OZEFRIDGE

Ozefridge Refrigeration Systems.

With A490 & AW490 DC Condensing units.

Installation & Operators Manual.

12VDC (24VDC or 115/240VAC with optional converter

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Cruiser Services

Supplying the gear that lets you Go Cruising, Not Camping

OZEFRIDGE-USA Marine Refrigeration

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NOTE: With every Ozefridge US order there is a SPARE control module, you will find with the packaging. This allows you to have spare in the event of a failure. Store in a dry locker for future use as needed.

SPARE INCLUDED

1: Sure-Thaw Controller.
2: Fault LED indicator.
3: On-Sleep switch.
4: Auto-Bypass switch.
5: ECO2 Power Manager
6: Air/ Water switch.
7: Internal wiring Fuse.
8:12V Power in & spike arrester.
9A & 9B. Water Nipples. (AW490)
10: DC out. Cycles with compressor
11: Pump supply terminals.
12: Temp Probe Terminals.
13: Condenser Fans
14: Mount holes under Fans
15: Suction service valve
16: Suction connection
17: Suction valve cover.
18: Liquid service valve.
19: Liquid line connection
20: Liquid valve cover

A: Raise/ lower Buttons
B: Compressor On / Off indicator.
C: Eutectic temperature read out.
D: Set button (Ignore other)
E: Fault indicator. See setting details, readouts etc., later in this manual.
F: Sleep / On switch
G: Manual / Auto switch
H: ECO2 On / Normal (off) switch
I: Pump + Hi/ Lo condenser speed

NOTE: The grey twin cable running inside black insulation is a spare for powering a light or fan etc., if needed. (2 amp maximum)

PANEL READ OUT SETTINGS-REFER BACK TO THIS AT START UP. P 2

Panel Control Read Out Set Up:
Press and hold the “SET” button until “E1” appears (about 6 seconds).
Press the “UP” or “DOWN” button to change.
Press the “SET” button to move to the next parameter.
Once all parameters have been set correctly, leave the buttons untouched and let the controller time out (about 6 seconds), the controller will automatically store new settings.

Parameter codes, recommended settings and meaning:
E1 = -25°C (lower set point limit)
E2 = 30°C (higher Set point limit)
E3 = 8 (hysteresis = difference between cut in and cut out temperature)
E4 = 1 (compressor start delay in minutes)
E5 = -3°C (eutectic temperature reading offset)
E6 = 0°C (condenser temperature reading offset)
F1 = 20 (max defrost duration in minutes) NOT APPLICABLE
F2 = 0 (defrost interval time in hours) NOT APPLICABLE
F3 = 20°C (defrost termination temperature) NOT APPLICABLE
F4 = 00 (display during defrost: 00=normal display, 01=last value before defrosting) NOT APPLICABLE

CF = °C (temperature unit of measure: °C- Celsius, °F= Fahrenheit)

UNPACKING & PREPARING FOR INSTALLATION. P 3

Each system has a refrigeration unit, and the eutectic plate(s) packed in the shipping box. (Shipping box may also contain additional options: Water cooling pump kit, Remote panel, Spare components or other optional extras if applicable)
Take care dismantling packaging and avoid handling the eutectic plate by the black insulation covering that is housing the refrigeration lines, these lines can be damaged. (Some boxes have special unpacking instructions on the inside.)

POINTER:

Leave the black insulated lines coiled until you are ready to install the system.
If the cabinet area is small, make a template of the eutectic plate mounting holes.
Use the template to mark and prepare your mounting holes.
It is usually best to locate the plate as high as possible within the cabinet box area.

POINTER:

The following tools will be required for the installation process:

- Material for marking a template / marking pen.
- 11mm wrench
- 16mm or 17mm open end wrench (depends on flare nut size)
- 19mm open end wrench
- 5mm Allen key
- Philips and blade screwdrivers.
- Line saddles and fixings for the eutectic plate to unit lines.
- Dish washing detergent for leak bubble testing. (Liquid)
- DC cable:(>2mt/6.5ft; 4mm²/#12)(>4mt/13ft; 6mm²/#10) >6mt/20ft; 10mm²/#8
- **Install a 15 amp fuse in-line near the DC *power supply source. (*Battery)**
- Eutectic plate stainless steel fixings. If the one supplied will not work for your layout.
- Silicon (non-acetic), Sikaflex or other sealant.
- Cleaning cloth
- PINK Eutectic solution (see page 6) DON'T FOGET TO ADD TO PLATE(S)

Pointer:

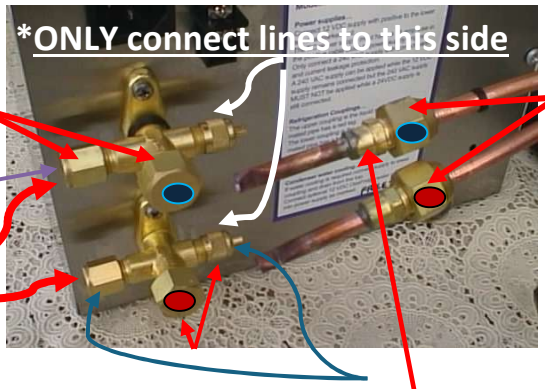
Plan how the lines should feed into and exit the cabinet box-where a >35mm/1 3/8" diameter hole can be installed on cabinet box wall. Prepare the refrigeration unit position and plan the line set run.

CAUTION: Twin plate systems must remain relative to each other until the final mounting inside the cabinet box.

INSTALLING THE COMPONENTS **P 4**

1: After establishing a cabinet box exit point for the line set, make a 35mm/1 3/8" hole.
2: Insulate this hole inner diameter to prevent damage to the line set black insulation.
3: With an assistant holding the eutectic plate(s), carefully unwind the lines.
4: Feed the coupling end into the fridge / freezer and out through the 35mm/1 3/8" exit hole. (Do not remove caps at this point)
5: Continue feeding the couplings and line set until they reach the condensing unit location, and the plate (plates) are also in position.
It is best if the refrigeration lines don't rise greater than 1500mm/5' to the AW490 condenser.
6: Gently work the copper refrigerant lines, with thumbs in an outward manner to form bends. Don't bend or stress the lines near their ends.
7: Fix plate(s) to the cabinet box wall, as high as possible.
8: Locate condensing unit position and work lines toward their respective couplings.
See below: (Color coded)
9: With the pipes *presenting horizontally to their respective couplings and sufficiently apart, they are now ready to connect. (*See picture below)

CAUTION:



10: Remove each service T valve's two dust covers. **(Interchangeable covers)**

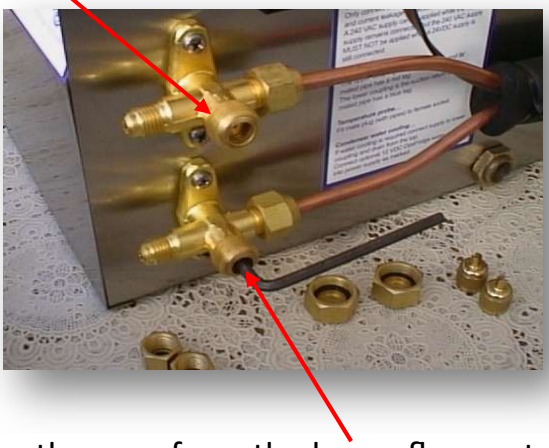
Pointer: ***(Keep the two caps to use if disconnecting later)***

11: Next, the following steps should be completed continuously & quickly. ……
With a 16mm wrench holding the flare nut, remove the upper cap. (Some safe holding charge gas will escape as you remove cap). Quickly screw 'blue' flare nut onto the upper T valve with fingers then tighten with wrench.
12: When the wrench has tightened to firm add a quarter turn.

NOTE: Caps /covers with 'O' rings should be firmly finger tightened only.

***Follow the instructions above and always refit cover-caps ASAP**

13: Next use the Allen key to fully open the upper service T valve counterclockwise until firm against the outer seat. Refit dust cover cap nut.



14: Now remove the caps from the lower flare nut, RED, fit flare nut to the lower service T valve and tighten with a wrench.
15: Use the Allen key to fully open this lower service T valve. RE-fit cover cap nut.
16: The condensing unit's refrigerant gas is now open to the entire system and ready to operate.
17: Now test for gas leakage by mixing dish wash detergent with an amount of water and use it to coat onto the couplings and dust caps. Do this in good light and watch for any very tiny bubbles. If present, tighten fittings slightly more.
18: Attach/anchor the insulated black line set to prevent line and coupling movement.
19: Connect a 12volt DC supply cable to the A490 or AW490's screw terminals 8. (See page 3 for cable sizes). The positive (red) connects to the RH (red) connecter.
Connect the optional 115/240VAC converter power supply if this is to be utlized.
20: Connect the temp sender wires onto their terminals (Page 2 number 12)
21: Connect water pump supply line to the AW490 condenser inlet 8mm nipple if water cooling is being used. AW490: Connect pump power to terminals number 11. Only recycling water from a freshwater tank is advised. Do not use raw water (See page 11)
22: Now connect the other end of the 12volt DC supply cable to battery or power supply switch and you are ready for startup and fine-tuning...

POINTER:

Having the lines horizontally will make coupling easier. (See picture above). Line connecting flare nuts should spin on freely by hand initially and then tighten with wrench. NEVER use sealant or tape on the line connections.

READY TO RUN BUT FIRST: EUTECTICS & PHASE CHANGE. P 6

POINTER:

To set up the Ozefridge system correctly it is best to first understand the basics of 'phase change, eutectics and the function of the Sure-Thaw monitoring and control system.
Process explanation:

When water changes from liquid to a solid (freezes) or when it thaws back into a liquid, it dissipates/absorbs more than eighty times the thermal energy that it required to alter the temperature up or down one degree while remaining as a liquid. (During phase change)

This change from a liquid to a solid or back to a liquid again is called 'phase change'. Simply: freeze – thaw – freeze – thaw – freeze etc.

Using this **latent heat** activity allows a large amount of thermal energy to be stored when the system is running, this stored energy is then available to maintain a constant cabinet box temperature when the condenser is in off cycle. Resulting factors = long run cycle and long off cycle.

The term 'eutectic solution' refers to the liquid used in the eutectic plate/s as a phase change medium.
If water was used as a eutectic solution, it would have a phase change temperature of approximately 0°c/32°f.

Note: All eutectic plate reservoirs are supplied dry, fill as follows:

To use the Ozefridge system in a cabinet box as a refrigerator requires a **eutectic solution to be added** with a phase change at approximately minus 5°c or 23°f.
(This relates to a mix of 10% PROPYLENE glycol (pink) with 90% pure water)
Using the Ozefridge system as a freezer requires a phase change at a point between minus 16°c to 20°c / 3°f to -4°f .
(This relates to 25% PROPYLENE glycol (pink) with 75% pure water) **solution.**

Eutectic Plate approximate Capacities:
P53-35-4 mix 2.8 Liters, P53-35-6 mix 5.0 Liters
P40-33-4 mix 1.6 Liters, P40-33-6 mix 2.7 Liters
P33-29-4 mix 1.1 Liters, P33-29-6 mix 1.9 Liters

Pointer:

Suggested eutectic mix to add to eutectic plate reservoir:
Start with a small container of *concentrated auto anti-freeze PROPYLENE glycol (pink radiator coolant, *approximately 100% glycol) then add clean water to provide the phase change blend ratio suggested above.

START UP AND TUNING P 7

1: First fill the eutectic reservoir to within *30mm/1 3/16" of the top with a premixed eutectic solution. Refit plug loosely. (*40mm/1 ½" for portrait models)
2: Leave brass filler plug loose until plate(s) are frozen, then tighten.
3: Suggested mix should have a freeze point of approx. minus 6°c/42°f for a refrigerator and minus 18°c/-1°f for a freezer. The suggested medium starts with concentrated PROPYLENE glycol (pink) Available at an auto parts store. Suggested mix: See page 6.
4: Note that comparable products are slightly toxic (GREEN), please read their label before using. We recommend only using food grade of Glycol (PINK).
5: With the reservoir/s filled, connect and switch on the 12 VDC power supply.

Pointer: If the buzzer sounds, press any button on controller to eliminate.
6: Wait for the one minute controller delay at which time the unit should re-start. Or switch on manual (by-pass) for testing.
7: The system will run for several hours to obtain a freeze of solution initially.
8: Until fine-tuned, the system will be slow, draw excess current and may default often. Best results will occur once the initial start-up has been completed.
9: Initial running and tuning should be on DC power where possible, switched to On, Auto, ECO2 to OFF and if equipped with optional water cooling system connected and operative.

TUNING: (Turn ECO to OFF until fine tuning is completed)

1: If the screen temperature is well below 0°c/32°f and the upper T valve (BLUE) is *frosting/ icing up, for a prolonged period before the required temperature is met, some reduction of the gas charge is needed. (****or*** *icy-cold / wet while temperature is reading just below or above 0°c/32°f*)
2: *To reduce gas charge, first remove the top **forward dust cover cap** (Page4) from the upper service valves with the unit running, then depress the service valve stem for 3 to 4 seconds. Only purge if and when icing etc occurs. Reinstall dust caps!
3: Allow continued operation, if after another 15-20 minutes icing is still accumulating, keep repeating perge process. (Possibly several times)
4: Icing / cold sweating may sometimes occur when within 1 to 2 degrees of the required temperature being achieved - this is considered acceptable.
5: Ideally icing should be present on the blue line tag at the top of eutectic plate but not on the (blue) suction line or T valve area on side of unit, when the system is within a degree +/- of set cut-off temperature.

POINTER: Temporary icing/frosting can occur in rough sailing conditions.

CAUTION: *Important note: The handling of R134a gas should be by a licensed tradespersons.

Your system is factory pre-set as a freezer, please re-program as required.
These settings are:
To operate as a fridge set (SET) = -10C/14°f (Using 10% Glycol to 90% Water)
To operate as a freezer set (SET) = -22C/-8°f (Using 25% Glycol to 75% Water)
Adjustment later of (SET) up or down may be required to suit your needs.

The Four Switches. (Normally use all in Blue position.)
(1) Sleep/ On: To switch on or off. Sleep. (Manual will over-ride).
(2) Manual/Auto: Bypasses all controls including on / off switch and causes the unit to run continuously. Bypass can be used if to run continuously perhaps while loading or use as a manual back up if the controller system fails.
(3) ECO Off/ ECO On: Off allows normal control and function. ECO2 On provides power supply management as described below…
(4) Cond Lo/ Cond Hi + water: Lo allows the unit to operate as an air-cooled system only on 1X fan. Hi for adding the second fan and water cooling (AW490 model only).
ECO2 (Fitted internally to all A490 & AW490 models)

POINTER:

1: Switch to 'ECO2' for maximum efficiency / less power cycling will occur.
2: Turn ECO to Normalize (Off) when on long term shore power or when fine tuning.

NOTE:

1: Refrigeration is also induced at times when shoe power is connected, reducing the demand later on battery storage by typically +40% or greater.
2: Whenever the DC supply rises above 13.3 volts (or 115/240VAC is detected) and the eutectic reservoir can take more freezing, the system will start. These functions are automatic with ECO2.
3: The ECO2 device also causes the eutectic mass to refreeze when DC power is abundant, keeping it within the colder 60% of the controllers' on-off settings.
4: Operating colder than minus 25C/-13°f can cause system stalling.

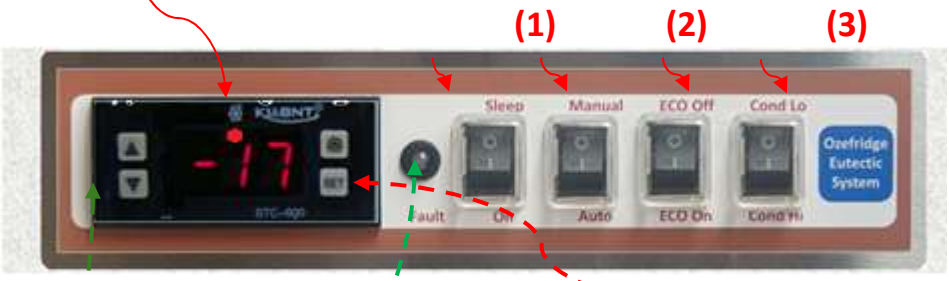
Fault Indicator LED. *Check voltage at unit while attempting to start.
The fault LED will indicate a problem with a sequence of flashes:
Flashes x 6 = *Controller/ electronic unit has a hardware failure.
Flashes x 5 = Thermal cut-out of electronic unit. (Check for faulty fan etc)
Flashes x 4 = Minimum motor speed error. (Very unlikely)
Flashes x 3 = *Motor start error. (Usually corrects itself. Leave running)
Flashes x 2 = Fan overload. (Faulty fan?.. replace)
Flashes x 1 = *Over or under voltage cut-off. (Voltage is <11.5 or > 17.0VDC

NOTE:

1: The LED may indicate at times other than indicating faults, such as when on start delay, when the power supply is erratic or prior to fine tuning.
2: Blinking red LED Below frost symbol of controller=start delay, solid = run.

SETTING THE CONTROLLER P 9

The Sure-Thaw controller is programmable to ensure that the Phase Change process operates correctly. (Cut off after eutectic freezes the on after thaw)



REFER BACK TO PAGE 2
PANEL READ OUT SETTING
SET UP (Celsius to Fahrenheit)

1: To change the selected Cut-Out (SET) temperature value, Press the Set button once, current cut out temp appears (blinking). Press "Up" or "Down" button to select desired temp.
2: Suggested cut-off settings are: To operate as a Fridge: SET= -10°c/-14°f
To operate as a freezer: SET = -22°c/-8°f.
3: The pre-set cut-in is always 8°c/46°f warmer than the SET cut-out setting. (8c=E3)

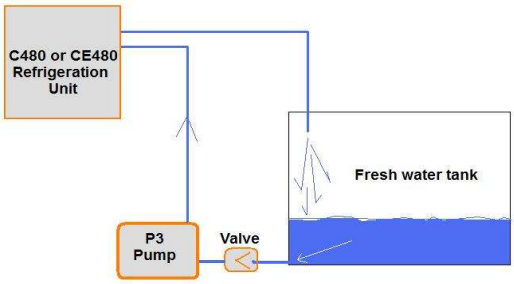
NOTE:

1: These settings will remain in memory and once set need not be changed unless a different temperature is required.
2: System will be on Start Delay for one minute. (Blinking red LED, top middle)
3: If alarm will sound when powered up. Press any button to stop sound.
4: To cancel Start Delay, press "Down" button.
5: Condenser temperature can be checked by pressing & holding "Up" button for 5s.
6: The fault indicator LED will indicate if the system detects a fault or is in Fail-safe' mode. (See page 8)

NOTE:

1: Compressor speed management and soft start is automatic.
2: The A490 & AW490 systems will start without any increase in current normally seen with electric motors and is almost silent when running.
3: The compressor will speed up in increments until it reaches the optimum speed for the job at hand.
4: If for any reason the system becomes overloaded, the compressor will slow to reduce the load. This usually will prevent overload cut-out which will only occur if the lower speed / load can't be safely maintained.
5: If a failsafe cut out occurs the unit will automatically attempt a restart every 60 Seconds until it can regain normal operations.
6: Top/Middle red LED system status: Flash=start delay Solid=run Off=off cycle

WATER COOLING INSTALLATION AW490 only P 10



All Ozefridge **AW490** condensing units are supplied pre-equipped with a water cooled condenser, connecting nipples, isolation switch, fuse and terminals for pump power supply, ready for the addition of the P3 water cooling pump.

NOTE:

1: Condenser water cooling greatly improves system performance and power efficiency when ambient temperatures exceed 30°c/86°f (25°c/77°f when a freezer) or when the AW490 condensing unit is in a confined area with less air flow.
2: Water cooling is additional to the air cooling. AW490 can operate from either.
3: Don't twist the brass water nipples on the AW490 unit.
4: Smear silicon onto the unit nipples then slide the 8mm tubing on. Allow to set for 5 hrs before running the pump. You may have to use a heat gun to soften hose ends then use long nose pliers to expand allowing it to go over brass nipples. Hose clamps are not recommended.
6: The fuse (page2, #7) provides protection for the pump circuit.
7: The AW490 has the unique Ozefridge 'Aqua-air' condenser and can operate as either an air cooled unit or water and air cooled. This coil is unique to the water cooled model and cannot be simply added to non-water cooled system.
8: The pump outlet should point upwards to reduce possible air cavitation.

POINTER:

1: To avoid corrosion and fouling, it is recommended that only water from the boat's freshwater tank be used. The cycling water is not harmed and the increase in tank water temperature is only 1° to 2° (30ltr or more) while the system is running, returning to normal soon after the cycle is completed.
2: The minimum effective tank storage is 30 litres.

INSTALL PUMP:

1: Locate the pump close to and below the freshwater tank.
2: Connect the thicker pump inlet (Suction) hose to the water tank outlet (or other outlet) with the check valve in this suction line. (Ensure the check valve is flowing in the correct direction!)
3: Then fit the thinner hose from pump outlet (Discharge) to the AW490's inlet nipple. (Avoid using hose clamps)
4: Connect a return hose from the AW490's outlet nipple back to the tank.
5: Connect the water pump wires to the 'Pump Supply' terminals. (Page 2 #11)

P3 WATER PUMP KIT (AW490 only) P 11

1: The 12VDC water pump will operate from a correct polarity power supply only therefore note colour coding. Connect to terminals 11 (+=RHS)

NOTE Power is **only** supplied to the pump once the condenser temperature reaches +30°c/86°f and switches off once the temperature lowers to +20°c/68°f.

2: Only connect to the fuse protected terminals (# 11) on the side of the unit.

CAUTION:

The water cooling should be re-cycled fresh water from the boat's tank. If raw water is used, measures to eliminate electrolysis, corrosion and fouling must be used.
Damage caused by raw water use is not covered by warranty.

3: The pump is a quiet centrifugal type. (Not a self-priming type).

4: The P3 pump should be located below the water level with a check valve.
If located above & with suction check valve, initial priming will be required.

5: The check valve locates between the pump inlet and water tank outlet.

6: Use a short piece of 8mm tube as a reducer for each side of the check valve.

7: Smear silicon over the 8mm brass nipples to ease the 8mm vinyl over. The food grade vinyl tubing will self-seal and usually doesn't require clamps.

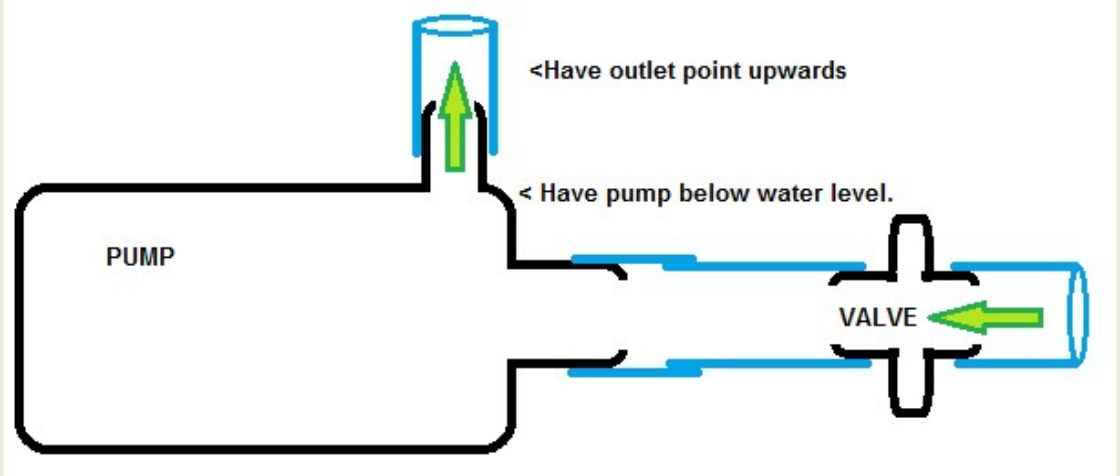
8: Running for long periods without water may cause harm to the pump.

To operate:

Select '+Cond Hi' and whenever the AW490 runs and the condenser **temperature exceeds 30°c/86°f,** the pump will start and continue pumping as needed to maintain condenser efficiency. (Press 'up' button to read condensing temp)

NOTE:

If for any reason the water cooling system fails, the AW490 will continue to operate as an air cooled only system, reduced or slower cooling will occur.



Q: I am ready to run my AW490 unit but don't have the water connected yet.
A: It can be run on DC but expect failsafe tripping and don't do any fine tuning of the gas charge until the water is connected and running.

Q: The system is running but stops occasionally.
A: The Ozefridge failsafe system protects against a range of harmful scenarios and does sometimes trip unnecessarily, especially until fine-tuned. (See page 7)

Q: I am not 100% sure of the 115/240 volt power supply available so is it safe to use.
A: Absolutely **not.** Only use 115/240 VAC from a reliable and properly grounded system supply.
We strongly recommend not using generators other than reputable brands.

Q: When I ordered, I didn't mention that it was to operate from 24VDC.
A: Contact Ozefridge before connecting to 24DC. You will need a converter available from Ozefridge.

Q: Is it ok to install the unit inside an enclosed cupboard or under a seat?
A: Yes, provided the water cooling is connected and operating. Otherwise, we suggest that two vents of at least 300cm²/23"(²) opening be provided to the enclosed area. One vent low down and preferably behind the unit adjacent to the air intake and the other high up in the enclosed area if possible.

Q: Can I duct the air away from the fan air exit area on top of the unit?
A: Yes, but the duct must be much larger than the fan area. We suggest at least 150mm diameter or similar. It is best to partition off between the front fan exit area and the air intake at the rear so that the warm air off the fan can't re-cycle.

Q: I have a single large vent where the unit is to go, is that sufficient?
A: No, air usually doesn't enter and exit the same hole. A flow through of air is required for proper ventilation, so a second vent properly located is essential.

Q: I need to run the wires through the walls to my remote controller's location.
A: Disconnect the multi- plug from the remote, run wiring through then re-couple the multi-plug. Contact Ozefridge if extension is required.

Q: I have been told that digital control systems can be affected by spikes!
A: True, also Motor Driver Modules but this system has a spike arrester fitted.

Q: Only 1X fan runs until the unit is getting quite warm on Cond-HI!
A: Like the water pump they are thermostatically controlled, switching second fan on at <30°C condenser temperature. (Press the up button to read condenser temperature) The second fan turns off again when the condenser cools to >20°C.

CAUTION: PLEASE NOTE. **P 13**

All refrigeration systems are heat pumps.
Efficient collection and disposal of this heat while restricting further heat from penetrating the insulated cabinet, is essential for a fridge to be effective.

Any 115/240AC power supply MUST be properly grounded and correctly wired. Suggest only using extension leads with moulded plug ends.

1: Ensure that warm air exiting the fan area (front) can't return through the condenser at the rear. Isolate if necessary to prevent warm air recycling.
2: Install the A490 or AW490 condensing unit in a dry, well-ventilated area.
3: Locate the eutectic tank as high as possible in the cabinet to reduce stratification. (Unless temperature differences top to bottom is desired)
4: A small circulation Fan will improve temperature spread throughout the cabinet if warm pockets occur. (Available from Ozefridge) Using the spare grey twin wires run with the piping, connect to terminals *8 on the unit for constant fan or *10 to allow the fan to cycle with the pump operation. (*See P2)
5: Make sure that **both** high and low sides are evacuated if any future servicing is done and recharge with >160 grams of **only R134a** refrigerant. (>200g twins).
6: Water cooling by recycling fresh water from the boats tank for most efficient refrigeration especially for tropical use. Water is NOT consumed or harmed.
7: Raw sea water can be used but with the risk of electrolysis and fouling that can damage the system and will void the warranty. (Copra nickel is used)
8: The system has several failsafe functions to protect itself. These are self-resetting and may cause some confusion until the system settles down, is finetuned (P7) and you have become properly acquainted!
9: Avoid vertical loops in pipe run. Horizontal is OK.
10: A490 & AW490 systems are set for **12VDC operation**.
Contact Ozefridge first if 24VDC is to be used. (Unless ordered as a 24VDC unit)
11: With either 12VDC or 115/240VAC converter connected, the unit knows to use the higher voltage when available. This is done automatically.
12: Performance can be affected in rough sea conditions, especially twin plate systems. Do not alter anything as the system will return to normal operation.
13: NEVER use R134a dye, or pipe sealer, pastes or tape on pipe connections.
14: INSIST that any refrigeration mechanic working on this equipment reads this manual first, particularly the 'Repair & Service' supplement if servicing.
The contents of this manual are intended for installation and operating Your Ozefridge unit.