



CTM Water Softener System Design Data

Softener System Selected is: CTM-90-PF Multi-Tank System

The CTM will Provide (Each Unit):

Continuous Flow, gpm	: 57 @ 15 psi loss
Peak Flow, gpm	: 75 @ 25 psi loss
Min. Recommended Flow, gpm	: 3
Resin Quantity, ft ³	: 3
Maximum Capacity, kgr	: 90 @ 45 lbs Salt
Minimum Capacity, kgr	: 60 @ 18 lbs Salt
Tank Size, in.	: 16x53
Tank Area, ft ²	: 1.4
Freeboard, in.	: 25



Regeneration Data Based on Recommended Brine System (Each Unit):

Brine Tank Size, in.	: 24x40	Backwash Flow Req'd, gpm	: 5
Max. Salt Load, lbs	: 600	Recond. Water Req'd, gals	: 173
Number of Regens/Salt Fill	: 13.33	Total Regen Time, min.	: 83
Salt Usage, lbs/Regen	: 45		

System Requirements:

Operating Press., psi	: 35-125	Voltage	: 120 Volts AC, 50/60 Hz, 1 Ph
Operating Temp., °F	: 40-120	Full Load, Amps	: < 1
Pipe Conn, in NPT...			
Inlet	: 2		
Outlet	: 2		
Drain	: 1.5		
Shipping Weight, lbs...			
Duplex	: 719		
Triplex	: 1061		
Quad	: 1315		
Operating Weight, lbs...			
Duplex	: 1650		
Triplex	: 2190		
Quad	: 2686		
Overall Dimensions, in....			
Width x Height x Depth			
Duplex	: 76 x 74 x 20		
Triplex	: 102 x 74 x 20		
Quad	: 128 x 74 x 20		



Culligan Top Mount Softener Engineer's Specification

1.0 SCOPE

- 1.1 Provide as indicated a vertical pressure type water softener system complete with pressure vessel, softening resin, control valve, brine maker and electronic controller. The system will be of an approved design as fabricated by a manufacturer regularly engaged in the production of water treatment equipment. All equipment and material will be supplied in compliance with the specifications as intended for a complete and operational system.
- 1.2 Qualified manufacturers of water softener equipment must be engaged in the manufacture of this type of equipment for a period of not less than fifty (50) years. Acceptable manufacturers are Culligan International Company or the Engineer's approved equal.
- 1.3 Qualified manufacturers will have the entire softener certified as a system to NSF/ANSI 61, NSF/ANSI 372, CSA 483.1, UL/CUL and CE.

2.0 GENERAL DESCRIPTION

- 2.1 The system specifications are based on Culligan International model CTM-90-PF Multi-tank System configured as with either a Timeclock, Water Meter or Aqua Sensor device.

The purpose of the Culligan International Culligan Top Mount automatic water softener will be to remove mineral hardness from a known water supply to a level not to exceed 17.1 mg/l, as determined by an accepted ASTM or EDTA test method, when the system is operated in accordance with the operating instructions.

The systems performance will be capable of a peak flow rate of 225 gpm for sustained periods of 90 minutes with a pressure drop of 25 psi.

3.0 PERFORMANCE AND DESIGN DATA

- 3.1 INFLUENT WATER ANALYSIS
N/A

- 3.2 DESIGN PARAMETERS (Each Tank System)

Normal System Flow & Pressure Drop	: 57 gpm @ 15 psi
Maximum System Flow & Pressure Drop	: 75 gpm @ 25 psi
Backwash/Rinse Flow	: 5 gpm
Backwash Volume	: 173 gallons nominal
Daily Water Usage	: 5000
Operating Temperature Range	: 40-120 °F
Operating Pressure Range (System)	: 35-125 psi
Electrical Requirements	: 120 Volts AC, 50/60 Hz, 1 Ph
System Dimension (L x W x H)	: 102x73.5x20

- 3.3 EFFLUENT WATER QUALITY : < 1 GPG HARDNESS (ASTM soap test method)

4.0 EQUIPMENT SPECIFICATIONS

4.1 SOFTENER TANK(S)

Each softener tank shall be 16 in. in diameter. The overall tank height (less base) shall be 56 in., sufficient to allow for a proper freeboard space above the resin bed for adequate expansion of the resin during backwashing.

4.1.1 Tank Construction

Tank(s) shall be manufactured of polyester reinforced by a continuous roving glass filament overwrap. The top opening will be 4"-8 UN threaded and the tank bottom will be supported on a molded structural base.

4.1.2 Access Openings (Optional)

Each tank will be equipped with openings for mineral filling and periodic inspection.

4.2 INTERNAL DISTRIBUTION

4.2.1 The upper distribution system shall be of the single point diffuser type to dispense water laterally to avoid channeling within the resin bed.

4.2.2 The lower distribution system shall be of the single point distributor type, constructed of PVC pipe and a fine slotted strainer to provide even flow distribution through the resin bed. The distribution system shall be embedded in a two layer subfill of washed inorganic material to support the resin bed.

4.3 MAIN OPERATING VALVE

The main operating valve shall be of a top mount design constructed of thermoplastic resistant to attack by substances found in natural water supplies. Inlet and outlet connections to be 1.5" or 2 inch NPTE. The Cv (flow coefficient) of the main operating valve shall be equal to/greater than 32.

A vacuum breaker and pressure regulating valve shall be integrated in the design of the main operating valve.

The main operating valve will be of the motor driven, mechanically activated design with 5 positions to accomplish the regeneration steps of backwash, brine draw/rinse, fast rinse and brine refill in addition to the service position. The internal seals will be of a modular design for ease of replacement and service.

The main operating valve will be fitted with a fixed orifice eductor to control brine draw/slow rinse.

The main operating valve shall be designed by the same manufacturer as the water softener system and tested prior to shipment.

4.4 FLOW CONTROL

The backwash flow controller shall be a pressure-compensating orifice capable of providing and maintaining proper backwash flows over the entire listed operating pressure range of the system. The backwash flow controller shall be easily serviced without special tools and design so that service to the flow controller can be performed without disassembly of the valve body or the sequencing controller and without disconnecting existing inlet and outlet piping connections.

4.5. CONTROLS

A fully integrated programmable microprocessor driven electronic controller shall be provided to automatically cycle the main operating valve through the regeneration sequence. The electronic controller shall be designed and manufactured by the same manufacturer as the water treatment equipment.

The controller shall be capable of initiating a regeneration by accepting an internal signal from the controller time keeping device; an external Hall-Effect flow sensor, a Culligan Aqua-Sensor®, an external device such as a remote start push-button or any combination of these methods. The controller shall sequence all steps of an automatic regeneration and automatically return the softener to a service or stand-by mode. The initiating time and/or volume setpoints shall automatically reset upon completion of the regeneration sequence.

The controller shall include a sealed keypad, capable of programming all controller functions, located on the face of the controller. The controller display shall be a multi-line OLED display capable of full text readouts of operating status and codes. The firmware shall be capable of being updated to the latest version.

An audible alarm beeper capable of emitting a tone of ~70 dBA shall be available but capable of being disabled if so desired.

The controller shall allow for a manual initiation of the automatic regeneration sequence by utilizing a regeneration selection from the controller menu.

The controller shall operate on a low voltage electrical system. The system shall include a UL/CUL listed transformer. The entire electronic control package and its associated inputs/outputs shall require not more than 24 VAC @ 50VA. The control shall be rated for wet environments and certified to NEMA 3R.

The controller shall utilize EEPROM to save pertinent programmed data and statistical functions. The controller must retain all functionality for power interruptions of less than 72 hours. A battery backup shall be installed and capable of maintaining the time of day for a minimum of 5 years.

4.5.1 System control options

One or a combination of below control options shall be available

Timeclock - An operator selected program of a time-initiated reconditioning for single units shall be available. The controller shall be capable of being entirely programmed in the field without additional interface devices. The operator shall be able to select reconditioning to occur after a specified number of hours or days or specific day of the week. The electronic controller shall indicate various data that includes number of reconditionings in the last 14 days, days since last reconditioning, total number of reconditionings for the life of the unit, current day of the week, time of day, and unit in reconditioning.

Water Meter - An operator selected volume based reconditioning for single units shall be available. A flow sensor package shall be provided consisting with an appropriately sized installation fitting. The operator shall be able to select reconditioning to occur after a specified number gallons. The electronic controller shall indicate various data that includes number of reconditionings in the last 14 days, days since last reconditioning, total number of reconditionings for the life of the unit, time of day, and unit in reconditioning.

Culligan Aqua Sensor- An operator selected program of immediate or delayed hardness initiated regeneration for single units shall be available. An Aqua-Sensor® control probe will be inserted into the resin bed and will sense the need for regeneration based on electrical impedance within the resin bed and will signal the circuit board to initiate regeneration after a continuous 6 minute increase in impedance ratio. The system will compensate for variations in water hardness and temperature and will require no field adjustments when operated within the normal temperature range of the softener. The controller shall be capable of being programmed in the field without additional interface devices. The controller shall indicate various data that includes number of regenerations in the last 14 days, days since the last regeneration, total number of regenerations for the life of the unit, last slow rinse time, time of day, and unit in regeneration.

4.5.2 In addition the following functions shall be provided as part of the system controller:

The controller shall have the capability of providing communications with the following external devices:

- Serial Communications (RS-232 & RS-485)
- USB
- Modbus RTU
- Profibus Communications
- BACnet Communications
- Modem (cell modem or land-line modem)
- Dry Contact Alarm Relay
- Wireless Remote (local RF wireless remote, 200 ft range)

Regeneration sequence timers: The controller shall allow control customization of individual regeneration cycle times, each programmable from 1 - 99 minutes. The regeneration cycle and time of cycle remaining shall be displayed when in regeneration.

Lockout function: The controller shall include a lockout to prevent unauthorized personnel from altering program data.

Regeneration override: The controller shall include a function to direct pre-programmed regeneration after a user determined period of time (hours or 24 hour intervals) without an input signal from another regeneration initiation device.

Alarm status indicator: The controller shall monitor operation of internal functions. If a fault is identified, the need for operator intervention will be signaled visually within the controller display.

Two Auxiliary Outputs: Two Auxiliary Outputs shall be integral to the controller circuit board. Each Output shall be capable of being programmed to provide power to a "Normally Open" or "Normally Closed" contact (user choice). These 24VAC outputs shall be used only for the purpose of energizing a relay coil.

Flow rate indication: The controller shall be capable of indicating the flow rate of the treated water.

Totalizer: The controller shall include a totalizer function and a display capacity to 99,999,999 units before resetting to zero. The totalizer value shall be displayed through the controller display during operation.

The controller shall have the availability to be wall- or remote-mounted for greater accessibility.

4.5.3 Flow Sensor(s)

Each softener will include a turbine-type Hall Effect flow sensor.

The sensor shall be integral to the control valve. A cable shall be provided for direct connection to the system controller.

The flow sensor package provided shall be functional within the flow range of 1.5 to 180.0 gpm.

The flow sensor shall have an accuracy of +/- 2% over the full range.

4.5.4 Aqua-Sensor® Probe

A patented Aqua-Sensor® control probe will be inserted into the resin bed and will sense the need for regeneration based on an electrical imbalance within the resin bed and will signal the circuit board to initiate regeneration after a continuous 6 minute imbalance. The system will compensate for variations in water hardness and temperature and will require no field adjustments when operated within the normal temperature range of the softener. The controller shall be capable of being programmed in the field without additional interface devices. The Aqua-Sensor will also be capable of determining when the brine solution is rinsed from the resin bed during the Brine Draw /Slow Rinse cycle, triggering the control to move to Fast Rinse cycle.

4.6 EXCHANGE RESIN

The ion exchange resin shall be virgin high capacity "standard mesh" of sulfonated polystyrene type stable over the entire pH range with good resistance to bead fracture from attrition or osmotic shock. Each cubic foot of resin will be capable of removing 30000.0 grains of hardness as calcium carbonate when regenerated with 15.0 pounds of salt. The resin shall be solid, of the proper particle size of 16x40 mesh, U.S. standard screen and will contain no agglomerates, shells, plates or other shapes that might interfere with the normal function of the water softener. The resin shall be manufactured to comply with the food additive regulation 21 CFR 173.25 as set forth by the USFDA.

The system shall include 3 cubic feet of exchange resin per vessel and a total of 9 cubic feet of resin for the system.

4.7 BRINE SYSTEM

Provide a complete brine system consisting of a plastic tank, cover, salt platform, brine well, an automatic brine valve and all necessary fittings for operation with the water softening system. The system shall consist of a combined brine measuring and salt storage tank with salt platform. The system will include a total of one (1) brine tank(s).

The brine tank will be equipped with a float operated non-corrosive field serviceable brine float valve for automatic control of brine withdrawal and fresh water refill.

The brine valve will automatically open to admit brine to the resin tank during eduction and close automatically providing positive shut-off to prevent air from entering the system. The brine valve will also regulate the flow of

soft water into the brine tank during refill. The brine valve works with the timed fill feature of the main operating valve controls to admit the correct volume of fresh water to the brine tank in accordance with the refill time setting in the control program. The brine valve will include a float operated safety shut-off valve as a back up to the timed refill from the main operating valve control to prevent brine tank overflow.

4.8 ACCESSORIES

5.0 INSTRUCTIONS

One (1) complete sets of installation, operating and maintenance manuals shall be provided.

6.0 FIELD SERVICE

The services of a factory authorized service representative can be made available to supervise, inspect and provide operator training as required for initial start-up and system operation. Contact your local Culligan dealer for service rates and scheduling.

7.0 WARRANTY

A single written warranty must be provided from the manufacturer of the water softener system covering workmanship and materials.

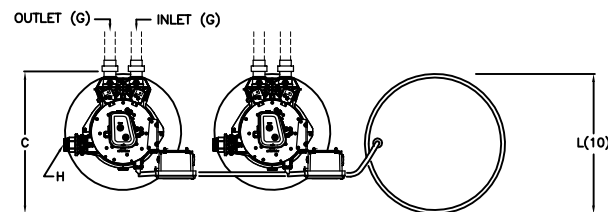
8.0 CTM MANUAL REFERENCE

Installation Instructions : 01029401-A
Smart Controller Communication: 01021512

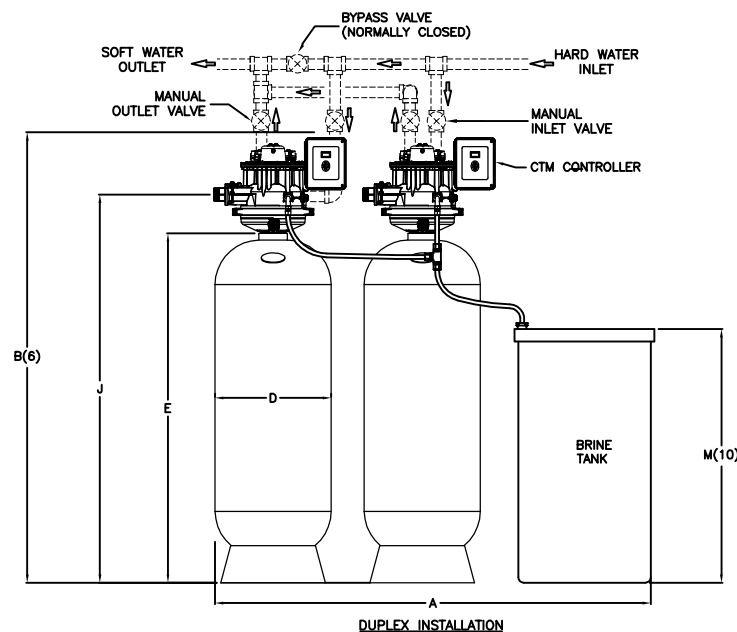
NOTES:

- (1) ITEMS SHOWN IN BROKEN LINES TO BE FURNISHED BY OTHERS.
- (2) ALL DIMENSIONS ARE $\pm 1"$ (25mm) AND SUBJECT TO CHANGE WITHOUT NOTICE.
- (3) UNIONS SHOULD BE LOCATED ON INLET AND OUTLET CONNECTIONS OF CONTROL VALVE TO FACILITATE SERVICING.
- (4) THE USE OF DISSIMILAR METALS IN A PIPING SYSTEM IS NOT RECOMMENDED. WHERE DISSIMILAR METALS MUST BE CONNECTED IN A WATER SYSTEM, THE USE OF NONCONDUCTIVE (DIELECTRIC) FITTINGS MAY REDUCE GALVANIC CORROSION.
- (5) A TEN FOOT POWER CORD (LONGER LENGTHS AVAILABLE) AND WALL MOUNT TRANSFORMER ARE PROVIDED. THE CUSTOMER SHOULD PROVIDE A RECEPTACLE, PREFERABLE ONE NOT CONTROLLED BY A SWITCH THAT CAN BE TURNED OFF ACCIDENTALLY, OBSERVE THE LOCAL ELECTRICAL CODES.
- (6) ALLOW 6-12 INCHES BEHIND THE UNIT FOR PLUMBING AND DRAIN LINES AND 12 INCHES ABOVE OVERALL HEIGHT FOR SERVICE ACCESS AND FILLING THE SALT CONTAINER.
- (7) SYSTEM USES FRP TANKS WHICH MUST NOT BE SUBJECTED TO VACUUM. INSTALL SIPHON BREAK ON DRAIN LINE. INSTALL VACUUM BREAKER ON INLET PIPING IF THE SERVICE LINE IS SUBJECT TO A VACUUM.
- (8) TO PERMIT THE OBSERVATION OF THE DRAIN FLOW DO NOT MAKE A DIRECT CONNECTION TO THE DRAIN. PROVIDE AN AIR GAP OF AT LEAST TWO TIMES THE DIAMETER OF THE DRAIN PIPE OR CONFORM TO LOCAL SANITATION CODES.
- (9) BRINE TANK DIMENSIONS SHOWN ARE FOR THE BRINE TANK MOST COMMONLY SELECTED FOR USE WITH THIS SIZE SYSTEM.
- (10) SHIPPING AND OPERATING WEIGHTS SHOWN ON THIS DRAWING INCLUDE THE BRINE SYSTEM.

	DIMENSIONS (INCHES)											UNIT DATA PER TANK							
MODEL	WIDTH A	HEIGHT B(6)	DEPTH C	TANK DIA. D	TANK HEIGHT E	INLET OUTLET PIPE SIZES F	INLET OUTLET PIPE SIZES G	DRAIN SIZE H	FLOOR TO INLET J	BRINE TANK DIA. L(10)	BRINE TANK HEIGHT M(10)	MAX. CAPACITY KGR ● SALT DOSAGE	RESIN VOLUME ft ³	CONTINUOUS FLOW gpm ● 15 psi drop	PEAK FLOW gpm ● 25 psi drop	DRAIN FLOW gpm	MIN. DRAIN PIPE SIZE IN.	DUPLEX OPER. WT. lbs.	DUPLEX SHIP. WT. lbs.
CTM-90-PF	76	73.5	19.6	16	55	1.5	2.0	1.5	62	24	40	90 ● 45	3	57	75	5	1.0	1650	719



TOP VIEW



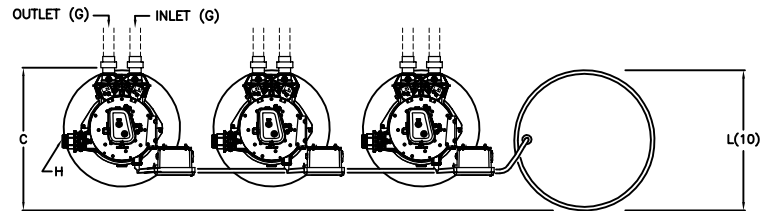
DUPLEX INSTALLATION

DO NOT SCALE DRAWING TOLERANCES: ±1/8" UNLESS OTHERWISE NOTED					Culligan® ENGINEERED SYSTEMS ROSEMONT, ILLINOIS PRINT AND BILL OF MATERIAL ARE NOT TO BE USED WITHOUT THE WRITTEN CONSENT OF CULLIGAN INTERNATIONAL CO.					NAME CTM 2.0" METERED DOWN FLOW AND UP FLOW AUTOMATIC SOFTENER DUPLEX TECHNICAL DATA SHEET					
Let.	Change	By	App	Date						DETAILED BY: MKM 8/04/15		APP. BY: LW 8/18/15		SHEET 1 OF 1	
					REF. NO.					PART NO. DRW-2126					

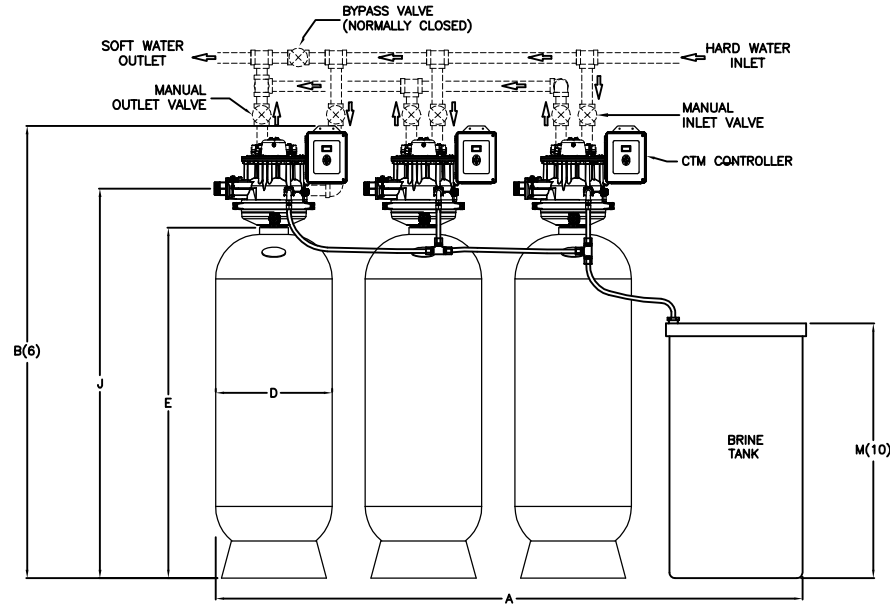
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- (5) A TEN FOOT POWER CORD (LONGER LENGTHS AVAILABLE) AND WALL MOUNT TRANSFORMER ARE PROVIDED. THE CUSTOMER SHOULD PROVIDE A RECEPTACLE, PREFERABLE ONE NOT CONTROLLED BY A SWITCH THAT CAN BE TURNED OFF ACCIDENTALLY, OBSERVE THE LOCAL ELECTRICAL CODES.
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	DIMENSIONS (INCHES)											UNIT DATA PER TANK								
MODEL	WIDTH A	HEIGHT B(6)	DEPTH C	TANK DIA. D	TANK HEIGHT E	INLET OUTLET PIPE SIZES F	INLET OUTLET PIPE SIZES G	DRAIN SIZE H	FLOOR TO INLET J	BRINE TANK DIA. L(10)	BRINE TANK HEIGHT M(10)	MAX. CAPACITY KGR @ SALT DOSAGE	RESIN VOLUME ft ³	CONTINUOUS FLOW gpm @ 15 psi drop	PEAK FLOW gpm @ 25 psi drop	DRAIN FLOW gpm	MIN. DRAIN PIPE SIZE 7/8" N.	TRIPLEX OPER. WT. lbs.	TRIPLEX SHIP. WT. lbs.	
CTM-90 -PF	102	73.5	19.6	16	55	1.5	2.0	1.5	62	24	40	90 @ 45	3	57	75	5	80.0	2190	1061	
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TOP VIEW



TRIPLEX INSTALLATION

DO NOT SCALE DRAWING TOLERANCES: $\pm 1/8"$ UNLESS OTHERWISE NOTED				
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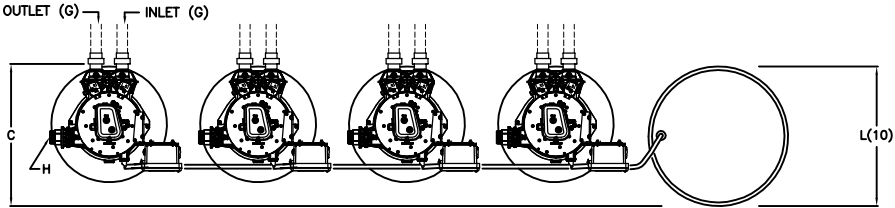
Culligan®
ENGINEERED SYSTEMS
 ROSEMONT, ILLINOIS
 PRINT AND BILL OF MATERIAL ARE NOT
 TO BE USED WITHOUT THE WRITTEN
 CONSENT OF CULLIGAN INTERNATIONAL CO.

NAME CTM 2.0" METERED DOWN FLOW AND UP FLOW AUTOMATIC SOFTENER TRIPLEX TECHNICAL DATA SHEET		
DETAILED BY: MKM 8/04/15	APP. BY: LW 8/18/15	SHEET 1 OF 1
REF. NO.	PART NO. DRW-2127	

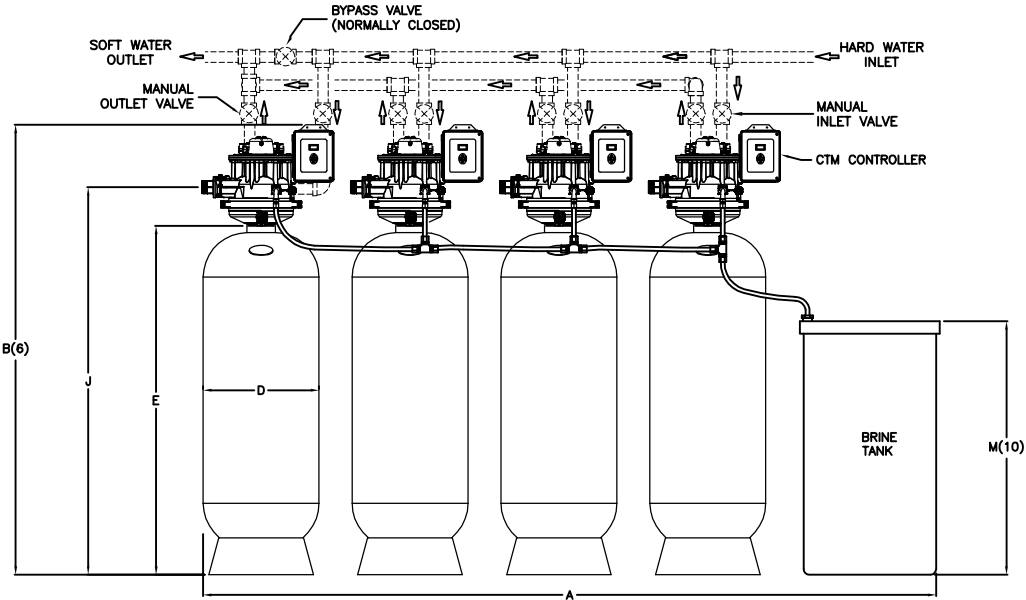
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- (7) SYSTEM USES FRP TANKS WHICH MUST NOT BE SUBJECTED TO VACUUM CONDITIONS. SYSTEM CONTROL VALVE DESIGN HAS INTEGRATED VACUUM BREAKER TO PREVENT SUCH CONDITIONS WHICH SHOULD NOT BE REMOVED DURING OPERATION.
- (8) TO PERMIT THE OBSERVATION OF THE DRAIN FLOW DO NOT MAKE A DIRECT CONNECTION TO THE DRAIN. PROVIDE AN AIR GAP OF AT LEAST TWO TIMES THE DIAMETER OF THE DRAIN PIPE OR CONFORM TO LOCAL SANITATION CODES.
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CTM-90 HWB NHWB MT	128	73.5	19.6	16	55	2.0	1.5	62	24	40	90 @ 45	3	57	75	5	1.0	2686	1315



TOP VIEW



QUAD INSTALLATION

DO NOT SCALE DRAWING TOLERANCES: ±1/8" UNLESS OTHERWISE NOTED					Culligan® ENGINEERED SYSTEMS ROSEMONT, ILLINOIS PRINT AND BILL OF MATERIAL ARE NOT TO BE USED WITHOUT THE WRITTEN CONSENT OF CULLIGAN INTERNATIONAL CO.		NAME CTM 2.0" METERED DOWN FLOW AND UP FLOW AUTOMATIC SOFTENER QUAD TECHNICAL DATA SHEET			
Let.	Change	By	App	Date			DETAILED BY: MKM 8/04/15		APP. BY: LW 8/18/15	
							REF. NO.		PART NO. DRW-2128	