Refrigeration System Installation & Operation Manual

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Table of Contents

Safety Information ……. 3
Receiving Inspection …… ….. 4
Locating and Mounting Condensing Units …… 4 - 5
Locating and Mounting Evaporator Coils …… 6
Wiring ……. 7
Piping ……. 7 - 10
Leak Test …… 11
Evacuation ……. 12
Refrigerant Charging …… 13
Operational Start-Up …… 13 – 15
Compressor Superheat …… 16
Evaporator Superheat …… 17
Electric Defrost Timer …….. 18
Air Defrost Timer …….. 19
Maintenance …….. 20
Troubleshooting Charts …… 21 – 23
Warranty Information …… 23
System Start-Up Data Sheet …… 24
Wiring Diagrams…… 25 – 46
Condensing Unit 115/1/60…… 25
Condensing Unit 208-230/1/60…… 26
Condensing Unit 208-230/3/60…… 27
Condensing Unit 460/3/60…… 28
Condensing Unit 208-230/1/60 w/Timer …….. 29
Condensing Unit 208-230/3/60 w/Timer…….. 30
Condensing Unit Medium Temp Scroll 208-230/1/60……..... 31
Condensing Unit Medium Temp Scroll 208-230/3/60……..... 32
Condensing Unit Low Temp Scroll 208-230/1/60…….. 33
Refrigeration System Low Temp Scroll 208-230/1/60…….. 34
Condensing Unit Low Temp Scroll 208-230/3/60…….. 35
Refrigeration System Low Temp Scroll 208-230/3/60…….. 36
Air Defrost Evaporator 115/1/60…… 37
Air Defrost Evaporator 115/1/60 w/Timer…… 38
Air Defrost with 2 Evaporators 115/1/60…….. 39
Air Defrost with 2 Evaporators w/Timer 115/1/60…… 40
Air Defrost Evaporator 230V..…… 41
Air Defrost Evaporator 230V w/Timer…….. 42
Air Defrost with 2 Evaporators 230V…….. 43
Air Defrost with 2 Evaporators 230V w/Timer …… 44
Electric Defrost Evaporator 208-230/1/60…….. 45
Electric Defrost with 2 Evaporators 208-230/1/60…….. 46

General Safety Information

Read this manual carefully before beginning the installation and operation of the refrigeration system. Special attention is required to all sections identified with the following warning and caution notices:

⚠ WARNING

Text in a Warning box alerts you to a potential personal injury situation. Read each Warning statement before proceeding and work carefully.

⚠ CAUTION

Text in a Caution box alerts you to a situation in which you could damage the refrigeration system. Read each Caution statement before proceeding and work carefully.

Disregarding these special notices may result in personal injury and/or damage to the refrigeration system.

Safety Notices:

- Installation and maintenance/servicing are to be performed only by trained and qualified personnel familiar with commercial refrigeration systems.
- Ensure that all field wiring conforms to the equipment requirements and all applicable local and national codes.
- Disconnect all power sources before servicing the refrigeration equipment.
- Sheet metal and coil surfaces have sharp edges. Use appropriate protective gloves to prevent injury.
- Use appropriate eye protection during installation and servicing.

Receiving Inspection

Check the shipment carefully and compare to the bill of lading. Account for all items listed and inspect each container for damage. Carefully inspect for any concealed damage. Report any shortages or damages to the carrier, note on the bill of lading, and file a freight claim.

Damaged material cannot be returned to the manufacturer without prior approval. A Return Material Authorization (RMA) must be obtained. Contact a sales representative at 800-826-7036.

Locating and Mounting Condensing Unit

General Guidelines:

- Check the selected installation location to ensure that racks, braces, flooring, foundations, etc. are adequate to support the condensing unit weight.
- The installation location is clean, dry, and level.
- Locate away from corrosive and noise sensitive atmospheres.
- Use the condensing unit skid and base when moving the unit. Do not remove unit from skid until the unit is moved to the mounting location.
- Mount the condensing unit base to pads or structural rails using properly sized bolts through the unit base.

⚠ WARNING

Do not lift the condensing unit by the refrigerant tubing or components. These features will not support the condensing unit weight. Injury and unit damage may occur!

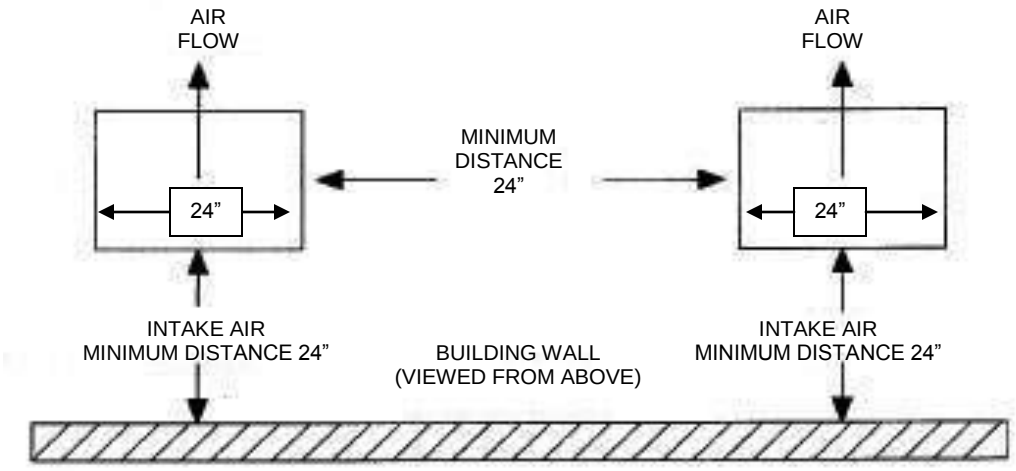
⚠ CAUTION

Do not leave the condensing unit mounted to the wooden skid. This prevents all of the unit supports from contacting the mounting surface. Excessive vibration and premature equipment failure can occur.

Clearance Requirements:

- Locate where there is a sufficient and unrestricted supply of clean ambient air.
- Locate where this is adequate space for the removal of the heated discharged air from the condensing unit area.
- Do not position multiple units so that discharge air from one unit is blowing into the condenser inlet air of the other unit.
- All sides of the unit should be positioned a minimum distance equal to the total width of the condensing unit away from any other unit, wall, or obstruction.

Example of Multiple Units with Horizontal Airflow



⚠CAUTION

Failure to observe clearance and air flow requirements will result in poor system performance and premature equipment failure!

Locating and Mounting Evaporator Coil

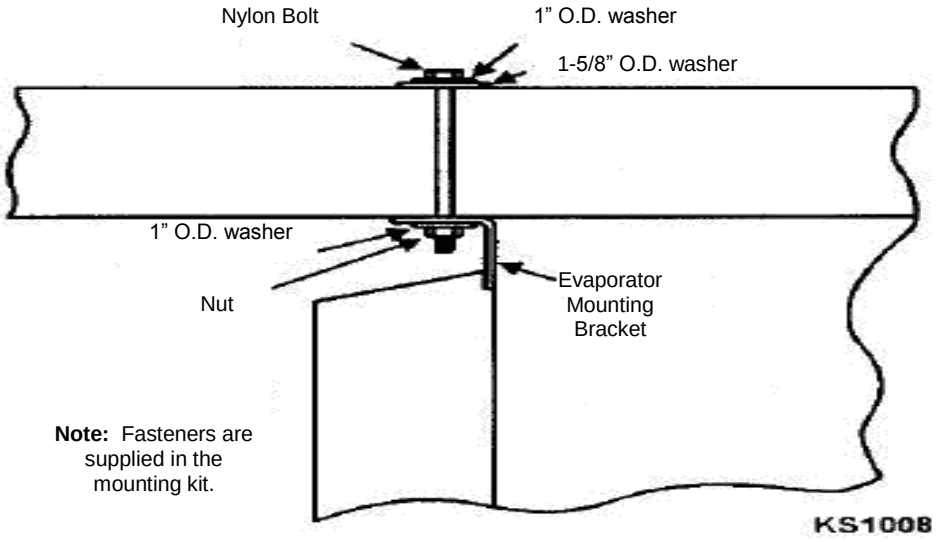
General Guidelines:

- Do not place the evaporator above or close to door openings. This will help prevent potential icing problems.
- Allow a minimum clearance equal to or greater than the coil height on all sides of the coil for proper air flow and service access.
- Use the evaporator coil for a template to locate and drill the mounting holes (1/2" diameter).
- Place a 1" and a 1-5/8" washer on each nylon bolt and insert through the drilled mounting holes.
- Lift the evaporator coil until the nylon bolts extend through the mounting brackets.
- Install washers and secure with nuts. Tighten until the coil is firm against the ceiling. The evaporator coil must be level.
- Additional information is available in the installation manual supplied with the evaporator.

⚠CAUTION

Failure to observe clearance and air flow requirements will result in poor system performance and premature equipment failure!

Evaporator Coil Mounting Diagram



Wiring

All electrical connections and routing must comply with local and national codes. Do not modify the factory installed wiring without written factory approval. The field wiring must enter through the knockouts provided. Refer to the nameplate on the condensing or evaporator coil to determine the proper electrical power supply. Wire type should be of copper conductor only and properly sized to handle the electrical load. The unit and coil must be properly grounded. Condensing unit wiring diagrams are attached inside the electrical box cover. Evaporator coil wiring diagrams are located inside the installation folder. Copies of the wiring diagrams are also available in the back of this manual.

⚠ WARNING

All wiring must comply with local and national codes. Wiring must be performed only by a refrigeration technician or certified electrician. Failure to follow these guidelines may result in injury!

⚠ CAUTION

Check all wiring connections, including factory terminals, before operation. Connections can become loose during shipment and installation.

Piping

General Requirements:

All refrigeration piping and components are to be installed in accordance with applicable local and national codes and in conformance with industry refrigeration guidelines to ensure proper operation of the refrigeration system. Only refrigeration grade copper tubing should be used. Long radius elbows should be used. Short radius elbows have points of excessive stress concentration and are subject to breaking at these points, do not use short radius elbows. Suction lines must be insulated with a minimum ¾" thick armaflex to reduce heat pick-up.

Cleanliness:

Condensing units and evaporator coils are cleaned and dehydrated at the factory. The condensing unit must remain closed and pressurized until the piping is complete and final connections are ready to be made.

⚠CAUTION

The maximum air exposure for dehydrated condensing units is 15 minutes. Systems exposed longer than 15 minutes must have the compressor oil and drier filter replaced. Leaving a system exposed to the atmosphere for more than 15 minutes can result in premature system failure.

Do not remove system tubing covers until work is ready to be performed. Ensure that all refrigeration tubing is clean and dry prior to installation. Use only tubing cutters when trimming tubing to the proper length. Do not use saws to cut tubing.

⚠CAUTION

The use of saws to cut tubing can contaminate the system with copper chips causing premature system failure.

Brazing joints require a dry inert gas, typically nitrogen, be passed through the lines at a low pressure to prevent scaling and oxidation. Use only silver solder brazing alloys. Minimize the amount of flux to prevent internal contamination. Flux only the male portion of the joint. Thoroughly clean fluxed joints after brazing.

⚠CAUTION

Dry inert gas must be passed through the system while brazing to prevent scaling and oxidation. Scaling and oxides can clog refrigeration components resulting in system failure.

Pipe Supports:

All tubing should be supported in a least two locations (near the end of each tubing run). Long runs will require additional support. As a guide, support 3/8” to 7/8” pipe every five feet, 1-1/8” to 1-3/8” every seven feet, and 1-5/8” to 2-1/8” every ten feet. Do not leave a corner unsupported when changing directions. Place supports within 2 feet of each direction change. Piping that is attached to a vibrating object (such as a compressor or compressor base) must be supported in a manner that will not restrict the movement of the vibrating object. Rigid mounting will fatigue the tubing causing refrigerant leaks.

Oil Traps:

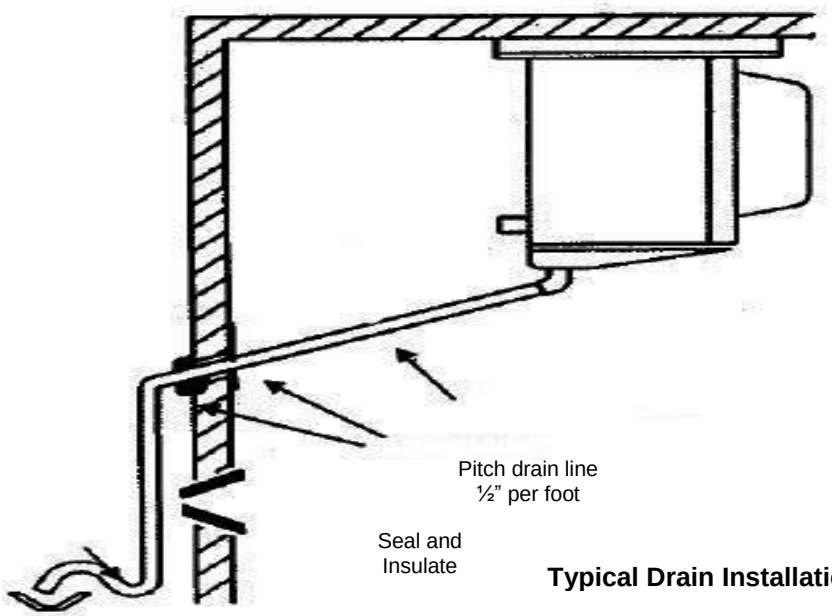
To ensure proper oil return to the compressor, a P-type oil trap should be installed at the base of each suction riser of four feet or more. The suction trap must be the same size as the suction line. Additional traps are necessary for long vertical risers. Add a trap for each length of pipe (approximately 20 feet) to insure proper oil return. Suction lines must slope ¼" per 10 feet toward the compressor. Install a suction line trap at the evaporator outlet if the suction line rises to a point higher than the connection on the evaporator.

⚠CAUTION

Failure to properly install oil traps can prevent sufficient oil return to the compressor resulting in premature compressor failure.

Drain Lines:

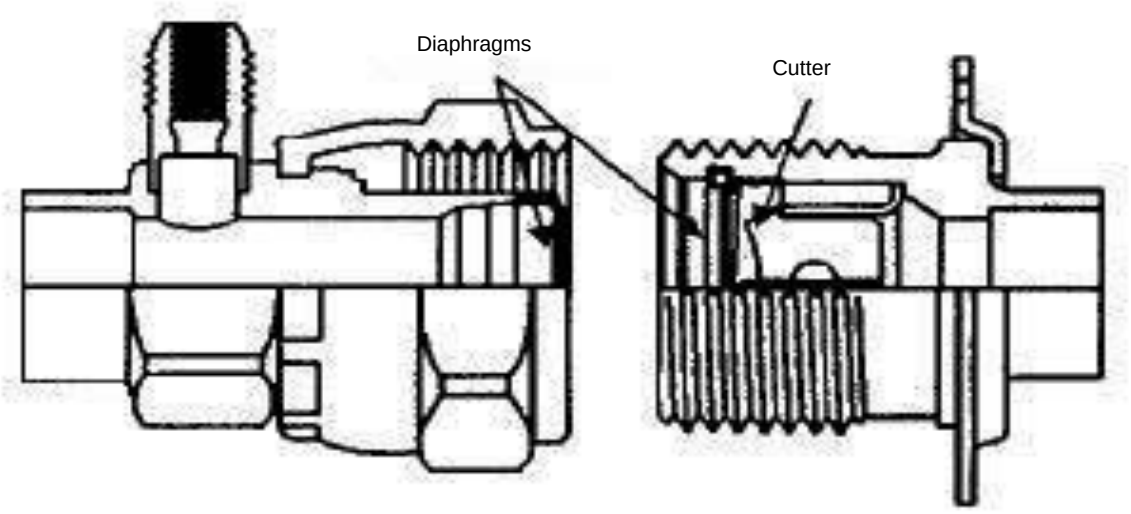
Evaporator coil drain lines should be pitched a minimum of ½" per foot to allow proper drainage and exit the walk-in as quickly as possible. Insulate and seal the drain line where it passes through the wall. Copper drain line is required. If the refrigerated space is 33°F or lower, drain line insulation and heat tape are required. Drain lines must be insulated with minimum ½" thick armaflex. The drain line heat tape must be wrapped around the copper drain line. Do not locate bends, elbows, or drain traps within the refrigerated space. Do not reduce the drain line size. Locate a drain line P-trap outside of the refrigerated space. Any traps exposed to low ambient temperatures should be wrapped with a drain line heater (provide 20 watts of heat per foot of drain line at 0°F, 30 watts per foot at -20°F.



Typical Drain Installation

Pre-Charged lines and Quick Connects:

Route the suction and liquid line sets between the condensing unit and evaporator coil following the piping guidelines identified in this manual. Remove the dust caps from the quick connect fittings and verify that the o-rings are intact. Wipe the coupling seals and threaded surfaces with a clean cloth to prevent contamination. Lubricate the threads and o-rings with Polyol Ester oil. Thread the coupling halves together by hand to ensure proper thread mating. Tighten with a wrench until the coupling bodies "bottom" or until there is definite resistance. Tighten an additional ¼ turn to ensure proper brass-to-brass seating. Once the system is opened and pressurized, check each fitting for refrigerant leaks. If a leak is detected, tighten until the leak stops.



⚠ WARNING

Do not loosen and disconnect the quick connect fittings before reclaiming the refrigerant and depressurizing the system. Disconnecting a pressurized system can result in injury!

⚠ CAUTION

Quick connects are for one time use only. Once disconnected, the coupling cannot be re-used. Refrigerant leaks will occur if the couplings are re-used resulting in poor system performance.

Leak Testing

After all connections are complete the refrigeration system must be tested for leaks. Failure to perform a leak test can result in unsatisfactory system performance, additional servicing and service costs, and possible system failure. Leak test should be performed using an electronic leak detector. All joints and components, both factory and field installed, should be thoroughly inspected for leaks. The system installation must be leak free!

Leak Testing "PR" model systems:

- Open both the liquid and suction service valves.
- Ensure the solenoid valve is energized and open.
- Add 50 psi refrigerant, then pressurize with dry nitrogen to the low side test pressure identified on the unit rating label.
- Allow thirty minutes for refrigerant to reach all parts of the system.
- Check all joints and components with an electronic leak detector.

Leak Testing "PC" model systems:

- Leave the service valves closed, the condensing unit is charged with refrigerant.
- Ensure the solenoid valve is energized and open.
- Add 50 psi refrigerant, then pressurize with dry nitrogen to the low side test pressure identified on the unit rating label.
- Allow thirty minutes for refrigerant to reach all parts of the system.
- Check all joints and components with an electronic leak detector.

Leak Testing "PCL" model systems:

- Open both the liquid and suction service valves.
- Ensure the solenoid valve is energized and open.
- Allow thirty minutes for refrigerant to reach all parts of the system.
- Check all joints and components with an electronic leak detector.

If a leak is detected, relieve the pressure and/or reclaim the refrigerant and repair the leak. If additional brazing is required, pass a dry inert gas (nitrogen) through the system to prevent contamination. Reference page 10 of this manual for leaks located at quick connects couplings. Retest the system as outlined above until no leaks are detected.

⚠CAUTION

If a braze joint is detected leaking, dry inert gas must be passed through the system while repairing the joint to prevent scaling and oxidation. Scaling and oxides can clog refrigeration components resulting in system failure.

⚠CAUTION

Always use the system specified refrigerant when pressuring to perform a leak test.

System Evacuation

Evacuation of the refrigeration system is necessary to remove all air and moisture from the system. A reliable rotary vacuum pump with an accurate deep vacuum gauge is recommended. Do not use the system compressor as a vacuum pump and do not operate the compressor while the system is under vacuum.

Evacuation of "PR" model systems:

- Open both the liquid and suction service valves.
- Ensure the solenoid valve is energized and open.
- Connect vacuum pump to the liquid and suction service valves.
- Evacuate the system to 250 microns and maintain for a minimum of 4 hours.
- Perform a vacuum decay test for a minimum of ten minutes to ensure the system is leak free and dry.

Evacuation of "PC" model systems:

- Leave the service valves closed, the condensing unit has been evacuated and is charged with refrigerant.
- Ensure the solenoid valve is energized and open.
- Connect vacuum pump to the liquid and suction service valves.
- Evacuate the system to 250 microns and maintain for a minimum of 4 hours.
- Perform a vacuum decay test for a minimum of ten minutes to ensure the system is leak free and dry.

Evacuation of "PCL" model systems:

- "PCL" systems do not require evacuation; this process has been performed at the factory.

⚠CAUTION

Do not use the system compressor to evacuate the system. Do not start the compressor while the system is under vacuum. This may damage to the compressor and cause premature system failure.

Refrigerant Charging

The refrigerant charge should be added to the system through the liquid line service valve. Do not charge liquid refrigerant into the suction service valve! The initial charge should be determined by weight and sight glass indication. Start the system. If the condensing temperature is 105° F or greater, charge the system until the sight glass clears. If the condensing unit temperature is below 105° F, reduce the condenser face surface area to raise the discharge pressures above 105° F and proceed to charge to a clear sight glass. Return to a full condenser face area when charging is complete.

⚠CAUTION

Do not charge liquid refrigerant into the suction service valve. Do not overcharge the system. These conditions can permit liquid refrigerant to enter the compressor and cause damage to internal components resulting in premature system failure.

Operational Start-Up

The first 2 – 4 hours of operation after initial start-up is a critical time. Do not just start the system and leave. Pressure values, compressor and evaporator superheat, and inspecting for excessive vibrations and loose connections are some of checks that must be performed prior to leaving the system.

Pre-Start Checks:

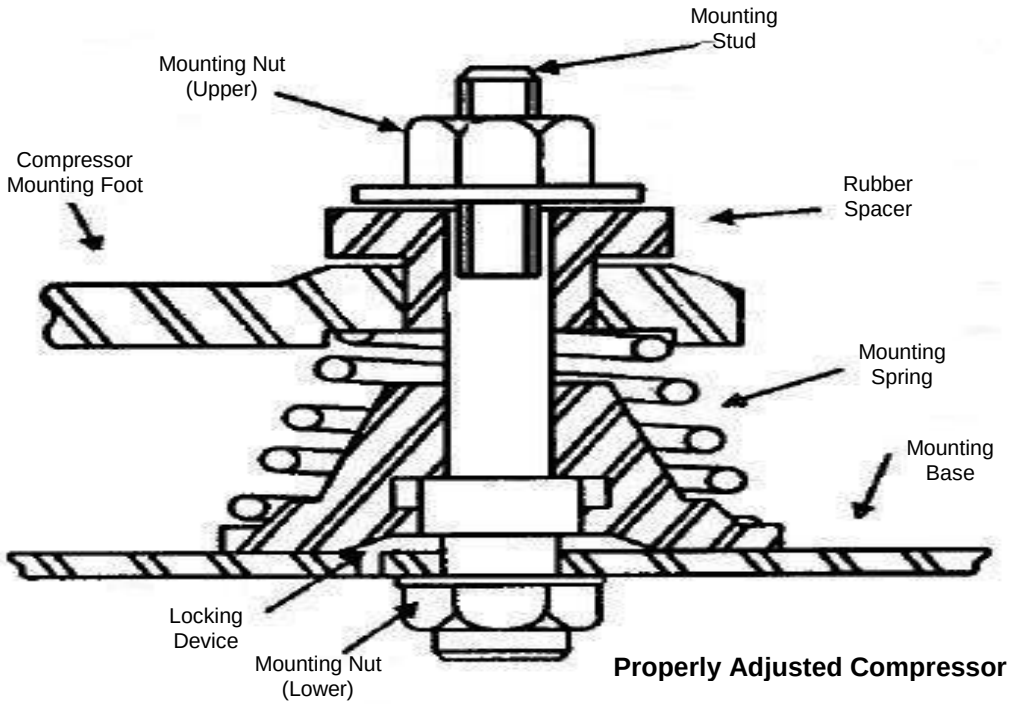
- Verify that all service valves are fully open.
- Ensure that all refrigerant and electrical connections are tight.
- Verify that the wiring and piping is properly routed and secured.
- The compressor mounting bolts are properly adjusted (see compressor mounts on page 14).
- All fan motors and mounting brackets are tight.
- The condensing unit base and evaporator coil are properly secured.

Compressor Mounts:

Hermetic Compressors – hermetic compressor springs are mounted internally; check the compressor mounting bolts to ensure the nuts have not become loose during shipment.

Semi-Hermetic Compressors – most semi-hermetic compressors have external spring mounts and are factory assembled. The following actions are required once the condensing unit is installed and before system start-up:

- Loosen the upper mounting nuts.
- Remove the spring steel clips from the mounting springs.
- Retighten the upper mounting nuts until the compressor can float on the springs approximately 1/16" between the mounting nut and rubber grommet.



Properly Adjusted Compressor Mount

⚠CAUTION

Failure to ensure the compressor mounts are properly tightened can result in fatigue to the system piping causing leaks and poor system performance.

Start-Up Procedure:

⚠ **CAUTION**
Do not start the system while in a vacuum. Do not leave the system unattended until normal operating conditions are achieved.

Operate the system for a minimum of two hours and perform checks of the following:

- Check the compressor discharge and suction pressures to ensure they are in the normal operating range.
- Check the liquid line sight glass for proper refrigerant charge.
- Monitor the compressor oil level (semi-hermetic compressors), add oil as necessary to keep the level at ¾ sight glass when idle and ½ sight glass when running.
- Check the voltage and amperage at the compressor terminals. Voltage must be within +10% or -5% of the rating indicted on the condensing unit name plate. On three phase compressors, verify there is a balanced load.
- Check all fans on the evaporator coil and condensing unit to be sure they are operational and turning in the correct direction.
- Check the piping and electrical connections for vibration. Add supports and strapping if needed.
- Check the crankcase heater operation (if equipped).
- Set the defrost control time and verify the defrost initiation settings. See pages 18 - 19 for additional details.
- Set temperature control to desired temperature range.
- Check the compressor and evaporator superheat (reference pages 16 - 17).

After all system checks have been checked, properly adjusted, and verified, replace all Schrader caps, service valve caps, electrical box covers, housings, etc. File a copy of this manual for future reference.

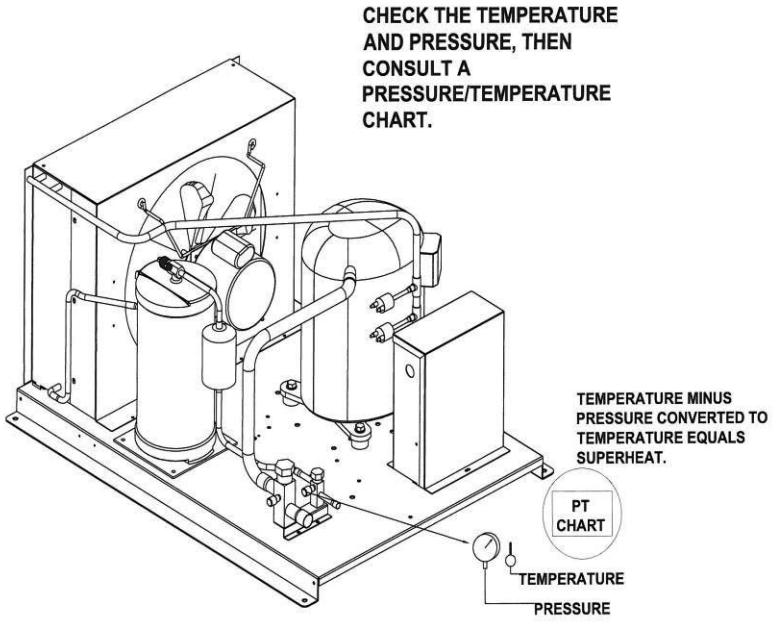
Compressor Superheat:

⚠ CAUTION
Failure to check and properly adjust compressor superheat can result in premature system failure.

Compressor superheat is a critical value that must be checked. Check the compressor superheat as follows:

1. Determine the suction pressure at the suction service valve of the compressor.
2. Determine the saturation temperature at the observed suction pressure using refrigeration pressure temperature tables.
3. Measure the suction line temperature 6 -10 inches away from the compressor.
4. Subtract the saturation temperature (step 2) from the measured temperature (step 3). The difference is the superheat of suction gas.

A low suction superheat can cause liquid to return to the compressor. This will cause dilution of the oil and eventual failure of the bearings, rings and valves. A high suction superheat will cause excessive discharge temperatures, which cause a breakdown of the oil. This causes piston ring wear, and piston and cylinder wall damage. System capacity decreases as the suction superheat increases. For maximum system capacity, keep the suction superheat as low as practical. Copeland requires a minimum compressor superheat of 20°F; however, to improve compressor life, 25°F to 40°F is preferred. Adjust the expansion valve at the evaporator when adjustments to the suction superheat are necessary. Refer to “Evaporator Superheat” on the next page for more information.



DETERMINING COMPRESSOR SUPERHEAT

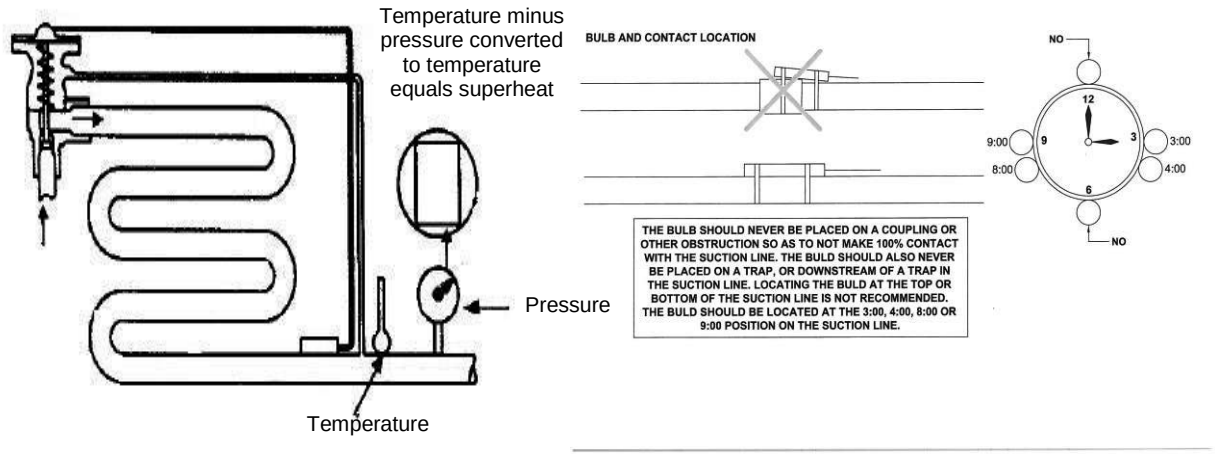
Evaporator Superheat:

Check the evaporator superheat once the walk-in has reached the desired temperature. Generally, systems with a design temperature drop of 10°F should have an evaporator superheat value of 6° - 10°F on freezers and 8° - 12°F on coolers for maximum efficiency.

To determine the evaporator superheat:

1. Measure the suction pressure at the evaporator outlet.
2. Convert the pressure to saturation temperature referencing a temperature-pressure chart.
3. Measure the temperature of the suction line at the expansion valve bulb. Ensure the bulb is mounted at the correct location on the suction tube.
4. Subtract the saturation temperature reading (step 2) from the measured temperature (step 3). The difference is the evaporator superheat.

Determining Evaporator Superheat



⚠CAUTION

Minimum compressor superheat of 20°F may override these recommendations on systems with short line runs.

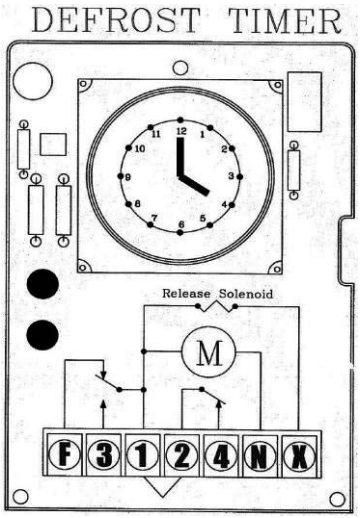
⚠CAUTION

The condensing unit must have the discharge pressure above the equivalent 105°F condensing pressure (reference refrigerant charging on page 13).

⚠CAUTION

Correct location and full contact of the expansion valve bulb is extremely important for proper system performance.

Electric Defrost Timer:



Defrost Time Clock

Instructions for setting the timer is located on the inside cover of the time clock. The defrost timer clock must be set to the correct time at initial start-up and after any power interruptions. Set the clock by rotating the clock face until the correct time is at the arrow on the face of the timer. The switch is programmed by pushing the captive trippers to the inner ring for the entire period the load is to be turned "ON". When a tripper is pushed to the outside, the switch is in the "DEFROST" position. Each defrost tripper represents 15 minutes of defrost time. The timer is factory set for four defrost cycles daily at the following times: 4:00AM, 10:00AM, 4:00PM, and 10:00PM. Each defrost cycle is programmed for 45 minutes duration. The defrost times may be changed to initiate at periods of low activity (trippers pushed out will close contacts to terminals 1 & 3).

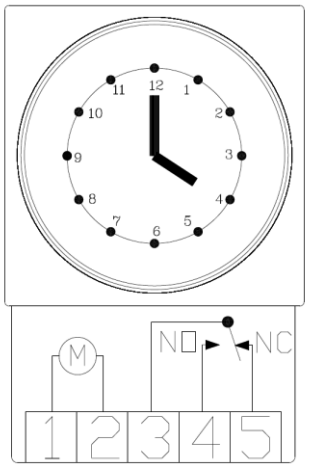
Note: If the defrost termination thermostat fails to close, the fail safe setting on the timer will terminate the defrost cycle. The timer starts the defrost cycle automatically at the predetermined times. A setting of two to four defrost cycles per day is typical. For heavier frost loads, additional cycles may be required.

When the defrost cycle begins:

1. Switch 2 to 4 opens in the time clock, breaking the circuit to the room thermostat, liquid line solenoid, and evaporator fan motors. This allows the compressor to pump down and shut off. Simultaneously, switch 1 to 3 closes in the timer, energizing the defrost heaters.
2. The heaters increase the coil temperatures above 32°F, melting the frost off the coil.
3. When the coil warms to approximately 55°F, the defrost termination thermostat closes and energizes the switching solenoid in the timer. At this time, switch 1 to 3 in the timer opens, terminating the defrost heaters. Simultaneously, switch 2 to 4 closes in the time clock, energizing the temperature control circuit.
4. Suction pressure rises, the low pressure control closes, and the compressor starts.
5. The fan relay closes when the coil temperature reaches approximately 30°F. This energizes the fan motors.
6. The system operates in the refrigeration cycle until another defrost cycle is initiated by the timer.

Air Defrost:

Air Defrost Timer 115V



Instructions for setting the timer is located on the inside cover of the time clock. The defrost timer clock must be set to the correct time at initial start-up and after any power interruptions. Set the clock by rotating the clock face until the correct time is at the arrow on the face of the timer. The switch is programmed by pushing the captive trippers to the outer ring for the entire period the load is to be turned “ON”. When the tripper is pushed to the inside, the switch is in the “Defrost” position. Each defrost tripper represents 15 minutes of defrost time. The timer is factory set for four defrost cycles daily at the following times: 4:00AM, 10:00AM, 4:00PM, and 10:00PM. Each defrost cycle is programmed for 30 minutes duration. The defrost times may be changed to initiate at periods of low activity (trippers pushed out will close contacts to terminals 3 & 4).

Note: The timer starts the defrost cycle automatically at the predetermined times. A setting of two to four defrost cycles per day is typical. For heavier frost loads, additional cycles may be required.

When the defrost cycle begins:

1. Switch 3 to 4 opens in the time clock, breaking the circuit to the temperature control and liquid line solenoid valve. This allows the compressor to pump down and shut off. Note, the evaporator fans continue to run during the defrost cycle.
2. At the end of the defrost duration, switch contacts 3 and 4 close, energizing the temperature control, solenoid valve circuit.
3. The suction pressure rises. When the cut-in pressure setting of the low pressure control is reached, the compressor contactor is energized, and the compressor starts.
4. The system operates in the refrigeration cycle until the next defrost cycle is initiated by the timer.

Maintenance

Maintenance Chart

Area	Task	Frequency
Evaporator	Check for proper defrosting	Monthly
	Clean the coil and drain pan	Every 6 months
	Check for proper drainage	
Condenser	Inspect /clean the coil if the air supply is near polluting sources (such as cooking appliances)	Monthly
	Clean the coil surface	Every 3 months
General	Check/tighten all electrical connections	Every 6 months
	Check all wiring and insulators	
	Check contactor for proper operation and contact point deterioration	
	Check all fan motors	
	Tighten fan set screws, and motor mount nuts and bolts	
	For semi-hermetics, check the oil level in the system	
	Check the operation of the control system	
	Make certain all safety controls are operating properly	
	Check operation of the drain line heater and examine for cuts and abrasions	
	Check/tighten all mechanical/flare connections	

⚠CAUTION

Failure to keep the condenser coil clean will result in reduced airflow through the condenser, resulting in poor system performance and premature compressor failure.

Polyol Ester (POE) Lubricants:

Polyol Ester (POE) lubricants quickly absorb moisture from the ambient surroundings. POE lubricants absorb moisture more rapidly and in greater quantity than conventional mineral oils. Because moisture levels greater than 100 PPM will result in system corrosion and component failure, it is essential that system exposure to ambient conditions be kept to a minimum.

If a system is left open to the atmosphere for more than 15 minutes, the liquid line drier and compressor oil must be replaced. Drain at least 95% of the oil from the compressor suction port. Measure the amount of removed oil, and replace it with exactly the same amount of new POE oil.

Mobil EAL™ ARCTIC 22 CC is the preferred Polyol Ester lubricant because of its particular additives. ICI Emkarate RL 32S is an acceptable alternative when the Mobil is not available. These POE lubricants must be used with HFC refrigerants. Lubricants are packaged in specially designed, sealed containers. Once opened, use the lubricant immediately. Properly dispose of any unused lubricant.

Troubleshooting Guides

Evaporator Troubleshooting Chart:

Problem	Possible Cause	Corrective Action
Fan(s) will not operate.	Main switch open	Close switch
	Blown fuse(s)	Replace fuse(s). Check for short circuits or overload conditions.
	Defective motor	Replace motor.
	Defective timer or defrost thermostat	Replace defective component.
	Unit in defrost cycle	Wait for completion of cycle.
Walk-in temperature too high.	Thermostat set too high	Adjust thermostat.
	Superheat too high	Adjust thermal expansion valve.
	System low on refrigerant	Locate and repair leak, recover, evacuate and recharge.
	Coil iced up	Manually defrost coil. Check defrost controls.
Ice accumulating on ceiling around evaporator and/or on fan guards, venturi, or blades.	Defrost duration is too long	Adjust defrost termination thermostat (if adjustable).
	Fan delay not delaying fans after defrost period	Replace defective defrost thermostat.
	Defective defrost thermostat or timer	Replace defective component.
	Too many defrost cycles per day	Reduce number of defrost cycles per day.
Frost on coil after defrost cycle.	Coil temperature not getting above freezing point during defrost	Check heater operation
	Not enough defrost cycles per day	Adjust timer for more defrost cycles per day
	Defrost cycle too short	Adjust timer for longer cycle, check defrost thermostat mounting
	Defective timer or defrost thermostat	Replace defective component.
Ice accumulating in drain pan.	Defective heater	Replace heater.
	Unit not pitched properly	Check and adjust.
	Drain line plugged	Clean drain line.
	Defective drain line heater	Replace heater.
	Defective timer or thermostat	Replace defective component.

Condensing Unit Troubleshooting Chart:

Problem	Possible Cause	Corrective Action
Compressor will not run.	Main switch open	Close switch
	Fuse blown	Check electrical circuits and motor winding for shorts or grounds. Investigate for possible overloading. Replace fuse after fault is corrected.
	Thermal overloads tripped	Overloads are automatically reset. Check unit closely when unit comes back on line.
	Defective contactor or coil	Repair or replace
	System shut down by safety devices	Determine type and cause of shutdown and correct
	No cooling required	None. Wait until cooling is required.
	Liquid line solenoid will not open.	Repair or replace coil.
	Low pressure switch will not close.	Replace switch
	Motor electrical trouble	Check motor for open windings or short circuit.
	Loose wiring	Check all wire junctions. Tighten all terminal screws.
Compressor noisy or vibrating	Flooding of refrigerant into crankcase	Check superheat setting of expansion valve
	Improper pipe support	Relocate or add hangers
	Worn compressor	Replace compressor
High discharge pressure	Non-condensable in system	Recover, evacuate and charge
	System overcharged with refrigerant	Remove excess charge
	Discharge shut-off valve partially closed	Open valve
	Fan not running	Check electrical circuit or replace defective fan motor
	Insufficient condenser air supply	Check for cause and correct
	Dirty condenser coil	Clean coil
Low discharge pressure	Faulty head pressure control	Check head pressure control operation.
	Suction shut-off valve partially closed	Open valve
	Insufficient refrigerant in system	Locate and repair leak, recover, evacuate and recharge
	Low suction pressure	See “Low Suction Pressure” page 3-8.

Condensing Unit Troubleshooting Chart (continued):

Problem	Possible Cause	Corrective Action
High suction pressure	Excessive load	Reduce load or add additional equipment
	Expansion valve overfeeding	Secure and insulate TXV bulb or if required adjust superheat.
Low suction pressure	Lack of refrigerant	Locate and repair leak, recover, evacuate and charge.
	Evaporator dirty or iced	Clean
	Clogged liquid line or suction line filter-drier	Replace filter-drier
	Expansion valve malfunctioning	Check and reset for proper superheat
	Condensing temperature too low	Check head pressure control
	Improper TXV	Check for proper sizing
Compressor loses oil	Lack of refrigerant	Locate and repair leak, recover, evacuate and recharge
	Excessive compression ring blow-by	Replace compressor
	Refrigerant flood back	Maintain proper superheat at compressor
	Improper piping or traps	Correct piping
Compressor thermal protector switch open	Operating beyond design	Add facilities so that operating conditions are within allowable limits
	Discharge valve partially shut	Open valve
	Dirty condenser coil	Clean coil
	Overcharged system	Correct charge

Notes:

Warranty Information

For information regarding warranty guidelines, claim form, product registration, warranty verification, or locating a service provider please visit our website at www.manitowocfsusa.com or call 1-800-225-9916.

System Start-Up Data Sheet

A permanent data sheet must be prepared on each installation. A completed copy should be retained with this manual.

System Reference Data

The following information should be filled out and signed by Refrigeration Installation Contractor:

Date System Installed: ____/____/____
Installer and Address: _____

_____

Phone Number: (____) ____-____
Service Agency: _____

_____

Phone Number: (____) ____-____

Condensing Unit: Model Number:_____
Serial Number:_____

Compressor Model Number:_____ Compressor Model Number:_____
Compressor Serial Number:_____ Compressor Serial Number:_____
Electrical:_____ Volts:_____ Phase:_____
Voltage at Compressor: L1:_____ L2:_____ L3:_____
Amperage at Compressor: L1:_____ L2:_____ L3:_____

Evaporator(s): Quantity:_____
Evaporator Model Number:_____ Evaporator Model Number:_____
Evaporator Serial Number:_____ Evaporator Serial Number:_____
Electrical:_____ Volts:_____ Phase:_____
Expansion Valve Manufacturer/Model Number:_____

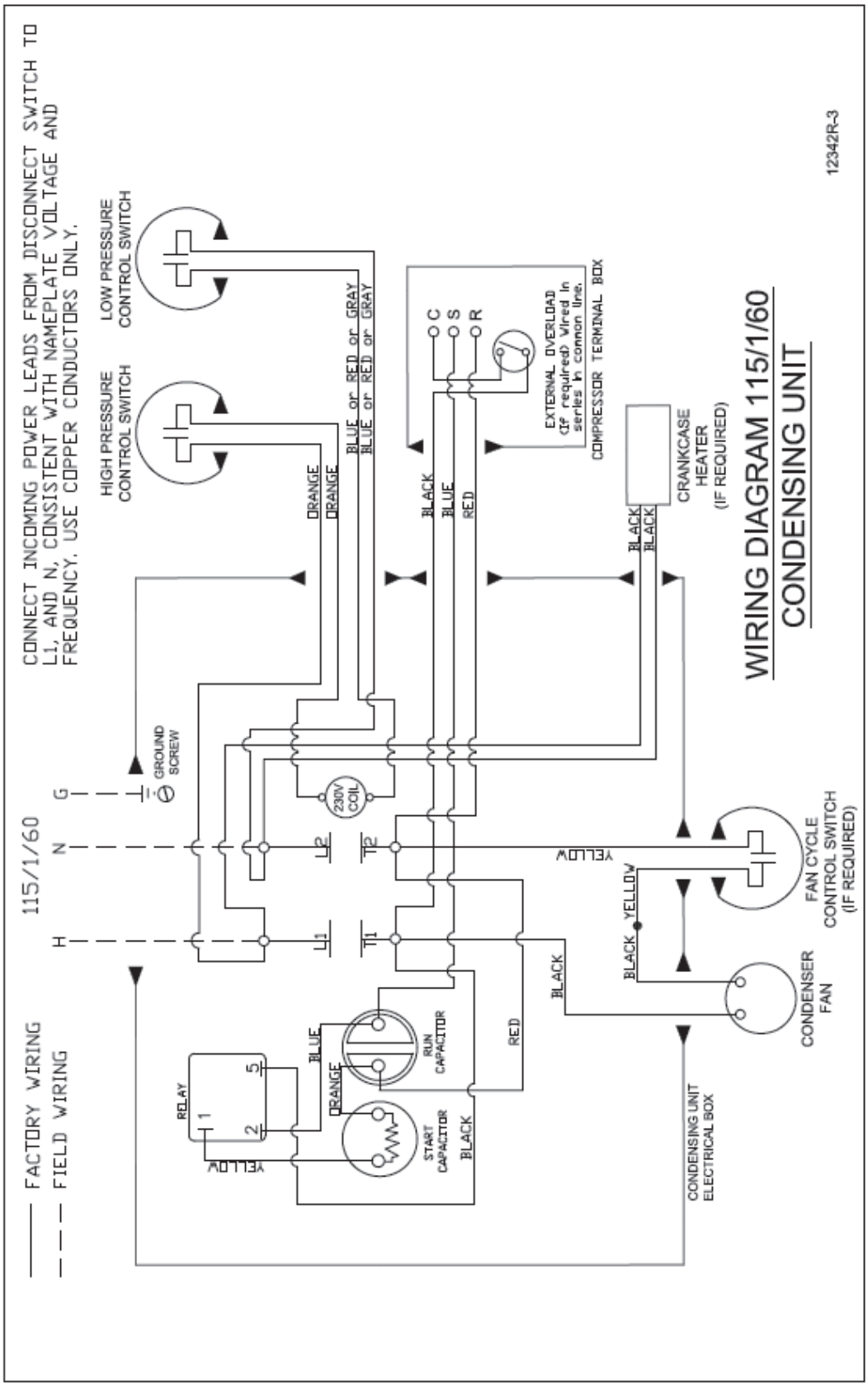
Ambient at Start-Up: _____°F
Design Box Temperature: _____°F _____ °F
Operating Box Temperature: _____ °F _____ °F
Thermostat Setting: _____°F _____ °F
Defrost Settings: _____/day _____minutes failsafe _____/day _____minutes failsafe

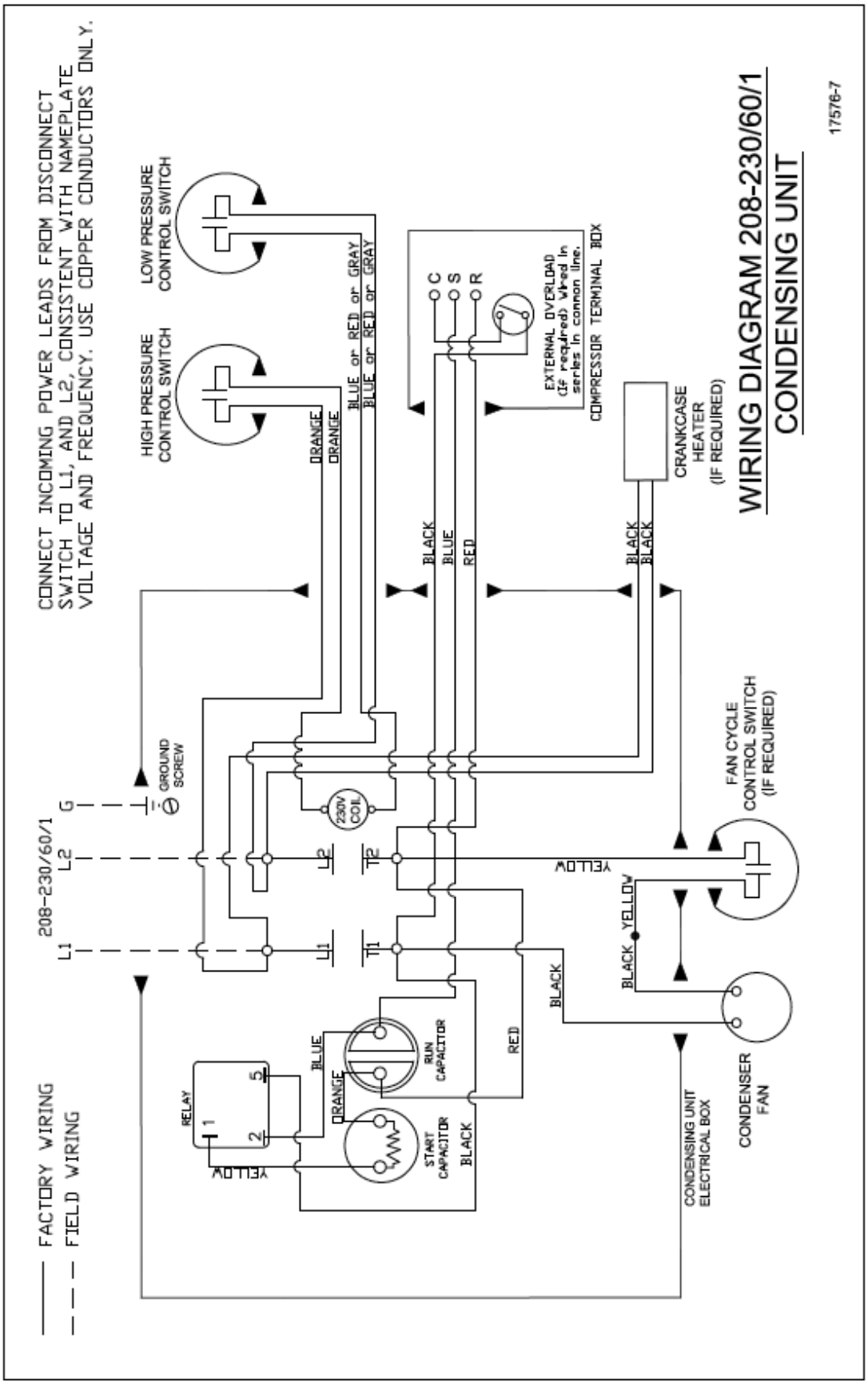
Compressor Discharge Pressure: _____ PSIG _____ PSIG
Compressor Suction Pressure: _____ PSIG _____ PSIG
Suction Line Temperature at Compressor:_____ °F _____ °F
Discharge Line Temperature at Compressor:_____ °F _____ °F
Superheat at Compressor: _____ °F _____ °F

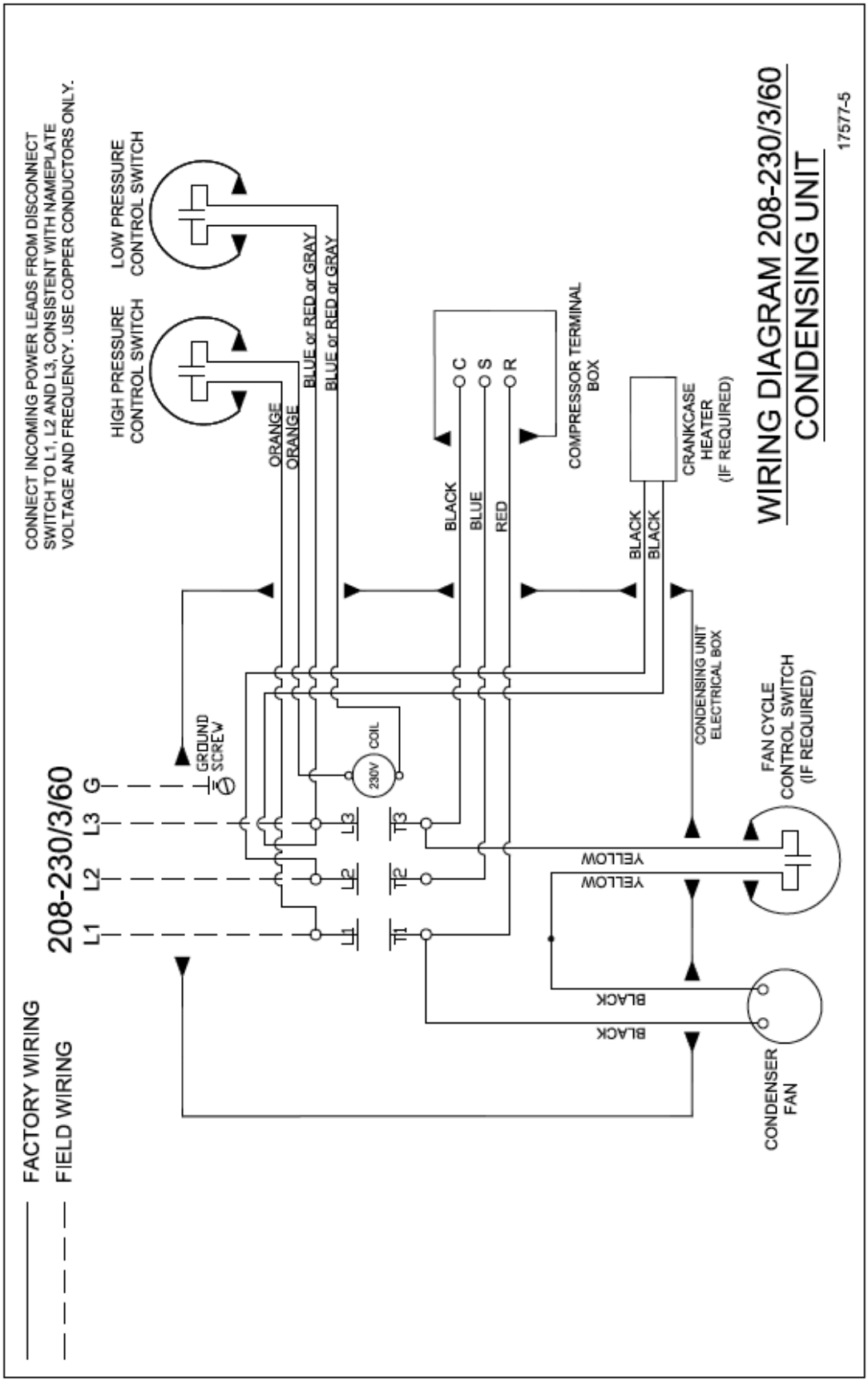
Suction Line Temperature at Evaporator:_____ °F _____ °F
Superheat at Evaporator: _____ °F _____ °F
Evacuation: # Times_____ Final Micron_____ # Times_____ Final Micron___

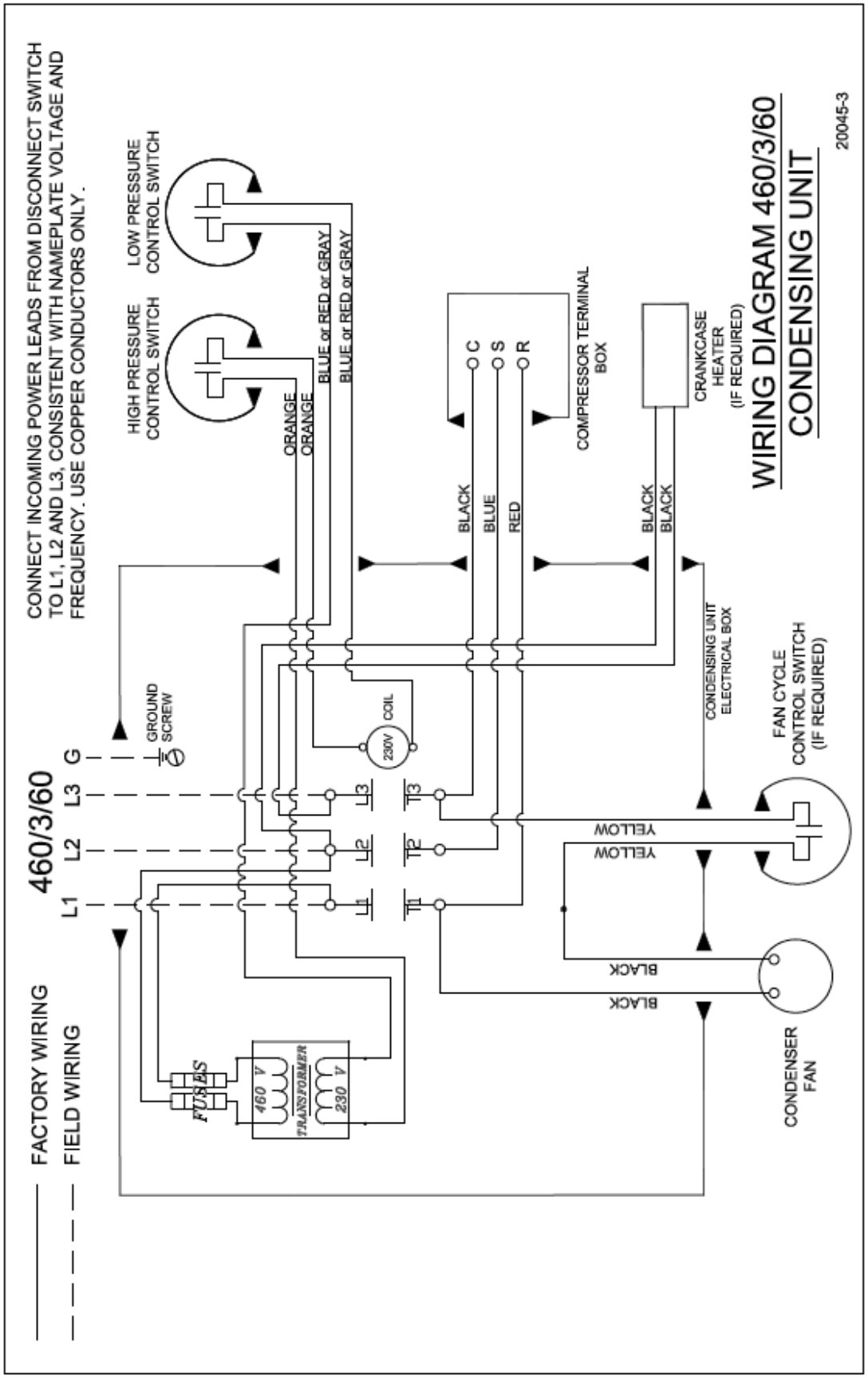
Evaporator Drain Line Trapped Outside of Box: Yes □ No □

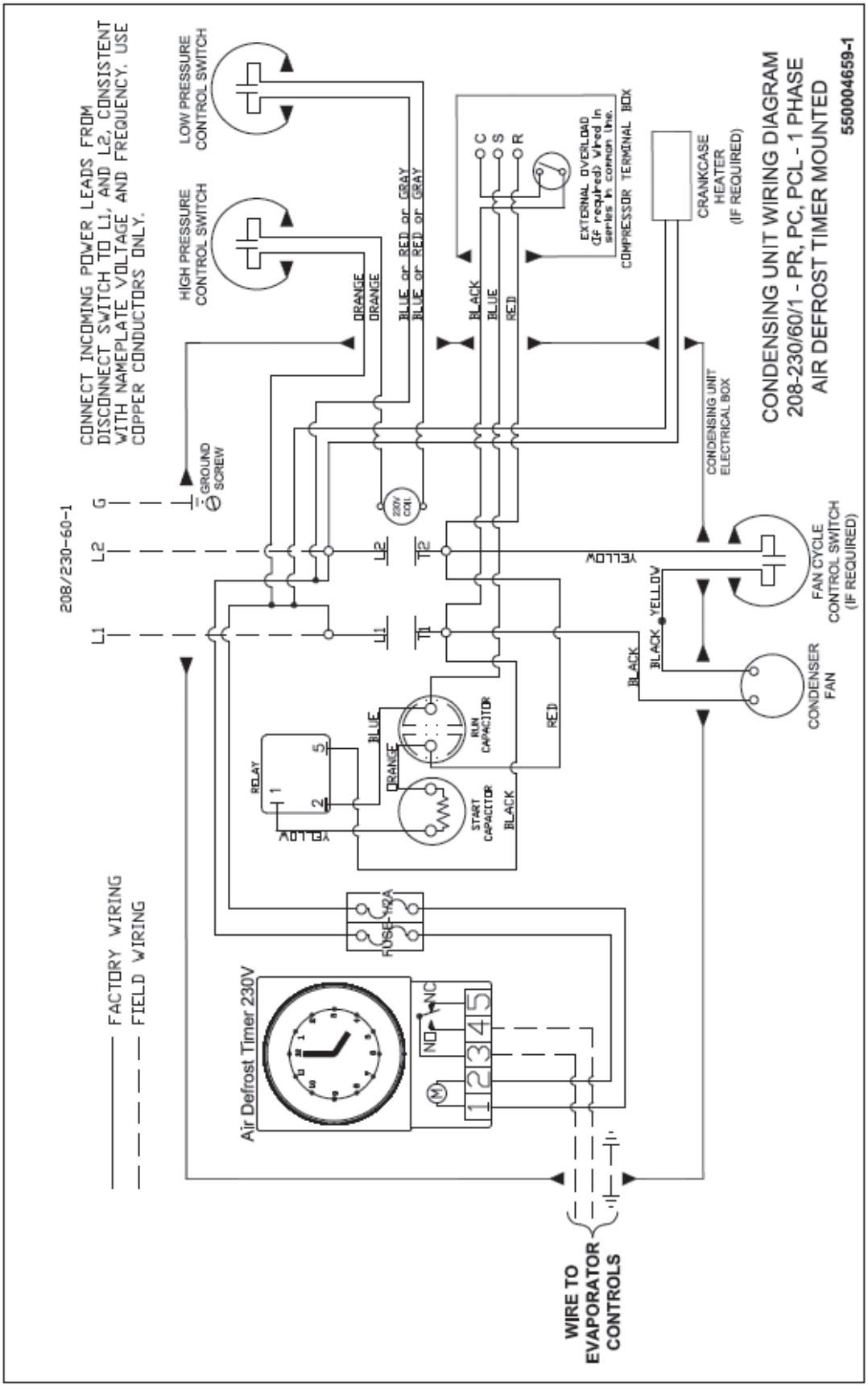
Wiring Diagrams

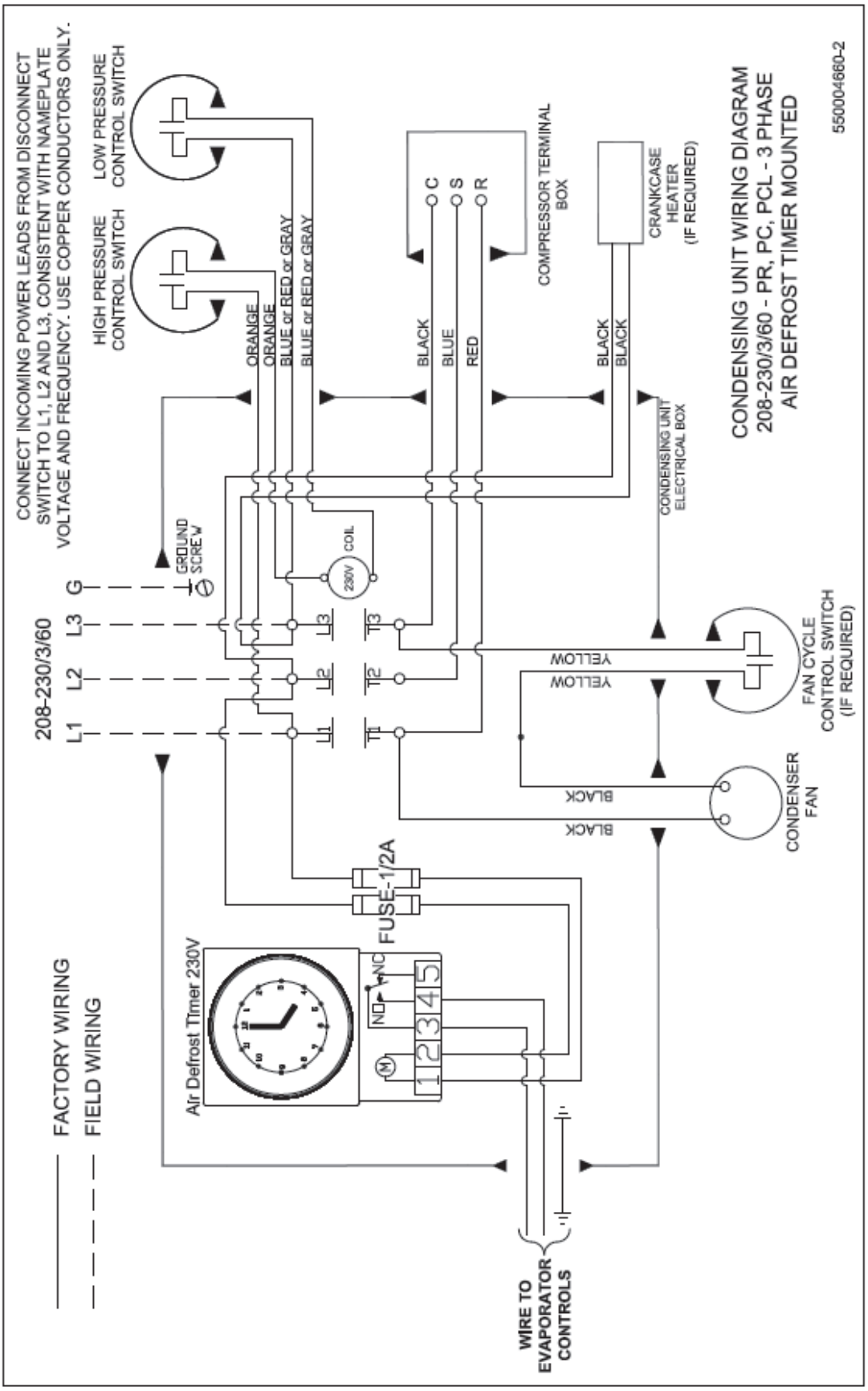


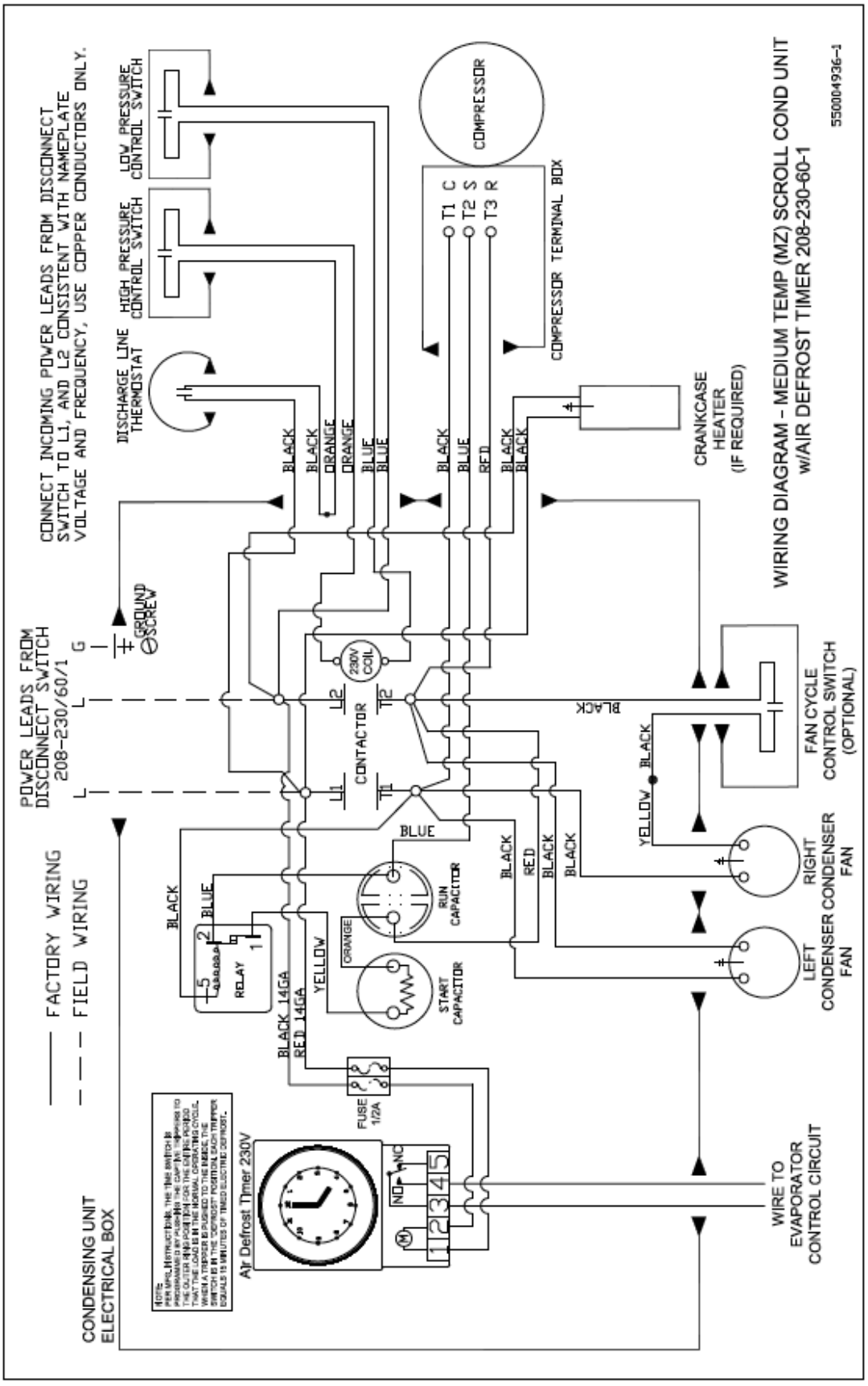

CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1, AND L2, CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY. USE COPPER CONDUCTORS ONLY.
WIRING DIAGRAM 208-230/60/1
CONDENSING UNIT
17576-7
FACTORY WIRING
FIELD WIRING
208-230/60/1
L1
L2
G
GROUND SCREW
HIGH PRESSURE CONTROL SWITCH
LOW PRESSURE CONTROL SWITCH
ORANGE
BLUE or RED or GRAY
BLACK
BLUE
RED
C
S
R
EXTERNAL OVERLOAD (If required) Wired in series in common line.
COMPRESSOR TERMINAL BOX
CRANKCASE HEATER (IF REQUIRED)
230V COIL
T2
T1
YELLOW
FAN CYCLE CONTROL SWITCH (IF REQUIRED)
RELAY
RUN CAPACITOR
START CAPACITOR
CONDENSING UNIT ELECTRICAL BOX
CONDENSER FAN

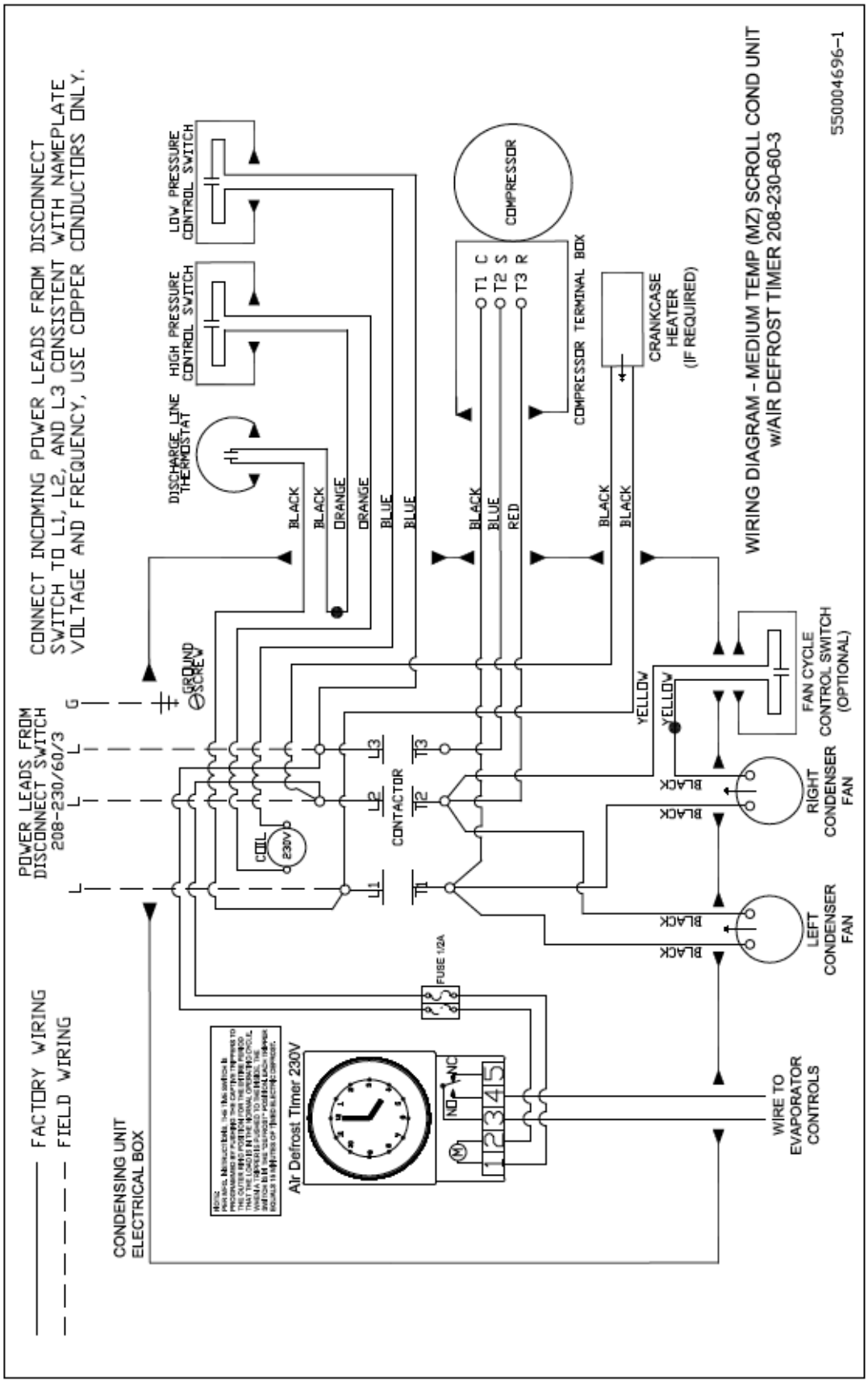

WIRING DIAGRAM 208-230/3/60
CONDENSING UNIT
17577-5
208-230/3/60
L1 L2 L3 G
CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1, L2 AND L3, CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY. USE COPPER CONDUCTORS ONLY.
FACTORY WIRING
FIELD WIRING
HIGH PRESSURE CONTROL SWITCH
LOW PRESSURE CONTROL SWITCH
GROUND SCREW
ORANGE
ORANGE
BLUE or RED or GRAY
BLUE or RED or GRAY
COIL
230V
L1
L2
L3
T1
T2
T3
C
S
R
BLACK
BLUE
RED
COMPRESSOR TERMINAL BOX
BLACK
BLACK
CRANKCASE HEATER (IF REQUIRED)
CONDENSING UNIT ELECTRICAL BOX
FAN CYCLE CONTROL SWITCH (IF REQUIRED)
YELLOW
YELLOW
BLACK
BLACK
CONDENSER FAN

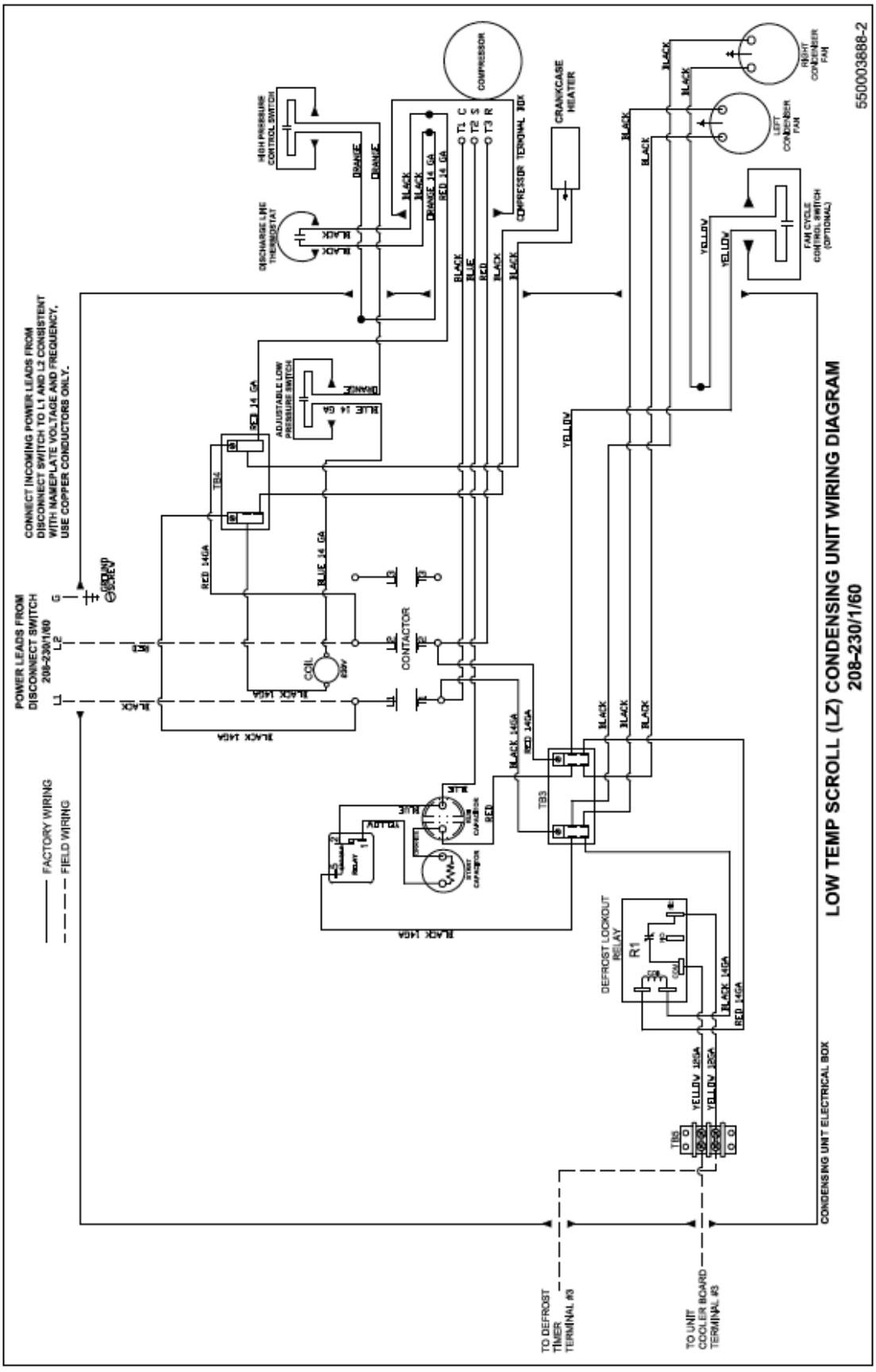

WIRING DIAGRAM 460/3/60
CONDENSING UNIT
20045-3
CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1, L2 AND L3. CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY. USE COPPER CONDUCTORS ONLY.
FACTORY WIRING
FIELD WIRING
460/3/60
L1
L2
L3
G
GROUND SCREW
HIGH PRESSURE CONTROL SWITCH
LOW PRESSURE CONTROL SWITCH
ORANGE
ORANGE
BLUE or RED or GRAY
BLUE or RED or GRAY
COIL
230V
C
S
R
COMPRESSOR TERMINAL BOX
BLACK
BLUE
RED
CRANKCASE HEATER (IF REQUIRED)
BLACK
BLACK
CONDENSING UNIT ELECTRICAL BOX
FAN CYCLE CONTROL SWITCH (IF REQUIRED)
YELLOW
YELLOW
BLACK
BLACK
CONDENSER FAN
FUSES
460 V
230 V
TRANSFORMER
T1
T2
T3

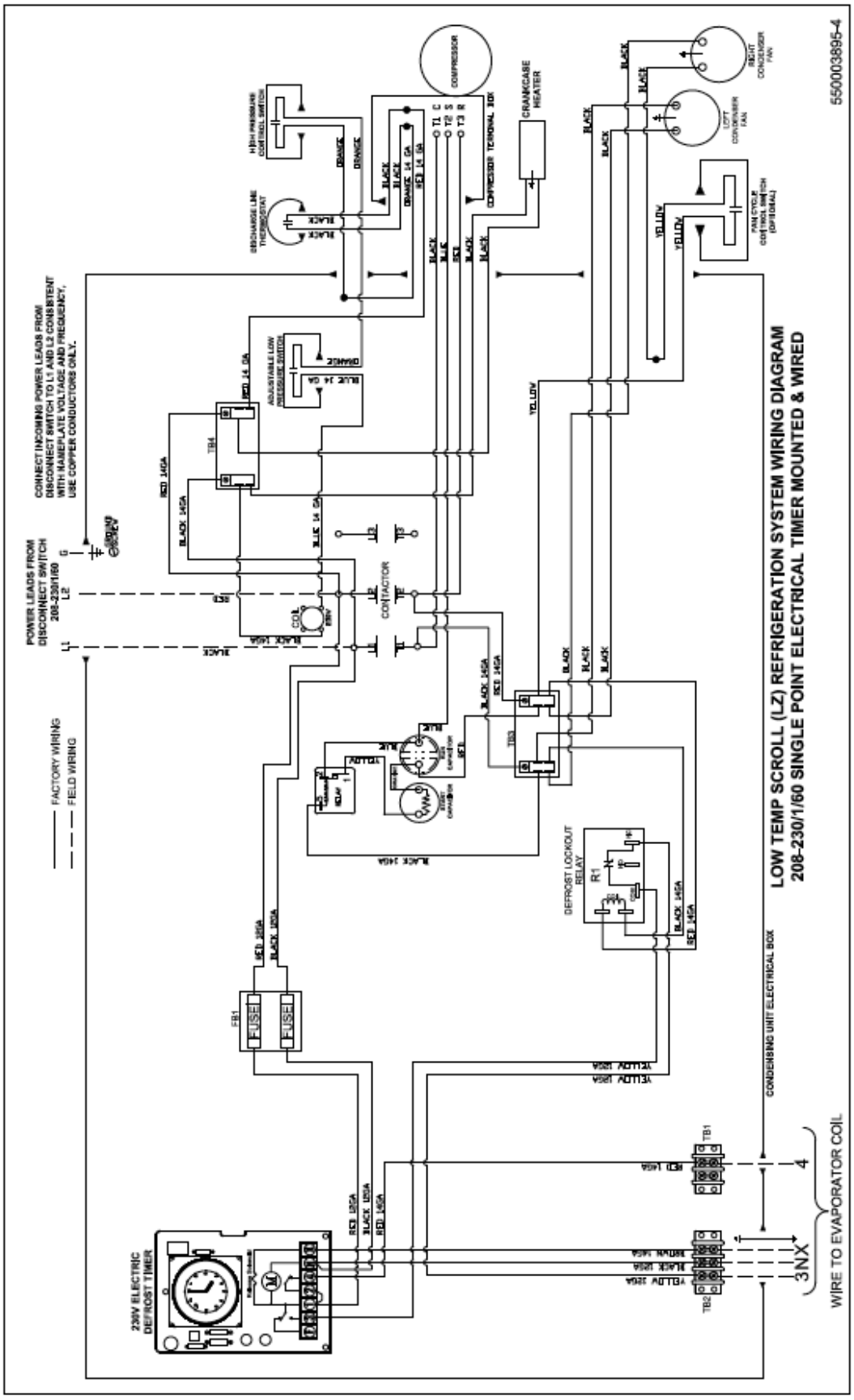

CONDENSING UNIT WIRING DIAGRAM
208-230/60/1 - PR, PC, PCL - 1 PHASE
AIR DEFROST TIMER MOUNTED
550004659-1
CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1, AND L2, CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY. USE COPPER CONDUCTORS ONLY.
208/230-60-1
L1
L2
G
GROUND SCREW
HIGH PRESSURE CONTROL SWITCH
LOW PRESSURE CONTROL SWITCH
ORANGE
ORANGE
BLUE or RED or GRAY
BLUE or RED or GRAY
BLACK
BLUE
RED
C
S
R
EXTERNAL OVERLOAD (If required) Wired in series in common line.
COMPRESSOR TERMINAL BOX
CRANKCASE HEATER (IF REQUIRED)
CONDENSING UNIT ELECTRICAL BOX
230V COIL
L2
T2
YELLOW
L1
T1
FAN CYCLE CONTROL SWITCH (IF REQUIRED)
YELLOW
BLACK
BLACK
CONDENSER FAN
RUN CAPACITOR
START CAPACITOR
RELAY
BLUE
ORANGE
RED
YELLOW
BLACK
FUSE 1.6A
Air Defrost Timer 230V
NO
NC
1 2 3 4 5
M
FACTORY WIRING
FIELD WIRING
WIRE TO EVAPORATOR CONTROLS

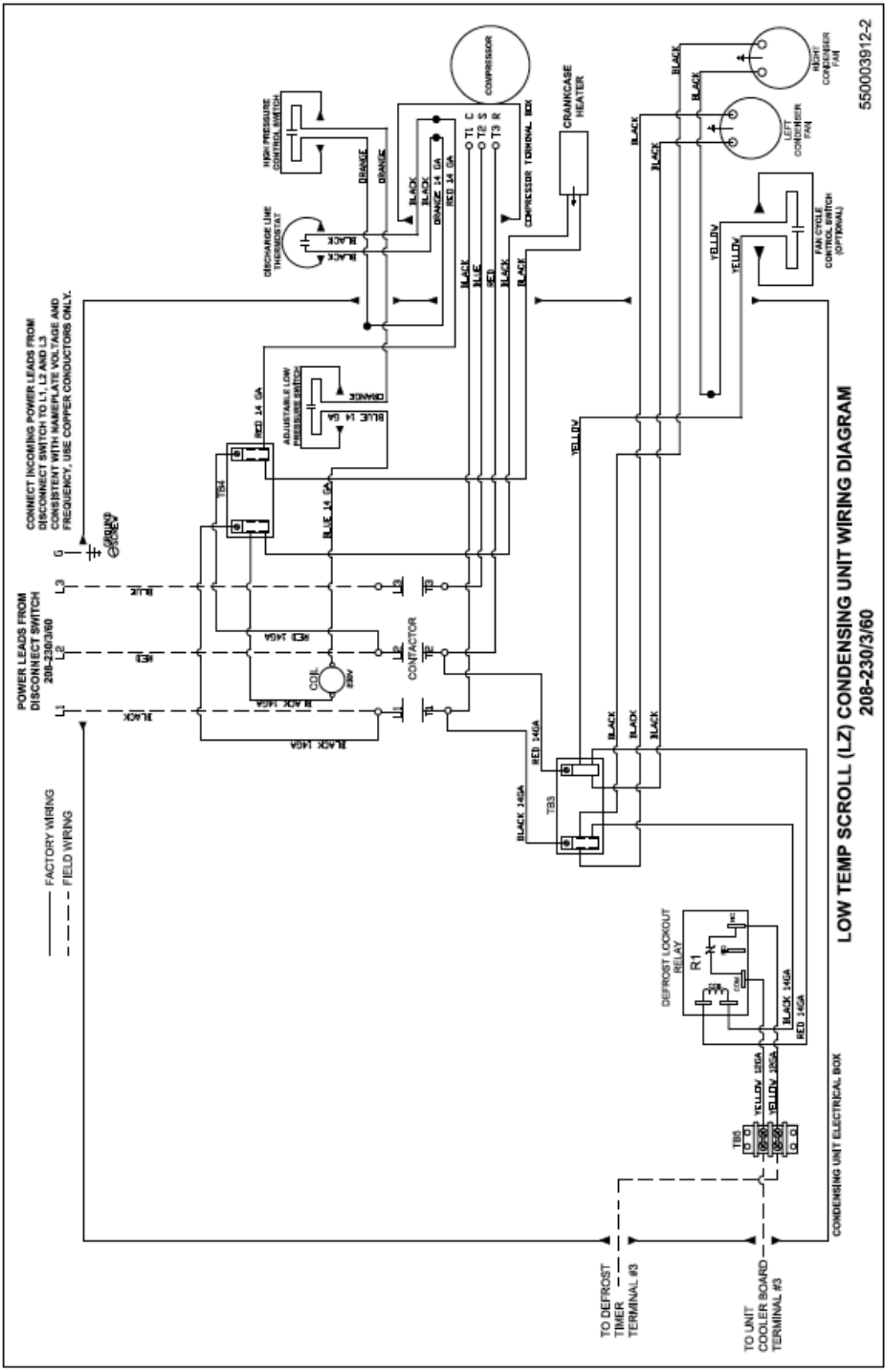

CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1, L2 AND L3, CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY. USE COPPER CONDUCTORS ONLY.
HIGH PRESSURE CONTROL SWITCH
LOW PRESSURE CONTROL SWITCH
208-230/3/60
L1
L2
L3
G
GROUND SCREW
ORANGE
ORANGE
BLUE or RED or GRAY
BLUE or RED or GRAY
COIL
230V
BLACK
BLUE
RED
C
S
R
COMPRESSOR TERMINAL BOX
BLACK
BLACK
CRANKCASE HEATER (IF REQUIRED)
CONDENSING UNIT ELECTRICAL BOX
YELLOW
YELLOW
FAN CYCLE CONTROL SWITCH (IF REQUIRED)
BLACK
BLACK
CONDENSER FAN
FUSE-1/2A
Air Defrost Timer 230V
NO
NC
1 2 3 4 5
M
WIRE TO EVAPORATOR CONTROLS
FACTORY WIRING
FIELD WIRING
CONDENSING UNIT WIRING DIAGRAM
208-230/3/60 - PR, PC, PCL - 3 PHASE
AIR DEFROST TIMER MOUNTED
550004660-2

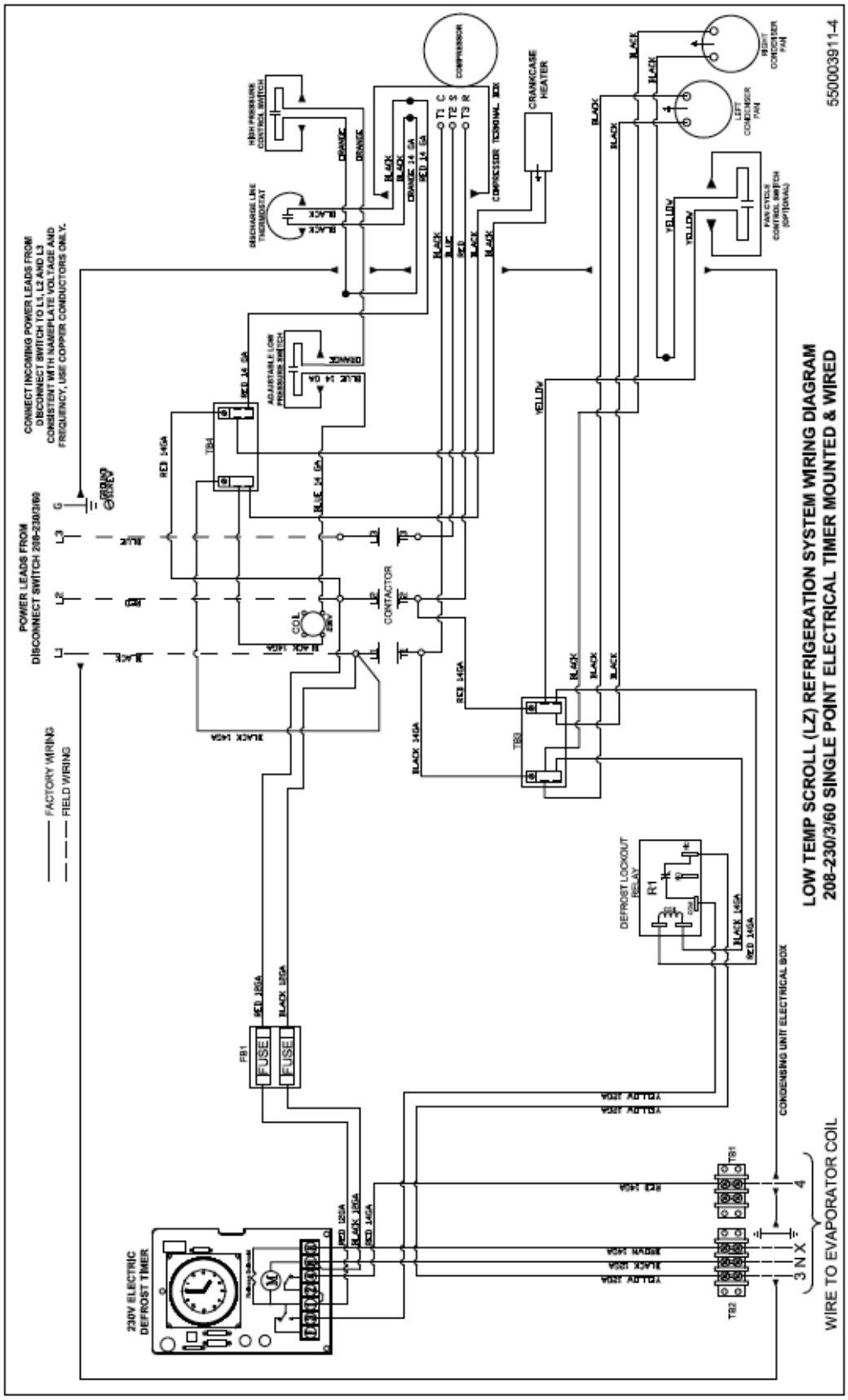

WIRING DIAGRAM - MEDIUM TEMP (MZ) SCROLL COND UNIT
w/AIR DEFROST TIMER 208-230-60-1
550004936-1
CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1, AND L2 CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY, USE COPPER CONDUCTORS ONLY.
POWER LEADS FROM DISCONNECT SWITCH 208-230/60/1
FACTORY WIRING
FIELD WIRING
CONDENSING UNIT ELECTRICAL BOX
GROUND SCREW
DISCHARGE LINE THERMOSTAT
HIGH PRESSURE CONTROL SWITCH
LOW PRESSURE CONTROL SWITCH
COMPRESSOR
COMPRESSOR TERMINAL BOX
T1 C
T2 S
T3 R
CRANKCASE HEATER (IF REQUIRED)
CONTACTOR
230V COIL
L1
L2
T1
T2
RUN CAPACITOR
START CAPACITOR
RELAY
FUSE 1/2A
Air Defrost Timer 230V
FAN CYCLE CONTROL SWITCH (OPTIONAL)
LEFT CONDENSER FAN
RIGHT CONDENSER FAN
WIRE TO EVAPORATOR CONTROL CIRCUIT
BLACK
BLUE
ORANGE
RED
YELLOW
BLACK 14GA
RED 14GA

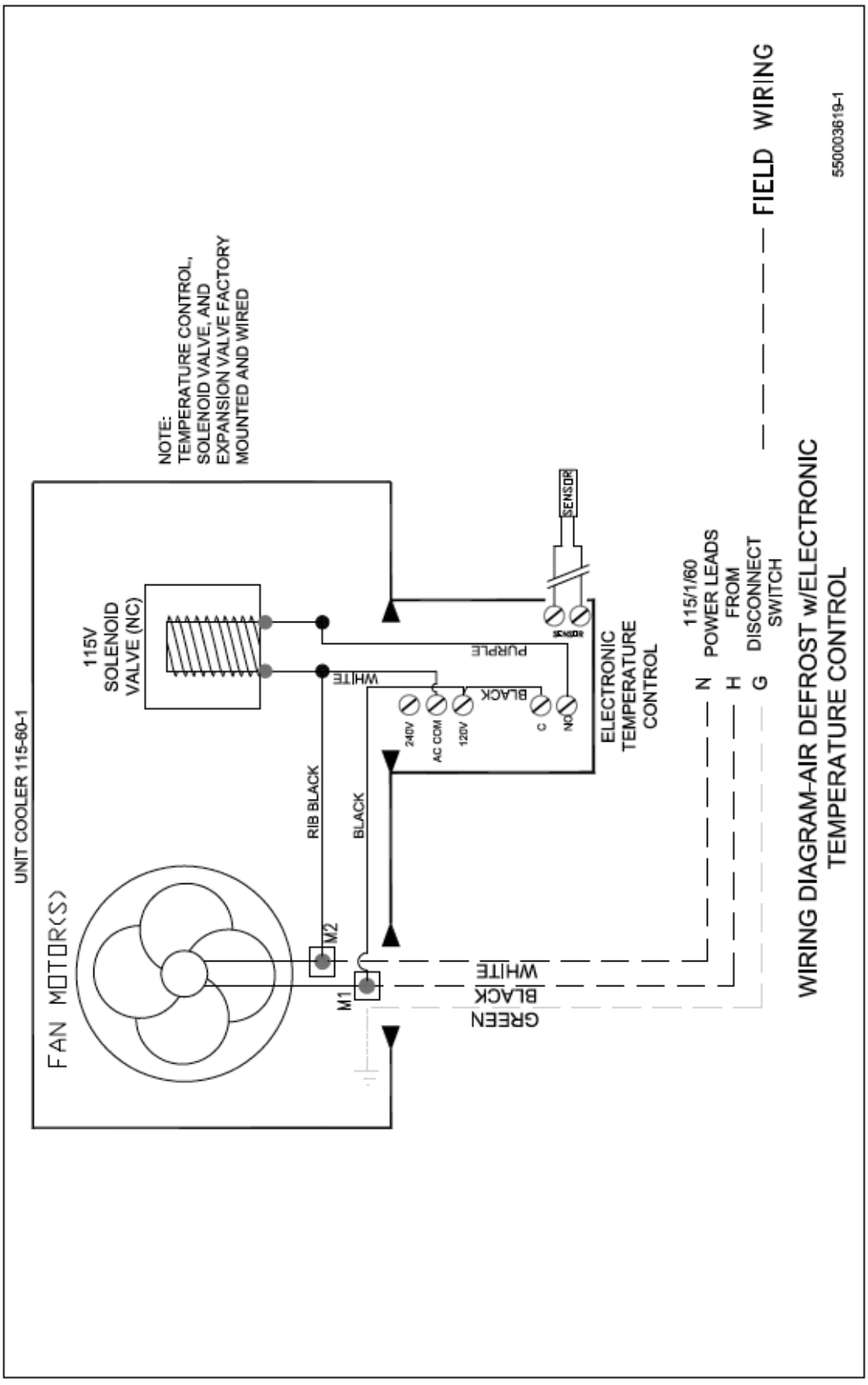

WIRING DIAGRAM - MEDIUM TEMP (MZ) SCROLL COND UNIT
w/AIR DEFROST TIMER 208-230-60-3
550004696-1
CONNECT INCOMING POWER LEADS FROM DISCONNECT
SWITCH TO L1, L2, AND L3 CONSISTENT WITH NAMEPLATE
VOLTAGE AND FREQUENCY, USE COPPER CONDUCTORS ONLY.
FACTORY WIRING
FIELD WIRING
CONDENSING UNIT
ELECTRICAL BOX
POWER LEADS FROM
DISCONNECT SWITCH
208-230/60/3
L1
L2
L3
G
GROUND SCREW
CONTACTOR
COIL
230V
FUSE 1/2A
Air Defrost Timer 230V
NO
NC
WIRE TO
EVAPORATOR
CONTROLS
DISCHARGE LINE
THERMOSTAT
HIGH PRESSURE
CONTROL SWITCH
LOW PRESSURE
CONTROL SWITCH
COMPRESSOR
COMPRESSOR TERMINAL BOX
T1 C
T2 S
T3 R
CRANKCASE
HEATER
(IF REQUIRED)
BLACK
ORANGE
BLUE
RED
YELLOW
LEFT
CONDENSER
FAN
RIGHT
CONDENSER
FAN
FAN CYCLE
CONTROL SWITCH
(OPTIONAL)

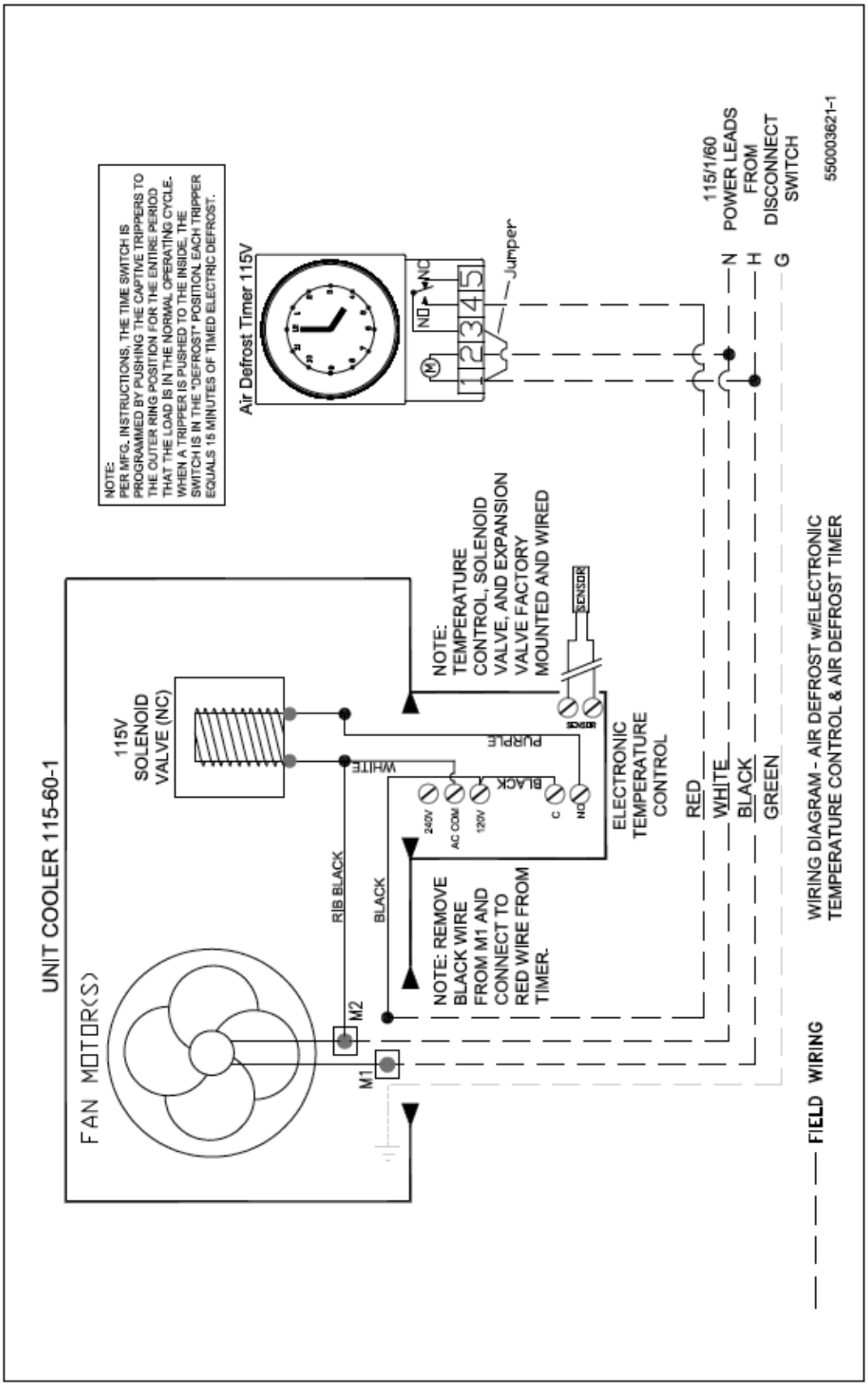

LOW TEMP SCROLL (LZ) CONDENSING UNIT WIRING DIAGRAM
208-230/1/60
5500036B8-2
CONDENSING UNIT ELECTRICAL BOX
FACTORY WIRING
FIELD WIRING
POWER LEADS FROM DISCONNECT SWITCH 208-230/1/60
CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1 AND L2 CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY. USE COPPER CONDUCTORS ONLY.
GROUND LUG
CONTACTOR
COIL
COMPRESSOR
COMPRESSOR TERMINAL BOX
CRANKCASE HEATER
HIGH PRESSURE CONTROL SWITCH
DISCHARGE LINE THERMOSTAT
ADJUSTABLE LOW PRESSURE SWITCH
FAN CYCLE CONTROL SWITCH (OPTIONAL)
RIGHT CONDENSER FAN
LEFT CONDENSER FAN
DEFROST LOCKOUT RELAY
TO DEFROST TIMER TERMINAL #3
TO UNIT COOLER BOARD TERMINAL #3

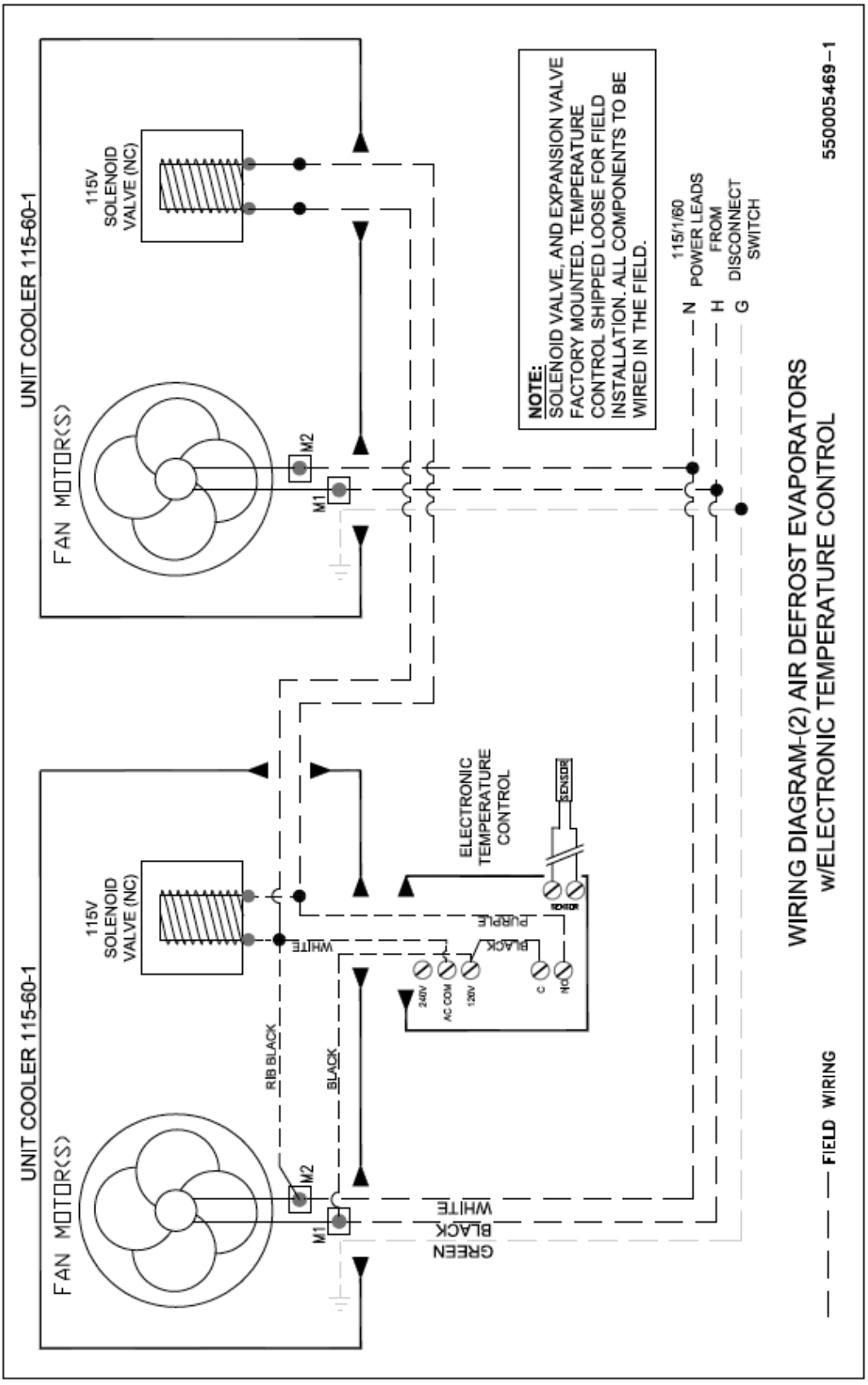

LOW TEMP SCROLL (LZ) REFRIGERATION SYSTEM WIRING DIAGRAM
208-230/1/60 SINGLE POINT ELECTRICAL TIMER MOUNTED & WIRED
5500038895-4
FACTORY WIRING
FIELD WIRING
CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1 AND L2 CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY. USE COPPER CONDUCTORS ONLY.
POWER LEADS FROM DISCONNECT SWITCH 208-230/1/60
L1
L2
G
CONTACTOR
COIL
COMPRESSOR
COMPRESSOR TERMINAL BOX
CRANKCASE HEATER
HIGH PRESSURE CONTROL SWITCH
DISCHARGE LINE THERMOSTAT
ADJUSTABLE LOW PRESSURE SWITCH
RIGHT CONDENSER FAN
LEFT CONDENSER FAN
FAN CYCLE PRESSURE SWITCH (OPTIONAL)
DEFROST LOCKOUT RELAY
R1
FUSE
FB1
TB1
TB2
TB3
TB4
230V ELECTRIC DEFROST TIMER
CONDENSING UNIT ELECTRICAL BOX
WIRE TO EVAPORATOR COIL
3NX
4

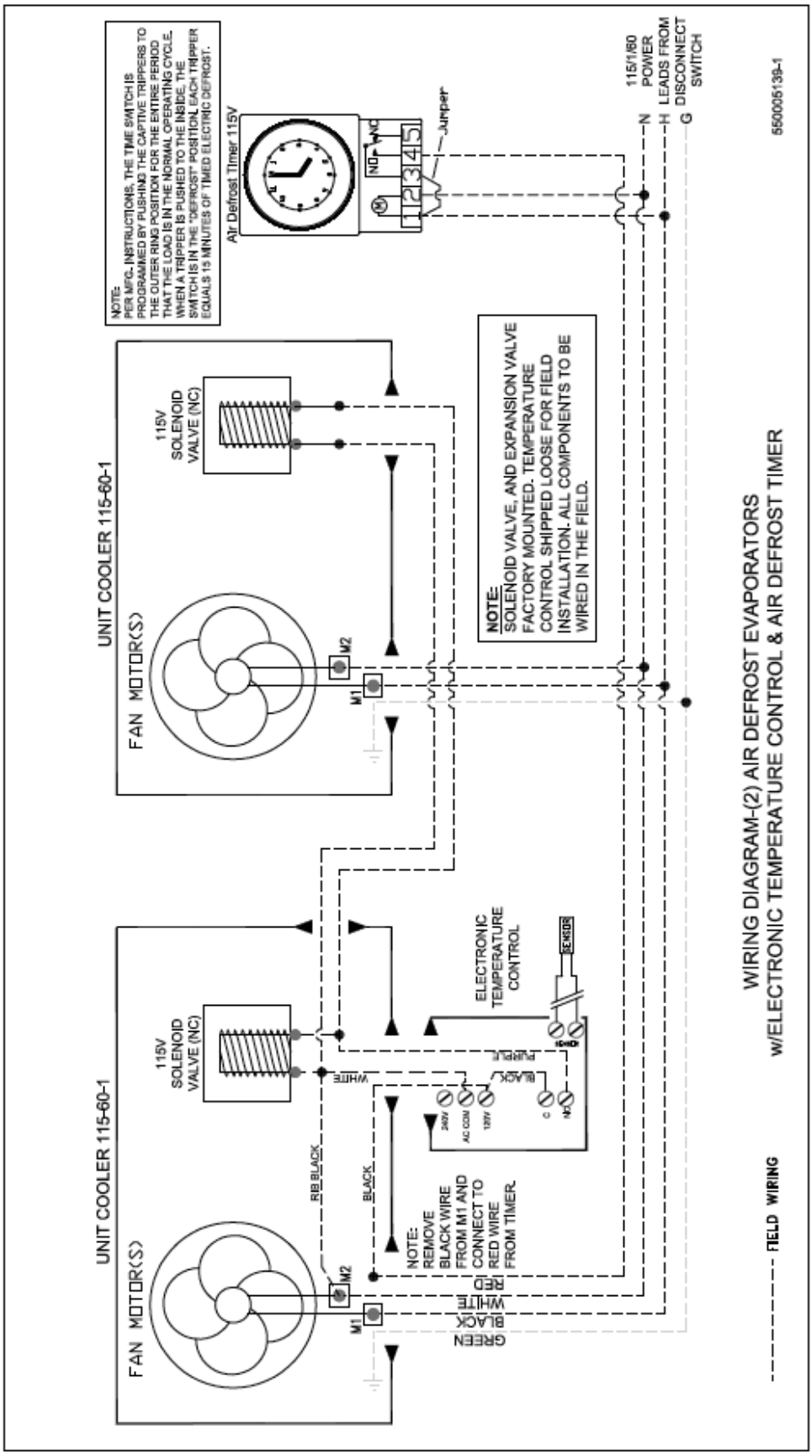

5500039912-2
LOW TEMP SCROLL (LZ) CONDENSING UNIT WIRING DIAGRAM
208-230/3/60
CONDENSING UNIT ELECTRICAL BOX
FACTORY WIRING
FIELD WIRING
POWER LEADS FROM DISCONNECT SWITCH 208-230/3/60
CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1, L2 AND L3 CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY. USE COPPER CONDUCTORS ONLY.
CONTACTOR
COIL
DEFROST LOCKOUT RELAY
R1
TB5
TS4
T83
COMPRESSOR
CRANKCASE HEATER
COMPRESSOR TERMINAL BOX
HIGH PRESSURE CONTROL SWITCH
DISCHARGE LINE THERMOSTAT
ADJUSTABLE LOW PRESSURE SWITCH
RIGHT CONDENSER FAN
LEFT CONDENSER FAN
FAN CYCLE CONTROL SWITCH (OPTIONAL)
TO DEFROST TIMER TERMINAL #3
TO UNIT COOLER BOARD TERMINAL #3

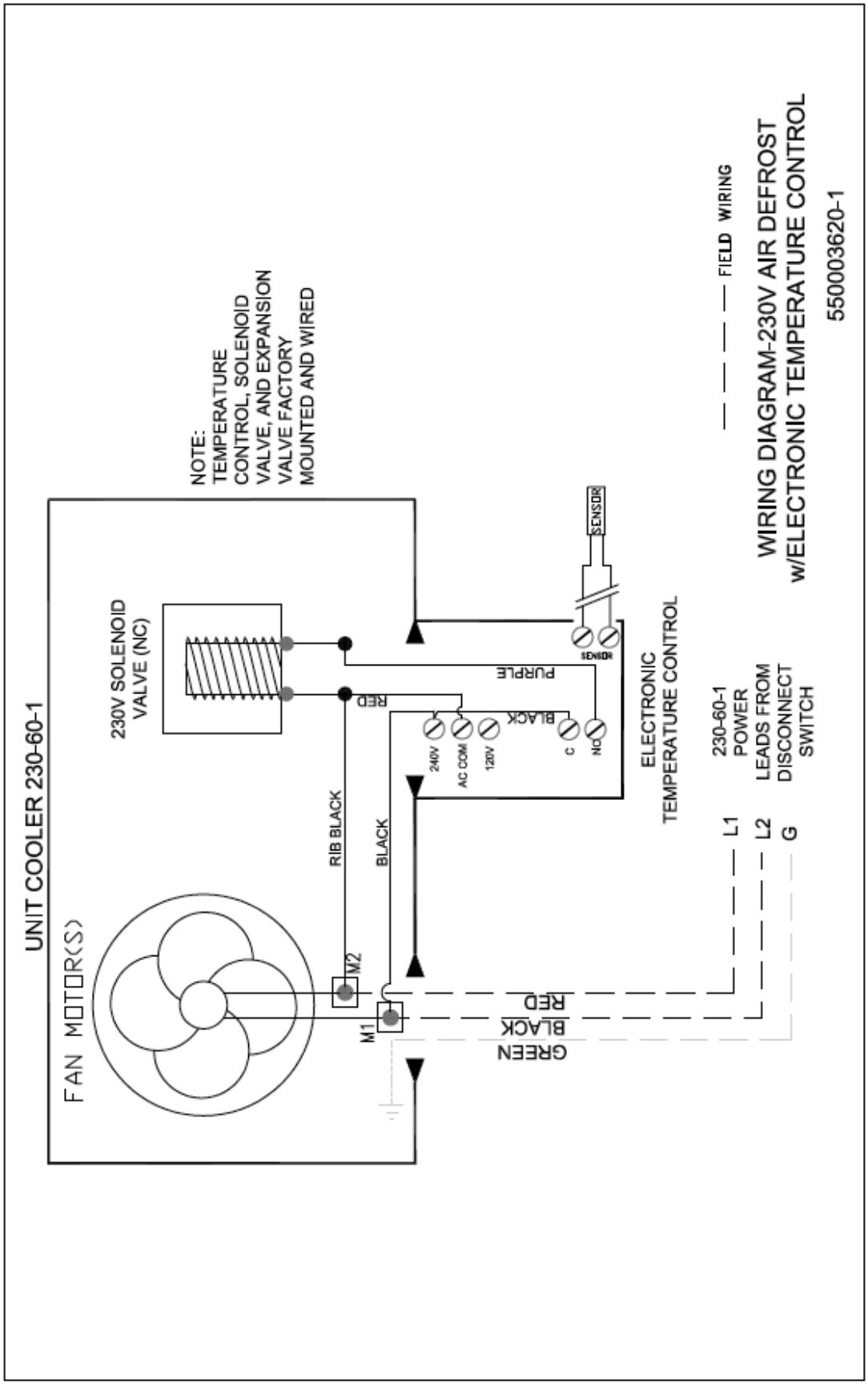

LOW TEMP SCROLL (LZ) REFRIGERATION SYSTEM WIRING DIAGRAM
208-230/3/60 SINGLE POINT ELECTRICAL TIMER MOUNTED & WIRED
5500039911-4
CONNECT INCOMING POWER LEADS FROM DISCONNECT SWITCH TO L1, L2 AND L3 CONSISTENT WITH NAMEPLATE VOLTAGE AND FREQUENCY, USE COPPER CONDUCTORS ONLY.
POWER LEADS FROM DISCONNECT SWITCH 208-230/3/60
FACTORY WIRING
FIELD WIRING
CONTACTOR
COIL
CRANKCASE HEATER
COMPRESSOR
COMPRESSOR TERMINAL BOX
T1 C
T2 S
T3 R
HIGH PRESSURE CONTROL SWITCH
DISCHARGE LINE THERMOSTAT
ADJUSTABLE LOW PRESSURE SWITCH
RIGHT CONDENSER FAN
LEFT CONDENSER FAN
FAN CYCLE CONTROL SWITCH (OPTIONAL)
DEFROST LOCKOUT RELAY
R1
FUSE
FB1
TB1
TB2
TB3
230V ELECTRIC DEFROST TIMER
CONDENSING UNIT ELECTRICAL BOX
WIRE TO EVAPORATOR COIL
3 N X
4

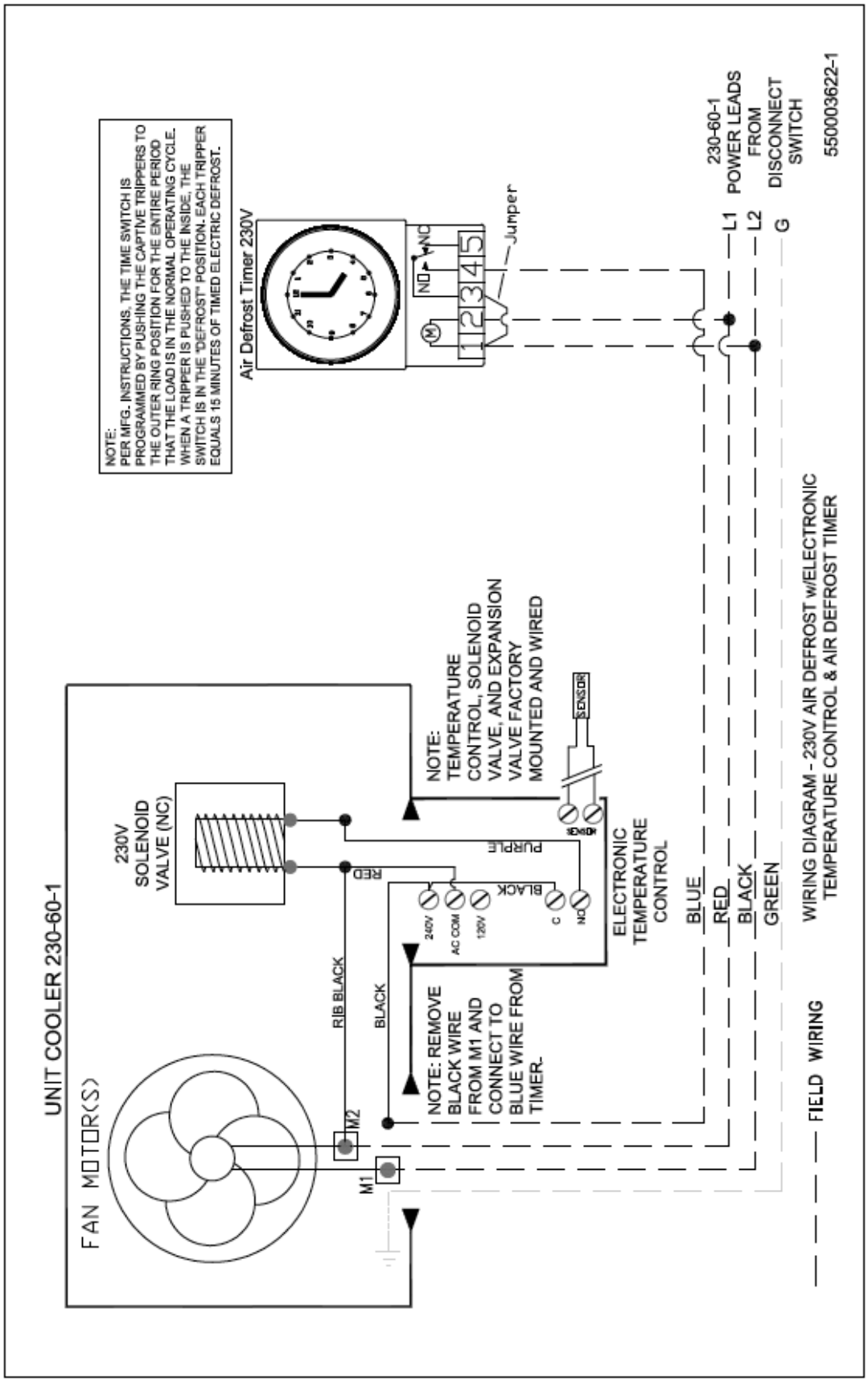

WIRING DIAGRAM-AIR DEFROST w/ELECTRONIC TEMPERATURE CONTROL
5500036819-1
FIELD WIRING
N 115/1/60 POWER LEADS FROM DISCONNECT SWITCH
H
G
ELECTRONIC TEMPERATURE CONTROL
240V
AC COM
120V
C
NO
BLACK
WHITE
PURPLE
SENSOR
115V SOLENOID VALVE (NC)
NOTE: TEMPERATURE CONTROL, SOLENOID VALVE, AND EXPANSION VALVE FACTORY MOUNTED AND WIRED
UNIT COOLER 115-60-1
FAN MOTOR(S)
M1
M2
GREEN
BLACK
WHITE
BLACK
RIB BLACK

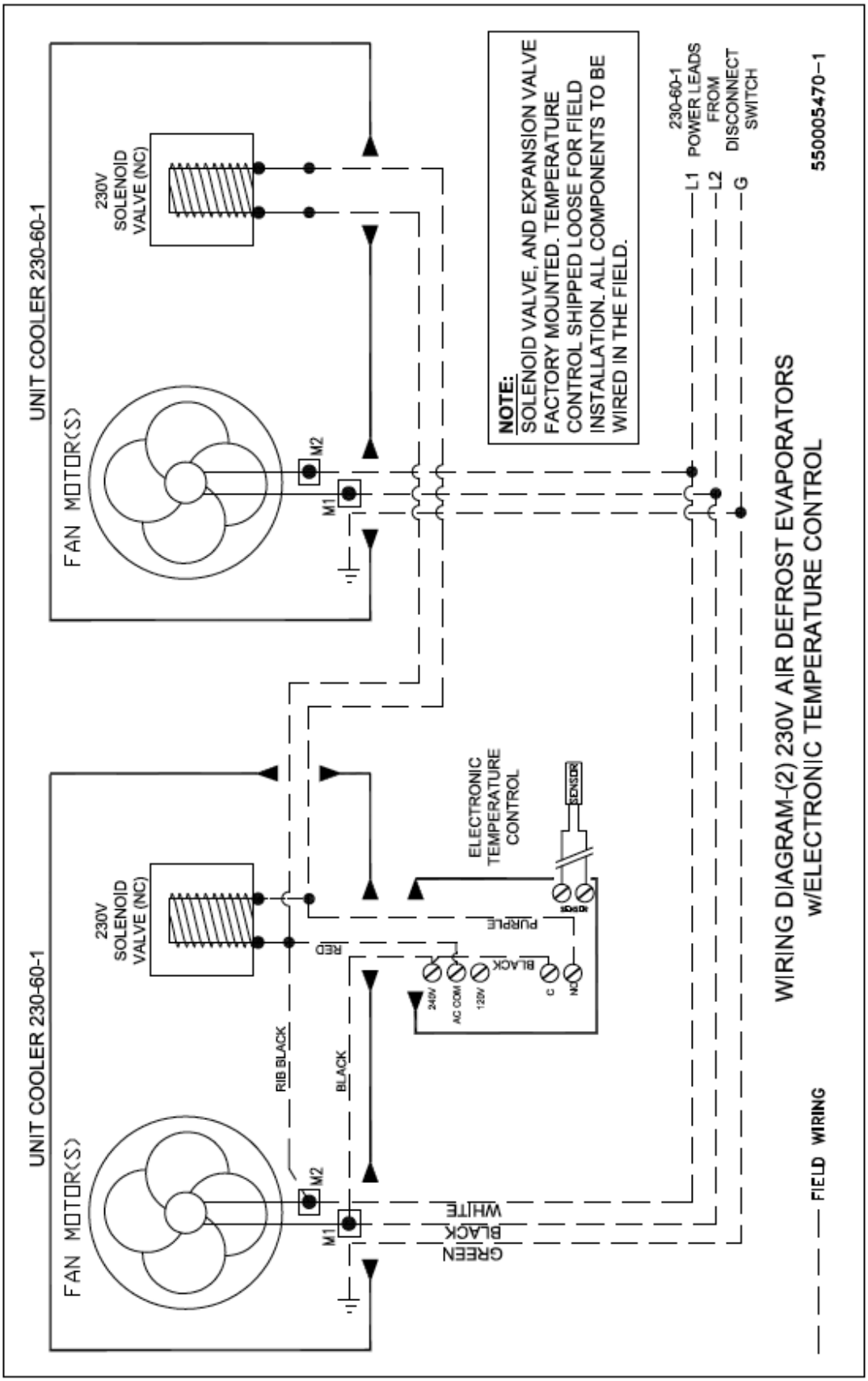

UNIT COOLER 115-60-1
FAN MOTOR(S)
M1
M2
115V SOLENOID VALVE (NC)
RIB BLACK
BLACK
WHITE
PURPLE
BLACK
240V
AC COM
120V
C
NO
SENSOR
ELECTRONIC TEMPERATURE CONTROL
NOTE: REMOVE BLACK WIRE FROM M1 AND CONNECT TO RED WIRE FROM TIMER.
NOTE: TEMPERATURE CONTROL, SOLENOID VALVE, AND EXPANSION VALVE FACTORY MOUNTED AND WIRED
NOTE: PER MFG. INSTRUCTIONS, THE TIME SWITCH IS PROGRAMMED BY PUSHING THE CAPTIVE TRIPPERS TO THE OUTER RING POSITION FOR THE ENTIRE PERIOD THAT THE LOAD IS IN THE NORMAL OPERATING CYCLE. WHEN A TRIPPER IS PUSHED TO THE INSIDE, THE SWITCH IS IN THE "DEFROST" POSITION. EACH TRIPPER EQUALS 15 MINUTES OF TIMED ELECTRIC DEFROST.
Air Defrost Timer 115V
NO
NC
1 2 3 4 5
Jumper
115/1/60 POWER LEADS FROM DISCONNECT SWITCH
N
H
G
RED
WHITE
BLACK
GREEN
FIELD WIRING
WIRING DIAGRAM - AIR DEFROST w/ELECTRONIC TEMPERATURE CONTROL & AIR DEFROST TIMER
550003621-1

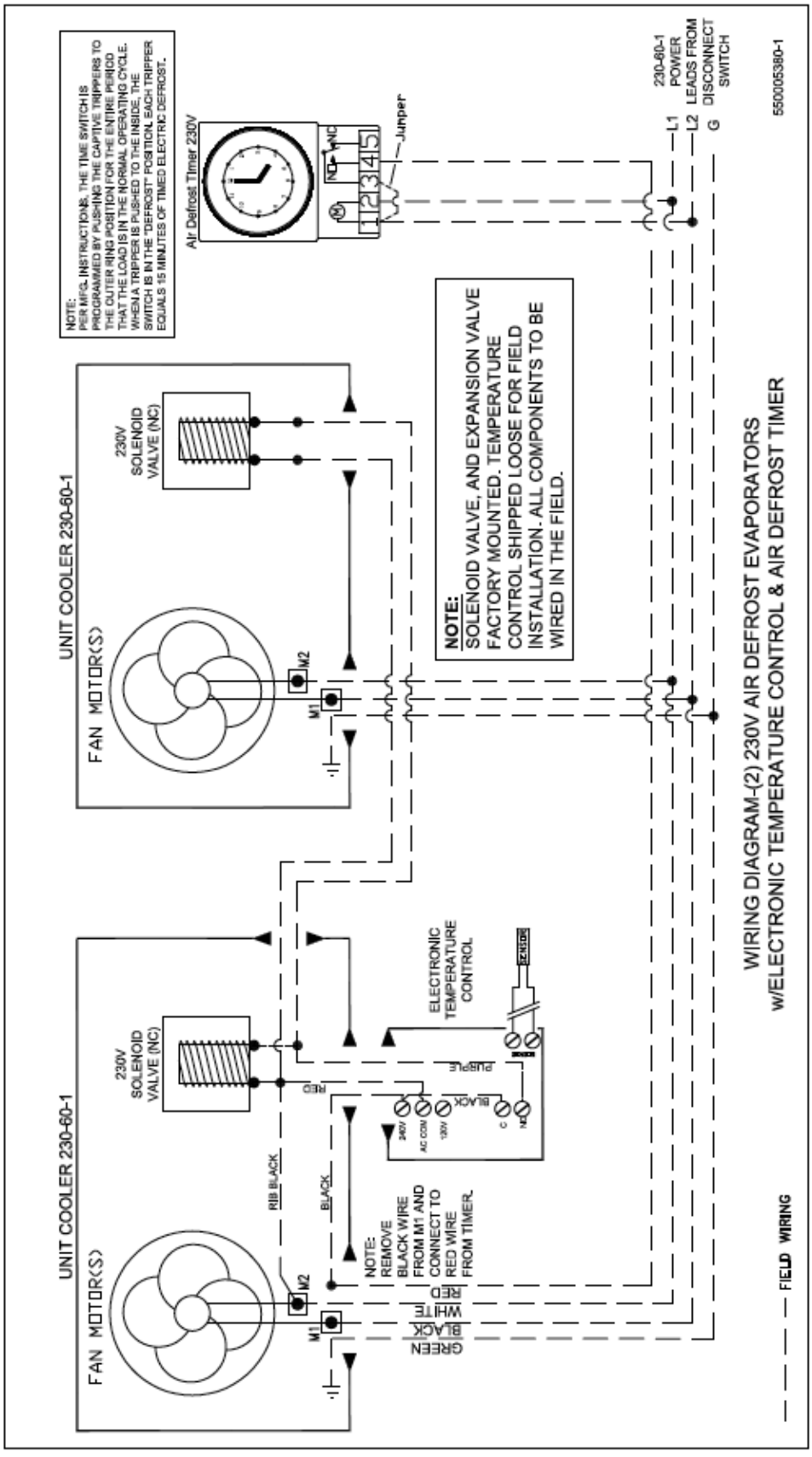

UNIT COOLER 115-60-1
FAN MOTOR(S)
M2
M1
115V SOLENOID VALVE (NC)
NOTE:
SOLENOID VALVE, AND EXPANSION VALVE FACTORY MOUNTED. TEMPERATURE CONTROL SHIPPED LOOSE FOR FIELD INSTALLATION. ALL COMPONENTS TO BE WIRED IN THE FIELD.
115/1/60 POWER LEADS FROM DISCONNECT SWITCH
N
H
G
ELECTRONIC TEMPERATURE CONTROL
SENSOR
PURPLE
BLACK
WHITE
240V
AC COM
120V
C
NO
RIB BLACK
BLACK
GREEN
BLACK
WHITE
WIRING DIAGRAM-(2) AIR DEFROST EVAPORATORS
w/ELECTRONIC TEMPERATURE CONTROL
550005469-1
FIELD WIRING

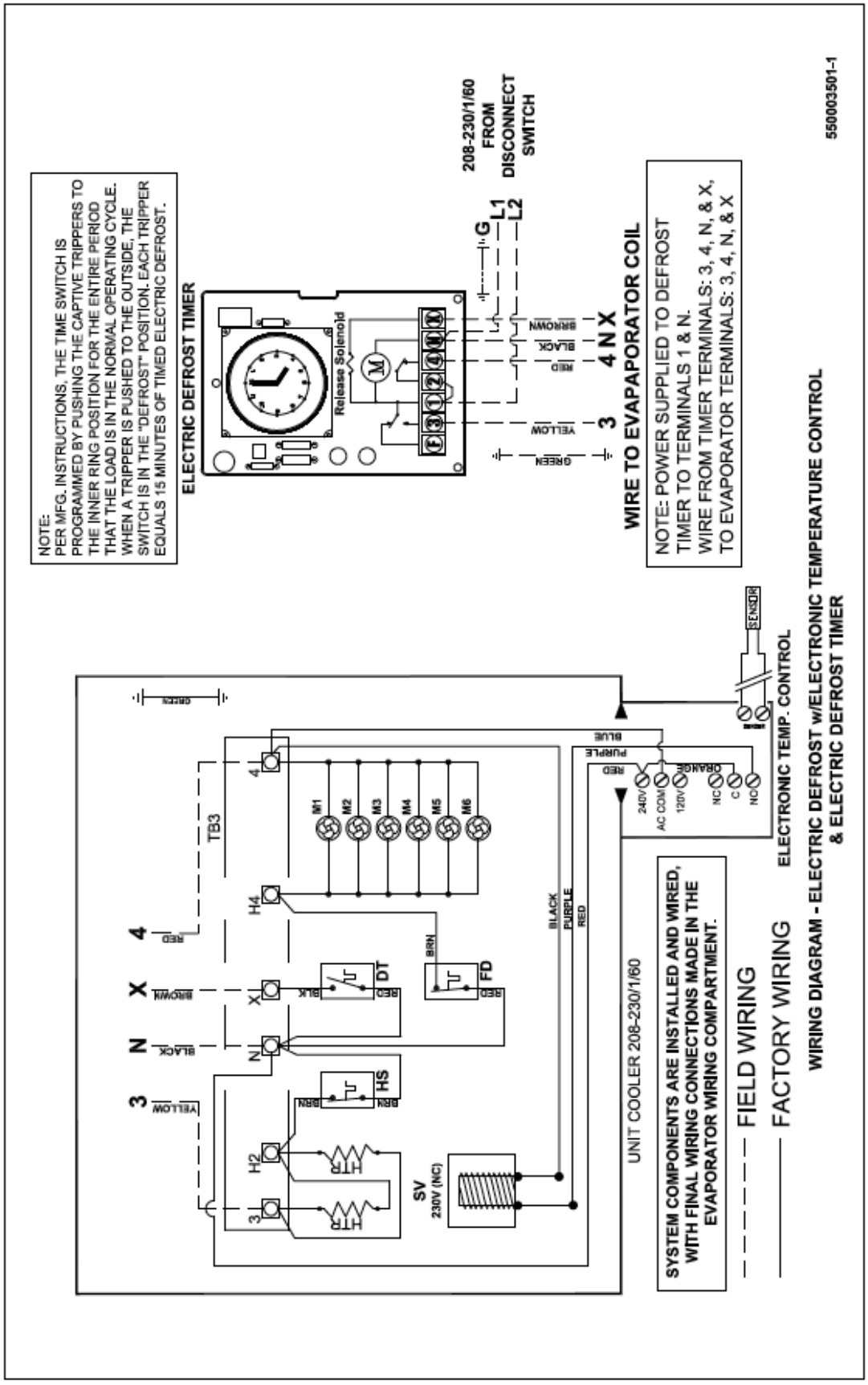

WIRING DIAGRAM-(2) AIR DEFROST EVAPORATORS
w/ELECTRONIC TEMPERATURE CONTROL & AIR DEFROST TIMER
5500005139-1
FIELD WIRING
UNIT COOLER 115-60-1
FAN MOTOR(S)
115V SOLENOID VALVE (NC)
M1
M2
NOTE:
SOLENOID VALVE, AND EXPANSION VALVE FACTORY MOUNTED. TEMPERATURE CONTROL SHIPPED LOOSE FOR FIELD INSTALLATION. ALL COMPONENTS TO BE WIRED IN THE FIELD.
ELECTRONIC TEMPERATURE CONTROL
SENSOR
PURPLE
WHITE
BLACK
RED
GREEN
RED BLACK
BLACK
NOTE:
REMOVE BLACK WIRE FROM M1 AND CONNECT TO RED WIRE FROM TIMER.
240V
AC COM
120V
C
NO
NC
Air Defrost Timer 115V
NO
NC
1
2
3
4
5
Jumper
115/1/60 POWER LEADS FROM DISCONNECT SWITCH
N
H
G
NOTE:
PER MFG. INSTRUCTIONS, THE TIME SWITCH IS PROGRAMMED BY PUSHING THE CAPTIVE TRIPPERS TO THE OUTER RING POSITION FOR THE ENTIRE PERIOD THAT THE LOAD IS IN THE NORMAL OPERATING CYCLE. WHEN A TRIPPER IS PUSHED TO THE INSIDE, THE SWITCH IS IN THE "DEFROST" POSITION. EACH TRIPPER EQUALS 15 MINUTES OF TIMED ELECTRIC DEFROST.

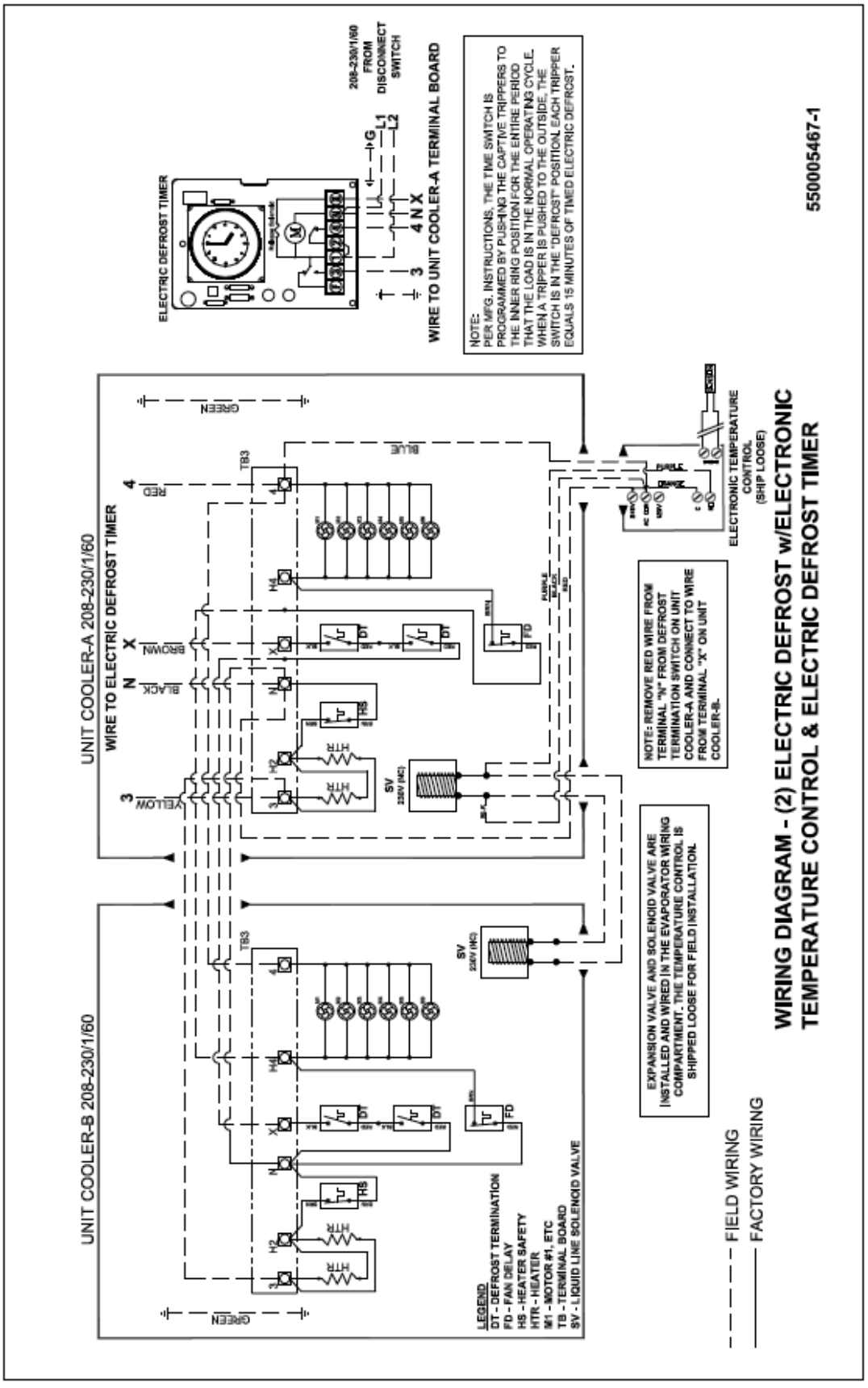

WIRING DIAGRAM-230V AIR DEFROST
w/ELECTRONIC TEMPERATURE CONTROL
550003620-1
FIELD WIRING
NOTE:
TEMPERATURE
CONTROL, SOLENOID
VALVE, AND EXPANSION
VALVE FACTORY
MOUNTED AND WIRED
UNIT COOLER 230-60-1
FAN MOTOR(S)
230V SOLENOID
VALVE (NC)
SENSOR
ELECTRONIC
TEMPERATURE CONTROL
230-60-1
POWER
LEADS FROM
DISCONNECT
SWITCH
L1
L2
G
RED
BLACK
PURPLE
240V
AC COM
120V
C
NO
RIB BLACK
BLACK
M1
M2
GREEN
BLACK
RED


NOTE:
PER MFG. INSTRUCTIONS. THE TIME SWITCH IS PROGRAMMED BY PUSHING THE CAPTIVE TRIPPERS TO THE OUTER RING POSITION FOR THE ENTIRE PERIOD THAT THE LOAD IS IN THE NORMAL OPERATING CYCLE. WHEN A TRIPPER IS PUSHED TO THE INSIDE, THE SWITCH IS IN THE "DEFROST" POSITION. EACH TRIPPER EQUALS 15 MINUTES OF TIMED ELECTRIC DEFROST.
Air Defrost Timer 230V
NO
NC
1 2 3 4 5
Jumper
230-60-1 POWER LEADS FROM DISCONNECT SWITCH
L1
L2
G
5500003622-1
UNIT COOLER 230-60-1
FAN MOTOR(S)
M1
M2
230V SOLENOID VALVE (NC)
NOTE: TEMPERATURE CONTROL, SOLENOID VALVE, AND EXPANSION VALVE FACTORY MOUNTED AND WIRED
SENSOR
SENSOR
ELECTRONIC TEMPERATURE CONTROL
240V
AC COM
120V
C
NO
PURPLE
RED
BLACK
RIB BLACK
BLACK
NOTE: REMOVE BLACK WIRE FROM M1 AND CONNECT TO BLUE WIRE FROM TIMER.
BLUE
RED
BLACK
GREEN
WIRING DIAGRAM - 230V AIR DEFROST w/ELECTRONIC TEMPERATURE CONTROL & AIR DEFROST TIMER
FIELD WIRING


UNIT COOLER 230-60-1
FAN MOTOR(S)
230V SOLENOID VALVE (NC)
M1
M2
UNIT COOLER 230-60-1
FAN MOTOR(S)
230V SOLENOID VALVE (NC)
M1
M2
NOTE:
SOLENOID VALVE, AND EXPANSION VALVE FACTORY MOUNTED. TEMPERATURE CONTROL SHIPPED LOOSE FOR FIELD INSTALLATION. ALL COMPONENTS TO BE WIRED IN THE FIELD.
230-60-1 POWER LEADS FROM DISCONNECT SWITCH
L1
L2
G
ELECTRONIC TEMPERATURE CONTROL
SENSOR
PURPLE
RED
BLACK
240V
AC COM
120V
C
NO
RIB BLACK
BLACK
GREEN
BLACK
WHITE
WIRING DIAGRAM-(2) 230V AIR DEFROST EVAPORATORS
w/ELECTRONIC TEMPERATURE CONTROL
550005470-1
FIELD WIRING


WIRING DIAGRAM-(2) 230V AIR DEFROST EVAPORATORS
w/ELECTRONIC TEMPERATURE CONTROL & AIR DEFROST TIMER
550005380-1
UNIT COOLER 230-60-1
FAN MOTOR(S)
230V SOLENOID VALVE (NC)
M1
M2
NOTE:
SOLENOID VALVE, AND EXPANSION VALVE FACTORY MOUNTED. TEMPERATURE CONTROL SHIPPED LOOSE FOR FIELD INSTALLATION. ALL COMPONENTS TO BE WIRED IN THE FIELD.
NOTE:
PER MFG. INSTRUCTIONS: THE TIME SWITCH IS PROGRAMMED BY PUSHING THE CAPTIVE TRIPPERS TO THE OUTER RING POSITION FOR THE ENTIRE PERIOD THAT THE LOAD IS IN THE NORMAL OPERATING CYCLE. WHEN A TRIPPER IS PUSHED TO THE INSIDE, THE SWITCH IS IN THE "DEFROST" POSITION. EACH TRIPPER EQUALS 15 MINUTES OF TIMED ELECTRIC DEFROST.
Air Defrost Timer 230V
NC
NO
1 2 3 4 5
Jumper
230-60-1 POWER LEADS FROM DISCONNECT SWITCH
L1
L2
G
ELECTRONIC TEMPERATURE CONTROL
SENSOR
PURPLE
BLACK
RED
240V
AC COM
120V
C
NO
RED
WHITE
BLACK
GREEN
RIB BLACK
BLACK
NOTE:
REMOVE BLACK WIRE FROM M1 AND CONNECT TO RED WIRE FROM TIMER.
FIELD WIRING


NOTE:
PER MFG. INSTRUCTIONS, THE TIME SWITCH IS PROGRAMMED BY PUSHING THE CAPTIVE TRIPPERS TO THE INNER RING POSITION FOR THE ENTIRE PERIOD THAT THE LOAD IS IN THE NORMAL OPERATING CYCLE. WHEN A TRIPPER IS PUSHED TO THE OUTSIDE, THE SWITCH IS IN THE "DEFROST" POSITION. EACH TRIPPER EQUALS 15 MINUTES OF TIMED ELECTRIC DEFROST.
ELECTRIC DEFROST TIMER
Release Solenoid
208-230/1/60 FROM DISCONNECT SWITCH
G
L1
L2
GREEN
YELLOW
BROWN
BLACK
RED
3
4 N X
WIRE TO EVAPAPORATOR COIL
NOTE: POWER SUPPLIED TO DEFROST TIMER TO TERMINALS 1 & N.
WIRE FROM TIMER TERMINALS: 3, 4, N, & X, TO EVAPORATOR TERMINALS: 3, 4, N, & X
5500035501-1
SENSOR
BLUE
PURPLE
RED
ORANGE
240V
AC COM
120V
NC
C
NO
ELECTRONIC TEMP. CONTROL
UNIT COOLER 208-230/1/60
TB3
M1
M2
M3
M4
M5
M6
H4
H2
H3
HS
DT
FD
SV
230V (NC)
BLACK
PURPLE
RED
BRN
SYSTEM COMPONENTS ARE INSTALLED AND WIRED, WITH FINAL WIRING CONNECTIONS MADE IN THE EVAPORATOR WIRING COMPARTMENT.
FIELD WIRING
FACTORY WIRING
WIRING DIAGRAM - ELECTRIC DEFROST w/ELECTRONIC TEMPERATURE CONTROL
& ELECTRIC DEFROST TIMER


WIRING DIAGRAM - (2) ELECTRIC DEFROST w/ELECTRONIC TEMPERATURE CONTROL & ELECTRIC DEFROST TIMER
550005467-1
UNIT COOLER-A 208-230/1/60
WIRE TO ELECTRIC DEFROST TIMER
UNIT COOLER-B 208-230/1/60
ELECTRIC DEFROST TIMER
WIRE TO UNIT COOLER-A TERMINAL BOARD
208-230/1/60 FROM DISCONNECT SWITCH
NOTE: PER MFG. INSTRUCTIONS, THE TIME SWITCH IS PROGRAMMED BY PUSHING THE CAPTIVE TRIPPERS TO THE INNER RING POSITION FOR THE ENTIRE PERIOD THAT THE LOAD IS IN THE NORMAL OPERATING CYCLE. WHEN A TRIPPER IS PUSHED TO THE OUTSIDE, THE SWITCH IS IN THE "DEFROST" POSITION. EACH TRIPPER EQUALS 15 MINUTES OF TIMED ELECTRIC DEFROST.
ELECTRONIC TEMPERATURE CONTROL (SHIP LOOSE)
NOTE: REMOVE RED WIRE FROM TERMINAL "N" FROM DEFROST TERMINATION SWITCH ON UNIT COOLER-A AND CONNECT TO WIRE FROM TERMINAL "X" ON UNIT COOLER-B.
EXPANSION VALVE AND SOLENOID VALVE ARE INSTALLED AND WIRED IN THE EVAPORATOR WIRING COMPARTMENT. THE TEMPERATURE CONTROL IS SHIPPED LOOSE FOR FIELD INSTALLATION.
LEGEND
DT - DEFROST TERMINATION
FD - FAN DELAY
HS - HEATER SAFETY
HTR - HEATER
M1 - MOTOR #1, ETC
TB - TERMINAL BOARD
SV - LIQUID LINE SOLENOID VALVE
FIELD WIRING
FACTORY WIRING