DOMETIC

KRA Refrigeration Systems

(with R-404A refrigerant)
Installation, Operation & Maintenance Manual

KRA 433X
Water-Cooled-Only

KRA 433X
Air-and-Water-Cooled

KRA 450X
Air-and-Water-Cooled

Dometic Marine
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SAFETY INSTRUCTIONS

READ THIS MANUAL BEFORE PROCEEDING

This manual contains essential information to ensure proper installation, operation and maintenance of your KRA refrigeration system. Improper installation or misunderstood operating procedures can result in unsatisfactory performance and/or premature failure of these units, so ***please read this manual completely before proceeding.***

It is very important that you read and understand the contents of this manual before using the equipment, and it should be kept on the boat for future reference. If you have questions or require assistance with your KRA refrigeration system, call your authorized dealer or the Dometic Marine Service Department at +1 954-973-2477.

RECOGNIZE SAFETY SYMBOLS, WORDS AND LABELS

The following symbols and labels are used throughout this manual to indicate immediate or potential safety hazards. it is the owner's and installer's responsibility to read and comply with all safety information and instructions accompanying these symbols. Failure to heed safety information increases the risk of personal injury, property damage, and/or product damage.

WARNING
The word "WARNING" indicates hazards or unsafe practices which COULD result in severe personal injury or death.

CAUTION
The word "CAUTION" indicates hazards or unsafe practices which COULD result in minor or moderate personal injury, product damage, or property damage.

SAFETY GUIDELINES

1. Allow only qualified, experienced technicians to install or service this system.
2. Install the system in accordance with all local codes. If no local codes exist, follow National Codes (NEC in the U.S., CEC in Canada).
3. Open the electrical disconnect switch(es) before electrically connecting the unit.
4. Before operating the unit, be certain it is properly grounded.
5. The units contain refrigerant gas under pressure. Avoid puncturing or breaking any tubing.
6. Before operating the system, complete the refrigerant connections.

WARNING
To avoid personal injury, shock, or death, ensure the electrical disconnect switch(es) is (are) in the OFF position before installing, modifying, or servicing the unit. Lock out and tag the switch with a suitable warning label. Wiring must conform with NEC or CEC and all local codes.

NOTICE
Contains R-404A fluorinated greenhouse gas in sealed equipment. Refer to the condensing unit's product data plate label for quantity of refrigerant shown in weight, global warming potential (GWP), and equivalent tonnes of CO2 (tCO2e). Any refrigerant added should be noted on unit label.

SAFE HANDLING OF REFRIGERANTS

Your refrigeration system uses the refrigerant gas R-404A. Federal law forbids the intentional release of the refrigerant gas to the environment. You should make certain that any field service is performed by a specialist with the proper equipment to prevent any loss of R-404A during servicing.

The following warnings can not cover every conceivable situation, but they should serve as a useful guide.

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

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

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

WARNING
To avoid possible explosion:

- Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.
- Never fill a cylinder more than 80% full of liquid refrigerant.
- Never add anything other than R-404A to an R-404A cylinder. Service equipment used must be listed or certified for R-404A.
- Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.

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

- Ensure the cylinder is free of damage which could lead to a leak or explosion.
- Ensure the hydrostatic test date does not exceed 5 years.
- Ensure the pressure rating meets or exceeds standard specification of DOT-4BA400.
- When in doubt, do not use the cylinder.

Drawings and Diagrams

Some equipment may be shipped with specific installation sheets or wiring diagrams that may supersede the information located in this manual.

REFRIGERATION BASICS

The instructions in this manual apply to all R-404A KRA refrigeration units. Any variations are noted in the text.

Slanted-top KRA condensing units are combination air-and-water-cooled, and the flat-top KRA condensing unit is water-cooled only. The evaporator section of the refrigeration system may consist of stainless steel plates installed in an insulated box, or may be copper tubing wrapped around the box, and then insulated.

The system works by removing heat from the refrigerator/freezer compartment (box) and transferring that heat to the outside air or seawater (depending on the condenser). Removing heat from the box reduces its temperature. However, whenever the compartment's door is opened, more heat is introduced into the box from the warmer outside air thus increasing the box temperature. This added heat must be removed. Heat is also transferred through the walls of the box; proper insulation will reduce this heat transfer and keep the box cooler for longer periods of time.

The refrigerant used is R-404A. It is EPA approved, but is illegal to vent to the atmosphere. See previous notice.

SYSTEM COMPONENTS

The system consists of two main parts; the condensing unit, and the evaporator section (refrigerator/freezer box). They are connected by copper lines or flexible hoses. Other parts include the refrigerant expansion valve (externally equalized expansion valve), thermostat, and seawater system for water-cooled titanium condensers.

Condensing Unit

All units have an R-404A compressor, air-and-water-cooled or water-cooled only titanium condenser, a receiver/dryer, and a sight glass.

The KRA condensing unit comes in an enclosed, painted aluminum box. It is available with a 1/3 HP or 1/2 HP compressor. There are no service valves. The unit includes low-loss quick-connect couplings, a moisture indicating sight glass, a receiver and filter/dryer and a sufficient charge of R-404A for almost all applications. Condenser cooling is either air-and-water-cooled (slanted-top models) or water-cooled only (flat-top model).

- Air cooling is beneficial because the unit can operate even with the boat out of water. **However, the unit suffers a drop in performance in ambient temperatures above 100°F/38°C where the unit is located, and the compressor may be damaged.**
- Water-cooled units are not affected by ambient temperature and do not need ventilation. Water flow should be a minimum of 1.5 GPM for the KRA 433X, and 2.0 GPM for the KRA 450X.
- The combination air-and-water-cooled units provide the best of both applications.

Evaporator

The evaporator will be either stainless steel plate(s), or a wrapped box in which the evaporative tubing is located against the outside surface of the box. See Figure 2: Various Flat-Plate Evaporators, page 16 and Figure 3: Wrapped-Box Evaporator, page 16.

Stainless plates should be designed to cover about 30% to 40% of the box's interior surface area for good freezer performance. For instance, a box that is 36" long, 16" deep and 20" wide (92 cm x 41 cm x 51 cm), should use plates that are about 36" x 16" (92 cm x 41 cm). This calculates to about 35% of the box's interior surface area. Less plate area is needed for a box that is to be only a refrigerator.

Box design is extremely important and requires considerations that are mostly outside the scope of this manual. For the power boat industry, where constant power is available, evaporators must have a minimum of 2" (5 cm) of insulation (R7 per inch) for a freezer. When power availability is not constant, 4" (10 cm) of R7 insulation is required. It is best to use as much insulation as is practical. Call the Dometic Applications Department for advice on larger sized boxes, or if you are unsure.

WARNING

Do not drill through the inside of a wrapped box evaporator. If the refrigerant tubing is punctured by doing so, it will not be covered under warranty.

Suction Line

The suction line returns refrigerant gas from the evaporator to the condenser and should be fully insulated.

Liquid Line

The liquid line is the bare, 1/4" (7 mm) copper line. You must install the filter dryer assembly (packaged with the unit) at the KRA unit on the liquid line female quick-connect fitting or the warranty will be voided.

Refrigerant Metering Device

Refrigerant metering is handled by a thermostatic expansion valve (TXV) that is externally equalized. This is used to compensate for varying installations. The TXV regulates the refrigerant flow into the evaporator depending on load. The valve is either set at the factory or at installation, and does not require further adjusting. A valve which has been severely misadjusted can damage the condensing unit, and will void warranty.

The metering valve must be insulated airtight! The TXV has a sensing bulb that must be firmly attached and thoroughly insulated to the suction line leaving the box. Bulb placement is important. Place at 3:00 to 9:00 o'clock on the side of the suction line.

The TXV controls the flow rate of liquid refrigerant entering the evaporator in response to the superheat of the refrigerant gas leaving the evaporator. It keeps the entire evaporator active, without permitting unevaporated refrigerant liquid to be returned through the suction line to the compressor. The function on the TXV is to feed liquid into the evaporator coils at a rate that will keep liquid evaporating in all the coils, and to control that feed so that only vapor will reach the outlet (return line to the compressor).

Thermostat

A thermostat controls the operation of the condensing unit, based on box temperature. An easy-to-use digital Dometic thermostat control is required for the installation, and digital input must be enabled (see "Parameter Programming" on page 11). No controls other than the Dometic digital control should be used; other controls are not supported.

SEAWATER SYSTEM

Condensing units that are using the water-cooled option must be installed with the necessary seawater system. The seawater system consists of a through-hull fitting, seacock, strainer, seawater pump, seawater hose and overboard discharge. If more than one condensing unit is supplied by a single pump, or the air conditioning system pump is being shared for the refrigeration, a pump relay is required.

REFRIGERATOR/FREEZER BOXES

The Dometic Applications Department can assist in box design. Box design is very important to the proper operation of a system. A poorly designed and/or built refrigerator/freezer box will result in poor operation of the overall system. Care must be taken to address type of insulation, thickness of insulation, air circulation and drains.

Insulation thickness is important to the performance of the system. More insulation offers better performance. If the box has a drain, a drain plug must be used. In addition, a gasket sealing the box lid is important to prevent moisture and heat-gain from entering the box.

SYSTEM INSTALLATION

This section covers installation procedures for your refrigeration system. Please read the manual completely before attempting to install any equipment.

This system is designed for certain capabilities and to operate under certain conditions. Any change in design conditions may result in lower capacities. Installer must understand: a) design requirements for the system; and b) conditions under which operation is expected and for which the system was designed. See “Tools Required” on page 6 for tools and accessories needed for the installation.

UNPACKING AND INSPECTION

Units are securely packed in shipping containers approved by the International Safe Transit Association.

Upon arrival, carefully check all items against the packing list to ensure all cartons were received. Move units to the normal “up” orientation as indicated by the arrows on each carton.

Check the cartons for external damage, removing the units from the cartons if necessary. If damage is found, file a request in writing for inspection by the carrier agent immediately. The carrier is responsible for making prompt inspection of damage and for a thorough investigation of each claim. The distributor or manufacturer will not accept claims from dealers for transportation damage. If no damage is found, carefully remove all shipping material and properly dispose of it.

After unpacking, keep the units upright. Laying a unit on its side or top could cause equipment damage.

IMPORTANT SAFETY CONSIDERATIONS

ELECTRICAL SHOCK HAZARD

WARNING

Electrical shock hazard. Disconnect voltage at main panel or power source before opening any cover. Failure to comply may result in injury or death.

To minimize the hazard of electrical shock and personal injury, this component must be effectively grounded. Refer to the installation guidelines for further information.

TOOLS REQUIRED

Before starting, make sure you have all of the following tools:

- Standard tool box
- Flaring tool (if flares are required)
- Refrigerant gauge manifold (rated for R-404A only)
- Refrigerant tank (rated for R-404A only)
- Nitrogen tank
- Vacuum pump
- Scale
- Micron gauge
- Electronic leak detector (rated for R-404A)
- Drill/hole saw
- Jig saw
- Insulated tape
- Duct tape
- Electrical tape
- Threaded-seal tape
- Bedding compound to seal thru-hull fittings
- Hardware to secure unit, pump, strainer, grilles, and control panel

INSTALLING THE REFRIGERATION SYSTEM

CONDENSING UNIT

Locate unit in a dry area where a constant source of circulated air is always available. Maximum air temperature for the system to operate at full capacity is: 100°F/38°C measured at the condensing unit. Temperatures above this will result in reduced capacity of the air condensing system and may cause compressor damage. Maximum water temperature for full capacity is 90°F/32°C. Air and water temperatures higher than those listed above will reduce system performance, capacity and ability to maintain box temperature.

Any time a condensing unit is installed in an engine room, water must be provided to the unit by way of a single-station pump, or a multi-station pump and a pump relay. The refrigeration condensing unit must have its own pump trigger. Any time a condensing unit is installed in an enclosed space (i.e. a space that does not have airflow in and out equal to the airflow through the condenser coil or a space that is less than 256 cu. ft./7.25 cu. m. per compressor horsepower), then the customer must provide fresh air or water flow. Provide minimum water flow as shown in the table below for your particular unit.

Table 1: KRA Condensing Unit Power Requirements, Dimensions, Weight

KRA Model	Horse Power	Voltage / Frequency	Max Run Amps	Height in / cm	Width in / cm	Depth in /cm	Weight lb / kg
KRA 433X 1161	1/3	115 / 60	6.3	17.77 / 45.1	8.94 / 22.7	14.5 / 37	58 / 26.3
KRA 433X 2361	1/3	230 / 60	2.38	17.77 / 45.1	8.94 / 22.7	14.5 / 37	57 / 25.8
KRA 433X 2251	1/3	220 / 50	2.4	17.77 / 45.1	8.94 / 22.7	14.5 / 37	59.8 / 27
KRA 433X 1161 Water-Cooled-Only	1/3	115 / 60	6.3	11.06 / 28.1	8.94 / 22.7	14.5 / 37	53 / 26.3
KRA 433X 2361 Water-Cooled-Only	1/3	230 / 60	2.38	11.06 / 28.1	8.94 / 22.7	14.5 / 37	52 / 25.8
KRA 433X 2251 Water-Cooled-Only	1/3	220 / 50	2.4	11.06 / 28.1	8.94 / 22.7	14.5 / 37	54.8 / 27
KRA 450X 1161	1/2	115 / 60	6	20.43 / 51.9	10.42 / 265	16.25 / 41.3	89 / 40.4
KRA 450X 2361	1/2	230 / 60	3	20.43 / 51.9	10.42 / 265	16.25 / 41.3	86 / 39
KRA 450X 2251	1/2	220 / 50	3.1	20.43 / 51.9	10.42 / 265	16.25 / 41.3	89 / 40.4

Table 2: Air-Flow and Water-Flow Requirements for KRA 4-Series Condensing Units

KRA Model	Minimum Free Area Cu. Feet / Cu. Meter	Air Flow CFM / CMM	Minimum Water Flow GPH / LPH
KRA 433X	96 / 2.72	200 / 5.66	90 / 340.69
KRA 433X Water-Cooled-Only	96 / 2.72	Not applicable	90 / 340.69
KRA 450X	128 / 3.62	250 / 7.08	120 / 454.25

If there are multiple units in a space, then add the minimum free area to get the minimum free area total for all of the units. This also applies to the space airflow. For example, if a KRA 433X and a KRA 450X unit are in an enclosed space, the area and airflow calculations are:

Area
96 Cu. Ft. + 128 Cu. Ft. = 184 Cu. Ft.
(2.72 Cu. M + 3.62 Cu. M = 6.34 Cu. M)

Airflow
200 CFM + 250 CFM = 450 CFM
(5.66 CMM + 7.08 CMM = 12.74 CMM)

Evaporator

- **Flat Plates -** Stainless-steel evaporator plates are an excellent choice for use in a bait-freezing, fish-keeping application. Plates with backs may be mounted directly to the wall, or mounted with stand-offs so that there is an air space behind the plate. Care must be taken to route the connecting tubes carefully to an accessible location outside the box. When installing, consider the necessity of cleaning the box. Seal the tubing exit holes to prevent ambient air intrusion. See **Figure 2: Various Flat-Plate Evaporators, page 16**.
- **Wrapped Box -** This type of box has a clean interior because the evaporator is wrapped around the outside of the box walls. The box must be installed in such a way that it can be serviced or replaced without causing damage to it or to its associated refrigeration lines or other components. Dometic cannot be held liable for any damages caused by moving the box. Service should be done by trained professional technicians only. Refer to the Owner's Limited Warranty Policy document for a full explanation of what is and what is not covered under warranty.

  Do not drill a hole in this box unless certain of the location of the tubing and that the tubing can be avoided. It is easy to drill a hole in the tubing resulting in loss of refrigerant and the voiding of the warranty. In order to detect location of refrigerant tubing, turn system on and watch for frost lines. Frost lines will appear where there is tubing.
- **Insulation -** Insulate all boxes with a minimum of 2" (5 cm) of R7 insulation. Use 4" (10 cm) of R7 on vessels where power is not constantly available. Insulation thickness is important to the performance of the system, and more insulation offers better performance.

TXV Placement

Typically, the Thermostatic Expansion Valve (TXV) bulb assembly is pre-made by Dometic, as shown in "Single-Plate System" on page 17. The TXV must be installed in an accessible location and fastened properly. Recommended location of the TXV is as close to the wrapped box or the plate as possible. The TXV sensing bulb is to be properly located and secured on the outlet (suction line) of the last plate in series as close to the plate as possible. Recommended location is on a horizontal portion of tubing on (between 3:00 and 9:00 o'clock position). The full length of the bulb should be in good thermal contact with the refrigerant tubing. Attach it to the closest straight piece of tubing exiting the last box. If either the expansion valve or its sensing bulb is located outside of the box, each part must be properly insulated to protect against condensation, as well as to allow accurate temperature sensing of the bulb. The bulb must be secured to the pipe with a metal clamp to ensure firm contact with the pipe and prevent movement. Plastic ties are not acceptable. Refer to "Adjusting the TXV" on page 13.

On systems with two plates, the TXV is connected to the inlet side of the first plate, and a jumper line is attached between the plates. The suction line then returns to the condensing unit.

Quick-Connect Fittings

All plates and lines have quick-connect fittings. Quick-connect (QC) fittings allow for the connection and disconnection of refrigerant lines with minimal loss of refrigerant. They also allow for the unit to come factory charged with refrigerant. All connections are polarized so that mis-connecting the lines, condensing unit, or evaporator is avoided. If installed correctly, they will not leak. The majority of problems with these have been leaks due to not tightening the connections properly. Over-tightening can damage the fitting. QCs are a one-piece model and may be tightened securely at the union nut.

Procedure for connecting the QC fittings:

1. Lightly lubricate the gasket seal and threads on the male threaded coupling with refrigeration-grade oil.
2. Thread the union nut of the female coupling onto the male threaded coupling by rotating the union nut clockwise.
3. Start the connection by hand, and then tighten the female thread connection with a 15/16" wrench while holding the opposite coupling with a 7/8" wrench (must use two wrenches to avoid damage). This should be tightened to 10-12 ft-lbs with a torque wrench.
4. ALTERNATE PROCEDURE WITHOUT A TORQUE WRENCH: Tighten clockwise the female coupling nut until the coupling halves "bottom out" or a definite resistance is felt. This will require about 6 full turns. Using a marker or ink pen, mark a line lengthwise from the female coupling hex to the male hex. Then tighten an additional 1/4 to 3/8 turn. The misalignment of the ink line will show the degree of tightening. This final turn is necessary to ensure that the knife-edge metal seal bites into the brass seat of the coupling halves, forming the leak-proof joint.

NOTE
Some custom applications use flare fittings on line sets in conjunction with QC fittings.

Sight Glass/Moisture Indicator

On the condensing units, there is a sight glass located directly inside the front cover. This glass will communicate many things about the system's operating condition.

1. The glass should show foam upon start-up. This should clear after a few minutes of running. If it doesn't clear, the charge could be low. If there was no foam upon start-up, the system may contain no refrigerant. The glass does not have to be full to operate correctly. The sight glass is not to be used for charging purposes, but may help indicate an issue with the charge. Use proper procedures as shown in "Recharging The System" on page 12.
2. There is a colored media around the hole inside the glass. When it is green, the system is dry. When it is yellow, the system is wet. Wet systems are systems that contain moisture. This will not allow your system to work correctly. See "TROUBLESHOOTING GUIDE" on page 14.
3. Upon unboxing the condensing unit, the sight glass may be yellow. This generally occurs because the media needs a liquid flow over it to correctly measure the moisture content. Hook up the unit, and let it run for about 30 minutes. The sight glass should turn green.

Thermostat

The thermostat controls the operation of the condensing unit based on box temperature. Set it to a point that conforms to the box and system design. One thermostat is required for each box. Thermostats may be located on the condensing unit, or remotely.

Each box thermostat should be set to the designed-condition temperature. For example, a 40°F/4.4°C drink box should be set to 40°F/4.4°C for operation. Setting this thermostat down to 15°F/-9.4°C will (A) not reach this temperature as the refrigeration system is not designed for this load, and (B) forcing any refrigeration system well below design conditions will extend the compressor's run time significantly, resulting in shortened unit life. To set the thermostat, see "Thermostat Operation" on page 10.

Thermostat bulb or thermistor should be mounted one-third of the way down **from the top** on the longest side wall in the box. Mount it in a position where it can sense average box temperature. Do not mount bulb or thermistor near the box opening. Replacement thermistor cover plates are available from your dealer.

Refrigerant Charge

- **All Systems -** The system is relatively charge insensitive due to the large receiver that allows the condensing unit to be charged with enough refrigerant to handle most normal plate and line configuration. No further charging should be required for most applications.
- **Linesets and Plates -** Typically, these have been evacuated and vapor charged.
- **Repair -** If the charge is lost, or is suspected to be incorrect, the system must be evacuated and recharged with the proper amount of R-404A. See "Recharging The System" on page 12.

See Figure 10: Refrigerant Pressure-Temperature Chart, page 21.

REFRIGERATION SYSTEM OPERATION

This section of the manual refers to essential safe operation for all KRA refrigeration systems. For any operational problems call your authorized dealer or the Dometic Marine Service Department at +1 954-973-2477.

KRA Refrigeration Start-Up Check List

Before You Start The System

1. Check that all refrigerant connections are tightened to10-12 ft. lbs.
2. Check to make sure that all refrigerant lines are secured so they do not rub against other objects during operation.
3. Ensure all suction line connections and the TXV assembly are insulated to prevent ice build-up.
4. Confirm that electrical connections are correct, and are tight.
5. Make sure that thermostat is securely mounted, and wires are routed safely.
6. Make sure that unit is securely mounted.
7. If applicable, check to make sure that airflow into and out of the unit is not obstructed.
8. Check water connections (if used) to make sure that they have correct flow direction, and that connections are tight and have two clamps.

9. Confirm that thermostat sensing bulb is mounted in the correct area of the box, and that it is secure.
10. Make sure that the thermostatic expansion valve bulb is mounted correctly and securely and insulated.
11. **Make sure that frequently accessed parts are easily accessible, i.e. TXV, thermostat, quick connects, condensing unit**.
12. Check the seals on the box lid to make sure that they have good contact to the box top.

Starting The System

1. Turn on the designated circuit breaker on the boat's electrical panel.
2. For units with a water-cooled condenser, first open the seacock. If pump is shared with another system, ensure that pump circuit breaker is on.
3. Set thermostat to desired temperature.
4. Watch the sight glass to make sure that refrigerant is flowing.
5. Confirm that water (if used) is flowing out of overboard discharge (see note below).
6. Confirm that condenser fan is running (if applicable).
7. Approximately 5-10 minutes after startup, open the box top to visually confirm frost is forming on wall of box or plate.
8. After 30 minutes of run time, check the sight glass to make sure the element inside is green (no moisture contamination).
9. Watch for a temperature decrease at the corresponding box thermostat.

System With 2 or 3 Evaporators and 1 Condensing Unit

1. Check all wiring to confirm that each thermostat brings on the corresponding box and the condensing unit and pump (optional).
2. To check pressures and refrigerant charge, if necessary, follow these instructions:
   - Turn on only one box. Make sure that box works correctly. Wait approximately 10 minutes.
   - Turn off the first box, turn on the other one. Wait approximately 10 minutes.
   - Turn all boxes on, and check for frost on box/plate surfaces. If not fully frosted, check subcool.
3. Follow procedures for "Starting The System" on page 10.

NOTE
The seawater pump will cycle automatically whenever the compressor is running. Regularly check for seawater flow by observing the overboard discharge when the system is first turned on. If you do not observe steady water flow, turn off the system and check for obstructions in the seawater cooling system.

Thermostat Operation

For operational reference, see Figure 5: Digital Thermostat (Dometic Control), page 16. For error codes, see Table 6: Thermostat Display Error Messages (digital Dometic control), page 15.

Operating the Dometic Control

Powering On The System

1. When the control is powered up (breaker on), the Dometic control display will light up showing all the icons and 888. That is followed by a display of r5.2 then - - -.
2. After - - - displays, depending on the mode it was in when it was last powered OFF, the display could flash between OFF and the box temperature, or start the cooling process by flashing the compressor delay icon for approximately 3 minutes, then the compressor will start and cooling will begin.
3. If the KRA unit was in the OFF mode, the control display alternates between OFF and the temperature reading. To turn on the compressor, press and hold the upper right power button for 2-3 seconds.
4. The control display will change from OFF and alternating temperature display to a constant temperature display. If the temperature setpoint is lower than the box temperature now displayed, the compressor icon will flash indicating a call for cooling, and there will be a 3-minute delay before starting the compressor. If compressor icon is on but not

flashing, the compressor is running. If the temperature set point is higher than the box temperature, the compressor will NOT turn on but will indicate box temperature.

Setting Temperature

1. Press and hold the set button SET until SET flashes in the display followed by numbers flashing and the cold icon.
2. Use the power button for UP and the aux button AUX for DOWN to change the temperature.
3. Press the set button SET to save the new setting.

Parameter Programming

Procedure

1. Press Prg/Mute PRG one or more times to make sure you are at the standard display (showing temperature of box).
2. Press and hold Prg/Mute PRG for more than 3 seconds (if an alarm is active, the buzzer will be muted). The display will show the code PS (for password) and the number 0.
3. Press the UP or DOWN AUX buttons to enter the password: 22. Press the SET button. The display shows parameter /2.
4. Press the UP or DOWN AUX buttons to reach the desired parameter as shown in Table 3, below. While scrolling, a code is displayed that represents the parameter.
5. When you find the parameter you want, press the SET button to display its current value. Press the UP or DOWN AUX buttons to change it, then press the SET button to temporarily save it and display the the parameter code again.
6. Repeat steps 4 and 5 to set other parameters, if needed.
7. **TO PERMANENTLY SAVE** all the parameter changes you made, press Prg/Mute PRG for 5 seconds. This also exits the parameter setting area and returns the control to normal operation.

Programming Parameter Codes

DO NOT CHANGE THE PROGRAMMING UNLESS ABSOLUTELY NECESSARY. There are many parameters included in the Dometic control, but ONLY those shown in the following table should ever be changed, and changes will rarely be needed.

Table 3: Dometic Preset Control Parameter Descriptions for KRA 433X and 450X Units

CODE	DESCRIPTION	UNITS	SET TO	SPECIAL NOTES
/5	Display temperature in Fahrenheit or Celsius. Fahrenheit (1) is default.	Temperature scale	1 for F 0 for C	
/tI	Probe 1	--	2	
/tE	Probe 1	--	2	
/A2	Probe 2 is not used. This must be set to 0 or system will fault.	--	0	
r3	Direct cooling	--	1	
rd	Temperature differential	Degrees	2	
c0	Start delay for Power ON. Min 3 minute wait time to	Minutes	3	*These 3 parameters must be set to 3 minutes or more to avoid compressor failure.*
c1	Time between starts	Minutes	3	
c2	Minimum compressor OFF time	Minutes	3	
A4	Low-pressure switch (error shows LP)	--	8	
A5	High-pressure switch (error shows 1A)	--	1	
h0	Modbus device address for STIIC applications only	Unique Modbus address		*See Table 4 below.*

MODBUS ADDRESSES FOR DOMETIC STIIC INTERFACE

To implement remote monitoring and control of the KRA system(s) via the Dometic Smart Touch Integrated Intelligence Control (STIIC), use the Modbus settings shown in the table below. There is a maximum of 3 controllers per KRA unit on STIIC.

Table 4: Modbus Device Addresses for KRA Units Using STIIC

Condensing Unit	Modbus Address	Extra Hardware	KRA Parameter Code	STIIC Connection
KRA unit #1	40, 41, or 42	IROPZ48500 Dongle	h0	J26-FB2
KRA unit #2	43, 44, or 45	IROPZ48500 Dongle	h0	J26-FB2
KRA unit #3	46, 47, or 48	IROPZ48500 Dongle	h0	J26-FB2
KRA unit #4	49, 50, or 51	IROPZ48500 Dongle	h0	J26-FB2
KRA unit #5	52, 53, or 54	IROPZ48500 Dongle	h0	J26-FB2
KRA unit #6	55, 56, or 57	IROPZ48500 Dongle	h0	J26-FB2

SERVICING YOUR REFRIGERATION SYSTEM

REFRIGERANT

This refrigeration system uses R-404A refrigerant. With a properly designed system, R-404A will perform well for temperatures down to 0°F/-32°C. R-404A is a blended-component refrigerant and should be charged in a liquid state. Never charge in the gas (vapor) phase. Because R-404A is a blend of gases, the most volatile gas will boil off first, so if there is a leak, the system will lose a portion of the blend first, creating an improper mixture and poor performance.

QUICK-CONNECT FITTINGS

QCs may be used in a similar manner as base valves. To check compressor suction valve integrity, remove the liquid line QC from the condensing unit. In 2-3 minutes or less, the unit should be pulling a vacuum. You may also use the QCs to troubleshoot leaks by narrowing down the search to individual parts, such as the liquid line, suction line, box, and condensing unit. Disconnect the QCs, and pressurize all parts separately.

RECHARGING THE SYSTEM

You only need to recharge the system if it was improperly charged or after a repair, and only after checking for leaks and finding none.

SYSTEM SHUTDOWN

It is best if the system can be turned off for 8-12 hours prior to servicing to allow the refrigerant to reach ambient temperature. This will expedite the recovery of the refrigerant, but is not necessary.

EVACUATE REFRIGERANT

1. Connect manifold gauges to both high and low side ports. Attach center line of gauge set to recovery apparatus.
2. Recover system per governing EPA regulations.
3. With the manifold gauges still connected to service ports, attach the center line of gauge set to vacuum pump.
4. Repeat vacuum process until a vacuum of 200-400 microns is achieved. If the system has been open to the environment, allow a minimum evacuation time of 12 hours. Close manifold valves and turn off the pump. If no vacuum is lost, proceed with charging.

CHARGING THE SYSTEM

Refer to Figure 10: Refrigerant Pressure-Temperature Chart, page 21.

1. Remove line from vacuum pump and connect to a R-404A bottle. The charge must be weighed in.
2. Pressurize the charging lines with liquid R-404A refrigerant.
3. With system OFF, charge on high side and allow the correct amount of R-404A to flow into the system by weight indicated on data label. Typical pressures are 20 PSI on the low side and 210 PSI on the high side (plus or minus 4 PSI) at typical entering temperatures of 73 to 75°F/23 to 24°C for air or water condenser. Since each installation is unique, your readings may vary. If questionable, call Dometic Technical Support.

4. The best way to make sure the unit is charged properly is by the subcooling method. This will ensure that you have a good liquid seal to the TXV with no flash gas or vapor. Typical subcooling is 6 to 10°F/-14 to -12°C depending on the condensing temperatures. Refer to Figure 10: Refrigerant Pressure-Temperature Chart, page 21.

NOTE
Check ability of vacuum pump to achieve 200-400 microns by connecting micron gauge directly to pump. If it does not achieve 200-400, service or replace pump.

NOTE
If moisture has been a problem, refer to Refrigeration Bulletin 02-1 for instructions on clean up. This bulletin is available on the Marine Resource Center under Technical Field Notices: "Control of Moisture in Refrigeration Systems" (FN#175-I2).

CAUTION
System contains R-404A refrigerant. Recovery machines containing mineral-based oils should not be used.

Adjusting the TXV

On rare occasions, **a qualified technician may need to make an adjustment,** but these adjustments are slight. Use a wrench to remove the nut covering the superheat adjustment valve stem. This exposes the valve stem. Once the system has had sufficient running time to stabilize the box temperatures, adjustment should be made in 1/4-turn increments only. Use the wrench to make adjustments. After each incremental adjustment, allow 15 to 20 minutes for the expansion valve diaphragm to stabilize.

Looking at the stem-end of the valve:

- Turn the valve stem clockwise to close the valve; this will decrease the flow of refrigerant and increase the superheat.
- Turn the valve stem counter-clockwise to open the valve; this will increase the flow of refrigerant and decrease the superheat.
- One full turn of the valve stem equals 4.5° of superheat.
- Follow directions with the valve. Replace the outer nut, and tighten to 3 ft-lbs. Insulate valve and bulb fully.

TXV Metering Device

If service or replacement is needed, follow manufacturer's recommendations for more information. Call Dometic Technical Support.

Sight Glass

See "Sight Glass/Moisture Indicator" on page 9" in the "Installing the Refrigeration System" section.

USER MAINTENANCE

Seawater System

Check the seawater strainer daily. Remove any debris. If you are in waters where jellyfish or other debris are a problem, you may find it necessary to add a strainer on the outside of the through-hull fitting.

Verify that all seawater connections are tight, and check for water flow from the overboard discharge. The centrifugal seawater pump does not need any regular maintenance.

Defrosting

Defrosting of your freezer box is required to keep the unit working at peak performance. Defrost the unit whenever more than 1/4" (7 mm) of ice or frost has accumulated on the plates or box sides.

To defrost, remove all the contents from the box and remove drain plug (if applicable), then disconnect the power to the KRA unit. Leave unit off until all ice has melted. Be sure to replace drain plug once unit has finished defrosting (if applicable).

To accelerate the defrost process, remove plug and use fresh water to melt ice and rinse the box clean. Never use a mechanical device to remove ice. Damage to box liner is not covered under Dometic Warranty.

Winterizing the System

Make sure all water has drained from the refrigerated box. On seawater-cooled units, close the seacock, and remove inlet hose from pump and outlet hose from unit to allow all water to drain from the system. Drain and clean seawater strainer.

TROUBLESHOOTING GUIDE

Before you call for service, review this list of problems and solutions. It may save you time and expense. This list contains common occurrences that are not a result of defective workmanship or materials. If you need service after trying these procedures, call your dealer. Also reference the wiring diagrams in this manual.

Table 5: General Troubleshooting

PROBLEM	POSSIBLE REASON/SOLUTION
Compressor and fan (or pump) does not run.	1. **Circuit breaker off.** Turn on or reset circuit breaker. 2. **Thermostat set incorrectly.** Check thermostat. Set for a cooler setting. 3. **High/Low pressure switch.** Check the Dometic control for fault LP or 1A. Call technician.
Fan or pump operates but compressor does not (high pressure switch or thermal overload has tripped)	1. **Low voltage to unit.** Check for low voltage to unit. Klixon may be open. 2. **Poor condenser cooling.** Check fan and coil for proper airflow. Ventilate area if temperature is above 100°F/38°C. Check seawater system. 3. **High/Low pressure switch.** Check the Dometic control for fault LP or 1A. Call technician.
Compressor and fan (or pump) running, but box does not cool.	1. **Poor condenser cooling.** Check fan and coil for proper airflow. Ventilate area if temperature is above 100°F/38°C. Check seawater system for proper flow. 2. **Thermostatic Expansion Valve (TXV) not set correctly.** See technician for service. 3. **Low refrigerant charge.** Check for a refrigerant leak and repair. Evacuate system and recharge with the correct amount of R-404A. 4. **TXV Mechanical failure.** Have technician confirm diagnosis and replace.
System starts to cool, but stops as plates freeze.	1. **Moisture in system.** Check sight glass for moisture. Yellow indicates moisture; green indicates dry system.
Compressor operates, but seawater pump doesn't.	1. **Pump relay failure.** Turn on or reset pump breaker. Check pump relay and pump relay trigger.
Unit does not run.	1. **Power is OFF at panel.** Turn Power ON, check to see if thermostat display comes on. 2. **Thermostat is set incorrectly or may be faulty.** If the display is on, check for proper thermostat setting. Ensure the correct voltage at thermostat. If the thermostat is showing a fault code, refer to "Thermostat Display Error Messages (digital Dometic control)" on page 15. If thermostat still does not send voltage to the condensing unit or if fault code is present, replace thermostat. 3. **No voltage is getting to the thermostat, but the panel switch is on.** Check for loose or missing wiring connections behind the control, then in electrical box. Make sure that there is not another in-line cut-off switch. 4. **Start component failure.** Check basic electrical components for failure. Replace if necessary. See technician. 5. **Compressor failure.** See technician.
Displays not lit.	1. **Power disconnected.** Check circuit breaker. 2. **Loose connection.** Check for loose connections. 3. **Wrong voltage.** Check voltage input of control. **4. See technician.**

Table 5: General Troubleshooting (continued)

PROBLEM	POSSIBLE REASON/SOLUTION
Insufficient cooling of box.	1. **Excessive frost is in box.** Turn unit OFF, and defrost according to instructions in "Defrosting" on page 13. 2. **Improperly set thermostat.** Review "REFRIGERATION SYSTEM OPERATION" on page 9. 3. **Excessive open-box time.** Unit requires time to catch up after being opened. Decide what you are going to get before opening the box, then conduct removal quickly to prevent warm air infiltration. 4. **Recent addition of large quantities of warm items.** Unit will slowly pull the heat out of the warm items, allow for recovery time. 5. **Poor seals, no drain plug.** Poor seals allow ambient air to infiltrate box, bringing moisture with it. Replace seals if necessary. Leaving the drain plug out during regular operation allows outside air, possibly even hazardous or bilge gases, to enter box. 6. **Improperly set Thermostatic Expansion Valve (TXV).** Have a certified technician check the suction pressure, and set the valve according to "Recharging The System" on page 12. 7. **Low refrigerant charge.** Have a certified technician check for this problem. If the technician finds a low charge condition, he/she should check for leaks using an electronic leak detector. Unit should be recharged to rated system capacity. 8. **High condensing temperature.** High ambient temperature – introduce cooler air into compartment that houses the condensing unit. High water temperature – while you cannot remedy this problem, you can help by introducing cooler air into the compartment that houses the condensing unit. Pump not operating – find cause and remedy. Condenser fan failure – replace component. 9. **Improperly mounted temperature sensor in refrigerated box.** Refer to "SYSTEM INSTALLATION" on page 6 for proper location of sensor. If drilling in a wrapped box, be sure to confirm placement of evaporator lines before drilling. This can be accomplished by turning the condensing unit on, and checking for frost lines in the box. 10. **Moisture in system.** Have a certified technician check for this problem. If there is moisture present, he/she will decide a course of action to take which should include: leak check, installation of liquid line filter/dryer, evacuation, and recharging. Unit should be checked at later date for any remaining moisture. 11. **Inadequate design.** Not every box is designed for every condition. It may be that your box was not designed properly. If this is the problem, replacement of the box or condensing unit may be the only solution.

Table 6: Thermostat Display Error Messages (digital Dometic control)

ERROR CODE	DESCRIPTION AND CORRECTION
lA	High Pressure Fault
LP	Low Pressure Fault
rE and E0 (flashing)	Temperature Probe Fault (a shorted or open circuit)
EE	Unit parameter EEPROM error
EF	Operating parameter EEPROM error

FIGURES & WIRING DIAGRAMS

Figure 1: KRA Cabinet-Type Condensing Units

Figure 2: Various Flat-Plate Evaporators

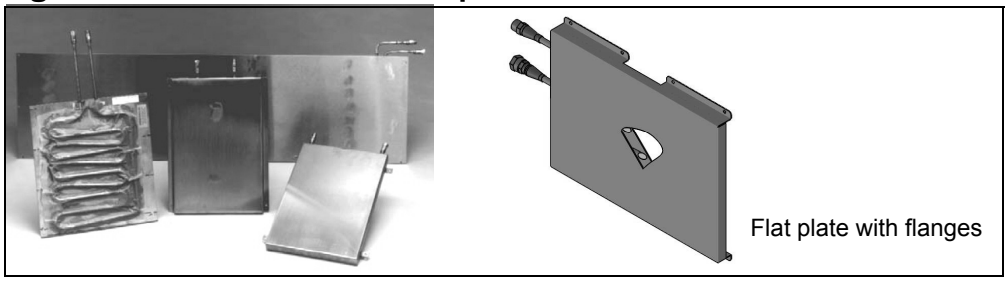


Figure 3: Wrapped-Box Evaporator

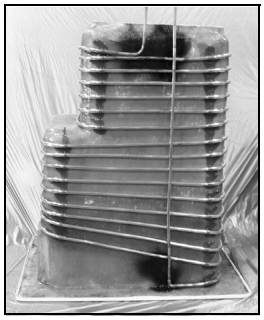


Figure 4: Flat-Plate Evaporator Designs

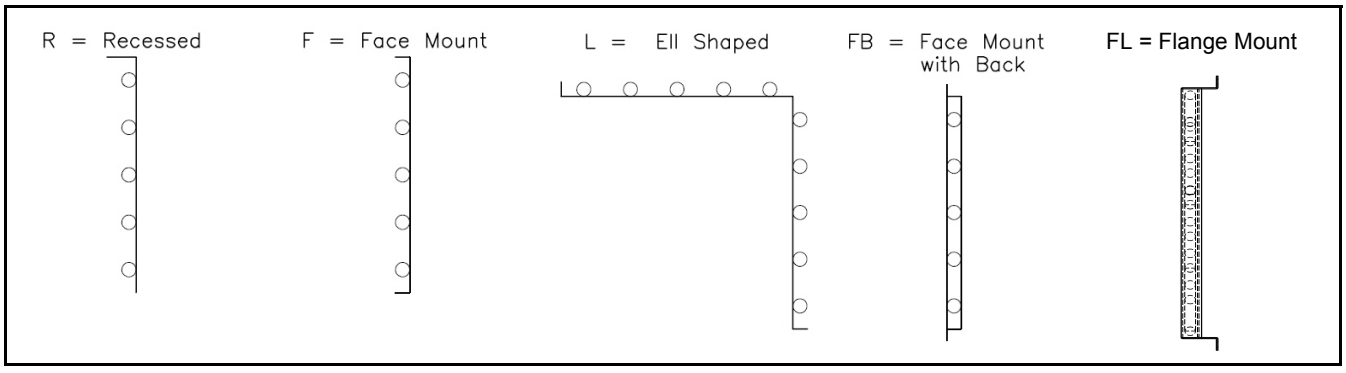


Figure 5: Digital Thermostat (Dometic Control)

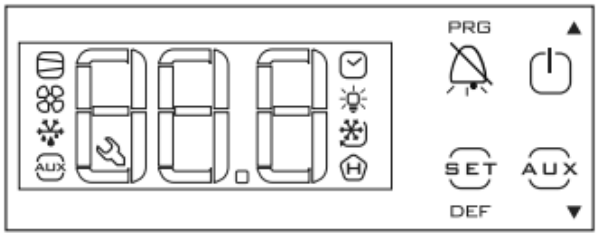


Figure 6: Single-Plate System

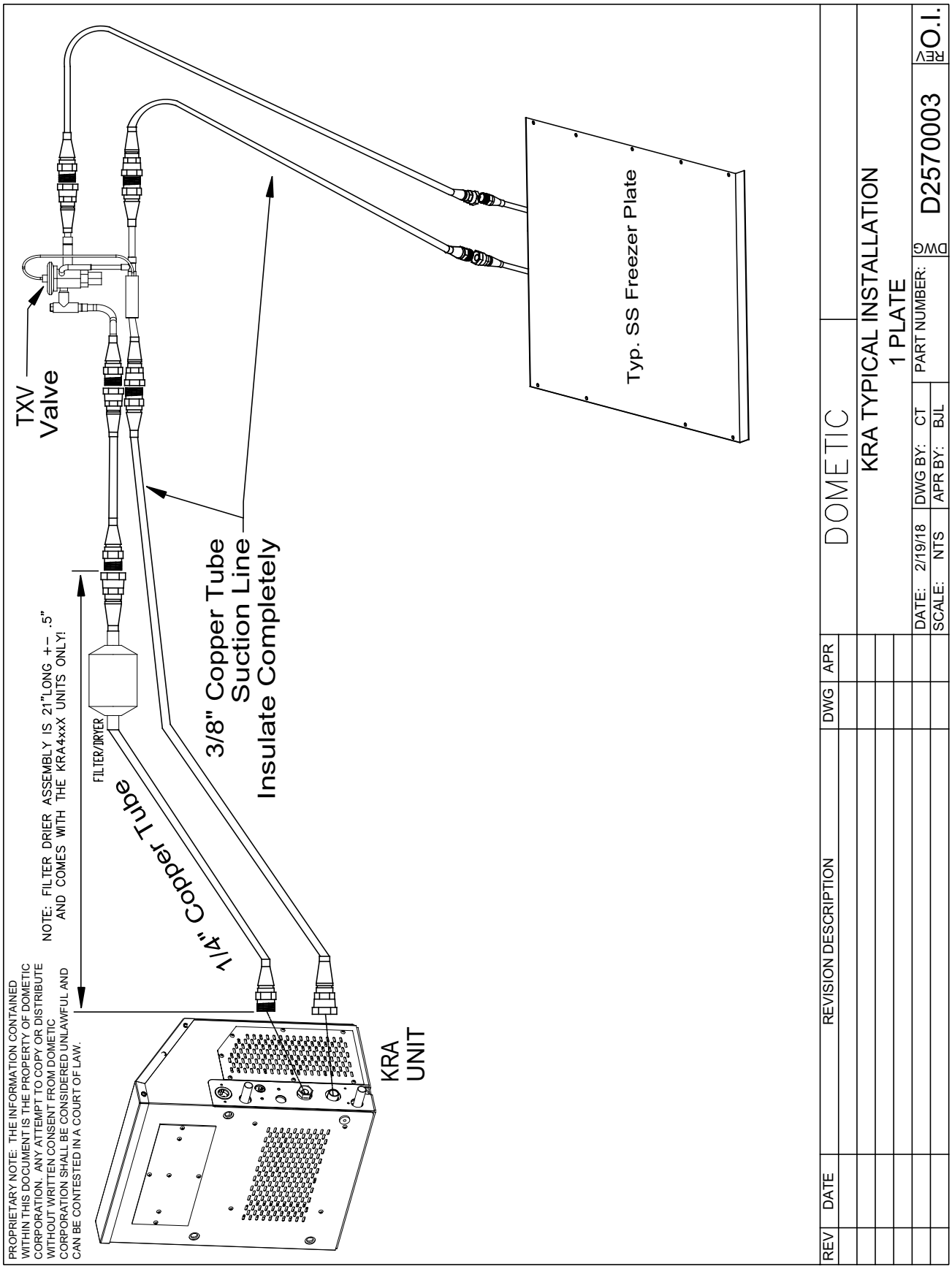


Figure 7: Dual-Plate System with Jumper

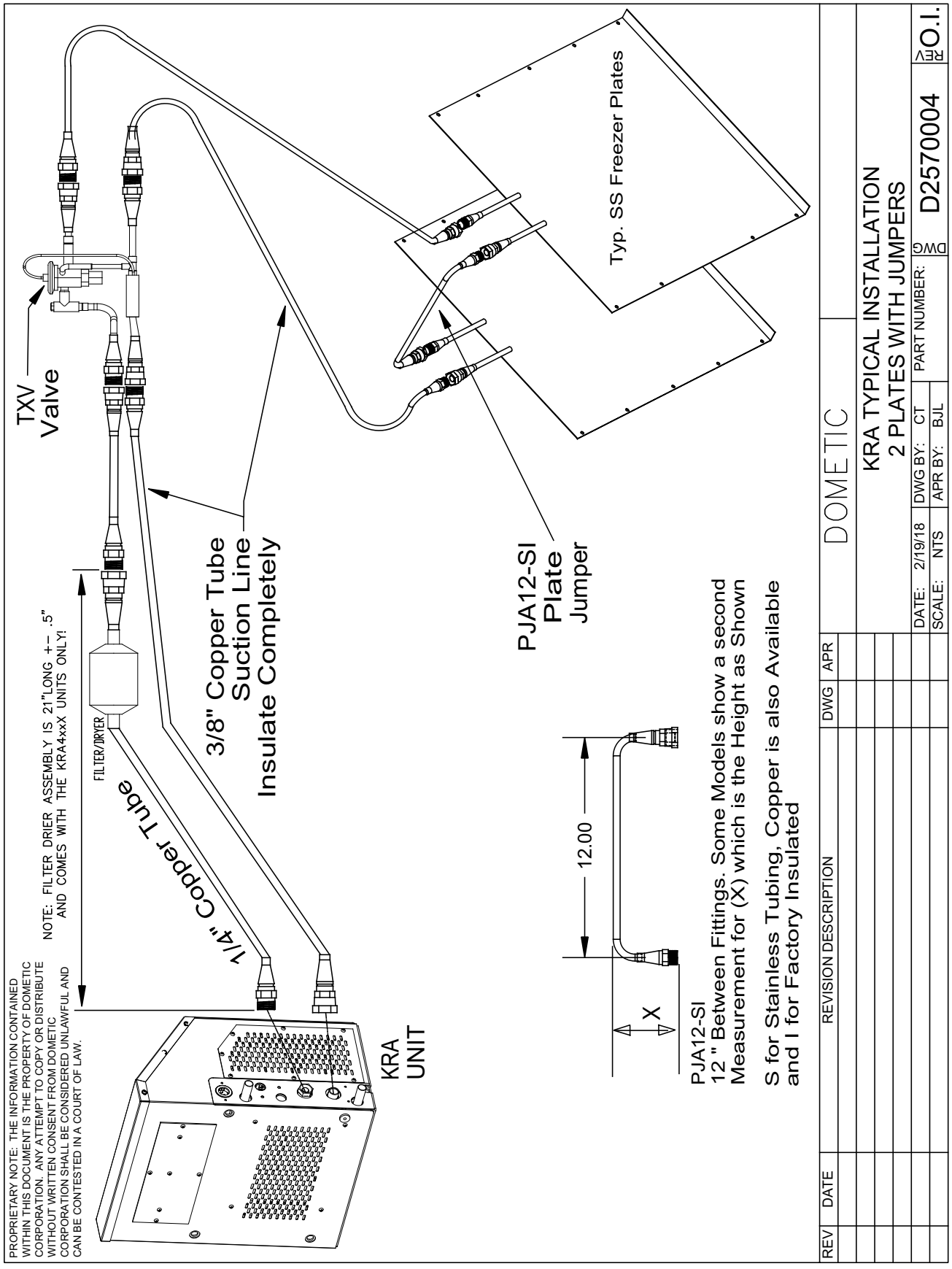


Figure 8: Installation Diagram - 2 Fish Boxes with KRA 433X

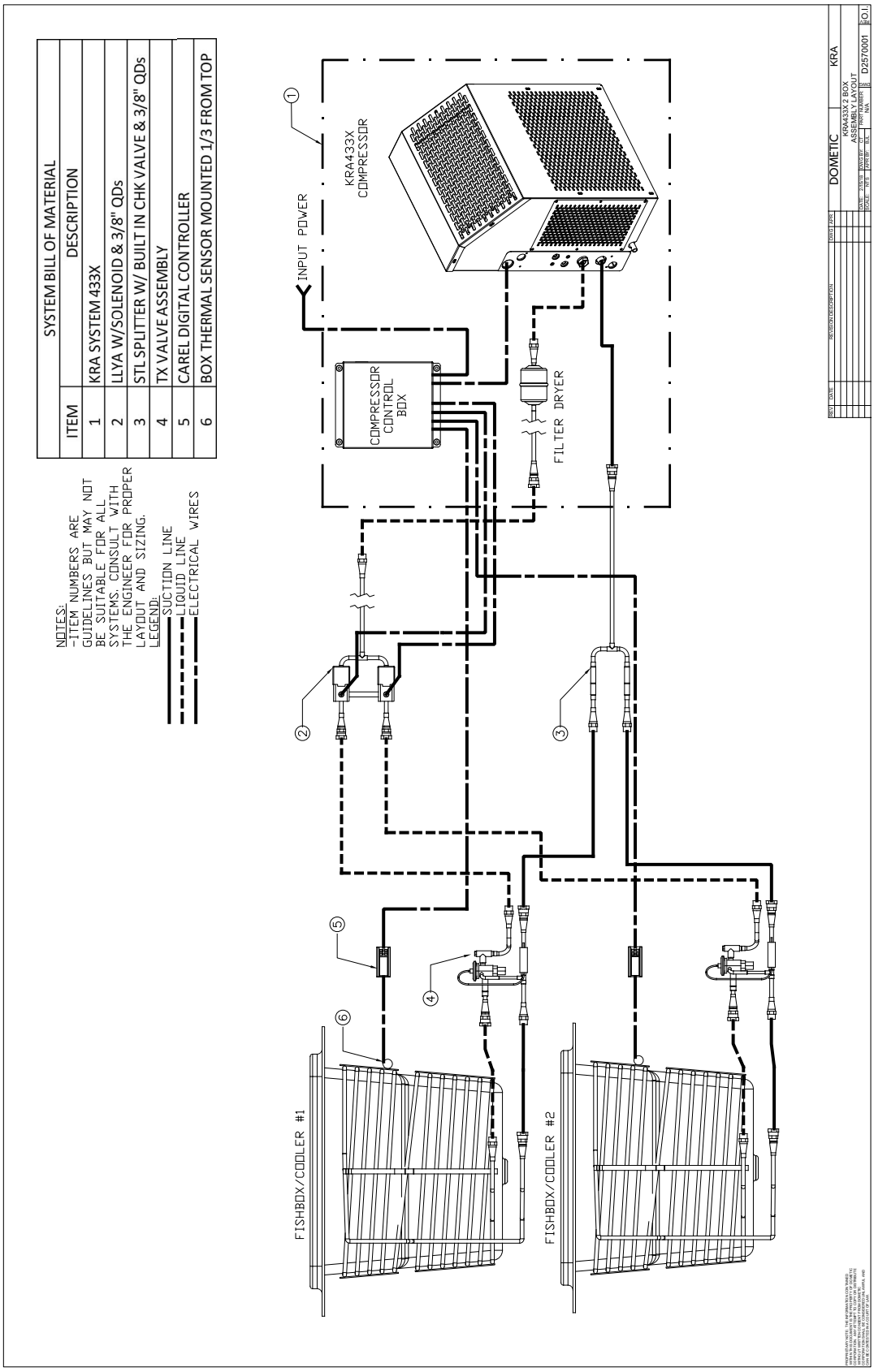


Figure 9: Installation Diagram - 3 Fish Boxes with KRA 450X

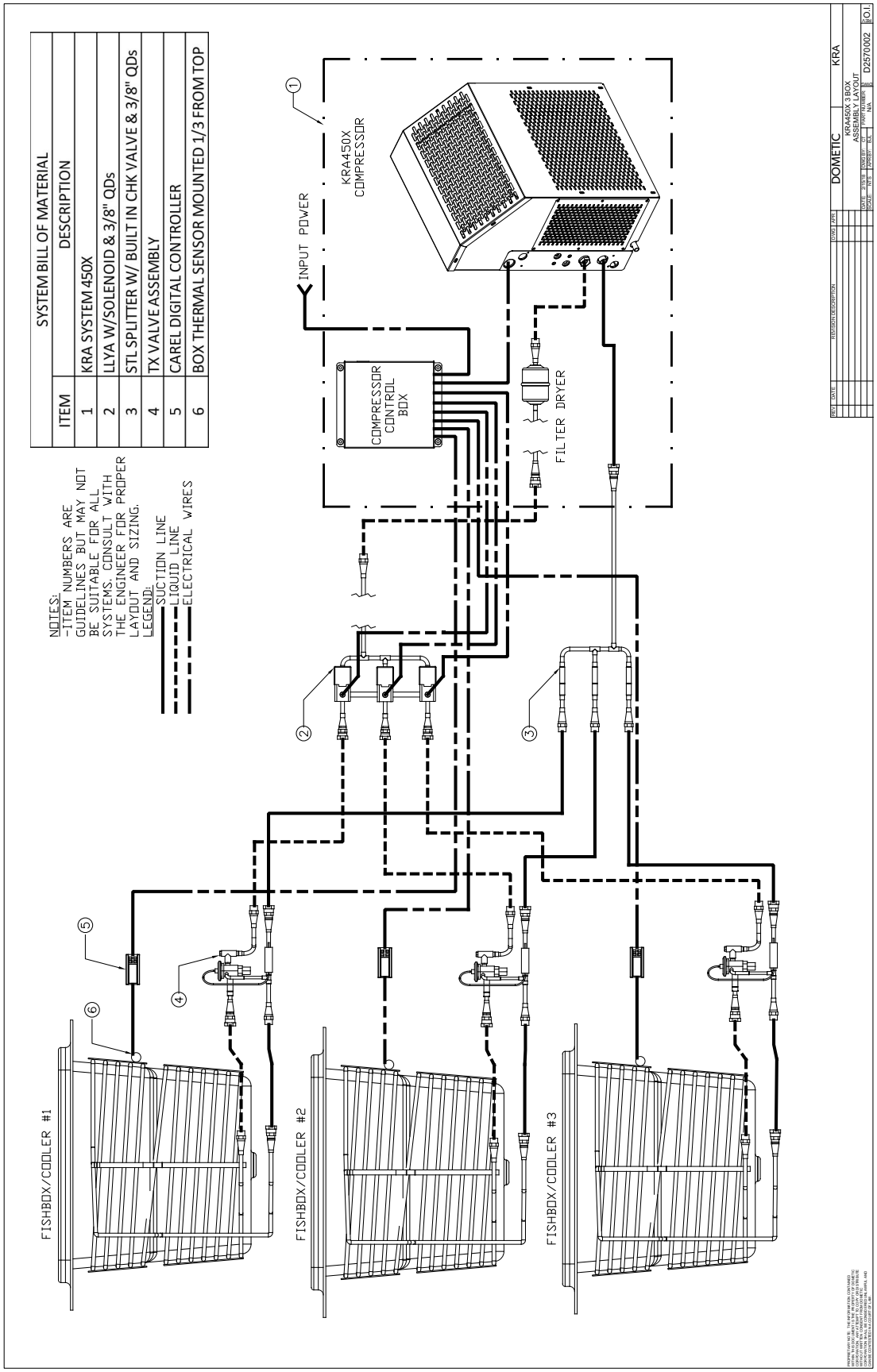
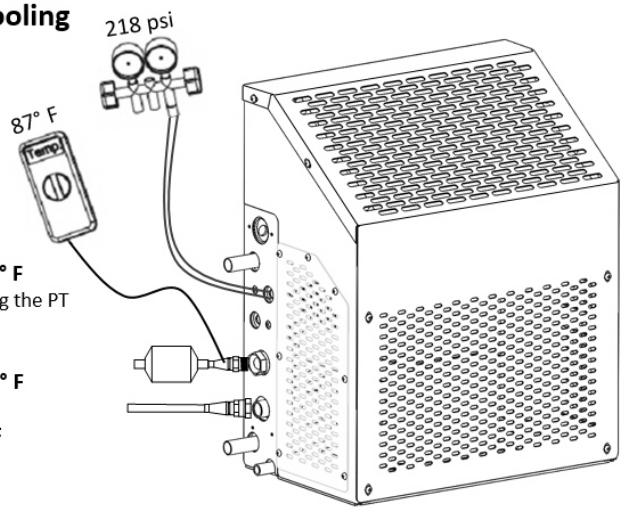


Figure 10: Refrigerant Pressure-Temperature Chart

Temperature F	Temperature C	R404A
-40	-40.0	4.3
-35	-37.2	6.8
-30	-34.4	9.5
-25	-31.7	12.5
-20	-28.9	15.7
-15	-26.1	19.3
-10	-23.3	23.2
-5	-20.6	27.5
0	-17.8	32.1
5	-15.0	37.0
10	-12.2	42.4
15	-9.4	48.2
20	-6.7	54.5
25	-3.9	61.2
30	-1.1	68.4
35	1.7	76.1
40	4.4	84.4
45	7.2	93.2
50	10.0	103
55	12.8	113
60	15.6	123
65	18.3	135
70	21.1	147
75	23.9	159
80	26.7	173
85	29.4	187
90	32.2	202
95	35.0	218
100	37.8	234
105	40.6	252
110	43.3	270
115	46.1	289
120	48.9	310
125	51.7	331
130	54.4	353
135	57.2	377
140	60.0	401
145	62.8	426
150	65.6	453

Refrigeration with TX Valve
How to Check Subcooling



Example
404 Refrigerant

Condenser Temperature 95° F
Convert Pressure of 218 psi Using the PT Chart
SUBTRACT
Liquid Line Temperature 87° F
EQUALS
Subcooling 8° F

Figure 11: Wiring Diagram for KRA 433X Unit with 1 Box

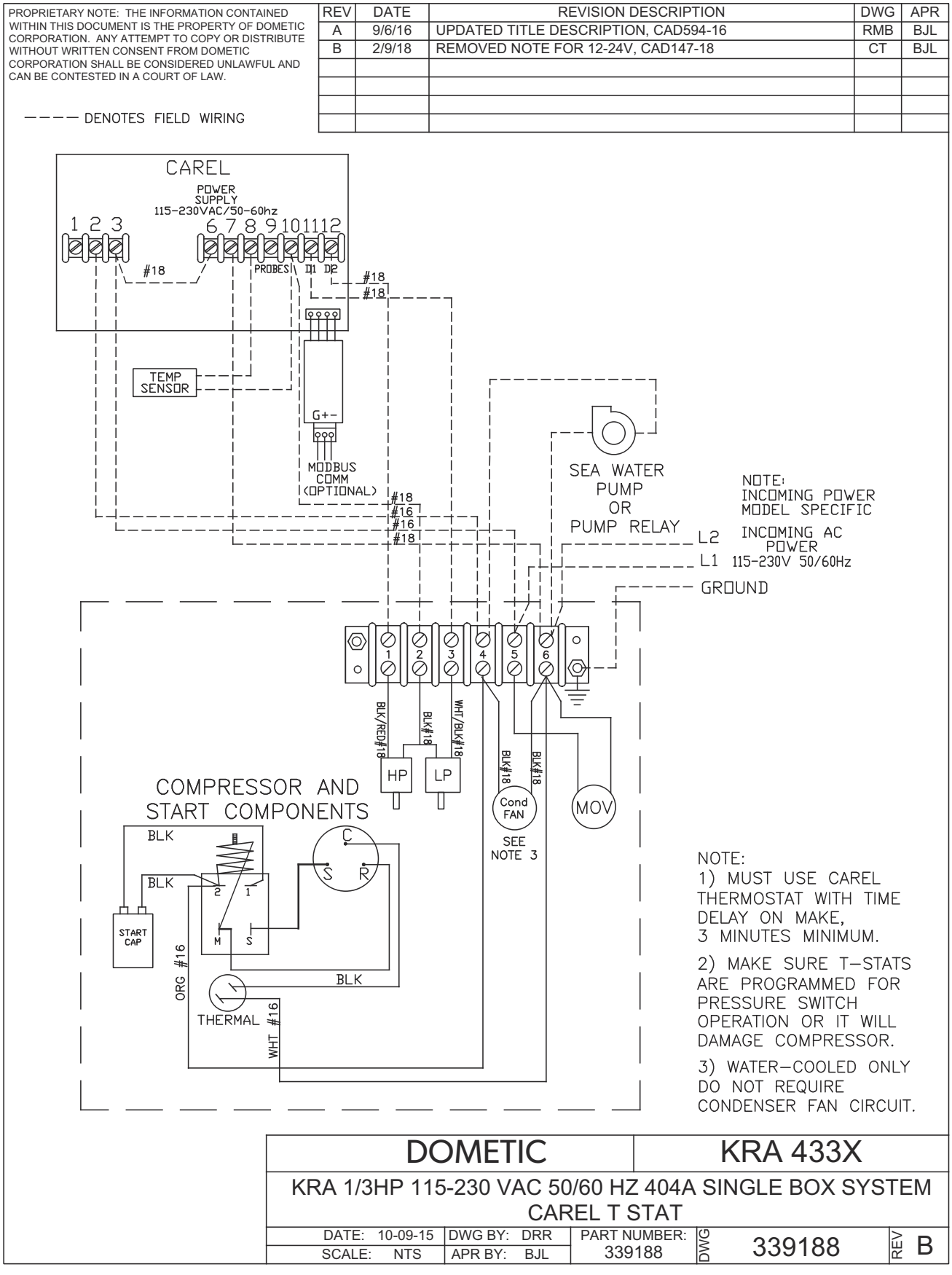
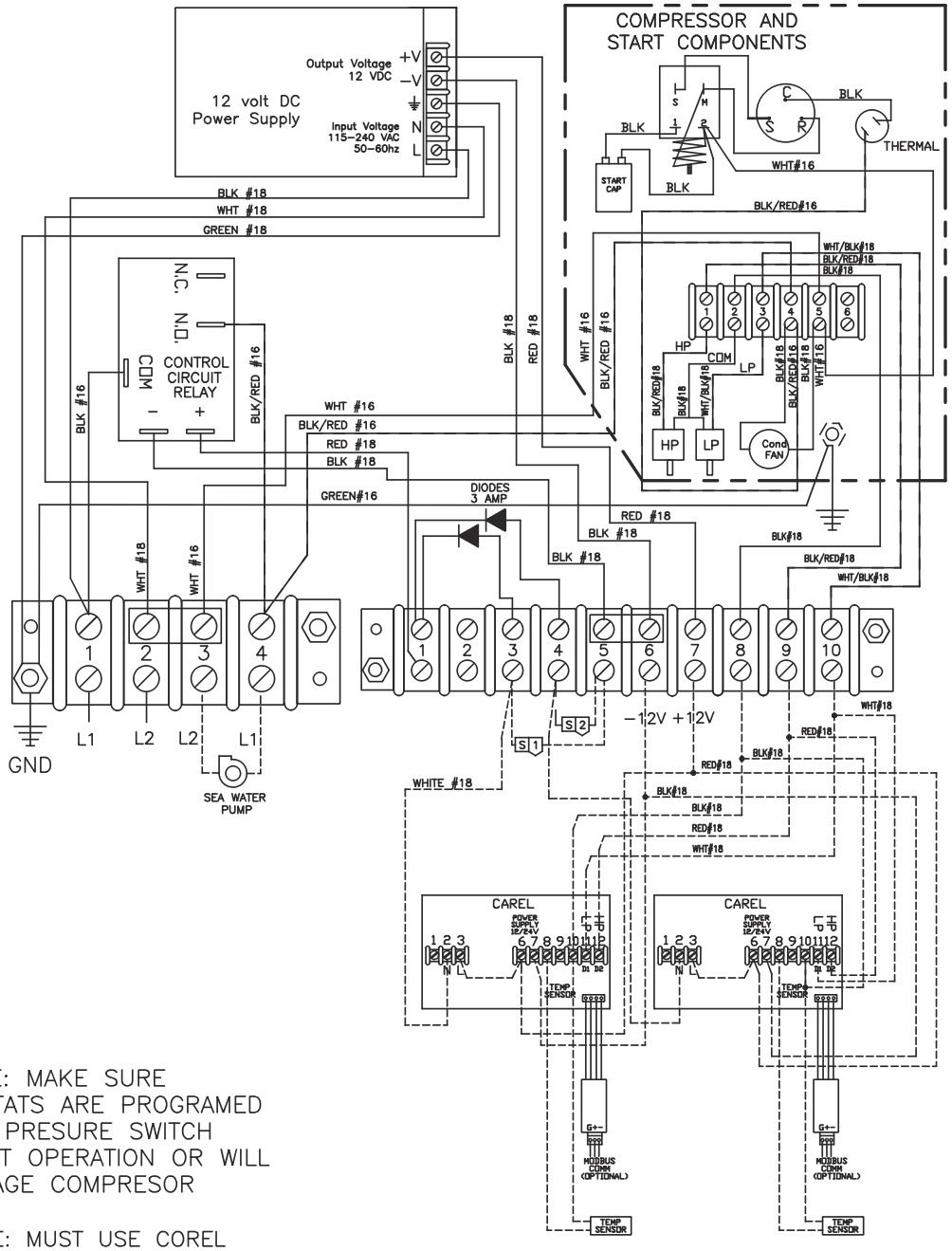


Figure 12: Wiring Diagram for KRA 433X Unit with 2 Boxes

REV	DATE	REVISION DESCRIPTION	DWG	APR
A	9/27/16	UPDATED HP AND KRA MODEL,CAD648-16	CT	BJL
B	1/25/18	UPDATED HPS/LPS PER VIKING SPEC,CAD101-18	NF	TV
C	8/29/18	UPDATED CONTROLLER CONNECTION,CAD828-18	CT	BJL



NOTE: MAKE SURE T−STATS ARE PROGRAMED FOR PRESURE SWITCH FAULT OPERATION OR WILL DAMAGE COMPRESOR

NOTE: MUST USE COREL THERMOSTATS ONLY! WITH TIME DELAY ON MAKE, 3 MINUTES MINIMUM.

-------- DENOTES FIELD WIRING

DOMETIC	KRA 433X				
KRA 1/3HP 115-230VAC 50/60Hz 404A 2 BOX SYSTEM 12 VOLT CAREL T STAT AND SOLENOIDS					
DATE: 3/10/15	DWG BY: DRR	PART NUMBER: 339426	DWG	339426	REV C
SCALE: NTS	APR BY: BJL				

Figure 13: Wiring Diagram for KRA 450X Unit with 1 Box

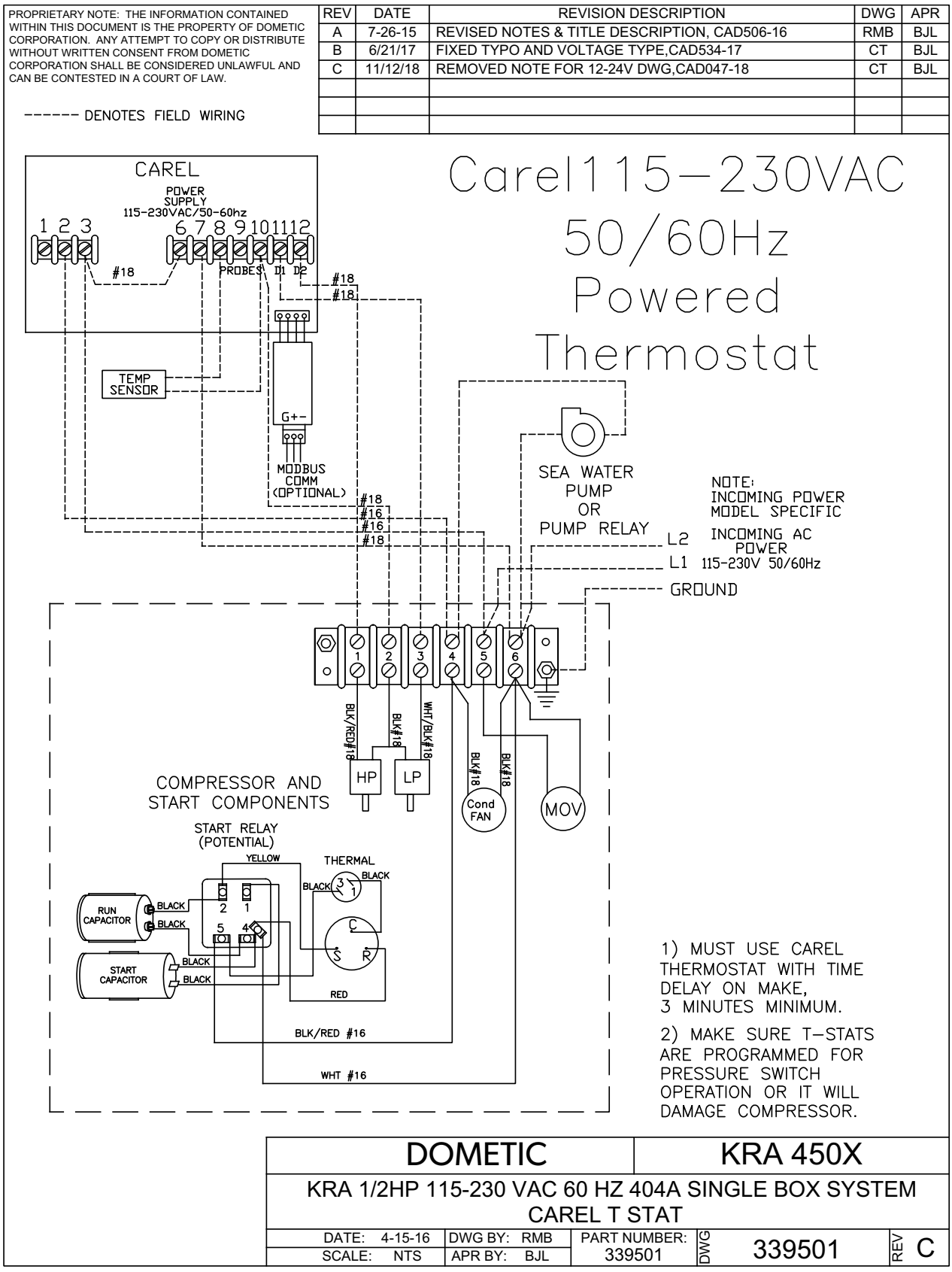
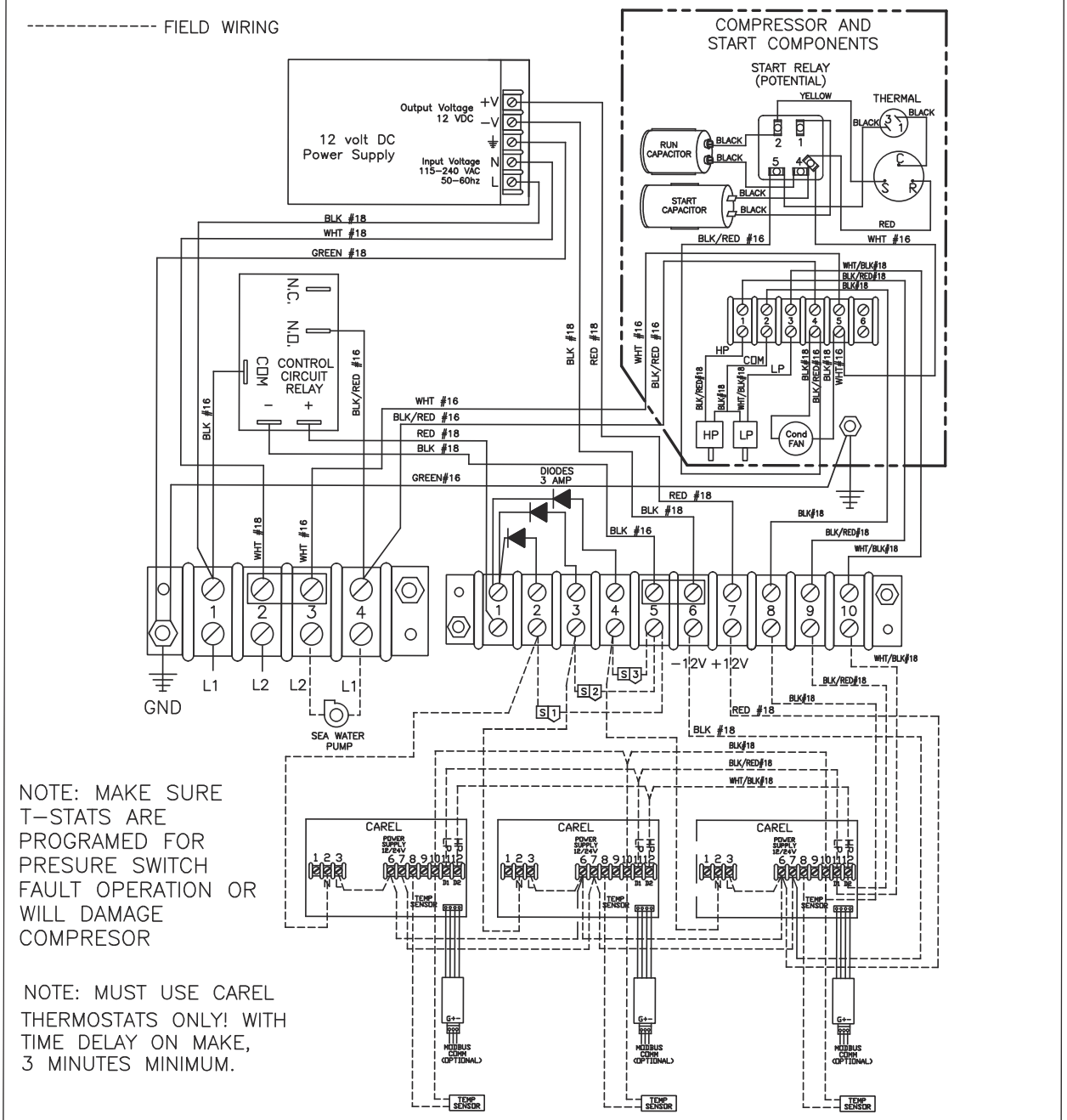


Figure 14: Wiring Diagram for KRA 450X Unit with 3 Boxes

REV	DATE	REVISION DESCRIPTION	DWG	APR
A	2/27/17	UPDATED WIRE COLOR,CAD167-17	CT	BJL
B	8/29/18	UPDATED CONTROLLER CONNECTION,CAD827-18	CT	BJL



DOMETIC	KRA450X
KRA 1/2HP 115-230VAC/50-60Hz 404A 3 BOX SYSTEM 12 VOLT CAREL T STAT AND SOLENOIDS	

DATE: 3/10/15	DWG BY: DRR	PART NUMBER: 339425	DWG 339425	REV B
SCALE: NTS	APR BY: BJL			

NOTES

NOTES

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