English

Signet 9900 Transmitter

3-9900.090 Rev. C 08/13

Operating Instructions

Panel Mount

Field Mount

Quick Start

Look for the Quick Start icon to quickly set up your new 9900.

Your new Signet 9900 Transmitter needs to be calibrated and the sensor needs to be initialized prior to use. The following steps outline the recommended procedure to start up a new system.

1. **Module Installation (pg. 4)**
2. **Installation (pg. 7)**
3. **Wiring (pg. 8)**
4. **Sensor Wiring (pg. 11)**
5. **Power Wiring (pg. 17)**
6. **Relay and Open Collector Wiring (pg. 18)**
7. **Relay Functions (pg. 19)**
8. **Operation (pg. 23)**
9. **Menu System (pg. 25)**

Description

The 9900 Transmitter, a member of Signet's line of SmartPro™ instruments, provides a single-channel interface for all Flow, pH/ORP, Conductivity/Resistivity, Salinity, Pressure, Temperature, Level, Dissolved Oxygen, Turbidity, Batch and other applications.

The 9900 is available in either Panel or Field Mount.
Both versions run on 10.8 to 35.2 VDC power (24 VDC nominal),
and can power certain sensors on loop power (see NOTE on pg. 2).

The 9900 Transmitter, also allows third-party 4 to 20 mA signals to be used as an input (optional Signet 8058 i-Go™ Signal Converter required, sold separately).

Compatibility

The 9900 is compatible with all GF Signet products listed in the column to the right.

- pH and ORP electrodes require the Signet 2750 DryLoc® Sensor Electronics (sold separately).
- Conductivity/Resistivity or Salinity measurement requires either the optional Direct Conductivity/ Resistivity Module (part number 3-9900.394) or the Signet 2850 Conductivity/Resistivity Sensor Electronics (sold separately).

  NOTE: If using the 2850, use the one-channel Digital (S^3L) models. The two-channel model 3-2850-63 may be used with only one channel connected. Do not use with both channels connected. The 4 to 20 mA models 3-2850-52 and 3-2850-62 are incompatible with the 9900.
- Turbidity measurement using Signet 4150 or Dissolved Oxygen measurement using Signet 2610-31 requires Signet 8058 i-Go™ Signal Converter (sold separately).

Flow
515*/8510*, 525*, 2000, 2100, 2507, 2536*/8512*, 2537, 2540*, 2551, 2552

pH/ORP
2724-2726 with 2750*
2756-WTx–2757-WTx with 3719 and 2750*
2764-2767 with 2750*
2774-2777 with 2750*

Conductivity/Resistivity, Salinity
2819-2823 with 2850 or Cond/Res Module
2839-2842 with 2850 or Cond/Res Module

Level, Temperature, Pressure
2250*, 2350*, 2450*

Turbidity
4150 with 8058

Dissolved Oxygen
2610-41 direct to 9900
2610-31 requires 8058

* Can be run on Loop Power (see NOTE on pg. 2)

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.

Signet 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).

Product Registration

Thank you for purchasing the Signet line of Georg Fischer measurement products.
If you would like to register your product(s), you can now register online in one of the following ways:

- Visit our website **www.gfsignet.com** and click on **Product Registration Form**
- If this is a pdf manual (digital copy), **click here**
- Scan the QR Code on the left

Safety Information

- Follow instructions carefully to avoid personal injury.
- 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) / Electrocution Danger** Alerts user to risk of potential damage to product by ESD, and/or risk of potential of injury or death via electrocution.
	**Personal Protective Equipment (PPE)** Always utilize the most appropriate PPE during installation and service of Signet products.
	**NOTE / Technical Notes** Highlights additional information or detailed procedure.

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.

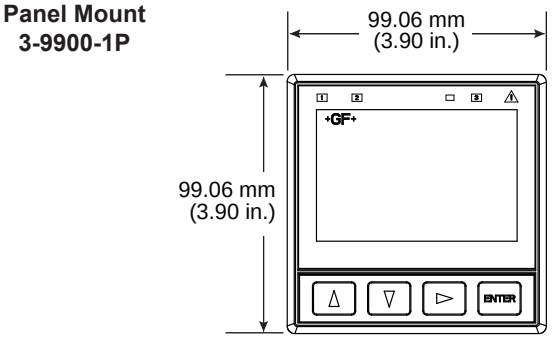
NOTE: Loop Power can be used ONLY for the following sensors: 515/8510, 525, 2250, 2350, 2450, 2536/8512, 2540, 8058 and pH/ORP sensors with 2750; all other measurement sensors require DC power.

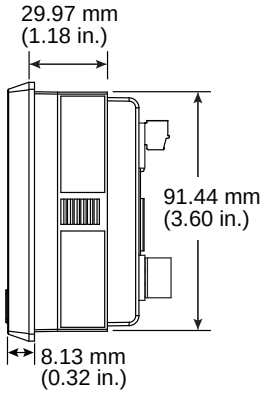
Loop powered systems cannot power both H COMM Module and pH sensors on one system. If using both H COMM Module and pH sensors, DC power is required.

Table of Contents

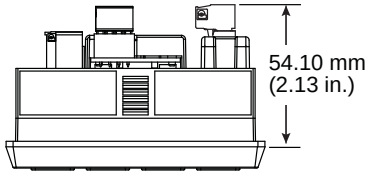
Dimensions

Panel Mount
3-9900-1P



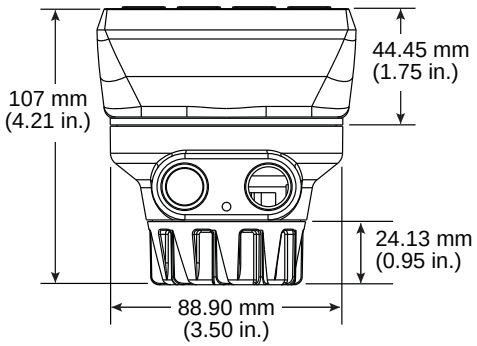


Side View



Top View

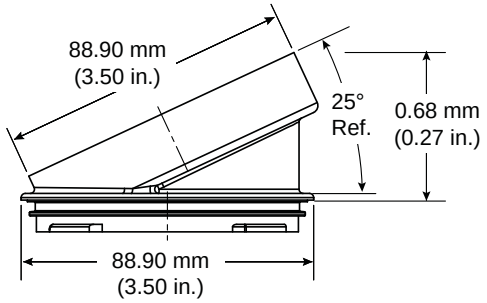
Field Mount
3-9900-1

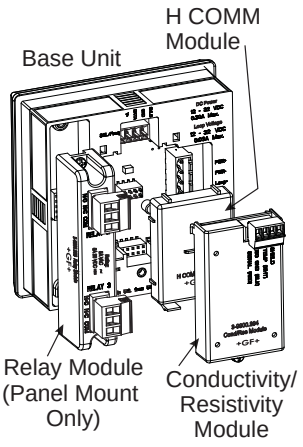


(3-8051-X shown)

NOTE: 3-8051-X Integral Mounting Kit sold separately.

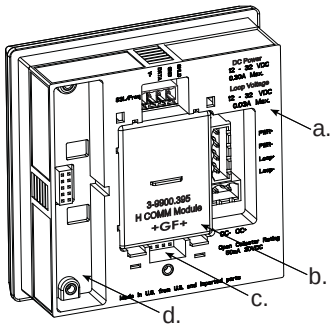
3-9900.396 Angle Adjustment Adapter Kit





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.



Module Installation

If the 9900 Base Unit will be mounted in a panel, the plug-in modules may be installed either before or after the base unit is mounted. If the 9900 Base Unit will be mounted using the accessory wall mount bracket, install plug-in modules first.

If installing both the Conductivity/Resistivity (Cond/Res) and the H COMM Modules, install the H COMM Module first, then the Cond/Res Module on top of it (see illustration on page 6).

The Relay, Cond/Res, and Batch Modules attach with screws.

The H COMM Module simply plugs in.

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

To install modules:
Remove power from the 9900.
Carefully align pins and connectors (do not bend connecting pins) and push module firmly into place, then attach with screw(s) (except H COMM Module).

CAUTION
LOOP as well as DC power MUST be removed BEFORE installing H COMM Module.

To remove modules:
Remove power from the 9900.
For Relay and Cond/Res Modules, unplug connectors, remove screw(s), and carefully pull module straight out from the base unit. Do not bend the connecting pins.
For H COMM Module, squeeze the tabs on the bottom edge, grasp the module and pull straight out. Do not bend the connecting pins.
For Batch Module, remove the Relay module. Loosen bottom screw of Batch module. Carefully grip and squeeze the tabs at the top of the module to release. Pull module away from the unit. Do not bend the connecting pins

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

Plug-In Modules

Optional modules and accessories are available for the 9900:

a. Base Unit (required)
b. Slot for optional H COMM Module
c. Slot for optional Cond/Res Module or optional Batch Module (3-9900-1P only)
d. Slot for optional Relay Module (not available on field mount)

Each item is ordered separately.

Modules are field-replaceable at any time.

See Installation and Ordering Information sections for more details.

Relay Module

(Panel Mount installations only)

Mfr. Part No.	Code	Description
3-9900.393	159 001 698	Relay Module - Two dry-contact relays

In addition to the standard programmable Open Collector output in the base unit, the Panel Mount version of the 9900 has a slot for an optional Relay Module, which adds two programmable dry-contact relays. The Open Collector output in the base unit uses the Relay 1 setting in the menus. If the optional Relay Module is installed, these are assigned to relays 2 and 3 in the menus.

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. Install RC Filter Kits, 3-8050.396, on relays used to switch motor or inductive loads.

- Two (2) SPDT dry-contact relay (DCR) inputs
- User programmable
- 250 V, 5 A maximum resistive loading (AC).
- Can switch line voltage (typically 120 to 240 VAC)
- Can switch DC voltage (< 30 VDC @ 5A)
- Larger voltage and current ratings than Open Collector outputs.

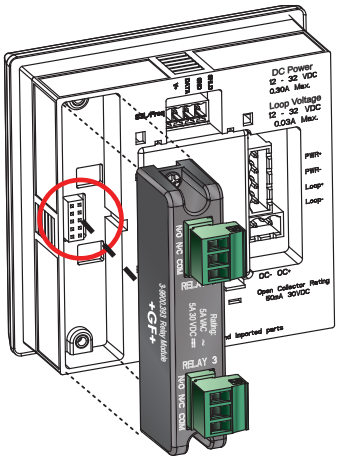
For wiring information, refer to the Relay and Open Collector Wiring section.

NOTE:
The Relay Module requires 10.8-35.2 VDC, 300 mA power connection to DC PWR Terminals. The Relay Module cannot be used with loop power.

- The two red Mechanical Relay Indicator LEDs on the front panel of the 9900 show the status of relays 2 and 3. (Status of all relays and Open Collector is available at all times in a single screen in View mode.)
- Hysteresis and time delay are adjustable for each relay.

CAUTION
DO NOT bundle Relay Module wiring with other wiring.

Doing so may cause injury and/or damage to 9900 Transmitter, Relay Module, and Batch Module.



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.)

Batch Module

Mfr. Part No.	Code	Description
3-9900.397	159 310 163	Batch Module

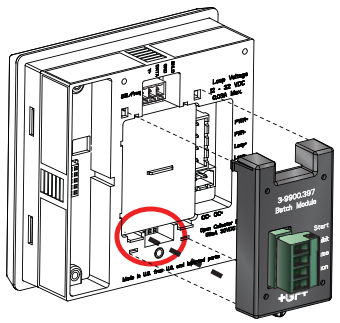
Convert a 9900-1P Transmitter (Generation II) into a Batch Controller system by utilizing a Batch Module (3-9900.397) and a Relay Module (3-9900.393).

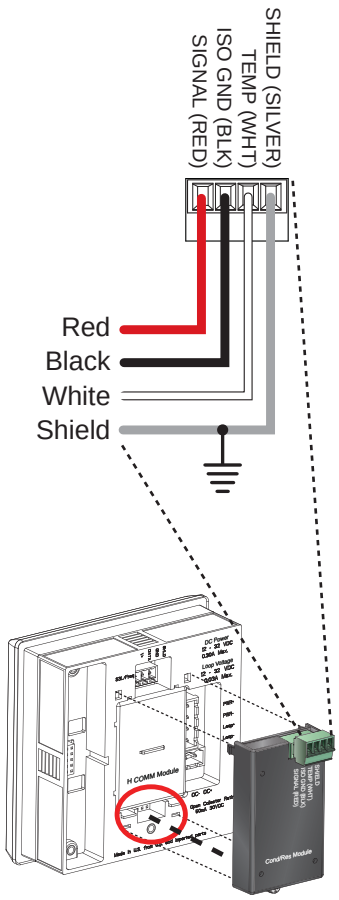
Optional Module Wiring:

- Wire an external button or keypad (customer supplied) to stop, start or resume a batch remotely.
- Wire an external input that can inhibit a batch from starting.

Full 9900-1BC Batch Controller System manual available at www.gfsignet.com

NOTE: The Batch Module is incompatable with the Direct Conductivity/Resistivity and H COMM Modules.





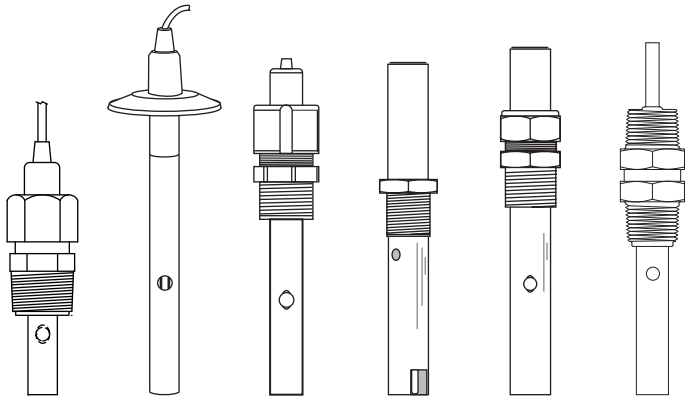
Direct Conductivity/Resistivity Module

Mfr. Part No.	Code	Description
3-9900.394	159 001 699	Direct Conductivity/Resistivity Module

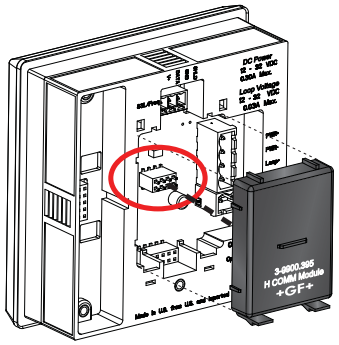
The Direct Conductivity/Resistivity (Cond/Res) Module interfaces Signet 2818-2823 and 2839-2842 Conductivity electrodes directly to the 9900.
(Conductivity/Resistivity and Salinity measurements may also be performed via the 2850 Sensor Electronics connected through the 9900 Digital (S^3L) input.)

- Provides filtering and conditioning.
- Sensor cable length can be extended to 30 m (100 ft).
- 2839 - 2842 sensors come with a cell constant certificate to improve the accuracy of the sensor measurements (see page 37).

For additional wiring information, refer to the Conductivity/Resistivity Module Instruction Sheet 3-9900.092.



2818 | Sanitary | 2819-2821 | 2822 | 2823 | 2839-2842



H COMM Module

Mfr. Part No.	Code	Description
3-9900.395	159 001 697	H COMM Module

The H COMM Module enables communication between the 9900 and a HART®-enabled device. The HART (**H**ighway **A**ddressable **R**emote **T**ransducer) Protocol superimposes digital signals on top of the 4 to 20 mA analog signal.

Refer to the 9900 H COMM Module Instruction Sheet 3-9900.094 for further details.

NOTE: With H COMM Module installed, a minimum of 24 V is required for loop-powered systems.

NOTE: The black rubber jumper adjacent to the power terminal should only be removed when both the H COMM Module is utilized and the required sensor cable length is over 304 m (1000 ft).

Installation

System Start-up: Step 1

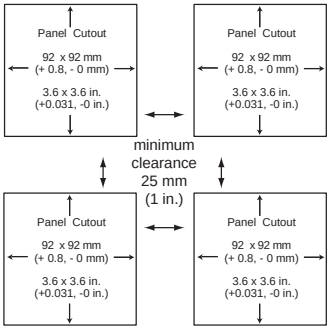
Prepare the transmitter installation location. If the back of the transmitter is difficult to access when installed, wire the removable terminal blocks first, then install it completely.

Next step: Wiring (see pg. 8).

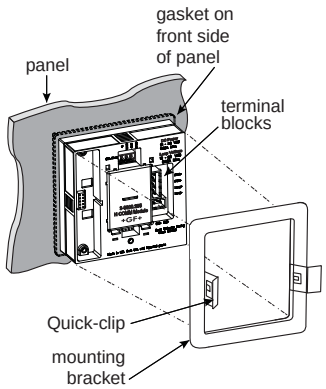
For future reference, for each installation, it is recommended to record the part number and serial number of each of the components listed here:

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

Base unit	3-9900-____	S/N _____
Relay Module	3-9900.393	S/N _____
Cond/Res Module	3-9900.394	S/N _____
H COMM Module	3-9900.395	S/N _____
Batch Module	3-9900.397	S/N _____



Do not mount in direct sunlight.



Panel Mount Installation

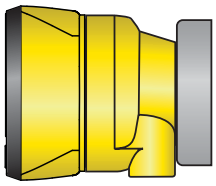
Tools and Equipment Required

- Fine-tooth file
- ¼ DIN punch or jigsaw suitable for cutting panel opening to within 1 mm (0.04 in) tolerance.
- ¼ DIN punches are available and recommended for creating clean, precise openings quickly and easily in most instrument panels.
- If a punch is not available, a jigsaw or other cutting tool can be used. An adhesive template is provided to help guide the cutting process. De-burr and smooth the opening with a file.

1. The panel mount transmitter is designed for installation using a ¼ DIN punch. Recommended clearance on all sides between instruments is 25 mm (1 in).
2. Place gasket on instrument, and install in panel.
3. Slide mounting bracket over back of instrument until bracket snaps into latches on sides of instrument.

To remove:

1. Secure instrument temporarily with tape from front or grip from rear of instrument. DO NOT RELEASE.
2. Press bracket clips outward and remove.

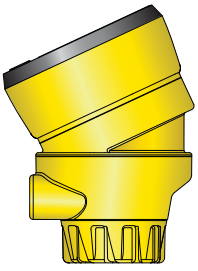


Field Mount with
3-8050 Universal Mount Kit

Field Mount Installation

Field mounting requires a separate mounting kit. The 3-8050 Universal Mount Kit, the 3-8051 or 3-8052 Integral Mount Kits, and the 3-9900.396 Angle Adjustment Adapter Kit enable the transmitter to be installed virtually anywhere. Detailed instructions for field installation options are included with the 3-8050, 3-8051 and 3-8052 adapter kits (see Ordering Information section).

For Field Mount installations with a Cond/Res Module, the 3-9900.396 Angle Adjustment Adapter is required along with a 3-8050 or 3-8052 adapter kit to allow for sufficient clearance for the wiring.

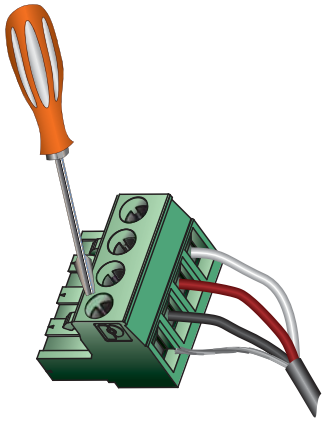


Field Mount with
3-8051 Integral Mount Kit
and Angle Adjustment Adapter

Tools Required

- Phillips screwdriver
- Flat-head screwdriver
- Wire strippers

For Field Mount installations, refer to the wiring diagram inside the Field Mount housing.



Wiring

System Start-up: Step 2

Wire the transmitter for all connections with the power off. Keep any 4 to 20 mA and relay-actuated output devices that are connected to it offline at this time.

Connect the sensors (pg. 11), power (pg. 17) and relay(s) (pg. 18).

Next step: Relay Functions (see pg. 19).

Wiring Tips:

- Do not route the sensor, DC power, or 4 to 20 mA cables in conduit containing AC power wiring. Electrical noise may interfere with sensor signal.
- Routing the sensor cable in grounded metal conduit can help prevent electrical noise and mechanical damage.
- Seal the cable entry points to prevent moisture damage.
- Only one wire should be inserted into a terminal.
- Splice double wires outside the terminal or use appropriate wire ferrule, not to exceed 2 mm (0.08 in) diameter.

All wiring connections to the 9900 are made via removable terminals.

In general:

- The Power, Loop and Open Collector plugs and the Relay Module plug accept 12 to 28 AWG wire.
  The S^{3}L/Freq plug and the Cond/Res Module plug accept 16 to 28 AWG wire.
- Strip 7 mm (0.28 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.

CAUTION:
Avoid Electrostatic Discharge (ESD)

- Minimize handling of 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 properly grounded piece of metal when handling modules.

Signal Type: Frequency

Signet flow sensors 515/8510, 525, 2000, 2100, 2507, 2536/8512 and 2540 provide a frequency output. (Flow sensors 2551 and 2552 can be configured with either Digital (S^3L) or Frequency outputs, see pg. 13.)

The maximum allowable cable length for sensors with frequency output is dependent upon the output signal strength of the sensors themselves, and the degree to which the signals are susceptible to EMI or "noise." This is largely a function of whether the sensors are self-powered (515/8510 and 525), or powered by an external source.

- The input terminals on the 9900 carry frequency data signals 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.
- 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.

Flow sensor models with Frequency Output	Maximum Cable Length	
	60 m (200 ft)	305 m (1000 ft)
515/8510	X	
525	X	
2000		X
2100		X
2507		X
2536/8512		X
2537		X
2540		X
2551		X
2552		X

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

Signal Type: Digital (S^3L)

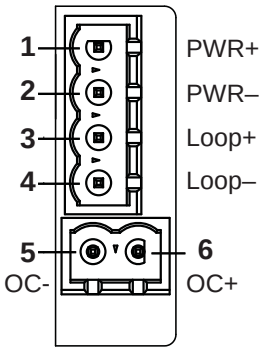
- The input terminals on the 9900 carry Digital (S^3L) serial data from the sensor.
- Do not route sensor or output cables in conduit containing AC power wiring. Electrical noise may interfere with sensor signal.
- Routing cable in grounded metal conduit will help prevent electrical noise and mechanical 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 (S^3L) 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.
- There are several methods that can help route the digital cables and remain within the distance limitations.

Maximum total cable length of the Digital (S^3L) Bus:

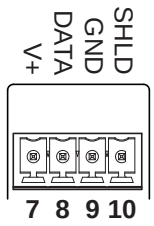
The quality of the cable used in the bus determines the maximum length of all branches combined. The maximum cable length may not exceed 305 m (1000 ft), regardless of current requirements.

For the 8058-2, connect Channel 1 ONLY

Power



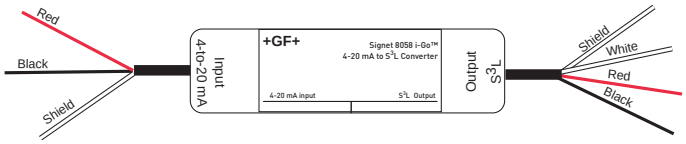
Digital (S³L)/Freq



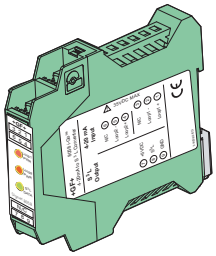
Signal Type: 4 to 20 mA

When connecting a non-Signet sensor to the 9900, the sensor's 4 to 20 mA signal must be converted to Digital (S³L). The 8058 i-Go Signal Converter accepts any 4 to 20 mA signal and converts it into Digital (S³L).

1. Wire the 8058 between the 4 to 20 mA loop source and the 9900 Digital (S³L) input terminals (see pg. 14).
2. In the 9900 INPUT TYPE menu (see System Setup Menu discussion, pg. 25), specify 4 to 20 mA INPUT.
3. Set additional labels and abbreviations as described on pgs. 42-43.



8058-1



8058-2

Terminal Identification

The 9900 requires regulated **10.8 to 35.2 VDC (24 VDC nominal)** from an external power supply (not supplied).
Maximum current draw is:
200 mA = 9900 without Relay module
300 mA = 9900 with Relay module

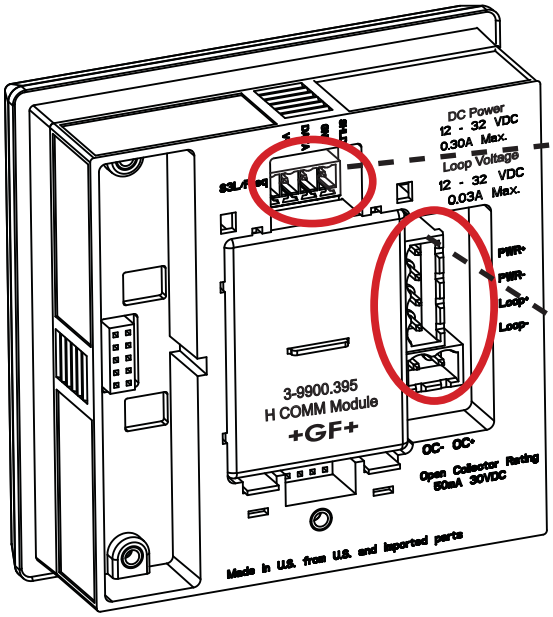
Terminals 1-2: DC Power
Required by the instrument
- 10.8 to 35.2 VDC input power to sensors, relays and the LCD backlight

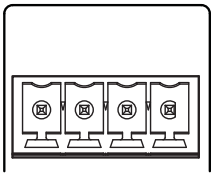
Terminals 3-4: Loop Power (may also be used for system power)
- 10.8 to 35.2 VDC
  NOTE: Backlight, LEDs and optional Relay Module do not operate on loop power. Any connected sensors or sensor electronics that cannot operate on loop power will also be inoperative.

Terminals 5-6: Open Collector
- Software selectable for Normally Open or Normally Closed.
- May be disabled (Off) if not used.

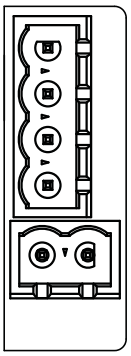
Terminals 7-10: Digital (S³L)/Frequency Input
7: V+: +5 VDC out to sensor (black wire)
8: DATA: Input signal from sensor (red wire)
9: GND: Sensor ground (white wire)
10: SHLD: Cable shield

Sensor Wiring





Connect sensor wires here as shown in the following figures.



Connect power and open collector wires here as shown on pages 17 and 18.

Sensor model	Freq Output	Digital (S^3L) Output	Run on Loop Power
515/8510	X		X
525	X		X
2000	X		
2100	X		
2250		X	X
2350		X	X
2450		X	X
2507	X		
2536/8512	X		X
2537-5		X	
2540	X		X
2551	X	X	
2552	X	X	
2610-41		X	
2610 + 8058		X	
2724-2726		X	
2750		X	X*
2756-2757		X	
2764-2767		X	
2774-2777		X	
2819-2823		X	
2839-2842		X	
2850		X	
4150 + 8058		X	

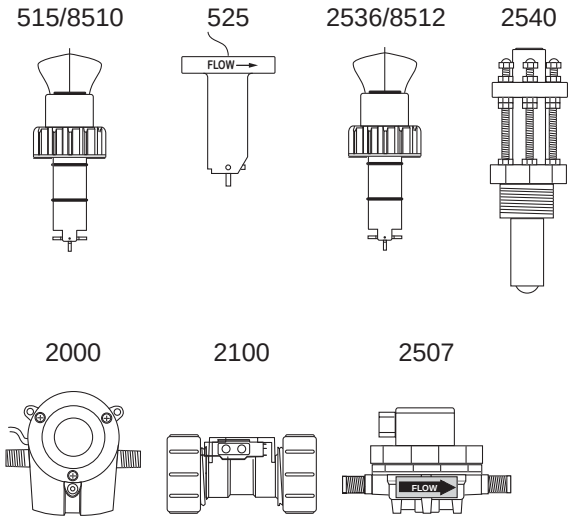
*A minimum of 24 VDC Loop Power is required for the 2750.

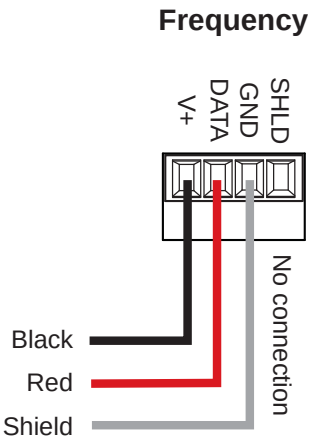
NOTE: Loop powered systems cannot power both a H COMM Module and pH sensors on one system. If using both an H COMM Module and pH sensors, DC power is required.

Technical Notes:
- See corresponding product manuals for maximum cable length.
- Maintain cable shield through cable splice.
- Route sensor cable away from AC power lines.
- 515/8510 and 525 installations, connect the silver (shield) wire to earth ground in case of EMI noise interference.

NOTE: Loop Power cannot be used to power Signet models 2000, 2100, 2507, 2537, 2551 or 2552 Flow sensors.

Wiring for:

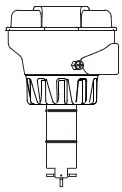


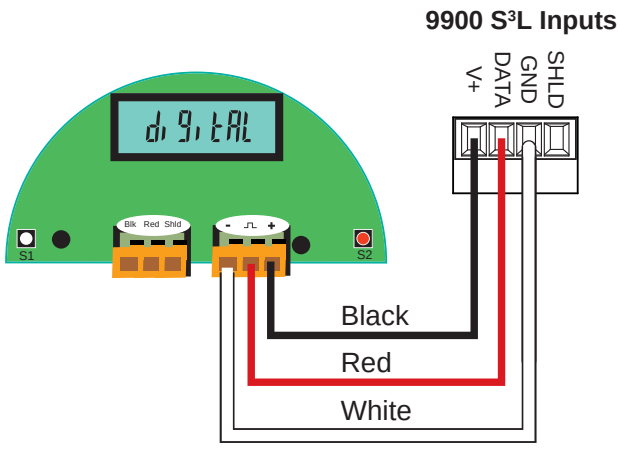


Technical Notes:
- Wiring terminals on the 2537 are rated for 16 to 22 AWG wires.
- The cable must be 7 mm to 10 mm in diameter (0.275 in. to 0.394 in.) to seal properly in the liquid-tight connector.
- The conduit ports have ½-inch NPT threads. After routing the cables, seal the port with a liquid-tight conduit connector (3-9000.392-1) or with conduit.
- The 2537 models can connect to the 9900 via a relay frequency signal or with a Digital (S^3L) output. Signet recommends installing the Digital (S^3L) output model (2537-5) because Digital (S^3L) is more accurate.
- See 2537 instruction manual for additional installation information.

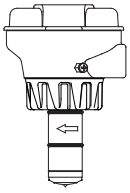
Wiring for:

2537-5

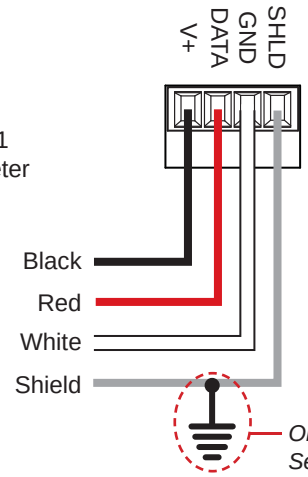


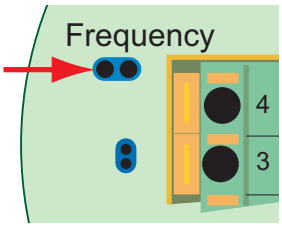


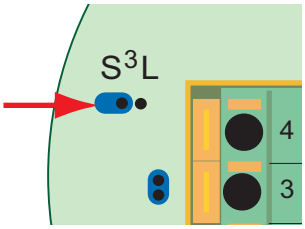
Wiring for:



2551-XX-11
Blind Magmeter







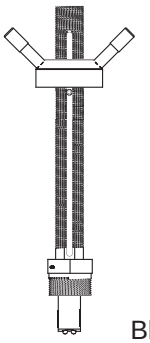
Only in case of EMI interference
See Frequency Output Technical Notes (2551 & 2552) at right

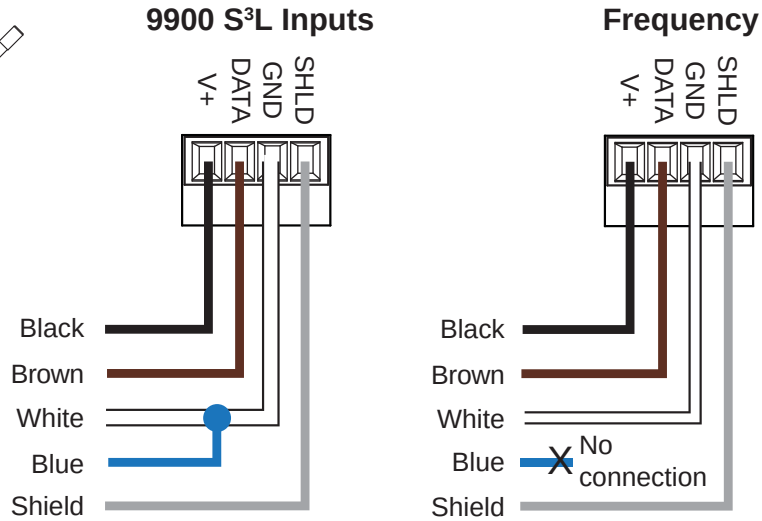
Input Wiring for 2551 and 2552 sensors

- Either Frequency or Digital (S^3L) may be used.
- **Signet recommends configuring these sensors with the Digital (S^3L) output because it is more accurate and will also display reverse flow (negative numbers).**
- Input type is selected by choosing between “SENSOR FREQ” and "SENSOR S3L" in the FLOW sensor type INPUT menu (see page 32).
- Loop Power cannot be used to power these sensors.

Wiring for:

2552





2551 Technical Notes:

- When the blue jumper illustrated here is placed over both pins, the 2551-XX-11 (Blind Magmeter) outputs an open collector frequency signal. When the jumper is removed (or placed over one pin for storage) the 2551-XX-11 outputs a digital (S^3L) signal (recommended).

Frequency Output Technical Notes (2551 & 2552):

- The frequency output will be displayed as positive flow regardless of the flow direction.
- 5 VDC power required by the 2551 & 2552 is supplied by the 9900. No additional power is required.
- Connect the silver wire (shield) to earth ground in case of EMI noise interference.
- If EMI noise interference continues, disconnect silver wire (shield) from 9900

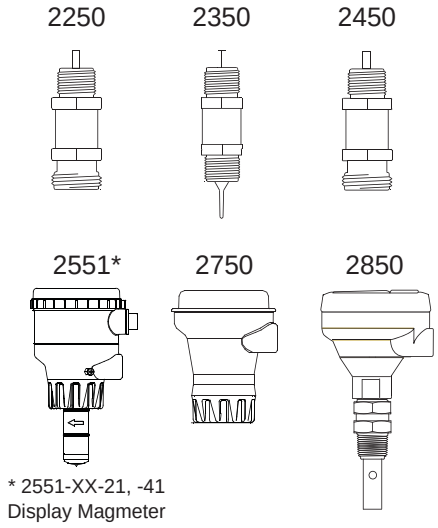
2552 Technical Notes:

- The 2552 outputs an open collector frequency signal that can be connected to the 9900.

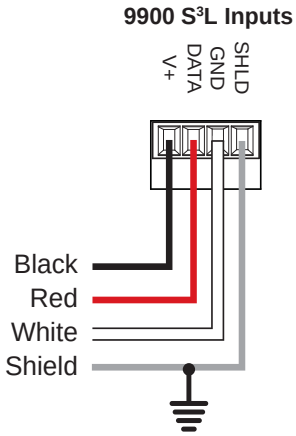
Technical Notes:
- Use three conductor shielded cable for sensor cable splices up to 305 m (1000 ft) max.
- Maintain cable shield through cable splice.
- Route sensor cable away from AC power lines.
- Connect the silver (shield) wire to earth ground in case of EMI noise interference.

Technical Notes:
- The 2850 has no SHIELD wire.
- To work correctly with the 9900, the 2850 must be set for the custom cell constant or the actual probe cell constant and the 9900 set for a 1.0 cell constant.

Wiring for:



* 2551-XX-21, -41
Display Magmeter



NOTE: The 2850 has no SHIELD wire.

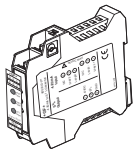
Technical Notes:
- The cable length from the 8058 to the 9900 must not exceed 60 m (200 ft).
- When using the 8058-2, connect the loop source to Channel 1 input ONLY.
- See the 8058 manual for more information.

Wiring for:

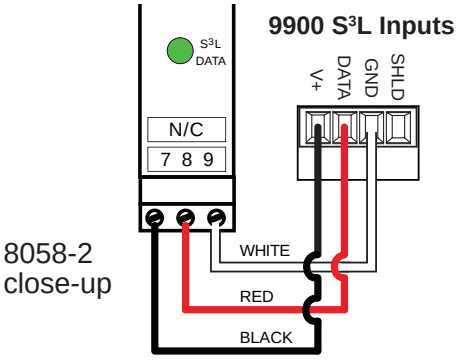
8058-1

8058-1 close-up

8058-2

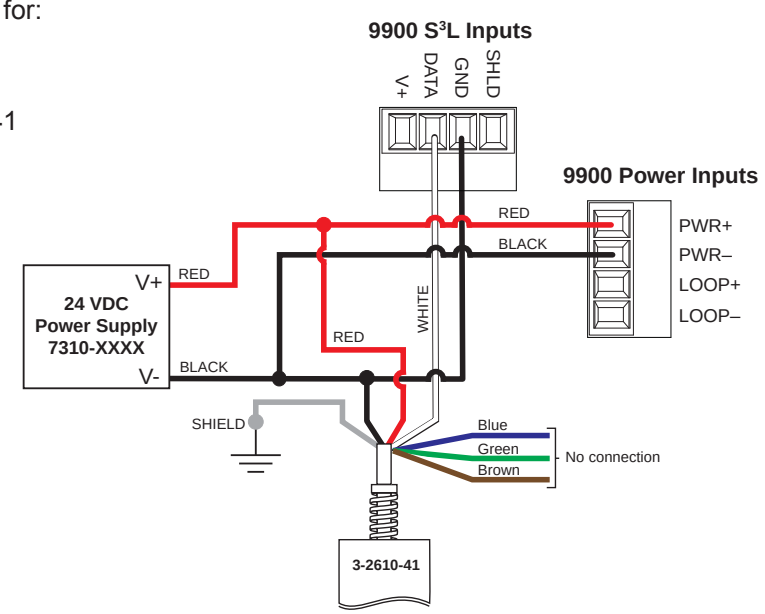


8058-2 close-up

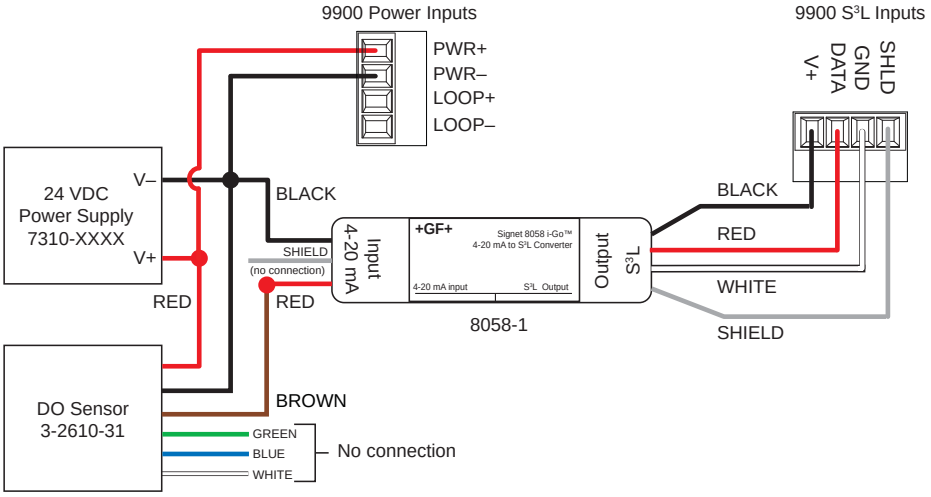


Wiring for:

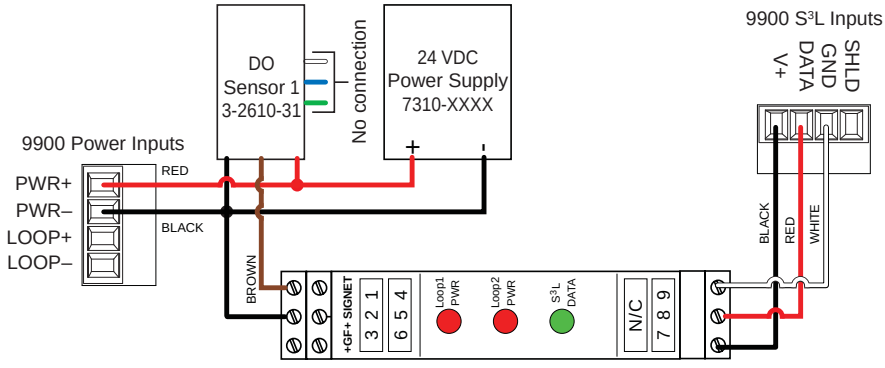
2610-41



2610-31 via 8058-1



2610-31 via 8058-2

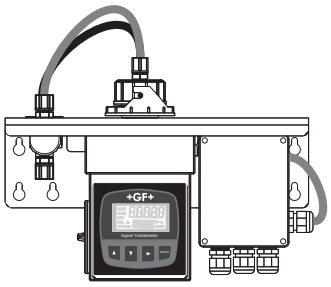


Technical Notes:
The wiring of the 3-2610-41 is non-standard:
- RED is 12 to 24 VDC
- WHITE is Data
- BLACK is VDC Ground
- A jumper MUST be installed between PWR- and S³L GND.

Technical Notes:
- 3-2610-31 Dissolved Oxygen Sensor can be connected to the 9900 only via a 3-8058-1 or 3-8058-2 i-Go Signal Converter.
- Program the 9900 for the 2610 DO sensor via the 4 to 20 mA sensor settings on the 9900 (see page 42).
- See the 2610 manual for more information.

Technical Notes:
- The cable length from the 8058 to the 9900 must not exceed 60 m (200 ft).

Technical Notes:
- When using the 8058-2 with the 9900, connect the loop power supply to 8058-2 Loop 1 inputs ONLY as shown in the figure.
- See the 8058 manual for more information.



Connect 4 to 20 mA wires to terminal board TB3 as shown in the figure.

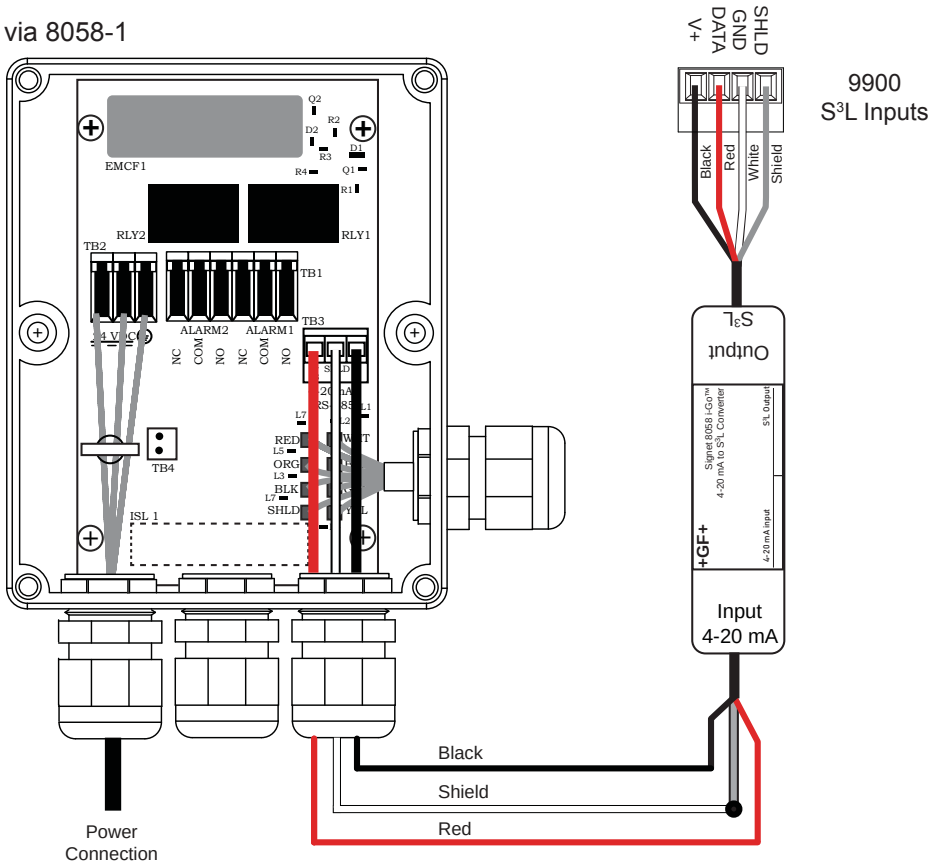
Refer to the latest revision of the Signet 4150 Turbidimeter Manual (3-4150.090) for further information.

Technical Notes:

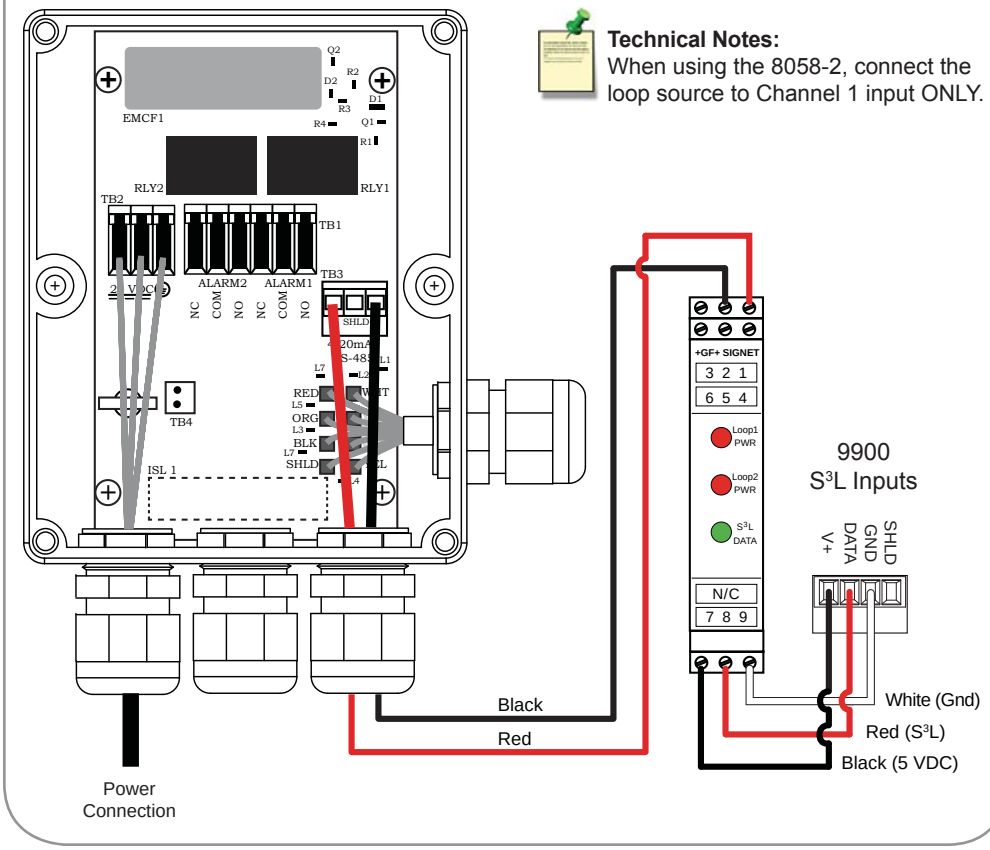
- All of the electrical connections to the instrument are made through the terminal box. The connections are labeled within the terminal box and are self-descriptive.
- A plug is inserted into the RS-485 cable bulkhead when shipped to ensure a watertight seal. Remove and discard this plug when cabling to this connection.
- The bulkhead will accept cable diameters from 5.8 mm (0.23 in.) up to 10 mm (0.34 in.). The terminals are designed to accept wires in the range of 14-28 AWG. All wires should be stripped to a length of 6 mm (0.25 in.).
- Ensure that the watertight seal is maintained after the terminal box has been wired for operation. If any of the bulkheads are not tightened properly around a cable or plug, the ratings of the instrument will be jeopardized and there is a possibility of creating a shock hazard.
- Do not run 4 to 20 mA cables in the same conduit as power.

Wiring for: 4150

via 8058-1



via 8058-2



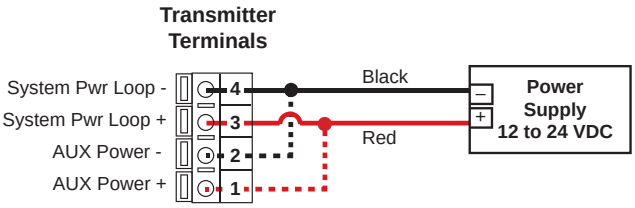
Technical Notes:
When using the 8058-2, connect the loop source to Channel 1 input ONLY.

Power Wiring

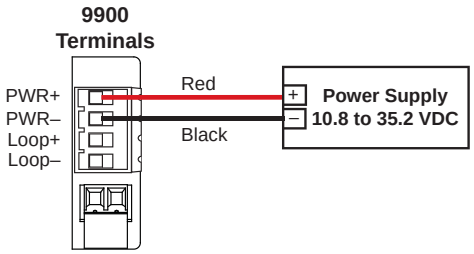
CAUTION!
DO NOT connect your 9900 to AC power.
The 9900 MUST be powered by
10.8 to 35.2 VDC ONLY.

Stand-alone application, no current loop used

ProcessPro
(for reference only)

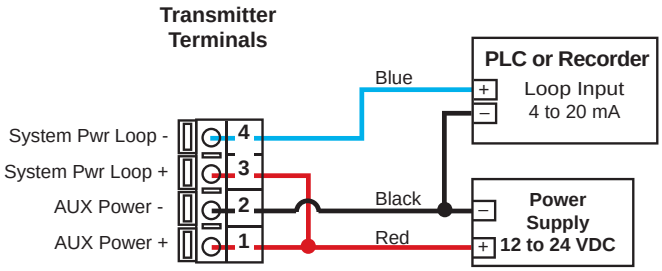


9900



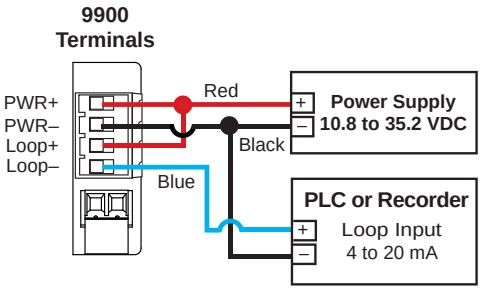
Connection to a PLC/Recorder, separate supply

ProcessPro
(for reference only)



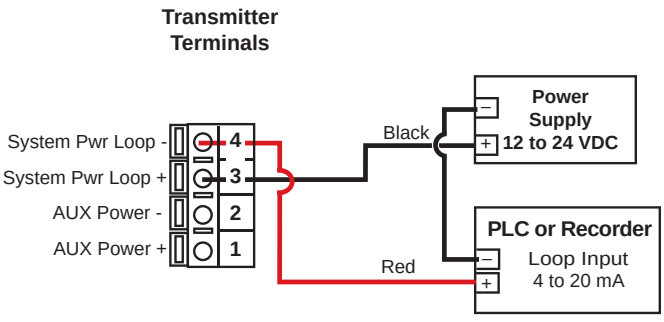
AUX power required for all 8750-2 systems

9900

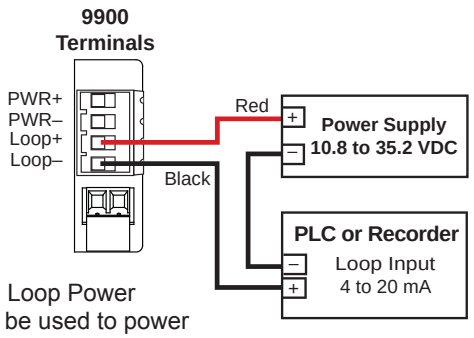


Loop Powered

ProcessPro
(for reference only)



9900

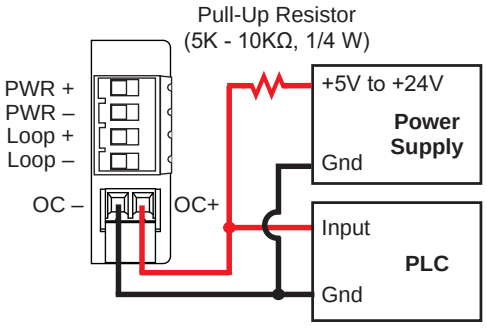


NOTE: Loop Power cannot be used to power certain Signet sensors. See table on pg. 11.

Relay and Open Collector Wiring

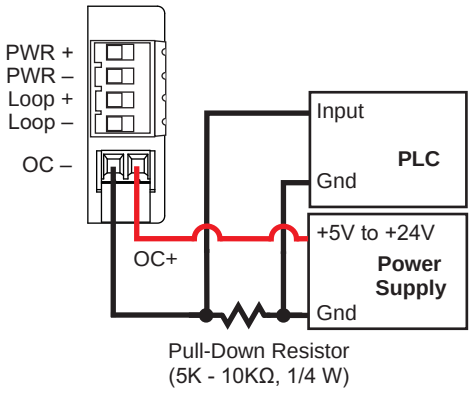
Open Collector wiring

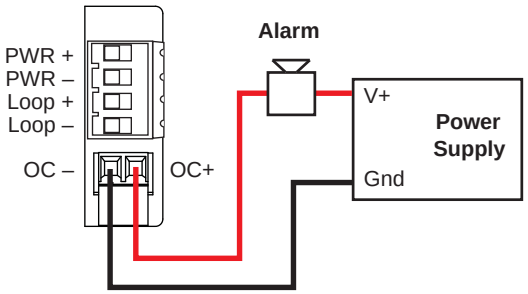
NPN Style Wiring



If PLC needs 0 logic input when relay is not energized, set NORMAL to CLOSED in the RELAY menu when using the Open Collector (R1) with NPN style wiring.

PNP Style Wiring





with NORMAL set to OPEN.

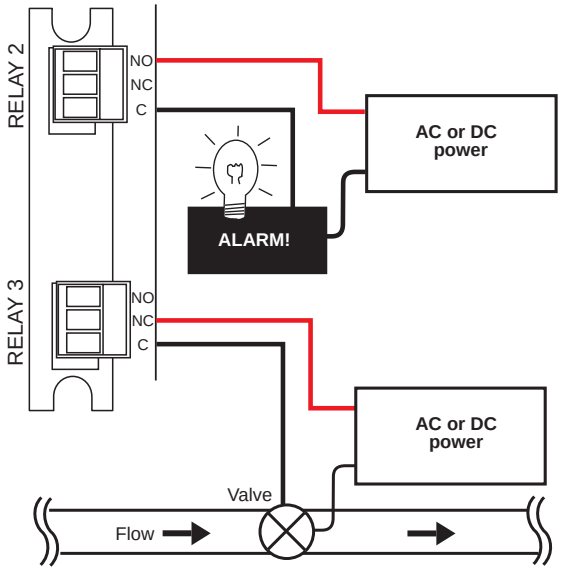
- The 9900 Open Collector (R1) output provides high-speed switching capability. Signal frequencies can reach 400 pulses per minute.
- The 9900 Open Collector (R1) output connection is dependent upon the type of circuit being controlled by the output.
- Most indicating instruments or control system inputs require a signal voltage of 0 to 5 V (TTL or CMOS logic levels) or 0 to 24 V. Therefore, the 9900 Open Collector output circuits must be equipped with a pull-up or pull-down resistor (not supplied), and a quality regulated 5 to 24 V (depending on the application) power supply (not supplied) is recommended to function properly.

Relay Module wiring

The alarm is OFF during normal operation, and will go ON when relay energizes according to 9900 Relay settings.

The valve is ON during normal operation, and will go OFF when relay energizes according to 9900 Relay settings.

NO = normally open (closes when energized)
NC = normally closed (opens when energized)



Relay Functions

System Start-up: Step 3

Set your relay functions to your own application requirements.

Next step: System Setup (see pg. 25).

Once a setting is saved it becomes immediately active.

1. Go to the Relay Menu (RELAY flashing on screen, press ENTER).
2. If prompted, select desired source.
3. Press ▼ to relay **MODE** selection screen.
4. If necessary, press ► and then ▼ or ▲ to select **R1 MODE LOW**. Press ENTER to confirm.
5. Press ▼ to **R1 SET LOW**. Press ► to enter GPM value of 5.5.
6. Press ENTER to save.
7. Scroll ▼ to the **R1 HYSTERESIS** menu.
8. Press ► to edit.
9. Set the hysteresis for this relay. This affects the turn off only: **2.5 gpm**.
10. Press ENTER.
11. Scroll down ▼ to the **R1 ON DELAY** menu.
12. Press ► to edit.
13. Set the turn-on delay in seconds for the relay: **15.0**.
14. Press ENTER.
15. 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 5.5 gpm with a time delay of 15 seconds and turn off at 8.0 gpm.

Remember,
SET LOW + hysteresis = OFF point:
5.5 + 2.5 = 8.0

Relay and Open Collector Outputs

RELAY HIGH and LOW Settings

Depending on the desired function of the circuit attached to the Open Collector (R1) output, it may be necessary to have the Open Collector turned “on” or “off” when the criteria for the activation of this output are met.

If the 9900 is set to operate in RELAY LOW mode, when the user-defined condition for the activation is met (e.g. exceeding an alarm limit) the Open Collector switch is turned “on.” If wired as standard “NPN-style” output (see previous page) the logic level of the attached control system or PLC input consequently becomes “low” logic level (when NORMAL is set to OPEN).

If a high input logic level is required for activation, it can be accomplished in one of three ways.
In order of preference,

1. Change the Open Collector (Relay 1) output function to “high” in the instrument's RELAY menu, or
2. Wire the Open Collector (R1) output “PNP” style as described on the previous page, or
3. Set the Open Collector (R1) to NORMAL CLOSED in the RELAY menu.

Fail-Safe Behavior

No matter the setting, the Open Collector output turns off if the 9900 loses power. This must be taken into account when evaluating system failure consequences. If the system layout requires a “closed” or “on” condition for the output in case of power loss, a mechanical dry-contact relay (NC contacts) must be used instead of the Open Collector (R1) output.

Voltage and Current Limitation

The supply voltage in the Open Collector output circuit MUST be limited to the specified maximum Open Collector voltage (see operating manual for specific instrument). The use of a quality 5 to 24 V (depending on the application) regulated power supply (not supplied) is recommended.

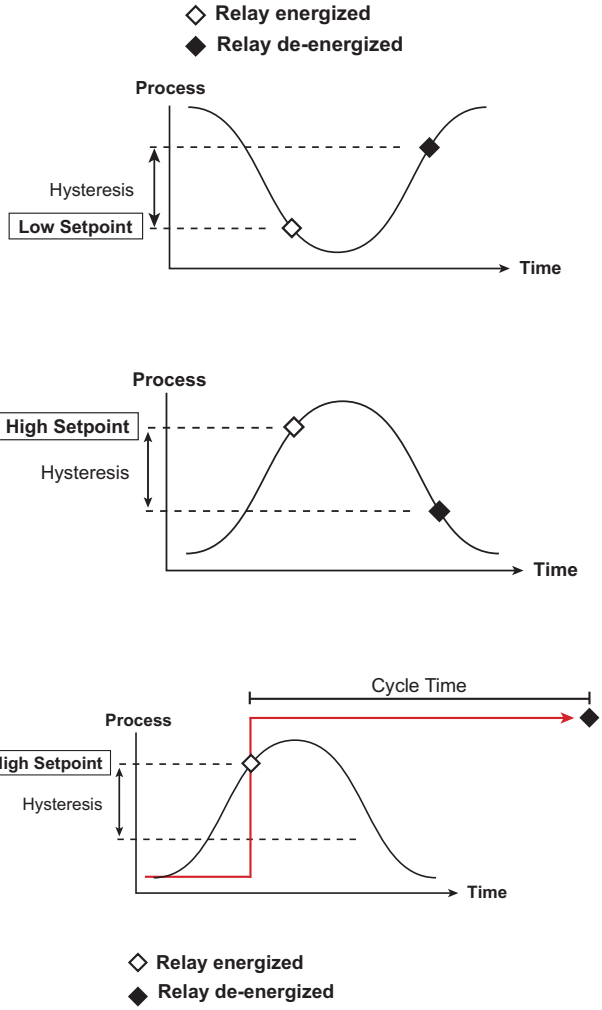
The current through the Open Collector switch also must be limited. Typical Open Collector outputs allow only for 10 to 50 mA switch current. Exceeding this current limit can burn out the Open Collector output components immediately.

Load and Pull-Up/Down Resistor Considerations

By utilizing basic arithmetic and Ohm’s Law, the safe limits of load resistance can be determined.
When the Open Collector switch is closed, almost the entire supply voltage is applied to the load (e.g., the pull-up or pull-down resistor, the alarm horn input, a potential power relay coil or annunciator lamp).
The resulting current through the load and through the Open Collector switch, as well, can be calculated as:

(Current) **=** (Supply Voltage) **/** (Load Resistance)

The 9900 open collector and 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.



CAUTION!

If power is lost to the 9900 Transmitter during a cycle, the Cycle Time will reset. If the condition still exists after power is restored, the relay will be energized for the complete Cycle Time.

Open Collector Output
- Longer life than a mechanical relay
- No moving parts
- Faster ON/OFF switching capabilities than mechanical relays
- Can switch DC voltage only (< 30 VDC)
- Not recommended for use with inductive loads.

◇ **Low Setpoint:**
Relay is on when the measured value is less than the setpoint.

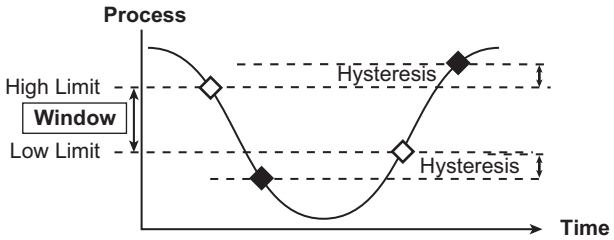
◇ **High Setpoint:**
Relay is on when the measured value is higher than the setpoint.

Cycle High/Low:
The relay can stay energized for a set length of time after the process value goes above (or below) the setpoint.
The relay will stay on for the CYCLE TIME and then turn off, even if the process value is still above (or below) the setpoint. The cycle will not repeat until the process value goes below (or above) the setpoint minus the hysteresis after the relay times out.

In FLOW, Cycle High activates the relay each time the volume reaches the SET VOLUME setpoint (see page 28).

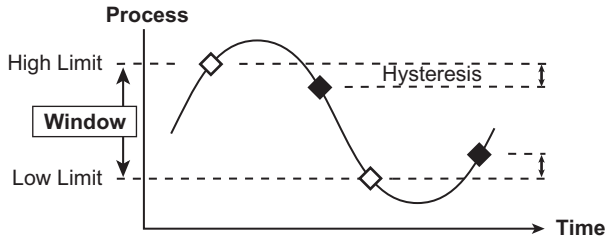
NOTE: To reset the timer (or volume in Flow): in the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

◆ **Window In/Out:**
Relay is on when the value is higher or lower than the high or low setpoint.
WINDow IN = relay on if measurement is inside the window of two setpoints. Measurement inside the two setpoints is abnormal condition.
WINDow OUT = relay on if measurement is outside the window of two setpoints.



Window IN example

◇ **Relay energized**
◆ **Relay de-energized**



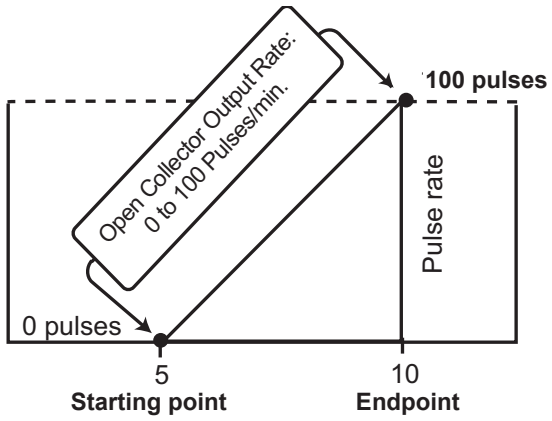
Window OUT example

⎍⎍ **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 from the relays is 300 pulses per minute. Example usage would be to control solenoid-operated dosing pumps.

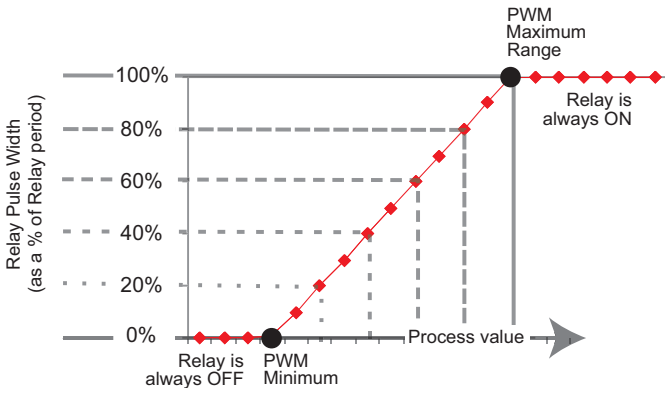
For example: As the process value drops below the setpoint, the output will start pulsing in relation to the process value, the maximum pulse endpoint and the programmed pulses/minute. The pulse rate will change as the process value changes and approaches the programmed endpoint. This functionality can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

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

NOTE: Relay LEDs are not lit in PULSE mode.



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 greater than 10.



- **Pulse Width Modulation**

PWM automatically varies the ratio of ON time to OFF time proportional to minimum and maximum range settings.

The relay period is the sum of the time a relay is ON and the time it is OFF.

Relay pulse width is the time the relay is ON.

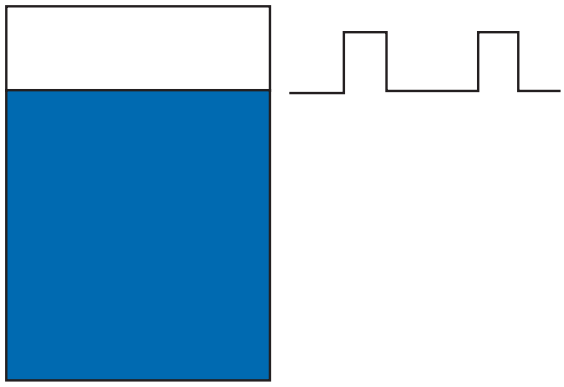
The 9900 must be programmed with the relay period, and with the low and high setpoints.

NOTE: The PWM mode is not used for Pressure applications.

NOTE: Relay LEDs are not lit in PWM mode.

Example:

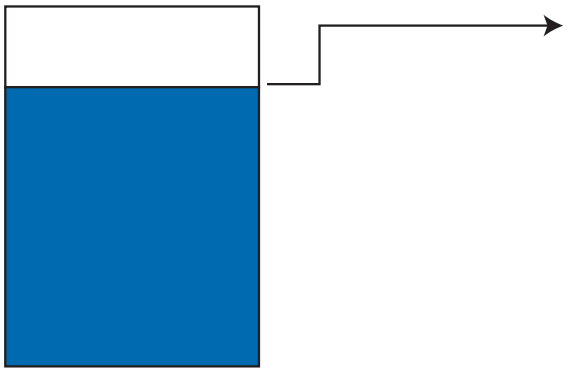
- The pulse width will be 0% of the relay period (relay always OFF) when the process value is less than the minimum range.
- The pulse width will be 100% of the relay period (relay always ON) when the process value is greater than the maximum range.
- The pulse width will be 60% of the relay period when the process value is at 60% of the span between the minimum and maximum range.



- **Volumetric Pulse**

A pulse is generated each time a specified volume of fluid is registered. For flow inputs only.

NOTE: Relay LEDs are not lit in VOLUMETRIC PULSE mode.



- **Totalizer Volume**

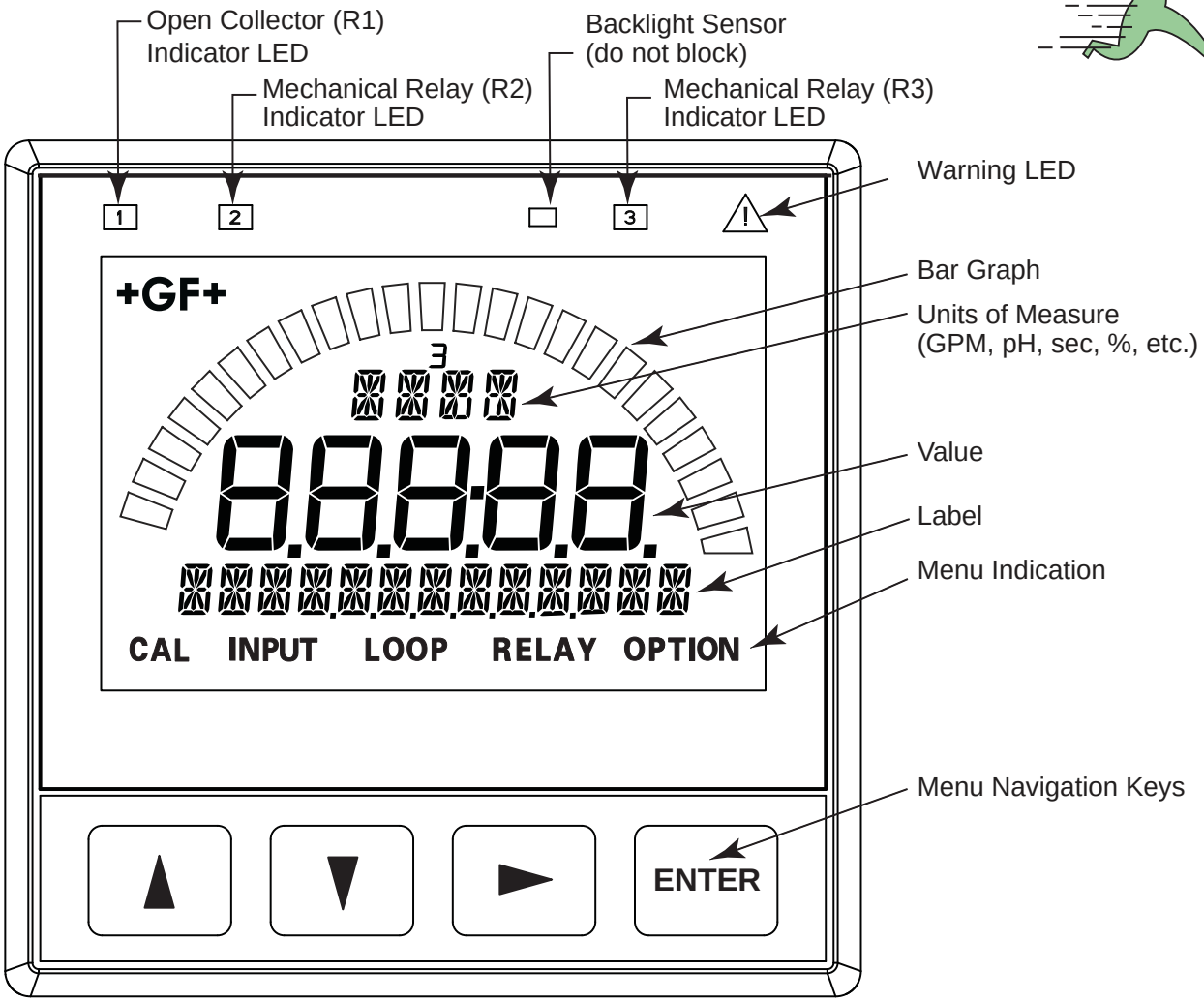
Relay activates and latches when a specified volume of fluid is registered. For Flow inputs only.

Total Volume mode counts the TOTALIZER Units until the setpoint volume is reached, then turns on the relay until the resettable totalizer is reset.

If the Resettable Totalizer reading is greater than the setpoint, the relay will be turned on immediately. The relay will be off when the totalizer is reset to zero.

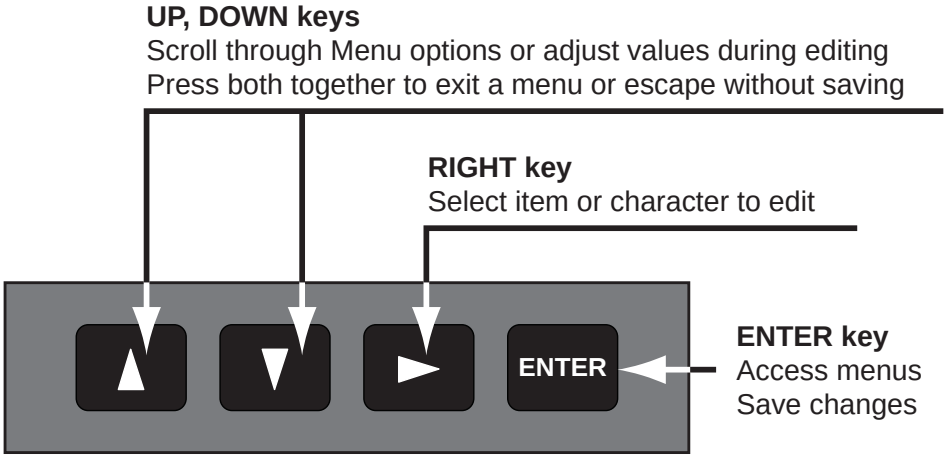
This mode is useful to trigger a reminder when a process is due, as for a backwash cycle or filter change.

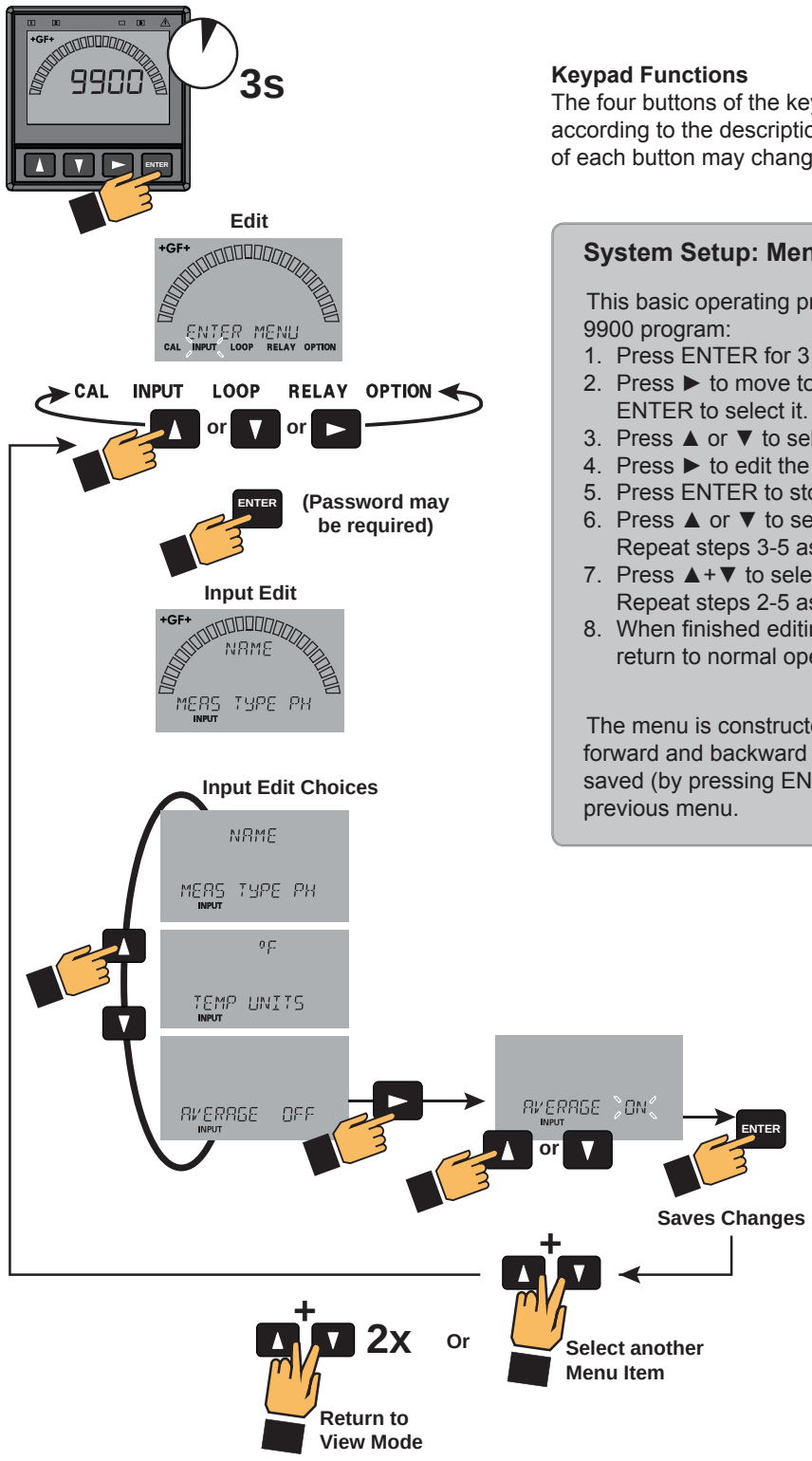
Operation



All possible segments shown in this illustration. The instrument's software controls which segments are shown at any particular time. Only the bar graph and GF logo are visible when the unit is turned off.

Warning LED will be lit when No Sensor or Wrong Sensor is detected in Digital (S^3L) mode.





Keypad Functions
The four buttons of the keypad are used to navigate display modes according to the descriptions in this table. Notice that the function of each button may change depending on the display mode.

System Setup: Menu Navigation

This basic operating procedure repeats throughout the 9900 program:

1. Press ENTER for 3 seconds to enter MENU mode.
2. Press ► to move to the desired menu then press ENTER to select it. (Password may be required.)
3. Press ▲ or ▼ to select the desired menu item for editing.
4. Press ► to edit the value/selection.
5. Press ENTER to store the new value/selection.
6. Press ▲ or ▼ to select another menu item if desired. Repeat steps 3-5 as required.
7. Press ▲+▼ to select a different menu to edit. Repeat steps 2-5 as required.
8. When finished editing all menus, press ▲+▼ again to return to normal operation.

The menu is constructed in a loop, so you can move forward and backward to select an item. After any item is saved (by pressing ENTER), the display will return to the previous menu.

Menu System

System Setup Menu

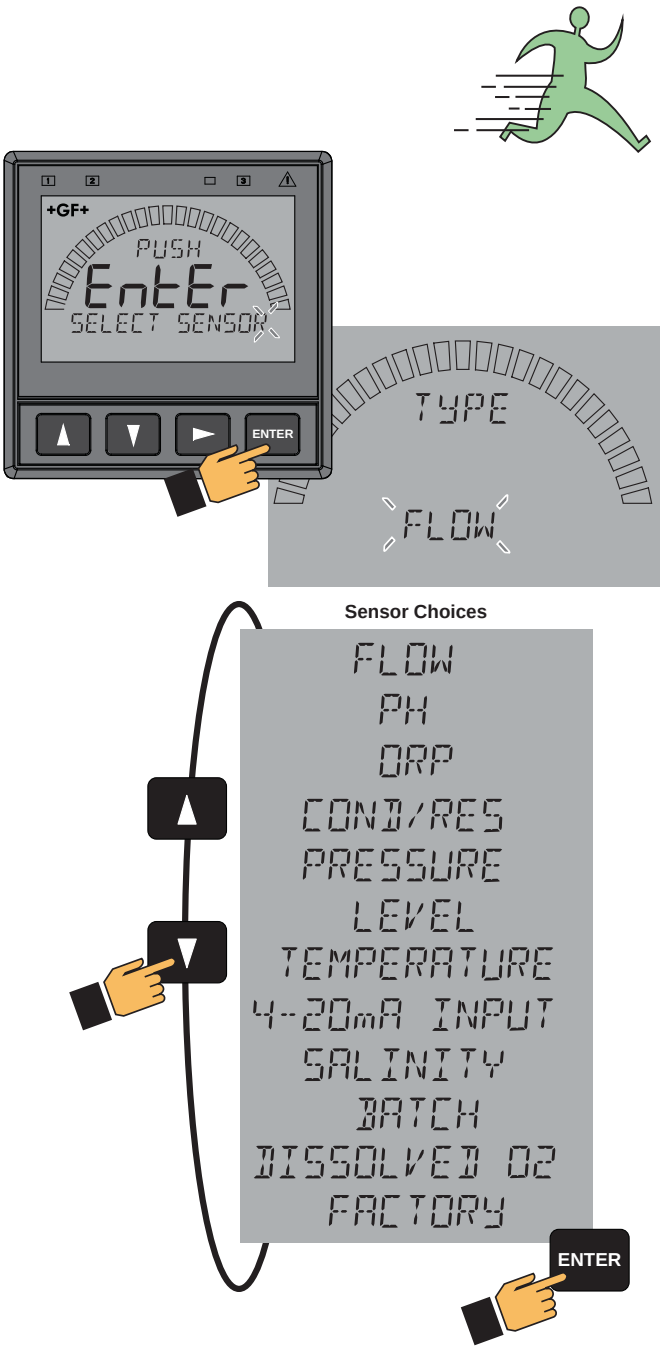
All of the basic system setup functions are automated in the 9900 for many sensors and sensor electronics. This includes identifying the sensor connected to the 9900, and configuring the display for the sensor. After installation and wiring is completed, apply power to the 9900.

When the 9900 is first powered on, it will attempt to determine the sensor type connected when ENTER is pressed (display will display LOOKING FOR). If no sensor is attached to the 9900, the words “TYPE” and “FLOW” are displayed. When a sensor is attached, the 9900 will attempt to determine the instrument type. If the 9900 does not identify your sensor type, use the ▲ and▼ keys to scroll through the available sensor types.

As you scroll through the available sensor types, press ► to select the desired sensor and then press ENTER.

You may change sensor type after initial power-on (if the sensor type is changed after your 9900 is already in service). Enter the INPUT menu, scroll to TYPE, press ►, and scroll to select the desired sensor type (you may be prompted for your password). Press ENTER. The bottom line will display ALL SETTINGS WILL BE RESET. ARE YOU SURE? The top line of the display will blink NO (unless switching from Factory mode). Press ▼ or ▲ to select YES. Press ENTER again to finalize your selection.

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



NOTE:
The 9900 displays the BATCH instrument type ONLY if the Batch Module is installed.

Error Handling

Errors occurring while in the VIEW Mode show a specific message (e.g., CHECK SENSOR). This message is displayed every 10 seconds and stays on for 5 seconds. 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 Overview

The top level of menus is referred to as the **VIEW Mode**. This view displays measurement values as well as current outputs and relay status. The radial bar graph represents the measurement value that is also displayed in the 7-segment numeric field below the bar graph. The bar graph is primarily used to display the full scale range of the sensor, but can be scaled via a menu item.

During normal operation, the 9900 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.

The ► button is used to change the position of the blinking cursor.
When the desired menu is blinking, press ENTER.

In the selected menu, use the ▲ and ▼ keys to navigate through the menu.
Use the ▲, ▼ and ► keys to edit the selected item (see Menu Navigation discussion, pg. 24).

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.

Password Overview

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

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

- **STD**
  The standard (STD) password is ▲▲▲▼, pressed in sequence. This password is designed to protect the 9900 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 mode.

Common Menus

System Start-up: Step 4
Customize your 9900 to your own installed sensors.

Common Menus
The menu system shares certain modes between sensor types.
The following describes the EDIT Mode menus found in common between most sensor types.

NOTE: Menu and Mode displays shown are examples only.
Your displays may vary.

INPUT Menu

	(ALL) Manually select Sensor Type (See pg. 25 for further instruction). Allows user to reset 9900 Transmitter to Factory settings. Note: User is strongly discouraged from changing the sensor type away from the correct sensor.

LOOP1 Menu

	(pH, COND/RES, LEVEL, SALINITY, DO only) Set LOOP1 output source; select between Primary and Secondary measurements of applicable sensor. Secondary measurements: DO, pH, COND/RES, and SALINITY = TEMP; LEVEL = VOL.
	(COND/RES only) Select LIN/LOG. Default = LIN. See LOG Current LOOP Output discussion in Appendix.
	(ALL) Set value corresponding to desired 4 mA output. 5 digits max. Default = 0 (ORP = -999).
	(ALL) Set value corresponding to desired 20 mA output. 5 digits max. (Not shown in COND/RES LOG Mode.) Defaults = 100 (Flow, Cond/Res, Temp), 14 (pH), 1000 (ORP), 10 (Lvl/Prs), 5 (4 to 20 mA), 80 (Sal).
	(ALL) Set desired LOOP1 output value when sensor error (e.g., bad sensor, broken wire) is detected. Select (3.6 mA, 22 mA). Default = 22.
	(ALL) Allows fine-tuning to compensate for errors in other equipment connected to the 9900. Adjust the minimum and maximum current output. The display value represents the precise current output. Adjustment limits: from 3.80 mA minimum to 5.00 mA maximum. Default = 4.00 mA.
	(ALL) Allows fine-tuning to compensate for errors in other equipment connected to the 9900. Adjust the minimum and maximum current output. The display value represents the precise current output. Adjustment limits: from 19.00 mA minimum to 21.00 mA maximum. Default = 20 mA.
	(ALL) Press ▲ or ▼ to manually order any output current value from 3.8 mA to 21.00 mA to test the output of LOOP1.

RELAY Menu

	(pH, LEVEL/VOL, COND/RES, SALINITY and DO only.) Select source for each of R1, R2 and R3 outputs. Choose pH/TEMP, LEVEL/VOLUME, COND/TEMP, SAL/TEMP, (DO)PPM/TEMP. Defaults = pH, COND, LEVEL, SAL, PPM.
	(ALL) Set Open Collector (R1) as Normally Open or Normally Closed. Default = OPEN.
	(ALL) Select the desired mode of operation for the open-collector (R1) output (OFF, LOW, HIGH, WINDow IN, WINDow OUT, CYC LOW (except FLOW), CYC HIGH, PROP PuLSe, VOL PuLSe, PWM, TOTAL, USP, ERROR mode) (See chart on pg. 29). Default = OFF. Continue stepping through to select R2 and R3 output modes. When MODE is set to ERROR, delays energizing relay until after ON DELAY time expires if sensor problem is detected. See Cycle High/Low discussion on pg. 20.
	(ALL) Relay turns on if process measurement goes lower than this value. Set desired value. (Shown if LOW, WIND IN/OUT or CYC LOW mode.) **NOTE:** The corresponding indicator lights do not light up in PROP PLS and PWM modes. The LEDs light up only when the Test Relay options are selected.
	(ALL) Relay turns on if process measurement goes higher than this value. Set desired value. (Shown if HIGH or WIND IN/OUT mode.) **NOTE:** The corresponding indicator lights do not light up in PROP PLS and PWM modes. The LEDs light only when the Test Relay options are selected.
	(FLOW only) Amount of accumulated flow that must be counted before a pulse is sent out. Relay turns on if flow volume exceeds this value. Set desired value. (Shown if CYC HIGH or VOL PLS mode.) Default = 100.00.
	(ALL) Hysteresis prevents the system from chattering around the set point. Set amount (in units of measure from INPUT Mode) to add to SET LOW or SET HIGH values. (Shown if LOW, HIGH, WIND IN/OUT, CYC LOW/HIGH or USP mode)
	(COND/RES only) Relay turns on if USP value drifts by this value away from USP limit. (Shown only in USP mode) See USP Limits discussion in the Appendix.
	(ALL) Set seconds (up to 9999.9) to wait before activating relay. (Shown if Low, High, WIND IN/OUT, CYC LOW/HIGH or Error mode.)
	(ALL except PRESSURE) Set minimum setpoint value for proportional pulsing. (Shown if PROP PLS mode.)
	(ALL except PRESSURE) Set maximum setpoint value for proportional pulsing. (Shown if PROP PLS mode.)
	(ALL except PRESSURE) Set desired maximum pulse rate (300 max) (Shown if PROP PLS mode.) **NOTE:** Pulse width fixed at 100 ms.
	(ALL except PRESSURE and FLOW) Set minimum value for pulse width modulation. (Shown if PWM mode)
	(ALL except PRESSURE and FLOW) Set maximum value for pulse width modulation. (Shown if PWM mode.)

NOTE: Defaults for most relay functions are dependent upon sensor type and are not listed here.

RELAY Menu - Cont.

	(ALL) Set time in seconds (up to 99999) for relay to remain on. See discussion on pg. 20. (Shown if CYC LOW/HIGH mode.)
	(FLOW only) Amount of accumulated flow that must be counted before a pulse is sent out. Set value. (Shown only if VOL PULS.)
	(FLOW only) Set time value for one pulse width. (Shown only if VOL PULS.)
	(ALL except PRESSURE and FLOW) Set time value for one complete pulse cycle (relay ON time + relay OFF time). (Shown if PWM mode)
	(FLOW only) Resettable value that, when exceeded, turns relay on. Must reset Totalizer (in VIEW Mode) to clear relay. Set maximum value. (Shown only if TOTAL.)
	(ALL) Press ▲ or ▼ to turn relay on or off for testing purposes. Can also be used to reset or latch/unlatch the relay. Does NOT reset the Totalizer.

Available Relay Modes by Sensor Type

	Flow	pH	ORP	Cond/Res	Pressure	Lvl/Vol	Temp	4 to 20 mA	Salinity	DO
Off	X	X	X	X	X	X	X	X	X	X
Low	X	X	X	X	X	X	X	X	X	X
High	X	X	X	X	X	X	X	X	X	X
Wind In	X	X	X	X	X	X	X	X	X	X
Wind Out	X	X	X	X	X	X	X	X	X	X
Cyc Low		X	X	X	X	X	X	X	X	X
Cyc High	X	X	X	X	X	X	X	X	X	X
Prop Pulse	X	X	X	X		X	X	X	X	X
Vol Pulse	X									
PWM		X	X	X		X	X	X	X	X
Total	X									
USP				X*						
Error	X	X	X	X	X	X	X	X	X	X

* In USP Relay Mode in Conductivity, Relay Source must be set to COND, TEMP COMP must be set to NONE and Unit Of Measure must be set to µS.

OPTION Menu

	Adjust the LCD contrast for best viewing for your environment. A setting of 1 is lowest contrast, 5 is highest. Default = 3.
	Select backlight level (OFF, LOW, HIGH, AUTO). Default = AUTO. **NOTE:** No backlight when operating on loop power.
	Enter 5 digit value to represent bar at minimum. Default = 0 (ORP = -999).
	Enter 5 digit value to represent bar at maximum. Defaults = 100 (Flow, Cond/Res, Temp), 14 (pH), 1000 (ORP), 10 (Lvl/Prs), 5 (4 to 20 mA), 80 (Sal)
	(ALL) Set the decimal to the best resolution for your application. The display will automatically scale up to this resolution. Select -----., ----.-, ---.-- or --.---. Default = ----.-.
	(FLOW only) Set the decimal to the best resolution for the Permanent Totalizer display. The display will automatically scale up to this resolution. Select -----., ----.-, ---.-- or --.---. Default = ----.-.
	(COND/RES only) Displays mS or µS as set in COND UNITS in INPUT Mode. Set ON/OFF. Default = OFF.
	(FLOW only) Locks the TOTALIZER output. Select OFF, ON (Does not affect Permanent Totalizer). Default = OFF.
	(ALL) Select STD, CODE. Default = STD.
	(ALL) Enter desired password code. 4-character entry not displayed, ---- displayed instead. (Shown if type = CODE.)
	(ALL) Enter 13-character string, if desired. Default = Blank.
	Enables Remote Setup to configure the 9900 via a computer and the optional PC COMM tool. Press ► and select YES to enable. REMOTE SETUP flashes when mode is enabled. **NOTE:** Communication with PC COMM tool is automatic when 9900 is in FACTORY state (Enter flashing). Refer to the PC COMM Configuration/Diagnostic Tool manual, 3-0251.090, included with your PC COMM tool.
	Displays Transmitter Generation Version.

Sensor-Specific Menus

The following pages list the sensor-specific settings for each sensor type.

Flow

This is the normal display and does not time out.

FLOW Setup Checklist

1. Make sure FLOW sensor type is selected (see System Setup Menu, pg. 25).
2. Set the Units of Measurement.
3. Set Sensor Type (Freq or S^{3}L).
4. If LOOP is used, set the minimum and maximum 4 to 20 mA setpoints.
5. Set K-Factor (pulses per Unit Volume) from Flow Sensor manual.
6. Set Totalizer factor.
7. Set Last Cal Date and initials.
8. If desired, set up relay functions for your own application.

VIEW Mode Menu

0 1 2 3 4 5 6 7 8 →	Display the flow rate and the resettable totalizer. Press ► to reset the totalizer. (If Reset is locked, enter the password first.) Lock or Unlock the totalizer in the OPTIONS menu. This is the resettable totalizer View display.
P 0 1 2 3 4 5 6 7 8 →	Display the Permanent Totalizer value (note the "P" indicating Permanent). Pressing ► displays units of measure.
LOOP 1 7.20 mA	Displays the 4 to 20 mA LOOP1 output.
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

CAL Menu

NO HOLD OUTPUTS	YES 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. Select YES/NO. Default = NO.
KF 60.0000	Set K-Factor (pulses per unit volume) from Flow Sensor manual. Min: 0.0001, max 999999. Cannot be zero. Default = 60.0000.
TF 1.000	Sets the volume of each count of the Totalizer as a multiple of the volume unit of the K-Factor. Min: 0.0001, max 999999. Cannot be zero. Default = 1.0000.
RATE CAL	Select to calibrate using Rate method (see Appendix).
VOLUME CAL	Select to calibrate using Volume method (see Appendix).
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (ii).

INPUT Menu

	If desired, a custom name can be entered. Enter 13-character string. Default = FLOW.
	If your flow sensor is configured for frequency output, select FREQ. If configured for Digital (S^3L) output (recommended), select S^3L. Default = FREQ.
	Set the units of measure. The last character sets the timebase: S (seconds) M (minutes) H (hours) D (days). Default = GPM.
	Identifies the Totalizer units. It has no effect on any calculation. Default = GALLONS.
	Dampens display, output and relay response rates. Select Low, Med, High, OFF. (See discussion in Appendix.) Default = OFF.
	Acts as a threshold for flow measurement response. A lower sensitivity setting gives a fast measurement response, a higher setting gives a slower response. Value expressed in units of measurement; response dependent on units of measurement being exceeded. (See discussion in Appendix.)

pH

This is the normal display and does not time out.

pH Setup Checklist

1. Make sure pH sensor type is selected (see System Setup Menu, pg. 25).
2. Set the Temperature Units (°C or °F).
3. If LOOP is used, set the minimum and maximum 4 to 20 mA setpoints.
4. Perform calibration (EasyCal, Standard or Standard and Slope).
5. Set Last Cal Date and initials.
6. Select source for Open Collector and Relay output (pH or Temp).
7. If desired, set up relay functions for your own application.

VIEW Mode Menu

TEMP ------ °C	Displays temperature at the sensor.
RAW ------ mV	Displays the millivolt input from the electrode. Use this display to determine the relative condition of your electrode during periodic calibration. (7 pH buffer = 0 mV, ± 50 mV)
LOOP1 720 mA	Displays the 4 to 20 mA LOOP1 output.
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

INPUT Menu

NAME MEAS TYPE PH	Enter string up to 13 characters (optional). Default = MEAS TYPE PH.
°C TEMP UNITS	Select °F or °C. Default = °C.
AVERAGE OFF	Dampens display, output and relay response rates. Select Low, Med, High, OFF (see discussion in Appendix). Default = OFF. **NOTE:** Signet strongly recommends leaving averaging OFF for pH and Pressure measurements (see discussion in Appendix).

CAL Menu

CAL AT INSTRUMENT	Select AT SENSOR to perform calibration using the Signet 2750 sensor electronics. Select AT INSTRUMENT to perform calibration at the 9900 via EasyCal or manual calibration. (See pH Calibration procedures in the Appendix.) Default = AT INSTRUMENT.
NO HOLD OUTPUTS	YES 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. Select YES/NO. Default = NO.
EASY CAL ->	Press ► to start the EasyCal process. You will be prompted to enter your password. (See pH EasyCal procedure in the Appendix).
SET PH STANDARD	Applies a linear offset to the pH measurement. The ideal value is the average pH of your application. (A sample of your application at process temperature is recommended.) (See pH Calibration procedures in the Appendix.) Shows error message if offset too high.
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. (See pH Calibration procedures in the Appendix.) Shows error message if slope is too low or high.
SET TEMPERATURE	Applies a linear offset to the temperature measurement. The ideal value is the average temperature of your application. "SAVING" will appear if offset is acceptable, "ERR TOO LARGE TO CALIBRATE" if offset is outside of range.
RESET PH CAL	Press ► to reset pH Calibration to factory default.
SET TEMP CAL	Press ► to reset temperature calibration to factory default.
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (ii).

NOTE: if CAL AT SENSOR is selected, the only screens shown will be CAL, HOLD OUTPUTS, and LAST CAL DATE.

ORP

This is the normal display and does not time out.

ORP Setup Checklist

1. Make sure ORP sensor type is selected (see System Setup Menu, pg. 25).
2. If LOOP is used, set the minimum and maximum 4 to 20 mA setpoints.
3. Set Averaging.
4. Perform calibration or set Standard (and Slope if desired).
5. Set Last Cal Date and initials.
6. If desired, set up relay functions for your own application.

VIEW Mode Menu

RAW ------ mV	Displays the millivolt input from the electrode. Use this display to determine the relative condition of your electrode during periodic calibration.
LOOP 1 720 mA	Displays the 4 to 20 mA LOOP1 output
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

CAL Menu

CAL AT INSTRUMENT	Select AT SENSOR to perform calibration using the Signet 2750 sensor electronics. Select AT INSTRUMENT to perform calibration at the 9900 via EasyCal or manual calibration. (See ORP Calibration procedures in the Appendix.). Default = AT INSTRUMENT.
NO HOLD OUTPUTS	YES 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. Select YES/NO. Default = NO.
EASY CAL ->	Press ► to start the EasyCal process. You will be prompted to enter your password. (See ORP EasyCal procedure in the Appendix).
SET ORP STANDARD	Applies a linear offset to the ORP measurement. For single point calibrations, assign the average value of your process to ORP STANDARD. For two-point calibrations, assign the min or max value of your process to ORP STANDARD. (See ORP Calibration procedures in the Appendix.).
SET ORP SLOPE	Applies a slope to the ORP measurement. The ORP SLOPE is used for two-point calibration along with the ORP STANDARD. If you applied the min value of your process to the ORP STANDARD, then apply the max value to the ORP SLOPE. Else, apply the min value to the ORP SLOPE. The slope value and the standard value must be at least 30 mV apart. (See pH Calibration procedures in the Appendix.)
RESET ORP CAL	Resets calibration to factory settings. After pressing ►, select YES/NO. (Shown if CAL AT INSTR)
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (ii).

INPUT Menu

NAME ORP	Enter string up to 13 characters (optional). Default = ORP.
AVERAGE OFF	Dampens display, output and relay response rates. Select Low, Med, High, OFF. (See discussion in Appendix.) Default = OFF.

Conductivity/Resistivity

This is the normal display and does not time out.

Cond/Res Setup Checklist

1. Make sure COND/RES sensor type is selected (see System Setup Menu, pg. 25).
2. Set Cell Constant.
3. Set the Temperature Units (°C or °F).
4. Set Conductivity units.
5. If LOOP is used, set the minimum and maximum 4 to 20 mA setpoints.
6. Set Temperature Compensation.
7. Set Last Cal Date and initials.
8. Select source for Open Collector and Relay output (COND or TEMP).
9. If desired, setup relay functions for your own application.

VIEW Mode Menu

TEMP ----- mV	Same as above with temperature, does not time out.
LOOP1 720 mA	Displays the 4 to 20 mA LOOP1 output.
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

CAL Menu

NO HOLD OUTPUTS	YES 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. Select YES/NO. Default = NO.
AUTO CAL	Shows real-time value and selected standard. “PLACE SENSOR IN STANDARD”. Unit waits until reading is stable; if bad cal, returns “ERROR, CANNOT DETERMINE STANDARD”. Refer to buffer values and AUTO CAL Procedure in the Appendix.
MANUAL CAL	Shows “CONDUCTIVITY” on bottom line; when user presses any button the live value is frozen and the user edits that value. If bad cal, returns “ERR TOO LARGE TO CALIBRATE”. See Manual Cal procedure in Appendix.
SET TEMPERATURE	Shows “TEMPERATURE” on bottom line; when user presses any button the live value is frozen and the user edits that value. If bad cal, returns “ERR TOO LARGE TO CALIBRATE”.
RESET CONDCAL	Resets Conductivity calibration. After pressing ►, select YES/NO.
RESET TEMPCAL	Resets Temperature calibration. After pressing ►, select YES/NO.
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (II).

INPUT Menu

	Enter string up to 13 characters (optional). Default = COND/RES
	Enter cell constant of sensor. Select 20.0, 10.0, 1.0, 0.1, 0.01, or CUSTOM. Default = 1.0 (See NOTE below)
	Enter the precise cell constant from the certificate provided with your sensor, or from the information label on the sensor. Shown if CELL CONSTANT = CUSTOM. (See NOTE below)
	Select °C, °F. Default = °C
	Select µS, mS, PPM, PPB, KOhm, or MOhm. Default = µS. **NOTE:** In USP Relay Mode, TEMP COMP must be set to NONE and Unit Of Measure must be set to µS.
	If the COND UNITS selection is PPM or PPB, set the ratio of Total Dissolved Solids to µS. Default = 0.50
	Dampens display, output and relay response rates. Select Low, Med, High, or OFF. (See discussion in Appendix) Default = OFF
	Select temperature compensation (NONE, LINEAR, PURE H2O). Default = LINEAR. **NOTE:** In USP Relay Mode in Conductivity, Relay Source must be set to COND, TEMP COMP must be set to NONE and Unit Of Measure must be set to µS.
	For LINEAR or PURE H2O temperature compensation, select a % per ºC slope. Maximum slope setting is 9.99 % per ºC. Default = 2.0 (If Temperature Compensation setting is NONE, this item will not be displayed)

Factory-Set Span:

0.01 cell (2819, 2839) ..... 0 to 100 µS
0.10 cell (2820, 2840) ..... 0 to 1000 µS
1.0 cell (2821, 2841) ..... 0 to 10,000 µS
10.0 cell (2822, 2842) ..... 0 to 200,000 µS
20.0 cell (2823) ..... 0 to 400,000 µS

NOTE: If using a 2850 Conductivity/Resistivity Sensor Electronics in conjunction with your 9900, the 2850 must be set for the custom cell constant or the actual probe cell constant and the 9900 set for a 1.0 cell constant.

Pressure

This is the normal display and does not time out.

PRESSURE Setup Checklist

1. Make sure PRESSURE sensor type is selected (see System Setup Menu, pg. 25).
2. If LOOP is used, set the minimum and maximum 4 to 20 mA setpoints.
3. Set Units of Measurement (PSI, BAR, KPa).
4. Set Last Cal Date and initials.
5. If desired, set up relay functions for your own application.

VIEW Mode Menu

LOOP1 720 mA	Displays the 4 to 20 mA LOOP1 output
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

CAL Menu

NO 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. Select OFF/ON. Default = OFF.
SET ZERO	With process pressure at zero, set zero point for measurement.
SET PRESSURE	Calibrate pressure reading to external reference. Provides a maximum 5 psi offset.
RESET CAL	Resets calibration to factory default. After pressing ►, select YES/NO.
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (II)

INPUT Menu

NAME PRESSURE	Enter string up to 13 characters (optional). Default = PRESSURE.
PSI UNITS	Enter units of pressure measurement. Select PSI, BAR, or KPa. Default = PSI.
AVERAGE OFF	Dampens display, output and relay response rates. Select: Low, Med, High, OFF (see discussion in Appendix.) Default = OFF. Signet strongly recommends leaving averaging OFF for pH and pressure measurements (see discussion in Appendix).

Level / Volume

This is the normal display and does not time out.

LEVEL/VOLUME Setup Checklist

1. Make sure LEVEL/VOLUME sensor type is selected (see System Setup Menu, pg. 25).
2. Select Main Measurement (Level or Volume).
3. Set Units of Measurement for LEVEL display (FT, IN, M, CM).
4. If desired, set Units of Measurement for VOLUME display.
5. Set the minimum and maximum 4 to 20 mA setpoints.
6. Set Specific Gravity.
7. Set Sensor Offset.
8. If VOLUME is used, set Shape.
9. Set Last Cal Date and initials.
10. If desired, set up relay functions for your own application.

VIEW Mode Menu

VOL 0.0 GAL	Displays the Volume value on the bottom line of the screen when LVL is the MAIN MEAS selection in INPUT menu.
LVL 0.0 FT	Displays the Level value on the bottom line of the screen when VOL is the MAIN MEAS selection in INPUT menu.
LOOP1 7.20 mA	Displays the 4 to 20 mA LOOP1 output
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

CAL Menu

NO 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. Select OFF/ON. Default = OFF.
LEVEL CAL	Shows SET LEVEL on bottom line. When user presses any key, the live value is frozen and the user edits that value. Returns either GOOD CAL or LEVEL OFFSET TOO LARGE.
RESET CAL	Resets calibration to factory default. After pressing ►, select YES/NO.
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (ii).

INPUT Menu

	Enter 13-character string (optional). Default = LEVEL/VOLUME.
	Select between Level or Volume. Default = LVL.
	Select unit of measure for LEVEL display (FT, IN, M, CM). Default = FT
	ON = Measurement will be displayed as a percentage of full scale. OFF = Measurement will be displayed in unit of measure selected in previous setting. Default = OFF.
	If PERCENT LEVEL = ON, set the desired full scale (100%) value in units of measure. Default = 10.00.
	Select unit of measure for VOLUME display (GAL, LIT, Lb, KG, FT^3, in^3, M^3, cm^3). Default = GAL.
	Select ON = Measurement will be displayed as a percentage of full scale. OFF = Measurement will be displayed in unit of measure selected in previous setting. Default = OFF.
	If PERCENT VOLUME = ON, set the full scale value (100%) in units of measure. Default = 100.00.
	Enter the specific gravity of the fluid at normal operating temperature. This setting is required only if the level measurement is made by a pressure sensor or if kg or lb volume units are selected. Default = 1.0000 (water).
	Enter the distance from sensor location to the Zero reference point in the vessel (see discussion in Appendix). Displayed in units of measure chosen in LEVEL UNITS. Default = 0.
	Dampens display, output and relay response rates. Select Low, Med, High, OFF (see discussion in Appendix). Default = OFF
	Select the shape of the vessel where the level sensor is located. VERT CYLINDER, HORIZ CYLINDER, RECTANGLE, or CUSTOM. (To define a custom tank shape, see Appendix page 50, Defining a Custom Tank.) Default = VERT CYLINDER.
	If VERT CYLINDER or HORIZ CYLINDER is selected, enter the diameter of the cylinder. Displayed in units of measure chosen in LEVEL UNITS. Default = 2.0000

Temperature

This is the normal display and does not time out.

TEMPERATURE Setup Checklist

1. Make sure TEMPERATURE sensor type is selected (see System Setup Menu, pg. 25).
2. If LOOP is used, set the minimum and maximum 4 to 20 mA setpoints.
3. Set Units of Measurement (°C or °F).
4. Set Last Cal Date and initials.
5. If desired, set up relay functions for your own application.

VIEW Mode Menu

LOOP 1 7.20 mA	Displays the 4 to 20 mA LOOP output
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

CAL Menu

NO 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. Select OFF/ON. Default = OFF.
SET TEMPERATURE	Provides a maximum 20 °C offset to match to a known standard (external reference).
RESET CAL	Resets Temperature Calibration to factory settings. After pressing ►, select YES/NO.
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (ii).

INPUT Menu

NAME TEMPERATURE	Enter string up to 13 characters (optional). Default = “TEMPERATURE”.
°F TEMP UNIS	Select °C or °F. Default = °C.
AVERAGE OFF	Dampens display, output and relay response rates. Select Low, Med, High, OFF. (See discussion in Appendix.) Default = OFF.

4 to 20 mA

This is the normal display and does not time out.

4 to 20 mA Setup Checklist

1. Make sure 4-20 mA INPUT sensor type is selected (see System Setup Menu, pg. 25).
2. Set 4 mA value (refer to your 3rd-party sensor manual).
3. Set 20 mA value (refer to your 3rd-party sensor manual).
4. Set Last Cal Date and initials.
5. If desired, set up relay functions for your own application.

VIEW Mode Menu

LOOP1 720 mA	Displays the 4 to 20 mA LOOP1 output
INPUT ----.--mA	Diagnostic display showing raw input from 4 to 20 mA sensor.
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

CAL Menu

NO 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. Select OFF/ON. Default = OFF.
SET STANDARD	Applies a linear offset to the measurement. For single point calibrations, assign the average value of your process to STANDARD. For two-point calibrations, assign the min or max value of your process to STANDARD.
SET SLOPE	Applies a slope to the measurement. The SLOPE is used for two-point calibrations along with the STANDARD above. If you assigned the min value of your process to the STANDARD, then assign the max value to the SLOPE. Else, assign the min value to the SLOPE. The slope and standard values must be at least 0.1 units apart.
RESET CAL	Resets Standard and Slope calibration to factory settings. After pressing ►, select YES/NO.
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (ii).

INPUT Menu

	Enter string up to 13 characters (optional). Default = 4-20 mA INPUT.
	Enter up to 4 characters describing unit of measure. Default = UNIT.
	Measurement value of your sensor when its output is 4.00 mA.
	Measurement value of your sensor when its output is 20.00 mA.
	Dampens display, output and relay response rates. Select Low, Med, High, OFF. (See discussion in Appendix.) Default = OFF.

To program the 9900 for Dissolved Oxygen measurement using the 3-2610-31 sensor:

From the 4 to 20 mA View Mode display:

1. Press and hold the ENTER key for 2 seconds.
2. Press the ▼ key to select the INPUT menu.
3. The first item is NAME. Press the ► key to change the displayed name from “4-20 mA INPUT” to a more descriptive name (e.g., DO) and press ENTER when done.
4. Press ▼ to select SENSOR UNIT menu item.
5. Press ► to change the label from UNIT to MG/L and press ENTER.
6. Press ▼ and ensure the 4 mA VALUE is set to 0.0000.
7. Press ▼ and change the 20 mA VALUE from 5.0000 to 20.000 and press ENTER.
8. Press both ▲ and ▼ simultaneously to return to the Menu.
9. Press ▼ to select the LOOP menu and press ENTER.
10. Set the 4 mA SETPOINT to your desired value. The 2610 is factory set for a 0 to 20 mg/L output. Press ENTER when done.
11. Press the ▼ key to select the 20 mA SETPOINT and set to your desired value. The 2610 is factory set for a 0 to 20 mg/L output. Press ENTER when done.
12. Press both ▲ and ▼ simultaneously to return to the Menu.
13. Press ▼ twice to select the OPTION menu and press ENTER.
14. Press ▼ twice to select SET BAR MIN. Change this option if desired. The 2610 is factory set for a 0 to 20 mg/L output. Press ENTER when done.
15. Press ▼ to select SET BAR MAX. Change this option if desired. The 2610 is factory set for a 0 to 20 mg/L output. Press ENTER when done.
16. Press both ▲ and ▼ simultaneously to return to the Menu.
17. ENTER the other menus and set the unit as desired for your application.
18. Press both ▲ and ▼ simultaneously to return to the View Menu.

Salinity

This is the normal display and does not time out.

SALINITY Setup Checklist

1. Make sure SALINITY sensor type is selected (see System Setup Menu, pg. 25).
2. Set Cell Constant.
3. Set the Temperature Units (°C or °F).
4. If LOOP is used, set the minimum and maximum 4 to 20 mA setpoints.
5. Set Last Cal Date and initials.
6. Select source for Open Collector and Relay output (SAL or TEMP).
7. If desired, set up relay functions for your own application.

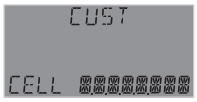
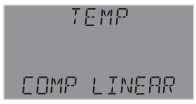
VIEW Mode Menu

TEMP 88888 °C	Displays temperature at the sensor.
LOOP1 720 mA	Displays the 4 to 20 mA LOOP1 output.
COND 88888 mS	Displays the equivalent conductivity value in milliSiemens.
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

CAL Menu

NO HOLD OUTPUTS	YES 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. Select YES/NO. Default = NO.
SET SALINITY	Manually set salinity value to match to a known standard (external reference).
SET TEMPERATURE	Provides a maximum 20 °C offset to match to a known standard (external reference).
RESET SAL CAL	Resets Salinity calibration to factory settings. After pressing ►, select YES/NO.
RESET TEMPCAL	Resets Temperature calibration to factory settings. After pressing ►, select YES/NO.
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (II).

INPUT Menu

	Enter string up to 13 characters (optional). Default = SALINITY.
	Enter cell constant of sensor. Select 20.0, 10.0, 1.0 or CUSTOM. Default = 20.
	Enter the precise cell constant from the certificate provided with your sensor, or from the information label on the sensor. Shown if CELL CONSTANT = CUSTOM.
	Select °C or °F. Default = °C.
	Dampens display, output and relay response rates. Select Low, Med, High, OFF. (See discussion in Appendix.) Default = OFF.
	Select temperature compensation (NONE, LINEAR). Default = LINEAR.
	For LINEAR temperature compensation, select a % per ºC slope. Maximum slope setting is 9.99 % per ºC. (If Temperature Compensation setting is NONE, this item will not be displayed.)

Dissolved Oxygen

This is the normal display and does not time out.

DISSOLVED O2 Setup Checklist

NOTE: The 3-2610-41 sensor uses non-standard wiring. Please ensure the correct wiring is used, as demonstrated on page 15 and in 2610 Dissolved Oxygen sensor manual.

1. Make sure DISSOLVED O2 sensor type is selected (see System Setup Menu, pg. 25).

NOTE: The Dissolved O2 sensor type is for use with 3-2610-41 (159 001 753) ONLY. DO NOT use with the 3-2610-31 (159 001 754). If a 3-2610-31 is installed, used the 4 to 20 mA Input instrument type (see page 42).

2. Set Units of Measurement (PPM, %SAT, TOR).
3. Set the Temperature Units (°C or °F).
4. Set Salinity reference value.
5. Set Barometric reference value.
6. If LOOP is used, set the minimum and maximum 4 to 20 mA setpoints.
7. Select source for Open Collector and Relay output (PPM or TEMP).
8. If desired, set up relay functions for your own application.

VIEW Mode Menu

TEMP ------°C	Displays temperature at the sensor.
LOOP 1 720 mA	Displays the 4 to 20 mA LOOP1 output.
EXP - - - - - MM-YYYY	Displays Cap Expiration Date MM-YYYY. If sensor cap is missing, - - - - - - - will be displayed.
RLYS 1 2 3 OFF OFF OFF	Bottom line shows one of three states (OFF, ON, PLS) for each of the three relays. Displays remaining time for CYC LOW or CYC HIGH mode. The relay(s) will remain ON while counting down. **NOTE:** To reset the timer: In the RELAY menu, select TEST RELAY function. The timer will reset to 0 if the condition no longer exists when the TEST is performed. The timer will restart if the condition still exists.

CAL Menu

NO HOLD OUTPUTS	YES 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. Select YES/NO. Default = NO.
SET 100% SOLUTION	Allows user to initiate the optional calibration process. **NOTE**: Dissolved Oxygen sensors do not require regular calibration and is at the discretion of the user. Press ► to begin the calibration process (password required). User will be prompted to place sensor in 100% Solution standard. Press ENTER to save value and establish a calibration point.
SET 0% SOLUTION	Allows user to establish an optional second calibration point. **NOTE**: Dissolved Oxygen sensors do not require regular calibration and is at the discretion of the user. Press ► to begin the calibration process. User will be prompted to place sensor in 0% Solution standard. Press ENTER to save value and establish an optional second calibration point. This option is only available immediately after a successful 100% Solution calibration.
RESET DO CAL	Resets Dissolved Oxygen calibration to factory settings. After pressing ►, select YES/NO.
LAST CAL MM-DD-YYYY II	Enter date of calibration (mm-dd-yyyy) and initials of calibrator (II).

INPUT Menu

	Enter string up to 13 characters (optional). Default = DISSOLVED O2.
	Set the units of measurement: PPM = DO in mg/L; %SAT = DO % saturation; TOR = Oxygen partial pressure. Default = PPM.
	Manually set Salinity value to match application Salinity (0 - 42 PSU). Units in Practical Salinity Unit (PSU). Fresh water = 0.00 PSU. Default = 0.00
	Manually set Barometric value to match application altitude above or below sea level (506.62 - 1114.7 mBAR). Default = 1013.2 (sea level)
	Select °C or °F. Default = °C.
	Dampens display, output and relay response rates. Select Low, Med, High, OFF. (See discussion in Appendix.) Default = OFF.

Troubleshooting

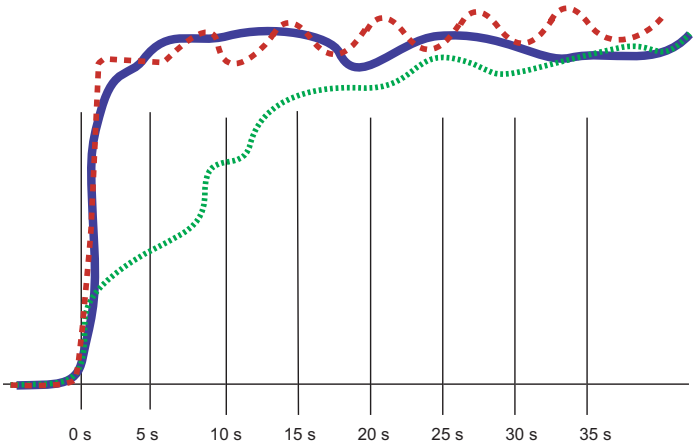
Condition	Possible Causes	Suggested Solution
Wrong Sensor	Incorrect sensor installed	Connect correct sensor
	Sensor Type set incorrectly in 9900	Set correct sensor TYPE in INPUT menu (see pg. 25)
Wrong Code	Wrong password entered	Enter correct password (see pg. 26)
K-Factor Out Of Range	K-Factors cannot be set to 0	Enter K-Factor from 0.0001 to 99999
Backlight inoperative	9900 operating on loop power	Connect 9900 to 10.8 to 35.2 VDC power.
	Backlight turned OFF (**NOTE:** Backlight can turn off automatically in AUTO mode.)	Set BACKLIGHT to LOW, HIGH or AUTO in OPTION menu.
Relays 2 and 3 inoperative	9900 operating on loop power	Connect 9900 to 10.8 to 35.2 VDC power.
	Relay Module installed incorrectly	Remove and reseat relay module
	Wrong settings in RELAY menu	Use test relay to verify relay operation then check relay settings
Relay LEDs inoperative	9900 operating in Loop Power	Use DC power. Check relay states in VIEW mode for status.
Open Collector (R1) or Relay (R2 or R3) always on	Hysteresis value too large	Change the hysteresis value
	Defective Relay Module	Replace Relay Module
OVR relay state (Pulse Overrun)	Relay pulse rate exceeds maximum of 300 pulses per minute	Increase volume pulse setting
		Reduce system flow rate
	Pulse width set too wide	Decrease pulse width
	(**NOTE:** Max pulse rate = 300; max pulse width = 100 mS.	
– – – – –	Flow rate exceeds display capability	Increase Flow units time base
		Change unit of measure
Check Sensor	9900 cannot "talk" to sensor	Check wiring
		Replace sensor
	(pH/ORP, Cond/Res, Sal) Missing sensor or bad temperature element	Install or replace sensor
Check Preamp	9900 cannot "talk" to the preamp	Check wiring or replace preamp
Warning LED lit	Look for error message	Correct error condition
Missing Cap	Dissolved Oxygen sensor is missing the sensor cap	Reinstall Dissolved Oxygen sensor cap
Replace Cap	Dissolved Oxygen sensor cap has expired	Install new Dissolved Oxygen sensor cap

Averaging

NO AVERAGING, NO SENSITIVITY
With SENSITIVITY set to 0 (zero) and AVERAGING set to OFF (0 seconds), the 9900 responds immediately to every shift in the process. The dashed red line represents the actual output of the sensor in varying conditions.

AVERAGING ONLY
With SENSITIVITY still set to zero and AVERAGING set to MED or HIGH the rate is stabilized, but a sharp change in rate is not represented for 8 to 32 seconds or longer.

AVERAGING AND SENSITIVITY
With SENSITIVITY at 50 and AVERAGING set to MED or HIGH, the rate is stabilized, while the sudden shift in process is reflected very quickly. **NOTE:** The SENSITIVITY function applies only to FLOW. The SENSITIVITY function has no effect if the AVERAGING function is set to OFF.



Averaging is different depending on the measurement type. Seconds to 99.5% of Final Value for Low, Med, and High are:

Sensor Type	Low	Medium	High
Flow	10	40	120
pH	2	4	12
ORP	2	4	12
Cond/Res	4	6	12
Pressure	4	10	30
Level/Volume	4	10	30
Temperature	3	10	30
4 to 20 mA	4	10	30
Salinity	4	6	12

LOG Current Loop Output

In Conductivity/Resistivity, the logarithmic (LOG) mode can be used when a very large measurement range is required, yet high resolution is needed at the low end, e.g., in a clean-in-place application where a high-resolution conductivity reading is needed at the low end while a very high conductivity reading is needed when a cleaning cycle is in progress.

Only two parameters need to be set up, the starting or base conductivity value (4 mA SETPNT) and the ending or maximum conductivity value (20 mA SETPNT). The 4 mA setpoint may be larger than the 20 mA point (reverse span).

What equation should be put in the PLC?

$$\text{Conductivity} = 0 \times (\text{mA input} - 4) \times \frac{(\text{Log}_{10}\ 20\ \text{mA setpnt} - \text{Log}_{10}\ 4\ \text{mA setpnt})}{16} + \text{Log}_{10}\ 4\ \text{mA setpnt}$$

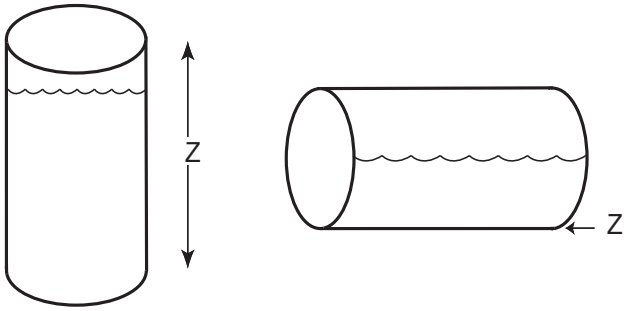
If only fixed thresholds are of interest, they can be calculated in mA and then the mA value can be checked directly. Inside the 9900 the following equation is used:

$$\text{mA} = (\text{Log}_{10}\,\text{Conductivity} - \text{Log}_{10}\,4\ \text{mA setpnt}) \times \frac{16}{(\text{Log}_{10}\ 20\ \text{mA setpnt} - \text{Log}_{10}\ 4\ \text{mA setpnt})} + 4$$

NOTE : If ADJUST 4 mA or ADJUST 20 mA is used, the mA value can be affected. To prevent any problems the adjust function should only be used to get exactly 4.0 and 20.0 at the PLC. The 9900 is accurate and the adjust functions are only needed to compensate for an offset due to noise or a not-so-accurate PLC input card.

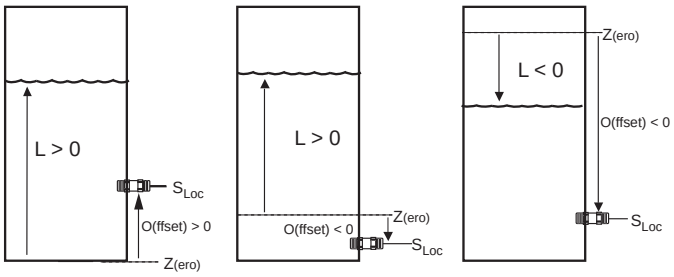
The error value of either 3.6 mA or 22 mA should be tested first before applying the conductivity equation.

Custom Measurements



For most vessels, the zero reference point (Z) may be designated as any height in the vessel.

For horizontal cylinders only, the zero reference point MUST be the lowest point in the vessel.



Defining a Custom Tank

1. Determine where the level measurement should start. This is the zero reference point (Z). Review the diagram to help select the best option.
2. Determine where you will mount the sensor. This is S_{LOC}. Consult the Sensor manual for information regarding the best location for the sensor.
3. Measure the distance between Z and S_{LOC}. This is O(ffset).
4. Enter the Offset into the INPUT Mode menu.

Zero reference point (Z):
The point in the vessel where you want the 9900 to display zero (0 ft, 0 gal. etc.).

- If Z is located below the fluid surface, the 9900 will display a positive level measurement.
- If Z is located above the fluid surface, the 9900 will display a negative level measurement.

Sensor Location point (S_{LOC}):
The point on the level sensor where the measurement is taken.

- The pressure sensor measures from the centerline of the diaphragm.

Offset (O):
The distance from Z to S_{LOC}.

- Enter a positive value in the Calibrate menu if the sensor is located above Z.
- Enter a negative value in the Calibrate menu if the sensor is located below Z.
- Enter 0 in the Calibrate menu if the sensor is located at Z.

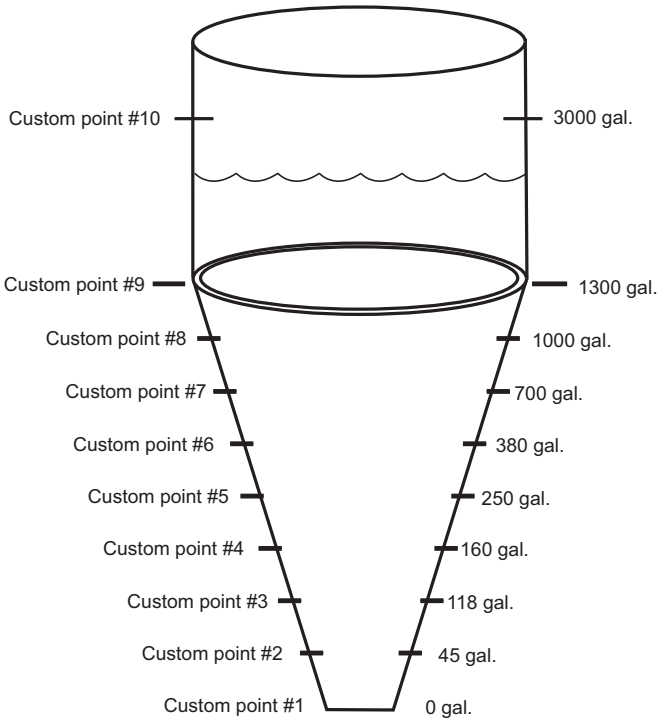
Level (L):
The distance from Z to surface of fluid (displayed as “Level” by 9900).

Level and Volume Calculation in Custom Shaped Vessels

In the LEVEL/VOLUME menu, if Custom Shape is selected in the INPUT menu, you can define from three to ten Custom Points to establish the relationship of level to volume in the vessel.

- Select Manual Level Measurement mode to edit both level and volume data (dry configuration).
- Select Automatic Level Measurement mode to accept the sensor measurement of the Level, while you assign a volumetric value to each custom point (wet configuration).
- Enter from 3 to 10 custom points to link level and volume values.
- The first custom point must be the lowest fluid level in the vessel. Each successive point must be greater than the preceding point.
- The last point must be equal to or greater than the highest fluid level in the vessel.
- A custom point should be located at all transition points in the vessel shape
  (for example, at custom point #9, where the shape changes from a cylinder to a cone).
- The more complex sections should be defined with more points.
  NOTE: The conical section of the illustration has been defined by custom points 1 through 9.
- Simpler sections require fewer defining points.
  NOTE: A cylinder requires only custom points 9 and 10.

Procedures for programming your 9900 for a custom tank shape are found on page 52.



In the LEVEL/VOLUME INPUT menu (see page 40), if SHAPE is set to HORIZ CYLINDER, RECTANGLE or CUSTOM, the tank shape can be defined with the following screens:

TANK LENGTH	If Horiz Cylinder or Rectangle shape is selected, enter the length of the vessel in LEVEL UNITS. 0.0000 to 99999.
TANK WIDTH	If Rectangle shape is selected, enter the width of the vessel in LEVEL UNITS. 0.0000 to 99999.
NUM CUST PNTS	If Custom shape is selected, enter the number of measurement points to be used to define the vessel shape (see Level and Volume Calculation in Custom Shaped Vessels discussion). Minimum 3 points, maximum 10 points. A larger number of points improves accuracy.
Auto LEVEL MEAS	Select (AUTO, MAN). Manual allows you to edit both the Level and the corresponding Volume for your custom tank. Automatic allows you to edit the Volume measurement (while displaying an automatically calculated Level value). See example below.
POINT 1 LEVEL	Enter the Level (if MAN measurement is selected) at each custom point in your vessel. If AUTO is selected, indication will read actual tank level in LEVEL UNITS at that point in your tank.
POINT 1 VOL	Set the Volume (if manual measurement is selected) at each custom point in your vessel.
POINT X LEVEL	Where (X) is number of custom points
POINT X VOL	Where (X) is number of custom points

To set AUTO LEVEL MEAS value:

1. Pour a known quantity of fluid into a tank.
2. POINT 1 LEVEL indicates actual tank level.
3. Press ▼ for POINT 1 VOL. Press ► to enter quantity of fluid (in VOLUME UNITS) you poured into the tank in step 1. Press ENTER.
4. Repeat for each point set in NUM CUST PNTS.

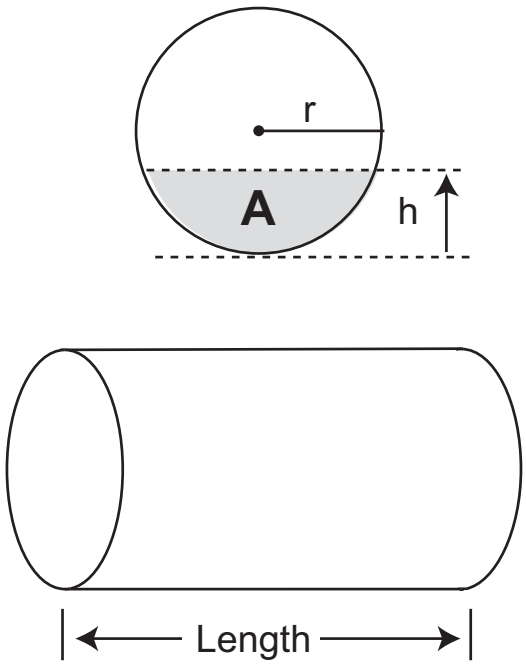
For example, in a 25-gallon conical tank set for three custom points:

1. Pour 10 gallons of fluid into the conical tank. POINT 1 LEVEL will indicate actual tank level.
2. In POINT 1 VOL, enter 10.
3. Pour another 10 gallons into the tank. POINT 2 LEVEL will indicate actual tank level.
4. In POINT 2 VOL, enter 10.
5. Pour the final 5 gallons into the tank. POINT 3 LEVEL will indicate actual tank level.
6. In POINT 3 VOL, enter 5.

Technical Reference for
Level, Volume, and Mass Measurement

The 9900 can automatically perform level, volume and mass calculations:

- Pressure-to-level
- Mass
- Volume



Pressure to level conversion:

$$Level = P \div (SG \times D)$$

where P = Pressure
SG = Specific Gravity of fluid
D = Density of water

With pressure in psi:
Level (meters) = 0.703069 × (P/SG)
With pressure in bar:
Level (meters) = 1.019715 × (P/SG)

Mass Conversion

$$m = D \times SG \times V$$

where m = mass of fluid
D = density of water = 1000 kg/m^3
SG = Specific Gravity of fluid
V = Volume of fluid (m^3)

m (kg) = 1000 × SG × V

Volume Calculations

Vertical cylinder:

$$V = \pi \times r^2 \times h$$

where r = radius of cylinder
h = height of fluid

Rectangular vessel:

$$V = w \times l \times h$$

where w = width
l = length
h = height

Horizontal cylinder:

$$V = A \times L$$

where A = area of segment
L = length of vessel

$$A = \left[\left(\left(r^2 \times \cos^{-1} \times \frac{r-h}{r}\right) - (r-h)\right) \times \sqrt{2rh - h^2}\right]$$

where r = radius of vessel
h = height of segment

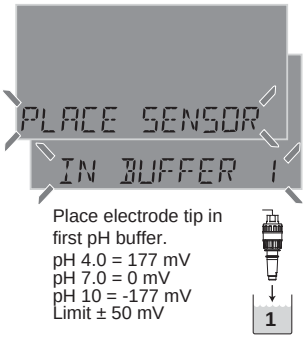
Calibration Procedures

EasyCal Procedure - pH

EasyCal is the fastest and simplest periodic calibration method. Requires prepared 4, 7 or 10 pH buffers (any two).

- This procedure simplifies pH calibration using standard 4.0, 7.0, 10.0 pH buffers only. If these pH buffers are not available, use MANUAL CAL and calibrate the system using the STANDARD and SLOPE settings.
- Set sensor temperature in the CAL Mode before performing EasyCal for new electrode installations.

To Calibrate: | **Response:** | **To Accept:**

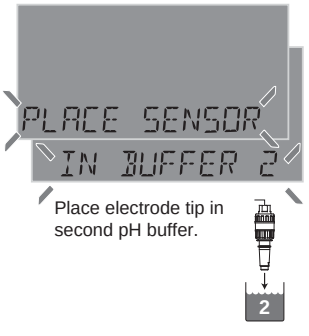


Place electrode tip in first pH buffer.
pH 4.0 = 177 mV
pH 7.0 = 0 mV
pH 10 = -177 mV
Limit ± 50 mV

30s

Allow for stabilization 30 seconds

to accept



Place electrode tip in second pH buffer.

30s

Allow for stabilization 30 seconds

to accept second buffer calibration

To exit menus and return to VIEW press ▲ and ▼ buttons at the same time.

Display returns to VIEW Mode in 10 minutes

Theoretical mV values

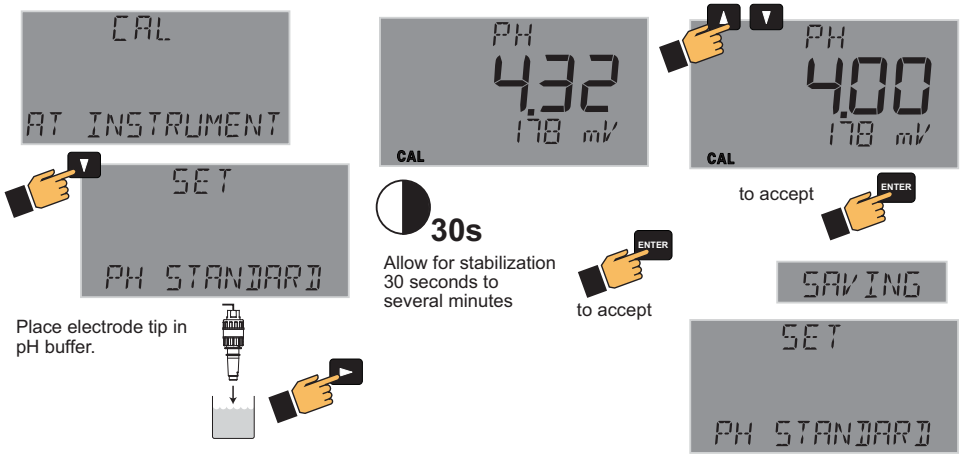
pH @ 25 °C	mV
2	+296
3	+237
4	+177
5	+118
6	+59
7	+0
8	–59
9	–118
10	–177
11	–237
12	–296

NOTE: The solutions can be used for calibrating more than one sensor; however, the solution must remain free of debris and must not be diluted by rinse water from previous calibrations.

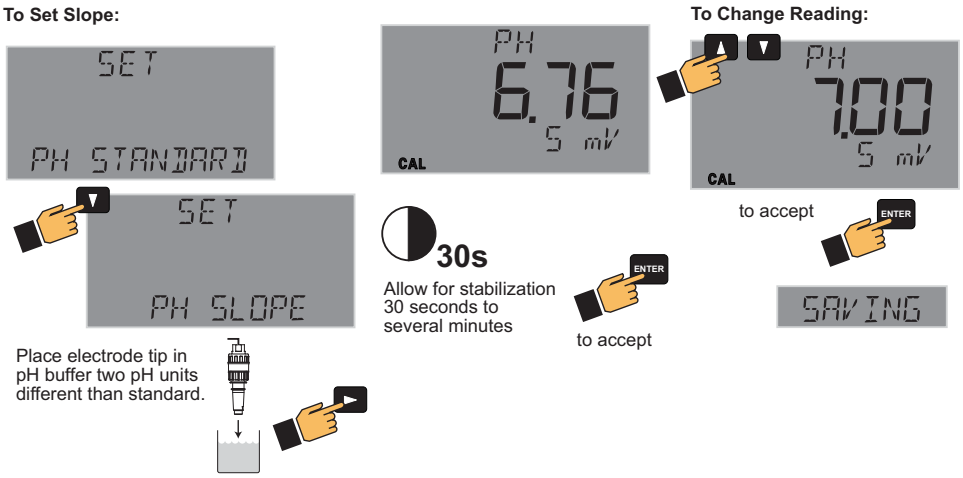
Manual Calibration Procedure - pH

Requires prepared buffers. System calibration is possible with two known pH solutions within 0 to 14 pH (buffers of pH 4.01, 7, or 10 are recommended, but use a buffer close to your own process value.)

To Calibrate:



To Set Slope:



To Set Calibration Date:

Single-point calibration sets STANDARD only; Signet recommends a two-point calibration to set SLOPE in addition to STANDARD.

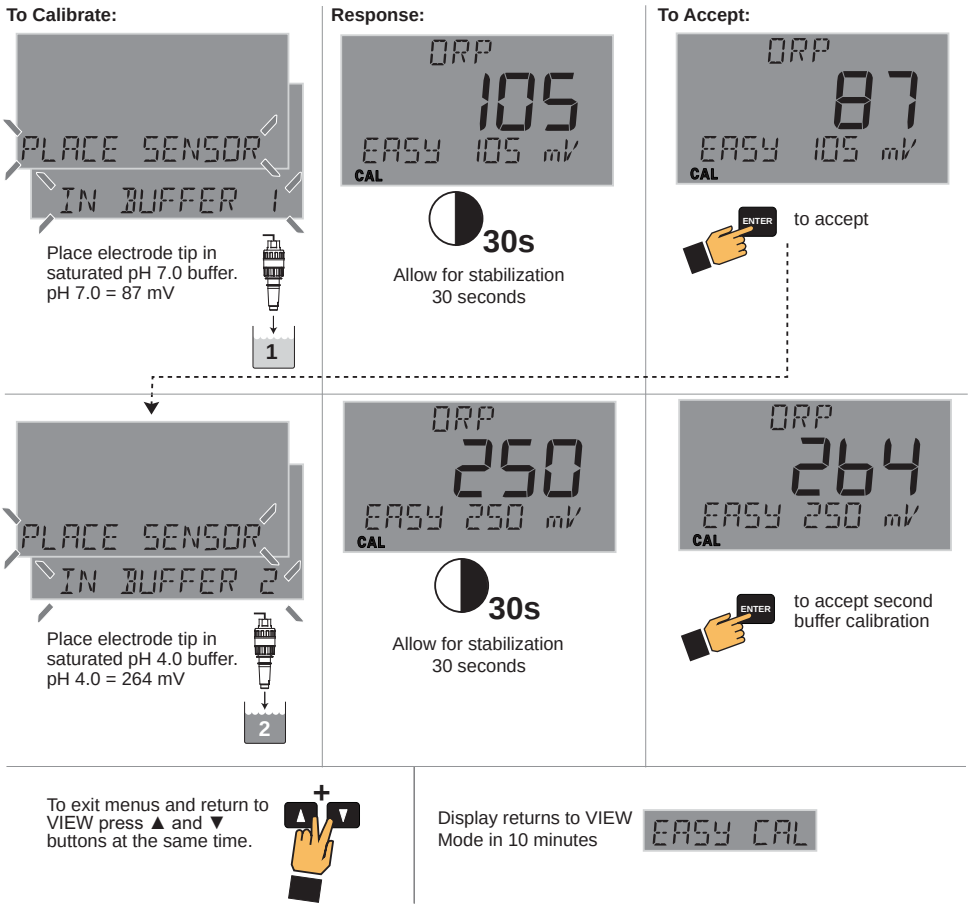
Quick Manual Calibration Procedures:

1-Point Calibration:
1. Set solution standard.

2-Point Calibration (recommended):
1. Set solution standard.
2. Set solution slope.

EasyCal Procedure - ORP

EasyCal is the fastest and simplest periodic calibration method. Requires a prepared quinhydrone solution: Saturate 50 mL of pH 4 and 7 buffers with 1/8 g quinhydrone.



NOTE: ORP solutions made with quinhydrone are very unstable and may not read properly once exposed to air for a prolonged time. These solutions must be disposed of within an hour.

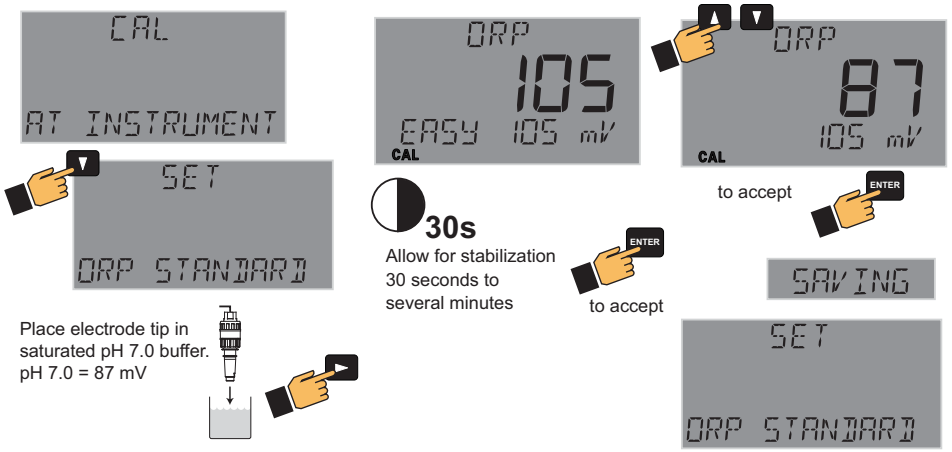
The solution can be used for calibrating more than one sensor. However, the solution must remain free of debris and must not be diluted by rinse water from previous calibrations.

Acceptable ranges for the readings are ± 80 mV (i.e., 87 ± 80 mV).

Manual Calibration Procedure - ORP

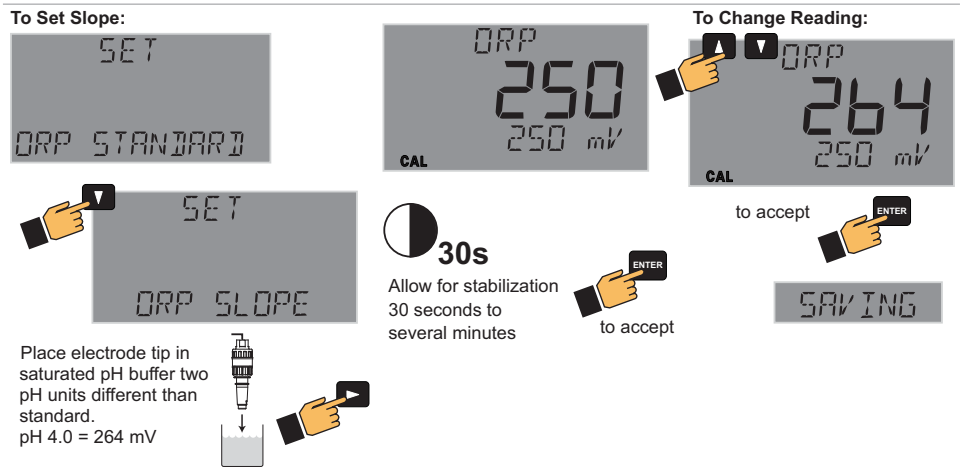
Requires prepared buffers and a prepared quinhydrone solution:
Saturate 50 mL of pH 4 and 7 buffers with 1/8 g quinhydrone.
(System calibration is possible with two known ORP solutions, but use a buffer close to your own process value).

To Calibrate:



To Change Reading:

To Set Slope:



To Change Reading:

To Set Calibration Date:

NOTE: ORP solutions made with quinhydrone are very unstable and may not read properly once exposed to air for a prolonged time. These solutions must be disposed of within an hour.

The solution can be used for calibrating more than one sensor. However, the solution must remain free of debris and must not be diluted by rinse water from previous calibrations.

Acceptable ranges for the readings are ± 80 mV (i.e., 87 ± 80 mV).

Single-point calibration sets STANDARD only; Signet recommends a two-point calibration to set SLOPE in addition to STANDARD.

Quick Manual Calibration Procedures:

1-Point Calibration:
1. Set solution standard.

2-Point Calibration (recommended):
1. Set solution standard.
2. Set solution slope.

Calibration Procedure - Conductivity/Resistivity

AutoCal is the fastest and simplest periodic calibration method.
Requires prepared buffer of a value appropriate to your process.

Conductivity units are displayed as selected in the CALIBRATE menu. Resistivity displayed when KΩ or MΩ ranges are selected.

Available buffer values are:

- 10
- 100
- 146.93
- 200
- 500
- 1000
- 1408.8
- 5000
- 10,000
- 12856
- 50,000
- 100,000

(all values in µS)

AutoCal Procedure

AutoCal is a single-point calibration system. During this procedure, if the measured value is within ± 10% of any of the test values listed below, the 9900 will automatically recognize the test value and calibrate the output to that value.

NOTE: The first step (Reset) is recommended each time an electrode is replaced, but is NOT necessary upon initial installation or periodic calibration.

NOTE: Ensure that the buffer solution is within ± 5 °C of 25 °C.

1. Reset the sensor to factory calibration (refer to sensor manual for procedure).
2. On the 9900, select AUTO CAL from the CAL menu. Press ►.
3. Place the electrode/sensor assembly into the conductivity test solution appropriate to your operating range. Shake the electrode to dislodge any air bubbles visible on the surface of the electrode.
4. Allow at least 2 minutes for the electrode response to stabilize.
5. When the display stabilizes, press ENTER.
6. If calibration is successful, 9900 will display "SAVING". If error is too large, "OUT OF RANGE USE MANUAL CALIBRATION" will display.

Calibration is complete. Return the system to service.

Manual Cal Procedure

NOTE: The first step (Reset) is recommended each time an electrode is replaced, but is NOT necessary upon initial installation or periodic calibration.

NOTE: Ensure that the buffer solution is within ± 5 °C of 25 °C.

1. Reset the sensor to factory calibration (refer to sensor manual for procedure).
2. On the 9900, select MANUAL CAL from the CAL menu. Press ►.
3. Place the electrode/sensor assembly into the conductivity test solution appropriate to your operating range. Shake the electrode to dislodge any air bubbles visible on the surface of the electrode.
4. Allow at least 2 minutes for the electrode response to stabilize.
5. When the display stabilizes, enter the value of the buffer solution using the ▼, ▲ and ► buttons.
6. Press ENTER.
7. 9900 will display "SAVING". If error is too large, "ERR TOO LARGE TO CALIBRATE" will display.

Calibration is complete. Return the system to service.

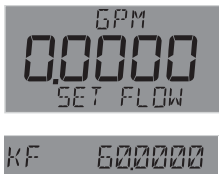
Calibration Procedure - Flow

Select RATE CALIBRATION to match the dynamic flow rate to an external reference. Entering a rate will modify the existing K-Factor.

Select VOLUME CALIBRATION if the flow rate can be determined by filling a vessel of known volume. The 9900 will count the number of pulses generated as the known volume of fluid passes through the sensor, and then use the information to calculate a new K-Factor.

Rate Calibration Procedure

1. Use ▲, ▼ and ► to set the flow rate in the flashing display to match the reference meter. Press ENTER when completed.
2. The 9900 displays the newly calculated K-Factor for your reference. (If the calculated K-Factor is less than 0.0001 or greater than 999999 (out of range at either extreme), the 9900 displays "ERROR NEW KF OUT OF RANGE" and returns to RATE CAL. If flow is too low to accurately calibrate, the 9900 displays "ERROR FLOW RATE TOO LOW and returns to RATE CAL.
3. Press ENTER to accept the new K-Factor (9900 displays "SAVING") or press ▲+▼ keys simultaneously to escape without saving and return to Enter Volume.
   NOTE: You may enter your own calculated K-Factor in the INPUT menu.



Volume Calibration Procedure

1. Press ENTER to start the volumetric calibration period. The 9900 starts counting pulses from the flow sensor.
2. Press ENTER to stop the volumetric calibration period. The 9900 stops counting pulses from the flow sensor.
3. Enter the volume of fluid known to have flowed past the sensor during the volumetric calibration period. This will modify the existing Flow K-Factor.
4. The 9900 displays the newly calculated K-Factor for your reference. (If the calculated K-Factor is less than 0.0001 or greater than 999999 (out of range at either extreme), the 9900 displays "ERROR VOLUME TOO HIGH" (or LOW) and returns to VOLUME CAL.)
5. Press ENTER to accept the new K-Factor (9900 displays "SAVING") or press ▲+▼ keys simultaneously to escape without saving and return to Enter Volume.
   NOTE: You may enter your own calculated K-Factor in the INPUT menu.

Calibration Error Messages

Message	Cause	Solution
Out Of Range Use Manual Calibration	(Cond/Res) Error > 10% in AutoCal	Use manual calibration method
	(pH) Buffer not found; Error > ±1.5 pH units	Use 4, 7, 10 pH buffers (with quinhydrone for ORP calibration) Clean sensor and retry EasyCal Use manual calibration method
	(ORP) No quinhydrone in buffer Error greater than ±80 mV	
Err Too Large To Calibrate	(Cond/Res) Manual cal when error > 100%	Inspect sensor and wiring for damage Clean sensor
	(pH) Offset > 1.3 pH units; Slope error > 100%	Check reference Clean sensor Replace sensor
	(Press) Slope must be < ±50% or offset must be < 2.75 PSI or equivalent.	
	(Sal) Slope error > 1000%	
Error Volume Too Low	User-entered volume too small to calibrate	Correct volume entry Use longer calibration period
Error New KF Out Of Range	The calculated K-Factor too low or high	Verify volume or rate entered Verify flow is present
Error Flow Rate Too Low	(Rate Cal) Flow too low to accurately calibrate	Increase flow
Cal Error Out Of Range	(4 to 20 mA) Slope error > 1000%	Check input at 4 mA and 20 mA settings
	(Temp) Offset must be < ±20 °C or equivalent.	Check sensor range Check reference Replace sensor
Slope Too Close To Standard	(4 to 20 mA) Difference in calibration values must be > 0.1 units	Check sensor Use fresh buffer Use two different buffer values Clean sensor
	(pH) Difference in calibration values must be > 2 pH units	
	(ORP) Difference in calibration values must be > 30 mV	
Standard Too Close To Slope	(4 to 20 mA) Difference in calibration values must be > 0.1 units	Clean sensor Use fresh 4, 7, 10 pH buffers Use two different buffer values
	(pH) Difference in calibration values must be > 2 pH units	
	(ORP) Difference in calibration values must be > 30 mV	
Level Offset Too Large	Offset must be < 1.0 meter	Decrease offset Replace sensor
Pressure Too High	Pressure must be lower than 2.5 PSI or equivalent to do zero cal.	Decrease pressure
Pressure Too Close To Zero	Pressure must be higher than 3 PSI or equivalent to do slope calibration.	Increase pressure Check reference

USP Limits

USP (United States Pharmacopoeia) has defined a set of conductivity values (limits) to be used for pharmaceutical water. The standard requires that conductivity measurement without temperature compensation be used for these applications. The limits vary according to the temperature of the sample. The 9900 has the USP limits stored in memory. It will automatically determine the proper USP limit based on the measured temperature.

Using the USP function
USP setpoints are defined as a percentage below the USP limit, so a USP alarm is always a HIGH alarm. The 9900 can be set to warn you if the conductivity approaches within a set percentage of the USP limit.

The following settings and conditions are required for a USP relay function:

1. In the RELAY menu:
- RELAY MODE must be set to **USP**.

2. In the INPUT menu:
- COND UNITS must be set to **µS**.
- TEMP COMP must be set to **None**.

Example:
- The water temperature is 19 ºC, so the USP limit is 1.0 µS.
- The USP PERCNT is set to 40%.
- The relay will be activated when the conductivity value reaches 40% below the 1.0 USP limit, or 0.6 µS.
- If the water temperature drifts to more than 20 ºC, the 9900 will automatically adjust the USP limit to 1.1. The relay will now be activated when the conductivity value reaches 40% below 1.1 µS (0.66 µS).

Temperature Range (ºC)	USP limit (µS)
0 to < 5	0.6
5 to < 10	0.8
10 to < 15	0.9
15 to < 20	1.0
20 to < 25	1.1
25 to < 30	1.3
30 to < 35	1.4
35 to < 40	1.5
40 to < 45	1.7
45 to < 50	1.8
50 to < 55	1.9
55 to < 60	2.1
60 to < 65	2.2
65 to < 70	2.4
70 to < 75	2.5
75 to < 80	2.7
80 to < 85	2.7
85 to < 90	2.7
90 to < 95	2.7
95 to < 100	2.9
100 to < 105	3.1

Specifications

General
Input channels: .....One

Enclosure and Display
Case Material: .....PBT
Window:.....Shatter-resistant glass
Keypad: .....4 buttons, injection-molded silicone rubber seal
Display:.....Backlit, 7- and 14-segment
Indicators.....“Dial-type” digital bar graph
Update rate:.....1 s
LCD Contrast:.....5 settings

Enclosure
- Size .....¼ DIN
- Color.....Black (Panel Mount), Yellow and black (Integral Mount)

Mounting
- Panel.....¼ DIN, ribbed on four sides for panel mounting clip inside panel, silicon gasket included
- Field .....Mounts to standard Signet field mount junction boxes. Optional angle adjustment adapter is available
- Wall..... Large enclosure (sold as an accessory) that encases the panel mount transmitter

Terminal Blocks
Pluggable screw type
Connector wire gauge:
- Power, Loop.....12 to 28 AWG
- Open Collector....12 to 28 AWG
- Freq/S^{3}L.....16 to 28 AWG

Module connector wire gauge:
- Relay.....12 to 28 AWG
- Cond/Res.....16 to 28 AWG
- Batch.....up to 14 AWG

Environmental Requirements
Ambient operating temperature:
- Backlit LCD:.....-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 Field and Panel Mount (front only); 0 to 95% non-condensing for Panel Mount back side.
- Maximum Altitude: .....4,000 m (13,123 ft); use only DC power supply to maintain UL safety standard up to this altitude
- Enclosure Rating: ..... Designed to meet NEMA 4X/IP65 (front face only on panel mount; field mount is 100% NEMA 4X/IP65).

Performance Specifications
System Accuracy
- Primarily dependent upon the sensor.

System Response
- Primarily dependent upon the sensor. Controller adds a maximum of 150 ms processing delay to the sensor electronics.
- Minimum update period is 100 ms
- System response is tempered by the display rate, output averaging and sensitivity feature.

Electrical Requirements
Power to Sensors

Voltage:	+4.9 to 5.5 VDC @ 25 °C, regulated
Current:	1.5 mA max in loop power mode; 20 mA max when using DC power
Short Circuit:	Protected
Isolation:	Low voltage (< 48 V AC/DC) to loop with DC power connected

No isolation when using loop power only

Input Power Requirements

DC (preferred):	24 VDC; input range: 10.8 to 35.2 VDC regulated
9900 w/o Relay Module:	200 mA *
9900 w/ Relay Module:	300 mA *

*The current draw of the other modules and the sensors are minimal

Loop:	10.8 to 35.2 VDC 4 to 20 mA (30 mA max.)
Overvoltage protection:	48 Volt Transient Protection Device (for DC ONLY)

Current limiting for circuit protection
Reverse-Voltage protection

Loop Characteristics
DC Powered System (preferred)
Max. loop impedance:

@ 12 V loop power	250 Ω max.
@ 18 V loop power	500 Ω max.
@ 24 V loop power	750 Ω max.

Loop Powered System
Max. loop impedance:

@ 12 V loop power	50 Ω max.
@ 18 V loop power	325 Ω max.
@ 24 V loop power	600 Ω max.

Relay Specifications

Hysteresis:	Adjustable (absolute in Engineering Units)
Latch:	Reset in test screen only
On Delay:	9999.9 seconds (max)
Cycle Delay:	99999 seconds (max)
Test Mode:	Set On or Off
Maximum Pulse Rate:	300 pulses/minute
Proportional Pulse:	400 pulses/minute
Volumetric Pulse Width:	0.1 to 3200 s
PWM period:	0.1 to 320 s

Open Collector

Type:	NPN
Max. Voltage Rating:	30 VDC
Max. Current Rating:	50 mA

Dry-Contact Relays

Type:	SPDT
Form:	C
Max. Voltage Rating:	30 VDC or 250 VAC
Max. Current Rating:	5 A resistive

Shipping Weights

Base Unit:	0.63 kg (1.38 lb)
H COMM Module:	0.16 kg (0.35 lb)
Conductivity Module:	0.16 kg (0.35 lb)
Relay Module:	0.19 kg (0.41 lb)

Standards and Approvals

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

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 for Quality, ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety.

Input Types

- Digital (S^3L) or AC frequency
- 4 to 20 mA input via the 8058
- Open collector
- pH/ORP input via the Digital (S^3L) output from the 2750 pH/ORP Sensor Electronics
- Raw Conductivity/Resistivity input directly from Signet Conductivity/Resistivity electrodes via Direct Conductivity/ Resistivity Module or via the Digital (S^3L) output from the 2850 Conductivity/Resistivity Sensor Electronics

Sensor Types..... Flow, pH/ORP, Conductivity/Resistivity, Salinity, Pressure, Temperature, Level/Volume, Dissolved Oxygen, Other (4 to 20 mA)

Input Specifications

Digital (S^3L):..... Serial ASCII, TTL level, 9600 bps
Frequency Type Sensors:
- Sensitivity ..... (for coil type sensors): 80 mV @ 5 Hz, gradually increasing with frequency to 2.5 V
- Freq. Range ..... (for square wave type sensors): 0.5 Hz to 1500 Hz @ TTL level input or open collector
- Accuracy:..... ± 0.5% of reading max error @ 25 °C
- Range..... 0.5 to 1500 Hz
- Resolution: ..... 1 µs
- Repeatability:..... ± 0.2% of reading

Power Supply
- Rejection: ..... No Effect ± 1 µA per volt
- Short Circuit..... Protected
- Reverse Polarity..... Protected (no isolation when using loop power only)

Update Rate: ..... (1/frequency) + 150 ms

Display Ranges:

pH: .....0.00 to 15.00 pH
pH Temp.: .....-99 °C to 350 °C (-146 °F to 662 °F)
ORP: .....-1999 to 1999.9 mV
Flow Rate:.....-9999 to 99999 units per second, minute, hour or day
Totalizer: .....0.00 to 99999999 units
Conductivity: .....0.0000 to 99999 µS, mS, PPM and PPB (TDS), kΩ, MΩ
Cond. Temp.: .....-99 °C to 350 °C (-146 °F to 662 °F)
Temperature:.....-99 °C to 350 °C (-146 °F to 662 °F)
Pressure: .....-40 to 1000 psi
Level: .....-9999 to 99999 m, cm, ft, in, %
Volume: .....0 to 99999 cm^3, m^3, in^3, ft^3, gal, L, lb, kg, %
Salinity .....0 to 100 PPT
Dissolved O_2 .....0 to 20 mg/L, 0 to 200%

Output Specifications

Current Loop Out..... ANSI-ISA 50.00.01 Class H
Span ..... 3.8 to 21 mA
Zero ..... 4.0 mA factory set; user programmable from 3.8 to 4.2 mA
Full Scale..... 20.00 mA factory set; user programmable from 19.0 to 21.0 mA
Accuracy..... ± 32 µA max. error @ 25 °C @ 24 VDC
Resolution..... 6 µA or better
Temp. Drift ..... ± 1 µA per °C
Pwr Sply Rejection ..... ± 1 µA per V
Isolation ..... Low voltage (< 48 VAC/DC)
Voltage..... 10.8 to 35.2 VDC
Max. Impedance: ..... 250 Ω @ 12 VDC
500 Ω @ 18 VDC
750 Ω @ 24 VDC
Update Rate ..... 100 mS nominal
Short circuit and reverse polarity protected
Adjustable span, reversible
Error Condition ..... Selectable error condition 3.6 or 22 mA.
Actual update rate determined by sensor type
Test Mode: ..... Increment to desired current (range 3.8 to 21.00 mA)

Open Collector Outputs: 1
Analog Outputs:..... 1 passive

Current Outputs

- One 4 to 20 mA output
- Linear scaling
- Logarithmic scaling for Conductivity
- Reverse span
- Selectable error mode: 3.6 mA or 22 mA
- Test Output mode that allows the user to test the current output
- Adjustable 4 to 20 mA end points
- HART communication via optional H COMM Module

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.

Ordering Information

9900 Transmitter Base Unit:
Single Channel, Multi-Parameter, 4 to 20 mA, Open Collector, DC Power

Mfr. Part No	Code	Description
3-9900-1P	159 001 695	9900 Base Unit, Panel Mount
3-9900-1	159 001 696	9900 Base Unit, Field Mount
3-9900-1BC	159 001 770	Batch Controller System
Optional Modules		
3-9900.393	159 001 698	Relay Module - 2 DCR (Dry Contact Relays)
3-9900.394	159 001 699	Direct Conductivity/Resistivity Module
3-9900.395	159 001 697	H COMM Module
3-9900.397	159 310 163	Batch Module
Accessories		
6682-0204	159 001 709	Conductivity Module Plug, 4 Pos, Right Angle
6682-1102	159 001 710	Open Collector Plug, 2 Pos, Right Angle
6682-1103	159 001 711	Relay Module Plug, 3 Pos, Right Angle
6682-1104	159 001 712	Power/Loop Plug, 4 Pos, Right Angle
6682-3104	159 001 713	Freq/S^{3}L Plug, 4 Pos, Right Angle
6682-3004	159 001 725	Freq/S^{3}L Plug, In-Line
7310-1024	159 873 004	24 VDC Power Supply, 10 W, 0.42 A
7310-2024	159 873 005	24 VDC Power Supply, 24 W, 1.0 A
7310-4024	159 873 006	24 VDC Power Supply, 40 W, 1.7 A
7310-6024	159 873 007	24 VDC Power Supply, 60 W, 2.5 A
7310-7024	159 873 008	24 VDC Power Supply, 96 W, 4.0 A
3-0251	159 001 724	PC COMM Configuration/Diagnostic tool
3-8050	159 000 184	Universal Mount Kit
3-8050.396	159 000 617	RC Filter Kit (for relay use), 2 per kit
3-8051	159 000 187	Flow Sensor Integral Mounting Kit, NPT, Valox
3-8051-1	159 001 755	Flow Sensor Integral Mounting Kit, NPT, PP
3-8051-2	159 001 756	Flow Sensor Integral Mounting Kit, NPT, PVDF
3-8052	159 000 188	¾ in. Integral Mount Kit
3-8058-1	159 000 966	i-Go™ Signal Converter, wire-mount
3-8058-2	159 000 967	i-Go™ Signal Converter, DIN rail mount
3-9900.390	159 001 714	Standard Connector Kit, Right Angle, (Included with 9900 Transmitter)
3-9900.391	159 001 715	Connector Kit, In-Line, 9900 Transmitter
3-9900.392	159 001 700	Wall Mount Accessory for 9900
3-9000.392-1	159 000 839	Liquid Tight Connector Kit, NPT (1 pc.)
3-9900.396	159 001 701	Angle Adjustment Adapter Kit (for Field Mounting)

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For the most up-to-date information, please refer to our website at www.gfsignet.com

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