Refrig

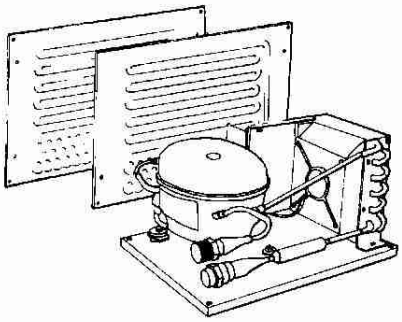
Nova Kool Mfg. Inc.

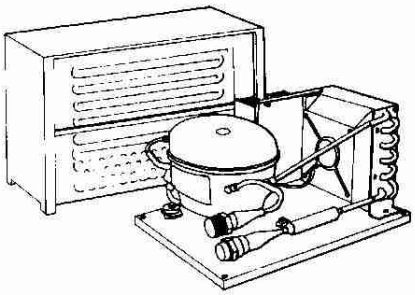
Installation guide lines

Owners manual

Warranty certificate

Trouble shooting Guide





Nova Kool Mfg. Inc.

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Pacific Standard Time

Introduction

Nova Kool's refrigeration systems are designed to run efficiently from AC Shore Power, Battery Power, or Solar Electric Power.

The Nova Kool custom refrigeration system includes the following:

1) condensing unit c/w compressor, fan cooled condenser, and reusable quick connect fittings. (LT100 FC is with out fittings)

2) an evaporator (cold plates) made up of three plates. The plates come complete with a cap tube, heat exchanger, refrigerant lines (12') and quick connect fittings to attach to the condensing unit. (LT100 FC is a fan cooled evaporator)

3) the third component to complete the installation is the system thermostat. The enclosure c/w therostat and knob can be mounted inside the refrigerator or out, but the small diameter sensing tube must be attached to the cold platesinside the fridge or freezer.

The unit is charged with a CFC free (R134a) Refrigerant. This refrigerant is a Zero Ozone Depleter.

Our unit features a reciprocating compressor which is very efficient. While running it uses less than 60 watts. 5A

This unit has built in battery protection. This feature is designed to help protect the battery from damage due to accidental Deep discharge.

Operation

Our units are easy to operate. The temperature inside your refrigerator is controlled by the thermostat.

This thermostat is a full range thermostat that will maintain your unit at the temperature you desire. Turning the control all the way to the right will give you the coldest position, and turning to the left will give you a warmer temperature in the fridge. The control is also an on/off switch when you turn it to the "O" position (hard left). A good setting to start with is #2.

Defrosting

The frequency of defrost depends on the usage, (door openings) and ambient (Outside) temperatures.

It is time to defrost when the refrigerator builds up .25 of an inch of ice on each side of the cold plate.

The best way to defrost the refrigerator is to remove all the food, and place a towel inside the fridge, on the bottom of the cabinet(s). Turn the thermostat to the "O" position.

(never use a knife to scrape ice from the cold plate. This will rupture the cold plate and let the refrigerant escape).

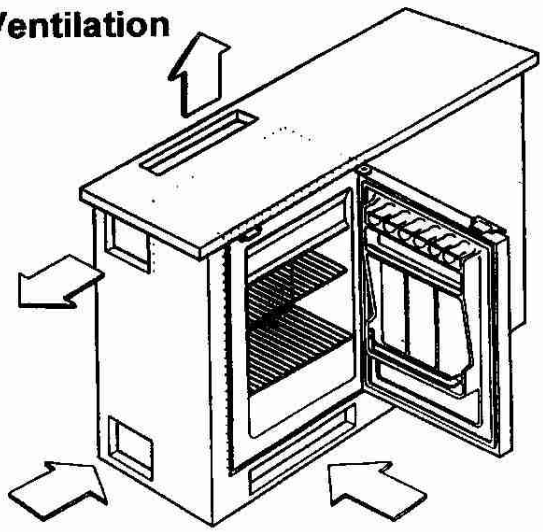
Cleaning

The best time to clean the fridge is after a defrost. Wipe the inside clean using a non abrasive cleaner(watered down) for the hard to clean stains.

We recommend baking soda as the first choice for a cleaner.

The condenser may collect lint and dust on the fins. If you notice your refrigerator running longer than normal, clean the condenser (every few years). The condenser is located on the condensing unit base, and can be cleaned by using a bottle Brush and brushing vertically from top to bottom on the face of the condenser. An alternative method is to vacuum the condenser. ***Be very careful not to damage the fins as they are aluminum and will bend easily.***

Ventilation



All refrigerators, regardless of the make, are heat-transfer machines. They transfer the heat from inside the fridge to the outside of the fridge. If adequate ventilation is provided, the compressor will operate more efficiently, and use less power .

If the compressor is installed in a hot room (engine room) , it should be located in the open with no enclosure to obstruct air flow to the unit, or cause condenser air to be re-circulated.

If the unit is mounted in a closed area (cupboard or locker), there must be two holes provided. One is for cool air to be pulled in by the fan and the other to allow the warm air to vent from the enclosure. The size of the opening must be at least 7"x7". The inlet must be ducted(separate passageway) so the air is drawn through the condenser and blown across the condenser.

If a decorative grill is to be placed over any of the ventilation openings the size of the opening must be increased in order to still provide 50 sq. inches of free area.

To test the effectiveness of the ventilation, measure the exhaust air inside the enclosure. The temperature should be no more than 5 degrees higher than the air entering the enclosure(ambient air temp).

Wire sizing

AWG	12VDC units	24VDC units
14	12	24
12	20	40
10	33	66
8	53	100

** Length is the return distance between the electronic unit and the battery in feet.

The circuit breaker must be a 20 amp capacity on the DC side and a 5 amp capacity on the (optional) AC side.

Failure to size the wire or breaker correctly, (too small) may cause premature shut down of the refrigerator by the Battery Protection Device.

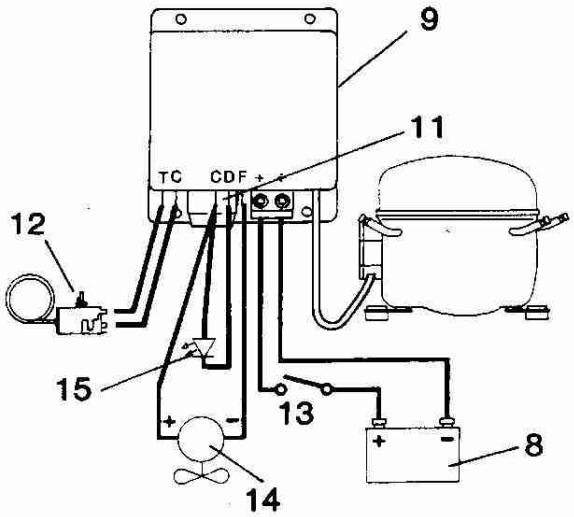
We recommend the refrigerator have its own circuit, with no other appliance connected to the same wires.

Using the ***COMMON BUSS*** for the refrigerator wiring can sometimes cause radio frequency noise and interference.

FUSES

Nova Kool refrigerators use a 15 amp (12 volt) and a 7.5 amp (24 volt) fuse in the electronic unit. This can be found under the gray plastic cap on the electronic unit.

On the AC power supply (optional) a, 4 amp (110 volt) or a 2 amp (220 volt) glass fuse can be found under the black fuse holder cap.



8-Battery

9-Module (electronic unit)

11-Fuse (12VDC 15 amp 24 VDC 7.5 amp)

12-Thermostat

13- 20 amp breaker

14-Air cooled fan (Optional)

15-Low voltage diode (N/A)

Installing the cold plates LT200 F

Most custom marine refrigerators are top opening. This is selected because cold air is heavier than warm air. With this design the door can be left open with out significantly increasing the temperature in the freezer. For the same reason, the cold plates must be mounted with their top edges near the top of the refrigerator, on the interior wall (**Cooling will only take place below the top portion of the cold plates)**

The Nova Kool systems are designed to work as a freezer or as a cooler. Turn the thermostat warm and the space becomes a refrigerator. Turn the thermostat cold the space becomes a freezer (providing the space is not to large).

To use our system for a fridge freezer, mount the cold plates in the section designed as a freezer.

Install an insulated partition between the fridge and the freezer, with a variable sized hole in the bottom (approximately 3" round). This hole will allow the cold freezer air into the refrigerator side of the cooler, and as the air warms it will rise over the top of the partition and start the natural circulation flow.

The size of your refrigerator or freezer depends on the amount of insulation and the ventilation design of the installation.

Installation check list

1) Select a location for the LT200 condensing unit. The lines are 12 feet in length. Check the laying length into the cooler, make sure you are close enough. Position the unit so the electrical connections and the quick connect fittings are easily accessible.(you will have to tighten the refrigerant line quick connect to the condensing unit line quick connects so leave room to swing two large wrenches).

2) Design your ventilation system. If it is necessary you can install an extra fan (same kind as the one on the unit) to terminals F & C. If you use an extra fan it will use approximately 3 watts of power, and run only when your unit runs).

3) The LT200 F freezer plates are connected together with tubing to allow an 18" spread width. They can be mounted across from each other or adjacent to one another inside the cooler. They should be mounted 1" from the interior top side of the refrigerator.

4) Make a cardboard template for the cold plate mounting holes and select the mounting position for both plates, with the copper tubing still coiled. Next select the most convenient location for the tubing exit hole. Drill a 2 1/2" hole using a hole saw.

5)Uncoil the tubing and feed the couplers and copper tubing through the hole, to the outside of the refrigerator. Fasten the plates using the spacers and screws provided to the area marked off in point #4.

6) Starting just inside the refrigerator, the foam tubing should run on the outside of the tubing in a direction towards the condensing unit. The exit hole must be sealed air tight on the outside and loosely on the inside, with fiberglass insulation in between. Moisture always moves to the coldest point, this is why it is important to seal on the outside of the tubing hole.(ensure your refrigerator box is sealed on the seams, as the refrigerator will release water during defrost).

7) Carefully and neatly run the tubing to the condensing unit. Make long radius bends if possible. To make a tight bend of 90° support the copper with both thumbs while making the bend. Excess tubing can be rolled back up and stored out of the way.(do not cut the tubing as it has a refrigerant charge in it) Make as few bends in the tubing as possible as it work hardens with each bend. Three bends areually maximum.

8) Connect the quick connects from the line set to the condensing unit. They are male and female and impossible to connect backwards. The connectors are designed to be put together and taken apart with out the loss of refrigerant.(do not be disturbed to see wrench marks on the connectors, as we connect them during our 12 hour unit test run.)

To connect:

a) put a small amount of oil or WD40 on the male coupling, and between the swivel part of the female nut.

b) connect and turn by hand till tight. (approximately 2 turns).

c) use two 12" crescent type of wrenches to tighten couplings together. ***Be sure not to let the copper tubing turn, or the unit will be damaged.***

Use one wrench on each side of the coupling.

9) The thermostat is installed in a small white box and is complete with 14' of wire. The thermostat connects to C & T on the module (polarity does not make any difference with the thermostat, but it does with all other connections)

You can mount the thermostat box inside or outside the refrigerator space, but the last 2" of the 48" sensing line must be connected to the cold plates. Connect the sensing tube to the cold plate by placing 2" of it under the 1x2 plate on the second cold plate, and tightening the two screws.

see page 6 for more detail

Trouble Shooting Guide

If your Nova Kool fails to run, first check all the electrical items exposed to the marine environment. In the case of a new refrigerator, these are also the items most likely to be damaged by transport and rough handling.

1) Check the fuse located under the gray cap, below the DC connections on the module. Reverse polarity will cause this to blow.

2) Check the voltage at the electronic module. On 12 volt systems the voltage should read 12.0 volts minimum, with the battery charger turned off.

3) If you don't read over 12.0 volts check the following:

* condition of batteries and state of charge.

* Wire size and connections

* If the circuit has a breaker it must be 20 amps capacity.

4) *Check the thermostat* by removing the wire from the terminal marked "T." Take a short piece of wire and jumper between "T" and "C". If this starts the compressor we then know that the thermostat circuit is faulty. Replace thermostat or faulty wiring that connects the thermostat to the module.

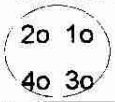
Note the compressor runs very quietly. Hold your hand on top of the compressor to tell if it is running.

If you here a small squeak when the compressor starts "this is normal".

5)Check the electronic module. This device is responsible for all electronic functions. These include motor commutating, battery monitoring, fan power(optional), and all safety functions.

The module is not field repairable and can be checked out by sending it to Nova Kool.

6) To check the compressor's internal windings, ohm the following terminals.



Terminal on the compressor

	12VDC	24VDC
Terminals 1 to 3	0.3	0.7
Terminals 4 to 3	0.3	0.7
Terminals 2 to 3	3.5	3.5

NEVER CONNECT POWER DIRECT TO COMPRESSOR!

7) If your fridge has our optional AC/DC converter, Check the following:

* the glass fuse under the fuse cap (110 volt 4 amp 220 volt 2 amp)

* check the AC power supply to the converter.

* Check the DC out put (12.5-14.5) volts DC

This unit can be replaced as an assembly.

8) If your fridge has an air cooled condenser Check the following:

* if the fan runs when the compressor runs you have no problem

* if the fan will not run check the connections, and the voltage at the module(terminal C-F) and check the connector on the fan motor to see that it is plugged in. Red to + always on C

* if the above checks out, replace the fan.

Refrigerant Charge & Sealed System

Your Nova Kool is charged with R134a. This is a environmentally safe refrigerant with a "O" Ozone Depletion Potential.

It is used by most of the domestic refrigeration and appliance repair companies & manufacturers.

If you need to repair the closed sealed system, use a qualified appliance refrigeration person.

For more information contact Nova Kool Mfg. Inc.

Operational Sequence

When the thermostat is turned on(you should hear a click) the compressor should try to start. It is not uncommon to hear a small squeak when it tries to start. If it does not start on the first attempt it will continue to try every 40 seconds. If for some reason the compressor becomes overloaded it will go through this cycle. (the fan will continue to run during the 40 seconds).

When the thermostat is satisfied the compressor and fan(optional) shut down.

Before doing warranty work contact your dealer or Nova Kool first.

For more information call your local dealer, or Nova Kool at 604-984-7764 or fax at 604-984-7794

Nova Kool Mfg. Inc.

Remove the tie strap that hold the two plates together and replace with mounting screw s through the first plate, through the nylon spacer and through the second plate. At this point you can use one or two spacers to keep the plates from the wall.

Depending on the temperature of your box, the third plate may not fully frost.

LT200 F and LT200 RT 6
Uses three plates for maximum efficiency.
Mount plates as close to the top of the refrigerated box as possible for best results

Refrigerated wall

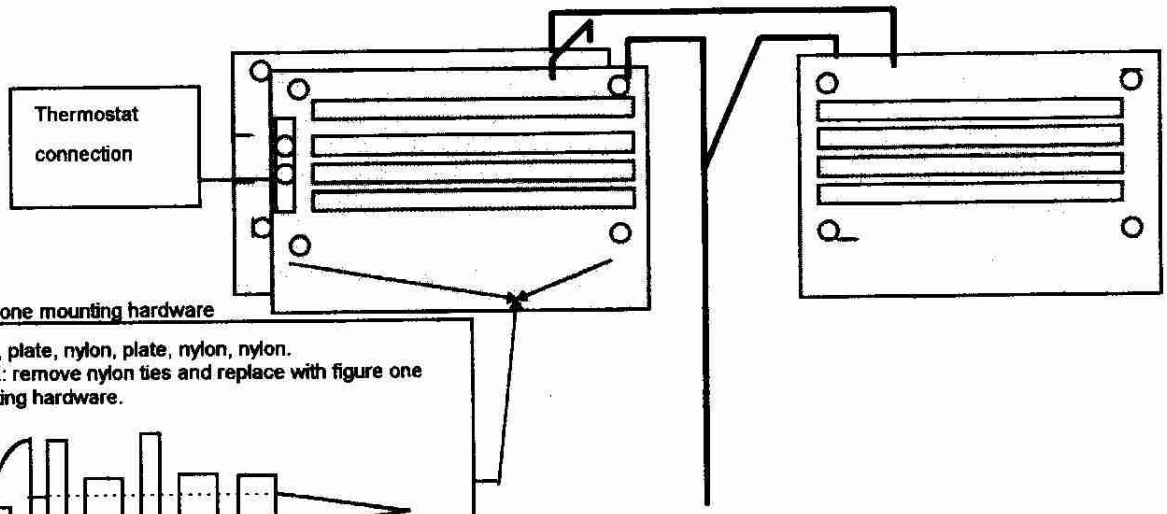
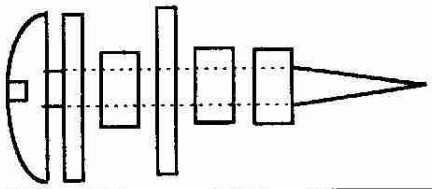


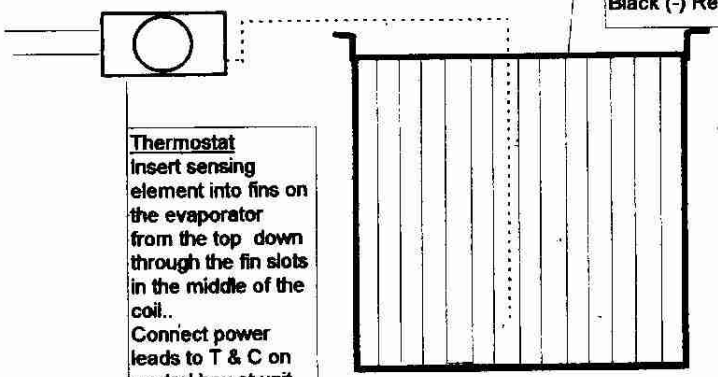
figure one mounting hardware

screw, plate, nylon, plate, nylon, nylon.
NOTE: remove nylon ties and replace with figure one mounting hardware.



LT100 FC
Unit does not use quick connect fittings.

Evaporator
Mount inside refrigerated box.
Connect fan leads to Battery terminal on control box. Fan runs all the time
Black (-) Red (+)



Thermostat
Insert sensing element into fins on the evaporator from the top down through the fin slots in the middle of the coil..
Connect power leads to T & C on control box at unit

5 YEAR WARRANTY

Terms and limitations

NOVA*KOOL refrigerators and refrigeration systems have been designed and engineered to provide many years of trouble-free service to mariners. Each unit has been tested as a full functioning unit, to verify its superior performance capability.

This Warranty is transferrable with the proper sale of a boat, provided the NOVA*KOOL unit remains in the boat as originally installed.

NOVA*KOOL Refrigeration systems are warranted to be free from defects in materials or workmanship. If any part of this unit proves to be defective in normal use within the FIRST year from the date received, it will be repaired without charge, including parts AND LABOUR.

During the subsequent 4 years, the Warranty covers PARTS ONLY which are part of the sealed refrigeration circuit, including compressor, cold plates, condenser and drier. Cabinet parts or electronic controls are NOT covered by this Warranty.

It is understood that the full 5-year Warranty is only effective for NOVA*KOOL refrigerators installed with the power supplied by the ship's charger and battery system.

The Warranty shall not apply to

1. improper installation
2. misuse or abuse of equipment
3. traveling time to and from boat
4. removal and transport of unit from boat.

Nor does the Warranty cover replacements or repairs necessitated by loss or damage resulting from any cause beyond the control of NOVA*KOOL Mfg., including but not limited to acts of God, acts of government, fires, sinking, etc.

To obtain name and address of the Warranty Service company nearest to you, please fax NOVA*KOOL Service at (604) 984-7794. Your fax must include a copy of this completed Warranty Certificate and a copy of the orginal Bill of Sale to establish Warranty commencement.

OWNERS NAME

COMPLETE ADDRESS (P.O. BOX NOT SUITABLE)

STATE ZIP

PHONE FAX

REFRIGERATOR SERIAL NO.

MODEL # PURCHASE DATE

NOVA KOOL

NOVA*KOOL MFG. INC.

1457 Barrow St. North Vancouver B.C. Canada V7J 1B6