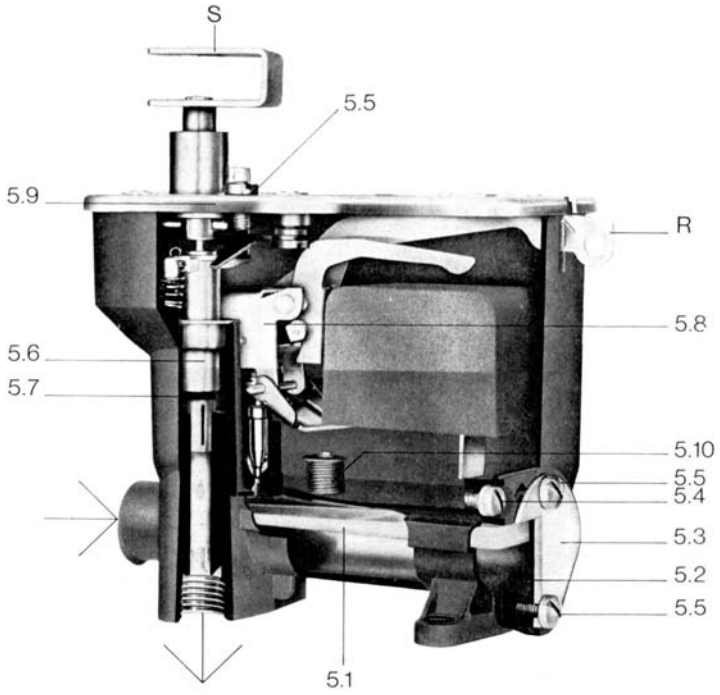
NordicStove TOBY DVR 5 Oil Control



5.1 Flat Filter
5.2 Filter Washer
5.3 Filter Cover
5.4 Drain Screw with washer
5.5 Attaching Screws
5.6 Metering Stem with spring and washer
5.7 Washer
5.8 Float Assembly
5.9 Lid Assembly
5.10 Anti-overheating safety device
R = Oil flow & over fill trip switch lever
S = Oil control knob

TOBY DVR 5 Principle of Operation (reproduced from "TOBY Handbook for Skilled Fitter.")
The oil control serves to regulate the capacity of a heating device fired with heating oil. Apart from the task of having to supply the burner with a controlled and pre-selected quantity of fuel per unit of time, the oil control also protects the burner against overloading and flooding. It is the safety organ of the heating device.

The oil control functions according to the customary principle of level regulation. Oil enters via the filter and the feed valve (part of float assembly) into the oil control. The rising oil level in the oil control lifts the float. When the oil reaches the level mark (mark on outside of control), the feed valve is closed by the float to allow only as much oil into the control as flows out of it to the burner. The oil control knob determines the pre-selected quantity of fuel entering the burner.

To start the oil flow, lift the oil flow & over fill trip lever (R). This sets the over fill switch and allows the float to drop down. It is normal for the oil flow lever to drop down after it is set. Should the feed valve become leaky from an accumulation of dirt or the flame die in the burner assembly, the oil will rise above the level mark causing the float to trip the over fill switch (trip lever is pictured directly above the float assembly). This causes the feed valve to completely close.

If the over fill switch is tripped by an extinguished flame, turn off oil control knob and remove excess fuel from burner. Light the burner and burn off excess fuel before turning on oil control knob. Allow excess fuel to drain from oil control before resetting oil flow lever. If the oil level in the control is above the level mark, you will not be able to reset the over fill trip switch.

Servicing the DVR

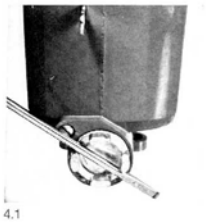
All mechanical devices require servicing at certain intervals. The time period between servicing will depend upon climate, type and quality of oil burned, quality of line filter, and age of tank.

The following sequence should be carried out during an annual service:

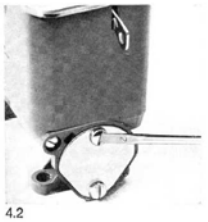
1. Turn oil flow off at the tank and clean or replace filter.

2. Set oil control knob to highest position and tap thermostat pin. This will help remove a slight accumulation of dirt in the metering stems slit. CLOSE oil control.

3. Clean carbon and coke from burner feed nozzle located inside the NordicStove.



4.1



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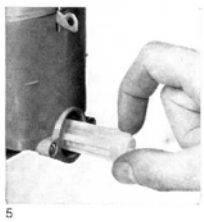
Removal of the filter. Cleaning the filter in fresh fuel oil, benzine, petrol, kerosene or hot water.



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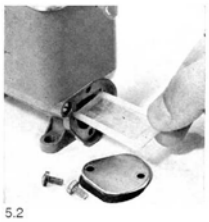
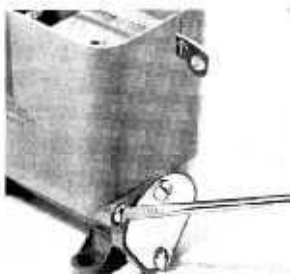


5.2

4. Surround area with oil absorbent material. Place a V-shape funnel under filter cover, remove cover screws, and drain into pan. Remove filter. Clean filter in fresh heating oil, kerosene, or hot water. If you use hot water, thoroughly dry filter before installing.

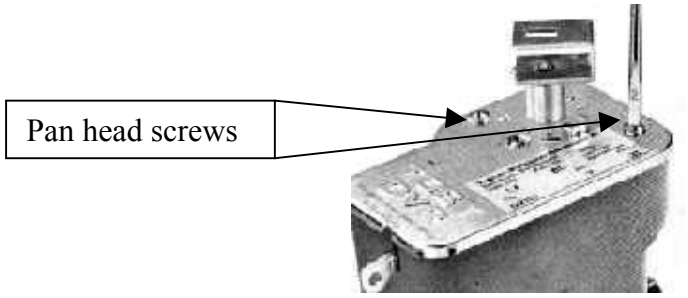


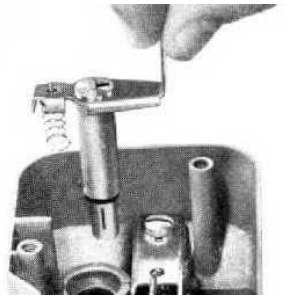
5. Remove drain screw and drain oil from inside oil control. If there is water and/or large accumulation of dirt, remove lid assembly and flush with clean oil (See Cleaning Metering Stem).

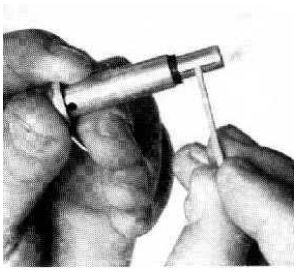
6. Replace filter, cover and drain screw. Test fire Nordic for proper operation.

<u>Cleaning Metering Stem and Feed Valve</u>

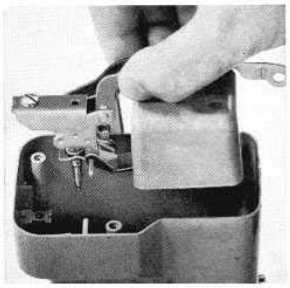
1. Turn off tank valve.
2. Burn off fuel in oil control by adjusting oil control to high; or drain oil from control by removing drain screw.
3. Remove the two PAN head screws from lid assembly. Lift lid from oil control knob end. Observe position of arm attached to lid. It rests on the metering stem.







4. Remove metering stem and clean slit. Cleaning should be done with a soft, non-metallic instrument. The slit must not be enlarged.

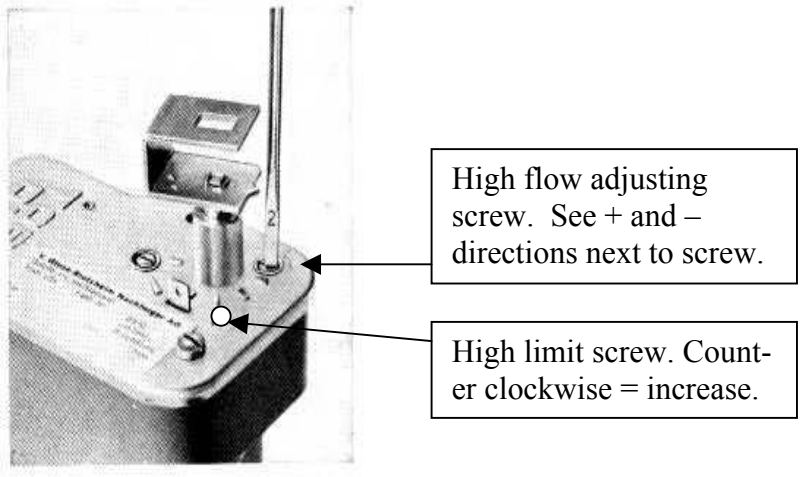


5. Remove attachment screws. Lift out assembly. If necessary, clean feed valve tip and seat.

Adjusting Oil Control for Oil Type and Chimney Height

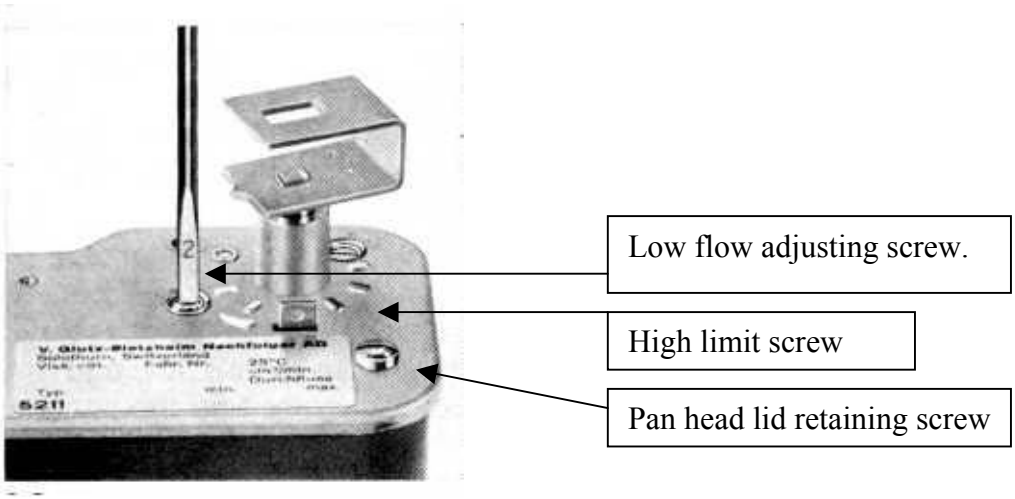
There are **two methods** that you can use to adjust and tune your NordicStove for efficient and safe operation with various fuel oils and for the draft conditions of your particular chimney system. These adjustments may be necessary because different fuels have **different viscosity** and will flow through the oil controller at different rates. In addition, each chimney system will create **different draft conditions** that can effect the way your NordicStove burns. The adjusting screws for the fuel flow are located on top of the oil controller. The Low adjustment screw is near the "0" position of the flow control knob scale and the High adjustment screw is near the last (sixth) mark on the scale. The smaller High Limit Screw is in between. (See diagram below.)

1) **Visual method.** Perform this adjustment the FIRST time the stove is operated.
   a) **First,** you should determine **whether the stove needs to be adjusted**. Be sure the stove is as level as possible. This is more critical when burning on the LOW setting.
      i) Ignite the stove and allow it to warm up slowly. Gradually turn the control knob counterclockwise until it is in the HIGH position.
      ii) Protect your eyes and face and look through the peephole on the top plate of the heater. Determine whether the flame is quite high in the stove or whether the stove appears to be getting quite hot, especially near the exhaust outlet.
      iii) Check the chimney outside and look for excessive smoke in the exhaust. (Dark exhaust, not light or white water vapor.) If it is smoky, the setting is incorrect. If not, you may leave it as is or try to increase it for more heat output.
      iv) Next, turn the control knob to the LOW position. Look through the view hole or window to see if the flame is burning steadily in the center of the burner or whether it is only burning on one side and only near the fuel nozzle. If it does not remain stable, the fuel flow rate must be increased.
      v) **Typically, if you use a fuel that is a "heavier or thicker" grade of fuel oil than #1 fuel oil or kerosene, the settings will require adjustment.**
   b) **Mark** the original position of the **Low** and **High** adjustment screws.
   c) **Mark** the original position of the **high limit screw**. (See below.) Turn the high limit



   screw about one full turn counterclockwise.
   d) **Adjust the HIGH setting first**. Turn the high adjustment screw about 1/8 turn clockwise (toward the "–" sign) to decrease fuel flow if the unit seems to be burning too hot or too rich or turn it counterclockwise to increase the fuel flow. Observe the exhaust

e) gases from your chimney outside. The exhaust gases should be clear or (if it is cold outside) like thin white smoke (water vapor).
f) Continue to **decrease or increase the fuel flow** until the top of the flame is slightly lower than the exhaust deflector plate (plate inside the stove near the exhaust pipe connection). **The flame should not touch the top plate, the exhaust should be clean, and no outer part of stove should glow red. (Just in burner.)**
g) After the High burn adjustment is satisfactory, gradually reduce the heat output by turning the control knob **clockwise to the Low** (first) mark on the scale.



h) **Observe the flame.** Be sure that the flame burns around the entire burner near the bottom and does not just burn on one side. (Be sure the stove is level.) It is very important that the flame be stable and does not go out and then flare back up again. It is <u>better to have a little too much flow at the low setting than not enough</u>. Adjust the Low flow screw until you can see a steady flame.
i) **Re-set the High Limit Screw** by returning the control knob to the High setting. Then, turn the High Limit Screw clockwise until it starts to change the flame or starts to move the flow control rod. (The rectangular flange that sticks out of the controller near the High Limit Screw.) This screw sets the maximum amount of fuel that will flow.

2) **Fuel Measurement Method.** <u>This procedure should be performed by a technician in a suitable facility.</u>
a) **Mark** the current position of the Low, High, and High Limit adjustment screws.
b) Find a **measuring container** that is calibrated in cubic centimeters (cc) or milliliters (ml).
c) Be sure the flow control knob is off but there is fuel in the controller.
d) **Remove the copper tube** that connects under the controller and to the burner.
e) Place your measuring container (or something to catch the fuel) under the controller.
f) Open the valve to the **HIGH position** for at least one minute. (Two to five is better.) Then divide by the appropriate number to determine the flow rate PER MINUTE.
g) **Loosen the high limit screw**. (See above.)
h) **Adjust the HIGH** screw until you are at the flow rate for your model.

Basic, Deluxe or Rustic 400	25 cc/minute
Basic, Deluxe or Rustic 250	16.8 cc/minute
Basic or Deluxe 110/130	9.5 cc/minute

Basic or Deluxe 68	7.1 cc/minute

i) **Adjust the LOW** screw until you are at the flow rate for your model

Basic, Deluxe or Rustic 400	7.8 cc/minute
Basic, Deluxe or Rustic 250	5.07 cc/minute
Basic or Deluxe 110/130	3.4 cc/minute
Basic or Deluxe 68	2.2 cc/minute

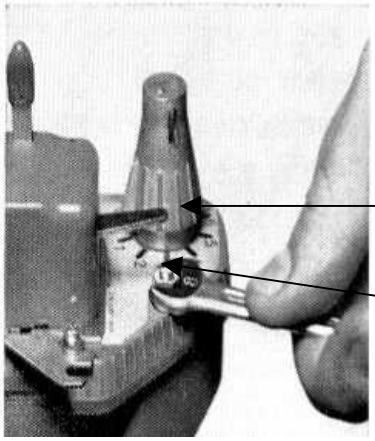
j) When you ignite, the stove for the first time **check the exhaust** coming from the chimney to be sure you do not see smoke. Be sure the stove is level. Also check the flame when the unit is burning on LOW to be sure the flame is steady. Check the unit at HIGH to be sure it is not too hot. The unit may require minor adjustments after these measurements have been set. (See Visual Method above.)

Thermostat

An optional Thermostat can be attached to the Nordic Toby Oil Control. The Thermostat device consists of a bulb filled with fluid, a coiled connecting tube, an adjustment knob, and an Actuation Lever. The connecting tube may be gently uncoiled to allow the bulb to be mounted on the wall near the stove. As the fluid contracts or expands, the Actuation Lever travels up or down. When the Thermostat is installed on the Oil Control, the end of the Actuation Lever sets over Thermostat Fuel Metering Pin.

Installing the Thermostat **(**Caution, hot stoves can cause injury.)

1. Light stove and burn for 20 minutes at medium. This will heat the flue and stabilize operating characteristics.
2. Adjust the Oil Control to a position that will maintain the desired comfort level.
3. Depress Thermostat Fuel Metering Pin located adjacent to the second and third notch. Hold down until low burn level is achieved (approximately 5 to 9 minutes). Observe flame. If flame goes out or burns to low, turn nut below Fuel Metering Pin counter clockwise. This will increase low burn when pin is depressed. Adjust the nut until low burn is satisfactory when pin is depressed for 5 to 9 minutes.
4. Turn Thermostat control knob counter clockwise. This will increase height of Actuation Lever.
5. Attach Thermostat to the top of the Oil Control with tip of Actuation Lever over the Thermostat Fuel Metering Pin.
6. Uncurl line and place copper bulb on wall behind stove. The exact location above floor and distance from stove will vary according to installation and may require



This is a picture of a TOBY TN with thermostat. The DVR with thermostat will look different. However, the operation principle is similar.

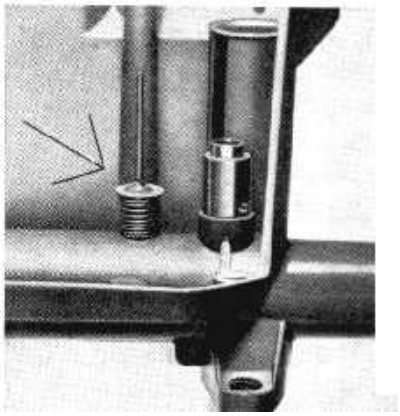
Actuation Lever

Thermostat Fuel Metering Pin

experimentation to find the right placement. Allow Thermostat to stabilize. This may take up to an hour.

7. Adjust Thermostat so Actuation Lever gently touches the top of the Fuel Metering Pin.
8. Increase Oil Control setting by one notch. As the room cools, the Actuation Lever will rise increasing fuel flow. As the room warms, the Actuation Lever will lower decreasing fuel flow.

If the Oil Control is increased or decreased, the thermostat must be adjusted.



The Nordic oil control is equipped with an overheat safety device (fusible link). If the oil control housing reaches approximately 210 F, the overheat safety device will close the feed valve. Should this failure occur, the complete oil control must be replaced.

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Problem	Cause	Solution
No oil flows to the burner assembly.	**Note**	On the smaller models, it can take several minutes for the oil to fill the burner oil line.
	Oil flow & over fill trip switch lever is not set.	Lift lever. It is normal for the lever to drop down after the switch is set.
	Tank valve off.	Check valve.
	Filter is dirty.	Replace.
	Stove is not level.	Level stove.
	Oil Control Knob is off.	Turn on.
	Burner nozzle is clogged.	Clean nozzle with coking device.
	Metering stem is stuck.	Tap thermostat pin or flat bar with oil control knob at highest setting. "0" = off.
Stove does not produce expected heat on high.	Oil control may need adjusting for your oil type.	See Adjusting Oil Control page 4.
	Stove is under sized for area.	
	Burner nozzle is clogged.	Clean nozzle with coking device.
	Metering stem is stuck.	Tap thermostat pin or flat bar with oil control knob at highest setting. "0" = off.
	Metering stem is dirty.	See Cleaning Metering Stem page 3.
Stove burns sooty or rumbles on high.	Oil control may need adjusting for your oil type.	See Adjusting Oil Control page 4.
	Chimney draft is not adequate.	Check combustion air port for restriction.
		Chimney is cold.

	Chimney height is less than 10 feet.	Increase height.
	Chimney size is larger than stove chimney size.	Install correct size liner in over size pipe.
	Burner assembly separated from upper chamber.	Contact dealer.
Wind causes rumbling on high or flame to extinguish on low.	Wind causes a down or up draft in chimney.	Install draft regulator or down/up draft termination cap.
Stove burns sooty or extinguishes on low	Flame does not fill bottom burner ring.	See Adjusting Oil Control page 4.
	Burner nozzle blocked.	Clean.
	See "Stove burns sooty or rumbles on high."	Section: Chimney … and Burner assembly …
	Metering stem is stuck.	Tap thermostat pin or flat bar with oil control knob at highest setting. "0" = off.
Oil flow fluctuates in burner.	Metering stem is dirty.	Tap thermostat pin or flat bar with oil control knob at highest setting. "0" = off.
	Burner nozzle is blocked.	Clean.
	Filter is dirty.	Replace.
	Tank vent is closed.	Open.
	Wind	Install Draft regulator.
Over fill switch trips.	Oil above level mark in oil control. Dirt in feed valve seat.	See Cleaning Metering Stem and Feed Valve page 3.
Oil in burner after oil control knob is turned off.	O-ring on metering stem leaking.	See Cleaning Metering Stem and Feed Valve page 3.