

## Water Valve Information

(Version 5)

*Valves may be supplied with bracket, illustration 6, if not required through into "Yellow bin"*

The following is an extract from my book "Australian Washing Machine Repairs" by Lindsay Alford.

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## Fair Warning

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I cannot guarantee your skill and knowledge in using the information

Repairing electrical appliances can be dangerous and the risk of electric shock is always present. It can be fatal! Read the section on "A1 Electric Shock". Improper repairs can make the appliance dangerous and can cause a fatal electric shock to the operator.

If you do not have the skills and knowledge to repair the appliance, do not do it, get an experienced qualified person.

**Always turn off and pull out the plug before removing any covers or touching wires or terminals!**

## A. Occupation Health & safety

### A1 Electric Shock

Electric shock is most unpleasant and can be fatal. It is important to adopt safety rules to avoid making contact with live parts. See section C6 for more details.

## **A1.1 Safety Rules**

1. Turn off and pull out the plug when making repairs to electrical appliances
2. Only test appliances when plugged into a portable safety switch (RCD) and an ammeter as described in appendix A
3. Only work when you are not tired, affected by alcohol or drugs.
4. Wear rubber soled shoes or boots. If your socks get damp when you stand in a puddle of water it is time to buy a new pair. Rubber sole will develop cracks when they become old, allowing water to enter. This lowers the insulation of the boot!
5. When making repairs it is often necessary to touch or put tools on possible live wires or terminals. Before touching them check to make sure that the lead is unplugged. Make it a habit, even if has been unplugged..
6. Use insulated screw drivers, but use other safety work practices as the first line of defense.
7. Be aware of charges in capacitors, they can give an electric shock. See section F7.4 and D6 for more details.

## **A1.2 Testing Live Equipment**

Sometimes it is necessary to test live equipment to make voltage measurements or to power up an individual component to test it. This should be done with great care!

1. Power up using a safety switch. Rule 1.1.2 above.
2. Turn off the power and unplug as soon as you have finished. the test. You can forget to do this, think about something else and later touch live wire or terminals.
3. Before power up make sure that you can put the voltmeter probe on the required location, keeping safe distances from live components and moving parts.
4. Keep other people a safe distance away.
5. When working on live equipment use only one hand and it is best to keeping the other hand in a pocket. See section C7 for the reason.

**Other hazards** are cuts, infection and manual handling, see my book for more detail.

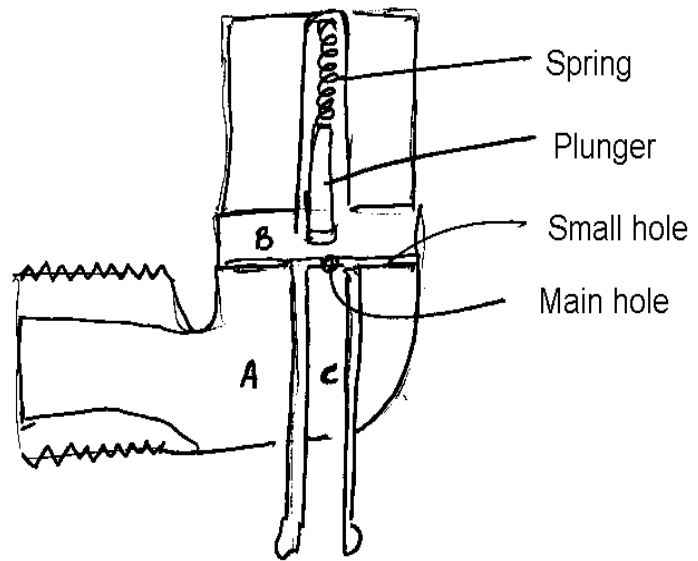
## E2 Water Valves

Water valves control the flow of water into a washing machine.

### E2.1 Water Valve Operation.

When water is applied to the valve, water flow through small holes in the rubber diaphragm. This causes pressure in chamber (B) above the diaphragm. This forces the diaphragm to close the outlet at 'C'. The valve is operated by passing a current through the coil pulling the plunger up opening the main hole. This reduces the pressure in "B", water cannot flow fast enough to keep "B" pressurised. The diaphragm lifts allowing water to flow from "A" to "C"

The valve closes again when the power to the coil is removed, the plunger drops closing the main hole. Chamber "B" becomes pressurised by leakage through the small holes, forcing the diaphragm to close.



Water valve parts

*Illustration 1: Water Valve*

### E2.2 Water Hammer

The closing of the valves is fast causing a shock wave or vibration in the plumbing system and this is caused water hammer. Water hammer arresters can be fitted between the taps and the inlet hoses. These reduce the water hammer but not completely remove it.

## E2.3.0 Faults

### E2.3.1 Slow Fill

This is the most common fault now with water valves. The flow rate is reduced and it takes a long time to fill the wash tub. The valve may become noisy. It is caused by the rubber diaphragm stretching and not allowing it to open fully. Some valves you can pull apart and see this. To fix, replace the valve.

### E2.3.2 Slow Turning Off

When the power is to the valve, water continues to flow for a short time. It may cause the washing machine to overflow. It may be caused by dirt in the valve, the plunger not moving freely or faulty diaphragm. To fix replace the valve or clean it if possible.

### E2.3.3 Not Turning Off

The valve fails to turn off causing the washing machine to overflow. If the inlet tap is turned off and the power is also off the valve may close. Carefully check the valve by



*Illustration 2: Water Hammer Arresters*

turning the power on and off. Also it may become faulty until it has operated for a short time. Cause and the fix is the same as "slow turn off." (Above.)  
Water valves may drip with gravity feed systems as the water pressure turns off the valve.

### E2.3.4 No Water Flow

No water flow from the valve. It is caused by:

1. Tap is turned off or there is no water! The customer should find this one!
2. The coil is open circuit. When the coil fails it may produce smoke or burn marks on the coil. Often there is no visual evidence a faulty coil. To test use multimeter on a mid ohm range, the resistance for a 240V coil will be about 3000 to 4000 ohms. An alternative test is to power up the valve using a suicide lead. **See safety precautions in OH&S Testing live equipment.** To fix, replace the valve or coil.
3. The plunger rusted or jammed. Fix by replacing valve or cleaning

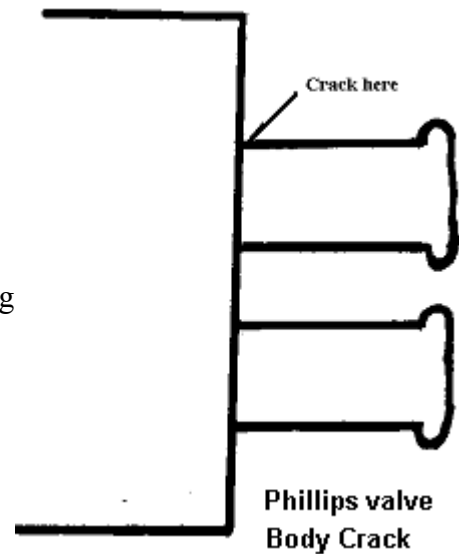


Illustration 3: Cracks

### E2.3.5 Body of Valve Leaking

Water leaks from the water valve

1. The body develops a small crack causing the valve to leak water.
2. Connection to the valve with the inlet or outlet hoses, fix by tightening the connections. See also hoses.
3. Phillips valve can develop cracks on the inlet hose nipple. This is caused by the hoses being pulled or a force is applied to the hose.

In all cases replace the valve



Illustration 4: Valve 90 deg

### E2.3.6 Water flowing back through the valve.

Water valves will stop the water flow in one direction only. If only cold is connected water may dribble back through the hot hose. To fix put a blanking cap on the valve, connect it to the tap, tie the hot hose up high or knick the hot hose.

## E2.4 Types of water valves

### E2.4.1 Phillips Valves

Double Phillips or Goyen valves as used on early Simpson or Hoover washing machines. These have a hot and cold inlet and a single outlet. Inlet hoses are 12mm (1/2in) and are held on with hose clamps.

### E2.4.2 Single valves

Single valves are of two types, 90° and 180° with a 10mm outlet. The inlet is a 3/4 BSP thread (Standard tap thread) These are the most common types on Australian washing machines. They are also available in 12mm outlet.

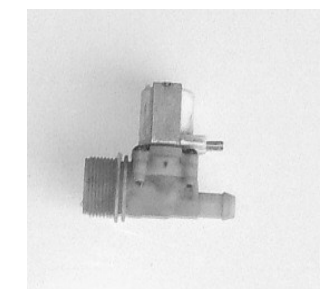


Illustration 5: Valve 180 deg

### E2.4.3 Double "Y" valve

A single 3/4 inch BSP inlet with two valves and outlets. Use with some front loader washing machines with soap draws for the cold water fill. One valve is a standard fill and the other is for fill with rinses aid. Some machines (i.e.



Illustration 6: Valve Bracket  
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Gorenje Pacific) have a resistor in the rinse aid fill. Fitting a valve with out this will cause the water to overflow in the soap draw. Some machines have a triple valve.

#### E2.4.4 USA water valves

These are double (and sometimes triple) valves. They have a hot and cold inlet and a single outlet. The inlet thread is  $\frac{3}{4}$ " USA tap/pipe thread which has less threads per inch (Coarser). Nut and tails or inlet hoses are available

#### E2.4.5 Dishwasher Valves

These are standard valves with a slow fill rate to avoid splashing and leaks at the door seal. Standard valves have a flow rate of 15l/min and dishwasher valves have 7l/min.



Illustration 7: Valve "Y"

#### E2.5 Electrical connections

Most water valves have 240V AC coils for operation. Some machines have with electronic controls may have other voltages. Fisher & Paykel have 12V and 24V coils. Some Japanese washing machines have 240V to 110V transformer and may have 110V coils. The voltages should be marked on the coils so check before replacing.

#### Wiring

With an AC coil there is no positive or negative terminals (or active or neutral) and the wire can be connected either way round. However ever the wires going to the different valves must not be mixed. The valves coils have a common neutral which loops from cold to the hot valve. The hot valve wire and the cold valve wire comes from the heat switch or controller.



Illustration 8: US Valve

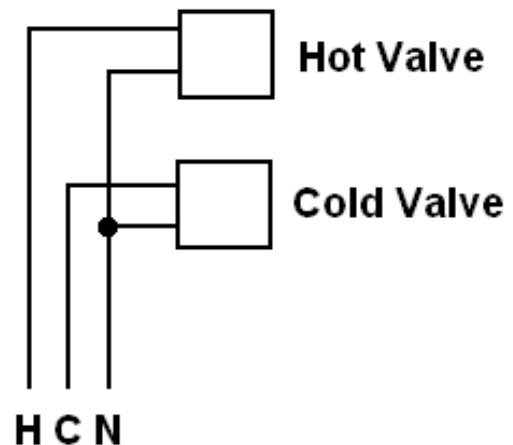


Illustration 9: Valve Wiring

## **Model Information**

### ***G Simpson Top Suspension Washing Machine***

#### **G4.1 Water Valve Problems**

See section E2 on water valves and faults. Machines can have either 90° or 180° so it is wise to view them before getting them. If possible reduce the pressure in the inlet hose by turning the valve on. Remove the nut & tail from the valve. Remove the control panel (G2.2). The outlet from the valve is by a short rubber hose to the spray in to the wash bowl. Some machines this is in the control panel and others it goes through a hole under neath the control panel in which case you have to remove the top (G2.3) The valve is held in by a plastic clip. Be careful removing them as they can break. If it breaks, use a small self tap screw to hold it in place. (Drill a small hole for the screw)

### ***H Hoover Capacitor Run Motor Machines***

#### **H5.1 Water Valves**

All Hoovers are fitted with 90deg valves . See E2 on water valves.

##### **H5.1.1 Water Valve Replacement (Large Machines)**

1. Move the machine out from the wall to make working space. (for 3).
2. Remove the front panel. (H2.2)
3. Hinge the top up (H2.3)
4. Using multi-grips remove the spring hose clamps and remove the hose.
5. Remove the wires
6. Unscrew the inlet hose
7. Undo the screw in the holding plate and slide it off
8. Remove the valve.
9. Reassemble is the reverse.

This is different to the Hoover 600-900 washing machines.

##### **H5.1.2 Water Valve Replacement (Medium Machines)**

1. Unscrew the inlet hose
2. Remove the control panel (H3.1).
3. Remove the wires
4. Remove the metal holding plate and remove the valve.
5. Remove the rubber tube joiner and put on the new valve.
6. Reassemble is the reverse taking care every thing pushes back correctly.

### ***J Hoover Washing machines (600-900 series)***

#### **J2.3 Water Valves (Access).**

Water valves. Phillips water valves are accessed from the back (pull the machine forward a little) on a small plate held in with 2 screws. Earlier models require the front panel and top to be lifted to get to the screws from the inside.

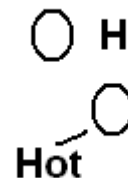
#### **J3.1 Water Valves**

See E3, replacement remove mounting plate (J2.3). It is easier to remove the coils (4 phillips or Pozidriv® screws than to remove the hoses and refit them. The body of the valves can leak, see E2.3.5

## J-D2 Water Valve Connections

(see illustration 9)

Hot.	White/Red/black	W/Red/gray
Neutral	White/Black	W/Red/Pink
Cold.	White/Pink	W/Pink



## K Simpson 144-175 and Delta

### K2.3 Water Valves. (Access)

A small panel hold the Phillips water valve, the opening is a tight fit to pull it clear of the machine.

### K3.1 Water Valves.

See water valves E4. Access K2.3. Replacement see Hoover J3.1

*Illustration 10:  
Hoover Valve  
Hose  
connections*

## M Fisher & Paykel

### M4.1 Test Procedures

Fisher & Paykel have a fairly consistent method diagnostic using the internal program, unlike some dishwashers.

#### M4.1.1 Initial Test

Turn the machine on. If no lights (LED) are lit then the motor control board has a blown fuse. Experience has shown that it is a waste of time replacing the fuse as a major electronic fault has occurred in the circuit and the fuse will blow again. Later model have a soldered in fuse which is not easy replaced.

Press the sequence of buttons as describe in M4.2. To get into test mode. To exit press the power button to turn off.

1. Checking the water valves: Pressing the *Temperature Up* button up turns on the hot valve, pressing the *Temperature Down* button turns on the cold valve. The lid can be lifted and the flow rate checked. Replace slow fill valves as in M5.5/M7.5
2. See my book for other tests

#### M4.2 Test Mode

To do the test in M4.1.1 you need to enter the test mode by:

Turn on the machine so no lights are visible. If light are visible, press the *Power* button until no lights are visible.

#### Most machines

Press and hold down the *Wash Temp Down* button and press the *Power* button. All the LED will light for a short time (*Advance* button will speed the turn off process) The machine may give 2 short beeps. You should be able to the M4.1.1 tests. To exit test mode press the power button.

#### M5.5 Water Valves

The water valves are tested M4.1.1.1 and have the same problems as other water valves. (E2), replacement see M7.5.

## M7.5 Water Valve Replacement

Test M4.1.1.1, faults M5.5. Remove control panel (M3.1). A plastic holder with 2 screw at the back holds the valves in place, remove. I find it easier to cut the back of the control compartment so that the valves can side upwards. A hacksaw or tin snips can use for the cutting. Slide the valve out, have a **cloth to absorb any water** as any leaks will run into the out of balance switch. Swap the seal ring, be careful not to break it, use small screw driver and gentle lift it over the ridge. (F/P do not supply them with there valves). Now put the new valve in place. **Test for leaks by using M4.1.1.1** before fitting the control panel.

### Valves and Cheaper Alternative

The water valve coil is 12V (spade connectors) or 24V (miniature connectors). The hot is a standard valve except for the coil. That cold valve is a variable flow valve. Genuine valves are expensive and as the main fault is the failure of the rubber diaphragm. I use a standard 240V valve as used in Hoover and Simpson and swap the coil. The coils pull off, a screw driver under the coil can help but be careful not to break the plastic. It also works for the cold valve but the temperature regulation is not as good. The coils just pull off and push on. The coils are reliable. Replacing the cold valve will only effect the wash temperature a little, other wise it works OK. Non-genuine 12V and 24V valves are now available at a reasonable price.

### Further Information and Filling Problems

Not all filling problems are due to water valves. When filling the bowl will rotate while filling. I the out of balance switch is faulty the machine will start to rotate/fill and stop, it will repeat this. I have made up a plug form a scrapped machine, that bypasses this switch. The switch is under the main (motor control ) PCB. Removing the blue, green or yellow with the water cooled heat sink requires a dry rag to catch any water. The plugs are all different so they should all fit back correctly. If the switch shows signs of corrosion it is likely to be faulty. I can supply these switches.

**Some error code for water valves** (see [washfix.com.au](http://washfix.com.au) and follow the links to information for more error codes)

**48** (00110000) Valves giving incorrect feedback signal

Wiring Fix/Check Check wiring harness and correct connection to valves or pins are not not backwards

Valves Fix/Check Check valve coil resistance. (use a \$10.00 digital multimeter from Jaycar, DSE, Car parts supplier etc. ) The resistance should be: 24V valves 64ohms, 12V valves 19ohms

Motor PVB Fix/Check Replace/Repair

**49** (00110001) Cold valve faulty, see 48

**50** (00110010) Hot valve faulty, see 48

Check the wiring/connectors, check the coil, if open circuit or different resistance, replace the valve, if this does not fix it, replace the PCB

### Fisher & Paykel Special Valves

One model of Fisher and Paykel washing machine has a double valve which combines the hot and the cold valve into a single valve. Since the rubber diaphragm fails, a new one from a standard valve could be fitted. However The valves are glued together preventing this from being done. Some solutions are:

1. Buy an expensive valve.
2. Wash with only cold water. Swap the inlet hoses and the wires to the valves. The hot valve wires will need to be extended.

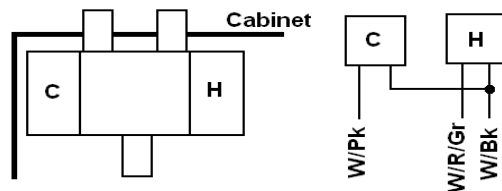


- Fit the mixing chamber from the earlier model and buy 2 valves. Can supply a mixing chamber (with two valves), see F/P parts.

### R Hoover Front Loaders

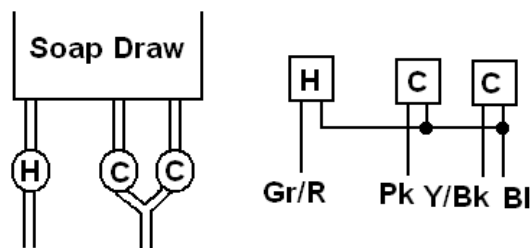
#### R6-H4.2 Water Valve Connections

Phillips water valve connections. (HFL Zodiac 12 480)



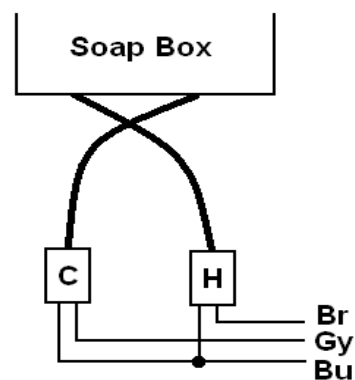
*Illustration 11: Phillips Water Valve*

Hoover front loader with soap draw and “Y” valve, ie Hoover Electra 550



*Illustration 12: Valves with Soap Draw*

### Simpson Front Loader



*Illustration 13: Simpson Valve Connections*