## **Protecting the Land** A Practical Guide to ELV and Sustainable Waste Management in Nunavut

August 2017



# Quick-Reference Instruction Sheets: De-Polluting Appliances





## Protecting the Land

End-of-life Vehicle and Appliance Management for Northern and Remote Communities



## **Table of Contents**

Refrigerators: Refrigerants	3
Refrigerators: Mineral Oil	4
Refrigerators: PCB Capacitors	5
Chest Freezers: Refrigerants	6
Chest Freezers: Mineral Oil	7
Chest Freezers: Mercury Switches	8
Washing Machines: Mercury Switches	9
Washing Machine: PCBs	10
Gas Ranges: Mercury Capillary Tube	11
Gas Hot Water Heaters: Mercury Thermocouple	12
Air Conditioners: Refrigerant	13
Air Conditioners: PCB Capacitor	14
Appliance de-pollution checklist	15

#### PLEASE NOTE:

To find reference notes for sources of information used in these Quick-Reference Instruction Sheets, please refer to the full-length document titled **Protecting the Land – End-of-life Vehicle and Appliance Management for Northern and Remote Communities**, which can be found at:

scoutenvironmental.com/programs/tundra-take-back

#### CONTACT:

Tundra Take-Back c/o Scout Environmental 30 Commercial Road Toronto, ON M4G 1Z4 (416) 922-2448 scoutenvironmental.com



End-of-life Vehicle and Appliance Management for Northern and Remote Communities

## TUNDRA Take-Back

## **Refrigerators: Refrigerants**

#### Description

Household refrigerators manufactured prior to 1995 commonly contained chlorofluorocarbon (CFC) refrigerant, which is known to destroy the earth's protective ozone layer, if released into the environment. Although refrigerators manufactured since 1995 contain ozonefriendly refrigerants, they still must be managed carefully before processing an appliance<sup>67</sup>.

Refrigerants were used in two types of applications in refrigerators; the first application is for the cooling system and the second application is in the foam used to insulate the appliance. Both need to be removed and stored appropriately.



- Locate the compressor. If there is a cover plate, use the socket wrench to remove it.
- 2. Attach the piercing tool to refrigerant line near compressor with the tip of the piercing tool placed over the line and the pressure nuts adjusted for tension.
- **3.** Check the gauge for pressure. If there is no pressure reading, it is assumed that the refrigerant has already escaped. If there is a pressure reading, the cooling system is intact.
- **4.** Open the manifold valve to begin the evacuation of refrigerant.
- **5.** As the pressure approaches 0, vigorously tap on the compressor with a mallet repeatedly to help separate the refrigerant from the lubrication oil.
- 6. When approximately 10 inches vacuum is maintained, tap the compressor again with the mallet.
- **7.** When the unit is fully evacuated, close both manifold valves.
- 8. Label the cylinder and store in cool, dry area<sup>68</sup>.





for Northern and Remote Communities



## **Refrigerators: Mineral Oil**

#### Description

Refrigerators contain a high-grade mineral oil used to lubricate the compressor and sealed refrigeration system. The main function of the oil is to reduce wear on the compressor, protect bearings against corrosion and improve sealing<sup>69</sup>.

In order to remove the mineral oil prior to crushing the appliance, the compressor will have to be removed. It is located at the bottom of the refrigerator and can be accessed from the rear of the unit<sup>70</sup>.



## **REMOVAL STEPS**

**1.** Locate the compressor. If there is a cover plate, use the socket wrench to remove it.



**2.** Using the socket wrench, remove the bolts that secure the compressor to its bracket. Pull the compressor off of its bracket slightly once all of the bolts have been removed.



- **3.** Using wire cutters, disconnect the wires from the compressor and remove the compressor from the refrigerator. If the compressor has wire clips connecting the wiring, pull them off by depressing the sides of the clips simultaneously with your hands<sup>71</sup>.
- **4.** Place a drain pan underneath the compressor. Using a step up drill bit, drill two holes no

smaller than 1/4" through the top of the compressor casing.

**5.** Turn compressor upside down over pan and wait for the mineral oil to completely drain.





**6.** Store waste oil as outlined in the Engine Oil section of this guide. Please note that this oil may contain traces of refrigerants, so it should be stored in a separate drum and should not be mixed with other oils.



## **Protecting the Land**

End-of-life Vehicle and Appliance Management for Northern and Remote Communities



## **Refrigerators: PCB Capacitors**

#### Description

It is unlikely that a refrigerator contains a PCB capacitor in its compressor, but it is very important to confirm that the capacitor in the refrigerator is dry (does not contain PCB) prior to crushing it.

Although this is not always the case, some capacitors will be stamped to indicate whether or not they contain PCBs. If there is no physical indication on the appliance or capacitor, it is best to remove it as a precaution.

The capacitor will be attached to the housing of the compressor, which you will be removing to drain the mineral oil out of it. The compressor is located at the bottom of the refrigerator and can be accessed from the back of the unit. It may be covered by a protective casing that will have to be removed<sup>72</sup>.

- **1.** Follow the steps outlined in the *Refrigerators: Mineral Oil* section to remove the compressor.
- 2. The capacitor will be mounted on the side of the compressor. If there is a protective casing covering the housing of the motor use a screwdriver to remove it.
- **3.** Using a screwdriver remove the screws holding the retainer clip in place and release the tension on the wires.
- **4.** Use wire clippers to cut the wires and detach the capacitor.
- **5.** Place the capacitor in approved drum and label properly.



End-of-life Vehicle and Appliance Management for Northern and Remote Communities

## TUNDRA Take-Back

## **Chest Freezers: Refrigerants**

#### Description

Like refrigerators, many chest freezer models manufactured prior to 1995 will likely contain chlorofluorocarbon (CFC) refrigerant, which is known to be hazardous and contribute to the depletion of the ozone layer<sup>73</sup>.

This and any other refrigerant found in chest freezers will need to be pumped out of the appliance prior to processing.

The compressor is located at the back of the freezer and will need to be attached to the refrigerant extractor hose. Once the refrigerant has been recovered, you will need to label and store it in an approved storage cylinder.



- Locate the compressor. If there is a cover plate, use the socket wrench to remove it.
- 2. Attach the piercing tools to the high and low side of the compressor with the tips of the piercing tool placed over the line and the pressure nuts adjusted for tension.
- **3.** Check the gauge for pressure. If there is no pressure reading, it is assumed that the refrigerant has already escaped. If there is a pressure reading, the cooling system is intact.
- **4.** Open the manifold valve to begin the evacuation of refrigerant.



- **5.** As the pressure approaches 0, vigorously tap on the compressor with a mallet repeatedly to help separate the refrigerant from the lubrication oil.
- 6. When approximately 10 inches vacuum is maintained, tap the compressor again with the mallet.
- **7.** When the unit is fully evacuated, close both manifold valves.
- Label the cylinder and store in cool, dry area<sup>74</sup>.





End-of-life Vehicle and Appliance Management for Northern and Remote Communities



## **Chest Freezers: Mineral Oil**

#### Description

Chest freezers contain a high-grade mineral oil used to lubricate the compressor and sealed refrigeration system. The main function of the oil is to reduce wear on the compressor, protect bearings against corrosion and improve sealing<sup>75</sup>.

In order to remove the mineral oil prior to crushing the appliance, the compressor will have to be removed. It is located at the bottom of the chest freezer and can be accessed from the rear of the unit<sup>76</sup>.



#### **REMOVAL STEPS**

1. Locate the compressor. If there is a cover plate, use the socket wrench to remove it.



2. Using the socket wrench, remove the bolts that secure the compressor to its bracket. Pull the compressor off of its bracket slightly once all of the bolts have been removed.



- Using wire cutters, disconnect the wires from the compressor and remove the compressor from the chest freezer. If the compressor has wire clips connecting the wiring, pull them off by depressing the sides of the clips simultaneously with your hands<sup>77</sup>.
- Place a drain pan underneath the compressor. Using a step up drill bit, drill two holes no



smaller than 1/4" through the top of the compressor casing.

**5.** Turn compressor upside down over pan and wait for the mineral oil to completely drain.



6. Store waste oil as outlined in the Engine Oil section of this guide. Please note that this oil may contain traces of refrigerants, so it should be stored in a separate drum and should not be mixed with other oils.



for Northern and Remote Communities



## **Chest Freezers: Mercury Switches**

#### Description

Some chest freezers built before January 1, 2000, were manufactured with mercury tilt switches incorporated into the light socket. This device senses when the lid is raised and turns on the light.

Mercury switches can be found in a light socket, inside the freezer cover<sup>78</sup>.



- **1.** Locate the light socket on the underside of the lid (on some freezers you may have to remove a plastic cover)
- **2.** Remove light bulb and use screwdriver to remove the plastic housing.
- **3.** Gently pull the light socket out of its mounting bracket and cut or remove the attached wires.
- **4.** Dispose of the entire light socket in collection container UN approved for storage and shipment of mercury.











End-of-life Vehicle and Appliance Management for Northern and Remote Communities



## Washing Machines: Mercury Switches

#### Description

A small number of washing machines manufactured prior to 1972 included mercury switches. The mercury switches were used for two different applications:

a) to detect a lid opening and engage a brake to quickly stop the washer drum from moving, and;

b) in the dynamic stabilizing system to prevent the machine from being out-of-balance.

A mercury switch will be found under the lid and another in the dynamic stabilizing system<sup>79</sup>.

#### REMOVAL STEPS: DYNAMIC STABILIZING SYSTEM

**1.** Locate the dynamic stabilizing switch on the back of the washing machine.



- 2. Remove the fastening bolts.
- 3. Disconnect the attached wires and dispose of the mercury switch in collection container UN approved for storage and shipment of mercury.





#### **REMOVAL STEPS: WASHING MACHINE LID**

- 1. Pry off the top of the washing machine.
- 2. On the underside of the lid, attached to the lid mounting rod, is an encapsulated mercury switch.
- **3.** Remove the switch from the bracket.
- **4.** Cut or remove any attached wires.









5. Dispose of the mercury switch in collection container UN approved for storage and shipment of mercury.





for Northern and Remote Communities



## Washing Machine: PCBs

#### Description

As with refrigerators, it is unlikely that the compressor in a washing machine will contain a PCB capacitor. It is still important to inspect the appliance and confirm whether or not the capacitor in the compressor contains PCB. If it is unmarked, it is best to remove the capacitor as a precaution.

The capacitor will be found in the compressor of the washing machine, which is located at the bottom of the appliance.



- **1.** Follow the steps outlined in the Refrigerators: Mineral Oil section to remove the compressor.
- The capacitor will be mounted on the side of the compressor. If there is a protective casing covering the housing of the motor use a screwdriver to remove it.
- **3.** Using a screwdriver remove the screws holding the retainer clip in place and release the tension on the wires.
- **4.** Use wire clippers to cut the wires and detach the capacitor.
- **5.** Place the capacitor in approved drum and label properly.



for Northern and Remote Communities



## Gas Ranges: Mercury Capillary Tube

#### Description

Gas ranges that include a pilot-light require a mechanical safety valve to prevent a dangerous quantity of gas from building up in the oven. The capillary tube component of this safety valve may contain mercury depending on when the appliance was manufactured. It is important that you are able to distinguish the mercury containing devices from the non-mercury containing devices. Many safety valve capillary tubes and sensor bulbs that are stainless steel are mercury-containing devices, while any safety valve capillary tubes or sensor bulbs that are copper will not contain mercury. Remove the broiler pan drawer to locate the capillary tube, which is in the burner assembly. If you discover an electronic pilot flame sensor while inspecting an appliance, which is identifiable by the two wires, the capillary tube is non-mercury<sup>80</sup>. (ARIC info bulletin – www.aham.org/industry/ht/a/GetDocumentAction/i/5370)



- Remove the broiler pan drawer and locate the small capillary tube on the burner assembly.
- Using a screwdriver loosen the burner assembly by removing the key (sometimes a screw or a pressure fit).
- **3.** Disconnect the gas feed line by loosening the fitting or cutting the gas line.
- 4. Disconnect the pilot gas feed line by loosening or cutting (there may be two feed lines).









- **5.** Remove the two screws holding the safety valve control in place.
- 6. Remove the burner assembly and use a screwdriver to remove the screw holding the gas safety valve control and gas safety capillary tube and bulb to the oven pilot assembly.
- 7. Carefully pull the gas safety valve capillary tube and safety valve sensor bulb back through the bracket.
- 8. Dispose of entire gas safety valve control, gas safety capillary tube and safety valve sensor bulb in UN approved collection container for storage and shipment of mercury.











End-of-life Vehicle and Appliance Management for Northern and Remote Communities

## TUNDRA Take-Back

## Gas Hot Water Heaters: Mercury Thermocouple

#### Description

Current evidence suggests that mercury was not used in residential hot-water heaters; however, as a precaution a procedure has been developed to prevent any mercuryadded thermocouples from entering the waste stream and eventually the environment.

This procedure should be followed to ensure that if there are any mercury-added thermocouples, they are removed.

The mercury thermocouple will be located on the temperature control unit<sup>81</sup>.



- REMOVAL STEPS
- 1. Locate the temperature control unit.



2. Determine if there is an electronic flame sensor (determined by the presence of wires) or if there is a mercury thermocouple.



- **3.** Use a magnet to determine if it is a mercury probe (non-magnetic probes are non-mercury).
- **4.** If the probe is mercury, remove the bottom of the heater and loosen the nut attaching the probe. Then properly dispose of the mercury thermocouple.







for Northern and Remote Communities



## Air Conditioners: Refrigerant

#### Description

Air conditioners often contain chlorofluorocarbon (CFC) refrigerants in their cooling systems and these refrigerants are known to deplete the ozone layer if not properly evacuated and managed.

The refrigerants, located in the compressor, will need to be pumped out of the appliance using a refrigerant extractor prior to crushing.

Remove the terminal panel of the air conditioner to locate the compressor.



- **1.** Locate the compressor. If there is a cover plate, use the socket wrench to remove it.
- **2.** Attach the piercing tools to the high and low side of the compressor with the tips of the piercing tool placed over the line and the pressure nuts adjusted for tension.
- **3.** Check the gauge for pressure. If there is no pressure reading, it is assumed that the refrigerant has already escaped. If there is a pressure reading, the cooling system is intact.
- 4. Open the manifold valve to begin the evacuation of refrigerant.
- 5. As the pressure approaches 0, vigorously tap on the compressor with a mallet repeatedly to help separate the refrigerant from the lubrication oil.
- 6. When approximately 10 inches vacuum is maintained, tap the compressor again with the mallet.
- 7. When the unit is fully evacuated, close both manifold valves.
- **8.** Label the cylinder and store in cool, dry area<sup>82</sup>.





End-of-life Vehicle and Appliance Management for Northern and Remote Communities



## **Air Conditioners: PCB Capacitor**

#### Description

Capacitors are found in all room air conditioners. Run capacitors, which contain oil that may contain PCBs, are designed for continuous work while the compressor is powered. This continual use causes heat to build up within the capacitor and the oil contained within is used to help dissipate this heat<sup>83</sup>.

If a run capacitor is found in an air conditioner, it is important that it is properly removed and stored. In some cases an air conditioner may have one or two oil-filled capacitors. One will be wired to the fan motor and the other will be wired to the compressor<sup>84</sup>.



#### **REMOVAL STEPS**

- **1.** Using a screwdriver, remove the screws holding the air conditioner's side panel to the main assembly.
- **2.** Pull the side panel from the air conditioner and place to the side.
- **3.** Locate the capacitor(s) and using wire cutters cut the wires connecting the capacitor to the compressor.
- **4.** Place the capacitor in an approved storage container and label properly.

\*\*Warning: Air conditioners contain high pressure Freon which produces acid if the compressor has failed. If you detect an odor, move away from the appliance until the odor dissipates<sup>85</sup>.



for Northern and Remote Communities



## **Appliance de-pollution checklist**

Use the following checklist to ensure that you've completely de-polluted the appliance.

Refrigerator	Gas Range
Refrigerants	Mercury Switch (Machine Lid)
Compressor Oil	Mercury Switch (Dynamic Stabilizing System)
Mercury Switch	Gas Hot Water Heater
Capacitor	Mercury Switch
Chest Freezer	Air Conditioner
Refrigerants	Refrigerant
Compressor Oil	Capacitor
Mercury Switch	

#### Washing Machine



Capacitor



