HYDROGUARD®
HG-602
Water Quality Analyzer

User Manual

Document ID HG602UM1.6

Disclaimer

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Trademark Acknowledgements

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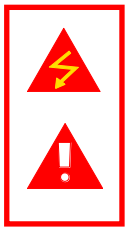
1 General Safety Precautions



This section presents important information intended to ensure safe and effective use of this product.

Read the following carefully before handling the product. These warnings and cautions must be followed carefully to avoid injury to yourself or damage to equipment.

Warning: Only properly trained and licensed electricians should attempt to wire or service the electronic components of the analyzer/controller.	Attention! Seuls des électriciens qualifiés ayant reçu la formation adéquate peuvent entreprendre le branchement, l'entretien ou la réparation des composants électroniques de l'analyseur/du contrôleur.
There is an Electrical Shock Hazard when servicing this system.	Il existe un risque de choc électrique lors de l'entretien de ce système.
Always verify that all electrical power source(s) are off before opening the analyzer/controller unit or attempting to service electronic components or wiring.	Ayez soin de toujours vérifier que la ou les source(s) d'alimentation électrique est ou sont bien déconnectée(s) avant d'ouvrir l'unité ou d'entreprendre toute opération de service technique et tout branchement des composants électroniques.
Caution: Extreme caution should be used when installing, operating, and maintaining the HYDROGUARD® Analyzer. Only properly trained technicians are authorized to install and maintain the analyzer/controller.	Attention! Il y a lieu d'agir avec une extrême prudence lors de l'installation, de la mise en œuvre et de la maintenance l'HYDROGUARD®. Seuls des techniciens dûment formés à cet effet sont autorisés à effectuer l'installation et la maintenance de l'analyseur/du contrôleur.
Only properly trained and licensed operators should attempt to make any changes to chemical dosing levels.	Seuls des opérateurs qualifiés ayant reçu la formation adéquate sont habilités à modifier les dosages des produits chimiques utilisés.
Always follow local health and safety regulations when performing any service on the analyzer/controller unit or when changing chemical dosing settings.	Conformez-vous sans exception aux consignes locales de santé et de sécurité lorsque vous effectuez toute opération technique sur l'analyseur/le contrôleur, ou lorsque vous modifiez les paramètres de dosages chimiques.
The main power supply may be connected to either 110-120 or 220-240VAC 50/60Hz. Switching between voltages is accomplished by changing two (2) jumpers located above the main power connection, to the left of the transformer. For 110-120VAC, a 1amp fuse should be use; for 220-240VAC, a 0.5amp fuse should be used. These changes must be completed prior to wiring.	L'alimentation générale peut être branchée sur 110-120 ou sur 220-240VAC 50/60Hz. Pour basculer d'une tension à l'autre, il suffit de changer les deux (2) cavaliers situés au-dessus de la principale connexion électrique, à gauche du transformateur. Une tension à 110-120VAC requiert un fusible de 1 Amp. ; une tension à 220-240VAC requiert un fusible de 0,5 Amp. Ces modifications doivent être accomplies avant le branchement électrique.
Caution: Before connecting to a power source, confirm that both jumpers are located on the correct voltage and that the appropriate fuse is in place.	Précautions! Avant de relier l'appareil à une quelconque alimentation électrique, vérifiez que les deux cavaliers sont situés sur les valeurs correctes de tension et que c'est le bon fusible qui est en place.

Each relay connection is limited to 4 amps, to prevent overheating. The relays may show a higher rating but do not connect equipment exceeding 4 amps.

Chaque connexion relais est limitée à 4 Amp. afin d'éviter toute surchauffe. Même si les relais affichent éventuellement une valeur supérieure, ils ne se connecteront pas à un élément dépassant 4 Amp.

All electrical connections should comply with National Electrical Code (NEC) and all local regulations.

Tous les branchements électriques doivent être conformes au Code Electrique National (NEC – *National Electrical Code*) ainsi qu'à toutes les consignes locales.

Caution: Do not use chemicals that reduce the surface tension. When using hydrochloric acid, observe all safety regulations.

Attention! N'utilisez pas de produits chimiques susceptibles de réduire la tension superficielle. Lors de l'utilisation d'acide chlorhydrique, appliquez scrupuleusement toutes les consignes pertinentes.

Electrodes:
Warning: Do not swallow the electrolyte. Avoid electrolyte contact with skin or eyes. In case of accidental contact, wash with a lot of cold water! In case of eye inflammation, contact a doctor immediately. Wear safety glasses and gloves when working with the electrolyte solution.

Les électrodes:
Attention! N'avalez pas de substance électrolyte. Evitez tout contact de l'électrolyte avec la peau ou les yeux. En cas de contact accidentel avec cette substance, rincez abondamment à l'eau froide! En cas d'inflammation oculaire, consultez immédiatement un médecin. Portez des lunettes et des gants de protection lors de la manipulation de la solution électrolyte.

Caution: Do not touch or damage the electrodes. The electrolyte is sensitive to oxidation: Always keep the electrolyte bottle closed after use. Do not transfer the electrolyte to other containers. The electrolyte should not be stored for more than one year and should be clear (not yellow) in appearance (for use by date, see label). Avoid forming air bubbles when pouring the electrolyte into the measuring chamber.

Attention! Ne touchez pas ni n'abîmez les électrodes. L'électrolyte est sensible à l'oxydation. Maintenez la bouteille contenant l'électrolyte toujours fermée après utilisation. Ne transvasez pas l'électrolyte dans d'autres récipients. L'électrolyte ne doit pas être conservé plus d'un an et doit garder une apparence claire (pas jaunâtre) (pour la période d'utilisation, voir l'étiquette). Evitez la formation de bulles d'air en versant la solution électrolyte dans le compartiment de dosage.

Caution: HYDROGUARD's control board unit should not be opened except for initial installation and troubleshooting, and should only be opened by a trained and approved technician.

Attention! Le tableau de commandes de l'HYDROGUARD ne doit en aucun cas être ouvert si ce n'est lors de l'installation initiale et en cas de dépannage – auquel cas son ouverture ne doit être effectuée que par un technicien ayant reçu la formation adéquate et dûment habilité.

2 Measurements and Features

The HYDROGUARD 602 can be configured to measure any combination of the following water quality parameters.

Available Measurements

- Free Cl (Amperometric)

OR

- Total Cl (Amperometric)

Additional Measurements

- Temperature (default with CL, pH, EC)
- Redox (ORP)
- pH
- Turbidity
- Conductivity (inductive or conductive)
- Flow rate

Note: It is highly recommended to include pH measurements as this will provide automatic compensation for the Cl measurement.

Optional communication protocol

- Modbus Protocol
- Blue I Protocol

Communication options:

- Internal 4 to 20 mA outputs (up to 6 channels)
- Ethernet

2.1 System Components

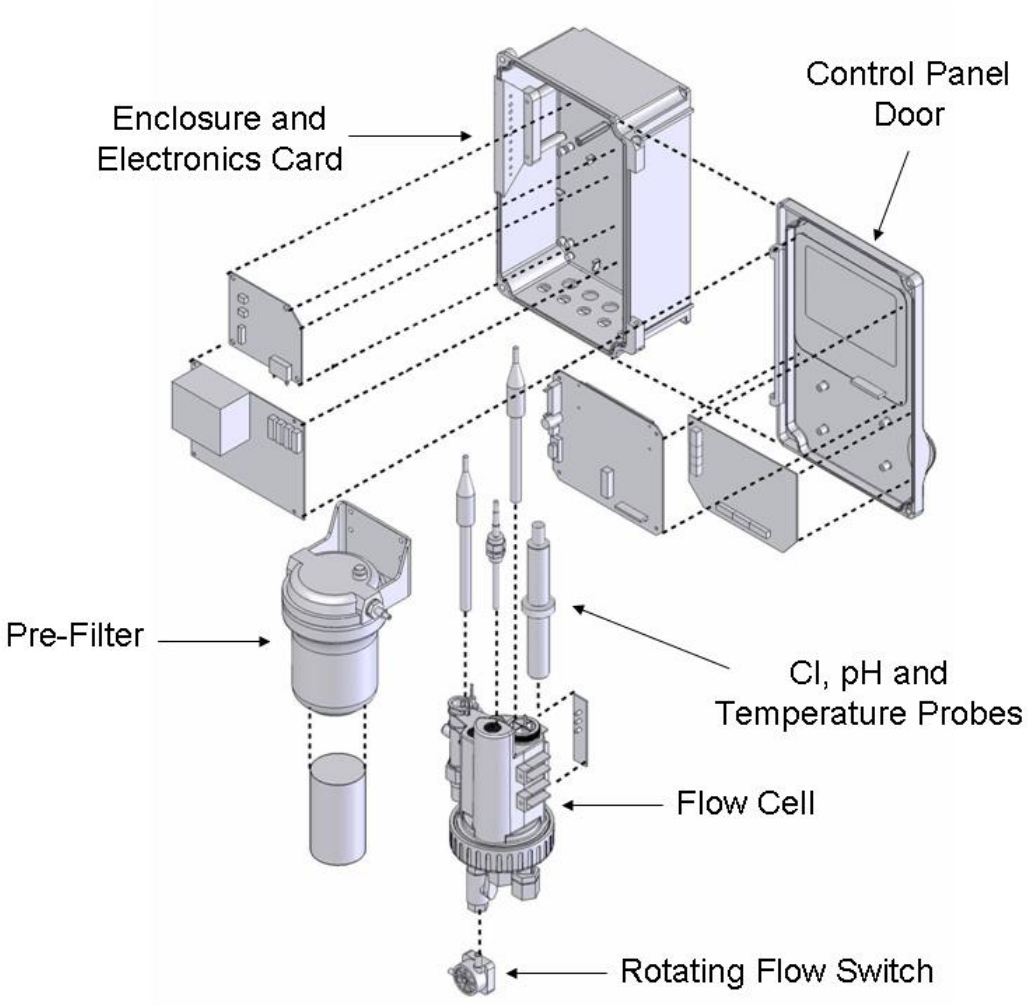


Figure 1: System Drawing

3 Installation

3.1 Working Environment

Pollution Degree: 2
Installation Category: 2
Altitude: 2,000 m
Humidity: 1 to 90% non-condensing
Electrical Supply: 100-115Vac, 1.0A or 200-230Vac, 0.5A, 50/60Hz
Temperature: 5°C to 45°C

3.2 Plumbing Requirements and Installation

This section explains the plumbing requirements necessary for installation.

3.2.1 Water Supply

HYDROGUARD requires a pressurized water supply to the flow cell, which must be adjusted less than 1 Bar (14.5psi) entering the pre-filter. A fitting is supplied for 6mm (1/4") tubing; however other tubing and fittings may be attached to the 3/8" FNPT connector on the pre-filter.

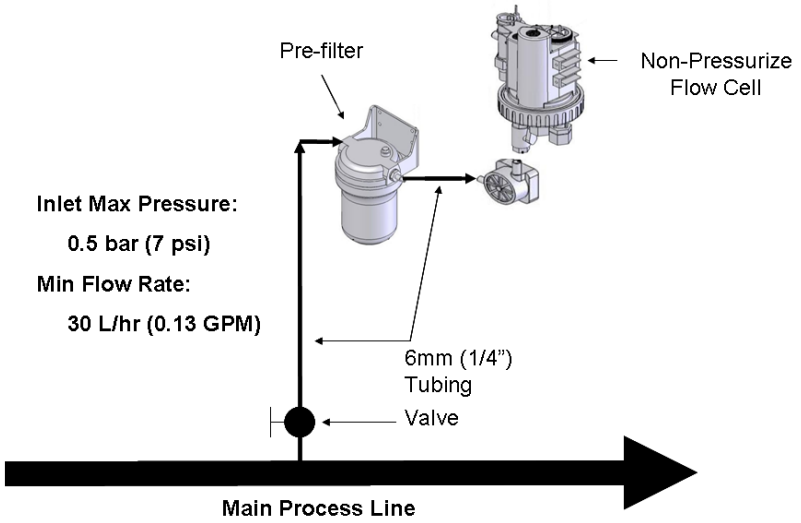


Figure 2: Water Supply Assembly

The distance from the main process pipe should be as short as possible, in order to minimize the delay time between the water being sampled and HYDROGUARD testing water.

3.2.2 Water Return

A gravity drain (zero pressure) is required from the outlet of the flow cell. A ¼" FNPT (8 mm) fitting is supplied for the flow cell drain connection. Make sure the outlet pipe is wider than the inlet pipe to ensure sufficient flow.

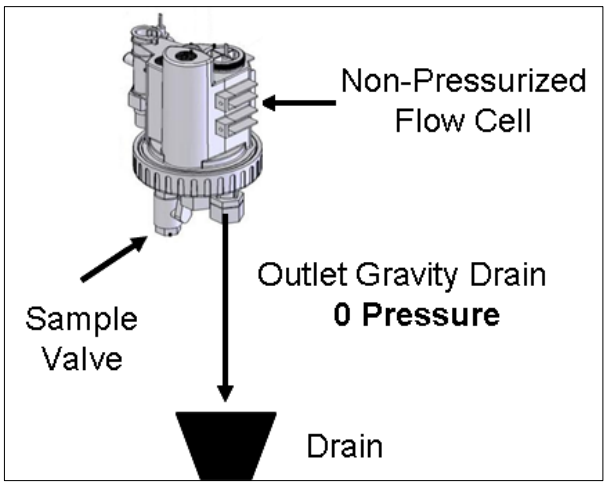


Figure 3: Water Return

3.3 Electrical Requirements and Installation

HYDROGUARD requires a 90-120 or 190-240 VAC, 50/60 Hz electrical power source. The main HYDROGUARD power supply should be connected to a non-dependent power supply so that the unit remains powered constantly. Any relays used to directly activate equipment should be powered by a dependent power supply (interlocked power supply).

3.3.1 Connecting the Main Electrical Power

The Main Power Supply may be connected to either 90-120 or 190-240 VAC 50/60Hz. Switching between voltages is accomplished by changing two (2) jumpers located above the main power connection, to the left of the transformer. For 90-120VAC, a 1-amp fuse should be used; for 190-240 VAC, a 0.5-amp fuse should be used. These changes must be completed prior to wiring.

Caution: Before making a connection to a power source, confirm that both the J21 and J22 jumpers are located on the correct voltage and that the appropriate fuse is in place (1.0 A for 110V and 0.5 A for 220V).

To connect the main electrical power:

1. Verify that the power switch or circuit breaker to the non-dependent power source is off.
2. Connect the line (live) wire to the I/O board connector marked Line.

3. Connect the neutral wire to the I/O board connector marked Neutral.
4. Connect the earth wire to the I/O Module connector marked Ground.
5. Continue with the other electrical connections.
6. Turn on electrical power only after all electrical connections have been completed.

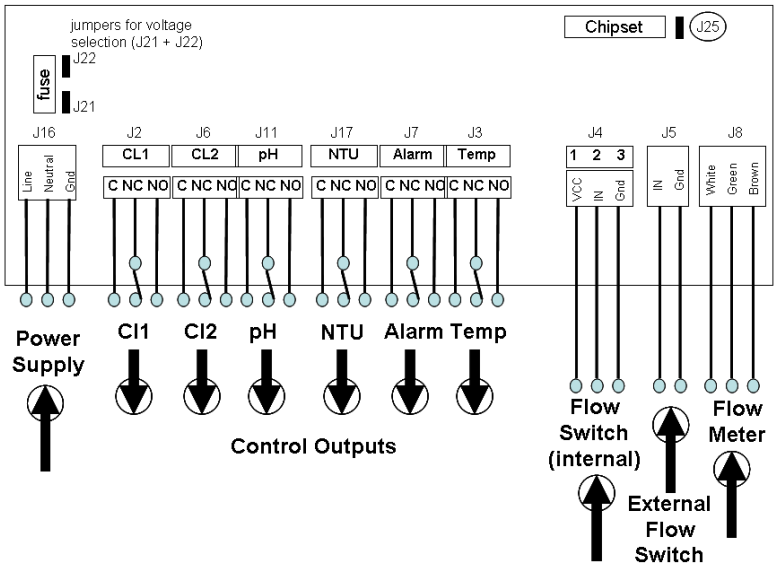


Figure 4: I/O Board

3.3.2 Input Switches

Flow input switch terminal blocks on the I/O module allow for three input switches to be connected to the system as additional layers of security against accidental chemical dosing when there is no flow.

Two flow switches and one flow meter may be connected:

- Flow Switch (internal): Flow switch connected to the flow cell of the analyzer. Supports both 2 and 3 wire flow switches.
  - If a 2 wire switch is used, it should be connected to the “In” and “GND” connections. If a 3 wire switch is used, the “VCC” connection will also be used.
- External Flow Switch ("external off"): Connection for an external 2-wire flow switch. If an external switch is not connected, a jumper must be installed for the analyzer to operate properly.

- Flow Meter: Connection for 2 or 3 wire flow meter where:
  - White = VCC
  - Green = IN
  - Brown = Ground

Note: Electrical connections in this section are ONLY recommendations. All electrical connections should comply with National Electrical Code (NEC) and all local regulations.

3.4 Installing Sensors

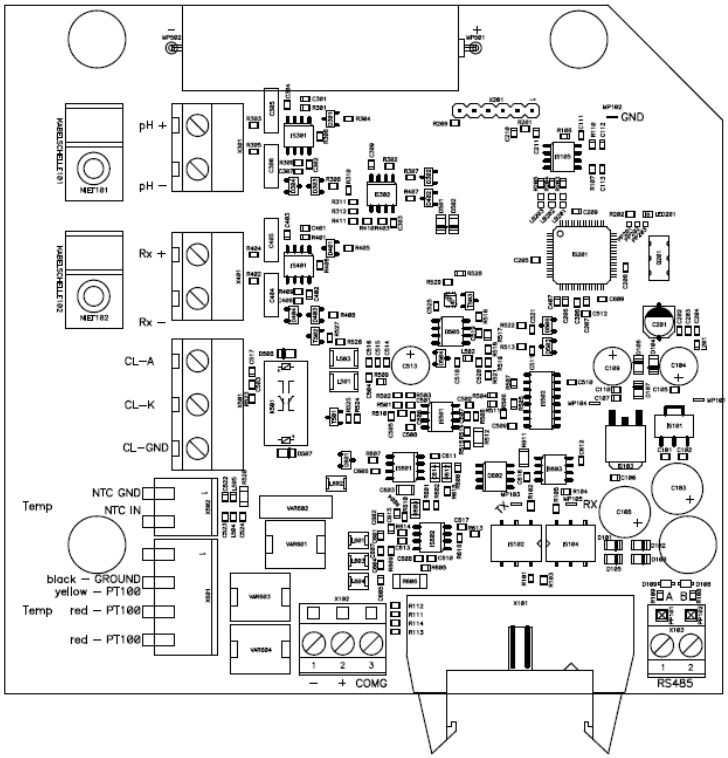


Figure 5: Sensors Card Drawing (pH-ORP-AMP-Tempr.Card)

NOTE: pH, ORP, and Cl sensors MUST be kept wet at all times. Fill the flow cell with water before installing sensors.

3.4.1 Free Cl Sensor

The Free Cl Sensor is supplied from the factory pre-filled with electrolyte solution and will not require filling at start-up unless the Sensor was allowed to dry-out or was damaged.

1. Install the Sensor into the large opening on the top of the flow cell and HAND-Tighten.
2. Route the wires through an open hole in the gasket and connect to the pH/Amp/Temp electronics card
    a. Connect wire K to CL-K terminal block
    b. Connect wire A to the CL-A terminal block
    c. Connect unmarked (ground) wire to the grounding tab on the terminal block.

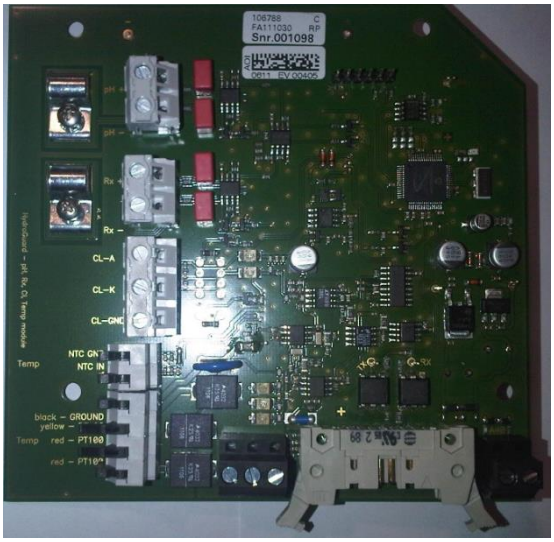


Figure 6: Sensors Card (pH-ORP-AMP-Tempr.Card)

3.4.2 pH or ORP Sensor

1. Install the Sensor into either ½" opening on the top of the flow cell and hand-tighten.
2. Route the wire through an open hole in the gasket and connect to the pH/ORP/Temp electronics card:
    a. Connect the center wire to the pH or ORP (+) terminal block.
    b. Connect the clamp onto the outside of the wire being sure that wire mesh is in contact with the metal plate on the electronics card.
    c. The pH or ORP (-) terminal block will remain empty.
3. Connect the wire to the sensor:
    - Press the connector onto the top of the Sensor and hand tighten.
4. If pH and/or ORP are not connected, a jumper wire MUST be placed between the (+) and (-) terminal blocks and a second jumper to the temperature Sensor ground connection (black wire).

3.4.3 Temperature Sensor (PT-100)

1. Install the Sensor into the yellow compression fitting opening.
    - Connect the red wires to the connection labeled red*.

      *Either red wire may go to either connection.

4 First Time Operation and Calibration

4.1 Menus and Settings

HYDROGUARD has two menu levels: Operator and Technician. The Operator menu includes settings that may be controlled by on-site operators. The Technician menu includes settings and calibrations that should be restricted to specially- trained HYDROGUARD maintenance technicians. Each menu has a separate password. The technician level password may be used whenever a password is required, however the operator password will only be accepted in the operator menu.

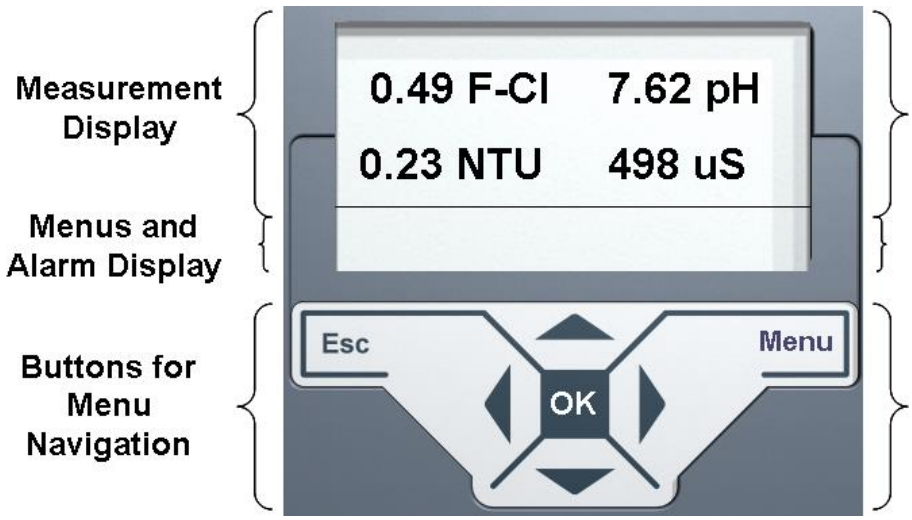


Figure 8: System Display

Note: The default Operator Password is: 123 and the default Technician Password is: 456.

Caution: DO NOT FORGET YOUR PASSWORD! There is no way to reset the technician password without a complete reprogramming of the HYDROGUARD System.

4.2 Setting Up the Technician Password

Use the following procedure to set up the password for Technician. The default password is “456”. You may change the password but be sure to save it in a secure place. If necessary you can restore the password easily.

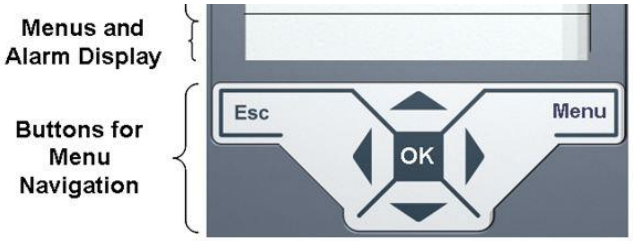


Figure 9: User Interface Touchpad

1. Press **Menu**. At the same time use the arrow keys to select the number "83" in the Menus and Alarm Display section of the HYDROGUARD Control Panel.
2. To change the password:
    a. Enter the previous password.
    b. Enter the new password.
    c. Confirm the new password.

Each of the parameters in the operator menu is configured in the same way. The following procedure describes how to configure a typical setting:

1. Locate the desired parameter in the menu:
    - Press Menu until the desired parameter name appears in the LCD display.
2. Press OK. The number 100 appears on the LCD display Enter the password.
3. Enter the Operator password (or technician password; both are accepted).
4. Press the up arrow or down arrow until the password number is reached.

Holding Menu while pressing the up or down keys will advance the first digit. Holding the up or down keys for an extended period of time will proceed through the numbers more quickly.

5. Press OK to accept the password. The parameter name and current setting appear in the LCD display.
6. Press OK again. The LCD display shows the parameter and the current setting.
7. Enter the new parameter setting:
    - Press the up arrow or down arrow until the desired value is reached.
    - The second row of the menu display, below the value that is being changed, shows the current value.
8. Press OK to save the new setting or Esc to abort without saving the new setting.

To change the settings of additional parameters, press Menu until the desired parameter appears in the LCD display and repeat steps 6-8 above to set the new parameter. Table 1 on the right outlines an example of menu settings.

Menu	Value
Low Cl Alarm	0.50
High Cl Alarm	4.00
Low pH	6.5
High pH	8.5
Low Temp	20
High Temp	30

Table 1: Menu Settings

4.2.1 Setting the Display Language

Use the information in Table 2 to choose the display language.

Menu Number	Main Menu Parameter
35	Language
	English
	French
	Italian
	German
	Spanish
	Portuguese
	Russian
	Hebrew

Table 2: Language Setting

The following procedure describes how to configure the display language:

1. Locate the desired parameter in the menu. Press **Menu** until the Language parameter appears in the LCD display.
2. Press **OK**. The number 100 appears on the LCD display. Enter the password.
3. Enter the Operator password (or technician password; both are accepted).
4. Press the up arrow or down arrow until the password number is reached.

Holding **Menu** while pressing the up or down keys will advance the first digit. Holding the up or down keys for an extended period of time will proceed through the numbers more quickly.

5. Press **OK** to accept the password. The parameter name and current setting appear in the LCD display.
6. Press **OK** again. The LCD display shows the parameter and the current setting.
7. Enter the new parameter setting by pressing the up arrow or down arrow until the desired value is reached. The second row of the menu

display, below the value that is being changed, shows the current value.

8. Press **OK** to save the new setting or **Esc** to abort without saving the new setting.

To enter the Technician Menu

Press Menu to enter the operator menu then press the UP and DOWN keys together until the display changes to menu # 51. Navigate the menus exactly the same as the operator menus, but the technician password is the only password accepted.

4.3 Configuring Internal 4-20mA Outputs

The menu for internal 4-20mA settings is found in the technician menu.

1. Set the 4-20mA outputs:
    a. Enter the technician menu and scroll until “4-20 Settings” appears in the LCD.
    b. Enter the technician password and press OK.
    c. Select the Output Channel (1 to 2 Built-In or 1 to 4 on NTU/4-20 card).
    d. Select the Output Parameter (Free Cl, Total Cl, pH, etc.).
    e. Select the Min Value for 4mA.
    f. Select the Max Value for 20mA.
    g. Test the output (with multimeter set on mA) using the test output settings will help adjust the external unit (PLC).

Repeat the preceding steps for the remaining outputs. Table 3 on the right outlines some example settings. Note that a single variable may be the output of more than one channel.

Channel	Variable	Min Value	Max Value
1	Free Cl	0	10
2	Total Cl	0	10
3	Total Cl	0	10
4	pH	4	10

Table 3: Set Up

2. Set the 4-20mA alarm output:
    - 2mA, 4mA, 20mA, or hold last value.

The 4-20 alarm output is the output value that will be sent in case of a problem with the HYDROGUARD that does not have flow or cannot perform a test (e.g. stuck piston or unclean cell). In case of low or high level (i.e. low chlorine), no 4-20mA alarm will be activated.

4.3.1 Chlorine 4-20mA Control

For Chlorine Only, the 4-20mA output may be set to Read or Control.

- Read Mode will operate like the standard 4-20mA output and send an output related to the measured value. See *Configuring Internal 4-20mA Outputs*.
- Control Mode will send an output to control the feed system based on:
  - Measured value
  - Cl set-point 1
  - Cl P-factor

The Control Mode has two options: normal and inverted ("Invert" in the menu)

Normal:

4 mA = No Cl Dosing
20mA = Max Cl Dosing

Inverted:

20mA = No Cl Dosing
4 mA = Max Cl Dosing

In order to use the Control feature, the dosing system must be capable of adjusting the dosing rate based on the 4-20mA Input.

Turn the Control Mode ON and follow this procedure:

a. Enter the technician password and press OK.
b. Select the Output Channel (1 to 2 onboard or 1 to 4 on NTU/4-20 card).
c. Select F-CL or T-CL as the output Parameter and press OK.
d. Select Control and press OK.
e. Select Normal or Invert and press OK.

You will also need to adjust the Cl P-factor (technician menu). A low P-factor will make slower changes in Cl dosing; a high P-factor will make faster changes to Cl dosing.

If the chlorine requirement in your system is relatively stable, use a lower P-factor. If the chlorine requirement (due to changes in flow or demand) changes quickly in your system, use a higher P-factor.

4.4 Chlorine Shock Mode

A chlorine shock mode is available to provide a high level of chlorine for a relatively short period of time.

Two menus control this feature:

1. Shock Chlorination
2. Cl Shock Set-point
   - Duration

During normal operation, the analyzer controller operates Cl dosing systems based on Cl Set Point 1.

When Cl Shock mode is turned ON, the controller will automatically control the Cl dosing system based on the Cl Shock Set Point. This will only affect Cl relay #1 and the 4-20mA Control Output. Cl relay #2 will still be controlled based on Cl Set Point #2.

Once the Cl Shock Mode is turned ON, the controller operates the Cl Shock Set Point for the user-selected duration. Then the controller automatically shuts Cl Chlorination Mode to OFF and returns to operating the Cl Set Point 1.

To Turn on Cl Shock Mode:

1. Enter the Cl Shock Set Point, Press OK.
2. Enter the Duration, Press OK.
3. Turn Cl Shock Mode ON.

You will also need to adjust the Cl P-factor on the technician menu. A low P-factor will make slower changes in Cl dosing; a high P-factor will make faster changes to Cl dosing. If you have trouble reaching the Cl Set Point, use a higher P-factor. If you greatly overshoot the Set Point, use a lower P-factor.

4.5 Modbus Communication Protocol

Modbus is a serial communications protocol, which allows for communication between many devices connected to the same network.

Note

If the HYDROGUARD analyzer is configured for **Modbus over Ethernet communication**, please refer to the setup instructions for this configuration and how to find the HG's IP at **http://www.blueitechnologies.com/products/hydroguard-hg-602/**

Modbus is configured via the technician menus.

1. To enter the Technician menu, press Menu to enter the operator menu and then press the up arrow and down arrow simultaneously until the menu display changes.
2. Locate the "Modbus com format" in the menu:
   - Press Menu until the desired parameter name appears in the LCD display.
   - Press OK. "Enter Password 100" appears on the LCD display.
3. Enter the Technician menu password:
   - Press the up arrow or down arrow until the correct password number is reached.
   - Press OK. The parameter name and current setting appear in the LCD display.

Note

The Technician menu password is different from the Operator menu password. The default Technician menu password is 456 and if lost, can only be reset by replacing the chipset.

4. Press OK, again. The LCD display shows the parameter and the current setting.
5. Enter the new parameter setting:
   - Press the up arrow or down arrow until the desired parameter value is reached, according to the options listed in Table 5.
   - The second row of the menu display, below the value that is being changed, shows the current value.
6. Press Enter to save the new setting or Esc to abort without saving the new setting.

Table 4: Modbus Configuration Options

Parameter value	Bit 4 2 stop / 1 stop bit	Bit 3 Floating point / Swapped floating point	Bit 2 19200bps / 9600bps	Bit 1 Parity Even / Odd	Bit 0 Parity / No parity
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	0
10	0	1	0	0	1
11	0	1	0	1	0
12	0	1	0	1	1
13	0	1	1	0	0
14	0	1	1	0	1
15	0	1	1	1	0
16	0	1	1	1	1
17	1	0	0	0	0
18	1	0	0	0	1
19	1	0	0	1	0
20	1	0	0	1	1
21	1	0	1	0	0
22	1	0	1	0	1
23	1	0	1	1	0
24	1	0	1	1	1
25	1	1	0	0	0
26	1	1	0	0	1
27	1	1	0	1	0
28	1	1	0	1	1
29	1	1	1	0	0
30	1	1	1	1	0
31	1	1	1	1	1

Table 5: Modbus Communications Options

Parameter's Name	Type	Address	Notes
Chlor main pump	Coil	0	
Chlor Addition. pump	Coil	1	
Acid/ Base Pump	Coil	2	
Turbidity cleaner	Coil	3	
Temperature control	Coil	4	
Alarm Lamp	Coil	5	
Low Reagent	Discrete Input	10015	
Alkali/Acid	Discrete Input	10016	
Flow sensor connection	Discrete Input	10017	
Turbidity module connection	Discrete Input	10018	
Chlorine averaging enable	Discrete Input	10019	
Chlorine <0.1 alarm enable	Discrete Input	10020	
Celsius/Fahrenheit	Discrete Input	10021	
Total Chlorine On/Off	Discrete Input	10022	
M3/H / GPM	Discrete Input	10023	
Free chlorine On/Off	Discrete Input	10024	
ORP On/Off	Discrete Input	10025	
pH On/Off	Discrete Input	10026	
Conductivity 4-20(1) On/Off	Discrete Input	10027	
No Flow	Discrete Input	10032	
Low Flow	Discrete Input	10033	
No Reagents	Discrete Input	10034	
Chlorine<0.1	Discrete Input	10035	
ORP>XXX	Discrete Input	10036	
Unclean cell	Discrete Input	10037	
Replace light	Discrete Input	10038	
Low chlor.	Discrete Input	10039	
High chlor.	Discrete Input	10040	
Low Ph	Discrete Input	10041	
High Ph	Discrete Input	10042	
Low ORP	Discrete Input	10043	
High NTU	Discrete Input	10044	
External OFF	Discrete Input	10046	
Parameter Name	**Type**	**Address**	**Notes**

Colorimetr comm. error	Discrete Input	10047	
High total chlor	Discrete Input	10048	
High combine chlorine	Discrete Input	10049	
No DPD3	Discrete Input	10050	
Chlor overfeed time	Discrete Input	10051	
Ph overfeed time	Discrete Input	10052	
Piston stuck	Discrete Input	10053	
Low temperature	Discrete Input	10054	
High temperature	Discrete Input	10055	
Low conductivity alarm	Discrete Input	10056	
High conductivity alarm	Discrete Input	10057	
Free chlorine	Input Register	30000	Floating point IEEE-754
pH	Input Register	30002	Floating point IEEE-754
Redox	Input Register	30004	Floating point IEEE-754
Temperature	Input Register	30006	Floating point IEEE-754
Flow	Input Register	30008	Floating point IEEE-754
Turbidity	Input Register	30010	Floating point IEEE-754
Total chlorine	Input Register	30012	Floating point IEEE-754
Combine chlorine	Input Register	30014	Floating point IEEE-754
Conductivity	Input Register	30016	Floating point IEEE-754
Colorimeter alarms	Input Register	30018	bit0 - Low Reagent bit1- No Reagents bit2 - No DPD3 bit3 - No Flo bit4 - External OFF bit5 - Unclean cell bit6 - Replace light bit7 - Colorimeter communication Error bit8 - Piston stuck
Controller ID	Input Register	30019	16 bit serial number
Modbus connection details	Holding Register	40000	bit0 - parity / noparity bit1 - parity even / odd bit2 - 19200bps / 9600bps bit3 - floating point / swapped floating point bit4 - 2 stop/1 stop bit
Chlor measures interval, sec	Holding Register	40001	

5 Calibration

Parameters must be calibrated with measurements taken with external testing devices. Always use digital calibration devices, not the less accurate visual test kits. Alternatively, standard solutions may be used. Make sure the standard solution is not expired or contaminated prior to using. Follow the procedures below EXACTLY as instructed.

ALWAYS take water for calibration from the sampling valve, NOT from the process line directly. The analyzer should always be calibrated with water from exactly the same source.

5.1.1 Chlorine Calibration

Note: Calibrate temperature and pH (if installed) and insure that both temperature and pH are at normal operating levels **before** calibrating chlorine. If pH is not an installed parameter, the pH value **must** be set in the calibration menu.

This method is also valid for other variable calibration using external testing devices. Use the following procedure:

1. Fill the sampling container from the HYDROGUARD flow cell.
2. Test the water sample for chlorine using a digital photometer or other external testing device.
3. Press Menu until “Cl Calibrated to” appears in the LCD display.

The top line will display “Cl Calibrated to” and a number. The number displayed is the last value someone entered for the calibration. The bottom line will display “Cl Sensor was” and a number. This number is the sensor reading without any calibration at the time of the last calibration. If there is a large discrepancy between these two numbers, the sensor was calibrated improperly or there is a problem with the analyzer. The value displayed normally on the main screen and the value the analyzer uses to determine dosing rates is the calibrated value.

Note: Chlorine calibration should always be performed within 25% of the set point. If current chlorine level is 25% above or below the set point, do not perform calibration until the chlorine level is closer to the set point. To continue:

1. Press OK.
2. Enter the password. Press the up arrow or down arrow until the password is reached.
3. Press OK.
4. Press OK again.

The display will now show “Calibrate Cl to” on the top line and “Sensor Reading” on the bottom line. The “Sensor Reading” is the current reading of

the sensor with no calibration. The “Calibrate Cl to” value is the new value which you want to set.

5. Press the up arrow or down arrow until the value is the same as the value given by the digital photometer.
6. Press OK to save the new calibration or Esc to abort without saving.
7. Press Esc to return to the main display.

5.1.2 Calibrating other Sensors and Meters

Calibration of other sensors and meters is similar to the chlorine calibration and requires the use of a reliable external testing device or standard solution. When using an external testing device, follow the chlorine calibration sequence making sure to take the water sample from the same water supply of the sampling cell (sensors).

Using Standard Solutions

1. Remove the Sensor or sensor, clean with a dry cloth and place in the standard solution.
2. Place the Sensor or sensor in the standard solution and wait for the reading to stabilize.

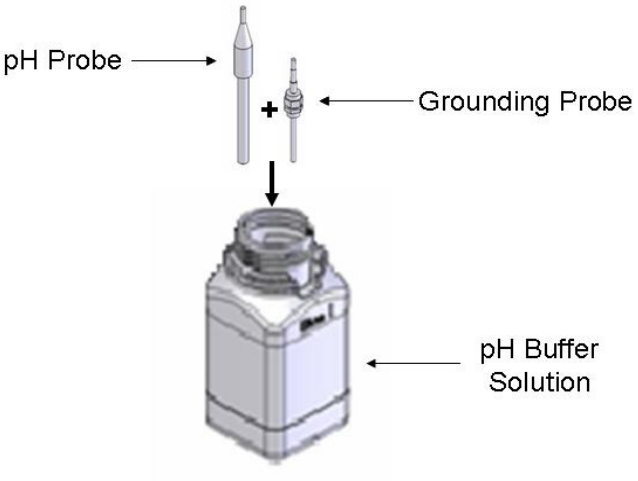


Figure 10: pH or ORP Sensor Calibration

Note: for pH (or ORP) calibration, the temperature Sensor must also be placed in the standard solution for the reading to stabilize.

3. Press Menu until “… Calibrated to” appears in the LCD display.
4. Press OK.
5. Enter the password. Press the up arrow or down arrow until the password is reached.
6. Press OK.
7. Press OK again.
8. Press the up arrow or down arrow until the value is the same as the standard solution.
9. Press OK to save the new calibration or Esc to abort without saving.
10. Press Esc to return to the main display.

6 Monitoring HYDROGUARD Alarms

HYDROGUARD issues alarms when it detects chemical levels that are above or below the allowed range. Every alarm is automatically displayed in the LCD status display and logged in the data logger. Most deviations in chemical levels, however, are automatically corrected. Thus, the internal alarms do not immediately activate an external alarm. A delay mechanism prevents false alarms from minor deviations that were automatically corrected. The external alarm is only activated after an internal alarm has been continuously active for a certain period of time, as defined by the operator.

The Alarm Delay command in the Operator menu sets the number of seconds HYDROGUARD waits before closing Relay 5, the relay that operates the external alarm. Only one alarm is shown on the screen at a time based on importance and the order in which it should be fixed. For example, if the pH is high and the ORP is low, only the pH alarm will be indicated since lowering the pH will likely also correct the low ORP. All of the alarms are presented in along with a description and the resulting action of the analyzer/controller.

Table 6: Alarm Description and Result

Alarm#	Alarm	Description	Result
A1	No flow	There is not enough water reaching the controller.	Stop all chemical dosing (all relays are open).
A2	Low flow	The water flow rate in the main circulation pipe is lower than the flow limit.	Stop all chemical dosing (all relays are open).
A3	Check CLRMTR connect	Communication error between colorimeter and colorimeter board.	No chlorine dosing – optional ORP emergency mode
A4	No reagents	Reagents are empty.	No chlorine dosing – optional ORP emergency mode
A5	Stuck piston	The piston is not moving properly.	No chlorine dosing – optional ORP emergency mode
A6	Unclean cell	The glass in the colorimeter is dirty.	No chlorine dosing – optional ORP emergency mode
A7	Replace light	LED in colorimeter is not working.	No chlorine dosing – optional ORP emergency mode
A8	Low reagents	Reagents are below 20%.	Blue LED will flash – message only
A9	Chlorine < 0.1	Chlorine unusually low.	No chlorine dosing
A10	High ORP	ORP above upper limit.	No chlorine dosing
A11	Low chlorine	Cl below lower limit.	--

Alarm#	Alarm	Description	Result
A12	High chlorine	Cl above upper limit.	--
A13	Low pH	pH below lower limit.	--
A14	High pH	pH above upper limit.	--
A15	Low ORP	ORP below lower limit.	--
A16	High NTU	Turbidity above upper limit.	--
A17	EXTERNAL OFF	External flow switch is off.	No chemical dosing
A18	Total Cl high	Total Cl above upper limit.	--
A19	Combine Cl high	Combined Cl above upper limit.	--
A20	Replace DPD3	DPD3 low	Total Cl testing stops
A21	Temp. low alarm	Temperature below lower limit.	--
A22	Temp. high alarm	Temperature above upper limit.	--
A23	Cl Overfeed time	Cl dosing on for longer than max time.	Cl dosing stops until reset
A24	pH Overfeed time	pH dosing for longer than max time.	pH dosing stops until reset
A25	Conductivity low	Conductivity below lower limit.	--
A26	Conductivity high	Conductivity above upper limit.	--
	No emergency	No problem to allow ORP emergency mode.	--
A0	ORP Emergency Mode	ORP Emergency Mode. Problem with Colorimeter reading. ORP is now controlling until problem is resolved (up to 3.5 days only).	Use with care. This method has disadvantages and will not reflect same results as normal operational mode.
* No dosing only affects the relay operation. Alarm relay will close and all other relays will open.			

7 Maintenance

7.1 Cleaning the Filter

This filter must be cleaned regularly as it becomes clogged with debris and impurities. The frequency at which the filter requires cleaning depends entirely on how much debris is in the water. Clean the filter using only water whenever a visible layer of dirt has accumulated on the filter.

7.2 Cl Sensor Maintenance

Conduct Sensor maintenance whenever any of the following conditions are met:

- If the membrane is visibly soiled, clean the sensor.
- Refill the sensor with electrolyte once per season or every 12 months. Depending on the water quality and chlorine level, this period can be reduced or extended.
- Calibrate the sensor when necessary (see "Calibration").

7.2.1 Cleaning the Sensor

Caution: Do not use chemicals that reduce the surface tension. When using hydrochloric acid, observe all the safety regulations.

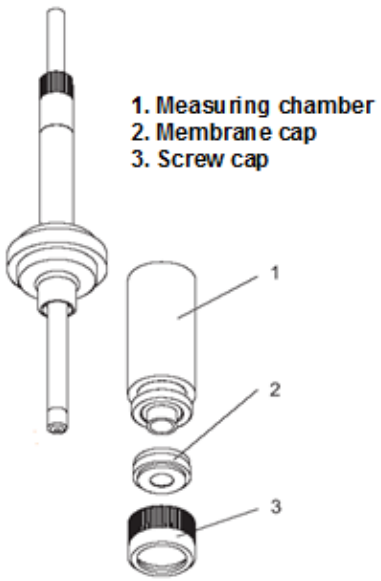


Figure 11: Free Chlorine Sensor

1. Remove the sensor from the flow assembly.
2. Clean the membrane mechanically with a gentle water jet or swirl in a solution of 2% hydrochloric acid (no other additives).
3. If the membrane is still visibly soiled, replace the membrane.

7.2.2 Replacing the Membrane

1. Unscrew the measuring chamber from the shaft.
2. Unscrew the front screw cap holding the membrane.
3. Remove the membrane and replace with a new membrane.
4. Refill the measuring chamber with electrolyte.

7.2.3 Refilling the electrolyte

Warning Do not swallow the electrolyte. Avoid contact of the electrolyte with skin or eyes. In case of accidental contact wash with a lot of cold water! In case of eye inflammation, contact a doctor immediately. Wear safety glasses and gloves when working with the electrolyte solution.

Caution Do not touch or damage the electrodes. The electrolyte is sensitive to oxidation: Always keep the electrolyte bottle closed after use. Do not transfer the electrolyte into other containers. The electrolyte should not be stored for more than one year and should be clear (not yellow) in appearance (use by date, see label). Avoid forming air bubbles when pouring the electrolyte into the measuring chamber.

To refill the electrolyte:

1. Unscrew the measuring chamber from the sensor shaft.
2. Hold the measuring chamber at an angle and fill in about 7 to 8 ml (0.24 to 0.27 fl.oz) electrolyte, up to the internal thread of the measuring chamber.
3. Tap the filled measuring chamber several times on a flat surface so that air bubbles can detach and rise.
4. Insert the sensor shaft vertically from above into the measuring chamber.
5. Slowly tighten the measuring chamber to the stop. Excess electrolyte is pressed out of the sensor during the tightening.

7.2.4 Reconditioning the Sensor

Long-term operation (> 1 week) in chlorine-free media, i.e. with very low sensor currents, leads to a deactivation of the sensor. This deactivation is a continuous process that decreases the ability of the sensor to work properly.

After long-term operation in a chlorine-free medium, the sensor must be reconditioned. You need the following materials for reconditioning:

- De-mineralized water (or electrolyte)
- Polishing sheet (Emory Cloth -- see Accessories)
- Beaker
- Approx. 100 ml (3.4 fl.oz) of chlorine bleach liquid NaOCl approx. 13%, pharmaceutical quality (available at chemical stores or pharmacies)

To recondition the sensor:

1. Remove the sensor from the assembly.

2. Unscrew the measuring chamber and set it aside.
3. Polish the gold cathode of the sensor using the polishing sheet:
   a. Place a wetted strip of the sheet in your hand.
   b. Polish the gold cathode by moving it circularly on the strip.
   c. Rinse the sensor with de-mineralized water (or electrolyte).
4. Top up the electrolyte if required and screw the measuring chamber back into place.
5. Fill the beaker with chlorine bleach liquid to about 10 mm (0.39") and position it safely.
6. **Caution** The sensor must not touch the liquid.
   Place the sensor in the gaseous phase about 5 to 10 mm (0.2" to 0.39") above the chlorine bleach liquid.
7. The sensor current will now increase. The absolute value and the speed of increase depend on the temperature of the chlorine bleach liquid:
   - When the sensor has reached a high value CL reading, leave the sensor under these conditions for 20 min.
   - If the chlorine value is not increasing, cover the beaker to minimize air movement.
8. After the 20 min. have elapsed, re-install the sensor in the assembly.
9. Re-establish flow. The sensor current will normalize.
10. After sufficient settling time (no noticeable drift), calibrate the sensor.

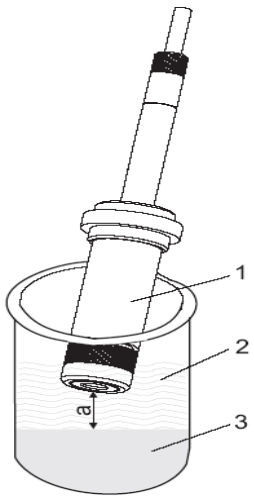


Figure 12: Sensor Recondition

8 Turbidity Measurements

8.1.1 Installation

If the HYDROGUARD system was ordered with Turbidity pre-installed some of these steps may have been completed in the factory.

Supplied Components

- Turbidity Input Module (electronics card)
- 250 mm flat cable
- Turbidity Sensor (wiper optional)
- Turbidity Flow Cell (bubble remover optional)
- Flow Cell Mounting Bracket

Caution

Prior to opening the analyzer or installing any electrical components, turn off all power supplies to the analyzer.

There are five (5) wires, contained in a single cord, from the sensor that must be connected to the analyzer. The standard wire length is 22 ft (7m), and may be cut or extended up to 650 ft (200m) as needed. The turbidity flow cell and sensor must be securely mounted using appropriate hardware for the mounting location. Unfiltered water will need to be supplied to the turbidity flow cell at a flow between 0.25 to 1 GPM and less than 30 psi (2 bar).

Hardware and Plumbing Installation

1. Mount the Turbidity Flow Cell, using the supplied bracket (or other mounting hardware as appropriate) such that the inlet and outlet ports are horizontal and the flow tube extends down.
2. Insert the sensor into the opening of the flow tube, ensuring that the notch in the top of the opening matches the rod on the sensor.
3. Hand-tighten the connector to secure the sensor and seal the turbidity flow cell.
4. Connect the water supply to the turbidity flow cell. Follow the flow indicated by the arrow on the flow cell.

Figure 13: Turbidity Sensor and Flow Cell without bubble remover

Figure 14: Flow Cell with bubble remover

The flow rate should be between 0.25 and 1 GPM (15-60 gal/hr or 50-225 L/hr) and the pressure should not exceed 30psi (2 bar). The inlet and outlet connections are ¼" FNPT.

Electrical Installation

5. Install the Turbidity Module (electronics card) on the inside bottom of the control panel door using the supplied screws.
6. Connect the turbidity module to the I/O module using the supplied ribbon cable and any open connector (the connectors on both boards operate in parallel).
7. Pass the sensor cable through an open tight Cable Gland (Pg)on the bottom of the analyzer.
8. Connect the wires from the sensor cable to the terminal block on the lower left corner of the Turbidity Module, following the color order indicated on the module.

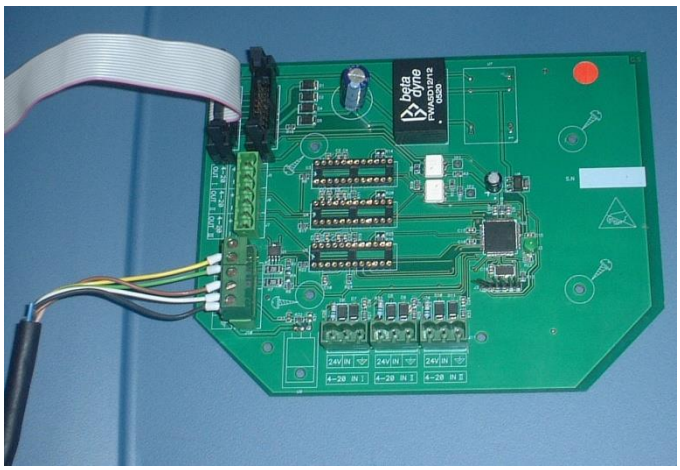


Figure 15: Connecting Turbidity Sensor to Turbidity Module

The sensor cable may be cut or extended up to a maximum distance of 650 feet (200m) as needed.
If the turbidity relay is not going to be connected to any external equipment, the installation is complete. If the relay will be used to operate equipment based on the turbidity set point, the following steps in *Relay Wiring and Use* will need to be followed.

8.1.2 Relay Wiring and Use

Wiring of the Turbidity Relay (NTU relay) is identical to wiring of all other relays and should be connected to a dependent (interlocked) power supply to prevent operation of equipment when the water supply is not active. Likewise, it operates based on closed-loop control.

The line (live) wire of the pump-dependent power source connects to the connection labeled Common (C) on the NTU relay. The line wire of the controlled external turbidity equipment is connected to the normally open (NO) or normally closed (NC) connection of each relay as appropriate. Normally Open means that the relay will be open (i.e. no power from the relay) until the analyzer calls for power; Normally Closed means that the relay will be closed (i.e. power from the relay) until the analyzer calls to stop power.

1. Turn OFF all power sources to the analyzer.
2. Connect the earth ground wire of the power supply to the ground return wire from the controlled external turbidity equipment.
3. Connect the neutral wire of the power supply to the neutral wire from the controlled external turbidity equipment.
4. Connect the line (live) wire of the power supply to the connector marked ‘C’ (common) on the NTU terminal block.
5. Connect the line (live) wire of the controlled external turbidity equipment to the normally open (NO) or normally closed (NC) connection on the NTU terminal block.

Caution

Each relay connection is limited to 4 amps, to prevent overheating. The relays may show a higher rating but do not connect equipment exceeding 4 amps.

Relay and External Equipment Operation

The relay will operate in an ON/OFF mode. Whenever the measured turbidity is below the set point, the relay will remain open (no power to normally open the connection). Whenever the measured turbidity is above the turbidity set point, the relay will close (power will be supplied to the normally open connection).

If the measured turbidity is above the turbidity high alarm, the alarm on the analyzer will be activated. The NTU relay will remain closed (power to the normally open connection) even during the alarm.

8.1.3 First Time Set-up and General Operation

Although the turbidity unit is connected, it will not operate until it is set-up in the analyzer menu.

Operator Menu

If the NTU relay is connected to external equipment:

1. Press Menu until “Turbidity Set Point” appears on the display and press OK.
2. Enter the operator or technician password and press OK.

3. Enter the turbidity set point value and press OK.

With or without the NTU relay connected to external equipment:

1. Press Menu until “Turbidity High Alarm” appears on the display and press OK.
2. Enter the operator or technician password and press OK.
3. Enter the turbidity high alarm value and press OK.

Technician Menu

1. Press Menu to enter the Operator Menu and then Press up and down together to enter the technician menu.
2. Press Menu until “Turbidity ON/OFF” appears in the display and press OK.
3. Enter the technician password and press OK.
4. Press UP to turn the turbidity sensor ON and then press OK.
5. Press Menu until “Turbidity Wiper Interval” appears in the display and then press OK.
6. Enter the technician password and press OK.
7. Enter the wiper interval (2 minutes is recommended) and press OK.

The turbidity unit should now be active. Confirm that the turbidity value appears on the LCD display. If it is not active, perform a system reset.

8.1.4 Routine Maintenance

8.1.4.1 Turbidity Calibration

1. Take a sample of water from the flow cell.
2. Test the sample using an accurate digital turbidly meter.
3. Press Menu until “NTUl Calibrated to” or “NTUh Calibrated to” appears in the LCD display.
4. If calibrating below 1.0 NTU use NTUl (low) if calibrating above 1.0 NTU use NTUh (high).
5. Press OK.
6. Enter the password. Press the up arrow or down arrow until the password is reached.
7. Press OK.
8. The value that appears is the last calibrated value.
9. Press OK again.
10. Press the up arrow or down arrow until the value is the same as the independent digital turbidity meter.
11. Press OK to save the new calibration or Esc to abort without saving.
12. Press Esc to return to the main display.

Note

Only 1 Turbidity calibration will be active. If the measured Turbidity is less than 1.0, only the NTUl calibration will be active; if the turbidity is greater than 1.0, only the NTUh calibration will be active.

8.1.4.2 Cleaning the Turbidity Sensor

The turbidity meter will need to be periodically cleaned to ensure proper operation and reliability. The cleaning frequency will depend on the water source being tested. The meter should be cleaned whenever the measurement accuracy is questionable and before calibration.

1. Turn off power to the analyzer.
2. Shut off the flow to the turbidity flow cell and remove the turbidity meter.
3. Rinse out the flow assembly with clean water to remove any sediment that may have been trapped in the flow cell.
4. Wash the turbidity meter under clean water and a cloth to remove any debris and oil. Be careful not to scratch the sensor covers.
5. If installed, inspect the wiper for signs of wear and replace if necessary.
6. Reinstall the meter and turn the flow back to the meter.
7. Confirm that the meter is operating properly and that the flow cell is sealed.

8.1.5 Replacing Components

8.1.5.1 Replacing the Turbidity Meter

1. Turn off the inlet and outlet water to the flow cell and the power to the analyzer.
2. Open the door of the control module.
3. Remove the 5 wires from the bottom of the Turbidity input module.
4. Remove the meter from the flow cell by unscrewing the cap and pulling gently.
5. Install the new meter in the flow cell.
6. Route the wires back to the turbidity module and reconnect the 5 wires following the color coding on the module.
7. Restart the flow and turn the power on
8. Confirm that proper operation has been restored.

8.1.5.2 Replacing Turbidity Input Module

Disconnect the power supply to the unit before opening the control unit.

1. Disconnect the flat cable plug from the card.
2. Disconnect all terminal blocks.
3. Unscrew the four (4) mounting screws.
4. Put in the new card and tighten the 4 mounting screws.
5. Connect the flat cable plug to the card.
6. Reconnect the terminal blocks.

8.1.6 Shut-down and Winterizing

1. Disable the Turbidity measurement in the technician menu.
2. Shut off the flow of water to the turbidity flow cell.
3. Open the drain at the bottom of the flow cell to drain all water.
4. If temperatures will drop below freezing, remove the turbidity sensor and store it in a safe location where temperatures will not drop below freezing.

9 Conductivity Measurements

9.1 Installation

If the HYDROGUARD system was ordered with Conductivity pre-installed some of these steps will have been completed in the factory.

Supplied Components

- Conductivity 4-20 input Module (electronics card)
- 150mm Flat Cable (ribbon cable)
- Conductivity meter
- Conductivity flow cell

Caution

Prior to opening the analyzer or installing any electrical components, turn off all power supplies to the analyzer.

1. Attach the module to the inside of the control panel door below the control panel module using the 4 supplied screws.
2. Attach the ribbon cable from the conductivity module to any open connector on the I/O module.
3. Mount the conductivity flow cell and meter on a solid wall or surface using appropriate hardware (not supplied). Make sure that the distance is less than 15m (45 feet) from the HYDROGUARD analyzer.
4. Connect a water supply of no greater than 2 bar (30 psi) to the inlet fitting using 6mm tubing. It may be a new separate water supply or a line tapped from the main analyzer water supply before the pre-filter. Larger tubing may be used if the fitting is replaced to accept the new tubing.
5. Connect a 6mm water outline line to the outlet fitting and connect to:
6. The water system at least 5 psi (0.3 bar) lower than the inlet water supply, or
7. The pre-filter of the HYDROGUARD analyzer.
8. Route the conductivity meter wire through an open gland on the bottom of the analyzer.
9. Connect the wires to an open 4-20mA input on the bottom of the 4-20 module.
10. Connect 24V from the meter to 24V on the module.
11. Connect mS from the meter to IN on the module.
12. Connect GND from the meter to ground (symbol) on the module.

9.2 First Time Set-up and General Operation

For Output of the conductivity measurement, see internal or external 4-20mA module sections to configure the output in your specific HYDROGUARD analyzer.

9.3 Routine Maintenance

9.3.1 Conductivity Calibration

Must be conducted when the process is stable; specifically, the temperature should be within normal operating range.

1. Test a sample of water with an accurate external conductivity meter.
2. Use the calibration adjustment screw to increase or decrease the conductivity, making very small changes.
3. Wait for the adjustment to take effect before making additional changes.

9.3.2 Cleaning the Conductivity Meter

Routine cleaning of the conductivity meter will ensure long-term reliability. The frequency of cleaning will depend on the water source being tested and should be conducted whenever there is significant visible dirt, the measurement accuracy is affected, or before the meter is calibrated.

1. Shut off the flow of water to the conductivity flow cell and remove the meter.
2. Wash the meter under a jet of water to remove the debris.
3. Use a soft cloth to remove any additional debris and oil.
4. Replace the meter and restore flow to the flow cell.

9.3.3 Replacing the Conductivity Meter

1. Turn off the inlet and outlet water to the flow cell and the power to the analyzer.
2. Open the door of the control module.
3. Remove the wires from the bottom of the Conductivity input module.
4. Remove the meter from the flow cell by unscrewing the cap and pulling gently.
5. Install the new meter in the flow cell.
6. Route the wires back to the conductivity module and reconnect the wires to the 4-20 input module.
7. Restart the flow and turn the power on.
8. Confirm that proper operation has been restored.

9.3.3.1 Replacing the Conductivity Input Module

Disconnect the power supply to the unit before opening the control unit.

1. Disconnect the flat cable plug from the card.
2. Disconnect all terminal blocks.
3. Unscrew the four (4) mounting screws.
4. Put in the new card and tighten the 4 mounting screws.
5. Connect the flat cable plug to the card.
6. Reconnect the terminal blocks.

9.3.4 Shut-down and Winterizing

1. Shut off the flow of water to the conductivity flow cell.
2. Drain the water from the flow cell.
3. If temperatures will drop below freezing, remove the conductivity sensor and store in a safe location where temperatures will not drop below freezing.

10 Shut-Down and Winterizing

The HYDROGUARD analyzer is designed to keep the sensors submerged even if there is no flow to the analyzer. However, if the analyzer is going to be offline for an extended period of time and/or exposed to freezing temperatures, it must be winterized to prevent damage to the analyzer and the sensors.

1. Store all sensors following directions in the supplemental manuals for each sensor.
    - Cl, pH, and ORP sensors MUST be stored in water at all times.
2. Drain the flow cell completely by opening the sampling valve on the bottom. Leave the valve in the open position to allow air to completely dry the cell.
3. Check the security of the analyzer doors to ensure a weatherproof seal.

10.1 Start-up and Preventive Maintenance

1. Replace all additional sensors and meters, close the sampling valve and turn on flow immediately to re-wet any sensors.
2. Recalibrate the analyzer.

Note: Cl, pH, and ORP sensors may take as long as 24 hours to re-polarize or re-stabilize and will need to be recalibrated at that time.

11 Troubleshooting

Table 7 outlines troubleshooting. For more information contact a representative at Blue I Technologies.

Before troubleshooting a problem:

1. Perform a System Reset (last menu of operator menu).
2. Check that all flat cable connections between electronic cards are secure.
3. Check that all chipsets on electronic cards are secure and no pins are bent.

Table 7: Troubleshooting

Problem / Symptoms	Potential Cause	Solution / Suggestion
Display not functioning or displaying unusual numbers.	Connection between boards is loose.	Check all connections between boards.
	pH and ORP wire reversed.	Trace pH and ORP wires from Sensor back to board.
	Chipset is loose or pin bent.	Check that no pins on the chipset are bent and it is in completely and correctly.
Controller won't power up.	Fuse is blown.	Check and replace fuse above Main Power Supply.
	I/O board has been damaged due to improper electrical installation.	Check for burn marks on I/O board. Recheck for proper wiring–confirm all neutrals and grounds in contact are from the same power supply.
Unstable ORP, CI and/or pH readings.	Poor grounding	Check: PT100 (temp sensor), I/O board ground, ORP and pH wire grounding.
External Off alarm	No external flow sensor installed.	Make connection on I/O board with flow sensor or wire to complete circuit.
No Flow alarm	Flow through flow chamber is too low.	Increase flow and check flow switch wire connection on board.

Problem / Symptoms	Potential Cause	Solution / Suggestion
Chlorine measurement is zero or low	Cl calibrated too low	Check calibration menu Cl calibrated < Cl Sensor Value. Recalibrate if needed.
	Membrane clogged	Clean Sensor membrane.
	Electrolyte needs to be replaced.	Replace electrolyte solution and membrane.
	At zero Cl for too long.	Bring Sensor back to normal Cl level and recalibrate.
	Sensor off for too long.	Wait 90 minutes for Sensor to re-polarize and then recalibrate.
Chlorine Measurement is High	Membrane damaged.	Replace membrane and electrolyte solution.
	CI calibrated too high.	Check calibration menu for Cl calibrated > Cl Sensor Value. Recalibrate if needed.

12 Appendix A: Technical Specifications

MECHANICAL DATA	
Dimensions (controller)	340 x 220 x 120mm
(W x H x D)	(14" x 7" x 5")
Cable entries	Pg 9 Cable Glands
Ingress protection	IP 65 (NEMA 4 equivalent)
Max. ambient temperature	2°C to 50°C (35.6°F to 122°F)
Weight Approx.	4.5kg (11 lbs.)
ELECTRICAL CONNECTION	
Power supply	100-115VAC/1A; 200-230VAC/0.5A; 50Hz/60Hz
Power consumption	Approx 60 VA
Power supply for RTC memory	3.6V Lithium battery
DATA SERIAL OUTPUT SIGNAL OUTPUT	
RS 485	Standard
4-20mA	Optional
RELAYS	
CL (Chlorine) set point 1	250VAC/DC 4A Max
CL (Chlorine) set point 2	250VAC/DC 4A Max
pH 1	250VAC/DC Max
Turbidity control* 1	250VAC/DC 4A Max
General Alarm	250VAC/DC 4A Max
Temperature control	250VAC/DC 4A Max
DISPLAY	
5.5” Large graphic monochrome display	
Character LCD with background light alarms and status	
pH MEASUREMENT	
Measurement range	0-14
Sensor	Ceramic diaphragm and gel filling
Input impedance	0.5 . 1012Ω
Cl MEASUREMENTS	
Indicator	Free chlorine
Measurement Principle	passive-operated sensor with gold cathode and silver/silver chloride anode
Working temperature	1°C to 55°C (33.8°F to 131°F)
Measuring range	0.01…2 ppm or 0.05…10 ppm
Max. operating pressure	1 bar (14.5 psi)
Material	PVC-U, PTFE, PBT, PVDF
pH range	4-8
Flow rate	30 to 40 LPH (0.132 to 0.176 GPM)

TEMPERATURE MEASUREMENT	
Sensor	PT-100
Measuring range	0°C to 55°C (32°F to 131°F)
FLOW REQUIREMENTS	
Measuring cell flow rate	35L/h - 60l/h
Inlet pressure	0.3 bar (4.4 psi) to 1 bar (14.5 psi)
Outlet pressure closed cell	Up to 0.9 bar (13 psi)
Flow switch type	Inductive proximity sensor
FLOW MEASUREMENT	
Frequency input or 4-20mA input	via I/O card via NTU card
Measurement range	0-1,000 m3/hour
pH VALUE CONTROL	
Control function	P or PI, or On/Off
Characteristics	Normal / Inverted
Relay function	Pulse length proportional controller Pulse frequency proportional controller
CHLORINE CONTROL #1	
Control function	PI, or On/Off
Proportional band	Yes
Relay function	Pulse length proportional controller Pulse frequency proportional controller
CHLORINE CONTROL #2	
Control function	On/Off
Proportional band	No
Integral action time	No
DATA LOGGER	
Memory	256K
Lines	1000
Recording interval	1-360 min
Event logger	Yes
Total relay on time	Yes
SECURITY	
Operation password	Yes
Technician password	Yes

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