

GF 9950-3 Chlorine Controller



3-9950-XP.090 Rev. 1 03/21

Operating Instructions (see page 6)



3-9950

Description

The 9950-3 Chlorine Controller is a two channel controller that can support two sensors in one instrument. The sensor types supported by the 9950-3 are GF Free Chlorine (FCI) Chlorine Dioxide (ClO₂) and pH. The 9950-3 (which is used in the GF Chlorine panels) software, combined with smart electronics connected to the Chlorine sensor (FCI, ClO₂) and the pH electrode delivers a real time, accurate Chlorine reading of the application process.

Includes improved calibration support by automatically time stamping the successful single point calibration of the Chlorine electrode and a two point calibration of the pH electrode. Operator can enter the next calibration date and will be notified by the display's background light turning red.

The addition of "Chemical Guard", only for free chlorine, to the relay menu ensures the proper dosing of Oxidants and pH adjusting chemicals are delivered safe and accurately. When Chemical Guard mode is selected, the pH control and adjustment is always a priority over dosing oxidizing chemicals whose concentration is pH dependent.

The 9950-3 comes standard with the 3-9950.393-3, four binary input and two mechanical relays. Binary input #1 is dedicated to an external flow switch input which enables access to the new relay mode "Chemical Guard" and also disables the relays when there is no flow through the system. The 9950-3 supports the -1 and -2 relay modules without flow switch or Chemical Guard.

The 3-9950-3 comes standard with four, 4 to 20 mA outputs, two mechanical relays with four binary input relay module.

The 9950 Modbus module makes adding the GF Chlorine Controller / panel assembly into a new or existing communication network very simple.

WARNING: The GF Chlorine Analyzer (electrode) is designed to be used in a clean, chlorinated flowing stream at all times. **DO NOT** use in applications where electrode could be exposed to periods without chlorine.








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Safety Information

- Please read entire manual before unpacking, setting up or operating this equipment. Adhere to all danger, warning and caution statements. Failure to do so could result in serious injury to the operator or damage the equipment. Make sure the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than specified in this manual.
- This unit is designed to be connected to equipment which can be hazardous to persons and property if used incorrectly.
- Read and understand all associated equipment manuals and safety warnings before using with this product.
- Remove power to unit before wiring connections.
- Wiring connections to this product should only be performed by qualified personnel.
- Do not use unit if front panel is cracked or broken.

	Warning / Caution / Danger Indicates a potential hazard. Failure to follow all warnings may lead to equipment damage, injury, or death
	Electrostatic Discharge (ESD) / Electrocutation Danger Alerts user to risk of potential damage to product by ESD
	Electrocution Danger Alerts user to risk of potential of injury or death via electrocution
	Personal Protective Equipment (PPE) Always utilize the most appropriate PPE during installation and service of GF products
	NOTE / Technical Notes Highlights additional information or detailed procedure

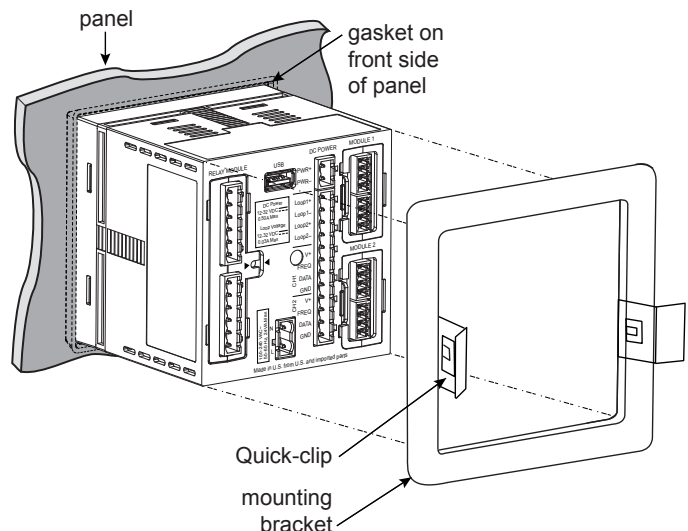
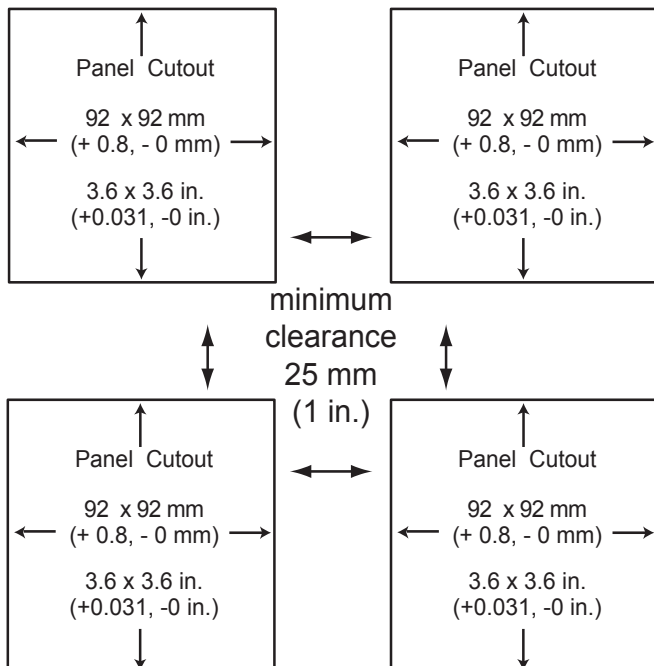
Installation

For future reference, for each installation, it is recommended to record the part number and serial number of each of the components listed here:

Facility Tag Number or System ID (user assigned): _____

Base unit	3-9950-3	S/N _____
Relay Module	3-9950.393-_____	S/N _____
Dual Channel 4 to 20 Current Loop Out. Module	3-9950.398-2	S/N _____
Modbus Module	3-9950.395-M	S/N _____

Panel Mount Installation



Allowable panel thickness 2.36 mm (0.093 in.) to 33 mm (1.31 in.)

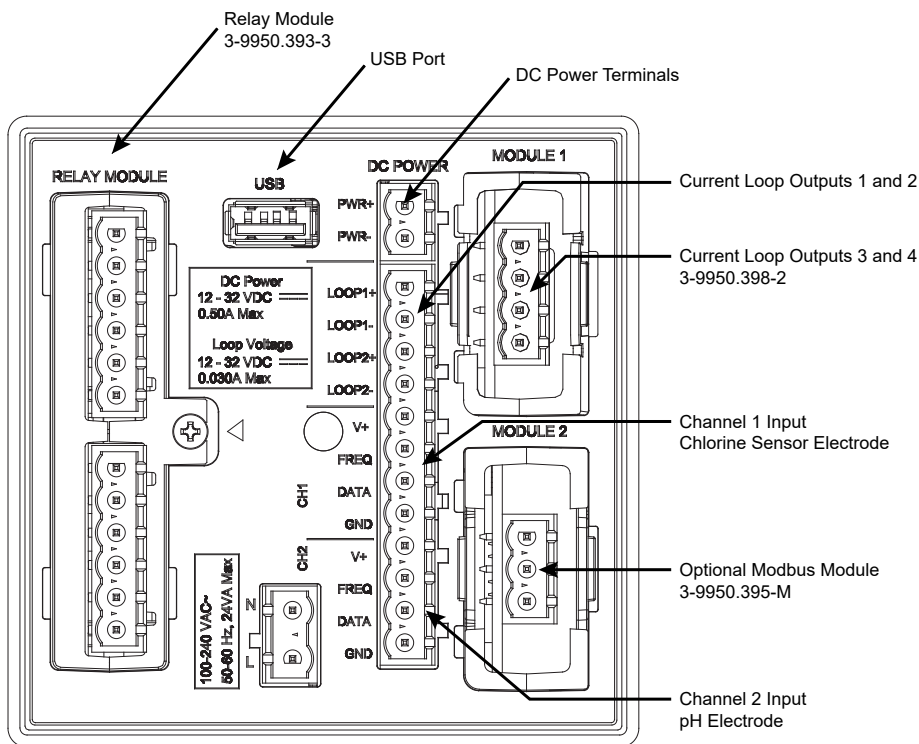
Terminal Identification

Prepare the transmitter installation location. If the back of the transmitter is difficult to access when installed, wire the removable terminal blocks first, then install them completely.



The 9950-3 requires regulated **12 to 32 VDC, ±10% (24 VDC nominal)**

Maximum current draw is:
500 mA with DC power
24 VA with AC power



DC Power Terminal 3-9950-3

Required by the instrument

- 12 to 32 VDC, ±10% regulated, 0.5 A MAX. DC power input and Loop current regulated voltage require the use of a UL60950-1 or UL61010-1 certified power supply. Power supply shall also be rated for operation at 4000 m altitude.

Relay Module

- 3-9950.393-3 Two mechanical relays, 5A 250 VAC or 30 VDC, and four binary inputs rated at 6 mA, 10 VDC to 24 VDC

Module 1

- 3-9950.398-2 Dual Channel 4 to 20 mA Current Loop Output Module

Module 2 (Optional, sold separately)

- 3-9950.395-M Modbus Module

Channel 1 (Chlorine) and Channel 2 (pH)

- V+: +5 VDC out to sensor (black wire)
- FREQ: Frequency input signal from sensor (red wire)
- S³L DATA: Digital input signal from sensor (red wire)
- GND: Sensor ground (white wire)

Loop Outputs

- Two Passive 4 to 20 mA current loop outputs 12 - 32 VDC, ±10% regulated (30 mA Max) built into the base 9950-3
- Two Passive 4 to 20 mA current loop outputs in Mod 1 A

USB Port

- Software updates will be provided through the USB port

Maintenance

- Clean the instrument case and front panel with a soft cotton cloth dampened with a mild liquid soap solution.
- Never wipe the front window with static retentive cloths such as wool or polyester which may induce a static charge.
- If a static charge develops on the window, you may notice temporary blotches form on the screen. When this occurs, clean the front window with an anti-static cloth, or a soft cotton cloth and anti-static spray or a mild liquid soap solution to remove the static charge.

Password Overview

The password is often required to start editing. Once entered correctly, this password will not be needed for subsequent edits, until the menu system is exited. The password is required when the menu system is re-entered.

Your choice of password (STD or CODE) is selected in the Options Menu.

- **STD**

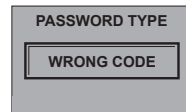
The standard (STD) password is ▲▲▲▼, pressed in sequence. This password is designed to protect the 9950 from unintentional changes. It is best suited for systems where a group of people need to be able to change settings.

- **CODE**

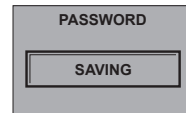
The CODE default setting is 0000, adjustable to any 4-digit numerical code up to 9999. Using a personal code provides the maximum degree of security. This code can be modified in the Options menu.

Password Reset

Turn off 9950-3 Press and hold all 4 keys on keypad while turning on 9950 and unit will revert back to STD password.



In the MENU mode, if the wrong code or password is entered, an ERROR message is displayed.



To change your CODE, go to OPTIONS mode, enter your desired code and press ENTER. (The STD password cannot be changed).

Wiring

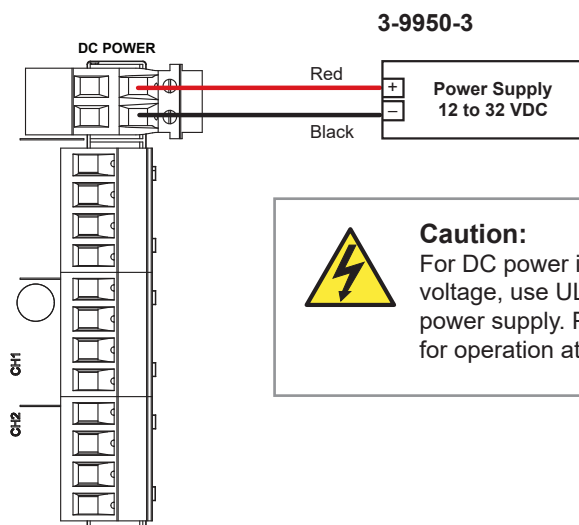
- Terminals accept 12 to 24 AWG wire.
- Strip 10 to 12 mm (0.4 to 0.5 in.) of insulation from wire tips and tin bare ends to eliminate fraying.
- Insert wire tip or ferrule completely into the terminal and secure with the screw.
- Do not allow any AC leads that may be connected to the internal relays to come in contact with low voltage wiring.

Input Power Wiring



WARNING

DO NOT connect AC power to the DC version
THE 3-9950-3 MUST BE POWERED BY
12 - 32 VDC at 0.5 A.

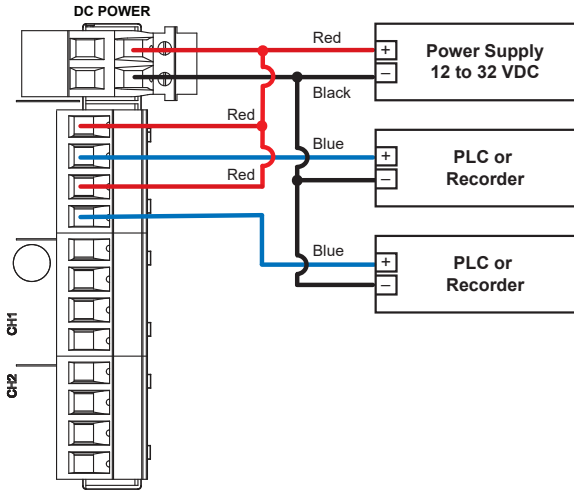


Caution:

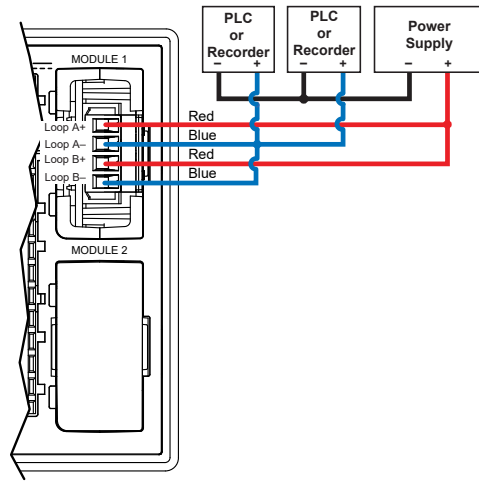
For DC power input and loop current regulated voltage, use UL60950-1 or UL61010-1 certified power supply. Power supply shall also be rated for operation at 4000 m altitude.

4 to 20 mA Wiring

Loop 1 & 2



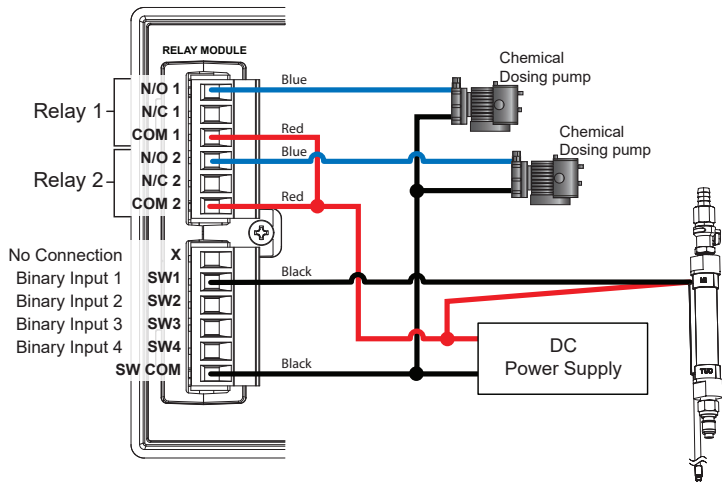
9950 Dual Channel 4 to 20 mA Module



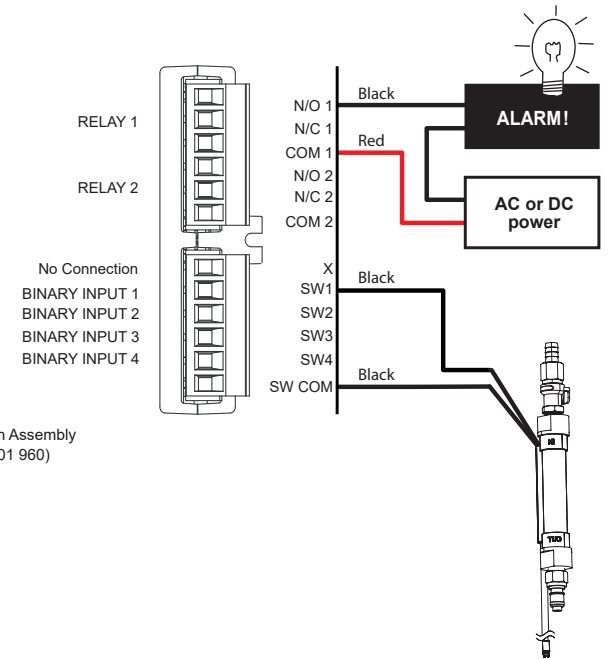
Relay Module Wiring

3-9950.393-3 Standard with 9950-3

The alarm is OFF during normal operation, and will go ON when the relay energizes according to 9950 Relay settings.

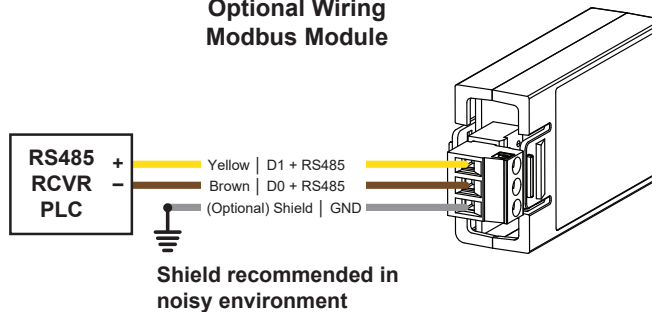


3-9950.393-3 with internally powered flow switch from factory

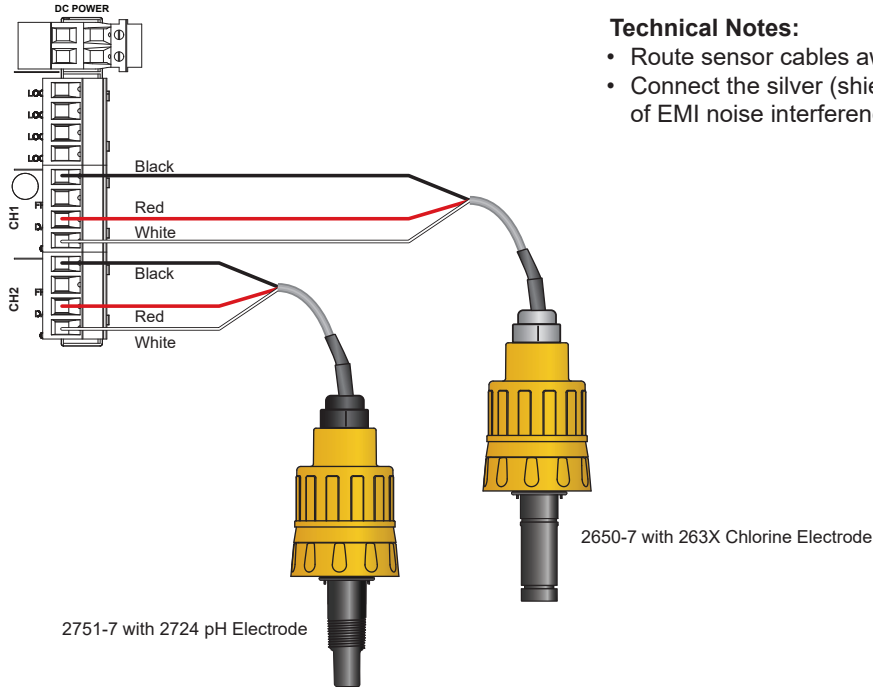


Modbus Wiring

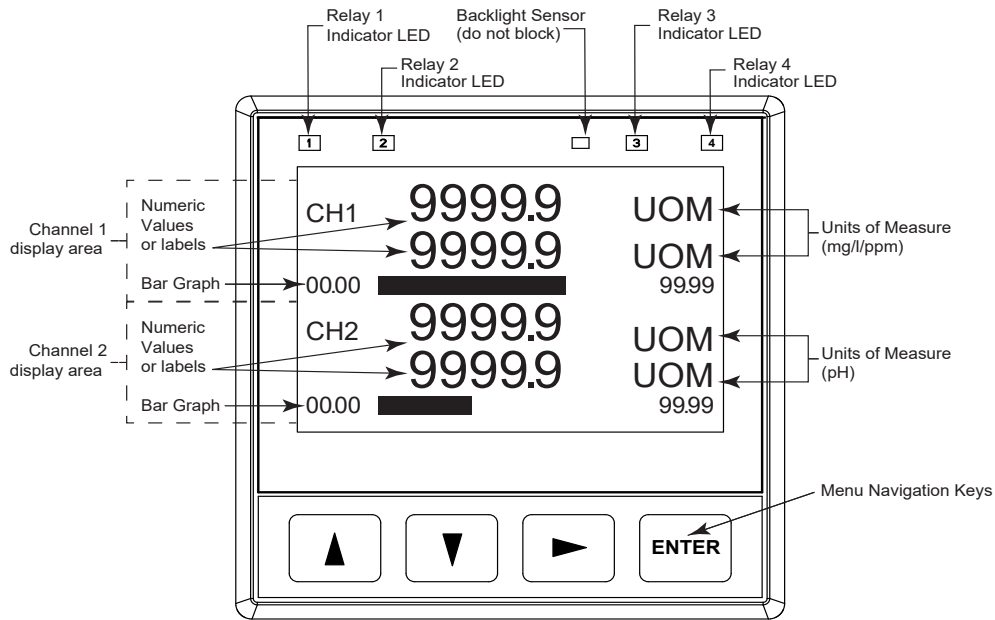
Optional Wiring Modbus Module



Sensor Wiring

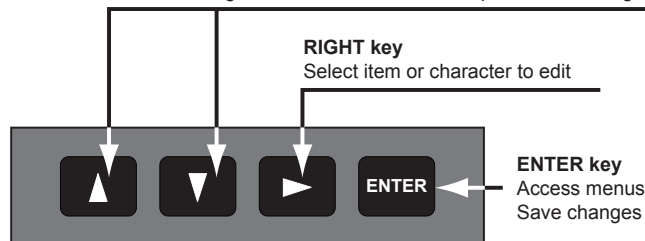


Operation



UP, DOWN keys

Scroll through Menu options or adjust values during editing
Press both together to exit a menu or escape without saving



Start-Up Guide

1. Wire the input power 12/24 VDC
2. Wire any or all 4-20 mA outputs
3. Wire the 3-2650-7 to the 9950 CH 1 (channel 1)
Wire the 3-2751-7 to the 9950 CH 2 (channel 2)
4. Install the Chlorine and pH electrodes into the 2650 and 2751-7 electronics (place electrodes into the flow cell or leave on the electrodes protective caps to protect the sensor tips)
5. Apply power

A new 9950-3 requires initial set up to select the language to be viewed and formatting of the displays. The following instructions will assist in the 9950 set up.

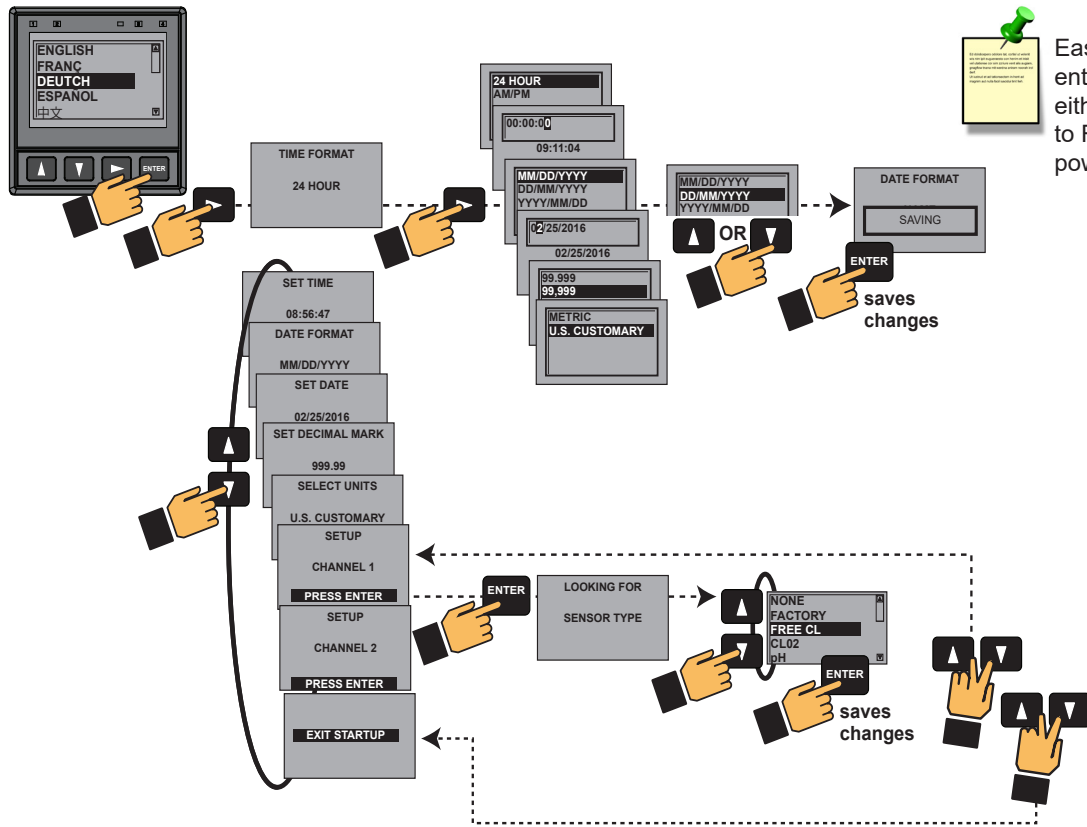
Keypad Functions

The four buttons of the keypad (▲ ▼ ► ENTER) are used to navigate display modes according to the descriptions in this table. Notice the function of each button may change depending on the display mode.

This menu operation sets up the 9950-3 for basic function:
See page 8 for reference.

1. Select desired language using the ▲ and ▼ arrows.
Press ENTER to save.
2. Press ► to select the TIME FORMAT.
Press ▲ or ▼ to select 24 hour or AM/PM.
Press ENTER to save the format selection.
3. Press the ▼ move to the next selection, SET TIME.
Press ► to scroll through hours, and minutes place values.
Use ▲ or ▼ to adjust the value.
Press ENTER to save the time selection.
4. Press ▼ to move to the next selection, SET DATE FORMAT.
Press ► to select the MM/DD/YYYY date format and ▼ or ▲ to scroll through other format options.
Press ENTER to save the date format selection.
5. Press ▼ to move to the next selection, SET DATE.
Press ► to scroll through the days, months, and years.
Use ▲ or ▼ to adjust the number, and ► to select the next number.
Press ENTER to save the Date selection.
6. Press ▼ to move to the next selection, SET DECIMAL MARK.
Press ► and use ▲ or ▼ to highlight desired decimal separator (comma or decimal mark).
Press ENTER to save the decimal mark selection.
7. Press ▼ to move to the next selection, SELECT UNITS.
Press ► and scroll ▲ or ▼ to choose Metric or U.S. Customary.
Press ENTER save unit selection.
8. Press ▼ to move to the next selection SETUP CHANNEL 1.
Press ENTER, ('Looking for Sensor Type' will appear on the screen).
The 9950-3 will search for an attached S³L sensor on Channel 1. The found sensor type will be highlighted. If your desired sensor is not highlighted, use the ▲ or ▼ to scroll through the sensor list and select another sensor type.
Press ENTER to save sensor type selected.
Press ▲ or ▼ to access screens to adjust common sensor parameters.
► = edit, ENTER = Save, ▲+▼= Cancel.
Press ▲+▼ to return to SETUP CHANNEL 1 screen.
9. Press ▼ to move to the next selection, SETUP CHANNEL 2.
Repeat steps in number 8 to set up Channel 2.
Press ▼ to go back to Channel 1, if desired.
When done, press ▲+▼ together one time exits to the previous menu. Press ▲+▼ together a second time to exit Easy Start Up.
10. Calibration Due will flash over each channel once a new electrode is detected.
Go to the Calibration section to review the proper procedures for calibration.

Start-Up Guide



Easy Set Up can be entered by setting either or both channels to Factory and cycling power on the 9950-3.

Calibration

Both the Chlorine and the pH electrodes are required to be calibrated for accuracy. Upon initial set up the electrodes will need to be placed in a chlorinated flow stream for a minimum of 4 hours in a conditioning period. Calibration of the Chlorine electrode is typically required every 14 to 21 days to comply with the EPA standard 334.0. The calibration frequency of the pH electrode is application dependent and the intervals between calibrations must be determined by the user of the system.

In order to achieve the most accurate chlorine measurement, after the minimum 4 hour conditioning period, calibration must be performed in the following specific order:

- Temperature
- pH electrode (Free Chlorine only)
- Chlorine electrode

NOTE: The Temperature element only requires calibration one time during initial commissioning. Once calibrated the Temperature element is calibrated for the life of the chlorine electrode.

Chlorine sensor temperature element calibration

The temperature element inside the chlorine sensor needs to be calibrated. Use a reference thermometer to verify the actual temperature of the sample. This value is then entered into the calibration screen of the Temperature Calibration menu.

Tip: Remove the pH electrode from the flow cell and insert the reference thermometer. If no pH sensor is being used (ClO₂ system), remove the cell plug to insert the thermometer. Replace the plug after calibration.

pH electrode calibration

It is highly recommended to perform a two point calibration of the pH electrode using a pH buffer 7 and pH buffer 4 or 10. The pH buffers' temperatures should be close to the system water temperature for an accurate calibration. Once a successful calibration is performed, the 9950 will automatically time stamp the "Last CAL" display with the date of calibration. The user can add a date to the "NEXT CAL" display which will generate a "Calibration Due" icon across the pH channel (CH2).

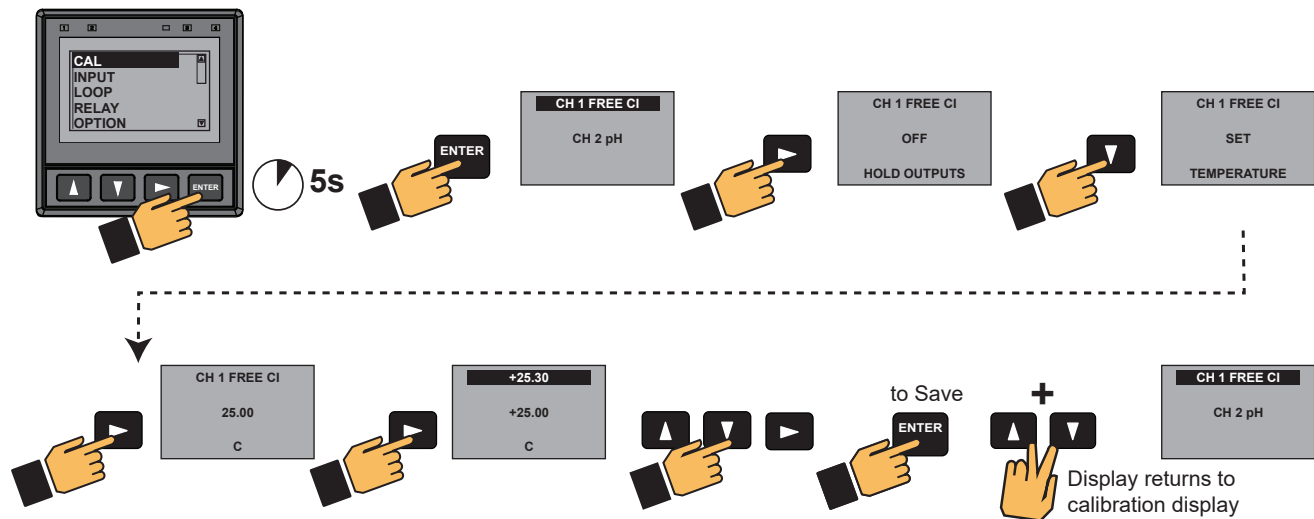
Chlorine sensor

Calibration must be performed to every new chlorine sensor (FCI or ClO₂) and any time a membrane cap or internal electrolyte is replaced. With the chlorine sensor attached to the 2650 electronics (with system power on) and placed in a chlorinated flow stream for the minimum of 4 hour conditioning period, the temperature and chlorine In-Process Calibration needs to be performed.

Once a successful calibration is performed the 9950 will automatically time stamp the "Last CAL" display with the date of calibration. The user can add a date to the "NEXT CAL" display which will generate a "Calibration Due" icon across the chlorine channel (CH1).

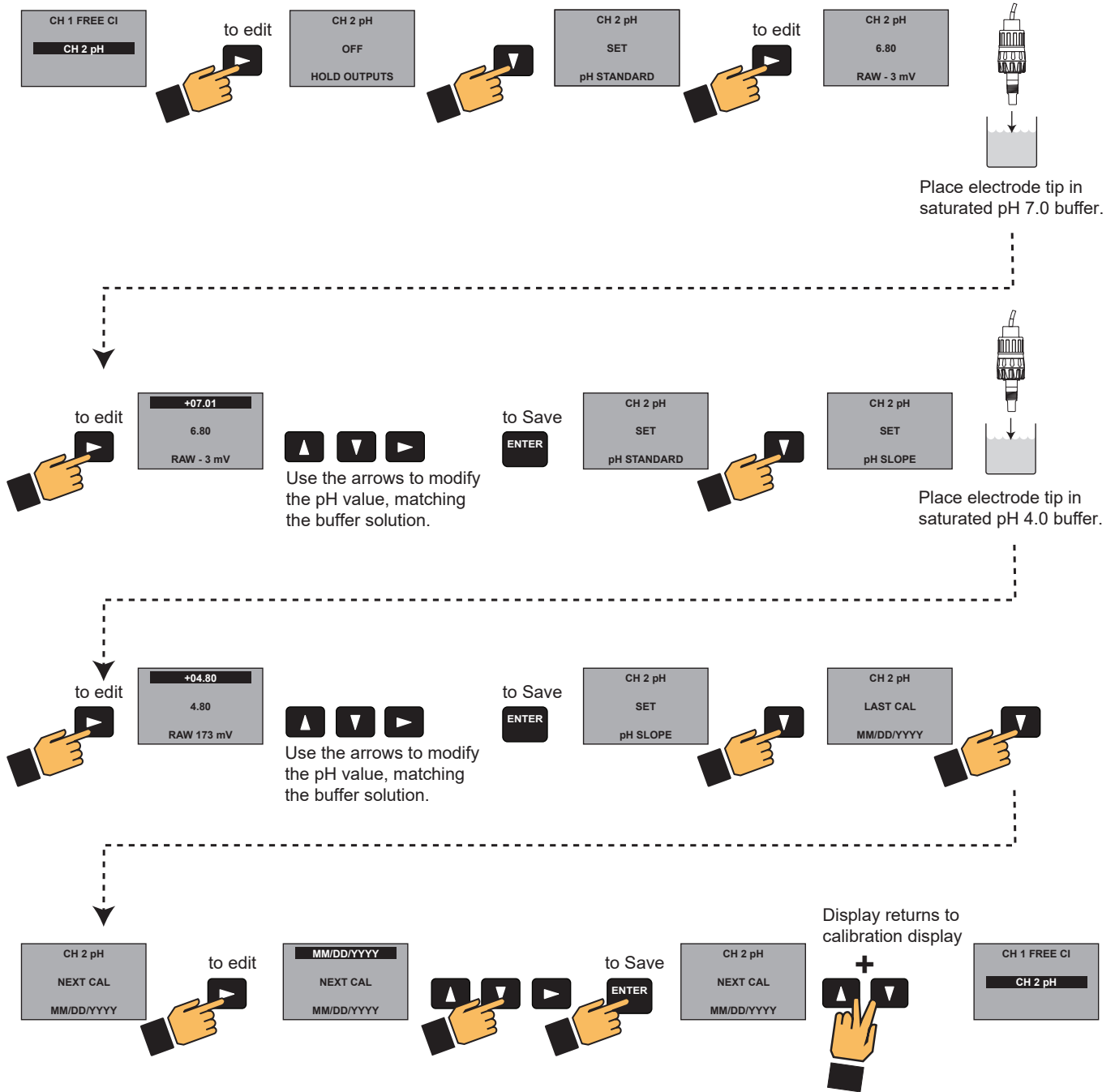
NOTE: It is advised to return 24 hours after the initial Chlorine calibration to verify and recalibrate if necessary.

Temperature Calibration



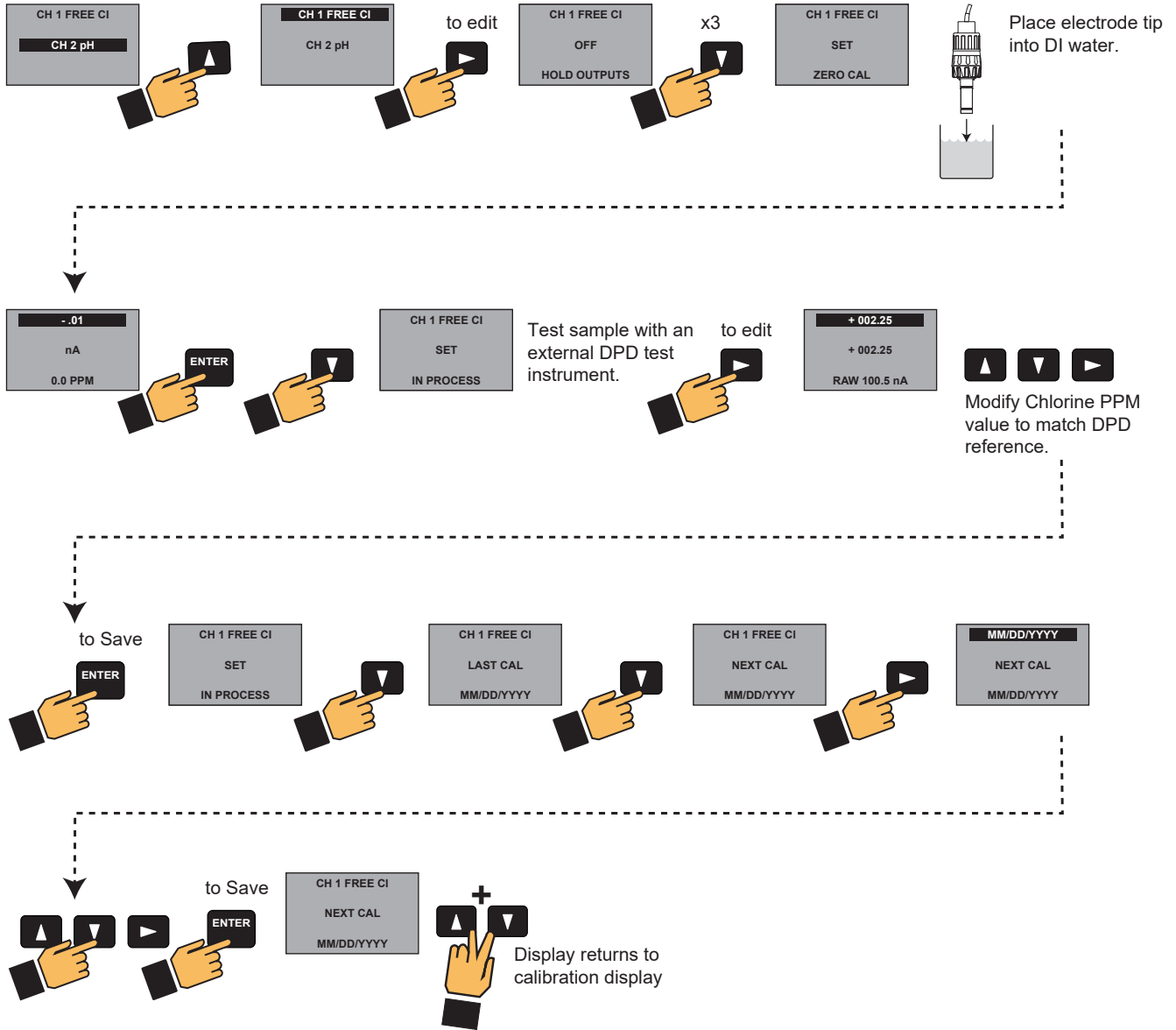
Calibration

pH Electrode Calibration



Calibration

Chlorine Electrode Calibration



Warranty Information

Refer to your local Georg Fischer Sales office for the most current warranty statement.

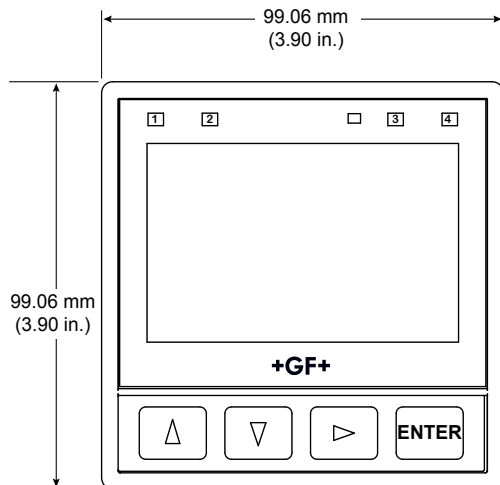
All warranty and non-warranty repairs being returned must include a fully completed Service Form and goods must be returned to your local GF Sales office or distributor. Product returned without a Service Form may not be warranty replaced or repaired.

GF products with limited shelf-life (e.g. pH, ORP, chlorine electrodes, calibration solutions; e.g. pH buffers, turbidity standards or other solutions) are warranted out of box but not warranted against any damage, due to process or application failures (e.g. high temperature, chemical poisoning, dry-out) or mishandling (e.g. broken glass, damaged membrane, freezing and/or extreme temperatures).

Dimensions

3-9950-3

Front View



Side View

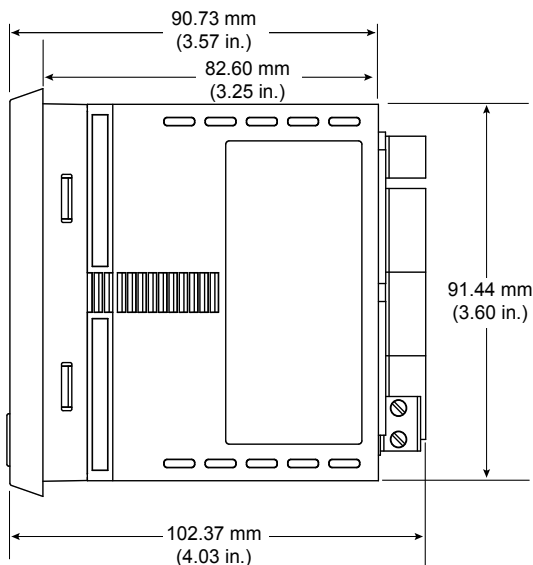


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Signal Type: Digital (S³L)

- The input terminals on the 9950-3 carry Digital (S³L) serial data from the sensor.
- Do not route sensor or output cables in conduit containing AC power wiring. Electrical noise may interfere with sensor signal.
- Routing cable in grounded metal conduit will help prevent electrical noise and mechanical damage.
- Seal cable entry points to prevent moisture damage.
- Only one wire should be inserted into a terminal. Splice double wires outside the terminal.
- The TOTAL cable length from I/O devices to the transmitter must not exceed 305 m (1000 ft).
- In case of noise interference, ground the sensor SHIELD wire to a local earth ground at a point near the sensor.
- Consult the sensor manual for additional wiring information.
- The maximum cable length of the Digital (S³L) bus varies depending on the types of sensors connected and the size of the conductors in the cable. For best results, determine the maximum cable length for the system before routing cables.

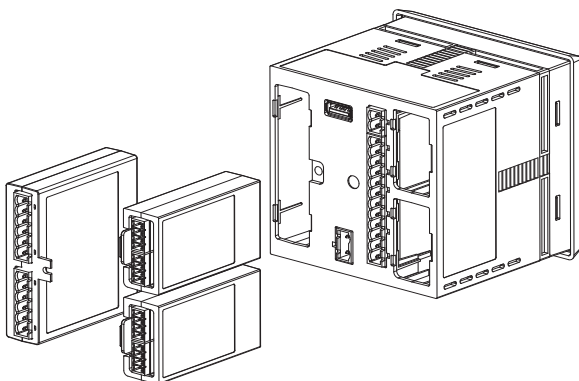


In case of noise interference, connect the cable shield to earth ground.

Maximum total cable length of the Digital (S³L) Bus:

The quality of the cable used in the bus determines the maximum length. The maximum cable length may not exceed 305 m (1000 ft), regardless of current requirements.

Module Installation



CAUTION
Avoid Electrostatic Discharge (ESD).

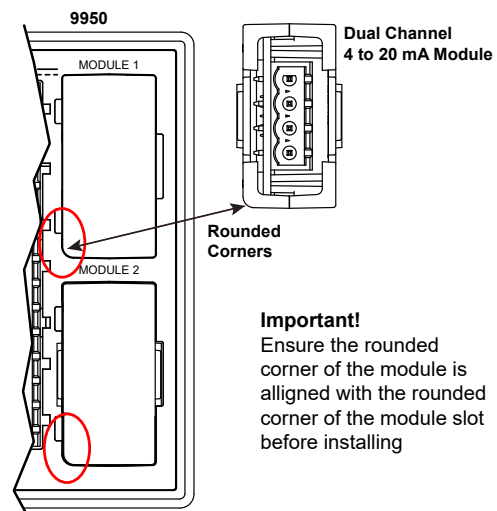
The plug-in modules may be installed either before or after the base unit is mounted. If the 9950-3 Base Unit will be mounted using the provided quick clip mounting bracket, install plug-in modules first with power disconnected.



CAUTION
Exercise care when installing modules. Do not bend connecting pins.

To install modules:

Remove power from the 9950-3. Carefully align pins and connectors (do not bend connecting pins) and push module firmly into place, then attach with screw(s) for Relay Modules only.



Rounded Corners

Important!
Ensure the rounded corner of the module is aligned with the rounded corner of the module slot before installing

To move modules:

Remove power from the 9950-3.

For Relay Modules:

Unplug connectors, remove screw(s), and carefully pull module straight out from the base unit. Do not bend the connecting pins.

For Dual Channel 4 to 20 mA, and Modbus Modules:

Unplug connectors and squeeze the two retaining tabs while pulling module out of 9950-3.



WARNING
Relays may be connected to external high-voltage power sources or multiple power sources creating an electrocution hazard.

Plug-In Modules

Standard modules for the 9950-3:

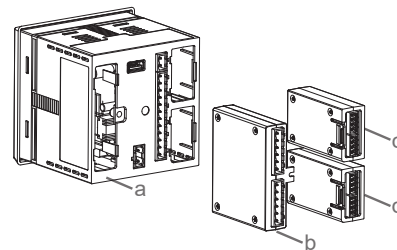
a. Base Unit (required)	3-9950-3	159 001 841	Base Controller, no modules
b. Relay Module	3-9950.393-3	159 310 270	Relay Module
c. Module 1	3-9950.398-2	159 001 848	Dual Channel 4 to 20 mA Output Module

Optional module for the 9950-3:

d. Module 2	3-9950.395-M	159 001 905	Modbus Module (optional)
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Each item is ordered separately. Modules are field-replaceable at any time.

See Module Installation (pg. 3) and Ordering Information (pg. 40) sections for more details.



CAUTION

Avoid Electrostatic Discharge (ESD).



- Minimize handling of the plug-in modules to reduce the possibility of damage due to ESD.
- Handle modules by the edges. Never touch any exposed circuitry or contacts.



- Wear an anti-static wristband or stand on an anti-static mat, or keep one hand touching a properly grounded pipe or other piece of properly grounded metal when handling modules.

Loop and Modbus Modules

Mfr. Part No.	Code	Description
3-9950.398-2	159 001 848	Dual Channel 4 to 20 mA Current Loop Output Module
3-9950.395-M	159 001 905	Modbus Module

Dual Channel 4 to 20 mA Module

Two additional 4 to 20 mA passive current loop outputs in a single module, allows up to six current loop modules in the 9950-3 Chlorine Controller.

Modbus Module

The Modbus Module connects the 9950-3 to serial RS485 Modbus automation networks. The Modbus Module will allow for PLCs and SCADA Systems to query the current readings, channel status, state of the relay and 4 to 20 mA outputs, along with status of the 9950-3 Chlorine Controller and Modbus communications.

Detail programming information is available in the 9950 Modbus Programming Manual.

Default Communication Parameters

ModBus Address	95
ModBus Termination	Off
ModBus Mode	RTU
ModBus Baud Rate	19.2K
ModBus Parity	Even
ModBus Endian	Big

Relay Modes

The 9950-3 has a slot for an optional Relay Module for the module listed on page 14.

- The four Binary Inputs can detect if an external switch is open or closed. The switch state can be used to enable or disable the relays in the module. The four binary inputs only control relay activation and are not considered an input measurement. This is standard on the 9950-3.
- A flow switch must be wired into Binary input #1 to allow access to the Chemical Guard mode of the 9950-3.
- Dry-contact relays are electromechanical switches with a moving contact armature. They are suitable for many general-purpose applications, AC or DC, including AC loads up to 250 V.

For wiring information, refer to the Relay Wiring section, page 5.

Binary Input Ratings

Maximum Input voltage (without damage)	30 VDC
Minimum Input voltage (without damage)	-5 VDC (no operation below 0 VDC)
Maximum input voltage for signal "Off" (low or "0")	1.5 VDC
Minimum input voltage for signal "On" (high or "1")	3.0 VDC
Maximum current draw for signal "0" (low)	≤500 μADC
Minimum current draw for signal "1" (high)	500 μA
Typical current draw for signal "1" (high)	6.0 mA at 30 VDC, 4.8 mA at 24 VDC, 2.4 mA at 12 VDC, 1.0 mA at 5 VDC



Power Switch
EXT
INT

The 3-9950.393-3 module can be set to supply power to the external switch/sensor. If an externally powered sensor is connected with the 3-9950.393-3 module, set the power switch to the EXT position. The module can power external sensors by switching the power switch to the INT position. Maximum power that can be drawn from the module is 6mA at 30 VDC. Important for externally powered switches/sensors ensure the output signal is within the allowable range for the 3-9950.393-3.

NOTE:

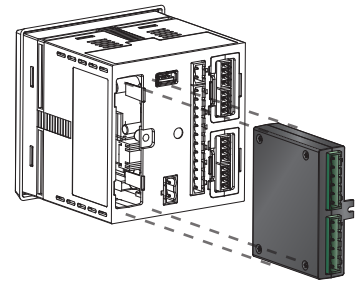
- The four red Indicator LEDs on the front panel of the 9950-3 show the status of relays 1, 2, 3, & 4. The LEDs will activate with or without a relay module installed.
- Hysteresis and time delay are adjustable for each relay.

CAUTION

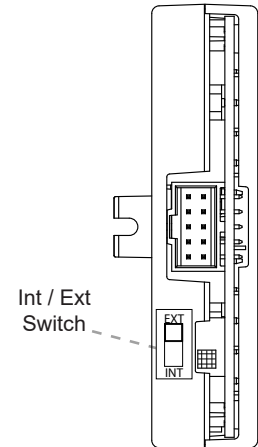
Switching active loads (usually inductive) can cause contact arcing sufficient to damage the relays.



The RC Filter Kit or "snubber" (part number 3-8050.396) is available as an accessory to reduce or eliminate these damaging effects. Recommended for inductive loads greater than 50 VAC (remote relays, solenoids, pumps, etc.)



3-9950.393-3



CAUTION

Keep relay wiring separate from electrode and signal wiring to prevent interference and damage to the 9950-3 Transmitter.

Relay Modes

Chemical Guard

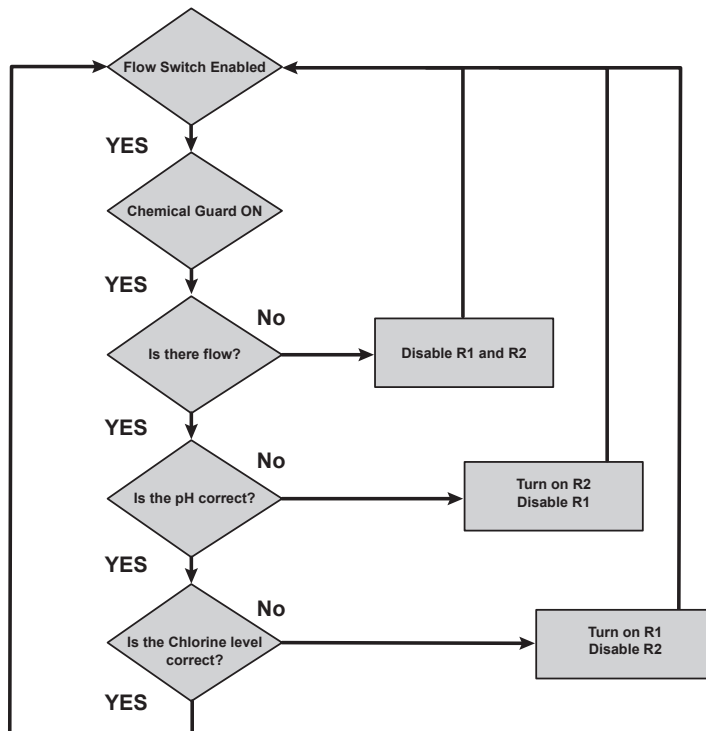
The Chemical Guard prevents overdosing of oxidant type chemicals (Chlorine) whose concentration varies based on the pH level of the application.

The Chemical Guard is only accessible in the relay menu when used in conjunction with a flow switch (GF option) that is wired to the Binary input #1 of the 3-9950.393-3 relay module.

When the Chemical Guard function is selected, relay 1 is automatically defaulted to control and adjust the Oxidant chemical (Chlorine) and relay 2 is defaulted to control and adjust the pH level of the application.

The control logic will always interrupt (disable) relay 1 if the pH requires adjusting. Once the pH is corrected, relay 1 is then available to add additional oxidants to the application.

The Chemical Guard allows relay 1 and relay 2 to be independently programmed as a low set point, high set point or a proportional pulse output.



1. Press and hold ENTER for 3 seconds
2. Go to the Relay Menu by pressing ▼ ▼ ▼ then ENTER
3. Display shows "FLOW SWITCH" NO, press ► and change to YES, Press ENTER to save
4. Press ▼ screen should show "RELAY CHEMICAL GUARD" OFF
5. Press ► and change to YES, press ENTER to save
6. Press ▼ screen should show "Oxidizer" Mode OFF
7. Press ► and select LOW
8. Press ▼ x2 to set POINT DISPLAY
9. Press ► to enter the LOW SET POINT value 3.0 ppm, press ENTER to save
10. Press ▼ then press ► to enter ON DELAY time of 15 seconds, press ENTER to save
11. Press ▼ then press ► to enter an OXIDIZER HYSTERESIS of 1.0 ppm, Press ENTER to save
12. Press ▼ x3 screen should show pH ADJUST Mode OFF
13. Press ► to change the Mode to HIGH
14. Press ▼ x2 then press ► to enter HIGH SET POINT of 7.5
15. Press ▼ then press ► to enter ON DELAY time of 15 seconds, press ENTER to save
16. Press ▼ then press ► to enter pH ADJUST HYSTERESIS of 0.3 ppm
17. Press ▲ + ▼ at the same time to go back to the VIEW Mode



Example: Maintain a pool's chemistry using two dosing pumps at pH 7.2 and chlorine at 3.0 ppm

Standard Relay Mode

Set your relay functions to your own application requirements.

Once a setting is saved it becomes immediately active.

1. Press and hold ENTER for 3 seconds
2. Go to the Relay Menu by pressing ▼ ▼ ▼ then ENTER
3. Press the ► to select desired source. You will be asked to enter a code or password. Select source and press ENTER to confirm
4. Press ▼ to enter the relay **MODE** selection screen
5. Press ► and then ▼ to select **R1 MODE LOW**. Press ENTER to confirm
6. Press ▼ to **R1 SET LOW**. Press ► to enter PPM value of 2.0
7. Use the ▲ and ▼ to change Set Point. Press ENTER to save
8. Scroll ▼ to the **R1 HYSTERESIS** menu
9. Press ► to edit
10. Set the hysteresis for this relay. Set the value to **1.0 ppm**
11. Press ENTER
12. Scroll down ▼ to the **R1 ON DELAY** menu
13. Press ► to edit
14. Set the turn-on delay in seconds for the relay: **15.0**
15. Press ENTER Then (▲▼) (▲▼)
16. Exit to View Mode

- Relay function can be tested in the RELAY menu



Example: Set a relay R1 to turn on at a low setpoint of 2.0 ppm with a time delay of 15 seconds and turn off at 3.0 ppm.

Remember,
SET LOW + hysteresis = OFF
Relay 1 Source = CH1 Primary
Relay 1 Mode = Low
R1 Set Low = 2.0
R1 Hysteresis = 1.0
R1 on delay = 15.0 sec

Relay Modes

• Binary

When the relay source is set to "Binary", the Binary Inputs can sense if the input is ON (Closed) or OFF (Open). The four binary inputs only control relay activation and are not considered a measurement source. Each binary mode is independent and each of them can be assigned to a relay mode.

• Error Mode

Relay activated when any related failures occur for the system.



Caution:

If HOLD WHILE RELAY # ACTIVE setting is changed while an Activation or Recovery is in process, the setting will be applied after the cycle is complete. To apply the change immediately, cycle power to the 9950-3.

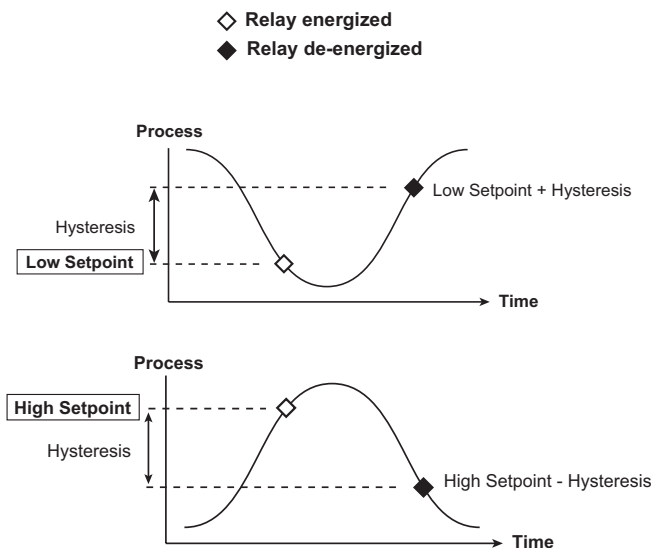
Example: Binary Input

A 3-4630.395 Flow Switch is mounted in the Chlorine flow cell.

The flow switch will prevent the relay(s) from activating if the flow to the cell is interrupted.

Relay Modes

The 9950-3 relays are selectable and configurable and can be used as switches that respond when the process value moves above or below a user-defined setpoint or it can be used to generate a pulse at a rate proportional to the process value. They can be used for Low Alarm, High Alarm or Proportional Pulse triggering related to the process value. All relay functions are set up in the RELAY menus.



▭ Proportional Pulse Operation:

The transmitter can output a pulse at the rate defined by the settings in the CAL menu and the sensor input. The maximum pulse output is 300 pulses per minute.

As the process value rises above the setpoint, the output will start pulsing in relation to the process value, the maximum pulse endpoint and the programmed pulses/minute. The pulse rate will change as the process value changes and approaches the programmed endpoint. This functionality can be used to precisely control the process.

The starting point, endpoint and maximum pulse rate are selectable in the RELAY menus.

Typical usage would be to control solenoid-operated dosing pumps.

NOTE: Relay LEDs will flash in PULSE mode.

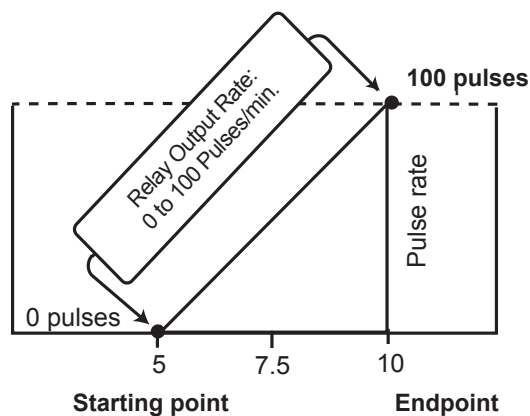
The 9950-3 supports the ability to activate the Red Backlight when a relay is activated. An optional check box is displayed during the programming of a relay that will turn the Red Backlight on when the relay is activated. The Red Backlight can be activated by any relay or relay mode.

◇ Low Setpoint:

Relay is on when the measured value is less than or equal to the setpoint. Relay turns off when the measured value is equal to or greater than the Low Setpoint + Hysteresis.

◇ High Setpoint:

Relay is on when the measured value is greater than or equal to the setpoint. The relay turns off when the measured value is less than or equal to the High Setpoint - Hysteresis.



In the example:

- The output will be 0 pulses/min. when value is less than 5.
- The output will be 50 pulses/min. when value is 7.5.
- The output will be 100 pulses/min. when value is 10 or greater.

Menu System

VIEW Mode Overview

The top level of screens are referred to as the **VIEW Mode**. The VIEW Mode displays the sensor measurement values, sensor raw measurement data, current output and relay status. The horizontal bar graph represents the primary measurement value that is also displayed in the numeric field above the bar graph. The bar graph is primarily used to display the full scale range of the sensor, but can be scaled via the OPTION menu item.

During normal operation, the 9950-3 displays the VIEW mode.

- To select a display, press the ▲ or ▼ arrow keys. The display selections scroll in a continuous loop.
- Changing the display selection does not interrupt system operations.
- No password is necessary to change display selection.
- Output settings cannot be edited from the View Mode.
- The display will return to the VIEW Mode if no button is pressed for 10 minutes.

MENU Mode Overview

The MENU Mode enables the user to view and configure all menu items. The five menus available are: **CAL**, **INPUT**, **LOOP**, **RELAY** and **OPTION**.

MENU Mode is entered by pressing and holding ENTER for three seconds.

To select a menu, use the ▲ and ▼ arrow keys to highlight the desired menu and press ENTER to select the menu.

In the selected menu, use the ▲ and ▼ keys to navigate through the menu. Use the ▲, ▼ and ► keys to edit the selected item.

To save the new selection, press the **ENTER** key. A message displaying “Saving” will be displayed for 3 seconds. After this message is displayed, the newly selected value will be displayed, if applicable. To abandon the changes press the ▲ and ▼ arrows simultaneously.

Password Overview

The password is often required to start editing. Once entered correctly, this password will not be needed for subsequent edits, until the menu system is exited. The password is required when the menu system is re-entered.

Your choice of password (STD or CODE) is selected in the Options Menu.

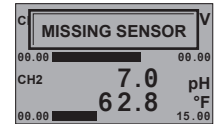
- **STD**
The standard (STD) password is ▲▲▲▼, pressed in sequence. This password is designed to protect the 9950 from unintentional changes. It is best suited for systems where a group of people need to be able to change settings.
- **CODE**
The CODE default setting is 0000, adjustable to any 4-digit numerical code up to 9999. Using a personal code provides the maximum degree of security. This code can be modified in the Options menu.

Password Reset

Turn off 9950-3 Press and hold all 4 keys on keypad while turning on 9950 and unit will revert back to STD password.

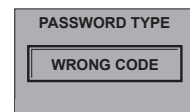
Error Handling

Errors occurring while on the measurement screens show a specific message (e.g., Wrong Sensor). Once the error is resolved or cleared, the error message stops.

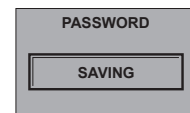
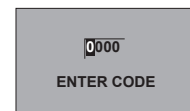


Scrolling

In some cases, more than one message or measurement may need to be displayed. This is accomplished by alternating the message portions across the screen.



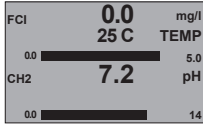
In the MENU mode, if the wrong code or password is entered, an ERROR message is displayed.



To change your CODE, go to OPTIONS mode, enter your desired code and press ENTER. (The STD password cannot be changed).

VIEW Mode

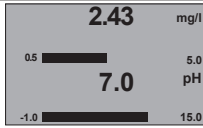
9950-3 VIEW Mode



View Measurement Display 1

Displays the primary (top line) and secondary (bottom line) values from the sensors assigned to Channel 1 and 2. If the Bar Graph feature is enabled in OPTION menu, the bar graphs will also be visible. If Channel 2 doesn't have a sensor assigned to it, the area will be blank.

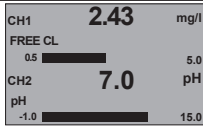
This is the default VIEW display and does not time out.



View Measurement Display 2

Channel 1 electrode information: Chlorine sensor primary value and visual bar graph on top line.

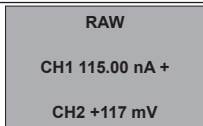
Channel 2 electrode information: pH primary value and visual bar graph on bottom line.



View Measurement Display 3

Channel 1 electrode information: primary value, bar graph and custom name on top line.

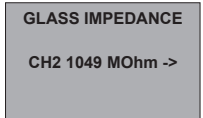
Channel 2 electrode information: primary value, bar graph and custom name on bottom line.



Electrode Wellness Information

Channel 1 electrode information: Chlorine sensor raw nanoamps (nA) value

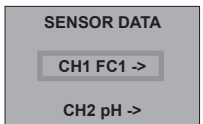
Channel 2 electrode information: pH electrode millivolt (mV) value



pH only, last measured glass impedance, press ► key to manually update reading.

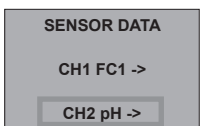
Select which sensor data to be reviewed by using the ▲ and ▼ arrows.

CH 1 Using the ► key, you will see the following screens:

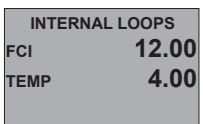


[Cl Sensor S/N]	Electrode Serial Number
[Cl Type and Range]	Identify the chlorine sensor type connected and its ppm range
[ZeroCAL: ppm & nA]	View user entered Zero Calibration data in ppm and nA
[In Proc: ppm & nA]	Users in process calibration value when it is entered in the calibration menu
[Temp at CAL]	Temperature recorded during user In-Process Calibration
[pH at CAL]	pH value recorded during user In-Process Calibration
[Temp Offset]	Temperature offset calculated from user entered temperature calibration from Calibrate Menu
[Elapsed Time]	Total hours of operation
[Low & High: C]	Lowest and highest temperatures the Cl sensor has been subjected to during operation

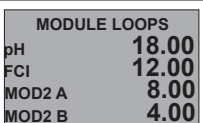
CH 2 Using the ► key, you will see the following screens:



[Serial Number]	Electrode Serial Number
[Model Number]	Electrode Model Number
[pH Sensor Efficiency]	Calibration Slope Value
[pH Offset Calibration]	Offset
[Factory Impedance]	pH only, Factory pH glass Impedance
[Usage Time]	Electrode Runtime in Hours
[Minimum pH]	Minimum Measured Value
[Maximum pH]	Maximum Measured Value
[Minimum Temperature]	Minimum Measured Temperature
[Maximum Temperature]	Maximum Measured Temperature



Displays the internal 4 to 20 mA LOOP output for each channel assigned primary and secondary sources. (3.6, 22.00 are error output values).



Displays the Module 4 to 20 mA LOOP output for each channel assigned primary and secondary sources. (3.6, 22.00 are error output values).

RELAY STATUS	
RELAY 1	ON
RELAY 2	OFF
RELAY 3	OFF
RELAY 4	OFF

Relay status is stated to the right of the relay number as (OFF, ON) for each relay.

BINARY STATUS	
FLOW SWITCH	OFF
BINARY 2	ON
BINARY 3	OFF
BINARY 4	ON

When the flow switch is enabled, the label for Binary Input will automatically change to FLOW SWITCH. The Binary labels can be manually configured. Binary labels can be edited by pressing ► on the Binary Status screen and scrolling through the Binary Label submenu. Pressing Cancel (▲ and ▼ simultaneously) returns to the Binary Status screen in View Mode. English, French, German, Italian and Spanish only. Binary status is stated to the right of the binary channel number as (OFF, ON) for each of the four binary inputs.

MODBUS STATUS	
ADDRESS	999
BUS MSG CNT	99999
9950 MSG CNT	99999
MSG ERR CNT	99999

If there is no module installed, the error code "Missing Module" will appear and blink.

SYS CONFIG	
CH1	FREE CI
CH2	pH
RELAY	399504033
MOD1	39950408
MOD2	

SYS CONFIG shows channel, parameter and relay module part number.

GENERATION 2	
SW VER	00-06
9950 S/N	0123456789

Generation Screen shows version of software and serial number of unit.

Note: Top shows the Generation of 9950

MENU ->

MENU-> will allow access to top level menu by pressing the ► key.

DATE
09/01/2016
09:06

DATE and TIME display show the current system date and time

Important

The Relay, Mod1 and Mod2 number returned by the Sys Config Screen is not the Mfr. Part No. To convert from the displayed number to the GF Mfr. Part No. use the chart below.

Module	RELAY, MOD1 or MOD2	Mfr. Part No.
Dual Channel 4 to 20 Out	39950408	3-9950.398-2
Modbus Module	39950409	3-9950-395M
Relay Four Mechanical	399504031	3-9950.393-1
Relay Two SS and Two Mechanical	399504032	3-9950.393-2
Relay Two Mech and Four Binary	399504033	3-9950.393-3

Calibration



For greater accuracy the initial calibration of the system must be performed in the following order:

1. Temperature (only required on the initial start up of the FCI electrode).
2. pH electrode (2 point calibration required using pH buffer 4.0 and 7.0).
3. Zero calibration, single point calibration in DI water.
4. Chlorine sensor. (Single point calibration using a DPD reference).
 - Before initial calibration, the FCI electrode must be connected in the 3-2650-7 electronics and system powered. The Chlorine electrode must be installed in the flow cell with chlorinated water flowing through the flow cell for at least 4 hours.
 - It is recommended that the FCI electrode be process calibrated 24 hours after the initial "Start up" calibration.
 - Chlorine and pH calibration screens will be shown only when a valid sensor is detected.
 - Chlorine calibration should be stable per EPA 334.0 and should require additional calibration every 14 to 21 days.
 - pH calibration is required over a period of time established by the customer based on the application requirement.

WARNING Temperature Calibration

Calibrate temperature element: Must be performed on new chlorine electrodes.

The temperature element is located in Chlorine Electrode (CH 1), see screens 1 and 2 below.

Once calibrated the temperature element does not have to be calibrated for the life of the chlorine electrode.

Chlorine Electrode Calibration

CH 1 FREE CI OFF HOLD OUTPUTS	ON prevents relays from activating while making adjustments and relays in PULSE mode will suspend pulsing. Output is held until the user exits the CAL menu or turns it OFF. Select ON/OFF. Default = OFF
CH 1 TEMP SET TEMPERATURE ->	Enter process temperature from a reference thermometer: °C or °F. Units are set up in the INPUT Menu. CAUTION: Refer to the calibration procedure on page 9
CH 1 FREE CI SET ZERO CAL	The ZERO CAL is only required to be performed when a chlorine electrode is initially installed. The chlorine sensor should be placed in a beaker of non chlorinated water (DI water). When ► is pressed, the LIVE readings in nA is displayed, but cannot be edited. Once the nA are stable press ENTER to save the ZERO OFFSET.
CH 1 FREE CI SET IN PROCESS ->	Enter process chlorine value determined by customer supplied DPD test kit.
CH 1 FREE CI LAST CAL MM - DD - YYYY	After a successful chlorine calibration the LAST CAL display is automatically updated and date stamped with the date of the calibration.
CH 1 FREE CI NEXT CAL MM - DD - YYYY	Operator manually enters the next required calibration date. To avoid an immediate error code, this date must be at least one day after the LAST CAL date. A warning will show up on the chlorine sensor channel showing "Calibration is Due". To override this warning the operator can input a year that is several years away (ie 2050).
CH FREE FCI RESET CAL	This menu resets CI readings and Zero Calibration back to Factory Calibration. WARNING! User entered CI calibration settings will be lost, the Temperature, Zero Point and Process Calibration will need to be done again.

Calibration

pH Calibration

CH 2 pH OFF HOLD OUTPUTS	ON prevents relays from activating while making adjustments and relays in PULSE mode will suspend pulsing. 4 to 20 mA output is held until the user exits the CAL menu or turns it OFF. Select ON/OFF. Default = OFF
CH 2 pH SET pH STANDARD ->	Applies an offset to the pH measurement. The slope value and the standard value must be at least 2 pH units apart. The ideal values are the minimum and maximum values of your process. An error message is displayed if offset is too high.
CH2 pH SET pH SLOPE ->	Applies a slope to the pH measurement. The slope value and the standard value must be at least 2 pH units apart. The ideal values are the minimum and maximum values of your process. An error message is displayed if the slope is too high or low.
CH 2 pH LAST CAL 12 - 31 - 2015	After a successful pH calibration, the LAST CAL display is automatically updated and date stamped with the date of the calibration.
CH 2 pH NEXT CAL MM - DD - YYYY	Operator manually enters the next required calibration date. A warning will show up on the pH sensor channel showing "Calibration is Due". To override this warning, the operator can input a date that is several years away (ie 2050)
CH2 pH SET RESET pH CAL ->	Press ► to reset pH calibration to factory default. This is useful to wipe out suspected corrupted calibration process prior to performing a new calibration.

INPUT Menu



Allows manual selection of sensor type assigned to the channel.
Channel 1 is dedicated to Chlorine electrodes (FCI and ClO₂). Channel 2 is dedicated to pH electrode.

Allows user to reset 9950-3 Transmitter to Factory settings or select "NONE" for sensor input. This feature is used when a pH electrode is not being used (ClO₂).

Allows user to configure electrode specific parameters such as selecting engineering units, Temperature (°C or °F) and Chlorine (mg/l or PPM).

Note: User is strongly discouraged from changing the sensor type away from the correct sensor.

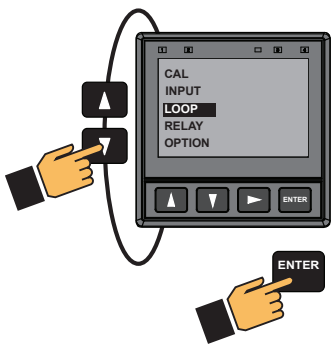
<p>CH 1 FREE Cl -></p> <p>CH 2 pH -></p>	<p>Select sensor type assigned to the channel. Channel 1 is dedicated to Chlorine electrodes (FCI and ClO₂). Choose FACTORY, FREE Cl or ClO₂.</p>
<p>CHANNEL 1</p> <p>NAME</p> <p>FREE Cl</p>	<p>Assign a specific name to the measurement point. Default name is the electrode type.</p>
<p>CHANNEL 1</p> <p>PPM</p> <p>UNITS</p>	<p>Select the Engineering units to be displayed. Select PPM or MG/L (Default PPM)</p>
<p>CH 1 FREE Cl</p> <p>°C</p> <p>TEMP UNITS</p>	<p>Select the Engineering units of the Temperature on the display. Select °C or °F. (Default is °C)</p>
<p>CH 1 FREE Cl</p> <p>AVERAGE</p> <p>OFF</p>	<p>Dampens Display, Output and Relay Response Rate. Select LOW, MED, HIGH, OFF Default = OFF</p>
<p>CH 1 FREE Cl</p> <p>TYPE</p> <p>FREE Cl</p>	<p>Current Channel type is listed. Manually change the channel type to match sensor type if sensor is not found by the S³L electronics. Select FACTORY, FREE Cl, ClO₂ DEFAULT = FACTORY, the 2751-7 (pH Electronics) and 2650 (Chlorine Electronics) will automatically be found by the controller.</p>

INPUT Menu

pH INPUT Menu

<p>CH 1 FREE Cl -></p> <p>CH 2 pH -></p>	<p>Select sensor type assigned to the channel. Channel 2 is dedicated to pH electrode. Choose FACTORY, NONE (use with ClO₂) or pH electrode.</p>
<p>CHANNEL 2</p> <p>NAME</p> <p>pH</p>	<p>Assign a specific name to the measurement point. Default name is the electrode type (Free Chlorine or NONE for Chlorine dioxide).</p>
<p>MANUAL pH</p> <p>OFF</p>	<p>Select MANUAL pH or Electrode. If manual pH is set to "OFF", the pH value from a connected pH electrode will be used for FREE CHLORINE calculations and pH measurement. When manual pH is selected "ON", a pH value manually entered is used for all Chlorine calculations.</p>
<p>MANUAL pH VALUE</p> <p>7.00</p> <p>pH</p>	<p>Enter your pH value here if a pH electrode is not connected. Default value = 7.00</p>
<p>CH 2 pH</p> <p>AVERAGE</p> <p>OFF</p>	<p>Dampens Display, Output and Relay Response Rate. Select LOW, MED, HIGH, OFF Default = OFF</p>
<p>CH 2 pH</p> <p>TYPE</p> <p>pH</p>	<p>Current Channel type is listed. Manually change the channel type to match sensor type if sensor is not found by S³L. Select NONE, FACTORY, pH DEFAULT = FACTORY, the 2751-7 (pH Electronics) will automatically be found by the controller. Select NONE when using Chlorine dioxide with NO pH electrode.</p>

4 to 20mA Output (LOOP OUTPUT)



The following can individually be set for each loop on the 9950-3.

Loops 1 and 2 are in the 9950-3 base unit.

Loops MOD1 A and MOD1 B are present when a loop module is in the Module 1 Slot.

Loops MOD2 A and MOD2 B are present when a loop module is in the Module 2 Slot.

<p>LOOP 1</p> <p>SOURCE</p> <p>NONE</p>	<p>Select source for each loop. Choose NONE, FCL, ClO₂, pH or Temperature. Temperature values are from the Chlorine sensor.</p>
<p>LOOP 1</p> <p>LABEL</p> <p>FCL</p>	<p>English, French, German, Italian and Spanish languages only. A custom label can be assigned to the loop for ease of identification. Default name will be the SOURCE sensor type chosen above.</p>
<p>L1 4 mA SETPOINT</p> <p>0.00</p> <p>PPM</p>	<p>(ALL) Set value corresponding to desired 4 mA output. 6 digits max. Default = 0 ppm (Chlorine), 0 (pH), 0 °C (32 °F) (Temperature)</p>
<p>L1 20 mA SETPOINT</p> <p>5.00</p> <p>PPM</p>	<p>Set value corresponding to desired 20 mA output. 6 digits max. Defaults = 5.00 ppm (Chlorine), 14 (pH), 45 °C (113 °F) (Temperature)</p>
<p>LOOP 1</p> <p>ERROR VALUE</p> <p>22 mA</p>	<p>(ALL) Set desired LOOP output value when sensor error (e.g., bad sensor, broken wire) is detected. Select (3.6 mA, 22 mA, or NONE). Default = 22</p>
<p>L1 ADJUST 4 mA</p> <p>4.00</p> <p>mA</p>	<p>(ALL) Allows fine-tuning to compensate for errors in other equipment connected to the 9950-3. Adjust the current output at 4 mA. The display value represents the precise current output. Adjustment limits: from 3.80 mA minimum to 5.00 mA maximum. Default = 4.00 mA</p>
<p>L1 ADJUST 20 mA</p> <p>21.0</p> <p>mA</p>	<p>(ALL) Allows fine-tuning to compensate for errors in other equipment connected to the 9950. Adjust the current output at 20 mA. The display value represents the precise current output. Adjustment limits: from 19.00 mA minimum to 21.00 mA maximum. Default = 20 mA.</p>
<p>L1 TEST LOOP</p> <p>12.05</p> <p>mA</p>	<p>(ALL) Press ▲ or ▼ to manually control the output current value from 3.8 mA to 21.00 mA to test the output of LOOP. The current loop will revert to automatic control when this menu item is left.</p>

Relay Menu



CHEMICAL GUARD Menu

<p>FLOW SWITCH? NO</p>	<p>A flow switch is necessary to enable the Chemical Guard feature. Verify the use of a flow switch by selecting YES. If NO is selected Chemical Guard will not be accessed and will go to Standard Relay Mode.</p>
<p>RELAY 1 CHEMICAL GUARD OFF</p>	<p>Enable the Chemical Guard feature by changing to ON. If Chemical Guard is not enabled go to RELAY 1 source by pressing ▼ once. See Standard Relay information on page 17.</p>
<p>OXIDIZER MODE OFF</p>	<p>RELAY 1 will automatically be assigned to control Oxidizing chemicals using the Input source of the Chlorine Sensor (CH1). MODE available are LOW, HIGH or PROPORTIONAL PULSE. NOTE: Chemical Guard must use a pH electrode. If the pH input is changed to MANUAL pH input, the Chemical Guard feature is disabled and the standard relay modes must be used control the system until the pH electrode is replaced.</p>
<p>RELAY 1 LABEL OXIDIZER</p>	<p>English, French, German, Italian and Spanish languages only. A custom label can be assigned to the relay for ease of identification. Default name will be the "Oxidizer".</p>
<p>OXIDIZER SET LOW 0.00 PPM</p>	<p>Relay turns on if the process measurement is equal to or lower than this value and the pH value is correct. Set to desired value. See Chemical Guard overview.</p>
<p>OXIDIZER SET HIGH 0.00 PPM</p>	<p>Relay turns on if the process measurement is equal to or higher than this value and the pH value is correct. Set to desired value. See Chemical Guard overview.</p>
<p>OXIDIZER MODE MODE PROP PULSE</p>	<p>Proportional Pulse Mode varies the frequency of pulses in direct proportion to minimum and maximum set points.</p>
<p>OXIDIZER PULSE MIN 5.00 PPM</p>	<p>Enter the desired minimum set point (END POINT) of the application. The number of pulses will be reduced to the chemical dosing pump as the set point is reached to prevent overdosing of chemicals. Default = 5.00 ppm</p>
<p>OXIDIZER PULSE MAX 0.10 PPM</p>	<p>Enter the maximum off set (START POINT) from desired set point (SEND POINT) of the application. This is usually the maximum allowable OFF SET value from the set point of the application. The closer to the starting point the more pulses will be sent to the chemical pump. Default = 0.01 ppm</p>
<p>R1 MAX RATE 120.00 PULSES/MIN</p>	<p>Set desired maximum pulse rate (300 max) NOTE: Pulse width fixed at 100 ms.</p>

Relay Menu

CHEMICAL GUARD Menu

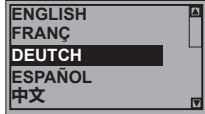
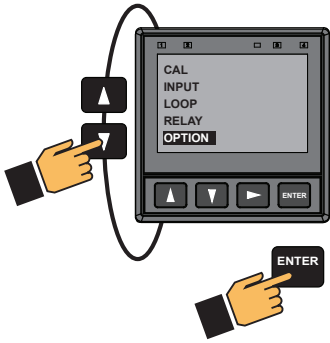
<p>RELAY 1 ACTIVATE</p> <p>RED BACKLIGHT</p> <p>NO</p>	<p>Select YES to have the Red Backlight illuminate during relay activation, NO to not have the Red Backlight activated by the relay activation.</p>
<p>pH ADJUST</p> <p>MODE</p> <p>OFF</p>	<p>RELAY 2 will automatically be assigned to control pH adjusting chemicals using the Input source of the pH Electrode (CH2). MODE available are LOW, HIGH or PROPORTIONAL PULSE. NOTE: Chemical Guard must use a pH electrode. If the pH input is changed to MANUAL pH input, the Chemical Guard is disabled and the standard relay modes must be used to control the system until the pH electrode is replaced.</p>
<p>pH ADJUST</p> <p>SET LOW</p> <p>0.00</p>	<p>Relay turns on if the process measurement is equal to or lower than this value. Set to desired value. See Chemical Guard overview.</p>
<p>RELAY 2</p> <p>LABEL</p> <p>OXIDIZER</p>	<p>English, French, German, Italian and Spanish only. A custom label can be assigned to the relay for ease of identification.</p>
<p>pH ADJUST</p> <p>SET HIGH</p> <p>0.00</p>	<p>Relay turns on if the process measurement is equal to or higher than this value. Set to desired value. See Chemical Guard overview.</p>
<p>pH ADJUST</p> <p>PULSE MIN</p> <p>7.00 pH</p>	<p>Enter the desired minimum set point (END POINT) of the application. The number of pulses will be reduced to the chemical dosing pump as the set point is reached to prevent overdosing of chemicals. Default = 8.00 pH</p>
<p>pH ADJUST</p> <p>PULSE MAX</p> <p>8.00 pH</p>	<p>Enter the maximum offset (START POINT) from desired set point (SEND POINT) of the application. This is usually the maximum allowable OFFSET value from the set point of the application. The closer to the starting point the more pulses will be sent to the chemical pump. Default = 7.00 pH</p>
<p>R1 MAX RATE</p> <p>120.00</p> <p>PULSES/MIN</p>	<p>Set desired maximum pulse rate (300 max) NOTE: Pulse width fixed at 100 ms.</p>
<p>RELAY 2 ACTIVE</p> <p>RED BACKLIGHT</p> <p>NO</p>	<p>Select YES to have the Red Backlight illuminate during relay activation, NO to not have the Red Backlight activated by the relay activation.</p>
<p>RELAY 2</p> <p>TEST RELAY</p>	<p>(ALL) Press ▲ or ▼ to turn relay on or off for testing purposes.</p>

Relay Menu

STANDARD RELAY Menu

<p>RELAY 1</p> <p>SOURCE</p> <p>NONE</p>	<p>All relay sources can be assigned to Relay 1 – 4.</p> <p>Choose NONE, FCI, ClO₂, pH, Temperature, Binary 1 – 4.</p> <p>If CHANNEL 1 is assigned a chlorine sensor the temperature source comes from the chlorine sensor.</p>
<p>RELAY 1</p> <p>MODE</p> <p>OFF</p>	<p>(ALL) Select the desired mode of operation for the (R1) output (OFF, LOW, HIGH, PROP PULSE, ERROR mode) (See page 15, Relay Modes). Default = OFF. Continue stepping through to select R2, R3 and R4 output modes. When MODE is set to ERROR, relay turns on if sensor problem is detected on either channel. ON DELAY delays the turning on of the relay until after the programmed delay time.</p>
<p>RELAY 1</p> <p>LABEL</p> <p>RELAY 1</p>	<p>English, French, German, Italian and Spanish only.</p> <p>A custom label can be assigned to the relay for ease of identification.</p>
<p>R1 SET LOW</p> <p>0.10</p> <p>PPM</p>	<p>(ALL) (Shown if LOW mode)</p> <p>Relay turns on if process measurement is equal to or lower than this value. Set desired value.</p> <p>Default = Chlorine 0.10 PPM, Temperature 25 C, pH 4.0</p>
<p>R1 SET HIGH</p> <p>5.00</p> <p>PPM</p>	<p>Relay turns on if process measurement is equal to or higher than this value. Set desired value.</p> <p>Default = Chlorine 5.00 PPM, Temperature 45 C, pH 8.0</p>
<p>R1 HYSTERSIS</p> <p>0.50</p> <p>PPM</p>	<p>Hysteresis prevents the mechanical relays from chattering around the set point.</p> <p>Set amount (in units of measure from INPUT Mode) to add to SET LOW or SET HIGH values.</p>
<p>R1 ON DELAY</p> <p>5.0</p> <p>SEC</p>	<p>Set seconds (up to 9999.9) to wait before activating relay once the relay condition is true.</p>
<p>NOTE: Screens below are only visible when Porportional Pulse Mode is selected.</p>	
<p>R1 PULSE MIN</p> <p>5.00</p> <p>PPM</p>	<p>Enter the desired minimum set point (END POINT) of the application. The number of pulses will be reduced to the chemical dosing pump as the set point is reached to prevent overdosing of chemicals.</p> <p>Default = Chlorine 5.00 PPM, Temperature 45 C, pH 8.0</p>
<p>R1 PULSE MAX</p> <p>0.10</p> <p>PPM</p>	<p>Enter the maximum off set (START POINT) from desired set point (SEND POINT) of the application. This is usually the maximum allowable OFF SET value from the set point of the application. The closer to the starting point the more pulses will be sent to the chemical pump.</p> <p>Default = Chlorine 0.10 PPM, Temperature 25 C, pH 4.0</p>
<p>R1 MAX RATE</p> <p>120.00</p> <p>PULSES/MIN</p>	<p>Set desired maximum pulse rate (300 max)</p> <p>NOTE: Pulse width is fixed at 100 ms.</p>
<p>RELAY 1 ACTIVATE</p> <p>RED BACKLIGHT</p> <p>NO</p>	<p>Select Yes to have the Red Backlight illuminate during relay activation, No to not have the Red Backlight activated by the relay activation.</p>
<p>RELAY 1</p> <p>TEST RELAY</p>	<p>(ALL) Press ▲ or ▼ to turn relay on or off for testing purposes.</p> <p>Can also be used to reset or latch/unlatch the relay. Does NOT reset the Totalizer.</p>

OPTION Menu



Choose desired the language for the 9950-3. Default = English

TIME FORMAT

24 HR

Choose a time format between a 24 Hour or an AM/PM clock. Default = 24 HR

SET TIME

08:56

Set the time according to the format chosen 00:00

DATE FORMAT

MM/DD/YYYY

Date Format; MM/DD/YYYY, DD/MM/YYYY, YYYY/MM/DD

SET DATE

02/25/2016

Set the date according to the format chosen 00/00/0000

SET DECIMAL MARK

999.99

Choose either comma or point according to local practices. Default = 999.99 (point).

SELECT UNITS

METRIC

Choose METRIC or US CUSTOMARY

CONTRAST


3

Adjust the displays contrast for best viewing. A setting of 1 is lower contrast, 5 is higher and 3 is default.

OPTION Menu

<p>WHITE BACKLIGHT</p> <p>AUTO LOW</p>	<p>White Backlight: OFF, LOW, HIGH, AUTO LOW, AUTO HIGH</p>
<p>RED BACKLIGHT</p> <p>ON</p>	<p>The Red Backlight illuminates when an error condition is detected or user selected relay(s) are activated. Default = ON</p>
<p>DISPLAY</p> <p>BAR GRAPH</p> <p>ON</p>	<p>Display Bar Graph: ON, OFF When enabled, user enters range to be displayed.</p>
<p>PASSWORD TYPE</p> <p>STD</p>	<p>(ALL) Select STD, CODE. Default = STD (Refer to page 4 for further detail)</p>
<p>PASSWORD TYPE</p> <p>CODE</p>	<p>(CODE) If code is selected Default Code = 0000 (Refer to page 4 for further detail)</p>
<p>CH2 BAR GRAPH MIN</p> <p>0.00</p> <p>PPM</p>	<p>Enter a value to represent bar at minimum. Default = 0</p>
<p>CH2 BAR GRAPH MAX</p> <p>100.00</p> <p>PPM</p>	<p>Enter a value to represent bar at maximum. Defaults = 5.00 ppm (Chlorine), 14 (pH)</p>
<p>CH1</p> <p>-----</p> <p>PPM DECIMAL</p>	<p>(ALL) Set the decimal to the best resolution for your application for both CH1 and or CH2. The display will automatically scale up to this resolution for each channel. Select 0, 1, 2, 3, or 4 decimal places, (varies by parameter). Default = 1 Decimal Place</p>
<p>CH1</p> <p>-----</p> <p>°F DECIMAL</p>	<p>(Chlorine electrodes) Set the Temperature decimal to the best resolution for your application for CH1. The display will automatically scale up to this resolution. Select 0, 1, or 2. Default = 1 Decimal Place</p>
<p>MEMO</p> <p>MEMO</p>	<p>(ALL) Enter 17-character string, if desired. Default = MEMO</p>

Modbus Menu

<p>MODBUS MODULE NONE</p>	<p>Select NONE, MOD 1 or MOD 2. The MODBUS module must be installed into Module 2 of the 9950.</p>
<p>MODBUS COMMUNICATION SETTINGS -></p>	<p>Press the ► key to change the settings of the Modbus Module. See page 33 for Modbus Communication Settings Menu.</p>
<p>MODBUS REMOTE UPDATE NO</p>	<p>Setting Modbus Remote update to YES allows remote Modbus device to change the settings on the 9950-3. Setting Modbus Remote Update to No prevents remote devices from make any changes to the 9950-3. Remote device will still be able to read all of the Modbus parameters.</p>
<p>9950 GENERATION 3</p>	<p>Displays Transmitter Generation Version.</p>
<p>USER MANUAL </p>	<p>QR code for user manual.</p>

Modbus Menu

OPTION Menu

MODBUS
COMMUNICATION
SETTINGS ->

Press the ► key to change the settings of the Modbus Module

Modbus Communication Settings Menus

MODBUS
ADDRESS
95

Set the Modbus address of the 9950-3.
The default address is 95

NETWORK
TERMINATION
NO

The 9950 Modbus Module has an electronic termination network.
The Termination can be activated by setting the value to Yes.
The default value is No (the termination is off).

MODBUS
BAUD RATE
19.2 K

Set the baud rate of the Modbus network.
The default value is 19.2K baud, 19200 baud.

MODBUS
PARITY
EVEN

Set the parity of the Modbus network.
The default value is Even parity.

MODBUS
ENDIAN
BIG

Set the byte order in which the 9950-3 transmits floating point numbers in the Modbus protocol.
The default value is Big Endian.

RESET TO
DEFAULT
NO

Reset all Modbus setting to the default values.

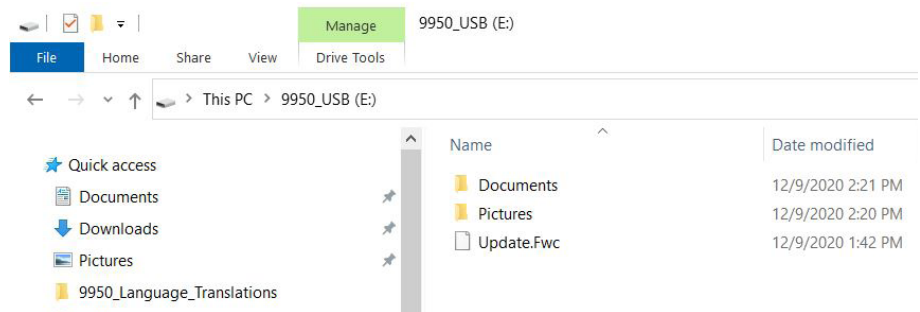
ACTIVATE
SETTINGS
NO

ACTIVATE SETTINGS:
YES sends the changes to the Modbus Module, NO keeps the current settings

9950 Field Software Upgrade

The 9950 upgrade file will be available on the Georg Fischer website. You will need a USB flash drive that is formatted, using Microsoft Windows, in either FAT16 or FAT32 format. **Do not** use exFAT or NTFS formats. These are incompatible with the 9950.

The upgrade file is named Update.Fwc. Copy the file to the root directory of the Flash Drive. Do not change the name of the file or store the file in a sub directory on the Flash Drive. The 9950 will only look in the root directory for the specific file, Update.Fwc.



Sample Flash Drive Directory with Update File

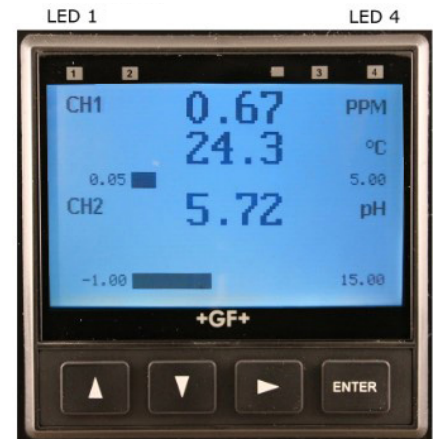


Important! Do not use a USB extension cable. The USB flash drive must be directly connected to the 9950 USB port.

Updating the 9950

Updates available on www.gfpscom.

1. Disconnect power from the 9950.
2. Insert the Flash Drive into the 9950 USB slot.
3. Reconnect power to the 9950.
4. LED 1 on the 9950 will flash quickly as the unit searches for a Flash Drive and the correct file.
5. When the 9950 detects a Flash Drive and a valid update file, LED 2 will slowly flash during the update process.
6. The update process takes approximately 30 seconds.
7. After a successful update the 9950 will boot to the normal screen.
8. If the update is successful, disconnect power, remove USB drive, reconnect power and review application settings.



Troubleshooting

If, after 10 seconds, the unit boots to the normal screen, the 9950 was unable to find the Flash Drive or the file.

- a. Verify the Flash Drive has been formatted in either FAT16 or FAT32 format, the upgrade file is in the root directory of the Flash Drive, and the file name is Update.Fwc. You may also need to try a different flash drive.
- b. If LED 4 on the 9950 is continuously illuminated, this indicates either the file found on the Flash Drive is corrupted, or power was interrupted during the upgrade process.
 - Remove power from the 9950.
 - Remove the Flash Drive.
 - Apply power to the 9950.
- c. If the 9950 starts normally, the file on the Flash Drive was corrupted.
 - Download a new copy of the update file and copy it to the Flash Drive.
 - Repeat the update instruction with the new file.
- d. If the 9950 starts up and stops with LED 4 on and a blank screen, this indicates that the update process was interrupted and the 9950 cannot start.
 - Disconnect power from the 9950.
 - Reattach the Flash Drive to the 9950.
 - Repeat the upgrade procedure.
- e. If the 9950 still does not respond after the second upgrade attempt to:
 - Download a new copy of the update file and copy it to a different Flash Drive.
 - Repeat the update instruction with the new Flash Drive.

Troubleshooting

Condition	Possible Causes	Suggested Solution
Wrong Sensor	Incorrect sensor installed on channel	Connect correct sensor to channel
	Sensor Type set incorrectly in 9950-3	Set correct sensor TYPE in INPUT menu (see page 24)
Wrong Code	Wrong password entered	Enter correct password (see page 4)
Backlight inoperative	Backlight turned OFF (NOTE: Backlight can turn off automatically in AUTO mode)	Set BACKLIGHT to LOW, HIGH, AUTO LOW or AUTO HIGH in OPTION menu.
Relays inoperative	Relay Module installed incorrectly	Remove and reseal Relay Module
	Wrong settings in RELAY menu	Use test relay to verify relay operation then check relay settings.
	Flow Switch OFF	Turn Flow Switch ON
Relay always ON	Hysteresis value too large	Change the hysteresis value
	Defective Relay Module	Replace Relay or Modbus Module
- - - - -	Measurement exceeds display capability	Change unit of measure
Missing Module	4 to 20 mA Module or Modbus Module is not installed in the Module Slot	Install the module in the correct slot
Wrong Module	The wrong Module (4 to 20 mA or Modbus Module) is installed in the slot	Replace module with the correct module
Calibration Due	Calibration is required for all new sensors	Do the Calibration
	Calibration was reset to factory	
	Next Calibration date reached	
	Next Calibration date was not set	
No pH value	pH electrode faulty	Replace pH electrode
		Place pH electrode input to Manual
No Flow	No flow detected through the Flow Switch	Verify water source is turned ON
		Verify the flow cell outlet ball valve is open
		Disable Flow Switch input via Relay Menu
Man pH	Manual pH compensation has been selected	Replace pH electrode
		Set Manual pH to OFF

Troubleshooting

Condition	Possible Causes	Suggested Solution
No Probe (Chlorine or pH)	9950 "cannot communicate" with Chlorine or pH electrode	<ul style="list-style-type: none"> • Check wiring • Install or replace electrode
	Missing sensor or bad temperature element	
Check Preamp (Chlorine or pH)	9950 "cannot communicate" with the Chlorine or pH electronics	Check wiring
		Replace 2751-7 or 2650 Electronics
Backlight of Screen is RED	Error is detected or Relay is activating the red backlight	Correct error condition
Broken Glass	pH electrode glass has been damaged and caused very low impedance	Visually inspect pH electrode for cracked and/or chipped glass
Hi Impedance	The measured pH electrode impedance is above the high impedance level.	Visually inspect the pH electrode and clean if necessary
	Electrode could be in air	Ensure electrode is submersed at all times
Check Cal (pH only)	Slope and/or Offset are out of range	Perform pH EasyCal (pg. 31 & 59)
		Set pH Slope or Standard (pg. 32 & 60)
		Reset pH CAL (pg. 32)

Calibration Error Messages

Message	Cause	Solution
Out Of Range Use Manual Calibration	(pH) Buffer not found; Error > ±1.5 pH units	<ul style="list-style-type: none"> • Use 4 and 7 pH buffers • Clean sensor and retry EasyCal • Use manual calibration method
Err Too Large To Calibrate	(pH) Offset > 1.3 pH units; Slope error > 100%	<ul style="list-style-type: none"> • Check reference • Clean sensor • Replace sensor
Cal Error Out Of Range	Chlorine - nA out of range when compared to the DPD sample pH - Calibration exceeds the maximum offset of the reference junction allowed	Check input at 4 mA and 20 mA settings
		<ul style="list-style-type: none"> • Check sensor range • Check reference • Replace sensor
Slope Too Close To Standard	(pH) Difference in calibration values must be > 2 pH units	<ul style="list-style-type: none"> • Check sensor • Use fresh buffer • Use two different buffer values • Clean sensor
Standard Too Close To Slope	(pH) Difference in calibration values must be > 2 pH units	<ul style="list-style-type: none"> • Clean sensor • Use fresh 4, 7 and 10 pH buffers • Use two different buffer values

Specifications

General

Input channels.....	Two channels
Outputs.....	Two passive 4 to 20 mA outputs Two active 4 to 20 mA outputs Two mechanical relays, 250 VAC, 5 amp

Enclosure and Display

Case Material	PBT
Window.....	Shatter-resistant glass
Keypad	4 buttons, injection-molded silicone rubber seal
Display.....	Dot Matrix LCD
Update Rate	1 s
LCD Contrast.....	5 settings
Indicators.....	Two horizontal digital bar graphs, four LED relay status indicators

Enclosure

Size¼ DIN

Mounting

Panel	¼ DIN, ribbed on four sides for panel mounting clip inside panel, silicon gasket included
Wall.....	Wall Mount Enclosure (sold as an accessory)

Terminal Blocks

Pluggable screw type: use minimum 105 °C rated wire
Torque ratings

Power/Loop.....	0.49 Nm (4.4 lb-in.)
Freq/S ³ L.....	0.49 Nm (4.4 lb-in.)
Relay.....	0.49 Nm (4.4 lb-in.)

Connector wire gauge:

Power, Loop.....	12 to 28 AWG
Freq/S ³ L.....	16 to 28 AWG

Module connector wire gauge:

Relay.....	12 to 28 AWG
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Environmental

Ambient Temperature:

DC Power	-10 °C to 70 °C (14 °F to 158 °F)
Storage Temp	-15 °C to 70 °C (5 °F to 158 °F)
Relative Humidity.....	0 to 100% condensing for (front only); 0 to 95% non-condensing (rear panel)

Maximum Altitude4,000 m (13,123 ft)

Enclosure Rating.....NEMA 4X/IP65 (front face only)

Installation Category Cat II

Pollution Degree 2

Performance Specifications

System Accuracy

- Primarily dependent upon the electrode.

System Response

- Primarily dependent upon the electrode. Controller adds a maximum of 150 ms processing delay to the electronics.
- Minimum update period is 500 ms.
- System response is tempered by the display rate, output averaging.

Electrical Requirements

Power to Electrodes

Voltage.....	+4.9 to 5.5 VDC @ 25 °C, regulated
Current.....	30 mA Maximum

Short Circuit.....Protected

Isolation

.....	Low voltage (< 48 V AC/DC)
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Power Requirements

DC (3-9950-3, -5)	24 VDC nominal (12 to 32 VDC, ±10% regulated). A UL60950-1 or UL61010-1 certified power supply must be used. Power supply shall also be rated for operation at 4000 m (13,123 ft) altitude.
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Sensor Input Specifications

Digital (S ³ L) Sensors	Serial ASCII, TTL level, 9600 bps
Accuracy.....	± 0.5% of reading max error @ 25 °C
Resolution.....	1 µs
Repeatability.....	± 0.2% of reading

Power Supply

Rejection.....	No Effect ± 1 µA per volt
Short Circuit.....	Protected
Reverse Polarity	Protected

Shipping Weights

Base Unit.....	0.63 kg (1.38 lb)
9950-3.....	1.0 kg (2.2 lb)
9950-5.....	0.63 kg (1.38 lb)
Relay Module.....	0.19 kg (0.41 lb)

Standards and Approvals

- CE, UL, CUL, WEEE
- RoHS Compliant
- China RoHS (Go to www.gfsignet.com for details)

FC Declaration of Conformity according to FCC Part 15

This device complies with Part 15 of the FCC rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

- Manufactured under ISO 9001, ISO 14001 and ISO 45001

Specifications

Binary Input Specifications (3-9950.393-3)

Input Voltage Range
(without damage)..... -5 VDC to 30 VDC
(no operation below 0 VDC)

Max. Voltage Rating 30 VDC
Max. Current Rating 6.0 mA

Maximum input voltage for
signal "Off" (low or "0") 1.5 VDC
Minimum input voltage for
signal "On" (high or "1")..... 3.0 VDC
Maximum current draw for
signal "0" (low):..... ≤500 µA DC
Minimum current draw for
signal "1" (high): 500 µA
Typical current draw for
signal "1" (high): 6.0 mA at 30 VDC
4.8 mA at 24 VDC
2.4 mA at 12 VDC
1.0 mA at 5 VDC

Current Loop Specifications (Internal and Modules)

Current Loop Out..... ANSI-ISA 50.00.01 Class H
(Passive, external voltage required)
Voltage..... 12 to 32 VDC, ±10% regulated. Use
UL60950-1 or UL61010-1 certified
power supply. Power supply shall
also be rated for operation at
4000 m (13,123 ft) altitude.
Max. Impedance: 250 Ω @ 12 VDC
500 Ω @ 18 VDC
750 Ω @ 24 VDC
Span 3.8 to 21 mA Adjustable, reversible
Accuracy..... ± 32 µA max. error @ 25 °C @ 24
VDC
Resolution..... 6 µA or better
Temp. Drift ± 1 µA per °C
Isolation Low voltage (< 48 VAC/DC)
Update Rate 100 mS nominal
Zero 4.0 mA factory set; user programmable
from 3.8 to 5.0 mA
Full Scale..... 20.00 mA factory set; user
programmable from 19.0 to 21.0 mA
Power Supply Rejection ± 1 µA per V
Actual update rate determined by sensor type
Short circuit and reverse polarity protected
Adjustable span, reversible
Error Condition Selectable error condition 3.6 or 22 mA
or None
Test Mode Increment to desired current
(range 3.8 to 21.00 mA)
Analog Outputs..... 2 Passive

Relay Specifications

Dry-Contact Relays
Type..... SPDT
Form C
Max. Voltage Rating 30 VDC or 250 VAC
Max. Current Rating 5 A resistive

Solid-State Relays, Optional Relay Module
Type..... SPDT
Form C
Max. Voltage Rating 30 VDC or 30 VAC
Max. Current Rating 0.050 A

Hysteresis..... Adjustable (absolute in
Engineering Units)
On Delay..... 9999.9 seconds (max.)
Test Mode..... Set On or Off
Maximum Pulse Rate 300 pulses/minute

Input Types

- Chlorine (FCI and ClO₂) input via the Digital (S³L) output from the 2650 Amperometric Electronics
- pH input via the Digital (S³L) output from the 2751-7 pH Electronics

Sensor Types:

Chlorine and pH

Current Outputs

- Two 4 to 20 mA output in base unit
- Linear scaling
- Reverse span
- Selectable error mode: 3.6 mA or 22 mA or None
- Test Output mode: allows testing of the current output
- Adjustable 4 to 20 mA end points
- Two 4 to 20 mA Output in base unit
- Two or Four 4 to 20 mA Outputs in optional Modules

Display Ranges:

FCI.....0 to 20 ppm
ClO₂.....0 to 2 ppm
pH.....-1.00 to 15.00 pH
pH.....-99 °C to 350 °C (-146 °F to 662 °F)

Ordering Information

9950 Transmitter Base Unit: Dual Channel, Multi-Parameter and DC Power

Mfr. Part No	Code	Description
3-9950-3	159 001 954	9950 Base Unit - DC Powered, 2 Channel Input, 2 Passive 4 to 20 mA Output, 2 Active 4 to 20 mA Output (Module) 2 Mechanical Relays, 4 Binary Inputs
3-9950-5	159 001 956	9950 Base Unit - DC Powered, 2 Channel Input, 2 Passive 4 to 20 mA Output

Optional Modules

3-9950.393-1	159 310 268	Relay Module with 4 Mechanical Relays
3-9950.393-2	159 310 269	Relay Module with 2 Mechanical and 2 Solid State Relays
3-9950.393-3	159 310 270	Relay Module with 2 Mechanical Relays and 4 Binary Inputs
3-9950.395-M	159 001 905	Modbus Module
3-9950.398-2	159 001 848	Dual Channel Output Module, 4 to 20 mA

Accessories

3-8050.396	159 000 617	RC Filter Kit (for relay use), 2 per kit
3-9950.391	159 310 278	Connector Kit, In-Line, 9950 Transmitter
3-9950.392	159 310 279	Relay Module Connector Kit, 9950 Transmitter
3-9900.392	159 001 700	Wall Mount Enclosure Kit
3-9000.392-1	159 000 839	Liquid Tight Connector Kit, NPT (1 pc.)



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