

IMPORTANT

**Electrostatic Discharge (ESD)
Sensitive Electronics**

ESD problems are present everywhere. ESD may damage or weaken the electronic control assembly. The new control assembly may appear to work well after repair is finished, but failure may occur at a later date due to ESD stress.

- Use an anti-static wrist strap. Connect wrist strap to green ground connection point or unpainted metal in the appliance
-OR-
Touch your finger repeatedly to a green ground connection point or unpainted metal in the appliance.
- Before removing the part from its package, touch the anti-static bag to a green ground connection point or unpainted metal in the appliance.
- Avoid touching electronic parts or terminal contacts; handle electronic control assembly by edges only.
- When repackaging failed electronic control assembly in anti-static bag, observe above instructions.

DIAGNOSTIC GUIDE

Before servicing, check the following:

- Is the power cord firmly plugged into a live circuit with proper voltage?
- Has a household fuse blown or circuit breaker tripped? Time delay fuse?
- Are both hot and cold water faucets open and water supply hoses unobstructed?
- All tests/checks should be made with a VOM or DVM having a sensitivity of 20,000 ohms per volt DC or greater.
- Check all connections before replacing components. Look for broken or loose wires, failed terminals, or wires not pressed into connectors far enough.
- The most common cause for control failure is corrosion on connectors. Therefore, disconnecting and reconnecting wires will be necessary throughout test procedures.
- Connectors: Look at top of connector. Check for broken or loose wires. Check for wires not pressed into connector far enough to engage metal barbs.
- Voltage checks **must** be made with all connectors **attached** to the boards.
- Resistance checks **must** be made with power cord unplugged from outlet, and with wiring harness or connectors **disconnected**.

! WARNING



Electrical Shock Hazard

**Disconnect power before servicing.
Replace all panels before operating.
Failure to do so can result in death or electrical shock.**

DISPLAY FAULT/ERROR CODES

DISPLAY	EXPLANATION AND RECOMMENDED PROCEDURE
PF	POWER FAILURE "PF" flashes when the washer is plugged in for the first time or after a power failure.
FF	FILL FAILURE If the transducer signals a high or a low water level for more than 16 seconds the washer will shut off and "FF" will flash. — Press the RINSE OPTIONS touchpad and select DRAIN/SPIN to drain washer. — Check the water level transducer hose and wire connections. — Also check the pressure dome hose to be sure they are properly connected. — Check the water level transducer (see TEST #7).
LF	LONG FILL "LF" flashes when the fill time exceeds 1 hour or the water valve(s) are turned off. Press STOP/CANCEL to clear display.
LD	LONG DRAIN "LD" flashes if it takes longer than 1 hour to pump out water down to a reset level (approx. 4"). Press STOP/CANCEL to clear display.
OL	OPEN LID "OL" flashes if the lid is opened during a spin cycle. — Close lid or press STOP/CANCEL to clear display. — If "OL" continues to flash, check lid switch.
OB	OFF BALANCE "OB" flashes when washer basket exceeds off balance limits during spin. The washer automatically attempts the spin cycle 4 times when an off-balanced load is detected. If clothes are not redistributed after these attempts, "OB" is displayed and washer goes into the STANDBY mode. — To clear display, evenly distribute the clothes load and close lid, or press STOP/CANCEL. — If "OB" continues to flash, check off-balance solenoid switch (see TEST #3).
F1	SPIN/AGITATE FAILURE "F1" flashes when basket has spun in error during the agitate portion of the cycle. Press STOP/CANCEL to clear display. — Select any cycle with agitation. Once agitation begins, "F1" should not flash, and washer should not spin during agitation. — If "F1" continues to flash, replace recirculation pressure switch and make sure there are no kinks or blockages in the tubing. — Select any cycle with agitation. Once agitation begins, "F1" should not flash. If "F1" continues to flash, replace the control board (see Page 8).
F3	LID SWITCH FAILURE "F3" flashes if the lid was NOT opened after the cycle was completed. The electronic board must detect that STOP/CANCEL was pressed during a cycle or the lid was opened at least once at the end of any cycle. This is continually tested to ensure proper lid switch operation. If "F3" is flashing, check continuity of the lid switch. — With the lid closed, lid switch contacts should be closed. — With the lid open, lid switch contacts should be open. — If the lid switch is failed, replace it. — If the lid switch is good, replace the control board.

DIAGNOSTIC TESTS

- The control must be in the OFF state before pressing the touchpad sequence to start the test.
- To start test, press the following touchpad sequence: AGITATION TIME; DELAY START; AGITATION TIME; DELAY START—all within 5 seconds.

- Activate the required test(s) as shown in chart below.

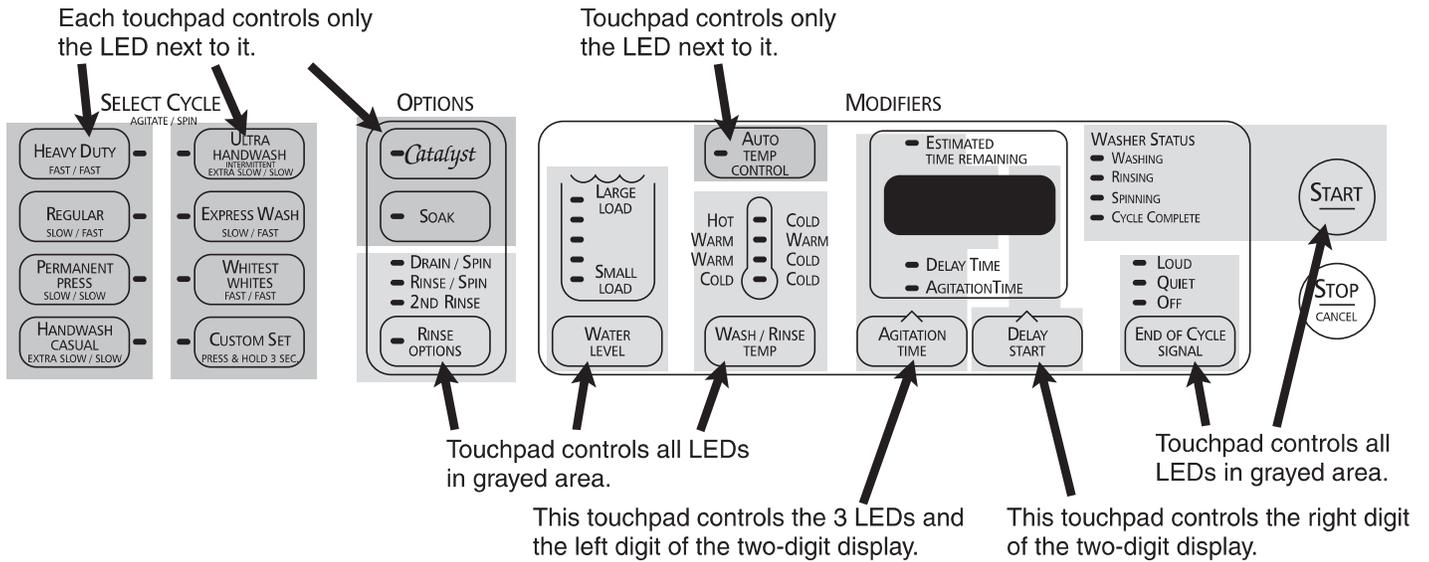
Any **Diagnostic Tests** can be stopped by pressing the STOP/CANCEL touchpad. Tests will self-terminate after running for about 3 minutes.

PRESS TOUCHPAD	DISPLAY	CONTROL ACTION
WATER INLET AND DISPENSER VALVE TEST		
HEAVY DUTY	t1	No valves on.
<i>repeat</i>	t1	All valves on.
<i>repeat</i>	t1	Cold, Fabric Softener, and Fresh valves on.
<i>repeat</i>	t1	Hot, Detergent, and Bleach valves on.
<i>repeat</i>	t1	No valves on.
<i>repeat</i>	blank	Exits test.
RECIRCULATION PRESSURE SWITCH TEST		
<i>NOTE: Empty the tub before continuing with this test.</i>		
REGULAR	Oscillates between t2 and Er	The washer starts to fill through the Hot, Cold, and Fresh water valves. Water is recirculating and the basket spins at med speed. The Recirculation Pressure switch should be closed. <i>NOTE: If "Er" is displayed immediately and persists, the recirculation pressure switch or tubing may have failed, or the pump is not recirculating water. As the water level approaches the switching point, the display may oscillate between "t2" and "Er" a few times if the pressure switch is operating properly.</i>
	Er	Once the proper level of water is reached for recirculation, the valves turn off and "Er" is displayed. The basket continues to spin at medium speed and water recirculates. <i>NOTE: If "t2" is displayed, there is a failure. Replace the recirculation switch.</i>
<i>repeat</i>	t2	The basket continues to spin at medium speed and water recirculates.
<i>repeat</i>	t2	Spinning and recirculation stops.
<i>repeat</i>	t2	Exit test.
PRESSURE TRANSDUCER/AGITATE TEST		
PERMANENT PRESS	Er	Hot, Cold, and Fresh water valves are on until a low water level is reached, and the small load water level LED comes on.
	t3	Agitation occurs at high speed. The small load water level LED is on.
<i>repeat</i>	t3	Agitation occurs at medium speed. The small load water level LED is on.
<i>repeat</i>	t3	Agitation occurs at low speed. The small load water level LED is on.
<i>repeat</i>	t3	Agitation stops, and the large load water level LED comes on.
<i>repeat</i>	t3	Hot, cold, & fresh water valves come on. The large load water level LED is on.
	Er	"Er" appears when water reaches full level. Motor agitates at low speed, and the large load water level LED is on.
<i>repeat</i>	t3	Agitation stops. The large load water level LED is on.
<i>repeat</i>	t3	Exit test.
NEUTRAL DRAIN/SPIN TEST		
HAND WASH/CASUAL	t4	Motor drains at high speed.
<i>repeat</i>	t4	Motor drains at medium speed.
<i>repeat</i>	t4	Motor drains at low speed.
<i>repeat</i>	t4	No action.
<i>repeat</i>	t4	Exit test.

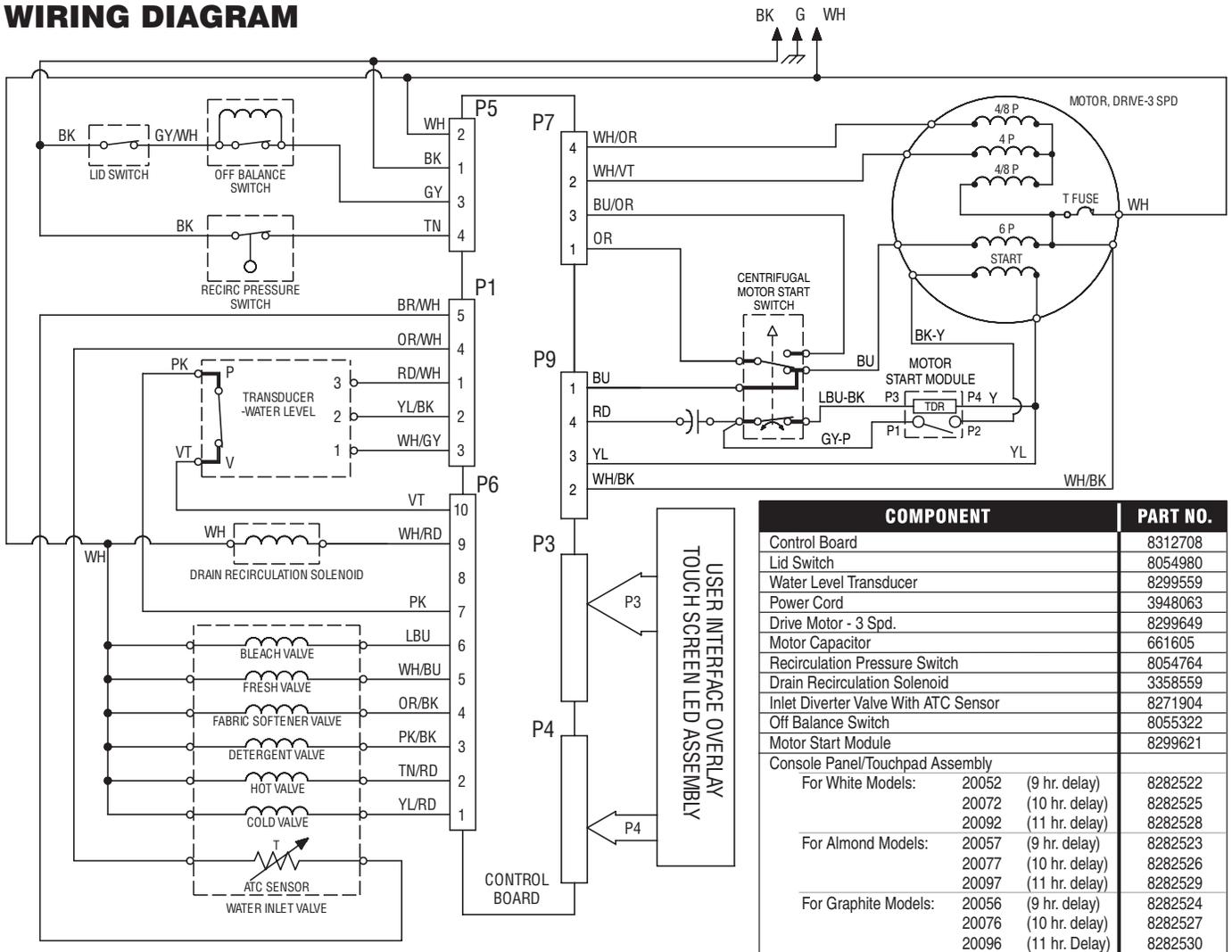
CONSOLE SWITCHES AND INDICATORS TEST

- To start test, press the following touchpad sequence: AGITATION TIME; DELAY START; AGITATION TIME; DELAY START —all within 5 seconds.

- Press the START touchpad. All LEDs should light and the display should show “88”.
- Pressing each touchpad should cause a “beep” sound, and control one or more LEDs as shown below.



WIRING DIAGRAM



TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE / TEST
<i>NOTE: Possible Cause/Tests MUST be performed in the sequence shown for each problem.</i>	
WON'T POWER UP. (<i>"PF" not displayed when first plugged in, or touchpads do not respond when pressed.</i>)	1. 120V electrical supply. See TEST #1. 2. Check harness connections. 3. Touchpad/LED assembly. See TEST #5.
WON'T START CYCLE.	1. See TEST #1. 2. Check harness connections. 3. Check START touchpad. See TEST #5.
WON'T SHUT OFF.	1. Check STOP/CANCEL touchpad. See TEST #5.
CONTROL WON'T ACCEPT SELECTIONS.	1. Touchpad/LED assembly. See TEST #5.
WON'T DISPENSE.	1. Dispense valves. See TEST #2. 2. Check harness connections.
WON'T FILL.	1. Fill valves. See TEST #2. 2. Check harness connections. 3. Check installation.
OVER FILLS.	1. Water level sensor. See TEST #7. 2. Check pressure hose.
WON'T AGITATE AT <u>ANY</u> SPEED.	1. Check harness connections. 2. Motor. See TEST #4, parts 4b and 4c. 3. Check gearcase.
WON'T AGITATE AT <u>SPECIFIC</u> SPEED.	1. Check harness connections. 2. Motor. See TEST #4, parts 4b and 4c. 3. Check gearcase.
WON'T SPIN AT <u>ANY</u> SPEED.	1. Check harness connections. 2. Motor. See TEST #4, part 4a. 3. Check gearcase. 4. Check Off Balance solenoid. See TEST #3.
WON'T SPIN AT <u>SPECIFIC</u> SPEED.	1. Check harness connections. 2. Motor. See TEST #4, parts 4b and 4c. 3. Check gearcase.
CLICKING OR HUMMING SOUNDS HEARD AS WASHER FAILS TO SPIN	1. See TEST #4, part 4a.
MOTOR OVERHEATS.	1. Motor. See TEST #4, part 4b, under <i>Motor overheats.</i>
WON'T DRAIN.	1. Check gearcase. 2. Check pump. See "Neutral Drain/Spin Test" in OPERATIONAL TESTS section.
MACHINE VIBRATES.	1. Check installation. 2. Check leveling feet. 3. Check Off Balance solenoid. See TEST #3.
ALL WATER LEVEL LEDS FLASHING.	1. Water level sensor. 2. Check pressure hose. 3. Check harness connections.
INCORRECT WATER TEMP.	1. Auto Temp (ATC). See TEST #6.
ALL HOT FILLS.	1. Temperature sensor. See TEST #6.
WON'T RECIRCULATE RINSE WATER.	1. Recirculation switch. See TEST #8.
DISPLAY FLASHING	1. See "DISPLAY FAULT/ERROR CODES" on page 1.

TROUBLESHOOTING TESTS

TEST #1

120 VAC Electrical Supply

- Check for 110-125 VAC to the control board. With the washer off but connected to the AC outlet, measure the AC voltage between Pins 2 and 1 at connector P5. Refer to the illustration on page 5.
- If 110-125 VAC is present, continue with the remaining **Troubleshooting Tests** as needed.
- If voltage is not present, check circuit breaker or fuse box, power cord connection at outlet and washer.

TEST #2

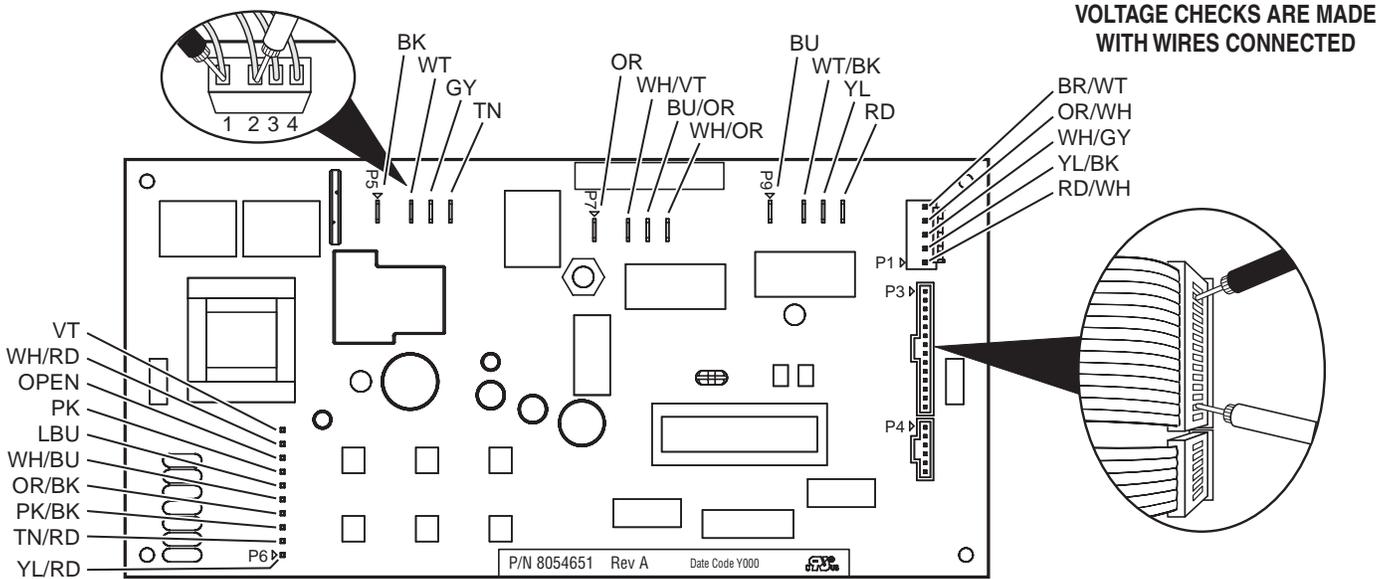
Water Inlet and Dispenser Solenoid Valve Test

This test checks for 110-125 VAC to these valves, the electrical connections to the valves, and the valves themselves.

- Check the relays and electrical connections to the valves. Do the **Diagnostic Tests** section and perform the "Water Inlet and Dispenser Valve Test". Each step in the test activates a group of valves.
- For the valve in question, measure the voltage across the pins shown in the table below. The voltage should be equal to the regular AC power voltage (110 VAC to 125 VAC).

P6 PIN #	P5 PIN #	FUNCTION
1	2	Cold water valve
2	2	Hot water valve
5	2	Fresh water valve
3	2	Detergent dispense valve
4	2	Fabric softener dispense valve
6	2	Bleach dispense valve
9	2	Drain recirculation valve

- If no voltage is present at any of these test points and voltage at the wall outlet is normal (see **Troubleshooting Test #1**), the control board has a faulty relay. Replace the control board (see page 8).
- If the voltage measurements are correct, check the individual solenoid valves. Unplug the washer and disconnect connectors P5 and P6 from the control board.
- Check the resistance at contacts shown in the following Solenoid Test table. If resistance is outside of range, replace the complete water inlet and dispenser assembly.



SOLENOID TESTED	RESISTANCE RANGE (OHMS)	CONTACTS MEASURED	
Bleach valve	800-1200	P5-2 (WH)	P6-6 (LBU)
Fresh water valve	600-1000	P5-2 (WH)	P6-5 (WH/BU)
Fabric softener valve	800-1200	P5-2 (WH)	P6-4 (OR/BK)
Detergent dispense valve	800-1200	P5-2 (WH)	P6-3 (PK/BK)
Hot water valve	800-1200	P5-2 (WH)	P6-2 (TN/RD)
Cold water valve	800-1200	P5-2 (WH)	P6-1 (YL/RD)

TEST #3
Off Balance Solenoid Switch Test

- Unplug the washer and disconnect connectors P5 and P6 from the control board before checking the resistance. *With the washer lid closed*, measure the resistance at the contacts shown in the table below.

SOLENOID	RESISTANCE (OHMS)	CONTACTS MEASURED	
Off Balance coil	1200	P5-1 (BK)	P5-3 (GY)

- If measured resistance is much larger or smaller than 1200 ohms, replace solenoid.

NOTE: Washer will not spin if the off balance switch is not connected or the switch paddle is continuously pushed in.

TEST #4
Motor and Motor Control System Tests

These tests check the motor control relays on the control board, the wiring connections between the control board and motor, the motor start components, and the motor.

4a. Motor Start Components

- Refer to the **Diagnostic Tests** section and perform the "Neutral Drain / Spin Test".
- **If a humming sound is heard** and the motor fails to spin the washer basket:
 - ➔ Unplug the washer.
 - ➔ Check the motor start capacitor first.
 - ➔ If the capacitor is OK, check the motor windings (see "4c. Wiring and Motor" on the following page).
 - ➔ If capacitor and motor windings are OK, replace the motor start module.
- **If a clicking sound is heard** and the motor fails to spin the washer basket:
 - ➔ Unplug the washer.
 - ➔ Check the centrifugal switch at the motor first.
 - ➔ If failed, replace the motor.
 - ➔ If OK, replace the motor start module.
- **If the motor overheats:**
 - ➔ Unplug the washer.
 - ➔ Measure between the gray-pink wire (P1) and black-yellow wire (P2) at the motor start module. If there is continuity, replace the motor start module.

4b. Control Relays

- Refer to the **Diagnostic Tests** section and perform the "Pressure Transducer / Agitate Test".
- As the test progresses, 110-125 VAC should be measured across the following test points for each agitation speed.

AGITATION	CONTACTS MEASURED	
HIGH SPEED	P9-2	P7-2
MEDIUM SPEED	P9-2	P9-1
LOW SPEED	P9-2	P7-4

- If a reading of 110-125 VAC is not measured across any of the points, replace the control board (see page 8).
- If a reading of 110-125 VAC is measured across these points but the motor does not run, proceed with 4c below.

4c. Wiring and Motor

- Check the Low, Med, and High speed motor windings by removing connectors P7 and P9 from the micro-computer board. Check for the resistance values shown below.

NOTE: START winding coil must be checked at the motor.

WINDING	RESISTANCE	CONTACTS MEASURED	
LOW	2.6 Ω	P7-4 (WH/OR)	P9-2 (WH/BK)
MEDIUM	2.4 Ω	P7-1 (OR)	P9-2 (WH/BK)
HIGH	2.3 Ω	P7-2 (WH/VT)	P9-2 (WH/BK)
START	5.1 Ω	Measure at the Motor, across the RD and Y wires	

- If the measurement shows infinite ohms, there is an open circuit in the motor winding or in the connection between the control board and motor.
- If the Start winding is in question and the resistance is much larger than 5.1 Ωs, replace the motor.
- If the low, medium, and high winding measurements are much higher (10s of Ωs to infinity) than shown in the preceding table, a problem exists in the motor winding or in the connection between the control board and the motor. Check the resistance at the motor. Remove the connector at the motor, and take measurements as shown in the following table.

WINDING	Measure resistance directly across the motor windings where these colored wires enter the motor	RESISTANCE (APPROXIMATE Ω)
LOW	WH/OR	2.6
MEDIUM	BU	2.4
HIGH	WH/VT	2.3

- If the resistance is tens of ohms or infinite, replace the motor.
- If the resistance at the motor is correct, there is an open circuit in the wiring between the motor and control board. Repair or replace the wiring harness.

TEST #5 Touchpad and LED Test

- Refer to the **Diagnostic Tests** section and perform the "Console Switches and Indicators Test".
- Start the test by pressing the START touchpad. Check for the following situations:
 - ✓ None of the LEDs light up
 - ✓ A particular group of LEDs does not light up
 - ✓ A single LED does not light up
 - ✓ No beep sound is heard
 - ✓ No washer function is activated when a particular touchpad is pressed

None of the LEDs light up:

- Visually check that connectors P3 and P4 are inserted all the way into the control board. If these connections are good, remove P3 and P4 from the control board while the power is still on.
- Place the negative (black) lead of your meter on P3-4 of the circuit board contacts. Check the DC supply voltage to the indicator and switch assembly by measuring the voltage between P3-4 and the contacts in the table at right.
- If a reading of at least 3 VDC is **not** measured at any of these points, replace the control board (see page 8).
- If a reading of at least 3 VDC is measured at all of these points, replace the console panel/touchpad assembly.

CONTACTS MEASURED	
P3-4	P3-10
	P3-11
	P3-12
	P3-13
	P3-14
	P4-2
	P4-3

A particular group of LEDs does not light up:

- A group or combination of LEDs share a common electronic connection. If this connection is open, all of the LEDs in the group will be disabled. Replace the console panel/touchpad assembly.

A single LED does not light up:

- Press the touchpad associated with the LED several times. If the LED does not light up, the LED has failed. Replace the console panel/touchpad assembly.

No beep sound is heard:

- If the associated LEDs do light up, it is possible that the beeper circuit has failed. Check touchpad functioning (see box at right) before replacing control board.

No washer function is activated when a particular touchpad is pressed:

- If the associated LEDs do light up, it is possible that the control board has failed. Check touchpad functioning (see box at right) before replacing control board.

CHECKING TOUCHPAD FUNCTIONING

Before replacing the control board, check for proper touchpad functioning as follows:

- Disconnect the power cord from the outlet.
- Remove connectors P3 and P4 from the control board.

Using the table below, measure the resistance across the switch when the touchpad is pressed.

NOTE: The meter must be connected with the proper polarity.

- **If using an analog readout meter:** the resistance reading should go from infinity (open circuit) down to about 10 or 20 Ω.
- **If using a digital readout meter:** the resistance reading should go from infinity down to about 2 MΩ - 4 MΩ (megohms). If available, you could use the “diode test” function of a digital meter, which will give a voltage of about 1.2 Vdc during the test.

TOUCHPAD	+ LEAD	- LEAD
Heavy Duty	P3-1	P3-4
Regular	P3-2	P3-4
Permanent Press	P3-3	P3-4
Hand Wash	P3-1	P3-5
Express Wash	P3-2	P3-5
Whitest White	P3-3	P3-5
Ultra Handwash	P3-1	P3-6
Custom	P3-2	P3-6
Rinse Options	P3-3	P3-6
Catalyst	P3-1	P3-7
Soak	P3-2	P3-7
Water Level	P3-3	P3-7
Wash/Rinse Temp.	P3-1	P3-8
Agitate Time	P3-2	P3-8
Delay Start	P3-3	P3-8
Start	P3-1	P4-5
Stop	P3-2	P4-5
End of Cycle Signal	P3-3	P4-5
Auto Temp. Control	P3-1	P4-6

- If any switches fail this test, replace the console panel/touchpad assembly.
- If all switches test OK, replace the control board (see page 8).

TEST #6 Automatic Temperature Control Test

This test checks the water inlet relays, the temperature sensor, and the control board.

- Check that the hot and cold water fill valves are working. Perform **Troubleshooting Test #2**.

NOTE: This test must be done with the Automatic Temperature Control (ATC) OFF.

- If fill valves are working properly, test the temperature sensor as follows:
 - ➔ Turn on the Automatic Temperature Control.
 - ➔ Set the water level setting to LOW.
 - ➔ Use the WASH/RINSE TEMP selector to set the Wash water temperature to WARM.
 - ➔ Press REGULAR or HEAVY DUTY cycle.
 - ➔ Press START.
 - ➔ After the tub fills, press STOP/PAUSE.
 - ➔ Measure the water temperature. At the WARM setting, a temperature range of 90 - 110°F indicates proper operation.
- If the temperature is not within this range, check the Automatic Temperature Control sensor as follows:
 - ➔ Remove connector P5 from the control board.
 - ➔ Measure the resistance between P5-5 and P5-4 at the wire harness connector. The resistance should be between 74 kΩ and 24 kΩ.
 - ➔ If resistance is not within this range, check for continuity between the connector and sensor. If continuity is good, replace the temperature sensor.
- If fill valves and temperature sensor are functioning properly, replace the control board (see page 8).

TEST #7 Water Level Transducer Test

This test is performed when either of the following situations occur:

- ✓ Customer complains of unexpected water levels
- ✓ “FF” error code is displayed on console

Unexpected water levels:

- Verify customer’s complaint by checking for proper water level fills as shown in the following table.

WATER LEVEL SELECTION	WATER LEVEL IN BASKET
— LARGE LOAD	14.0”
—	12.75”
— (medium load)	11.5”
—	10.25”
— SMALL LOAD	9.0”

- If the complaint is not verified, refer to the **Diagnostic Tests** section and perform the “Pressure Transducer/Agitate Test”. Note the results of the first step and the third from the last step of the routine. If this test is OK, ask the customer to duplicate the problem.
- If complaint is verified, check the hose connections between the pressure transducer in the console and the pressure dome attached to the tub.
- If hose connections are good, check the control board as follows:
 - With AC power on and the tub empty, measure the DC voltage between pins P1-1 and P1-2 while the connector is still attached to the control board.
 - If the voltage is between 2 and 3 VDC, replace the control board (see page 8).
 - If the voltage is outside of this range, check the harness connections.
 - If harness connections are good, replace the water level transducer.

“FF” error code is displayed:

- Check the hose connections between the pressure transducer in the console and the pressure dome attached to the tub.
- If hose connections are good, check the control board as follows:
 - With AC power on and the tub empty, measure the DC voltage between pins P1-1 and P1-2 while the connector is still attached to the control board.
 - If the voltage is between 2 and 3 VDC, replace the control board (see page 8).
 - If the voltage is outside of this range, check the harness connections.
 - If harness connections are good, replace the water level transducer.

TEST #8

Drain/Recirculation Pressure Switch Test

- Refer to the **Diagnostic Tests** section and perform the “Recirculation Pressure Switch Test”.
- If the test is failed (water recirculation does not take place), use an AC voltmeter to measure across P5-4 and P5-2. At the periods in the diagnostic routine when

recirculation should occur, the AC voltage reading should go from a reading of about 120 Vac down to about 0 Vac. If this does not happen, replace the drain/recirculation pressure switch. NOTE: When the tub is empty, the drain/recirculation pressure switch is closed and line voltage (125 Vac) must be measured across P5-4 and P5-2. If test fails, replace the drain/recirculation pressure switch.

- If test shows that the drain/recirculation pressure switch is OK, the problem is either in the microcomputer board or the drain/recirculation solenoid valve.
 - Unlike other solenoids, the coil resistance in the drain/recirculation solenoid valve can't be measured. Replace the solenoid.
 - If washer still doesn't recirculate, replace the control board.

CONTROL BOARD REMOVAL OR REPLACEMENT

NOTE: Be sure to perform the Diagnostic Tests before replacing the control board.

IMPORTANT: Electrostatic (static electricity) discharge may cause damage to electronic control assemblies. See page 1 for details.

To remove control board:

1. Remove all connectors from the control board.

NOTE: To aid removal, a slotted screwdriver may be used between the 10-pin connector and locking tab.
2. Disconnect the ground wires (G-Y) from the metal chassis of the control board assembly.
3. Push the mounting legs on both sides of control board toward each other. Lift control board away from bracket.

To replace control board:

1. Attach control board mounting legs to bracket.
2. Connect the ground wires (G-Y) to the metal chassis of the control board assembly.
3. Plug all connectors into the control board.

PART NO. 3954052 REV. A

NOTE: This sheet contains important Technical Service Data

**FOR SERVICE TECHNICIAN ONLY
DO NOT REMOVE OR DESTROY**