



48/50HJ008-014 Single Package Rooftop Gas Heating/Electric Cooling and Electric Cooling Units 50/60 Hz



Wiring Diagrams

NOTE: This literature applies to units manufactured on or after April 3, 1995.

INDEX

UNIT	UNIT VOLTAGE-PHASE	TYPE	NUMBER	FIG. NO.
48HJ008-014	208/230-3-60	Schematic/Component Arrangement	50HJ501296	1
	460-3-60	Schematic/Component Arrangement	50HJ501297	2
	575-3-60	Schematic/Component Arrangement	50HJ501298	3
50HJ008-012	208/230-3-60	Schematic/Component Arrangement	50HJ501299	4
	460-3-60	Schematic/Component Arrangement	50HJ501299	4
	575-3-60	Schematic/Component Arrangement	50HJ501301	5
50HJ014	208/230-3-60	Schematic/Component Arrangement	50HJ501300	6
	460-3-60	Schematic/Component Arrangement	50HJ501299	4
	575-3-60	Schematic/Component Arrangement	50HJ501301	5
50HJ008-014	220-3-50	Schematic/Component Arrangement	50HJ501302	7
	400-3-50	Schematic/Component Arrangement	50HJ501303	7

Electric Heat

UNIT SIZE	ELECTRIC HEATER		LABEL	FIG. NO.
	V-Ph	kW		
50HJ008,009	208/240-3	18.6/24.8	3-05626	8
50HJ008-014	208/240-3	7.8/10.4 12.0/16.0	3-05623	9
	208/240-3	24.0/32.0 31.8/42.4	3-05626	8
50HJ012,014	208/240-3	37.5/50.0	3-05626	8
50HJ008,009	480-3	13.9	3-05624	10
	480-3	16.5	3-05624	10
50HJ008-014	480-3	27.8 33.0 41.7	3-05625	11
50HJ012,014	480-3	50.0	3-05625	11
50HJ008-014	575-3	18.0	3-05624	10
	575-3	36.0	3-05625	11
50HJ012,014	575-3	54.0	3-05625	11

Accessories

UNIT	COMPONENT	FIG. NO.
50HJ008-014	Motormaster® Device	12
	Time Guard® II Control	13
	Remote Control Panel	14
	Accusensor™ II Enthalpy Control	15
	Accusensor III Enthalpy Control	16
	Enthalpy Control and Economizer Control Board	17
	Carrier TEMP System Thermostat and Apollo Communicating Control	18
	Apollo Communicating Control	19
	PARABLADE Economizer	20

OPERATING SEQUENCE

48HJ Units

COOLING, UNITS WITHOUT ECONOMIZER — When thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporator) fan contactor (IFC) and compressor contactor no. 1 (C1) are energized, and indoor (evaporator) fan motor (IFM), compressor no. 1, and condenser fans start. The outdoor (condenser) fan motors (OFMs) run continuously while unit is cooling. For units with 2 stages of cooling, if the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts.

When the thermostat is satisfied, C1 and C2 are deenergized and the compressors and OFMs shut off. After a 30-second delay, the IFM shuts off. If the thermostat fan selector switch is in the ON position, the evaporator motor will run continuously.

COOLING, UNITS WITH VARISLIDE™ ECONOMIZER — When the outdoor-air temperature is above the outdoor-air thermostat (OAT) setting and the room thermostat calls for cooling, the compressor contactor no. 1 is energized to start compressor no. 1 and outdoor (condenser) fan motors (OFMs). The indoor (evaporator) fan motor (IFM) is energized and the economizer damper moves to the minimum position. Upon a further call for cooling, compressor contactor no. 2 will be energized, starting compressor no. 2. After the thermostat is satisfied and the IFM is deenergized, the damper moves to the fully closed position.

When the outdoor-air temperature is below the OAT setting and the thermostat calls for Y1 and G, the economizer damper moves to the minimum position when the evaporator fan starts. The first stage of cooling is provided by the economizer. If the supply-air temperature is above 57 F (14 C), a switch on the supply-air thermostat is closed between the T2 terminal and the 24 vac terminal. This causes the damper to continue to modulate open until the supply-air temperature falls below 55 F (13 C) or the damper reaches the fully open position.

When the supply-air temperature is between 55 F and 52 F (13 C and 11 C), the supply-air thermostat has open switches between the T2 and 24 vac terminals and between the T1 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

If the supply-air temperature falls below 52 F (11 C), a switch on the supply-air thermostat is closed between the T1 terminal and the 24 vac terminal. This causes the damper to modulate closed until the supply-air temperature rises above 55 F (13 C) or the damper reaches the minimum position.

When the supply-air temperature is between 55 F and 57 F (13 C and 14 C), the supply-air thermostat has open switches between the T2 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

If the outdoor air alone cannot satisfy the cooling requirements of the conditioned space, economizer cooling is inte-

grated with mechanical cooling, providing second-stage cooling. Compressor no. 1 and condenser fans will be energized, and the position of the economizer damper will be determined by the supply-air temperature. Compressor no. 2 is locked out.

When the second stage of cooling is satisfied, the compressor and OFMs will be deenergized. The damper position will be determined by the supply-air temperature.

When the first stage of cooling is satisfied, the IFM shuts off after a 30-second delay. The damper then moves to fully closed position.

COOLING, UNITS WITH PARABLADE ECONOMIZER — When the outdoor air is above the enthalpy control setting, and the room thermostat calls for cooling, compressor contactor no. 1 is energized to start compressor no. 1 and the outdoor (condenser) fan motors (OFMs). The indoor (evaporator) fan motor (IFM) is energized and the economizer damper moves to the minimum position. Upon further call for cooling, compressor contactor no. 2 is energized, starting compressor no. 2. After the room thermostat is satisfied, the damper will spring-return to the fully closed position.

When the outdoor air is below the enthalpy control setting and the thermostat calls for cooling, the economizer outdoor-air damper is opened proportionally to maintain between 50 F and 56 F (10 C and 13 C) at the mixed-air sensor. If outside air alone cannot satisfy the cooling requirements, economizer cooling is integrated with mechanical cooling and the second stage is locked out. When the room thermostat is satisfied, the damper will spring-return to the fully closed position.

HEATING, UNITS WITHOUT ECONOMIZER — When the thermostat calls for heating, terminal W1 is energized. In order to prevent thermostat short-cycling, the unit is locked into the Heating mode for at least 1 minute when W1 is energized. The induced-draft motor (IDM) is then energized and the burner ignition sequence begins. The IFM is energized 45 seconds after a flame is ignited. When additional heat is needed, W2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the thermostat is satisfied and W1 and W2 are deenergized, the IFM stops after a 45-second time-off delay.

HEATING, UNITS WITH ECONOMIZER/TWO-POSITION DAMPER — When the thermostat calls for heating, terminal W1 is energized. In order to prevent thermostat short-cycling, the unit is locked into the Heating mode for at least 1 minute when W1 is energized. The induced-draft motor is then energized and the burner ignition sequence begins. The IFM is energized 45 seconds after a flame is ignited and the damper moves to the minimum position. If the two-position damper is used, the outdoor-air damper opens to the minimum position whenever the evaporator fan runs. When additional heat is needed, W2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the thermostat is satisfied and W1 and W2 are deenergized, the IFM stops after a 45-second time-off delay. The economizer damper then moves to the fully-closed position. When using continuous fan, the damper will remain in the minimum position.

50HJ Units

COOLING, UNITS WITHOUT ECONOMIZER — When the thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporator) fan contactor (IFC), and compressor contactor no. 1 (C1) are energized and the indoor (evaporator) fan motor (IFM), compressor no. 1, and condenser fans start. The outdoor (condenser) fan motors (OFMs) run continuously while unit is cooling. If the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts.

COOLING, UNITS WITH VARISLIDE™ ECONOMIZER — When the outdoor-air temperature is above the outdoor-air thermostat (OAT) setting and the room thermostat calls for cooling, the compressor contactor no.1 is energized to start compressor no. 1 and outdoor (condenser) fan motors (OFMs). The indoor (evaporator) fan motor (IFM) is energized and the economizer damper moves to the minimum position. Upon a further call for cooling, compressor contactor no. 2 will be energized, starting compressor no. 2. After the thermostat is satisfied and the IFM is deenergized, the damper moves to the fully closed position.

When the outdoor-air temperature is below the OAT setting and the thermostat calls for Y1 and G, the economizer damper moves to the minimum position when the evaporator fan starts. The first stage of cooling is provided by the economizer. If the supply-air temperature is above 57 F (14 C), a switch on the supply-air thermostat is closed between the T2 terminal and the 24 vac terminal. This causes the damper to continue to modulate open until the supply-air temperature falls below 55 F (13 C) or the damper reaches the fully open position.

When the supply-air temperature is between 55 F and 52 F (13 C and 11 C), the supply-air thermostat has open switches between the T2 and 24 vac terminals and between the T1 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

If the supply-air temperature falls below 52 F (11 C), a switch on the supply-air thermostat is closed between the T1 terminal and the 24 vac terminal. This causes the damper to modulate closed until the supply-air temperature rises above 55 F (13 C) or the damper reaches the minimum position.

When the supply-air temperature is between 55 F and 57 F (13 C and 14 C), the supply-air thermostat has open switches between the T2 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

If the outdoor air alone cannot satisfy the cooling requirements of the conditioned space, economizer cooling is integrated with mechanical cooling, providing second-stage cooling. Compressor no. 1 and condenser fans will be energized, and the position of the economizer damper will be determined by the supply-air temperature. Compressor no. 2 is locked out.

When the second stage of cooling is satisfied, the compressor and OFMs will be deenergized. The damper position will be determined by the supply-air temperature.

When the first stage of cooling is satisfied, the damper will move to fully closed position.

COOLING, UNITS WITH PARABLADE ECONOMIZER — When the outdoor air is above the enthalpy control setting, and the room thermostat calls for cooling, compressor contactor no. 1 is energized to start compressor no. 1 and the outdoor (condenser) fan motors (OFMs). The indoor (evaporator) fan motor (IFM) is energized and the economizer damper moves to the minimum position. Upon further call for cooling, compressor contactor no. 2 is energized, starting compressor no. 2. After the room thermostat is satisfied, the damper will spring-return to the fully closed position.

When the outdoor air is below the enthalpy control setting and the thermostat calls for cooling, the economizer outdoor-air damper is opened proportionally to maintain between 50 F and 56 F (10 C and 13 C) at the mixed-air sensor. If outside air alone cannot satisfy the cooling requirements, economizer cooling is integrated with mechanical cooling and the second stage is locked out. When the room thermostat is satisfied, the damper will spring-return to the fully closed position.

HEATING, UNITS WITHOUT ECONOMIZER — Upon a call heating through terminal W1, IFC and heater contactor no. 1 (HC1) are energized. On units equipped for 2 stages of heat, when additional heat is needed, HC2 is energized through W2.

HEATING, UNITS WITH ECONOMIZER/TWO-POSITION DAMPER — When the room thermostat calls for heat through terminal W1, the IFC and heater contactor no. 1 are energized. On units equipped for 2 stages of heat, when additional heat is needed, heater contactor no. 2 is energized through W2. The economizer damper moves to the minimum position. If the two-position damper is used, the outdoor-air damper opens to the minimum position whenever the evaporator fan runs. When the thermostat is satisfied, the damper moves to the fully closed position.

LEGEND (Fig. 1 - 7)

AHA	– Adjustable Heat Anticipator	MCA	– Minimum Circuit Amps
APS	– Air Pressure Switch	MGV	– Main Gas Valve
AWG	– American Wire Gage	MTR	– Motor
BR	– Blower Relay	NEC	– National Electrical Code
C	– Contactor, Compressor	OAT	– Outdoor-Air Thermostat
CAP	– Capacitor	OFC	– Outdoor (Condenser) Fan Contactor
CB	– Circuit Breaker	OFM	– Outdoor (Condenser) Fan Motor
CC	– Cooling Compensator	P, PL	– Plug
CLO	– Compressor Lockout	QT	– Quadruple Terminal
COM	– Common	R	– Relay
COMP	– Compressor Motor	RS	– Rollout Switch
CR	– Control Relay	SAT	– Supply-Air Thermostat
D	– Diode	SEN	– Sensor
EC	– Enthalpy Control	SW	– Switch
ECON	– Economizer (Varislide™)	SW1	– Switch, Fully Open
EPS	– Emergency Power Supply	SW2	– Switch, Fully Closed
EQUIP	– Equipment	SW3	– Switch Minimum Vent Position
ER	– Economizer Relay	SW4	– Switch Maximum Vent Position
FP	– Flame Prove	TB	– Terminal Block
FPT	– Freeze Protection Thermostat	TC	– Thermostat, Cooling
FSS	– Filter Status Switch	TH	– Thermostat, Heating
FU	– Fuse	TRAN	– Transformer
GND	– Ground		
GVR	– Gas Valve Relay		Field Splice
HC	– Heater Contactor (Electric Heater)		Terminal (Marked)
HPS	– High-Pressure Switch		Terminal (Unmarked)
HR	– Holding Relay		Terminal Block
HS	– Hall Effect Sensor		Splice
HTR	– Heater		Factory Wiring
HV TRAN	– High-Voltage Transformer		Field Control Wiring
I	– Ignitor		Field Power Wiring
IDM	– Induced-Draft Motor		Accessory or Optional Wiring
IFC	– Indoor (Evaporator) Fan Contactor		To indicate common potential only, not to represent wiring.
IFM	– Indoor (Evaporator) Fan Motor		
IFR	– Indoor (Evaporator) Fan Relay		
IGC	– Integrated Gas Controller		
LPS	– Low-Pressure/Loss-of-Charge Switch		
LS	– Limit Switch		
LSM	– Limit Switch (Manual Reset)		

NOTES (Fig. 1-3)

1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Three-phase motors are protected under primary single-phasing conditions.
3. Thermostat:
HH07AT170, 172, 174 and P272-2783
Subbase:
HH93AZ176, 178 and P272-1882, 1883
4. Set heat anticipator for first stage at 0.14 amp, second stage at 0.2 amp. For 48HJ008 and 009 low heat, set both first and second stage at 0.14 amp.
5. Use copper conductors only.
6. TRAN is wired for 230 v unit. If unit is to run with 208 v power supply, disconnect BLK wire from 230 v tap (ORN) and connect to 200 v tap (RED). Insulate end of 230 v tap.

NOTES (Fig. 4-7)

1. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
2. Three-phase motors are protected under primary single-phasing conditions.
3. Thermostat:
HH07AT170, 172
Subbase:
HH93AZ176, 178 and 179
4. Set heat anticipator at 1 amp.
5. Use copper conductors only.
6. Use copper, copper-clad aluminum, or aluminum conductors.
7. TRAN is wired for 230 v unit. If unit is to run with 208 v power supply, disconnect BLK wire from 230 v tap (ORN) and connect to 200 v tap (RED). Insulate end of 230 v tap.



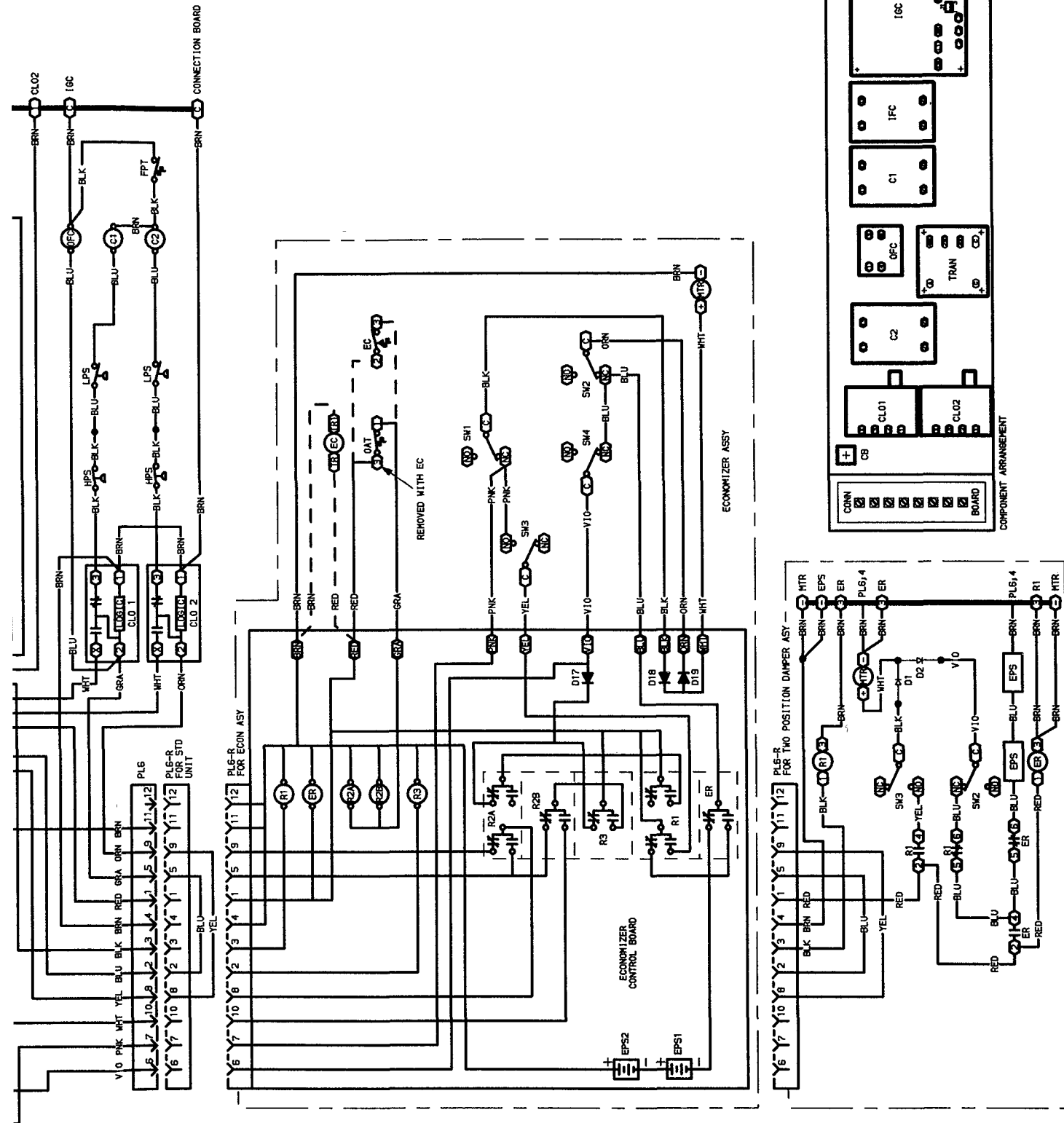
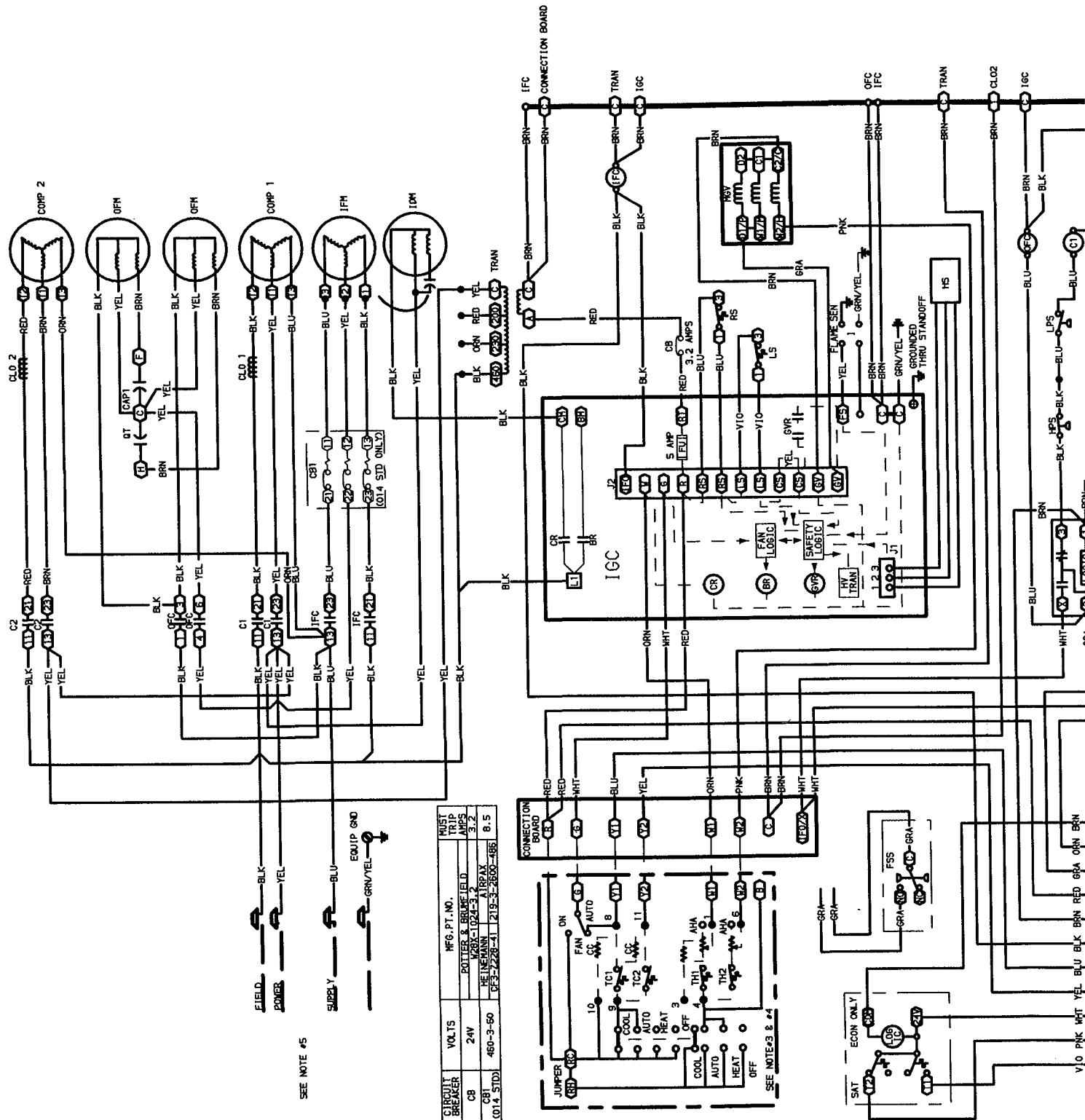


Fig. 1 — Label Diagram, Schematic and Component Arrangement;
48HJ008-014, 208/230-3-60



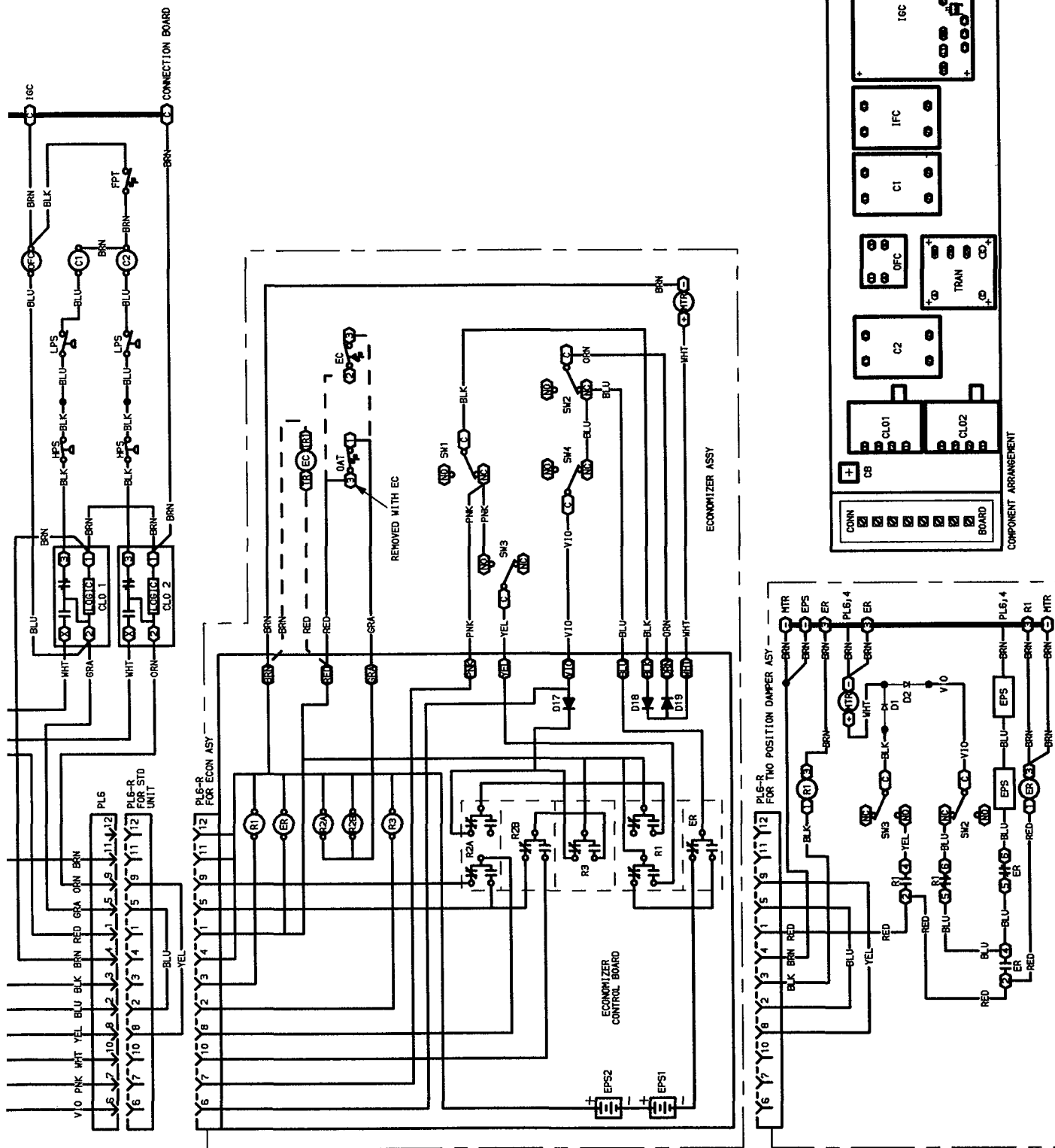


Fig. 2 — Label Diagram, Schematic and Component Arrangement;
48HJ008-014, 460-3-60



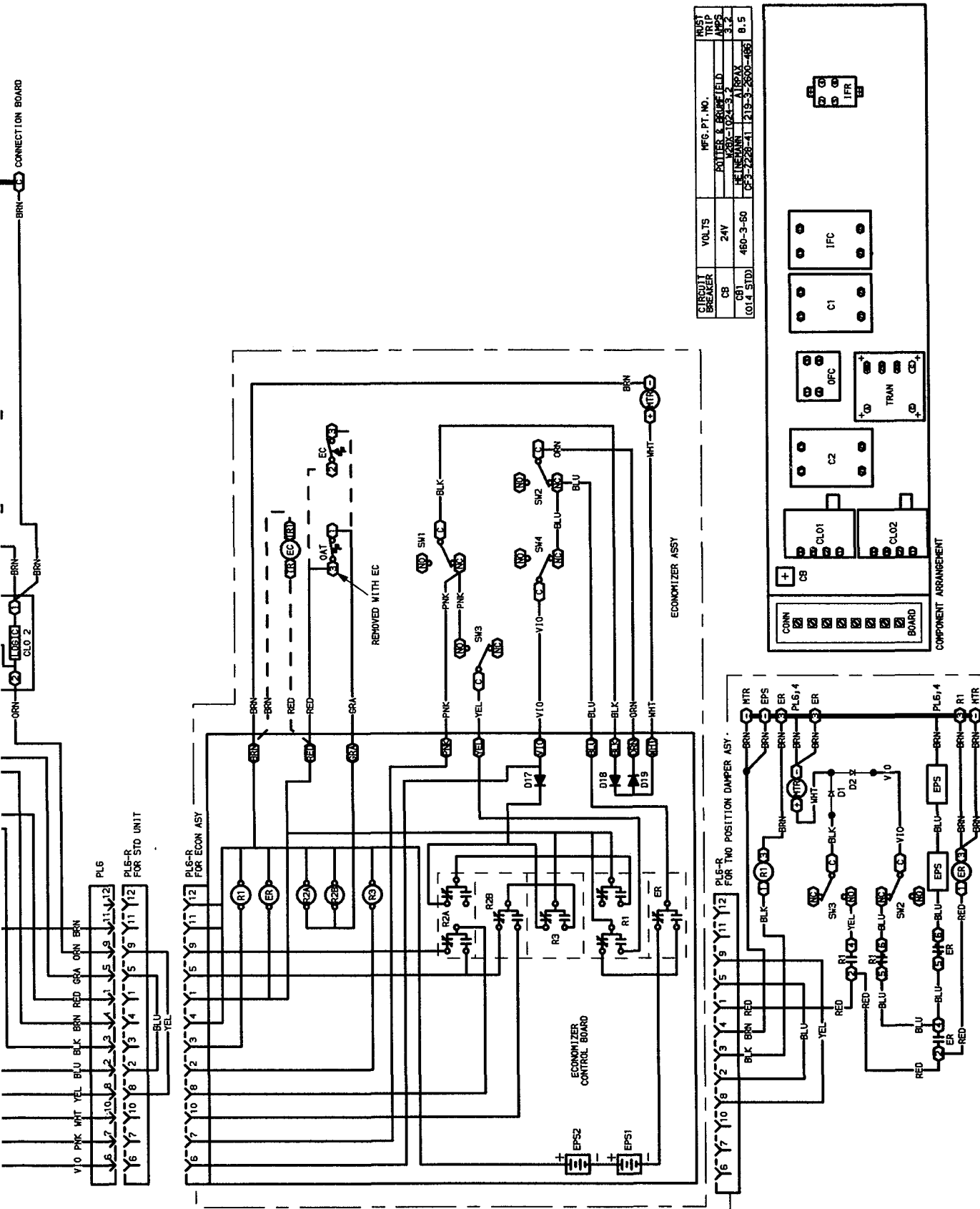


Fig. 4 — Label Diagram, Schematic and Component Arrangement;
50HJ008-012, 208/230-3-60 and 50HJ008-014, 460-3-60

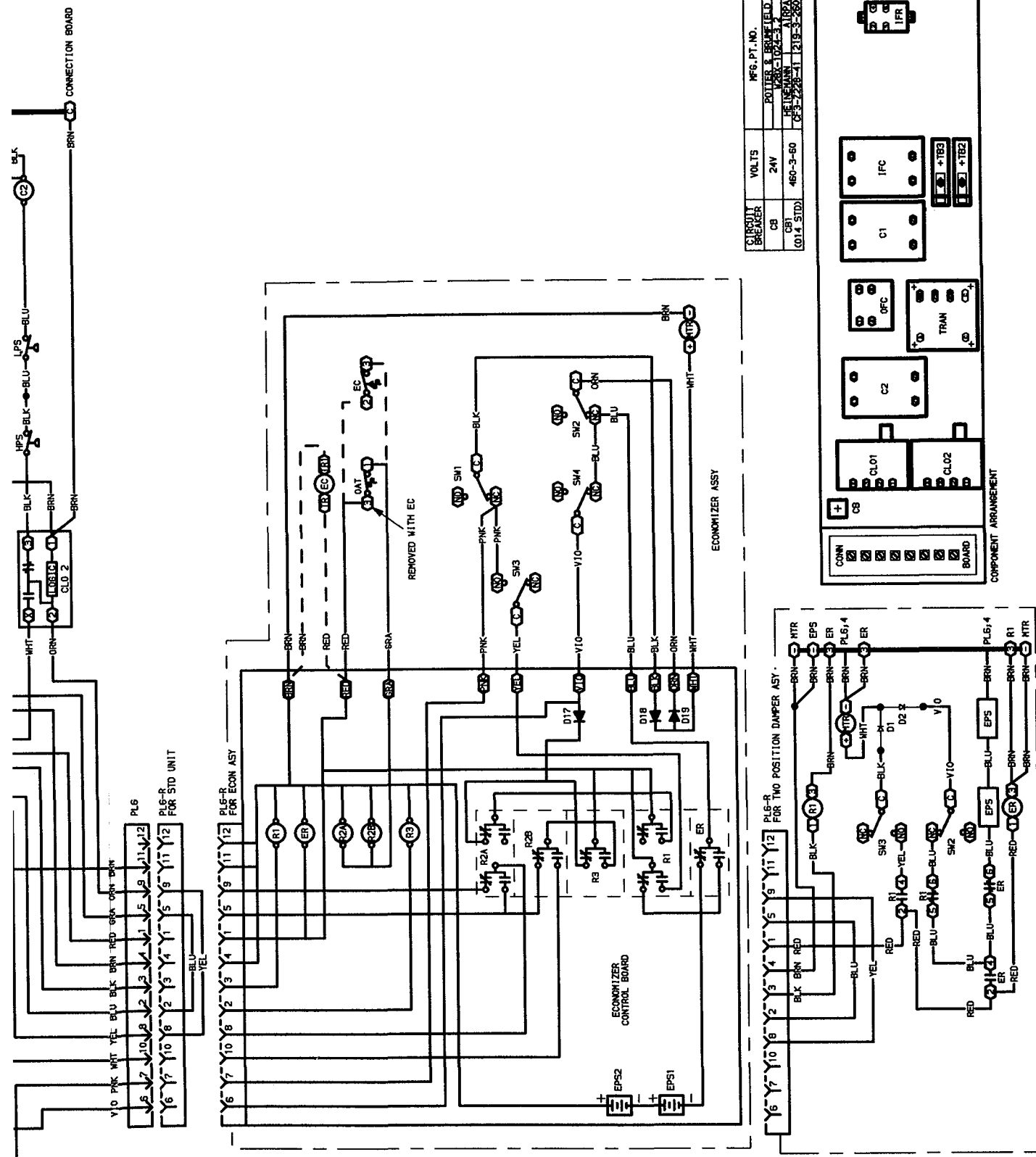
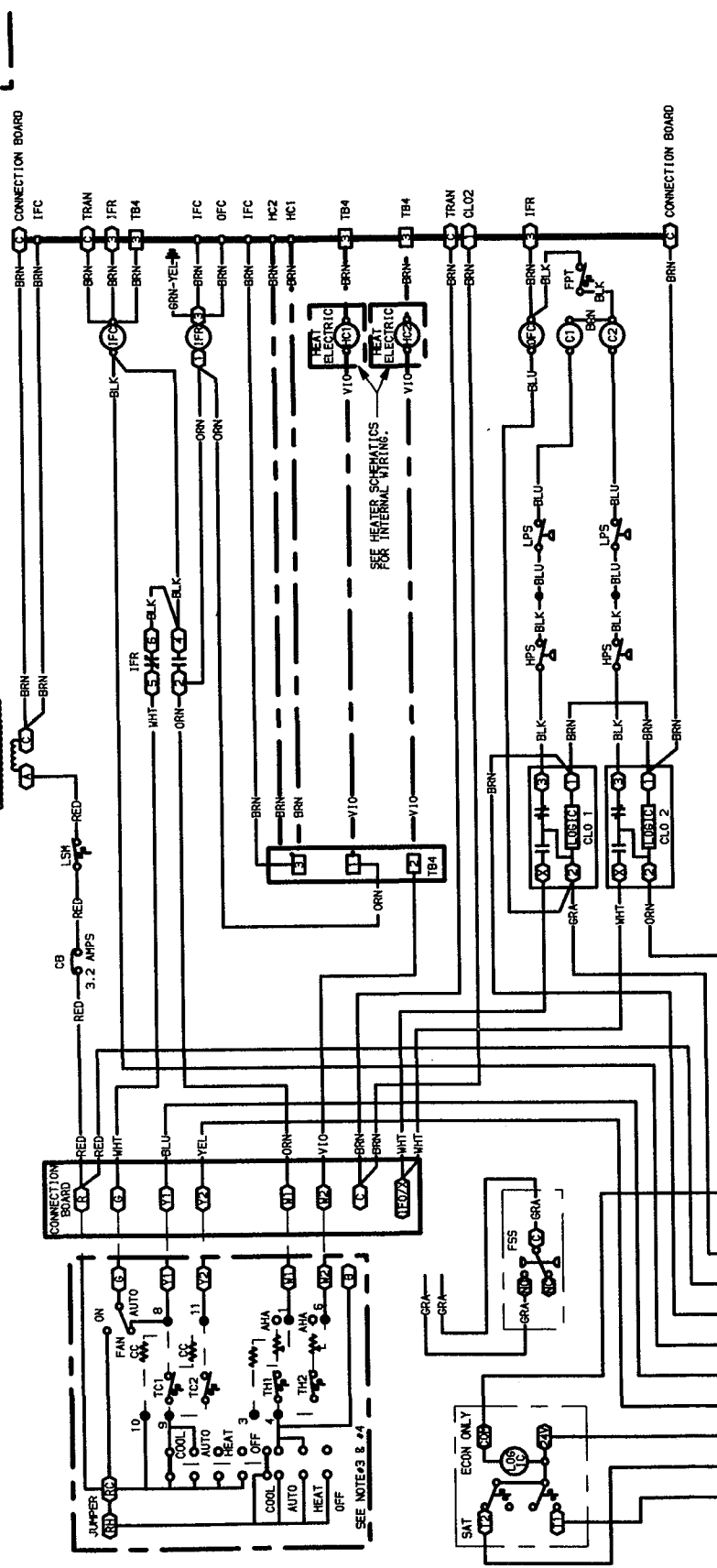
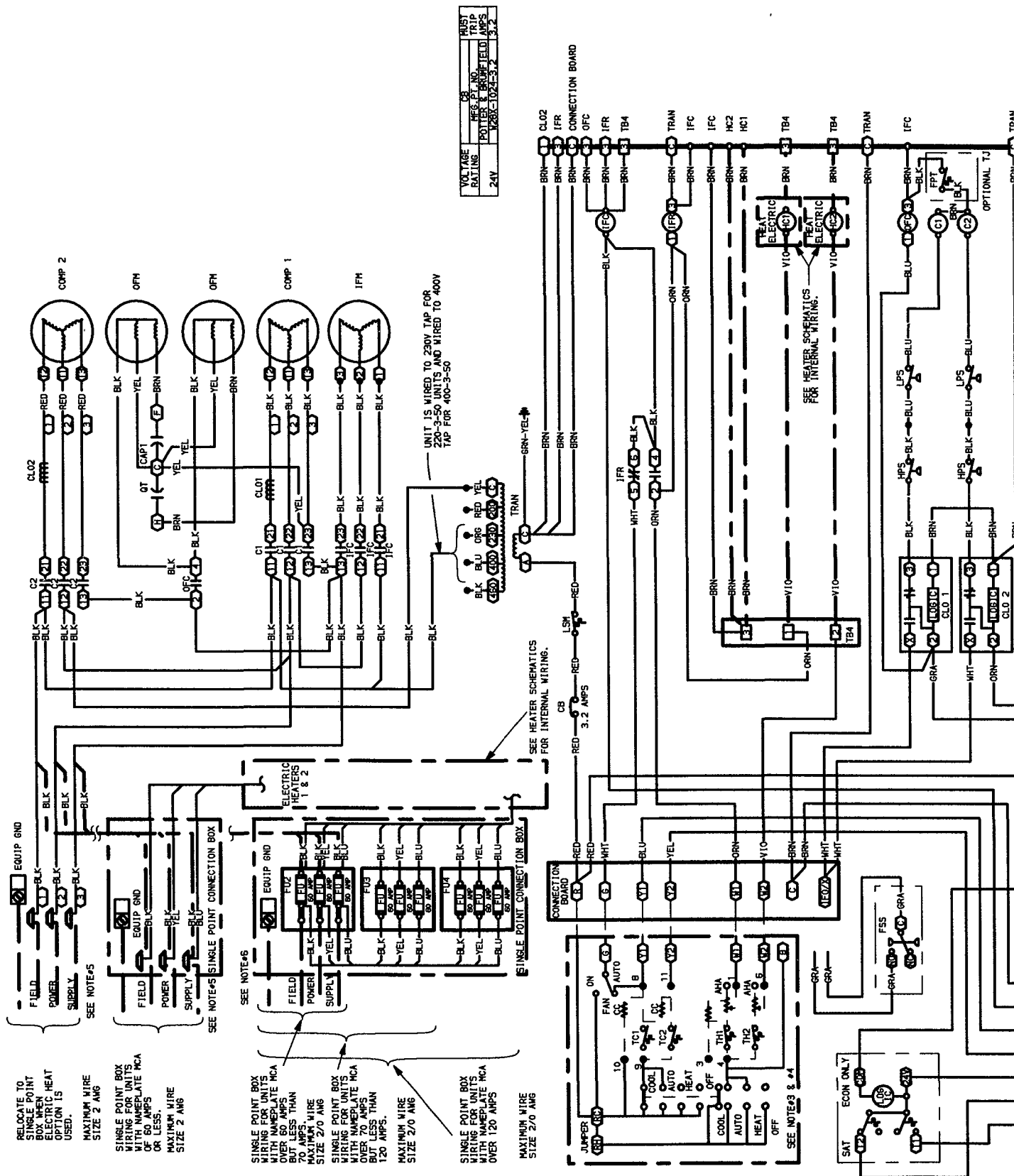


Fig. 5 — Label Diagram, Schematic and Component Arrangement;
50HJ008-014, 575-3-60



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VOLTAGE RATING	CS	HEATER NO.	TRIP
24V	POTTER & BRUMFIELD	W288-1024-3-2	3.2

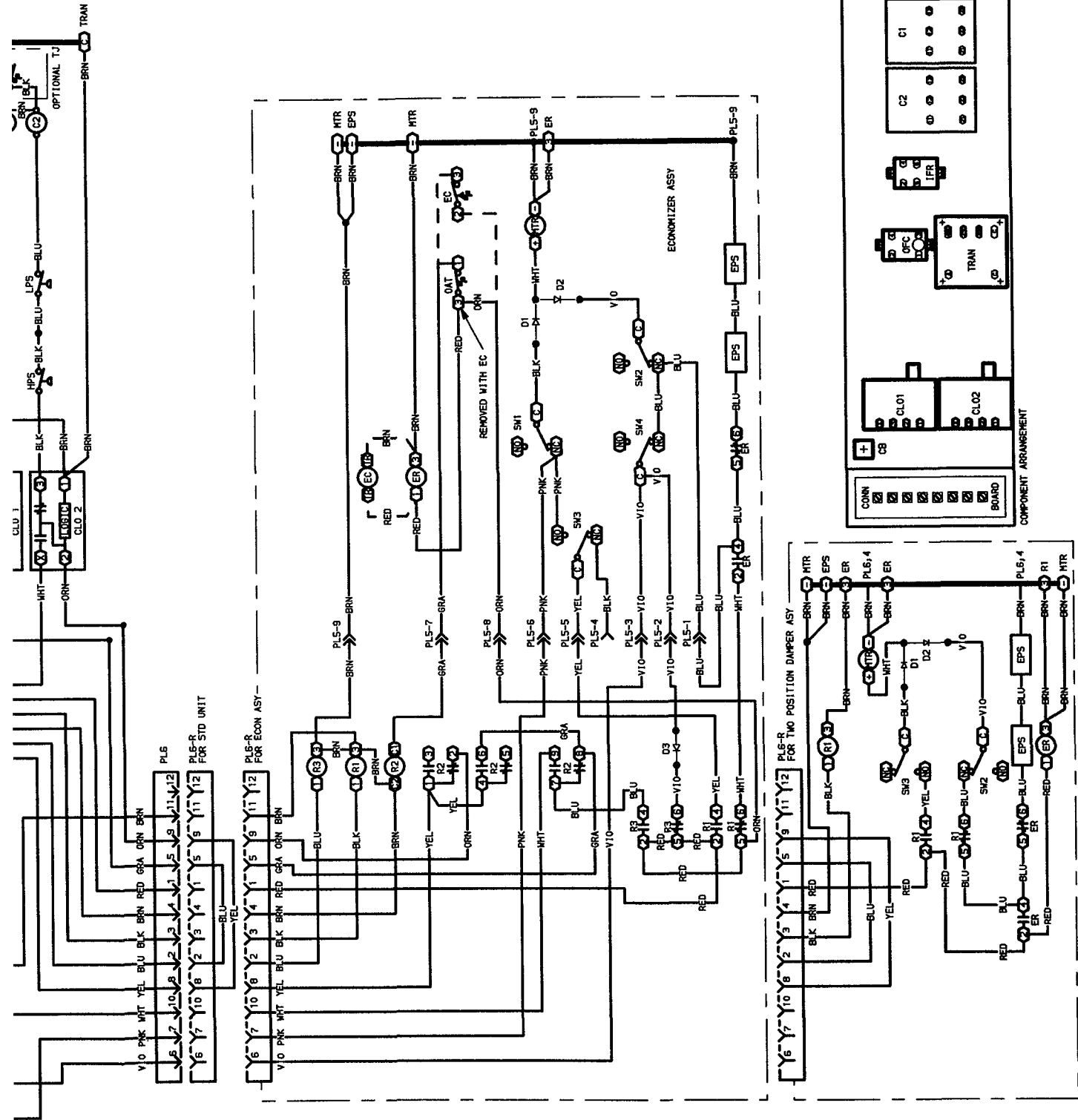
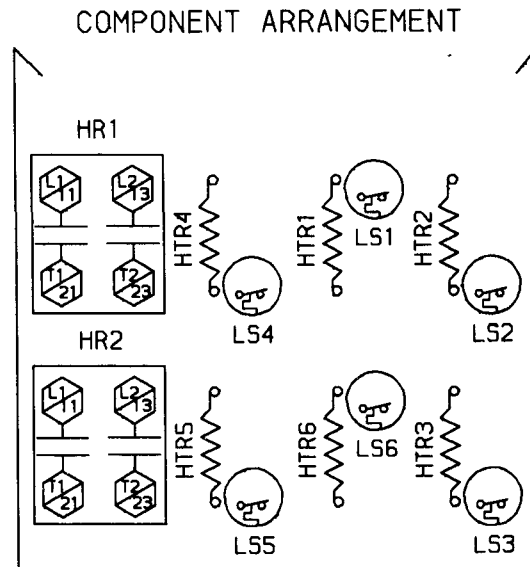
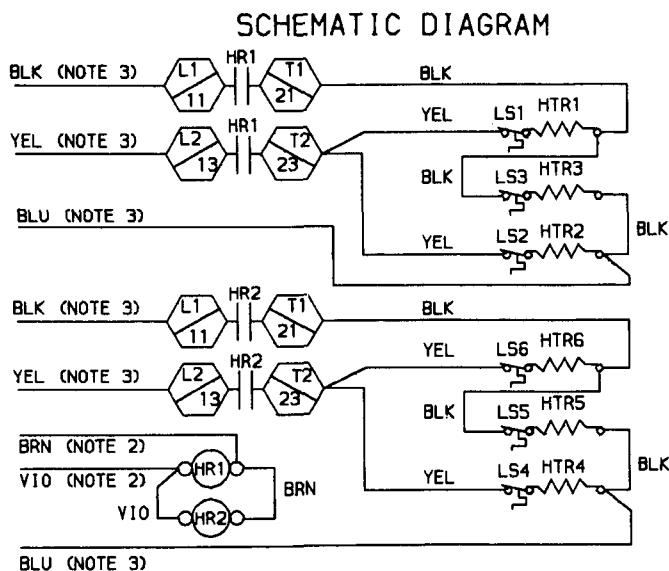


Fig. 7 — Label Diagram, Schematic and Component Arrangement;
50HJ008-014, 220-3-50, 400-3-50



⚠ WARNING

Electric shock hazard. Disconnect all branch circuits before removing this cover.

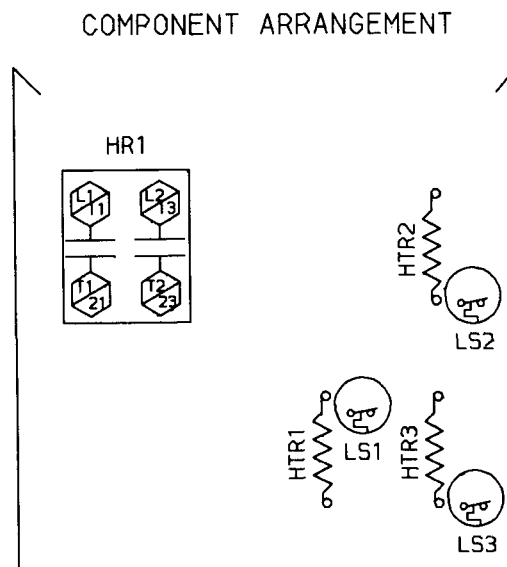
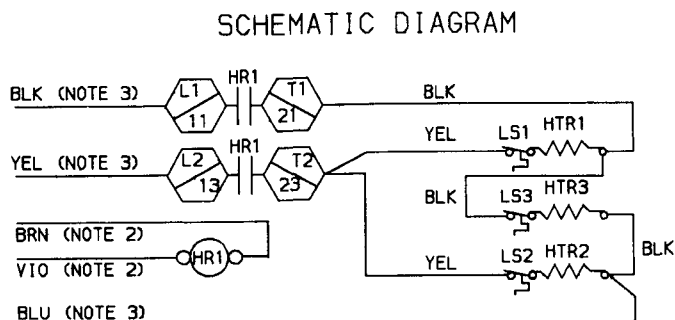
NOTES:

- 1 To be wired in accordance with NEC and local codes
- 2 Brown and violet 24-vac wires are supplied with heater and connected at installation to base unit as shown on base unit wiring diagram
- 3 Power wires are supplied with heater and connected at installation to base unit field power connection box as shown on base unit wiring diagram. For field installation of electric heaters, field power connection box shown on equipment nameplate must be used

LEGEND

- Sylvania
- Marked Terminal
- Elmwood
- Unmarked Terminal
- HTR** - Heater
- HR** - Heater Relay
- LS** - Limit Switch
- NEC** - National Electric Code

Fig. 8 — Accessory Electric Heater Label Diagram, 18.6/24.8 kW, 24.0/32.0 kW, 31.8/42.4 kW, and 37.5/50.0 kW, 208/240 V, 3 Phase



⚠ WARNING

Electric shock hazard. Disconnect all branch circuits before removing this cover.

NOTES:

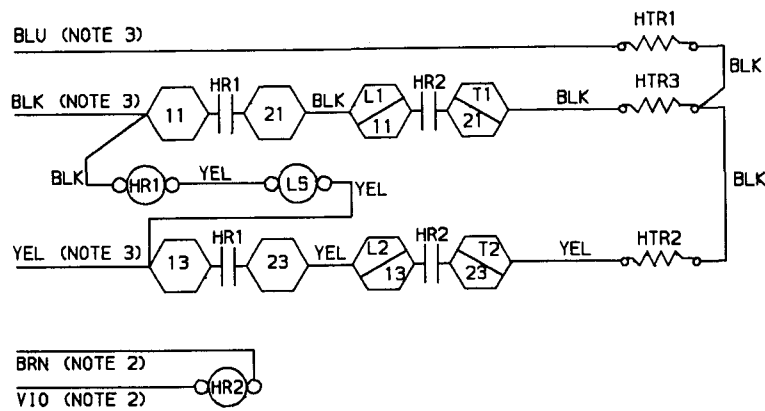
- 1 To be wired in accordance with NEC and local codes
- 2 Brown and violet 24-vac wires are supplied with heater and connected at installation to base unit as shown on base unit wiring diagram
- 3 Power wires are supplied with heater and connected at installation to base unit field power connection box as shown on base unit wiring diagram. For field installation of electric heaters, field power connection box shown on equipment nameplate must be used

LEGEND

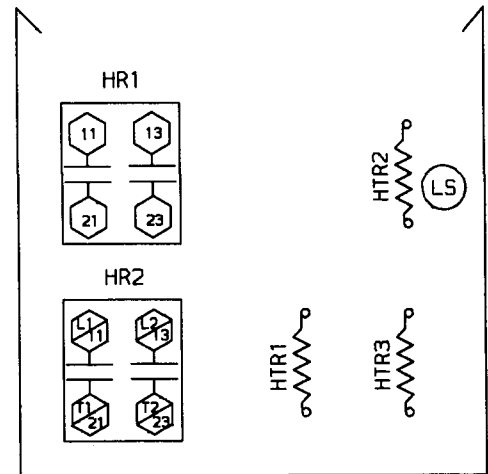
- Sylvania
- Marked Terminal
- Elmwood
- Unmarked Terminal
- HTR** - Heater
- HR** - Heater Relay
- LS** - Limit Switch
- NEC** - National Electric Code

Fig. 9 — Accessory Electric Heater Label Diagram, 7.8/10.4 kW and 12.0/16.0 kW, 208/240 V, 3 Phase

SCHEMATIC DIAGRAM



COMPONENT ARRANGEMENT



⚠ WARNING

Electric shock hazard. Disconnect all branch circuits before removing this cover.

NOTES:

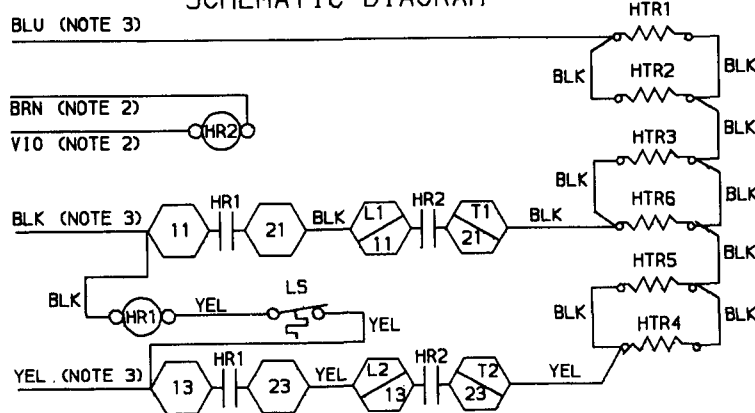
1. To be wired in accordance with NEC and local codes
2. Brown and violet 24-vac wires are supplied with heater and connected at installation to base unit as shown on base unit wiring diagram
3. Power wires are supplied with heater and connected at installation to base unit field power connection box as shown on base unit wiring diagram. For field installation of electric heaters, field power connection box shown on equipment nameplate must be used

LEGEND

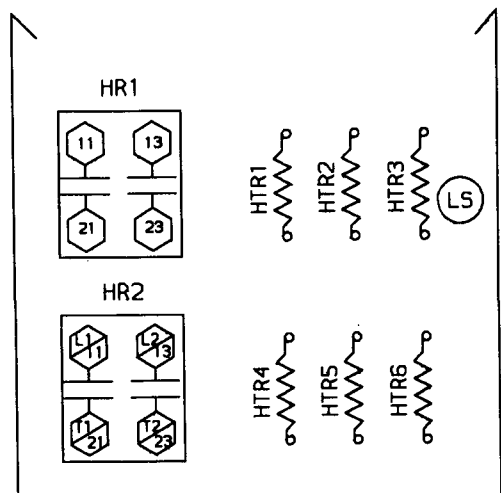
- Sylvania
- Marked Terminal HR2 Only
- Elmwood
- Unmarked Terminal
- HTR - Heater
- HR - Heater Relay
- LS - Limit Switch
- NEC - National Electric Code

Fig. 10 — Accessory Electric Heater Label Diagram, 13.9 kW and 16.5 kW, 480 V, 3 Phase; 575 V, 3 Phase

SCHEMATIC DIAGRAM



COMPONENT ARRANGEMENT



⚠ WARNING

Electric shock hazard. Disconnect all branch circuits before removing this cover.

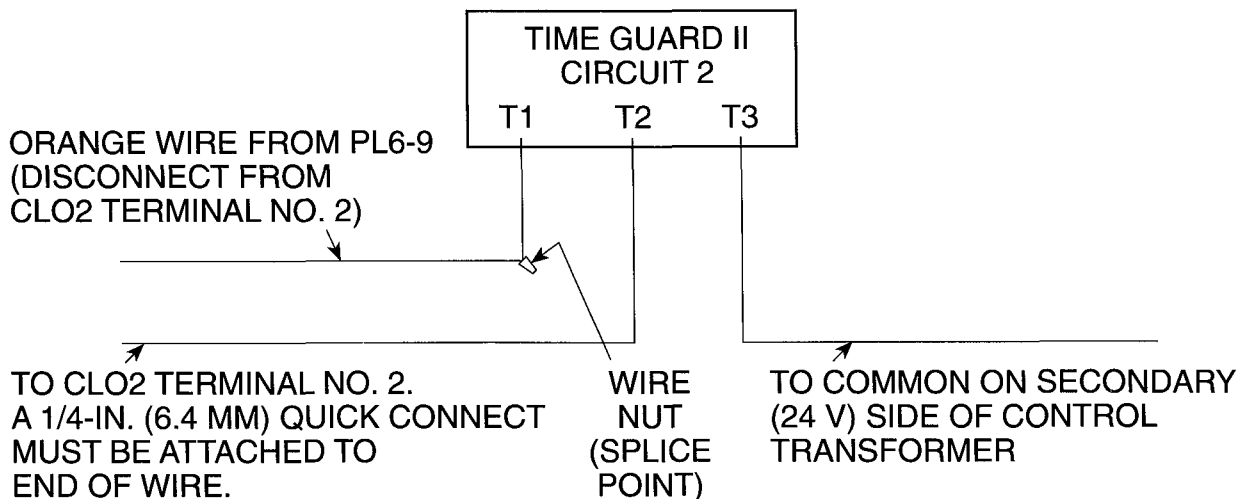
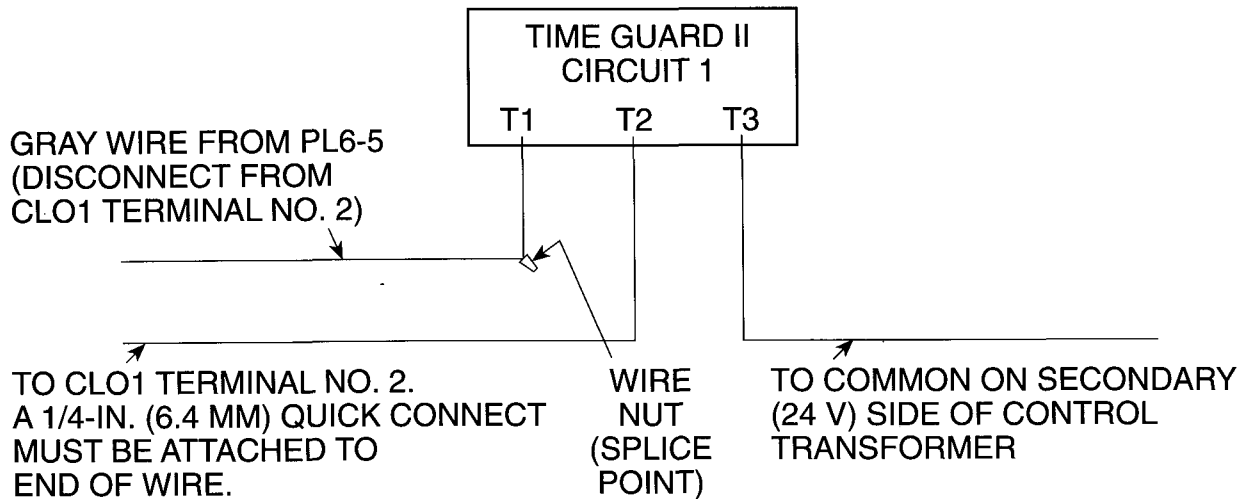
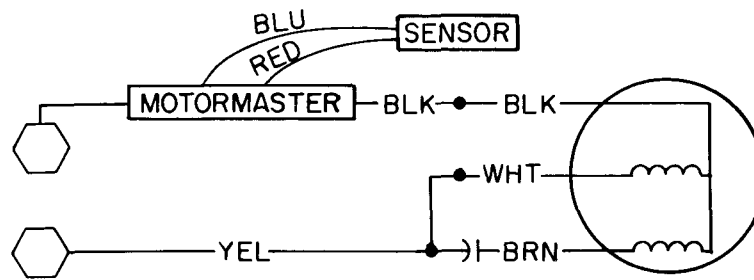
NOTES:

1. To be wired in accordance with NEC and local codes
2. Brown and violet 24-vac wires are supplied with heater and connected at installation to base unit as shown on base unit wiring diagram
3. Power wires are supplied with heater and connected at installation to base unit field power connection box as shown on base unit wiring diagram. For field installation of electric heaters, field power connection box shown on equipment nameplate must be used

LEGEND

- Sylvania
- Marked Terminal HR2 Only
- Elmwood
- Unmarked Terminal
- HTR - Heater
- HR - Heater Relay
- LS - Limit Switch
- NEC - National Electric Code

Fig. 11 — Accessory Electric Heater Label Diagram, 27.8 kW, 33.0 kW, 41.7 kW, and 50.0 kW, 480 V, 3 Phase; 36.0 kW and 54.0 kW, 575 V, 3 Phase



LEGEND

CLO - Compressor Lockout
PL - Plug
T - Terminal

Fig. 13 — Time Guard®II Control Wiring

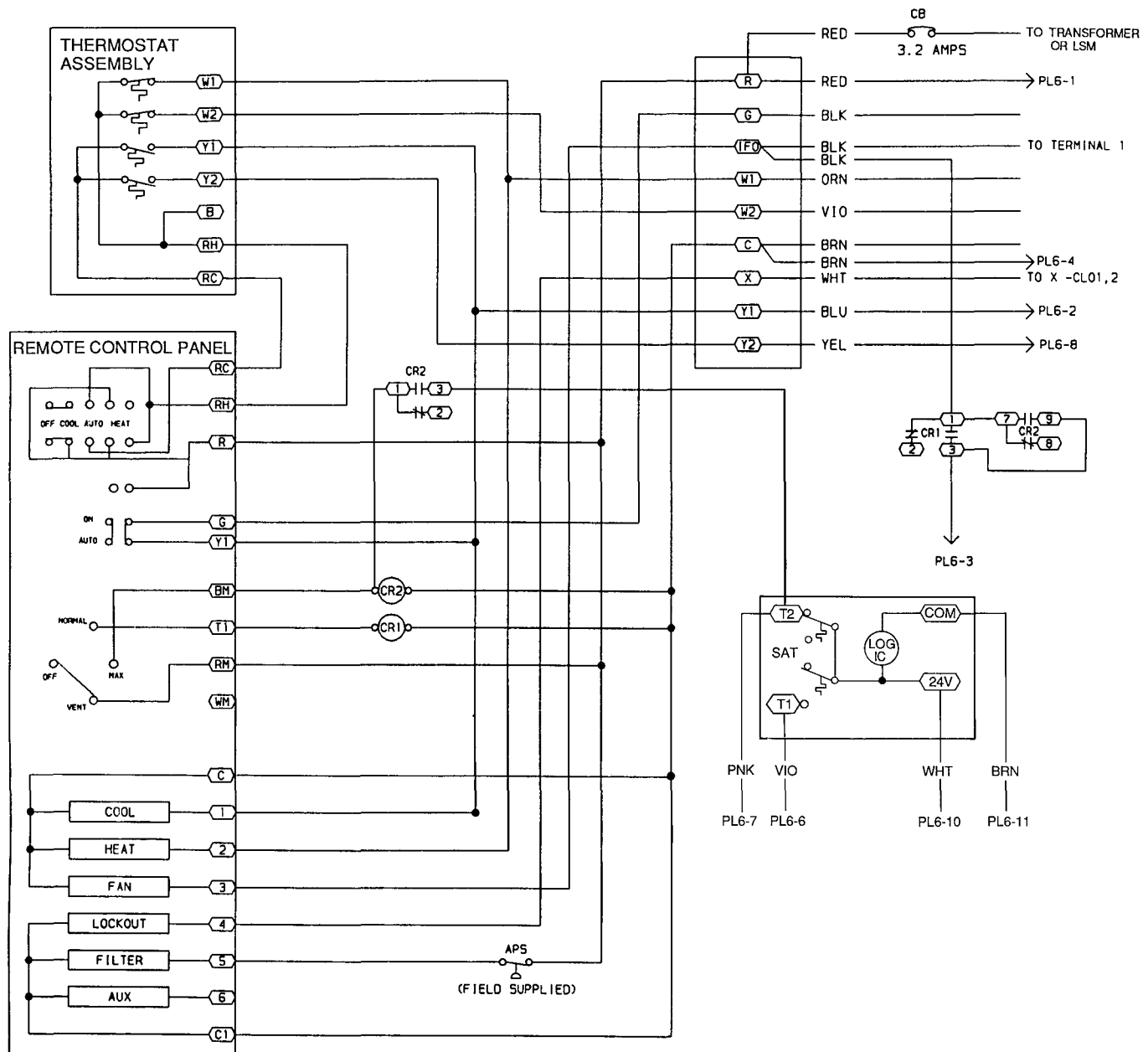
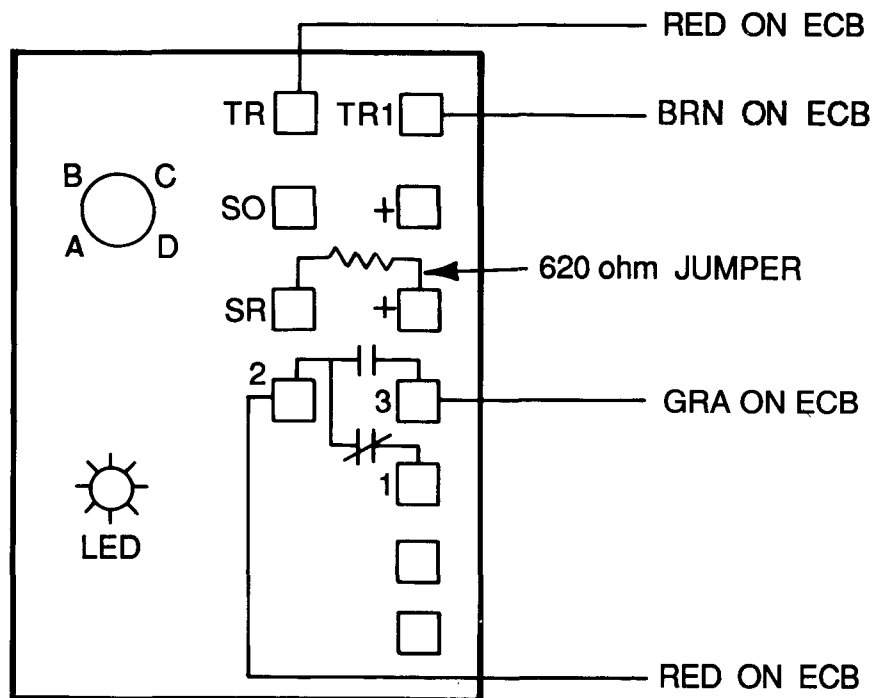


Fig. 14 — Remote Control Panel Wiring

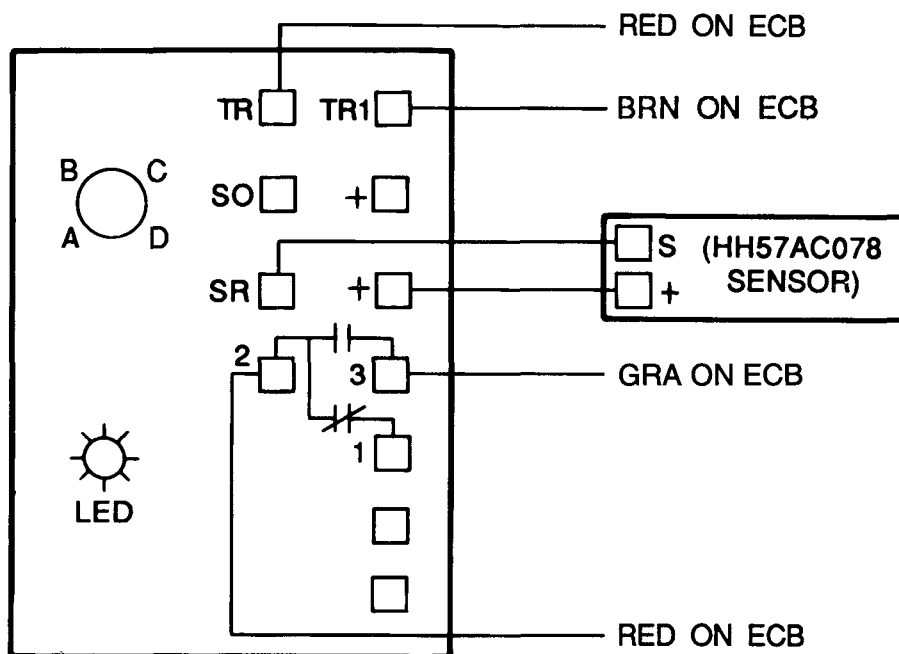


LEGEND

ECB - Economizer (Varislide™) Control Board
LED - Light-Emitting Diode

NOTE: Switches shown in high enthalpy state. Terminals 2 and 3 close on enthalpy decrease.

Fig. 15 — Accusensor™II Enthalpy Control (Part No. HH57AC077) Wiring



LEGEND

ECB - Economizer (Varislide) Control Board
LED - Light-Emitting Diode

NOTES:

1. Remove factory-installed 620-ohm jumper across SR and + before connecting wires from HH57AC078 sensor
2. Switches are shown in high outdoor-air enthalpy state. Terminals 2 and 3 close on low outdoor-air enthalpy relative to indoor-air enthalpy

Fig. 16 — Accusensor III Enthalpy Control (Part No. HH57AC077 and HH57AC078) Wiring

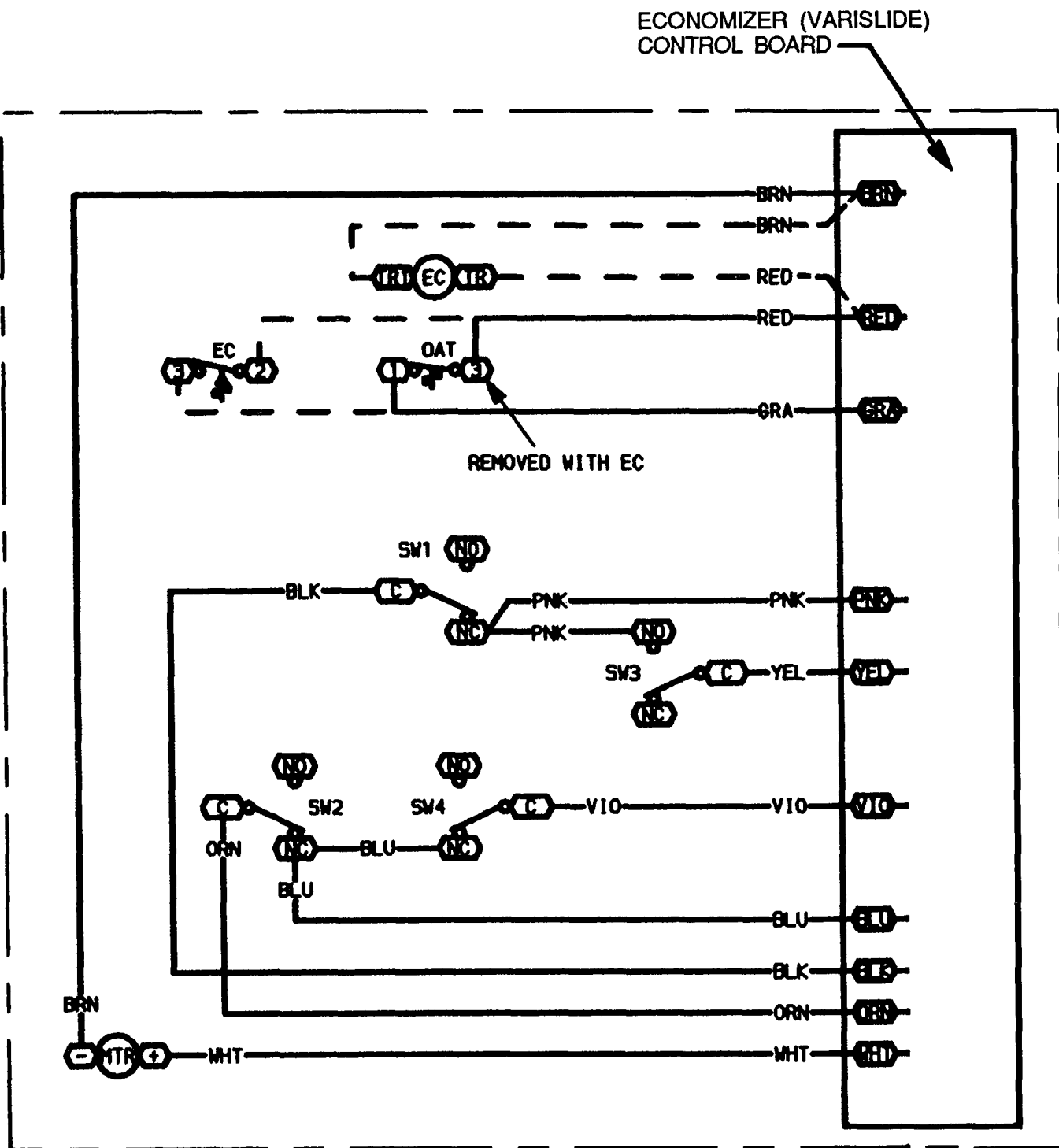
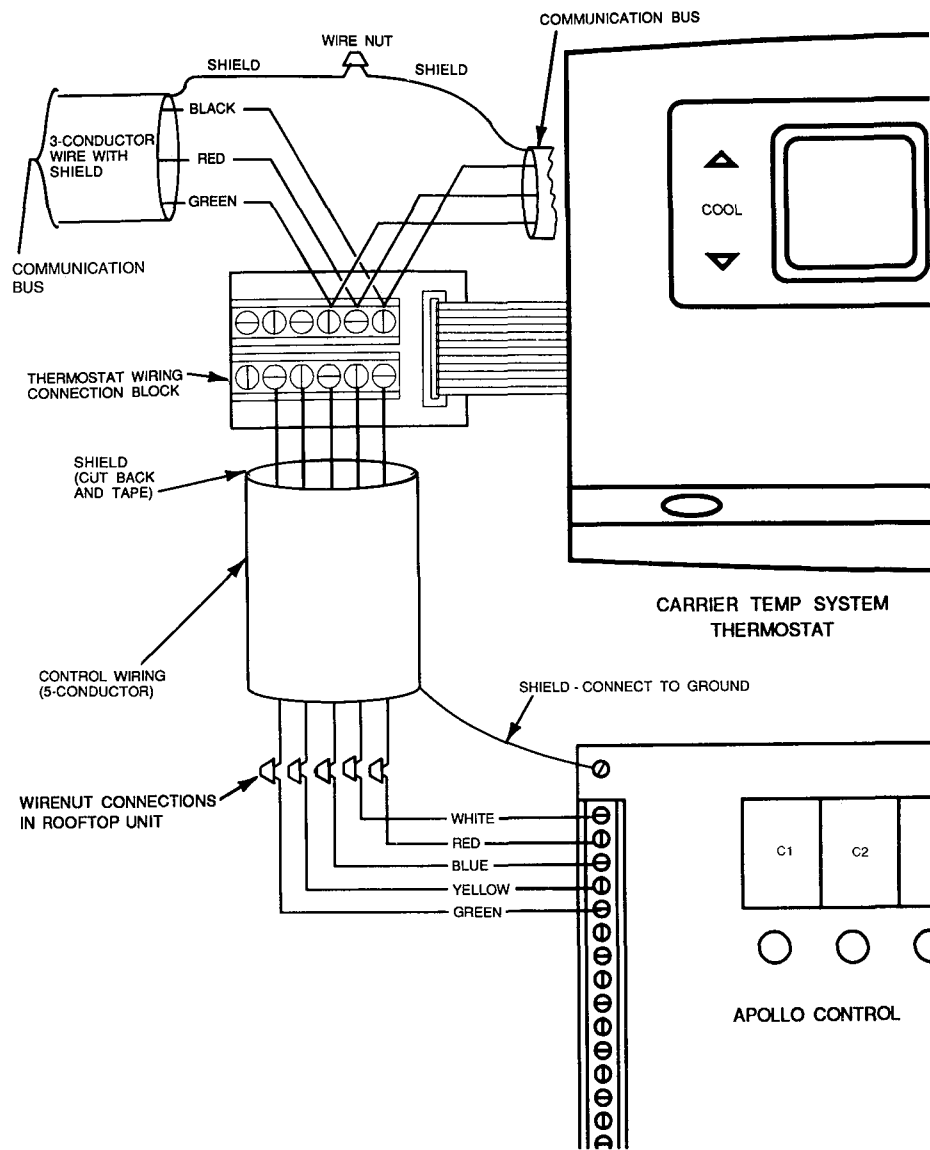
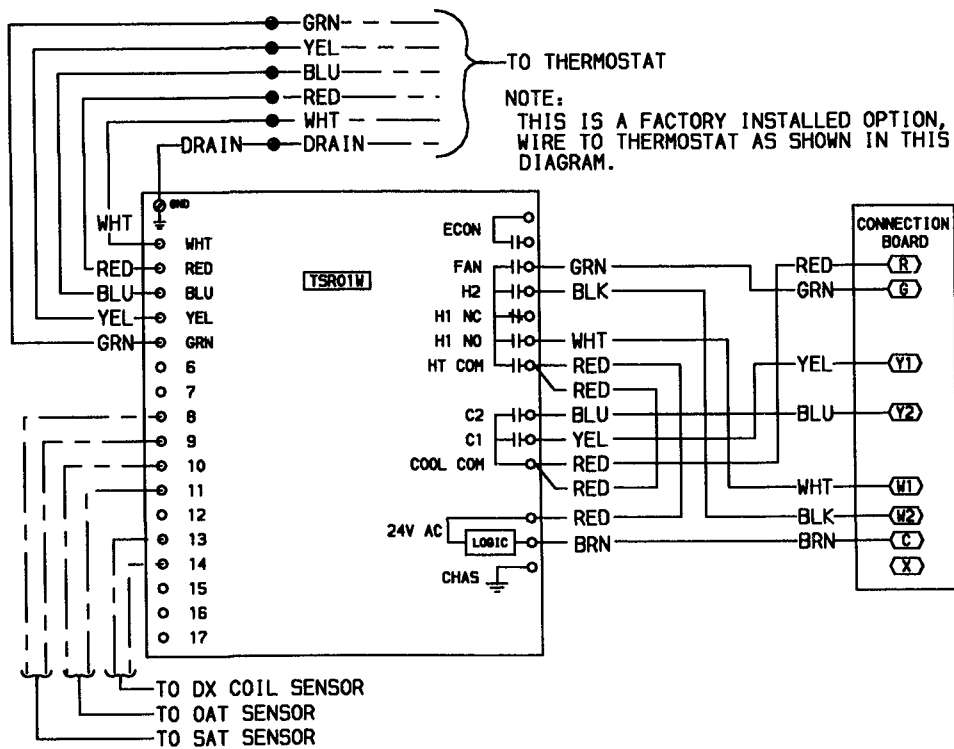


Fig. 17 — Enthalpy Control and Varislide™ Economizer Control Board Wiring



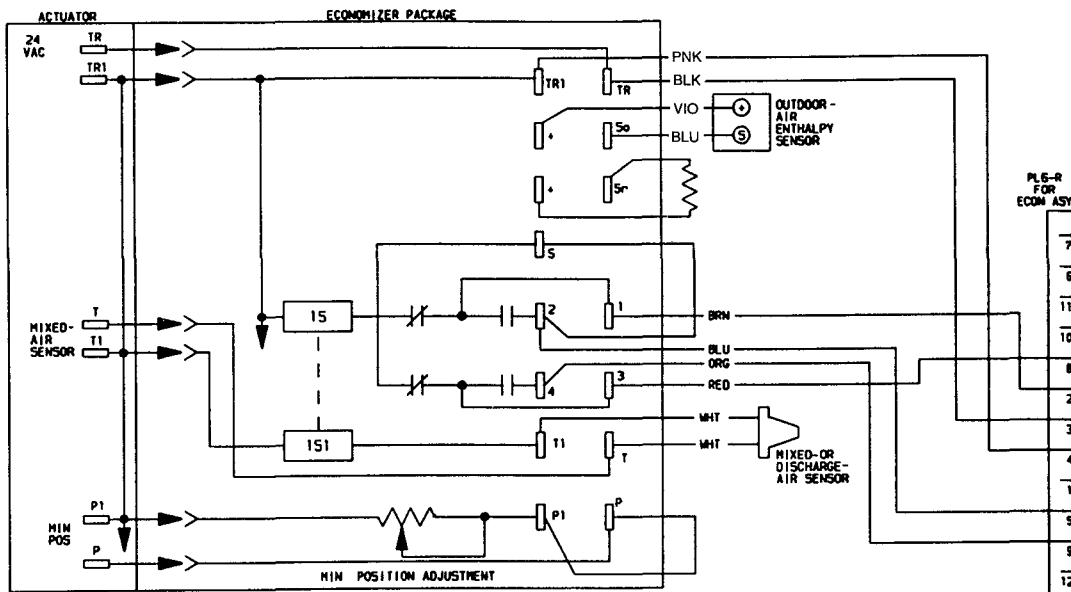
NOTE: Refer to Product Support Bulletin No 93-005 for shielded wire applications when wiring the thermostat to the Apollo control and for all communication bus wiring connections

Fig. 18 — Carrier TEMP System Thermostat and Apollo Communicating Control Wiring



CHAS	- Chassis Ground	GND	- Ground	TRAN	- Transformer
COM	- Common	HT COM	- Heat Common	—	Factory Wiring
DX	- Direct Expansion	OAT	- Outdoor-Air Thermostat	----	Field Control Wiring
ECON	- Economizer	SAT	- Supply-Air Thermostat		

Fig. 19 — Apollo Communicating Control Wiring



ECON	- Economizer	PL	- Plug	SO	- Sensor, Outdoor
MIN	- Minimum	POS	- Position	SR	- Sensor, Return
P	- Position	S	- Switch, Sensor	TR	- Transformer

Fig. 20 — PARABLADE Economizer Wiring

