How Salt Brominator's Work

The Bromine Device is an in-line halogen generator, used to produce bromine from a precursor of NaBr.

The Genesis Salt System from Pioneer will be used as an example.

Brominator (Components)

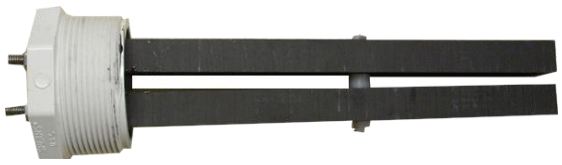
There are 3 components:

Digital Control Box

1. **Bromine Generating Electrode Cell**
2. **PVC Cell Chamber**
3. **Controller**

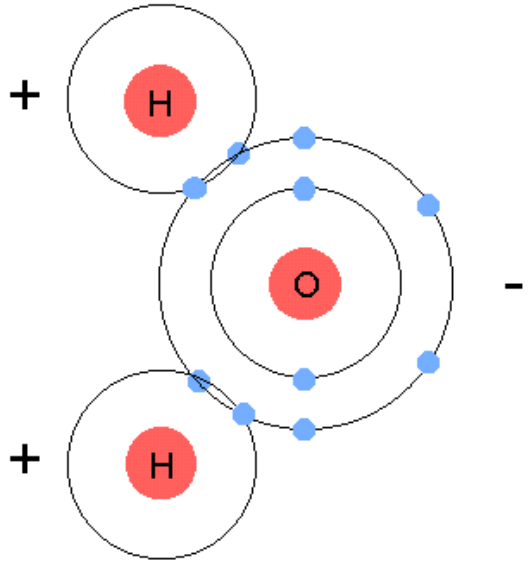
Brominator (How It Works)

- After salt (sodium bromide) is added to the water, you simply set the control box to the desired bromine production level.
- As the spa water circulates, a small amount of the bromide salt contacts the electrode cell and is broken down into bromine.
- Later, as part of a perpetual cycle of bromine production, the bromine will revert to salt again for circulation through the electrode cell...creating an endless supply of the bromine your tub needs for sanitizing.



Brominator (How It Works)

Sodium bromide ("NaBr" - a close relative to sodium chlorine - "NaCl" - otherwise known as table salt) is added to your spa's water. The dissolved bromide ions are circulated through a bromine generating contact cell located in your spa plumbing. This converts the bromide ions into free bromine (bromine is the recommended sanitizer for hot tubs and spas)

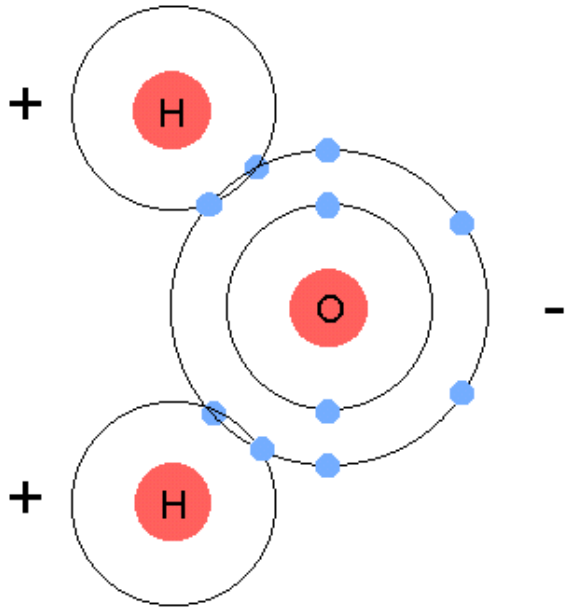


The free bromine attacks nitrogen based compounds and breaks them down, then reverts back to sodium bromide (salt) --- thus creating a perpetual cycle. Additional sodium bromide is only added when your water level declines due to splash out, or when you drain and refill the tub.

GENESIS Electrode

Brominator (How It Works)

The system's electrodes are comprised of high density, ultra-porous "graphite". The controller operates at extremely low DC voltages, resulting in the electrical cost of operation at just pennies a day.



The Brominator electrode is made up of 2 of these unique and powerful plates. The plates measure 1 inch wide by 8 inches long and 1/2 inch thick. The electrodes are self cleaning, virtually impervious to harsh chemicals and the oxidation process. Still, over time, the flow of water will erode the replaceable cell.

Less than 30 watts of total DC power is digitally pulsed across the electrode cell, producing bromine from bromide salt.

Brominator (How It Works)

Electrodes and Salt

The Electrodes are made from graphite, this material is a good electrical conductor. A small electrical field between the two electrodes is created when DC power is applied.

This electrical field strips the bromine out of the sodium bromide salt. The bromine kills nitrogen compounds and in doing so turns back into salt, to be reused again. Electrodes only create bromine when 4 to 9 volts DC is applied to the electrodes. The amp draw will be less than 0.5 amp. Water must be circulating past the electrodes or the bromine production Stops.

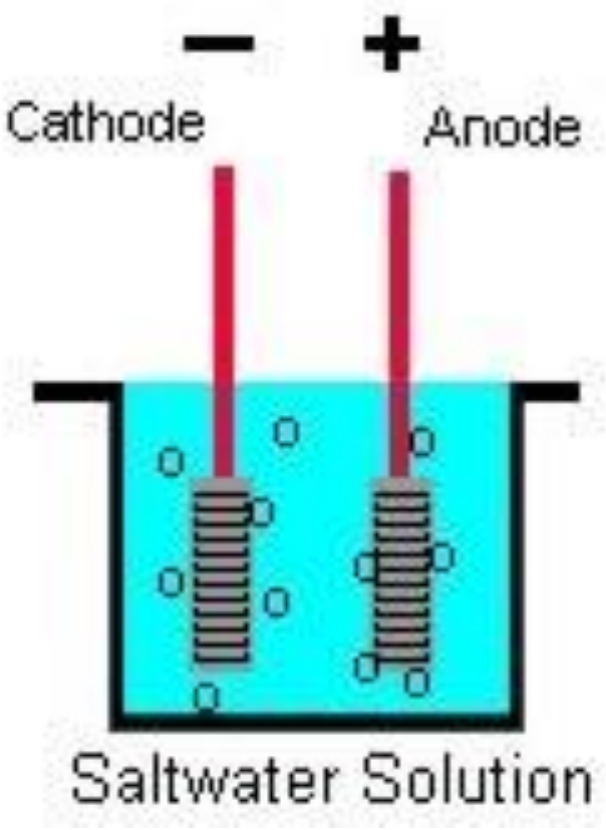
Sodium bromide - NaBr" - is a close relative to sodium chloride (table salt)- "NaCl. When added to the spa water the dissolved bromide ions are circulated past the electrodes. This converts the bromide ions into free bromine before reverting back to sodium bromide giving the spa a perpetual cycle of reusable bromine.

NOTE: do not use regular salt.

Brominator (How It Works)

Brominator technology utilizes a digital controller that stimulates a pair of non-metallic electrodes comprised of an anode and an cathode which consists of a patent pending composite material. The controller has ten different power settings.

The power is not increased or decreased, but rather the time that the power is made available is either increased or decreased. This process is known as “digital duty cycle control” and is highly efficient with respect to current distribution to the reduction (anodic reaction).



Brominator (Access)

The chamber, containing the electrode cell is installed into the circulation system after the heater.

The Control Box will be installed in the equipment area for easy access to the out put adjustment knob.

The 24 hour circ pump is ideal for consistent bromine output.

If using a 2 speed pump set filter cycle for minimum 8 hours to insure adequate bromine output.

Brominator (Access)

The electrode cell is fitted into a custom 2” PVC T’ (slip x slip x thread) fitting housed within the circulation system of a hot tub in such a manner as to always be in contact with hot tub water that has been doped with a specific amount of NaBr.

As the electrolyte enriched water passes through the electrode cell chamber, small amounts of the NaBr are reduced on the anode into free bromine which is then carried by the flow of water into the spa’s bathing area to act as a sanitation agent.

Brominator (Start Up)

PRIOR TO ACTIVATION OF THE **BROMINATOR** DEVICE ON A HOT TUB, IT IS ESSENTIAL THAT THE FOLLOWING WATER CHEMISTRY PARAMETERS HAVE BEEN ESTABLISHED AND VERIFIED!

TDS (TOTAL DISOLVED SOLIDS): must be less than 500 PPM (ideal range 50-300 ppm) prior to adding the sodium bromide bank to the tub's water. NOTE: After addition of sodium bromide at a rate of 1 litre for every 50 US gallons (40 Imp), "TDS" will be approximately 2,500 ppm.

pH: must be between 7.2 and 7.8 with 7.4 to 7.6 being optimum.

Total Alkalinity: should be between 80 and 120 PPM.

Total Calcium: should be between 100 and 200 PPM. Calcium becomes corrosive on the low end of the scale

Brominator (Start Up)

The water used to fill a spa is not as pure as you may think. There are impurities, such as, copper, iron, calcium and other deposits that can be harmful to your spa. Some of these deposits can seriously affect the bromine production of The Brominator and damage your equipment. Using clarifiers, coagulants, flocculants and, stain and scale preventers will reduce these impurities, but will not eliminate the problem. These products will also interferer with bromine production. You can reduce the total dissolved solids (TDS) problem and increase the life & quality of your spa water with a carbon block filter

Carbon Block Filter

Removes

Rust
Minerals
Dirt
Sediment
Iron
Copper
Calcium
Sodium
Magnesium
Fungus
Algae
Chloramines

Directions:

1) Fasten to any standard garden hose
2) Turn on hose till pool or spa is filled to appropriate levels.
3) Replace when filter is full and restricts water.

Brominator (Start Up)

1. Make sure the “DECREASE/INCREASE” dial on the faceplate of the Controller is turned to the “OFF” position.

2. Fill your tub with water to the recommended level.

3. Test water for its “**TDS**” (*Total Dissolved Solid- various organic and inorganic matter present in your water*) content with purchased test strips. The ideal range for your start-up TDS is between 50 and 300 ppm. If your starting TDS is above 500 (or water is from a well or non-municipal source) a metal remover or Carbon block spa pre-filter should be used to reduce TDS.

DO NOT FILL SPA WITH WATER FROM A “WATER SOFTENER”.

Brominator (Start Up)

4. Balance the spa water to the recommended levels:

pH:	7.2 - 7.8
Total alkalinity:	100 - 120 ppm
Calcium hardness:	100 - 200 ppm
Phosphate level	less than 125 ppb

*NOTE: Test that the **phosphate** level in your spa water is within acceptable parameters using a paper test strip or by taking a water sample to your spa product supplier.

****Allow water to stabilize for at least 12 hours after treatment with metal and/or phosphate removers before proceeding to step “5”.**

Brominator (Start Up)

5. With the jets running on high speed, add **one litre liquid sodium bromide per 40 Imperial gallons (50 US gal or 190L)** of spa water. Example: If your spa has a volume of **360 Imperial gallons,** at start-up you will require **9 litres of liquid sodium bromide.** (360 divided by 40 = 9). Pour the contents of the bottles evenly over the surface of the water.

6. Oxidize any pre-existing contaminants with 125g Tru Ox Make sure that the hot tub's pump is set to high speed.

7. Ensure the spa filters are clean after the above treatments.

Brominator (Start Up)

NOTE: If using a TDS meter total TDS should equal start-up TDS plus approximately 2,000 (Does not have to be exact – 1,900-2,200 is acceptable) For example, if your start-up TDS was 300 and you added 9 litres of sodium bromide to your 360 gallon spa, your TDS count will now be 2,300 (2,000 plus 300). You can verify this with a sodium bromide test strip if desired, but it is NOT required.

Brominator (Start Up)

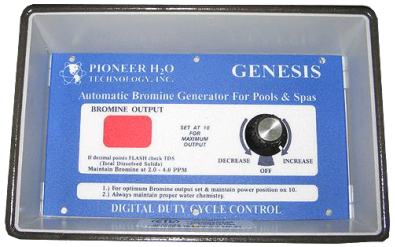
It is important to note that sodium bromide is only one contributor to the TDS count in your water. Over time, the TDS count in your water will rise (from such things as residuals from other chemicals, minerals, and unfilterable material).

It is advisable for you to test the TDS every few months to make certain it stays in check**.**

Regardless of what water testing facilities suggest, when utilizing a Bromine system, draining your water is not required prior to water reaching a TDS count of 3,500 ppm.

Brominator (Start Up)

8. Turn the “DECREASE/INCREASE” dial to the right until the LED display (to the left of the dial) reads “6”. If using a two-speed pump system, set the daily circulation time to a minimum of 8 hours per day.



(NOTE: Brominator will only produce Bromine during low speed circulation on a two-speed system. The lights or power on the Brominator Controller will only appear during these times. If using a 24 hour circulation pump, the unit will produce bromine 24 hours/day).

NOTE: The Controller will have a “+” or “-“sign to the right of the power setting (1-10) and will reverse every 4-6 minutes. This is normal and indicates that the electrode is reversing polarity during its self-cleaning process.

Brominator (Start Up)

9. Keep the dial set at 6 unless your bromine level rises above 5 ppm. If your bromine level exceeds 5 ppm turn the dial down **one setting**, then test the bromine level after 24 hrs. If still too high, repeat the process (turn down one setting, test after 24 hrs) until your “maintenance” setting is achieved.
Turning the dial down more than one setting at a time can result in a dramatic drop in the bromine level.

10. Oxidize daily, weekly, or as required based on water quality and bather load (*If you find that your desired bromine residual is not being maintained, this is a good indication that more frequent shocking is required*).
It can take several days for the bromine level to stabilize

Brominator (Start Up)

* With monitoring spa use, and adjustment of the output level of the *Brominator unit*, you will be able to determine your maintenance setting. You will have arrived at your maintenance setting when, after a period of normal use of your spa; you no longer have to adjust the output level on your *Brominator* to keep your bromine level between 3 and 5 ppm.

* The appropriate setting for your *Brominator* unit will depend on how often you use your spa. A spa with a higher-than-average bather load will require a higher setting on the *Brominator* unit. This simply means that the *Brominator* needs to produce more bromine to maintain the level between 3 and 5 ppm."

** It is good spa management to test the bromine level in spa water daily and always before spa use.*

Brominator (Troubleshooting)

It is important to be able to maintain the appropriate amount of sodium bromide in your spa's water.

There are several other factors to consider, though. You will normally find that over the weeks and months that your customers are enjoying the use of their spa, the water level will decrease for several reasons. One is evaporation. The other is a result of water "removal" (splashing, exiting bathers, etc). The first cause of water loss – evaporation – will not reduce the sodium bromide that is available in the spa, because it does not evaporate. The second cause – water removal – will, however, result in loss of some sodium bromide.

Since it is impossible to know how much water loss results from evaporation, and how much from removal, it is necessary to determine your sodium bromide level when adding water to the tub. There are sodium bromide test strips. Use of these strips will help you determine how much sodium bromide to add.

Brominator (Troubleshooting)

Low or No Bromine Reading:

Power On and Unit Connected? Double Check the Brominator Device to make sure that the digital display lights up when the spa is circulating. **Keep the Brominator at a power setting of "10"** unless the bromine residual exceeds desired level.

Sufficient Circulation Time? Two Speed Systems: Ensure the spa is circulating on low speed a minimum 8 hours per day. Above average bather load or adverse water conditions will require increased circulation time.

Brominator (Troubleshooting)

Appropriate Amount of liquid bromide salt? Using the Brominator "*Sodium Bromide Test Strips*", make sure your bromide reading is between 7.8 - 8.0. If Salt reading is greater than 8.4 adjust by a <u>partial drain</u> of the spa (drain 4 to 8 inches and then refilling the water back up to the Spa's water line should be adequate in most circumstances).

Proper Water Balance? Ensure that your water chemistry is correct. The pH needs to be between 7.2 – 7.8. The Alkalinity needs to be 80 – 120. Calcium Hardness needs to be 150 – 200 ppm.

Clean Filter? Make sure that you are cleaning your filter or back washing weekly if needed.

Brominator (Troubleshooting)

Shocking? Oxidizing or “shocking” is required weekly, and in some cases daily, to oxidize waste, reduce demand on bromine and restore spa water’s sparkle and clarity. See Brominator User Manual for dosing instructions.

Flashing dots on the Controller? Check the TDS (Total Dissolved Solids). Flashing dots indicate that TDS is becoming too high. A partial drain & fill will typically correct this problem.

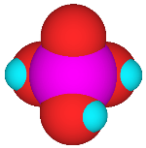
Solid dots on the Controller? This indicates TDS is at a level above that in which the brominator can function. The power to the electrodes has been disabled and the system is not producing bromine. The TDS must be lowered. A complete drain and refill will typically solve the problem.

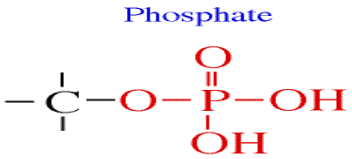
Brominator (Troubleshooting)

NOTES ABOUT TDS: TDS (Total Dissolved Solids) is a combination of metals, minerals and other organic material. The Brominator requires that the TDS from the fill water be in the low range of 0-500 ppm. Municipal water sources in <u>most cases</u> are typically in the acceptable range. Well water is typically high in TDS (500 – 1200 ppm). **Before filling from a high-TDS source, a carbon block pre-filter is highly recommended. A** metal remover can sometimes reduce TDS sufficiently. <u>NOTE:</u> Do not fill spa with water from a salt water softener!

Brominator (Troubleshooting)

Phosphate level high?

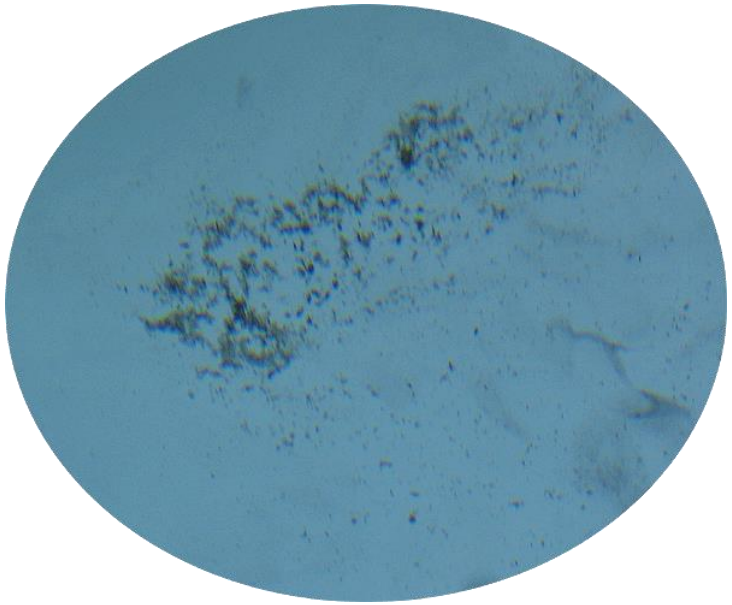




Phosphates are a contaminant that promotes algae growth and inhibits Bromine production. Phosphates can be introduced to your spa in many ways (via domestic water sources, fertilizers, hygiene products such as soaps shampoos and lotions). Some spa chemicals (including some spa filter cleaners and some metal sequestering agents) contain phosphates and should not be used. Phosphate test strips are available that can determine if level exceeds the maximum acceptable level of 100 ppb. Treatment with a phosphate remover (Phos Out, Phos Free etc) for 4-5 days with a follow-up filter cleaning is recommended to remedy this problem.

Brominator (Troubleshooting)

Broken/Cracked Electrode? If the brominator is not producing desired bromine level and a black coloring is visible in the filter or at the water line, there could be a cracked or broken electrode.



NON-USE of Spa: If spa will not be in use for an extended period of time, turn down the power setting to ½ the normal maintenance setting to prevent elevated bromine residual.

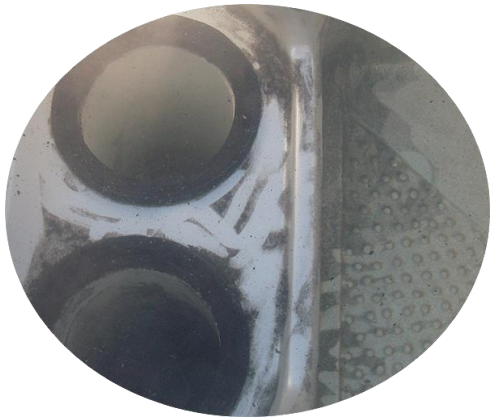
This should only be performed by a qualified spa technician.

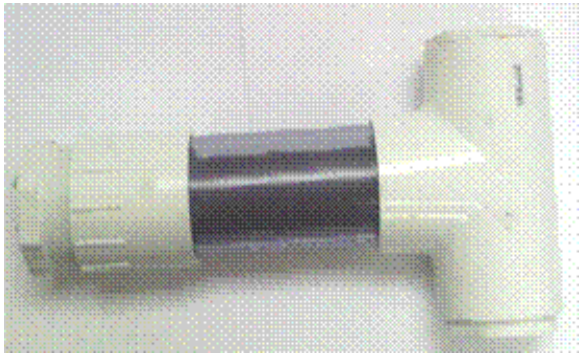
Brominator (Troubleshooting)

Look for bubbling or fizzing in the clear view tube, this is bromine being produced by the electrodes.

Look for salt residual build up on electrodes. If the build up becomes too much the electrodes will become bridged and the current will pass through the bridge and not the water.

NOTE: if black coloring is visible in the filter or at the water line, there could be a cracked or broken electrode





This should only be performed by a qualified spa technician.

Brominator (Troubleshooting)

Brominator only creates bromine when the water is circulating past the electrodes.

Brominator Controller's display numbers are only "ON" during low speed circulation on a two-speed system but they will be on continually with a 24 hour circulation system

Brominator is only capable of creating bromine not chlorine.

Brominator (Troubleshooting)

NOTE: If Brominator is not producing bromine:
Test salt level is correct (2000 to 2200 ppm)
Test that the TDS level is not too high (less than 3500ppm)
Use meter to confirm that 4 - 9v DC is present at the electrode terminals (test with controller set on 10)
Test for Phosphates

NON-USE of Spa: If spa will not be in use for an extended period of time, turn down the control setting to ½ of the normal operational setting to prevent elevated bromine residual building up.