

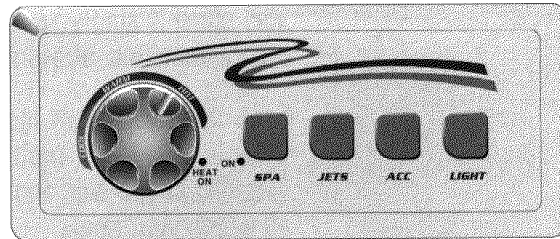
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# TROUBLESHOOTING GUIDE

## BRETT AQUALINE

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THIS GUIDE PROVIDES BASIC TROUBLESHOOTING TIPS FOR BRETTLINE MODELS BL-40, BL-40TC, AND BL-40 COMBO POOL AND SPA CONTROL SYSTEMS.



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## INTRODUCTION

This Troubleshooting Guide has been designed for easy simple step-by-step problem solving.

It is important to identify all of the possible causes of the problem before making a final diagnosis. What you see at first is usually a symptom of the problem, not necessarily the problem itself.

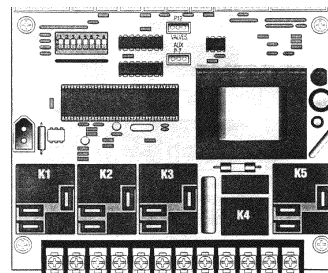
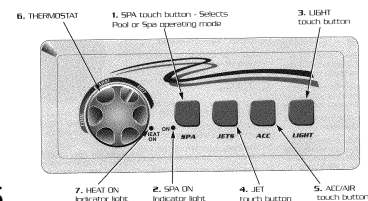
Read the whole trouble shooting procedure related to what you are testing prior to doing the test. This will help give you a clearer overall view and avoid a costly mis-diagnosis.

### TO PREPARE FOR THE SERVICE CALL:

- Be sure you fully understand how the system operates. Read the information contained in IDENTIFYING THE PROBLEM page 3.
- Use standard testing devices, such as:
  - Volt OHM Meter (VOM)
  - 6 inch test wire with alligator clips
  - Clamp-on ammeter
  - Accurate thermometer
- Take necessary test and replacement parts:

### RECOMMENDED REPLACEMENT PARTS:

- BL-40 Spa-side control panel – Standard P/N 24-310025, Compact P/N 24-30025
- Water temperature sensor – P/N 070840
- Printed circuit board – P/N 34-5023 (BL-40 Combo P/N 34-5023C)
- Low voltage jumper – P/N 080040
- All purpose splice kit – P/N 080170
- Valve transformer (BL-40 Combo only) – P/N 37-1039

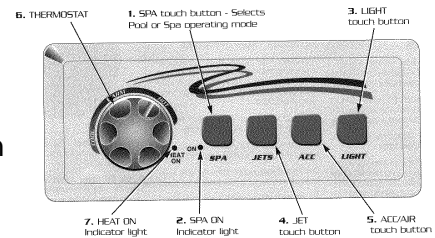


## IDENTIFYING THE PROBLEM

To avoid mis-diagnosis and better understand how the system operates, read and familiarize yourself with the operation of the control system.

### BL-40 and BL-40TC SPA-SIDE CONTROL PANEL OPERATION:

- **SPA TOUCH BUTTON** – Function: The SPA touch button bypasses the system timers and allows manual operation of the spa. The JET and Accessory functions will not operate unless the spa is in the manual operation mode.
- Press the SPA touch button once to operate the spa manually. The SPA “ON” indicator light will illuminate and the primary pump will operate (two single-speed pump system). Note: On 2-speed pump systems, the pump will operate in low speed. The heater will operate as required to maintain the spa water temperature, as determined by the setting of the thermostat. The JET and ACC/AIR touch button will now operate as described in the following sections on JET and ACC/AIR touch button operation.



**NOTE:** If the system is equipped with an in-house master control panel, the spa-side control panel will be disabled until the REMOTE touch button on the in-house Master control panel is pressed to transfer control from in-house to spa-side. The spa-side control panel is enabled when the remote "ON" indicator light is illuminated.

*Tip: If the in-house master control panel is inaccessible, disconnect the in-house master control panel from terminal "P2" of the BL-40 printed circuit board to allow operation of the system. Reconnect the in-house master control panel when service is completed.*

- Press the SPA button again to return the spa to the timer control mode (units with time clock only). The JET and ACC functions will be disabled. An "Extended Filtration Cycle" will commence and operate the primary pump for approximately 30 minutes. During the "Extended Filtration Cycle" the SPA "ON" indicator light will blink rapidly and the heater will not operate. At the end of the "Extended Filtration Cycle" the SPA "ON" indicator light will turn off and the system will return to the timer control mode.

- To manually by-pass the “Extended Filtration Cycle” and return the system to the timer control, press the SPA touch button a second time at any time during the “Extended Filtration Cycle”

NOTE: If the power to the system is interrupted, the system will automatically reset to the timer control mode when power is restored.

- **SPA “ON” INDICATOR LIGHT** – Function: The SPA “ON” indicator light will illuminate when the spa is operating in the manual control mode. It will blink rapidly when the system is operating during an “Extended Filtration Cycle”.

- **LIGHT TOUCH BUTTON** – Function: The LIGHT touch button turns the spa light ON and OFF.

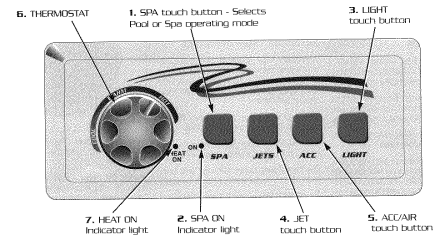
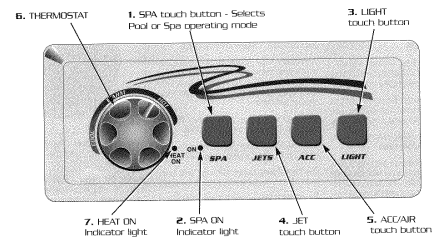
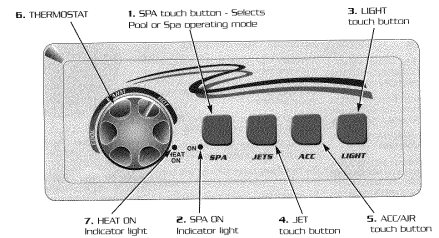
NOTE: The spa light is not controlled by the spa button and may be operated at any time, independent of other functions.

- Press the LIGHT touch button to turn the spa light ON, press again to turn the spa light OFF.

NOTE: A safety shut-off timer automatically turns the spa light OFF after four hours of operation.

- **JET TOUCH BUTTON** – Function: The JET touch button operates the jets.
- Make certain the SPA “ON” indicator light is illuminated, if not; press the SPA touch button to enable the JET touch button.
- One 2-speed pump system – To activate the jets, press the JET touch button once for high speed, press again for high speed off.
- Two single-speed pump system – To activate the jets press the JET touch button once and jet 2 will operate, press again and jet pump 2 will turn off.

NOTE: A safety shut-off timer circuit automatically turns the jets off after 30 minutes (1 hour on units with Catalina Controls circuit boards) of operation. To continue using the jets, press the JET touch button again as previously outlined.



- Optional extra single-speed pump (DIP switch eight must be set ON) – If the system is equipped with this feature, press the JET touch button twice rapidly and the pump will operate, press the JET touch button twice rapidly again and the pump will turn off.

- **ACC (or AIR) TOUCH BUTTON** – Function: The ACC (or AIR) touch button operates either an air blower or other 16 amp accessory.

- Make certain the SPA “ON” indicator light is illuminated, if not; press the SPA touch button to enable the ACC touch button.

- To activate the air blower or accessory, press the ACC/AIR touch button once; press again to turn OFF.

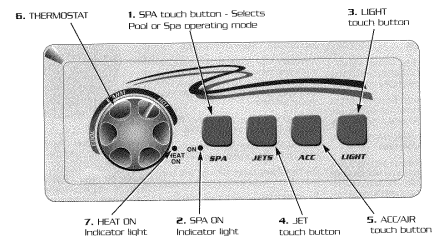
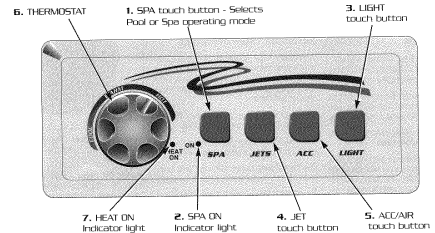
NOTE: A safety shut-off timer circuit automatically turns the air blower or accessory off after 30 minutes (1 hour on units with Catalina Controls circuit boards) of operation. To continue using the air blower or accessory, press the ACC touch button again.

- **THERMOSTAT** – Function: The spa water temperature is controlled by rotating the thermostat control knob.

To increase the temperature setting, turn the thermostat control knob clockwise (counterclockwise on older Catalina Controls models).

To decrease the temperature setting turn the thermostat control knob counterclockwise (clockwise on older Catalina Controls models).

- The length of time required for the spa water to reach desired temperature depends on several factors: water temperature at start, ambient air temperature, spa gallonage, and whether an insulative spa cover is used.
- The pump will operate for approximately 10 seconds before the heater turns ON. When the heater turns OFF, the pump will continue to operate for approximately 2-3 minutes. This assures maximum water flow when the heater turns ON and allows the heater to cool-down prior to the pump turning OFF.
- NOTE: If the system is equipped with an in-house master control panel, the thermostat on the spa-side control

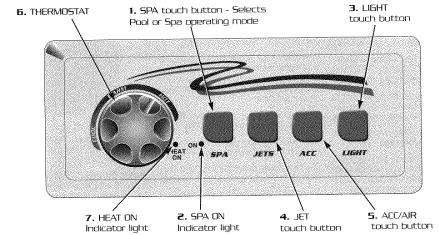


panel is disabled until the REMOTE touch button on the in-house Master control panel is pressed to transfer control from in-house to spa-side.

*Tip: If the in-house master control panel is inaccessible, disconnect the in-house master control panel from terminal "P2" of the BL-40 printed circuit board to allow operation of the system. Reconnect the in-house master control panel when service is completed.*

- **HEAT ON INDICATOR LIGHT** – Function: The HEAT ON indicator light will illuminate any time the heater is ON.

- When the desired spa water temperature is reached, the HEAT ON indicator light will turn OFF, indicating the spa is heated and ready for use.

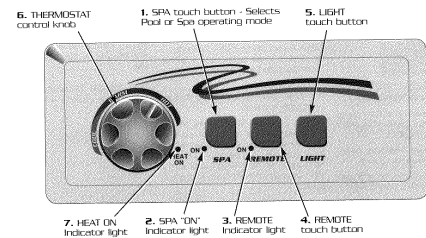


BL-40 and BL-40TC

**IN-HOUSE MASTER CONTROL PANEL OPERATION:**

- **SPA TOUCH BUTTON** – Function: The SPA touch button bypasses the system timers and allows manual operation of the spa.

- Press the SPA touch button once to operate the spa manually. The SPA "ON" indicator light will illuminate and the primary pump will operate (two single-speed pump systems). Note: On 2-speed pump systems, the pump will operate in low speed. The heater will operate as required to maintain the spa water temperature, as determined by the setting of the thermostat.



- Press the SPA button again to return the spa to the timer control mode (units with time clock only). The JET and ACC functions will be disabled. An "Extended Filtration Cycle" will commence and operate the primary pump for approximately 30 minutes. During the "Extended Filtration Cycle" the SPA "ON" indicator light will blink rapidly and the heater will not operate. At the end of the "Extended Filtration Cycle" the SPA "ON" indicator light will turn off and the system will return to the timer control mode.

- To manually by-pass the "Extended Filtration Cycle" and return the system to the timer control, press the SPA touch button a second time at any time during the "Extended Filtration Cycle"

NOTE: If the power to the system is interrupted, the system will automatically reset to the timer control mode when power is restored.

- **SPA “ON” INDICATOR LIGHT** – Function: The SPA “ON” indicator light will illuminate when the spa is operating in the manual control mode. It will blink rapidly when the system is operating during an “Extended Filtration Cycle”.

- **REMOTE INDICATOR LIGHT** – Function: The REMOTE indicator light will illuminate whenever the spa-side control panel has been enabled as described below.

- **REMOTE TOUCH BUTTON** – Function: The REMOTE touch button enables or locks-out the spa-side control panel.

- Press the Remote touch button once to enable the spa-side control, all functions including system on/off and temperature control are transferred to the spa-side control panel (the in-house master control panel is disabled). Press the REMOTE touch button again to transfer control from the spa-side back to in-house.

- **LIGHT TOUCH BUTTON** – Function: The LIGHT touch button turns the spa light ON and OFF.

NOTE: The spa light is not controlled by the spa button and may be operated at any time, independent of other functions.

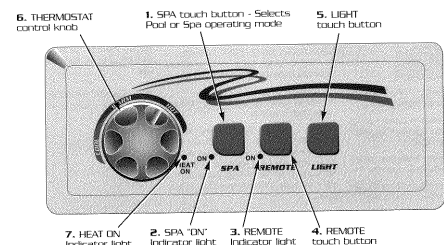
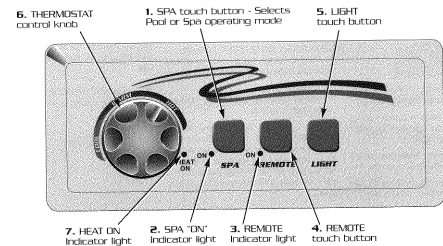
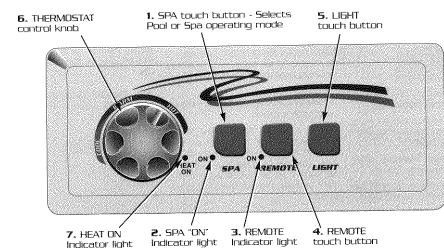
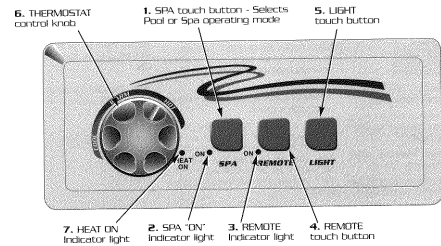
- Press the LIGHT touch button to turn the spa light ON, press again to turn the spa light OFF.

NOTE: A safety shut-off timer automatically turns the spa light OFF after four hours of operation.

- **THERMOSTAT** – Function: The spa water temperature is controlled by rotating the thermostat control knob.

To increase the temperature setting, turn the thermostat control knob clockwise (counterclockwise on older Catalina Controls models).

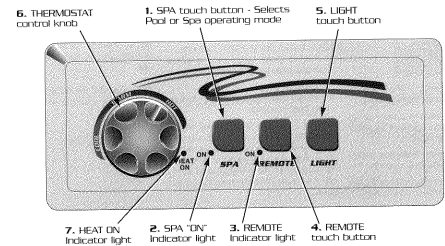
To decrease the temperature setting turn the thermostat control knob counterclockwise (clockwise on older Catalina Controls models).



- The length of time required for the spa water to reach desired temperature depends on several factors: water temperature at start, ambient air temperature, spa gallonage, and whether an insulative spa cover is used.
- The pump will operate for approximately 10 seconds before the heater turns ON. When the heater turns OFF, the pump will continue to operate for approximately 2-3 minutes. This assures maximum water flow when the heater turns ON and allows the heater to cool-down prior to the pump turning OFF.
- **NOTE:** If the system is equipped with an in-house master control panel, the thermostat on the spa-side control panel is disabled until the REMOTE touch button on the in-house Master control panel is pressed to transfer control from in-house to spa-side.

*Tip: If the in-house master control panel is inaccessible, disconnect the in-house master control panel from terminal "P2" of the BL-40 printed circuit board to allow operation of the system. Reconnect the in-house master control panel when service is completed.*

- **HEAT ON INDICATOR LIGHT** – Function: The HEAT ON indicator light will illuminate any time the heater is ON.
- When the desired spa water temperature is reached, the HEAT ON indicator light will turn OFF, indicating the spa is heated and ready for use.



## BL-40 COMBO – SPA-SIDE AND IN-HOUSE MASTER CONTROL PANEL OPERATION:

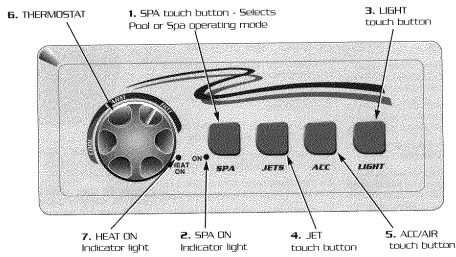
The BL-40 COMBO in-house and Spa-Side Control Panels operate as describe above with the following exceptions:

- **SPA TOUCH BUTTON** – Function: The SPA touch button selects either Pool or Spa operation.
- The motor controlled valves will automatically rotate, diverting the pump water flow to the spa.

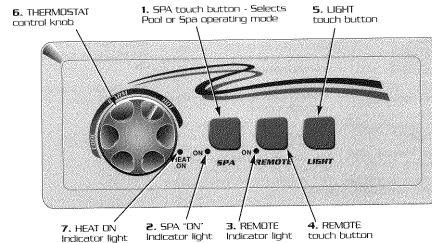


## CONTROL SYSTEM DESCRIPTION

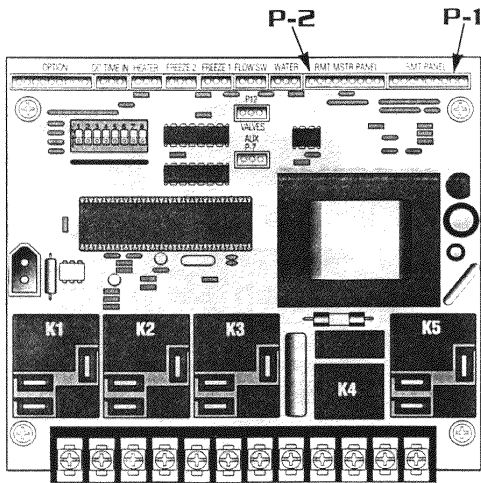
The BL-40 control system consists of a spa-side control panel, optional in-house control panel, control module containing the BL-40 printed circuit board, water temperature sensor, and time clock (model BL-40TC & BL-40 Combo only). The spa-side and in-house master control panels contain the following components:



Spa-side Control



In-house control



1 2 3 4 5 6 7 8 9 10 11 12

**Terminal Strip**

- 1 & 2 – Input power
- 3 & 4 – Primary pump (low)
- 5 & 6 – Secondary pump (high)
- 7 & 8 – Accessory (air blower)
- 9 & 10 – Light
- 11 & 12 – Heater

The printed circuit board contains the following components:

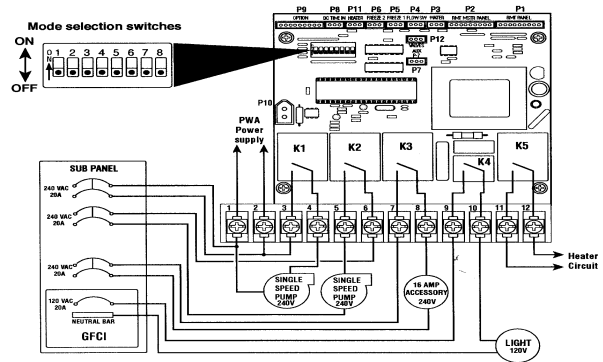
8-Position mode selection switch (DIP switch)

**Relays**

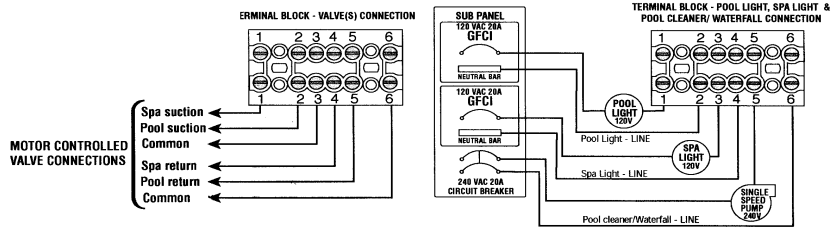
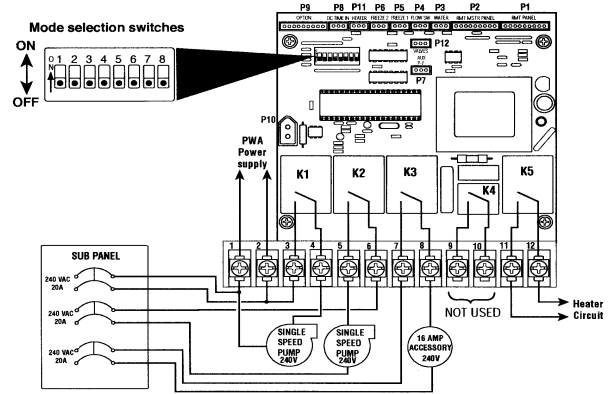
- K1 Primary or low speed pump
- K2 Secondary or high speed pump
- K3 Accessory or air blower
- K4 Light
- K5 Heater

- Low voltage connection ports
- Spa-side control panel
- In-house master control panel
- Water temperature sensor
- Pressure/flow switch
- Freeze switch
- Heat
- DC time in
- Options

# WIRING DIAGRAMS



TYPICAL BL-40 & BL-40TC  
WIRING DIAGRAM



TYPICAL BL-40 COMBO TC  
WIRING DIAGRAM

## TROUBLESHOOTING TIPS

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- Is the problem with a new or existing installation? The same techniques for troubleshooting new installations can be applied to existing installations. However, with existing installations, the reason for the malfunction or failure is not likely to be an incorrectly installed circuit board or module.
- The BL-40 system consist of four basic components:
  - a) BL-40 printed circuit board
  - b) Spa-side (remote) control panel
  - c) Water temperature sensor
  - d) Jumper/pressure switch connected to “FLOW” (P4) receptacle.
- The system requires the following for correct operation:
  - a) Functional temperature sensor must be connected to the “WATER” (P3) receptacle
  - b) FLOW receptacle (P4) must have either a jumper plug or pressure/flow switch connected.
  - c) Functional spa-side control must be connected (P1).
  - d) SPA touch button must be pushed prior to operating other functions.

There may be other components in the system, such as timers, freeze switches, transformers, in-house master remote control panel, etc., but these four are the minimum required for proper operation. If any of the four is defective, the system will not work properly. Troubleshooting a BL-40 system is a matter of finding which of the four is defective.

- The **“KEY TO THE PINS”** section of this guide provides a process of elimination to determine if there is a defective circuit board or if the trouble is with the spa-side or in-house master control panel. This section has instructions to use a jumper wire on the low voltage pins to bypass the spa-side, in-house master, control panel touch buttons and thermostat to activate the corresponding components of the system. Simply hold one end of a jumper wire to pin number three (black wire) of SPA (J1) or MASTER (J2), and momentarily touch the other end of the jumper to the appropriate pin for the component to be activated. If there is no response to this test, the printed circuit board is defective. If the printed circuit board has passed this test but fails to respond to the touch buttons at the spa-side or in-house panel, then the spa-side or in-house remote control panel needs to be replaced.
- The **“TEMPERATURE Vs RESISTANCE”** section of this guide provides instructions on how to test the water temperature sensor. The water temperature sensor utilizes a thermistor, which changes resistance as a function of temperature. Using an Ohm meter, measure the resistance of the water temperature and compare the reading to the water temperatures listed on the Temperature Vs Resistance table to determine if the resistance readings are within the acceptable range.

## TROUBLESHOOTING SPECIFIC PROBLEMS

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### **LOW SPEED OR PRIMARY PUMP STAYS ON**

- Make sure a jumper plug is not installed in “DC TIME IN” (P8).
- TC units only – make sure tabs are out on timer.
- Turn power off and measure continuity across relay K1 common and normally open contacts. If continuity is measured with power off, the relay contacts are stuck together and the board should be replaced.

### **NO LOW SPEED OR PRIMARY PUMP OPERATION**

- Check spa-side control by jumping low voltage pin number three to five of spa-side panel (P1). If pump functions, replace spa side. See “Key to the Pins” for additional information.
- With system on, measure voltage from terminal one to terminal four of twelve connector terminal strip. If zero replace printed circuit board.

### **HIGH SPEED OR SECOND PUMP STAYS ON**

- Make sure a temperature sensor is installed in “WATER” (P3).
- Make sure temperature sensor test O.K. – see Temperature Vs Resistance Table.
- Make sure a jumper plug is not installed in “FREEZE 1 or FREEZE 2” (P5 & P6).
- Check water temperature. If water temperature is less than 45°F the unit may be operating in freeze mode.
- Turn power off and measure continuity across relay K2 common and normally open contacts. If continuity is measured with power off, the relay contacts are stuck together and the board should be replaced.

### **NO HIGH SPEED OR SECOND PUMP OPERATION**

- Make sure the “SPA” touch button has been pressed.
- Check spa-side control by jumping low voltage pin number three to eight. If pump functions, replace spa side. See “Key to the Pins” for additional information.
- With system on, measure voltage from terminal one to terminal six. If zero replace printed circuit board.

### **TWO SPEED PUMP OPERATING IN BOTH SPEEDS AT SAME TIME**

- Check DIP switch settings. On BL-40 & BL-40TC, switch number six should be set “ON”. On BL-40 COMBO series, switch number eight should be set “ON”.
- Turn power off and measure continuity across relay K1 and K2 common and normally open contacts. If continuity is measured with power off, the relay contacts are stuck together and the board should be replaced.

### **TWO SINGLE SPEED PUMPS WONT OPERATE AT SAME TIME**

- Check DIP switch settings. On BL-40 & BL-40TC, switch number six should be set “OFF”. On BL-40 COMBO series, switch number eight should be set “OFF”.

### **NO AIR BLOWER OR ACCESSORY OPERATION**

- Make sure the “SPA” touch button has been pressed.

- Check spa-side control (P1) by jumping low voltage pin number three to seven. If blower functions, replace spa side. See “Key to the Pins” for additional information.
- With system on, measure voltage from terminal one to terminal eight. If zero replace printed circuit board.

#### **NO HIGH SPEED OR BLOWER (ACCESSORY)**

- Make sure the “SPA” touch button has been pressed.
- Check spa-side control (P1) by jumping low voltage pin number three to seven, then jump pins three to eight. If pump and blower functions, replace spa side. See “Key to the Pins” for additional information.

#### **NO SPA LIGHT OPERATION**

- Make sure the “LIGHT” touch button has been pressed.
- Check spa-side control (J1) by jumping low voltage pin number three to six. If light functions, replace spa side. See “Key to the Pins” for additional information.

#### **NO HEAT**

- Using the KEY TO THE PINS method, jump low voltage pin number 3 to pin number 1 and hold for up to 90 seconds (due to fire mans switch delay) while checking heater relay. If the heater relay (K5) contacts close, the problem is in the spa-side control panel.
- Make sure that either the pressure/flow switch is operating properly or that a jumper is connected to the FLOW (P4) receptacle.
- If the heater relay (K5) contacts remain open test the water temperature sensor using the TEMPERATURE vs RESISTANCE chart. If the water temperature sensor test O.K., replace the printed circuit board.

#### **TEMPERATURE NOT HIGH ENOUGH**

- Test the water temperature sensor using the TEMPERATURE vs RESISTANCE chart. If the water temperature sensor test O.K., replace the printed circuit board.
- Unplug spa-side (or in-house) panel and using an OHM meter check the resistance from spa-side panel low voltage pin number 3 to pin number 1. Rotating the dial from cold to hot, the acceptable resistance range is 0 to approximately 10,000 or 20,000 ohms.

#### **NO HEAT, HIGH SPEED STAYS ON**

- Make sure temperature sensor test O.K. – see Temperature Vs Resistance Table.
- Check water temperature. If water temperature is less than 45°F the unit may be operating in freeze mode.

#### **NOTHING WORKS**

- Check for correct input power at terminals T1 & T2. Refer to product data label for correct input power voltage.
- Use “key to the Pins” method to check spa side operation. Jump low voltage pin (P1) number 3 to pin number 5. If system starts, replace spa-side. Otherwise, replace circuit board.
- If an in-house “master” control panel is installed, make sure the panel “REMOTE” touch button has been pressed to allow use of the spa-side panel. OR temporarily disconnect the in-house master control panel from the “RMT MST PANEL” position.

### **VALVES DO NOT ROTATE (BL-40 COMBO ONLY)**

- Make sure the relay valve harness is connect to the “Valves” (P12) terminal of the circuit board and that the valves are connected properly.
- Check voltage at valve relay coils. 12 volts DC should be present at one of the two relays. If 12 volts is present at one relay coil, press and release the SPA touch button and check for 12 volts DC at the other relay coil. If correct voltage is not measured, the problem is either in the circuit board or spa side control. See “Key to the Pins” section to check spa-side control operation.
- Check voltage at valve transformer output. 24 volts DC should be measured between either valve relay common terminal, and the common terminal of the valve terminal block (terminals 3 or 6). If correct voltage is not measured, check valve transformer fuse. If fuse is O.K., replace the transformer.
- Check for 24 volts DC between either valve relay N.O. and N.C. terminal and valve terminal block number 6 (common). Press the SPA button and check for 24 volts DC at the opposite terminal (example: if 24 volts is measured between valve terminal block number 6 and one of the valve relays N.O. terminal, after pressing the spa button 24 volts should be present at the valves N.C. terminal). Repeat this process on the second valve relay. If either valve relay fails to operate in this manner, replace the valve relay.

## KEY TO THE PINS

### RELAY OPERATION CHECK OUT

The low voltage pins read from right to left. To bypass the spa-side panel or master panel and test the relays operation on the circuit board – unplug the panel(s), then with power applied to the circuit board, short from pin number 3 to the appropriate pins with a wire jumper. Pin number 3 is the ground pin. The relay functions are listed below:

Example: If K-2 (the jet relay) is to be tested, from the spa side panel connector, use a wire jumper and short (touch) from pin number 3 (ground) to pin number 5 (system relay K-1) this will enable the low speed pump and the “System” circuit. Then touch between pin number 3 (ground) and pin number 8 (Jet button relay K-2). The K-2 relay should energize.

SPA-SIDE PANEL			IN-HOUSE MASTER PANEL		
PIN	COLOR	FUNCTION	PIN	COLOR	FUNCTION
1	White	Temp relay K5	1	White	Temp relay K5
2	Red	System LED	2	Brown	Heater LED
<b>3</b>	<b>Black</b>	<b>Ground</b>	<b>3</b>	<b>Black</b>	<b>Ground</b>
4	Brown	Heater LED	4	Blue	Spa LED
5	Yellow	Sys btn relay K1	5	Orange	Light btn relay K4
6	Orange	Light btn relay K4	6	Red	System LED
7	Blue	Acc button relay K3	7	Yellow	Sys btn relay K1
8	Green	Jet button relay K2	8	Green	Spa button
9	Clear	Cable shield	9	Clear	Cable shield

### LIGHT EMITTING DIODE (LED) CHECK OUT

The LED's on the spa-side panel are controlled by pins 2 & 4. On the master panel, the LED's are controlled by 2,4, & 6. To determine if LED's are receiving the correct voltage, use your volt meter on the DC scale. Place the negative probe on pin number 3 (ground) and the other on the pin which corresponds to the LED you want to test. You should get a reading of at least 10 VDC. (Note: the function for the LED you are testing must be energized.)

## TEMPERATURE vs RESISTANCE TABLE

TEMP. (degrees F.)	THERM. KOHN	TEMP. (degrees F.)	THERM. KOHN	TEMP. (degrees F.)	THERM. KOHN
32	32.7	57	16.5	82	8.82
33	31.8	58	16.0	83	8.61
34	30.9	59	15.6	84	8.41
35	30.0	60	15.2	85	8.22
36	29.2	61	14.8	86	8.03
37	28.4	62	14.5	87	7.84
38	27.6	63	14.1	88	7.66
39	26.8	64	13.7	89	7.48
40	26.1	65	13.4	90	7.31
41	25.4	66	13.1	91	7.14
42	24.7	67	12.7	92	6.98
43	24.0	68	12.4	93	6.82
44	23.3	69	12.1	94	6.67
45	22.7	70	11.8	95	6.52
46	22.1	71	11.5	96	6.37
47	21.5	72	11.2	97	6.23
48	20.9	73	11.0	98	6.09
49	20.4	74	10.7	99	5.96
50	19.8	75	10.4	100	5.83
51	19.3	76	10.2	101	5.70
52	18.8	77	9.95	102	5.57
53	18.3	78	9.71	103	5.45
54	17.8	79	9.48	104	5.33
55	17.3	80	9.25	105	5.22
56	16.9	81	9.03	106	5.10

### TEMPERATURE SENSOR CHECKOUT PROCEDURE

The temperature sensor utilizes a thermistor, which changes resistance as a function of temperature. In order to troubleshoot the thermistor, you must know what the resistance should be at a given temperature.

- Use a standard VOM (Volt/Ohm meter) set to read R x 30,000 minimum.
- Disconnect the sensor from "WATER" (P3) on the control circuit board. Attach a 3 pin base (receptacle) to the sensor plug to provide male contact points for resistance reading, or insert probe tips into the back of the plug until contact is made.
- Using the VOM, record the resistance reading of the temperature sensor.
- Use an accurate thermometer and check the spa water temperature. The acceptable range is 2°F above or 2°F below the actual spa water temperature. Refer to the Temperature vs Resistance Table above and compare the spa water temperature to determine if the resistance readings are within the acceptable range.