



**TWT® System Packaging Contents**

- TWT Microprocessor Deposit Control Unit
- Wire for onsite wiring & solenoid coil hookup
- Hardware kit: Screws, wire ties, hose/pipe clamps
- System registration card

**Not included, sold separately:**

Contact your dealer and/or TWT, Inc. before installation of system if application requires a–

- TWT Copper Pipe Signal Enhancer
- Teflon coated wire
- TWT Reaction Chamber

# OWNER APPLICATION & INSTALLATION MANUAL

## TWT® Patented Microprocessor Deposit Control System(s)

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TWT-5C8-163-12VDC  
Battery Powered Deposit Controller

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**Section 1: Water Line P.O.E. Application**

**Section 2: Coolant/Fuel Line POU Application**

**Read All Instructions Carefully Before Installing the System**

To find out even more about us, and how we can help you, contact us at:  
Email: [info@triangularwave.com](mailto:info@triangularwave.com) • [triwaveinc@aol.com](mailto:triwaveinc@aol.com)

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Visit Triangular WaveTechnologies, Inc.'s comprehensive website,  
the valuable technical resource for all involved in water and fluid management...

[WWW.TRIANGULARWAVE.COM](http://WWW.TRIANGULARWAVE.COM)

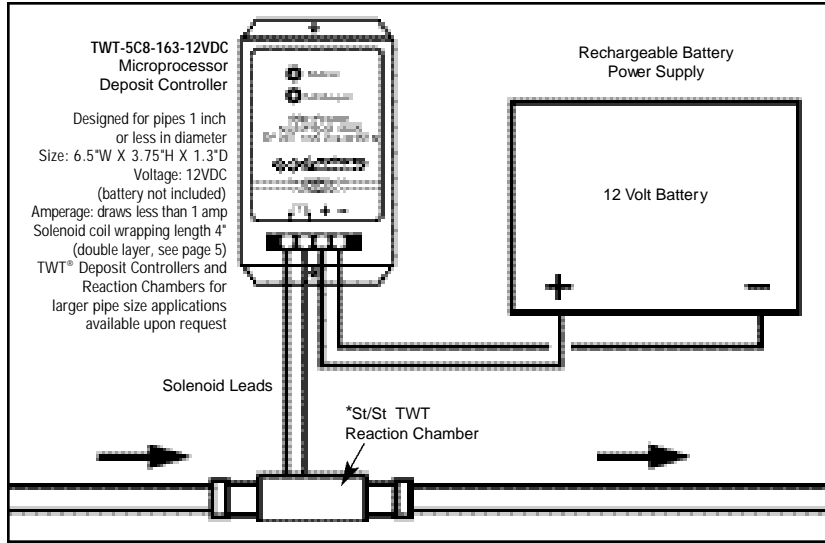
**Bringing You The best in Fluid Management Solutions**



M1



## System Layout



**High Temperature Applications** for Triangular Wave Technologies Deposit Control Systems 176°F and above (Teflon Wire Required)  
Solenoid coil wrapping length: 3.5 inch wrap— The solenoid is wound in two overlapping layers, approx. 60 turns per layer  
Application Guidelines

- Onsite solenoid wrap wire included ( Teflon special order) • Copper pipe: TWT-CSE-0227 copper signal enhancer (not included)
- Reaction Chamber (not included): Refer to product list for item numbers and sizes

## IMPORTANT REMINDERS

### TWT Factory Wrapped Reaction Chamber

The Triangular Wave Deposit Control System creates an electromagnetic field which is used to address the fluids in the pipe. Do not install the wire coil on any magnetic pipe, such as **STEEL, GALVANIZED STEEL, IRON, DUCTILE IRON OR CAST IRON**. When the coil is applied to a magnetic material, the pipe then becomes a shield, and prevents the energy from entering the fluid path. If the fluid pipe is magnetic, it is necessary to insert a section of non-magnetic pipe to provide the proper pipe material for the unit to work as designed (Please see Reaction Chamber Application page).

\*TWT-S/S St reaction chambers should match tube/pipe size, (e.g.) if tube/pipe is 1/2" use 1/2" reaction chamber

### TWT Copper Pipe Signal Enhancer

Copper pipes, although acceptable, are one of the more difficult of materials to work with. To overcome this... TWT has developed its Copper Pipe Signal Enhancer. (Please see Copper Pipe Signal Enhancer Application page)

### Teflon Coated Wire

For high temperature (hot water) applications of 176°F and above, request and use teflon wire. Teflon wire solenoid wrap sizes vary according to pipe material and pipe size, please contact your dealer for additional information.

**WHEN THE TWT SYSTEMS ARE PROPERLY INSTALLED, THE Effects of the Patented Triangular Wave Technology Treatment Last Downstream**

## Introduction . . .

The Triangular Wave System is a revolutionary breakthrough in the treatment of hard water and its effect on fluid based applications. The system is non-invasive and non-chemically design and is suitable for all applications requiring hard water treatment.

## Operating Principals . . .

The signal from the Triangular Wave System circuitry flows to a solenoid coil wound around the pipe being treated. The signal in the coil develops the modulated electrical field that immediately conditions the water. The field penetrates the piping to its center, acting on the passing water and the dissolved minerals and particles in the water. The conditioning effects on the water are long lasting.

## Section #1: Water Line P.O.E./P.O.U. Application

The most desirable place to install the unit is immediately after the water meter, or before any plumbing line tee, so that the entire plumbing system is treated for deposits. The TWT System is provided with a S/S St reaction chamber. The controller should not be connected to the battery until the installation is completed. Connect the wire leads to the two terminals on the TWT Reaction Chamber, then attach the wire leads to the two left terminal screws on the Deposit Controller. From the positive (+) terminal screw on the Deposit Controller run a wire lead to the (+) terminal on the 12 volt battery, then from the negative terminal (-) on the deposit controller run the second wire lead to the negative terminal (-) to the battery as illustrated.

The unit may be installed outdoors at a wellhead for example, provided a separate weatherproof housing such as NEMA enclosure is used. Because the unit is a solid state device, it may be mounted in any position necessary.

## Fitting Instructions . .

Locate the incoming water main. Choose a position for the coil and a location for the Triangular Wave Control Unit that is near a 12 volt battery.

Locate the coil on a straight length of pipe approximately 6 inches long or longer (between pipe fittings).

## Control Unit Mounting Hardware Provided:

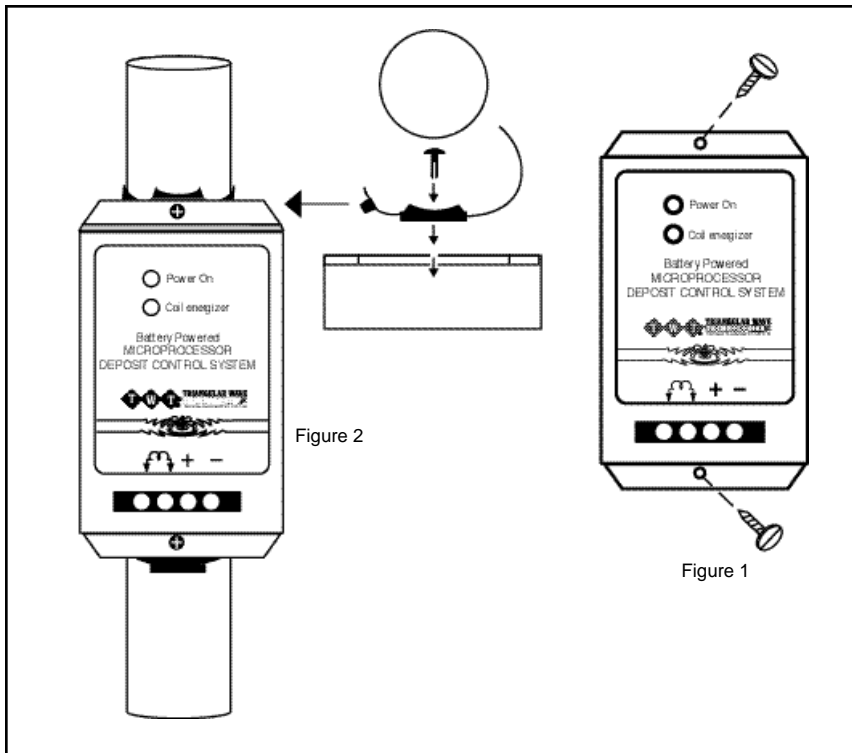
- 2 No.6 Steel Self-tapping Screws
- 2 Nylon Rivets
- 2 Nylon Universal Mounting Straps
- 2 Hose/Pipe Clamps

### Control Unit Screw Mounting

For screw mounting on a flat wooden surface or other surface, use the two No. 6 steel self-tapping screws provided (See *Figure 1*). Alternate screw mounting to a drilled channel or plate can be done with No. 6, No. 8 or No.10 machine screws and appropriate nuts or hardware.

### Pipe Mounting

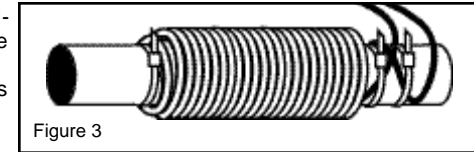
Two universal mounting straps and pop rivets have been provided for mounting the control unit on a pipe up to 3/4 inch in diameter. Snap the rivet through the universal mounting strap and into the bottom of the unit mounting hole. Slide the strap end through the buckle portion and tighten until the strap is snug around the pipe (See *Figure 2*). The buckle is provided with a release button to make removal quick and easy.



Enough wire is provided to reach about six (6) feet from the control unit to the reaction chamber. If a greater length is needed, standard speaker wire may be used to extend the solenoid wire to the control unit.

### Section #1: Solenoid coil wrapping instructions: (when using in place of reaction chamber)

1. Measure and mark a 4-inch section in the middle of the pipe segment. Fasten the signal wire to the pipe with a cable tie (provided) at one end of the 4-inch section. Leave enough wire to reach to the control unit, a 5 foot length is provided. Wrap the signal wire around the pipe in a tight coil, in a clockwise direction, so that the adjacent wires are touching each other. Continue to wrap until the 4-inch section of pipe is completely covered. Fasten down the coil wire with the second cable tie (provided). You can hold the first layer in place with pieces of cloth tape or electrician's tape.



**Be sure:** 1.the coil is tight, and  
2.the wire turns are side by side and touching each other.

2. Add a second layer to the coil by continuing to wind in a clockwise direction. This time start the wind where you completed the first layer and wind back to the starting point. Place the second layer directly on top of the first layer, being careful to wind the second layer tightly in the same direction as the first layer. Place the turns side by side and touching each other. Complete the second layer by clamping the wire with the third cable tie (provided).(See *Figure 3* above)

### Please Note:

**Do Not Twist or Cut Wire or the System WILL NOT Function.** Place the second layer directly on top of the first layer. Be careful to wind the second layer tightly **in the same clockwise manner** as the first layer **back in the direction of the starting point**.

- 3 Wrap the coil with electrician's tape or cloth tape (duct tape) to help maintain a tight coil and protect the coil from being disturbed.
4. Guide both wires to the Triangular Wave deposit Controller and leave about 4-inches of extra wire. Strip 1/4 inch of insulation off the ends of the wires.
5. Unscrew the pipe solenoid terminals on the Triangular Wave Control Unit. Place one bare wire into each of the connectors and tighten the screw. Be sure that the wire insulation is clear of the screw. A slight tug on the wire will check these connections.

### Outdoor Installation

For slab-built homes with the water meter outdoors, it is appropriate to mount the control unit indoors, running the signal cable through the exterior wall to the pipe being treated. An easy to seal, 1/4-inch hole is all that is required.

### Performance Check . . .

1. After all connections are made and controller is connected to 12 volt battery, check the following:
  - **Power On light will be on.**
  - **Coil Energized lights will be on.**
2. If the pipe solenoid is incorrectly connected, disconnected, or this circuit becomes open, the Triangular Wave Control Unit will indicate failure as follows:
  - **Power On light will be on.**
  - **Coil Energized lights will be off.**
3. To test the connection, unscrew one of the pipe solenoid connections and remove the wire. Observe that the fault is correctly indicated. Replace the wire and tighten the connection. The Triangular Wave System should indicate normal operation. Your new Triangular Wave Deposit Control System is now in service.

### Performance Guide . . .

The Triangular Wave Deposit Control System treats all incoming water as it passes the coil and alters the characteristics of the calcium so that it does not stick and form hard scale. It is important to remember that the calcium is still in the water and will be visible in appliances that are not subject to free flowing water.

#### Your Electronic Deposit Control System Will:

1. Prevent further hard scale build-up.
2. Remove the existing scale that is inside your water system.
3. Soften the existing hard scale around taps, basins, and toilets, etc.
4. Reduce soap scum and improve the lather of soap.
5. Make the water feel silkier.
6. Reduce the harsh effects of hard water on skin and clothes.

### Completed System Installation Must Reflect:

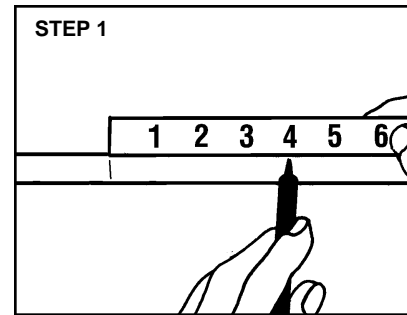
- A. Solenoid coil correctly field wrapped or factory wrapped  
Reaction Chamber / Copper Pipe Signal Enhancer Installed
- B. Visual placement of controller for periodic visual inspection of LEDs  
*All wires must be securely fastened and/or taped to connections*  
*All associated wiring/conduit / line cords must be fastened with plastic wire ties and out of harms way*

High Temperature Applications for Triangular Wave Technologies Deposit Control Systems 176° F and above (Teflon Wire Required) Solenoid coil wrapping length: 3.5 inch wrap– The solenoid is wound in two overlapping layers, approx. 60 turns per layer

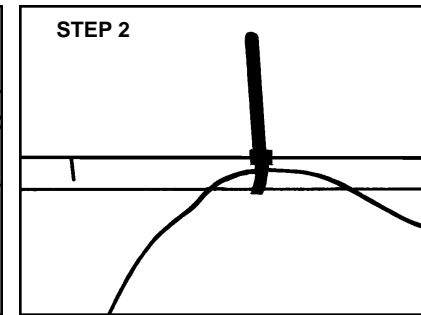
#### Application Guidelines

- Onsite solenoid wrap wire included ( Teflon special order)
- Copper pipe: TWT-CSE-0227 copper signal enhancer (not included)
- Reaction Chamber (not included): Refer to product list for item numbers and sizes

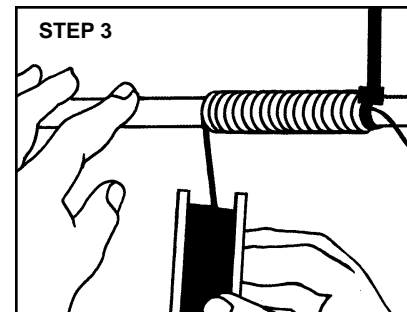
### Step by Step Coil Wrap Instructions



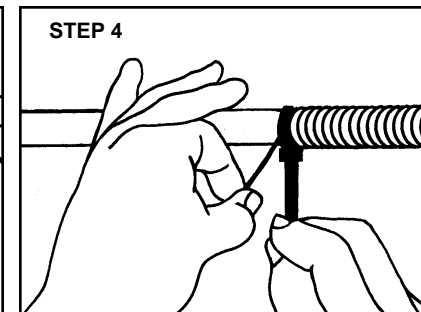
Measure and mark a 4-inch section in the middle of a straight pipe segment.



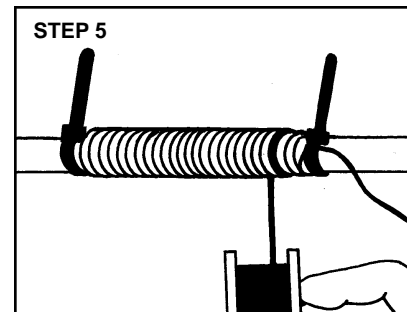
Fasten the signal wire to the pipe with a cable tie (provided) at one end of the 4-inch section. **Be sure the free end is long enough to reach to the power supply.**



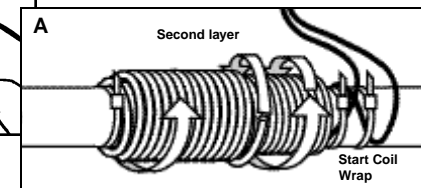
Wrap the signal wire around the pipe in a tight coil, in a clockwise manner, so that the adjacent wires are touching each other.

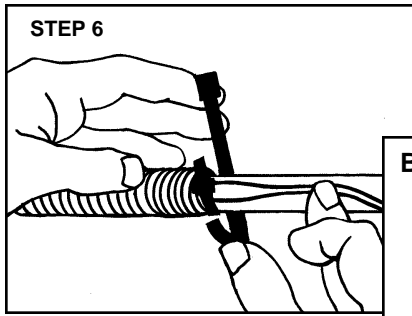


Continue to wrap until the 4-inch section of pipe is completely covered. Fasten down the end of the coil with the second cable tie (provided). You can hold the first layer in place with cloth tap or electrician's tape.

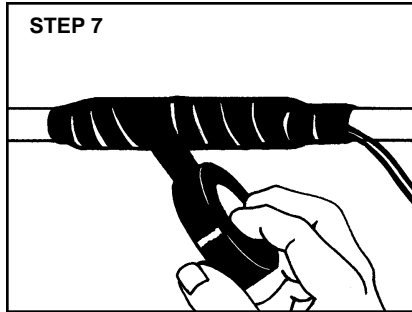
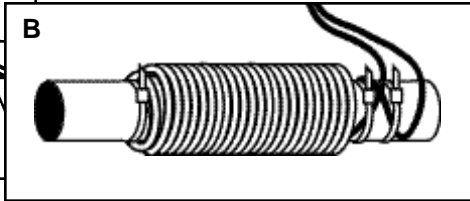


Add a second layer to the coil by continuing to wind in a clockwise manner starting where you completed the first layer and wind **back in the direction of the starting point.** ( see Diagram A) **Do Not Twist or Cut Wire or the System WILLNOT Function.** Place the second layer directly on top of the first layer. Be careful to wind the second layer tightly **in the same clockwise manner** as the first layer **back in the direction of the starting point.**





Complete the second layer by clamping the wire with third cable tie (provided). (See Diagram B)



**Please Note:**  
When wrapping it does not matter if you wrap the first layer clockwise or counter clockwise, but you must wrap the second layer returning in the same direction as you started. If not the signal will be negated, and the unit will not work.

Wrap the coil with electrician's tape or cloth tape (duct tape) to help maintain a tight coil and protect the coil from being disturbed.

### How will you know the system is working?

The amount of time required before you experience the effects of the system varies from home to home, depending on the amount of water used. Generally, signs of aggressive descaling are seen within 1 to 2 weeks. Note: The system may initially seem to become "less effective" at times. This is due to the removal of the existing scale which is brought back into solution, which will briefly create the effect of increased hardness. Once the scale has been removed from the system being treated, the full effectiveness of the deposit control system will return.

### External Scale

It is a good idea to use external scale as a tracking reference to determine whether or not the system is working. Areas to identify for this are:

1. Scale around taps, sinks, etc. will begin to soften, provided that the newly treated water is in regular contact with the area. Once softened, these deposits can be removed using a stiff scouring pad.

2. Surfaces in contact or splashed with water become easier to clean.
3. Scale on shower heads softens and can be removed. During descaling, some deposits may collect inside the nozzle. These can be easily rinsed away.

### Internal Scale

1. As your hot water system is descaling, water heating will become progressively more efficient, heating faster and generally to a higher temperature. Therefore, you may save considerable energy by reducing thermostat settings.
2. If the water system was severely scaled, an improvement in water flow may also occur.

### Soap, Scum, and Skin Effects

As the calcium is non-sticky, you will usually notice:

1. A reduction of around 30% in soap detergents needed.
2. Less scum formed on the bathtub, and an improved soap lather.
3. A great improvement in skin condition for anyone suffering from dry skin. Even those with normal skin can expect improvements and reduction in the use of hand creams, etc.

### Dishwasher

Continue to use rinse aid in dishwashers in accordance with the manufacturer's instructions, otherwise soft calcium deposits may be evident where water has dried on horizontal surfaces.

### IMPORTANT NOTES:

1. For some time after installation, the unit will be descaling your water system. This often results in the water appearing to be harder and calcium deposits may increase in places like shower heads. Once descaled inside, your water system will be scale-free and calcium marks outside the system should easily wipe away.
2. Water Softeners - Water softeners often leave deposits inside a water system; therefore, if a softener is in use, you may want to allow the Deposit Control System to remove the deposits before the softener is switched off. In that case, leave the softener and the Deposit Control System on together for about 1 month.  
**Remember, install the Triangular Wave system downstream of the water softener, if you plan to run them together.**

### Typical User Experiences . . .

#### Silky Water Feeling

The treated water is immediately altered and will start dissolving scale build-up in the pipes. The scale redissolves one particle at a time, so there are no problems with clogging filters or screens in the plumbing system. If you have never used a water softener before, you will experience a dramatic difference in the "feel" of the water. The water will have a silky feeling, and you will notice that your hair is "squeaky clean" after a shampoo.

## **Chlorine**

You may smell chlorine dissipating if your water has been chlorinated because of the reduced surface tension of the treated water. The chlorine controls organisms inside your plumbing, but it is not good for you, your hair, or your skin. So having the chlorine perform its function in the water, and then having it dissipate before you drink it or bathe is ideal.

## **Replacing a Salt Water Softener**

If you have replaced a salt water softener, you may notice the water becoming harder as the scale begins dissolving. You may wonder, "What have I done here?" Do not worry, this is a consequence of descaling, and the condition will improve daily as the scale is removed. Your plumbing took years to get full of scale, however it only takes a short time to clean it up. This period may be brief for a newer home, or several months for older homes with low water usage. We recommend draining your water heater regularly to shorten the descaling process. The shorter the descaling period takes, the more money you will end up saving.

## **Dishwasher**

If you use a dishwasher and replaced a salt water softener, you may notice calcium spotting. This situation will diminish to the residual level of calcium present in your water supply when the descaling is finished. In the meantime, reduce the amount of detergent used and add Jet-Dri™, or a half cup of household vinegar, or a tablespoon of Borax to the rinse cycle. The reduction of detergents used also applies to laundering.

## **Bathroom Fixtures**

You should also notice the toilet bowl, tub, and glass shower stall scaling will come off more easily with normal cleaning after the first several weeks of usage. Another side benefit of the Triangular Wave System is that the naturally present microorganisms causing black molds in the bath area will diminish, and then stop completely. One common problem is scale build-up caused by back splashing on faucet's and tub/shower enclosures. Since there is not direct water flow across these surfaces, unlike inside a pipe, the scale must be removed manually. After initial cleaning, new accumulations will wipe off easily. In some cases, it may be necessary to install a sediment filter when eliminating a softener.

## **First Ninety Days**

All descaling should be complete, and you will be left with:

- 1. Soft feeling water from every tap!**
- 2. Clean pipes!**
- 3. A savings in energy and detergent expenses!**

Remember to drain the water heater regularly for the quickest results.

## **Typical Customer Questions . . .**

**What does a softener do that an electronic deposit control system does not?**

- 1. The water softener softens a hard water situation very well. *IT REMOVES CALCIUM FROM THE WATER BY REPLACING THE CALCIUM WITH SODIUM.* Thus, it will remove hard water spotting and provide more sudsing.**
- 2. The softener gives you a feeling that you can not get rid of soap from your body.**
- 3. The water softener makes your skin dry.**
- 4. The water softener adds salt in your water.**
- 5. The water softener requires that you purchase salt periodically.**

**What does the Triangular Wave System do that a water softener does not?**

- 1. MOST IMPORTANTLY, IT REMOVES CALCIUM BUILD-UP IN HOT WATER HEATERS** (Saves energy costs).
- 2. SAVES MONEY** (No salt purchases).
- 3. Provides salt-free water, a concern for many health conscious people.**
- 4. Provides environmentally clean water, while eliminating the discharge of salt-laden water into the water table as a result of the normal regeneration cycle of conventional water softeners.**
- 5. Reduces the consumption of detergents. *BIG SAVINGS FOR COMMERCIAL USERS.***

**If there is a water softener already installed, how do you install the Triangular Wave System?**

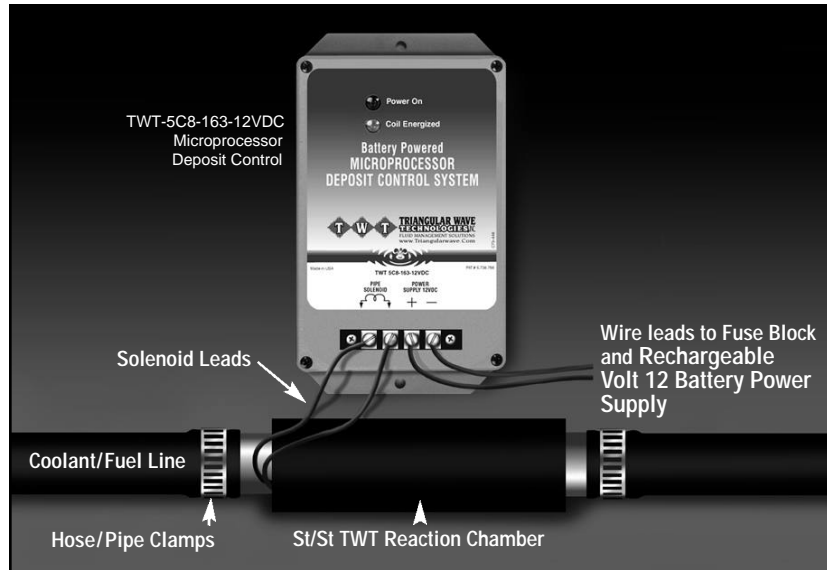
**Should we use both a water softener and the Triangular Wave System?**

The option is yours. Because existing scale build-up in your plumbing will be dissolved into the water, the use of your water softener may help to diminish the effects of this increase in hardness. After approximately 1 month put the softener on "by-pass".

**How can I tell the Triangular Wave System is working?**

- 1. Scale around taps, sinks, shower heads, and any surfaces in contact with water will disappear.**
- 2. You can see a difference in the toilet tank float if you turn it half a turn to establish a reference point for future referral.**
- 3. For water heater cases: as the water is treated, the heater becomes more efficient. Water heats more quickly and generally to a higher temperature. The user can save considerable energy.**
- 4. Soap and detergent consumption may decrease.**

## Section #2: System Layout for Coolant/Fuel System Installation



### Section #2: Installation Instructions

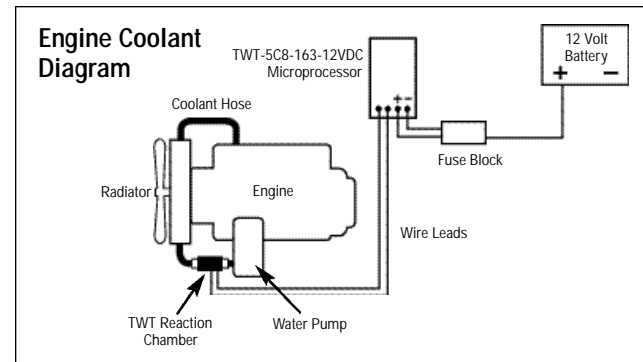
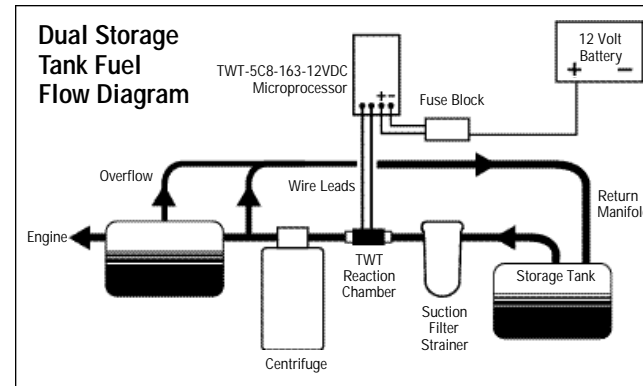
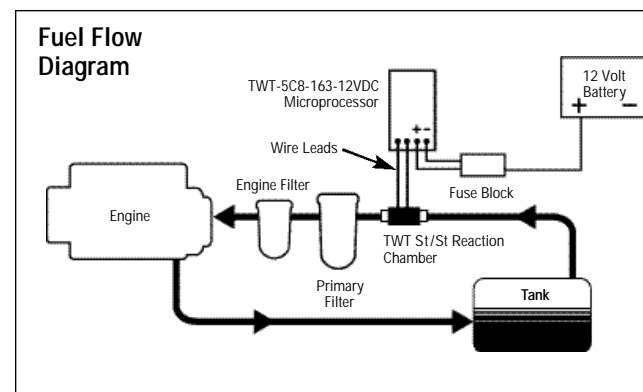
The TWT-163 Microprocessor should be mounted inside the vehicle at any location which will provide access to the vehicle fuse block and for the Reaction Chamber/solenoid wiring into the engine bay. The Deposit Controller requires 12vdc to power the circuit. Select a fused circuit in the fuse panel which is switched by the ignition switch. The Controller is to be on (12vdc) when the engine is running. Connect one wire (+12vdc), to the switched fuse panel and then to the input barrier strip on the Controller. The 2nd wire lead to the ground connection (-) may be connected at any convenient chassis ground, then connected to the Controller barrier strip (-) terminal. This completes the power connection.

The Reaction Chamber, if required is a stainless steel tube that is to be installed "in-line" in the coolant/fuel engine system. Standard hose clamps will secure the Reaction Chamber to the coolant hoses as illustrated. Secure the reaction Chamber to prevent the Reaction Chamber from moving around during operation.

The Reaction Chamber/solenoid coil wires should be fed through the firewall to the Controller's location. Connect the two wires leads to the terminals on the Controller as illustrated. Be sure the wires clear the fan blades or any other moving parts. Secure the wires to the engine bay to ensure they remain in place and cannot come into contact with any moving parts.

When the ignition is turned on the green led lamp on the deposit Controller will light up, indicating the system is in operation. The yellow led lamp will alternate on and off, indicating Reaction Chamber, solenoid coil is energized. The yellow lamp will go out if the load circuit is broken or open.

## Coolant & Fuel (Diesel) System Installation Guidelines



### Some Basic Application Guidelines

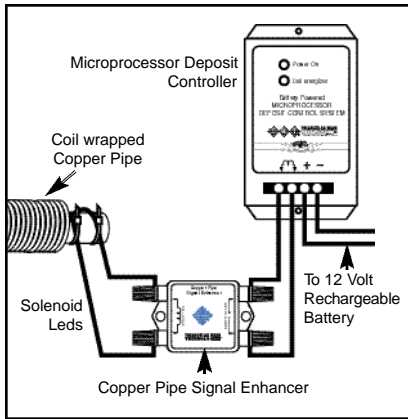
#### Optional Application:

If there is no fused circuit "switched" position in the fuse panel, then you may choose to use a relay switch. The relay switch should have a fuse, and an on off control.

Illustrated diagrams are not to scale, for reference only, licensed mechanic recommended for all applications & installations

## Water Line P.O.E. Application

### TWT-CSE Copper Pipe Signal Enhancer *For copper pipes only*

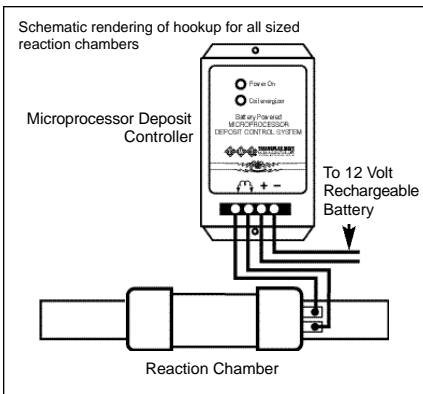


**Copper pipes, although acceptable, are one of the more difficult of materials to work with. To overcome this...**

TWT has developed its Copper Pipe Signal Enhancer. This unit is placed between the Deposit Controller and the solenoid coil on the copper pipe as illustrated. The function of the signal enhancer is to provide a proper impedance match and to ensure maximum energy transfer between the controller and the solenoid, which, in turn, ensures enhanced treatment of the fluid.

The copper signal enhancer is a passive signal / impedance matching circuit. The Signal Enhancer **must be** used in all copper pipe applications to maximize the performance, and provide a power boost to the conditioning signal in copper pipes.

### TWT FACTORY WRAPPED REACTION CHAMBERS



To use in conjunction with the TWT Deposit Control Systems when required, Triangular Wave Technologies, Inc. has developed a line of factory-wrapped wire coil Reaction Chambers to address magnetic pipe environments. **Typically, wire coil cannot be installed on any magnetic pipe, such as steel, galvanized steel, ductile iron, or cast iron.** If a coil is applied to such a pipe, the pipe becomes a shield and prevents the wave energy from entering the fluid path. TWT Reaction Chambers solve this problem by providing an easily installed section of non-magnetic pipe to provide the proper pipe material for the Deposit Control System to work as designed. TWT Reaction Chambers are fully sealed, protecting their two layers of factory-wrapped coil. The PVC, Stainless Steel and the Industrial Reaction Chamber systems are designed and manufactured to meet the highest quality specifications necessary and to meet the needs of all Deposit Controllers.

## Maintenance

Your Triangular Wave Technologies Deposit Control System is manufactured in the U.S.A. with premium electronic components. No periodic maintenance is required. The front panel display indicates the status of the AC Power and Solenoid Coil. These indicators are LED's and will not require replacement. If the indicators are not correct, check the AC power and the wire to the solenoid.

For Technical Support contact us at Triangular Wave Technology Inc.

## Product Warranty

All components of the Triangular Wave Microprocessor Deposit Control Systems are covered by a Five (5) Year Warranty provided that:

1. No modifications are performed on the unit;
2. The system is installed as recommended by Triangular Wave Technologies, Inc. and
3. There is no modification or change of installation without prior consultation with Triangular Wave Technologies, Inc. or its agents.

In the unlikely event that the unit becomes non-functioning, e.g., the "power" light and/or the "coil energized" light are not receiving the signal & are not lit, please return the unit for replacement to the place of purchase, with proof of purchase information.\*

The Triangular Wave System does not affect the potability or the natural mineral content of the water, as there is no direct contact with the water. Triangular Wave Technologies, Inc., therefore, accepts no responsibility for water quality.

## Performance Warranty ( 90 Days )

Triangular Wave Technologies, Inc. warrants that the Triangular Wave Microprocessor Deposit Control System will perform as indicated in this Owner's/ Installation Manual. If the product does not perform as indicated, the unit may be returned within 90 days from the invoice date for a refund of the purchase price, less the direct cost of shipping, installation.\* Customer agrees that Triangular Wave Technologies, Inc. or its agents will be given access to the equipment for 90 days in order to monitor its performance, if desired, and/or to inspect the product and installation prior to any requested return authorization.

Under no circumstances shall Triangular Wave Technologies, Inc. or its agents be liable for consequential, special, or contingent damages or other claims or demands in excess of the purchase price of its products. The Deposit Control System is non-invasive and non-chemical by design, and is suitable for nearly all applications requiring hard water treatment. The treatment process does not add anything to the fluid and should not cause damage to piping or equipment. The Deposit Control System is designed to remove scale; if piping or equipment has suffered corrosion prior to the installation of a TWT Deposit Control System, the removal of this scale may potentially reveal cracks/pinholes in this piping or equipment that had been held together by this scale. If structural damage or corrosion is suspected to exist, appropriate measures should be taken to alleviate this condition prior to or in conjunction with the installation of the TWT Deposit Controller. Equipment owners must continue to be responsible in standard infrastructure and equipment maintenance procedures as recommended by the manufacturers of all piping and fluid fed equipment.

Triangular Wave Microprocessor Deposit Control System components should be inspected, upon receipt, for damage that might occur during shipment. The carrier and Triangular Wave Technologies, Inc. or its agents must be notified immediately if damage is found.\*\* With proper care during installation and maintenance, the system will provide faithful service for many years.

\*Triangular Wave Technologies, Inc. or its Authorized Representatives must be notified prior to any return for the proper Return Authorization, conditions and procedures.

\*\*With the exception of Triangular Wave Technologies, Inc. represented products / components, which are covered by a separate standard warranty indicated in the products' Owners Installation Manual provided.

Triangular Wave Technologies, Inc., provides total support before, during, and after the installation.