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23080 Hamilton Rd. Richmond, B.C. Canada V6V1C9  
Tel (604) 522-0233 Fax: (604) 522-9608

## Force 10 Diesel Burner

1. The Force 10 diesel burner is virtually the same as our kerosene burner. The only difference is in the nipple/pricker size. However, they will still burn kerosene very well.
2. There are many different grades of diesel fuel. Some contain large amount of carbon, which tend to clog the burner. Therefore, try using higher grades of diesel, which are characterized by a very light or clear colour. If high grade diesel fuel is not found, the burner may not function well. In this case, kerosene may be the only option.
3. The calorific value of diesel fuel is about 5% higher than kerosene. This means gallon for gallon, diesel will produce 5% more heat than kerosene.
4. Starting tips: Until you learn how much alcohol to use for pre-heating, always fill the spirit cup completely. This will ensure the burner is hot enough. Keep in mind, a hot burner lights readily, while a cool burner will flare up. When your burner burns nice blue flames, diesel fuel will be less pungent.
5. Burning tips: Outside air must be supplied, or the oxygen level will drop, creating a funny smell. If this problem is not rectified, you may find yourself getting headaches. An open flame will create moisture, CO<sub>2</sub> and CO, and other products of combustion. Therefore, DO NOT use your stove to heat your cabin. Heaters with outside stacks, such as the Force 10 Cozy Cabin Heater, should be used for steady heating.
6. Fuel Pressure: Fuel should be provided at 1 atm. or 10 to 15 psi. We recommend using a separate pressure tank to fuel the burner. This will maintain a more constant pressure to your burner.



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**Suggestions on fixing problems with kerosene or diesel burners**  
**made by Optima or Patria**

**The burner burns with a yellow smokey flame:**

1. The burner was not preheated enough. Turn off the burner and preheat again with alcohol. Be careful when putting alcohol on a hot burner. Make sure the flame is completely out -- wait at least one minute after the burner is turned off.
2. If you often have problems with not getting the burner hot enough, try this trick. Take an empty can, about 3" - 4" in diameter. Remove the top and bottom of the can and place it around the preheating burner -- this will contain the heat and prevent any draft.
3. Perhaps you used methyl hydrate alcohol which contains 40% water. We recommend that you use only denatured alcohol, which burns quite a bit hotter.
4. If your flame is blue with yellow tips, it may be that the inner cap is not properly seated. Remove the outer cap and push the inner cap all the way down.
5. ~~If you want to start your burner in tough weather and have trouble keeping the alcohol cup full, you can use alcohol paste, available in some marine stores.~~
6. The fuel line may not have been purged. Therefore, when you turn the burner on after preheating, all you get is air for some time purge the line. When fuel finally arrives at the burner, the burner may have cooled off enough that it produces a yellow flame. We suggest that you purge the line first before preheating, by opening the burner and watching the nipple until liquid fuel appears. Wipe off the excess fuel before preheating.

**The burner flame is blue on one side and a yellow on the other:**

1. You may have carbon build-up in your nipple. Turn the control knob to the clean cycle a few times. This should clear the orifice. If the problem persists, try switching to a different fuel. Buy fuel that is as clear as possible and always filter your fuel.
2. Your outer or inner caps are not on straight or they may have carbon deposits on them. Wipe them clean and install them straight. Caution: Be sure the burner is cool before handling, or use oven mitts.
3. You may have a nipple with a bad pricker. Replace the pricker by following the instructions in the parts replacement kit.

**No fuel is getting to your burner:**

1. Check fuel level in your tank
2. Pressure gauge may be faulty. Check pressure using a tire gauge on the air fitting. Replace the pressure gauge if necessary.
3. For installations where a long fuel line is used, we install a restrictor in the bottom of the burner (in the burner fitting). This is to prevent surging of the burner. This restrictor may be plugged, so follow the instruction sheet for burner replacement and clean it with a fine wire or a spare pricker.

**The flame shrinks after burning for a while:**

1. Some fuels contain more carbon than others. If you use yellow coloured fuel it has a higher content of carbon. This carbon will build up at the end of the spindle inside the burner, restricting the flow of vapourized fuel. You can fix this by tapping the burner with a screwdriver or other utensil. This will knock off the carbon build up. If a large piece of carbon is blocking the orifice, turn the control knob to the clean cycle to unplug the orifice. **Note:** If you operate the unit with clear fuel, you will eliminate this problem 75% of the time.
2. There is not enough pressure from the tank. Check to make sure the pressure gauge is working by using a tire gauge. The minimum pressure required is a constant 10 psi. Running the fuel straight off a fuel pump without a pressure tank will not work properly.
3. Do not fill the tank to the top. The less air in the tank, the quicker the pressure will drop. It is best to fill the tank 3/4 full and then pressurize.

**Burner leaks slightly when not in use:**

1. The burner control knob may be in the clean position and not the closed position.
2. If the knob has more than 180° of turn, your pricker will prevent the spindle from closing the burner. Look at the instructions in the repair kit to learn how to fix this problem
3. The spindle may be worn at the tapered point. Inspect and replace if necessary.

**Burner creates a smell:**

1. You may be using inferior fuel.
2. You may have a few small leaks around the burner connection, which are not visible. Use the procedures in the repair kit document to find and repair the small leaks.

**The flame is continuously too small:**

1. Test the pressure gauge on the tank with a tire gauge. Replace the gauge if necessary. Run the burner between 10 and 20 psi or 3/4 to 1 1/2 atm.
2. Your burner may be plugged up internally with carbon. If cleaning does not help you may need to replace the burner.
3. If the control knob has only 90° of turn, the pricker is not installed properly. Refer to the directions on the repair sheet in the repair kit.

**The flame surges or jumps:**

1. The flame will surge if the burner is attached to the tank with more than 2 feet or 60 cm of fuel line. This length creates uneven fuel pressure. You may need a restrictor either in the base of the burner or at the burner fitting.

**A small yellow flame burns around the end of the handle:**

1. Tighten stuffing box nut with a crescent wrench, about half a turn.
2. If it does not want to tighten anymore replace the packing.

**In conclusion:**

1. use clean fuel
2. always filter your fuel
3. always preheat properly

We suggest you have a spare parts kit and a service wrench on hand just in case you need to do a quick repair. If you still have a problem, call your local dealer or contact our service department at (604) 522-0233. We will be pleased to help you in any way possible.

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### Repairing The Swedish Optimus No. 207 Burner or The Portuguese Patria Burner:

Read over procedures before trying to repair your burner system. Never remove the entire burner from the stove or heater unless absolutely necessary. Always attempt to fix it in place, as once the burner is removed it can be very difficult to re-seal the bottom. The only reason to ever remove a burner is if the body of the burner is leaking (very uncommon) or if it is plugged with carbon.

#### Procedure For Dismantling The Burner:

Ensure the pressure is released from the supply tank and the control knob is in the closed position (Clockwise).

1. Turn and remove the two steel caps on the top of the burner. Using the nozzle wrench, remove the nipple by inserting the wrench in through the top of the burner and unscrewing it. Be sure to press down firmly on the wrench.
2. Open the control knob 1/4 turn until you can see the needle appear where the nipple was.
3. Using a normal pencil with an eraser in the end, drop it in the top of the burner and push the eraser onto the needle.
4. Continue to open the control knob until the needle and the pricker are free and may be lifted out with the pencil. If the wire of the pricker is gone, use a small screwdriver from the side.
5. Remove the control knob by taking out the spring clip.
6. Using a 10mm or small crescent wrench, turn the stuffing box counter clockwise until it is free and can be removed.
7. Replace the control knob and turn the spindle counter clockwise until it is free and can be removed.
8. Inspect all parts for damage or excessive carbon build up.

#### Procedure For Re-Assembling The Burner:

1. With the washer, packing and control knob on the spindle, screw the spindle all the way until it stops.
2. Remove the handle and put the stuffing box nut over the spindle.
3. Using the stuffing box nut, push the packing in until the thread on the stuffing box nut engages the thread on the burner.
4. Using a 10mm or a small crescent wrench tighten the stuffing box nut until there is a perceptible drag felt when turning the control knob. This indicates it is compressing the packing against the shaft of the spindle.
5. Check the control handle is in the closed position (all the way clockwise).
6. Stick the pricker in the pencil. With the control knob pointing towards you, lower the pricker into the hole with the teeth facing to the left. Allow it to rest on the spindle.
7. Keep a slight downward pressure on the pencil and pricker and very slowly start opening the control knob (counter clockwise). Continue to open it until you feel four distinct clicks of the pricker through the pencil. This indicates you have passed four teeth on the spindle.
8. Close the control knob while keeping the slight downward pressure on the pencil. This action will draw the pricker into the burner.
9. Replace the nipple using the nozzle wrench (do not tighten it up hard until going through the check procedure outlined latter in this document).
10. If the nipple keeps falling out of the wrench, use a little grease to keep it in the wrench.

#### Check Procedure:

A correctly assembled burner has about 135° of turn on the control knob from fully closed to the end of the clean cycle (between 1/2 and 1/4 turn). If the burner has more or less turn it indicates the teeth on the pricker have engaged the wrong teeth on the spindle.

**Correction Procedure:**

**If the burner has only 90°** or one quarter turn on the knob this will cause the burner just to burn with a small flame.

Close the valve (clockwise). Remove the nipple and open the control knob until the pencil can be placed on the pricker. Keep a slight downward pressure on the pencil and continue to open the control knob until you feel the pricker jump one more tooth. Close the valve (clockwise). Re-assemble and re-check.

**If the burner has 180°** or one-half turn on the knob this condition will cause the burner to leak slightly when fully closed as the pricker contacts the inside bottom of the burner before the control knob has turned far enough to close.

Turn burner to closed position (clockwise). Remove the nipple and open the control knob (counter clockwise) until the pencil can be placed on the pricker. Keep a slight upward pull on the pencil and continue to slowly open the control knob (CC) until the pricker is released. From this exact point where the control knob released the pricker, lift the pricker about a quarter inch and turn the control knob clockwise very slightly. Only enough to pass one more tooth on the spindle and re-insert the pricker. Close the control knob all the way (clockwise), this will draw the pricker in, and replace the nozzle and go through the check procedures again.

You must get the correct amount of turn (between 1/2 and 1/4) or you are wasting your time and your burner will not work properly, so have patience and repeat the procedures if necessary.

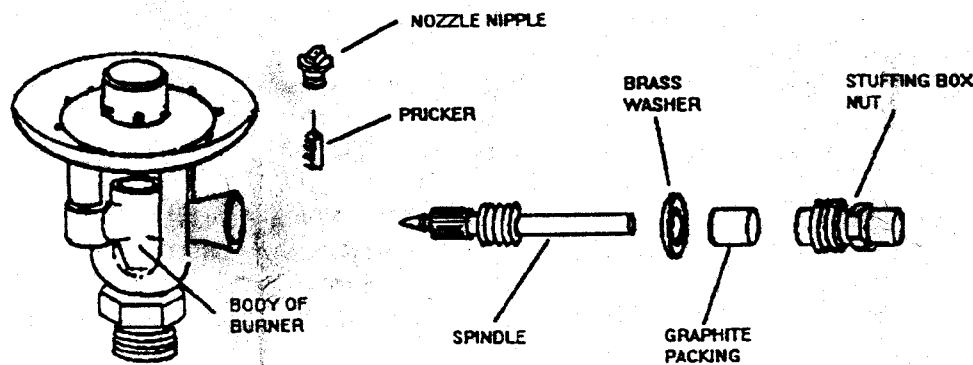
If you now have the correct amount of turn on the control knob, tighten up the nozzle.

If you have removed your burner from your stove or heater and you re-installed it, drain your tank completely and pressurize the whole system with air only. Now test all your reconections with soapy water and a small brush. If you see bubbles, you have leak that needs to be corrected.

Small leaks can be dangerous, and evaporated liquid fuel can cause headaches. So be safe and make sure there are no leaks in your system.

**Shut-Off Valves:**

Force 10 does not install shut-off valves in their tanks as they are dangerous. People sometimes turn off the shut-off valves while everything is under pressure. The next time the burner is preheated, and the user has forgotten to open the shut-off valve, the pressurized liquid fuel in the line and burner may come under very high pressure because of preheating the burner. This often blows holes in the burner. If no shut-off valve exists the excess pressure is taken up by the air cushion in the tank. We recommend releasing the air pressure in the tank as a better alternative to a shut-off valve when not on board.



**Burner Diagram**

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