WATERLESS®
GEOTHERMAL

M SERIES

(Multi-Function Machines)
WG2AD (Forced air/heating/cooling with domestic water heating)
WG1AH and WG2AH (Forced air/heating/cooling with hydronic water heating)
AD/AH 2 Stage Models Available in 3, 4 and 5 Ton Models
Single Stage AH Models available in 3 to 5 ton Models

Installation Manual

.**Please note that illustrations in these manuals are for reference only and may not show all detail. Also, specifications are subject to change without notice. It is imperative that only the manuals shipped with the equipment be used for each installation.**

Disclaimer

Proper installation and servicing of the Total Green Mfg. Heat Pump is essential to its reliable performance. All Total Green Mfg. systems must be installed and serviced by a qualified HVAC contractor. Equipment sizing, selection and installation are the sole responsibility of the installing contractor.

Installations of equipment on an existing copper earth loop design that does not match a current Total Green Mfg. earth loop design is not permitted, will void all warranties on the equipment, and are the sole responsibility of the installing contractor. Installation must be made in accordance with the instructions set forth in this manual. Failure to provide installation by a qualified HVAC contractor in a manner consistent with this manual will void and nullify the limited warranty coverage for the system.

Total Green Mfg. shall not be liable for any defect, unsatisfactory performance, damage or loss, whether direct or consequential, relative to the design, manufacture, construction, application or installation of any field specified components.

All commissioning and registration paper work must be filled out at start up and returned to Total Green Mfg. for full warranty coverage.

Please Note: Electrical data given in this manual is subject to change without notice. Please refer to the equipment data label for the most up to date specifications.

This appliance 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 appliance.

Compressor Unit Nomenclature

WG 1 A-24 C 1-CP1-D-S

Brand & Product:
Waterless™ Geothermal

Compressor Stages:
1 = Single Stage
2 = Two Stage

Model Functions:
A = Air Only
AH = Air & Hydronic
AD = Air & Domestic Hot Water (2 stage only)
H = Hydronic Only - Chilled & Hot Water

Unit Capacity:
24 = 24,000 BTU Capacity (2 Ton)
30 = 30,000 BTU Capacity (2.5 Ton)
36 = 36,000 BTU Capacity (3 Ton)
42 = 42,000 BTU Capacity (3.5 Ton)
48 = 48,000 BTU Capacity (4 Ton)
54 = 54,000 BTU Capacity (4.5 Ton)
60 = 60,000 BTU Capacity (5 Ton)
66 = 66,000 BTU Capacity (5.5 Ton)
72 = 72,000 BTU Capacity (6 Ton)

Refrigerant:
C = R-410A Refrigerant
D = Future Refrigerant
E = Future Refrigerant

Electrical:
1 = 230V 1 ph, 60 Hz
2 = 230V 3 ph, 60 Hz
4 = 230V 1 ph, 50 Hz
5 = 400V 3 ph, 50 Hz

Cathodic Protection:
CPX = External Cathodic Protection
CP1 = 1 Impressed Current Rectifier
CP2 = 2 Impressed Current Rectifiers

Options:
D = Desuperheater
S = Soft Start

Air Handler Nomenclature

AH-024-V-2V

Product Type:
AH = DX Air Handler
HAH = Hydronic Air Handler

Unit Size:
24 = 24,000 BTUH = 2 Ton
30 = 30,000 BTUH = 2.5 Ton
36 = 36,000 BTUH = 3 Ton
42 = 42,000 BTUH = 3.5 Ton
48 = 48,000 BTUH = 4 Ton
54 = 54,000 BTUH = 4.5 Ton
60 = 60,000 BTUH = 5 Ton
66 = 66,000 BTUH = 5.5 Ton
72 = 72,000 BTUH = 6 Ton

Air Handler Position:
1V = 1 Piece Vertical Position
2V = 2 Piece Vertical Position
1M = 1 Piece Multi-Position
2M = 2 Piece Multi-Position

Motor Style:
V = Variable Speed ECM
F = Fixed Speed ECM (Constant Torque)

***Figure 1**. Model Nomenclature*

Guidelines for the general layout of the system components are shown in Figure 2A. Before placing the compressor unit (outside or indoors), review the guidelines in Figure 2.

INSTALLATION GUIDELINES

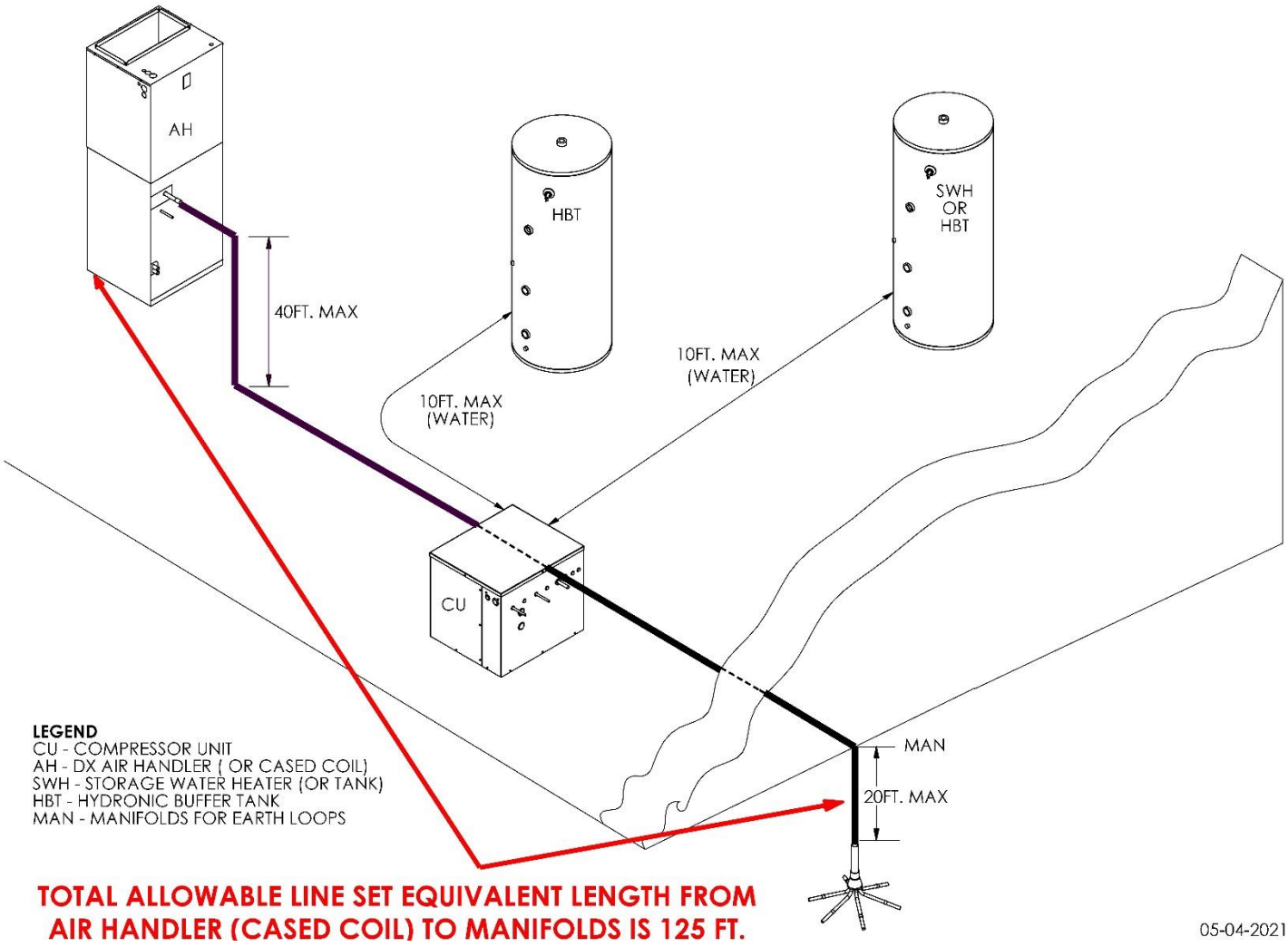
- All refrigerant and water lines between these above ground components must be insulated with at least 1/2" wall thickness Armaflex, Insul-Tube or equivalent insulation.
- All line set fittings must be factored in when calculating equivalent length.
- Please use the following chart to figure the fittings equivalent length.

Pipe Fitting Equivalent Lengths

Long Radius 90 = 3 ft. **Coupling = 1 ft.** **Swaged Connection = 1ft.** **45 Degree Elbow = 1.5 ft.**

Important Note: Short Radius 90° elbows are NOT permitted to be used in any piping.

***Figure 2**. General Layout of System Components*



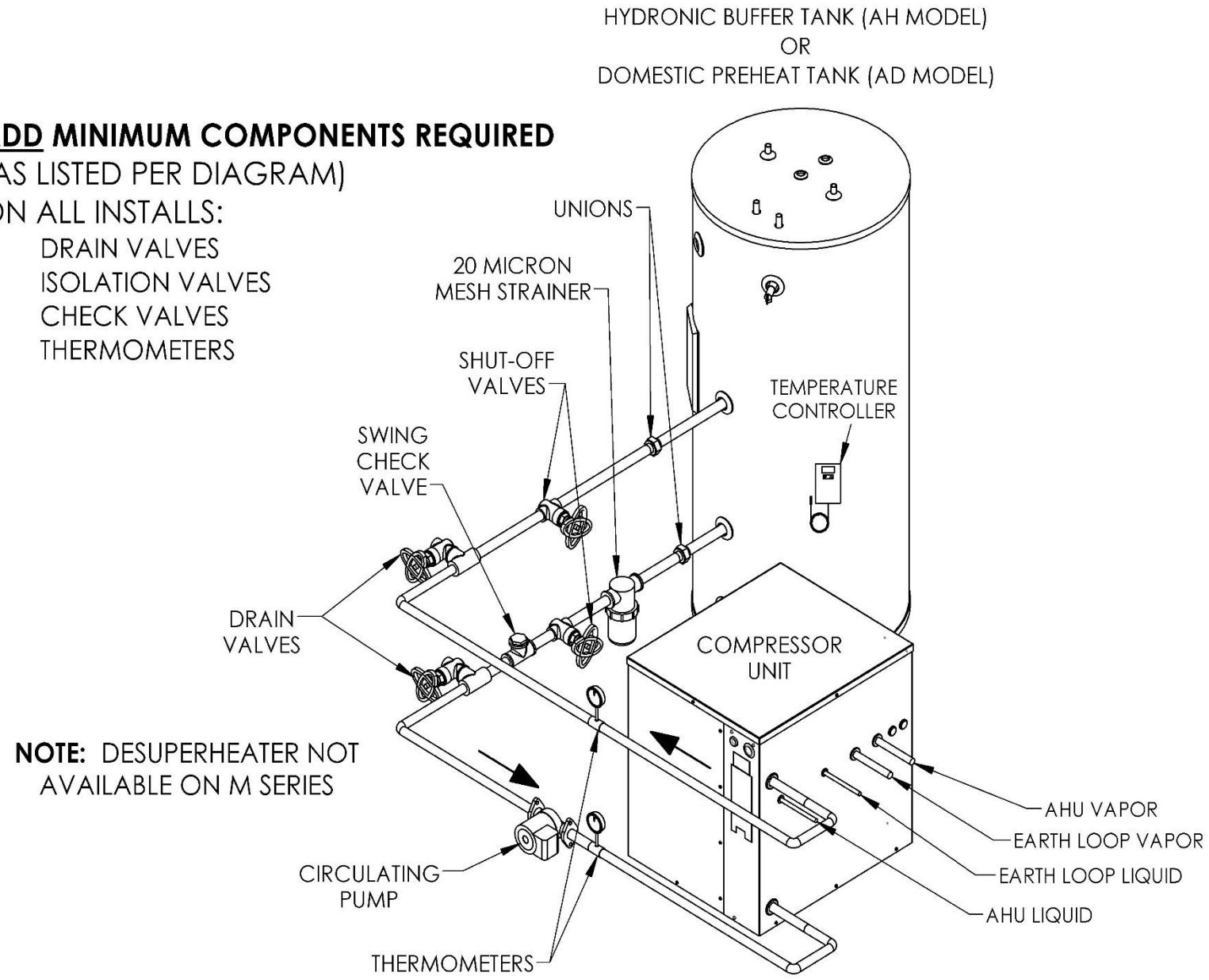


Figure 2B. *Typical Installation of WG2AD and WGxAH.*

1) Compressor Unit Placement

- Total Green Mfg. compressor units may be located inside or outside. If outside, place compressor unit on a standard HVAC outdoor unit pad. If inside, place it on a level, hard surface. If the compressor unit is to be fastened down, see Figure 3 for bracket installation.
- Avoid placing the compressor unit in or near sound sensitive areas of the residence.
- Clearance around the unit for service is illustrated in Figure 4. However, local codes and applicable regulations take precedence.

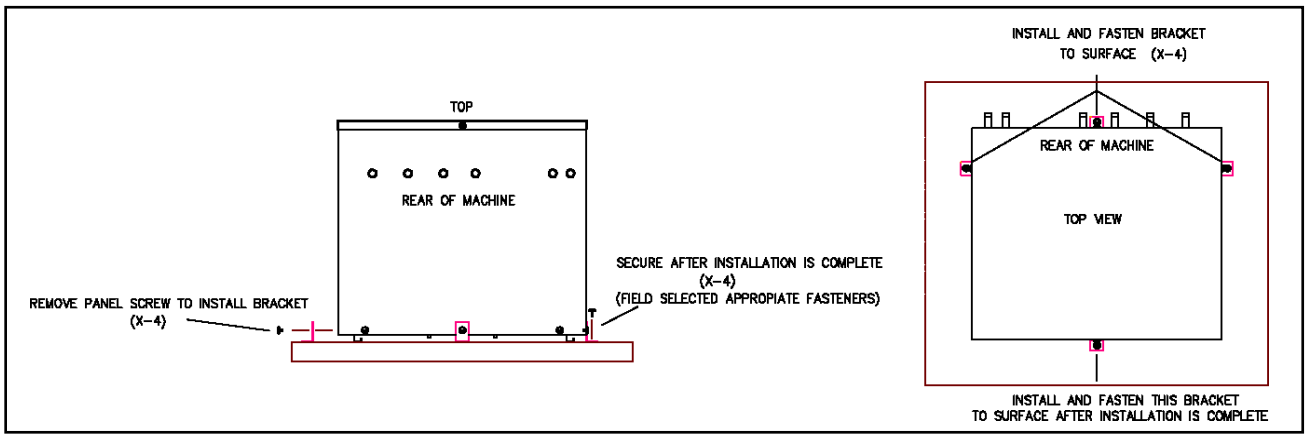


***Figure 3**. Compressor Unit Bracket Installation*

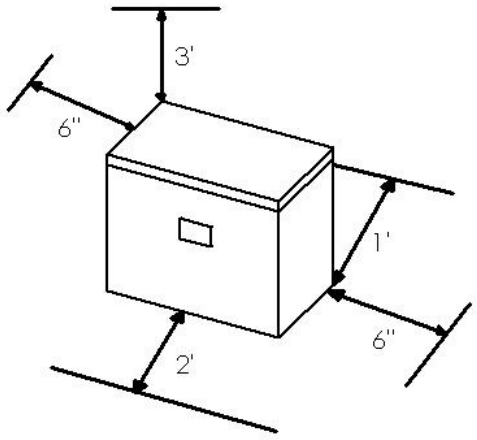
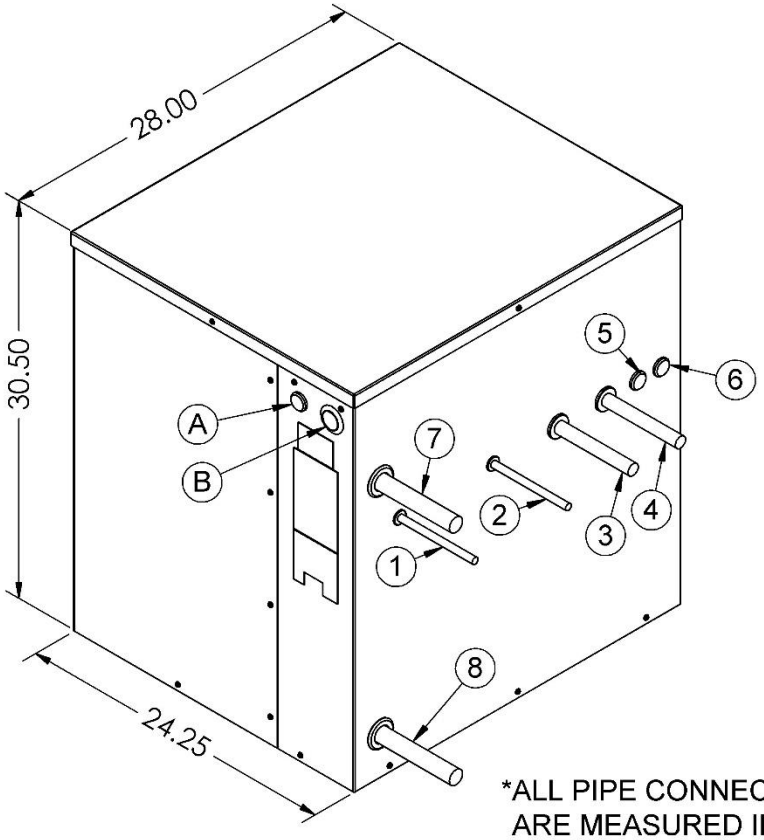


***Figure 4**. Compressor Unit Clearance*

Placement instructions for other pieces of equipment that make up the Total Green Mfg. System are included with those pieces of equipment and are listed in this manual under **Equipment Manuals.**

2) Refrigeration Piping

After the Total Green Mfg. compressor unit and other system components are placed, the refrigeration system tubing is run from the compressor unit to the other components, as appropriate. Figure 5 illustrates the refrigeration and electrical connection points for the compressor unit.



*ALL PIPE CONNECTIONS ARE MEASURED IN O.D.

PORT	FUNCTION	CONNECTION	
A	ELECTRICAL	7/8" HOLE	
B	ELECTRICAL	1-1/4" HOLE	
		2 THRU 3 TON UNITS ONLY	3.5 THRU 6 TON UNITS ONLY
1	AH/CC LIQUID	3/8"	1/2"
2	EARTH LOOP LIQUID	3/8"	1/2"
3	EARTH LOOP VAPOR	3/4"	7/8"
4	AH/CC VAPOR	3/4"	7/8"
5	N/A	PLUGGED	
6	N/A	PLUGGED	
7	HX OUT	1-1/8"	
8	HX IN	1-1/8"	

***Figure 5**. Connections*

Compressor units are shipped from the factory with a low pressure nitrogen holding charge. Carefully relieve the holding charge when the compressor unit is being prepared to connect refrigerant system piping.

REQUIREMENT

REFRIGERANT PIPING CONNECTIONS

Refrigerant joints must be brazed with 15% silver content brazing alloy, utilizing the NITROGEN BRAZING PROCESS.

CAUTION!

REFRIGERANT OIL

After the initial nitrogen holding charge has been released from the compressor unit, it is critical that air not be allowed to enter the compressor unit during the process of preparing compressor unit refrigerant connections (tube cutting, deburring, cleaning, brazing, etc).

CAUTION!

NITROGEN BRAZING PROCESS

PURPOSE: Utilize the NITROGEN BRAZING PROCESS on all brazed refrigerant piping connections. This process eliminates oxidation products from inside joint surfaces.

TECHNIQUE: "Trickle" nitrogen gas at 1-2 psi pressure through the joint area being brazed, to displace the oxygen. When oxygen has been displaced, turn off the nitrogen, and relieve the pressure at the joint to atmospheric prior to brazing.

CONSEQUENCES: Failure to displace oxygen with nitrogen at the brazed joint will result in particulate matter being released into the system. The result is discoloration of refrigerant oil, contamination of the system and possible system failure.

For field supplied line set sizes, refer to Figure 6A. Line set sizes are for both field manifolds to compressor unit and from compressor unit to air handler or cased coil. Lines set length is from field manifolds to air handler or cased coil with the compressor being anywhere in between. Line set length **cannot** exceed 125 ft. For maximum efficiency, line set lengths should not exceed 100 ft. Line set lengths as stated are equivalent lengths, not actual. Fittings must be accounted for. Example; a coupling is equal to 1 ft. of line set and a long radius elbow is equal to 3 ft. of line set. In addition, never use close radius elbows in the system piping.

Pipe Fitting Equivalent Lengths

Long Radius 90 = 3 ft. **Coupling = 1 ft.** **Swaged Connection = 1ft.** **45 Degree Elbow = 1.5 ft.**

Important Note: Short Radius 90° elbows are NOT permitted to be used in any piping.

LINE SET PIPING AND ADAPTERS REQUIRED ARE FIELD SUPPLIED. CHECK ALL APPROPRIATE COMPRESSOR UNIT STUB-OUT TUBING SIZES FOR REQUIRED FIELD SUPPLIED ADAPTERS!

R410A EARTHLOOP, AIR HANDLER, CASED COIL LINE SETS		
COMPRESSOR UNIT SIZE	R410A LINE SET O.D., INCHES	
	LIQUID	VAPOR
3.0 Tons (-036)	3/8	3/4
3.5 Tons (-042)	1/2	7/8
4.0 Tons (-048)	1/2	7/8
4.5 Tons (-054)	1/2	7/8
5.0 Tons (-060)	1/2	7/8

***Figure 6**. Line set sizes*

3) Service Valves

All Total Green Mfg. compressor units ship with service valves to be installed at the time of the equipment installation. These valves are used to isolate the field from the above ground equipment. They are to be installed on the Earth Loop liquid and vapor lines near the rear of the compressor unit. The valves should be orientated so that the Schrader ports are open to the field when the valves are closed. Figure 7A and 7B illustrate the valve types that ship with the equipment and their orientation.

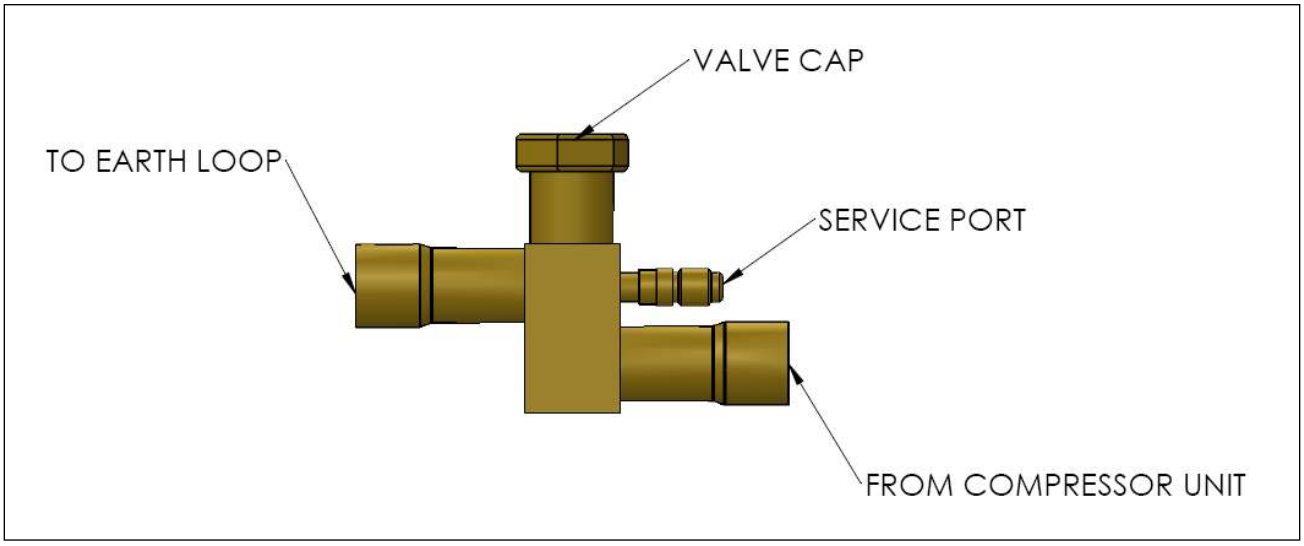


Figure 7A.*King Valve*

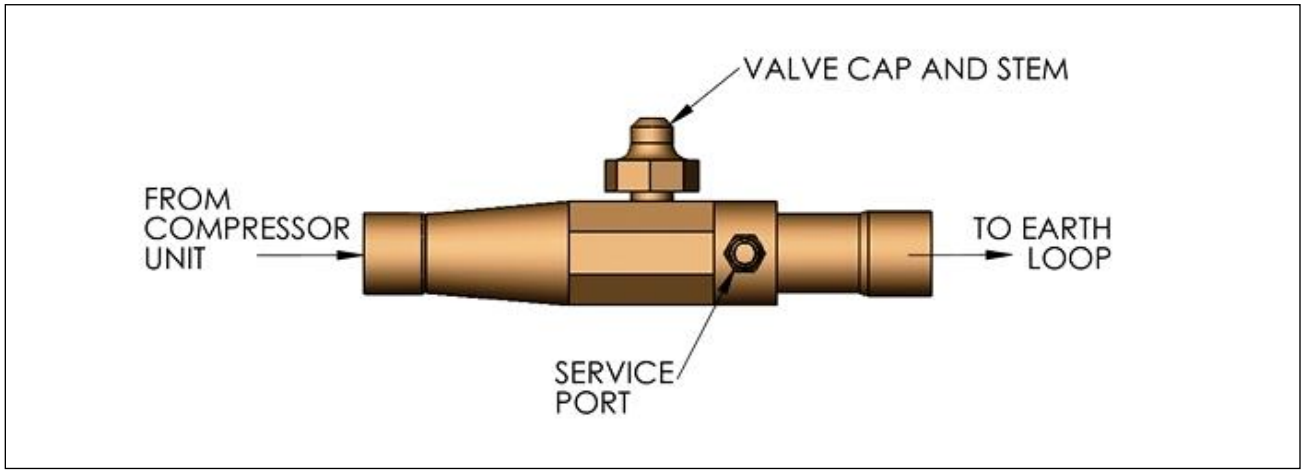


Figure 7B.*Ball Valve*

4) Storage Tanks and Water Piping

Figure 8A shows a typical water storage tank installation.

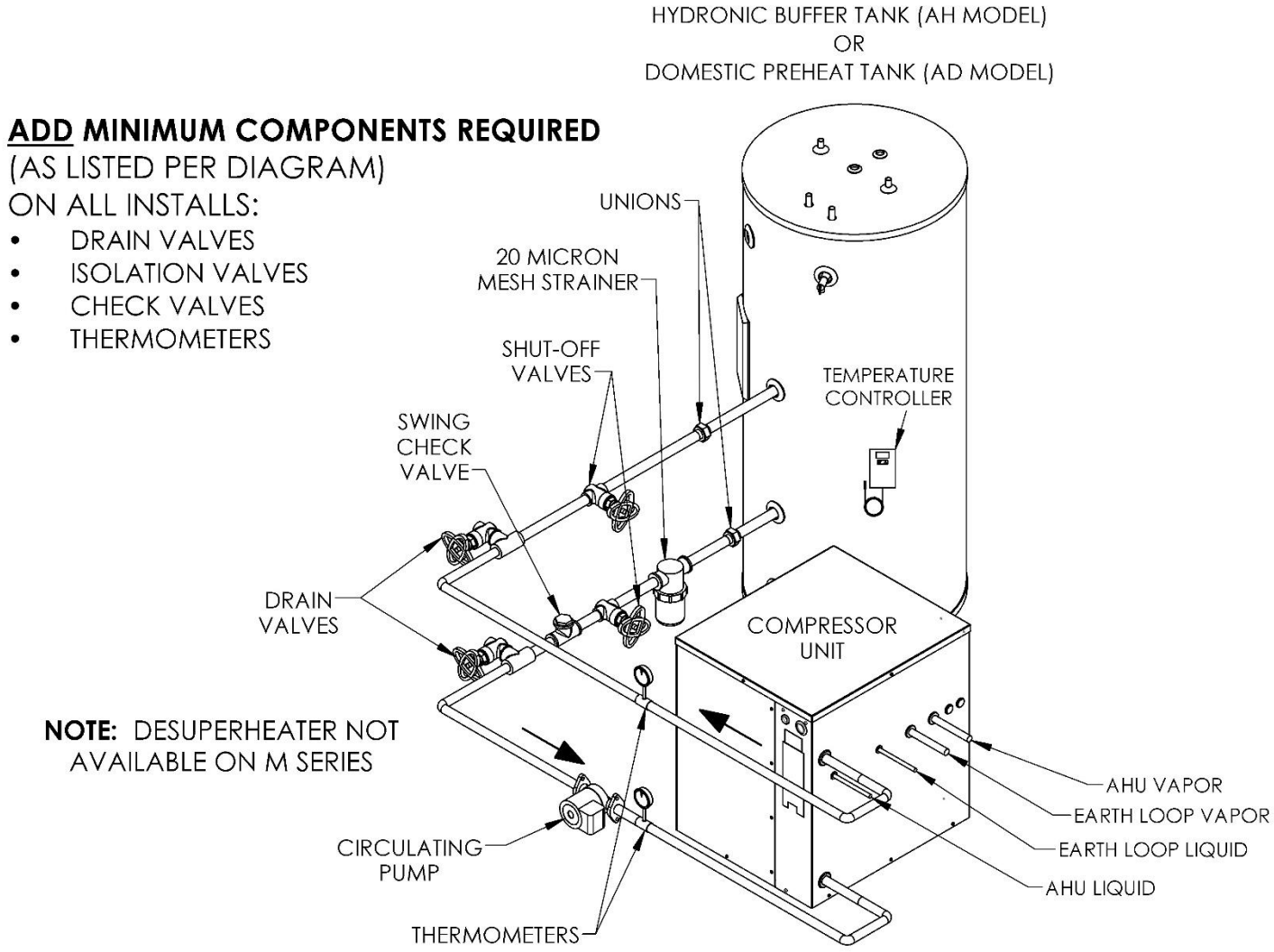


Figure 8A. *Typical WG2AD and WGxAH Primary Hydronic Circuit Plumbing*

The components are as follows:

1. **Circulating Pump:** Circulating pumps, flange kits and mounting brackets are included and ship with the equipment. The design flow rate of the water circuit for the WG1AH, WG2AH and WG2AD should be 3 to 4 GPM per unit ton. This should be easily accomplished using the supplied circulator pump and follow the piping instruction set forth in this manual. To verify the appropriate flow rate through the compressor unit heat exchanger, begin by fastening thermocouples securely on the water supply and water return copper stub outs of the compressor unit. Start the unit in heating mode. After the system has stabilized, determine the temperature differential between the supply temperature and the return temperature. The flow rate is correct if the temperature differential is 8 degrees or less. Ideally, no more than 7 degrees. If the temperature differential is higher than 8 degrees, corrections are to be made as needed to raise the flow rate.

2. **Temperature Controllers:** Digital thermostats can be provided by Total Green Mfg. These thermostats can be mounted remotely and come with a Sensor Wire 6.5 feet long.

3. **Tank:** Tanks are available through Total Green Mfg. in 80 and 119/120 US Gallon capacities, and are designed for use with Waterless® geothermal systems. These tanks are equipped with a 4.5 kW supplemental electric heating element.

4. **Other Plumbing Components and Parts:** Fittings, isolation valves, drain valves, strainer, unions, copper pipe, pipe insulation, etc. meeting USA industry and local code standards are commercially available through plumbing supply outlets. All elbows should be long radius and all valves should be full port.

All plumbing installations are to be in accordance with the applicable local and national codes.

Required minimum and recommended tank capacities and piping sizes are shown in Figure 8B, for the nominal tonnage of the compressor unit specified. All field supplied tanks and piping must match what is listed.

Compressor Unit Model/Capacity, BTUH	***Tank Size, US Gallons***	***Minimum Nominal Type L Hard Copper Pipe & Fittings, inches***
3, 3.5 Ton (36 and 42)	60, 80	1-1/4 I.D.
4,4.5 and 5 Ton (48,54 and 60)	80, 119/120	1-1/2 I.D.

Figure 8B*. Storage Tank Capacity per Unit Size*

<u>Note</u>: All water piping to be insulated with ½ inch wall pipe insulation.

5) Hydronic Water Heating –AH Model

Hydronic Water Heating Maximum Temperature is 110°F as Measured at the Heat Exchanger Outlet

The water tank thermostat should be adjusted, regardless of the temperature shown on its display, to satisfy the call when the above condition is met. It is also recommended, for maximum efficiency, that the water temperature as measured from the water outlet of the heat exchanger be kept at 100°F or less. Your hydronic heating distribution, such as a radiant floor system, should be designed to operate at 100°F or less. If a hydronic water temperature higher than 110°F is desired, that difference in temperature should be made up with a supplemental heat source.

6) Antifreeze Protection

The water circulating system of a WGxAH unit must be protected from potential damage from corrosion, build-up and freeze-up by utilizing a 20% minimum of Propylene-glycol antifreeze with an Inhibitor to water solution. This antifreeze protection is provided by the installer prior to system start-up. Prior to adding glycol, tank anode rods, if any, must be removed so as not to react with the glycol.

Propylene-glycol antifreeze solution with an inhibitor is the type of antifreeze solution required for Total Green Mfg. products utilized in radiant panel hydronic heating systems. These systems shall be freeze protected consistent with the application-specific minimum temperature as shown in the table below. Propylene-glycol antifreeze solutions should always be in the range of 20% to 50% by volume, as indicated in Figure 8C.

TEMPERATURE, °F	PROPYLENE GLYCOL, %
18	20
8	30
-7	40
-29	50

***Figure 8C**. Propylene Glycol Freeze Protection Table*

ALWAYS REMOVE THE ANODE ROD(S) FROM THE STORAGE WATER TANK OR HEATER UTILIZED IN A RADIANT PANEL HYDRONIC HEATING IF THE ANODE ROD(S) ARE NOT REMOVED, THE PROPYLENE-GLYCOL SOLUTION WILL REACT WITH THE ANODE ROD(S) TO CREATE PARTICLES THAT BLOCK FLOW AND CAUSE SYSTEM FAILURE.

7) Domestic Water Heating –AD Model

Domestic Water Heating Maximum Temperature 120°F

Please note that the maximum water temperature for the WG2AD (domestic water heating) system is 120°F as measured at the water outlet of the unit heat exchanger. This temperature is enough to satisfy most domestic water heating needs. The water tank thermostat should be adjusted, regardless of the temperature shown on its display, to satisfy the call when the above condition is met. If a higher domestic water temperature is desired, that difference in temperature should be made up with a supplemental electric element. You also have the option of sending preheated water to the cold water inlet of a standard water heater.

8) Filtration and Water Quality

The inclusion of a water filter in all applications for domestic water heating is necessary. A water filter reduces the potential for silt, dirt, rust and other particulate matter from entering the heated water system. This can be achieved using a whole house water filtration system or, at the least, a water filter on the cold water line entering the water tank.

When specifying a system for domestic water heating, it is important to ensure that the water is not hard, and to have the water analyzed and treated as appropriate for several factors that affect the quality of potable water.

Please refer to the applicable manual for installation of other Total Green Mfg. equipment:

- ***Air Handler***
- ***Cased Coil***
- ***Earth Loops***

After installing and nitrogen brazing the HVAC system components, turn the Service Valves to **Full Open** and pressurize the refrigeration system to 150 psig with dry nitrogen and a trace of refrigerant. Valve off the nitrogen tank from the HVAC system components and check joints with a sensitive Electronic Leak Detector and bubble solution to ensure they are sealed. Repair any leaks and re-test as appropriate.

9) Electrical Data

Please Note: Electrical data is subject to change without notice. Please refer to the equipment data label for the most up to date specifications.

WG-1-XXX-C-1-XX 410A SINGLE STAGE SINGLE PHASE					
TON	SINGLE PHASE	LRA	RLA	MCA	MFS
3 TON (036)	230V - 60HZ	112	17.9	22.4	35
3.5 TON (042)	230V - 60HZ	117	21.8	27.3	40
4 TON (048)	230V - 60HZ	134	25	31.3	45
4.5 TON (054)	230V - 60HZ	178	28.3	35.4	50
5 TON (060)	230V - 60HZ	178	30.8	38.5	50
WG-1-XXX-C-2-XX 410A SINGLE STAGE THREE PHASE					
TON	3 PHASE	LRA	RLA	MCA	MFS
3 TON (036)	230V - 60HZ	83.1	13.6	17.0	25
3.5 TON (042)	230V - 60HZ	98	14.5	18.1	30
4 TON (048)	230V - 60HZ	110	16	20.0	30
4.5 TON (054)	230V - 60HZ	136	19.2	24.0	35
5 TON (060)	230V - 60HZ	136	19.6	24.5	35
MFS = Maximum Fuse or HACR Circuit Breaker Size MCA = Minimum Circuit Ampacity					

WG-2-XXX-C-1-XX 410A TWO STAGE SINGLE PHASE					
TON	SINGLE PHASE	LRA	RLA	MCA	MFS
3 TON (036)	230V - 60HZ	104	21.2	26.5	40
4 TON (048)	230V - 60HZ	139.9	26.9	33.6	50
5 TON (060)	230V - 60HZ	179.2	29.7	37.1	55
WG-2-XXX-C-2-XX 410A TWO STAGE THREE PHASE					
TON	SINGLE PHASE	LRA	RLA	MCA	MFS
3 TON (036)	230V - 60HZ	83	14.0	17.5	25
4 TON (048)	230V - 60HZ	110	16.5	20.6	30
5 TON (060)	230V - 60HZ	136	17.6	22	35
MFS = Maximum Fuse or HACR Circuit Breaker Size MCA = Minimum Circuit Ampacity					

10) Field Wiring

Refer to the compressor unit wiring diagram on the underside of the cabinet lid for more detail.

Refer to figure 9 for field wiring as it pertains to your equipment.

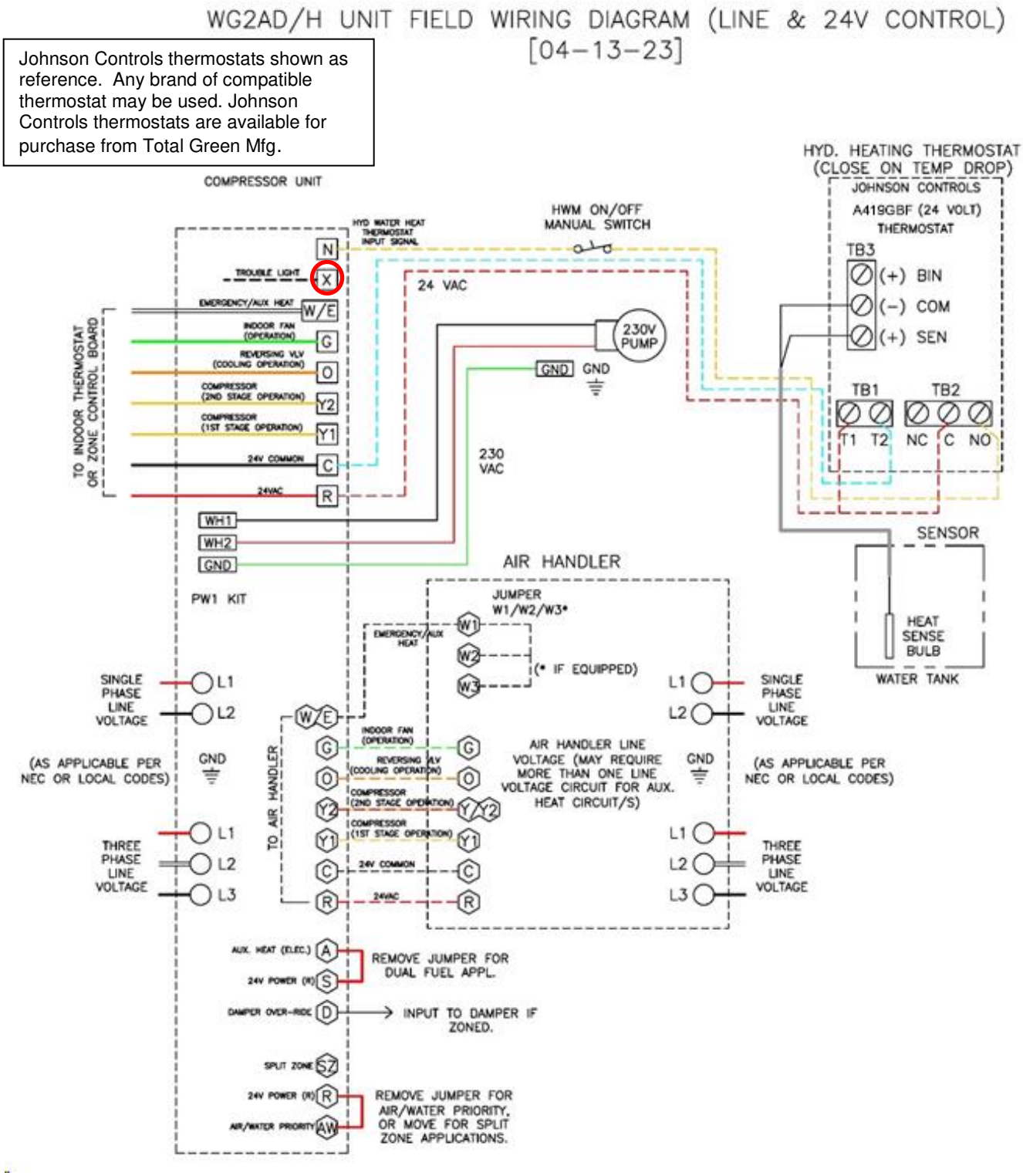


***Figure 9**. WG2AD and WGxAH Field Wiring Diagram*

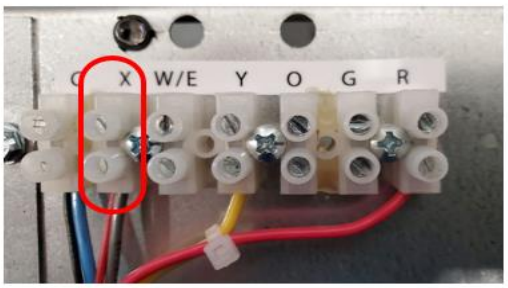
<u>Please note</u>: that for single stage WG1AH models, the compressor unit will only have a Y connection. This should connect to the Y/Y2 of your air handler unit.

Using the "X" terminal. Please note the "X" terminal circled in red on figure 9 on page 16. All Total Green Mfg. Waterless® Geothermal units utilize the "X" terminal along with an LED fault indicator light located above the "X" terminal on the field wiring terminal strip of the unit's electrical box.

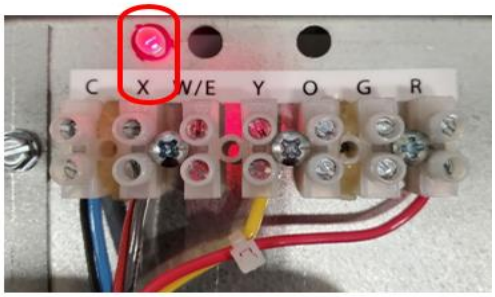
In the event of a system lock out, low pressure, high pressure or discharge temperature fault, the "X" terminal energizes so that 24 volts can be read between "X" and the common terminal "C". The LED fault light will also light indicating a system lockout. The lockout circuit is in place to protect the compressor unit from damage in the event the operating parameters of the system are out of range. Should a lockout occur, the system should be evaluated and, any corrections are to be made prior to placing the unit back into service. Please note that repeatedly resetting the lockout without any needed service can still result in compressor damage and may void the equipment warranty.

The "X" terminal can also be used to send a "service required" signal to a compatible thermostat. Thermostats with this feature will typically have an "L" or "L/A" terminal. Please review your thermostat manufacturer's installation manual for this function. Below is an example of a Honeywell thermostat service required indicator.

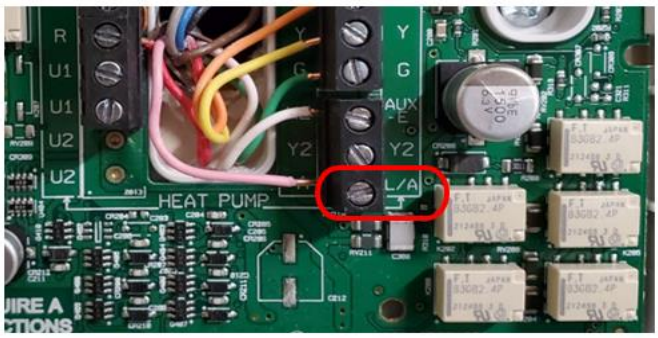
Please Note: If using a zone control system for air zoning requiring a separate control transformer, this feature will not function and should not be wired in.



"X" Terminal in unit connects to "L/A" Terminal on T-stat



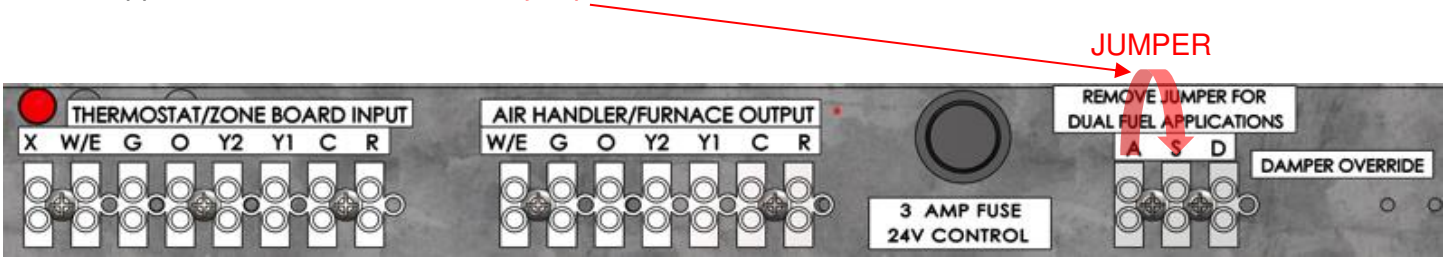
Indicator Light Inside Geo Unit & on Thermostat



11) Dual Fuel Option and Thermostat Settings

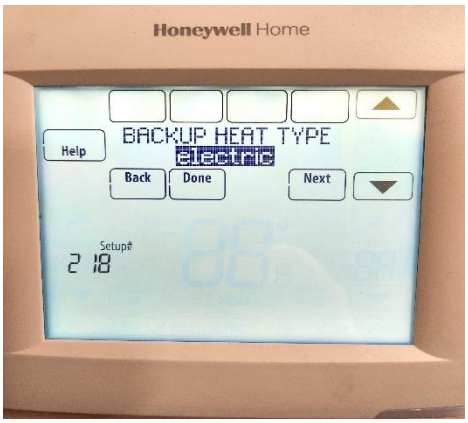
WG2A units utilize a Smart Logic Control with built in Dual Fuel system control. This dual fuel function must be utilized anytime the AUX/BACKUP heat source is applied prior to the indoor coil such as, a cased coil installed on the outlet of a furnace.

When shipped, a WG2A unit will have a jumper wire installed across the “A” and “S” terminals as shown below.

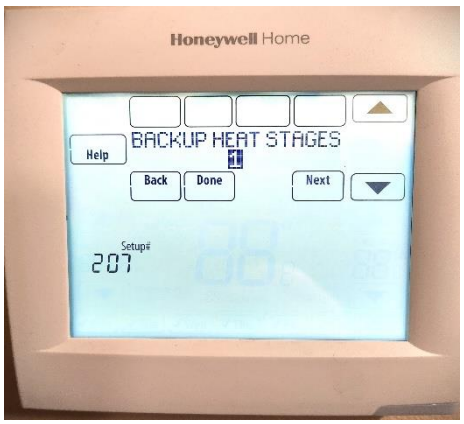


This jumper remains in place for a standard air handler with heat strips but, it must be removed in a dual fuel application as described above.

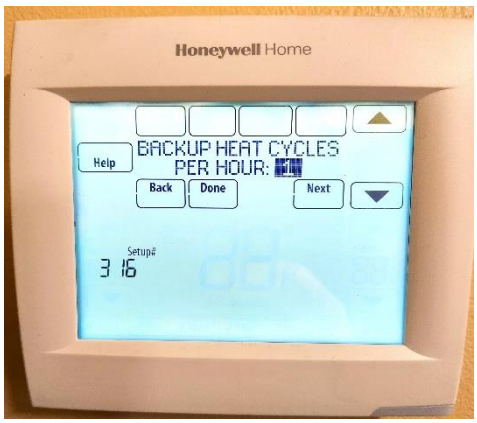
The unit will handle the dual fuel function. Please use the following settings in your thermostat when using the unit’s dual fuel function. A Honeywell thermostat is shown as reference.



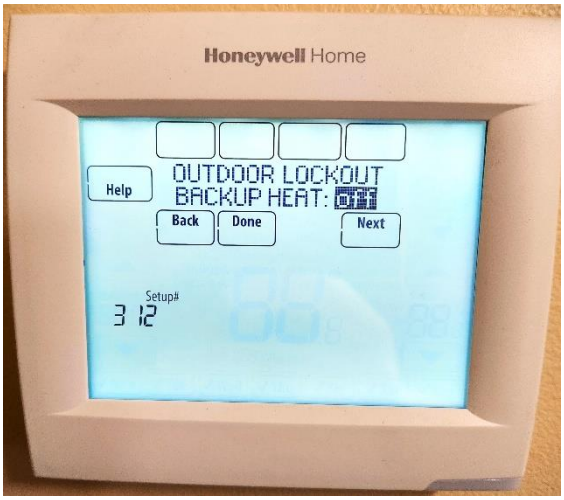
Back Up heat type should be set to electric.



Backup heat stages should be set to 1.



Backup Heat CPH should be set to 1.



Do not use outdoor lockouts. Leave these settings OFF.

12) Ducting, Air flow and Air Zoning.

Total Green Mfg. WG1A (single stage) refrigerant-to-air systems require 400 CFM of air flow per unit ton with no more than .5 inches of total static pressure. For WG2A (two-stage) refrigerant to air systems, the same specifications are required when in second-stage operation. When air zoning, it is recommended that a WG2A (two-stage) unit be used in conjunction with a fully variable air handler blower. When air zoning, it is recommended that the1st or largest zone be sized to 70% of the total air flow requirement and that the 2nd zone be sized for 60% of the total air flow requirement.

This recommendation is due to a reliability feature called a "Maintenance Cycle" designed into the WG2A units. After four consecutive first-stage calls without reaching second-stage prior to satisfying the zone call, the system will run in second-stage for 5 minutes. This is to ensure proper oil return back to the compressor unit for a longer compressor life.

In some incidences, sizing zones as stated above may not be possible leaving you with a small zone that may never call for second-stage nor support the required air flow for the "Maintenance Cycle". For this reason, a 24 volt signal, referred to as "Damper Override", is provided by the "D" terminal on WG2A units. Terminal "D" is only energized while the unit is in the "Maintenance Cycle". This 24 volt signal can be used to force open the largest zone of the duct system while the equipment is in the "Maintenance Cycle". Utilizing this option requires the installation of a field supplied SPDT relay with a 24 volt coil to isolate the zone board and air handler power supplies. The "D" terminal and relay provides a means of making the "R" and "Y" thermostat input of the zone board's largest zone. When in the "Maintenance Cycle", forcing that zone open relieves excessive static pressure at the air handler without the need of a bypass or dump zone. See Figure 10 for the Field Wiring Diagram for use with the damper override signal.

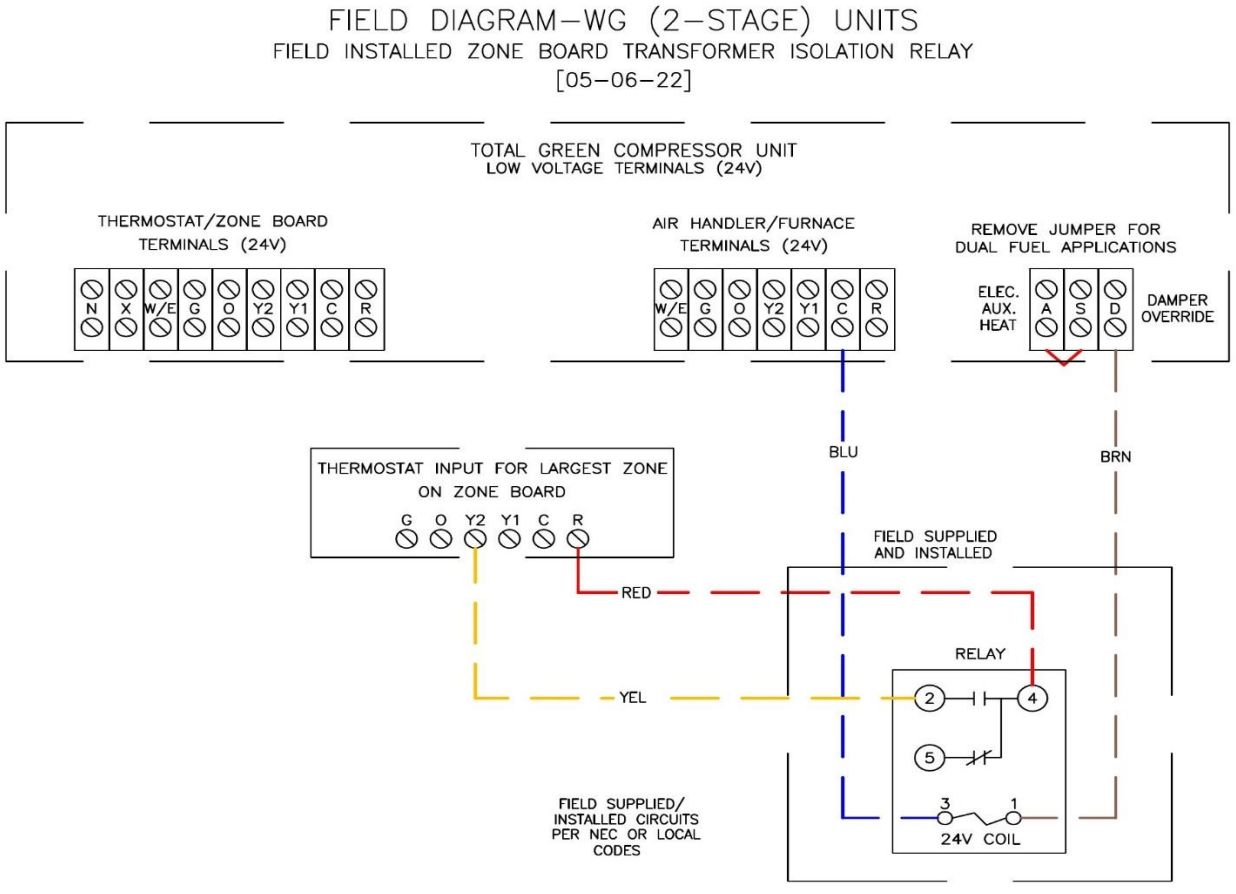


***Figure 10**. WG2AD and WG2AH Field Wiring Diagram with Damper override signal*

Please refer to your Vacuum and Charging procedures manual for startup.

In addition, please refer to your Smart Logic Controller Functions manual for unit operation and function options.

13) Seal Test

WARNING!

To avoid personal injury and equipment damage, follow all safety procedures set forth by OSHA, in the handling of high pressure gases. Always use a pressure regulator and hoses that are capable of withstanding the pressures prescribed herein. Do not subject system components OTHER than the earth loop/manifold/line set configuration to 400 PSIG nitrogen.

After brazing in the earth loop system (includes manifolds, earth loops and earth loop line set, but NOT the compressor unit or any other HVAC refrigeration system component), the complete underground system is to be seal tested with 400 PSIG nitrogen. After connecting a high pressure hose from the regulator on the nitrogen tank to a Schrader port temporarily installed on the vapor line of the line set, slowly increase the nitrogen pressure to 400 PSIG while checking for any obvious leaks audibly.

If no audible leaks are detected, check all joints to ensure they are sealed, by one of the following methods:

1. Ultrasonic Leak Detector or Bubble Solution Leak Detector
2. Electronic Leak Detector (requires a trace amount of refrigerant in the system)

IMPORTANT – LOOP READINESS

Check for leaks by either of these methods or any other reliable method to ensure that there are no leaks and the earth loop system is sealed! It is absolutely necessary that the earth loop/manifold/line set assembly be completely sealed at 400 psig nitrogen. Recheck all leak detector readings.

When the line set/manifolds/earth loops are deemed leak free and sealed, **valve off the nitrogen source and monitor the pressure on the underground system to ensure that 400psig has been maintained for minimum of 8 hours.**

Monitor the pressure reading during the backfilling operation to ensure that the earth loop system remains sealed.

Important: Final Whole System Seal Test.

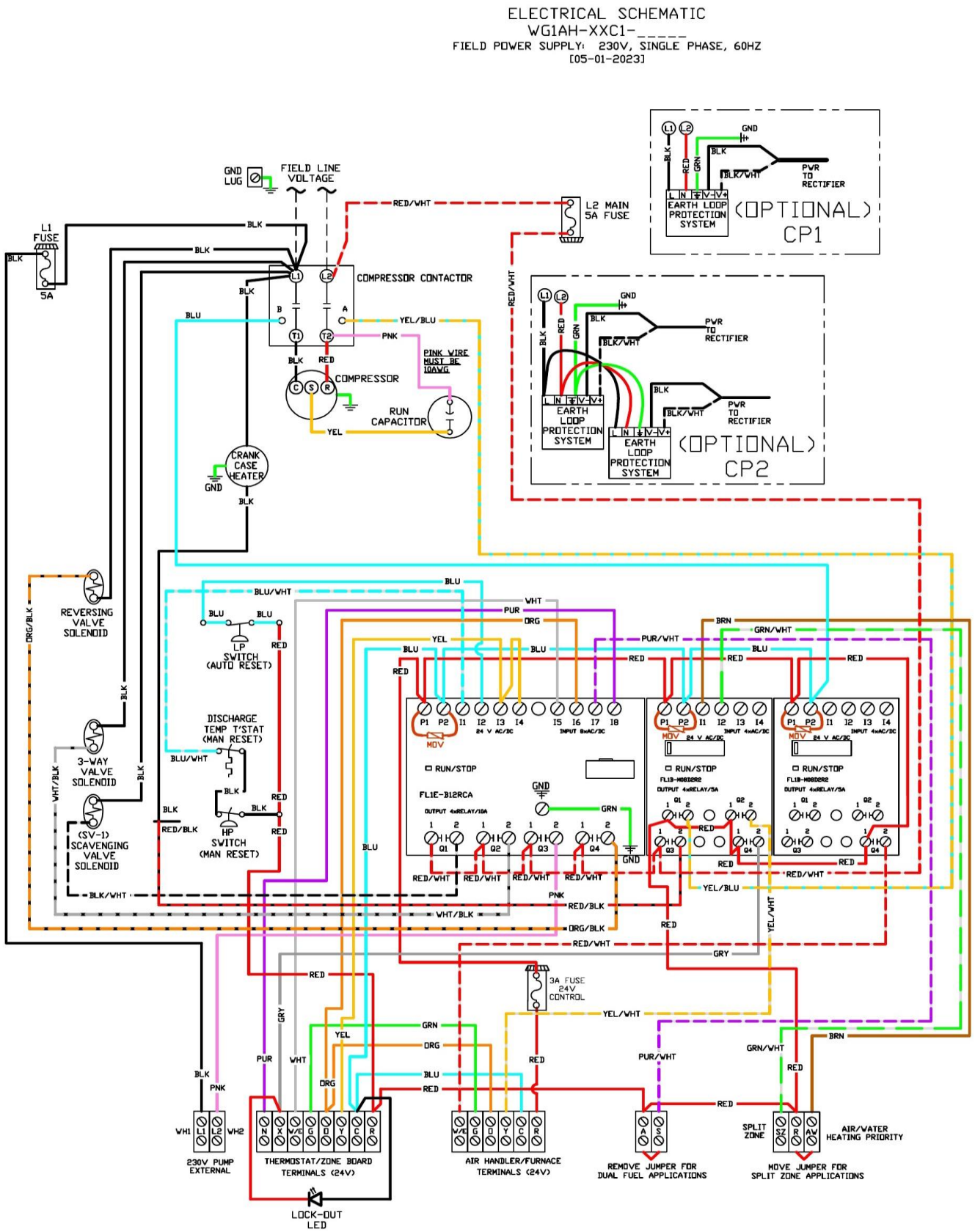
After having tested the field at 400 P.S.I. as stated above, once the remaining equipment such as the compressor unit, air handler or cased coil, ETC, is installed, the entire system should be pressurize to 150 P.S.I. and left to stand for a min. of 8 hours for a total system seal test.

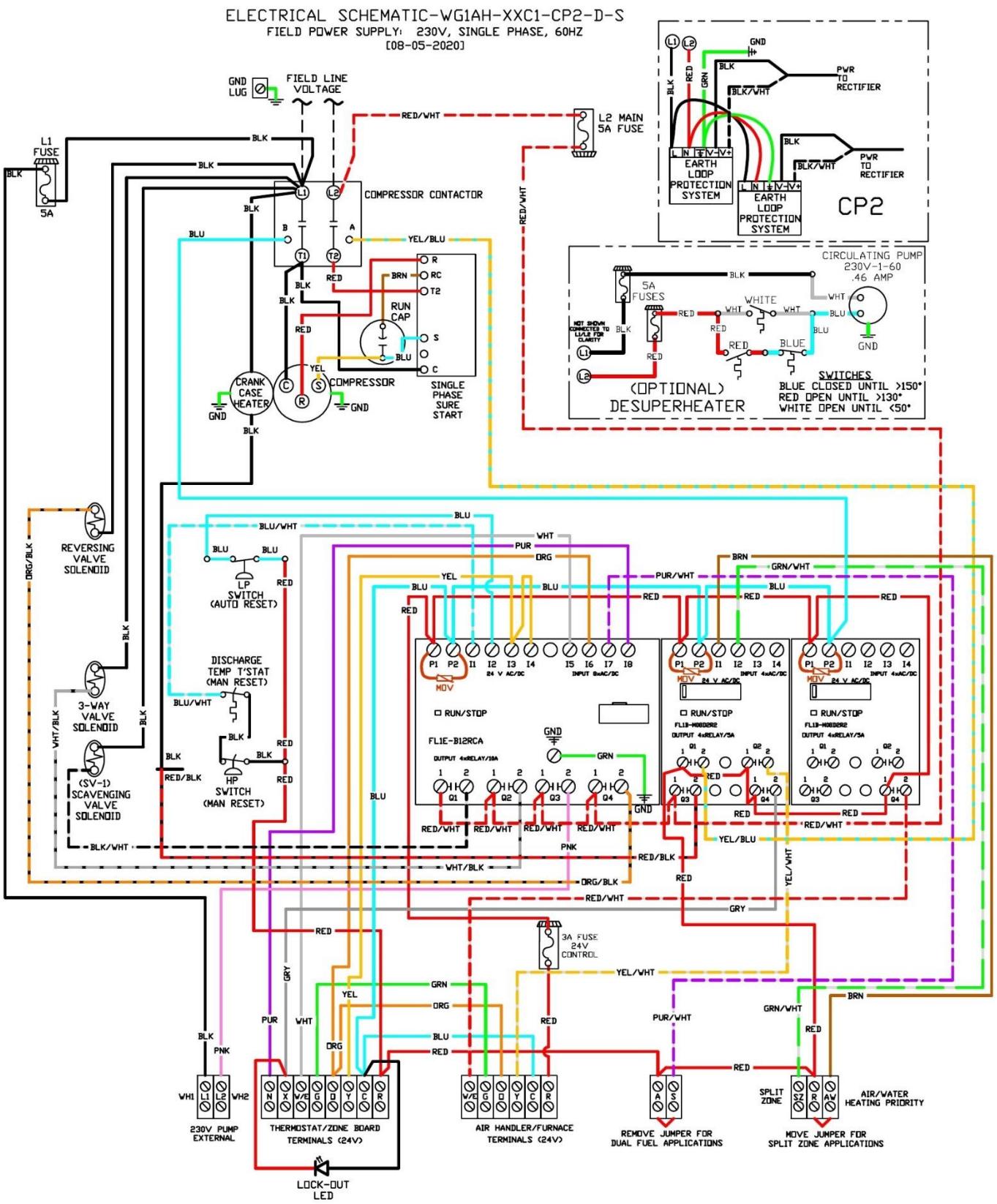
If you have any questions regarding these procedures, please contact Total Green Mfg. technical support at 419-678-2032.

IMPORTANT!

If any specifications in this manual that cannot be met, contact Total Green Mfg. for a possible solution and approval. Any approved solutions that differ from the specifications in this manual must be approved with a written variance from Total Green Mfg.

14) Compressor Unit Wiring Schematics

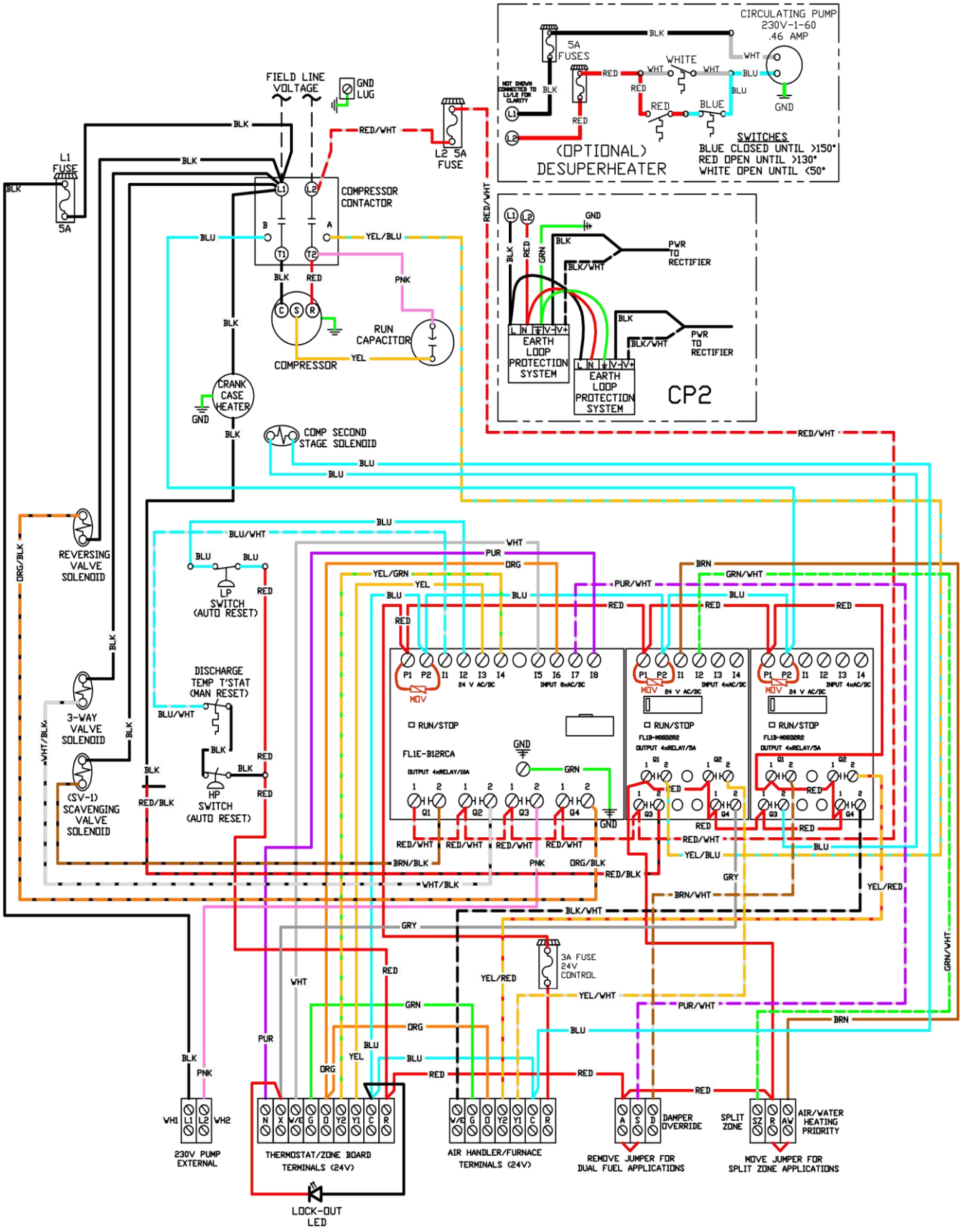



ELECTRICAL SCHEMATIC-WG1AH-XXC1-CP2-D-S
FIELD POWER SUPPLY: 230V, SINGLE PHASE, 60HZ
[08-05-2020]
GND LUG
FIELD LINE VOLTAGE
L2 MAIN 5A FUSE
L1 FUSE 5A
COMPRESSOR CONTACTOR
RUN CAP
CRANK CASE HEATER
COMPRESSOR
SINGLE PHASE SURE START
EARTH LOOP PROTECTION SYSTEM
PWR TO RECTIFIER
CP2
CIRCULATING PUMP 230V-1-60 .46 AMP
5A FUSES
WHITE
RED
BLUE
(OPTIONAL) DESUPERHEATER
SWITCHES
BLUE CLOSED UNTIL >150°
RED OPEN UNTIL >130°
WHITE OPEN UNTIL <50°
REVERSING VALVE SOLENOID
3-WAY VALVE SOLENOID
(SV-1) SCAVENGING VALVE SOLENOID
LP SWITCH (AUTO RESET)
DISCHARGE TEMP T'STAT (MAN RESET)
HP SWITCH (MAN RESET)
FL1E-B12RCA
FL1B-MODER2
RUN/STOP
3A FUSE 24V CONTROL
230V PUMP EXTERNAL
THERMOSTAT/ZONE BOARD TERMINALS (24V)
LOCK-OUT LED
AIR HANDLER/FURNACE TERMINALS (24V)
REMOVE JUMPER FOR DUAL FUEL APPLICATIONS
SPLIT ZONE
AIR/WATER HEATING PRIORITY
MOVE JUMPER FOR SPLIT ZONE APPLICATIONS

ELECTRICAL SCHEMATIC-WG2AH-XXC1-CP2-D

FIELD POWER SUPPLY: 230V, SINGLE PHASE, 60HZ

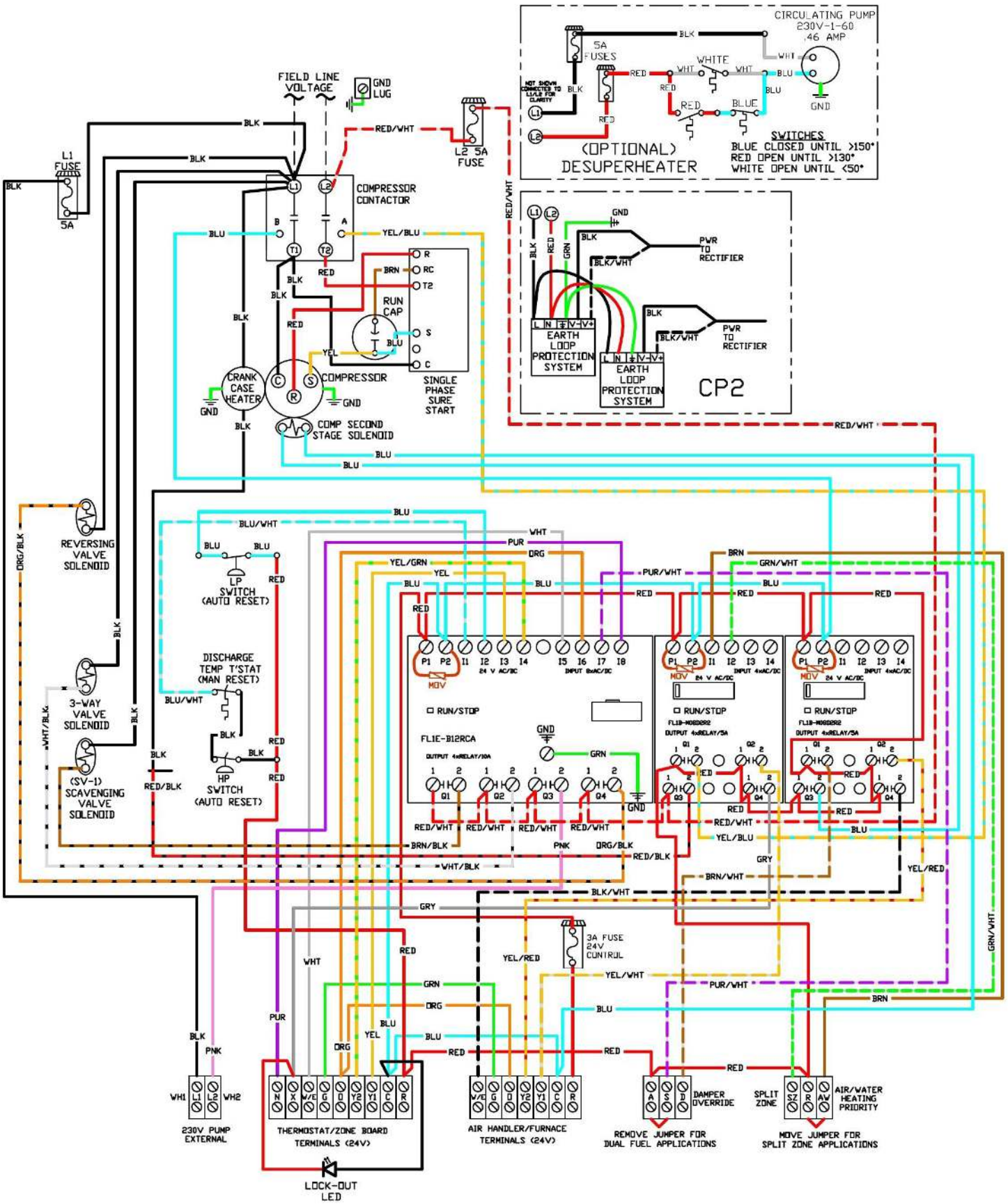
[08-05-2020]

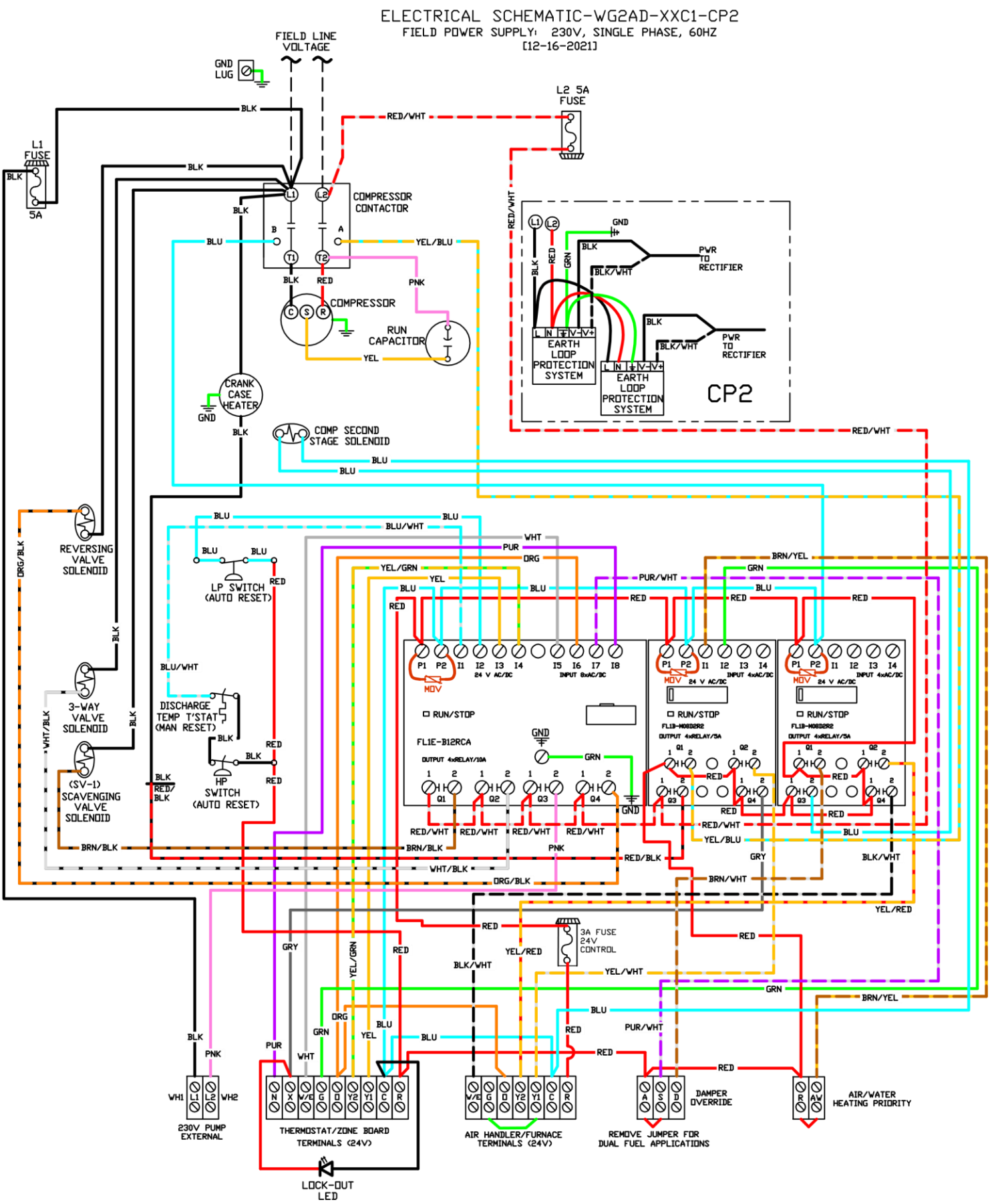


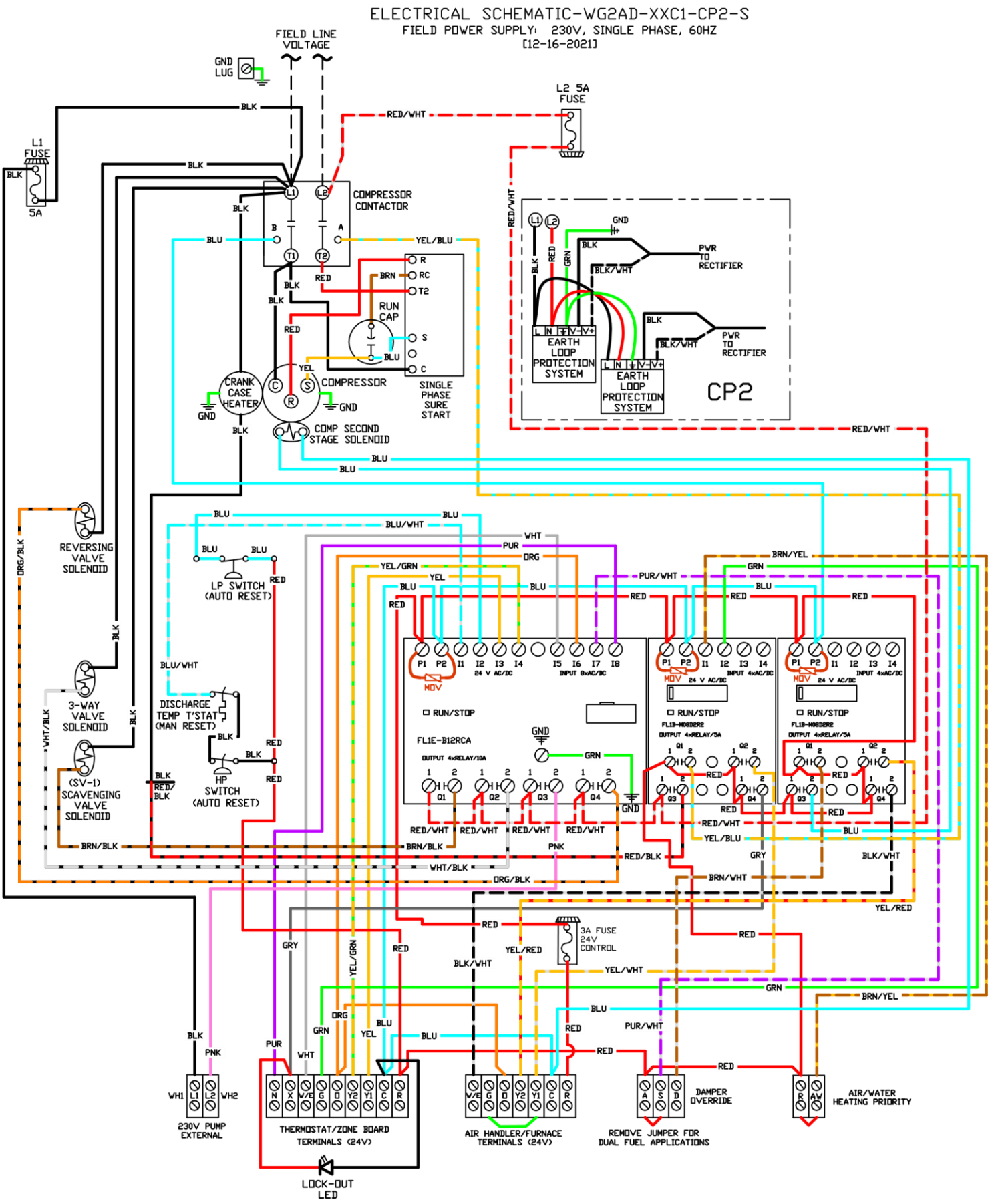
ELECTRICAL SCHEMATIC-WG2AH-XXC1-CP2-D-S

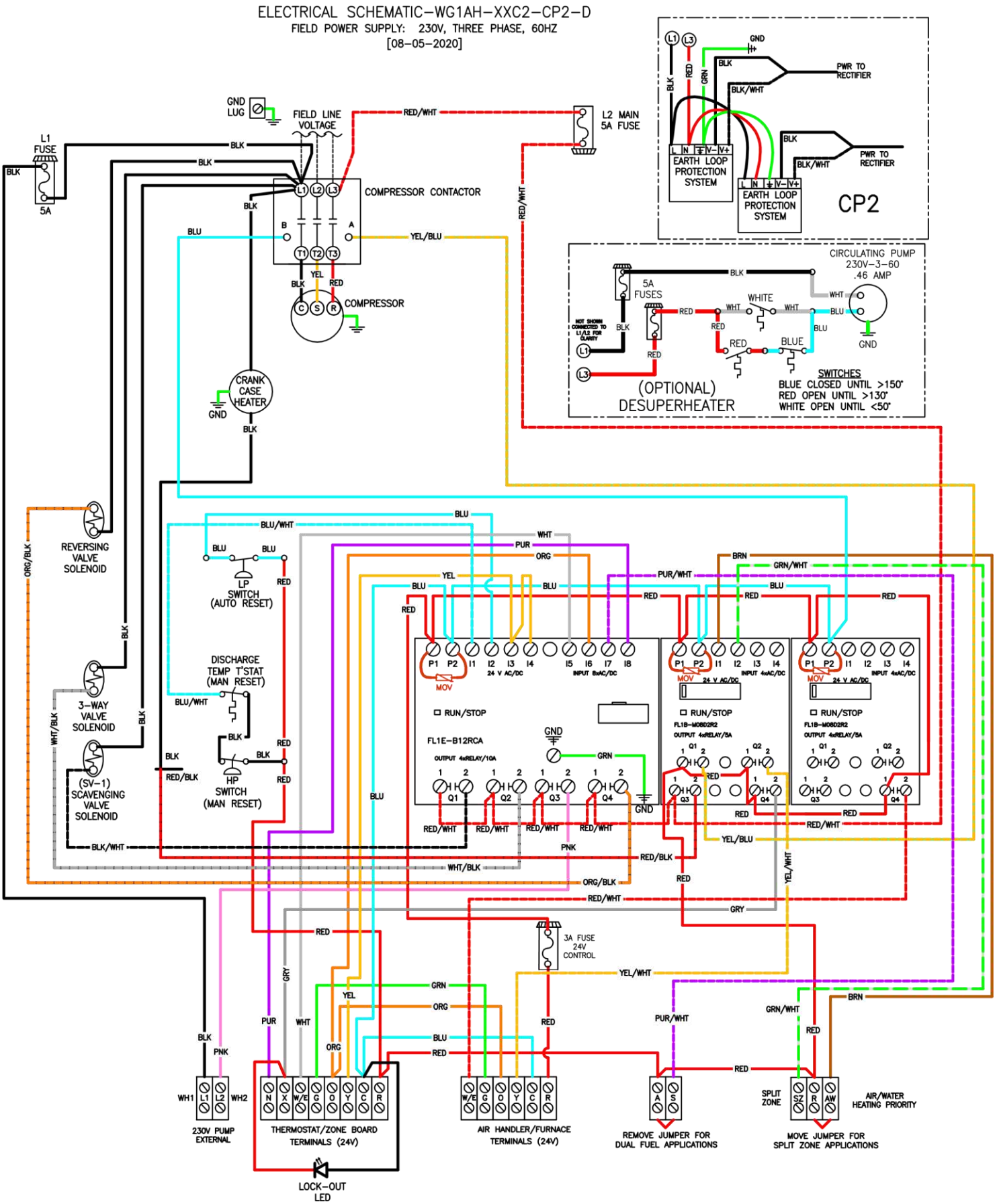
FIELD POWER SUPPLY: 230V, SINGLE PHASE, 60HZ

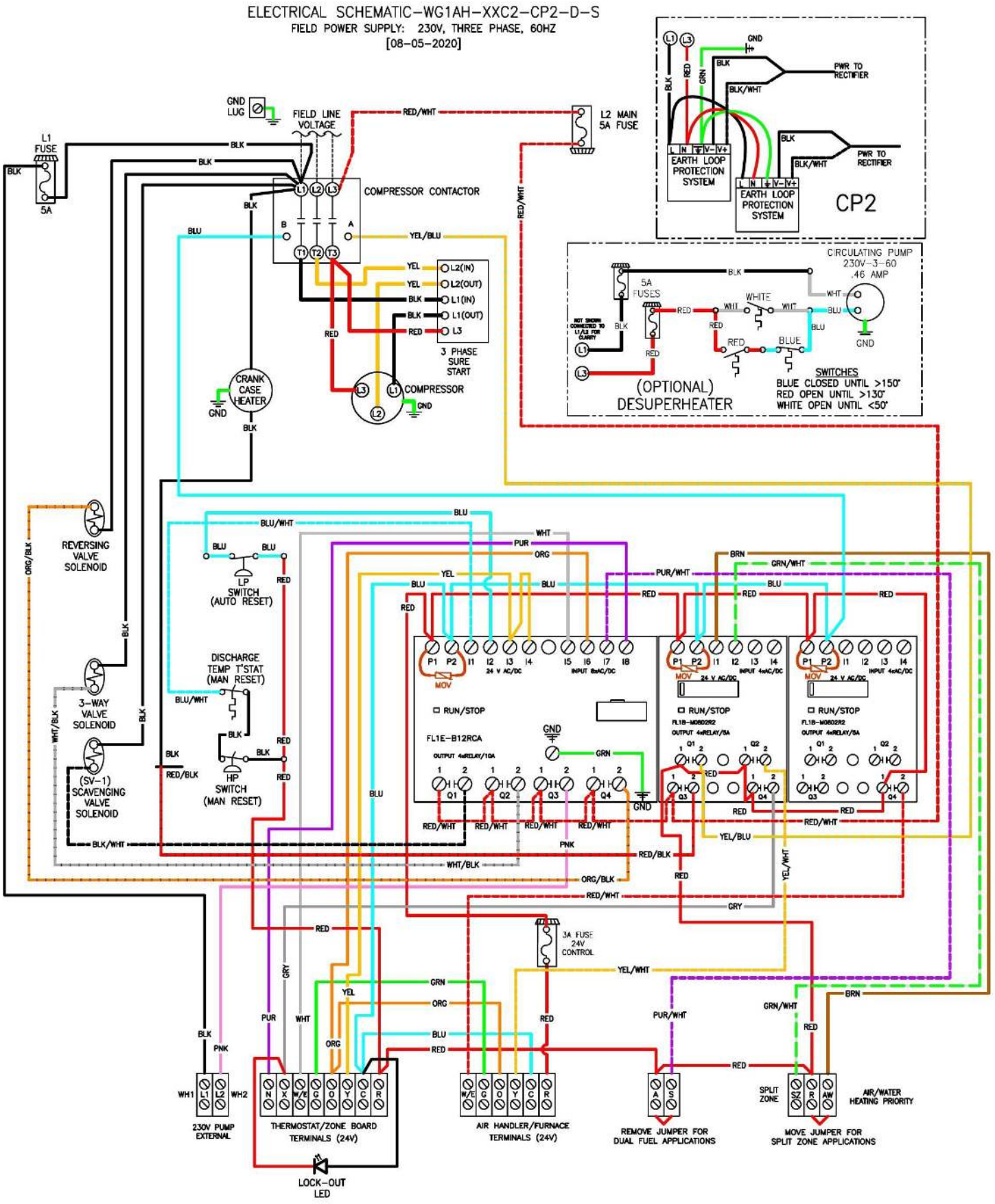
[08-05-2020]




ELECTRICAL SCHEMATIC-WG2AD-XXC1-CP2
FIELD POWER SUPPLY: 230V, SINGLE PHASE, 60HZ
[12-16-2021]
FIELD LINE VOLTAGE
GND LUG
L1 FUSE 5A
L2 5A FUSE
COMPRESSOR CONTACTOR
COMPRESSOR
RUN CAPACITOR
CRANK CASE HEATER
COMP SECOND STAGE SOLENOID
REVERSING VALVE SOLENOID
3-WAY VALVE SOLENOID
(SV-1) SCAVENGING VALVE SOLENOID
LP SWITCH (AUTO RESET)
DISCHARGE TEMP T'STAT (MAN RESET)
HP SWITCH (AUTO RESET)
PWR TO RECTIFIER
EARTH LOOP PROTECTION SYSTEM
CP2
FL1E-B12RCA
3A FUSE 24V CONTROL
230V PUMP EXTERNAL
THERMOSTAT/ZONE BOARD TERMINALS (24V)
AIR HANDLER/FURNACE TERMINALS (24V)
REMOVE JUMPER FOR DUAL FUEL APPLICATIONS
DAMPER OVERRIDE
AIR/WATER HEATING PRIORITY
LOCK-OUT LED


ELECTRICAL SCHEMATIC-WG2AD-XXC1-CP2-S
FIELD POWER SUPPLY: 230V, SINGLE PHASE, 60HZ
[12-16-2021]
FIELD LINE VOLTAGE
GND LUG
L1 FUSE 5A
L2 5A FUSE
COMPRESSOR CONTACTOR
RUN CAP
SINGLE PHASE SURE START
CRANK CASE HEATER
COMPRESSOR
COMP SECOND STAGE SOLENOID
CP2
EARTH LOOP PROTECTION SYSTEM
PWR TO RECTIFIER
REVERSING VALVE SOLENOID
LP SWITCH (AUTO RESET)
3-WAY VALVE SOLENOID
DISCHARGE TEMP T'STAT (MAN RESET)
HP SWITCH (AUTO RESET)
(SV-1) SCAVENGING VALVE SOLENOID
FL1E-B12RCA
FL1B-M08D2R2
RUN/STOP
3A FUSE 24V CONTROL
230V PUMP EXTERNAL
THERMOSTAT/ZONE BOARD TERMINALS (24V)
AIR HANDLER/FURNACE TERMINALS (24V)
REMOVE JUMPER FOR DUAL FUEL APPLICATIONS
DAMPER OVERRIDE
AIR/WATER HEATING PRIORITY
LOCK-OUT LED

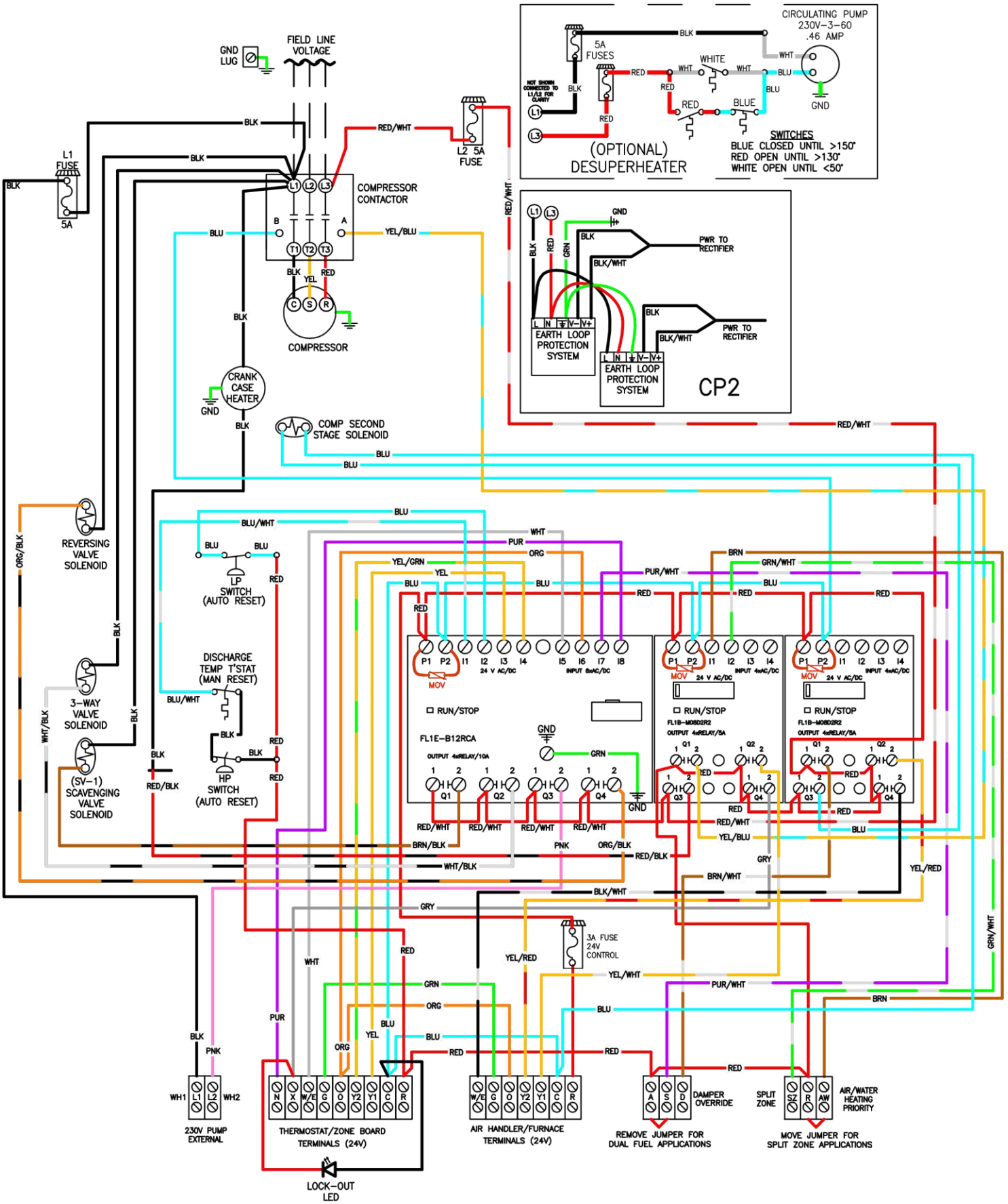

ELECTRICAL SCHEMATIC–WG1AH–XXC2–CP2–D
FIELD POWER SUPPLY: 230V, THREE PHASE, 60HZ
[08–05–2020]
GND LUG
FIELD LINE VOLTAGE
L2 MAIN 5A FUSE
L1 FUSE
5A
COMPRESSOR CONTACTOR
COMPRESSOR
CRANK CASE HEATER
REVERSING VALVE SOLENOID
3–WAY VALVE SOLENOID
(SV–1) SCAVENGING VALVE SOLENOID
LP SWITCH (AUTO RESET)
DISCHARGE TEMP T'STAT (MAN RESET)
HP SWITCH (MAN RESET)
EARTH LOOP PROTECTION SYSTEM
PWR TO RECTIFIER
CP2
CIRCULATING PUMP 230V–3–60 .46 AMP
5A FUSES
WHITE
BLUE
SWITCHES
BLUE CLOSED UNTIL >150°
RED OPEN UNTIL >130°
WHITE OPEN UNTIL <50°
(OPTIONAL) DESUPERHEATER
FL1E–B12RCA
FL1B–M08D2R2
RUN/STOP
3A FUSE 24V CONTROL
230V PUMP EXTERNAL
THERMOSTAT/ZONE BOARD TERMINALS (24V)
AIR HANDLER/FURNACE TERMINALS (24V)
REMOVE JUMPER FOR DUAL FUEL APPLICATIONS
SPLIT ZONE
AIR/WATER HEATING PRIORITY
MOVE JUMPER FOR SPLIT ZONE APPLICATIONS
LOCK–OUT LED


ELECTRICAL SCHEMATIC–WG1AH–XXC2–CP2–D–S
FIELD POWER SUPPLY: 230V, THREE PHASE, 60HZ
[08–05–2020]
GND LUG
FIELD LINE VOLTAGE
L2 MAIN 5A FUSE
L1 FUSE 5A
COMPRESSOR CONTACTOR
3 PHASE SURE START
CRANK CASE HEATER
COMPRESSOR
REVERSING VALVE SOLENOID
LP SWITCH (AUTO RESET)
DISCHARGE TEMP T'STAT (MAN RESET)
3-WAY VALVE SOLENOID
(SV-1) SCAVENGING VALVE SOLENOID
HP SWITCH (MAN RESET)
EARTH LOOP PROTECTION SYSTEM
PWR TO RECTIFIER
CP2
CIRCULATING PUMP 230V–3–60 .46 AMP
5A FUSES
WHITE
RED
BLUE
(OPTIONAL) DESUPERHEATER
SWITCHES
BLUE CLOSED UNTIL >150°
RED OPEN UNTIL >130°
WHITE OPEN UNTIL <50°
FL1E–B12RCA
RUN/STOP
3A FUSE 24V CONTROL
230V PUMP EXTERNAL
THERMOSTAT/ZONE BOARD TERMINALS (24V)
LOCK–OUT LED
AIR HANDLER/FURNACE TERMINALS (24V)
REMOVE JUMPER FOR DUAL FUEL APPLICATIONS
SPLIT ZONE
AIR/WATER HEATING PRIORITY
MOVE JUMPER FOR SPLIT ZONE APPLICATIONS

ELECTRICAL SCHEMATIC–WG2AH–XXC2–CP2–D

FIELD POWER SUPPLY: 230V, THREE PHASE, 60HZ

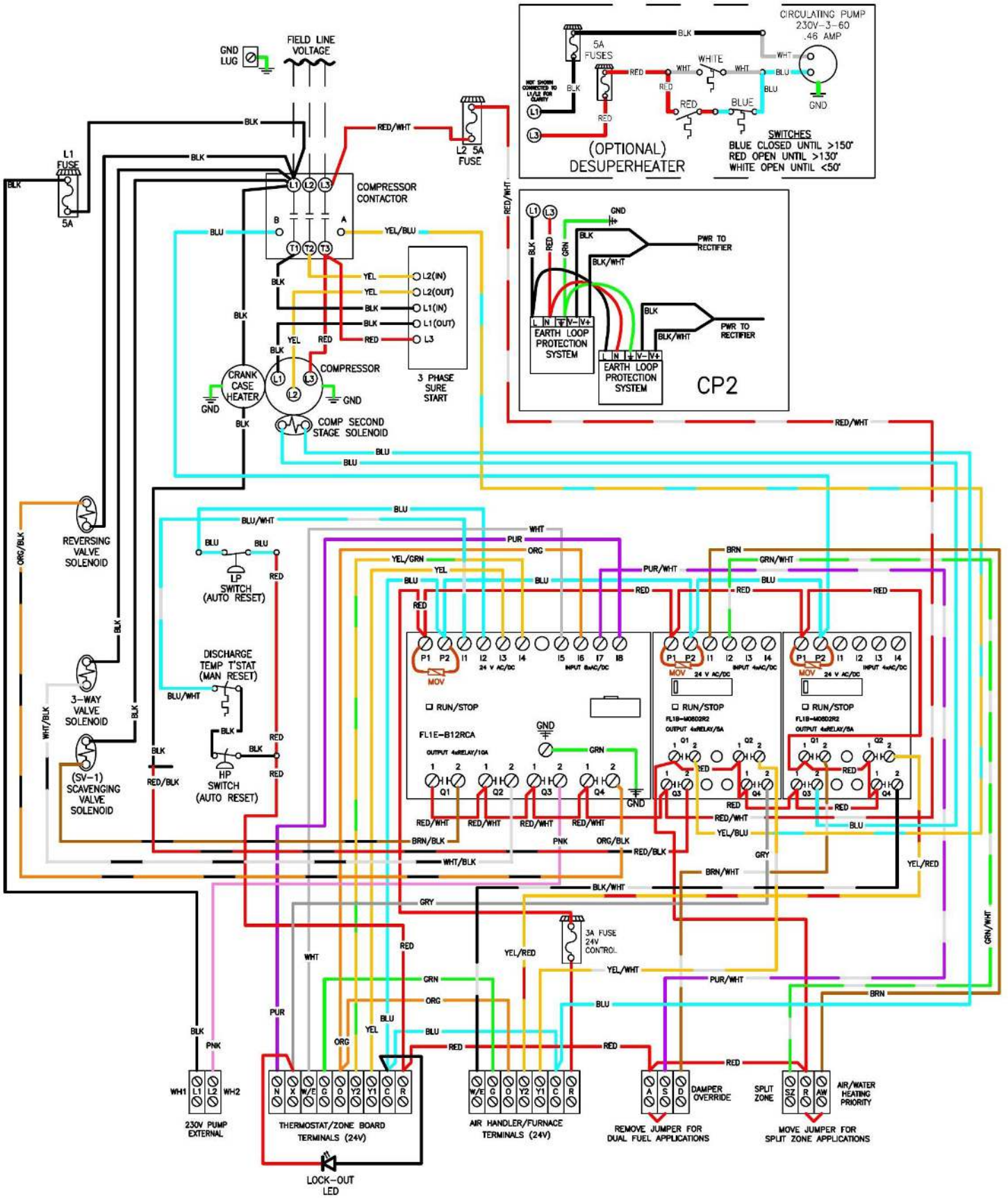
[08–05–2020]

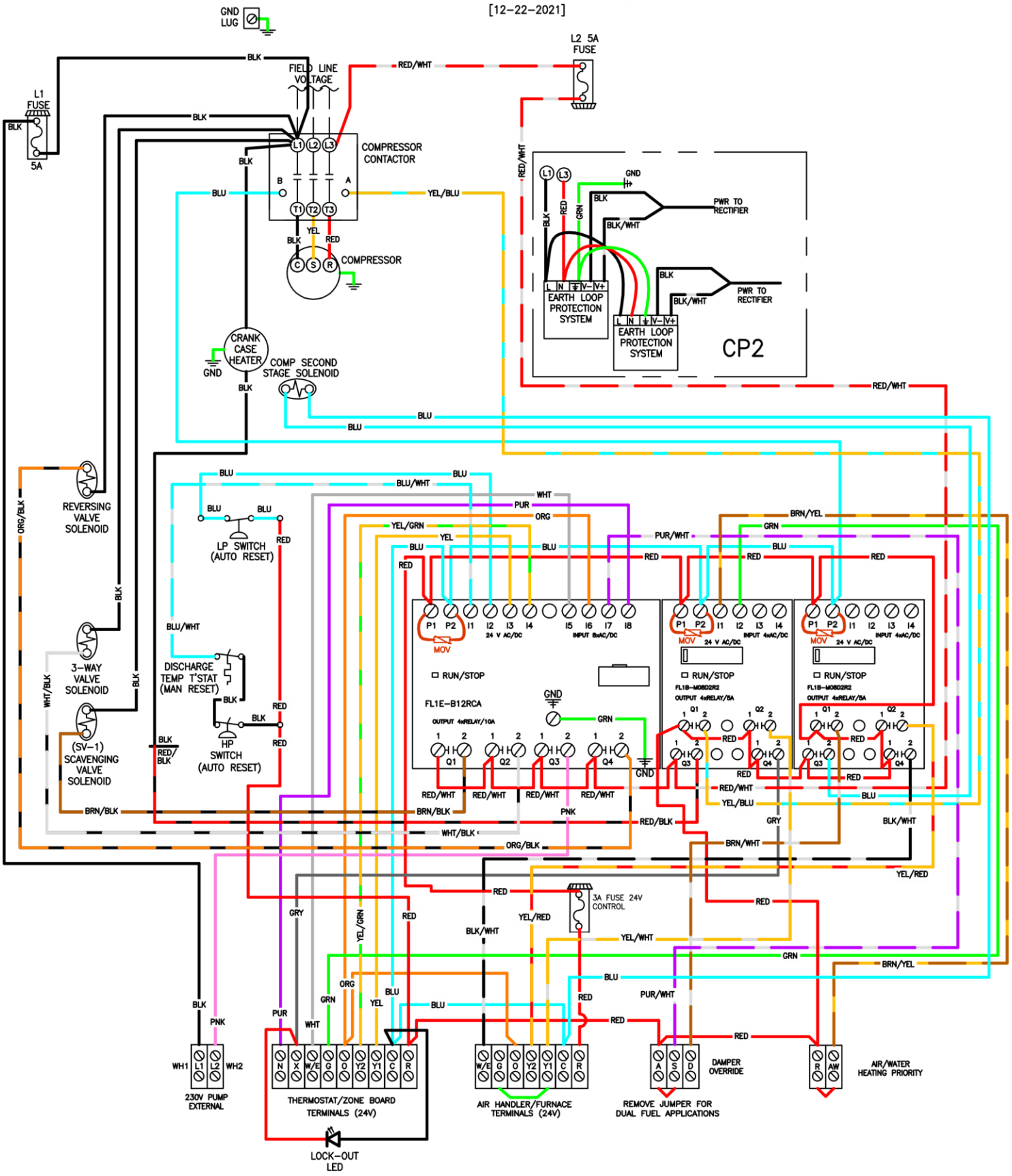


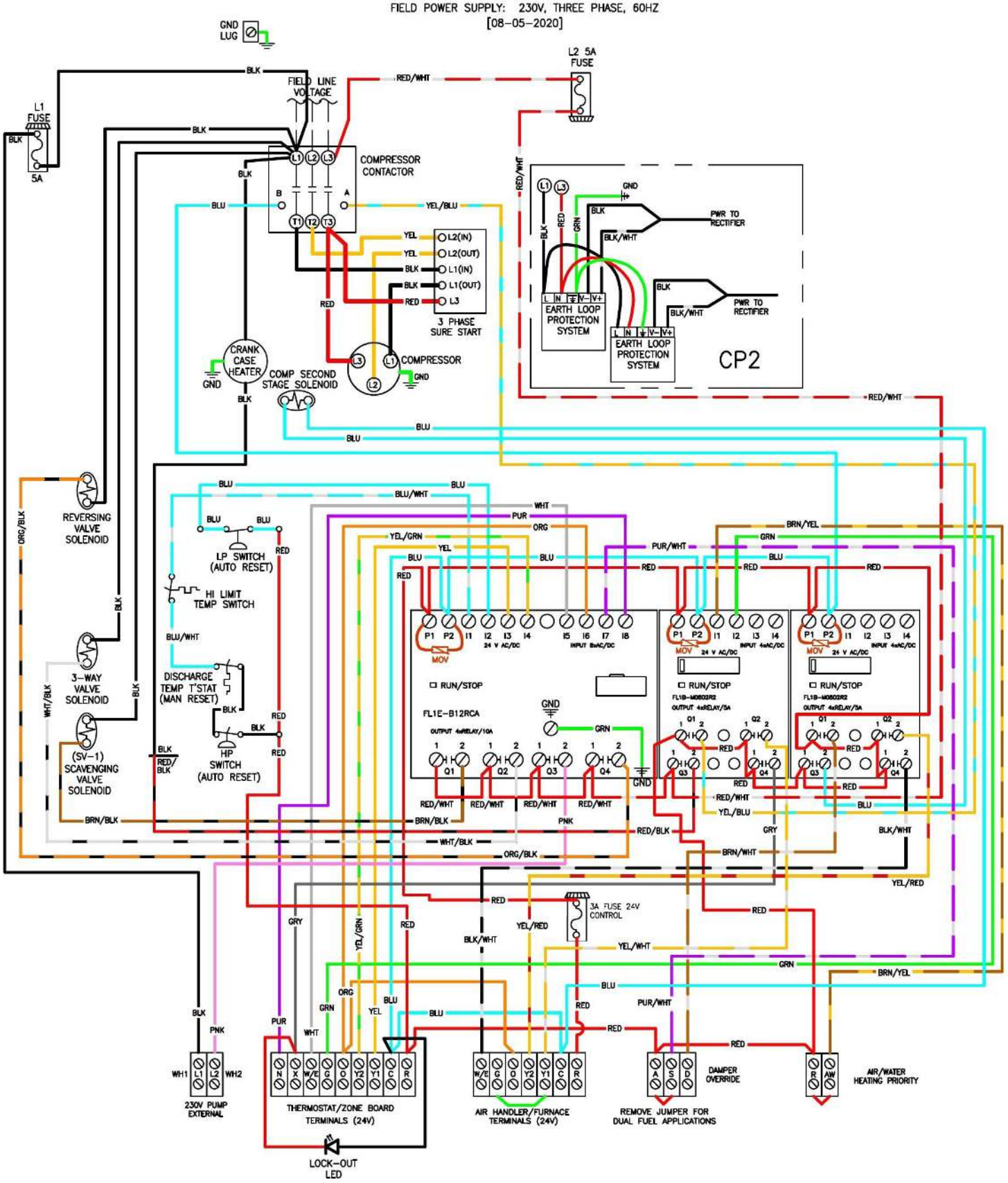
ELECTRICAL SCHEMATIC–WG2AH–XXC2–CP2–D–S

FIELD POWER SUPPLY: 230V, THREE PHASE, 60HZ

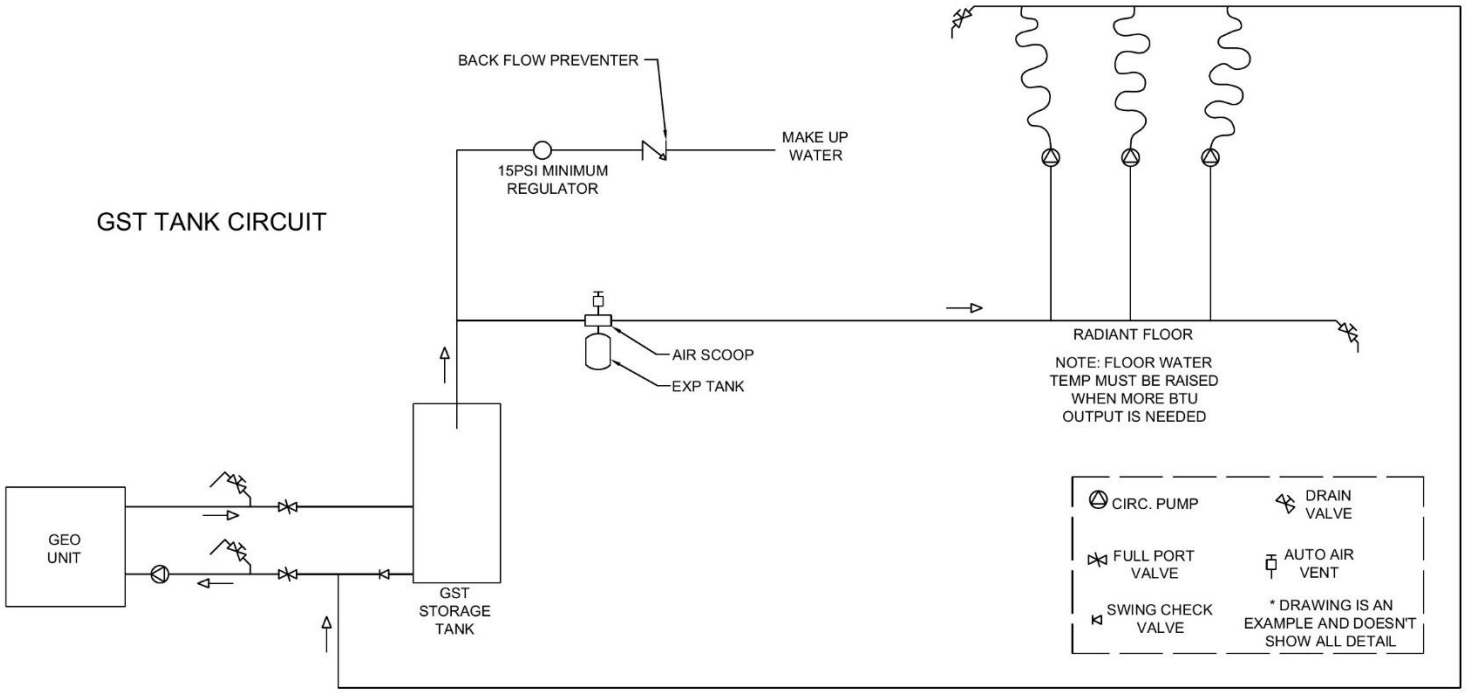
[08–05–2020]

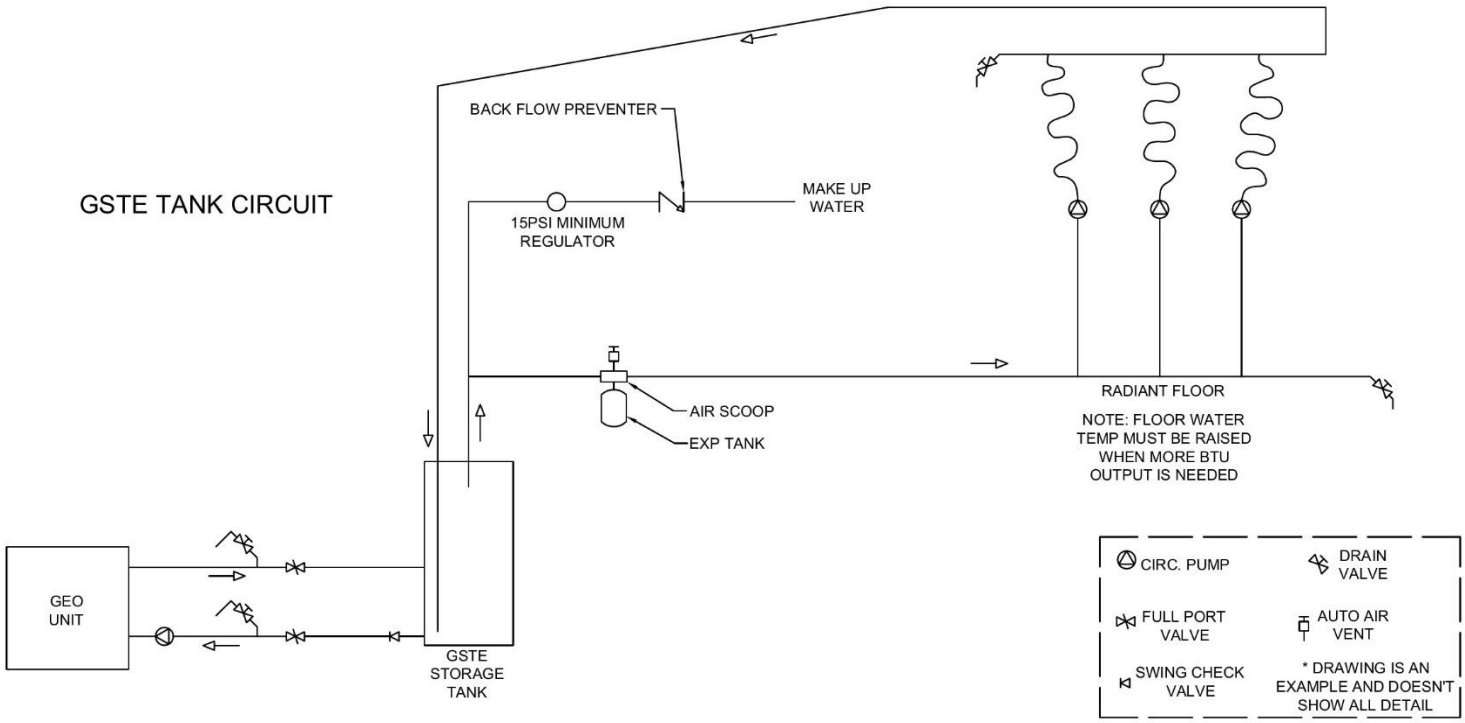



ELECTRICAL SCHEMATIC–WG2AD–XXC2–CP2
FIELD POWER SUPPLY: 230V, THREE PHASE, 60HZ
[12–22–2021]
GND LUG
L2 5A FUSE
FIELD LINE VOLTAGE
L1 FUSE 5A
COMPRESSOR CONTACTOR
COMPRESSOR
CRANK CASE HEATER
COMP SECOND STAGE SOLENOID
EARTH LOOP PROTECTION SYSTEM
PWR TO RECTIFIER
CP2
REVERSING VALVE SOLENOID
LP SWITCH (AUTO RESET)
3–WAY VALVE SOLENOID
DISCHARGE TEMP T'STAT (MAN RESET)
(SV–1) SCAVENGING VALVE SOLENOID
HP SWITCH (AUTO RESET)
FL1E–B12RCA
FL1B–MOBD2R2
RUN/STOP
3A FUSE 24V CONTROL
230V PUMP EXTERNAL
THERMOSTAT/ZONE BOARD TERMINALS (24V)
AIR HANDLER/FURNACE TERMINALS (24V)
REMOVE JUMPER FOR DUAL FUEL APPLICATIONS
DAMPER OVERRIDE
AIR/WATER HEATING PRIORITY
LOCK–OUT LED

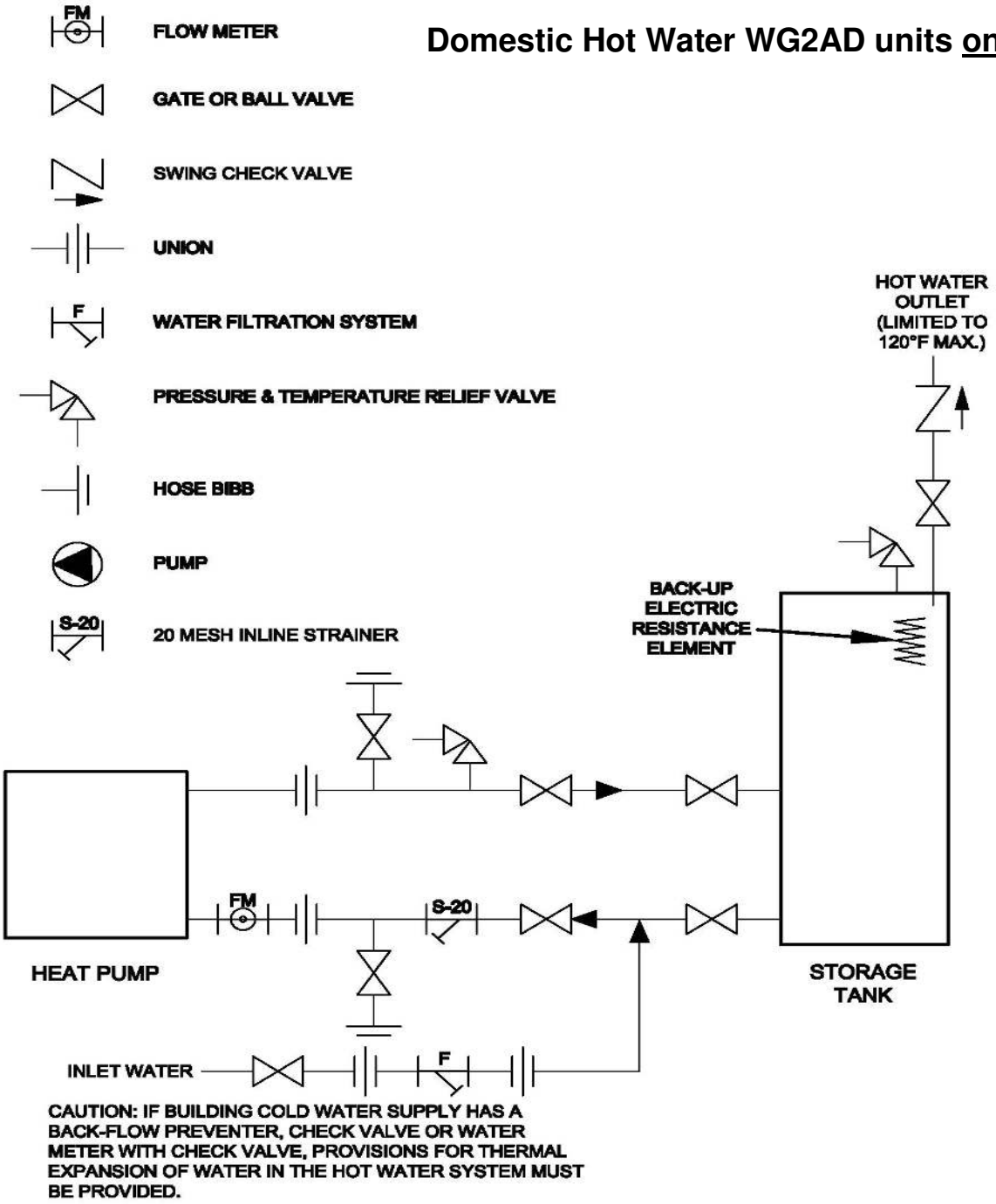

ELECTRICAL SCHEMATIC–WG2AD–XXC2–CP2–S
FIELD POWER SUPPLY: 230V, THREE PHASE, 60HZ
[08–05–2020]
GND LUG
L1 FUSE 5A
FIELD LINE VOLTAGE
L2 5A FUSE
COMPRESSOR CONTACTOR
3 PHASE SURE START
L2(IN)
L2(OUT)
L1(IN)
L1(OUT)
L3
CRANK CASE HEATER
COMP SECOND STAGE SOLENOID
COMPRESSOR
EARTH LOOP PROTECTION SYSTEM
PWR TO RECTIFIER
CP2
REVERSING VALVE SOLENOID
LP SWITCH (AUTO RESET)
HI LIMIT TEMP SWITCH
DISCHARGE TEMP T'STAT (MAN RESET)
HP SWITCH (AUTO RESET)
3-WAY VALVE SOLENOID
(SV–1) SCAVENGING VALVE SOLENOID
FL1E–B12RCA
RUN/STOP
3A FUSE 24V CONTROL
230V PUMP EXTERNAL
THERMOSTAT/ZONE BOARD TERMINALS (24V)
AIR HANDLER/FURNACE TERMINALS (24V)
REMOVE JUMPER FOR DUAL FUEL APPLICATIONS
DAMPER OVERRIDE
AIR/WATER HEATING PRIORITY
LOCK–OUT LED

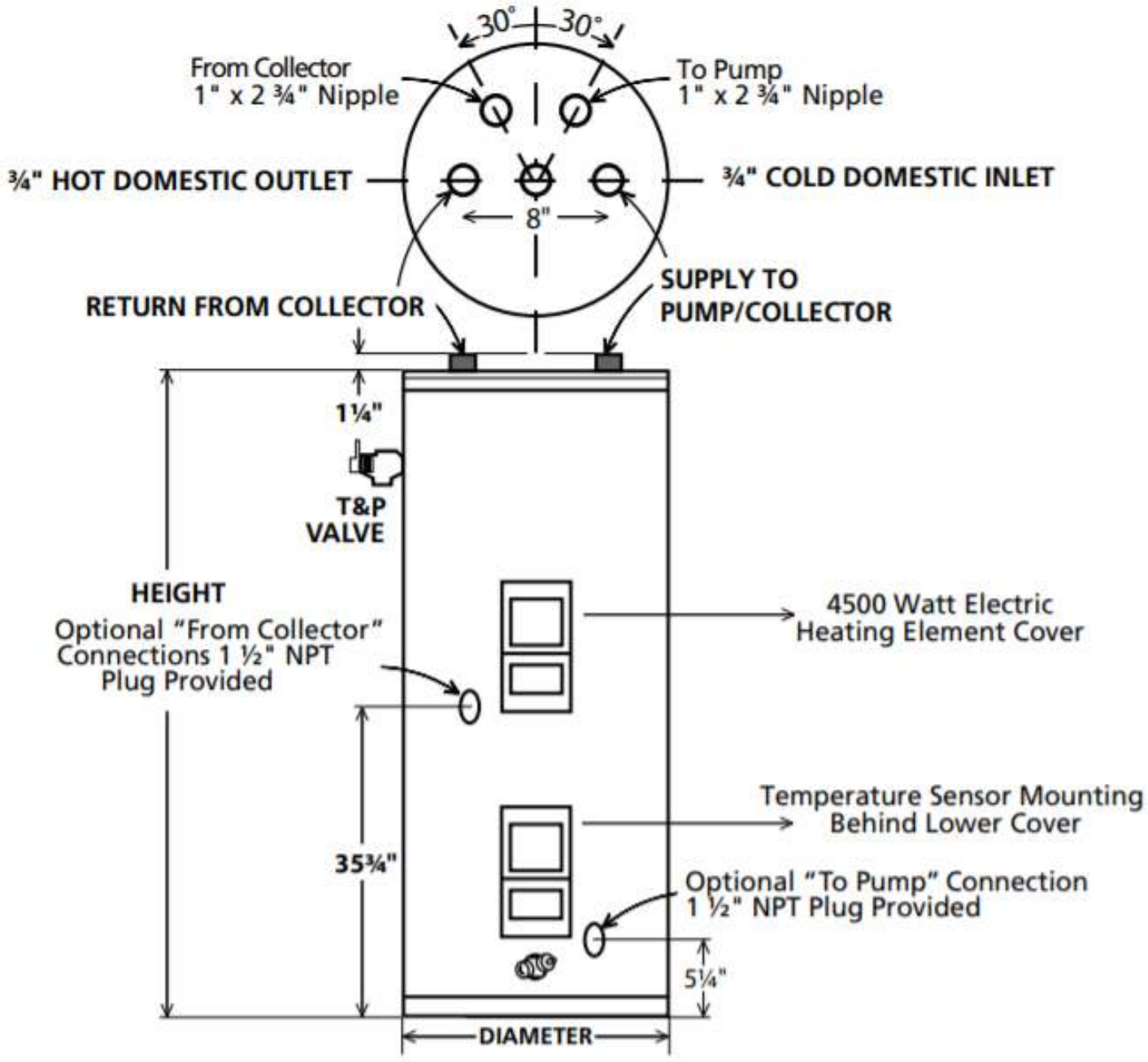
15) Generic Distribution Piping, Tank and Design Examples, WGxAH <u>only</u>.



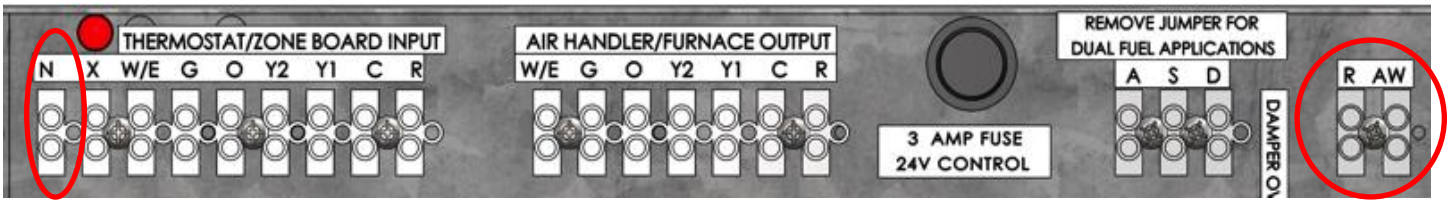


Domestic Hot Water WG2AD units only.

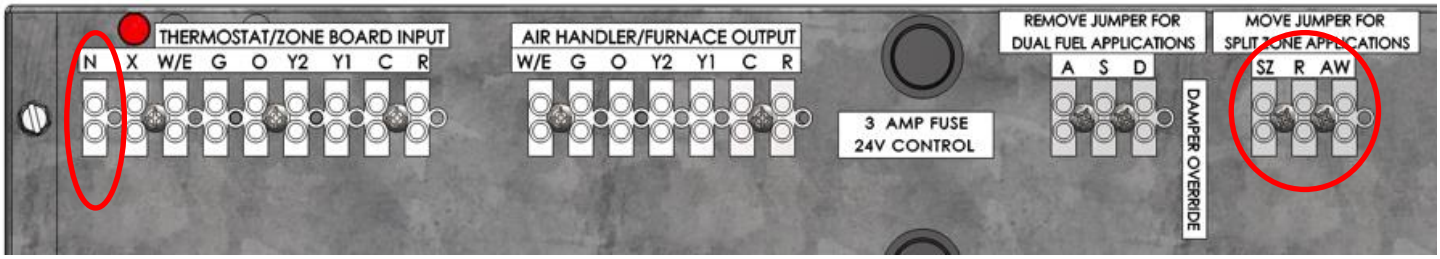



30°
30°
From Collector
1" x 2 ¾" Nipple
To Pump
1" x 2 ¾" Nipple
¾" HOT DOMESTIC OUTLET
¾" COLD DOMESTIC INLET
8"
RETURN FROM COLLECTOR
SUPPLY TO
PUMP/COLLECTOR
1¼"
T&P
VALVE
HEIGHT
Optional "From Collector"
Connections 1 ½" NPT
Plug Provided
4500 Watt Electric
Heating Element Cover
Temperature Sensor Mounting
Behind Lower Cover
35¾"
Optional "To Pump" Connection
1 ½" NPT Plug Provided
5¼"
DIAMETER

16) Installer Function Options, Jumper Wires



AD Unit



AH Unit

Shown on the top, the AD unit, forced air heating and cooling with 100% domestic hot water on demand ships with a jumper wire across terminals “R” and “AW”. With this jumper installed, air heating and cooling take priority over water heating. Given the fast recovery time for water heating, we recommend removing this jumper to prioritize water heating for most installations. Please note the “N” on the input strip. This is the water tank thermostat call.

Shown below the AD unit, the AH unit, forced air heating and cooling with hydronic diverting circuit has the following terminals and features:

- ❑ Please note the “N” on the input strip. This is the water tank thermostat call.
- ❑ Please Note the “SZ”, “R” and “AW” . These are your function option terminals.
- ❑ Units are shipped with a jumper wire across terminals “R” and “AW”. This prioritizes the forced air call over the water heating call. Removing the jumper prioritizes the water heating call over the forced air call.
- ❑ Split Zoning: The “SZ” terminal (Split Zone) allows the unit to heat one zone or floor with hydronic heat and another zone or with forced air. “Split Zone” is active by removing the priority call jumper making hydronic water heating the priority over air and, jumping “R” to the Split Zone “SZ” terminals of the field wiring terminal block. In this mode, while the unit is heating water for the hydronic zone, any “Y” call for heating in the forced air zone is shifted to the Auxiliary heating “W” Terminal. After the call completes, unit resumes normal operation.

Examples of when air heating should be priority over hydronic water heating:

- ❑ When radiant floor heat is not the primary heat source such as floor tempering, meaning just enough heat to not have cold floors - such as in a Master Bath or areas of the home with tile or hard wood floors.

- ❑ When the radiant floor system uses tubing spacing or lengths of tubing requiring water temperatures above 110°F to deliver adequate heat to be the primary heat source. In this case, the radiant floor system is just tempering the floor.
- ❑ When heating set backs are used and fast recovery times are required.
- ❑ When Split Zoning is not used.

If you have any questions regarding these procedures, please contact Total Green Mfg. technical support at 419-678-2032.

17) R–410A QUICK REFERENCE GUIDE

• R–410A refrigerant operates at 50% – 70% higher pressures than R–22. Be sure that servicing equipment and replacement components are designed to operate with R–410A.

• R–410A systems should be charged with liquid refrigerant only.

• R–410A is only compatible with POE oil. The oil used in a Waterless® Geothermal system is **Copeland Ultra 32-3 MAF**. Using any other brand or type will void the manufacture's equipment warranty.

• POE oils absorb moisture rapidly. Do not expose oil to atmosphere. Always flow nitrogen anytime a system is open to prevent atmosphere from entering any part of the system.

• Vacuum pumps will not remove moisture from oil.

• Never open system to atmosphere while it is under a vacuum.

• A liquid line filter drier is required on every unit.

• Wrap all filter driers and service valves with wet cloth when brazing.

• When system must be opened for service, break vacuum with dry nitrogen and replace all filter driers.

• Wrap all filter driers and service valves with wet cloth when brazing.

• Do not vent R–410A into the atmosphere.