air temperature of 53 F (12 C). By producing colder air, fan horsepower is reduced and operating savings are maximized.

The microprocessor drives the economizer motors at different rates depending on discharge-air temperature deviation from set point. If discharge-air temperature is within 1.5° F (0.8° C) of set point, no action is taken. (The 1.5° F [0.8° C] deadband area is used, because of the inherent play normally found in linkages and ball joints.) Should the deviation exceed 1.5° F (0.8° C), the following schedule occurs:

DEVIATION FROM DISCHARGE-AIR TEMPERATURE		MOTOR RESPONSE TIME (Minutes)
°F	°C	
±1.5 to 6	±0.8 to 3.3	35.0
±6 to 12	±3.3 to 6.7	13.4
±12 and Up	±6.7 and Up	6.7

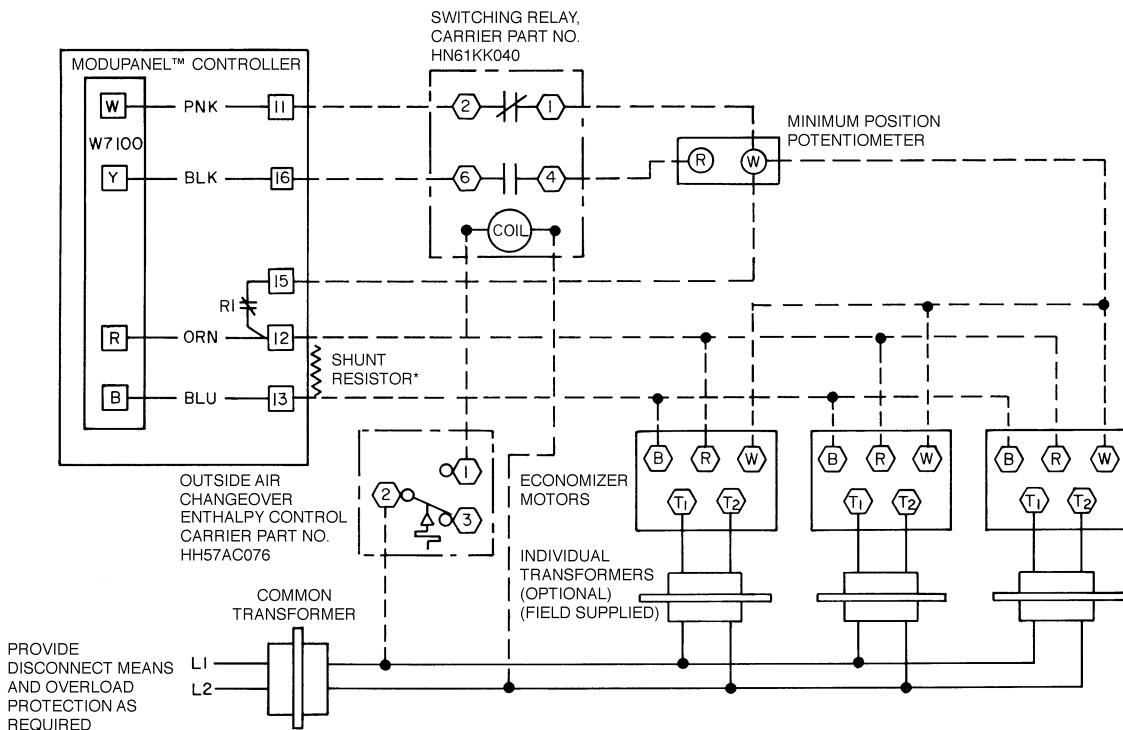
See Fig. 15 or 16 for economizer control wiring.



NOTES:

1. Economizer motor(s) must have a 24-v power supply.
2. A common transformer may be used for the motor(s) or each motor can have an individual transformer. When common transformer is used, connect transformer lead to T_1 on each motor and then connect other lead to T_2 on each motor. The Modupanel transformer has 30 va available for economizer motor operation. When individual motor transformers are used, they must have same characteristics as the common transformer, and all must be powered by a single branch circuit. The Honeywell Part No. M955 and M954 motors may be purchased with cover-mounted transformer, if desired.

Fig. 15 — Typical Economizer Wiring with Electronic Enthalpy Control for Outside-Air Changeover



*Shunt resistor values are as follows:

NO. MOTORS	RESISTOR (OHMS)
1	Not Required
2	1300
3	910
4	768

NOTES:

1. Economizer motor(s) must have a 24-v power supply.
2. A common transformer may be used for the motor(s) or each motor can have an individual transformer. When common transformer is used, connect transformer lead to T_1 on each motor and then connect other lead to T_2 on each motor. The ModuPanel transformer has 30 va available for economizer motor operation. When individual motor transformers are used, they must have same characteristics as the common transformer, and all must be powered by a single branch circuit. The Honeywell Part No. M955 and M954 motors may be purchased with cover-mounted transformer, if desired.

Fig. 16 — Typical Economizer Wiring with Electro-Mechanical Enthalpy Control for Outside-Air Changeover

DISCHARGE-AIR RESET — During light load conditions, the discharge-air temperature can automatically be reset to a higher temperature to prevent space overcooling. This function can be controlled by sensing space or ambient temperature. See Fig. 17 and 18. Reset control is adjustable from 5 F to 20 F (3 C to 11 C). In applications where high humidity is a concern, an outdoor thermostat set to lock out reset operation above 60 F (16 C) can be used. (An alternative is to use an indoor humidity sensor.)

TRANSFORMER (24 v) — The 24-v transformer is factory-installed to supply power to microprocessor and control relays. Transformer also supplies 30 va for use on other field-installed controls.

TIME-DELAY RELAY — Time-delay relay is factory-installed to ensure building stabilization before system locks out morning warm-up cycle. When return-air temperature rises to its set point, the time-delay relay keeps warmup operation of the ModuPanel on hold for approximately 60 seconds. Beyond this time, if return-air temperature has not fallen, the final changeover to Day mode occurs.

FIRE STAT CONNECTIONS — A factory-installed jumper is connected between ModuPanel terminals 37 and 38 . (See Fig. 6). By removing jumper, ModuPanel controller can be connected to a fire switch. If fire switch opens, relay on the air handler motor drops out and system shuts down.

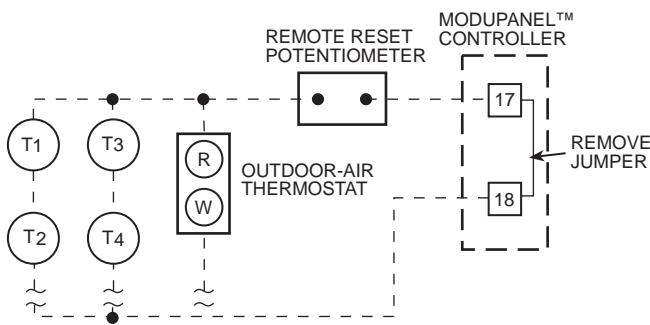
TIMECLOCK — The ModuPanel controller is designed to use the accessory 7-day timeclock to regulate the building schedule. See Fig. 2 and 19 for installation and wiring. A building clock or other field-supplied timeclock can also be used. See Fig. 20 for wiring.

NIGHT SETBACK AND MORNING WARM-UP — Input from night setback and morning warm-up accessory thermostats (see Table 2) can be used by the ModuPanel controller to regulate the morning warm-up and night setback functions, which regulate building temperature before and after the building is occupied. Refer to Fig. 21 and 22 for wiring information.

NOTE: If morning warm-up is not used, install a jumper between ModuPanel terminals 41 and 43 .

PERIMETER HEATING — The ModuPanel controller is factory-wired to operate a perimeter heating system. When the heating relay is energized, it remains energized even when system shifts to Day mode. This allows the perimeter heating system to operate while building core is being cooled. If perimeter heating system is to be locked out during the Day mode, install relay R3 as shown in Fig. 23.

The ModuPanel controller can also be modified for application to systems utilizing central station heating. In this application, the 39 series unit heaters can be used for morning warm-up, night setback, and air tempering during the Day mode.



T — Zone Thermostats, Series-Parallel Connection

NOTE: Remove reset potentiometer is used only with space reset control sensors. Do not use with outdoor sensors.

Fig. 17 — Indoor Reset Sensor Connections



Fig. 18 — Outdoor Reset Sensor Connections

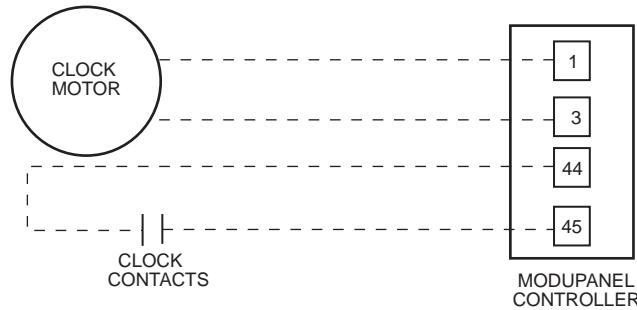
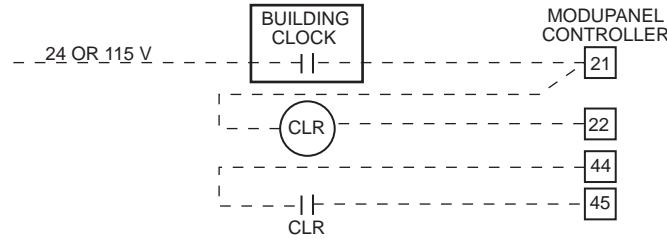


Fig. 19 — 7-Day Clock Installation



CLR — Clock Relay; Single-Pole, Single-Throw Normally Open, Pilot Duty.
(Carrier Part No. HN61KK040 — 24 v; Carrier Part No. HN61KK041 — 115 v)

Fig. 20 — Building Timeclock Control

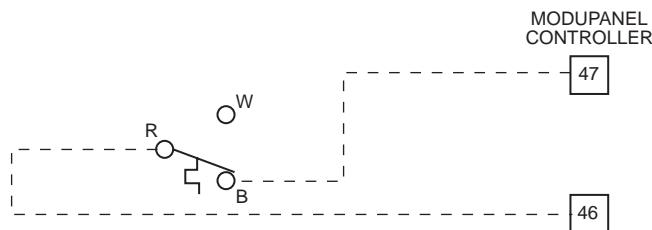
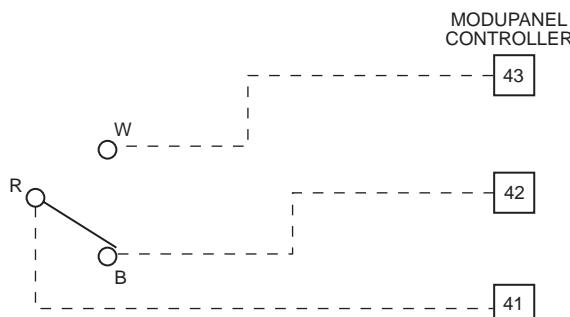


Fig. 21 — Night Setback



NOTE: If morning warm-up is not used, install a jumper between ModuPanel terminals 41 and 43.

Fig. 22 — Morning Warm-Up

Occasionally, during the normal Day mode (cooling cycle), outdoor-air entering the system through the economizer is too cool. Even though the economizer is at minimum position and air terminals have throttled back to their minimum ventilation position, the conditioned space can be over-cooled.

To prevent over-cooling, the ModuPanel™ satellite automatically provides stages of electric heat for air tempering. As shown in Fig. 24, the changeover thermostat energizes 1K and 2K. The microprocessor satellite (H1, H2) activates electric heat contactors C1 and C2, via the signal from the discharge-air thermostat.

In the Night Setback mode and Morning Warm-Up mode, the heaters are cycled by the room-air thermostat (set at same temperature as morning warm-up thermostat) through the heater step controller. Refer to 39N series air handling unit Application Data for additional information.

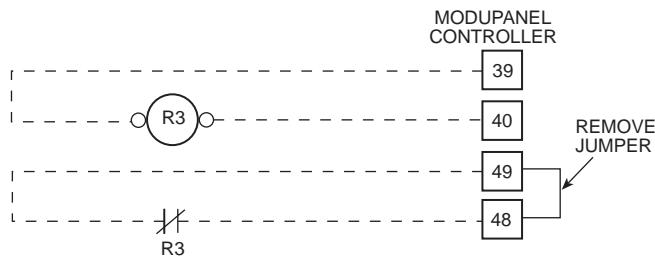
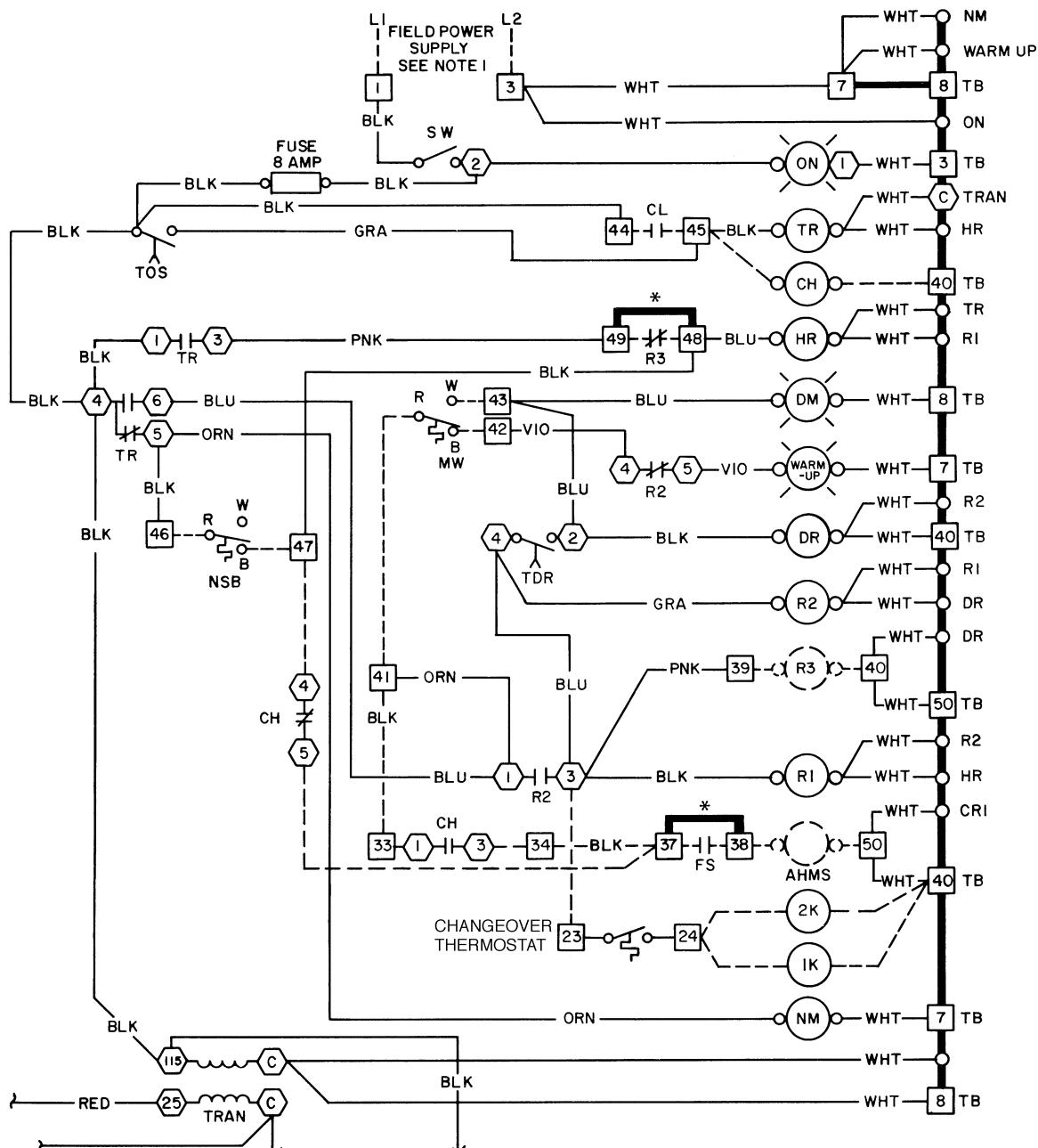


Fig. 23 — Heating Mode Lockout Relay (R3)



ELEMENTARY WIRING DIAGRAM

LEGEND

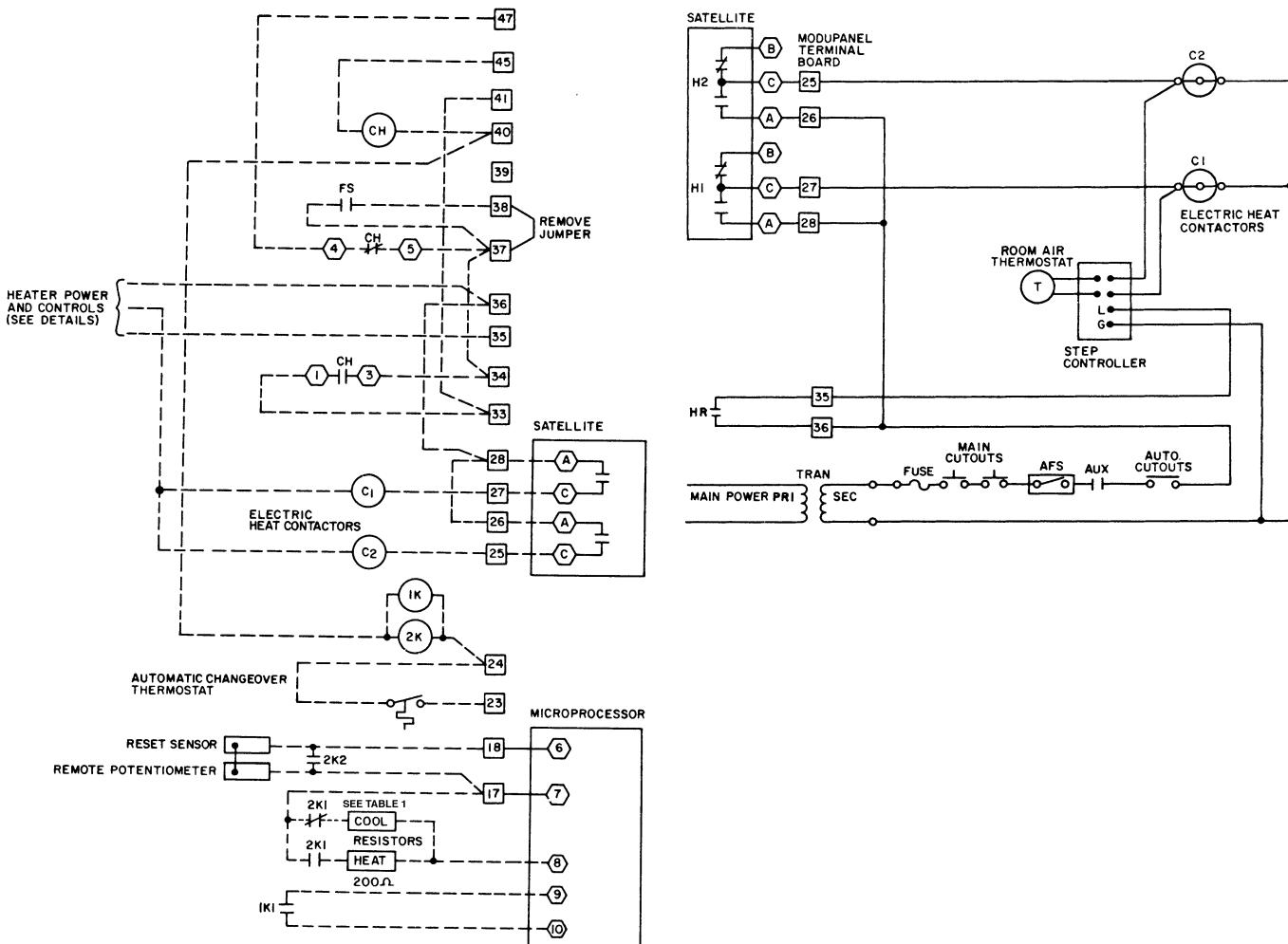
AFS	— Airflow Switch
AHMS	— Air Handler Motor Starter
C	— Contactor, Electrical Heat
CH	— Crankcase Heater
CL	— Clock
CR	— Cooling Relay
DM	— Day Mode
DR	— Delay Relay
FS	— Fire Stat
HR	— Heating Relay
MW	— Morning Warm-Up
NM	— Night Mode
NSB	— Night Setback Thermostat
PRI	— Primary
R	— Relay

SEC	— Secondary
TB	— Terminal Block
TDR	— Time-Delay Relay
TOS	— Timer Override Switch
TR	— Timer Relay
TRAN	— Transformer

—	Terminal Block
○	Terminal (Unmarked)
○○	Terminal (Marked)
—	Factory Wiring
- - -	Field Wiring
—	To include common potential only; not to represent wire.

*Remove jumper if terminals are used.

Fig. 24 — Modification for Central Heating



ELECTRIC HEAT DETAILS — MODUPANEL™ INTERCONNECTIONS FOR AUTOMATIC CHANGEOVER
(HEATING DURING DAY MODE)

Fig. 24 — Modification for Central Heating (cont)

SEQUENCE OF OPERATION

General — Refer to Fig. 25 for the ModuPanel™ control sequence flowchart. The control sequence begins with Night mode operation and ends with the beginning stages of mechanical cooling. Note that the heating functions referred to in the flowchart are switching mechanisms only; heating device control depends on the system configuration and is left to the system designer to complete.

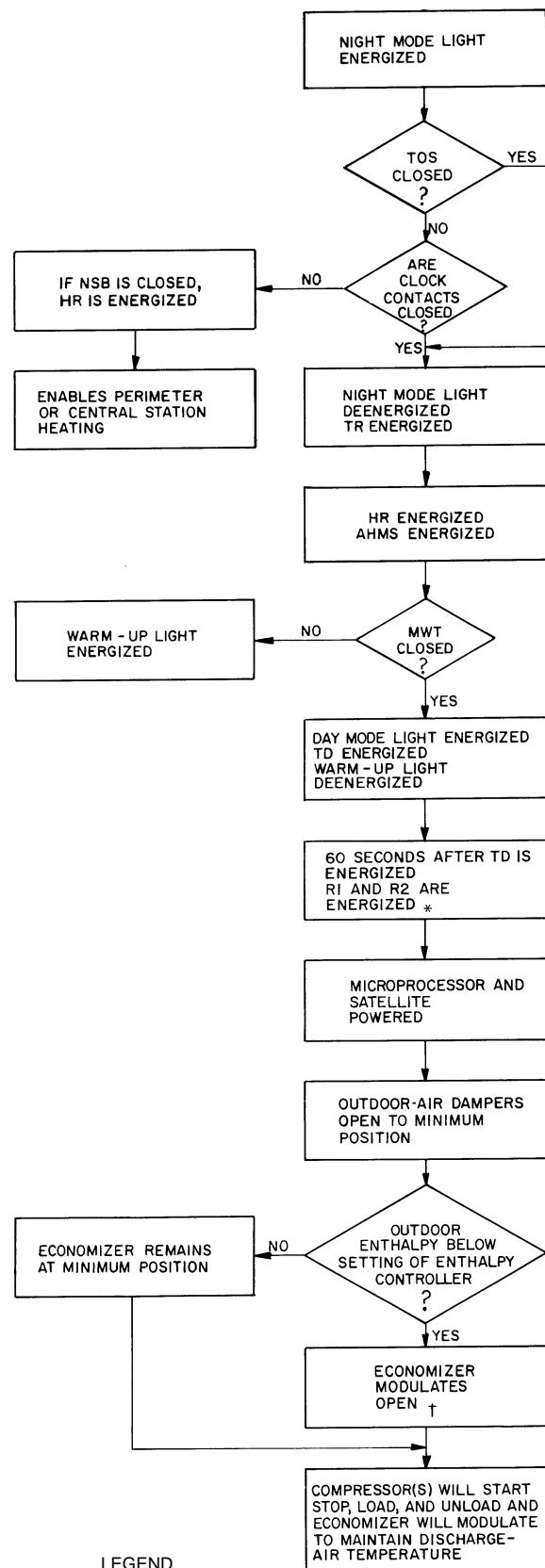
Cooling operation is also dependent on system design, and varies with the 38AH condensing unit selected. As a prerequisite for operation with the ModuPanel controller, 38AH condensing units must be ordered with the VAV factory-installed option, which includes electric unloaders on the lead (circuit no. 1) compressor as follows:

- 1 unloader — 38AH044
- 2 unloaders — 38AH024-034, 054-084, 104
- 3 unloaders — 38AH094
- 4 unloaders — 38AH124,134 (2 per module)

The option also includes a low-voltage terminal block in the condensing unit control box so that the unloaders can be wired to the ModuPanel controller.

Field-supplied suction-line accumulators (Carrier RCD part no. KH73LZ001) are also required on each circuit for VAV application with outdoor units.

Typical Cooling Stage Operation (38AH Condensing Units) — When the 38AH condensing unit unloader solenoids are deenergized, its compressors are loaded. A brief description of each cooling stage for all 38AH units is described in Tables 4A-4C. For further details on loading sequences, see the Product Data catalog for the related condensing unit.



AHMS	Air Handler Motor Starter
HR	Heating Relay
MWT	Morning Warm-Up Thermostat
NSB	Night Setback Thermostat
R	Relay
TD	Time Delay
TOS	Time Override Switch
TR	Timer Relay

*If R3 is installed, R3 is energized.

†Economizer cooling is integrated with mechanical cooling.

Fig. 25 — ModuPanel Control Sequence

Table 4A — One 2-Stage Thermostat Capacity Control for 38AH024-084 Dual-Circuit Units

UNIT 38AH	QUANTITY OF LOADED COMPRESSOR CYLINDERS			SYSTEM CAPACITY (%)
	Circuit A	Circuit B	Total	
024-034	6	6	12	100
	4	6	10	83
	2	6	8	67
	—	6	6	50
	4	—	4	33
	2	—	2	17
044	4	4	8	100
	2	4	6	75
	4	0	4	50
	2	0	2	25
054	4	6	10	100
	2	6	8	79
	2	4	6*	59
	4	0	4	42
	2	0	2	21
064	6	6	12	100
	4	6	10	84
	2	6	8*	68
	6	0	6	48
	4	0	4	32
	2	0	2*	16
074	6	6	12	100
	4	6	10	86
	2	6	8*	72
	6	0	6	43
	4	0	4	29
	2	0	2*	15
084	6	6	12	100
	4	6	10	83
	2	6	8*	66
	6	0	6	50
	4	0	4	33
	2	0	2*	17

*Requires units with VAV (variable air volume) factory-supplied option.

NOTE: Units have 2 independent refrigeration circuits. Circuit A is lead circuit.

Table 4C — One 2-Stage Thermostat Capacity Control for 38AH094-134 Units

UNIT 38AH	QUANTITY OF LOADED COMPRESSOR CYLINDERS			SYSTEM CAPACITY (%)
	Ckt A	Ckt B	Total	
094	10	6	16	100
	10	4	14	85
	10	2	12	70*
	10	0	10	55
	8	0	8	44
	6	0	6	33
104	4	0	4	22
	10	12	20	100
	8	12	18	91
	10	10	16	82
	6	6	12	73
	6	4	10	55
	0	6	6	45
	4	0	4	27
	0	4	4	18
	2†	0	2	18
	12	12	24	9†
	10	12	22	100
124	10	10	20	92
	8*	10	18	83
	6	10	16	75*
	6	8*	14	67
	6	6	12	58*
	4	6	10	50
	6	0	6	42
	4	0	4	25
	2*	0	2	17
	12	12	24	8*
134	10	10	20	100
	8*	10	18	92
	6	10	16	83
	6	8*	14	75*
	6	6	12	67
	4	6	10	58*
	6	0	6	50
	4	0	4	42
	2*	0	2	25
	12	12	24	8*

*Requires VAV (variable air volume) unit or accessory unloader(s) field installed on circuit lead compressor.

†Requires field-installed accessory unloader on circuit lead compressor.

Table 4B — One 2-Stage Thermostat Capacity Control for 38AH044-084 Optional Single-Circuit Units

UNIT 38AH	QUANTITY OF LOADED CYLINDERS	SYSTEM CAPACITY (%)
044	8	100
	6	75
	4	50
	2	25
054	10	100
	8	81
	6	60
	6	56
	4	37
	2*	19*
064	12	100
	10	82
	8	64
	6	56
	4	36
	2†	18
074	12	100
	10	81
	8	62
	6	57
	4	38
	2†	19
084	12	100
	10	83
	8	66
	6	50
	4	33
	2†	17

*Requires accessory unloader on lead 06E-265 compressor (A1).

†Requires VAV (variable air volume) factory-installed option or accessory unloader.