

# **ENCON® SAFETY PRODUCTS**

## **SAF-T-FLO®**

**EMERGENCY SHOWER & EYEWASH  
WATER TEMPERING SYSTEM**

### **INSTALLATION, OPERATION AND MAINTENANCE MANUAL**

**MODEL:  
STF30 & STF60 SERIES**

**09900003A Rev. F**

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**Patent # 6,270,014 B1**

# SAF-T-FLO®

PATENT# 6,270,014 B1

## PRODUCTION DESCRIPTION

The SAF-T-FLO® is a water tempering system designed to deliver tepid (Encon's desired output temp is 78°F - 93°F [25.5°C - 33.8°C ]) water to emergency eyewash and shower equipment (ESEW) when supplied with adequate amounts of hot and cold water (see OPERATIONAL SPECIFICATIONS below for requirements). Through an electro-mechanical series of controls, the SAF-T-FLO® will blend from 3 to 30 gpm (STF30 series) or 8 to 60 gpm (STF60 series) of water to a tepid temperature, while providing the necessary safeguards to help ensure end user safety. In the event of an electrical power failure, mechanical component failure or flow restriction, the SAF-T-FLO® "fail-safe" controls work to eliminate hot water use and provide a cold supply water flow only (bypass mode). The SAF-T-FLO® can be installed to serve a single ESEW station or plumbed to serve multiple ESEW stations.

## OPERATIONAL SPECIFICATIONS

- Electrical Requirement:
  - No heater: 120 Volt AC, 0.16 Amp
  - With heater: 120 Volt AC, 1.0 Amp
  - No heater: 240 Volt AC, 0.16 Amp
- Alarm relay capacity: 3 Amps
- Size:
  - STF30 Series: Without case: 32 ¾" long X 18" wide X 9 ¾" deep
  - With case: 37 ¾" long x 22" wide x 15 7/8" deep
  - STF60 Series: Without case: 42 1/8" long X 18" wide X 11" deep
  - With case: 42 1/8" long x 22" wide x 15 7/8" deep
- Weight:
  - STF30 Series: Without case: Approx. 49 pounds
  - With case: Approx. 79 pounds
  - STF60 Series: Without case: Approx. 75 pounds
  - With case: Approx. 105 pounds
- Maximum design water flow rate: 

STF30 Series:	30 gpm
STF60 Series:	60 gpm
- Pressure drops as follows:

3.5 gpm:	5 psig
8.0 gpm:	8 psig
20 gpm:	15 psig
30 gpm:	20 psig
- Recommend water quality: potable water
- Inlet / Outlet connections: 

STF30 Series:	1" Coupling (water), ¾" Coupling (electrical)
STF60 Series:	1 ½" Coupling (water), ¾" Coupling (electrical)
- Water temperature requirements:

Cold:	75°F (23.9°C) max	33°F (0.56°C) minimum
Hot:	160°F (71°C) max	90°F (32°C) minimum
- Outlet temperature: 

80° to 90°F (26.7° to 32°C) design temperature
85°F (29.4°) target temperature

## I. OPERATION

During static (non-flowing) conditions, an independent LED will indicate the following: POWER ON indicator will be lit and the BLENDING and FLOW lights will be off. For optimum performance the hot water inlet temperature should be between 90° and 160°F (32.2° and 71.1°C) and the cold water inlet temperature should be between 33° and 75°F (0.56° and 23.9°C). During flow conditions, the Water Outlet Temperature gauge should be between 80° and 90°F (26.7° and 32.2°C) and LED will indicate the following: POWER ON, BLENDING and FLOW indicators will be lit.

If an upset situation occurs upon activation of flow and the thermostat detects blended water above 92°F (33.3°C), the 2-SOL solenoid valve closes to shut off the tepid water flow and the bypass solenoid (1-SOL) opens to bypass the blending valve to provide a cold water flow, the BLENDING indicator light is off, and the FLOW indicator light is on. Upon return to proper water temperature (lower than 92°F [33.3°C]), the bypass solenoid closes, the tepid water solenoid valve opens, and the BLENDING indicator light is lit.

## II. INSPECTION AND INSTALLATION

### A. DIRECTIONS

1. Remove Saf-T-Flo® from shipping carton/pallet.
2. Inspect unit for external damage. If damages are discovered, notify your **transport carrier** and proceed with claim with the transport carrier.
3. Mount Saf-T-Flo® to wall, structural steel or "I" beam using the mounting bolt holes located in the piping support steel within the enclosure, if there is one. The Saf-T-Flo® can be positioned upright horizontally with the inlet pipes entering the top of the unit or vertically with the inlet pipes entering either the right or left of the unit. The unit cannot lie flat in operation or for testing purposes.

**NOTE:** Mounting hardware not included.

### **CAUTION CAUTION CAUTION**

**ADEQUATE WALL SUPPORT IS RECOMMENDED.**

**THE UNIT CANNOT LIE FLAT IN OPERATION OR FOR TESTING PURPOSES.**

4. Prior to connecting the hot and cold water supply lines to the Saf-T-Flo® inlet union connections, flush the hot and cold water supply lines assuring any foreign particulate is removed from supply lines. It is recommended that 100 mesh strainers and, if necessary, dielectric unions can be installed at the inlet connections.
5. Connect the blended water outlet to the shower supply piping.

### **CAUTION CAUTION CAUTION**

**ENSURE CORRECT CONNECTIONS OF HOT AND COLD WATER SUPPLY LINES.**

**REVERSE CONNECTIONS WILL RESULT IN OVER TEMPERATURE WATER DISCHARGE FROM THE UNIT.**

**CAUTION CAUTION CAUTION**

**TO AVOID ELECTRICAL SHOCK, DISCONNECT POWER BEFORE PROCEEDING! DE-ENERGIZE AT CIRCUIT BREAKER.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE INDICATING LIGHT WIRING INSIDE THE BOX.**

**GROUNDING LUG HAS BEEN PROVIDED TO BASE PLATE OF JUNCTION BOX. CUSTOMER TO PROVIDE ADEQUATE GROUND AT MAIN POWER SUPPLY FEED.**

6. Connect electrical supply, 120/240 volt (check model for proper voltage connection), to terminals 1TB1 and 1TB2 in the junction box. Refer to **Diagram 4** in **Section VII**.
7. If applicable, connect remote alarm signal or electrical supply to 1-CR contacts 10 and 2 (N.C.) 2TB or 10 and 6 (N.O.) 2TB enabling operational alarm under main electrical power failure conditions. Contact rating is 3 amps at 120 volts or 3 amps at 240 volts.

**B. START-UP**

1. Alert control room or appropriate personnel of potential alarm, if applicable.
2. Open cold water supply valve.
3. Open hot water supply valve.
4. Energize electrical circuit.
5. Actuate Emergency Shower Eyewash equipment down stream of the Saf-T-Flo®.
6. Observe the Saf-T-Flo® performance by comparing to the description in **Section I - OPERATION**.

**NOTE:** If Saf-T-Flo® does not function per the description in **Section I - OPERATION**, consult **Section V - TROUBLESHOOTING**.

**III. TESTING AND INSPECTION**

- A. Test of the Saf-T-Flo® is limited to activating a shower unit down stream of the Saf-T-Flo®, and observing the Water Outlet Temperature gauge and indicator lights. During flow conditions, the Water Outlet Temperature gauge should be between 80° and 90°F (26.7° and 32.2°C) and LED will indicate the following: POWER ON, BLENDING and FLOW indicators will be lit. Should the BLENDING or FLOW indicator light remain off following activation of flow, consult **Section V - TROUBLESHOOTING**.

**B. ALARM TEST** (if applicable)

Upon flow activation, the flow switch alarm can be checked locally by opening the junction box cover and checking continuity across the I-CR contacts, 2TB1 and 2TB2 (N.C.) or 2TB1 and 2TB3 (N.O.). Refer to **Diagram 4** in **Section VII**.

**CAUTION CAUTION CAUTION**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER WHILE ELECTRICAL POWER IS CONNECTED AND ON.**

**PROTECTION OF THE INDICATING LIGHT WIRING INSIDE THE BOX IS ALSO RECOMMENDED.**

## IV. MAINTENANCE

Maintenance is typically limited to testing the emergency shower equipment down stream of the Saf-T-Flo®. However, should problems occur on the Saf-T-Flo®, the use of **Section V - TROUBLESHOOTING** can help isolate those components requiring repair or replacement. An adjustable locking wrench applied to unions is the recommended hand tool for repairs and maintenance, unless noted otherwise.

### CAUTION CAUTION CAUTION

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE PIPE SEALANT SPARINGLY.**

#### A. FLOW SWITCH - 1-FLS

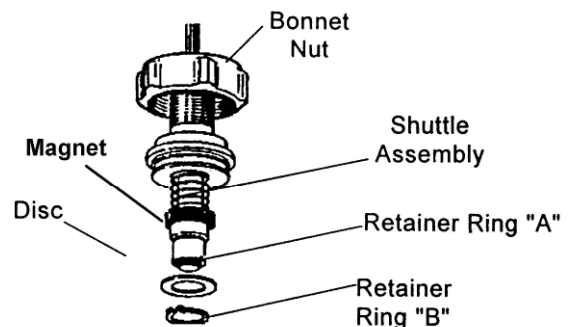
Flow switch 1-FLS is used as a normally closed switch; as such, electrical continuity testing will determine the proper operation of the flow switch. Refer to **Diagram 4** in **Section VII**.

##### 1. Removal of Flow Switch Bonnet Assembly – 1-FLS:

- a) Carefully open junction box cover while protecting the indicating light wiring. The indicating light leads are wired to the terminal strip and must remain properly connected to facilitate rapid maintenance.
- b) With power off, disconnect 1-FLS power leads from 1TB1 and 1TB3. Tie a piece of pulling line to the wires to assist in re-assembly.
- c) The flow switch is a pressure component, ensure all water lines are drained.
- d) Separate conduit union at the electrical conduit run to the flow switch.
- e) With the conduit union separated, loosen the 1-FLS bonnet nut using an adjustable wrench. Remove the bonnet ring. Rotate bonnet assembly counterclockwise, clearing the conduit and remove the bonnet assembly from flow switch body. Bonnet assembly is shown in **Figure A** below.
- f) You can now access the shuttle assembly for testing and/or cleaning.

##### 2. Electrical Testing of Flow Switch 1-FLS:

- a) With the flow switch bonnet disconnected and removed from the Saf-T-Flo®, perform an electrical continuity test using the red and black leads (normally closed) for 1-FLS.



**FIGURE A BONNET ASSEMBLY**

- b) 1-FLS will show electrical continuity or a closed circuit under no flow (N.C.) conditions. Should the test show otherwise, operate the switch through a cycle (lift and drop shuttle, test electrical continuity readings).
- c) If the circuit remains closed throughout the cycling of the drop shuttle, clean all particulate from the shuttle assembly and magnet. Remove Retainer Ring "A" for complete shuttle disassembly. Remove Retainer Ring "B" to disassemble disc only.
- d) Retest electrical continuity. If electrical continuity cannot be broken, switch contacts have failed, and flow switch bonnet assembly will require replacement. See **Section VI - REPLACEMENT PARTS**.

3. Replacement of 1-FLS:

Replacement procedure is the reverse order of disassembly.

4. Rewire and connect 1-FLS power leads to 1TB1 and 1TB3 for normal operation.

**B. 3-WAY MIXING VALVE – 1-TCV**

The 3-way mixing valve 1-TCV is a self-contained internal temperature sensing thermostatic control device. The valve has a factory pre-set (fixed) set point and is non-adjustable. In operation, the valve plug modulates, proportioning the hot and cold water, allowing the temperature control element to adjust to it's designed set point (80° to 90°F [26.7° to 32.2°C]) .

Maintenance of the 1-TCV is limited to replacement of the temperature control element and seals when variation in the controlled temperature is noticed. Seals should be replaced when replacing element.

**CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
DRAIN ALL WATER LINES.**

**MIXING VALVE SHOULD BE ALLOWED TO COOL, IF HOT.**

**USE PIPE SEALANT SPARINGLY.**

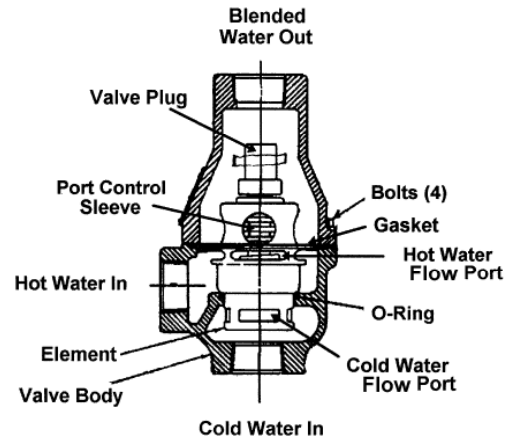
- 1. To remove the temperature control element 1-TCV, separate the pipe unions. Remove the four (4) valve body bolts from 1-TCV exposing the temperature control element. Remove the element and perform the element functionality test, refer to **Figure B**, page 6.
- 2. Element Functionality Test –
  - a) Element Test Hot Port Open - Immerse the sensing element in ice water, observing the valve plug travel. The hot water flow port should open and the cold water flow port should close.

## CAUTION CAUTION CAUTION

**WEAR PROTECTIVE EQUIPMENT DURING HOT WATER TEST.**

- b) Element Test Cold Port Open - Immerse the sensing element in hot water (105°F /40.6°C to 110°F/43.3°C maximum) observing the valve plug travel. The cold water flow port should open and the hot water flow port should close.

**NOTE:** The port control sleeve effects both ports simultaneously. You will notice when the hot water flow port is fully open; the cold water flow port is fully closed and vice-versa. If the temperature control element does not pass the functionality test, replace the element. Repair kit consisting of an element and seals is available. See **Section VI - REPLACEMENT PARTS.**



**FIGURE B  
(Back View)**

### 3. Installation of 3-Way Mixing Valve – 1-TCV Element:

- Refer to **Diagrams 2 and 3** in **Section VII** for proper arrangement prior to installation.
- The temperature control valve has two seals. Place valve element with the o-ring installed into the inlet port section of the valve body assembly. Place the other lubricated flat rubber gasket firmly on the body recess to ensure a proper seal.
- Replace the outlet port valve body section and tighten the four (4) valve body bolts.
- Reconnect the pipe union to complete installation.

### C. SYSTEM THERMOSTAT – 1-TAS

The system thermostat 1-TAS is a non-adjustable (fixed set point) thermostat. In operation, its function is to sense the outlet water temperature and control the solenoid valves (closed 1-SOL and open 2-SOL). As a sealed component, maintenance is limited to re-placement. Refer to **Diagrams 2, 3 and 4** in **Section VII** for reference.

## CAUTION CAUTION CAUTION

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY AND DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE PIPE SEALANT SPARINGLY.**

## **CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE OF PIPE TAPE IS NOT RECOMMENDED, USE PIPE SEALANT SPARINGLY.**

1. Carefully open junction box cover while protecting the indicating light wiring. The indicating light leads are wired to the terminal strip and must remain properly connected to facilitate rapid maintenance.
2. With power off, disconnect 1-TAS power leads to 1TB4 and 1TB5. Tie a piece of pulling line to the wires to assist in re-assembly.
3. Loosen the conduit union below the elbow and separate the conduit union at the junction box. This will free 1-TAS conduit assembly from the unit.
4. Apply wrench to 1-TAS hex flats and remove 1-TAS from conduit assembly by turning counterclockwise.
  - a) If testing is desired, an electrical continuity test can be performed by immersing 1-TAS in cold water (75°F/23.9°C). Electrical continuity meter should indicate contacts closed.
  - b) Immerse 1-TAS in hot water (95°F/35°C); continuity should show open contacts.
5. If the above test procedure does not indicate satisfactory temperature operation, replace thermostat 1-TAS. See **Section VI - REPLACEMENT PARTS**.
6. Replacement procedure is the reverse order of disassembly.
7. Rewire and connect 1-TAS power leads to 1TB4 and 1TB5 for normal operation.

### **D. THERMOMETER – 1-TI**

The bimetal thermometer provides a visual temperature reading of the outlet water. Maintenance is limited to periodic cleaning and periodic calibration of the instrument as determined by the user. For 1-TI removal and installation procedures, see No. 3 below.

1. Cleaning:
  - a) Keep dial lens clean for proper viewing. Clean using commercial window cleaner.
  - b) Periodic cleaning of residue from the stem may be required to ensure thermometer sensitivity.
2. Calibration:
  - a) Periodic calibration should be as determined by the user.
  - b) Carefully remove 1-TI and immerse stem into a temperature-calibrated medium. Immerse entire stem or 4" minimum.



## **CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE PIPE SEALANT SPARINGLY.**

- c) Use a small open-end wrench or flat head screwdriver to turn the calibration screw. Turn the calibration screw to adjust the thermometer pointer to the correct temperature, if necessary.
  - d) Reinstall 1-TI to unit. Follow installation procedures below.
3. 1-TI removal and installation procedures:
- a) To remove, apply an open-end wrench of the appropriate size to the 1-TI hex screw and remove by turning counterclockwise. Care must be taken to prevent damage to dial lens.
  - b) To reinstall, apply appropriate thread sealant on the hex screw and place 1-TI stem into the thermowell. Carefully tighten the hex screw until a non-leaking fit is achieved and the head is facing the desired position.

### **E. SOLENOID VALVES - 1-SOL and 2-SOL**

The Saf-T-Flo® contains two (2) solenoid valves: 1-SOL and 2-SOL. 1-SOL (a normally open valve) is located in the bypass line adjacent to the cold water connection of the blending valve. It operates as the bypass valve under over-temperature conditions. Prior to flow actuation, this valve stays open allowing cold water to bypass the mixing valve 1-TCV. 2-SOL (a normally closed valve) is located in the blended water outlet line. It is used to shut off the water flow if high temperature is detected by thermostat 1-TAS. These two valves are wired in parallel and are controlled by a flow switch 1-FLS and thermostat 1-TAS. 1-SOL and 2-SOL are used to control and direct water flow in order to provide redundant safe guards against hot water leaving the blending system. The valves also ensure there is water flow available to the emergency shower stations at all times. Refer to **Diagrams 1 through 4, Section VII.**

Solenoid valve inspection is limited to checking proper operation and valve water leakage.

- 1. Terminal connections to the solenoid valves should be inspected periodically to ensure they are tight and free of oxide build-up and dust.
- 2. Depending on service conditions and filtration utilized, it may be required to periodically clean and/or replace worn components. Valve body need not be removed from the lines. Valve rebuild kits are available. See **Section VI - REPLACEMENT PARTS** and **Diagrams 5 and 6, Section VII.**

**1-SOL** Instructions for Inspection, Cleaning and/or Replacing Parts:

NOTE: For Electrical Schematic, refer to **Diagram 4** in **Section VII**.

- a) Verify 1-SOL solenoid is functioning.

**CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

- 1) Carefully open junction box cover while protecting the indicating light wiring. The indicating light leads are wired to the terminal strip and must remain properly connected to facilitate rapid maintenance.
- 2) In the junction box, disconnect 1-SOL leads from terminal 1TB5 (#6R) and connect to TB1. When Saf-T-Flo® is electrically re-energized the valve (1-SOL) should now be held CLOSED.
- 3) Close junction box cover. Place hand on solenoid valve body (1-SOL) when Saf-T-Flo® is re-energized. Solenoid is functioning when momentary internal movement in valve body is detected by hand.
- 4) De-energize Saf-T-Flo® and return unit to pre-test condition.

**NOTE:** Never replace a shorted solenoid until the cause has been determined. (i.e., plugged or worn plunger seal, no voltage, over voltage, etc). Consult **Section V - TROUBLESHOOTING**.

- b) Removal instructions for 1-SOL solenoid:

**CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
AND DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE PIPE SEALANT SPARINGLY.**

- 1) With power off, disconnect 1-SOL power leads from 1TB5 (#6R) and 1TB2 (#2W3). Tie a piece of pulling line to the wires to assist in re-assembly.
- 2) Separate the conduit union as required to free 1-SOL from the junction box.

- 3) Remove the nut and washer from the solenoid. This will allow you to separate the solenoid switch from the solenoid valve body.
  - 4) Remove solenoid switch and leads from the electrical conduit assembly by turning the solenoid counterclockwise, clearing the conduit assembly.
  - 5) Inspect solenoid for cracks in the housing.
- c) Inspect 1-SOL valve body.

- 1) Disassembly instructions for valve body: (For explosion view of parts, refer to **Diagram 5** in **Section VII**).

**NOTE:** Care should be taken to never remove the sleeve by clamping onto the sleeve tube, as this may cause the tube to dent or bend. Do not use a pipe wrench. Use a Skinner U99-011 wrench nut (included in the Valve Rebuild Kit) directly onto the sleeve flange.

- 1.1) To unscrew the sleeve assembly, mate the wrench nut to the sleeve flange and turn the wrench nut. The snubber, plunger, wave washer, stop, seal retainer, plunger return spring and flange seal may now be removed.
- 1.2) Unscrew cover screws. Lift cover from valve body. The diaphragm return spring, diaphragm assembly and O-ring can now be removed.

**NOTE:** If the cover cannot be easily lifted off the valve body, laterally tap the cover or gently pry the cover from the body with a screwdriver. Care should be taken not to damage the diaphragm, cover or body.

- 1.3) To disassemble the diaphragm assembly, remove the lock nut, seal, diaphragm support plate, O-ring and screw.

- 2) Clean components using appropriate cleaning fluid (mild soap and water).

### **CAUTION CAUTION CAUTION**

**DO NOT EXPOSE PLASTIC OR ELASTOMERIC MATERIALS TO ANY TYPE OF COMMERCIAL CLEANING FLUID.  
PARTS SHOULD BE CLEANED WITH A MILD SOAP AND WATER SOLUTION.**

- 3) Examine these components for damage or wear and replace as needed. Check seals for swelling, cracking or general deterioration. When the plunger lifts, it normally makes contact with the sides and the sleeve stop. As a result, the top of the plunger and the inside of the sleeve may show wear as well. The spring should be inspected for worn or broken coils.
- 4) If replacement of internal part(s) is required, a valve rebuild kit should be used. Parts included in each rebuild kit are marked with an asterisk (\*) shown in **Diagram 5** in **Section VII**.
- 5) Inspect orifices in the cover and valve body for nicks and debris. If dirt or mineral build-up is present, clean with appropriate cleaning fluid. Replace with new 1-SOL if damage is evident. See **Section VI - REPLACEMENT PARTS**.

d) 1-SOL re-assembly instructions:

1) Valve body:

- 1.1) Parts must be replaced in the order and orientation shown in the exploded view **Diagram 5** in **Section VII**.
- 1.2) To assemble the diaphragm assembly, torque the lock nut with input torque of 45-55 in-lbs. Apply one (1) drop of appropriate thread locking liquid to the lock nut threads.
- 1.3) When assembling the diaphragm assembly to the valve body, the diaphragm tab should be positioned as follows:
  - 1" NPT port size - the diaphragm tab is located over the outlet port of the body.
  - 1-1/2" NPT port size - the diaphragm tab should be located 30 degrees counter-clockwise from the outlet port when viewed from the diaphragm side.Ensure the diaphragm bolt holes and flow holes line up with the appropriate bolt and flow holes in the valve body.
- 1.4) Replace valve cover and tighten cover screws with an input torque of 110-150 in-lbs.
- 1.5) Install the snubber, plunger wave washer, stop, seal retainer and plunger return spring in the sleeve. Install flange seal and tighten at sleeve flange using wrench nut with an input torque of 130-150 in-lbs.

**CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
AND DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE PIPE SEALANT SPARINGLY.**

2) Solenoid:

- 2.1) With the solenoid repositioned on the sleeve, slide washer over sleeve, replace nut, and tighten nut with an input torque of 45-53 in-lbs.  
**NOTE:** Never apply electricity to a solenoid valve without ensuring that the solenoid is properly installed on the valve sleeve. The resulting high in-rush of current can result in an electrical short in the solenoid.
- 2.2) Rewire and connect valve power leads to 1TB5 (#6R) and 1TB2 (#2W3) for normal operation. Refer to Electrical Schematic **Diagram 4** in **Section VII**.
- 2.3) Tighten conduit union to complete installation.

4. **2-SOL** Instructions for Inspection, Cleaning and/or Replacing Parts:

a) Verify 2-SOL solenoid is functioning:

With both cold and hot water supplied to the Saf-T-Flo®, place a hand on 2-SOL valve. Have someone open the closest shower station. Solenoid assembly is functioning if internal operational movement is detected by hand when flow through the Saf-T-Flo® occurs.

**NOTE:** Never replace a shorted solenoid until the cause has been determined. (i.e., plugged or worn plunger sleeve, no voltage, over voltage, etc). Consult **Section V - TROUBLESHOOTING**.

b) Removal instructions for 2-SOL solenoid:

**CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
AND DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE PIPE SEALANT SPARINGLY.**

- 1) Carefully open junction box cover while protecting the indicating light wiring. The indicating light leads are wired to the terminal strip and must remain properly connected to facilitate rapid maintenance.
  - 2) With power off, disconnect 2-SOL power leads from 1TB5 (#7R) and 1TB2 (#2W4). Tie a piece of pulling line to the wires to assist in re-assembly. Refer to Electrical Schematic **Diagram 4** in **Section VII**.
  - 3) STF30 series: Separate the conduit union located at the conduit elbow.  
STF60 series: Separate conduit union at 2-SOL. This will free 2-SOL from the junction box.
  - 4) Remove the nut and washer from the solenoid. This will allow you to separate the solenoid from the valve body.
  - 5) STF30 series: Remove the solenoid and leads from the electrical conduit assembly by turning the solenoid counterclockwise, clearing the conduit assembly.  
STF60 series: Remove the solenoid and leads, clearing the electrical conduit assembly.
  - 6) Inspect the solenoid for cracks in the housing.
- c) Valve Body - For general cleaning and internal parts replacement, there is no reason to remove the sleeve from the valve cover. See explosion view of parts **Diagram 6** in **Section VII** as reference.
- 1) Unscrew cover screws. Lift cover from valve body. The diaphragm retainer/plunger assembly, plunger return spring, diaphragm and O-ring can now be removed.

- 2) Clean parts using appropriate cleaning fluid (mild soap and water).

**CAUTION CAUTION CAUTION**

**DO NOT EXPOSE PLASTIC OR ELASTOMERIC MATERIALS TO ANY TYPE OF  
COMMERCIAL CLEANING FLUID.  
PARTS SHOULD BE CLEANED WITH A MILD SOAP AND WATER SOLUTION.**

- 3) Examine the components for damage or wear and replace as needed. Check seals for swelling, cracking or general deterioration. When the plunger lifts, it normally makes contact with the sides and the sleeve stop. As a result, the top of the plunger and the inside of the sleeve may show wear as well. The spring should be inspected for worn or broken coils.
- 4) If replacement of internal part(s) is required, a valve rebuild kit should be used. Parts included in each rebuild kit are marked with an asterisk (\*) shown in **Diagram 6** in **Section VII**.
- 5) Inspect orifices in the cover and valve body for nicks and debris. If dirt or mineral build-up is present, clean with appropriate cleaning fluid. Replace with new 2-SOL if damage is evident. See **Section VI - REPLACEMENT PARTS**.

**CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
AND DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE PIPE SEALANT SPARINGLY.**

- d) 2-SOL re-assembly instructions:

- 1) Valve body:

- 1.1) Parts must be replaced in the order and orientation shown in explosion view of parts, refer to **Diagram 6** in **Section VII**.
- 1.2) Assemble O-ring into the body groove. Replace plunger return spring over plunger and install plunger diaphragm with the diaphragm installed into the sleeve cover assembly. Avoid damaging the main orifice when placing the diaphragm assembly in the valve.
- 1.3) Replace valve cover and tighten screws with an input torque of 70-80 in-lbs.

**NOTE:** If the sleeve was removed from the cover, tighten sleeve assembly with an input torque of 260-270 in-lbs. Do not use a pipe wrench directly on the sleeve tube.

2) Solenoid:

- 2.1) With the solenoid repositioned on the sleeve, slide washer over sleeve, replace nut, and tighten nut with an input torque of 43-53 in-lbs.

**NOTE:** Never apply electricity to a solenoid valve without ensuring that the solenoid is properly installed on the valve sleeve. The resulting high in-rush of current can result in an electrical short in the solenoid.

- 2.2) Rewire and connect valve power leads to 1TB5 (#7R) and 1TB2 (#2W4) for normal operation. Refer to Electrical Schematic **Diagram 4** in **Section VII**.

- 2.3) Tighten conduit union to complete the installation.

5. Check solenoid valves for valve water leakage.

a) External valve water leakage:

Open the closest shower station down stream of the Saf-T-Flo®. Perform a visual inspection of both valves for water leakage.

b) Internal valve water leakage:

**NOTE:** Refer to Electrical Schematic **Diagram 4** in **Section VII**.

**CAUTION CAUTION CAUTION**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE INDICATING LIGHT WIRING INSIDE THE BOX AND TO AVOID ELECTRICAL SHOCK.**

**USE PIPE SEALANT SPARINGLY.**

- 1) Carefully open junction box cover while protecting the indicating light wiring. The indicating light leads are wired to the terminal strip and must remain properly connected to facilitate rapid maintenance.
- 2) In the junction box, bypass the flow switch 1-FLS by placing a temporary jumper wire from TB1 to TB3. This will keep the 1-CR energized. Be sure to tag the bypass/jumper for identification.
- 3) Disconnect 1-SOL power leads from terminal TB5 (#6R) and connect to TB1. The 1-SOL valve should now be held CLOSED.
- 4) With both cold and hot water supplied to the Saf-T-Flo®, open the closest shower station down stream of the Saf-T-Flo®. If water flow is present at the shower station, valve water leakage has been determined.
- 5) Identify the failed solenoid valve:
  - 2-SOL valve water leakage: If delivered water temperature is warm.
  - 1-SOL valve water leakage: If delivered water temperature is cold.
6. If solenoid valve(s) performed unsatisfactory and the failed valve(s) have been identified, disassemble to inspect the internal valve components. Replace any damaged or worn components. Follow instructions in **Section E.3** (for 1-SOL) and/or **Section E.4** (for 2-SOL).
7. If solenoid valves test to satisfaction, rewire for normal operation.

**F. IN-LINE CHECK VALVE – 1-CV**

Check valve 1-CV is designed to be virtually maintenance free. If a problem should arise, **do not** remove valve while the line is under pressure. Drain all water lines prior to attempting maintenance. Debris or particulate should be rinsed or washed away.

**CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
AND DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE PIPE SEALANT SPARINGLY.**

**G. HEATER WITH THERMOSTAT – 1-HTR**

Heater and Heater Thermostat are optional components and available only on Saf-T-Flo® units (120 V) with wall cabinets. Heater thermostat 2-TAS is a factory pre-set (fixed set point at 50°F/10°C) thermostat and is non-adjustable. 2-TAS senses the temperature in the Saf-T-Flo® cabinet and controls the heater 1-HTR for freeze protection. Maintenance is limited to replacement. Refer to **Diagrams 2 and 4** in **Section VII** for reference.

**1. Heater – 1-HTR:**

- a) Carefully open junction box cover while protecting the indicating light wiring. The indicating light leads are wired to the terminal strip and must remain properly connected to facilitate rapid maintenance.
- b) With power off, disconnect heater 1-HTR power leads to 1TB6 and 1TB2. Tie a piece of pulling line to the wires to assist in re-assembly.
- c) Separate conduit union at the junction box. This will free 1-HTR from the junction box.
- d) Remove 1-HTR by turning counterclockwise, clearing the electrical conduit run.
- e) Replace with new 1-HTR. See **Section VI - REPLACEMENT PARTS**.
- f) Rewire for normal operation.



2. Thermostat – 2-TAS:

**CAUTION CAUTION CAUTION**

**PRIOR TO ATTEMPTING MAINTENANCE:  
TO AVOID ELECTRICAL SHOCK, DE-ENERGIZE SAF-T-FLO® AT MAIN ELECTRICAL  
POWER SUPPLY  
AND DRAIN ALL WATER LINES.**

**CARE MUST BE TAKEN WHEN OPENING JUNCTION BOX COVER TO PROTECT THE  
INDICATING LIGHT WIRING INSIDE THE BOX.**

**USE PIPE SEALANT SPARINGLY.**

- a) Carefully open junction box cover while protecting the indicating light wiring. The indicating light leads are wired to the terminal strip and must remain properly connected to facilitate rapid maintenance.
- b) With power off, disconnect 2-TAS power leads to 1TB4 and 1TB6.
- c) Separate conduit union at the junction box. This will free the 2-TAS from the junction box.
- d) Replace with new 2-TAS. See **Section VI - REPLACEMENT PARTS.**
- e) Tighten conduit union and rewire 2-TAS power leads to 1TB4 and 1TB6 for normal operation.

## V. TROUBLESHOOTING

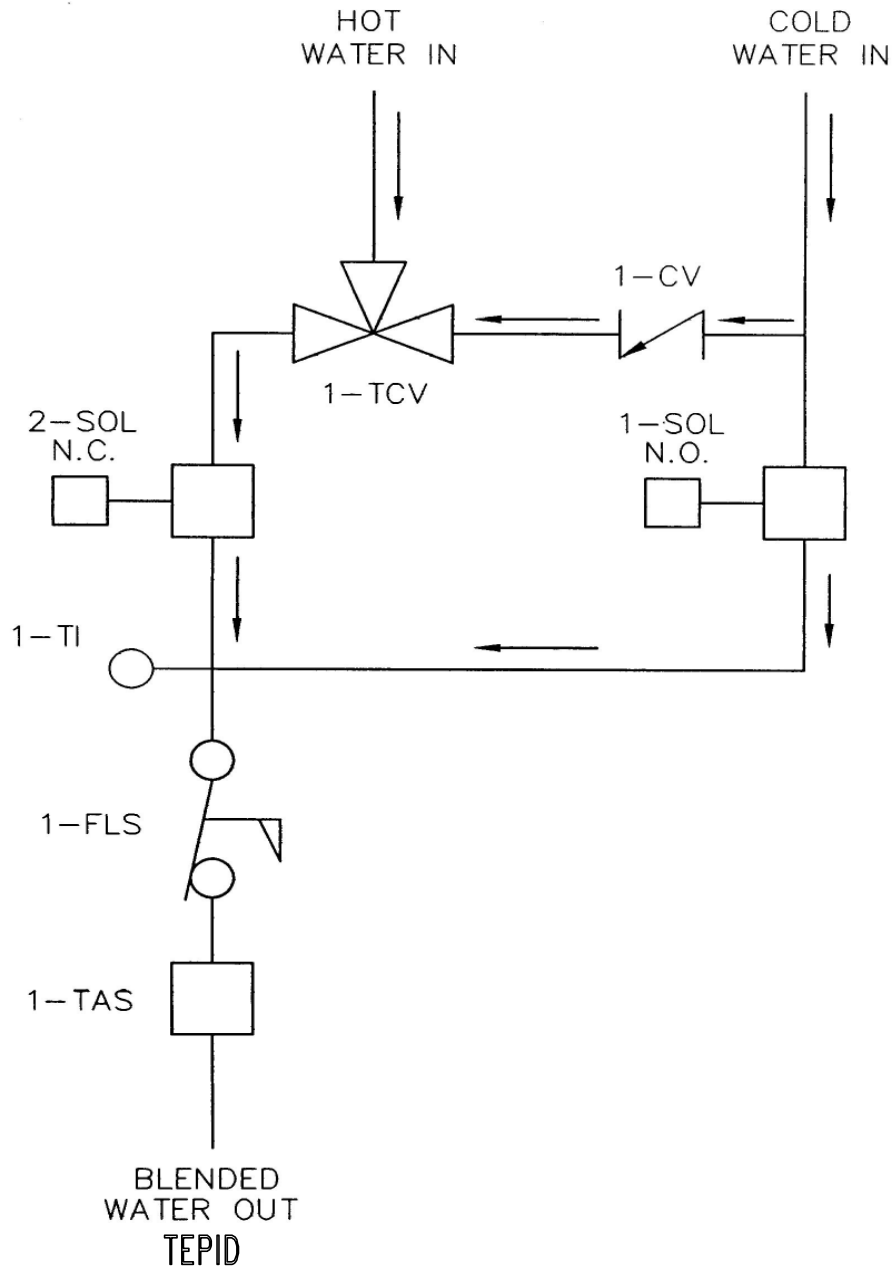
SYMPTOM	PROBLEM	SOLUTION
No flow	Hot or Cold water supply valve is shut off.	Open water supply valves.
Delivered water is under temperature.	<ol style="list-style-type: none"> <li>1) Hot water supply valve is shut off or supply is not hot</li> <li>2) System thermostat (1-TAS) failed.</li> <li>3) Mixing valve (1-TCV) is not functioning properly.</li> </ol>	<ol style="list-style-type: none"> <li>1) Open hot water supply valve.</li> <li>2) Replace 1-TAS according to Section IV-C (page 6).</li> <li>3) Check 1-TCV according to Section IV-B (page 5).</li> </ol>
Blended water is flowing and within 80°F to 90°F [26.7° to 32.2°C]) range, but blending indicator light remains off.	<ol style="list-style-type: none"> <li>1) Blending indicator light may need replacement.</li> <li>2) Cold water supply temperature may be too high (above 92°F/33.3°).</li> <li>3) System thermostat (1-TAS) is not functioning properly.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check and if necessary replace blending LED.</li> <li>2) Check and if necessary Bring cold water temperature within limits (between 33° and 75°F [0.56° and 23.9°]).</li> <li>3) Check 1-TAS according to Section IV-C (page 6).</li> </ol>
Delivered water is over temperature	<ol style="list-style-type: none"> <li>1) Hot and cold water supply Connections reversed.</li> <li>2) Cold supply too hot</li> </ol>	<ol style="list-style-type: none"> <li>1) Correct and reconnect.</li> <li>2) Correct overheating of cold water supply.</li> </ol>
Blended water pulses from hot to cold to hot, etc.	Flow may be below the 2.0 GPM flow switch (1-FLS) set point.	Increase flow rate of supply water to or from blending system.
Solenoid valve is sluggish or inoperative, but electrical supply and pressure check out.	Internal components in the solenoid valve body may be damaged, dirty, or foreign particles may be present.	Disassemble and inspect 1-SOL & 2-SOL according to Section IV-E (page 8). Replace all damaged and/or clean internal components.
Water leakage is present at solenoid valve body.	Diaphragm assembly or flange o-ring in solenoid valve body may be damaged.	Disassemble and inspect 1-SOL & 2-SOL according to Section IV-E (page 8). Replace damaged or torn diaphragm, body seals, and o-rings.
Delivered water is warm or cold and blending light is on.	Internal solenoid valve leakage.	Inspect 1-SOL & 2-SOL according to Section IV-E (page 8). Replace damaged or clean internal valve body components.
Alarm continuous (under no flow condition).	<ol style="list-style-type: none"> <li>1) Flow switch magnet contaminated allowing contacts to remain de-energized.</li> <li>2) Relay (1-CR) failure.</li> </ol>	<ol style="list-style-type: none"> <li>1) Clean flow switch bonnet of debris and test. Replace if necessary. See Section IV-A (page 4).</li> <li>2) Replace 1-CR.</li> </ol>

## VI. REPLACEMENT PARTS

Nomenclature	ISA Symbol	STF30 SERIES		STF60 SERIES
		120 V	240 V	120 V
Thermostat, 92 deg.F/33.3 deg.C	1-TAS	00014640	00014640	00014640
Flow Switch Bonnet	1-FLS	00014683	00014683	00014775
Solenoid w/Leads, (N.O.)	1-SOL	00010939	00010940	00010941
Solenoid w/Leads, (N.O.) <b>FOR STAINLESS STEEL MODELS ONLY</b>	1-SOL	TBD	TBD	N/A
Solenoid w/Leads, (N.C.)	2-SOL	00010939	00010940	00010942
Solenoid w/Leads, (N.O.) <b>FOR STAINLESS STEEL MODELS ONLY</b>	2-SOL	TBD	TBD	N/A
Valve Rebuild Kit for 1-SOL		00010944	00010944	TBA
Valve Rebuild Kit for 1-SOL <b>FOR STAINLESS STEEL MODELS ONLY</b>		TBD	TBD	N/A
Valve Rebuild Kit for 2-SOL		00010943	00010943	TBA
Valve Rebuild Kit for 2-SOL <b>FOR STAINLESS STEEL MODELS ONLY</b>		TBD	TBD	N/A
Solenoid Valve, (N.O.)	1-SOL	00010930	00010931	00010932
Solenoid Valve, (N.O.) <b>FOR STAINLESS STEEL MODELS ONLY</b>	1-SOL	00010947	00010948	N/A
Solenoid Valve, (N.C.)	2-SOL	00010928	00010929	00010933
Solenoid Valve, (N.C.) <b>FOR STAINLESS STEEL MODELS ONLY</b>	2-SOL	00010945	00010946	N/A
Temp. Control Element Repair Kit	1-TCV	00011089	00011089	00014348
Indicator Light - Green (LED)	1-LT, 2-LT, 3-LT	00014682	00014688	00014682
Relay, 3 amp C1D2 & C1D1	1-CR	00013393	00013252	00013393
Thermometer	1-TI	00013304	00013304	00013304
Heater, includes Thermostat *	1-HTR	00014485	\	\
Heater Thermostat *	2-TAS	00013787	\	\

\* Used only in (120 V) Saf-T-Flo® units with wall cabinet.

## **VII. DIAGRAMS**

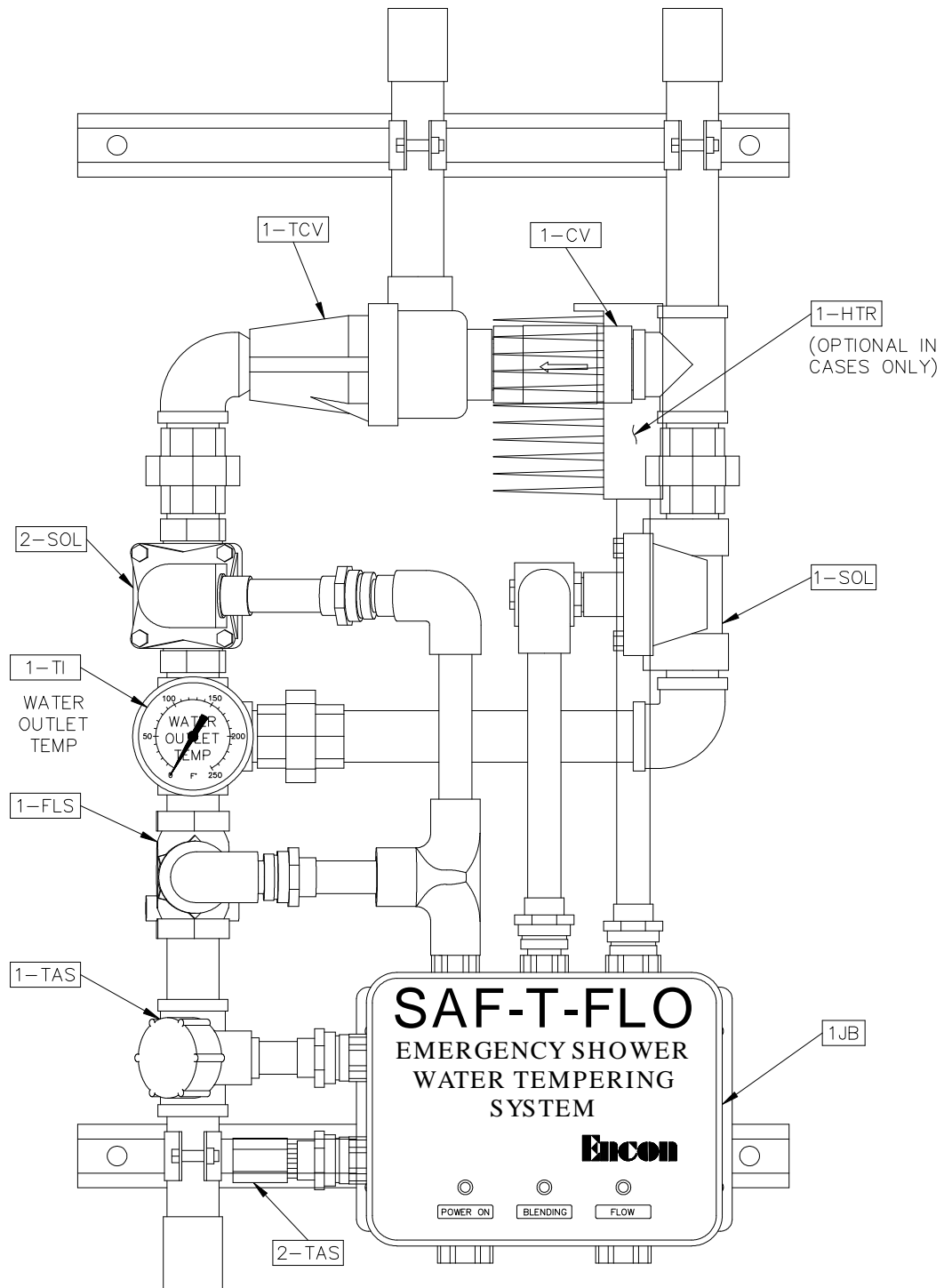


FLOW CONTROL

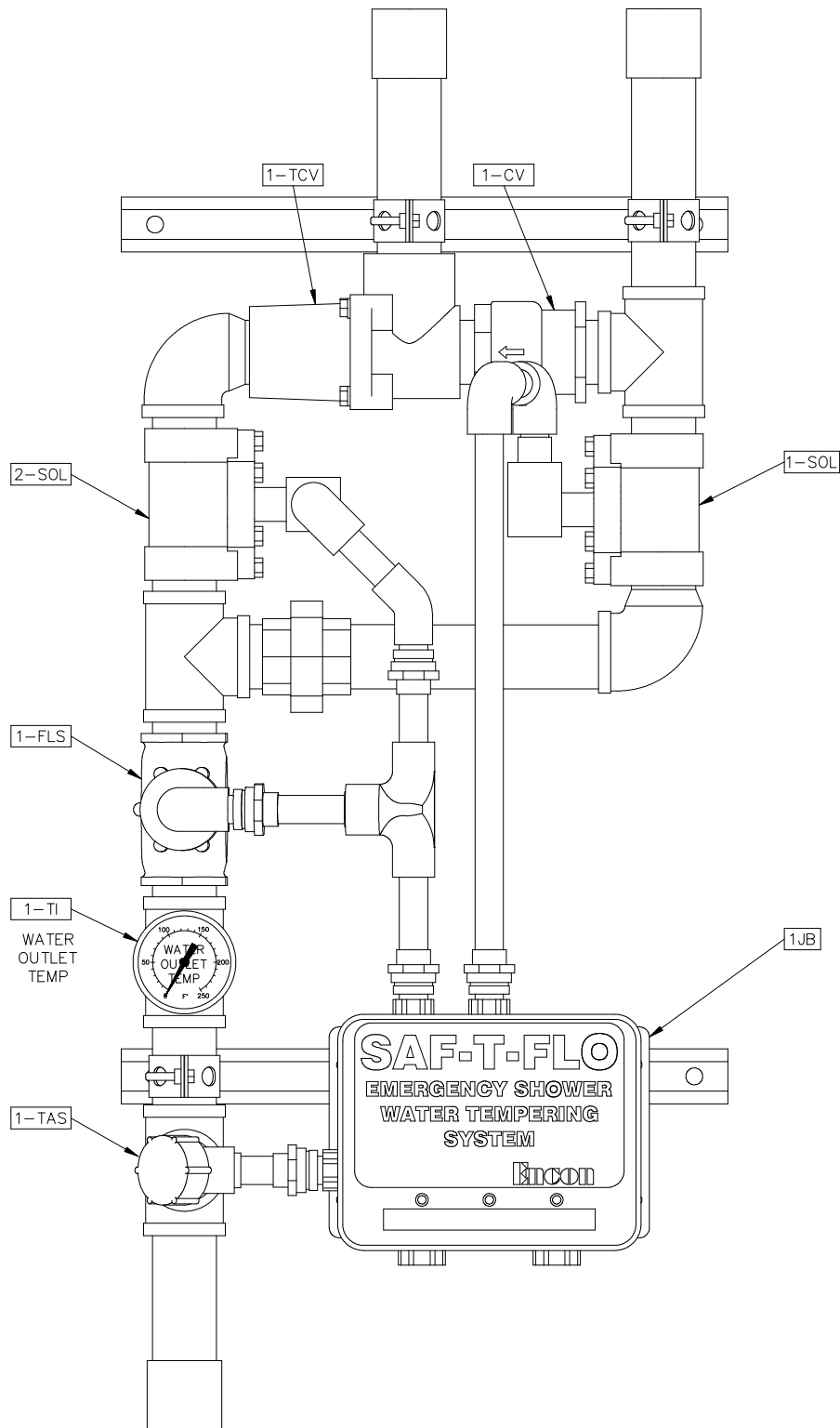
## DIAGRAM 1

Patent #6,270,014 B1

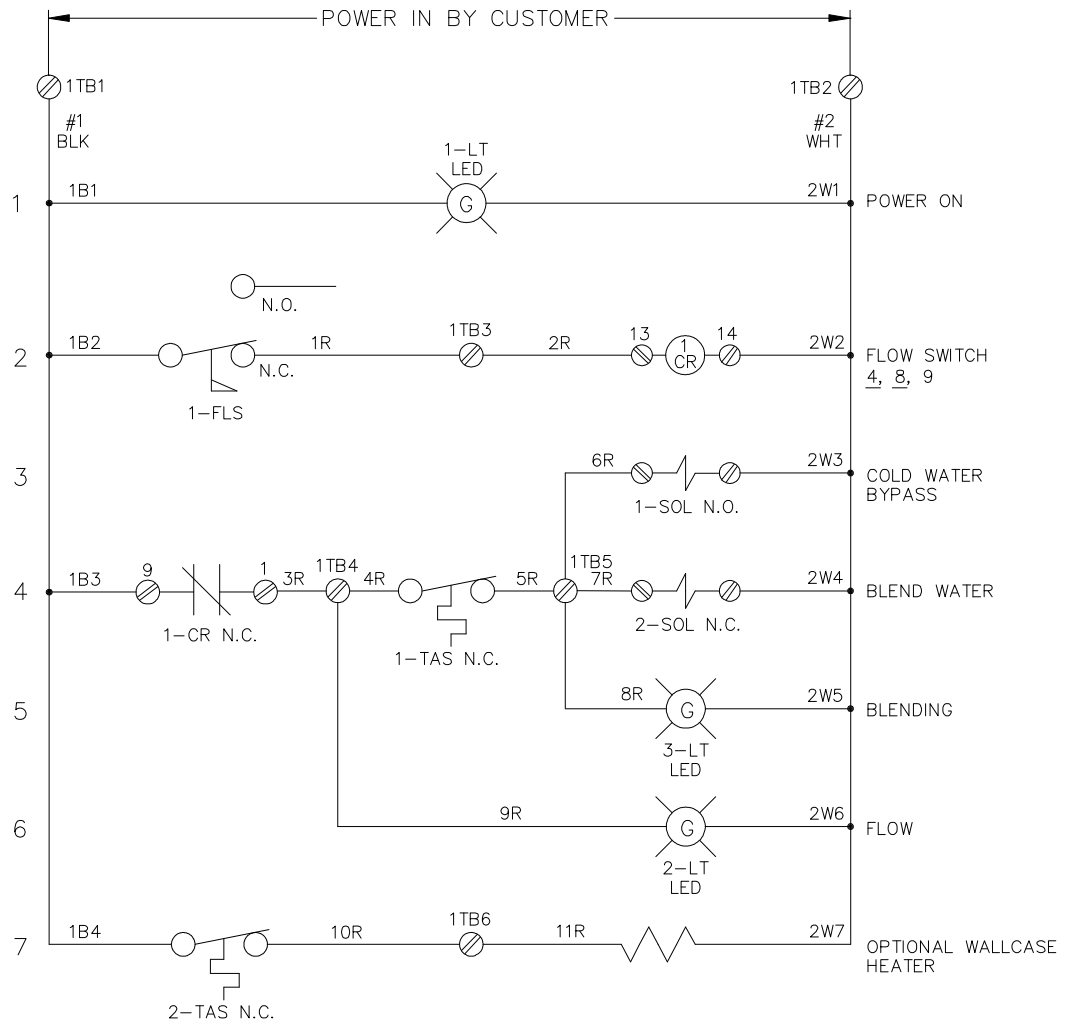
ID	Description
1-CV	Check Valve
1-TCV	Blending Valve
1-SOL	Solenoid Valve (bypass)
2-SOL	Solenoid Valve (blended supply)
1-TI	Temperature Indicator
1-FLS	Flow Switch
1-TAS	Temperature Switch



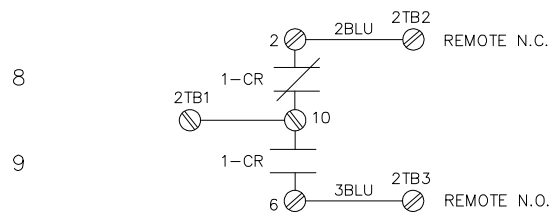
**DIAGRAM 2**  
STF30 SERIES SHOWN  
Patent #6,270,014 B1



**DIAGRAM 3**  
**STF60 SERIES SHOWN**  
 Patent #6,270,014 B1

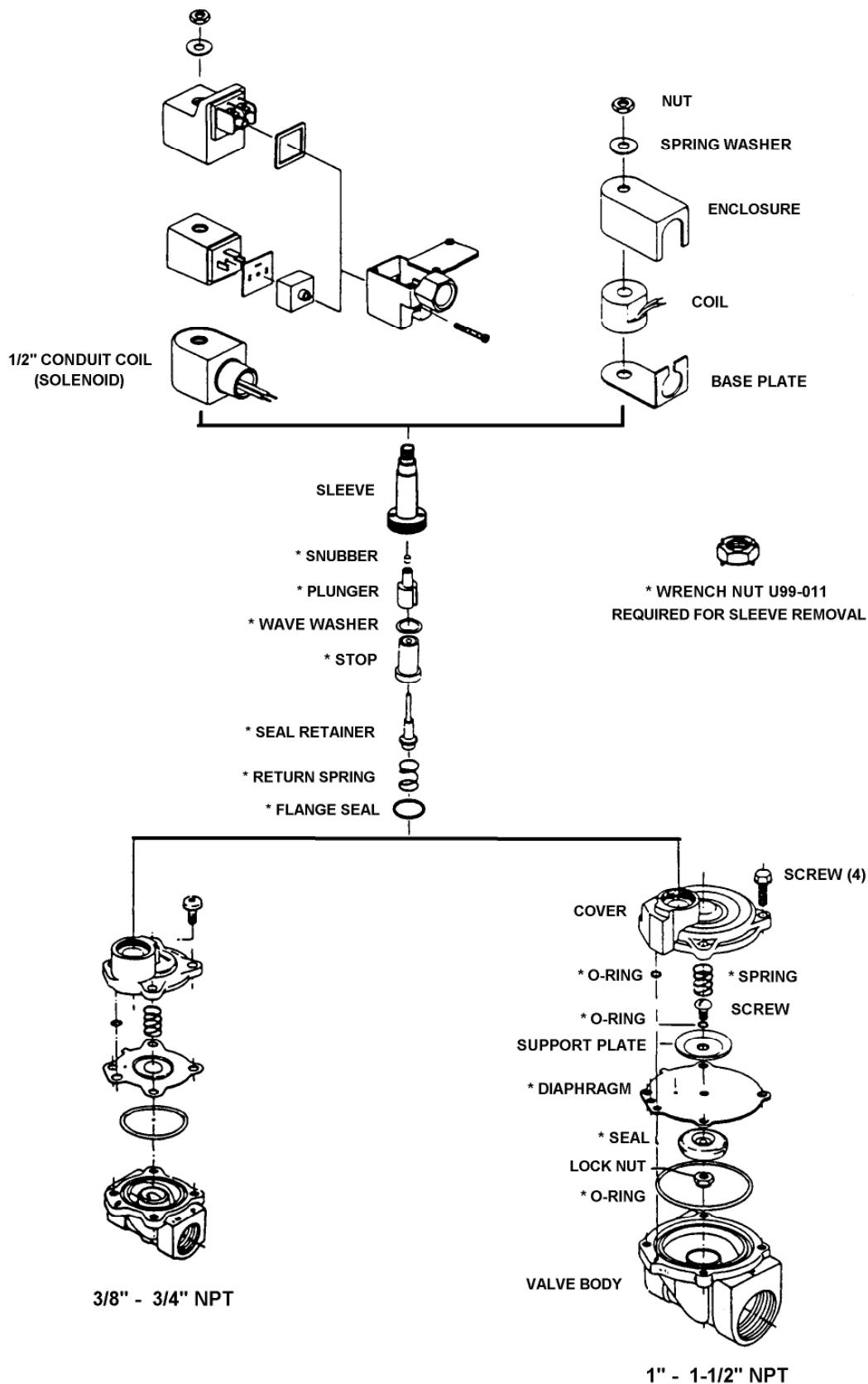


#### ALARM CONTACTS



**DIAGRAM 4**  
**ELECTRICAL SCHEMATIC**  
 Patent #6,270,014 B1





**DIAGRAM 5**  
**1-SOL SOLENOID VALVE COMPONENT PARTS**



## VIII. WARRANTY STATEMENT

ENCON HEREBY DISCLAIMS ALL WARRANTIES EXPRESSED OR IMPLIED INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF THIRD-PARTY RIGHTS, EXCEPT AS HEREINAFTER PROVIDED.

Encon Safety Products warrants that for one year from the date of purchase of any Encon products, the product will be free of defects in materials and workmanship if properly used and cared for or cleaned under normal conditions in accordance with Encon's use and care instructions and properly installed, if applicable, in accordance with Encon's installation instructions. With respect to the product, Encon's only obligation and purchaser's exclusive remedy under this warranty is to repair or replace such product; provided that:

1. Encon is notified of the defect within one year of shipment, and
2. the product is determined by Encon to be defective.

Encon requires proof of original ownership as proof of warranty coverage, and Encon must receive any claim under this Limited Warranty within one year of purchase of the product.

NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED HEREIN, ENCON SHALL NOT BE LIABLE FOR LOSS, DAMAGE, OR EXPENSE ARISING DIRECTLY OR INDIRECTLY AS A CONSEQUENCE OF USE OF THE EQUIPMENT WITH OTHER PRODUCTS OR FROM ANY OTHER CAUSE, INCLUDING ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL OR EXEMPLARY DAMAGES, EXCEPT FOR ENCON'S OBLIGATION TO REPAIR OR REPLACE DEFECTIVE PRODUCTS AS EXPRESSLY PROVIDED IN THIS STATEMENT.

Replacement parts purchased from Encon are warranted for one year following the shipment of such replacement part, or until the expiration of the warranty period for the product, whichever is less. No warranty is given in connection with products that are altered without Encon's expressed written consent. The same warranty limitations and the obligations of Encon as set out herein above shall apply to replacement parts.

Encon's total liability arising out of this warranty (including, but not limited to, warranty claims) regardless of forum and regardless of whether such action or claim is based on tort, contract or otherwise will not exceed the total purchase price of the product.



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