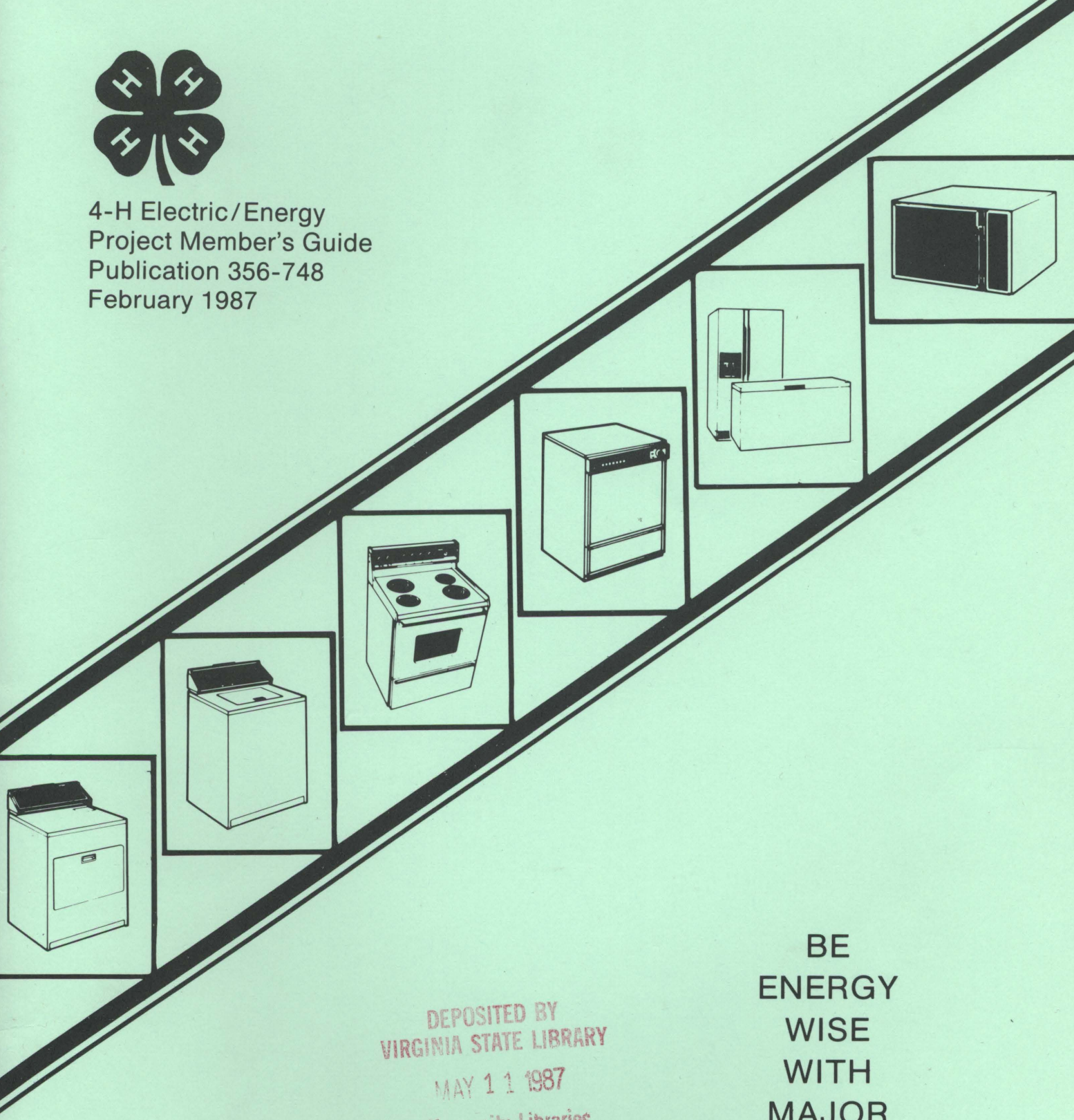

4-H Electric/Energy
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BE ENERGY WISE WITH MAJOR APPLIANCES

Virginia Cooperative Extension Service
Virginia Tech and Virginia State
Virginia's Land-grant Universities

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This project was planned and developed as a part of the work of the 4-H Committee of the Virginia Farm and Home Electrification Council under chairperson, Dean Allen, Extension Specialist, 4-H Youth.

Special recognition is given to Margie Cahill, Appalachian Power Co., Roanoke, a member of the committee.

Appreciation is also expressed to JoAnne Barton, Extension Specialist, Foods and Nutrition, and Mary Helen Marshall, Extension Specialist, Clothing and Textiles, who served as consultants, and to the Extension agents, 4-H leaders and members in the three Extension units who pilot-tested the project.

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Major home appliances are large appliances designed to perform one of five basic household functions: 1) food preservation and storage; 2) cooking; 3) home laundry; 4) kitchen clean-up; and 5) home comfort.

CONTENTS

Introduction

What would you and your family do if you didn't have a refrigerator and other major appliances such as a clothes washer? These appliances have become such an accepted part of households it is easy to take them for granted and forget the contribution they make in today's world. At the very least, household equipment makes most housework less tedious or tiring. However, appliances use 20 to 30% of all energy used in the home.

As sophisticated as today's appliances are, getting the most value from them depends in large measure on being a wise user. This project will give you a head start toward that goal.

Objectives

The objectives of this project are:

1. To help you understand effective energy management with major appliances.
2. To help you understand basic performance, safety, and energy features of major appliances.
3. To help you understand how to use and care for major appliances in a safe and effective manner.

What You Need to Do

To complete this project:

1. Study the sections on "Getting Acquainted with Major Appliances," Refrigerator/Freezers," "Automatic Clothes Washers," and at least two other sections.

2. Do at least one suggested activity or equivalent at the end of each section studied.

3. Do each of the following based on the sections studied:

a) Show others something you have learned by making one or more posters or exhibits.
b) Show others something you have learned by giving one or more presentations.

Note: This project is designed to be studied with the assistance of a leader. Instructions for some activities are included in the leader's guide.

GETTING ACQUAINTED WITH MAJOR APPLIANCES

Chapter I

Use and Care Booklets

The best source of information about how to operate and care for any appliance is the use and care booklet provided by the manufacturer of the appliance. Appliance design and technology vary so much that the techniques which apply to using one model of an appliance will not necessarily be suitable for another model of that type of appliance. It pays to get acquainted with the operation of any appliance through reading the use and care booklet and to refer back to this booklet when there is any question about the care of the appliance.

Warranties

Who is responsible for repairing an appliance? When will the manufacturer pay for defective parts? These are some of the questions that are answered in the warranty for any appliance. The warranty is a written promise that generally states what the manufacturer will do over a specific period of time if a product becomes defective.

When you look at a warranty, you should be able to answer these questions:

1. Does the warranty cover the entire appliance? Only certain parts? Is labor included?
2. Who is responsible for repairing the appliance?
3. Who pays for repairs?
4. How long does the warranty last on the entire product? On individual parts?
   Appliance warranties cover a specific period of time, not for how much usage the appliance has had.
5. In the case of a refrigerator, can the owner expect to be reimbursed for food losses if the appliance stops working?

To get satisfaction from your appliance, the Major Appliance Consumer Action Panel (MACAP) recommends you:

-- know your service agency and the terms of your appliance warranty before you purchase.
-- keep an "appliance file" of use and care manuals, warranties, sales receipts, and service history for all your appliances in a convenient spot for easy reference.
-- call your dealer, the service agency he recommends, or an organization "franchised" by the manufacturer if your appliance needs service.

Note: MACAP is a group of independent consumer experts sponsored by appliance manufacturing and retailing organizations.

EnergyGuide Labels

Since May 1980, new refrigerator/freezers, automatic clothes washers, and dishwashers have been required to have "EnergyGuide" labels (Fig 1). This label identifies the estimated annual operating cost of a particular model.

(Name of Corporation)
Refrigerator-Freezer — Model(s) AH503, AH504, AH507
Capacity 17 Cubic Feet — Type of Defrost: Full Automatic

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97¢ per kilowatt hour.

Only models with 16.5 to 18.4 cubic feet are compared in the scale.

Model with lowest energy cost **$50**

$70

Model with highest energy cost **$88**

THIS MODEL

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. This energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

		Yearly cost
		Estimated yearly $ cost shown below
Cost per kilowatt hour	**2¢**	$28
	4¢	$57
	6¢	$85
	8¢	$113
	10¢	$142
	12¢	$170

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Important Removal of this label before consumer purchase is a violation of federal law (42 U.S.C. 6302)

Figure 1

This cost is based on: a) the model's performance under laboratory tests and b) the national average electricity rate. In the case of clothes washers and dishwashers, the operating cost figure takes into account the cost of heating the water used by these appliances. The label is designed to be a way of helping shoppers compare the estimated energy consumption of similar types and capacities of appliances. It is not meant to represent the exact energy consumption of an appliance in your home because actual usage may differ from that in the laboratory.

Ranges and clothes dryers are not required to have energy labels. The Federal Trade Commission has found that it would not be economically feasible to require labels for these appliances because the energy used with both appliances varies more with operator use and less with the efficiency of the appliance.

Major Appliances Need Grounding

Refrigerator/freezers, dishwashers, and automatic washers come with permanently attached grounding cords and plugs designed to be used with a properly grounded three-hole outlet (receptacle) (Fig 2). Ranges and dryers requiring 240-volts are designed with three-wire connections and built-in grounding systems.

Grounding of electrical appliances is necessary to reduce shock and fire hazards to users and damage to the wiring system and electrical equipment resulting from accidental faults in the equipment and lightning.

Since 1960 the National Electrical Code has required all new household outlets to be of the grounding type. If a grounding circuit is not available, an adapter can be used if it is properly connected. See Fig. 2. The adapter has three holes (to accept the plug) and two blades (to match the outlet). It also has another essential feature--a means of connecting the adapter to ground. A tab from the adapter must be connected to the screw holding the outlet plate in position. If the electrical outlet box is not grounded prop-

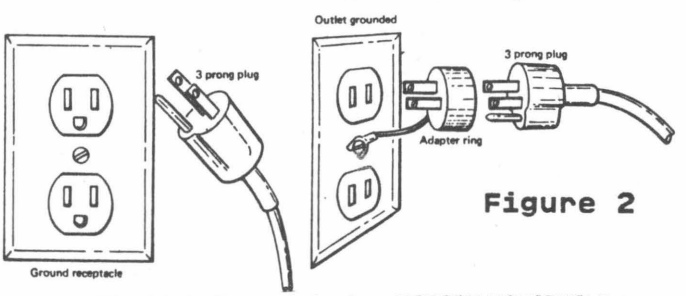

Figure 2

erly, use of an adapter will not result in protection against electrocution. Therefore, the round hole of the adapter should be checked to establish that the adapter is actually grounded. One way to do this is through the use of a commercial circuit tester, following the directions on the package. At no time should the third prong of an electrical plug be cut off.

Another way to reduce shock and fire hazards to users is through the installation of a ground fault interrupter (Fig 3). Since 1981 the National Electrical Code has required ground fault interrupters for bathroom, garage, and outdoor outlets in new homes. Use of a ground fault interrupter is also recommended in laundry rooms. In older homes, ground fault interrupters can be installed by a qualified electrician in an outlet box or ground fault circuit breakers may be installed in the service entrance.

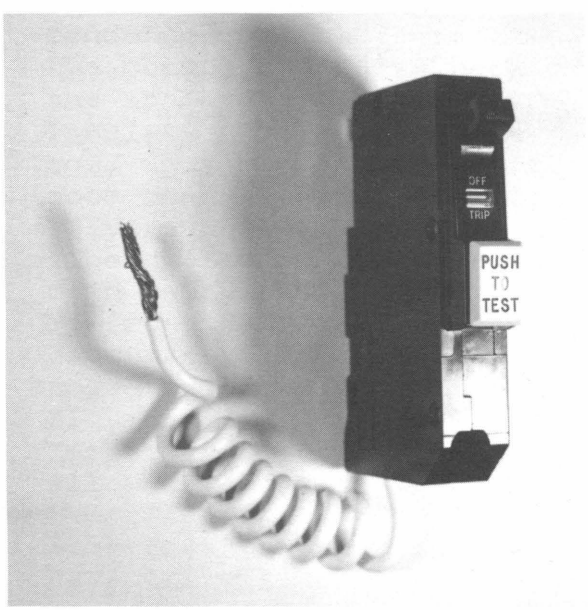

Figure 3

Major Appliances Should Be Level

All major appliances should be level for satisfactory operation. If not level, an appliance is apt to vibrate or be noisy, and moving parts may wear out faster than normal. An uneven range also causes uneven baked products.

Leveling legs or feet are located on two or four sides of the appliance. Check the installation instructions or use and care booklets for your appliances for specific directions for adjusting the leveling devices. Figure 4 is an example of adjusting the leveling legs on one model of range.

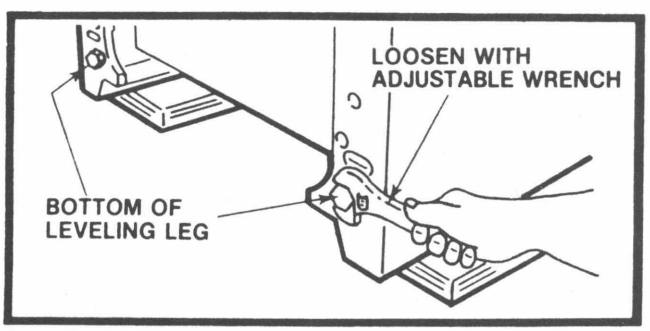

Figure 4

Suggested Activities

1. Study the use and care booklet for the major appliances in your home. Identify information about: operation, cleaning, safety, energy-management, and servicing.

2. Develop a system for organizing use and care booklets for major appliances in your home.

3. Take a trip to appliance dealers to
   a) compare EnergyGuide labels.
   b) compare warranties.

4. Use a level to see if the major appliances in your home are level.

Appliance	Suggested Placement of Level
Refrigerator	In the center of a shelf
Range	In the center of an oven rack
Washer	In the center of the lid
Dryer	In the center of the top

If an appliance is not level, work with an adult to adjust the leveling devices.

5. Study the warranties for the major appliances in your home. Make a chart using the first four questions on page 3 to record the information found in the warranties you are studying.

REFRIGERATOR/FREEZERS

CHAPTER II

How A Refrigerator Works

The cooling fluid in a refrigerator or freezer is called the "refrigerant". Its purpose is to absorb heat within the refrigerator or freezer and carry it outside the cabinet.

The refrigeration system works this way (Fig. 5). Liquid refrigerant boils inside the evaporator (1). As the refrigerant boils, the evaporator becomes very cold and soaks up heat from inside the cabinet. Vapor from the evaporator is then drawn into the compressor (2). The compressor pressurizes the vapor and sends it to the condenser (3). The hot vapor inside the condenser gives off heat into the room. As the vapor cools, it condenses back to a liquid. The liquid refrigerant is then sent back to the evaporator through the capillary tube (4).

When the condenser is located at the bottom of a refrigerator, it's easy to feel the heat coming into the room when you stand near the grille at the base of the refrigerator.

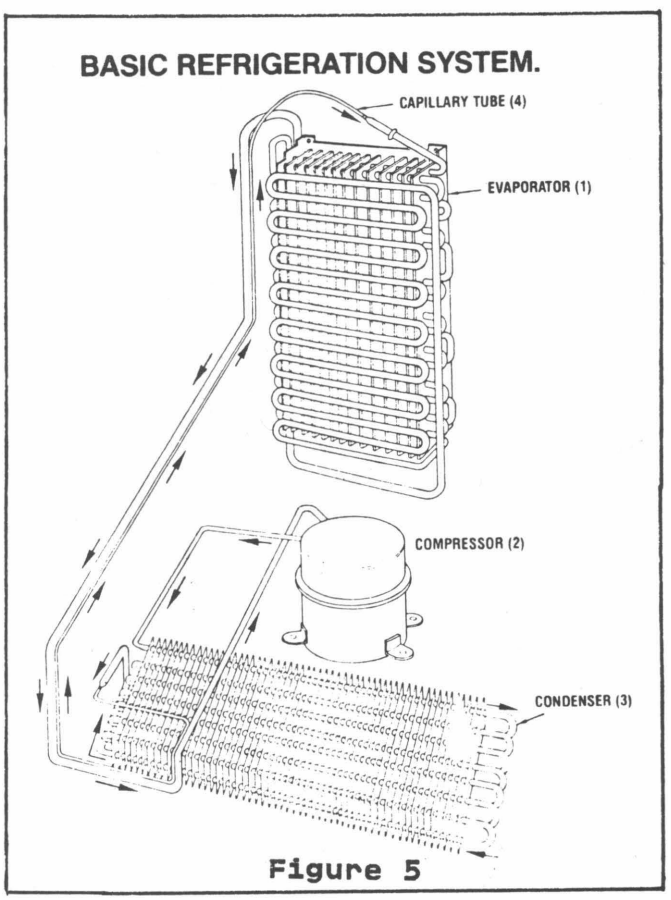

Figure 5

Parts of a Refrigerator* (Fig 6)

*In this project the term refrigerator often will be used to describe both single door manual defrost refrigerators and refrigerator/freezer combinations.

A. The compressor is a pump with an electric motor attached to the drive shaft. The compressor is located at the bottom rear portion of the refrigerator and can only be seen from the back of the appliance. The compressor brings the vaporized refrigerant from the evaporator and sends it to the condenser under pressure.
B. The evaporator coil absorbs heat from the air in the refrigerator. The location of the evaporator varies with the model.
C. The condenser coil takes the heat away from the vaporized refrigerant, so that it can become a liquid, and releases it into the air. The condenser may be found at the bottom or on the back of the appliance.
D. Insulation helps keep the cold in and the heat out for good operating performance. Polyurethane foam and fiberglass are the materials used today.
E. No-frost refrigerator/freezers have several fans to speed up and/or direct the flow of air.
F. Temperature and air controls allow for adjustment of temperatures.
G. Some refrigerator/freezers have low wattage heaters to keep the cabinet surface temperature above the dew point, eliminating the formation of moisture on the cabinet in warm,humid weather. Since moisture does not form in dry weather, some of these heaters can be turned off when they are not needed, in order to save electricity. This is done with a power-saving control.
H. The defrost drain hose carries water melted off the evaporator and directs it into the defrost pan, where it is collected.
I. The gasket, which contains a magnetic core, keeps the door shut and creates a seal that helps to keep the cold in and the heat out.
J. An ice cube maker (an optional feature) provides a continuous supply of ice cubes which collect in the bin underneath. When the bin becomes full, ice production automatically stops. The refrigerator must be connected to a source of water for operation of this feature. Ice cube trays must be manually filled and emptied; a bin for the cubes may or may not be supplied with the refrigerator/freezer.
K. Grille covers area where defrost pan and condenser are located on some models.

Note: Federal regulations require that refrigerators be equipped with safety door catches that can be opened by someone inside exerting no more than 15 pounds.

Parts of a Refrigerator-Freezer

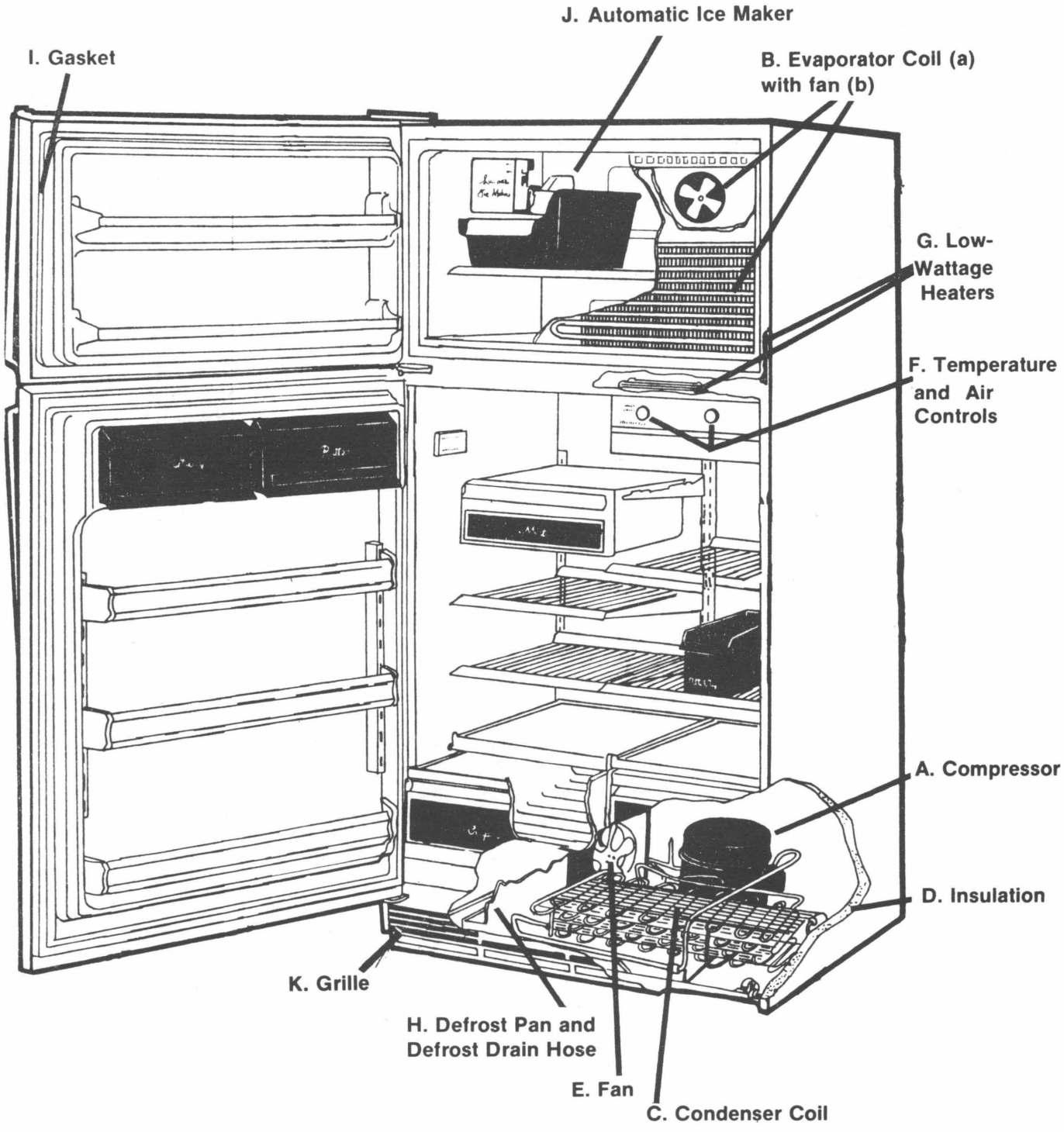

Figure 6

Refrigerator Defrost Systems

Frost from the air forms on the evaporator as heat is removed from the food. Any frost accumulation will interfere with the cooling process,so it must be removed. There are basically three defrost systems found in today's refrigerators. They are: Manual; Automatic or Cycle; and Frostless or No-frost.

The Association of Home Appliance Manufacturers (AHAM) defines these systems as follows:

A manual defrosting refrigerator is a cabinet in which the accumulation of frost on the refrigerated plates and coils must be removed by the user. These refrigerators usually have a single door.

A cycle defrosting refrigerator/freezer is a cabinet in which the defrosting is automatic in the fresh food (refrigerator) compartment and manual in the freezer compartment. The defrost cycle of the refrigerated plates or coils in the refrigerator compartment is automatic, and the water from defrosting is disposed of automatically. The defrosting of the refrigerated plates or coils in the freezer compartment is started and stopped by the user. This type of refrigerator/freezer can be recognized by the cold plate at the interior back of the refrigerator cabinet.

A frostless or no-frost refrigerator/freezer operates automatically to prevent the permanent formation of frost on refrigerated plates or coils in both the freezer compartment and the fresh food (refrigerator) compartment. No accumulation of ice or frost forms on the stored food. The water from defrosting is disposed of automatically.

Handle Refrigerators Safely

-- Because a refrigerator is grounded, all other electrical devices used nearby must be kept in good electrical repair.
-- Disconnect the power before attempting any repair work, light bulb replacement, or cleaning. Either unplug the refrigerator, or if you are sure that the refrigerator is on a separate circuit, turn off the circuit breaker. Turning the control to "off" does not disconnect power to the appliance.
-- After the refrigerator/freezer is in operation, do not touch the refrigerating coils or surfaces, particularly with damp or wet hands.
-- Keep hands and fingers out of the automatic ice-making mechanism.
-- If an old refrigerator/freezer is to be stored or discarded, remove the door to reduce the possibility of trapping a child inside.

Energy-saving Practices in Use and Care

-- If a refrigerator has a power-saver switch, use it according to the manufacturer's instructions.
-- Make certain there is enough space behind and above the refrigerator/freezer to allow enough air circulation for the condenser.
-- Open the refrigerator door as few times as possible. Most of the food needed for one

meal can be removed or replaced at one time. Keep an accurate up-to-date list of the food in the freezer and where it is located so that users can find particular items quickly.

-- Check to make sure the door to the refrigerator is completely closed after being opened.

-- Defrost manual or partial automatic models regularly. Don't let more than 1/4 inch of frost build up. Frost acts as an insulator, making the refrigerator use more energy to maintain temperature levels.

-- Clean the refrigerator condenser coils at least twice a year with the crevice nozzle attachment of your vacuum cleaner or a long handled brush. Be sure to turn the appliance off first. Check the use and care booklet for cleaning instructions.

-- Check the door seals occasionally. Be sure they're clean and fit properly.

A poorly fitting door gasket may indicate that the door needs to be realigned, the leveling needs adjustment, or that the gasket itself needs to be replaced.

One way to check the fit of the door is with a strong flashlight (a 3- cell battery or stronger flashlight is preferred). Place the flashlight inside the refrigerator. Darken the room. Aim the flashlight at one side of the refrigerator at a time. Cracks of light showing from the outside indicate that the gasket is fitting poorly.

Other Use and Care Considerations

-- Food storage temperatures and humidity control are important if a refrigerator/freezer is to do its job of storing food without spoilage and loss of quality. The use and care booklet is the most reliable guide for the temperature and air flow setting which will enable your refrigerator/ freezer to work properly.

-- Refrigerators are designed to maintain a temperature of 34 degrees to 40 degrees F in the fresh food section. If you notice difficulty in keeping milk cold,check the temperature inside the refrigerator by using a refrigerator thermometer. Leave it several hours before reading the temperature. An adjustment in setting may be needed to achieve the recommended temperature.

-- A temperature of 0 degrees F or below is best for long term storage of food in the freezer section. The maximum recommended temperature for a freezer is 5 degrees F. If the freezer can't keep ice cream hard, the temperature is above the recommended level, and should be adjusted if possible. The frozen food compartment in a one-door conventional refrigerator is not a true freezer and should not be used as such. Use this compartment for short-term storage of already frozen food.

-- Most foods (raw or cooked) should be stored covered in the refrigerator,especially in a no-frost model, to avoid excess drying of the foods. An exception is raw meat which should be loosely wrapped if stored for several days. Covering foods also prevents strong odors from traveling within the refrigerator to other foods. Foods in the freezer section should be

stored in moisture-vapor proof packages.
-- If a refrigerator/freezer has special storage compartments such as for meat, cheese, or vegetables, be sure that they are used as the manufacturer intended.

Cleaning and Defrosting A Refrigerator or Freezer

CLEANING

PART	WHAT TO USE	HOW TO CLEAN
Exterior	Sponge, cloth or paper towel, mild detergent or mild soap and warm water	Wash with warm water using detergent or soap. Rinse; dry. Do not use an abrasive or harsh cleanser. Waxing is not recommended.
All Shelves, Crispers, Crisper Covers, Ice Trays, Bins, Meat Pan, and other removable parts; Gasket	Mild detergent or mild soap and warm water; cloth for drying	Remove all removable parts, according to your use and care guide instructions. Wash with warm water and detergent or soap. Wash any glass shelves separately. Rinse and dry. Wash gasket with warm water and soap or detergent. Rinse well; dry.
Interior (including Door Liner)	Sponge, soft cloth or paper towel, warm water and mild soap or mild detergent or baking soda; cloth for drying	Wash the walls and door liner with warm water and soap or detergent or use a solution of 2 tablespoons (30 g.) of baking soda in 1 quart (1 L) of warm water. Rinse thoroughly; dry.
Defrost Pan and Forced Air Condenser (behind the Base grille)	Warm water and mild detergent; vacuum cleaner (use crevice tool attachment)	Remove base grille following instructions on the grille or in your use and care guide. Pull out the defrost pan; empty, if necessary, and wash. Clean lint from the condenser with a vacuum cleaner (be sure refrigerator or freezer is unplugged) about every 2-3 months. Replace defrost pan, being sure it is completely pushed in. Replace base grille.
Static Condenser (on back of a refrigerator or freezer)	Vacuum cleaner with dusting brush attachment	Clean lint from condenser on the back of the refrigerator or freezer cabinet using a vacuum cleaner with the dusting brush, about every 6 months, or as needed.
Floor under refrigerator	Whatever you would ordinarily use to clean floors	If possible, roll the refrigerator forward to clean the floor, then roll back after cleaning. If the refrigerator or freezer does not have rollers, be sure to protect the floor before sliding an appliance over it. Follow directions in the use and care guide for moving an appliance. If there is an ice maker, don't move further than the ice maker line will allow.

NOTE: CLEANING WAXES, CONCENTRATED DETERGENTS, BLEACHES, AND CLEANSERS CONTAINING PETROLEUM PRODUCTS SHOULD NOT BE USED TO CLEAN PLASTIC PARTS OF THE REFRIGERATOR OR FREEZER OR THE GASKET.

Suggested Activities

1. Take a trip to an appliance dealer and examine several refrigerators and evaluate the features for convenience, cleanability, energy-saving, and safety.

2. a) Work with an adult to clean the following areas of a refrigerator:
   1) the condenser and
   2) inside the cabinet.
   b) Then be responsible for cleaning the inside of the refrigerator for a month. Defrost if appropriate.

c) Your mother has asked you to teach your younger brother or sister to clean the refrigerator. Make a list of the steps to be taken in cleaning. Record these steps on the Record Sheet. (Note: If you don't have a younger brother or sister, choose someone else to teach.)

3. With the refrigerator in your home:

a) Observe the energy management practices for a week for all persons who use the refrigerator.

b) Make and write out a plan for improving the energy consumption of the refrigerator.

c) Carry out this plan. Report your plan and experiences in carrying it out on the Record Sheet for this project.

4. Experiments:

a) Store the following foods on a refrigerator shelf for three days:
Slice of cheese -- unwrapped vs wrapped in plastic wrap
Slice of bread -- unwrapped vs wrapped in plastic wrap
Dish of pudding -- uncovered vs covered with plastic wrap

At the end of the storage period, observe the foods and look for signs of excessive dryness. What is your conclusion about a recommended way to store these foods in terms of covering and/or wrapping?

b) Put a refrigerator thermometer inside the fresh food compartment. Place on a middle shelf according to the instructions for the thermometer. After a 24-hour period, start checking the temperature in the refrigerator. Record the temperature at the same time each day for a week. For example at 7 p.m. What is the average temperature for the week? If the temperature is not within the recommended range, adjust the controls as needed. What is the average temperature?

c) Check the door gasket on a refrigerator to be sure that it fits tightly. If necessary, consider getting a new gasket installed.

d) Look in the use and care book for your refrigerator for suggestions for storing fresh food. Also, look at the labels on foods stored in your refrigerator and see if refrigerator storage is recommended. Make changes in the refrigerator storage if needed. Report what you did.

RANGES

Chapter III

How an Electric Range Works

You learned in another 4-H electric/energy project about the principle of electrical resistance heating. In an electric range,heat is generated by resistance of the wire in the surface and oven heating elements to the flow of electrical current. The amount of heat produced by an element is regulated by the amount of electricity allowed to flow through the wire. The various degrees of resistance are achieved by different wiring patterns.

The wire which resists the flow of electricity is covered by insulation and a metallic tube. Most electric ranges have similar type heating elements for the surface, oven, and broiler units. See Fig. 7.

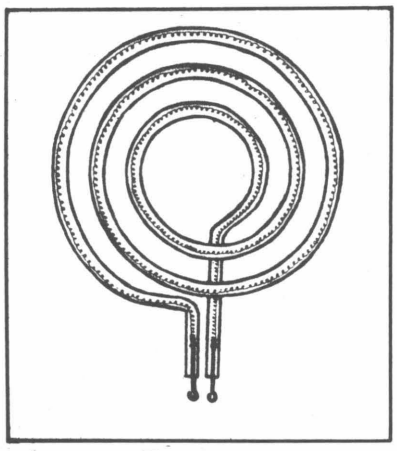

Figure 7

Parts of a Conventional Electric Range (Fig 8)

A. The surface units are tubular heating elements containing nichrome wire.

B. Reflector bowls are made of porcelain enamel, aluminum, stainless or chrome-plated steel. These bowls catch spillovers and protect wiring and other range components from surface unit heat.

C. Trim rings provide a finished edge for the surface unit openings and support the reflector bowls and surface units. In some models the trim rings and the reflector bowls are a single unit.

D. Surface units have two types of controls: fixed and infinite. Fixed controls have a specific number of settings. Infinite controls can be adjusted to any number of settings between off and high. Controls may be of the rotary type with a rotating knob or push-button type.

Since 1975, it has been mandatory that controls for surface units require at least two motions by the user to prevent accidental operation of the unit. Generally, rotary controls operate by turning.

E. The bake element is the lower element in the oven. It comes on with the broil unit to pre-heat the oven. The bake element cycles on and off during baking and roasting to maintain the set oven temperature.

F. The broil element is the upper element in the oven. It is used alone for broiling and combined with the bake element for preheating the oven. The broil element cycles

on periodically in some ovens to provide more even baking.

G. The oven vent is an opening for warm air to flow out of the oven, allowing necessary air circulation during baking.

H. The oven door seal or gasket helps prevent the escape of heat while the oven is on.

I. The thermostat causes the oven to cycle on and off to maintain the selected temperature.

J. Insulation helps prevent heat loss, keeps the surface cooler, and maintains more even temperatures. Standard and continuously cleaning ovens have similar amounts of insulation. A self-cleaning oven has thicker insulation to retain heat during the cleaning cycle.

Parts of an Electric Range

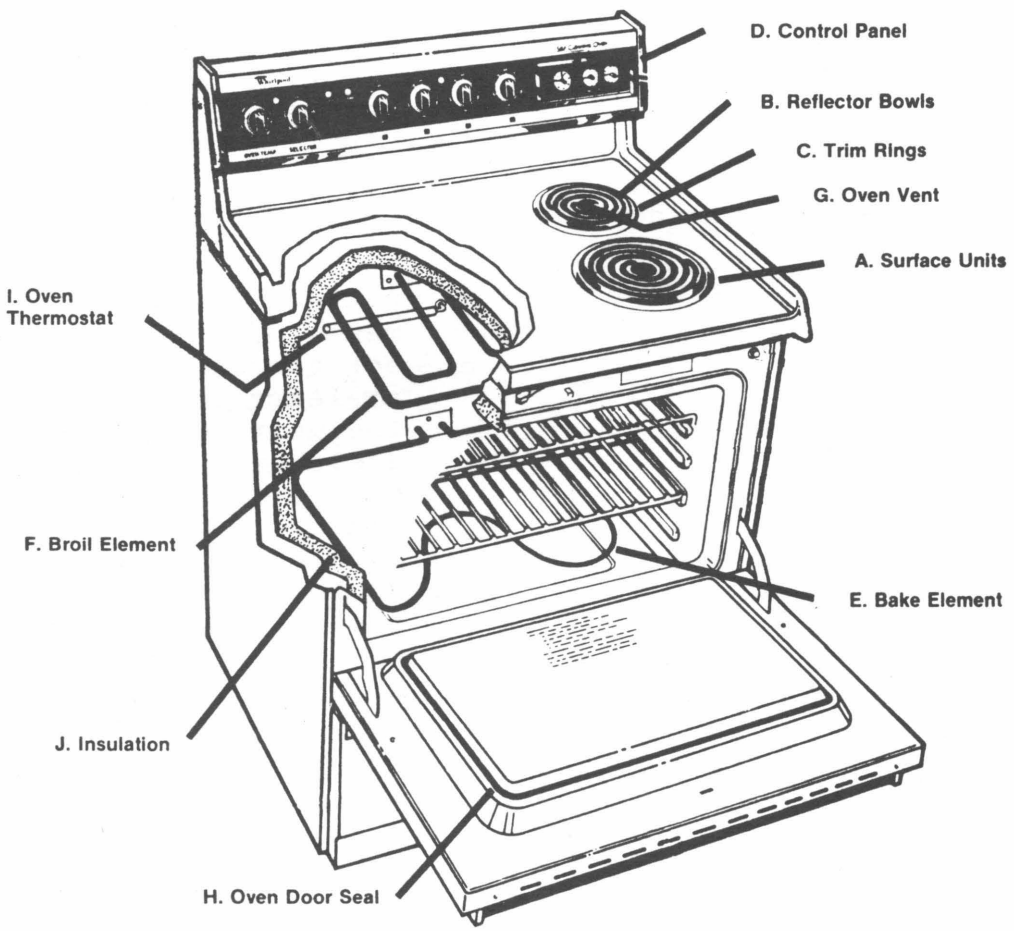

Figure 8

Types of Automatic Oven Cleaning

Self-Cleaning

The self-cleaning system removes oven soil by heating the oven cavity to a high temperature (usually between 850 degrees and 1100 degrees F) and decomposing the soil to a grayish-white ash. The ash can then be wiped out with a damp cloth or paper towel. The cycle usually lasts from 2 to 4 hours including time to cool down after cleaning. Some manufacturers suggest cleaning oven racks and drip pans from surface units in the oven during the cleaning cycles. Refer to the use and care booklet before doing this.

Continuous cleaning

In the continuous-cleaning oven, soil gradually disappears as the oven is being used for cooking. The specially formulated porcelain enamel finish of the oven is rough in texture and of a dull, dark color which, when magnified, appears to have peaks and valleys and increases the exposed surface area for the cleaning to take place. Food spatters have a wet look as they change to carbon dioxide, a gas that disappears into the air. The speed of the cleaning process depends on the oven temperature and length of cooking time, as well as size and kind of soil spatter.

ENERGY

Energy-saving Practices in Use and Care

-- Don't use your range to heat the kitchen.

-- Make sure you turn off all controls after using your range.

-- Thaw frozen foods before cooking.
For food safety, keep food in the refrigerator during the thawing process or use a microwave oven.

-- Take advantage of retained heat in the oven and on surface units. Turn the control to off before cooking is completed and let the remaining heat finish the job.

-- Make full use of the heated oven. Plan ahead with complete oven or broiler meals.

-- Don't be an "oven peeker." A significant amount of heat escapes each time you open the oven door. Instead, depend on timers and the oven door window.

-- Use the cleaning cycle on the self-cleaning oven right after baking or roasting. The oven won't have to heat up as much to get to the cleaning temperature.

-- When basting, checking temperature, or adding vegetables, remove the roast pan from the oven and close the door.

-- Arrange racks to accommodate baking pans BEFORE turning on the oven.

-- Keep preheating to the shortest possible time. Sometimes preheating is unnecessary.

-- Check your use and care manual to see if the manufacturer recommends use of foil in your oven. Using aluminum foil as an oven liner may reduce oven efficiency in some models.

-- Fit the pot to the size of the surface unit. A six-inch pan on an eight-inch unit wastes energy.

-- Use pots and pans with flat bottoms, straight sides and tight-fitting lids.

-- Place the pan on the surface unit BEFORE turning it on.

-- Start most food on a high heat setting and reduce to a lower heat as soon as foods reach boiling.

-- Cook with as little liquid as possible and at the lowest possible setting.

-- Cover pots and pans during cooking on a surface unit to shorten cooking time and reduce heat loss.

-- Keep reflector bowls under surface units clean.

Wattage

The nameplate of the electric range gives the kilowatt (KW) rating or total connected load for the range. This figure is the sum of the maximum wattages of the surface units, bake and broil units, and electrical accessories such as the clock and lights. Wattage for individual surface units and oven elements is marked on the unit,but may be difficult to see on older range models. The wattage of surface units in today's ranges varies from 1250 to 1600 watts for six-inch units and 2000 to 2700 for eight-inch units. The wattage of oven elements varies from 2000 to 4000 watts.

Energy Consumption of the Range Compared with Portable Appliances

Small electric appliances may operate with less energy than range surface units and ovens in preparing the same foods. Consider using small appliances such as the toaster-oven or skillet instead of the range oven, especially when small quantities of food are involved.

Safe Range Operation

-- Never wear loose fitting or hanging garments while using the range. The fabric could accidentally touch a hot heating element and burn or catch on fire.

-- Use only dry potholders;using damp potholders on hot surfaces may result in burns from steam. Do not let the potholder touch hot elements. Avoid using a towel or other bulky cloth for a potholder.

-- Make sure the reflector bowls are in place during cooking to avoid subjecting the wiring and components underneath them to damage.

-- Turn pan handles inward, but not over other surface units. This will minimize the possibility of burns, ignition of flammable materials, and spills due to accidentally bumping the pan.

-- Use care when opening the oven door. Let hot air or steam escape before removing or replacing food.

-- Always place the oven rack(s) in the proper position(s) while the oven is cool. If a rack must be moved while the oven is hot, don't let the potholder contact the hot heating elements in the oven.

-- Improper use of aluminum foil to line surface unit reflector bowls or oven bottom may result in a shock or fire hazard.

-- Do not touch surface units or the oven interior while they are operating. Surface units may be hot even though they are dark in color and appear cool.

-- Do not leave young children alone or unattended in the area where the range is in use. They should never be allowed to sit or stand on any part of the appliance.

-- Do not use water on grease fires. To smother the fire or flame, cover the pan with a lid or use a dry chemical or foam type extinguisher.

-- Never leave surface units unattended at high heat settings. A boilover causes smoking and greasy spill-overs that may ignite.

-- Look in the use and care book for a range for additional cautions.

Cleaning of Ranges

Part	What to Use	How to Clean
Outside of appliance	Soft cloth, warm soapy water Nylon or plastic scouring pad for stubborn spots.	.Wipe off regularly when range is cool. .Do not allow food containing acids such as vinegar, tomato, lemon juice or milk to remain on surface. Acids will remove the glossy finish. .Do not use abrasive or harsh cleansers.
Surface units	No cleaning required.	.Spatters or spills will burn off. .Wipe off excessive spills with damp cloth when surface unit is cold.
Control knobs and chrome rims	Warm, sudsy water and bristle brush	.Wash, rinse, and dry well. .Do not soak.
Reflector-bowls	Follow instructions in the use and care booklet.	
Broiler pan and grid	Warm, soapy water or soapy steel wool pads	.Wash with other cooking utensils.
Control Panel	Warm, soapy water	.Wash, rinse, and dry with soft cloth.

Upper oven racks	Warm, soapy steel wool pads	. Wash, rinse, and dry. Use steel wool pads for stubborn areas. . Check use and care booklet to see if they can be put in lower oven during self-cleaning oven cycle.
Lower oven racks	Self-Cleaning Oven cycle or Warm, soapy steel wool pads	. Leave in oven during self-cleaning cycle. . Wash, rinse, and dry. Use soapy steel wool pads for stubborn areas.
Oven door glass	Warm, soapy water or plastic scrubbing pad Commercial glass cleaner	. Make certain oven door is cool. . Wash, rinse, and dry well with soft cloth. . Do not use harsh abrasives.
Oven door liners	Warm soapy water or plastic scrubbing pad	. Make certain oven door is cool. Wash, rinse, and dry well with soft cloth. . Do not use harsh abrasives.
Oven lining (manual cleaning)	Follow instructions in the use and care booklet. On some models, the oven door can be removed for ease of cleaning.	
Continuous cleaning or Self-Cleaning Oven	Follow instructions in the use and care booklet.	

Suggested Activities

1. Study the use and care booklet on two electric ranges. Record the following information about them:
   a) Model number, total kilowatt rating
   b) Number and sizes of surface units
   c) Material used for reflector bowls
   d) Type of surface unit controls--rotary or push-button; fixed or infinite
   e) Number of oven controls--one or two
   f) Type of oven cleaning system--standard, continuous cleaning, or self-cleaning
2. Work with an adult in your household to:
   a) Improve the energy management of the range.
   b) Clean a range. Then be responsible for cleaning the range for a month.

3. Experiments

Work with your 4-H Leader, preferably in a group situation, for the following activities:

a) Study the effect of the use of a lid on the speed of heating food.

1) Heat 2 cups of tap water in a saucepan with a lid for 2 minutes.

Use the HIGH setting for the range unit. Take the temperature of the water before and after heating.

2) Wait until the pan is cold. Then, on a different element (but one of the same size) than used in step 1, heat 2 cups of tap water in the saucepan without the lid for 2 minutes. Take the temperature of the water before and after heating.

Note: The beginning temperature of the water should be as nearly the same as possible for both steps 1 and 2 above. Using a different surface unit for step 2 than used for step 1 is a quicker way to have a cold surface unit at the beginning of each test than waiting for the surface unit used in step 1 to cool.

Which method of heating resulted in higher water temperature--with a lid or without a lid? What do these results mean in terms of cooking food and energy saving?

b) Study the effect of retained heat on surface cooking by observing how long (number of minutes 2 cups of water will continue to simmer after the control has been set to OFF). Use the results of this experiment the next time you cook on this surface unit. Turn off the element before the end of cooking, and complete cooking on the OFF setting.

c) Study the evenness of the bottom of utensils used for surface cooking in your home.

d) Study the uniformity of heat distribution in the oven by baking cookies.

4. Compare the approximate energy consumption of:

1) Making grilled cheese sandwiches in an eight-inch skillet on a surface unit, in an electric skillet, or in a sandwich grill.

2) Popping corn in a skillet on a surface unit and in an electric corn popper.

3) Baking 2 potatoes in a range oven and a toaster-oven

4) Making a small meat loaf in a range oven and in a toaster oven.

5) Cooking rice on a surface unit and in the range oven.

MICROWAVE OVENS

Chapter IV

How Microwave Ovens Work

In microwave cooking,electrical energy is converted to microwave energy by means of the magnetron tube. Depending on the density of the food, the microwaves penetrate food 3/4 to 2 inches and cause certain molecules in the food to vibrate at extremely high rates of speed. This vibration causes friction between the molecules and produces heat. Cooking occurs when the heat is transferred from the hot, outer layer to the uncooked inner layers.

Microwaves have the following properties which relate to cooking:

1. Microwaves travel in straight lines.
2. Microwaves are absorbed by food.
3. Microwaves are transmitted through glass, glass-ceramic, paper, pottery, and plastics. Because microwaves pass through these materials without heating them, they are generally recommended as cooking utensils. More specific information about cooking utensils is provided in the literature which comes with the appliance.
4. Microwaves are reflected by metal. With newer technological developments, restrictions about the use of metal utensils and coverings in microwave ovens have been revised. Specific guidelines are provided in the literature which comes with the appliance.

Energy

It is possible to save energy by using the microwave oven, especially as a substitute for the conventional oven. This appliance is most efficient for reheating or cooking in small quantities.

Another way that microwave ovens can reduce household energy consumption is by reducing the need for air-conditioning in the kitchen. The heat generated in microwave cooking stays within the oven much more than it does in conventional cooking.

Safety

Properly used, the microwave oven is one of the safest kitchen appliances. The Bureau of Radiological Health (BRH), a part of the Food and Drug Administration (FDA), requires that microwave oven doors have 2 or more interlocks so that if one lock should fail to shut off the microwaves when the door is opened, another will take over. Another regulation limits the amount of radiation that may be emitted around the oven door to levels below which there are clearly no harmful effects. The limit is one milliwatt (1/1000 of a watt) per square centimeter measured 5 centimeters (2 inches) from the oven door when it leaves the factory, and 5 milliwatts per square centimeter during the life of the oven.

The possibility of excessive microwave leakage is highly unlikely if the manufacturer's use

and care instructions are followed. To further assure your safety: be sure to check your microwave oven for shipping damage when it is delivered to your home, and keep the door seal clean. Never try to close the door with anything between it and the oven cavity (such as a pot holder). If you are concerned that your oven may have excessive leakage, contact an authorized service center for your microwave oven. Some county health department sanitarians also test microwave ovens for radiation leakage upon request.

Do not operate the microwave oven when it is empty.

Some use and care books neglect to mention the possibility of burns and fires that can result from microwave use. Fires are not likely to occur, but items can get hot enough to char, smoke, or even burst into flame. This can happen when you're handling low (small) loads such as drying herbs or freshening crackers. A cup of water placed in the corner of your oven will help to absorb excess microwave energy. Burning can occur when heat from food transfers to the container. Foods high in fat or sugar should be handled carefully because of their affinity for microwave energy.

As with any other cooking, use caution when removing any type of covering or lid; steam builds up in the container and can cause burns. Always tilt lids away from you and leave a space for steam to escape when using plastic film covering. Plastic bags or pouches must be pierced to prevent steam buildup and possible burns.

Other Use and Care Considerations

Output wattage

One way microwave ovens are rated is according to the output wattage. This is the power available for cooking and is lower than the input wattage. The higher the output wattage, the faster the cooking.

Parts of the Countertop Microwave Oven (Fig 9)

A. The door is a metal wire mesh. This door lets you see inside but does not allow the microwaves to get out.
B. The magnetron tube is the main part of the microwave oven which changes electricity to microwave energy.
C. The cavity is the inside of the oven. Some ovens have stainless steel walls; others have acrylic paint over metal walls. Some ovens have a removable glass tray in the bottom of the cavity; others have a built-in glass ceramic shelf.
D. You can hear the fan running when the oven operates. The fan helps cool the magnetron tube so it will last longer.
E. A stirrer looks very much like a fan. It moves the microwaves throughout the inside of the cavity before they enter the food. This helps food cook evenly. Some ovens use a rotating tray to move the food around the cavity instead of moving the microwaves.
F. The wave guide is like a pipe which carries the microwaves from the magnetron tube to the cavity.
G. Safety door seal system and door switches help insure

Parts of a Microwave Oven

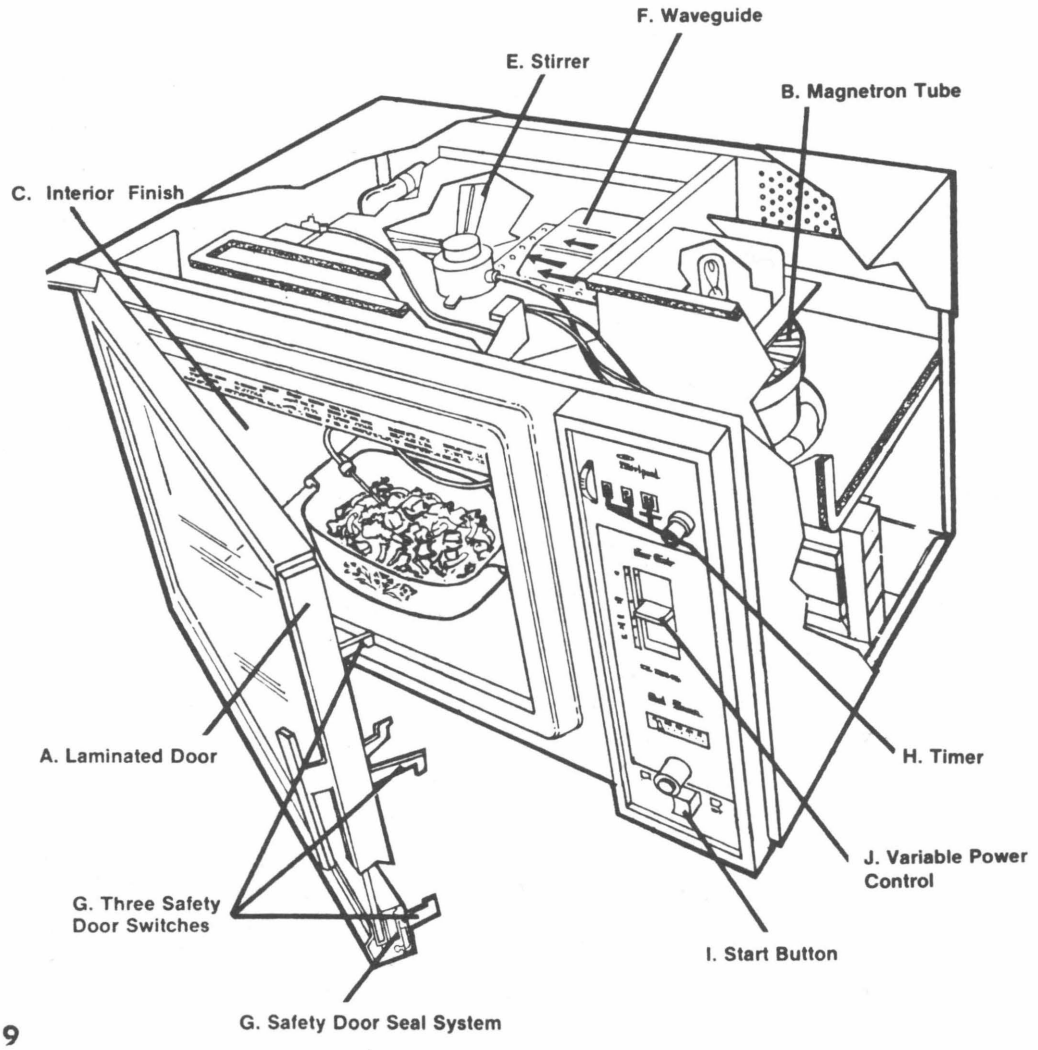

Figure 9

safe operation of the appliance.

H. A dial, digital, or electronic <u>timer</u> provides an accurate means of controlling cooking, heating and defrosting times.

I. <u>Start button</u> helps to prevent accidental operation.

J. <u>Variable power control</u> (optional) provides three or more power settings to slow down cooking. It adds the extra convenience and flexibility to cook, defrost, and reheat a wide variety of items.

Selecting Correct Time

When baking foods in a conventional oven, an extra minute usually will not ruin the food. But, an extra minute in the microwave may produce a disaster.

Many foods cook faster in the microwave oven than in the conventional oven. However, foods such as rice and spaghetti will take the same amount of time as

conventional cooking and microwaving would not save energy.

Many factors affect the defrosting, heating, and cooking time. The type of food, as well as the microwave speed, affect the time needed.

-- Amount of food: More food takes longer to cook.

-- Density of food: Density is the weight of food in comparison to volume. The denser the food, the longer the cooking time. For example, one pound of hamburger will take longer to defrost than one pound of bread.

-- Moisture: Food with a high moisture content will take longer to cook than food with less moisture.

-- Sugar and fat: Foods high in fat or sugar cook quicker than foods with a lower content.

-- Temperature: Frozen or cold food takes longer to cook than room temperature foods.

-- Power level: Some models can be set at different cooking levels. Lower levels slow down cooking.

Selecting Cooking Utensils

Use utensils that allow the microwaves to pass through them. For example, most paper or glass ovenware will allow the microwaves to go directly through to the food.

Utensils which are metal or contain metal parts cannot be used in some microwave ovens. The microwaves would bounce off the utensil or could damage the magnetron tube. Refer to your manufacturer's instructions about using metals in your oven.

Avoid the following items:

-- Glass dishes trimmed in gold or silver
-- A metal handle
-- Staples in tea bags or straw baskets
-- Metal ties to close plastic bags
-- Metal stirring spoons
-- Aluminum foil in large amounts
-- Dinnerware dishes having metallic content
-- Foil trays and metal skewers
-- Melamine plastic dinnerware
-- Heat sensitive plastic containers.

Items to use:

-- Plastic cooking bags: Use any boilable bag, but not foil lined. DO NOT USE plastic storage bags. Secure bags with a string, not metal ties. Be sure A heavy duty plastic type utensil is made for microwave use. Special browning dishes are useful in meat cookery. These utensils are helpful but not required for cooking.
-- Glass ovenware and glass ceramics: Most see-through or white baking dishes, casseroles, and measuring cups are ideal.
-- Paper: Wax paper, paper towels, paper napkins, and paper plates can be used for short term cooking.

How To Test Your Dishes For Use In The Microwave Oven

Do not use metals or plastics unless labeled for microwave use.

To test other utensils, fill a glass measuring cup with 8 ounces of cool water. Place the measuring cup of water into the microwave appliance along with the dish being tested. Microwave on HIGH power for one minute, then check the dish and water.

-- If the dish is cool and the water is warm, the dish is okay for use in the microwave oven.
-- If the dish is warm only on the edges, and the water is warm, it is best not to use the dish.
-- If the dish is hot and the water cool, DO NOT USE THE DISH IN THE MICROWAVE OVEN.

Care of The Microwave Oven

Wipe up spillovers right away. Otherwise, they will absorb microwaves and make cooking times longer.

Use a damp cloth to wipe out crumbs that fall between the door and the frame. Keep this area clean to make sure the door closes properly and no microwaves escape the cavity.

Clean all surfaces of the oven with soapy water. Rinse with clean water and polish dry with a soft cloth or paper towel. Do not use abrasive cleaners on any part of the oven.

Suggested Activities

1. Study the features on two countertop microwave ovens. Evaluate these features for convenience, cleanability, and safety. Make a chart and record your comments.

2. Prepare an exhibit to illustrate cookware which is suitable for microwaving and that which is not suitable.

3. Work with your 4-H Leader or other adult on the following experiments:

   a) Objective: To observe the effect of the amount of food on the cooking time.

      On HIGH setting, compare the length of time for heating 1 and 2 cups of tap water to boiling. (Be sure water has the same initial temperature.) What do the results mean

   b) Objective: To observe the effect of the initial temperature of food on the cooking time.

      On HIGH setting heat 1 cup of ice water to boiling. Record the time. How did the time compare with heating 1 cup of tap water?

      What do the results mean in terms of cooking other foods?

   c) Objective: To observe the effect of the density of food on cooking time.

      Compare the length of time needed for cooking or heating the following:

      1 baked potato and 1 roll

      1 package of frozen whole broccoli spears and 1 package of frozen chopped broccoli.

      Follow the directions in your microwave cookbook or on the package of food.

d) Test at least 4 different types of cooking utensils to see if they are suitable for microwave cooking.

e) Experiment with reheating the following foods using the directions for the microwave oven: 2 rolls, leftover vegetables, leftover casserole.

How much time did each item take to heat? How satisfactory were the results? How would you improve your microwave techniques?

f) Compare cooking 1 hot dog in roll wrapped in paper towel or a napkin with a hot dog in roll wrapped in plastic wrap.

Which type of covering gave more satisfactory results?

DISHWASHERS

Chapter V

How Dishwashers Work

A dishwasher cleans dishes, pots, glasses, silverware, and cutlery by spraying them with a mixture of hot water and detergent. A dishwasher interior does not fill with water the way a clothes washer does.

During the typical wash or rinse portion of a cycle,water enters the dishwasher. The water is pumped through the spray arms, onto the dishes over and over again. As the water runs off the dishes, it flows through the filter system and back to the pump. The filter system strains most food particles from the water so they won't be sprayed back onto the dishes.

At the end of a wash or rinse, the water is pumped out of the dishwasher. Small food particles go down the drain with the water. Large pieces are trapped on the removable pump guard section of the filter. Next, the dishwasher fills again with water for the next wash or rinse. Finally, the dishwasher enters the drying portion of the cycle. If heat is used for drying, the heating element in the dishwasher turns on to help dry dishes and utensils. Warm air circulates through the dishwasher and leaves through the vent. If the user has the option to have the dishes and utensils air dry, the dishwasher timer proceeds through the drying portion of the cycle, but the heating element does not turn on. Dishes take longer to dry (overnight is recommended) when dried without heat.

Safety

-- Do not touch the heating element if the dry cycle is interrupted at the end of the cycle. The heating element might still be hot and you could be burned.
-- Don't try to remove or clean any part of the filter until the heating element has had adequate time to cool following the end of the dishwashing cycle, about 20 minutes.
-- Store dishwasher detergent in a cool, dry place where children cannot reach it. Dishwasher detergent is very strong and caustic.

Energy-saving Practices

-- Wash full loads. Running a half-filled dishwasher takes the same amount of electricity as a fully loaded dishwasher.
-- Use a shorter cycle whenever possible. A shorter cycle for dishwashing uses less hot water and less electricity and can satisfactorily wash lightly to normally soiled loads. Follow manufacturer's instructions provided with the dishwasher for specific cycle information.
-- Allow dishes to air dry. When you don't need a rapid-drying cycle, air drying provides satisfactory results.
-- Load the dishwasher correctly. Incorrect loading may cause poor washing and create the need to rewash all or part of the load.
-- Use the dishwasher during "off-peak" hours. Local power suppliers recommend this practice to avoid heavy usage of energy at certain times of the day. Also using the dishwasher in the evening in the summer helps reduce the extra heat in the house.

Other Use and Care Considerations

-- Before placing items in the dishwasher, remove bones, large quantities, and large pieces of food. Pre-rinsing of normal food soil is not necessary. Empty cups and glasses. If you are using a cycle that provides extra washing action for heavy or cooked-on soil,it may not be necessary to soak and scrape pots and pans.
-- Wash only dishwasher-safe items. Be sure that such items as spoons do not nest together in the silverware basket. Improper washing will result. Some good sharp knives will last longer and retain their sharpness longer if they are washed by hand.
-- Soft water (with a low iron content) that is at least 140 degrees F with a correct dishwasher detergent concentration washes best.
-- Harder water requires more detergent. Consult the use and care booklet for the dishwasher for the amount of detergent recommended for your water conditions. Add detergent just before operating the dishwasher.
-- Do not use any type of cleaner other than automatic dishwasher detergent. Other cleaners cause foaming or sudsing that interferes with operation of the dishwasher.

Cleaning

-- Clean the exterior with a soft,damp cloth or sponge and mild detergent as necessary. Dry thoroughly.
-- Prolonged use of hard water may cause a white film to appear on the interior surfaces. Clean these surfaces with a mild, non-abrasive,non-sudsing cleaner.
-- Food film may build up on the interior bottom edge of the paper towel, sponge, or cloth to clean this area about once a week.
-- Remove debris from the filter screen (if your dishwasher has this feature).

Parts of a Dishwasher (Fig 10)

A. The tub liner is a hard finished surface, usually porcelain enamel, that resists stains and wear.
B. The motor and pump circulate the water onto dishes and through the filter during washing and rinsing.
C. The overfill protector protects against the water level getting too high in the dishwasher. It shuts off the water fill valve when the correct water level is reached.
D. The heating element provides heat, when necessary, during washing and drying. It heats the water (in certain cycles) and it heats the air for heated drying.
E. Sound insulation is provided around the sides and top and in the door for quiet dishwasher operation.
F. The hose connects to the household drain for disposal of wash and rinse water.
G. The control panel is on the top of the dishwasher door and is the location for the cycle and option selector buttons, vent, door latch, and indicator lights.
H. The cycle and option-selector buttons and/or timer control the valve that allows hot water to come into the dishwasher, the pump that circulates the water, the heating element, and the vent that allows air to flow out of the dishwasher during drying. These controls also turn the dishwasher off at the end of a cycle.
I. The door latch allows the dishwasher to run only when the door is firmly closed. When the door is opened after the dishwasher is started, washing action stops and resumes when the door is closed.
J. Indicator lights glow during different portions of the cycle to indicate what the dishwasher is doing. The presence and number of lights vary with dishwasher models.
K. The racks hold dishes. Design varies with models of dishwashers.
L. Silverware and cutlery basket holds silverware and cooking spoons, spatulas, etc. so that circulating water can reach them for cleaning. Most baskets are removable for convenient loading and unloading. Location of baskets varies with models.
M. Water may be distributed onto dishes using various systems with one or more places for water to enter dishwasher.
N. The vent allows warm, moist air to flow out of the dishwasher during drying.
O. The detergent dispenser holds detergent and dispenses it into the wash water at the designated time. Location and design vary with manufacturers.

Suggested Activities

1. Prepare an exhibit on dishes and utensils which can be safely machine washed and those which cannot be machine washed.

2. Work with an adult to load a dishwasher and operate it for a week. Make a list of any problems noted in getting the dishes clean. What could be done to avoid these problems?

3. Check the temperature of the water in the dishwasher after the first fill.

4. Determine the hardness of the water in your home. If you live in town, call the local water department. If you have your own water supply, do your own test with the help of your 4-H leader, agent, or another adult.

5. Work with an adult to improve the energy management of the dishwasher.

6. Talk with three or four homemakers to discuss their experiences in using a dishwasher. What recommendations would you make to other consumers for using their dishwashers? What features did they find useful? What features caused dissatisfaction?

Parts of a Dishwasher

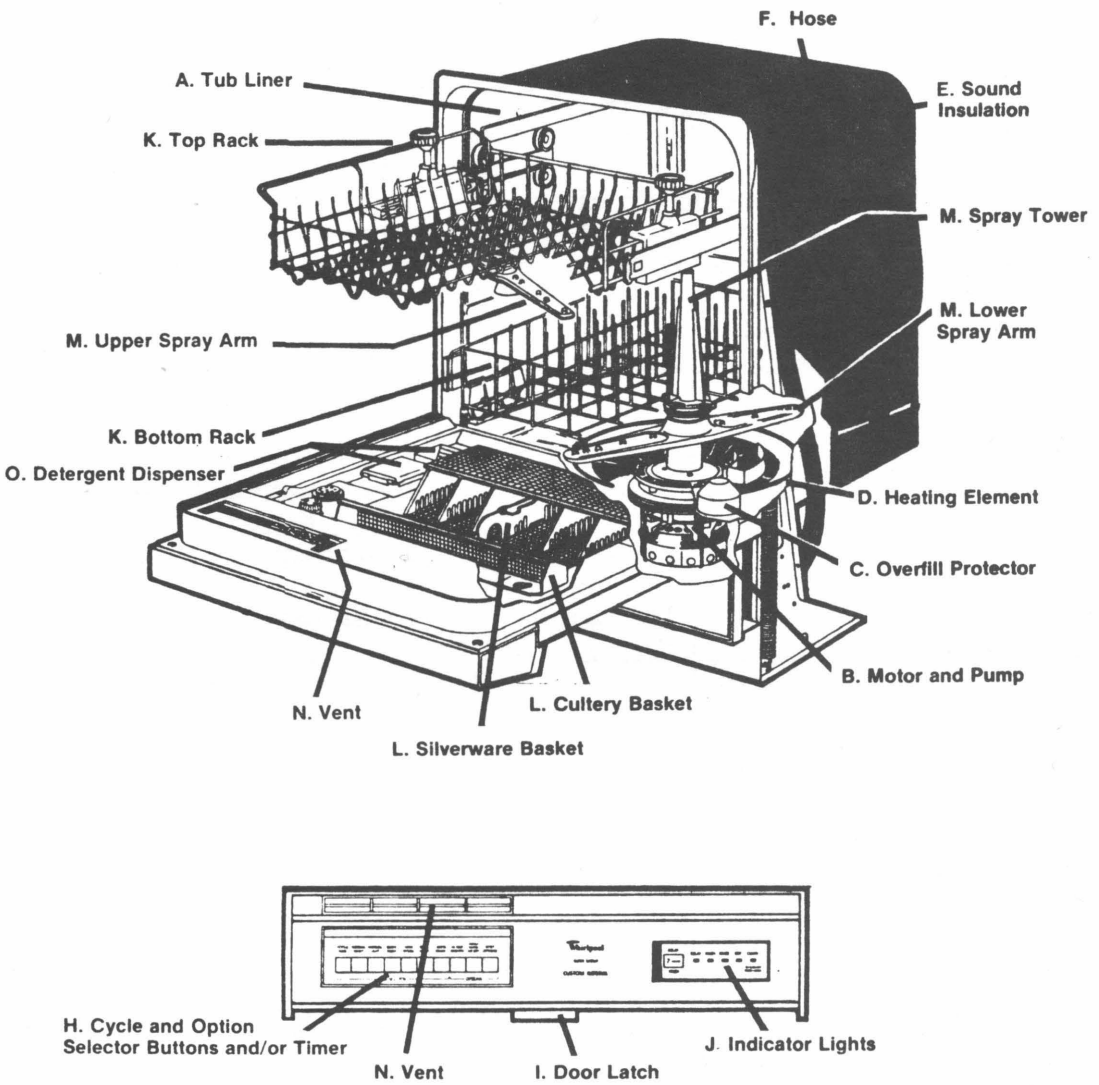

Figure 10

AUTOMATIC CLOTHES WASHERS

Chapter VI

The Laundry System

The automatic clothes washer does its job in a laundry system that includes chemical, thermal, and mechanical energy. Detergent and other laundry additives provide the chemical energy. Heated water is the source of thermal energy. The automatic washer supplies the mechanical energy in the form of agitation or tumble action, filling and draining, and spinning.

The energy inputs are shown in equal quantities--as they should be if the laundry system is in balance for good washing results. If one energy input is reduced, then others should be increased to maintain the balance (Fig 11).

For example, if water temperature is lowered from 140 degrees F (hot) to 100 degrees F (warm) or to 70 degrees F (cold), more energy from detergents and/or the washer is required for good washing results.

Types of Automatic Washers

There are two basic types of automatic washers: top-loading and front- loading. Top-loading models (the most widely used type) have a center post agitator or pulsator which provides washing action. Front-loading models achieve washing action by means of a circular drum which rotates, causing the fabrics to tumble. Items in the load are lifted out of the water and then dropped back into it. In this project only the agitator type will be featured. However, the principles of use and care apply to any type washer.

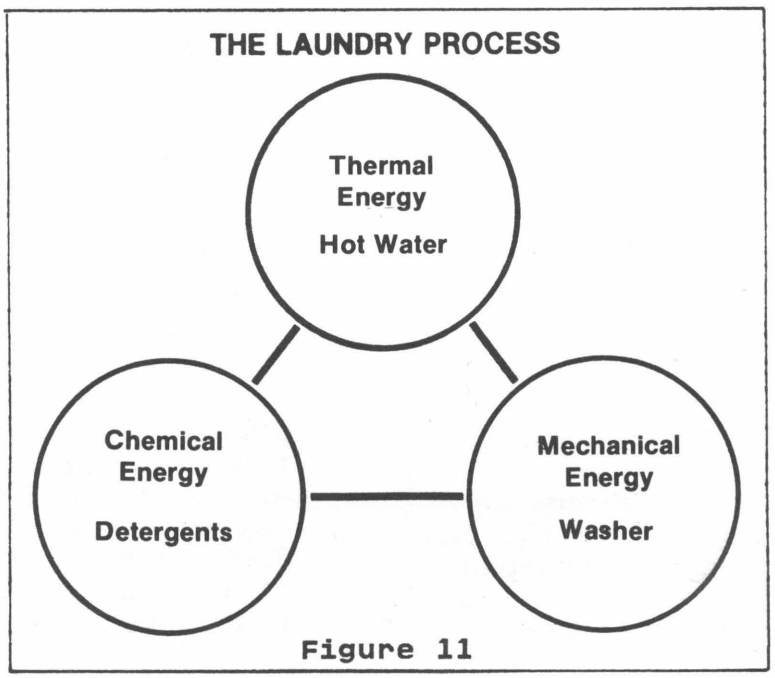

Figure 11

Energy-Saving Practices in Use and Care

-- About 90% of the energy used for washing clothes automatically is for heating water. The most important way to save energy and money is to use less hot water.

-- Use a cold water rinse. The temperature of the rinse water does not affect cleaning.

-- Use hot water only for heavily soiled loads or loads with greasy soils.
Most laundry loads can be washed in warm water.

-- Always wash full loads that have been sorted correctly. Be careful not to overload to prevent having to re-wash with a waste of energy.

-- Some washers have variable water levels. When washing small loads, always match water level to load size.

-- Be sure that the correct cycle and enough detergent are used for each load. Poor washing results may mean that the load has to be re-washed, using double amounts of energy.

-- Always use the highest spin available for heavy fabrics (such as sweat shirts, towels, jeans) to reduce drying energy.

Safety

-- Do not add or remove any article or reach into the tub unless the washer is stopped.

-- Keep detergents, bleaches, and other laundry products out of the reach of small children.

Other Use and Care Considerations

-- Be sure that the washer is level to prevent excessive vibration and noise.

-- When sorting items into loads, remove metal belts, pins, buckles,or other sharp objects. Sharp metal items can damage porcelain and plastic parts, making them rough and creating spots that may damage fabrics in future loads.

-- Strong, harsh,or flammable chemicals should not be used on or in the automatic washer. Use pretreatment laundry products such as Spray'n Wash or Shout on fabrics at a sink or counter to avoid damaging the finish of the washer. Acids,such as vinegar, can etch the porcelain basket, making it rough and abrasive. Use a plastic container, not the washer, if items need to be soaked in vinegar.

-- After washing, it is suggested that water faucets for the washer be turned off. This is to reduce the pressure on the hoses. This practice also reduces the danger of flooding in the event that the water valve in the washer mal-functions.

-- Check the use and care book for your washer about the recommended cleaning procedure. On most models, the only care needed is to wipe off the outside of the cabinet with sudsy water. Some washers have lint filters and/or dispensers that need to be cleaned.

Parts of an Automatic Washer

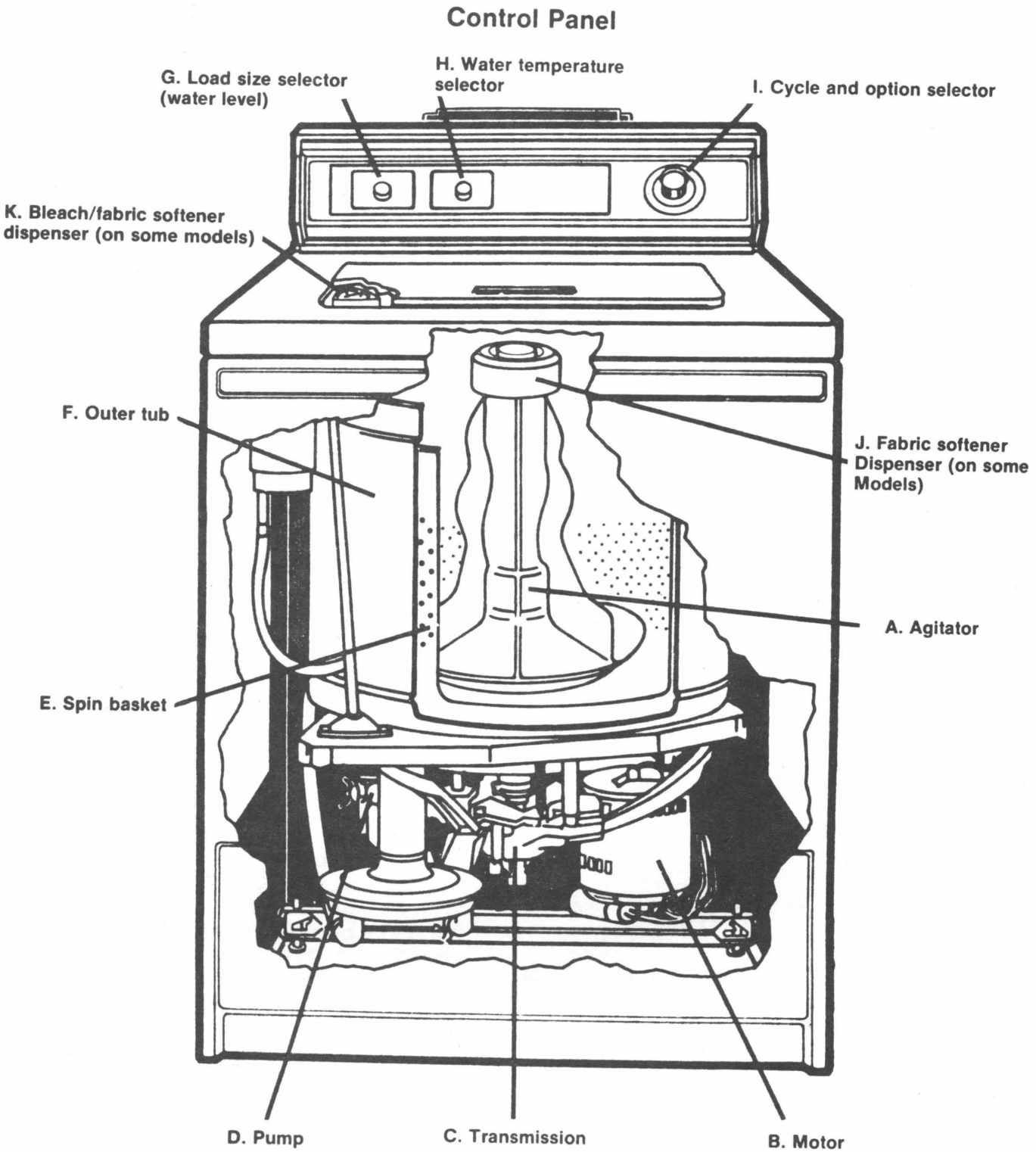

Figure 12

Parts of the Agitator-Type Top-Loading Automatic Washer (Fig 12)

A. Agitators are made in many shapes and sizes to move the wash water and tumble the clothes.
B. The motor provides the power for the agitator and the pump.
C. The transmission is the mechanism that connects the motor with either the agitator, the inner tub during spinning or the pump.
D. During washing the pump circulates water from the tub through a lint filter and back into the tub. After washing or rinsing,the pump drains water from the machine. On washers equipped with a suds-saver, the pump draws water from the storage tub into the machine.
E. The items to be laundered are loaded into the tub and come into direct contact with the spin basket. This basket spins during extraction and is perforated to allow water to flow out. Wash baskets are often porcelain enamel but may also be made of plastic or stainless steel.
F. The outer tub is the housing for the entire washer system.
G. The load size selector determines the water level for washing and for rinsing the load.
H. The water temperature selector allows a choice of washing and rinsing temperatures.
I. The cycle and option selector is the control used to select the wash cycle (normal, permanent press, gentle,etc.) and the wash time needed.
J. The fabric softener dispenser, an optional feature, permits adding liquid fabric softener at the start of a load.
K. The bleach dispenser, an optional feature, automatically dilutes and dispenses bleach.

Suggested Activities

1. Study the cycles available on an automatic washer.
   a) How many cycles are available?
   b) What is the purpose of each cycle?
   c) Work with an adult or older family member who is familiar with the operation of the washer and time what happens during the regular cycle for a full load. Illustrate the processes with a bar graph.

2. Work with an adult to:
   a) Wash at least one load of articles on each of the washer cycles.
   b) Clean the washer.

3. a) What choices of wash and rinse water temperatures are available on the washer in your household?
   b) With a cooking thermometer,check the temperature of the water in the wash and rinse cycles when the wash water temperature is set on each of these combinations.

4. Work with your parents to improve the energy management with the washer.

CLOTHES DRYERS

CHAPTER VII

Function of The Clothes Dryer

The dryer serves its function in today's home laundry by evaporating water from fabrics with:

1. Heat produced by the electric heating element.
2. Air flow produced by a fan.
3. Tumble action produced by a rotating drum and baffles.

The heat of the sun is replaced by an electric heating element. As air is heated, its capacity to hold moisture is increased. The more heat applied, the faster the rate of evaporation. Too much heat, however, can be damaging, so the heating process must be closely controlled.

The second basic principle of drying is the movement of air. The motor-driven blower fan produces an artificial wind. Moisture laden air is replaced with dry air. The fan pulls room air in over the heater and forces the warm dry air to circulate over and through the fabrics in the drum. After the air has absorbed as much moisture as possible, it is exhausted from the dryer through the lint filter.

The tumbling action of the dryer also simulates the action of the wind. When the wind blows, it causes fabric to move and flex. The movement exposes more surface of the material to the heat and the air for faster drying. The flexing of the cloth fibers has a softening effect. The rotating dryer drum furnishes the movement and flexing action in the dryer. To insure good tumbling action, the drum's baffles lift, turn, and tumble the wet load.

Tumbling helps to expose all fabric surfaces to the heated air. At the same time the tumbling action flexes the cloth fibers, keeping them soft and pliable, helping to remove wrinkles.

Parts of a Dryer (Fig 13)

A. Dryer door is on the front panel and is hinged on either side or the bottom.
B. The motor rotates the drum and runs the fan.
C. The baffles are an extension of the drum. They increase the tumbling motion of the laundry items for better air circulation.
D. The drum holds and tumbles items while they are dried.
E. Room temperature air passes over the heater and then enters the drum. As a safety feature, many dryers have an automatic shut-off for the heater whenever the motor stops.
F. The lint filter collects lint from air circulating in the dryer. Lint filter may be found on the top of the dryer or in the door.
G. Heated air is blown into the drum area through the air inlet.
H. Air leaves the dryer drum through the air outlet. This exhaust should be vented to the outside.
I. The fan circulates the air by the heater to the air inlet, through the drum, to the air outlet, and then exhausts it to the outside.
J. The control panel consists of the cycle selector, the temperature selector, and the start button.
K. The cycle selector is used

to select automatic or timed drying.

L. The temperature selector is used to select air flow temperature in the dryer.

M. The start button is a separate safety feature. The door must be closed and the start button pushed before the drying cycle will begin.

N. The moisture sensing control (optional) is found on dryers with automatic cycles. It may be located on the baffle, the walls, or the back of the drum.

Parts of a Dryer

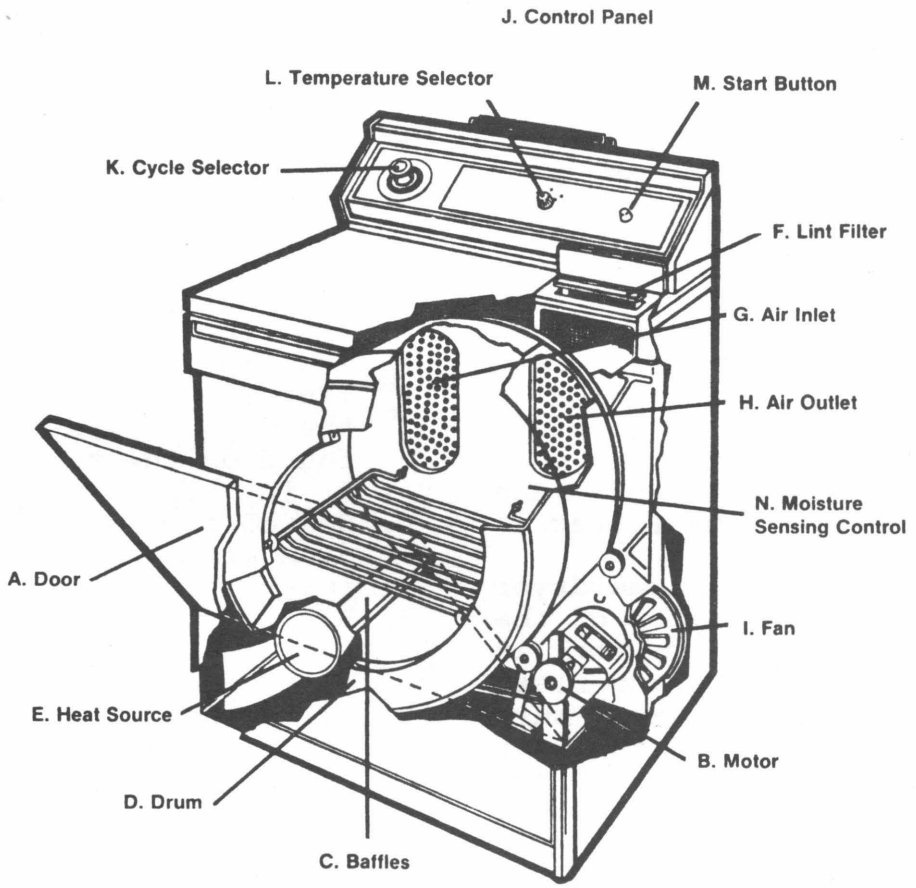

Figure 13

Energy-saving Practices in Use

-- Don't overdry items. Try to reduce your regular drying time by about 5 minutes or more. Remember, most fabrics have some natural moisture and should not be "bone dry."

-- Don't overload the dryer. Articles must be able to tumble freely.

-- Clean the lint trap screen after each load and check it before each load. If too much lint is on the screen, the air will not move freely and the dryer will run longer.

-- If possible, dry loads one right after another. In this way you can use the heat left over from the previous load.

-- Avoid installing the dryer in an unheated room.

Safety

-- Never let children operate or crawl inside the dryer. Serious injury could result from tumbling, if dryer is started while they are inside; or from lack of air.

-- Use only the AIR FLUFF setting to dry items containing plastic, rubber, foam rubber, or any other rubber-like materials.

-- Never dry rags or clothes containing wax or paint in the dryer.

-- Keep the lint screen clean at all times. Don't operate the dryer with the lint screen removed.

Other Use and Care Considerations

Steps for good drying results

-- Always sort into proper loads. Refer to the use and care book for the dryer.

-- Make sure that all spots and stains are removed. Dryer heat can set stains into synthetic and permanent press fabrics, making them impossible to remove.

-- Remove items from the dryer as soon as it stops (or use the after-cycle tumble feature) to minimize wrinkling.

Care and Cleaning

-- Clean the dryer with a soft, damp cloth. Wipe up any spills immediately.

-- Clean the lint filter before every load. This is necessary for efficient drying and for safety reasons.

-- Clean the exhaust duct at least once a year. Make sure that it is properly vented to the outdoors to quickly discharge moisture laden air.

-- Every 2 to 3 years, clean out the lint from inside the cabinet. A qualified service person should be contacted for this cleaning.

-- Do not put sharp, rough, or heavy objects into the dryer. These objects may tear clothing in the load. They may also scratch the drum's finish, causing it to snag clothing in later loads.

-- Use pretreatment products, bleaches, and detergents away from the dryer. Don't use the top of the dryer as a work surface for applying chemicals which can damage the finish and console.

Suggested Activities

1. Study the cycles available on a clothes dryer.
   a) How many cycles are available?
   b) What is the purpose of each cycle?
2. Study and compare the features on several dryers in terms of ease of use, ease of cleaning,and energy management.
3. Work with an adult to clean the lint tray on a dryer.
4. Work with an adult to dry clothes using each of the cycles available.

   Also use the no-heat setting to freshen pillows or for some other appropriate use.

CAREER EXPLORATION

Optional Activity

If you have enjoyed this project, you may be interested in thinking about a career related to electric appliances. Some possible careers are:

--appliance sales demonstrator

--manager or owner of an appliance store or department

--service technician

--home economist or engineer with an electric power supplier

--home economist or engineer with an appliance manufacturer.

Explore these career opportunities to determine the nature of the job, education/training and experience needed, working conditions, range of expected earnings and job benefits.

Do at least one of the following activities:

a) Observe and/or interview someone who is working with the appliance industry. Ask your 4-H leader to help you design a form to use for your observation or interview.
b) Write a short report about careers in this field using references available in your school or public library or from your 4-H leader.
c) Invite persons employed in the appliances industry to your club meeting to discuss careers in this field.

IDENTIFYING CAUSES OF PROBLEMS

Refrigerator

PROBLEM: Uses Too Much Energy/ Runs Too Often

Is control set too cold? Use firmness of ice cream and coldness of milk as guides for good temperatures in a refrigerator-freezer.
Try next warmer control setting.
Is condenser clean?
Is there adequate air circulation allowed around the unit?
Are doors opened often--and held open for long periods?
Is unit level, with doors/lids closing and sealing properly?
Does freezer need defrosting?
On manual defrost units, frequent defrosting is required to keep energy usage low.
Is refrigerator a new model?
New, high efficiency units have smaller, more efficient compressors which run frequently, but use less energy than older designs.
Is the new unit a large, no-frost,ice maker model while previous unit was smaller, manual defrost?
Is the old unit still in use so the new unit is added energy load?

Range

PROBLEM: Surface or oven elements fail to come on.

Is the unit plugged in?
Is there a tripped circuit breaker or blown fuse?
Are the oven controls properly set on "manual"?

PROBLEM: Range does not cook as expected.

Oven

1. Is the range level?
2. Are recommended pans-- of correct size for recipe-- used for baking?
3. Has 1-1/2 to 2 inches been allowed on all sides of pans for good oven air circulation?
4. Is baking done on rack placed so food is in center of oven rather than too near top or bottom heating elements?
5. Is oven selector set for Bake (not preheat or broil)?
6. Is oven vent blocked, creating poor air air circulation and too much moisture?

Surface units

1. Do cooking utensils have smooth,flat bottoms?
2. Do cooking utensils fit the surface unit being used?
3. Has correct heat setting for type of food been selected?

Microwave Oven

PROBLEM: Oven won't operate.

Is the oven plugged in?
If plugged in but still doesn't work, the cause may be wiring, a fuse, or circuit breaker.
Is the oven door securely closed?
Is the oven correctly set?
Are the air vents blocked?
The oven may overheat and turn off if the air vents are blocked.
Let oven cool one hour, then restart.
If it still won't operate, call a service technician.

Dishwasher

PROBLEM: Dishwasher won't start.

Is dishwasher (portable) plugged in?
Have fuses and circuit breakers been checked?
Is door latched properly?
Reset the timer dial or desired cycle button.

PROBLEM: Dishwasher will not fill with water.

Is door latched properly?
If applicable, is the indicator light lit?
If not, there is no electrical power getting through the timer.
After checking to make sure that the unit is plugged in and the door is latched, the fuse box or circuit breaker should be checked.
On portable models, check to make certain that the hot water faucet is turned on.

Washer

PROBLEM: Washer won't run or spin.

Is the unit plugged in?
Is there a tripped circuit breaker or blown fuse?
Will the washer operate on other cycles or other portions of cycles? Push button and turn dial to desired selections.
Will a small electrical appliance (such as a hair dryer) operate in the same receptacle?
Is the lid closed?
Washer won't spin with lid open.

PROBLEM: Washer won't fill.

Check faucets. Are they turned on and is water available?
Check water level-control buttons.
Is one and only one button fully depressed?

Dryer

PROBLEM: Dryer won't start or run.

Is dryer plugged in?
Is door securely shut?
If plugged in, have an electrician check the electrical system.

PROBLEM: Dryer runs but won't heat.

Check the fuses. If they are okay, call a service technician.

MY 4-H ELECTRIC/ENERGY PROJECT RECORD

_____ , 19_____
(Year)

Name _____ Age ____

Address _____

Extension Unit _____ Name of 4-H Club _____

Tell briefly about the activity you did in the following chapters of this project: (If you need additional space, use extra sheets of paper.

1. GETTING ACQUAINTED WITH MAJOR APPLIANCES

2. REFRIGERATOR/FREEZERS

3. CLOTHES WASHERS

4. Other CHAPTERS STUDIED (Check at least two.)

Microwave Ovens
Ranges
Dishwashers
Clothes Dryers

Tell briefly about the activities you did in these chapters. (Use another sheet if needed.)

5. Information shared with others.

a) List the presentations you did and the number of people in each audience:

Title	Number in Audience

b) List the posters or exhibits you did:

Title	Where Displayed

c) Other ways you shared information, and number of people reached:

6. Write a story about your experiences with this project. (Use a separate sheet.)

Signed

IDEAS FOR PRESENTATION

The following ideas are designed to start your thinking about possible topics. You may think of others that are suitable in terms of the objectives of the 4-H Electric/Energy Projects.

1. Where to store appliance use and care booklets
2. How consumers should use energyguide labels
3. The how and why of leveling major appliances
4. Why warranties for major appliances are important to consumers and what information should be included in a warranty
5. How a refrigerator power-saver switch works to save energy
6. How to clean a refrigerator condenser
7. Energy-saving practices in using one or more major appliances
8. Safety practices in using one or more major appliances
9. Advantages and limitations of range oven cleaning systems: manual, continuous, self-cleaning
10. Comparison of energy consumption of a conventional range and a portable appliance
11. How a load size selector on clothes washer works and its value in energy management
12. Explanation of items which can and cannot be washed in a dishwasher
13. Testing cooking utensils to determine their suitability for microwave cooking
14. Energy-saving features of one major appliance

ADDITIONAL EXHIBIT IDEAS

The exhibit ideas below supplement those included in the suggested activities in Chapters 1 to 7.

1. How ground fault interrupters work
2. Energy-saving practices for any of the major appliances
3. Four factors which affect cooking time in a microwave oven. Show examples of foods comparing cooking times.
4. Safety-practices for any of the major appliances.
5. How to check the evenness of the bottom of a saucepan or skillet