

# NOVA KOOL

## **INSTALLATION AND TROUBLE SHOOTING MANUAL for all Models of Nova Kool Remote Condensing units & Cold plates.**



Thank you for choosing Nova Kool for your refrigeration needs. For over 20 years we have been providing quality DC & AC/DC products for mobile, off power grid and energy conscious installations around the world.

Each unit goes through a series of tests to ensure strict compliance with our quality policy “Strive for continual improvement of all business processes while involving all associates in the management of quality”. Your unit has been run test at the plant for a minimum of 12hrs, followed by a series of inspections and electrical tests to ensure the quality, the reliability and the safety of your unit.

All Nova Kool units are covered by a 2-year parts warranty that commences upon delivery of the unit to the end user customer.

Please take the time to fill in the information below which can be found on the inside of your new refrigerator. This will help when phoning for service or warranty information.

**Model #** \_\_\_\_\_

**Serial #** \_\_\_\_\_

**Date of Purchase:** \_\_\_\_\_

**Date of Del of Vessel:** \_\_\_\_\_

**(Or vehicle where applicable)**

**Selling dealer:** \_\_\_\_\_

Our service department can be reached at 604-523-6515 ext 104,  
or at [support@novakool.com](mailto:support@novakool.com) from 7:00am to 5:00pm PST

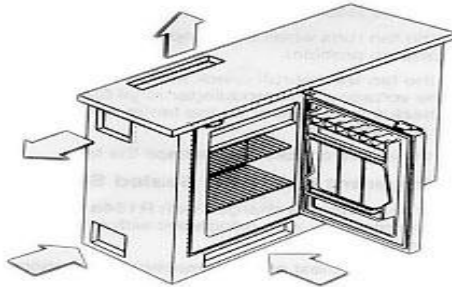
# Thing's you need to think about before you cut your first hole



## 1. Where do you want to mount the condensing unit?

Closets, cupboards, bilge, engine room, lazarette, are all good locations. We are not ignition protected so take caution when mounting around gasoline engines.

Keep in mind no matter where you mount it you will need to ventilate the enclosure. We recommend 120 sq. inches. Ideally 60 coming from the cabin and 60 going back out to the cabin.



## 2. Do you have access to power close by?

The shorter the run the less voltage drop in the wiring and the lighter the gauge of wire required. Most installations will require a minimum of 10 gauge wire to the unit from the battery. If you are using a breaker it should be a 20 amp dc breaker to minimize voltage drop.

Size AWG Gauge	mm	Max length 12 vdc		Max length 24 vdc	
		ft.	m	ft.	m
14	2.5	8	2.5	16	5
12	4	13	4	26	8
10	6	20	6	40	12
8	10	32	10	65	20

The wire length is the distance from the battery to the unit.

**A quick note:** *The unit knows the difference between 12vdc and 24 vdc. It will run on either one right out of the box.*

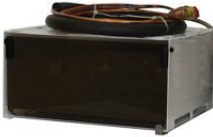
3. How far is the cooler or freezer box going to be from the condensing unit?

The standard unit comes with a line set of refrigerant tubing 12 feet (4 m) long. (Factory order of up to 20 feet (7 m) available special order)

Are you building a cooler, a freezer or a spill over?

A spill over application is when you have one cooler box and you want to make this cooler box part freezer and part cooler. This is done by putting a dividing wall between the cooler and the freezer. The cold plates are mounted in the freezer side and the dividing wall has an opening at the bottom and the top to allow the cold air from the freezer to go into the cooler side and as it warms return to the freezer side.

If your box is mostly refrigerator but you would like a little freezer, then you would put the RT6 or the RT4 evaporator box in. It can be mounted as a front or top opening. The RT6 box gives you close to  $\frac{3}{4}$  cu. ft. of freezer space.



RT6



RT4

If you want all freezer or all refrigerator or the spill over use the F plates or one of the other evaporators that fit your box the best. You can always call 604-523-6515 for more information.



F plates



FL plate (large)  
FM plate (medium)

## Let's get started installing the unit

1. Take a look at the path you will be running the copper line kit. You get about three bends from the copper before it work hardens and will not bend any further. So it is real important to know where you are running it before you start with the bends.

Unroll the copper tube on a flat surface. Cut a 1 ½ inch hole in your box where you want the line kit to exit and go towards the condensing unit. Keep the hole plug to fill the hole after you run the couplings through the hole. You will need to notch the plug for the line set before re installing the plug in the hole



### **A quick note:**

*Do not cut the line set; roll up unused portion before making final connection to the condensing unit.*

## Mounting the cold plates

Cold air drops; with this in mind it is important to mount the cold plates as high up the wall of the box as you can. The cooling will start at the top of the cold plate and continue down to the bottom of your box.

If you want a cooler place in your box but not a real cold space, mount the cold plates a little lower in your box and the space above the cold plates will be the warmest part of your box.

You can mount the cold plate in any direction. It is important to keep the tubes that come out of the cold plates away from any standing water that may form in the box during operation or defrosting. If the tubes are sitting in the standing water electrolysis may form shortening the life of your unit.

Your cold plates have mounting holes and hardware included to help with the installation. If for some reason you need more mounting holes you can drill into the cold plate but must keep the drill and hole at least ½ inch (10 mm) from the raised pattern on the cold plate where the refrigerant flows.

On the line set is a 3 foot piece of black foam insulation. This piece is to be positioned at the outlet of your refrigerated box. Just slide it into position.



## Mounting the thermostat and sensing tube



The thermostat is housed in a plastic enclosure that you will mount inside your box with two screws.

The knob is marked from 1 to 7. All the way clockwise will get you to 7, which is the coldest setting. Go counter clockwise to 1 this is the warmest setting. Go a little past 1 to shut the unit off.

The setting on the thermostat will regulate the temperature in the box. The thermostat has a metal sensing tube that must mount to the cold plates for proper operation. Depending on your cold plate, you will have two tabs or a cover plate and screws to mount the sensing tube under. Do not cut the sensing tube if it is too long. Coil it up without kinking the tube.

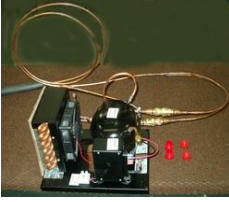
The thermostat sensing tube enters in a small hole in either side and under tabs on the back inside the



**Quick note:** *unlike the gas pedal in a car that will give the engine more fuel and go faster, the thermostat is only an on off switch. If you turn to 7 it will not get the box colder faster than if you turn to 1, it will keep it running longer and get the box colder over time.*

## Connecting the refrigerant lines to the condensing unit.

After you have run the line kit from your cold plates to the condensing unit, remove the plastic caps that protect the couplings. Put a drop of oil on the thread of the male couplings. Connect the couplings from the unit to the couplings of the line set. With your fingers tighten the couplings until you can not thread any further. This should be about 4 rotations. At this point connect two wrenches to the couplings to make them tight.



### Quick Note:

Failure to use two wrenches could cause the copper to twist and leak.

### Electrical:

The DC models are 12 & 24 VDC. The unit will run on 12 vdc setting until the voltage reaches 17 volts. 17-21 volts is the dead band where it determines if you are running it on 12 or 24 vdc.

### Quick note:

The condenser fan which is wired to the electronic control is always a 12 vdc fan, even when you are supplying 24 vdc.

### DC breaker & fuse sizing

20-amp breaker (main switch) for both 12 & 24 VDC applications. Both the fuse and the breaker are to protect the power source and should be installed near the power source.

15 Amp fuse for 12VDC

7.5 Amp fuse for 24VDC

*Breakers and fuses are not supplied with the LT unit*

## DC Wire Sizing:

Ensuring the correct wire sizing will eliminate premature shut down due to low DC voltage at the refrigerator. Please follow these guidelines.

Nova Kool product is designed to stop running at 10.4 vdc and cut back in at 11.7 vdc, to protect your batteries.

Size AWG Gauge	mm	Max length 12 vdc		Max length 24 vdc	
		ft.	m	ft.	m
14	2.5	8	2.5	16	5
12	4	13	4	26	8
10	6	20	6	40	12
8	10	32	10	65	20

The Max length is from the fridge to the battery.

In some cases you may like to lower the voltage the unit cuts out on for battery protection.

This can be done by placing a jumper wire between the “P” and the “C” terminal on your electronic control board. By doing this you will set the control unit to cut out at 9.6 vdc and cut in at 10.9 vdc.

We supply a red jumper pre connected on the thermostat wire for convenience. By connecting it to the P on the control module it will allow the unit to run to the lowest voltage before it cuts out on low voltage. (see wiring diagram)

## 4. Compressor Speed:

All Nova Kool units are supplied with the quiet and efficient variable speed compressors. Nova Kool has supplied your unit preset at the optimum speed for most “normal” applications.

The speed is controlled by a resistor in the **thermostat circuit**. 0 ohms (no resistor) runs the compressor on its slowest speed, a 1523 ohm resistor will provide you with the fastest speed.

The slower the speed, the lower the amp draw, and the lower the capacity.

The chart provides four examples; the resistance must be between 0 ohms and 1523ohms.

Resistor Ohms	Motor Speed rpm	Approximate running current
0	2,000	2.3 – 2.8amps
277	2,500	3.2 – 3.7 amps
692	3,000	4.2 – 4.9 amps
1523	3,500	5.0 - 6.5 amps

In our testing we have found if you run the unit at a lower speed and amperage for a longer period, your total amperage consumed will be less than if you run the unit at a higher speed and amperage for a shorter period.

Every time the unit starts up it draws a higher start up current and it also needs 15 – 30 seconds of run time to start to do actual cooling. Longer run times at lower amperage, usually improves efficiency and lowers power consumption.

*Think about it as a car. The speed limit is 50, the small car get to the destination the same time as the big car, but the small car does it with less fuel consumption.*

**Quick note:**

We have included a black 500ohm resistor for medium speed and a red 1500 ohm resistor for high speed compressor operation. For low speed just connect the thermostat wire to “C” and “T” without the resistor. The resistors we supply are not to be used together in series. Choose one or the other or do not use one for low speed.

**We have supplied you with a quality unit.  
If for some reason you would like to call us for support please do.**

**Before you call consider that, the three main reasons for problems in the field are:**

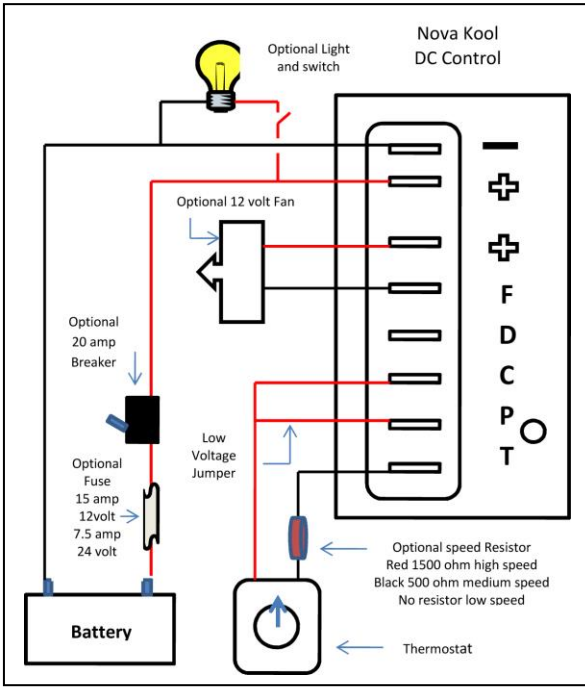
**Lack of ventilation**

**Power problems, often related to wire sizing or connectors.**

**Battery voltage, capacity or age.**

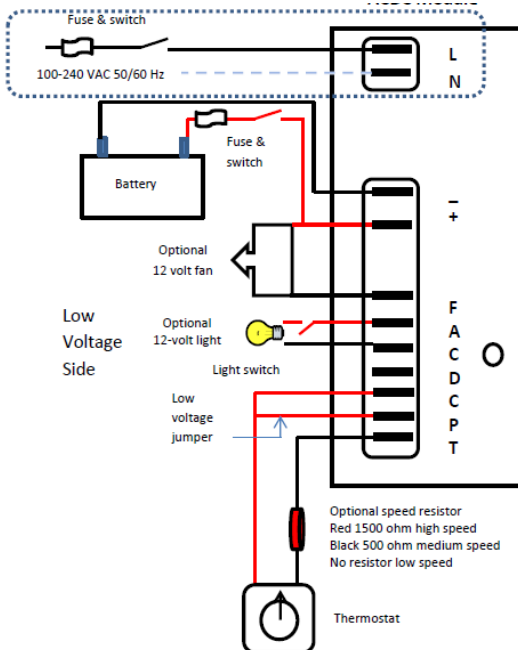


# Wiring diagram



After serial number 256409 the thermostat wire has an additional red wire which is used to control cut out voltage. If it is placed on P the cut out voltage is 9.4 vdc. If it is simply left off of terminal P the cut out voltage is 10.6 vdc

## Optional AC DC control module



# Trouble Shooting

## Check DC operation first then check AC/DC starting at #19

		YES	NO
1	Turn DC power on and turn thermostat to "7" position	Go to #2	
2	Is the compressor running? (Put your hand on top to feel slight vibration to be sure).	Go to #16	Go to #3
3	DC Breaker is in the "on" position & optional fuse is good?	Go to #5	Go to #4
4	Replace fuse or turn breaker "on". Does optional fuse or breaker blow?	Go to #6	Go to #5
5	Check voltage at the refrigerator "+" & "-" terminals on the black module. Is it over 12.2 vdc? (or 24.5vdc where applicable)	Go to #7	Go to #6
6	Check batteries, wiring and connections to the refrigerator for fault, corrosion, proper wire sizing and correct the problem.	Go to #1	
7	Put a jumper wire between terminals "C" & "T". Is the compressor running now?	Go to #12	Go to #8
8	Disconnect small black wire from the fan that goes into the "F" terminal. Is the compressor running now?	Go to #15	Go to #9
9	Disconnect power. Remove electronic module (Philips screw beside terminal designation label will require removal). Disconnect the plug. Measure resistance (ohms) between each of the three compressor terminal pins. Is the measured resistance APPROXIMATELY the same?(it should be)	Go to #10	Go to #11
10	Replace Electronic Module.	Go to #1	
11	Have compressor replaced by qualified appliance technician who has the ability to evacuate and recharge the system. This is seldom necessary so please be sure and if possible contact Nova Kool for further instruction beforehand.		
12	Check wiring to thermostat with ohm meter to ensure there is continuity. (No broken or damaged wires or connectors). Is the wiring & speed resistor (if so equipped) okay?	Go to #14	Go to #13
13	Disconnect power. Repair or replace wiring or speed resistor (if so equipped) as necessary	Go to #1	
14	Replace thermostat.	Go to #1	
15	Replace Fan	Go to #1	
16	Have refrigerator in a well ventilated area (i.e. on cabin floor). After an hour is it refrigerating?	Go to #17	Go to #18

17	Check that adequate ventilation has been provided. 60 sq. in. for single door models and 120 sq. in. for 2-door models. See ventilation suggestion in this manual. Add ventilation as required.		
18	Have a qualified appliance technician determine if there is a refrigerant leak or a compressor with a mechanical problem.		
		<b>Yes</b>	<b>No</b>
19	Switch DC breaker off and AC breaker on. Does the compressor run?	<b>Go to #16</b>	<b>Go to #20</b>
20	Is there 110VAC or 220VAC available the AC plug on vessel?	<b>Go to #21</b>	<b>Go to #25</b>
21	Check Power on the “L” & “N” terminal on the electronic module (see AC/DC wiring diagram in this manual) is there 110vac or 220vac available?	<b>Go to #7</b>	<b>Go to #22</b>
22	Check 4 amp fuse on power plug on refrigerator (see picture), is it good?	<b>Go to #20</b>	<b>Go to #23</b>
23	Replace fuse 4 amp. Did it blow again?	<b>Go to #24</b>	<b>Go to #21</b>
24	Check wiring to “L” & “N” module, Is wire damaged or shorted out?	<b>Go to #26</b>	<b>Go to #10</b>
25	Check plug, wiring, breaker, shore power or genset for damage or fault. Repair or replace as required.	<b>Go to #19</b>	
26	Repair short or damage between plug & electronic module then <b>Go to #21</b>		

## Defrost & Cleaning:

The frequency of defrost is dependant on the number of door openings, the ambient temperature and the humidity level.

Typically, it is a good practice to defrost once there is ¼” of frost buildup on either side of the evaporator (cold plate).

When defrosting, the unit is shut off at either the breaker panel or by turning the thermostat counterclockwise to the OFF (0) position. Prop the door open. We suggest placing a towel in the bottom of the refrigerator to catch excess moisture.

Speeding up the process with a knife or scraper is strongly discouraged due to the likelihood of rupturing the refrigerant circuit; in the event this happens give us a call 604-523-6515 ext.104.



Now that the unit has been defrosted, the interior can be cleaned with a non-abrasive cleaner. Do not use “brilo” or “sos” type abrasive pads, as they will score the surfaces. Baking soda is recommended.

If you are turning off the unit for some time it is best to clean it first, and then leave the door open a small amount to allow the air to move freely in and out of the refrigerator.

**Do not leave the door closed while the refrigerator is not in use. Mold and odor will build up on the inside of the refrigerator without air movement.**

## **Two-Year Limited Warranty**

*This refrigeration unit is warranted to be free from manufacturer’s defects in both material and workmanship providing that the unit is used in a manner consistent with the intentions of Nova Kool.*

*The warranty is in effect from the final sale to the end-user (whether installed in a vehicle or sold separately) for a period of two years.*

*Nova Kool will supply the required replacement part or parts at no charge.*

*This warranty does not cover problems out of the control of Nova Kool Mfg. inc. including but not limited to acts of God, acts of Government or misuse.*

*Before calling for warranty please review the troubleshooting in this guide and have your serial # and model # ready.*

*Our service department can be reached at*

*604-523-6515 ext 104, or at [support@novakool.com](mailto:support@novakool.com) from 7:00 am to 4:00 pm PST.*