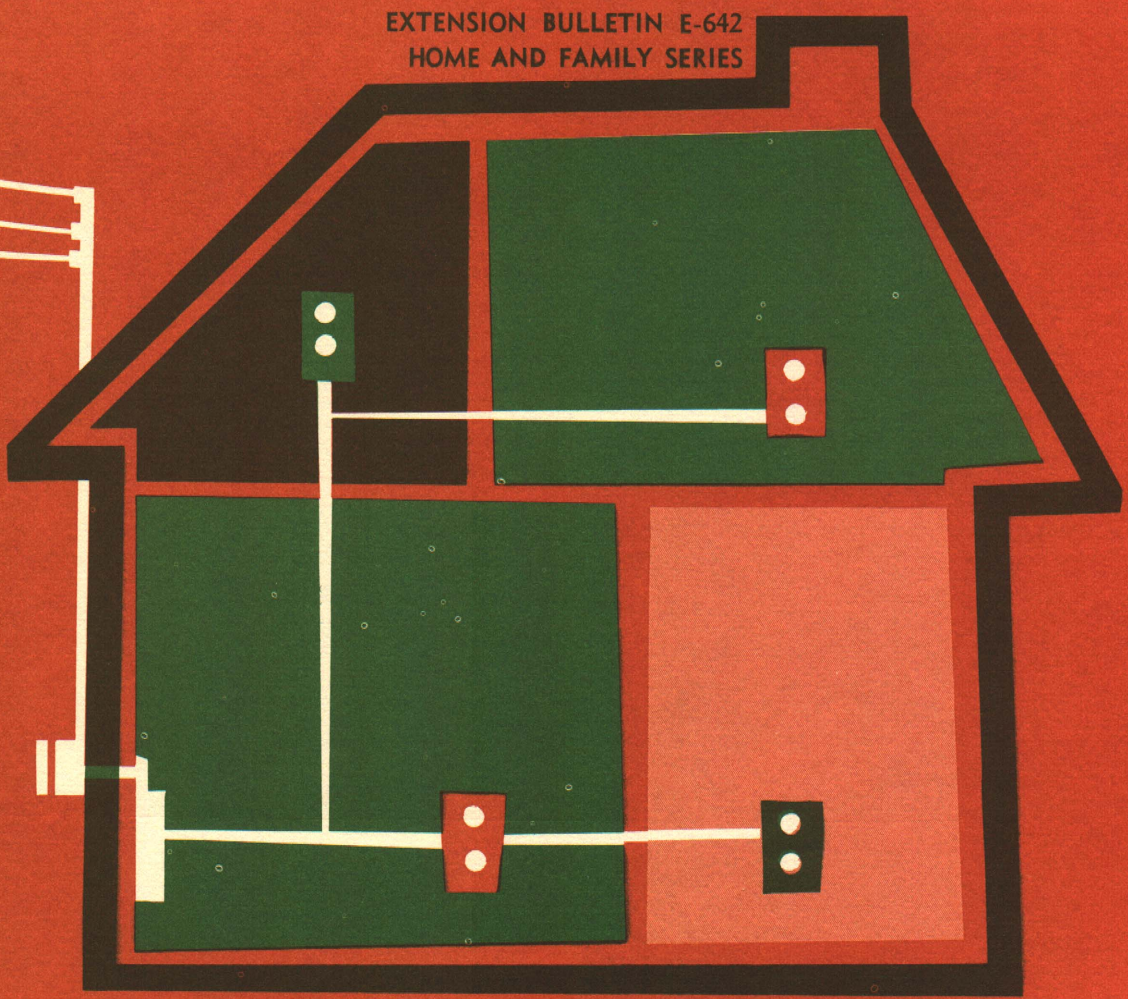
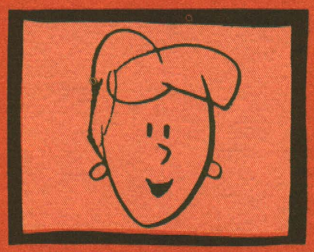
EXTENSION BULLETIN E-642
HOME AND FAMILY SERIES



ELECTRICITY in the HOME



A GUIDE FOR HOMEMAKERS

MICHIGAN STATE UNIVERSITY * * * COOPERATIVE EXTENSION SERVICE

CONTENTS

HERE ARE THE SUGGESTIONS you will find in this bulletin on how to deal with electrical problems:

(Current (1971) Extension Specialists in Home Management are Lucile Ketchum and Anne Field)

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. George S. McIntyre, Director, Cooperative Extension Service, Michigan State University, East Lansing, Michigan.

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ELECTRICITY in the HOME

By Georgianne Baker, *Former Extension Specialist in Home Management*
and Robert L. Maddex, *Extension Specialist in Agricultural Engineering*

ELECTRICITY is like the air. It is everywhere. And it would be hard to get along without it. But, just what is electricity?

Scientists say that electricity is an unseen natural force that converts energy into light, heat and power.

One of the authors of this bulletin – a home management specialist – might call it a "technological resource" in homemaking.

But you know it best as a modern "genie" in your home – a genie that moves over copper wires in the walls, waits at outlets and, when you flick a switch, goes to work sweeping, ventilating, refrigerating, vacuuming, freezing, sewing, waxing and polishing, baking a cake, grinding garbage, washing clothes.

Electric motors and heaters have meant less human muscle needed for certain jobs. But you may be using more of your human capacities (physical energy, mental skills and personal talents) for managing money, meal planning, entertaining, buying, organizing community affairs, teaching the children simple skills, interior decorating, contributing to the family income – and chauffering! You have little, if any, outside help from willing relatives and others. Yet your standards of accomplishment are as high or even higher than they were. More human resources go into activities which require real management know-how – making decisions about family goals, organizing and controlling activities to strengthen values important in your family.

The aid of electricity in getting your work done *does not* mean that you necessarily use less total hours for homemaking than your grandmother did – nor that you have more "leisure time". *What you do and how you do it* may have changed – not the hours spent!

The more you know about electricity in your home, the better you can control it and the more creatively you can use it. This bulletin is planned to give you information you can use to:

- maintain a more healthy, comfortable and safe home
- get satisfying results from electrical appliances you are using each day.

Common Electrical Problems

The genie of electricity is not a perfect servant. He will work only as much and as safely as you let him. You must provide him with safe working conditions, or he may try to do more than he should.

Here are electrical trouble signs in today's homes. You may have them in yours. If you have to check *any* of these problems, then read on to see what you can do about it.

Check if this happens in Your home!

1. Only two wires run from utility pole to your house and the electrical service entrance* has only 4 circuits and fuses. ☐
2. You are not sure if you have the right size fuses in the service entrance. ☐
3. You find only one or two fuses in the service entrance. ☐
4. Fuses blow or circuit breakers trip often. ☐
5. There are too few switches and outlets where you need them – (you can never find a good place to plug in the hair dryer or vacuum cleaner!) ☐
6. More than one appliance cord or extension cord is connected to one outlet. ☐
7. Long cords are strung around your living room under furniture or rugs. ☐
8. Cords are frayed, cracked or split; plugs are cracked or broken. ☐
9. Motors operate slowly and overheat quickly. ☐
10. Your toaster, iron, and other heating appliances warm up slowly. ☐
11. Lights dim or flicker when the refrigerator motor or other appliances come on. ☐
12. Your husband complains that TV picture shrinks in size or flutters when other appliances start to operate. ☐

**Electrical service entrance includes the wires and equipment through which electrical power enters your home. This explanation is listed in the Language of Electricity on page 11. As you read, you will want to look up the meaning of other electrical terms here.*

Start at the Beginning

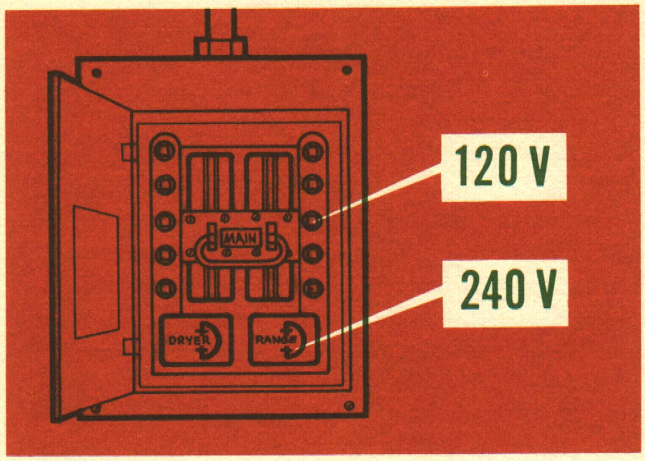
Look at the Wiring System Itself . . .

Here are three basic requirements for adequate household wiring today. Check at the right of each item if your house doesn't measure up!

1 A 100-ampere service entrance with at least six 120-volt circuits and two 240-volt circuits, or eight 120-volt circuits and one 240-volt circuit. (Additional circuits may be needed for heating equipment, home workshop or a larger than average home.) ☐

2 Enough circuits, properly fused, with outlets in work areas (in the kitchen and laundry) so that you can plug in all the appliances you want to operate at one time. (See chart below) ☐

3 Enough other outlets and switches in the circuits placed *where you need them!* ☐



Service Entrance

The Circuits You Need:

CIRCUIT	ROOMS	USE	NUMBER NEEDED	POWER SUPPLIED
General Purpose Circuits	Throughout the house.	Lighting outlets and convenience outlets except those in the kitchen, laundry, and dining areas. 120-volt.	One 15-ampere circuit for each 375 square feet (if wire size No. 14* is used), or — One 20-ampere circuit for each 500 square feet (if wire size No. 12 is used).	1,800 watts 2,400 watts
Small Appliance Circuits	In kitchen, laundry, dining areas.	Convenience outlets serving: 120-volt small appliances, such as a toaster, coffee maker, iron, mixer.	Two 2-wire 20-ampere circuits with ground wire (wire size No. 12).	2,400 watts
Special Purpose Circuits	In kitchen, laundry, utility room.	Major 120- or 240-volt equipment, such as an electric range, dishwasher, disposer, water heater, automatic washer, clothes dryer, furnace.	One 3-wire circuit for each piece of equipment. Depending on the appliance and circuit, the fuse rating can vary from 20 to over 50 amperes; the wire size can vary from No. 14 to No. 6.	Depends on the circuit.

**See pages 8 and 12 for definition of wire size.*

Look at the Amount of Power You Are Now Using . . .

How many of the appliances listed at the right are you using, or do you expect to be using, in the next few years?

The chart gives typical electrical power ratings. By checking it or the name plates on appliances connected to a circuit at one time, you can add up all the power you expect the circuit to deliver.

Remember that each circuit has a number of outlets. Check all of them so that you are certain to count all the appliances being used on the circuit.

Are you expecting too much from a 1930-era electrical supply, when the average American home today has *tripled* the number of appliances in use?

Label the Capacity Of Your Household Circuits . . .

Find out for yourself how much electricity is now being used in your home. An electrician or a person familiar with electricity can help you make a chart like the one shown below. Use the chart on page 13. Cut it out and fasten it to the inside of your service entrance.

Stand on a dry surface and use only one hand when working at the service entrance. Loosen one fuse or flip one circuit breaker at a time, and then check to see which rooms, parts of rooms or appliances are affected. If you are not sure as to which circuit certain outlets are on, plug in a small table lamp to check them. Write what you find out on the chart and post it at the service entrance.

Household Appliances and Equipment:

On General Purpose or Small Appliance Circuits

APPLIANCE	WATTS*	APPLIANCE	WATTS*
Baker (portable)	800 to 1,000	Knife Sharpener	103
Bottle Warmer	95	Lawn Mower	250
Broiler-Rotisserie	1,320 to 1,650	Mixer	100
Clock	1	Portable Heater	1,000
Coffee Maker or Percolator	440 to 1,000	Radio (each)	100
Corn Popper	150	Record-Changer	75
Deep Fat Fryer	1,350	Refrigerator	150
Egg Cooker	500	Refrigerator-Freezer	300
Electric Bed Cover	200	Sandwich Grill	660 to 800
Elecric Fan (portable)	100	Saucepan or Skillet	1,000
Electric Roaster	1,650	Sewing Machine	75
Food Blender	230 to 250	Shaver	12
Hair Dryer	235	Television	300
Hand Iron (steam or dry)	1,000	Toaster (modern automatic)	up to 1,150
Heating Pad	60	Vacuum Cleaner	125 to 750
Heated Tray	500	Ventilating Fan (built-in)	140
Hedge Clipper	225	Waffle Iron	up to 1,100
Ironer	1,650	Waxer-Polisher	350

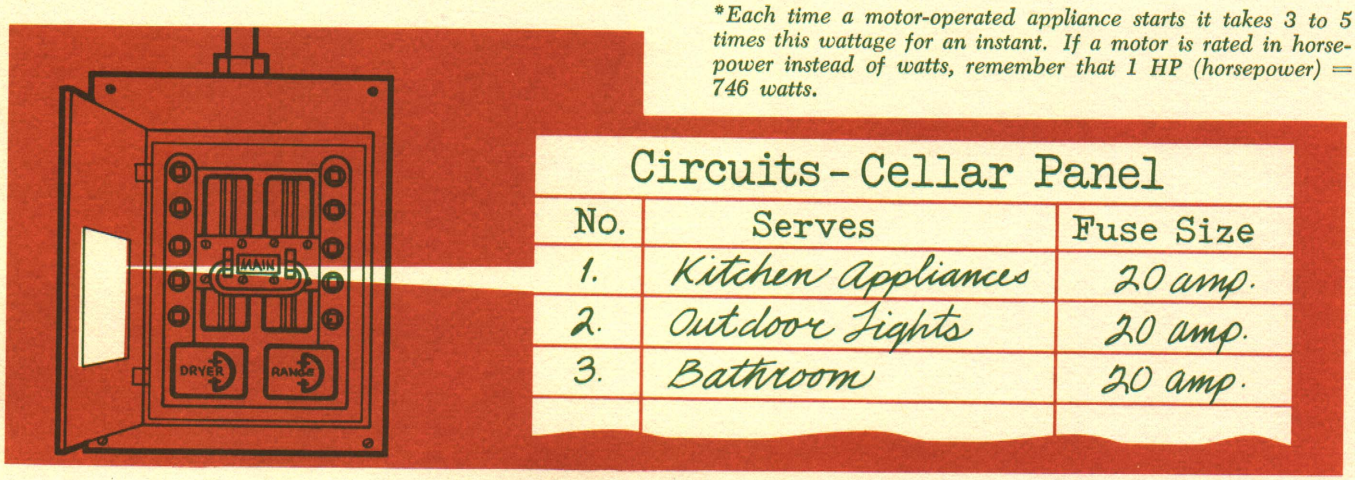
On Special Purpose Circuits, 240 Volts

EQUIPMENT	WATTS*	EQUIPMENT	WATTS*
Electric Clothes Dryer	4,500 to 9,000	Electric Water Heater	2,000 to 4,500
Electric Range	8,000 to 16,000	Room Air Conditoner (depending on horsepower)	1,350 to 3,120
Built-in Cook Top	4,800	Water Pump	700 to 1,500
Built-in Oven	4,800		

On Special Purpose Circuits, 120 Volts

Automatic Washer	700	Summer Cooling Fan	250 to 750
Built-in Bathroom Heater	1,000 to 1,500	Waste-disposer only, without Dishwasher	400
Dishwasher-Waste Disposer	1,500	Water Pump	700
Electrostatic Air Cleaner	60	Workshop or Bench	(Total wattage will vary)
Home Freezer	350		
Mechanism for Fuel-fired Heating Equipment	800		
Room Air Conditioner	750 to 1,420		

**Each time a motor-operated appliance starts it takes 3 to 5 times this wattage for an instant. If a motor is rated in horsepower instead of watts, remember that 1 HP (horsepower) = 746 watts.*



Circuits - Cellar Panel

No.	Serves	Fuse Size
1.	Kitchen Appliances	20 amp.
2.	Outdoor Lights	20 amp.
3.	Bathroom	20 amp.

Remove some appliances from any circuit that is overloaded when all the appliances connected to it are in operation at the same time. Decide which circuits can safely carry an additional electrical load and arrange to connect the appliances to those circuits. For example, plan to use the toaster in the dining room instead of on a kitchen circuit that is already carrying a full load.

Learn How to Change Fuses . . .

Who is usually at home when a fuse blows? You are! Therefore, you need to know how to change a fuse or reset a circuit breaker. Either one is an easy and completely safe task if you follow the rules.

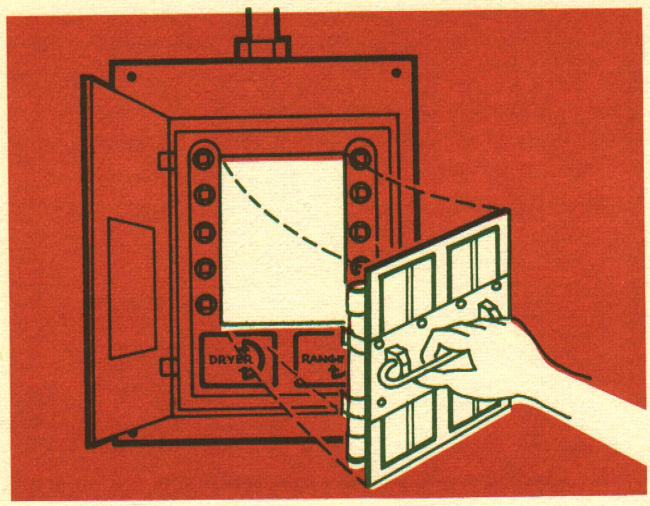
THE FUSE contains a metal link which melts and cuts off electricity from the branch circuit before the circuit wires become overheated from an overload or a short circuit. Electricity will remain "off" in that circuit until the cause of the difficulty has been removed, and the fuse replaced. The new fuse must be the correct size. A larger size eliminates the protection provided by the correct size, because it lets more current flow through the wire than the wire can safely carry. Fuses will blow when the circuit is overloaded. That is the signal that something is wrong. An oversized fuse may cause permanent damage to the circuit wires within the walls, ceilings and floors. Such damage can cause fire.

THE CIRCUIT BREAKER performs exactly the same function as the fuse, but in a slightly different way. When an overload or a short circuit occurs in the branch circuit, the circuit breaker automatically trips open. No electricity will flow over the circuit until you have reset the circuit breaker, after removing the cause of the difficulty.

A short circuit can develop in an appliance or cord and cause fuses to blow or circuit breakers to trip open. Therefore it is wise periodically to check over all portable lamps and other electrical equipment for possible defects in the equipment itself and for frayed or broken cords. Ideally, of course, the best treatment for blown fuses and tripped circuit breakers is preventive. In an adequately wired home, the occurrence will be very rare.

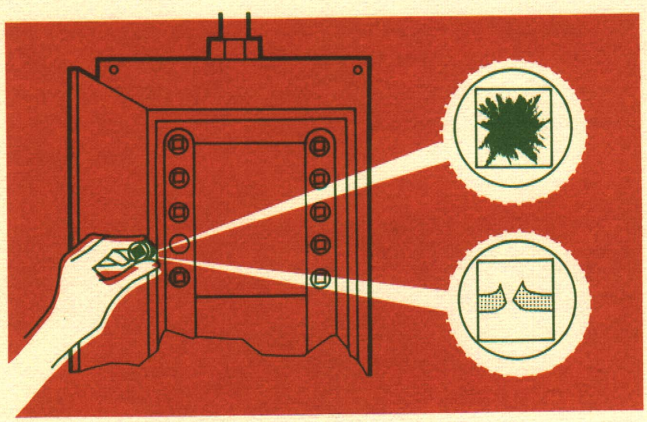
Changing a Fuse

1. Disconnect lamps and appliances that were in use when the fuse blew. (You can tell very easily if you have made the circuit chart as suggested on page 3.)
2. When you change a fuse, it is a good idea to pull the main switch if it is labeled and easy to reach and operate. This will turn off all the electricity in the house.



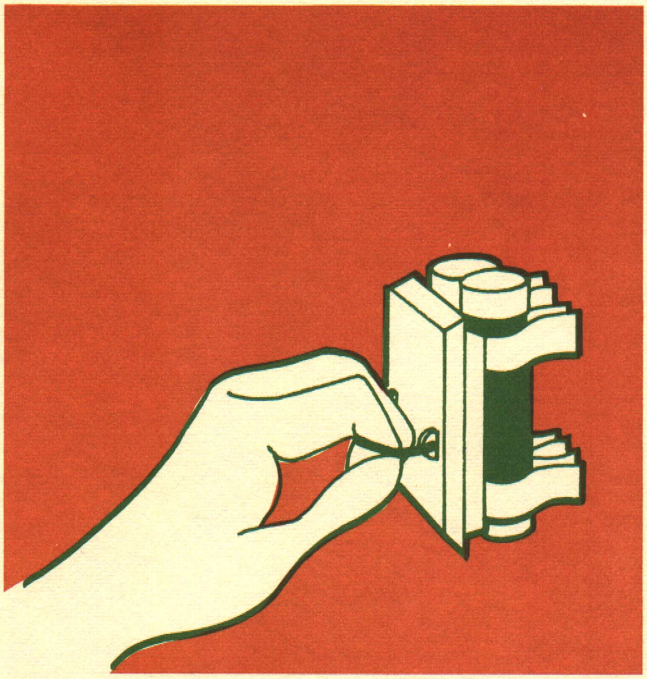
Main Disconnect

3. Find the blown fuse. When a fuse blows, the transparent window becomes cloudy or blackened. Unscrew the blown fuse.

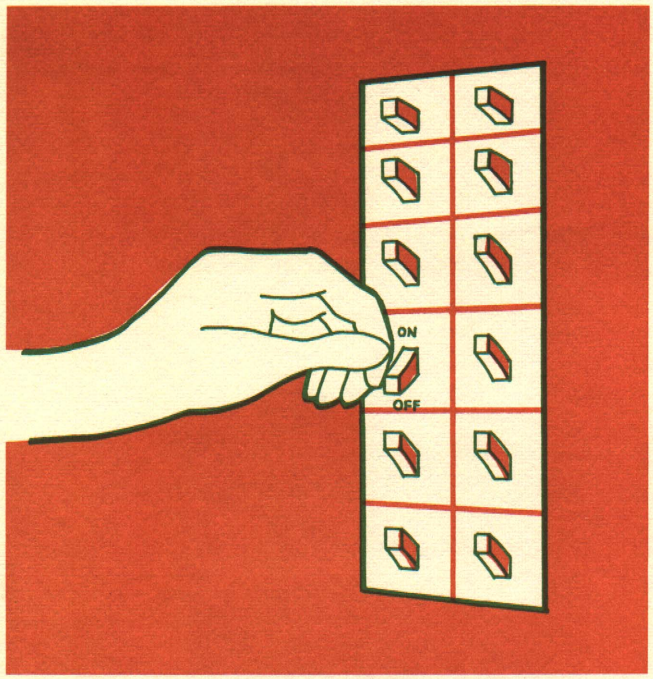


Blown Fuse

4. Replace the blown fuse with a new one of proper ampere size. Fuses screw in and out just like light bulbs. Circuits of 240 volts are usually protected with a cartridge-type fuse. This fuse is difficult to change. You can't tell by looking at it if it is blown



Cartridge Type Fuse



Resetting a Circuit Breaker

or not. Call your electric utility for help in changing it.

5. Close the main switch or replace pull-out section in the service entrance to restore electricity.
6. Throw away the blown fuse. Be sure you have extra good fuses handy.
7. Reconnect lamps and appliances.

Resetting a Circuit Breaker

1. Disconnect lamps and appliances in use when circuit went out.
2. Return circuit breaker handle to "on" position.
3. Reconnect lamps and appliances.

Teach Your Family Safe Habits

These facts about electricity plus the experience you gain by controlling and using it in day-to-day living help you get the best use from this important resource. If you place a high value on health, you will want your family to develop habits of safety when they work with electricity. Here are the problems you will want to watch.

A. Know the *safe* load to your circuits. (You wouldn't overload a clothes line!)

B. Replace incorrect size fuses with one of proper amperes.

C. Be sure the appliance is getting the current (amperage) and pressure (voltage) it requires.

D. Use electrical appliances away from the sink.

E. Ground appliances used outdoors where the operator might be in direct contact with the earth or concrete on earth.

F. Use appliances in good repair only.

G. Don't use appliances where heat will damage counters or wall finishes.

H. Do not allow motors to overheat. If palm of hand cannot be held on motor 10 seconds, it is too hot.

I. Turn current off when equipment is not in use to avoid overheating and unnecessary wear.

J. Keep cords and detachable thermostats in a cool dry place.

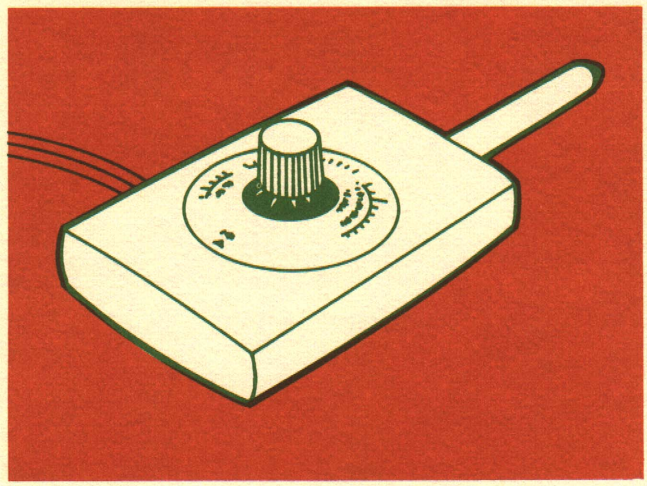
K. Remember that faulty cords and plugs cause short circuits.
- Don't bend or run cords under rugs, or allow knots in cords.
- grasp the plug, not the cord, when disconnecting.

L. Attach cord to equipment before connecting to convenience outlet, to prevent "sparking". Turn off your appliance before you plug it in.

M. Protect cords and equipment by disconnecting cord at the convenience outlet when not in use.

N. See that all connections between cord and plug and between cord and equipment fit tightly.

O. Keep contact points of plugs and probe controls bright and clean for perfect electrical contact.



Appliance Probe Control or Thermostat

P. Protect plug caps, equipment plugs, switches and thermostats from swinging against hard surfaces, being struck by heavy objects, or stepped on.

Q. Keep oil and grease away from cords.

R. Avoid use of extension cords by providing more convenience outlets if needed.

S. Use only heater cords (asbestos or special rubber) with heating appliances, and don't interchange them between appliances.

T. Use waterproof covered cords if they might possibly get wet.

U. *For safety,* prevent electric shock or burns by never touching open wires or sockets. Be sure hands are dry when handling connected equipment. Don't use forks or metal objects to remove toast from the toaster.

V. Don't immerse thermostats in water.

W. Use detachable thermostats only in appliances of like brand.

Plan for Improvements

It is important to know how to plan for more electrical wiring for future home activities that will need power. The following suggestions are based upon recommendations of specialists in the electrical field.

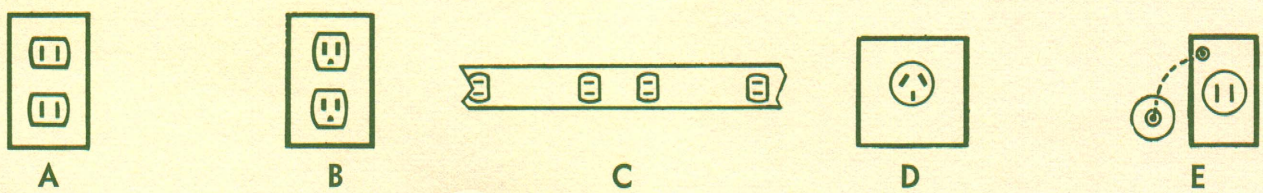
Convenience Outlets

1. In living rooms, dining rooms, and bedrooms, and in family rooms or recreation areas, duplex outlets should be placed so that any point along the floor line of an unbroken wall is within six feet of an outlet. Additional outlets should be provided in any smaller but usable wall space, two feet or more in length.
2. In a breakfast nook or at snack counter, outlets should be located at table or counter level.
3. In kitchen work areas there should be outlets for each 4 feet of work surface, about 44 inches above floor. The kitchen also needs an outlet to serve the refrigerator.
4. In the laundry area, there should be at least one convenience outlet.
5. Basement and utility rooms require an outlet near the furnace and at least one near the work-bench location.
6. Bathrooms should have an outlet adjacent to the mirror.
7. Hallways require one or more outlets depending on length.
8. If electrical equipment will be used on a porch or terrace, an outlet should be placed there every 15 feet. There should be one at the front entrance.
9. In the attic, one outlet is needed for general use.

Convenience and pleasing appearance are two key factors in locating electric outlets in the home. However, each household has its own requirements. If you iron while watching television, or sew in a kitchen corner, you will want to remember these work habits when having outlets placed. The modern wiring plan should provide outlets for permanent lighting as well as convenience outlets for portable lamps and appliances.

Outlets for Special Locations and Equipment

1. In the kitchen, the electric range or the built-in oven and surface cooking top each requires a special purpose outlet, as do built-in ventilating equipment, the dishwasher and food waste disposer, the electric wall clock and freezer (separate from refrigerator).
2. Laundry areas need special purpose outlets – one each for the automatic washer, the electric clothes dryer, a ventilating fan, and an electric water heater if it is located there.
3. In living areas and bedrooms, special purpose outlets are needed for room air conditioners and for electric heating equipment.
4. Attics should have a special purpose outlet if a summer cooling fan is located there. Such fans should be switch-controlled from some other location in the house for ease of operation.
5. Out of doors install a weatherproof outlet with a cap to keep out moisture, dirt and insects.
6. Some equipment must be connected to a *grounded outlet* through which the metal part of an appliance can be grounded for increased safety. To take advantage of this feature, such appliances (ranges, dishwashers, washers, power tools) should be equipped with three-prong plugs. It is necessary that a ground connection exist *between the outlet and the service entrance.* An electrician can best judge for you if the circuit is truly grounded.



A – duplex outlet; B – grounded outlet; C – strip outlet; D – grounded outlet for major appliance such as a clothes dryer; E –waterproof outlet

Placement of Switches

1. Locate switches so that you can light your path ahead as you move through the house. General lighting in each room, each hall or other passage-way should be controlled from every entrance-way to that area, if entrances are 10 feet or more apart.

2. Stairway lighting should be controlled from switches placed at both the bottom and top of the stairs. These are called 3-way switches.

3. Outdoor lights should be controlled from inside.

4. Garage lights should be controlled from both house and garage.

5. Door or wall switches are preferable for closet lights.

6. In some rooms, it is desirable to have one opening in some convenience outlets controlled by a wall switch. For example, you might want to be able to turn on a night lamp in the children's room from the door.

7. A light may be controlled from several switches on a low voltage circuit. This method may be less expensive or easier to install than regular wiring in some homes.

A Wiring Layout for a Home

The guides for outlets and switches, plus thoughtful analysis of activities in your own home, should help you locate or re-locate outlets and switches where they are most needed. You might indicate them on a floor plan of the room or house being remodeled or constructed. See the drawing on page 9 for some "shorthand" symbols you could use on the plan. Most architects and electrical contractors use these symbols or variations of them.

Wiring Materials and Their Uses

There is a wide selection of wire and wiring materials available. Generally the selection should be left up to the electrician; however, some knowledge of the various types of wires and materials might prove helpful to you.

Wire size is marked in gauge numbers with the size of wire increasing as the gauge number goes down. For example, No. 12 wire will carry more current than a No. 14. A No. 8 wire carries more current than a No. 12.

The first number in a sequence indicates the number of wires in a cord or cable; the next number indicates the wire size; and the third group of letters or word indicates the make-up of the particular wire. For example, 2-wire 14 Romex, indicates that this is a cable with 2 wires, each wire being Number 14 in size, and the cable is covered with fabric covering called Romex.

The type of covering on a cable depends upon the use and location of the cable. A cable located inside the home where it is dry and is not subject to mechanical injury, generally would have a fabric covering, commonly called Romex. (*Romex* is a trade name, however, of a particular manufacturer.) Cables are also available with plastic coverings for use in wet areas or underground with weatherproof coverings and other coverings not generally used in the home.

The number of wires in a cable depend upon its use. In home wiring, the most commonly used cable is made up of two wires or two wires with ground. A ground is a bare copper wire that is a third wire in a cable. It is used for connecting all of the convenience outlets or a fixture base to ground through a continuous wire. It is essential that this type of cable be used where appliances with the grounding connector are used in the circuit.

Occasionally a 3-wire cable is used in home wiring for the purpose of the convenience of the electrician. This is three individually covered wires each of which make up a part of a circuit. It is a different cable than the 2-wire with ground that is also used in certain areas of the home.

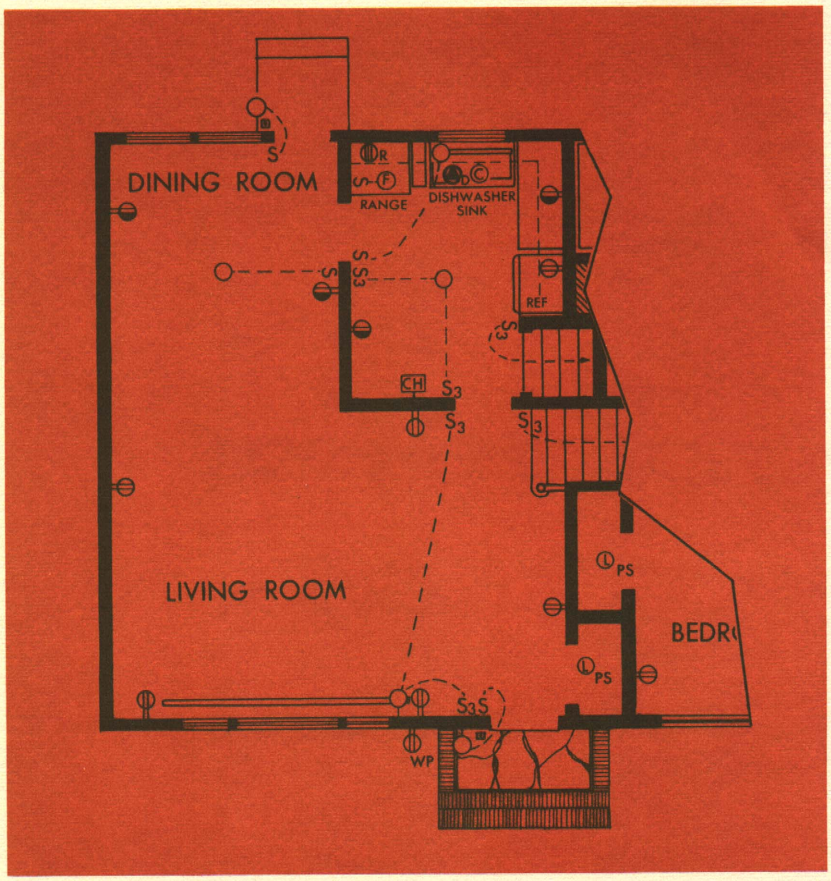
Wiring materials which include the convenience outlets, metal and plastic wall boxes or receptacles, switches, duplex outlets, connectors and other items are available in almost every store.

1. **Wall boxes** (receptacles)—plastic and metal boxes are available. Some are for flush mounting which means the box is recessed into the wall and the cover of the box will be flush with the wall surface. Some are for recessed mounting and some are surface mounting. There are several shapes and sizes of these items depending to some extent upon the use and upon how many wires will be pulled into or through this box.

2. **Large switch boxes** or boxes for entrance services also vary in size and use. It is best to get the assistance of someone who is quite familiar with electrical wiring to help in this selection. These range from 15 to 20 amp switch boxes used for individual circuits up to 200-amp entrance boxes used in homes with many circuits and appliances.

3. **Plugs and connectors**—there is a wide variation of plugs and connectors. The better plugs and connectors are of sturdy construction and provide for some method of anchoring the wire to the plug or connector in addition to the point of electrical

(Continued on page 10)



Partial Wiring Layout

SYMBOLS USED IN WIRING PLANS

This is a partial list of symbols used in wiring plans. They are the same ones that are used in the floor plan above. These symbols have been extracted or adopted from American Standards Association Standard ASA Z32.9-1943.

General Outlets

Lighting Outlet

Continuous Wireway for Fluorescent Lighting on ceiling, in coves, cornices, etc. (Extend rectangle to show length of installation.)

Lighting Outlet with Lamp Holder and Pull Switch

Fan Outlet

Clock Outlet

To indicate wall installation of above outlets, place circle near wall and connect with line as shown for clock outlet.

Convenience Outlets

Duplex Convenience Outlet

Duplex Convenience Outlet – Split Wired

Weatherproof Convenience Outlet

Combination Switch and Convenience Outlet

Combination Radio and Convenience Outlet

Range Outlet

Special-Purpose Outlet. Use subscript letters to indicate function. DW-Dishwasher, CD-Clothes Dryer, etc.

Switch Outlets

Single-Pole Switch

Three-Way Switch

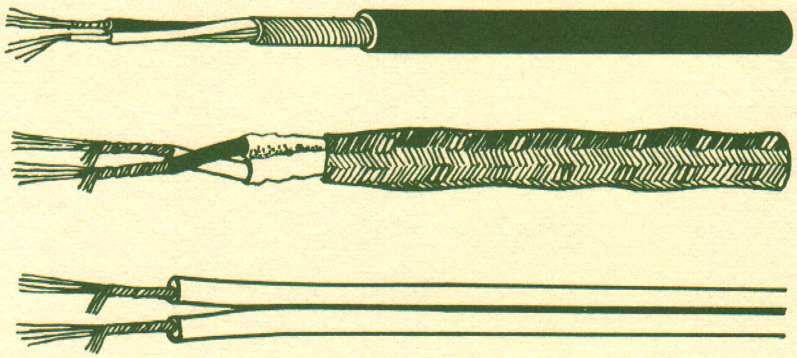
Chime

Connects outlets with control points.

connection where the wire is fastened with a screw. A good plug also provides some type of covering or insulating material that will prevent contact of fingers with the wire that connects to the plug prongs.

4. **Many clip-on plugs are available.** These are designed only for use on lamp cords or other very light appliances which pull less than 250 or 300 watts. If used for this purpose, they are quite satisfactory.

5. **Cords** come with several kinds of covering depending on their use and are usually No. 16 or No. 18 stranded wire. A rubber or silk covered cord of No. 18 wire is used for connecting lamps. Cords for connecting appliances may have a heavy rubber cover, or an asbestos covering. Rubber covering can be selected to be oil resistant, water resistant, or have other features as required. Cords for heating appliances should be made of No. 16 or No. 14 wire with asbestos insulation.



Know the Language of Electricity

You will find here definitions of electrical terms used in the bulletin. You should know them, for you work with them almost every day.

Electric Service Entrance – Wires and equipment through which the electrical power enters the home.

Volt – Unit of measure of electrical pressure. House circuits are rated at 120 and 240 volts.

Ampere (Amp.) – Unit of measure of the rate of flow of electrical current. Fuses and appliances may be rated in amperes.

Watt – Unit of measure of electrical power, or rate of doing work. Volts × Amps. = Watts. A kilowatt (KW) is 1,000 watts. A thousand watts used for one hour is "one kilowatt hour." Electricity is sold by the kilowatt hour, abbreviated KWH on electric bills.

Branch Circuit – Path through which electricity travels from the electrical service entrance to one or more outlets to which appliances, lights and equipment are connected.

(A) **General Purpose Circuit** – That part of house wiring system extending from electric service entrance to outlets and lights throughout the house except in the kitchen, laundry and dining areas where they supply lights only.

(B) **Small Appliance Circuits** – Circuits which provide power for outlets only (no lights) in kitchen, laundry and dining areas.

(C) **Special Purpose Circuit** – Circuit installed to supply a single appliance.

(D) **Low Voltage Circuit** – Special circuit used to provide several locations for switching a special outlet such as a front doorbell, basement or attic light. A special transformer reduces the regular circuit voltage to permit the use of lower cost wire and switches in a low voltage circuit.

Overload – Too much electricity – more than a circuit or appliance is built to safely carry.

Short Circuit – Bare wires in a cord come into contact with each other so that current does not flow through appliance but literally takes the short path, building up excessive heat, causing sparks and a blown fuse.

Fuse – The "safety valve" of an electrical system – protective device made of wire or metal strip in a special container. It is set in a circuit (in the service entrance box) to protect conductor wires or appliances from excessive currents. When a circuit is overloaded the fuse melts or blows and so cuts off current.

Circuit Breaker – Safety device used in place of fuse to protect conductor wires or appliances from excessive current. A thermostatic device that automatically trips and so cuts off the current in case of overloaded.

Ground – Electrical connection to moist earth. Grounding appliance circuits or exposed metallic boxes protects a human being from electrical shock that can result from damage to equipment or wiring.

Outlet – The point on the circuit at which current is taken to supply lights or appliances. A **duplex outlet** is a double outlet.

(A) **Convenience Outlet** – Device into which portable lamps and appliances can be plugged.

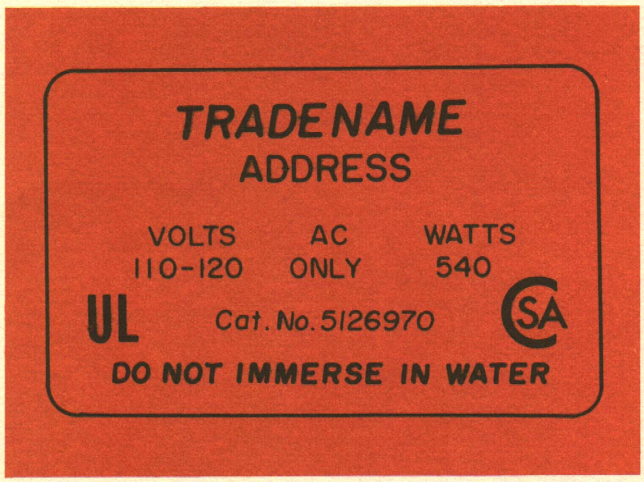
(B) **Grounding-Type Outlet** – A convenience outlet with a third opening through which metal parts of appliances can be grounded for increased safety (especially for kitchen, laundry, work bench, etc.). The wiring system must have a ground to the service entrance which is also grounded to the earth.

(C) **Lighting Outlet** – For permanently installed light fixtures.

(D) **Multi-Outlet Assembly** – Combination of circuit wires, outlets and protective cover in a strip to be mounted on the surface or in a wall or counter.

(E) **Weatherproof Outlet** – A convenience outlet with a weatherproof cover and grounding connection, for out of doors.

Appliance Name Plate – Essential information stamped on the appliance, such as voltage, power rating in watts, sometimes amperage, UL label if approved; special cautions such as "Do not immerse in water."



Conductors and Insulators – Materials are called electrical conductors if they are able to conduct or carry electrical current; they are called insulators if they oppose or insulate against the flow of electricity. Aluminum, copper, water, the human body are conductors; glass, ceramics, plastic, rubber and cotton are common insulators.

Wire Size – The size of wire used in electrical conductors depends on the amount of current the wire needs to carry. Wire size is marked in gauge numbers – the higher the number the smaller the size. Gauge numbers most common in home wiring are 14, 12, and 10 for general purpose and appliance circuits, 6 for electric range circuits, 2 for service entrance wires. Gauges 16 and 18 are used in flexible cords for portable lamps, 14 for small heating appliances.

UL – Underwriters' Laboratories Seal of Approval – Indicates that the electrical appliance, cord, plug, etc. on which the label appears has passed certain tests for safety against fire and shock hazard. Buy only equipment with this label.

Where to Get Extra Help

Reliable local electrician, electrical contractor.

Farm service representative or home service advisor of your electrical utility.

National Wiring Bureau, 155 East 44th Street, New York 17, N.Y.

Books

Household Equipment Principles by Helen J. Van Zante. Prentice-Hall Inc., 1964.

Household Equipment by Louise Jenison Peet and Lenore Sater Thye. John Wiley and Sons, 1961.

Bulletins You Can Write For:

Bright Ideas for Ladies or What to Teach Husbands About Electric Wiring, Armored Cable Section, National Electrical Manufacturers Association, 155 East 44th Street, New York 17, N.Y.

Residential Wiring Handbook, A Guide to Electrical Planning for New and Modernized Homes; and *Farmstead Wiring Handbook, A Guide to Wiring and Lighting Farm Buildings and Outdoor Circuits,* Industry Committee on Interior Wiring Design, Room 2650, 420 Lexington Avenue, New York 17, New York.

National Electric Code, National Fire Protection Association, 60 Battery March Street, Boston 10, Massachusetts.

See Your Home in a New Light, General Electric Co., Nela Park, Cleveland, Ohio.

Household Circuit Chart*

Description of Circuits				Circuit Location and Use		
Circuit	*Volts*	*Correct Fuse Size (amps)*	*Power Capacity† (watts)*	*Rooms Served*	*Appliances and Lighting Served*	*Total Watts In Use§*
No. 1						
No. 2						
No. 3						
No. 4						
No. 5						
No. 6						
No. 7						
No. 8						
No. 9						
No. 10						
No. 11						
No. 12						

**This chart is adapted from* Some Things to Know About Electricity, *published by Ohio State University, Columbus, Ohio.*

†To find the power capacity of a circuit, multiply the voltage x the ampere rating of the fuse. For example: a 120-volt circuit protected by a 15-ampere fuse has a power capacity of 1,800 watts.

§This total should never be higher than the power capacity shown in column No. 4.