Installation, Operation, and Maintenance Manual

CSM - Model 28062

Copper Silver Monitor

⚠ WARNING

Read this Manual BEFORE using this equipment.

Failure to read and follow all safety and use information can result in death, serious personal injury, property damage, or damage to the equipment.

Keep this Manual for future reference.

THINK SAFETY FIRST

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Table of Contents

1.0 Understanding Safety Information

This manual contains safety and use instructions that must be followed during the installation, commissioning, operation, care and maintenance and service of the CSM. All responsible personnel must read this manual prior to working with this instrument and should familiarize themselves with the following safety symbols, signals and pictorials.

⚠WARNING This symbol identifies hazards which, if not avoided, could result in death or serious injury.

⚠CAUTION This symbol identifies hazards which, if not avoided, could result in minor or moderate injury.

NOTICE This symbol identifies practices, actions, or failure to act which could result in property damage or damage to the equipment.

This pictorial alerts you to the need to read the manual.

This pictorial alerts you to electricity, electrocution, and shock hazards.

2.0 Introduction to the Unit

2.1 Overview

The CSM (Copper Silver Monitor) has been specially designed to measure and report the concentration of copper and silver dosing in water samples over specified ranges from an ionization system. The monitor uses chemistry to test for copper and silver at the required concentrations.

2.2 Specifications

NOTICE

Specifications listed are based on installation/operation at sea level.

Measurement Range	50 ppb to 250 ppb silver 200 ppb to 2000 ppb copper
Repeatability	±10% RSD
Accuracy	±20%
Time Between Measurements	User selectable up to 23 hours, 59 minutes
Path Length	10mm
Display	3.5" Color graphic, touch screen
Analog Output	Powered 4-20mA, 1000 Ω drive, isolated
Maximum Water Pressure	124 kPa (18 psi) (see Plumbing Connections section)
Flow Rate	185 ml/min. to 225 ml/min. (.044 to .059 Gal/min)
Operating Temperature	1°C – 50°C (34°F – 122°F)*
Max Sample Water Intake and Drainage Flow	225 ml/minute
Wetted Materials	PBT, Polypropylene, 316 Stainless Steel, Viton®, Noryl®, Reslyn, Borosilicate Glass, PPS, PEEK, Fluoroelastomer, Acetal, Nitrile, EDPM
Sample Temperature Range	1°C – 50°C (34°F – 122°F)
Power Supply	100– 240 VAC, 47 - 63 Hz, 300 VA
Insulation Rating	Double Insulated, Pollution Degree 2, Overvoltage Category II
Environmental Conditions	The unit is intended for indoor use. Up to 95% RH (non-condensing)
Regulatory Compliance And Certifications	cLCus, Lead Free, conforms to CAN/CSA-C22.2 No. 61010-1-12 (R2017)/UL 61010-1 (Ed. 3)
Shipping Weight	73 lbs

*Operating temperatures above 38°C may require the instrument to be primed before readings or increase frequency of readings.

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Noryl® is a registered trademark of SABIC Global Technologies B.V.

2.3 Unpacking and Inspection of the Instrument

Remove all items from packing carton and carefully inspect to ensure that no visible damage has occurred during shipment and that all items listed below have been received. If the items received do not match the order, please contact your local distributor or the HF scientific Customer Service department.

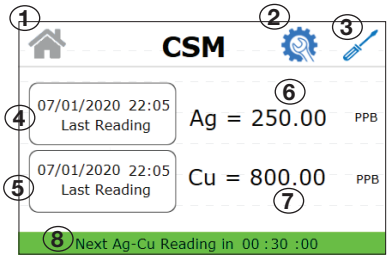
- CSM - Copper Silver Monitor
- Instruction Manual
- Chemical Reagents, shipped separately

2.4 Instrument Labels

The following labels should be applied to the outside of the enclosure.

Purpose	Location	Label
Serial number, manufacturer, part number, power rating, UL marking	Side of Unit	
Informational	Front of Unit	

2.5 Display



1 - Home Button

2 - Configuration Menu Access

3 - Service Menu Access

4 - Date/Time of last Silver reading

5 - Date/Time of last Copper reading

6 - Last Silver reading

7 - Last Copper reading

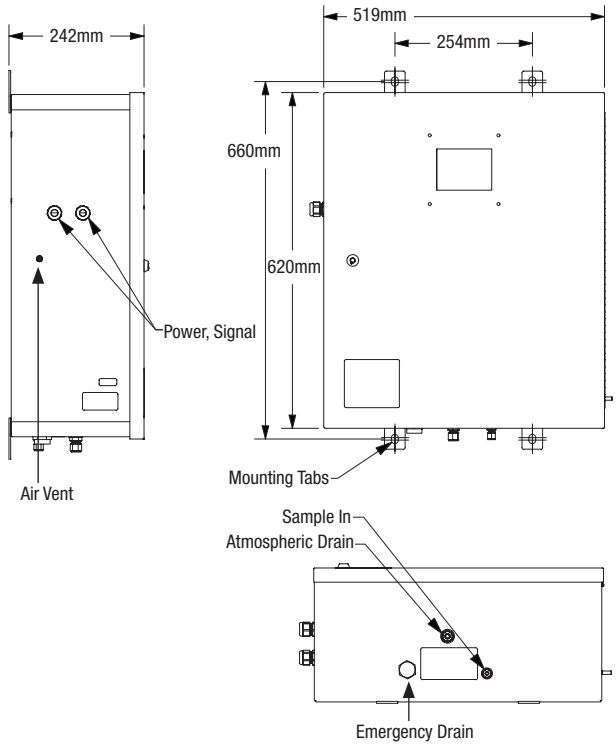
8 - Cycles through current instrument status, warnings (yellow), errors (red). If instrument is operating as normal, background will be green.

3.0 Installation

3.1 Site Selection and Mounting

The instrument is designed for wall mounting. The instrument should be mounted at eye level and be easily accessible for operation and service. Consideration must be made for the plumbing and electrical conduit connections. Recommended mounting screws are M8 (5⁄16") fasteners for the instrument enclosure.

It is critical that the instrument be mounted as close as possible to the sampling point to ensure a quick response time (within 2 to 3 meters (6 to 10 feet) of the sampling point).



3.2 Plumbing Connections

NOTICE

It is recommended to install pressure regulating and relief valves to maintain proper inlet pressure for the instrument. Contact HF scientific Customer Service to order pressure regulators and relief valves.

NOTICE

When using this instrument in potable water applications, the drain water from this instrument should NEVER be reintroduced back into the incoming water stream. This water MUST be directed to a convenient drain.

All plumbing connections are made with user supplied OD tubing using the push to connect fittings attached to the CSM. All water tubing used to connect to the CSM is supplied by the installer.

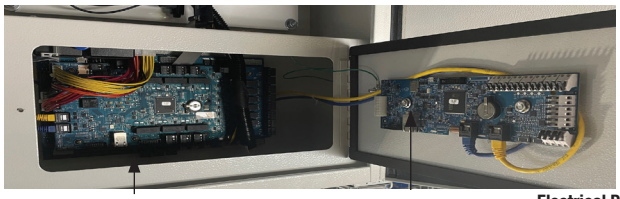
- Sample water should be particulate free.
- The sample water supply does not need to be pressurized. The CSM incorporates a regulator at the water supply inlet.
- In order to ensure that the sample measured is representative, keep the sample pipe run as short as possible.
- A water shutoff valve should be located close to the instrument to allow for periodic maintenance.

1. Connect the sample water line to the CSM using the ¼" push to connect fitting on the bottom of the enclosure.
2. Connect the main drain line to the CSM using the ⅜" push to connect fitting on the bottom of the enclosure. There is no tubing connection for the emergency drain.

3.3 Electrical Connections

⚠ WARNING

Installation of this instrument involves line voltage that could endanger life. Only qualified electricians should perform installation of the instrument.



Electrical Panel

All electrical connections are located in the upper electrical compartment. The electrical compartment access at the front can and should only be opened during installation. No power should be applied until the electrical compartment access is closed and sealed.

The CSM has two types of electrical connections. First, the mains power connection, which connects to the cable gland on the left side of the CSM. Second, the low voltage connections, which are made through the 2nd gland on the left side of the CSM.

Electrical Wiring Requirements

The CSM is required to be wired with a 15A circuit breaker. The cable should be sized for a 15A supply with all three wires the same gauge.

Local Disconnect

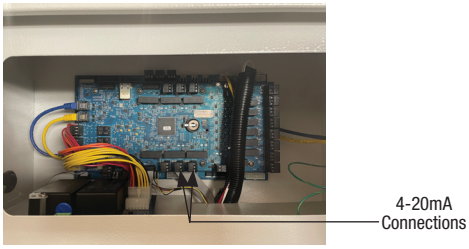
A local two pole disconnect needs to be installed less than 2 meters (6 feet) from the instrument and labeled as the disconnect for the CSM. This allows for emergency disconnect and isolation of the equipment.

⚠ WARNING

All low voltage connections should be completed before the mains power is connected to the system.

Low Voltage Connections

All of the low voltage electrical communication connections to the instrument are made at the termination area located on the middle



Main UI Board Located inside the Electrical Panel

bottom side of the Main UI board located inside the electrical panel. To access the connections, open the access panel by loosening the captive Phillips screw. The connections are labeled (CN27 for Silver, CN28 for Copper). Upper pin is negative, lower pin is positive. Please follow all government recommendations and requirements for installation of electrical connections to and between the instrument and other peripheral devices. All terminals are designed to accept wires in the range of 14 - 28 AWG.

4-20mA Analog Output

There are 2 4-20mA outputs, one for Copper and one for Silver. The connections are located in the mid bottom side of the board inside the electrical panel. The 4-20mA output is driven by a 24 VDC power source and can drive recorder loads up to 1000 ohms. **Do not run 4-20 mA cables in the same conduit as power.** Transformer isolation is provided on the CSM. Operation of this output is covered in the Analog Output Menu. Negative polarity is on the top, positive polarity is on the bottom.

The recommended cable is 22 AWG shielded twisted pair. To prevent ground loops, connect the shield only at its destination. The black terminal block is removable to assist in making connections.

The 4-20mA is factory calibrated. An adjustment can be made using the Analog Output Menu. In addition to making adjustments, these menus output continuous 4mA or 20mA and can be used as a signal test. The configuration mode will time out after 15 minutes.

Securing the Glands - Low Voltage

Low voltage connections to the instrument are made through electrical glands located on the left side of the enclosure. Once the appropriate low voltage wiring is inserted through the electrical gland and wiring is secured at the terminals on the Main UI board, the gland on the left side of the enclosure must be tightened to ensure wiring is safely installed.

Mains Power Connections

Once all low voltage connections are made, the mains power should be connected through the 2nd gland located on the left side of the enclosure.

The CSM is not supplied with a power cord. The CSM requires a user supplied power cable, capable of 120/240V.

Terminal 3: Earth Ground
Terminal 2: Neutral
Terminal 1: Line or Hot

⚠ WARNING

The instrument can accept 100-240 VAC, 47-63 Hz. Verify that the mains voltage falls within these specifications.

Suitable wire would be stranded, 3 conductors 18-12 AWG copper or tin plated copper with a voltage rating of 600 VAC with a temperature rating of 90°C or higher.

Common earth bond points are provided both inside the enclosure on the chassis and outside of the enclosure. This terminal set can be removed for easier connections. Please ensure this terminal set is properly tightened using the two side screws.

⚠ WARNING

To minimize the risk of receiving an electrical shock, there is an earth stud located outside of the enclosure on the right side. This must be tied to earth before powering up the CSM.

Securing the Glands - Mains Power

Mains power connection to the instrument is made through an electrical gland located on the left side of the enclosure. Once the mains power wiring is inserted through the electrical gland and wiring is secured at the mains power terminal on the left side of the enclosure, the electrical gland must be tightened to ensure mains power is safely installed. A cable tie down is provided. Route the power cable through the white tie down located on the bottom left side of the electrical panel and tighten.

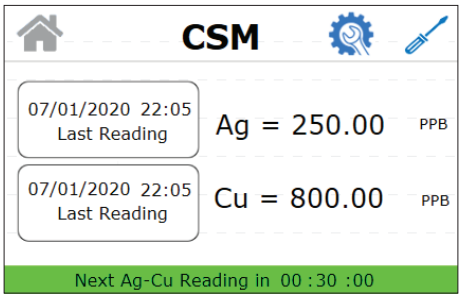
Securing the Electrical Enclosure

Once all electrical connections are made, the electrical panel must be secured by closing the compartment and tightening the captive Phillips screw.

4.0 Commissioning and Start-Up

1. Once all water and electrical connections have been made, turn on power to the CSM.
2. The CSM will run through a startup process that takes less than 10 seconds.
3. The most recent Silver and Copper readings will be displayed along with the date and time stamps and units. The green banner at the bottom of the screen provides information on when the next reading will occur.

4.1 Measurements



This monitor allows for the measurement of the copper and silver output from a copper silver ionization disinfection system in a water source. Measurements are usually taken in Parts per Billion (ppb). The CSM can measure silver (Ag) dilutions ranging from 50ppb to 250ppb and copper (Cu) dilutions ranging from 200ppb to 2000ppb. Any measurement outside of these ranges will give a screen notice that the measurement is out of range. The reading will be shown but the accuracy can not be guaranteed.

Measurements can also be taken in Parts per Million (ppm), Milligrams per Liter (mg/L) and Milligrams per Milliliter (mg/mL).

When a continuous process stream is flowing through the instrument, the instrument will take samples at preset intervals and display the readings on the screen. In addition, the equivalent signal is provided on the analog (4-20 mA) outputs, depending on the options selected.

NOTICE

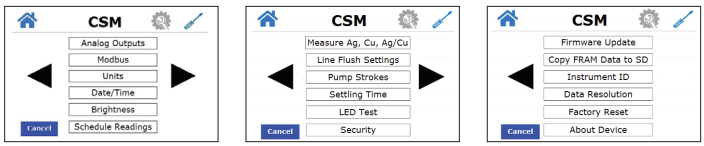
There is a removable light shield attached to the optical block to help prevent light from entering the optical block which may affect the readings. Be sure this shield is in place at all times when taking readings or doing a calibration to ensure reading accuracy.

5.0 Instrument Configuration

The instrument has the ability to be customized at any time during operation. Configuration Mode has been split into sub-menus to facilitate instrument configuration. While in Configuration Mode, the instrument has a time-out feature that automatically returns the sub-menus to the previous screen after a 60 second period. Configuration screens timeout after 60 seconds to the Home screen.

To enter Configuration Mode:

1. Press the button on the home screen to enter the Configuration Menu.
2. Sub-menu options are then shown. To move between sub-menus, use the left and right arrows on either side of the screen.

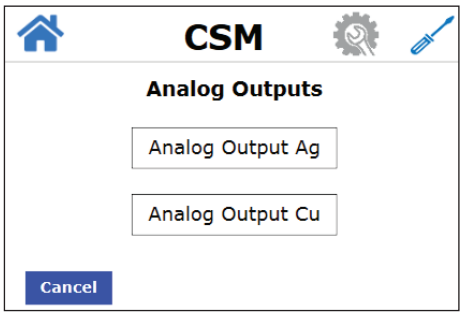


3. Press the button to return to the home screen or press **Cancel** to return to the previous menu.

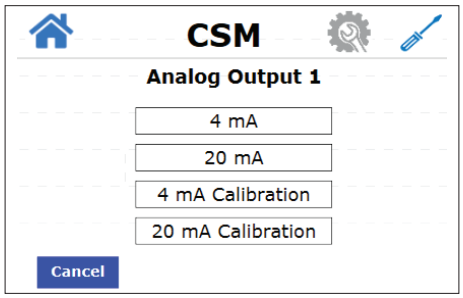
5.1 Selecting the Analog Output

The first configuration sub-menu is the Analog Output. There are 2 Analog Outputs for the 4-20mA output, one for Silver and one for Copper. To set the Analog Outputs:

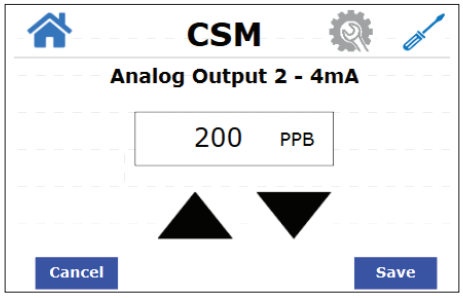
1. Press **Analog Outputs** on the Configuration Menu screen.
2. Press **Analog Output Ag** or **Analog Output Cu** to set the corresponding values.



3. Press the desired output that needs to be set.



4. Use the up and down arrows to input the desired setting and then press **Save**. Do this for the remaining output settings for Analog Output Ag and Cu, if desired.

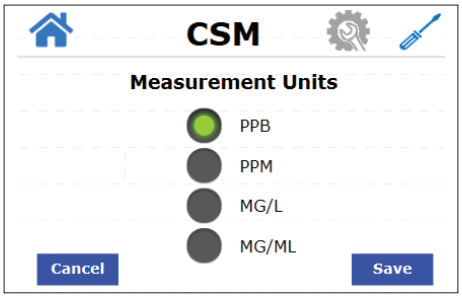


5. Once all outputs have been saved, press the button to return to the home screen or press **Cancel** to return to the previous menu.

5.2 Setting the Units of Measurement

This instrument can measure in Parts per Billion (ppb), Parts per Million (ppm), Milligrams per Liter (mg/L) and Milligrams per Milliliter (mg/mL). To select the unit of measurement:

1. Press **Units** on the Configuration Menu screen.
2. Press the desired unit of measurement for the instrument. Then press **Save**.

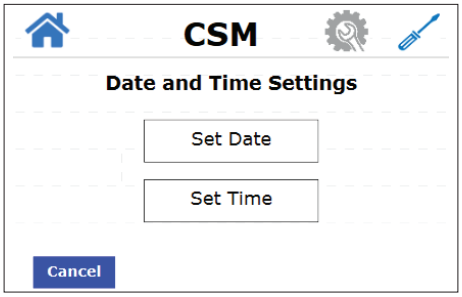


3. Once the units of measurement have been saved, press the button to return to the home screen or press **Cancel** to return to the previous menu.

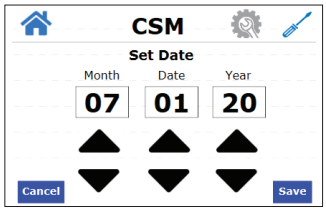
5.3 Setting the Date/Time

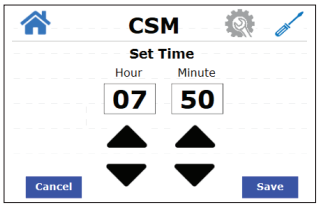
The time and date can be adjusted using this menu. The change will be reflected in the date/time stamps on the home screen and logged data. To set/change the date/time:

1. Press **Date/Time** on the Configuration Menu screen.
2. Press **Set Date** or **Set Time**, depending on which setting you wish to change.



3. If changing the date, use the up and down arrows to select the month, date and 2-digit year. If changing the time, use the up and down arrows to select the hour and minutes. Then press **Save**.



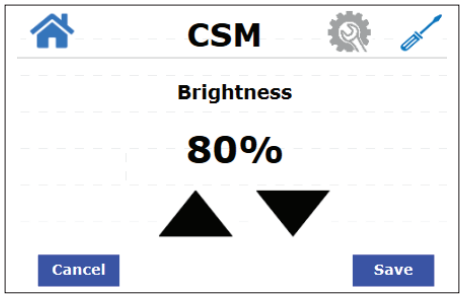


4. Once the date and time have been saved, press the button to return to the home screen or press **Cancel** to return to the previous menu.

5.4 Adjusting the Brightness

The screen brightness can be adjusted to provide easier readability of the display in low light or no light conditions. There are 10 brightness levels available. To adjust the screen brightness:

1. Press **Brightness** on the Configuration Menu screen.
2. Using the up and down arrows, select the desired brightness. Then press **Save**.



3. Once the desired brightness has been saved, press the button to return to the home screen or press **Cancel** to return to the previous menu.

5.5 Setting the Time Schedule

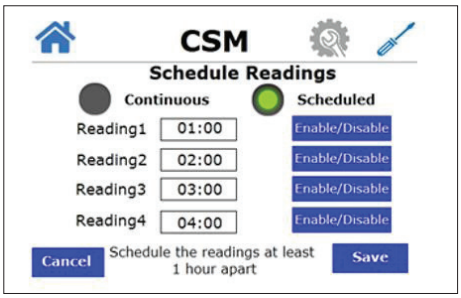
The Schedule Readings screen provides the option to enable and schedule up to 4 readings in a 24 hours day. Continuous mode will take readings without any delay and can be useful during the commissioning of the instrument.

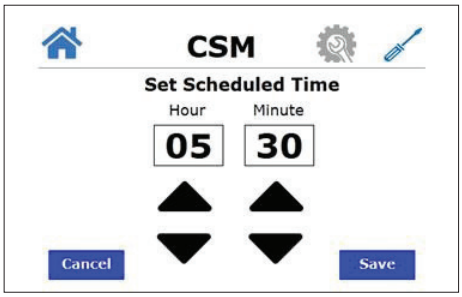
For the Scheduled/Continuous mode to work the instrument must be in Auto Mode.

To change the schedule:

1. Click the time text box to configure the schedule. Note: Readings must be scheduled at least one hour apart, if you attempt to schedule less than one hour apart then the time setting will not be accepted.

   Note: Scheduling configuration buttons are disabled if the instrument is in Continuous mode. 00:00 will set the timer at 24:00.





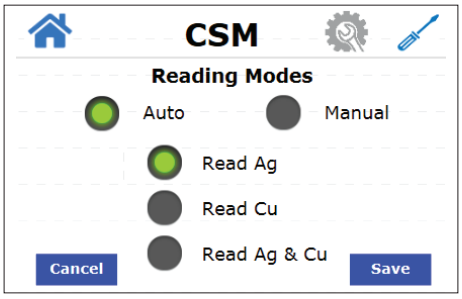
5.6 Setting the Reading Mode

The CSM has 2 different modes of taking readings, The first is Auto Mode. In Auto Mode, measurements are taken at a preset time interval and displayed on the Home screen. A countdown clock showing the time until the next reading is displayed in the status bar on the bottom of the home screen.

The second mode is Manual Mode. In Manual Mode, the date/time button on the home screen is used to take an on-demand reading. The date/time button displays the date and time of the last reading while the measurement data is shown to the right. The status bar shows GOOD, rather than a countdown clock.

To set the Reading Mode:

1. Press **Measure Ag, Cu, Ag/Cu** on the Configuration Menu screen.
2. Press **Auto** or **Manual**.
3. Press which parameter you wish to monitor: Silver, Copper or both. Then press **Save**.



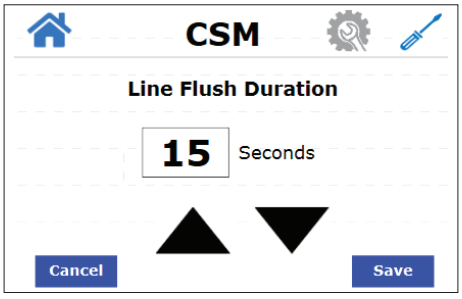
4. Once the desired Reading Mode has been saved, press the button to return to the home screen or press **Cancel** to return to the previous menu.

5.7 Adjusting the Line Flush Duration

A line flush is necessary to wash the cuvette between measurements. The line flush setting is used to set the amount of time in seconds to wash the cuvette. This time will be applied to the wash step in the reading sequence, discussed later in this manual. The default duration is 5 seconds, which is also the minimum. The maximum line flush duration is 60 seconds. The suggested line flush duration is 1 second for every foot of sample line tubing (assuming inlet pressure of 4-60psi)

To adjust the line flush duration:

1. Press **Line Flush Setting** on the Configuration Menu screen.
2. Using the up and down arrows, set the desired duration for the line flush in seconds.
3. Once the desired Line Flush Duration has been saved, press the button to return to the home screen or press **Cancel** to return to the previous menu.

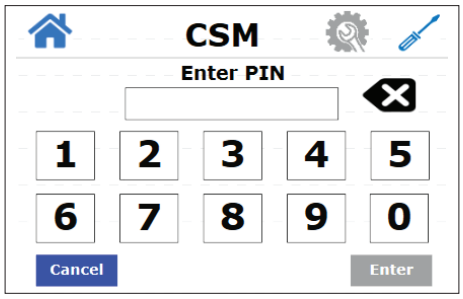


5.8 Security Setting

The CSM has a security setting that when enabled will only allow authorized users with a valid numeric password to configure the instrument. The user must enter a 6 digit PIN to gain admin access. There is a Master PIN that is hard-coded into the software and it cannot be changed. If a user forgets their personal pin, HF can provide the Master PIN and the instrument will prompt the user to choose a new PIN. Contact HF scientific Technical Service Department for the Master PIN.

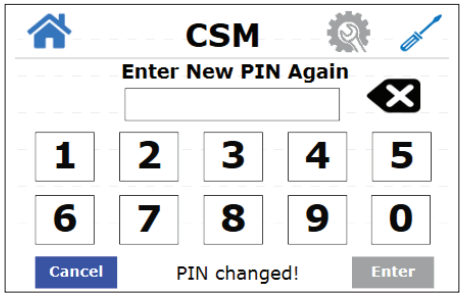
To enable a Security PIN:

1. Press **Security** on the Configuration Menu screen.
2. If this is the first time entering the Security PIN, enter the Master PIN provided by HF scientific. If you already have a personal PIN assigned, enter that PIN. Press **ENTER**.



3. Press Enable Admin or Change PIN.

4. If selecting to **Enable Admin**, enter the security PIN again to enable. If selecting **Change PIN**, enter the new pin. You will be prompted to enter the new pin a second time. Then press **Enter**.



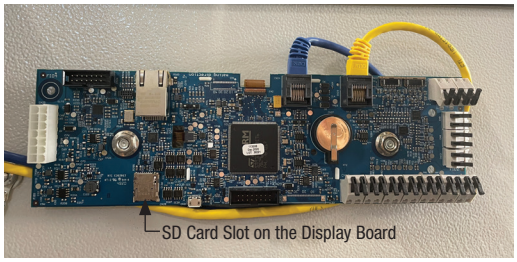
5. Once the security PIN or setting has been saved, press the button to return to the home screen or press **Cancel** to return to the previous menu.

5.9 Firmware Update

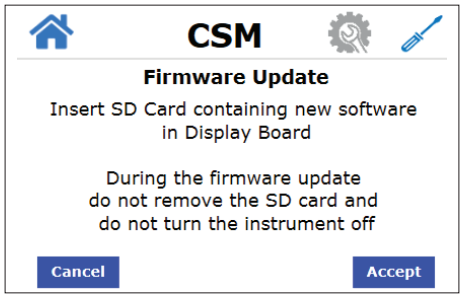
Software for the CSM can be updated using an SD card. While the software is being updated, it is important to not turn off power to the instrument. Once the software update has been complete, the instrument will require a reboot. To ensure the software update was successful, you can view the software version in the About Device menu.

To update the software on the CSM:

1. Press **Firmware Update** on the Configuration Menu screen.
2. Insert an SD card containing the software update into the SD slot on the display board located on the electrical panel door. Press **Accept**.



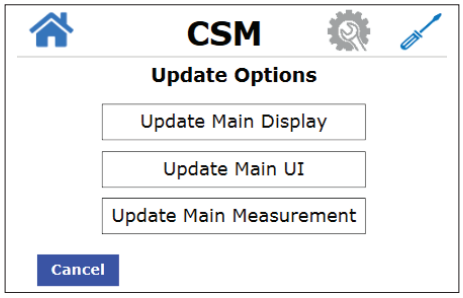
Display Board Located on the Electrical Panel Door



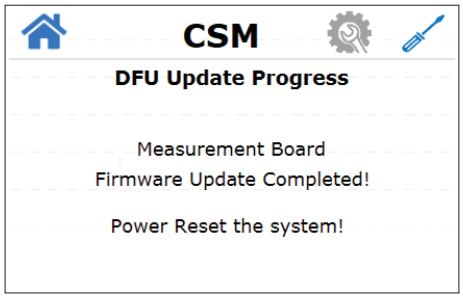
NOTICE

Do not remove the SD card or turn power off while the software update is in progress. Doing so can cause an unrecoverable failure.

3. Press which software option you wish to update: **Update Main Display**, **Update Main UI**, **Update Main Measurement**.



4. After pressing the update option, the firmware will begin to update. A status update will appear on the screen to display the progress of the update. Once the update is complete, a restart of the instrument is required.



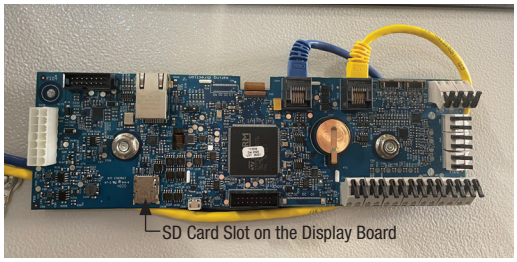
5.10 Copying FRAM data to SD Card

The following information from the CSM can be transferred to an SD card in CSV file format.

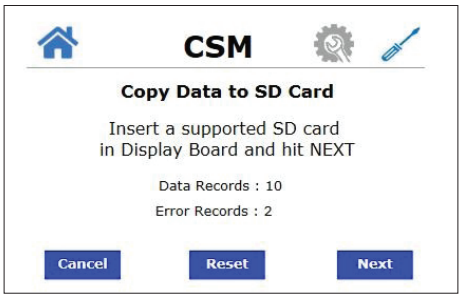
- Readings
- Error and warning logs with date and time stamps
- All user settings
- Calibration data

To transfer data from the CSM to an SD card:

1. Press **Copy FRAM Data to SD Card** on the Configuration Menu screen.
2. Insert an SD card into the SD slot on the display board located on the door of the electrical panel and press **NEXT**.



Display Board Located on the Electrical Panel Door



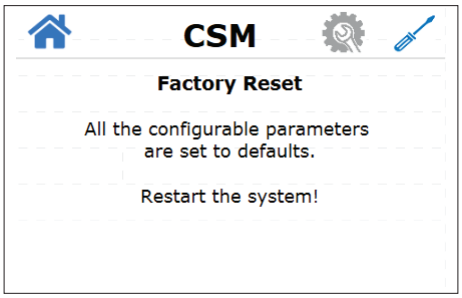
3. After pressing NEXT, the data will being copying to the SD card. A status update will appear on the screen stating Copying Records to SD Card in Progress... Once the data has been copied to the SD card, a completion update will appear on the screen.

5.11 Factory Reset

To reset all settings to factory defaults:

1. Press **Factory Reset** on the Configuration Menu screen.
2. Press **Reset** if you wish you to proceed with the factory reset. This cannot be undone.

3. A status message will appear letting you know all configurable parameters have been reset to factory defaults. A restart of the CSM is then required.

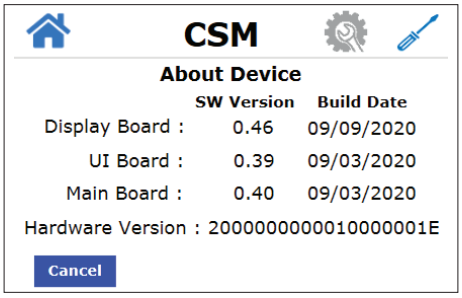


5.12 About Device

The About Device menu displays information about the CSM.

To view any of this information:

1. Press **About Device** on the Configuration Menu screen. The software version, software build date and hardware version will be displayed.



2. Press **Cancel** to return to the previous menu.

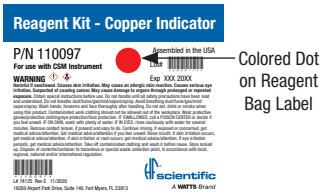
6.0 System Start Up

Once all plumbing connections have been made, the CSM is turned on and all configurations have been completed, it is ready for use.

6.1 Prepare Reagents

The reagent bag labels have a colored dot on them that corresponds with the line it connects to on the CSM.

- Blue - Silver Buffer
- Yellow - Silver Indicator
- Red - Copper Indicator
- Green - Acid Digestion



Reagent Bag Label

To connect the reagents to the CSM:

1. Remove the cap from the reagent bag.
2. Gently squeeze out excess air from reagent bag, being careful not to squeeze reagent liquid out of bag.
3. Connect the corresponding colored tube/cap to the reagent bag with the same colored dot on the bag label.
4. Place the reagent bag onto the reagent bag bracket with the colored tubing connector facing down in the CSM.
5. Repeat these steps for all 4 reagent bags.

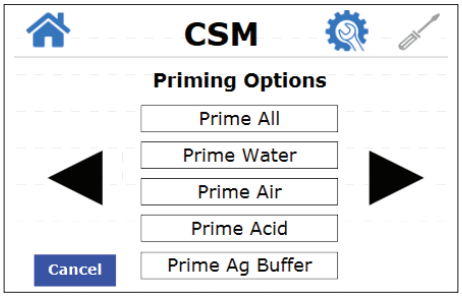
Reagent Bags Hanging on Brackets

6.2 Priming the CSM

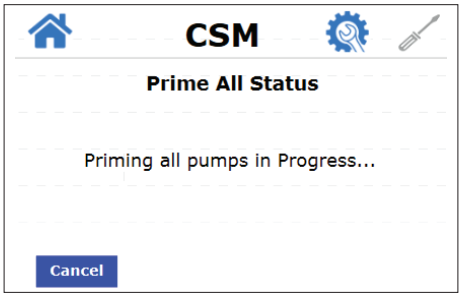
Once the reagent bags have been properly connected, the CSM needs to be primed before taking readings.

To prime the CSM:

1. From the screen, press to enter the Service Menu.
2. Press **PRIME** to enter the prime sub-menu.
3. Press the desired priming option. If this is the first time starting up the instrument, start with **Prime Water** and repeat this step for all priming options in this menu.

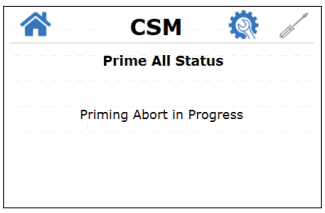


4. A status message will appear letting you know priming is in progress.



5. Once priming is complete, another status message will appear letting you know priming was completed successfully.

6. If at any time, priming needs to be aborted, press **Cancel**. A status message will appear letting you know priming is being aborted. Then another status message will let you know priming was aborted successfully.



6.3 Taking Readings

Once priming has been completed successfully, the CSM is ready to take readings. CSM will take readings manually or automatically at preset intervals, depending on the setting. See Setting the Reading Mode section for more information.

NOTICE

There is a removable light shield attached to the optical block to help prevent light from entering the optical block and affecting the readings. Be sure this shield is in place at all times when taking readings or doing a calibration to ensure reading accuracy.

7.0 Maintenance

7.1 Calibration

The CSM was tested and calibrated prior to leaving the factory. The instrument operates from a predetermined calibration curve for high accuracy. Calibration is recommended every 3 months or every time the reagents are replaced.

When performing calibration, a calibration kit (p/n 28159S) is necessary. The calibration kit includes:

- Low Range Copper/Silver (500 ml) (**Solution A** in Cal Procedure)
- Mid Range Silver (500 ml) (**Solution B** in Cal Procedure)
- High Range Copper/Silver (500 ml) (**Solution C** in Cal Procedure)
- DI Water (500 ml) (**Solution D** in the Cal Procedure)

NOTICE

There is a removable light shield attached to the optical block to help prevent light from entering the optical block and affecting the readings. Be sure this shield is in place at all times when taking readings or doing a calibration to ensure reading accuracy.

NOTICE

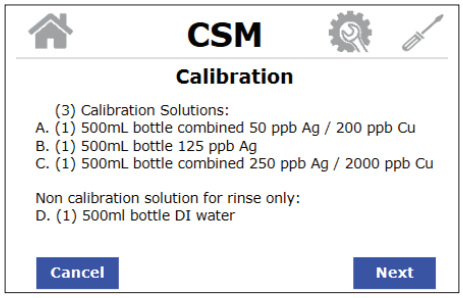
To ensure there is enough solution to complete the calibration, be sure that the Line Flush Duration setting is set to 10 seconds. See Adjusting the Line Flush Duration section in this manual for instructions on how to adjust this setting.

NOTICE

If new reagent was just installed in the CSM, be sure that the CSM has been primed and the new reagent is in the lines to ensure the new reagent is being used for the calibration procedure.

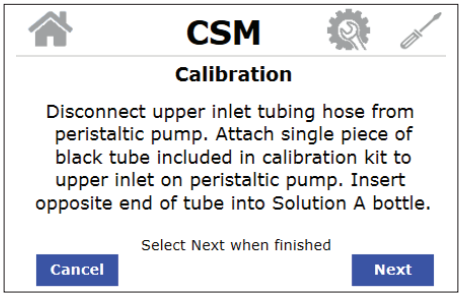
To recalibrate the CSM, follow the prompts on the screen.

1. From the screen, press **Service** to enter the Service Menu.
2. Press **CALIBRATE** to begin the Calibration sequence. Ensure you have the calibration kit ready, then press **NEXT**.

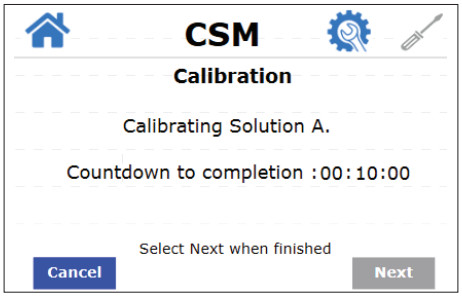


3. Turn off the water supply. Press **Next**.

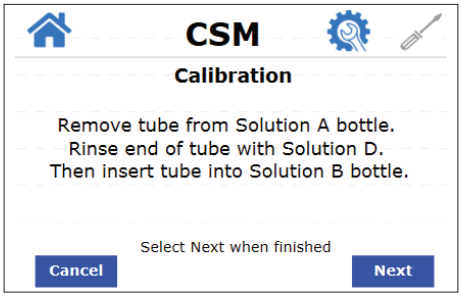
4. Disconnect the upper inlet tubing hose from the peristaltic pump and attach a single piece of black tubing included in the calibration kit to the upper inlet on the peristaltic pump. Insert the opposite end of the tubing into Solution A bottle (Low Range Copper/Silver). Press **Next**.



5. During this time, the software will take 1 silver reading and 1 copper reading and store the readings as calibration data. When the reading is captured, press **Next**.

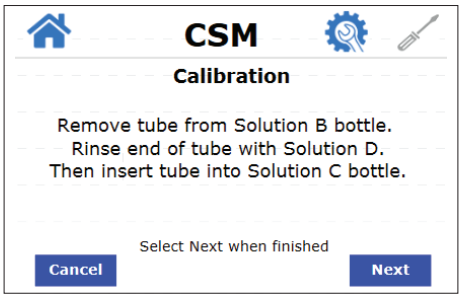


6. Remove tube from Solution A bottle, rinse with Solution D (DI water). Insert tube into Solution B bottle (Mid Range Silver). Press **Next**.



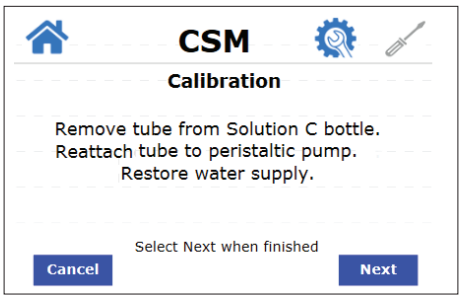
7. The instrument will take 1 silver reading and store the reading as calibration data. When the reading is captured, press **Next**.

8. Remove tube from Solution B bottle, rinse with Solution D. Insert tube into Solution C bottle (High Range Copper/Silver). Press **Next**.



9. The instrument will take 1 silver reading and 1 copper reading and store the reading as calibration data. When the reading is captured, press **Next**.

10. Remove tube from Solution C bottle and reattach tube to peristaltic pump. Restore the water supply and click **Next**.



Calibration is now complete. Calibration data is saved after all steps are complete. If calibration is canceled at any point in the calibration process, the last successful calibration data remains stored. The CSM returns to normal operation once calibration is complete.

8.0 Accessories and Replacement Parts List

Catalog Number	Accessory Description
25018S	Replacement Cuvette
28062	CSM Instrument
28141S	Pump Head Replacement Kit
28159S	Calibration Kit
28190S	Pressure Regulator Assembly
28162S	Tubing Replacement Kit
28163S	Reagent Kit
28164S	Air Pump Kit
28167S	Reagent Pump Kit
100184	Operation Manual, CSM
100003S	Solenoid Valve Kit
110154S	Tethered Light Shield Replacement Kit

To order any accessory or replacement parts, please contact the HF scientific Customer Service Department.

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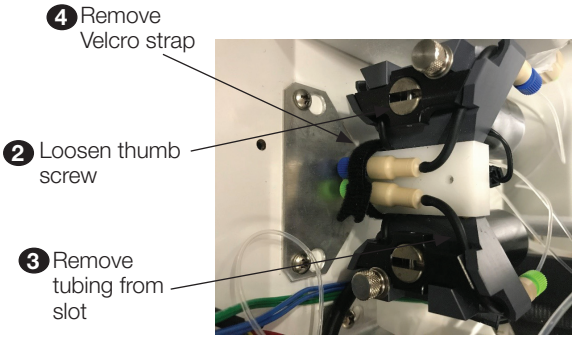
Fax: 239-454-0694
Email: hf.info@wattswater.com
Website: www.hfscientific.com

9.0 Maintenance

9.1 Replacing the Reagent Tubing (Kit #28162S)

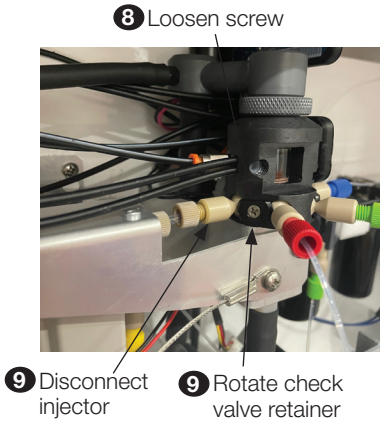
To replace the reagent tubing on the CSM instrument:



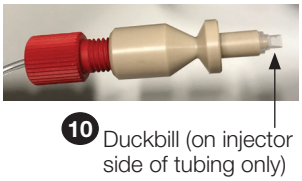
1. Disconnect tubing from reagent bag.
2. Loosen the thumbscrew on the reagent pump.
3. Remove tubing from slot on outside of reagent pump and pump balancing loops.
4. Remove Velcro strap holding reagent tubing in place on top of pump bracket.

If replacing silver indicator reagent tubing (yellow), continue on to step 5.
If replacing Green, Red and Blue reagent tubing, skip to step 8.

5. Using a screwdriver, loosen the screw on the optical assembly that holds the reagent injectors in place.
6. Rotate the check valve retainer 90 degrees and disconnect the injector from the optical assembly.
7. Remove two screws that hold solenoid bracket to the optical assembly bracket.



8. Rotate the check valve retainer 90° and disconnect the injector from the optical assembly.
9. Ensure duckbill was attached to injector upon removal. If not, remove duckbill from connection on optical assembly.

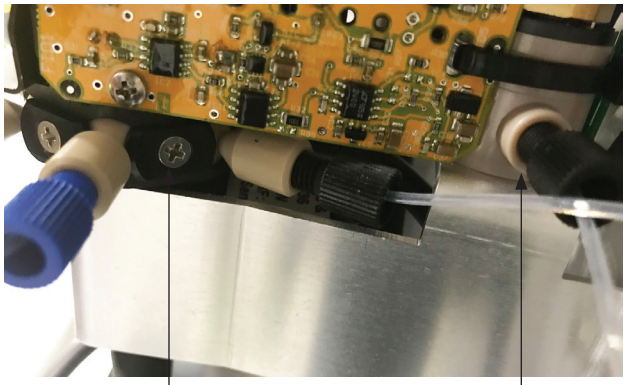


10. Place new injector with duck bill attached into the optical assembly.
11. Rotate the check valve retainer 90° and tighten screw to lock injector in place in the optical assembly.

If replacing silver indicator reagent tubing (yellow), continue on to step 13.
If replacing Green, Red and Blue reagent tubing, skip to step 16.

12. Insert short piece of new tubing into outlet fitting on solenoid valve. Insert other end into inlet fitting into optical injector.
13. Secure solenoid valve to bracket with 2 screws removed in step 6.
14. Insert end of new tubing into inlet of the solenoid valve.
15. Reuse Velcro strap to secure the reagent tubing check valves to the top of the pump bracket.
16. Guide tubing back into slot on outside of reagent pump and guide pump balancing loop into back slot of pump.
17. Tighten thumbscrew on the reagent pump.
18. Reattach tubing to reagent bag.

Replacing the Air Pump Tubing (Kit #28162S)



To replace the air pump tubing on the CSM instrument:

1. Loosen screw towards back right side of optical assembly to loosen the injector of the air pump tubing.
2. Rotate the check valve retainer 90° and disconnect the injector from the optical assembly. Be sure duckbill is still attached to injector.
3. Remove black fitting from air pump.
4. Insert new tubing into air pump.
5. Insert other end of tubing with injector and duckbill into the optical assembly.
6. Rotate the check valve retainer 90° and tighten screw to lock injector in place in the optical assembly.

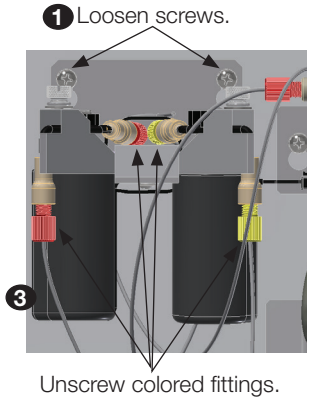
9.2 Replacing the Reagent Pump (Kit #28167S)

NOTICE

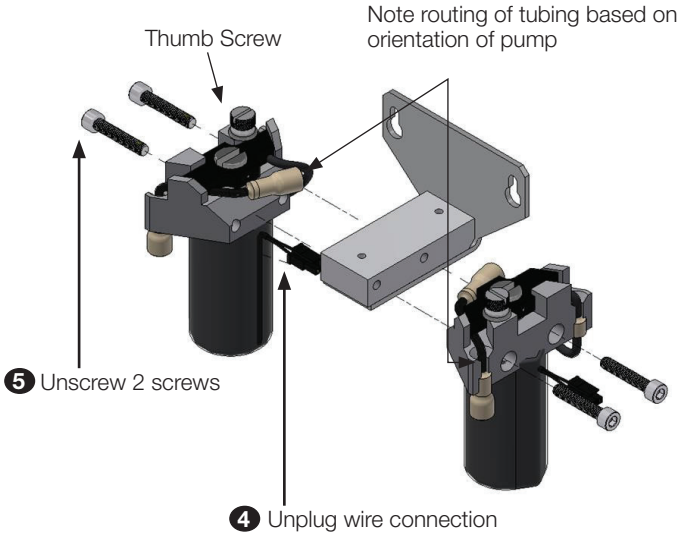
Take note of the orientation of the check valves and tubing. The placement of these items depends on the orientation of the pump being replaced. To change the orientation of the new pump, loosen thumb screw from the pump, remove check valves and tubing and route to the opposite side of pump. Tighten thumb screw. The check valve always needs to be towards the front of the pump when looking into the enclosure from the front.

To replace the reagent pump on the CSM instrument:

1. Loosen the 2 screws that hold the reagent pump bracket to the back panel.



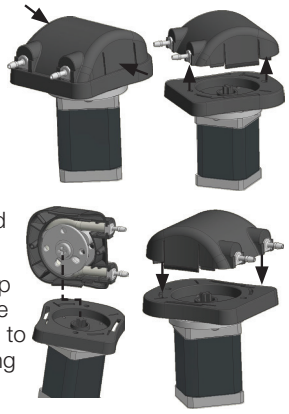
2. Lift the bracket assembly off of the screws.
3. Unscrew the colored fittings from the reagent pump.
4. Unplug the wire connection from the reagent pump.
5. Unscrew the 2 screws holding the reagent pump to the mounting block.



6. Install new reagent pump to the mounting block using the 2 screws removed in Step 5.
7. Plug wire connections into new reagent pump.
8. Screw in the colored fittings to new reagent pump.
9. Screw the reagent pump bracket to the back panel using the 2 screws that were loosened in Step 1.

9.3 Replacing the Peristaltic Pump (Kit #28141S)

To replace the peristaltic pump on the CSM instrument:

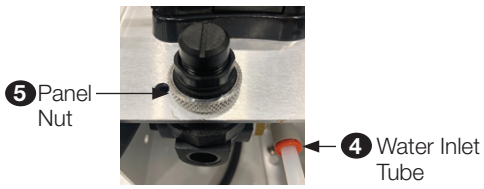


1. Push tabs in on sides and pull up to remove the pump head from the base.
2. Remove existing clamps and detach hoses. Take care to keep hose ends in good condition and note which hose is connected to the IN and which is connected to the OUT; these will need to be reattached to the new pump head in the same order.
3. Based on the arrows between the pump head fittings, reattach the IN hose to the IN pump head fitting and the OUT hose to the OUT pump head fitting. Secure using the new clamps.
4. Align the cutout of the pressure rotor with the cutout in the base.
5. Lower the new pump head down to securely reattach it to the base.

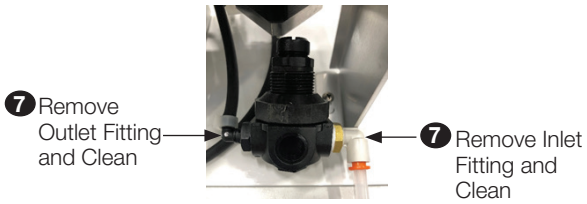
9.4 Replacing the Pressure Regulator Assembly (Kit #28190S)

To replace the pressure regulator assembly on the CSM instrument:

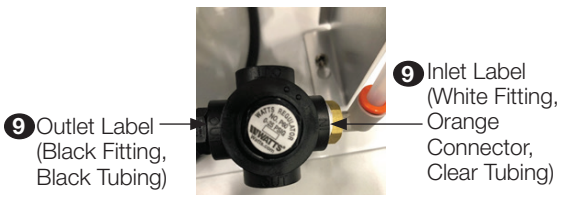
1. Turn off water to the CSM instrument.
2. Loosen the screws on the bracket connecting the pressure regulator to the back panel.
3. Lift bracket and attached components from back panel.
4. Loosen the water inlet tube (orange) from the pressure regulator.



5. Remove the panel nut that holds the regulator in place.
6. Lower the regulator down through the bracket.
7. Remove fittings (x2) from inlet and outlet of regulator. Be sure to note “IN and “OUT” positions of the regulator.



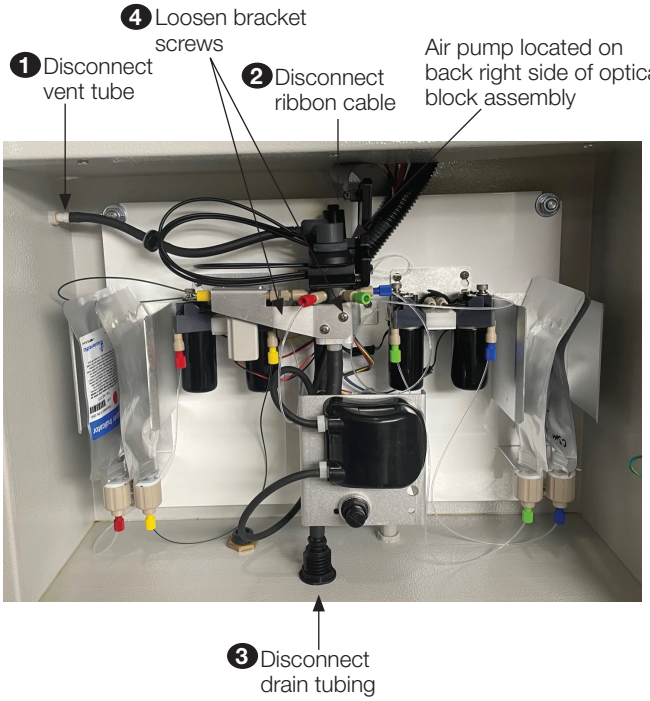
8. Clean off the old fittings and apply new Tellon tape to the threads of the fittings.
9. Reinstall the fittings into the new regulator in the same orientation as the original. Be sure the “IN” and “OUT” positions are orientated the same as the old regulator. “IN” and “OUT” are labeled on the pressure regulator.



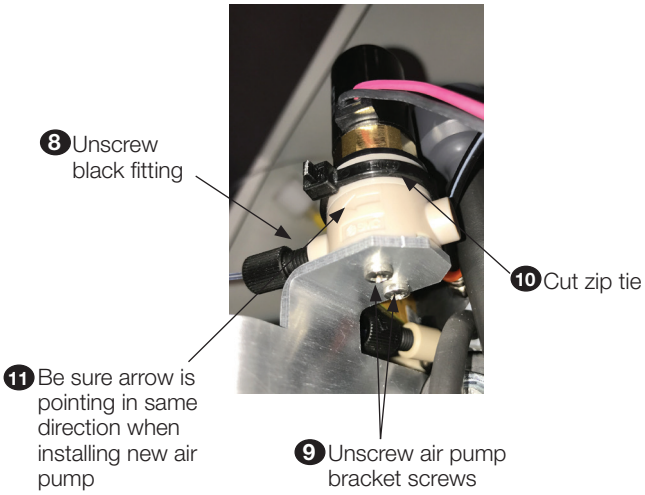
10. Place the regulator back into the brackets and secure into place with panel nut.
11. Reattach bracket and attached components to the back panel and tighten screws loosened in step 2.
12. Insert the water tubing back into the push to connect inlet fitting.
13. Turn water supply to CSM instrument back on.
14. Turn CSM instrument on and check for leaks.

9.5 Replacing the Air Pump (Kit #28164S)

To replace the air pump on the CSM instrument:



1. Disconnect the vent tube from the side of the cabinet.
2. Disconnect the ribbon cable from the optical board.
3. Loosen the press to connect fitting and disconnect the drain tubing at the bottom of the enclosure.
4. Loosen the optical block assembly bracket screws. This is the bracket that holds the optical block assembly to the back panel.
5. Lift optical block assembly up and off of bracket screws.
6. Pull optical block assembly forward to access the air pump. The air pump is located on the back right hand side.
7. Disconnect the black and pink air pump wiring (connection located in the electrical panel).



8. Unscrew black fitting from air pump.
9. Unscrew 2 screws from underneath air pump bracket.
10. Cut the zip tie that attaches the air pump to the optical board and then remove air pump.
11. Insert new air pump. Be sure the arrow on the new air pump is facing the correct direction.
12. Install 2 screws from underneath air pump bracket.
13. Attach air pump to optical board using the included zip tie.
14. Screw in black fitting into air pump outlet.
15. Reconnect the black and pink air pump wiring (connection located in the electrical panel).
16. Slide the optical assembly with new air pump back to original position.
17. Place optical block assembly onto bracket screws located on the back panel of the enclosure.
18. Tighten the optical block assembly bracket screws.

NOTICE

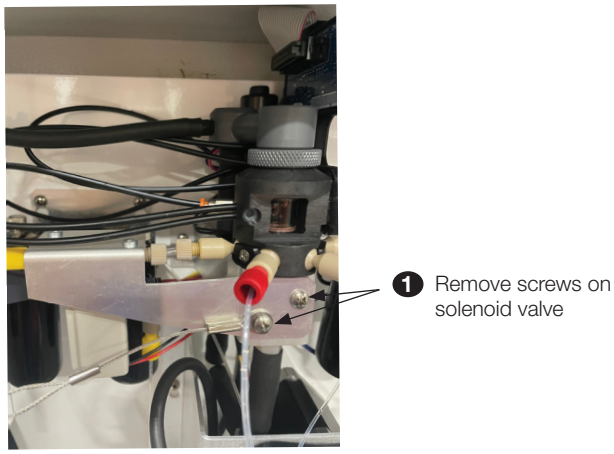
To prevent damage to the wiring, ensure wiring is routed behind bracket and not pinched between the bracket and the back panel of the enclosure.

19. Reconnect the drain tubing, ribbon cable and vent tube.

9.6 Replacing the Solenoid Valve

To replace the solenoid valve on the CSM instrument:

1. Remove the two solenoid valve mounting screws.



2. Unplug wiring from harness.

3. Remove fittings from solenoid valve inlet and outlet.
4. Attach fitting to new solenoid valve inlet and outlet.
5. Install reagent tubing to both sides of solenoid valve.
6. Plug in wiring to harness.
7. Reinstall two screws removed in step 1.

10.0 Troubleshooting

Symptoms	Possible Cause	Solution
4-20mA output repeats 2-3 times. (Frozen reading)	Fault Error.	Visually inspect the instrument and correct the fault.
No sample water intake.	Inlet water line clogged.	Add a filter to the inlet water line.

For technical assistance, please contact the HF scientific Technical Services Department.

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11.0 Warranty

Watts Regulator Co. (the “Company”) warrants each municipal market instrument product to be free from defects in material and workmanship under normal usage for a period of one (1) year from first use or two (2) years from date of the Company’s invoice from the original sale of the product, whichever occurs first. In the event of such defects within the warranty period, the Company will, at its option, replace or recondition the product without charge. Parts which by their nature are normally required to be replaced periodically, consistent with normal maintenance, specifically reagents, desiccant, sensors, electrodes and fuses, are excluded. Also excluded are accessories and supply-type items.

Proof of purchase from the Company (Company invoice or paid order confirmation) and/or first use (commissioning) must be provided when making a product warranty claim.

THE WARRANTY SET FORTH HEREIN IS GIVEN EXPRESSLY AND IS THE ONLY WARRANTY GIVEN BY THE COMPANY WITH RESPECT TO THE PRODUCT. THE COMPANY MAKES NO OTHER WARRANTIES, EXPRESSED OR IMPLIED. THE COMPANY HEREBY SPECIFICALLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The remedy described in the first paragraph of this warranty shall constitute the sole and exclusive remedy for breach of warranty, and the Company shall not be responsible for any incidental, special or consequential damages, including without limitation, lost profits or the cost of repairing or replacing other property which is damaged if this product does not work properly, other costs resulting from labor charges, delays, vandalism, negligence, fouling caused by foreign material, damage from adverse water conditions, chemical, or any other circumstances over which the Company has no control. In addition, the Company shall not be responsible for any costs incidental to the Company’s warranty response efforts, including, without limitation, costs associated with the removal and replacement of systems, structures or other parts of facilities, de-installation, decontamination and re-installation of products, or transportation of products to and from the Company. This warranty shall be invalidated by any abuse, misuse, misapplication, improper installation or improper maintenance of the product, alteration of the product or use of any parts or accessories (including but not limited to reagents) not provided by the Company.

Some states do not allow limitations on how long an implied warranty lasts, and some states do not allow the exclusion or limitation of incidental or consequential damages. Therefore the above limitations may not apply to you. This Limited Warranty gives you specific legal rights, and you may have other rights that vary from State to State. You should consult applicable state laws to determine your rights. **SO FAR AS IS CONSISTENT WITH APPLICABLE STATE LAW, ANY IMPLIED WARRANTIES THAT MAY NOT BE DISCLAIMED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO ONE YEAR FROM THE DATE OF ORIGINAL SHIPMENT.**

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