

REFRIGERATION PARTS SOLUTION

“Do It Yourself” Kit Assembly and Installation Manual



**Danfoss Retrofit
Compressor BD2.0F, BD2.5F, or BD3.0F to BD50F**

Part Number 011-1010

Manual Version 1.0 - December 2008

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List of Compatible Systems

This Retrofit DIY Kit is designed for any 12 or 24-volt DC refrigeration system using the obsolete Danfoss BD2.0F, BD2.5F or BD3.0F compressor. This includes:

- All models of the "Cold Machine" manufactured by Adler-Barbour
- "Baysider I" and "Baysider II" manufactured by Grunert
- Most models manufactured by Frigoboat
- Several models manufactured by Isotherm
- Most models manufactured by Nova Kool
- A 12 volt icemaker manufactured by U-line
- Several Planet DC refrigerator/freezers, and other models made by several other manufacturers from the late 1970's through 1998

Contact the DIY Kit Support Forum (<http://www.rparts.com/forum/list.php?f=4>) for assistance in determining if your system is compatible with this Retrofit DIY Kit.

List of Parts: Complete List (Included with Kit)

Item	Part No.	Qty	Description
1	010-1170	1	Danfoss BD50F Compressor (mm)
2	010-1175	1	12/24v Power Module for BD50F (3-pin)
3	020-0500	1	Spun Copper Filter-Drier
4	025-0042	1'	Copper Tubing - 1/4" OD
5	079-0661	1	Swaging Tool - 1/4"
6	079-0803	1	Stay-Brite #8 Solder - 2'
7	079-0806	1	Stay Clean Flux Paste - 4 oz Jar
8	079-2001	1	SS Tube/Fitting Brush - 1/4" OD
9	079-2010	1	Abrasive Cleaning Pad - 6" L x 4" W
10	096-0034	1	Schrader Valve Access Port - 1/4" OD Stem
11	290-0001	4	Insulated Female Spade Electrical Terminal - 22-18 ga.
12	290-0011	2	Insulated Female Spade Electrical Terminal - 12-10 ga.
13	400-0911	8	Standard Cable Tie - 7 1/2"
14	NA	1	CD Manual

Required Tools

The following tools are required and are not included with the kit.

- #11 X-acto™ blade and handle
- Assorted open end and adjustable open end wrenches
- Bubble solution leak detector
- Hammer
- Medium Phillips screwdriver
- Nitrogen or CO2 tank with regulator
- Pencil and marking pen
- Pliers
- Propane torch
- Refrigeration service manifold gauge set
- Slotted (flat bladed) screwdriver
- Tape measure
- Tubing cutter
- Vacuum pump
- Wire cutting, stripping and crimping pliers

Additional Required Parts

The following parts are required and are not included with the kit.

Item	Qty	Description
1	tbd	Acetone or Similar Cleaning Solvent
2	1	Any Air-Cooled 12 volt or 24 volt DC Condensing Unit Using a Danfoss BD2.0F, BD2.5F or BD3.0F Compressor
3	1	Cotton Rag
4	tbd	Foam Tube or Adhesive Tape Insulation (to Insulate Suction Line)
5	3-5 oz.	Refrigerant - R134a (and Refrigerant Can Tap Adapter if Using Disposable Cans)

Preparation: Tubing and Fitting Procedures

Please read the following section carefully before proceeding with the assembly and installation of the kit. Proper understanding of copper tubing and fitting preparation is essential for the successful building of this kit.

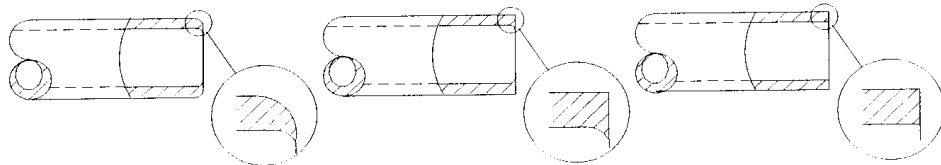
Procedure for **Cutting** tubing:

The copper tubing should be unrolled, and the cut made on a straight section. Place the tubing cutter around the tubing and tighten the blade adjustment knob until the cutting blade begins to bite into the tubing. Roll the cutter around the tubing once or twice, and then tighten the knob about a half turn. Repeat rolling the cutter around the tubing, tightening the knob each turn or two until the tubing is cut through.

Procedure for **De-burring** tubing:

Use the tip of a #11 X-acto™ blade to reach inside the end of the copper tubing and cut out the ridge or burr by rotating the blade around the inside of the tubing. Keep the shavings out of the tubing. When completed, there should not be any ridges around the rim of the cut edge of the tubing.

De-burring



The proper de-burred tubing should resemble the diagram on the right (pictured above).

Procedure for **Bending** tubing:

Straighten the tubing by holding one end on a flat surface and unrolling the vertically positioned coil against the flat surface. Tubing benders are available, but the small diameter tubing included in the kit is relatively easy to bend by hand. Try to make large radius bends, and decrease the radius gradually and evenly until the bend is a good fit in the installation. Avoid over-bending and re-bending any section excessively. Often it is better to solder a straight section to the compressor and then bend it, using the compressor solder fitting to hold one end of the tube. The copper tubing should be bent carefully, and as little as possible. Repeated re-bending of the tubing will cause it to "work harden" and resist further bending. With repeated bending in the same location, the tubing will get very stiff and will reach a point that it will kink or break.

Procedure for **Cleaning** tubing and fittings:

Clean the copper tubing after cutting and de-burring by using a piece of abrasive cleaning pad (also known as Scotch-Brite™ pad). Wrap the pad around the end of the tubing, and rotate the pad back and forth until the copper is shiny, bright, and clean. Avoid having dust from the pad enter the tubing end.

Use the SS tube/fitting brush to clean the inside of the female copper solder fittings. Insert the brush into the fitting while rotating the brush clockwise. Always turn the brush clockwise, and scrub the inside of the fitting with the brush until it is shiny, bright, and clean. Avoid having contaminants enter the end.

Procedure for **Fluxing** tubing:

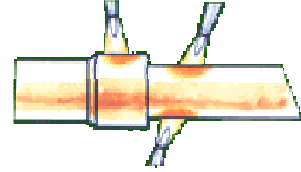
Once the copper tubing is clean, wipe a very small amount of flux over the end of the male tubing being soldered. Only the smallest film of flux is required to protect the tubing until soldering. Do not apply any flux to the inside of the female fitting; there will be enough flux from the male fitting.

Procedure for **Soldering** tubing:

After the copper tubing has been cut, de-burred, cleaned, and fluxed, fit the pieces together. Light the propane torch and adjust to a "medium" flame. The point of the inner blue flame is where the torch is hottest.

Start heating the tubing, first applying the flame at a point just adjacent to the fitting. Work the flame alternately around the tubing and fitting until both reach soldering temperature (as indicated by the flux becoming clear and fluid) before applying the solder.

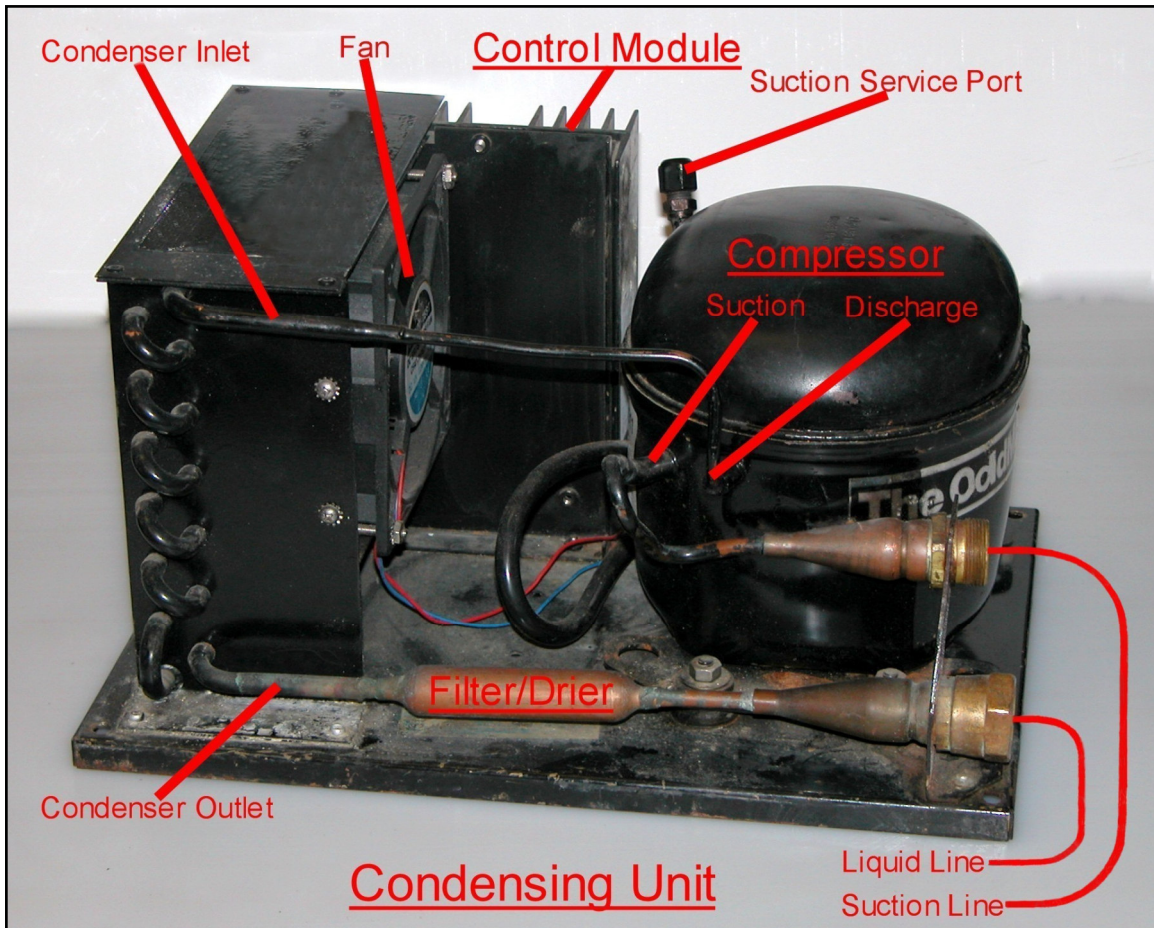
Move the flame to the fitting and apply solder with a wiping motion directly on the connection to ensure that it flows evenly into the joint. Spread the molten solder evenly around the entire fitting. Do not keep adding solder and heat in an attempt to "fill the joint" as this can allow liquid solder to flow into the system. A properly soldered joint requires very little solder.



Sweep the flame back and forth along the axis of assembled joint...tubing and fitting...to achieve uniform heat in both parts. Avoid overheating the copper tubing. If the tubing starts turning a dark color and/or begins smoking, it is best to let it cool, re-clean and re-flux the fittings before re-soldering. After the joint is soldered, with the tubing still warm, thoroughly clean the joint of all excess flux using a water-moistened rag.

Introduction to the Condensing Unit

The condensing unit houses the most essential component of the refrigeration system, the compressor. The compressor is the most vital component as it is the "heart" that pumps the refrigerant throughout the system. A Danfoss BD series compressor powers this DC Retrofit DIY Kit as it has proven to be the most reliable and efficient compressor for small DC refrigeration systems.



Paired together with the compressor on the base plate is the condenser. The electrical fan moves air through the condenser, cooling the hot compressed refrigerant gas supplied from the discharge port of the compressor. This cooling causes the refrigerant vapor to condense into a liquid.

The compressor pushes the liquid refrigerant from the condenser through the filter-dryer. The refrigerant then continues through the high side (discharge) copper tubing to the capillary tube and on into the evaporator. The capillary tube is the metering device that regulates the amount of refrigerant flowing into the evaporator. This creates high pressure on the condensing unit side of the capillary tube inlet and low pressure on the discharge end of the capillary tube within the evaporator. As the refrigerant moves from the high-pressure side to the low-pressure side, the refrigerant evaporates and absorbs heat from the aluminum evaporator eventually freezing the contents of the box.

The compressor pulls the refrigerant vapor back from the evaporator through the low side (suction) tubing and into the compressor, which compresses it again, and the process continues. This difference in pressure driven by the capillary tubing is the key to the whole refrigeration process.


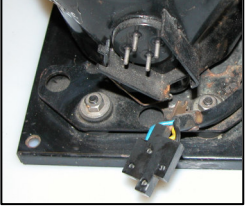
List of Parts: Condensing Unit Mechanical Assembly

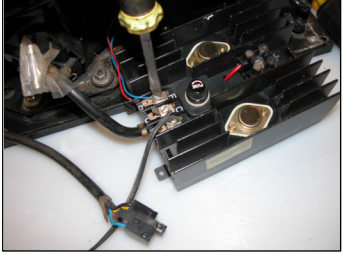
Item	Part No.	Qty	Description
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2	010-1175	1	12/24v Power Module for BD50F (3-pin)
3	020-0500	1	Spun Copper Filter-Drier
4	025-0042	1'	Copper Tubing – 1/4" OD
5	079-0661	1	Swaging Tool – 1/4"
6	079-0803	1	Stay-Brite #8 Solder – 2'
7	079-0806	1	Stay Clean Flux Paste – 4 oz Jar
8	079-2001	1	SS Tube/Fitting Brush – 1/4" OD
9	079-2010	1	Abrasive Cleaning Pad – 6" L x 4" W
10	096-0034	1	Schrader Valve Access Port– 1/4" OD Stem


During the assembly of the condensing unit, be aware that the oil used in the compressor is very *hygroscopic*. The oil will absorb moisture (humidity) out of the air and this moisture will form acidic compounds that cannot be removed by evacuation. These acidic compounds will diminish the life of the compressor. **Try to limit the total time that the compressor oil is exposed to open air to 15 minutes or less.** Always keep the compressor caps on the fittings until right before soldering the connections to them. **Also note to keep all open fittings capped once they have been soldered onto the compressor.**

Disassembly Instructions: Condensing Unit (Mechanical)

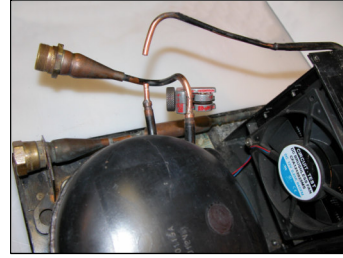
1. Assure that the refrigerant has been removed by an EPA certified refrigeration technician using an EPA approved recovery device. Detach the condensing unit and move to a clean and dry work area.

2. Remove the plastic cover over the compressor wiring terminal by inserting a slotted (flat bladed) screwdriver under the wire clip holding the cover to the compressor and popping the clip out of the bracket as shown in the photo to the right. Remove and discard the cover and clip. Un-plug the 4-pin socket from the pins on the compressor as shown in the photo to the left.  

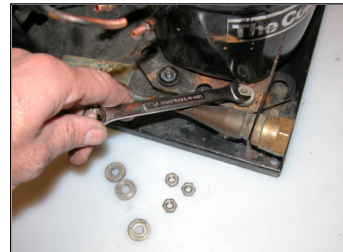
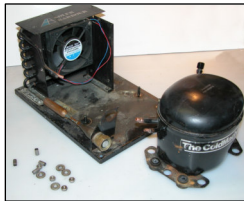
3. Remove the screws holding the control module to the bracket near the fan on the condensing unit. Remove the fan and thermostat wires from the control module and set the control module aside. Discard the short thermostat wire and plug; new terminals will connect the remaining thermostat wire to the new control module in a later step. Dispose of the module in an appropriate manner. 

4. Clean the discharge line near the compressor with the abrasive cleaning pad (079-2010). Bend the discharge line coming out of the compressor into a straight section of tubing, and use the tubing cutter to cut this tube off as close to possible to the compressor discharge tubing stub. De-burr the end of the tube that connects to the condenser inlet. 

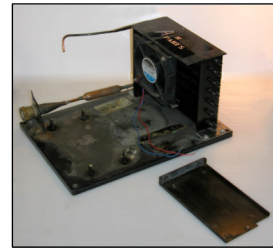
5. Use the tubing cutter to cut off the suction line as close as possible to the compressor suction tubing stub. It is not necessary to de-burr the end of the cut tubing, as this section will be discarded and replaced with a new piece. Heat the end of the suction line quick connect fitting with a torch and remove the short section of 1/4" tubing from it. Do not overheat the body of the quick connect fitting.



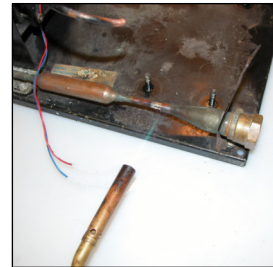
6. Remove the fasteners holding the compressor to the condensing unit mounting base as shown in the photo to the right. Retain these fasteners for use in a later step. Remove the compressor from the condensing unit mounting base. Remove and retain the rubber mounting feet from the old compressor base and dispose of the compressor according to EPA regulations.



7. Turn the condensing unit mounting base over and remove the screws attaching the control module bracket to the mounting base, and set the bracket aside.



8. Use the propane torch to heat the liquid line quick connect fitting where it joins to the filter-drier. When the solder begins to melt, separate the two components at this point. Do not overheat the body of the quick connect fitting.



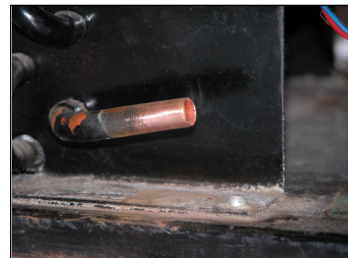
9. Bend the filter-drier up and out, away from the mounting base. Clean the condenser discharge tube near where it joins to the filter-drier with the abrasive cleaning pad (079-2010).



10. Cut the condenser discharge tube about 3/8" from the joint with the filter-drier. Cut off the old filter-drier as shown in the photo to the right and recycle or dispose of it properly.



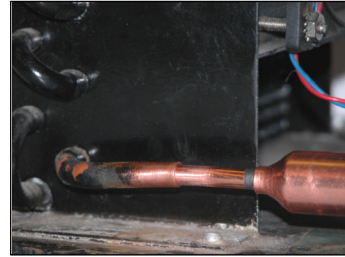
11. De-burr the end of the condenser discharge tube. Carefully bend the condenser discharge tube back to near where it was before removing the old filter-drier.



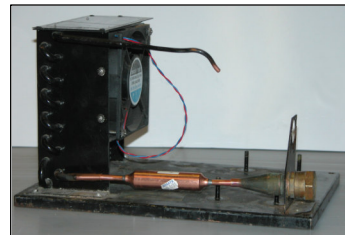
This completes the disassembly of the condensing unit. Proceed to the Mechanical Reassembly Instructions for the Condensing Unit.

Reassembly Instructions: Condensing Unit (Mechanical)

1. Clean both ends of the filter-drier (020-0500) with the abrasive cleaning pad (079-2010). Insert one end of the filter-drier about a 1/2" into the condenser discharge tube end. If there is an arrow on the filter-drier, it should point away from the condenser. Slide the discharge quick connect fitting into the lower hole on the bracket attached to the base plate. Insert the other end of the filter-drier into the discharge quick connect fitting. Mark both ends of the filter-drier where it will be cut and soldered to the discharge quick connect fitting and the condenser discharge tube. Allow about 1/4" of the filter-drier to fit into the ends of the condenser discharge tube and the discharge quick connect fitting.



2. Clean the inside of the condenser discharge tube and the discharge quick connect fitting with the stainless steel fitting brush (079-2001). Cut both ends off the filter-drier (020-0500), and flux (079-0806) both ends. Insert the filter-drier into these two cleaned pieces and solder together. Do not overheat the body of the quick connect fitting when soldering.
3. Insert the four rubber feet from the old compressor (from Step 6 of Disassembly Instructions) into the base of the new compressor (010-1170). Install the new compressor on the condensing unit by mounting the base bolts from the underside of the base plate and guiding the compressor base holes through the bolts on the top side of the base plate. Assemble the spacer sleeves, flat washers, and nuts over the four mounting bolts that are attached to the condensing unit base. Tighten these nuts with the appropriate sized wrench.



4. Cut the copper stem on the 1/4" Schrader valve service (access) port (096-0034) so that 3/4" of stem remains beyond the end of the brass fitting. Remove the cap and the Schrader valve core with the valve core tool and set aside until Step 6. De-burr the stem, clean the stem with the abrasive cleaning pad (079-2010) and flux (079-0806) the end of the stem. This Schrader valve service port will connect to the compressor suction tube in Step 6.



5. Remove the aluminum cap and rubber plug on the compressor suction tube that is nearest to the end with the electrical contacts with a pair of pliers. Use a hammer and the 1/4" swaging tool (079-0661) to enlarge the tube to 1/4", the size of the copper tubing that will be soldered to it. Align the swaging tool carefully and strike firmly and squarely with the hammer several times until the swaging tool



bottoms out against the shoulder of the tube as shown in the photo to the left. Remove the swaging tool from the compressor suction tube. **It is very important to limit the exposure of the oil to the atmosphere to 15 minutes or less, as the oil is very hygroscopic and will absorb moisture (humidity) out of the air.** The moisture will react with the oil and form acidic compounds that cannot be removed by evacuation, and will diminish the life of the compressor.

6. Use the 1/4" SS tube/fitting brush (079-2001) to clean the inside of the compressor suction tube. Only twist the brush clockwise. Clean the edge or shoulder of the suction tube with the abrasive cleaning pad (079-2010). Twist the corner of a clean cotton rag into a point. Moisten the rag point with a solvent such as Acetone, and twist the point of the rag in the compressor suction tube to clean any oily film from the inside of the compressor suction tube. Repeat as necessary to remove all oil or oily film from the inside of this tube. Insert the cleaned and fluxed end of the 1/4" Schrader valve service port (096-0034) fitting from Step 4 into the compressor suction tube and solder. Avoid overheating the fitting or the tubing. Only use a minimum amount of solder to make this connection and do not allow solder to enter the compressor. When the Schrader valve service port has cooled, re-install the Schrader valve core with the valve core tool.



7. Measure and cut an 8" long piece of 1/4" copper tubing (025-0042). Clean and de-burr both ends of this tubing, and flux one end. Insert the fluxed end of this tube into the suction line quick connect fitting from Step 5 of the Disassembly Instructions, and solder. Do not overheat the body of the quick connect fitting when soldering.

8. Use pliers to remove the aluminum cap and rubber plug on the remaining compressor suction tubing stub (the other top port on the compressor). Use a hammer and the 1/4" swaging tool (079-0661) to enlarge the tube to 1/4", as in Step 5. Use the 1/4" SS tube/fitting brush (079-2001) to clean the inside of the compressor suction tube. Only twist the brush clockwise. Clean the edge or shoulder of the suction tube with the abrasive cleaning pad (079-2010). Twist the corner of a clean cotton rag into a point. Moisten the rag point with a solvent such as Acetone, and twist the point of the rag in the compressor suction tube to clean any oily film from the inside of the compressor suction tube. Repeat as necessary to remove all oil or oily film from the inside of this tube. Insert the 1/4" copper tubing from Step 7 through the top hole of the bracket attached to the condensing unit base, and gently bend the open end of the tubing up and around so that it may be inserted into the compressor suction tube stub.

9. Insert the cleaned, de-burred, and fluxed end of the tubing into the compressor suction tube stub, and solder. Only use a minimum amount of solder to make this connection and do not allow solder to enter the compressor.



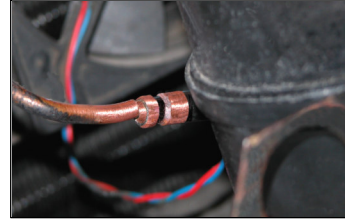
10. Bend the small copper tube attached to the condenser inlet down and orient it so it can be inserted into the compressor discharge tube. Clean the end of this small tube with the abrasive cleaning pad (079-2010), and apply a small amount of flux (079-0806) to the end.

11. Using a pair of pliers, remove the aluminum cap and rubber plug covering the compressor discharge tube (closest to the label) and use the 1/4" SS tube/fitting brush (079-2001) to clean the inside of the compressor discharge tube. Only twist the brush clockwise. Twist the corner of a clean cotton rag into a point. Moisten the rag point with a solvent such as

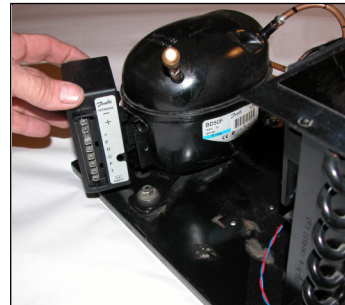


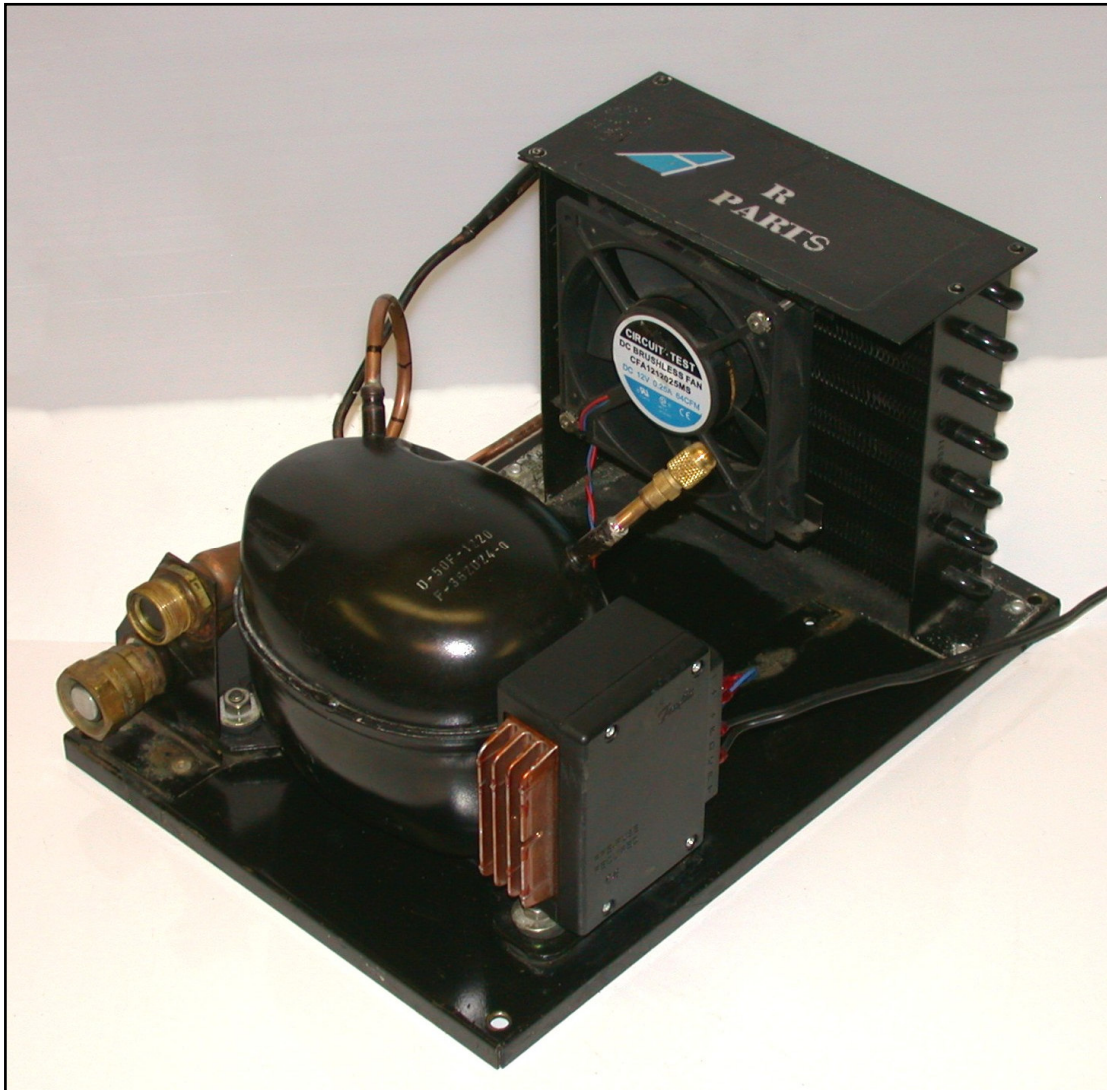
Acetone, and twist the point of the rag in the compressor suction tube to clean any oily film from the inside of the compressor discharge tube. Repeat as necessary to remove any oil or oily film from the inside of this tube. Use the abrasive cleaning pad (079-2010) to clean the shoulder of the discharge tube on the compressor. Apply a small amount of flux to the shoulder of the compressor discharge tube stub.

12. Lift the long side of the base plate (the side parallel with the compressor electrical contacts) and rest it on a box or other object about three inches high to tilt the compressor so that the compressor discharge tube is horizontal. This will prevent excess solder from running down into the compressor and plugging it. Bend the small tubing from Step 10 and insert the cleaned, fluxed end of this tube into the compressor discharge tube and solder. Avoid overheating the fitting or the tubing. Only use a minimum amount of solder to make this connection. If solder is allowed to enter the discharge tubing of the compressor, it may plug the compressor and ruin it. *Damage of this sort is not warranted in any way by RParts.* Rest the base plate flat after soldering.



13. Attach the compressor power module (010-1175) plug to the three compressor pins on the end of the compressor that has the module mounting bracket. Orient the plug so that the wires come off the top of the plug. Push this plug firmly onto the pins of the compressor. Remove the module mounting screw located on the module mounting bracket flange on the compressor. Orient the plastic housing of the module over the flange on the condenser side of the module mounting bracket. The module will fit around this flange, and the screw hole on the power module will align with the screw hole on the compressor module mounting bracket. Attach the module housing over the bracket, insert the screw through the hole in the module housing and into the threaded hole in the bracket on the compressor, and tighten the screw with a screwdriver.





This completes the Mechanical Assembly of the Condensing Unit. Proceed to the Electrical Assembly section for the Condensing Unit.

When moving the condensing unit, lift by the base. Never attempt to lift the condensing unit by the tubing.

List of Parts: Condensing Unit Electrical Assembly



Item	Part No.	Qty	Description
1	290-0001	4	Insulated Female Spade Electrical Terminal – 22-18 ga.
2	290-0011	2	Insulated Female Spade Electrical Terminal – 12-10 ga.
3	400-0911	-	Standard Cable Tie – 7 1/2"

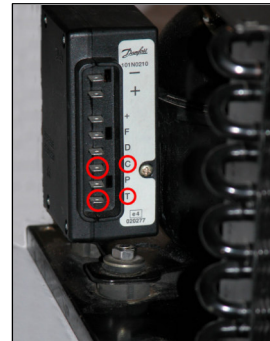
Assembly Instructions: Condensing Unit (Electrical)

1. Locate and measure the length of the supply wiring from the source to the condensing unit. Assure that the wire size (gauge) is adequate for the wire distance and amperage load of the compressor and is in good condition. Refer to the chart on page 21 in the Installation Instructions: Electrical Connections section to determine the correct wire size. Locate the two wires connected to the fan on the condensing unit. Locate the duplex wire from the thermostat to the condensing unit mounting area.
2. Strip 3/8" of insulation from the ends of each wire identified in Step 1. Crimp one 12-10 gauge insulated female spade electrical terminal (290-0011) on one end of each of the (at least) 12 gauge supply wires. Supply wires of a different size than 12-10 gauge will require appropriate sized insulated female spade electrical terminals that are not included with the kit. Crimp one 22-18 gauge insulated female spade electrical terminal (290-0001) to the end of each of the two wires attached to the fan. Crimp one 22-18 gauge insulated female spade electrical terminal (290-0001) to the end of each of the two thermostat wires.

3. Connect the 22-18 gauge insulated female spade electrical terminal (290-0001) attached to the red fan wire to the *small* "+" connection on the control module (010-1175). Connect the 22-18 insulated female spade terminal (290-0001) attached to the other wire from the fan to the "F" terminal on the compressor control module as shown in red in the photo to the right.



4. Connect one 22-18 gauge insulated female spade electrical terminal (290-0001) on one of the thermostat wires to the "T" connection on the control module (010-1175) as shown in red in the photo. Connect the other 22-18 insulated female spade terminal (290-0001) attached to the other thermostat wire to the "C" connection on the control module.



5. Connect the 12-10 gauge insulated female spade electrical terminal (290-0011) on the red supply wire to the *large* "+" terminal on the compressor control module (010-1175). Connect the other 12-10 gauge insulated female spade electrical terminal on the black or yellow supply wire to the "-" terminal on the compressor control as shown in red in the photo to the right.



6. Use the cable ties (400-0911) as necessary to secure the wiring and prevent accidental disconnecting of the wire terminals from their connections.

This completes the Electrical Assembly of the Condensing Unit. Proceed to the Installation Instruction section of the Condensing Unit.

When moving the condensing unit, lift by the base. Never attempt to lift the condensing unit by the tubing.

List of Parts: Installation Process

Item	Part No.	Qty	Description
1	---	1	Completed Condensing Unit
2	400-0911	-	Standard Cable Tie – 7 1/2"
3	079-0880 Not Included	1	Bubble Solution Leak Detector
4	055-0040 Not Included	tbd	Foam Tube or Adhesive Tape Insulation (to Insulate Suction Line)

Installation Instructions: Condensing Unit

1. Mount the condensing unit on a dry, level, and sturdy platform, solidly attached to the vessel where vibrations will not resonate or amplify noise with 1/4" bolts, washers, and nuts. Securely bolt the unit to the platform through the four holes on the corners of the base plate. It may be mounted in any alignment, either fore and aft or athwart ship. The base must be horizontal and parallel to the waterline when the boat is at rest. Position the unit to allow access for attachment of the refrigerant lines, electrical wires, and service gauge hose.
2. Assure that the area is well ventilated. The compressor will produce heat and ventilation is important for cool air to flow in and warm air to flow out of small spaces.

Installation Instructions: System Connection

1. The suction line from the evaporator to the condensing unit will sweat in humid weather unless it is insulated. Use foam tube insulation or foam adhesive tape insulation (not included) to insulate the suction line. The insulation tube or tape should be pushed up against the tubing access hole on the outside of the insulated box and cover the suction line about three feet from where the line exits the insulated box. More than one layer of insulating tape may be necessary in hot, humid climates.
2. At the end of the evaporator tubing near the condensing unit, connect each of the quick connect couplings to the matching coupling on the condensing unit. Tighten these fittings with two wrenches to about 20 to 25 ft. lbs of torque. (These couplings have a rubber initial seal, but the primary seal is made by a sharp steel ring biting into the brass of the mating fitting, so this connection must be very tight).

Installation Instructions: Leak Testing

1. Assure that both valves on the refrigeration service manifold gauge set are shut, fully clockwise (CW). Attach the low side suction hose (blue) of the refrigeration manifold gauge set to the service port (top connection) on the compressor. Attach the center service hose (yellow) of the refrigeration manifold gauge set to the low-pressure side of the regulator attached to the nitrogen bottle. Open the valve on the nitrogen tank counter clockwise (CCW), and adjust the regulator to allow 125 psig to enter the yellow hose.
2. Slowly open the low side suction hose (blue) knob of the refrigeration service manifold gauge set counter clockwise (CCW) and allow the nitrogen to enter the refrigeration circuit. Allow the nitrogen to enter until the pressure equalizes. If necessary, adjust the nitrogen regulator pressure so the gauges read 125 psig. Close the manifold valve fully clockwise (CW) and observe the pressures over a period of several hours or overnight. Close the valve on the nitrogen tank clockwise (CW).
3. If the suction gauge quickly loses pressure, listen and try to hear where the leak is. If the gauge slowly loses pressure, apply a soap bubble solution to all solder joints and fittings to try to find the source of the leak. Tighten the fitting or re-solder the connection to fix the leak(s). **The nitrogen pressure must be released before solder repairs are attempted.** Re-pressurize and leak test again after repairing leak(s).
4. If the gauge reading remains the same for an hour or so, the system is probably leak-free. If the nitrogen pressure is left in the system overnight and there is a temperature drop, some of the nitrogen will dissolve in the refrigerant oil and the pressure on the gauge will drop slightly, usually only a pound or two.
5. After finding and repairing all of the leaks and verifying that the system is **leak-free**, release the pressure through the hose connection. Remove the hose, and attach and tighten the cap on the suction fitting on the compressor.

Installation Instructions: Electrical Connections

Verify the correct gauge for the electrical supply wiring from the following chart based on the round trip distance from the distribution panel breaker to the condensing unit location and back. Longer runs will require heavier wire.

0-10'	10'-20'	20'-30'	30'-40'
14 AWG	12 AWG	10 AWG	8 AWG

To retain the reliability of this RParts system upgrade, it is important that all connections are made properly using a high strand count, 100% tinned, marine-grade wire and high quality tin plated wire terminals.

If necessary to update or improve the wiring to acceptable standards, use appropriate sized terminals for all connections and make good crimp connections. The non-heat shrink terminals have two crimp connections, one for the electrical connection, and one for a mechanical connection to the insulation on the wire. Use the correct part of the wire-crimping tool to crimp each connection. It is advisable to use adhesive lined heat shrink tubing over marine grade terminals. Use cable ties (400-0911) and appropriate fasteners to secure the wiring (and tubing) in an out of the way route from the condensing unit to the insulated box.

1. Supply Wiring

The existing supply wiring may be re-used after inspection and verification that it is adequately sized and in good condition. Otherwise, attach the appropriate wire ring terminal to the correct gauge red wire and connect to the load side of an unused 15-amp DC breaker labeled "Refrigeration" in the distribution panel of the boat. Attach the appropriate wire terminal and connect the yellow or black wire to a 12-volt DC negative buss or connection at the distribution panel. Run these wires in a professional manner through the boat to the condensing unit. Use cable ties (400-0911) as necessary to keep the wiring out of the way.

2. Fan and Thermostat Wiring

The existing wiring may be re-used, assuming that it is in good condition.

3. Electronic Control Module Wiring

All electronic control wiring was completed previously in the Assembly Instructions section for the Condensing Unit (Electrical).

Now that the complete system has been installed, connected, and proven leak free, it is time to evacuate and charge the system with refrigerant. Proceed to the Evacuating and Charging section and read it completely before beginning.

REFRIGERATION PARTS SOLUTION

"Do It Yourself" Kit Evacuating and Charging Manual



For Danfoss Retrofit DIY Kit (Compressor Upgrade)

Manual Version 1.0 – December 2008

List of Parts: Charging System

Item	Part No.	Qty	Description
1	Not Included	3-6 oz.	Refrigerant – R134a (and Refrigerant Can Tap Adapter if using Disposable Cans)

Required Tools

- Refrigeration service manifold gauge set
- Vacuum pump

Evacuating Instructions

1. Begin by assuring that the valves on the service manifold are shut (CW). Connect the low side suction hose (blue) of the refrigeration service manifold gauge set to the suction access port on the compressor.
2. Connect the middle service hose (yellow) of the refrigeration manifold gauge set to the vacuum pump. Plug in the vacuum pump and switch it on. Open the vacuum pump valve between the pump and the yellow hose.
3. Open (CCW) the knob of the manifold gauge set blue hose and allow the vacuum pump to evacuate the refrigerant circuit. The pressure readings on the blue gauge should go down, it should soon show a vacuum, eventually down to 30" Hg.
4. Allow the vacuum pump to run for the amount of time according to the ambient temperature of the refrigeration system environment. Refer to the table below for the recommended evacuation time.

Ambient Temperature	Evacuation Time
Above 80° F./27° C.	1 hour
70° F./21° C.	2 hours
65° F./18° C.	6 hours
60° F./15° C.	24 hours
50° F./10° C.	48 hours

It may be necessary to warm the boat so that the evacuation process can occur in a reasonable amount of time.

5. When the evacuation process is finished, close (CW) the valve on the service manifold. Remove the blue hose from the suction access port on the compressor. Replace and tighten the cap for this port. Remove the yellow hose from the vacuum pump and proceed to the next section.

Charging Instructions

1. Begin by assuring that the thermostat is set to off ("0"), and that the refrigeration service breaker on the electrical distribution panel is "On". Assure that the service manifold valves are closed (CW).
2. Attach the blue hose to the suction access port on the compressor. Attach the service hose (yellow) of the refrigeration service manifold gauge set to the refrigerant source. Orient the refrigerant container to discharge vapor, and open the valve on the refrigerant container.
3. Slowly open (CCW) the service manifold gauge set valve next to the blue hose and gauge and allow refrigerant vapor to enter the refrigerant circuit. Allow the pressure to equalize through the gauge set. Close (CW) the gauge set valve.
4. Turn the thermostat knob to its middle position (about "3" or "4"). The fan and compressor should start. When the compressor starts, the suction pressure gauge (blue) reading will go down.
5. When the gauge reading approaches zero, slowly open (CCW) the service manifold gauge set valve to allow more refrigerant vapor to enter the system. Keep regulating the valve to try to maintain about 8 to 10 psig on the gauge. Add refrigerant slowly. Releasing vapor pressure from the refrigerant container will cause the container to chill, which lowers the pressure. It may be necessary to warm the refrigerant container to speed up the refrigerant transfer from the container to the condensing unit. Keep adding refrigerant while the system is running until the evaporator is frosted and the suction pressure is around 5 psig.
6. After adding refrigerant 134a to the condensing unit, close (CW) the service manifold gauge set valve, close the refrigerant cylinder valve, and remove the hoses from the refrigerant cylinder and suction service port on the compressor. Install the cap (brass) on the suction service port. The system is now ready for use. The thermostat should be set to a middle position and the box should be allowed to cool. The thermostat may need to be adjusted to achieve the desired box temperature.

This concludes the assembly, installation, and charging of the RParts DIY kit. Please direct any questions, comments, or feedback to the DIY Forum at RParts.com. (<http://www.rparts.com>).

RParts DIY Kits Warranty

LIMITED WARRANTY

RParts DIY kits are warranted with the following conditions.

The warranty covers defects in materials and workmanship of kit components for a period of 6 months from the date of purchase. The warranty is limited to the actual cost of the defective component(s) and does not include coverage for any labor cost incurred in the removal or reinstallation of such component(s). Warranted component(s) shall be repaired or replaced at the sole discretion of the manufacturer. Shipping costs are not included.

This warranty does not include failure due to:

- improper installation
- abuse, misuse or improper maintenance
- rust/corrosion due to water exposure

Components expressly excluded from this warranty are:

- Danfoss power module
- Sea water pump

RParts shall not be liable for consequential damages resulting from the use of this product. Coverage for any incidental damage to vessel, equipment or supplies caused, either directly or indirectly, by the failure of any RParts component is specifically excluded. This warranty is valid only for components included with the kits and does not include RParts equipment or components of other manufacturers used in conjunction with the kits. The coverage herein described constitutes the whole, no other warranty written or verbal is authorized.

To obtain warranty service, obtain a return merchandise authorization (RMA) by sending an email to rma@rparts.com. When making a warranty claim, be sure to detail the problem encountered and include evidence of purchase date along with the order number, your name, address and telephone number.