

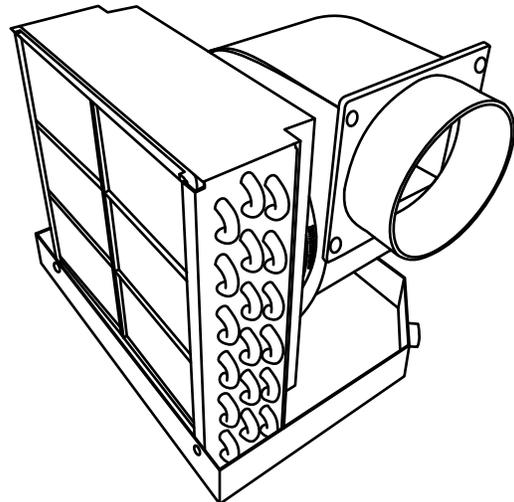
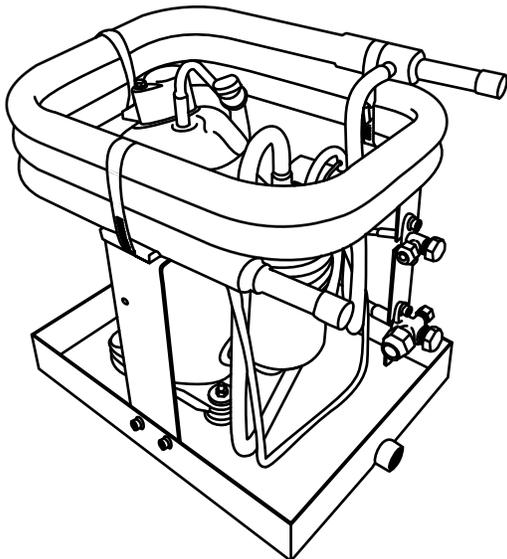


MARINE SPLIT-SYSTEM AIR CONDITIONER

**CX Models
(10,000 - 48,000 BTU)**

**EV Models
(6,000 - 16,000 BTU)**

INSTALLATION & USER MANUAL



Please visit <http://ctm-marine.com/user-manual/>
for the most updated version of this manual.

Form No. UM-SS05012023

CTM-MARINE

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WARNING

Cancer and reproductive Harm
www.P65warnings.ca.gov

Follow each one of the steps as explained on this manual, any deviation from the procedure explained herein constitutes improper installation of the unit and therefore waives and forever discharges CTM Marine and its subsidiaries from any liability in connection to the installation; use; and functioning of the unit and any and all systems and parts connected to it.

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Unit Label information

How To Read Your Label

S = Unit With Soft Start
H = 208 - 240 V Unit
HS = 208 - 240 V Unit With Soft Start

Vessel's water pump minimum requirement

Factory Refrigerant Charge

Condensing Unit CX

		PRODUCT NO. 24101C		
MODEL CX-16H				
COOLING CAP. (BTU) 16,000	VOLTAGE/HERTZ 208-240 V / 50-60 HZ		PHASE 1	
FUSE MAX./MIN. (AMP) 20 A / 13 A	INPUT: COOL/HEAT (AMP) 5.1A / 6.6 A	REFRIG. R410A	OZ./GR. 15.9 / 450	L.R.A (AMP) 34A
SUGGESTED WATER FLOW (GAL/H) 500	WATER IN/OUT 5/8" / 5/8"	CXN. DIS./SUCT. 1/4" / 3/8"	DIAGRAM 10016	NET WEIGHT 57LBS
SERIAL NO. CTM21CXXXXXX		Miami, FL 33172 USA www.ctm-marine.com <small>Assembled in China</small>		

*Unit label data changes by model

Evaporator Unit EV

		PRODUCT NO. 24101C		
MODEL EV-16				
COOLING CAP. (BTU) 16,000	VOLTAGE/HERTZ 100-120 V / 50-60 HZ		PHASE 1	
FUSE MAX./MIN. (AMP) 40 A / 25 A	INPUT: COOL/HEAT (AMP) 10.5 A / 13.5 A	REFRIG. R410A	OZ./GR. 15.9 / 450	L.R.A (AMP) 60 A
SUGGESTED WATER FLOW (GAL/H) 500	WATER IN/OUT (IN) 5/8" / 5/8"	DIAGRAM 10016	NET WEIGHT 57LBS	
SERIAL NO. CTM21CXXXXXX		Miami, FL 33172 USA www.ctm-marine.com <small>Assembled in China</small>		

*Unit label data changes by model

Warning Labels

WARNING

THIS AIR CONDITIONER UNIT, INCLUDING DUCT WORK, MUST NOT BE INSTALLED IN A FUEL VAPOR AREA OR ENGINE ROOM WHERE ANY POSSIBILITY OF FUEL VAPOR, ENGINE EXHAUST OR ANY OTHER TOXIC GASES MAY EXIST, THIS UNIT IS NOT VAPOR PROOF AND COULD INTRODUCE DEADLY GASES INTO THE LIVING SPACE IF IMPROPERLY INSTALLED. THIS COULD LEAD TO DEATH OR DISABILITY OF THE OCCUPANTS. SEE OWNER'S MANUAL.

CAUTION!

HIGH COMPRESSOR
TEMPERATURE IS NORMAL
DO NOT TOUCH

DANGER

ELECTRICAL SHOCK HAZARD
DISCONNECT VOLTAGE AT MAIN PANEL
OR POWER SOURCE INLET BEFORE
OPENING ANY COVER
**FAILURE TO COMPLY WILL RESULT IN
INJURY OR DEATH**

Type of Refrigerant

R410A
REFRIGERANT

Follow each one of the steps as explained on this manual, any deviation from the procedure explained herein constitutes improper installation of the unit and therefore waives and forever discharges CTM Marine and its subsidiaries from any liability in connection to the installation; use; and functioning of the unit and any and all systems and parts connected to it.

Please carefully read and follow all safety information and instructions before installing your unit. You may always contact Customer Service if you have any doubts, concerns, or questions in connection to your unit or to this Instructions Manual.

NOTICE: Failure to strictly follow these warnings and instructions may result in malfunction of the product, death or serious injury.

CTM Marine does not accept any liability for damage in case of:

- > Failure to assemble or connect the unit properly following the instructions in this manual.
- > Damage to the unit and its accessories resulting from mechanical influences and excess voltage.
- > Any alteration to the units.
- > Use for purposes other than the purposes described in this manual.

In the interest of product improvement, the specifications and design are subject to change without prior notice.

How To Read This Manual

This manual provides proper installation information of CTM-Marine self-contained air conditioning units. Improper installation procedures can result in unsatisfactory performance and/or premature failure of these a/c units as well as serious injury or death. Before proceeding, please read this manual completely. Follow each one of the steps as explained on this manual, any deviation from the procedure explained herein constitutes improper installation of the unit and therefore waives and forever discharges CTM Marine from any liability in connection to the installation; use; and functioning of the unit and any and all systems and parts connected to it.

Throughout this manual you will find a few signaling symbols. Please take a time to read and understand what each signaling symbol means:



Used to indicate a dangerous situation where, if not followed carefully, could result in serious injury or death.



Used to indicate important and useful information.



Used to indicate additional information.



QR Code for access to virtual content such as tutorial videos.

Pay attention to signaling symbols throughout this manual with important information.

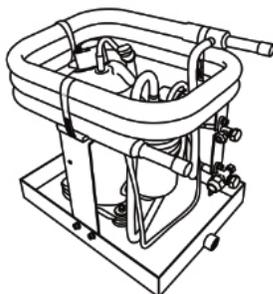
Some sections of this instructions manual have QR codes that you can easily scan with your Smartphone. They generally contain tutorial videos following the instructions in this manual or additional information.

Unit Installation

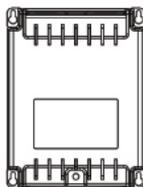
 Read these instructions completely and then plan all connections which must be made to the unit including ducting, condensate drain line, seawater inlet and outlet hoses, electrical power connection, location of control, and seawater pump placement, to assure easy access for routing and future servicing for both the condensing and evaporator units.

 Installation and servicing of this system can be hazardous due to system pressure and electrical components. When working on this equipment, always observe precautions described in the literature, tags and labels attached to the unit. Follow all safety codes. Wear safety glasses and work gloves and place a fire extinguisher close to the work area.

Mounting The Condensing Unit and CX Electrical Box



CX Condensing Unit



Electrical Box

1. Install the condensing unit at a location where it will be dry and able to be serviced easily and where it is close to the evaporator units. The condensing unit should be installed lower than the air handlers so the refrigerant oil returns directly to the compressor.

Mount the condensing unit on a horizontal surface that is designed to bear the weight of the unit and the torsion loads produced by the vessel's movement. One of the drains should point aft; the base pan may be rotated to accomplish this configuration if needed. The holes at the corners of the base pan can be used to bolt the base pan at four points.

2. The electrical box may be installed on the condensing unit or remotely mounted to a bulkhead or sturdy frame. In multi-ton condensers the electrical box may contain a position-sensitive relay. In that case, the box can be remote-mounted in the same position as it sits on the condensing unit, or if a different position is needed, open the box and rotate the relay bracket to the proper position.

3. The four mounting brackets provided should be placed around edge of drain pan as equally spaced as possible. Secure unit to a flat level mounting surface. Brackets are provided. Customer is to supply the necessary hardware such as screw/bolts, and washers (See Figure 1).



SCAN ME

 **ELECTRICAL SHOCK HAZARD**
 > Ensure power source is OFF or disconnected at main panel before opening any electrical boxes. Failure to comply may cause serious injury or death.
 > It is imperative that the components of this system are properly grounded to minimize any electrical shock hazard and/or personal injury.

 **REFRIGERANT SAFE HANDLING**
 > Because refrigerants are heavier than air, they can push out oxygen from your lungs or from enclosed spaces. To avoid death or difficulty breathing, take the following precautions:
 1. You should never sniff a refrigerant.
 2. No refrigerant should ever be purged into an enclosed space or room. By law, all refrigerants must be reclaimed.
 3. If you suspect an indoor leak, you must thoroughly ventilate the area before you begin work.
 4. If you do get contact with liquid refrigerant, wear gloves and goggles to avoid frostbite or blindness. If liquid refrigerant does get in your eyes or on your skin, seek medical attention immediately.
 5. Refrigerant can cause poisonous gas to be released if it is burned.
 6. Always follow EPA regulations.

 **EXPLOSION HAZARD**
 > Do not apply flame or steam to a refrigerant cylinder. If heat is needed to charge faster, partially immerse the cylinder in warm water. > A cylinder should never contain more than 80% of liquid refrigerant. > Add only R-410A to an R-410A cylinder. It operates at much higher pressures than R-22. Service equipment used with R-410A must be listed.
 > Do not use a cylinder as a platform or roller. Always store a cylinder in a cool, dry place.

Refer to the illustrations throughout this manual for guidance.

Some pages have a boxed section on the right to indicate potential physical injury hazards and potential damages to the units. It's important to read, understand and obey safety instructions.



Product Description & Features

Thank you for purchasing our CTM Marine split-system marine air conditioner. The CTM Marine split-system air conditioner consists of two separate units; a condensing unit (CX); an evaporator unit (EV); and a refrigerant gas circulating through both. The CX unit includes a compressor and a condenser coil, while the EV unit consists of a blower fan and an evaporator coil.

The CTM Marine split-system works by removing heat and moisture from the cabin, which lowers the temperature and the humidity levels. At the same time conditioned air is blown through the ducting system.

The blower fan of the evaporator unit (EV) draws warm humid air from the cabin across the evaporator where the heat from the air is transferred to the refrigerant in the evaporator coil. The refrigerant then evaporates and transforms from liquid to gas, absorbing the heat from the cabin air.

The compressor from the condensing unit (CX) compresses the refrigerant gas and pumps it through the condenser coil. Seawater is circulated through the inner tube in the condenser coil by the seawater pump which cools the refrigerant and condenses into a liquid.

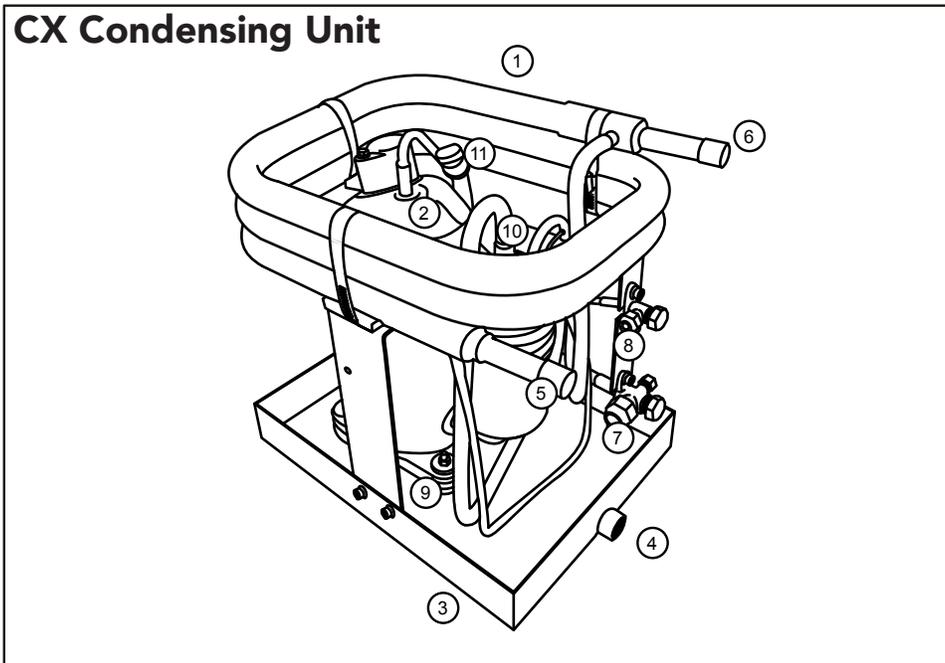
The heat absorbed by the evaporator in the refrigerant is then exchanged to the seawater and discharged overboard. The liquid refrigerant is then passed through the evaporator coil again to repeat the cycle.

The same process occurs for reverse-cycle heating, but backwards. The refrigerant flows in the opposite direction through the reversing valve and heat is transferred from the seawater in the condenser coil to the refrigerant and then to the air blowing through the evaporator.

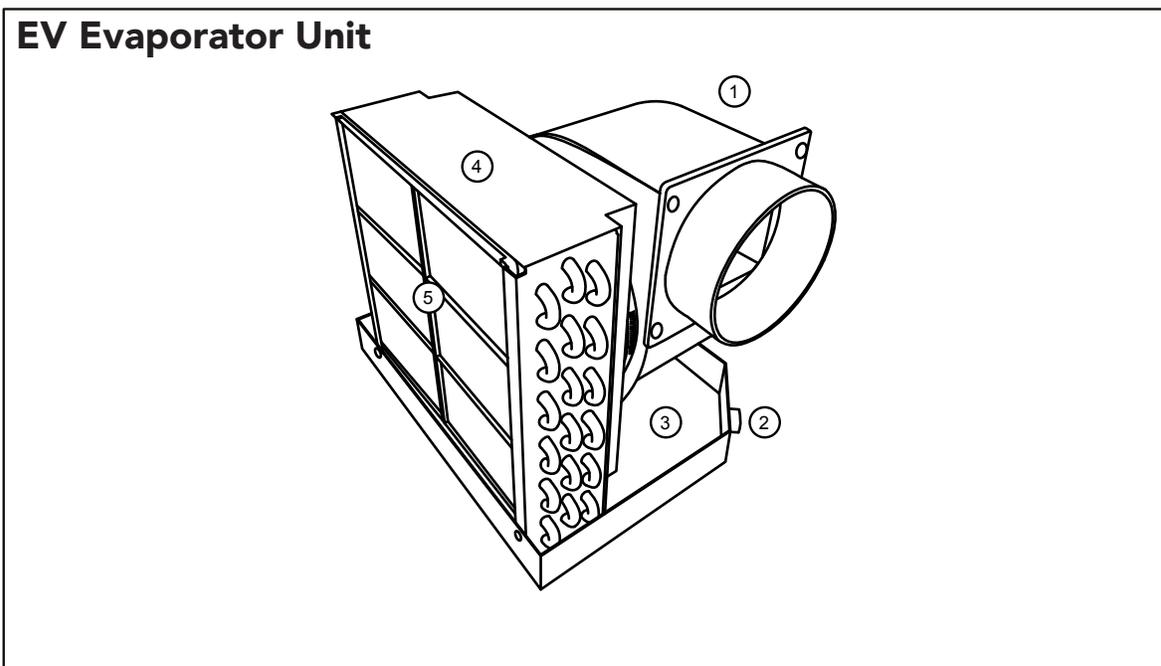
Water temperature is crucial for the CTM Marine split-system to function properly. The system will operate most efficiently in temperatures below 90°F (32°C) when cooling, and above 55°F (13°C) when heating. The unit will operate at higher or lower seawater temperatures, but at a reduced capacity. However, when seawater temperatures drop below 40°F (5°C) the system operates at around 50% capacity. Anything below those temperatures will not work since the pressure in the system will be so low that the unit will shut down in consequence a low-pressure fault.

Refrain from altering the unit. Any alteration may cause malfunction, serious injury or death. This unit contains electric and heat connectors and sources. Alteration to any part of this unit may cause exposure to toxic or harmful elements.

Technical Data

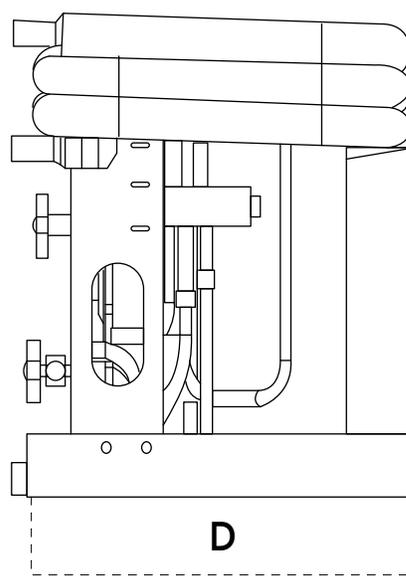
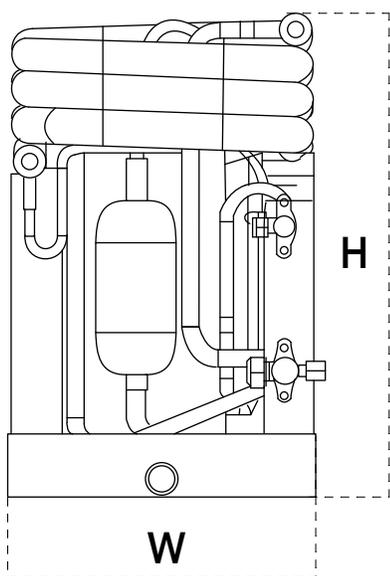


- | | | |
|---------------------|--------------------|-------------------------------|
| 1. Condenser Coil | 5. Coil Inflow | 9. Vibration Isolation Mounts |
| 2. Compressor | 6. Coil Outflow | 10. Reversing Valve |
| 3. Base Drain Pan | 7. Suction Valve | 11. High Pressure Switch |
| 4. Condensate Drain | 8. Discharge Valve | |

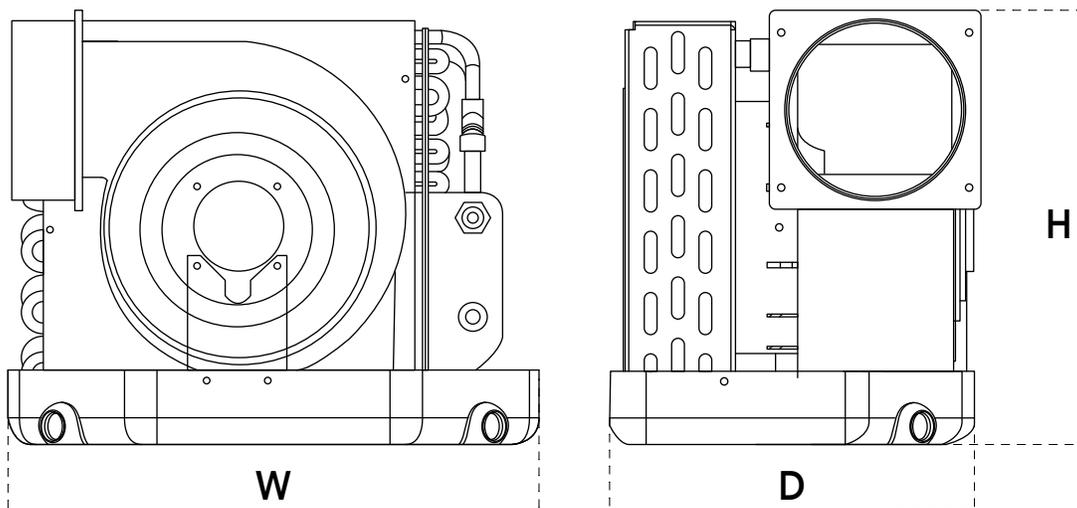


- | |
|---------------------|
| 1. Blower |
| 2. Condensate Drain |
| 3. Base Drain Pan |
| 4. Evaporator |
| 5. Air Filter |

	CX10		CX12		CX16				CX24		CX36		CX48
Capacity (BTU)	10,000		12,000		16,000				24,000		36,000		48,000
Model No.	CX10	CX12	CX12H	CX16	CX16S	CX16H	CX16HS	CX24H	CX24HS	CX36H	CX36HS	CX48HS	
Voltage (V)	105-120	105-120	208-240	105-120	105-120	208-240		208-240		208-240		208-240	
Cycle (Hz) / Phase (Ph)	50-60 / 1												
Input: Cool (A)	6.5	8.6	4.2	10.5	10.5	5.1		7.6		7.6		14	
Input: Heat (A)	8.5	11	5.2	13.5	13.5	6.6		9		9		19	
Fuse Max/Min (A)	25 / 16	30 / 20	20 / 15	40 / 25		20 / 13	20 / 15	25 / 16		40 / 25		65 / 40	
Locked Rotator Amps (A)	42	42	22	60	60	34		50		60		123	
Seawater Inlet (in/mm)	5/8 / 9.52											3/4 / 19.05	
Seawater Outlet (in/mm)	5/8 / 9.52											3/4 / 19.05	
Seawater Flow (GPH)	250			500				500		600		1000	
Refrigerant Type	R410A												
Net Weight (lbs/Kg)	35 / 16			42 / 19				60 / 27		81 / 37		127 / 79	
Width (W) in/mm	8.67 / 220			9.8 / 250									13 / 332
Height (H) in/mm	13.5 / 344							15.4 / 392		17.9 / 455		18.38 / 467	
Depth (D) in/mm	13.5 / 344											19 / 487	

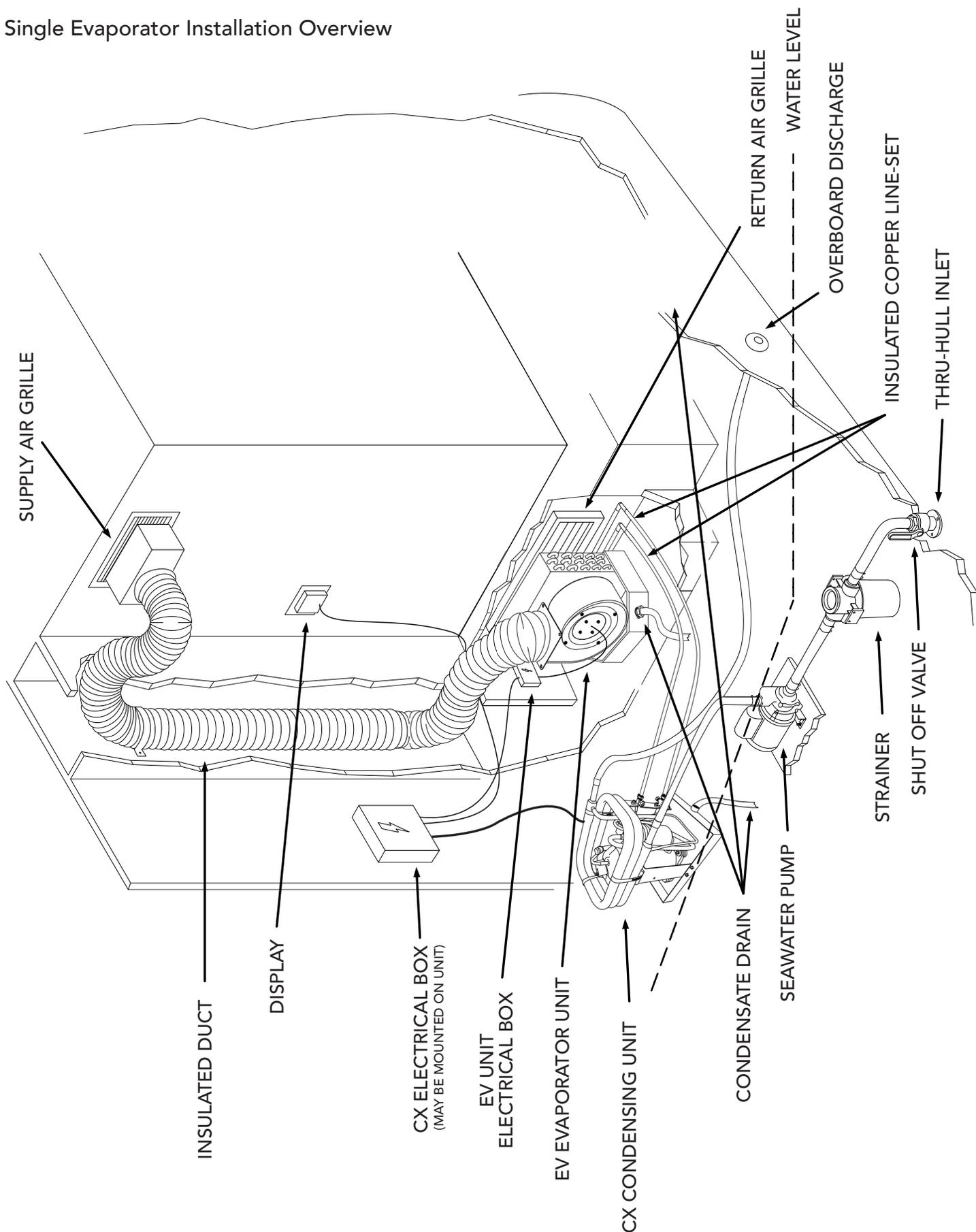


Model No.	EV6		EV8	EV10	EV12	EV12H	EV16	EV16H
Capacity (BTU)	6,000		8,000	10,000	12,000		16,000	
Voltage (V)	105-120	208-230	105-120	105-120	105-120	208-230	105-120	208-230
Cycle (Hz) / Phase (Ph)	50-60 / 1							
Fuse Max (A)	2			3	3	2	4	2
Input Rotor Amps (A)	0.82	0.42	0.82	1.5	1.5	0.65	1.6	0.82
Locked Rotor Amps (A)	0.91	0.5	0.91	1.8	1.8	0.8	2	1
Discharge (in/mm)	¼ / 6.35							
Suction (in/mm)	3/8 / 9.52						½ / 12.7	
Seawater Flow (GPH)	250						500	
Refrigerant Type	R410A							
Net Weight (lbs/Kg)	15 / 7		16 / 7.2	19.84 / 9			24.25 / 11	
Duct Ring (in)	4		5				6	
Width (W) in/mm	12.6 / 320			16.1 / 410			16.9 / 430	
Depth (D) in/mm	8.9 / 227			10.7 / 273			11.6 / 295	
Height (H) in/mm	10.8 / 275		11.2 / 285	13.4 / 340			13.9 / 354	



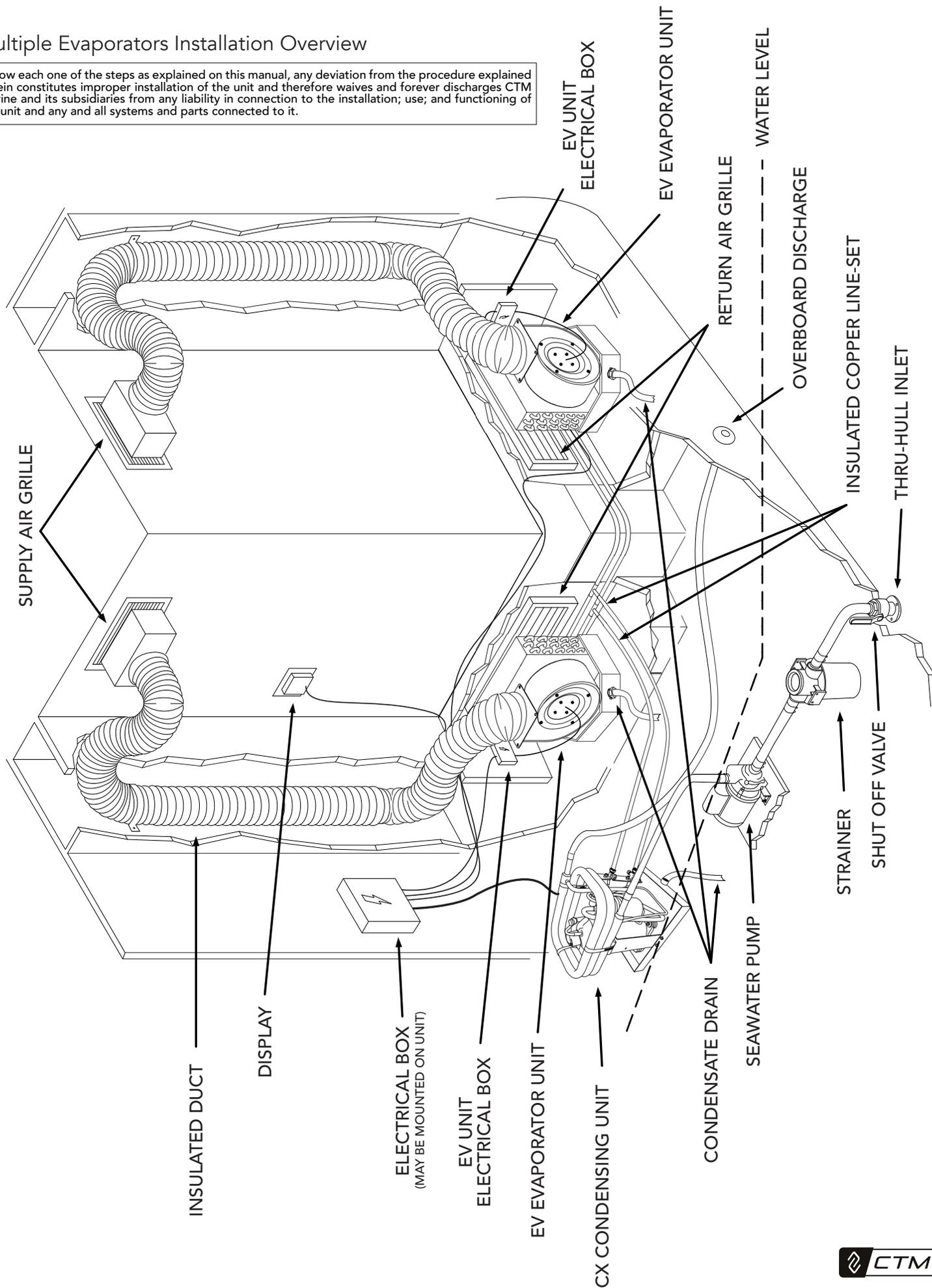
Installation Overview

Single Evaporator Installation Overview



Multiple Evaporators Installation Overview

Follow each one of the steps as explained on this manual, any deviation from the procedure explained herein constitutes improper installation of the unit and therefore waives and forever discharges CTM Marine and its subsidiaries from any liability in connection to the installation; use; and functioning of the unit and any and all systems and parts connected to it.



Unit Installation

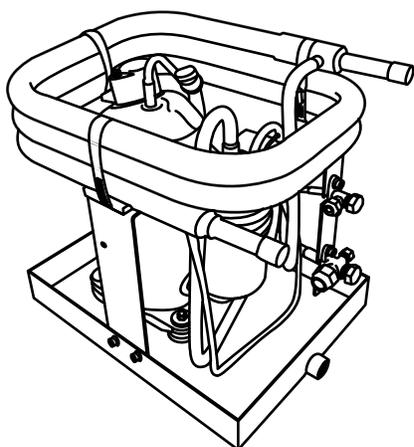


Read these instructions completely and then plan all connections which must be made to the unit including ducting, condensate drain line, seawater inlet and outlet hoses, electrical power connection, location of control, and seawater pump placement, to assure easy access for routing and future servicing for both the condensing and evaporator units.

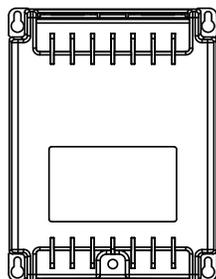


Installation and servicing of this system can be hazardous due to system pressure and electrical components. When working on this equipment, always observe precautions described in the literature, tags and labels attached to the unit. Follow all safety codes. Wear safety glasses and work gloves and place a fire extinguisher close to the work area. If you have questions, contact CTM Marine: customer service representatives are available to answer questions. Installing parts on maritime equipment requires knowledge on handling tools and marine equipment. If you are not sure whether or not you possess the skills CTM Marine recommends consulting with a professional before engaging on self-help.

Mounting The Condensing Unit and CX Electrical Box



CX Condensing Unit



Electrical Box

1. Install the condensing unit at a location where it will be dry and able to be serviced easily and where it is close to the evaporator units. The condensing unit should be installed lower than the air handlers so the refrigerant oil returns directly to the compressor.

Mount the condensing unit on a horizontal surface that is designed to bear the weight of the unit and the torsion loads produced by the vessel's movement. One of the drains should point aft; the base pan may be rotated to accomplish this configuration if needed. The holes at the corners of the base pan can be used to bolt the base pan at four points.

2. The electrical box may be installed on the condensing unit or remotely mounted to a bulkhead or sturdy frame. In multi-ton condensers the electrical box may contain a position-sensitive relay. In that case, the box can be remote-mounted in the same position as it sits on the condensing unit, or if a different position is needed, open the box and rotate the relay bracket to the proper position.

3. The four mounting brackets provided should be placed around edge of drain pan as equally spaced as possible. Secure unit to a flat level mounting surface. Brackets are provided. Customer is to supply the necessary hardware such as screw/bolts, and washers (See Figure 1).

Follow each one of the steps as explained on this manual, any deviation from the procedure explained herein constitutes improper installation of the unit and therefore waives and forever discharges CTM Marine and its subsidiaries from any liability in connection to the installation; use; and functioning of the unit and any and all systems and parts connected to it.



SCAN ME



ELECTRICAL SHOCK HAZARD

> Ensure power source is OFF or disconnected at main panel before opening any electrical boxes. Failure to comply may cause serious injury or death.

> It is imperative that the components of this system are properly grounded to minimize any electrical shock hazard and/or personal injury.



REFRIGERANT SAFE HANDLING

> Because refrigerants are heavier than air, they can push out oxygen from your lungs or from enclosed spaces. To avoid death or difficulty breathing, take the following precautions:

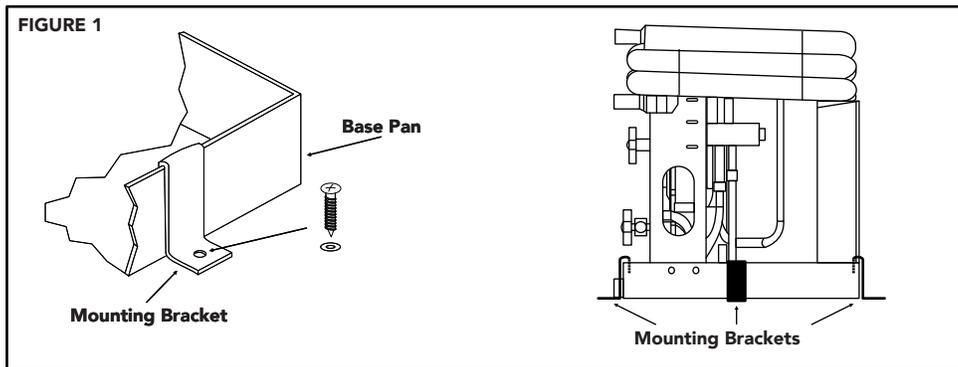
1. You should never sniff a refrigerant.
2. No refrigerant should ever be purged into an enclosed space or room. By law, all refrigerants must be reclaimed.
3. If you suspect an indoor leak, you must thoroughly ventilate the area before you begin work.
4. If you do get contact with liquid refrigerant, wear gloves and goggles to avoid frostbite or blindness. If liquid refrigerant does get in your eyes or on your skin, seek medical attention immediately.
5. Refrigerant can cause poisonous gas to be released if it is burned.
6. Always follow EPA regulations.



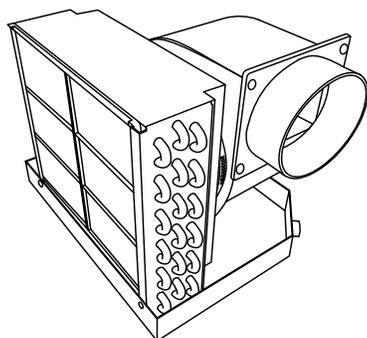
EXPLOSION HAZARD

> Do not apply flame or steam to a refrigerant cylinder. If heat is needed to charge faster, partially immerse the cylinder in warm water. > A cylinder should never contain more than 80% of liquid refrigerant. > Add only R-410A to an R-410A cylinder. It operates at much higher pressures than R-22. Service equipment used with R-410A must be listed.

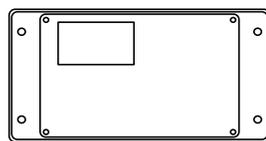
> Do not use a cylinder as a platform or roller. Always store a cylinder in a cool, dry place. If you have an emergency or feel unsafe due to fire hazards during this installation, call 911 immediately.



Mounting The EV Evaporator Unit and EV Electrical Box



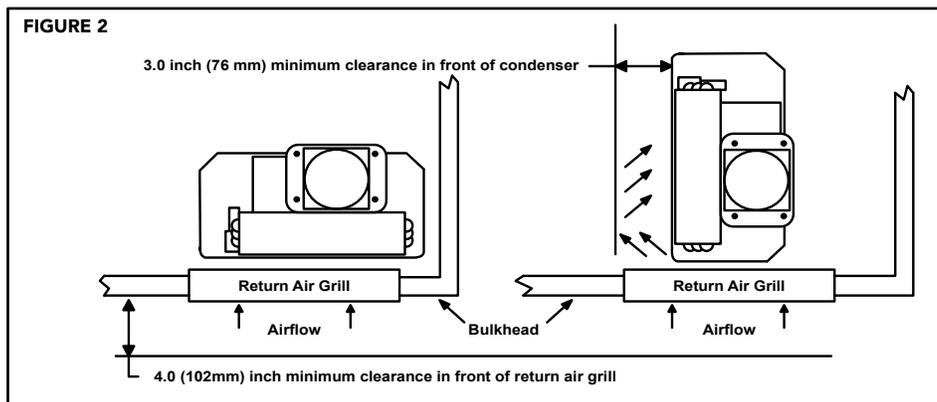
EV Evaporator Unit



EV Electrical Box

1. The EV evaporator unit should be installed as low as possible (under a V berth or in the bottom of a locker) and the supply air duct should be installed as high as possible. This will ensure proper air flow and prevent short cycling of the system.

2. Mount unit with evaporator coil directly behind the return air grill or with at least 3" (76mm) of air circulation clearance if adjacent to a bulkhead or other obstructions (See Figure 2).



3. The EV Evaporator electrical box should be installed remotely to a bulkhead or sturdy frame (refer to Installation Overview diagram on page 11-12. The EV Evaporator electrical box contains the start capacitor of the evaporator's blower fan.

! CARBON MONOXIDE HAZARD

- > Never install your EV Evaporator Unit in the bilge or engine room. Make sure that the selected location is isolated from bilge and/or engine room vapors. Do not terminate condensate drain line within three feet (91 cm) of any outlet of engine or generator exhaust systems, nor in a compartment housing them either, nor in a bilge, unless the drain is properly sealed and connected to a condensate or shower sump pump.
- > The EV Evaporator Unit should never be placed such that it can circulate carbon monoxide, fuel vapors or other noxious fumes into the boat's living spaces. Do not install or operate a EV Evaporator Unit in the engine room or near an internal combustion engine. Failure to follow this precaution could result in serious injury or death.

! ELECTRICAL SHOCK HAZARD

- > Ensure power source is OFF or disconnected at main panel before opening any electrical boxes. Failure to comply may cause serious injury or death.
- > It is imperative that the components of this system are properly grounded to minimize any electrical shock hazard and/or personal injury.

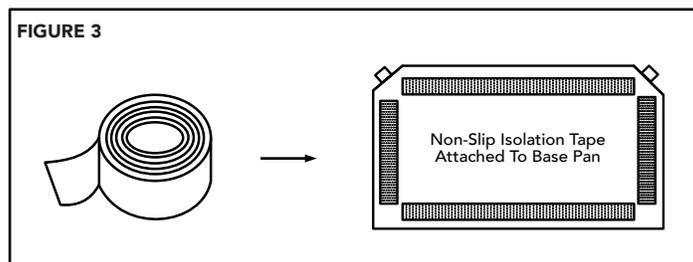
🔍 > The unit must be mounted to a low flat level surface, in bottom of locker, under a bunk or dinette seat, or in a similar location. Failure to obey these installation notices could result in damage to the unit.

- > To ensure proper airflow, allow a minimum clearance of 3 in. (76 mm) in front of the evaporator, and a minimum clearance of 4 in. (102 mm) in front of the return air grille.

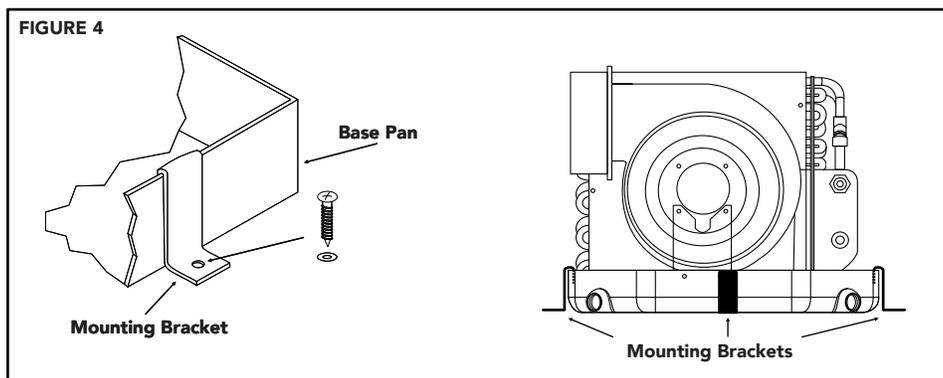
Follow each one of the steps as explained on this manual, any deviation from the procedure explained herein constitutes improper installation of the unit and therefore waives and forever discharges CTM Marine and its subsidiaries from any liability in connection to the installation; use; and functioning of the unit and any and all systems and parts connected to it.



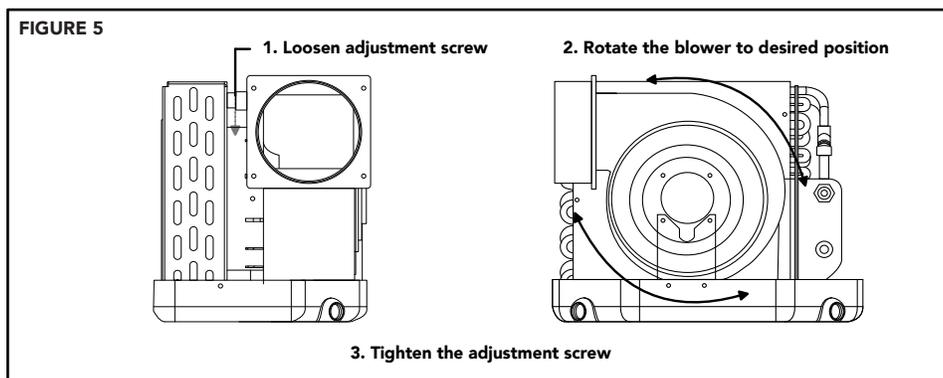
4. Your unit comes with a separate non-slip isolator tape design to dampen the vibration caused by the operating unit. Proceed to place the tape on the base of the unit securely (See figure 3).



5. The four mounting brackets provided should be placed around edge of drain pan as equally spaced as possible. Secure a/c unit to a flat level mounting surface. Brackets are provided. Customer is to supply the necessary hardware such as screw/bolts, and washers (See Figure 4).



6. If needed, loosen the lock screw on the blower, and secure the screw tightly once the blower is adjusted at the optimal position with the most direct airflow discharge (See figure 5).





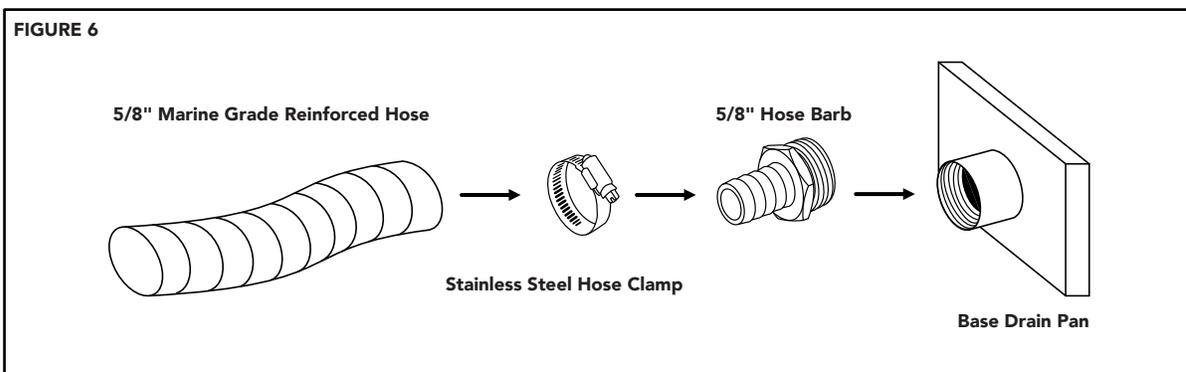
CARBON MONOXIDE HAZARD

Do not terminate condensate drain lines within three feet (91 cm) of any outlet of engine or generator exhaust systems, nor in a compartment housing an engine or generator, nor in a bilge, unless the drain is connected properly to a sealed condensate or shower pump. If you have any questions or concerns call CTM Marine customer service.

Condensate Drains

Drain lines must be installed at both the condensing unit and the evaporator unit. It is highly important to route the condensate drain to a sump pump. **DO NOT** route directly to the bilge.

Place the hose barbs (supplied) in their respective drain holes on the base pan of both the condensing and the evaporator units. Secure the drain hose with a stainless steel hose clamp. Route drain hose to a proper collection point (See figure 6).



Copper Line Sets

The refrigerant circuit from the evaporator to the condensing unit must be connected with refrigeration-grade tubing (see figure 7). You must use the proper diameter and wall thickness specified for R-410A pressures (See Table 1).

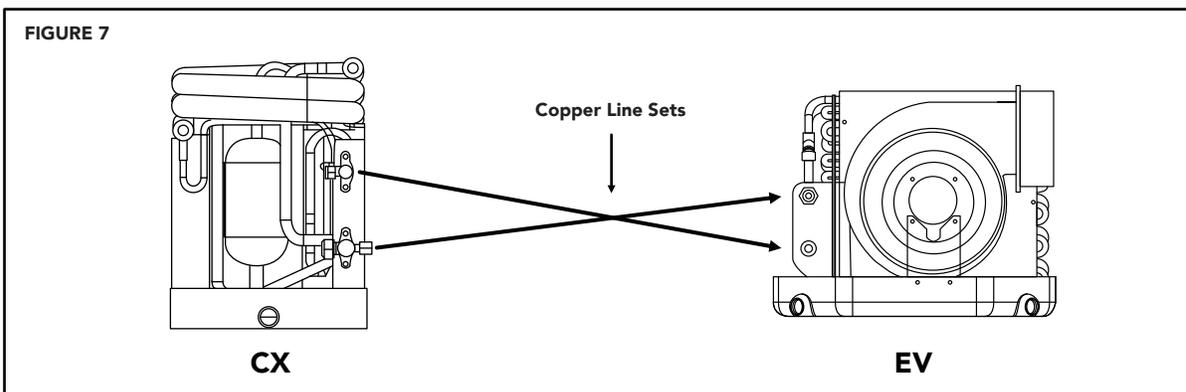


TABLE 1

Tube OD (in/mm)	Up to 1/2 / 12.7	5/8 / 15.88	3/4 / 19.05	7/8 / 22.22
Wall Thickness (in/mm)	0.028 / 0.711	0.035 / 0.889	0.042 / 1.067	0.045 / 1.143



All refrigerant lines should be capped to prevent moisture and dust from entering until the flare connection is made to the evaporator and condenser base valves.

Lines must be bent using a properly conceived tool to avoid any sharp bends or kinks. Any section of kinked or crushed copper pipe must be replaced. There should be no vertical loops in the copper lines. Any excess tubing must be coiled in a horizontal plane and secured to prevent vibration.

Make sure tubing is clear of bilge water, steering cables, and similar obstructions. Secure tubing approximately every 12 inches (30 cm) to prevent chafing. Do not crush the insulation.

When multiple evaporators are used, ensure that the double, triple or quad fittings are properly sized to connect proper tubing to each CX evaporator unit and provide the required refrigerant flow to each one.

Refrigerant Line Sizing and Connection Sizes

Refer to Table 2 for the required tube sizes. Using smaller refrigerant lines may decrease performance of the units.

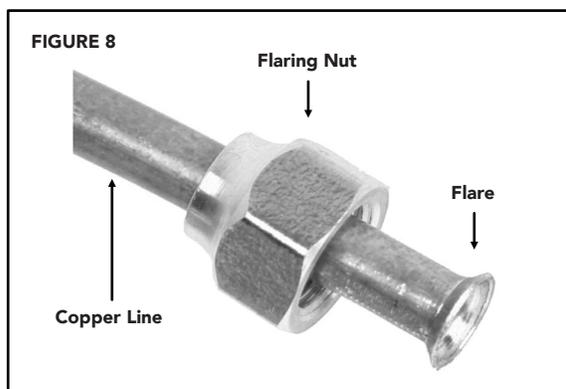
TABLE 2

Condensing Unit Size (BTU)		16,000	24,000	36,000
Evaporator Unit Size (BTU)	12,000	16,000		
Discharge Connection Size (in/mm)	¼ / 6.35	¼ / 6.35	¼ / 6.35	3/8 / 9.52
Suction Connection Size (in/mm)	3/8 / 9.52	½ / 12.7	½ / 12.7	5/8 / 15.87

Single Thickness Flare

The liquid and the suction lines must be flared and connected to the base-mounted valves. The flares of the refrigeration units must be perfectly flared (see figure 8).

Unsuccessful installations are usually due to faulty flare connections. Make sure to check your flaring tool is in perfect condition, ensure your cone does not have any damage. If the cone is damaged or scratched do not use it. You should not attempt to use a plumbing tool, use a refrigeration flaring tool instead.



 Installation of CTM Marine CX and EV units should be performed by a professional and an EPA certified technician. Failure to do so may result in an unsuccessful installation of the system, and loss of warranty.

 Be careful not to allow any contaminants to fall inside the copper tubing as this may cause failure of the system.

 It is advisable that when the condensing unit needs to be replaced, you replace the evaporator unit (EV) as well. This will avoid any residues in the system that may cause the evaporator and consequently the whole system to fail. Failure to do so, will void 1 year of the standard 2 year warranty of both the CX and EV units.

 Make sure the ends of tubing are sealed before and during installation, as the compressors POE oil is very sensitive to moisture absorption, which could lead to compressor failure. The system should not be open to atmosphere any longer than necessary.

 **R410A REPLACEMENT**
If line set is reused from previous system, drain and flush the mineral oil from it, completely. Use a proper solvent to clean the system. Failure to do so may cause the system and units to fail.

Pressure and Leak Checking

After all the line-sets connections are made you need to do a pressure and a leak check of the system. **DO NOT** open the base valves until the system is ready for operation. These valves are in the front-seated position to retain the refrigerant in the unit.

Pressure Test

It is commonly believed leaks can originate from the unit, but in reality they could also come from the gauge manifold hoses too. Always make sure the manifold hoses and gaskets are not damaged, and fittings on the manifold are tighten.

STEP 1: Make sure hand valves on the gauge manifold are closed.

STEP 2: Connect both high and low side hoses of the gauge manifold to the condenser base valves. **DO NOT** over-tighten the nuts. Make sure the nuts are torqued no more than 7.5 ft. Lbs.

STEP 3: Connect a dry nitrogen cylinder to the gauge manifold and set it to 500 psig. **DO NOT** use compressed air or CO2 as they can add moisture and contaminate the system.

STEP 4: Open the hand valve from nitrogen cylinder slowly. Once the nitrogen tank's regulator is set, proceed to open the high-pressure valve on the gauge manifold.

STEP 5: Pressurize the refrigerant lines and the evaporator or evaporators to 500 psig. Open the hand valve on the nitrogen cylinder to reach the desired pressure.

STEP 6: Once the desired pressure is reached, monitor the gauge readings. Pressure should hold at least 15 minutes. If pressure holds and remains constant, close the nitrogen cylinder's valve, disconnect it from the gauge manifold and proceed with the **system evacuation process:**

To properly evacuate the system the preferred method is the **Deep Vacuum Method Procedure.**

 > Never use oxygen or flammable gases for leak testing of a refrigerant system to avoid the risk of fire and/or explosion which may cause serious injury or death.

> Make sure there is a pressure regulator and a pressure relief valve from the nitrogen cylinder line. **DO NOT** exceed 800 psi, poor flare line-set connections may rupture and cause fire and/or explosion which may cause serious injury and/or death.

> **DO NOT** exceed 500 psig when performing pressure testing. Higher pressure may cause explosion and damage the equipment.

> Always wear safety glasses and gloves when handling high-pressure nitrogen.

> Nitrogen should not be expelled into a confined space. Make sure gauge hoses are tighten before opening the nitrogen cylinder valve. Inhalation of nitrogen should be avoided.

> The mixture of nitrogen and refrigerant when in contact with a hot surface or flame could cause Phosgene Gas, which if inhaled may cause serious respiratory problems and/or death.

> If your skin or eyes come in contact with refrigerant, flush immediately and thoroughly with water. Wear gloves all the time.

 The CTM Marine Split System CX unit is shipped with the valve stem front-seated and caps installed. System should be completely evacuated before opening these valves.

Deep Vacuum Method Procedure

! Installation of CTM Marine split systems should always be performed by certified technicians. **DO NOT** attempt these procedures if you are not a certified technician. Failure to do so may cause the system and units to fail and warranty to be voided. More seriously, it can cause serious injury or death.

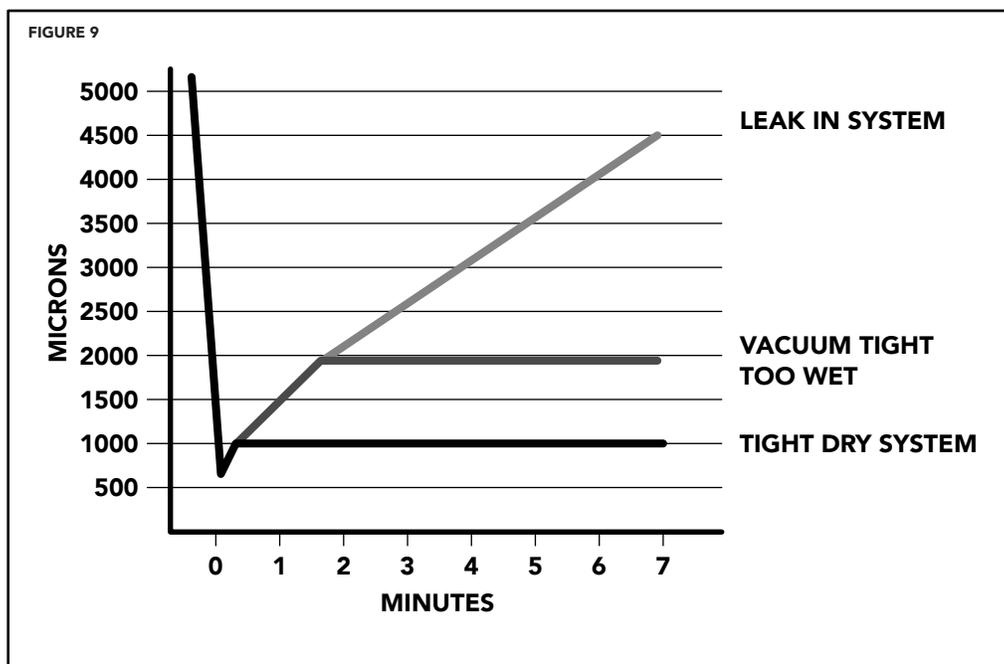
Make proper connections to start the Deep Vacuum Method Procedure. The equipment used is crucial for the success of this process. Ensure the pump being used is capable of pulling a vacuum of 200 microns.

Once all connections are done correctly, proceed to open the valves required to start the vacuum process.

Refer to Figure 9 for the Deep Vacuum Method. The goal is to achieve a constant pressure of not more than 1000 microns for a period of time between 5-10 minutes. If that is the case the system is properly evacuated and leak free.

If the pressure rises and holds at roughly 2000 microns, the system is too wet. Moisture is still present, so the pump should be turn on and continue the evacuation until moisture is removed and pressure holds at no more than 1000 microns.

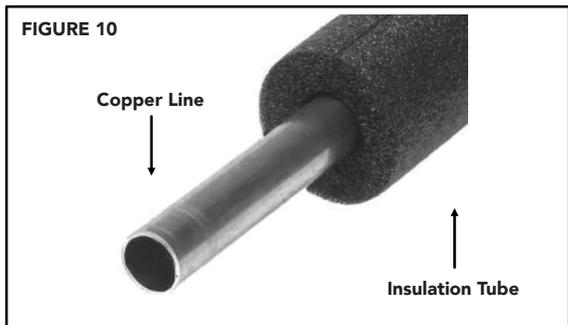
If the pressure rises above 5000 microns, the system has a leak. Turn off the vacuum pump and check for leaks. Make corrections and start the vacuum process again.



Copper Line Sets Insulation

Before insulating the copper lines, make sure there are no leaks. Both suction line and discharge line should be insulated for best results; However, the discharge line is not required to, unless the line is required to pass through an area where the temperature could reach 120°F (49°C). Then it's mandatory. **DO NOT INSULATE BOTH LINES TOGETHER.**

Use a ¾ inch tube insulation with an internal diameter that matches the tubing diameter (see figure 10, and refer to table 1 for tubing diameter on page 13).



Insulation tube joints should be glued to prevent air pockets and consequently condensation forming on the piping. Never use tie wraps/zip ties to secure the insulation as it may compress the insulation and cause condensation drips.

Avoid any copper or brass exposure on the line set, use insulation tape to wrap up any connections and ends.

Ducting & Air Grille Installation

Refer to table 3 below, for the minimum ducting diameter, and its corresponding minimum supply/return air grille area based on Evaporator capacity (BTU).

TABLE 3

Model No	EV12	EV16
Duct Diameter (inches)	5	6
Duct Area (sq. Inches)	28.3	38.5
Return Air Grille (sq. Inches)	140	168
Supply Air Grille (sq. Inches)	70	84

 The supply air duct should be installed as high as possible. This will ensure proper air flow and prevent short cycling of the system. At the same time, the return air grille should be installed as low as possible along with the evaporator unit (EV). Make sure there is at least 3" (76mm) of air circulation clearance if adjacent to a bulkhead or other obstructions (See Figure 2 on page 11).

Ducting



Good airflow is critical for the performance of the entire system. It is highly dependent on the quality of the ducting installation. The ducting should be run as straight, smooth and taut as possible minimizing the number of 90° bends (two 90° bends can reduce airflow by 25%).



CARBON MONOXIDE HAZARD

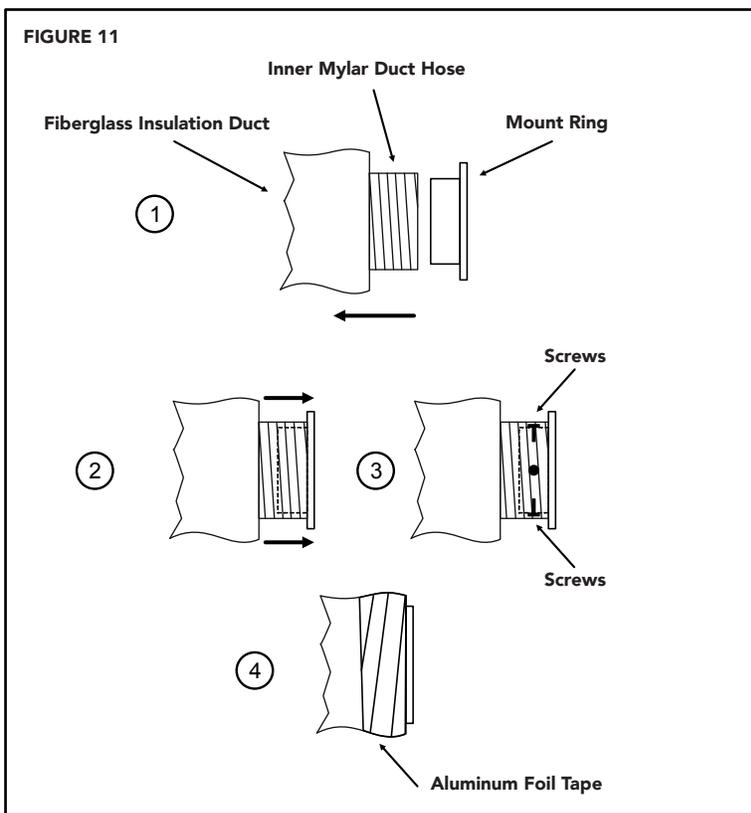
Do not route ducting through engine room or any area where it may be exposed to dangerous vapors or exhaust fumes. If you have any questions or concerns call CTM Marine customer service.



If you install a transition box, make sure that the total area of supply air ducts going out of the transition box is at least equal to the area of the supply duct going into the box.

The ducting should be appropriately sized. Make sure it is run as smoothly as possible, so make sure to keep bends and loops as low as possible. Secure the ducting to all possible surfaces to prevent moving while the boat is operating, but be aware of flattening the ducting as this will reduce the air flow. If any ducting shall pass through an area where temperatures are high, make sure it's insulated.

1. Slide back the fiberglass insulation duct to reveal the inner mylar duct hose.
2. Put the mylar duct hose around the mount ring.
3. To make sure the mylar duct hose doesn't slide out, screw 3-4 stainless steel screws through the duct hose into the mount ring. Make sure a few wires from the mylar duct are captured by the screws.
4. Slide back the fiberglass insulation duct and cover the inner mylar duct hose, and mount ring. Secure with high-quality aluminum foil tape or any condensation inhibiting tape (See figure 11).



Follow each one of the steps as explained on this manual, any deviation from the procedure explained herein constitutes improper installation of the unit and therefore waives and forever discharges CT Marine and its subsidiaries from any liability in connection to the installation; use; and functioning of the unit and any and all systems and parts connected to it.

Seawater System

Refer to the drawings below for an overview of how the seawater system should look like:

Consider the following instructions when setting up the seawater system of your air conditioning unit. Failure to follow this procedure will void the warranty:

1. Place a clam-shell type thru-hull fitting as far away from the water line as possible. Slots should be directed towards the bow to obtain positive pressure in the suction line.
2. Place a bronze seacock on the thru-hull fitting.
3. Place a seawater strainer **below** the level of the pump.
4. Connect the seacock and the strainer with a reinforced marine-grade hose.
5. The pump should be install at least 30 inches **below** the waterline, except when a self-priming pump is used.
6. Connect the strainer and the pump with a reinforced, marine-grade hose.
7. Connect the pump's outflow to the coil inflow (See page 5 to locate the coil inflow) with a 5/8 inch reinforced, marine-grade hose.
8. Connect the a/c unit discharge from the coil outflow (See page 5 to locate the coil outflow) with a 5/8 inch reinforced, marine-grade hose.

 > The a/c seawater system should have a dedicated thru-hull fitting for the pump.

> The inlet for the thru-hull, seacock, hose, and strainer should not be smaller than the pump inlet.

> The pump strainer assembly should be installed with a gentle upwards slope from the seacock to the pump.

> Keep all the piping as short as possible without kinks or loops where air can become trapped.

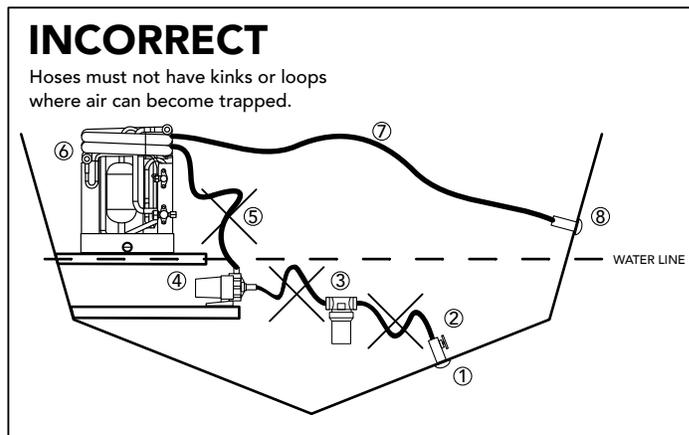
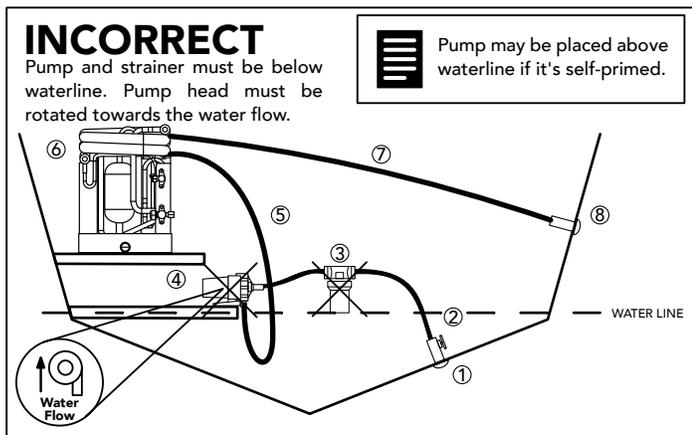
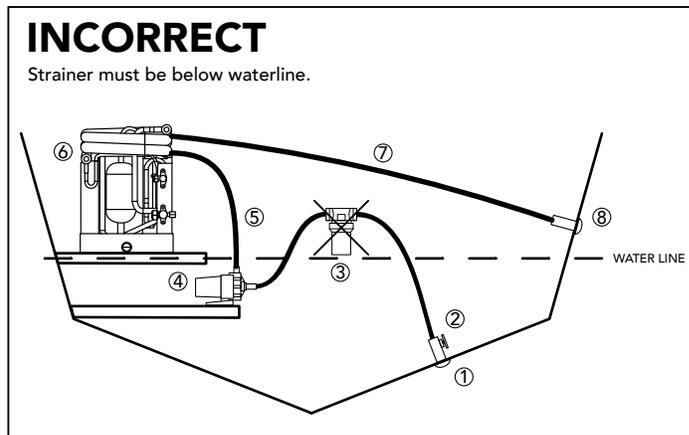
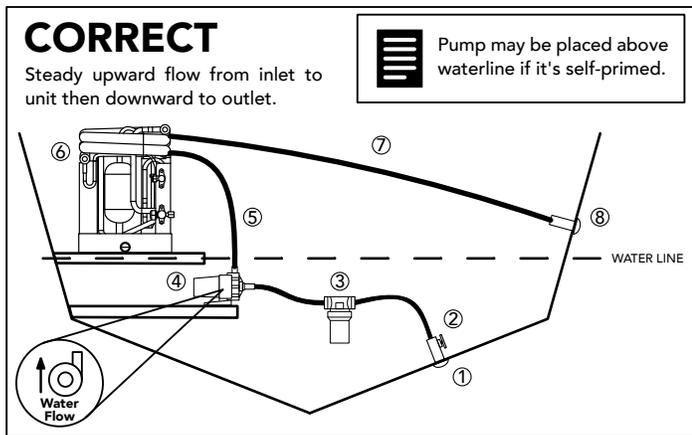
> Avoid 90° elbow fittings as much as possible.

> Ensure that the pump head is rotated toward the direction of water flow.

> Use seal tape on all threaded connections.

> Double-clip all hose connections with stainless steel clamps.

> Connect all metallic parts in contact with seawater to the vessel's bonding system.



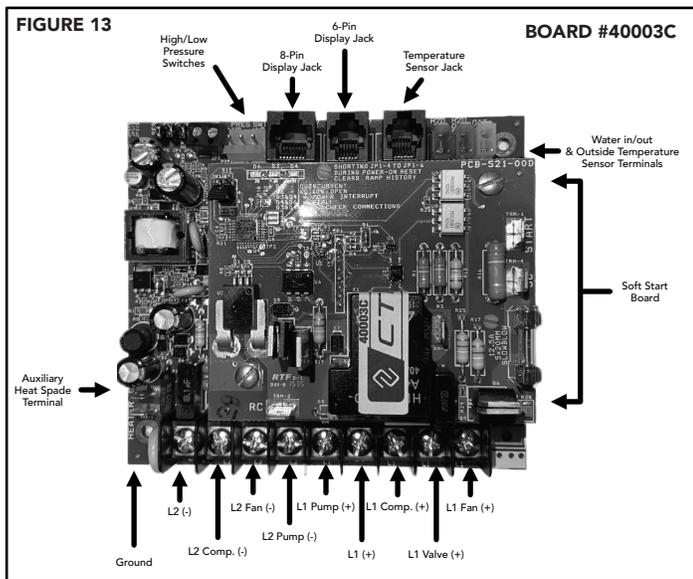
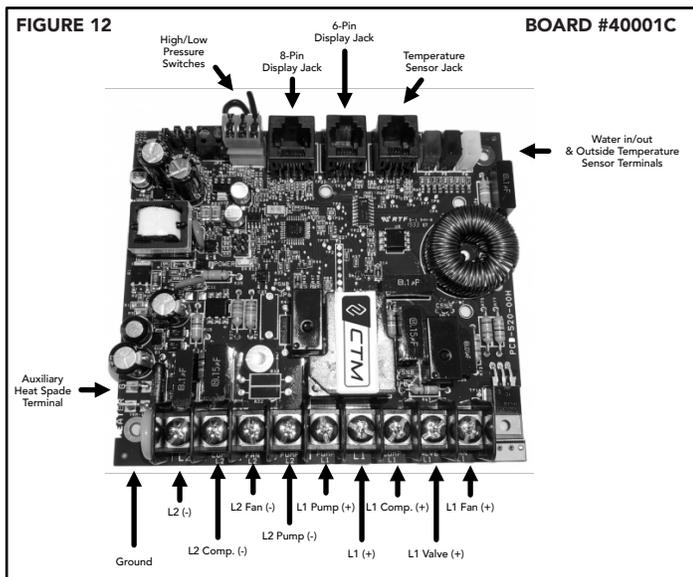
- | | | |
|----------------------|------------------|--------------------|
| 1. Thru-hull fitting | 4. Seawater Pump | 7. Coil Outflow |
| 2. Seacock | 5. Coil Inflow | 8. Seawater Outlet |
| 3. Strainer | 6. CX Unit | |

Electrical Connections

The following must be observed when making the electrical connections:

1. In accordance with ABYC standard E-8, or equivalent, the Alternating Current (AC) ground (green wire) must be connected to the ground terminal (marked "GRND") on the AC input terminal block of the unit(s) for supply.
2. Connections between the vessel's AC system grounding conductor (green wire) and the vessel's Direct Current (DC) negative or bonding system should be made as part of the vessel's wiring, per ABYC standard E-9, or equivalent.
3. When servicing or replacing existing equipment that contains a chassis mounted ground stud, the service person or installer must check the vessel's wiring for the existence of the connection required in item 2 above.

Figure 12 shows the Standard U-Board. Figure 13 shows the Soft-Start U-Board.



> Make sure all metallic parts in contact with saltwater are properly grounded and bonded properly to the vessel's bonding system. Failure to follow these instructions will void the warranty.

> Each a/c unit installed requires a dedicated circuit breaker. For installations of two or more units sharing the same pump, the pump wires will be connected to a pump relay panel (PRP), which in turn has its own dedicated circuit breaker sized for the pump (20 A max).

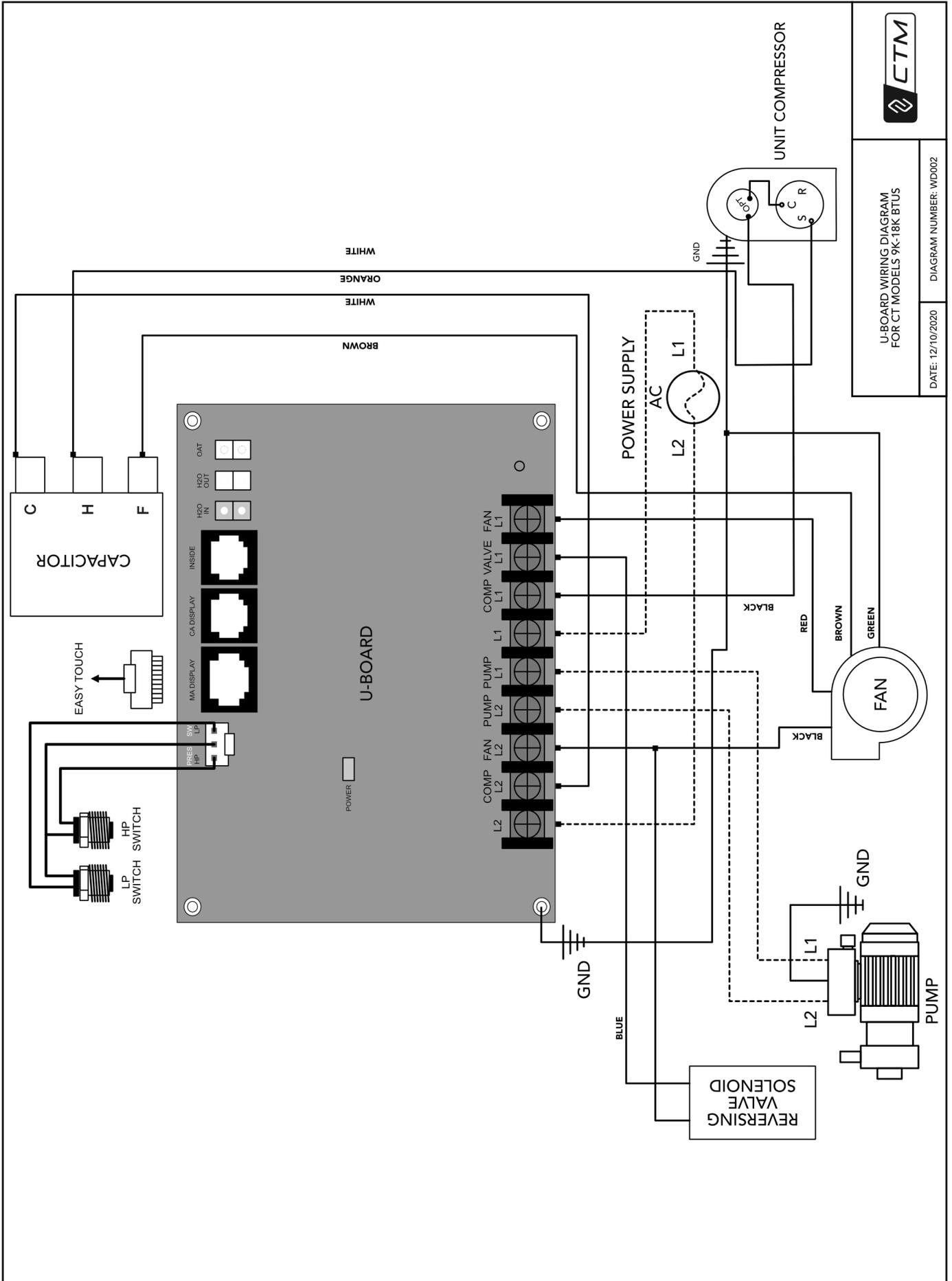
> Electrical connections in the bilge and/or below the waterline should be sealed with heat shrink type butt splices.

> Field wiring must comply with ABYC electrical codes. Power to the unit must be within the operating voltage range indicated on the data plate. Properly sized fuses or HACR circuit breakers must be installed for branch circuit protection. Refer to the data plate for max fuse/circuit breaker size (mfs) and minimum circuit capacity (mca).



> ABYC standards are available from :

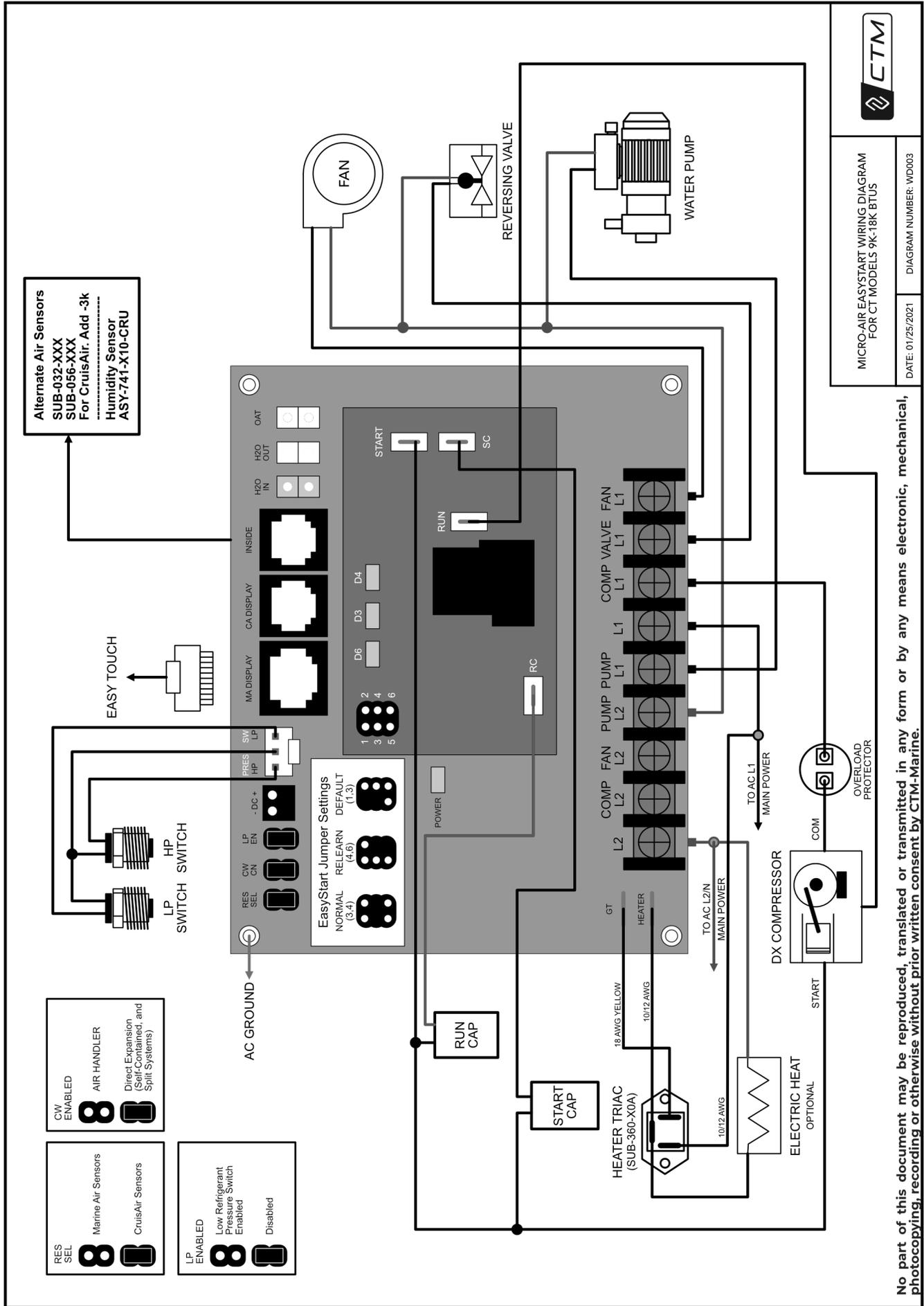
American Boat and Yacht Council
 613 Third Street, Suite 10
 Annapolis, MD 21403
 Phone: (410) 990-4460
 Fax: (410) 990-4466



CTM

U-BOARD WIRING DIAGRAM FOR CT MODELS 9K-18K BTUS

DATE: 12/10/2020 DIAGRAM NUMBER: WD002



Alternate Air Sensors
 SUB-032-XXX
 SUB-056-XXX
 For CruisAir. Add -3k
 Humidity Sensor
 ASY-741-X10-CRU

RES SEL Marine Air Sensors
 CruisAir Sensors

LP ENABLED
 Low Refrigerant Pressure Switch Enabled
 Disabled

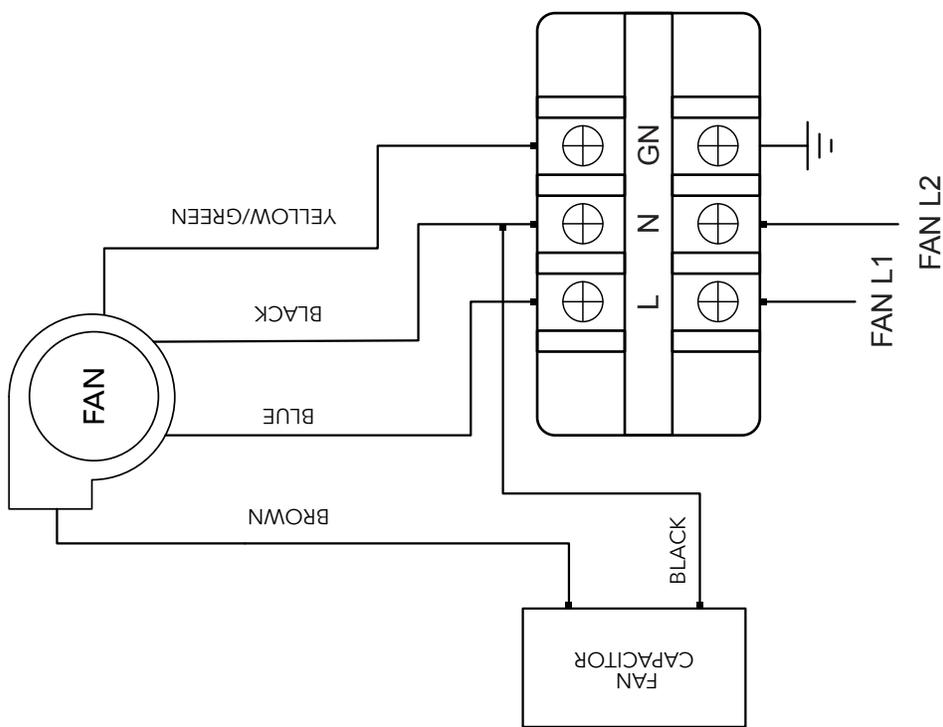
CW ENABLED AIR HANDLER
 Direct Expansion (Self-Contained, and Split Systems)

CTM

MICRO-AIR/EASYSTART WIRING DIAGRAM
 FOR CT MODELS 9K-18K BTUS

DATE: 01/25/2021 DIAGRAM NUMBER: WD003

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ELECTRICAL BOX WIRING DIAGRAM
FOR EV MODELS 12K-16K BTUS

DATE: 01/25/2021 DIAGRAM NUMBER: WD004

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Follow each one of the steps as explained on this manual, any deviation from the procedure explained herein constitutes improper installation of the unit and therefore waives and forever discharges CT Marine and its subsidiaries from any liability in connection to the installation; use; and functioning of the unit and any and all systems and parts connected to it.



Display Control

CTM Marine Split System units are compatible with most thermostats currently in the market. Below are the most common thermostats displays used by major marine air conditioner manufacturers.

DISPLAY	MODEL	6-PIN CABLE	8-PIN CABLE
	Smart Touch / Easy Touch (wi-fi)	●	●
	SMXIR	●	
	Passport I/O		●
	Elite II		●
	SMXII	Needs Adapter #290340229	Needs Adapter #763100043

Starting-Up The System

⚠ When handling refrigerant, wear safety glasses, protective clothing, and gloves to protect yourself from injury. Don't expose refrigerants to the atmosphere during system repair or final disposal. Always turn counter-clockwise (Fully backseat) the valve stem before removing gage port caps and connecting/disconnecting manifold gauges hoses.

Charging System: Table Method

Table 4 below shows the refrigerant charge of each unit as shipped from the factory. Condensing units are supplied with a charge sufficient for the condenser and evaporator with 15 feet (4.57 m) of lineset.

TABLE 4

UNIT	Factory Charge (oz)
16K BTU	15.9
24K BTU	28.2
36K BTU	35.3

Refer to table 5 if lineset is longer than 15 feet (4.57 m). For lineset lengths in between the lengths specified on table 5, run down or interpolate the amount of ounces.

TABLE 5

Unit	20 Feet	25 Feet	30 Feet	40 Feet	45 Feet	50 Feet
16K BTU	1.3	2.6	3.9	6.5	7.8	9.1
24K BTU	3.2	6.4	9.6	16.0	19.2	22.4
36K BTU	3.4	6.7	10/1	16.8	20.1	23.5

Charging System: Sub-cooling Method

Charge refrigerant in cool mode steady to achieve between 1-4 °F at condensing unit valve. Alternatively, if there is a pressure port at the evaporator's inlet, charge to achieve between 5-10 °F of sub-cooling just upstream of the evaporator. DO NOT overcharge the system with refrigerant. Failure to do so may result in failure of the system. Watch for high head pressure, high running current, and high sub-cooling. If you notice one of the above, the system may be overcharged.



⚠ AVOID COMPRESSOR DAMAGE AND/OR PERSONAL INJURY

- > Never overcharge the system with refrigerant.
- > Never operate the unit in a vacuum or with negative pressure.

AVOID COMPRESSOR DAMAGE AND/OR PERSONAL INJURY

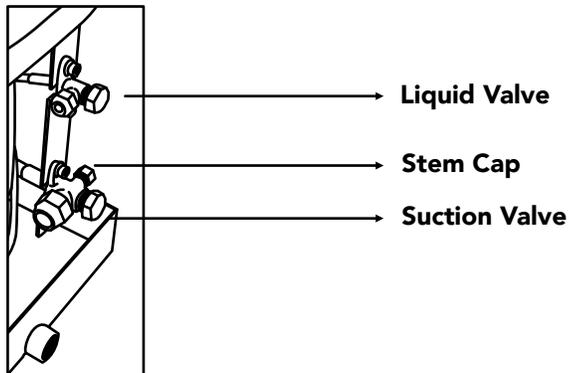
- > Never overcharge the system with refrigerant.
- > Never operate the unit in a vacuum or with negative pressure.

Factory Refrigerant Charge Release Into System



Use certified refrigerant that meets ARI standard 700. Using repurposed refrigerant may cause system failure and will void the warranty.

STEP 1: Remove the service valve stem cap on the suction valve.



STEP 2: The liquid line valve can be opened after successful evacuation. Rotate it counterclockwise to the mid-seated position. As the refrigerant passes through the metering device, the pressure rises rapidly on the high-side gauge followed by a steady rise on the low-side gauge.

STEP 3: Open the suction-side base valve to the mid-seated position. During the process of the unit being run, the system pressures can be monitored and additional refrigerant can be added as necessary.

System Start-up

STEP 1: Connect the manifold gauge set hoses to the service valves and make sure the service valve stem is back-seated.

STEP 2: Half-turn the base valve stem clockwise, to start getting pressure readings by the manifold gauges.

STEP 3: Close the electrical disconnects to energize system.

STEP 4: Set the cabin thermostat to "cool" mode and the fan control to "auto" or "on". Set the temperature control well below room temperature. Operate the system for 20 minutes. Check the system refrigerant charge.

Adding or Removing Refrigerant Charge

If additional refrigerant charge is required proceed with the following steps:

STEP 1: Connect the center hose from the gauge manifold to the refrigerant charging cylinder. The cylinder valve should be opened and the hose cleared out of all air.

STEP 2: Add refrigerant through the low side of the gauge manifold in small amounts. Small amounts of liquid refrigerant added will prevent slamming the compressor.

STEP 3: Rotate the liquid valve fully counter clockwise or to the back-seated position. Open both gauge manifold valves to allow the residual liquid and vapor in the hoses to return into the suction side.

If less refrigerant charge is needed, refer to Table 4 and Table 5 to determine the installed liquid line charge needed and recover the excess refrigerant.

STEP 4: If the system is performing properly, proceed to fully backseat the liquid valve. Remove the manifold gauge from the liquid valve.

STEP 5: Open both gauges to pull refrigerant to low side pressure.

STEP 6: Remove suction side hose.

STEP 7: Backseat the suction valve and torque valve to the values in Table 6, below.

TABLE 6

Tubing Size	Front/Back Seat Stem (Foot-Pounds)	Flare Nuts (foot-Pounds)
1/4"	10	9
3/8"	10	17
1/2"	16	30
5/8"	16	40
3/4"	22	52

STEP 8: Put back all service port cores and caps. Torque caps to 10 foot pounds.

STEP 9: Make refrigerant leak test on the valves and sweat connections.

STEP 10: Adjust thermostat to desired temperature.

Troubleshooting

Always refer to the user manual of your digital control for troubleshooting as well.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
System won't start	EV handler circuit breaker is OFF.	Turn circuit breaker ON at the main vessel's panel.
	Wrong wiring terminal strip	Check the wiring diagram and make the necessary corrections
	Input-line Voltage is insufficient.	Check power source, either shore or generator power for proper voltage. Check wiring terminals for proper sizes and connections. Verify with a volt-meter that power at the unit matches the power source's voltage.
Fan is not running	Refer to the troubleshooting section of your digital control manual	
Unit is not cooling	Temperature set point.	Lower temperature to desired temperature on display control.
	Obstructed seawater flow	Clean seawater strainer, check for any obstructions at scoop thru-hull inlet, and check for good steady flow from overboard discharge.
	Seawater pump may be air-locked	Remove hose from pump discharge to purge air from line.
	Loss of refrigerant gas	Check unit for leakage and call an certified technician.
	Seawater temperature too high for cooling.	Seawater temperature will directly affect the efficiency of your unit. Your unit will effectively cool your boat with seawater temperatures up to 90°F (32.2°C).
	Fan coil is iced	Refer to the troubleshooting section of your digital control manual
	Fan is not running	Refer to the troubleshooting section of your digital control manual
	Seawater Plumbing is air-locked	Make sure the seawater plumbing system is properly installed per the instructions in this manual.
	High-Pressure Switch is open due to improper seawater flow	Strainer or intake may be plugged, seacock may be closed. Check seawater hose for kinks or collapses. Verify pump operation.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Unit is not heating	Temperature set point.	Lower temperature to desired temperature on display control.
	Wrong wiring terminal strip	Check the wiring diagram and make the necessary corrections
	Obstructed seawater flow	Clean seawater strainer, check for any obstructions at scoop thru-hull inlet, and check for good steady flow from overboard discharge.
	Seawater pump may be air-locked	Remove hose from pump discharge to purge air from line.
	Loss of refrigerant gas	Check unit for leakage and call an certified technician.
	Seawater temperature too low for heating.	Seawater temperature will directly affect the efficiency of your unit. Your unit will effectively heat your boat with seawater temperatures as low as 40°F (4.4°C).
	High-Pressure Switch is open due to improper seawater flow	Strainer or intake may be plugged, seacock may be closed. Check seawater hose for kinks or collapses. Verify pump operation.
	High-Pressure Switch is open due to high seawater temperature	The unit may cycle on high pressure if seawater temperature is above 55°F (12.8°C), increase fan speed.
	Unit is in "cool only" mode, or reversing valve may be stuck.	Tap reversing valve lightly with a rubber mallet while is in heat mode. Call a certified technician if this doesn't work.
Low Airflow	Airflow is blocked	Remove obstructions from the return air stream. Clean return-air filter and grille. Check crushed or obstructed ducting.
	Fan speed set to manual low	Set fan speed to desired speed.
Fan coil is iced	Thermostat set too low.	Raise temperature
	Improper flow	Remove obstructions from the return air stream. Clean return-air filter and grille. Check crushed or obstructed ducting.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Fan coil is iced	Supply air is short-cycling	Redirect supply air so that is not blowing into the return air stream. Check and seal any leaks in ducting.
	Humidity too high	Close hatches, doors, portholes, to minimize humidity inside the air conditioned cabin.
	When nothing else works	Switch to heat mode to defrost fan coil or use hair dryer.
Water coil is iced in the heating mode	Seawater temperature is below 40°F (4.4°C)	Shut down system to prevent damage to the condensing unit. Allow coil to defrost.
System runs continuously	Temperature set point not properly set	Too low for cooling or too high for heating. Adjust
	Portholes, hatches or doors open.	Close all portholes, doors and hatches.
	Seawater temperature too high for cooling or too low for heating	Check optimal operation seawater temperatures
	Improper air sensor location	Check your specific digital control troubleshooting section.

Go to

<http://ctm-marine.com/support/troubleshooting/>

or scan the code below with your smart device to visit the interactive

Thermostat troubleshooting page.



CTM LIMITED NON-TRANSFERABLE WARRANTY

CTM Marine (hereinafter referred to as CTM) warrants their Air Conditioning Systems against defects in material and workmanship for two (2) years effective at the time of installation or vessel registration date for original equipment installation (OEM). This warranty period may not exceed two (2) years from the original date of sale by CTM. CTM warrants the compressors and compressor brackets against defects in material and workmanship for one (1) year effective at the time of installation or vessel registration date for original equipment installation (OEM). This warranty period may not exceed eighteen (18) months from the original date of sale by CTM. This warranty period may be superseded by written contractual agreements.

Replacement parts are covered for six (6) months or the remainder of the original warranty period, whichever is longer.

The intent of the CTM warranty is to protect the original end-user of the Air Conditioning System from defects and provide free repair and replacement of defective parts in the manner provided herein. During the warranty period, the exclusive remedy will be for CTM, at their discretion, to repair or replace those parts which are demonstrated to be defective in material or workmanship.

While warranty is provided to the "original end-user", it is to be administered and serviced through an authorized CTM dealer in accordance with the CTM warranty policy or contractual agreement between CTM and a second party. To locate the nearest CTM authorized dealer for warranty service, visit <http://www.ctm-marine.com> or call (800) 766-5256 in USA.

Limitations: CTM specifically excludes and limits warranty from the following:

- Normal wear of service parts: (Filters and fuses are not covered)
- Removal and replacement of Air Conditioning System.
- Damage to product in transit. All claims must be filled with carrier.
- Improper installation, which is not in accordance with valid, supplied installation instructions or approved OEM applications.
- Deterioration due to normal wear, corrosion, abuse, damage, accident, improper storage or operation, lack of reasonable maintenance.
- Modification of product by alteration, use of non-genuine parts or repair by unauthorized personnel.
- Economic loss for expenses related to travel, vehicle disability, personal injury or other incidental or consequential damages arising from any breach of this expressed warranty.

Product registration:

The Air Conditioning System can be registered by visiting www.ctm-marine.com/warranty/. A proof of purchase is required for all Air Conditioning Systems that are not registered.

THIS WARRANTY IS NON-TRANSFERABLE. IMPLIED WARRANTIES INCLUDING THAT OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY LIMITED TO THE DURATION OF THIS WARRANTY. CTM DISCLAIMS ANY LIABILITY FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES.

SOME STATES AND CANADIAN PROVINCES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSIONS MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY AMONG STATES AND CANADIAN PROVINCES.

CTM RETAINS THE RIGHT TO MODIFY THESE WARRANTY TERMS WITHOUT NOTICE IN ORDER TO COMPLY WITH POLICY OR LAWS GOVERNING WARRANTY ISSUES IN STATES OR COUNTRIES HAVING SPECIFIC REMEDIES DIFFERING OR ADDITIONAL TO THOSE DESCRIBED WITHIN THIS DOCUMENT.

**You can register your CTM unit or file a claim
by visiting www.ctm-marine/warranty
or by scanning the code below with your smart device.**

