

Raker

Appliance Repair Professionals, Inc.

Automatic Dryers

Manual 4

Harry D. Raker

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Automatic Dryers

Automatic dryers will be covered in two lessons. The same method will be used that we followed on automatic washers. First we will cover the general operation. Second we will go over the individual systems involved, including:

1. General Theory
2. Belt and Drive Systems
3. The Air Flow System
4. Understanding Thermostats and Controls Systems
5. Automatic Cut-off Systems
6. Gas Heating Systems
7. Electric Heating Systems
8. Spots and Staining on Clothes

In the next lesson, Lesson 4, we will go into all the specific problems on each particular brand.

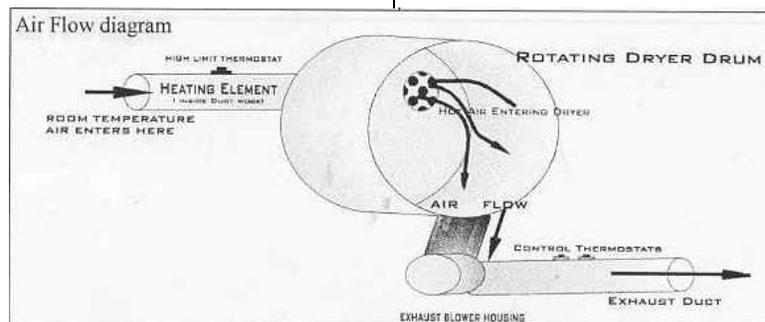
1. General Theory

A dryer is a sealed drum in which hot air flows across tumbling clothes.

The hot air is blown out of the dryer through a 4" vent. In nearly all cases, the fan that blows the hot air, moist air out of the dryer, also creates a vacuum that sucks air across the clothes. The air that enters the dryer comes across the heating element and gets heated up to about 140 °F. Looking at the air flow diagram, you can see the air path. Room temperature air crossing the heating element, reaches 140-150°F. and flows into the drum, through the tumbling clothes, out the drum exhaust, across the fan blade, and out of the dryer into the vent.

All dryers have a drive motor that tumbles the basket through a belt system and a fan and blower housing to create the air flow. The heat is controlled by a system of thermostats. The hot air source is either an electric heating element or a gas flame.

**Fig041_01
Air Flow Diagram**



Gas dryers are heated by gas (what else) and the motor is powered by 110 VAC. A 30 amp 220 VAC circuit powers electric dryers. The 30-amp circuit is necessary to supply enough power for the heating element. An electric dryer generally draws 20-22 amperes on a 30-amp circuit. Overall dryers are simpler to repair than washers and tend to last twice as long.

Fig041_02
Belt Around the Drum Design

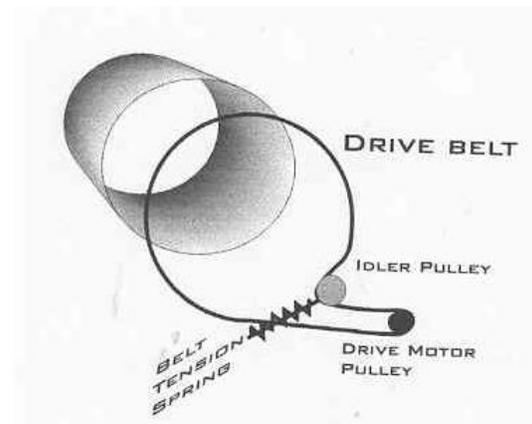


Typically, the fan is mounted on one end of the drive motor and the belt drive pulley is mounted on the other end.

The airflow in all of the current dryers follows the same pattern. The fan creates a vacuum, sucks air through the system and blows it out the vent.

1. It gets sucked past the heating system and gets hot.
2. It passes through the basket and heats up the clothes driving off the moisture.
3. It is sucked through the lint filter out of the basket into the exhaust duct leading to the blower
4. Through the fan and out into the exhaust vent (now under pressure not in

Fig041_03
Typical Belt Pattern



a vacuum). The control thermostats are mounted near the blower.

A dryer is not a very complex device. Regardless of brand the repairs fall into the following groups:

1. *My dryer won't turn.*
2. *My dryer won't get hot.*
3. *My dryer takes too long to dry.*
4. *My dryer makes a lot of noise.*
5. *My dryer won't start.*

Once you develop a complete understanding of how a dryer operates, it is easy to see how all these complaints come about. Items #4 and #5 vary with brand and will be covered in Lesson 4. Let's start on an easy one first:

Fig041_04
New Whirlpool Tension and Drive System



2. Belt and Drive Systems

The motor and belt system are pretty simple. All of today's dryers use the clothesbasket as a drive pulley. The belt threads around the motor and the basket, a spring tensioning device keeps it tight. On most current dryers, a belt that completely encircles it drives the basket. It's about 100" long and runs around the motor drive pulley. It then circles the whole entire clothesbasket and uses the drum itself as a second pulley. The belts wear out and break frequently. They get noisy, crack and shred.

The belt is tensioned by an idler system, another small pulley close to the motor. The idler pulleys also wear out, get noisy, and cause belts to fail.

In most cases, one end of the motor drives the blower; and the other end drives a small multi-grooved drive pulley. This small pulley drives the belt around the drum.

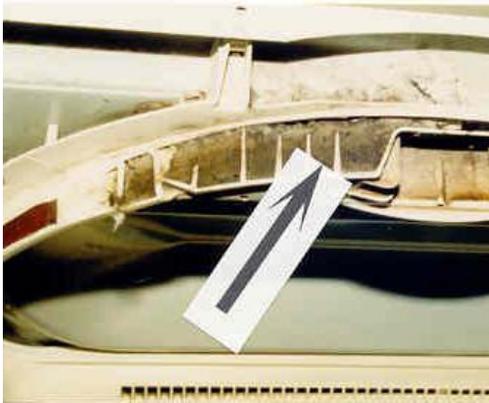
The basket is rotated at a slow speed (around 45 RPM) so that the clothes can fall through the hot air. Felts support the front of the basket or nylon skids and the back is supported by small rollers that look like little rubber tires.

Both the front and rear supports wear out and cause the drum to make noise as it turns. It rumbles and drops down if the wear is excessive. Sometimes it gets so far out of position that clothes pinch in the gaps that form between the rotating drum and the back panel of the dryer. Worn drum supports break the air seals and cause airflow problems.

Fig041_05
A Whirlpool Drum Showing Rear Felt and Belt



**GE Worn Front Support
Fig041_06**



Most drum support and belt and idler problems are obvious upon visual inspection. Details on each brand will come later.

Overheating Drive Motors

Occasionally a dryer will run one load and won't run the second or it may quit after two or three cycles. Dryer motors have high-temperature safety thermostats embedded within the motor. The safety will shut the dryer down if the motor gets too hot. The dryer often re-starts after sitting for a few hours.

Uncle Harry's
Trick of the Trade # 51

Don't try to vacuum an overheating motor. It cannot be effectively cleaned. It is a waste of time; the motor must be replaced. Trust your *Uncle Harry*.

Often an overheating motor can be diagnosed over the phone. It is bad for business to charge a service charge for such an easy diagnosis. Handling this one over the phone, it will result in more business.

3. The Air Flow System

Problems with dryer heating systems require a full understanding of the air flow and heat controls. Let's go through the air system section by section and discuss the different components.

By far the most common dryer complaint is

“My dryer takes too long to dry”

Many different flaws in the duct system result in this complaint. Be careful, there's a big difference between "no heat" and a "small amount" of heat. Some heat is far more common than no heat at all.

Uncle Harry's

Trick of the Trade # 52

Always run a dryer yourself and test for heat, before proceeding with any other tests.

Small Amount of Heat

Some heat but not enough for efficient drying indicates a particular set of failures. To achieve proper drying time the entire dust work must be intact and unclogged.

The Low Pressure Side (Before the Blower)

Consider the sections preceding the blower: Any break in the seals will allow cold air to mix in with the hot air and dilute the temperature of the air hitting the clothes. This will cause long drying time.

Also there will be less air flowing across the heating system. The heating system will act like a fireplace with the damper closed. Heat will go everywhere but the right place. The heater will be shut down by the high temperature limit mounted on the heater box.

The typical weak spots in vacuum section of the air system are;

1. The felt seals that ride between the turning drum and the stationary front and back of the dryer.
2. The felts between the heating system and the dryer inlet (Maytag, for instance).
3. A broken door catch not keeping the door tightly closed.

A hole in that inlet system is much like having the door buckled. Instead of the air being drawn across the heat source, the air gets sucked in around the door.

Fig041_07
Maytag Dryer Drum (Showing Hot Air Inlet and Lint Filter)



The High Pressure Side (After the Blower)

After the air crosses the blower it passes the various thermostats and exits the dryer. A 4" vent carries the hot moist air to the outside of the house.

Uncle Harry's
Trick of the Trade # 53

If you find water pockets in the vent or duct system the vent is surely plugged up. Some time you even see moisture forming around the door seals. The wet air can't get out and deposits water everywhere.

A clogged vent on a dryer is the most popular situation of all. Customers often don't want to believe it. To convince them, disconnect the vent from the back of the dryer and if necessary, let them run one load with it off. See if the drying drops down to a normal 40-50 minutes for a load of towels.

Fig041_08
Vent Clogged by a Bird Nest



If the complaint is long drying time, advise a customer during the initial call. Ask them to check the vent system. A skilled mechanic doesn't really want to be too involved in taking down venting. Small jobs, yes, but often the task is more involved. Frequently, vents are

built into a wall or finished ceilings and are virtually inaccessible.

Fig041_09
Badly Worn Whirlpool Support
Roller



The best alternative is to recommend a chimney sweep. They are equipped with special brushes, vacuums and air pressure systems that can unclog the vent for the homeowner. Prices vary from \$75.00-\$150.00. I'm certainly not against taking down 6 or 10 ft. of accessible vent to accommodate the customer. However, if it looks like a tough job, back away from it. More profitable jobs are always waiting.

Uncle Harry's
Trick of the Trade # 54

Early in your new career, disconnect the vent from the back of a few dryers. Feel the airflow and the temperature. The flow is fairly powerful and the temperature is definitely uncomfortable. Compare the airflow at the back of the dryer to that at the outside of the house. They should be the same. Insert a thermometer and watch the reading. It should vary between 125°F and 150°F as the heating system turns on and off.

Feeling a trickle of heat coming out of the outside vent misleads many customers. They think that there's nothing wrong with the vent system. It's our job to know better. Birds, squirrels and mice all build nests in the last two feet of dryer vent systems. Dogs, lawnmowers and kids bash and block the flapper on the outlet. It should easily flip open with the force of the exhaust air. I've even seen dryer vents buried in snow or even in deep, wet leaves in the fall.

Some customers use old silk or nylon stocking to catch the lint and keep the heat inside the house in the wintertime. They must be careful and change it frequently. A significant amount of lint comes past the lint catcher and out of the dryer. It quickly clogs an old stocking.

Some brands of dryers are more sensitive to partial clogging than others. GE, for instance, is very sensitive to a mere 25% or 35% obstruction. It will work fine if it's cleaned out thoroughly.

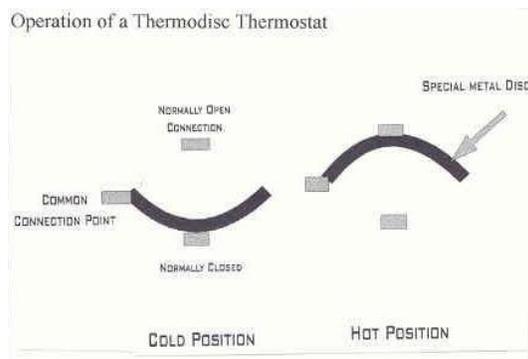
Uncle Harry's
Trick of the Trade # 55

A human hand starts sending pain messages at about 125°F. 140°F is definitely unpleasant and will cause you to jerk your hand away. The hand makes for a good thermometer.

4. Understanding Thermostats and Control Systems

Thermostats (often called thermo-discs) are scattered throughout the air system for maintaining safe temperature control. All thermostats in today's dryers operate on the same principle. Inside each thermostat is a disc of special bi-metal. The disc has a bulge to it. When it gets hot the disc pops like the lid of an oilcan. Once it cools down, it pops back to its old position.

Fig041_10c
High Temperature Safety and Thermodisc



The discs are carefully designed to provide exact temperature control. By placing the thermostat in different parts of the duct system, various temperatures are controlled.

A high temperature safety, for instance, is mounted on the top of the hot air tube where the heating element is located. If the airflow is blocked, the temperature will build up in the heating element. In a short time the high temperature safety will shut off the heat. Safety thermostats operate from 225°F -300°F.

Thermostats that control the temperature of the clothes are placed on the outlet of the clothesbasket. These thermostats (frequently there is more than one) operate at 120°F -155°F. Old dryers, built prior to permanent press fabrics, operated about 10°F higher than today's.

Fig041_10b
High Temperature Safety and Thermal Fuse Mounted on Heater Box

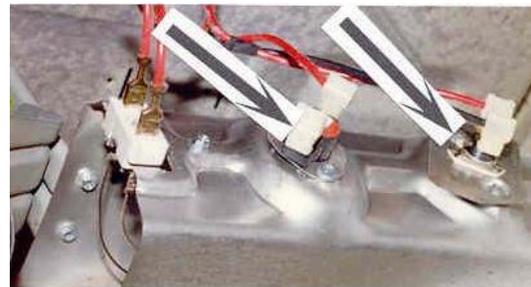


Fig041_11

Bias Control Thermostat and Thermal Fuse Mounted Next to the Blower (Whirlpool)



Most dryers have several choices of drying temperatures. This is accomplished in two ways.

1. Multiple thermostats.

Historically, a second or even a third temperature has been achieved by switching to different thermostats. A dryer may have a 130°F and a 140°F thermostat mounted side-by-side. The temperature selector switch chooses either one. Of course the “air only” selection disconnects the heating system.

2. A bias thermostat

In recent years a new, cheaper system has gained popularity. A tiny heater is built within the standard thermostat. The amount of heat is controlled by the temperature selection control. This second heat source fools the disc. With a greater “bias heat”, a lower air temperature will snap the bi-metal disc. A bias thermostat provides greater variation of temperature control. Naturally, this is a selling feature.

Monitoring Vent Temperatures

Watching the reading of a thermometer in a dryer vent is confusing. The temperature varies a great deal more than you would expect.

It is normal for the air temperature to vary 30°F, the average is what is important. The heating system will cycle on for several minutes and then off for several minutes. At the beginning of a load, it will stay on much longer until the clothes reach the set temperature.

Fig041_12
A Sample of Available Thermostats & Dryer Outlet Air Temperature

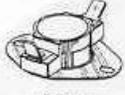
A Sample of Available Thermostats

Dryer Thermostats

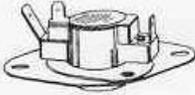
General Purpose "L" and "LD" Series

A multi-purpose series of popular Single Pole Thermostats with temperature ratings used in home laundry and dryer applications. This series may also be used for fan limit when applicable.

All "L" and "LD" Series Thermostats are supplied with contacts in the closed position. Contacts will open when temperature reaches heat rating indicated on thermostat. Contacts will close when differential temperature is reached.



"L" Series



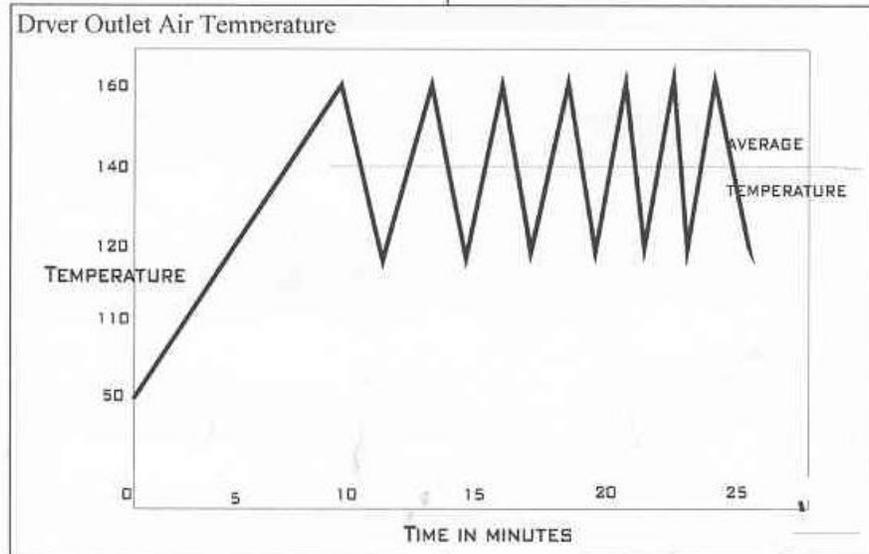
"LD" Series

"L" Series
Single Pole — Single Throw

ORDER NO		
L120	L165	L240
L125	L170	L250
L130	L175	L260
L135	L180	L270
L140	L190	L290
L145	L200	L300
L150	L205	L320
L155	L225	L340

"LD" Series
Single Pole — Double Throw

ORDER NO	
LD110	LD170
LD120	LD200
LD130	LD225
LD135	LD240
LD140	LD270
LD145	LD290
LD155	



Thermal Fuses

Many of today's dryer incorporate a second safety system in addition to high limit thermostats. Often thermal fuses are installed either on the heater box or next to the control thermostats. The thermal fuse is wired in the motor circuit. If the dryer overheats, the fuse will melt and completely shut it down. A clogged vent can cause the fuse to melt. Unlike a high limit thermostats the fuse will not reset and must be replaced.

5. Automatic Cut-off Systems

Many dryers have an automatic dry selection on the dial. Automatic cutoff systems are designed in two different ways:

1. Temperature monitoring systems
2. Moisture sensing systems

1. Temperature Systems

The most popular and reliable system uses temperature to cut off the dryer at the end of the cycle. This design utilizes the fact that the heat is on more at the beginning and less at the end of the cycle. The operating thermostat is wired in series with the dryer timer motor.

When the dryer is first turned on, the thermostat is cold. It breaks the circuit to the dryer timer motor, so that it will not advance. The timer remains in a stalled position until the thermostat turns off the heat. **The timer only moves when the heat is off.**

In the early stages of drying a full wet load, the heating system can only bring the dryer up to about 110°F. Even though the heating system is on full blast, the control thermostat will not be satisfied. Normally it will stall for 8 to 10 minutes until the thermostat finally reaches its set point.

On reaching the 145 °F. temperature, the thermostat closes and the timer motor begins to run. This condition will only exist for a few minutes until the thermostat senses that the air temperature has dropped. It will quickly open the circuit to the timer motor and close the circuit to the heating system. This cycle repeats until the clothes are dry.

In the meantime, the timer is advancing in short spurts, whenever the heating system is off. As the clothes begin to dry, the heating system is off for greater periods of time and the timer is on. Toward the end of the cycle, the cool down period begins. For the last 10-15 minutes, only cool air hits the clothes

Uncle Harry's
Trick of the Trade # 56

The customer complains,

“My dryer won't shut off on the automatic cycle.”

The problem is a clogged vent, not a bad timer.

If a dryer vent is partially plugged, the hot moist air will back up into the drum and the heating system will stay on almost 100% of the time. Consequently, the timer motor won't move, and the timer will act like it's broken.

Uncle Harry's
Trick of the Trade # 57

It's easy to separate a timer motor failure from a heating system failure. Simply switch the cycle selection over to time dry. Set it exactly on one particular setting, and watch for 2 or 3 minutes. See if it moves. If it does, you know that the timer is fine. The problem is in the heating system.

A clogged lint filter will cause similar problems, long drying time with a small amount of heat. A broken door catch on the dryer door is another example. The clothes banging against the door pop it open enough to allow cold air to mix with the hot.

In review, you can see that it is essential that the air system be sealed on the low-pressure side before the blower. It is just as important that it be open on the higher pressure side downstream from the blower.

Fig041_13
A Pocket Thermometer



A pocket thermometer held in the open vent of the dryer should cycle at around 140 °F. It should gradually climb up to as high as 160°F or 165°F then drop down to 125°F or so before the heat comes back on. On a gas dryer, you'll hear the gas valve turn on. On an electric dryer, you'll either hear the thermostat click or feel the heat change in the air vent.. The difference between low, medium, and high is a range from 135°F -150°F.

Permanent Press

No heat, air fluff, cool down, all mean the same thing. It's a dryer tumbling with the heating system turned off. Let's talk about permanent press and the cool down cycle. The operating temperatures of dryers have dropped in the last 10-15 years. This is in response to the types of clothes that are now being dried. Permanent press fabrics have resins imbedded in the fabrics that minimize wrinkling. However, they will wrinkle just as much as any other clothes if they're submitted to what is known as "temperature shocking".

Turn a dryer off before the cool down period and let the clothes cool on their own. They will be wrinkled beyond belief. However, if they come out of the dryer close to room temperature, they won't have but a few wrinkles. The clothes gradually cool down with the heating system off, and come out cool.

A customer can accomplish the same thing by taking hot clothes out of the dryer in mid-cycle, and hanging them on a hanger. Of course ironing is another alternative.

Faulty Thermostat

If the dryer control thermostat fails, and leaves the heat on continuously, the dryer air will go up to about 180°F. At that point the safety thermostat kicks in to shut down the heating system. Such a high temperature can result in scorched or shrunken clothes. Diagnosis is easy with the pocket thermometer stuck in the vent. Don't be misled by wide fluctuations on the outlet temperature. Just mentally calculate the average.

Vent Limitations

Manufacturers design the drying system to be able to accommodate 2 or 3 bends in a maximum of 15 feet of venting. Anything beyond that begins to decrease the efficiency of the dryer. A 30 or 40 ft. vent with 2 bends is guaranteed to clog up after 4 or 5 years. The dryer just does not have enough air flow to blow the lint all the way out the far end and it will settle throughout the system. The lint settles like silt in a stream.

Timer dials

It's important that you understand the timer settings on the dryer better than

your customer. Often drying problems are a result of customer ignorance. The automatic dry systems usually have a star or an asterisk somewhere on the automatic cycle dial. This is a suggested starting point for most loads of clothes. Setting the timer closer to "off" will shorten the time and will be satisfactory for a lighter load. Setting it further into the cycle is necessary for a heavier load. An average drying time is 20-30 min. for a light load of nylon and underwear and 60 minutes for a heavy load of towels.

2. Moisture Control Systems

An alternative to the cycling thermostat automatic system is an electronic system. Electronic systems actually sense moisture in the clothes. Some dryers have no timed cycle option. It is all automatic. The dryer begins the cool down when the moisture is all gone.

This magic is accomplished by measuring the resistance of the clothes. Wet, damp clothes have a lower resistance than dry clothes. All electronic dryers include two items:

1. A small printed circuit board that can measure resistance.
2. A sensing device mounted somewhere in the dryer basket. Tumbling clothes are continually hitting the moisture sensor. The sensing device it usually two small bars mounted close together. A tiny current flows between the bars when ever wet clothes hit them. When the clothes are fully dry the current flow is completely stopped. The dryer then advances to the cooldown cycle.

Uncle Harry's
Trick of the Trade # 58

The usual problems on electronic sensors are:

1. Gum or dirt between the bars
2. Dirt or lint behind the sensor causing improper current flow

On a Maytag, for instance, once the resistance reached the pre-set value, the clothes are given another 10-15 min. to finally dry before the dryer automatically shuts off. Whirlpool/Kenmore uses a crescent shaped bar in the rear of the drum connected to a small printed circuit.

Fig041_14
Electronic Sensing Bars (Whirlpool)



These systems work well. If anything such as a melted crayon or dirt shorts the bars out, the dryer will read "wet" continuously and the dryer never shuts off. The problem is rarely the printed circuit board.

Customers don't often call to get the electronic cycle repaired. If they have a time cycle backup, they will switch to the time cycle and ignore the electronic cycle.

6. Gas Heating Systems

All gas dryer manufacturers buy their gas systems from two subcontractors, Robert Shaw and Harper Wyman. Many of the components are interchangeable between brands. This interchangeability is very helpful to the service man. It reduces the inventory.

To fully understand gas heating systems we will review the history and development of today's designs. Originally, gas valves were extremely simple one coil devices. All utilized a pilot light. You may still see a few in operation. Pilot systems were used into the 60's.

The pilot light performed two functions. Of course, it lit the gas off like any pilot light does. Also, the heat from the pilot light was used to provide an safety interlock system. The main gas valve could not come on until the pilot light was hot.

Thermocouples

To give you a familiar example, certainly you have had to light a water heater sometime in the past. If you recall, you had to rotate a selector knob to a pilot position, hold down on a red button, and light the pilot with a match. Once lit, you had to continue holding down on the button for at least 30 and maybe as long as 60 seconds before the pilot would stay on.

The device that you were operating is called a thermocouple. It was and still is a popular, reliable pilot checking system. It works in the following way. The tip of the thermocouple sits in the pilot flame. When it gets red hot, it generates a trickle of electrical current. That small current, measured in milliamperes, flows through a coil in the gas valve. It magnetizes a portion of the gas valve. The magnet then holds down the interlock that you have depressed with the red button.

As long as the pilot is on, the thermocouple generates the current and the magnet holds the gas valve open. If the pilot blows out, the magnet loses its power and closes off the gas valve. Thermocouple systems are still seen in many places besides water heaters. Because of their high reliability, they are common in commercial ranges and in older residential gas ranges.

Thermocouples fail in the following way:

1. The most common problem is caused by pilot light combustion byproducts. The flame leaves behind small amounts of ash and the thermocouple is not heated properly in the flame.
2. The wiring in the magnet coil fails.
3. The thermocouple stops generating the trickle current.
4. The fitting where the thermocouple enters the gas valve gets loose or dirty, breaking the electrical connection, breaking the trickle current.

Fig041_15
Thermocouple



Uncle Harry's
Trick of the Trade # 59

The tip of a thermocouple must be a visible **cherry red** to operate correctly. Any lower temperature will not work reliably.

One universal U-line thermocouple will fit just about any possible thermocouple need. Also, cleaning of the pilot assembly is a frequent cure.

Pilot Orifices

When you disassemble the pilot assembly, you will find a tiny orifice at the end of the small gas tube. Never try to clean the orifice with a pin or other sharp device. If you jab anything into the pilot hole, you will create a much larger flame or a ragged flame that will quickly foul and create a callback. Gentle cleaning is usually sufficient. The aluminum tubes and brass pilot fittings are fragile and needed to be handled with care.

Fig041_16
Pilot Orifice



Uncle Harry's
Trick of the Trade # 60

Clean a pilot orifice with a soft cloth or by blowing through it. If this method fails replace the orifice.

Capillary Tube Systems

The second type of pilot light system that was used for many years is the capillary tube system. This device is looks similar to the thermocouple. It also sits in the gas flame and is connected by a small bronze tube to the gas valve assembly. This similar-looking device works in a completely different way.

The tube and bulb at the end is filled with a fluid that boils in the pilot light flame. By boiling, it expands and pressurizes the capillary tube. At the far end, back at the gas valve, a small bellows moves in response to this increase in pressure. The bellows motion is linked to the gas valve and allows the valve to stay open.

On this type of an interlock system, instead of pushing down a little red button, you push down on the arm of a little lever. The lever bypasses the mechanical interlock rather than bypassing the magnet like the thermocouple. If the fluid leaks out of the small sealed system, the capillary tube system fails. Similar to the thermocouple style, it usually fails because of dirt and improper heating of the sensing tip.

Fig041_17
Maytag Capillary System (1960's)



The most common problem is caused by the pilot light combustion byproducts. The flame leaves behind small amounts of ash and the capillary is not heated properly in the flame. The same *Uncle Harry's* tip applies.

Fig041_18
Maytag Standing Pilot Gas System



Pilotless Ignition Systems

In the 80's, with the advent of the energy crunch, technology evolved that eliminated the need for pilot lights. Instead of having a simple highly reliable pilot light system, we switched to electrical ignition systems that eliminated pilot lights. As usual the increased complexity is good for our business.

Wire Glow Coils

The earliest pilotless systems were tiny glow coils that came on and lit the pilot light. The pilot light in turn heated a bi-metal device and allowed the gas valve to open. All of these original devices are now so old that they are on the junk heap. To date I have been unable to get a picture of one.

Sparkers

During the 70's, there was a device that acted much like the spark plug in a car. Contact points in the igniter vibrated together and flashed in the gas flame. The flame lit up without a pilot system. Sparkers are easily recognized by the loud clattering noise that they make when igniting. The sparker rattles and clatters for a few seconds until it senses the flame and then it quiets down. Replacement sparkers are outrageously expensive today and not worthwhile.

Little is to be gained by going into detail on how these two old pilot systems operate because they're not worth repairing anymore. They're too expensive and bordering on obsolete

Carbide Ignition Systems

Coming into the 80's, a carbide igniter was designed, one in the shape of a large cigarette, coiled around in a spiral, and the other shaped more like a rocket ship.

Carbide igniters are a special conducting ceramic that glows almost white-hot when current flows through it. Carbide is a very hard, durable material that has the single disadvantage of being brittle. These igniters eliminate a pilot. They are placed directly in the main gas flame. Following is the ignition sequence:

1. Power is supplied to the gas valve system. After five or ten seconds the igniter begins to glow red hot, then white hot.

2. A glow bar sensing device (“the picture taker”) monitors the white hot bar, shuts off the igniter and closes the circuit to the gas coils. The gas fires off.

Fig041_19

Carbide Igniters



Diagnosing and Repair of Carbide Igniter Systems

Uncle Harry's
Trick of the Trade # 61

A gas valve makes an audible click when it begins the ignition sequence. If you hear the click but don't see a glow, the glow bar is usually broken.

If you don't hear the click, back up and test for 110 VAC at the gas valve input connector. Trace back as needed to find the break in the power.

Replacing a Broken Igniter

1. Turn off the gas, take out the 2 5/16 screws that hold the gas valve in place.

2. Disconnect the wiring from the gas valve and the two wires off the picture taker.

3. Lift out the gas valve and inspect the igniter. Replace as needed.

Glow Bar Sensor Failure

If the orange glow bar continues and doesn't shut off, the sensor is bad or not sensing the heat. It's very possible that it's just dirty. Sometimes the clear glass window gets clogged up and needs to be cleaned. Usually it has failed internally.

The sensor can be replaced with a stubby screwdriver, leaving the gas valve in place.

Coil Failure

The third failure in the glow bar system, is the least common but the most difficult to diagnose. It is the failure of one of the three gas coils. The customer complaint will be,

"The heat comes just for a little while, then goes off and won't come back on."

Uncle Harry's Story Time

Once, I even had a customer post vigil at the gas flame and give me a written report on the gas flame failure. He pulled up a chair drink in hand and made notes as the gas cycled. For some strange reason he was fascinated by the strange failure. He knew it worked for a while before it quit. His report saved me twenty minutes and told me exactly what I needed to know.

Here is the sequence of this odd failure:

1. The gas will come on normally at the beginning of the dry cycle and cycle off on the thermostat. Then it will cycle on, off, on, off, as it should. It may function fine for from 5-30 minutes. Eventually, due to heat build up, one of the tiny wires in the gas coil opens circuits.

At this point, the glow bar will come on, the "picture taker" will register that the glow bar is cherry red, and shut off the glow bar as designed. However, the main gas will not come on. Instead, it will cycle back to the beginning and glow and click and glow and click in a slow sequence, never lighting the gas flame.

If the dryer is left to cool down overnight, it will again work until the coils get hot.

Fig041_20

Glow Bar Sensor



Uncle Harry's Trick of the Trade # 62

It is possible to save diagnosis time and accelerate the coil failure. Use a blow dryer to heat up the gas valve.

Gas Coil Replacement

Gas valve coils come as a prewired set. The repair is similar to replacing the igniter bar.

1. Remove the gas valve assembly.
2. Loosen the little brackets that pinch down the coils. The screws require a 7/32" nut driver.
3. Install the new set of coils and the associated wiring.

The instructions that come with the coil kit are self-explanatory. Take special care to blow away dust at the top of the main gas valve. Be careful that the two "O" rings on the bottom of the coils are in place when you re-assemble it.

Sniff for leaks when you have turn the gas back on.

In recent years, the coil kits have been redesigned to a newer style. The newer style is shown compared to the older. The repair procedures have not changed.

Fig041_21

Blow Drying a Gas Valve



Fig041_22
Changing a Coil Kit



Gas Conversion Kits

Unless otherwise specified, gas dryers come through set up to operate on natural gas. If a customer is operating the dryer on propane, LP or any of the other gases scattered around the country, it is necessary to convert in the gas valve assembly to that specific gas. Kits are available from the manufacturer and come in two ways. One is a conversion from natural to LP, the other is a conversion from LP to natural.

Naturally, it depends on whether you're moving from city to the country or from the country to the city. Natural gas is distributed near larger cities and “bottled gases” are in rural areas. Most of the time a natural to propane kit is needed.

Understanding different gases

Why is this kit necessary? Natural gas operates at a lower pressure than propane and have a lower amount of energy per cubic foot. These two differences require two changes in the gas valve design.

1. Propane requires a smaller pilot and main gas orifice. A smaller orifice lets through less propane. A natural gas orifice operated on propane will result in a huge gas flame. The higher gas pressure will force too much gas through the metering hole.

2. A natural gas valve assembly also includes a regulator. The regulator levels out any fluctuation in the incoming pressure. Since the propane is at a higher pressure it is necessary to block out the action of the regulator. The conversion kit includes a block that is screwed into the regulator.

It's considered “good form” to leave the old parts in a little bag, with the instructions attached, sitting inside the dryer. At some future date, the customer may reverse the procedure. Conversion kits come with labels that are posted on the gas valve. The labels show that it has been converted from one gas to the other.

*Uncle Harry's
Story Time*

One morning I was repairing a man's refrigerator. As often happens, after he got to know me, and felt comfortable, other work appeared.

He asked me if I could convert a gas dryer to LP for him.

"No problem, get me a model number and I'll order a conversion kit."

He proceeded to relate what happened to him at Sears.

He was at a Sears Appliance Center and asked a sales woman if they sold LP gas dryers.

The sales woman replied, "Certainly, gas dryers are right over here."

He made himself perfectly clear the second time and said, "No, I'm interested in an LP gas dryer."

She replied with a little sarcasm, "All the gas dryers are the same."

Rather than get into an argument, he left.

I laughed and said, "Good thing you didn't buy one and hook it up; you might have burned your house down."

**Fig041_23
Gas Conversion Kit**



7. Electric Dryer Element Systems

Electric dryers use a nichrome wire coiled into a spiral shape. The coil is heated by 220 VAC, and typically generates around 4000 watts. The element is housed in steel box that has fresh air coming in one side and heated air going out the other. The heating chamber is mounted in various places on different dryers.

It always includes a high limit thermostat, and on many newer models a thermal fuse. The thermostat and fuse keep the dryer from getting too hot, if for any reason the air flow is not sufficient to cool the heating coil.

Fig041_24b
A Whirlpool Element and Heater Box

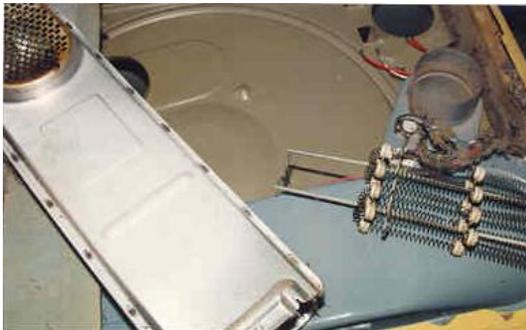


Fig041_24a
GE Element Mounted Behind the Basket



Burned out electric elements are commonplace. Burned wires at the high limit thermostat are also common. Virtually all dryers have a single coil heating element with two wires connected to it. GE is the only current exception. For many years, G. E. has had two independent concentric coils that supply the heat. One coil is used for low heat and both are used for regular or high heat. A few, very old Whirlpool dryers, also had a double coil system.

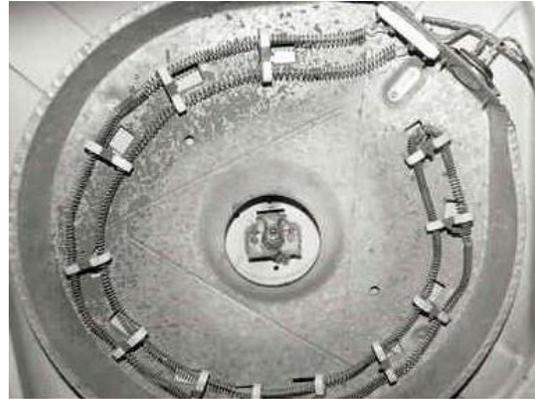
One Whirlpool element will fit at least 90% of all the Whirlpool dryers operating today. (The primary exception is Whirlpool's 27" dryer.) Maytag has traditionally had two basic coil designs, which we'll explain in the Maytag section. (A third style came out in the late 1990's.) Other brands have their own way of heating the hot air and they will be covered separately.

Fig041_25a
Restringing a Maytag Dryer



Electric elements are not interchangeable between brands. In contrast to the gas coil systems and igniters, each heating element is brand specific.

Fig041_25b
Westinghouse Design



The following question is often asked,

“Can I run my electric dryer on 110 VAC?”

Yes, with a wiring change in the connection circuit, it is possible to run an electric dryer on 110 VAC. However it is unsatisfactory system. It will take two to four hours to dry a load of clothes. There's just not enough wattage in a 110 VAC circuit to supply adequate heat to dry the clothes.

8. Spots and Stains on Clothes

Now that we have covered all of the theory of laundry equipment, It is important to tie washers and dryers together as a unit. After all the cleaning of the clothes is a complete process with two steps, washing and drying. Many times it is difficult to locate the source of a cleaning problem

First, it is important to understand some of the basics of cleaning soaps, and detergents, in order to keep yourself out of trouble. Customers often call with strange questions about marks or stains on clothes.

Detergents and Soaps

Detergents and soaps work differently removing dirt. Today's washers are really designed to work on detergents, not soaps. Customers frequently get in trouble using Ivory Flakes and other soaps in their machines.

It is true soaps are easier on clothes, but they don't clean as well. The biggest problem arises in removing the soap during the rinse. If you recall, one of the leaks we discussed back in the GE washer section was a result of oversudsing. Today's washers are energy efficient and utilize mostly cold water. Soaps do not dissolve in cold water and cause problems. Even detergents build up residue in pure cold water.

Most customers are under the misconception that more bubbles are better. Not true, the best level is when the bubbles just begin to form. Maximum cleaning occurs when the clothes beat against one another, not when they are floating in bubbles.

Sometimes a customer will describe or show you white clothes with a kind of gray and white powdery, smearing stain. The colored clothes may have fuzz and other large, nondescript stains. This is known as re-deposition. Either poor rinsing or low temperature water causes it. The stains are simply left over detergent not properly rinsed from the clothes.

Today's detergents are designed are to work fairly well in cold water, but a customer that never uses warm at all is playing a dangerous game. Unrinsed detergent will gradually build up to the point where you'll be able to see it.

Uncle Harry's

Trick of the Trade # 63

Suggest to the customer that they wash their clothes with warm or hot water without putting any soap in the tub. Let them observe how much foam they get just from the clothes, all left over from previous washes.

*Uncle Harry's
Story Time*

A neighbor of mine, a surgeon's wife, called me to repair a bad water valve on her washer. She had be getting by with only cold water for several years.

I easily replaced the valve and then came the tough part. She showed me some stained clothes. It looked like classic re-deposition to me, but I had never seen it happen before on a direct-drive Kenmore. I was puzzled.

The solution was not evident, until I removed the clothes basket. The inside of outer tub was covered with an inch of fatty slime. It was a horrible mess, all a result of no hot water. It was a good thing nobody in the family was allergic to detergent, because their clothes were full of it.

Stains Caused by Mechanical Problems

Sometimes a stain is long and skinny and looks like the clothes were pushed into a crack or crease. It may look like a rub mark. This type of stain will come from two places:

1. Clothes can get caught underneath the agitator in the washing machine and pinch. They can also get caught between the inner and the outer tub up near the top.
2. Similarly, when the basket support system begins to fail on the dryer, clothes can get caught. Gaps that have formed between the rotating basket and the stationary sections will pinch the clothes.

It is always difficult to determine whether the stains have come from the washer or the dryer or from the customer usage of the clothes. All you have is the end result.

Scorch Marks and Snags

An overheating dryer will cause scorch marks that look as though you took a flame and blasted it against a section of the clothes. The brown scorch marks will appear more quickly in areas that have been starched. Scorch starch stains will come out. Unfortunately, scorched cloth is permanent.

Little tears and little holes and snags can be caused by safety pins or other sharp metal object embedded in the dryer drum or stuck in the holes of the wash basket. Get your head and trouble light inside and rotate the washer or dryer drum until you locate the source of the problem.

Other foreign objects such as a melted crayon can cause stains on the clothes in the dryer when the dryer gets good and hot.

Filter screen covers and light shield covers break and leave ragged edges. The old Whirlpool dryer had a football-shaped cover that was famous for breaking and then snagging clothes.

Fig041_26
Snagging Style Lint Cover



Water supply problems rather than the washing machine or the dryer usually causes rusty-looking stains. Even if the porcelain is chipped on the wash basket, if the washing machine is used frequently, there is little chance for the rust stains on the clothes. Only if the customer has a habit of leaving wet clothes sit for long periods of time is there a potential problem.

Of course, the worst stain of all is oil, transmission oil. On a few brands, the upper oil seal fails on the transmission. Oil will get into the water will wind up on the clothes. This is particularly true of GE, Maytag, Westinghouse and occasionally Norge. It is possible on Frigidaires, although I have yet to see a sample.

Oil will show up on the clothes as small round spots that gradually spread out like a drop of oil does on water. Sometimes you can smell the presence of transmission oil by sticking your head into the tub or smelling the stain on the clothes. It has a distinctive 90 weight gear oil odor.

Holes in the clothes:

Once in a great while, a customer's clothes start to fall apart or get large holes in them. The fabric becomes very fragile. This problem may be caused by phosgene gas. Phosgene gas is generated when a fluorine or chlorine product is in the air and it crosses a gas flame. Some cleaning agents include fluorides.

If the customer is cleaning or using oil based paint around the basement and drying the clothes at the same time, fluorides can get into the gas dryer. The flame will create phosgene gas, which may dissolve organic materials, such as cotton.

Uncle Harry's Story Time

I remember back in the 70's, when I owned Laundromats with coin dry cleaning machines. The dry cleaning machines leaked perchlorethylene solvent, which contained chlorides. The solvent odors would occasionally get sucked into the gas dryers.

I remember vividly watching the son of a regular customer trying to put on his undershirt. It disintegrated in his hands. His mother picked up a bra, which also fell into pieces. The cups and straps were fine, they were made of nylon. Only the cotton in all the seams was affected.

It's funny today, remembering back, but at the time I was mentally counting up the damage estimate

Examination

Lesson 4

Automatic Dryers Part 1

1. The drum air temperature is about
 - A. 120 °F
 - B. 90 °F
 - C. 140 °F
 - D. 185 °F

2. On a 220 VAC circuit a dryer draws
 - A. 20-22 amps
 - B. 10-12 amps
 - C. 28-30 amps
 - D. 36 amps

3. A gas conversion kit
 - A. is an unnecessary luxury
 - B. requires an understanding of gas systems
 - C. is an update option
 - D. includes drilling holes in orifices

4. Belt and idler problems
 - A. are miserable to locate
 - B. are usually obvious
 - C. are rare
 - D. cause pinched clothes

5. Long drying time is usually caused by
 - A. bad timers
 - B. shorted elements
 - C. a clogged vent system
 - D. heavy loads

6. A safety thermostat
 - A. operates at 125 °F
 - B. operates often
 - C. operates at 225 °F
 - D. is next to the operating thermostat

7. A bias thermostat
 - A. doesn't like Poles
 - B. has been around forever
 - C. is a type of high limit
 - D. provides variable temperature control

8. On a temperature controlled cut-off
 - A. the timer moves constantly
 - B. moisture is monitored by a sensor
 - C. the timer moves when the heat is off
 - D. the timer moves when the heat is on

9. Carbide igniters
 - A. ignite by glowing
 - B. ignite by arcing
 - C. sense the flame
 - D. are obsolete

10. The glow bar sensor
 - A. shuts off the gas valve
 - B. senses the igniter heat
 - C. is too expensive to replace
 - D. controls the pilot

Examination Answers

Lesson 4

Automatic Dryers Part 1

- | | |
|--|---|
| <p>1. The drum air temperature is about
C, or around 140°F, varying up and down as
the heat is on and off.</p> <p>2. On a 220 VAC circuit a dryer draws
A.20-22 amps</p> <p>3. A gas conversion kit
B. requires an understanding of gas systems</p> <p>4. Belt and idler problems
B. are usually obvious and very common.</p> <p>5. Long drying time is usually caused by
C. a clogged vent system</p> | <p>6. A safety thermostat
C. operates at 225 °F or above</p> <p>7. A bias thermostat
D. provides variable temperature control</p> <p>8. On a temperature controlled cut-off
C. the timer moves when the heat is off</p> <p>9. Carbide igniters
A. ignite by glowing</p> <p>10. The glow bar sensor
B. senses the igniter heat</p> |
|--|---|

Raker

Appliance Repair Professionals, Inc.

Automatic Dryers

Part 2, Including

Whirlpool Kenmore, Kitchen-Aid & Roper

Manual 4

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Introduction

Part 1 covered general dryer theory. You now have a good grasp of air flow and heating system problems. In this lesson we will go into full detail on each specific brand. Keep in mind that the “Appliance Tree” concept covered in Manual 1 still applies. For instance, Kenmore, Whirlpool, Roper and Kitchen-Aid dryers are all the same thing. It would be worthwhile to review the trees to refresh your memory.

Fortunately for us, dryer designs are very similar across all brands. In contrast, washer designs on some brands are drastically different. Look at the differences between a Maytag and a Kenmore direct-drive washer. This similarity of design in dryers makes studying and mastering the various brands a lot easier.

Our plan of study will be similar to that used on washers. We will cover the most popular brand, Kenmore, first. Next we will proceed with GE, Maytag, and then the off-brands. A great many photographs are included to show you exactly what goes wrong.

Kenmore Dryers

For about 20 years or more until just very recently, the Whirlpool Corporation has been kind enough to use a stable dryer design. This stability allows us, the appliance techs, to carry one box of parts that will fit hundreds of different models and maintain a very high completion rate.

From the late 60’s until the late 80’s the cabinet and drive system design has remained the same. Only recently have any changes been made. First we will cover what is by far the most popular design.

**Fig042_01
Typical Kenmore Dryer
With Hamper Door**



Second we will go over the differences between that and the newest style. The newer design was introduced at the same time as the direct-drive washer. Because dryers fail less frequently than washers, only a very few of the new style dryers have needed service so far. They have only been on the market since about 1988, a relatively short time for a dryer. It is my prediction that beginning in 1997, we will start seeing a lot more of the newer design.

Cabinet Removal

The Whirlpool dryer cabinet is made in two basic ways with a few variations on each. In all cases the top is held down by two screws next to the lint filter and two front clips similar to those on belt-drive washer.

Fig042_02
Lint Filter and Access Screws

Once the top is lifted up the screws holding on the front can be easily reached.

Electric Dryers

On all electric dryers the entire front can be tilted forward, pulled up and off. It is only held by two slide clips at the bottom and two 5/16" screws at the top. Be sure to first mark and remove the wires connected to the door switch.

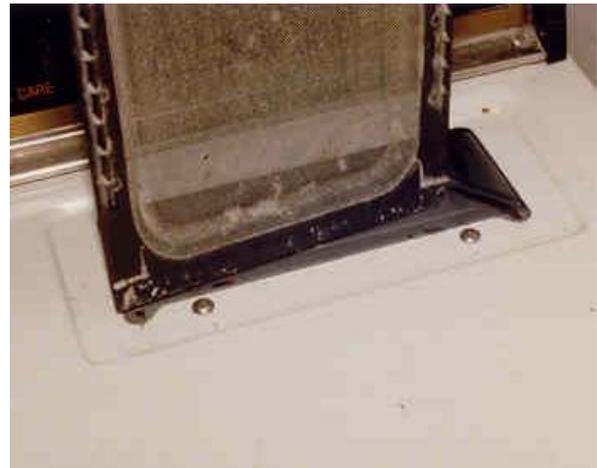
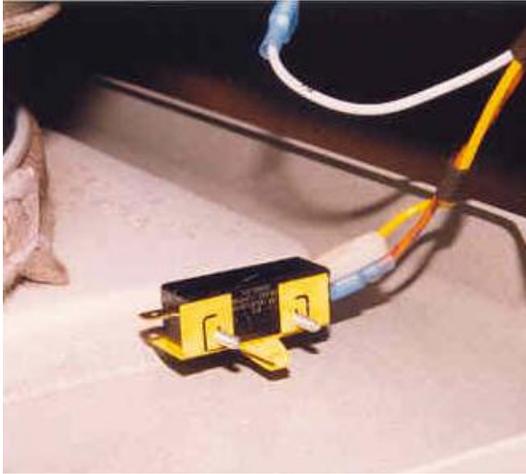


Fig042_03
Door Switch and Cabinet Screw



After lifting off the front, reach under and unthread the belt from the tensioning pulley. The entire basket is now free and will lift out. With the basket out the inside of the cabinet is empty except for the motor assembly and the drum rollers.

By taking off the rear cover of the cabinet, access is gained to the heating element, the thermostats and the blower housing.

Gas Dryers

M

Most gas dryers include a lower access cover (held on by spring clips) that allows access to the gas valve assembly and the idler pulley. The bottom of the cabinet front is held by two screws, instead of two slide clips. (On older models, with a hamper style door, often two additional, long phillips head screws holding the hinges must be removed.)

Uncle Harry's
Trick of the Trade #64

Don't remove the two lower 5/16" screws, just loosen them a full turn. Instead, use them for a holder to position the front.

The new style cabinet is different and similar the direct-drive style. The same engineer must have designed both of them. It is necessary to flip back the console (sound familiar) to get to the 1/4" screws holding on the cabinet top. Once the top is off, the front is held on in the same old way.

Dryer Operation

All of the dryers operate in the same way. First the timer dial is set and then the start button is pushed. Of course the door must be closed. The selection of time and the use of the automatic settings was covered extensively in the previous lesson. You already have a full understanding of temperatures, clogged vents, air flow and the importance of the cooldown.

Fig042_04
Lower Panel Removed



Component by Component

Remember back in Lesson 3, I promised to cover two items in this lesson. They were:

1. *“My dryer makes a lot of noise.”*
2. *“My dryer won’t start.”*

The Basket Drive System

By far, the most common source of problems with the Whirlpool dryer is the basket drive and support system. The basket is supported in the rear by two miniature rubber tires. The front is supported by a long, skinny, rectangular felt and the basket is driven by a belt that rolls all the way around the drum and feeds through an idler assembly to the motor pulley.

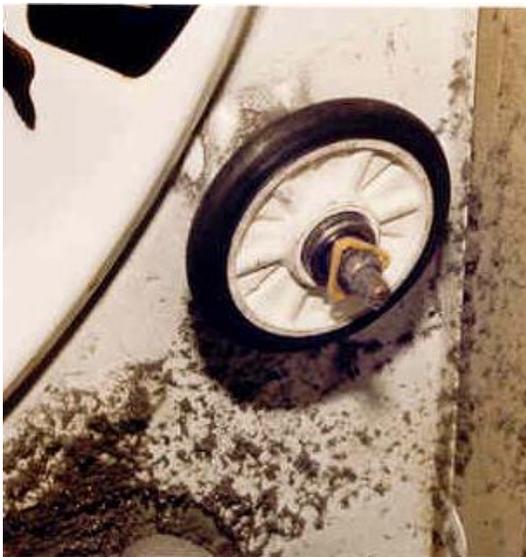
Drum Support Rollers

Failure of the drum rollers is common. They fail in one of two ways.

1. The hub of the small wheel wears out and the wheel will wobble and make noises.
2. The rubber wheel will harden and get flat spots on it. The dryer will make a rapid, thumping noise as it revolves.

If ignored long enough, a badly worn roller will even make a rapping noise as the wheel flops around.

Fig042_05
Whirlpool Drum Roller



Uncle Harry's Story Time

I was repairing an oven one day when the customer asked me to look at her dishwasher. It was a Kitchen-Aid and it wasn't getting the dishes clean. I first removed the filter under the spray arm and showed her that it was badly clogged. Then I tested it.

The dishwasher made so much noise that it was impossible to talk. I pulled off the front inspection cover and pointed to the motor. It was a corroded ball of rust. The bearings were rusted and making all the noise.

I told her it wasn't going to last long and that she needed a new motor. Then I asked how long it had been making the noise.

She said, "I don't know, maybe 5 or 6 years. We just turn it on and go to bed. That way we can't hear it."

So much for my prediction. As far as I know it's still operating that way today. People can procrastinate for a long time.

Drive Belts

The belt, of course, is a very common source of service calls as is the idler roller on the tension spring arm. Most often the customer will complain,

“My dryer gets hot , but it won’t turn.”

Failure of the tension roller will make high-pitched fast squealing noise. It is wise to replace the idler assembly whenever a belt is replaced.

Rethreading the belt through the tensioning roller the first time is a little puzzling. Following is a sketch to help you visualize the pattern.

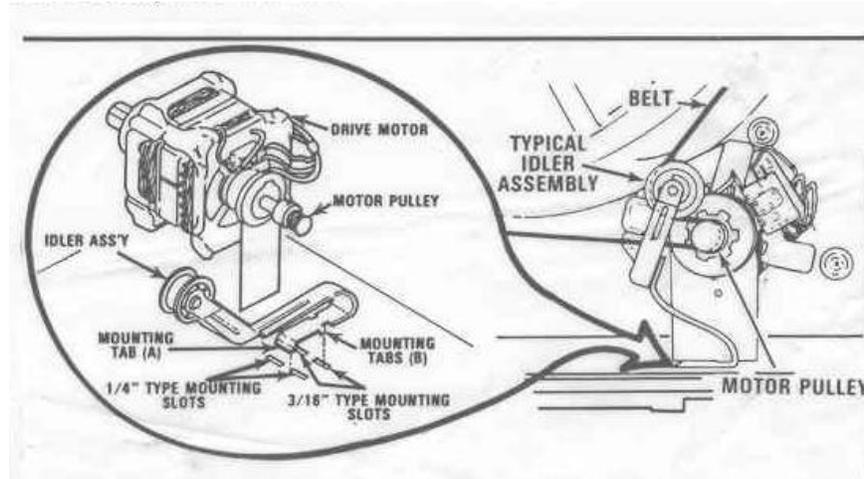
One belt, one idler and one drum roller part number (all supplied in your parts book) will fit 90% of all Whirlpool dryers.

Uncle Harry's
Trick of the Trade # 65

On a 10 or 15 year-old dryer, both rollers, the belt, and the idler pulley should be replaced simultaneously. The parts are cheap and the dryer will run much quieter. Give the old dryer a "100,000 mile checkup"!

Fig042_06
Idler Spring Next to the Motor





This repair, in your price book, is competitively priced at somewhere between \$140 and \$175, about 1/3 the cost of a new dryer. A noisy drum roller is hard to find by visual inspection. A fresh pair is the safest policy. With the dryer all opened up, it's easy to vacuum it out clean it, squirt WD-40 on the little shafts, and vacuum out the motor as well.

Uncle Harry's

Trick of the Trade # 66

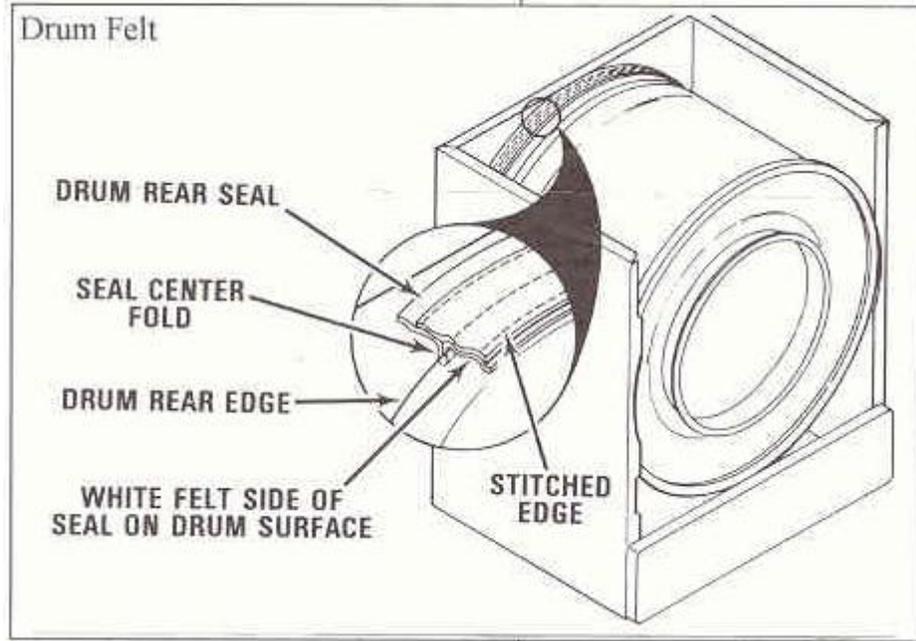
A novice will replace the roller shaft along with the rollers. The drum roller shafts never wear out. They are made of a tougher steel than the roller. They only need to be cleaned and oiled.

Drum Felts

The air seal at the front and back of the clothes drum is accomplished with a felt material. The front felt doubles as a support and rarely fails. The rear one occasionally causes problems. The source is usually worn out drum rollers. A badly worn roller will allow the drum to drop and damage the rear felt. A torn felt will result in a lost vacuum in the drum, poor air flow, and long drying time. The felt comes in a kit, including a good high temperature glue to attach it to the basket.

Drum Felt

Fig042_08



The Door Switch

The Whirlpool door microswitch is a good source of easy service calls.

The micro-switch is operated by a small metal finger that sticks out into the door jam. The little finger breaks off frequently. The switch and the little bracket and arm assembly come in a package together and are very easily replaced without even taking the front off the dryer. It can be done just by lifting the top.

"My dryer won't run."

A "dead" dryer complaint could easily be a broken tab and can be found by visual inspection.

Door Switch Tab



Uncle Harry's
Trick of the Trade # 67

A "dead" dryer can be quickly checked by moving the switch arm back and forth and making sure that you can hear that micro-switch clicking.

*Uncle Harry's
Story Time*

One of the fathers from cub scouting asked me to repair his dryer. He had been fooling with it and finally gave up. It was completely dead. I asked him to go down the basement and turn on the circuit breaker.

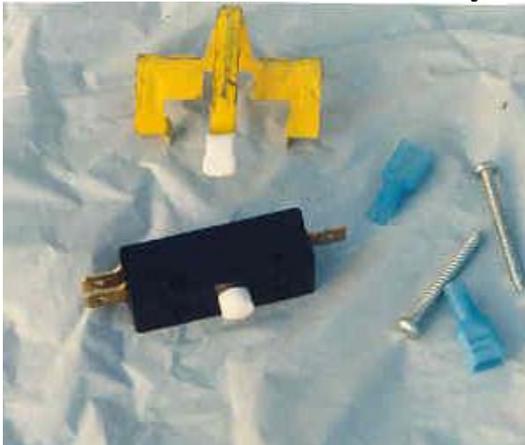
While he was on his way down the steps I spotted a broken switch tab. As soon as he turned on the breaker, I pressed the remains of the broken tab and on went the dryer.

"Al," I yelled down, "Turn it back off."

He came pounding up the steps and sputtered, "What'd you do? I heard it run for a second from down stairs. Come on Harry, tell me! How did you fix it so fast? I know you did it, you can't fool me, I heard it run."

I let him suffer for a little while before I showed him the broken tab.

Fig042_09
Door Switch and Bracket Assembly

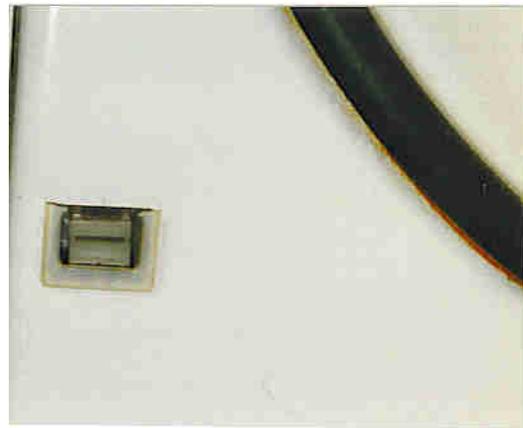


Other Door Problems

The Latch

A weak spot on all dryers is the door latch. Typically the latch, not the strike is the problem. Remember a bad latch can cause long drying time. The old latch can be popped out with a screwdriver.

Fig042_09a
A Broken Latch



Door Cables

On older dryers door cables support the hamper style door. When the cables snap the door falls and gradually buckles from the weight of the clothes. Once it is bent it fails to close properly and we are back to poor drying time. It begins to sound like a broken record doesn't it? The cables are retracted by a spring. The springs never break, only pop into the dryer somewhere. Look through the lint and you will find them.

Uncle Harry's
Trick of the Trade # 68

To unspring a door, jam a tool handle into the hinge and close the hamper door. Push against the door a few times to undo the old damage.

Fig042_10a
Door Cable



Door Seal

Once in a great while a door seal will tear or fall off and result in long drying time.

The Electric Heating System

Fig042_10
Heating Element Sample



On Whirlpool the heating element slides into a long sheet metal box which is clamped onto the rear of the dryer. The bracket that holds the heater box is held in by one screw. The small bracket squeezes the heating element chamber up against the back of the rear basket frame. It is accessible in two ways.

1. From the top with a stubby 5/16" nutdriver
2. From the back with a long 5/16" nutdriver. Push the nutdriver through the hole drilled expressly for that purpose.

Testing the Element

"My dryer won't get hot."

Once the back is off the dryer, the element terminals are accessible.

Using insulated test leads connect a voltmeter to the terminals of the element. With the dryer running, the meter should show 220VAC. If it does and there is no heat, the element is faulty.

With the 5/16" screw and bracket removed, and the wires are disconnected, the element lifts out. The heating element can be slid out of the heating chamber by taking out one last screw. A single element fits virtually all Whirlpools.

The high limit is mounted on the side of the heater box. It also is a common source of heat failure. The connection wires burn off.

Fig042_11

Testing an Element (Note the buried treasure frequently found in dryers.)



Uncle Harry's

Trick of the Trade # 69

Don't just replace burned wires to any thermostat, also replace the thermostat. The excessive heat is a result of heat build up inside the thermostat, not the connection point itself. This hint applies to all burned off wires, on all types of components and will be mentioned often.

Line Cord Failure

All electric dryers draw a heavy current from the house hold wiring.

The line cord is a special 30 Amp design. Both the line cord and sockets fail. A bad connection at the receptacle can cause a dangerous situation. It is a definite fire hazard. Check the condition of the cord and receptacle when you connect and disconnect a dryer. Replace both if there is any evidence of overheating

Fig042_12
A Badly Burned Line Cord



*Uncle Harry's
Story Time*

A GE dryer can be a problem. It is hard to gain access to the various thermostats for testing. One day I had a call on an intermittent drying problem. The element would work for 10 minutes and then shut down. Of course, the difficulty was finding the reason for the loss of power. At some points when it reached the correct temperature, it was supposed to shut off on the control thermostats.

However, the customer knew that it just would not dry properly. Something was definitely going on. The vent was not an issue, it was short and wide open. It was late in the day and I was tired. I fooled with the thing for nearly an hour, a very long time for me.

After repeated tests, I finally caught it during the right moment and determined that the problem was in the 220VAC-power supply, not in the dryer. I decided that the circuit breaker was at fault. I asked the customer to turn the breaker on and off, while I watched the voltmeter. I was looking for confirmation of my diagnosis.

Unfortunately, every time she turned it on, the power reading was steady. Not knowing what else to do, I wiggled the plug in the socket. Lo and behold the meter dropped to zero! The entire problem was a worn out outlet. It would heat up and open circuit on the 220 VAC side, still allowing the dryer motor to run. After it cooled down, it would connect again. I was further confusing the issue by removing and wiggling the line cord, as I moved my meter to different test points.

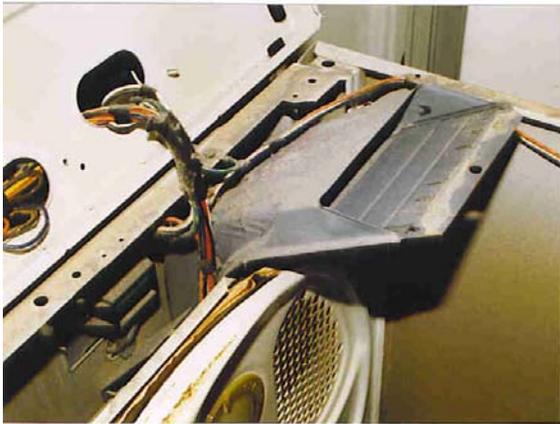
With a deep sigh of relief, I happily replaced the outlet.

The Lint Trap

On the back left side of the dryer is a piece of ductwork that houses the long, thin lint filter. That chamber frequently catches foreign objects that clog it or lodge in the blower. Anything left on the top of the dryer is a likely candidate. I have removed shoes, brushes, combs, sponges, toys, and clothes of all kinds.

Getting into the duct for service takes a little effort. It is necessary to first flip back the top and remove the back. Remove the four screws holding the blower cover in place. It is now possible to pull the lint trap duct out enough to clean it.

Fig042_13
Lint Trap Duct



The Motor and Blower System

The back end of the motor shaft goes into the blower housing. A fan is screwed onto the shaft with a left-handed thread. Whirlpool is unique, it has a felt seal on the motor shaft between the fan and the duct work. The felt is there to help insure a vacuum in the air flow system. This felt begins to break up when the dryer is older. It will form a lump and spin around between the housing and the blower. Sometimes, a piece of felt will get so tightly lodged that the motor will jam. Usually it makes strange, hard to diagnose, whirring noises.

In order to repair it, it is necessary to disassemble the dryer. The drum needs to be removed in order to gain access to the motor. It is necessary to hold the pulley end of the motor shaft with a wrench. The motor shaft is made with a flat section to accommodate a wrench. Using a heavy pair of Channellocks pliers break the blower loose. Remember, it's a left-handed thread. The blower must be turned clockwise, looking from the back, in order to come off the motor shaft.

Once the blower is loose, you can find out what's behind it and remove it. A new felt that comes with a new blower. It is necessary to remove and reinstall the motor in order to properly install a new felt.

Fig042_14
Torn felt Seal

Uncle Harry's
Trick of the Trade # 70

The dryer will work fine without a felt. The loss of the seal will not cause a noticeable change in drying time.



The Drive Motor

Obviously, changing a motor requires the same effort as removing a torn shaft felt. Drive motors fail in three ways:

1. The bearings dry out and the shaft locks up. A locked motor will hum when the start button is pushed. Also, it will be difficult to turn the basket by hand from the inside.
2. The bearings will wear out and result in a loss of starting torque.

Uncle Harry's Story Time

An old customer called because her dryer wouldn't run. It was a 25 year old Kenmore and it hummed on startup. I opened the door and gave the basket a push. On the next try it started up. It needed a new motor, but really, it was too old to warrant that expense. She told me she was going to buy a new one.

A few months later, I ran into her. She was cooking hamburgers on opening day of the little league season. She said, "You know I'm still using my dryer. I just give it a push, like you did, to get it started."

3. The windings or starting switch will quietly fail. If the motor won't run and 110 VAC is present on terminals 5 and 6, the motor is bad.

The two heavy red wires connected to the motor are part of the heater circuit. They connect to a switch within the motor that closes when the motor is running. Power to the heater is broken, whenever the motor is off. Once in a great while this switch can be the cause of a heating problem.

Thermostats

The high limit thermostat on the Whirlpool dryer is the only one that creates any trouble. The other thermostats are highly reliable. Once in a while, a control thermostat causes a problem. Before concluding that a thermostat is bad, pull the thermostat loose from the housing. Make sure that there's not lint gathered around the disc of the thermostat. Lint will cause it to read cooler than it's designed to. The lint will insulate it from the hot air flow.

Universal control thermostats, will work most of the time. They may require new spade ends..

Timers and the Console

Timers and control switches are highly reliable on Whirlpool dryers. Once in a while a timer motor will fail and the timer will not advance on any cycle. It's a very easy job to replace one. Also, occasionally a contact in the heating circuit will fail within the timer. This can only be determined by tracing the circuit.

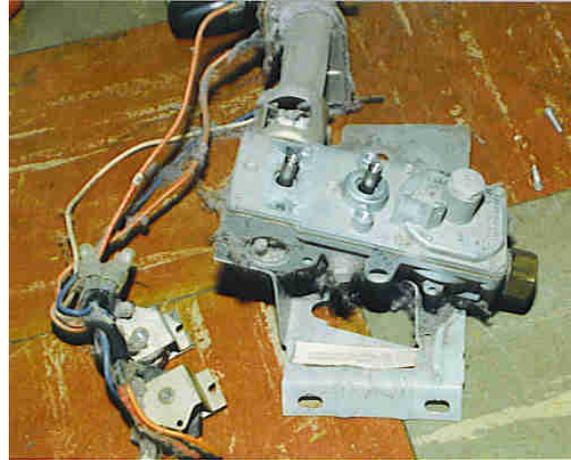
Gas heating Systems

The gas heating systems on Whirlpool are exactly as described in the previous lesson.

Fig042_15
Typical Gas Valve



Fig042_15a
Changing a Coil Kit



Many Whirlpool models use the round ceramic igniter.

Fig042_16
Flame Tube and Igniter



The New 27" Whirlpool Dryer

Many components have been changed on the new style 27" dryer. The design and layout is now almost exactly the same as Maytag.

Two thermal fuses are in the circuit instead of just one. The thermal fuse on the heater box (both gas and electric) blows easily if the vent is clogged. A new idler requires a different belt and roller kit. The drive motor will not interchange with the wider design.

Contact failure in the timer itself has been causing dead dryer complaints and require circuit tracing with a meter. Beware of this unusual failure and don't make the mistake of replacing the motor.

Fig042_17

Motor and Blower Layout on a 27" Whirlpool Dryer



Overall the Whirlpool dryer is easy to diagnose and repair. The components are easily accessible and are not tricky to change. The dryer can be disassembled and repaired in less than 30 minutes. A belt can be put on in 10. It can be fixed so fast that, often, you may feel that you need to slow down. Otherwise the job will look **too** easy.

Sample Flat Rate

Following is *Uncle Harry's* suggested pricing for typical dryer repairs. A complete set of flat rates is in the Flat Rate Book.

Whirlpool Dryers (Kenmore, KitchenAid, Roper & In-Sink-Erator)

Description of the Job	Price
1) Replace broken belt, idler and clean up lint 2) (idler-691366, 341241 belt)	\$115.00
3) Replace belt, idler, and set of rollers 4) (691366 and two 399241)	148.00
5) Replace blower and shaft felt (279711)	145.00
6) Replace rear drum seal (239087)	138.00
7) Replace door latch (279570)	65.00
8) Replace door switch and bracket (279347)	89.00
9) Replace drive motor (278827 or 279787 left mount)	189.00
10) Replace set of door cables and springs (230131 & 337186)	98.00
11) Replace electric heating element (4391960 or 3387747)	148.00
12) Replace thermal cutoff (270769, 3390719, & 3392519)	125.00
13) Replace gas valve coil kit (279137 & SCA700)	158.00
14) Replace ceramic igniter (279311)	135.00
15) Replace igniter sensor (338906)	135.00
16) Unclog vent line (refer to chimney sweep in difficult cases)	90-130.00
17) Replace thermostats (various)	145.00
18) Replace timer	189.00

Examination

Automatic Dryers Part 2

Automatic Whirlpool Dryers

(More than one answer may be correct.)

1. The most common Whirlpool dryer problems involve
 - D. belts and idlers.
2. The rear felt fails because
 - A. the drum falls and tears it and/or
 - B. it simply wears out.
3. The door switch tab
 - C. frequently breaks off.
4. A heating element is best tested
 - A. with a voltmeter.
5. A dryer line cord
 - D. should be checked carefully.
6. The blower shaft felt
 - A. jams the blower.
7. Gas valve design on Whirlpool
 - C. is the same as any other brand and
 - D. causes odd failures.
8. A good parts stock for repairing Roper dryers includes
 - A. a small number of parts.
9. Customer procrastination leads to all of the following
 - A. is unpredictable.
 - B. leads to more expensive service calls.
 - C. never helps the appliance.
 - D. A,B,& C.
10. In dryer diagnosis
 - A. sounds are important.
 - B. ignore the customer and get out the meter.
 - C. speed is important.
 - All of the above!

Examination Answers

Automatic Dryers Part 2

Automatic Whirlpool Dryers

1. The most common Whirlpool dryer problems involve
 - D. belts and idlers.
2. The rear felt fails because
 - A. the drum falls and tears it and/or
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3. The door switch tab
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 - A. is unpredictable.
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 - D. A,B,& C.
10. In dryer diagnosis
 - A. sounds are important.
 - B. ignore the customer and get out the meter.
 - C. speed is important.

All of the above!

Raker

Appliance Repair Professionals, Inc.

Automatic General Electric Dryers

Part 3, Including

Hotpoint

Manual 4

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General Electric Automatic Dryers

Manual 4, Part 3

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GENERAL ELECTRIC

G.E. dryers, like Whirlpool, have been made the same way for a long time. There have been a few variations, but nothing significant. On a theoretical basis, their operation is identical to Whirlpool. Only the parts layout is somewhat different.

Cabinet Removal

In order to get the top off the GE, instead of popping two front clips, it is necessary to take out four screws that are right above the door jamb. The top hinges back and allows access to the front panel. Front removal is identical to Whirlpool. In fact the same hint applies to the two bottom screws that hold on the front. Don't remove them, only loosen them a turn. Lift off the front and disconnect the door switch.

Fig043_01
Typical GE Dryer



Uncle Harry's
Trick of the Trade # 71

Always, carefully disconnect the GE door switch. It is fragile, and easily breaks, if the weight of the door is applied.

Unfortunately, unlike Whirlpool, the belt system is not easily accessible, once the front is removed. That is, unless, you have skinny arms. The drum is in the way and it is held in place by a center bearing. The bearing shaft is held in place by a "C" clip that needs to be removed from the rear.

The basket can be raised a few inches and some mechanics can get their arms in far enough to rethread the drive belt. Most, however, need to remove the lower back cover to gain access to the belt and idler. Also, on the center of the back is a small plate that covers the shaft clip. Once the clip and belt are removed the entire drum lifts out. With the drum out, all of the mechanical parts are exposed.

Gas versus Electric Models

The front panel on GE are very similar for both gas and electric. On gas an access panel is provided for the gas valve. Even though it is small, it is possible to remove and service the entire valve without removing the front.

As your knowledge expands, it is easier and easier to build on what you already know. Problems with a GE are close to those encountered on Whirlpool. We will cover the various components, one by one, and point out the items particular to GE.

Component by Component

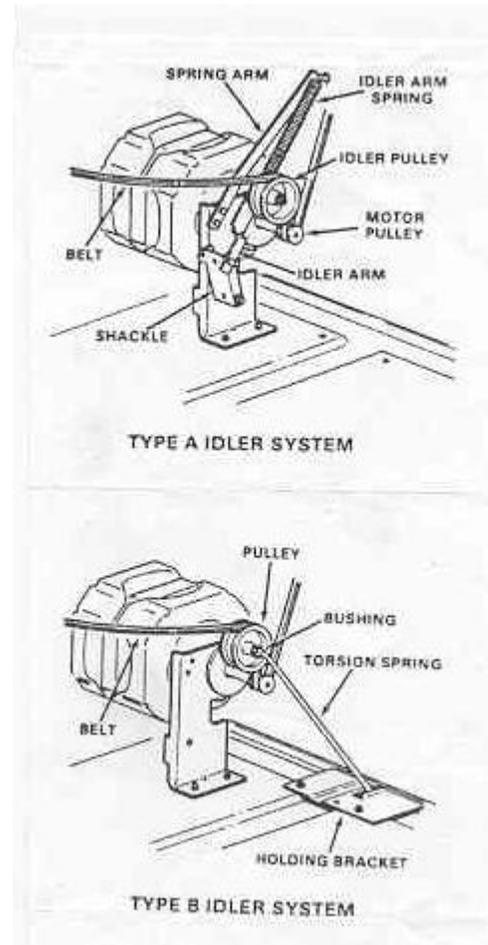
Belt and Idler

Like on all brands, the GE belt and idler system are a common source of service calls. The GE idler, in particular, is very light weight and solid plastic. It has no metal center like Whirlpool and Maytag. When it fails, it can make a squeal loud enough to drive you out of the room.

GE uses the popular belt around the drum design. Replacement takes a little extra time, because the back cover needs to be removed for rethreading.

It's not necessary to take the drum out in order to replace the belt, nor is it necessary to take the front completely off. Only the top screws on the front need to be removed and the front panel tilted forward. Holding the front against your body, lay the a new belt around the drum.

Fig043_02
GE Idler Systems



Uncle Harry's
Trick of the Trade #71

"My dryer makes a loud rapping noise."

It's a broken belt. On older models, without the belt holding it back, the idler pulley arm raps up against the drive pulley. It makes a very distinctive sound.

Rear Drum Support

G.E. uses a rear bearing, instead of two rubber wheels. It has a center shaft that goes through the back of the dryer and sits in a plastic sleeve bearing. As the dryer ages, the bearing wears out and allows the shaft to grind into the housing. This will generate a grinding noise that will vary with the basket rotation.

If the wear continues long enough, not only the bearing, but also the shaft and housing will need to be replaced. Usually, the noise forces customers call early enough to avoid serious damage.

Fig043_03
GE Motor and Idler
(Newer Style)



For years GE and Gemline made a cheap little kit that could be installed from the rear.

Now, however, the replacement bearing includes a shoulder and it must be installed from the inside and requires removing the basket. That is unless you listen to your *Uncle Harry*.

Uncle Harry's
Trick of the Trade # 72

Use a razor knife to cut the shoulder off the current style bearing and install it from the rear. First, fish out the remnant of the old bearing.

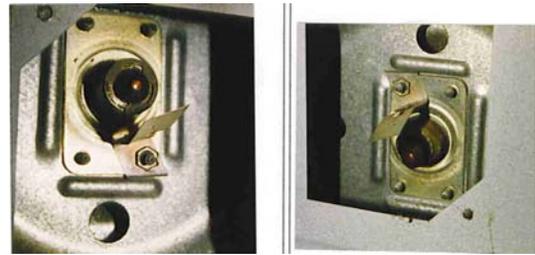
Fig043_04

Drum Rear, Shaft and Shoulder Bearing



Fig043_04a

“C” clip and New Bearing Installed



Shaft Rubbing Against the Housing

Front Drum Support

The front of the drum sits on two nylon slide bearings, backed up by a felt. These slides last a long time, but they do wear out. When they do an unusual problem occurs. The slide wear allows the front of the basket to drop slightly. The clearance between the rear of the basket and the shroud of the heating element is close. In some cases, a worn front bearing will allow the rear of the drum to rub the shroud as it rotates. **Beware that the noise coming from the rear may be caused by wear at the front.**

Uncle Harry's
Trick of the Trade # 73

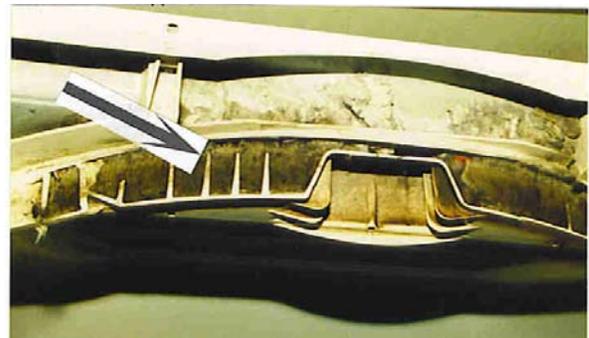
Test for this problem by lifting the front slightly as it turns. Use a tool handle, just for a few seconds, as the drum turns.

On the more recent design, the entire front support is now plastic. Under heavy use the slides will wear through and the basket will eat into the support.

Fig043_05
Older style Front Support



Fig043_05a
Worn Out Front Support



Heating Element

Burned out heating elements are common on GE. Remember, they are installed as a pair rather than one large one as are most brands. Consequently, the wire gauge is less and they are more fragile. As they age, they sag and short out.

The heating element terminals are accessible with the top up. Unfortunately it is a tight squeeze. It is always preferable to live test heating elements, like we do on Whirlpool.. Great care must be exercised to live test a GE

Of course the fastest test is with the belt still on. The rotating basket tends to rip off the test leads. (It is similar to using a timing light on an engine and praying the fan belt doesn't eat the test leads.) A more conservative technique is to temporarily remove the belt during the test.

Fig043_06
Heating Element and Thermostats
showing Tight Squeeze



The elements come as a pair and need to be re-strung through all the insulators that are mounted to the back of the dryer. It takes some time to re-string the element properly. Care must be taken not to stretch the element too much when you're re-threading. The element should be threaded so that it has a slight tension on it after you're finished and it looks neat and tidy and is not close to any metal.

Since GE has two elements, one bad element can cause long drying time. Test both individually or visually inspect.

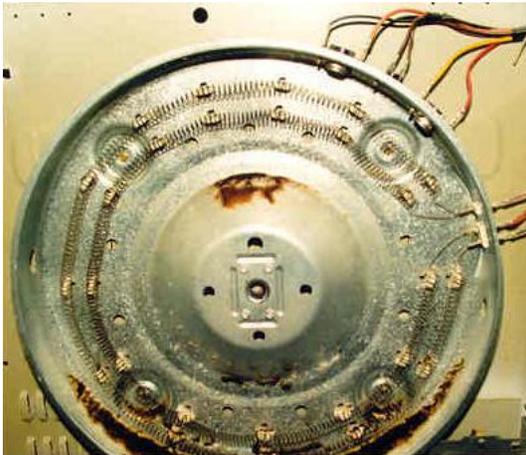
Be careful tightening up the new mounting bolts at the ends of the element. It's not hard to break the porcelain insulators. *Uncle Harry* has been there. Try to save a few of the various styles of dryer insulators, whenever you have an opportunity.

Uncle Harry's
Trick of the Trade # 74

The directions with the element provide the proper element lengths. It's much faster to stretch them between your outstretched arms. That is about 5' and the elements spring back. Always start with them a little short and stretch each segment a slight amount as you approach the end.

GE has it's own thermal fuse mounted on top off the heater shroud. It completely kills the dryer just like the ones on Whirlpool and Norge. On a dead dryer call, look first at the door switch and second, at the thermal fuse.

Fig043_07a
Typical Heating Element



Terminal Block

For some unknown reason, the terminal block occasionally burns up. This can happen to any dryer, but more often, it occurs on GE.

Fig043_07a
Terminal Block

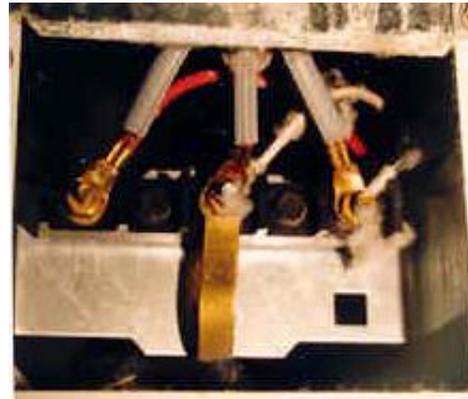


Fig043_08
Thermal Fuse Between Two
Thermostats

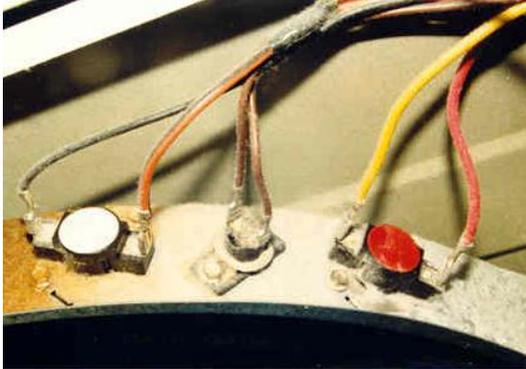


Fig043_08a
Door Switch



Door Switch

The door switch on the GE dryer is a common problem.

"My dryer won't start," or

"My dryer won't work at all."

Universal switches will not work. The switch is special with a very fine 1/8" spade ends. The switch fits only GE products. A bad door switch can be diagnosed in less than a minute. Lift the top and short a screwdriver (insulated, of course) across the switch terminals. I've even had my 9-year old daughter diagnose a dryer that way. The same style switch is found on GE refrigerators for light and fan operation.

New Cabinet Style

Like Whirlpool, GE redesigned their dryer about 1988. The heating element is still in the back but the element string kit is different.

The rear basket bearing can now only be installed only from the inside. The older style strong front bearings and front felt are now gone and replaced with a plastic housing. The new front support housing gets ground to pieces when the small front slides wear out. Oddly enough, the element and thermostats are still hard to test, even on the new design.

On the new style you will also encounter torx screws holding down the lid and the console.

Thermostats

The thermostats on the older traditional GE are a nasty item. They are housed below the lint trap in the front door. They are hard to access and particularly hard to test. They are jammed into a little box that leaves little room for maneuverability or changing the wire ends. Happily, that is seldom a problem.

Uncle Harry's Story Time

A customer called with a slow drying problem. After looking it over, I told the woman that the regular thermostat was bad. It would work fine on low heat and on permanent press. We called her husband at the University of Maryland Shock Trauma, where he worked. He didn't want to spend the \$130.00 that I had quoted..

A month went by, and I got a phone call from the husband. He asked me if I would mind fixing his dryer.

"Certainly," I said, once he refreshed my memory about the job. He owed me \$130.00, less the service charge of \$40.00 that was already paid.

He paused and explained that he had been on the Hot Line to GE more times than he cared to admit. They kept sending thermostats and he kept trying to install them. He said, "Never again will I attempt an appliance repair!" Obviously, he was better at medicine than at appliances.

When I got to the house, there on the front porch was a stack of small boxes, ready for UPS pickup. He was returning a good number of thermostats to GE.

The job was completed in about 20 minutes with a stock generic thermostat, just like the ones covered in the last lesson. I must admit, I felt a little sensitive about making him look so foolish.

The worst part is that GE charges between \$50.00 and \$70.00 for factory original thermostats. Imagine how much money and time he had involved in that simple job. My thermostat cost about \$5.00.

I believe his difficulty centered on matching the spade terminals. Many new parts are universal and need to be converted.

Motor and Blower System

The blower and motor system are another difficult problem. The dryer has to be completely disassembled in order to get to the motor or the blower. It takes about 50 minutes to replace either one. The entire blower housing and motor must be removed to replace the blower. The GE design must create more lint more than other brands. The motor is prone to overheating and stopping after one or two loads. Most often customers replace the dryer, rather than pay for a motor.

A peculiar clamp that occasionally comes loose holds on the blower on the front end of the motor shaft. It then allows the blower to rattle around on the motor shaft. Be forewarned that the blower fan is very expensive. Some blowers are up to \$75.00. If you happen to come across a used one, grab it.

No customer in his or her right mind is going to pay that for a simple plastic blower. They would just know they are being ripped off. In fact, GE is rapidly gaining a reputation among servicemen for having peculiar pricing on certain items. Don't get stuck in the middle. If in doubt, check first.

Sample Flat Rate

Following is *Uncle Harry's* suggested pricing for typical dryer repairs. A complete set of flat rates is in the Flat Rate Book.

General Electric Dryers

(GE & Hotpoint & J. C. Penny)

Description of the Job	Price
1) Replace belt and idler (WE12X82P, WE12X36, & WE12X81)	\$125.00
2) Replace rear drum bearing and shaft (WE25X205)	155.00
3) Replace only drum bearing (from the rear)	115.00
4) Replace front support glide set (WE25X60)	145.00
5) Replace set of heating elements (WE11X60 twin)	160.00
6) Or WE11M21 non-restringable	240.00
7) Replace door switch (WE4X197)	89.00
8) Replace thermostats (various)	145.00
9) Replace motor and pulley (WE17X32 & WE12X41)	240.00
10) Replace gas coil set (WE49X560)	170.00
11) Replace ceramic igniter or sensor (WE4X44)	125.00
12) Replace blower fan	185.00
13) Replace thermal limit (WE4X800)	130.00
14)	
15)	

Examination

Automatic General Electric Dryers

(Some questions may have more than one correct answer.)

1. Rethreading a GE belt
 - A. is the fastest of all.
 - B. is easily done from the front.
 - C. takes longer than Whirlpool.
 - D. is very time consuming.
2. An older GE with a broken belt
 - A. should be thrown on the junk heap.
 - B. makes a rapping noise.
 - C. makes a squealing noise.
 - D. is a problem to diagnose.
3. The door switch on GE
 - A. is not a problem.
 - B. is hard to locate.
 - C. tab frequently breaks off.
 - D. is fragile.
4. Testing the heating element with a voltmeter
 - A. is a tight squeeze.
 - B. is not a reliable test.
 - C. is simple.
 - D. is impossible.
5. The rear drum support bearing
 - A. makes a rapping noise.
 - B. can often be replaced from the rear.
 - C. should be tightened.
 - D. should be checked carefully.
6. On the new style cabinet
 - A. felt jams the blower.
 - B. the element is easily accessible.
 - C. problems are easily diagnosed.
 - D. you need a torx screwdriver.
7. The thermal fuse
 - A. shuts down the dryer.
 - B. can be bypassed.
 - C. is specific to GE.
 - D. causes odd failures.
8. If you over stretch a heating element
 - A. cut off the extra and proceed.
 - B. kiss your profit goodbye.
 - C. start over with a new one.
 - D. squeeze it together.
9. Heating elements
 - A. come in pairs.
 - B. are replaced from the rear.
 - C. often short out.
 - D. A,B,& C.
10. A worn front support
 - A. frequently occurs.
 - B. can make noises in the back.
 - C. seldom occurs.
 - D. none of the above.

Examination Answers

Automatic General Electric Dryers

(Some questions may have more than one correct answer.)

1. Rethreading a GE belt
C. takes longer than Whirlpool.
2. An older GE with a broken belt
B. makes a rapping noise.
3. The door switch on GE
D. is fragile.
4. Testing the heating element with a
voltmeter
A. is a tight squeeze.
5. The rear drum support bearing
B. can often be replaced from the rear.

6. On the new style cabinet
 - A. felt jams the blower.
 - B. the element is easily accessible.
 - C. problems are easily diagnosed.
 - D. you need a torx screwdriver.

7. The thermal fuse
 - A. shuts down the dryer.

8. If you over stretch a heating element
 - A. cut off the extra and proceed.
 - B. kiss your profit goodbye.
 - C. start over with a new one.All of the above

9. Heating elements
 - A. come in pairs and
 - C. often short out.

10. A worn front support
 - B. can make noises in the back.

Raker

Appliance Repair Professionals, Inc.

Automatic Maytag Dryers

Part 4

Manual 4

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Maytag Automatic Dryers

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Maytag

Over the last 30 years Maytag dryers have been made in two basic styles. The "recent style" was introduced in the 70's and represents the majority of what is in use today. It is a belt around the drum style, like everybody else's today, and is very similar to the current Whirlpool and GE design. Our primary emphasis will be on the current design. Toward the end of the Chapter we will summarize the high points of the old style, known as the "Halo of Heat Dryer". If you get stuck on one, contact *Uncle Harry*, he's fixes one or two.

Fig044_01
Typical Maytag Dryer



Cabinet Removal

Maytag has always prided itself on making dryers (and washers) convenient for service. Virtually all repairs can be done from the front. Like the washer, the front hinges from the top, once the two lower screws are removed. Four more screws hold the front bearing support. The belt can also be unthreaded from the front and the basket lifted out. Within five minutes the entire cabinet is open.

Uncle Harry's
Story Time

Back in the late 60's I bought a coin laundry that was equipped with front load Philco-Bendix washers - I bet you never heard of that one. The washers were bolted to a long concrete slab that was about 10" high. The motor, pump, and transmission were all one long unit hanging under the machine. Nearly all of the service was accomplished entirely from the rear.

The miserable part was that the machines were mounted in a long row, about 12" away from the wall. In order to get to the center one, the mechanic, me, had to wiggle along behind the row to the center. Heaven forbid that you forgot a tool, and had to crawl out or over the machine.

I developed two things as a result of that experience. The first was a mild case of claustrophobia and the second was a strong appreciation for front service equipment.

Fig044_02
Front of Cabinet Removed



Gas versus Electric Models

The older gas models are similar to GE, they had a small service panel for the gas assembly. Recently that panel has been discontinued and the front must be removed for gas valve service.

Component by Component

Belt and Idler

The Maytag belt design is unique. All other brands run the belt with the ribbed side against the basket. Maytag claims that the belt wears out faster that way. Their belt is reversed. Threading the reversed belt confuses many people.

The first few times that you install a Maytag dryer belt, it is wise to thread it from the rear like the book says.

Uncle Harry's
Trick of the Trade # 75

Any serviceman worth his salt does it from the front with his eyes closed. You can't see it anyway. Stick your hands over the motor system and under the drum, which you hold in place with your shoulders. Install the belt by feel. It is helpful to let the belt ride down in the rear groove in the drum during the threading. Once threaded, gradually ride in into the correct position. Using the groove adds a little length and makes it easier on the fingers.

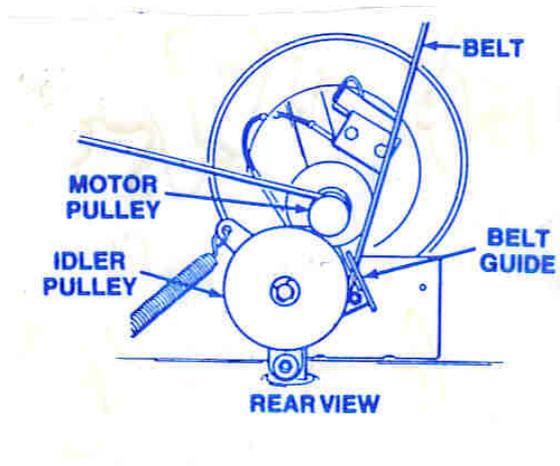
Don't fret if it initially seems impossible. You will get used to it.

Fig044_03
Belt threading from the Front



The idler pulley is seldom a problem. Occasionally the bearing dries out and it gets noisy and must be replaced.

Belt Threading through the Idler



Rear Drum Support

The rear of the drum is supported exactly like the Whirlpool, by two rollers. The Maytag rollers are a stronger design than Whirlpool, but they do dry out and seize. Sometimes a stuck roller will result in a broken belt.

Uncle Harry's
Trick of the Trade # 76

Always spin the rollers when replacing a drive belt. Make sure that they spin freely. Spray them with WD-40 to dissolve any built up grime on the roller shaft. You don't want to break a new belt.

Fig044_04
Maytag Drum Roller



Front Drum Support

The front support of the drum is supported by two Teflon slides that are pop-riveted to the front of the drum support. The slides will wear out after years of heavy use. Replacement is easy as long as you have a pop-rivet tool.

Fig044_05
Front Slide



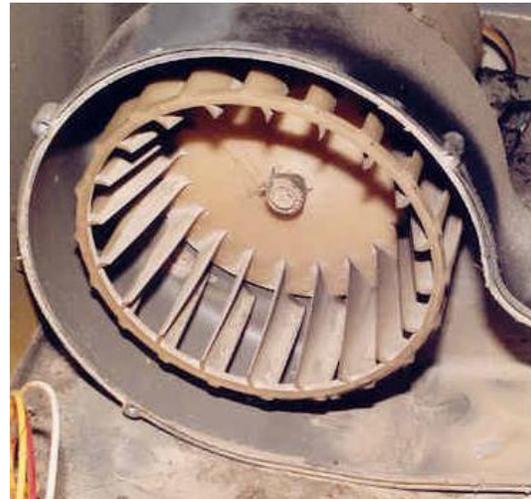
Heating Elements and Blower System

Maytags, of course, have the same heating system failures as any other brand because they are using basically the same parts. However, here, there is a real weak spot. It is the nylon squirrel cage blower that is mounted on the front of the motor shaft. The blower fails with great frequency. The hole in the blower becomes egg shaped and the fan wobbles. On dryer's 8-10 years old, this is a frequent source of service problems.

Incidentally, the same blower part fits the Norge, Wards, and Maytag products, even though the dryers are not exactly alike. The blower is easy to change. Remove the front and the drum support. Remove the front half of the blower housing. The fan blade itself is held on by two clips that are easily removed with pliers and a small screwdriver (snap ring pliers are the best tool.).

The heating element fails with the same frequency as any brand. It can be diagnosed with a voltmeter or an ohmmeter. Often an ohmmeter is easier because the front is off during the test. The ohmmeter is faster than bypassing the door switch to make it run.

A Noisy Fan Blade



The element can be repaired in two ways. First the element can be purchased as an entire unit. Second, and much more popular among service men is a restring kit. The kit is much cheaper.

Fig044_06
Restringing a Maytag Heating Element



Uncle Harry's
Trick of the Trade # 76

Buy a few insulators as a precaution. Sometimes the insulators are cracked or fall apart when you restring. Little else will substitute, so be ready.

The Door Switch

The door switch is a reliable part but it is a “Maytag only” part, not a universal type.

Uncle Harry's
Story Time

A customer called because her Maytag dryer was “full of water.” We had had a torrential rain that had filled her window well to the point that water came down the vent hose. The dryer actually made sloshing noises if you moved the basket.

I quickly removed the front parts, drained the blower housing and dried the bottom frame with rags. I was finished in 15 minutes. She said, “That certainly was easy.”

Trying my best to be gentle and kind, I said, “When I do it, it looks a little easier than it is.” She was happy and I charged her \$64.00.

A week later she called again. It had rained again, before they could clean out the gutters. She said, “My husband tried to fix it this time and he really broke it.”

He had attempted the same repair and ripped apart the door switch. I had to charge her again, plus the switch.

I can just imagine the conversation that ensued, when it rained a second time..

“Look, honey, I don’t want to pay that guy again. It only took him 10 minutes and I watched the whole time. There was nothing to it. I’ll show you exactly what he did and we can save a second \$64.00.”

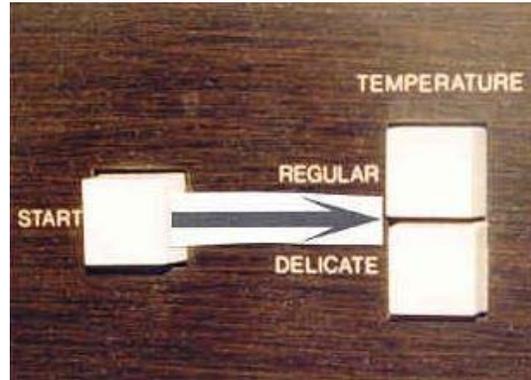
Fig044_07
Door Switch



Thermostats

The only thermostat that fails with any regularity is the high limit mounted on the heater box. It is a “stand off” style and must be bought by Maytag part number. The wiring burns off and as we know that means a new thermostat, not just new wires.

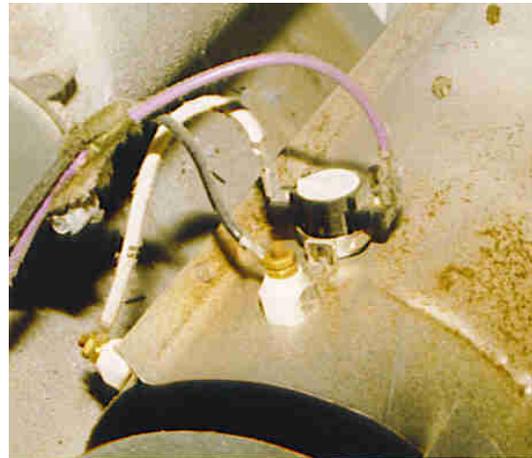
Selector in the “Dead Spot”



Temperature control switches do not have positive lock positions. With neither selection depressed, no power will get to the gas valve.

“My dryer won’t get hot.”

High limit Thermostat



Drive Motor

Replacing a Maytag drive motor is just about as time consuming as a GE. It has one further disadvantage. Often the drive pulley is so tight that it needs to be heated to get the set screw loose.

Uncle Harry's
Trick of the Trade # 77

When purchasing a motor buy a drive pulley at the same time and save yourself the potential for a lot of grief.

Drive motors can fail in any of the ways previously discussed, but usually they lock up and hum.

Fig044_08
Drive Motor



Maytag “Halo of Heat Dryers”

The older style which was used in the 60's and 70's was a V-belt pulley style. A fair number are still in service today. First and foremost, the dryer is a completely different design from what we just discussed. It is a rear service unit with a wrap around cabinet. The heating element is in a ring, very similar to the GE. It is mounted on the front of the dryer like a halo around the door, rather than the rear. The drum of the dryer is hanging in space held in position by a shaft at the back. A bearing housing mounted on the base plate of the dryer supports the basket.

The dryer is completely rear service. When the rear panel is removed, the structure of the dryer is lost. It sags so much that, the rotating drum will rub up against the frame.

A quick run through the problems typical of this dryer:

1. The “V” belts wear out and the tensioning system doesn't have enough force to keep the belts under tension. Often low “V” belt tension is caused by a bad motor pulley. A strange at it may sound, **motor pulleys** on the older style dryers wore out.. If you find a dryer that doesn't go fast enough, even with new belts, change the green motor pulley.

2. The next common weak spot is a dragging blower bearing. The blower is in a housing in the center of the dryer. The bushings get tight and the blower slows down. Oiling will not work, clean the shaft and replace the blower.

3. In order to test the electric heating element, it is necessary to take the top off. If the heating element needs to be replaced, the wrap around three-sided sheet metal frame needs to be taken completely off. Replacement will take over an hour. Price the job accordingly.

4. Gas "Halo of Heat" dryers have a small access panel on the lower right front. It is possible to remove the gas valve through the hole to service the pilot light system. It is the capillary type that was pictured under general type gas heating systems

Fig044_09

Old Halo of Heat Dryer



Sample Flat Rate

Following is *Uncle Harry's* suggested pricing for typical dryer repairs. A complete set of flat rates is in the Flat Rate Book.

Maytag Dryers

Belt around the drum

Description of the Job

Price

Description of the Job	Price
1) Install new belt (312959)	\$115.00
2) Install belt and idler pulley (303705)	145.00
3) Install drum rollers (303373)	145.00
4) Restring heating element (3-13538)	159.00
5) Replace blower (303836)	140.00
6) Replace thermostat	145.00
7) Replace door switch (16805)	88.00
8) Replace gas igniter (304970, 279311 or 303376)	125.00
9) Replace igniter sensor	125.00
10) Replace coil kit (SCA700 or 279137)	145.00
11) Replace drive motor (303358)	190.00
12) Rebuild front glide pair (306508, pop-rivet gun needed)	155.00
13)	
14)	

Maytag Dryers

Halo of Heat Models

Description of the Job	Price
1) Replace blower fan (3-843)	140.00
2) Replace heating element (3-11946)	170.00
3) Replace belt set (2-11012 & 2-11013)	135.00
4) Replace pilot capillary safety	145.00
5) Replace drive motor and pulley (3-2278)	195.00
6)	
7)	
8)	

Examination

Automatic Maytag Dryers

(Some questions may have more than one correct answer. Unless noted all questions apply to the current style.)

1. Rethreading a Maytag belt
 - A. is the fastest of all.
 - B. can be done from the front.
 - C. takes longer than Whirlpool.
 - D. requires practice.
2. The Maytag dryer
 - A. should be thrown on the junk heap.
 - B. is serviced from the front.
 - C. is serviced from the rear.
 - D. is a problem to diagnose.
3. The dryer belt
 - A. is reversed from other brands.
 - B. is hard to locate.
 - C. is expensive.
 - D. is fragile.
4. When replacing a belt
 - A. get ready for trouble.
 - B. replace the idler pulley.
 - C. grease the motor.
 - D. always check the rollers.
5. Maytag fan blades
 - A. are highly reliable.
 - B. can often be replaced from the rear.
 - C. wobble and make noise.
 - D. are a common problem.
6. Most mechanics
 - A. restring the heating element.
 - B. stay away from Maytag.
 - C. thread the belt from the rear.
 - D. A, B, & C..
7. Heat selector switches
 - A. shut down the dryer.
 - B. can be bypassed.
 - C. have dead spots
 - D. cause odd failures.
8. Gas valves
 - A. are unique on Maytag.
 - B. are the same as any other brand.
 - C. fail often.
 - D. none of the above.
9. On a "halo of heat" model
 - A. expect to spend more time than average.
 - B. service is from the rear.
 - C. the motor pulley wears out.
 - D. A,B,& C.
10. A worn front support
 - A. frequently occurs.
 - B. can make noises in the back.
 - C. seldom occurs.
 - D. none of the above.

Examination Answers

Automatic Maytag Dryers

(Some questions may have more than one correct answer. Unless noted all questions apply to the current style.)

1. Rethreading a Maytag belt
 - B. can be done from the front.
 - D. requires practice.
2. The Maytag dryer
 - B. is serviced from the front.
3. The dryer belt
 - A. is reversed from other brands.
4. When replacing a belt
 - D. always check the rollers.
5. Maytag fan blades
 - C. wobble and make noise.
 - D. are a common problem.

6. Most mechanics
 - A. restring the heating element.

7. Heat selector switches
 - C. have dead spots

8. Gas valves
 - B. are the same as any other brand.

9. On a "halo of heat" model
 - A. expect to spend more time than average.
 - B. service is from the rear.
 - C. the motor pulley wears out.
 - D. A,B,& C. All of the above.

10. A worn front support
 - C. seldom occurs.

Raker

Appliance Repair Professionals, Inc.

Automatic Off-Brand Dryers

Part 5, Including
Westinghouse, Norge, Frigidaire, Amana

Manual 4

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Off Brand Automatic Dryers

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Dryers, The Other Brands

The vast majority of dryers that you will service have now been covered in detail. As you have seen there is a great deal of similarity between brands. Years ago it was totally different, a great deal of variety existed and a lot more experience was necessary.

The distribution of the off-brand dryers parallels that of the automatic washers. We'll cover the brands in the same sequence that we did on the washing machines. Even the off-brands utilize the same design methods as the major brands. The components don't interchange but the logic and locations of the parts are still the same. To round out your laundry equipment education we will go over some of the highlights in the rare brands. We will go over obvious weak spots and major design differences. Basically your knowledge of the major brands will enable you to easily service any stranger.

Fig045_01
Norge Dryer
(Very Similar to Maytag)



Norge dryers

Like the Norge washers, they were very popular back in the 60's and 70's. The Norge dryer actually held up very well. It had one consistent flaw; it was always a big lint producer. The drum, rather than being under a slight vacuum as are all others, instead was under pressure. Lint would squeeze out any crack in the seals as the fan constantly pressed air against them.

They were an early belt-around-the-drum style. The construction was very heavy and the dryers lasted a long time. They have one primary weak spot, the design of the blower hub bearing. The blower on the Norge dryer is a very large fan that covers almost the whole rear of the drum. It is belt-driven from the back end of the motor and rotates at a high speed.

As the dryer ages, that bearing will seize, and begin to make unusual noises. It is necessary to remove the top, the front, and the basket to access the fan hub. The dryer basket is held in by a bolt covered by a chrome cap in the center of the back of the basket. Replacement of the blower hub is fairly easy. Take care to get the shims right, so that the basket does not bind as it slowly rotates around the common shaft with the blower fan. This model dryer is always a mess. It's always filled with lint and needs to be vacuumed out whenever you do a repair.

However, few of the old style are still running. The current Norge style dryer is almost identical to the Maytag; naturally, Maycor now owns it. In fact the plastic blower fan, which causes problems on the Maytag, causes problems on the Norge.

Uncle Harry's
Trick of the Trade # 78

A Whirlpool drum belt is an exact fit for a Norge.

If in a bind a Norge blower will fit a Maytag but not the reverse. The Norge is slightly larger in diameter. A Maytag blower will rub against the Norge housing.

Fig045_02
Installing a Whirlpool Belt on a Norge



The current style Norge has not been on the market long enough to develop a pattern of failures, except for one thing. The heating element has problems. On the side of the heating element is a thermal fuse. When the thermal blows, just like it does on the Whirlpool design, the dryer goes dead. The thermal fuse is mounted right next to the high limit thermostat. Apparently there is a design problem and the heat builds up too easily. It also appears to be very sensitive to partial vent clogging.

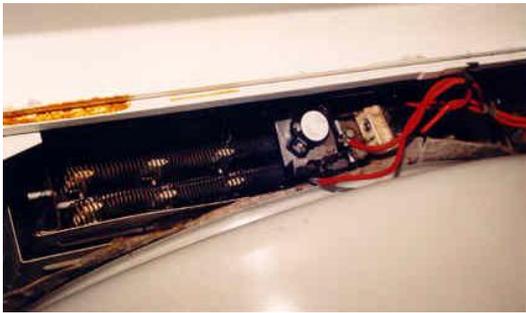
The repair part includes **both** the high limit thermostat and the thermal fuse. Both must be replaced simultaneously for a proper repair. It's safe to assume that as the Maytag quality philosophy gradually works its way through the Norge organization, the quality of the Norge products is no doubt going to improve.

Amana

The Amana dryer utilizes the Norge design. The Speed Queen dryer is very rare, like the washing machine. It utilizes the belt-around-the-drum concept and copies the Norge system of drum rollers and rear support shaft. If you happen to encounter one, go with the basic design knowledge that you have from the other brands and apply it to the stranger.

Fig045_03

Norge Element, High Limit and Thermal Fuse



Frigidaire

The current design of the Frigidaire style dryer utilizes the universal belt-around-the-drum concept, but it is unusual in that it does not have rear drum support rollers like most of the other brands. Instead it has a center shaft with a ball on the rear end that sits in a nylon bearing. Westinghouse initially used this design many years ago.

This is similar to the GE dryer design and like the GE, it is a weak spot. As the dryer ages, the lubricant dries out on the rear drum bearing and the dryer begins to squeak as it turns. If ignored, it gradually grinds itself to pieces, the shaft is sheared off, and the back of the drum actually drops. The repair kit is reasonably cheap and the job is worth doing. Felts support the front of the drum. Under heavy use, they wear out.

Fig045_04
Kelvinator Showing the Rear Basket
Ball



The older Frigidaire models used a series of five rollers to support the basket. Often they need to be replaced as a set. Several design changes were made in this model because the rollers failed too quickly.

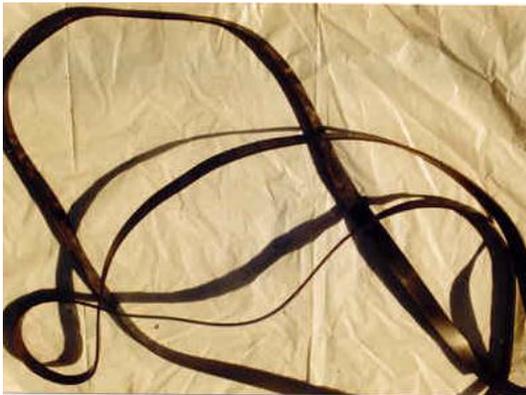
Fig045_05
Frigidaire Roller



Westinghouse

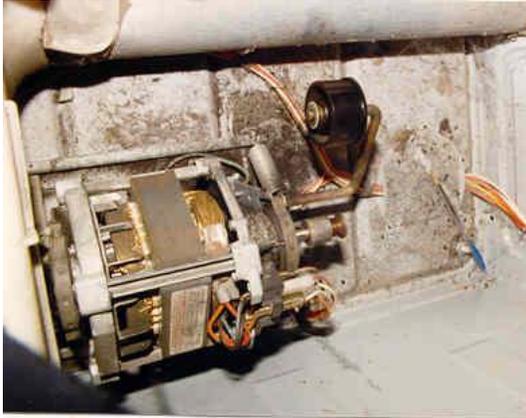
Also part of the Frigidaire family is the old Westinghouse. Westinghouse dryer design is easily recognized by a flat belt without ribs.

Fig045_06
Westinghouse Belt



The Westinghouse design uses the rear support ball, a rear electric element like G.E. and a layout like Maytag.

Fig045_07
Westinghouse Motor and Idler



As quickly becomes obvious, the various off-brand designs are just variations of designs already described.

We have extensively covered every aspect of laundry equipment design and troubleshooting. You are now ready to repair any washer or dryer ever made. Nothing will surprise you. Every possible failure has been gone over in detail. The only subject not fully covered is electrical trouble shooting. That comes next, in Lesson 5.

Fig045_08
Westinghouse Idler Assembly



Sample Flat Rate

Following is *Uncle Harry's* suggested pricing for typical dryer repairs. A complete set of flat rates is in the Flat Rate Book.

Frigidaire Dryers

(Westinghouse & Kelvinator)

Description of the Job	Price
1) Replace belt (5303281154, 5303161099 or 5308057424)	\$95.00
2) Replace rear drum bearing (5303281008)	135.00
3) Replace belt and idler assembly (5303212849)	130.00
4) Replace heating element (5303937005 or 5309956777)	165.00
5) Replace blower wheel (5306599498)	145.00
6) Replace drum support rollers (5309956509 or 5308057416)	148.00
7) Replace front glide (5303937123 or 5308950195)	140.00
8) Replace door switch (5300184701)	85.00
9) Replace motor (5300603182 or 5300603185)	275.00
10) For gas ignition problems follow Whirlpool pricing	
11)	
12)	

Examination

Automatic Off Brand Dryers

(Some questions may have more than one correct answer.)

- | | |
|---|---|
| <p>1. The off-brand dryers</p> <ul style="list-style-type: none">A. represent a small part of the market.B. are similar to others.C. are very popular.D. are expensive. <p>2. Westinghouse dryers</p> <ul style="list-style-type: none">A. use "V" belts.B. are laid out like Maytag.C. use a flat belt.D. are very popular. <p>3. Some Norge parts</p> <ul style="list-style-type: none">A. are reversed from other brands.B. are hard to locate.C. are expensive.D. interchange with other brands. | <p>4. When replacing a Norge thermal fuse</p> <ul style="list-style-type: none">A. replace the wiring.B. check the rollers.C. grease the motor.D. replace the high limit too. <p>5. Norge fan blades</p> <ul style="list-style-type: none">A. are highly reliable.B. can often be replaced from the rear.C. wobble and make noise.D. are a common problem. <p>6. A Kelvinator weak spot is</p> <ul style="list-style-type: none">A. the heating element.B. the rear ball and shaft.C. the drive belt.D. A, B,& C.. |
|---|---|

Examination Answers

Automatic Off Brand Dryers

- | | |
|--|---|
| <p>1. The off-brand dryers
A. represent a small part of the market.
B. are similar to others.</p> <p>2. Westinghouse dryers
C. use a flat belt.</p> <p>3. Some Norge parts
D. interchange with other brands.</p> | <p>4. When replacing a Norge thermal fuse
D. replace the high limit too.</p> <p>5. Norge fan blades
C. wobble and make noise.
D. are a common problem.</p> <p>6. A Kelvinator weak spot is
A. the heating element.
B. the rear ball and shaft.
C. the drive belt.
D. A, B,& C..
All but especially B.</p> |
|--|---|