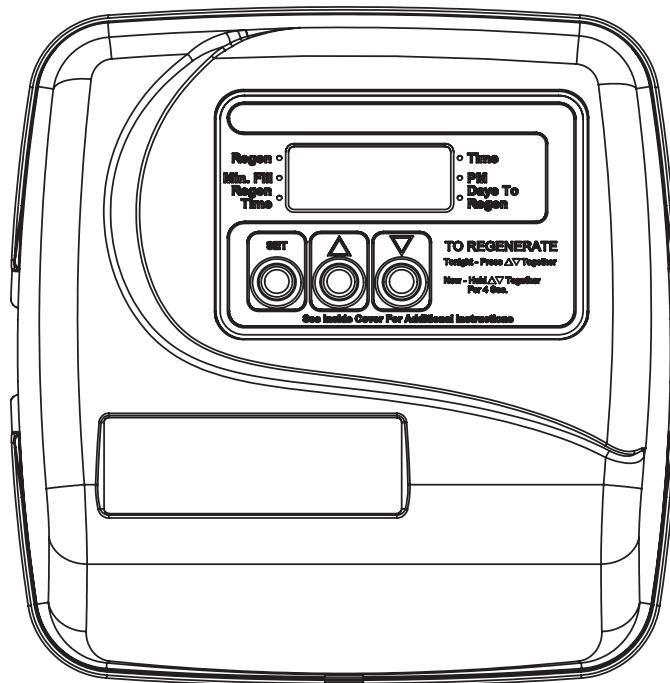# Water Specialist
1" Control Valve Series Model: WS1TC
1.25" Control Valve Series Model: WS1.25TC

Operation and Instruction Manual for OEM Only.

Please Note: This operation and instruction manual is for the training of the OEM and for the OEM to use to train their customers. This document is not to be used as the complete system manual.

Table of Contents

**FOR INFORMATION COMMON TO ALL 1" & 1.25" CONTROL VALVES
REFER TO THE WS1&WS1.25 DRAWINGS AND SERVICE MANUAL**

Control Valve Function and Cycles of Operation

This glass filled Noryl[1] (or equivalent) fully automatic control valve is designed as the primary control center to direct and regulate all cycles of a downflow regeneration water softener or filter.

The time clock control valve can be set to perform downflow regeneration or simply backwash. The time clock control valve has two calendar options for regeneration frequency:
1. An option where the user can choose the number of days (1-99) between each regeneration; and
2. A seven-day option where the user can choose which day(s) of the week a regeneration should occur.

The control valve is compatible with a variety of regenerants and resin cleaners. The control valve is capable of routing the flow of water in the necessary paths to regenerate or backwash water treatment systems. The injector regulates the flow of brine or other regenerants. The control valve regulates the flow rates for backwashing, rinsing, and the replenishing of treated water into a regenerant tank, when applicable.

The control valve uses no traditional fasteners (e.g. screws); instead clips, threaded caps and nuts and snap type latches are used. Caps and nuts only need to be firmly hand tightened because radial seals are used. Tools required to service the valve include one small blade screw driver, one large blade screw driver, pliers and a pair of hands. A plastic wrench is available which eliminates the need for screwdrivers and pliers. Disassembly for servicing takes much less time than comparable products currently on the market. Control valve installation is made easy because the distributor tube can be cut ½" above to ½" below the top of tank thread. The distributor tube is held in place by an o-ring seal and the control valve also has a bayonet lock feature for upper distributor baskets.

The power supply comes with a 15 foot power cord and is designed for use with the control valve. The power supply is for dry location use only. The control valve maintains timekeeping for up to 8 hours if the power goes out and the battery is not depleted. After 8 hours, the only item that needs to be reset is the time of day; valve status and programming are permanently stored in the nonvolatile memory. If a power loss lasts less than 8 hours and the time flashes on and off, the time of day should be reset and the non rechargeable battery should be replaced.

Table 1 shows the time for the backwash, regenerative, and rinse cycles for the ten available programming options. Six different programs are available for a softener, one for a regenerative filter, and three programs for backwash only filters. When the control valve is used as a:
• Softener - one or two backwashes occur and refill always occurs after the rinse cycle (P0 through P5)
• Regenerative Filter - one backwash occurs and refill always occurs after the rinse cycle (P6)
• Backwashing Filter - one backwash occurs (P7 through P9)

Table 1
Regeneration Cycles and Times for Different Programs

Program	All times in Minutes				
	C1 1st Backwash	C2 Regenerate	C3 2nd Backwash	C4 Rinse	C5 Fill
P0	3	50	3	3	1-99
P1	8	50	8	4	1-99
P2	8	70	10	6	1-99
P3	12	70	12	8	1-99
P4	10	50	Skipped	8	1-99
P5	4	50	Skipped	4	1-99
P6	12	6	Skipped	12	1-99
P7	6	Skipped	Skipped	4	Skipped
P8	10	Skipped	Skipped	6	Skipped
P9	14	Skipped	Skipped	8	Skipped

NOTE: During regeneration the display will show C1, C2, etc. If the cycle is skipped, that cycle number will not be displayed.

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[1] Noryl is a trademark of Sabic Innovative Plastics IP B.V. Company

• The user can initiate manual regeneration. The user has the option to request the manual regeneration at the delayed regeneration time or to have the regeneration occur immediately. Simultaneously press ▲ and ▼ to start a regeneration at the next delayed regeneration time. If a regeneration is to occur "today" an arrow will point to REGEN. For immediate regeneration, simultaneously press and hold ▲ and ▼ for three seconds.

When in regeneration, step through the different regeneration cycles by pressing ▲ or ▼.

OEM General Instructions

The control valve offers multiple procedures that allow the valve to be modified to suit the needs of the installation. These procedures are:
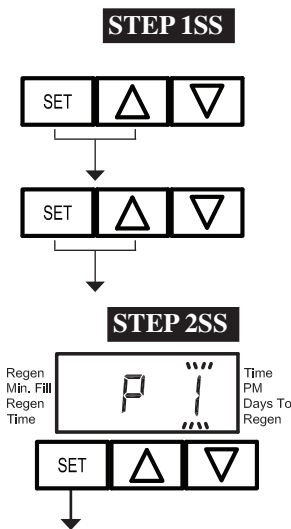
• OEM System Setup
• Installer Displays & Settings (either 1-99 Days Between Regeneration option or 7-Day option)
• User Displays

These procedures can be accessed in any order. Details on each of the procedures are provided below and on the following pages.

When in operation, normal user displays show the time of day or days remaining before regeneration. When stepping through a procedure, if no buttons are pressed within five minutes the display returns to a normal user display. Any changes made prior to the five minute time out are incorporated.

To quickly exit Installer Displays & Settings or OEM Setup, simultaneously press SET + ▼. Any changes made prior to the exit are incorporated.

To reinitialize the control valve, check to make sure the valve is in the User Display. Then simultaneously press SET + ▼ or unplug power source plug (4-pin connector) on the circuit board, wait 3 seconds and plug back in.
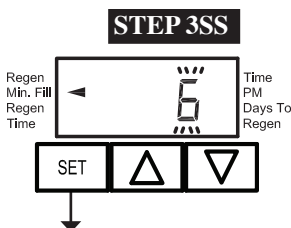
OEM System Setup

STEP 1SS

STEP 1SS – From normal mode, press SET + ▲ buttons simultaneously for 3 seconds and release. Then press SET + ▲ simultaneously for 3 seconds and release.

STEP 2SS

STEP 2SS – Choose the desired program by pressing ▲ or ▼. Prior to selecting a program, verify the correct valve body, main piston, regenerant piston, and stack are being used, and that the injector or injector plug(s) are in the correct locations. See Valve Body Compliance Table in the WS1 and WS1.25 Drawings and Service Manual.
Press SET button to go to Step 3SS.

Regeneration Cycles and Times for Different Programs

Program	C1 1st Backwash	C2 Regenerate	C3 2nd Backwash	C4 Rinse	C5 Fill
	All times in Minutes				
P0	3	50	3	3	1-99
P1	8	50	8	4	1-99
P2	8	70	10	6	1-99
P3	12	70	12	8	1-99
P4	10	50	Skipped	8	1-99
P5	4	50	Skipped	4	1-99
P6	12	6	Skipped	12	1-99
P7	6	Skipped	Skipped	4	Skipped
P8	10	Skipped	Skipped	6	Skipped
P9	14	Skipped	Skipped	8	Skipped

STEP 3SS

STEP 3SS – If program P0 through P6 was selected, enter in the minutes of fill using ▲ or ▼. The allowable values vary from a low of 1 to a high of 99. If program P7, P8 or P9 was selected, this screen will not appear. Press SET button to go to Step 4SS. Note: For each minute of fill 0.5 gallons of water is added to the solution tank. With Sodium Chloride, each 0.5 gallon of water will dissolve 1.5 pounds of salt.
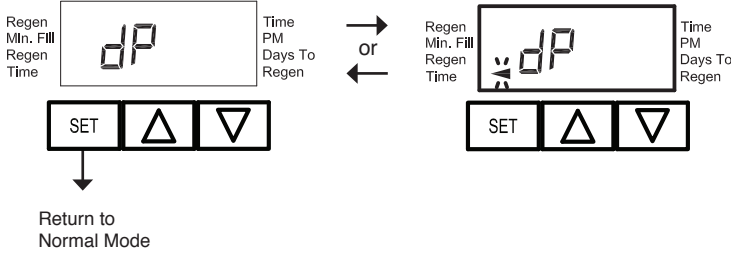
STEP 4SS
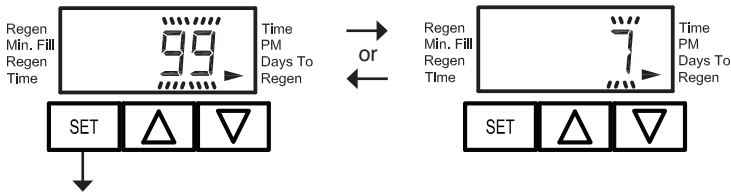
STEP 4SS - Use ▲ or ▼ to switch between:
• 1-99 Days Between Regeneration - Regeneration is determined by the number of days that have passed since the last regeneration scheduled.
• 7-Day - Regeneration is scheduled for specific days of the week.
Press SET to go to Step 5SS.

STEP 5SS

STEP 5SS - If a differential pressure switch is installed and actuated for 2 minutes:
• a regeneration will occur immediately if no arrow points at Regen Time; or
• a regeneration will occur at the delayed regeneration hour if an arrow points at Regen Time.
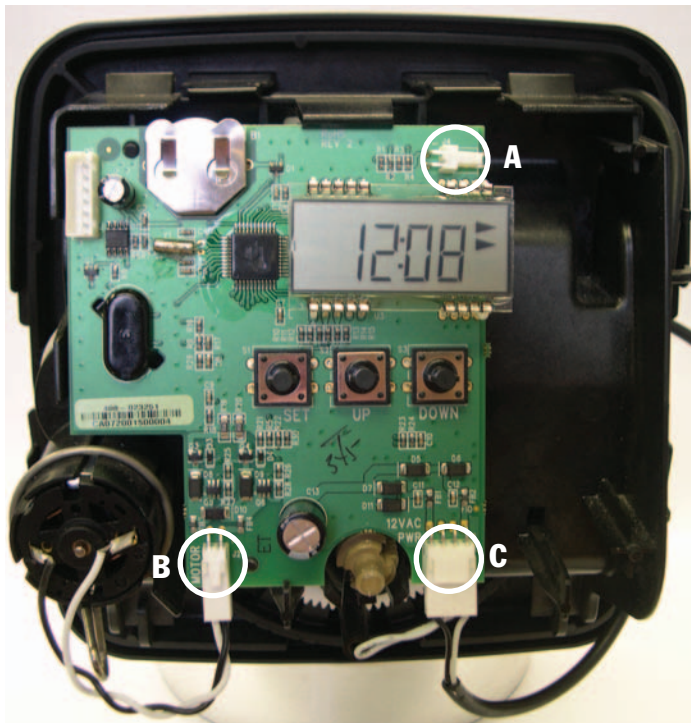Use ▲ or ▼ to switch between the two choices. If a differential switch is not installed the settings in this display are ignored. Press SET to go to Step 6SS.

STEP 6SS
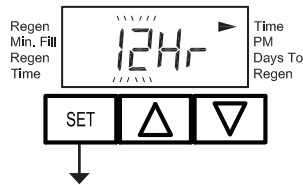
STEP 6SS - Timekeeping format – only viewed when DC power supply is used. Use ▲ or ▼ to select 12 for 12 hour AM/PM format or 24 for 24 hour format.
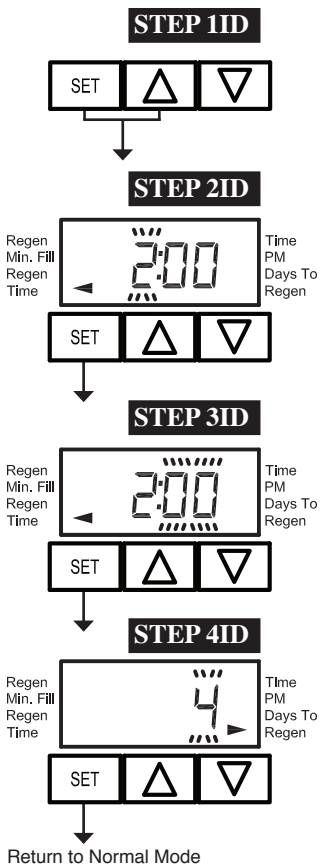Press SET to exit OEM System Setup.

NOTE: A regeneration will be initiated or scheduled after the control has received a signal for two minutes to the DP Input (Item A).
A. Differential pressure switch connection
B. Motor wire connection
C. Power supply wire connection

STEP 1ID

**Installer Displays & Settings (1-99 Days Between Regeneration Option)**

STEP 1ID – From normal mode, press SET + ▲ buttons simultaneously for 3 seconds and release.

STEP 2ID

Regen
Min. Fill
Regen
Time

Time
PM
Days To
Regen

STEP 2ID – Regeneration Time Hour: Set the time for regeneration to start using ▲ or ▼. Press SET to go to the next step.

STEP 3ID

Regen
Min. Fill
Regen
Time

Time
PM
Days To
Regen

STEP 3ID – Regeneration Time Minutes: Set the time for regeneration to start using ▲ or ▼. Press SET to go to the next step.

STEP 4ID

Regen
Min. Fill
Regen
Time

Time
PM
Days To
Regen

STEP 4ID – Days to Regen: Set the number of days between regenerations. The allowable range is 1 to 99. Press SET to exit Installer Displays and Settings.

Return to Normal Mode

Installer Displays & Settings (7 Day Option)
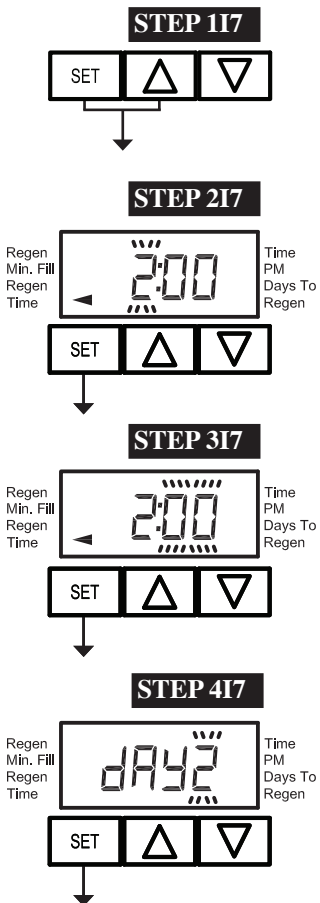
STEP 1I7

STEP 1I7 – From normal mode, press SET + ▲ simultaneously for 3 seconds and release.

STEP 2I7

Regen
Min. Fill
Regen
Time

Time
PM
Days To
Regen

**STEP 2I7** – Regeneration Time Hour: Set the time for regeneration to start using ▲ or ▼. Press SET to go to Step 3I7.

STEP 3I7

Regen
Min. Fill
Regen
Time

Time
PM
Days To
Regen

STEP 3I7 – Regeneration Time Minutes: Set the time for regeneration to start using ▲ or ▼. Press SET to go to Step 4I7.

STEP 4I7

Regen
Min. Fill
Regen
Time

Time
PM
Days To
Regen

STEP 4I7 – Current Day of Week: Set the current day of the week by using ▲ or ▼ (See chart at right for date codes). Press SET to go to STEP 5I7.

Display		Day of Week
day 1	d1	Sunday
day 2	d2	Monday
day 3	d3	Tuesday
day 4	d4	Wednesday
day 5	d5	Thursday
day 6	d6	Friday
day 7	d7	Saturday

STEP 5I7

Regen
Min. Fill
Regen
TIme

d 1

Time
PM
Days To
Regen

SET △ ▽
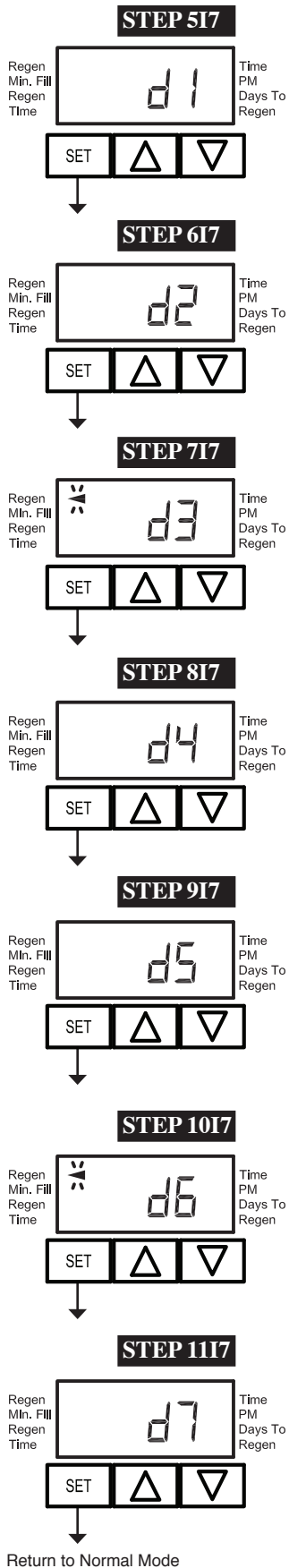
STEP 5I7 – Sunday Regeneration: To regenerate on Sunday use ▲ or ▼ until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Sunday. Press SET to go to STEP 6I7.

STEP 6I7

Regen
Min. Fill
Regen
Time

d2

Time
PM
Days To
Regen

SET △ ▽

STEP 6I7 – Monday Regeneration: To regenerate on Monday use ▲ or ▼ until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Monday. Press SET to go to STEP 7I7.

STEP 7I7

Regen
Min. Fill
Regen
Time

d3

Time
PM
Days To
Regen

SET △ ▽

STEP 7I7 – Tuesday Regeneration: To regenerate on Tuesday use ▲ or ▼ until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Tuesday. Press SET to go to STEP 8I7.

STEP 8I7

Regen
Min. Fill
Regen
Time

d4

Time
PM
Days To
Regen

SET △ ▽

STEP 8I7 – Wednesday Regeneration: To regenerate on Wednesday use ▲ or ▼ until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Wednesday. Press SET to go to STEP 9I7.

STEP 9I7

Regen
Min. Fill
Regen
Time

d5

Time
PM
Days To
Regen

SET △ ▽

STEP 9I7 – Thursday Regeneration: To regenerate on Thursday use ▲ or ▼ until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Thursday. Press SET to go to STEP 10I7.

STEP 10I7

Regen
Min. Fill
Regen
Time

d6

Time
PM
Days To
Regen

SET △ ▽

STEP 10I7 – Friday Regeneration: To regenerate on Friday use ▲ or ▼ until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Friday. Press SET to go to STEP 11I7.

STEP 11I7

Regen
Min. Fill
Regen
Time

d7

Time
PM
Days To
Regen

SET △ ▽

Return to Normal Mode

STEP 11I7 – Saturday Regeneration: To regenerate on Saturday use ▲ or ▼ until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Saturday. Press SET to exit Installer Displays & Settings.
NOTE: If all arrows are turned off in d1-d7, the program will default to d7.

User Displays

General Operation

When the system is operating one of two displays will be shown. Pressing ▲ or ▼ will alternate between the displays. One of the displays is always the current time of day. The second display is the days remaining until the next regeneration. If the days remaining is equal to one, a regeneration will occur at the next preset regeneration time. The user can scroll between displays as desired.

If the system has called for a regeneration that will occur at the preset time of regeneration, the arrow will point to Regen.

Regeneration Mode

Typically a system is set to regenerate at a time of low water usage. An example of a time with low water usage is when a household is asleep. If there is a demand for water when the system is regenerating, untreated water will be used.

When the system begins to regenerate, the display will change to the Regeneration Cycle Display to indicate the current regen cycle step and time remaining. An arrow will also point to Regen. The system will run through the steps automatically and will reset itself to provide treated water when the regeneration is completed.

Manual Regeneration
Sometimes there is a need to regenerate the system sooner than when the system calls for it, usually referred to as a manual regeneration. There may be a period of heavy water usage because of guests or a heavy laundry day.

To initiate a manual regeneration at the preset delayed regeneration time, simultaneously press ▲ and ▼ and release. The arrow will point to the word Regen if a regeneration is expected "tonight." To cancel the regeneration simultaneously press ▲ and ▼ and release.

To initiate a manual regeneration immediately, simultaneously press ▲ and ▼ for three seconds. The system will begin to regenerate immediately. The request cannot be cancelled.
Note: For softeners, if brine tank does not contain salt, fill with salt and wait at least two hours before regenerating.
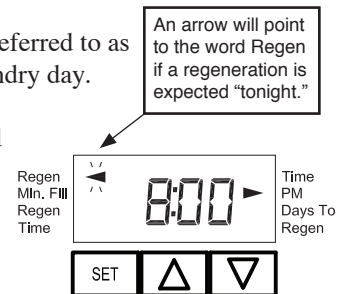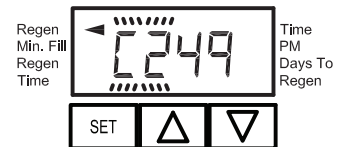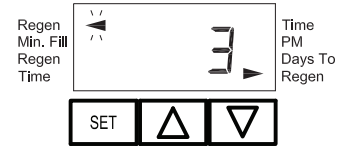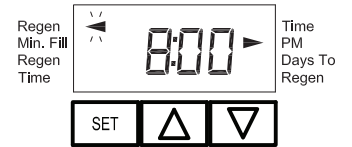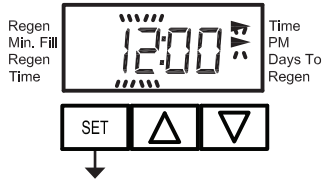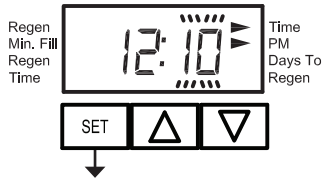
Set Time of Day

STEP 1U

STEP 1U – Press SET

STEP 2U

STEP 2U – Current time: Adjust hour with ▲ or ▼. With 60 Hz line frequency detection on power-up, timekeeping is 12 hour with PM indicator. With 50 Hz line frequency detection on power-up, timekeeping is 24 hour without the PM indicator. Press SET to go to Step 3U.

STEP 3U

STEP 3U – Adjust minutes with ▲ or ▼. Press SET to exit Set Time of Day.

Power Loss

Only the current time of day will need to be reset if power is lost for greater than 8 hours. If power is lost while the system is regenerating, the control will complete regeneration at the point of interuption once power is restored.
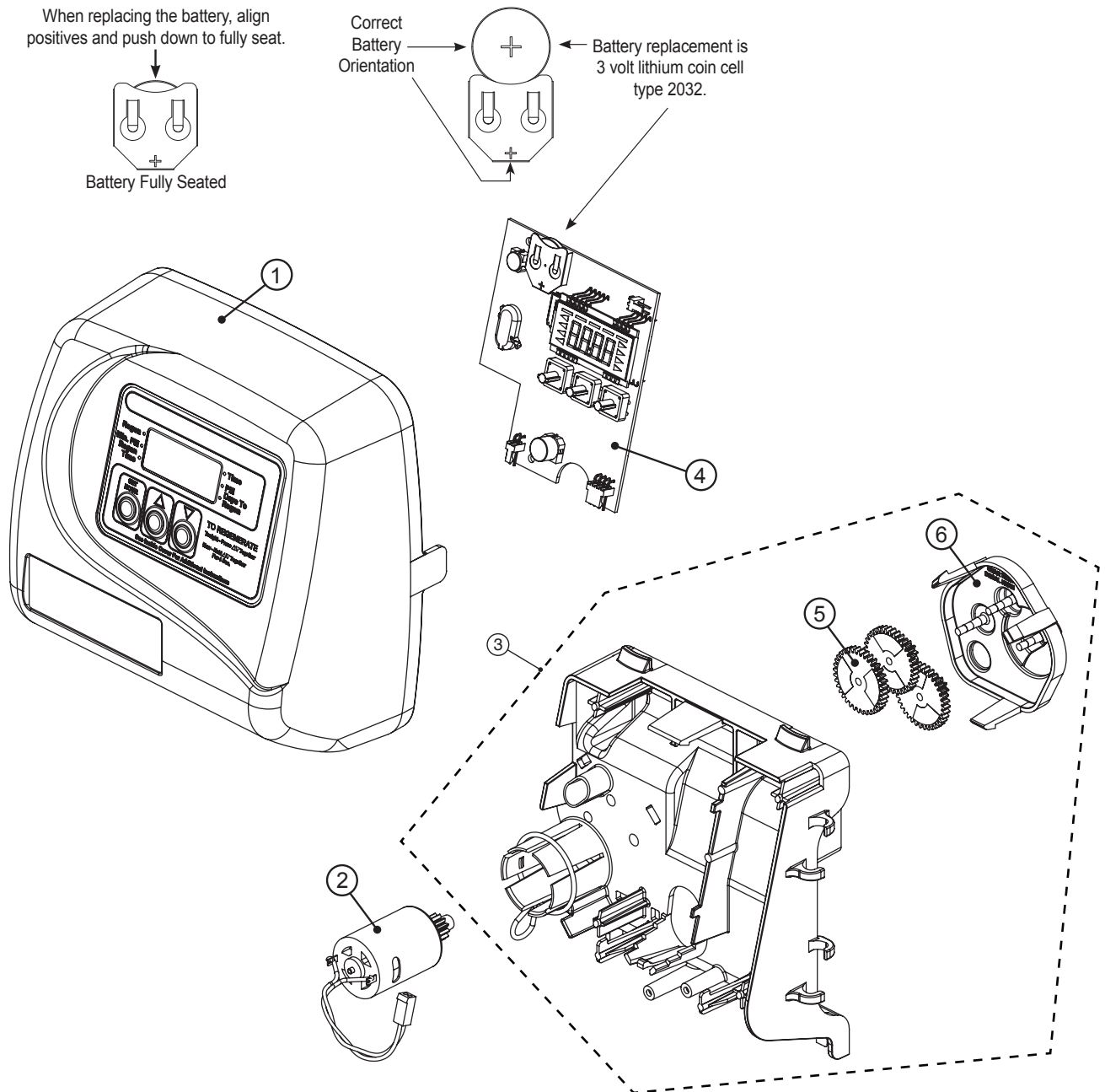
Error Message

If "E1," "E2", "E3" or "E4" appears on the display contact the OEM for help. This indicates that the valve did not function properly.
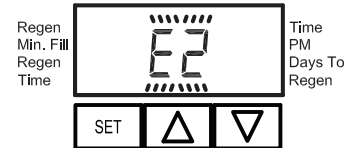
Front Cover and Drive Assembly

Drawing No.	Order No.	Description	Quantity
1	V3175TC-01	WS1TC FRONT COVER ASY	1
2	V3107-01	WS1 MOTOR ASY	1
3	V3002-A	WS1 DRIVE BRACKET ASY	1
4	V3818TC-01 BOARD	WS1/125TC-01 PC B 4-DIGIT REPLACE	1
5	V3110	WS1 DRIVE REDUCING GEAR 12 X 36	3
6	V3109	WS1 DRIVE GEAR COVER	1
Not Shown	V3186-06	WS1 POWER SUPPLY US 15VDC HOCP	1
	V3186EU-06	WS1 POWER SUPPLY EU 15VDC HOCP	
	V3186UK-06	WS1 POWER SUPPLY UK 15VDC HOCP	
	V3186-01	WS1 POWER CORD ONLY 15FT	

When replacing the battery, align positives and push down to fully seat.

Battery Fully Seated

Correct Battery Orientation

Battery replacement is 3 volt lithium coin cell type 2032.

Revision History:

1/27/2017

PAGE 12:

* Drawing number parts 2, 3, 5 and 6 may be purchased as a complete assembly, part V3002.

4/11/2017

PAGE 7:

Added timekeeping section

PAGE 12:

Updated part numbers for PC Board and Power Supplies

8/23/2017

PAGE 12:

Updates to table and drawing - Bracket and Spring Clip / Power Supply

6/11/2020

PAGE 12:

Removed #7 V3106-01 from table and drawing

Not Shown	V3186-06	WS1 POWER SUPPLY US 15VDC HOCP	1
	V3186EU-06	WS1 POWER SUPPLY EU 15VDC HOCP	
	V3186UK-06	WS1 POWER SUPPLY UK 15VDC HOCP	
	V3186-01	WS1 POWER CORD ONLY 15FT	