

## TWT Enhanced Control Pool Management System Product/Technical Description

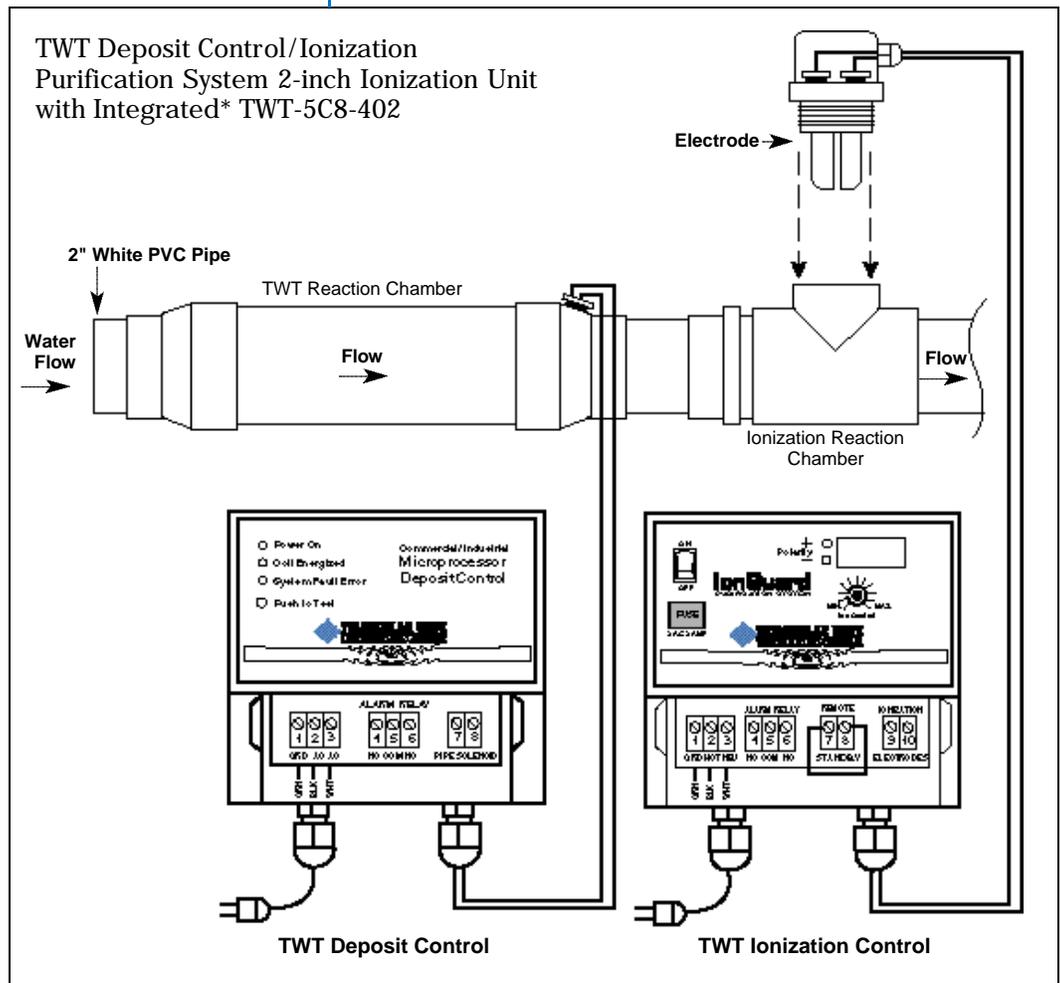
The TWT Enhanced Control Pool Management System consists of the TWT Deposit Controller, Reaction Chamber, IonGuard Purification Unit, and Copper/Silver Electrodes. It is designed to be used in conjunction with the filter and pump systems of the pool. This ensures automatic operation of the IonGuard Purification component. The TWT IonGuard unit is a current source control device that will adjust its output automatically to maintain the ion level over the useful life of the electrodes. Included with the system is a simple to use copper level test kit, used to determine the proper IonGuard system settings. This system provides a clean and attractive environment for you and your guests.

The TWT IonGuard Purification System purifies water through and ionization process, using a low voltage direct current [DC] to place precise and minute amounts of copper and silver ions into water systems. Copper ions kill algae, and silver ions kill bacteria. An ion is merely an electronically charged atom or group of atoms. An atom acquires this charge by gaining or losing electrons. Negatively charged electrons are one of the three major subatomic particles; the others are protons, which have a positive charge, and neutrons, which have no charge. Ions in the TWT system are positively charged; algae, bacteria and other particles in the water are negatively charged. The positive to negative attraction between them allows the ions to attach to the organisms, penetrate their cell walls and kill them. When the system is used in conjunction with a filter, the dead bacteria with the silver ion attached to it will be large enough for the filter to remove. Normal filter backwashing will then remove the dead particles.

The IonGuard Purification System is an electrolytic copper/silver ion generator. The system units contain specially cast copper/silver alloy electrodes. These electrodes are mounted in PVC housing designed for easy access. The criteria for copper and silver in water are as follows: the EPA standard for drinking water is 1.0 ppm (parts per million) maximum for copper and 50 ppb (parts per billion) maximum for silver. The system is programmed so that a water test showing 0.25 ppm to 0.35 ppm copper automatically provides the proper ratio of silver. This will produce drinking quality water in any water system treated (although drinking of any pool water is most strongly discouraged). The system requires no chemicals in its function of controlling algae and bacteria, although for pool and spa applications, some minimum level of chlorine may be required by municipal regulations.

In all ionization units, copper and silver ions plate off from the electrodes and enter the water. Over time, the electrodes will become smaller, and the gap between the electrodes will become larger, decreasing their efficiency. Most manufacturers of ionization units use "voltage source" generators to power their units. A "current source" generator powers the TWT IonGuard Purification System. The current source generator will automatically compensate for the change in gap size, while the voltage source generators must be manually inspected and adjusted. The current source generators on the TWT IonGuard Purification System offer trouble-free operation.

The TWT Enhanced Control Pool Management System also includes the TWT Deposit Controller, which will keep the electrodes on the IonGuard Purification System free of scale and other deposits, for maximum protection. Typically, ionization electrodes may develop a layer either of scale or of oxidation. In either case, it is necessary to periodically clean the electrodes with an acid solution. The Deposit Control System eliminates the need for this periodic cleaning. In addition, the Deposit Control System will help eliminate scale and bio-film deposits throughout the entire water system. We recommend that the IonGuard Purification System be installed downstream of the Deposit Control System for best results.



# IonGuard Purification

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The System is designed to be coordinated and used in conjunction with the pool pump. This ensures automatic operation of the IonGuard system. Included with the system is a simple to use copper level test kit to determine the proper IonGuard settings. The Triangular Wave IonGuard System is a current source control device, that will adjust its output automatically to maintain the ion level over the useful life of the electrodes. This system provides a clean and attractive environment for you and your guests.

The chemical odor and other unpleasant odors are removed. Perhaps more significant than the odor control benefit, the water treatment produced by the Triangular Wave Technologies swimming pool systems, (although not recommended for drinking) is actually rendered to an acceptable level, in case of accidental ingestion. Finally, the cost savings on chemicals, electricity, labor, increased life cycles of equipment and other uses is sufficient enough to pay for the system in 18 months or less. In contrast to current pool maintenance program, the Triangular Wave Technologies system will result in significant cost savings. More importantly, it will provide you and your guests with a clean, odorless and healthier swimming environment. The Triangular Wave Technologies System is designed to be coordinated and used in conjunction with the pool pump. This ensures automatic operation of the IonGuard system. Included with the system is a simple to use copper level test kit to determine the proper IonGuard settings. The Triangular Wave IonGuard System is a current source control device, that will adjust its output automatically to maintain the ion level over the useful life of the electrodes. This system provides a clean and attractive environment for you and your guests.

These are compelling reasons to select the Triangular Wave Technologies Deposit and IonGuard System for both residential and commercial swimming pools and other water features. The Triangular Wave Technologies system is an advanced method for maintaining high quality water, bacteria free, algae free and chemical free. Triangular Wave Technologies make sense from an economical, operational and safety point of view.

The Triangular Wave IonGuard Purification System disinfects water through a process called ionization. That process utilizes a low voltage direct current [DC] to place precise and minute amounts of copper and silver ions into water systems. Copper ions kill algae and silver ions kill bacteria. An ion is merely an electronically charged atom or group of atoms. An atom acquires this charge by gaining or losing electrons. Negatively charged electrons are one of the three major subatomic particles; the others being protons, which have a positive charge, and neutrons, which have no charge. Ions in the Triangular Wave system are positively charged; algae, bacteria and other particles in the water are negatively charged. The positive to negative attraction allows the ions to attach to the organisms, penetrate their cell walls and kill them. The IonGuard Purification System incorporates an electrolytic copper/silver ion generator. The system units contain specifically cast copper/silver alloy electrodes. These electrodes are mounted in a PVC housing designed specifically for easy access.

When the system is used in conjunction with a filter, the dead bacteria with the silver ion attached to it will be large enough for the filter to remove. Normal filter backwashing will then remove the dead particles. The criteria for copper and silver in water are as follows: The EPA standard for drinking water is 1.0 ppm (parts per million) maximum for copper and 50 ppb (parts per billion) maximum for silver. The system is programmed so that a water test showing 0.25 ppm to 0.35 ppm copper automatically provides the proper ratio of silver. This will produce drinking water quality in any water system treated. The system requires no chemicals in their function of controlling algae and bacteria.

A "current source" generator powers the IonGuard Purification System. "Voltage source" generators power other ionization units. In all ionization units, copper and silver ions plate off of the electrodes and enter the water. Over time, the electrodes will become smaller, and the gap between the electrodes will become larger. The current source generator will automatically compensate for the change in gap size; while the voltage source generators must be manually inspected and adjusted. The current source generators on the Triangular Wave IonGuard System offers trouble free operation. We recommend that the IonGuard Purification System be installed downstream of a Triangular Wave Deposit Control System. The Deposit Control will keep the IonGuard System electrodes free of scale and other deposits for more effective results. And, at the same time, the Deposit Control System will help eliminate scale and biofilm deposits through the entire water system. Without the Triangular Wave Deposit Control System in place, the ionization electrodes may develop either a layer of scale or oxidation. In either case, it is necessary to periodically clean the electrodes with an acid solution. The Deposit Control System eliminates the need for periodic cleaning.

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***Clearly, in comparison to traditional pool maintenance programs, the TWT Enhanced Control Pool Management System will result in significant cost savings and increased profits.***

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## Maintenance Guide for Triangular Wave Technologies Pool/Spa System Products

Pool / Spa ownership offers exciting opportunities for warm weather fun and entertainment. It is important for you, the pool/spa owner, to understand that safety and comfort can be enjoyed by keeping your pool/spa well maintained and operating efficiently. Your pool/spa equipment supplier and maintenance contractor will work with you to determine an appropriate maintenance schedule for your pool/spa, and will follow through with stocking any necessary supplies.

However, it is most important for you, the pool/spa owner, to closely follow all instructions that are provided by your maintenance contractor for weekly, interim maintenance. Such items can include testing, equipment adjustments, filter cleaning, skimming, etc. As a user of Triangular Wave Technologies products and solutions, you have the distinct advantage of reduced maintenance efforts and costs. Simply follow the easy Triangular Wave Technologies Maintenance Guide that will hang in your pool/spa equipment room. You can use the TWT products without the added use of chemicals, but depending upon your individual environment, you may find that a small amount of chemicals is desired; you may also find that the pool will need a "shocking" after special events .

But regardless of the pool/spa management system in place, you, the pool/spa owner, must commit to a partnership with your pool builder, maintenance contractor, and equipment supplier, in order to obtain the best results possible. By adhering to the recommended schedules and performing the required interim maintenance tasks, your reward will be years of fun and pleasure at peak operating conditions and reasonable maintenance costs.

### **The Nature Of Water**

All water is not alike. Although two atoms of hydrogen and one of oxygen form the liquid we call water, within this liquid are dozens of other elements, compounds and living organisms. There are traces of iron, copper and manganese, minerals like calcium and sodium, dissolved gasses like nitrogen and carbon dioxide, living organisms like bacteria, algae, mold and fungus, not to mention all the other chemicals we deliberately add. Water is known as the universal solvent. That means virtually any elements that occur in nature can be picked up or dissolved into solutions in water. This becomes a challenge to keep the water clean for use in pools/spas and other water related equipment.

Typical fill water needs some help in order to make the water suitable for pools and spa use. The parameters of water treatment cover three basic areas of attention:

### **Sanitization / Disinfection**

#### **Oxidation**

#### **Water Balance**

Adding products for maintenance is one thing, but there is only one way to determine whether water has the proper level of sanitizer and mineral balance.... you have to test the water.

### **An Introduction To Swimming Pools**

At the most basic level, a pool is simply a structure that holds water. Beyond that, every pool has its own unique personality. The pool structure can be above-ground or in-ground. Its interior surface can be made out of plaster, vinyl, tile or fiberglass. Just as pools/spas are not all the same, neither is all water the same. Although most municipal water is similar, regional differences in water quality and mineral content cause wide variance, based on its source.

### **Common Contaminants Come From A Variety Of Outside Sources:**

- Leaves, worms, insects and other wildlife that fall into the pool
- Oils and cosmetics that wash off human skin
- Perspiration and urine from swimmers
- Organisms like bacteria , algae, fungus and mold, that, if given opportunity will grow and thrive in warm water, clinging to walls and other surfaces, forming a biofilm
- Naturally occurring elements such as calcium, phosphorous, nitrogen and metals. Some affect the mineral water balance, while others affect the sanitizer efficiency and effectiveness.

### **Keys To Pool And Spa Care.**

1. **Circulation**-The pump has to run 8-12 hours a day to circulate the water through the filter and redistribute the water products throughout the pool, for proper deposit control.
2. **Filtration**-The filter has to function efficiently to remove for foreign particles. The filter must be cleaned every 4-6 weeks to keep it functioning properly.
3. **Cleaning**-Brushing, vacuuming and skimming the pool must be done on a regular basis.
4. **Testing**- water factors and other control products have to be kept within proper ranges. If water is out of balance, product will not work properly. In addition, the water may feel uncomfortable and either corrode surfaces and equipment or cause scale formation.

The ownership of a pool can offer tremendous rewards for you, your family, and friends.

**Your responsible adherence to minor interim maintenance requirements will help ensure extended equipment life and lasting enjoyment of your investments.**

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**Triangular Wave Technologies, Inc.**  
**Deposit Control • Reaction Chambers**  
**IonGuard Ionization System**

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# IonGuard Purification

## Triangular Wave Technologies Solves These Common Problems With Its Deposit Control & IonGuard Purification Systems for Swimming Pools, Spas, and Decorative Water Features.

### COMMON PROBLEMS WITH CONVENTIONAL POOL TREATMENT SYSTEMS

- **Algae and bacteria growth, corrosion, scale and bio-film accumulation in water lines and equipment**
- **Deterioration of water lines and equipment from harsh chemicals**
- **High electrical costs (heating and pumping equipment)**
- **High chemical costs (chlorine, bromine, etc.)**
- **Labor costs for cleaning, maintenance, and supervision**
- **Complaints related to a harsh chemical odor (usually from chlorine) and resulting irritation, of the eyes and mucous membrane, bleached swim wear, hair discoloration, etc.**

Each of these problems can be solved with the Triangular Wave Technologies Deposit Control and IonGuard Disinfection System. This highly effective system and method of maintenance has two basic components:

- **The deposit control microprocessor that produces an electromagnetic field with the attached reaction chamber through which the-circulated pool water flows.**
- **The IonGuard system provides purification of the water**

The TWT Enhanced Control Pool Management System offers pool maintenance firms an opportunity to reduce their material and labor costs, lessen the storage and handling of the chemicals now used, and increase profits. In combination with the pool's filter and pump systems, the complete TWT system augments the chemical treatment normally applied by controlling the habitats where bacteria, algae, and bio-film grow. When these habitats are uniformly controlled and/or eliminated, the pool maintainer can reduce the usage and handling of harsh chemicals, and use less labor in the performance of his (contracted) services.

### ALGAE AND BACTERIA GROWTH

Bacteria and algae must attach to something (such as pipes, equipment or pool walls) to feed and reproduce. The triangular wave electromagnetic field generated by the patented TWT Deposit Controller prevents this attachment by keeping bacteria and algae dispersed in the water. With the contaminants "in solution", the IonGuard Purification Unit goes to work, killing the algae and bacteria by producing copper and

silver ions, a proven and safe method for control. This "chemical-free" method of treatment produces no negative effects on people, no damage to equipment, and no pollution of the environment. It is the safest known deposit control and purification method for controlling algae and bacteria, and eliminates side-effects.

### CORROSION, SCALE AND BIOFILM ACCUMULATION IN LINES AND EQUIPMENT

The TWT Enhanced Control Pool Management System attacks this problem by causing contaminants to repel from each other and from the surfaces of pipes and equipment, with its enhanced surface charge on particles in the water. Bio-corrosion is prevented because biofilm, its home, is never given the opportunity to form on the surfaces.

### DETERIORATION OF LINES AND EQUIPMENT FROM HARSH CHEMICALS

Many of the chemicals used in water treatment (chlorine especially) cause PVC pipes to become brittle, resulting in the need for extensive maintenance and/or replacement. These chemicals also reduce the useful life of the rest of the equipment in the system.

### HIGH ELECTRICAL COSTS (HEATING AND PUMPING EQUIPMENT)

The electricity required for heating pools and pumping water can be a considerable expense. As the TWT Enhanced Control Pool Management System reduces scaling and corrosion in the heating elements, the elements work more efficiently, reducing electrical costs for heating the water. Similarly, many pool, spa and decorative water feature operators feel the need to operate their pumps continuously to enhance the filtration process and produce clear water.

As the TWT Enhanced Control Pool Management System eliminates clouding contaminants, the use of the pumps to obtain satisfactory levels of clarity can be greatly reduced, usually to 1/3 or less of a routine operation. Additionally, as the corrosion and scale are eliminated, the pumps operate more efficiently, resulting in reduced electricity costs, as with the heating elements.

### CHEMICAL USE (CHLORINE, ETC.)

While necessary, chlorine treatment of swimming pools is not only costly, but also objectionable in terms of practical, aesthetic and health considerations. As a chemical, chlorine has a corrosive effect on pool lines and equipment, resulting in periodic replacement. Although chlorine has been the accepted standard for treating water (and in fact a minimum residual level of chlorine is required in

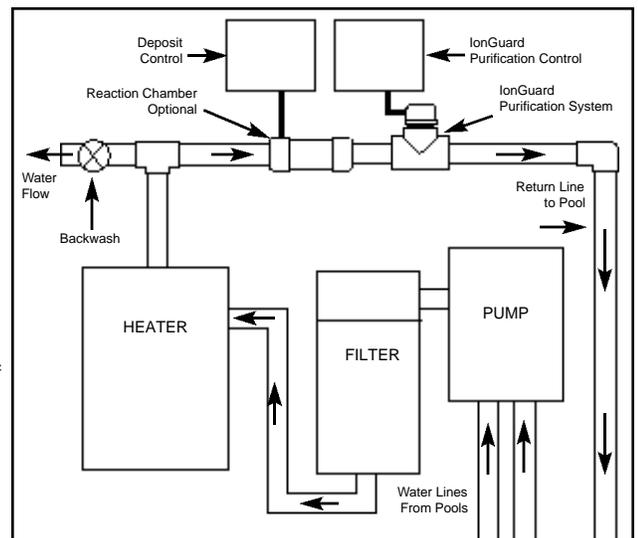
commercial and smaller amounts will create other problems. Alternatively, the TWT Enhanced Control Pool Management System will enable desired reduction in chemical treatment, while maintaining appropriate levels of purification.

### LABOR COSTS FOR CLEANING, MAINTENANCE AND SUPERVISION

The TWT Enhanced Control Pool Management System allows routine pool maintenance to be accomplished more quickly and efficiently, allowing the maintenance company to service more pools and accounts with existing staff levels. The TWT units are virtually maintenance-free. The IonGuard unit requires only routine inspection and periodic changes of the electrodes (usually annually depending upon usage). However, in contrast to the frequent tasks of traditional pool maintenance, the tasks associated with the TWT systems are minimal. This reduced maintenance permits reduced labor costs per pool.

### COMPLAINTS RELATED TO ODOR (CHLORINE, FISHY SMELL, ETC.)

The chemical odor and other unpleasant odors are removed. Perhaps more significant than the odor control benefit, the water treatment produced by the swimming pool systems, (although not recommended for drinking; in case of accidental ingestion. Finally, the cost savings on chemicals, electricity, labor, increased life cycles of equipment and other uses is sufficient enough to pay for the system in 18 months or less. In contrast to current pool maintenance program, the system will result in significant cost savings. More importantly, it will provide you and your guests with a clean, odorless and healthier swimming environment.



Typical installation overview of equipment room

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