



cRUUS



REVOLUTION

INSTALLATION AND SERVICE MANUAL

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End User Warning

This Installation Manual is provided solely to aid qualified spa service technicians in installing spas with control systems manufactured by Balboa Water Group. Balboa controls have absolutely no end user serviceable parts. Balboa Water Group does not authorize attempts by the spa owner/user to repair or service any Balboa products. Non-qualified users should never open or remove covers, as this will expose dangerous voltage points and other dangerous risks. Please contact your dealer or authorized repair center for service.

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Warnings: Danger! Risk of Electric Shock!

- All electrical work must be performed by a qualified electrician and must conform to all national, state, and local codes.
- Before making any electrical connections, make certain that the Main Power breaker from the house breaker box has been turned off.
- Do not attempt service of this control system. Contact your dealer or service organization for assistance.
- Do not permit any electric appliance, such as a light, telephone, radio, or television within 5' (1.5m) of a pool or spa.
- Follow all owner's manual power connection instructions.
- Installation must be performed by a licensed electrician and all grounding connections must be properly installed.
- No user serviceable parts.
- Water temperature in excess of 38°C may be injurious to your health.
- Disconnect the electrical power before servicing.
- Keep access door closed.

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CAUTION

- Test the ground fault circuit interrupter before each use of the spa.
- Read the instruction manual.
- Adequate drainage must be provided if the equipment is to be installed in a pit.
- To ensure continued protection against shock hazard, use only identical replacement parts when servicing.
- Install a VG Compliant suction guard that is suitably rated to match the maximum flow rate marked.

WARNING:

Water temperature in excess of 38°C may be injurious to your health.
Disconnect the electrical power before servicing.
Keep access door closed.

ATTENTION

- Toujours vérifier l'efficacité du disjoncteur différentiel avant d'utiliser le bain.
- Lire la notice technique.
- Lorsque l'appareillage est installé dans une fosse, on doit assurer un drainage adéquat.
- Afin d'assurer une protection permanente contre le danger de choc électrique, lors de l'entretien employer seulement des pièces de rechange identiques.
- Les prises d'aspiration doivent être équipées de grilles convenant au débit maximal indiqué.

AVERTISSEMENT:

Des températures de l'eau supérieures à 38°C peuvent présenter un danger pour la santé.
Déconnecter du circuit d'alimentation électrique avant l'entretien.
Garder la porte fermée.

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GFCI

It is required by code to install a Ground Fault Circuit Interrupter (GFCI) in the supply power for a spa. This device will trip the breaker if there is an unsafe electrical condition caused by a malfunctioning component or even the slightest short to ground.

Note: Connect the control system only to a circuit protected by a Class A GFCI mounted at least 5' (1.52M) from the inside walls of the spa/hot tub and in line of sight from the equipment compartment.

Refer to NEC (*National Electrical Code*), 2005 Edition, Article 680 for more information.

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Revolution Overview

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Overview

REVOLUTION – Transforming the Control of Hot Tubs

Balboa's Revolution hot tub control is setting a new industry standard for unmatched system reliability, manufacturing flexibility and end user friendliness.

INCOMPARABLE SYSTEM RELIABILITY

Utilizing advanced technology and high temperature corrosion proof mission critical materials from the automotive and other industries, the Revolution hot tub control systems all but eliminate leaks due to corrosion or harsh chemicals. Together with a newly designed, energy efficient heating coil that reduces element failures due to rattling, Balboa is providing peace of mind for the end-user.

TIGHT SPOTS ARE A THING OF THE PAST

The Revolution sports a compact low profile package offering flexibility with mounting to give you the most in tub design and manufacturing line flexibility. A single model can be configured on the line to support various system configurations without adding additional skus – the Revolution expands the world for you.

POWERFUL, YET SIMPLE USERFACE

The sleek new topside panel includes a large easy to read back-lit LCD with simple to follow end user menus. With new press and hold button technology, setting temperature and other common tasks have been simplified. User navigation is intuitive and easier than ever, reducing customer service help calls.



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revolution features

MANUFACTURED UNDER ONE OR MORE OF THESE PATENTS: U.S. PATENTS: 5332944, 5361215, 5550753, 5559720, 5,883,459, 6253227, 6282370, 6590188, 6976052, 6965815, 7030343, 7,417,834 B2, CANADIAN PATENT: 2342614, AUSTRILIAN PATENT: 2373248 OTHER PATENTS BOTH FOREIGN AND DOMESTIC APPLIED FOR AND PENDING. ALL SOFTWARE COPYRIGHT BALBOA WATER GROUP.



Consumer Interface Innovations

end user friendliness
easier to see and use in low light and at night



press and hold buttons provide scrolling capabilities for temperature, time of day etc.

tactile button feel
instant, positive feedback when button is pressed

bigger LCD display
1"x 2" display (easy to read)

display with backlight
easier to see

End User Friendliness



System Innovations



Heater Innovations

M7
patented technology that increases reliability

corrosion resistant heater elements materials
no brazing, no dissimilar metals, no welds

thermoplastic heater enclosure
high tech, high temp materials proven use in automotive & mission critical applications minimizes harmful effects of harsh chemicals on heater enclosure

titanium element option
standard unit ships with incoloy heater replaces incoloy heater element with titanium, longer life element

coiled heater, lower watt density
relaxed bends, more heating area reduces hot spots

flow through heater design
maximizes water flow minimal loss due to element bi-directional flow for more flexibility in tub design and plumbing configurations

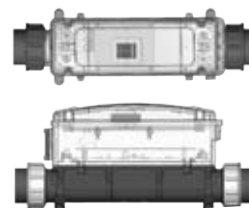


Inventory Innovations

50/60 Hz
systems available for domestic or export markets
reduces inventory needs
fewer skus

single skus
multiple configurations are picked via menus on the manufacturing line
reduced inventory need
fewer skus

low flow circ pumps configurations
special low flow adapter to support M7 more options for circ pump tubs



Consumer Usability Innovations

user settable selections
day of week/time of day
user preferences
more flexibility

temperature settings
50-104 – two temperature ranges
lower range allows for energy savings when spa is idle



End User Friendliness

user friendly menus
intuitive, easy navigation and option settings

english messages & error codes
text error messages clearly written and easy to understand for the consumer



design flexibility
the ease with which the system can be modified for use in applications or environments other than those for which it was originally designed

bi-directional flow pressure or vacuum applications

compact footprint
1/2 cubic foot of space in tight equipment compartments needed

time outs settable
energy efficient savings based on manufacturers preferences, manages energy usage more efficiently – GREEN



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Revolution Specifications

System Model

Revolution 60 Hz, (BP1500)

Part Number

55697 with a 4kW 800 Incoloy Element

55700 with a 4kW 800 Titanium Element

Topside Panels

TP 600

AX10: One button

AX20: Two button

AX40: Three button

Couplings (nuts and seals included)

Part No. 55911 2" Tailpieces (2-Speed Pump 1)

Part No. 55914 1.5" Tailpieces (2-Speed Pump 1)

Part No. 55912 1" Tailpiece Inserts (Circ)

Part No. 55913 One Direct Circ Pump Coupling, and one 1" Tailpiece Insert



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Revolution Components

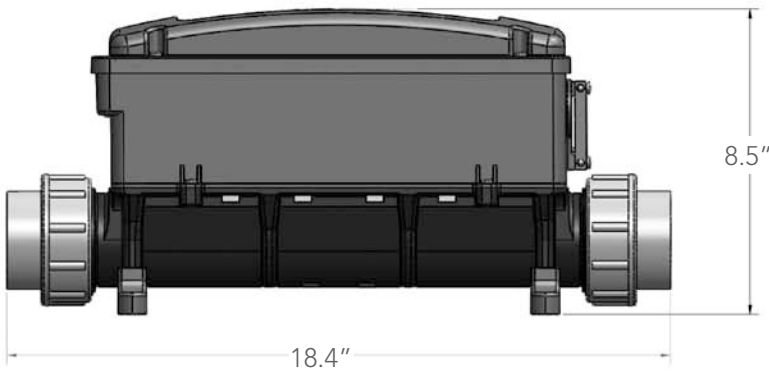


- ① Electric Housing Cover
- ② Bi-directional Flow Heater
- ③ Heater Housing
- ④ Electronic Enclosure
- ⑤ Nut and Tailpiece
- ⑥ Support Legs

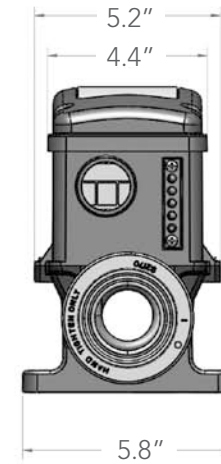
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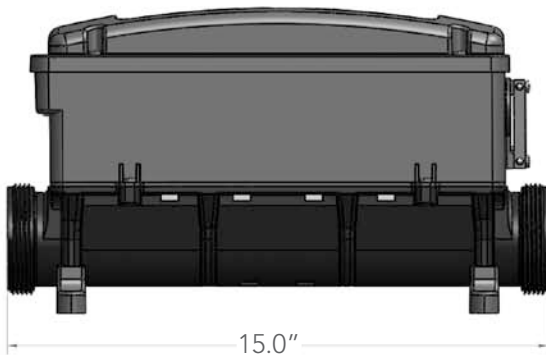
System Dimensions



FRONT VIEW with tail pieces



SIDE VIEW (RIGHT SIDE)



FRONT VIEW w/o tail pieces



BOTTOM VIEW





Installation

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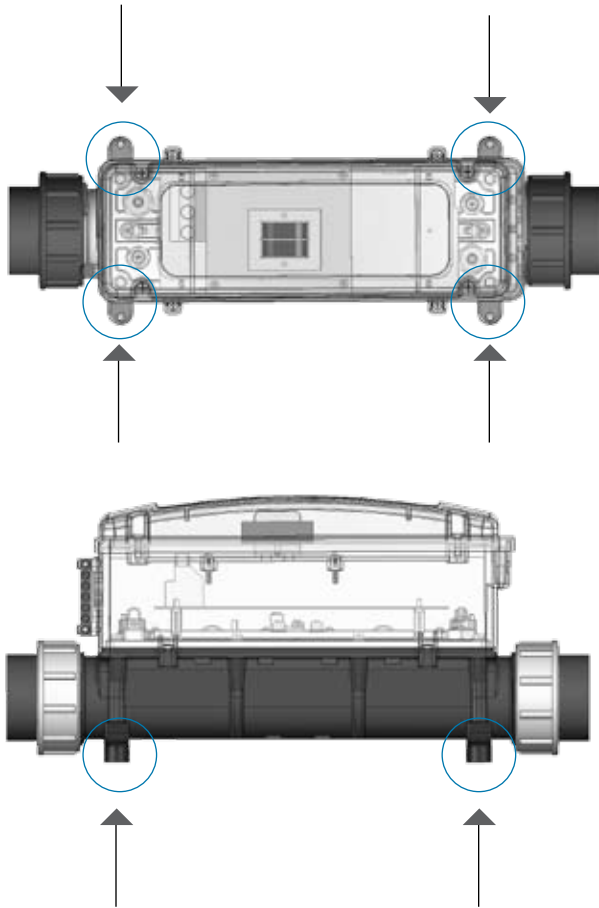
When Mounting the System

The design and technology behind the Revolution allows it to be used in most any application, and can be mounted on the suction side or discharge side of the pump.

TIP

To improve reliability, take steps to minimize vibration from the pump(s) that could be transmitted to the Revolution.

- Use rubber isolation pads under the pumps and flexible PVC between the filtration pump and the heater to help minimize vibration.
- Mount the system with the heater horizontal and as low as possible in the equipment compartment.
- To avoid any potential for water to drip directly on the system, do not mount the system directly under the control panel mounting location. Allow a drip-loop in the control panel wiring to keep any water that may travel down the wire from wicking onto the system box.
- Do not mount upside down.



Firmly attach mounting holes on each side of the system box with the screws and washers provided.

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Top-Side Panel Installation



TIP

Choosing a Location for the Topside Panel

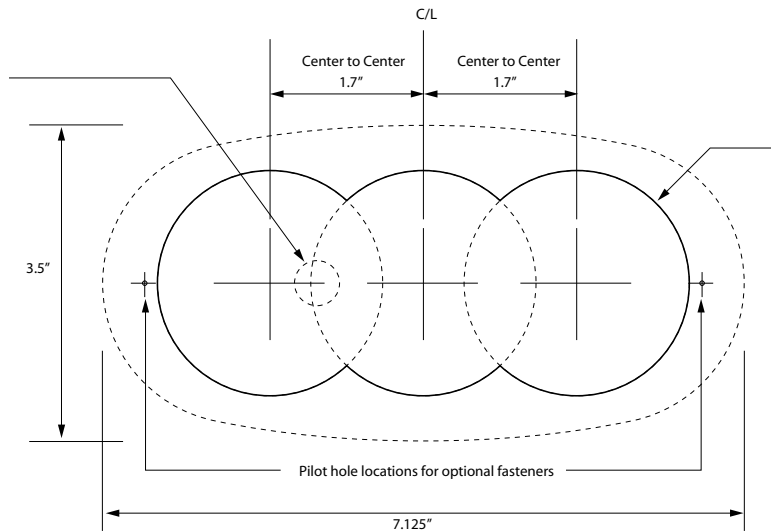
- Select a location that is easily accessible. The user should be able to reach the panel without stretching or getting into an awkward position.
- The mounting location should allow the user to see all of the visual indicators and display features of the topside panel without strain.
- Before drilling the cutout of the panel, test to see that the orientation of the topside panel is correct. Also, be sure that the cable reaches the control system without stretching or being forced against any sharp corners.
- Hold the topside panel at the desired mounting location and route the connecting cable toward the control system to determine that the cable is long enough to allow it to be connected inside of the unit.
- The mounting area must be above the maximum water level of the spa and in an area with good drainage to prevent the accumulation of any water. The topside panel should not be submerged.
- If the topside panel must be mounted underneath a spa cover, select a mounting location that will prevent the cover from resting directly upon the panel, but will allow the cover to seal when closed.



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Topside Panel Installation (cont.)

The topside panel is specifically designed to withstand the harsh spa environment and is intended to be mounted in a location on, or close to the spa, in order to provide the spa user with the greatest convenience when controlling the spa equipment.



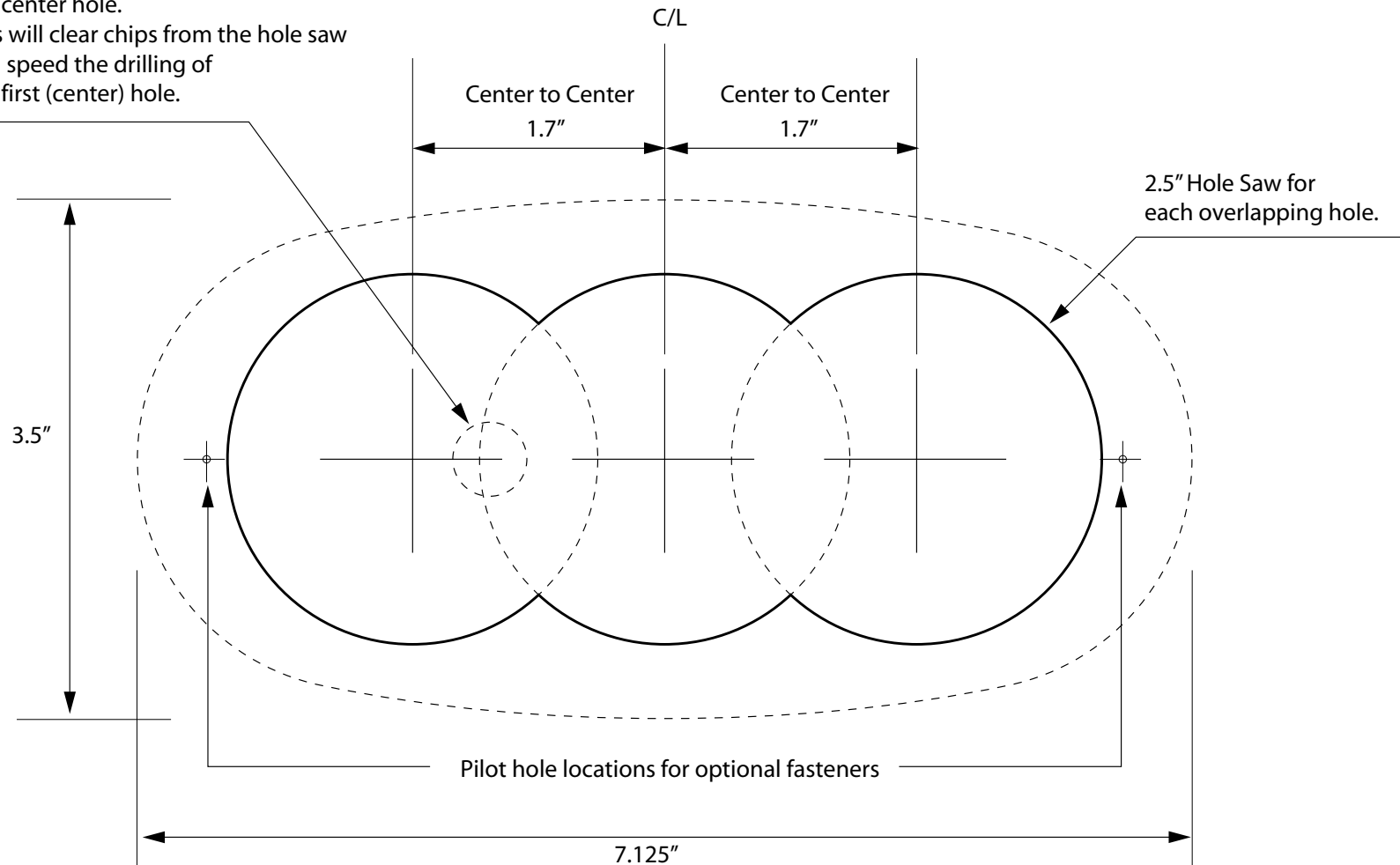
- 1 Drill a .5" hole on the kerf of the center hole. This will clear chips from the hole saw and speed the drilling of the first (center) hole.
- 2 2.5" hole saw for each overlapping hole.
- 3 Pilot hole locations for optional fasteners.

1. Cut a mounting hole as shown. (A more detailed view is shown on the following page.)
2. Fit the topside panel into the hole to make sure the hole is the proper size before proceeding.
3. Remove all dust and particles from the mounting surface around the hole. A clean smooth surface that is dry and oil free is required for the adhesive on the back of the panel to attain a good bond.
4. Remove the paper backing from the adhesive on the rear of the panel. All of the adhesive should be exposed.
5. Route the connecting cable through the opening and place the topside panel into the opening. Align the panel and press firmly onto the mounting surface. Route the cable to the control system.
6. Remove the top cover to the control system, and remove the cable retaining clamp.
7. Plug the cable connector into the connector labeled J33. Replace the connector clamp and secure the screw.

Cutout Template

Drill a .5" hole on the kerf of the center hole.

This will clear chips from the hole saw and speed the drilling of the first (center) hole.



Note:
To print actual size, set Page Scaling to NONE in the Acrobat print dialog.

To download a PDF of this template, please visit our web site:

<http://service.balboa-instruments.com/appnotes/> > Topside Panels > VL600S. Click on the "Download the Cutout Template here" link.

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Topside Panel Cable Installation

1. Plug the panel connector into J33.
2. Route the panel connecting cable under the cable clamp.



TIP Allow for a drip-loop in the panel cable before it enters the enclosure.

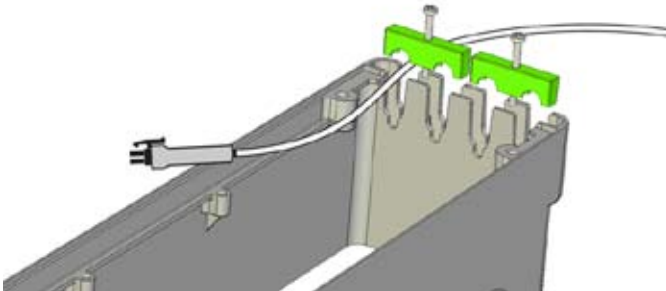
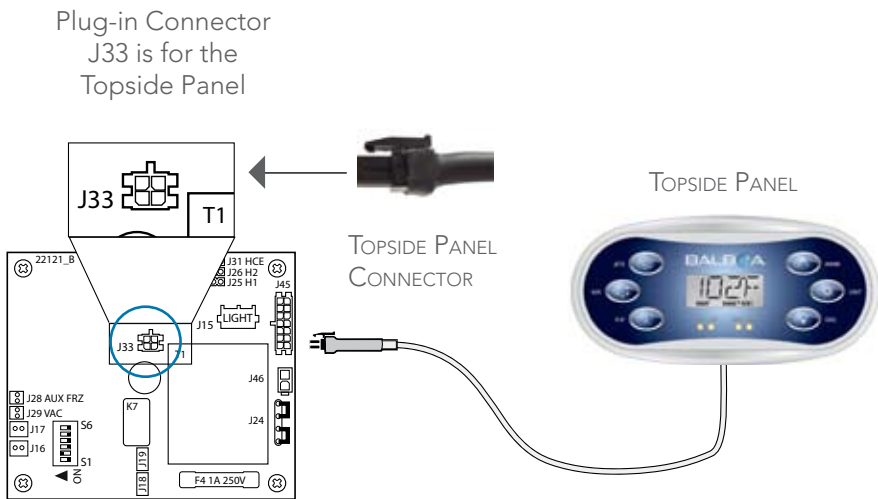
3. Verify settings on the logic board.
4. At this time, while the lid is off, check to see if any system configuration changes must be made. (See Advanced System Setup.)



TIP

The only configurations requiring a change would be:

- Adding or removing a blower, or
- Changing the operation voltage.



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Terminal Block Connections

Tools Needed: Phillips and flat screwdrivers, wire strippers.

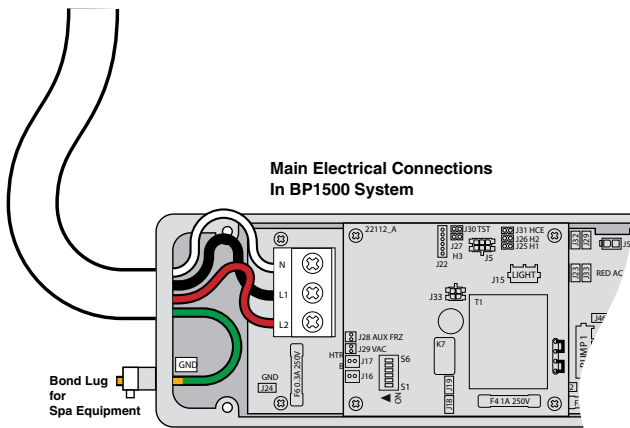
1. Remove the four screws holding the system lid.
2. Attach the conduit or wire connector to the system box.
3. Strip away 1" of insulation of each wire.
4. Pull the cable through the access hole.
5. Push the wires into the proper terminals as indicated on the terminal block sticker.
6. Connect the ground wire to the Bond Lug ground bar through the hole in the system box and tighten the screw.
7. Tighten the screws on the terminal block; torque between 21 and 23 in lbs.



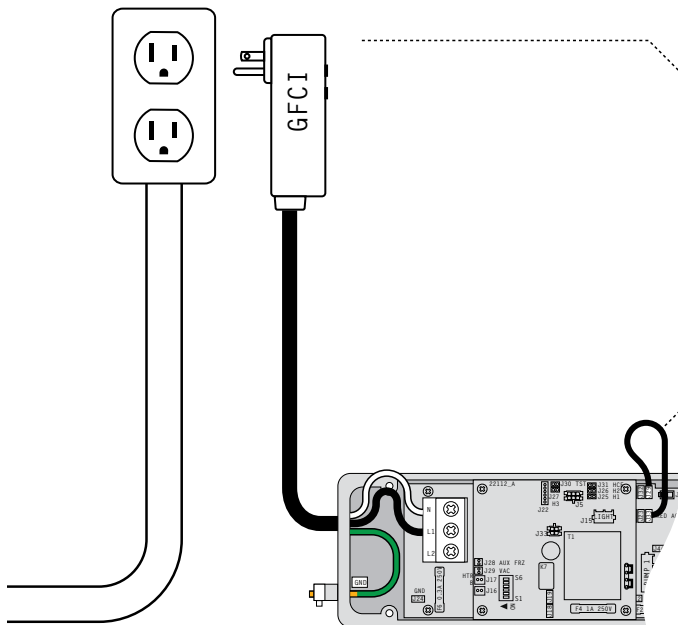
TIP

When installing and routing wires to the terminal block, providing service loops to incoming wiring is highly recommended. Service loops provide an extra length of wire in the event of future serviceability.

You are now ready to fill and power up the spa.



240V Wiring Installation



120V Wiring Installation



Before Power-up: Filling the Spa

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Preparation Before Power-up

Preparing the spa refers to:

- Filling the spa
- Priming the spa

Filling the spa

Fill the spa to its correct operating level. Follow manufacturer's instructions.



TIP

Be sure to open all valves in the plumbing system before filling to allow as much air as possible to escape from the plumbing and the control system during the filling process.

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Power-up Screen

Each time the system powers up, a series of numbers is displayed as the system runs a self diagnostic check. This is normal, and lasts for about 10 seconds.

When LINK appears, press any button to link the panel with the system.



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Priming the Spa: Priming Mode

- Press the JETS button once to start Pump 1 in low speed
- Press again to switch to high speed
- Press the AUX button to turn on Pump 2, if available. Be sure to energize the 2nd pump.
- The pumps will now be running at high speed to assist priming.

! IMPORTANT

A pump should not be allowed to run without priming for more than 2 minutes. Under NO circumstances should a pump be allowed to run without priming beyond the end of the 4-5 minute priming mode. Doing so may cause damage to the pump and cause the system to energize the heater and go into an overheat condition.

Priming Mode



Press to Start Pump 1 at Low Speed
Press Again to Switch to High Speed



Press to Start Pump 2

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RUN PMPS PURG AIR ----

When this menu appears, the system is asking what you would like to do. You have 3 options:

- If the spa does not need to be primed, priming mode can be exited by pressing any TEMP button.
- Do nothing. (Priming mode terminates within 4 - 5 minutes.)
- Run Priming Mode

NOTE: Normally, priming mode can be bypassed. Priming mode is necessary only if the spa is refilled and if there's the possibility of air being in the system.



Run pumps to purge the air



Exits Priming Mode

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Priming the Spa: If the Pumps have not Primed



TIP

- If the pumps have not primed after 2 minutes, and water is not flowing from the jets in the spa, do not allow the pumps to continue to run. Turn off the pumps and repeat the process.
- Turning the power off and back on again will initiate a new pump priming session. Sometimes momentarily turning the pump off and on will help it to prime.
- Do not do this more than 5 times. If the pump(s) will not prime, shut off the power to the spa and call for service.



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Exiting Priming Mode

Once the system has exited Priming Mode, the topside panel momentarily displays the set temperature; however, not immediately. The system requires approximately 1 minute of water flowing through the heater to determine the water temperature and display it.

The following pages show panel operations assuming no priming is needed.

Once the system has exited Priming Mode, the topside panel momentarily displays the set temperature.

The system then requires approximately 1 minute of water flowing through the heater to determine the water temperature and display it.



Initial Software Configuration

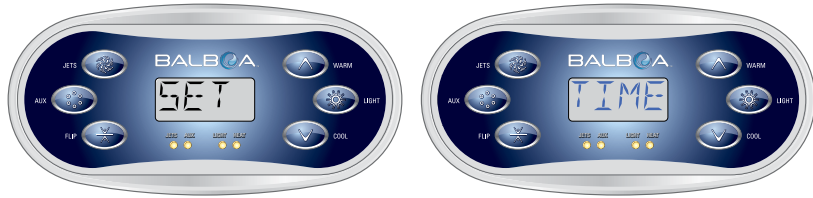
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Setting the Time

Set the time before operating the system. Filtration times and other features are determined by the panel clock being set.

SET TIME appears on the screen if clock is not set.



Display: SET TIME appears if clock is not set.



Press TEMP

To Set the Time

Press TEMP



The temperature flashes.

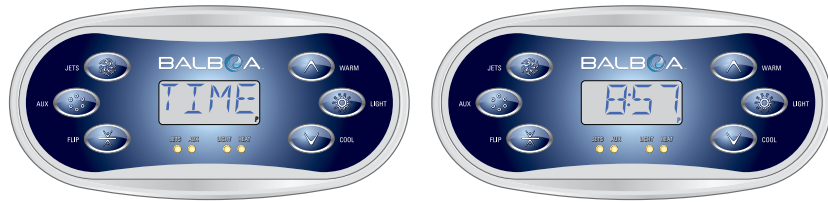


Press LIGHT repeatedly until TIME appears

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Setting the Time (cont.)

TIME and a clock is displayed.



- Press TEMP



- When the screen flashes hours, press TEMP to change the hours up or down.



NOTE: If the clock is in a 12 hour clock mode, AM/PM switches automatically as the time advances or recedes.



- Press LIGHT to change the display to minutes.

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Setting the Time (cont.)



- When the screen flashes minutes, press TEMP to change the minutes up or down.

- Press LIGHT to exit.
- The display will return to the main screen in approx. 10 sec.

If a 24 hour display is preferred, see [Setting the 24 Hour Clock](#).



Diagnostic Messages

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Messages

Messages are part of the diagnostic function of the Revolution and require action.

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General Messages

---°F ---°C

After the pump has been running for 1 minute, the temperature will be displayed.

42°F TOO COLD

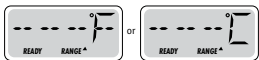
A potential freeze condition has been detected, or the Aux Freeze Switch has closed, and all pumps and blower are activated. All pumps and blower are ON for at least 4 minutes after the potential freeze condition has ended, or when the aux freeze switch opens.

In some cases, pumps may turn on and off and the heater may operate during Freeze Protection.

This is an operational message, not an error indication.

NO COMM

The control panel is not receiving communication from the System. Call for Service.



Water Temperature is Unknown



Too Cold - Freeze Protection



No Communications

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General Messages (cont.)



Pre-Production Software

BETA VER- SION ----

The Control System is operating with test software. Call for Service.



°F or °C is replaced by °T

102°T

The Control System is in Test Mode. Call for Service.

Flow Related Checks

Check for low water level, suction flow restrictions, closed valves, trapped air, too many closed jets and pump prime.

On some systems even when spa is shut down, some equipment may occasionally turn on to continue monitoring temperature or if freeze protection is needed.

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Heater Related Messages

HTR FLOW LOSS ----

There may not be enough water flow through the heater to carry the heat away from the heating element. Heater start up will begin again after about 1 min. See "Flow Related Checks" below.

HTR FLOW FAIL ----

There is not enough water flow through the heater to carry the heat away from the heating element and the heater has been disabled. See "Flow Related Checks" below. After the problem has been resolved, you must press any button to reset and begin heater start up.

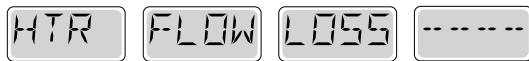
HTR MAY BE DRY ---- WAIT ----

Possible dry heater, or not enough water in the heater to start it. The spa is shut down for 15 min. Press any button to reset the heater start-up. See "Flow Related Checks" below.

HTR DRY ----

There is not enough water in the heater to start it. The spa is shut down. After the problem has been resolved, you must press any button to reset and restart heater start up. See "Flow Related Checks" below.

* This message can be reset from the topside panel with any button press.



Heater Flow is Reduced (HFL)



Heater Flow is Reduced (LF)*



Heater may be Dry (dr)*



Heater is Dry*

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Heater Related Messages (cont.)



Water is too Hot - (OHS)

WATR TOO HOT ---- (OHS)

One of the water temp sensors has detected spa water temp 110°F (43.3°C) and spa functions are disabled. System will auto reset when the spa water temp is below 108°F (42.2°C). Check for extended pump operation or high ambient temp.



Heater is too Hot (OHH)*

HTR TOO HOT ---- (OHH)

One of the water temp sensors has detected 118°F (47.8°C) in the heater and the spa is shut down. You must press any button to reset when water is below 108°F (42.2°C). See "Flow Related Checks" below.



Press Button to Reset

PRES BTTN TO RSET

Some errors may require power to be removed and restored. A reset message may appear with other messages.

* This message can be reset from the topside panel with any button press.

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Sensor-Related Messages



Sensor Balance is Poor

102°F SNSR BAL- ANCE

The temperature sensors MAY be out of sync by 2°F or 3°F. *Call for Service.*



Sensor Balance is Poor*

SNSR SYNC ---- CALL FOR SRVC ----

The temperature sensors ARE out of sync. The Sensor Balance is Poor. Fault has been established for at least 1 hour. *Call for Service.*



SNSR A ---- CALL FOR SRVC ----

SNSR B ---- CALL FOR SRVC ----

A temperature sensor or sensor circuit has failed. Call for Service.



Sensor Failure

* This message can be reset from the topside panel with any button press.

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System-Related Messages



Memory Failure - Checksum Error*



Memory Failure - Persistent Memory Error*



Configuration Error – Spa will not Start Up

MEM FAIL ----

At Power-Up, the system has failed the Program Checksum Test. This indicates a problem with the firmware (operation program) and requires a service call. This message will repeat on each power-up.

MEM RSET ----

Contact your dealer or service organization if this message appears on more than one power-up

CNFG FAIL ----

Contact your dealer or service organization.

* This message can be reset from the topside panel with any button press.

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System-Related Messages (cont.)



A Pump Appears to be Stuck ON

STUK PUMP ----

Water may be overheated. POWER DOWN THE SPA. DO NOT ENTER THE WATER. Contact your dealer or service organization.



A Pump Appears to have been Stuck ON when spa was last powered UP

HOT FALT ---- CALL FOR SRVC ----

A Pump appears to have been Stuck ON when spa was last powered

POWER DOWN THE SPA. DO NOT ENTER THE WATER. Contact your dealer or service organization.

This fault can be reset by powering up in Test Mode.

WARNING:

HOT FALT indicates a serious condition and should not be treated lightly. The spa probably had a pump stuck in the ON position and could not be turned off, thereby overheating the water. The system tripped the GFCI to avoid additional heating.

NOTE: The GFCI Trip Feature must be enabled for this safety feature to function. The system should be monitored carefully and the main circuit board may need to be replaced.



Troubleshooting Support

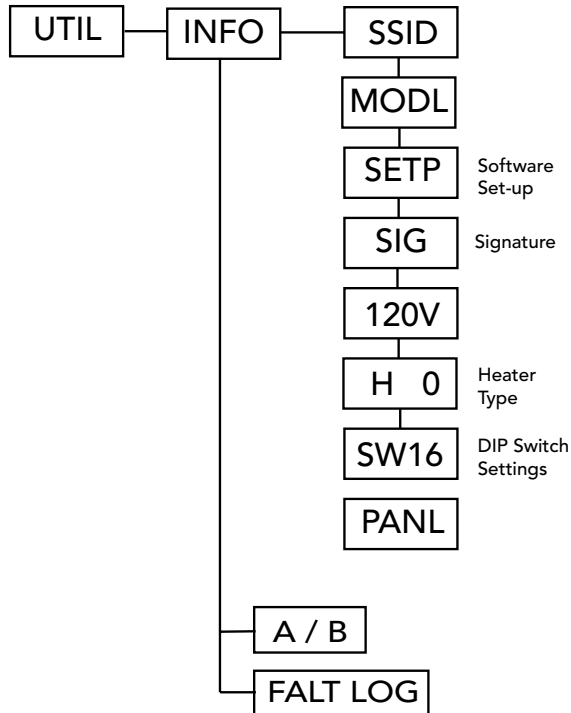
Revolution

The Utilities Menu

Utilities provides general support of the Revolution. Utilities provides access to viewing information on hardware, panel, and software revisions. It also permits viewing of reminder and personal settings.

Main Menu > Utilities > Information >

- SSID: Software Self Identification (or, System Panel ID)
- MODL: Model
- SETP: Setup
- SIG: Signature
- 120V: 120V or 240V configuration
- H0: Heater type
- SW16: DIP switch settings
- PANL: Panel version
- A/B: Display, alternates A and B sensor readings
- FAULT LOG: Displays fault log
- DEMO: Demo, only if enabled



“At a Glance” of the Utilities Menu Tree

Revolution

Entering the Utilities Menu

Press TEMP for a flashing display.



The temperature flashes.



Press LIGHT repeatedly until UTIL appears.



Revolution

Entering the Utilities Menu (cont.)



Press LIGHT.



Press LIGHT to set "A/B" On.



Please TEMP to toggle A/B sensor readings. When set to ON, Panel will display alternate readings from Sensor A and Sensor B on Main Screen.

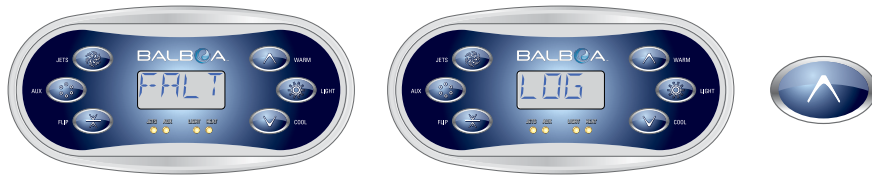


Or, press LIGHT to continue to the Fault Log.

Transforming the Control of Hot Tubs

Revolution

Entering the Utilities Menu (cont.)



Displays Fault Log.

Waiting 10 seconds allows the screen to return to normal operation.

Transforming the Control of Hot Tubs

Revolution

Entering the Sub-utilities Menu

Press TEMP for a flashing display.



Revolution

Entering the Sub-utilities Menu (cont.)



Press TEMP.



SSID is displayed.



After SSID is displayed, a string of numbers appear. There is a two second delay on each number.



Press LIGHT to view MODL.

Revolution

Entering the Sub-utilities Menu (cont.)

After MODL is displayed, the string of numbers is displayed. (There is a two second delay on each number.)



Press LIGHT to view SETP.



Set-up displays the hardware set-up: S01, S 02, S 03, etc. (There is a two second delay on each number.)

Revolution

Entering the Sub-utilities Menu (cont.)

Press LIGHT to view SIG.



Revolution's current SIG (Signature) appears. (There is a two second delay on each number.)



Press LIGHT to view current VAC input power sensed by the Revolution.

Revolution

Entering the Sub-utilities Menu (cont.)



Current VAC input power shown. Press LIGHT to continue to display Heater Type.



Current Heater Type shown. Press LIGHT to continue to display DIP Switch Settings.



Current DIP Switch settings.

In this case:

- 0 = DIP Switch 1 – Test Mode Off (0) or On (1)
- 3 = DIP Switch 2+3+4 = the number of HS pumps with heat
- 1 = N/A or Special Amperage Rule 1 or 2
- 0 = Store Settings (0) or Memory Reset (1)



Revolution

Entering the Sub-utilities Menu (cont.)

Press LIGHT to continue to display Panel Version.



Pressing LIGHT again will take you back to INFO.

To EXIT to the Main Screen, wait 10 seconds to allow the screen to return to normal operation.



Revolution

Fault Log

The Fault Log stores up to 24 events in memory and they can be reviewed under the Fault Log Menu.

Each event captures a Fault Message Code, how many days have passed since the fault, Time of the fault, Set Temperature during the fault, and Sensor A and B temperatures during the fault. The Fault Log is also available from the Test Menu (in Test Mode).

Revolution

Fault Log (cont.)

Press TEMP for a flashing display.



The temperature flashes.



Press LIGHT repeatedly until UTIL appears



Revolution

Fault Log (cont.)



Press LIGHT repeatedly until FALT appears



Pressing TEMP displays up to 24 messages. Fewer messages may be displayed.

FALT LOG appears across the display



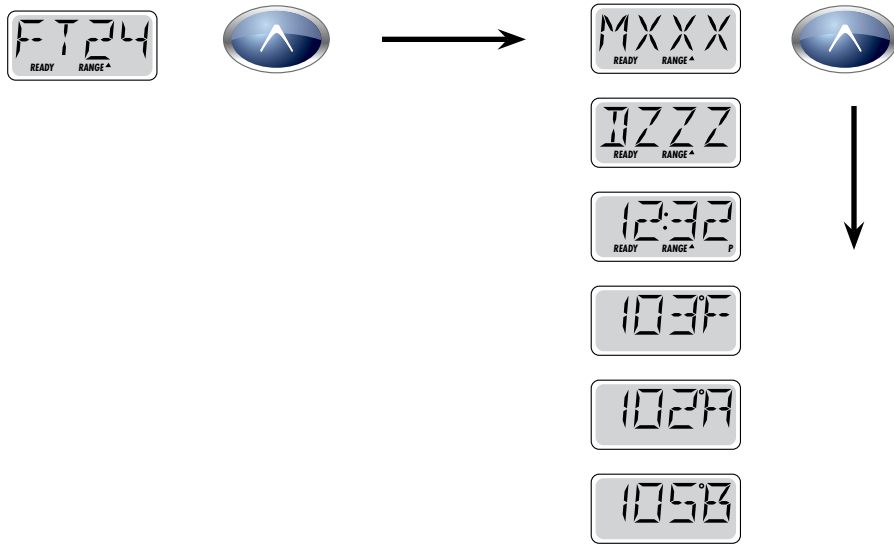
Each press of the LIGHT button displays the next numbered fault log event. Pressing TEMP at any fault event reveals a Message Code (next page).

Revolution

Fault Log (cont.)

Pressing TEMP at any fault event reveals a Message Code

- Continuing to press TEMP reveals additional information for that specified numbered fault event.
- Waiting 30 seconds inside the fault log menu allows the screen to return to normal operation.



Fault Log Message Codes

- MXXX: Fault Message Code
- DZZZ: How many days have passed since the fault
- Time of the fault
- Set Temperature during the fault
- Sensor A Temperature during the fault
- Sensor B Temperature during the fault



Advanced System Configuration & Setup

Revolution

System Configuration

Flexibility in the Revolution allows the manufacturer or installer to choose from eight (8) preconfigured system options. Changing the configurations is made via the topside panel and in some options with a simple jumper wire change on the system board.

A basic configuration is shipped from the factory and any optional setups are documented here.



TIP

- The default factory setting is Setup 1: 2 Speed, Pump 1; 1 Speed, Pump 2.
- Most configurations only require a software change via the topside panel.
- Wiring changes are only needed for adding/removing a blower or changing an operating voltage.

Revolution

To Configure the Revolution

1. Decide on a configuration. (Consider what devices will be connected; see chart below.)
2. Make any changes on the power board, if needed.
3. If changing voltage, make a DIP switch change on the logic board.
4. Install incoming voltage supply wires.
5. If needed, configure the software through the panel.

Configuration Table

Setup No.	Pump 1 (P1) J8	Pump 2 (P2) J14	Blower J14	Circ Pump J21	Ozone J22	Voltage
1	2 SPD	1 SPD	NA	NA	240V	240V 60Hz
2	1 SPD	1 SPD	NA	YES	240V	240V 60Hz
3	2 SPD	NA	YES	NA	240V	240V 60Hz
4	1 SPD	NA	YES	YES	240V	240V 60Hz
5	2 SPD	NA	NA	NA	240V	240V 60Hz
6	1 SPD	NA	NA	YES	240V	240V 60Hz
7	2 SPD	NA	NA	NA	120V	120V 60Hz
8	1 SPD	NA	NA	YES	120V	120V 60Hz

Transforming the Control of Hot Tubs

Revolution

Configuration Setup 1, 2, 5 & 6

240 VOLT CONFIGURATION WITHOUT BLOWER

Power Board:

Wiring changes: Not required

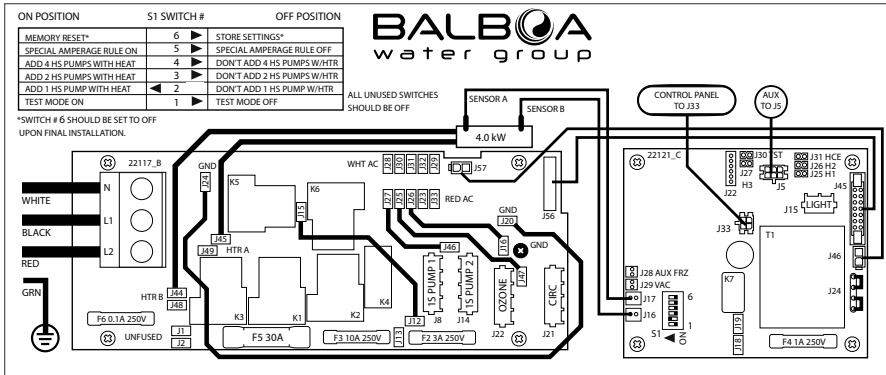
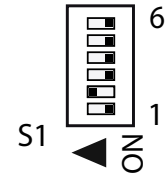
Voltage: 240V, 60Hz

Heater: 4.0 KW @ 240 VAC

Logic Board:

S1 DIP switch No. 2: ON

LED Spa Light (J15): 12 VAC .25 A



Default Setup 1 includes:

Setup 1, 2, 5 & 6

Factory default settings.

As shipped; no wiring changes needed.

Power Board Setup Chart

Setup No.	Pump 1 (P1) J8	Pump 2 (P2) J14	Blower J14	Circ Pump J21	Ozone J22	Jumper 15 Connects To
1	2 SPD	1 SPD	NA	NA	240V	J12
2	1 SPD	1 SPD	NA	YES	240V	J12
5	2 SPD	NA	NA	NA	240V	J12
6	1 SPD	NA	NA	YES	240V	J12



Revolution

Configuration Setup 3 & 4

240 VOLT CONFIGURATION WITH BLOWER

NOTE: The top logic board must be removed to gain access to the connections on the power board.

If the board configuration is changed, the software setup must be changed. This is accomplished in the SETP menu under UTIL.

Power Board:

Wiring changes: Move J12 to J13

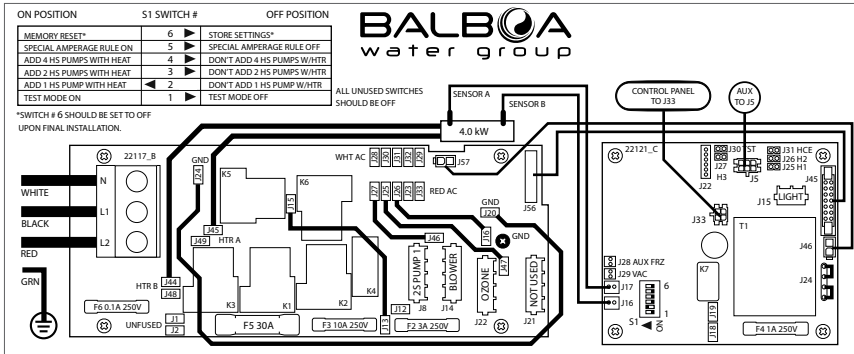
Voltage: 240V, 60Hz

Heater: 4.0 KW @ 240 VAC

Logic Board:

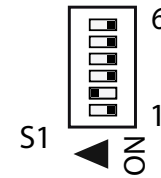
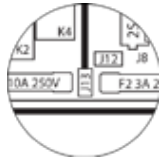
S1 DIP switch No. 2: ON

LED Spa Light (J15): 12 VAC .25 A



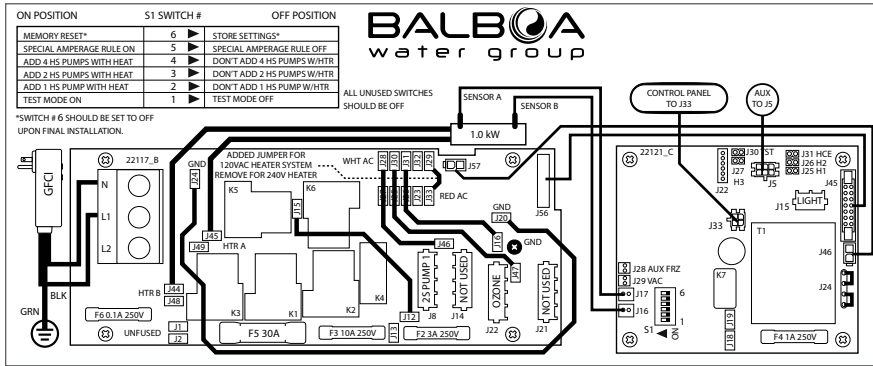
Setup 3 & 4

Move jumper wire connector J12 to J13.



Power Board Setup Chart

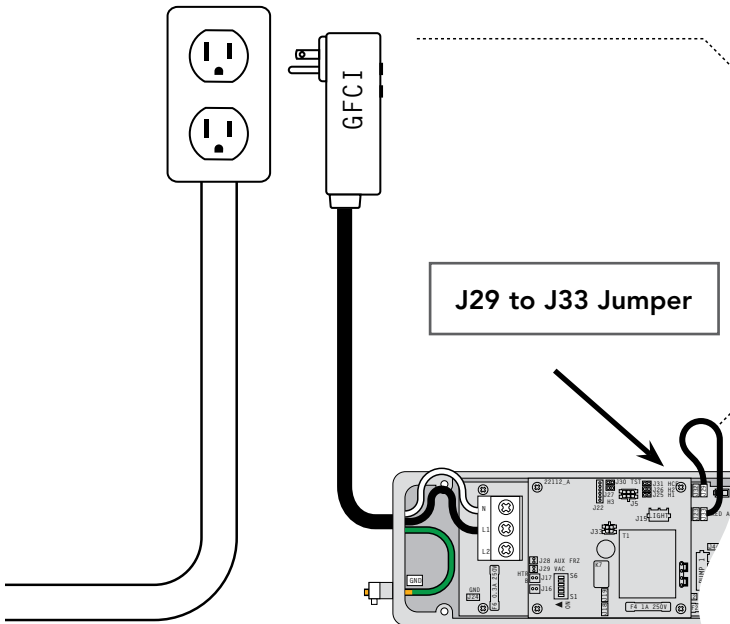
Setup No.	Pump 1 (P1) J8	Pump 2 (P2) J14	Blower J14	Circ Pump J21	Ozone J22	Jumper 15 Connects To
3	2 SPD	NA	YES	NA	240V	J13
4	1 SPD	NA	YES	YES	240V	J13



Setup 7 & 8

Wiring changes:

Add Jumper J29 - J33 to change system to 120V.



Transforming the Control of Hot Tubs

Revolution

Configuration Setup 7 & 8

120 VOLT CONFIGURATION

NOTE: The top logic board must be removed to gain access to the connections on the power board.

All services will run at 120V when the jumper J29 - J33 is installed.

Power Board:

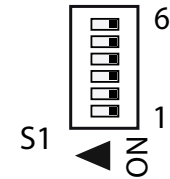
Voltage: 124V, 60Hz

Heater: 1.0 KW @ 120 VAC

Logic Board:

S1 DIP switch No. 2: OFF

LED Spa Light (J15): 12 VAC .25 A



Setup No.	Pump 1 (P1) J8	Circ Pump J21	Ozone J22	S1 Switch No. 2	Jumper 15 Connects To
7	2 SPD	NA	120V	OFF	J12
8	1 SPD	YES	120V	OFF	J12



Revolution

Software Setup

Note: Software Setup is changed through the panel, and is only necessary if the wiring configuration is changed from factory default (Setup 1). If the factory default had not been changed, this section can be skipped.

! *The No. 1 DIP switch on the logic board must be set to S-1 (ON).*

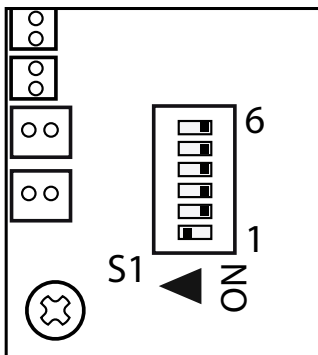
1. Remove Lid.

1



Remove Lid

2



2. Place DIP switch No. 1 on the logic board to the ON position. (Note: The power does not have to be off for this change.)

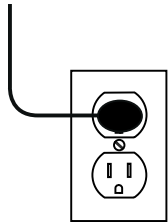
Revolution

Software Setup (cont.)

3. If the power is off, turn it on.

4. Once LINK appears, press the TEMP button repeatedly until a temperature reading appears and is flashing

3



4



Press repeatedly until a temperature reading appears

Revolution

Software Setup (cont.)

5



The temperature flashes.



5. Press Light once. TEST will appear.

6



Press repeatedly until a setup choice appears (S 01 - S 08)



6. Press TEMP repeatedly until your choice of S 01 - S 08 appears.



Transforming the Control of Hot Tubs

Revolution

Software Setup (cont.)

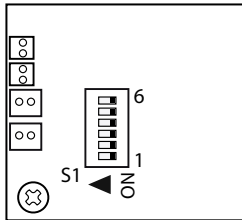
7



7. Stop at your chosen setup. Press LIGHT to enter your choice into the configuration system. Press LIGHT again to exit the menu.

Press LIGHT twice.

8



8. Place DIP switch No. 1 to the OFF position.

9



9. Software configuration is complete. Replace Lid.

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Spa Information

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Transforming the Control of Hot Tubs

Revolution

Specifications & Certifications

Environmental, Mechanical, Enclosure, Certifications, Electrical, Patents & Copyrights.

Environmental	
Operating Temperature	-20°C (-4°F) to 60°C (140°F)
Storage Temperature	-25°C (-13°F) to 85°C (185°F)
Humidity	Humidity: up to 85% RH, non condensing
Mechanical	
Weight (without cable)	7.83 lbs. (3.552 kg)
Dimensions (without tail pieces)	8.5"H x 15.0"W x 5.8"D
Dimensions (mounting holes)	11.45" x 5.30"
Enclosure	
IPx5	Thermoplastic Heater
Certifications	
UL Standard/Files	UL 1563 5th Edition/E90059 UL 1795 3rd Edition/E188744
Electrical	
Pump 1	1 or 2 Speed - 240V/12A or 120V/12 A
Pump 2	1 Speed - 240V/12A or 120V/12A
Circ Pump and Ozone (combined total)	240V/5.5A or 120V/5.5A
Blower	240V/8A
LED Lights (No Incandescent lights)	12 VAC/.25A
Option Output	4 Amp Max.
Heater Flow	20 GPM minimum.
Patents & Copyrights	
<p>Manufactured under one or more of these patents. U.S. Patents: 5332944, 5361215, 5550753, 5559720, 5,883,459, 6253227, 6282370, 6590188, 6976052, 6965815, 7030343, 7,417,834 b2, Canadian Patent: 2342614, Australian patent: 2373248 other patents both foreign and domestic applied for and pending.</p> <p>All material copyright of Balboa Water Group. Additional Patents Pending. Specifications subject to change without any prior notice.</p>	

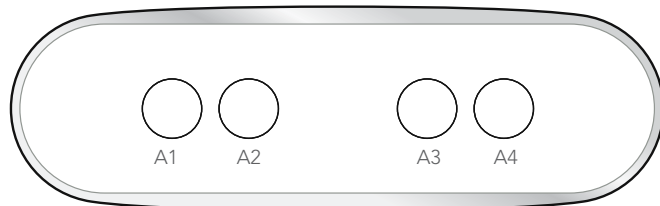




AX10 A1	NO O/L	52803
AX10 A2	AUX O/L	55919 (SHOWN)
AX10 A3	NO O/L	52805
AX10 A4	NO O/L	52806



AX20 A1 A2	NO O/L	52800
AX20 A1 A3	AUX O/L	52801
AX20 A1 A4	NO O/L	52802



AX40	NO O/L	52799
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Transforming the Control of Hot Tubs

Revolution

Auxiliary Panels

FEATURE:	DEFAULT	OPTIONS
Aux Button A1	Jets 1	See Aux Button Note
Aux Button A2	Jets 2	See Aux Button Note
Aux Button A3	Unused	See Aux Button Note
Aux Button A4	Light	See Aux Button Note



TIP

Aux Buttons can be set with the following functions based on Manufacturer Specification: (These functions can vary by Setup Number as well).

Unused – Up – Down – Temp – Jets 1 – Jets 2 – Jets 3 – Jets 4 – Jets 5 – Jets 6 – Jets 7 – Jets 8 – Blower 1 – Blower 2 – Mister 1 – Mister 2 – Mister 3 – Light 1 – Light 2 – Light 3 – Light 4 – Fiber Optic – Option 1 – Option 2 – Option 3 – Option 4 – Either Light





2" TAILPIECE KIT, PART No. 55911

Standard 2" sockets to glue up to 2" PVC pipe.



1.5" TAILPIECE KIT, PART No. 55914

1.5" sockets to glue up to 1.5" PVC pipe with the I.D.
Be sure to orient the fittings so that the insert is at the 12:00 position to prevent trapped air.



1" CIRC PUMP INSERT KIT, PART No. 55912

1" barb fittings for use with 1" tubing. Be sure to orient the fittings so that the insert is at the 12:00 position to prevent trapped air.



1" CIRC PUMP INSERT KIT, PART No. 55913

One fitting for direct coupling to the threaded suction of an appropriately-sized circ pump. A 1" barb fitting for use with 1" tubing is used on the other end of the heater. Be sure to orient the fittings so that the insert is at the 12:00 position to prevent trapped air.

Transforming the Control of Hot Tubs

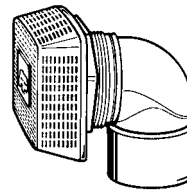
Revolution

Plumbing Kit Options

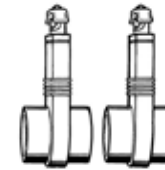
Tailpiece Kit and Circ Pump Insert Kits

Revolution

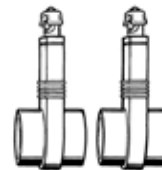
Recommended Installation Accessories



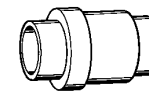
RATED SUCTION FITTINGS



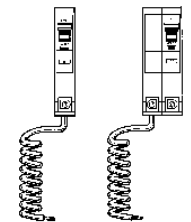
PUMP 1 SHUT-OFF VALVES



PUMP 2 SHUT-OFF VALVES



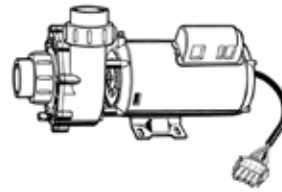
AIR BLOWER CHECK VALVE



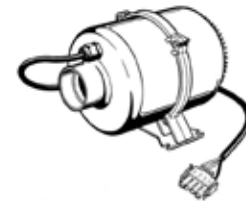
GROUND FAULT CIRCUIT BREAKER (GFCI)

Revolution

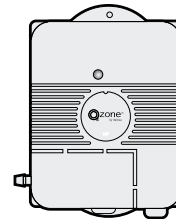
Optional System Components



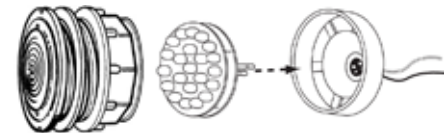
2ND PUMP



AIR BLOWER



OZONE GENERATOR



LED SPA LIGHT

Revolution

Glossary

Circ Pump (or circulation pump)

Low horse power pump designated especially for maintenance of filtration and heating. It often runs all day.

Clean-up (or purge) Cycle

An action designed to circulate water to maintain sanitary conditions. Pumps or blowers purge standing water to prevent the water from becoming stagnant.

Filtration Cycle

Period of time designated to filter the system. Oftentimes there are two filter cycles, 12 hours apart, and designated as F1 and F2.

Freeze Protection

A safety feature detecting water or air temperature approaching freezing. Once a set low temperature is reached, an action is often initiated automatically. Oftentimes pumps will start to keep water circulating in all plumbing and the heater may operate.

Revolution

Glossary (cont.)

GFCI

A device intended to protect people in the event of an electrical malfunction. Spa owners should know how to test the GFCI as routine maintenance.

Link

Refers to “linking” the TP600 panel with the BP1500 system so that they communicate with each other. Linking is necessary only when a new panel or auxiliary panels are installed. Linking can be done at any time the system is functioning.

Preferences

Programmed events according to personal preferences.

SSID

Software Self Identification (or, System Panel ID)

Revolution

Glossary (cont.)

Priming Mode

Act of water flow through the plumbing to purge air from the spa system.

Normally, priming mode can be bypassed. The priming mode is necessary only if the spa is refilled and if there's the possibility of air being in the system.

What Priming Mode does:

Each time the spa is powered up, it will enter Priming Mode. The purpose of Priming Mode is to allow the user to run each pump and manually verify that the pumps are primed (air is purged) and water is flowing. This typically requires observing the output of each pump separately, and is generally not possible in normal operation. Priming Mode lasts 4 minutes, but you can exit it earlier by pressing any Temp button. The heater is not allowed to run during Priming Mode. **NOTE:** If your spa has a Circ Pump, it will turn on with Jets 1 in Priming Mode. The Circ Pump will run by itself when Priming Mode is exited.

Programming

Setting an order and time for planned events, such as filter times, clean-up cycle, etc.

Revolution

Supporting Documents

- “Revolution Series Installation and Setup, Application Notes and Setup Guidelines,” Balboa Water Group Document No. 47012.
- BWG TP600 Control Panel Document No. 40940.
- A Cutout Template for the BWG TP600 Control Panel.

Supporting Documents for Download

- Also, visit our technical site for Application Notes:
<http://service.balboa-instruments.com/appnotes/>

Topics include:

Auxiliary Jet Pumps Installation

Basic Configurations & System Mounting

Circ Pump Plumbing: Vacuum Heater, Vacuum Filter, Pressure Heater,
Freeze Sensor Installation

GFCI: Requirements, Wiring, Trip Features & Trip Issues

Guidelines, Plumbing Guidelines & Schematics.

NON-Circ, 2-Speed Pump 1

Ozone Installation

pH and ORP Installation

Spa Design Guidelines: Suction System Guidelines, Pressure System

Vacuum Filter, Vacuum Heater, Pressure Filter.

Transforming the Control of Hot Tubs

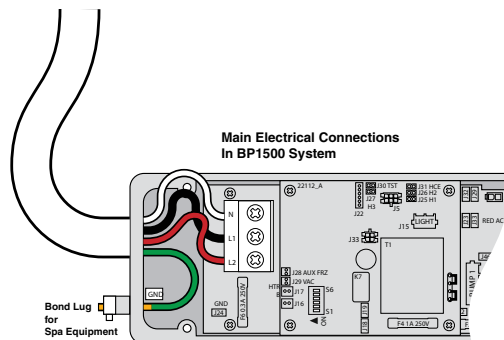
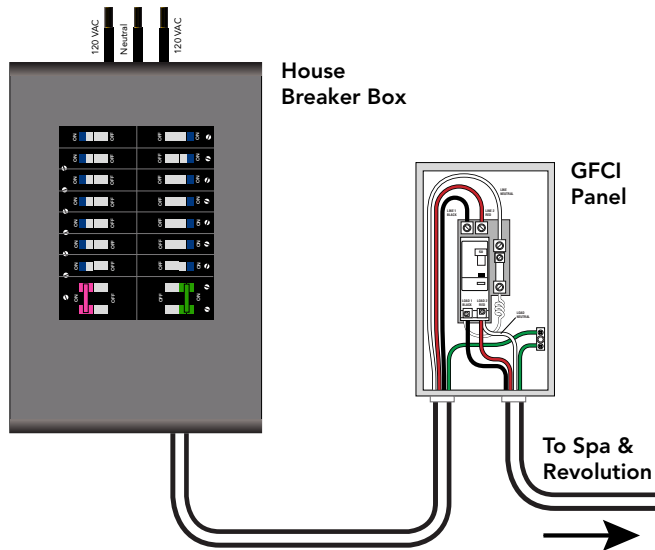
Revolution

Codes and Compliance

- All of the electrical wiring methods and materials used to complete the electrical installation of the Revolution control system must be in accordance with the National Electrical Code or the Canadian Electric Code, as well as any local electrical codes in effect at the time of installation.
- The selection of electrical materials required to accomplish this installation and the installation of the control system must be made by, or be under the direct supervision of, a qualified electrician.
- The Revolution is classified as a “continuous duty appliance” and is intended primarily for installation at a single family dwelling. The installation recommendations and instructions contained in this manual are directed solely toward these issues.

WARNING!

If there is any doubt whether the system that you are installing into does not have these features, contact a licensed, qualified electrician. **Do not attempt to modify the wiring yourself.**



Revolution

Electrical Protection

1. Local Disconnect
A local disconnect (sometimes referred to as an “electrical disconnect”) is installed apart from the main service panel. The local disconnect must be installed where readily accessible and within sight of the spa, but at least 5’ (1.5 meters) from the inside wall of the spa.
2. GFCI
It is required by code to install a Ground Fault Circuit Interrupter (GFCI) in the supply power for a spa.

NOTE: A GFCI power cord is included with a 120VAC spa. This can be used for a cord-connected 120V setup only, and only in place of a stand-alone GFCI.

Safety and Electrical Systems

- Use minimum 6AWG copper conductors only.
- Torque field connections between 21 and 23 in-lbs.
- Connect only to a circuit protected by a Class A Ground Fault Circuit Interrupter (GFCI) CSA enclosure: Type 2.
- The Revolution is classified as a “continuous duty appliance” and is intended primarily for installation at a single family dwelling. The installation recommendations and instructions contained in this manual are directed solely toward these issues.

WARNING!

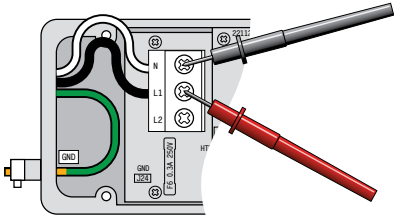
If there is any doubt whether the system that you are installing into does not have these features, contact a licensed, qualified electrician. **Do not attempt to modify the wiring yourself.**

Revolution

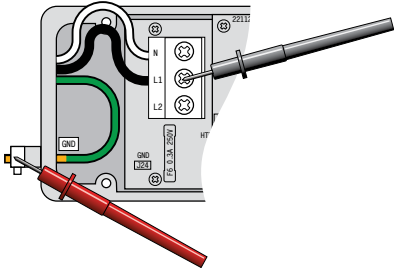
Voltage Checks

120 VAC Systems

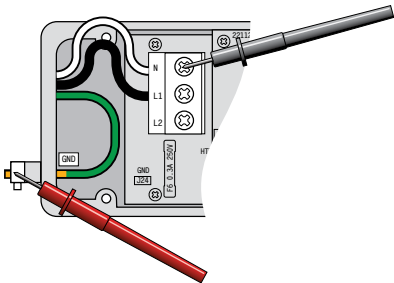
120VAC (108VAC-132VAC)
Line 1 and Neutral



120VAC (108VAC-132VAC)
Ground and Line 1

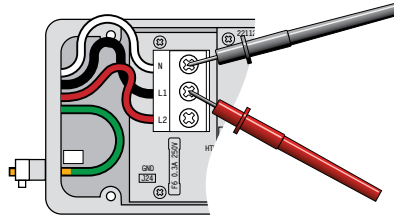


0 Volts
Ground and Neutral

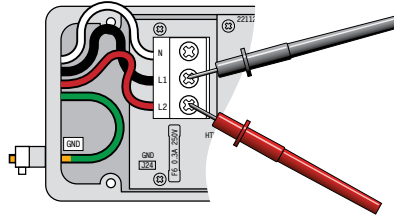


240 VAC Systems

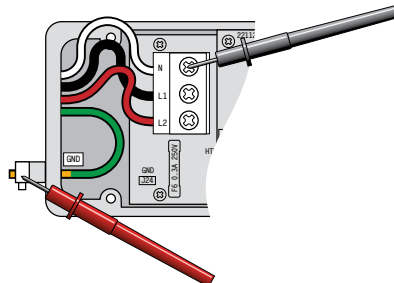
120VAC (108VAC-132VAC)
Line 1 and Neutral



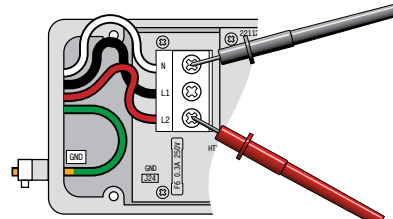
240VAC (216VAC-264VAC)
Line 1 and Line 2



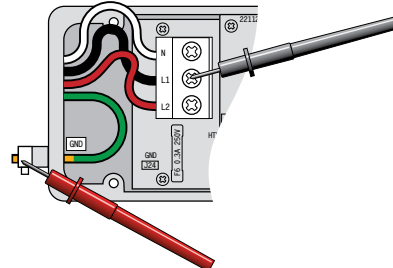
0 Volts
Ground and Neutral



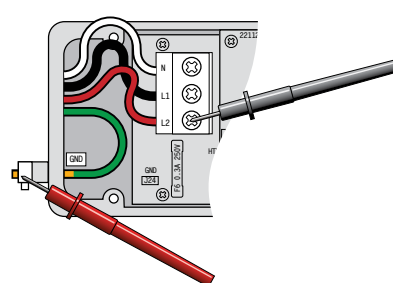
120VAC (108VAC-132VAC)
Line 2 and Neutral



120VAC (108VAC-132VAC)
Line 1 and Ground



120VAC (108VAC-132VAC)
Line 2 and Ground



Set voltmeter to AC Volts. Voltages should check out as follows:

- Line 1 Black to Line 2 Red – 240VAC:
(Range of acceptability: 216VAC – 246VAC)
- Either Line to Neutral – 120VAC
(Range of acceptability: 108VAC – 132VAC)
- Either Line to Ground – 120VAC
(Range of acceptability: 108VAC – 132VAC)
- Neutral to Ground – 0 Volts

These readings should be consistent at all points in all electrical enclosures and breaker boxes. If the readings are not in the acceptable ranges, do not power up the system.



Installation and Setup/Appendix

Revolution

General Spa Design Guidelines

System Orientations Supported

The Revolution supports two basic system configurations. When installing the Revolution, keep in mind the following characteristics that each system has. It will help in determining where to place and how to configure the Revolution. Follow these guidelines.

Two Circulation Systems

- **Non-circ System:** A non-circ system uses a 2-speed pump to heat and filter the spa.
- **Circ System:** A circ system uses a dedicated 1-speed pump to heat and filter the spa. The circ pump motor must not exceed 2 amps.

Also, keep in mind that:

- The heater requires at least 20 Gallons per Minute (GPM) of flow for proper function.
- Some systems may require at least 25 GPM.

Revolution

Spa Guidelines to Keep in Mind

Whether replacing an older control system, or if designing a new spa system, keep these guidelines in mind.

1. The suction system for the 2-speed pump or for the circ pump must be dedicated. There must not be any other pumps connected to this suction system.
2. The suction system for the 2-speed pump or for the circ pump must include the following:
 - a. 2 suction fittings, or
 - b. 1 suction fitting and a skimmer.
3. If the suction system for the 2-speed pump or for the circ pump includes a filter, it is desirable that the filter incorporate a by-pass around the filter cartridge that opens when the cartridge gets dirty. (Spring tension holding the by-pass valve closed must be overcome by the vacuum of the pump.) This by-pass should be capable of flowing a minimum of 20 GPM during the low speed operation of the 2-speed pump or during circ pump operation with the cartridge 100% blocked. The inclusion of a suction fitting appropriately plumbed into the suction circuit in conjunction with a vacuum filter may also meet this requirement.
4. The pressure system for the 2-speed pump or for the circ pump must be dedicated. There must not be any other pumps connected to this pressure system.

Revolution

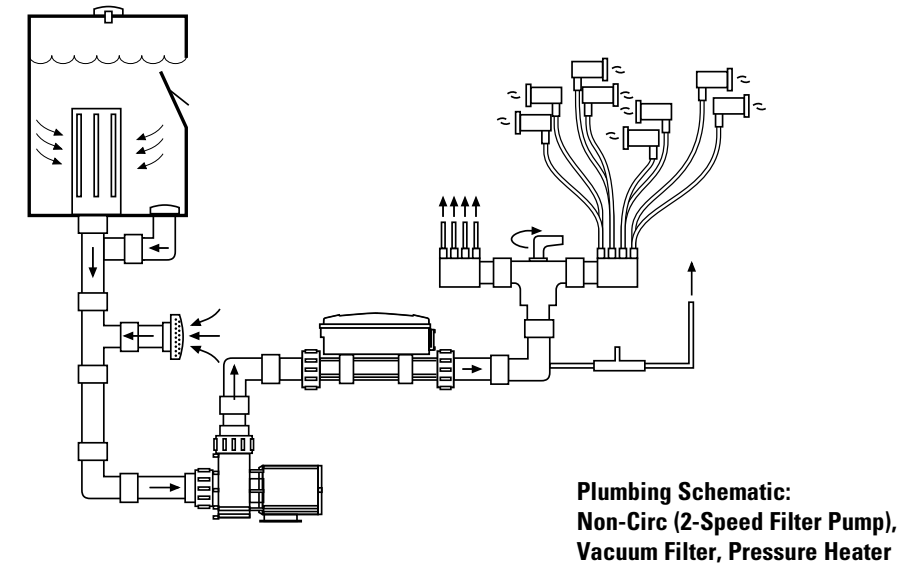
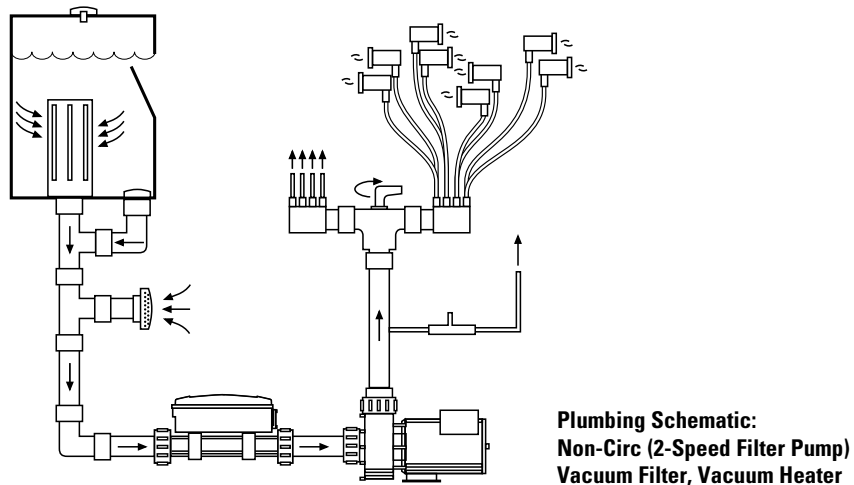
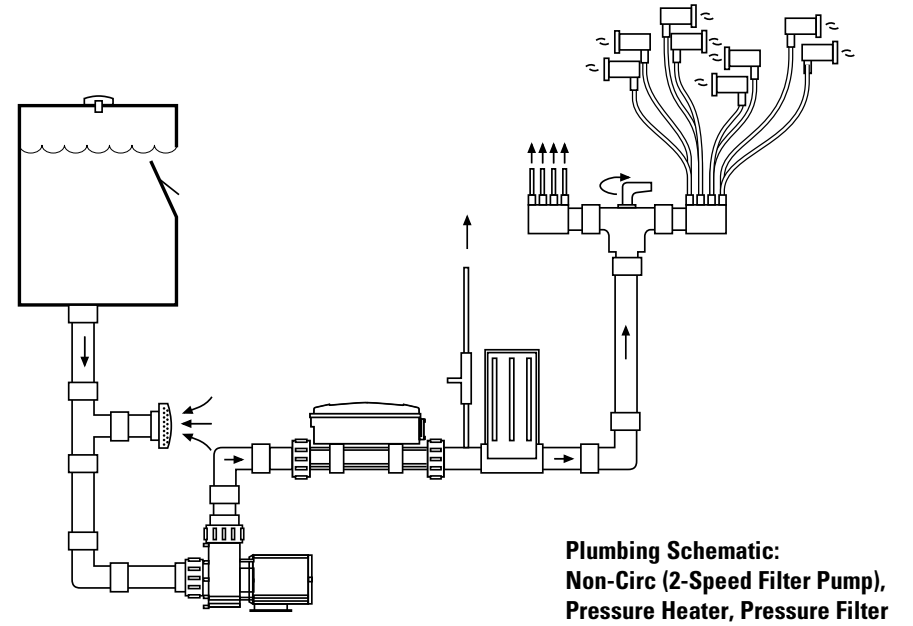
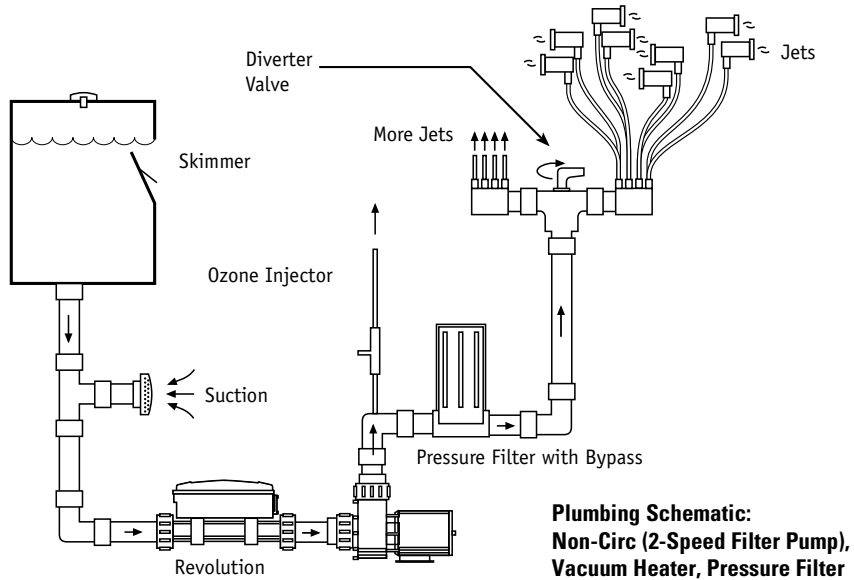
5. The pressure system for the 2-speed pump or for the circ pump must discharge water freely into the spa.
6. If the pressure system for the 2-speed pump includes a diverter valve, or a diverter jet, there must not be an "off" position that would stop water flow from the pump or any other position that would throttle or reduce water flow from the pump.
7. If the pressure system for the 2-speed pump includes flow adjustable jets that can be 100% closed, at least 2 non-adjustable jets must be included in each possible inlet circuit so that a minimum of 20 GPM can flow during low pump operation with all the jets closed. Any other means of by-passing flow around the closed jets is acceptable as long as the by-pass means is down stream from the heater and allows a minimum of 20 GPM to flow through the heater during low speed operation.
8. If the pressure system for the 2-speed pump includes flow adjustable jets that do not close 100%, at least 20 GPM must flow during low speed operation through each possible inlet circuit with all the jets closed.
9. If the pressure system for a 2-speed pump or for a circ pump includes a filter, the filter must be equipped with a by-pass around the cartridge that opens when the cartridge gets dirty. (Spring tension holding the by-pass valve closed must be overcome by the pressure of the pump.) This by-pass must be capable of flowing a minimum of 20 GPM during low pump operation with the cartridge 100% blocked.

Revolution

10. If the pressure system for a 2-speed pump or for a circ pump includes branch circulation lines such as circuits intended to operate ozone injection systems, these branch circulation lines must be connected downstream from the heater.
11. Avoid inter-connection of the plumbing circuits for the 2-speed pump or for the circ pump with other pumps in the spa plumbing system for the purpose of freeze protection. The Revolution control system will provide freeze protection. There is also provision for remote sensing freeze protection if required.
12. Position inlets and jets in the spa so that they do not direct water flow towards suction fittings or skimmers. This will avoid a “thermal short circuit” and prevent excessive heater and pump cycling.
13. If service valves are a part of the circulation system for the 2-speed pump or for the circ pump, be sure to use valves that incorporate a means of “locking” in the open position.
14. If the 2-speed pump or the circ pump is replaced in the field by service personnel, the replacement used must equal or exceed the hydraulic specifications of the original pump.
15. To assure adequate performance, the spa plumbing must be 1 1/2” minimum. The use of 2” is highly recommended. Either schedule 40 or flexible PVC pipe is acceptable.
16. It is recommended that shut-off valves be installed in the suction and discharge lines.

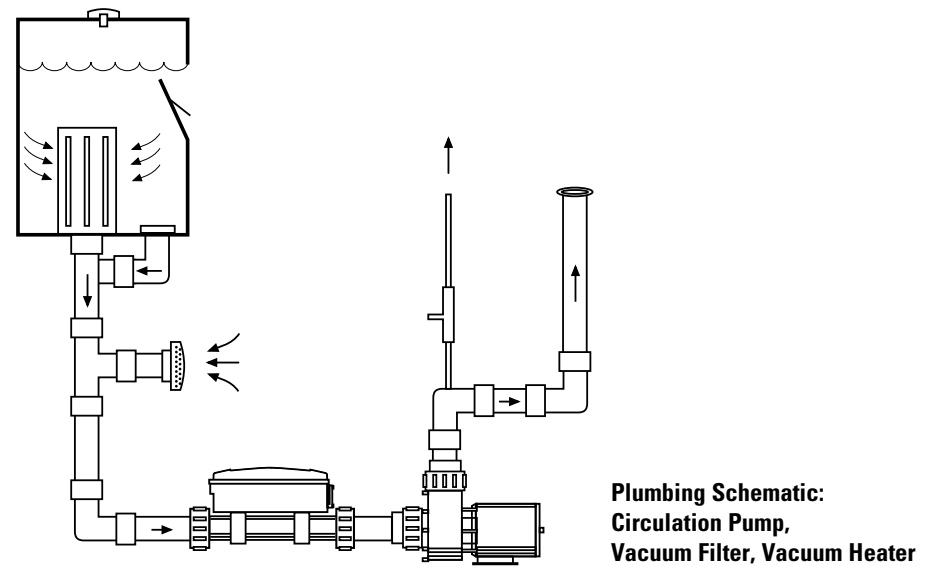
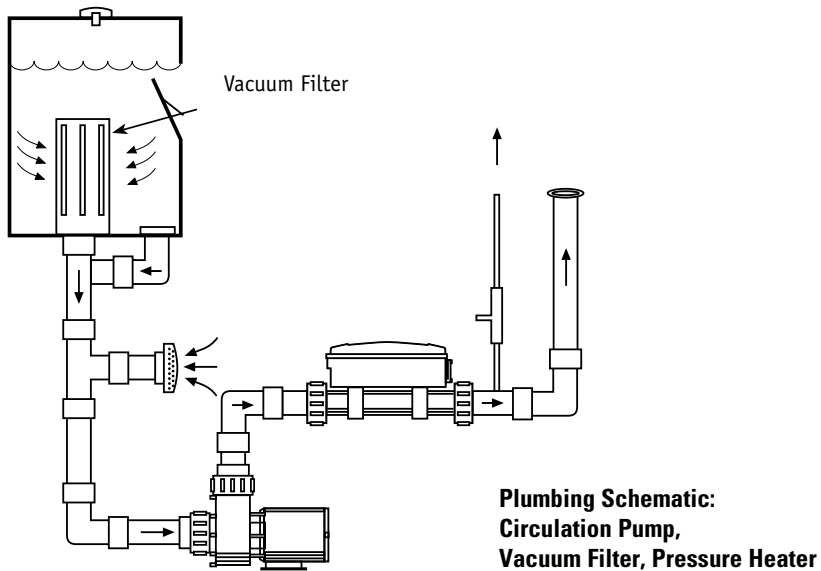
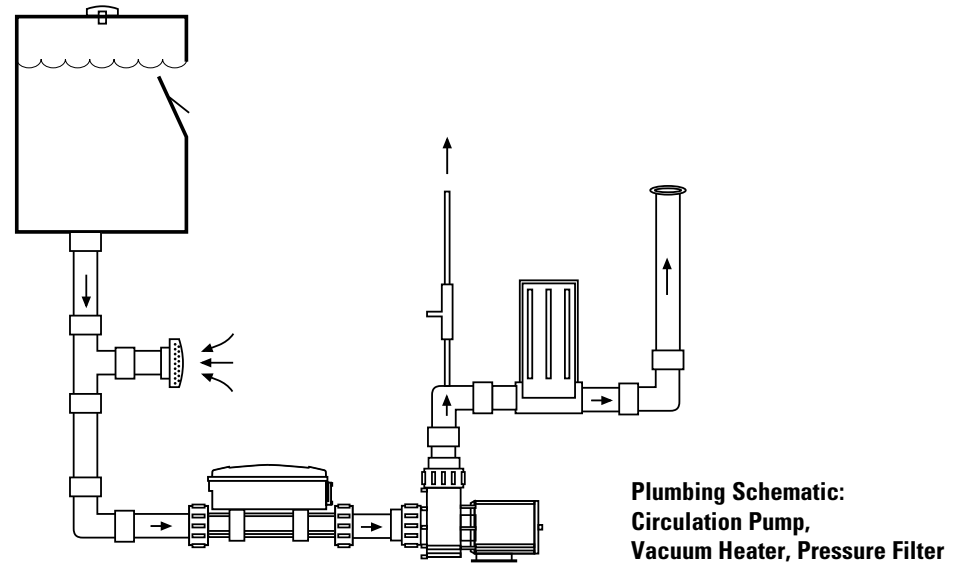
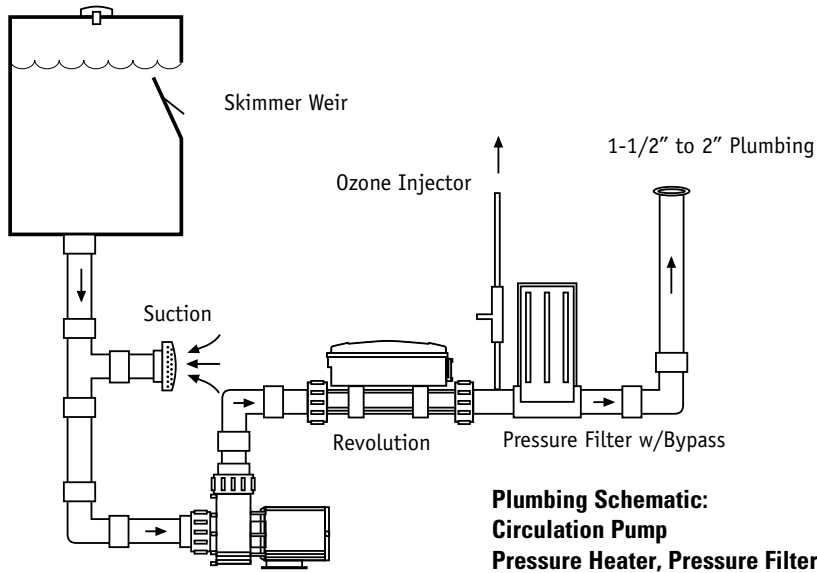
Non-Circ Pump Plumbing Schematics

Non-Circ Systems must use a 2-speed Pump 1 for filtration and heating.



Circ Pump Plumbing Schematics

Circ Systems use a dedicated low horsepower pump.



Revolution

Pressure and Suction Side Mounting

- The Revolution can be used in most any application. If installing in a newly built spa system, study the diagrams in order to plan the location of the Revolution. Also, keep in mind that:
- The heater requires at least 20 Gallons Per Minute (GPM) of flow for proper function.
- Some systems may require at least 25 GPM.
- **Pressure-Side System:**
A pressure side heater system is a heater that is located on the discharge side of the pump.
- **Vacuum-Side System:**
A vacuum side heater system is a heater that is located on the suction side of the pump.

Revolution

Mounting

- Revolution technology allows mounting flexibility. The Revolution can be mounted on either the suction or pressure (discharge) side of the pump. However, it must be mounted on a flat surface parallel to the ground.
- To improve reliability, take steps to minimize vibration from the pump(s) that could be transmitted to the Revolution.
- Use rubber isolation pads under the pumps and flexible PVC between the filtration pump and the heater to help minimize vibration.
- Mount the system with the heater horizontal and as low as possible in the equipment compartment.
- To avoid any potential for water to drip directly on the system, do not mount the system directly under the control panel mounting location.
- Allow a drip-loop in the control panel wires to keep any water that may travel down the wire from wicking onto the system box.
- The Revolution can not be mounted upside down. The Revolution is not to be mounted sideways. The Revolution is only to be mounted upright on a flat horizontal surface.

Revolution

Suction-Side System Mounting

- When mounting the system on the suction (vacuum) side of the pump, care must be taken to mount the system in such a way that it is aligned with the suction port on the pump wet-end. The suction-side mounting can generally be done much lower in the system, making it easier to keep proper water flow in the heater at all times. The system should be mounted with appropriate fasteners.
- **Note:** When employing suction-side mounting, the system may need to be placed on a spacer block so that it complies with UL height requirements for electrically live components, in the same manner as a pump motor.

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