2022 Light Commercial Products

Carrier

CE

bryant
Heating & Cooling Systems

CLASS AGENDA

- Light commercial equipment review
- Understanding Carrier Nomenclature
- Installation
- Component setup/operation
  - Central Terminal Board
  - Defrost Board
  - Ignition Gas Control Board
- Troubleshooting

PRODUCT OFFERINGS

Good	**Better**	**Best**
WEATHERMAKER Standard Efficiency	WEATHERMASTER High-Efficiency	WEATHEREXPERT Ultra-High Efficiency
48/50 KC (3-6 ton) 48/50 TC (6-27.5 ton)	48/50 HC (3-25 ton)	48/50 LC (3-5 ton)
Common style CTB and standard drive blower assembly		
48/50 FC (3-6 ton)	48/50 GC (3-5 ton)	48/50 JC (3-5 ton) Variable Speed
Updated CTB and New EcoBlue Blower assembly		

48 means Gas Heat with AC
50 means Elec Heat with AC
Heat Pumps will be **50****Q** example: 50TCQ, 50GCQ, 50FCQ

BRANT SLIDE NEEDS UPDATING PRODUCT OFFERINGS

Good	**Better**	**Best**
Preffer	WEATHERMASTER	WEATHEREXPERT
Standard Efficiency	High-Efficiency	Ultra-High Efficiency
48/50 KC (3-6 ton) 48/50 TC (6-27.5 ton)	48/50 HC (3-25 ton)	48/50 LC (3-5 ton)
Common style CTB and standard drive blower assembly		
48/50 FC (3-6 ton)	48/50 GC (3-5 ton)	48/50 JC (3-5 ton) Variable Speed
Updated CTB and New Axion Blower assembly		

48 means Elec(AC) with Gas
50 means Elec(AC) with Elec heat
Heat Pumps will be **50****Q** example: 50TCQ, 50GCQ, 50FCQ

WHY TECHNICAL SUPPORT NEEDS THE FULL MODEL NUMBER

Model number nomenclature

Carrier

48FC MODEL NUMBER NOMENCLATURE

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Example:	4	8	F	C	D	A	0	4	A	2	A	5	-	0	A	0	A	0

Unit Heat Type
48 – Gas Heat Packaged Rooftop

Model Series - WeatherMaker®
FC – 14.0 SEER Standard Efficiency, sizes 04-06
15.0 IEER Standard Efficiency, size 07

Heat Size
D = Low Gas Heat
E = Medium Gas Heat
F = High Gas Heat
L = Low NOx – Low Gas Heat[1]
S = Low Heat w/ Stainless Steel Exchanger
R = Medium Heat w/ Stainless Steel Exchanger
T = High Heat w/ Stainless Steel Exchanger
(Low NOx models include Stainless Steel HX)

Refrig. Systems Options
A = Standard One Stage Cooling Models[1]
B = Standard One Stage Cooling Models with Humidi-MiZer® system[1, 3]
M = Single Circuit, Two Stage Cooling[2, 3]
N = Single Circuit, Two Stage Cooling with Humidi-MiZer system[2]

Cooling Tons
04 = 3 tons
05 = 4 tons
06 = 5 tons
07 = 6 tons

Sensor Options
A = None
B = Return Air (RA) Smoke Detector
C = Supply Air (SA) Smoke Detector
D = RA + SA Smoke Detector
E = CO_2 Sensor
F = RA Smoke Detector and CO_2 Sensor
G = SA Smoke Detector and CO_2 Sensor
H = RA + SA Smoke Detector and CO_2 Sensor
J = Condensate Overflow Switch
K = Condensate Overflow Switch and RA Smoke Detector
L = Condensate Overflow Switch and RA and SA Smoke Detectors
M = Condensate Overflow Switch and SA Smoke Detector

Indoor Fan Options
1 = Direct Drive – EcoBlue – Standard Static
2 = Direct Drive – EcoBlue – Medium Static
3 = Direct Drive – EcoBlue – High Static

Coil Options – (Outdoor - Indoor - Hail Guard)
A = Al/Cu - Al/Cu
B = Precoat Al/Cu - Al/Cu
C = E-coat Al/Cu - Al/Cu
D = E-coat Al/Cu - E-coat Al/Cu
E = Cu/Cu - Al/Cu
F = Cu/Cu - Cu/Cu
M = Al/Cu -Al/Cu — Louvered Hail Guard
N = Precoat Al/Cu - Al/Cu — Louvered Hail Guard
P = E-coat Al/Cu - Al/Cu — Louvered Hail Guard
Q = E-coat Al/Cu - E-coat Al/Cu — Louvered Hail Guard
R = Cu/Cu - Al/Cu — Louvered Hail Guard
S = Cu/Cu - Cu/Cu — Louvered Hail Guard

Packaging & Seismic Compliance
0 = Standard
1 = LTL

Electrical Options
A = None
C = Non-Fused Disconnect
D = Thru-The-Base Connections
F = Non-Fused Disconnect and Thru-The-Base Connections

Service Options
0 = None
1 = Unpowered Convenience Outlet
2 = Powered Convenience Outlet
3 = Hinged Panels
4 = Hinged Panels and Unpowered Convenience Outlet
5 = Hinged Panels and Powered Convenience Outlet

Intake / Exhaust Options
A = None
B = Temperature Economizer w/ Barometric Relief
F = Enthalpy Economizer w/ Barometric Relief
K = Two-Position Damper[1]
U = Temperature Ultra Low Leak Economizer w/ Barometric Relief
W= Enthalpy Ultra Low Leak Economizer w/ Barometric Relief

Base Unit Controls
0 = Electro-mechanical Controls – can be used with field-installed W7212 EconoMi$er® IV (Non-Fault Detection and Diagnostic)
2 = RTU Open Multi-Protocol Controller
3 = SystemVu™ Controls
6 = Electro-mechanical Controls – can be used with W7220 EconoMi$er X (with Fault Detection and Diagnostic)

Design Revision
- = Factory Design Revision

Voltage
1 = 575/3/60
3 = 208-230/1/60[1]
5 = 208-230/3/60
6 = 460/3/60

[1] Size 04/05/06 models only
[2] Size 07 models only
[3] Units with Humidi-MiZer System include Low Ambient controller

Note: On single phase (-3 voltage code) models, the following are not available as a factory-installed option:
- Humidi-MiZer System
- Two-Position Damper
- Coated Coils or Cu Fin Coils
- Louvered Hail Guards
- Economizer or 2-Position Damper
- Powered 115 Volt Convenience Outlet

MODEL NUMBER NOMENCLATURE

bryant

581K MODEL NUMBER NOMENCLATURE

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Example:	5	8	1	K	E	0	6	N	0	6	7	A	1	A	0	A	A

Unit Type
581 - Gas Heat RTU
Perferred™ Series

Model
K - Puron® (R-410A) Refrigerant

Voltage
E = 460-3-60
J = 208/230-1-60
P = 208/230-3-60
T = 575-3-60

Cooling Tons
04 - 3 tons
05 - 4 tons
06 - 5 tons

Refrig. System/Gas Heat Options
N = Two-Stage cooling models/Single Circuit with Alum Exchanger
P = Two-Stage cooling models/Single Circuit with Low NOx
Q = Two-Stage cooling models/Single Circuit with Stainless Steel Exchanger
R = Two-Stage cooling models/Single Circuit with Alum Exchanger and Perfect Humidity™
S = Two-Stage cooling models/Single Circuit with Low NOx and Perfect Humidity
T = Two-Stage cooling models with Stainless Steel Exchanger and Perfect Humidity
Note: Units with Perfect Humidity include Low Ambient control.
Low NOx models include Stainless Steel HX.

Heat Level Input (Three-Phase)
067 = 67,000
110 = 100,000
150 = 150,000

Heat Level Input (Single-Phase)
065 = 65,000
090 = 90,000
130 = 130,000

Note: On single phase (-J voltage code) models, the following are not available as a factory installed option:
- Perfect Humidity
- Coated Coils or Cu Fin Coils
- Louvered Hail Guards
- Economizer
- Powered 115 Volt Convenience Outlet

Packaging and Control
A = Standard Packaging, electro-mechanical controls, no intake or exhaust option. Will allow for use of all field-installed economizers, manual or 2-position damper.
B = LTL Packaging, electro-mechanical controls, no intake or exhaust option. Will allow for use of all field-installed economizers, manual or 2-position damper.
C = Standard Packaging, electro-mechanical controls that require W7220 EconoMi$er X
F = LTL Packaging, electro-mechanical controls that require W7220 EconoMi$er X

Factory Installed Options
0A = None
NOTE: See the 581K 3 to 5 ton Price Pages for a complete list of factory-installed options.

Outdoor Air Options
A = Electro-mechanical controls. Allows for use of all field-installed economizers and dampers.
B = Temperature Economizer, Barometric Relief, Low Leak (W7220)
E = Temperature Economizer, Barometric Relief, Low Leak w/CO_2 (W7220)
H = Enthalpy Economizer, Barometric Relief, Low Leak (W7220)
L = Enthalpy Economizer, Barometric Relief, Low Leak w/CO_2 (W7220)
U = Temperature Economizer, Barometric Relief, Ultra Low Leak (W7220)
W= Enthalpy Economizer, Barometric Relief, Ultra Low Leak (W7220)

Indoor Fan Options
1 = Standard Static ECM Motor with Axion Fan
2 = Medium Static ECM Motor with Axion Fan
3 = High Static ECM Motor with Axion Fan

Coil Options (RTPF) (Outdoor - Indoor - Hail Guard)
A = Al/Cu - Al/Cu
B = Precoat Al/Cu - Al/Cu
C = E-coat Al/Cu - Al/Cu
D = E-coat Al/Cu - E-coat Al/Cu
E = Cu/Cu - Al/Cu
F = Cu/Cu - Cu/Cu
M = Al/Cu - Al/Cu — Louvered Hail Guard
N = Precoat Al/Cu - Al/Cu — Louvered Hail Guard
P = E-coat Al/Cu - Al/Cu — Louvered Hail Guard
Q = E-coat Al/Cu - E-coat Al/Cu — Louvered Hail Guard
R = Cu/Cu - Al/Cu — Louvered Hail Guard
S = Cu/Cu - Cu/Cu — Louvered Hail Guard

WHAT'S IN THE MODEL NUMBER?

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Example:	5	0	T	C	-	A	0	8	A	1	A	5	-	0	A	0	A	0

1 & 2 Unit Heat Type
- 48 – Gas Heat Packaged Rooftop
- 50 – Electric Heat Packaged Rooftop

3 & 4 Model Series
- TC – Standard Efficiency
- TD – High Efficiency

5 Heat Size Type
- 0 – No Heat

6 Configuration Systems Options
- A – One Stage Cooling
- B – Two Stage Cooling

7 & 8 Cooling Tons
- 08 – 6.5 Tons
- 10 – 8.5 Tons
- 12 – 10 Tons
- 14 – 12.5 Tons
- 16 – 15 Tons

9 Sensor Options
- A – Standard Cooling Models (08-16)
- B – Two Stage Cooling w/ Humidi-Mizer (07 Only)
- C – Two Stage Cooling w/ AI/Cu Cond Coils and Humidi-Mizer

10 Outdoor Fan Options
- A – Direct Drive, Standard Static Option
- B – Belt Drive, Standard Static Option
- C – Direct Drive, High Static Option
- D – Belt Drive, High Static Option

11 Coil Options – RTPF (Outdoor – Indoor – Hail Guard)
- A – Al/Al – Al/Cu
- B – Al/Al –Cu/Cu
- C – Cu/Cu – Al/Cu
- D – E-coat Al/Al – E-coat Al/Cu
- E – Cu/Cu –Al/Cu
- F – Cu/Cu – Cu/Cu
- M – Al/Al – Al/Cu – Louvered Hail Guard
- N – Cu/Cu – Al/Cu – Louvered Hail Guards
- Q – E-coat Al/Cu – E-coat Al/Cu – Louvered Hail Guards
- R – Cu/Cu –Al/Cu – Louvered Hail Guards

11 Coil Options – Novation (Outdoor – Indoor – Hail Guard)
- G – Al/Al – Al/Cu
- H – Al/Al –Cu/Cu
- J – Al/Al – E-coat Al/Cu
- K – E-coat Al/Al –Al/Cu
- L – E-coat Al/Al –E-coat Al/Cu
- T – Al/Al – Al/Cu – Louvered Hail Guard
- U – Al/Al –Cu/Cu – Louvered Hail Guard
- V – Al/Al – E-coat Al/Cu – Louvered Hail Guard
- W – E-coat Al/Al –Al/Cu – Louvered Hail Guard
- X – E-coat Al/Al –E-coat Al/Cu – Louvered Hail Guard

15 Intake / Exhaust Options

14 Base Unit Controls

13 Design Revision

12 Voltage

SERIAL NUMBER BREAKDOWN

1418PXXXXX

The first 4 numbers indicate the week and year the unit was built

General Installation

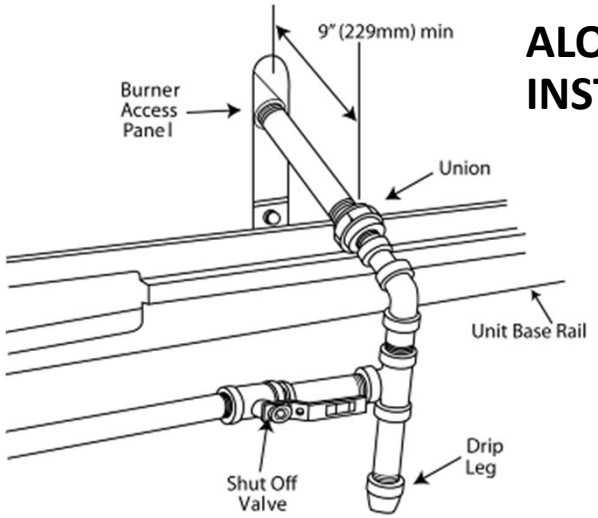
Curb Unit Power and Gas

CURB UNIT ELECTRICAL POWER AND GAS

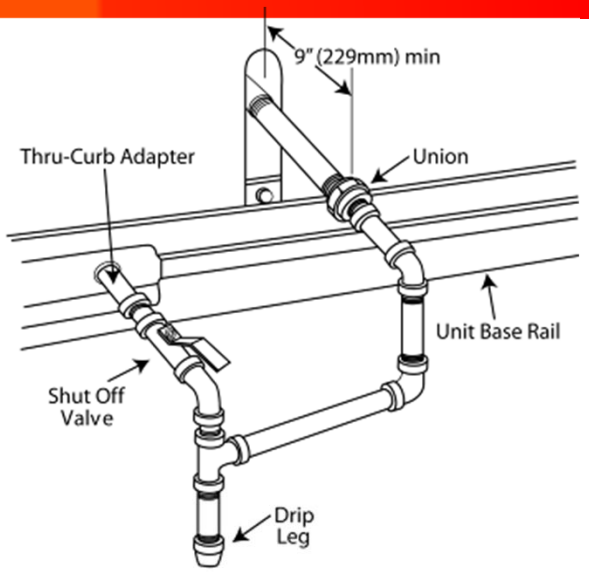
CURB UNIT ELECTRICAL POWER AND GAS

GAS LINE ROUTING

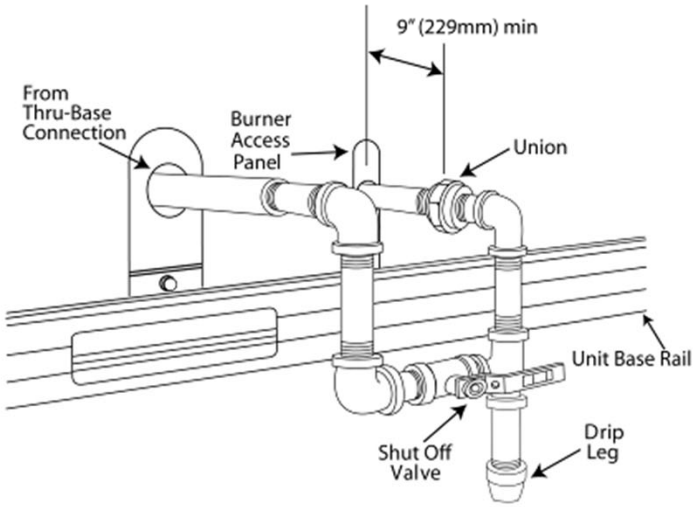
ALONG-THE-ROOF INSTALLATION



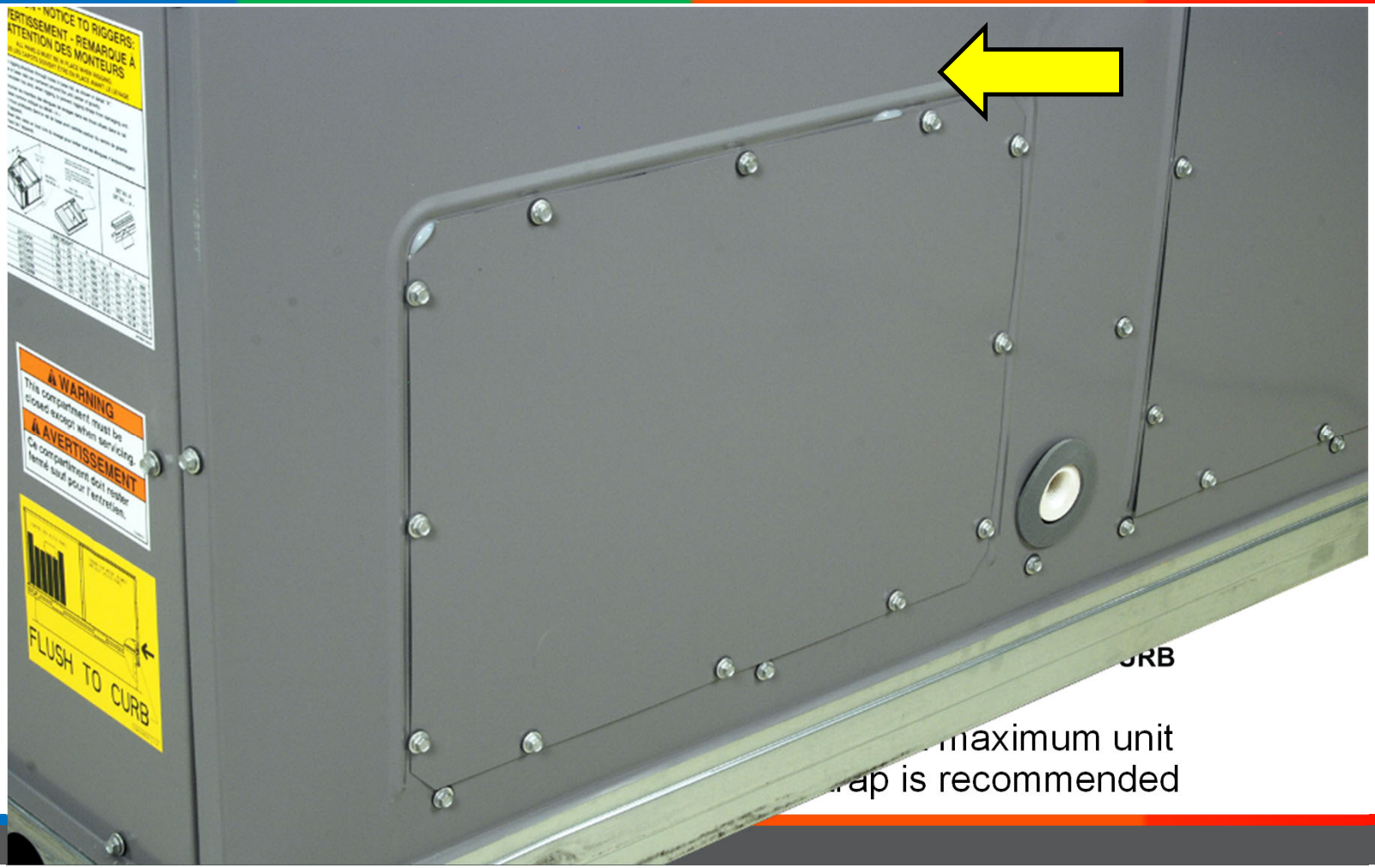
THRU-CURB INSTALLATION



THRU-BASE INSTALLATION

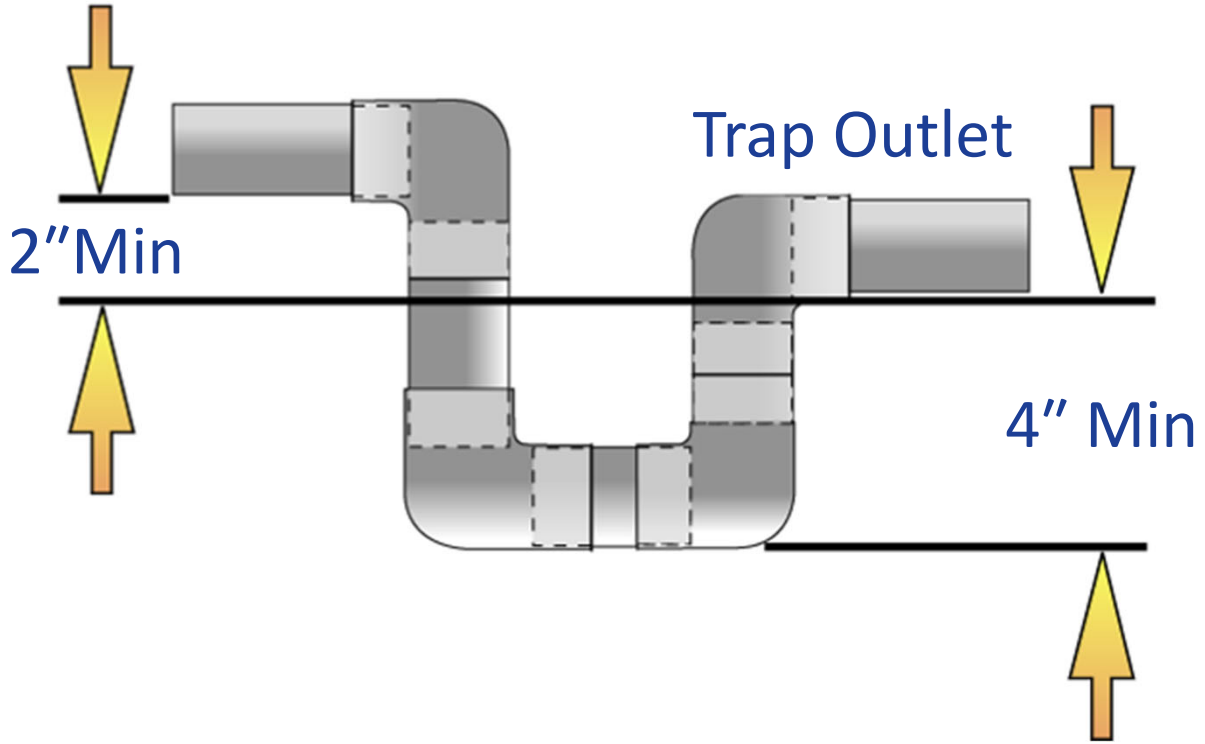


CONDENSATE DRAINAGE



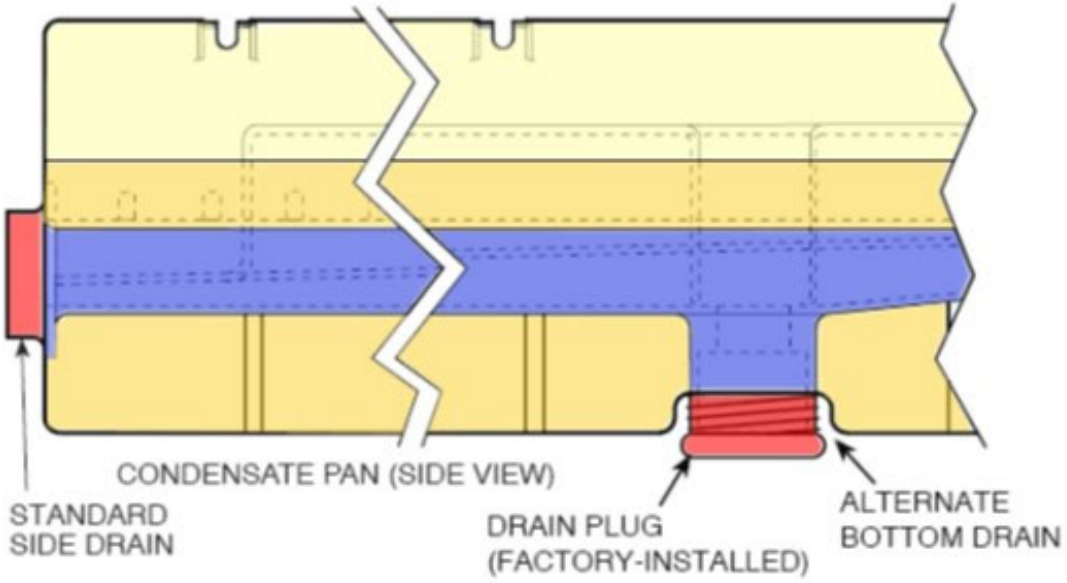
CONDENSATE DRAIN PIPING DETAIL

Condensate Trap (Using PVC)



CONDENSATE DRAIN PIPING DETAIL

Condensate Bottom Drain



COMMERCIAL SPLITS

Heat Pump
38AUQ

Air Conditioner
Single Stage
38AUZ

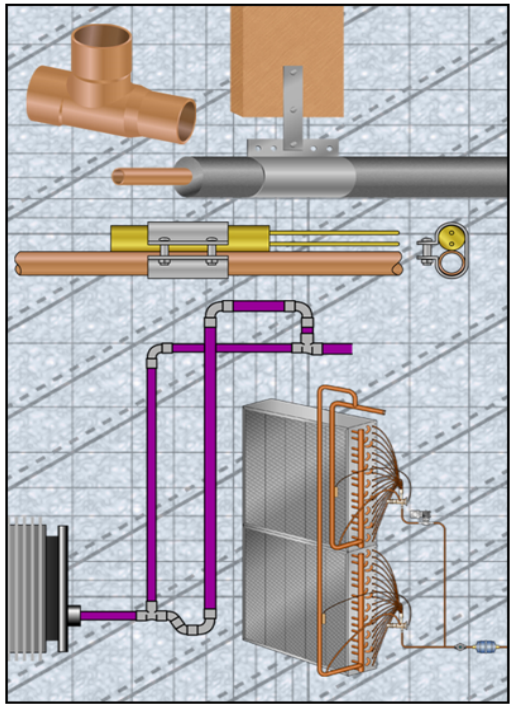
Air Conditioner
2-Stage Stage
38AUD

COMMERCIAL SPLITS

Heat Pump Air Handler
40RUQ

Cooling Only Air Handler
40RUA

COMMERCIAL SPLITS



Refrigerant
Piping
Systems

COMMERCIAL SPLITS

Refrigerant Piping Concerns

- Application
- Length of Piping
- Routing & Obstacles
- Pressure Drop vs. Capacity Loss
- Oil Return at Minimum Capacity
- System Charge
- Liquid at the metering device
- Protect the compressor
  - Liquid slugging oil & refrigerant
  - Off-cycle protection

COMMERCIAL SPLITS

Improper line size can cause problems

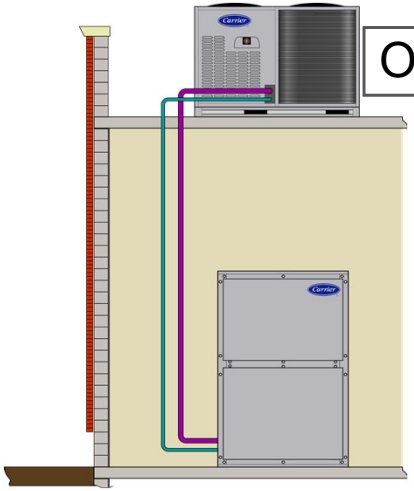
- Compressor Failures
  - Floodback
  - Slugging
  - Oil Loss
  - Overheating
- Poor Evaporator Performance
  - Flash Gas At TXV
  - Low SST’s
  - Frosting

COMMERCIAL SPLITS

1. Keep it simple, keep it short
2. Size piping based on the best compromise of pressure loss and cost
3. Design for oil return in vapor lines at minimum load conditions
4. Avoid oil and liquid refrigerant traps
5. Design for liquid at the expansion valve
6. Limit system charge to 4 lbs./ton
7. Support the piping adequately
8. Provide valves and access fittings for service
9. Insulate piping where needed

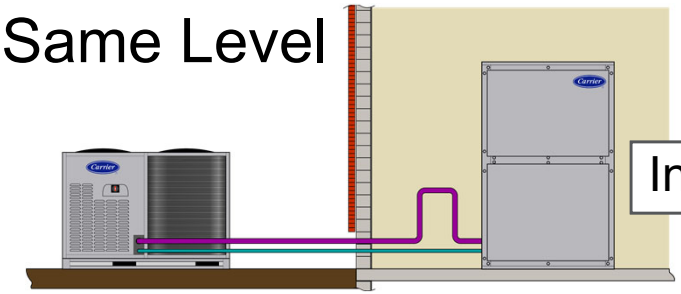
COMMERCIAL SPLITS

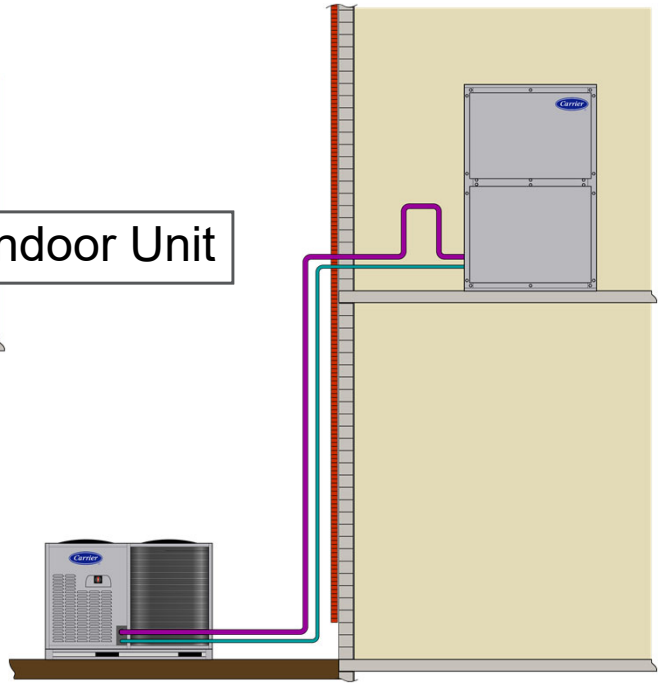
TYPICAL ORIENTATIONS



Compressor Above

Same Level



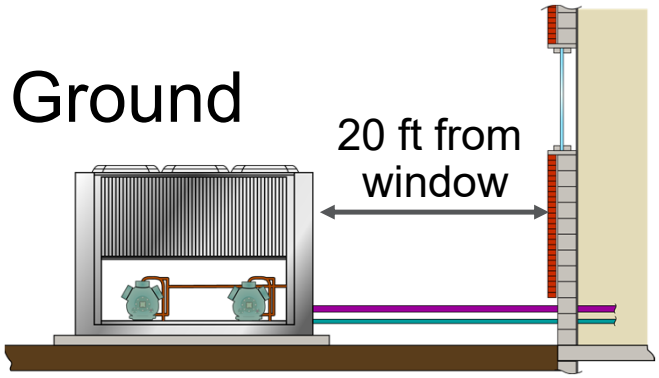


Compressor Below

COMMERCIAL SPLITS

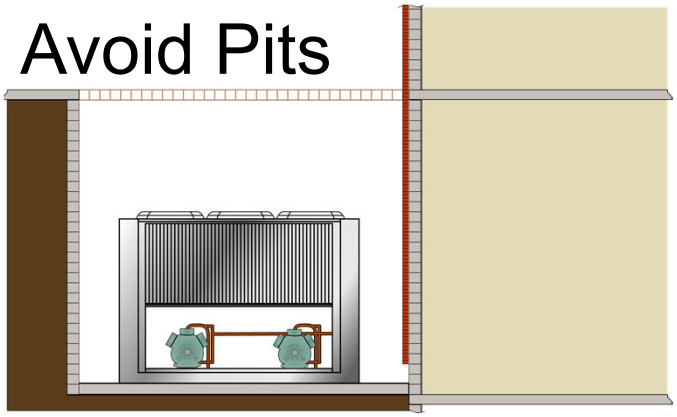
OUTDOOR LOCATIONS

Ground

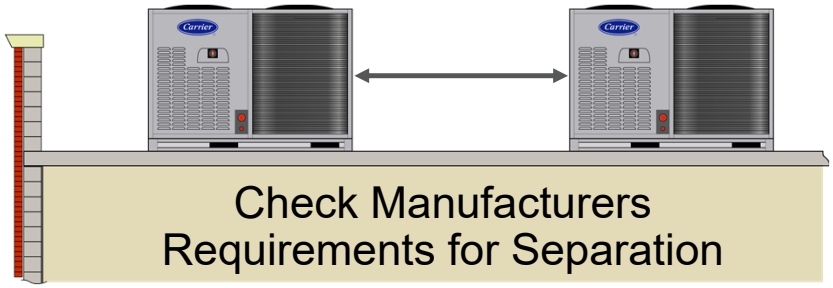


Do Not Bury Lines!

Avoid Pits



Roof



Check Manufacturers
Requirements for Separation

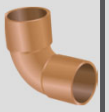
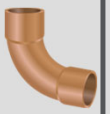
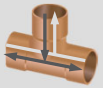
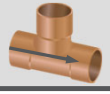
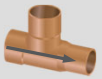
COMMERCIAL SPLITS

Max. Piping Length depends on the application

- Always keep both run and lift as short as possible.
- Air conditioning systems.
  - Maximum run 200 linear feet
  - Maximum lift depends unit model and refrigerant
- Heat pumps – 100 linear feet maximum.
- Equivalent feet = Linear feet of pipe + Equivalent feet of fittings, valves and specialties.
- Consult Product Data and Installation Instructions for piping recommendations.
  - Use System Design Manual, ASHRAE design guide or Refrigerant Piping Design program for special applications or to verify if existing piping is adequate.

COMMERCIAL SPLITS

FITTING PRESSURE DROP

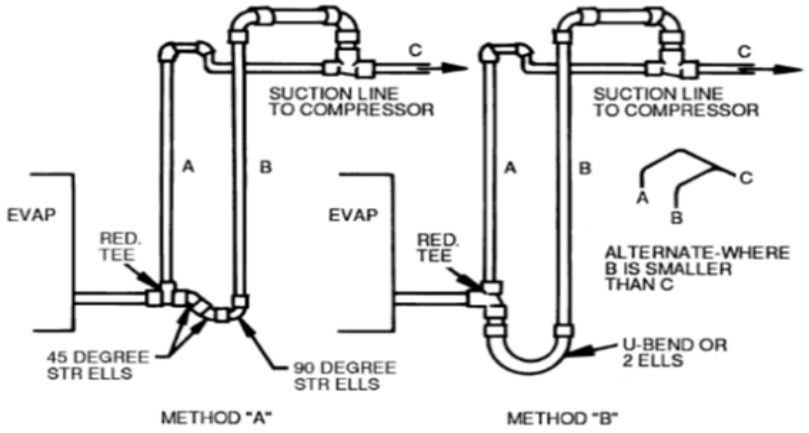
Normal Pipe or Tube Size (in.)	Smooth Bend Elbows						Smooth Bend Tees			
	90° Std* 	90° Rad. † 	90° Street* 	45° Std* 	45° Street* 	180° Std* 	Flow-Thru Branch 	Straight-Thru Flow		
								No Reduction 	Reduced ¼ 	Reduced ½ 
3/8	1.2	0.8	2.1	0.6	0.9	2.1	2.4	0.8	1.0	1.2
1/2	1.4	0.9	2.3	0.7	1.1	2.3	2.7	0.9	1.2	1.4
5/8	1.6	1.0	2.5	0.8	1.3	2.5	3.0	1.0	1.4	1.6
3/4	1.8	1.2	2.9	0.8	1.4	2.8	3.5	1.2	1.7	1.8
7/8	2.0	1.4	3.2	0.9	1.6	3.2	4.0	1.4	1.9	2.0
1 1/8	2.6	1.7	4.1	1.3	2.1	4.1	5.0	1.7	2.2	2.6
1 3/8	3.3	2.3	5.6	1.7	3.0	5.6	7.0	2.3	3.1	3.3
1 5/8	4.0	2.6	6.3	2.1	3.4	6.3	8.0	2.6	3.7	4.0
2 1/8	5.0	3.3	8.2	2.6	4.5	8.2	10.0	3.3	4.7	5.0
2 5/8	6.0	4.1	10.0	3.2	5.2	10.0	12.0	4.1	5.6	6.0
3 1/8	7.5	5.0	12.0	4.0	6.4	12.0	15.0	5.0	7.0	7.5
3 5/8	9.0	5.9	15.0	4.7	7.3	15.0	18.0	5.9	8.0	9.0
4 1/8	10.0	6.7	17.0	5.2	8.5	17.0	21.0	6.7	9.0	10.0
5 1/8	13.0	8.2	21.0	6.5	11.0	21.0	25.0	8.2	12.0	13.0
6 1/8	16.0	10.0	25.0	7.9	13.0	25.0	30.0	10.0	14.0	16.0

COMMERCIAL SPLITS

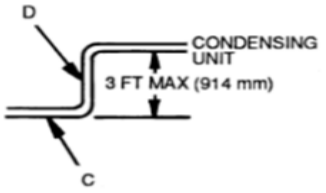
- Suction Line Design
  - Keep It Short and Simple
  - Do not use oversized vapor lines or exceed maximum lengths.
  - In many situations a smaller size can be used without the increased pressure drop having significant impact on the system performance.
  - Pitch horizontal lines minimum 1/8 inch per foot in the direction of flow.
  - Use Suction Loop At Evaporators When Compressor Is Below To Prevent Drainage to Compressor

COMMERCIAL SPLITS

Double Suction Riser Detail



Method B not recommended



LEGEND

A	—	Pipe A, Suction Riser, without Trap
B	—	Pipe B, Suction Riser with Trap
C	—	Suction Line to Condensing Unit
D	—	Pipe D, Suction Riser Short Lift
RED.	—	Reducer
STR	—	Street

NOTES:
1. Short riser, pipe D, is used when routing suction line to condensing unit connection. See table at right.
2. See Tables 6A-9B for values of A, B, and C.

UNIT 38AH	PIPE D DIAMETER					
	Dual Circuit*				Single Circuit*	
	A		B			
	in.	mm	in.	mm	in.	mm
044	1 5/8	41	1 5/8	41	2 1/8	54
054	1 5/8	41	1 5/8	41	2 1/8	54
064	1 5/8	41	2 1/8	54	2 1/8	54
074	2 1/8	54	2 1/8	54	2 1/8	54
084	2 1/8	54	2 1/8	54	2 5/8†	67†
094, 104	2 1/8	54	2 1/8	54	—	—
124, 134	2 5/8	67	2 5/8	67	—	—

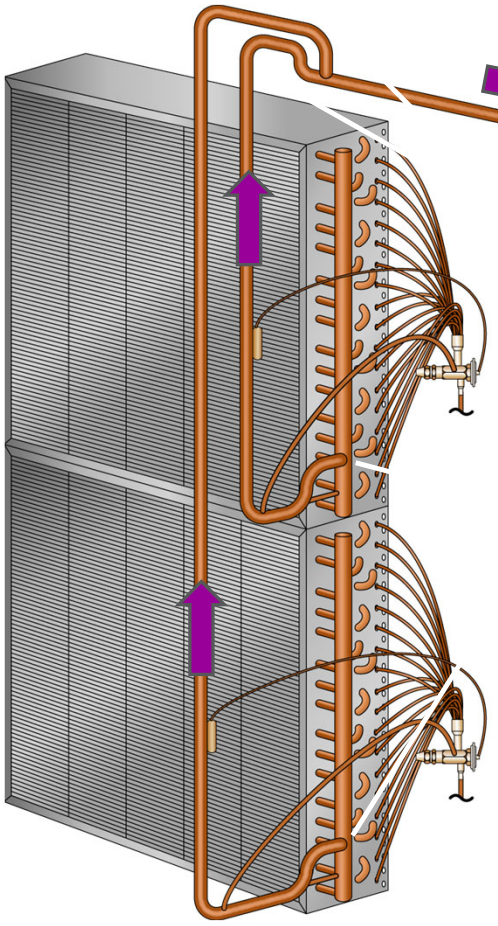
*Maximum length of riser is 3 ft (914 mm).
†Double suction riser required if accessory unloader is field installed.

Fig. 15 — Double Suction Riser Construction

COMMERCIAL SPLITS

OFF-CYCLE PROTECTION

Multiple Evaporators
On Common Suction Line



COMMERCIAL SPLITS

WATCH OUT FOR SUCTION LINE TRAPS

When using the existing refrigerant piping from systems that used older reciprocating compressors the oil volume on many reciprocating compressors was around 2 gallons and the scrolls used today only hold around a ½ a gallon of oil and if there are existing trap's they can cause lack of oil return and premature compressor failures.

COMMERCIAL SPLITS

- Suction Line Design
  - TXV Bulb Location Is Critical
    - Do Not Install On Common Line Of Multiple Circuit Evaporators
    - Install on Vertical Line After Two Elbows To Ensure Good Mixing
  - DO NOT Bury Refrigerant Lines!
  - Accumulators Are Required In Long Line, VAV, VVT and Other High-Risk Applications
  - Vibration Eliminators are Not Recommended.

COMMERCIAL SPLITS

SUCTION LINE SUMMARY

1. Keep the path as short and simple as possible.
2. Design lines for a 2°F line loss. Remember this is only a guideline for sizing. In many situations a smaller size can be used without the increased pressure drop having significant impact on the system performance.
3. Check for oil return at the minimum load condition.
    a. Use a reduced riser size first, if does not work then use a double suction riser.
4. Pitch horizontal lines minimum 1/8 inch per foot in the direction of flow.
5. Loop the piping to prevent drain back to the compressor in the off cycle.
6. Do not put in intermediate traps in the risers or a trap at the base of a suction riser.
7. Insulate the entire suction line.
8. Provide valves to isolate the line for compressor service and provide gauge ports.
9. Install suction accumulator where necessary.

COMMERCIAL SPLITS

Liquid Line Design

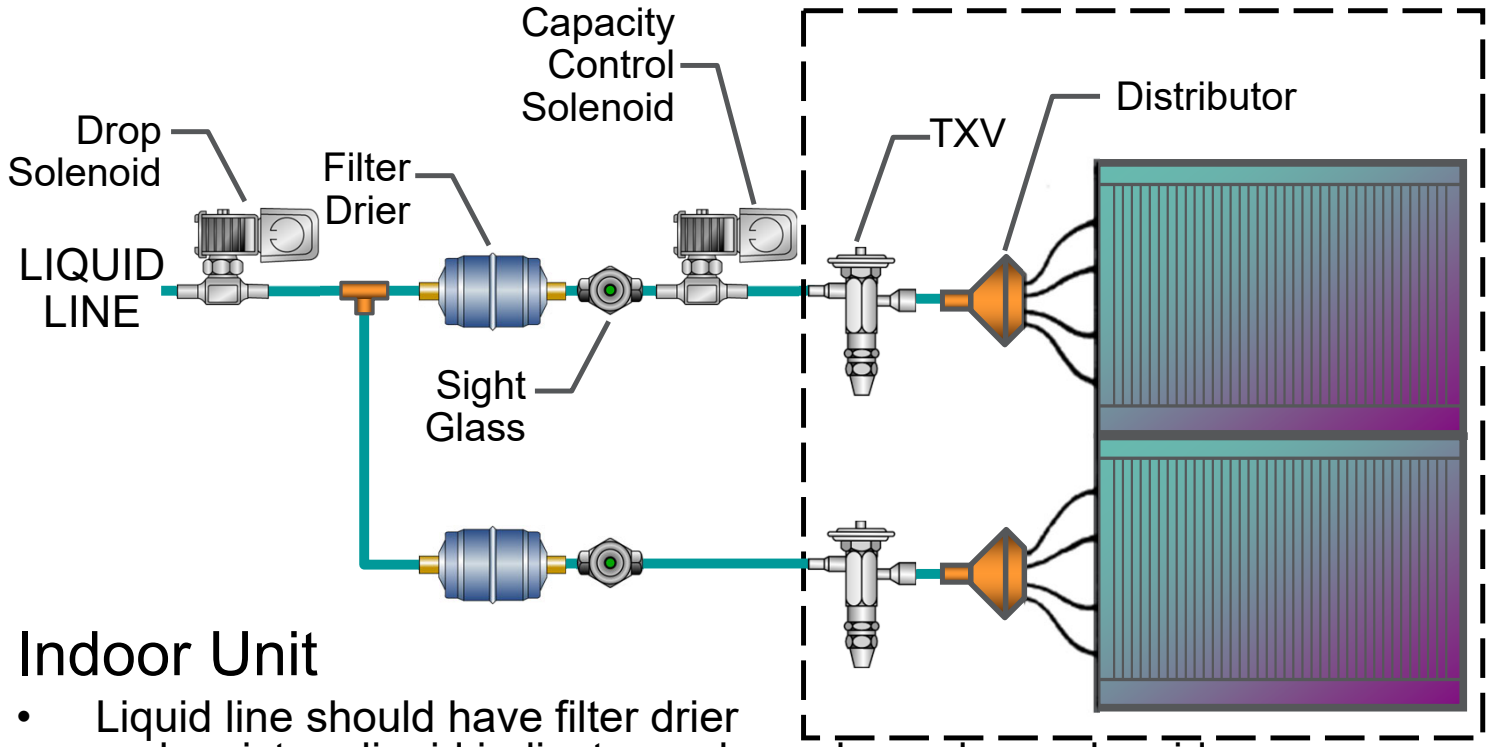
- Horizontal liquid lines can run parallel to the suction line.
- Do not exceed liquid lift recommendations
  - Risk of flashing before reaching the TXV
  - Loss of capacity
  - Increased head pressure due to static head
- Smaller is better!
  - Use smallest line to reduce refrigerant charge.

COMMERCIAL SPLITS

Install Liquid Line Solenoid Valves —

It is recommended that a bi-directional solenoid valve be placed in the main liquid line (see Figs. 5 & 6) between the outdoor unit and the indoor coil. Locate the solenoid valve at the end of the liquid line, near the outdoor unit connections, with flow direction arrow pointed at the outdoor unit. Refer to Table 5. (A liquid line solenoid valve is required when the liquid line length exceeds 75 ft [23 m].) This valve prevents refrigerant migration (which causes oil dilution) to the compressor during the off cycle, at low outdoor ambient temperatures. Wire the solenoid according to the unit label diagram.

COMMERCIAL SPLITS

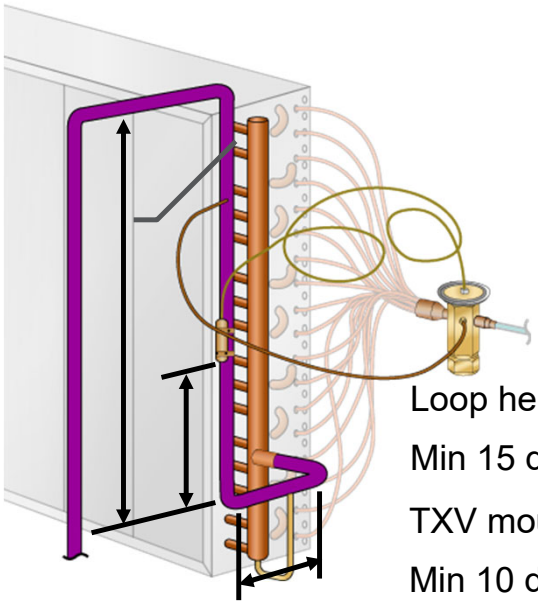


Indoor Unit

- Liquid line should have filter drier and moisture liquid indicator and may have drop solenoid
- With two circuits, units are equipped with capacity control valve(s)

COMMERCIAL SPLITS

MOUNTING TXV BULB ON SUCTION LINE



Loop height

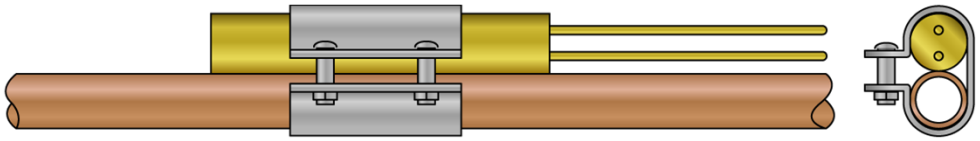
Min 15 diameter

TXV mounting

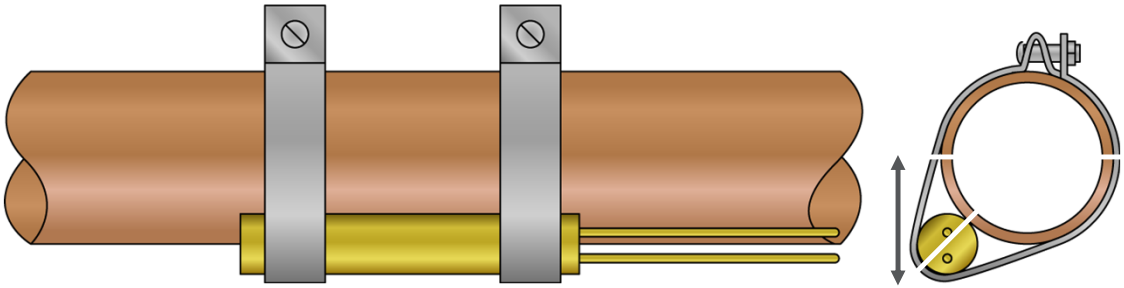
Min 10 diameter

Horizontal run

Min 8 diameter



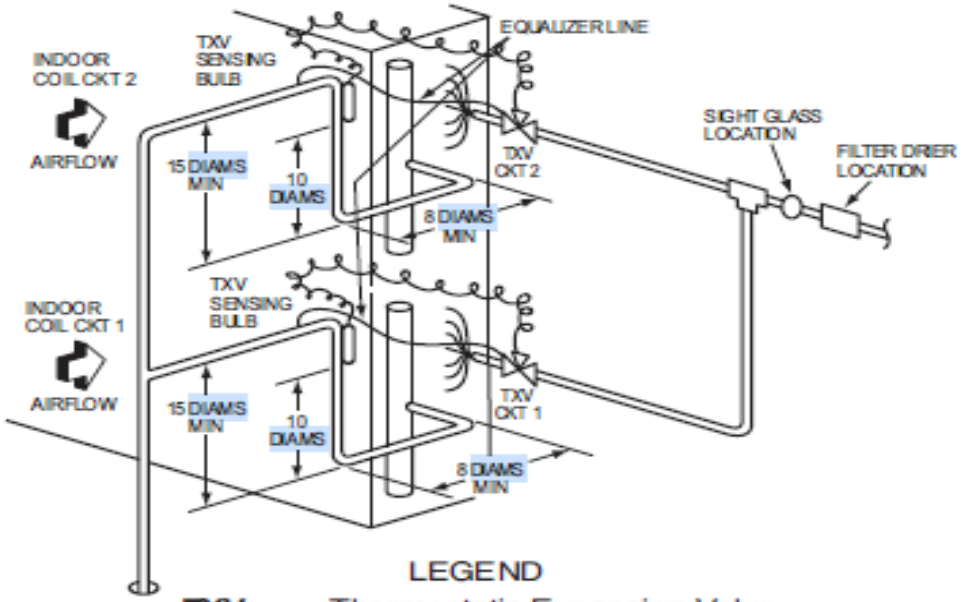
Remote Bulb on Small Suction Line (Less than 7/8 in.)



Remote Bulb on Large Suction Line (7/8 in. and Larger)

COMMERCIAL SPLITS

- Please fully read the installation manual
- Correct piping is very critical



C11037

Fig. 6 - Location of Sight Glass(es) and Filter Driers (typical 38AUQ size 12)

COMMERCIAL SPLITS

- Factory charge is 9lbs Refrigerant must be added. Subtract 9lbs from Charge and add for lineset

Table 2 – 38AUQ*07-12 Piping Recommendations (Single-Circuit Unit)

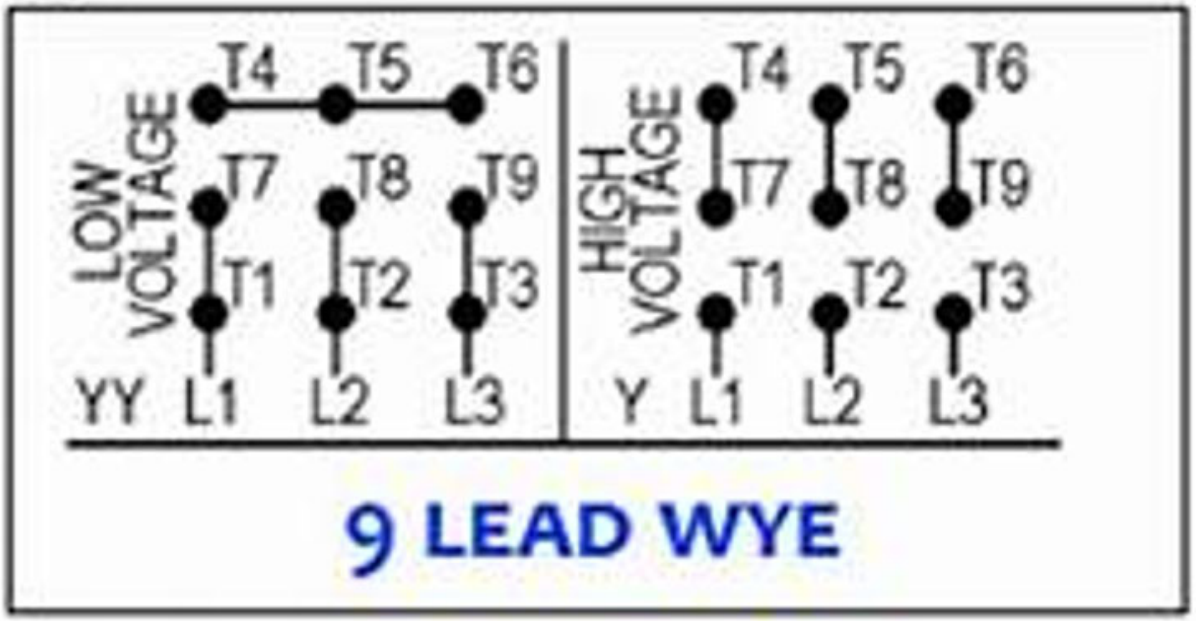
R-410A	Equivalent Length							
	Ft	0-38		38-75		75-113		113-150	
Model **Nominal Capacity**	Length Linear Length Equiiv	0-25 0-38		25-50 38-75		50-75 75-113		75-100 113-115	
38AUQ*07	Liquid Line	3/8		3/8		3/8	1/2	3/8	1/2
	Max Lift Cool Heat	 25 25		 50 50		 48 46	 75 60	 39 31	 100 60
	Vapor Line	7/8		7/8		1-1/8		1-1/8	
	Charge (lbs)	17.8		18.8		20.3	22.6	21.4	24.5
38AUQ*08	Liquid Line	1/2		1/2		1/2		1/2	
	Max Lift Cool Heat	 25 25		 50 50		 75 60		 100 60	
	Vapor Line	7/8	1-1/8	1-1/8		1-1/8		1-1/8	
	Charge (lbs)	20.9		23.0		24.9		26.8	

COMMERCIAL SPLITS

- 40RUA air handler is cooling only
- 40RUQ air handler for heat pump applications
- Unit voltages 208/230/460
- Motors come wired for 460
- 208/230 applications you must wire 9 lead motor for low voltage operation.

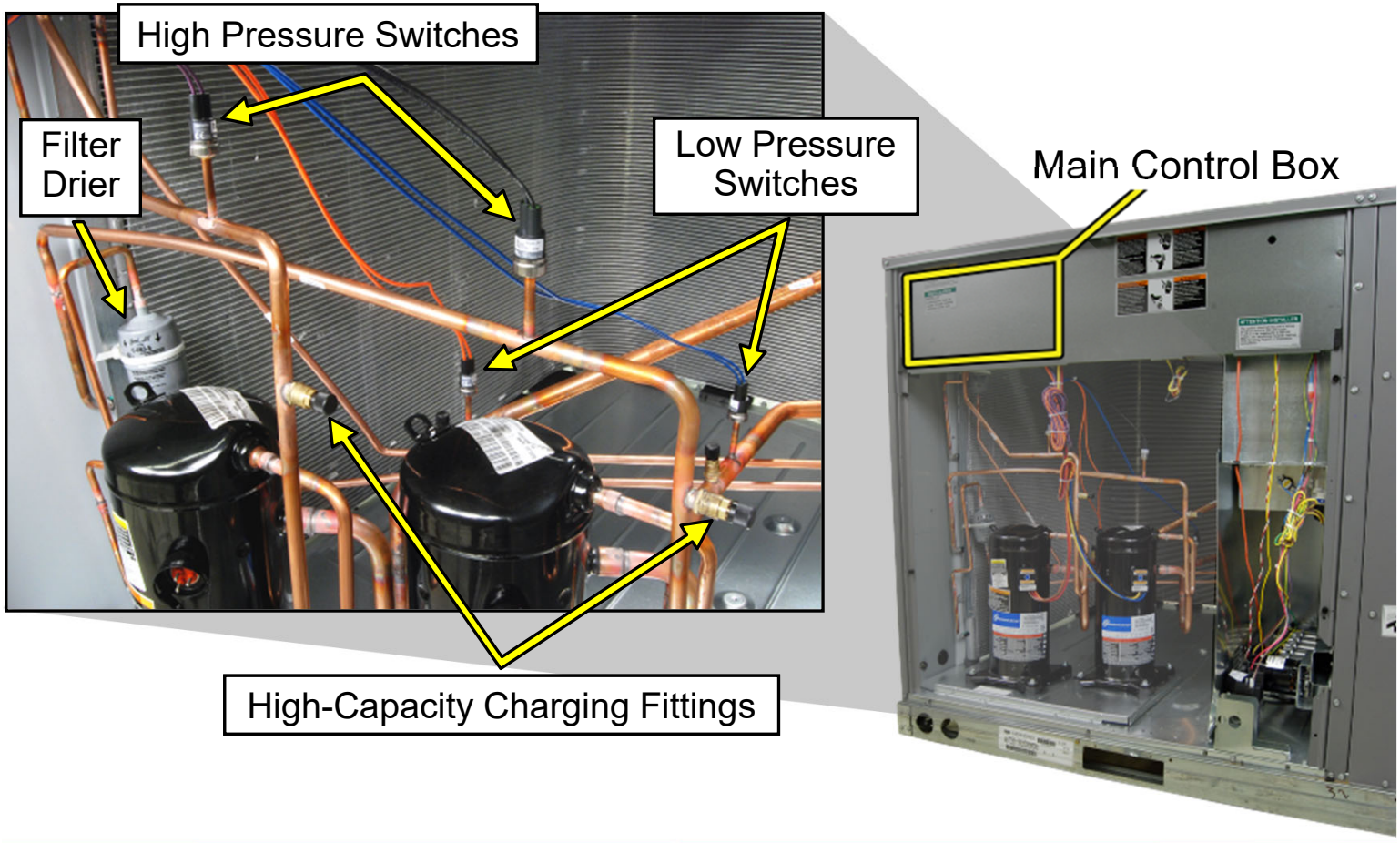
COMMERCIAL SPLITS

- 9 Lead Motor wiring

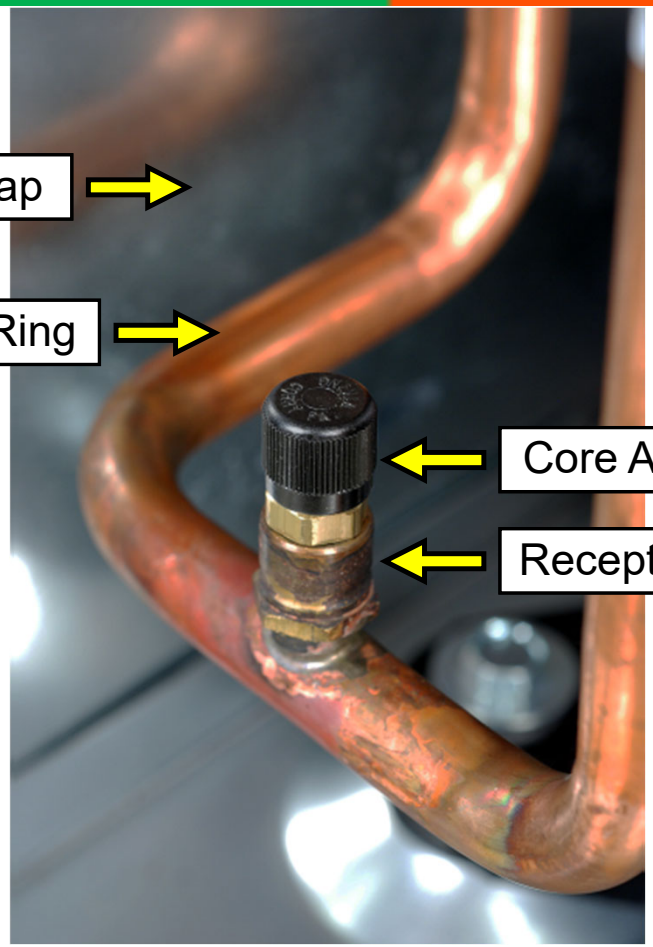


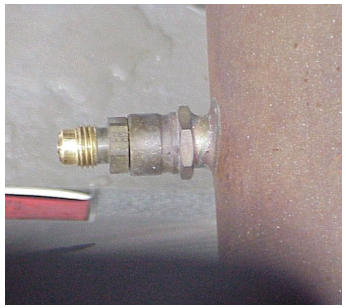
General System Layout & Components

COMPRESSOR SECTION



SYSTEM SERVICE PORTS





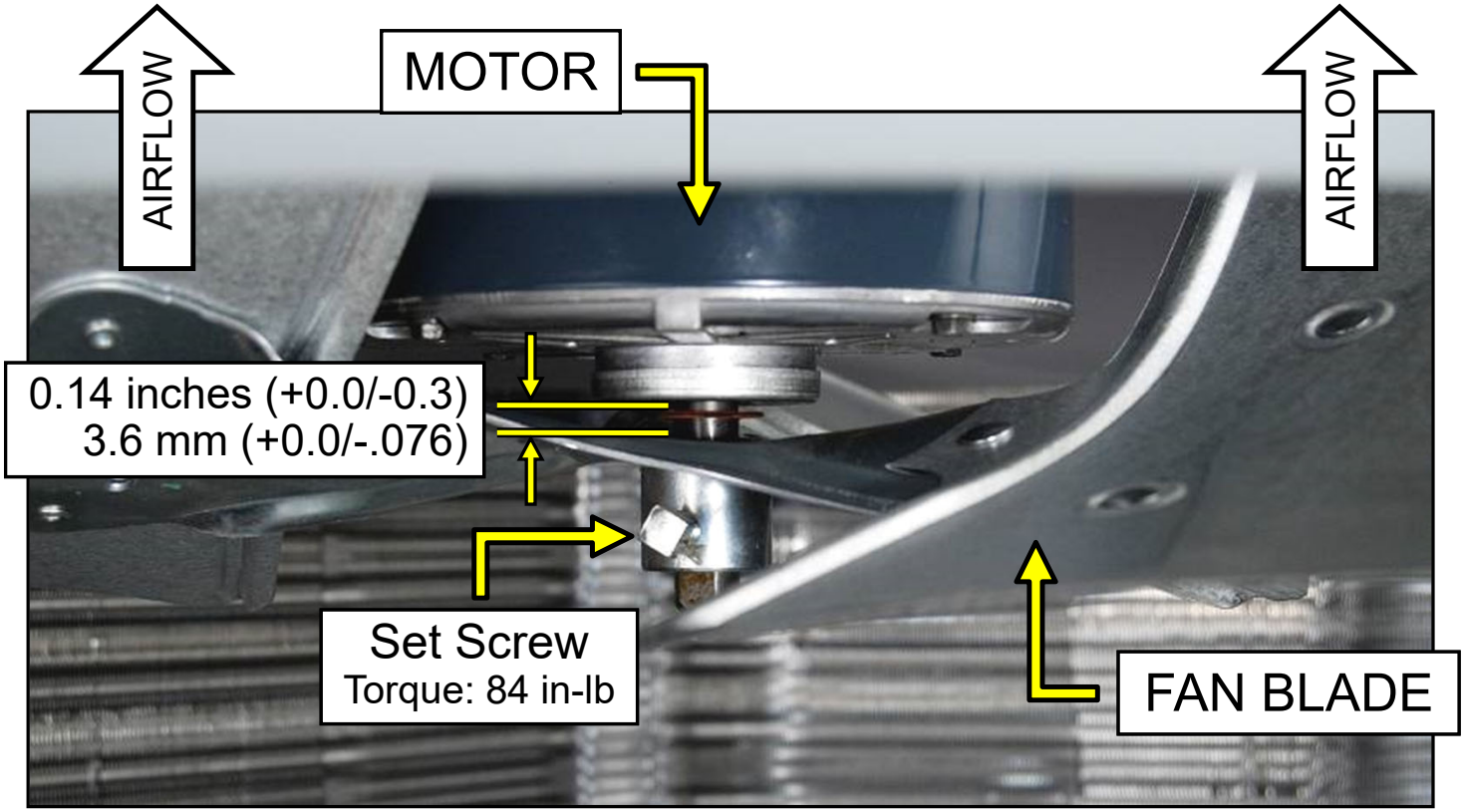
Coremax Type High Flow Access Valve

The cap goes on the ports when not in use.

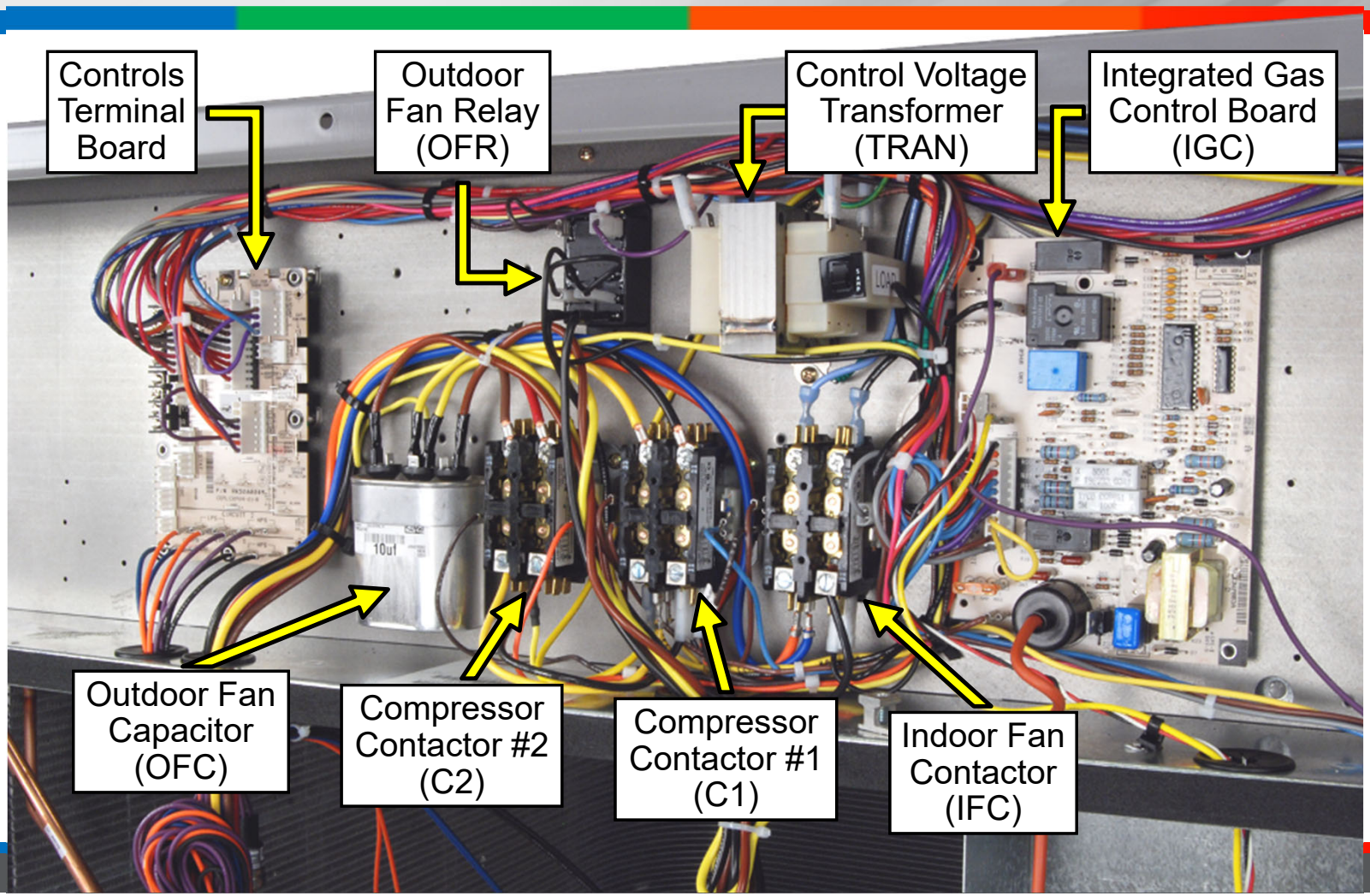
HIGH-PRESSURE SWITCH

LOW-PRESSURE SWITCH

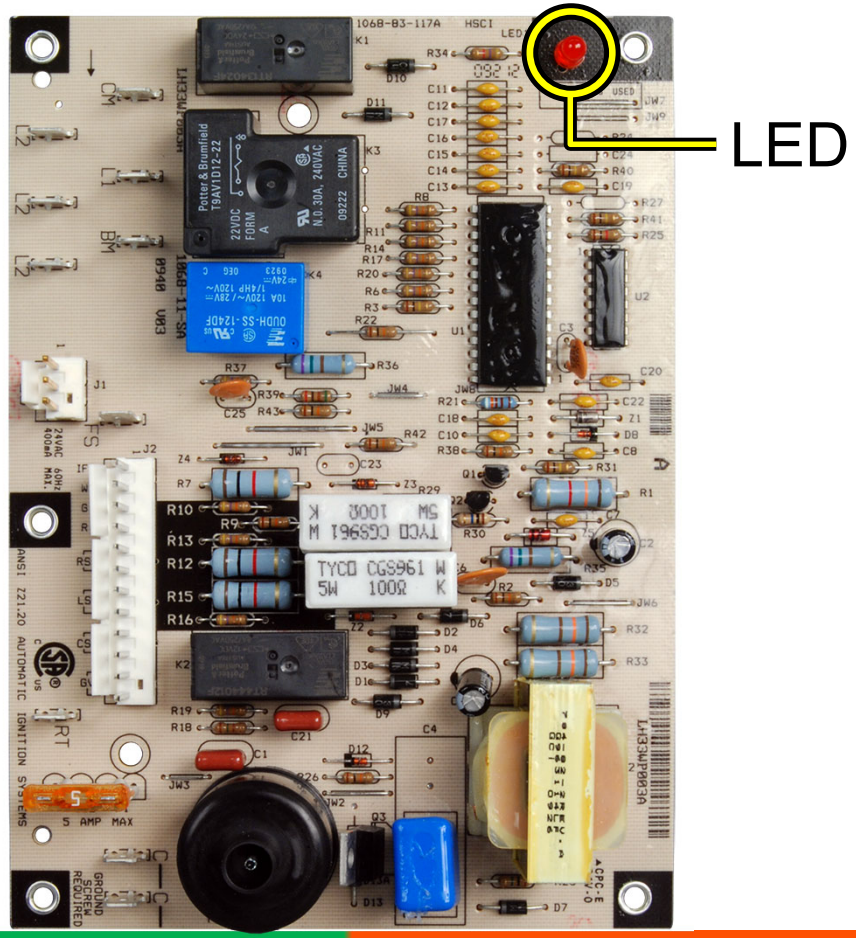
CONDENSER FAN



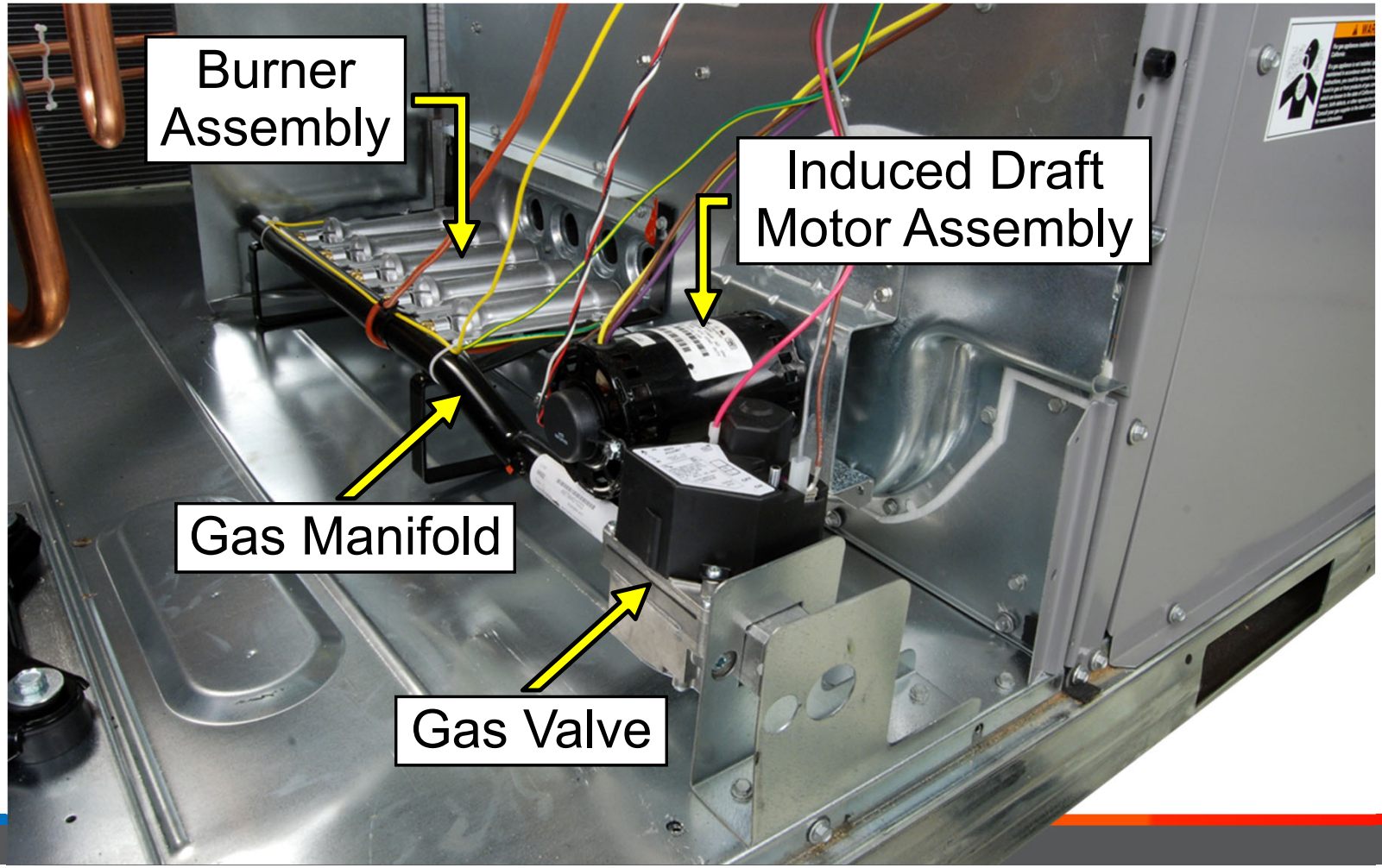
GAS HEAT CONTROL BOX



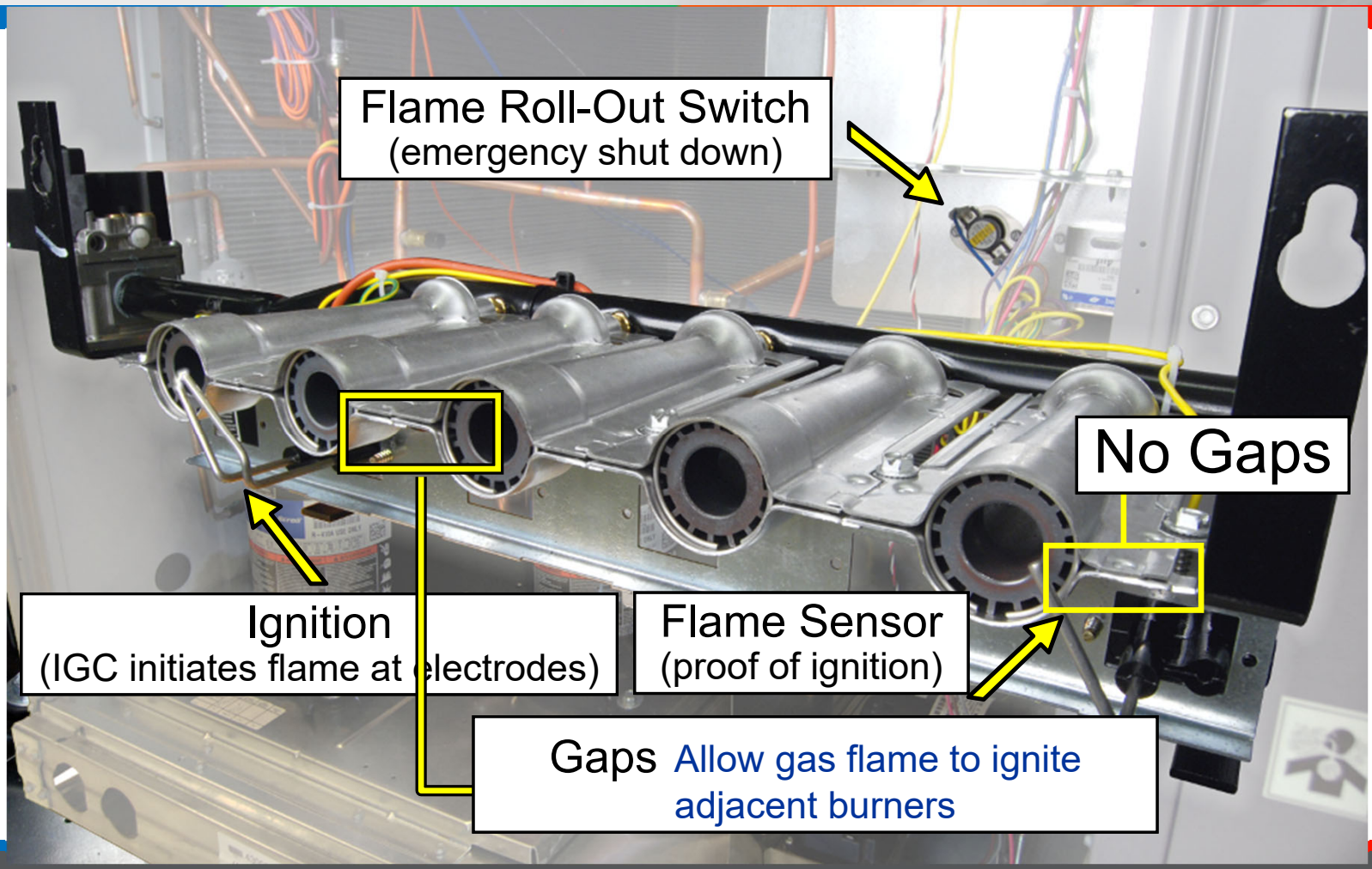
INTEGRATED GAS CONTROL BOARD



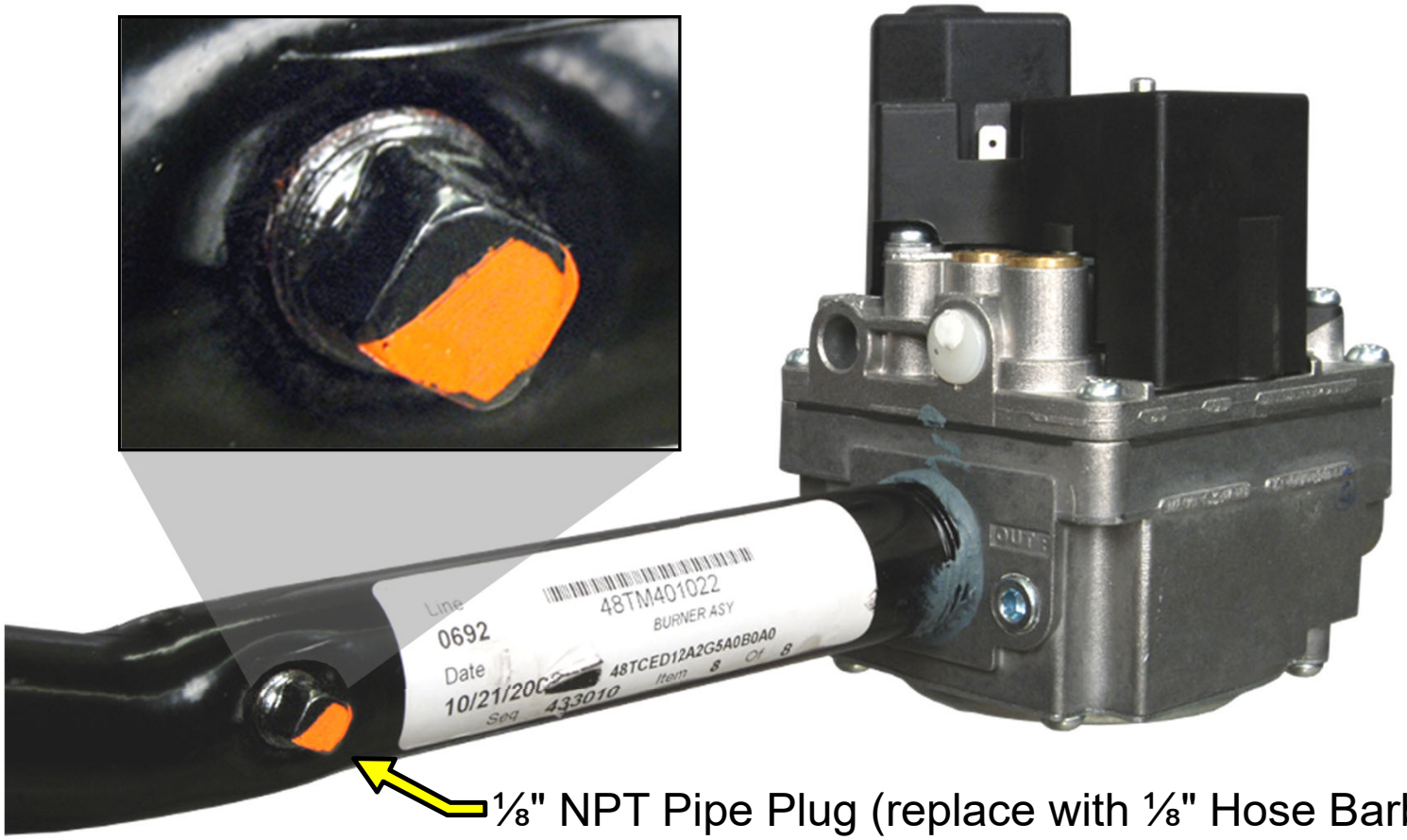
GAS HEAT SECTION



BURNER ASSEMBLY

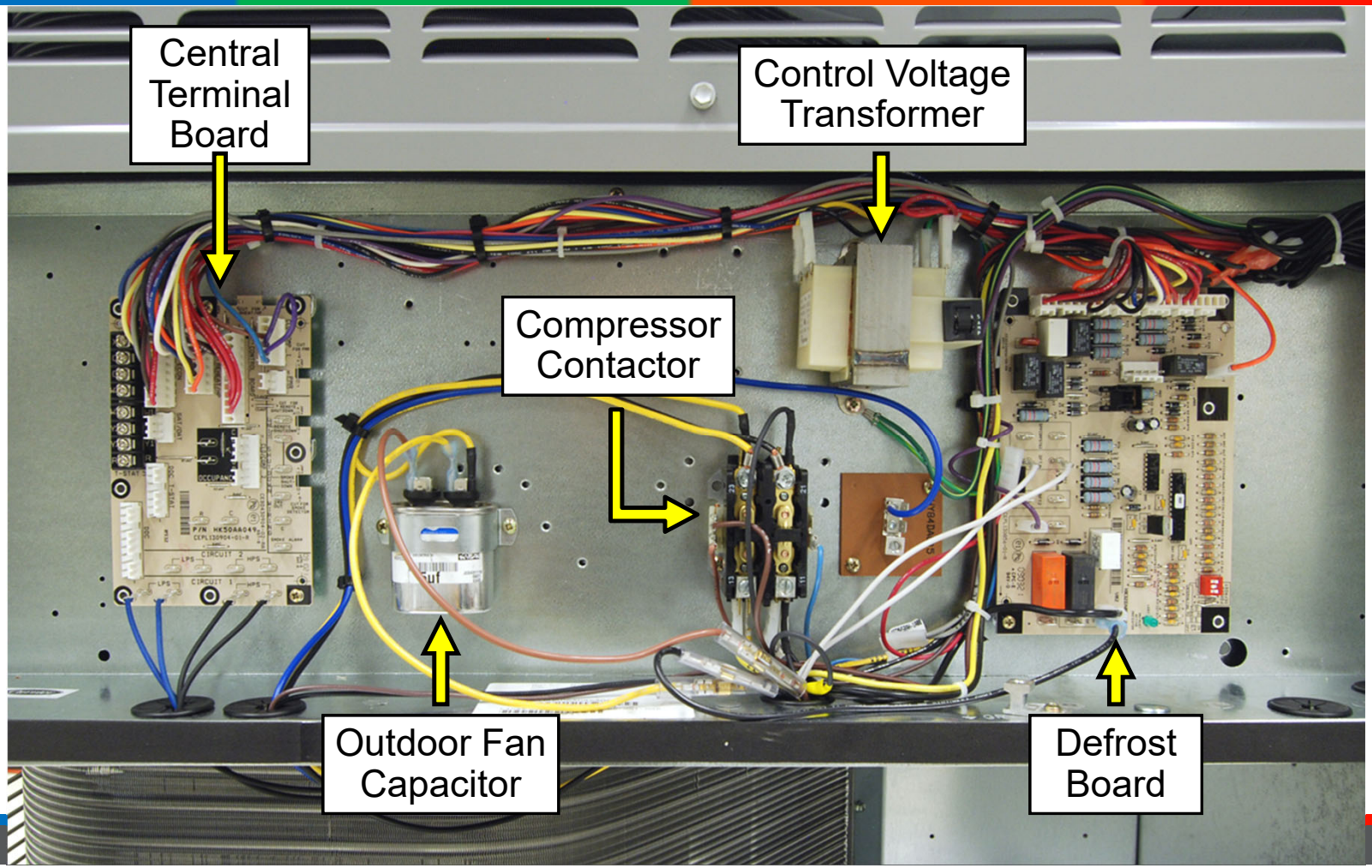


MEASURING MANIFOLD PRESSURE

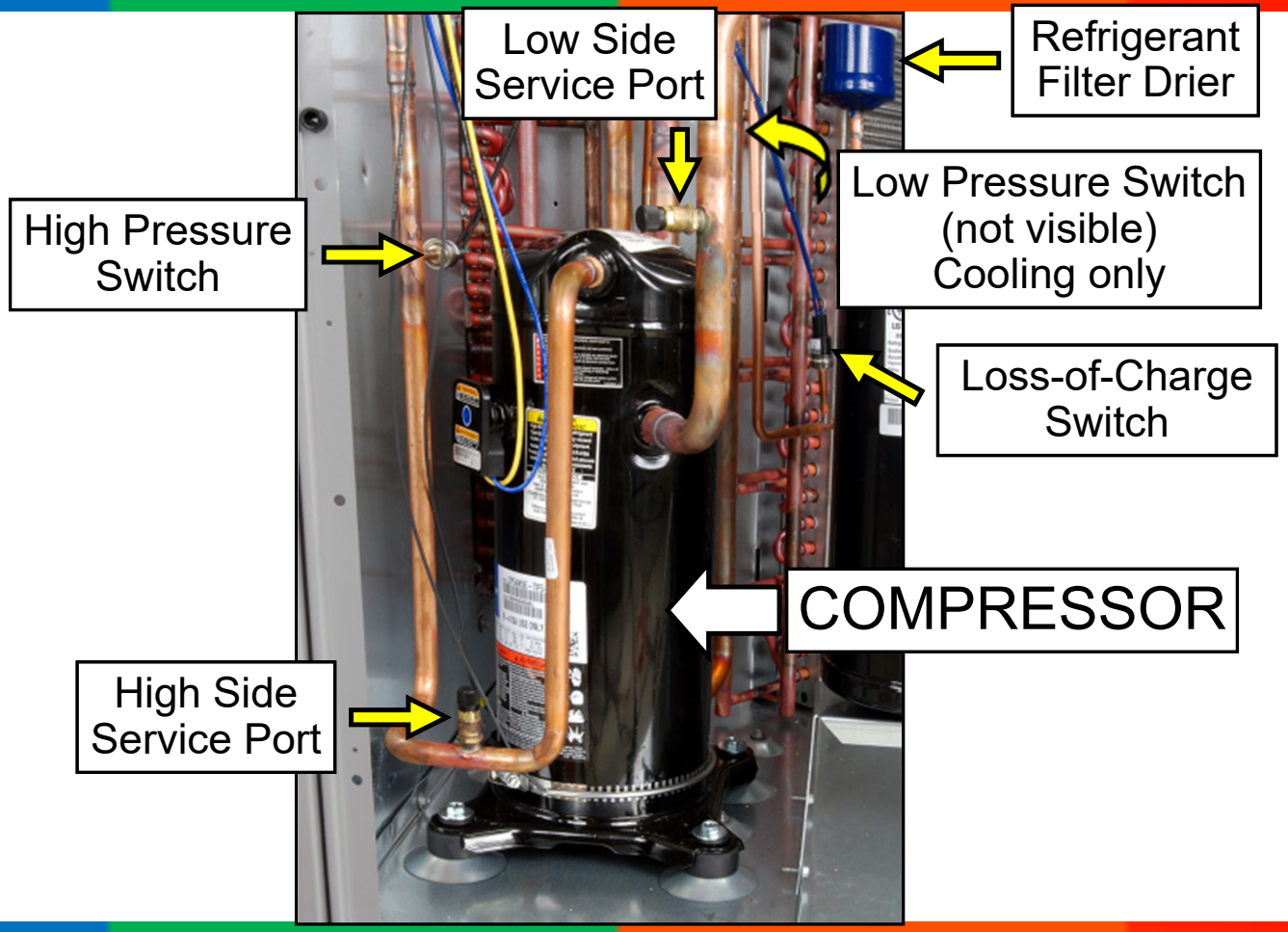


⅛" NPT Pipe Plug (replace with ⅛" Hose Barb)

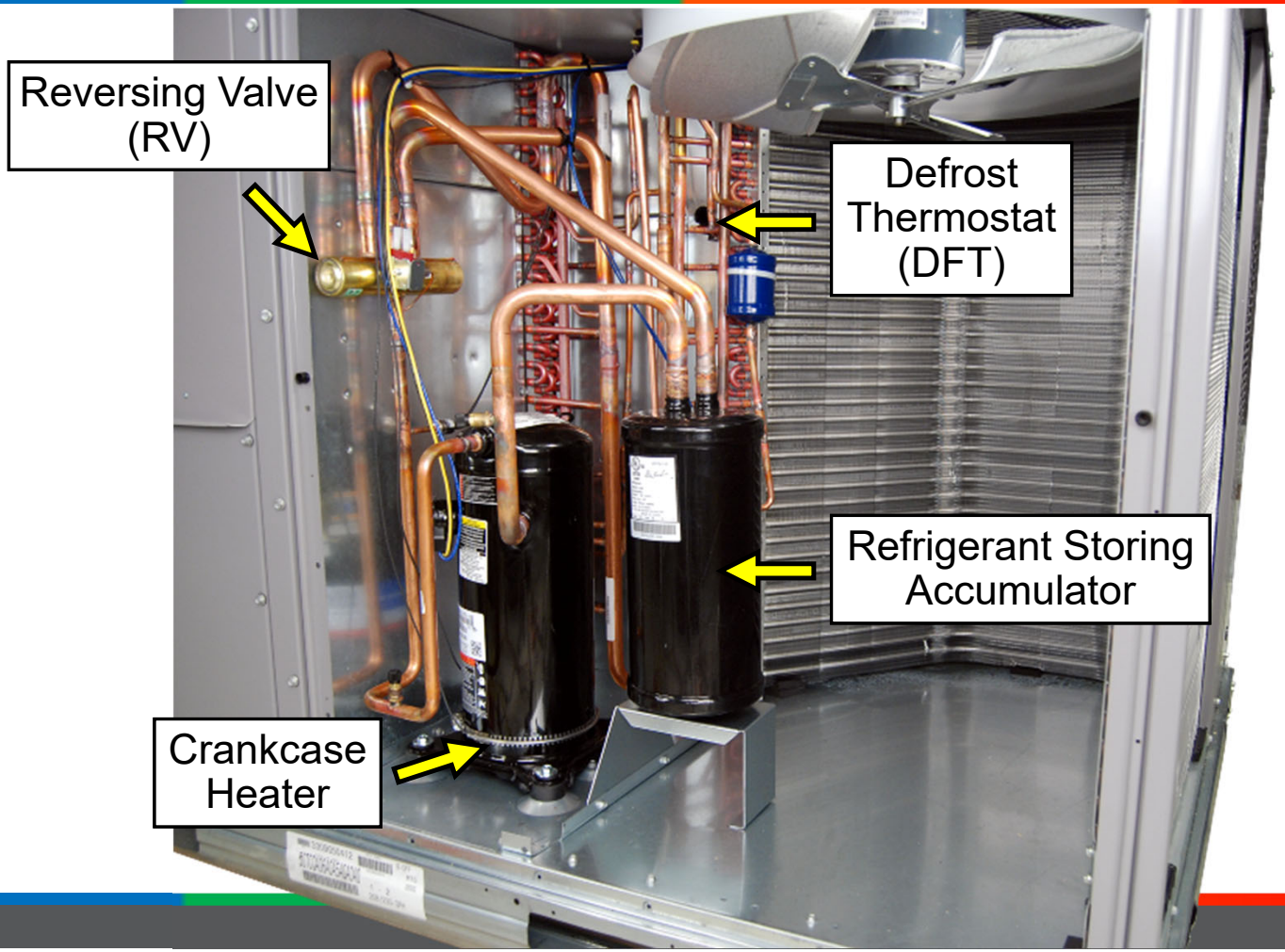
HEAT PUMP CONTROL BOX



HEAT PUMP COMPONENTS

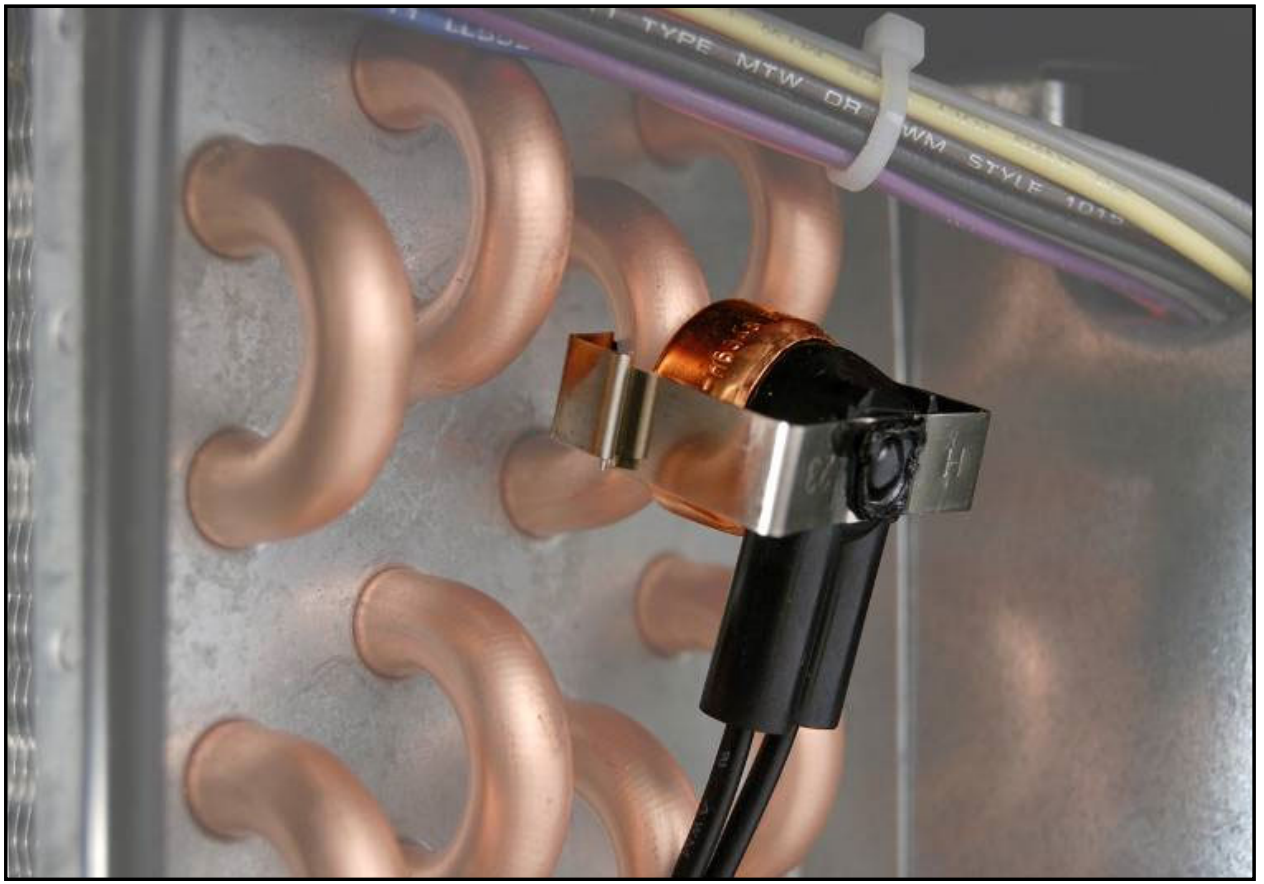


MORE HEAT PUMP COMPONENTS

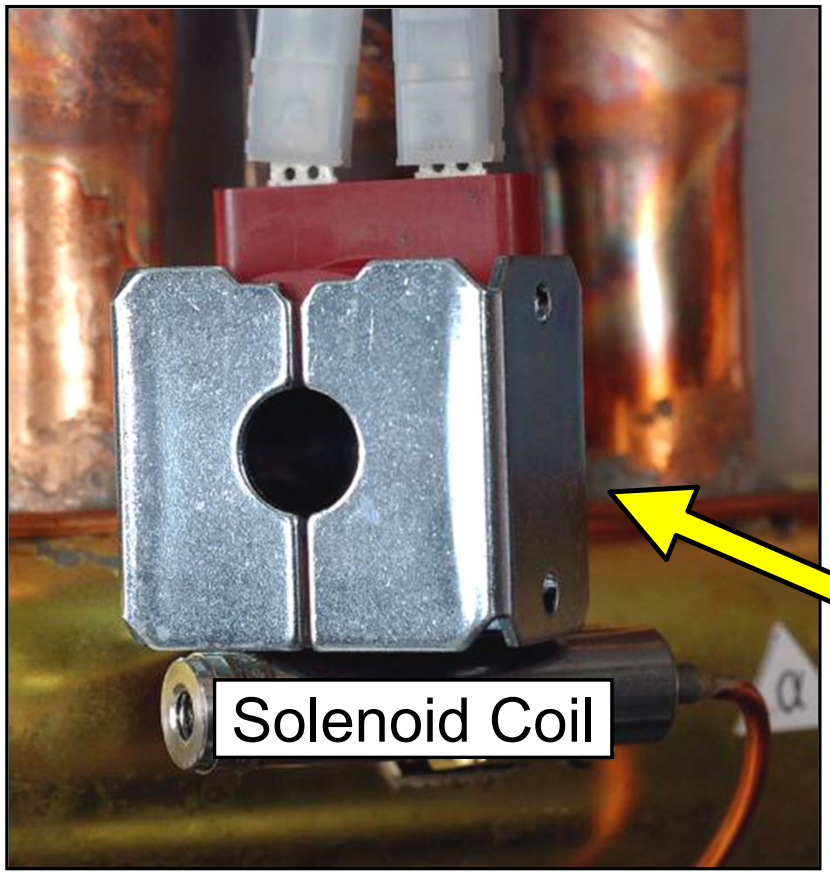


LOSS OF CHARGE PRESSURE SWITCH

FREEZE PROTECTION THERMOSTAT SWITCH

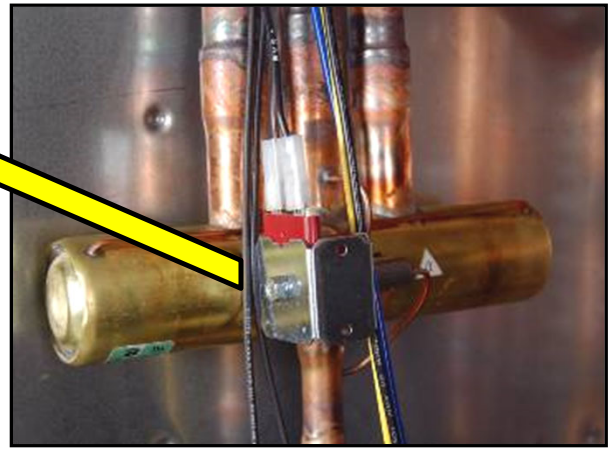


REVERSING VALVE



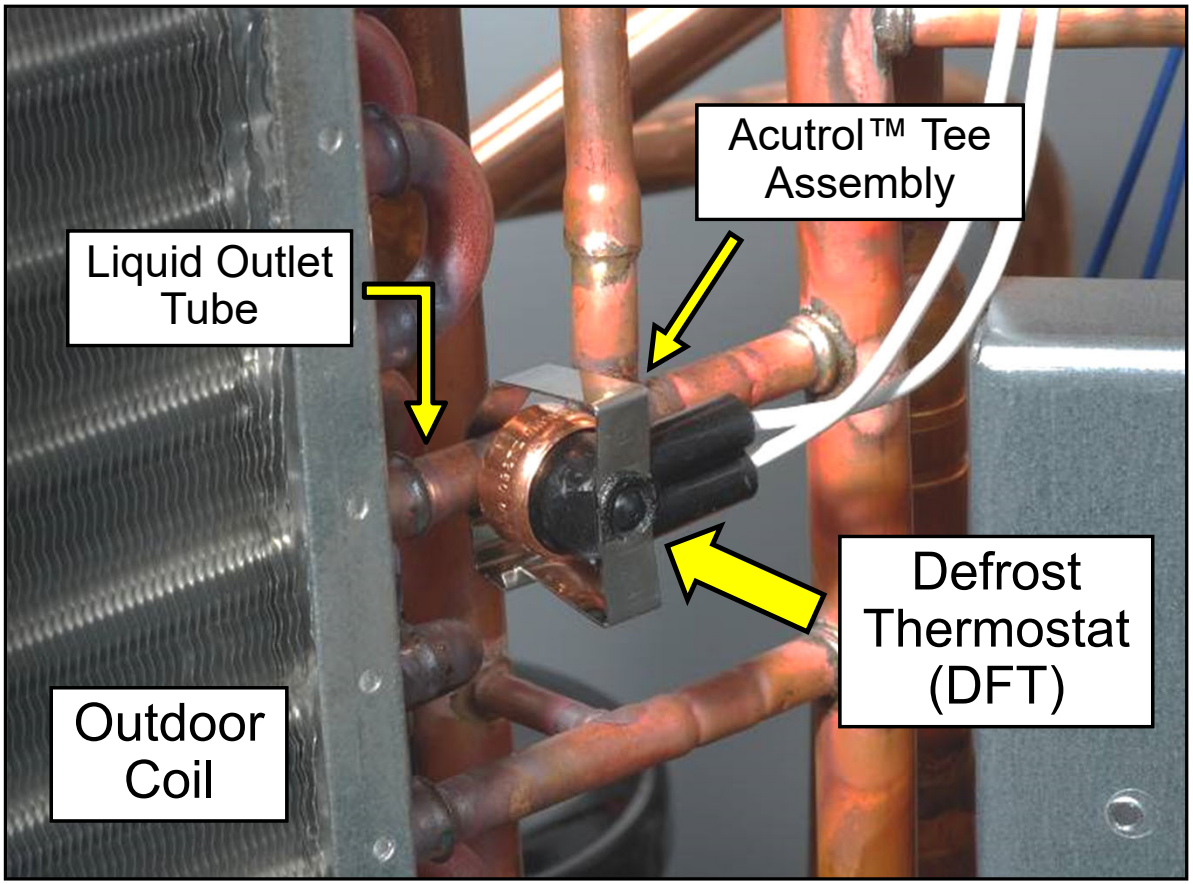
Solenoid Coil

- Removable
- Replaceable

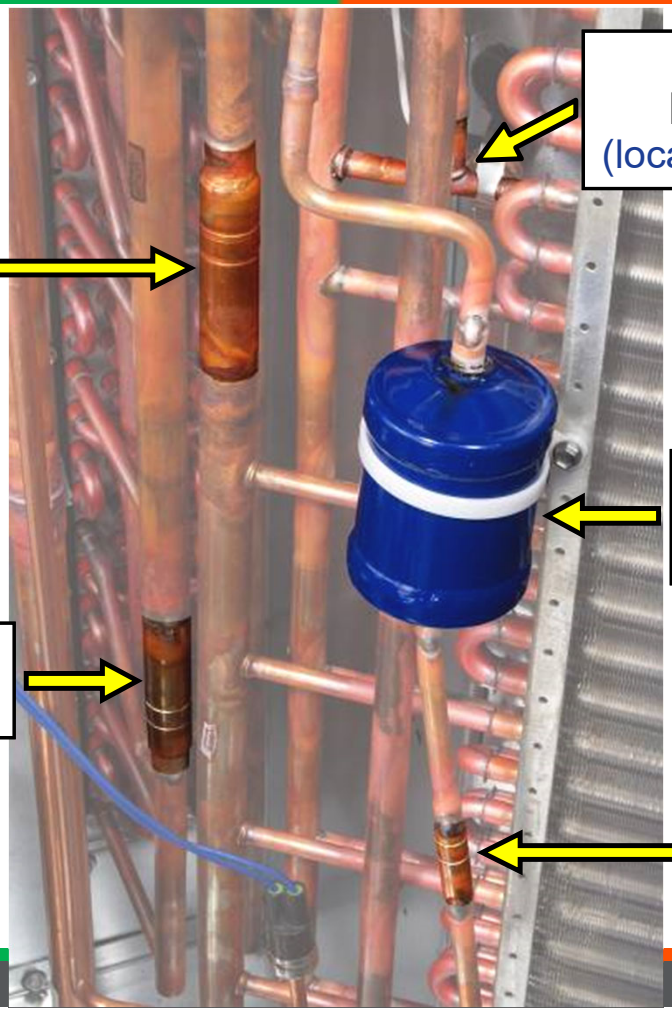


4-Way Reversing Valve

DEFROST THERMOSTAT



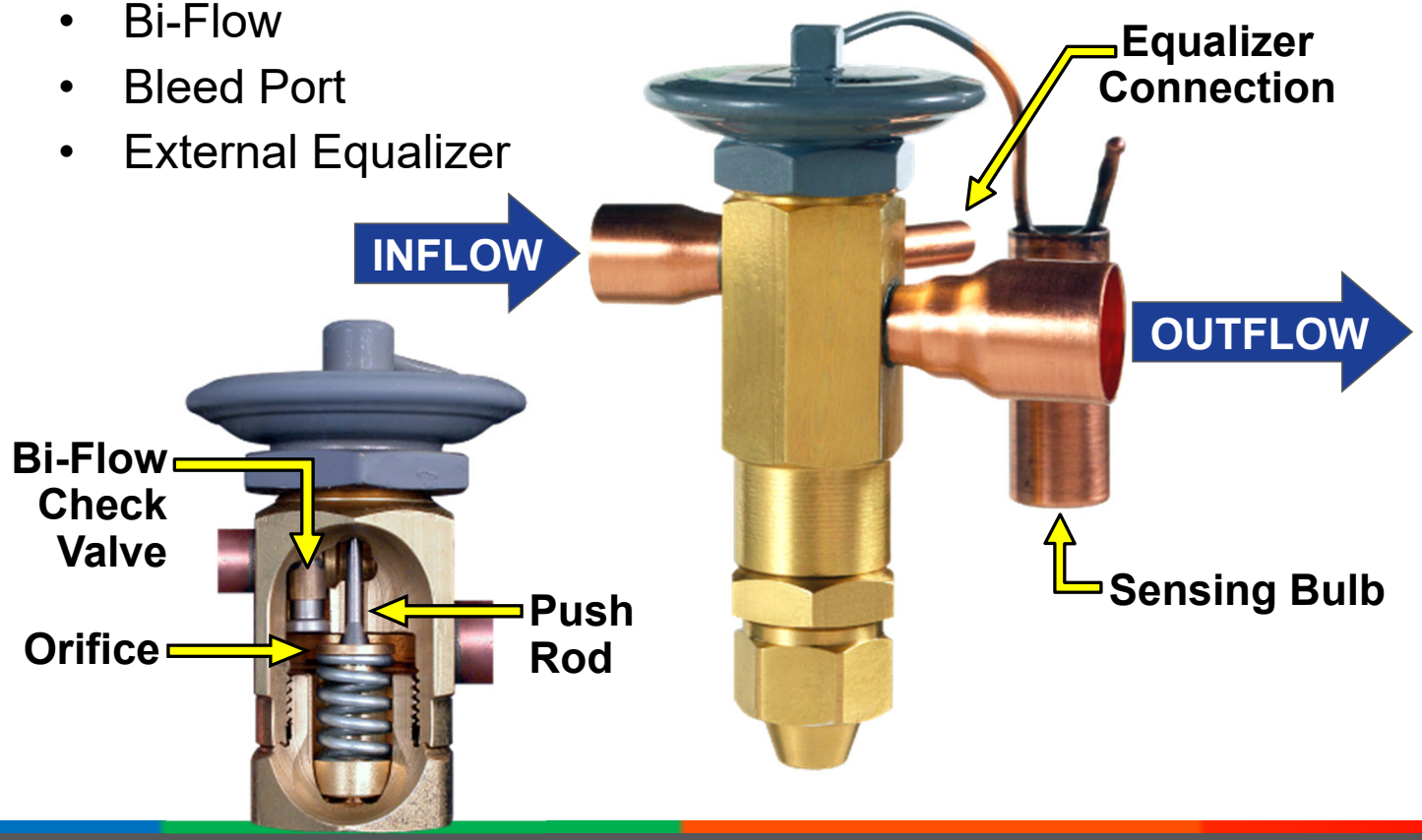
HEAT PUMP COILS



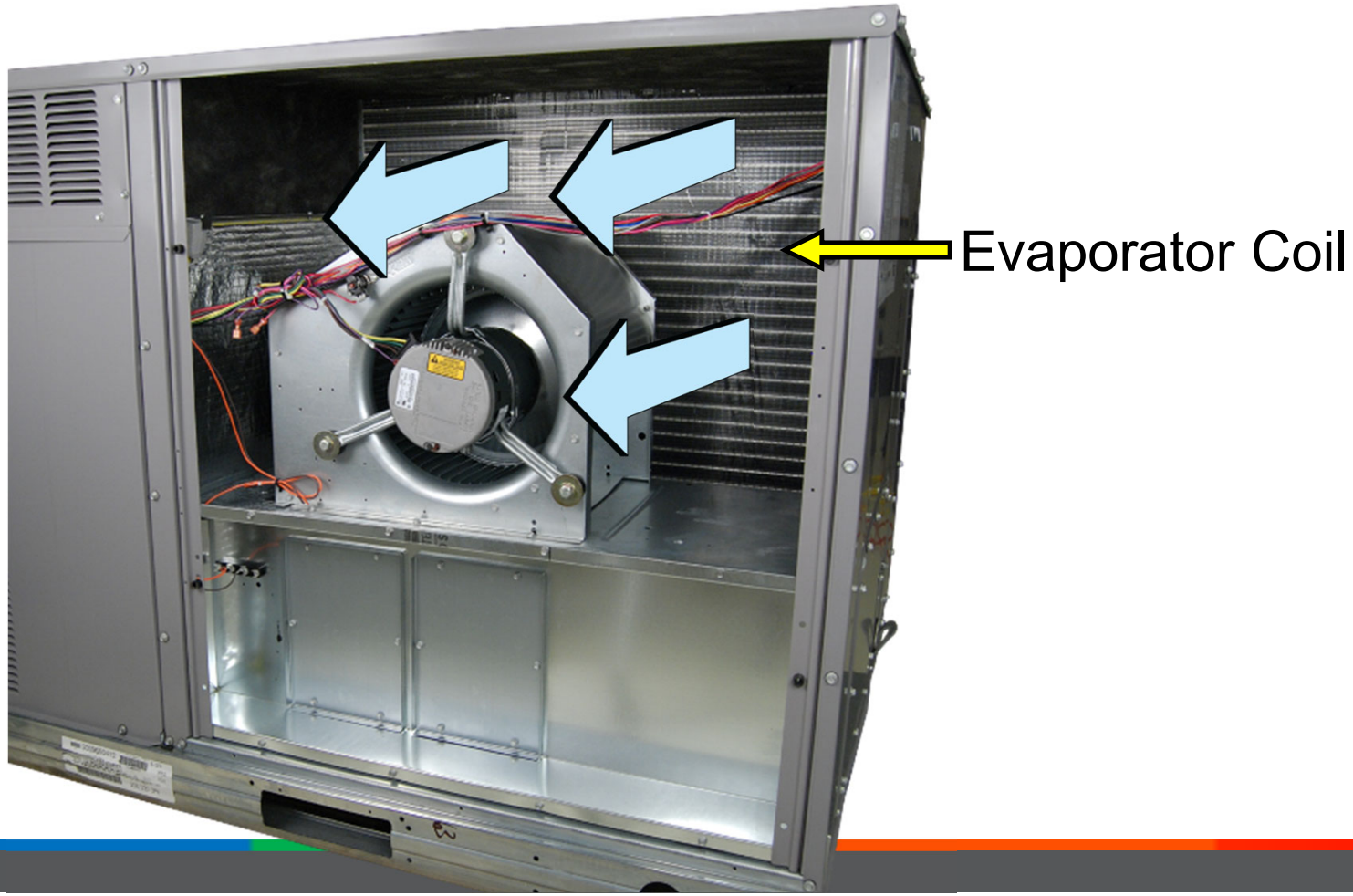
THERMOSTATIC EXPANSION VALVE

TXV for Ultra-High Efficiency Units:

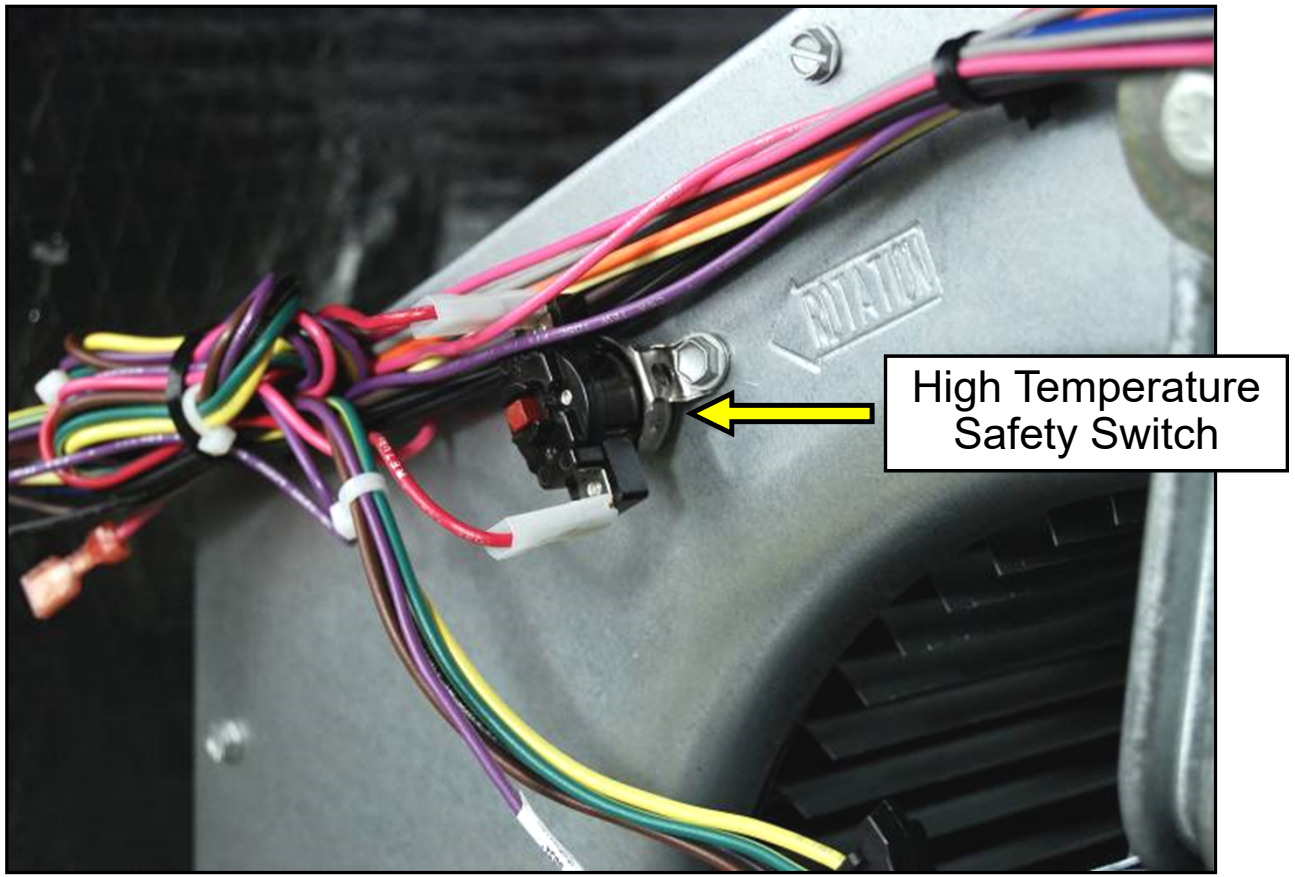
- Bi-Flow
- Bleed Port
- External Equalizer



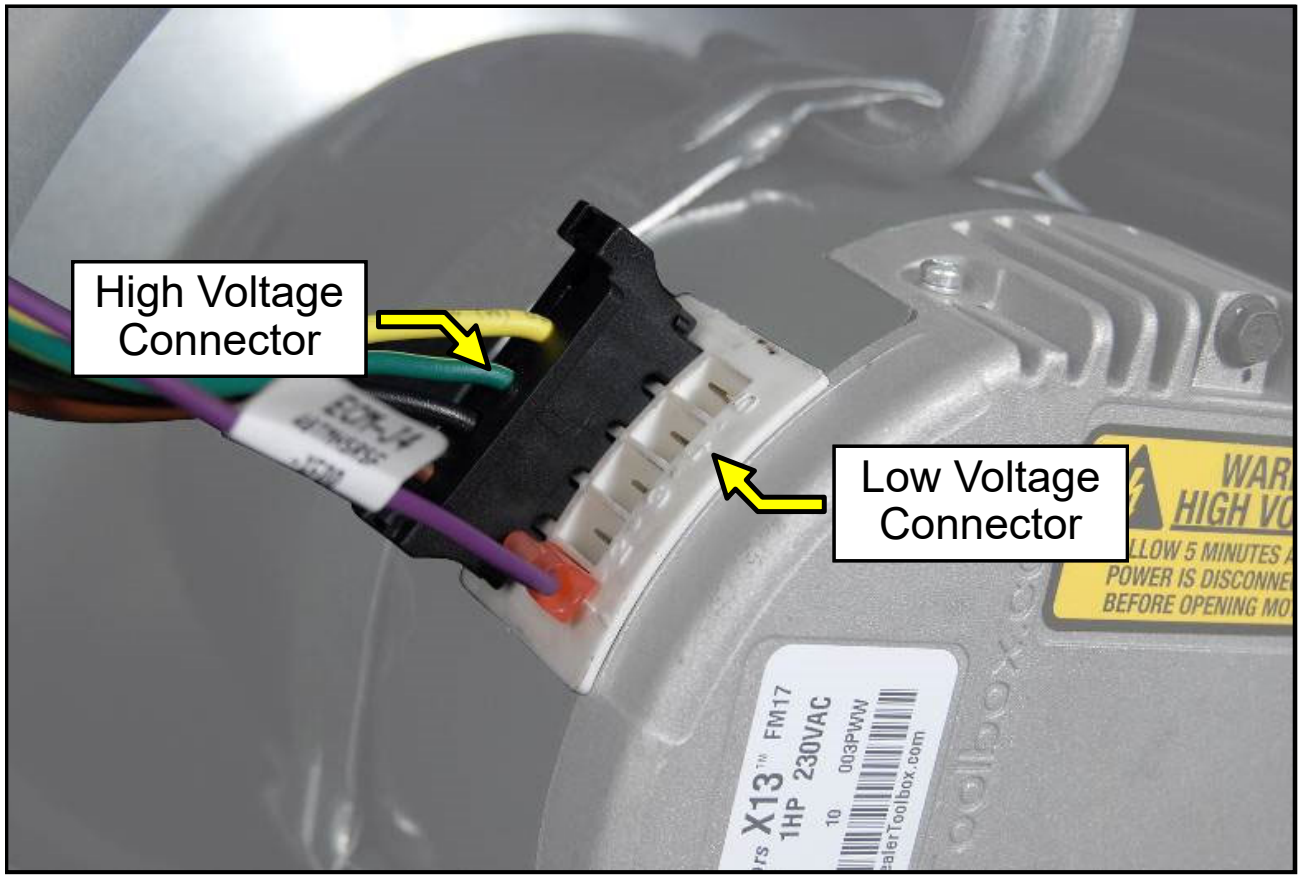
INDOOR FAN



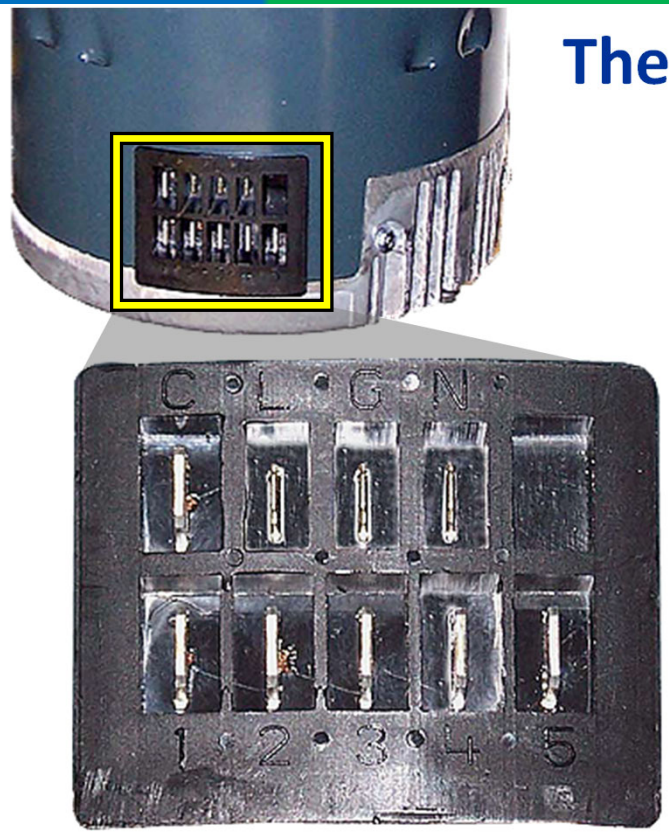
SAFETY SWITCH



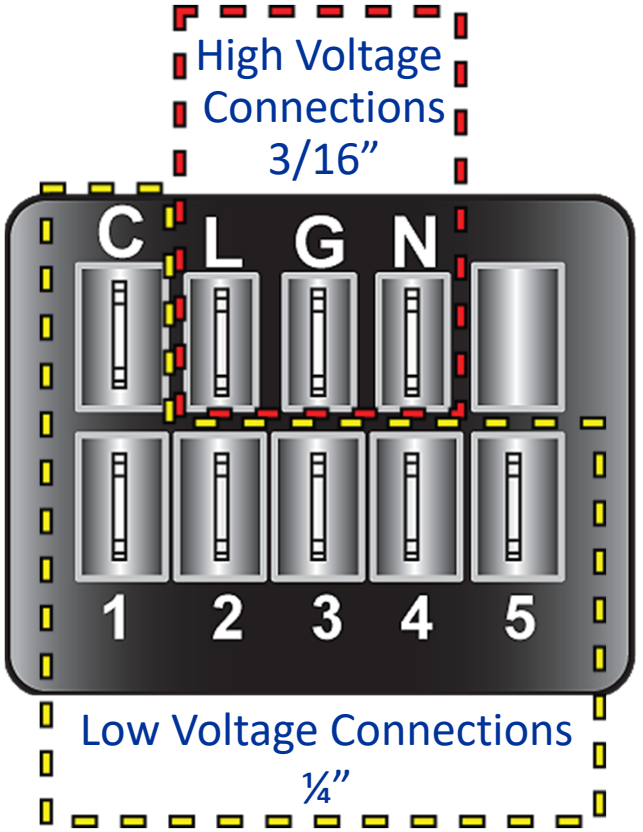
X13™ MOTOR


High Voltage Connector
Low Voltage Connector
X13™ FM17
1HP 230VAC
003PWW
WAR
HIGH VO
LLOW 5 MINUTES
POWER IS DISCONNE
BEFORE OPENING MO

MOTOR CONNECTIONS

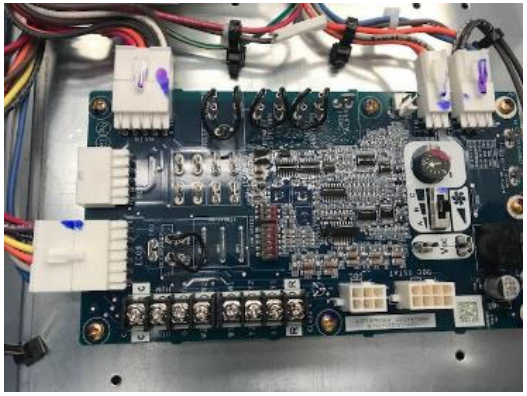


The General Electric X13 Motor

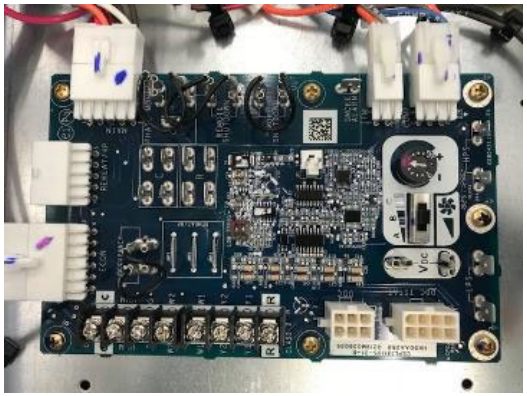


New Vane Axial Blower Assembly

Single Phase HK50AA055

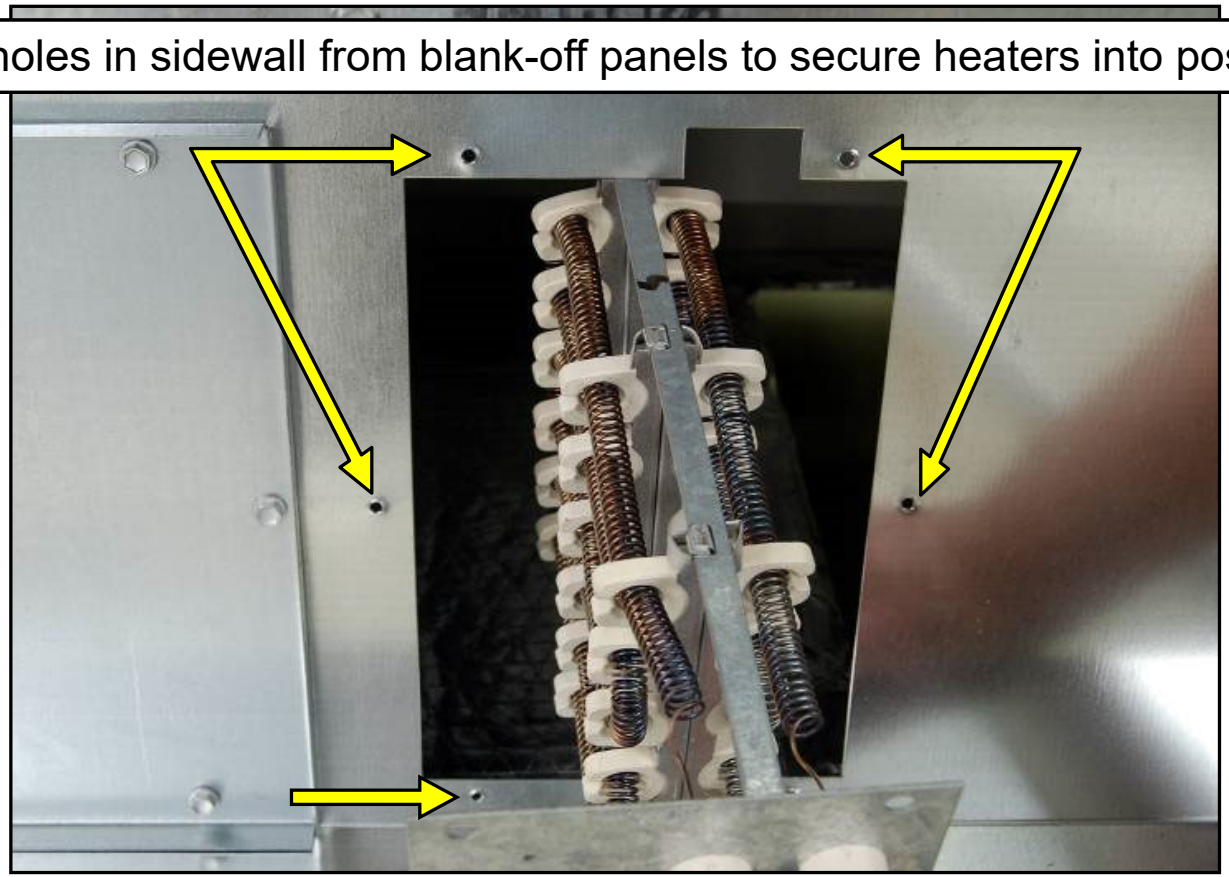


Three Phase HK50AA058

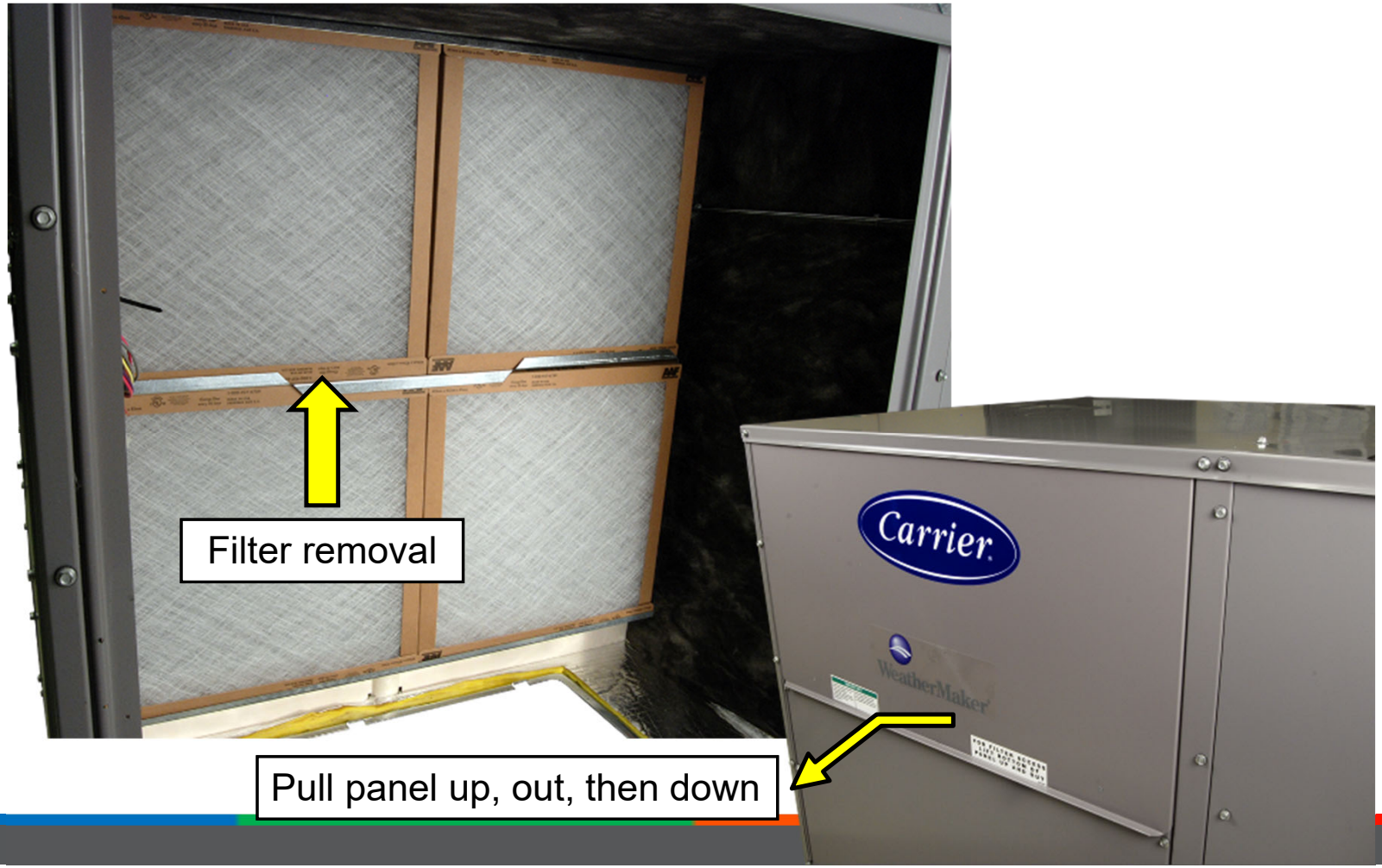


ELECTRIC HEAT

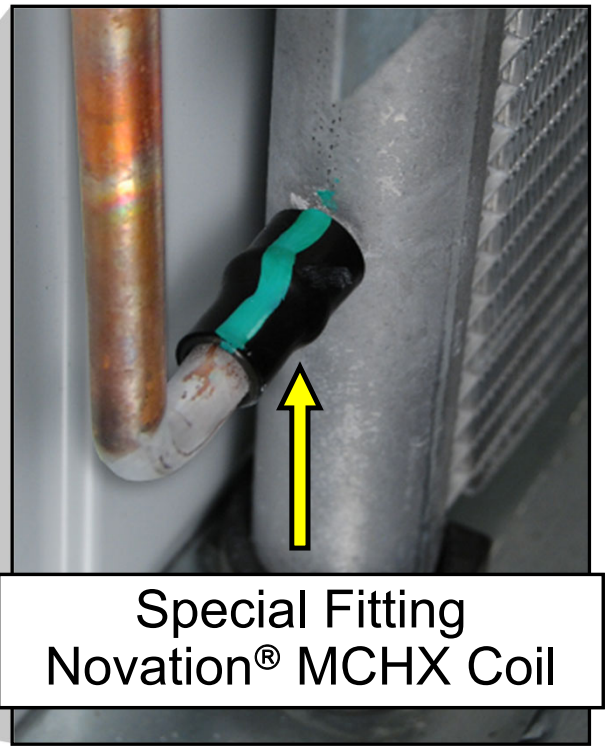
Use holes in sidewall from blank-off panels to secure heaters into position



INDOOR AIR FILTERS



NOVATION® MCHX CONDENSER COILS



Special Fitting
Novation® MCHX Coil

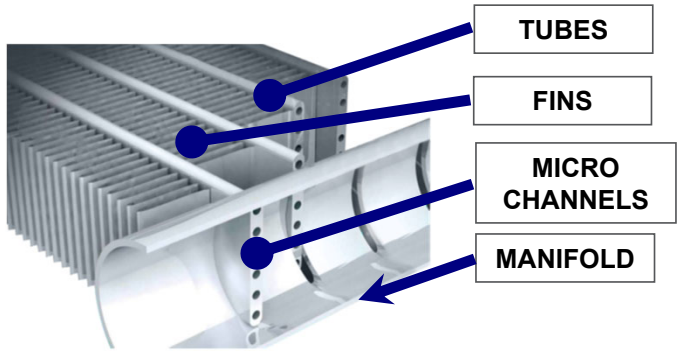
NOVATION
HEAT EXCHANGER TECHNOLOGY

WHAT IS NOVATION™ CONDENSER COIL

Novation™ Heat Exchanger Technology

- Aluminum Flat Tube – Multi Port Design
- Aluminum Wave Fin Pattern
- Structurally Robust / Easy To Clean
- E-Coating required for coastal and industrial applications

NOVATION™
HEAT EXCHANGER TECHNOLOGY



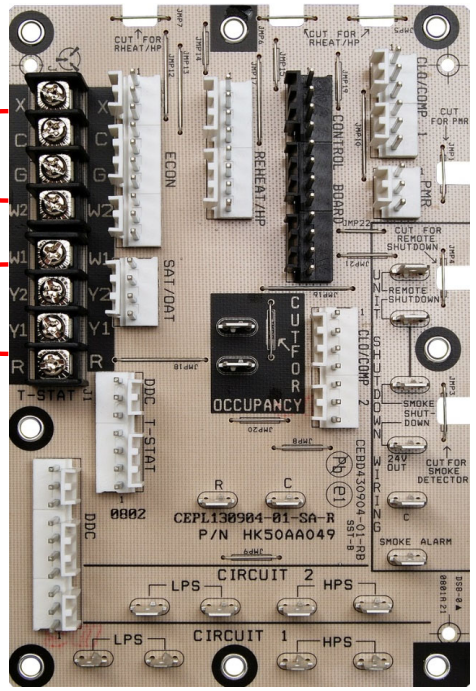
Central Terminal Board - CTB

CENTRAL TERMINAL BOARD

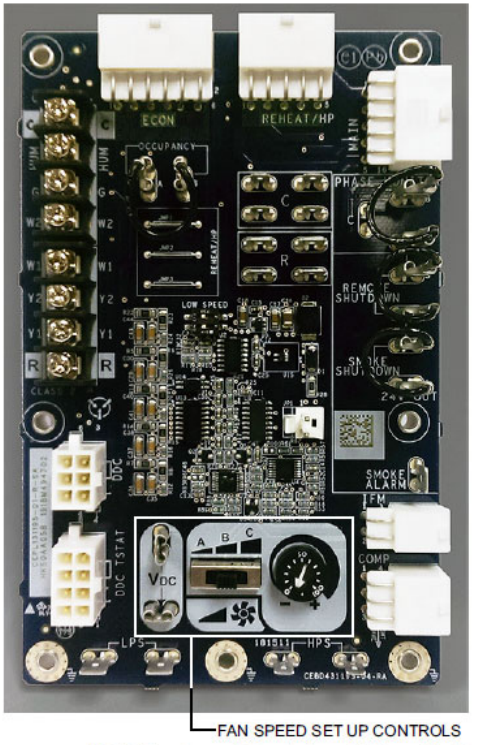
Total of 11 terminal strips:

J1-J2: Screw terminals for
(thermostat wires)
0.046-in square pin

Total of 18 quick-connect terminals



Standard CTB
Newer boards are blue

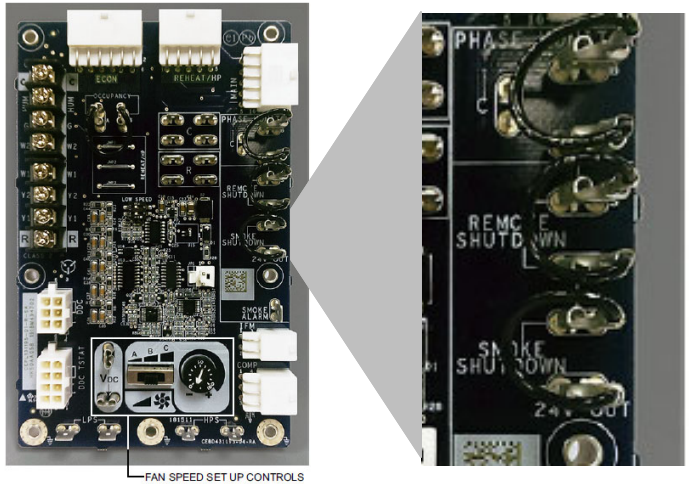


UCB Fan Speed Controls - 3-Phase Units

EcoBlue CTB

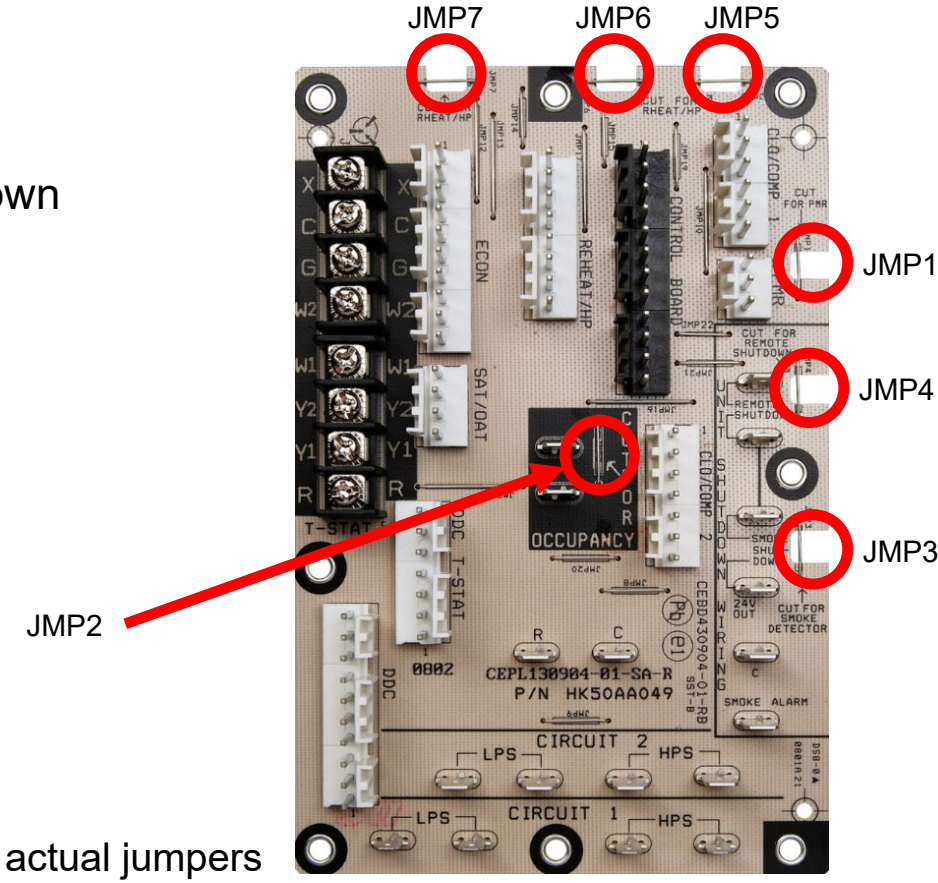
CTB: JUMPERS

- JMP1 Phase Monitor
- JMP2 Occupancy Control
- JMP3 Smoke Detector Shutdown
- JMP4 Remote Shutdown
- JMP5, 6, 7 Heat Pump / Reheat

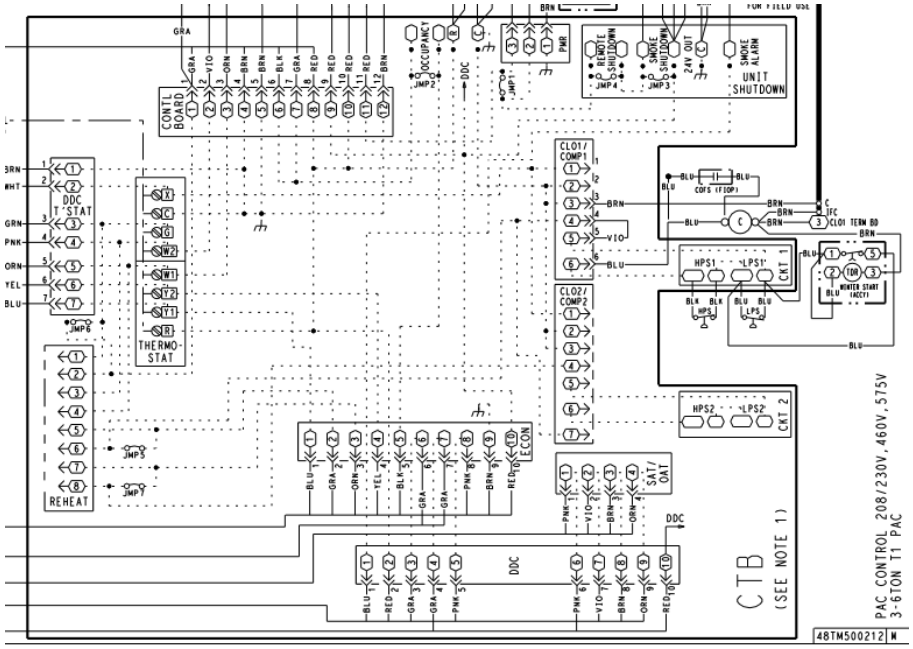


UCB Fan Speed Controls - 3-Phase Units

EcoBlue CTB uses actual jumpers

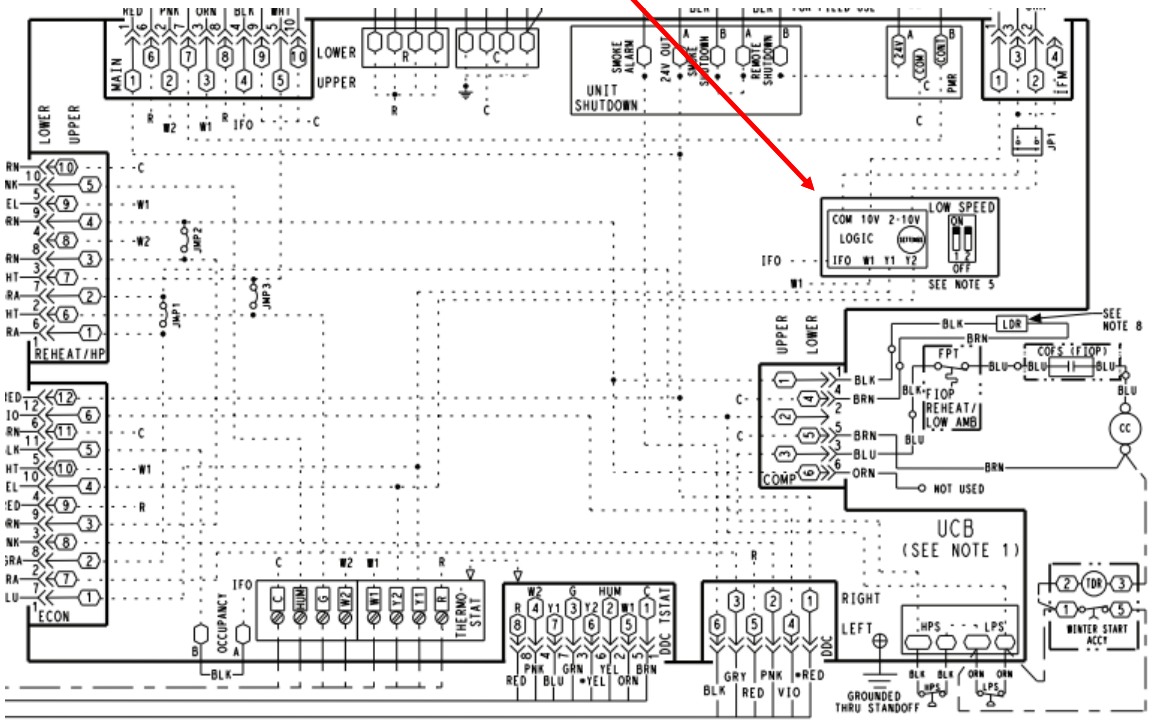


Wire Diagram Found on Equipment of CTB



Regular style CTB

EcoBlue style CTB



JUMPERS 1 + 2

- Jumper 1

  Phase Monitor Accessory

  – Phase Monitor Relay power between 2 + 3

  – Opens Red-Pink of Phase Monitor Relay

    • Removes 24 vac from Remote Shutdown + Smoke Shutdown

  – Result

    • Immediate unit Shutdown

- Jumper 2

  Occupancy Jumper

  – Occupancy: Used to signal Building occupied and Min Economizer ventilation when IFM energized

  – Removes power to Economizer Control “N”

  – Result

    • Economizer closes until it gets a call for free cooling or ventilation.

JUMPERS 3 + 4

- Jumper 3

  Smoke Detector

  – Allows Smoke Detector to control signal (Open contacts) to force unit “OFF”

  – Removes Transformer “R” from Terminal Board

  – Result: Immediate unit shutdown

- Jumper 4

  Remote Shutdown

  – Allows remote contacts (NC) to control unit “ON” or “OFF”

  – Removes Transformer “R” from Terminal Board

  – Result: Immediate unit shutdown

JUMPERS 5 + 6

- Jumper 5

  Used with R/H or Heat Pump

  – Opens “Y1” from Econo (pin 2), Reheat/Heat Pump (pin 6), CLO/Comp1 (pin 4)

  – Allows RH control board to send signal CLO 1 controlling compressor 1 (pin 4)

- Jumper 6

  Used with R/H or Heat Pump

  – Opens “G” from Reheat/Heat Pump (pin 1), IFM signal return (pin 2) and “G” from Control Board (pin 1)

  – Allows RH control board to control IFM

JUMPER 7

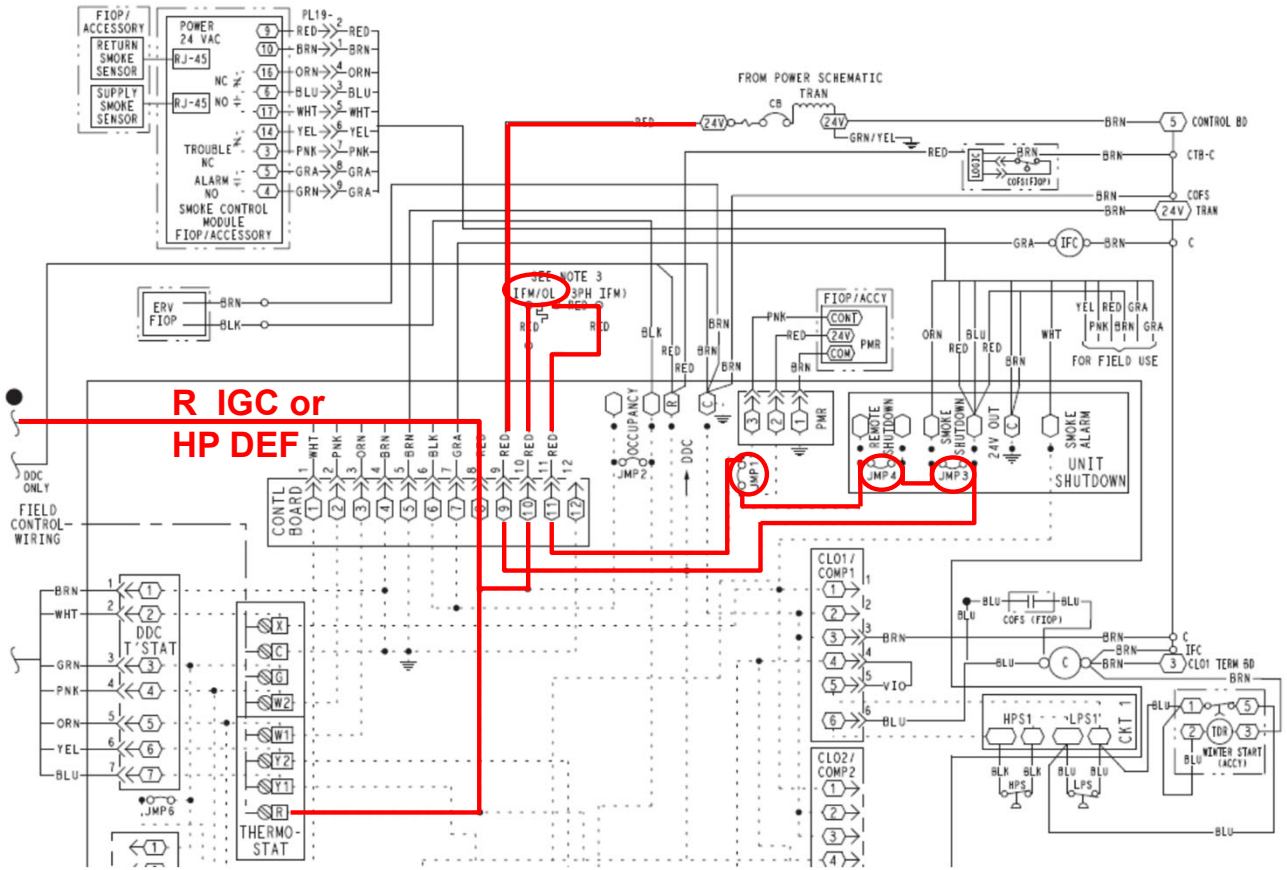
- Jumper 7

  Used with R/H or Heat Pump

  – Opens “Y2” from Econ (pin 3), Reheat/Heat Pump (pin 8)

  – Allows Reheat/Heat Pump board to send signal to CLO 2 (pin 4) controlling Compressor 2

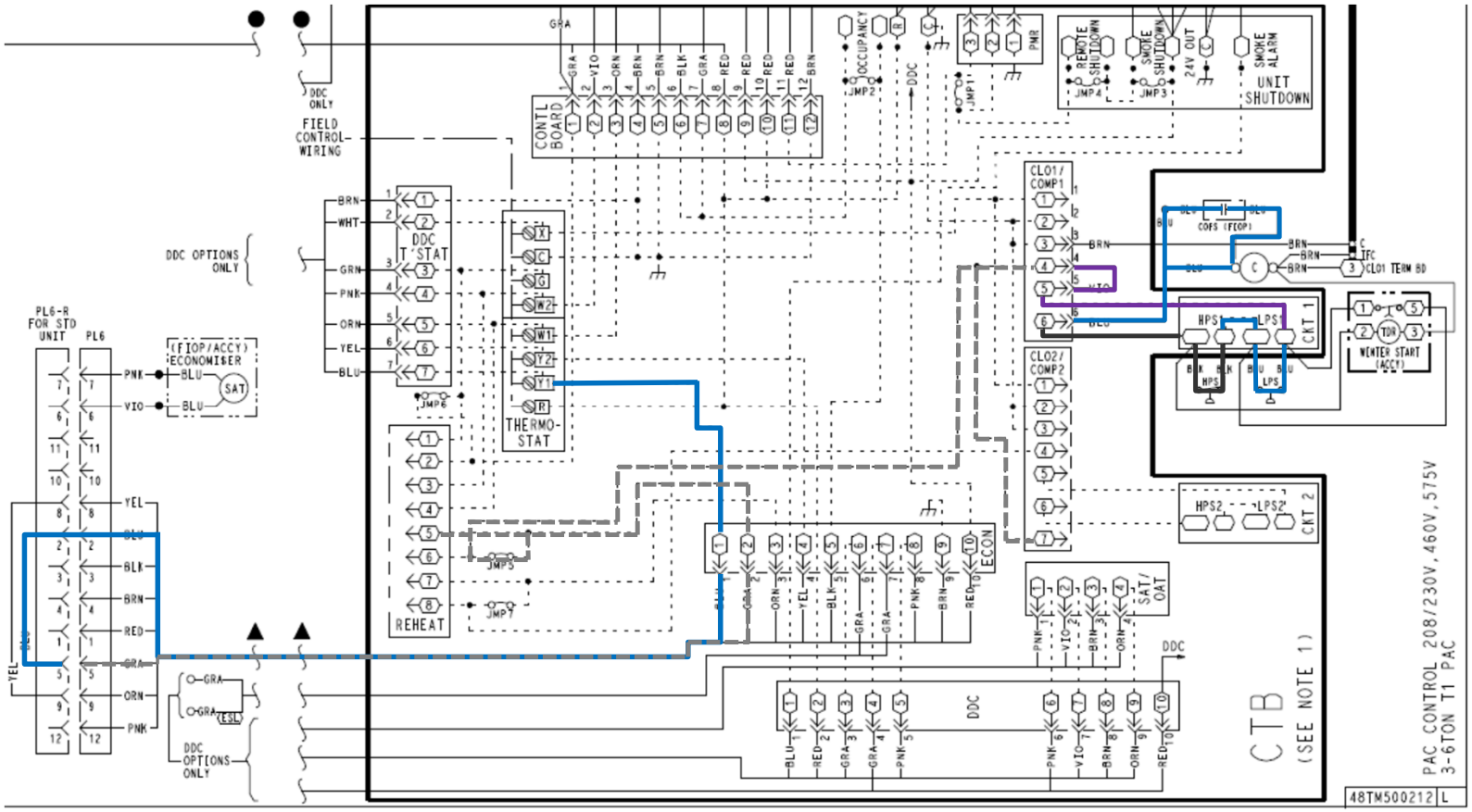
24 Volt Troubleshooting (Power)



Safeties that can break 24vac to R-Connection

- The IFMOL Indoor fan motor overload limit
- Limit switches
- Roll Out switches
- Smoke detectors if installed
- Phase monitor if installed

24 Volt Troubleshooting (Y1 Cooling)

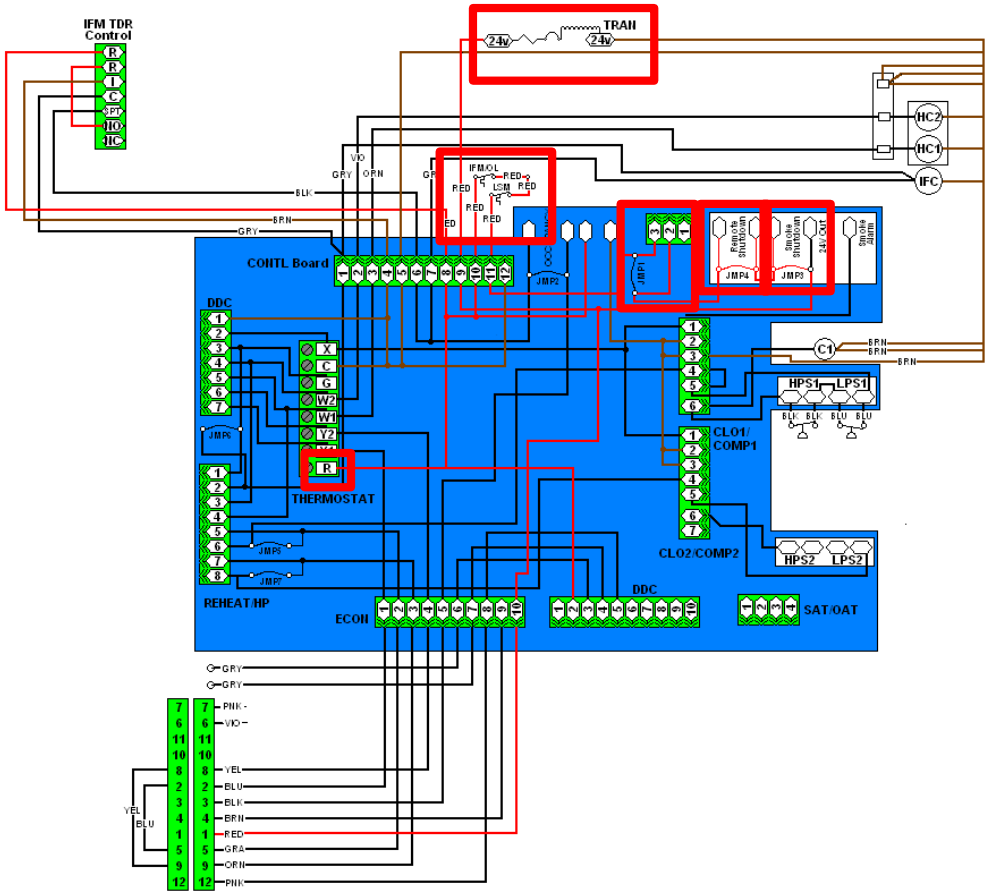


PATH OF POWER

Low Voltage – Stand by

1. Transformer
2. Smoke Shutdown (JMP3)
3. Remote Shutdown (JMP4)
4. Phase Monitor (JMP1)
5. Indoor Fan Safeties
6. R Terminal/Accessories

Powered Economizer
Always Remains Powered

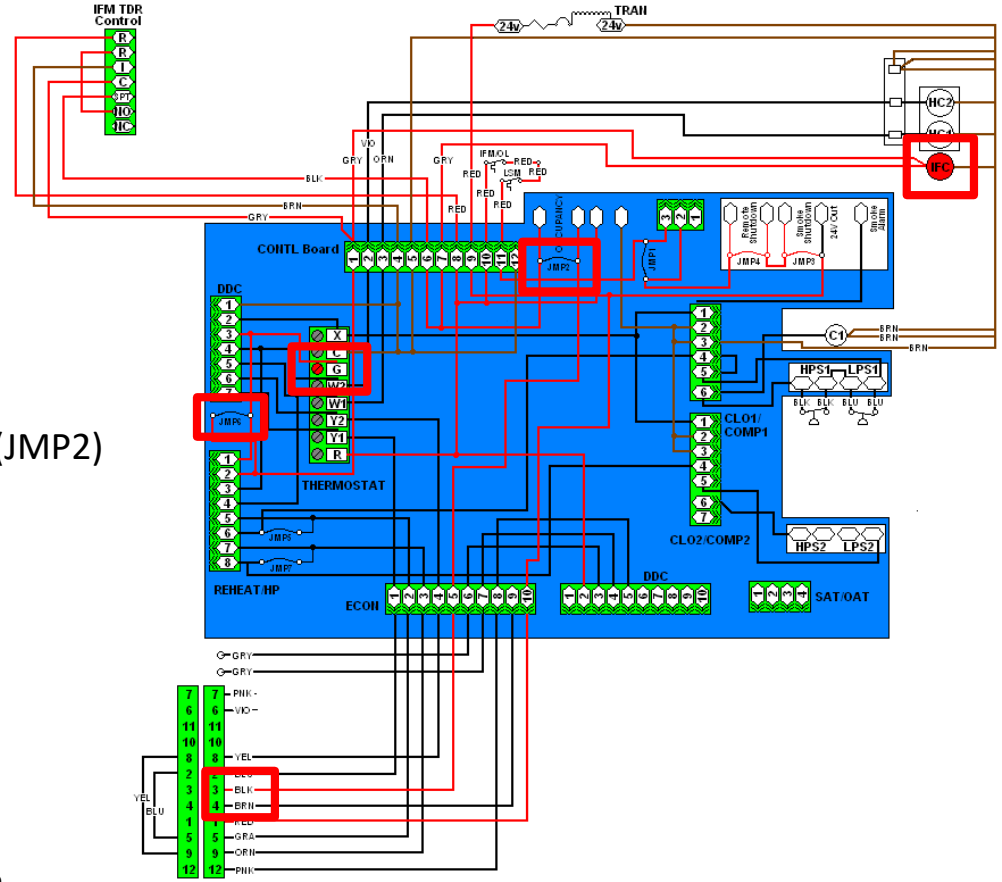


Can be found on cematraining.com

PATH OF POWER

Low Voltage – Fan

1. 24VAC to G
2. Through Fan Jumper (JMP6)
3. To Fan Contactor
4. Through Occupancy Jumper (JMP2)
5. To Economizer Min Position (BLK)

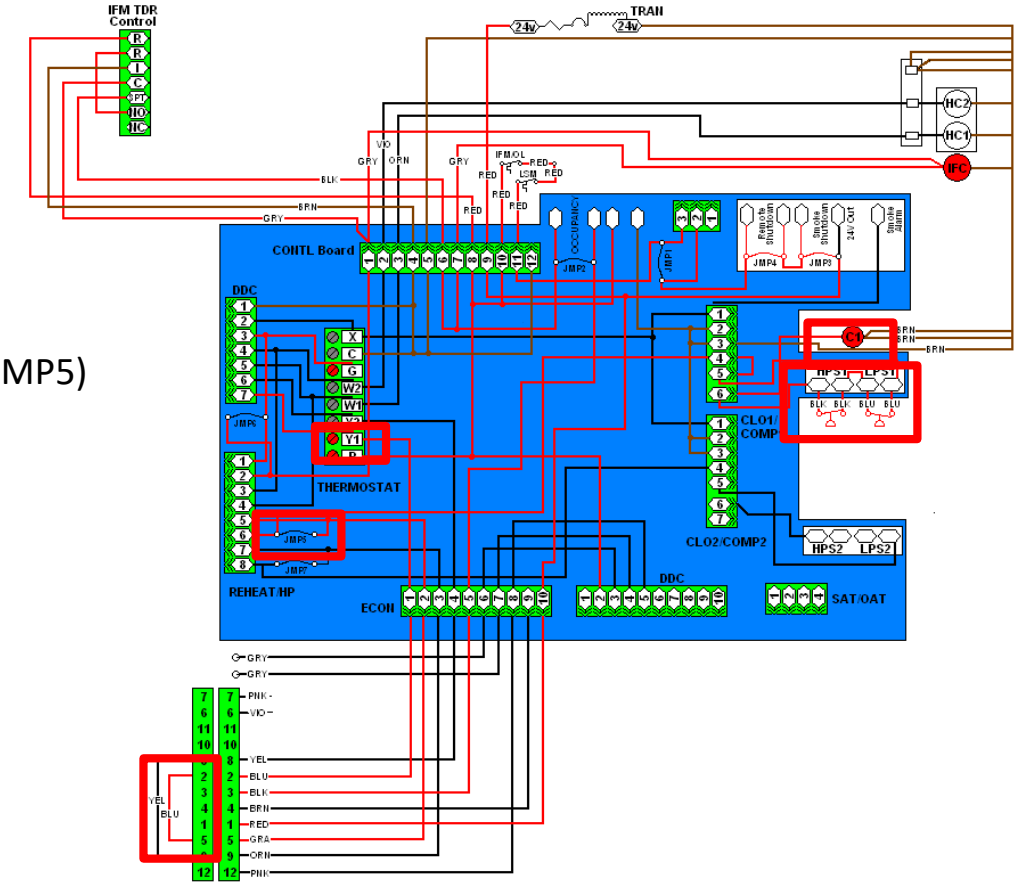


Can be found on cematraining.com

PATH OF POWER

Low Voltage – 1st Stage Cooling

1. 24VAC to Y1
2. To Economizer
3. To 1st Stage Cooling Jumper (JMP5)
4. To Unit Safeties (HPS1/LPS1)
5. To 1st Stage Contactor (C1)

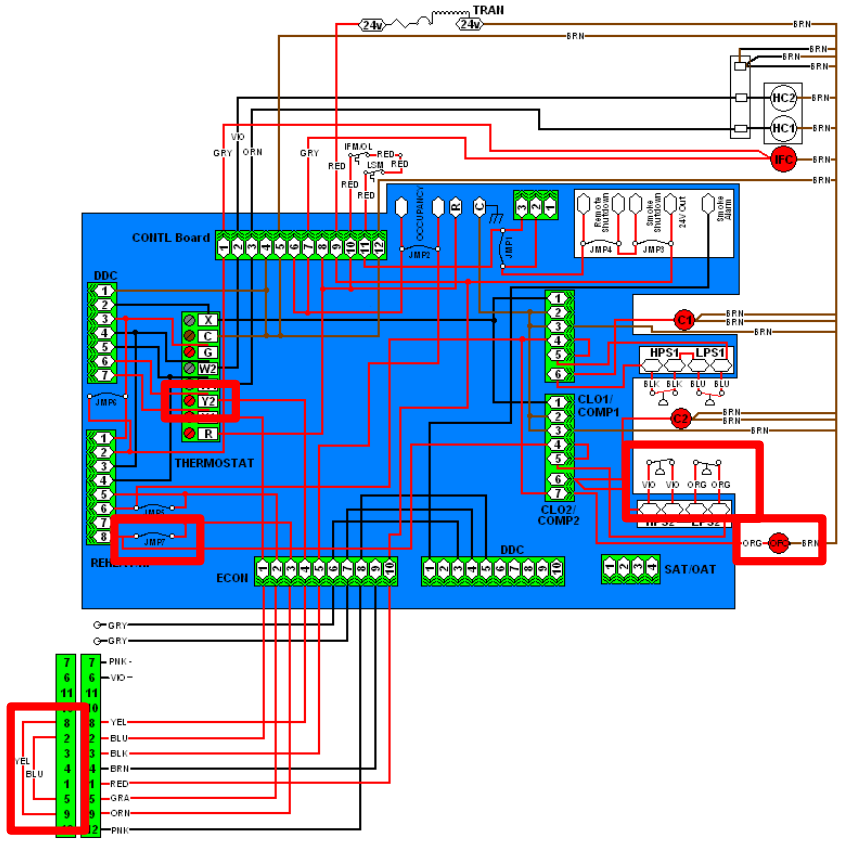


Can be found on cematraining.com

PATH OF POWER

Low Voltage – 2nd Stage Cooling

1. 24VAC to Y2
2. To Economizer
3. To 2nd Stage Cooling Jumper (JMP7)
4. To Unit Safeties (HPS2/LPS2)
5. To 2nd Stage Contactor (C2)

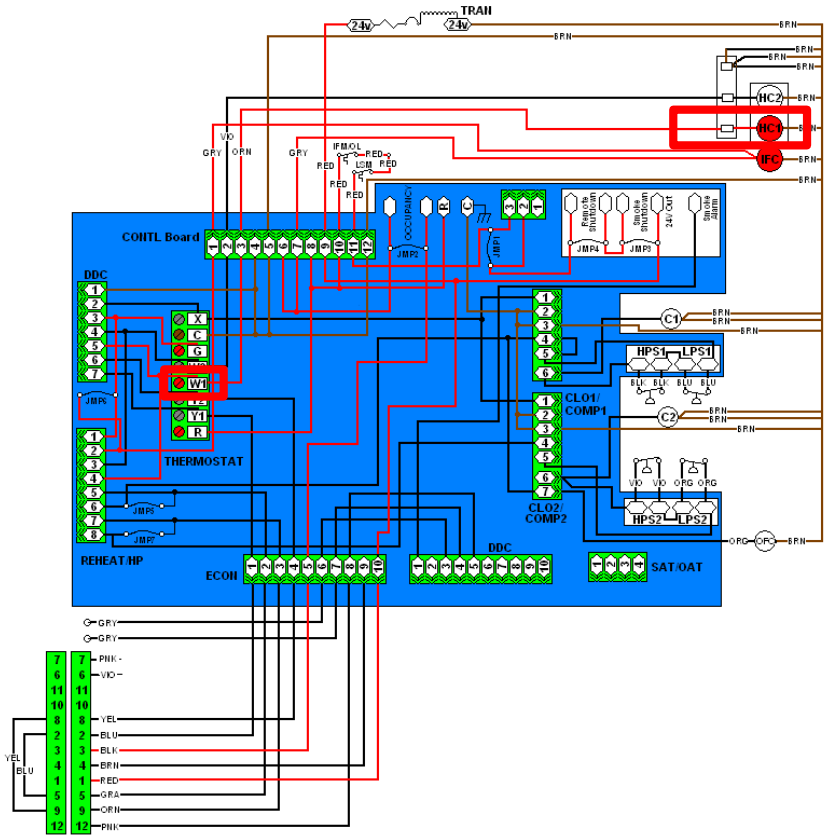


Can be found on cematraining.com

PATH OF POWER

Low Voltage – 1st Stage Electric Heating
2nd Stage Electric Heating is the same

1. 24VAC to W1
2. To Electric Heat Contactor



Can be found on cematraining.com

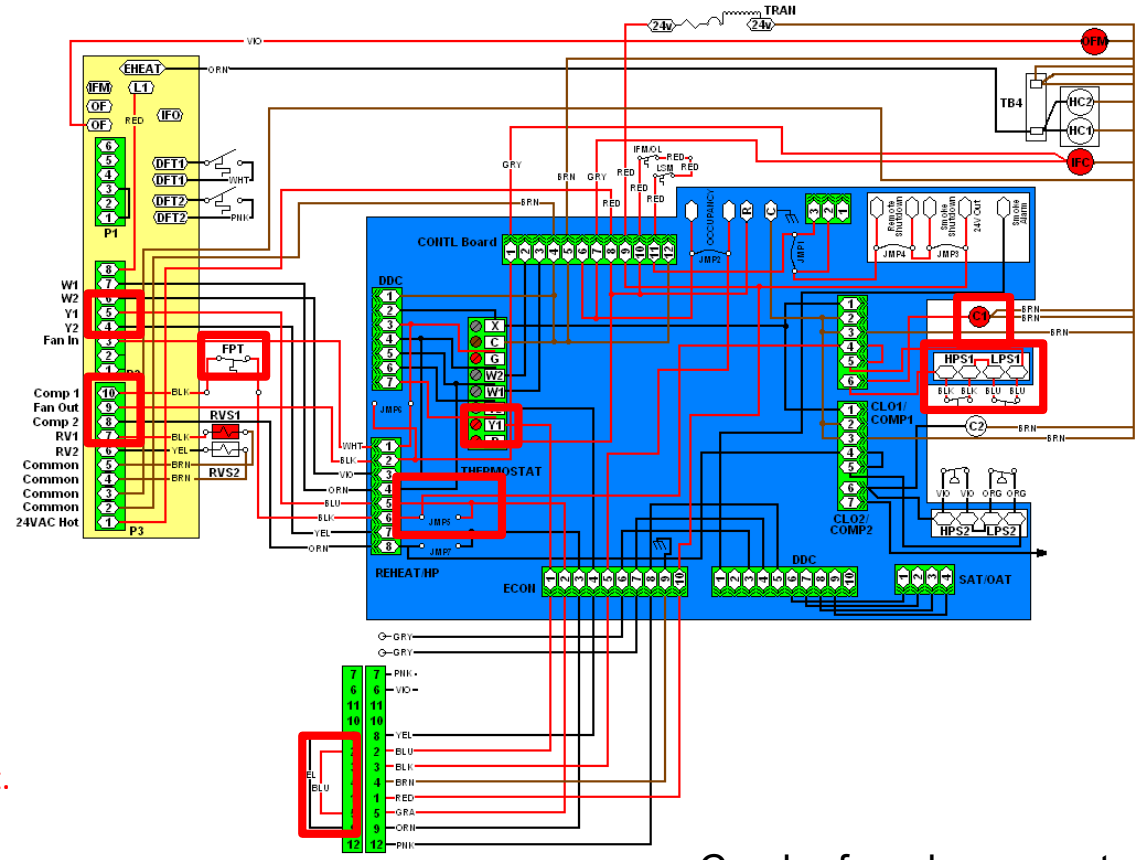
PATH OF POWER

Low Voltage – Heat Pump Cooling

1. 24VAC to Y1
2. To Economizer
3. Back to 1st Stage Cooling Jumper (cut)
4. To Defrost Board Y1 Input
5. Comp 1/RV1 Outputs made
6. Through Freeze Protection Stat
7. To Unit Safeties (HPS1/LPS1)
8. To 1st Stage Contactor (C1)

Y2, W1, and W2 work the same. Their signal is sent to the Defrost Board which controls the outputs for Reversing Valves, Compressors and Electric Heat.

Notice also that the fan Jumper (JMP6) is cut. The Defrost Board also controls the fan operation.

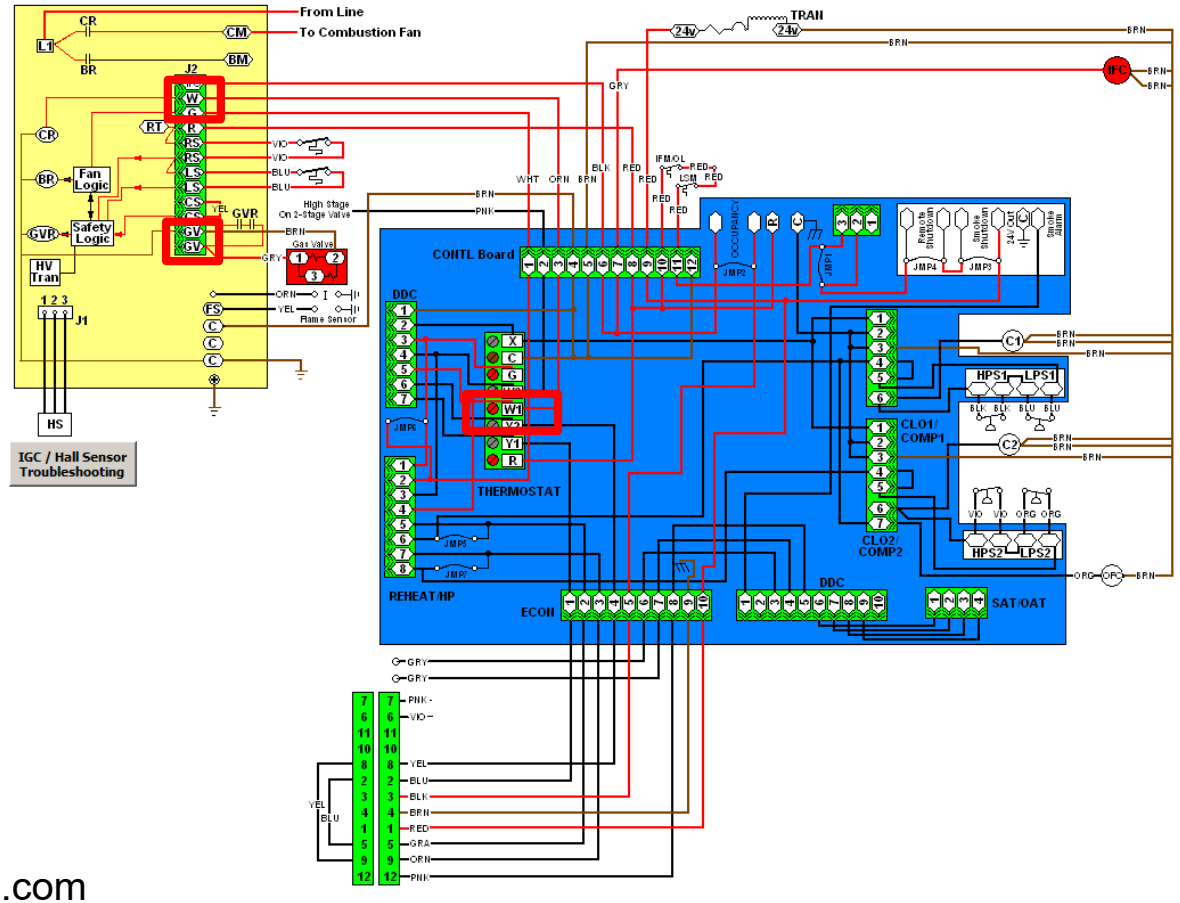


Can be found on cematraining.com

PATH OF POWER

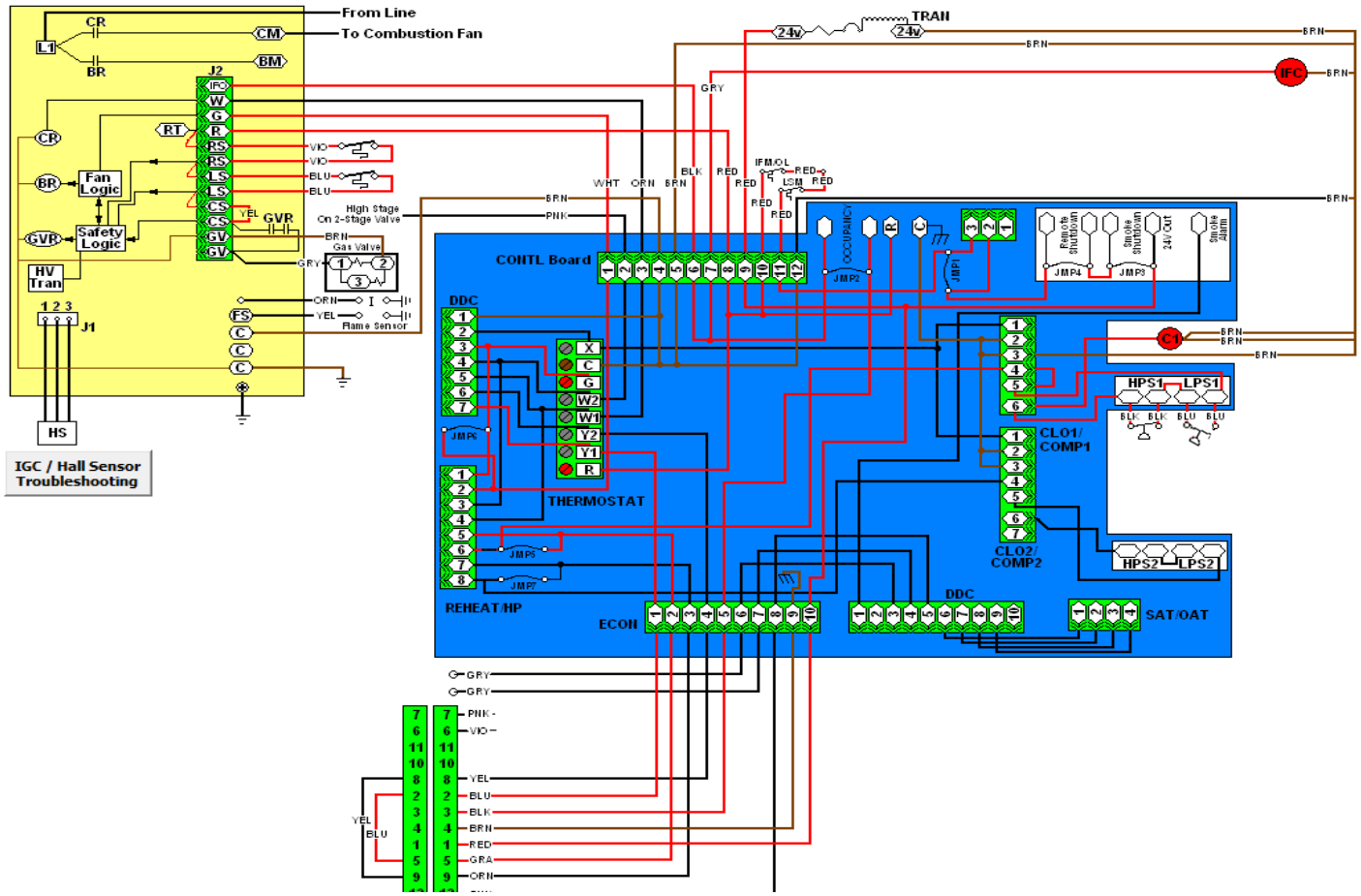
Low Voltage – Gas Heating

1. 24VAC to W1
2. Signal sent to W on IGC
3. IGC goes through Sequence and eventually opens gas valve.

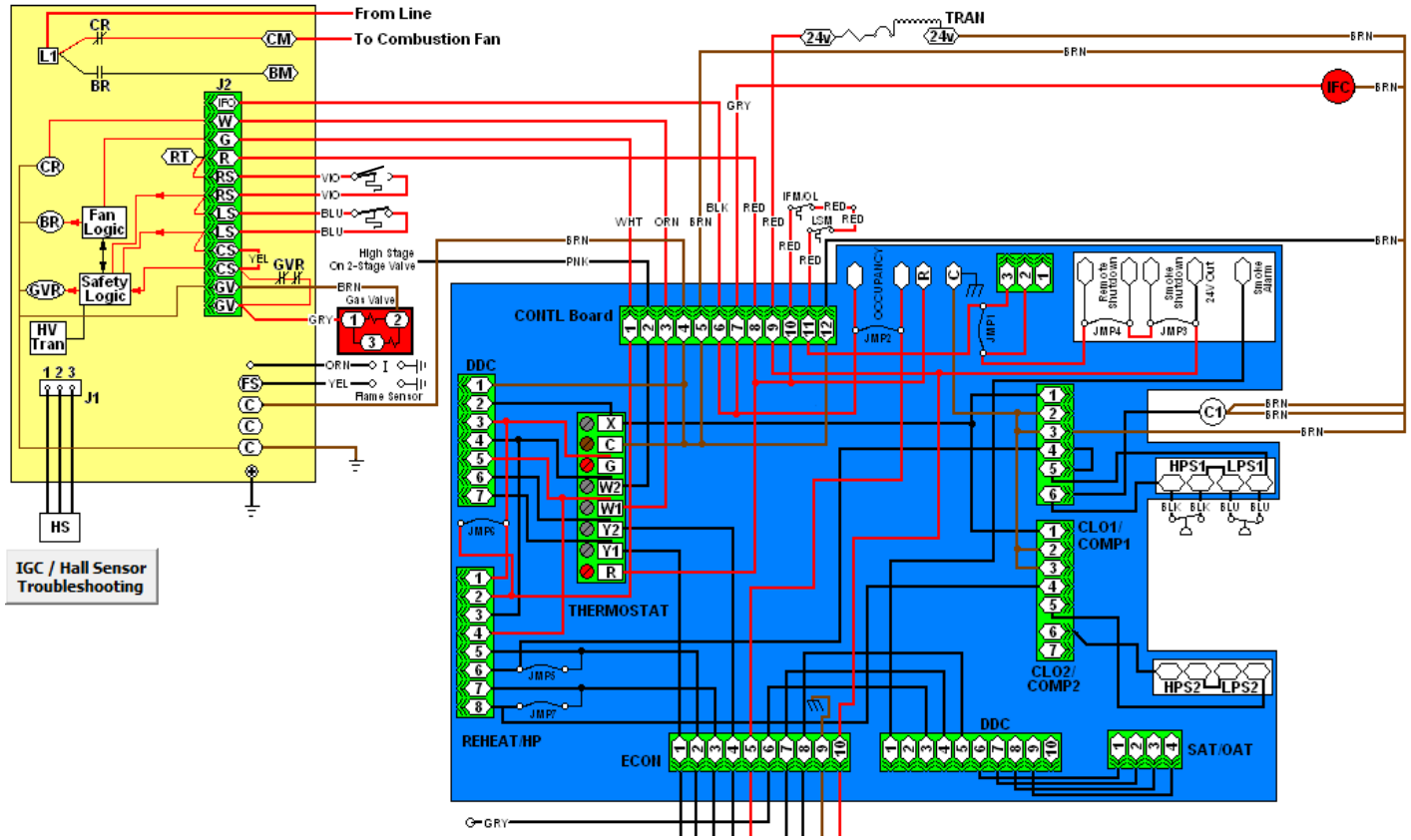


Note that G signal goes to IGC.
IGC takes control of Indoor Fan.

CLASS EXERCISE NO COOLING CALL WHAT IS WRONG ?



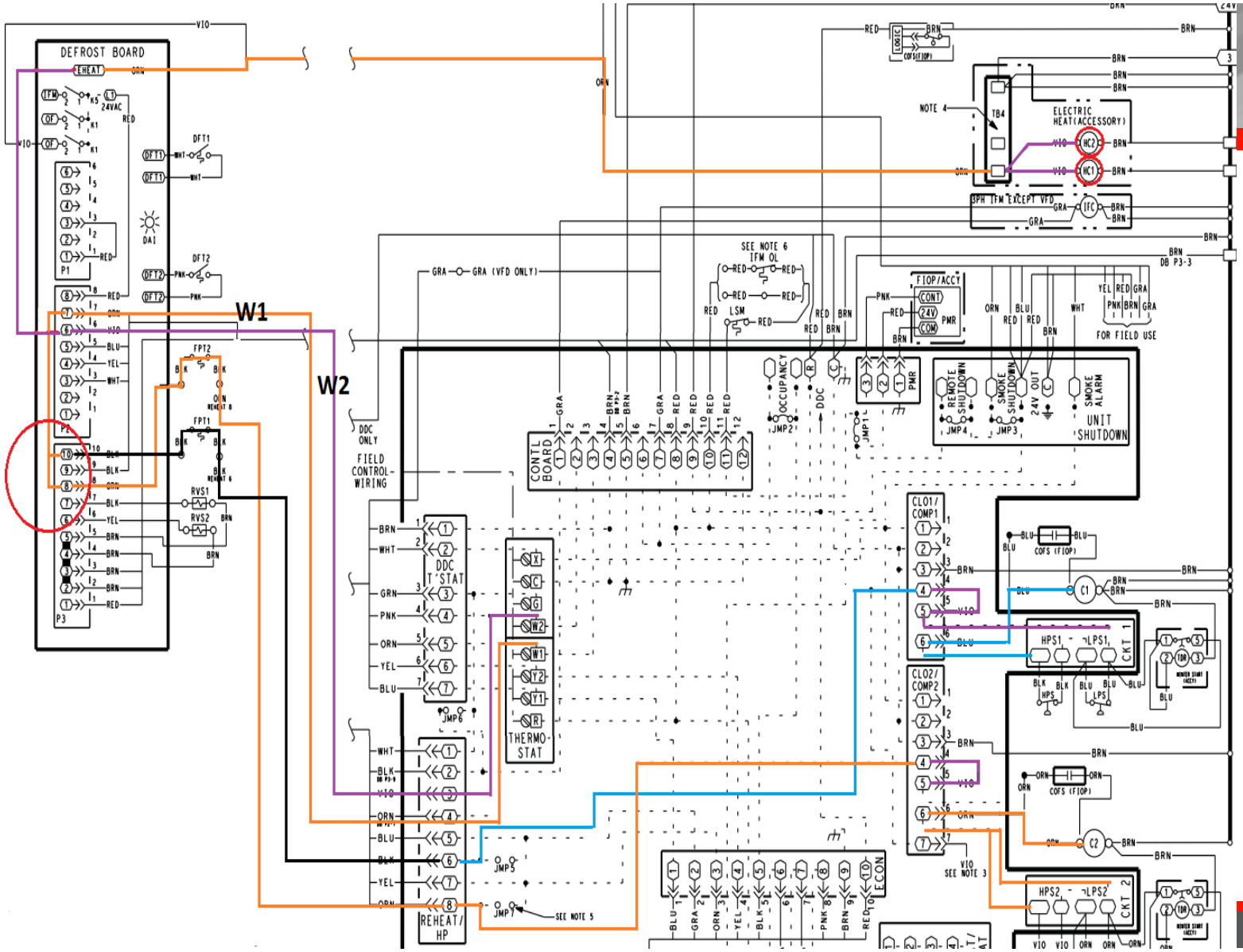
CLASS EXERCISE NO HEATING ON A CALL FOR GAS HEAT ?



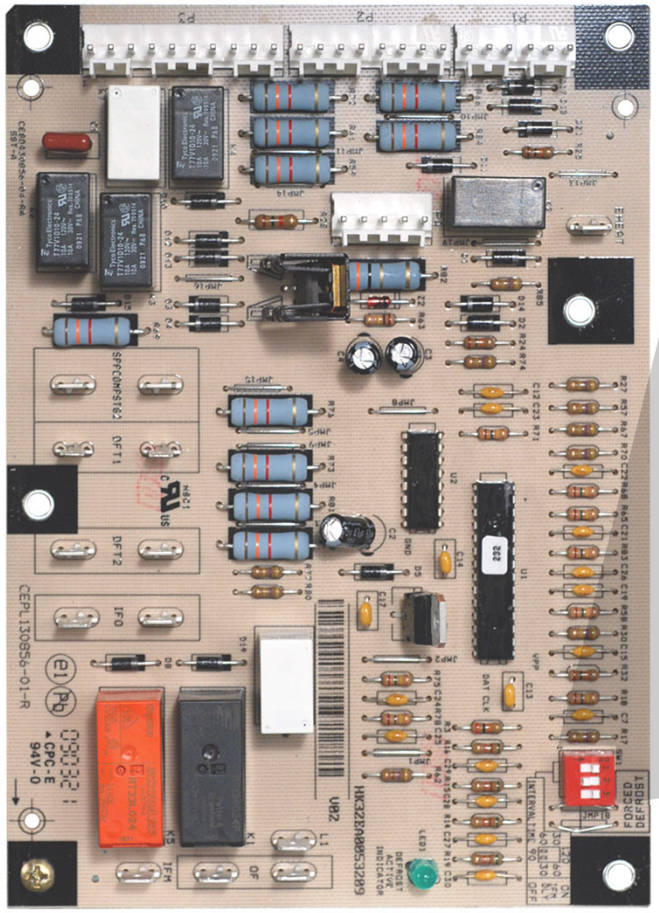
Heat Pump Operation

HEAT PUMP OPERATION

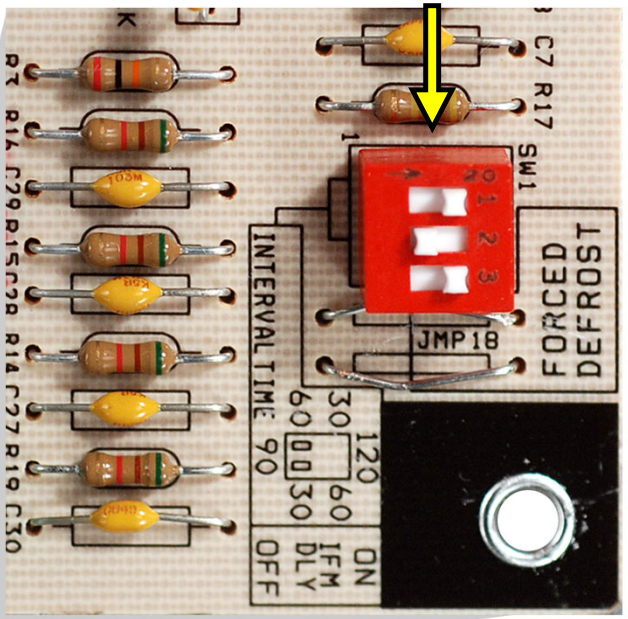
- Commercial heat pumps use a conventional Heat / Cool thermostat
  - DO NOT use **O**
- W1 from the thermostat energizes both compressors in the Heat mode.
- W2 from the thermostat energizes the electric heat


DEFROST BOARD
W1
W2
DDC ONLY
FIELD CONTROL WIRING
CONTL BOARD
DDC T'STAT
THERMO-STAT
REHEAT/HP
ELECTRIC HEAT(ACCESSORY)
UNIT SHUTDOWN
FOR FIELD USE
SEE NOTE 6
IFM OL
LSM
FIOP/ACCY
CLO1/COMP1
CLO2/COMP2
HPS1
LPS1
HPS2
LPS2
ECON
SEE NOTE 5
SEE NOTE 3

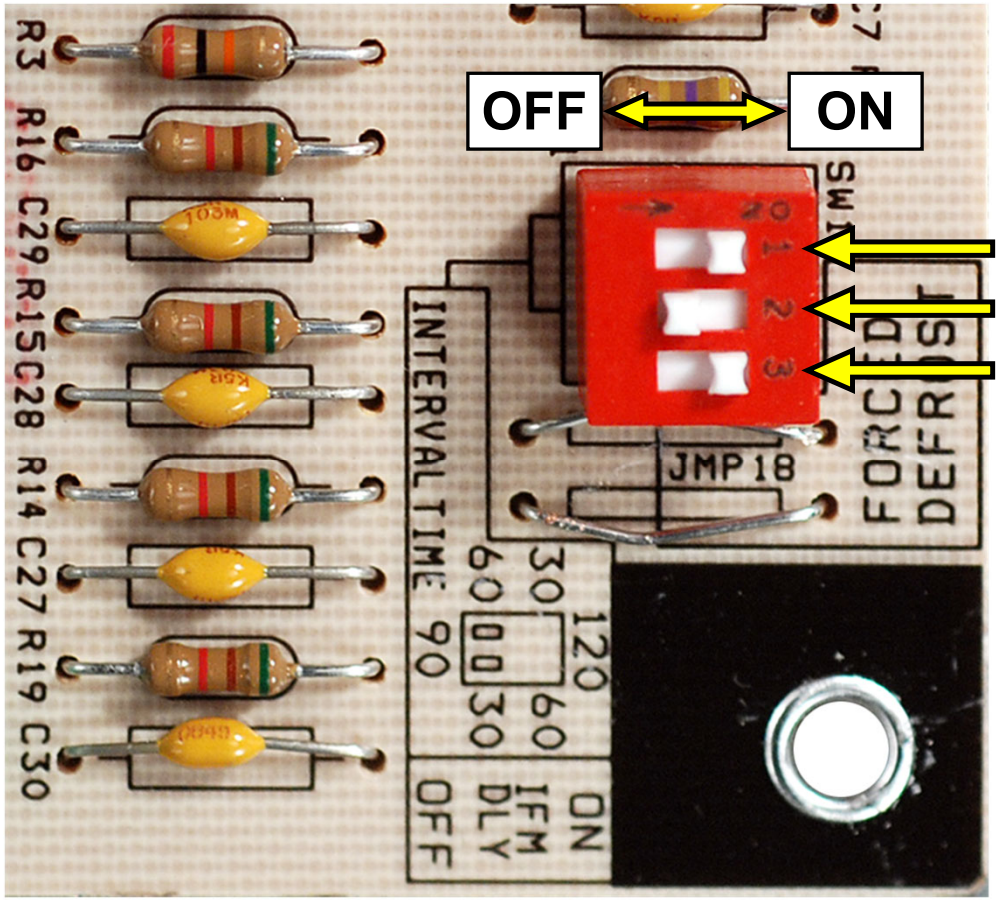
DEFROST



Defrost Control Board
DIP-SWITCHES



DEFROST INTERVAL

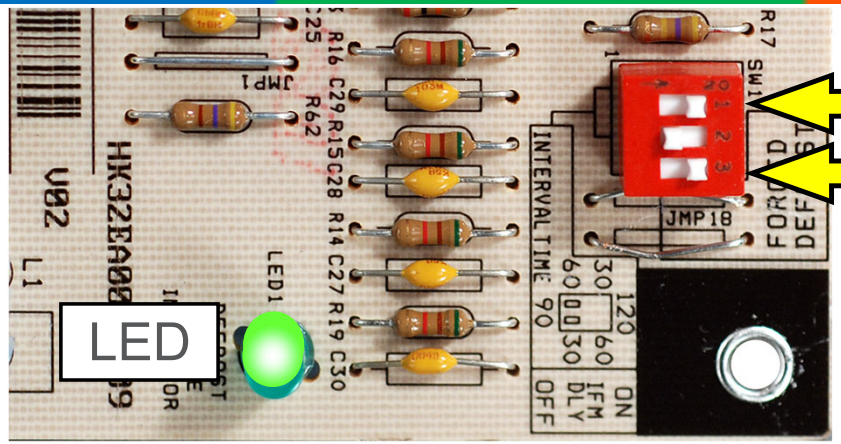


DIP-SWITCH #1 **ON**

DIP-SWITCH #2 **OFF**

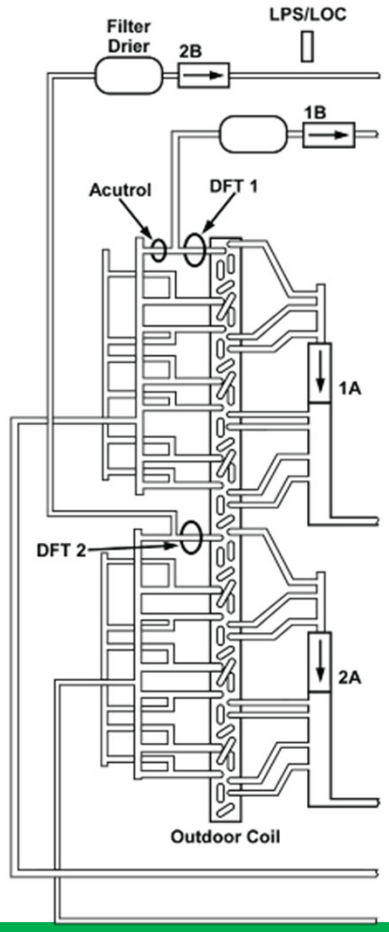
DIP-SWITCH #3 **ON**

DIP-SWITCHES



SWITCH 1	SWITCH 2	TIME
ON	OFF	30 MINUTES
OFF	ON	60 MINUTES
OFF	OFF	90 MINUTES
ON	ON	120 MINUTES

DEFROST THERMOSTAT (DFT)



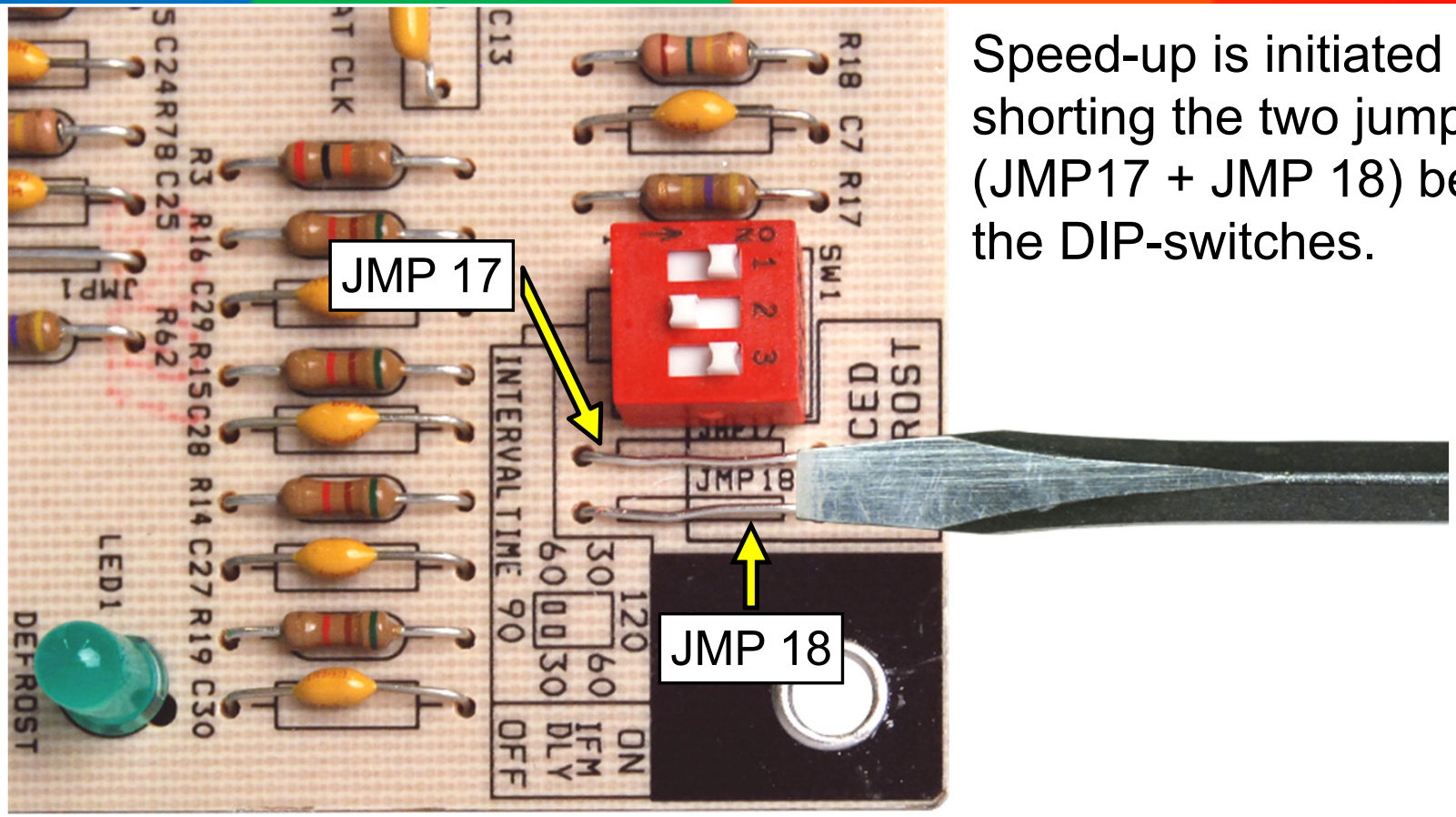
To Indoor Coil / Circuit #2

To Indoor Coil / Circuit #1

From Reversing Valve #1 / Circuit #1

From Reversing Valve #2 / Circuit #2

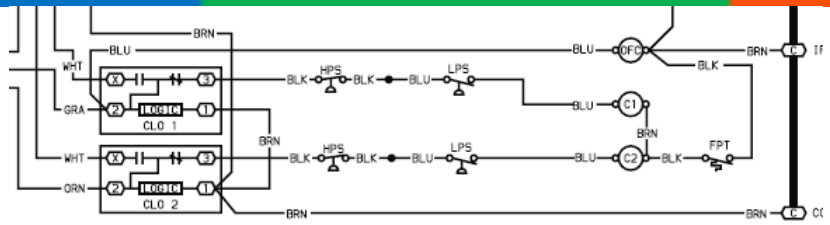
SPEED-UP PINS



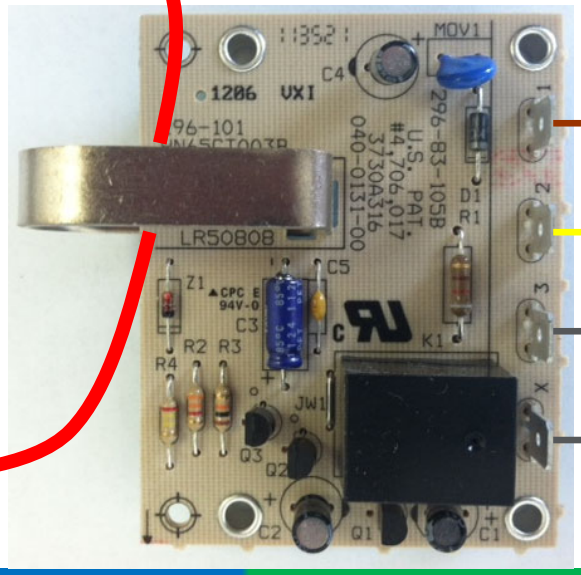
Speed-up is initiated by shorting the two jumpers (JMP17 + JMP 18) beneath the DIP-switches.

CLO & Comfort Alert

CLO Wiring and Operation



Compressor Wire



The CLO is energized by a 24 volt signal to terminal 2. Terminal 3 is 24 volts out to the contactor after passing the safeties. One load wire going to the compressor after the contactor goes through the sensor loop. If the #2 terminal has 24 volts and there is no amperage sensed going through the loop the #3 wire is de-energized locking out the compressor.

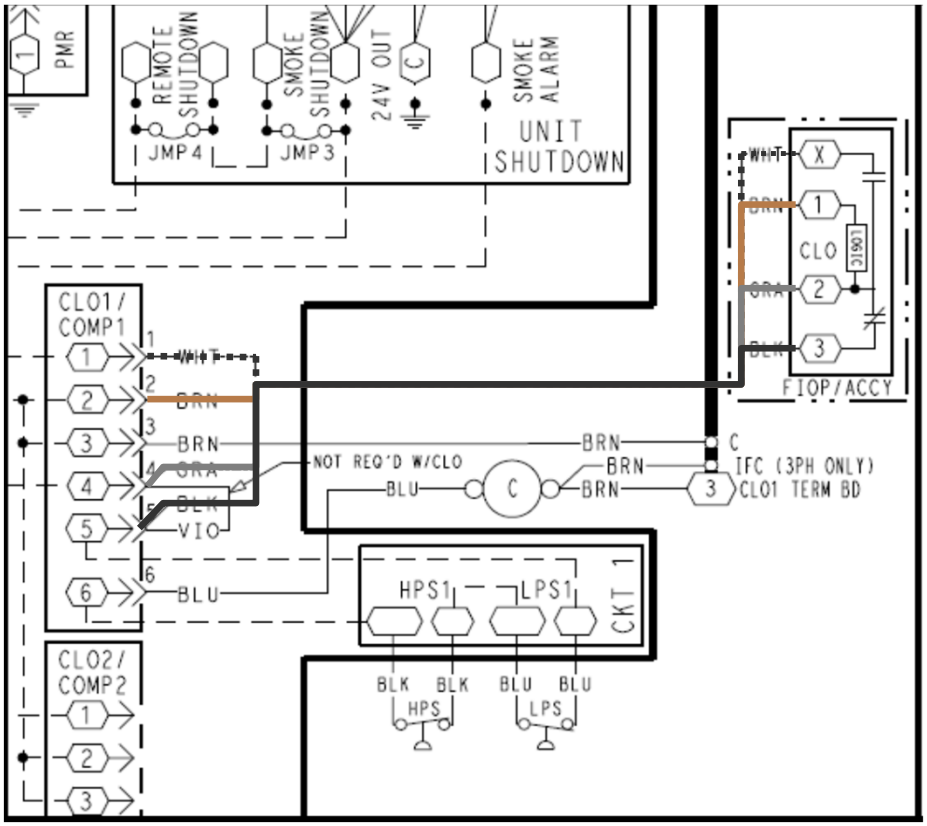
1 - 24 Volt Common

2 - Y 24 volt control input

3 - 24 volt out to safeties / compressor contactor

X - 24 volt to trouble light if used

CLO CONNECTIONS



EMERSON COMFORT ALERT TROUBLESHOOTING

Controls

- Comfort Alert Diagnostic Module

EMERSON COMFORT ALERT TROUBLESHOOTING

Comfort Alert Description

Capability To Send Signal To Thermostat

3Φ module detects missing and reverse phase

Green POWER LED Indicates Voltage Is Present At The Power Connection Of The Module

Spade Connectors Detect Tstat "Y" Demand and Pilot Voltage

Yellow ALERT LED Flashes To Indicate Fault Code

Diagnostics Key Directs Service Tech Quickly And Accurately To Root Cause Of The Problem

Red TRIP LED Indicates If Compressor Is Tripped Or Has No Power

EMERSON COMFORT ALERT TROUBLESHOOTING

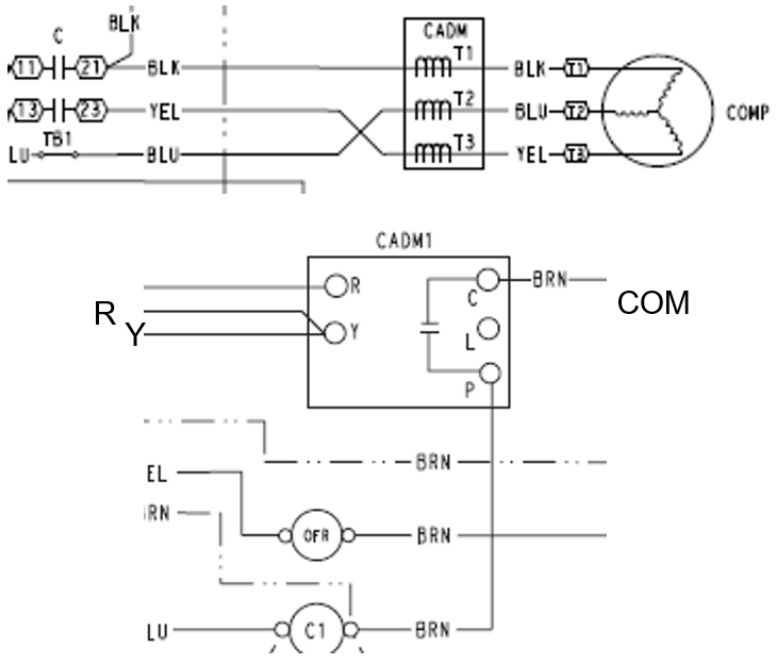
- **"Alert" Light Blinks When Any Of 8 Harmful System Conditions Is Detected**

Alert Code	System Condition	Diagnostic Alert Light	Lockout?
Code 2	System Pressure Trip	Blinks 2 Times	YES
Code 3	Short Cycling	Blinks 3 Times	YES
Code 4	Locked Rotor	Blinks 4 Times	YES
Code 5	Open Circuit	Blinks 5 Times	NO
Code 6	Missing Phase	Blinks 6 Times	YES
Code 7	Reverse Phase	Blinks 7 Times	YES
Code 8	Welded Contactor	Blinks 8 Times	NO
Code 9	Low Voltage	Blinks 9 Times	NO

Protective Faults That Result In Compressor Lockout

EMERSON COMFORT ALERT TROUBLESHOOTING

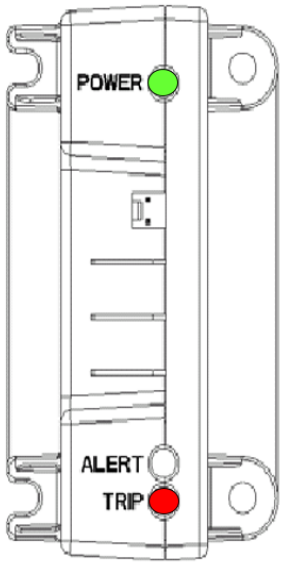
Comfort Alert Connections



EMERSON COMFORT ALERT TROUBLESHOOTING

Sensing Motor Protector Trips

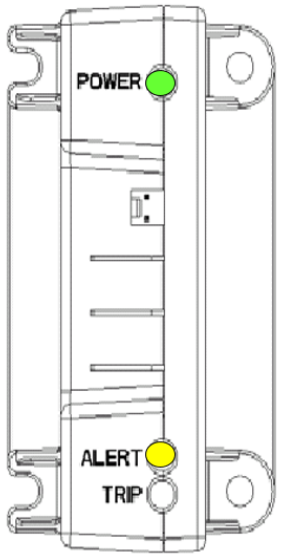
- **Comfort Alert Detects A Motor Trip When:**
  - Thermostat Demand “Y” Is On
  - No Current Is Measured To Compressor
- **Interpretation: Compressor Isn’t Operating When System Demand Is Present**
- **Root Causes**
  - **LPS, HPS Open**
  - **Motor Protector Open**
  - **Power Disconnected (Fuse, Switch, Etc.)**
  - **Comfort Alert Not Wired Properly**



EMERSON COMFORT ALERT TROUBLESHOOTING

Sensing System Pressure Trip
Code 2

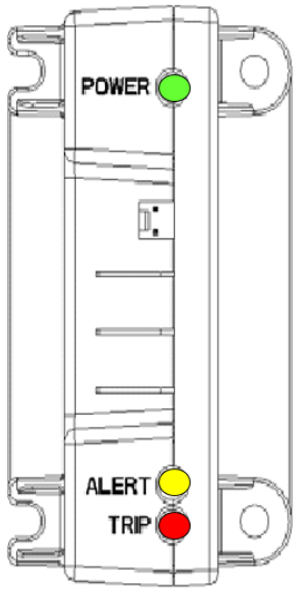
- **Comfort Alert Detects System Pressure Code When:**
  - Four Consecutive Protector Trips Occur
  - The Average Run Until Trip Time Is Between 1 Minute And 15 Minutes
- **Interpretation: High Pressure Condition Causes Compressor To Run Briefly Before Tripping**
- **Root Causes**
  - **Blocked Condenser Coils**
  - **Condenser Fan Not Running**
  - **LPS**



EMERSON COMFORT ALERT TROUBLESHOOTING

Sensing Short Cycling
Code 3

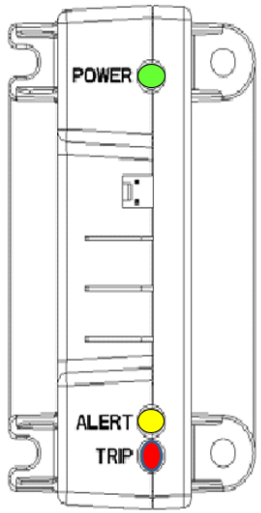
- **Comfort Alert Detects Short Cycling Code When:**
  - A Pattern Of Short Cycles Emerges
  - Average Run Time For Past 4 Runs Is Less Than 3 Minutes
  - Normal End-of-Cycle (Y Input Removed)
- **Interpretation: Compressor Is Running Only Short Periods Of Time**
- **Root Causes**
  - Low Space Load
  - Faulty Thermostat



EMERSON COMFORT ALERT TROUBLESHOOTING

Sensing Locked Rotor
Code 4

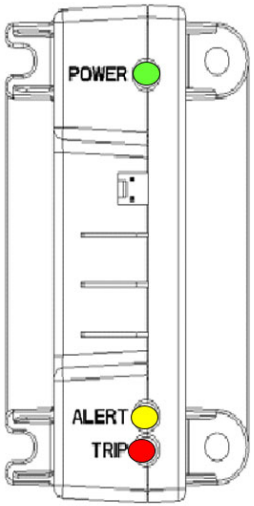
- **Comfort Alert Detects Locked Rotor Code When:**
  - Four Consecutive Protector Trips Occur
  - Y Demand Is Constant, Uninterrupted
  - The Average Run Until Trip Time Is Less Than 15 Seconds
- **Interpretation: Compressor Is Attempting To Start But Cannot**
- **Root Causes**
  - **Low Line Voltage**
  - **Mechanical Issue With Compressor**



EMERSON COMFORT ALERT TROUBLESHOOTING

Sensing Open Circuit
Code 5

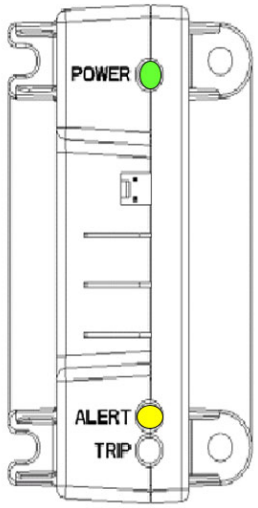
- **Comfort Alert Detects A Open Circuit Code When:**
  - Y Present, No Compressor Current For More Than 4 Hours (Protector Trip)
- **Interpretation: Power Is Not Connected To Compressor**
- **Root Causes**
  - Power Disconnected (Fuse, Switch, Etc.)
  - Failed Compressor Protector
  - Comfort Alert Not Wired Properly
    - Motor Leads Not Routed Through Comfort Alert Current Sensors



EMERSON COMFORT ALERT TROUBLESHOOTING

Sensing Missing Phase
Code 6

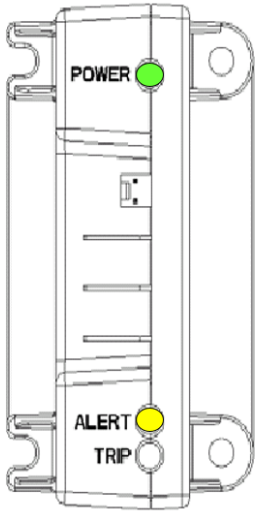
- **Comfort Alert Detects A Code 6 When There is Power to Y or Y1 and:**
  - Time Frequency between T1 and T3 is within certain parameters depending on 50 or 60 Hz power supply when T2 is missing
  - Either T1 or T3 Does Not Detect Current
  - Both Events Have To Last One Second
- **Interpretation: One Winding Of Compressor Not Getting Power**
- **Root Causes**
  - Blown Fuse
  - Loose Or Broken Wires
  - Compressor Winding Damage



EMERSON COMFORT ALERT TROUBLESHOOTING

Sensing Reverse Phase
Code 7

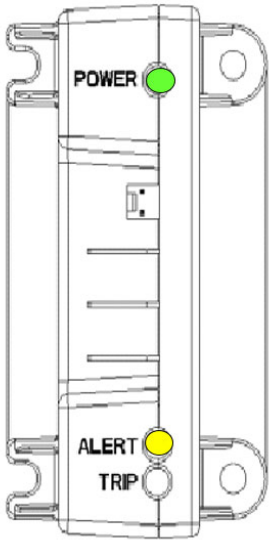
- **Comfort Alert Detects A Code 7 When There is Power to Y or Y1 and:**
  - Time Frequency between T1 and T3 is within certain parameters depending on 50 or 60 Hz power supply for 1 Second. This Time Parameter is Different from Code 6.
- **Interpretation: Two of the Phases are Reversed**
- **Root Causes**
  - Supply Power Leads Not Routed Correctly
    - •From Power Source To Compressor



EMERSON COMFORT ALERT TROUBLESHOOTING

Sensing Welded Contactor
Code 8

- **Comfort Alert Detects A Welded Contactor Code When:**
  - Current Is Detected Without “Y” Input
- **Interpretation: Compressor Contactor Will Not Disengage**
- **Root Causes**
  - Welded Contactor
  - Comfort Alert Not Wired Properly
    - Demand Wire Bypassing Comfort Alert Module

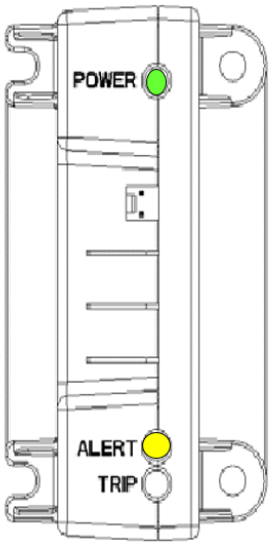


EMERSON COMFORT ALERT TROUBLESHOOTING

Sensing Low Voltage
Code 9

- **Comfort Alert Detects Low Voltage Code When:**
  - Comfort Alert 24VAC Is Below 18VAC
- **Interpretation: Low Voltage Condition Exists**
- **Root Causes**
  - Control Transformer Overloaded
  - Line Voltage Low

Auto-reset at 19 VAC
3-Minute Recheck



EMERSON COMFORT ALERT TROUBLESHOOTING

Multiple Alerts Condition

- **If Multiple Alerts Occur, Comfort Alert Displays The First Code That Is Detected**
  –Allows Technician To Determine The Root Cause
- **Example**
  - Low Line Voltage Leads To Locked Rotor Condition On Compressor
  - Comfort Alert Displays Low Voltage Code Even While Locked Rotor Events Are Happening
- **Protective codes (2,3,4,6,7,9) have Precedence over Non Protective Codes**
- **Over Current Sensed at Comfort Alert P-Terminal (1.5 +/-0.5 Amps) takes Precedence over Protective Code**

EMERSON COMFORT ALERT TROUBLESHOOTING

CADM Resets

- **Automatic Reset**

  –Voltage Alert (Code 9) Resets When Voltage Rises Above 19VAC

- **Manual Reset**

  - All Alert Codes Can Be Reset By Cycling 24VAC Power

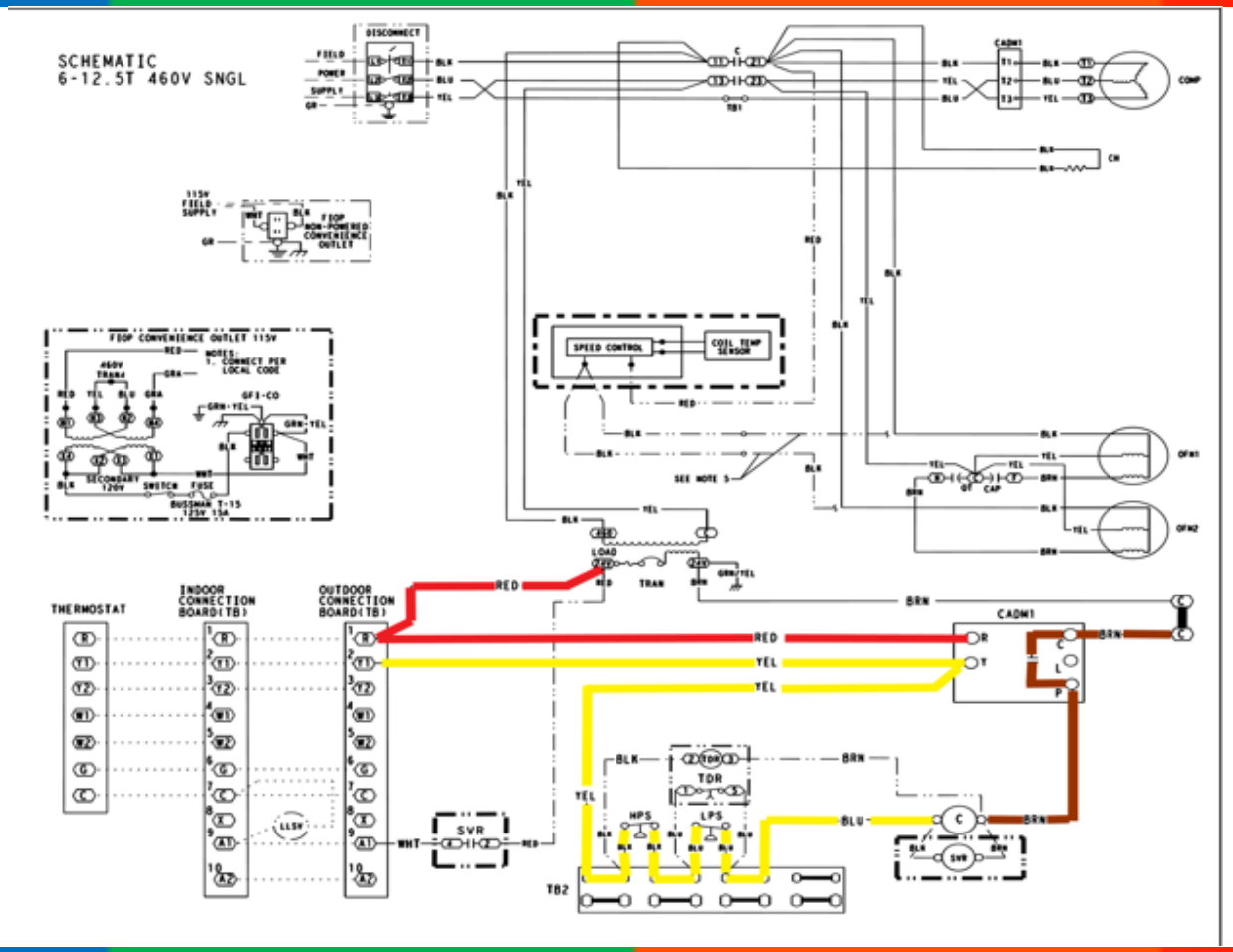
  - Previous Code Will Flash 60 Seconds

EMERSON COMFORT ALERT TROUBLESHOOTING

CADM Memory

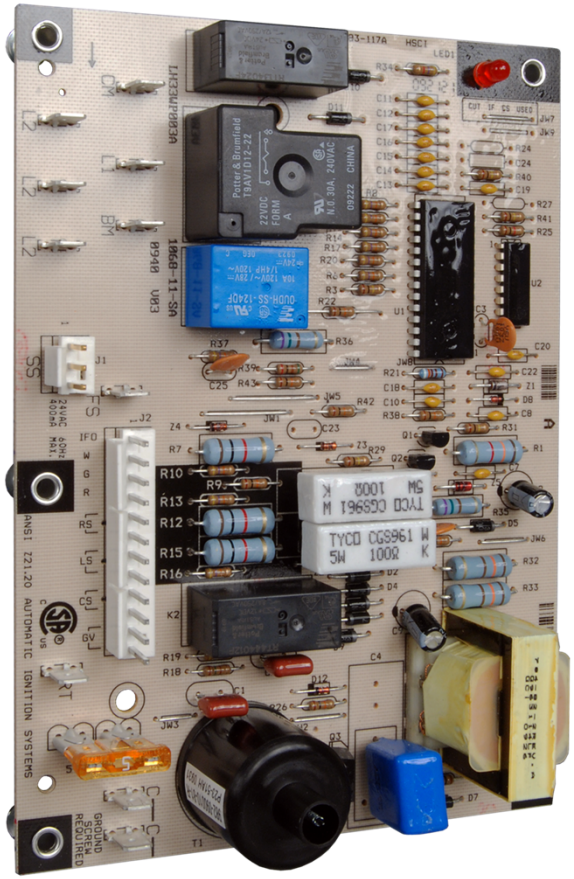
- **Comfort Alert Displays Last Alarm At Each Power Up**
  - **–Displays Code If Alarm Occurred During Last Power Cycle**
  - **–Display Lasts For One Minute**
- **Alarm History Is Kept In Memory**
  - –Comfort Alert Analysis Software Required
  - –Seven Day History Of Alarms
  - –Overall Count Of Alarms In Permanent History
- **Anti Short Cycle Timer**
  - –3 Minute Off Cycle after normal Shutdown
  - –Time Delay not Active First 50 Starts
  - – RED LED Flashes during OFF Period

EMERSON COMFORT ALERT TROUBLESHOOTING



Integrated Gas Control - IGC

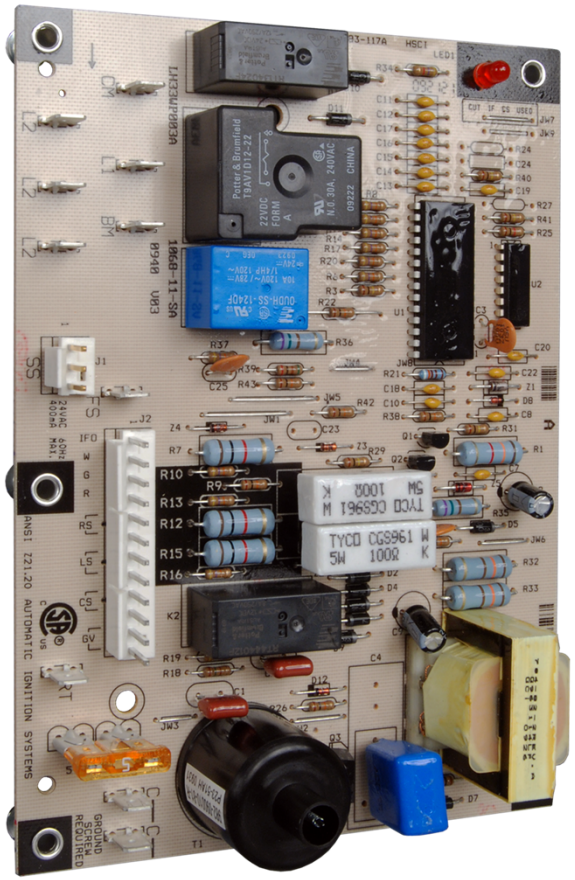
GAS HEAT CONTROLS AND HARDWARE

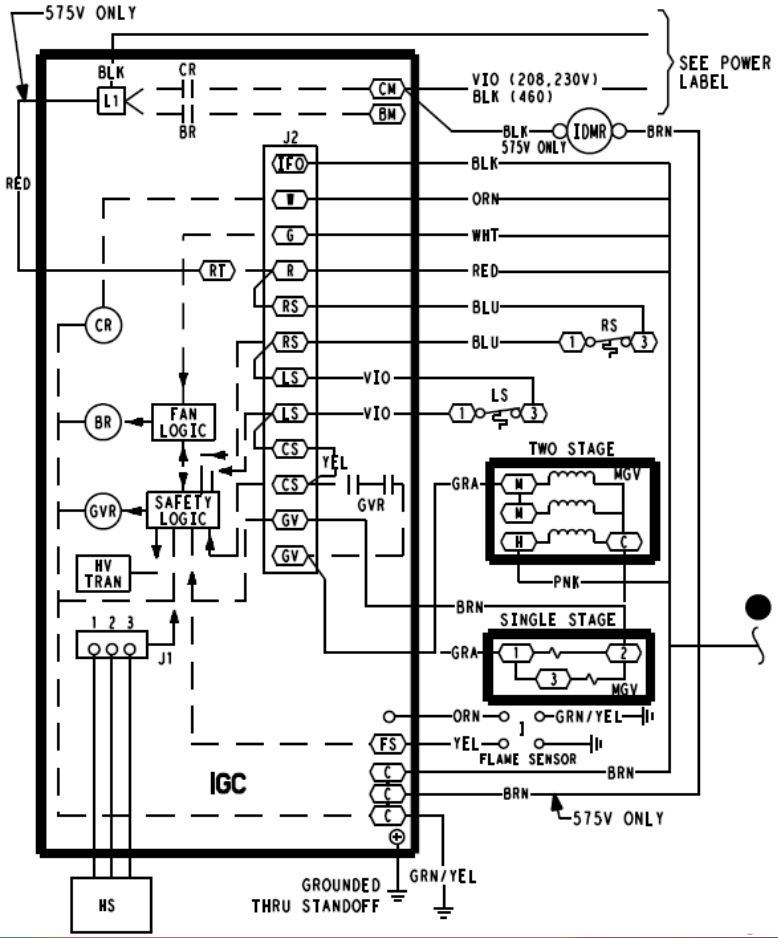


IGC Board:

- Burner ignition and flame sensing
- Timed on/off control of the indoor fan
- Continuous monitoring of safety devices
- LED display of system status and error codes

IGC INTEGRATED GAS CONTROL





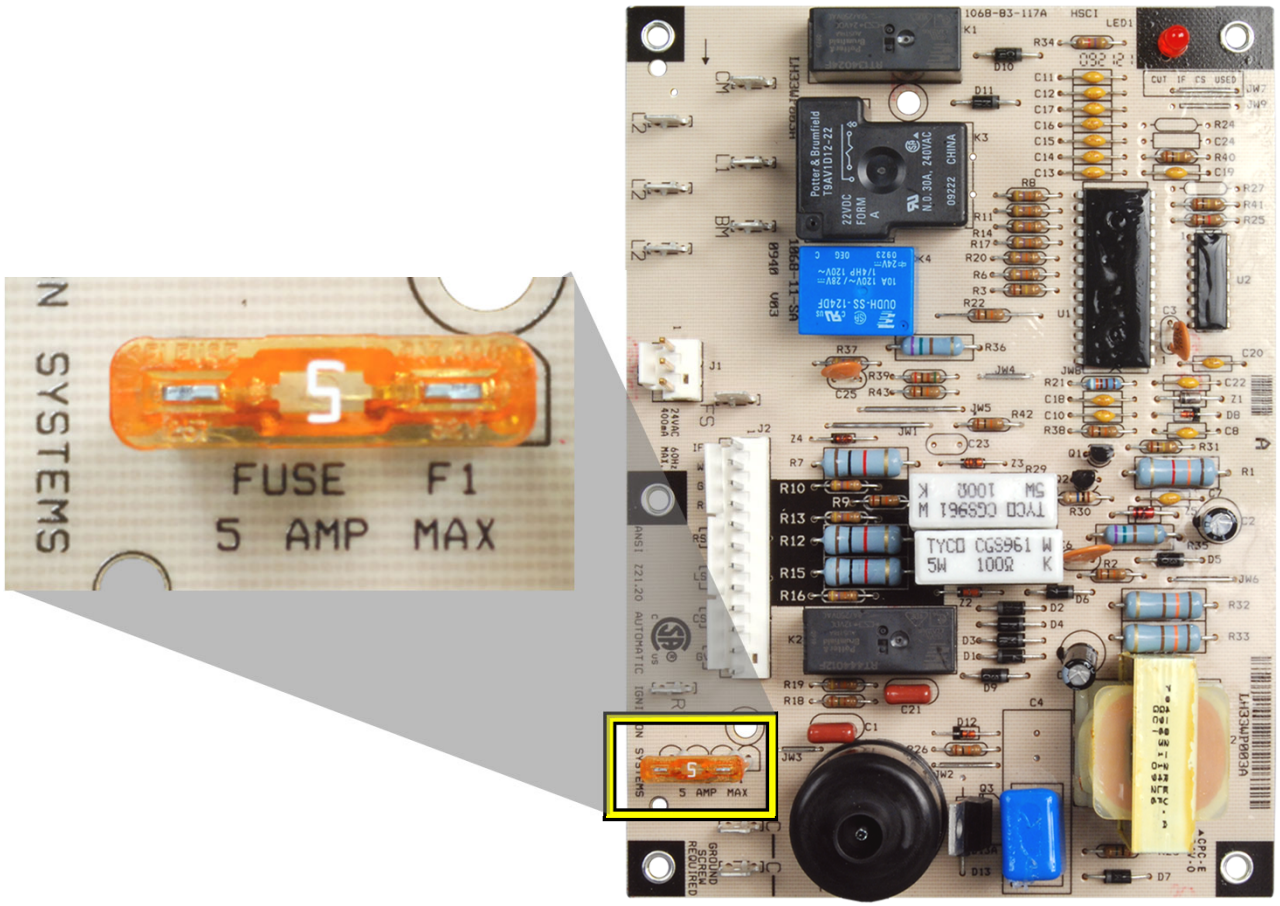
IGC FAULT CODES

LED FLASH CODE	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
On	Normal Operation	—	—	—
Off	Hardware Failure	No gas heating.	—	Loss of power to the IGC. Check 5 amp fuse on IGC, power to unit, 24V circuit breaker, transformer, and wiring to the IGC.
2 Flashes	Limit Switch Fault	Gas valve and igniter Off. Indoor fan and inducer On.	Limit switch closed, or heat call (W) Off.	High temperature limit switch is open. Check the operation of the indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is within the range on the unit nameplate. Check wiring and limit switch operation.
3 Flashes	Flame Sense Fault	Indoor fan and inducer On.	Flame sense normal. Power reset for LED reset.	The IGC sensed a flame when the gas valve should be closed. Check wiring, flame sensor, and gas valve operation.
4 Flashes	Four Consecutive Limit Switch Fault	No gas heating.	Heat call (W) Off. Power reset for LED reset.	4 consecutive limit switch faults within a single call for heat. See Limit Switch Fault.
5 Flashes	Ignition Fault	No gas heating.	Heat call (W) Off. Power reset for LED reset.	Unit unsuccessfully attempted ignition for 15 minutes. Check igniter and flame sensor electrode spacing, gaps, etc. Check flame sense and igniter wiring. Check gas valve operation and gas supply. Check gas valve connections to IGC terminals. BRN lead must be on Pin 11.
6 Flashes	Induced Draft Motor Fault	If heat off: no gas heating. If heat on: gas valve Off and inducer On.	Inducer sense normal, or heat call (W) Off.	Inducer sense On when heat call Off, or inducer sense Off when heat call On. Check wiring, voltage, and operation of IGC motor. Check speed sensor wiring to IGC.
7 Flashes	Rollout Switch Lockout	Gas valve and igniter Off. Indoor fan and inducer On.	Power reset.	Rollout switch has opened. Check gas valve operation. Check induced-draft blower wheel is properly secured to motor shaft.
8 Flashes	Internal Control Lockout	No gas heating.	Power reset.	IGC has sensed internal hardware or software error. If fault is not cleared by resetting 24 v power, replace the IGC.
9 Flashes	Temporary Software Lockout	No gas heating.	1 hour auto reset, or power reset.	Electrical interference is disrupting the IGC software.

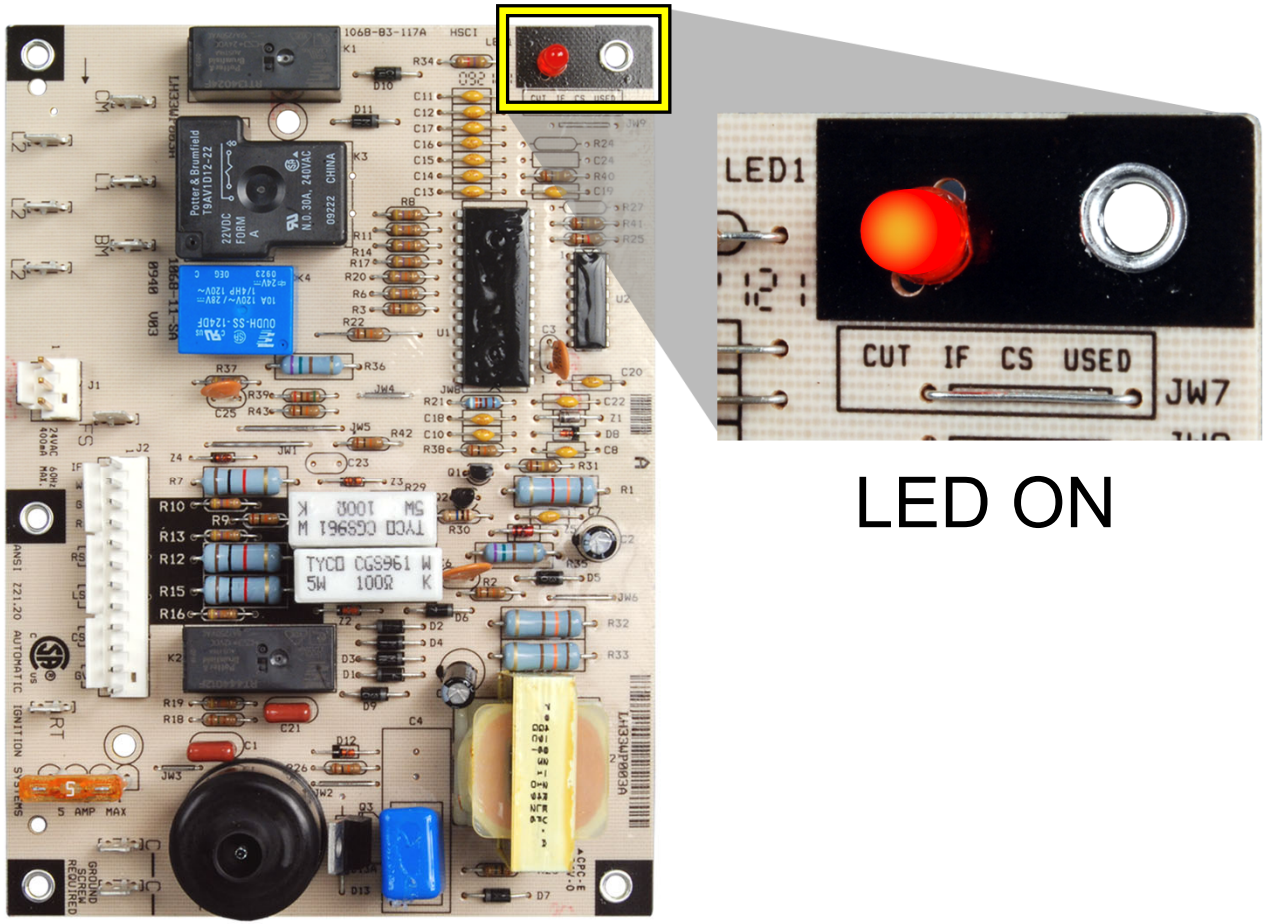
RESETTING FAULT CODES

CODE	ACTION	LOCKOUT	RESET MODE
1	Blower On/Off Delay Modified	No	Code Retained Until Unit's 24 Volts is Cycled
2	Limit Trip	Temporary	Cleared After Limit Switch Resets
3	Flame Sensing Error – Senses Flame When it Shouldn't	Temporary	Cleared After Error Clears
4	Four Consecutive Limit Trips in One Call for Heat	Yes – Soft	Cleared by Cycling "W" Signal
5	Ignition Lockout – Attempted Ignitions for 15 Minutes Without Success	Yes – Soft	Cleared by Cycling "W" Signal
6	Inducer Fault – Signal Between Board and Motor Do Not Match	Yes – Soft	Cleared by Cycling "W" Signal
7	Rollout Switch Opens	Yes – Hard	Lockout is Retained Until Unit's 24 Volts is Cycled
8	Control Fault – Detects Hardware or Software Failure	Yes – Hard	Lockout is Retained Until Unit's 24 Volts is Cycled
9	Safety Critical Code Fault – Detects Hardware or Software Failure	Temporary	Cleared After 1 Hour

BLOWN FUSE

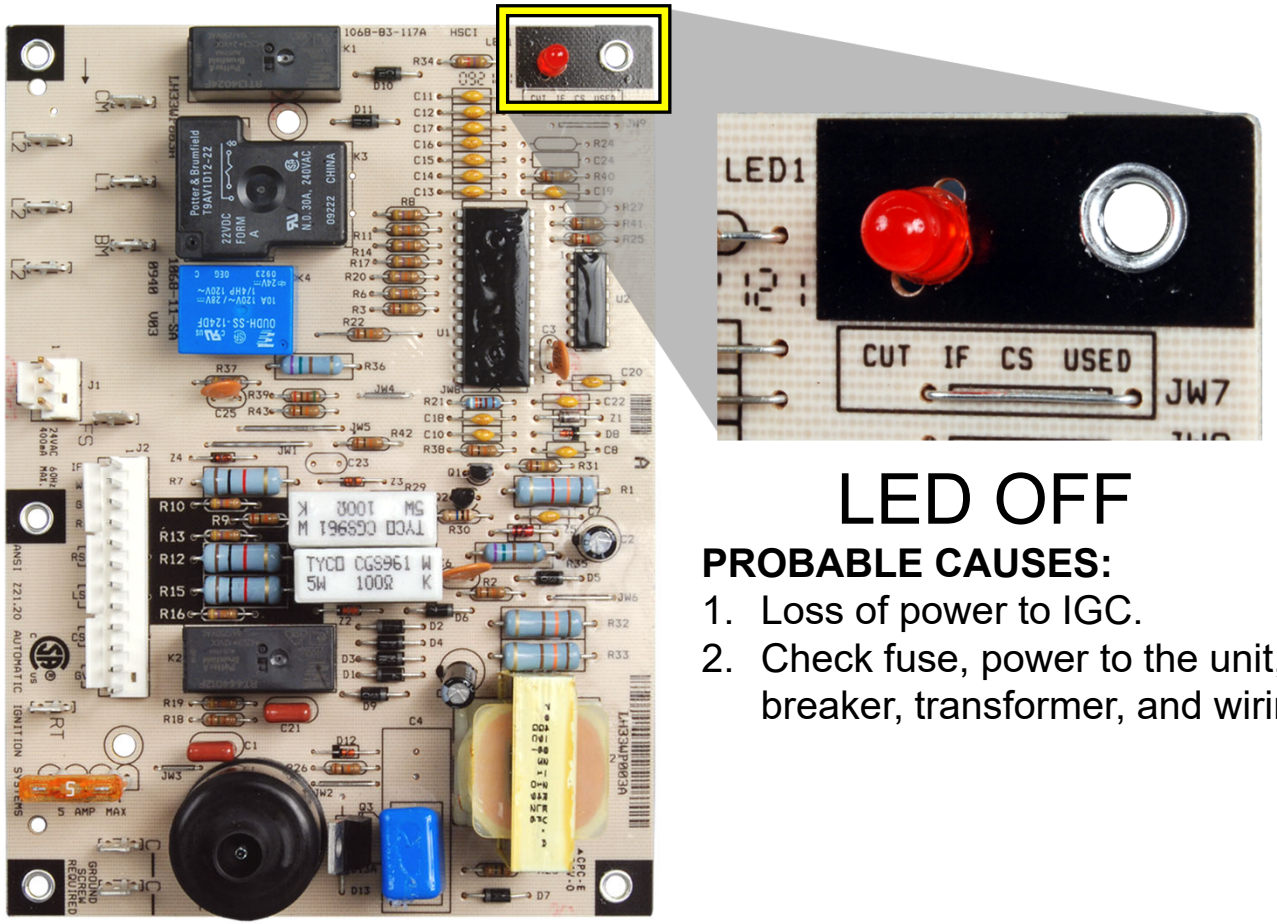


NORMAL OPERATION



LED ON

HARDWARE FAILURE

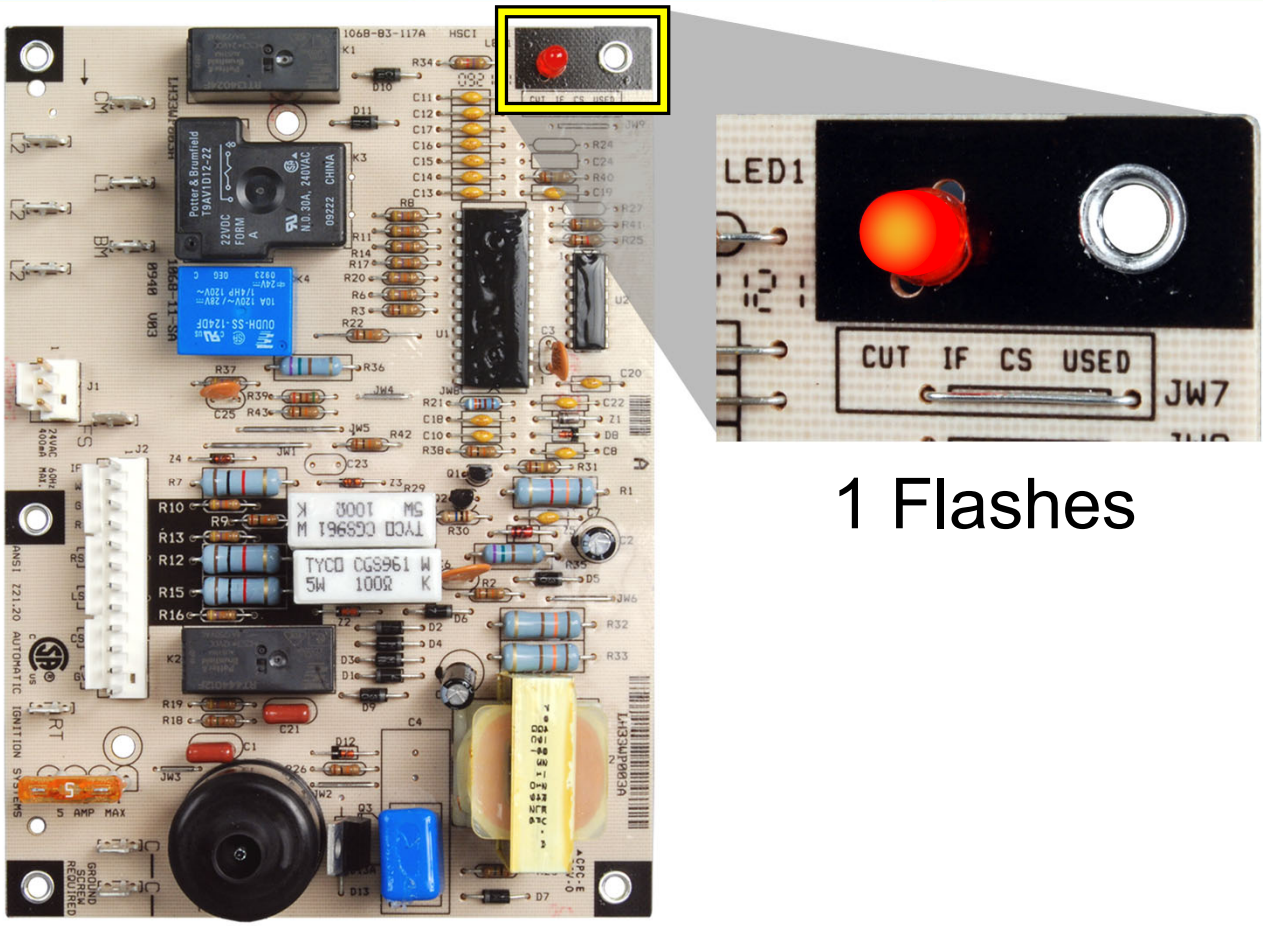


LED OFF

PROBABLE CAUSES:

1. Loss of power to IGC.
2. Check fuse, power to the unit, 24 volt circuit breaker, transformer, and wiring.

EVAPORATOR FAN ON/OFF DELAY MODIFED



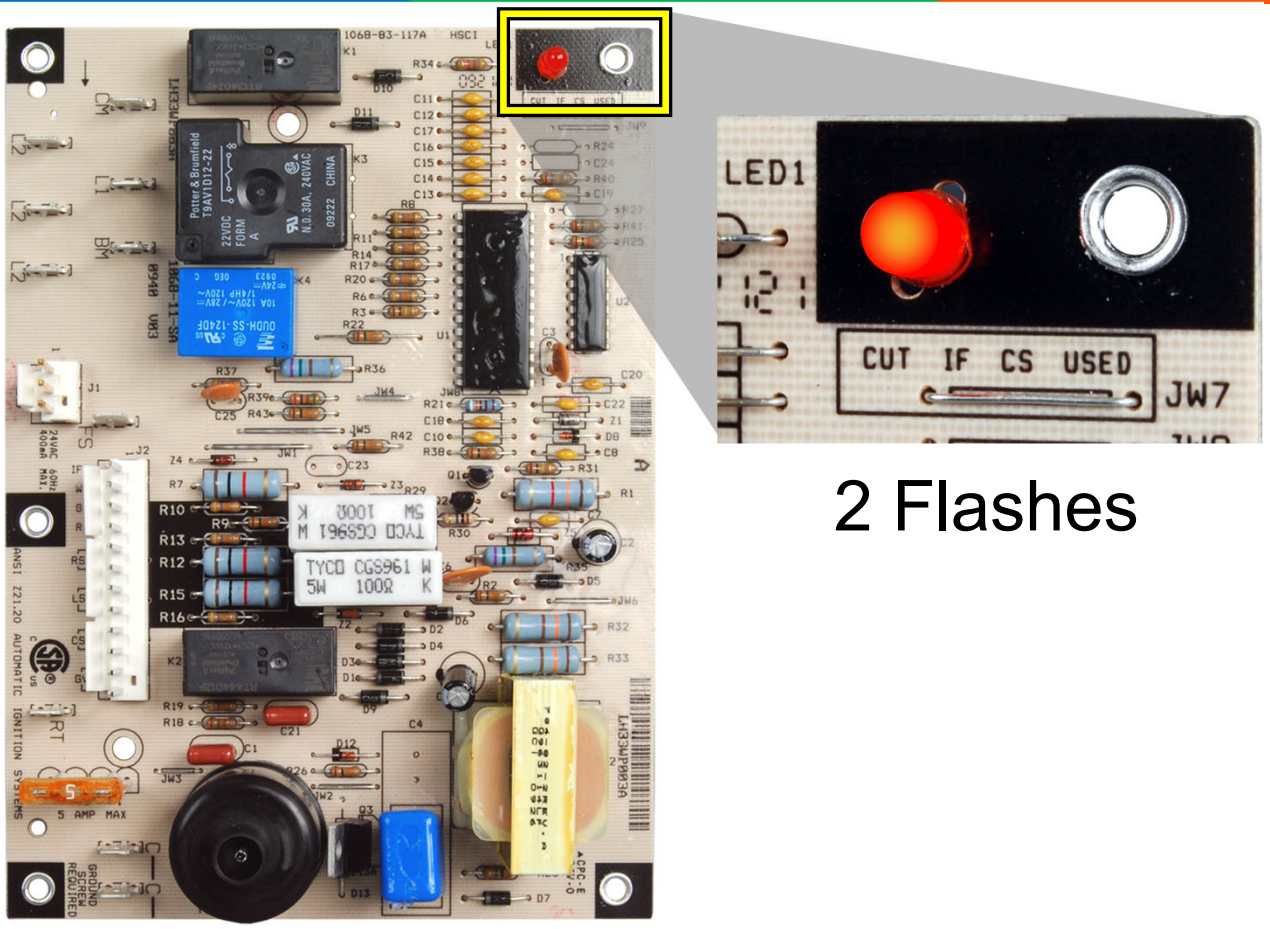
1 Flashes

IGC Fault Code 1 (1 flashes): Indicates a code that is not an error. The unit will continue to operate when this code is displayed.

The action taken by the control is 5 seconds subtracted from the On delay or 5 seconds added to Off delay (3 min max).

PROBABLE CAUSE: The high temperature limit switch opened during heat exchanger warm-up period before fan-on delay expired. The high temperature limit switch opened within 10 minutes of heat call (W) Off.

LIMIT SWITCH FAULT

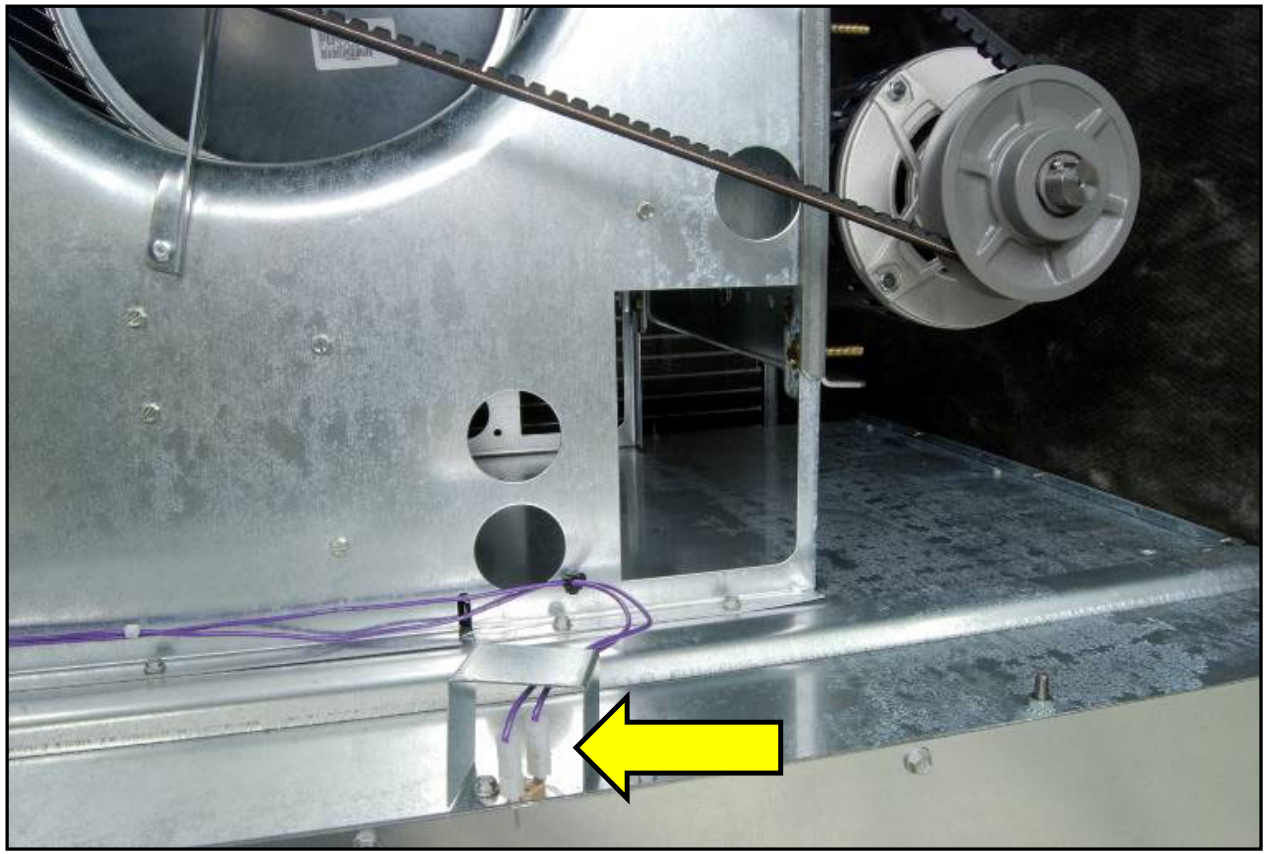


2 Flashes

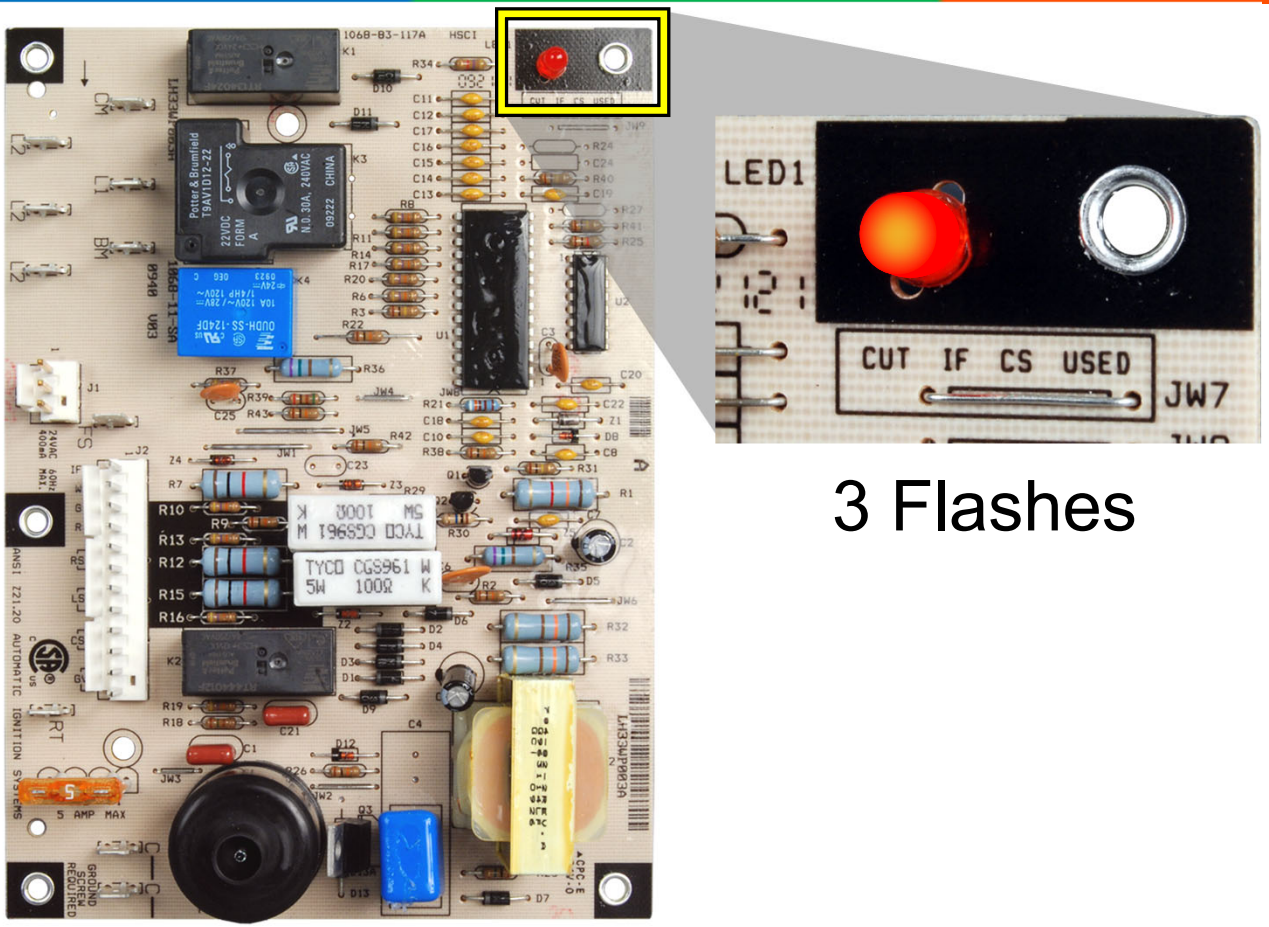
IGC Fault Code 2 (2 flashes): The action taken by the control will turn the gas valve and igniter off. The indoor fan and inducer will be turned on.

PROBABLE CAUSE: High temperature limit is open. Check the operation of the indoor fan motor. Ensure that the supply-air temperature rise is within the range on the unit nameplate. Check the wiring and limit switch operation.

LIMIT SWITCH



FLAME SENSE FAULT

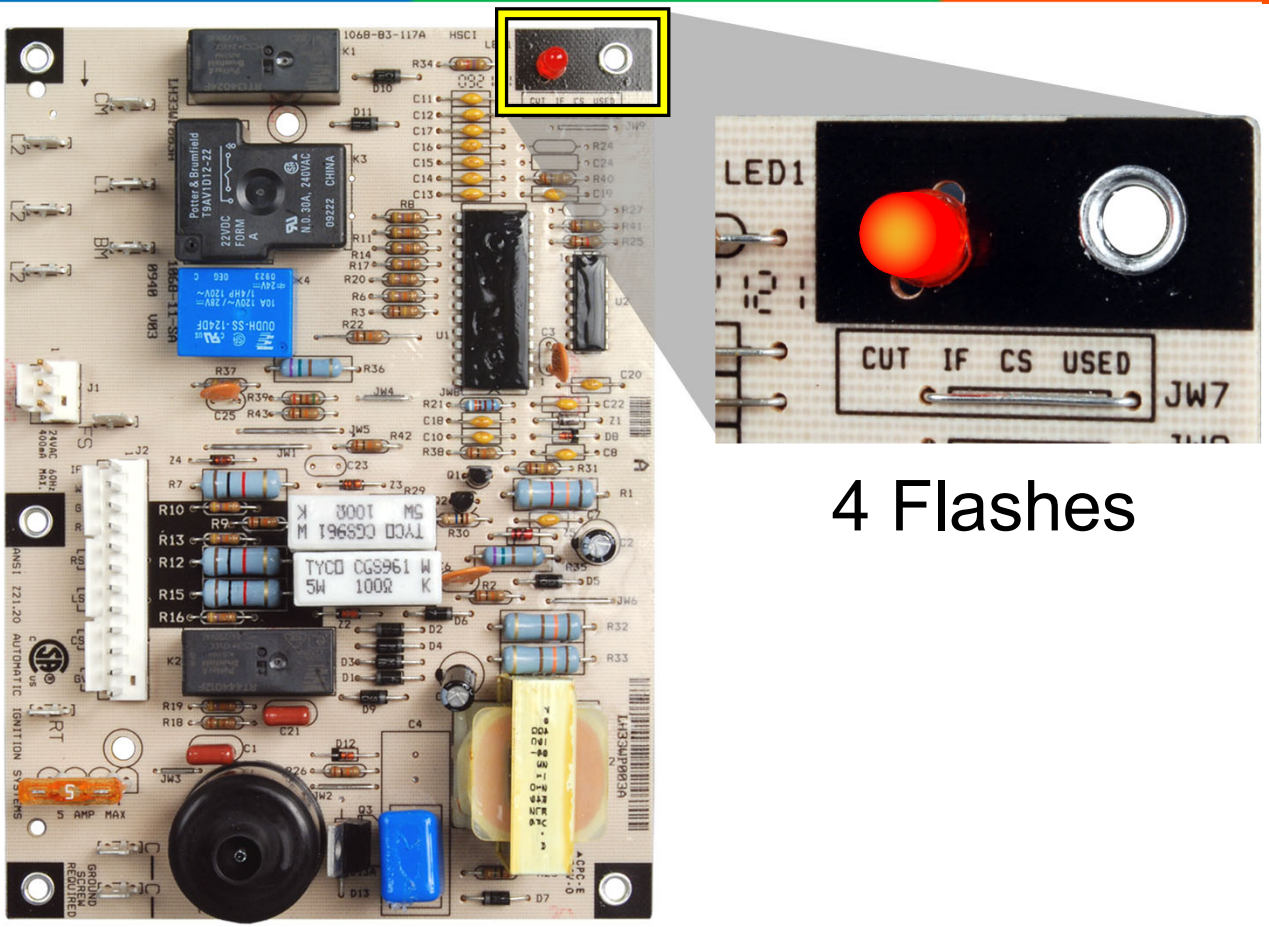


3 Flashes

IGC Fault Code 3 (3 flashes): The action taken by the control is turn the indoor fan and inducer on.

PROBABLE CAUSE: The IGC sensed a flame when the gas valve should be closed. Check wiring flame sensor, and gas valve operation.

FOUR CONSECUTIVE LIMIT SWITCH FAULT

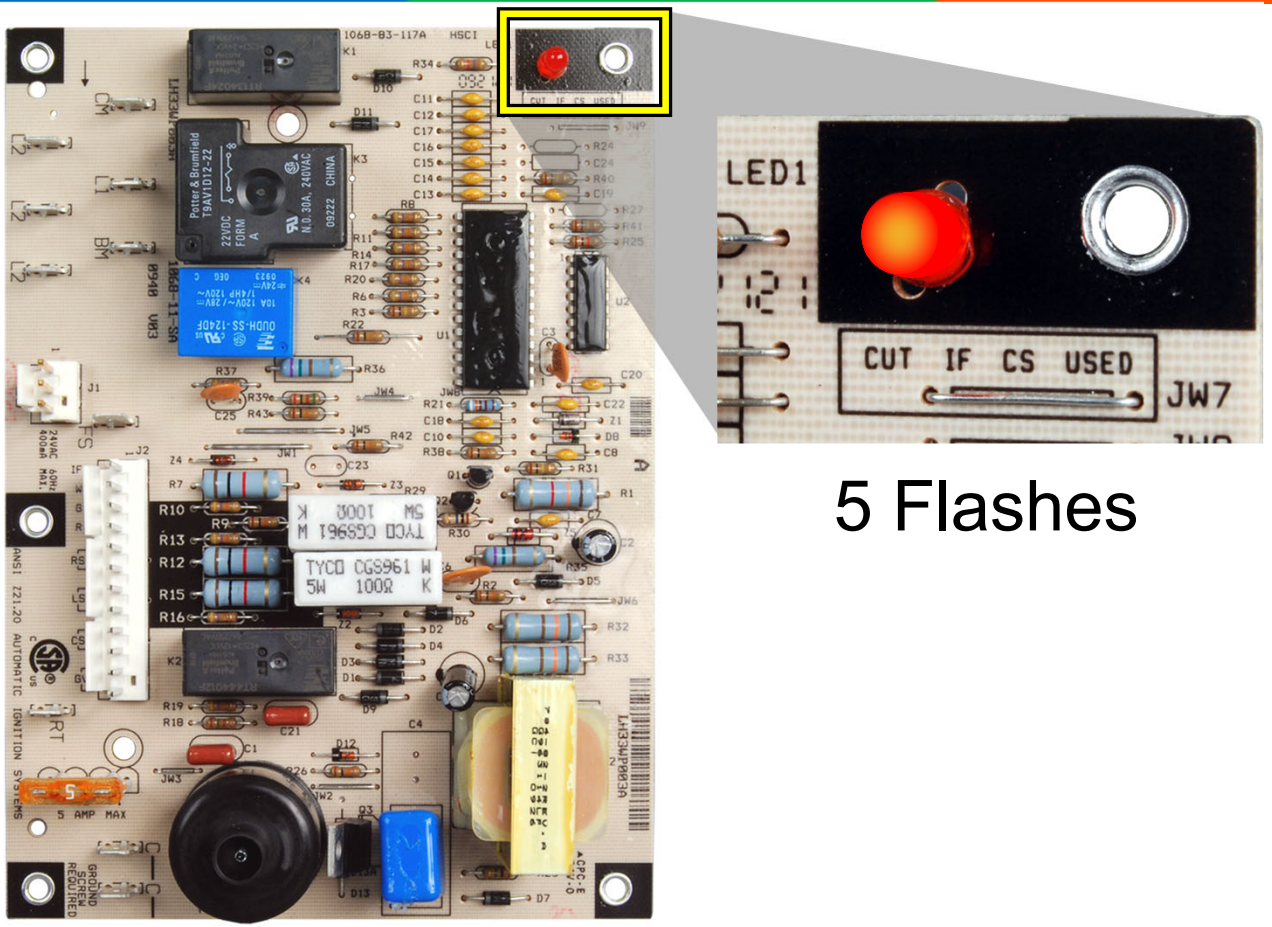


4 Flashes

IGC Fault Code 4 (4 flashes): The action taken by the control is no gas heat operation will occur.

PROBABLE CAUSE: 4 consecutive limit switch faults within a single call for heat. See Limit Switch Fault.

IGNITION FAULT



5 Flashes

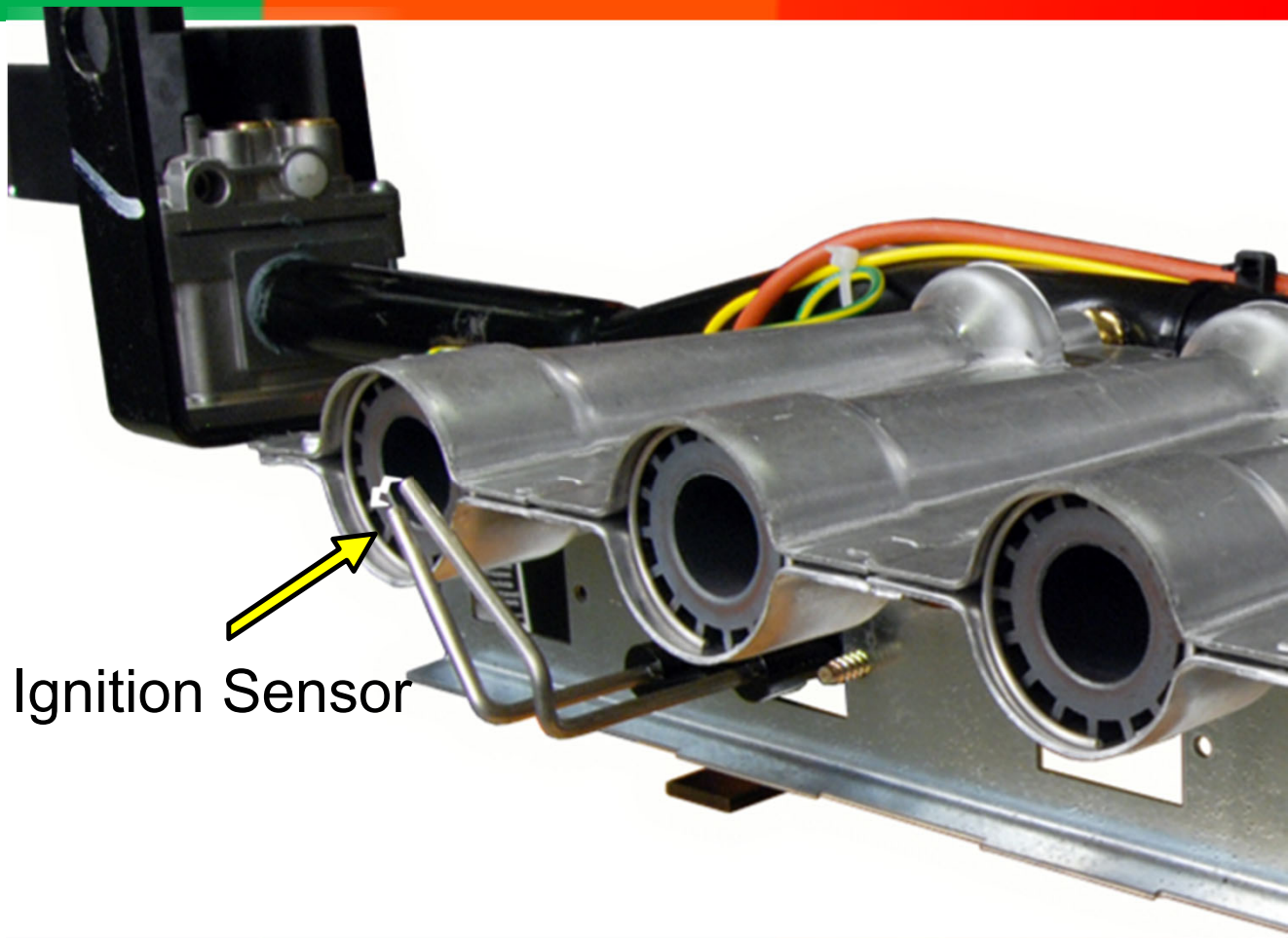
IGC Fault Code 5 (5 flashes): The action taken by the control is no gas heating operation will occur.

PROBABLE CAUSE: The unit unsuccessfully attempted ignition for 15 minutes. Check igniter and flame sensor electrode spacing, gaps, etc. Check flame sense and igniter wiring. Check gas valve operation and gas supply.

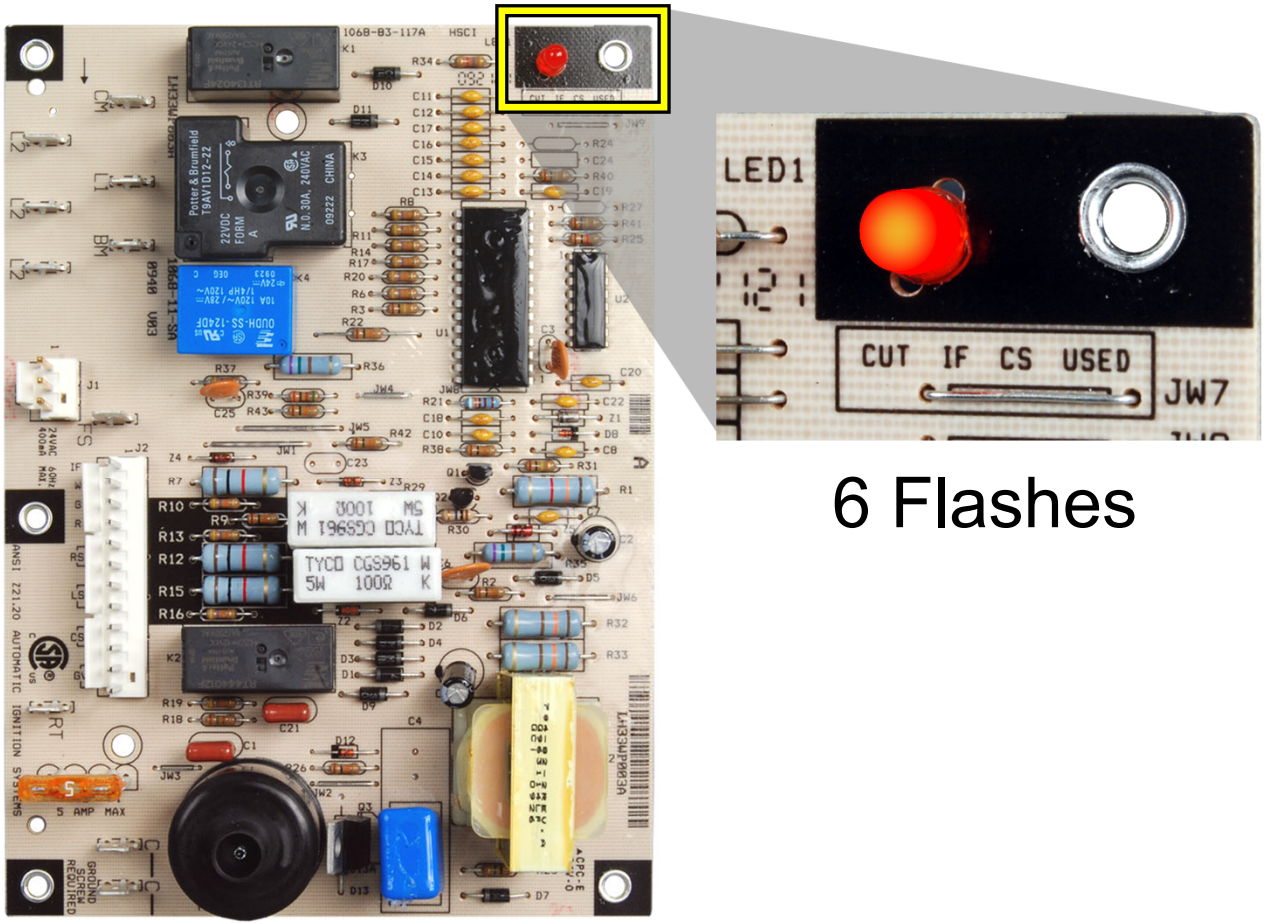
IGNITION

IGC Fault Code 5 (5 flashes) will be displayed if the flame signal is lost during a call for heat. The control will attempt to re-ignite the furnace. If after 15 minutes of unsuccessful attempts to re-light the furnace, the control will lock-out and fault code 5 will be displayed.

Check for oxide build-up on the flame sensor and clean with fine steel wool. The flame sensor senses micro-amps and a build-up of oxide will interrupt the circuit. The flame sensor cannot be grounded or it will not operate. Also check the inlet gas pressure, control ground continuity, and the gas valve.



INDUCED DRAFT MOTOR FAULT

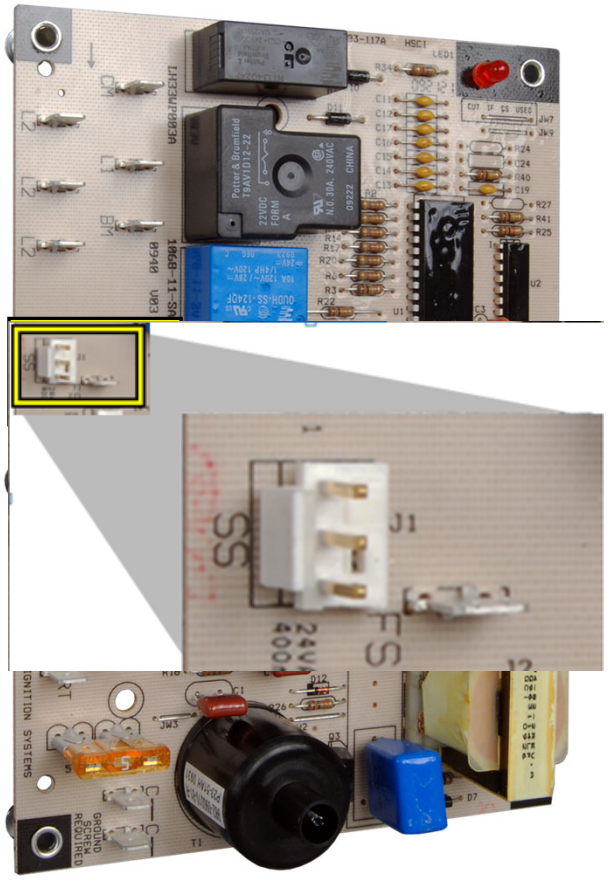


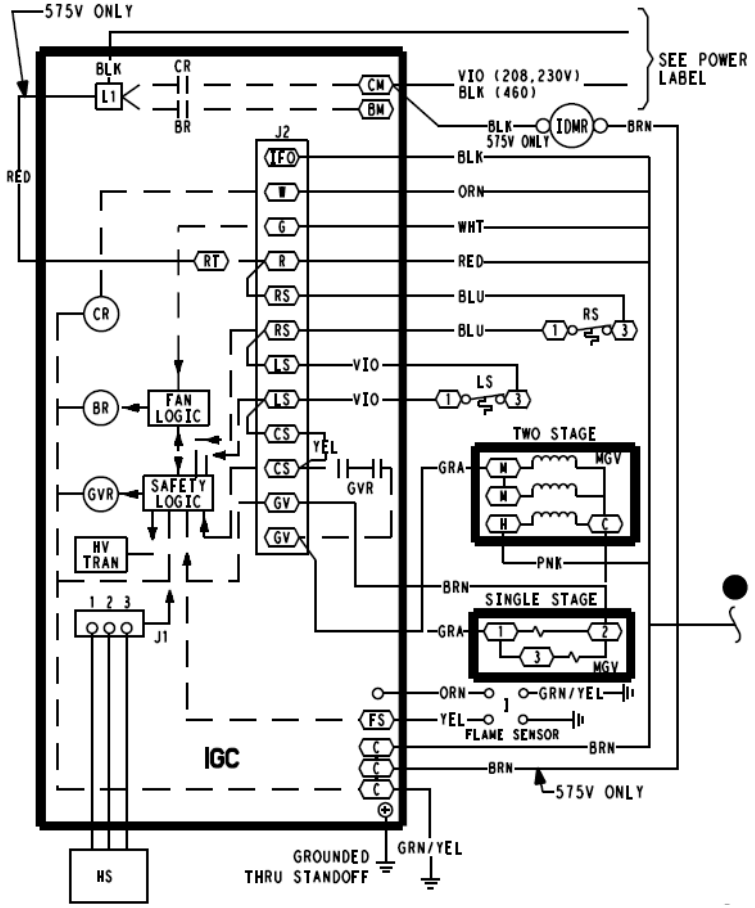
6 Flashes

IGC Fault Code 6 (6 flashes): The action taken by the control if the heat is off will be no gas heat operation, if the heat is on it will turn the gas valve and inducer off.

PROBABLE CAUSE: The inducer was sensed on when heat call was off, or the inducer was sensed off when heat call on. Check wiring, voltage, and operation of IGC motor. Check speed sensor wiring to IGC.

TROUBLESHOOTING HALL EFFECTS SWITCH





TEST IGC BOARD AND HALL EFFECT SENSOR

Unplugged – reading circuit board

Pin #3 black lead and pin #1 red lead

Read 7.5-10 vdc

Pin #3 black lead and pin #2 red lead

Read 21-24 vdc

If outside these readings – Replace IGC

Plugged into circuit board

Same pin test point (1-3), rotate motor

Half turn reads <1 vdc, other half turn reads 6.5-9 vdc

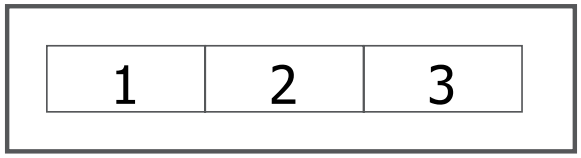
Same pin test point (2-3), rotate motor

Will read 16-21 vdc

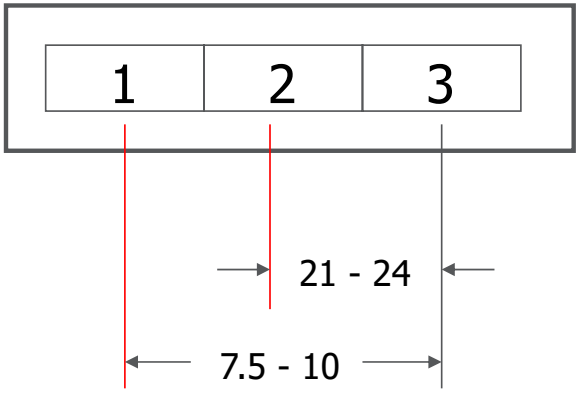
Anything outside of readings – Replace Hall Effect Sensor

TEST IGC BOARD AND HALL EFFECT SENSOR

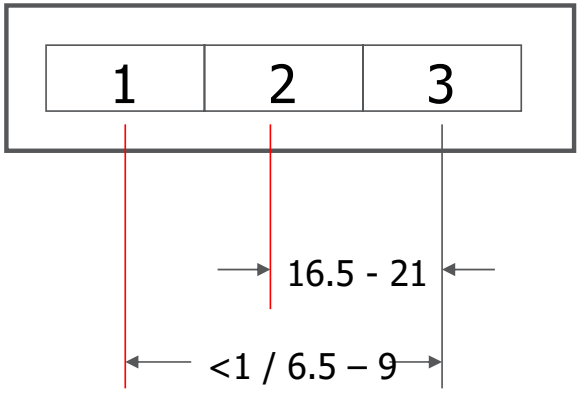
Three Wire Plug



Plug at Board (Unplugged)



Plug in the Board



DC Meter Required

TEST IGC BOARD AND HALL EFFECT SENSOR

The Hall Effect Sensor is a magnetic device it send a signal to the board to verify the motor is running at the correct speed

Testing the IGC board

De-energize the IGC board
Unplug the Hall Effect Sensor
Energize the IGC board
Set the thermostat in off position
Set meter to DC volts 30vdc range
Connect Black lead from meter to pin #3 of the board
Connect the Red lead from the meter to pin #1 of the board you should read 7.5-10vdc
Then move the Red lead from the meter to pin #2 of the board you should read 21vdc

If either of these 2 are out of range replace the IGC

TEST IGC BOARD AND HALL EFFECT SENSOR

Testing the Hall Effect Sensor

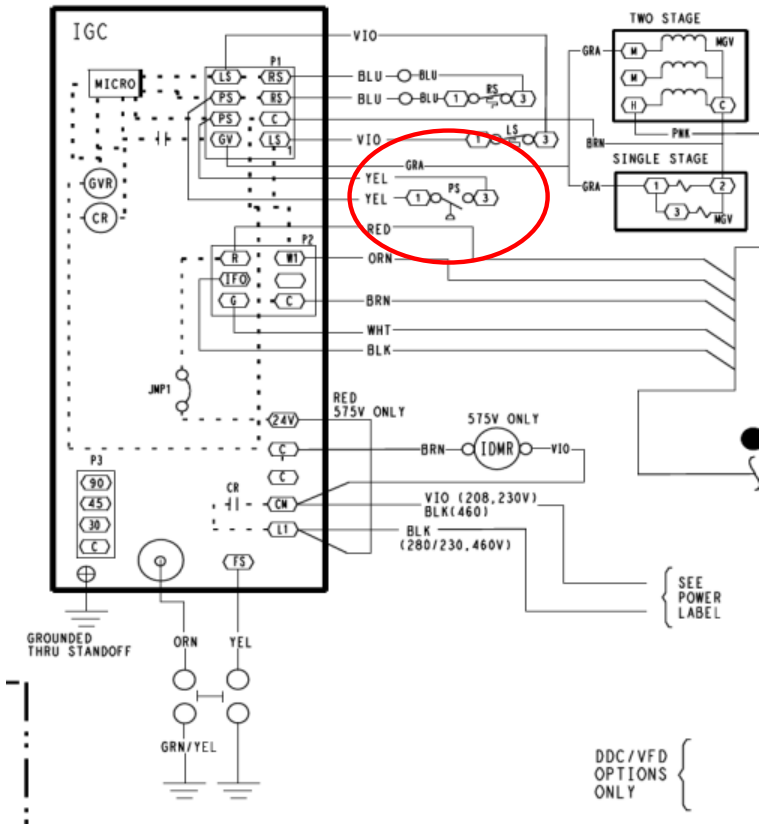
Re-plug the Hall Effect Sensor on to the IGC board
Still with power applied to the IGC board
Keep the thermostat in off position
Connect Black lead from meter to pin #3 of the plug
Connect the Red lead from the meter to pin #1 of the plug
Now rotate the inducer motor by hand
You should read 6.5-9vdc on half of the motor rotation and then >1vdc on the other half of the rotation.
And keep alternating for each inducer motor rotation

Then move the Red lead from the meter to pin #2 of the board, you should now read 16.5-21vdc

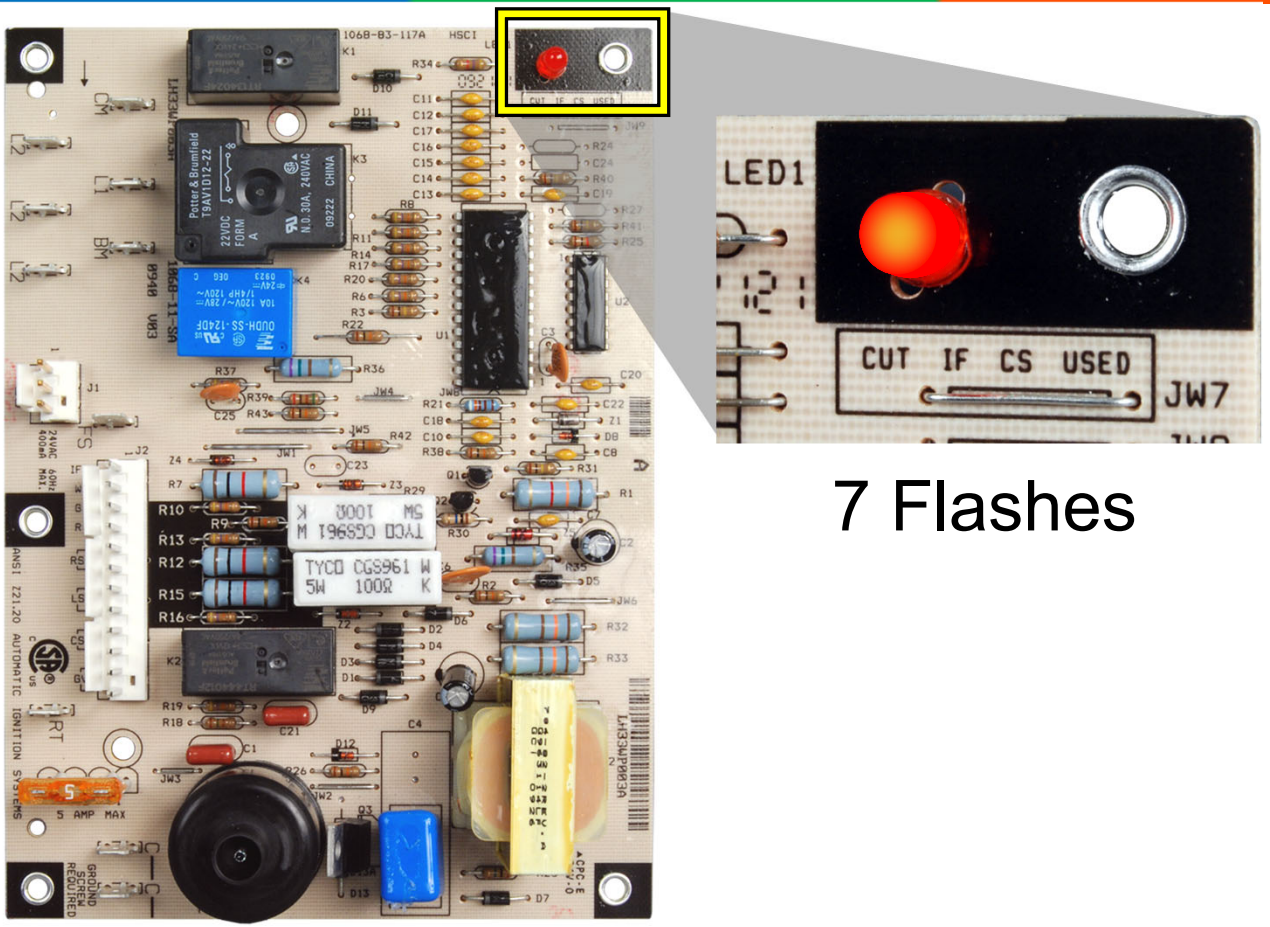
If either of these 2 are out of range replace the Hall Effect Sensor

PRESSURE SWITCH HK06WC061

- Mounting Limitation: Switch diaphragm must be mounted vertically.
- Function: Normally Open to close on negative pressure rise of .18 +- .07 inches W. C. Minimum open/close pressure differential at .015 inches W.C.
- Maximum System Pressure 3.0 inches W. C.



ROLLOUT SWITCH LOCKOUT

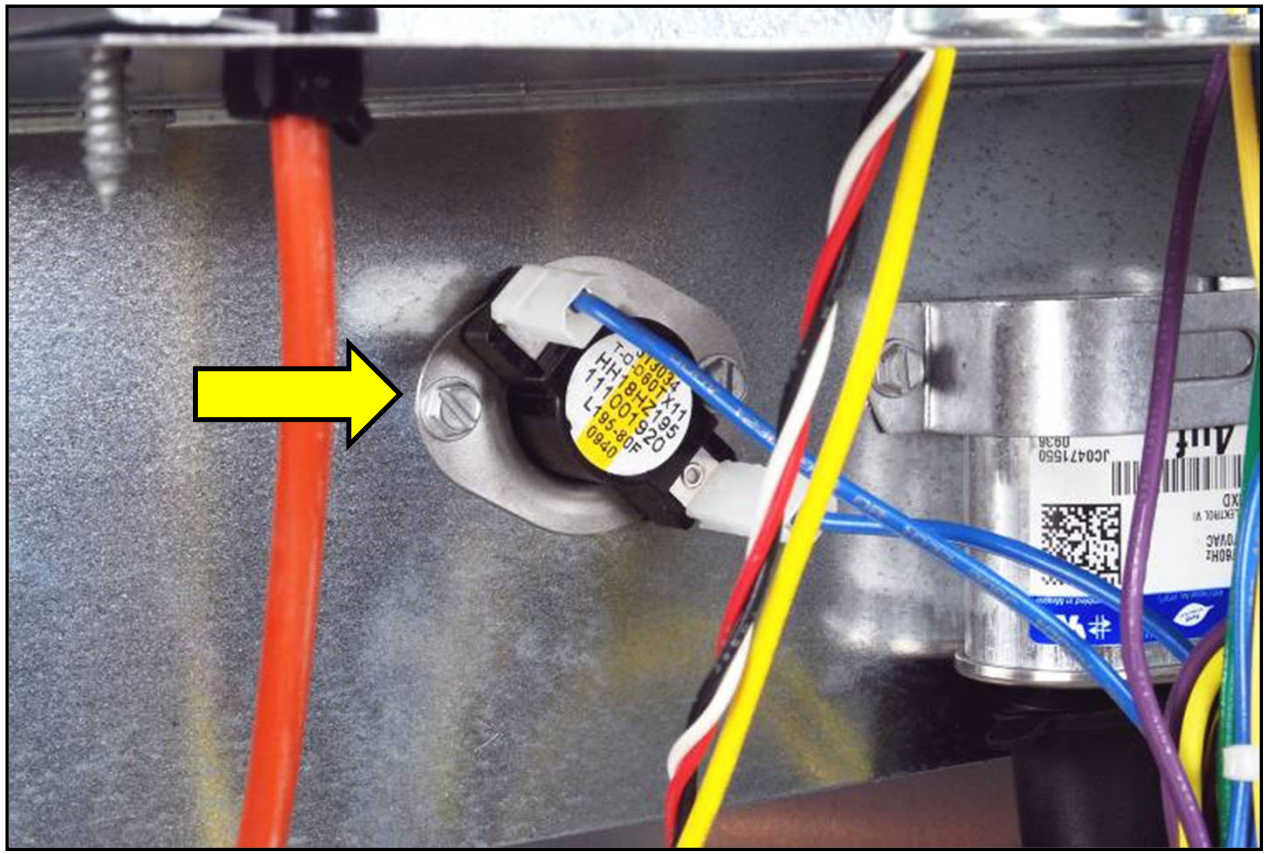


7 Flashes

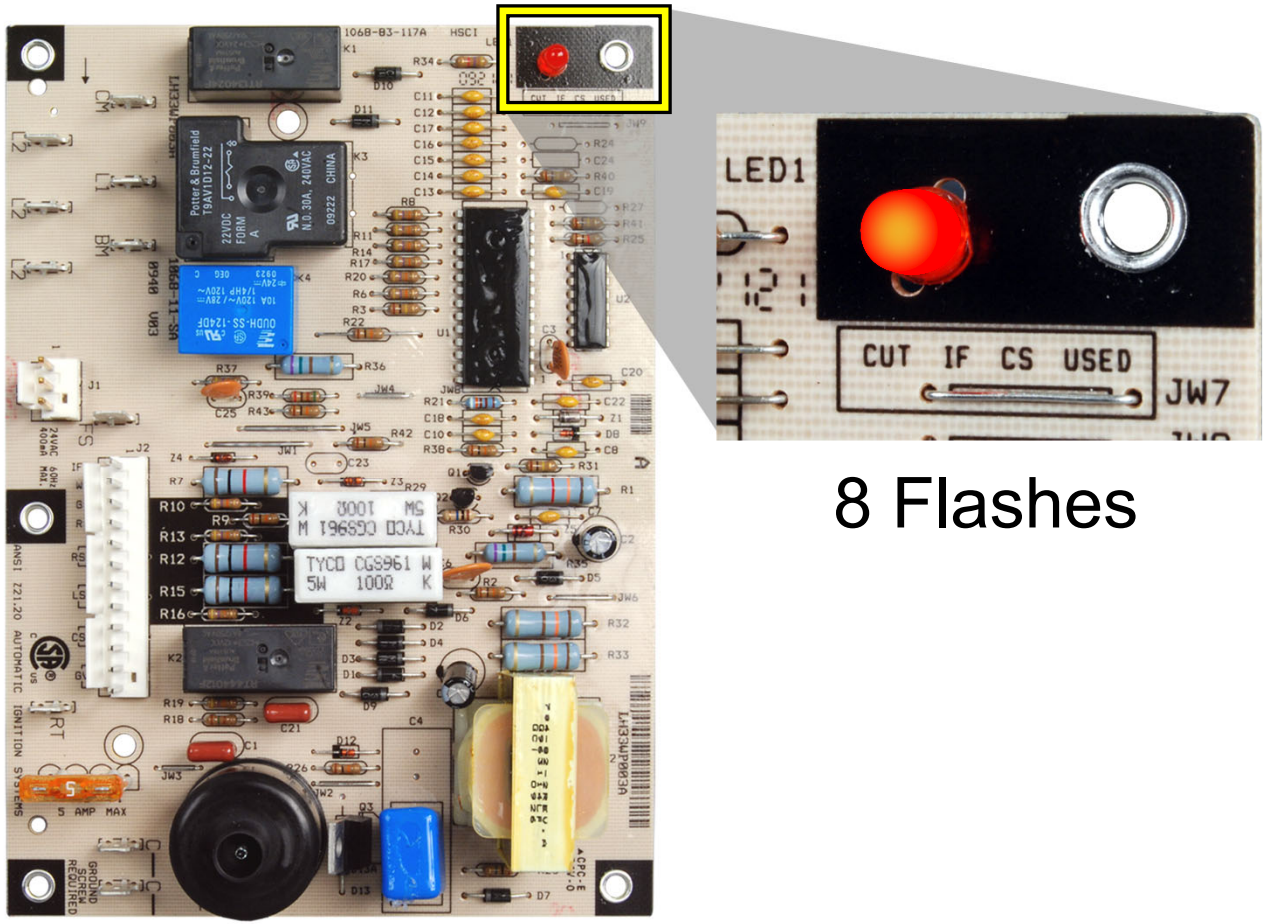
IGC Fault Code 7 (7 flashes): The action taken by the control will be to turn the gas valve and igniter off, and the indoor fan and inducer on.

PROBABLE CAUSE: Rollout switch has opened. Check gas valve operation. Check induced-draft blower wheel is properly secured to motor shaft. This could also be an indication of a restricted heat exchanger.

ROLLOUT SWITCH



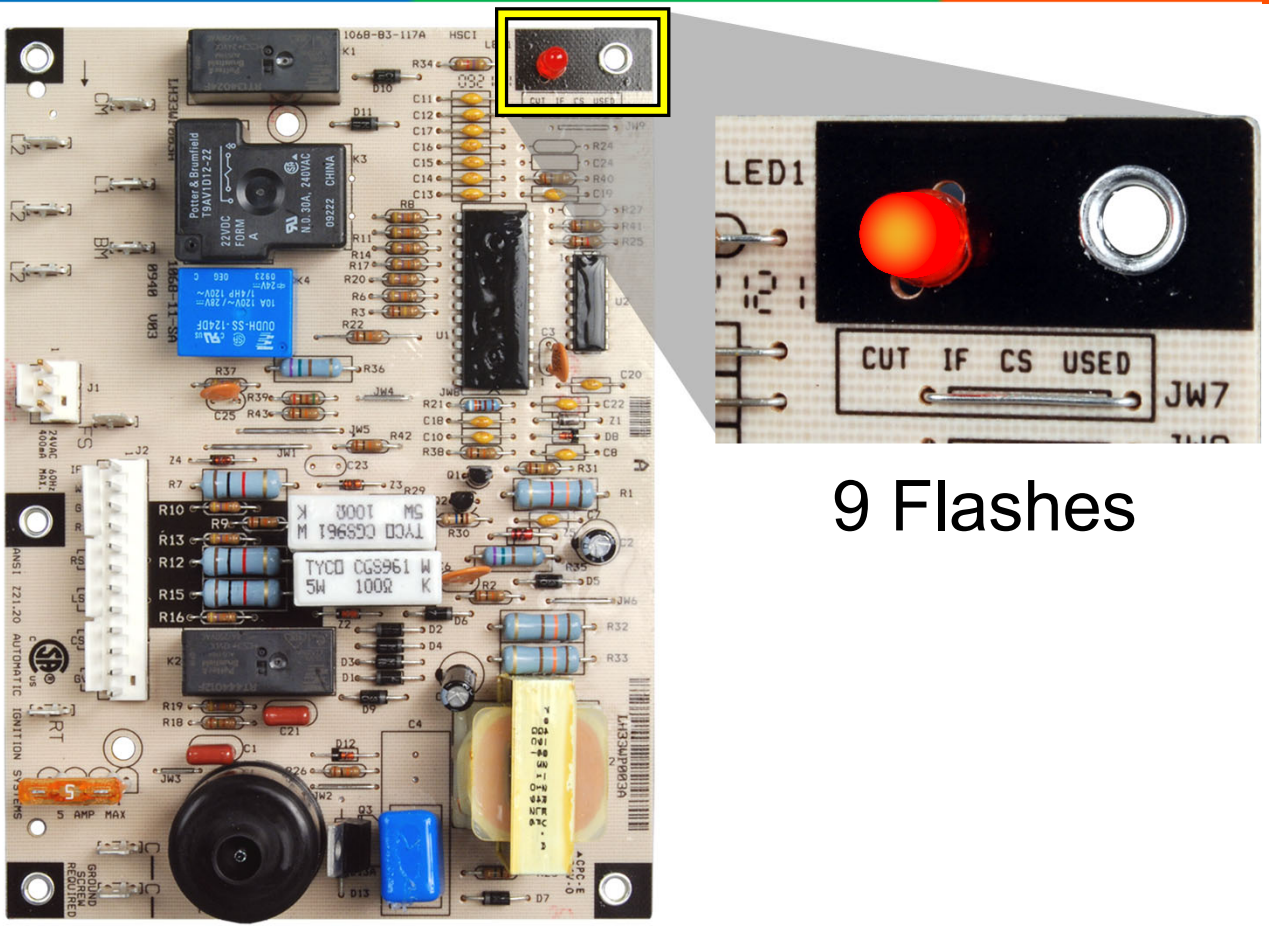
INTERNAL CONTROL FAULT



8 Flashes

IGC Fault Code 8 (8 flashes): A mandatory feature of the IGC board is the internal control fault. If something in the software changes, possibly due to electrical frequency interference, the internal built in software check will detect the software change, recognize that this may be a safety issue and shut down the entire gas system and the LED will flash eight (8) times. If this fault is observed, the board must be changed in order to operate the heating system.

SOFTWARE LOCKOUT

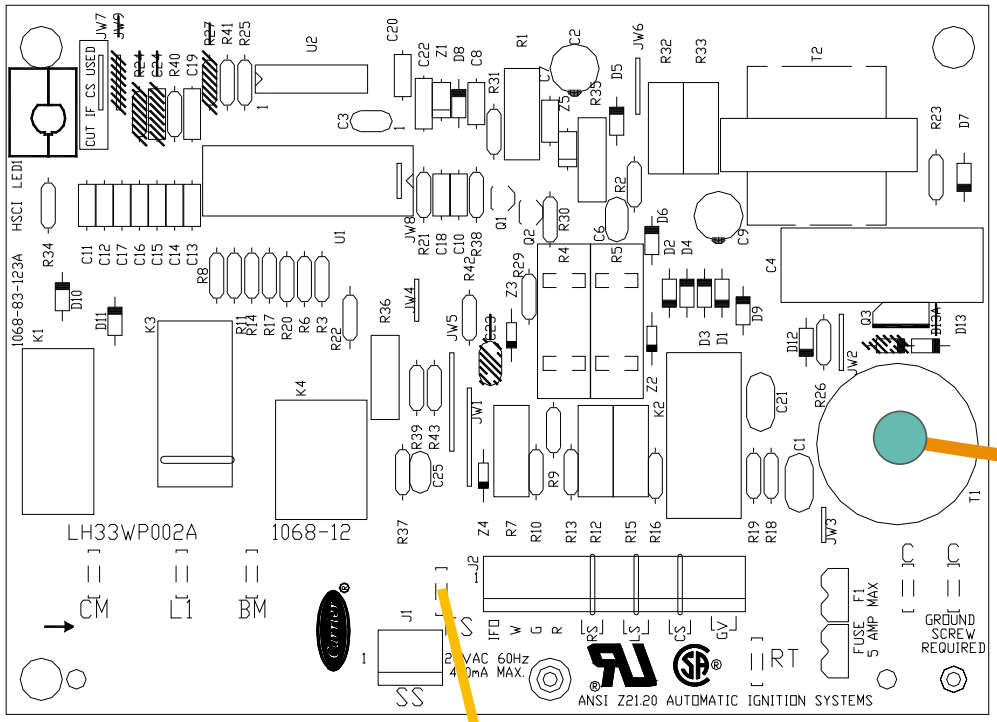


9 Flashes

IGC Fault Code 9 (9 flashes): In the event that electrical frequencies are interfering with or disrupting the operation of the software in the IGC board, the IGC board will temporarily lock out and stop unit operation for one (1) hour. Nine flashes of the fault code will be displayed. Reset will occur automatically in one (1) hour, or it can be reset manually by removing and replacing the 24-volt power from the board. If this problem persists, see your local equipment distributor for the addition of filters and signal chokes. All fault codes will be eliminated or lost if power to the unit or the IGC board is interrupted.

IGC ERROR CODES: FAULT 9

Possible Cause:
Ensure routing of Flame Sensing and Ignition Wire Do Not overlap

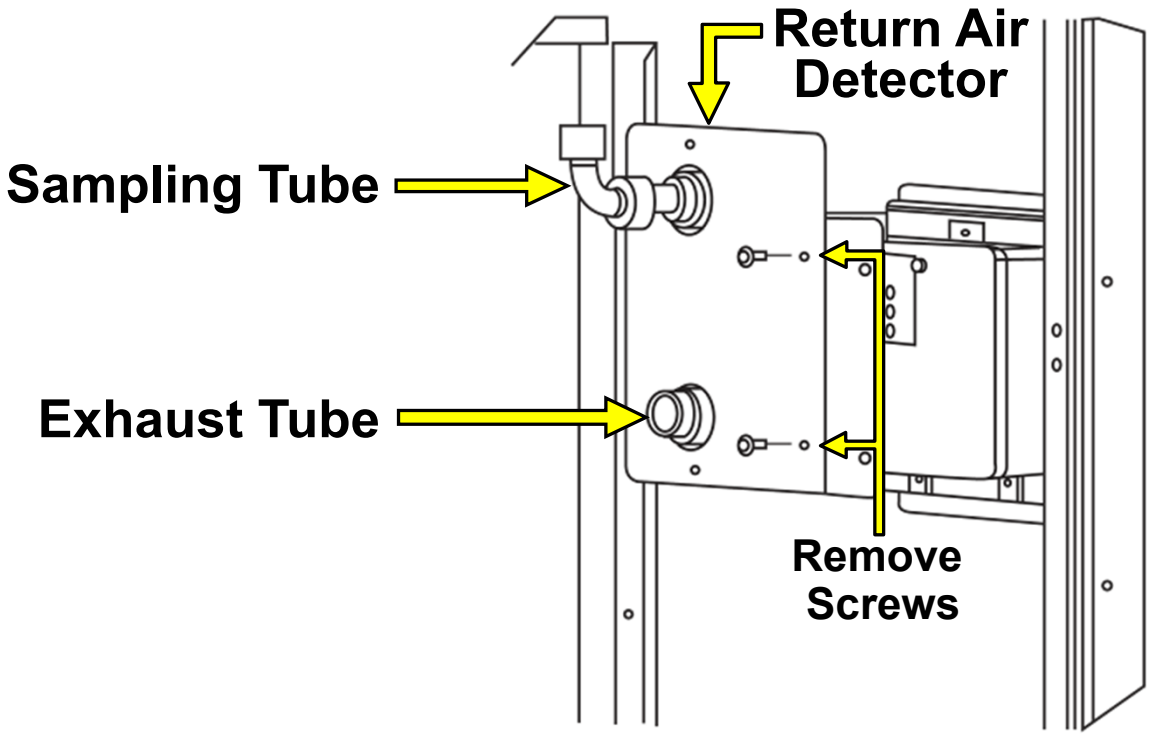


Ignition Wire

Flame Sensing Wire

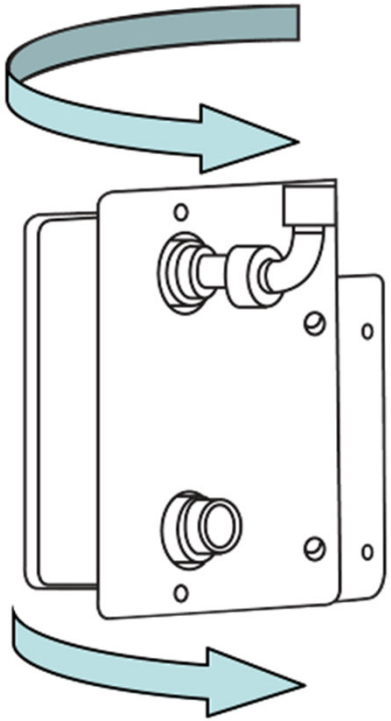
Smoke Detector

SMOKE DETECTOR COMPONENTS SHIPPED TOGETHER



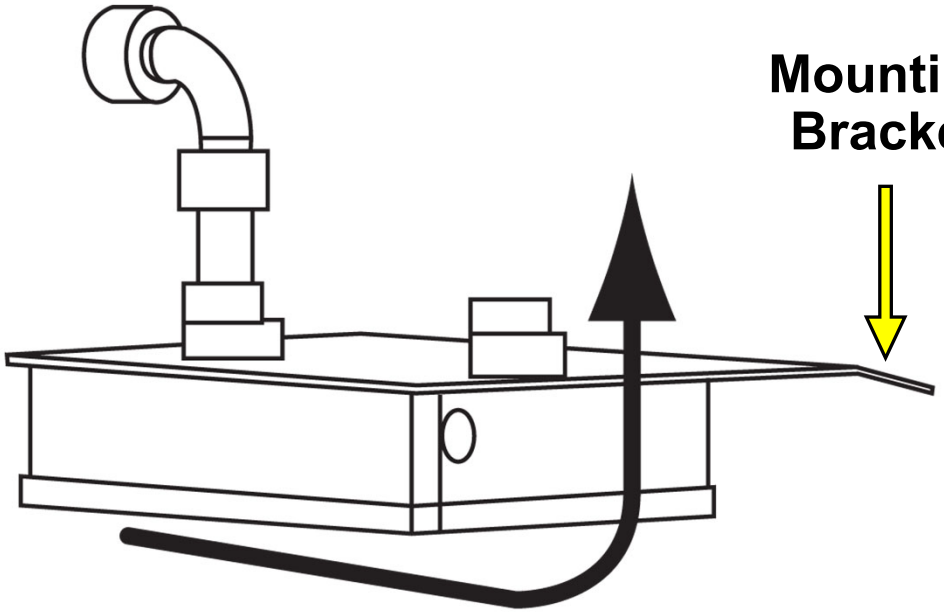
As received in the field, the components are mounted together.

ALIGN RETURN AIR DETECTOR



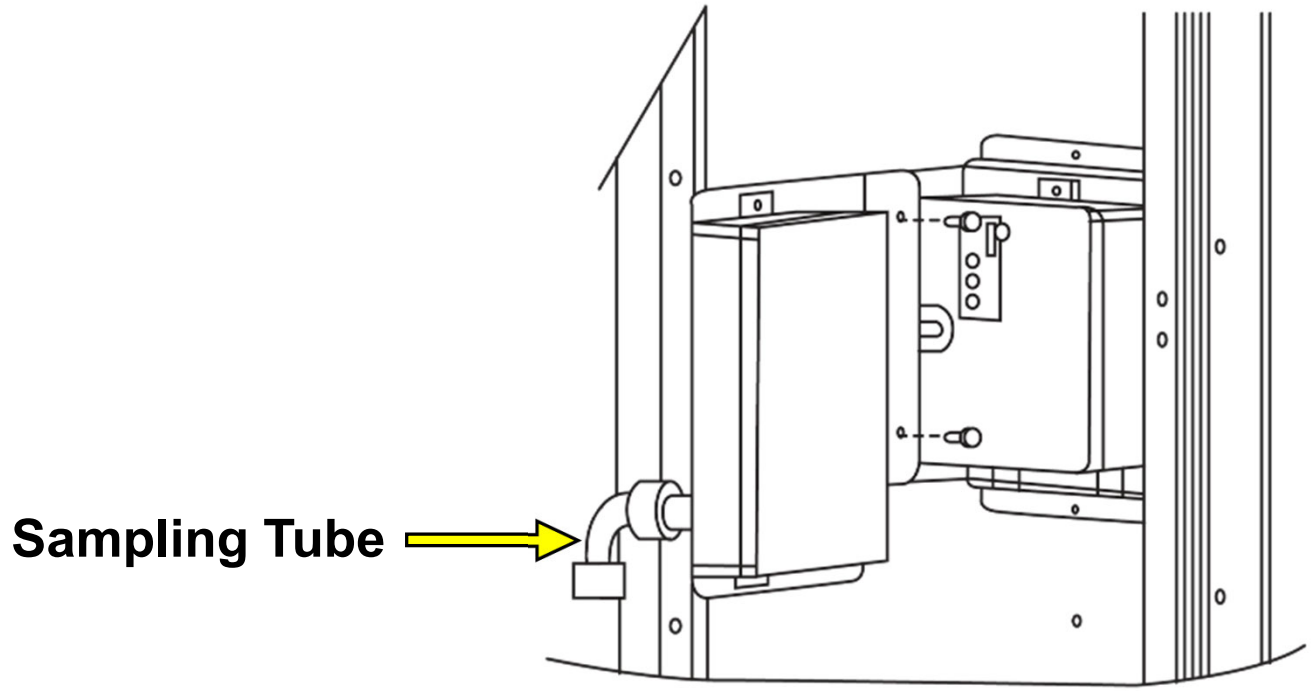
Rotate 90° (¼-turn) to align parallel to filters.

ROTATE RETURN AIR DETECTOR



Rotate the return air detector end-to-end
to where the elbow fitting is pointed down.
Notice the mounting bracket has a slight bend to it.

ATTACH RETURN AIR DETECTOR TO CONTROLLER

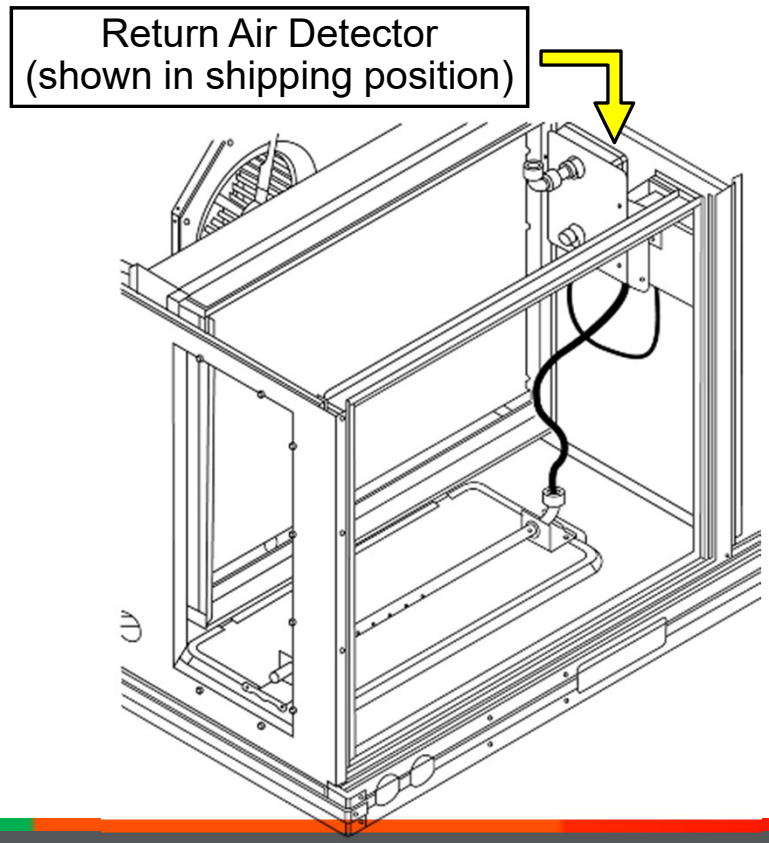


Attach return air detector to controller using mounting bracket.

SMOKE DETECTOR

COMPLETING INSTALLATION OF THE SMOKE DETECTOR:

- Sampling tube is located across base pan return air opening without economizer
- Sampling tube is located in the economizer damper housing
- Sampling tube holes are on the bottom
- Connect the sampling tube to the return air detector with tubing
- Supply air sensor module is located in the indoor fan section
- Application tip –
  See Catalog No. HKRNKA-1XA



SMOKE DETECTOR WIRING

FIOP Smoke Detector Wiring and Response

All units: The FIOP smoke detector is configured to automatically shut down all unit operations when a smoke condition is detected. See Fig. 40, Smoke Detector Wiring.

Highlight A: The JMP 3 is factory–cut, transferring unit control to the smoke detector.

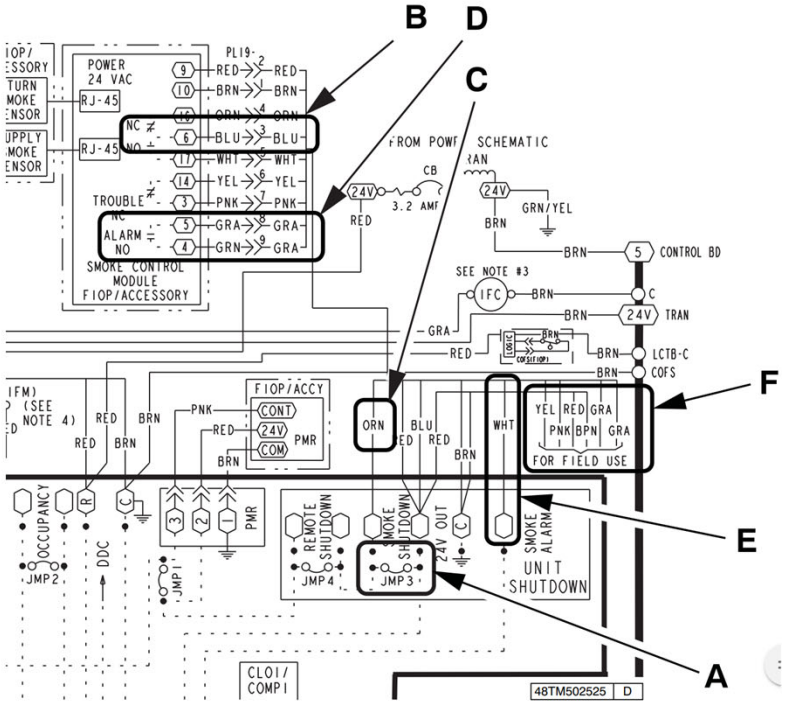
Highlight B: The smoke detector NC contact set will open on a smoke alarm condition, de–energizing the ORN conductor.

Highlight C: 24V power signal using the ORN lead is removed at the Smoke Detector input on the Central Terminal board (CTB); all unit operations cease immediately.

PremierLinkt and RTU––Open Controls: Unit operating functions (fan, cooling and heating) are terminated as described above. In addition:

Highlight D: On smoke alarm condition, the smoke detector NO Alarm contact will close, supplying 24V power to the GRA conductor.

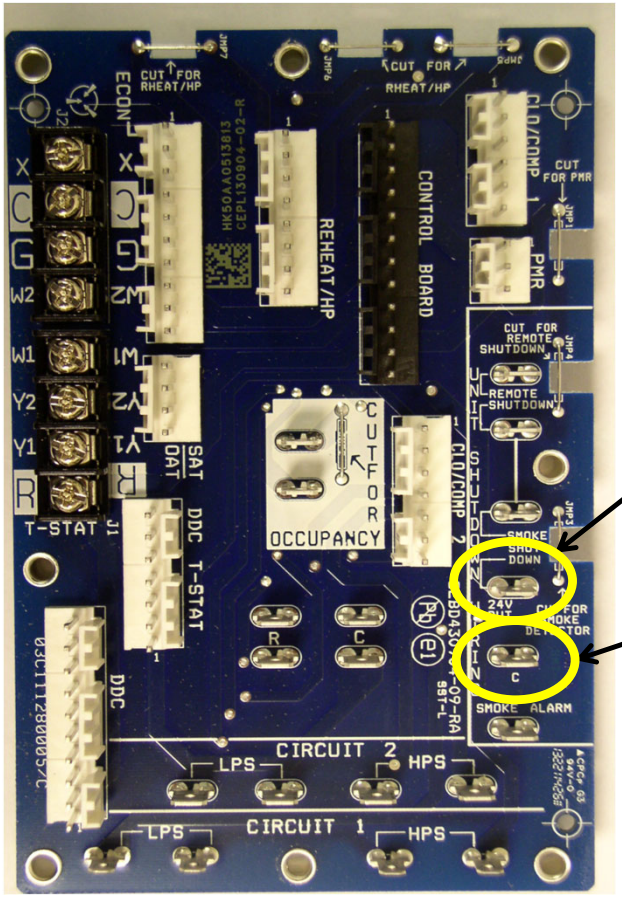
Highlight E: The GRA lead at the Smoke Alarm input on LCTB provides a 24V signal to the FIOP DDC control.



noke Detector System Wiring

SMOKE DETECTOR WIRING

SMOKE DETECTOR WIRING

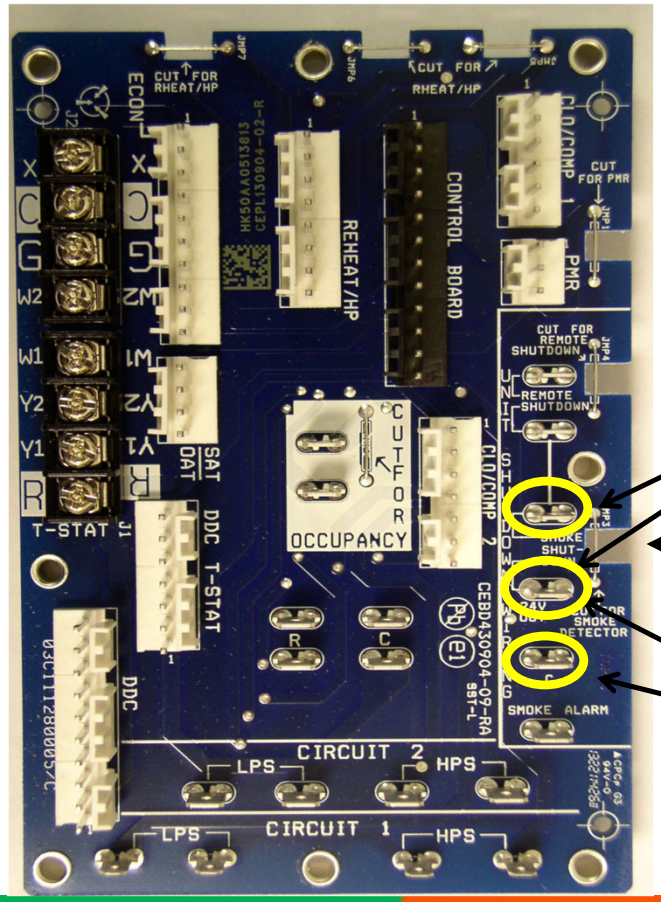


24V Out is alway's Hot

C's are always Common

SMOKE DETECTOR WIRING

SMOKE
DETECTOR
WIRING

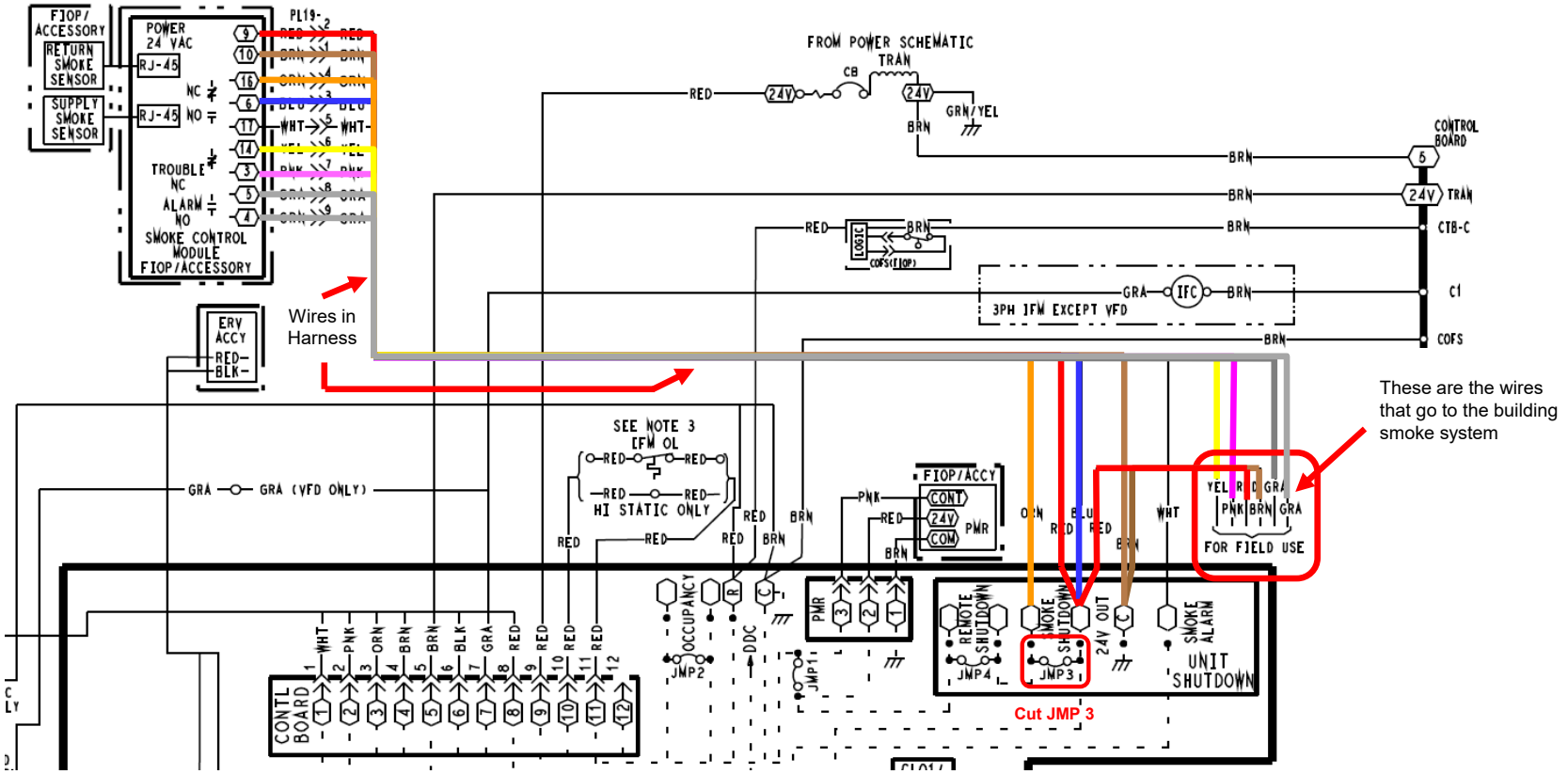


To Dry Contacts

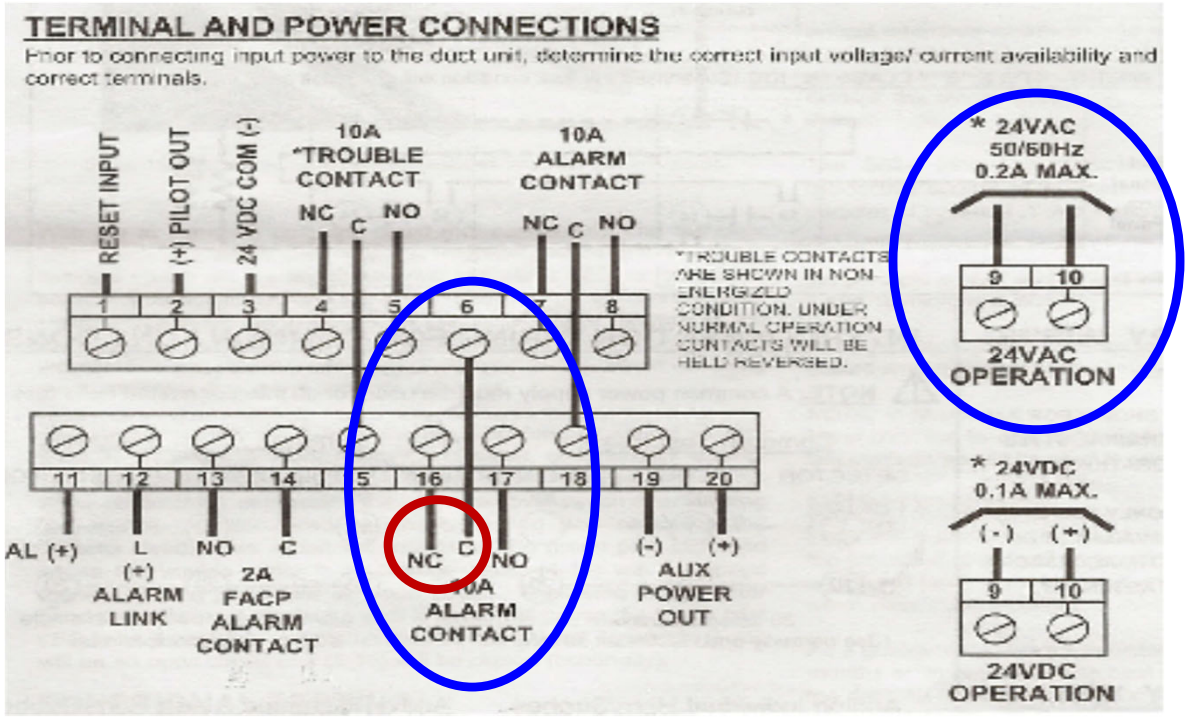
(Cut Jumper)

To 24V Power

TYPICAL SMOKE DETECTOR CONNECTIONS



TYPICAL SMOKE DETECTOR CONNECTIONS



SMOKE DETECTOR: LED

Controller's Trouble LED is On

1. Check the Trouble LED on each sensor connected to the controller. If a sensor's Trouble LED is on, determine the cause and make the necessary repairs.
2. Check the wiring between the sensor and the controller. If wiring is loose or missing, repair or replace as required.

Controller's Trouble LED is Flashing

1. One or both of the sensors is 100% dirty.
2. Determine which Dirty LED is flashing then clean that sensor assembly as described in the detector cleaning section.

Sensor's Trouble LED is On

1. Check the sensor's Dirty LED. If it is flashing, the sensor is dirty and must be cleaned.
2. Check the sensor's cover. If it is loose or missing, secure the cover to the sensor housing.
3. Replace sensor assembly.

Sensor's Power LED is Off

1. Check the controller's Power LED. If it is off, determine why the controller does not have power and make the necessary repairs.
2. Check the wiring between the sensor and the controller. If wiring is loose or missing, repair or replace as required.

Controller's Power LED is Off

1. Make sure the circuit supplying power to the controller is operational. If not, make sure JP2 and JP3 are set correctly on the controller before applying power.
2. Verify that power is applied to the controller's supply input terminals. If power is not present, replace or repair wiring as required.

Remote Test/Reset Station's Trouble LED Does Not flash When Performing a Dirty Test, But the Controller's Trouble LED Does

1. Verify that the remote test/station is wired as shown in Fig. 22. Repair or replace loose or missing wiring.
2. Configure the sensor dirty test to activate the controller's supervision relay. See "Changing sensor dirty test operation."

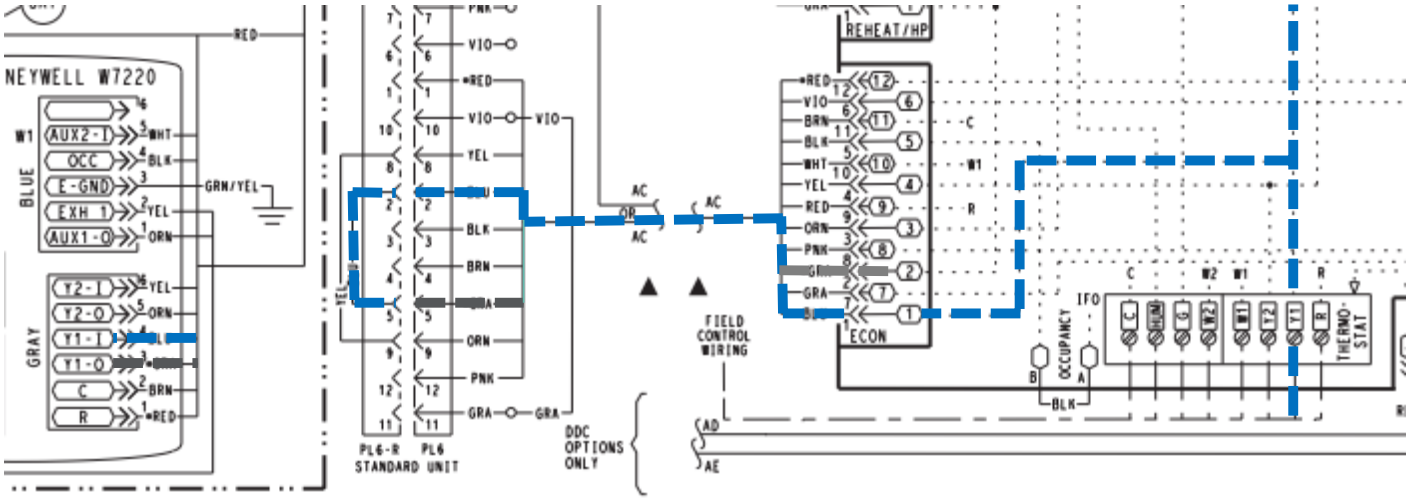
Sensor's Trouble LED is On, But the Controller's Trouble LED is OFF

Remove JP1 on the controller.

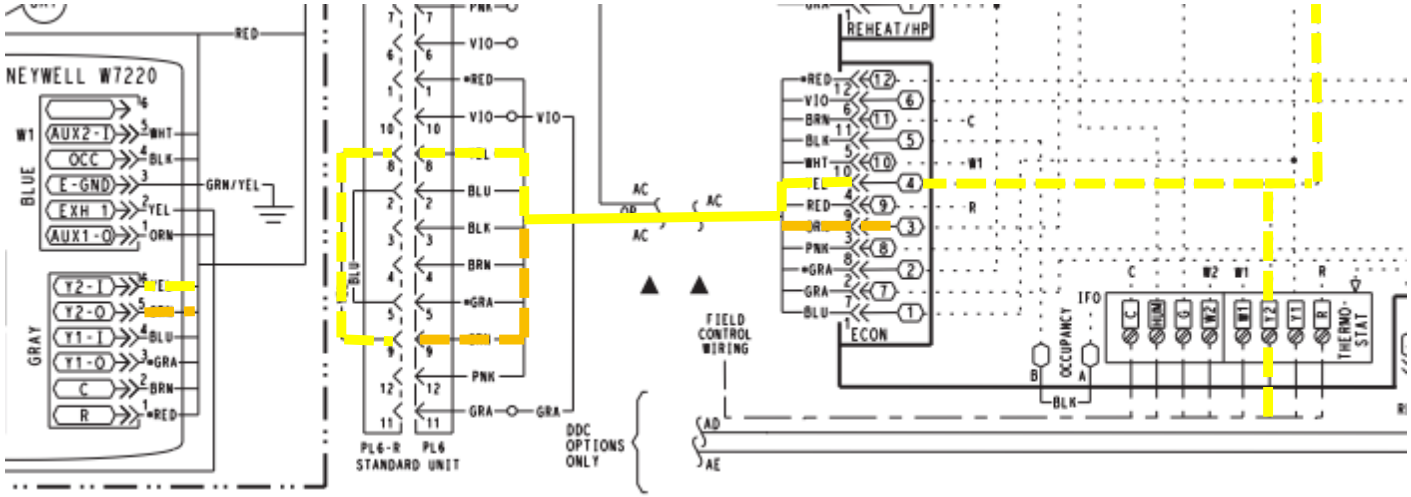
Economizer

JADE ECONOMIZER

ECONOMIZER CIRCUIT – 1ST STAGE "Y1"



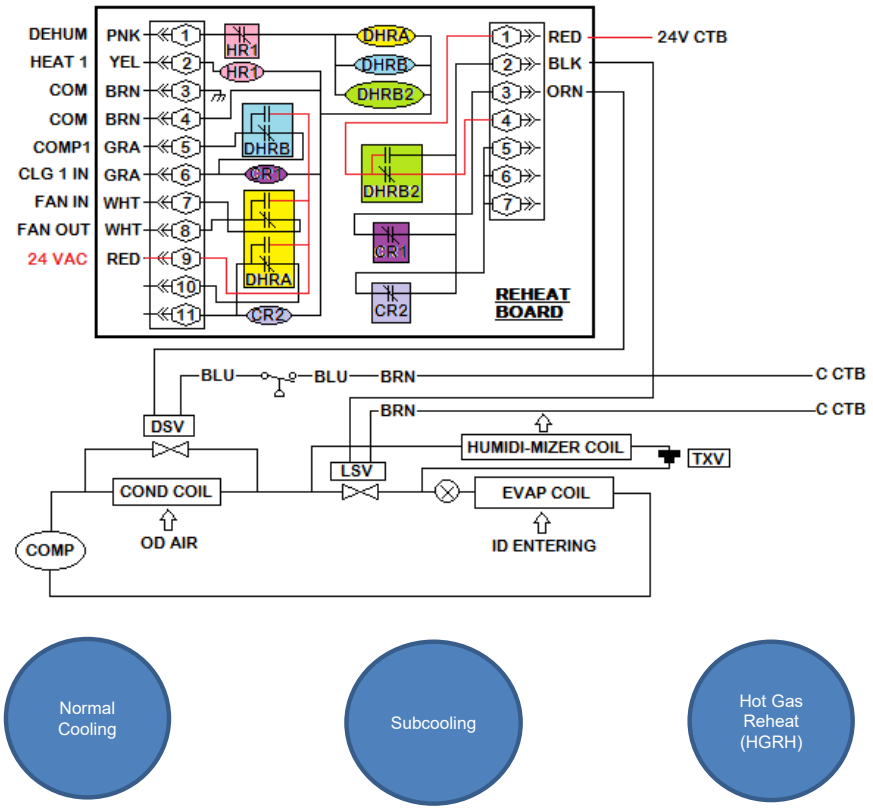
ECONOMIZER CIRCUIT – 2ND STAGE "Y2"



Humidi-mizer System

HUMIDI-MIZER® SYSTEM

3 Modes



Normal Cooling

Subcooling

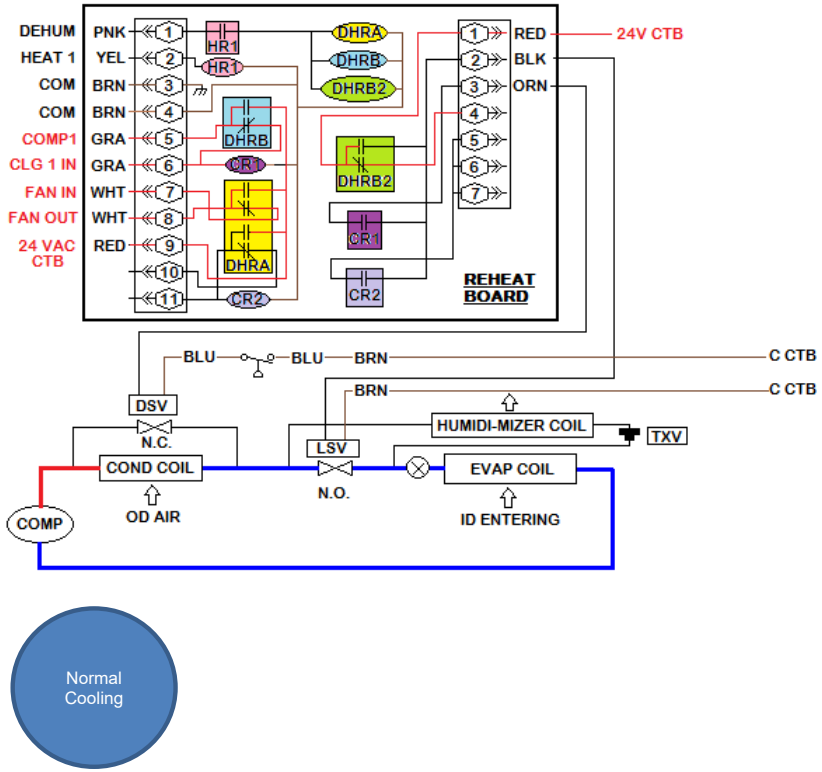
Hot Gas Reheat (HGRH)

Combines the MoistureMi$er system and ReHeat (RH) systems.

Adds a condenser bypass and additional coil to a standard RTU Circuit

HUMIDI-MIZER® SYSTEM

3 Modes

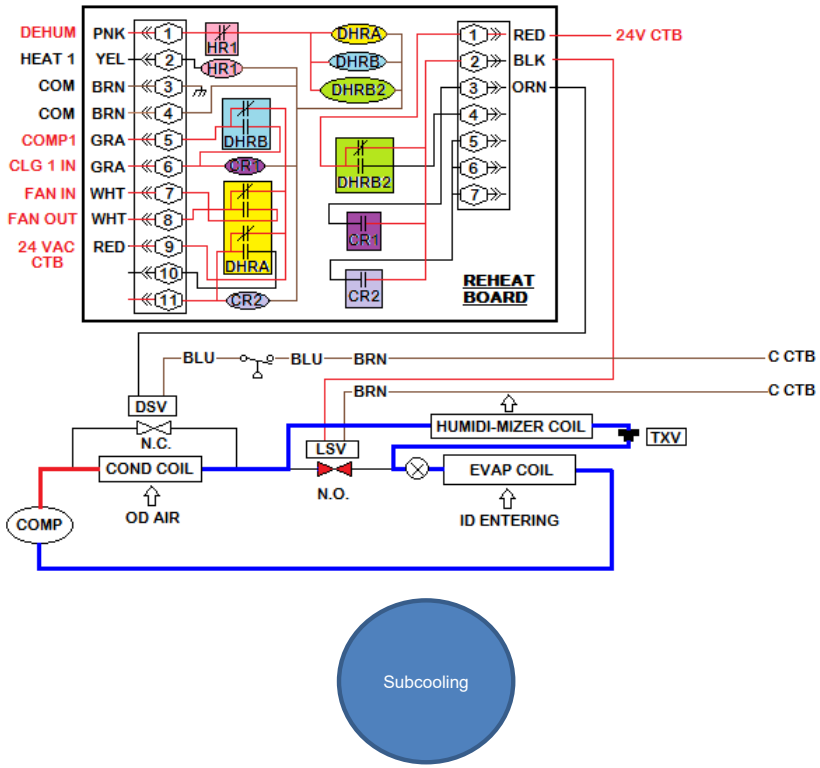


Normal Cooling

- Signal for Fan and First Stage Cooling come into Reheat Board
- Signal is sent out to run fan and compressor
- Valves are left at normal state position
- Outdoor condenser coil is used, HumidiMizer coil bypassed.

HUMIDI-MIZER® SYSTEM

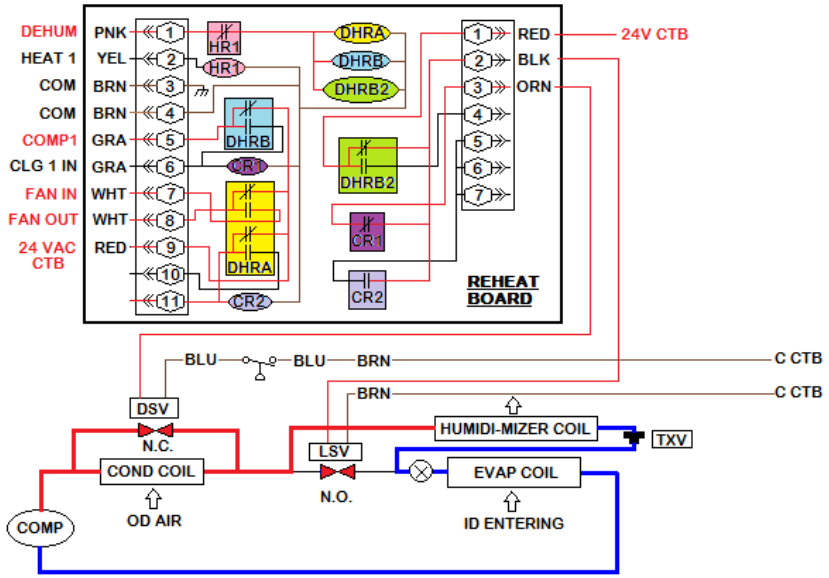
3 Modes



- Signal for Fan, Cooling and Dehumidification come into Reheat Board.
- Signal is sent out to run fan and compressor.
- LSV Valve is energized.
- Outdoor condenser coil is used, HumidiMizer coil is used for sub cooling refrigerant.

HUMIDI-MIZER® SYSTEM

3 Modes



- Signal for Fan and Dehumidification come into Reheat Board.
- Signal is sent out to run fan and compressor.
- Both valves are energized.
- Outdoor condenser coil is bypassed, HumidiMizer coil used for condensing refrigerant and reheating cold dry air from evaporator coil.

Hot Gas Reheat (HGRH)

WHAT'S THE BENEFIT?

Each refrigerant circuit in a HumidiMiZer system can provide a total of 3 different modes of operation: *Normal, Sub-cooling, and Reheat modes*

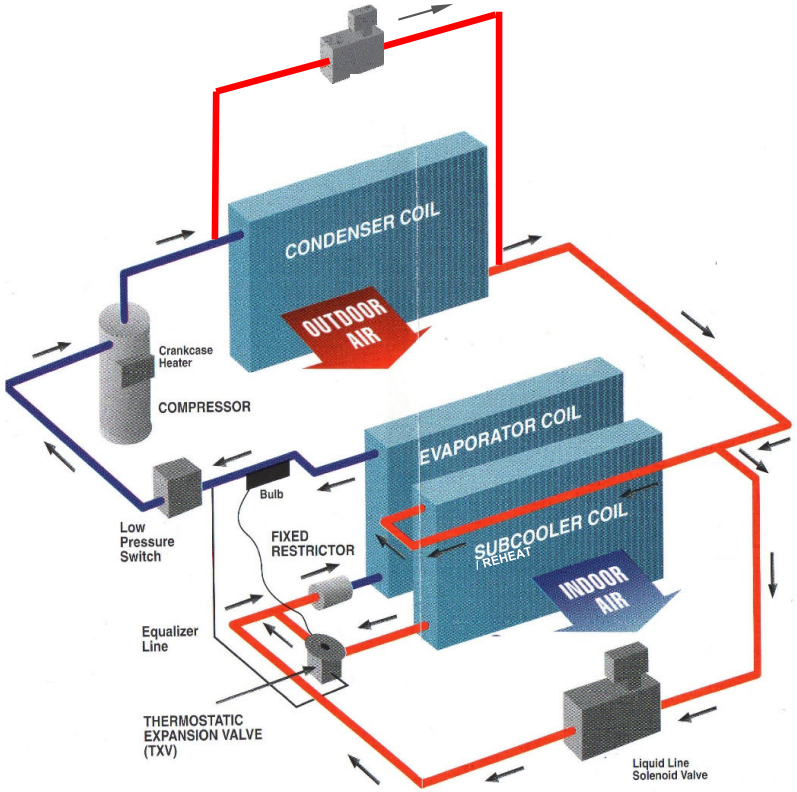
- Control of each mode determined by call for DEHUM, Y1, or Y2
- Only physical change to the system is the refrigerant valves (Liquid Solenoid Valve & Discharge Solenoid Valve)
- Compressor stays running (except when in complete free cooling mode w/ economizer)

This results in a unit that can provide many ratios of Sensible/Latent capacity to match the demands of the space

- Up to 5 additional modes of unit operation for the unit on 2 stage systems.
- Must use Sequence of Operation table to determine how components are operating

Humidi-Mizer / Perfect Humidity

Sequence of Operation



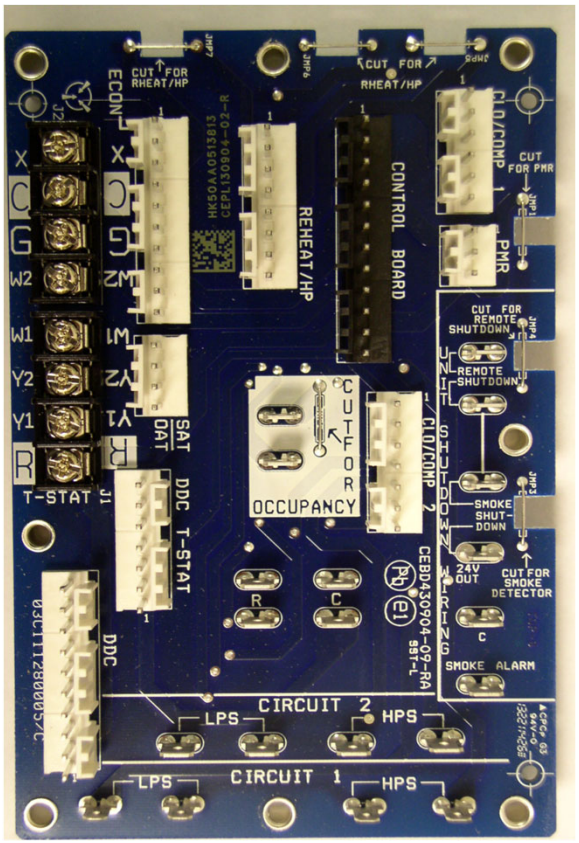
1) Normal Mode – Hot Conditions (approx. 20 DeltaT)
   - T > Set point, H < Set point
   - 55°F Supply Air

2) Sub cooling Mode – Hot & Humid (approx. 10 DeltaT)
   - T > Set point, H > Set point
   - 60 - 65°F Supply Air

3) Hot Gas Reheat Mode – Humid (approx. 0 DeltaT)
   - T < Set point, H > Set point
   - 75°F Neutral Air

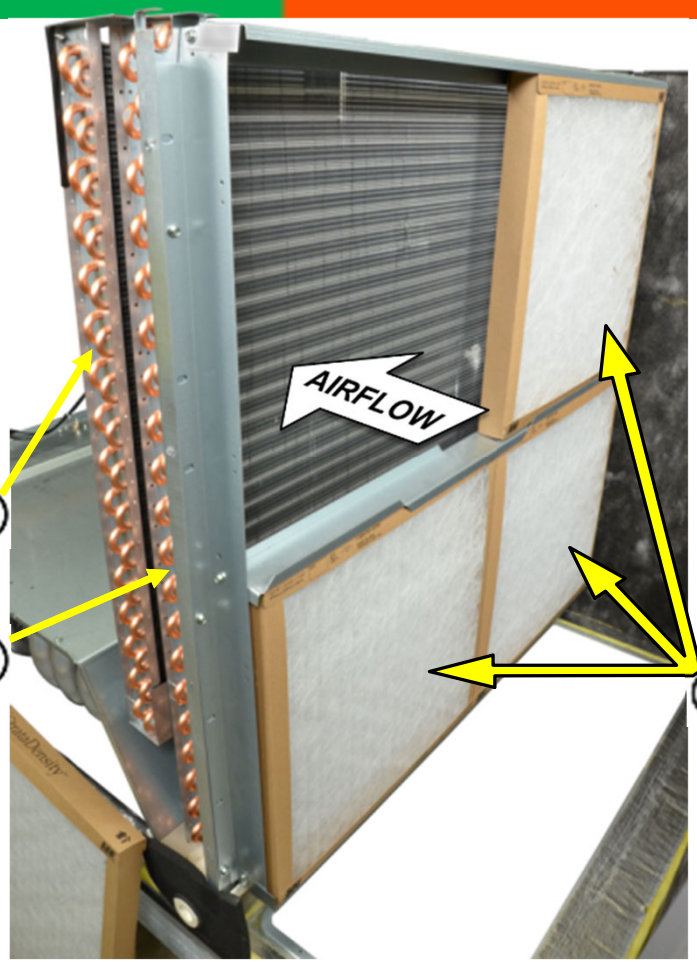
DEHUMIDIFICATION CONTROLS

Central Terminal Board



Reheat Control Board

INDOOR COILS

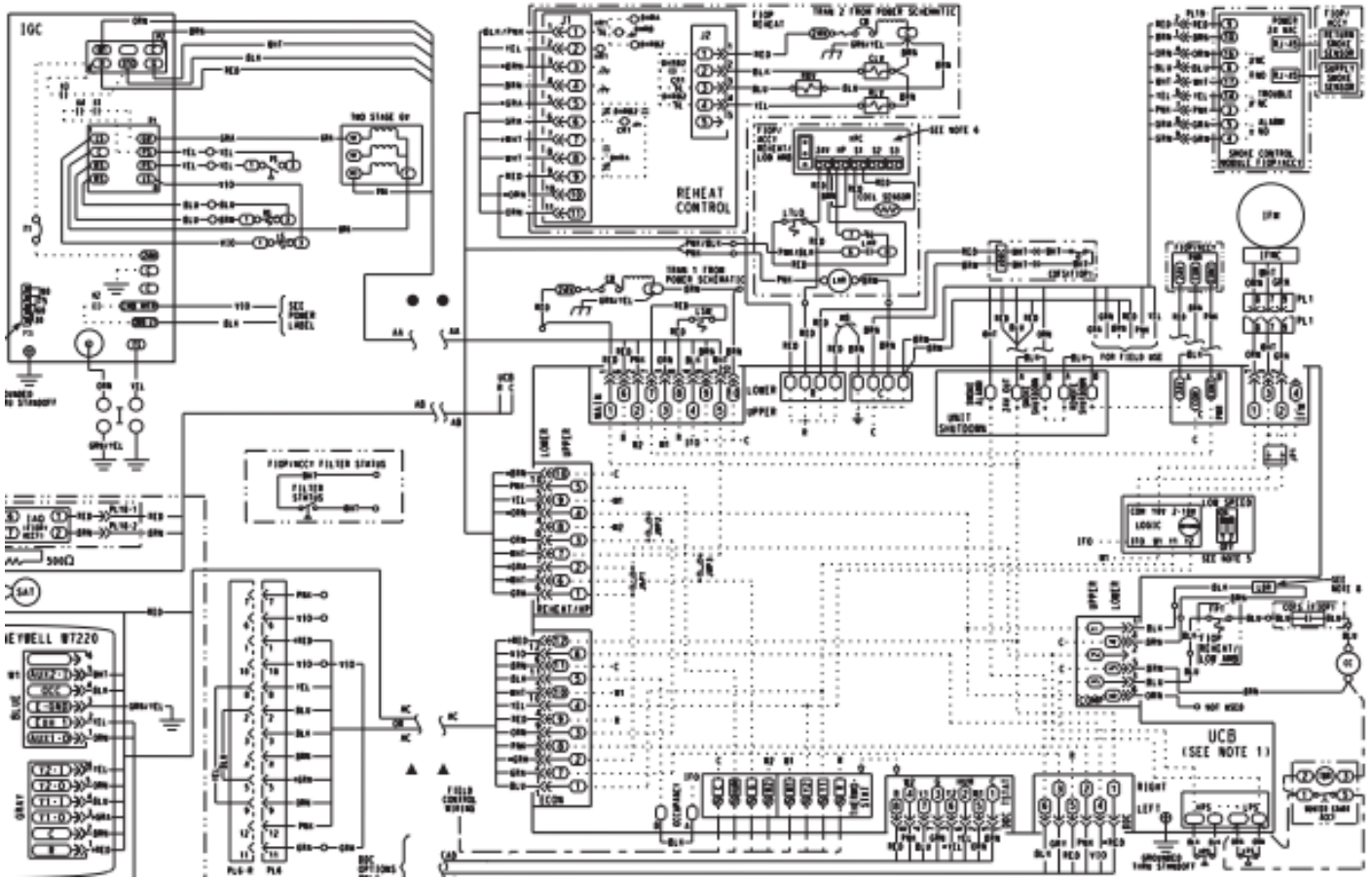


Adaptive Dehumidification Coil ②

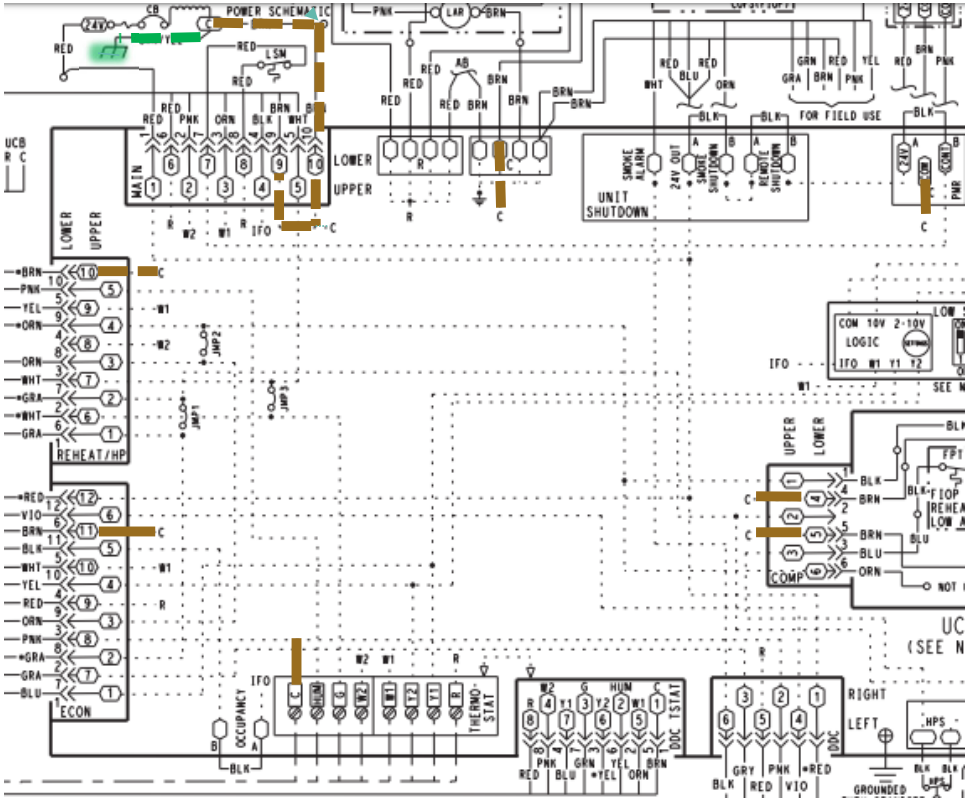
Evaporator Cooling Coil ①

③ Air Filters

TROUBLESHOOTING THE HUMIDIMIZER CONTROL CIRCUIT

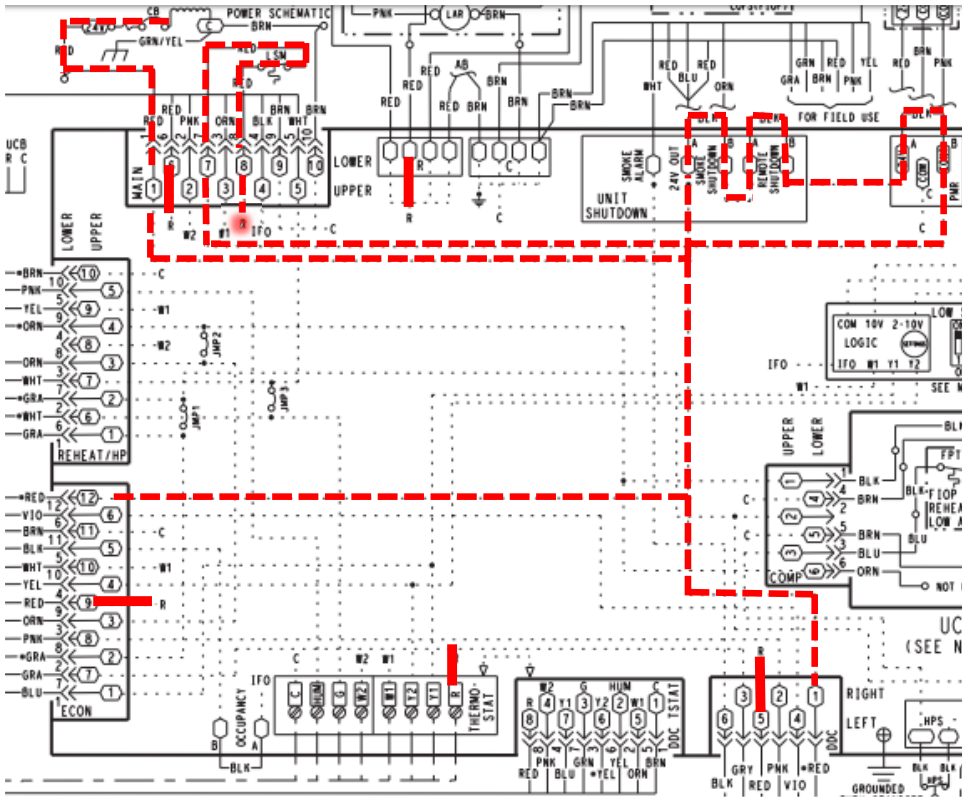


CIRCUIT BOARD 24 VAC COMMON

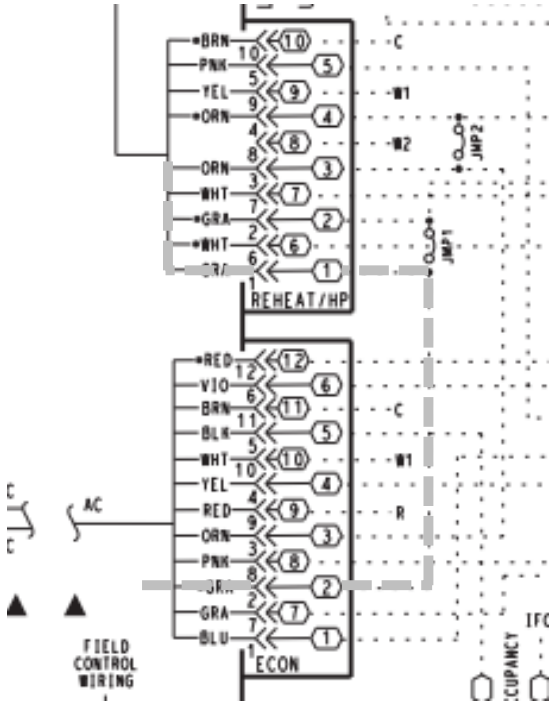


24v common is any of the brown wires in control panel on any control board or component

CIRCUIT BOARD 24 VAC

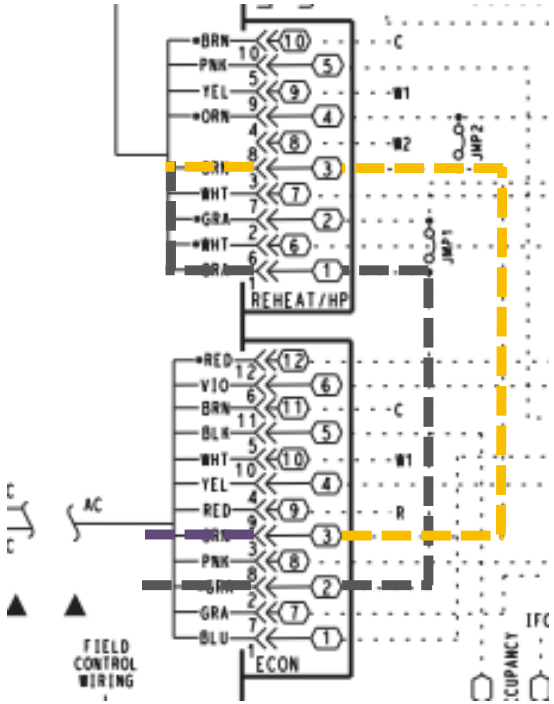


CONTROL BOARD - ECONOMIZER/REHEAT PIN - 1ST STAGE "Y1"



When HumidiMiZer Reheat board is added to a system. Jumper 1, 2 & 3 will be cut and removed.

CONTROL BOARD - ECONOMIZER/REHEAT PIN – 2ND STAGE “Y2”

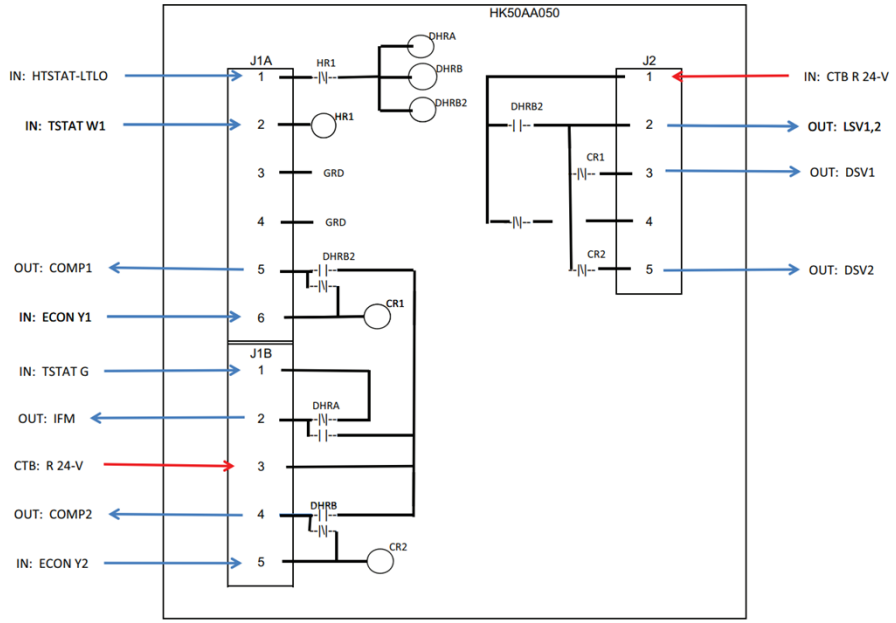


When HumidiMiZer Reheat board is added to a system. Jumper 1, 2 & 3 will be cut and removed.

HUMIDIMIZER SOLENOID OUTPUTS – NORMAL MODE

DEMAND AND MODE			OUTPUTS			
Dehumidification Demand	**Cooling Demand**	**Mode**	**Compressor**	**RDV**	**CLV**	**RLV (48/50FC 07 and 48/50GC 04–06 only)**
No Power	No Power	No power	Off	De–energized (no flow)	De–energized (flow)	De–energized (flow)
No	No	Off	Off	De–energized (no flow)	De–energized (flow)	Energized (no flow)
No	Yes	COOL	On	De–energized (no flow)	De–energized (flow)	Energized (no flow)
Yes	Yes	DEHUM/MECH COOL	On	De–energized (no flow)	Energized (no flow)	De–energized (flow)
Yse	No	DEHUM	On	Energized (flow)	Energized (no flow)	De–energized (flow)

REHEAT CONTROL BOARD WIRING SCHEMATIC



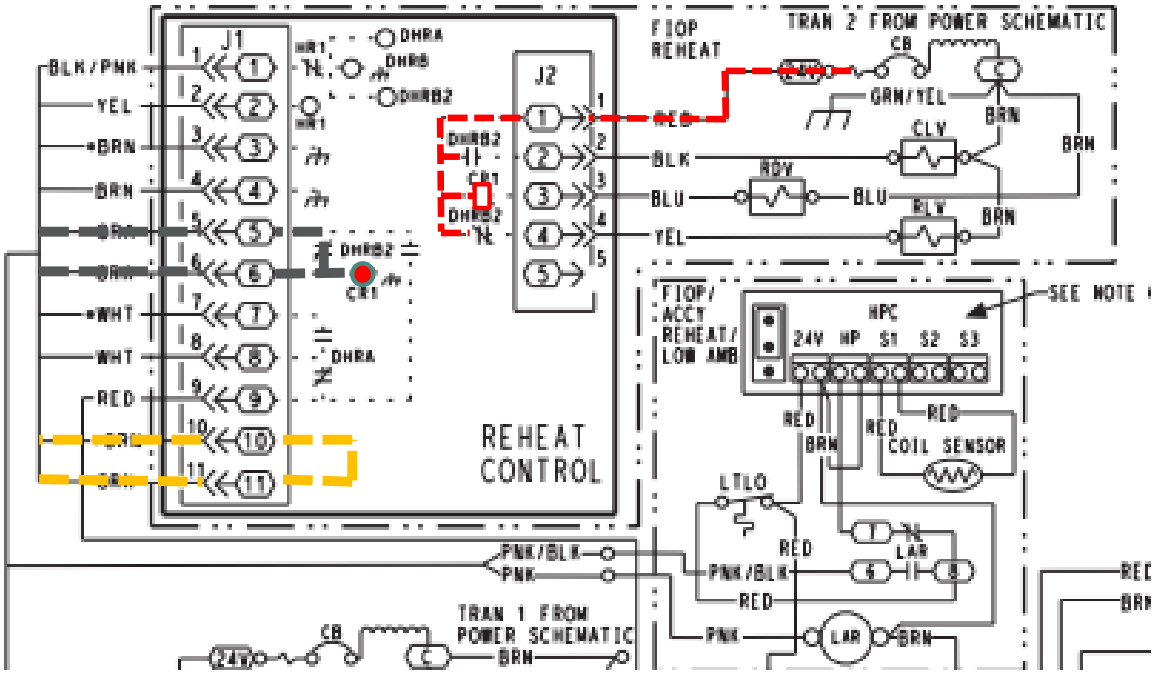
LEGEND

COMP -- COMPRESSOR
CR -- COOLING RELAY (24-VDC COIL, COM TO GROUND)
DHR -- DEHUMIDIFICATION RELAY (24-VDC COIL)
DSV -- DISCHARGE LINE SOLENOID VALVE
ECON -- ECONOMIZER
GRD -- GROUND
HR -- HEATING RELAY (24-VDC COIL)
HSTAT -- HUMIDISTAT
IFM -- INDOOR/SUPPLY FAN MOTOR
LSV -- LIQUID (3-WAY) SOLENOID VALVE
LTLO -- LOW TEMPERATURE LOCKOUT

C13

Fig. 80 - Reheat Control Board Schematic

REHEAT CONTROL BOARD – NORMAL MODE

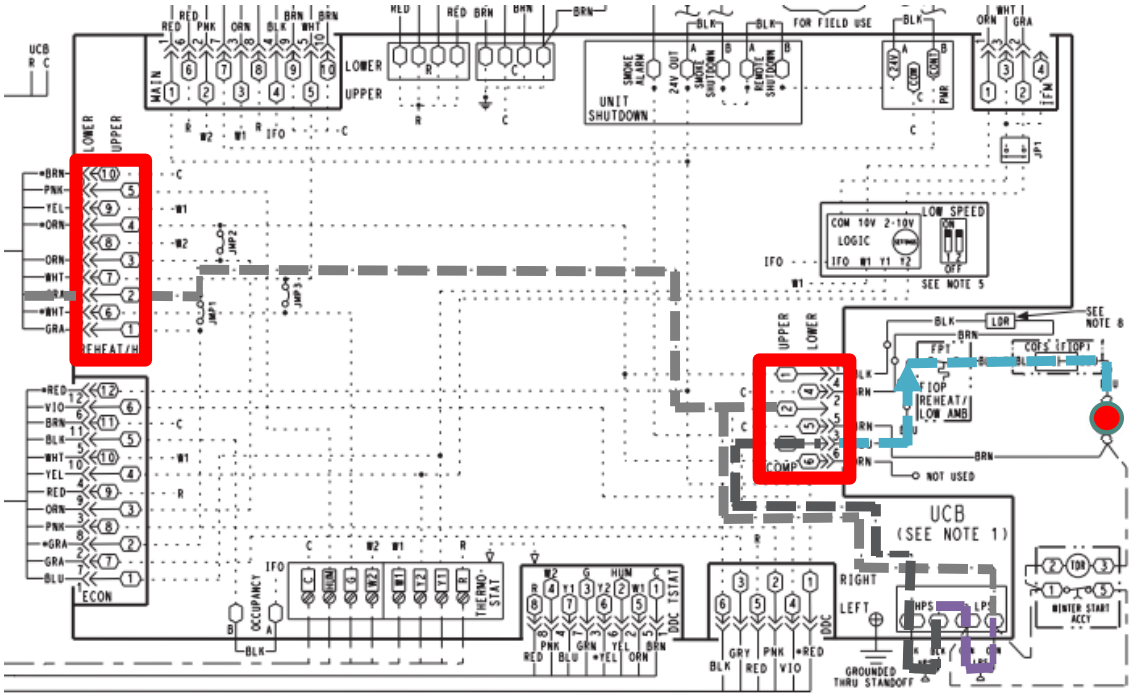


J2 pin connector is powered by Transformer 2. This transformer is designated for the reheat solenoid circuits only!

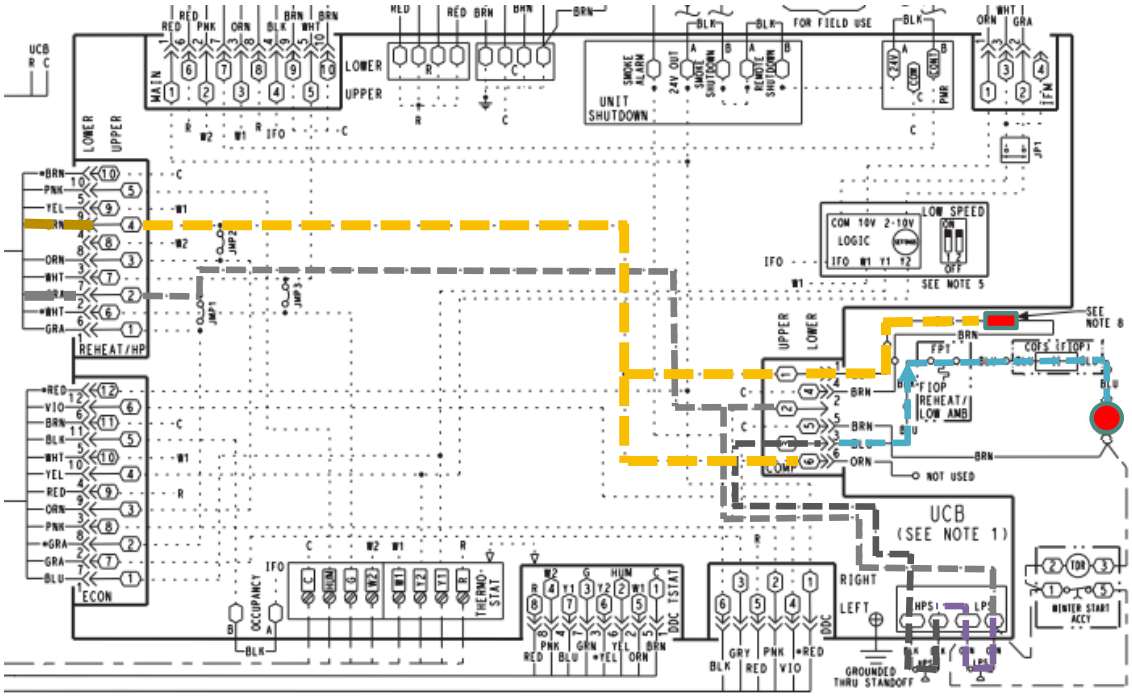
Y1 circuit is powered from the main circuit board on pin 6 (*). Pin 6 completes the circuit to CR1 relay which opens the (*) CR1 contact to RDV solenoid. This is to make sure discharge bypass circuit is never active during a cooling demand. The circuit continues through the DHRB2 NC contacts and back to pin 5 output Y1 circuit back to main control board.

If system is a 2-stage cooling system, (*) pin 11 sends circuit back to pin 10 and then back to main control board.

COMPRESSOR “Y1” CONTACTOR CIRCUIT

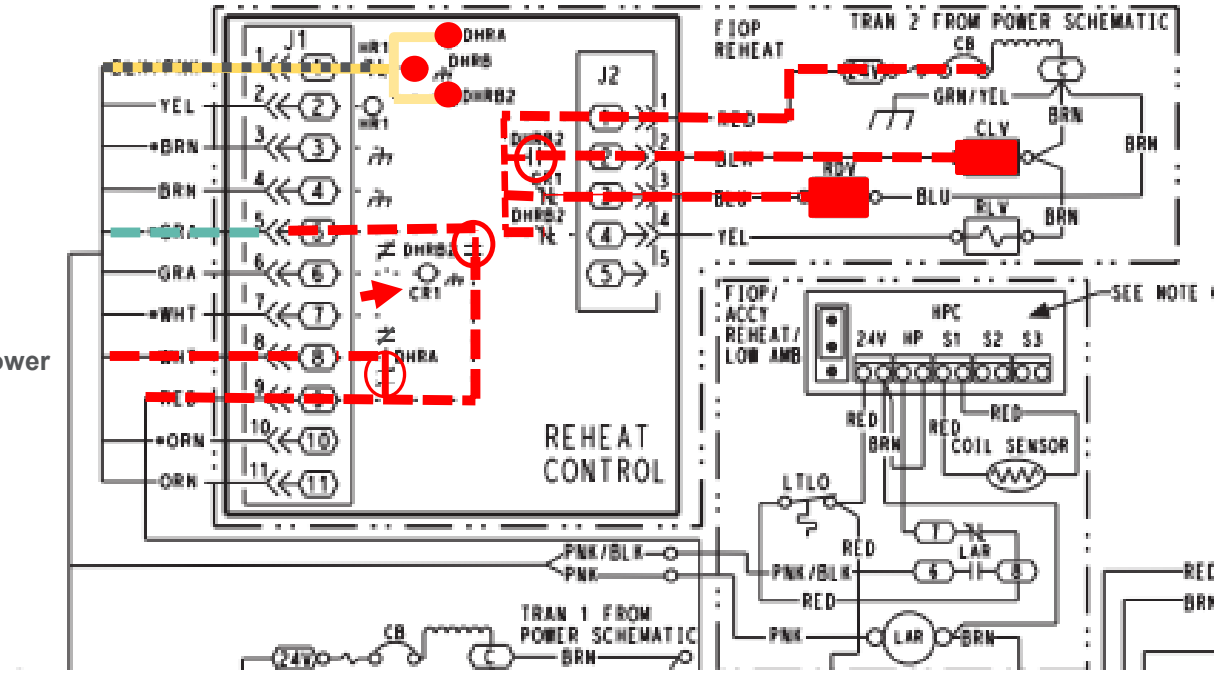


COMPRESSOR “Y2” CONTACTOR CIRCUIT



REHEAT CONTROL BOARD – HOT GAS REHEAT MODE

G circuit Blower "ON"



Tran 2 transformer powers the control circuit to Reheat contacts and solenoids.

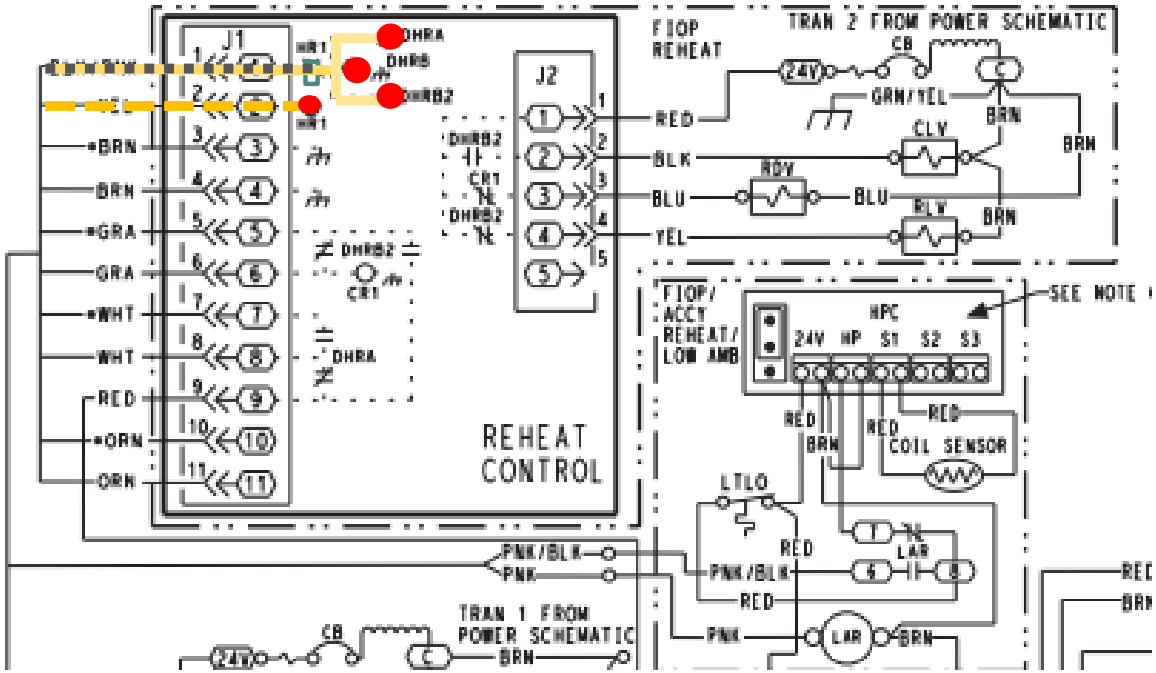
We must also consider the 24vac circuit powering pin 9 (*) on the reheat board because it is now responsible for completing blower circuit and Y1 circuit since there is no call for cool or "G" circuit.

When demand for dehumidification occurs without a call for cooling,(*) reheat solenoids are energized.

N/O contacts for DHRA close (*) and complete 24 vac to pin 8 blower circuit. (*) N/O DHRA2 contacts (*) close energizing the cooling liquid valve.

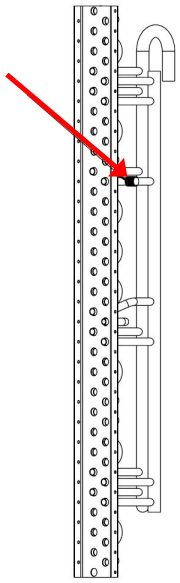
Remember, if there is no call for cooling, no 24v on Y1 the gray wire pin 6 does not energize (*) CR1 relay. (*) CR1 N/C contacts are closed allowing circuit to energize discharge solenoid valve. (*) N/O DHRB2 points are closed and send 24v from J1-9 pin to J1-5 making the compressor contactor circuit.

“W” HEAT MODE



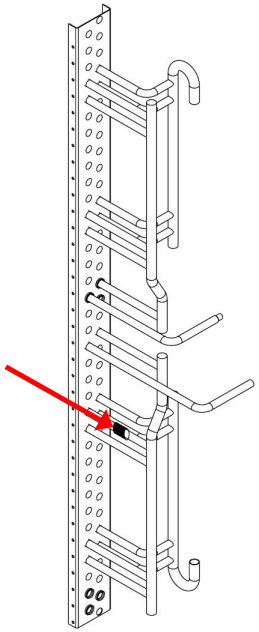
Any call for heating cycle will disable HG Reheat mode by opening HR1 N/C points. After heat demand is satisfied, system returns back to reheat mode if demanded as long as ODT is above the 40 degree.

MOTORMASTER SENSORS



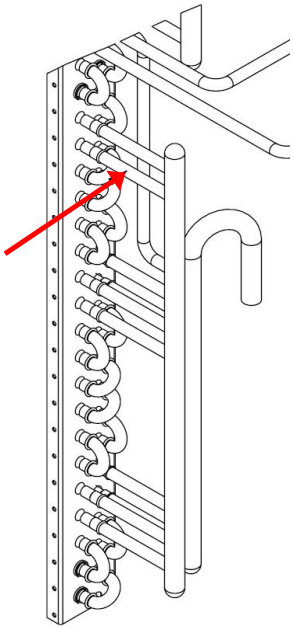
HJ 005-006

5th Leg up from bottom



HJ 008

4th Leg up from bottom on circuit # 1



HJ 009-014

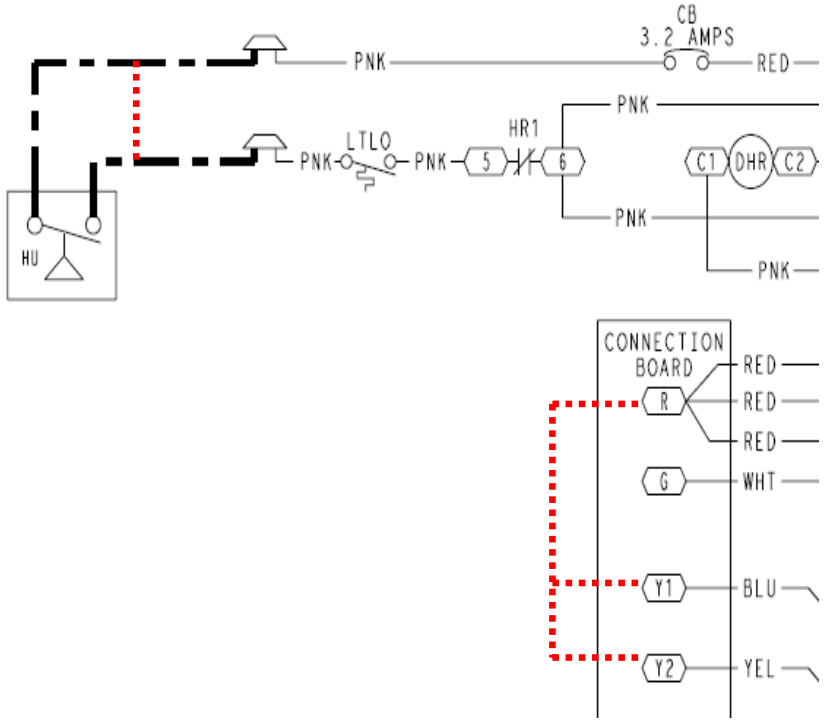
5th Leg up from bottom on circuit #1

CHARGING A HUMIDIMIZER

The subcooling/reheat dehumidification coil liquid line solenoid valve MUST be energized to use the charging chart

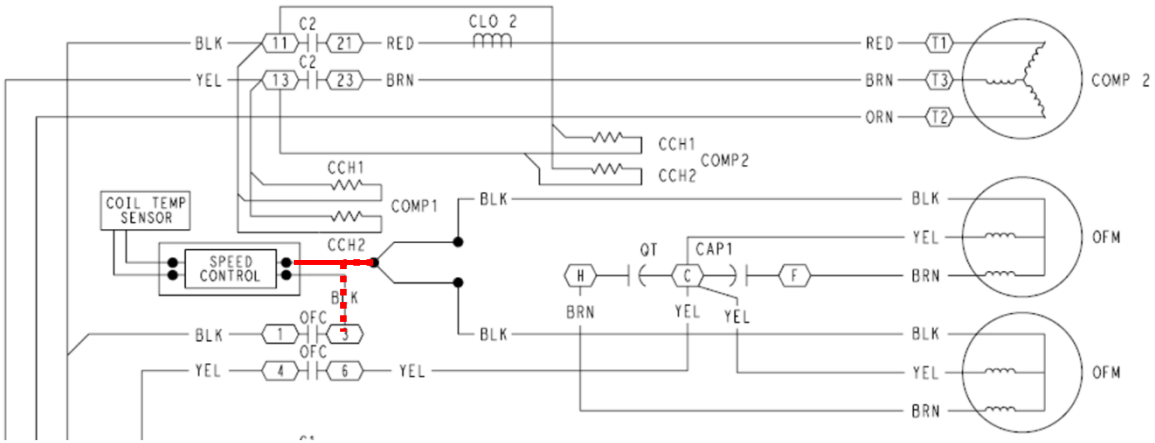
Sub-cooling mode = circuit must have call for H, and Y1/Y2

- On TB-1, jumper “R” to Y1 and Y2
- In unit control box, jumper the two pink “DEHUM” wires



CHARGING A HUMIDIMIZER

Bypass the low ambient controller to allow the condenser fans to run at full speed.



TROUBLESHOOTING

PROBLEM	CAUSE	REMEDY
Subcooling Mode Will Not Energize	No power to control transformer from evaporator-fan motor.	Check power source and evaporator-fan relay. Ensure all wire connections are tight.
	No power from control transformer to liquid line solenoid valve.	1. Fuse open; check fuse. Ensure continuity of wiring. 2. Low-pressure switch open. Cycle unit off and allow low-pressure switch to reset. Replace switch if it will not close. 3. Transformer bad; check transformer.
	Liquid line solenoid valve will not operate.	1. Solenoid coil defective; replace. 2. Solenoid valve stuck open; replace.
	Liquid line solenoid valve will not open.	Valve is stuck closed; replace valve.
Low System Capacity	Low refrigerant charge or frosted evaporator coil.	1. Check charge amount. Charge per HumidiMiZer charging chart. 2. Evaporator coil frosted; check and replace low-pressure switch if necessary.
Loss of Compressor Superheat Conditions with Subcooling/Reheat Dehumidification Coil Energized	Thermostatic expansion valve (TXV)	1. Check TXV bulb mounting, and secure tightly to suction line. 2. Replace TXV if stuck open or closed.

TROUBLESHOOTING – CONT'D

PROBLEM	CAUSE	REMEDY
Reheat Mode Will Not Energize	No power to control transformer from evaporator-fan motor.	Check power source and evaporator-fan relay. Ensure all wire connections are tight.
	No power from control transformer to hot gas line solenoid valve.	1. Fuse open; check fuse. Ensure continuity of wiring. 2. Low-pressure switch open. Cycle unit off and allow low-pressure switch to reset. Replace switch if it will not close. 3. Transformer bad; check transformer.
	Hot gas line solenoid valve will not operate.	1. Solenoid coil defective; replace. 2. Solenoid valve stuck closed; replace.
	Low refrigerant charge or frosted evaporator coil.	1. Check charge amount. Charge per HumidiMiZer charging chart. 2. Evaporator coil frosted; check and replace low-pressure switch if necessary.
Excessive Superheat	Liquid line solenoid valve will not operate.	Valve is stuck; replace valve.
	Hot gas line solenoid valve will not close.	Valve is stuck; replace valve.

End of Deck LCU Pt 1
Please transition to Deck LCU Pt 2