DAIKIN Service Instructions

Base Efficiency (DB* series) 3-25 Ton, High Efficiency (DR* series) 3-12.5 Ton, and 2023 Standard Efficiency (DF* series) 3-25 Ton Commercial Packaged Units with 410A Refrigerant

2024 Standard Efficiency (DS* Series) 3-25 Ton and High Efficiency (DH* series) 3-12.5 Ton Commercial Packaged Units with 32 Refrigerant

WARNING

ONLY PERSONNEL THAT HAVE BEEN TRAINED TO INSTALL, ADJUST, SERVICE, MAINTENANCE OR REPAIR (HEREINAFTER, "SERVICE") THE EQUIPMENT SPECIFIED IN THIS MANUAL SHOULD SERVICE THE EQUIPMENT.

THIS EQUIPMENT IS NOT INTENDED FOR USE BY PERSONS (INCLUDING CHILDREN) WITH REDUCED PHYSICAL, SENSORY OR MENTAL CAPABILITIES, OR LACK OF EXPERIENCE AND KNOWLEDGE, UNLESS THEY HAVE BEEN GIVEN SUPERVISION OR INSTRUCTION CONCERNING USE OF THE APPLIANCE BY A PERSON RESPONSIBLE FOR THEIR SAFETY.

CHILDREN SHOULD BE SUPERVISED TO ENSURE THAT THEY DO NOT PLAY WITH THE EQUIPMENT.

THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SUPERVISION, SERVICE OR SERVICE PROCEDURES. IF YOU SERVICE THIS UNIT, YOU ASSUME RESPONSIBILITY FOR ANY INJURY OR PROPERTY DAMAGE WHICH MAY RESULT. IN ADDITION, IN JURISDICTIONS THAT REQUIRE ONE OR MORE LICENSES TO SERVICE THE EQUIPMENT SPECIFIED IN THIS MANUAL, ONLY LICENSED PERSONNEL SHOULD SERVICE THE EQUIPMENT. IMPROPER SUPERVISION, INSTALLATION, ADJUSTMENT, SERVICING, MAINTENANCE OR REPAIR OF THE EQUIPMENT SPECIFIED IN THIS MANUAL, OR ATTEMPTING TO INSTALL, ADJUST, SERVICE OR REPAIR THE EQUIPMENT SPECIFIED IN THIS MANUAL WITHOUT PROPER SUPERVISION OR TRAINING MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

DO NOT BYPASS SAFETY DEVICES.

This manual is to be used by qualified, professionally trained HVAC technicians only. Daikin does not assume any responsibility for property damage or personal injury due to improper service procedures or services performed by an unqualified person.

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IMPORTANT INFORMATION

IMPORTANT NOTICES

RECOGNIZE SAFETY SYMBOLS, WORDS AND LABELS

WARNING

TO PREVENT THE RISK OF PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH, DO NOT STORE COMBUSTIBLE MATERIALS OR USE GASOLINE OR OTHER FLAMMABLE LIQUIDS OR VAPORS IN THE VICINITY OF THIS APPLIANCE.

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



WARNING

THIS UNIT SHOULD NOT BE CONNECTED TO, OR USED IN CONJUNCTION WITH, ANY DEVICES THAT ARE NOT DESIGN CERTIFIED FOR USE WITH THIS UNIT OR HAVE NOT BEEN TESTED AND APPROVED BY THE MANUFACTURER. SERIOUS PROPERTY DAMAGE OR PERSONAL INJURY, REDUCED UNIT PERFORMANCE AND/OR HAZARDOUS CONDITIONS MAY RESULT FROM THE USE OF DEVICES THAT HAVE NOT BEEN APPROVED OR CERTIFIED BY THE MANUFACTURER.

WARNING

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer. The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.) Do not pierce or burn. Be aware that refrigerants may not contain an odor.

WARNING

Only auxiliary devices approved by the appliance manufacturer or declared suitable with the refrigerant shall be installed in connecting ductwork.

SAFE REFRIGERANT HANDLING

While these items will not cover every conceivable situation, they should serve as a useful guide.

WARNING

Auxiliary devices which may be a POTENTIAL IGNITION SOURCE shall not be installed in the duct work. Examples of such POTENTIAL IGNITION SOURCES are hot surfaces with a temperature exceeding 700°C and electric switching devices.

WARNING

The compressor POE oil for R-410A units is extremely susceptible to moisture absorption and could cause compressor failure. Do not leave system open to atmosphere any longer than necessary for installation.

WARNING

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space. To avoid possible difficulty in breathing or death:

- Never purge refrigerant into an enclosed room or space. By law, all refrigerant must be reclaimed.
- If an indoor leak is suspected, thoroughly ventilate the area before beginning work.
- Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact with refrigerant and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, seek medical help immediately.
- Always follow EPA regulations. Never burn refrigerant, as poisonous gas will be produced.

WARNING

To avoid possible injury, explosion or death, practice safe handling of refrigerants.

WARNING

To avoid possible explosion:

- Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.
- Never fill a cylinder more than 80% full of liquid refrigerant.
- Never add anything other than R-22 to an R-22 cylinder or R-410A to an R-410A cylinder. The service equipment used must be listed or certified for the type of refrigerant used.
- Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.

IMPORTANT INFORMATION

WARNING

To avoid possible explosion, use only returnable (not disposable) service cylinders when removing refrigerant from a system.

- **Ensure the cylinder is free of damage which could lead to a leak or explosion.**
- **Ensure the hydrostatic test date does not exceed 5 years.**
- **Ensure the pressure rating meets or exceeds 400 lbs.**

When in doubt, do not use cylinder.

QUALIFICATION OF WORKERS

Personnel must be certified to service, work, and/or repair units with FLAMMABLE REFRIGERANTS. A certificate should document the competence and qualification achieved through training that included the substance of the following:

• Information about the explosion potential of FLAMMABLE REFRIGERANTS to show that flammables may be dangerous when handled without care.

• Information about POTENTIAL IGNITION SOURCES, especially those that are not obvious, such as lighters, light switches, vacuum cleaners, electric heaters.

• Information about the different safety concepts, including ventilated and unventilated areas.

• Information about refrigerant detectors, including function, operation, and service measures.

• Information about the concept of sealed components and sealed enclosures according to IEC 60079-15:2010.

• Information about the correct working procedures, including commissioning, maintenance, repair, decommissioning, and disposal procedures.

SYSTEM OPERATION

NORMAL SEQUENCE OF OPERATION – HEATING

This unit has one (RS) Manual Reset Limit Control Switch. Check the limit to make sure it has not tripped. The limit may arrive at the job site tripped as a result of shipping shock.

If the vent motor comes on, but the unit does not attempt ignition, check if the ALS (Automatic Reset High Limit Control Switch) requires resetting.

1. With electricity and gas turned on, the system switch in the "HEAT" or "AUTO" position and the fan switch in the "AUTO" position, the thermostat will close the circuit between unit terminals R and W (R-W) when the temperature falls below the thermostat setting.
2. D1 on IIC energizes relay VMR.
3. Relay VMR energizes the vent motor.
4. Operation of the vent motor closes the pressure switch PS located in the burner compartment. The control then initiates a 15-second pre-purge time delay. During this period, the vent motor will clear the combustion chamber of any residual gas.
5. After the pre-purge period, the ignition control energizes the Wl-C gas valve and simultaneously initiates a "three (3)-try" spark ignition sequence.
6. When the burners are ignited, a minimum four (4) micro-amp DC current will flow through the flame between the sensor electrode and the grounded burner.
7. When the controller proves that the flame has been established, it will keep the gas valve energized and discontinue the ignition spark. First stage manifold pressure will be approximately 2.0" w.c. for natural gas and 7.0" w.c. for propane (LP).
8. If the control is unable to ignite the burners after its initial attempt, it will initiate another purge and spark sequence. A third purge and spark sequence will be initiated if the second attempt is unsuccessful. If the third attempt is unsuccessful, the controller will close the gas valve and lock itself out. It may be reset by momentarily interrupting power. This may be accomplished by briefly lowering the room thermostat set-point below room temperature, or by shutting off the main power to the unit. (See TP-105 for more details.)
9. Integrated ignition control will close its normally open contacts after a delay of approximately 30 seconds. This action energizes contactor BC and starts the supply fan motor. Operation of the supply fan circulates air across the heat exchanger and delivers heated air to the conditioned space.
10. When the space temperature rises, the thermostat will open R-W. Opening R-W will cause the gas valve to close, and the furnace to shut down.
11. The furnace has three high temperature limit controls, which can shut down the burner. They do not shut down the vent motor.

Unit Shutdown

1. Set the thermostat to lowest setting.
2. Turn off the electrical power supply to the unit.
3. Remove the heat exchanger door on the side of the unit by removing screws.
4. Move the gas control valve switch to the OFF position. Do not force.
5. Close manual gas shut off valve external to the unit.
6. Replace the heat exchanger door on the unit.
7. If cooling and/or air circulation will be desired, turn ON the electrical power.

NORMAL SEQUENCE OF OPERATION – COOLING

Refrigeration Sequence Check

With the disconnect switch open, remove the field connected thermostat wire from terminal R on TB1 terminal block. Place a jumper across terminals R and G, and across R and Y1 on TB1 terminal block. On 6-25 ton systems place a jumper on Y1 and Y2 to engage 2nd stage of cooling. Close the disconnect switch. The following operational sequence should be observed.

1. Current through primary winding of transformer TRANS1 energizes the 24-volt control circuit. The control voltage is passed through any installed safety shutdown devices such as the smoke detector before providing 24VAC to TB1.
2. To simulate a mechanical call for cooling from the wall thermostat, place a jumper across terminals R and Y1 of terminal block TB1. Add a jumper from Y1 to Y2 for high stage cooling.
3. **UNIT WITH ECONOMIZER OPTION**: The compressor circuit is interlocked through terminals 3 and 4 of the economizer module. If the outdoor air enthalpy (temperature and humidity) is not suitable for cooling, the economizer terminals will be closed permitting compressor to be energized.
4. The blower motor is operated to provide cool supply air to the space.

SYSTEM OPERATION

For 3 phase belt drive motors: Check supply fan rotation. If the supply fan is rotating in the wrong direction, disconnect and lock off Single Point Power Block. Do not attempt to change load side wiring. Internal wiring is set at the factory to assure that the supply fan and compressors all rotate in the proper direction. Verification of correct supply fan rotation at initial startup will also indicate correct compressor rotation. Reconnect power and check for proper operation.

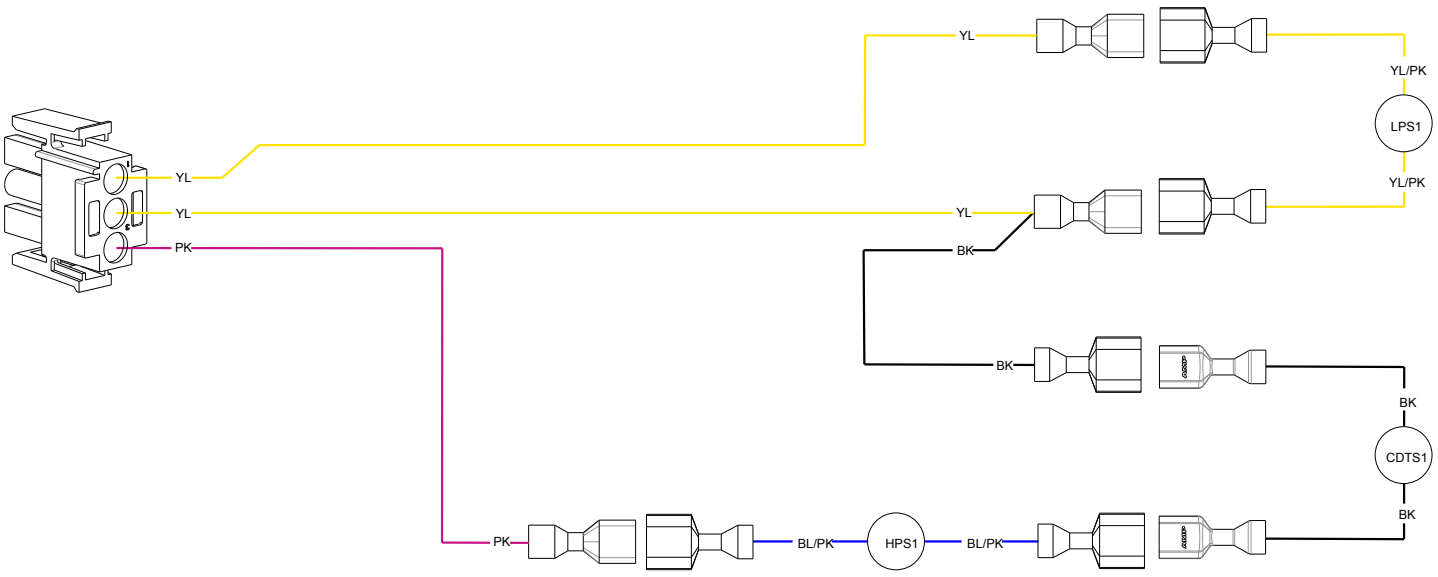
5. Compressor contactor closes its contacts to provide power to the compressor motor. In addition, the condenser fan motor is energized through the compressor contactor.

Check that each compressor is operating correctly. The scroll compressors in these units MUST operate in the proper rotation. To ensure the compressors are operating in the correct direction, check the compressor discharge line pressure or temperature after each compressor is started. The discharge pressure and discharge line temperature should increase. If this does not occur and the compressor is producing an exceptional amount of noise, perform the following checks.

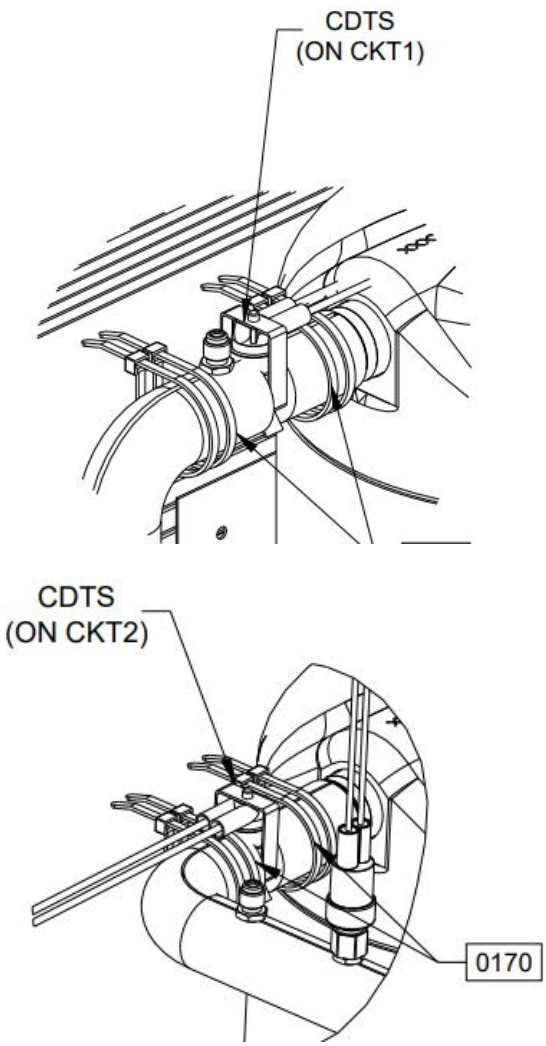
- Ensure all compressors and the supply fan motor are operating in the proper direction. If a single motor is operating backwards, check the power wiring for that motor and correct any leads that have been interchanged at the contactor or at the motor.
- If all the motors are operating backward, disconnect the unit power supply and lock it in the "OFF" position. Switch two leads of the power supply at the unit Single Point Power Block. Reconnect power and check for compressor and supply fan motor operation.

6. With all safety devices closed, the system will continue cooling operation until the thermostat is satisfied.
7. Disconnecting the jumper wire between R and Y1 and Y2 and between R and G on TB1 terminal block will simulate a satisfied thermostat. The compressors will cycle off and IIC (pin 12) will initiate its time delay cycle. The compressor and the supply fan will cycle off.
8. After a time delay of approximately 3 minutes, the compressor control circuits will be ready to respond to a subsequent call for cooling from the wall thermostat.
9. Open disconnect switch. Reconnect the field thermostat wire at terminal R on terminal block TB1.

Compressor Discharge Temperature Switch (CDTS) (will be used on 20 and 25 ton units only)
Compressor Discharge Temperature Switch (CDTS) is a thermostatic switch located on the discharge line which turns off the compressor if the temperature of hot gas is 275°F or greater. The CDTS is located on each compressor's discharge line within 6 inches of the discharge line braze joint. Discharge 16 temperature switch must not be moved from its factory installed location or electrically disconnected.



SYSTEM OPERATION



OPERATING TEMPERATURE:	
OPEN:	126.7 / 137.8 DEG.C 260.0 / 280.0 DEG.F
CLOSE:	76.7 / 98.9 DEG.C 170.0 / 210.0 DEG.F

HEAT PUMP OPERATION

Cooling Cycle

When the heat pump is in the cooling cycle, it operates exactly as a Summer Air Conditioner unit. In this mode, all the charts and data for service that apply to summer air conditioning apply to the heat pump. Most apply on the heating cycle except that “condenser” becomes “evaporator”, “evaporator” becomes “condenser”, “cooling” becomes “heating”.

Heating Cycle

The heat pump operates in the heating cycle by redirecting refrigerant flow through the refrigerant circuit external to the compressor. This is accomplished through the reversing valve. Hot discharge vapor from the compressor is directed to the indoor coil (evaporator on the cooling cycle) where the heat is removed, and the vapor condenses to liquid. It then goes through the expansion device to the outdoor coil (condenser on the cooling cycle) where the liquid is evaporated, and the vapor goes to the compressor.

When the solenoid valve coil is operated either from heating to cooling or vice versa, the piston in the reversing valve to the low pressure (high pressure) reverse positions in the reversing valve.

The following figures show a schematic of a heat pump on the cooling cycle and the heating cycle. In addition to a reversing valve, a heat pump is equipped with an expansion device and check valve for the indoor coil, and similar equipment for the outdoor coil. It is also provided with a defrost control system.

The expansion devices are flowrator distributors and perform the same function on the heating cycle as on the cooling cycle. The flowrator distributors also act as check valves to allow for the reverse of refrigerant flow.

When the heat pump is on the heating cycle, the outdoor coil is functioning as an evaporator. The temperature of the refrigerant in the outdoor coil must be below the temperature of the outdoor air in order to extract heat from the air. Thus, the greater the difference in the outdoor temperature and the outdoor coil temperature, the greater the heating capacity of the heat pump. This phenomenon is a characteristic of a heat pump. It is a good practice to provide supplementary heat for all heat pump installations in areas where the temperature drops below 45° F. It is also a good practice to provide sufficient supplementary heat to handle the entire heating requirement should there be a component failure of the heat pump, such as a compressor, or refrigerant leak, etc.

Since the temperature of the refrigerant in the outdoor

coil on the heating cycle is generally below freezing point, frost forms on the surfaces of the outdoor coil under certain weather conditions of temperature and relative humidity. Therefore, it is necessary to reverse the flow of the refrigerant to provide hot gas in the outdoor coil to melt the frost accumulation. This is accomplished by reversing the heat pump to the cooling cycle. At the same time, the outdoor fan stops to hasten the temperature rise of the outdoor coil and lessen the time required for defrosting. The indoor blower continues to run, and the supplementary heaters are energized.

Defrost Control

NOTE: DBH and DFH models have one stage of mechanical heating. The defrost accumulation period will start when either first or second stage defrost thermostat closes. Defrost termination occurs when both thermostats open or the 10 minute cycle has completed.

During operation the power to the circuit board is controlled by a temperature sensor, which is clamped to a feeder tube entering the outdoor coil. Defrost timing periods of 30,60 and 90 minutes may be selected by connecting the circuit board jumper to 30, 60 and 90 respectively. Accumulation of time for the timing period selected starts when the sensor closes (approximately 31° F), and when the wall thermostat calls for heat. At the end of the timing period, the unit's defrost cycle will be initiated provided the sensor remains closed. When the sensor opens (approximately 75° F), the defrost cycle is terminated and the timing period is reset. If the defrost cycle is not terminated due to the sensor temperature, a ten minute override interrupts the unit's defrost period.

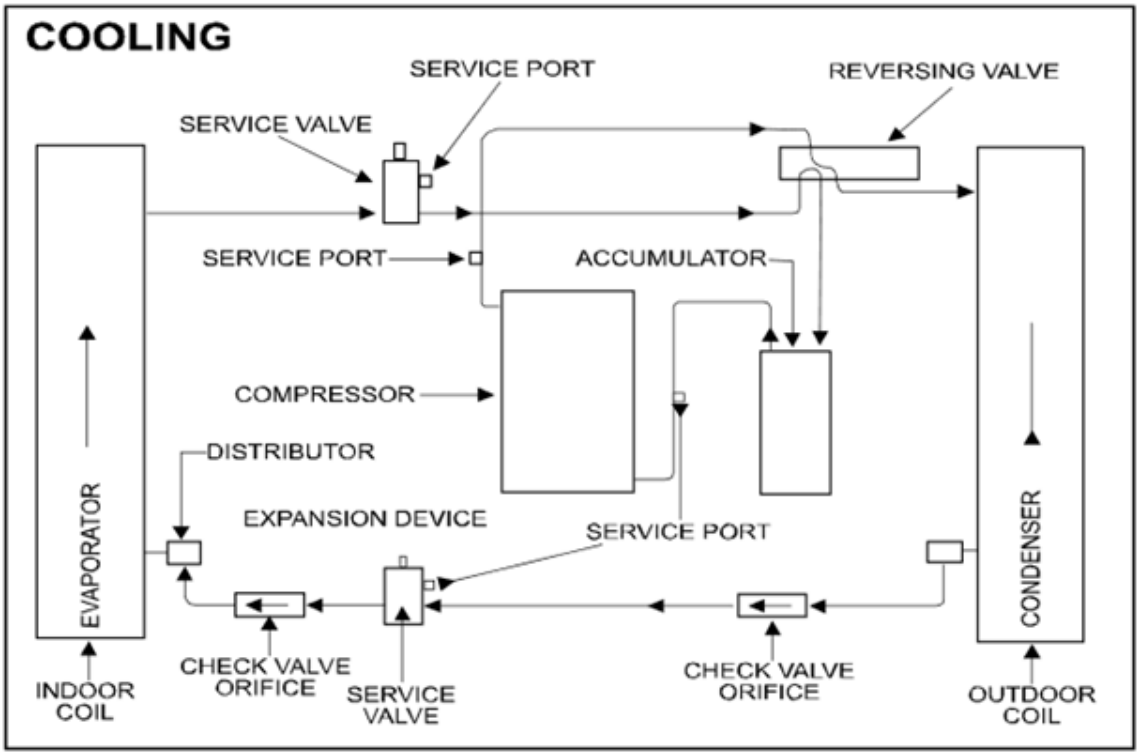
Refrigeration Detection System (RDS)

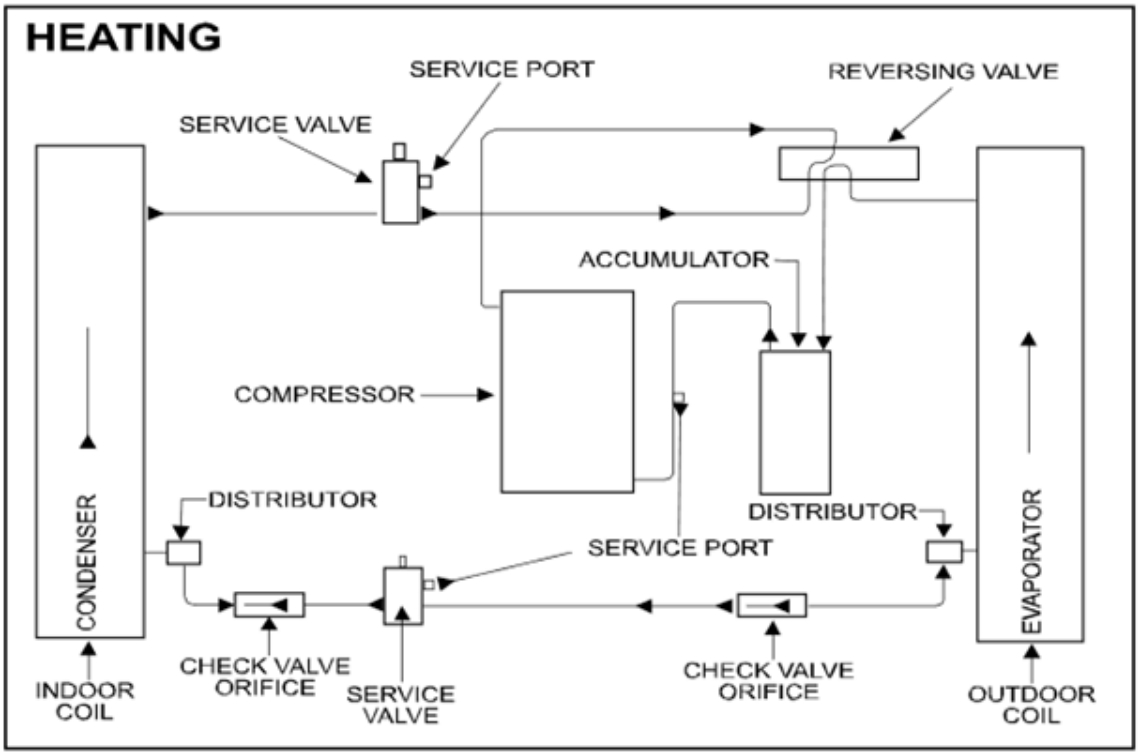
NOTE: Only DS* models are equipped with REFRIGERATION DETECTION SYSTEMS.

The mitigation system is a stationary device that detects the presence of R-32 refrigerant above 25% LFL using refrigerant sensors and then initiates mitigation actions. The mitigation system's primary function is to reduce the concentration of leaked R-32 refrigerant to prevent serious safety hazards. The mitigation actions are accomplished by halting HVAC operation and continuing indoor blower operation to provide airflow. Once refrigerant concentration reaches below a safe threshold, the unit will remain in mitigation mode for five minutes to evacuate any remaining R-32 refrigerant within the unit. Upon completion, the unit will resume its normal operation.

The mitigation system is controlled by a refrigerant sensor(s), which is secured to a designated location(s) for active monitoring. If a leak is detected, HVAC operation is disabled and the indoor blower fan is activated, providing airflow at or above the minimum required airflow to evacuate excess concentration. If a Zone Control system is installed in the ductwork attached to this system, the Zone controller must be powered through a Daikin Zoning/ Accessory PCB to ensure that the Zoning Dampers open during mitigation mode to provide ventilation throughout all ducting. If the unit is installed with a communicating thermostat, the thermostat will display relevant alerts/ information concerning mitigation mode. Once sensors read concentration levels below a safe threshold, a five-minute timer will initiate. Once the time is over, the unit will resume its normal operation. If the sensors detect another concentration excess, the unit will go back into mitigation mode and will repeat the same process.

SYSTEM OPERATION

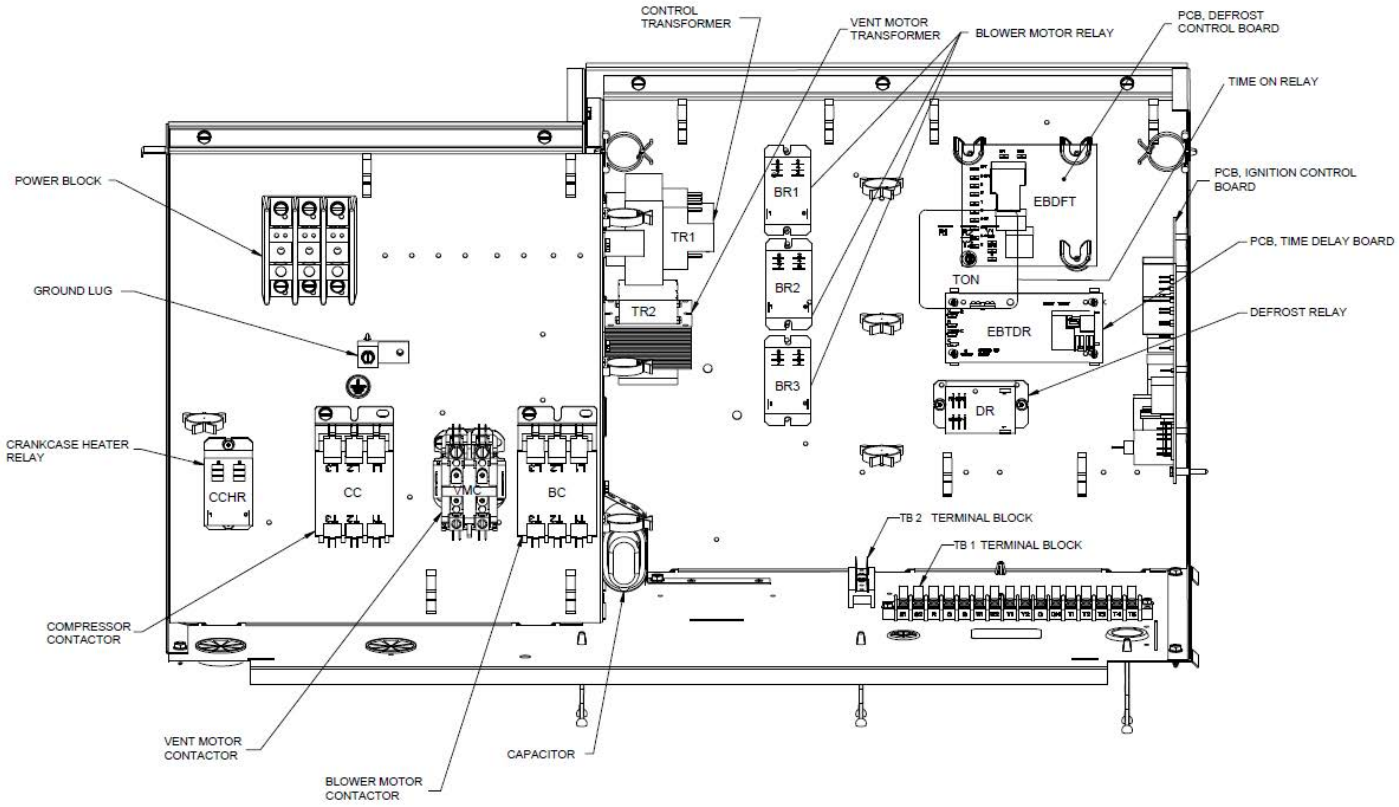




CONTROL BOX AND COMPONENT LOCATIONS

CONTROL BOX AND COMPONENT LOCATIONS

3 TO 6 TON CONTROL BOX (DB, DR AND DF MODELS)

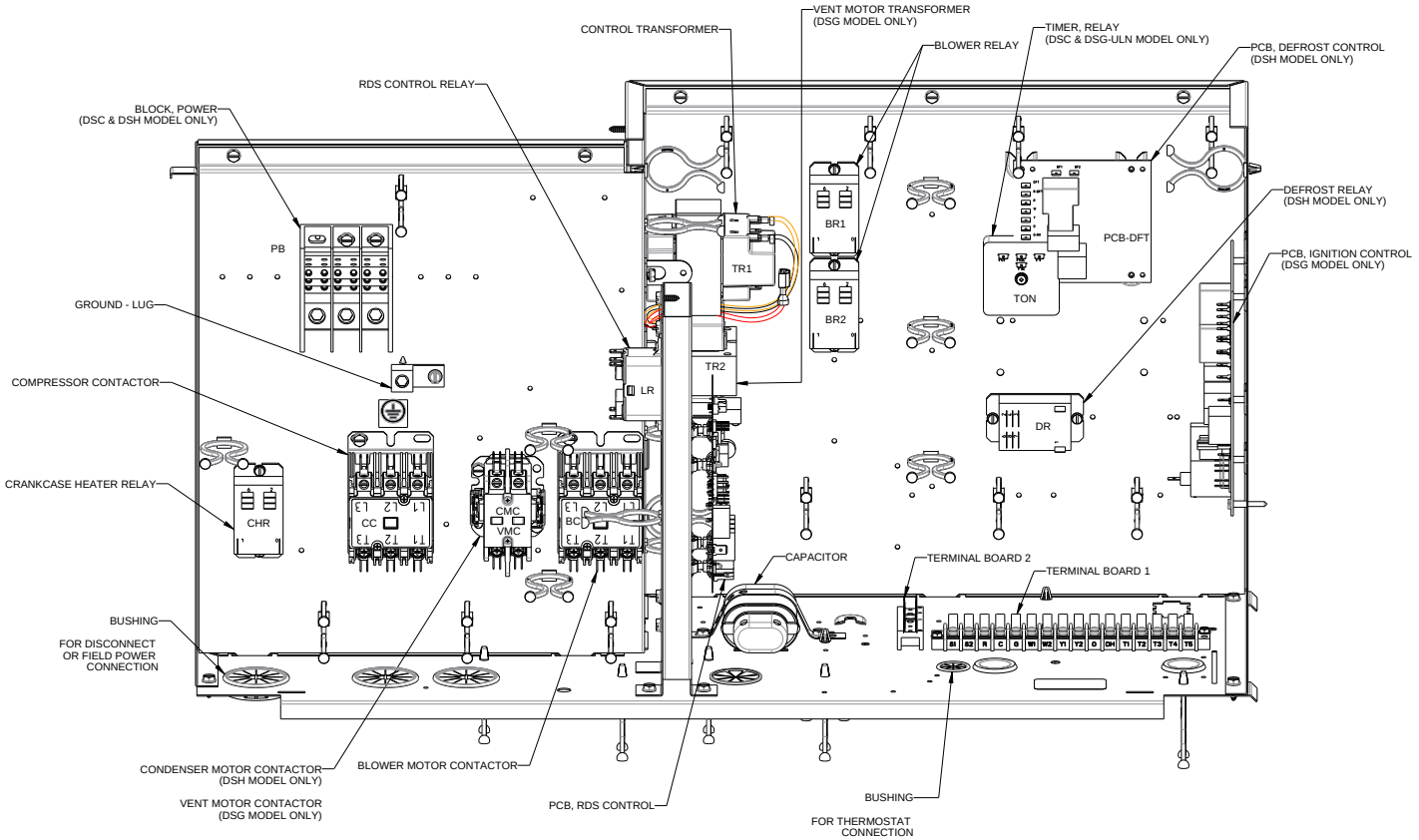


ULN ONLY PRESSURE TRANSDUCER

NOTE: All components shown are included with every product.

CONTROL BOX AND COMPONENT LOCATIONS

3 TO 6 TON CONTROL BOX (DS MODELS)

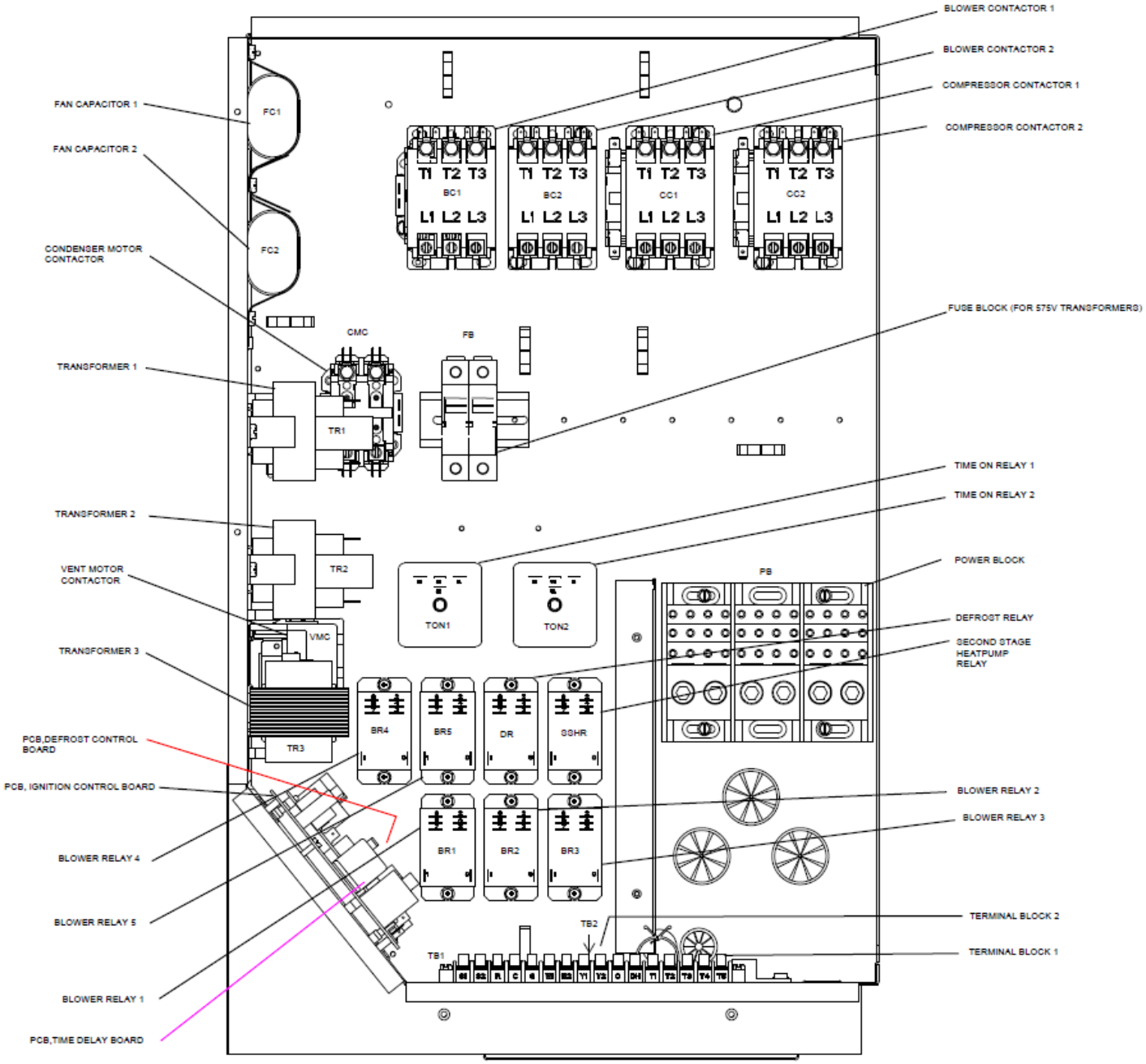


DSC/DSH MODEL

NOTE: All components shown are included with every product.

CONTROL BOX AND COMPONENT LOCATIONS

7.5 TO 12.5 TON CONTROL BOX (DB AND DR MODELS)

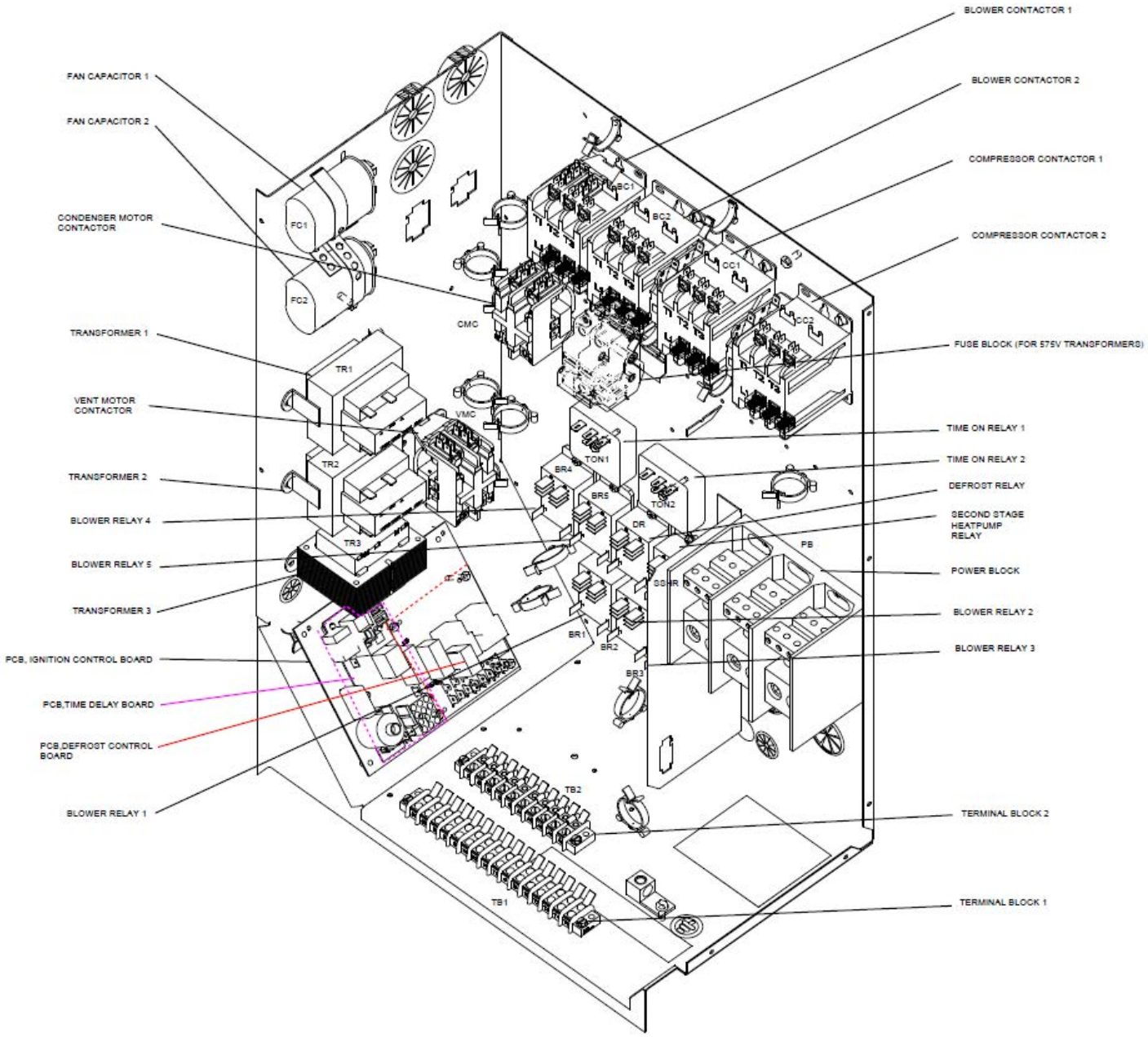


NOTE: All components shown are included with every product.

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CONTROL BOX AND COMPONENT LOCATIONS

7.5 TO 12.5 TON CONTROL BOX (DB AND DR MODELS)

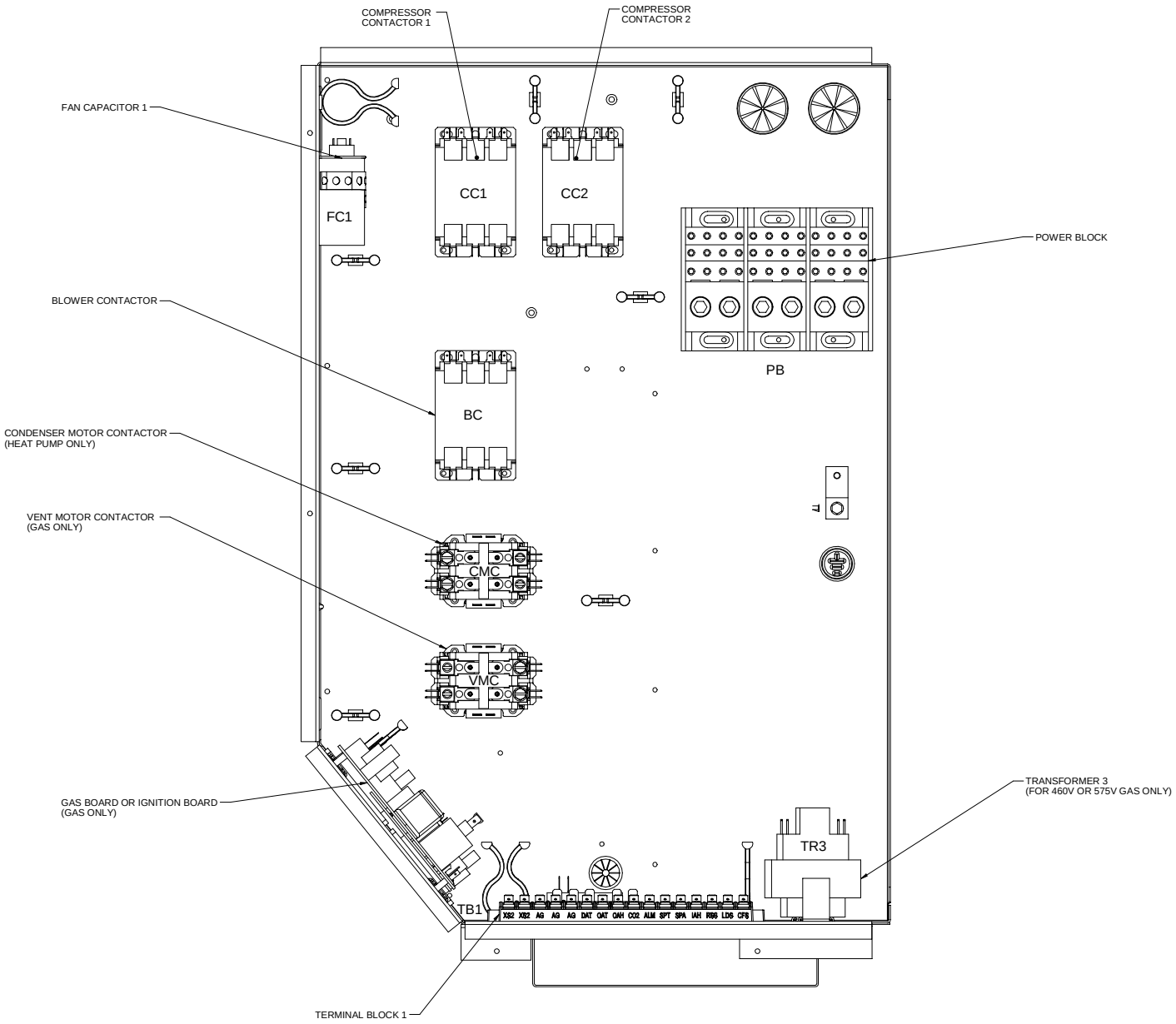


NOTE: All components shown are included with every product.

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CONTROL BOX AND COMPONENT LOCATIONS

7.5 TO 12.5 TON CONTROL BOX (DF MODELS)

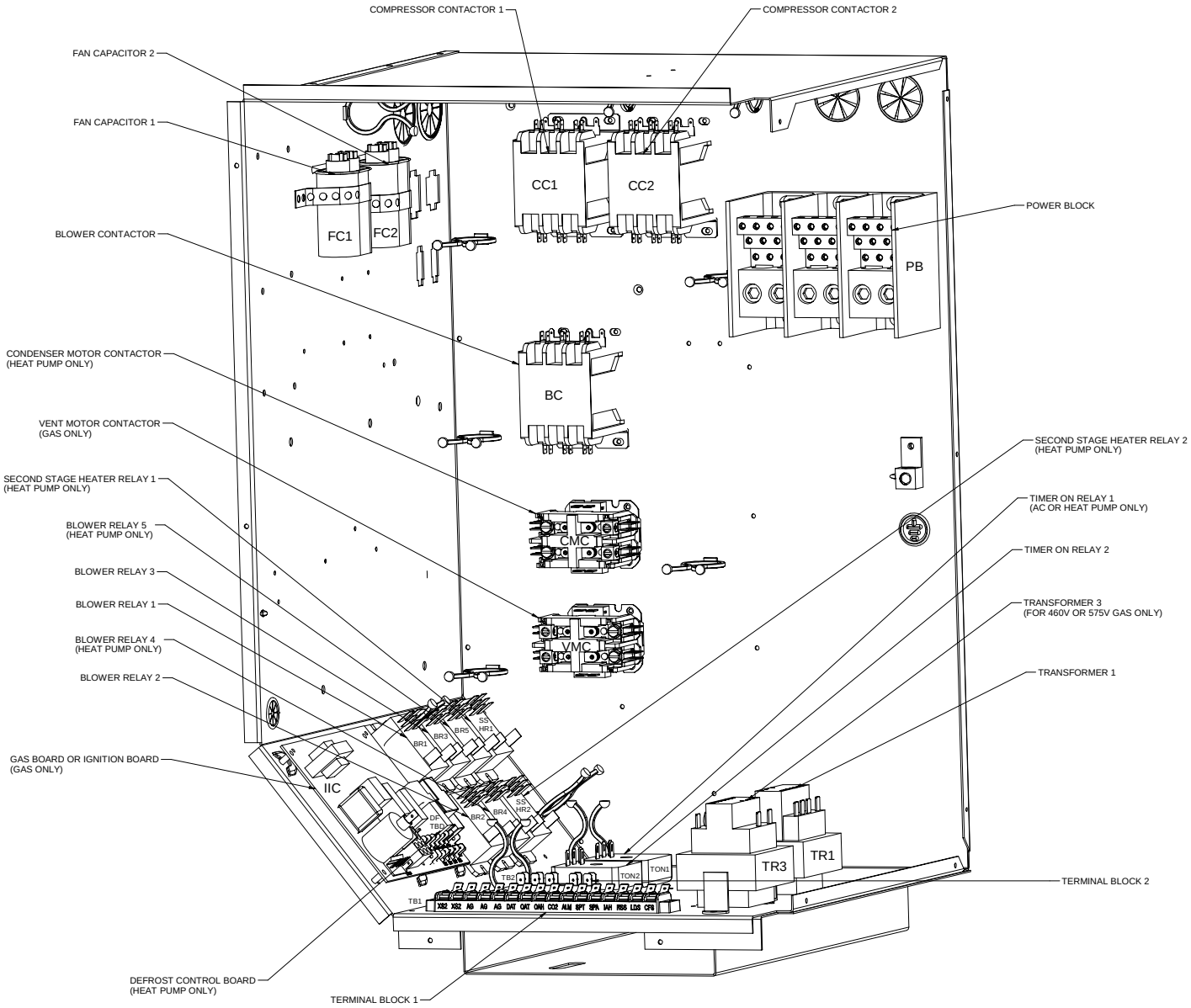


NOTE: All components shown are included with every product.

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CONTROL BOX AND COMPONENT LOCATIONS

7.5 TO 12.5 TON CONTROL BOX (DF MODELS)

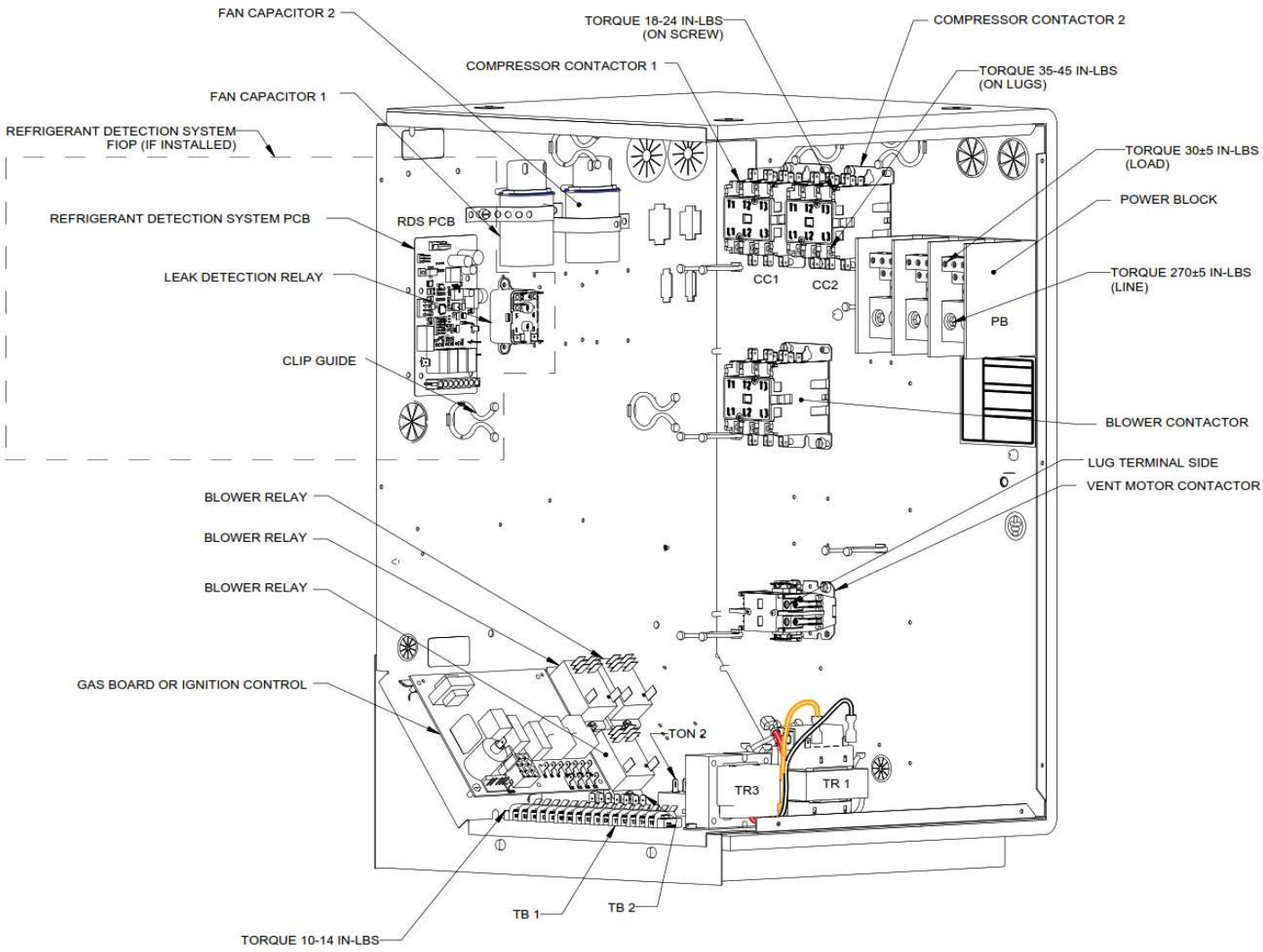


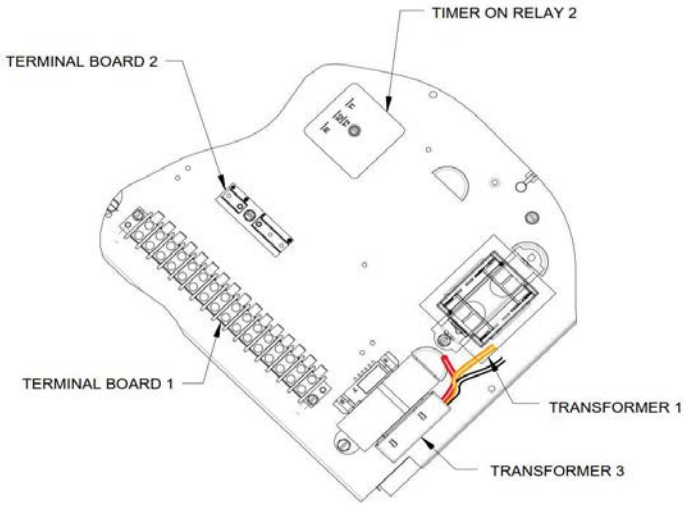
NOTE: All components shown are included with every product.

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CONTROL BOX AND COMPONENT LOCATIONS

7.5 TO 12.5 TON CONTROL BOX (DS & DH MODELS)

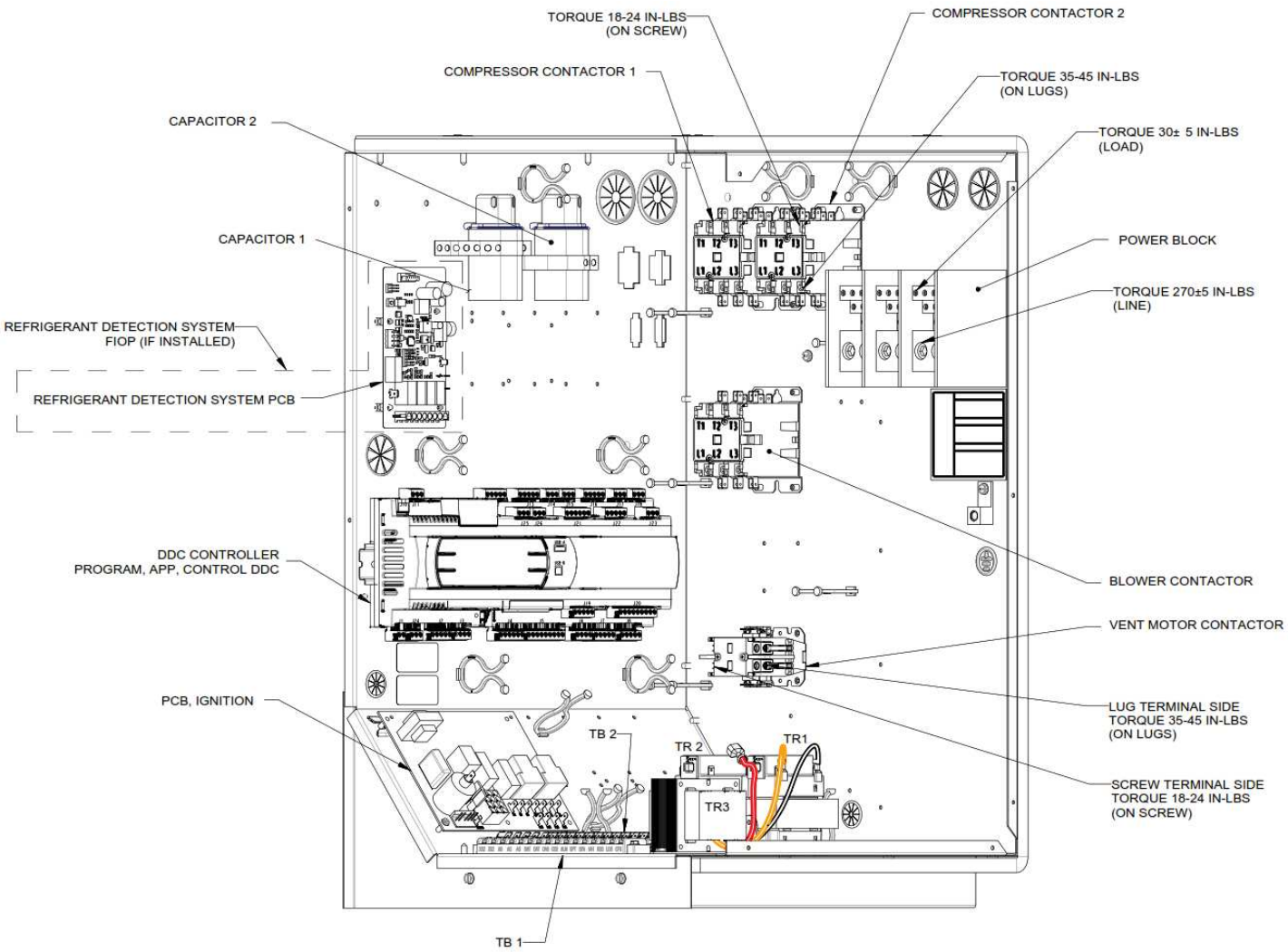


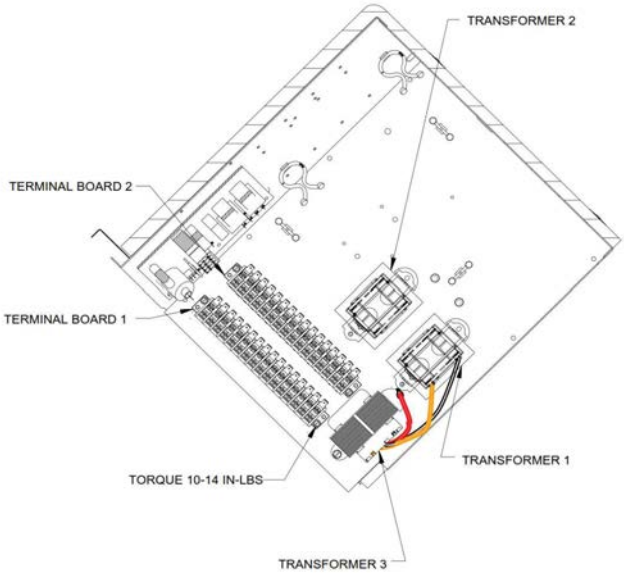


NOTE: All components shown are included with every product.

CONTROL BOX AND COMPONENT LOCATIONS

7.5 TO 12.5 TON CONTROL BOX (DH MODELS WITH DDC CONTROL)

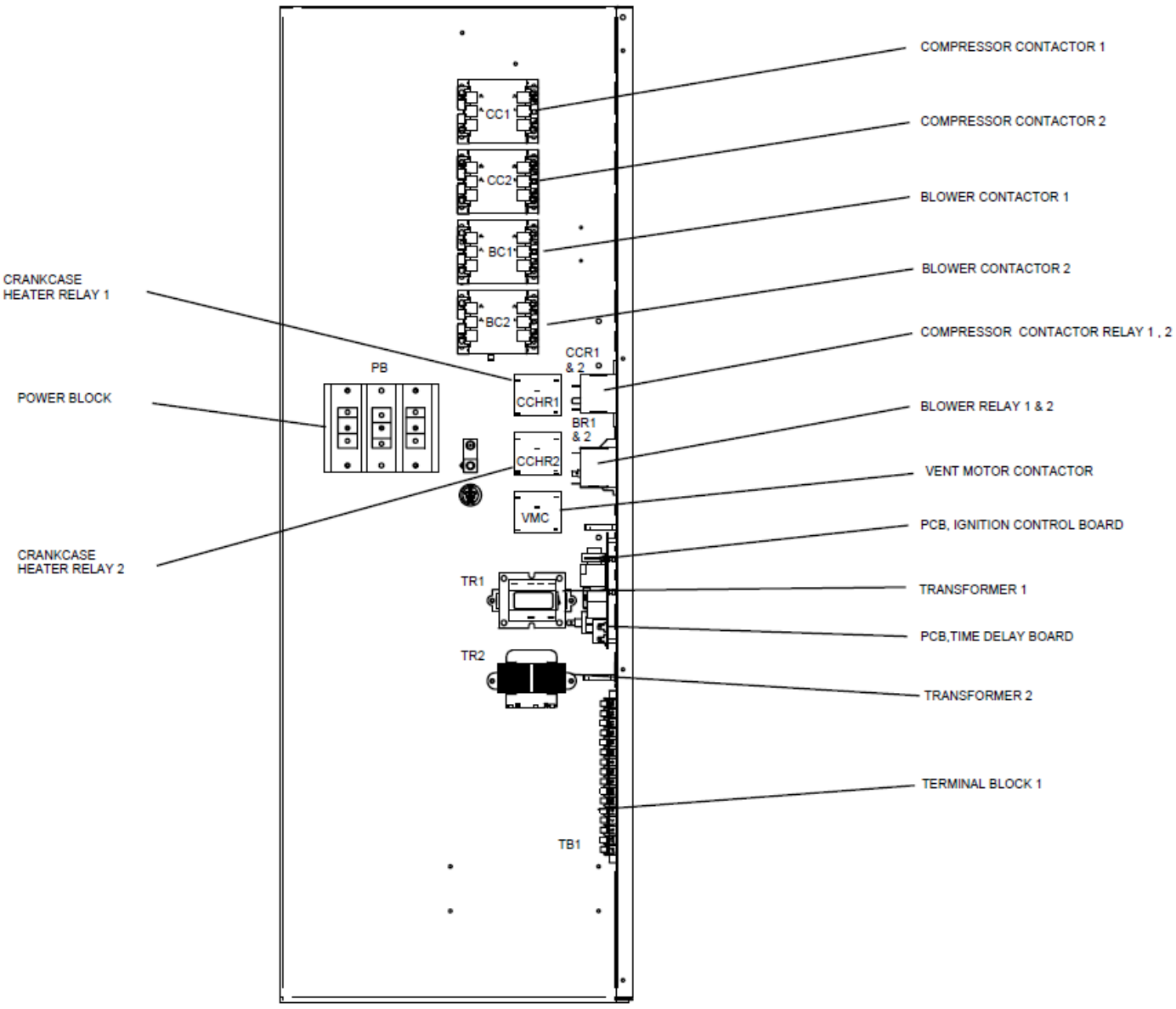




NOTE: All components shown are included with every product.

CONTROL BOX AND COMPONENT LOCATIONS

15 TO 20 TON CONTROL BOX (DB MODELS)

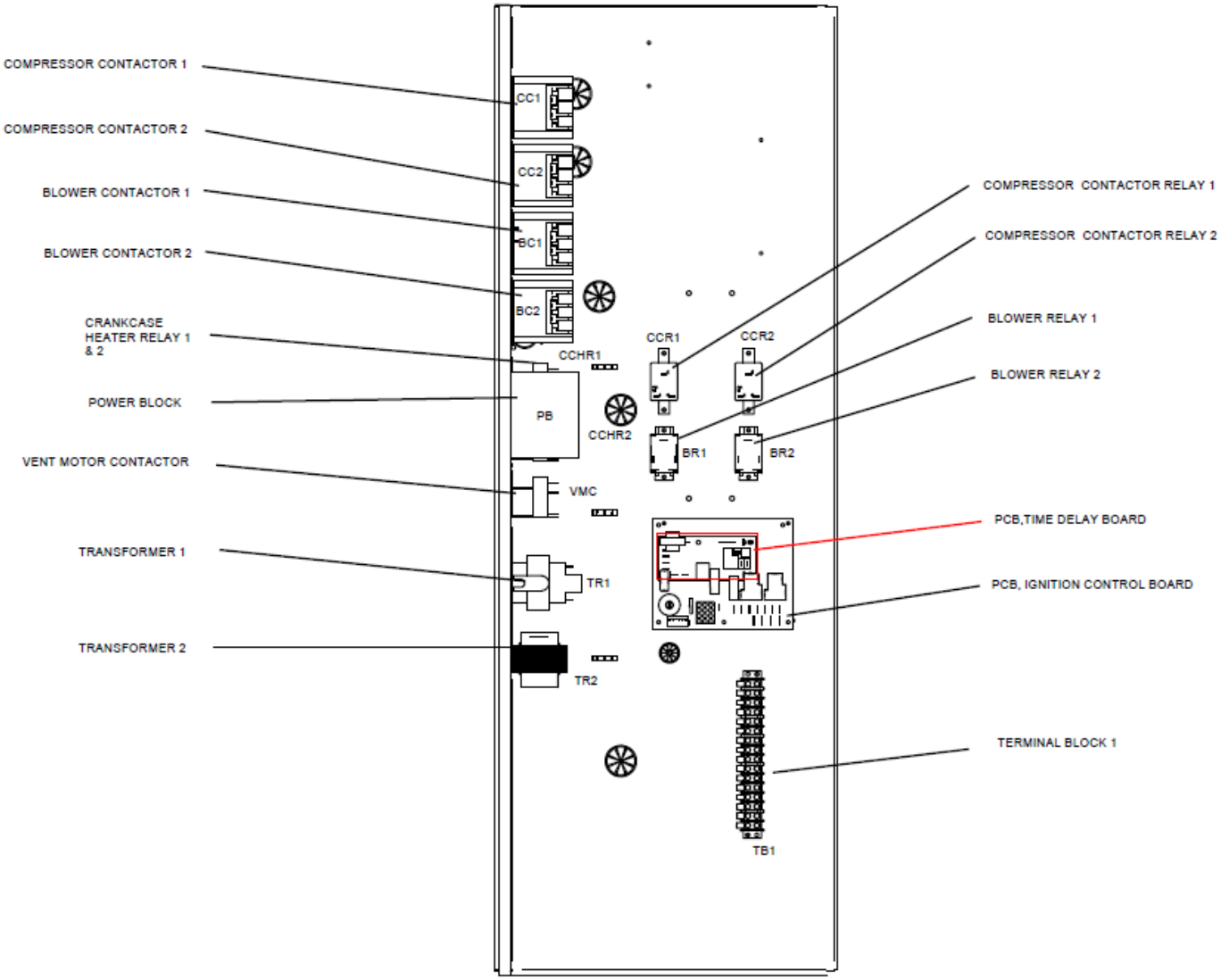


NOTE: All components shown are included with every product.

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CONTROL BOX AND COMPONENT LOCATIONS

15 TO 20 TON CONTROL BOX (DB MODELS)

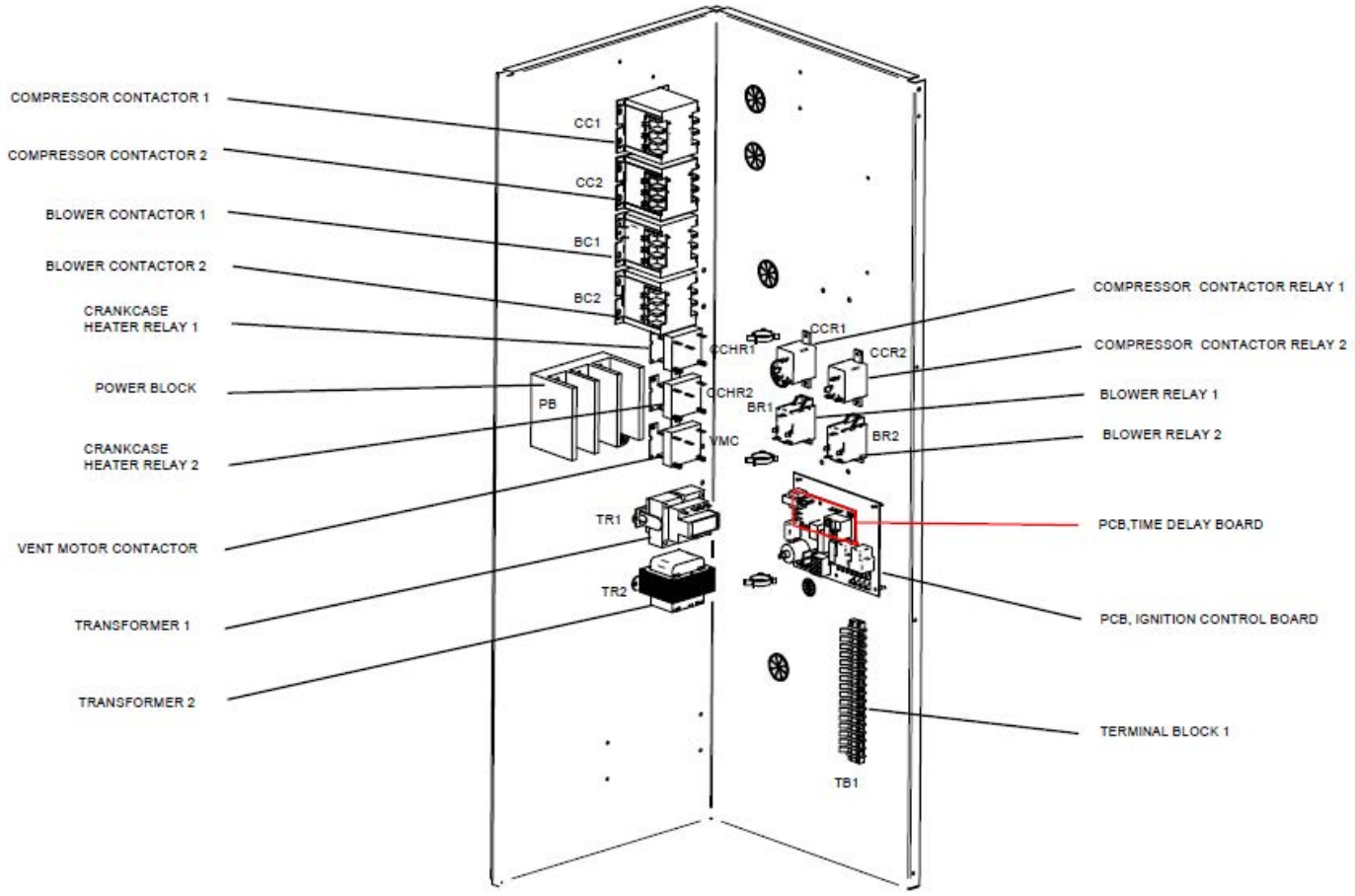


NOTE: All components shown are included with every product.

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CONTROL BOX AND COMPONENT LOCATIONS

15 TO 20 TON CONTROL BOX (DB MODELS)

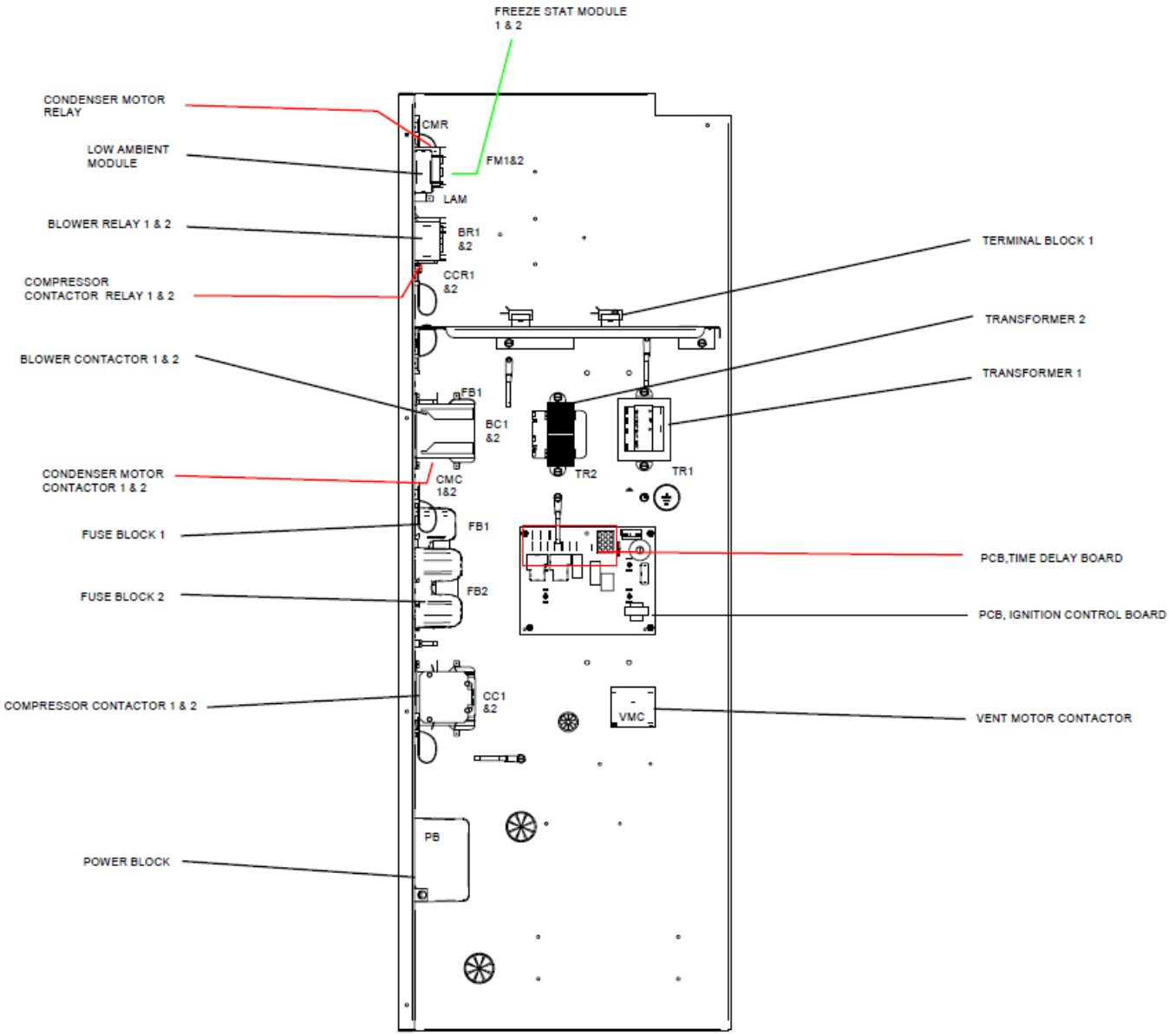


NOTE: All components shown are included with every product.

20

CONTROL BOX AND COMPONENT LOCATIONS

25 TON CONTROL BOX (DB MODELS)

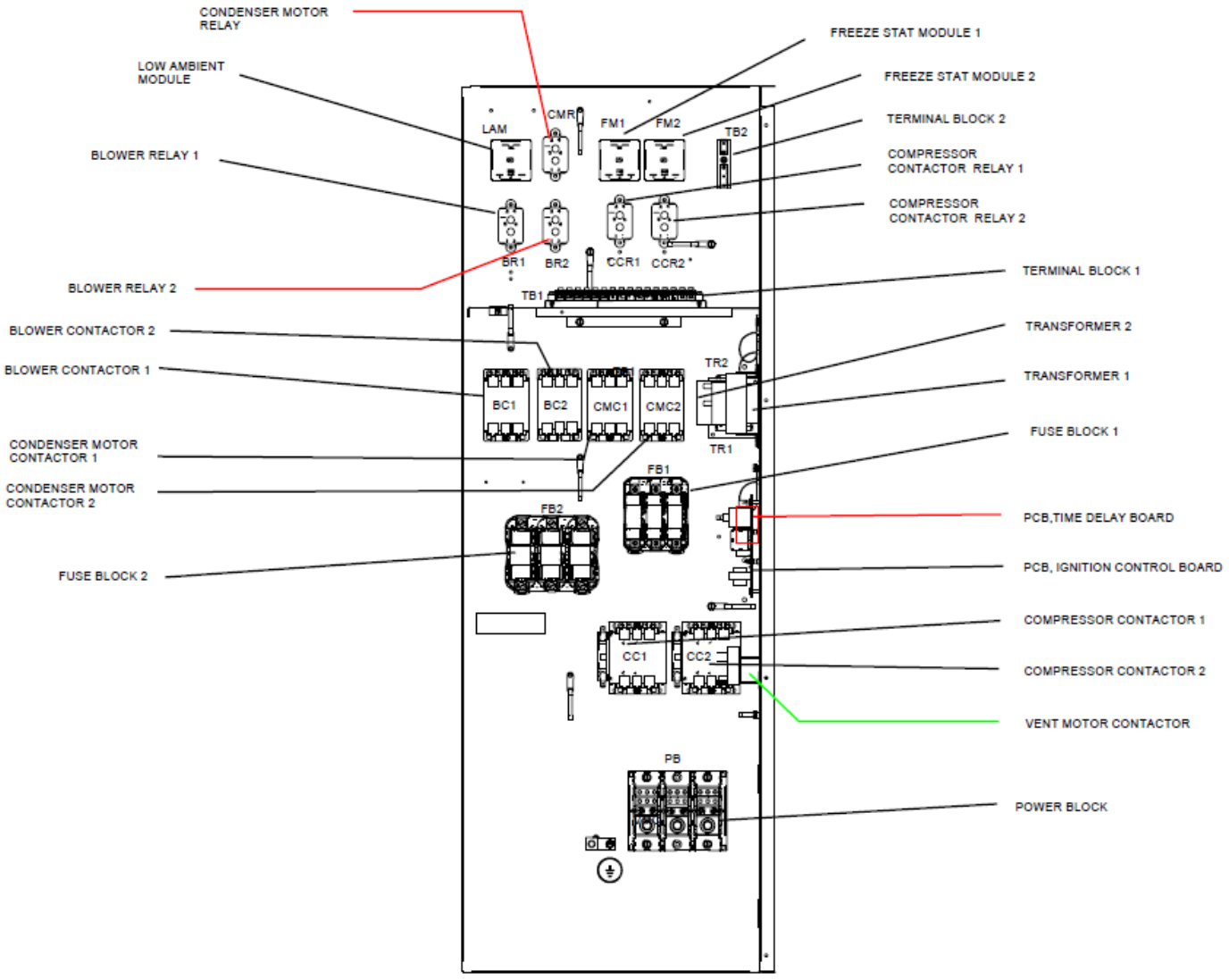


NOTE: All components shown are included with every product.

21

CONTROL BOX AND COMPONENT LOCATIONS

25 TON CONTROL BOX (DB MODELS)

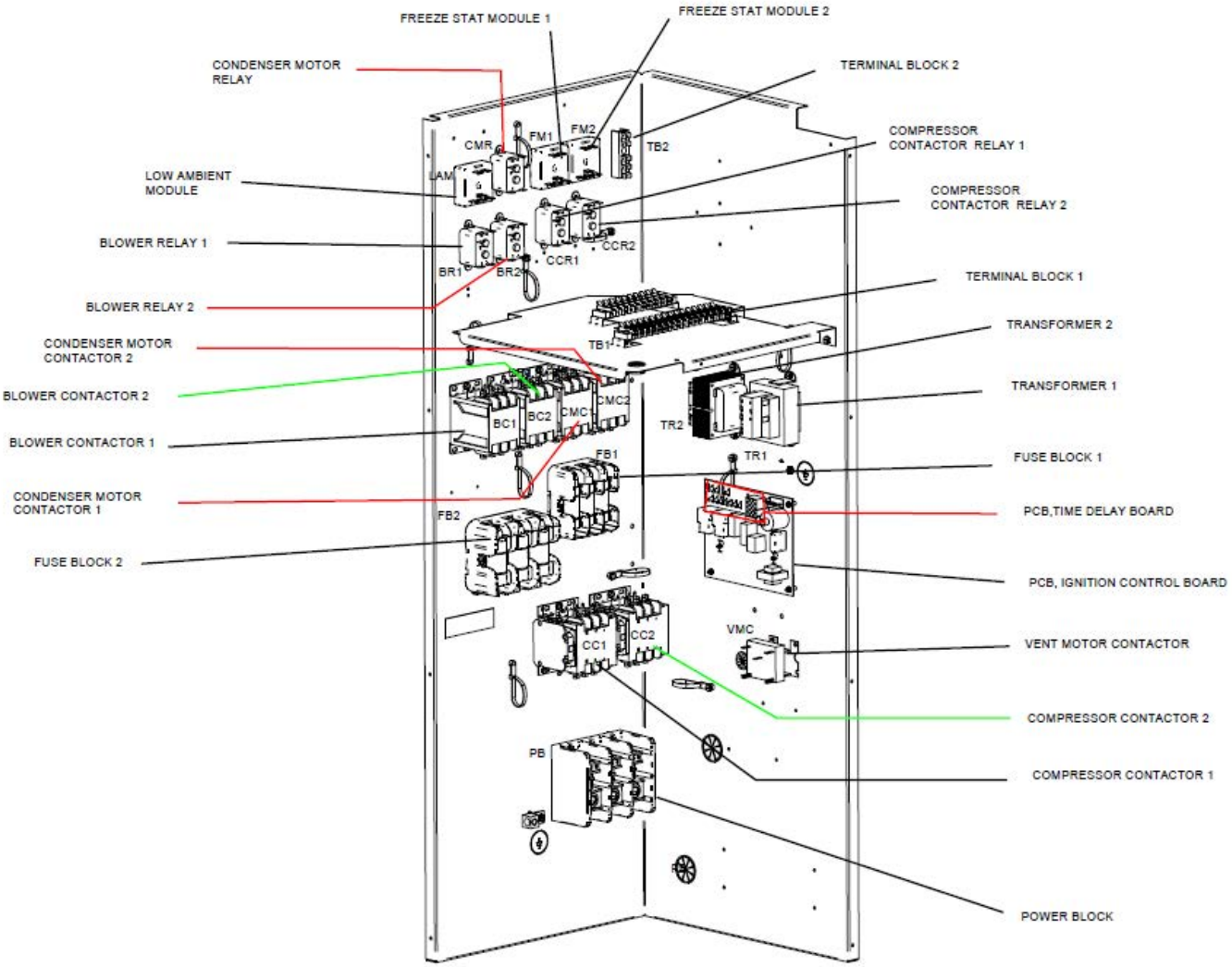


NOTE: All components shown are included with every product.

22

CONTROL BOX AND COMPONENT LOCATIONS

25 TON CONTROL BOX (DB MODELS)

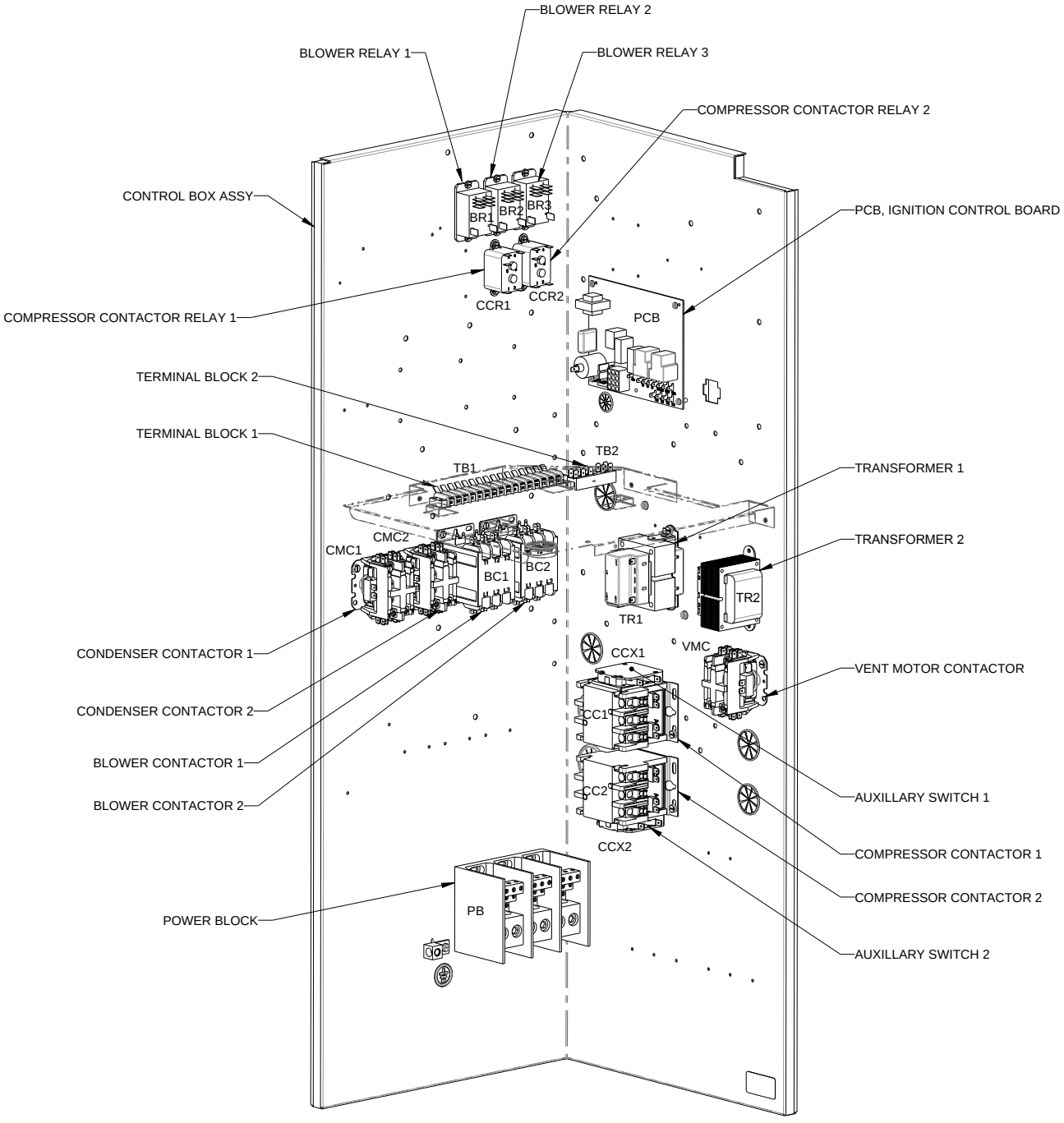


NOTE: All components shown are included with every product.

23

CONTROL BOX AND COMPONENT LOCATIONS

25 TON CONTROL BOX (DF MODELS)

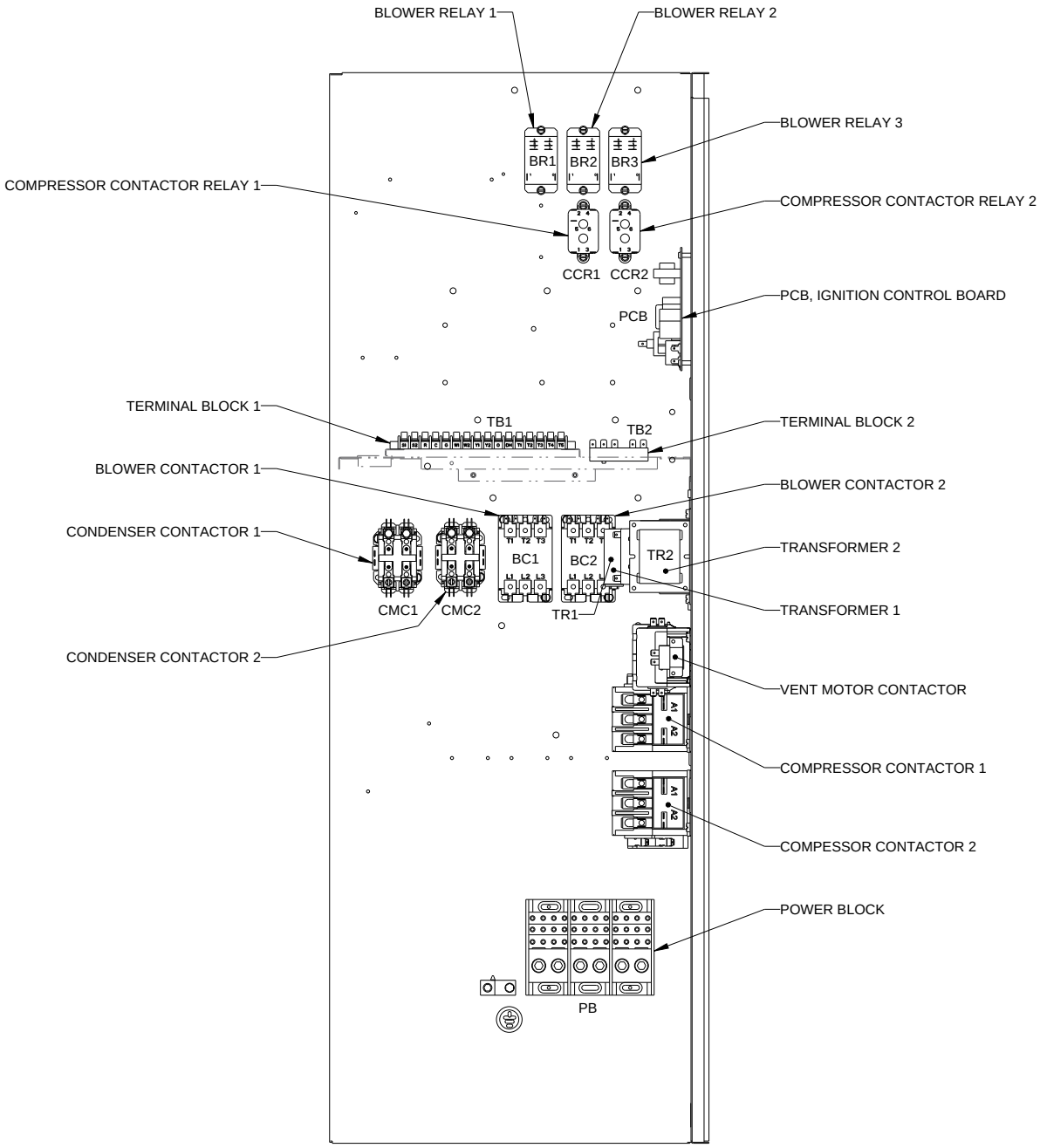


NOTE: All components shown are included with every product.

24

CONTROL BOX AND COMPONENT LOCATIONS

25 TON CONTROL BOX (DF MODELS)

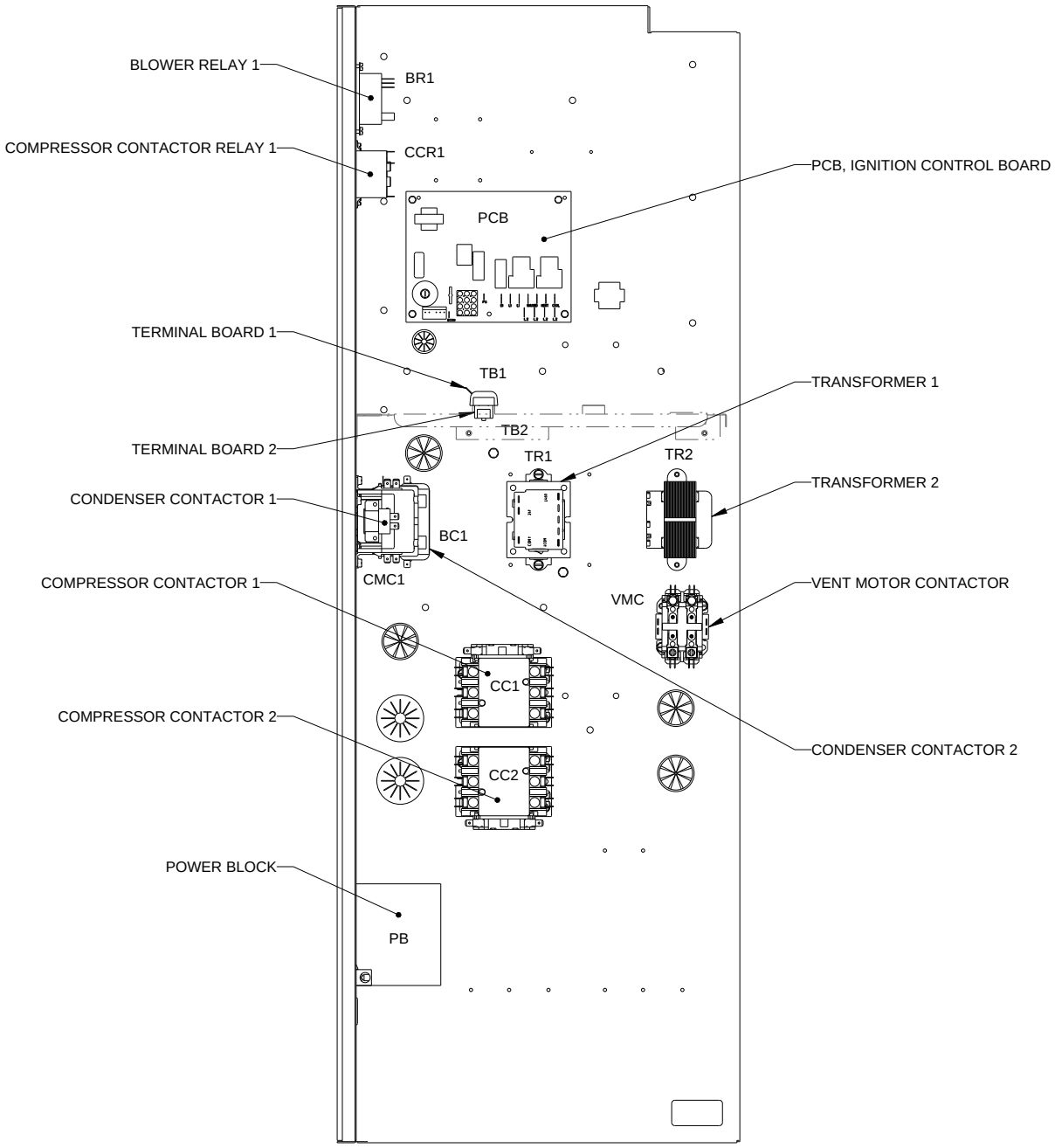


NOTE: All components shown are included with every product.

25

CONTROL BOX AND COMPONENT LOCATIONS

25 TON CONTROL BOX (DF MODELS)

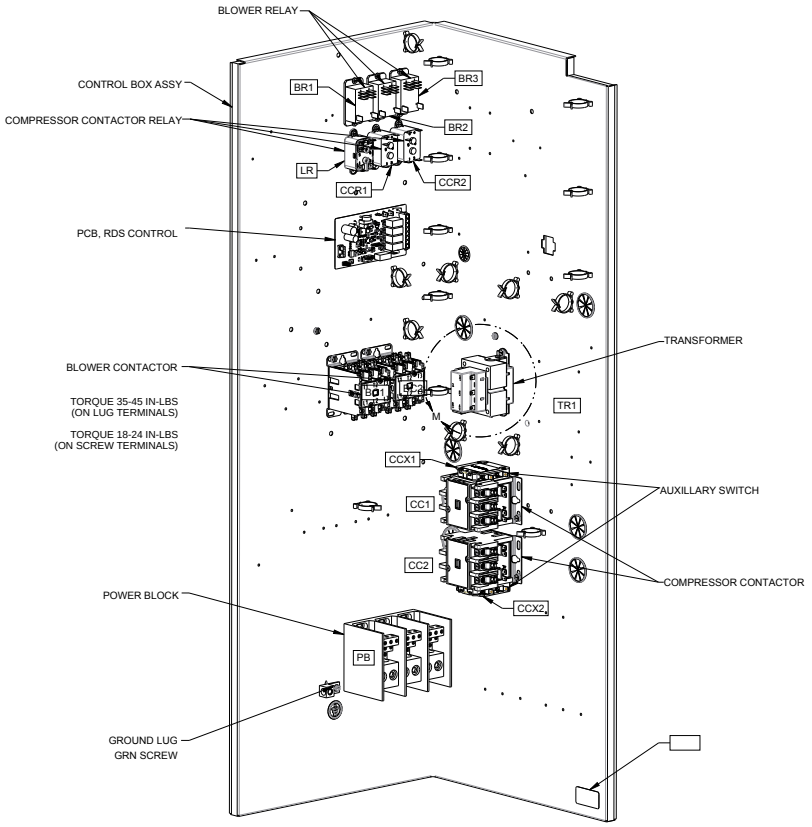


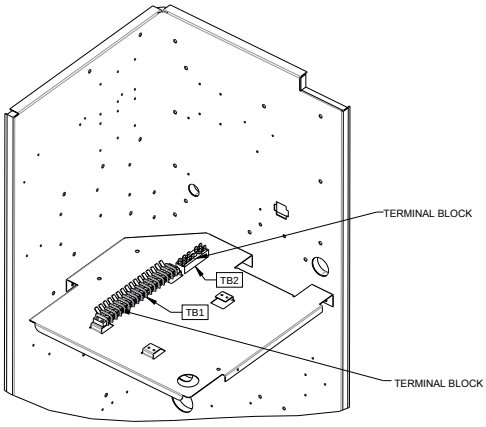
NOTE: All components shown are included with every product.

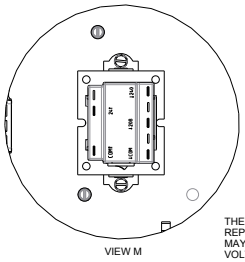
26

CONTROL BOX AND COMPONENT LOCATIONS

15T AND 20T CONTROL BOX (DSC MODEL)







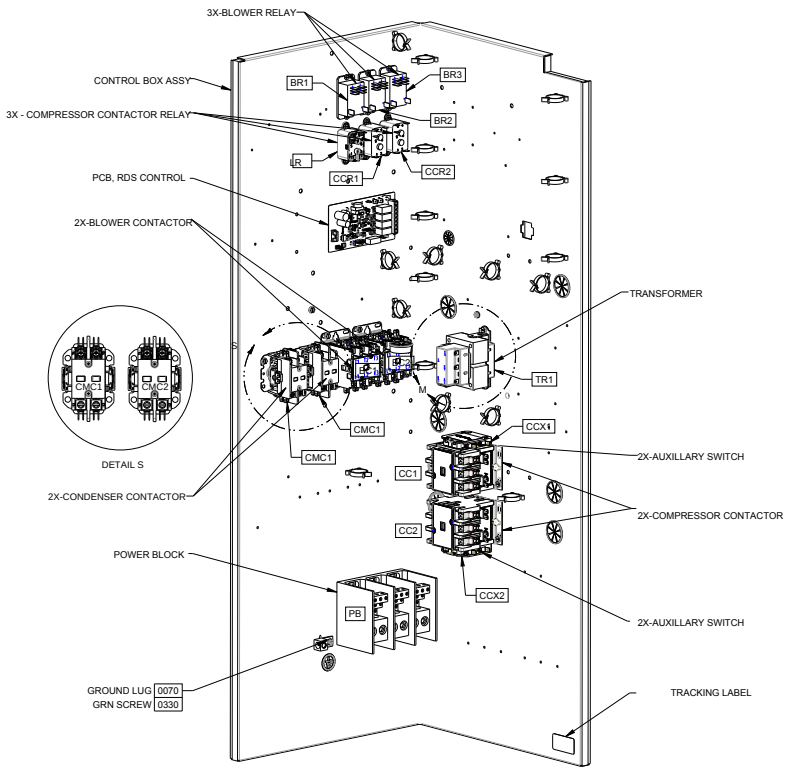
VIEW M

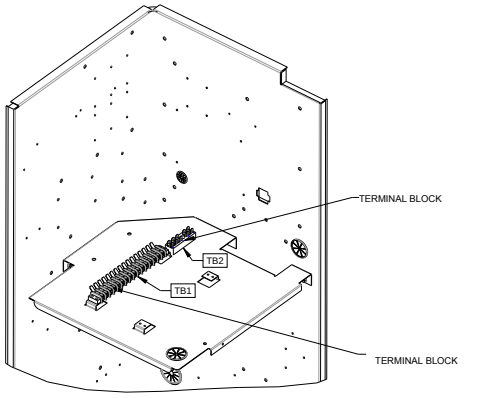
THE TRANSFORMER SHOWN IS FOR REPRESENTATION ONLY. TRANSFORMER MAY VARY ACCORDING TO MODELS AND VOLTAGES USED.

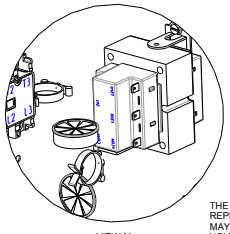
NOTE: All components shown are included with every product.

CONTROL BOX AND COMPONENT LOCATIONS

25T CONTROL BOX (DSC MODEL)







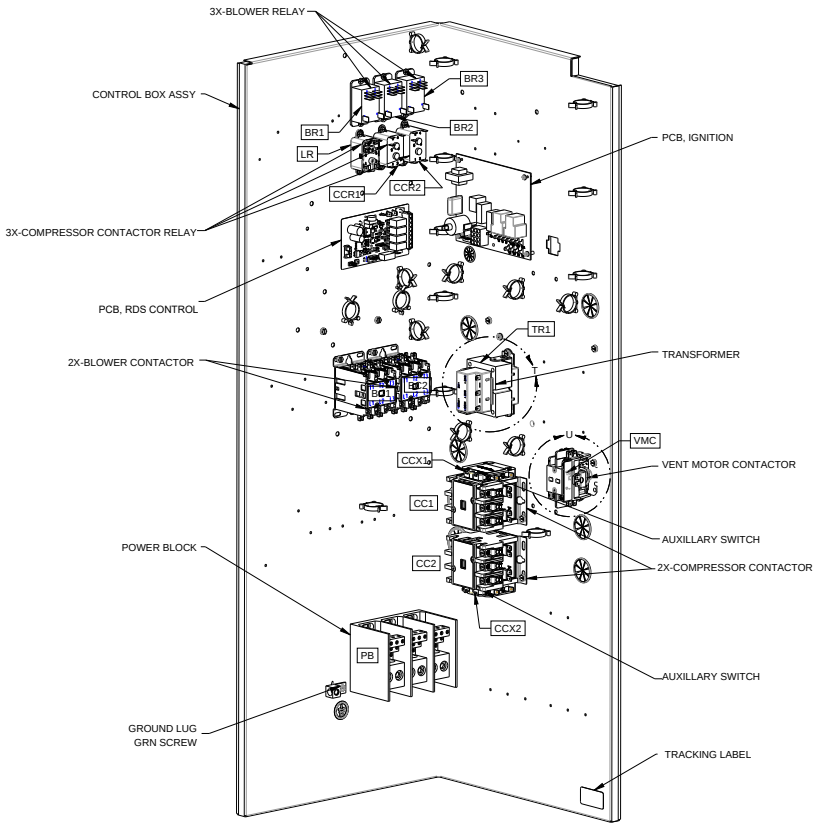
VIEW M

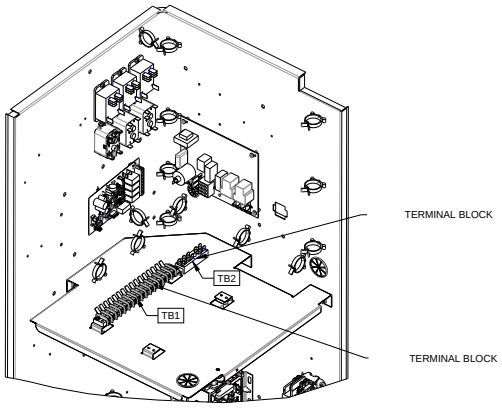
THE TRANSFORMER SHOWN IS FOR REPRESENTATION ONLY. TRANSFORMER MAY VARY ACCORDING TO MODELS AND VOLTAGES USED.

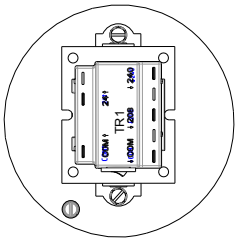
NOTE: All components shown are included with every product.

CONTROL BOX AND COMPONENT LOCATIONS

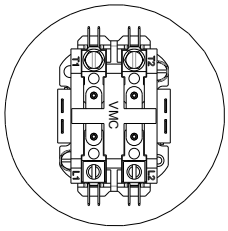
15T AND 20T CONTROL BOX (DSG MODEL)







DETAIL T

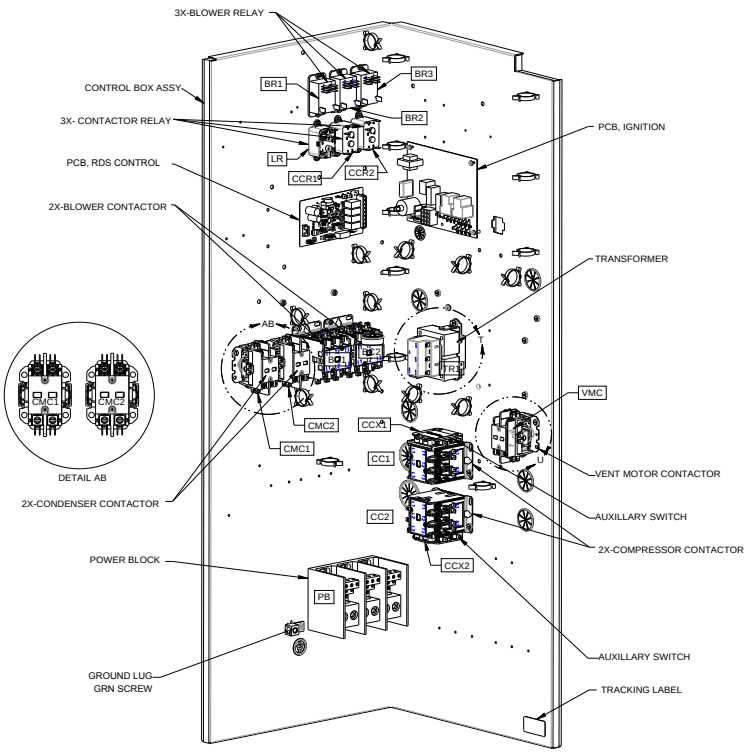


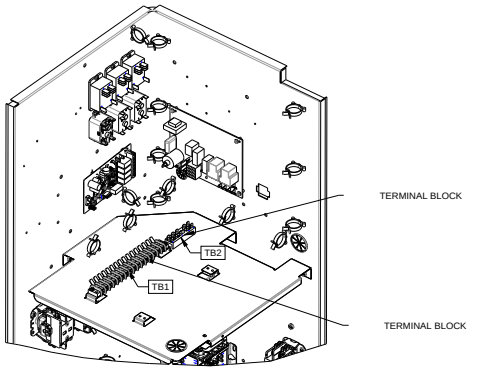
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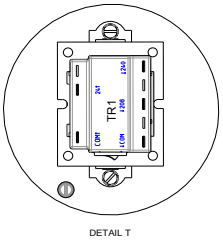
NOTE: All components shown are included with every product.

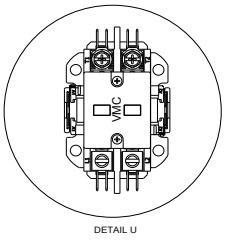
CONTROL BOX AND COMPONENT LOCATIONS

25T CONTROL BOX (DSG MODEL)





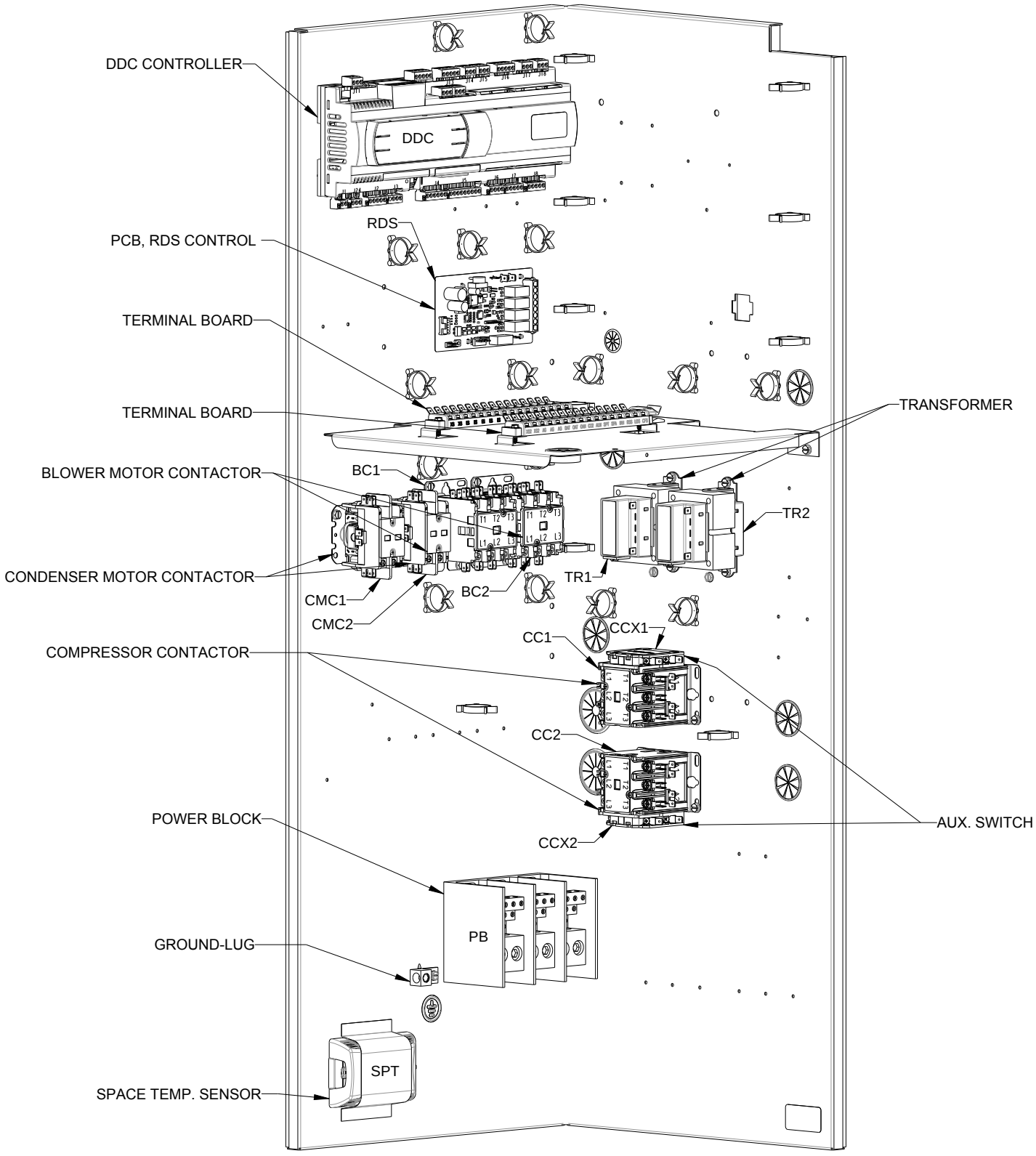




NOTE: All components shown are included with every product.

CONTROL BOX AND COMPONENT LOCATIONS

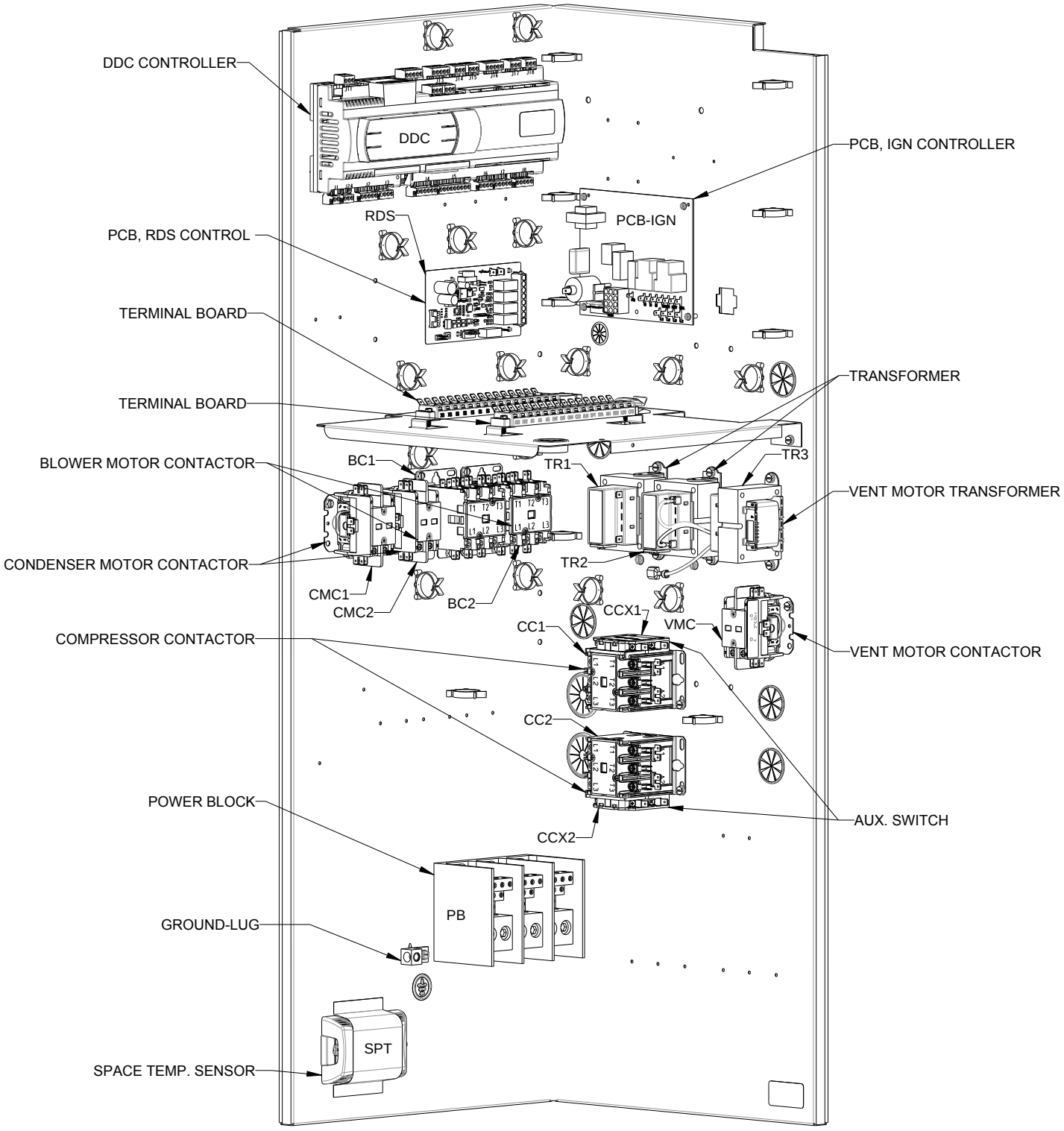
DSC DDC 15T, 20T, 25T MODELS



NOTE: All components shown are included with every product.

CONTROL BOX AND COMPONENT LOCATIONS

DSG DDC 15T, 20T, 25T MODELS

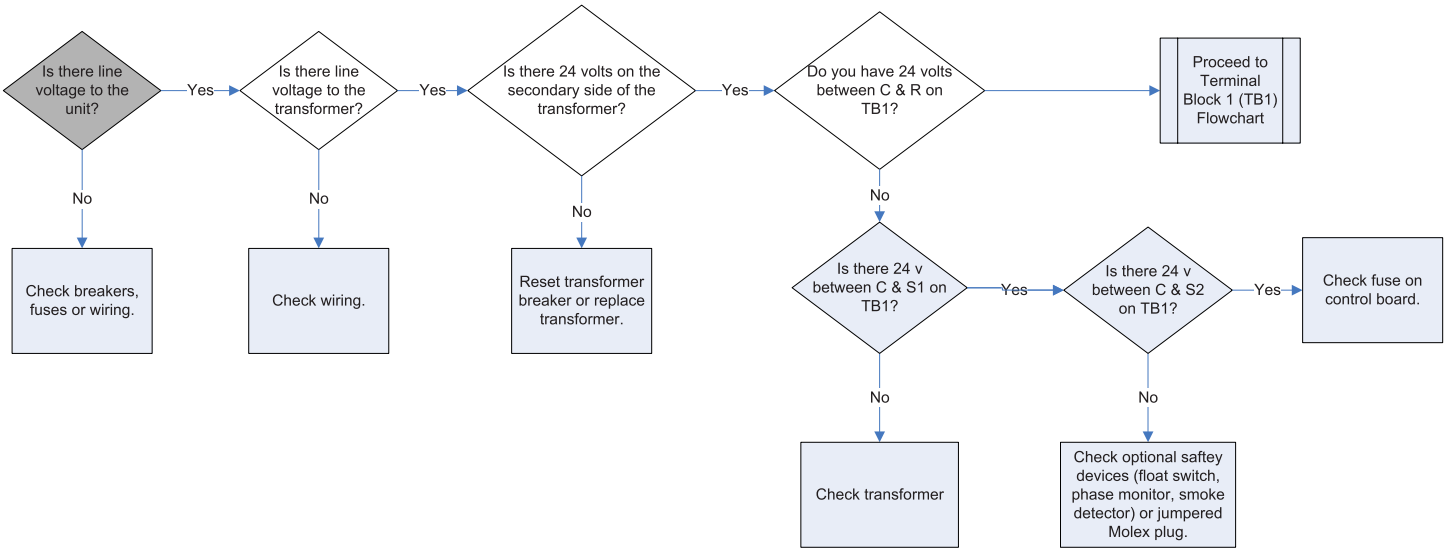


NOTE: All components shown are included with every product.

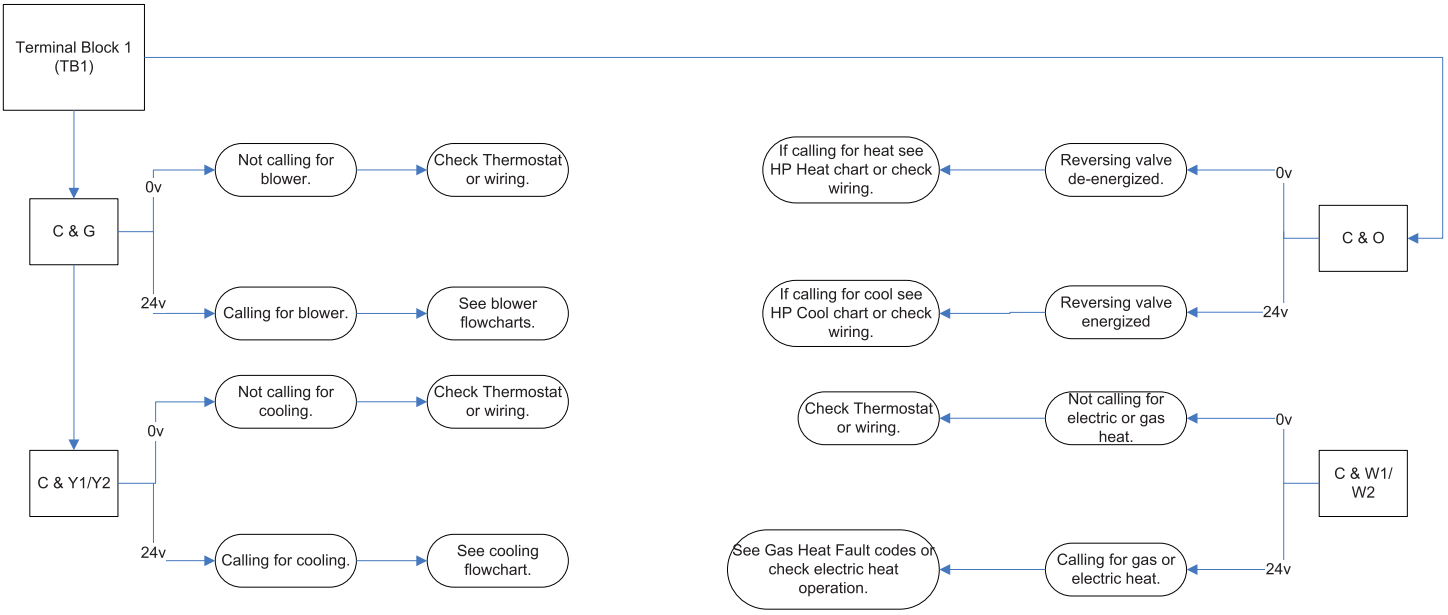
TROUBLESHOOTING FLOWCHARTS

TROUBLESHOOTING FLOWCHARTS

Voltage Troubleshooting Flowchart

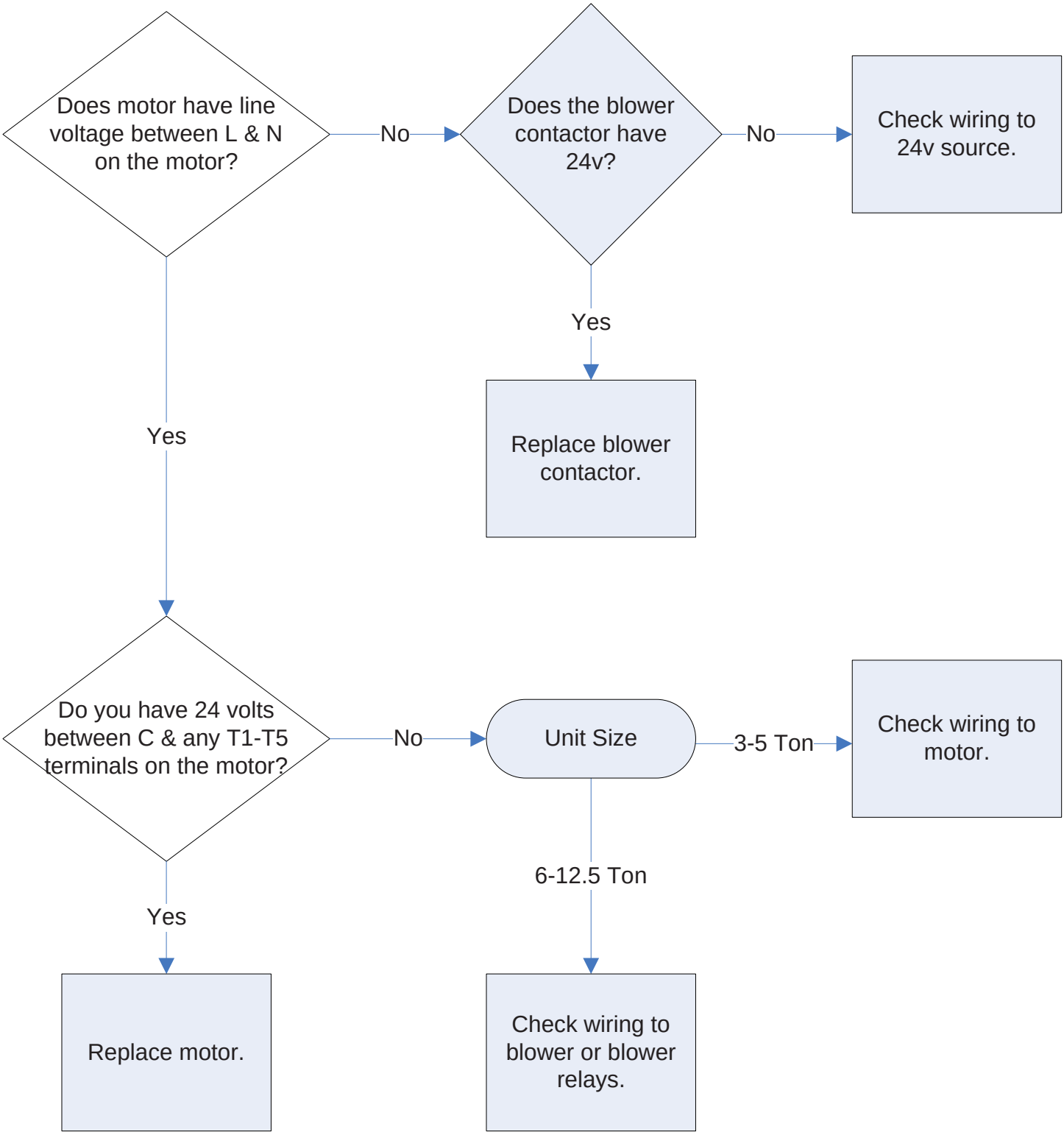


Terminal Block 1 (TB1) Troubleshooting Flowchart



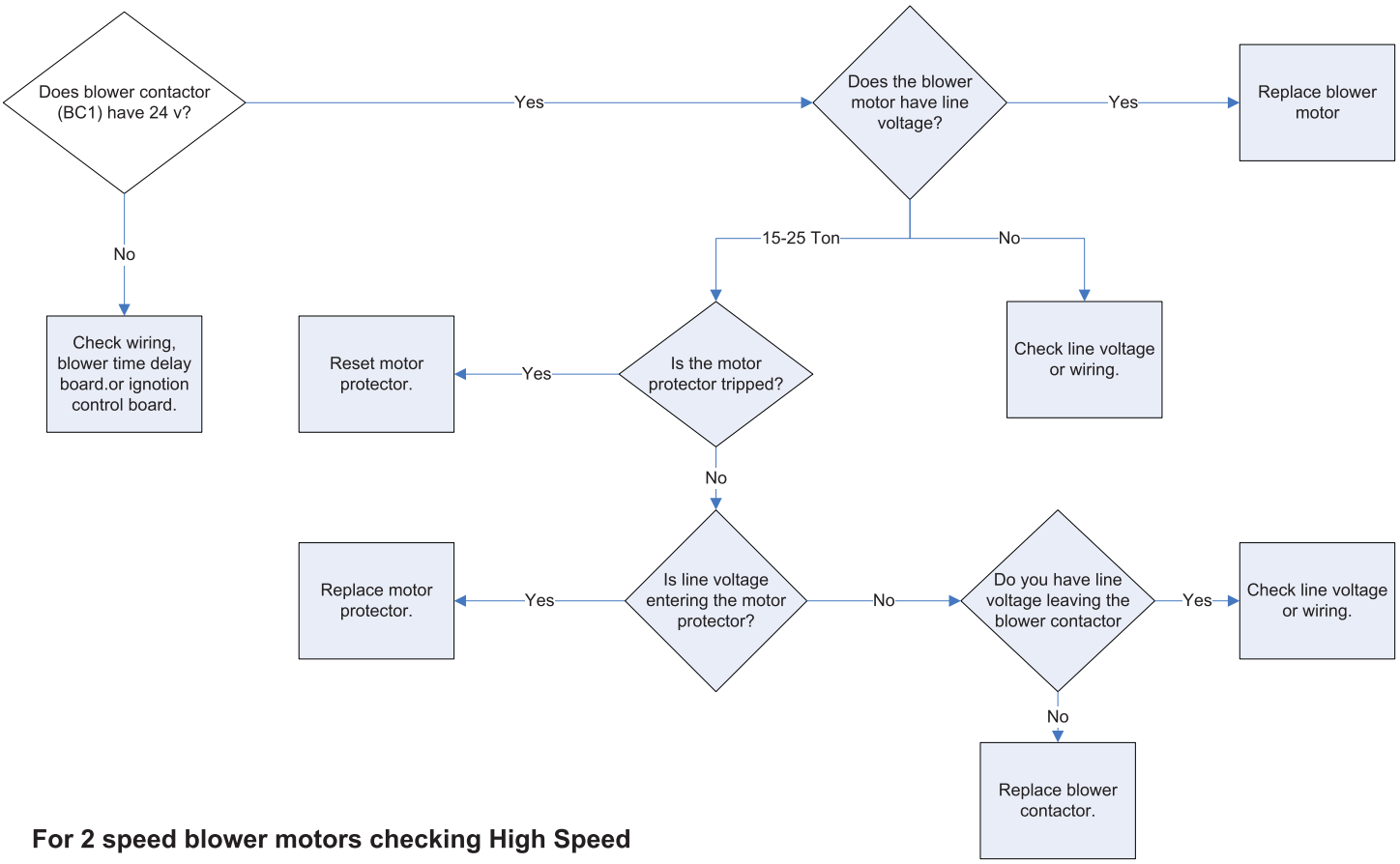
TROUBLESHOOTING FLOWCHARTS

ECM Blower Troubleshooting Flowchart



TROUBLESHOOTING FLOWCHARTS

Belt Drive Motor Troubleshooting Flowchart

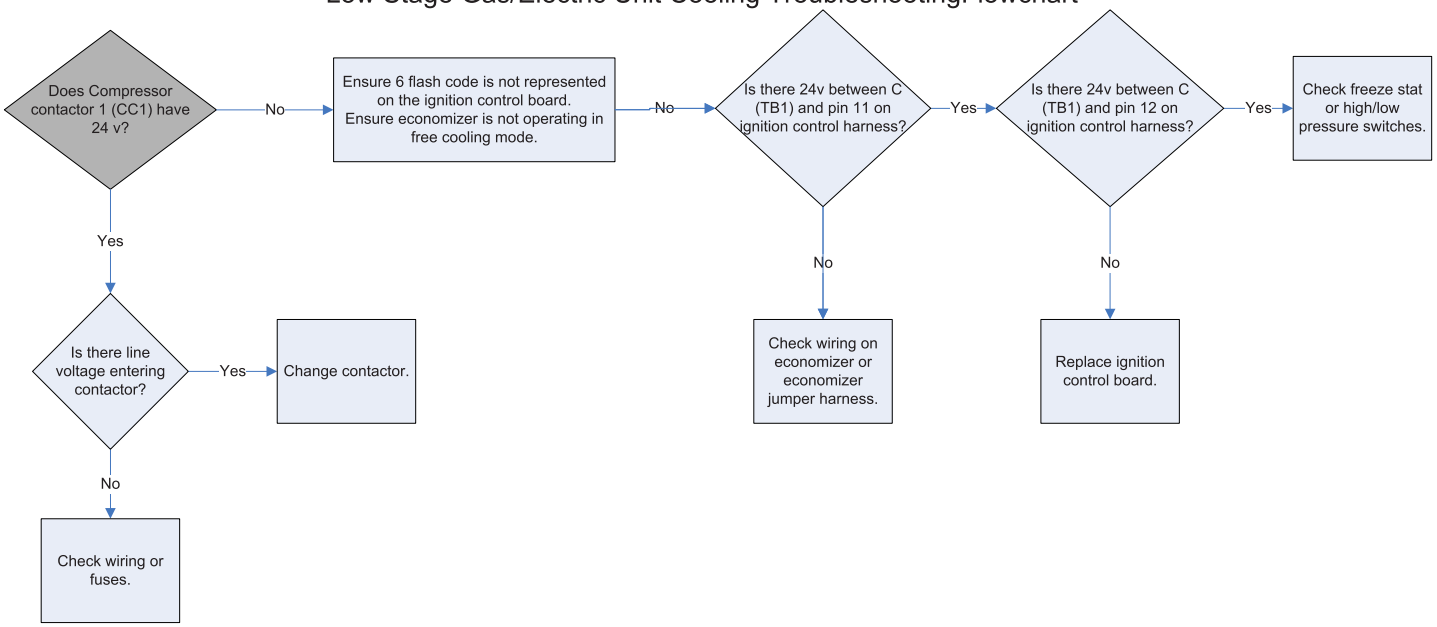


For 2 speed blower motors checking High Speed

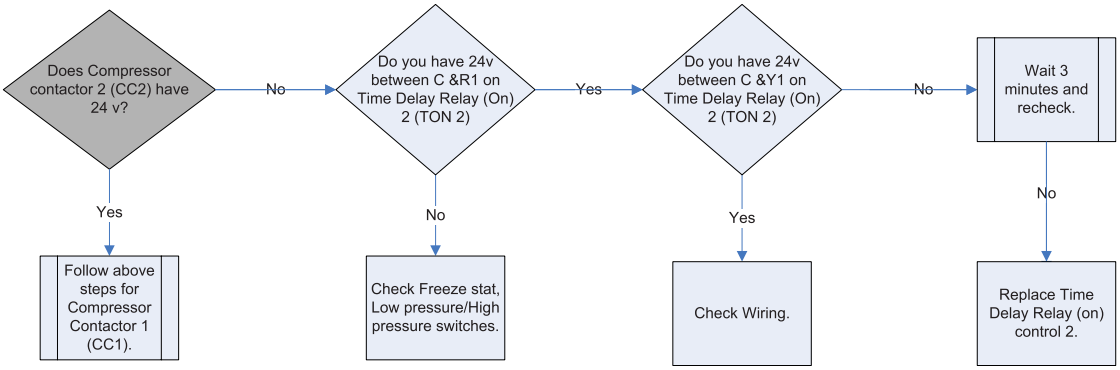
1. Follow same procedure starting with blower contactor 2 (BC2) as low speed BC1.
2. Blower contactors BC1 and BC2 should never be energized at the same time. If this occurs, check wiring.
3. On 15-25 ton systems, if the external motor breaker trips on high speed but not low speed, check that the motor speed are wired to the correct high and low speed breakers and verify motor amperage.
4. If the blower spins in different directions when switching between low and high speeds, check the motor phasing of the speed spinning the wrong direction.

TROUBLESHOOTING FLOWCHARTS

Low Stage Gas/Electric Unit Cooling TroubleshootingFlowchart

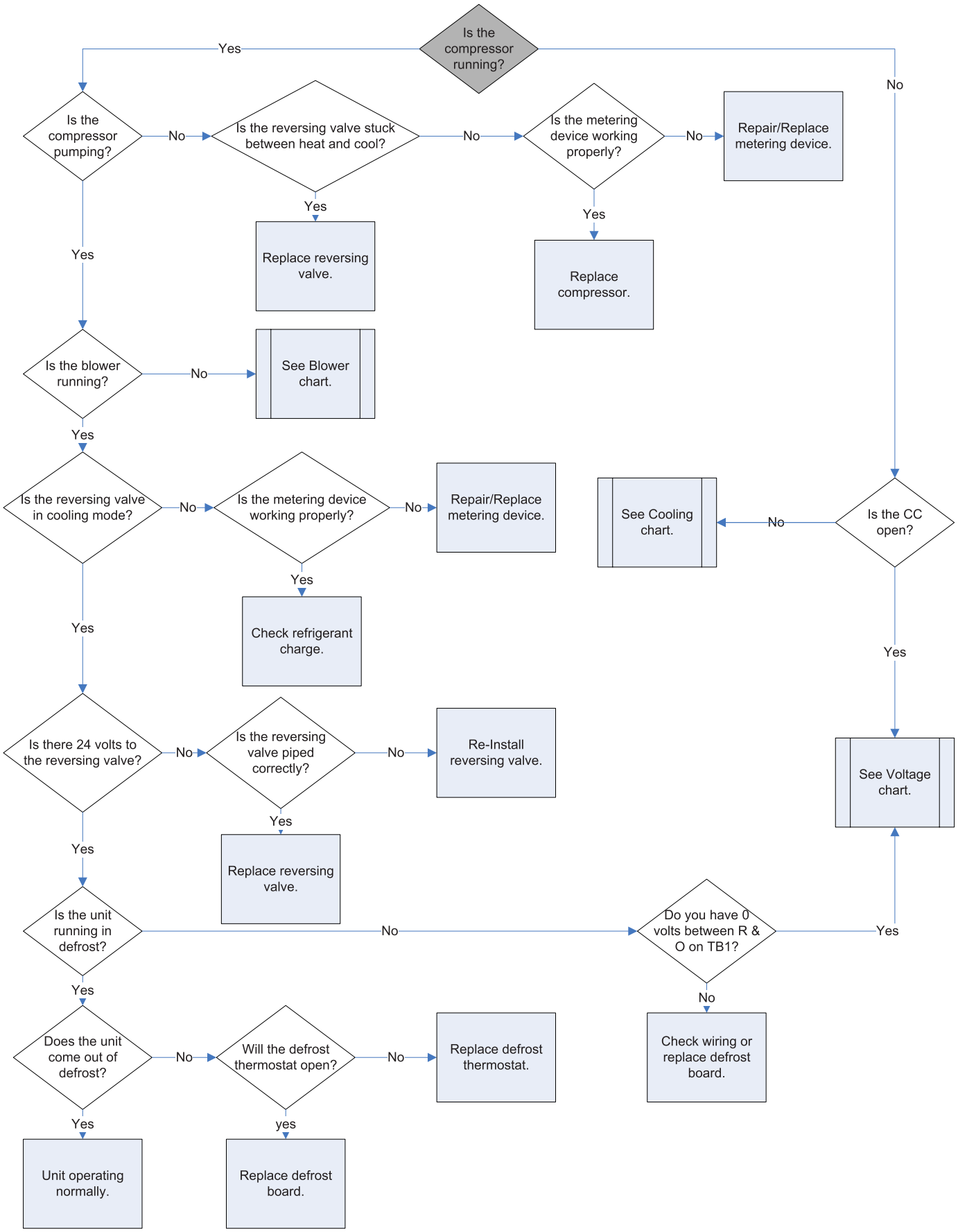


High Stage Gas/Electric Unit Cooling Troubleshooting Flowchart

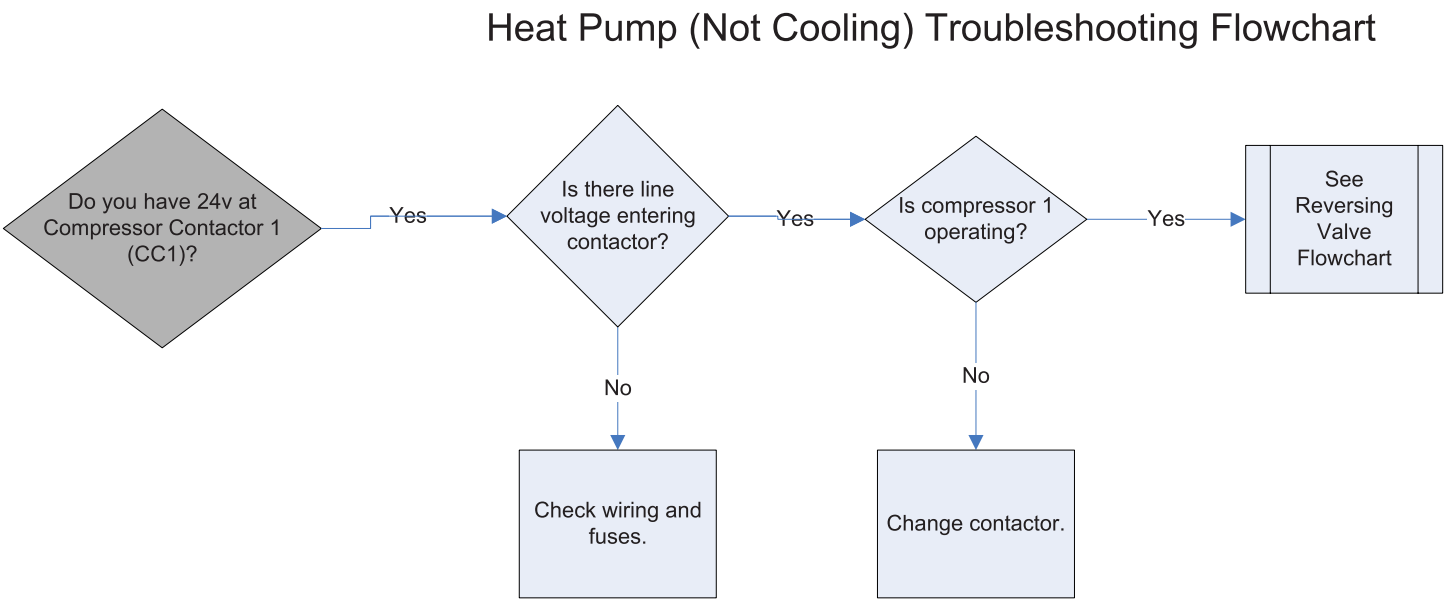


TROUBLESHOOTING FLOWCHARTS

Heat Pump (No-Heat) Troubleshooting Flowchart

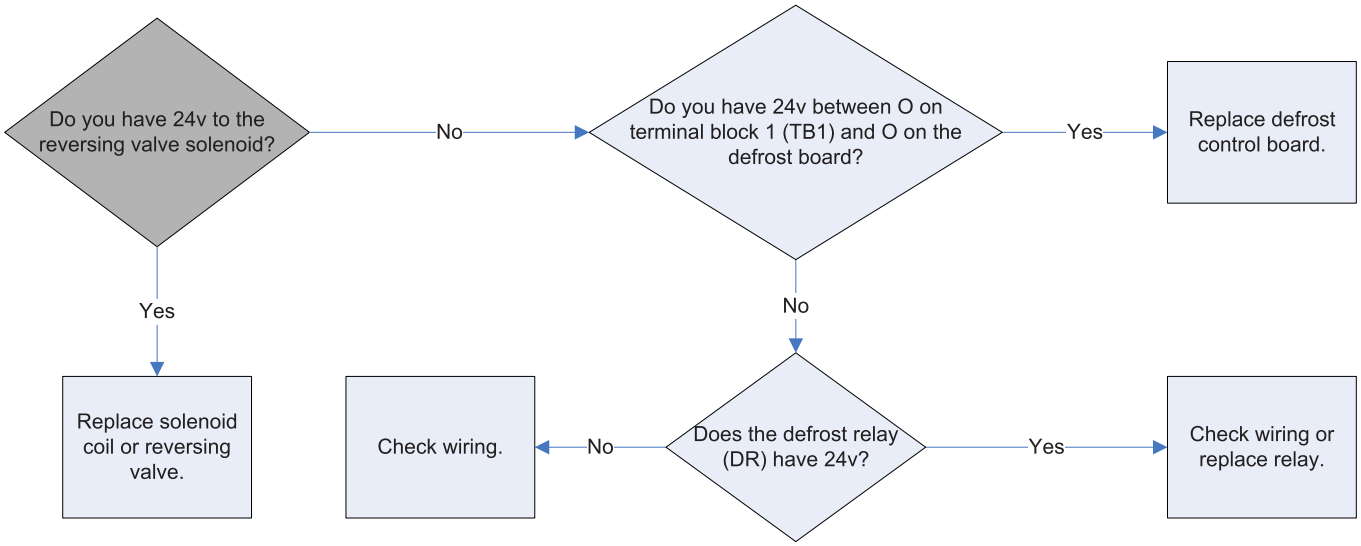


TROUBLESHOOTING FLOWCHARTS

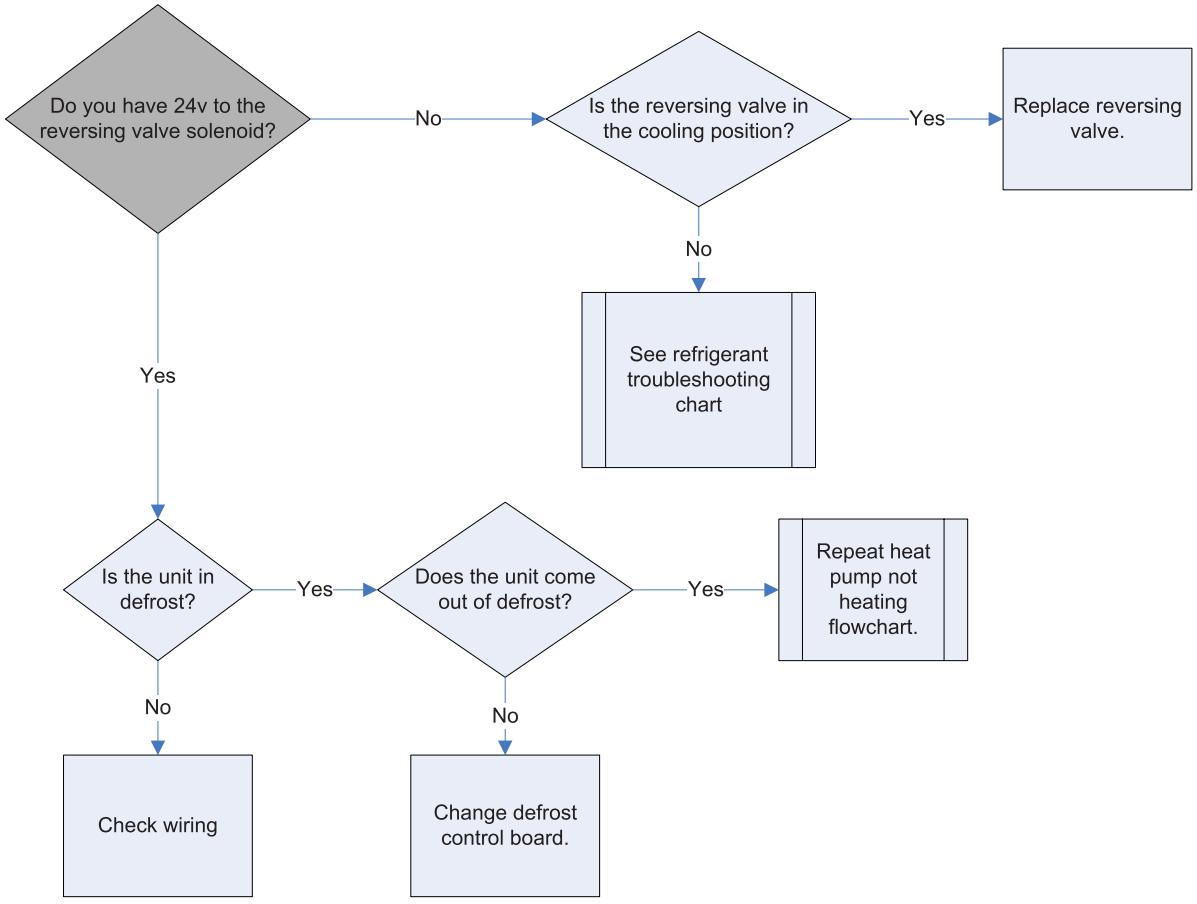


TROUBLESHOOTING FLOWCHARTS

Reversing Valve (When Checking Cooling) Troubleshooting Flowchart

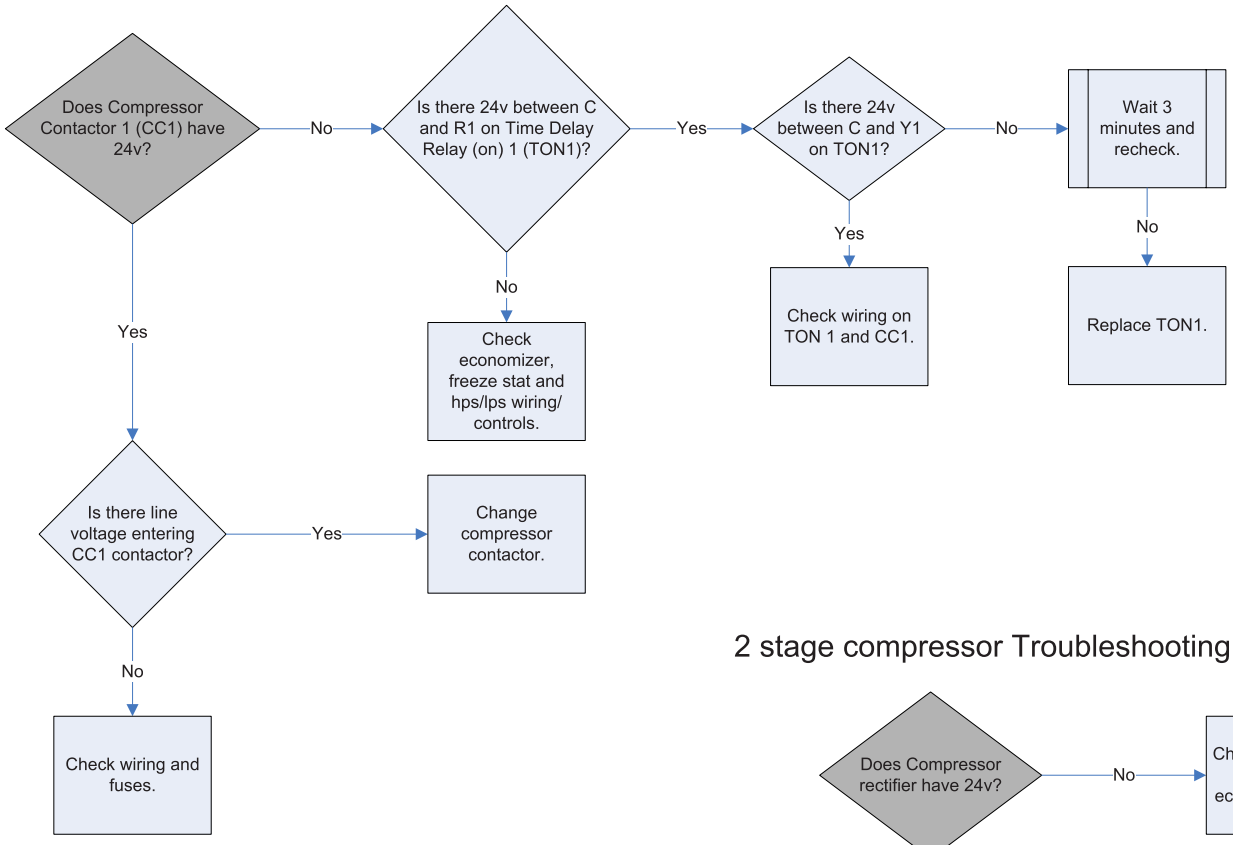


Reversing Valve (When Checking Heating) Troubleshooting Flowchart

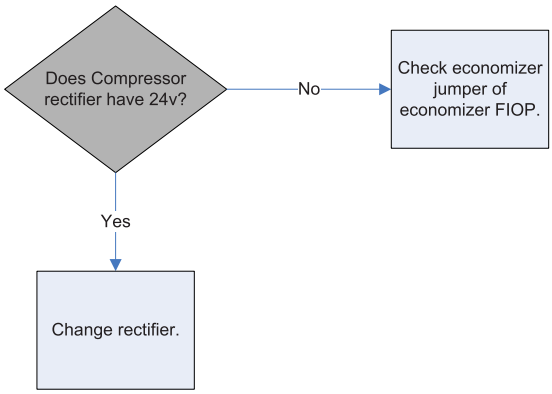


TROUBLESHOOTING FLOWCHARTS

Air Conditioner Unit Troubleshooting Flowchart

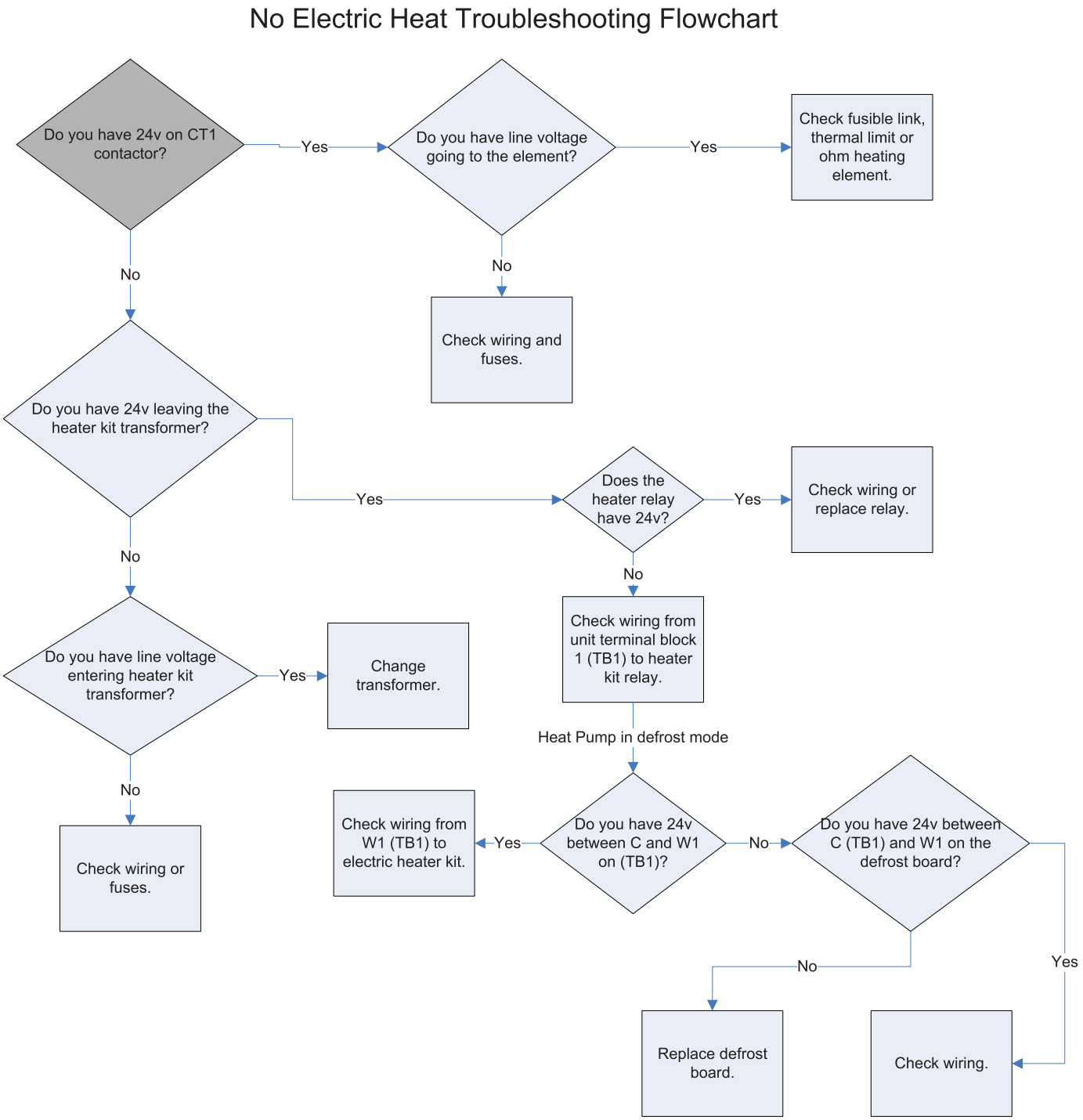


2 stage compressor Troubleshooting Flowchart



*Use same procedure for checking 2nd stage compressor starting with compressor contactor 2 (CC2).

TROUBLESHOOTING FLOWCHARTS



For 2 stage heaters, follow the same procedure for the additional contactors.

SERVICING

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Note:
Separation of High and Low voltage wires (15T, 20T, 25T units only):
Our new units DSC and DSG models will have high voltage wires and low voltage wires bundled separately. Different Zip tie colors will be used to distinguish between low voltage wires and high voltage wires. Blue colored zip ties are used to bundle low voltage wires while non-blue colored (which includes black and white color) zip ties are used to bundle high voltage wires. Colors are subjective to change in future for large chassis units.

SERVICING

S-1 Checking Voltage

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



WARNING

HIGH VOLTAGE
PRIOR TO SERVICING THE UNIT OR REMOVING THE COMPRESSOR TERMINAL PLUG OR TERMINAL COVER, DISCONNECT ALL ELECTRICAL POWER FROM THE UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT.



WARNING

DO NOT OPERATE THE COMPRESSOR(S) WITHOUT THE TERMINAL PLUG FULLY ENGAGED OR THE TERMINAL COVER PROPERLY INSTALLED. GET AWAY IF UNUSUAL SOUNDS ARE HEARD FROM WITHIN THE COMPRESSOR. DISCONNECT ELECTRICAL POWER FROM THE COMPRESSOR / UNIT.

WARNING

A TRIPPED CIRCUIT BREAKER OR BLOWN FUSE MAY INDICATE THAT AN ELECTRICAL PROBLEM EXISTS. DO NOT RESET A CIRCUIT BREAKER OR REPLACE FUSES WITHOUT FIRST PERFORMING THOROUGH ELECTRICAL TROUBLESHOOTING AND TESTING PROCEDURES.

WARNING

HERMETIC COMPRESSOR ELECTRICAL TERMINAL VENTING CAN BE DANGEROUS. IN CERTAIN CIRCUMSTANCES, THE TERMINAL MAY BE EXPELLED, VENTING THE REFRIGERANT VAPOR AND COMPRESSOR OIL CONTAINED WITHIN THE COMPRESSOR HOUSING AND SYSTEM. BE ALERT FOR SOUNDS OF ARCING (SIZZLING, SPUTTERING, OR POPPING) INSIDE THE COMPRESSOR. IMMEDIATELY GET AWAY IF YOU HEAR THESE SOUNDS AND DISCONNECT ELECTRICAL POWER FROM THE COMPRESSOR / UNIT.

Never operate the compressor without the terminal cover secured and properly in place or without the electrical plug fully seated and engaged to the terminal posts.

If a terminal is damaged, electrically overloaded, or short circuits to ground, there is a remote possibility that the terminal can be suddenly expelled from the terminal housing thereby venting the refrigerant and compressor oil mixture to atmosphere.

This discharge can be ignited from electrical arcing, or other open sources of ignition, and can cause potentially severe or fatal injury. This event is known as “Terminal Venting.”

To reduce the possibility of external ignition, all open flames or other heat sources must be extinguished, and all electrical power must be turned off prior to opening the terminal cover or removing the electrical plug and servicing the system.

Proper sealed system evacuation is required during servicing to maintain adequate internal system cleanliness while eliminating contaminates.

Be alert for sounds of arcing (sizzling, sputtering, or popping) inside the compressor. IMMEDIATELY GET AWAY from the unit if you hear these sounds and disconnect electrical power.

Pre-Startup Check

1. Remove doors, control panel cover, etc. from unit being tested.

With power ON:

WARNING

LINE VOLTAGE NOW PRESENT.

2. Using a voltmeter, measure the voltage across terminals L1 and L2 of the contactor for single phase units, and L3, for 3 phase units.
3. No reading - indicates open wiring, open fuse(s) no power or etc. from unit to fused disconnect service. Repair as needed.
4. With ample voltage at line voltage connectors, energize the unit.
5. Measure the voltage with the unit starting and operating, and determine the unit Locked Rotor Voltage.

SERVICING

Locked Rotor Voltage is the actual voltage available at the compressor during starting, locked rotor, or a stalled condition. Measured voltage should be above minimum listed in chart below.

To measure Locked Rotor Voltage attach a voltmeter to the run "R" and common "C" terminals of the compressor, or to the T_1 and T_2 terminals of the contactor. Start the unit and allow the compressor to run for several seconds, then shut down the unit. Immediately attempt to restart the unit while measuring the Locked Rotor Voltage.

6. Voltmeter should read within the voltage tabulation as shown. If the voltage falls below the minimum voltage, check the line wire size. Long runs of undersized wire can cause low voltage. If wire size is adequate, notify the local power company in regards to either low or high voltage.

Unit Supply Voltage		
Voltage	Min.	Max.
208/230	198	253
460	437	506
575	546	604

Three phase units require a balanced 3 phase power supply to operate. If the percentage of voltage imbalance exceeds 3% the unit must not be operated until the voltage condition is corrected.

$$\text{\% Voltage Imbalance} = \frac{\text{Max. Voltage Deviation From Average Voltage}}{\text{Average Voltage}} \times 100$$

To find the percentage of imbalance, measure the incoming power supply.

L1 - L2 = 240V
L1 - L3 = 232V
L2 - L3 = 238V
Total 710V

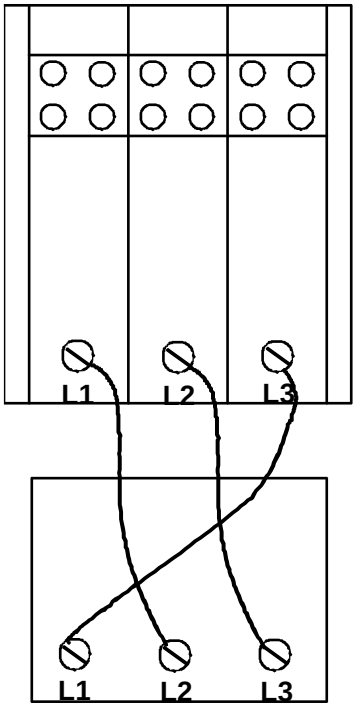
Avg. V = 710 / 3 = **236.7**

To find Max. deviation:
240 - 236.7 = +3.3
232 - 236.7 = **-4.7**
238 - 236.7 = +1.3

Max deviation was 4.7V

% Voltage Imbalance = 4.7 / 236.7 = **1.99%**

If the percentage of imbalance had exceeded 3%, it must be determined if the imbalance is in the incoming power supply or the equipment. To do this rotate the legs of the incoming power and retest voltage as shown below.



By the voltage readings we see that the imbalance rotated or traveled with the switching of the incoming legs. Therefore the imbalance lies within the incoming power supply.

If the imbalance had not changed then the problem would lie within the equipment. Check for current leakage, shorted motors, etc.

S-2 Checking Wiring

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



1. Check wiring visually for signs of overheating, damaged insulation and loose connections.
2. Use an ohmmeter to check continuity of any suspected open wires.
3. If any wires must be replaced, replace with comparable gauge and insulation thickness.

SERVICING

S-4 Checking Transformer and Control Circuit

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

A step-down transformer (either 208-240, 460 or 575 volt primary to 24 volt secondary) is provided with each unit. This allows ample capacity for use with resistance heaters.

WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

1. Remove control panel cover to gain access to transformer.

With power ON:

WARNING

LINE VOLTAGE NOW PRESENT.

2. Using a voltmeter, check voltage across secondary voltage side of transformer (R to C).
3. No voltage indicates faulty transformer, bad wiring, or bad splices.
4. Check transformer primary voltage at incoming line voltage connections and/or splices.
5. If line voltage available at primary voltage side of transformer and wiring and splices good, transformer is inoperative. Replace.

S-8 Checking Contactor Contacts

WARNING

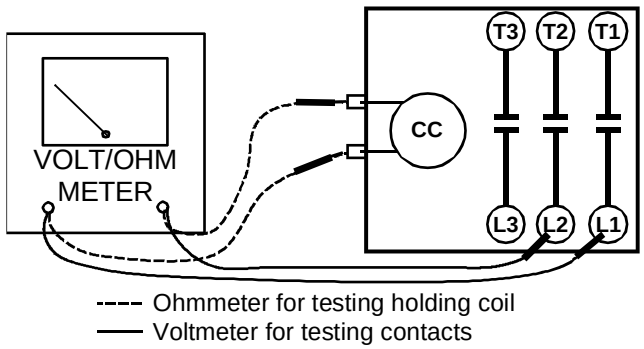
HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

1. Disconnect the wire leads from the terminal (T) side of the contactor.
2. With power ON, energize the contactor.

WARNING

LINE VOLTAGE NOW PRESENT.

3. Using a voltmeter, test across terminals.
   A. L1-L2, L1-L3, and L2-L3 - If voltage is present, proceed to B. If voltage is not present, check breaker or fuses on main power supply..
   B. T1-T2, T1-T3, and T2-T3 - If voltage readings are not the same as in "A", replace contactor.



TESTING COMPRESSOR CONTACTOR (Three Phase)

S-9 Checking Fan Relay Contacts

Fan Controls

DBG: The fan control is incorporated into the control board. See Ignition Control Board (PCBAG123) section for checking control board for gas models.

For 3 phase and belt drive models, the procedure for testing the fan relay contacts will be the same as checking the compressor contactor contacts

DBC/DBH: The Electronic Blower Time Delay Relay (PCBFM103) is used on belt driven models.

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

SERVICING

Checking EBTDR Contact Operation

1. With power off, remove wires from terminals NC, COM, and NO.
2. Using a VOM, check for resistance from NO to COM. Should read open. Next, check for resistance from NC to COM. Should read closed.
3. If not as above, replace EBTDR.

Checking EBTDR Contact Operation

With power on:

1. Set the thermostat to the fan "on" position.
2. Check for 24 volts at the C and G terminals of the EBTDR.
3. If no voltage present, check fan circuit from thermostat. If 24 volts present, proceed to step 4.
4. Using a VOM, check for line voltage from the purple wire at the transformer (terminal 3 on 240 volt units, terminal 2 on 208 volt units) to terminal NO on the EBTDR. Should read line voltage. If no voltage present, check line voltage wiring in unit. If line voltage present, proceed to step 5.
5. Using a VOM, check for line voltage from the purple wire at the transformer (terminal 3 on 240 volt units, terminal 2 on 208 volt units) to the COM terminal on the EBTDR. Should read line voltage. If not as above, replace EBTDR.

On the 5 ton units with the ECM motor, a standard fan relay is used.

1. Apply 24 volts to coil terminals 1 and 3.
2. Using a VOM, check for 24 volts from terminals 3 and 2 of relay. Should read 24 volts. If no voltage, check low voltage wiring from transformer to relay. If voltage present, proceed to step 5.
3. Using a VOM, check for 24 volts from terminals 3 and 4 of relay. Should read 24 volts. If not as above, replace relay.

S-11 Checking Loss Of Charge Protector

(Heat Pump Models)

The loss of charge protector senses the pressure in the liquid line and will open its contacts on a drop in pressure. The low pressure control will automatically reset itself with a rise in pressure.

The low pressure control is designed to cut-out (open) at approximately 22 PSIG. It will automatically cut-in (close) at approximately 50 PSIG.

Test for continuity using a VOM and if not as above, replace the control.

S-13 Checking Low Pressure Control

The low pressure control senses the pressure in the suction line and will open its contacts on a drop in pressure. The low pressure control will automatically reset itself with a rise in pressure.

The low pressure control is designed to cut-out (open) at approximately 22 PSIG ± 7 PSIG. It will automatically cut-in (close) at approximately 50 PSIG ± 7 PSIG.

Test for continuity using a VOM and if not as above, replace the control.

NOTE: Screw on style pressure switches have schrader cores installed so the switch can be replaced without loss of charge.

S-15 Checking Capacitor

CAPACITOR, RUN

A run capacitor is wired across the auxiliary and main windings of a single phase permanent split capacitor motor. The capacitors primary function is to reduce the line current while greatly improving the torque characteristics of a motor. This is accomplished by using the 90° phase relationship between the capacitor current and voltage in conjunction with the motor windings so that the motor will give two phase operation when connected to a single phase circuit. The capacitor also reduces the line current to the motor by improving the power factor.

CAPACITOR, START

SCROLL COMPRESSOR MODELS

Hard start components are not required on Scroll compressor equipped units due to a non-replaceable check valve located in the discharge line of the compressor. However hard start kits are available and may improve low voltage starting characteristics.

This check valve closes off high side pressure to the compressor after shut down allowing equalization through the scroll flanks. Equalization requires only about one or two seconds during which time the compressor may turn backwards.

Your unit comes with a 180-second anti-short cycle to prevent the compressor from starting and running backwards.

SERVICING

S-16D Checking ECM (Energy Efficient Motor) Motors

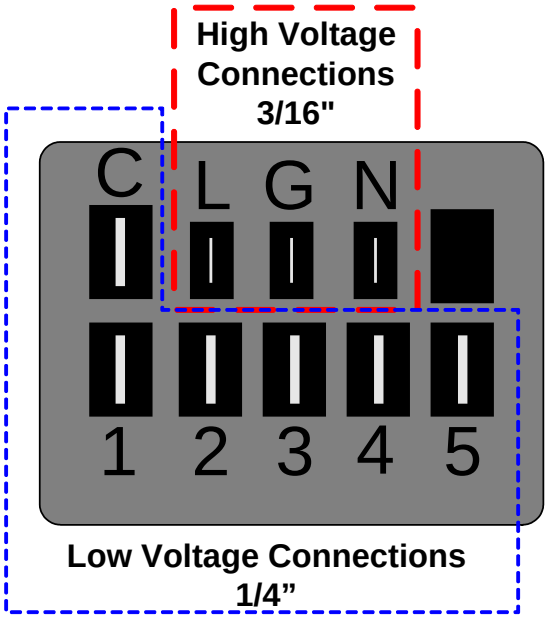
Applies only to units with ECM Motors

The ECM Motor is a one piece, fully encapsulated, 3 phase brushless DC (single phase AC input) motor with ball bearing construction. Unlike the ECM 2.3/2.5 motors, the ECM features an integral control module.

NOTE: The GE TECMate will not currently operate the GE ECM motor.

1. Using a voltmeter, check for 230 volts to the motor connections L and N. If 230 volts is present, proceed to step 2. If 230 volts is not present, check the line voltage circuit to the motor.
2. Using a voltmeter, check for 24 volts from terminal C to either terminal 1, 2, 3, 4, or 5, depending on which tap is being used, at the motor. If voltage present, proceed to step 3. If no voltage, check 24 volt circuit to motor.
3. If voltage was present in steps 1 and 2, the motor has failed and will need to be replaced.

NOTE: When replacing motor, ensure the belly band is between the vents on the motor and the wiring has the proper drip loop to prevent condensate from entering the motor.



ECM MOTOR CONNECTIONS

S-17 Checking Compressor Windings

WARNING

Hermetic compressor electrical terminal venting can be dangerous. When insulating material which supports a hermetic compressor or electrical terminal suddenly disintegrates due to physical abuse or as a result of an electrical short between the terminal and the compressor housing, the terminal may be expelled, venting the vapor and liquid contents of the compressor housing and system.

If the compressor terminal PROTECTIVE COVER and gasket (if required) are not properly in place and secured, there is a remote possibility if a terminal vents, that the vaporous and liquid discharge can be ignited, spouting flames several feet, causing potentially severe or fatal injury to anyone in its path.

This discharge can be ignited external to the compressor if the terminal cover is not properly in place and if the discharge impinges on a sufficient heat source.

Ignition of the discharge can also occur at the venting terminal or inside the compressor, if there is sufficient contaminant air present in the system and an electrical arc occurs as the terminal vents.

Ignition cannot occur at the venting terminal without the presence of contaminant air, and cannot occur externally from the venting terminal without the presence of an external ignition source.

Therefore, proper evacuation of a hermetic system is essential at the time of manufacture and during servicing.

To reduce the possibility of external ignition, all open flame, electrical power, and other heat sources should be extinguished or turned off prior to servicing a system.

S-18 Testing crankcase heater (Optional Item)

The crankcase heater must be energized a minimum of four (4) hours before the condensing unit is operated.

Crankcase heaters are used to prevent migration or accumulation of refrigerant in the compressor crankcase during the off cycles and prevents liquid slugging or oil pumping on start up.

A crankcase heater will not prevent compressor damage due to a floodback or over charge condition.

SERVICING

WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

1. Disconnect the heater lead in wires.
2. Using an ohmmeter, check heater continuity - should test continuous. If not, replace.

The condition of the scroll flanks is checked in the following manner.

1. Attach gauges to the high and low side of the system.
2. Start the system and run a “Cooling Performance Test.

If the test shows:

A. Below normal high side pressure.
B. Above normal low side pressure.
C. Low temperature difference across coil.
D. Low amp draw at compressor.

And the charge is correct. The compressor is faulty - replace the compressor.

S-21 Checking Reversing Valve And Solenoid

Occasionally the reversing valve may stick in the heating or cooling position or in the mid-position.

When stuck in the mid-position, part of the discharge gas from the compressor is directed back to the suction side, resulting in excessively high suction pressure. An increase in the suction line temperature through the reversing valve can also be measured. Check operation of the valve by starting the system and switching the operation from COOLING to HEATING cycle.

If the valve fails to change its position, test the voltage (24V) at the valve coil terminals, while the system is on the COOLING cycle.

If no voltage is registered at the coil terminals, check the operation of the thermostat and the continuity of the connecting wiring from the “O” terminal of the thermostat to the unit.

If voltage is registered at the coil, tap the valve body lightly while switching the system from HEATING to COOLING, etc. If this fails to cause the valve to switch positions, remove the coil connector cap and test the continuity of the reversing valve solenoid coil. If the coil does not test continuous - replace it.

If the coil test continuous and 24 volts is present at the coil terminals, the valve is inoperative - replace it.

S-24 Testing Defrost Control

To check the defrost control for proper sequencing, proceed as follows: With power ON; unit not running.

1. Jumper defrost thermostat by placing a jumper wire across the terminals “DFT” and “R” at defrost control board.
2. Connect jumper across test pins on defrost control board.
3. Set thermostat to call for heating. System should go into defrost within 21 seconds.
4. Immediately remove jumper from test pins.
5. Using VOM check for voltage across terminals “C & O”. Meter should read 24 volts.
6. Using VOM check for voltage across fan terminals DF1 and DF2 on the board. You should read line voltage (208-230 VAC) indicating the relay is open in the defrost mode.
7. Using VOM check for voltage across “W2 & C” terminals on the board. You should read 24 volts.
8. If not as above, replace control board.
9. Set thermostat to off position and disconnect power before removing any jumpers or wires.

NOTE: Remove jumper across defrost thermostat before returning system to service.

S-25 Testing Defrost Thermostat

1. Install a thermocouple type temperature test lead on the tube adjacent to the defrost control. Insulate the lead point of contact.
2. Check the temperature at which the control closes its contacts by lowering the temperature of the control. On 2 and 2.5 ton units, it should close at 34°F ± 5°F. On 3 thru 5 ton units, it should close at 31°F ± 3°F.
3. Check the temperature at which the control opens its contacts by raising the temperature of the control. On 2 and 2.5 ton units, it should open at 60°F ± 5°F. On 3 thru 5 ton units, it should open at 75°F ± 6°F.
4. If not as above, replace control.

TROUBLESHOOTING

THE FOLLOWING INFORMATION IS FOR USE BY QUALIFIED SERVICE AGENCY ONLY: OTHERS SHOULD NOT ATTEMPT TO SERVICE THIS EQUIPMENT.

Common Causes of Unsatisfactory Operation of Heat Pump on the Heating Cycle.

SERVICING

Inadequate Air Volume Through Indoor Coil
When a heat pump is in the heating cycle, the indoor coil is functioning as a condenser. The return air filter must always be clean, and sufficient air volume must pass through the indoor coil to prevent excessive discharge pressure, and high pressure cut out.

Outside Air into Return Duct
Do not introduce cold outside air into the return duct of a heat pump installation. For units with 2-speed motors, do not allow air entering the indoor coil to drop below 65° F. Air below this temperature will cause low discharge pressure, thus low suction pressure, and excessive defrost cycling resulting in low heating output. It may also cause false defrosting.

Undercharge
An undercharged heat pump on the heating cycle will cause low discharge pressure resulting in low suction pressure and frost accumulation on the outdoor coil.

Poor "Terminating" Sensor contact
The unit's defrost terminating sensor must make good thermal contact with the outdoor coil tubing. Poor contact may not terminate the unit's defrost cycle quickly enough to prevent the unit from cutting out on high discharge pressure.

Malfunctioning Reversing Valve - This may be due to:

1. **Solenoid not energized** - In order to determine if the solenoid is energized, touch the nut that holds the solenoid cover in place with a screwdriver. If the nut magnetically holds the screwdriver, the solenoid is energized and the unit is in the cooling cycle.
2. **No voltage at unit's solenoid** - Check unit voltage. If no voltage, check wiring circuit.
3. **Valve will not shift**:
   - **A. Undercharged** - check for leaks;
   - **B. Valve Body Damaged** - Replace valve;
   - **C. Unit Properly Charged** - If it is on the heating cycle, raise the discharge pressure by restricting airflow through the indoor coil. If the valve does not shift, tap it **lightly** on both ends with a screwdriver handle. **DO NOT TAP THE VALVE BODY**. If the unit is on the cooling cycle, raise the discharge pressure by restricting airflow through the outdoor coil. If the valve does not shift after the above attempts, cut the unit off and wait until the discharge and suction pressure equalize, and repeat above steps. If the valve does not shift, replace it.

S-50 Checking Heater Limit Control(s)
(OPTIONAL ELECTRIC HEATERS)
Each individual heater element is protected with an automatic rest limit control connected in series with each element to prevent overheating of components in case of low airflow. This limit control will open its circuit at approximately 150°F. to 160°F and close at approximately 110°F.

WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

1. Remove the wiring from the control terminals.
2. Using an ohmmeter test for continuity across the normally closed contacts. No reading indicates the control is open - replace if necessary. Make sure the limits are cool before testing.

IF FOUND OPEN - REPLACE - DO NOT WIRE AROUND.

S-52 Checking Heater Elements
Optional electric heaters may be added, in the quantities shown in the spec sheet for each model unit, to provide electric resistance heating. Under no condition shall more heaters than the quantity shown be installed.

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



1. Disassemble and remove the heating element(s).
2. Visually inspect the heater assembly for any breaks in the wire or broken insulators.
3. Using an ohmmeter, test the element for continuity - no reading indicates the element is open. Replace as necessary.

S-201 Checking Temperature Rise
Temperature rise is related to the BTUH output of the unit and the amount of air (CFM) circulated over the heat exchanger.

SERVICING

All units are designed for a given range of temperature increase. This is the temperature of the air leaving the unit minus the temperature of the air entering the unit.

The more air (CFM) being delivered through a given unit the less the rise will be; so the less air (CFM) being delivered, the greater the rise. The temperature rise should be adjusted in accordance to a given unit specifications and its external static pressure.

1. Check BTUH input to unit do not exceed input rating stamped on rating plate.
2. Take entering and leaving air temperatures.
3. Select the proper speed tap or dip switch setting for direct drive units.
4. For gas heat units, the airflow must be adjusted so that the air temperature rise falls within the ranges given stated on Data Plate by adjusting the variable pitch sheave on the motor (see Blower Performance section in appropriate Specifications Sheet Manual for correct pulley adjustment).
5. Take motor amperage draw to determine that the motor is not overloaded during adjustments.

S-206 Indoor Fan Rotation Check

Evaporator Fan Rotation Check (Three Phase Models Only)

Check that fan rotates clockwise when viewed from the drive side of unit and in accordance with rotation arrow shown on blower housing. If it does not, reverse any two incoming power cables at Single Point Power Block. In this case, repeat bearing check.

Do not attempt to change load side wiring. Internal wiring assures all motors and compressors will rotate in correct direction once evaporator fan motor rotation check has been made.

SERVICING

Air Conditioning Diagnostic Chart					
Issue	Discharge Pressure	Suction Pressure	(Orifice) Superheat	(TXV) Subcooling	Temperature Split
Liquid Line Restriction	↓	↓	↑	↑	↓
System Undercharge	↓	↓	↑	↓	↓
System Overcharge	↑	↑	↓	↑	↓
Non Condensible	↑	↑	↑	↑	↓
Low Indoor Airflow	↓	↓	↓	↑	↑
Inefficient Compressor	↓	↑	↑	↓	↓

Heat Pump Diagnostic Chart					
Issue	Discharge Pressure	Suction Pressure	(Orifice) Superheat	(TXV) Subcooling	Temperature Split
Liquid Line Restriction	↑	↓	↑	↑	↓
System Undercharge	↓	↓	↑	↓	↓
Leaking Reversing Valve	↓	↑	Normal	↓	↓
Low Indoor Airflow	↑	↑	Normal	Normal	↑
Inefficient Compressor	↓	↑	Normal	↓	↓

NOTE: Superheat and Subcooling is determined by the system metering device.

SERVICING

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SERVICING

S-100 Refrigeration Repair Practice

SAFETY CHECKS AND WORK PROCEDURES

Prior to beginning work on a unit, safety checks are necessary to ensure that the risk of ignition is minimized.

Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

NOTE: Sealed electrical and intrinsically safe components shall be replaced. These components are not to be repaired.

NOTE: "Intrinsically safe" refers to equipment and wiring that are incapable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition.

NOTE: "Sealed electrical components" are designed to prevent the ingress of dust, moisture, and other contaminants. Examples include hermetically sealed relays, sealed capacitors, etc.

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

If a leak is suspected, all naked flames shall be removed/ extinguished.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system.

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.

Check any markings to the equipment continue to be visible and legible. Markings and signs (ex. serial plate, labels) that are illegible shall be corrected.

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

SERVICING

Initial safety checks shall include:
• that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
• that no live electrical components and wiring are exposed while charging, recovering or purging the system;
• that there is continuity of earth bonding.

Check that cabling/wiring will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

DANGER

ALWAYS REMOVE THE REFRIGERANT CHARGE IN A PROPER MANNER BEFORE APPLYING HEAT TO THE SYSTEM.

When repairing the refrigeration system:

WARNING

DISCONNECT ALL POWER BEFORE SERVICING.

1. Never open a system that is under vacuum. Air and moisture will be drawn in.
2. Plug or cap all openings.
3. Remove all burrs and clean the brazing surfaces of the tubing with sand cloth or paper. Brazing materials do not flow well on oxidized or oily surfaces.
4. Clean the inside of all new tubing to remove oils and pipe chips.
5. When brazing, sweep the tubing with dry nitrogen to prevent the formation of oxides on the inside surfaces.
6. Complete any repair by replacing the liquid line drier in the system, evacuate and charge.

BRAZING MATERIALS
Copper to Copper Joints - Sil-Fos used without flux (alloy of 15% silver, 80% copper, and 5% phosphorous). Recommended heat 1400°F.

Copper to Steel Joints - Silver Solder used without a flux (alloy of 30% silver, 38% copper, 32% zinc). Recommended heat - 1200°F.

S-101 Leak Testing (Nitrogen Or Nitrogen-Traced)

WARNING

TO AVOID THE RISK OF FIRE OR EXPLOSION, NEVER USE OXYGEN, HIGH PRESSURE AIR OR FLAMMABLE GASES FOR LEAK TESTING OF A REFRIGERATION SYSTEM.

WARNING

TO AVOID POSSIBLE EXPLOSION, THE LINE FROM THE NITROGEN CYLINDER MUST INCLUDE A PRESSURE REGULATOR AND A PRESSURE RELIEF VALVE. THE PRESSURE RELIEF VALVE MUST BE SET TO OPEN AT NO MORE THAN THE MAX ALLOWABLE PRESSURE. REFER TO THE SERIAL PLATE.

Pressure test the system using dry nitrogen and soapy water to locate leaks. If leaks are found, repair them. After repair, repeat the pressure test. If no leaks exist, proceed to system evacuation.

S-102 Evacuation

WARNING

REFRIGERANT UNDER PRESSURE!
FAILURE TO FOLLOW PROPER PROCEDURES MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

This is the most important part of the entire service procedure. The life and efficiency of the equipment is dependent upon the thoroughness exercised by the serviceman when evacuating air (non-condensables) and moisture from the system.

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely. When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer

should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Air in a system causes high condensing temperature and pressure, resulting in increased power input and reduced performance.

Moisture chemically reacts with the refrigerant oil to form corrosive acids. These acids attack motor windings and parts, causing breakdown.

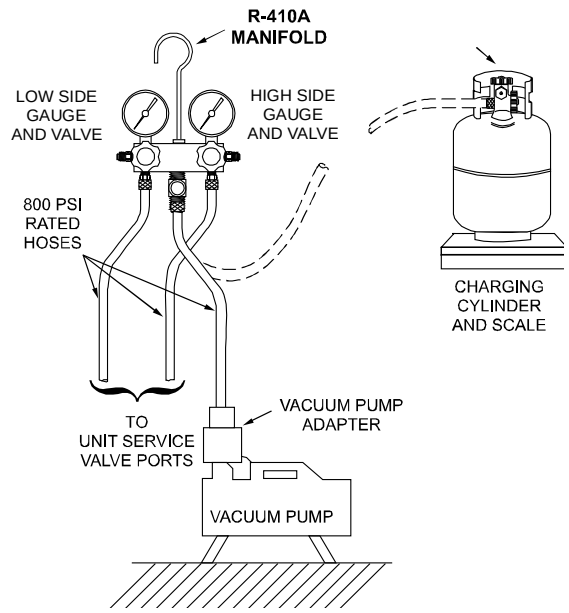
The equipment required to thoroughly evacuate the system is a high vacuum pump, capable of producing a vacuum equivalent to 25 microns absolute and a thermocouple vacuum gauge to give a true reading of the vacuum in the system

NOTE: Never use the system compressor as a vacuum pump or run when under a high vacuum. Motor damage could occur.

WARNING

DO NOT FRONT SEAT THE SERVICE VALVE(S) WITH THE COMPRESSOR OPEN, WITH THE SUCTION LINE OF THE COMPRESSOR CLOSED OR SEVERELY RESTRICTED.

1. Connect the vacuum pump, vacuum tight manifold set with high vacuum hoses, thermocouple vacuum gauge and charging cylinder as shown.
2. Start the vacuum pump and open the shut off valve to the high vacuum gauge manifold only. After the compound gauge (low side) has dropped to approximately 29 inches of vacuum, open the valve to the vacuum thermocouple gauge. See that the vacuum pump will blank-off to a maximum of 25 microns. A high vacuum pump can only produce a good vacuum if its oil is non-contaminated.



EVACUATION

3. If the vacuum pump is working properly, close the valve to the vacuum thermocouple gauge and open the high and low side valves to the high vacuum manifold set. With the valve on the charging cylinder closed, open the manifold valve to the cylinder.
4. Evacuate the system to at least 29 inches gauge before opening valve to thermocouple vacuum gauge.
5. Continue to evacuate to a maximum of 250 microns. Close valve to vacuum pump and watch rate of rise. If vacuum does not rise above 1500 microns in three to five minutes, system can be considered properly evacuated.
6. If thermocouple vacuum gauge continues to rise and levels off at about 5000 microns, moisture and non-condensables are still present. If gauge continues to rise a leak is present. Repair and re-evacuate.
7. Close valve to thermocouple vacuum gauge and vacuum pump. Shut off pump and prepare to charge.

S-103 Charging

WARNING

REFRIGERANT UNDER PRESSURE!
- **Do not overcharge system with refrigerant.**
- **Do not operate unit in a vacuum or at negative pressure.**

Failure to follow proper procedures may cause property damage, personal injury or death.

SERVICING

CAUTION

Only use refrigerant certified to AHRI standards. Used refrigerant may cause compressor damage. Daikin is not responsible for damage or the need for repairs resulting from the use of unapproved refrigerant types or used or recycled refrigerant. Most portable machines cannot clean used refrigerant to meet AHRI standards.

In addition to conventional charging procedures, the following requirements shall be followed.

• Ensure that contamination of different refrigerants does not occur when using charging equipment.
• Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
• Cylinders shall be kept in an appropriate position according to the instructions.
• Ensure that the REFRIGERATING SYSTEM is earthed prior to charging the system with refrigerant.
• Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.

NOTE: "Earthing" is defined as achieving an earth ground by connecting the equipment's supplied grounding lug to the earth. This should be verified by a certified technician.

Charge the system with the exact amount of refrigerant.

Refer to the specification section or check the unit nameplates for the correct refrigerant charge.

An inaccurately charged system will cause future problems.

1. Using a quality set of charging scales, weigh the proper amount of refrigerant for the system. Allow liquid refrigerant only to enter the high side.
2. After the system will take all it will take, close the valve on the high side of the charging manifold.
3. Start the system and charge the balance of the refrigerant through the low side.

NOTE: R410A should be drawn out of the storage container or drum in liquid form due to its fractionation properties, but should be "Flashed" to its gas state before entering the system. There are commercially available restriction devices that fit into the system charging hose set to accomplish this. DO NOT charge liquid R410A into the compressor.

4. With the system still running, close the valve on the charging cylinder. At this time, you may still have some liquid refrigerant in the charging cylinder hose and will definitely have liquid in the liquid hose. Reseat the liquid line core. Slowly open the high side manifold valve and transfer the liquid refrigerant from the liquid line hose and charging cylinder hose into the suction service valve port. CAREFUL: Watch so that liquid refrigerant does not enter the compressor.

Final Charge Adjustment

The outdoor temperature must be 60°F or higher. Set the room thermostat to COOL, fan switch to AUTO, and set the temperature control well below room temperature.

After system has stabilized per startup instructions, compare the operating pressures and outdoor unit amp draw to the numbers listed in the spec sheet manual. If pressures and amp draw are too low, add charge. If pressures and amp draw are too high, remove charge. Check subcooling and superheat as detailed in the following section.

5. With the system still running, remove hose and reinstall both valve caps.
6. Check system for leaks.

Due to their design, Scroll compressors are inherently more tolerant of liquid refrigerant.

NOTE: Even though the compressor section of a Scroll compressor is more tolerant of liquid refrigerant, continued floodback or flooded start conditions may wash oil from the bearing surfaces causing premature bearing failure.

The condition of the valves or scroll flanks is checked in the following manner.

1. Attach gauges to the high and low side of the system.
2. Start the system and run a Cooling Performance Test.

If the test shows-

⇒ Below normal high side pressure.
⇒ Above normal low side pressure.
⇒ Low temperature difference across coil.
⇒ Low amp draw at compressor.

- and the charge is correct. The compressor is faulty - replace the compressor.

S-104 Checking Compressor Efficiency

The reason for compressor inefficiency is broken or damaged scroll flanks on Scroll compressors, reducing the ability of the compressor to pump refrigerant vapor.

SERVICING

During the "OFF" cycle, the high side pressure bleeds to the low side through the fixed orifice restriction device. Check equalization time as follows:

1. Attach a gauge manifold to the suction and liquid line dill valves.
2. Start the system and allow the pressures to stabilize.
3. Stop the system and check the time it takes for the high and low pressure gauge readings to equalize.

If it takes more than seven (7) minutes to equalize, the restrictor device is inoperative. Replace, install a liquid line drier, evacuate and recharge.

S-106 Overfeeding

Overfeeding by the expansion valve results in high suction pressure, cold suction line, and possible liquid slugging of the compressor.

If these symptoms are observed:

1. Check for an overcharged unit by referring to the cooling performance charts in the spec sheet manual.
2. Check the operation of the power element in the valve as explained in S-110 Checking Expansion Valve Operation.
3. Check for restricted or plugged equalizer tube.

S-108 Checking Superheat

Refrigerant gas is considered superheated when its temperature is higher than the saturation temperature corresponding to its pressure. The degree of superheat equals the degrees of temperature increase above the saturation temperature at existing pressure. See Temperature - Pressure Chart.

CAUTION

To prevent personal injury, carefully connect and disconnect manifold gauge hoses. Escaping liquid refrigerant can cause burns. Do not vent refrigerant to atmosphere. Recover during system repair or final unit disposal.

1. Run system at least 10 minutes to allow pressure to stabilize.
2. Temporarily install thermometer on suction (large) line near compressor with adequate contact and insulate for best possible reading.
3. Refer to the superheat table provided for proper system superheat. Add charge to lower superheat or recover charge to raise superheat.

Superheat Formula = Suct. Line Temp. - Sat. Suct. Temp.

EXAMPLE (R410A):

A. Suction Pressure = 143
B. Corresponding Temp. °F. = 50
C. Thermometer on Suction Line = 59°F.

To obtain the degrees temperature of superheat, subtract 50.0 from 59.0°F.

The difference is 9° Superheat. The 9° Superheat would fall in the ± range of allowable superheat.

S-109 Checking Subcooling

Refrigerant liquid is considered subcooled when its temperature is lower than the saturation temperature corresponding to its pressure. The degree of subcooling equals the degrees of temperature decrease below the saturation temperature at the existing pressure.

1. Attach an accurate thermometer or preferably a thermocouple type temperature tester to the liquid line close to the pressure switch.
2. Install a high side pressure gauge on the high side (liquid) service valve at the front of the unit.
3. Record the gauge pressure and the temperature of the line.
4. Compare the hi-pressure reading to the "Required Liquid Line Temperature" chart on the preceding page. Find the hi-pressure value on the left column. Follow that line right to the column under the design subcooling value. Where the two intersect is the required liquid line temperature.
   Alternately you can convert the liquid line pressure gauge reading to temperature by finding the gauge reading in Temperature - Pressure Chart and reading to the left, find the temperature in the °F. Column.
5. The difference between the thermometer reading and pressure to temperature conversion is the amount of subcooling.

Add charge to raise subcooling. Recover charge to lower subcooling.

Subcooling Formula = Sat. Liquid Temp. - Liquid Line Temp.

EXAMPLE (R410A):

A. Liquid Line Pressure = 417
B. Corresponding Temp. °F. = 120°
C. Thermometer on Liquid line = 109°F.

To obtain the amount of subcooling, subtract 109°F from 120°F.

The difference is 11° subcooling. See the specification sheet for the design subcooling range for your unit.

See R410A Pressure vs. Temperature chart.

S-110 Checking Expansion Valve Operation

1. Remove the remote bulb of the expansion valve from the suction line.

2. Start the system and cool the bulb in a container of ice water, closing the valve. As you cool the bulb, the suction pressure should fall and the suction temperature will rise.
3. Next warm the bulb in your hand. As you warm the bulb, the suction pressure should rise and the suction temperature will fall.
4. If a temperature or pressure change is noticed, the expansion valve is operating. If no change is noticed, the valve is restricted, the power element is faulty, or the equalizer tube is plugged.
5. Capture the charge, replace the valve and drier, evacuate and recharge.

S-112 Checking Restricted Liquid Line

When the system is operating, the liquid line is warm to the touch. If the liquid line is restricted, a definite temperature drop will be noticed at the point of restriction. In severe cases, frost will form at the restriction and extend down the line in the direction of the flow.

Discharge and suction pressures will be low, giving the appearance of an undercharged unit. However, the unit will have normal to high subcooling.
Locate the restriction, replace the restricted part, replace drier, evacuate and recharge.

S-113A Overcharge Of Refrigerant

An overcharge of refrigerant is normally indicated by an excessively high head pressure.

An evaporator coil, using an expansion valve metering device, will basically modulate and control a flooded evaporator and prevent liquid refrigerant return to the compressor.

An evaporator coil, using a fixed orifice restrictor device (flowrator) metering device, could allow liquid refrigerant to return to the compressor under extreme overcharge conditions.

Also with a fixed orifice restrictor device (flowrator) metering device, extreme cases of insufficient indoor air can cause icing of the indoor coil and liquid refrigerant return to the compressor, but the head pressure would be lower.

There are other causes for high head pressure which may be found in the “Service Problem Analysis Guide.”

If other causes check out normal, an overcharge or a system containing non-condensables would be indicated.

If this system is observed:

1. Start the system.
2. Remove and capture small quantities of refrigerant as from the suction line access fitting until the head pressure is reduced to normal.
3. Observe the system while running a cooling performance test. If a shortage of refrigerant is indicated, then the system contains non-condensables.

S-113B Undercharge Of Refrigerant

An undercharge of refrigerant is normally indicated by an excessively low head pressure. An evaporator coil, using an expansion valve metering device, will open fully due to a lack of superheat provided by the system. An evaporator coil, using a fixed orifice restrictor device (flowrator) metering device, will not flash liquid refrigerant entering the evaporator coil under extreme undercharge conditions. Also with a fixed orifice restrictor device (flowrator) metering device, extreme cases of insufficient indoor air can cause icing of the indoor coil and higher than normal suction temperature return to the compressor, which can cause the compressor to overheat.

If other causes check out normal, an undercharge or a system containing non-condensables would be indicated.

If this system is observed:

1. Start the system.
2. Add small quantities of refrigerant as from the suction line access fitting until the head pressure is increased to normal.

Or
Recover all refrigerant, evacuate system and recharge the system with the amount of refrigerant indicated on the unit’s nameplate.

3. Observe the system while running a cooling performance test. If a shortage of refrigerant is indicated, then the system contains non-condensables.

(Heat Pump) Undercharge

An undercharged heat pump on the heating cycle will cause low discharge pressure resulting in low suction pressure and frost accumulation on the outdoor coil.

SERVICING

S-114 Non-Condensables

If non-condensables are suspected, shut down the system and allow the pressures to equalize. Wait at least 15 minutes. Compare the pressure to the temperature of the coldest coil since this is where most of the refrigerant will be. If the pressure indicates a higher temperature than that of the coil temperature, non-condensables are present.

Non-condensables are removed from the system by first removing the refrigerant charge, replacing and/or installing liquid line drier, evacuating and recharging.

S-115 Compressor Burnout

When a compressor burns out, high temperature develops causing the refrigerant, oil and motor insulation to decompose forming acids and sludge.

If a compressor is suspected of being burned-out, attach a refrigerant hose to the liquid line dill valve and properly remove and dispose of the refrigerant.

SERVICING

Pressure vs. Temperature Chart											
R-410A											
PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F
12	-37.7	114.0	37.8	216.0	74.3	318.0	100.2	420.0	120.7	522.0	137.6
14	-34.7	116.0	38.7	218.0	74.9	320.0	100.7	422.0	121.0	524.0	137.9
16	-32.0	118.0	39.5	220.0	75.5	322.0	101.1	424.0	121.4	526.0	138.3
18	-29.4	120.0	40.5	222.0	76.1	324.0	101.6	426.0	121.7	528.0	138.6
20	-36.9	122.0	41.3	224.0	76.7	326.0	102.0	428.0	122.1	530.0	138.9
22	-24.5	124.0	42.2	226.0	77.2	328.0	102.4	430.0	122.5	532.0	139.2
24	-22.2	126.0	43.0	228.0	77.8	330.0	102.9	432.0	122.8	534.0	139.5
26	-20.0	128.0	43.8	230.0	78.4	332.0	103.3	434.0	123.2	536.0	139.8
28	-17.9	130.0	44.7	232.0	78.9	334.0	103.7	436.0	123.5	538.0	140.1
30	-15.8	132.0	45.5	234.0	79.5	336.0	104.2	438.0	123.9	540.0	140.4
32	-13.8	134.0	46.3	236.0	80.0	338.0	104.6	440.0	124.2	544.0	141.0
34	-11.9	136.0	47.1	238.0	80.6	340.0	105.1	442.0	124.6	548.0	141.6
36	-10.1	138.0	47.9	240.0	81.1	342.0	105.4	444.0	124.9	552.0	142.1
38	-8.3	140.0	48.7	242.0	81.6	344.0	105.8	446.0	125.3	556.0	142.7
40	-6.5	142.0	49.5	244.0	82.2	346.0	106.3	448.0	125.6	560.0	143.3
42	-4.5	144.0	50.3	246.0	82.7	348.0	106.6	450.0	126.0	564.0	143.9
44	-3.2	146.0	51.1	248.0	83.3	350.0	107.1	452.0	126.3	568.0	144.5
46	-1.6	148.0	51.8	250.0	83.8	352.0	107.5	454.0	126.6	572.0	145.0
48	0.0	150.0	52.5	252.0	84.3	354.0	107.9	456.0	127.0	576.0	145.6
50	1.5	152.0	53.3	254.0	84.8	356.0	108.3	458.0	127.3	580.0	146.2
52	3.0	154.0	54.0	256.0	85.4	358.0	108.8	460.0	127.7	584.0	146.7
54	4.5	156.0	54.8	258.0	85.9	360.0	109.2	462.0	128.0	588.0	147.3
56	5.9	158.0	55.5	260.0	86.4	362.0	109.6	464.0	128.3	592.0	147.9
58	7.3	160.0	56.2	262.0	86.9	364.0	110.0	466.0	128.7	596.0	148.4
60	8.6	162.0	57.0	264.0	87.4	366.0	110.4	468.0	129.0	600.0	149.0
62	10.0	164.0	57.7	266.0	87.9	368.0	110.8	470.0	129.3	604.0	149.5
64	11.3	166.0	58.4	268.0	88.4	370.0	111.2	472.0	129.7	608.0	150.1
66	12.6	168.0	59.0	270.0	88.9	372.0	111.6	474.0	130.0	612.0	150.6
68	13.8	170.0	59.8	272.0	89.4	374.0	112.0	476.0	130.3	616.0	151.2
70	15.1	172.0	60.5	274.0	89.9	376.0	112.4	478.0	130.7	620.0	151.7
72	16.3	174.0	61.1	276.0	90.4	378.0	112.6	480.0	131.0	624.0	152.3
74	17.5	176.0	61.8	278.0	90.9	380.0	113.1	482.0	131.3	628.0	152.8
76	18.7	178.0	62.5	280.0	91.4	382.0	113.5	484.0	131.6	632.0	153.4
78	19.8	180.0	63.1	282.0	91.9	384.0	113.9	486.0	132.0	636.0	153.9
80	21.0	182.0	63.8	284.0	92.4	386.0	114.3	488.0	132.3	640.0	154.5
82	22.1	184.0	64.5	286.0	92.8	388.0	114.7	490.0	132.6	644.0	155.0
84	23.2	186.0	65.1	288.0	93.3	390.0	115.0	492.0	132.9	648.0	155.5
86	24.3	188.0	65.8	290.0	93.8	392.0	115.5	494.0	133.3	652.0	156.1
88	25.4	190.0	66.4	292.0	94.3	394.0	115.8	496.0	133.6	656.0	156.6
90	26.4	192.0	67.0	294.0	94.8	396.0	116.2	498.0	133.9	660.0	157.1
92	27.4	194.0	67.7	296.0	95.2	398.0	116.6	500.0	134.0	664.0	157.7
94	28.5	196.0	68.3	298.0	95.7	400.0	117.0	502.0	134.5	668.0	158.2
96	29.5	198.0	68.9	300.0	96.2	402.0	117.3	504.0	134.8	672.0	158.7
98	30.5	200.0	69.5	302.0	96.6	404.0	117.7	506.0	135.2	676.0	159.2
100	31.2	202.0	70.1	304.0	97.1	406.0	118.1	508.0	135.5	680.0	159.8
102	32.2	204.0	70.7	306.0	97.5	408.0	118.5	510.0	135.8	684.0	160.3
104	33.2	206.0	71.4	308.0	98.0	410.0	118.8	512.0	136.1	688.0	160.8
106	34.1	208.0	72.0	310.0	98.4	412.0	119.2	514.0	136.4	692.0	161.3
108	35.1	210.0	72.6	312.0	98.9	414.0	119.6	516.0	136.7	696.0	161.8
110	35.5	212.0	73.2	314.0	99.3	416.0	119.9	518.0	137.0		
112	36.9	214.0	73.8	316.0	99.7	418.0	120.3	520.0	137.3		

*Based on ALLIED SIGNAL Data

SERVICING

SATURATED SUCTION PRESSURE -TEMPERATURE CHART				
R-32				
SUCTION PRESSURE (PSIG)	SATURATED SUCTION TEMPERATURE (°F)		SUCTION PRESSURE (PSIG)	SATURATED SUCTION TEMPERATURE (°F)
50	1		130	44
52	2		140	48
54	4		150	52
56	5		160	55
58	6		170	59
60	8		200	68
62	9		210	71
64	10		220	74
66	12		230	77
68	13		240	80
70	14		250	82
72	15		260	85
74	17		270	87
76	18		280	90
78	19		290	92
80	20		300	94
82	21		320	99
84	22		340	103
86	23		360	107
88	24		380	111
90	25		400	115
92	26		420	118
94	27		440	122
96	28		460	125
98	29		480	128
100	30		500	132
102	31		520	135
104	32		540	138
106	33		560	141
108	34		580	143
110	35		600	146
120	40		620	149

REQUIRED LIQUID LINE TEMPERATURE						
R-410A						
LIQUID PRESSURE AT ACCESS FITTING (PSIG)	REQUIRED SUBCOOLING TEMPERATURE (°F)					
	8	10	12	14	16	18
189	58	56	54	52	50	48
195	60	58	56	54	52	50
202	62	60	58	56	54	52
208	64	62	60	58	56	54
215	66	64	62	60	58	56
222	68	66	64	62	60	58
229	70	68	66	64	62	60
236	72	70	68	66	64	62
243	74	72	70	68	66	64
251	76	74	72	70	68	66
259	78	76	74	72	70	68
266	80	78	76	74	72	70
274	82	80	78	76	74	72
283	84	82	80	78	76	74
291	86	84	82	80	78	76
299	88	86	84	82	80	78
308	90	88	86	84	82	80
317	92	90	88	86	84	82
326	94	92	90	88	86	84
335	96	94	92	90	88	86
345	98	96	94	92	90	88
354	100	98	96	94	92	90
364	102	100	98	96	94	92
374	104	102	100	98	96	94
384	106	104	102	100	98	96
395	108	106	104	102	100	98
406	110	108	106	104	102	100
416	112	110	108	106	104	102
427	114	112	110	108	106	104
439	116	114	112	110	108	106
450	118	116	114	112	110	108
462	120	118	116	114	112	110
474	122	120	118	116	114	112
486	124	122	120	118	116	114
499	126	124	122	120	118	116
511	128	126	124	122	120	118

NOTICE

VIOLATION OF EPA REGULATIONS MAY RESULT IN FINES OR OTHER PENALTIES.

Now determine if a burn out has actually occurred. Confirm by analyzing an oil sample using a Sporlan Acid Test Kit, AK-3 or its equivalent.

Remove the compressor and obtain an oil sample from the suction stub. If the oil is not acidic, either a burnout has not occurred or the burnout is so mild that a complete clean-up is not necessary.

If acid level is unacceptable, the system must be cleaned by using the clean-up drier method.

CAUTION

DO NOT ALLOW THE SLUDGE OR OIL TO CONTACT THE SKIN. SEVERE BURNS MAY RESULT.

NOTE: Daikin does NOT approve the flushing method using R-11 refrigerant.

SUCTION LINE DRIER CLEAN-UP METHOD

The POE oils used with R410A refrigerant is an excellent solvent. In the case of a burnout, the POE oils will remove any burnout residue left in the system. If not captured by the refrigerant filter, they will collect in the compressor or other system components, causing a failure of the replacement compressor and/or spread contaminants throughout the system, damaging additional components.

The suction line filter drier should be installed as close to the compressor suction fitting as possible. The filter must be accessible and be rechecked for a pressure drop after the system has operated for a time. It may be necessary to use new tubing and form as required.

NOTE: At least twelve (12) inches of the suction line immediately out of the compressor stub must be discarded due to burned residue and contaminates.

1. Remove the liquid line drier and expansion valve.
2. Purge all remaining components with dry nitrogen or carbon dioxide until clean.
3. Install new components **including** liquid line drier.
4. Braze all joints, leak test, evacuate, and recharge system.
5. Start up the unit and record the pressure drop across the drier.
6. Continue to run the system for a minimum of twelve (12) hours and recheck the pressure drop across the drier. Pressure drop should not exceed 6 PSIG.
7. Continue to run the system for several days, repeatedly checking pressure drop across the suction line drier. If the pressure drop never exceeds the 6 PSIG, the drier has trapped the contaminants. Remove the suction line drier from the system.
8. If the pressure drop becomes greater, then it must be replaced and steps 5 through 9 repeated until it does not exceed 6 PSIG.

NOTICE: Regardless, the cause for burnout must be determined and corrected before the new compressor is started.

S-200 CHECKING EXTERNAL STATIC PRESSURE

The minimum and maximum allowable duct static pressure is found in the Specifications Sheet Manual.

NOTE: False ceilings or drop ceilings may be used as a return air plenum.

Too great of an external static pressure will result in insufficient air that can cause icing of the coil, whereas too much air can cause poor humidity control, and condensate to be pulled off the evaporator coil causing condensate leakage. Too much air can cause motor overloading and in many cases this constitutes a poorly designed system. To determine proper air movement, proceed as follows:

1. Using a draft gauge (inclined manometer) measure the static pressure of the return duct at the inlet of the unit, (Negative Pressure).
2. Measure the static pressure of the supply duct, (Positive Pressure).
3. Add the two readings together.

NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired.

4. Consult proper table for quantity of air.

If the external static pressure exceeds the minimum or maximum allowable statics, check for closed dampers, dirty filters, undersized or poorly laid out ductwork.

S-205 CHECKING BELT TENSION

NOTE: Section on high static tables may require a field motor change.

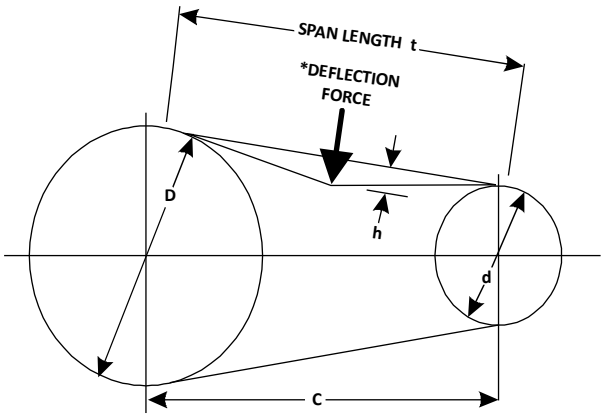
SERVICING

Belt Drive Tension and Alignment Adjustment

Check drive for adequate run-in belt tension. Correct belt tension is very important. A belt that is loose will have a substantially shorter life, and a belt that is too tight may cause premature motor and bearing failure. Correct belt tension on these units can be checked by measuring the force required to deflect the belt ⅛" at the midpoint of the span length (Figure 21). Belt tension force can be measured using a belt tension checker, available through most belt manufacturers. The correct deflection force is 5 Ibs. for a new belt and 3.5 Ibs. for a belt that has been run in. New belt tension includes initial belt stretch.

When new V-belts are installed on a drive the initial tension will drop rapidly during the first few hours. Check tension frequently during the first 24 hours of operation.

Subsequent retensioning should fall between the minimum and maximum force. To determine the deflection distance from the normal position, use a straightedge or stretch a cord from sheave to sheave to use as a reference line. On multiple belt drives, an adjacent undeflected belt can be used as a reference.



***Apply force to the center of the span.**

t = Span length, inches
C = Center distance, inches
D = Larger sheave diameter, inches
d = Smaller sheave diameter, inches
h = Deflection height, inches

DRIVE BELT TENSION ADJUSTMENT

15&20 TON MODELS

MODEL	TYPE		SHEAVE DIAMETER (in)	DEFLECTION FORCE (lbs)		DEFLECTION (in)
	BELT	DRIVE		Used	New	
15 Ton	B, BA	Standard	4.3 to 5.5	5.5 ± .5	8.2 ± .5	1/4 ± 1/16
20 Ton 25 Ton	B, BA	Standard	4.3 to 5.5	5.5 ± .5	8.2 ± .5	1/4 ± 1/16

RECOMMENDED POUNDS OF FORCE PER BELT

S-207 Motor Sheave Adjustments

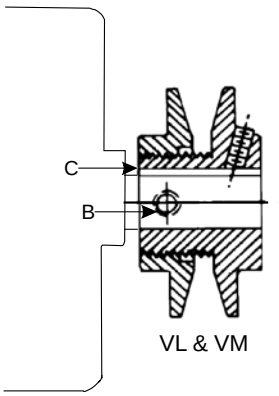
VL, VM & 2VP Variable Pitch Key Type Motor Sheaves

The driving and driven motor sheaves should be in alignment with each other and the shafts parallel.

VL & VM Sheaves Adjustment

1. Loosen set screw "B" using a 5/32" Allen key.
2. Making half or full turns from closed position, adjust sheave pitch diameter for desired speed. DO NOT OPEN MORE THAN SIX FULL TURNS.
3. Tighten set screw "B" securely over flat.
4. Carefully put on belts and adjust belt tension. DO NOT FORCE BELTS OVER GROOVES.
5. Ensure all keys are in place and the set screws tight before starting drive. Recheck set screws and belt tension after 24 hours service.

NOTE: Future adjustments should be made by loosening the belt tension and increasing or decreasing the pitch diameter of the sheave by half or full turns as required. Readjust belt tension before starting drive.



VL & VM

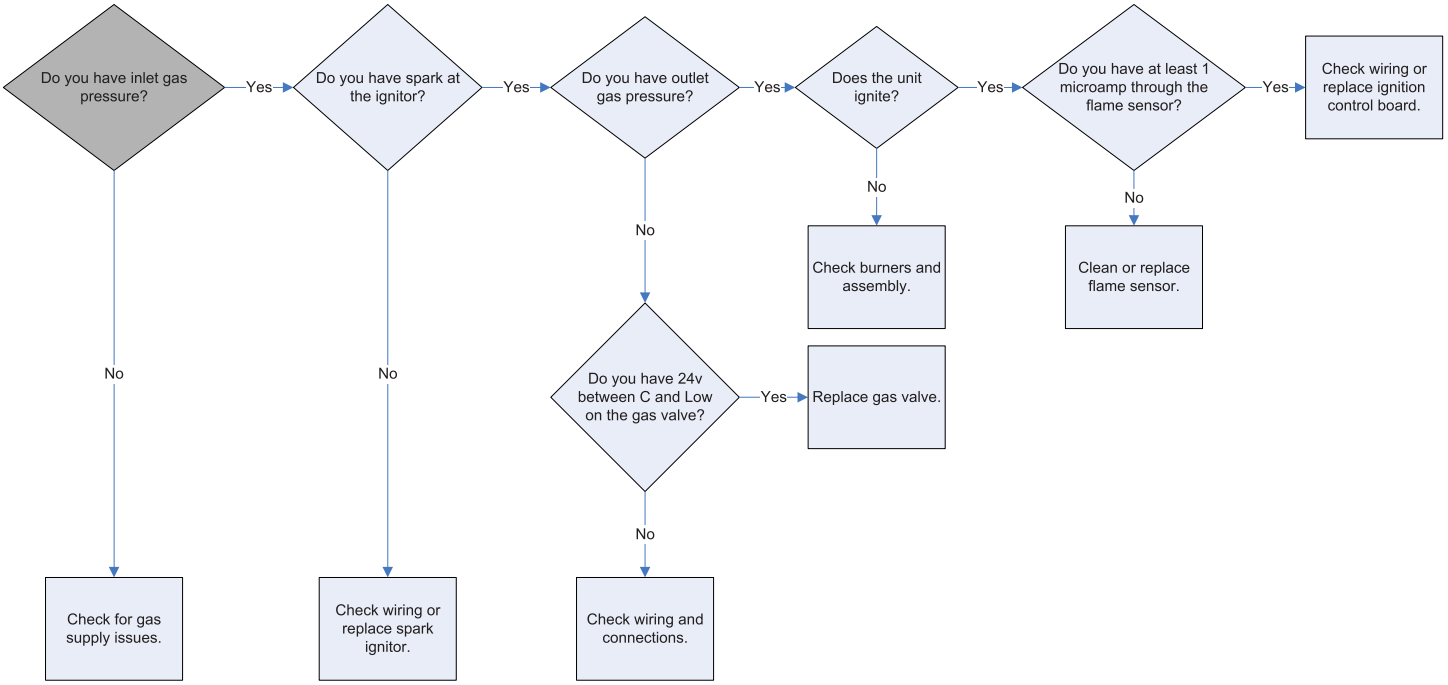
NOTE: Do not operate sheave with flange projecting beyond the hub end.

PCBAG123 IGNITION CONTROL TROUBLESHOOTING FLOWCHART

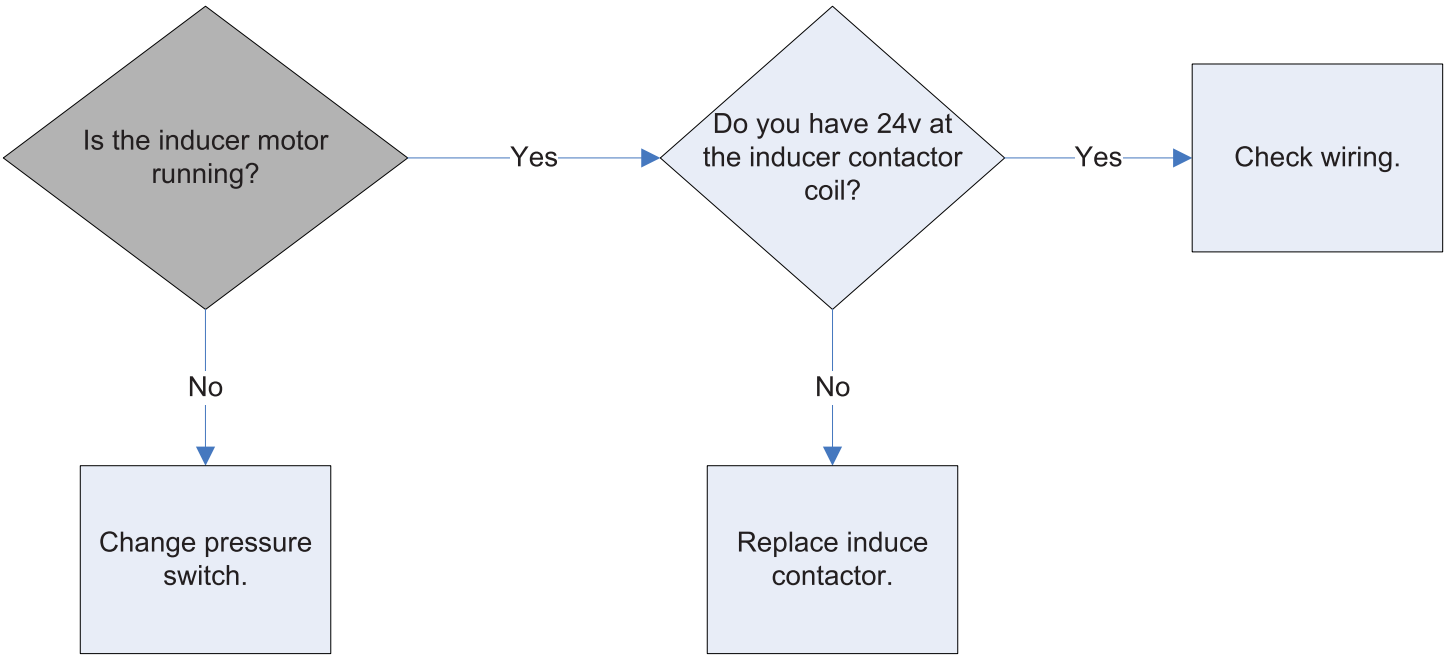
Steady On - Normal

No Light - Check Power or Wiring

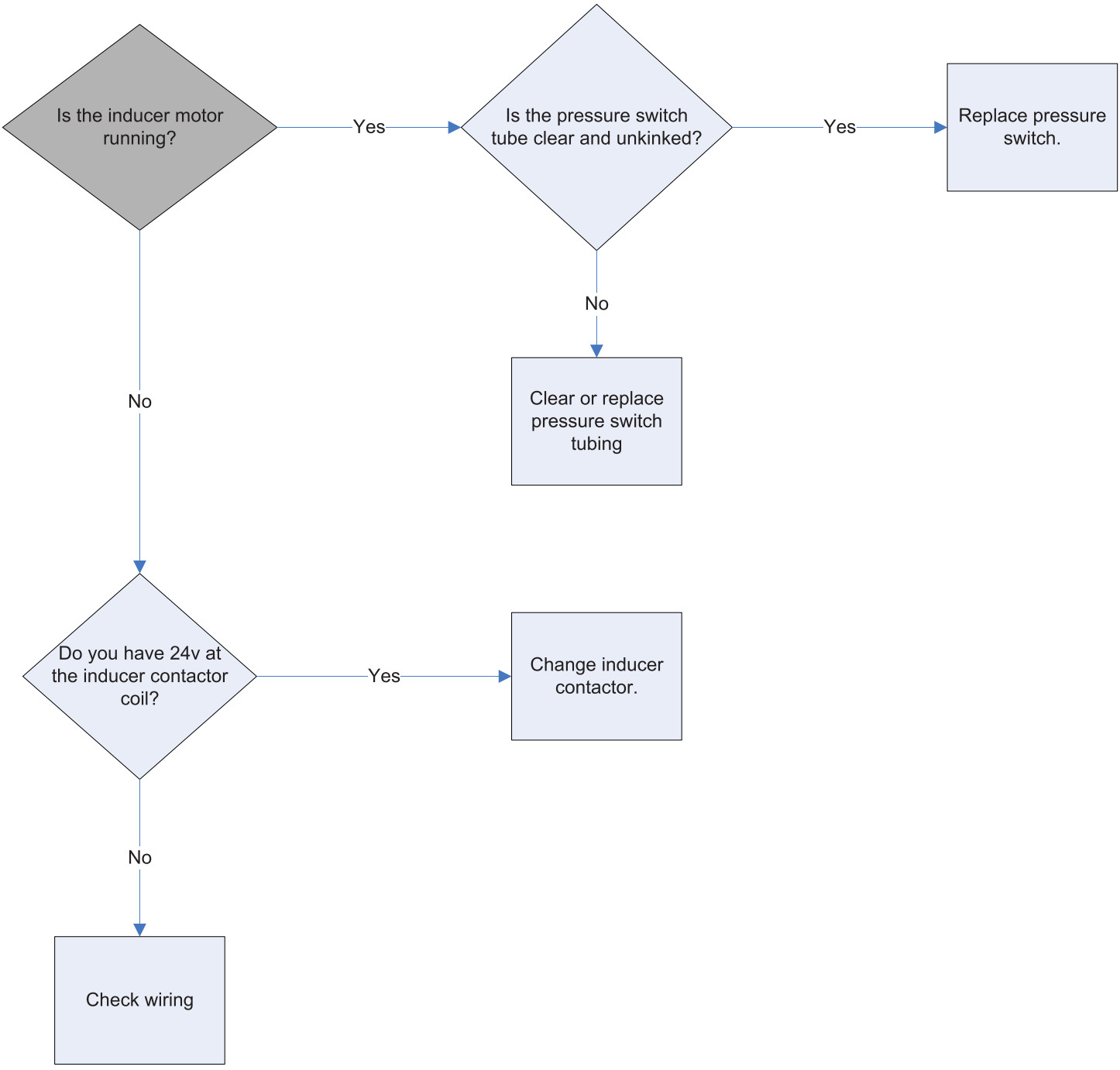
1 Flash – Ignition Lockout (3 Failed Ignition Trials)



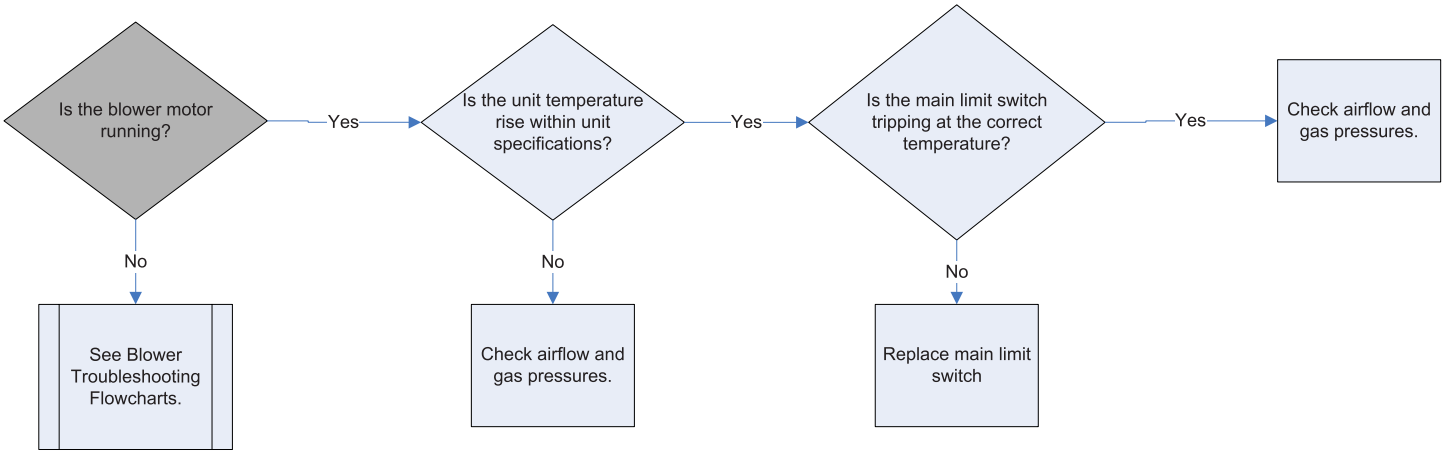
2 Flash – Pressure Switch Stuck Closed



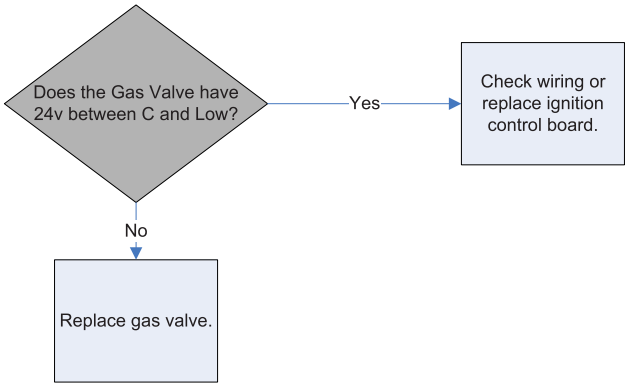
3 Flash – Pressure Switch Stuck Open



4 Flash – Open High Temperature Limit



5 Flash – Flame Detected with Gas Valve De-Energized



6 Flash – Compressor Short Cycle Delay Active (3 minute delay)

SERVICING

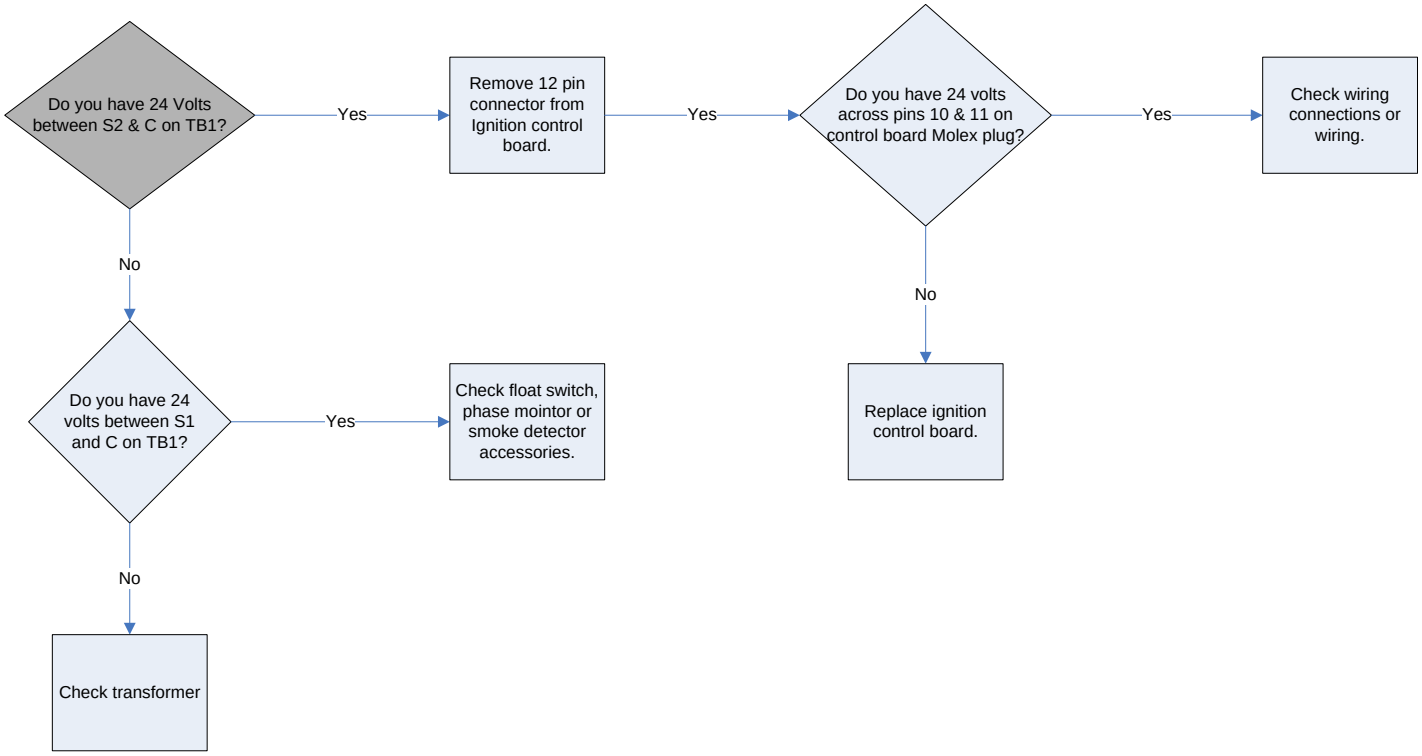
ULTRA LOW NOX

LED ACTIVITY	RED	AMBER	GREEN
BOOT-UP	ON	ON	ON
STEADY ON	CONTROL FAULT DETECTED	OEM TEST MODE	STANDBY NORMAL OPERATION NO THERMOSTAT REQUESTS
RAPID FLASH	———	FIELD TEST MODE	CLEAR ERROR HISTORY
1 FLASH	IGNITION RETRIES EXCEEDED	LOW FLAME SENSE	CALL FOR HEATING
2 FLASH	PRESSURE SENSOR NULL ERROR: INCONSISTENT READING WITH INDUCER OFF	ID PLUG FAILURE	CALL FOR COOLING
3 FLASH	PRESSURE SENSOR SPAN ERROR: INCONSISTENT READING WITH INDUCER ON, OR INDUCER FAILS TO REACH TARGET PRESSURE	CONTROL FUSE OPEN	CONTINUOUS FAN OPERATION
4 FLASH	HIGH LIMIT SWITCH OPEN	———	———
5 FLASH	FLAME PRESENT WITH GAS VALVE OFF	———	———
6 FLASH	NORMALLY CLOSED BURNER SWITCH/AUXILIARY SWITCH OPEN	———	———
7 FLASH	GAS VALVE CIRCUIT SHORTED	———	———
10 FLASH	HIGH LIMIT SWITCH RECOVERY TIMER EXPIRED	———	———
OFF NO LED ACTIVITY	NO 24 VAC POWER TO CONTROL		

SERVICING

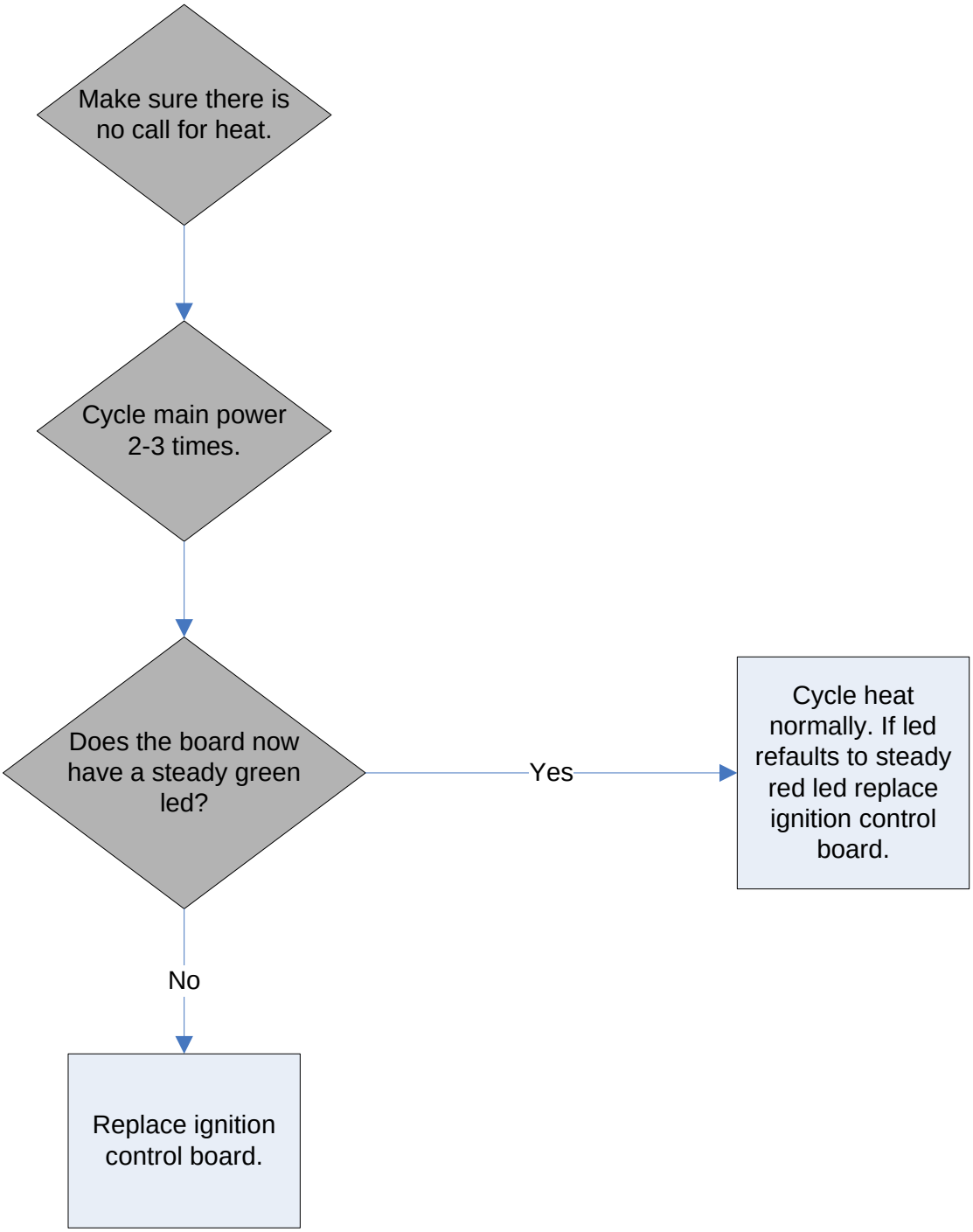
ULN ONLY

LED Flashing - None



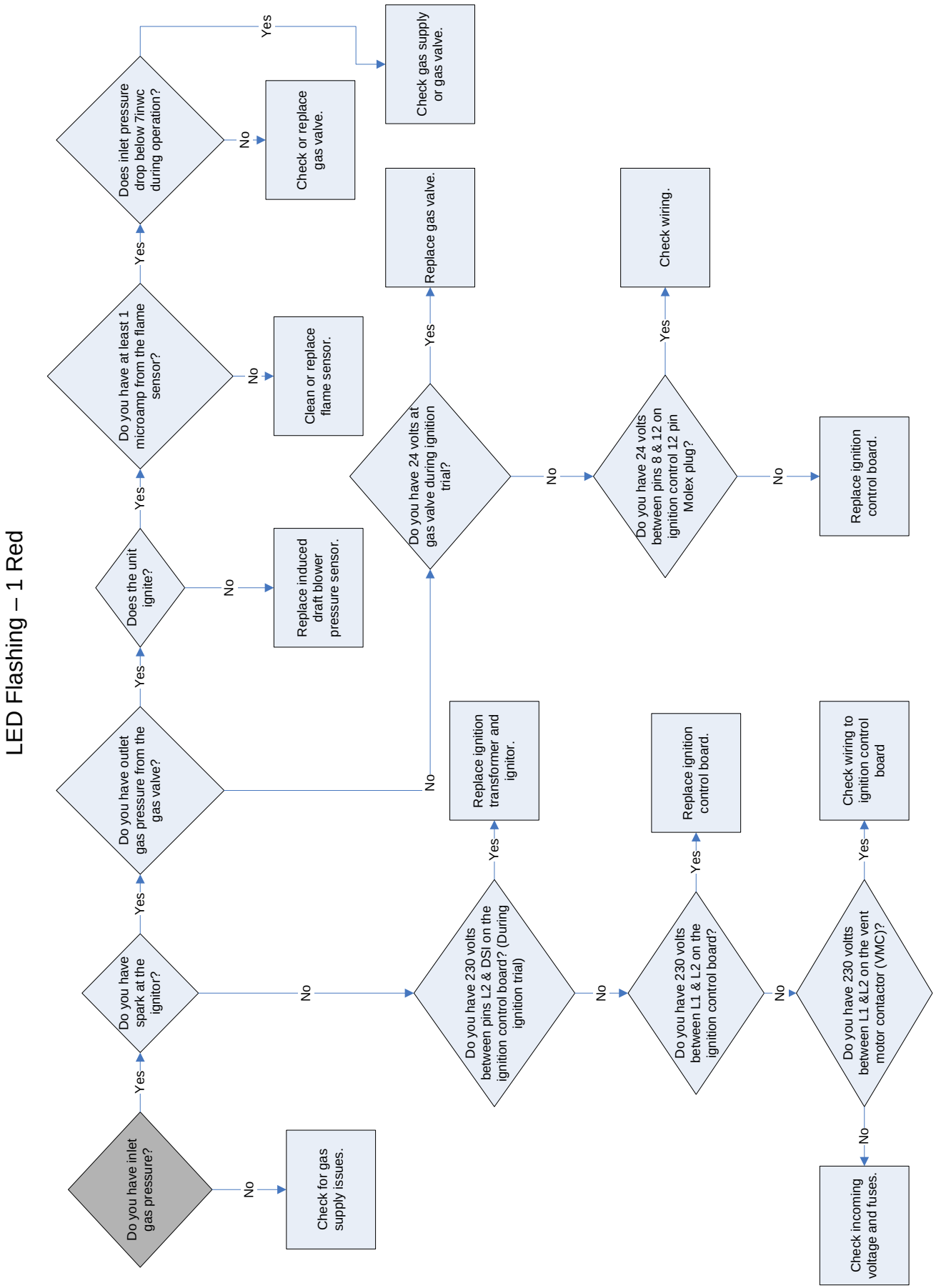
ULN ONLY

LED Flashing – Steady Red



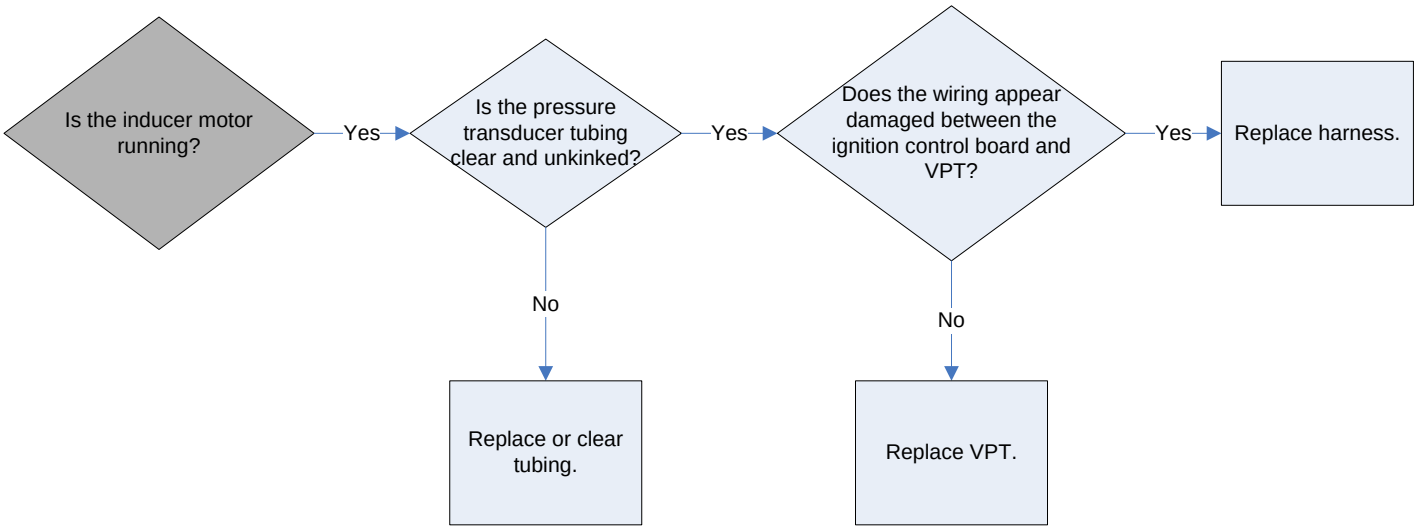
SERVICING

ULN ONLY



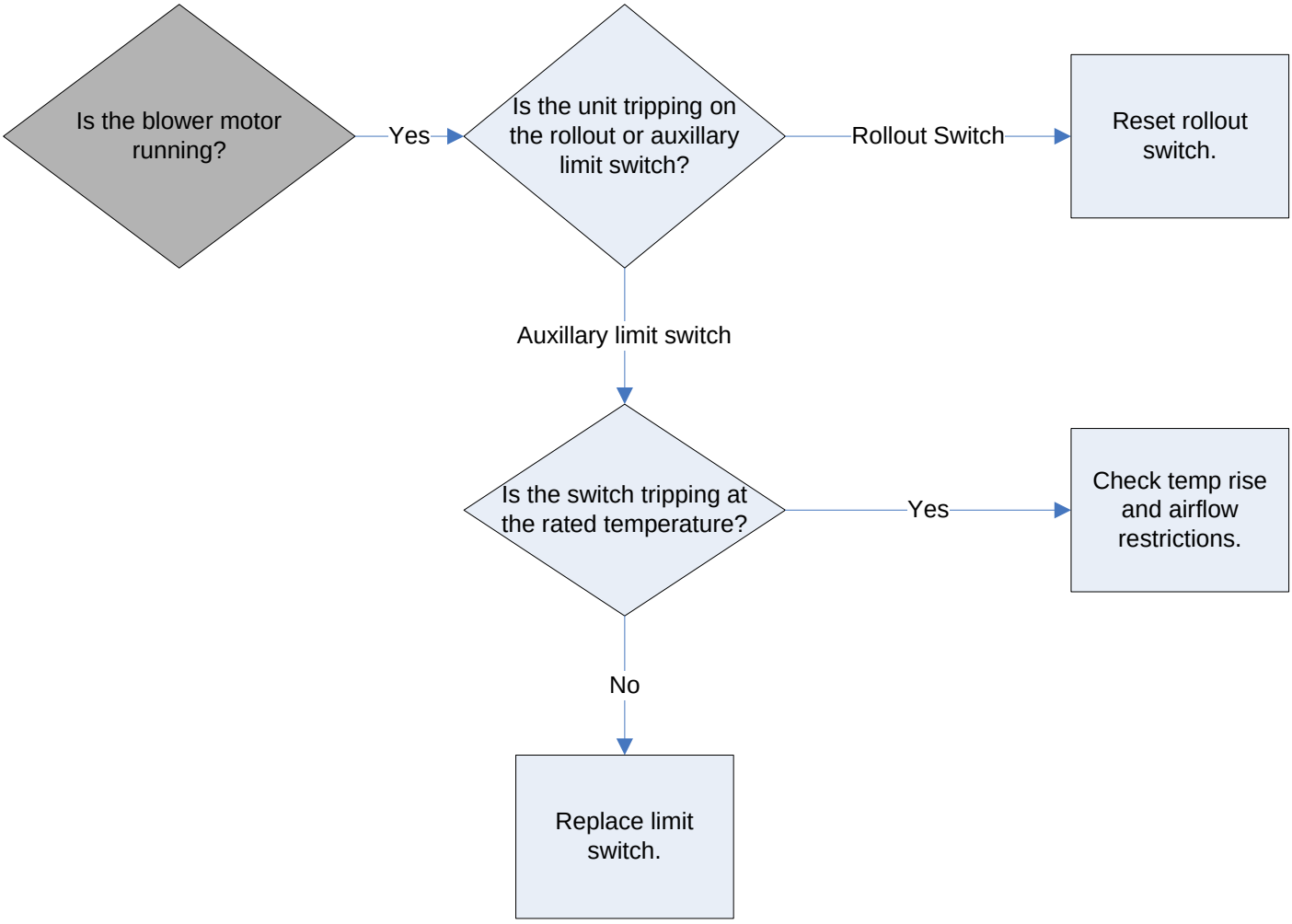
ULN ONLY

LED Flashing – 3 Red



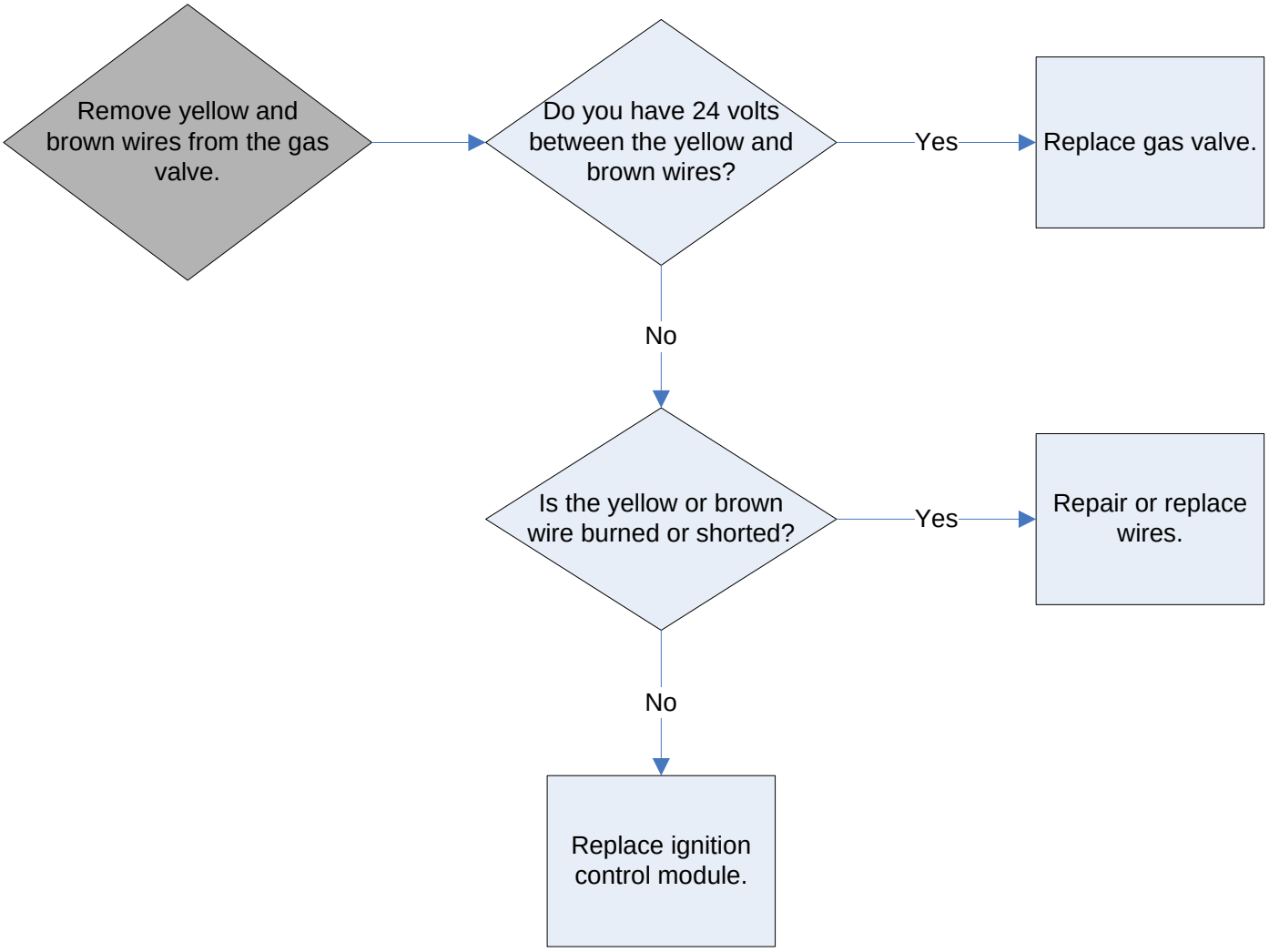
ULN ONLY

LED Flashing – 6 Red

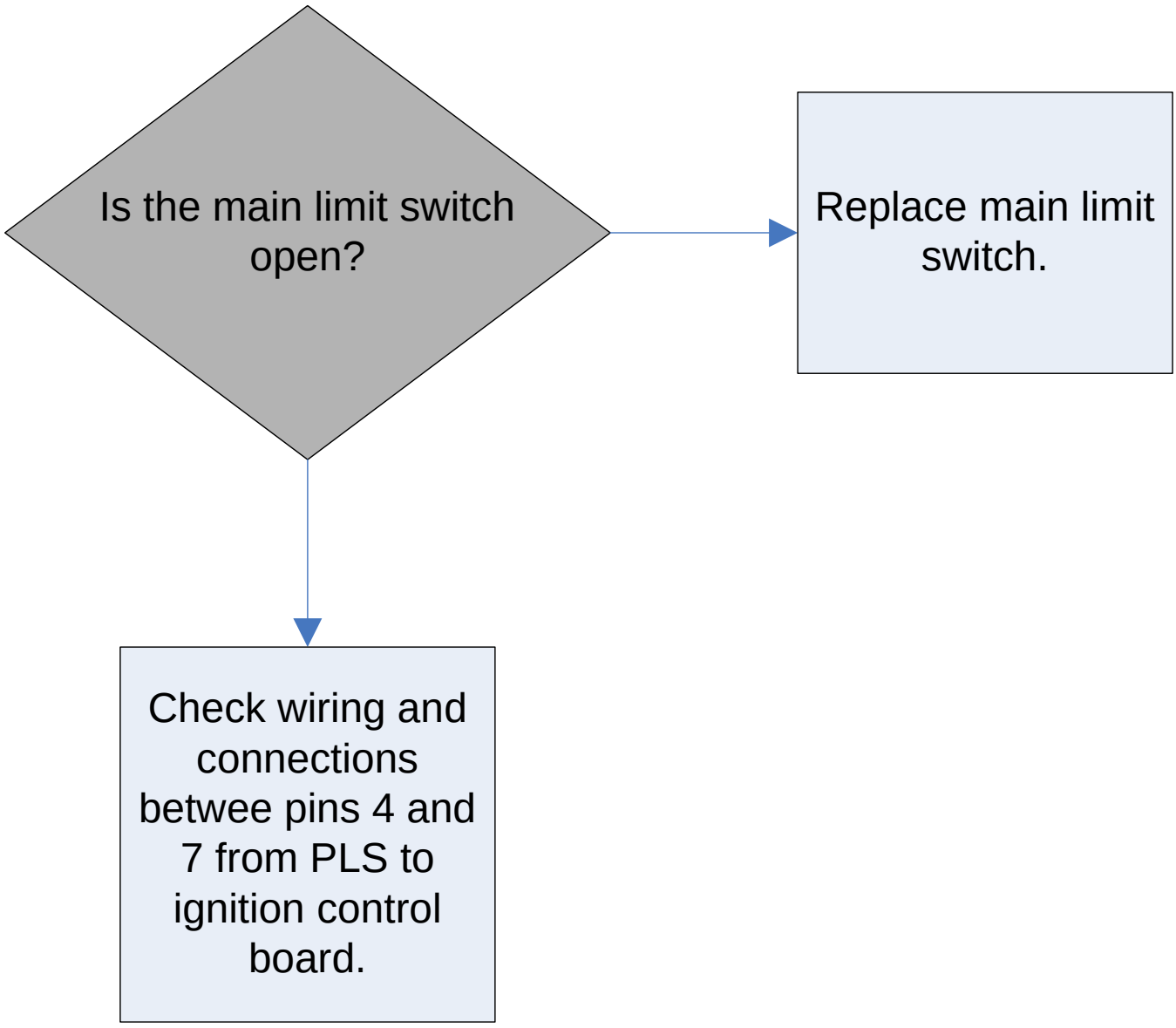


ULN ONLY

LED Flashing – 7 Red

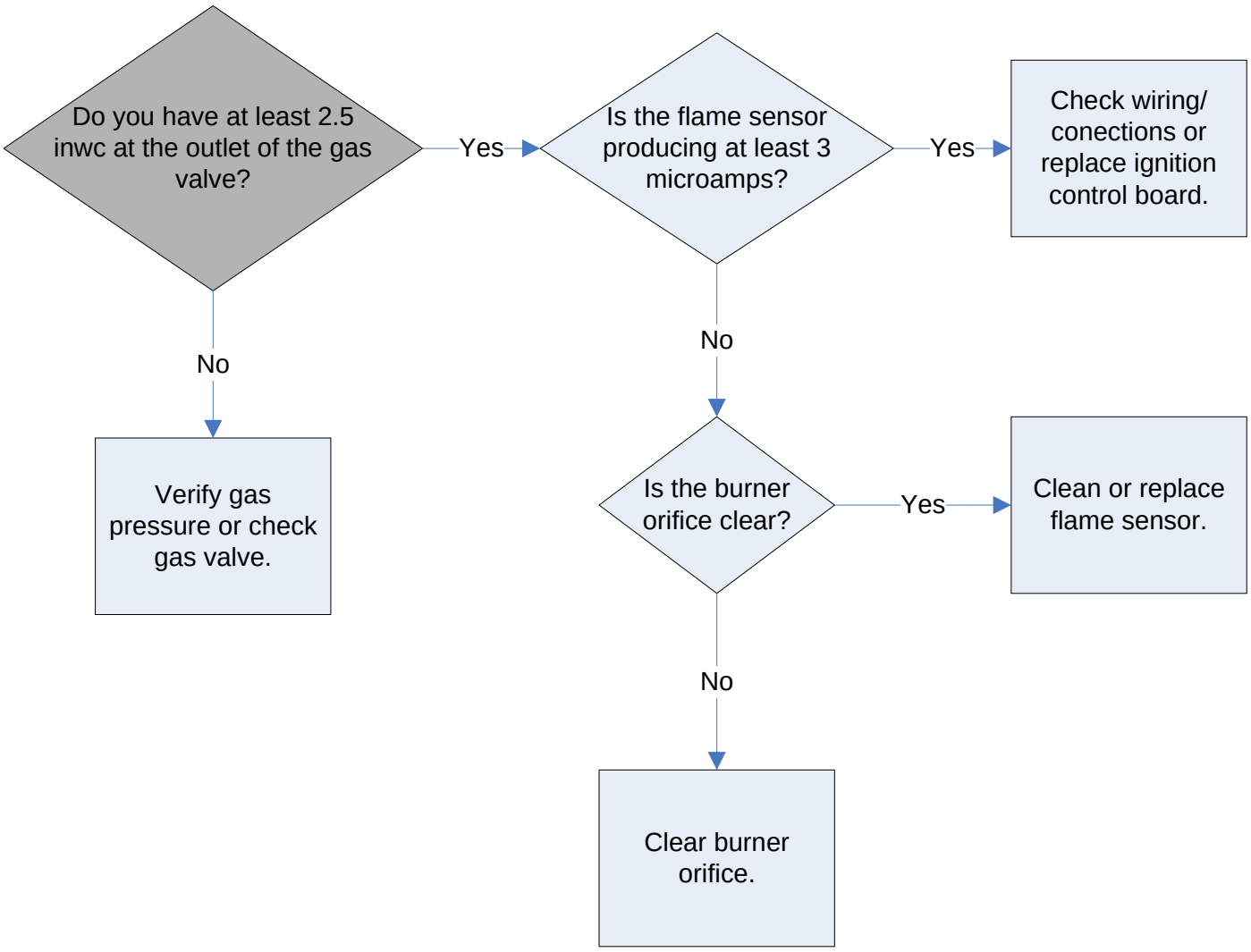


LED Flashing – 10 Red



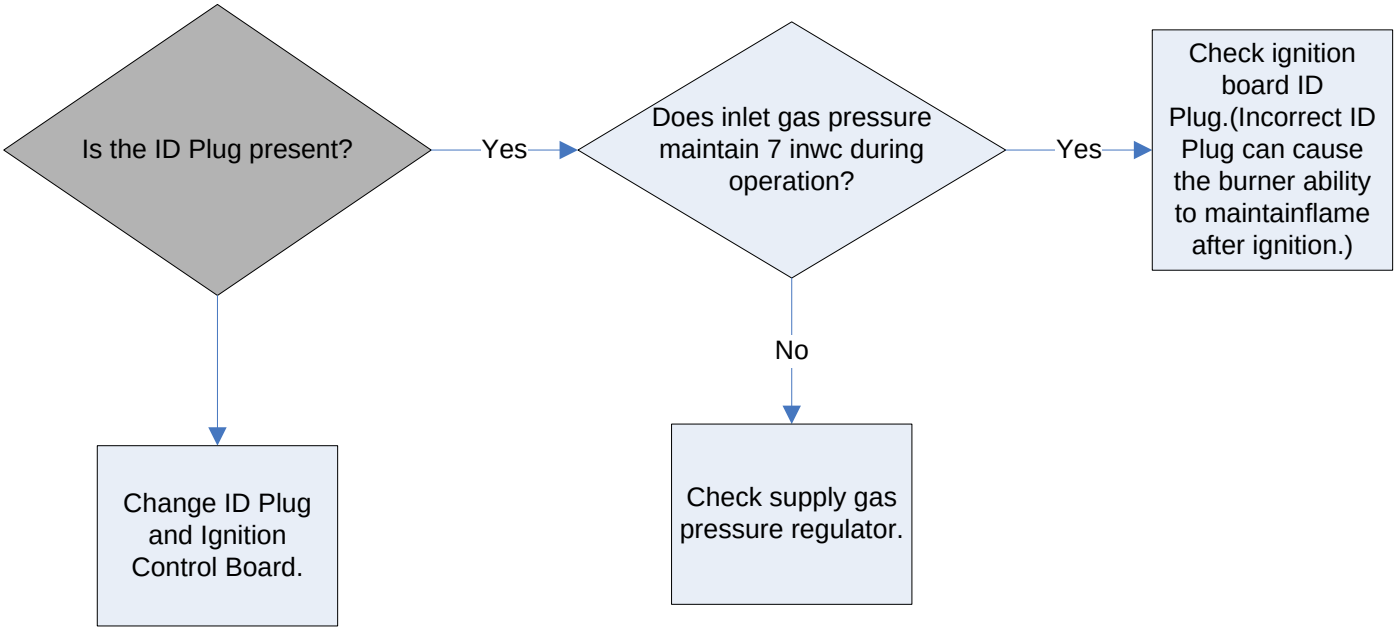
ULN ONLY

LED Flashing – 1 Amber



ULN ONLY

LED Flashing – 3 Amber



SERVICING

GAS HEAT SERVICING TABLE OF CONTENTS

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SERVICING

S-201 Checking Temperature Rise

Temperature rise is related to the BTUH output of the unit and the amount of air (CFM) circulated over the heat exchanger.

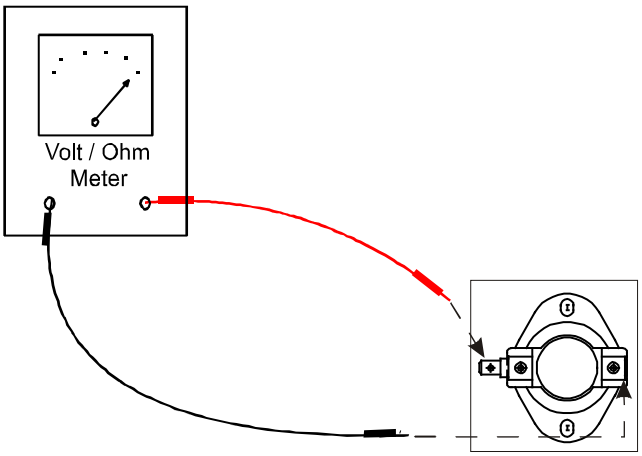
All units are designed for a given range of temperature increase. This is the temperature of the air leaving the unit minus the temperature of the air entering the unit.

The more air (CFM) being delivered through a given unit the less the rise will be; so the less air (CFM) being delivered, the greater the rise. The temperature rise should be adjusted in accordance to a given unit specifications and its external static pressure.

1. Check BTUH input to unit do not exceed input rating stamped on rating plate.
2. Take entering and leaving air temperatures.
3. Select the proper speed tap or dip switch setting for direct drive units.
4. For gas heat units, the airflow must be adjusted so that the air temperature rise falls within the ranges given stated on Data Plate by adjusting the variable pitch sheave on the motor (see Blower Performance section in appropriate Specifications Sheet Manual for correct pulley adjustment).
5. Take motor amperage draw to determine that the motor is not overloaded during adjustments.

S-300 Testing Primary Limit Control

DCG units use a snap-disk type primary limit device. Sometimes referred to as “stat on a stick”. The limit setting is fixed and must not be readjusted in the field.



Testing Primary Limit Control

Refer to the specification section to determine the proper limit cutout temperature for the model being serviced.

In all instances the limit control is wired in series with the ignition control.

If the temperature within the furnace should exceed this setting, the control will open, de-energizing the ignition control which in turn will open the electrical circuit to the gas valve.

The control will automatically reset when the temperature within the combustion chamber is sufficiently lowered.

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



1. Remove electrical power to unit. Some units may have more than one source of power.
2. Remove the wires from the limit control terminals.
3. Using an ohmmeter, test for continuity across the two terminals.
4. If limit test open allow unit to cool and retest.
5. If still open, replace the control.

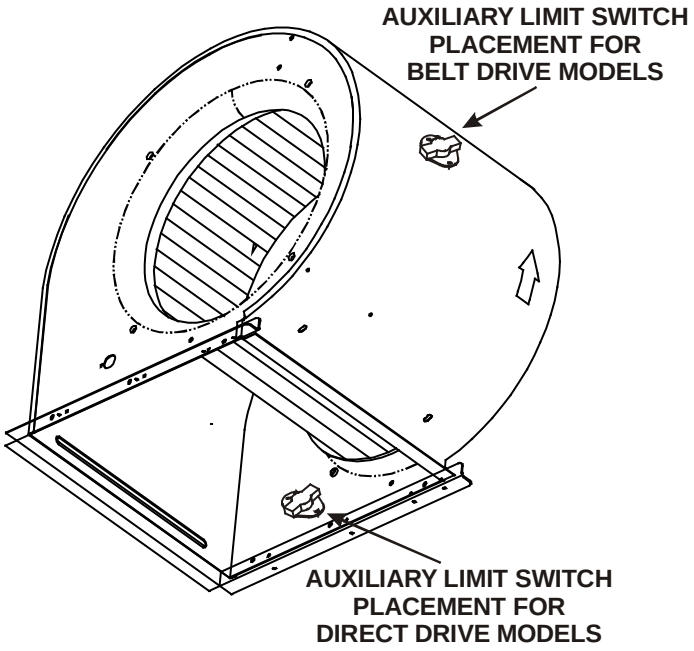
S-301 Testing Auxiliary Limit

The auxiliary limit control is a preset nonadjustable control mounted in the blower compartment area.

It is connected in series with the rollout switch wiring to the gas valve. If its temperature should be exceeded, it will open, interrupting the voltage to the gas valve causing it to open.

An additional limit (primary limit) control is required for safety control of high temperature within the furnace or ductwork.

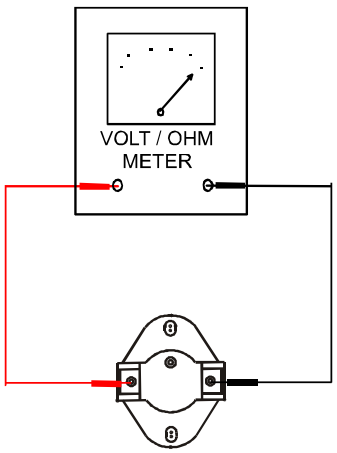
SERVICING



WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

1. Remove the wires from the auxiliary limit control terminals.
2. Using an ohmmeter, test for continuity across the two terminals. No reading indicates the control is open. Push the red reset button, test again - if still open, replace the control.
3. If limit tests open, allow unit to cool and retest.
4. If still open, replace the control.

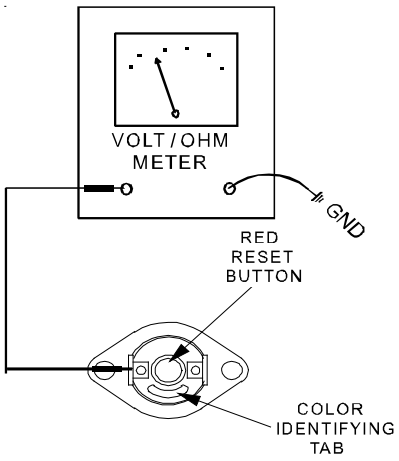


TESTING AUXILIARY LIMIT CONTROL

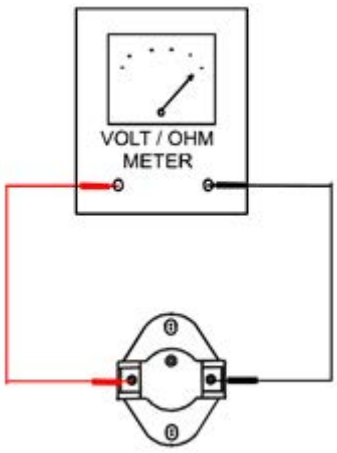
S-302 Checking Flame Rollout Switch

DCG units are equipped with a temperature-activated manual reset control. This control is mounted to the manifold assembly and is wired in series with the auxiliary limit and gas valve. The control is designed to open should a flame roll out occur. An over firing condition or flame impingement on the heat shield can also cause the control to open.

If the rollout control has opened, the circuit between the ignition control and gas valve will be interrupted and the ignition control module will go into lockout. The servicer should reset the ignition control by opening and closing the thermostat circuit. The servicer should look for the ignitor glowing which indicates there is power to the ignition control. The servicer should measure the voltage between each side of the rollout control and ground while the ignition control is try to power the gas valve.



CHECKING FLAME ROLLOUT SWITCH



TESTING BURNER LIMIT CONTROL

SERVICING

Limit Switch Operation (Applies to Primary, Auxiliary, and Roll Out Limits) DSI systems.
If a limit switch opens, the indoor blower is energized on heat speed and the induced draft blower is energized. The LED on the control flashes "4" to indicate an open limit switch. The blower and inducer remain on while the limit switch is open. The gas valve is de-energized. Power to the thermostat "R" is removed while the limit switch is open.

When the limit switch re-closes, the induced draft motor runs through its post purge and the indoor blower goes through the heat off delay.

If a call for heat exists when the limit switch re-closes, the control goes through a pre-purge period and then makes an ignition attempt. The indoor blower remains on (for the delay off time) during the re-ignition attempt.

1. If no voltage is measured on either side of control it indicates ignition control or wiring to control problem.
2. If voltage is measured on one side of the control and not the other, it indicates the control is open.
3. If voltage is measured on both sides of the control the wiring to gas valve or valve is at fault.

Servicing procedure with furnace not firing.

4. Confirm that the outer door was in place and all screws tightened. (No leaks under the door.)
5. Check to see if any damage was done to the furnace especially the wiring.
6. Confirm that heat exchanger is not obstructed by feeling for discharge air from the flue hood when the combustion blower is running but the unit is not firing.

If the above steps do not suggest the reason the control has tripped the furnace should be fired.

1. Remove the heating compartment door.
2. Turn of the power or open the thermostat circuit.
3. Reset the rollout control.
4. Turn power on and put the unit into a call for heating.

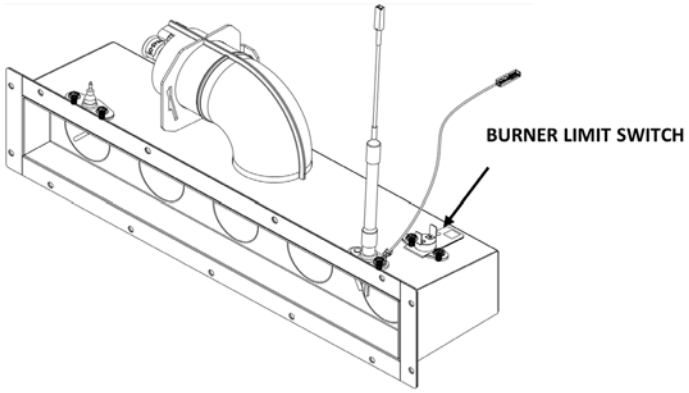
CAUTION

FLAME ROLLOUT COULD OCCUR. KEEP FACE AND HANDS A SAFE DISTANCE FROM BURNER AREA.

5. Look under the heat shield as the unit is running. Flames should be drawn into firing tubes.
   A. If only one burners flame is not drawn into the tube, that tube is restricted.
   B. If, without the air circulation blower running, all flames are not drawn into the tubes either the collector box, combustion blower, or flue outlet is obstructed. If the combustion blower or flue outlet is obstructed, the pressure switch should have opened preventing the unit from firing, also inspect the unit pressure switch and wiring.
   C. If the burner flame is not drawn into the tube only when the air circulation blower is running, then a cracked heat exchanger tube is present.

S-303 Testing Burner Limit (ULN ONLY)
ULN units are equipped with a temperature-activated automatic reset limit. This limit is mounted to the Burner assembly and is wired in series with the auxiliary limit and gas valve. It is designed to open should the air inlet to burner get obstructed.

If the Burner limit has opened, the circuit between the ignition control and gas valve will be interrupted and the ignition control module will go into lockout. The servicer should reset the ignition control by opening and closing the thermostat circuit.



SERVICING

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

1. Remove the wires from the burner limit control terminals.
2. Using an ohmmeter, test for continuity across the two terminals. No reading indicates the control is open.
3. If limit tests open, allow unit to cool and retest.
4. If still open, replace the control.

S-304 Testing Gas Valve

Direct Spark Ignition (DSI) Systems

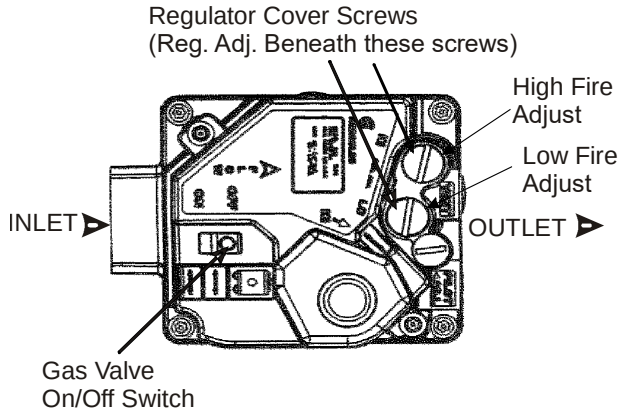
TWO STAGE MODELS ONLY: A two-stage combination redundant operator type gas valve which provides all manual and automatic control functions required for gas fired heating equipment is used.

The valve provides control of main burner gas flow, pressure regulation, and 100 percent safety shut-off.

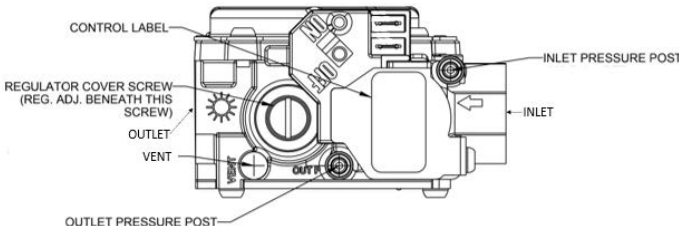
WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

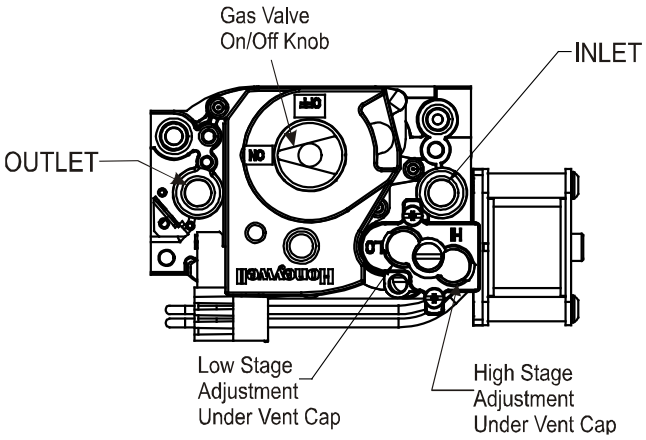
1. Ensure gas valve and main gas supply are on.
2. Using a voltmeter, check from C and M on gas valve for 24 volts to gas valve.
3. If 24 volts are present and no gas flows through the valve, replace valve.



WHITE-RODGERS 36H54 PRESSURE ADJUSTMENTS



ULN GAS VALVE



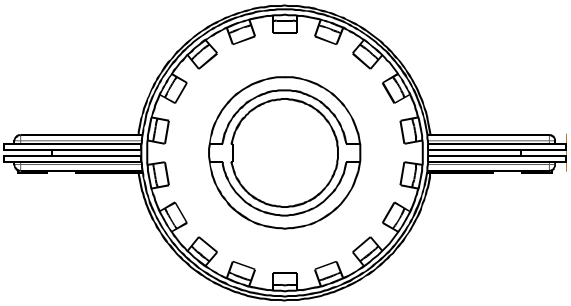
HONEYWELL 0151M00015 PRESSURE ADJUSTMENTS

S-305 Checking Main Burners

The main burners are used to provide complete combustion of various fuels in a limited space, and transfer this heat of the burning process to the heat exchanger.

Proper ignition, combustion, and extinction are primarily due to burner design, orifice sizing, gas pressure, primary and secondary air, vent and proper seating of burners.

SERVICING



BECKETT BURNER

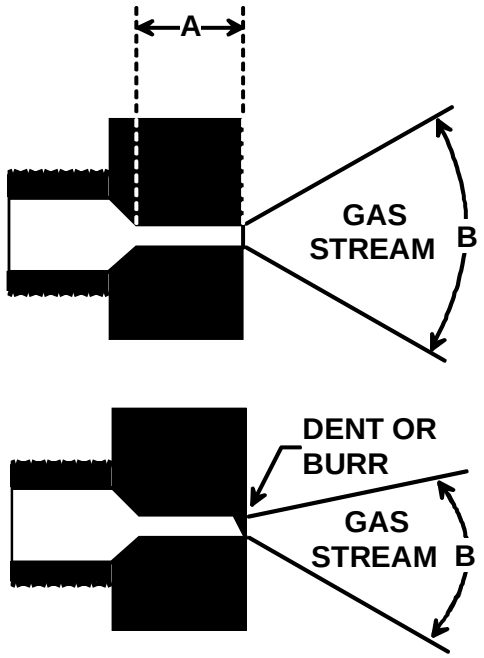
WARNING

DISCONNECT GAS AND ELECTRICAL POWER SUPPLY.

In checking main burners, look for signs of rust, oversized and undersized carry-over ports restricted with foreign material, etc.

S-306 Checking Orifices

A predetermined fixed gas orifice is used in all of these furnaces. That is an orifice which has a fixed bore and position.



The length of Dimension "A" determines the angle of Gas Stream Defraction, "B".

A dent or burr will cause severe deflection of gas stream. No resizing should be attempted until all factors are taken into consideration such as inlet manifold gas pressure, alignment, and positioning, specific gravity and BTU content of the gas being consumed.

The only time resizing is required is when a reduction in firing rate is required for an increase in altitude.

Orifices should be treated with care in order to prevent damage. They should be removed and installed with a box-end wrench in order to prevent distortion. In no instance should an orifice be peened over and redrilled. This will change the angle or deflection of the vacuum effect or entraining of primary air, which will make it difficult to adjust the flame properly. This same problem can occur if an orifice spud of a different length is substituted.

WARNING

DISCONNECT GAS AND ELECTRICAL POWER SUPPLY.

1. Check orifice visually for distortion and/or burrs.
2. Check orifice size with orifice sizing drills.
3. If resizing is required, a new orifice of the same physical size and angle with proper drill size opening should be installed.

S-307 Checking Gas Pressure

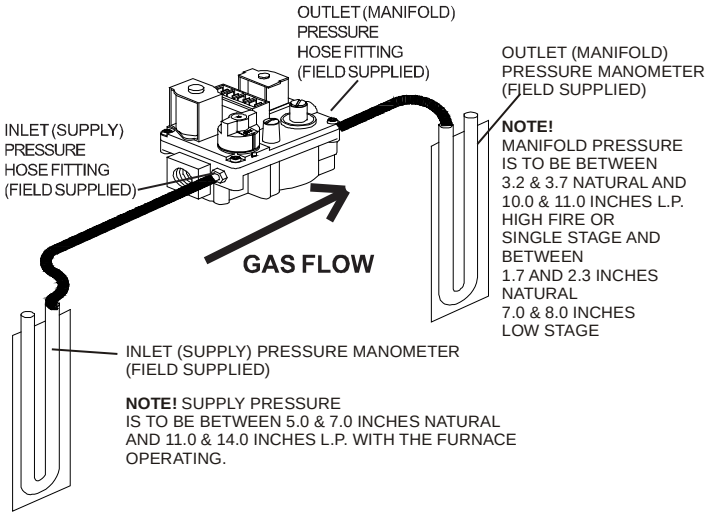
Gas inlet and manifold pressures should be checked and adjusted in accordance to the type of fuel being consumed.

WARNING

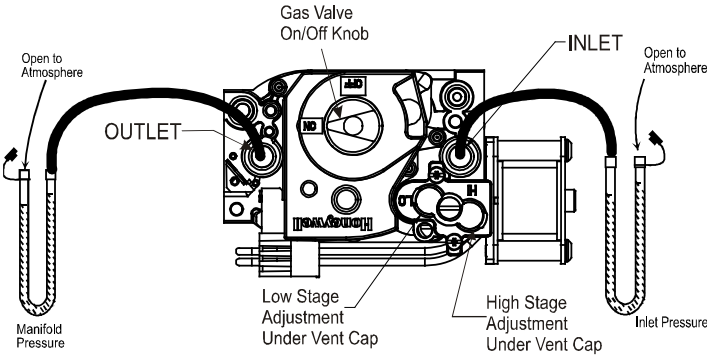
DISCONNECT GAS AND ELECTRICAL POWER SUPPLY.

1. Connect a water manometer or adequate gauge to the inlet pressure fitting of the gas valve.
2. Remove the pressure tap fitting at the manifold if provided or check at the gas valve outlet fitting and connect another manometer or gauge.

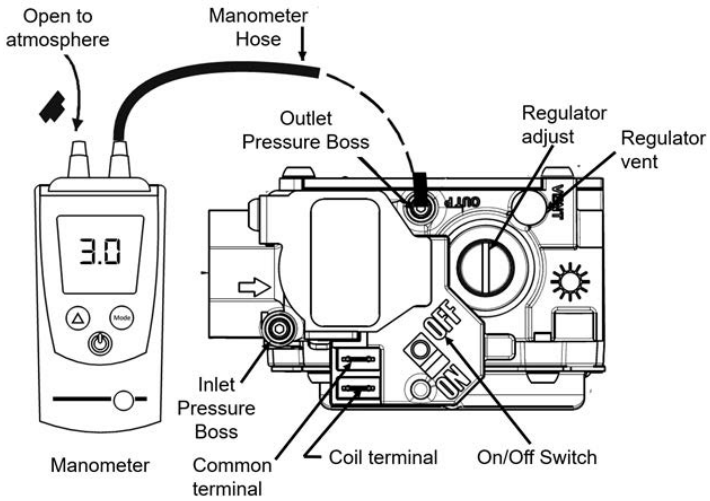
SERVICING



TWO-STAGE H VALVE MEASURING INLET AND MANIFOLD GAS PRESSURE



HONEYWELL 2 STAGE GAS VALVE



ULN 2 STAGE GAS VALVE

With Power ON:

WARNING

LINE VOLTAGE NOW PRESENT.

3. Put unit into heating cycle and turn on all other gas consuming appliances.

For **NATURAL GAS:**

A. Inlet pressure should be a nominal 7” w.c.
B. (2 stage heat models only) Manifold pressure on low stage should be 2.0” w.c. ± 3” w.c.
C. Manifold pressure for single stage heat models and 2 stage heat models on high stage should be 3.5” ± .3”w.c.

For **PROPANE GAS:**

A. Inlet pressure should be a nominal 11” w.c.
B. (2 stage heat models only) Manifold pressure for 2 stage heating models on low stage should be 6” w.c.
C. Manifold pressure for single stage heat models and 2 stage heat models on high stage should be 10” w.c.

For **ULN:**

MANIFOLD GAS PRESSURE 2 Stage Heat Models			
Gas		Range	Nominal
Natural	Low Stage	1.6 - 2.2" w.c.	2.0" w.c.
	High Stage	3.2 - 3.8" w.c.	3.5" w.c.
Propane	Low Stage	5.7 - 6.3" w.c.	6.0" w.c.
	High Stage	9.7 - 10.3" w.c.	10.0" w.c.
ULN	Natural	2.7 - 3.3" w.c.	3.0" w.c

If operating pressures differ from chart, make necessary pressure regulator adjustments, check piping size, etc., and/or consult with local utility.

S-308 Checking For Delayed Ignition

Delayed ignition is a delay in lighting a combustible mixture of gas and air which has accumulated in the combustion chamber.

When the mixture does ignite, it may explode and/or rollout causing burning in the burner venturi.

If delayed ignition should occur, the following should be checked:

1. Improper gas pressure - adjust to proper pressure. (See S-307)
2. Improper burner positioning - burners should be in locating slots, level front to rear and left to right.
3. Carry over (lighter tube or cross lighter) obstructed - clean.

4. Main burner orifice(s) deformed, or out of alignment to burner - replace.

S-308B Checking For Delayed Ignition (ULN Only)

Delayed ignition is a delay in lighting a combustible mixture of gas and air which has accumulated in the combustion chamber. When the mixture does ignite, it may cause hard ignition in the burner causing a loud sound.
If delayed ignition should occur, the following should be checked:

1. Improper gas pressure - adjust to proper pressure. (See S-307)
2. Improper ignitor grounding or deposits on the ignitor leads – Ensure the ground wire is firmly connected to the ignitor. Also ensure there are no white deposits anywhere near the spark gap.
3. Change the ignitor if the above troubleshooting doesn't help.

S-309 Checking For Flashback

Flashback will also cause burning in the burner venturi, but is caused by the burning speed being greater than the gas-air flow velocity coming from a burner port.

Flashback may occur at the moment of ignition, after a burner heats up or when the burner turns off. The latter is known as extinction pop.

Since the end results of flashback and delayed ignition can be the same (burning in the burner venturi) a definite attempt should be made to determine which has occurred.

If flashback should occur, check for the following:

1. Improper gas pressure - adjust to proper pressure. See S-307.
2. Check burner for proper alignment and/or replace burner.
3. Improper orifice size - check orifice for obstruction.

S-310 Checking Pressure Control

A pressure control device is used to measure negative pressure at the induced draft blower motor inlet to detect a partial or blocked flue.

Pressure Switch Operation (DSI Direct Spark System)

The pressure switch is ignored unless there is a call for heat. When the control receives a call for heat, the control checks to see that the pressure switch is open. If the control sees that the pressure switch is closed before the induced draft blower is energized, the LED will flash a code of "2" (to indicate the pressure switch is stuck closed) and the inducer will remain off until the pressure switch opens. If the pressure switch opens before the ignition period, the induced draft blower will remain on and the control will stay in pre-purge until the pressure switch is closed for an entire 15 second pre-purge period. The LED will flash a code of "3" to indicate open pressure switch.

If the pressure switch opens after the gas valve has been energized, the control will de-energize the gas valve and run the indoor blower through the heat off delay. The inducer stays on until the pressure switch re-closes. Then the control makes another ignition attempt.

WARNING

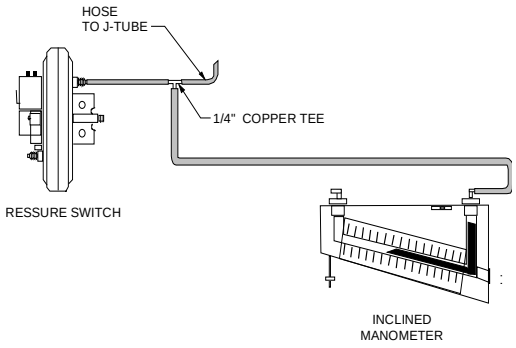
HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



1. Remove wires from the electrical terminals.
2. Using a VOM check from Common to NO (Normally Open) - should read open.

If switch reads as noted proceed to Step 3, otherwise replace control.

3. Remove the pressure control hose from the control and interconnect with an inclined manometer as shown:



Reconnect wires to the Common and NO terminals.

With Power ON:

WARNING

LINE VOLTAGE NOW PRESENT.

4. Energize furnace for heating cycle. The induced draft blower motor will begin to run. The inclined manometer should read approximately -1.2" ± 0.3" W.C with no combustion.
5. Remove and check the two electrical wires and using the VOM check from Common to NO (Normally Open), it should read closed (with I.D. motor running). If not as above, replace pressure control.
6. Reconnect all wires to the control and place in heating cycle.
7. As the unit fires on high stage, the inclined manometer negative pressure will drop to -0.9" ± 0.3" W.C.
8. If not as listed, replace control.

NOTE: The pressure switch must be mounted with the diaphragm in a vertical position.

S-311 High Altitude Application

IMPORTANT NOTE: The gas/electric units naturally derate with altitude. Do not attempt to increase the firing rate by changing orifices or increasing the manifold pressure. This can cause poor combustion and equipment failure. At all altitudes, the manifold pressure must be within 0.3 inches W.C. of that listed on the nameplate for the fuel used. At all altitudes and with either fuel, the air temperature rise must be within the range listed on the unit nameplate. Refer to the Installation Manual provided with the LP kit for conversion from natural gas to propane gas and for altitude adjustments.

When this package unit is installed at high altitude, the appropriate High Altitude orifice kit must be installed. As altitude increases, there is a natural reduction in the density of both the gas fuel and combustion air. This kit will provide the proper design certified input rate within the specified altitude range. High altitude kits are not approved for use in Canada. For installations above 2,000 feet, use kit HAKT36300. The HAKT36300 kit is used for both Natural and LP gas at high altitudes.

Use LPKT180300A propane conversion kit for propane conversions at altitudes below 2000 feet. Natural gas installations below 2000 feet do not require a kit.

For propane conversions above 2000 feet, high altitude kit HAKT36300 is required in addition to LPKT180300A propane conversion kit.

NATURAL GAS AND LP GAS INSTALLATIONS AT ALTITUDES > 2000 FT.

INPUT/BURNER	HIGH ALTITUDE KIT	35,000 BTUH NAT/33,000 BTUH/L.P. ELEVATION ABOVE SEA-LEVEL (FEET)							
		2000	3000	4000	4500	5000	6000	7000	8000
U.S. BURNER ORIFICE	HAKT36300	35/53	36/53	36/53	-	37/53	37/53	38/53	39/54
CANADA BURNER ORIFICE	HAKT36300	35/53	-	-	39/54	-	-	-	-

INPUT/BURNER	HIGH ALTITUDE KIT	50,000 BTUH NAT/45,000 BTUH/L.P. ELEVATION ABOVE SEA-LEVEL (FEET)							
		2000	3000	4000	4500	5000	6000	7000	8000
U.S. BURNER ORIFICE	HAKT36300	29/48	30/48	30/49	-	30/49	30/49	31/50	31/50
CANADA BURNER ORIFICE	HAKT36300	29/48	-	-	31/50	-	-	-	-

Use HAUL100 (for 100,000 BTU/h models) and HAUL6080 (for 60,000 and 80,000 BTU/h models) high altitude kits for ULN model installations above 4500 ft. Manifold pressure adjustments and ID Plug changes are required as per IO supplied in the kit.

S-313 Testing Ignition Control Module

NOTE: Failure to earth ground the unit, reversing the neutral and hot wire connection to the line (polarity), or a high resistance connection in the ground or neutral lines may cause the control to lockout due to failure to detect flame.

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



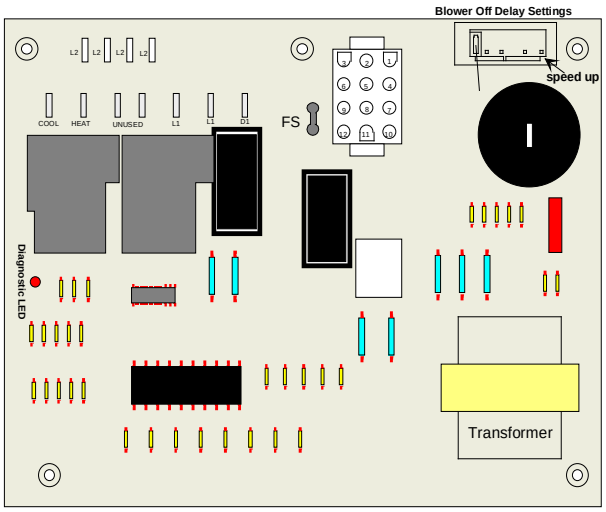
The ground wire must run from the unit all the way back to the electrical panel. Proper grounding can be confirmed by disconnecting the electrical power and measuring resistance between the neutral (white) connection and the burner closest to the flame sensor. Resistance should be less than 10 ohms.

DSI Direct Spark Ignition Systems

NORMAL SEQUENCE OF OPERATION (DSI Direct Spark Ignition System)

1. Thermostat calls for heat by energizing "W". The control checks the pressure switch for open condition. If the pressure switch is closed the control will flash code "3" and wait for the pressure switch to open.
2. The induced draft motor is energized and the control flashes code "2" and waits for the pressure switch to close. Once the pressure switch is closed, the LED stops flashing and the control begins timing the 15 second pre-purge.

SERVICING



DSI Control Board

3. The control energizes the spark igniter and gas valve for 7 seconds. If flame is established, the control goes into a 30 second heat on delay.
4. The indoor blower is energized at the heat speed after a 30 second on delay.
5. The control monitors the safety circuit inputs, flame, and thermostat during operation.
6. When the thermostat is satisfied, the gas valve is de-energized and the induced draft blower remains on for a 29 second post purge. The indoor blower remains on for the selected heat blower off delay (90, 120, or 150 seconds). Indoor blower off timing begins when thermostat call for heat ends.

Testing Direct Spark Ignition (DSI) systems

Thermostat calling for heat (15 second prepurge time and 7 second trial for ignition).

1. Check for 230 VAC from L1 terminal of control module to L2. No voltage - check wire connections, continuity, etc.
2. Check for 24 VAC at "R" to "C" thermostat terminals.
   A. No voltage - check 3 amp automotive type fuse on control board. A blown fuse would indicate a short in the 24 VAC circuit (thermostat or limit circuit).
   B. Voltage Present - check limit, auxiliary limit and rollout (S-300, S-301 and S-302). If limit, auxiliary limit and rollout are closed, then check for 24 VAC at the gas valve terminals.
   C. No 24 VAC at gas valve - replace Control board.

TROUBLESHOOTING

Ignition Control Error Codes

The following presents probable causes of questionable unit operation. Refer to *Diagnostic Indicator Chart* for an interpretation of the signal and to this section for an explanation.

Remove the control box access panel and note the number of diagnostic LED flashes. Refer to *Diagnostic Indicator Chart* for an interpretation of the signal and to this section for an explanation.

Internal Control Failure

If the integrated ignition control in this unit encounters an internal fault, it will go into a "hard" lockout and turn off the diagnostic LED. If diagnostic LED indicates an internal fault, check power supply to unit for proper voltage, check all fuses, circuit breakers and wiring. Disconnect electric power for five seconds. If LED remains off after restoring power, replace control.

Abnormal Operation - Heating Codes

External Lockout (1 FLASH CODE)

An external lockout occurs if the integrated ignition control determines that a measurable combustion cannot be established within three (3) consecutive ignition attempts.

If flame is not established within the seven (7) second trial for ignition, the gas valve is deenergized, 15 second inter-purge cycle is completed, and ignition is reattempted. The control will repeat this routine three times if a measurable combustion is not established. The control will then shut off the induced draft blower and go into a lockout state.

If flame is established but lost, the control will energize the circulator blower at the heat speed and then begin a new ignition sequence. If flame is established then lost on subsequent attempts, the control will recycle for four (4) consecutive ignition attempts (five attempts total) before locking out.

SERVICING

The diagnostic fault code is 1 flash for a lockout due to failed ignition attempts or flame dropouts. The integrated control will automatically reset after one hour, or it can be reset by removing the thermostat signal or disconnecting the electrical power supply for over five seconds. If the diagnostic LED indicates an external lockout, perform the following checks:

- *Check the supply and manifold pressures*
- *Check the gas orifices for debris*
- *Check gas valve for proper operation*
- *Check secondary limit*
  A dirty filter, excessive duct static, insufficient air flow, a faulty limit, or a failed circulator blower can cause this limit to open. Check filters, total external duct static, circulator blower motor, blower motor speed tap (see wiring diagram), and limit. An interruption in electrical power during a heating cycle may also cause the auxiliary limit to open. The automatic reset secondary limit is located on top of the circulator blower assembly.
- *Check rollout limit*
  If the burner flames are not properly drawn into the heat exchanger, the flame rollout protection device will open. Possible causes are restricted or blocked flue passages, blocked or cracked heat exchanger, a failed induced draft blower, or insufficient combustion air. The rollout protection device is a manual reset limit located on the burner bracket. The cause of the flame rollout must be determined and corrected before resetting the limit.
- *Check flame sensor*
  A drop in flame signal can be caused by nearly invisible coating on the sensor. Remove the sensor and carefully clean with steel wool.
- *Check wiring*
  Check wiring for opens/shorts and mis-wiring.

IMPORTANT: If you have to frequently reset your gas/ electric package unit, it means that a problem exists that should be corrected. Contact a qualified servicer for further information.

Pressure Switch Stuck Open (2 FLASH CODE)
A pressure switch stuck open can be caused by a faulty pressure switch, faulty wiring, a disconnected or damaged hose, a blocked or restricted flue, or a faulty induced draft blower.

If the control senses an open pressure switch during the pre-purge cycle, the induced draft blower only will be energized. If the pressure switch opens after ignition has begun the gas valve is deenergized, the circulator blower heat off cycle begins, and the induced draft blower remains on. The diagnostic fault code is two flashes.

Pressure Switch Stuck Closed (3 FLASH CODE)
A stuck closed pressure switch can be caused by a faulty pressure switch or faulty wiring. If the control encounters a pressure switch stuck closed, the induced draft blower remains off. The diagnostic LED code for this fault is three (3) flashes.

Open Thermal Protection Device (4 FLASH CODE)
If the primary limit switch opens, the gas valve is immediately deenergized, the induced draft and air circulating blowers are energized. The induced draft and air circulator blowers remain energized until the limit switch re-closes. The diagnostic fault code for an open limit is four (4) flashes.

A primary limit will open due to excessive supply air temperatures. This can be caused by a dirty filter, excessive duct static, insufficient air flow, or a faulty limit. Check filters, total external duct static, blower motor, blower motor speed tap (see wiring diagram), and limit. This limit will automatically reset once the temperature falls below a preset level.

Flame Detected with Gas Valve Closed (5 FLASH CODE)
If flame is detected with the gas valve deenergized, the combustion and air circulator blowers are energized. The diagnostic fault code is five (5) flashes for this condition. The control can be reset by removing the power supply to the unit or it will automatically reset after one hour. Mis-wiring is the probable cause for this fault.

Abnormal Operation - Heating Codes

Resetting From Lockout (ULN ONLY)
An external lockout occurs if the integrated ignition control determines that a measurable combustion cannot be established within three (3) consecutive ignition attempts. If flame is not established within the four (4) second trial for ignition, the gas valve is de-energized, 30 second inter-purge cycle is completed, and ignition is re-attempted. The control will repeat this routine three times if a measurable combustion is not established. The control will then shut off the induced draft blower and go into a lockout state.

If flame is established but lost, the control will energize the circulator blower at the heat speed and then begin a new ignition sequence. If flame is established then lost on subsequent attempts, the control will recycle the ignition sequence.

SERVICING

The diagnostic fault code is 1 flash for a lockout due to failed ignition attempts. The integrated control will automatically reset after one hour, or it can be reset by removing the thermostat signal or disconnecting the electrical power supply for over five seconds.

Important Note: If you have to frequently reset your gas/electric package unit, it means that a problem exists that should be corrected. Contact a qualified servicer for further information.

Pressure Sensor

The pressure sensor is mounted in the control box and connected to the induced draft blower. Its function is to regulate the induced draft blower's speed in order to maintain proper air-fuel ratio for clean and reliable combustion. The electrical output signal from the sensor is expected to be proportional to the magnitude of the differential pressure between the inducer inlet negative pressure and the ambient air pressure. The pressure sensor also guards against insufficient airflow (combustion air and flue products) through the heat exchanger.

At the beginning of a call for heat, the control ensures the inducer is in an off state, then checks the pressure sensor output for the proper null offset value. If the pressure sensor output is outside the acceptable range for the null value, the control enters a five minute lockout. After the lockout timer has expired, the control resumes normal operation.

During inducer operation, including all operating modes except for the null test, the control monitors the pressure sensor output for expected values. The control limits during normal operation are expected to be within certain tolerances of the target pressures. In response to a pressure sensor span error, the control enters a five minute lockout. After the lockout timer has expired, the control resumes normal operation.

Primary Limit

A primary limit will open due to excessive supply air temperatures. This can be caused by a dirty filter, excessive duct static, insufficient air flow, or a faulty limit. Check filters, total external duct static, blower motor, blower motor speed tap (see wiring diagram), and limit. This limit will automatically reset once the temperature falls below a preset level.

If a limit switch opens, the gas valve is immediately de-energized, the induced draft and air circulating blowers are energized. The induced draft and air circulator blowers remain energized for 5 minutes or until the limit switch re-closes, whichever happens first.

NOTE: If the primary limit opens three (3) times within the same call for heat, the ignition control will lock out for one (1) hour with the air circulating blower energized at heating speed.

Flame Detected with Gas Valve Closed

If flame is detected with the gas valve de-energized, the combustion and air circulator blowers are energized. The control can be reset by removing the power supply to the unit or it will automatically reset after one hour. Mis-wiring is the probable cause for this fault. The initial lockout period is 5 minutes. After that time, the control continues to monitor the flame sense input and resumes normal operation when flame is no longer sensed.

Low Flame Signal

Under some conditions, the fuel or air supply can create a nearly invisible coating on the flame sensor. This coating acts as an insulator causing a drop in the flame signal. If the flame signal drops below a predetermined value, the ignition control will display an error code of (1) flash on the amber diagnostic LED. The unit will continue to operate until the control can no longer detect flame.

Burner Switch

The burner temperature switch is mounted on the burner assembly to monitor the burner box temperature. It is normally closed (electrically), auto-reset sensor. This switch guards against the burner flames not being properly drawn into the heat exchanger.

The control senses an open blocked burner switch, indicating that the burner temperature/pressure has exceeded its set point. The control de-energizes the gas valve, energizes the inducer to the pre-purge setting and energizes the indoor blower. The initial lockout period is five minutes. After this time elapses, the control evaluates the state of the blocked burner switch. If the switch is closed, the control resumes normal operation. The control will enter a one hour lockout state if the blocked burner switch fails to reset before the recovery timer has expired.

SERVICING

ID Plug

The control operational parameters are stored in ID Plug which connects on the circuit board. The control requires a valid ID plug present to operate in heating mode. If a valid ID plug is not present the control will not respond to a call for heat. However, the control will respond to thermostat inputs "Y" or "G", operating the appropriate fan output. The cooling delays are ignored in this operating mode. The control puts the burner into hard lockout and will not respond to heating requests until the power is cycled with a valid ID plug installed.

NOTE: Some electronic thermostats also have a built-in compressor short cycle timer that may be longer than the three minute delay given above. If you are using an electronic thermostat and the compressor has not started after three minutes, wait an additional five minutes to allow the thermostat to complete its short cycle delay time.

The status light on the furnace control may be used as a guide to troubleshooting this appliance. Some more useful status light codes are below:

[1] The fault condition must be cleared for 30 seconds before normal operation can resume. A power cycle will also reset any lockout.

Abnormal Operation - Cooling Codes

Short Cycle Compressor Delay (6 FLASH CODE)

The automatic ignition control has a built-in feature that prevents damage to the compressor in short cycling situations. In the event of intermittent power losses or intermittent thermostat operation, the ignition control will delay output to the compressor contactor for three minutes from the time power is restored. (Compressor is off a total of three minutes). The diagnostic LED will flash six (6) times to indicate the compressor contactor output is being delayed.

NOTE: Some electronic thermostats also have a built-in compressor short cycle timer that may be longer than the three minute delay given above. If you are using an electronic thermostat and the compressor has not started after three minutes, wait an additional five minutes to allow the thermostat to complete its short cycle delay time.

NOTE: The flash rate is 0.25 seconds on, 0.25 seconds off, with a 2-second pause between codes.

S-314 Checking Flame Sensor

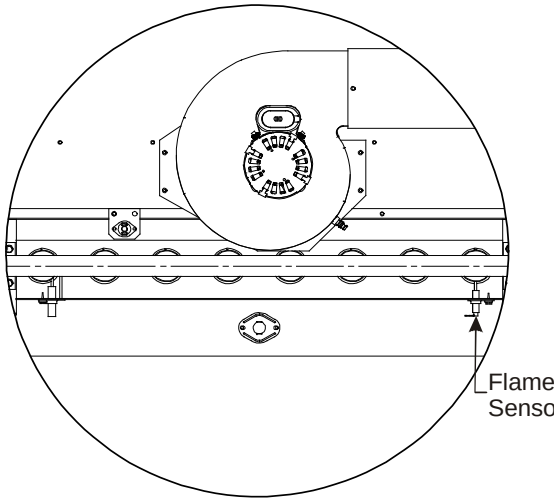
A flame sensing device is used in conjunction with the ignition control module to prove combustion. If a microamp signal is not present the control will de-energize the gas valve and "retry" for ignition or lockout.

DSI DIRECT SPARK IGNITION SYSTEMS

WARNING

HIGH VOLTAGE
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

1. Disconnect the flame sensor wire from terminal FS of the ignition control module.



Flame Sensor

2. Connect a microamp meter in series with this wire and terminal FS.
3. Be sure the negative side of the meter is to the wire and the positive of the meter is to terminal FS.
4. Turn on Power.

WARNING

LINE VOLTAGE NOW PRESENT.

5. With Power ON, Place the unit into a heating cycle.
6. As soon as flame is established a microamp reading should be evident once proof of flame (microamp reading) is established, the hot surface ignitor will be de-energized.

SERVICING

7. The microamp reading should be 4 - 6 microamps.
8. If the microamp current is less than 0.5 microamp the control will lockout and flash a code of 1 flash after attempting to reestablish flame sense.
9. If the microamp reading is less than the minimum specified, check for high resistance wiring connections, the distance (3/16") between the sensor and burner, flame sensor connections, dirty flame sensor or poor grounding.
10. If no reading, check for continuity on all components and if good - replace ignition control module.

NOTE: Contaminated fuel or combustion air can create a nearly invisible coating on the flame sensor. This coating works as an insulator causing a loss in the flame sense signal. If this situation occurs the flame sensor must be cleaned with steel wool. Do not use sand paper, the silicone in sand paper will further contaminate the sensor.

PCBBL216 ULN CONTROL ERROR CODES

LED ACTIVITY	DESCRIPTION	COLOR	MINIMUM LOCKOUT PERIOD[1]	LED ACTIVITY	DESCRIPTION	COLOR	MINIMUM LOCKOUT PERIOD[1]	LED ACTIVITY	DESCRIPTION	COLOR	MINIMUM LOCKOUT PERIOD[1]
LED OFF	NO 24 VAC POWER TO CONTROL	-	N/A	6 FLASHES	NORMALLY CLOSED BLOCKED BURNER SWITCH/AUXILLARY SWITCH OPEN	RED	MAXIMUM RECOVERY PERIOD - 1 HOUR IF TIME EXCEEDED	2 FLASHES	ID PLUG FAILURE	AMBER	HARD LOCKOUT HEATING MODE
RED, AMBER, GREEN	POWER-UP VERIFICATION OF LED	-	N/A	7 FLASHES	GAS VALVE CIRCUIT SHORTED	RED	1 HOUR	3 FLASHES	CONTROL FUSE OPEN	AMBER	5 MINUTES
STEADY ON	CONTROL FAULT DETECTED	RED	1 HOUR OR HARD LOCKOUT	8 FLASHES	RESERVED	RED	-	STEADY ON	STANDBY NORMAL OPERATION NO THERMOSTAT REQUESTS	GREEN	N/A
1 FLASH	RETRIES EXCEEDED	RED	1 HOUR FIXED	10 FLASHES	HIGH LIMIT SWITCH RECOVERY TIMER EXPIRED	RED	1 HOUR OR HARD LOCKOUT	RAPID FLASH	CLEAR ERROR HISTORY	GREEN	N/A
2 FLASHES	PRESSURE SENSOR NULL ERROR	RED	5 MINUTES	STEADY ON	OEM FACTORY TEST MODE	AMBER	N/A	1 FLASH	CALL FOR HEATING	GREEN	N/A
3 FLASHES	PRESSURE SENSOR SPAN ERROR	RED	5 MINUTES	RAPID FLASH	FIELD TEST MODE	AMBER	N/A	2 FLASHES	CALL FOR COOLING	GREEN	N/A
4 FLASHES	HIGH LIMIT SWITCH OPEN	RED	MAXIMUM RECOVERY TIME - 1 HOUR AFTER MAX TRIPS EXCEEDED	1 FLASH	LOW FLAME SENSE	AMBER	N/A	3 FLASHES	CONTINUOUS FAN OPERATION	GREEN	N/A
5 FLASHES	FLAME PRESENT WITH GAS VALVE OFF	RED	5 MINUTES	-	-	-	-	-	-	-	-

ACCESSORIES

ECONOMIZER (JADE)

INTERFACE OVERVIEW

This Section describes how to use the Economizer's user interface for:

- Keypad and menu navigation
- Settings and parameter changes
- Menu structure and selection

User interface

The user interface consists of an LCD display and a 4-button keypad on the front of the economizer module. The LCD is a 16 character by 2 line dot matrix display.

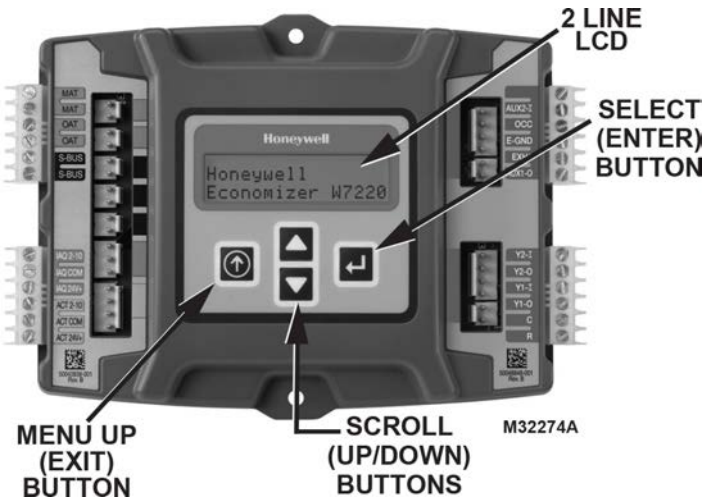


Figure 18 - Economizer LCD and Keypad Layout.

Keypad

The four navigation buttons shown in Figure 18 are used to scroll through the menus and menu items, select menu items, and change to parameter and configuration settings.

Using the Keypad with Menus

- To use the keypad when working with menus:
- Press the ▲ button to move to the previous menu.
- Press the ▼ button to move to the next menu.
- Press the ↵ button (Enter) to display the first item in the currently displayed menu.
- Press the ⓣ button (Menu up) to exit a menu's item and return to the list of menus.

Using the Keypad with Settings and Parameters

- To use the keypad when working with Setpoints, System and Advanced Settings, Checkout tests, and Alarms:
- Navigate to the desired menu.
- Press the ↵ Button (Enter) to display the first item in the currently displayed menu.
- Use the ▲ and ▼ buttons to scroll to the desired parameter.
- Press the ↵ button (Enter) to display the value of the currently displayed item.
- Press the ▲ button to increase (change) the displayed parameter value.[a]
- Press the ▼ button to decrease (change) the displayed parameter value.[a]
- Press the ↵ button to accept the displayed value and stores it in non-volatile RAM.
- CHANGE STORED displays.
- Press the ⓣ button (Menu Up/Exit) to return to the previous menu.

[a]When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

Menu Structure

Table 6 illustrates the complete hierarchy of menus and parameters for the JADE™ Economizer system.

The Menus in display order are:

- STATUS
- SETPOINTS
- SYSTEM SETUP
- ADVANCED SETUP
- CHECKOUT
- ALARMS

IMPORTANT

Table 6 illustrates the complete hierarchy.

Your menu parameters will be different depending on your configuration.

For example, if you do not have a DCV (CO_2) sensor then none of the DCV parameters appear and only MIN POS will display.

If you have a CO_2 sensor, the DCV MIN and DCV MAX will appear AND if you have 2-speed fan, DCV MIN (high and low speed) and DCV MAX (high and low speed will appear).

Setup and configuration

Before before placed into service, the JADE™ Economizer module must be setup and configured for the installed system.

IMPORTANT

During setup, the Economizer module is live at all times.

The setup process uses a hierarchical menu structure that is easy to use. You press the ▲ and ▼ arrow buttons to move forward and backward through the menus and press the ↵ button to select and confirm setup item changes.

Time-out and Screensaver

When no buttons have been pressed for 10 minutes, LCD displays a screen saver, which cycles through the Status items. Each Status items displays in turn and cycles to the next item after 5 seconds.

ECONOMIZER (JADE)

Menu Structure[a].

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
STATUS	ECON AVAIL	NO	YES/NO	YES = economizing available; the system can use Outdoor Air for free cooling when required.
	ECONOMIZING	NO	YES/NO	YES = Outdoor Air being used for 1st stage cooling.
	OCCUPIED	NO	YES/NO	YES = OCC signal received from space thermostat or unitary controller. YES = 24 Vac on terminal OCC No = 0 Vac on terminal OCC.
	HEAT PUMP	n/a[c]	COOL HEAT	Displays COOL or HEAT when system is set to heat pump (non-conventional)
	COOL Y1-IN	OFF	ON/OFF	Y1-I signal from space thermostat or unitary controller for cooling stage 1. ON = 24 Vac on term Y1-I OFF = 0 Vac on term Y1-I
	COOL Y1-OUT	OFF	ON/OFF	Cool Stage 1 Relay Output to mechanical cooling (Y1-OUT terminal).
	COOL Y2-IN	OFF	ON/OFF	Y2-I signal from space thermostat or unitary controller for second stage cooling. ON = 24 Vac on term Y2-I OFF = 0 Vac on term Y2-I
	COOL Y2-OUT	OFF	ON/OFF	Cool Stage 2 Relay Output to mechanical cooling (Y2-OUT terminal).
	MA TEMP	_ _._ °F	-40 to 150 °F	Displays value of measured mixed air from MAT sensor. Displays --.- if not connected, short, or out- of-range.
	DA TEMP	_ _._ °F	-40 to 150 °F	Displays when Discharge Air Sylk Bus sensor is connected and displays measured discharge air temperature. Displays --.-°F if sensor sends invalid value, if not connected, short or out-of-range.
	OA TEMP	_ _._ °F	-40 to 140 °F	Displays measured value of outdoor air temperature. Displays --°F if sensor sends invalid value, if not connected, short or out-of-range.
	OA HUM	_ _ %	0 to 100%	Displays measured value of outdoor humidity from OA Sylkbus sensor. Displays --% if not connected, short, or out- of-range.
	RA TEMP	_ _._ °F	0 to 140 °F	Displays measured value of return air temperature from RA Sylkbus sensor. Displays --°F if sensor sends invalid value, if not connected, short or out-of-range.
	RA HUM	_ _ %	0 to 100%	Displays measured value of return air humidity from RA Sylkbus sensor. Displays --% if sensor sends invalid value, if not connected, short or out-of-range.
	IN CO2	_ _ _ ppm	0 to 2000 ppm	Displays value of measured CO2 from CO2 sensor. Invalid if not connected, short or out-of-range. May be adjusted in Advanced menu by Zero offset and Span. See note on page 6 concerning C7632 sensor.
	DCV STATUS	n/a	ON/OFF	Displays ON if above setpoint and OFF if below setpoint, and ONLY if a CO2 sensor is connected.
	DAMPER OUT	2.0V	2.0 to 10.0 V	Displays output voltage or position to the damper actuator.[e]
	ACT POS	n/a	0 to 100%	Displays actual position of actuator.
	ACT COUNT	n/a	1 to 65,535	Displays number of times actuator has cycled. 1 Cycle equals the sum of 180° of movement in any direction.
	ACTUATOR	n/a	OK/Alarm (on Alarm menu)	Displays Error if voltage or torque is below actuator range
	EXH1 OUT	OFF	ON/OFF	Output of EXH1 terminal. Displays ON when damper position reaches programmed percentage setpoint. ON = 24 Vac Output; OFF = No Output.

ECONOMIZER (JADE)

Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
STATUS CONTINUED	EXH2 OUT	OFF	ON/OFF	Output of AUX1 O terminal Displays ON when damper position reaches programmed percentage setpoint ON = 24 Vac Output, OFF = No Output; displays only if AUX1 O = EXH2
	ERV	OFF	ON/OFF	Output of AUX1 O terminal, ON = 24 Vac Output, OFF = No Output; displays only if AUX1 O = ERV
	MECH COOL ON or HEAT STAGES ON	0	0, 1, or 2	Displays number of mechanical cooling stages that are active. Displays the stage of heat pump heating that is active.
	FAN SPEED	n/a	LOW or HIGH	Displays speed of fan on a 2-speed fan unit
	W (HEAT IN)	n/a	ON/OFF	Displays status of heat on a 2-speed fan unit.
SETPOINTS	MAT SET	53°F	38 to 70 °F; increment by 1	The economizer will modulate the OA damper to maintain the mixed air temperature at the setpoint.
	LOW T LOCK	32°F	-45 to 80 °F; increment by 1	Setpoint determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout. At or below the setpoint the Y1-O and Y2-O will not be energized on the controller.
	DRYBLB SET	63°F	48 to 80 °F; increment by 1	*Dry bulb setpoint will only appear if using dry bulb change over.* Setpoint determines where the economizer will assume outdoor air temperature is good for free cooling; e.g.; at 63 °F setpoint unit will economizer at 62 °F and below and not economize at 64 °F and above. There is a a 2 °F deadband.
	ENTH CURVE	ES3	ES1, ES2, ES3, ES4, or ES5	*ES curve will only appear if using enthalpy changeover.* Enthalpy boundary "curves" for economizing using single enthalpy. See page 22 for description of enthalpy curves.
	DCV SET	1100ppm	500 to 2000 ppm increment by 100	Displays ONLY if a CO2 sensor is connected. Setpoint for Demand Control Ventilation of space. Above the setpoint, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the setpoint.
	MIN POS	2.8 V	2 to 10 Vdc	Displays ONLY if a CO2 sensor is NOT connected.
				With 2-speed fan units MIN POS L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for MIN POS L is 3.2V and MIN POS H is 2.8V.
	VENTMAX	2.8 V	2 to 10 Vdc	Displays only if a CO2 sensor is connected. Used for Vbz (ventilation max cfm) setpoint. VENTMAX is the same setting as MIN POS would be if you did not have the CO2 sensor.
			100 to 9990 cfm increment by 10	If OA, MA RA and CO2 sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 cfm.
			2 to 10 Vdc	With 2-speed fan units VENTMAX L (low speed fan) and VENTMAX H (high speed fan) settings are required. Default for VENTMAX L is 3.2V and VENTMAX H is 2.8V.
	VENTMIN	2.25 V	2 to 10 Vdc	Displays only if CO2 sensor is connected. Used for Va (ventilation min cfm) setpoint. This is the ventilation requirement for less than maximum occupancy of the space.
			100 to 9990 cfm increment by 10	If OA, MA RA and CO2 sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 cfm.
			2 to 10 Vdc	With 2-speed fan units VENTMIN L (low speed fan) and VENTMIN H (high speed fan) settings are required. Default for VENTMIN L is 2.5V and VENTMIN H is 2.25V.
	ERV OAT SP[d]	32°F	0 to 50 °F; increment by 1	Only when AUX1 O = ERV

ECONOMIZER (JADE)

Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
SETPOINTS CONTINUED	EXH1 SET	50%	0 to 100%; increment by 1	Setpoint for OA damper position when exhaust fan 1 is powered by the economizer. With 2-speed fan units Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required. Default for Exh1 L is 65% and Exh1 H is 50%
	EXH2 SET	75%	0 to 100%; increment by 1	Setpoint for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX1 O is set to EHX2. With 2-speed fan units Exh2 L (low speed fan) and Exh2 H (high speed fan) settings are required. Default for Exh2 L is 80% and Exh2 H is 75%
SYSTEM SETUP	INSTALL	01/01/11		Display order = MM/DD/YY Setting order = DD, MM, then YY.
	UNITS DEG	°F	°F or °C	Sets economizer controller in degrees Fahrenheit or Celsius.
	EQUIPMENT	CONV	CONV HP	CONV = conventional. HP O/B = Enables Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller.
	AUX2 IN	n/a	Shutdown (SD) Heat (W1) HP(O) HP(B)	In CONV mode: SD = Enables configuration of shutdown (default); W = Informs controller that system is in heating mode. **NOTE: If using 2-speed fan mode, you must program CONV mode for W. Shutdown is not available in the two-speed fan mode.** In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on Heat.
	FAN SPEED	1 speed	1 speed/ 2 speed	Sets economizer controller for operation of 1 speed or 2 speed supply fan. The controller does not control the fan but positions the OA and RA dampers to the heating or cooling mode. See page 23 for modes and position. **NOTE: 2-speed fan option also needs Heat (W1) programmed in AUX 2 In.**
	FAN CFM	5000cfm	100 to 50000 cfm; increment by 100	This is the capacity of the RTU. The value is found on the label from the RTU manufacturer. The cfm of the fan is only used with DCV CAL ENABLE AUO
	AUX1 OUT	NONE	NONE ERV EXH2 SYS	• NONE = not configured (output is not used) • ERV= Energy Recovery Ventilator[d] • EXH2 = second damper position 24 Vac out for second exhaust fan. • SYS = use output as an alarm signal
	OCC	INPUT	INPUT or ALWAYS	When using a setback thermostat with occupancy out (24 Vac), the 24 Vac is input “INPUT” to the OCC terminal. If no occupancy output from the thermostat then change program to “ALWAYS” OR add a jumper from terminal R to OCC terminal.
	FACTORY DEFAULT	NO	NO or YES	Resets all set points to factory defaults when set to YES. LCD will briefly flash YES and change to NO but all parameters will change to factory default values.

ECONOMIZER (JADE)

Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
ADVANCED SETUP	MA LO SET	45 °F	35 to 65 °F; increment by 1°	Temp to activate Freeze Protection (close damper or modulate to MIN POS if temp falls below set value)
	FREEZE POS	CLO	CLO MIN	Damper position when freeze protection is active (closed or MIN POS).
	CO2 ZERO	0ppm	0 to 500 ppm; increment by 10	CO2 ppm level to match CO2 sensor start level.
	CO2 SPAN	2000ppm	1000 to 3000 ppm; increment by 50	CO2 ppm span to match CO2 sensor; e.g.; 500-1500 sensor output would be 500 CO2 zero and 1000 CO2 span. See note on page 6 for C7632 CO2 sensor.
	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4h or OFF	Delay after stage 2 for cool has been active. Turns on 2nd stage of mechanical cooling when economizer is 1st stage call and mechanical cooling is 2nd stage call. Allows three stages of cooling, 1 economizer and 2 mechanical. OFF = no Stage 3 cooling.
	SD DMPR POS	CLO	CLO OPN	Indicates shutdown signal from space thermostat or unitary controller. When controller receives 24 Vac input on the SD terminal in conventional mode, the OA damper will open if programmed for OPN and OA damper will close if programmed for CLO. All other controls, e.g., Y1-O, Y2-O, EXH1, etc. will shut off.
	DA LO ALM	45 °F	NONE 35°F to 65°F in 5°F increments	Used for alarm for when the DA air temperature is too low. Set lower range of alarm, below this temperature the alarm will show on the display.
	DA HI ALM	80 °F	NONE 70 °F to 180 °F in 5° F increments	Used for alarm for when the DA air temperature is too high. Set high range of alarm, above this temperature the alarm will show on the display
	DCVCAL ENA	MAN	MAN (manual) AUTO	Turns on the DCV automatic control of the dampers. Resets ventilation based on the RA, OA and MA sensor conditions. Requires all sensors (RA, OA, MA and CO2). This operation is not operable with a 2-speed fan unit.
	MAT T CAL	0.0 F°	+/-2.5F°	Allows for the operator to adjust for an out of calibration temperature sensor
	OAS T CAL	0.0F°	+/-2.5F°	Allows for the operator to adjust for an out of calibration temperature sensor
	OAS H CAL	0% RH	+/-10% RH	Allows for the operator to adjust for an out of calibration humidity sensor
	RA T CAL	0.0F°	+/-2.5F°	Allows for the operator to adjust for an out of calibration temperature sensor
	RA H CAL	0% RH	+/-10% RH	Allows for the operator to adjust for an out of calibration humidity sensor
	DA T CAL	0.0 F°	+/-2.5F°	Allows for the operator to adjust for an out of calibration temperature sensor
	2SP FAN DELAY	5 Minutes	0 to 20 minutes in 1 minute increments.	When in economizing mode this is the delay for the high speed fan to try to satisfy the call for second stage cooling before the first stage mechanical cooling is enabled.

Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
CHECKOUT[f]	DAMPER MINIMUM POSITION	n/a	n/a	The checkout for the damper minimum positions is based on the system. See Table 6.
	DAMPER OPEN	n/a	n/a	Positions damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure you pause in this mode to allow for exhaust contacts to energize due to the delay in the system.
	DAMPER CLOSE	n/a	n/a	Positions damper to the fully closed position.
	CONNECT Y1-O	n/a	n/a	Closes the Y1-O relay (Y1-O). See **CAUTION** on page 31
	CONNECT Y2-O	n/a	n/a	Closes the Y2-O relay (Y2-O). See **CAUTION** on page 31
	CONNECT AUX1-O	n/a	n/a	Energizes the AUX1-O output. If AUX1-O setting is: • NONE – no action taken • ERV – 24 Vac out. Turns on or signals an ERV that the conditions are not good for economizing but are good for ERV operation.[d] • SYS – 24 Vac out. Issues a system alarm.
	CONNECT EXH1	n/a	n/a	Closes the power exhaust fan 1 relay (EXH1)
ALARMS(#)				**Alarms display only when they are active. The menu title "ALARMS (#)" includes the number of active alarms in parenthesis (). When using SYLK bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen.**
	MA T SENS ERR	n/a	n/a	Mixed air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	CO2 SENS ERR	n/a	n/a	CO2 sensor has failed, gone out of range or become disconnected - check wiring then replace sensor if the alarm continues
	OA SYLK T ERR	n/a	n/a	Outdoor air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	OA SYLK H ERR	n/a	n/a	
	RA SYLK T ERR	n/a	n/a	Return air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	RA SYLK H ERR	n/a	n/a	
	DA SYLK T ERR	n/a	n/a	Discharge air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	OA SENS T ERR	n/a	n/a	Outdoor air temperature sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues
	ACT ERROR	n/a	n/a	Actuator has failed or become disconnected - check for stall, over voltage, under voltage and actuator count. Replace actuator if damper is moveable and supply voltage is between 21.6 V and 26.4 V. Check actuator count on STATUS menu.
	FREEZE ALARM	n/a	n/a	Check if outdoor temperature is below the LOW Temp Lockout on setpoint menu. Check if Mixed air temperature on STATUS menu is below the Lo Setpoint on Advanced setup menu. When conditions are back in normal range then the alarm will go away.
	SHUTDOWN ACTIVE	n/a	n/a	AUX2 IN is programmed for SHUTDOWN and 24 V has been applied to AUX 2IN terminal
	DMP CAL RUNNING	n/a	n/a	If DCV Auto enable has been programmed, when the Jade is completing a calibration on the dampers, this alarm will display. Wait until the calibration is completed and the alarm will go away. Must have OA, MA and RA sensors for DCV calibration; set up is in the Advanced setup menu
	DA SENS ALM	n/a	n/a	Discharge air temperature is out of the range set in the ADVANCED SETUP Menu. Check the temperature of the discharge air.

Menu Structure[a]. (Continued)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment[b]	Notes
ALARMS(#) CONTINUED	SYS ALARM	n/a	n/a	When AUX1-O is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-O terminal has 24 Vac out.
	ACT UNDER V	n/a	n/a	Voltage received by Actuator is above expected range
	ACT OVER V	n/a	n/a	Voltage received by Actuator is below expected range
	ACT STALLED	n/a	n/a	Actuator stopped before achieving commanded position
FEATURES ADJUSTABLE ONLY BY USE OF THE W7220 PC MOD TOOL				
	ACT STALL ALARM SUPPRESSION	Disabled	Enabled or Disabled	If enabled this feature allows the operator to suppress the stall alarm in a specific range of the actuator stroke.
	FACTORY DEFAULTS	n/a	n/a	Allows the operator to hide the factory default menu item using the PC Tool.

[a] Table 5 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO_2) sensor, then none of the DCV parameters appear.

[b] When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

[c] n/a = not applicable

[d] ERV Operation: When in Cooling mode AND the conditions are NOT OK for economizing - the ERV terminal will be energized. In the Heating mode the ERV terminal will be energized when the OA is below the ERV OAT setpoint in the setpoint menu.

[e] When used with Honeywell communicating actuator the damper out is reported in XX.X% open versus XX.X Vdc.

[f] After 10 minutes without a command or mode change, the controller will change to normal operation.

Table 6. Damper minimum position settings and readings on checkout menu.

Fan Speed	Demand Control Ventilation (CO2 Sensor)	Setpoints	Checkout
1	NO	MIN POS	VMAX-HS
1	NO	N/A	N/A
2	NO	MIN POS H	VMAX-HS
2	NO	MIN POS L	VMAX-LS
1	YES	VENT MIN	VMIN-HS
1	YES	VENT MAX	VMAX-HS
2	YES	VENT MIN H	VMIN-HS
2	YES	VENT MAX H	VMAX-LS
2	YES	VENT MINL	N/A
2	YES	VENT MAX L	N/A

ECONOMIZER (JADE)

SEQUENCE OF OPERATION

Dry Bulb Operation No DCV (CO2 sensor) - 1 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	24-v/On	0-v/Off	MIN POS	Closed
		On	On	High	24-v/On	24-v/On	MIN POS	Closed
None	Yes	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	0-v/Off	0-v/Off	MIN POS to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	MIN POS to Full-Open	Closed to Full-Open

[a] With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Dry Bulb Operation With DCV (CO2 sensor) - 1 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below CO2 set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN to Full-Open	Closed to Full-Open
Above CO2 set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN to VENTMAX	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN to Full-Open	Closed to Full-Open

[a] With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

ECONOMIZER (JADE)

Enthalpy Operation No DCV (CO2 sensor) - 1 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	24-v/On	0-v/Off	MIN POS	Closed
		On	On	High	24-v/On	24-v/On	MIN POS	Closed
None	Yes	Off	Off	High	0-v/Off	0-v/Off	MIN POS	Closed
		On	Off	High	0-v/Off	0-v/Off	MIN POS to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	MIN POS to Full-Open	Closed to Full-Open

[a] With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Enthalpy Operation With DCV (CO2 sensor) - 1 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN to Full-Open	Closed to Full-Open
Above set	No	Off	Off	High	0-v/Off	0-v/Off	VENTMIN to VENTMAX	Closed
		On	Off	High	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	High	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	High	0-v/Off	0-v/Off	VENTMIN to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	VENTMIN to Full-Open	Closed to Full-Open

[a] With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

ECONOMIZER (JADE)

Dry Bulb Operation No DCV (CO2 sensor) - 2 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
None	No	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	24-v/On	0-v/Off	MIN POS L	Closed
		On	On	High	24-v/On	24-v/On	MIN POS H	Closed
None	Yes	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	0-v/Off	0-v/Off	MIN POS L to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	MIN POS H to Full-Open	Closed to Full-Open

[a]With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

Dry Bulb Operation With DCV (CO2 sensor) - 2 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN H to Full-Open	Closed to Full-Open
Above set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	VENTMIN H to Full-Open	Closed to Full-Open

[a]With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

Enthalpy Operation No DCV (CO2 sensor) - 2 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
NO CO2 SENSOR	No	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	24-v/On	0-v/Off	MIN POS L	Closed

ECONOMIZER (JADE)

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
		On	On	High	24-v/On	24-v/On	MIN POS H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	MIN POS L	Closed
		On	Off	Low	0-v/Off	0-v/Off	MIN POS L to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	MIN POS H to Full-Open	Closed to Full-Open

[a]With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

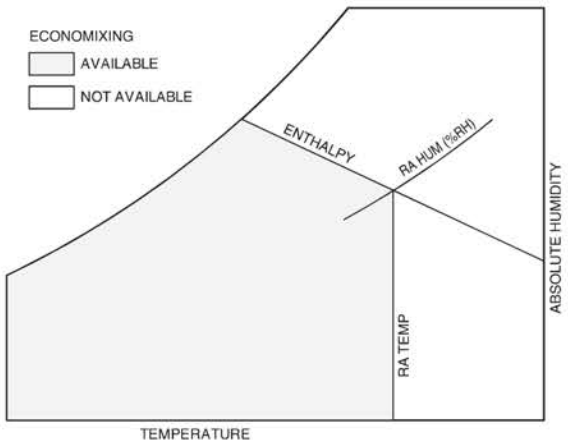
ECONOMIZER (JADE)

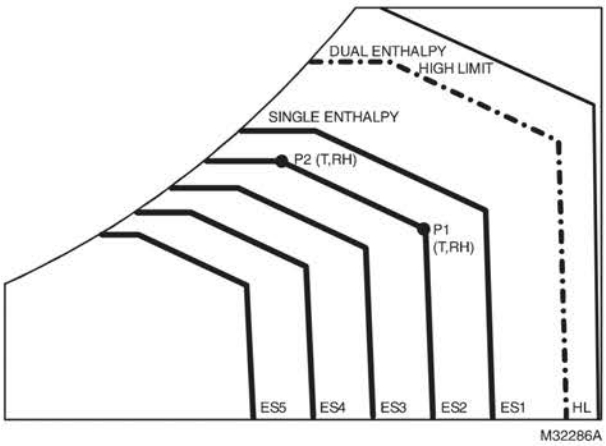
Enthalpy Operation With DCV (CO2 sensor) - 2 Speed Fan.

DCV	OA Good to economize?	Y1-I	Y2-I	FAN SPD	Y1-O	Y2-O	Occupied	Unoccupied
Below set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	24-v/On	0-v/Off[a]	VENTMIN H to Full-Open	Closed to Full-Open
Above set	No	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	24-v/On	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	On	High	24-v/On	24-v/On	VENTMIN H to VENTMAX	Closed
	Yes	Off	Off	Low	0-v/Off	0-v/Off	VENTMIN L to VENTMAX	Closed
		On	Off	Low	0-v/Off	0-v/Off	VENTMIN L to Full-Open	Closed to Full-Open
		On	On	High	DELAY[b] 24-v/On	0-v/Off[a]	VENTMIN H to Full-Open	Closed to Full-Open

[a]With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on 2nd stage of mechanical cooling Y2 –O after the delay if the call for Y1-I and Y2-I have not been satisfied.

[b] With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.





Single Enthalpy curve and boundaries.

Single Enthalpy and Dual Enthalpy High Limit Curves.

Enthalpy Curve	Temp. Dry-Bulb (°F)	Temp. Dewpoint (°F)	Enthalpy (btu/lb/da)	Point P1		Point P2	
				Temp. °F	Humidity %RH	Temp. °F	Humidity %RH
ES1	80.0	60.0	28.0	80.0	36.8	66.3	80.1
ES2	75.0	57.0	26.0	75.0	39.6	63.3	80.0
ES3	70.0	54.0	24.0	70.0	42.3	59.7	81.4
ES4	65.0	51.0	22.0	65.0	44.8	55.7	84.2
ES5	60.0	48.0	20.0	60.0	46.9	51.3	88.5
HL	86.0	66.0	32.4	86.0	38.9	72.4	80.3

ECONOMIZER (JADE)

Enthalpy Settings

When the OA temperature, enthalpy and dew point are below the respective setpoints, the Outdoor Air can be used for economizing. Fig. 22 shows the new single enthalpy boundaries in the W7220. There are 5 boundaries (setpoints ES1 through ES5), which are defined by dry bulb temperature, enthalpy and dew point.

Refer to Table 15 for the ENTH CURVE setpoint values.

To use enthalpy the W7220 must have a C7400S Sylkbus sensor for OA. The W7220 calculates the enthalpy and dew point using the OA temperature and humidity input from the OA sensor. When the OA temperature, OA humidity and OA dew point are all below the selected boundary, the economizer sets the economizing mode to YES, economizing is available.

When conditions are above the selected boundary, the conditions are not good to economize and the mode is set to NO.

Fig. 22 shows the 5 current boundaries. There is also a high limit boundary for differential enthalpy. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL when a compressor stage is energized.

Table 15 provides the values for each boundary limit.

Two-Speed Fan Operation

The later versions of the W7220 Jade controller have the capability to work with a system using a 2-speed supply fan. The W7220 does not control the supply directly but uses the following input status to determine the speed of the supply fan and controls the OA damper to the required position.

State	Fan Speed
OCC	Low
Y1	Low
Y2	High
W	High

The W (heating mode) is not controlled by the W7220 but it requires the status to know where to position the OA damper for minimum position for the fan speed.

The 2 speed fan delay is available when the system is programmed for 2 speed fan (in the System Setup menu item). The 2 speed fan delay is defaulted to 5 minutes and can be changed in the Advanced Setup menu item. When the unit has a call for Y1 In and in the free cooling mode and there is a call for Y2 In, the 2-speed fan delay starts and the OA damper will modulate 100% open, the supply fan should be set to high speed by the unit controller. After the delay one of two actions will happen:

- The Y2 In call will be satisfied with the damper 100% open and fan on high speed and the call will turn off

OR

- If the call for additional cooling in the space has not been satisfied then the first stage of mechanical cooling will be enabled through Y1 Out or Y2 Out.

ECONOMIZER (JADE)

CHECKOUT

Inspect all wiring connections at the Economizer module's terminals, and verify compliance with the installation wiring diagrams.

For checkout, review the Status of each configured parameter and perform the Checkout tests.

NOTE: See "Interface Overview" on page 18. For information about menu navigation and use of the keypad.

WARNING

ELECTRICAL SHOCK HAZARD!
CAN CAUSE SEVERE INJURY, DEATH OR PROPERTY DAMAGE. DISCONNECT POWER SUPPLY BEFORE BEGINNING WIRING OR MAKING WIRING CONNECTIONS, TO PREVENT ELECTRICAL SHOCK OR EQUIPMENT DAMAGE. IF ANY WIRING CHANGES ARE REQUIRED, FIRST BE SURE TO REMOVE POWER FROM THE ECONOMIZER MODULE BEFORE STARTING WORK. PAY PARTICULAR ATTENTION TO VERIFYING THE POWER CONNECTION (24 VAC).



POWER UP

After the module is mounted and wired, apply power.

INITIAL MENU DISPLAY

On initial start up, Honeywell displays on the first line and Economizer W7220 on the second line. After a brief pause, the revision of the software appears on the first line and the second line will be blank.

POWER LOSS (OUTAGE OR BROWNOUT)

All setpoints and advanced settings are restored after any power loss or interruption.

All settings are stored in non-volatile flash memory.

STATUS

Use the Status menu (see Table 5) to check the parameter values for the various devices and sensors configured.

NOTE: See "Interface Overview" on page 18 for information about menu navigation and use of the keypad.

CHECKOUT TESTS

Use the Checkout menu (Table 5) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.

NOTE: See "Interface Overview" on page 18. For information about menu navigation and use of the keypad.

To perform a Checkout Test:

1. Scroll to the desired test in the Checkout menu using the ▲ and ▼ buttons.
2. Press the ↵ button to select the item.
3. RUN? Appears on the display.
4. Press the ↵ button to start the test.
5. The unit pauses and then displays IN PROGRESS
6. When all parameters have been tested, press the ⓘ button (Menu up) to end the test (e.g. turn off the relay).

The checkout tests can all be performed at the time of installation or any time during the operation of the system as a test that the system is operable.

CAUTION

EQUIPMENT DAMAGE MAY RESULT!
BE SURE TO ALLOW ENOUGH TIME FOR COMPRESSOR STARTUP AND SHUTDOWN BETWEEN CHECKOUT TESTS SO THAT YOU DO NOT SHORT-CYCLE THE COMPRESSORS.

TROUBLESHOOTING

ALARMS

The Economizer module provides alarm messages that display on the 2-line LCD.

NOTE: Upon power up, the module waits 60 minutes before checking for alarms. This allows time for all the configured devices (e.g. sensors, actuator) to become operational. The exception is the MA sensor which will alarm immediately.

If one or more alarms are present and there has been no keypad activity for at least 5 minutes, the Alarms menu displays and cycles through the active alarms.

You can also navigate to the Alarms menu at any time.

CLEARING ALARMS

Once the alarm has been identified and the cause has been removed (e.g. replaced faulty sensor), the alarm can be cleared from the display.

ECONOMIZER (JADE)

To clear an alarm, perform the following:

1. Navigate to the desired alarm.
2. Press the ↵ button.
3. ERASE? displays.
4. Press the ↵ button.
5. ALARM ERASED displays.
6. Press the ⓘ button (MenuUp/Exit) to complete the action and return to the previous menu.

NOTE: If the alarm still exists after you clear it, it re-displays within 5 seconds.

SMOKE DETECTOR

DIP SWITCH SETTINGS:

Designation	Default	Selection	Features
TRBL SHUTDN	OFF	OFF	Aux relay does not switch states with a Trouble condition
		ON	Aux relay switches states with a Trouble condition
SENSORS	1	1	Only one sensor is connected the Power Board
		2	Two sensors are connected to the Power Board
MIN TMPR DELAY	7	7	Provides a Trouble condition (terminals 3 and 14 open) when Sensor Housing cover has been removed or has been secured improperly for more than 7 minutes
		0	Provides an instantaneous Trouble condition(terminals 3 and 14 open) upon cover removal

DETECTOR STATUS INDICATION

NOTE: There are two LED's on the Power board D4P120, each indicating the Status of the two sensors connected. When there is only one sensor connected, LED2 will remain off.

Status	Description	LED Status		Status of Relays
		Sensor D4S	Power Board D4P120	
Sensor Initialization	At power-up or reset at the panel, the sensor will take approx 35 seconds to initialize. Also occurs if the sensor has been removed and restored in the base in the sensor housing.	RED Blink every 5 seconds	Alternating Green/amber every 1 second	**Supervisory relay**: Terminals 3 and 14 are closed. **Alarm Relay**: Terminals 4 and 5 are open. **Aux Relay** does not switch states:Terminals 6 and 16 are closed,Terminals 8 and 18 are closed
	Sensor is missing during the seven minute tamper Delay, if selected.	Off	Alternating Green/amber every 1 second	**Supervisory relay**: Terminals 3 and 14 are closed **Alarm Relay**: Terminals 4 and 5 are open. **Aux Relay** does not switch states:Terminals 6 and 16 are closed,Terminals 8 and 18 are closed
Maintenance	Sensor D4S is outside it's UL approved sensitivity limits and needs to be cleaned or replaced.	RED Blink every 5 seconds	Amber Blink every 5 seconds	**Supervisory relay**: Terminals 3 and 14 are closed. **Alarm Relay**: Terminals 4 and 5 are open. **Aux Relay** does not switch states:Terminals 6 and 16 are closed,Terminals 8 and 18 are closed
Trouble	.Unit loses Power	Off	Off	**Supervisory relay**: Terminals 3 and 14 are open. **Alarm Relay:** Terminals 4 and 5 are open. **Aux Relay** does not switch states with no shutdown on Trouble selected: Terminals 6 and 16 are closed. Terminals 8 and 18 are closed. **Aux Relay** Switches states with shutdown on Trouble selected: Terminals 6 and 16 are open, Terminals 8 and 18 are open
	.Cover Tamper Delay times out	Green Blink every 5 seconds	Amber solid	
	.Wiring Problems between the Sensor and the Power Board	Off	Amber solid	
	.Mismatch between the number of sensors connected and the Dip Switch setting			
	1 sensor connected,2 selected	Green blink every 5 seconds on first sensor. No second sensor.	LED1 Green blink every 5 seconds LED2 Amber solid	
	2 sensors connected,1 selected	Green blink every 5 seconds on first sensor. LED's off on second sensor	LED1 Green blink every 5 seconds LED2 Amber solid	
Alarm	Unit detects smoke	Solid Red	Solid Red	**Supervisory relay**: Terminals 3 and 14 are closed **Alarm Relay**: Terminals 4 and 5 are closed. **Aux Relay** switches states: Terminals 6 and 16 are open, Terminals 8 and 18 are open
Standby	Unit has Power and it is not in initialization, Trouble, Maintenance or Alarm.	Green Blink every 5 seconds	Green Blink every 5 seconds	**Supervisory relay**: Terminals 3 and 14 are closed **Alarm Relay**: Terminals 4 and 5 are open. **Aux Relay** does not switch states: Terminals 6 and 16 are closed, Terminals 8 and 18 are closed

NOTE: If any other visual indication is noted contact System Sensor technical support at 1-800-SENSOR2.


Calling for Cooling Y1
No
Check Thermostat
Yes
Compressor Contactor closes
No
FC-11, S-3, S-4, S-12
Yes
Compressor Starts
No
FC-1, FC-2, S-3, S-4, S-12
Yes
Outdoor Fan Starts
No
FC-1, FC-2, S-3, S-4, S10
Yes
Indoor Fan Contactor Closes
No
FC-1, FC-2, S-3, S-4
Yes
Indoor Fan Starts
No
Belt Drive FC-4
Yes
Direct Drive FC-3


Calling for Cooling Y-2
No
Check Thermostat
Yes
24v AC to Rectifier
No
FC-12
Yes
Compressor valve closes for 2nd stage
Discharge pressure and Amps increase
No
Change Compressor
Yes
Indoor Fan switches to high speed
No
Belt Drive FC-4
Yes
Unit runs until stat is satisfied
No
Check stat
Yes
No issue


Y1 Call for Cooling (Stage 1)
S-2
Contactor closes
No
S-3, 4, 5, 6, 8.9, FC-11
Yes
Compressor 1 starts
No
S-3, S-4, S-12, FC-1, FC-2
Yes
Outdoor fan starts
No
S-3, S-4, S-8, FC-1, FC-2
Yes
Indoor fan starts low speed
No
Belt drive FC-4
Yes
Direct drive FC-3

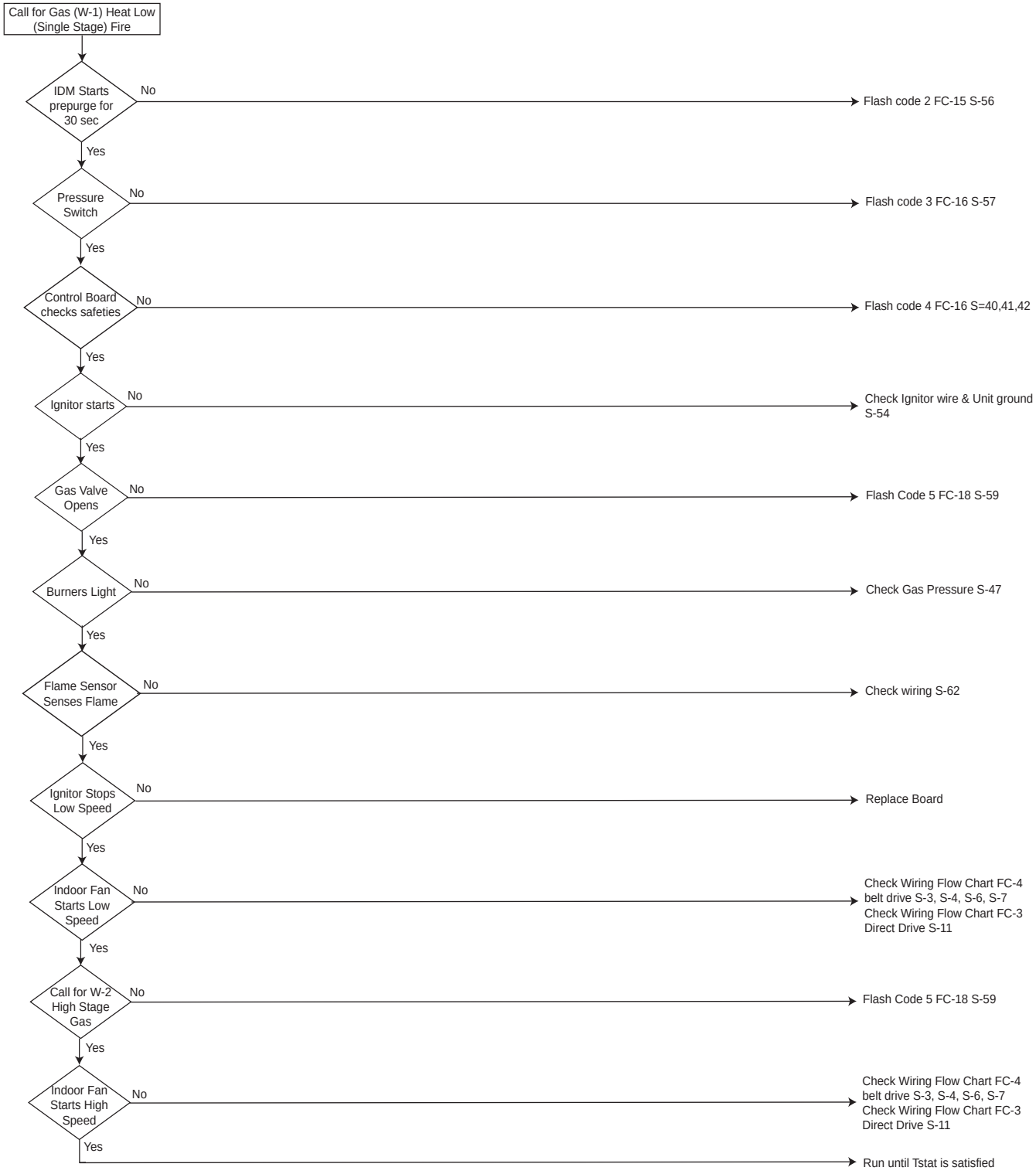

Y2 Call for Cooling (Stage 2)
Contactor closes
No
S-3, 4, 5, 6, 8.9, FC-11
Yes
Compressor 2 starts
No
S-3, S-4, S-12, FC-1, FC-2
Yes
Indoor fan contactor closes high
No
S-3, S-4, S-8, FC-1, FC-2
Yes
Indoor fan starts high speed
No
Belt drive FC-4
Direct drive FC-3
Yes
Unit runs to temperature is satisfied
No
Check stat
Yes
No action needed

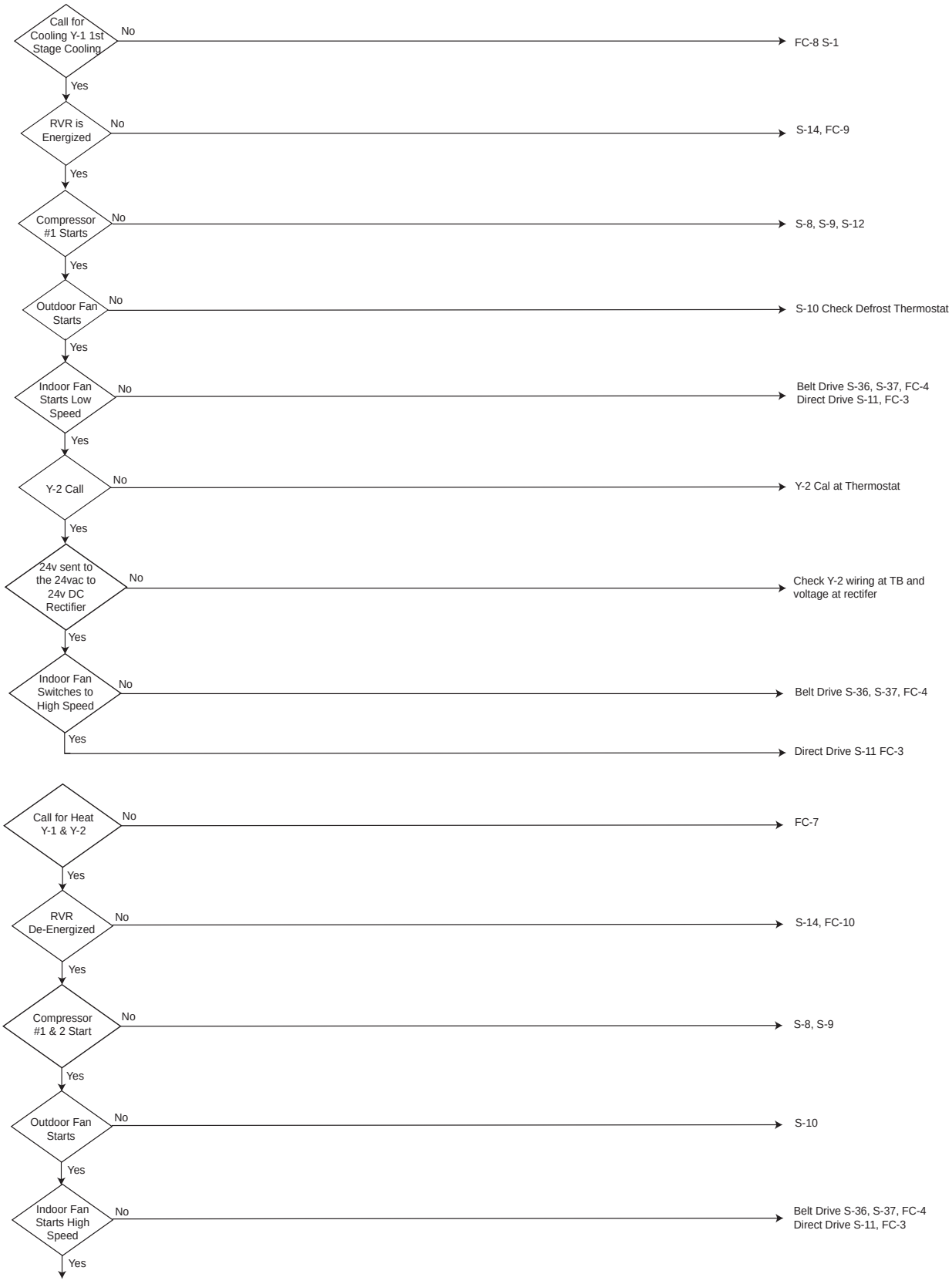

Y1 Call
No
Check Stat for call and wiring FC-2
Yes
Compressor Contactor closes
No
IIC Board Code 6
Yes
Compressor Starts Low
No
Check wiring S-6
Yes
Outdoor Fan Starts
No
Check wiring S-6
Yes
Indoor Fan Contactor
No
Check DSI Board Input/Outputs
Yes
Indoor Fan Closes Low
No
Belt Drive FC-3
Yes
Direct Drive FC-4


Calling for Cooling Y-2
No
Check Thermostat
Yes
24v AC to Rectifier
No
FC-12
Yes
Compressor valve closes for 2nd stage
Discharge pressure and Amps increase
No
Change Compressor
Yes
Indoor Fan switches to high speed
No
Belt Drive FC-4
Yes
Unit runs until stat is satisfied
No
Check stat fuction
Yes
No action needed


Y1 Call Low Stage Cooling
No
Check Stat for CAll and Wiring FC-2, S-3, S-4, S-5, S-6, S-8, S-9
Yes
Compressor Contactor closes
No
IIC Board Code 6 FC-5
Yes
Compressor Starts
No
Check Wiring S-6
Yes
Indoor Fan Contactor closes
No
Check DSI Board Input/Outputs FC-5
Yes
Indoor Fan Starts Low Speed
No
Belt Drive FC-3 S-3, S-4, S-6, S-7
Yes
Direct Drive FC-4 S-11


Y2 Call High Stage Cooling
No
Check stat for call and wiring FC-2
Yes
Compressor Contactor closes
No
S-3, 4, 5, 6, 8.9, FC-11
Yes
Compressor Starts
No
Check Wiring S-6
Yes
Indoor Fan Contactor closes
No
S-4, S-6, S-7
Yes
Indoor Fan Starts Low Speed
No
Belt Drive FC-3 S-3, S-4, S-6, S-7
Direct Drive FC-4
Yes
Unit runs until stat is satisfied
No
Check Stat
Yes
No action needed


Call for Gas (W-1) Heat Low (Single Stage) Fire
IDM Starts prepurge for 30 sec
No
Flash code 2 FC-15 S-56
Yes
Pressure Switch
No
Flash code 3 FC-16 S-57
Yes
Control Board checks safeties
No
Flash code 4 FC-16 S=40,41,42
Yes
Ignitor starts
No
Check Ignitor wire & Unit ground S-54
Yes
Gas Valve Opens
No
Flash Code 5 FC-18 S-59
Yes
Burners Light
No
Check Gas Pressure S-47
Yes
Flame Sensor Senses Flame
No
Check wiring S-62
Yes
Ignitor Stops Low Speed
No
Replace Board
Yes
Indoor Fan Starts Low Speed
No
Check Wiring Flow Chart FC-4 belt drive S-3, S-4, S-6, S-7
Check Wiring Flow Chart FC-3 Direct Drive S-11
Yes
Call for W-2 High Stage Gas
No
Flash Code 5 FC-18 S-59
Yes
Indoor Fan Starts High Speed
No
Check Wiring Flow Chart FC-4 belt drive S-3, S-4, S-6, S-7
Check Wiring Flow Chart FC-3 Direct Drive S-11
Yes
Run until Tstat is satisfied


Call for Cooling Y-1 1st Stage Cooling
No
FC-8 S-1
Yes
RVR is Energized
No
S-14, FC-9
Yes
Compressor #1 Starts
No
S-8, S-9, S-12
Yes
Outdoor Fan Starts
No
S-10 Check Defrost Thermostat
Yes
Indoor Fan Starts Low Speed
No
Belt Drive S-36, S-37, FC-4
Direct Drive S-11, FC-3
Yes
Y-2 Call
No
Y-2 Cal at Thermostat
Yes
24v sent to the 24vac to 24v DC Rectifier
No
Check Y-2 wiring at TB and voltage at rectifer
Yes
Indoor Fan Switches to High Speed
No
Belt Drive S-36, S-37, FC-4
Yes
Direct Drive S-11 FC-3
Call for Heat Y-1 & Y-2
No
FC-7
Yes
RVR De-Energized
No
S-14, FC-10
Yes
Compressor #1 & 2 Start
No
S-8, S-9
Yes
Outdoor Fan Starts
No
S-10
Yes
Indoor Fan Starts High Speed
No
Belt Drive S-36, S-37, FC-4
Direct Drive S-11, FC-3
Yes


Yes
Defrost
No
S-15, S-16
Yes
RVR Energized
No
FC-9
Yes
Outdoor Fan Stops
No
Check Defrost Board
Yes
Remain in Defrost for 10min or until Coil Tep reaches 60deg
No
S-16
Yes
Defrost Teranates
No
Check Defrost Thermostat and Control Board
Yes
RVR De-Energized Outdoor Fan Starts
No
Check Defrost Thermostat and Control Board
Yes
Unit runs till thermostat is satisfied


Call for Cooling Y-1 1st Stage Cooling
No
FC-8 S-1
Yes
RVR is Energized
No
S-14, FC-9
Yes
Compressor #1 Starts
No
S-8, S-9, S-12
Yes
Outdoor Fan Starts
No
S-10 Check Defrost Thermostat
Yes
Indoor Fan Starts Low Speed
No
Belt Drive S-36, S-37, FC-4
Direct Drive S-11, FC-3
Yes
Y-2 Call
No
Y-2 Cal at Thermostat
Yes
Compressor #2 Starts
No
S-8, S-9, S-12
Yes
Indoor Fan Switches to High Speed
No
Belt Drive S-36, S-37, FC-4
Yes
Direct Drive S-11 FC-3


Call for Heat Y-1 & Y-2
No
FC-7
Yes
RVR De-Energized
No
S-14, FC-10
Yes
Compressor #1 & 2 Start
No
S-8, S-9
Yes
Outdoor Fan Starts
No
S-10
Yes
Indoor Fan Starts High Speed
No
Belt Drive S-36, S-37, FC-4
Direct Drive S-11, FC-3
Yes


Yes
Defrost
No
S-15, S-16
Yes
RVR Energized
No
FC-9
Yes
Outdoor Fan Stops
No
Check Defrost Board
Yes
Remain in Defrost for 10min or until Coil Tep reaches 60deg
No
S-16
Yes
Defrost Teranates
No
Check Defrost Thermostat and Control Board
Yes
RVR De-Energized Outdoor Fan Starts
No
Check Defrost Thermostat and Control Board
Yes
Unit runs till thermostat is satisfied

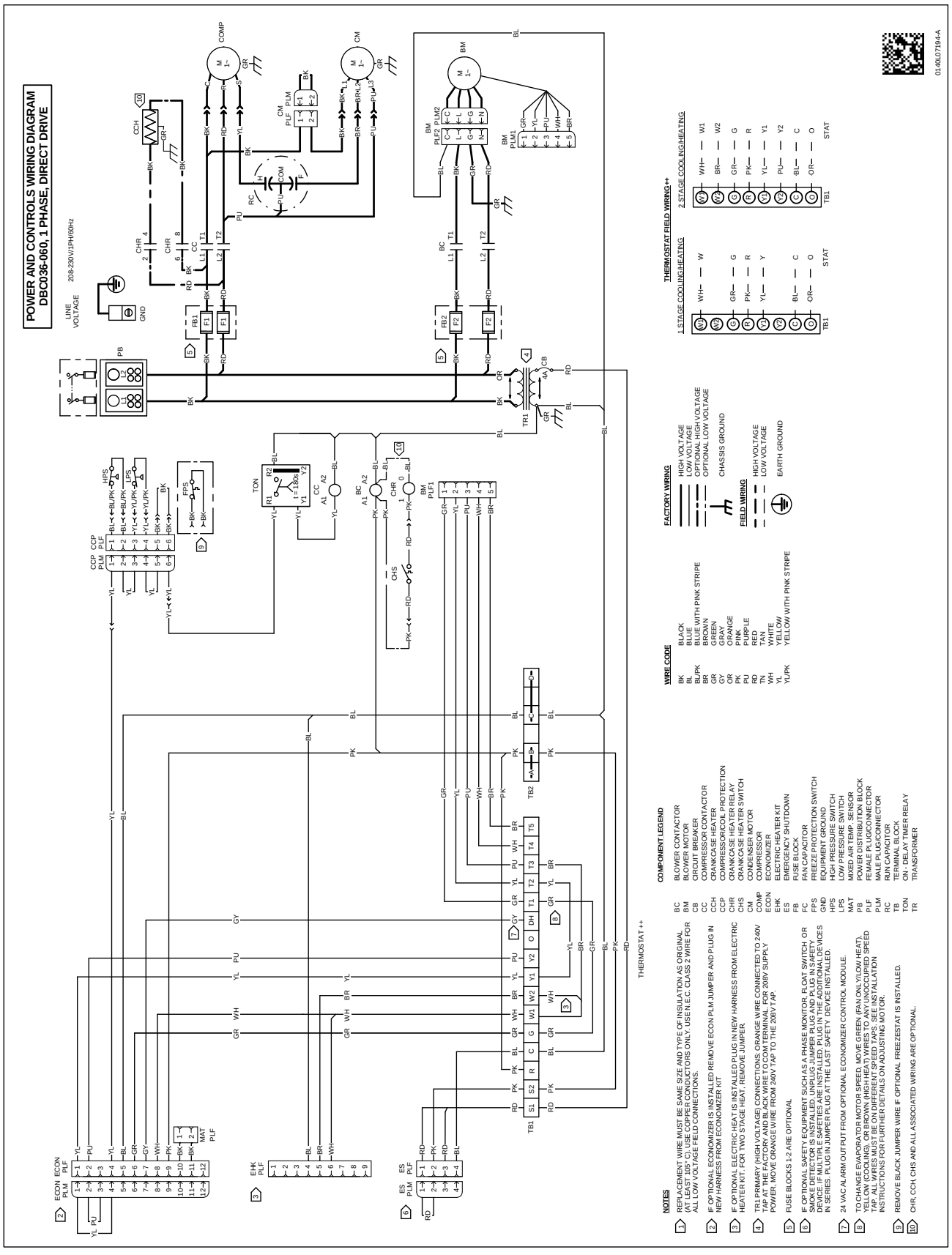

Call for cooling from thermostat energizing Y
No
Check TB1 R for 24v. Is thermostat call for cooling. FC-1, FC-2, FC-20
Yes
Contactor energizes starting compressor low stage condenser fan start
No
Check LPS, HPS, FPS, TON Delay, BRI (4-3)
Yes
Indoor blower motor starts low speed
No
Check ULN control “cool fan” for 24v. TB-T1 from k24v. BM PLF1-4 for 24v. FC-3 Check wiring S-6
Yes
Y2 call high stage cooling
No
Check TB1-Y2 for 24v AC FC-2
Yes
24v AC to DC rectifier energizes
No
Check Compressor Solenoid for 24v DC
Yes
Indoor blower motor starts high speed
No
Check 24v AC TB1-T3, BRI-(7-8) Bm PLF1-6 FC-3
Yes
Unit runs till thermostat is satisfied


W1 Call for Heat
No
Thermostat is calling for heat Check TB1-W1 for 24v control LED Red steady on: Control Fault FC-21 Red Flashing: none FC-20
Yes
Inducer draft blower is energized for 30 seconds prepurge
No
Open Safeties: LED Red Flashing 6 FC-22 LED Red Flashing 7 FC-23 LED Red Flashing 10 FC-24
Yes
Integrated control module transitions the induced draft blower to light-off setting
No
LED Red Flashing 3 FC-22
Yes
The spark igniter and gas valve are energized for 4 seconds
No
LED Red flashing 1 FC-21
Yes
Gas valve will remain open only if the flame is detected.
No
LED Red Flashing 4 LED Red Flashing 5
Yes
Unit runs till thermostat is satisfied

DBC WIRING DIAGRAMS

SMALL CHASSIS BELC

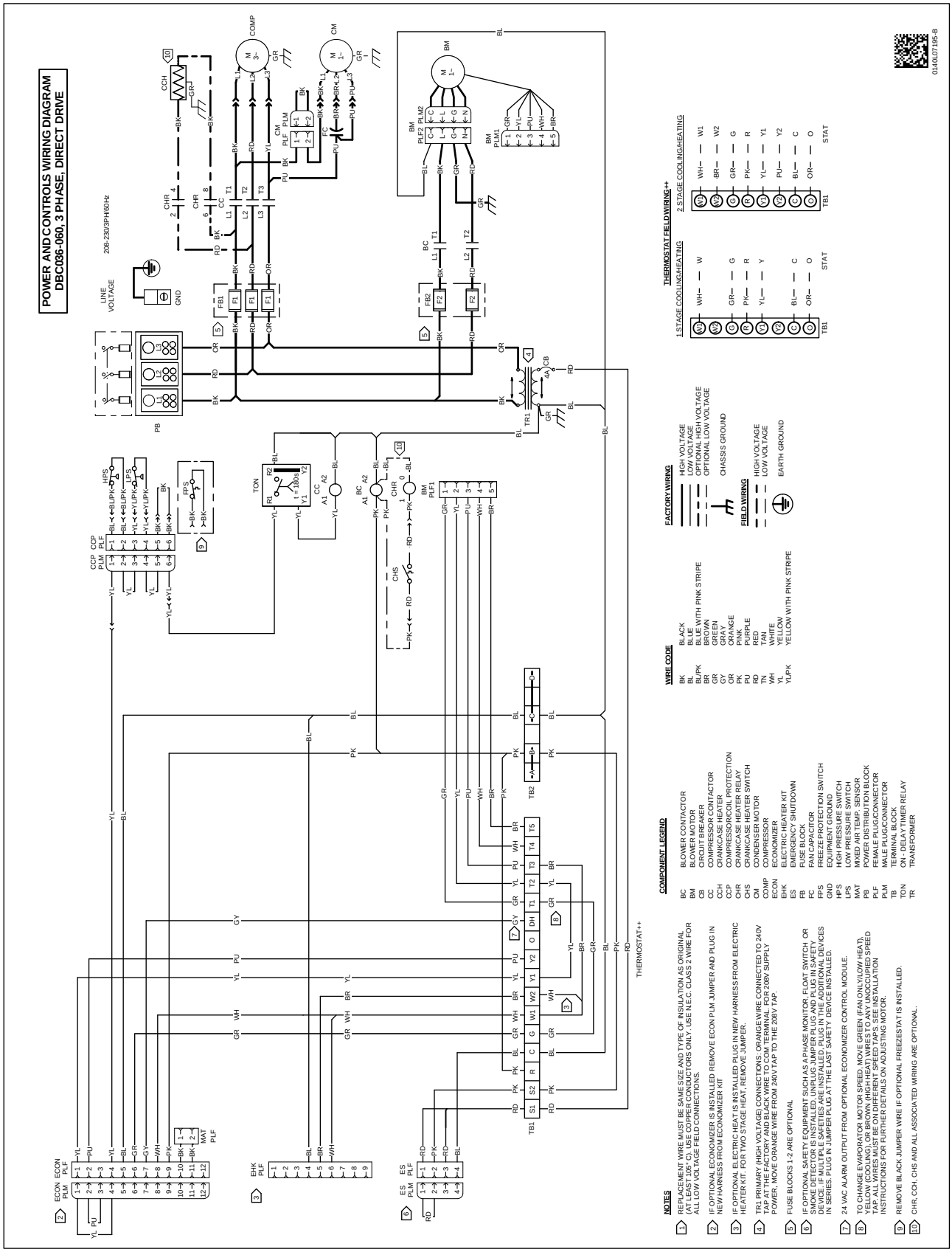
HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

WARNING

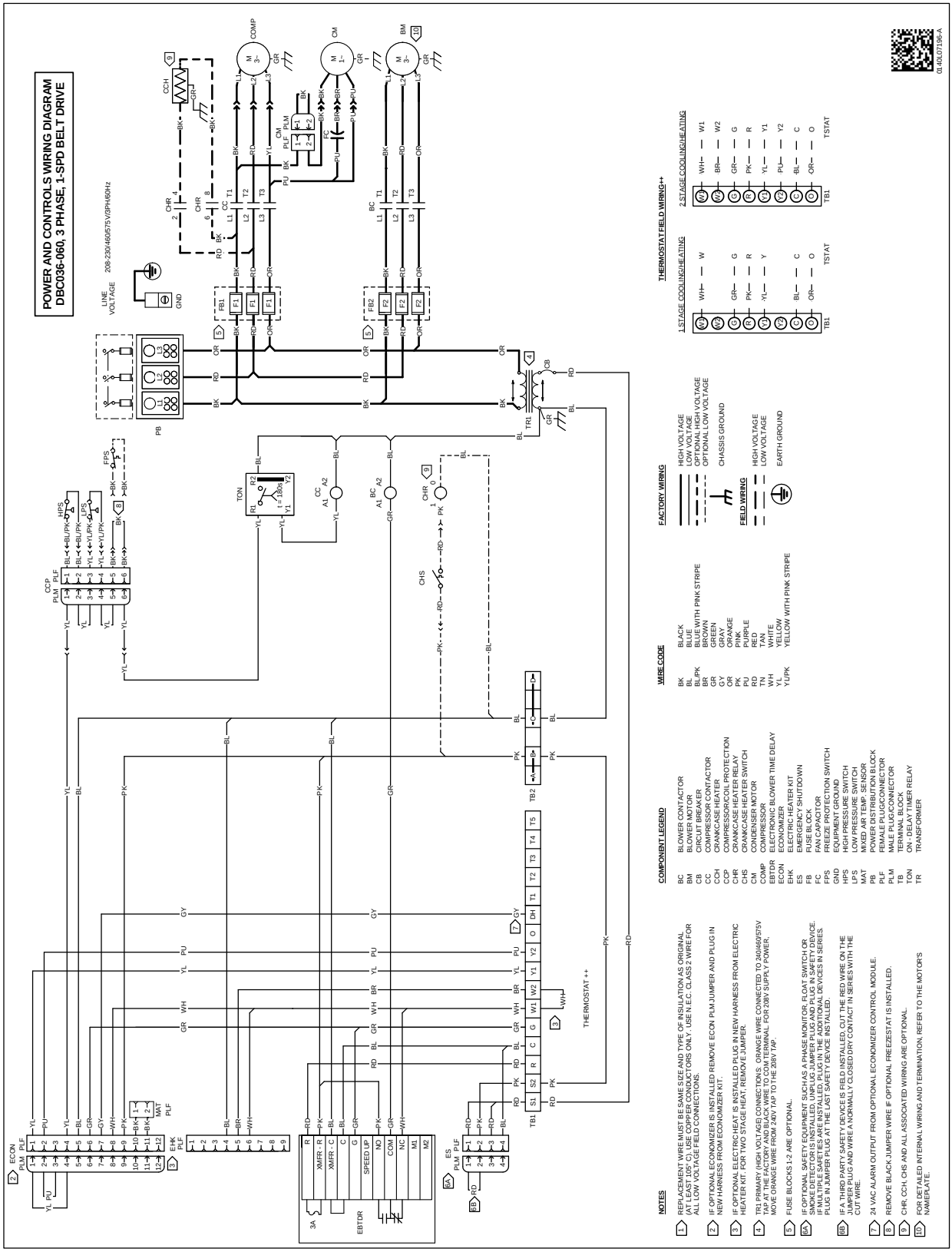
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WARNING

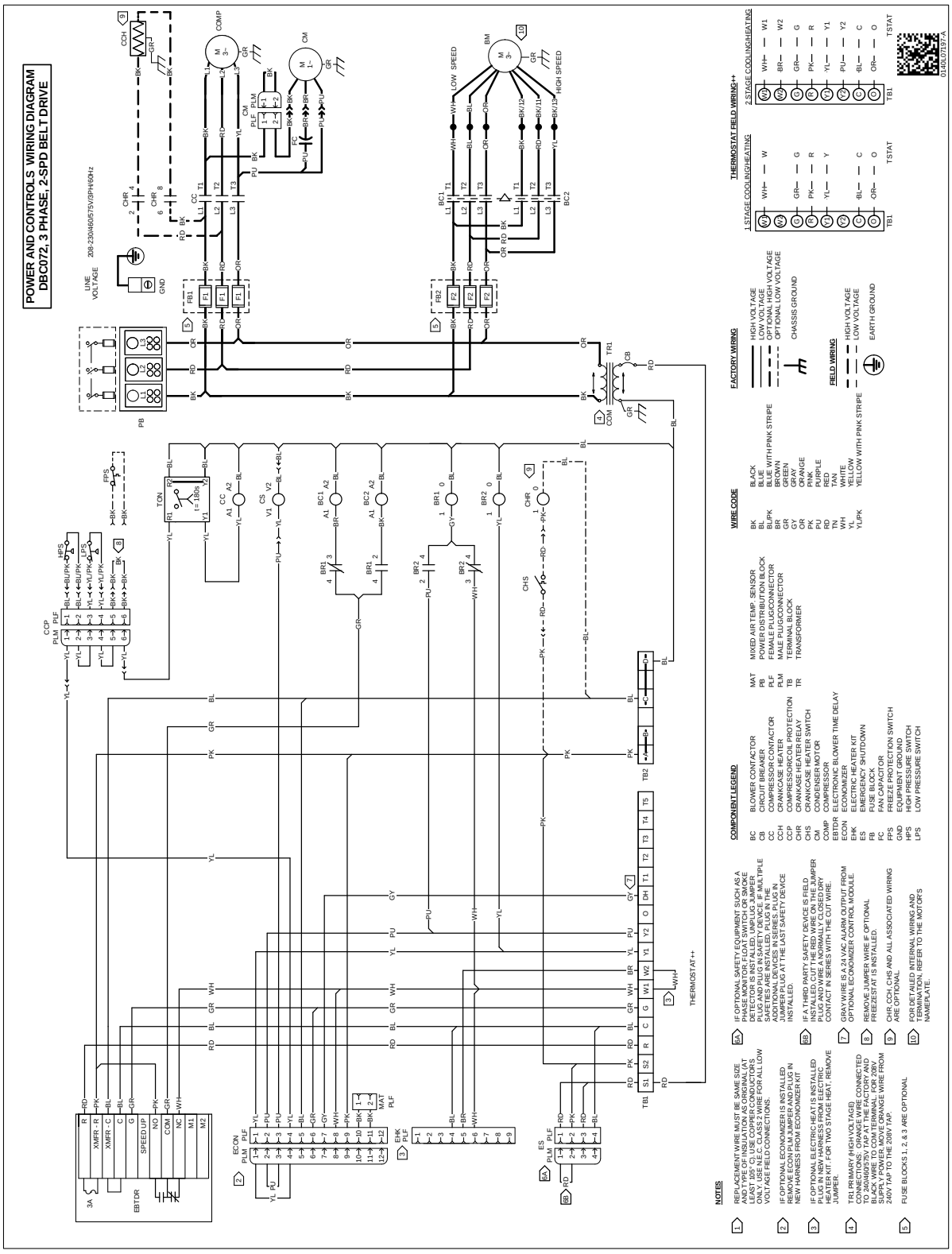
HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

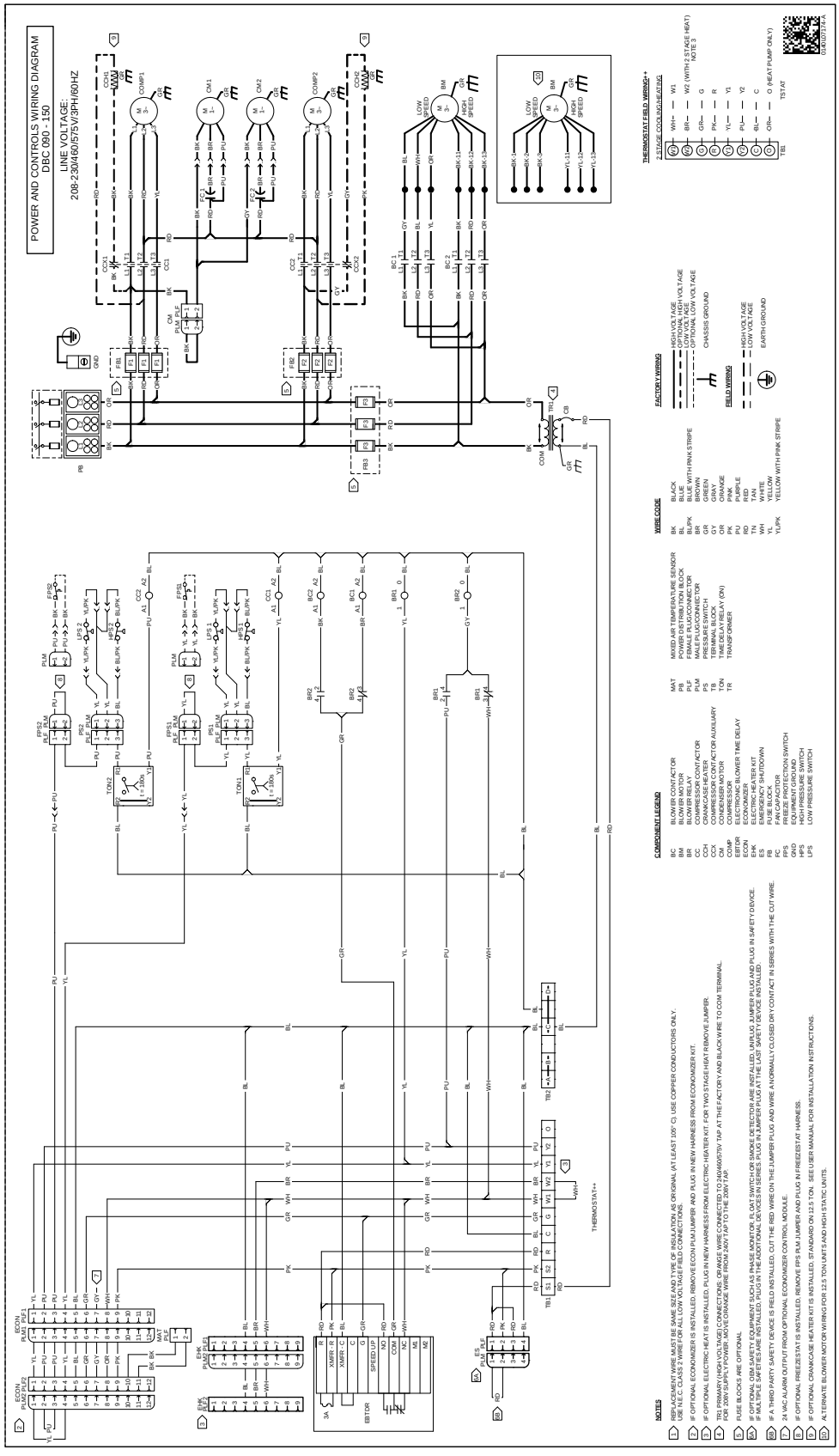


Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

MEDIUM CHASSIS BELC

WARNING

HIGH VOLTAGE!
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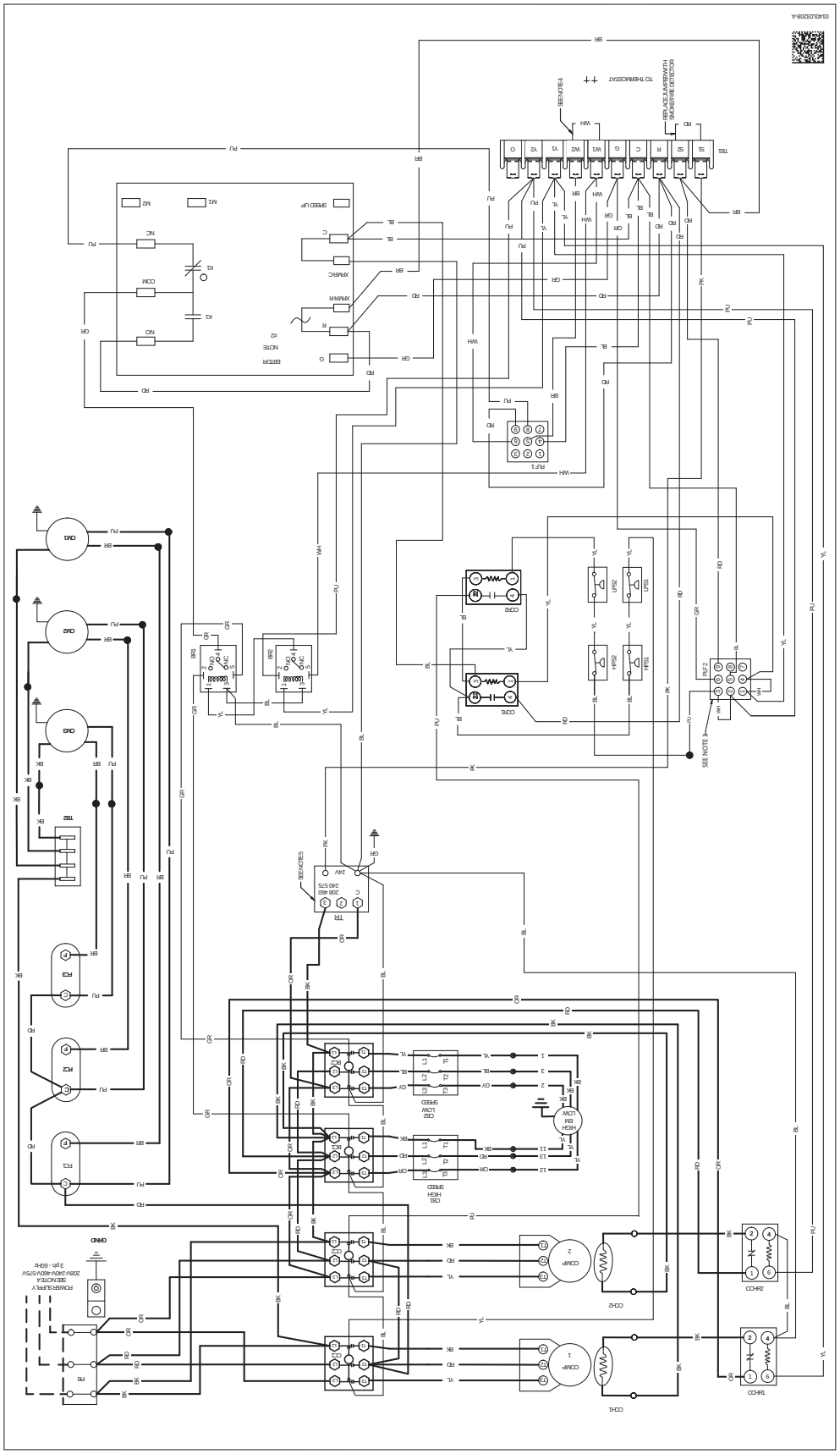


Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

LARGE CHASSIS BELC

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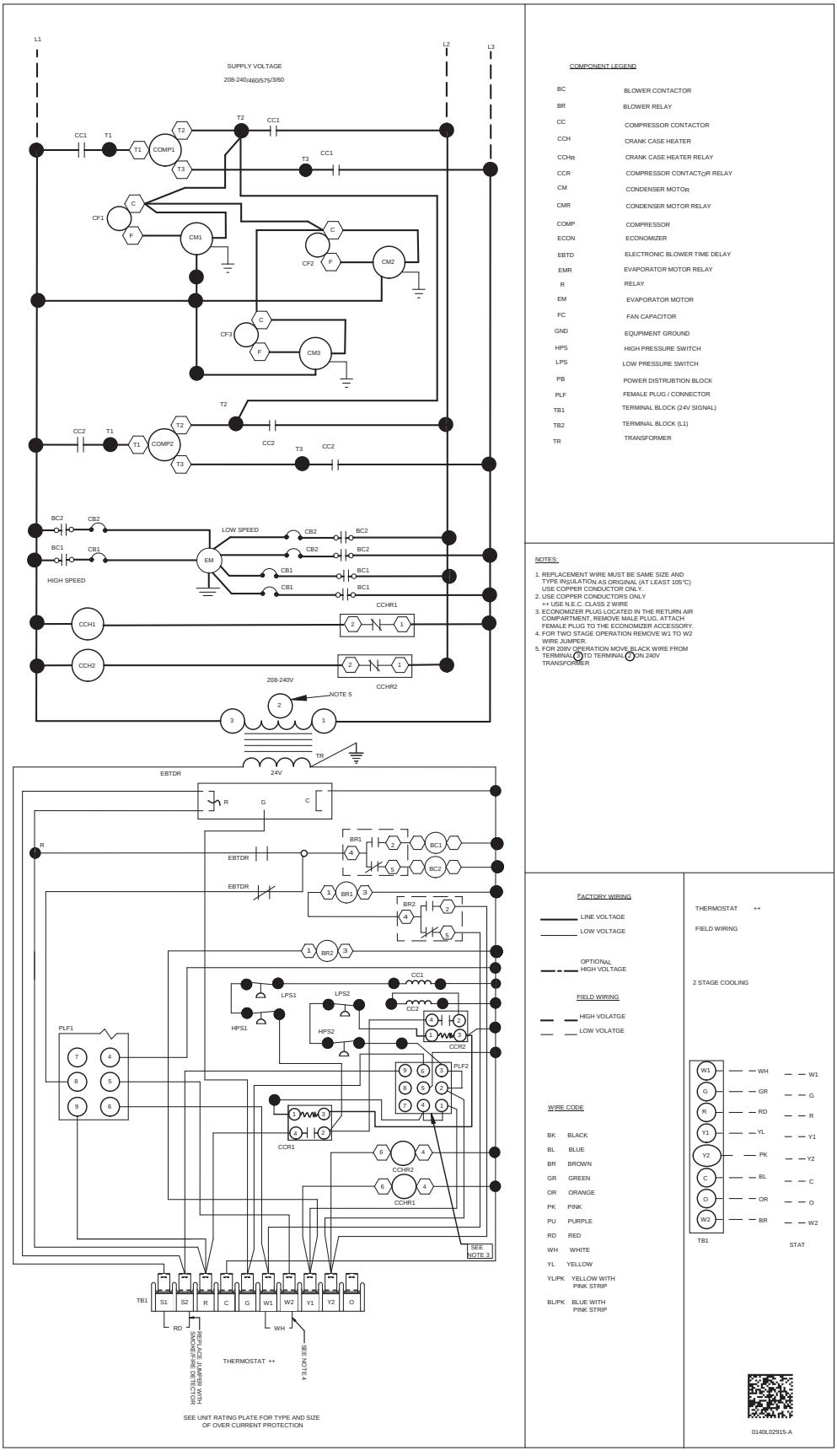
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UNIT WIRING DIAGRAMS

DBC180-240, 3PH 2 SPD, BELT

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WARNING



COMPONENT LEGEND

BC	BLOWER CONTACTOR
BR	BLOWER RELAY
CC	COMPRESSOR CONTACTOR
CCH	CRANK CASE HEATER
CCHR	CRANK CASE HEATER RELAY
CCR	COMPRESSOR CONTACTOR RELAY
CM	CONDENSER MOTOR
CMR	CONDENSER MOTOR RELAY
COMP	COMPRESSOR
ECON	ECONOMIZER
EBTD	ELECTRONIC BLOWER TIME DELAY
EMR	EVAPORATOR MOTOR RELAY
R	RELAY
EM	EVAPORATOR MOTOR
FC	FAN CAPACITOR
GND	EQUIPMENT GROUND
HPS	HIGH PRESSURE SWITCH
LPS	LOW PRESSURE SWITCH
PB	POWER DISTRUBTION BLOCK
PLF	FEMALE PLUG / CONNECTOR
TB1	TERMINAL BLOCK (24V SIGNAL)
TB2	TERMINAL BLOCK (L1)
TR	TRANSFORMER

NOTES:

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE INSULATION AS ORIGINAL (AT LEAST 105°C) USE COPPER CONDUCTOR ONLY.
2. USE COPPER CONDUCTORS ONLY
   ++ USE N.E.C. CLASS 2 WIRE
3. ECONOMIZER PLUG LOCATED IN THE RETURN AIR COMPARTMENT. REMOVE MALE PLUG, ATTACH FEMALE PLUG TO THE ECONOMIZER ACCESSORY.
4. FOR TWO STAGE OPERATION REMOVE W1 TO W2 WIRE JUMPER.
5. FOR 208V OPERATION MOVE BLACK WIRE FROM TERMINAL (3) TO TERMINAL (2) ON 240V TRANSFORMER

FACTORY WIRING
- LINE VOLTAGE
- LOW VOLTAGE
- OPTIONAL HIGH VOLTAGE

FIELD WIRING
- HIGH VOLATGE
- LOW VOLATGE

WIRE CODE

BK	BLACK
BL	BLUE
BR	BROWN
GR	GREEN
OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
WH	WHITE
YL	YELLOW
YL/PK	YELLOW WITH PINK STRIP
BL/PK	BLUE WITH PINK STRIP

THERMOSTAT ++

FIELD WIRING

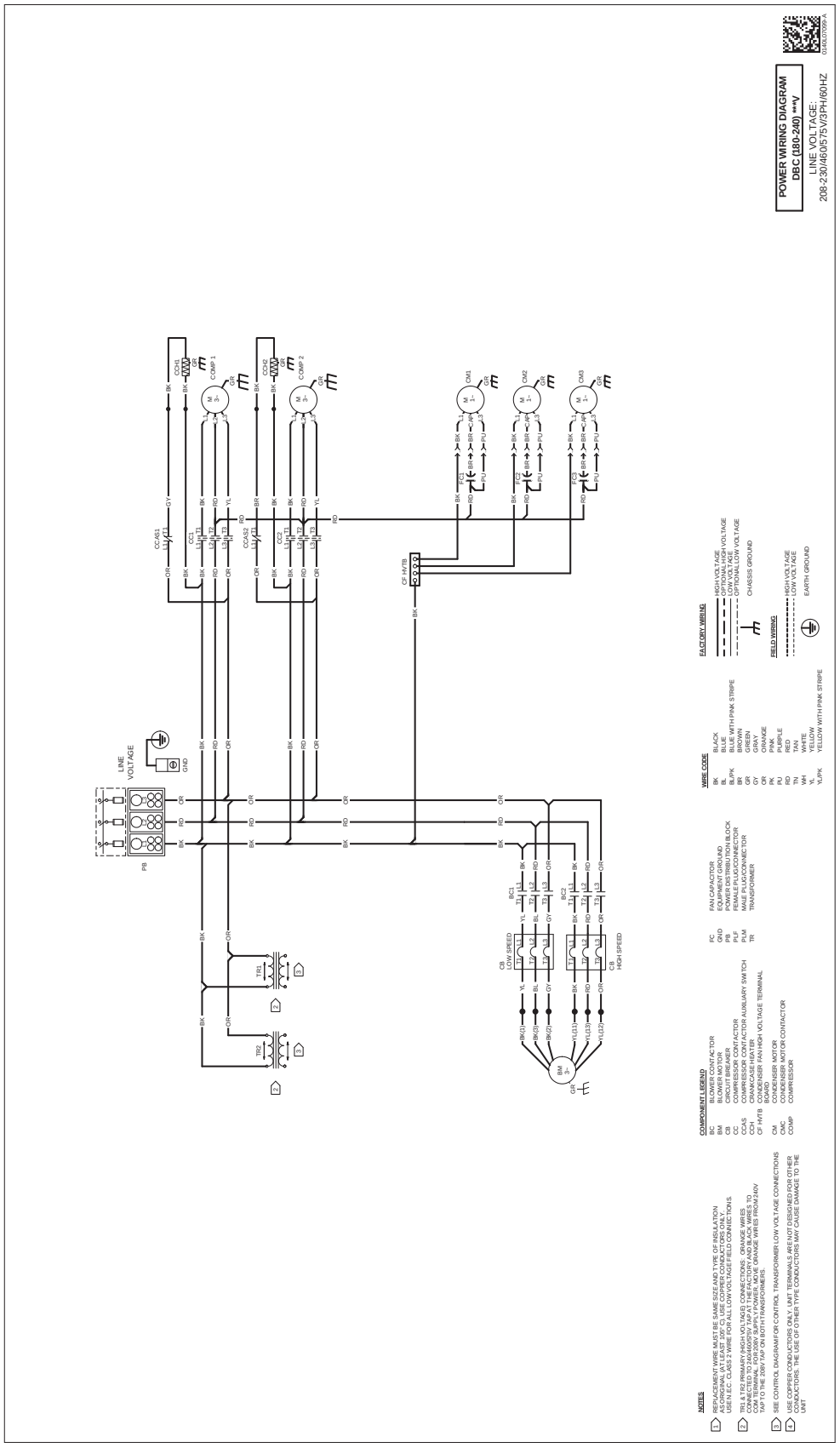
2 STAGE COOLING

0140L02915-A

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WARNING

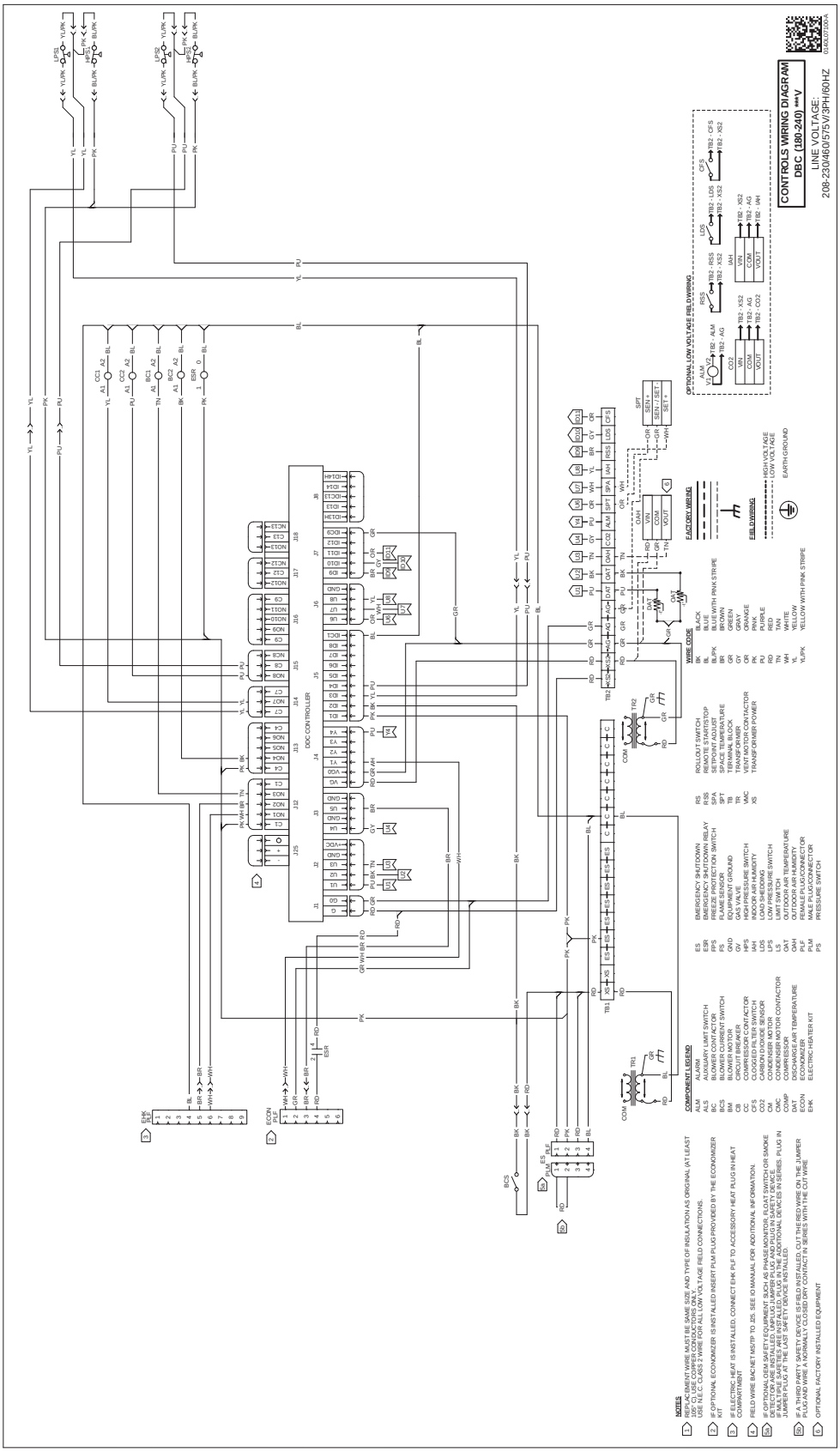
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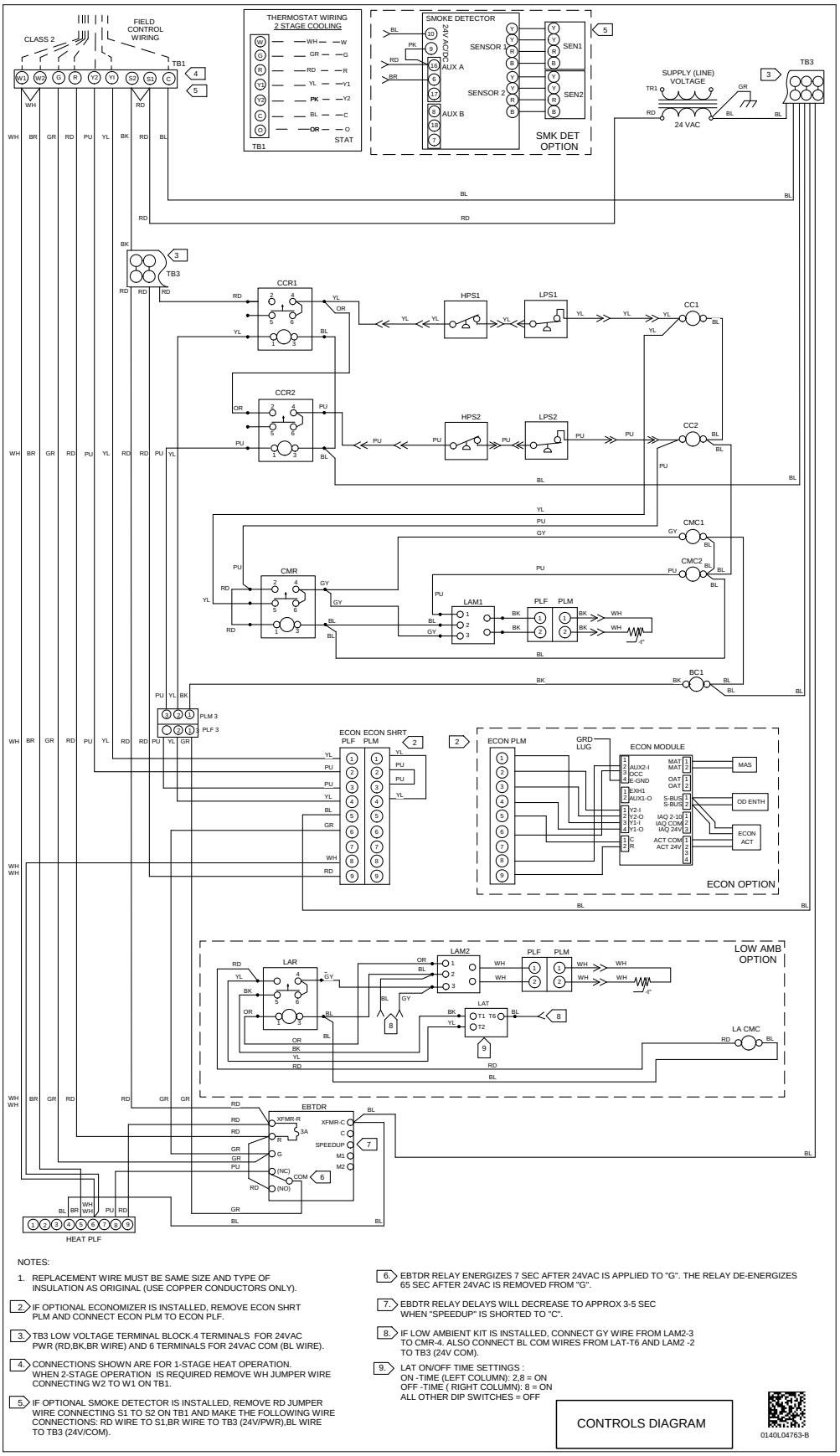
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WARNING



NOTES:

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (USE COPPER CONDUCTORS ONLY).
2. IF OPTIONAL ECONOMIZER IS INSTALLED, REMOVE ECON SHRT PLM AND CONNECT ECON PLM TO ECON PLF.
3. TB3 LOW VOLTAGE TERMINAL BLOCK.4 TERMINALS FOR 24VAC PWR (RD,BK,BR WIRE) AND 6 TERMINALS FOR 24VAC COM (BL WIRE).
4. CONNECTIONS SHOWN ARE FOR 1-STAGE HEAT OPERATION. WHEN 2-STAGE OPERATION IS REQUIRED REMOVE WH JUMPER WIRE CONNECTING W2 TO W1 ON TB1.
5. IF OPTIONAL SMOKE DETECTOR IS INSTALLED, REMOVE RD JUMPER WIRE CONNECTING S1 TO S2 ON TB1 AND MAKE THE FOLLOWING WIRE CONNECTIONS: RD WIRE TO S1,BR WIRE TO TB3 (24V/PWR),BL WIRE TO TB3 (24V/COM).
6. EBTDR RELAY ENERGIZES 7 SEC AFTER 24VAC IS APPLIED TO "G". THE RELAY DE-ENERGIZES 65 SEC AFTER 24VAC IS REMOVED FROM "G".
7. EBDTR RELAY DELAYS WILL DECREASE TO APPROX 3-5 SEC WHEN "SPEEDUP" IS SHORTED TO "C".
8. IF LOW AMBIENT KIT IS INSTALLED, CONNECT GY WIRE FROM LAM2-3 TO CMR-4. ALSO CONNECT BL COM WIRES FROM LAT-T6 AND LAM2 -2 TO TB3 (24V COM).
9. LAT ON/OFF TIME SETTINGS : ON -TIME (LEFT COLUMN): 2,8 = ON OFF -TIME (RIGHT COLUMN): 8 = ON ALL OTHER DIP SWITCHES = OFF

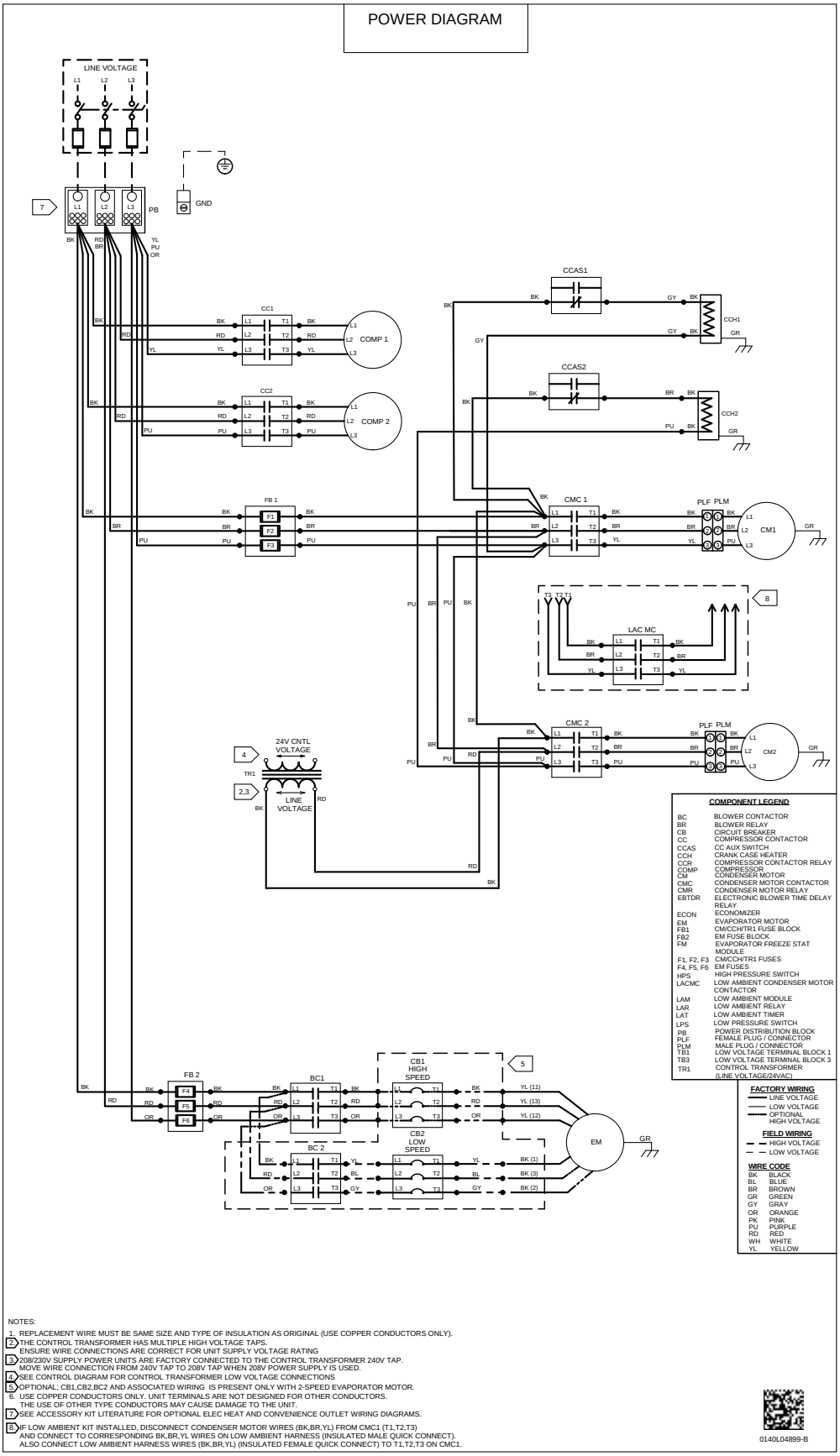
CONTROLS DIAGRAM

0140L04763-B

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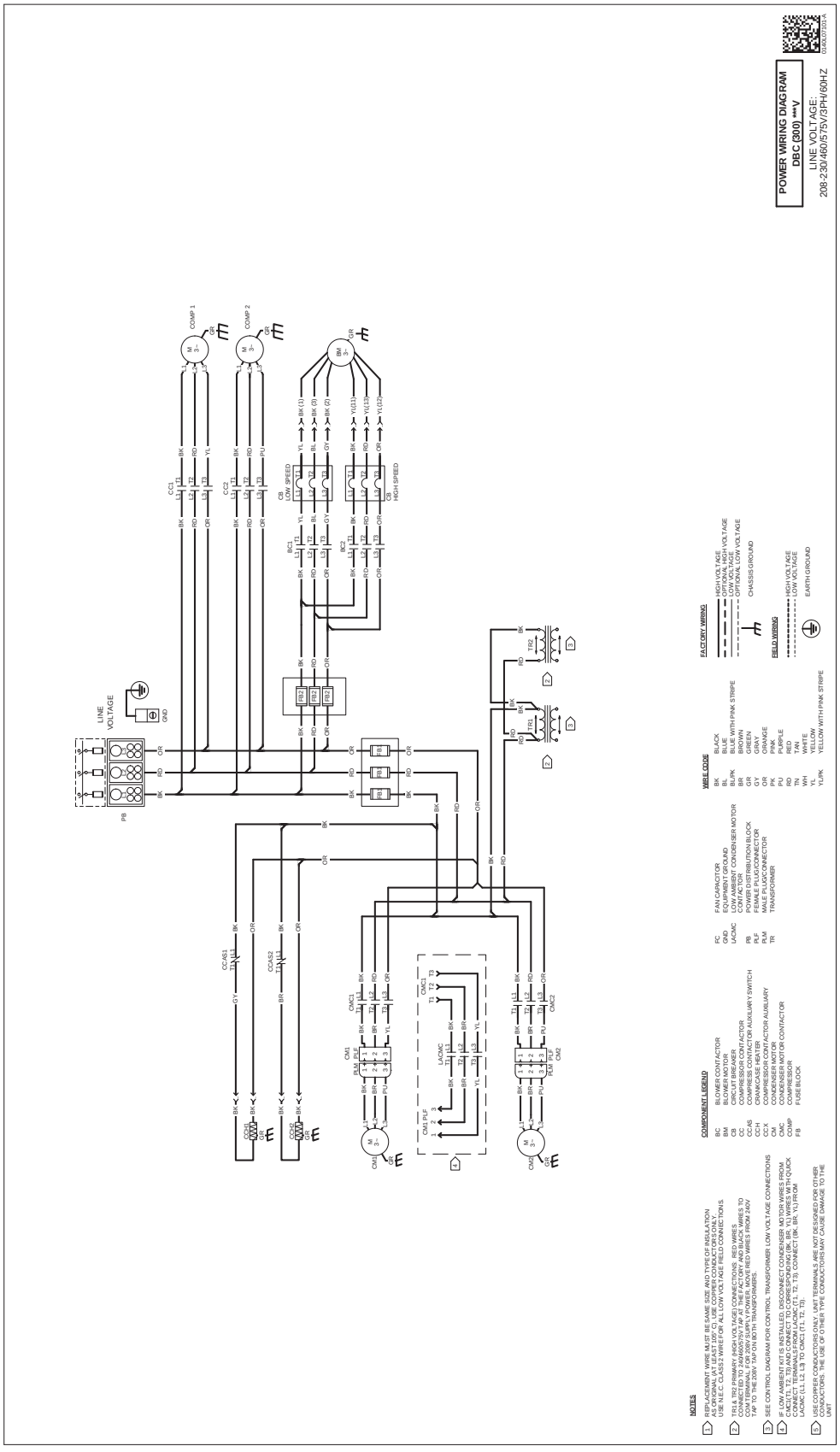
WARNING



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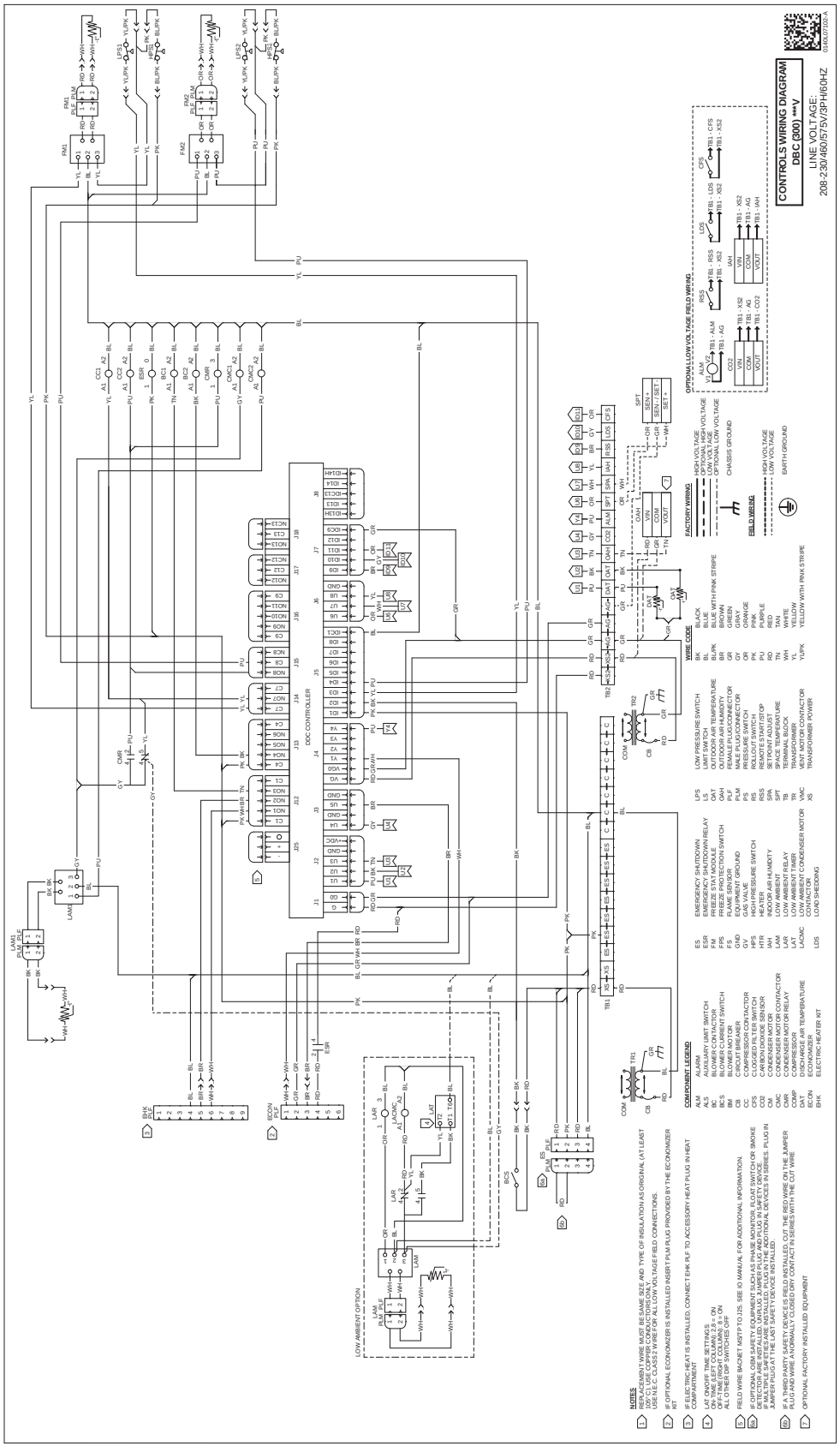
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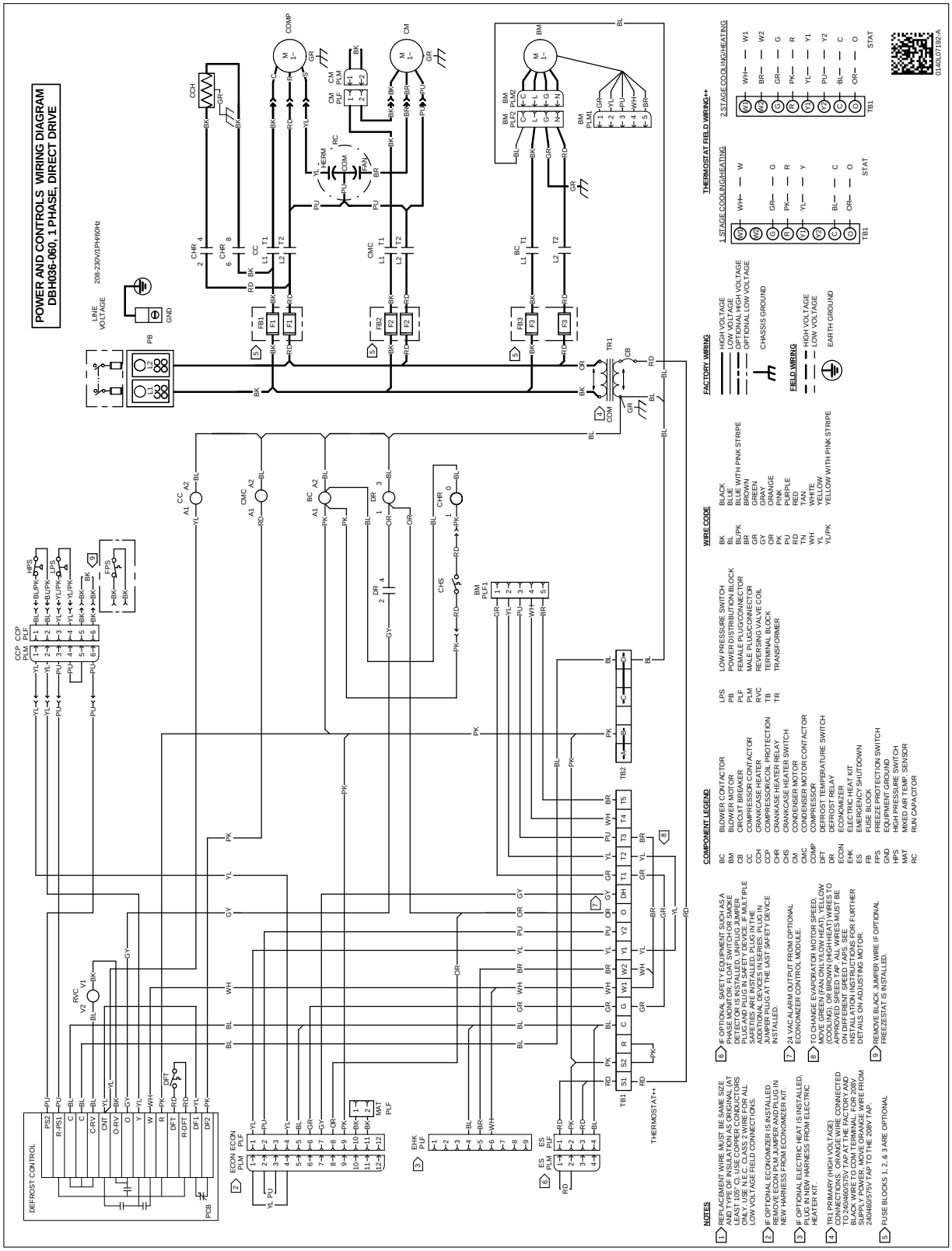
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DBH WIRING DIAGRAMS

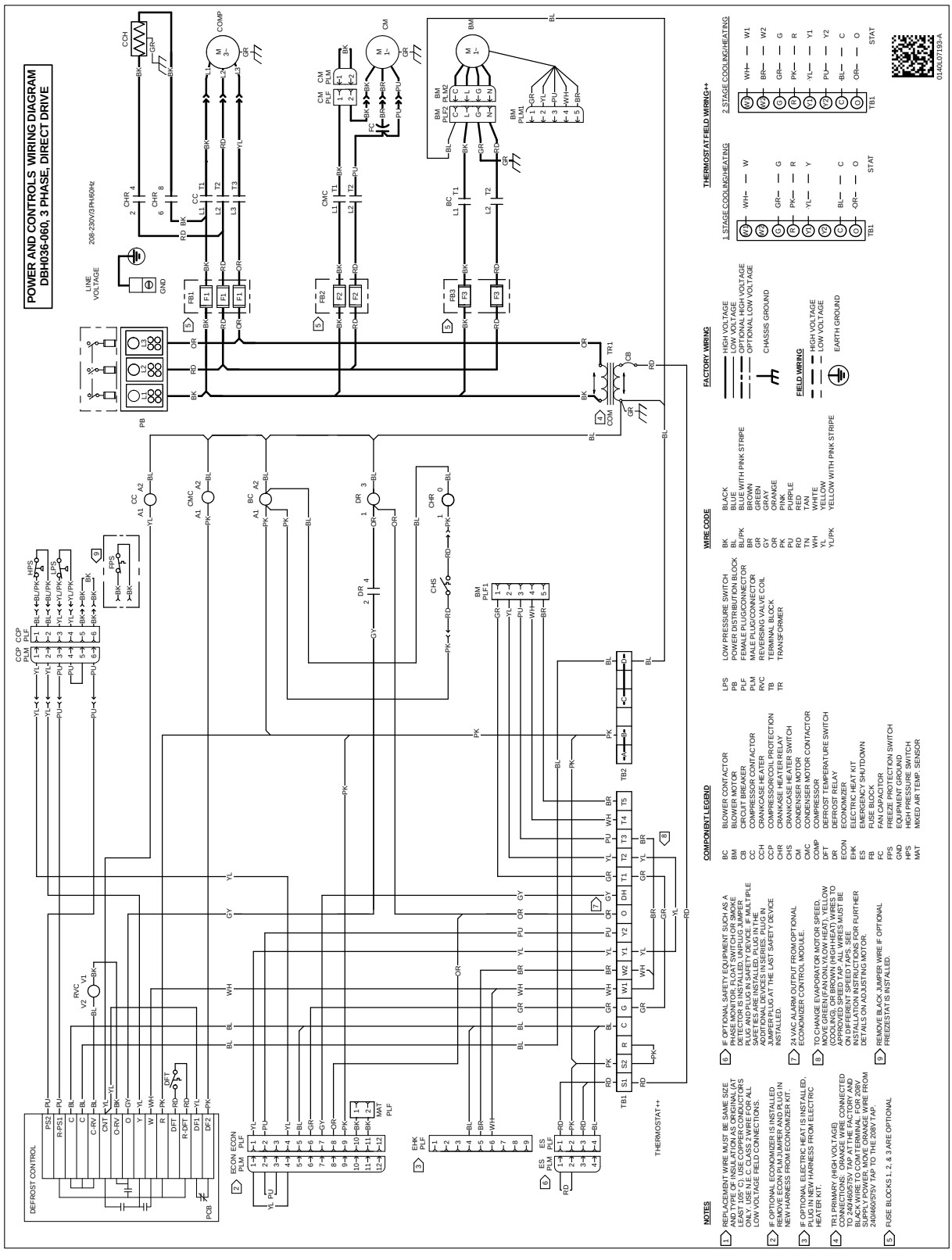
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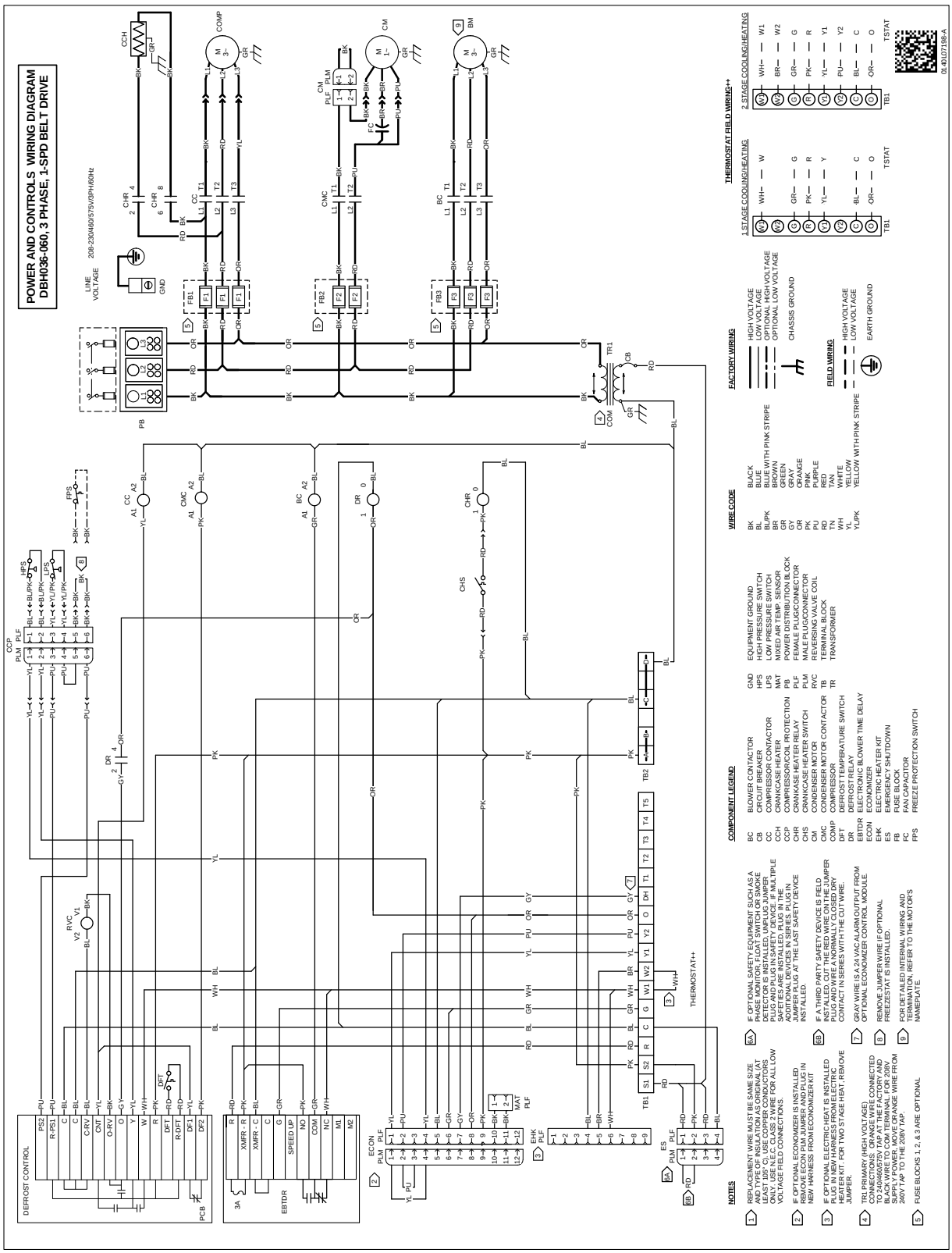
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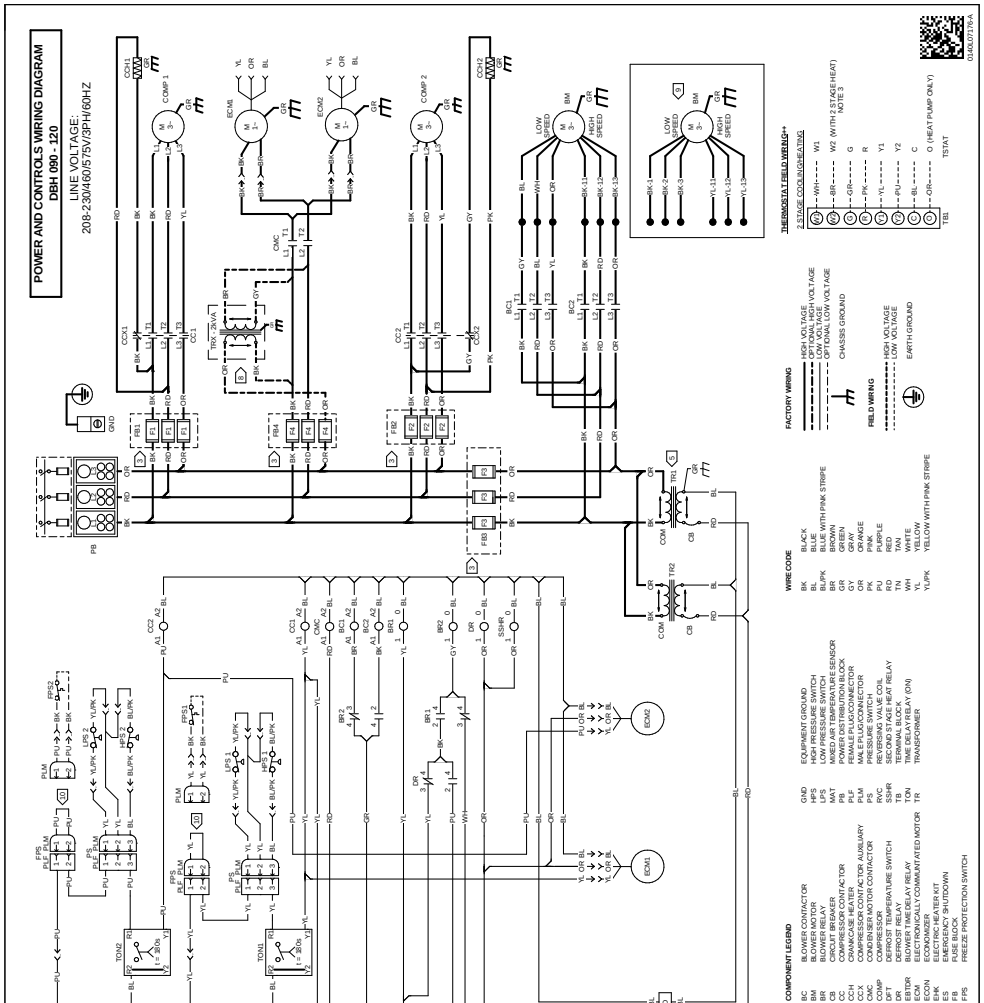
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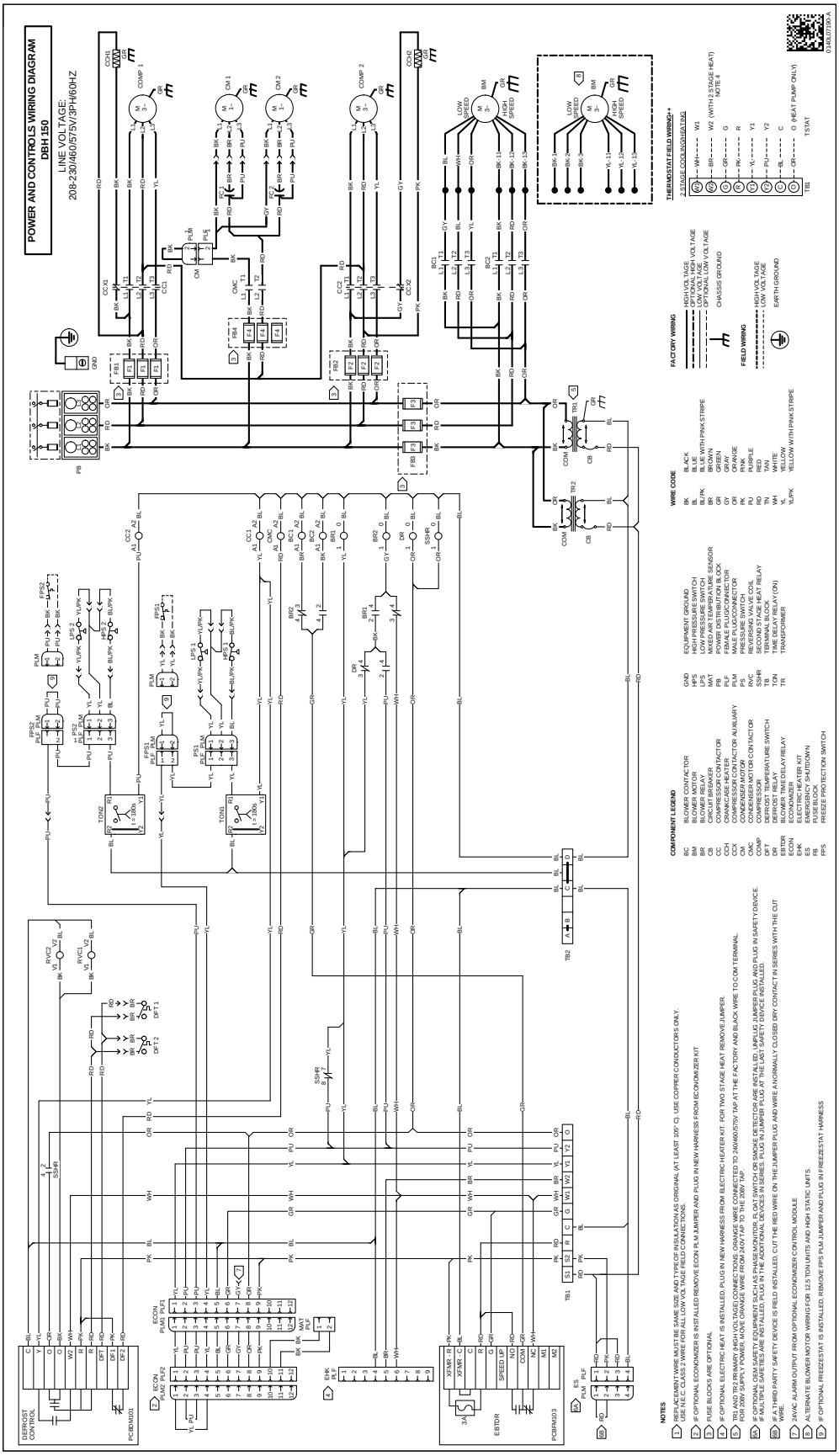
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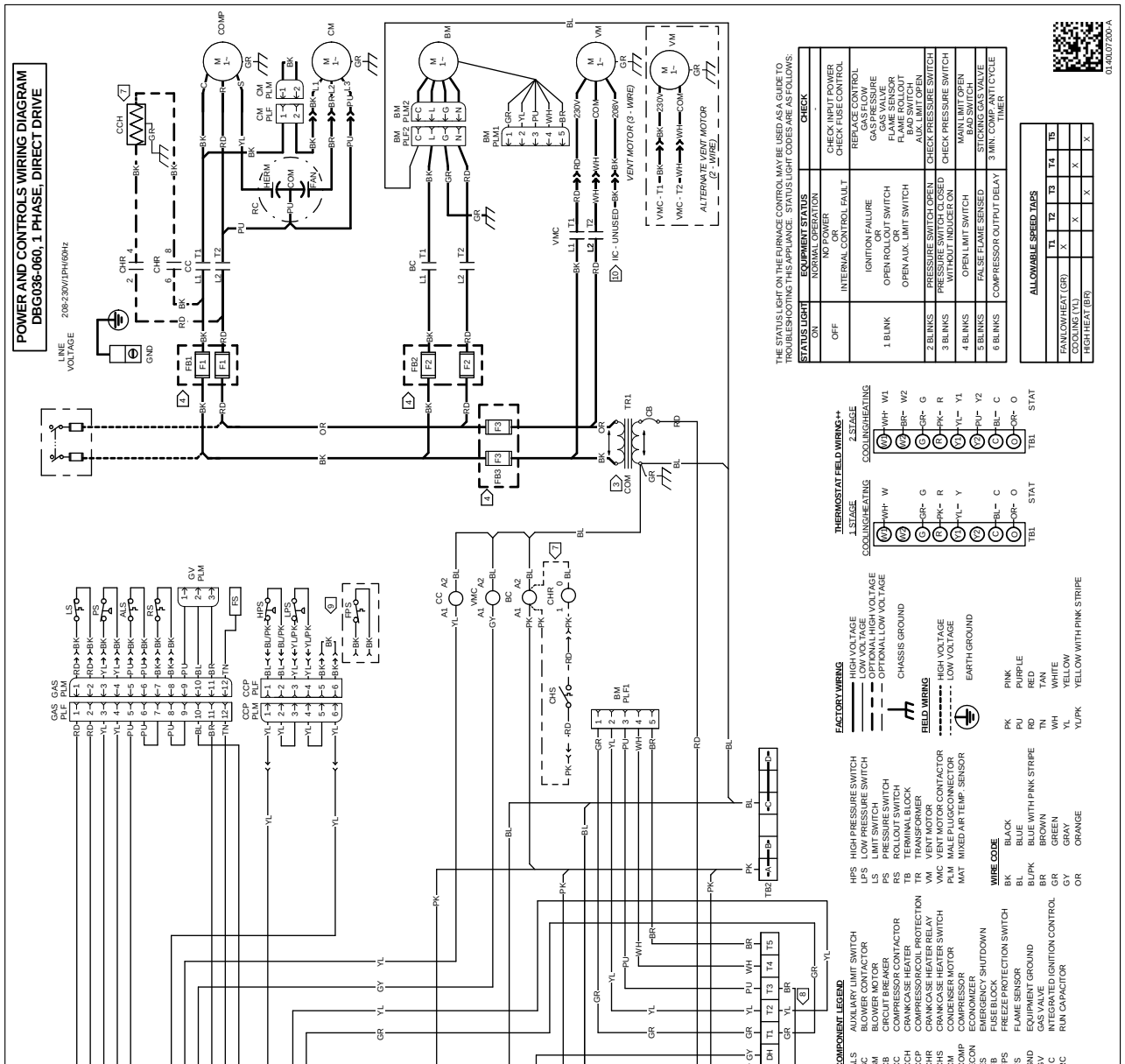


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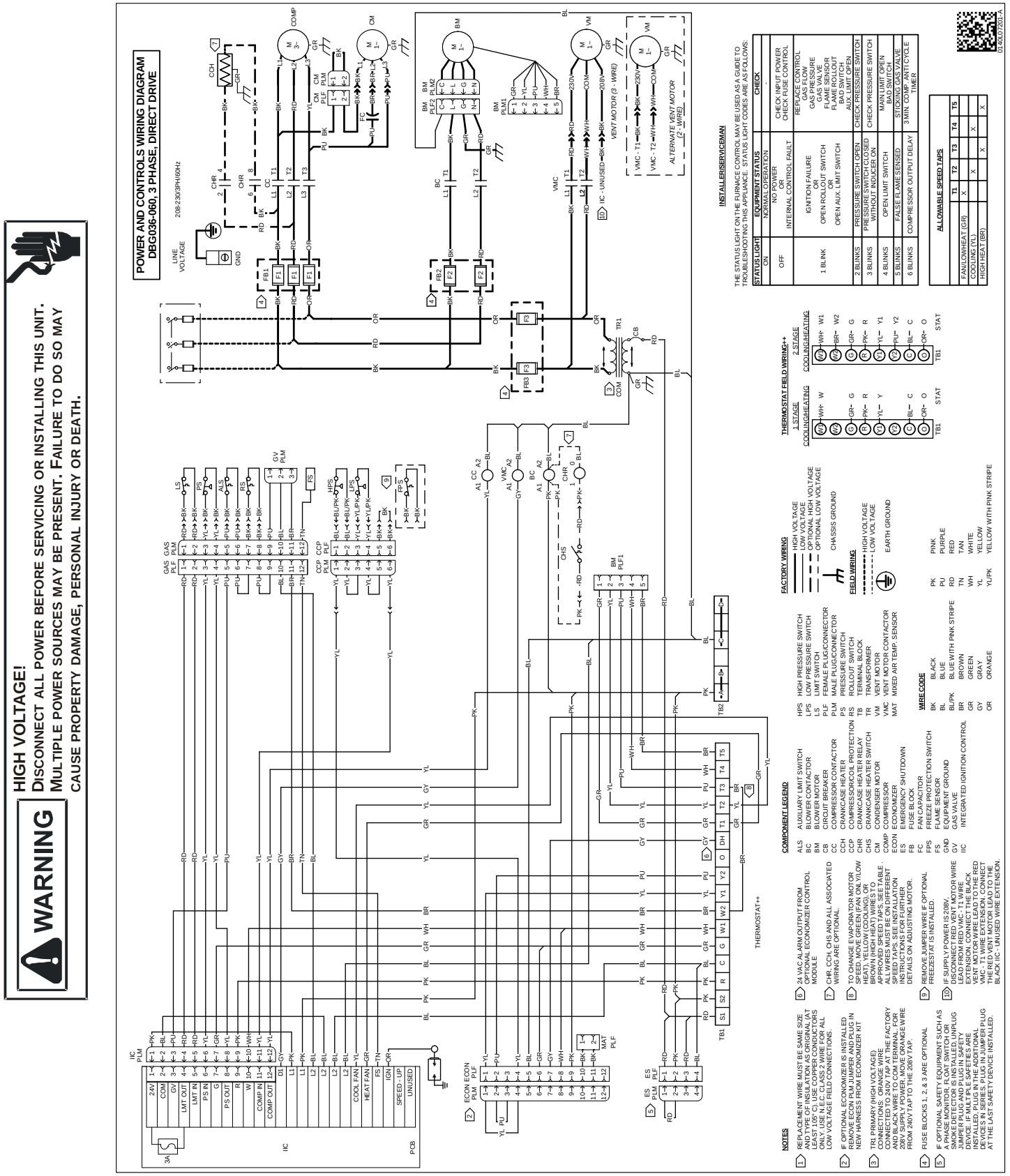
DBG WIRING DIAGRAMS

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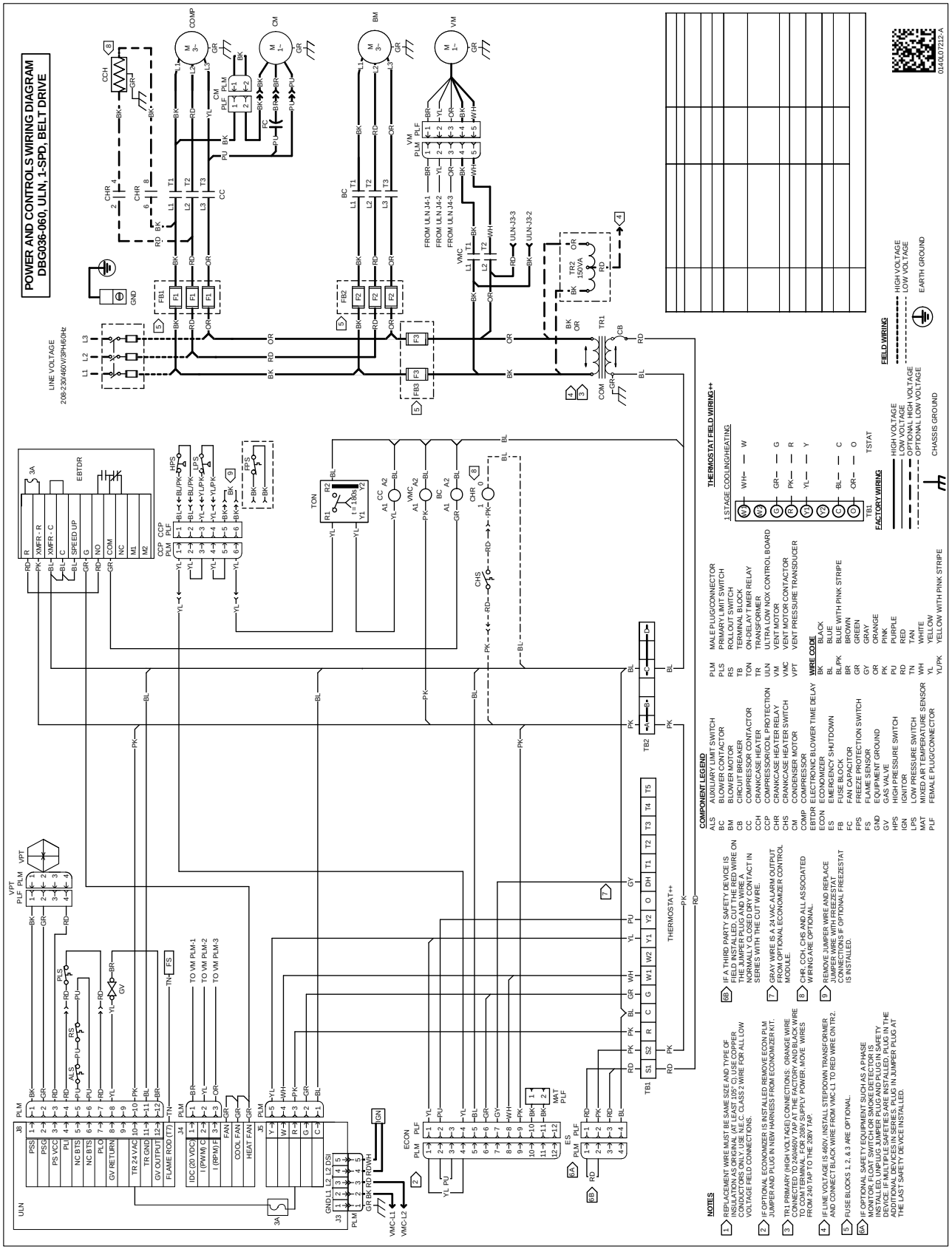
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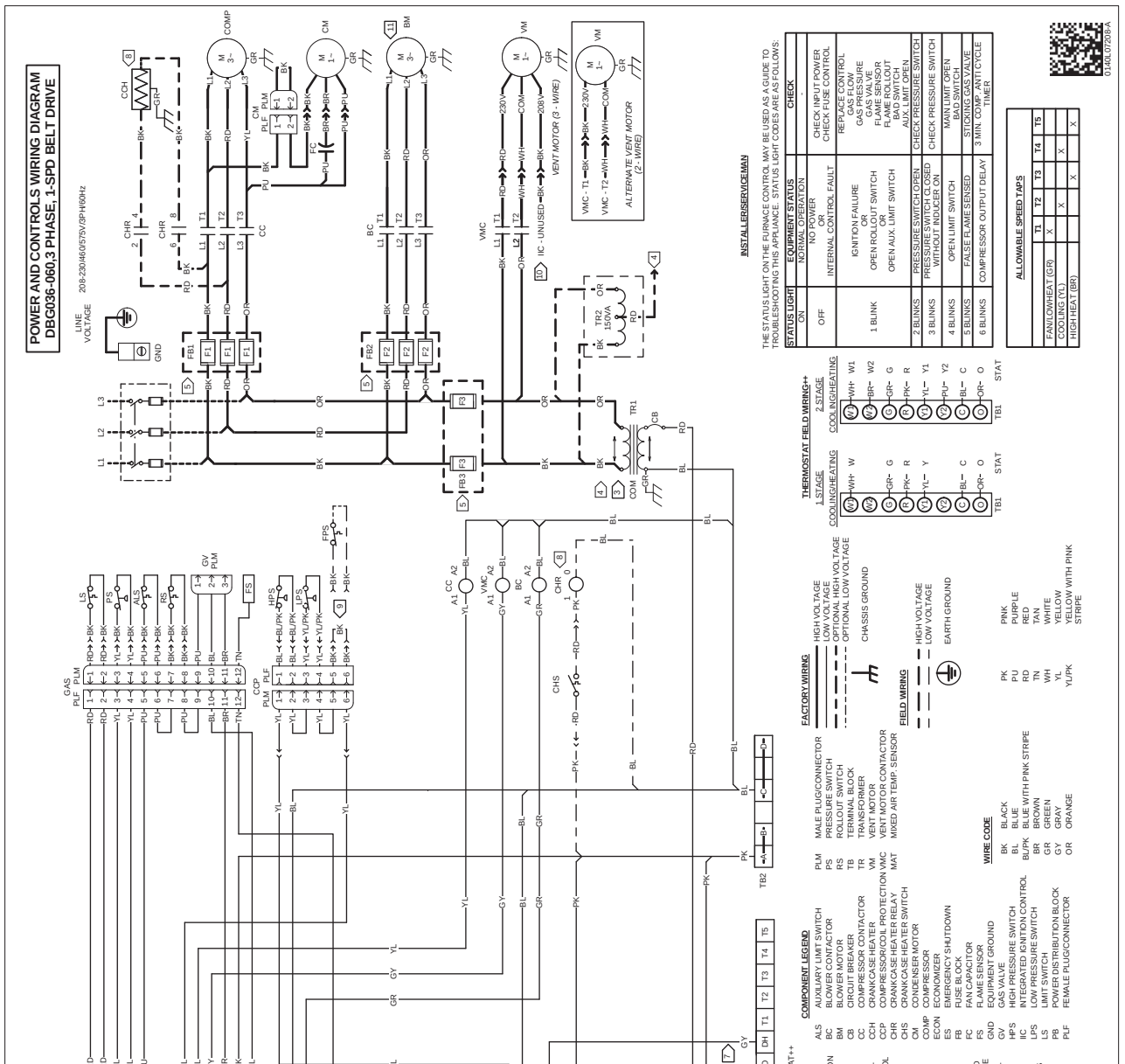
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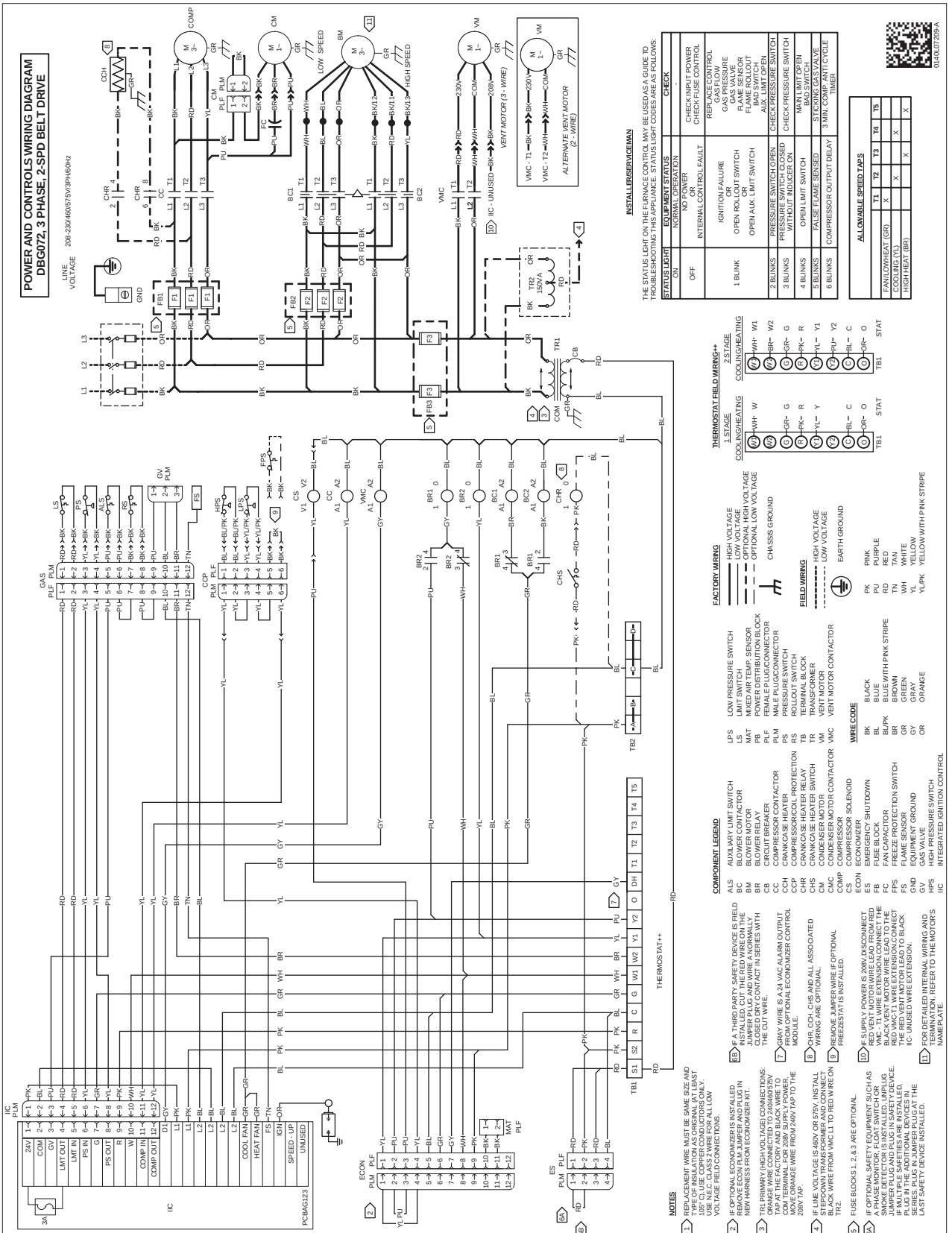
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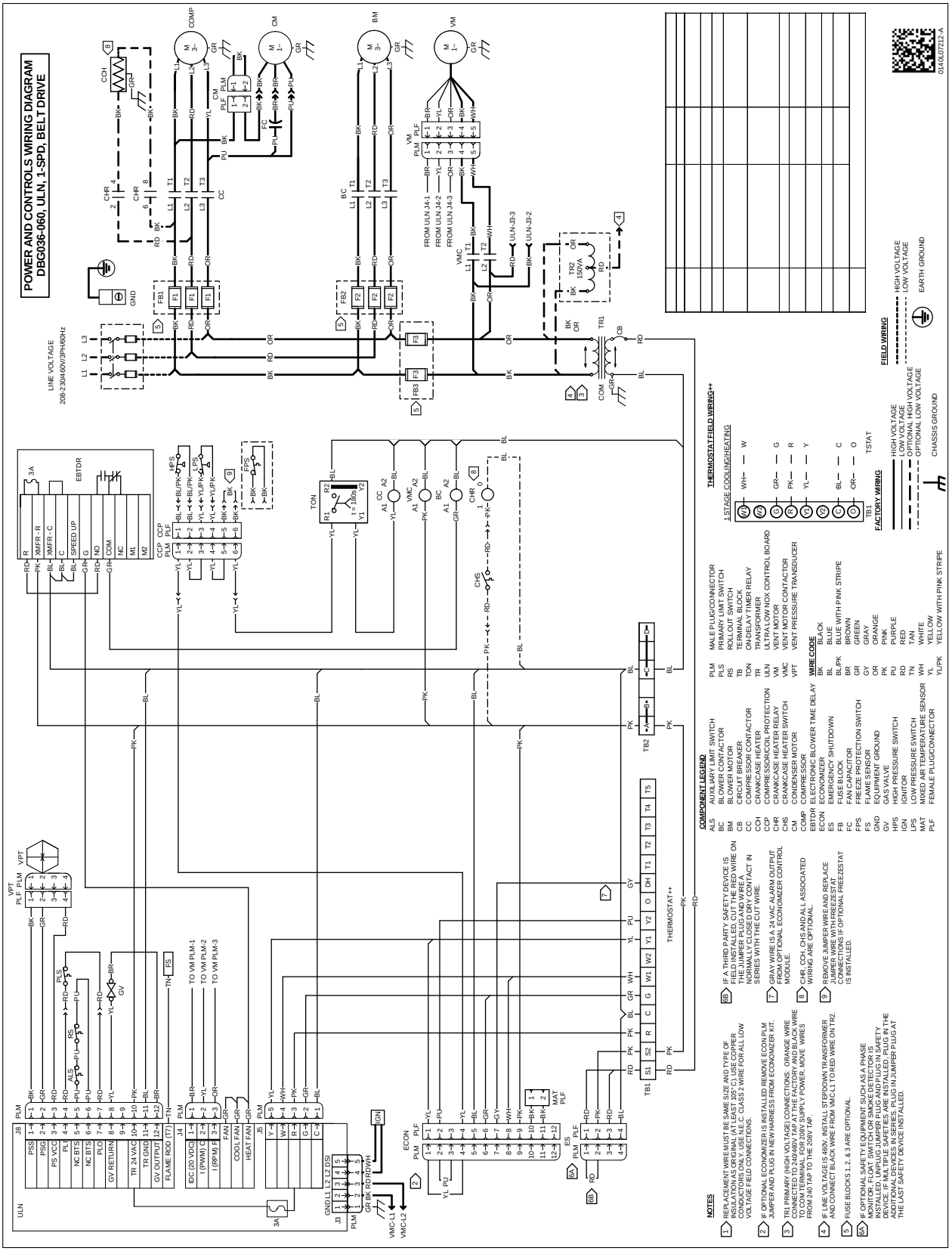
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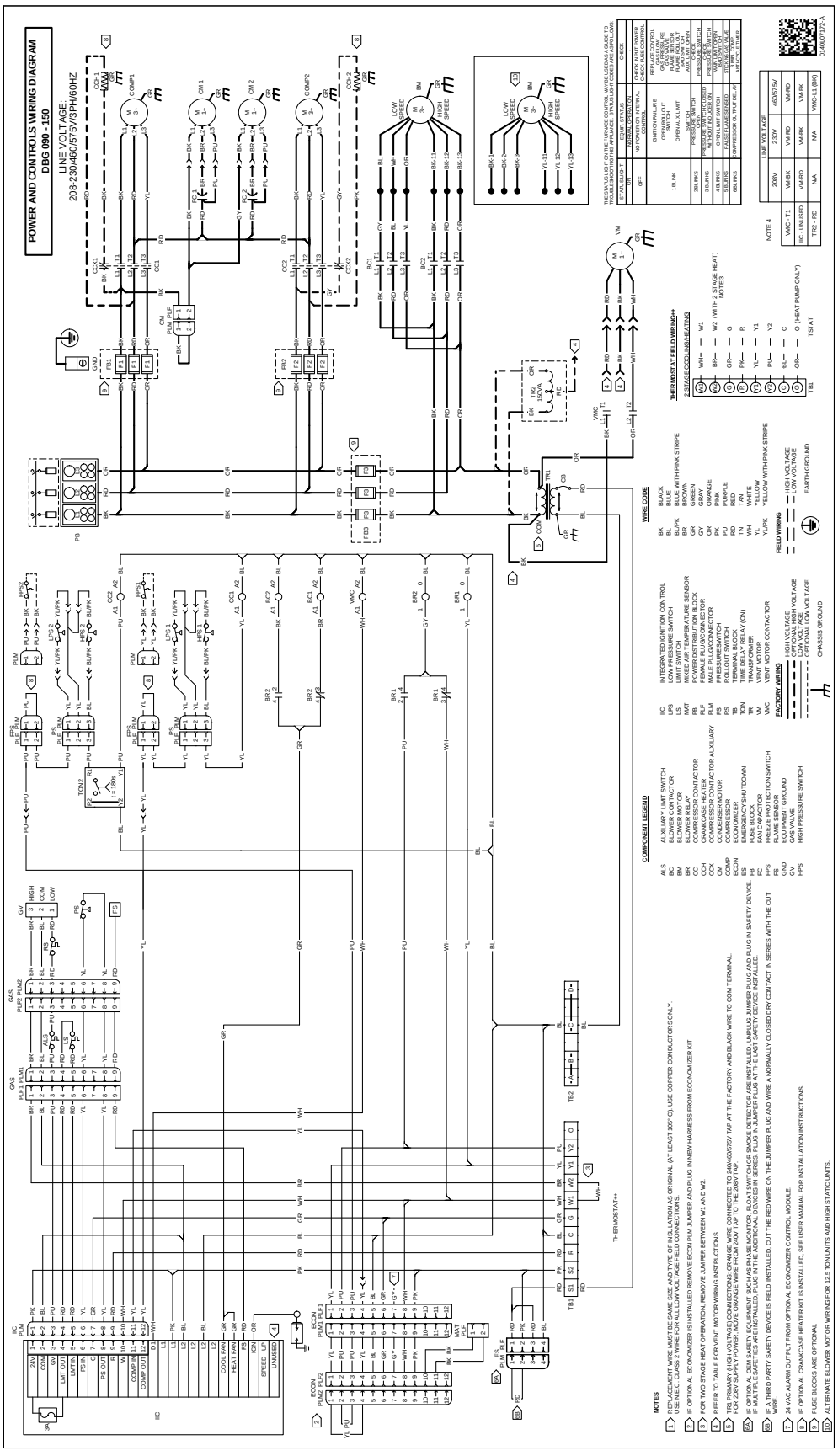
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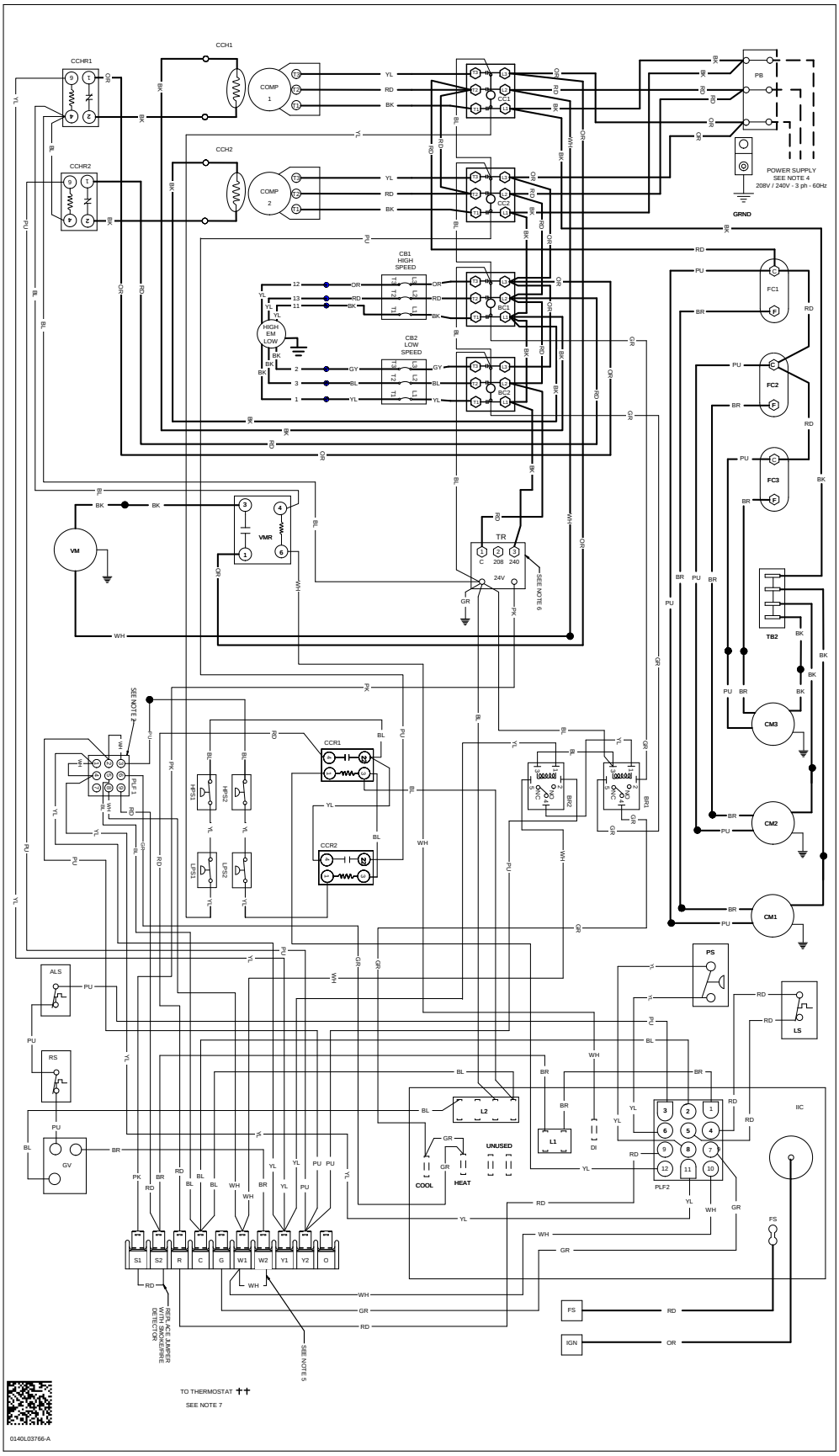
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UNIT WIRING DIAGRAMS

DBG180-240, 3PH 2 SPD, BELT

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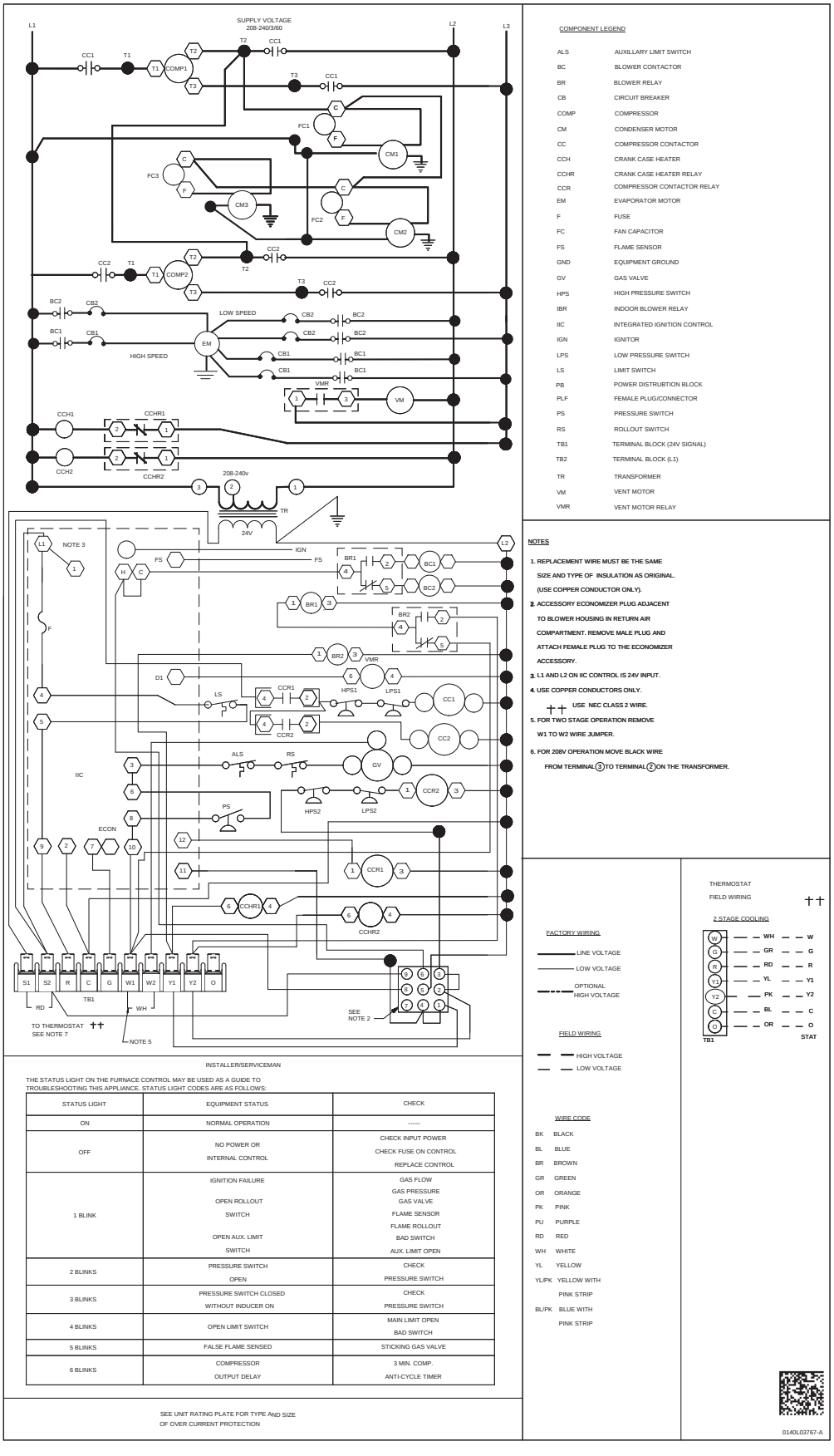
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WARNING



COMPONENT LEGEND

ALS	AUXILLARY LIMIT SWITCH
BC	BLOWER CONTACTOR
BR	BLOWER RELAY
CB	CIRCUIT BREAKER
COMP	COMPRESSOR
CM	CONDENSER MOTOR
CC	COMPRESSOR CONTACTOR
CCH	CRANK CASE HEATER
CCHR	CRANK CASE HEATER RELAY
CCR	COMPRESSOR CONTACTOR RELAY
EM	EVAPORATOR MOTOR
F	FUSE
FC	FAN CAPACITOR
FS	FLAME SENSOR
GND	EQUIPMENT GROUND
GV	GAS VALVE
HPS	HIGH PRESSURE SWITCH
IBR	INDOOR BLOWER RELAY
IIC	INTEGRATED IGNITION CONTROL
IGN	IGNITOR
LPS	LOW PRESSURE SWITCH
LS	LIMIT SWITCH
PB	POWER DISTRUBTION BLOCK
PLF	FEMALE PLUG/CONNECTOR
PS	PRESSURE SWITCH
RS	ROLLOUT SWITCH
TB1	TERMINAL BLOCK (24V SIGNAL)
TB2	TERMINAL BLOCK (L1)
TR	TRANSFORMER
VM	VENT MOTOR
VMR	VENT MOTOR RELAY

NOTES

1. REPLACEMENT WIRE MUST BE THE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL. (USE COPPER CONDUCTOR ONLY).
2. ACCESSORY ECONOMIZER PLUG ADJACENT TO BLOWER HOUSING IN RETURN AIR COMPARTMENT. REMOVE MALE PLUG AND ATTACH FEMALE PLUG TO THE ECONOMIZER ACCESSORY.
3. L1 AND L2 ON IIC CONTROL IS 24V INPUT.
4. USE COPPER CONDUCTORS ONLY.
   ++ USE NEC CLASS 2 WIRE.
5. FOR TWO STAGE OPERATION REMOVE W1 TO W2 WIRE JUMPER.
6. FOR 208V OPERATION MOVE BLACK WIRE FROM TERMINAL (3) TO TERMINAL (2) ON THE TRANSFORMER.

INSTALLER/SERVICEMAN

THE STATUS LIGHT ON THE FURNACE CONTROL MAY BE USED AS A GUIDE TO TROUBLESHOOTING THIS APPLIANCE. STATUS LIGHT CODES ARE AS FOLLOWS:

STATUS LIGHT	EQUIPMENT STATUS	CHECK
ON	NORMAL OPERATION	------
OFF	NO POWER OR INTERNAL CONTROL	CHECK INPUT POWER CHECK FUSE ON CONTROL REPLACE CONTROL
1 BLINK	IGNITION FAILURE OPEN ROLLOUT SWITCH OPEN AUX. LIMIT SWITCH	GAS FLOW GAS PRESSURE GAS VALVE FLAME SENSOR FLAME ROLLOUT BAD SWITCH AUX. LIMIT OPEN
2 BLINKS	PRESSURE SWITCH OPEN	CHECK PRESSURE SWITCH
3 BLINKS	PRESSURE SWITCH CLOSED WITHOUT INDUCER ON	CHECK PRESSURE SWITCH
4 BLINKS	OPEN LIMIT SWITCH	MAIN LIMIT OPEN BAD SWITCH
5 BLINKS	FALSE FLAME SENSED	STICKING GAS VALVE
6 BLINKS	COMPRESSOR OUTPUT DELAY	3 MIN. COMP. ANTI-CYCLE TIMER

SEE UNIT RATING PLATE FOR TYPE AND SIZE OF OVER CURRENT PROTECTION

FACTORY WIRING
- LINE VOLTAGE
- LOW VOLTAGE
- OPTIONAL HIGH VOLTAGE

FIELD WIRING
- HIGH VOLTAGE
- LOW VOLTAGE

WIRE CODE

BK	BLACK
BL	BLUE
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OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
WH	WHITE
YL	YELLOW
YL/PK	YELLOW WITH PINK STRIP
BL/PK	BLUE WITH PINK STRIP

THERMOSTAT FIELD WIRING ++

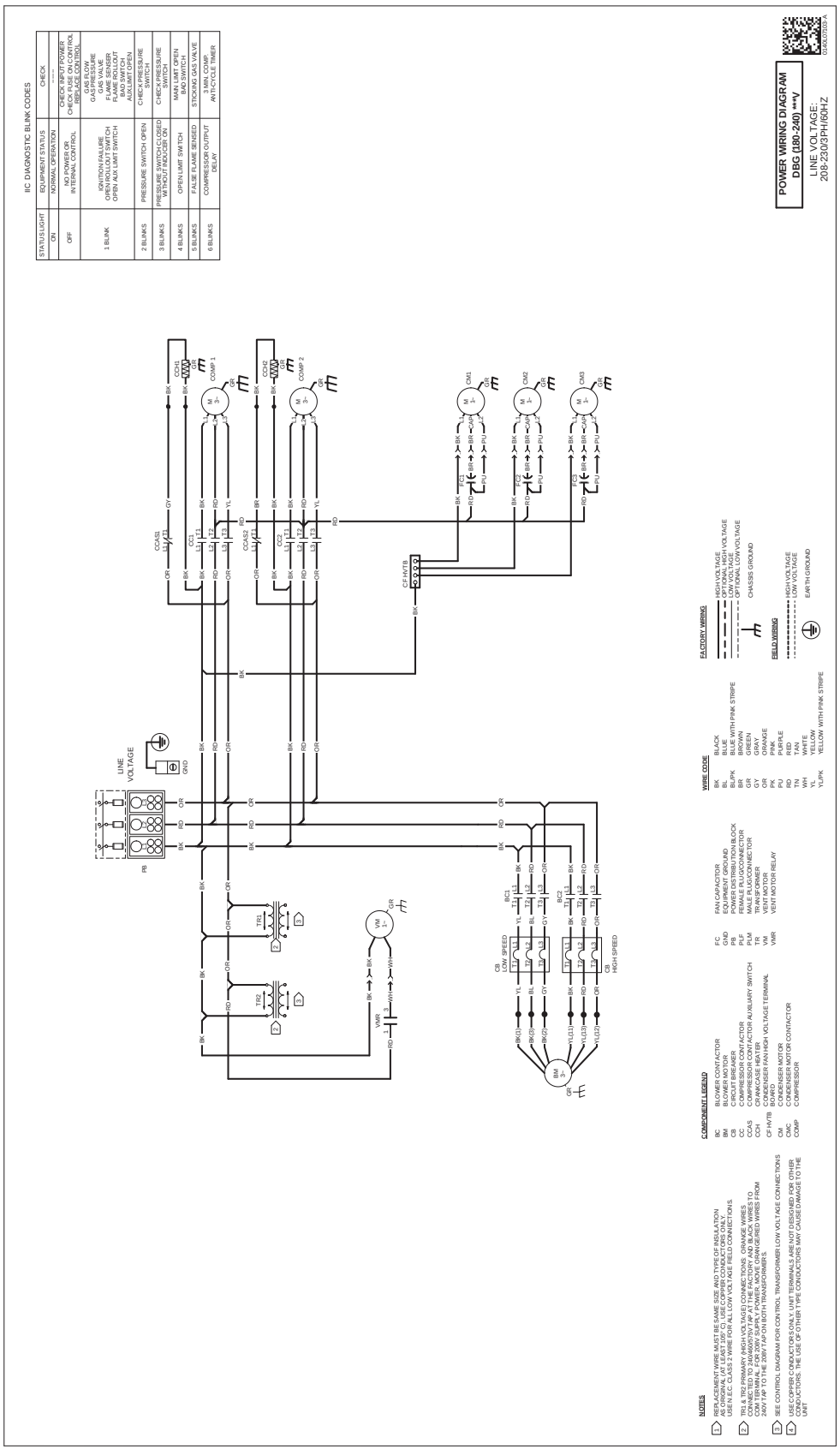
2 STAGE COOLING

0140L03767-A

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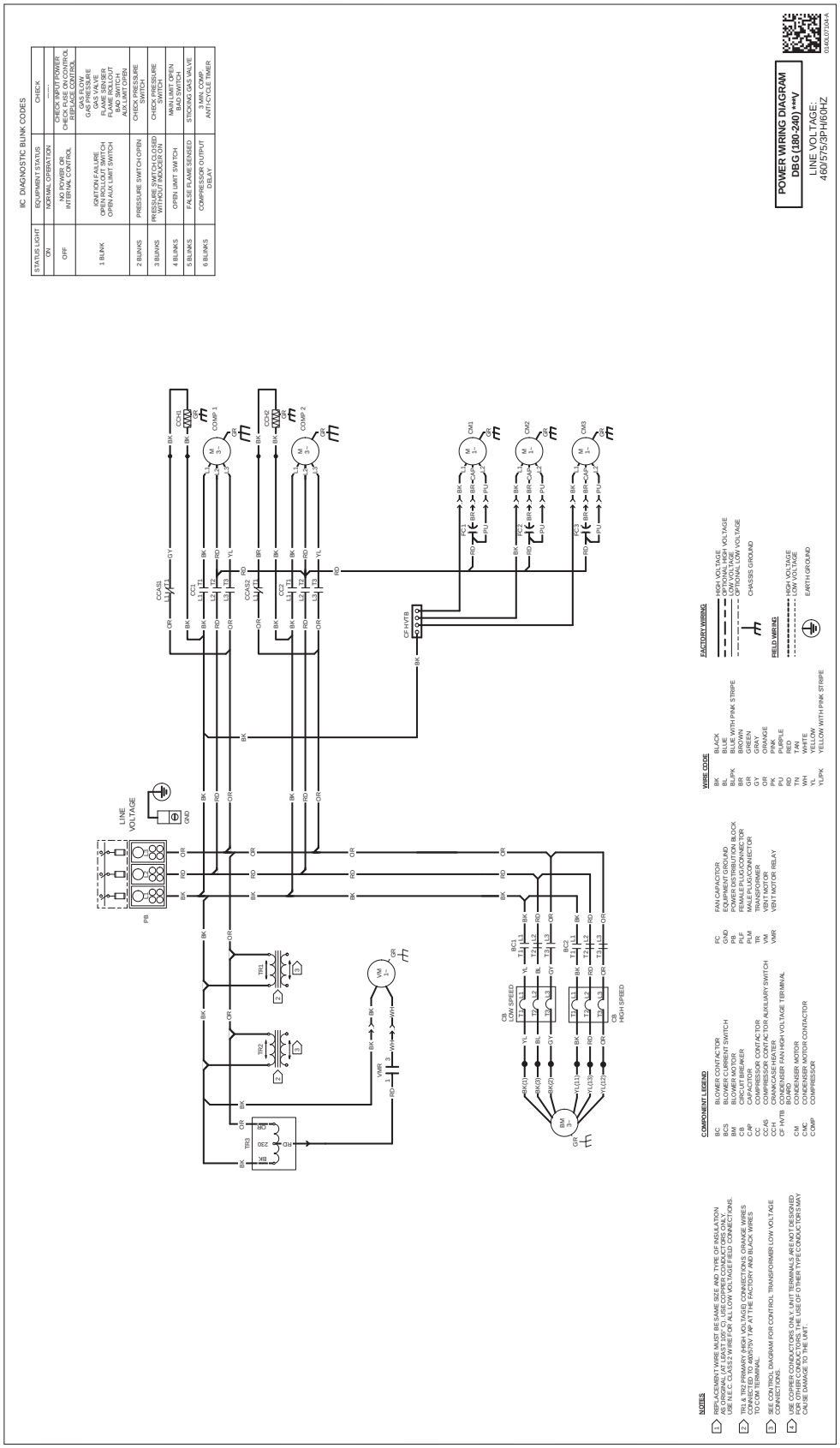
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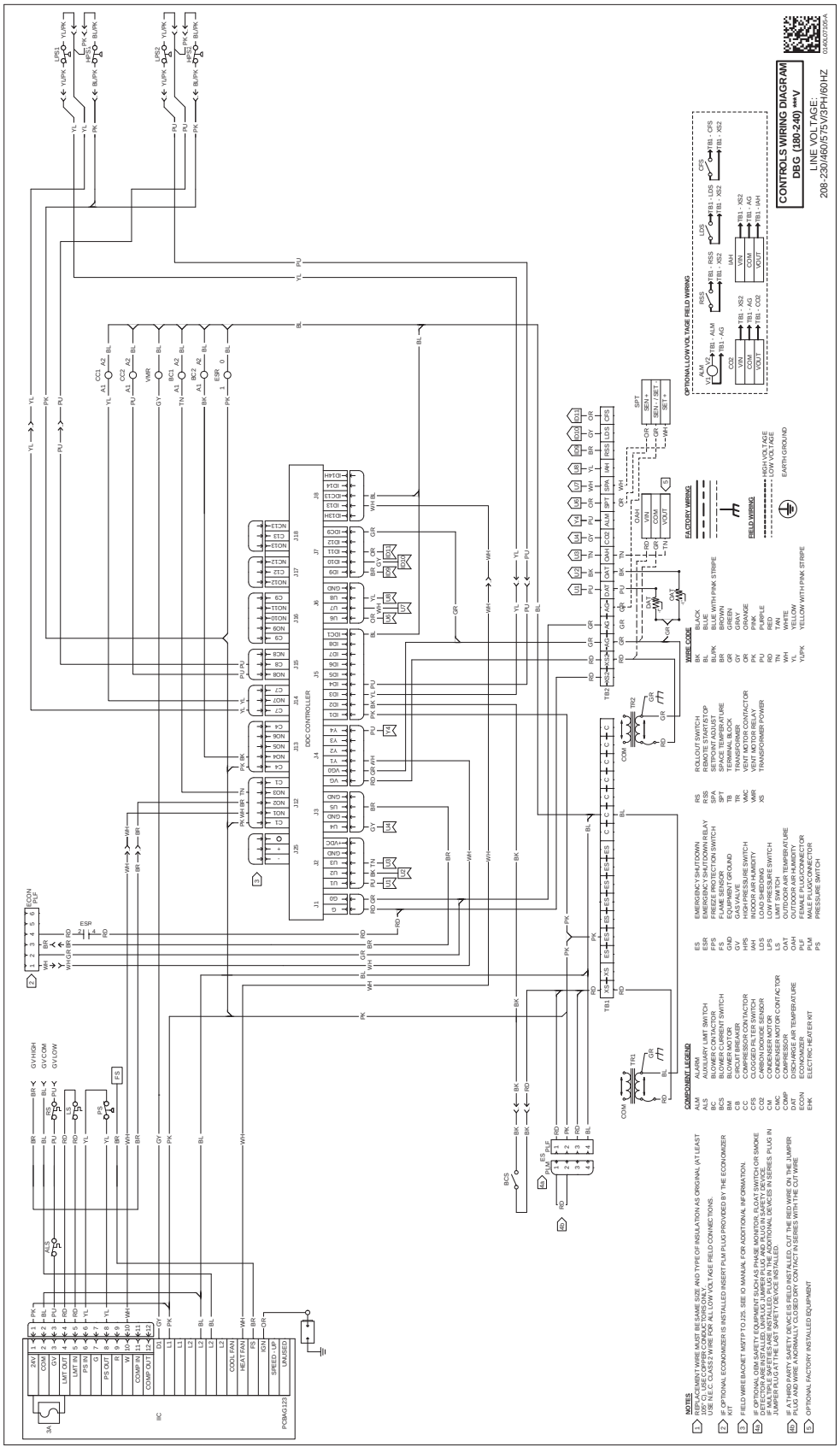
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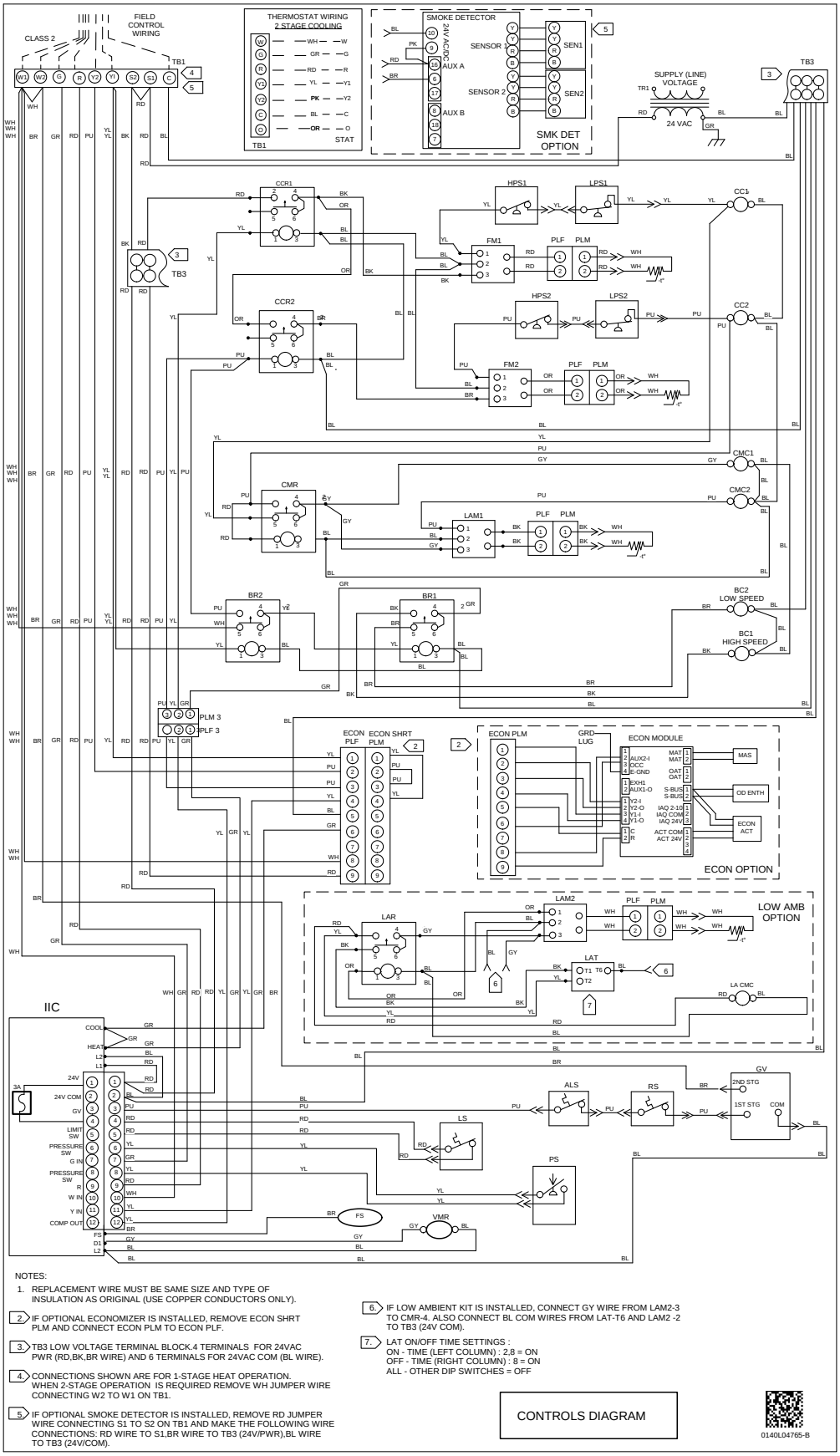
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WARNING



NOTES:

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (USE COPPER CONDUCTORS ONLY).
2. IF OPTIONAL ECONOMIZER IS INSTALLED, REMOVE ECON SHRT PLM AND CONNECT ECON PLM TO ECON PLF.
3. TB3 LOW VOLTAGE TERMINAL BLOCK.4 TERMINALS FOR 24VAC PWR (RD,BK,BR WIRE) AND 6 TERMINALS FOR 24VAC COM (BL WIRE).
4. CONNECTIONS SHOWN ARE FOR 1-STAGE HEAT OPERATION. WHEN 2-STAGE OPERATION IS REQUIRED REMOVE WH JUMPER WIRE CONNECTING W2 TO W1 ON TB1.
5. IF OPTIONAL SMOKE DETECTOR IS INSTALLED, REMOVE RD JUMPER WIRE CONNECTING S1 TO S2 ON TB1 AND MAKE THE FOLLOWING WIRE CONNECTIONS: RD WIRE TO S1,BR WIRE TO TB3 (24V/PWR),BL WIRE TO TB3 (24V/COM).
6. IF LOW AMBIENT KIT IS INSTALLED, CONNECT GY WIRE FROM LAM2-3 TO CMR-4. ALSO CONNECT BL COM WIRES FROM LAT-T6 AND LAM2 -2 TO TB3 (24V COM).
7. LAT ON/OFF TIME SETTINGS : ON - TIME (LEFT COLUMN) : 2,8 = ON OFF - TIME (RIGHT COLUMN) : 8 = ON ALL - OTHER DIP SWITCHES = OFF

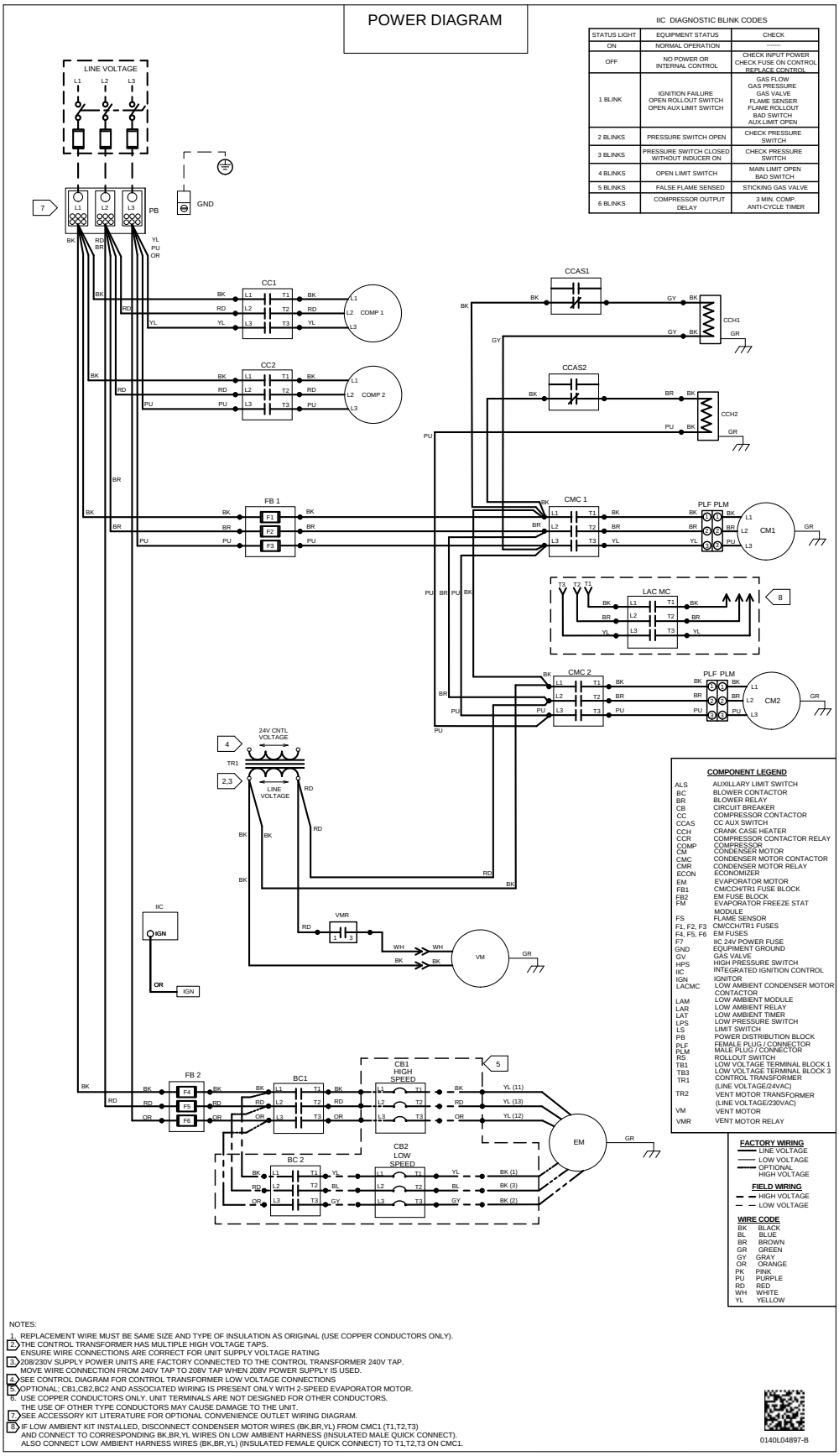
CONTROLS DIAGRAM

0140L04765-B

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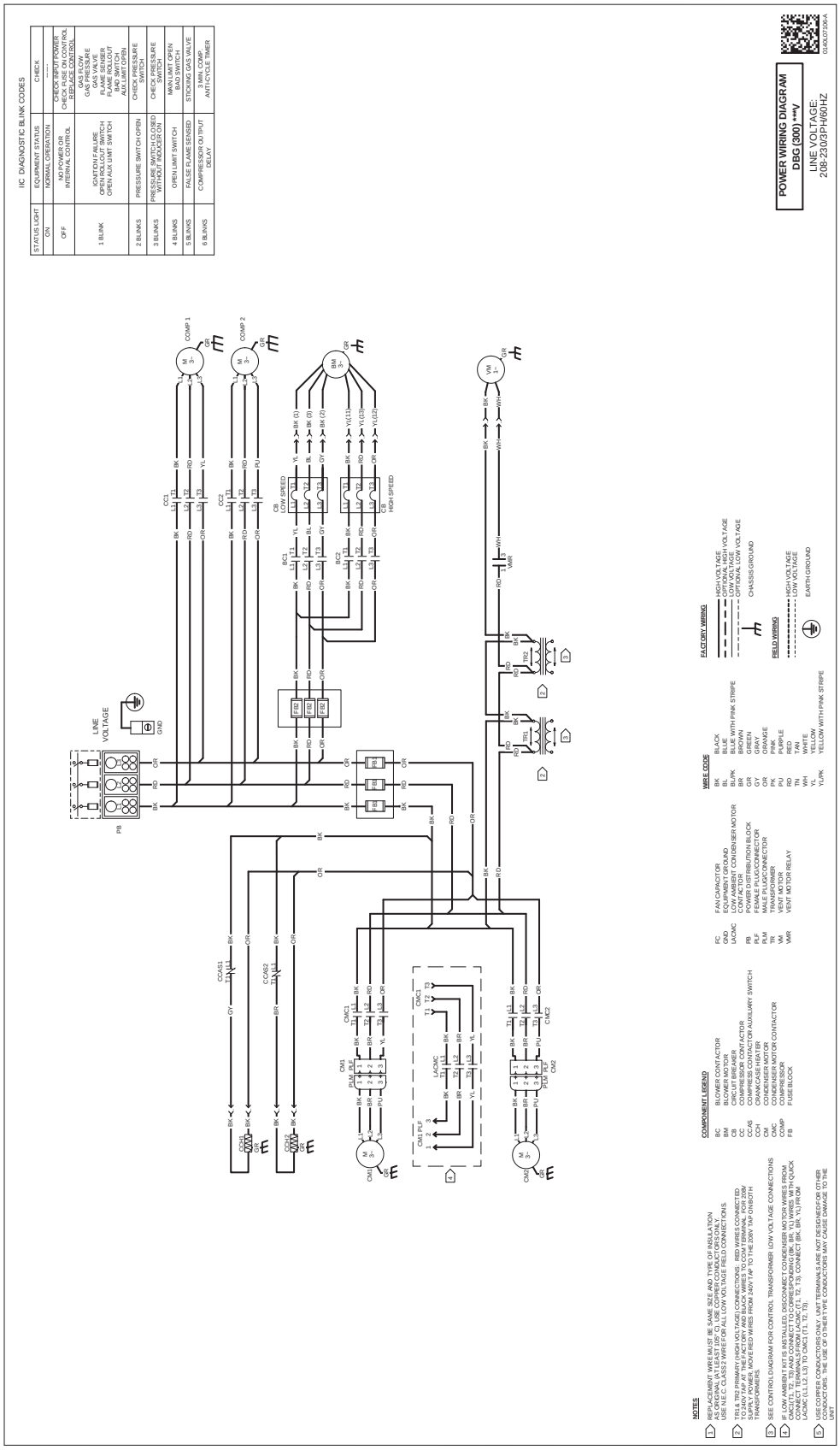
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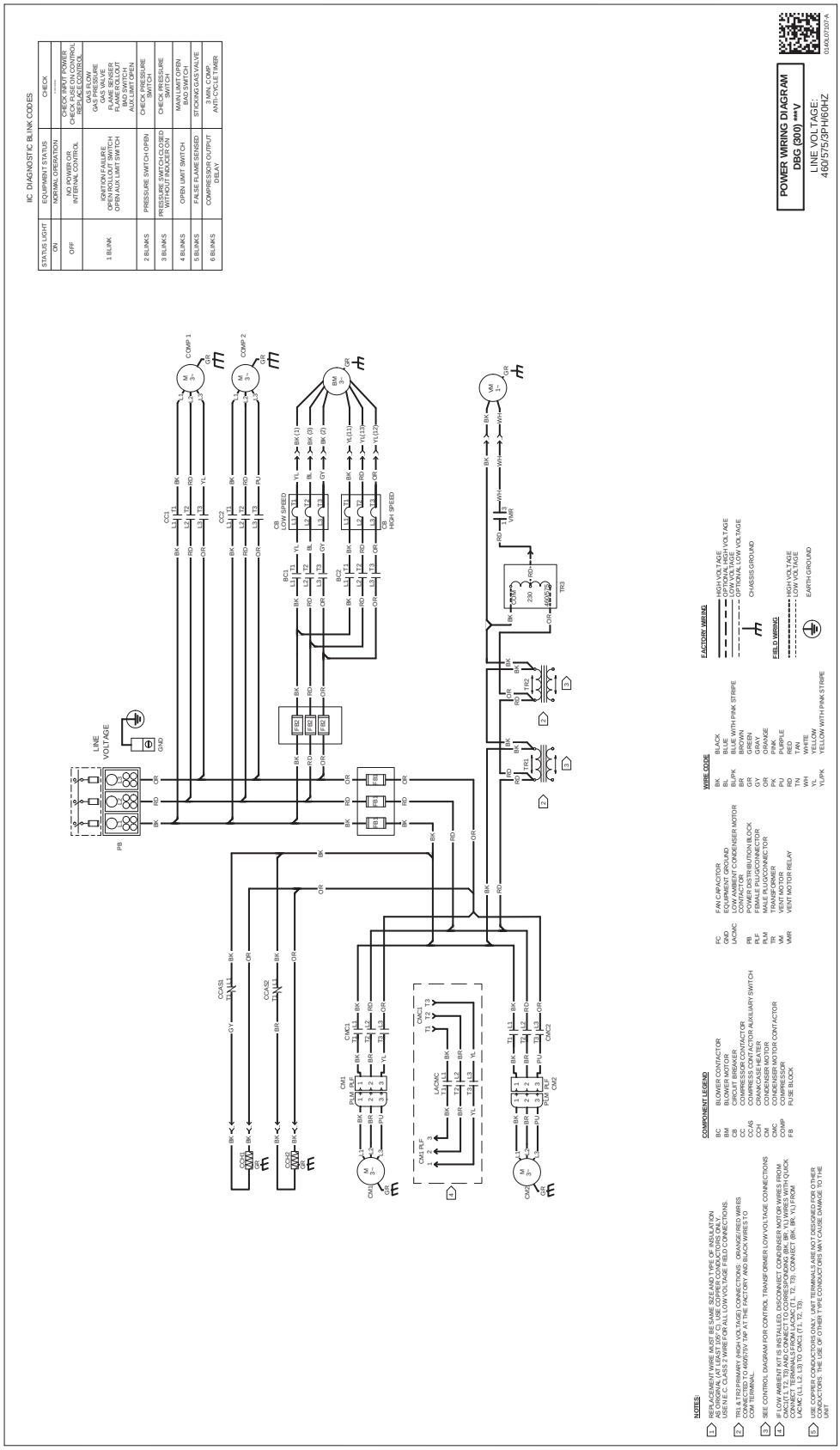
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WARNING

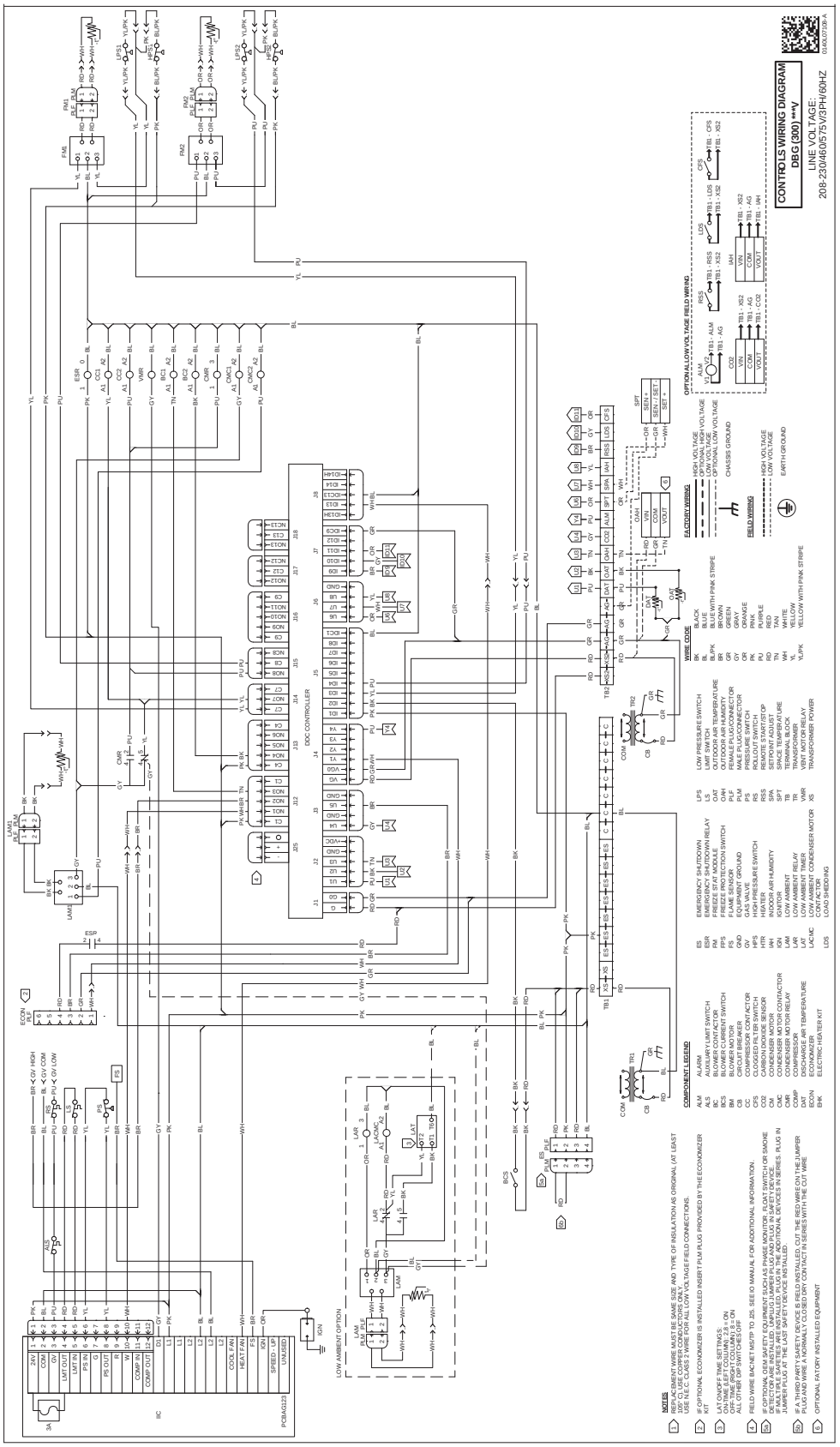
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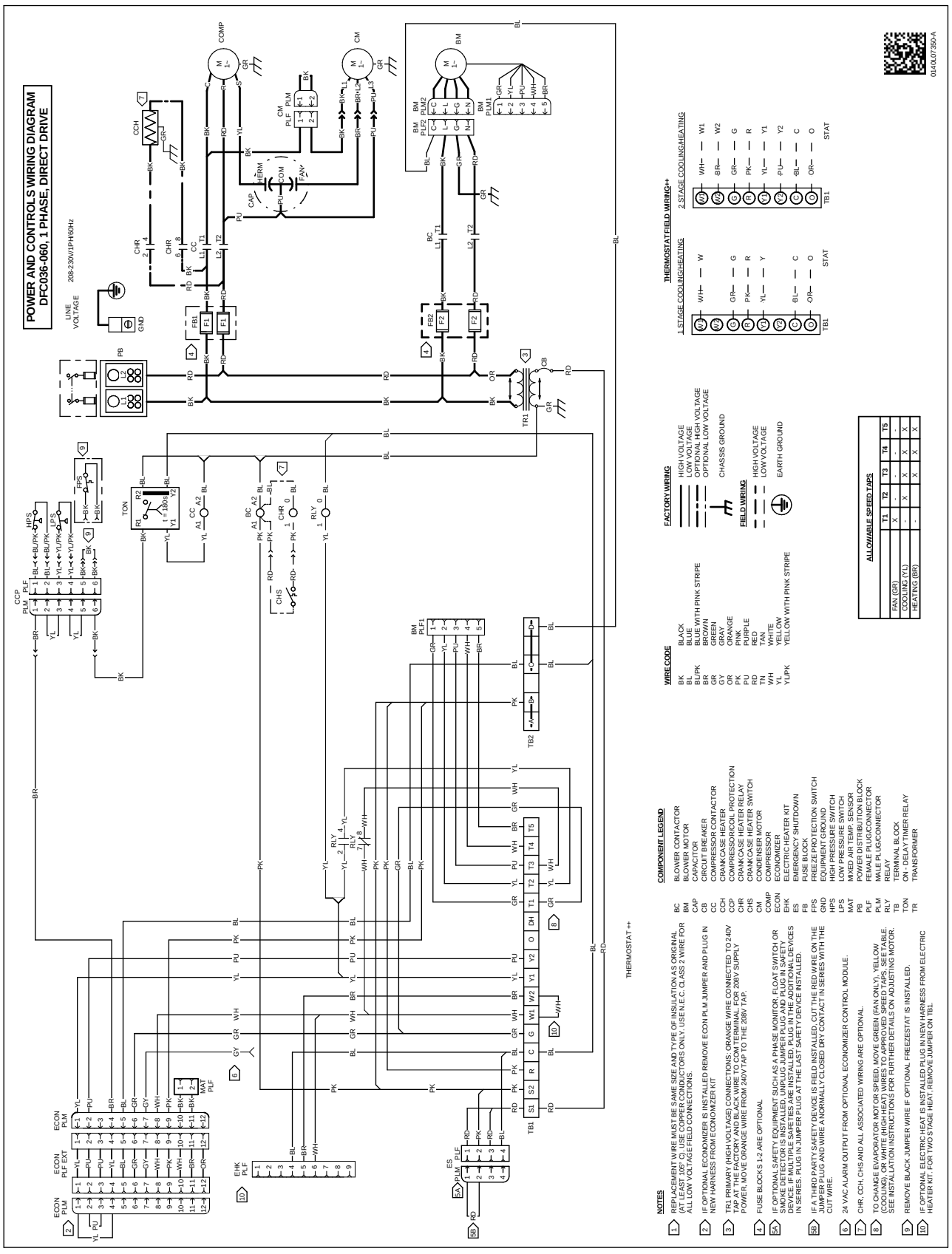


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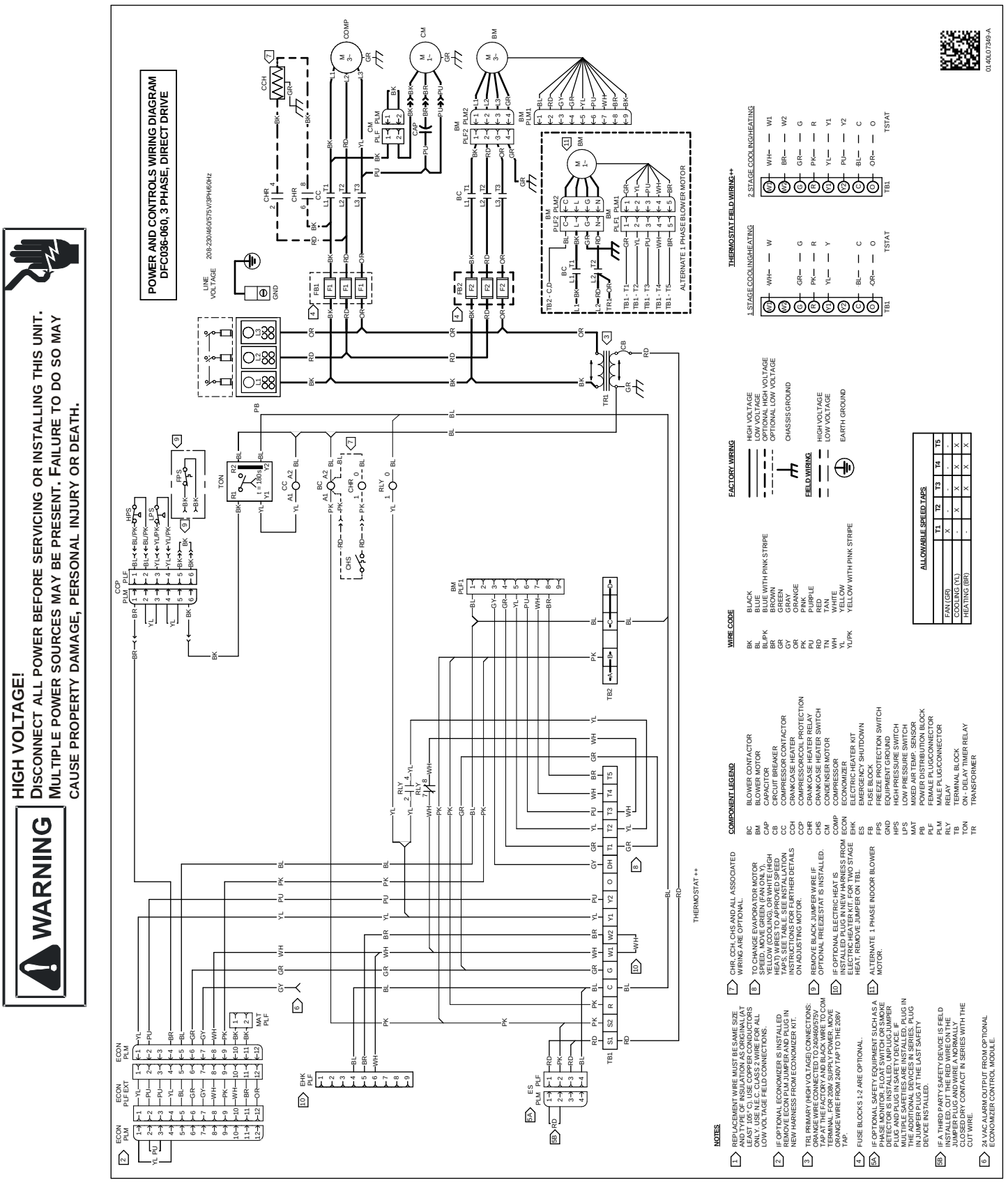
DFC WIRING DIAGRAMS

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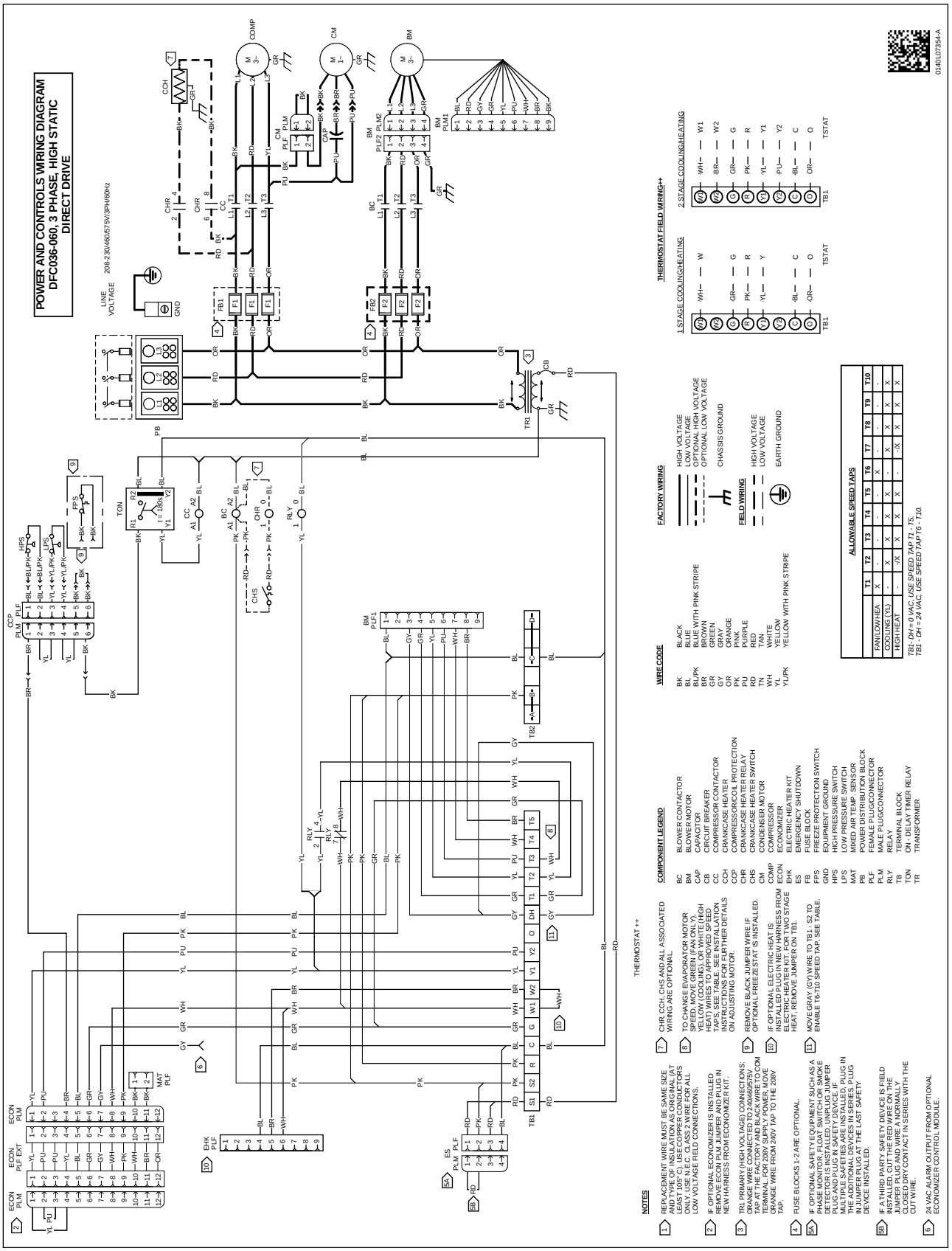
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NOTES

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (AT LEAST 105° C). USE COPPER CONDUCTORS ONLY. USE N.E.C. CLASS 2 WIRE FOR ALL LOW VOLTAGE FIELD CONNECTIONS.
2. IF OPTIONAL ECONOMIZER IS INSTALLED REMOVE ECON PLM JUMPER AND PLUG IN NEW HARNESS FROM ECONOMIZER KIT.
3. TR1 PRIMARY (HIGH VOLTAGE) CONNECTIONS: ORANGE WIRE CONNECTED TO 240/480/575V TERMINAL FOR 208V APPLICATIONS. BLACK WIRE TO COM TERMINAL FOR 208V, 240V, 480V, AND 575V. ORANGE WIRE FROM 240V TAP TO THE 208V TAP.
4. FUSE BLOCKS 1-2 ARE OPTIONAL.
5A. IF OPTIONAL SAFETY EQUIPMENT SUCH AS A PHASE MONITOR, FLOAT SWITCH OR SMOKE DETECTOR IS INSTALLED, REMOVE FACTORY JUMPER PLUG AND PLUG IN SAFETY DEVICE. IF MULTIPLE SAFETIES ARE INSTALLED, PLUG IN THE ADDITIONAL DEVICES IN SERIES. PLUG IN UNUSED SAFETY PLUG AT THE LAST SAFETY DEVICE INSTALLED.
5B. IF A THIRD PARTY SAFETY DEVICE IS FIELD INSTALLED, CUT RED JUMPER WIRE AT THE JUMPER PLUG AND WIRE A NORMALLY CLOSED DRY CONTACT IN SERIES WITH THE CUT WIRE.
6. 24 VAC ALARM OUTPUT FROM OPTIONAL ECONOMIZER CONTROL MODULE.
7. CHR, CCH, CHS AND ALL ASSOCIATED WIRING ARE OPTIONAL.
8. TO CHANGE EVAPORATOR MOTOR SPEED, MOVE GREEN (FAN ONLY), YELLOW (COOLING), OR WHITE (HIGH HEAT) WIRES TO APPROVED SPEED TAPS. SEE TABLE. SEE INSTALLATION INSTRUCTIONS OR OWNER'S MANUAL FOR FURTHER DETAILS ON ADJUSTING MOTOR.
9. REMOVE BLACK JUMPER WIRE IF OPTIONAL FREEZESTAT IS INSTALLED.
10. IF OPTIONAL ELECTRIC HEAT IS INSTALLED PLUG IN NEW HARNESS FROM ELECTRIC HEAT KIT. FOR TWO STAGE HEAT, REMOVE JUMPER ON TB1.
11. MOVE GRAY (GY) WIRE TO TB1 - S2 TO ENABLE 1ST STAGE HEAT FOR TWO STAGE.

COMPONENT LEGEND

BC	BLOWER CONTACTOR
BM	BLOWER MOTOR
CAP	CAPACITOR
CB	CIRCUIT BREAKER
CC	COMPRESSOR CONTACTOR
CCH	CRANKCASE HEATER
CCP	COMPRESSOR/COIL PROTECTION
CHR	CRANKCASE HEATER RELAY
CHS	CRANKCASE HEATER SWITCH
CM	CONDENSER MOTOR
COMP	COMPRESSOR
ECON	ECONOMIZER
EHK	ELECTRIC HEATER KIT
ES	ENERGY SHUTDOWN
FB	FUSE BLOCK
FPS	FREEZE PROTECTION SWITCH
GND	EQUIPMENT GROUND
HPS	HIGH PRESSURE SWITCH
LPS	LOW PRESSURE SWITCH
MAT	MIXED AIR TEMP. SENSOR
PB	POWER DISTRIBUTION BLOCK
PLF	FEMALE PLUG/CONNECTOR
PLM	MALE PLUG/CONNECTOR
RLY	RELAY
TB	TERMINAL BLOCK
TON	ON - DELAY TIMER RELAY
TR	TRANSFORMER

WIRE CODE

BK	BLACK
BL	BLUE
BL/PK	BLUE WITH PINK STRIPE
BR	BROWN
GR	GREEN
GY	GRAY
OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
TN	TAN
WH	WHITE
YL	YELLOW
YL/PK	YELLOW WITH PINK STRIPE

ALLOWABLE SPEED TAPS

	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
FAN/LOW/HEA	X	-	-	-	-	X	-	-	-	-
COOLING (YL)	-	X	-	X	X	-	X	X	X	X
HIGH HEAT	-	-/X	X	X	X	-	-/X	X	X	X

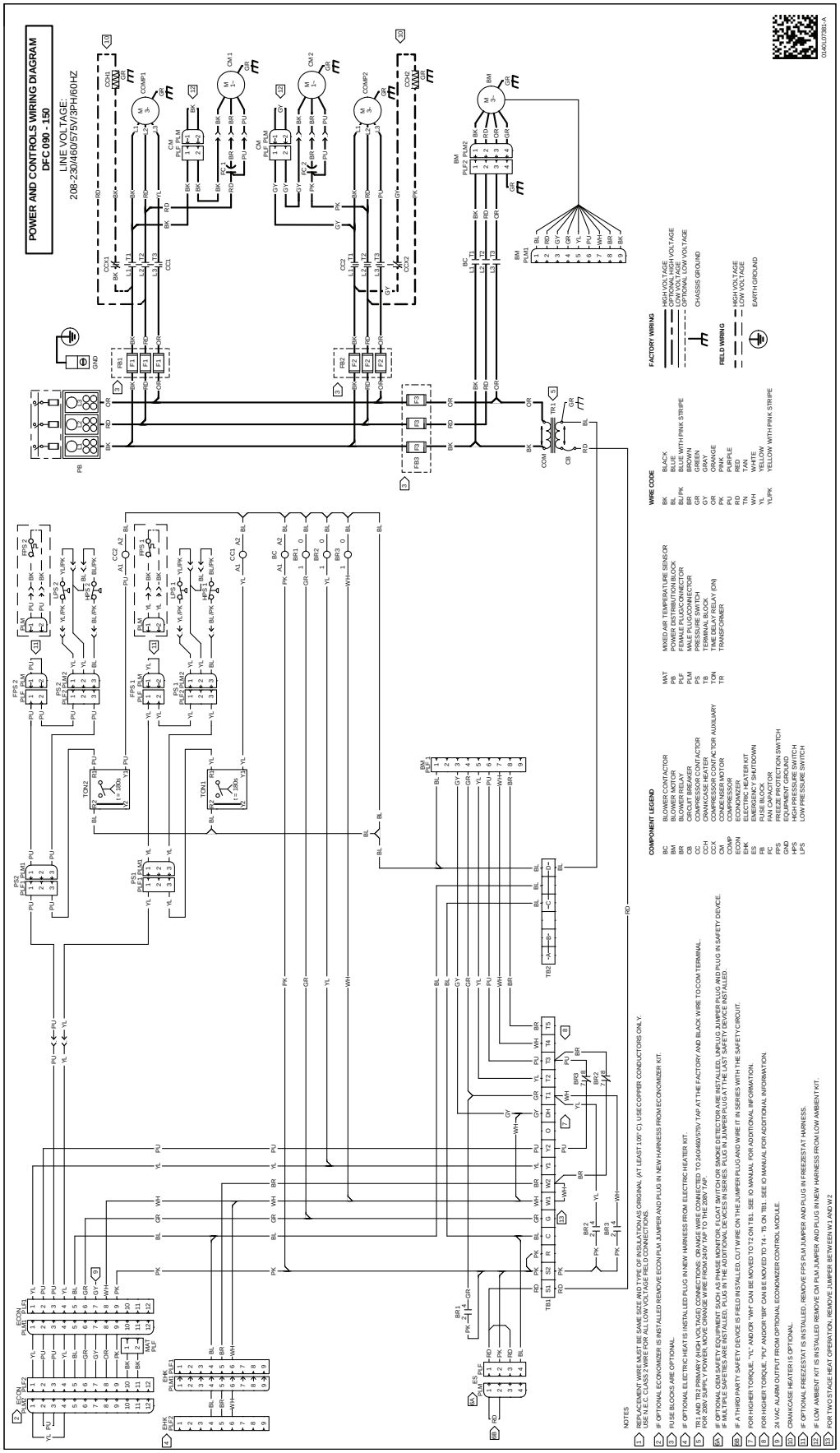
TB1 - DH = 0 VAC: USE SPEED TAP T1 - T5.
TB1 - DH = 24 VAC: USE SPEED TAP T6 - T10.

0140L07354-A

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WARNING

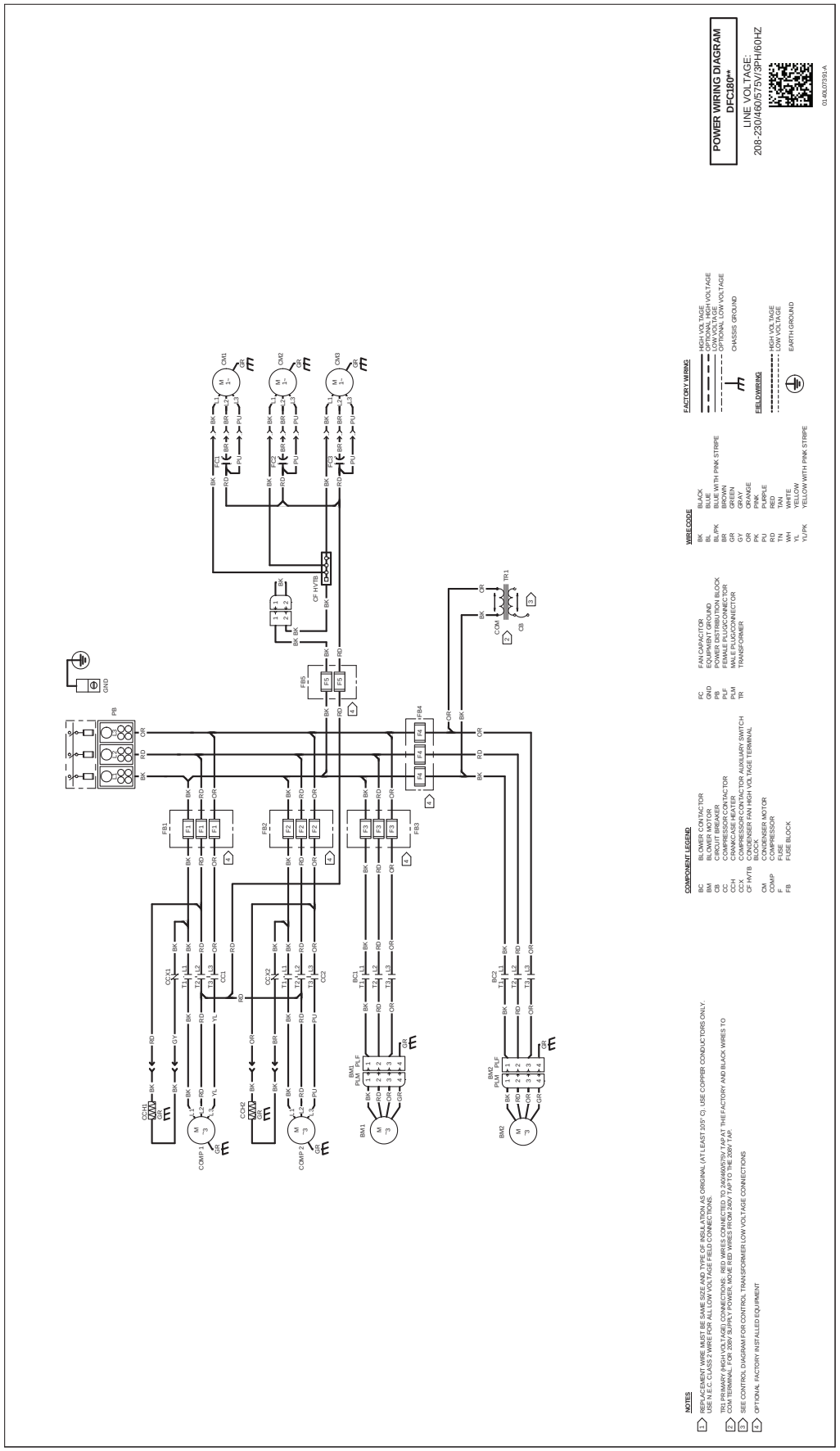
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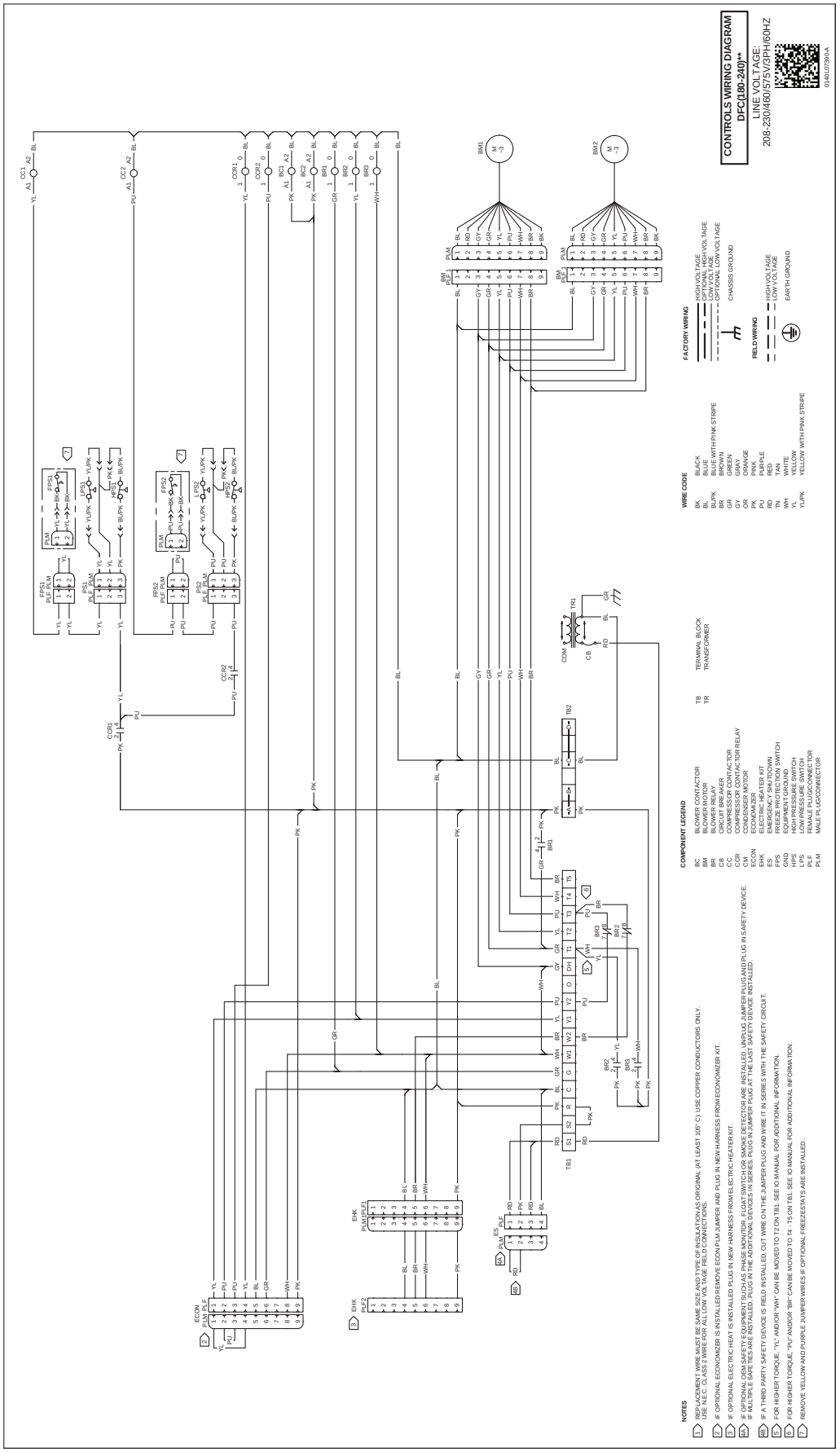
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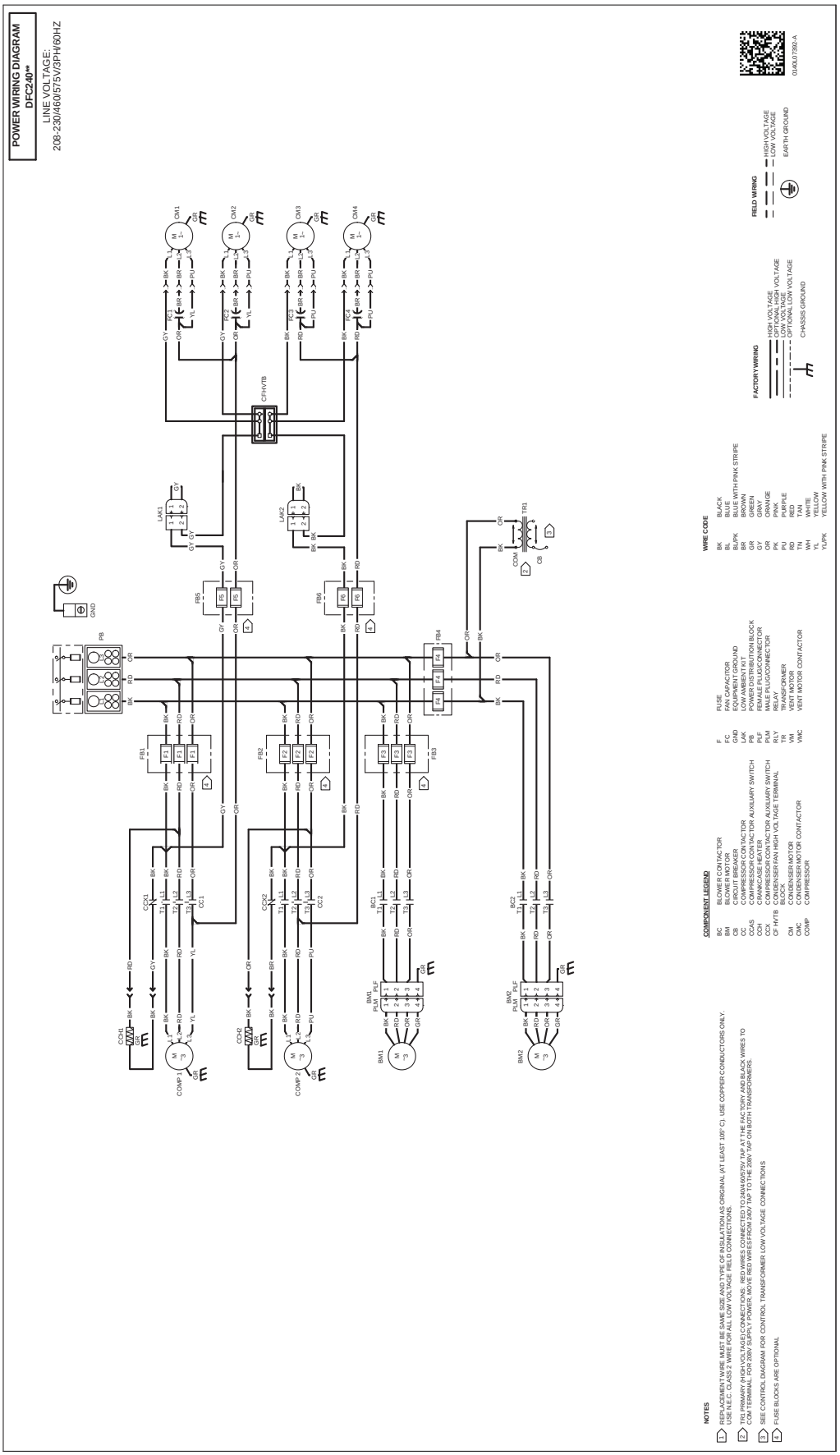
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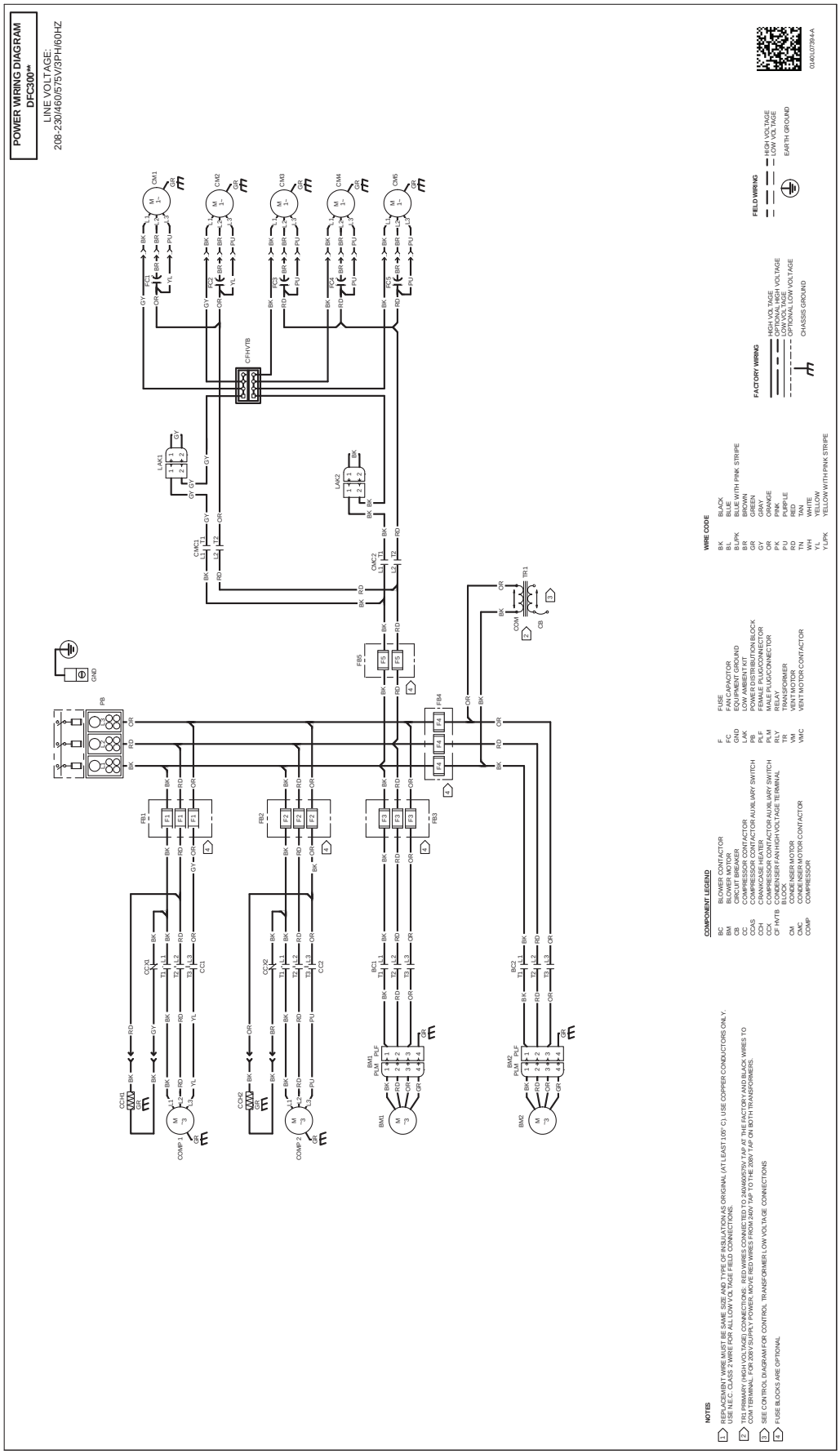
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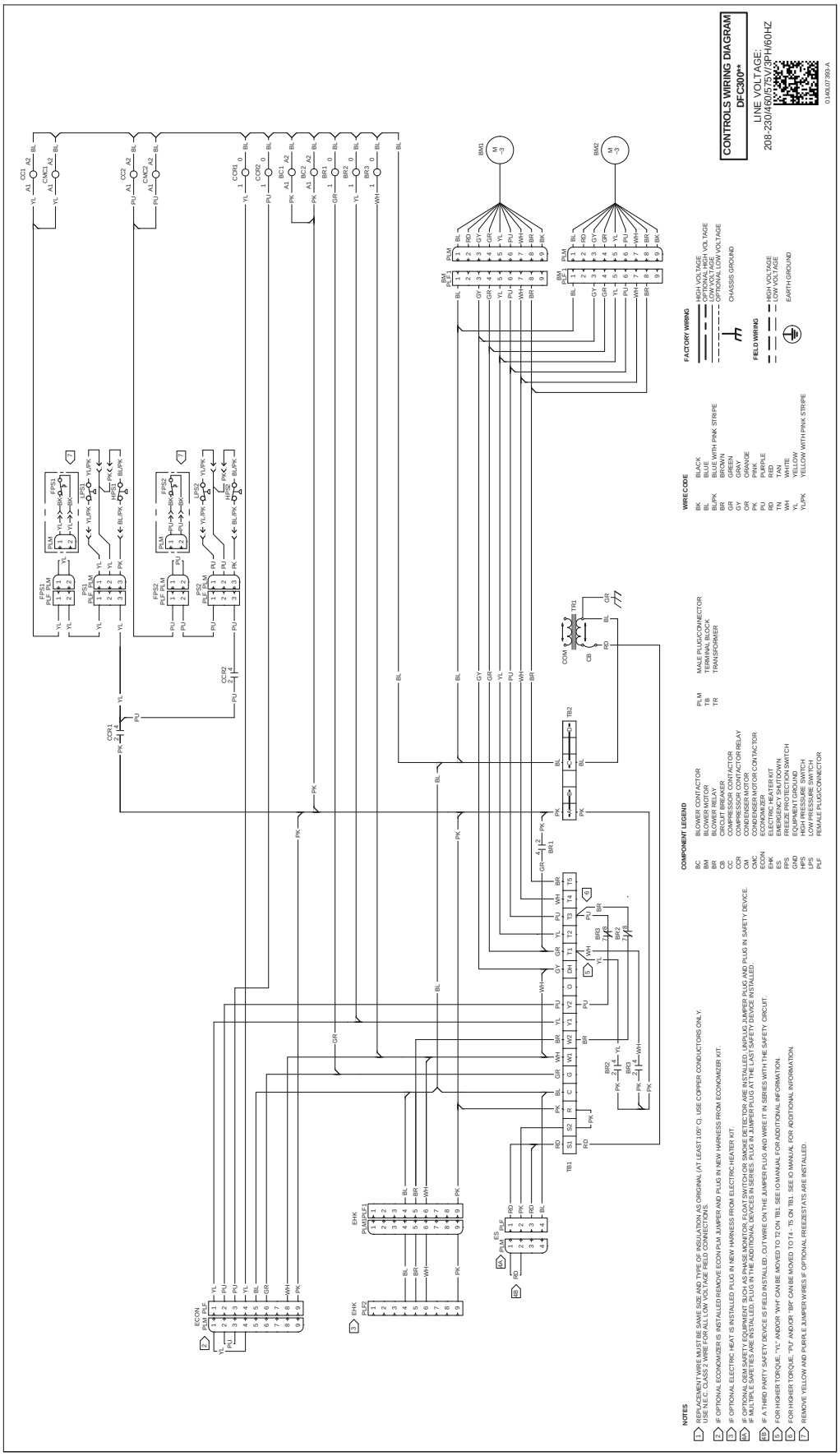
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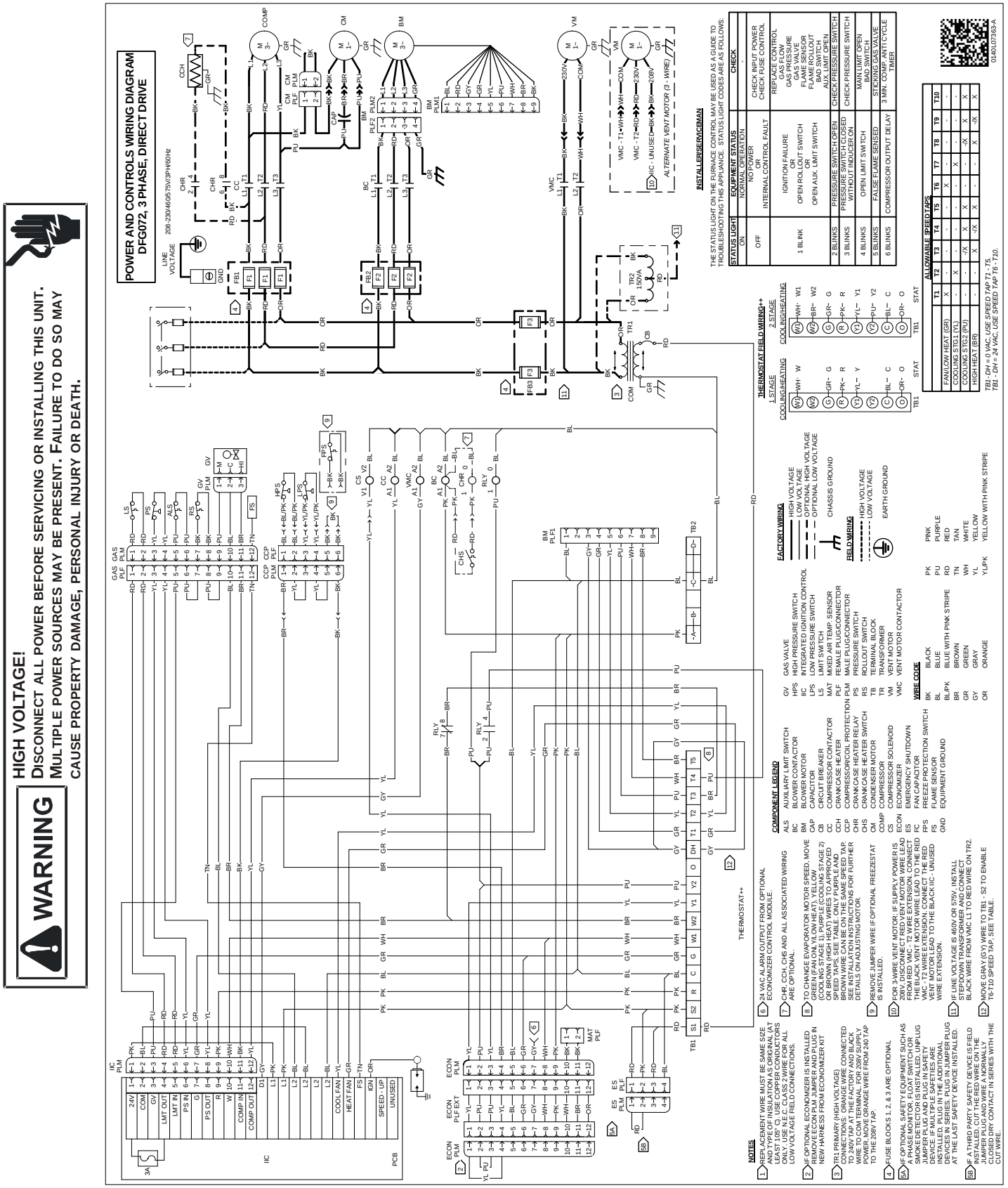


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DFG WIRING DIAGRAMS

UNIT WIRING DIAGRAMS

DFG0723

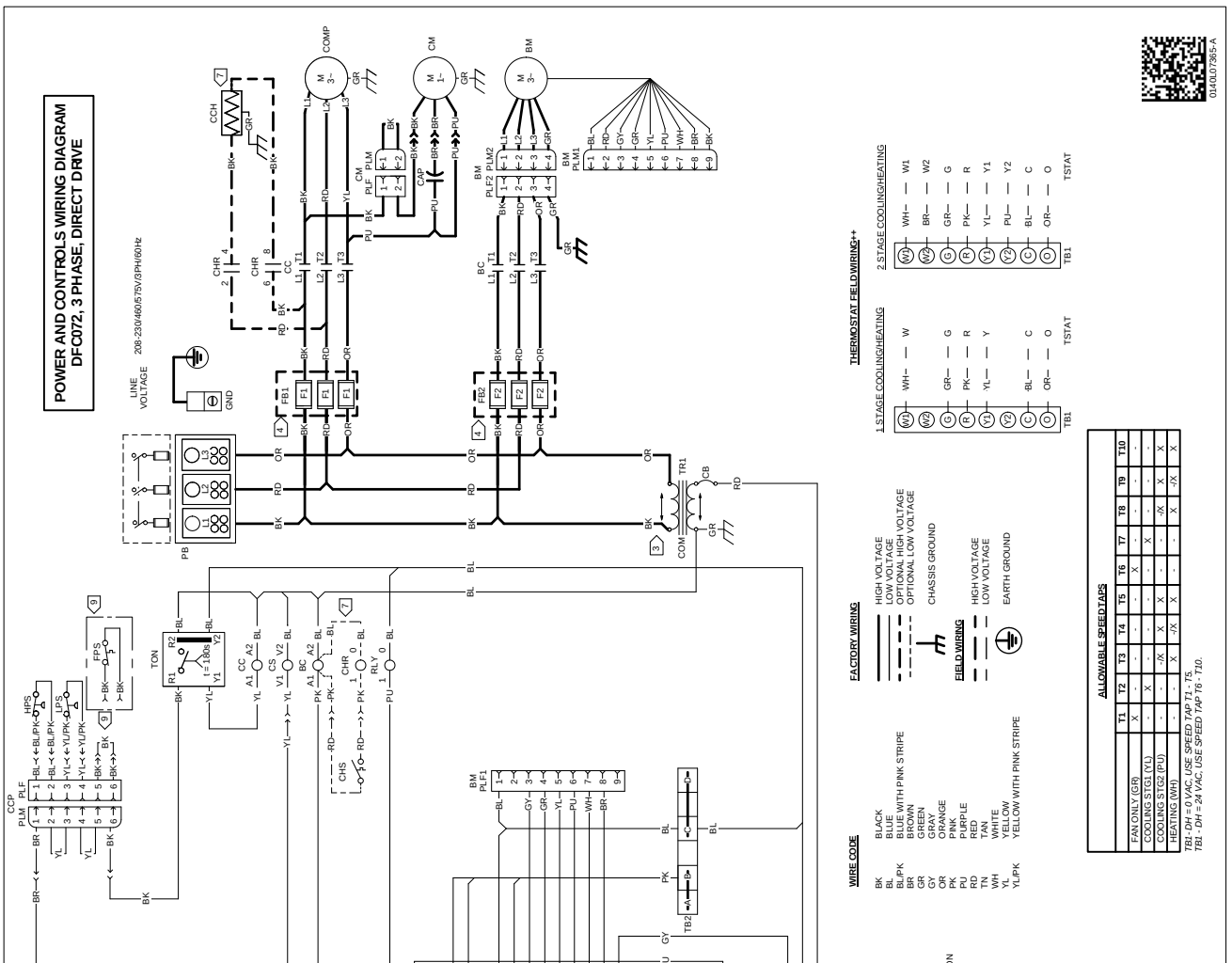


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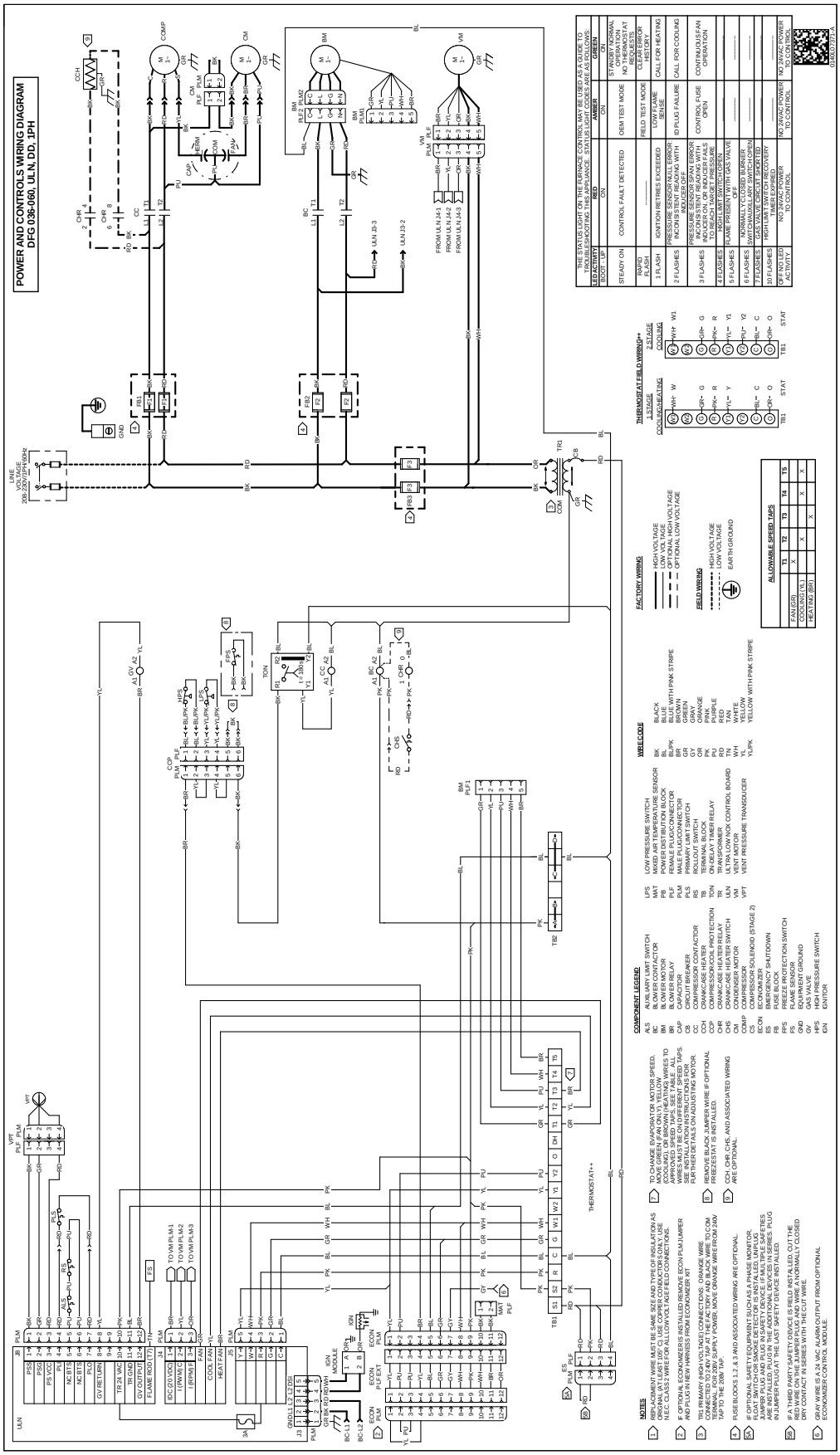


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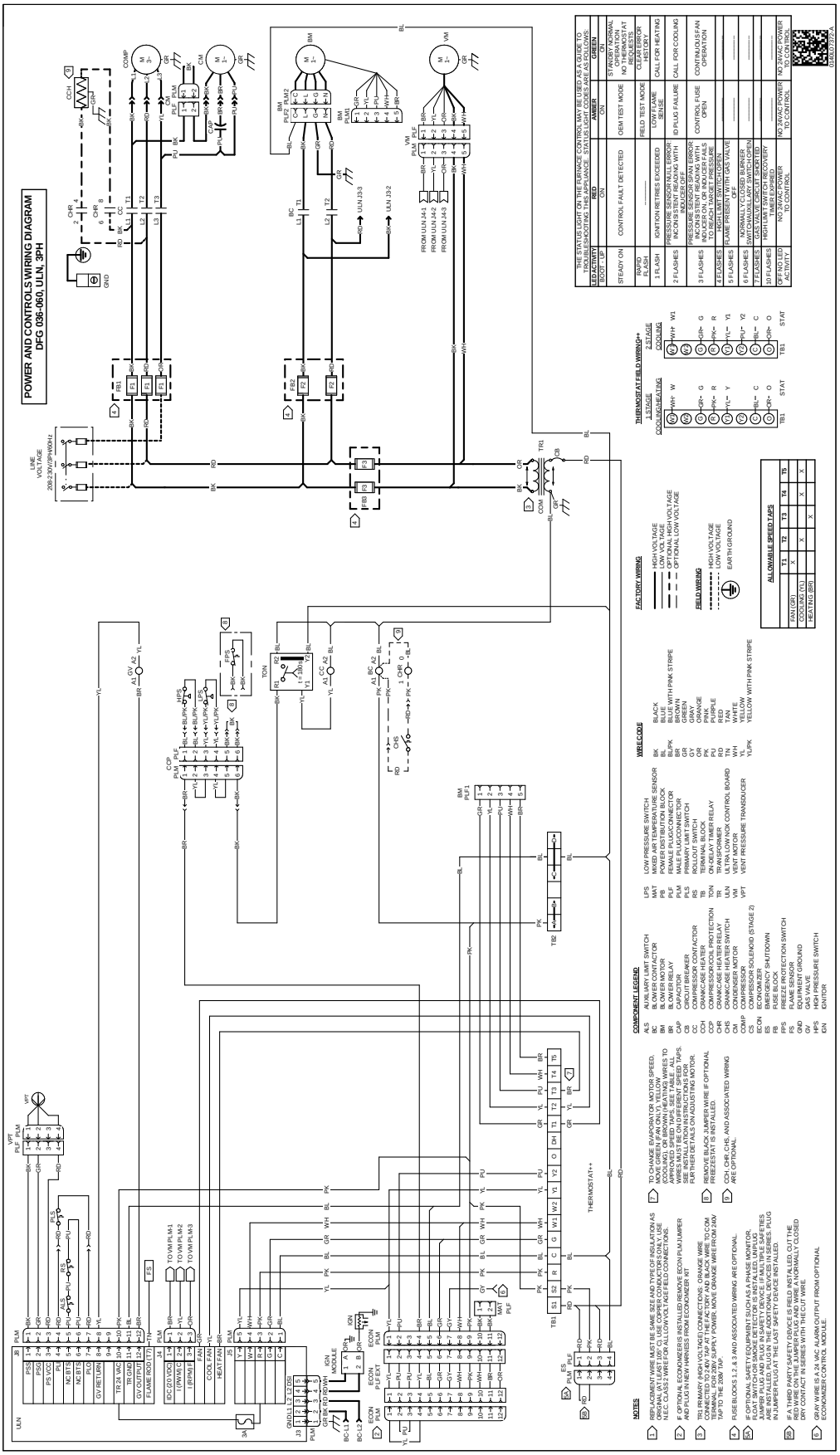


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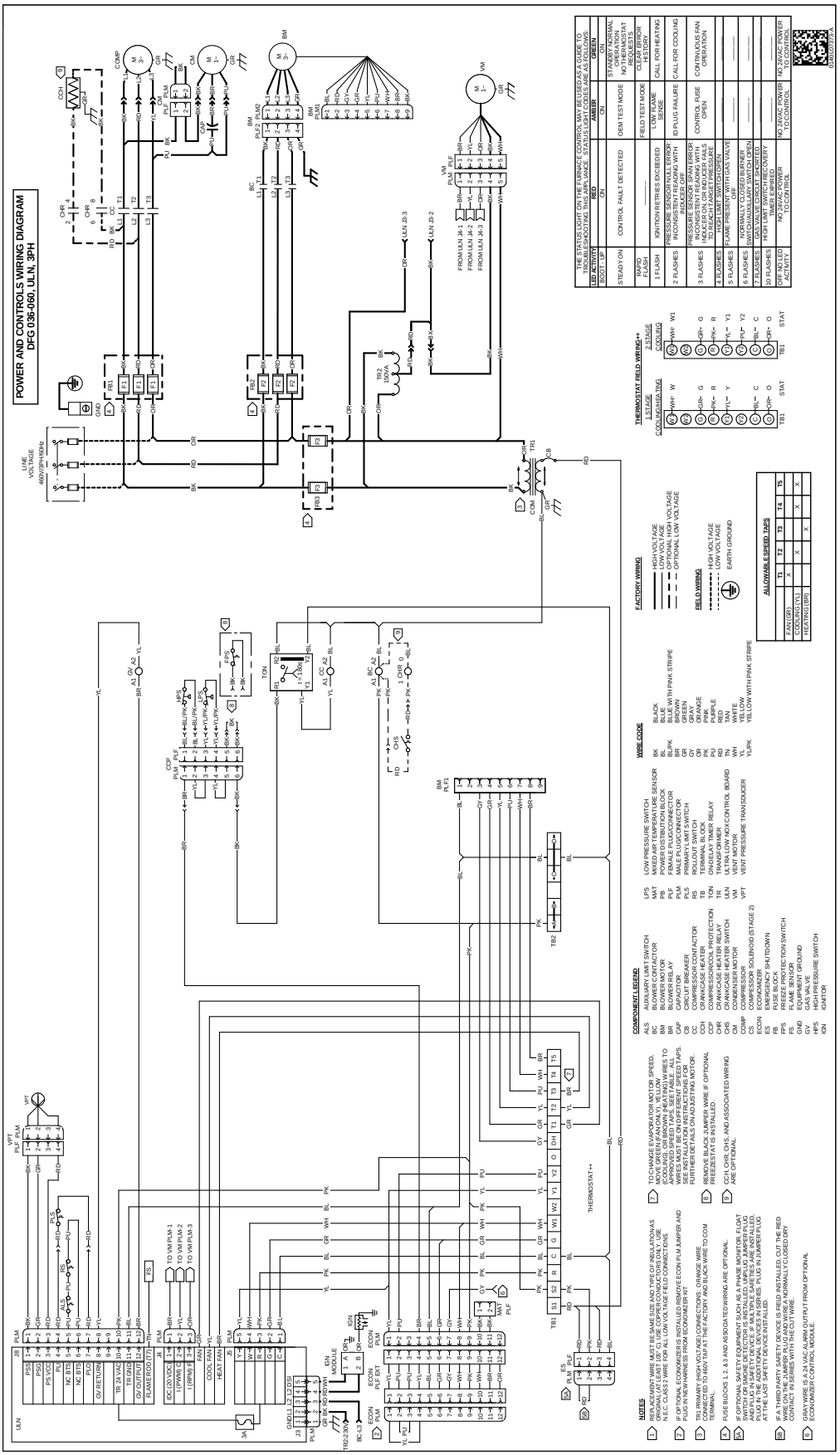


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UNIT WIRING DIAGRAMS

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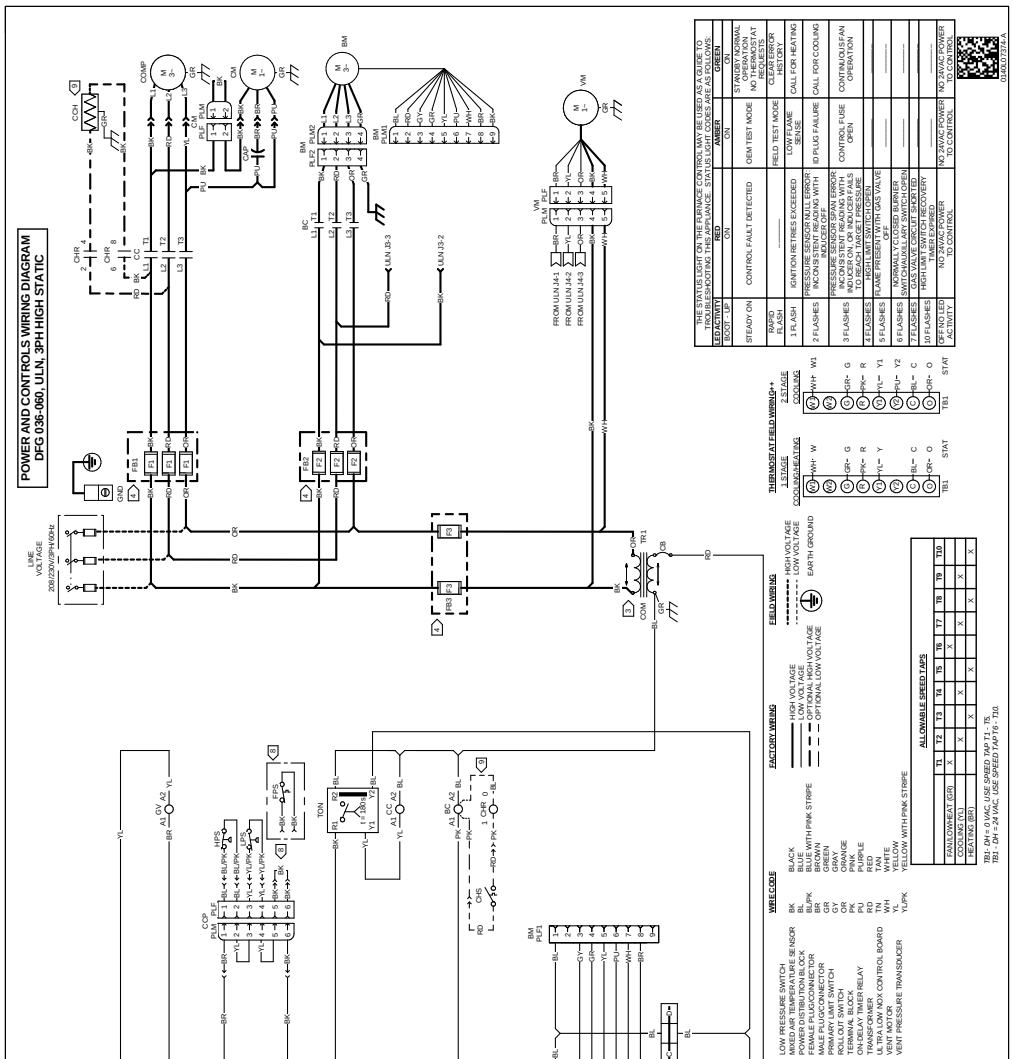
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POWER AND CONTROLS WIRING DIAGRAM
DFG 036-060, ULN, 3PH
THE STATUS LIGHT ON THE FURNACE CONTROL MAY BE USED AS A GUIDE TO TROUBLESHOOTING THE FURNACE. STATUS CODES ARE AS FOLLOWS:
LED ACTIVITY
RED
AMBER
GREEN
BOOT - UP
ON
ON
ON
STEADY ON
CONTROL FAULT DETECTED
OEM TEST MODE
STANDBY NORMAL OPERATION NO THERMOSTAT DEMAND
RAPID FLASH
FIELD TEST MODE
CLEAR ERROR HISTORY
1 FLASH
IGNITION RETRIES EXCEEDED
LOW FLAME SENSE
CALL FOR HEATING
2 FLASHES
PRESSURE SWITCH INCONSISTENT READING WITH INDUCER ON
ID PLUG FAILURE
CALL FOR COOLING
3 FLASHES
PRESSURE SWITCH INCONSISTENT READING WITH INDUCER ON, OR INDUCER FAILS TO REACH SPEED
CONTROL, FUSE OPEN
CONTINUOUS FAN OPERATION
4 FLASHES
HIGH LIMIT SWITCH OPEN
5 FLASHES
FLAME PRESENT WITH GAS VALVE OFF
6 FLASHES
NORMALLY CLOSED BURNER MOTOR LIMIT SWITCH OPEN
7 FLASHES
GAS VALVE CIRCUIT SHORTED
10 FLASHES
HIGH LIMIT SWITCH RECOVERY TIME EXCEEDED
OFF NO LED ACTIVITY
NO 24VAC POWER TO CONTROL
NO 24VAC POWER TO CONTROL
NO 24VAC POWER TO CONTROL
THERMOSTAT FIELD WIRING++
1 STAGE COOLING/HEATING
2 STAGE COOLING
TB1 STAT
FACTORY WIRING
HIGH VOLTAGE
LOW VOLTAGE
OPTIONAL HIGH VOLTAGE
OPTIONAL LOW VOLTAGE
FIELD WIRING
HIGH VOLTAGE
LOW VOLTAGE
EARTH GROUND
ALLOWABLE SPEED TAPS
T1 T2 T3 T4 T5
FAN (GR) X
COOLING(YL) X X
HEATING(RD) X X X
COMPONENT I LEGEND
ALS AUXILIARY LIMIT SWITCH
BC BLOWER CAPACITOR
BM BLOWER MOTOR
BR BLOWER RELAY
CAP CAPACITOR
CB CIRCUIT BREAKER
CC COMPRESSOR CONTACTOR
CH CRANKCASE HEATER
COP COMPRESSOR/COIL PROTECTION
CHR CRANKCASE HEATER RELAY
CHS CRANKCASE HEATER
COMP COMPRESSOR
CS COMPRESSOR SOLENOID (STAGE 2)
ECON ECONOMIZER
ES EMERGENCY SHUTDOWN
FB FUSE BLOCK
FPS FREEZE PROTECTION SWITCH
FS FLAME SENSOR
GND EQUIPMENT GROUND
GV GAS VALVE
HPS HIGH PRESSURE SWITCH
IGN IGNITOR
LPS LOW PRESSURE SWITCH
MAT MANIFOLD AIR TEMPERATURE SENSOR
PB POWER DISTRIBUTION BLOCK
PLF FEMALE PLUG/CONNECTOR
PLM MALE PLUG/CONNECTOR
PLS PRIMARY LIMIT SWITCH
PS PRESSURE SWITCH
RS ROLLOUT SWITCH
TS FLOOR TEMP SENSOR
TDN ON/DELAY TIMER RELAY
TR TRANSFORMER
ULN ULTRA LOW NOX CONTROL BOARD
VM BLOWER MOTOR
VPT VENT PRESSURE TRANSDUCER
WIRE CODE
BK BLACK
BL BLUE
BLPK BLUE WITH PINK STRIPE
BR BROWN
GR GREEN
GY GREY
OR ORANGE
PK PINK
PU PURPLE
RD RED
TN TAN
WH WHITE
YL YELLOW
YLPK YELLOW WITH PINK STRIPE
NOTES
1 REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (AT LEAST 105° C). USE COPPER CONDUCTORS ONLY. USE COPPER OR ALUMINUM WIRE BETWEEN THE DISCONNECT AND THE UNIT.
2 IF OPTIONAL ECONOMIZER IS INSTALLED REMOVE ECON PLM JUMPER AND PLUG IN NEW HARNESS FROM ECONOMIZER KIT
3 TR1 PRIMARY (HIGH VOLTAGE) CONNECTIONS: ORANGE WIRE CONNECTED TO 460V TAP AT THE FACTORY AND BLACK WIRE TO COM TERMINAL.
4 FUSE BLOCKS 1,2, & 3 AND ASSOCIATED WIRING ARE OPTIONAL.
5 SWITCH OR SENSOR CONTACTS ARE CLOSED FOR PROPER FLOAT SWITCH OR SENSOR DETECTION. WHEN ALL SAFETIES ARE INSTALLED, AND PLUG #3 SAFETY DEVICE #, MULTIPLE SAFETIES ARE INSTALLED, PLUG #3 MUST BE REMOVED AND ALL SAFETIES PLUGGED INTO PLUG #3. PLUG #4 JUMPER PLUG AT THE LAST SAFETY DEVICE INSTALLED.
5B IF A THIRD PARTY SAFETY DEVICE IS FIELD INSTALLED, CUT THE RED WIRE AT THE JUMPER PLUG AND WIRE NORMALLY CLOSED DRY CONTACTS IN SERIES WITH THE JUMPER.
6 GRAY WIRE IS A 24 VAC ALARM OUTPUT FROM OPTIONAL ECONOMIZER CONTROL MODULE.
7 TO CHANGE EVAPORATOR MOTOR SPEED, MOVE GREEN (FAN) OR Y1 YELLOW (COOLING) OR W1 BLUE (HEATING) WIRES TO APPROVED SPEED TAPS. SEE TABLE. ALL UNUSED MOTOR LEADS SHOULD BE CAPPED AND TAPED. SEE INSTALLATION INSTRUCTIONS FOR FURTHER DETAILS ON ADJUSTING MOTOR.
8 REMOVE BLACK JUMPER WIRE IF OPTIONAL TWO-STAGE THERMOSTAT IS INSTALLED.
9 COIL CHR, CHS, AND ASSOCIATED WIRING ARE OPTIONAL.
10 THERMOSTAT SHOWN IN COOLING MODE. FOR HEATING MODE, REMOVE JUMPER BETWEEN R AND G AND ADD JUMPER BETWEEN R AND W1.
11 FOR 2 STAGE THERMOSTAT, REMOVE JUMPER BETWEEN R AND G AND ADD JUMPER BETWEEN R AND Y2.
12 FOR 2 STAGE COOLING, REMOVE JUMPER BETWEEN R AND G AND ADD JUMPER BETWEEN R AND Y2.
13 FOR 2 STAGE HEATING, REMOVE JUMPER BETWEEN R AND W1 AND ADD JUMPER BETWEEN R AND W2.
14 FOR 2 STAGE COOLING AND 2 STAGE HEATING, REMOVE JUMPER BETWEEN R AND G AND ADD JUMPER BETWEEN R AND Y2. REMOVE JUMPER BETWEEN R AND W1 AND ADD JUMPER BETWEEN R AND W2.
15 FOR 2 STAGE COOLING AND 1 STAGE HEATING, REMOVE JUMPER BETWEEN R AND G AND ADD JUMPER BETWEEN R AND Y2.
16 FOR 1 STAGE COOLING AND 2 STAGE HEATING, REMOVE JUMPER BETWEEN R AND W1 AND ADD JUMPER BETWEEN R AND W2.
17 FOR 1 STAGE COOLING AND 1 STAGE HEATING, NO JUMPERS NEED TO BE REMOVED.
++ SEE THERMOSTAT MANUAL FOR ADDITIONAL INFORMATION.
ULN
PLM
PLF
ECON PLM
ECON PLF
IGN MODULE
TB1
TB2
PLS
PLF1
PLF2
PLM1
PLM2
PLM1
PLF1
PLM2
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PLM
PLF
PLM
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PLF

UNIT WIRING DIAGRAMS

WARNING

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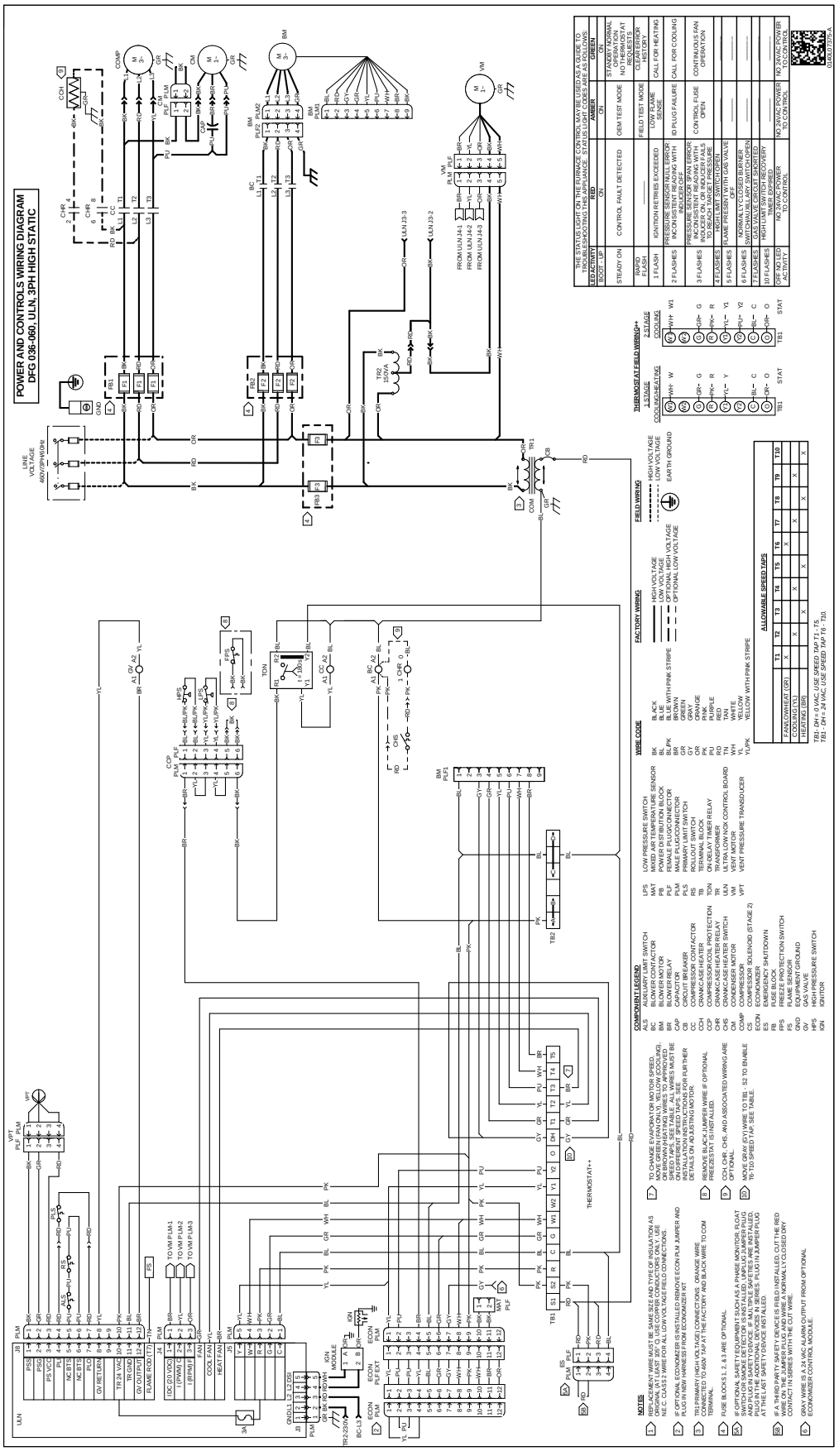


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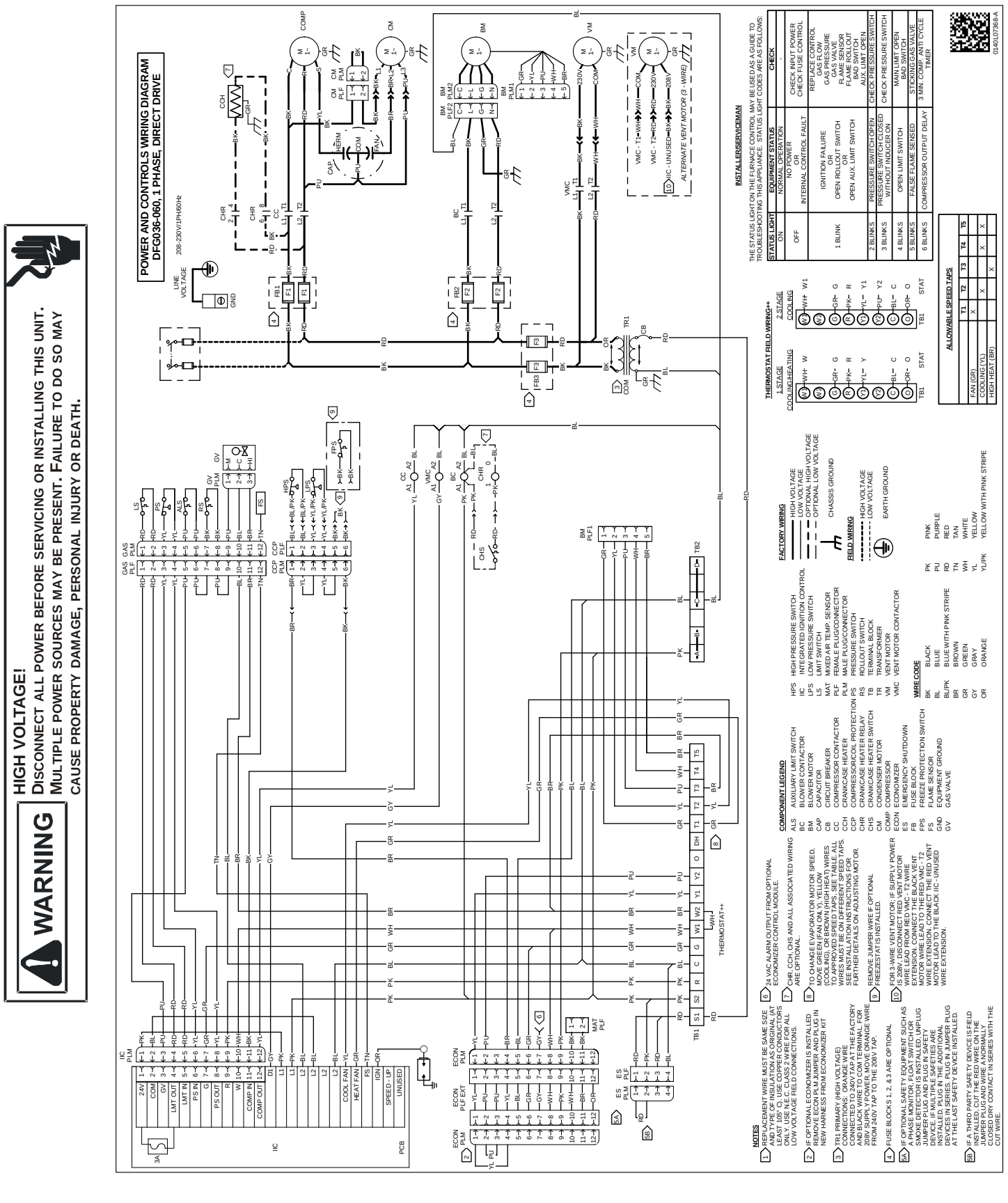
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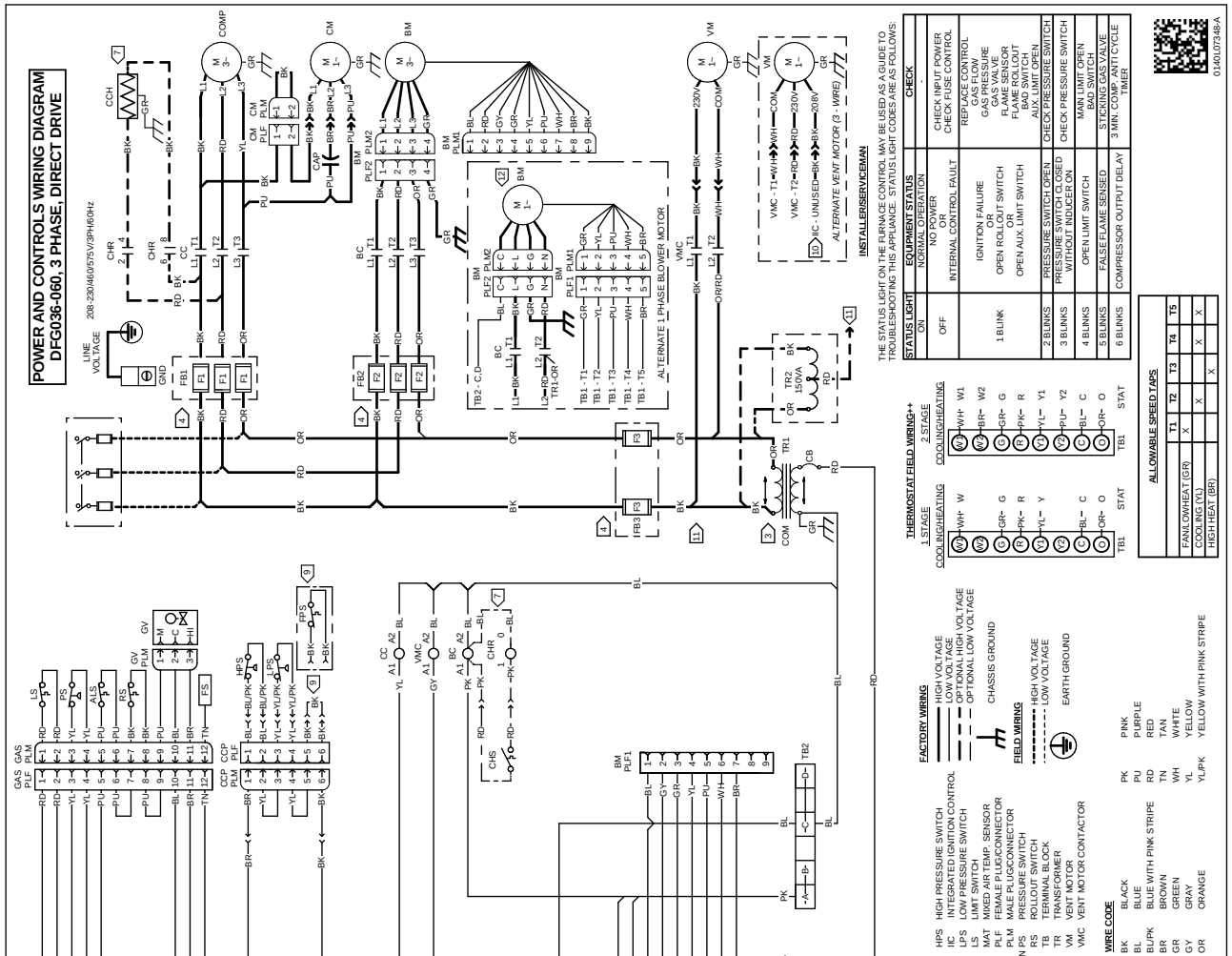
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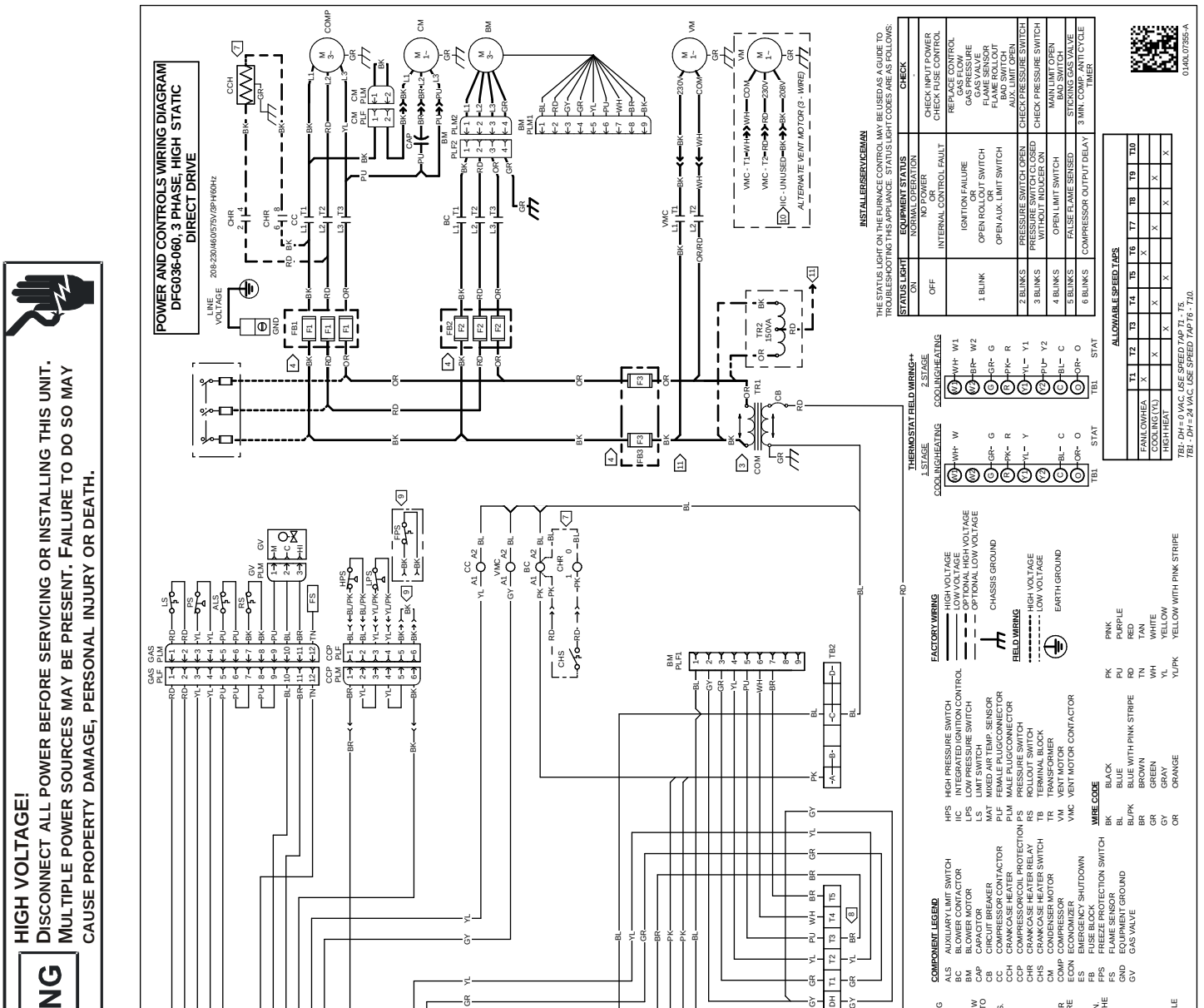
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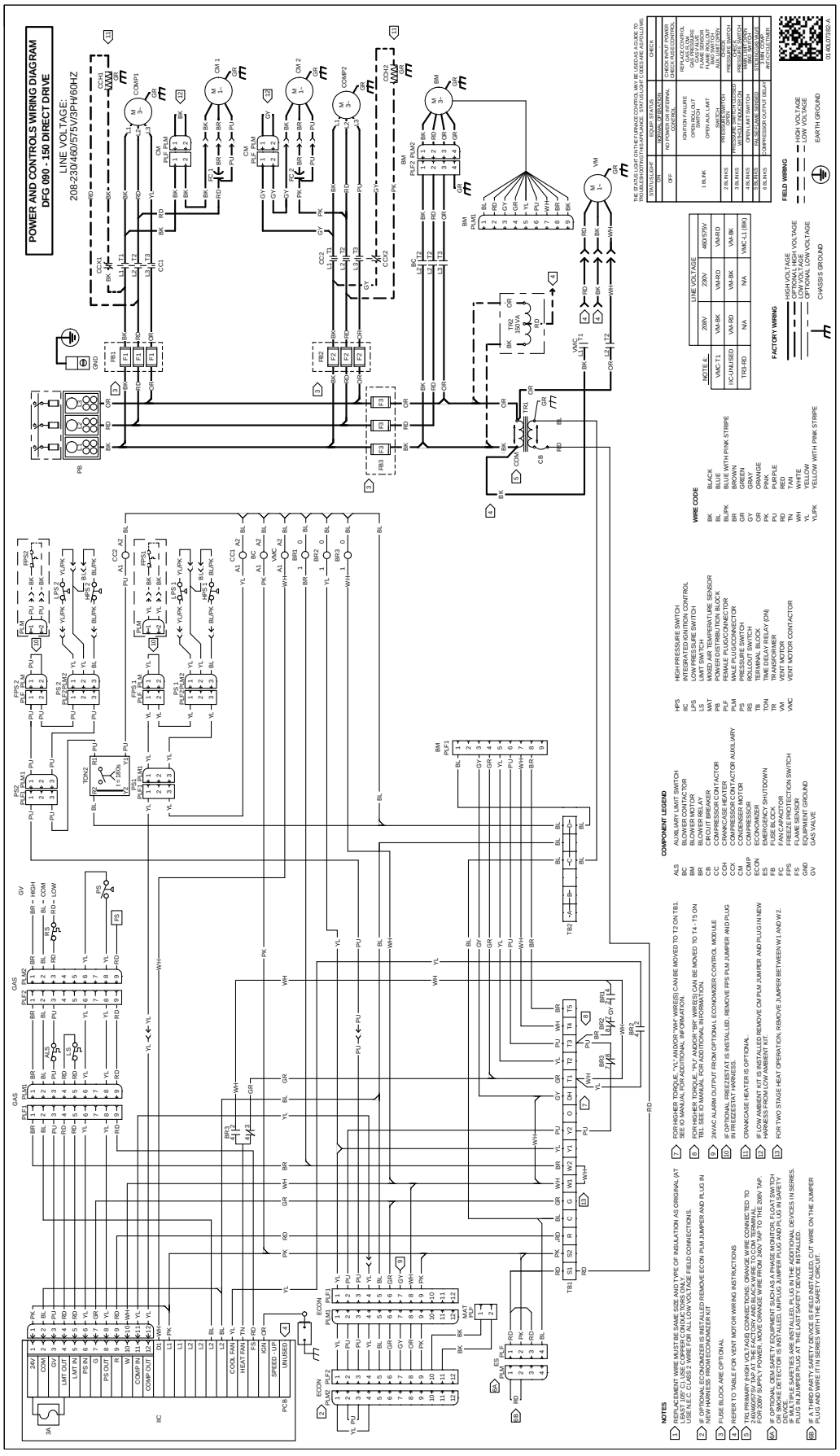
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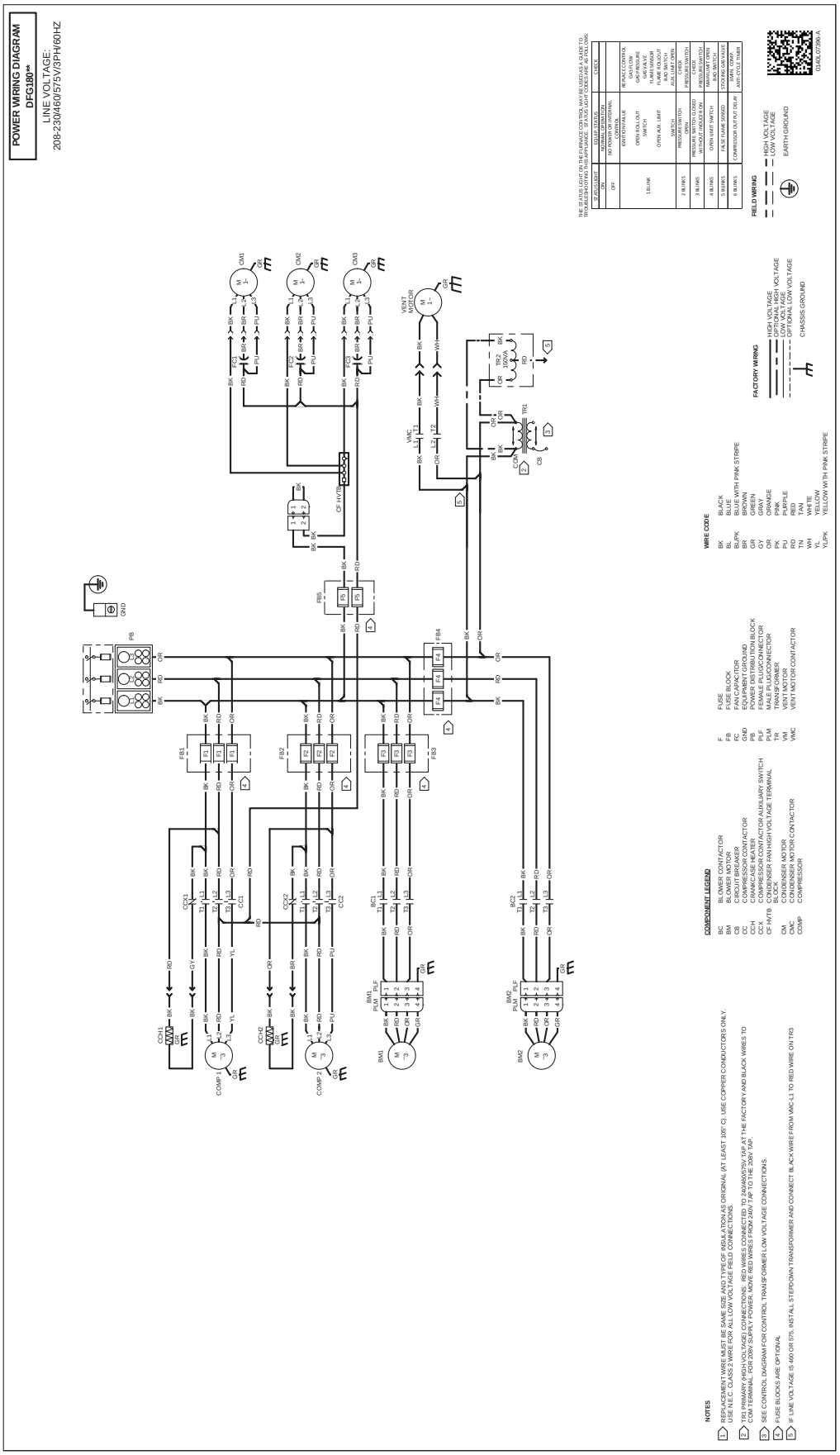
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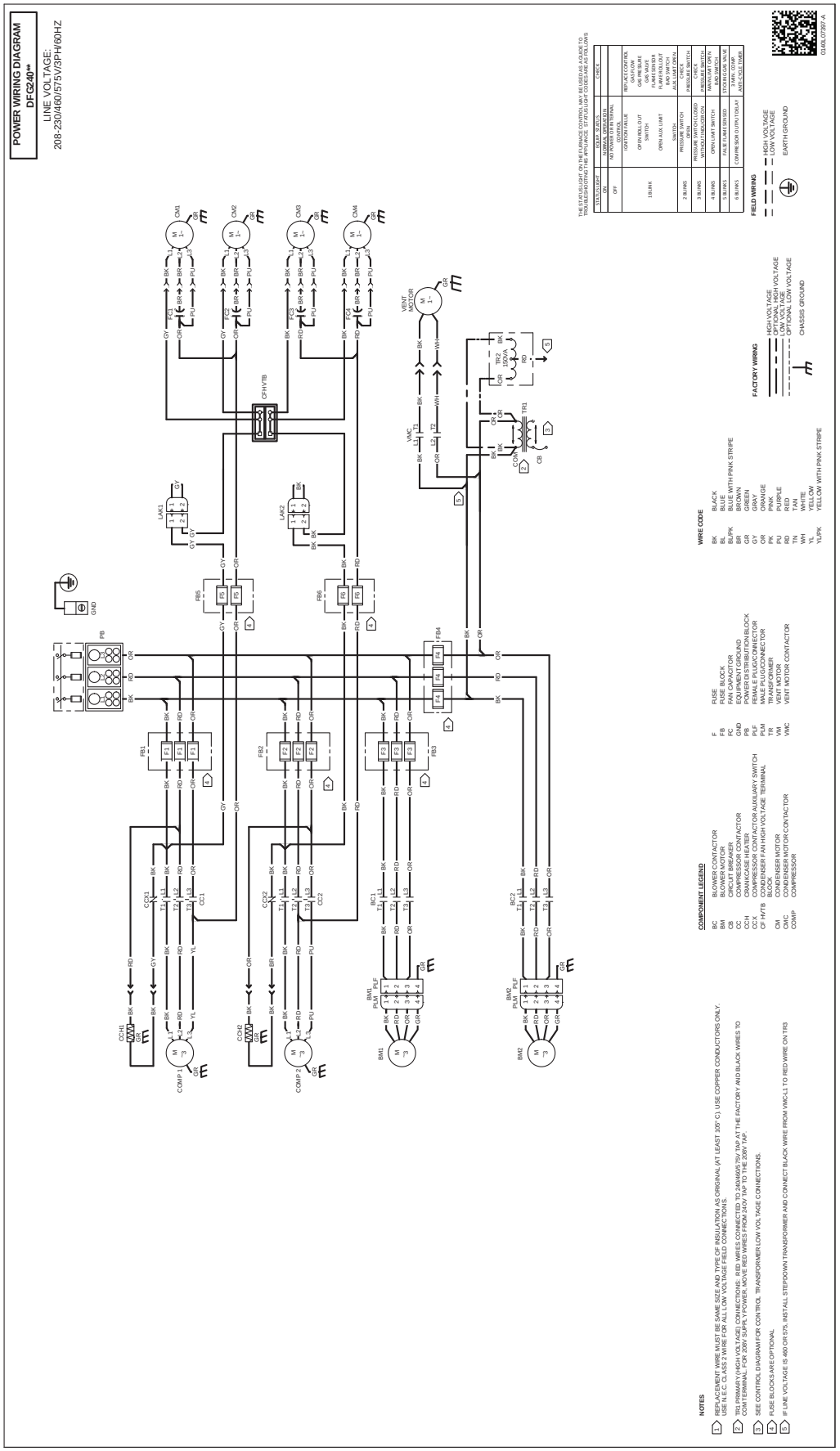
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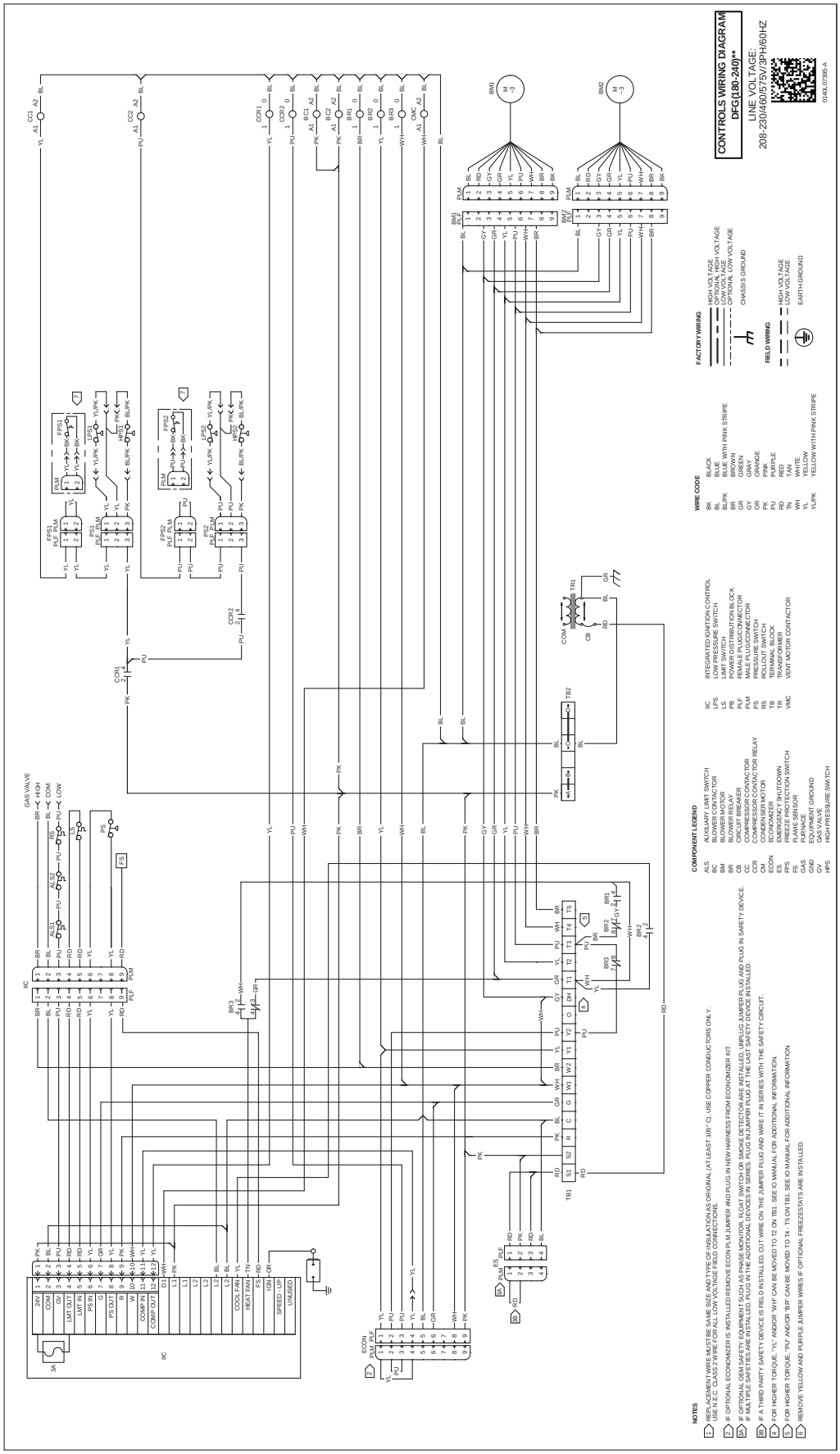
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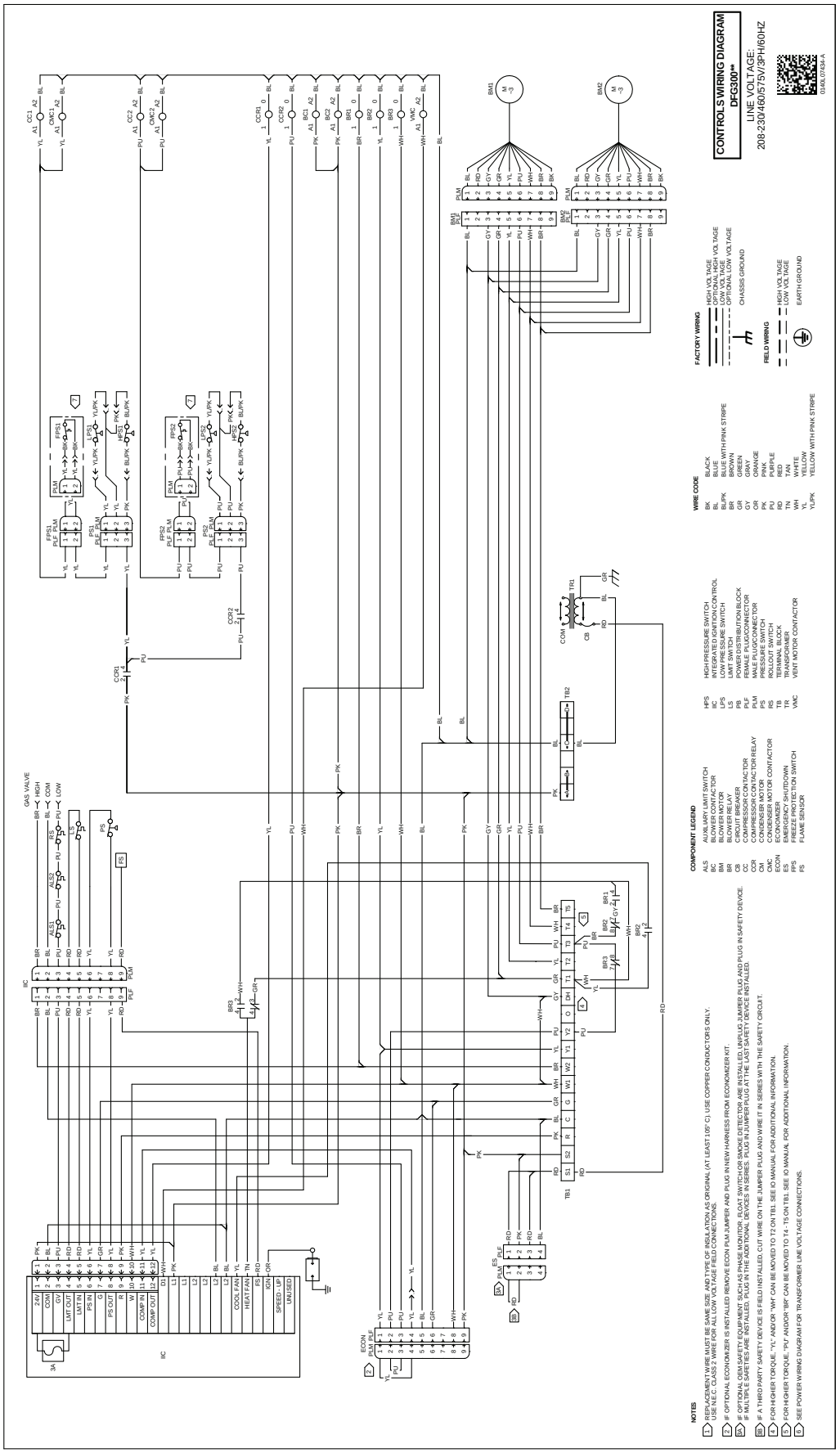
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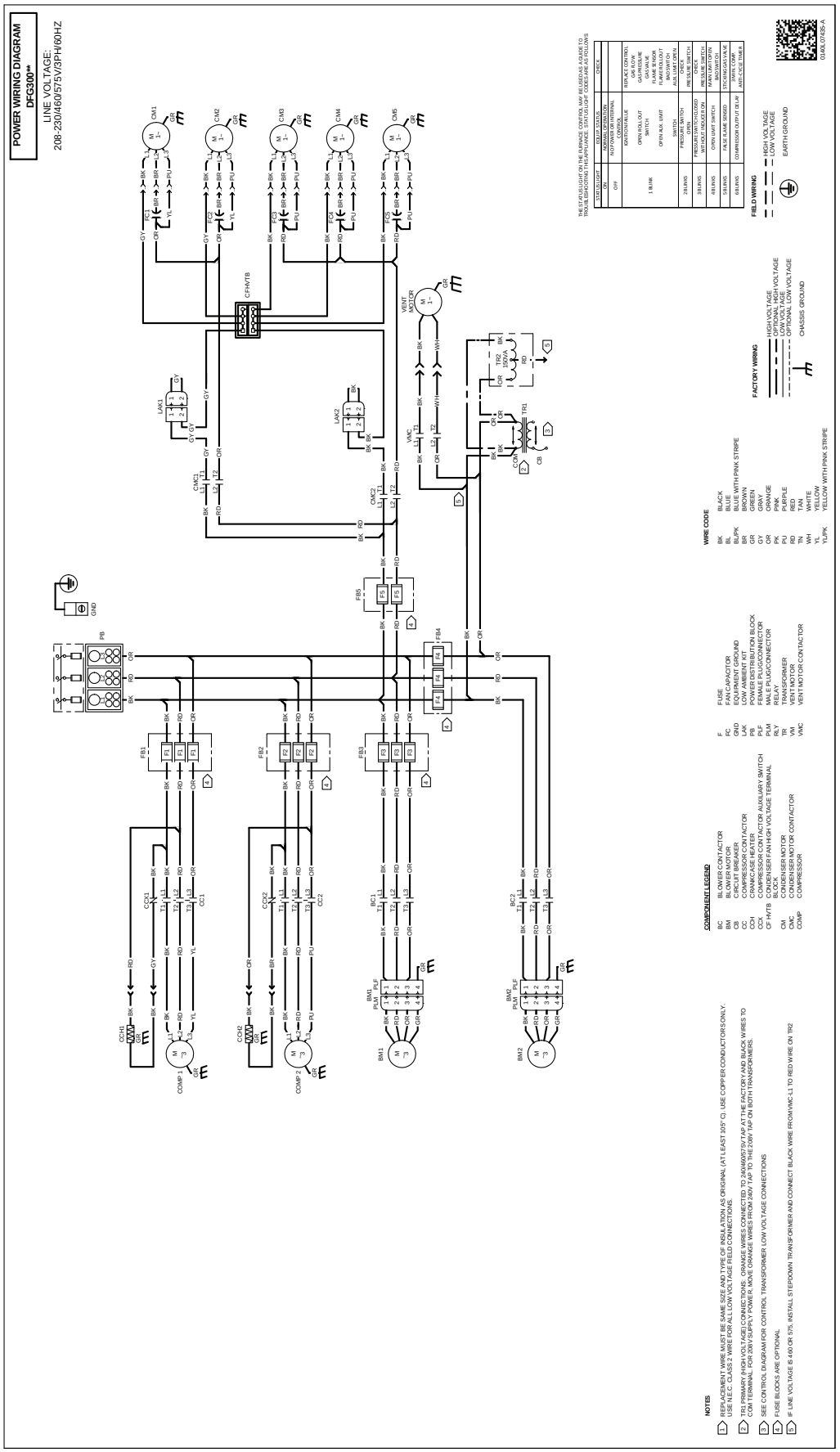
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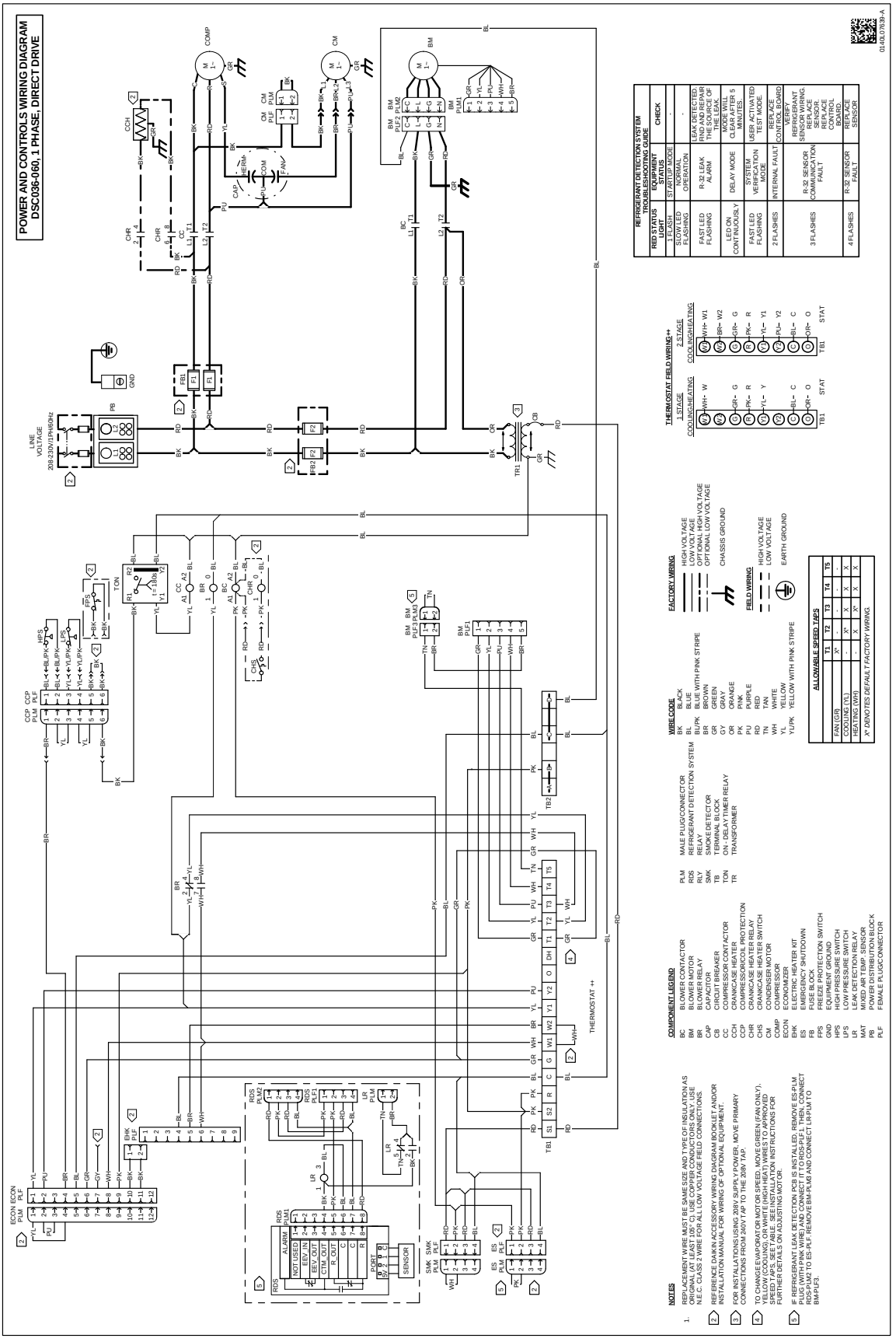


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DSC WIRING DIAGRAMS

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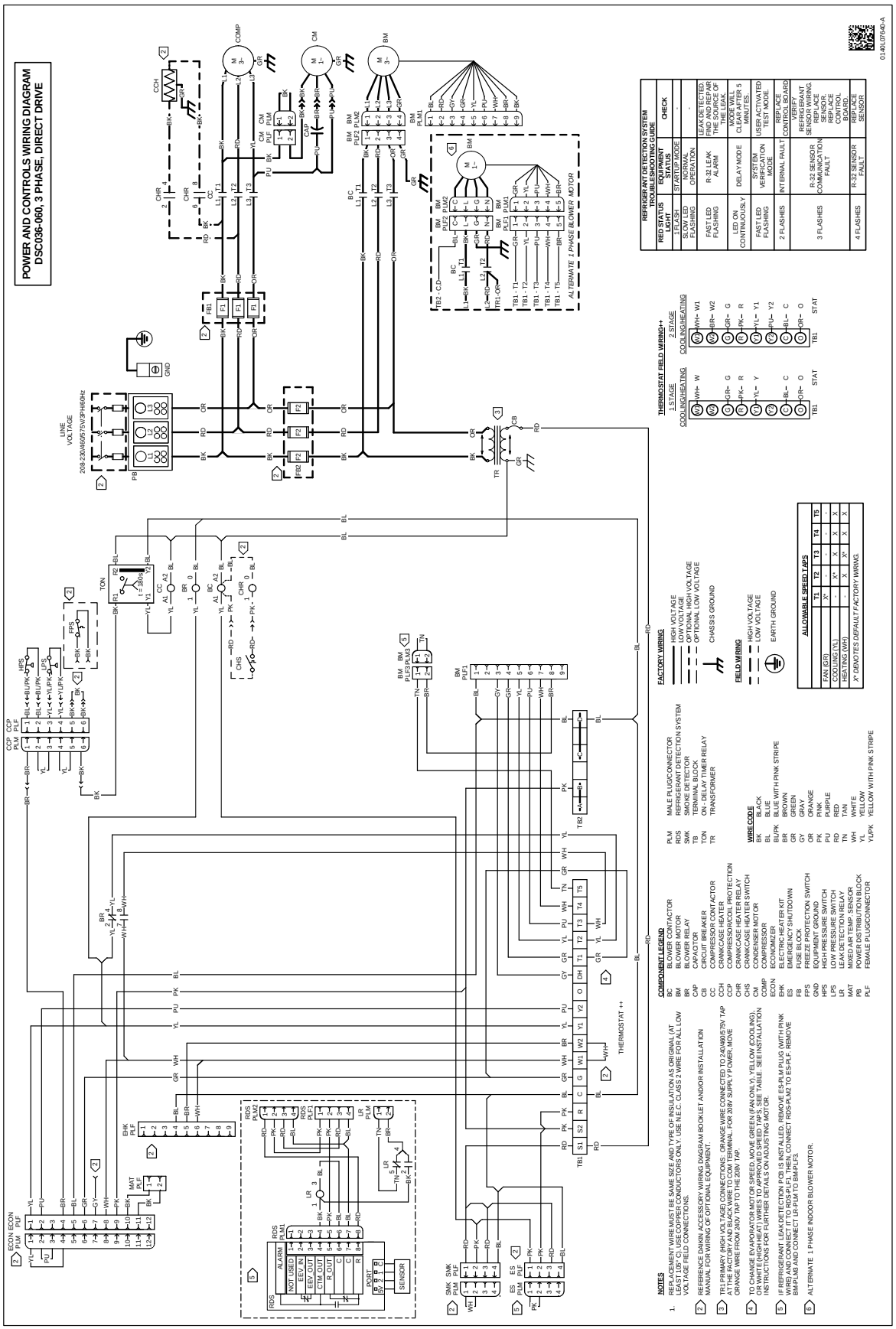
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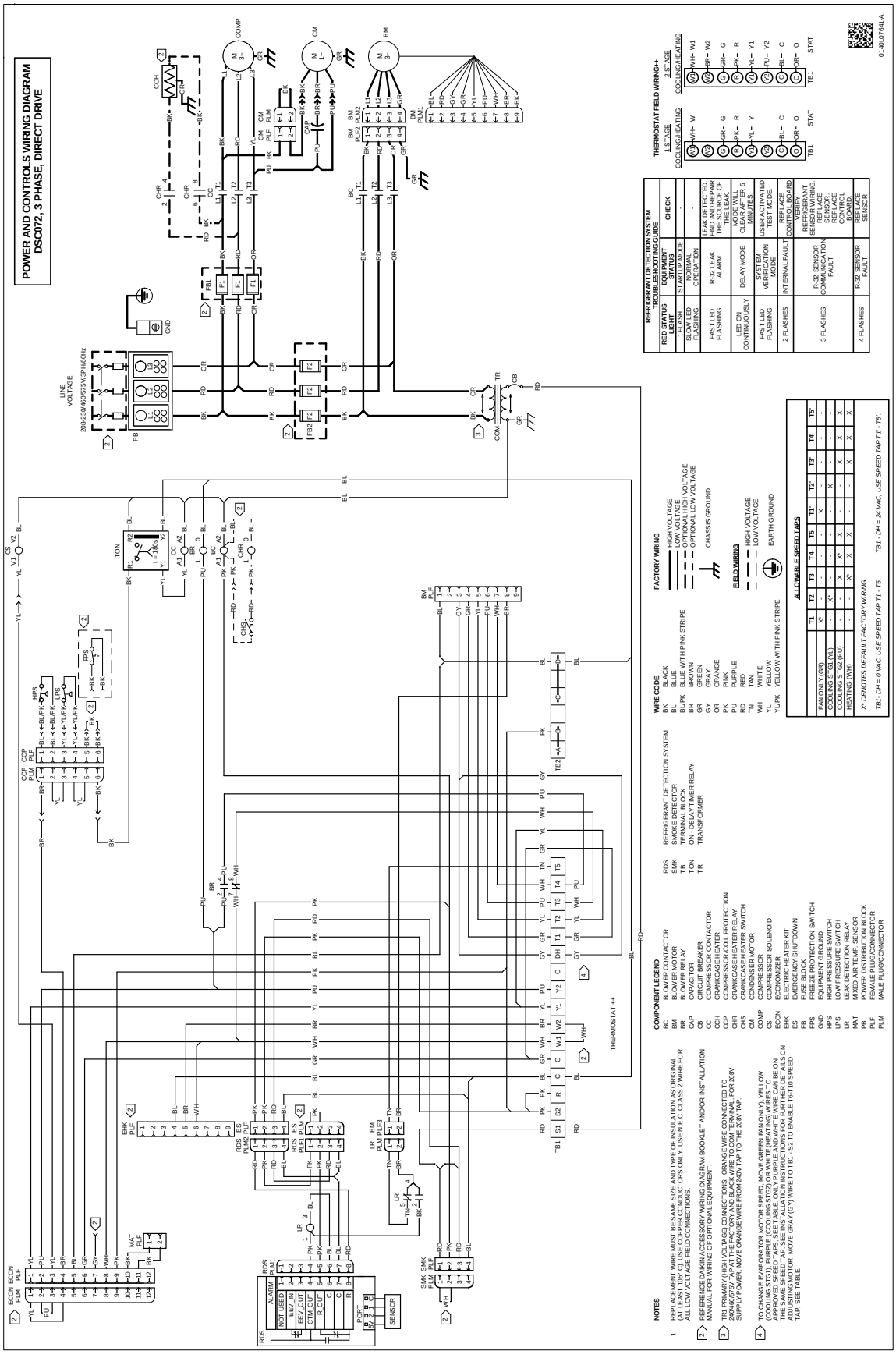
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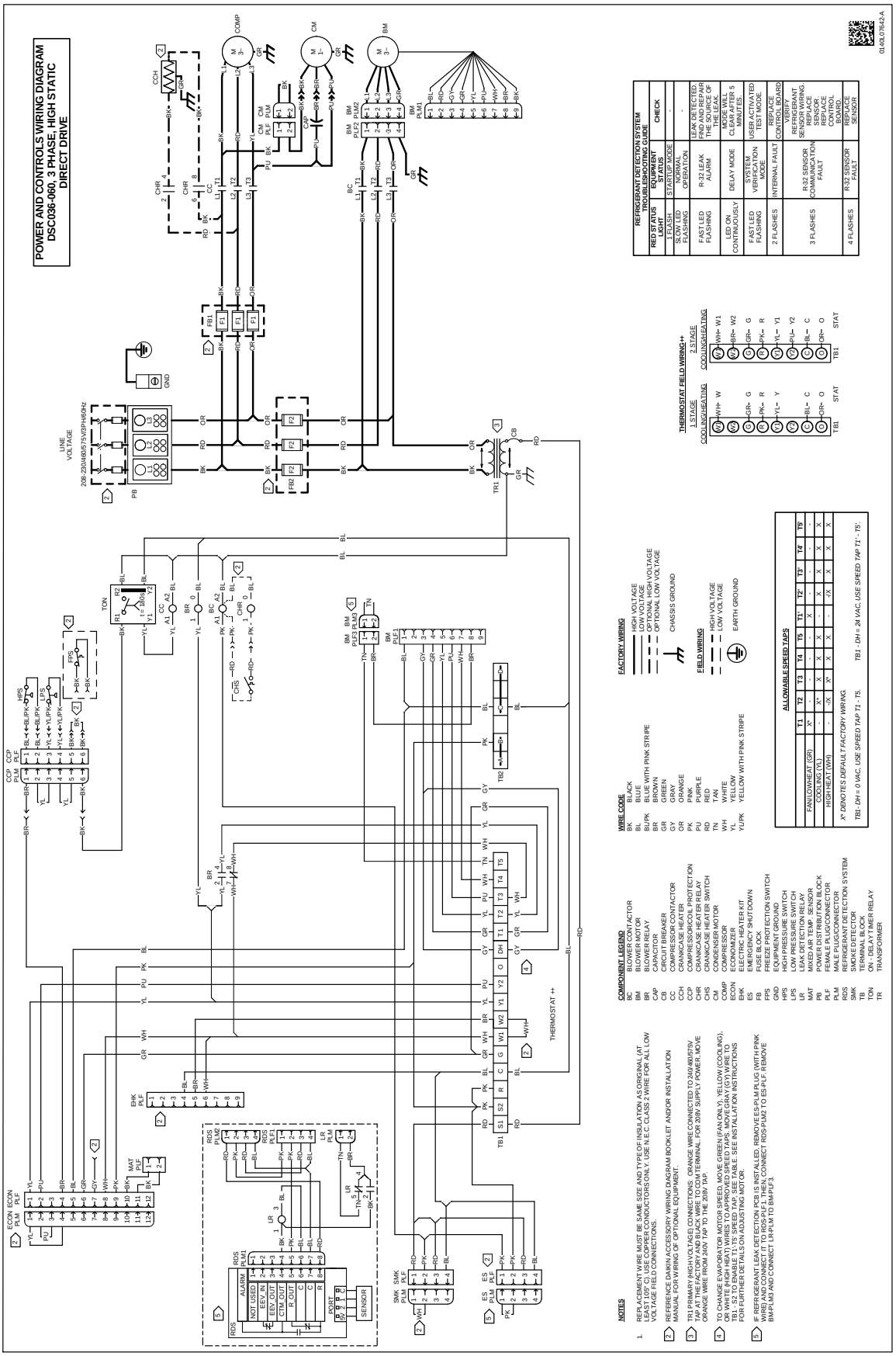
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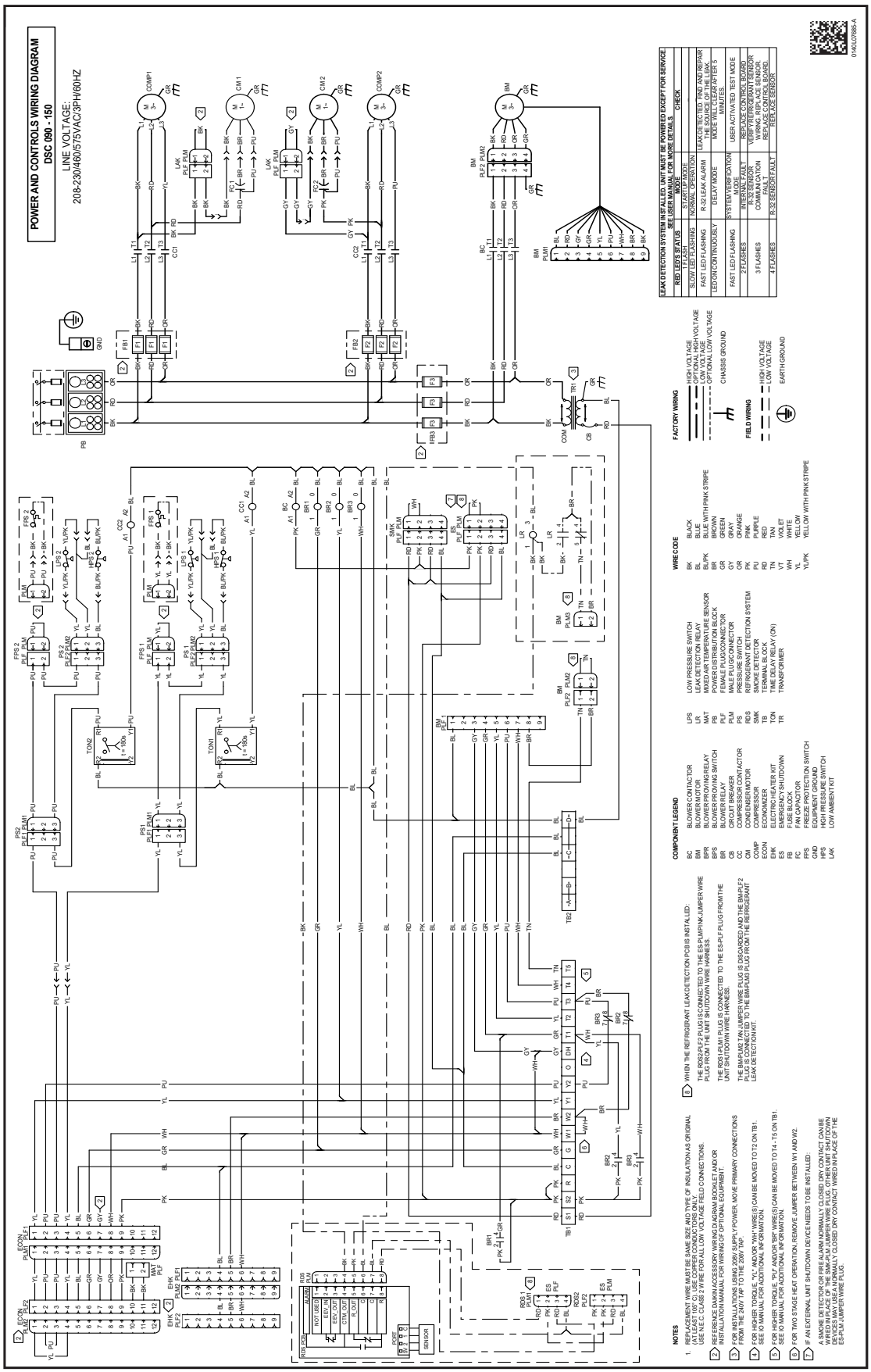
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UNIT WIRING DIAGRAMS

DSC090-150**

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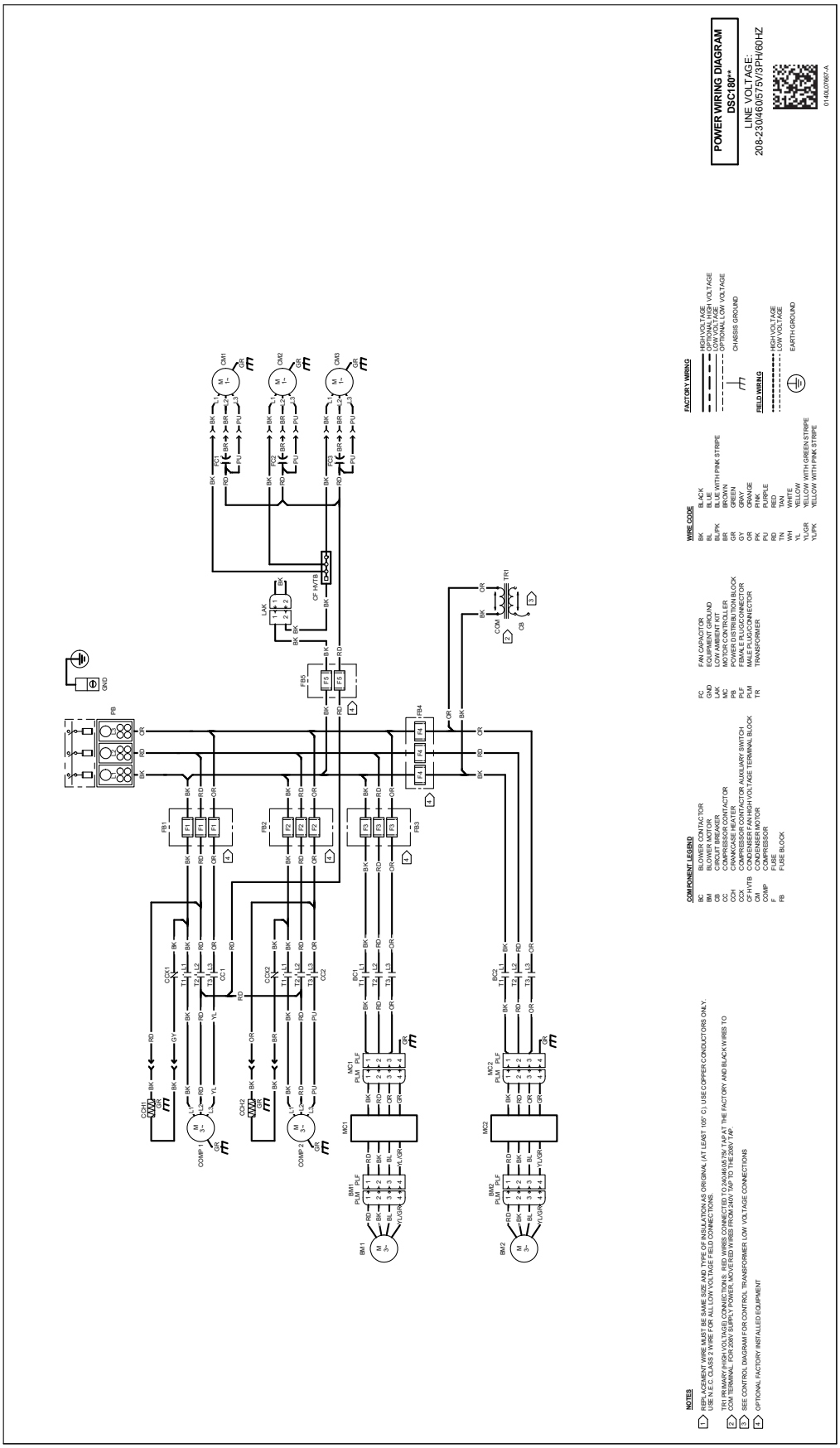
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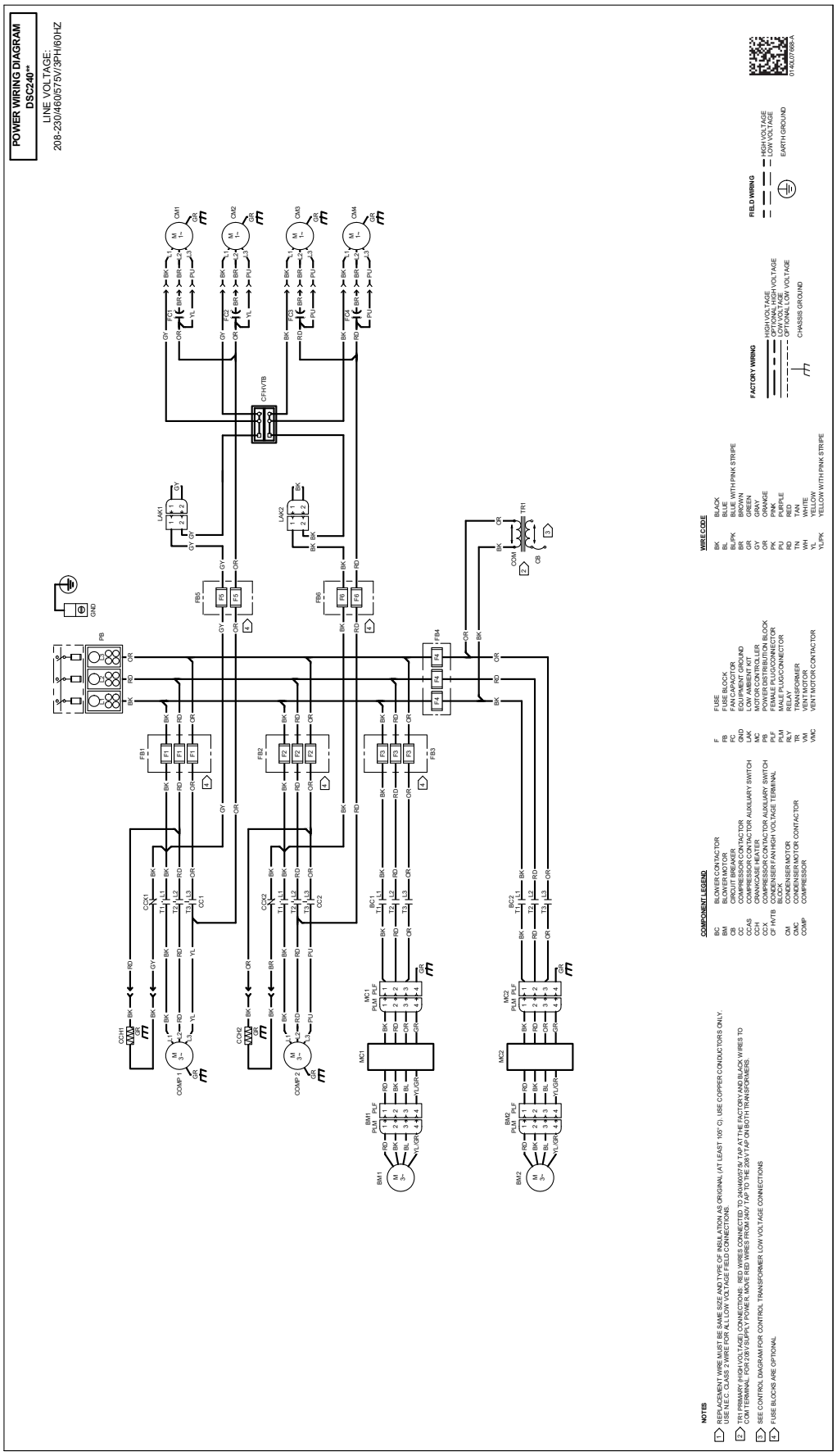
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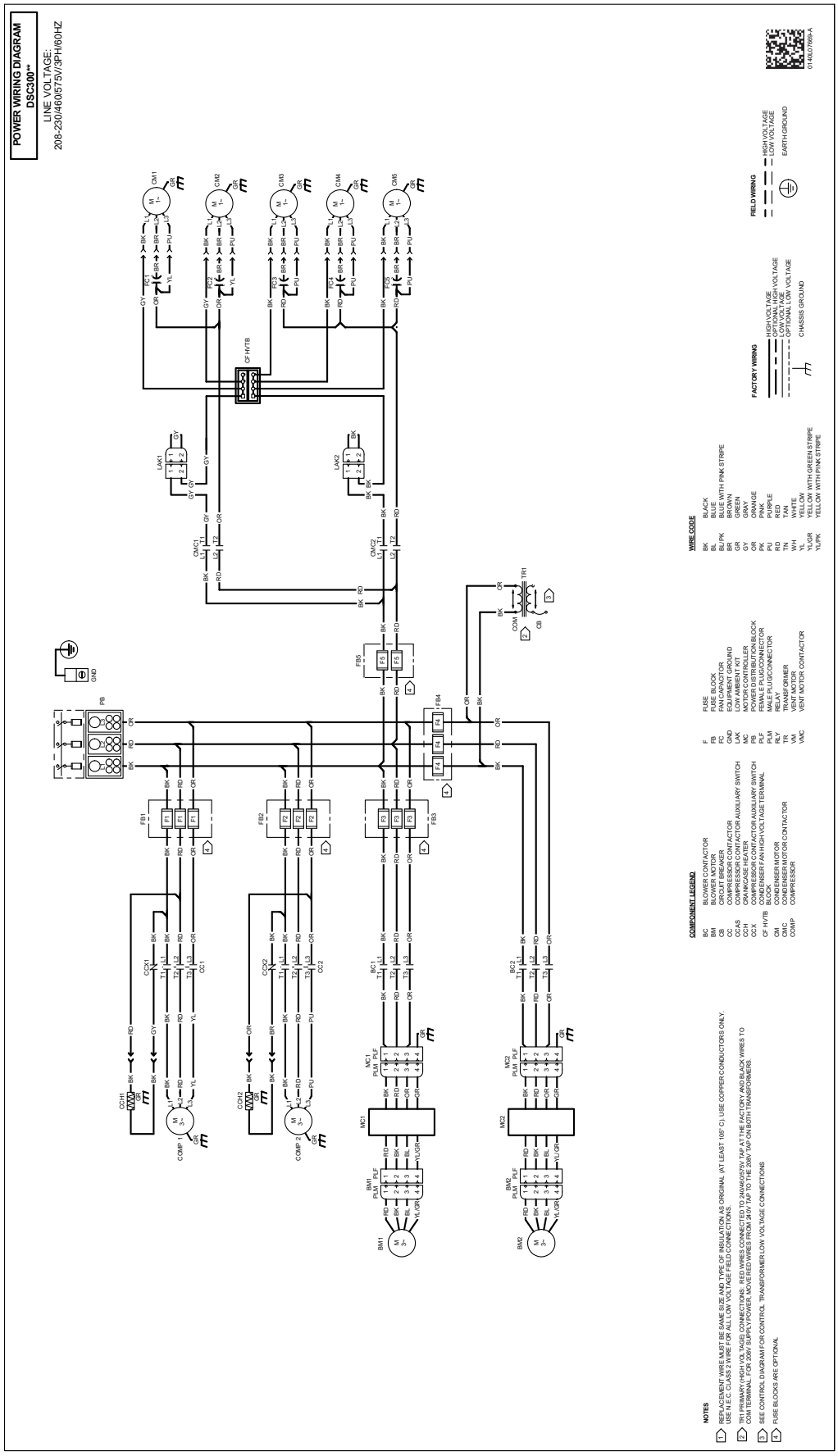
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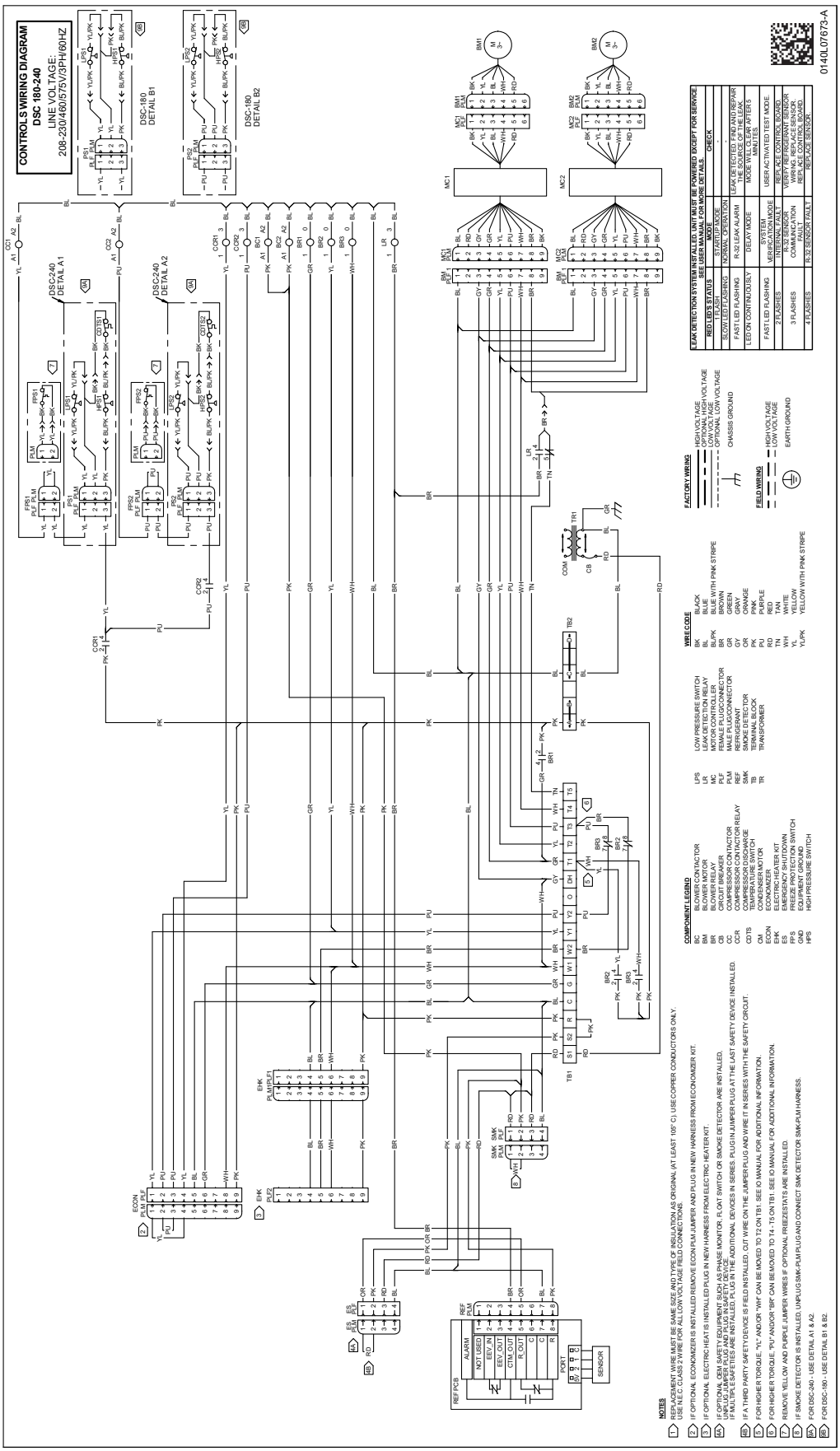
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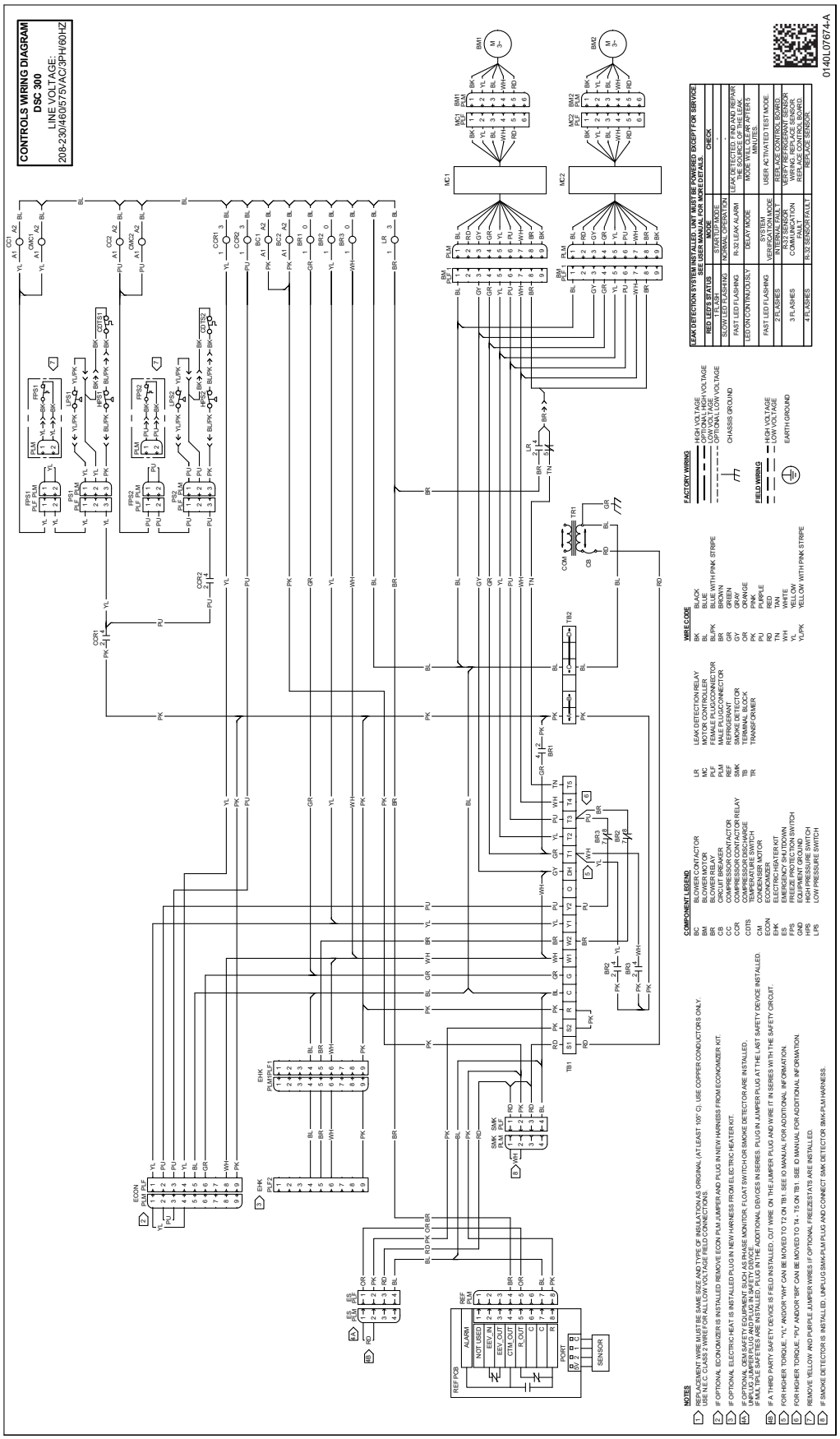


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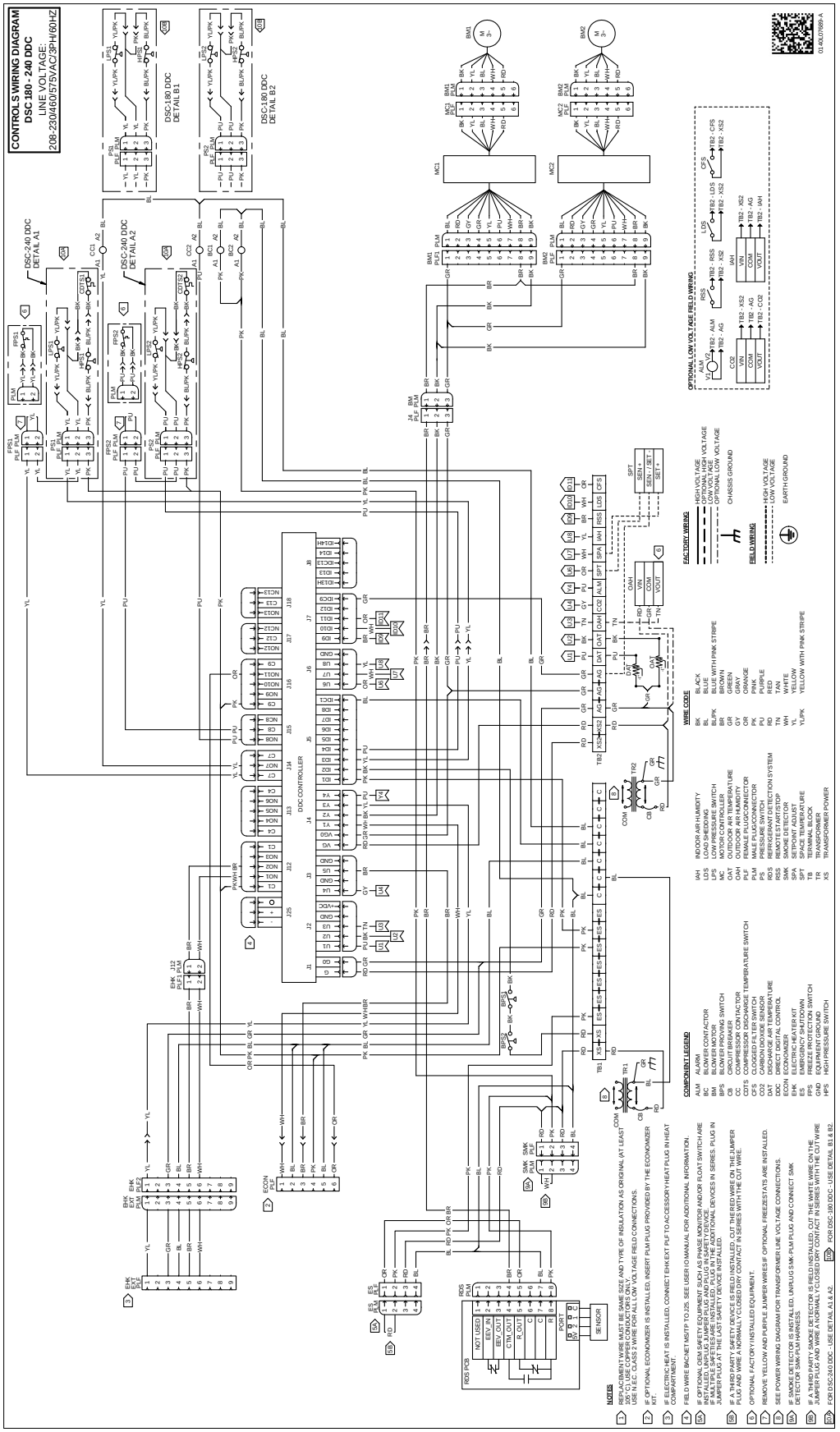
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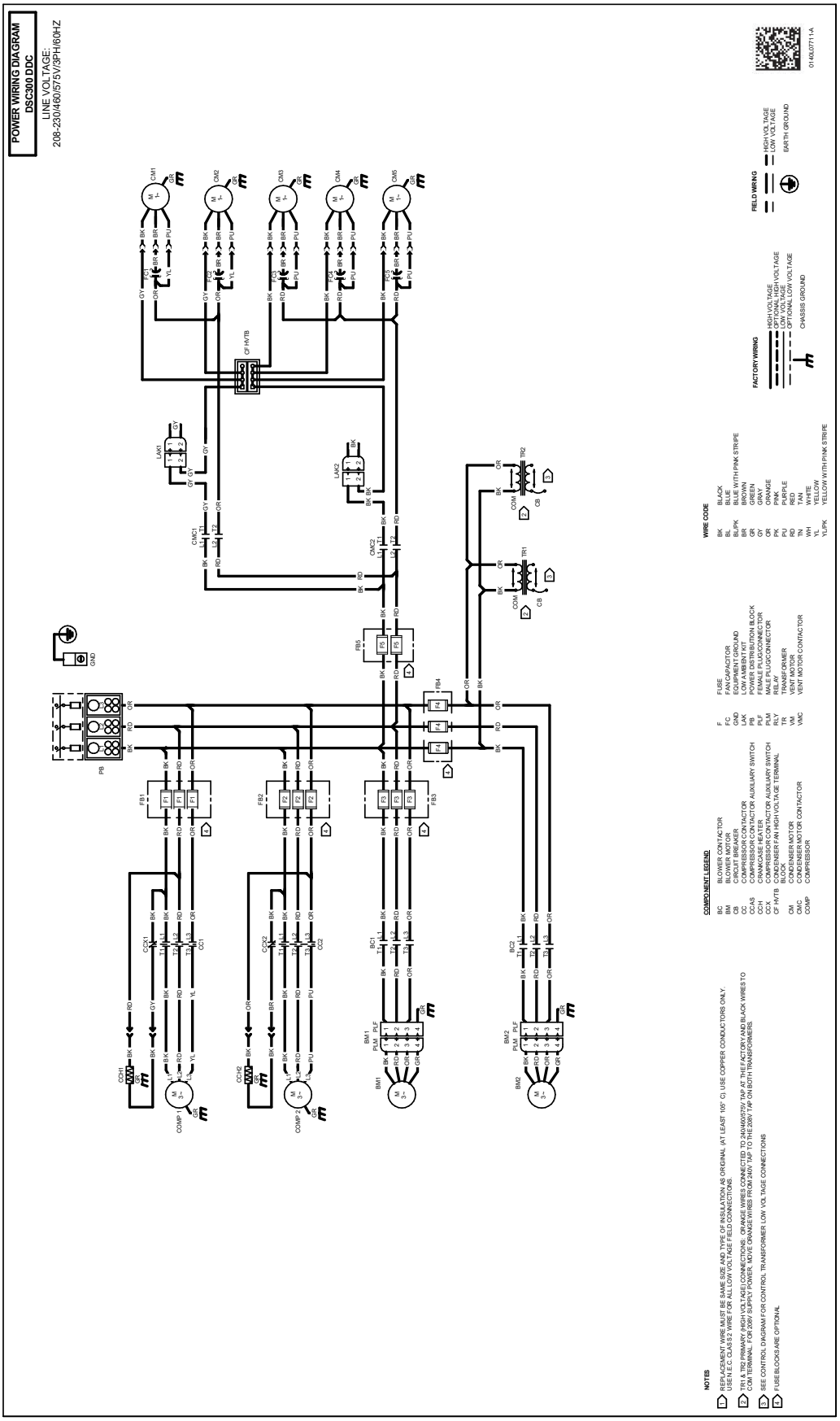


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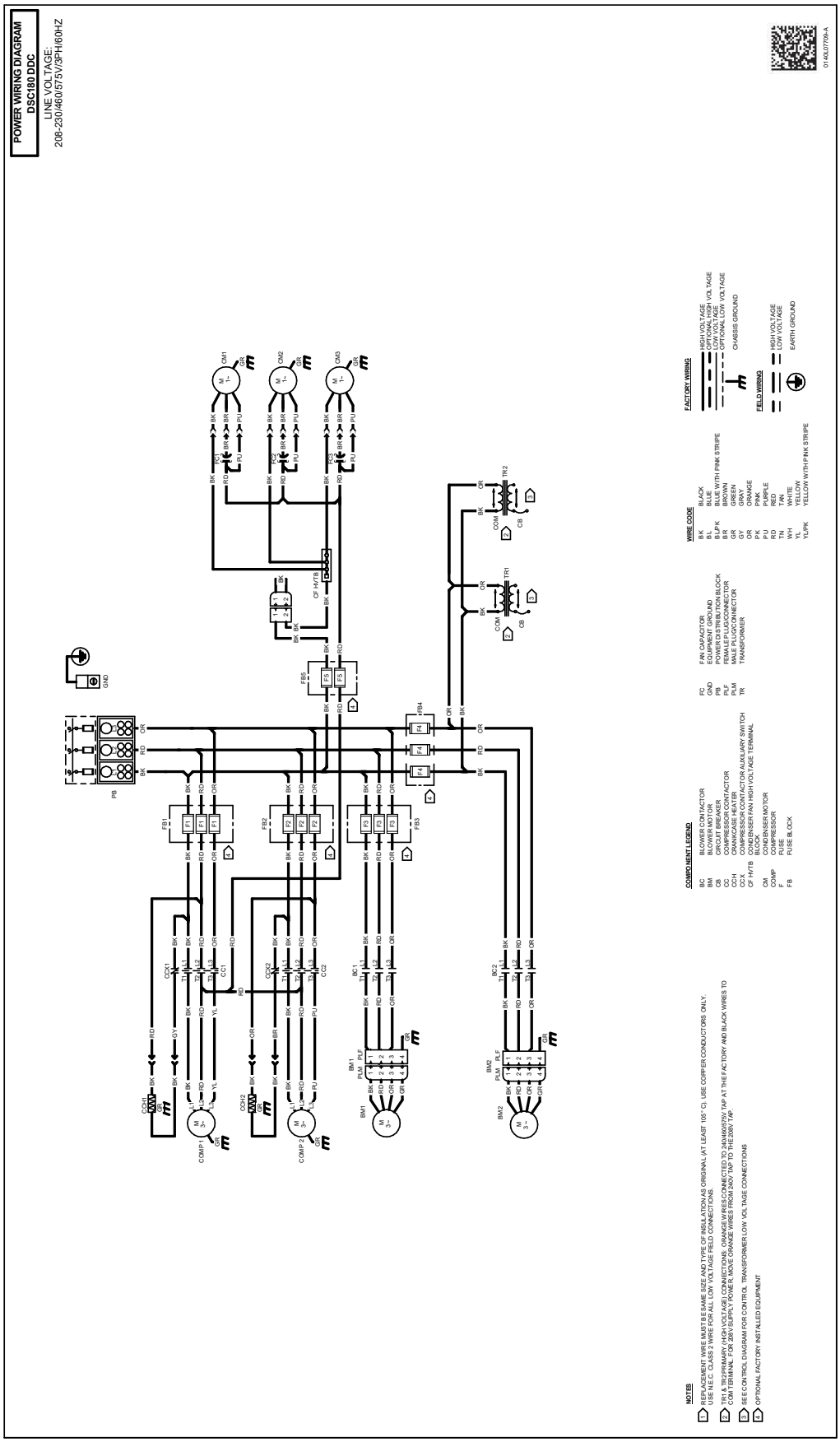
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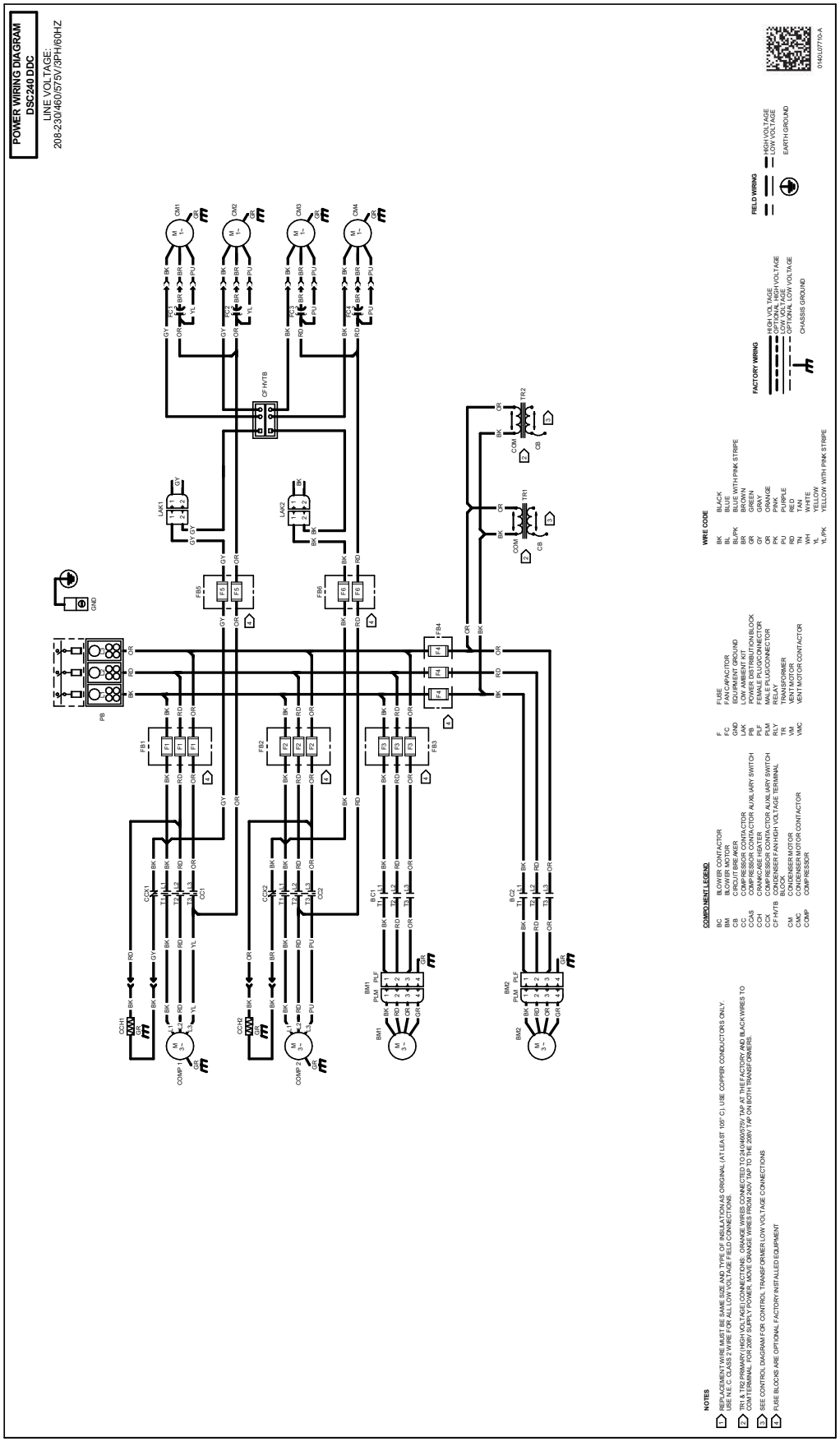
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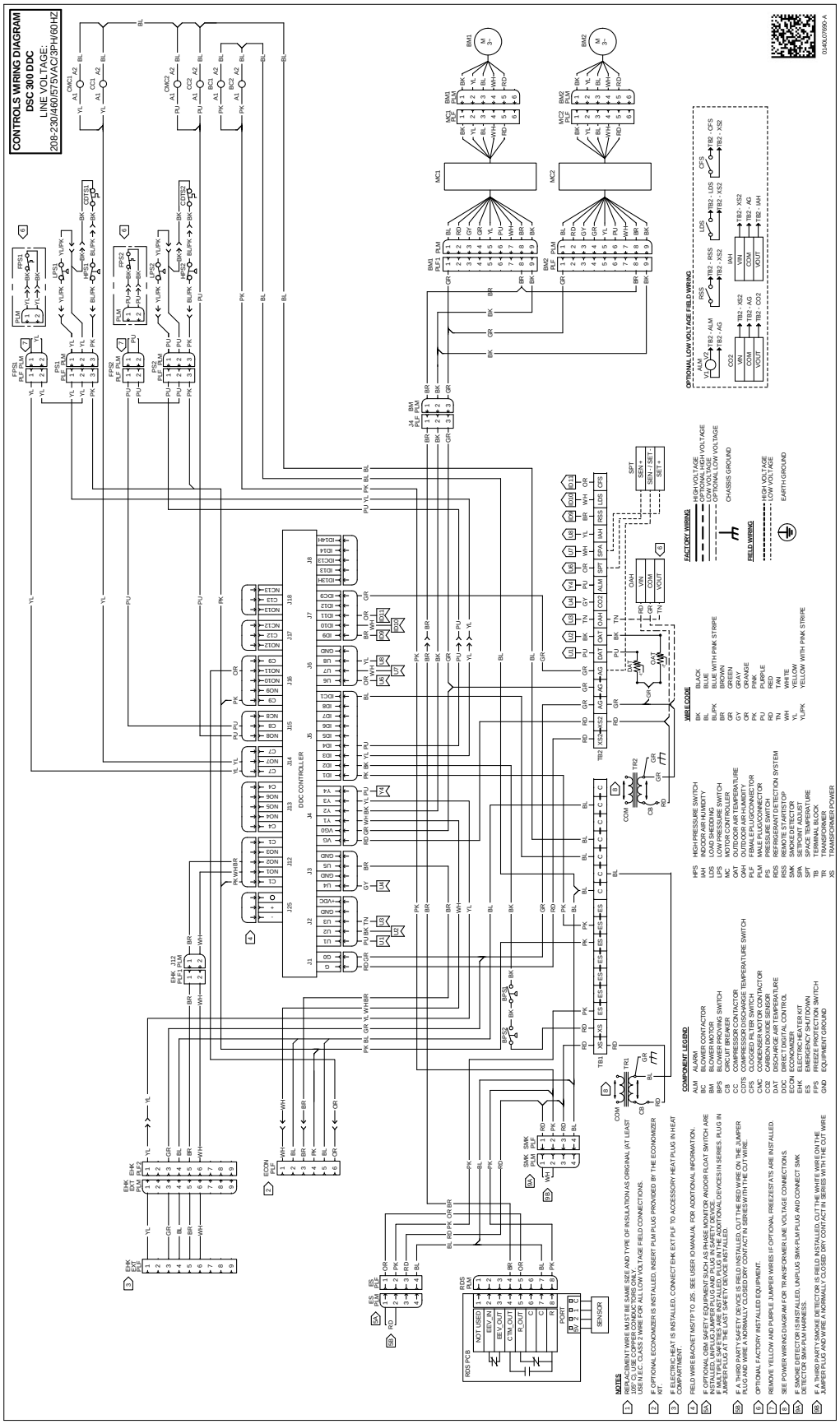
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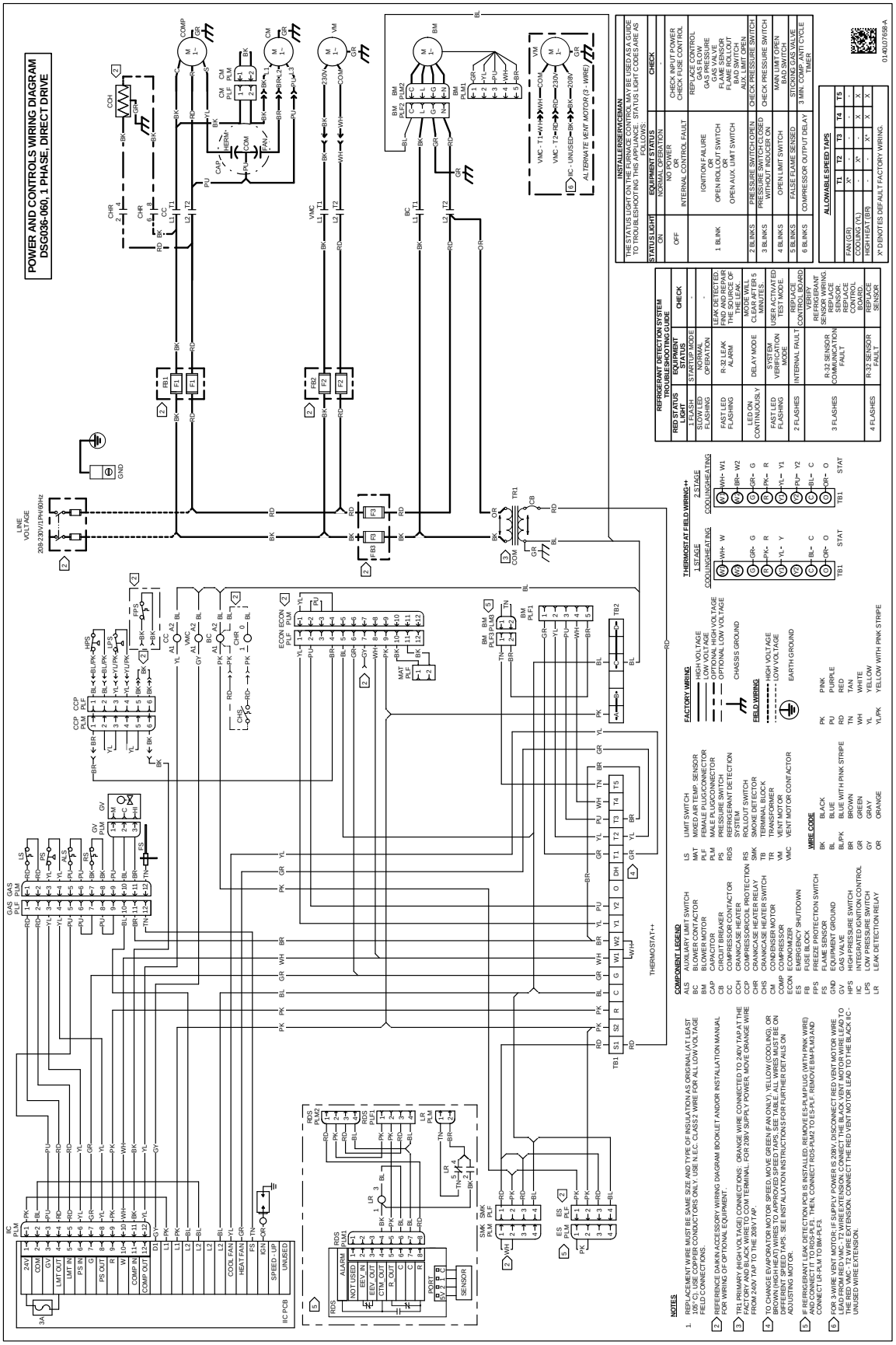


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DSG WIRING DIAGRAMS

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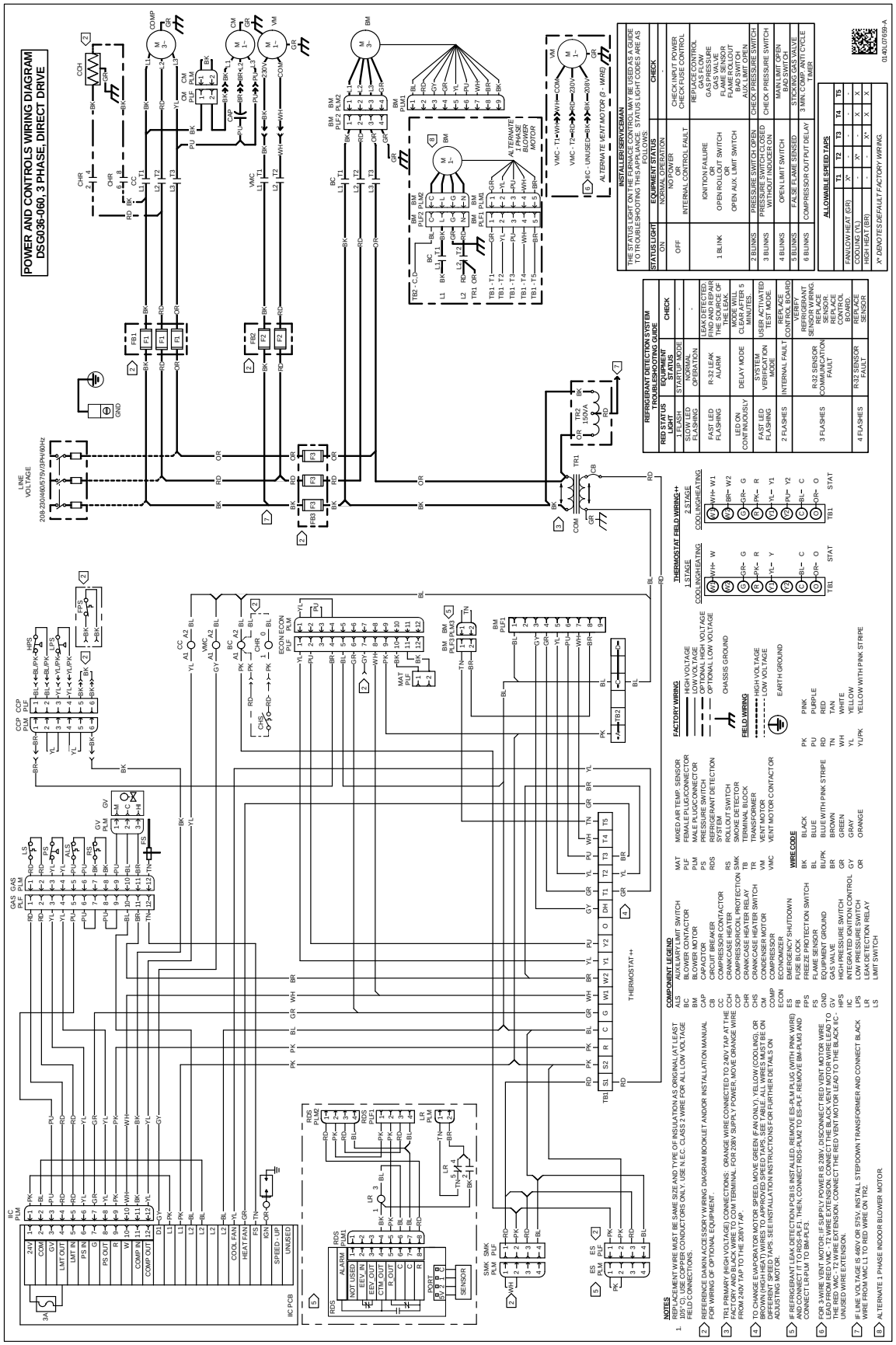
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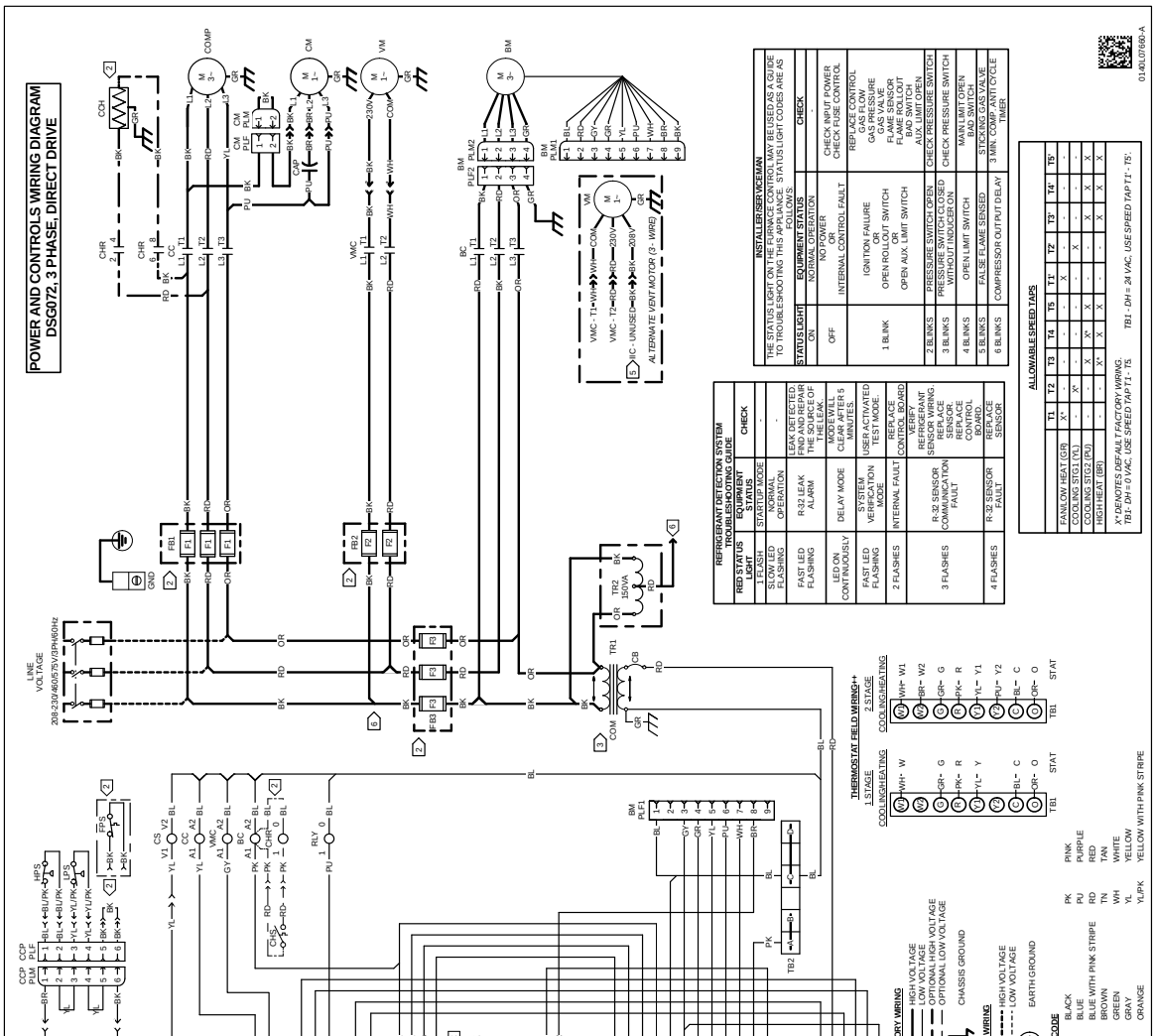
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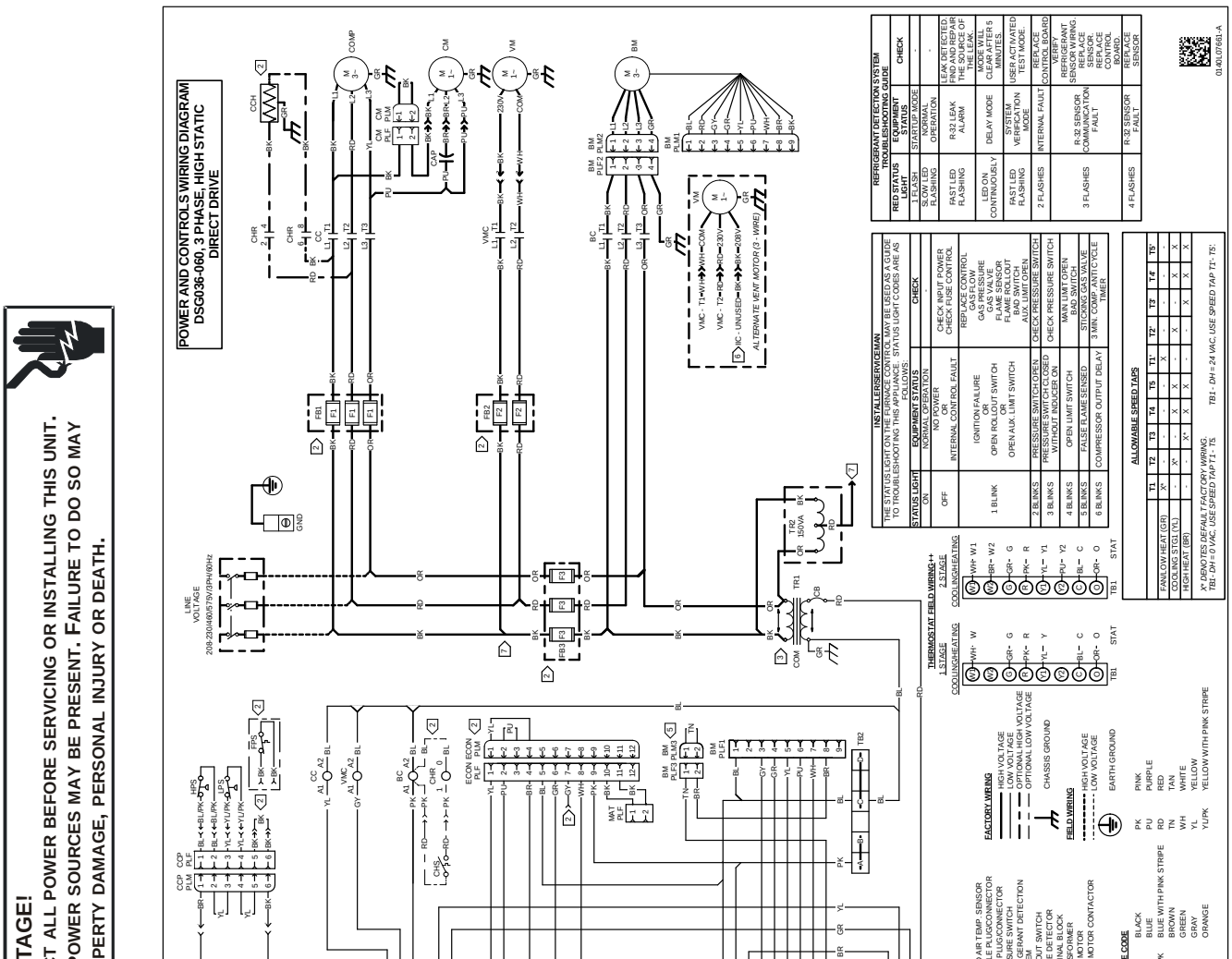
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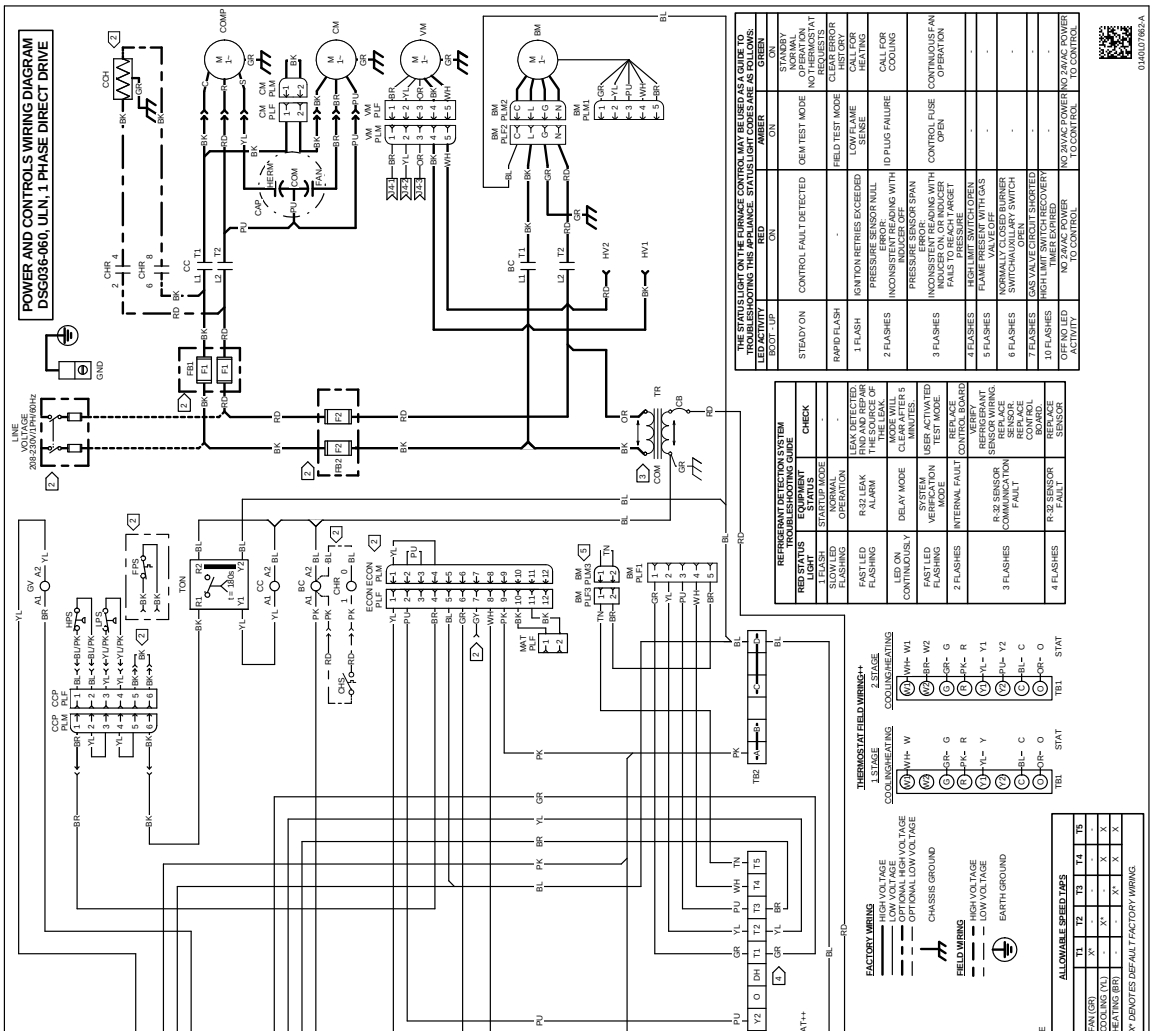
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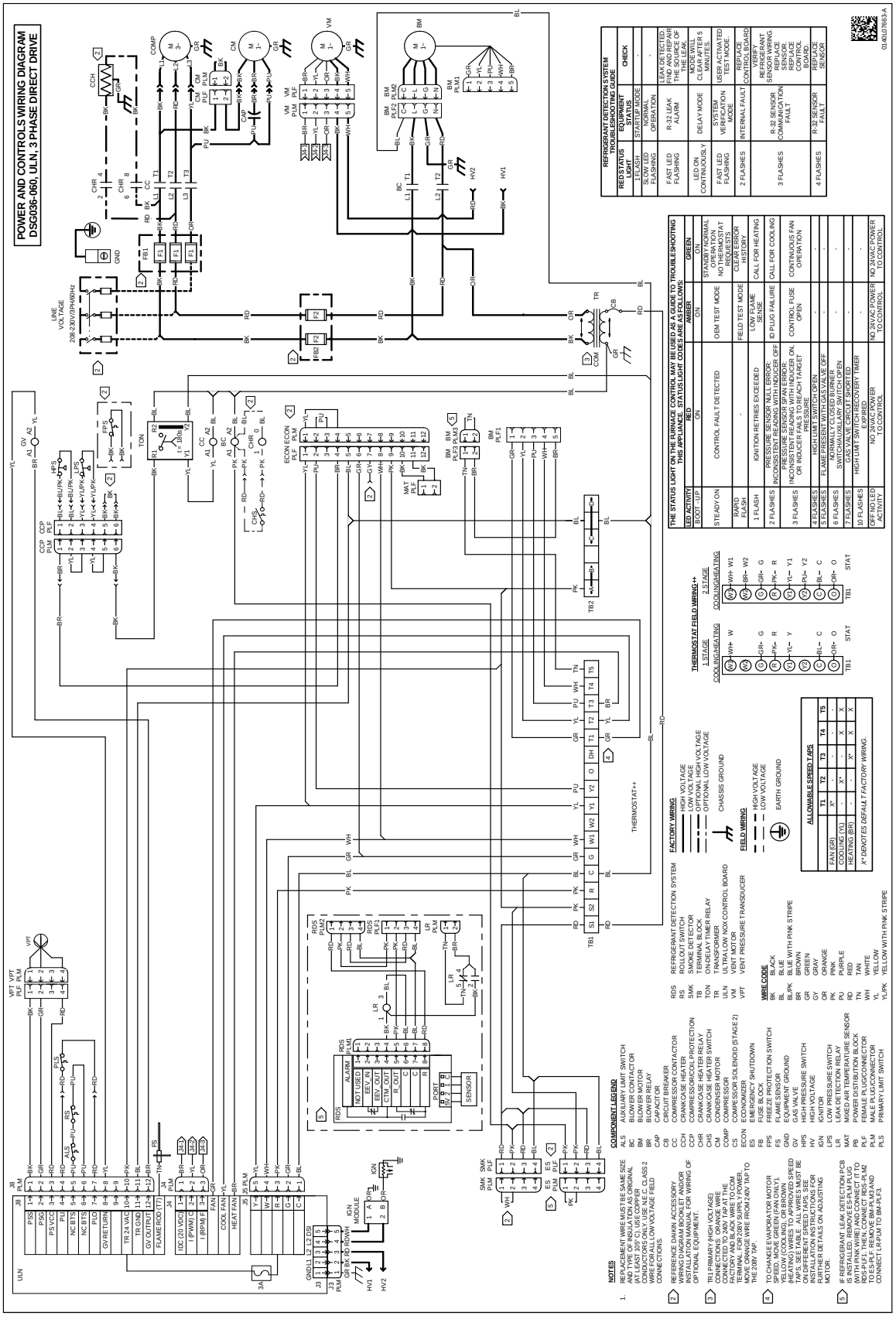
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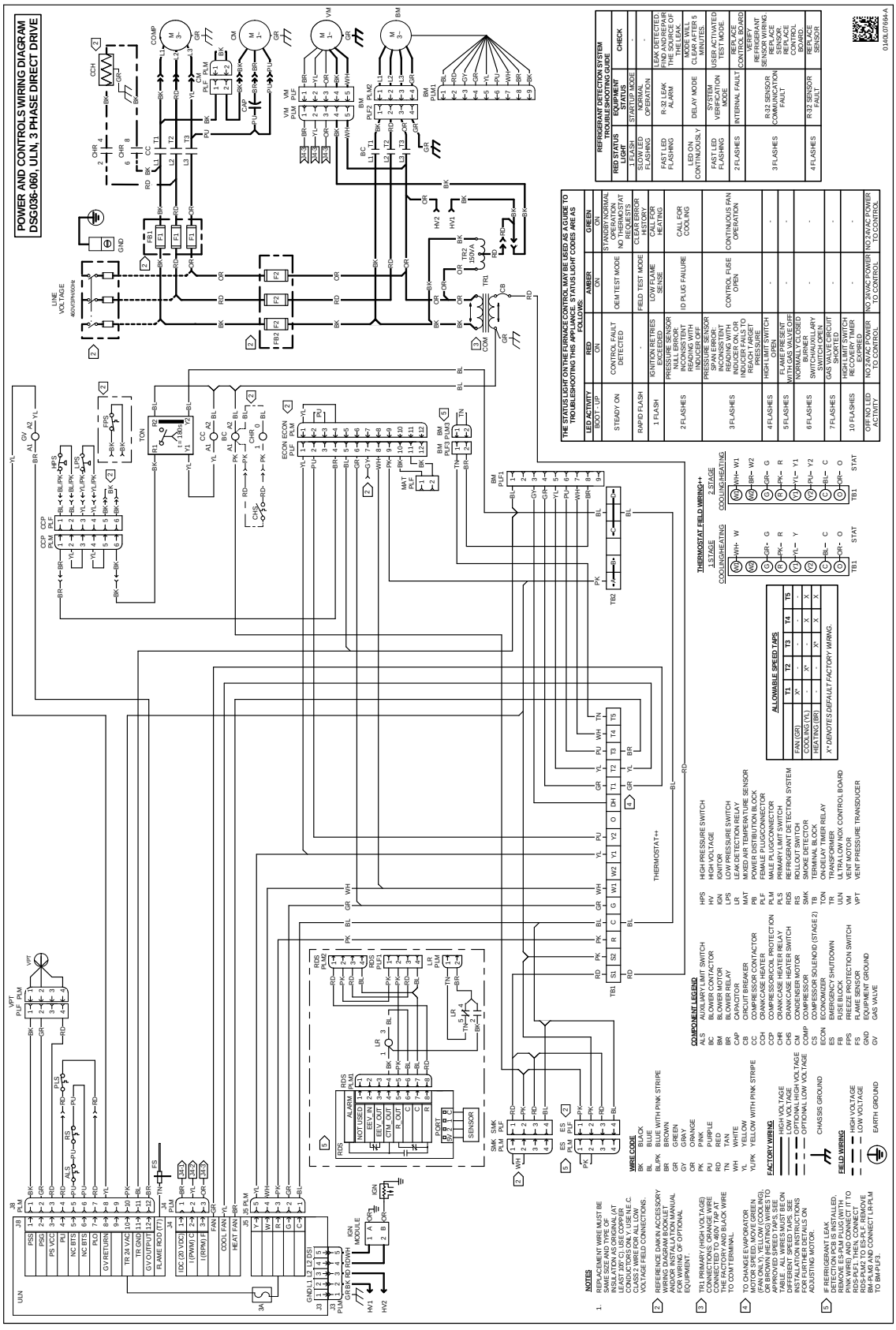
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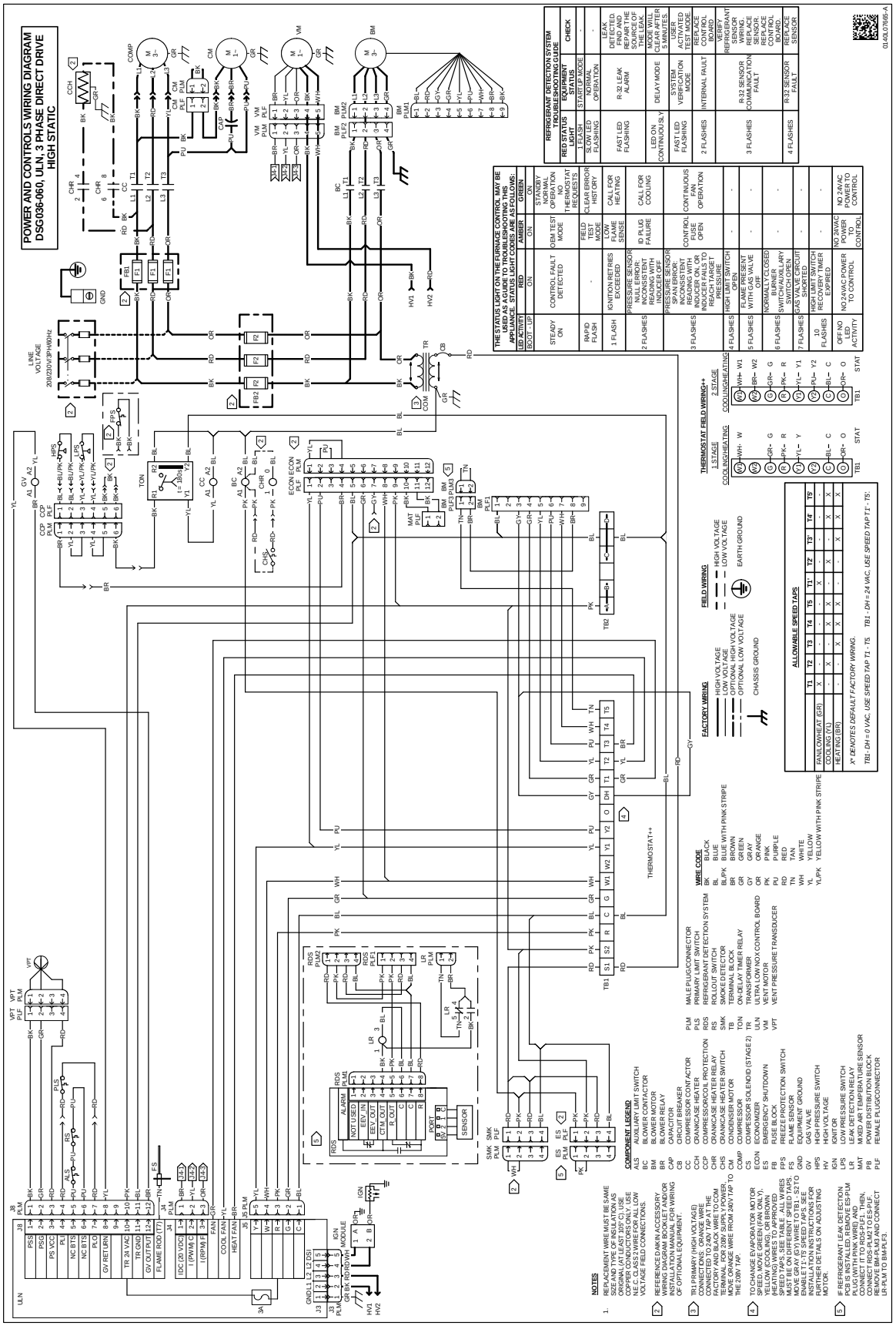
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UNIT WIRING DIAGRAMS

DSG036-060, ULN, 3 PHASE, HIGH STATIC (208-230V)

WARNING

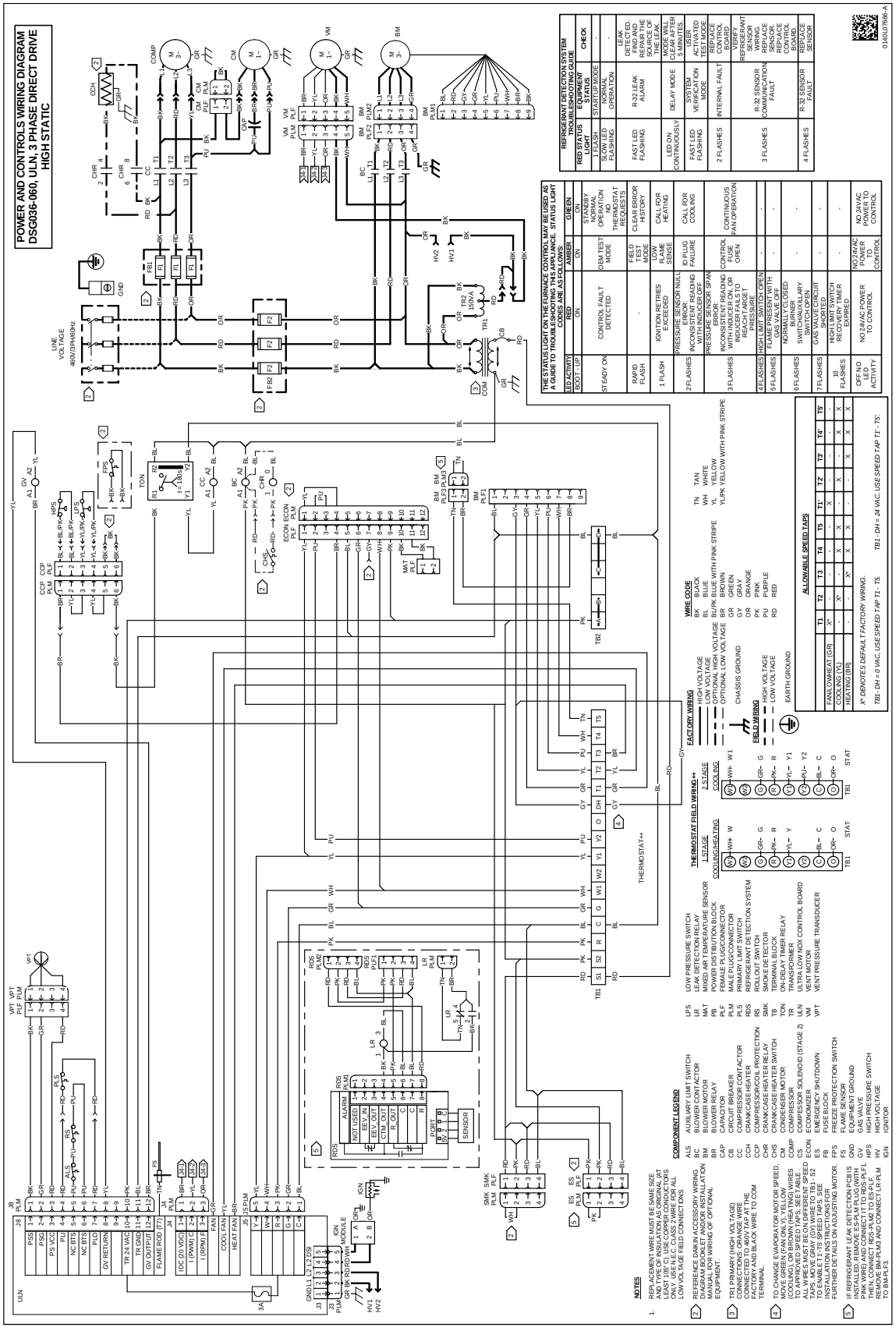
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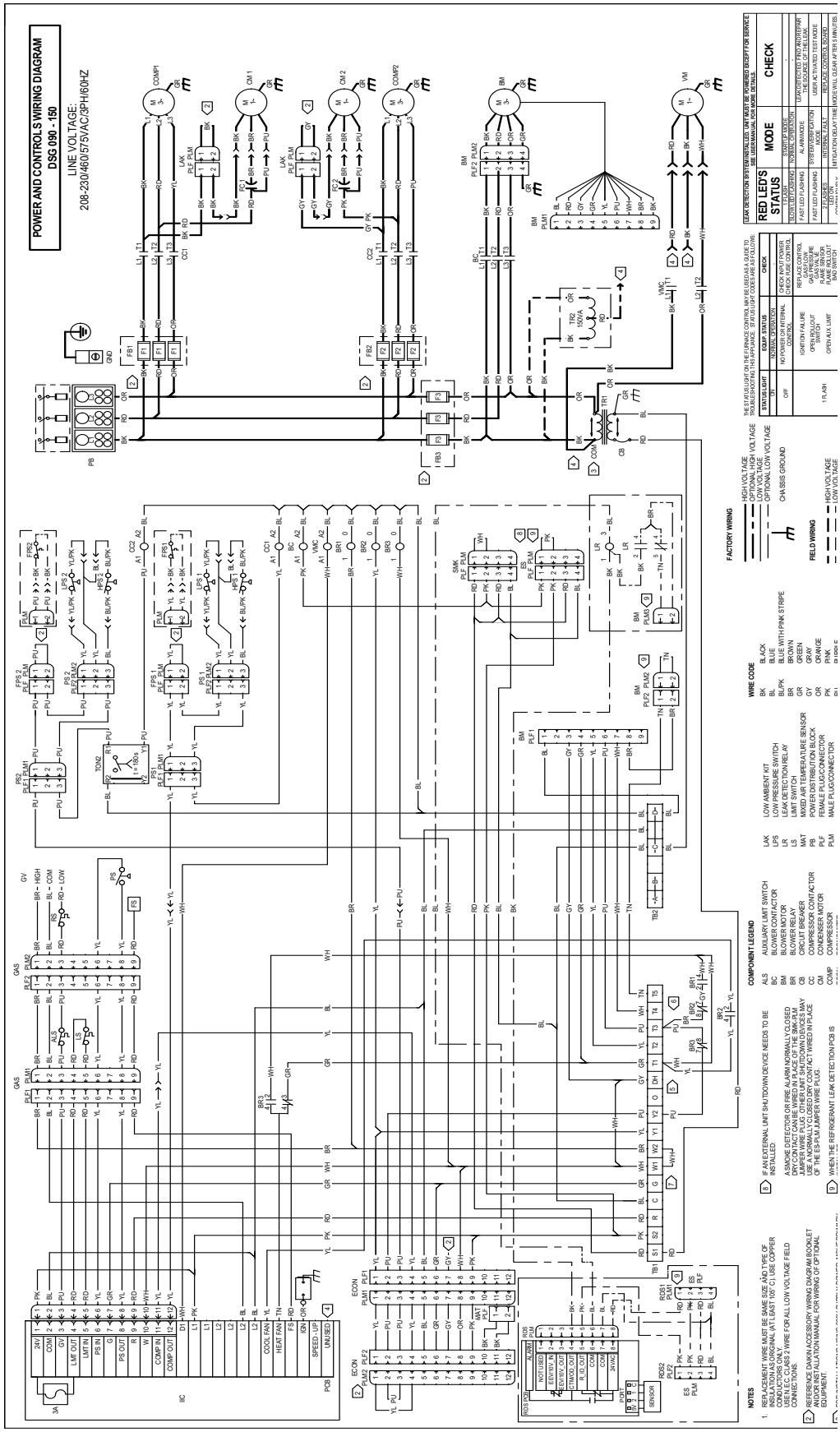
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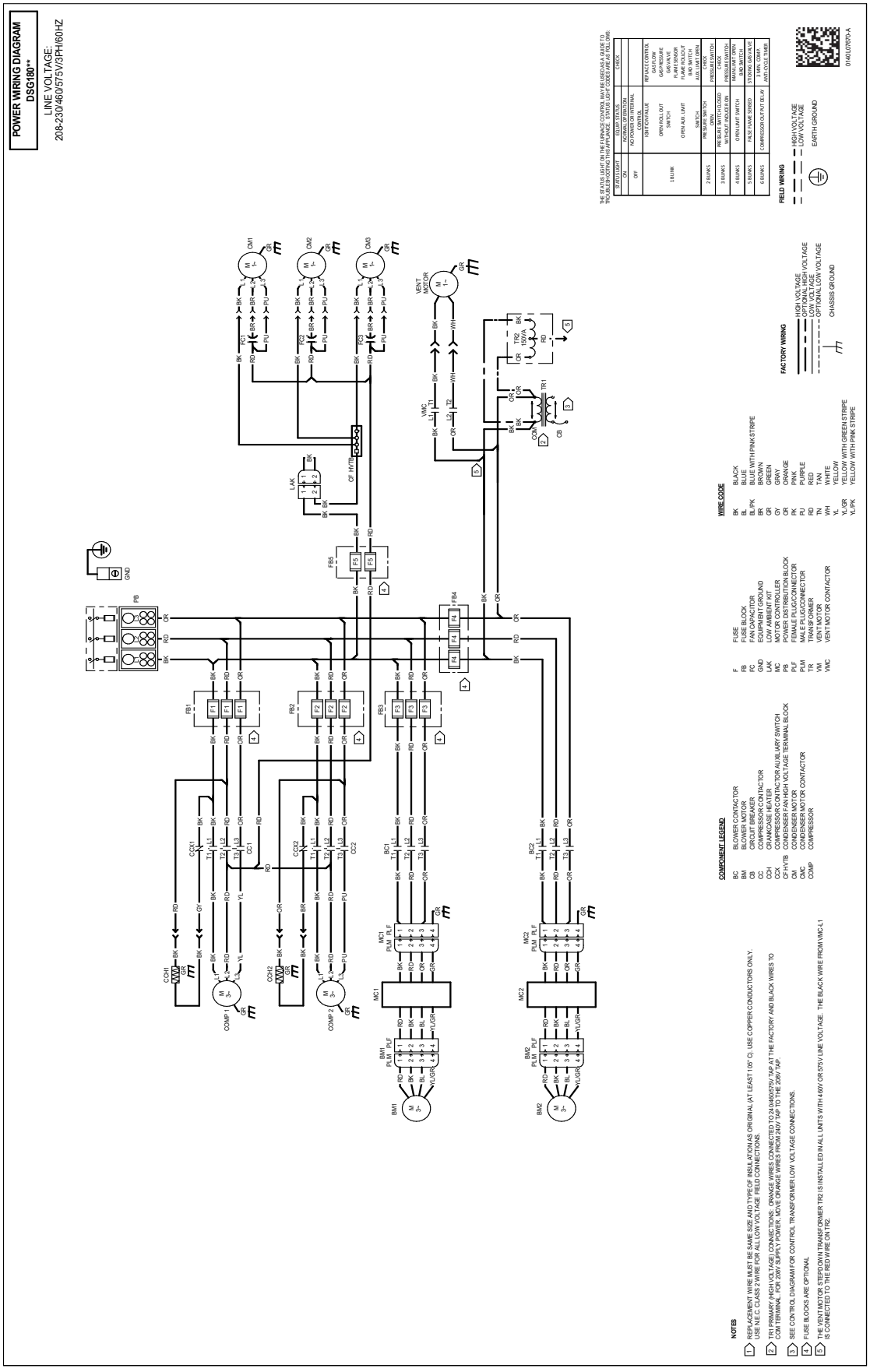
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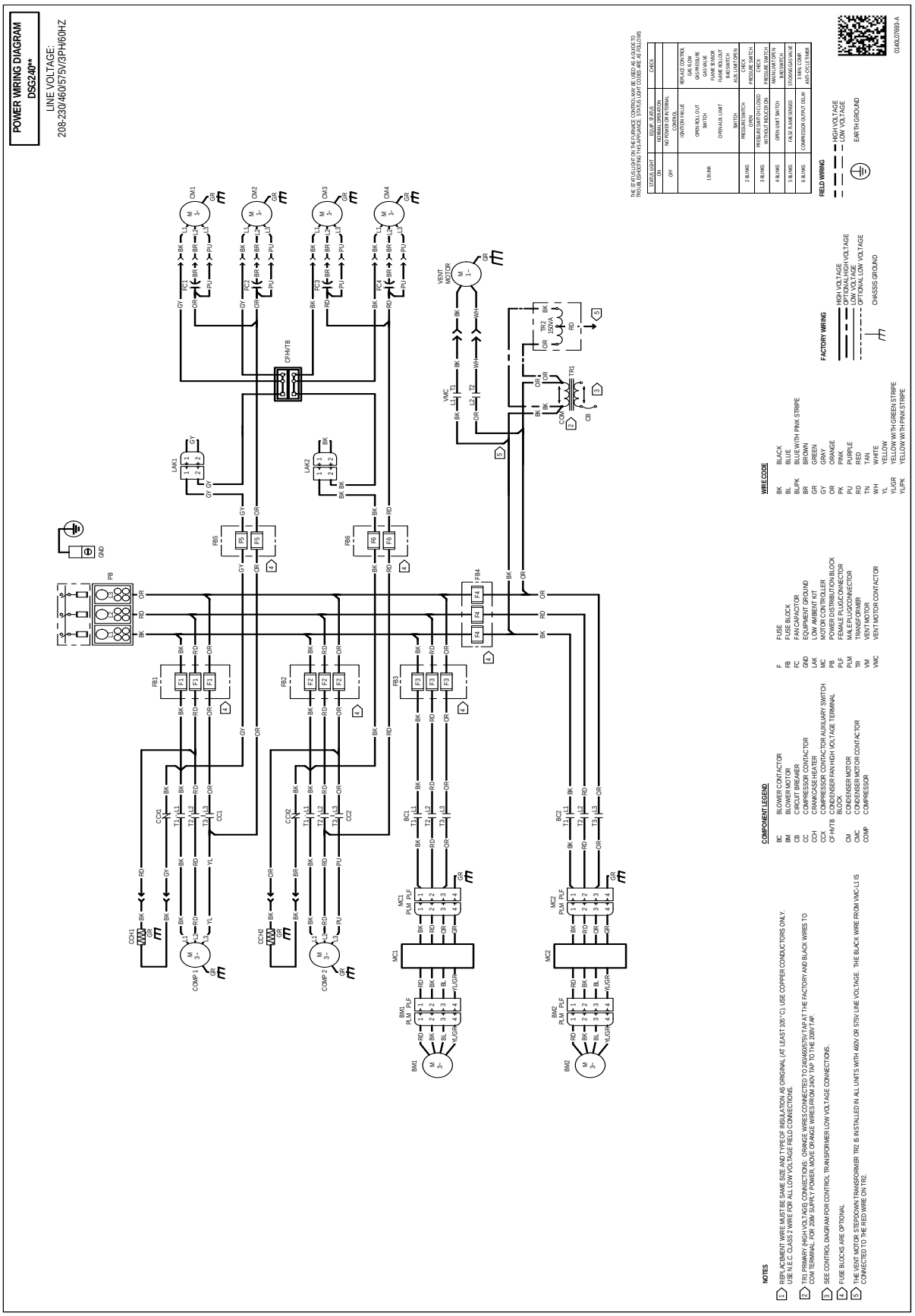
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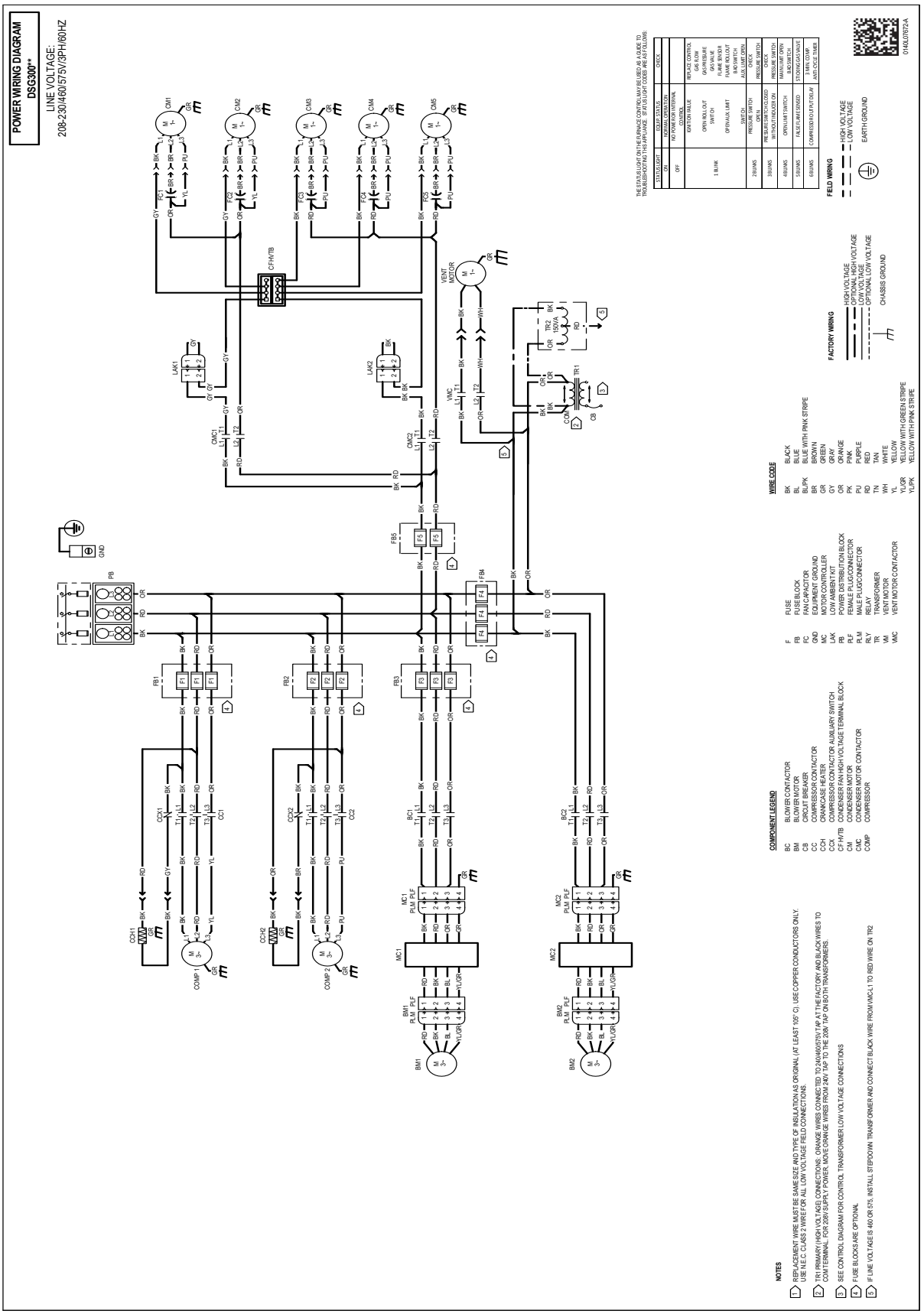
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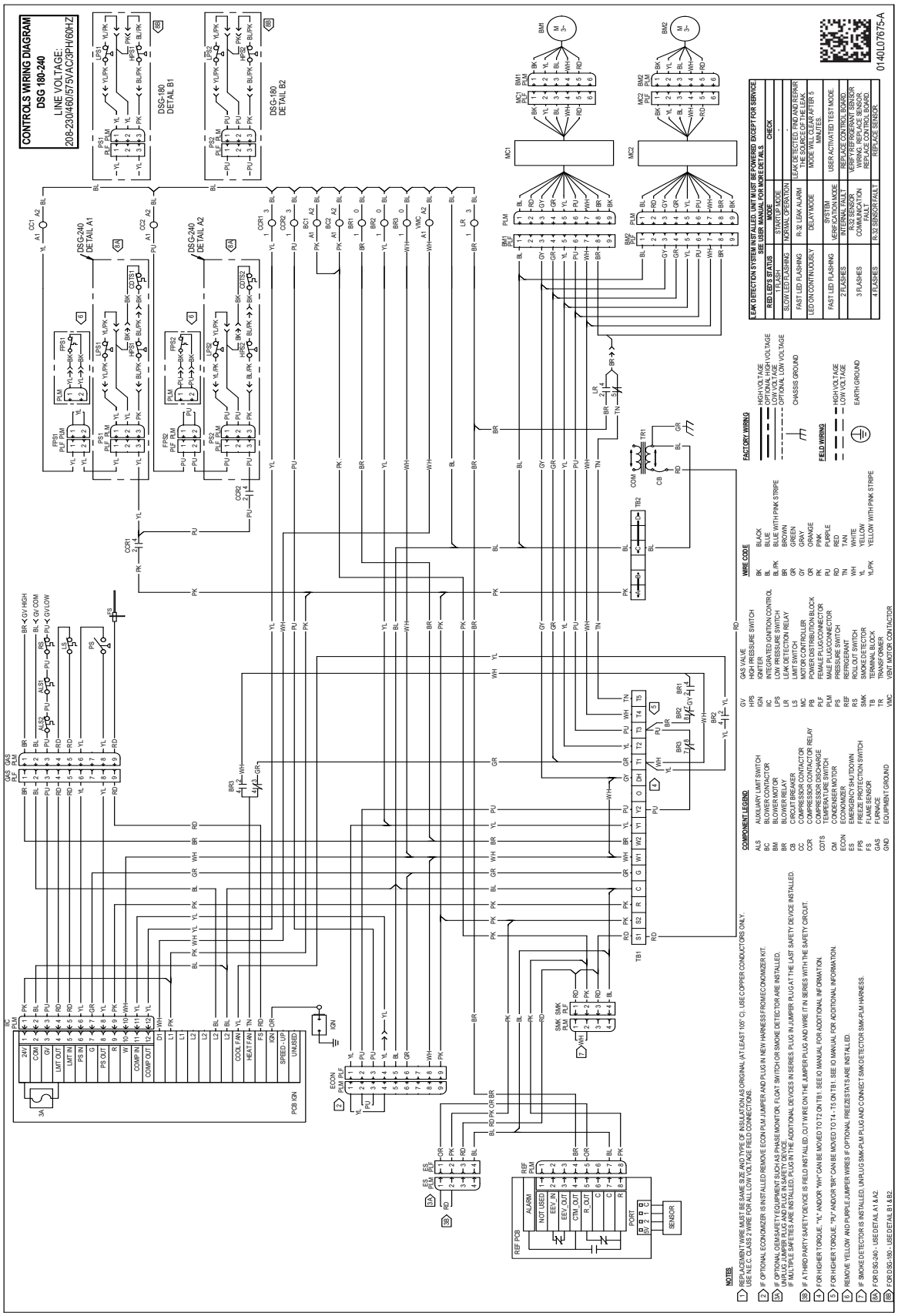
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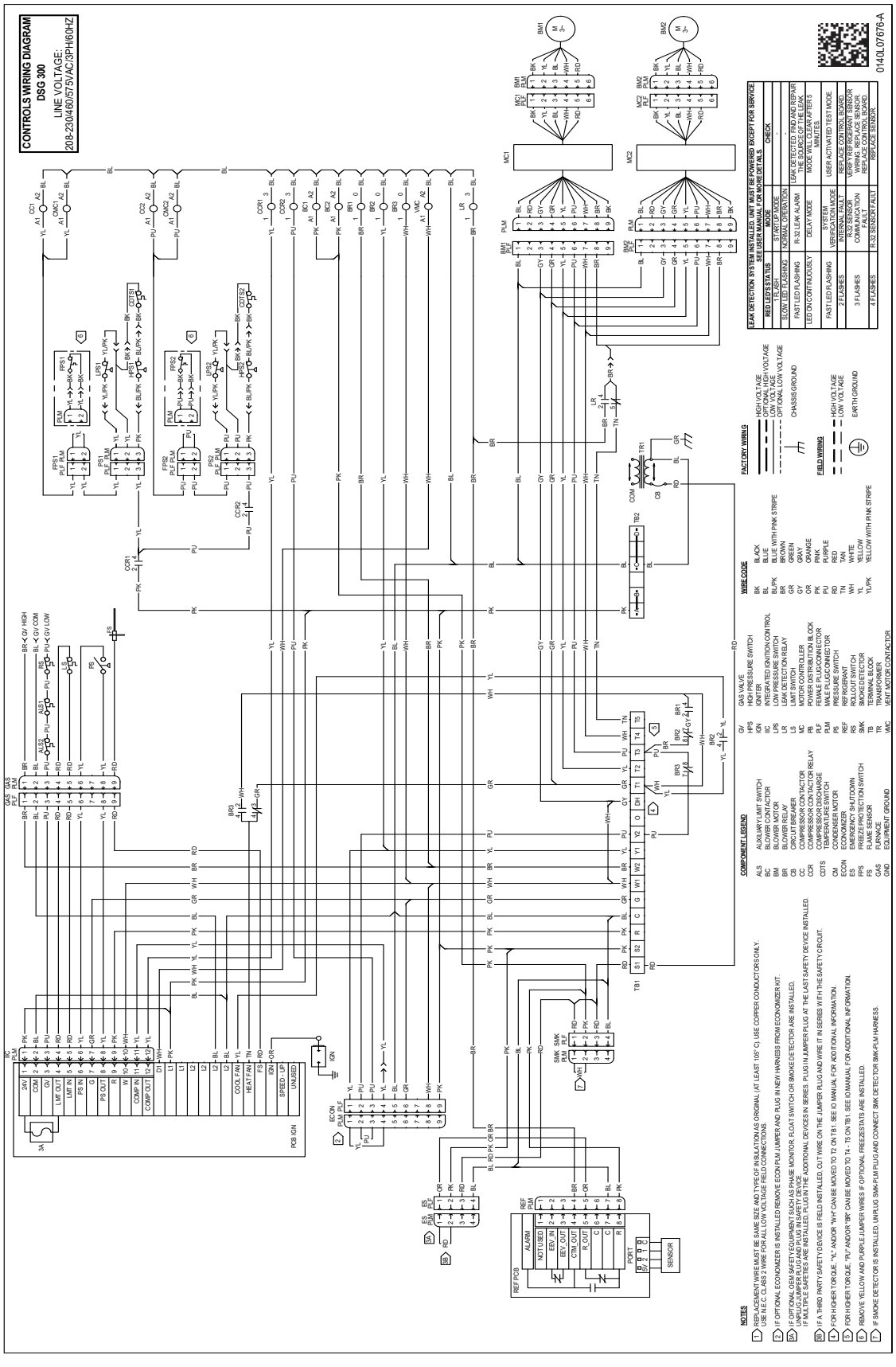


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UNIT WIRING DIAGRAMS

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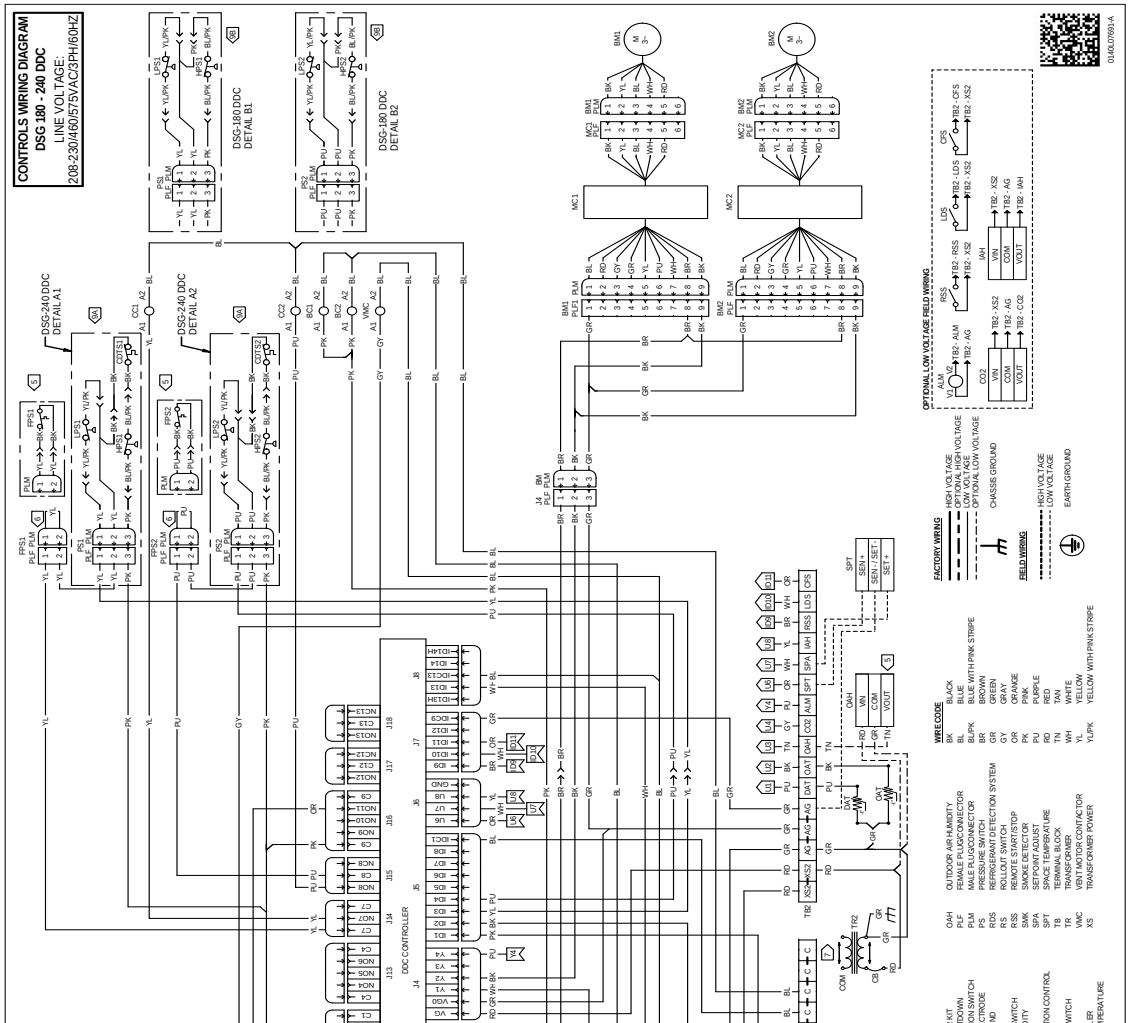
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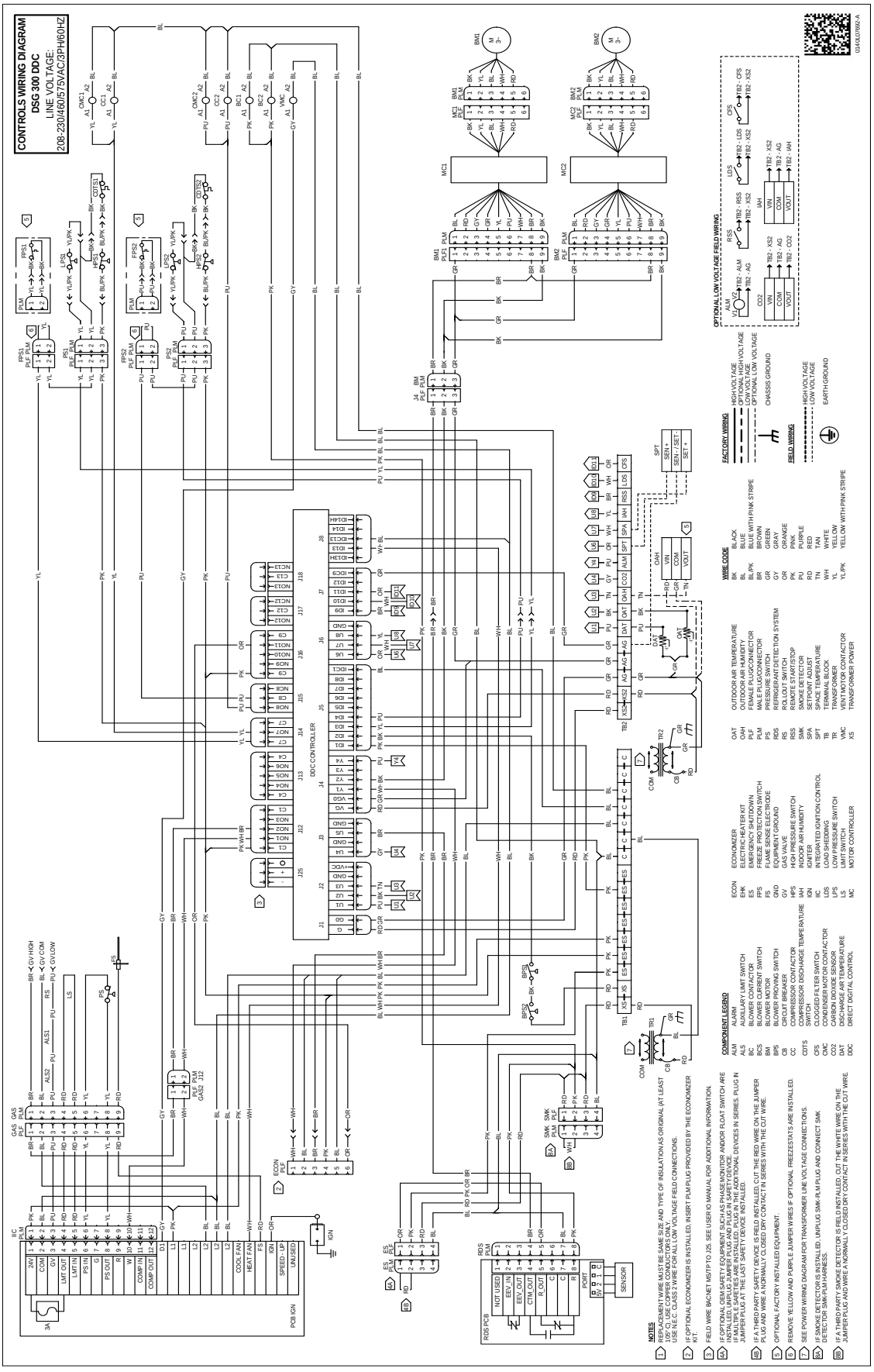
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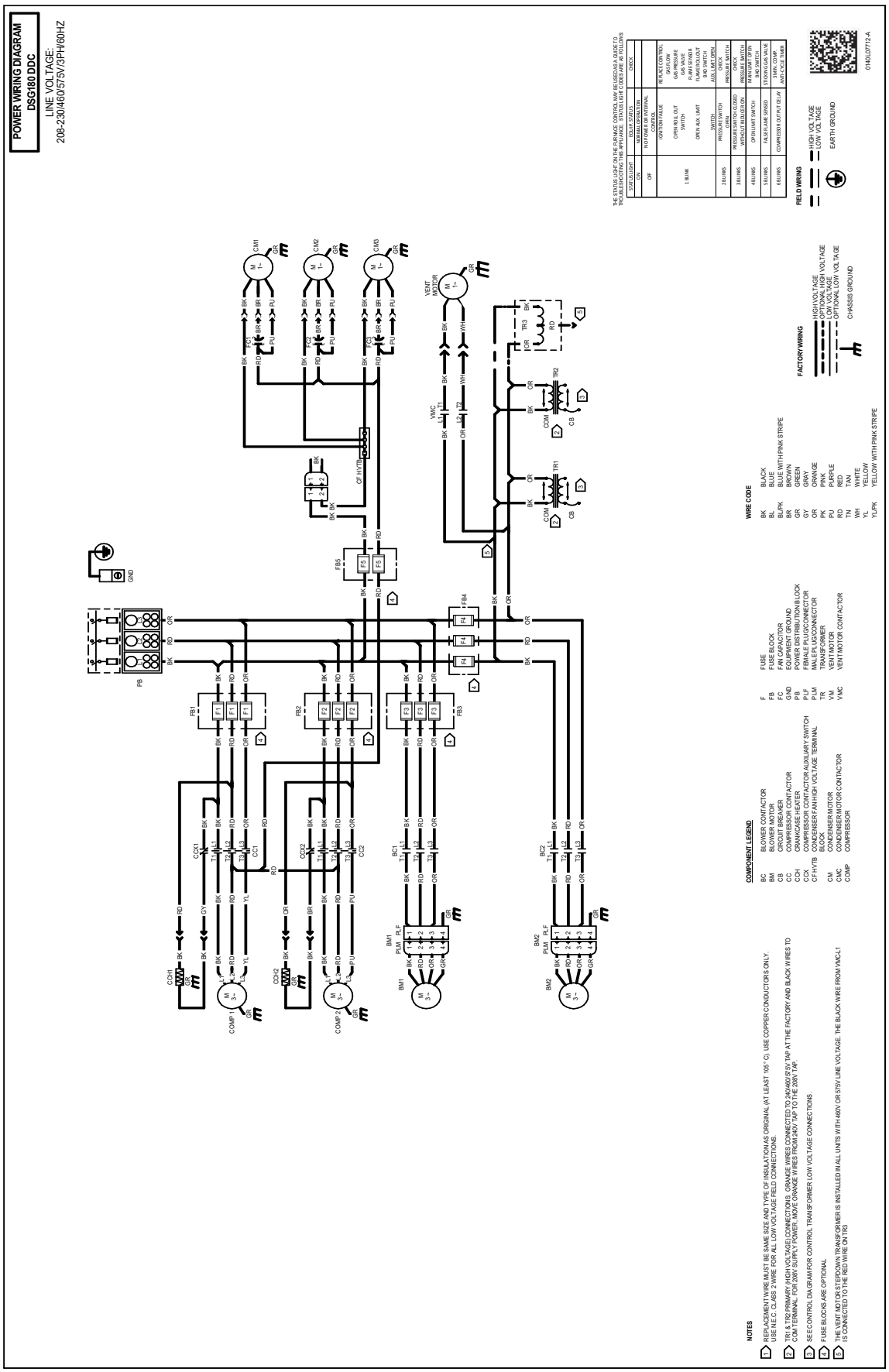
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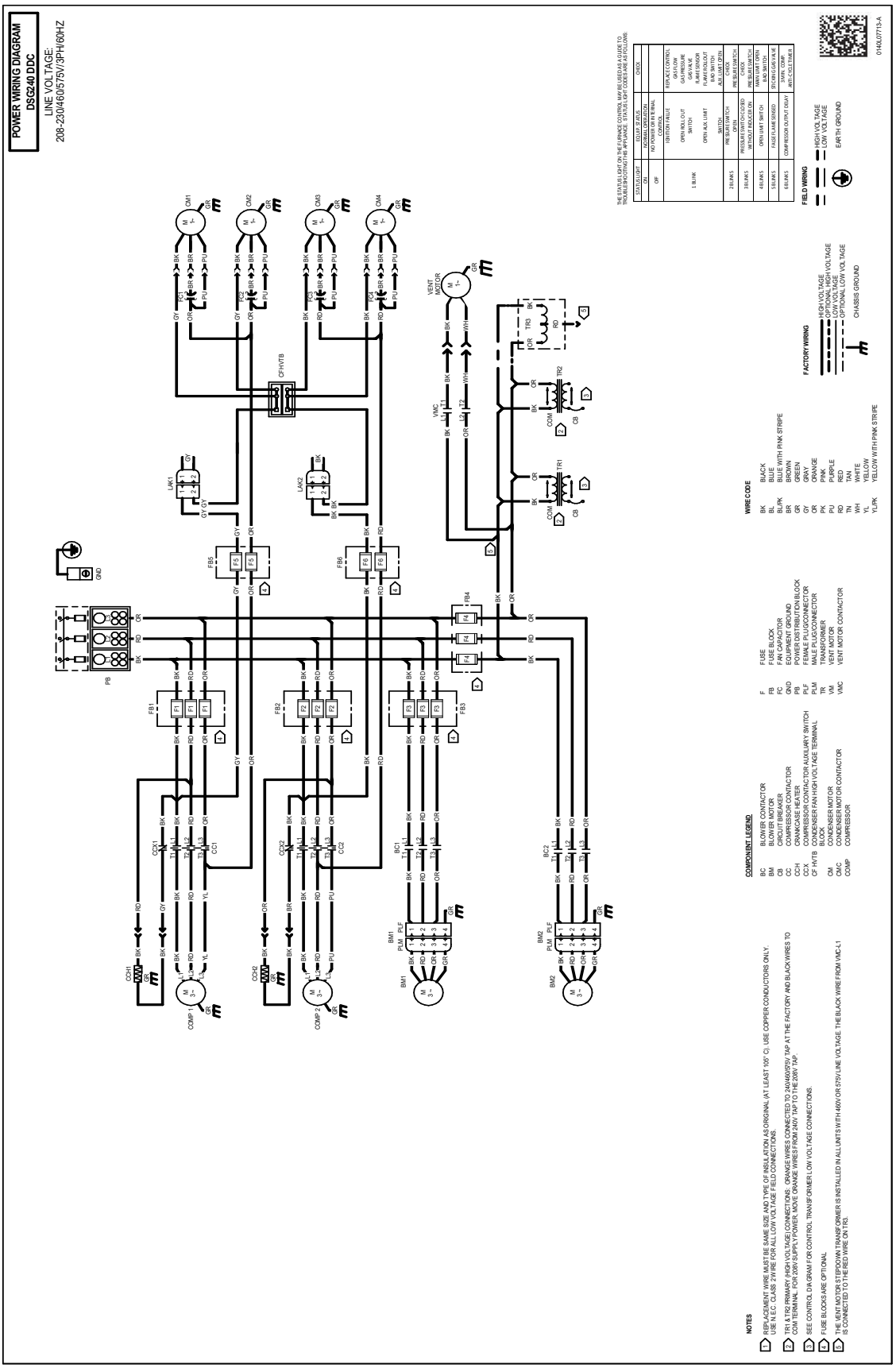
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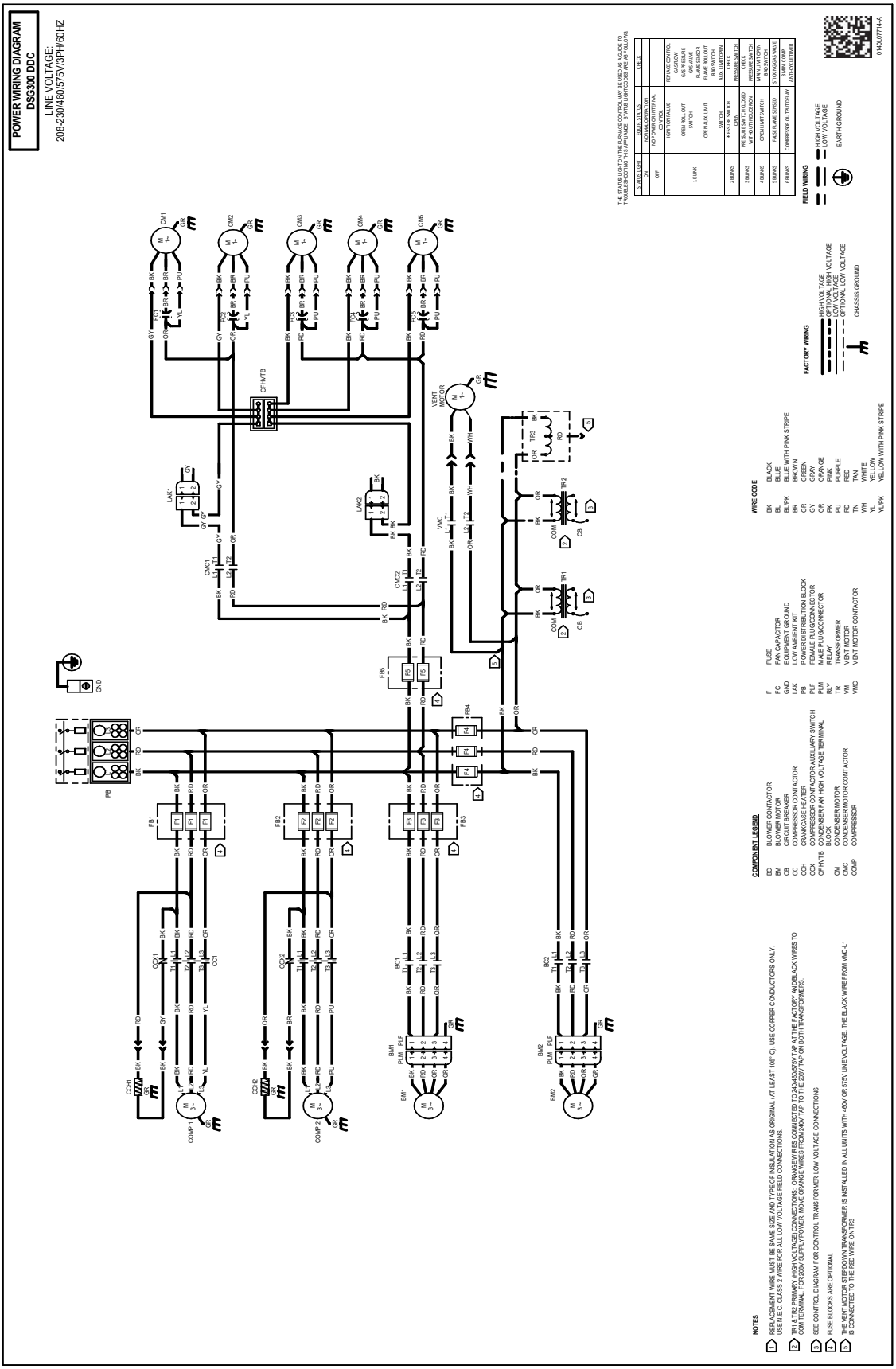
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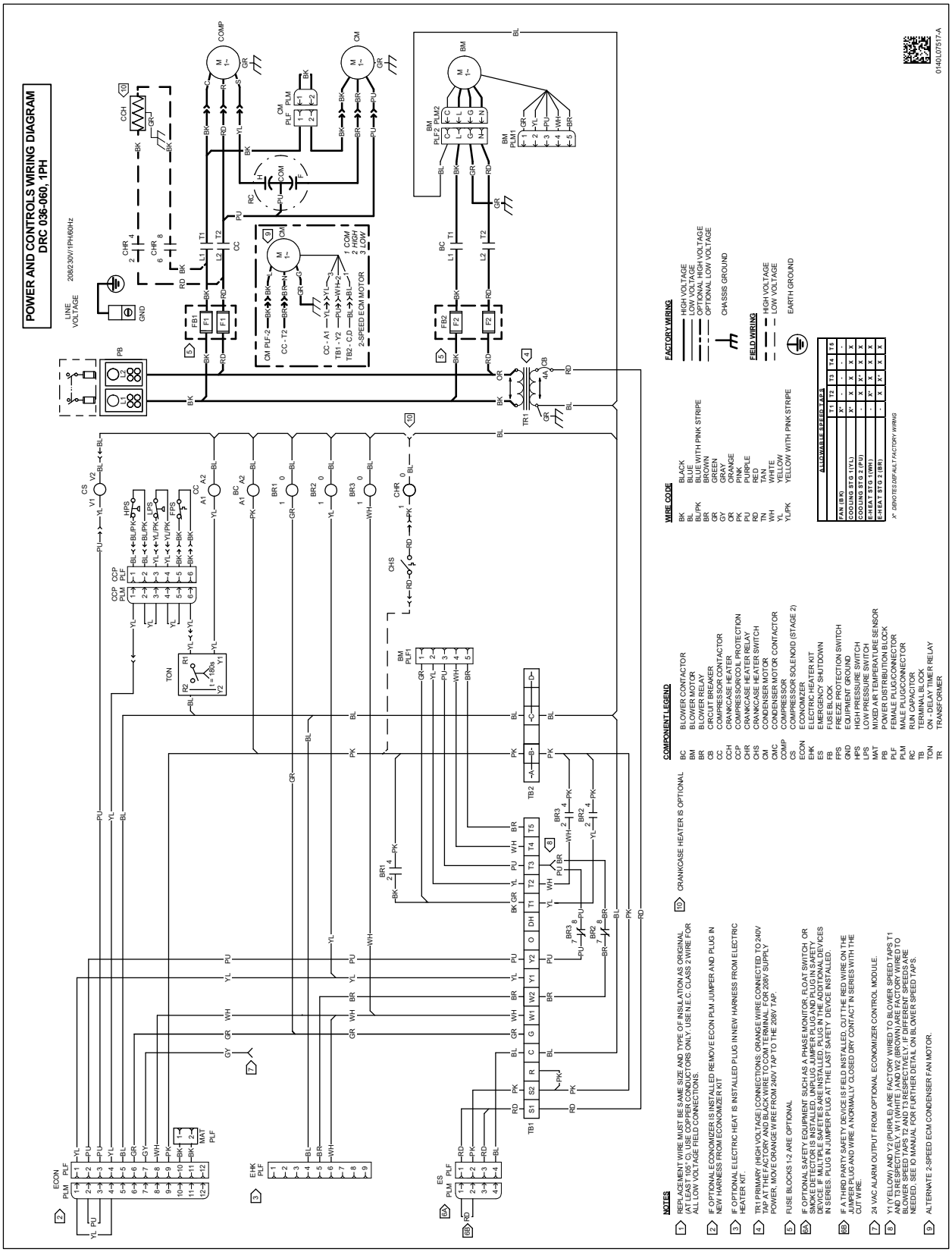
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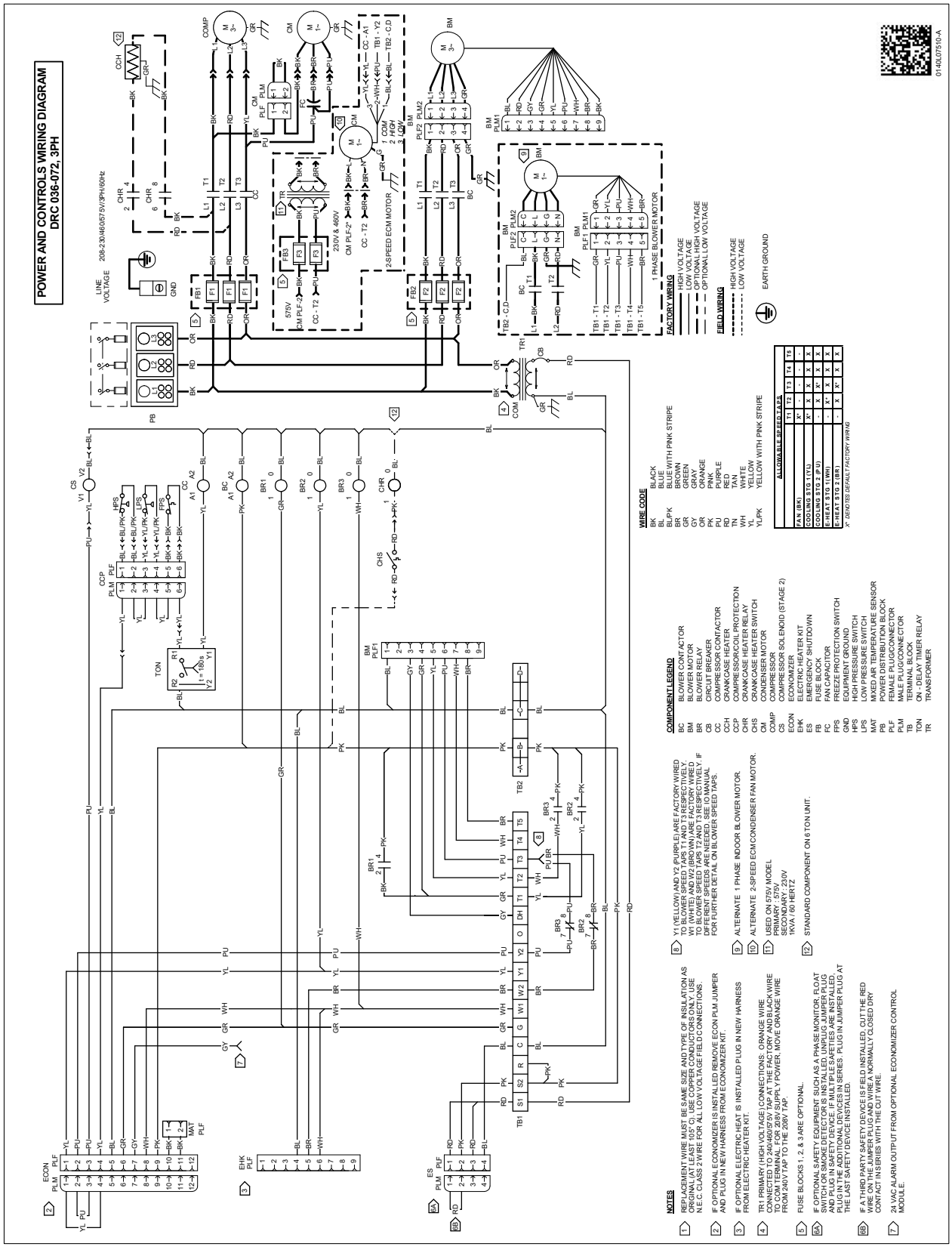
DRC WIRING DIAGRAMS

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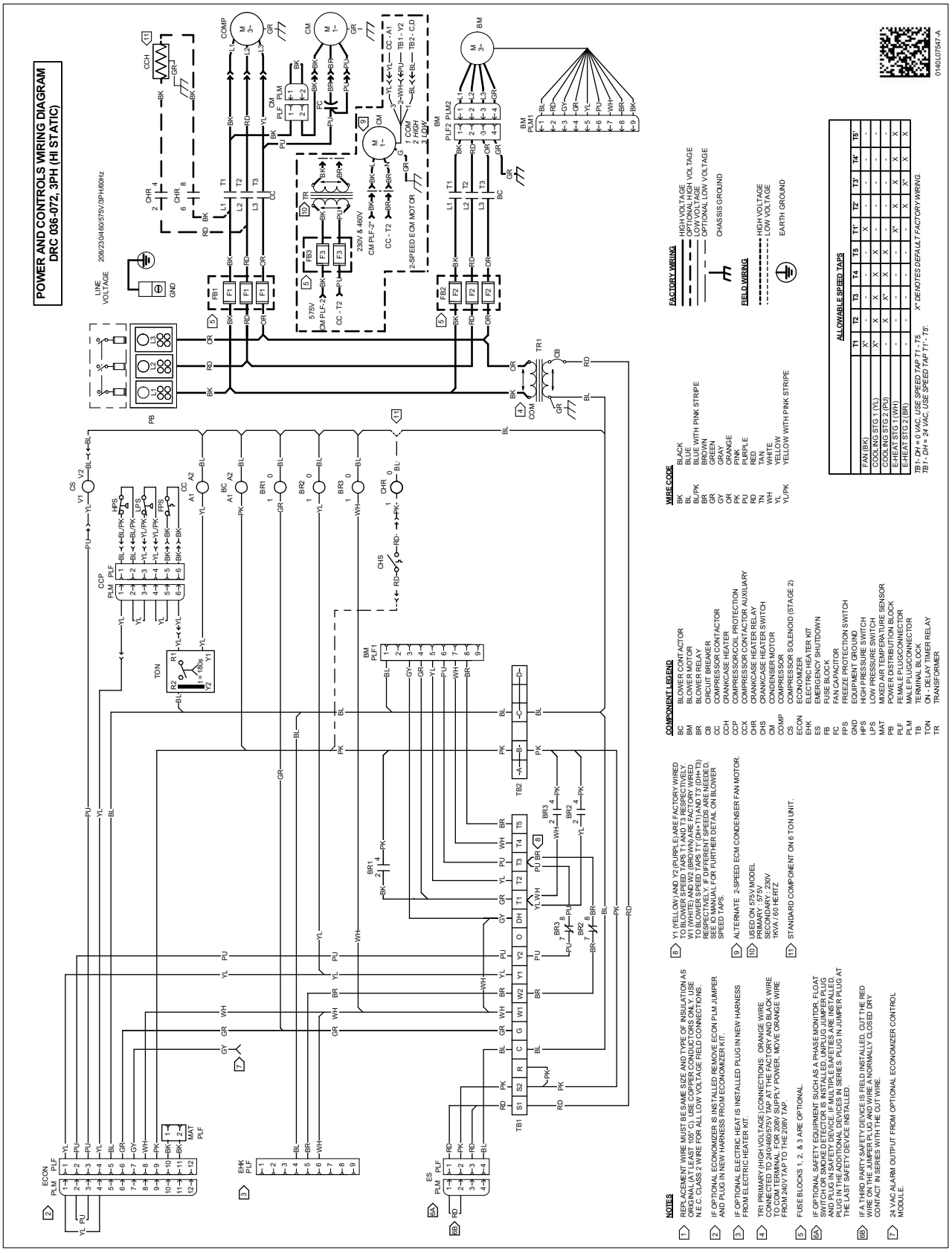
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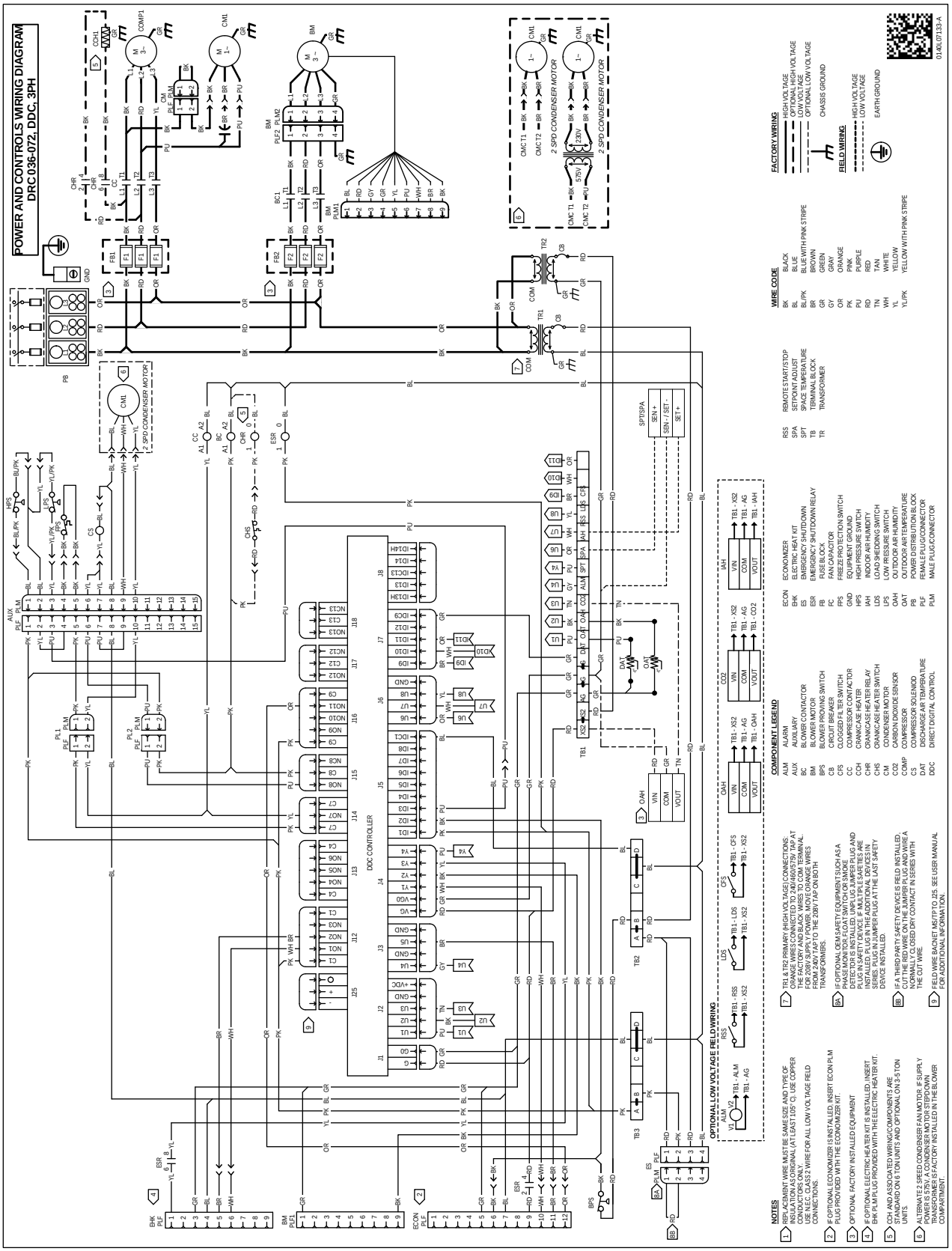
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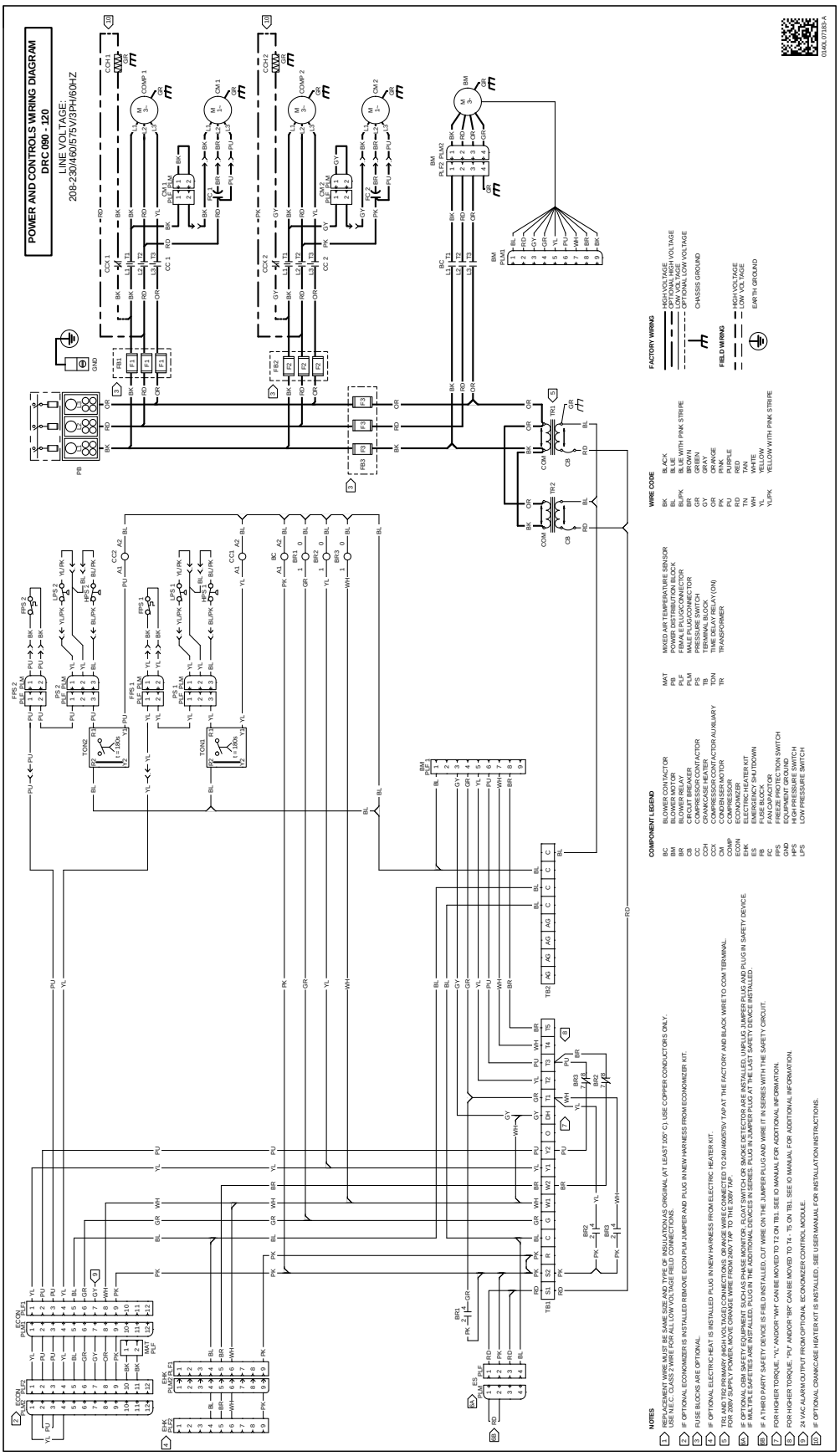
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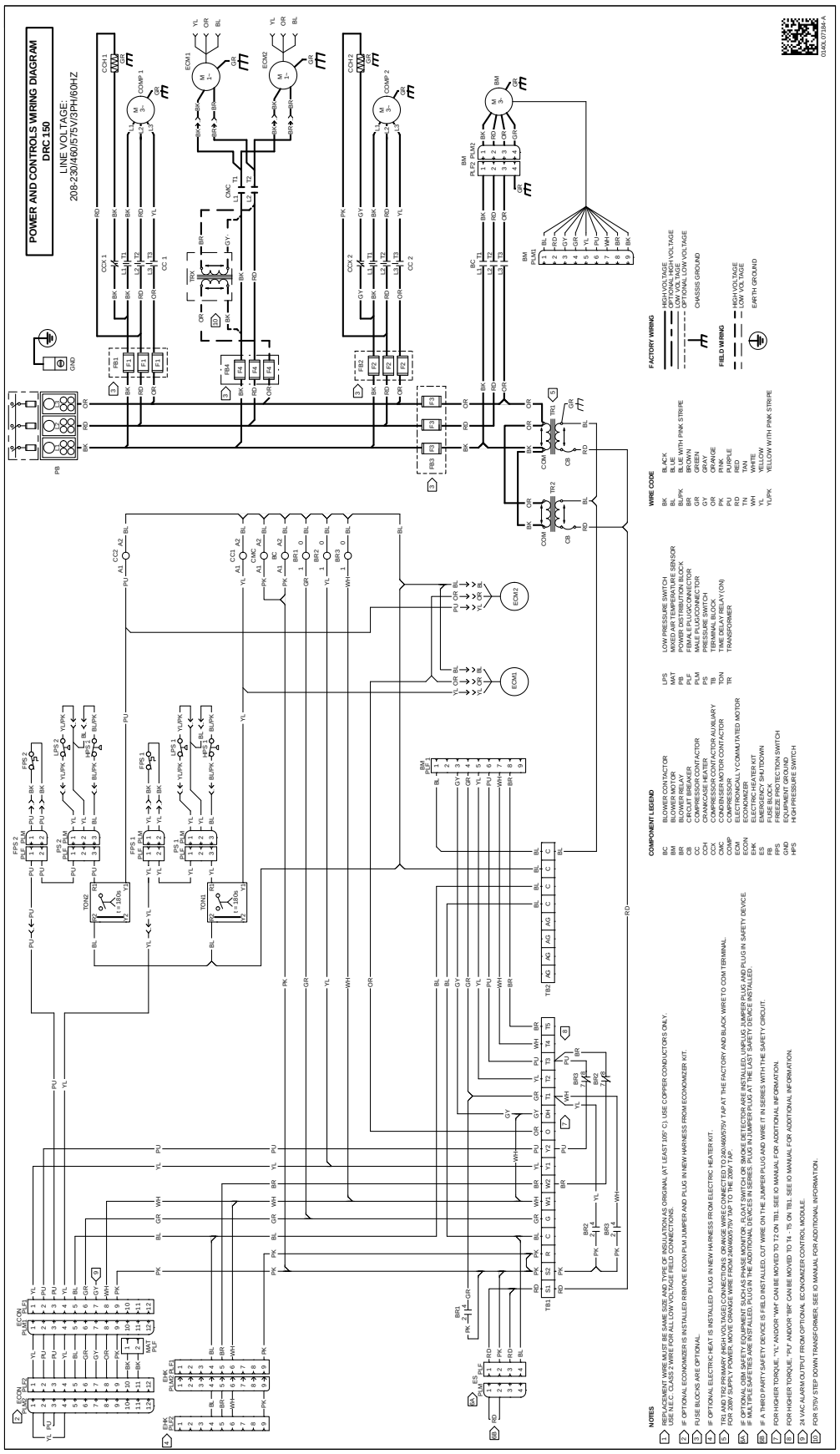
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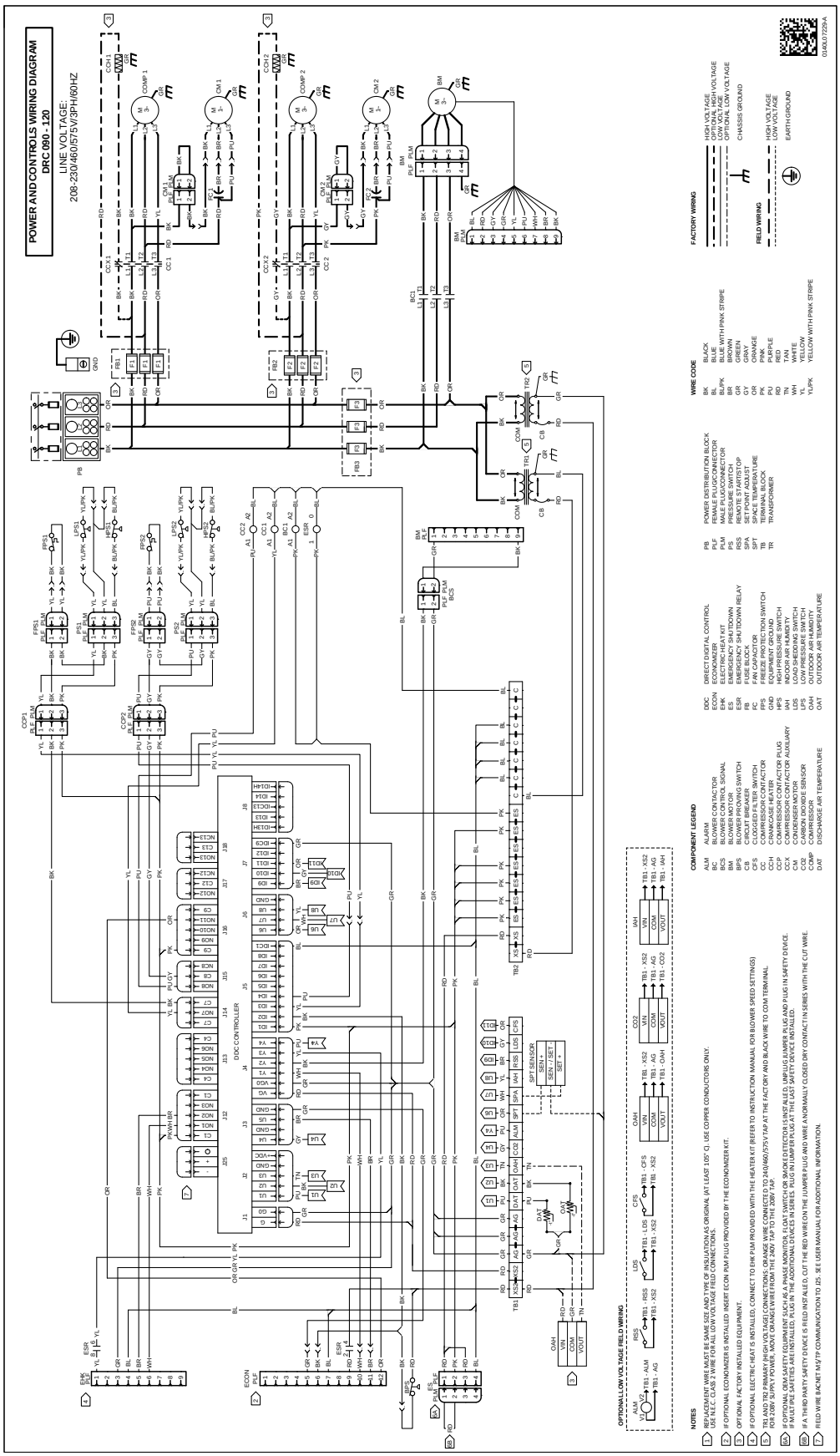
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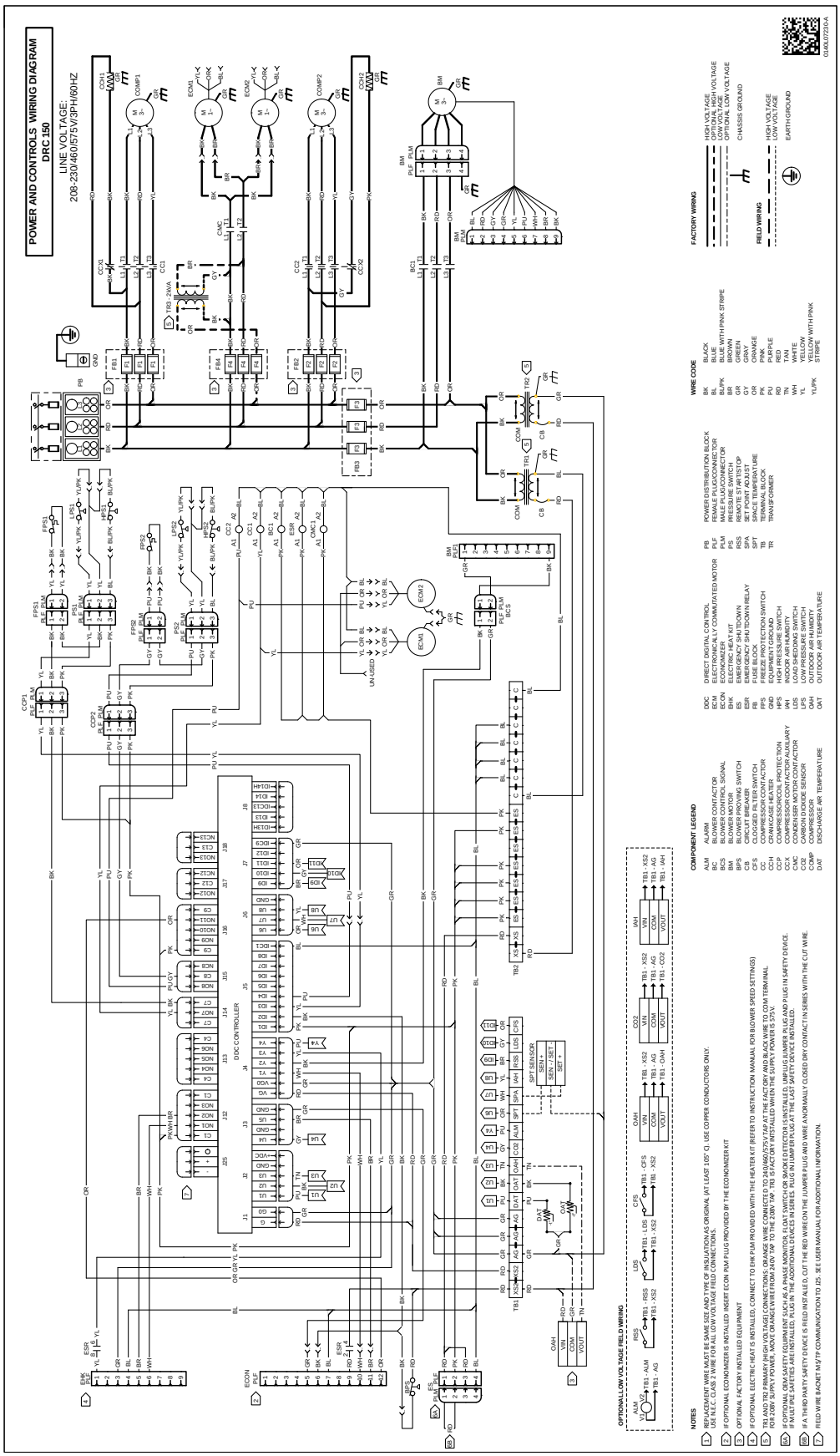
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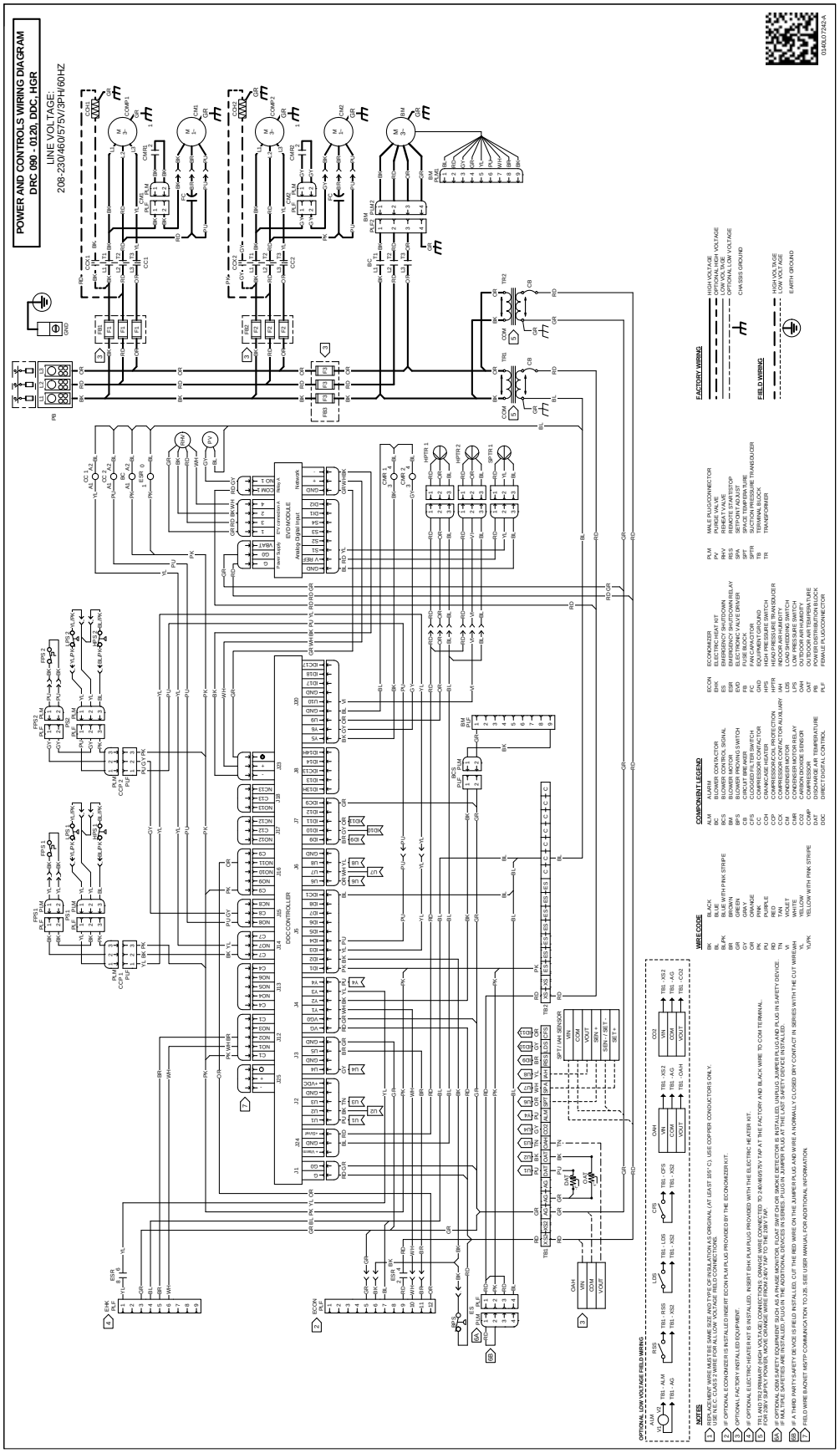
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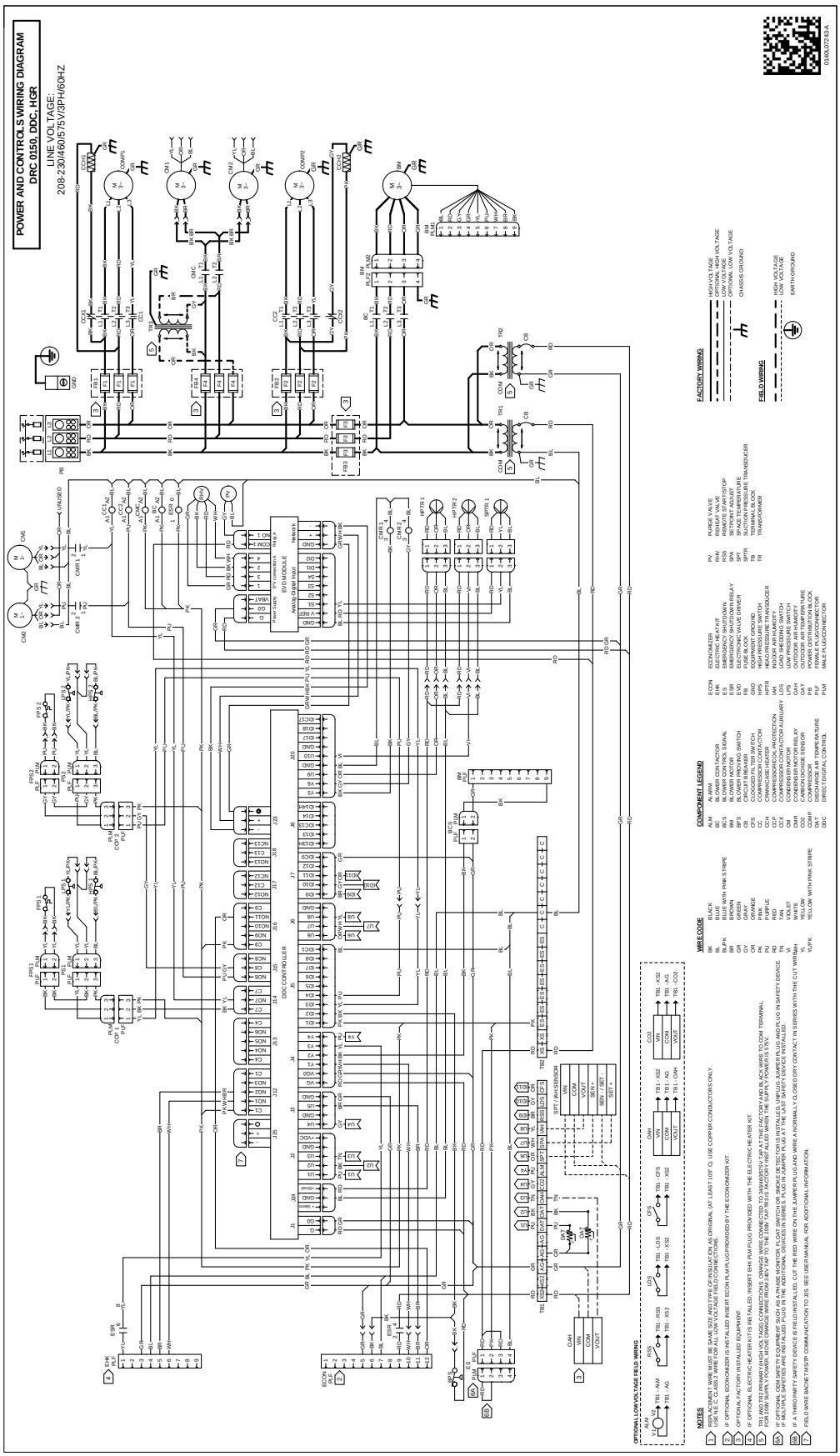
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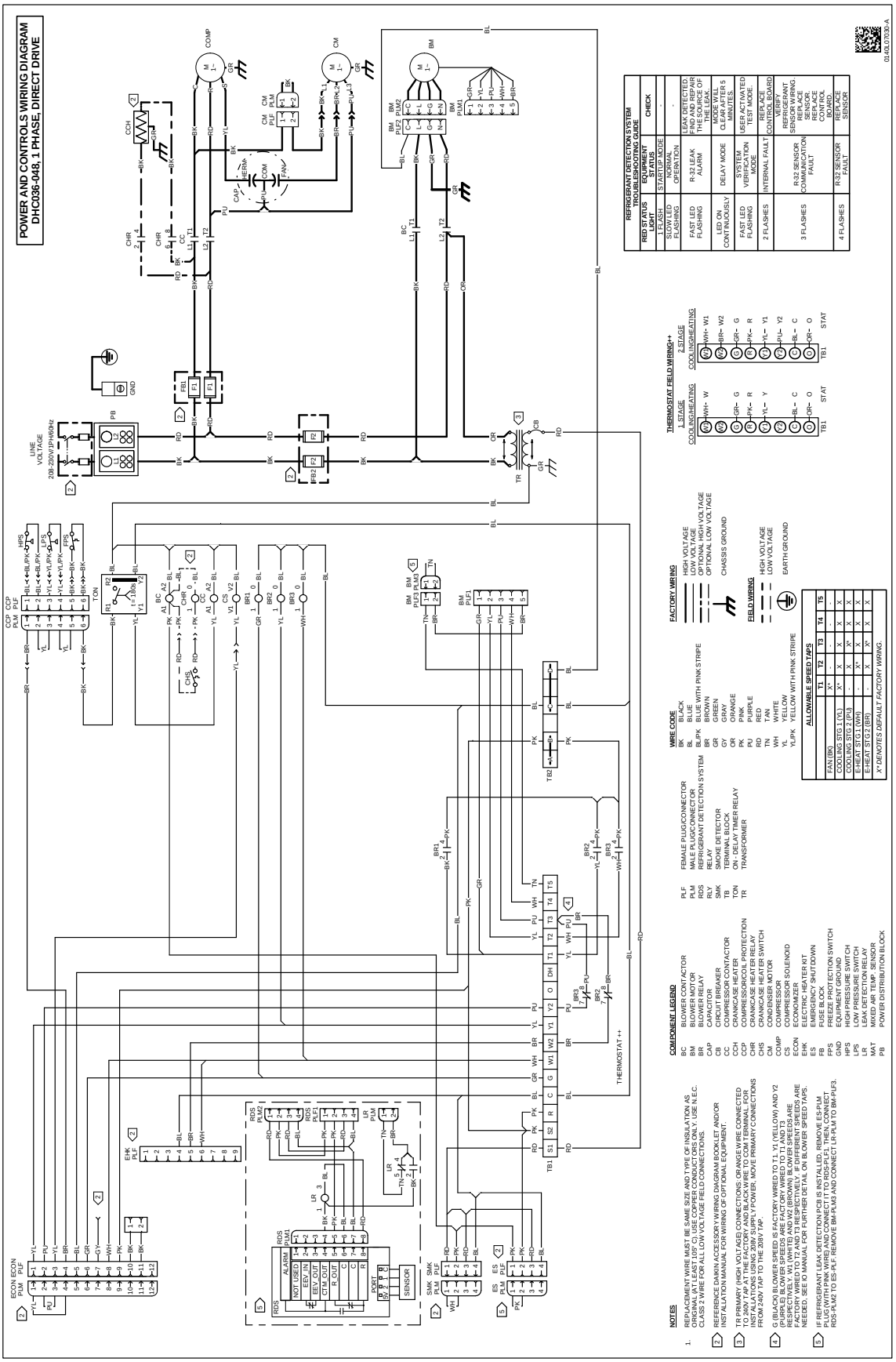


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DHC WIRING DIAGRAMS

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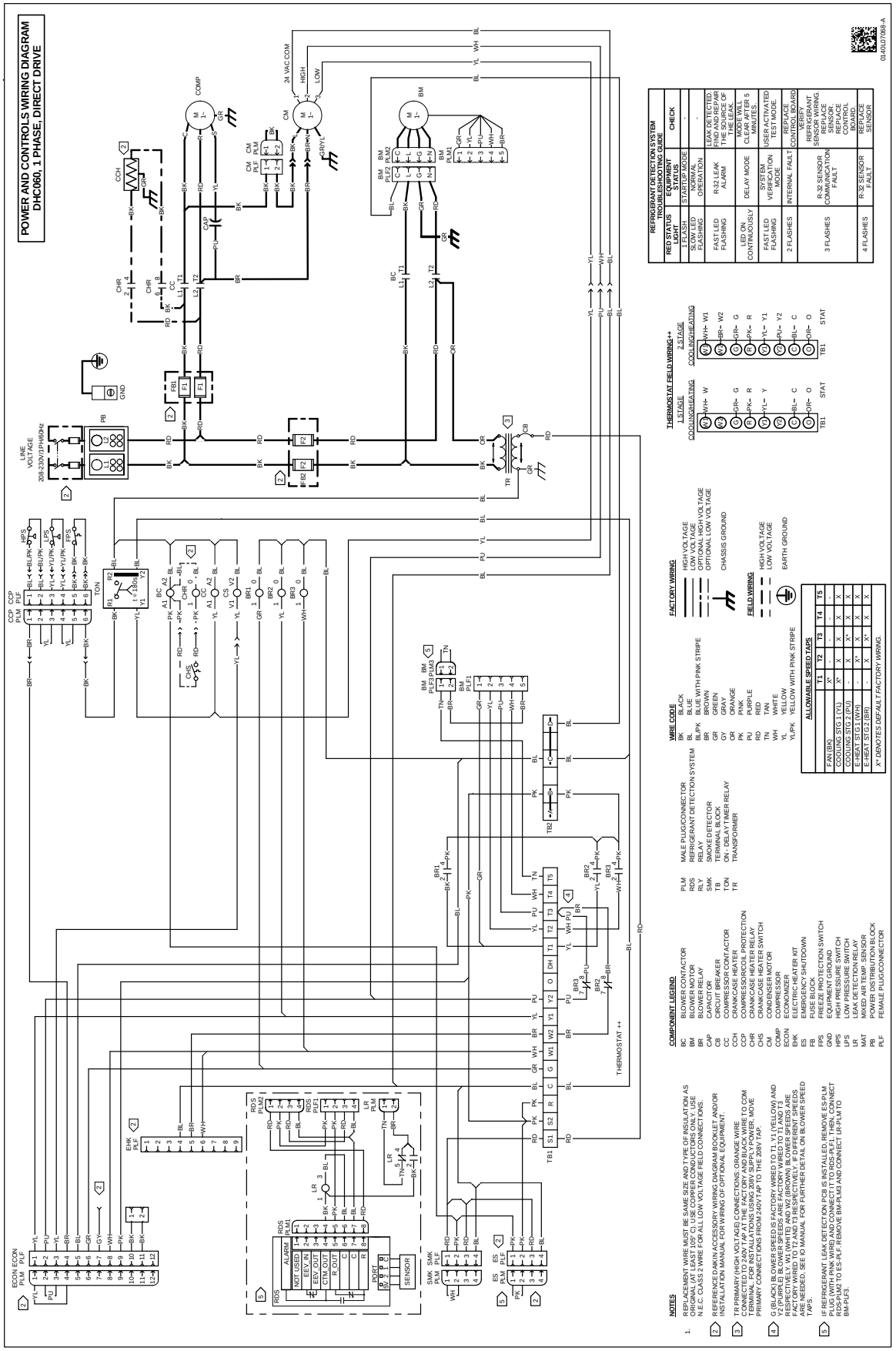
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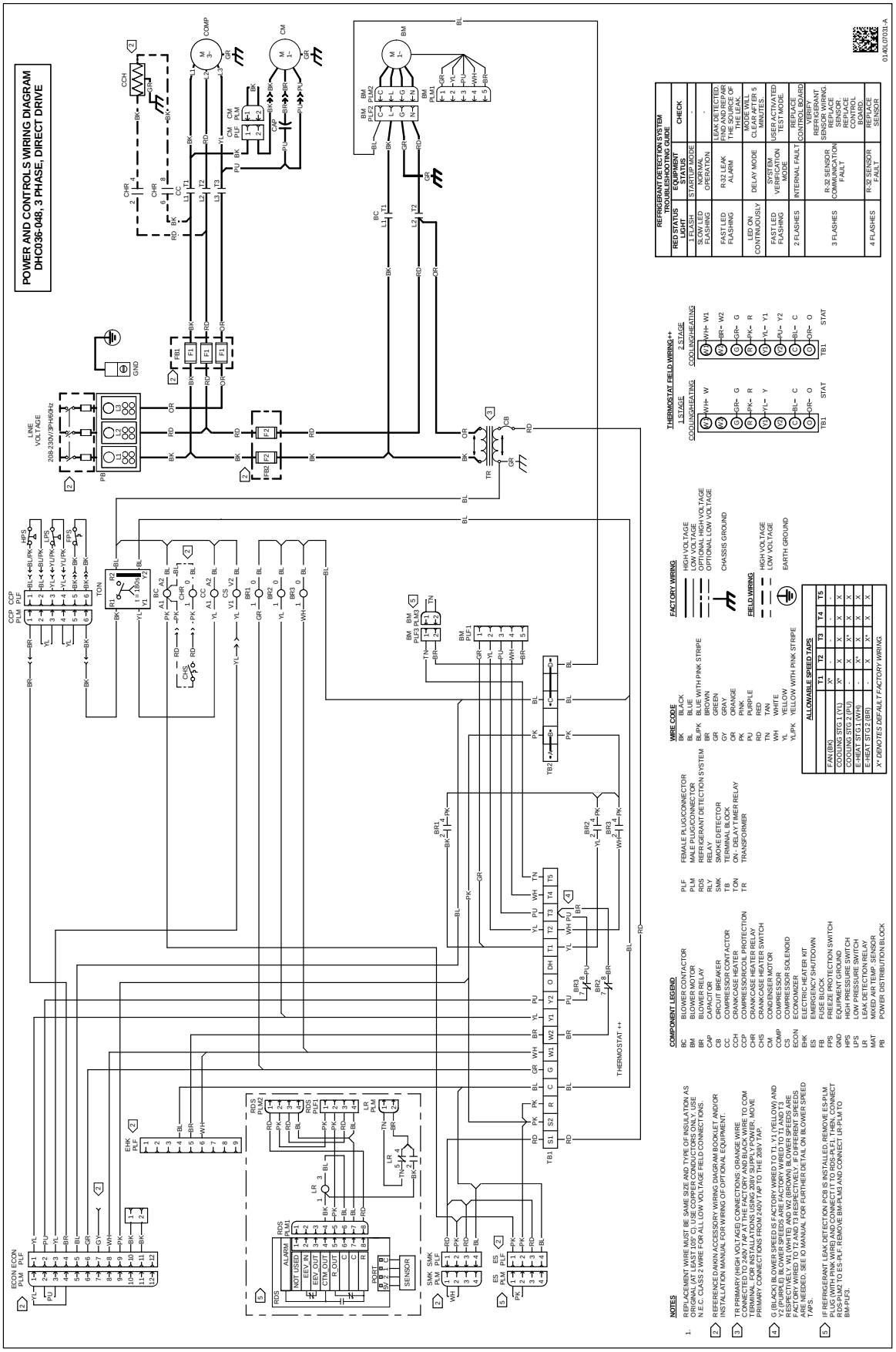
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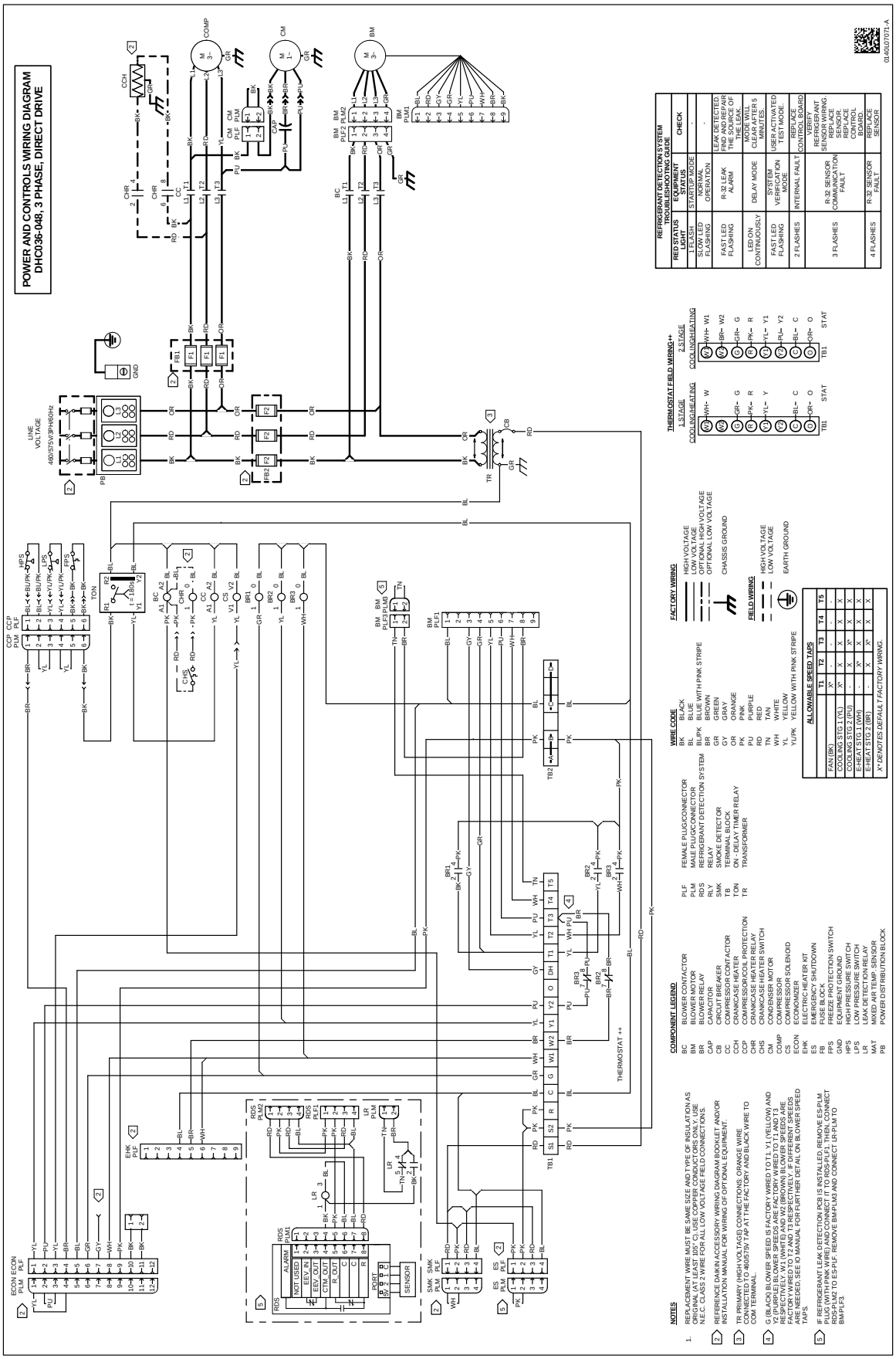
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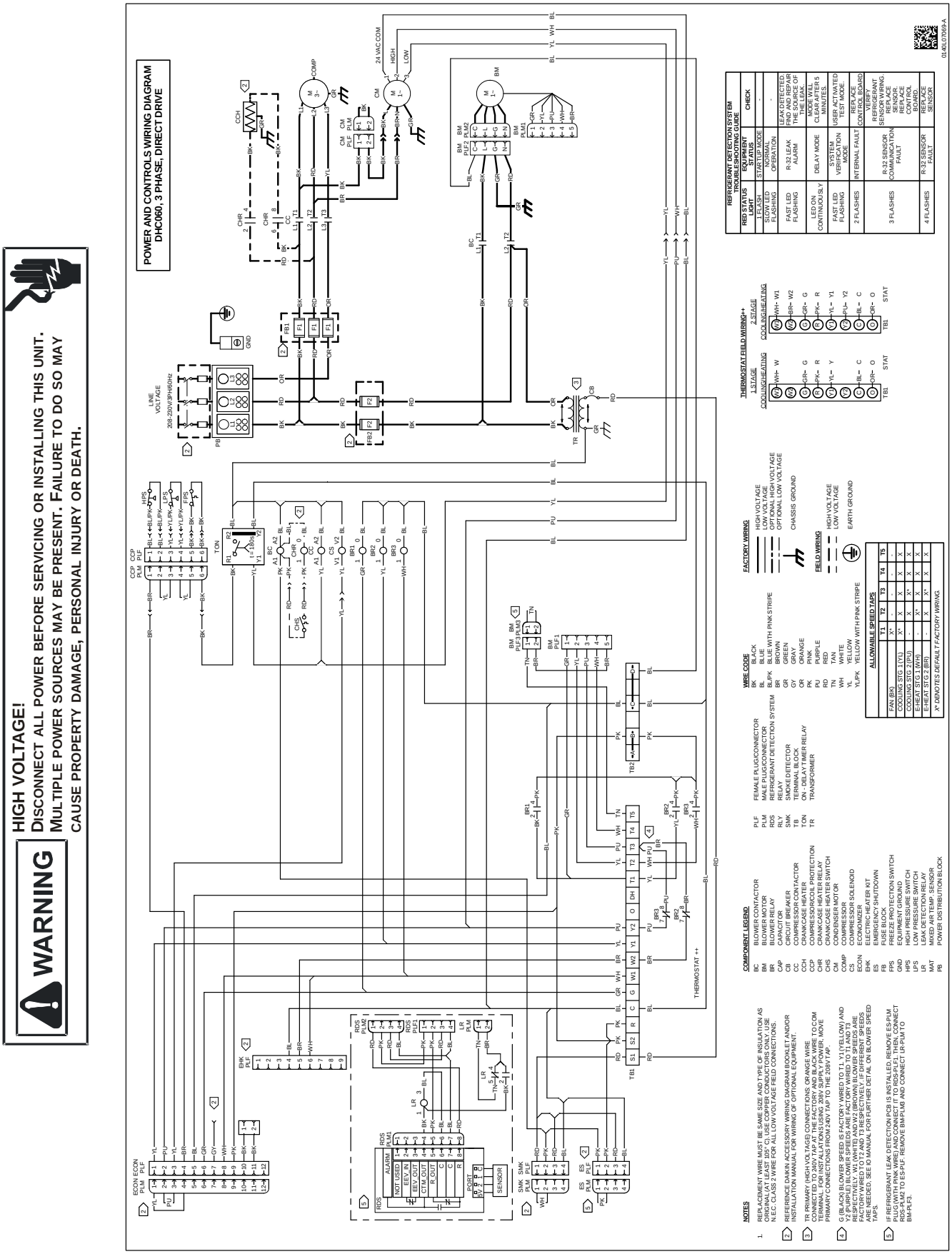
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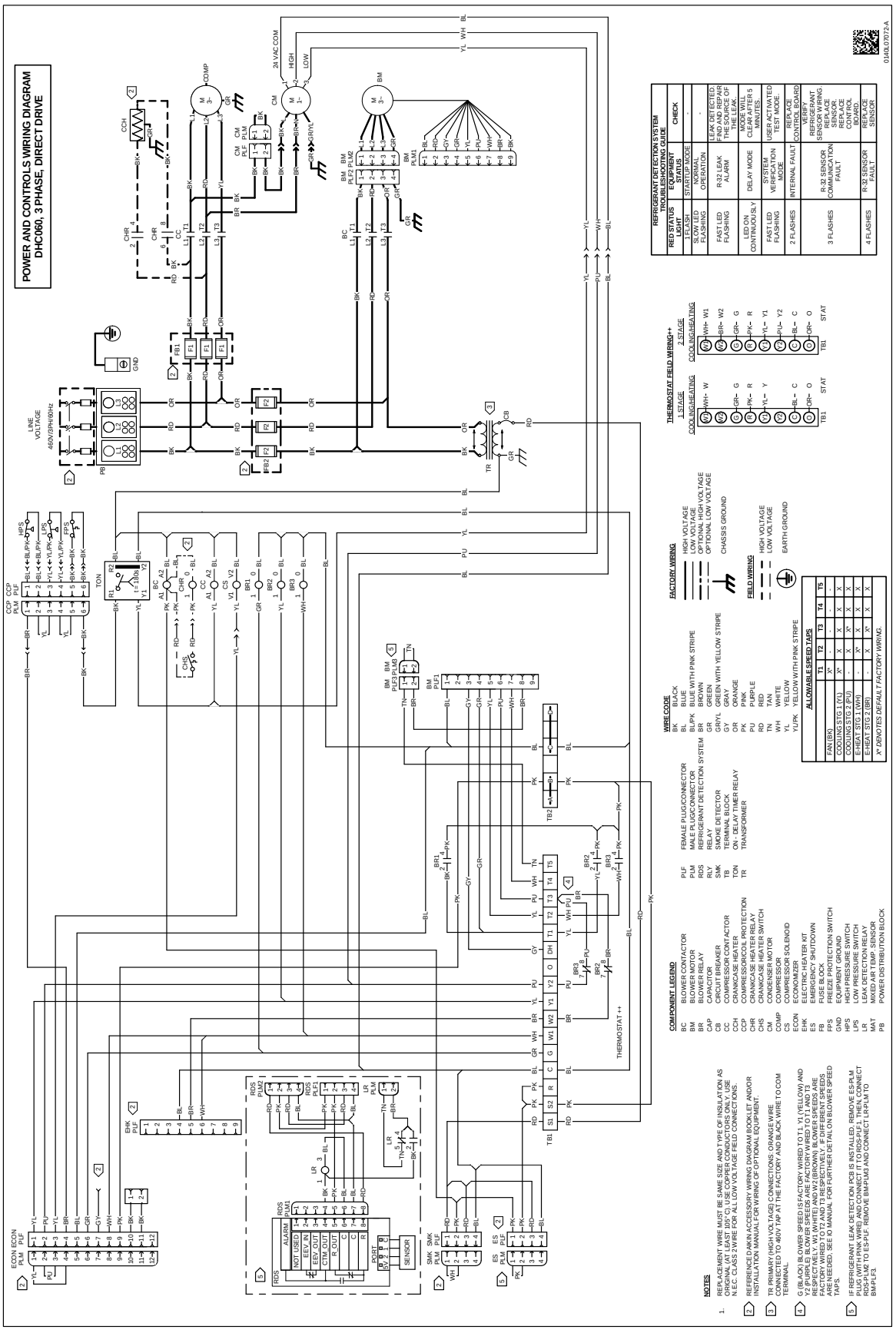


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UNIT WIRING DIAGRAMS

DHC060, 3 PHASE (460V)

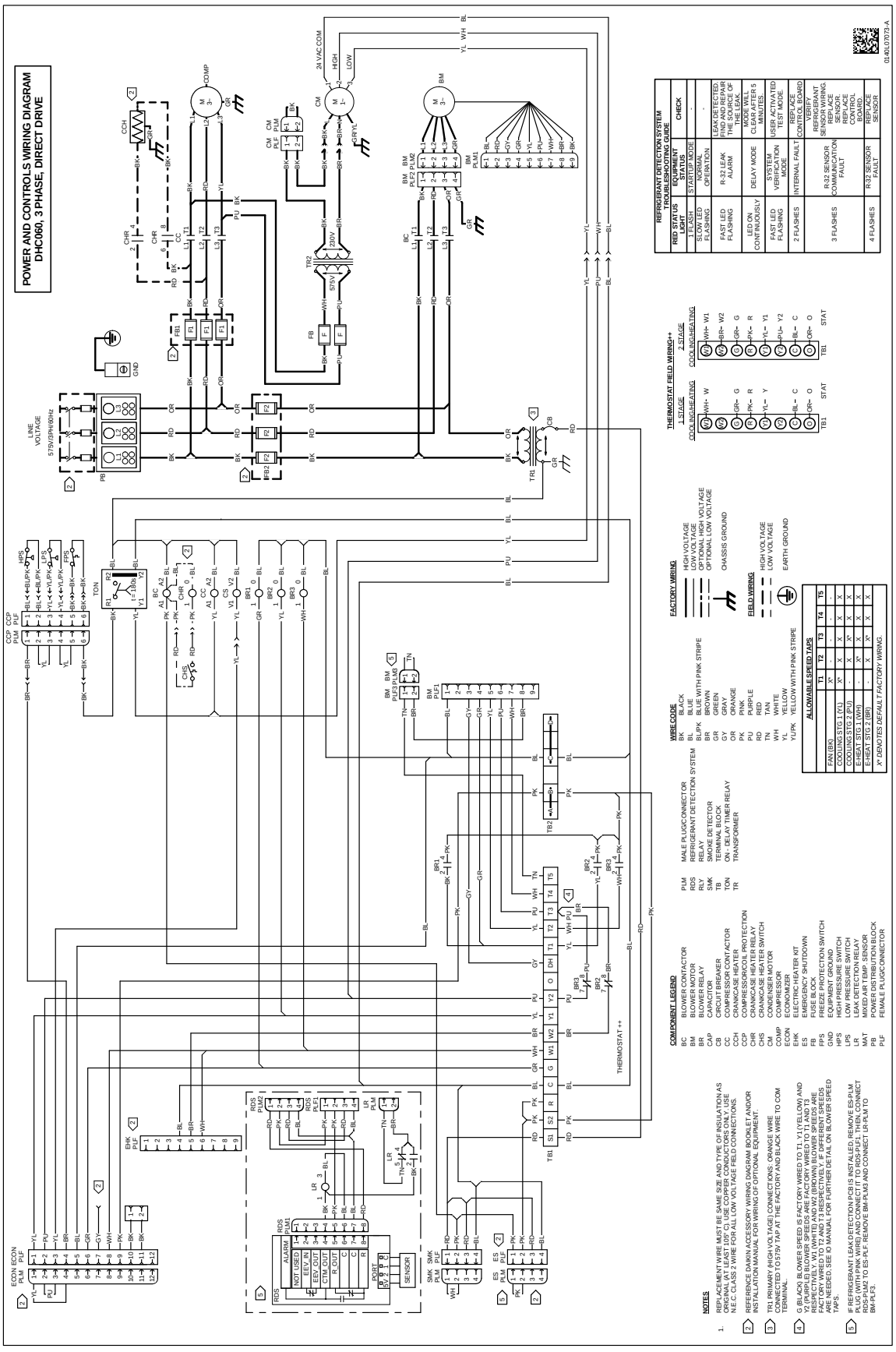
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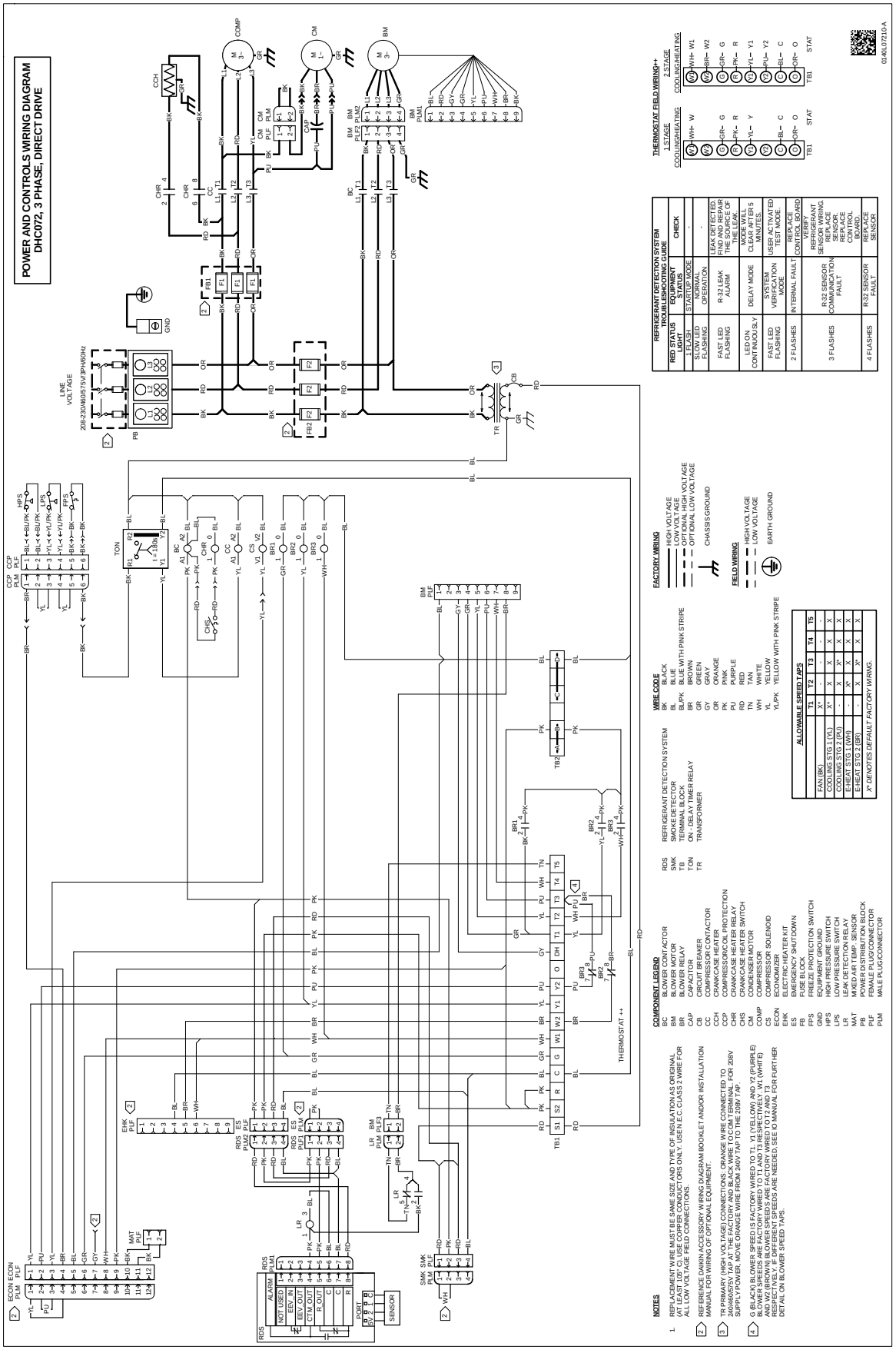
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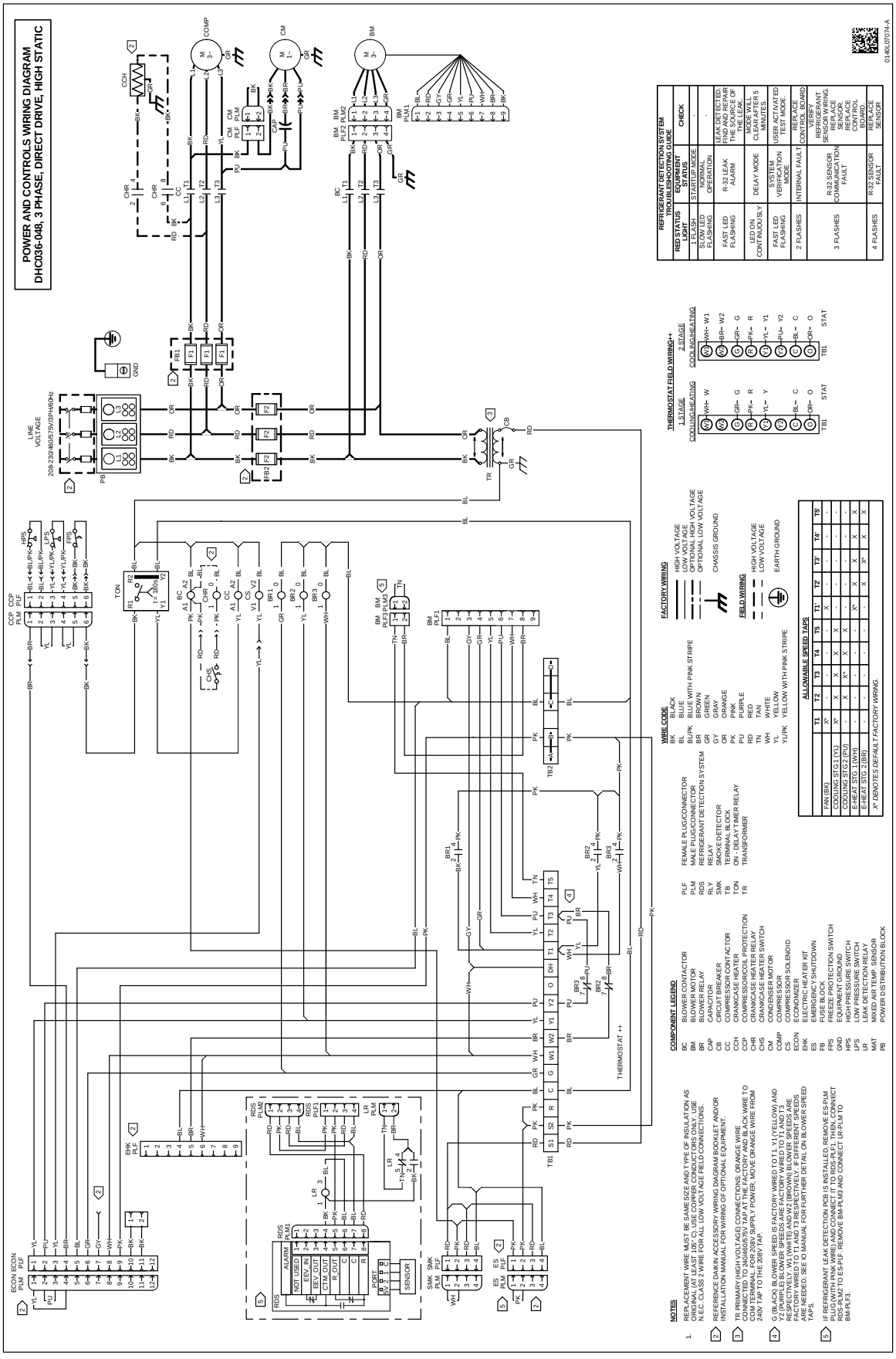
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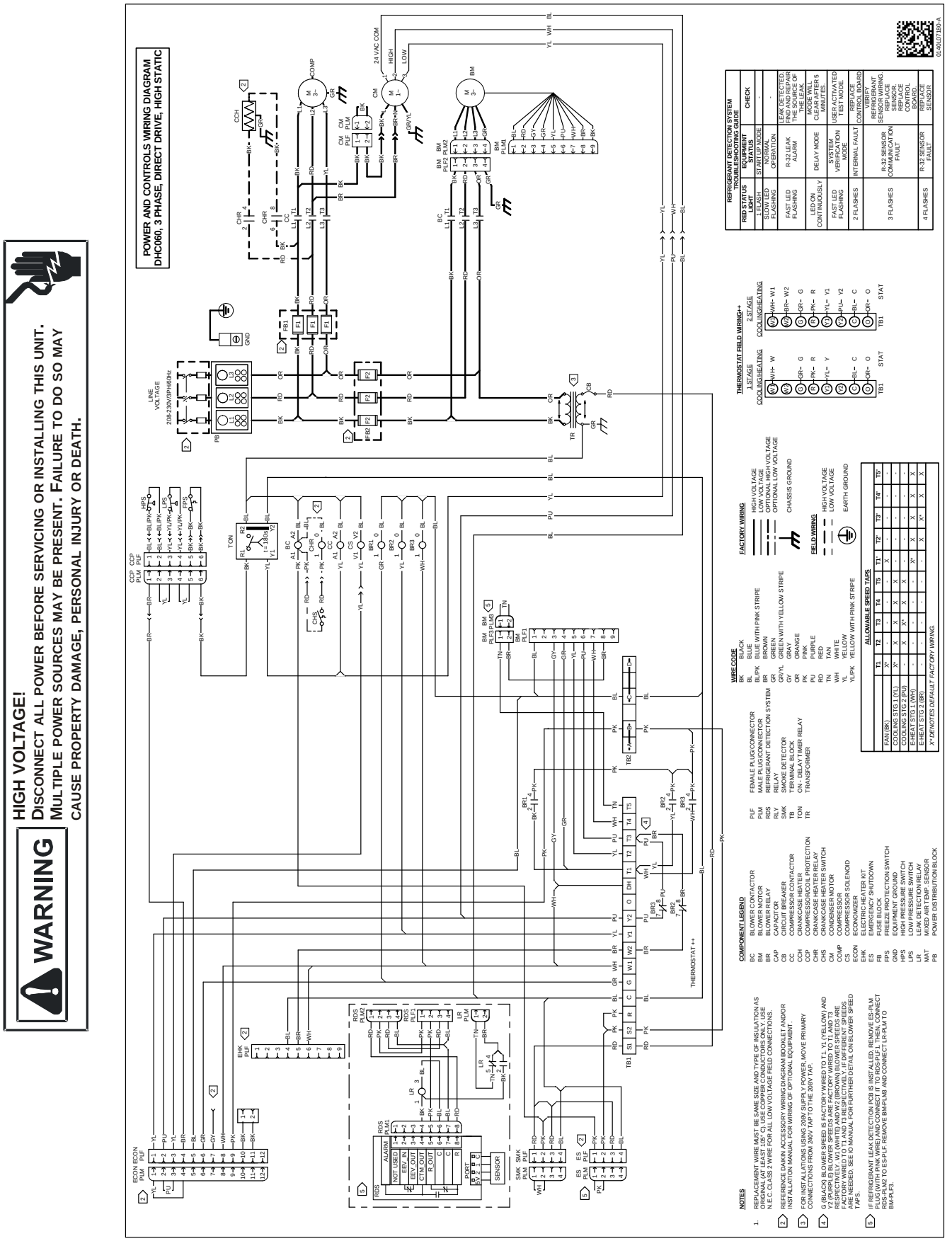
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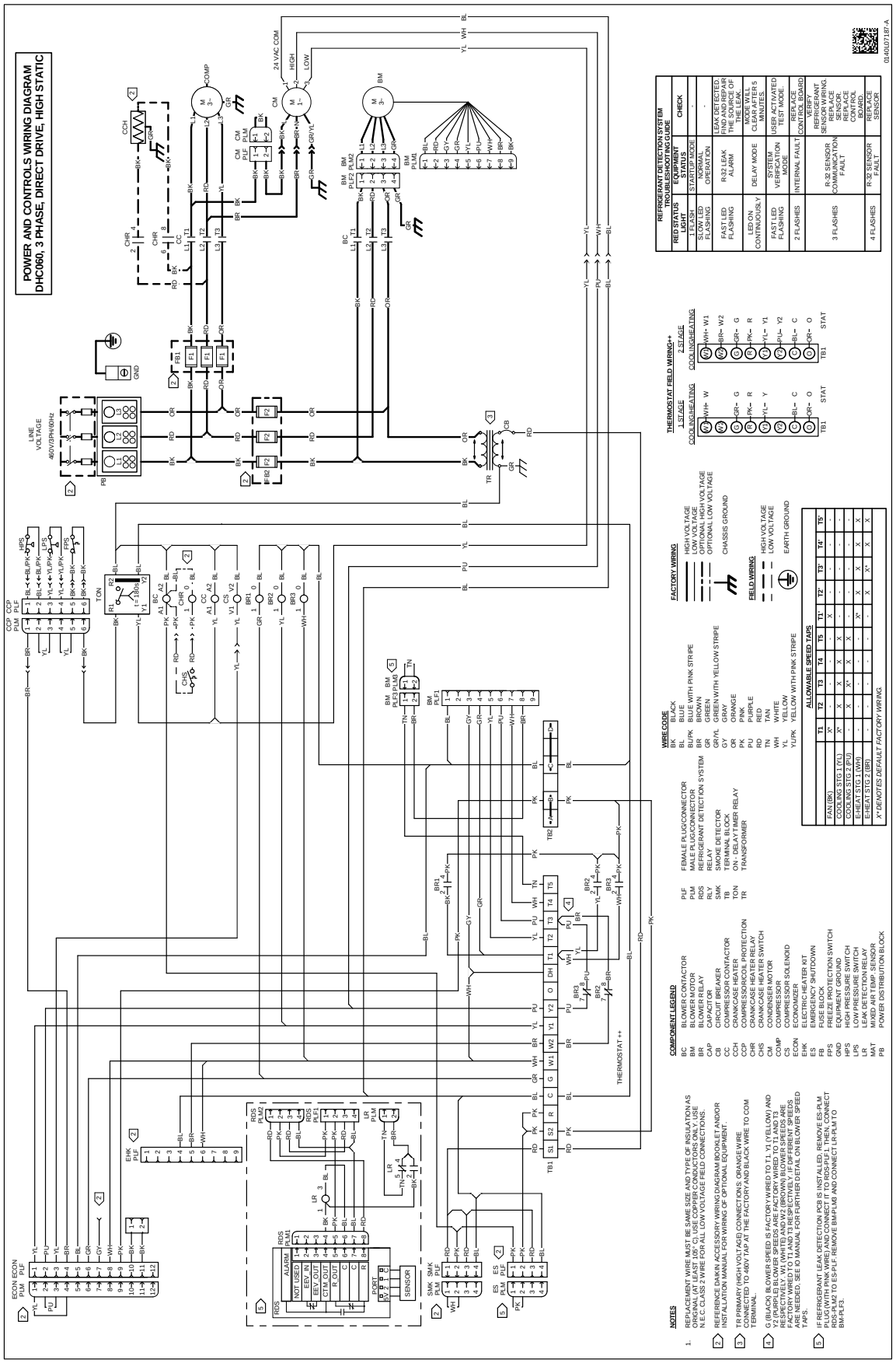
UNIT WIRING DIAGRAMS

DHC060, 3 PHASE, HIGH STATIC (208-230V)



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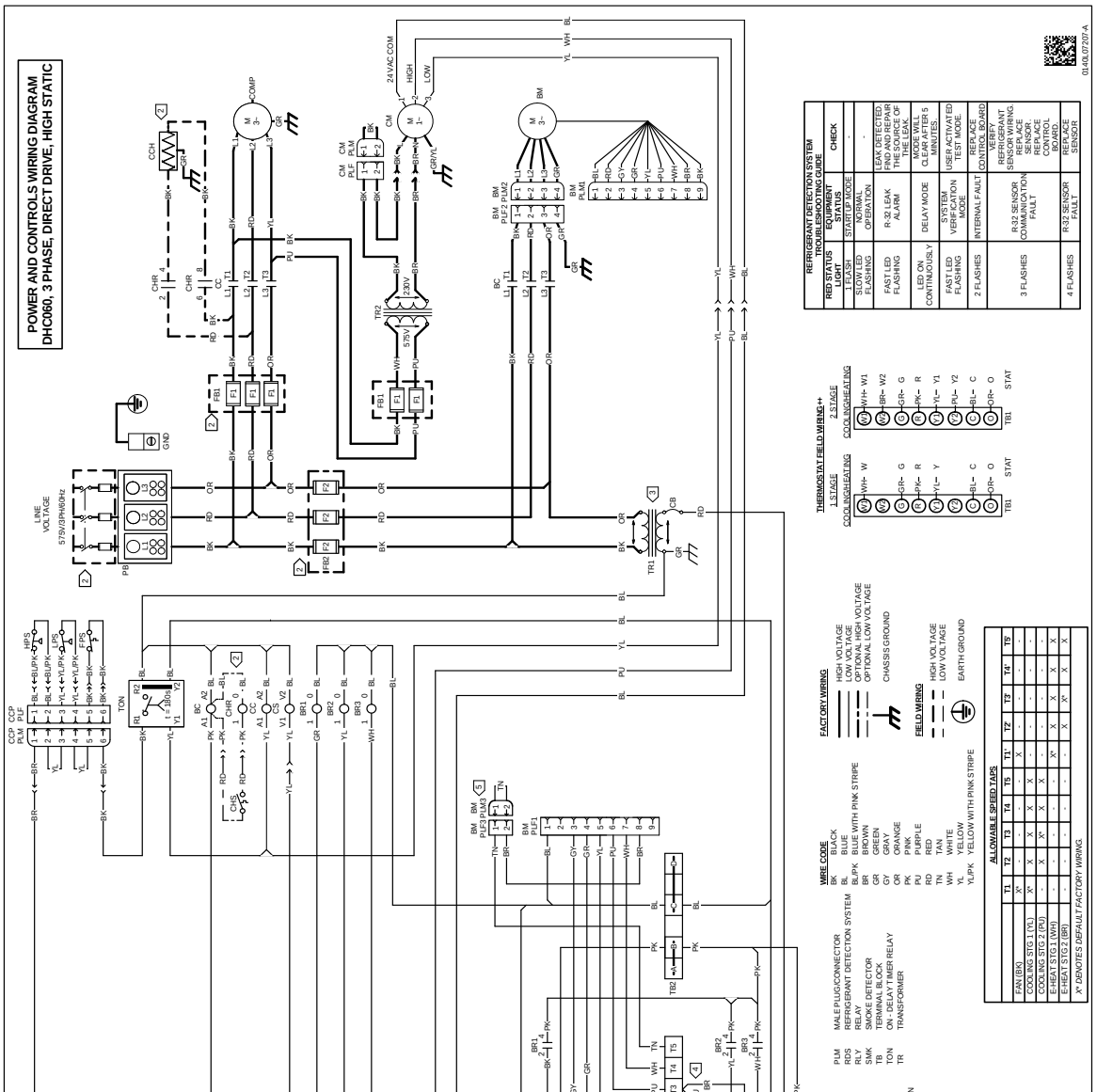


REFRIGERANT DETECTION SYSTEM TROUBLESHOOTING GUIDE			
RED STATUS LIGHT	EQUIPMENT STATUS	CHECK
1 FLASH	STARTUP MODE	-
SLOW LED FLASHING	NORMAL OPERATION	-
FAST LED FLASHING	R-32 LEAK ALARM	LEAK DETECTED FIND AND REPAIR THE SOURCE OF THE LEAK
LED ON, CONTINUOUSLY	DELAY MODE	MODE WILL CLEAR AFTER 5 MINUTES
FAST LED FLASHING	SYSTEM VERIFICATION MODE	USER ACTIVATED FEATURE
2 FLASHES	INTERNAL FAULT	REPLACE CONTROL BOARD
3 FLASHES	R-32 SENSOR COMMUNICATION FAULT	VERIFY REFRIGERANT SENSOR WIRING. REPLACE SENSOR IF NEEDED. REPLACE CONTROL BOARD
4 FLASHES	R-32 SENSOR FAULT	REPLACE SENSOR

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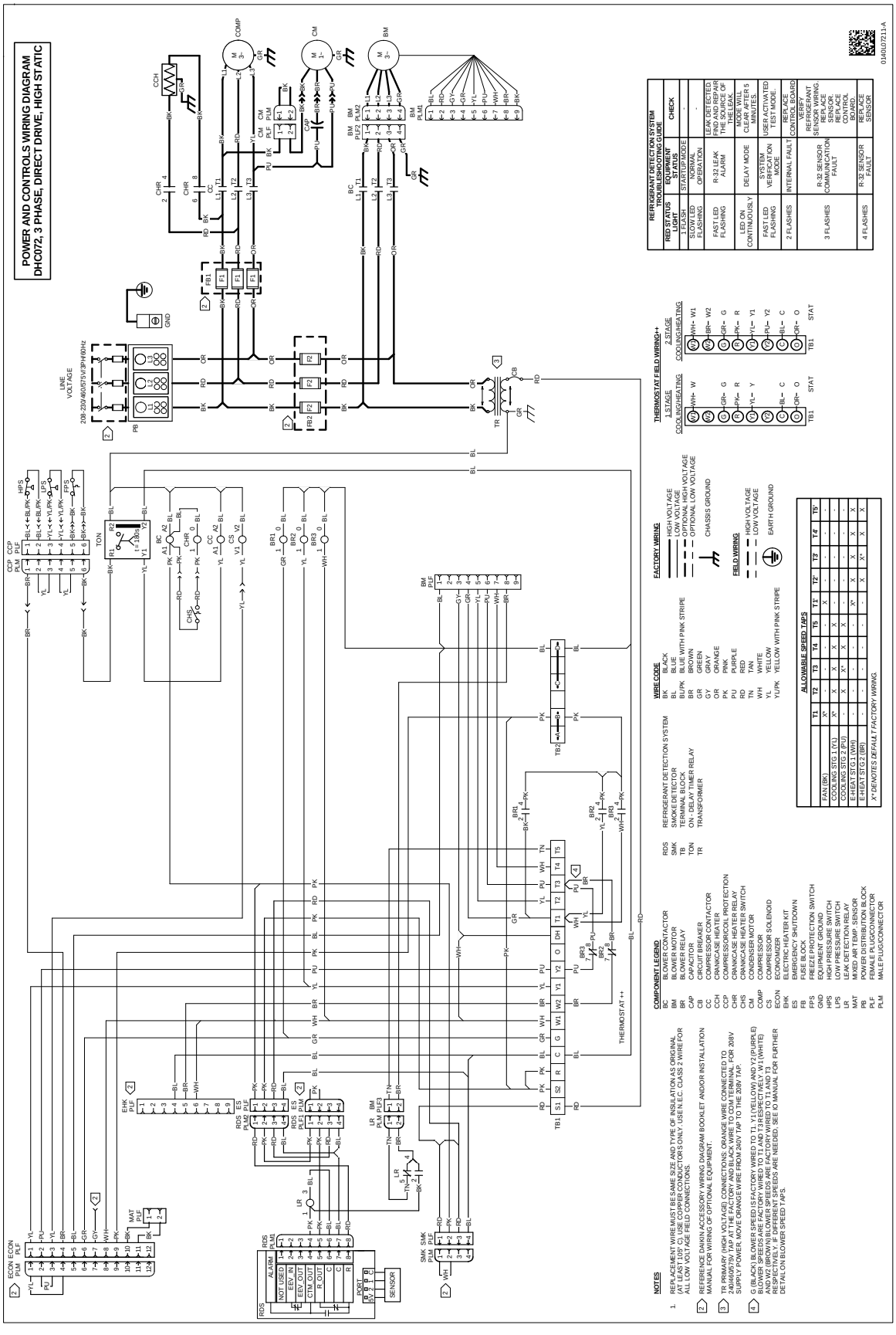
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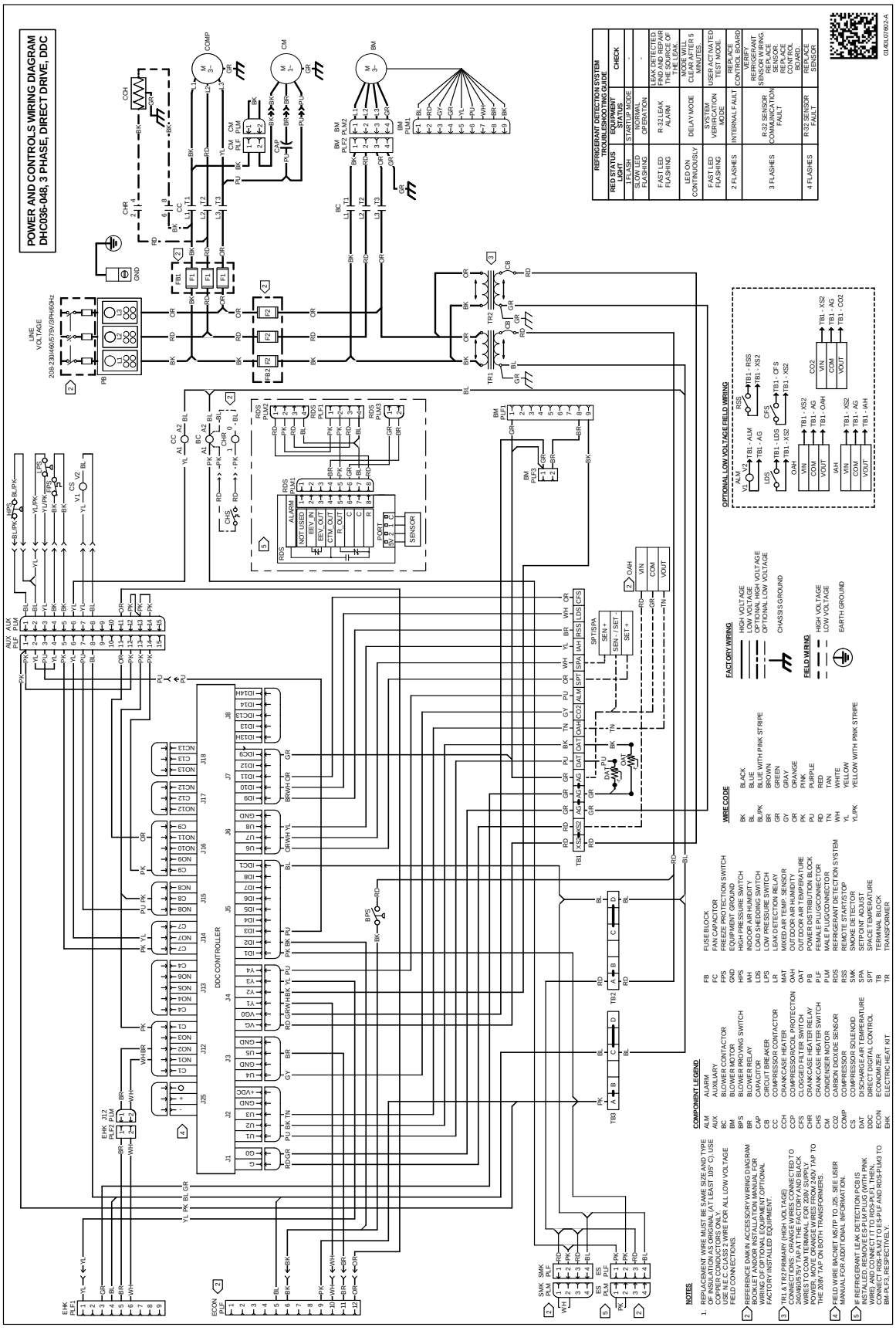
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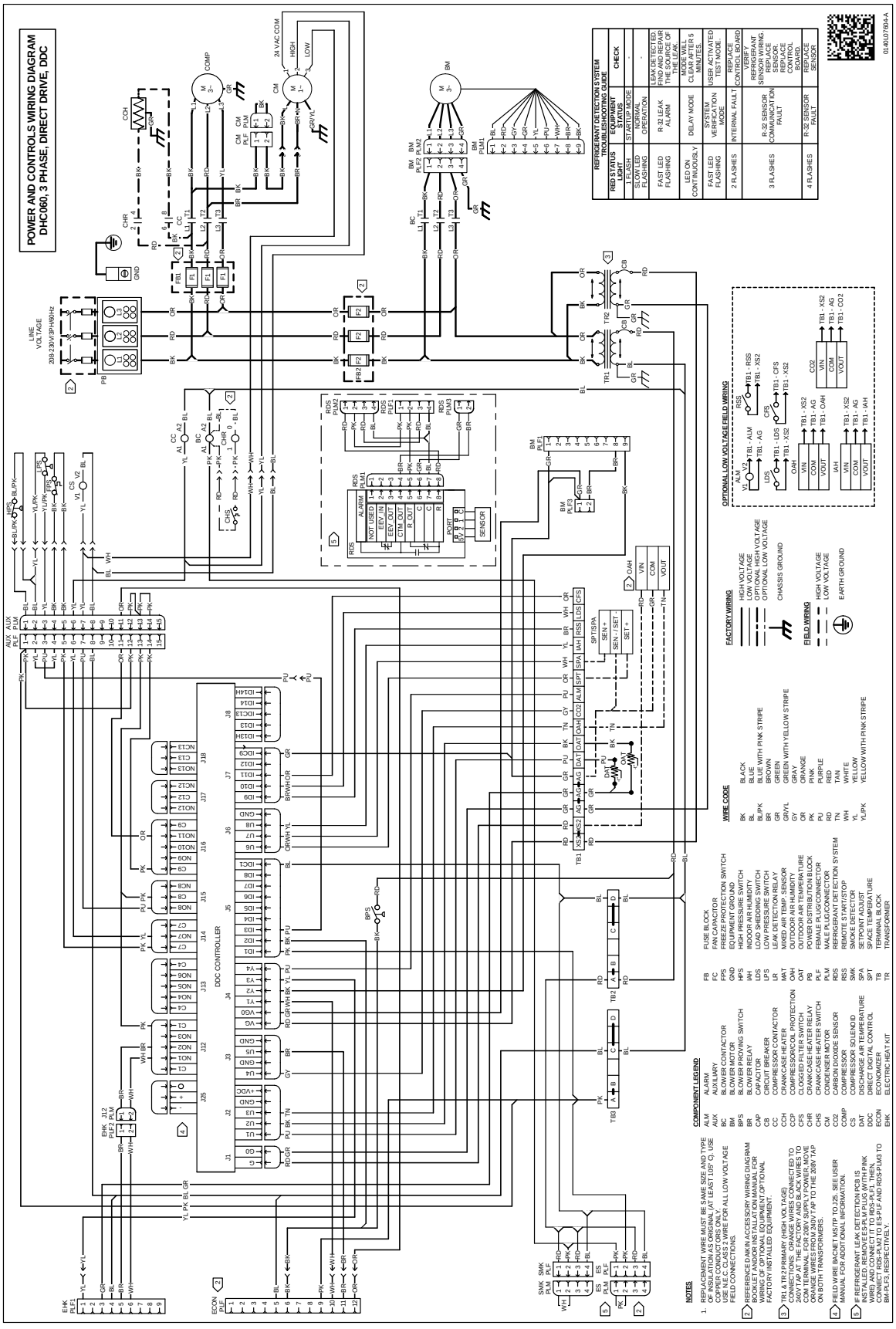
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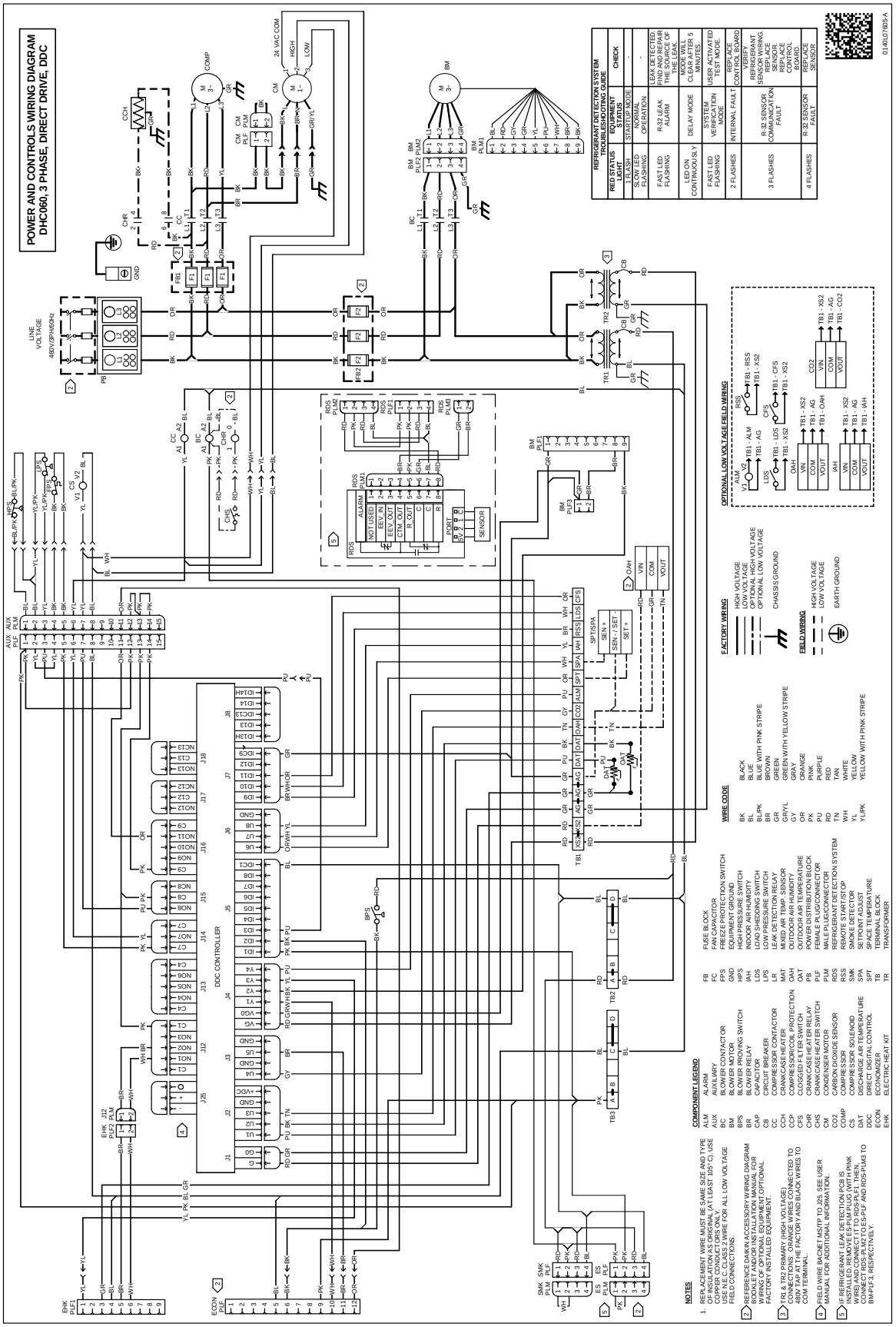
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UNIT WIRING DIAGRAMS

DHC060, 3 PHASE, DDC (460V)

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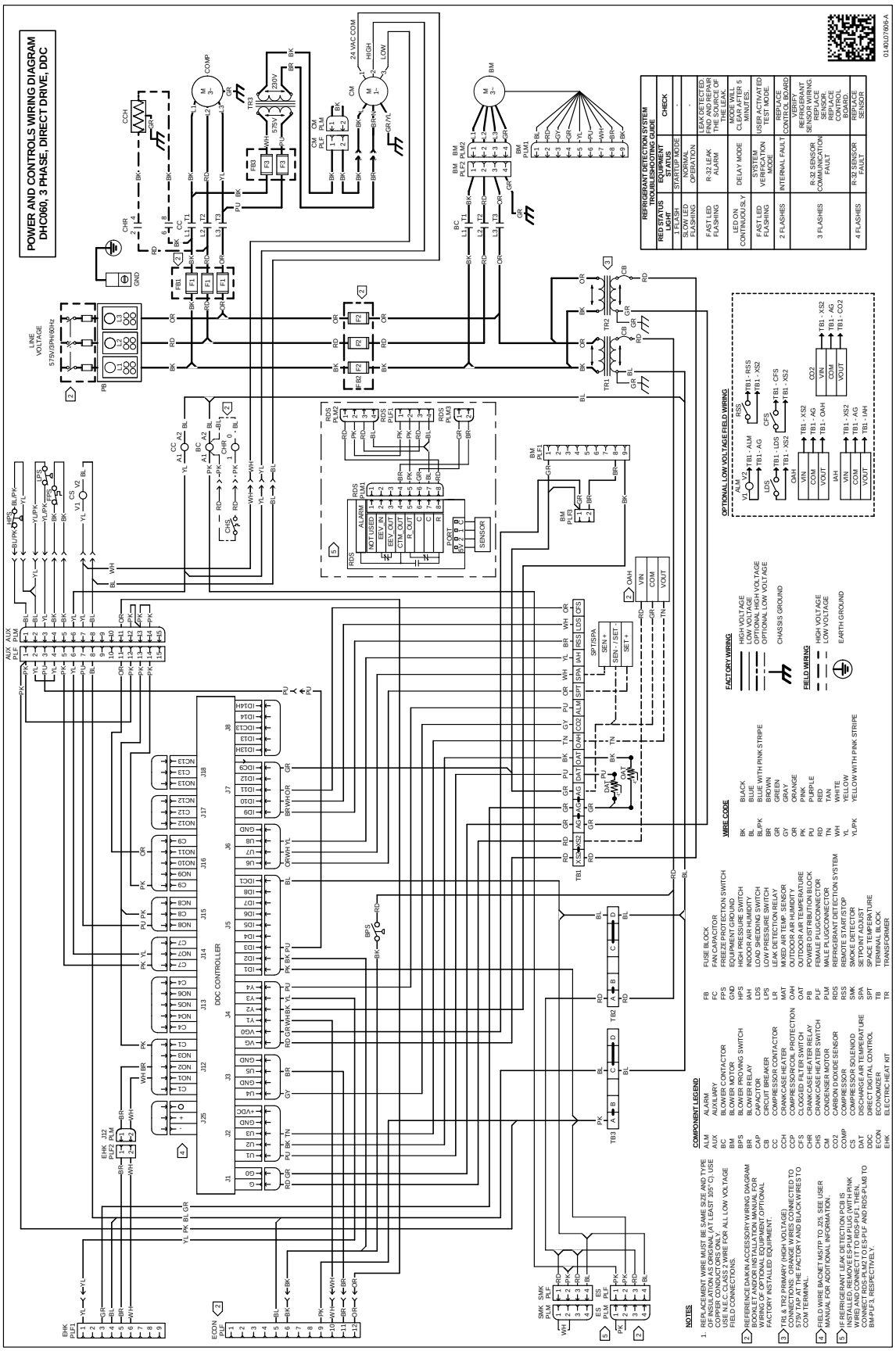
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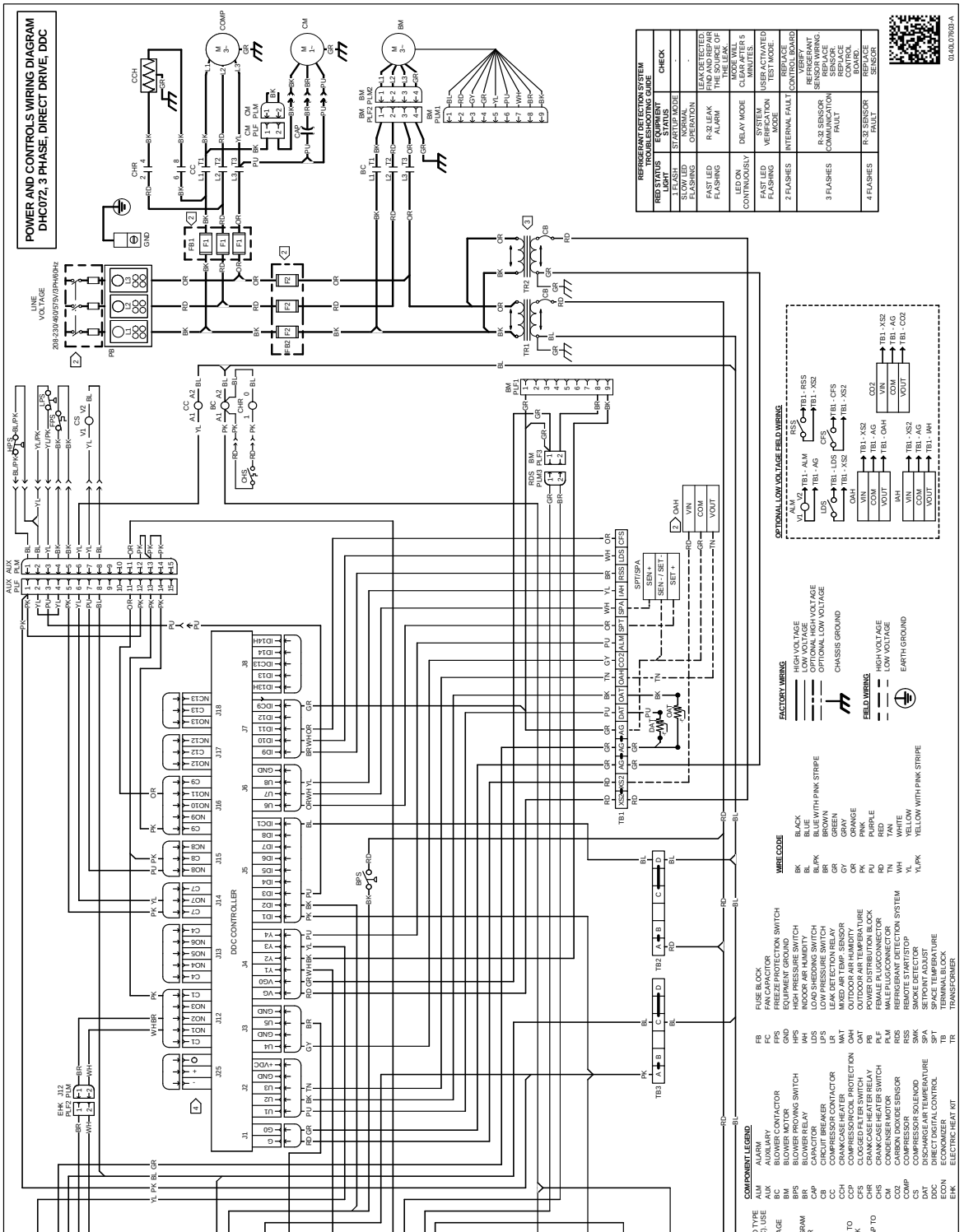
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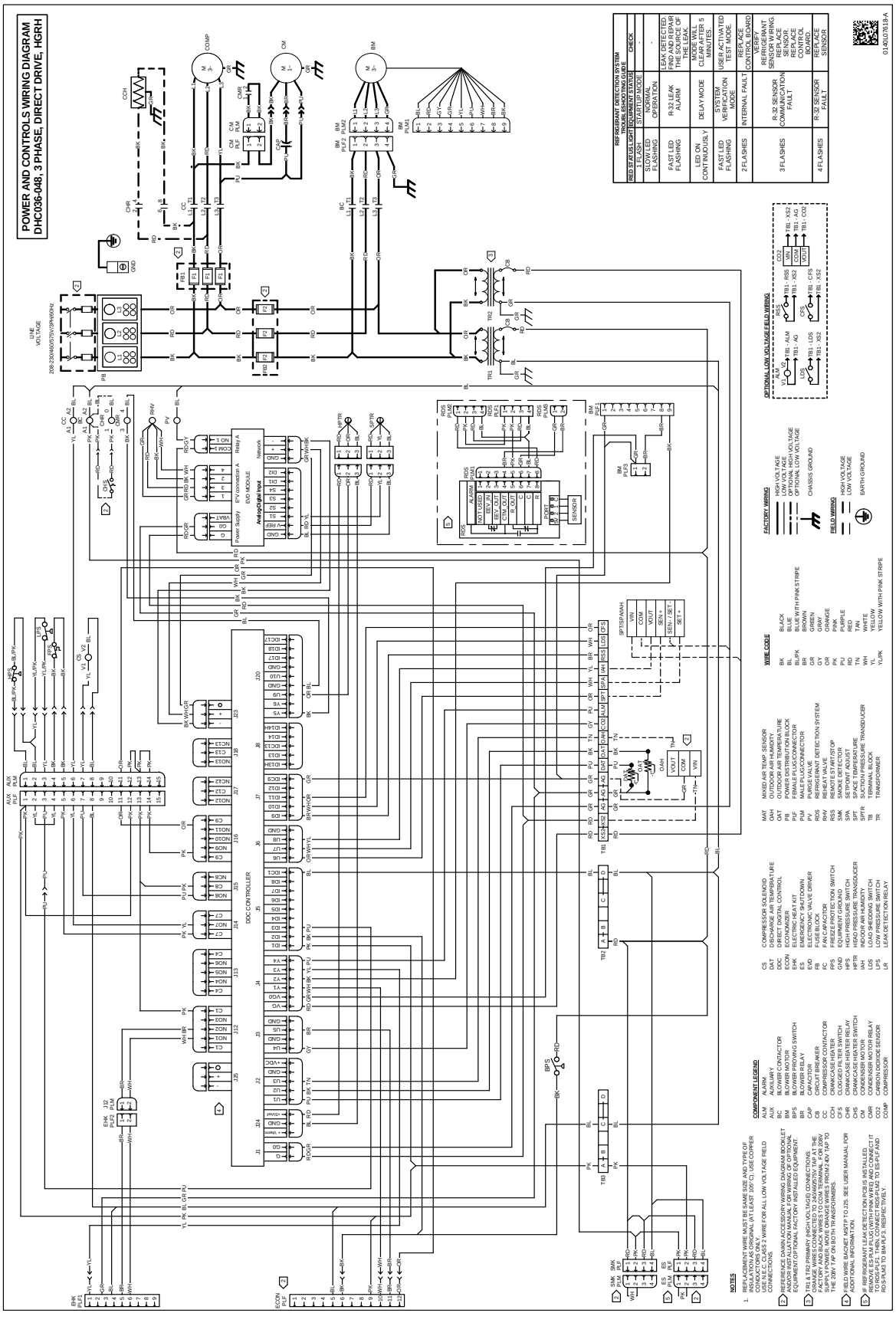
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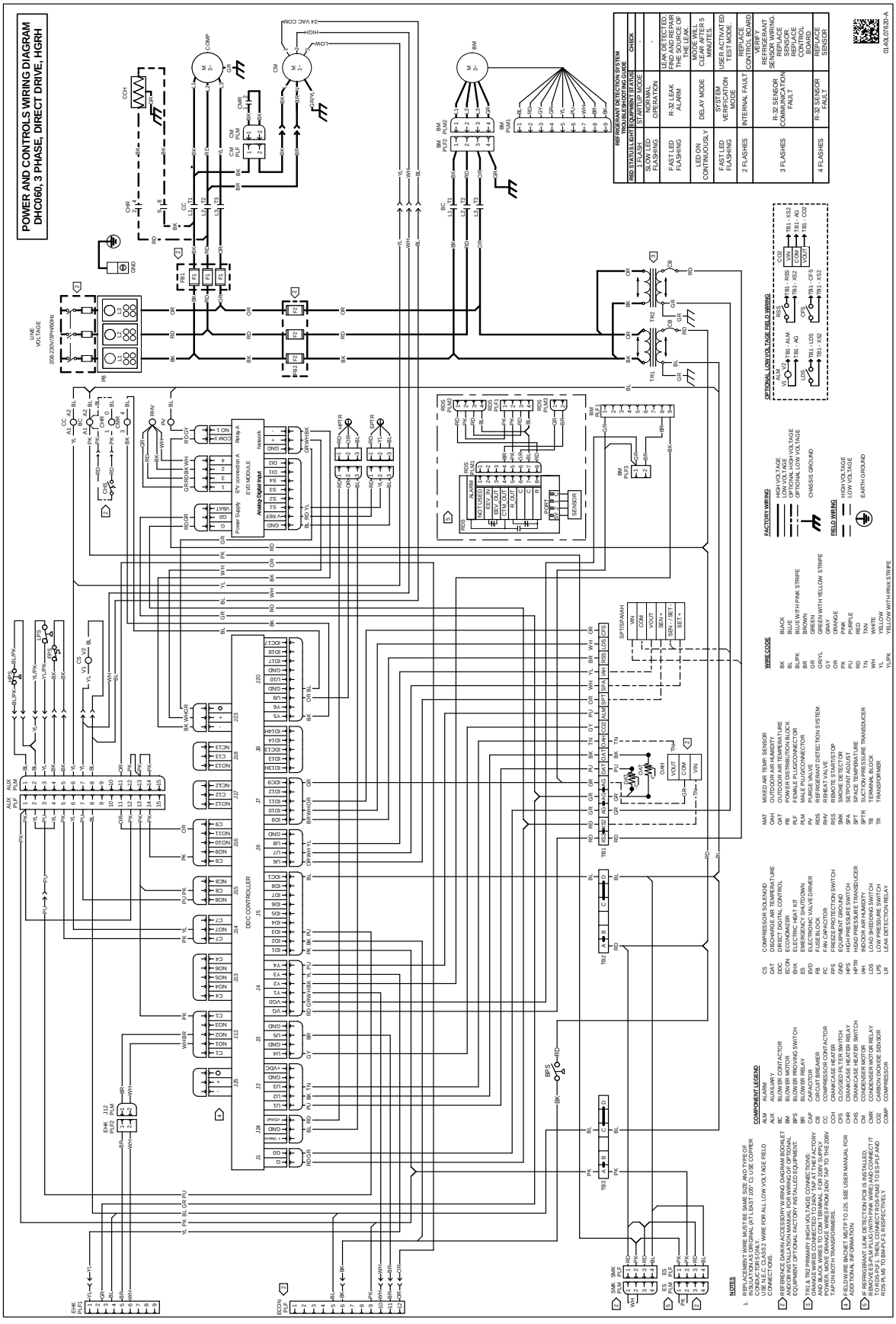
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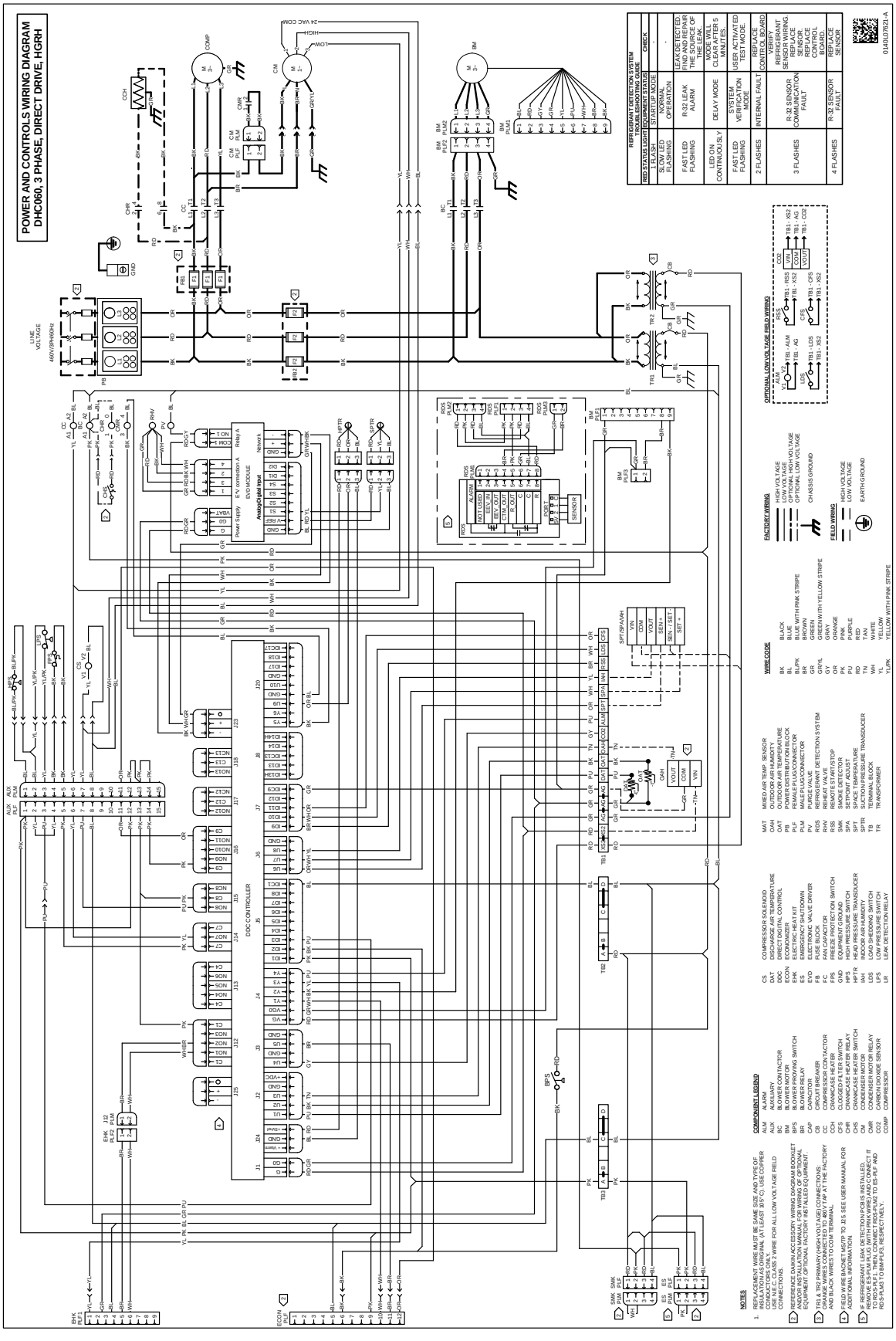
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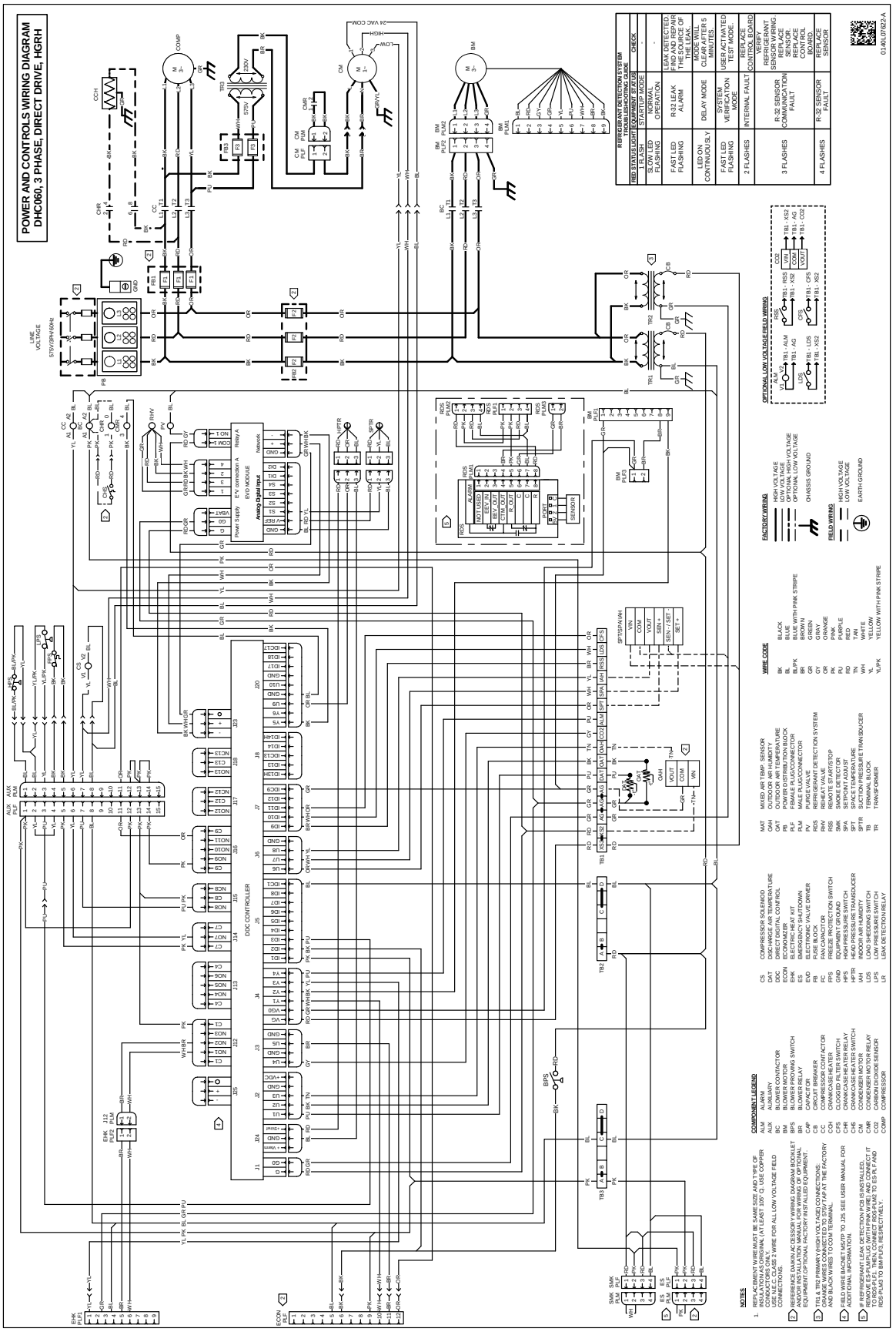
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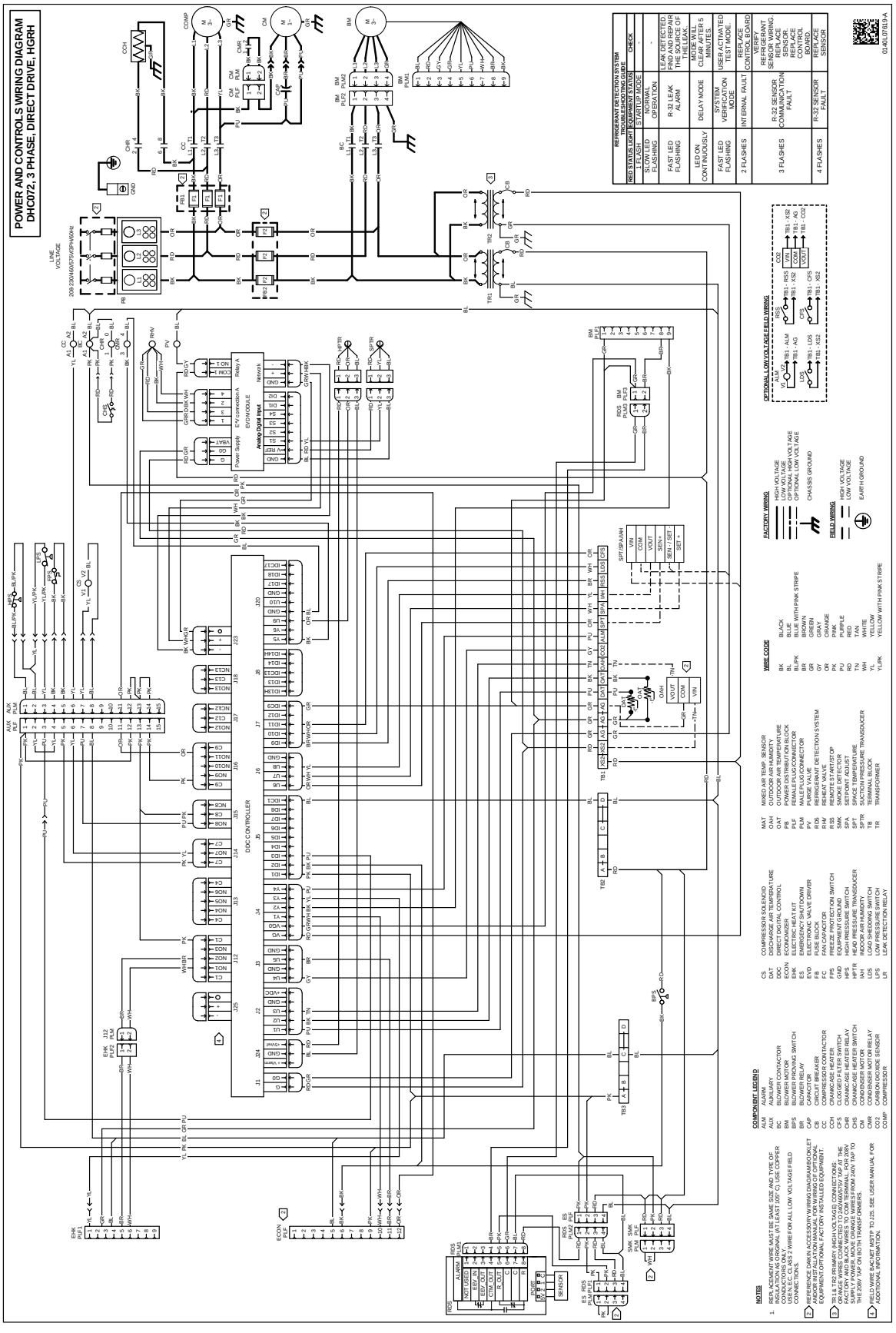
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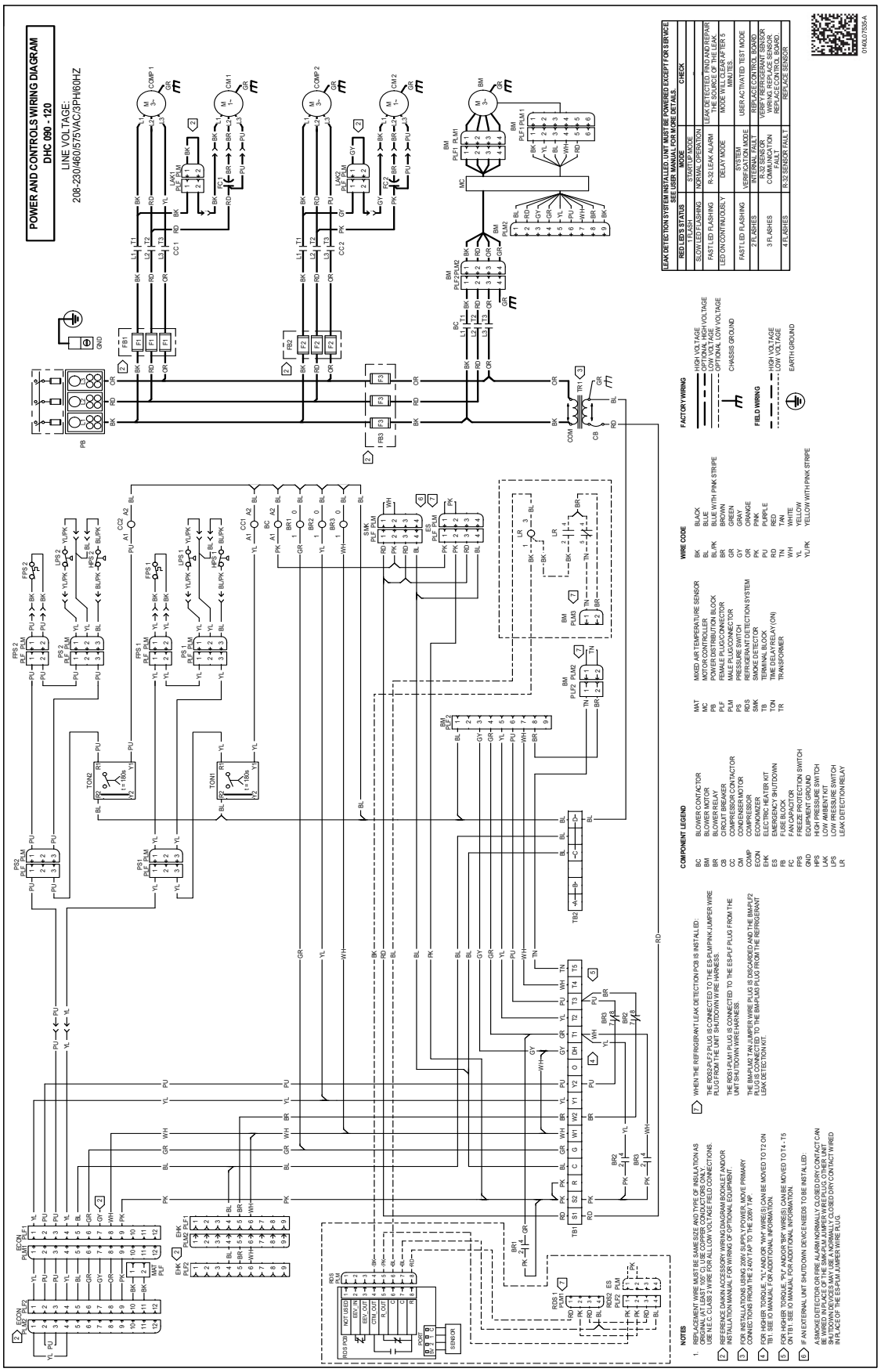
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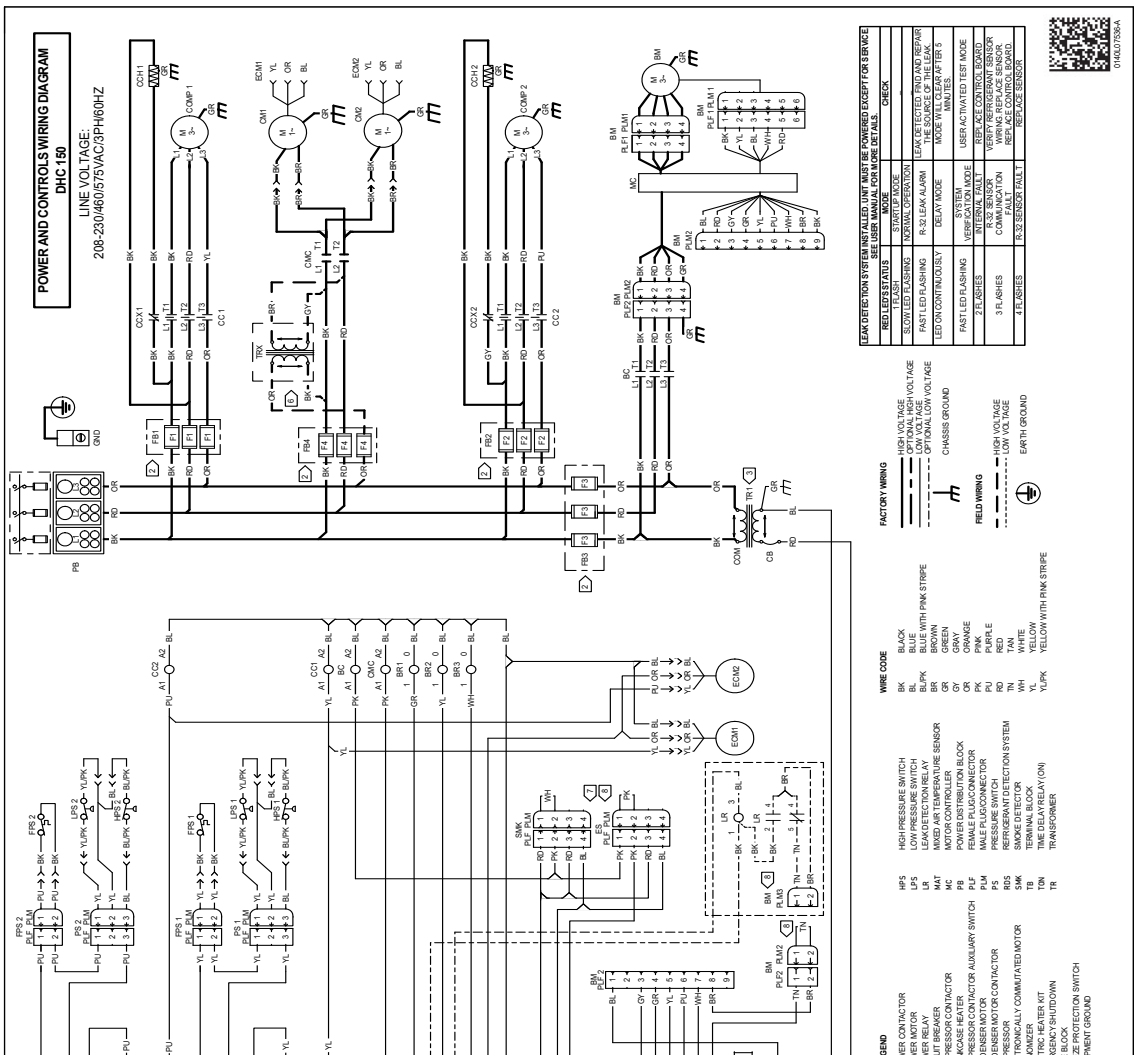


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UNIT WIRING DIAGRAMS

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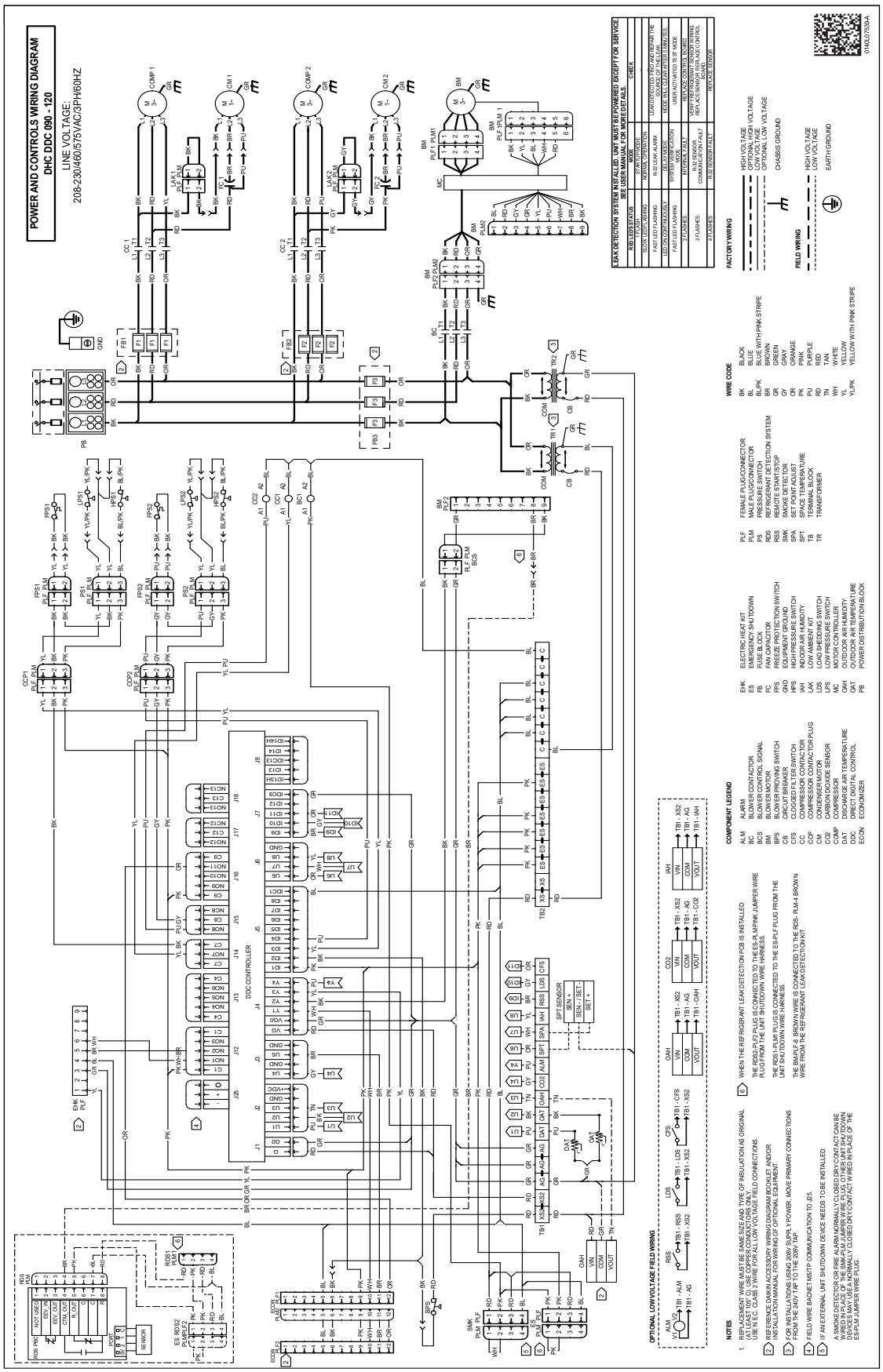
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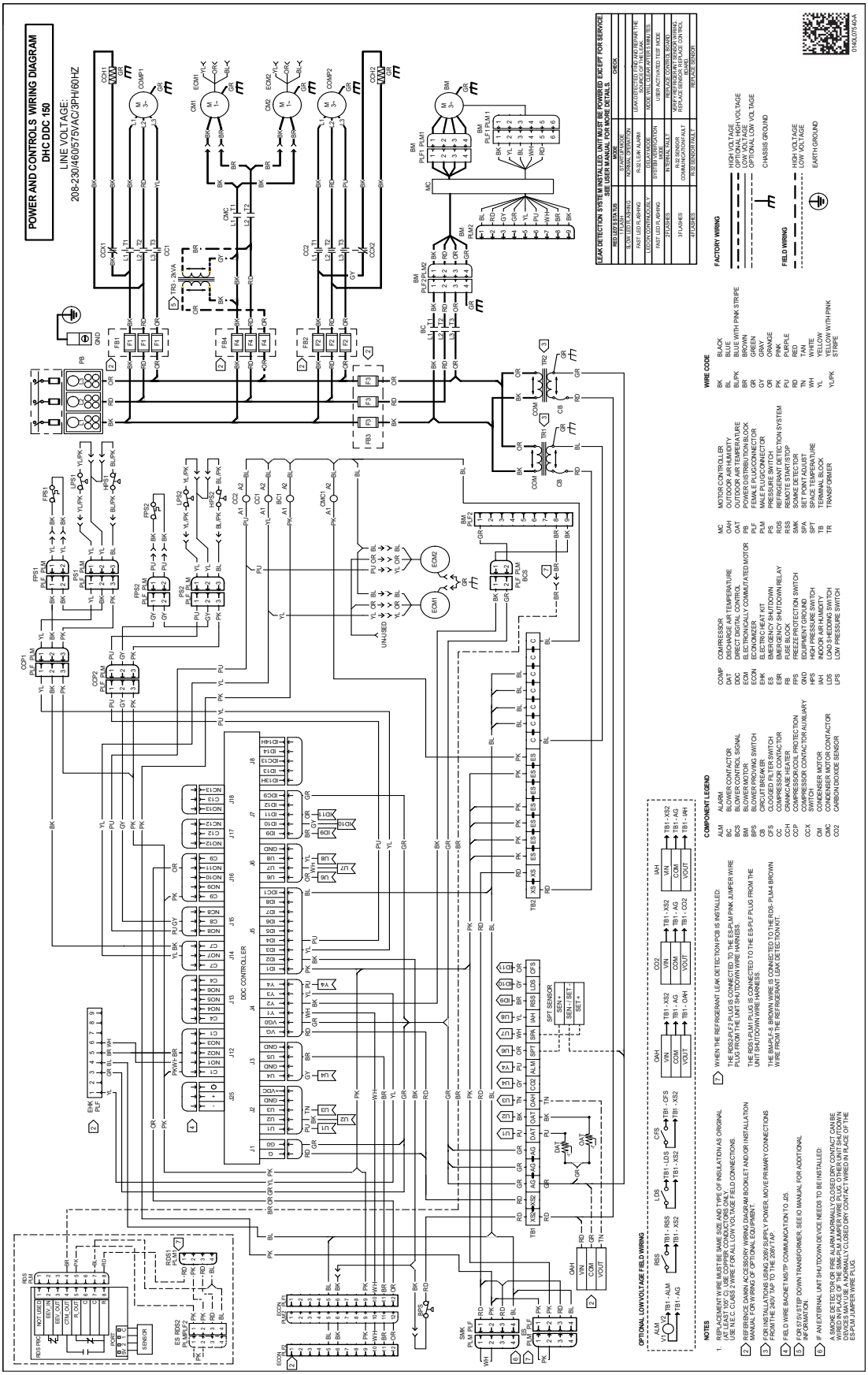
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POWER AND CONTROLS WIRING DIAGRAM
DHC DDC 090 - 120
LINE VOLTAGE:
208-230/460/575VAC/3PH/60HZ
LEAK DETECTION SYSTEM MUST BE LEFT UNIT MUST BE POWERED EXCEPT FOR SERVICE. SEE USER MANUAL FOR MORE DETAILS.
KEY LEDS STATUS
SOLID GREEN
SLOW FLASHING
FAST LED FLASHING
LED ON CONTINUOUSLY
FAST LED FLASHING
3 FLASHES
5 FLASHES
6 FLASHES
NORMAL OPERATION
NORMAL OPERATION
R-32 LEAK ALARM
RELAY MODE
SYSTEM STOP LOCATION
MEMORY FAULT
R-32 SENSOR COMMUNICATION FAULT
R-32 SENSOR FAULT
WORK
LEAK DETECTED, FIND AND REPAIR THE LEAK, PURGE AND RECHARGE
MODE WILL CLEAR AFTER 5 MINUTES
USER ACTIVATED TEST MODE
REPLACE CONTROL BOARD
USER POWERED LEAK DETECTION SYSTEM, REPLACE SENSOR, RE-PLACE CONTROL
REPLACE SENSOR
CHECK
-
LEAK DETECTED, FIND AND REPAIR THE LEAK, PURGE AND RECHARGE
MODE WILL CLEAR AFTER 5 MINUTES
USER ACTIVATED TEST MODE
REPLACE CONTROL BOARD
USER POWERED LEAK DETECTION SYSTEM, REPLACE SENSOR, RE-PLACE CONTROL
REPLACE SENSOR
FACTORY WIRING
FIELD WIRING
HIGH VOLTAGE
OPTIONAL HIGH VOLTAGE
LOW VOLTAGE
OPTIONAL LOW VOLTAGE
CHASSIS GROUND
HIGH VOLTAGE
LOW VOLTAGE
EARTH GROUND
WIRE CODE
BK BLACK
BL BLUE
BLPK BLUE WITH PINK STRIPE
BR BROWN
GR GREEN
GY GRAY
OR ORANGE
PK PINK
PU PURPLE
RD RED
TN TAN
WH WHITE
YL YELLOW
YLPK YELLOW WITH PINK STRIPE
COMPONENT LEGEND
ALM ALARM
BC BLOWER CONTACTOR
BCS BLOWER CONTROL SIGNAL
BM BLOWER MOTOR
BPS BLOWER PROVING SWITCH
CB CIRCUIT BREAKER
CFS CLOGGED FILTER SWITCH
CC1 COMPRESSOR CONTACTOR
CC2 COMPRESSOR CONTACTOR
CM CONDENSER MOTOR
CO2 CARBON DIOXIDE SENSOR
COMP COMPRESSOR
DAT DISCHARGE AIR TEMPERATURE
DDC DIRECT DIGITAL CONTROL
ECON ECONOMIZER
EHK ELECTRIC HEAT KIT
ES EMERGENCY SHUTDOWN
FB FUSE BLOCK
FC FAN CONTACTOR
FPS FREEZE PROTECTION SWITCH
GND EQUIPMENT GROUND
HPS HIGH PRESSURE SWITCH
IAH LOW AMBIENT KIT
LAK LEAK ALARM KIT
LDS LOAD SHEDDING SWITCH
LPS LOW PRESSURE SWITCH
MC MOTOR CONTROLLER
OAH OUTDOOR AIR HUMIDITY
OAT OUTDOOR AIR TEMPERATURE
PB POWER DISTRIBUTION BLOCK
PLF FEMALE PLUG/CONNECTOR
PLM MALE PLUG/CONNECTOR
PS PRESSURE SWITCH
RDS REFRIGERANT DETECTION SYSTEM
RSS REMOTE START/STOP
SMK SMOKE DETECTOR
SPA SET POINT ADJUST
SPT SPACE TEMPERATURE
TB TERMINAL BLOCK
TR TRANSFORMER
NOTES
1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (AT LEAST 105°C). USE COPPER CONDUCTORS ONLY.
2. FOR INSTALLATIONS USING 208V SUPPLY POWER, MOVE PRIMARY CONNECTIONS FROM THE 240V TAP TO THE 208V TAP.
3. FIELD WIRE BACNET MS/TP COMMUNICATION TO J25.
4. IF AN EXTERNAL UNIT SHUTDOWN DEVICE NEEDS TO BE INSTALLED:
A SMOKE DETECTOR OR FIRE ALARM NORMALLY CLOSED DRY CONTACT CAN BE WIRED IN PLACE OF THE SMK JUMPER WIRE PLUG. ALL OTHER SHUTDOWN DEVICES MAY USE A NORMALLY CLOSED DRY CONTACT WIRED IN PLACE OF THE ES-PLM JUMPER WIRE PLUG.
5. REFERENCE DAIKIN ACCESSORY WIRING DIAGRAM BOOKLET AND/OR INSTALLATION MANUAL FOR WIRING OF OPTIONAL EQUIPMENT.
6. WHEN THE REFRIGERANT LEAK DETECTION PCB IS INSTALLED:
THE RDS2-PLF2 PLUG IS CONNECTED TO THE ES-PLM PINK JUMPER WIRE PLUG FROM THE UNIT SHUTDOWN WIRE HARNESS.
THE RDS1-PLM1 PLUG IS CONNECTED TO THE ES-PLF PLUG FROM THE UNIT SHUTDOWN WIRE HARNESS.
THE BM-PLF-8 BROWN WIRE IS CONNECTED TO THE RDS- PLM-4 BROWN WIRE FROM THE REFRIGERANT LEAK DETECTION KIT.
OPTIONAL LOW VOLTAGE FIELD WIRING
ALM
LDS
RSS
CFS
OAH
IAH
CO2
SPT SENSOR
SEN +
SEN - / SET -
SET +
DDC CONTROLLER
J1
J2
J3
J4
J5
J6
J7
J8
J12
J13
J14
J15
J16
J17
J18
J25
TB1
TB2
XS1
XS2
XS3
VIN
COM
VOUT
DAT
OAT
ECON
PLF
SMK
PLM
BPS
ES
RDS1
RDS2
SENSOR
NOT USED
BEV_NO
BEV_COM
BEV_NC
RDS PLM
RDS PLF
FPS1
FPS2
PS1
PS2
LPS1
LPS2
HPS1
HPS2
CCP1
CCP2
CC1
CC2
BC1
BC2
EHK
FB1
FB2
FB3
PB
GND
COMP 1
COMP 2
CM 1
CM 2
LAK1
LAK2
RC1
RC2
BM
MC
TR1
TR2
CB
COM
OAH
IAH
CO2
SPT SENSOR
TB1 - XS2
TB1 - AG
TB1 - CO2
TB1 - LDS
TB1 - CFS
TB1 - RSS
TB1 - ALM
TB1 - OAH
TB1 - IAH
TB1 - XS1
TB1 - XS3
TB1 - DAT
TB1 - OAT
TB1 - GND
TB1 - VDC
TB1 - VSG
TB1 - VSP
TB1 - VSW
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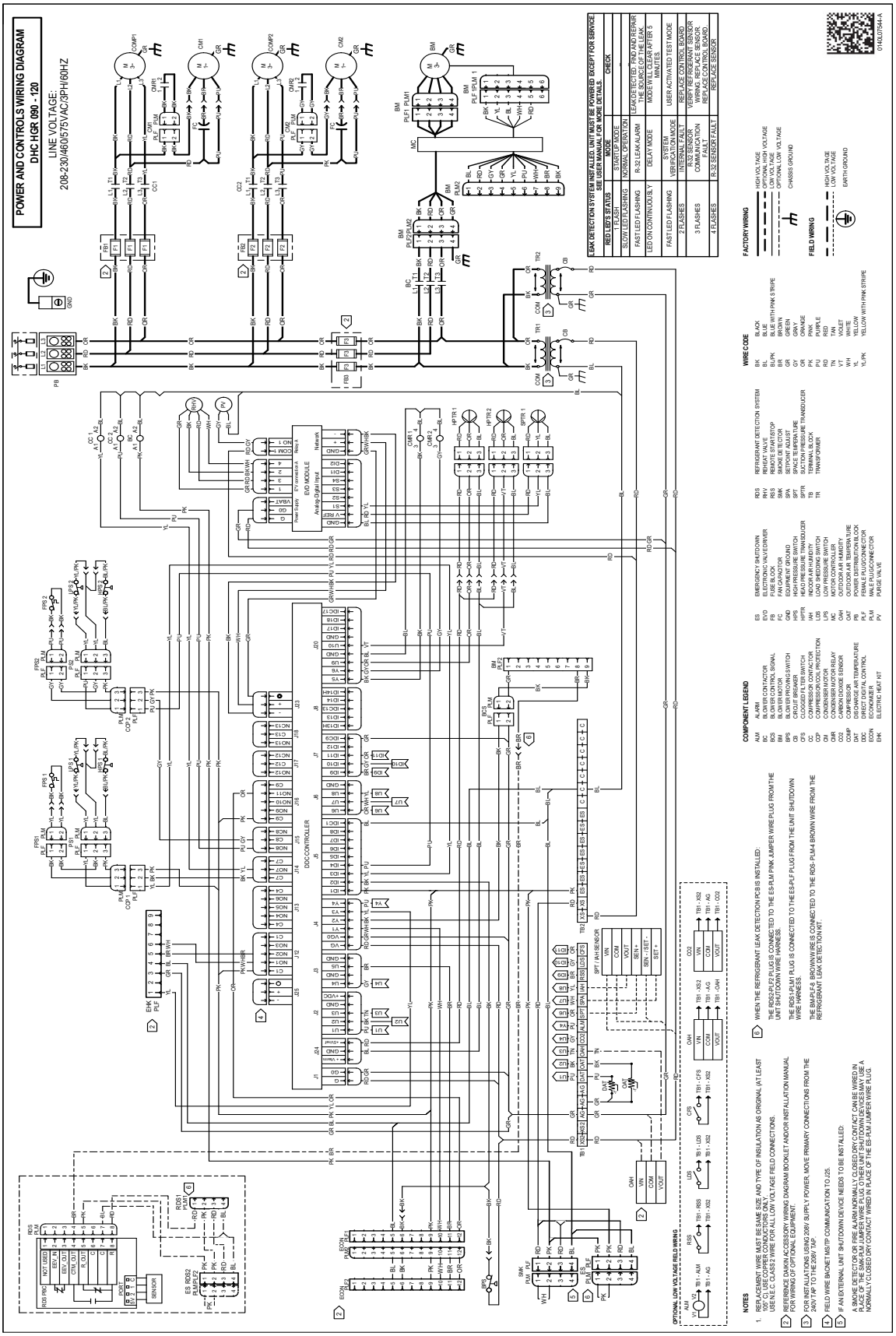
HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

WARNING

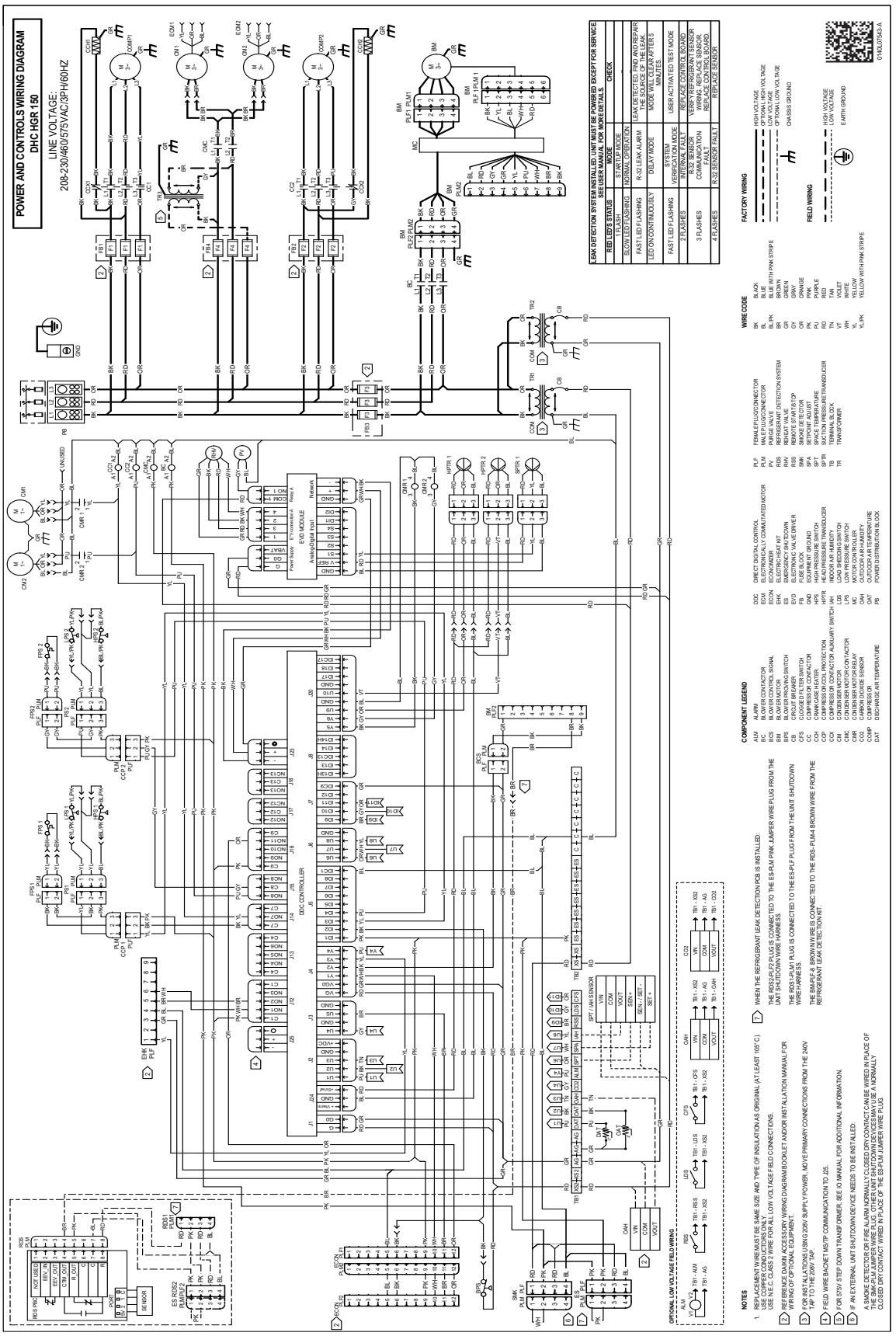
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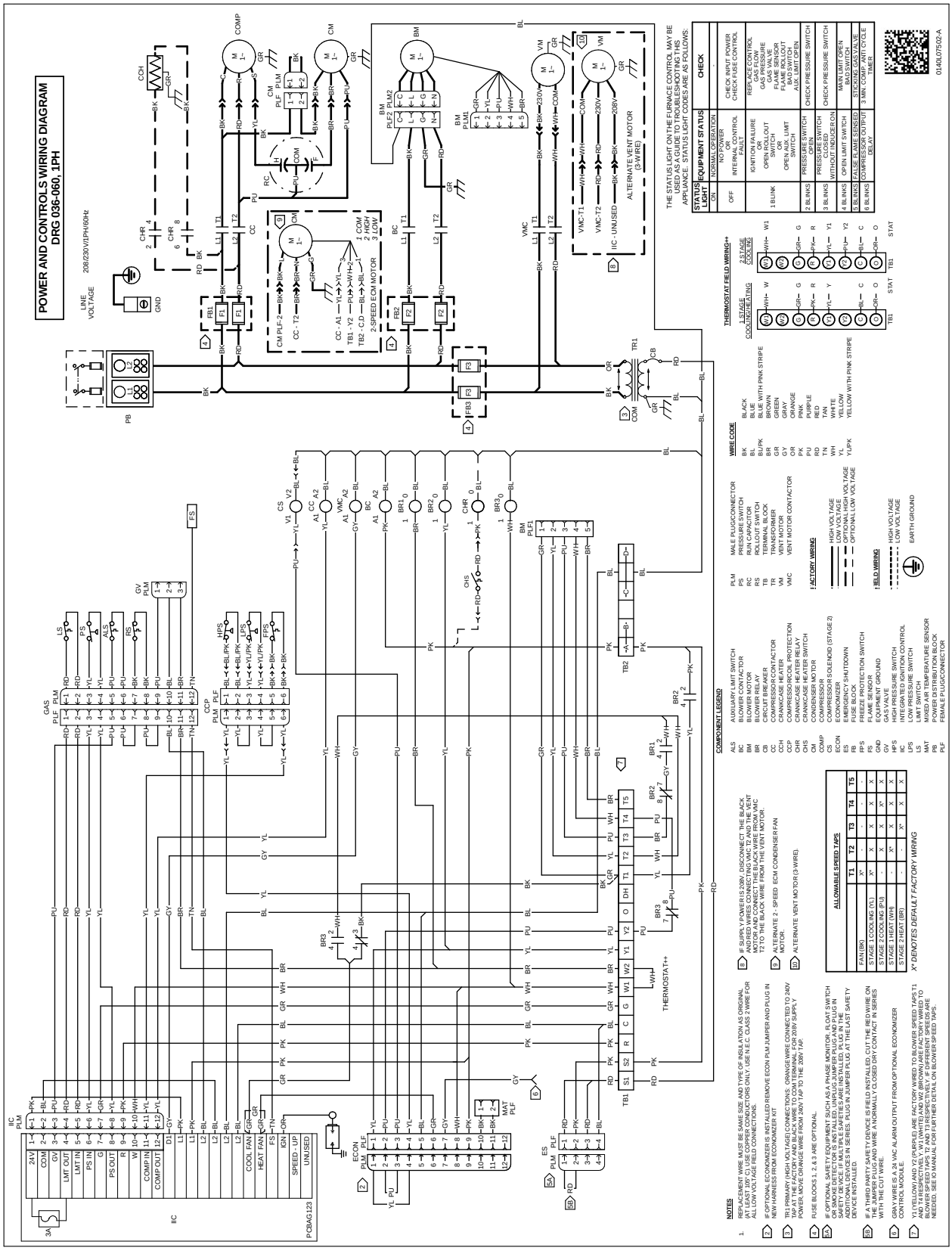


Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

DRG WIRING DIAGRAMS

WARNING

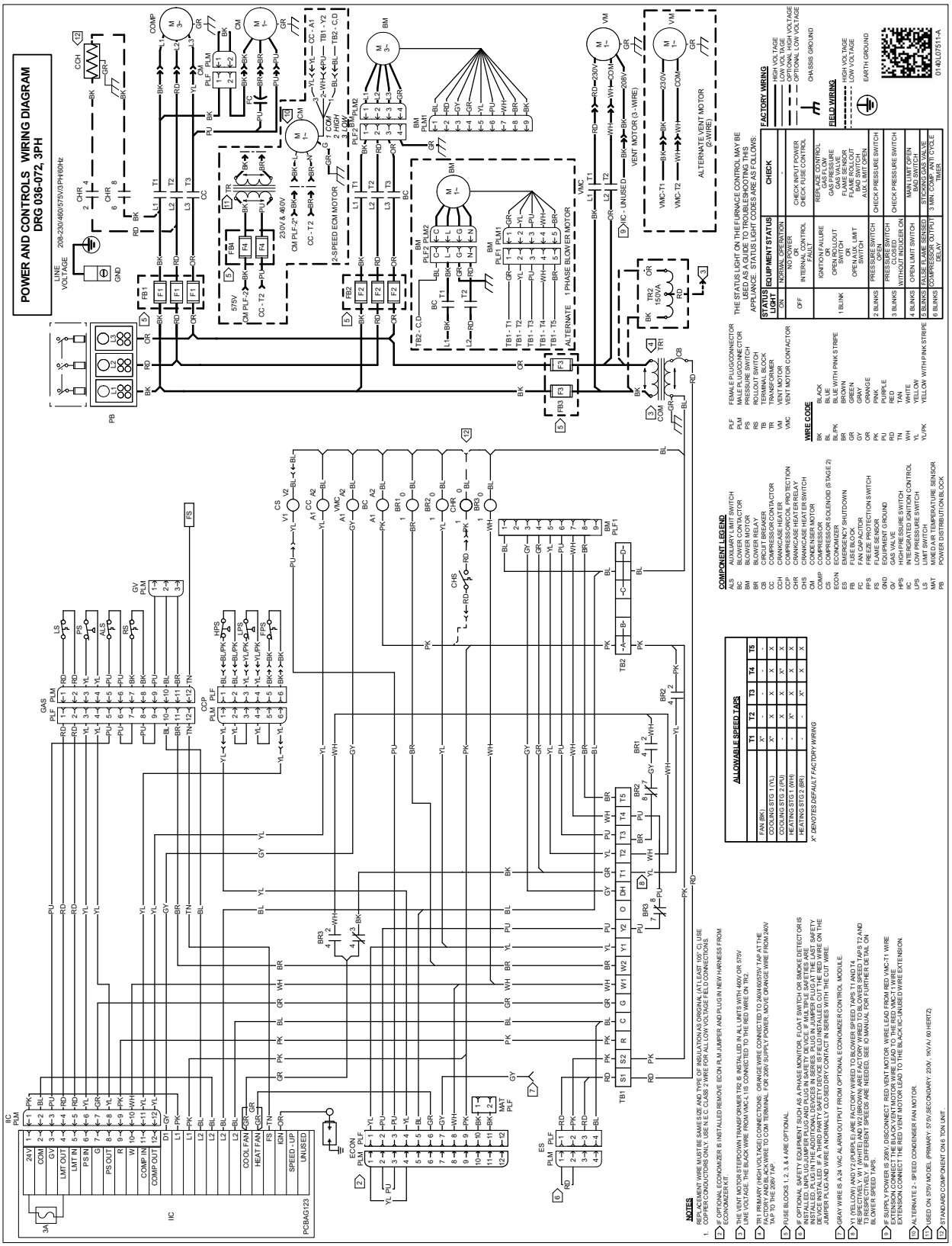
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WARNING

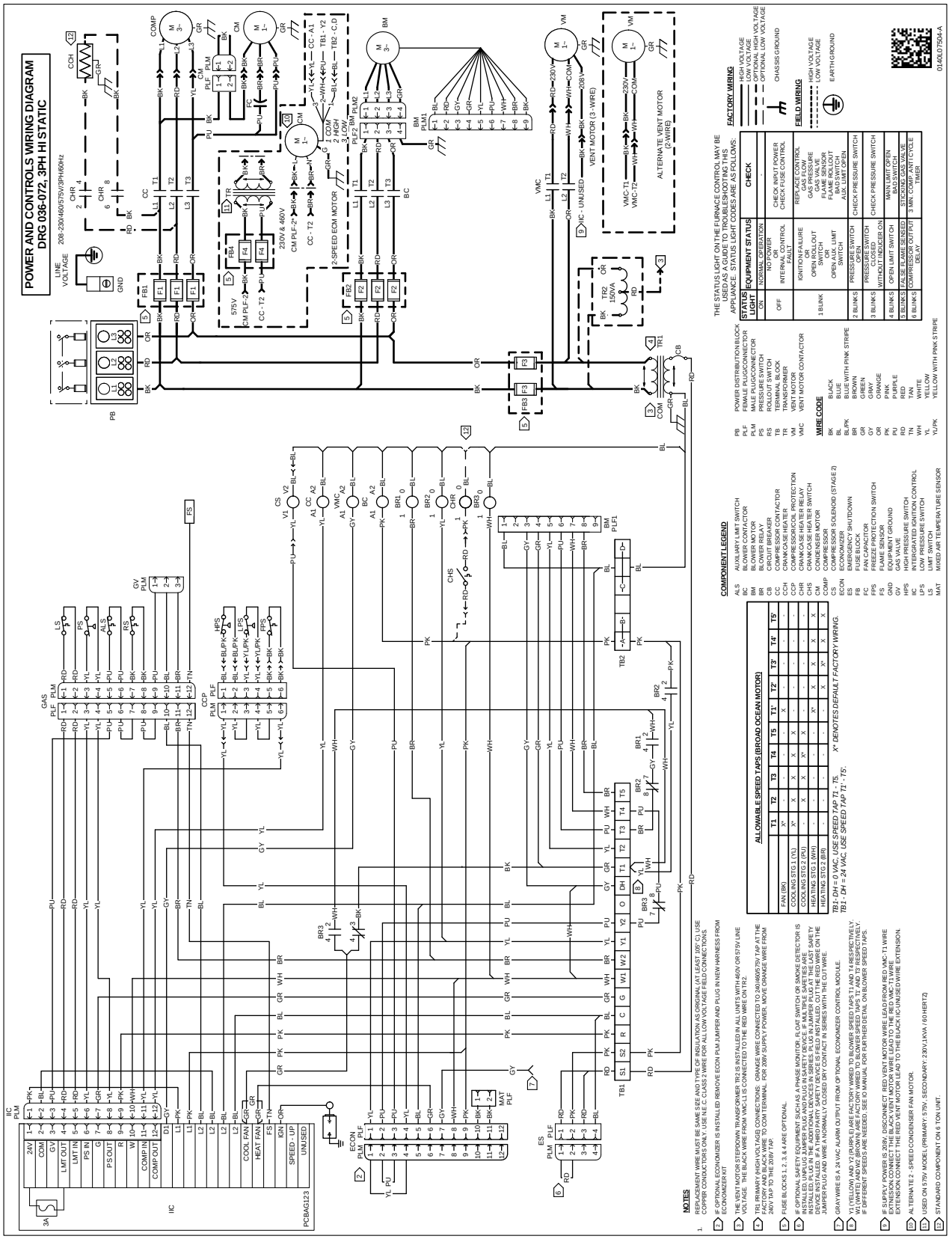
HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

WARNING

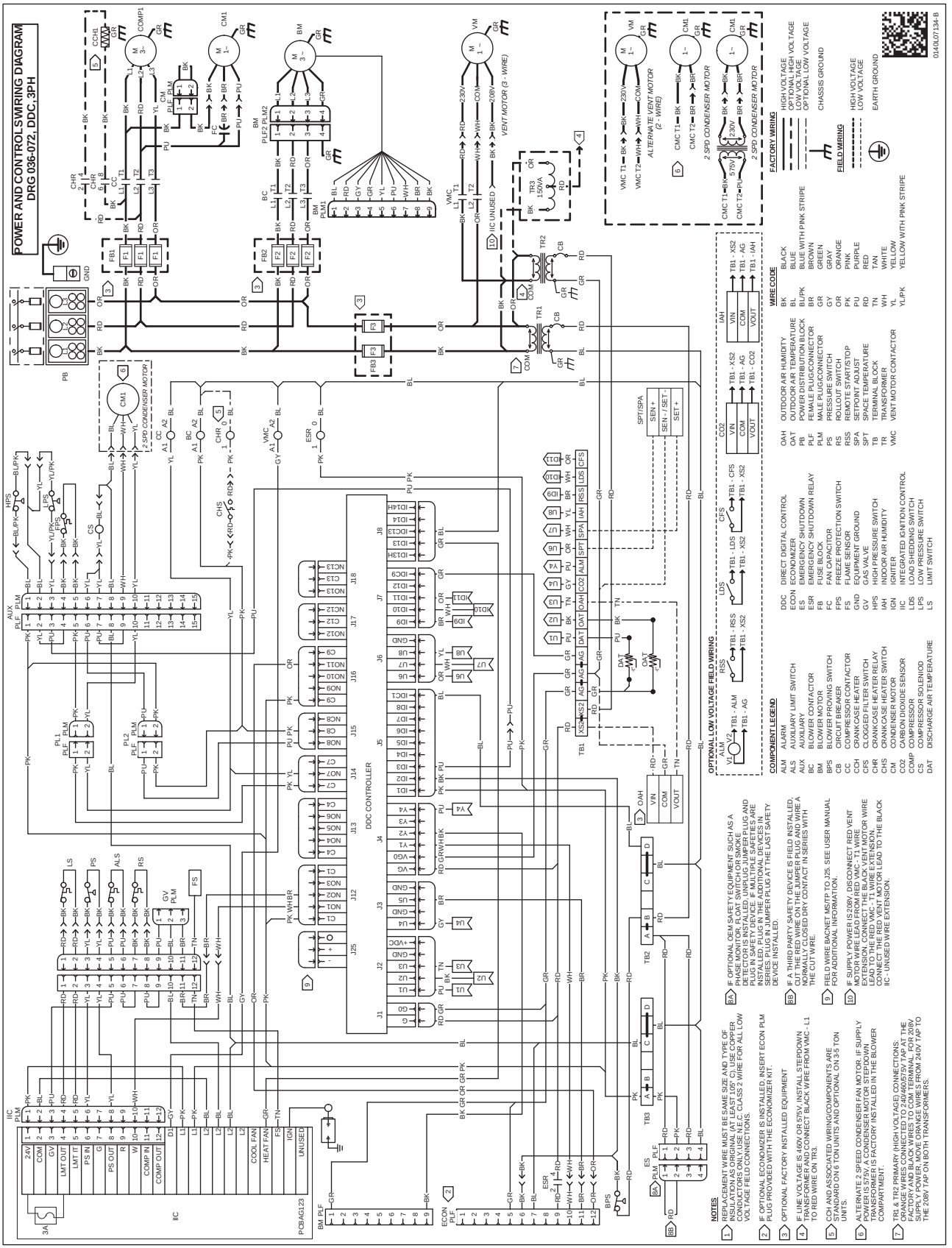
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WARNING

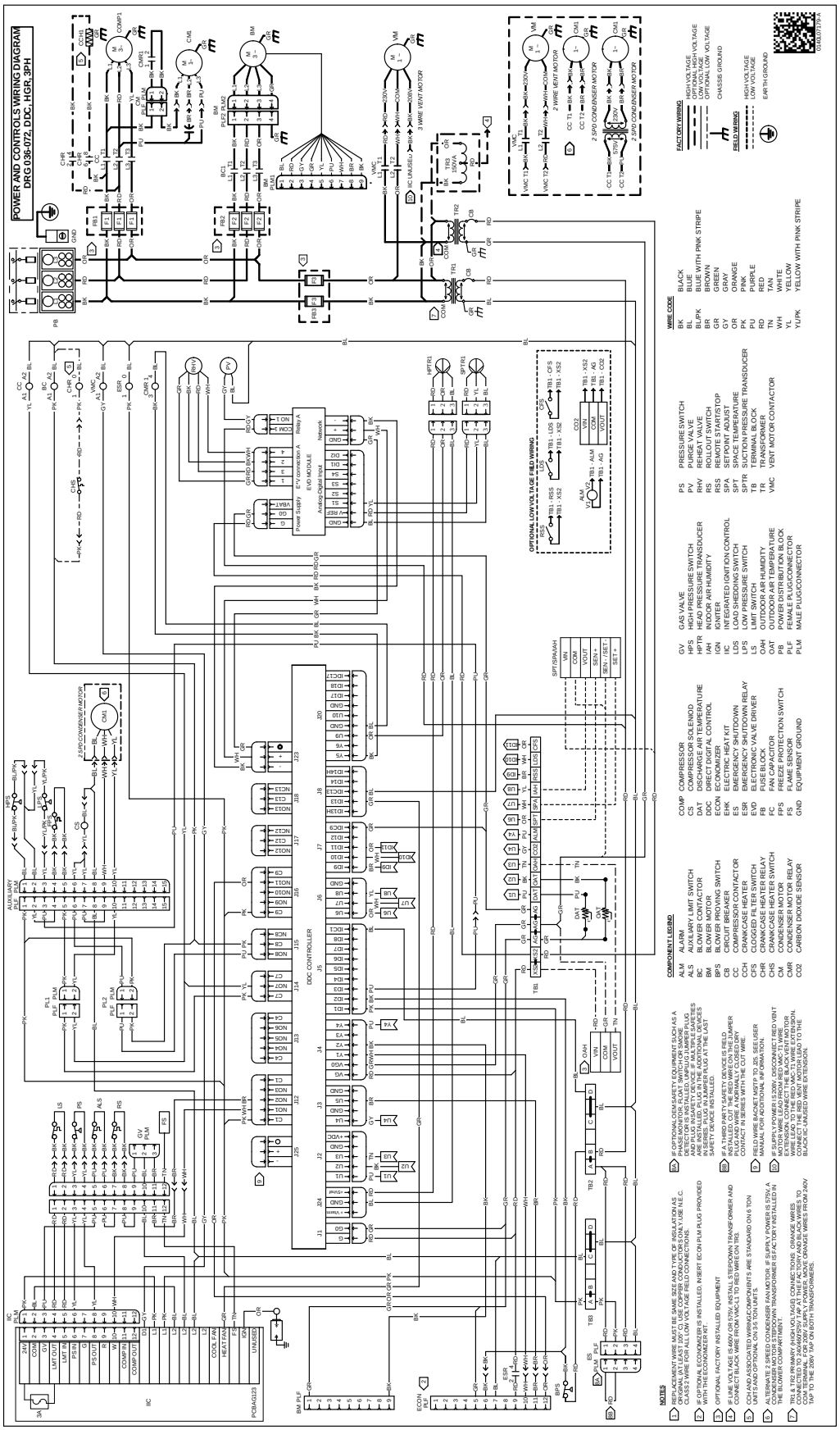
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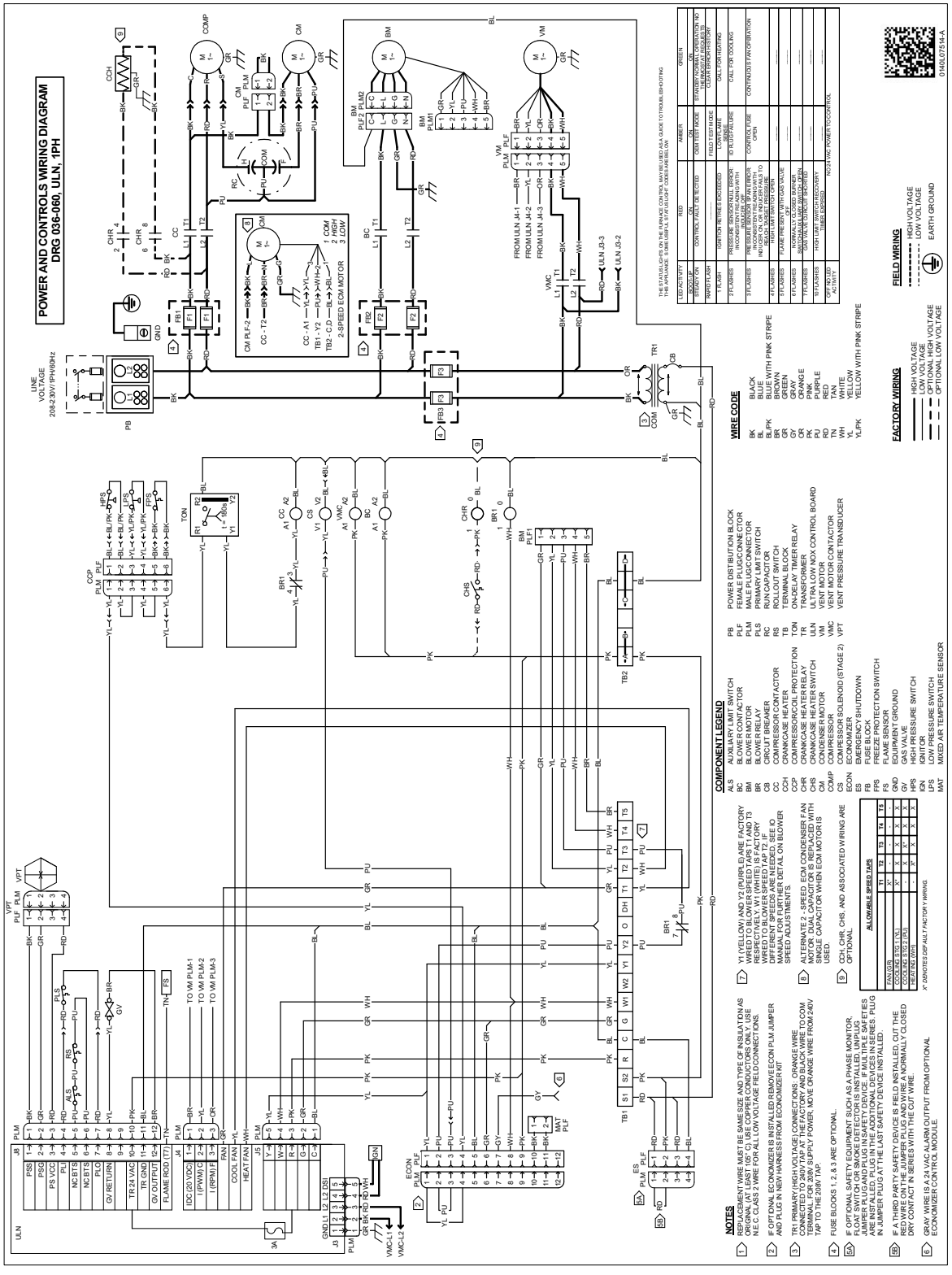
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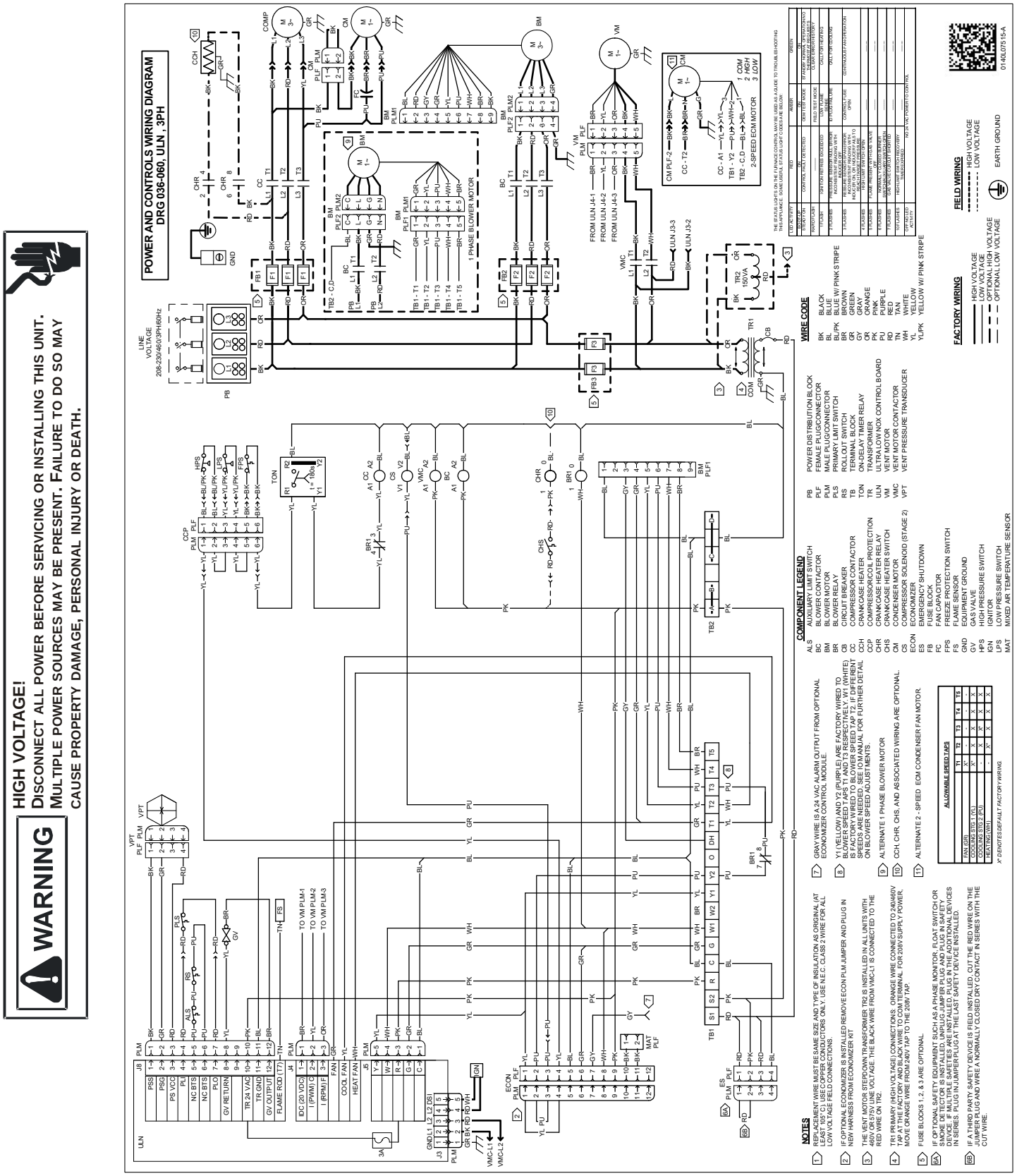
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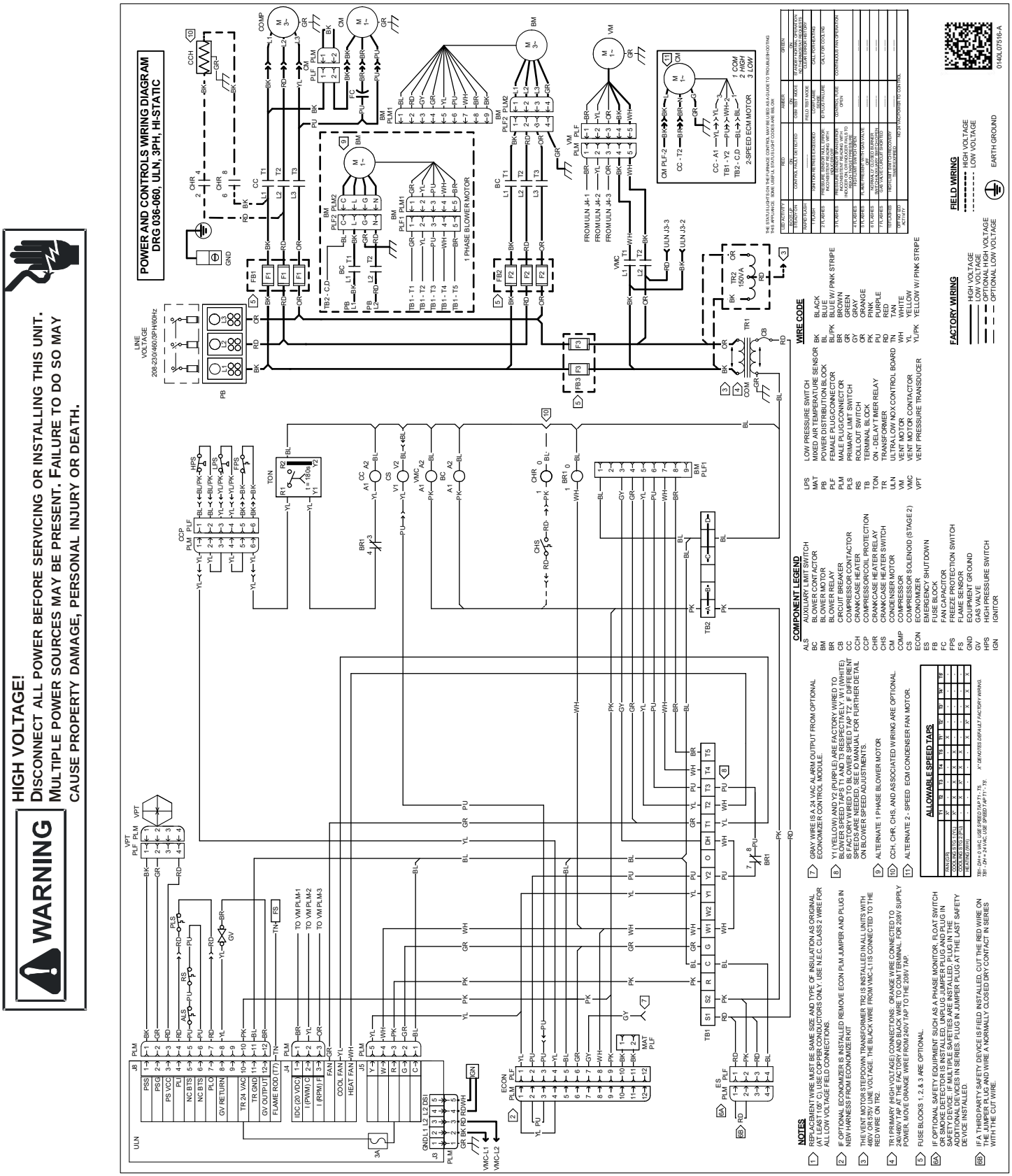
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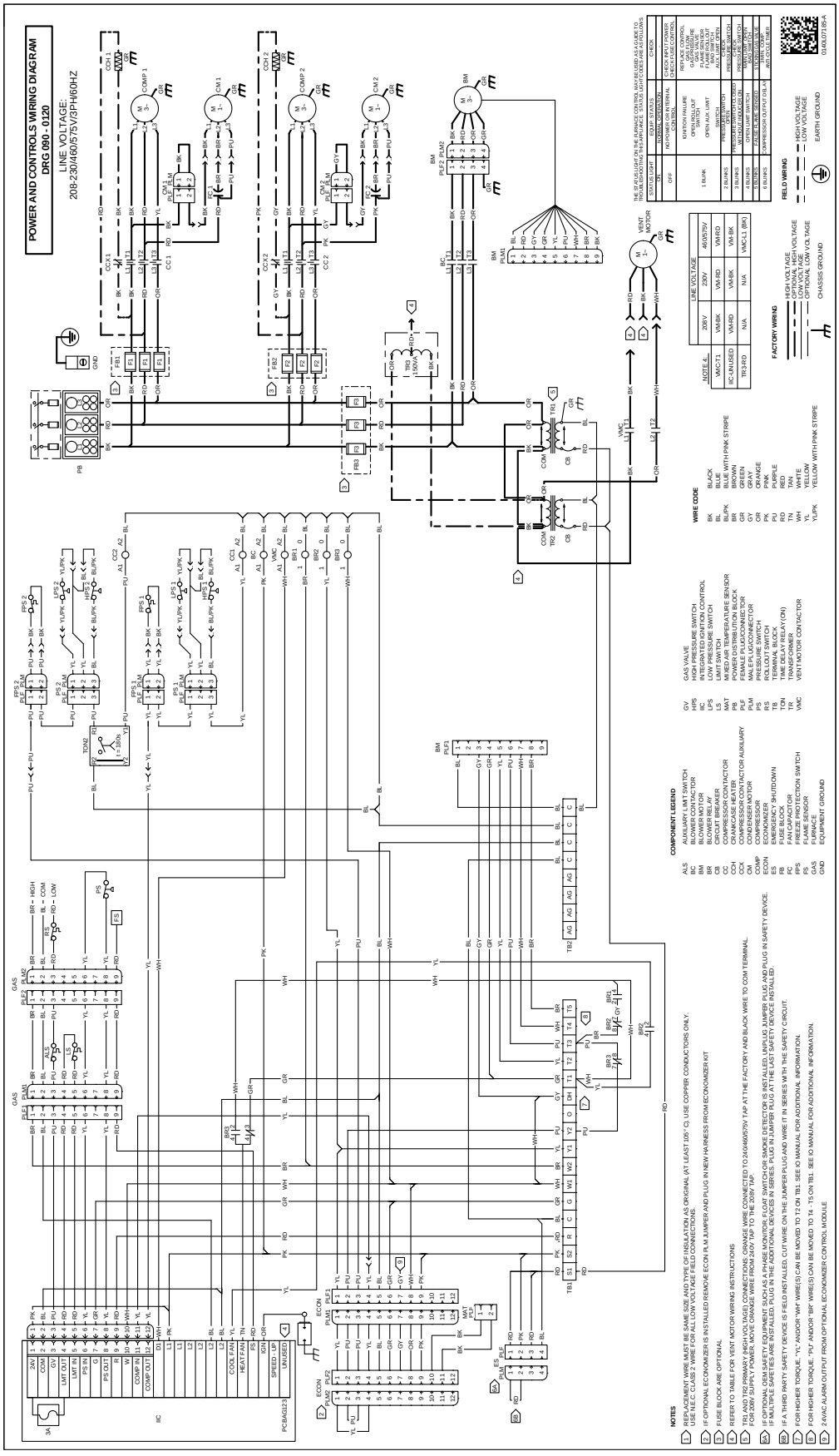
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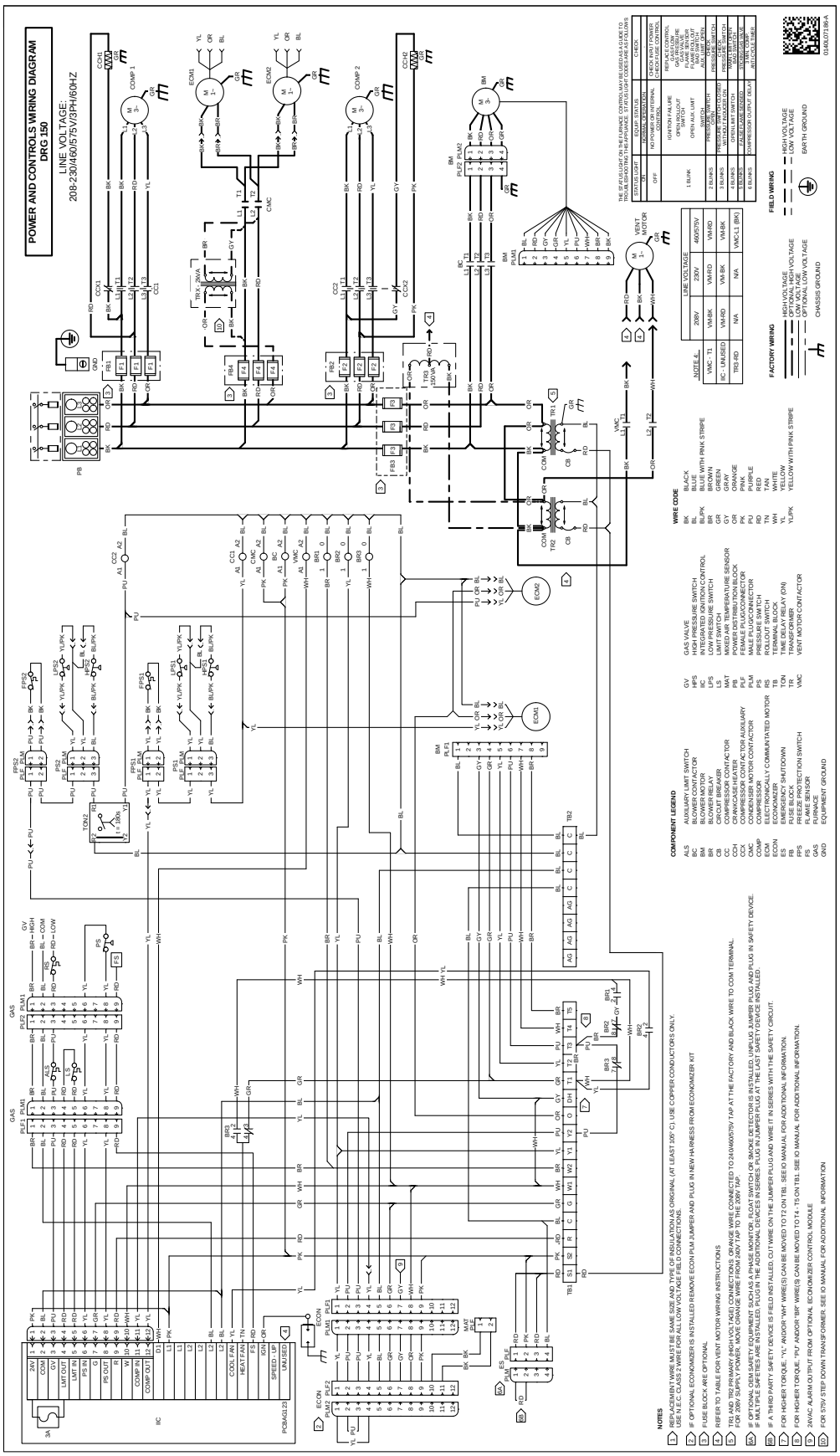
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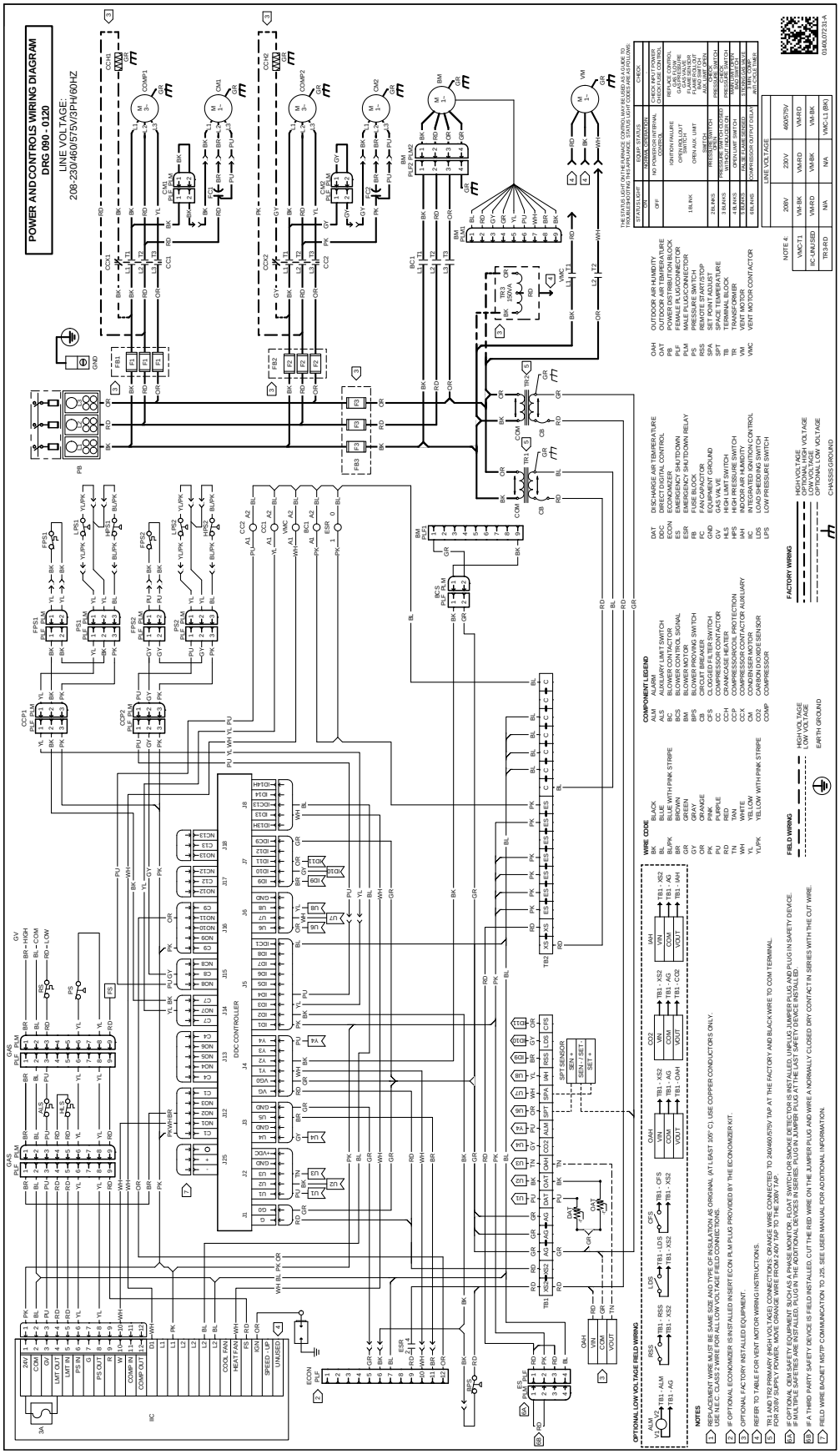
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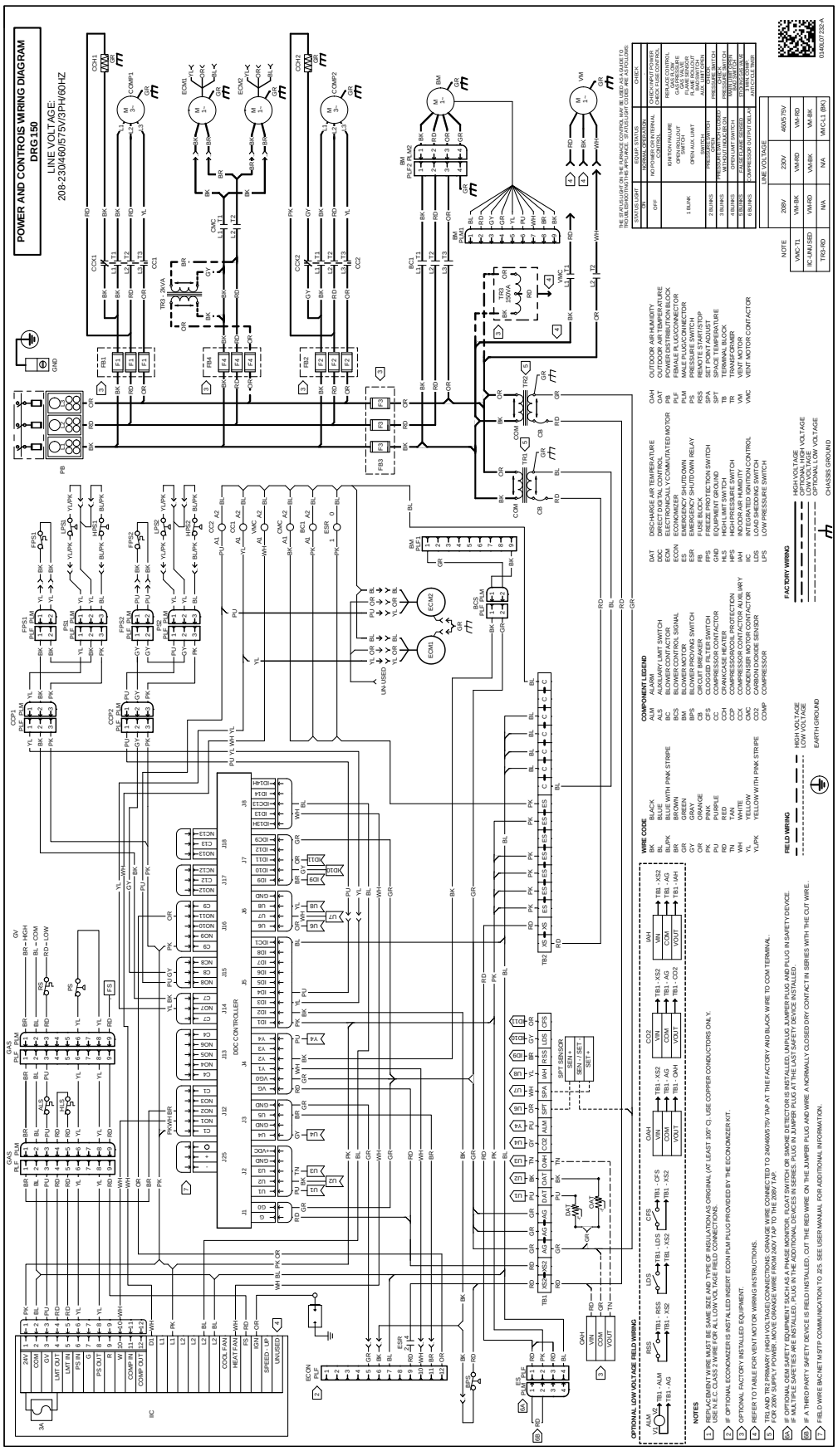
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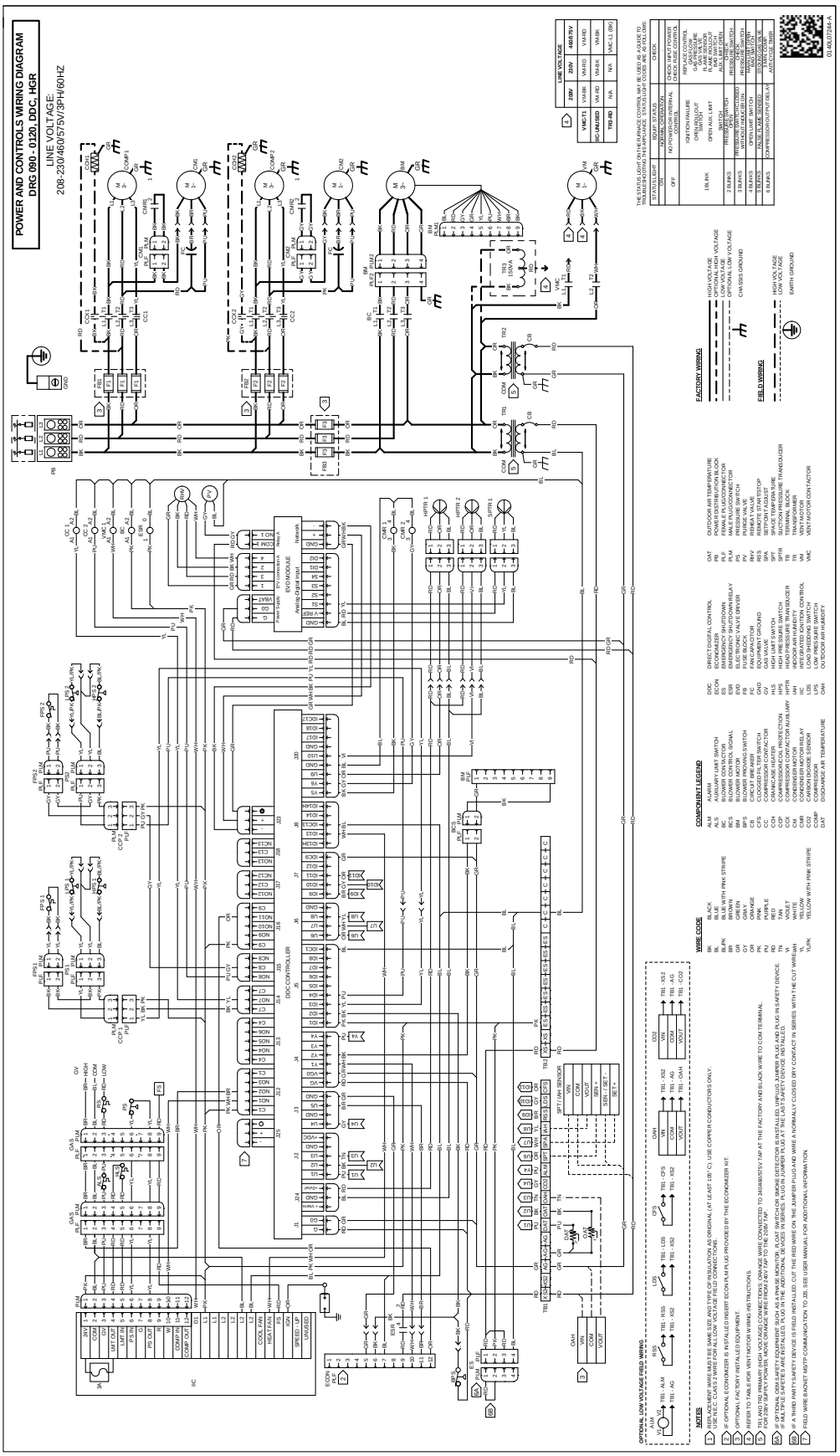
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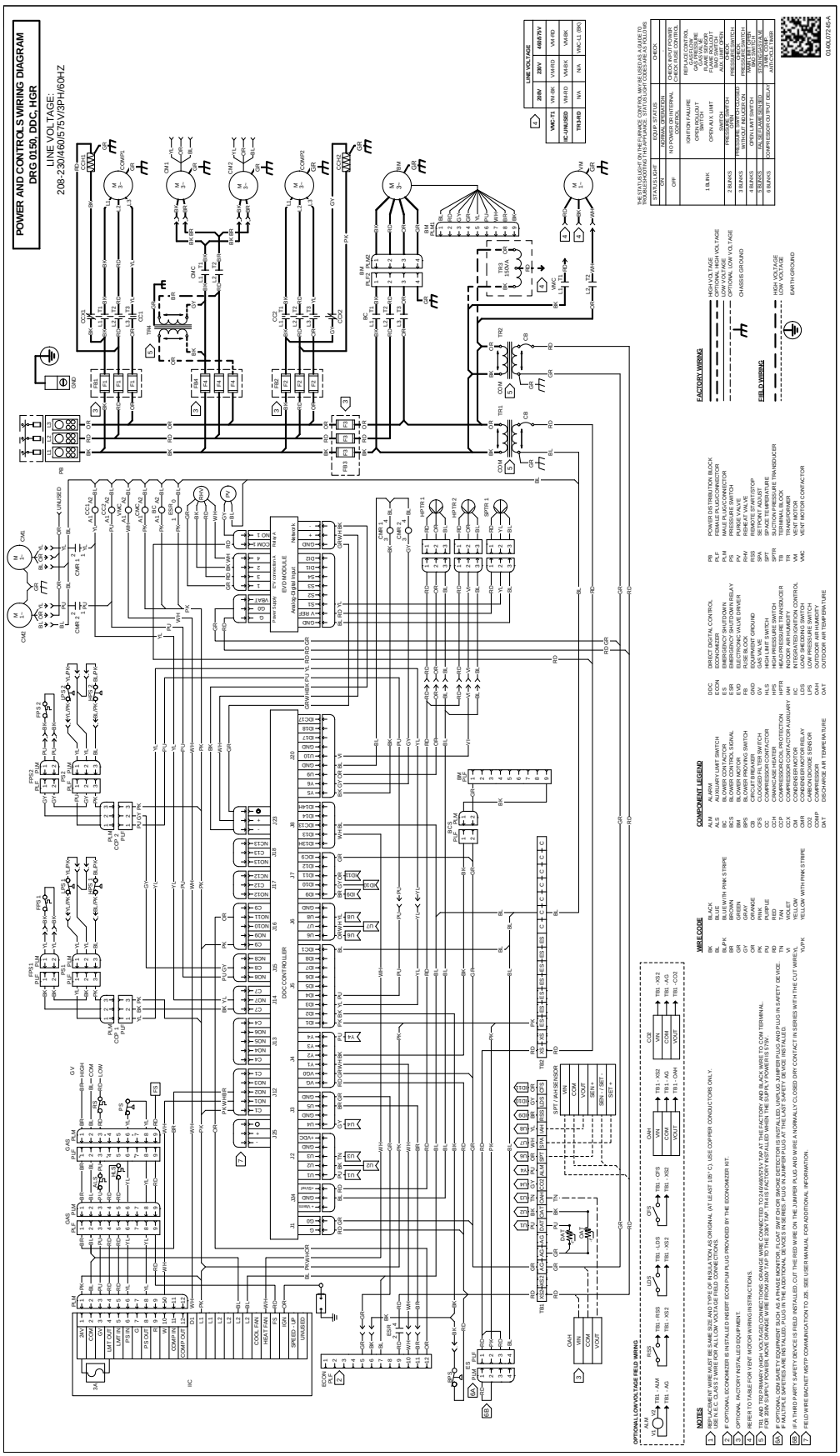
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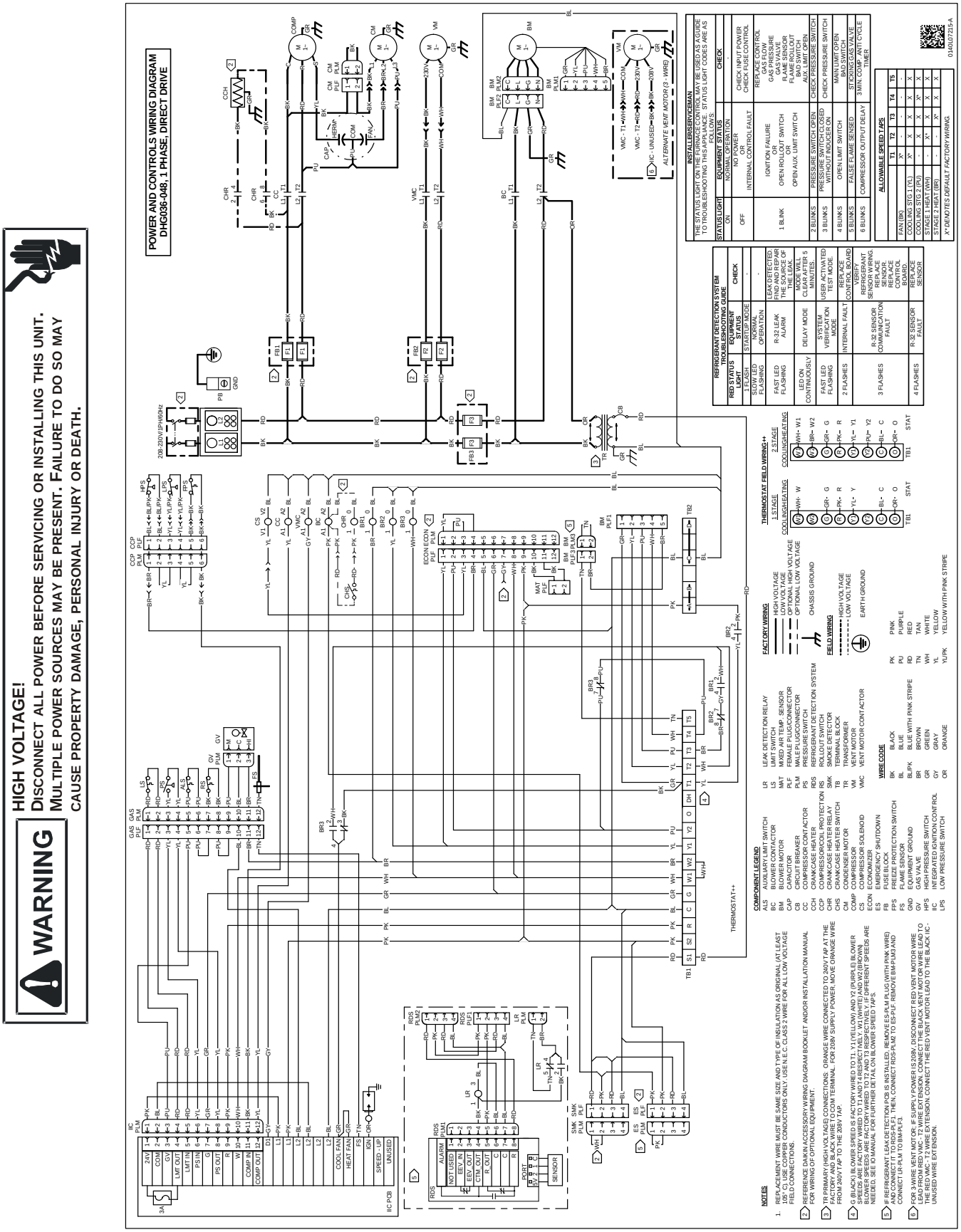
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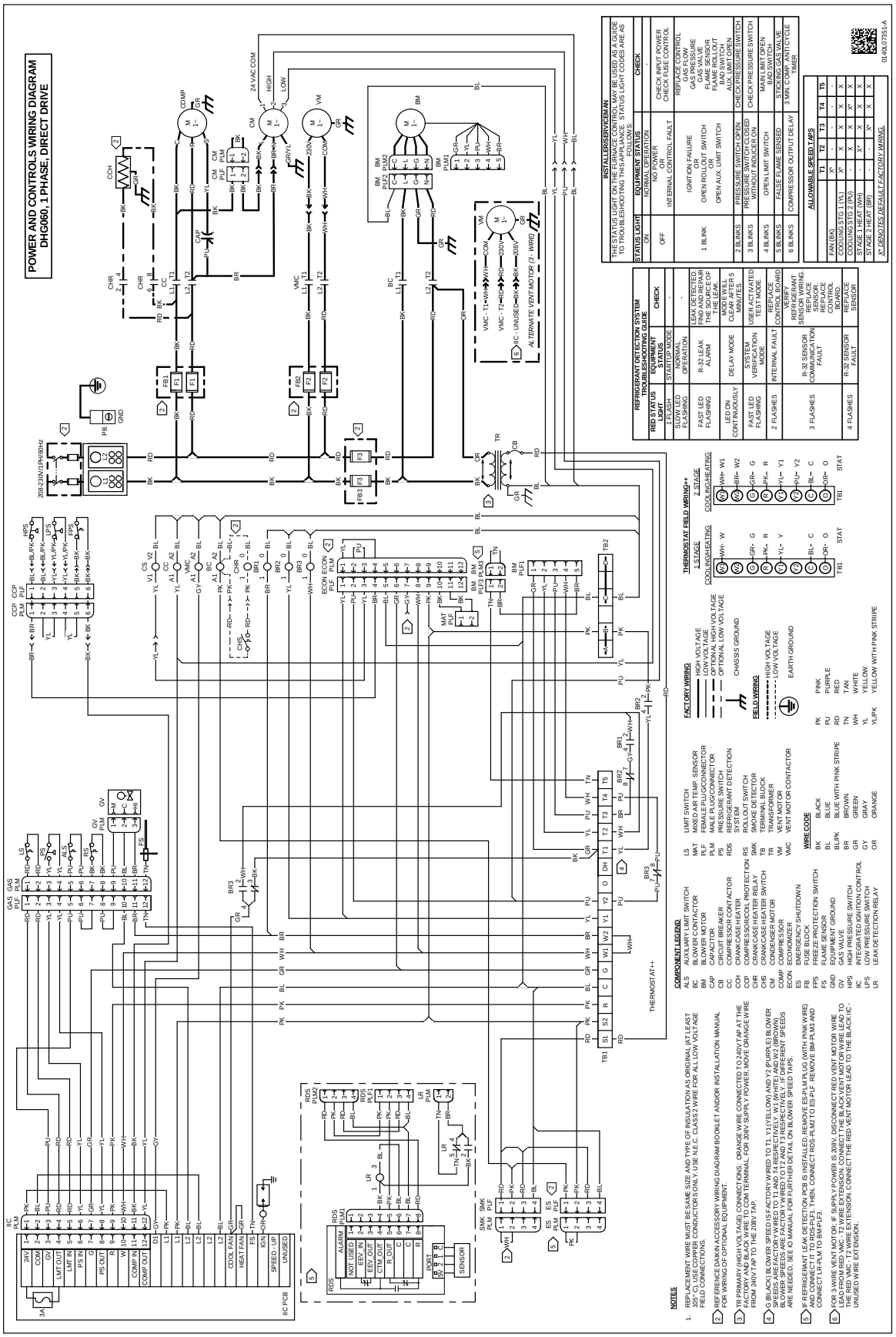
DHG WIRING DIAGRAMS



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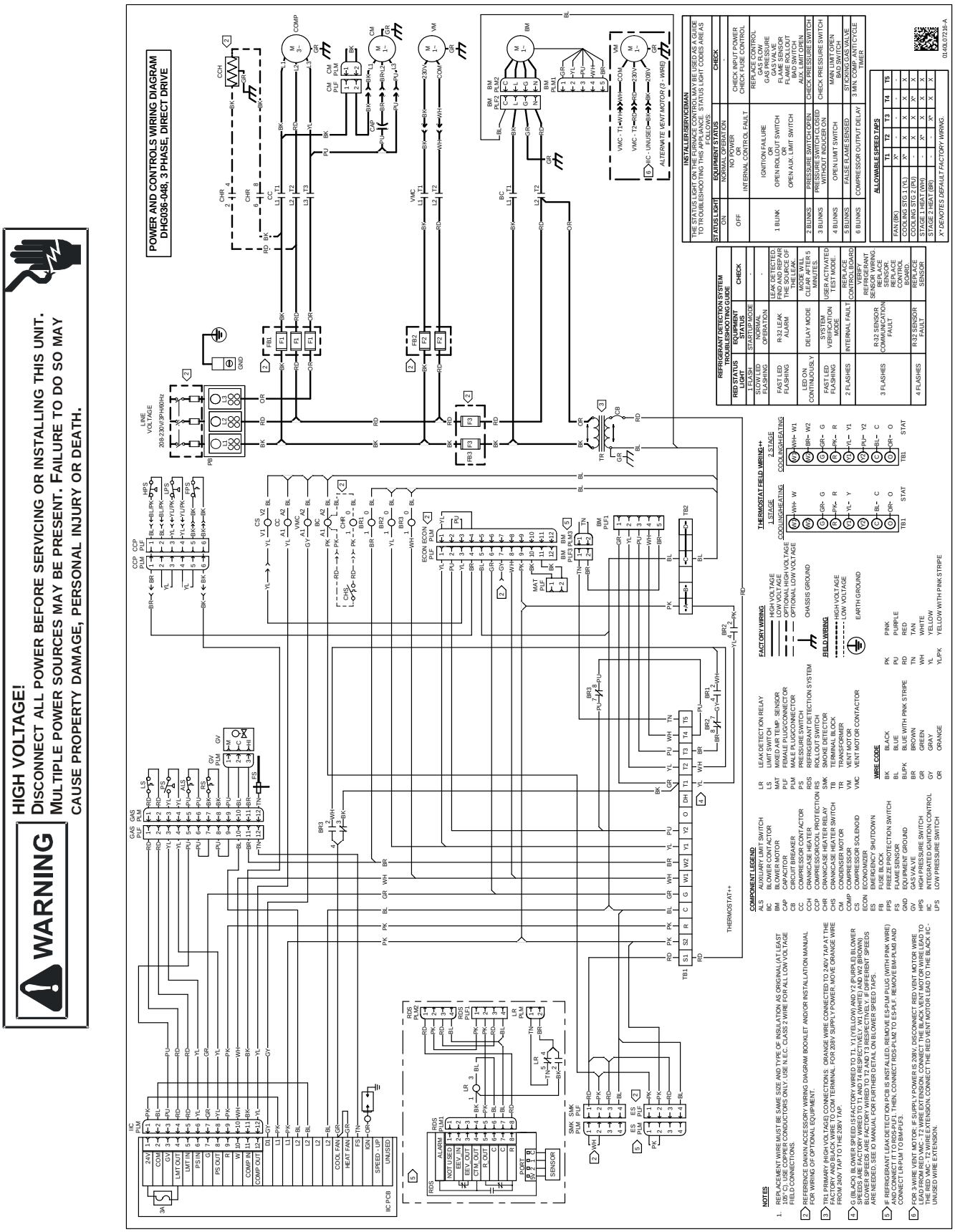
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UNIT WIRING DIAGRAMS

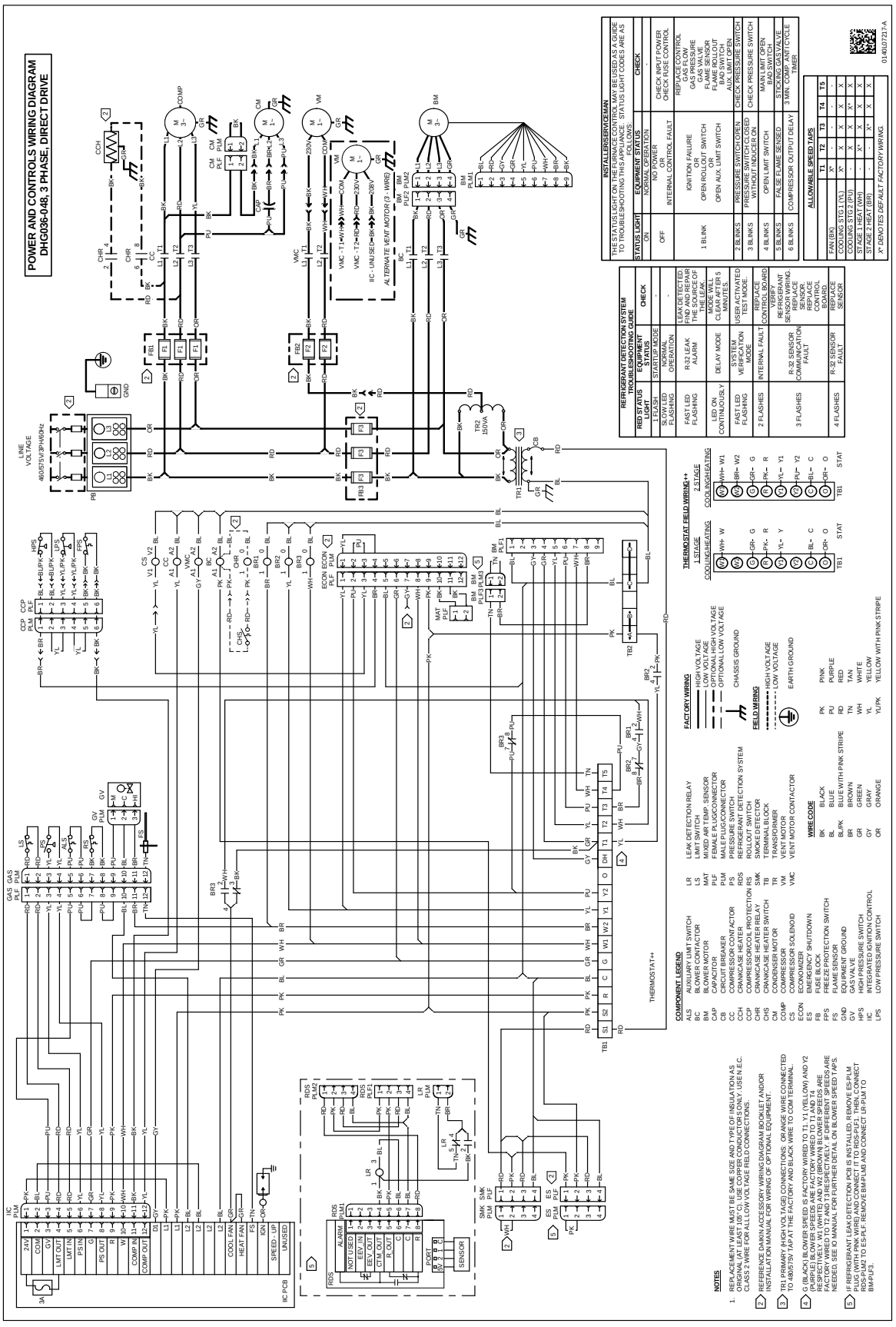
DHG036-048, 3 PHASE (208-230V)



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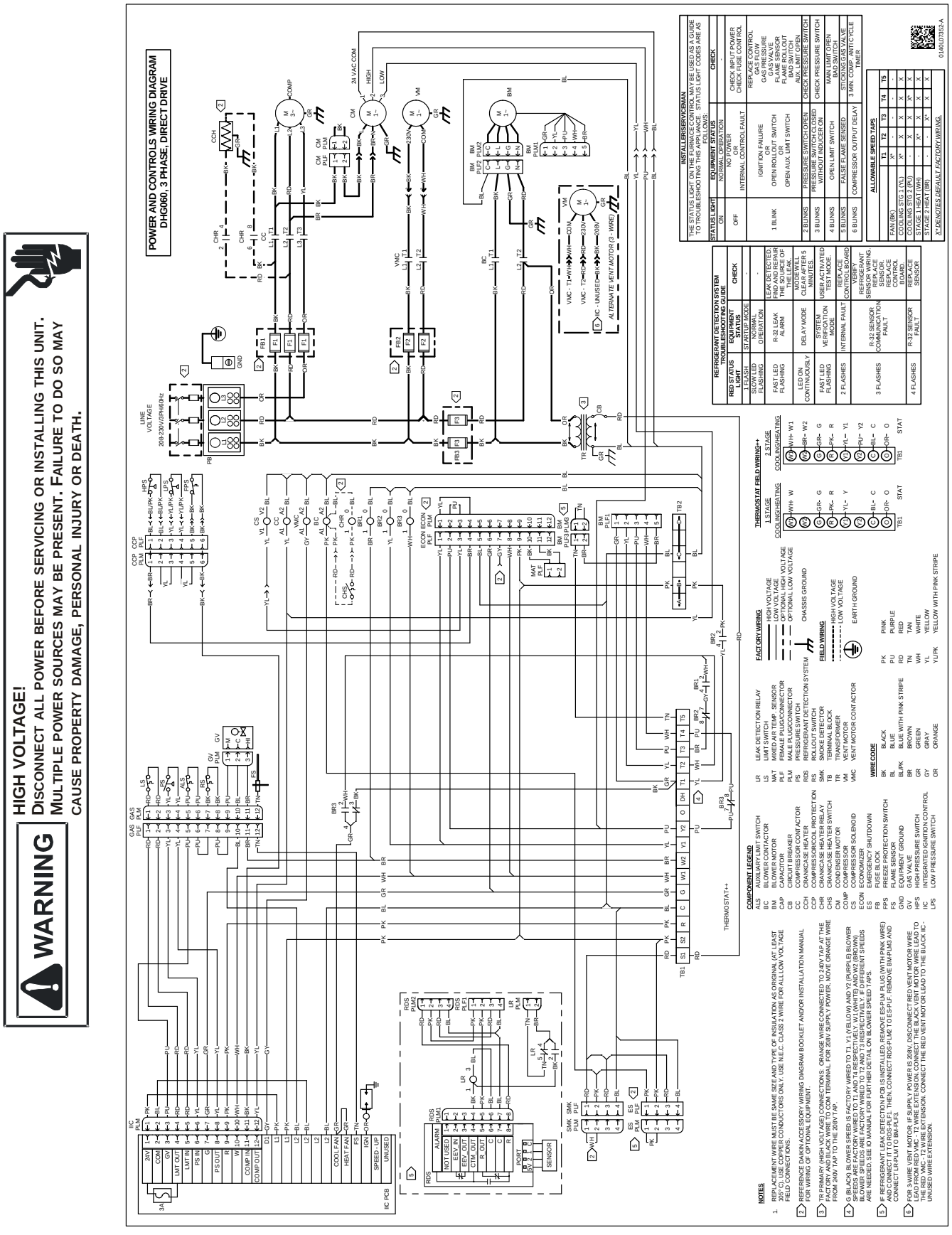
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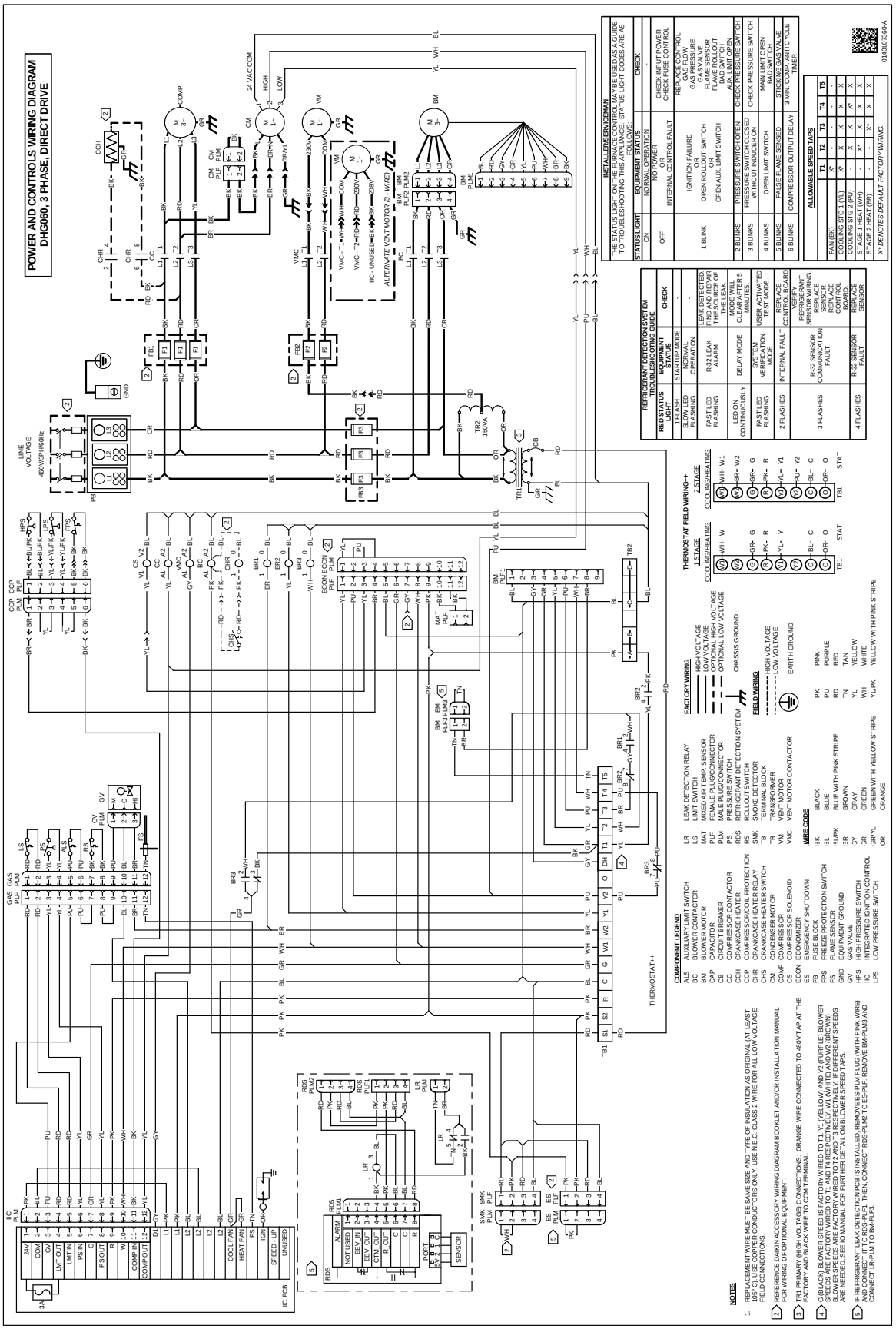
DHG060, 3 PHASE (208-230V)



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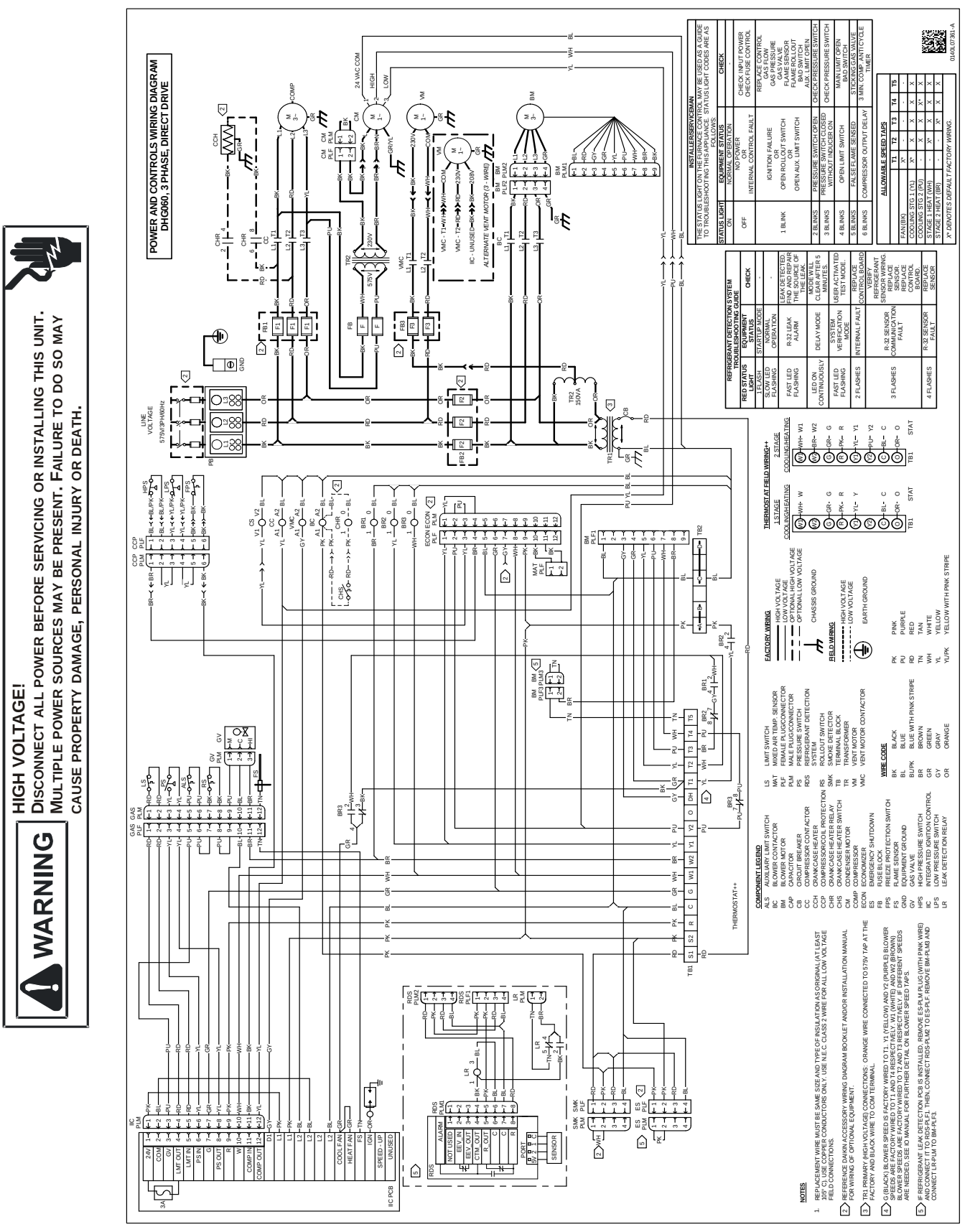
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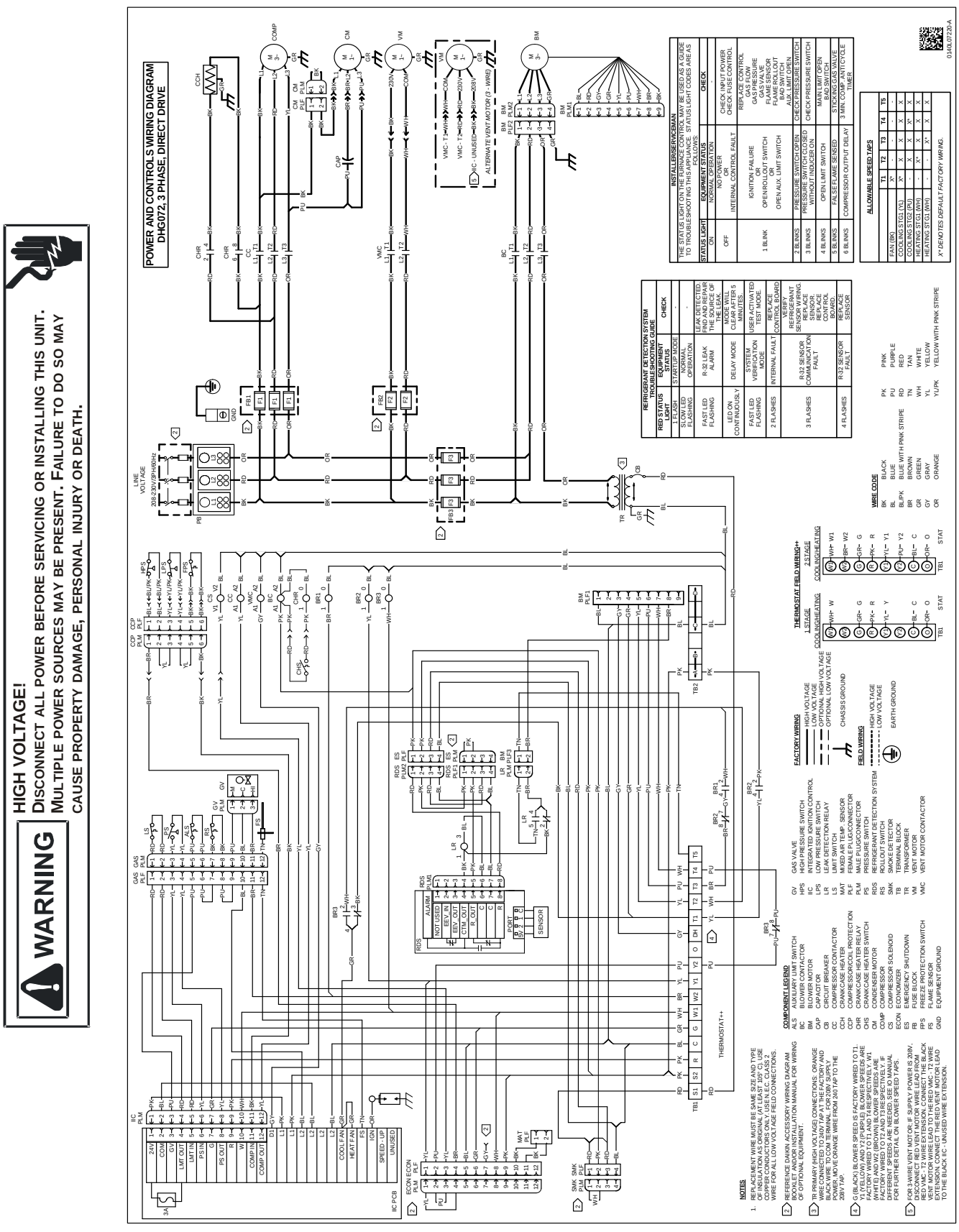
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UNIT WIRING DIAGRAMS

DHG060, 3 PHASE (575V)



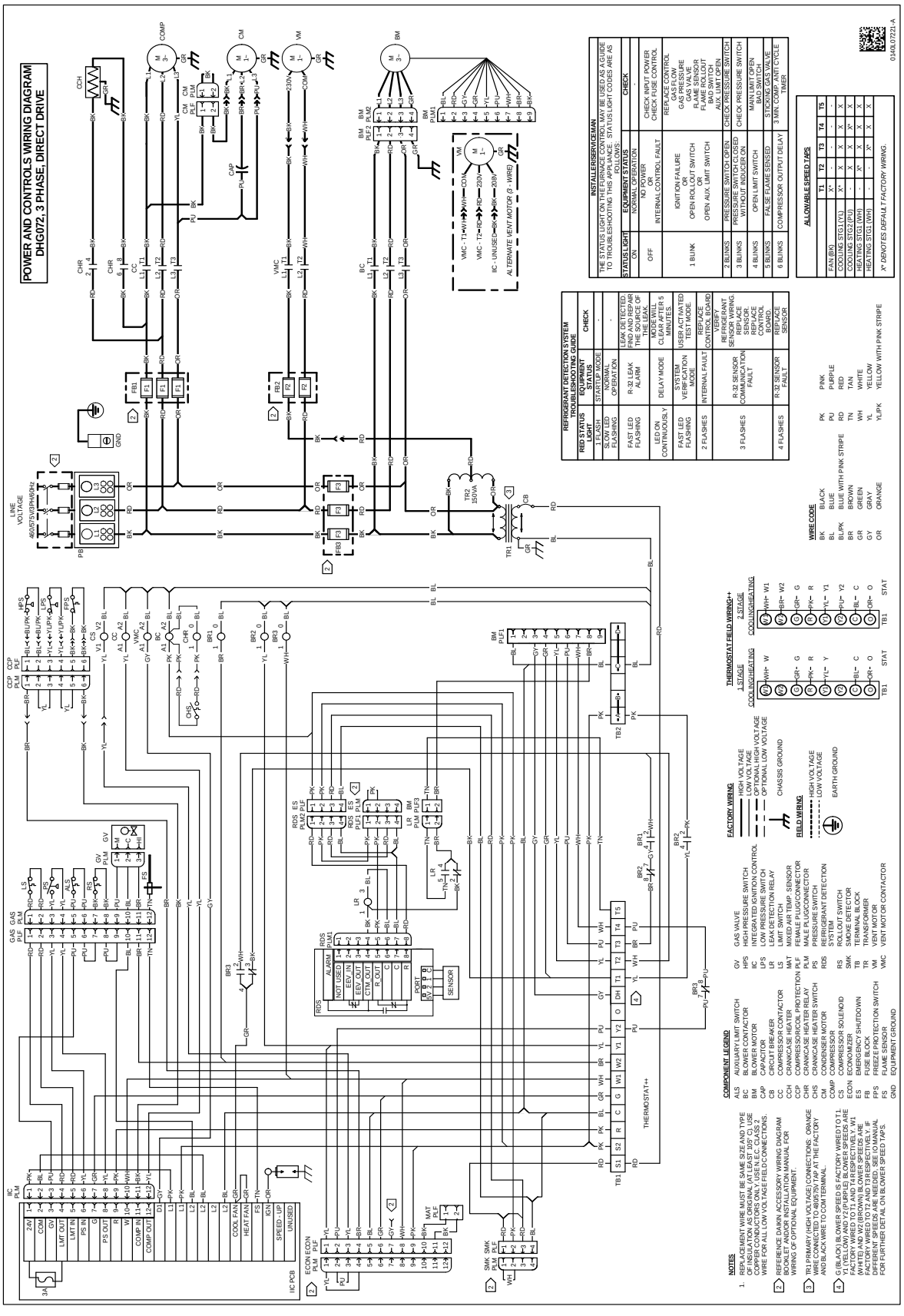
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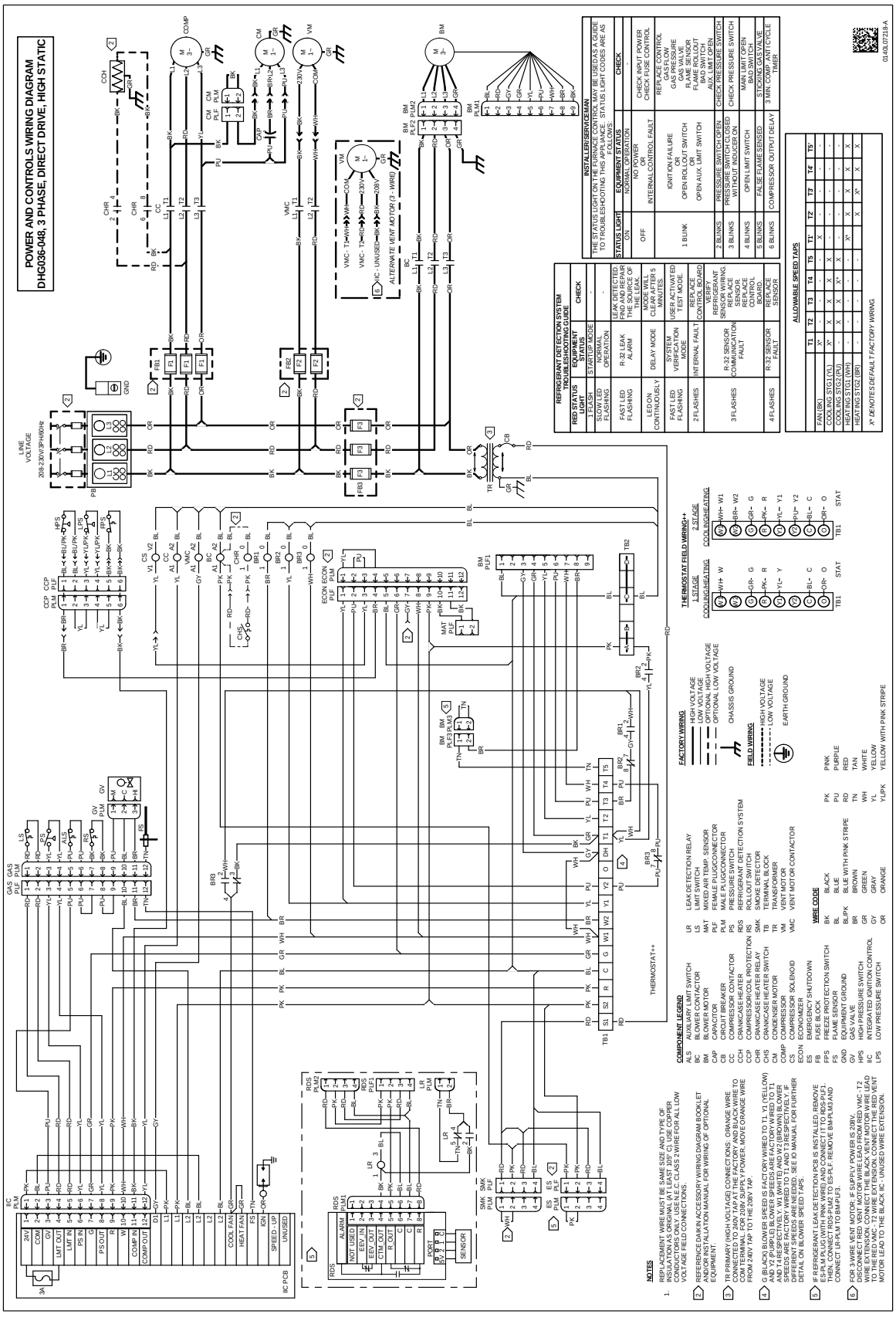
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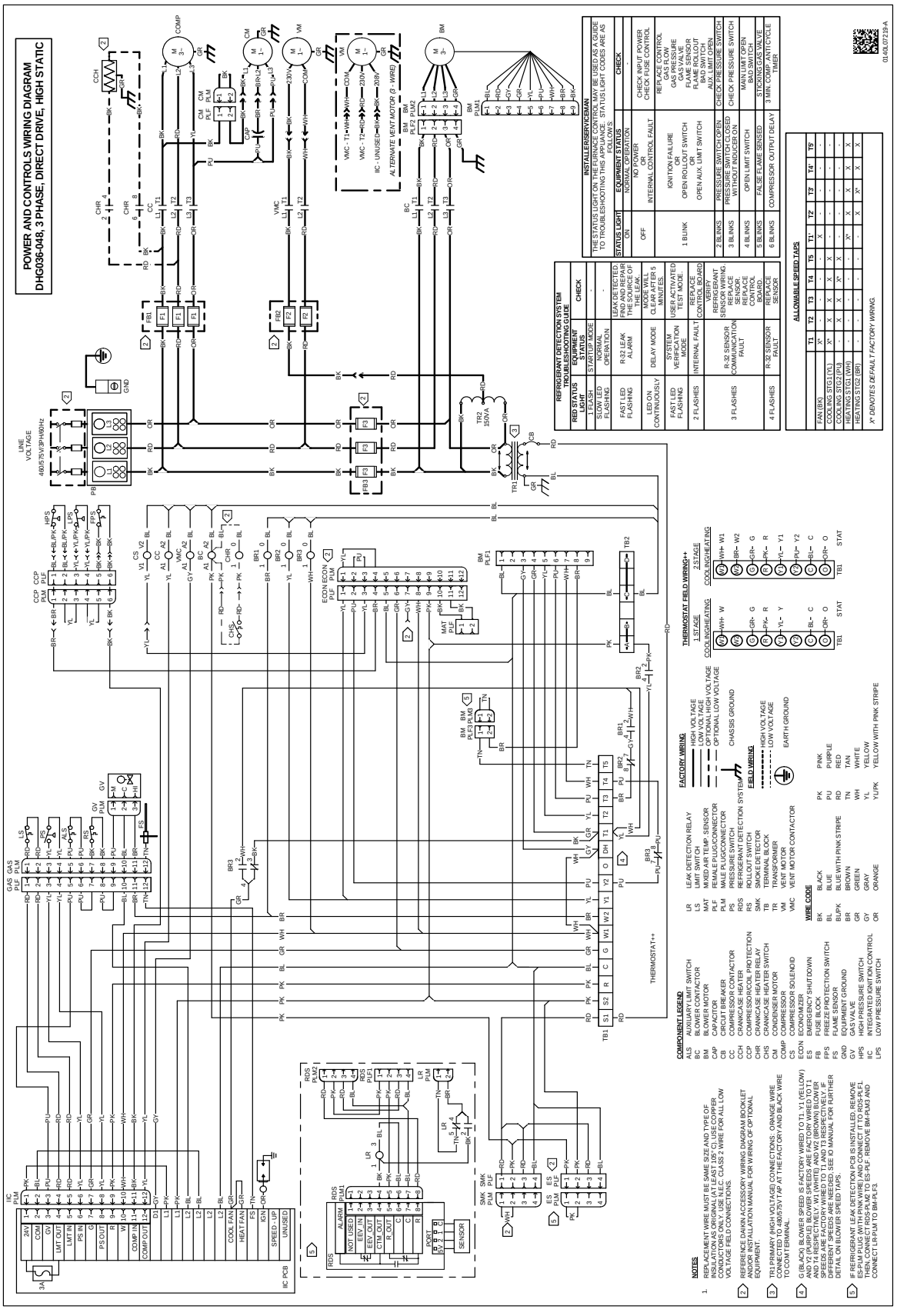
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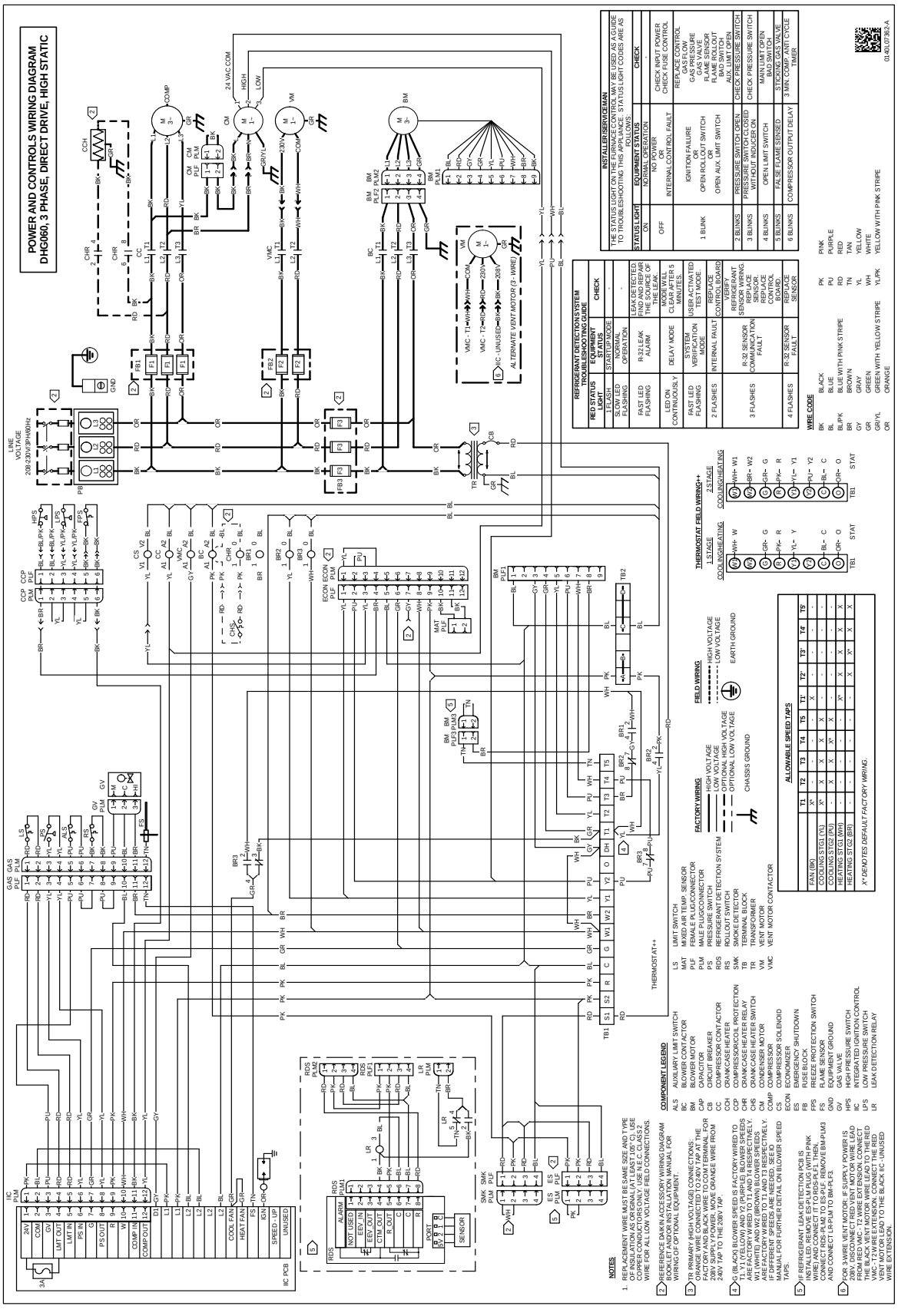
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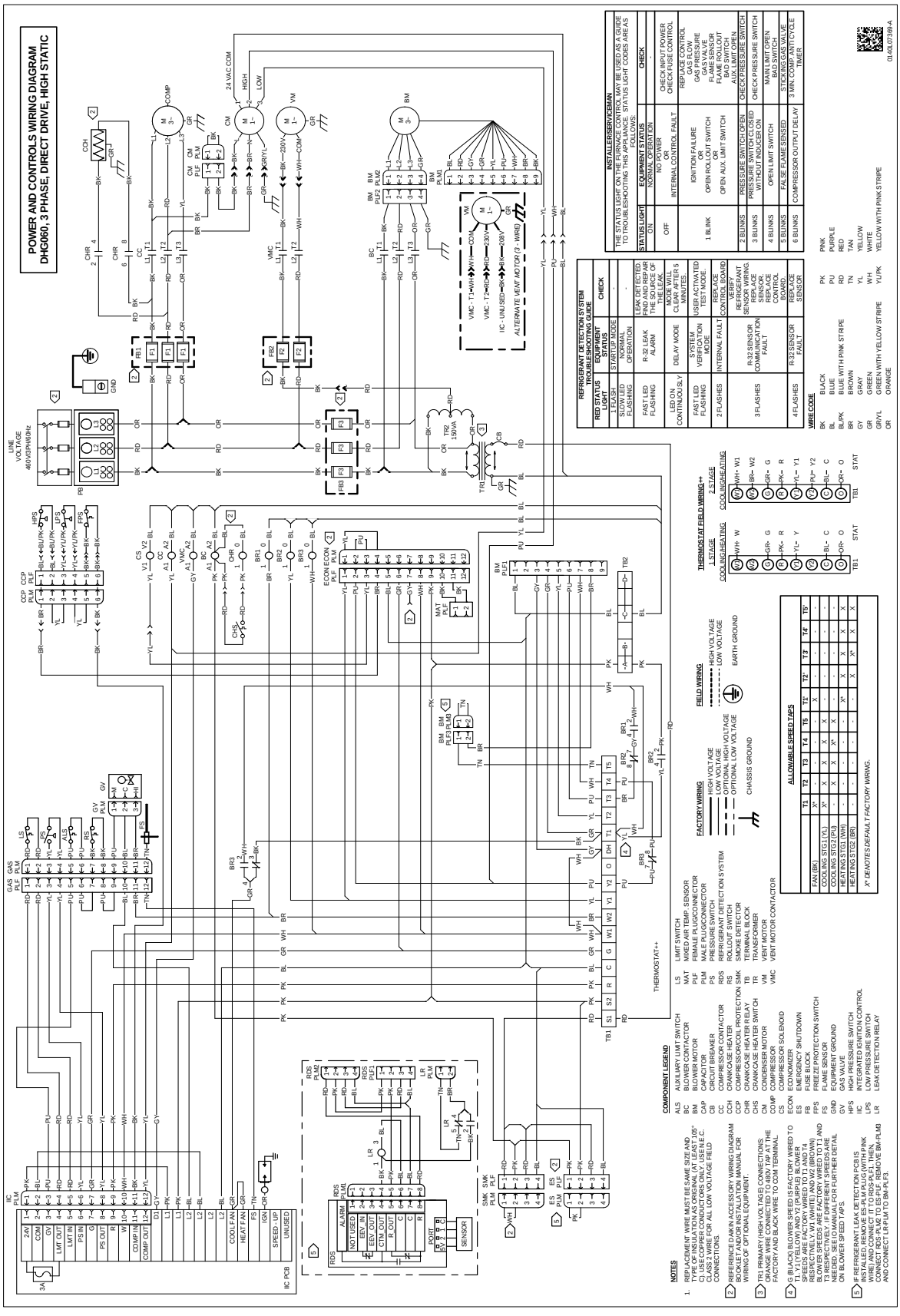
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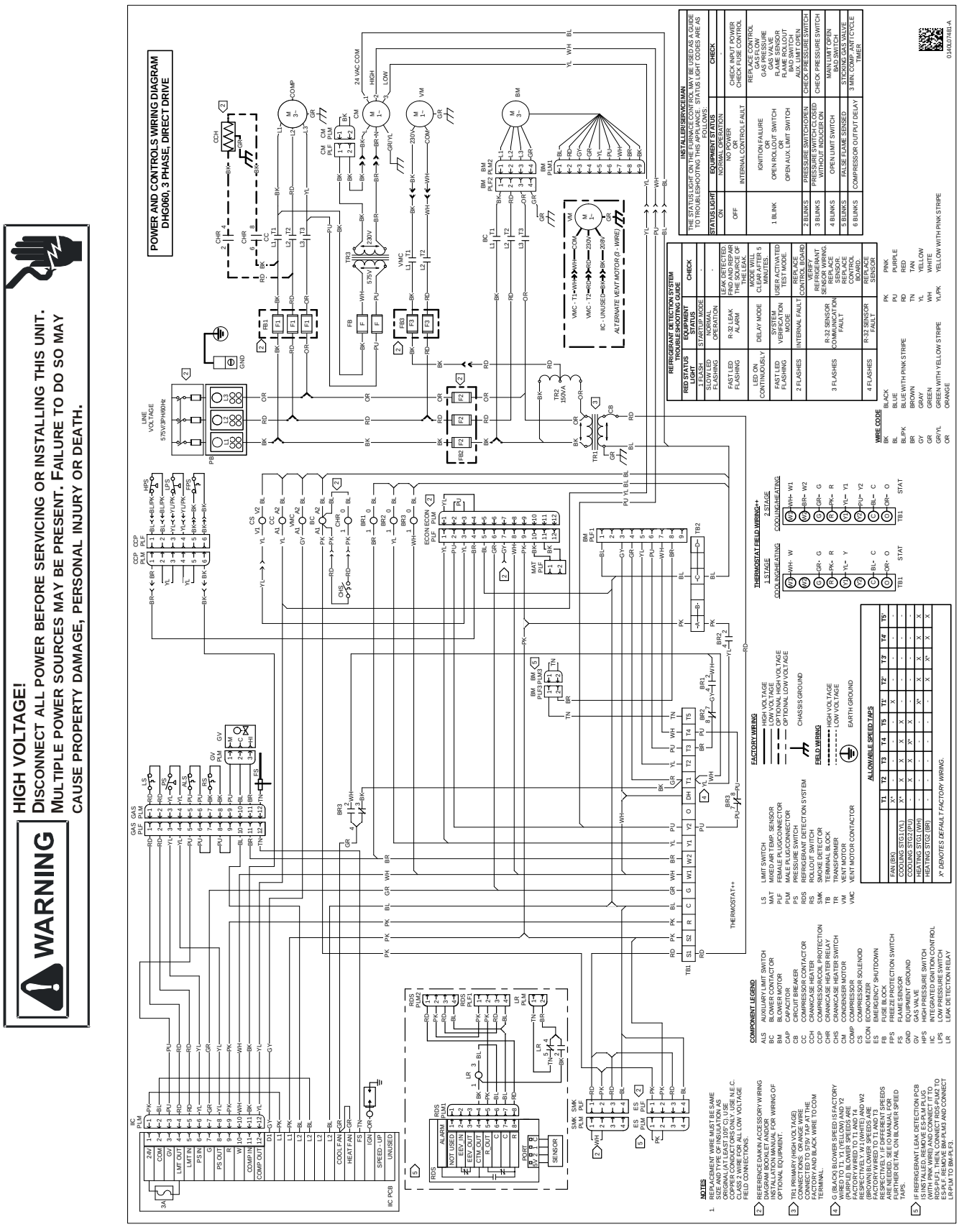
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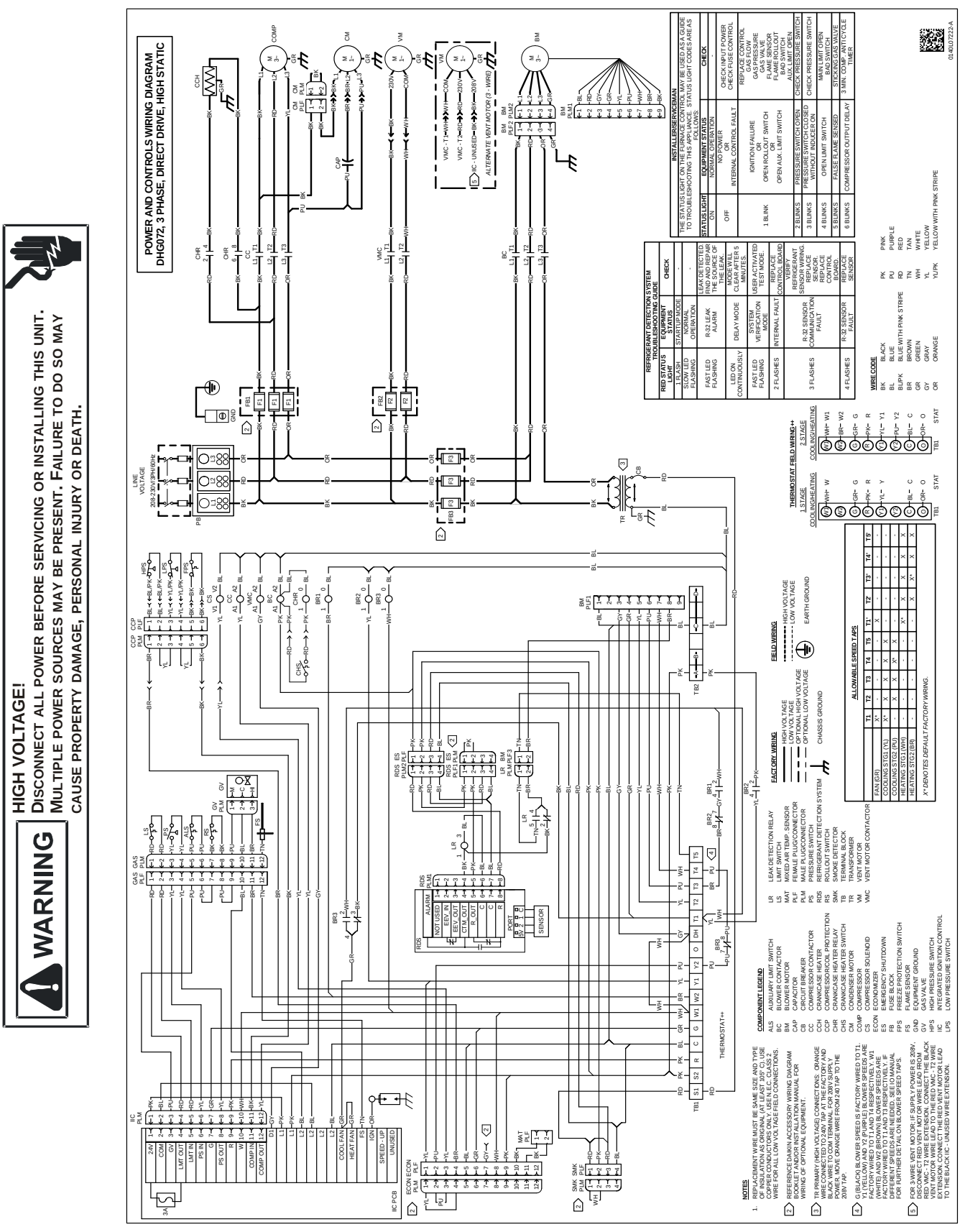
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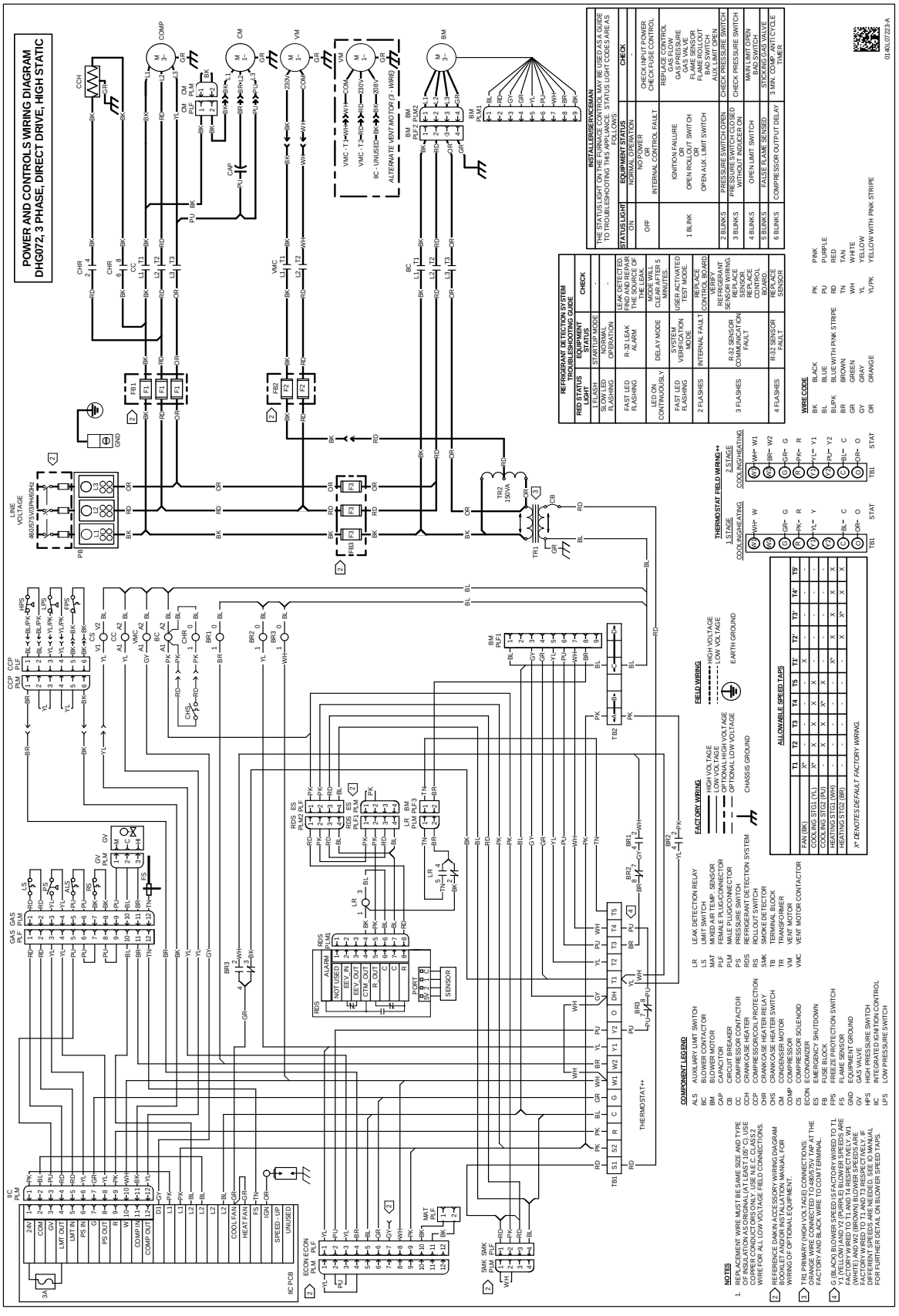
DHG072, 3 PHASE, HIGH STATIC (208-230V)



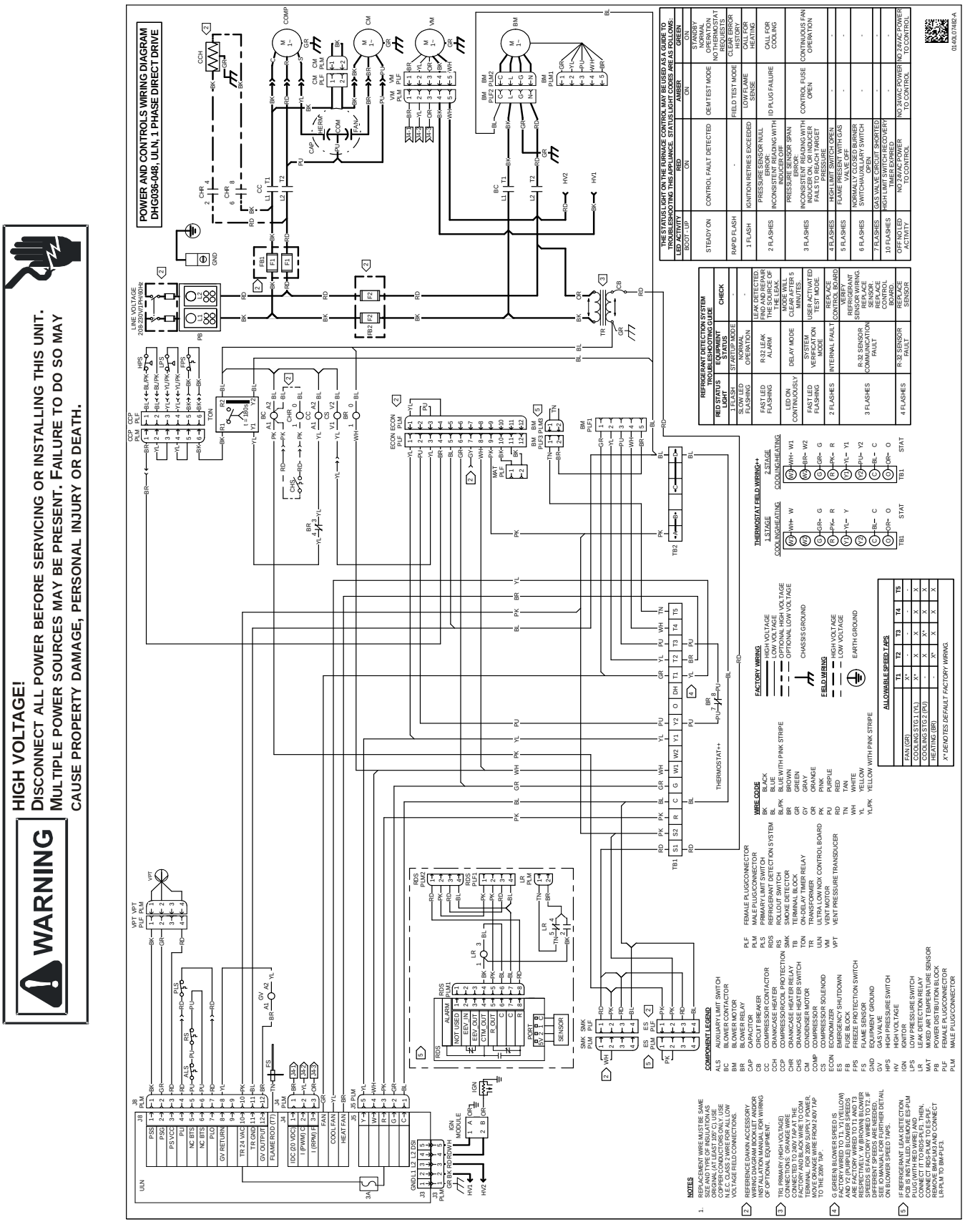
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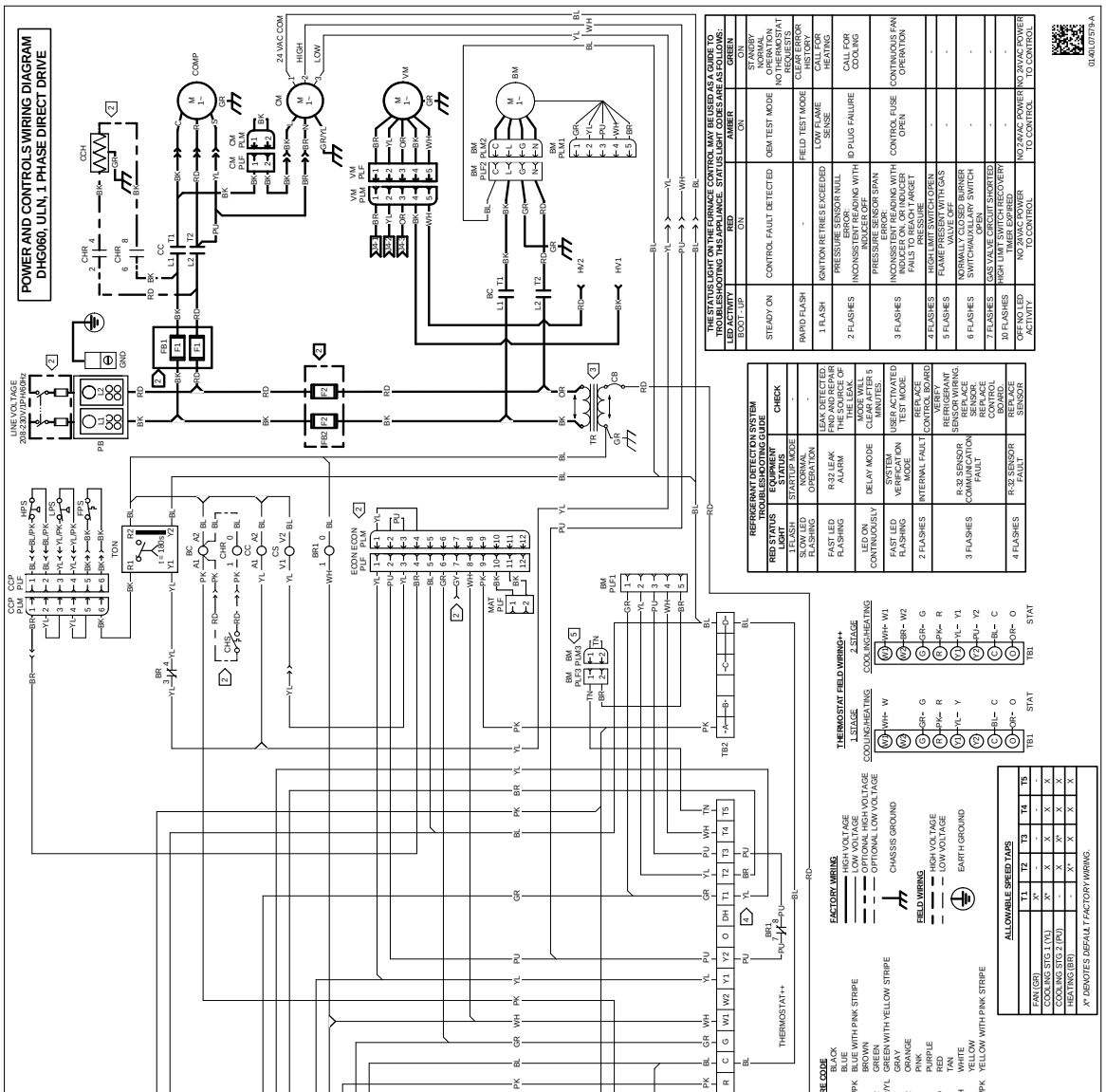
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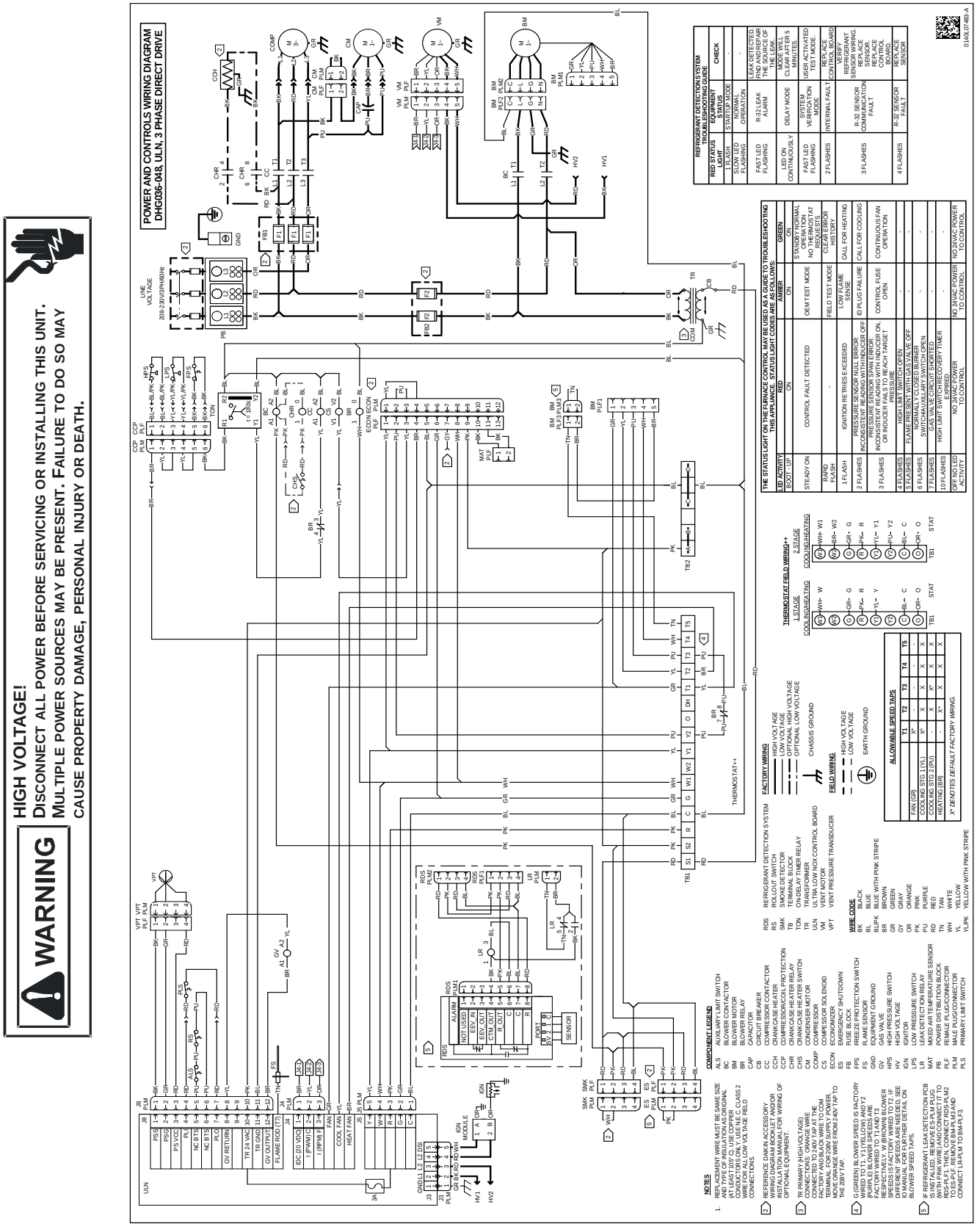
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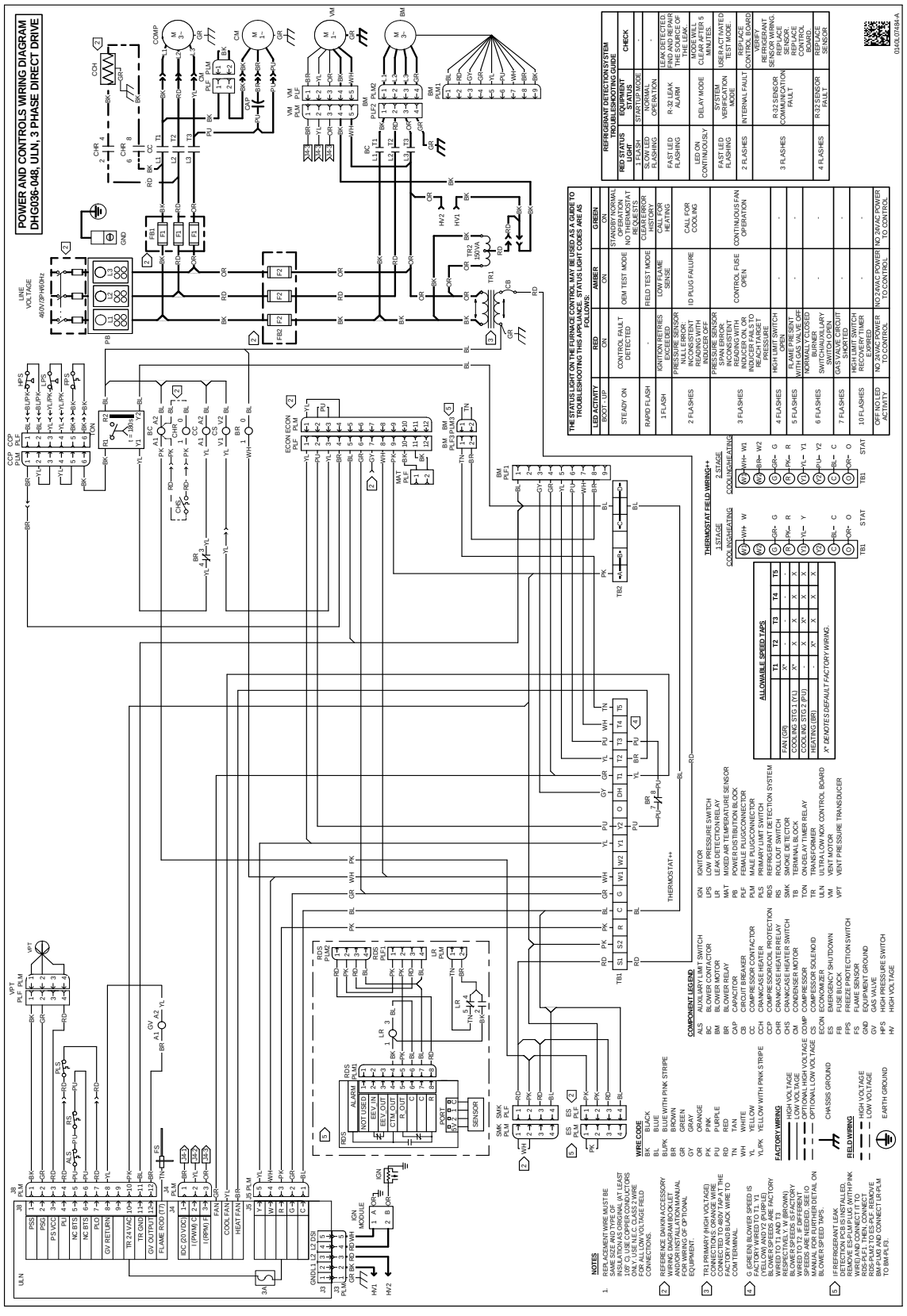
DHG036-048, 3 PHASE, ULN (208-230V)



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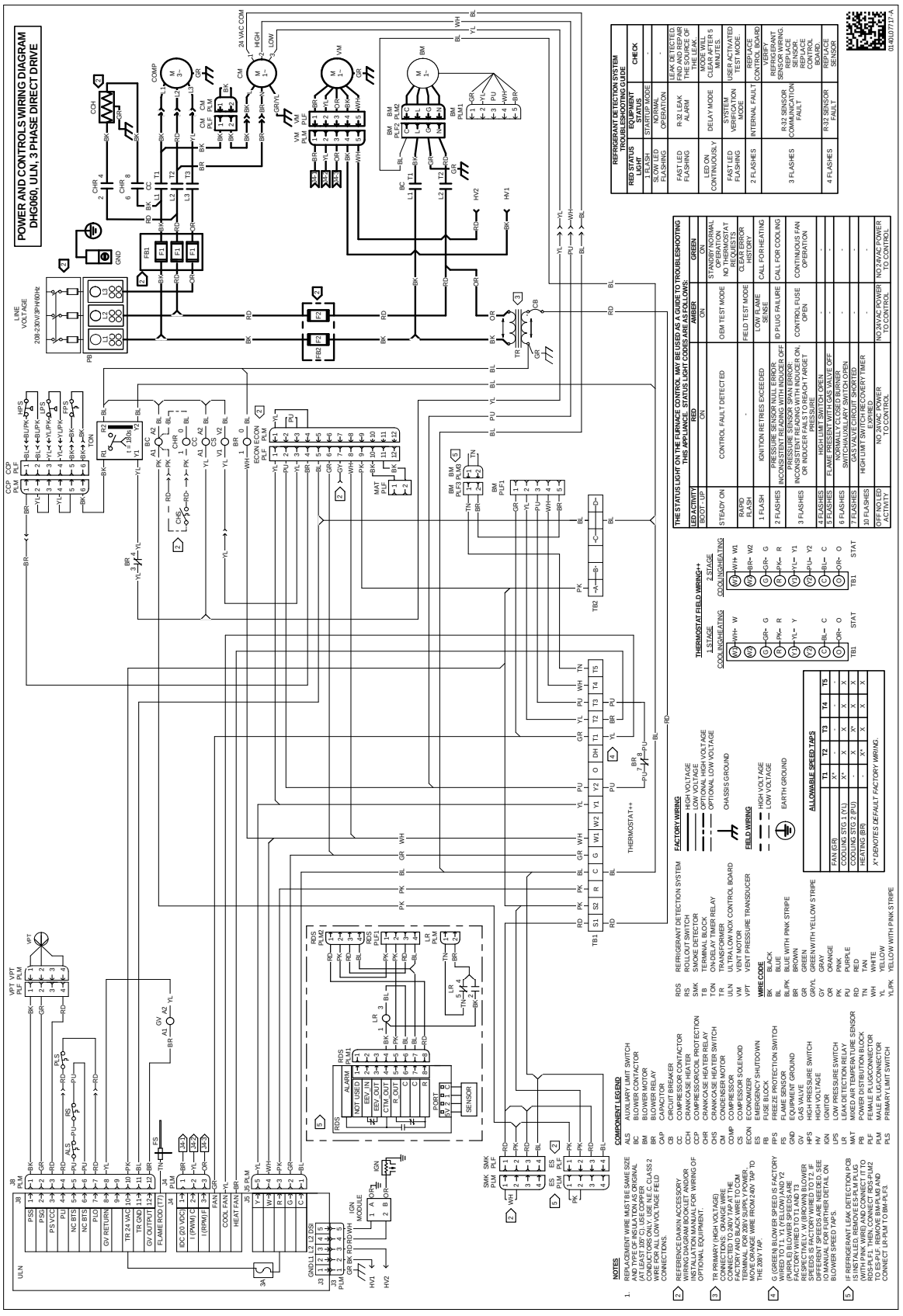
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UNIT WIRING DIAGRAMS

DHG060, 3 PHASE, ULN (208-230V)

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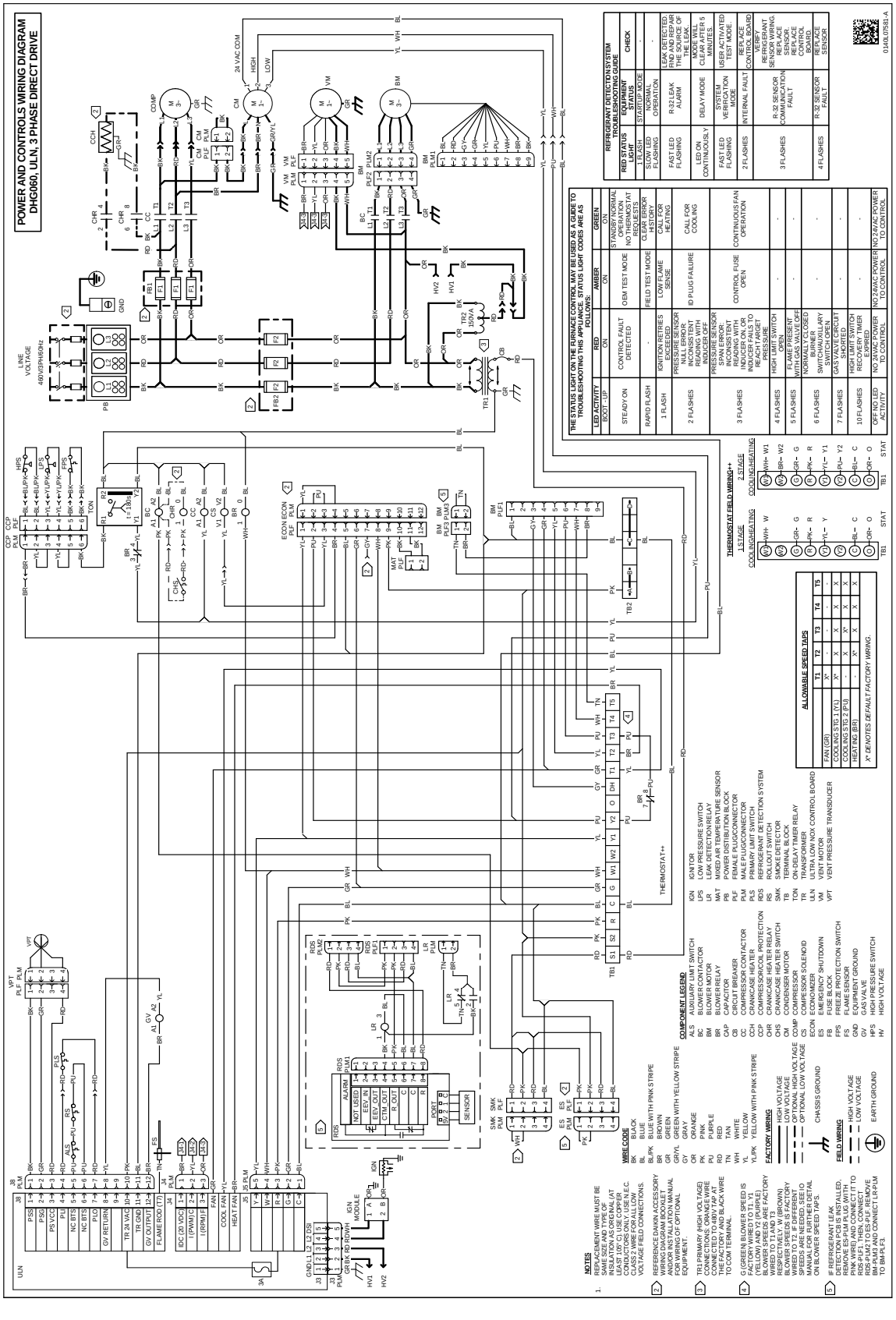
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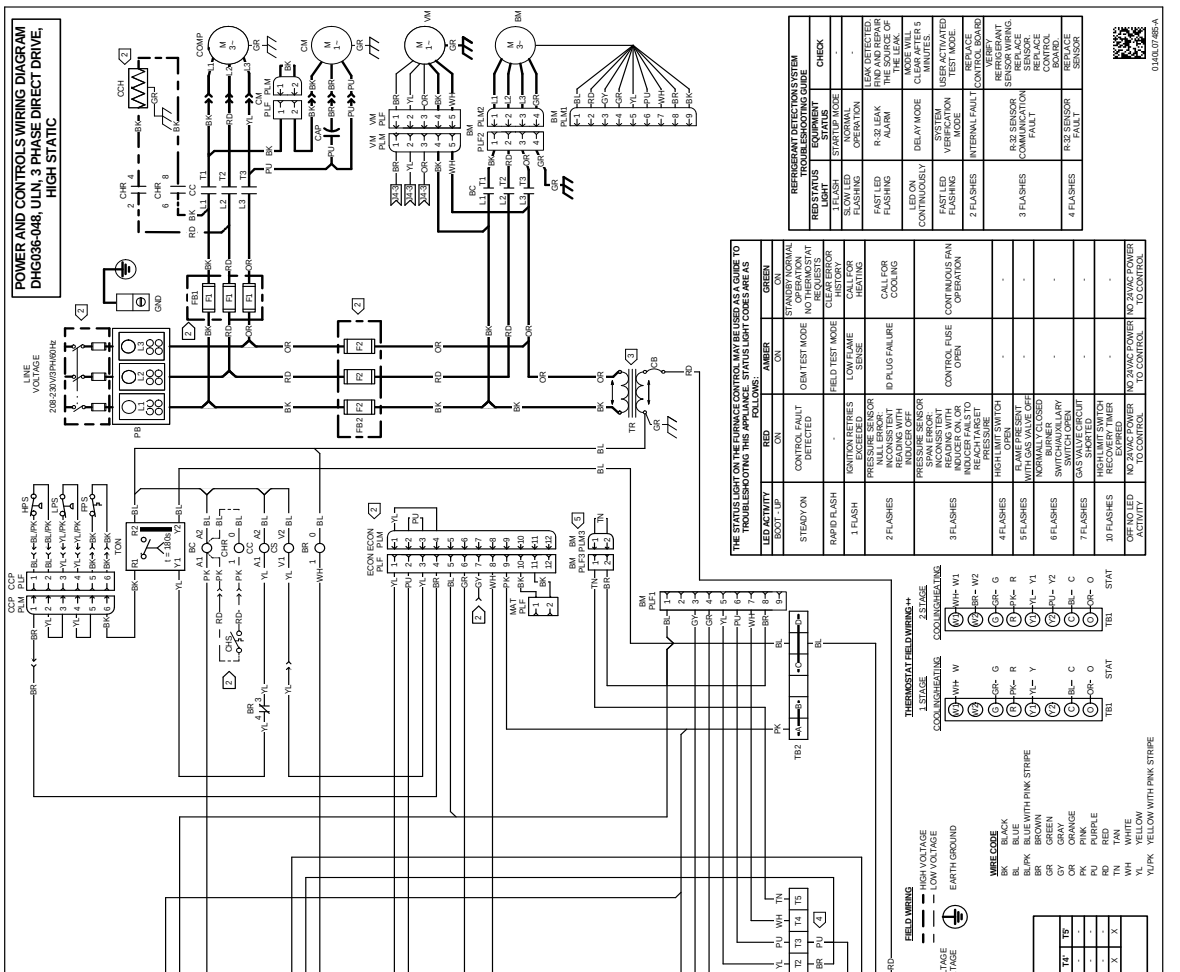
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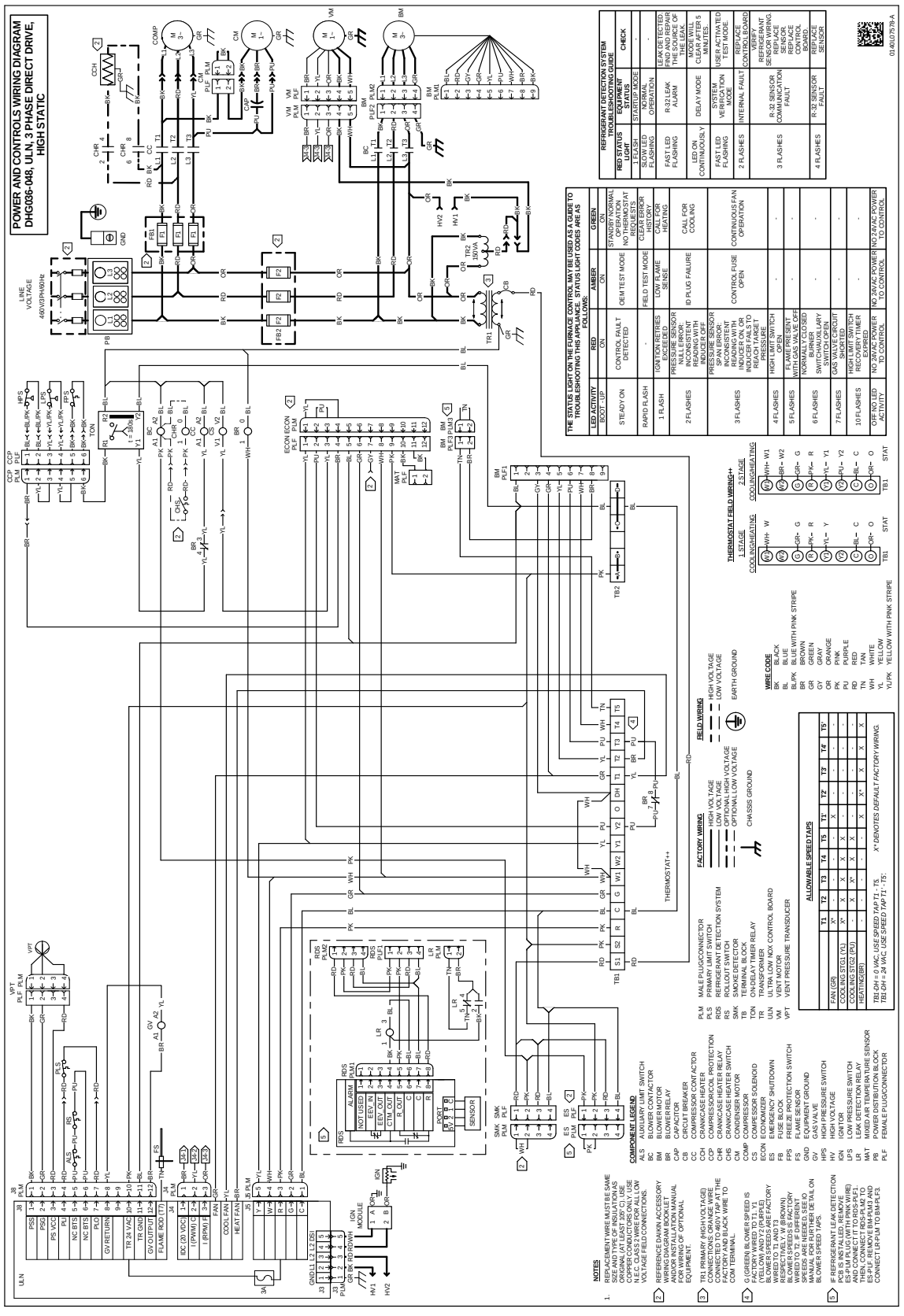
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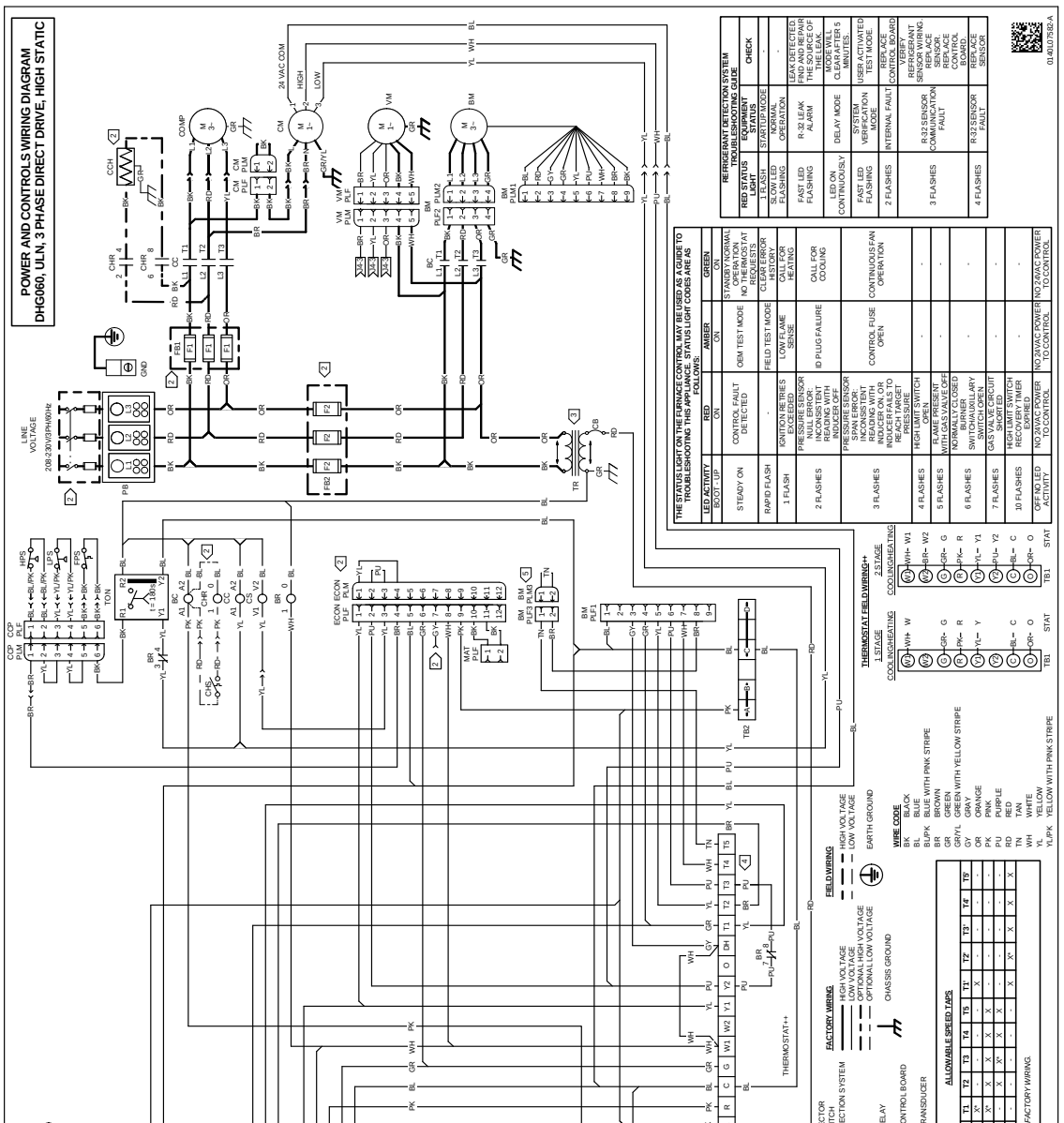
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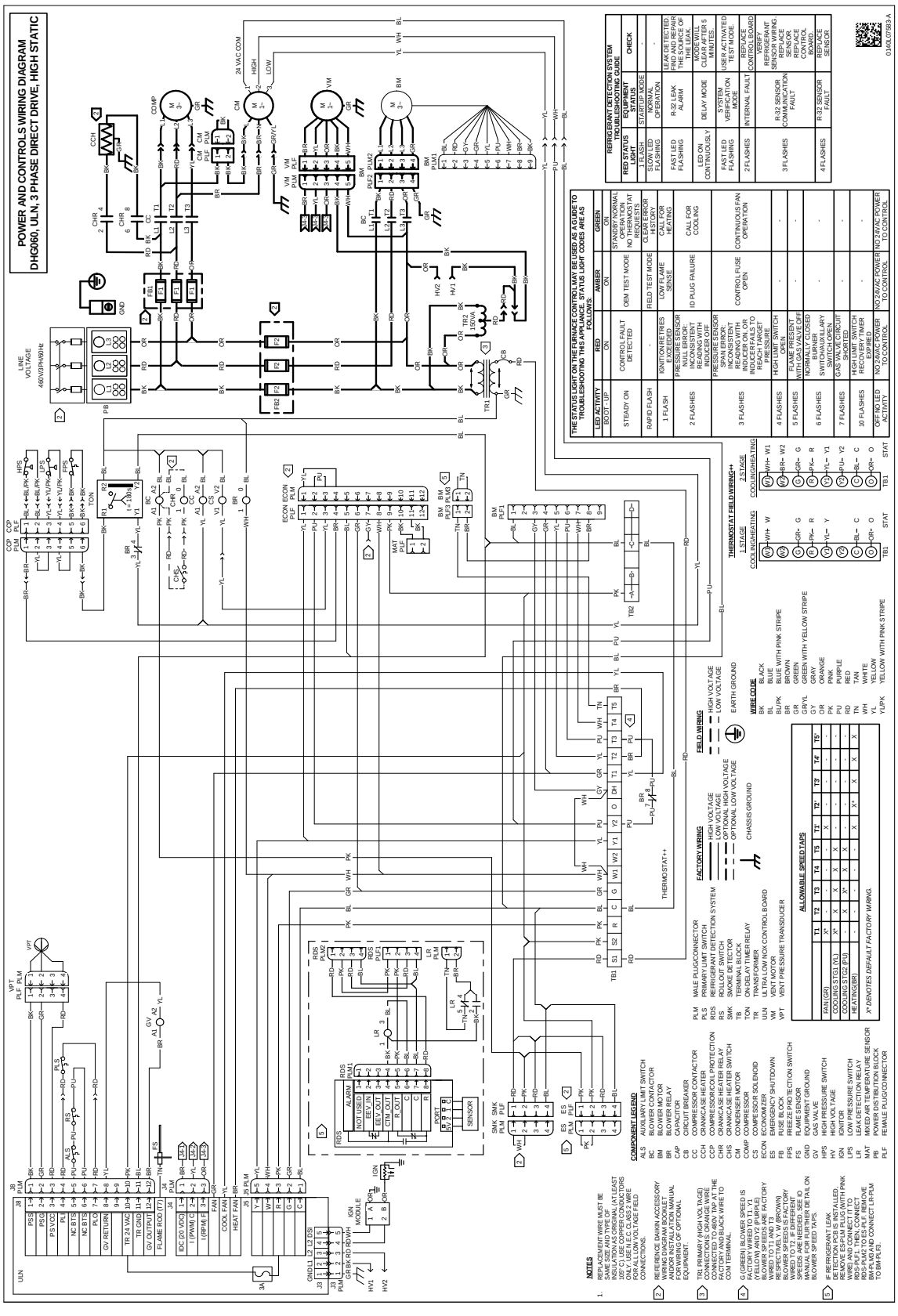
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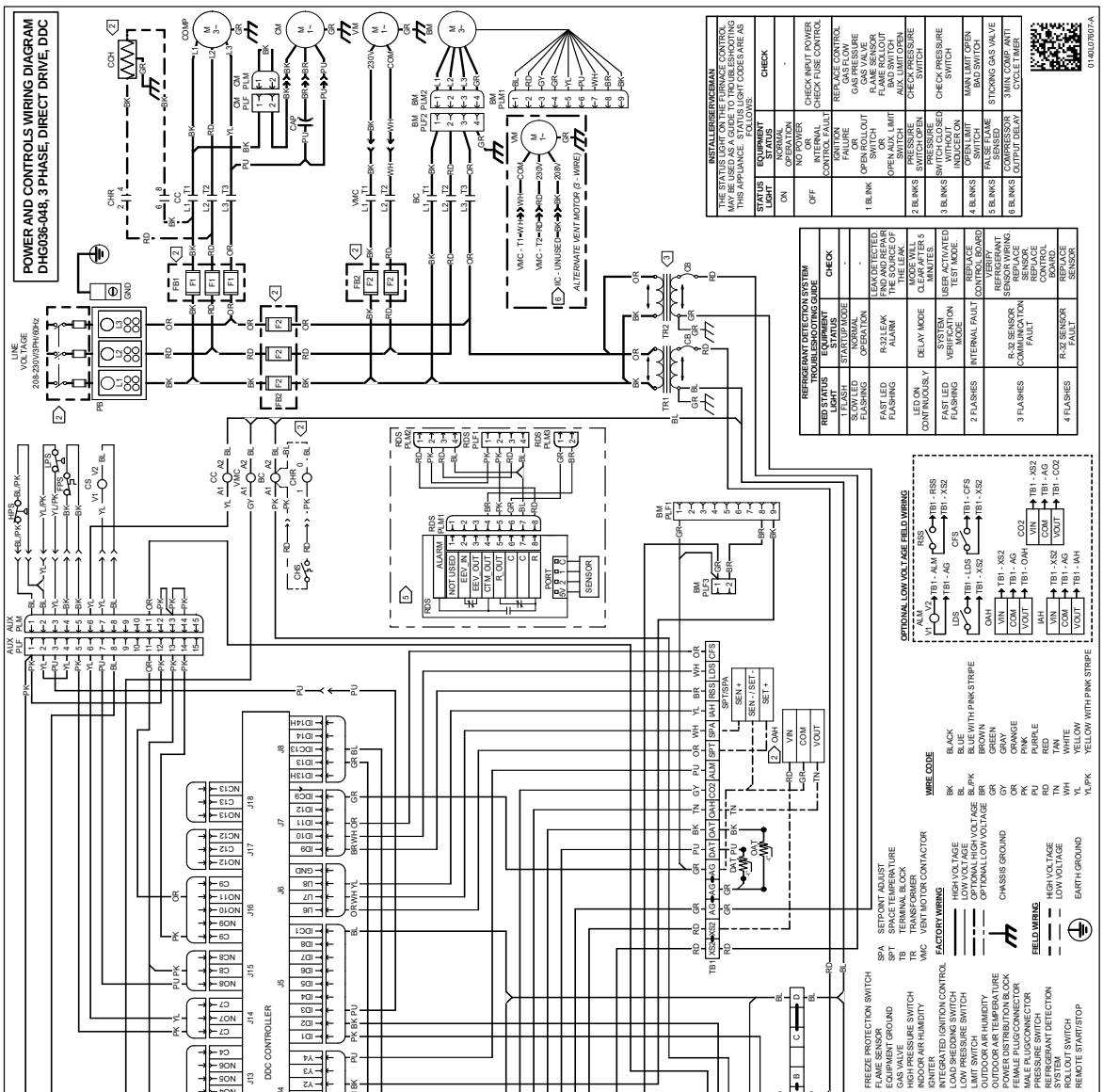
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UNIT WIRING DIAGRAMS

DHG036-048, 3 PHASE, DDC (208-230V)

WARNING

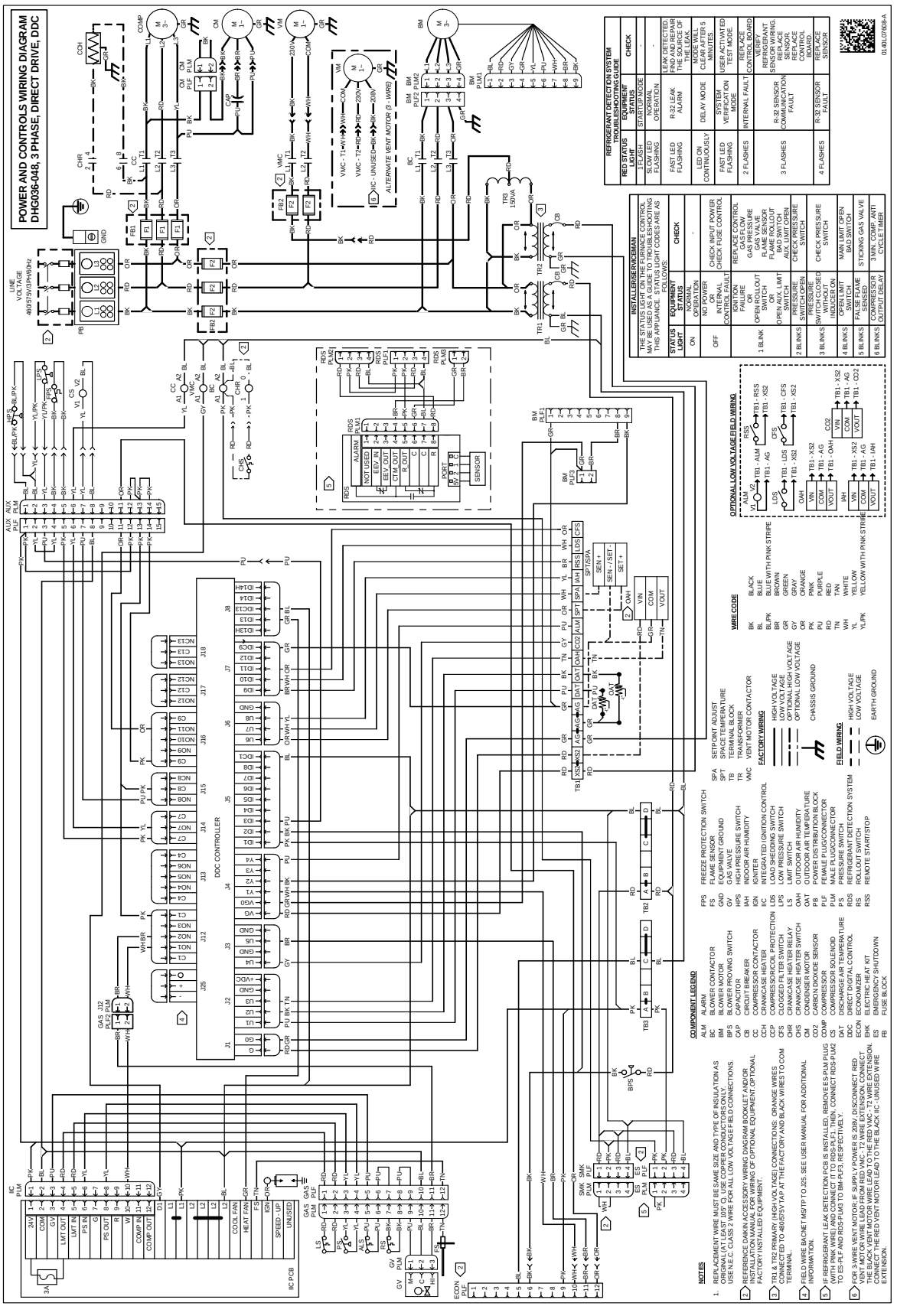
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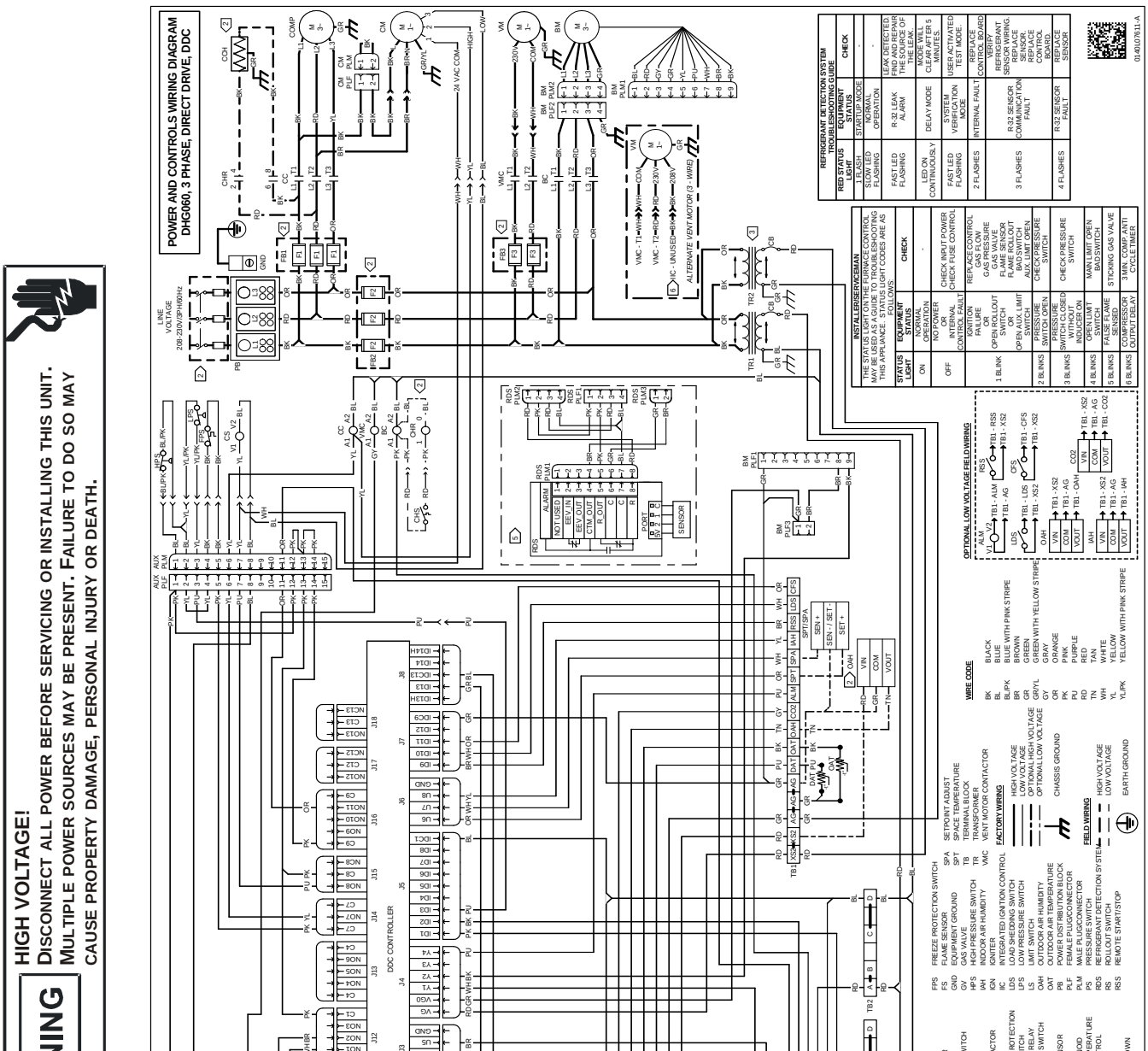
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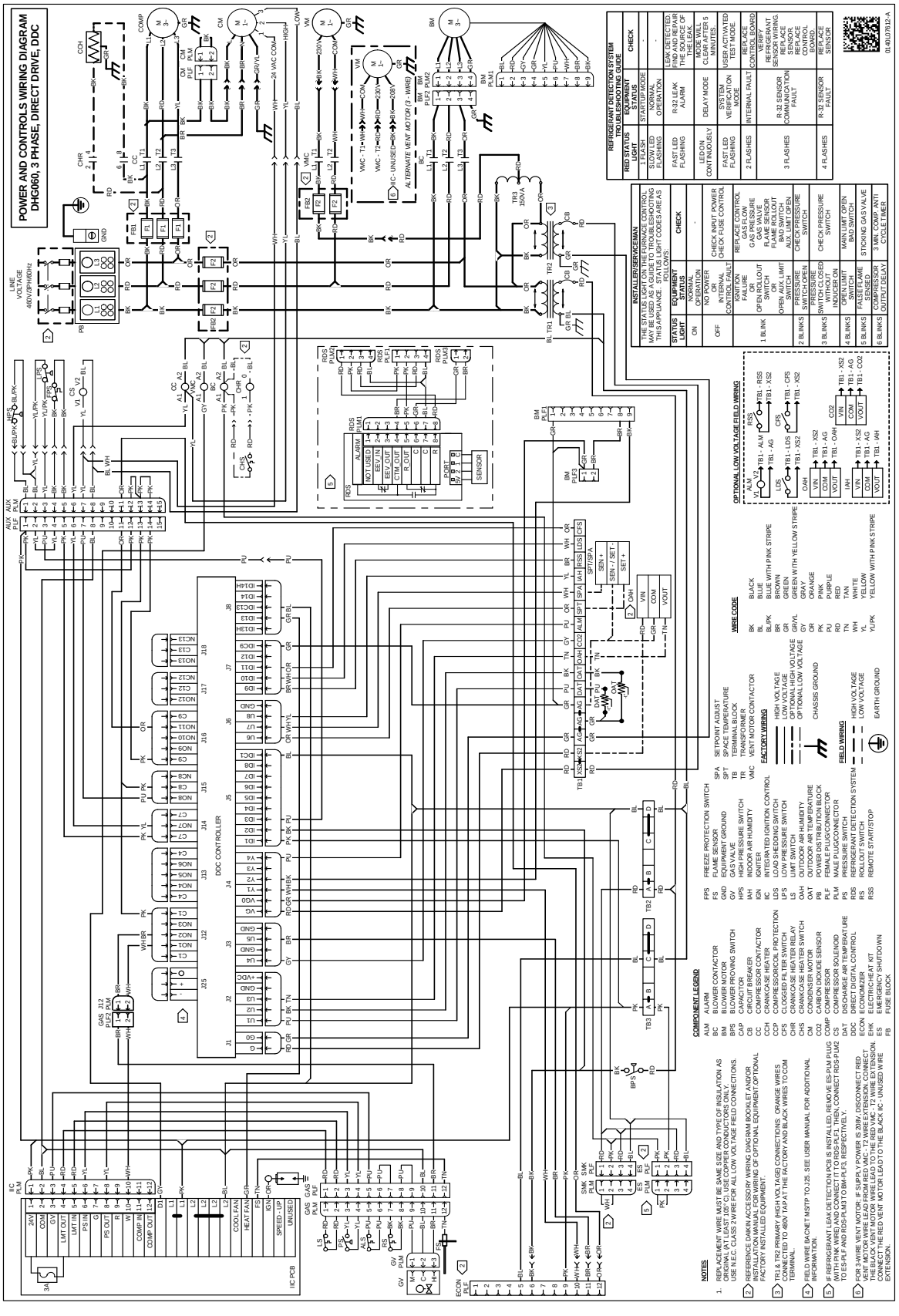
DHG060, 3 PHASE, DDC (208-230V)



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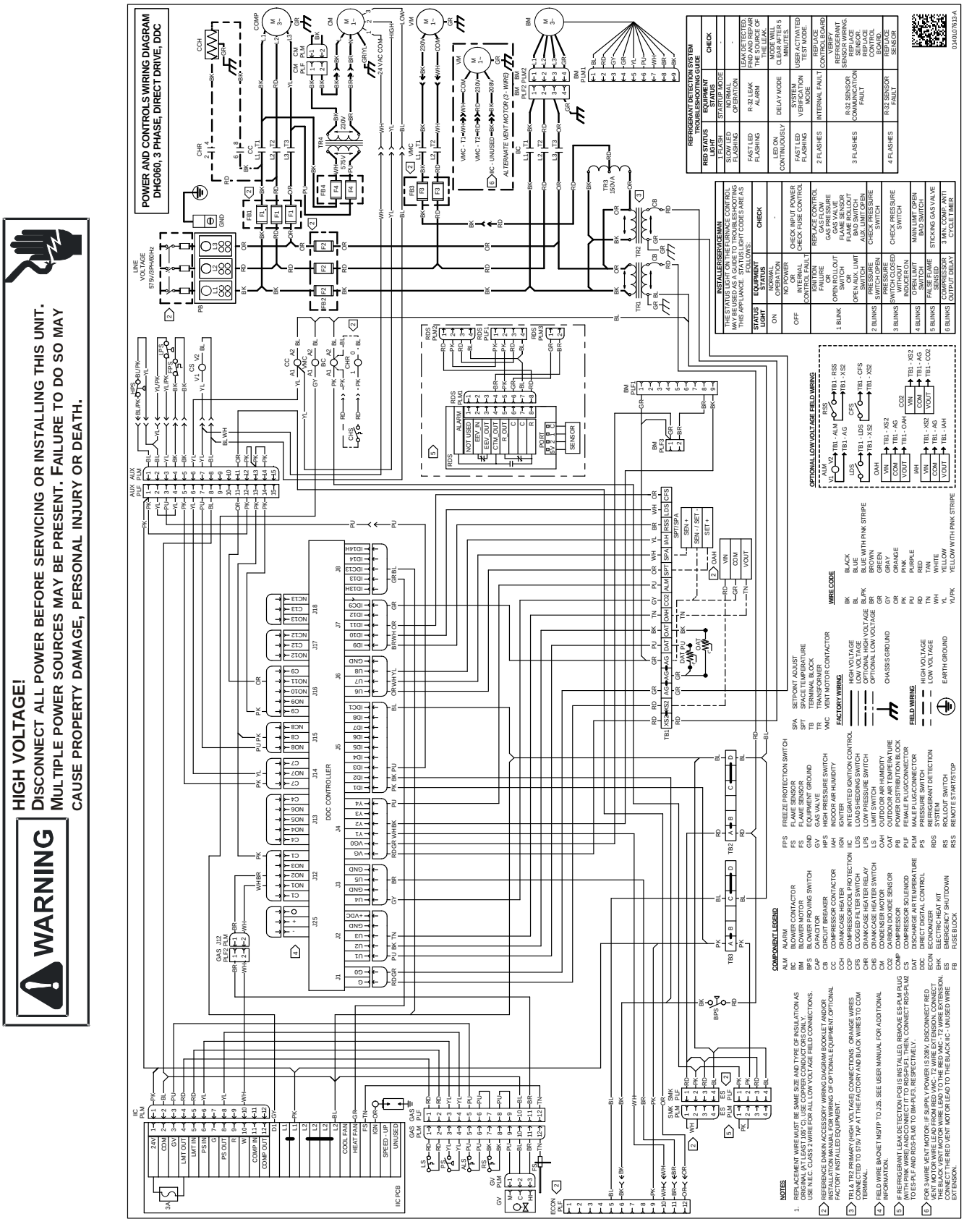
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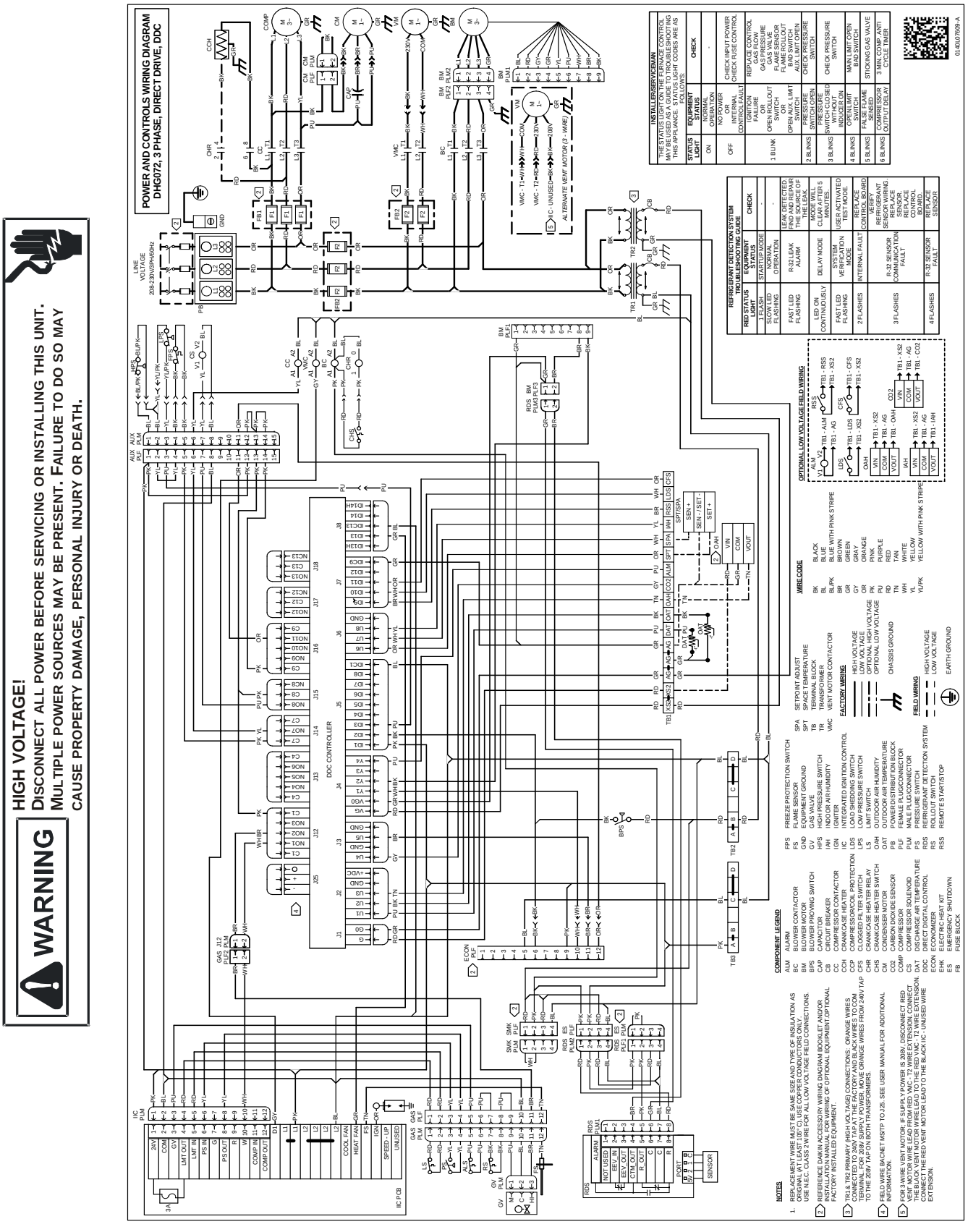
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UNIT WIRING DIAGRAMS

DHG060, 3 PHASE, DDC (575V)



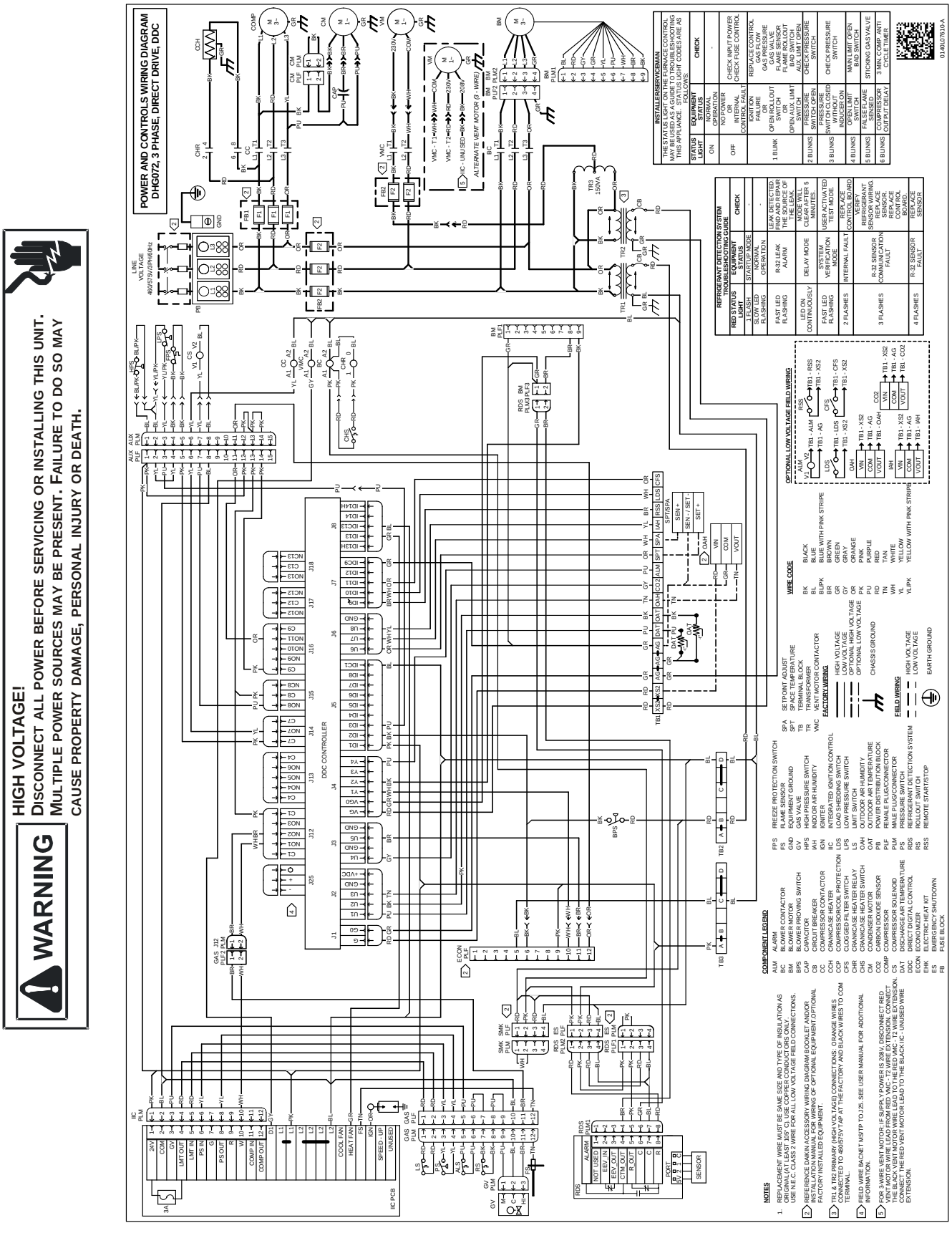
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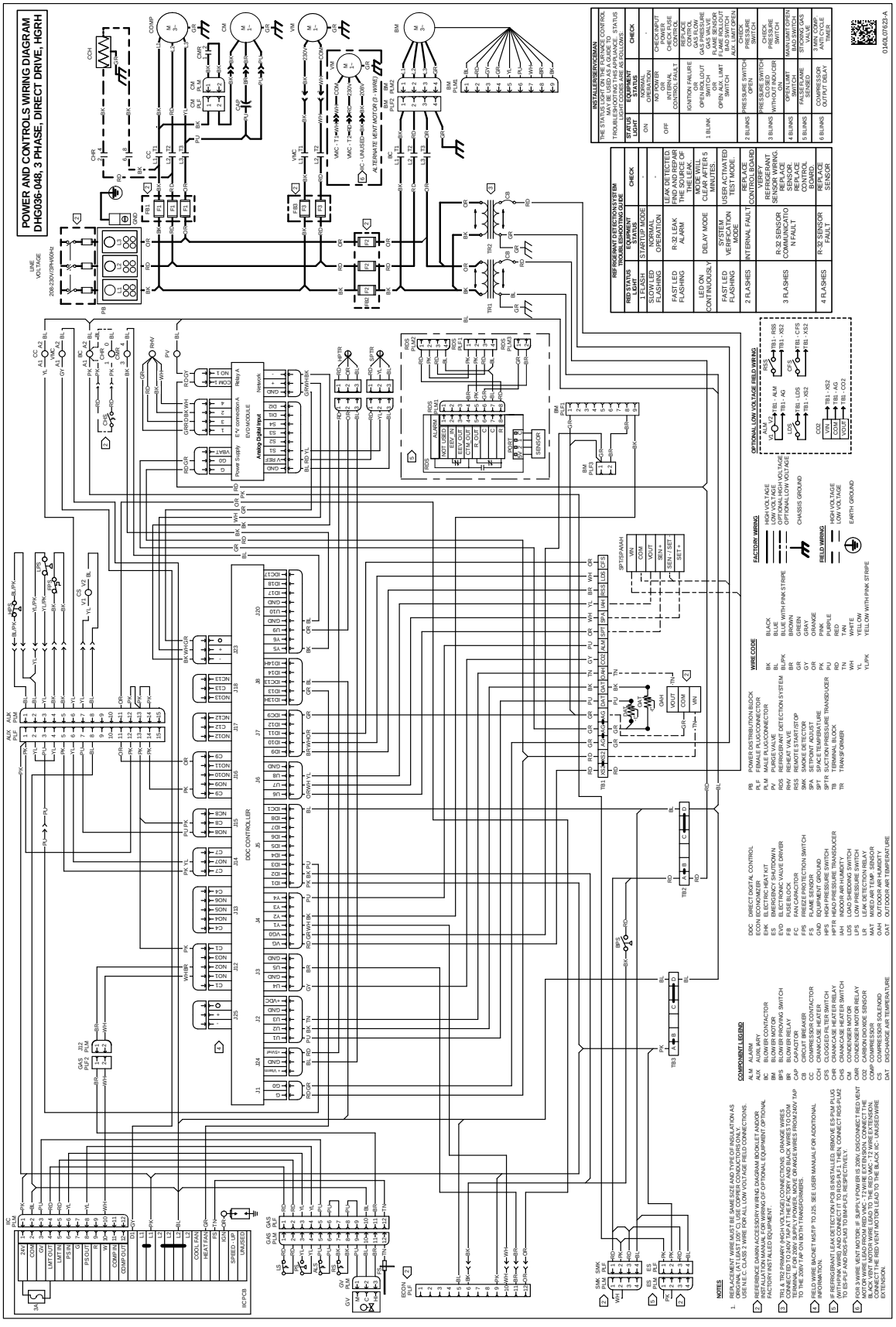
UNIT WIRING DIAGRAMS

DHG072, 3 PHASE, DDC (460/575V)



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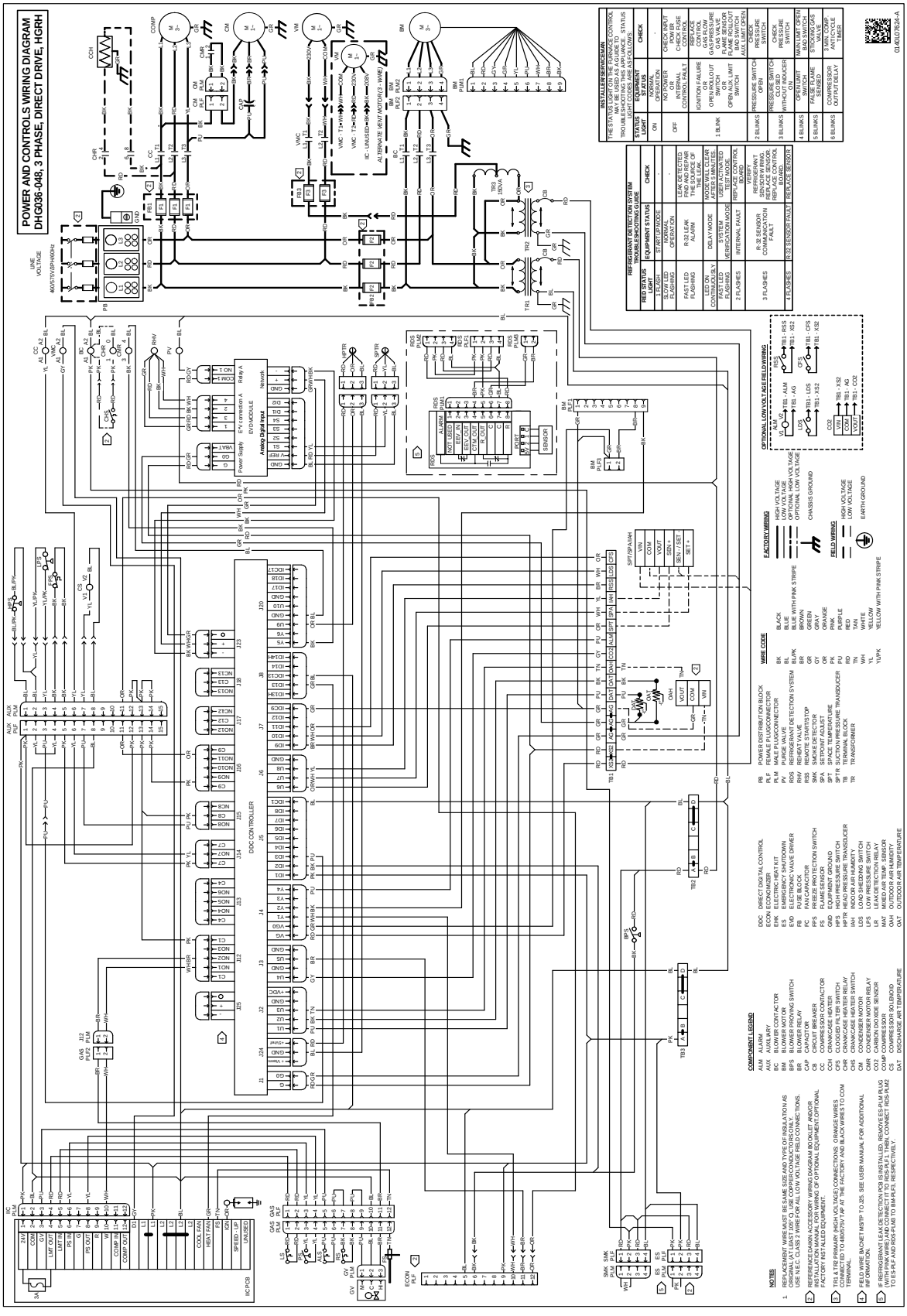


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UNIT WIRING DIAGRAMS

DHG036-048, 3 PHASE, HGRH (460/575V)

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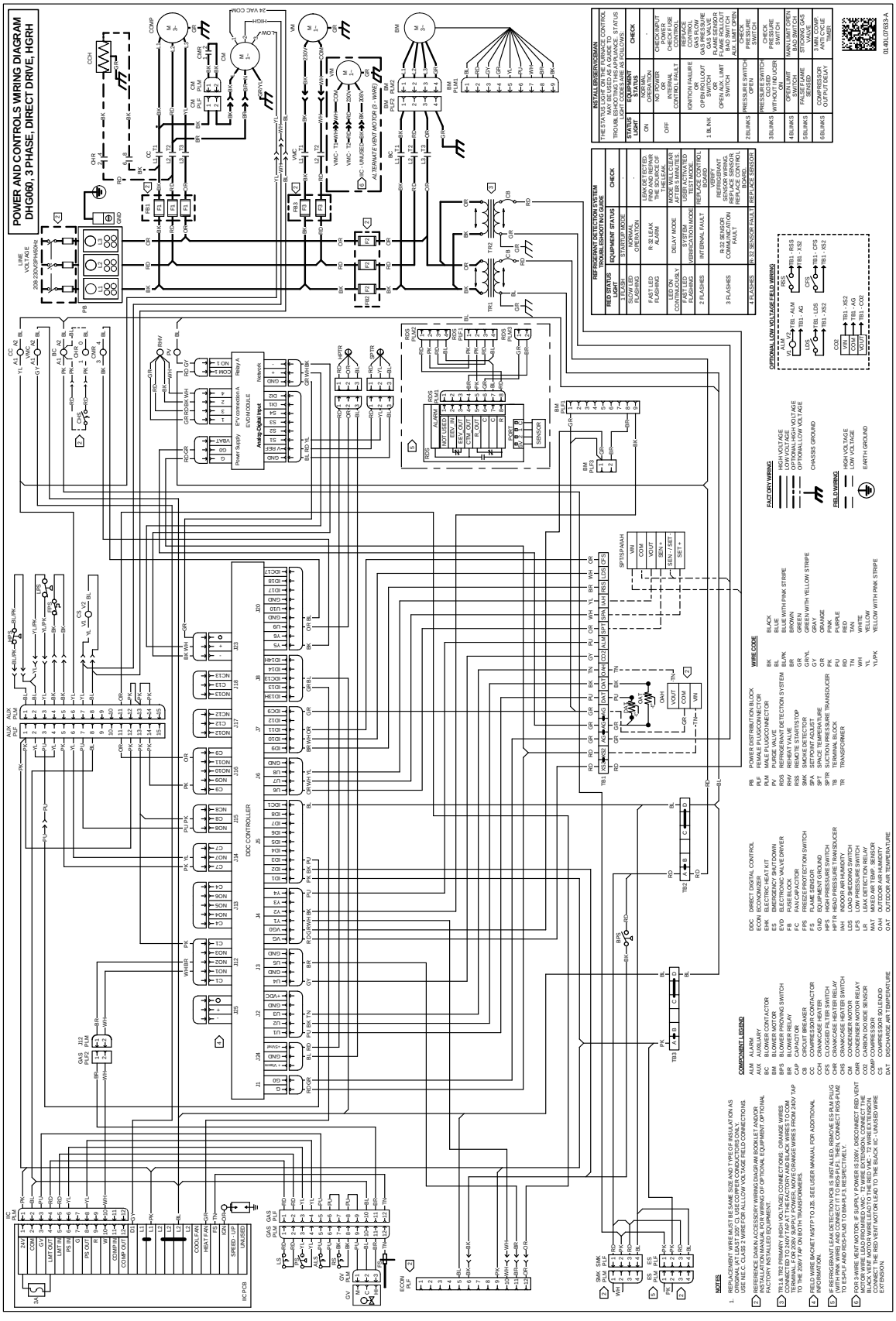
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UNIT WIRING DIAGRAMS

DHG060, 3 PHASE, HGRH (208-230V)

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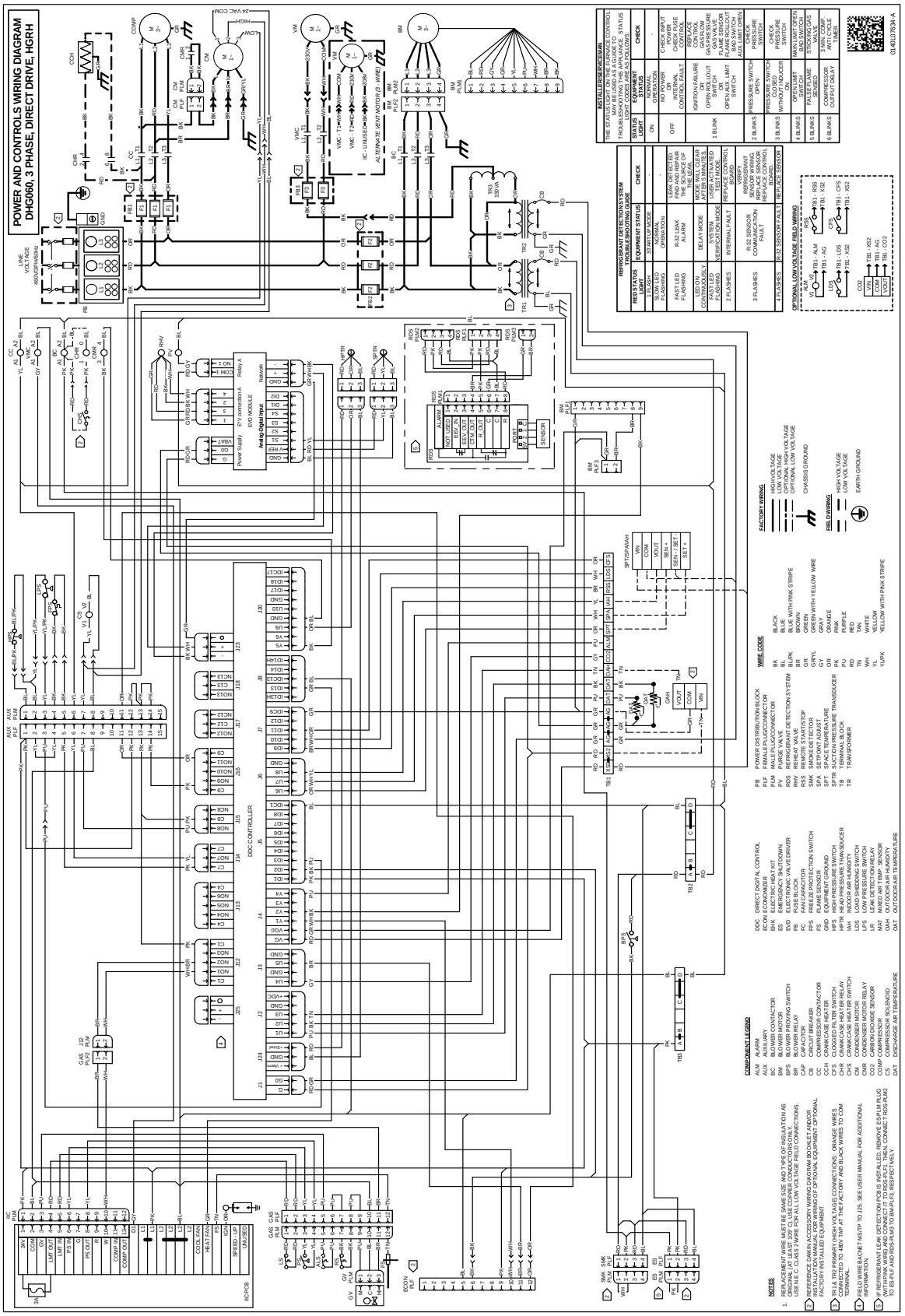
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UNIT WIRING DIAGRAMS

DHG060, 3 PHASE, HGRH (460V)

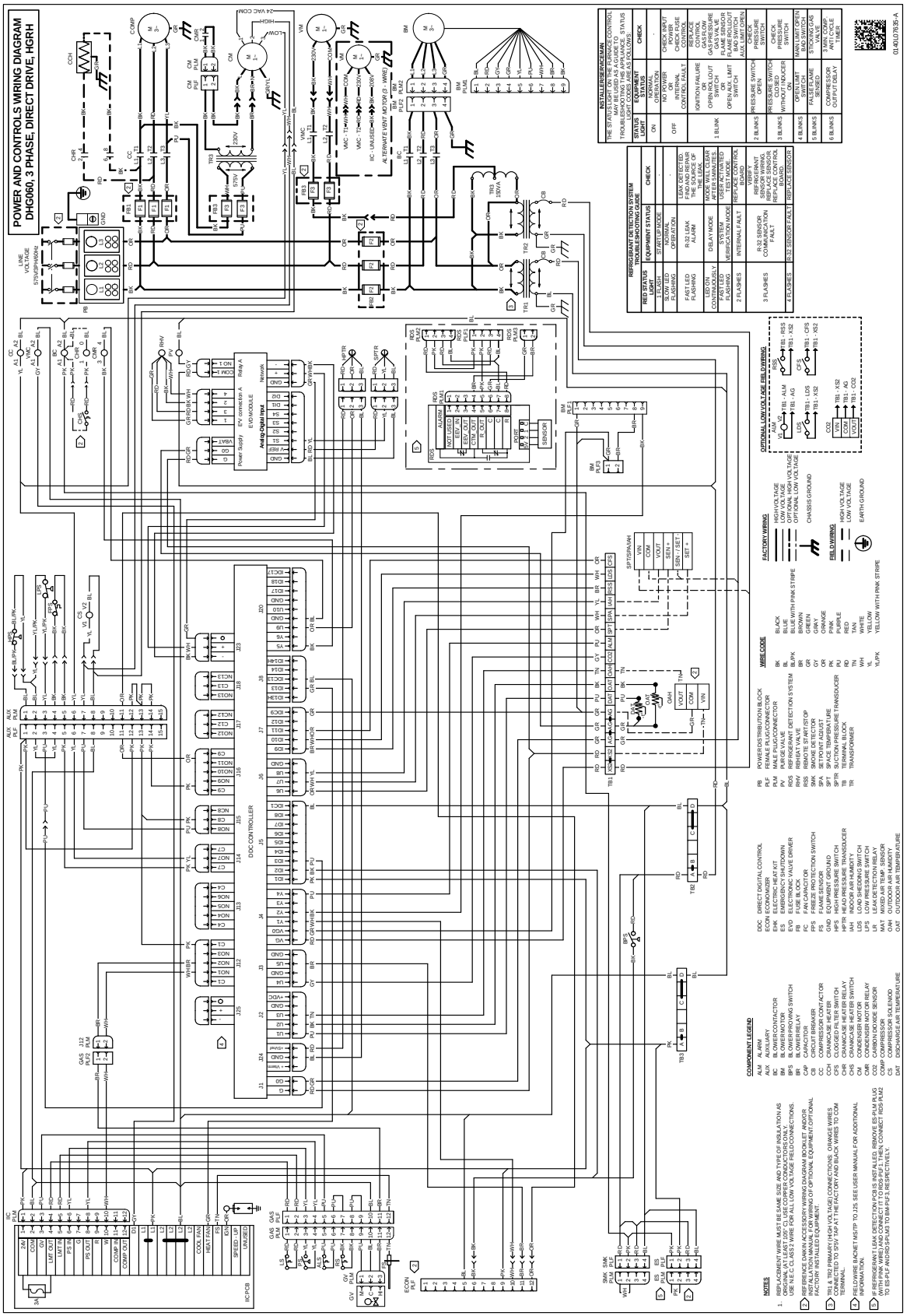
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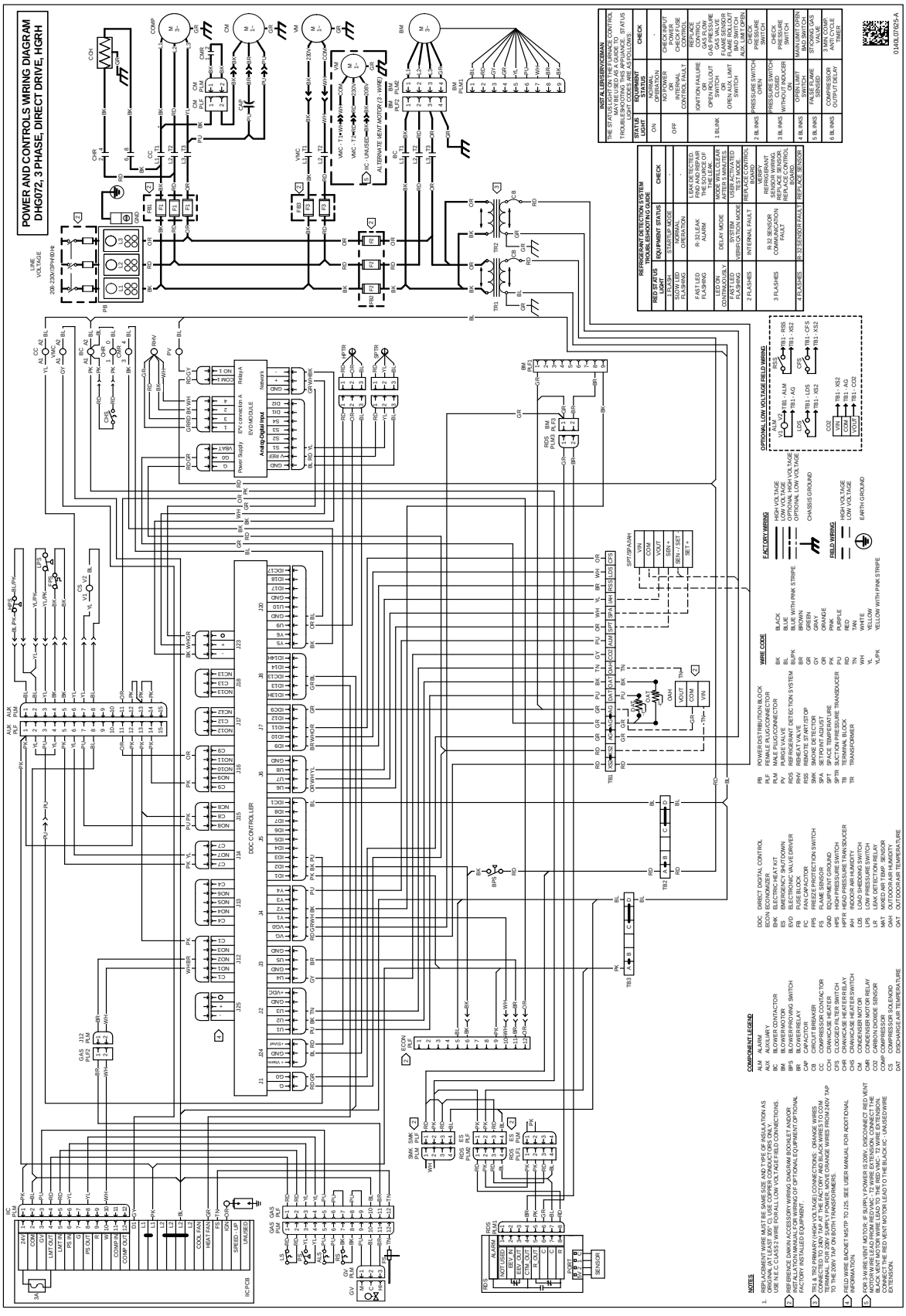
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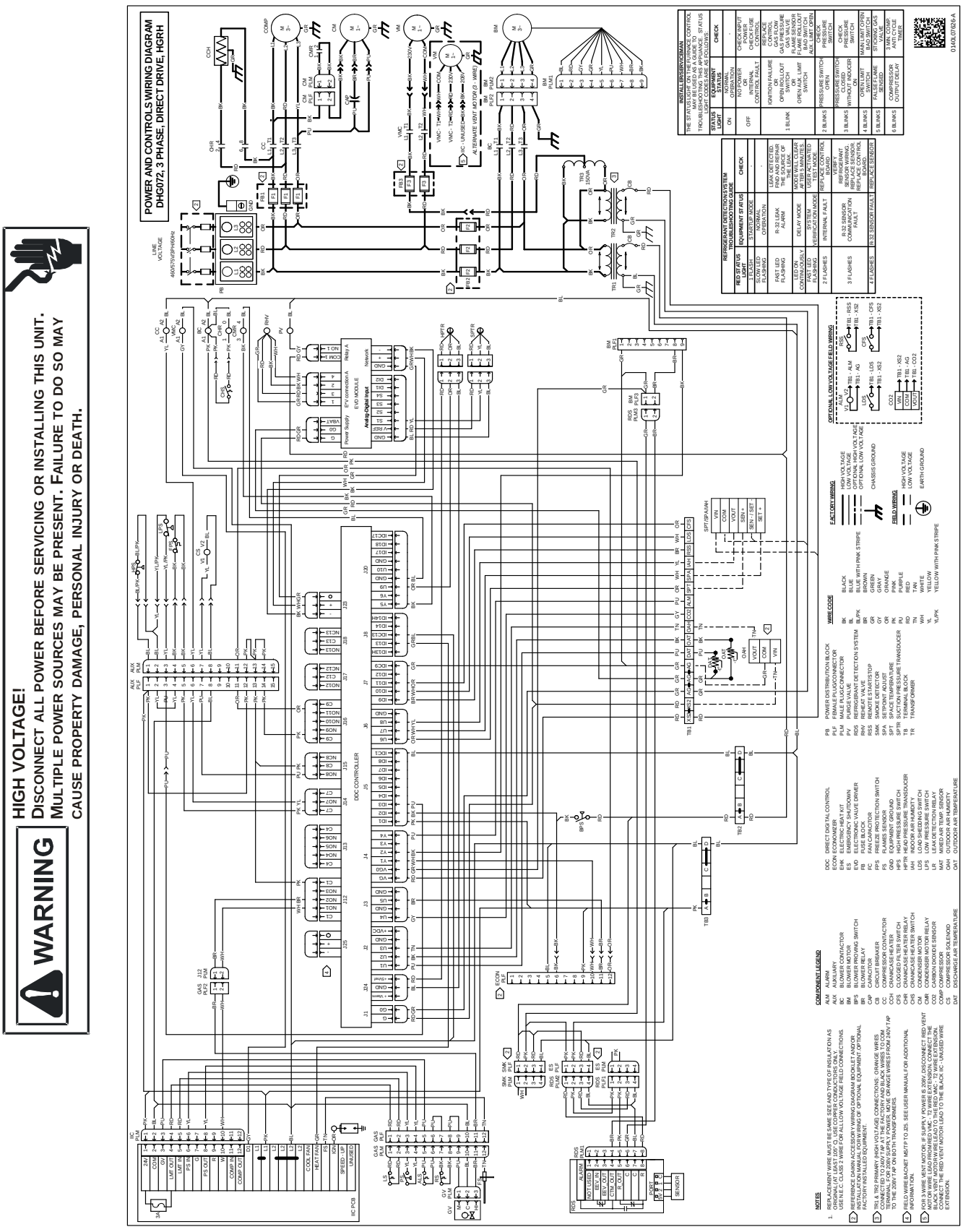
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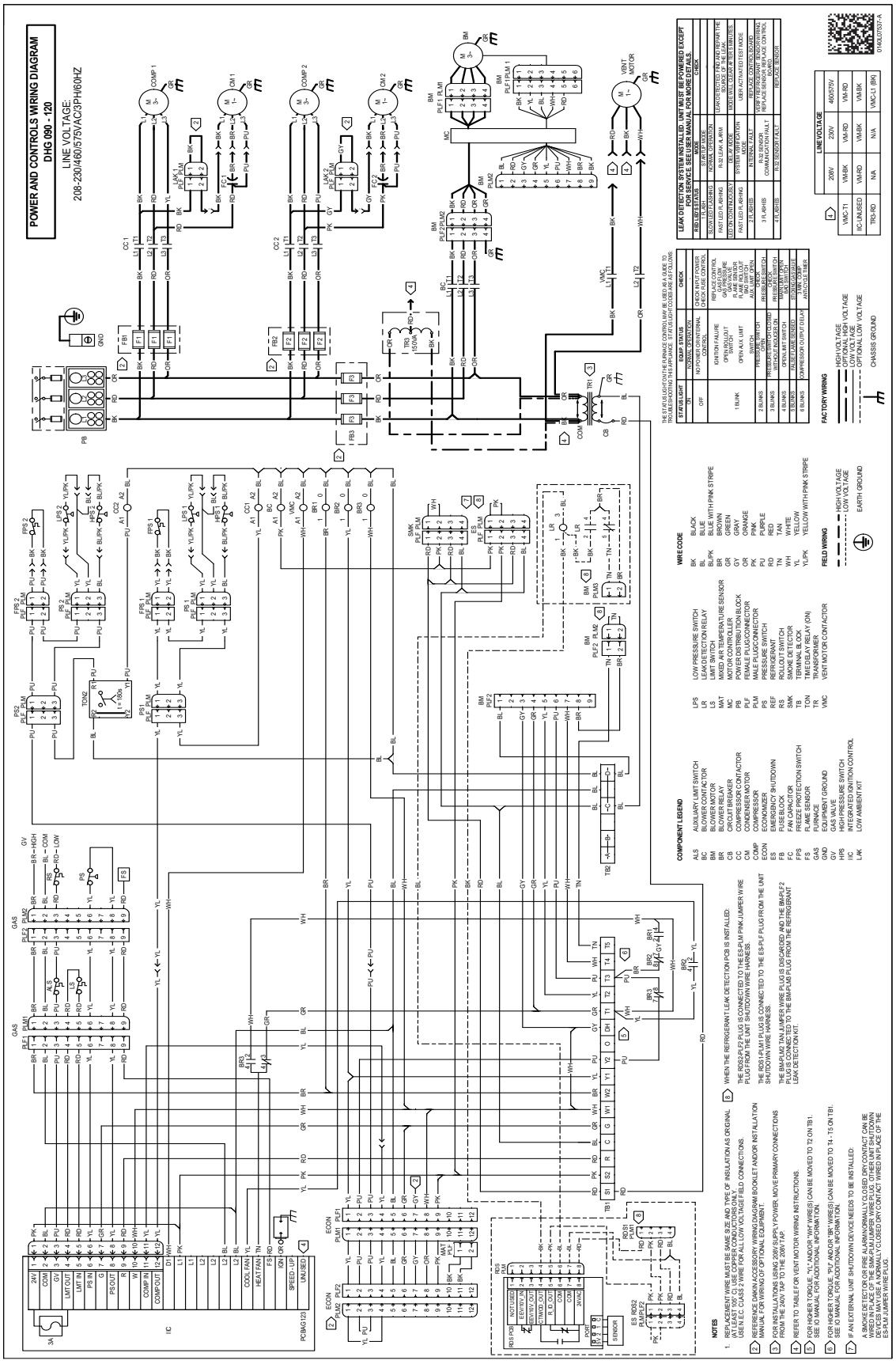
DHG072, 3 PHASE, HGRH (460/575V)



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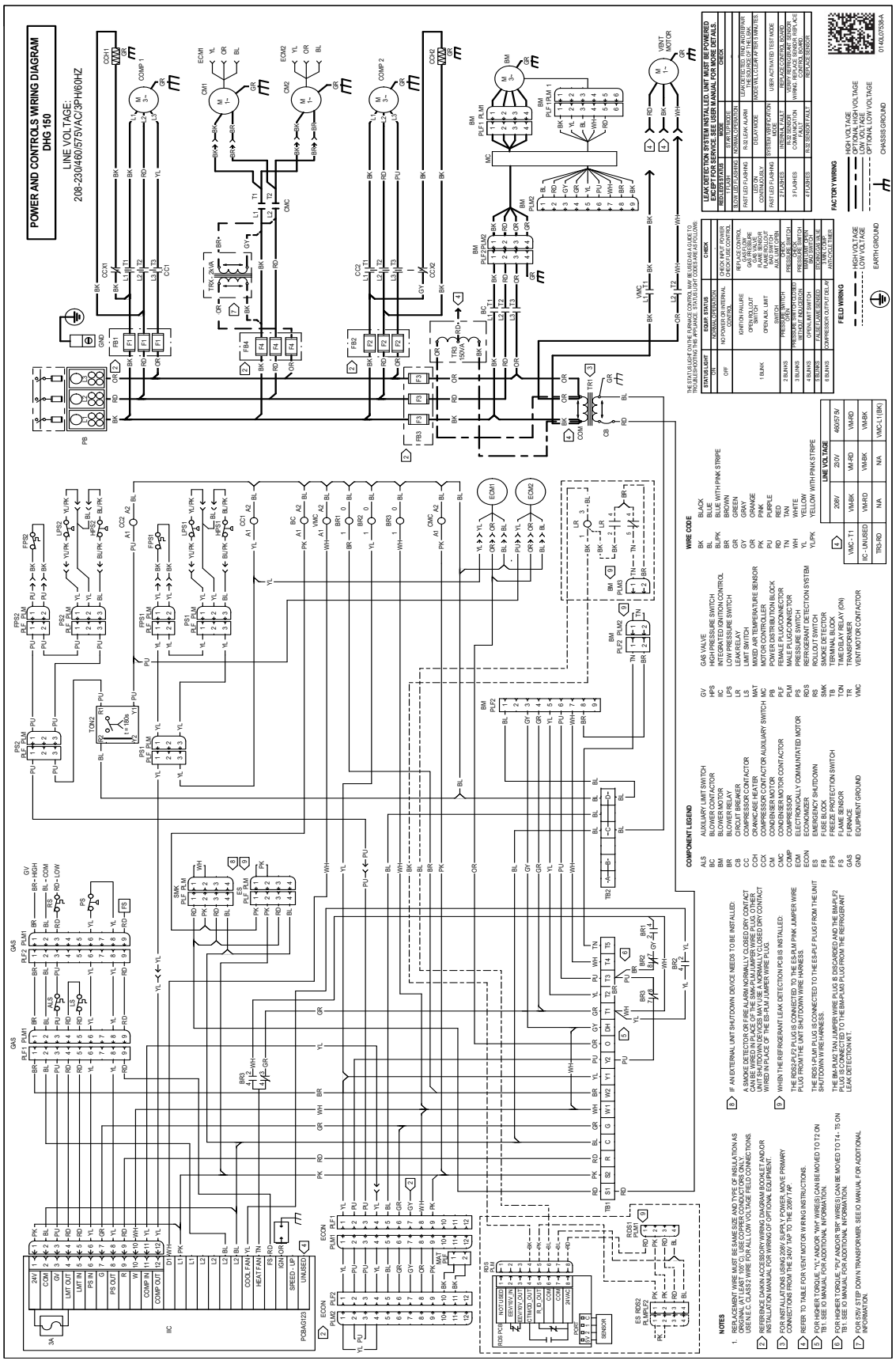
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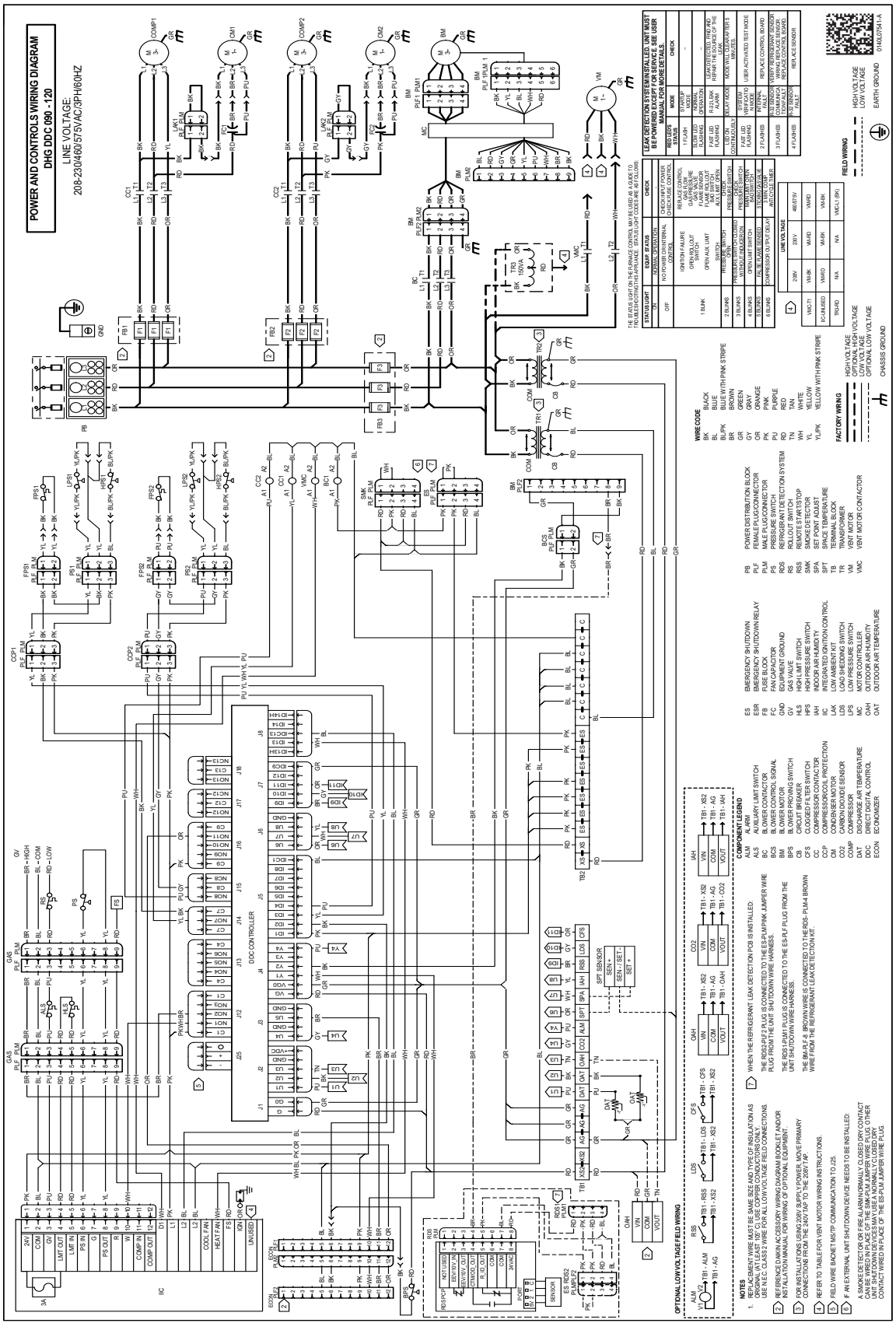
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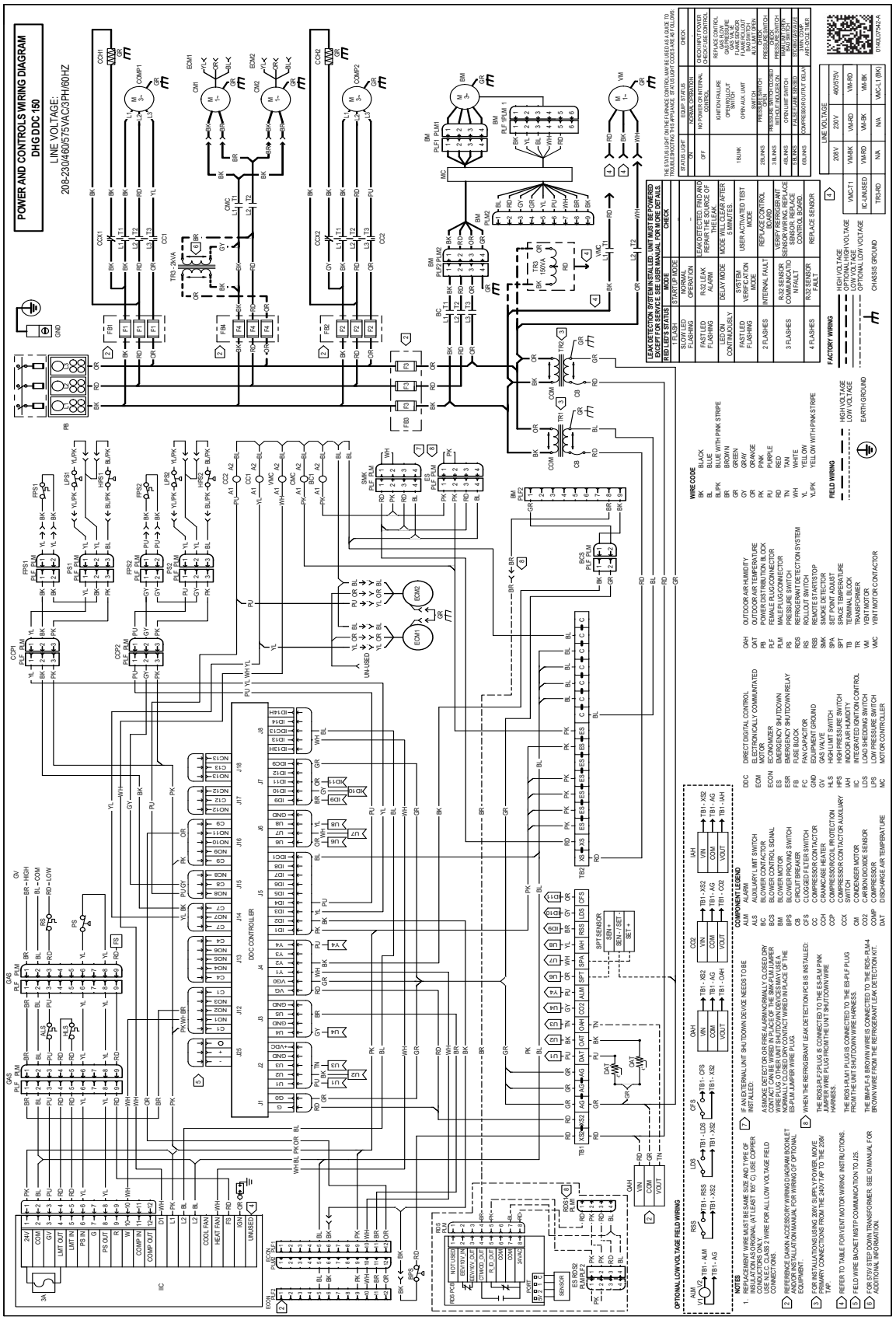
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POWER AND CONTROLS WIRING DIAGRAM
DHG DDC 090 - 120
LINE VOLTAGE:
208-230/460/575VAC/3PH/60HZ
WIRE CODE
BK BLACK
BL BLUE
BLWH BLUE WITH PINK STRIPE
BR BROWN
GR GREEN
GY GRAY
OR ORANGE
PK PINK
PU PURPLE
RD RED
TN TAN
WH WHITE
YL YELLOW
YLPK YELLOW WITH PINK STRIPE
FACTORY WIRING
HIGH VOLTAGE
OPTIONAL HIGH VOLTAGE
LOW VOLTAGE
OPTIONAL LOW VOLTAGE
CHASSIS GROUND
FIELD WIRING
HIGH VOLTAGE
LOW VOLTAGE
EARTH GROUND
LEAK DETECTION SYSTEM INSTALLED. UNIT MUST BE POWERED EXCEPT FOR SERVICE. SEE USER MANUAL FOR MORE DETAILS.
RED LEDS STATUS
CHECK
1 FLASH
STARTUP MODE
2 FLASHES
NORMAL OPERATION
FAST LED FLASHING
LEAK DETECTED. FIND AND REPAIR REFRIGERANT LEAK
FAST LED FLASHING
LOW REFRIGERANT CHARGE
SLOW LED FLASHING
USER ACTIVATED TEST MODE
1 FLASH
REPLACE CONTROL BOARD
2 FLASHES
REPLACE CONTROL BOARD
3 FLASHES
REPLACE CONTROL BOARD
4 FLASHES
REPLACE SENSOR
STATUS/SHUT
EQUIP STATUS
CHECK
ON
NORMAL OPERATION
OFF
NO POWER OR INTERNAL FAULT
CHECK POWER TO UNIT. CHECK LEAK CONTROL
1 BLINK
IGNITION FAILURE
OPEN ROLLOUT SWITCH
OPEN AUX. LIMIT SWITCH
REPLACE CONTROL
CHECK IGNITER
CLEAN FLAME SENSOR
CHECK GAS VALVE
2 BLINKS
PRESSURE SWITCH FAULT
CHECK PRESSURE SWITCH
3 BLINKS
PRESSURE SWITCH CLOSED WITHOUT BLOWER
CHECK PRESSURE SWITCH
4 BLINKS
OPEN LIMIT SWITCH
CHECK LIMIT SWITCH
5 BLINKS
COMPRESSOR OUTPUT RELAY
CHECK COMPRESSOR
6 BLINKS
COMPRESSOR OUTPUT RELAY
CHECK COMPRESSOR
UNIT VOLTAGE
208V
230V
460/575V
VMC1
VMJK
VMQ
VMR0
VMBK
VMWK
VMC1 (BK)
VMC1 (RK)
N/A
N/A
N/A

WARNING

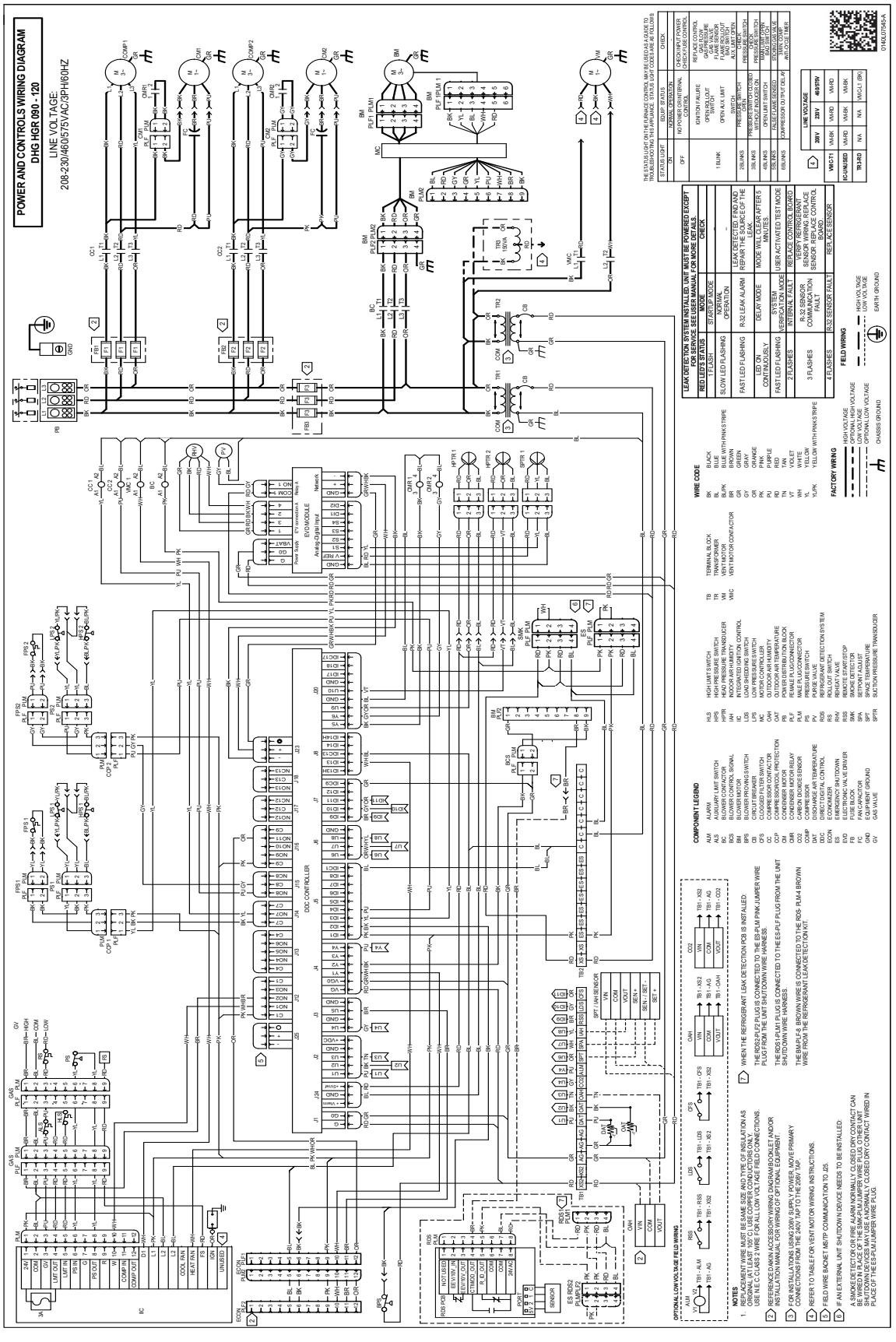
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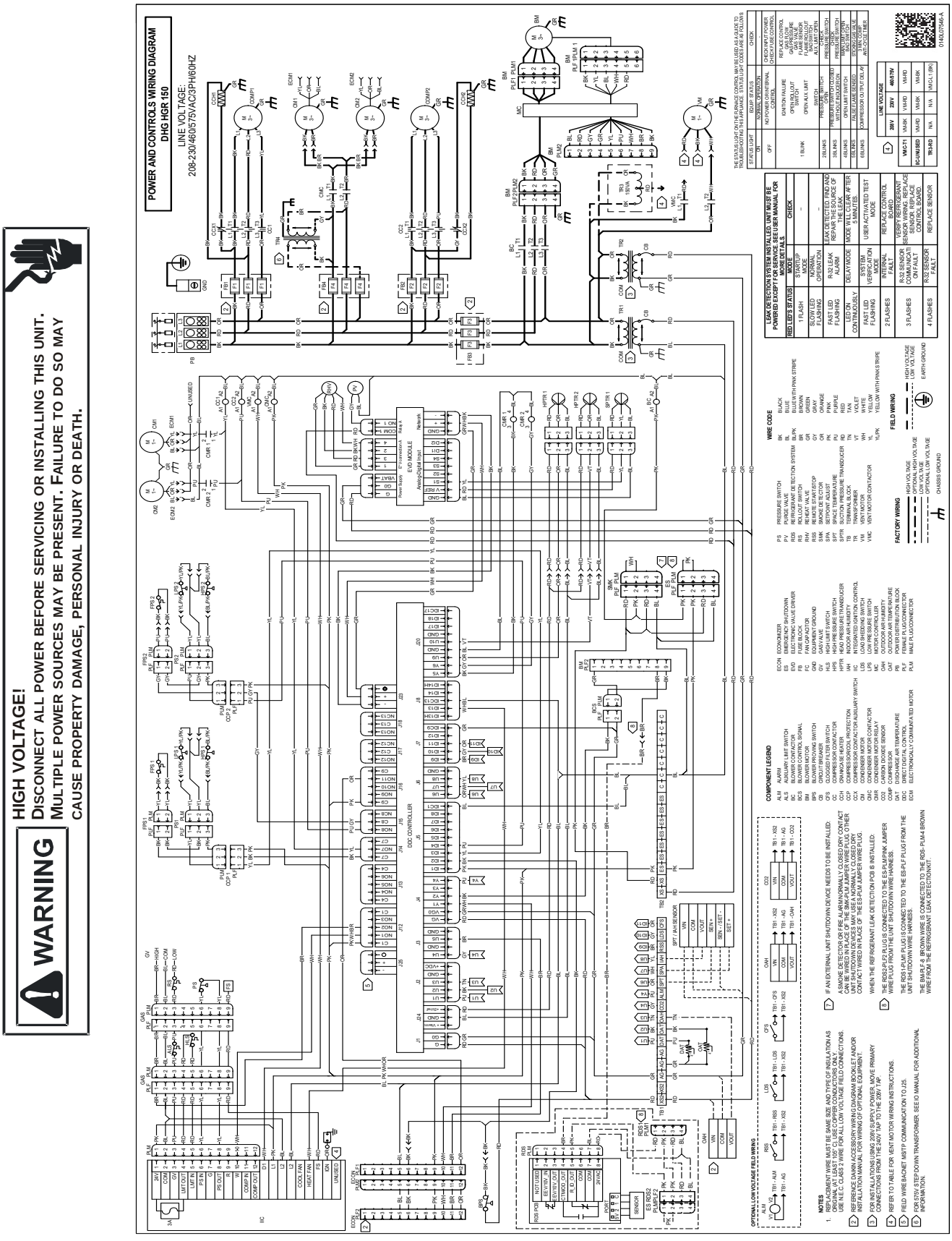
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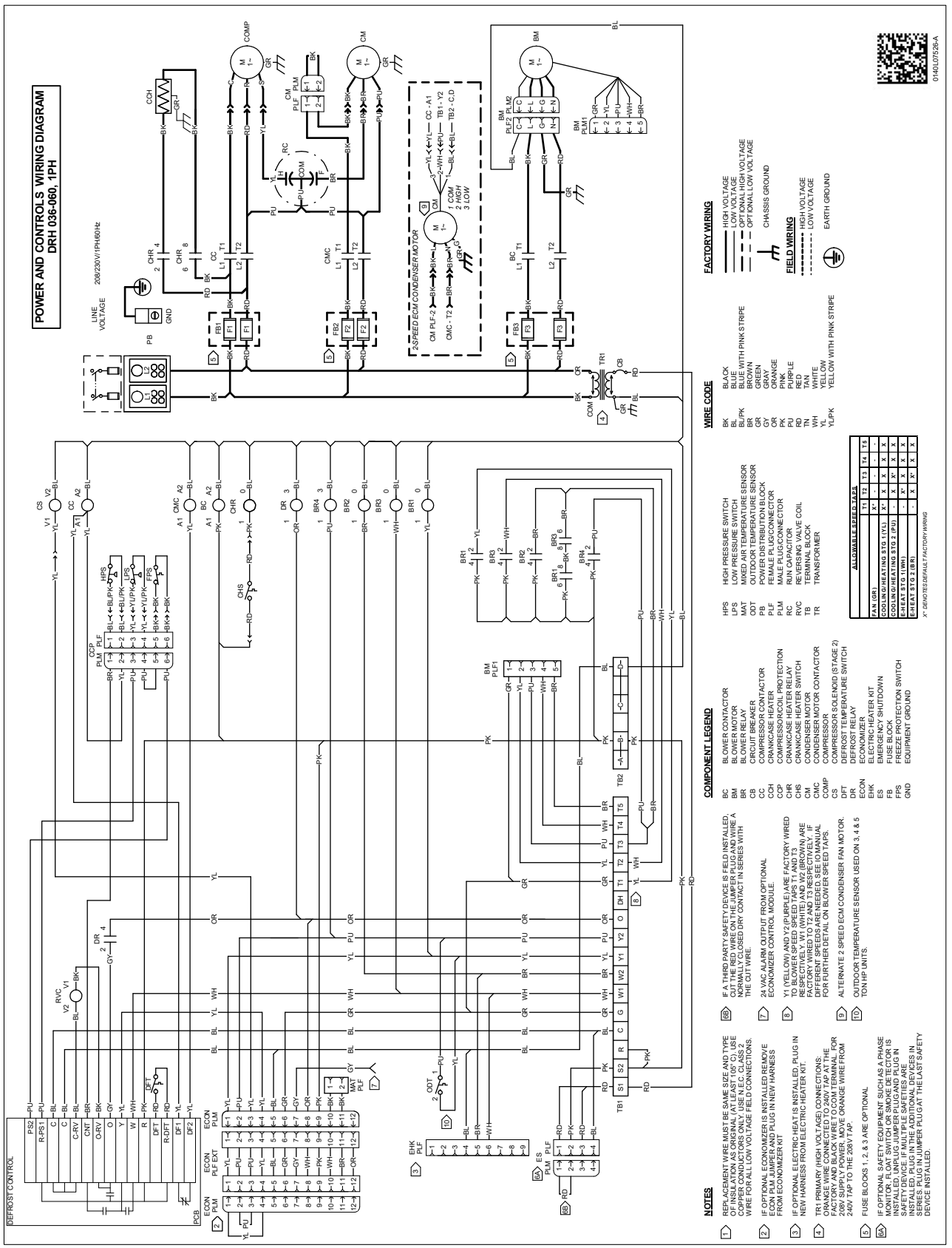


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DRH WIRING DIAGRAMS

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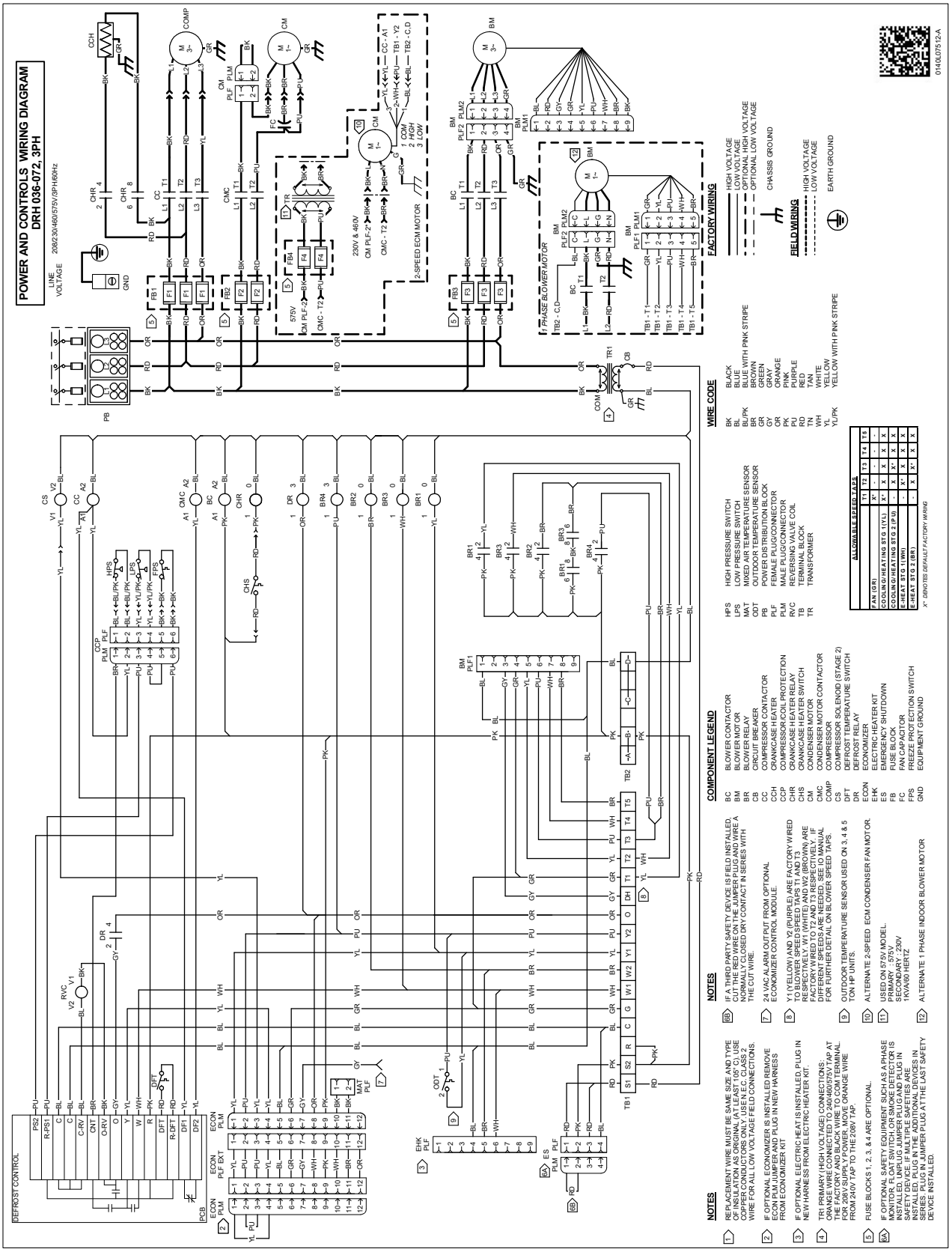
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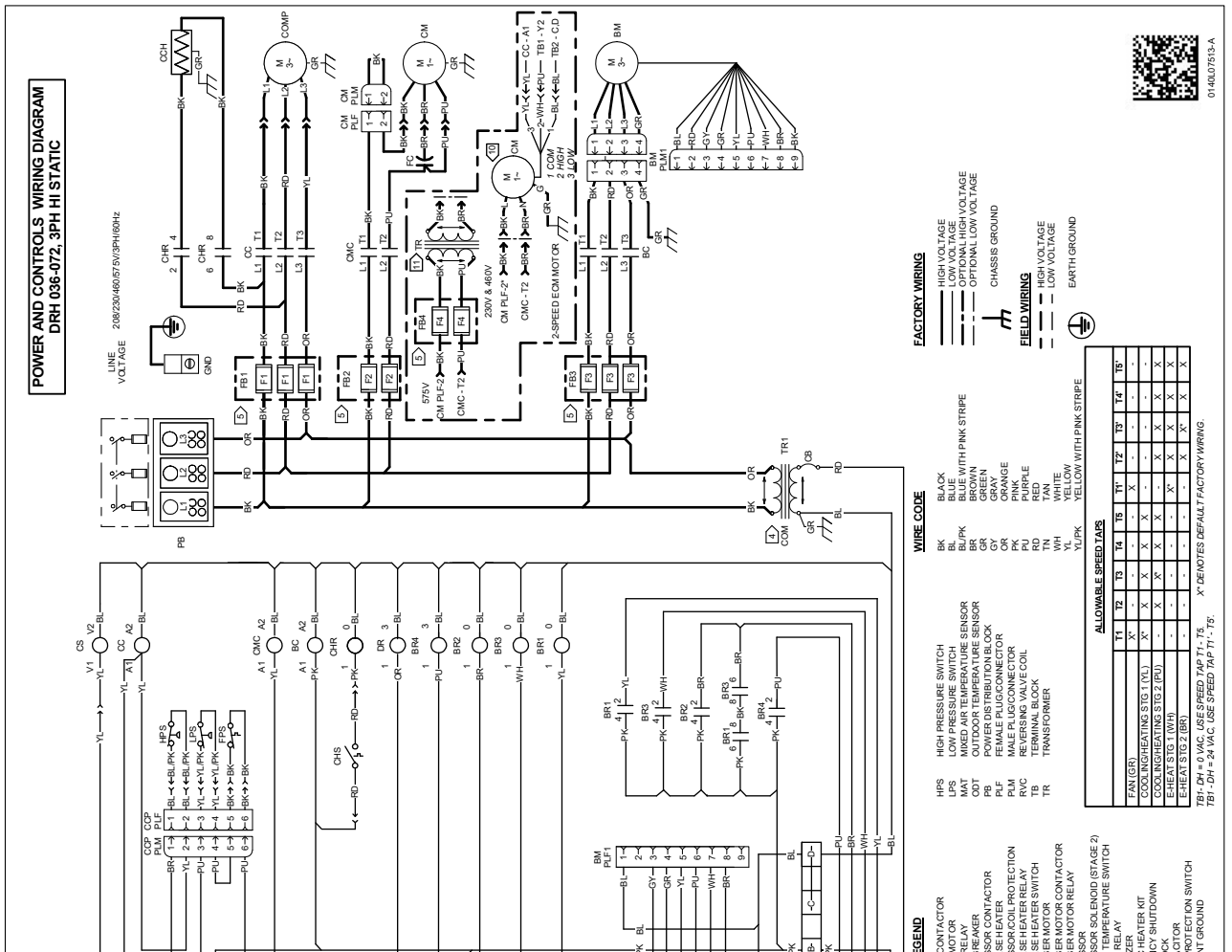
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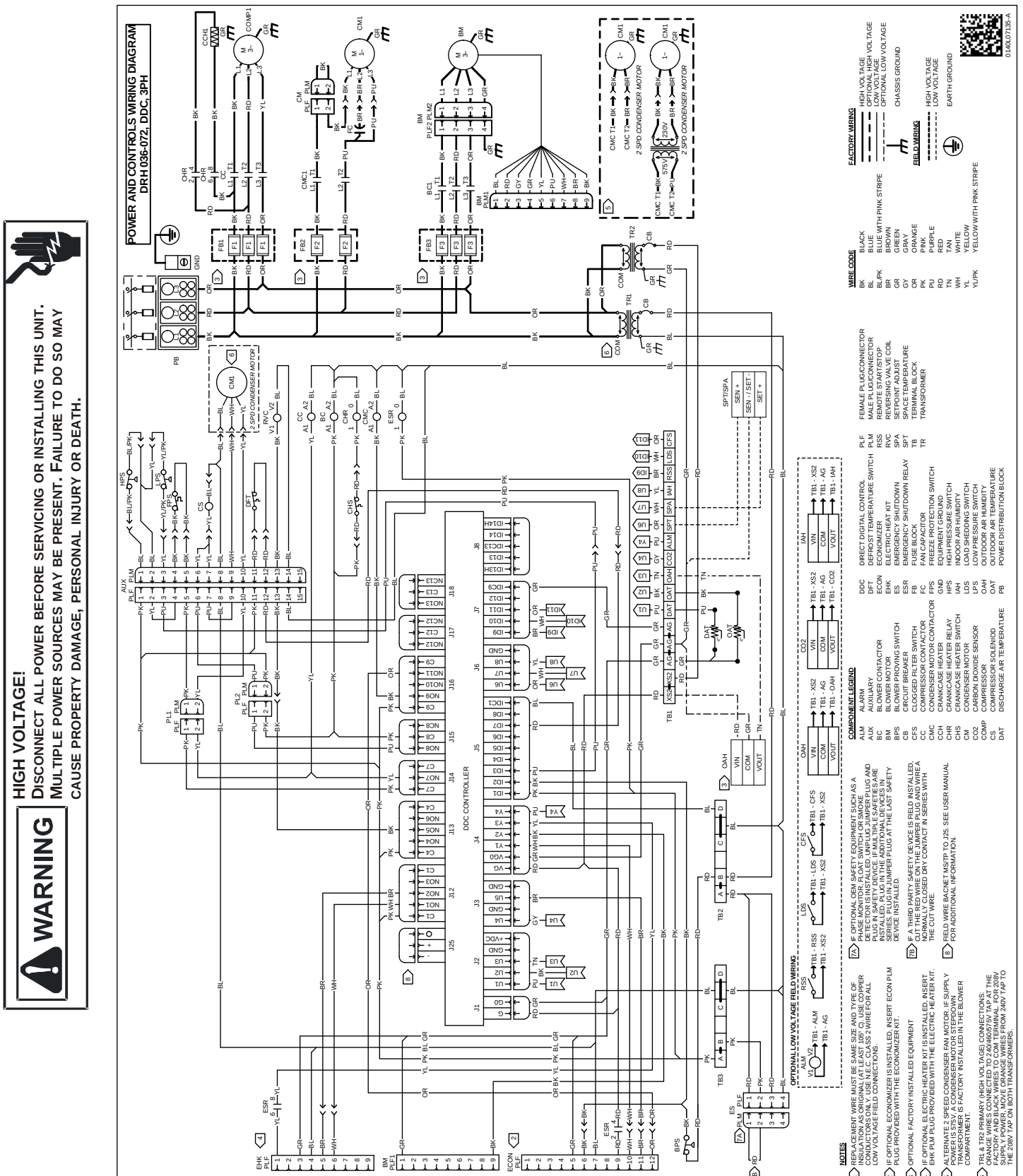
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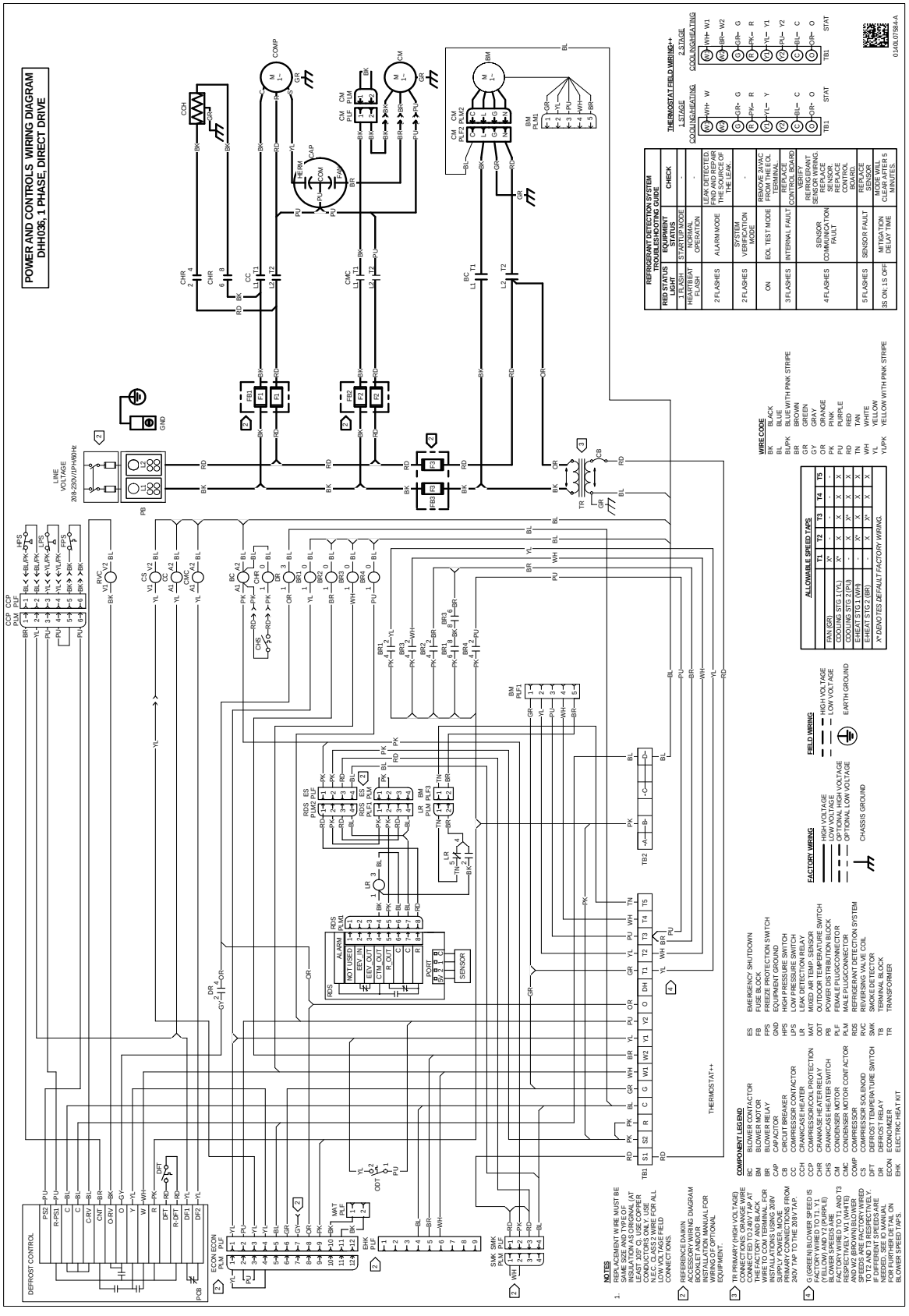


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DHH WIRING DIAGRAMS

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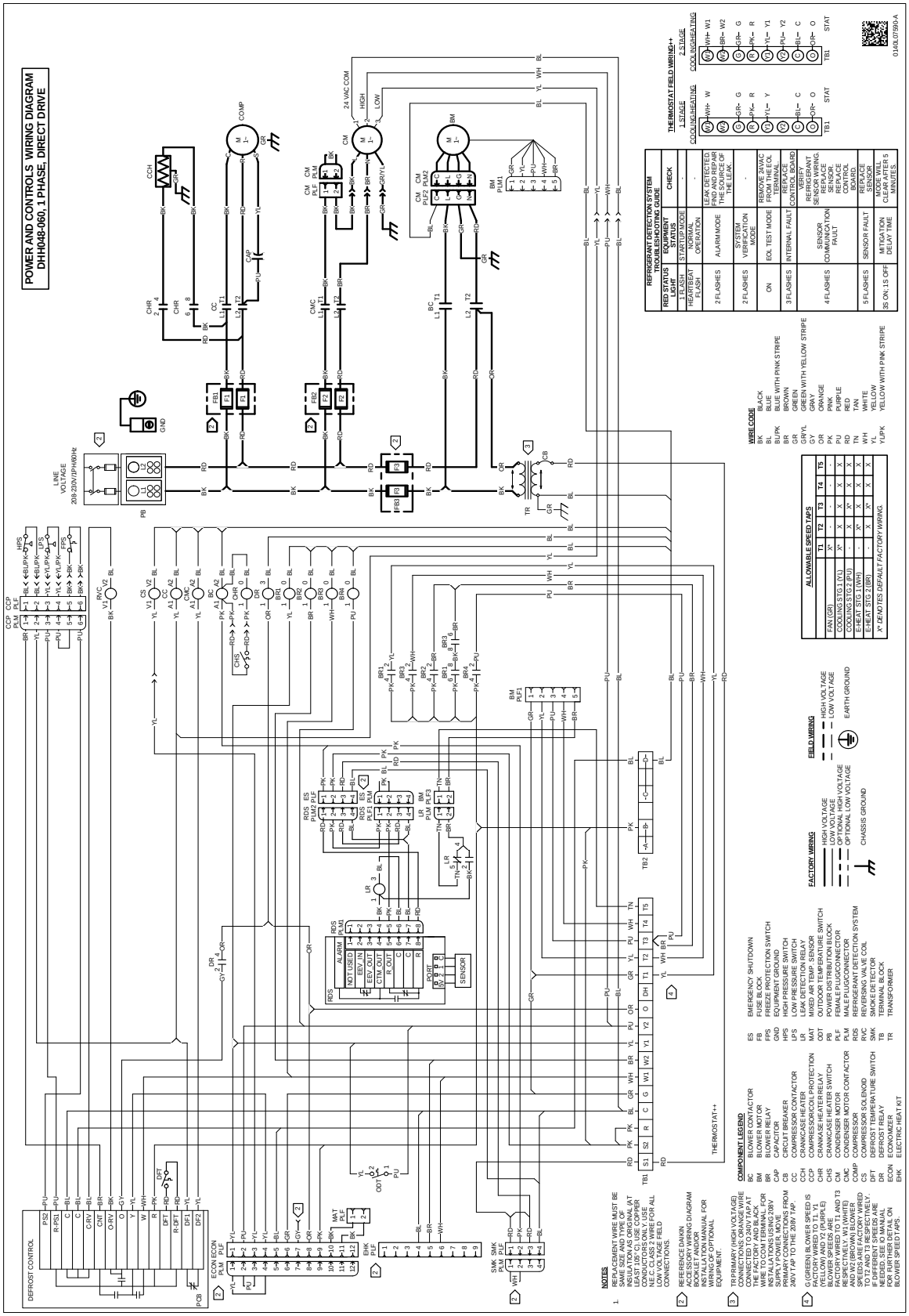
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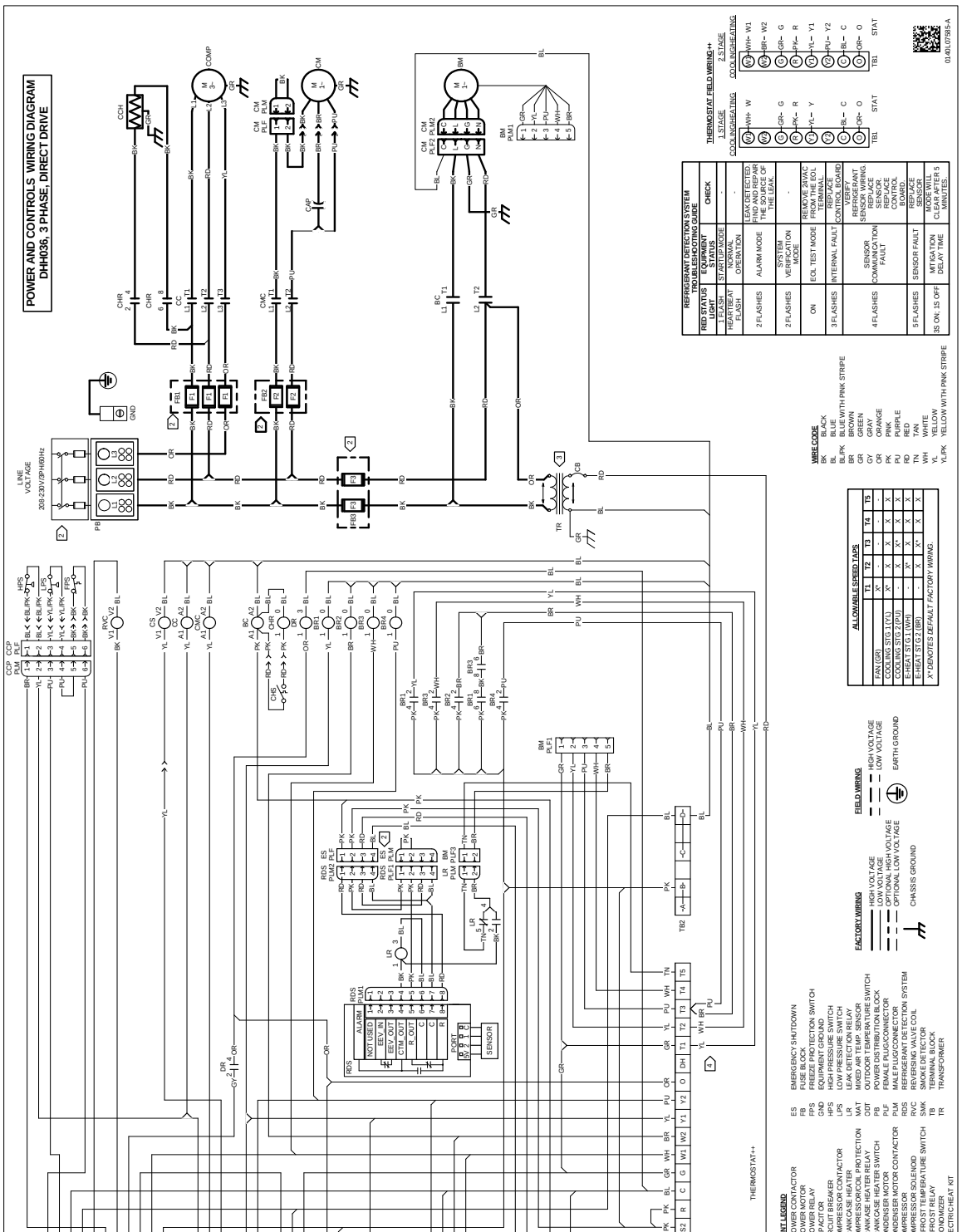
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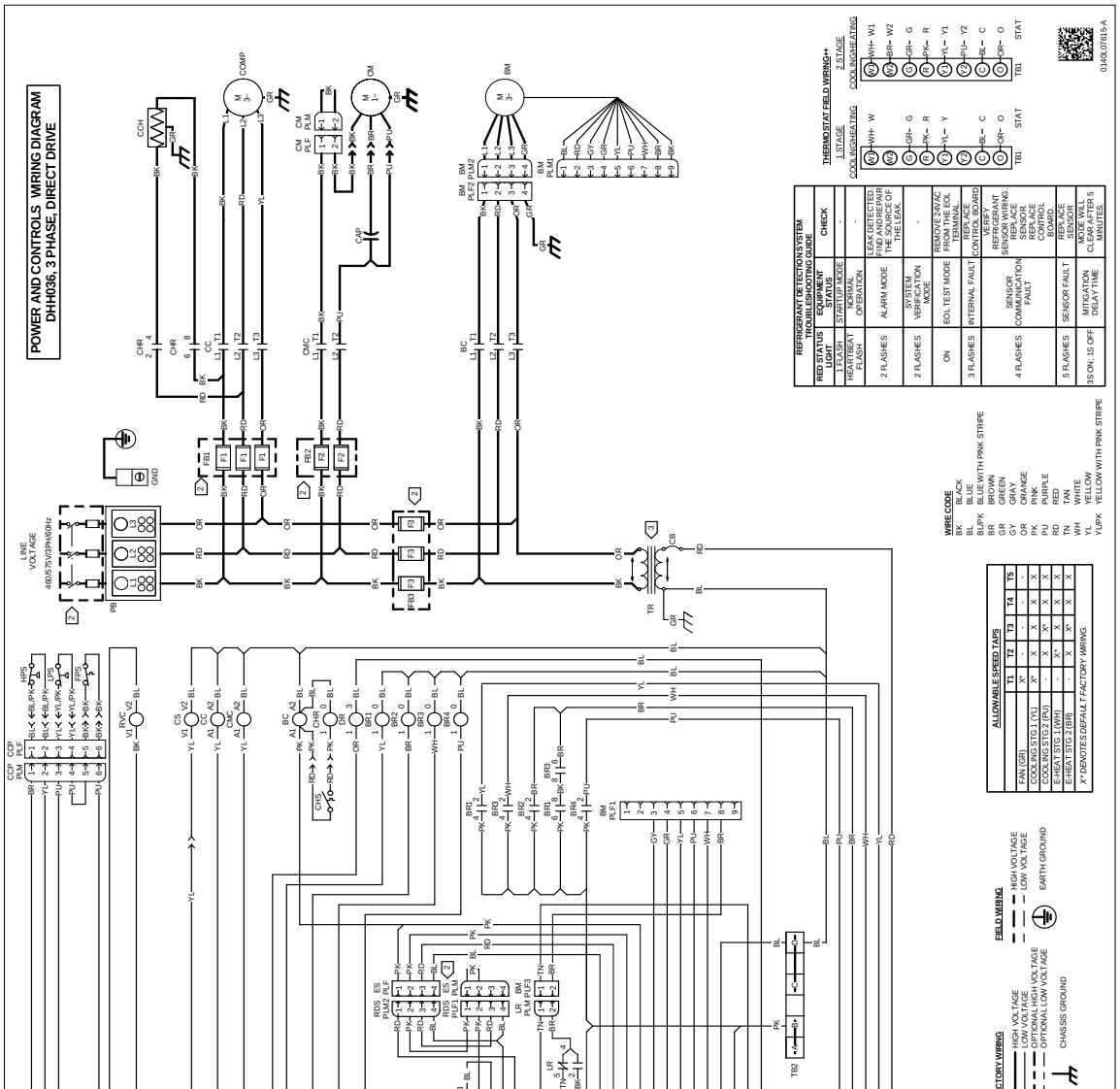
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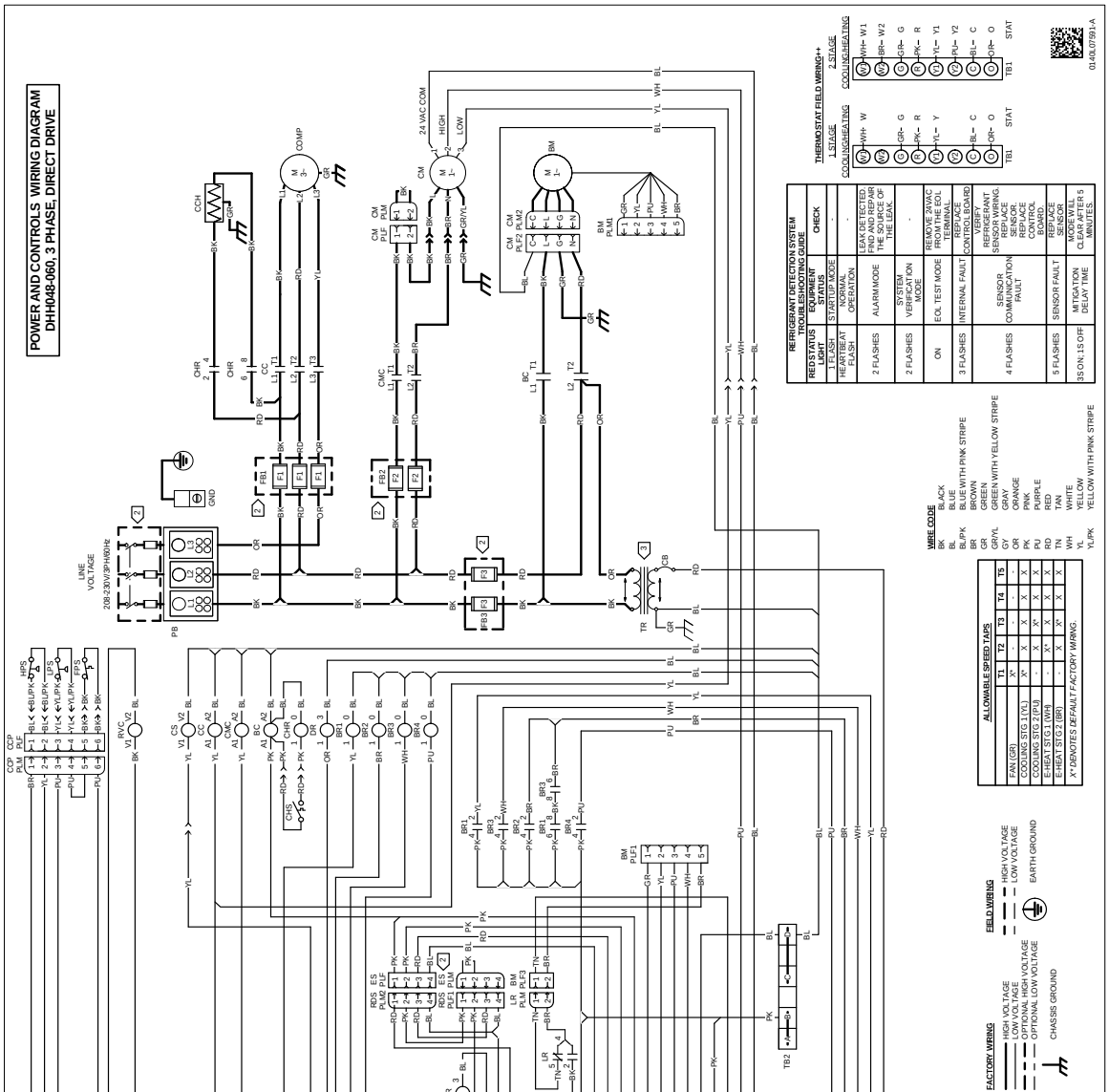
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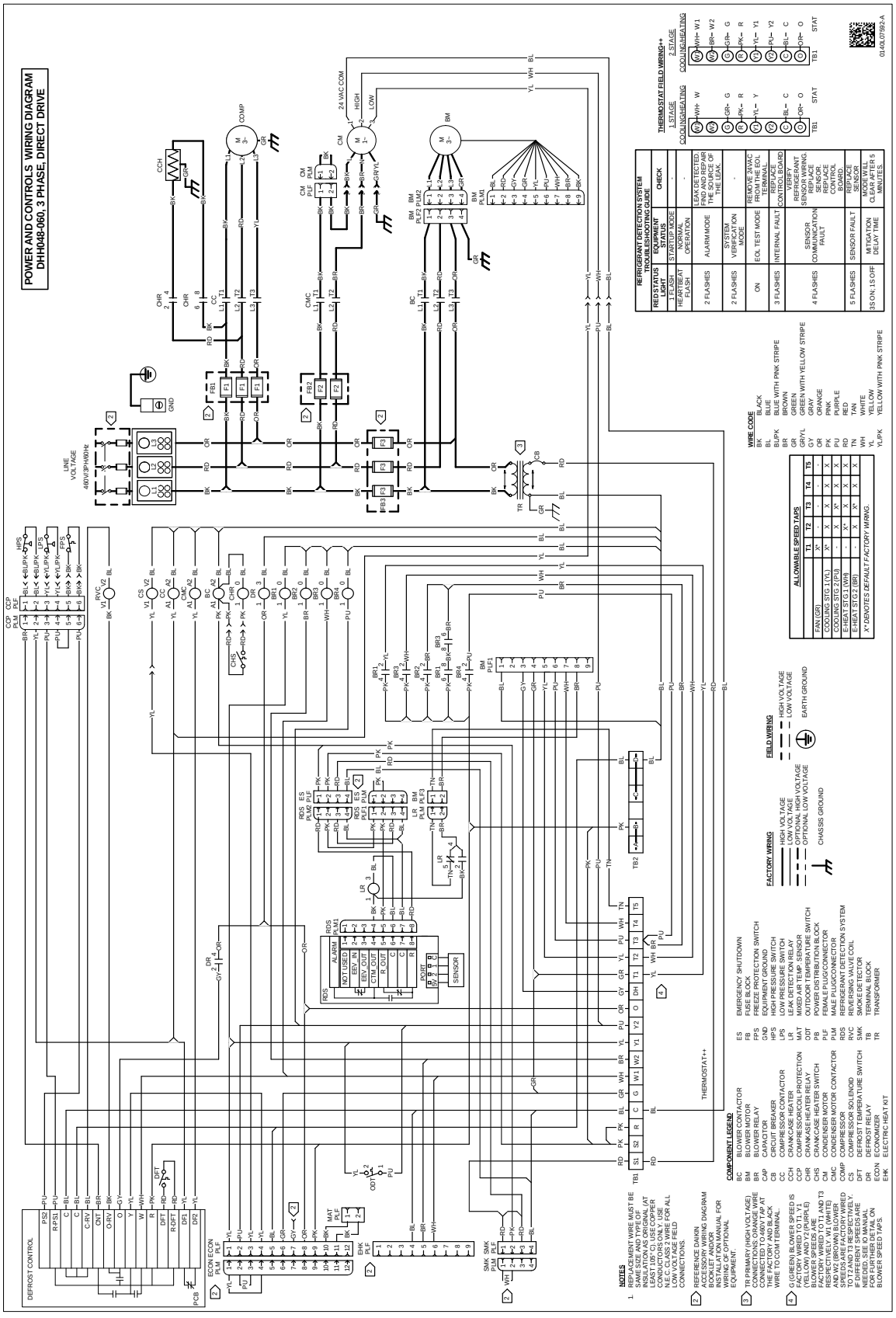
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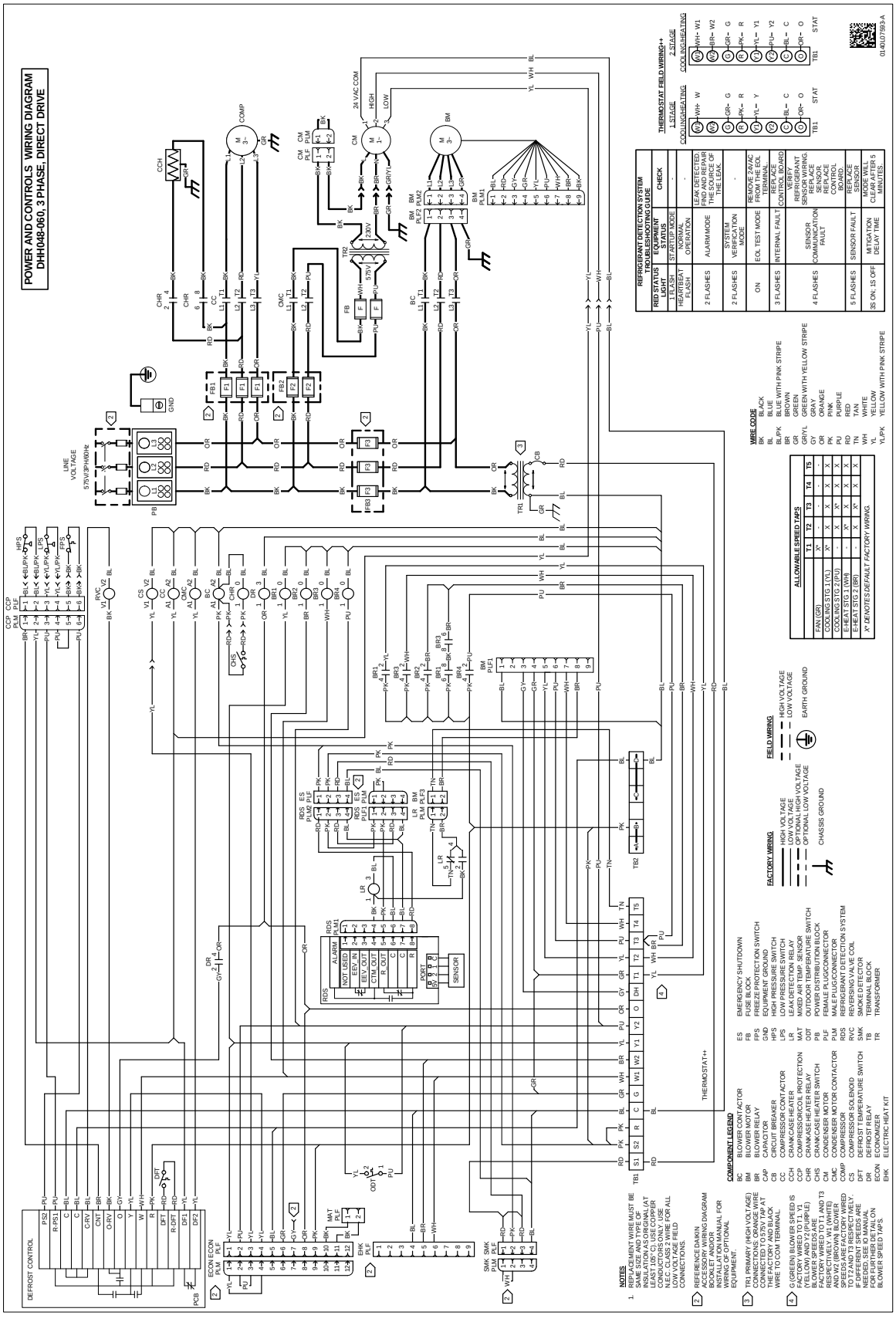
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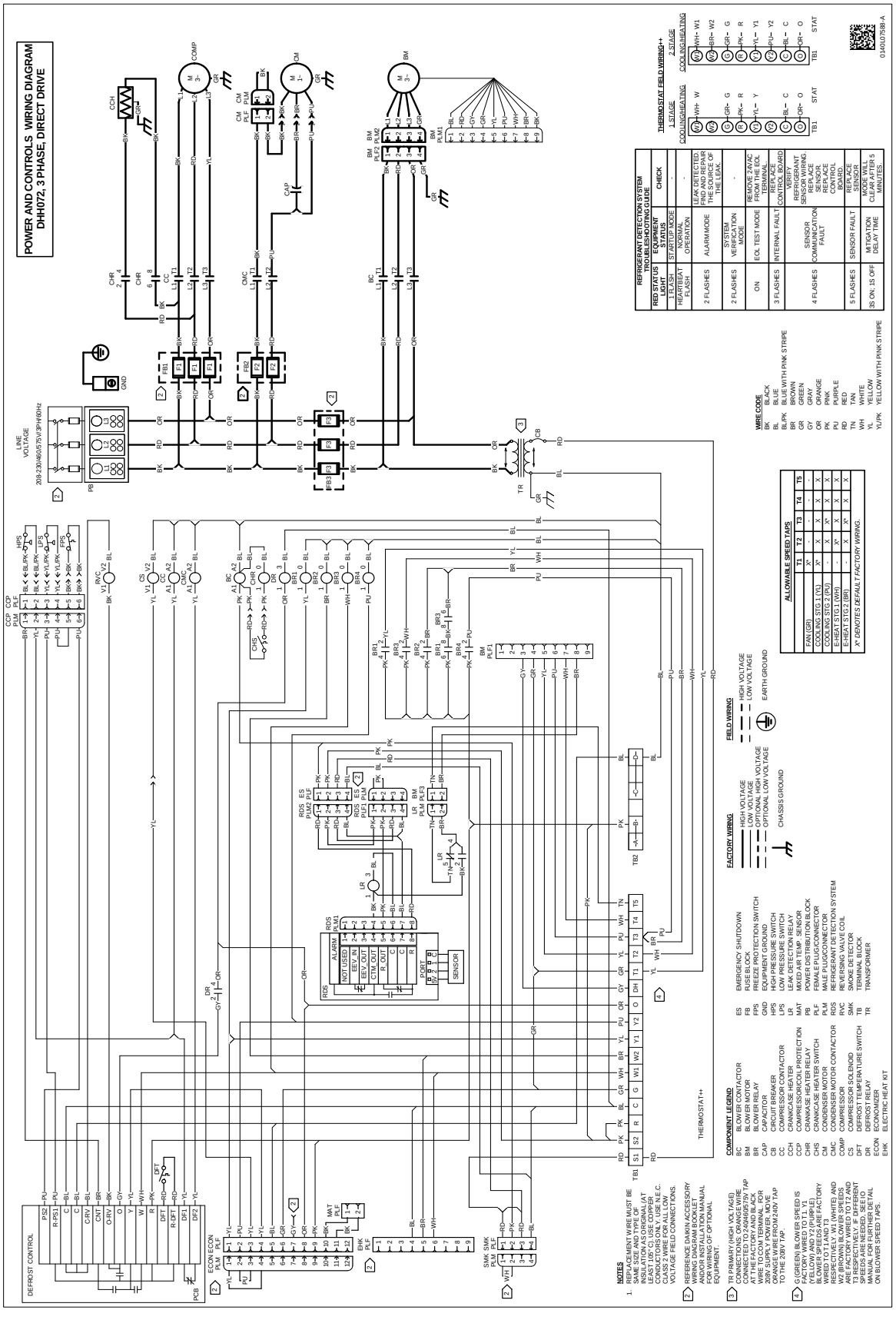
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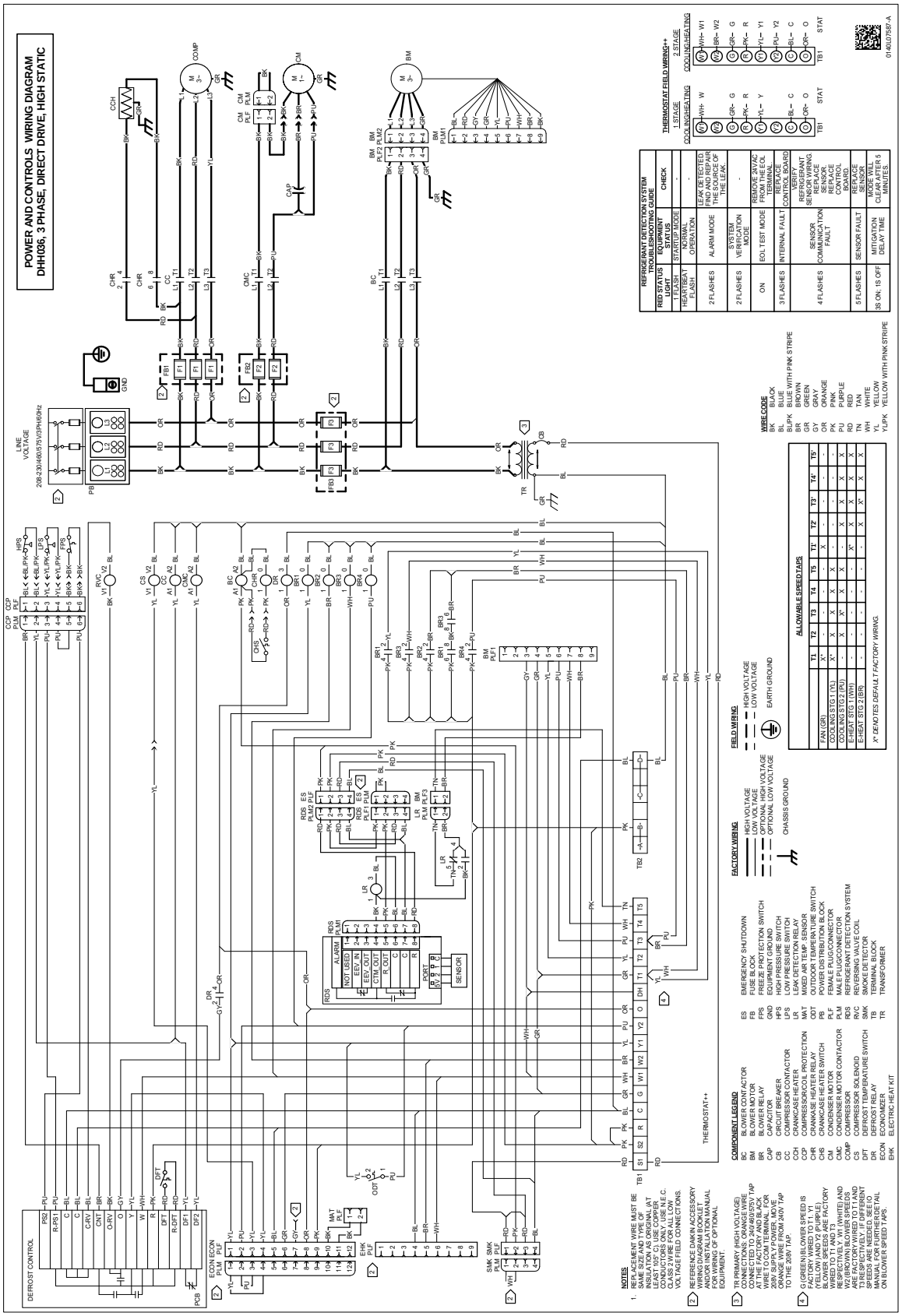
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HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

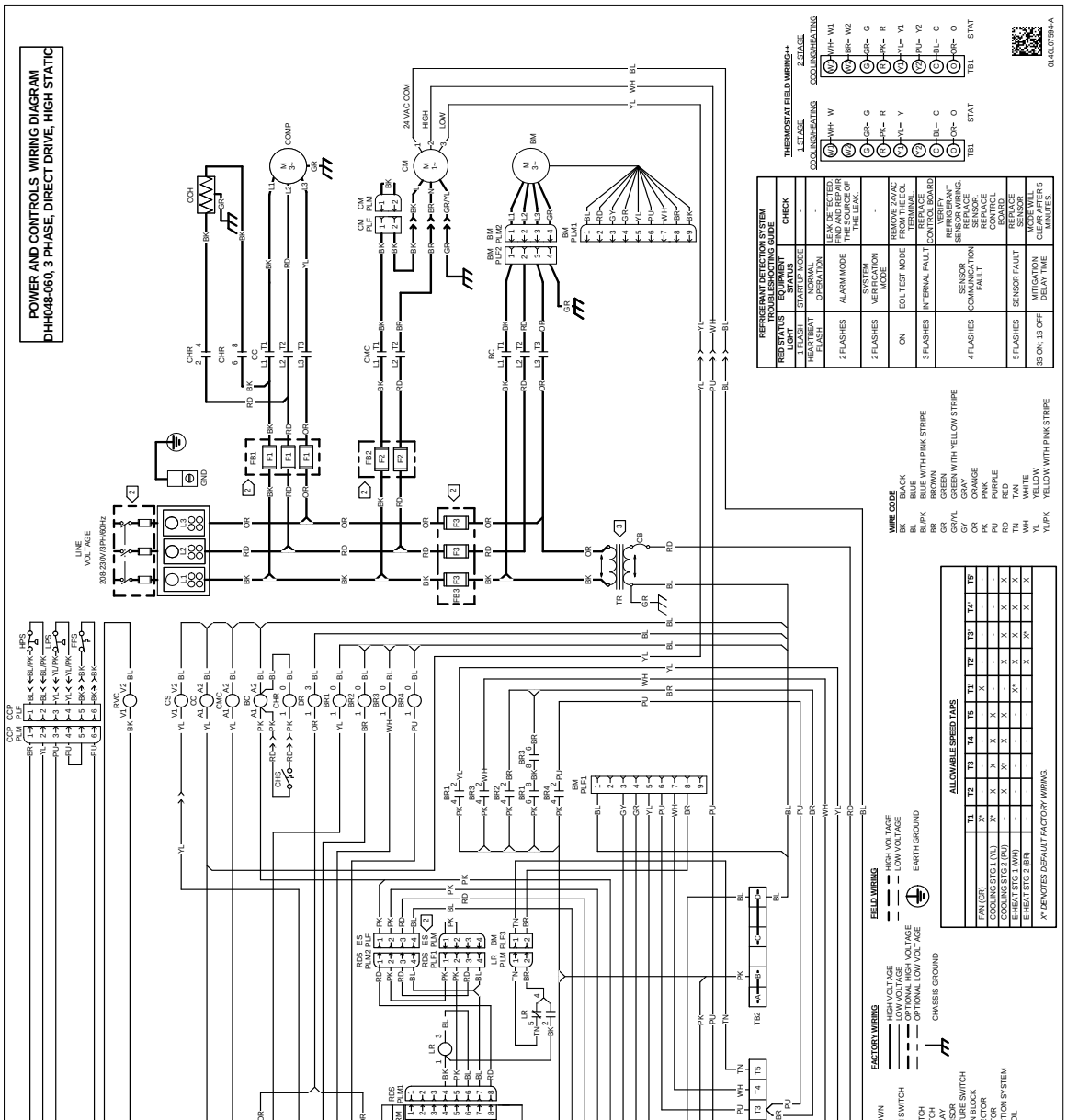
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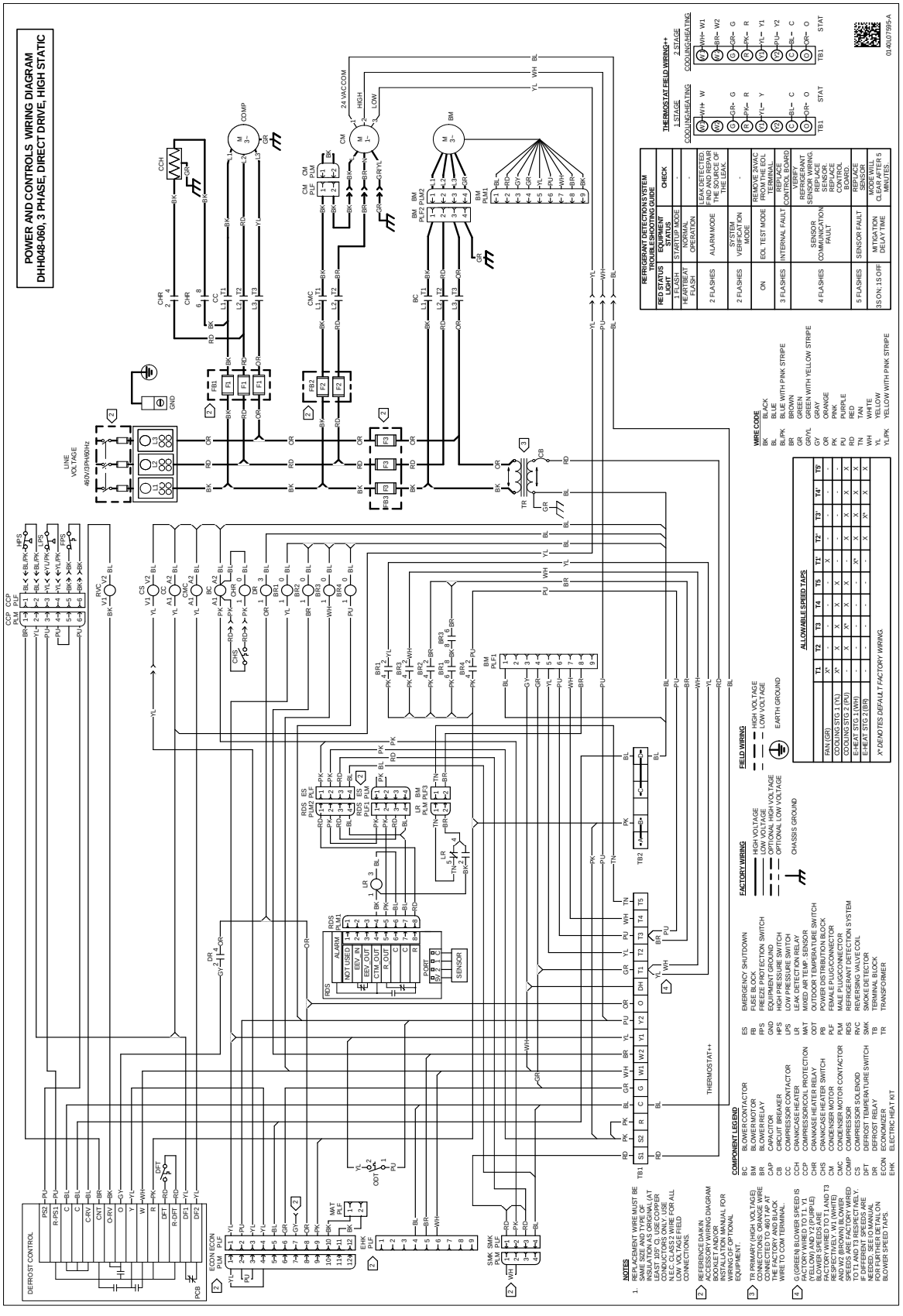
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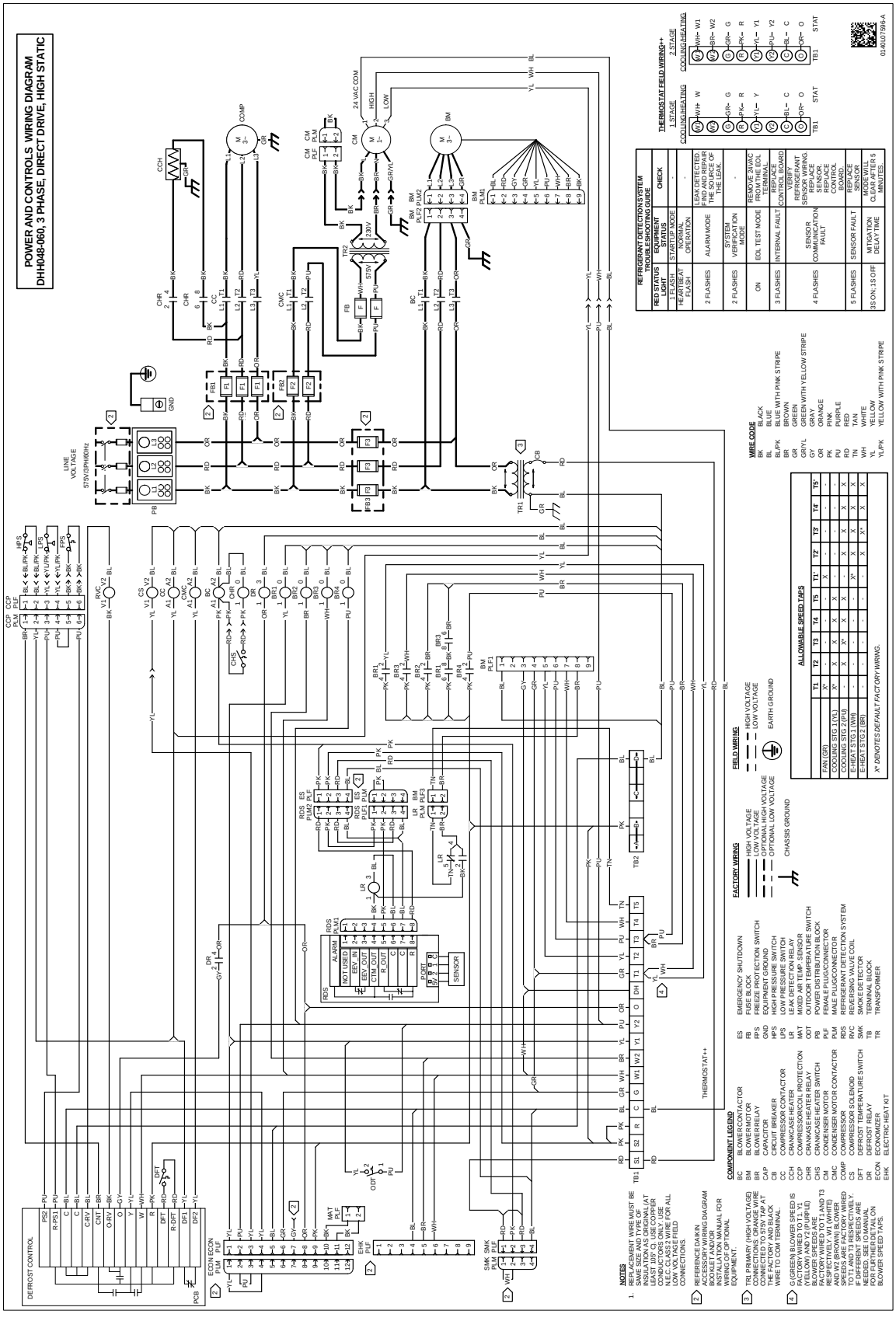
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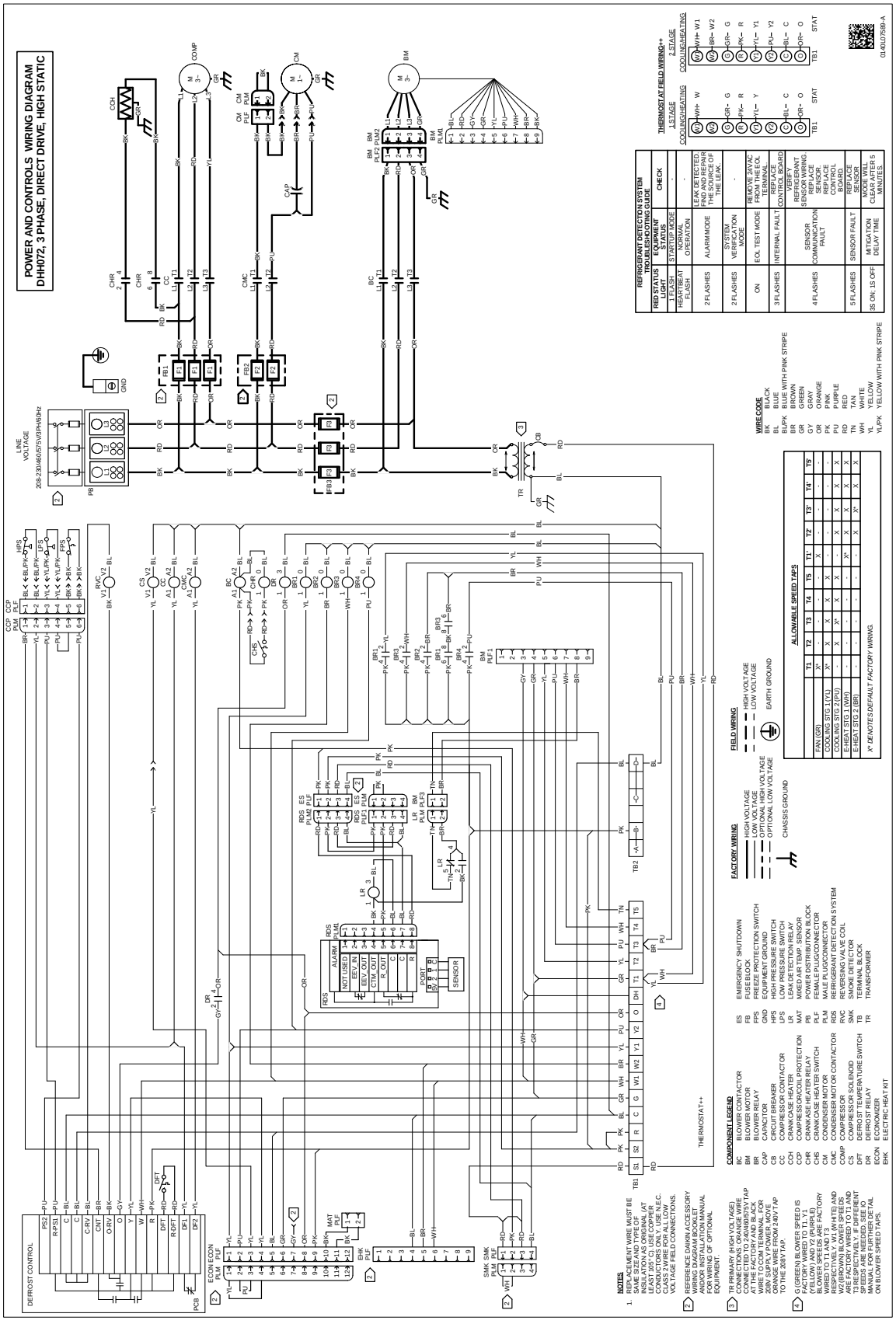
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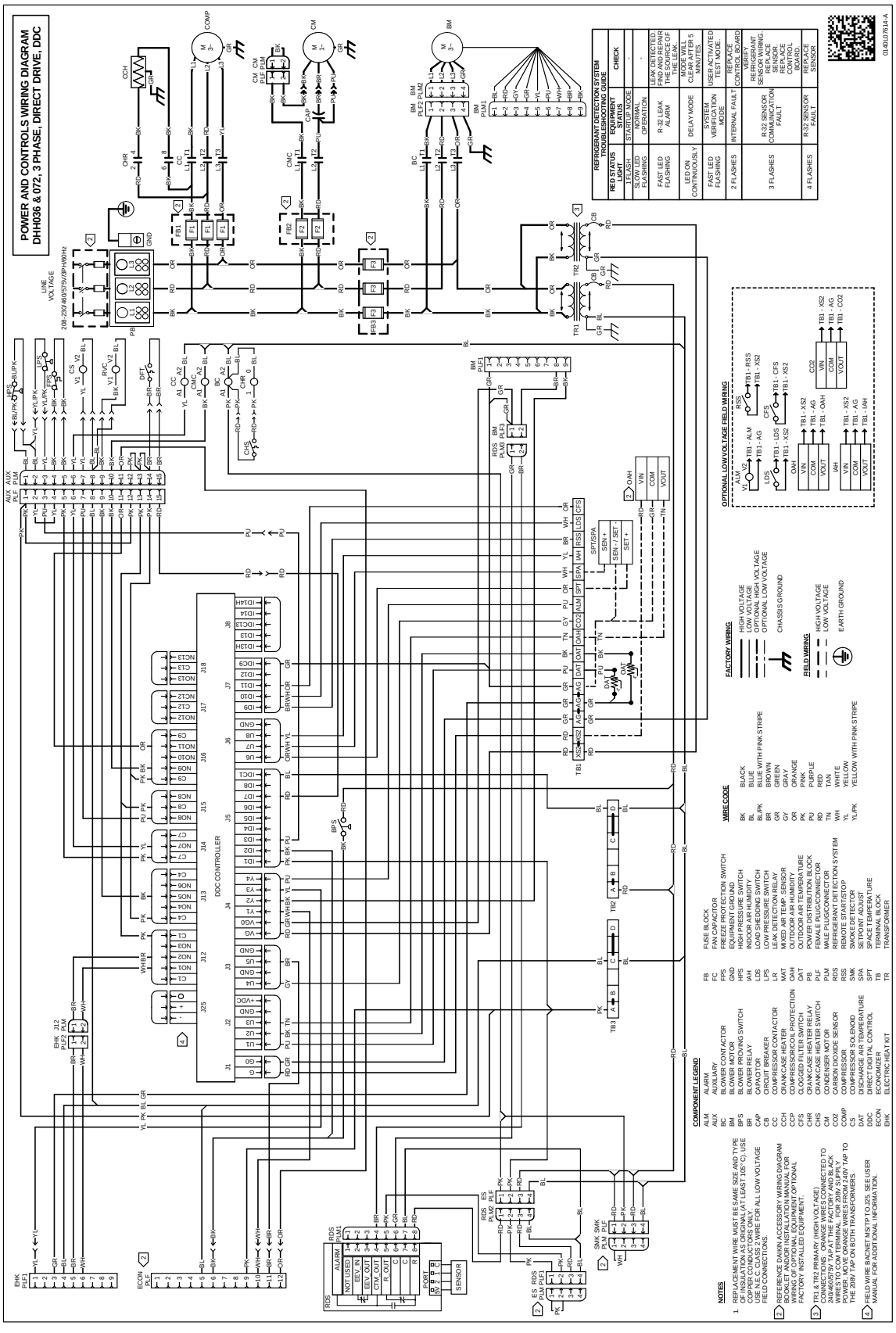
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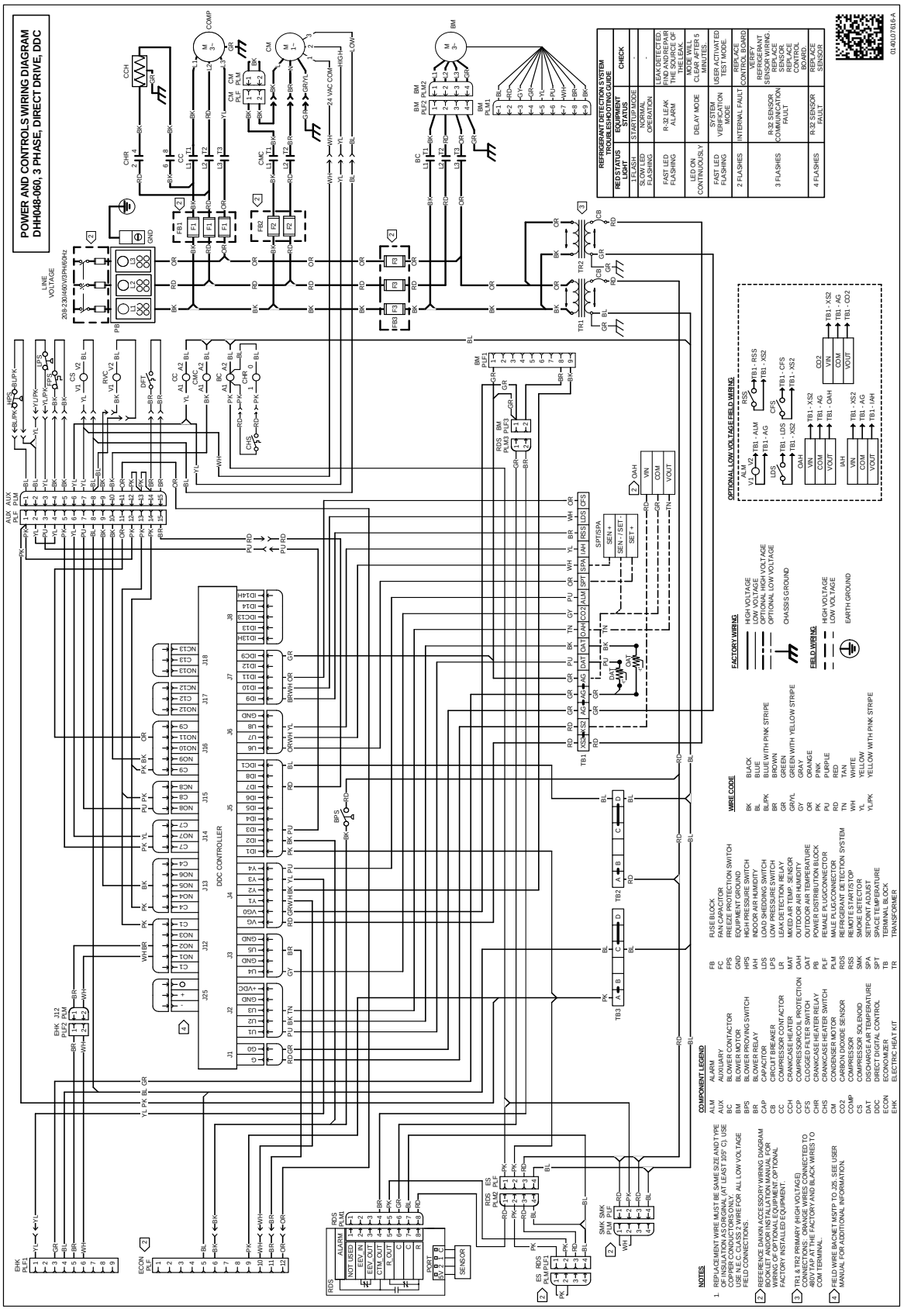
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UNIT WIRING DIAGRAMS

DHH048-060, 3 PHASE, DDC (208-230/460V)

WARNING

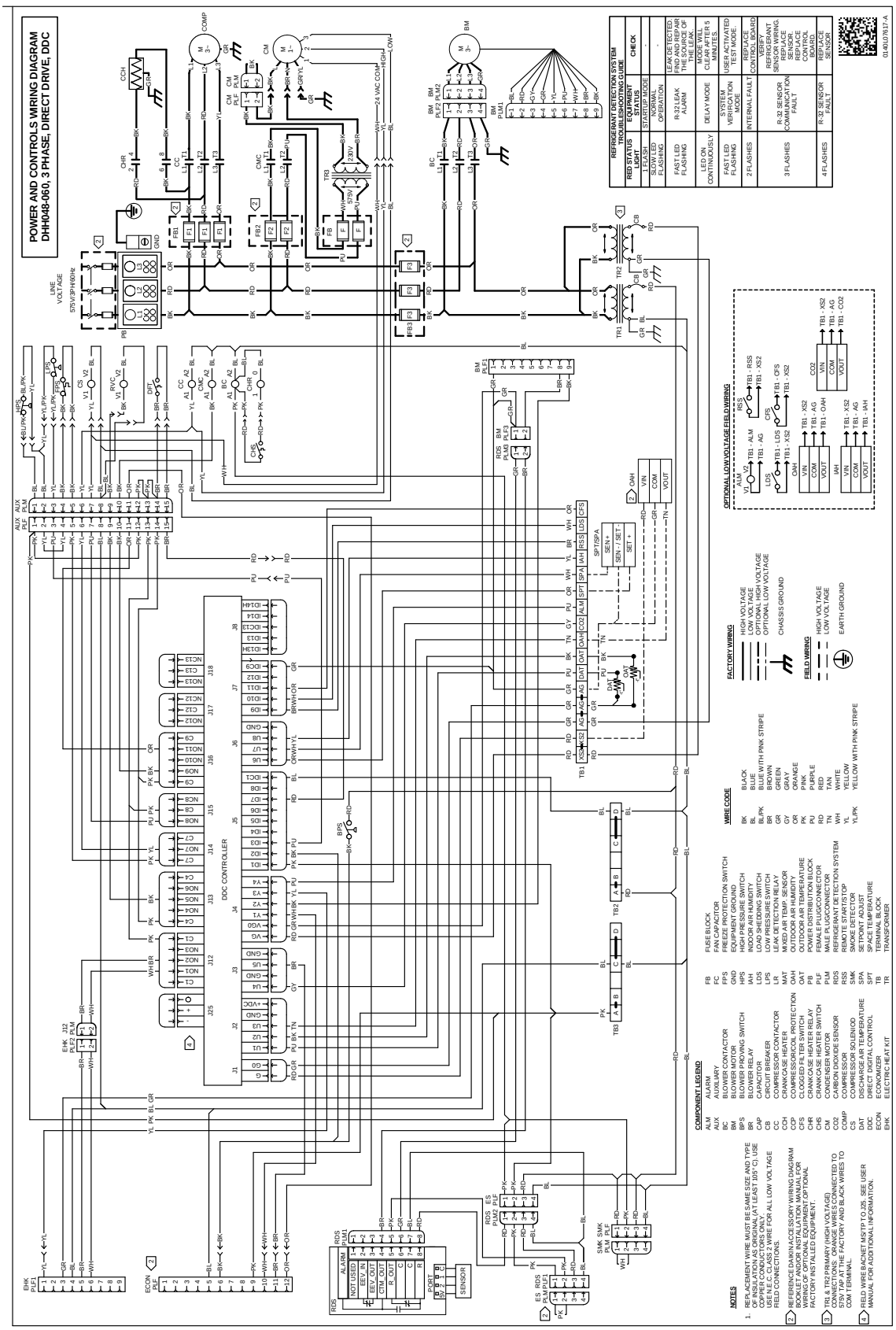
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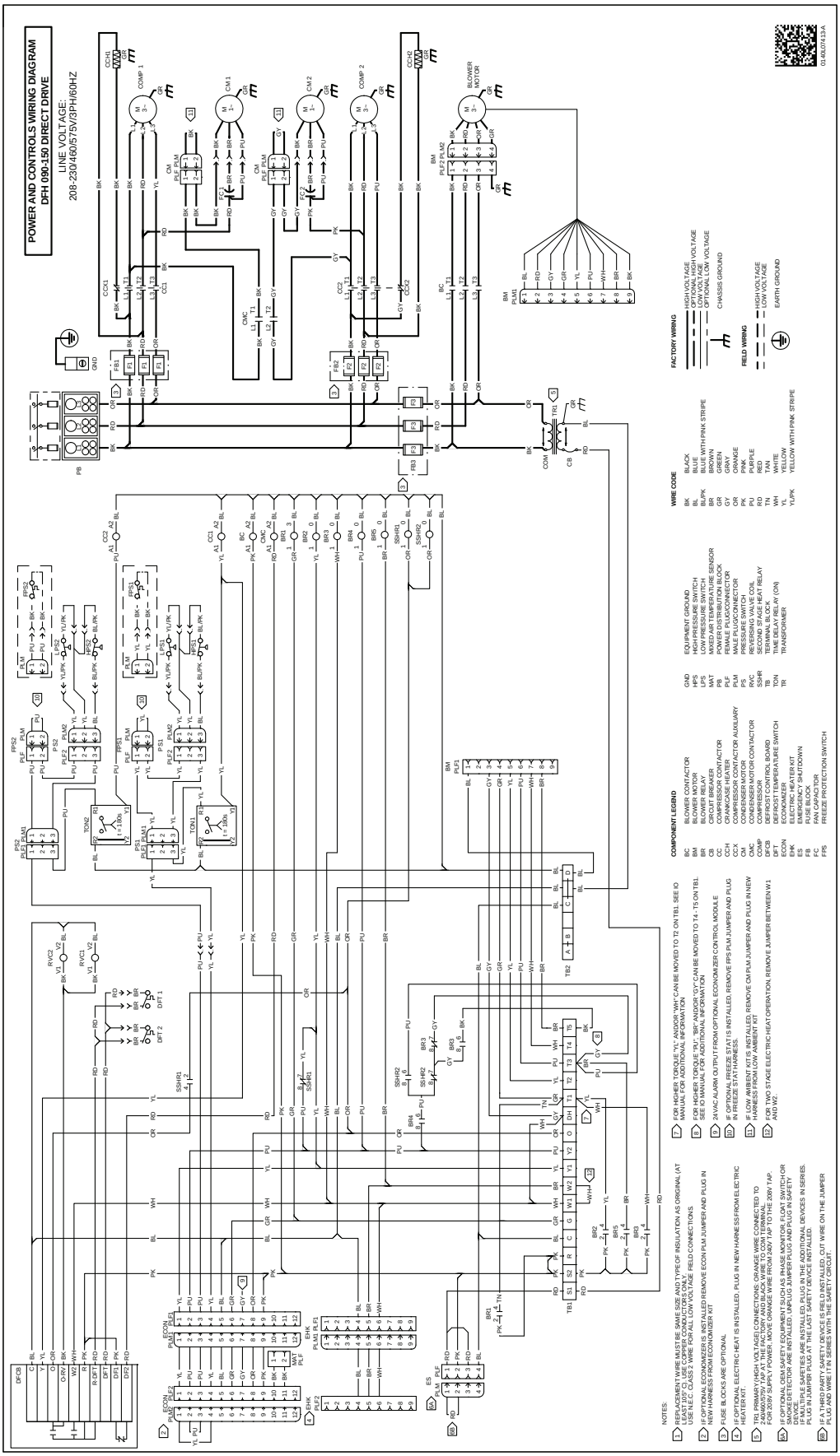


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DFH WIRING DIAGRAMS

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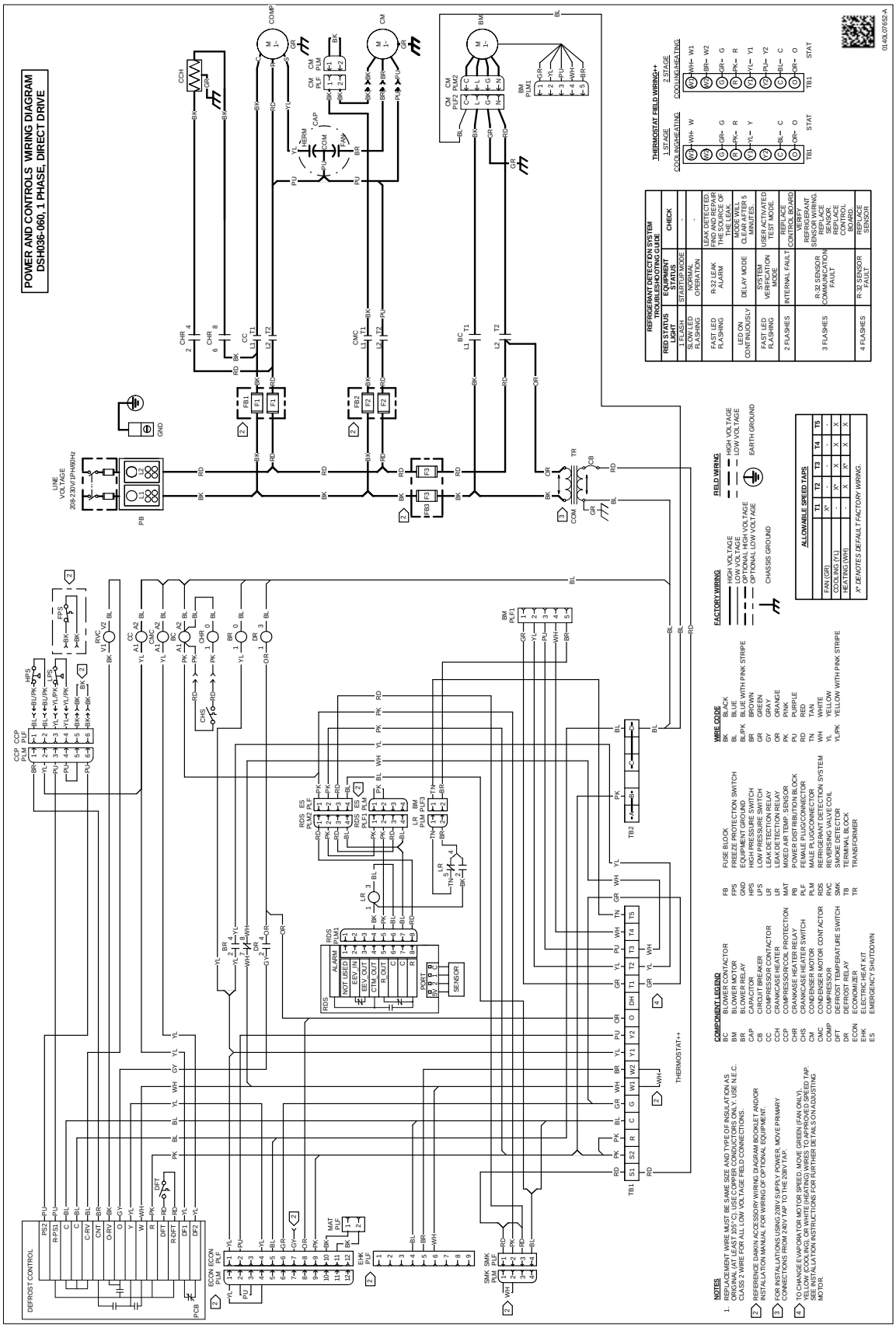


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DSH WIRING DIAGRAMS

WARNING

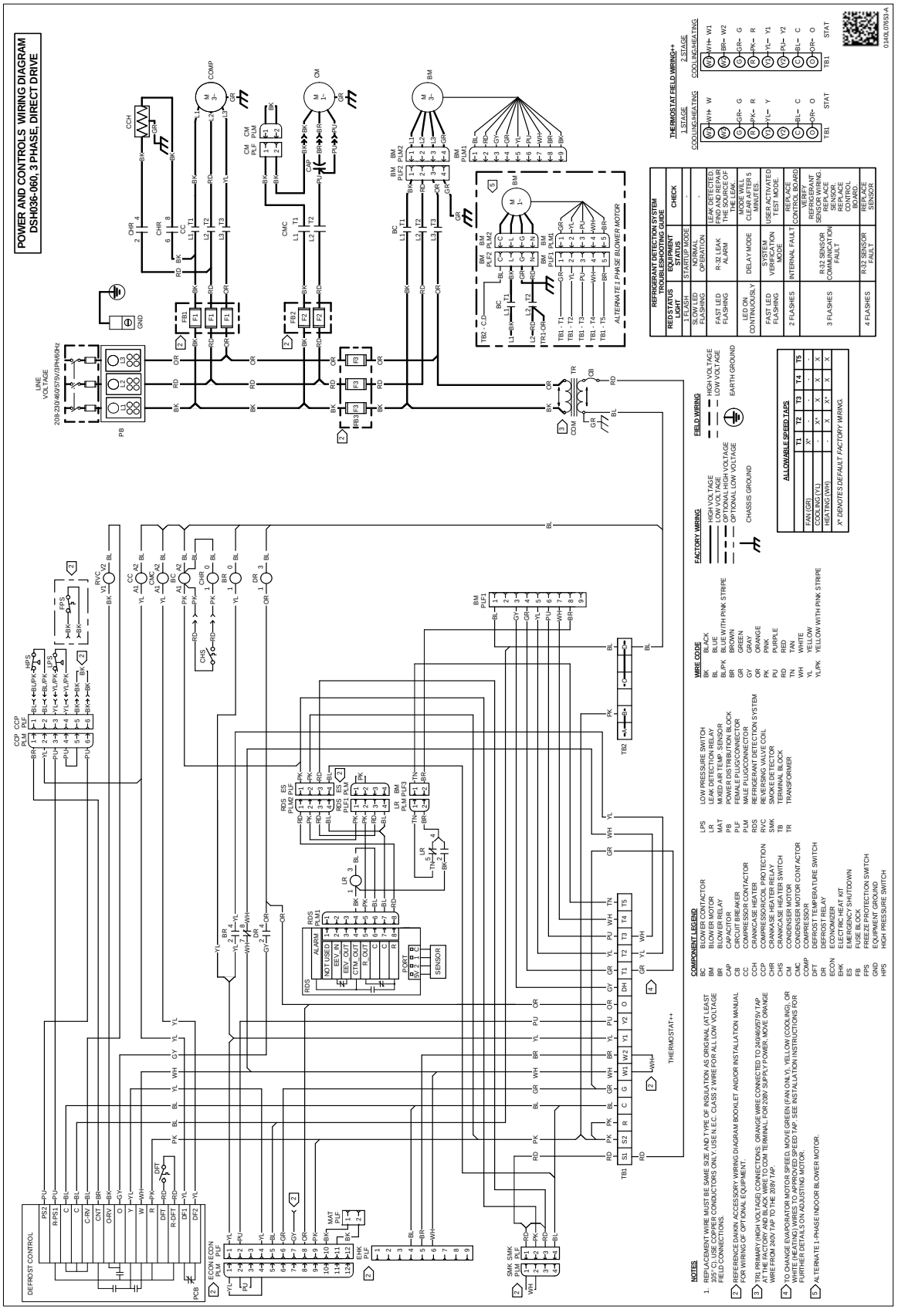
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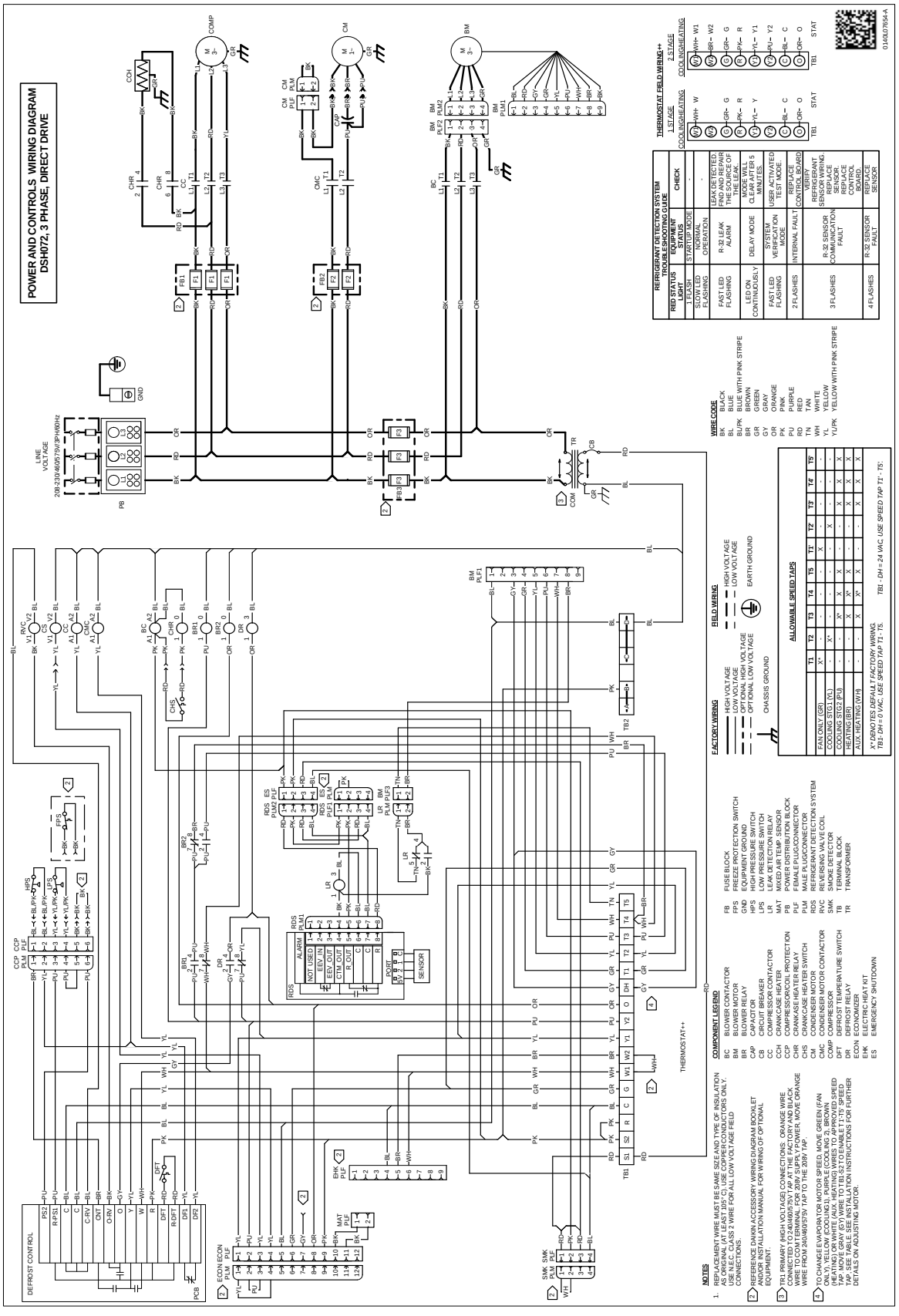
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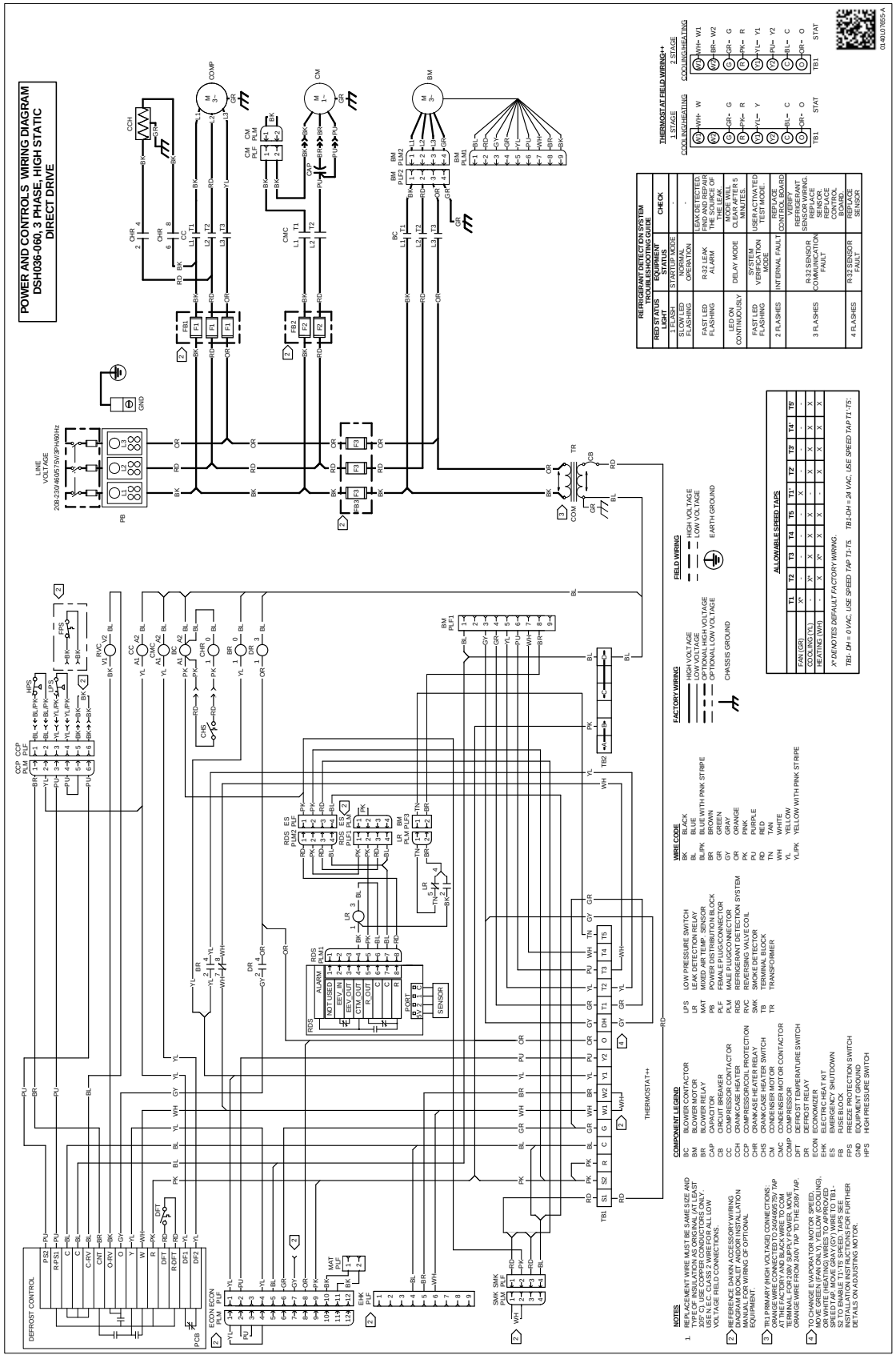


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HIGH VOLTAGE!

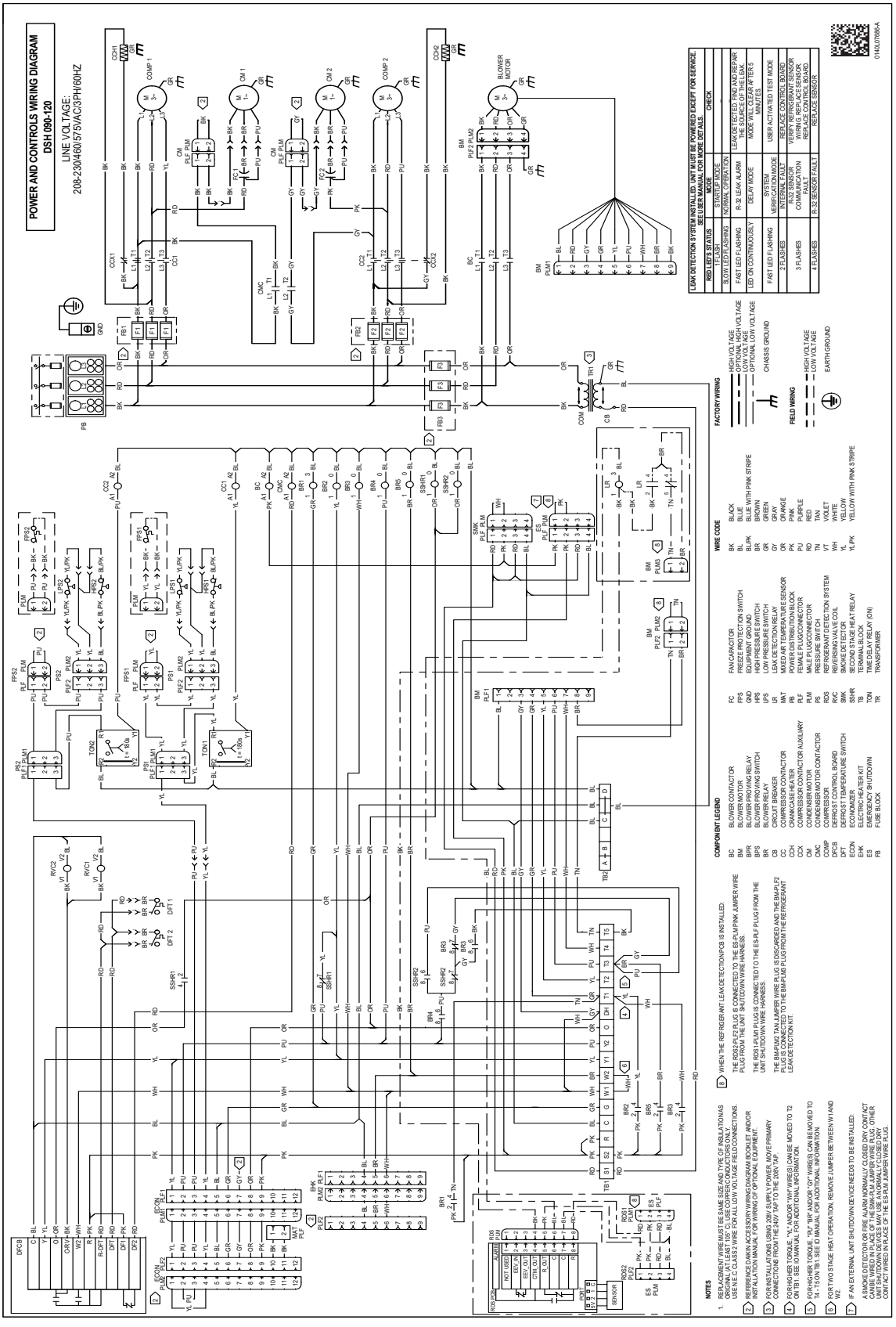
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Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

SCHEDULED MAINTENANCE

WARNING

ELECTRICAL SHOCK, FIRE OR EXPLOSION HAZARD
Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death or property damage.
Improper servicing could result in dangerous operation, serious injury, death or property damage.

- **Before servicing, disconnect all electrical power to furnace.**
- **When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.**
- **Verify proper operation after servicing.**

WARNING

HIGH VOLTAGE!
Disconnect all power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.



WARNING

To prevent personal injury or death due to improper installation, adjustment, alteration, service or maintenance, refer to this manual. For additional assistance or information, consult a qualified installer, servicer agency or the gas supplier.

CAUTION

Sheet metal parts, screws, clips and similar items inherently have sharp edges, and it is necessary that the installer and service personnel exercise caution.

Preventive maintenance is the best way to avoid unnecessary expense and inconvenience. Have this system inspected at regular intervals by qualified service personnel, at least twice a year. Routine maintenance should cover the following items:

1. Tighten all belts, set screws, and wire connections.
2. Clean evaporator and condenser coils mechanically or with cold water, if necessary. Usually any fouling is only matted on the entering air face of the coil and can be removed by brushing.
3. Lubricate motor bearings.
4. Align or replace belts as needed.
5. Replace filters as needed (see Filters section).
6. Check for blockage of condensate drain.
7. Check power and control voltages.
8. Check running amperage.
9. Check operating temperatures and pressures.
10. Check and adjust temperature and pressure controls.
11. Check and adjust damper linkages.
12. Check operation of all safety controls.
13. Check condenser fans and tighten set screws.

Filters

CAUTION

To prevent property damage due to fire and loss of equipment efficiency or equipment damage due to dust and lint build up on internal parts, never operate unit without an air filter installed in the return air system.

Every application may require a different frequency of replacement of dirty filters. Filters must be replaced at least every three (3) months during operating seasons.

Dirty filters are the most common cause of inadequate heating or cooling performance. Filter inspection should be made at least every two months; more often if necessary because of local conditions and usage.
Dirty throwaway filters should be discarded and replaced with a new, clean filter.

Disposable return air filters are supplied with this unit. See the unit Specification Sheet or Technical Manual for the correct size and part number. To remove the filters, remove the filter access panel on return side of the unit.

Cabinet Finish Maintenance

Use a fine grade automotive wax on the cabinet finish to maintain the finishes original high luster. This is especially important in installations with extended periods of direct sunlight.

Clean Outside Coil (Qualified Servicer Only)

The coil with the outside air flowing over it should be inspected annually and cleaned as frequently as necessary to keep the finned areas free of lint, hair and debris.

Clean Indoor Coil (Qualified Servicer Only)

Before cleaning the indoor coil, A2L sensor must be removed from the unit to avoid damage and contamination. Air filters should also be removed before performing maintenance. The coil with the filtered air flowing over it should be inspected and cleaned as frequently as necessary to keep the finned areas free of debris. Coil cleaning should be performed, utilizing an approved cleaning method and cleaning agent, from inside-out (opposite operating airflow direction) to prevent damage to the tube, fin coil, and any other components. Prior to resuming unit operation, ensure to reinstall the A2L sensor.

SCHEDULED MAINTENANCE

Condenser And Induced Draft Motors

Bearings on the condenser fan motors and the combustion fan motor are permanently lubricated. No additional oiling is required.

Lubrication

The fan shaft bearings, the supply fan motors, the condenser fan motors and compressors are permanently lubricated.

Functional Parts

Refer to the unit Parts Catalog for a list of functional parts. Parts are available from your distributor.

MCHX CARE

Lubrication

The fan shaft bearings, the supply fan motors, the condenser fan motors and compressors are permanently lubricated.

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Clean Indoor Coil (Qualified Servicer Only)

Before cleaning the indoor coil, A2L sensor must be removed from the unit to avoid damage and contamination. Air filters should also be removed before performing maintenance. The coil with the filtered air flowing over it should be inspected and cleaned as frequently as necessary to keep the finned areas free of debris. Coil cleaning should be performed, utilizing an approved cleaning method and cleaning agent, from inside-out (opposite operating airflow direction) to prevent damage to the tube, fin coil, and any other components. Prior to resuming unit operation, ensure to reinstall the A2L sensor.

Maintenance of MicroChannel Heat Exchangers (MCHE)

Frequent servicing is essential to maintaining the required MCHE performance. For every installed Danfoss MCHE, service records must be documented.

CAUTION

Prior to servicing MCHE, be sure to disconnect the power supply and use lock-out methods to prevent the power from accidentally being turned on.

Shut Down Periods

During periods when the MCHE is not operated for longer than a week, the MCHE must be completely cleaned following the cleaning procedure. This practice must also be performed during short shut-down periods where corrosive deposits accumulate on the MCHE.

Cleaning Procedure

Relative to tube & fin heat exchangers, MicroChannel heat exchanger coils tend to accumulate more dirt on the surface of the coil and less dirt inside the coil, making them easier to clean. Follow the steps below for proper cleaning:

Step 1: Remove Surface Debris

Remove surface dirt, leaves, fibers, etc. with a vacuum cleaner (preferably with a brush or other soft attachment rather than a metal tube), compressed air blown from the inside out, and/or a soft bristle (not wire!) brush. Do not impact or scrape the coil with the vacuum tube, air nozzle, etc.

Step 2: Rinse

Rinse the coil by following procedure:

1. Rinse the coil by approved MCHE cleaner first, or rinsing by water directly;
2. Waiting for 5 minutes;
3. Wash the coil by water;

Adjust the angle of gimbaled nozzle and insert it through fans. Using an extension rod if the nozzle cannot reach the bottom side. Preferably cleaning the coils from the inside-out and top to bottom (see figure 1), running the water through every fin passage until it comes out clean. The fins of MicroChannel coils are stronger than traditional tube & fin coil fins but still need to be handled with care. Do not hit the coil with the hose. We recommend placing your thumb over the end of the hose to obtain a gentler spray and reduce the possibility of impact damage. Please PAY MORE ATTENTION when using a pressure cleaning equipment to prevent damage.

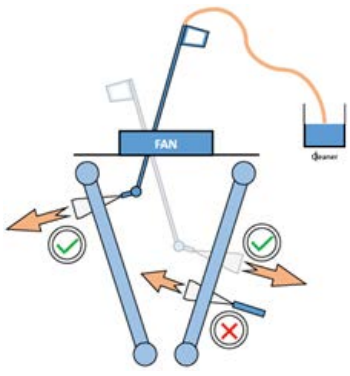


Figure 1

SCHEDULED MAINTENANCE

Highest pressure of cleaning equipment shall not exceed 15 bar, and tentatively move the cleaning equipment from far to near to prevent damage.

- KEEP the outlet of washer away from coil for at least 4in (see figure 2);
- KEEP the water gun perpendicular to the coil surface and the angle error shall less than 20°, or ±40° if the distance from washer to coil is more than 12in (see figure 2);
- Water outlet angle for high pressure cleaning equipment shall over 15° (see figure 3).

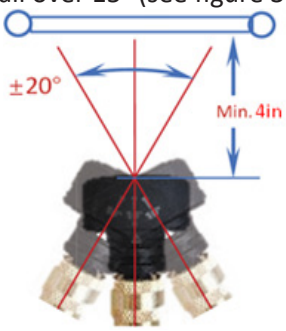


FIGURE 2



FIGURE 3

Warranty claims related to cleaning damage, especially for incorrect pressure washing operation, or corrosion resulting from applying non-recommended cleaners, will NOT be honored.

STEP 3: REMOVE SURFACE DEBRIS

Depending on the installation and fin geometry, MicroChannel heat exchangers could possibly retain more water compared to traditional tube & fin coils. It is advised to blow off or vacuum out the residual water from the coil to speed up drying and prevent pooling. Daikin recommends a quarterly cleaning of the coils, as the minimum. The cleaning frequency should be increased depending on the level of dirt/dust accumulation and the environment (e.g., coastal areas with chlorides and salts) or industrial areas with aggressive substances.

⚠ WARNING

FIELD APPLIED COATINGS ARE NOT RECOMMENDED FOR BRAZED ALUMINUM MICROCHANNEL HEAT EXCHANGERS. MICROCHANNEL HEAT EXCHANGERS MUST NOT BE COATED USING ANY OTHER COATING, COATING OF A COIL USING A SUPPLIER OR COATING PROCESS IS NOT APPROVED AND IS NOT COVERED UNDER THE WARRANTY. IT MAY ALSO REDUCE THE LIFETIME AND/OR THE PERFORMANCE OF THE MICROCHANNEL HEAT EXCHANGER.

INSPECTION & CLEANING

All flue product carrying areas of the furnace, its vent system, and main burners should be examined by a qualified service agency, and cleaned if necessary, before the start of each heating season. This examination is necessary for continued safe operation. Particular attention should be given to deterioration from corrosion or other sources. This examination is accomplished in the following manner.

1. Disconnect power to the unit and remove furnace section access panel.
2. Remove burner assembly:
   A. Disconnect the wires from the gas valve after noting which wires are connected to each terminal.
   B. Disconnect wires from the flame rod and ignition electrode.
   C. Disconnect the gas piping at the union.
   D. The entire burner assembly can now be removed from the unit.

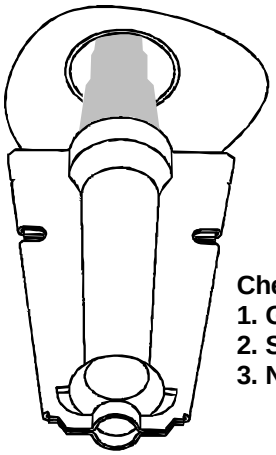
NOTE: Use all screws that were removed; they are necessary for safe and proper operation of the unit.

3. Inspect and periodically clean the vent outlet (bird screen) on the access panel.

NOTE: Periodic observation of the flame and a log of $C0_2$ measurements are recommended. This will aid in determining whether the furnace is operating efficiently or if the furnace requires cleaning.

Flames should be stable, soft and blue (dust may cause orange tips but must not be yellow). The flames must extend directly outward from the burner without curling, floating or lifting off.

SCHEDULED MAINTENANCE



Check the burner flames for:
1. Good adjustment
2. Stable, soft and blue
3. Not curling, floating, or lifting off.

BURNER FLAME

WARNING

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRIC SHOCK, DO NOT REMOVE ANY INTERNAL COMPARTMENT COVERS OR ATTEMPT ANY ADJUSTMENT. CONTACT A QUALIFIED SERVICER AT ONCE IF AN ABNORMAL FLAME SHOULD DEVELOP.

At least once a year, prior to or during the heating season, make a visual check of the burner flames.

NOTE: This will involve removing and reinstalling the heat exchanger door on the unit, which is held by two screws. If you are uncertain about your ability to do this, contact a qualified servicer.

If a strong wind is blowing, it may alter the airflow pattern within the unit enough that an inspection of the burner flames is not possible.

Functional Parts

Refer to the unit Parts Catalog for a list of functional parts. Parts are available from your distributor.

TROUBLESHOOTING

Ignition Control Error Codes

The following presents probable causes of questionable unit operation. Refer to *Diagnostic Indicator Chart* for an interpretation of the signal and to this section for an explanation.

Remove the control box access panel and note the number of diagnostic LED flashes.

Internal Control Failure

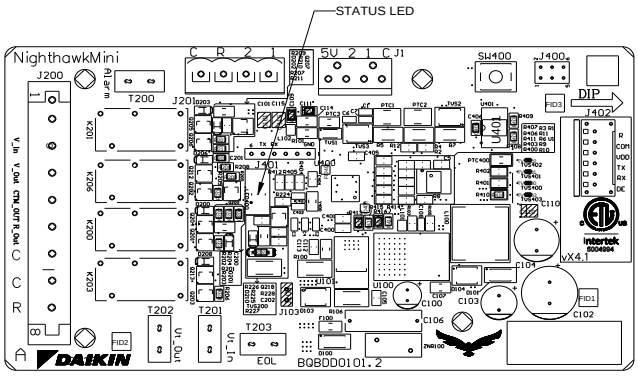
If the integrated ignition control in this unit encounters an internal fault, it will go into a “hard” lockout and turn off the diagnostic LED. If diagnostic LED indicates an internal fault, check power supply to unit for proper voltage, check all fuses, circuit breakers and wiring. Disconnect electric power for five seconds. If LED remains off after restoring power, replace control.

SCHEDULED MAINTENANCE

Servicing Measures for the Refrigerant Detection System:

Before servicing, identify the mode of operation of the system by reading the LED flashing pattern on the PCB within the control box and matching the LED flashing pattern with mode of operation in the REFRIGERANT DETECTION SYSTEM TROUBLESHOOTING GUIDE on the wiring diagram which is attached on the back side of the control box panel (RDS PCB Fault Code table). After identifying the mode of operation, take recommended actions as specified in the Recommended Actions for PCB LED Flashing Codes table.

REFRIGERANT SENSORS for REFRIGERANT DETECTION SYSTEMS shall only be replaced with sensors specified by the manufacturer. If REFRIGERANT SENSOR requires replacement, please replace with Sensata R32 Sensor PN#RGD-00ML12 (Daikin PN#SER2A08011).



RDS PCB

LED STATUS	
MODE	**LED FLASHING PATTERN**
NORMAL OPERATION	SLOW LED FLASHING PATTERN (2 SECONDS ON 2 SECONDS OFF)
R-32 LEAK ALARM	FAST LED FLASHING PATTERN
DELAY MODE	LED WILL BE ON CONTINUOUSLY
SYSTEM VERIFICATION MODE	FAST LED FLASHING PATTERN
CONTROL BOARD INTERNAL FAULT	LED WILL FLASH 2 TIMES AND THEN BE OFF FOR 5 SECONDS
R32 SENSOR COMMUNICATION FAULT	LED WILL FLASH 3 TIMES AND THEN BE OFF FOR 5 SECONDS
R32 SENSOR FAULT	LED WILL FLASH 4 TIMES AND THEN BE OFF FOR 5 SECONDS

RDS PCB Fault Code Table

	warning; flammable materials
	service indicator; read technical manual
	operator's manual; operating instructions
	warning; low burning velocity material
	UN GHS flame symbol

Marking Symbol Table

SCHEDULED MAINTENANCE

1	Normal Operation	No faults to report.	Slow LED flashing pattern (2 seconds on and 2 seconds off)	No actions needed.	
2	R32 Leak Alarm	R32 leak is currently being detected.	Fast LED Flashing Pattern	A technician will need to find where the refrigerant leak and address it. Unit shall be thawed before servicing.	In terms of the controls, no action is needed. The controls and sensor are working fine.
3	Delay Mode	After R32 leak or alarm has been cleared, the unit will remain in alarm mode for 5 minutes before returning to normal operation.	LED will be on continuously	No action needed - If the system was previously experiencing an actual R32 Leak, the refrigerant can no longer be detected by the sensor meaning it's either gone and the system won't work anymore or there was a false alarm. If the system was experiencing a Fault, the fault is gone and the system will return to normal operation in 5 min.	After any alarm or fault, it is required to remain in R32 mitigation mode for 5 minutes.
4	System Verification Mode	Manual test run by contractor to simulate R32 Leak Alarm (test will last for 5 minutes max).	Fast LED Flashing Pattern	No actions needed.	To enter system verification test mode, press the button on the control 2 times within 5 seconds. The control will enter a simulated R32 Leak Alarm state and remain in that mode for 5 minutes. After 5 minutes, the control will return to Normal Operation automatically. If the contractor wants to end the test early they need to press the button one time.
5	Control Board Internal Fault	Control board has detected an issue with the R32 detection system.	LED will flash 2 times and then be off for 5 seconds, before repeating pattern	1) Unplug and plug the R32 sensor back in. Cycle power to the system. 2) If the control is in "Normal Operation" or "Delay Mode", there is no more issue. If not, continue with diagnostics 3) Unplug R32 sensor and leave unplugged. Cycle power to the system 4) If the control still displays "Control Board Internal Fault" (2 flash pattern), replace the control. If the control now displays "R32 Sensor Communication Fault" (3 flash pattern), replace the sensor.	This error could indicate an on board relay failure or a short with the sensor communications. A sensor communication short could occur on the board itself or external to the board. These steps will determine if the error is on the board or external to the board.
6	R32 Sensor Communication Fault	Control board does not have communications with R32 sensor.	LED will flash 3 times and then be off for 5 seconds, before repeating pattern	1) Unplug and plug the R32 sensor back in. Cycle power to the system. 2) If control is in "Normal Operation" or "Delay Mode", there is no more issue. If not, continue with diagnostics. 3) If the control still displays "R32 Sensor Communication Fault" (3 flash pattern), replace both the sensor and the PCB.	If the control cannot talk to the sensor there could be a problem with the sensor, a problem with the sensor harness or a problem internal to the control. The field will not be able to measure anything to reliably fix this error assuming the connector is properly secured to the control. Replacing both is the only option.
7	R32 Sensor Fault	R32 Sensor has reported an internal issue.	LED will flash 4 times and then be off for 5 seconds, before repeating pattern	Replace R32 sensor.	Communications to the sensor are perfectly fine. The sensor itself is reporting an internal fault.

RECOMMENDED ACTIONS FOR PCB LED FLASHING CODES TABLE

SCHEDULED MAINTENANCE

DECOMMISSIONING

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

A. Become familiar with the equipment and its operation.
B. Isolate system electrically.
C. Before attempting the procedure, ensure that:
    - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
    - all personal protective equipment is available and being used correctly;
    - the recovery process is supervised at all times by a competent person;
    - recovery equipment and cylinders conform to the appropriate standards.
D. Pump down refrigerant system, if possible.
E. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
F. Make sure that cylinder is situated on the scales before recovery takes place.
G. Start the recovery machine and operate in accordance with instructions.
H. Do not overfill cylinders (no more than 80 % volume liquid charge).
I. Do not exceed the maximum working pressure of the cylinder, even temporarily.
J. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
K. Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked.

Equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing FLAMMABLE REFRIGERANTS, ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.