

WF448 Front Load Washer



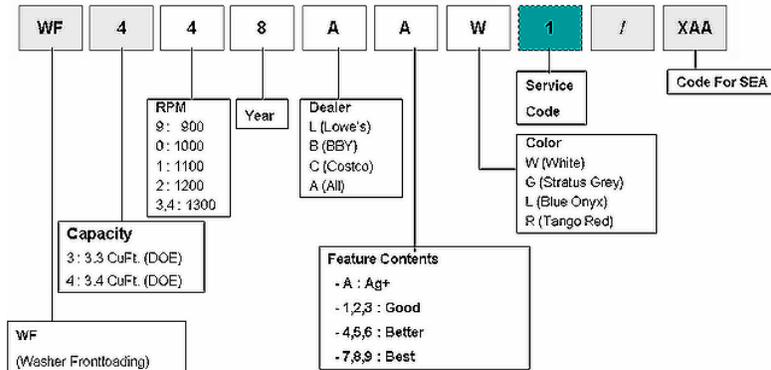
Main Features

- ▶ Large Capacity (4.5 Cu. Ft.)
- ▶ Vibration Reduction Technology
- ▶ Steam Wash/Steam Dry (VRT team™)
- ▶ SilverCare™ Technology
- ▶ Energy-Efficient : MEF 2.7

 Appliance Technical Training

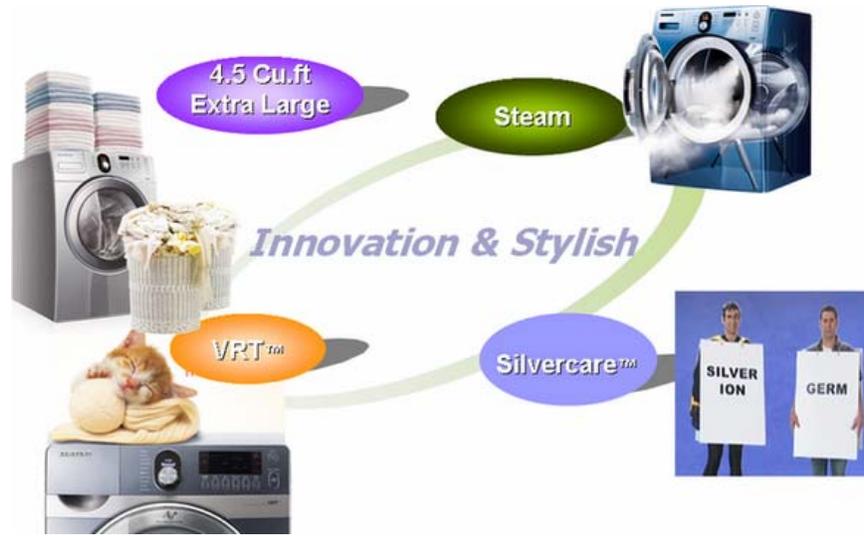
This course will describe the features, service modes, testing and troubleshooting changes of the new large capacity front load washer

Model Number Nomenclature



Model number nomenclature for the Purple project showing how to read the number to be able to tell which features and color the model has.

New Product Features



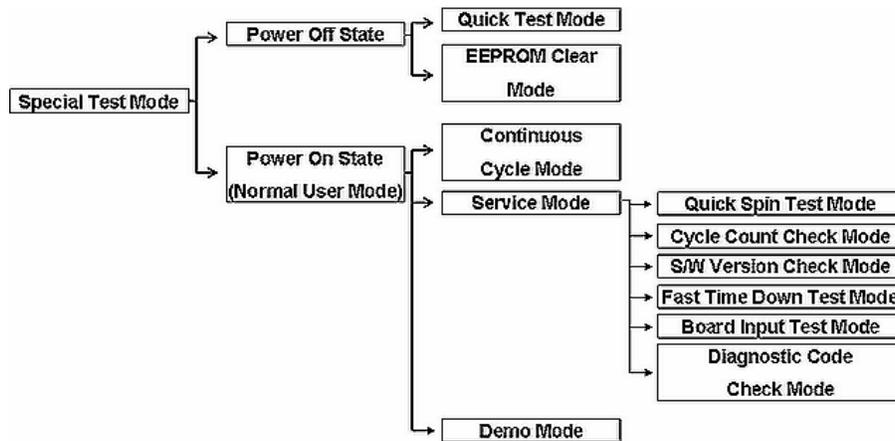
New features for 2008 are a larger capacity, steam, VRT and silver care. The VRT and SilverCare features have been used successfully in the previously marketed models

2008 - 2007 Model Comparison

Project Name	PURPLE	FRONTIER 2
Model Name	WF448AAW WF448AAP	WF337AAW WF328AAG
Image		
Feature	<ul style="list-style-type: none"> - Steam Wash/Steam Dry (VRT Steam™) - Extra-Large Capacity - Vibration Reduction Technology - Stylish design : Center jog - Energy-Efficient : MEF over 2.6 - Diamond drum - Ag+ Sanitization - DD motor - LCD Display 	<ul style="list-style-type: none"> - Silvercare Sanitization - Extra Large Capacity - High Efficiency Energy & Water Saving - Direct Drive Inverter Motor - Woolmark Certified™
Capacity	4.5 cu.ft	3.8 cu.ft

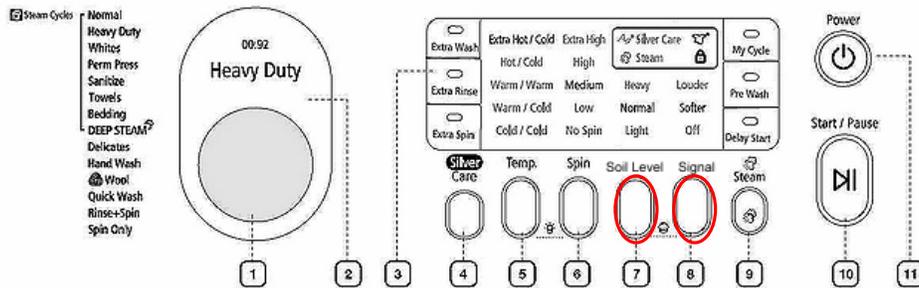
Compared to the top end model from 2007, the 2008 model has many new features including a newly designed drum that is gentler on the laundry during the high speed spin.

Test and Service Modes



There are several test and service modes to help the technician troubleshoot and diagnose various problems in the laundry products. This module will explain how to enter these modes and what tests can be accomplished.

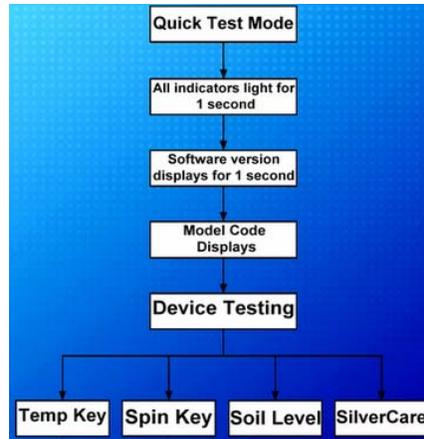
Quick Test Mode



Enter the Quick Test Mode by pressing the soil level, signal and power buttons at the same time

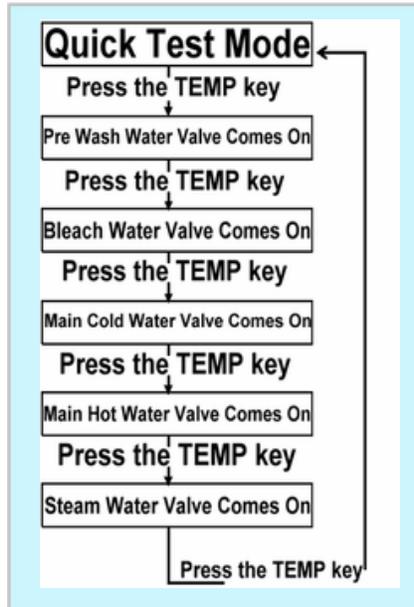
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Quick Test Mode



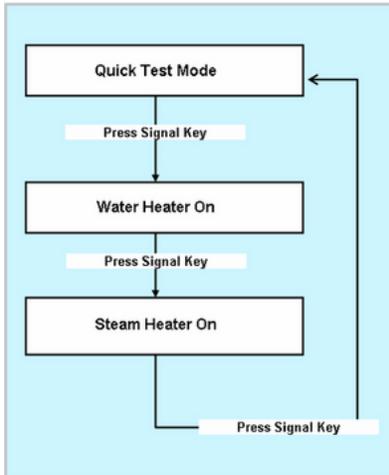
In the quick test mode there are 4 different tests that can be performed through the on board diagnostics. In this mode if the cycle selector dial is turned to indicate "spin" and then the start button is pressed, the technician or installer can go to the quick spin mode which is the high spin drum test. This is necessary for the installer to test level and balance and for the technician to test the drum.

Water Valve Check



In the quick test mode with every press of the temp key a different water valve will be activated until after the last valve and then the temp key will cancel the operation.

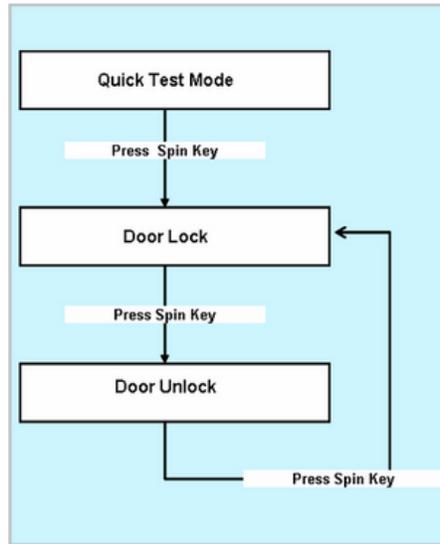
Heater Check



When testing the heaters you will hear the relay clicking to indicate the heater is on and the 120VAC can be measured as well.

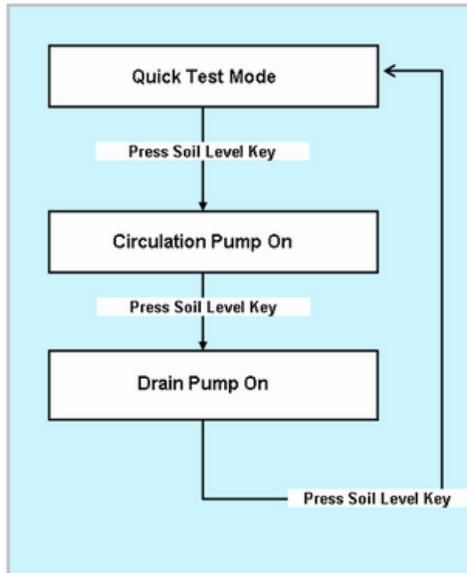
There are 2 heaters in this machine. One for the steam feature and one for the sanitize wash cycle. In the quick test mode press the signal key to first turn on the water heater and then the steam heater and once again to cancel the operation.

Door Lock Check



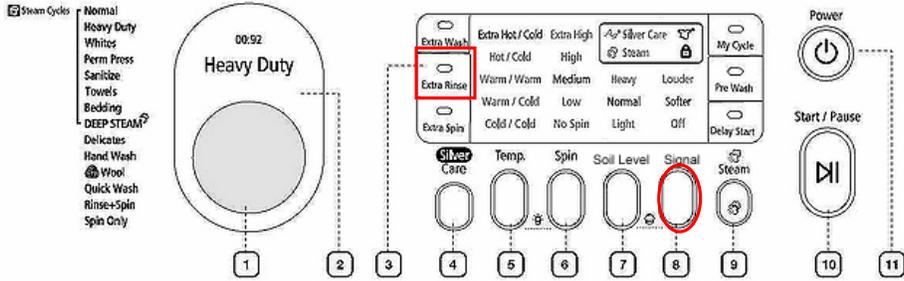
To check the door lock from the quick test mode press the spin key and check the function of the lock assembly.

Pump Check



There are 2 pumps in the purple washer. A drain pump and a circulation pump. They can both be tested by pressing the soil level key in the quick test mode.

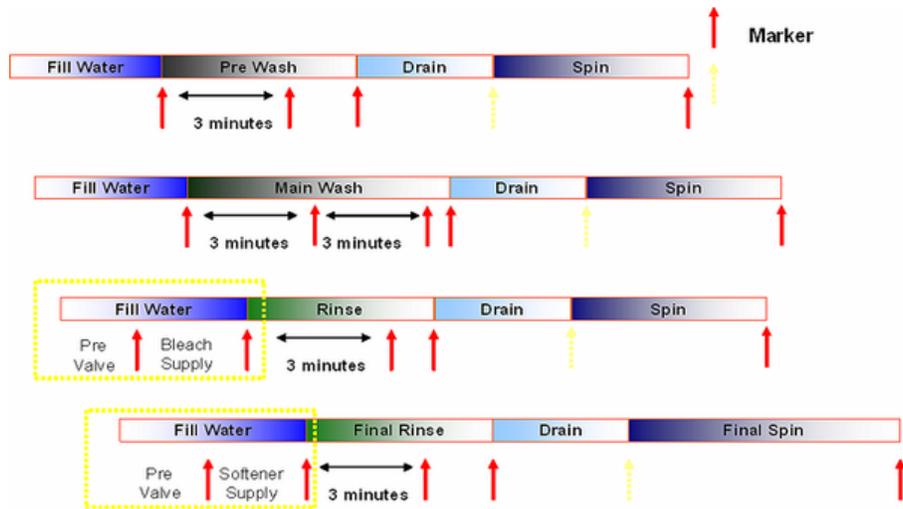
Service Mode



The service mode is entered with the power on and pressing the signal and extra rinse buttons together.

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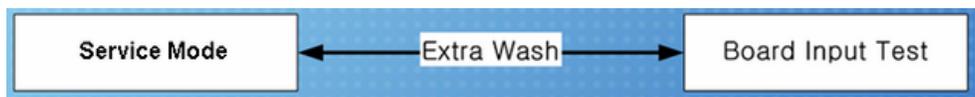
Fast Time Down



To enter the fast time down mode, press the temp button in the service mode

In the service mode press the temp button and the machine will go into a mode the resembles a complete wash cycle in a fraction of the time it would normally take. Every water valve and motor will be used to check operations.

Cycle Selector Test

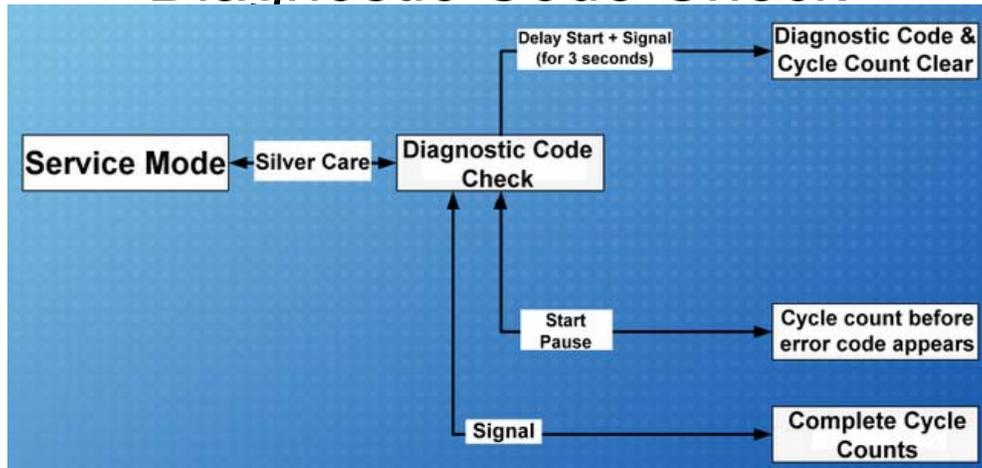


In the service mode press the extra wash button

<u>Cycle selector position</u>	<u>Press Start</u>	<u>Test item</u>
Extra Rinse LED On		Measure internal water temperature
Extra Spin LED On		Door status (open/close)
Delay Start LED On		Door lock status (lock/unlock)
My Cycle LED On		Silver care board

In the service mode press the extra wash button to test, among other items, the temperature of the water in the tub, the status of the door - open/closed and locked/unlocked and the condition of the silver care board.

Diagnostic Code Check



In the service mode press the silver care button until there is a flashing "d" on the LCD display. Turn the cycle selector dial either way and if there are any stored codes they will be displayed

The washer retains 9 diagnostic codes in memory that can be retrieved. In the service mode press the silver care button until there is a flashing "d" on the LCD display. Turn the cycle selector dial either way and if there are any stored codes they will be displayed. For an understanding of these code refer to the error code section of the service manual. Also in the diagnostic code check mode the cycle count of complete wash cycle can be seen by pressing the signal button and the cycle count and diagnostic codes can be cleared by pressing the delay start and signal buttons for 3 seconds.

WF448 VRT Technology



VRT or Vibration Reduction Technology is a simple but effective way of counter balancing the load inside the wash drum.

This presentation will explain the Vibration Reduction Technology feature in the new front load washing machines.

VRT Theory of Operation



Balanced load with VRT

However it takes some time before they are in a position of balance. Until the drum speed reaches approximately 300 RPM the drum will seem to be out of balance.

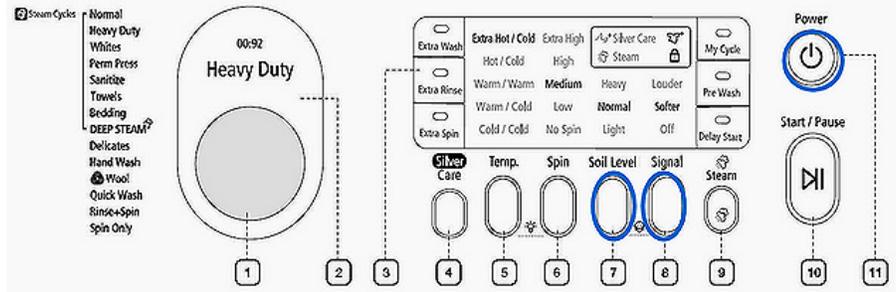
The steel balls will find their balanced position based on the weight of the wash load.



Without VRT the wash load is hard to balance

Seen in this animation is the mathematical equations behind the principal of the VRT system. The steel balls will find their "sweet spot" based on the weight of the wash load. However it takes some time before they are in a position of balance. Until the drum speed reaches approximately 300 RPM the drum will seem to be out of balance.

Testing the VRT System



Enter the "Quick Test Mode", turn the cycle selector to "Spin" and press the "Start/Pause" button

To test the VRT for balance, place approximately 1lb of wet towels into the drum. Put the machine into the quick test mode by pressing the "soil level", "Signal" and "Power " buttons simultaneously. Move the cycle select dial to indicate "Spin" in the LCD display and press the Start/Pause button. The drum will go into the high speed spin and after about 300 RPM will become balanced.

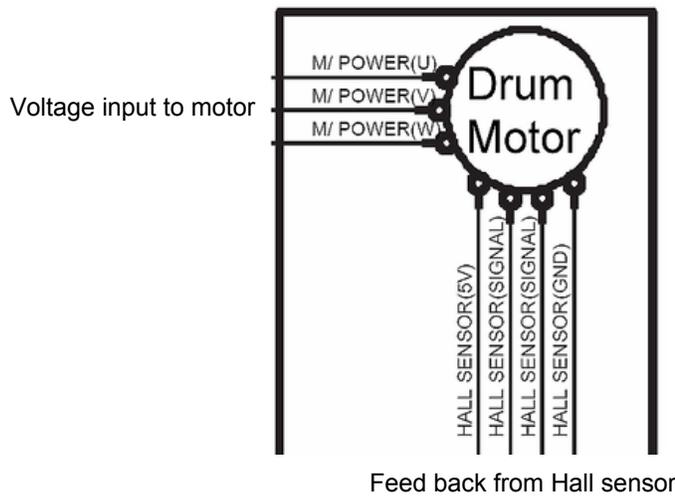
WF448 Drum Motor



Operation, troubleshooting and replacement procedure

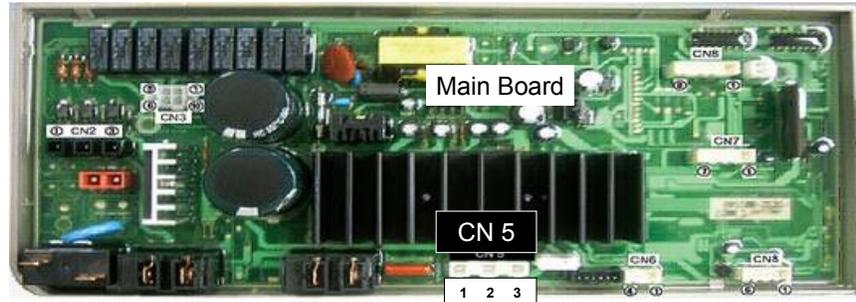
This module will explain the operation, testing and troubleshooting and replacement of the rotor and stator combination drum motor.

Drum Motor Circuit



The drum motor receives voltage to the windings of the stator from the main board. Depending on the speed of the motor different windings will be supplied with the necessary voltage to increase or decrease the speed of the motor including electronic braking. The Hall sensor supplies feedback to the main board to indicate that the motor is moving, what direction the motor is moving and how fast the motor is rotating. The main board then takes this data and converts it to read RPM on the LCD display in the service mode. The Hall sensor is also used for detecting unbalanced conditions.

Troubleshooting the Drum Motor



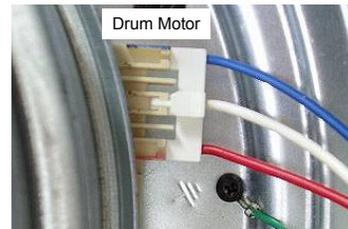
The red, white and blue wires go directly from CN5 to the stator of the drum motor.

Motor Windings Check:

Resistance at Pin #1 and #2 of CN5 = 12Ω

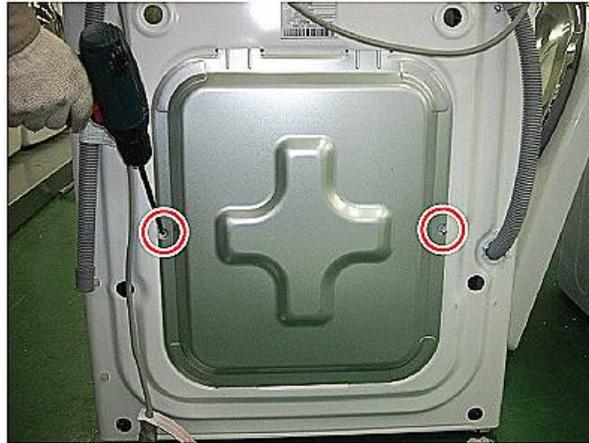
Resistance at Pin #1 and #3 of CN5 = 12Ω

Resistance at Pin #2 and #3 of CN5 = 12Ω



The red, white and blue wires go directly from CN5 to the stator of the drum motor. The resistance or continuity of the stator windings and the wiring harness can be checked together by measuring the resistance from the Main board.

Drum Motor Rotor Removal



Remove the rear access panel to uncover the drum motor

After removing the rear access panel, slide a Philips screw driver into a hole in the rotor and through a stator winding. This will keep the rotor from spinning the drum when loosening the nut. Using a 19mm wrench or socket, remove the retaining nut and washer. Care must be taken to prevent the screwdriver from damaging the stator windings. With both hands remove the rotor from the drum shaft. The splined shaft the strong magnetic pull of the rotor will make this a somewhat difficult task. Reassembly is the reverse procedure but watch your fingers don't get pinched when the rotor pulls itself onto the shaft due to the strong magnetic attraction.

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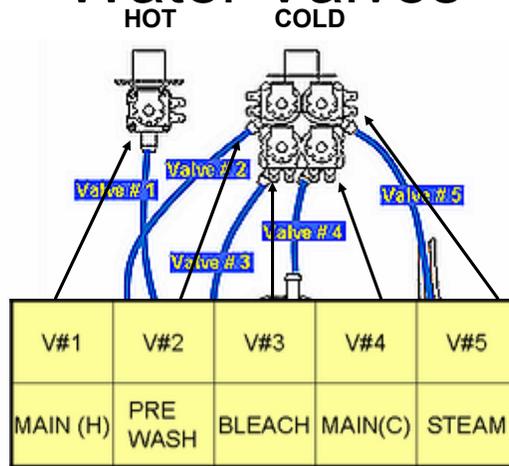
Drum Motor Stator Removal



Remove the 6 - 10mm bolts that secure the stator to the rear tub section

With the rotor removed, remove the 6 - 10mm bolts that secure the stator to the rear tub section. Carefully remove the 2 connectors from the stator first. Reassembly is the reverse procedure.

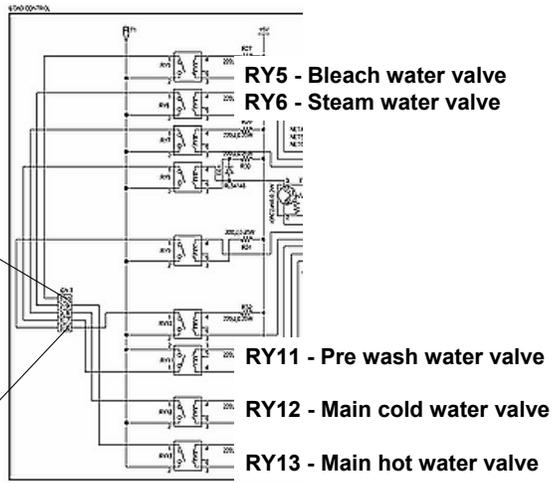
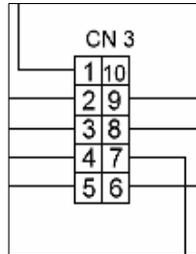
Water Valves



This module will explain the water valve operation and function. Valve 1 is the hot water connection, valve 2 is the pre wash cycle cold water valve, valve 3 is the bleach cycle valve, valve 4 is the main wash cold water valve and valve 5 is cold water valve for the steam function.

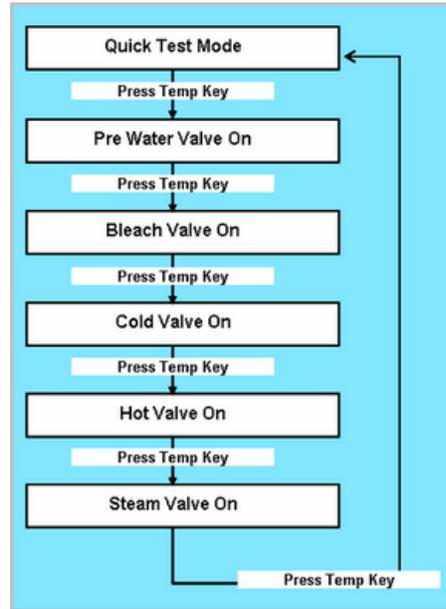
Water Valve Relay Circuit

- CN 3 pin 1 - Pink wire - Bleach valve
- CN 3 pin 2 - Brown wire - Steam valve
- CN 3 pin 7 - Yellow wire - Pre wash valve
- CN 3 pin 8 - Blue wire - Main cold valve
- CN 3 pin 9 - Red wire - Main hot valve



Checking the Water Valves

Enter into the "Quick Test" mode and press the "Temp" button



 Appliance Technical Training

Once in the quick test mode with every press of the temp button, a different water valve will open.

Testing the Water Valves



Water Valve Check

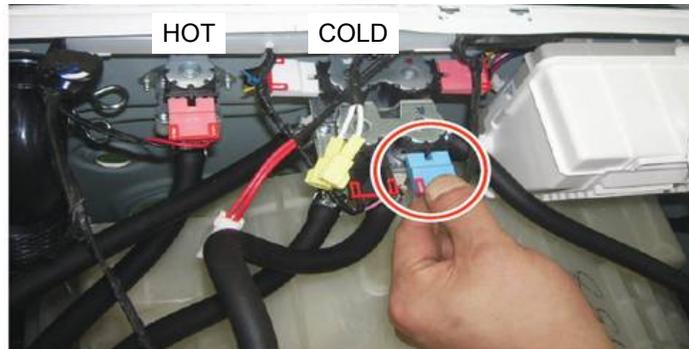
Check the Voltage at Pin #1 of CN2 and Pin #1, 2, 7, 8 and 9 of CN3

When each valve operates the measured voltage is 120VAC

When checking the resistance of the water valve solenoids they should all measure approximately 5 Ω

Checking the voltage to the water valves should measure 120VAC. When measuring the resistance of the valve solenoid at the valve, disconnect the electrical connector and the coil windings should read about 5 Ω

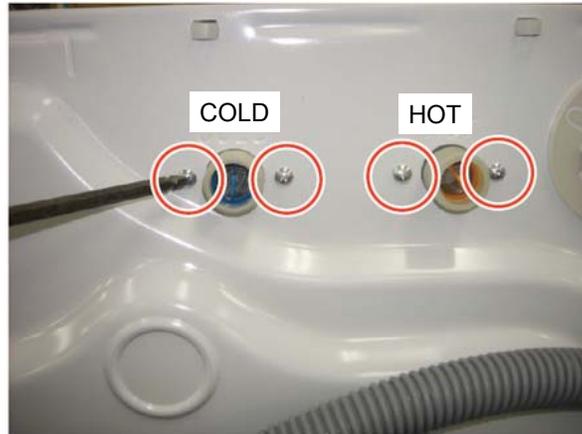
Replacing the Water Valves



The hot water valve is a single valve and the cold valve is a quad valve

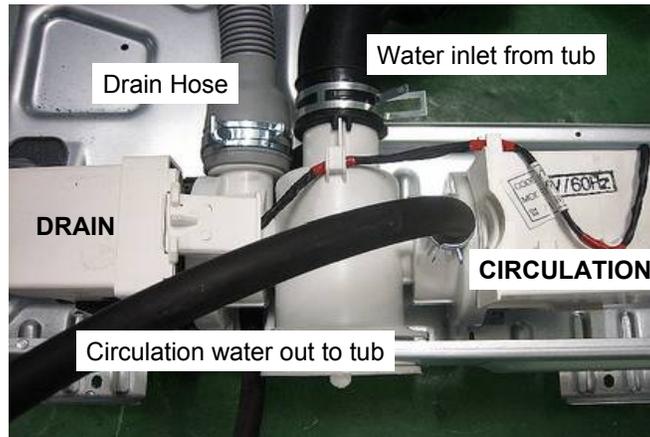
To replace a defective cold water valve all four are replaced as a unit. The hot water valve is replaced independent of the cold water valves. Start by making sure the power is removed from the machine. Remove the top cabinet panel and disconnect the electrical connector(s) from the valve body. When disconnecting the water valves it is important that the correct connector be returned to the correct valve or the wash cycles will not have the proper water valve opening when called for.

Replacing the Water Valves



After the electrical connections are removed, remove the screws from the defective valve body. Next disconnect the water hoses going to the detergent drawer and remove the valve. Assemble in the reverse order.

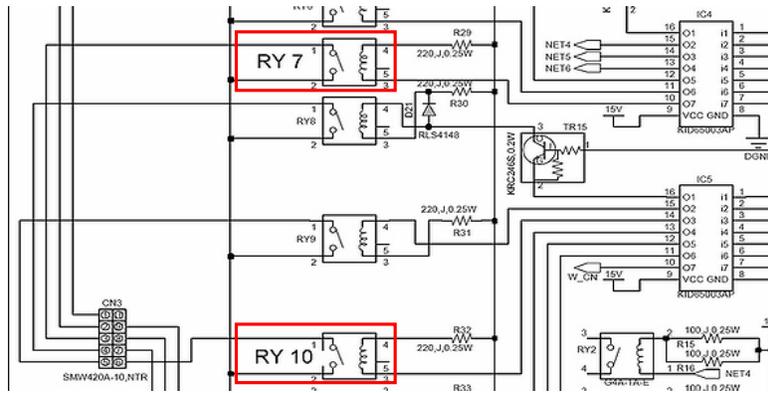
Drain and Circulation Pump



Drain pump and circulation pump operation, troubleshooting and diagnosis and replacement

This module will explain the drain pump operation and some troubleshooting tips as well as the procedure for replacement.

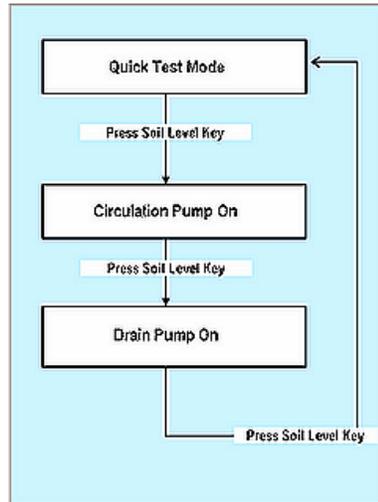
Drain and Circulation Pump Circuit



RY 7 controls the drain pump and RY 10 controls the circulation pump

RY 10 controls the circulation pump and RY 7 controls the drain pump. IC 4 and 5 act as buffers between the relay circuits and the main processor or MICOM that controls all functions of the machine. Low voltage and current circuits switching high voltage and current devices on and off.

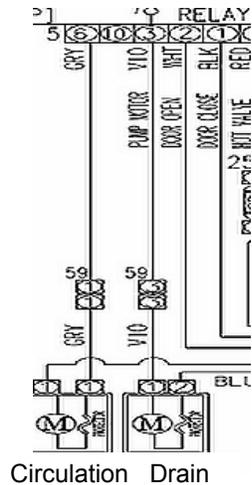
Troubleshooting the Drain and Circulation Pumps



To check the Drain Pump operation, press the Soil Level Key while model information is being displayed during the Quick Test Mode.

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Troubleshooting the Drain and Circulation Pumps



Drain Motor Check

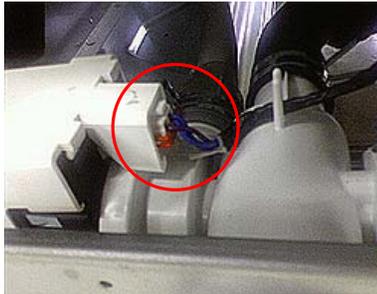
Check the voltage at Pin #1 (common blue wire) of CN2 and Pin #3 (violet wire) of CN3
When Drain Motor operates = AC 120V

Circulation Motor Check

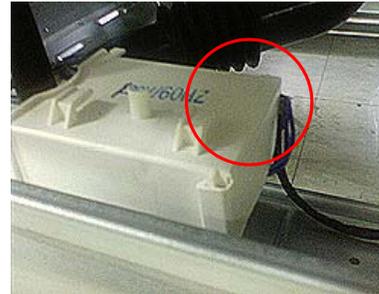
Check the voltage at Pin #1 (common blue wire) of CN2 and Pin #6 (gray wire) of CN3
When Circulation Motor operates = AC 120V

If the pumps are not operating properly, check the voltage from the main board to the pumps. This is 120VAC so caution must be used. If the proper voltage is there this indicates the main processor and relays are working properly and the pump motor is suspect.

Troubleshooting the Drain and Circulation Pumps



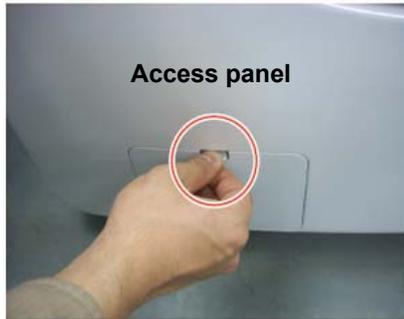
Remove the connector and read the resistance at the terminals on the Drain Pump: Should be 14 Ω



Remove the connector read the resistance at the terminals on the Circulation Pump: Should be 28 Ω

If the voltages to the pumps measures 120VAC then the pump or the wiring harness is suspect. Gain access to the pumps through the front of the machine and disconnect the wiring harness to each. Using a multi meter measure the resistance of the motor windings according to the service manual. If the resistance is correct, check the connector on the motor and the wiring harness for bent pins or a wire that may not have been crimped properly. Also check the continuity of the harness back to the main board.

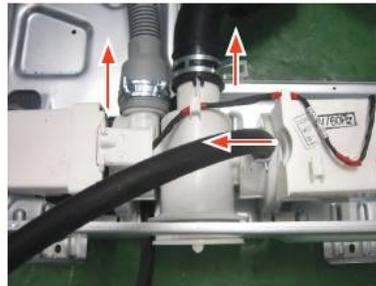
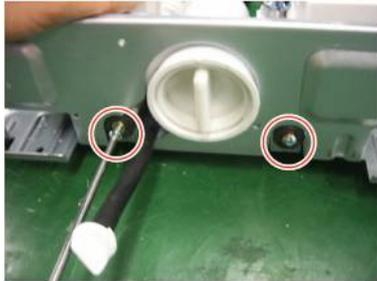
Removing the Drain and Circulation Pumps



Remove the front access panel to the pump clean out filter and drain the excess water.

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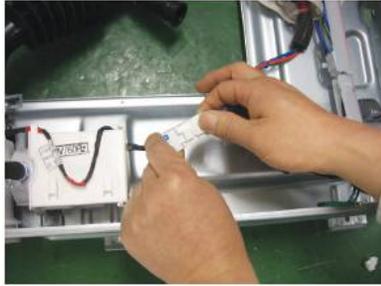
Removing the Drain and Circulation Pumps



With the front panel of the machine removed, remove the 2 screws that hold the pump assembly in place and remove the hoses.

With the front panel of the machine removed, remove the 2 screws that hold the pump assembly in place and remove the hoses going to and from the pump assembly.

Removing the Drain and Circulation Pumps



Disconnect the wiring harness connectors to the drain and circulation pump sections and remove both as an assembly. Install the new pump following the reverse order of this procedure.

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WF448 Steam Function

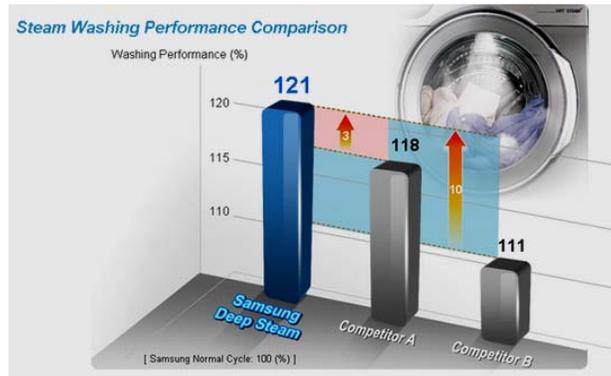


Soaking stains before washing by pre-programming the washing cycle with steam, heavily stained clothes are easily cleaned. You don't waste extra time on washing clothes or damaging clothes from frequent washing, but get the same clean result.

This module will explain the steam feature of the WF448 large capacity front load washer.

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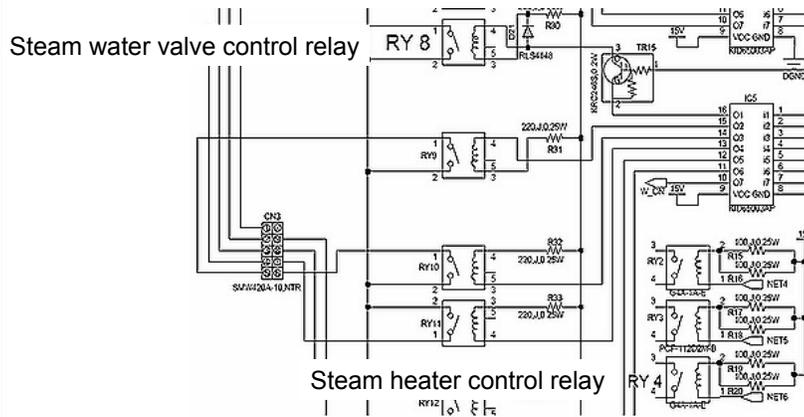
Steam Washing Performance



Deep steam - For heavily soiled, colorfast garments. This cycle improves stain removal using hot washing temperature and steam.

Steam Care is available with Heavy Duty, Normal, Whites, Perm Press, Sanitize, Towels, Bedding cycles. For heavily soiled, colorfast garments, Steam care can improve stain treatment and use less water of each cycle

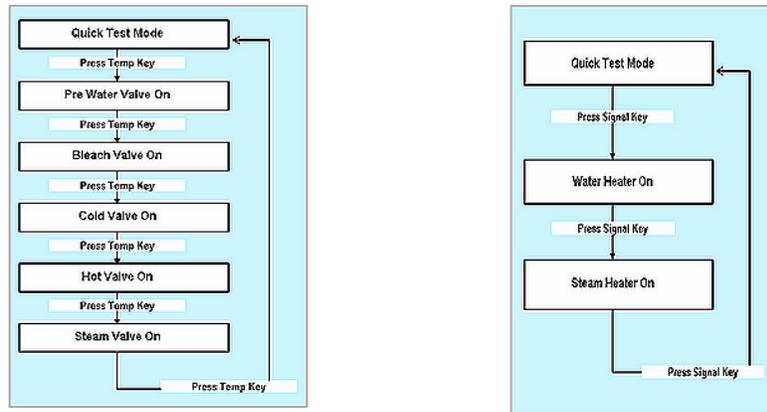
Steam Troubleshooting



The steam feature consists of two major components. A cold water valve dedicated to the steam and a heater to create the steam

The steam feature consists of two major components. A cold water valve dedicated to the steam and a heater to create the steam. Both the heater and the water valve run at 120VAC and can be turned on manually.

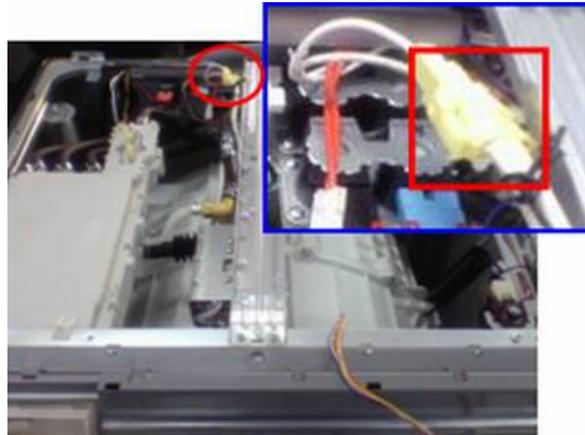
Checking the Steam Water Valve and Heater



Both the water valve and the heater for the steam feature can be turned on in the quick test mode to test. For the steam heater you will hear the relay click on and off.

Both the water valve and the heater for the steam feature can be turned on in the quick test mode to test.

Troubleshooting the Steam System



Remove the connector and read the resistance at the terminals on the Steamer : Should be 16 Ω

To troubleshoot the steam components the resistance of the steam heater can be checked at the steam unit and the resistance of the steam water valve can be checked at the valve (see the water valve section)

Removing the Steam Heat Element



Remove the screws that secure the steam unit to the frame of the machine

Remove the screws that secure the steam unit to the frame of the machine

Replacing the Steam Heat Element



With the screws removed, disconnect the wiring harness and water lines to the steam unit and remove. Reverse the procedure to install the new steam unit.

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Error Codes

NO	LED Display	Error Image	Diagnostic Code	Description	Corrective Action
1	nd		1	The water level fails to drop below the Reset Water Level within 15 minutes.	Go to "Will Not Drain" Troubleshooting Section.
2	LO		2	Door fails to unlock after 7 attempts.	Go to "Will Not Unlock" Troubleshooting Section.
3	nF		3	When the filling continues for more than 15 minutes or there is no change of water level for 2 minutes.	Go to "No Water Fill" Troubleshooting Section.
4	FL		4	Door fails to lock after 7 attempts.	Go to "Will Not Lock" Troubleshooting Section.
5	LE		8	Water Level Sensor Trouble. (When the input signal from the water level sensor is out of range, the unit will send out beeping sounds and halts the cycle.)	Go to "No Water Fill" Troubleshooting Section.
6	OE		E	A fault is detected in the water level sensor. Data (frequency) shows the water level is at or above the overflow water level. (When this condition is detected, the machine will automatically start draining water until the water level falls below the overflow water level)	First check to see that all of water valves are not stuck. If water valves are OK, check water level sensor.
7	dc		10	Unbalance or cabinet bump is detected during final spin, which prevents the drum from spinning over 150 rpm. (Never exceeds 150 RPM due to unbalanced load)	Go to "Wet Clothes" Troubleshooting section.

Error Codes

8	-		11	EEPROM Fault. (Program settings are being reset.)	Go to "EEPROM Clear Mode" If display shows "FAIL", replace machine control board.
9	E2		15	Jammed Key. (When key input signals are output for more than 30 seconds, it is regarded as a jam.)	Check all keys. If a key is sensed to be stuck, all keys will not respond.
10	dL		18	Door is detected as open when the motor is operating.	Check for loose wire connections. Go to "Quick Test Mode" and then do door lock unlock test and motor test.
11	dS		22	Door is detected as open while it is trying to lock the door.	Go to "Quick Test Mode" and then do Door Lock/Unlock Test
12	bE		25	Motor hall sensor signals come out without motor operation.	Replace Machine Control Board.
13	tE		29	Abnormal high/low temperature or resistance (Thermal sensor or PBA) resistance.	Go to "Board Input Test" and check Water temperature. Check loose or pinched wires. Replace PCB or
14	E3		2E	MICOM is attempting to drive the motor but is not getting any response signals from the hall sensor. Visual check shows motor is not running. (locked, defective hall sensor or overload)	Evaluate wire harness for loose connections. Go to "Quick Test Mode" and test Motor.

Error Codes

15	Sr		34	System Relay (Main Relay) Failure.	Replace PCB.
16	Hr		36	Heater Relay Failure (No Heater Relay Check Signal)	Replace PCB
17	3E		3E	Over-current is detected. Motor won't turn. (IPM detects over-current.)	Evaluate wire harness for loose connections. Go to "Quick Test Mode" to test Motor.
18	2E		91	Voltage for motor control bus is over specified limit.	Replace PCB
19	2E		92	Voltage for motor control bus is under specified limit.	Replace PCB
20	7E		7E	Silver Care Kit (Silver Care PCB) Failure.	Check Silver Care PCB, Main PCB & Wire-harness
21	SUDS		-	Suds are detected during the washing session. ("SUDS" is not an error. If the washer is in suds period, "SUDS" will light up instead of remaining time.)	Guide the user to reduce the amount of detergent used.