Sentry

LIQUID LEVEL GAUGE
MODELS 200 / 200C / 200CO

OWNER MANUAL

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1. SAFETY PRECAUTIONS

   The potential for electrical shock exists whenever water is present near conductive electrical equipment. Check for sources of electricity from other nearby devices before working on this equipment. Due to transformer isolation and low direct current (DC) voltages this instrument poses no danger when handling or opening the enclosure or connecting the sensor. Best practice, however, is to disconnect power when working on this equipment.

2. APPLICATION

   The *Sentry* Liquid Level Gauge continuously monitors the level of potable water, wastewater or water based solutions. It is used in cisterns, holding tanks, pump chambers, sumps, treatment plants, irrigation channels or truck tanks. The indoor level display indicates the depth of water in feet, meters or percent. HIGH and LOW level alarm points and an audible alarm with silence and auto reset can be used to warn of an alarm condition. A yellow LED indicates when the silence is activated.

   The gauge also continuously tests that its parts are functioning correctly. The display has error messages that indicate shorts, open connections, incorrect programming or faults.

   Four relay dry contacts on the Model 200C and 200CO may be configured to operate pumps, aerators, remote alarms, security system, auto dialer or other control applications. Four green LEDs on the display indicate the relay status.

   The Model 200CO may feed the level signal directly to a PLC or computer.

3. INSTALLATION

   3.1 Mount indoor alarm display

   Mount the *Sentry* level display in a dry location, at a convenient viewing height within 6 feet of a 110 VAC receptacle. Power to the receptacle should be supplied from a circuit separate from any pump or equipment that is being monitored or controlled by this gauge. The supplied screws can be used to mount the
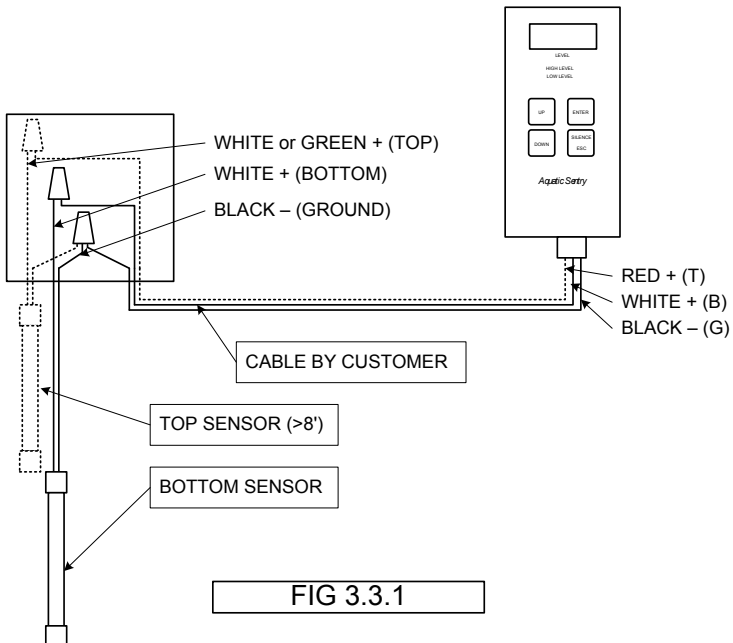
unit. Install screws 3" apart vertically and projecting ¼" from the surface. Install the AC adapter and plug into the level display. The LED display will read `OPEn` indicating that the sensor is not connected.

3.2   Mount the outdoor junction box

Mount the *Sentry* outdoor weatherproof NEMA 6P junction box to a post or a riser pipe, above grade, near the tank.

3.3   Install interconnecting cable

Install a two or three conductor cable between the junction box and the indoor display. Single sensors 8 feet and less in length use two conductor cable. Dual sensors or sensors greater than 8 feet require three conductor cable. An 18 gauge instrument communication cable, stranded conductors, PVC jacket is recommended for most applications. The sensor cable(s) are connected to the cable run inside the junction box. See Fig 3.3.1. The sensor screw terminal plug is installed on the display end of the cable and plugged into the display. See Fig 3.6.1.
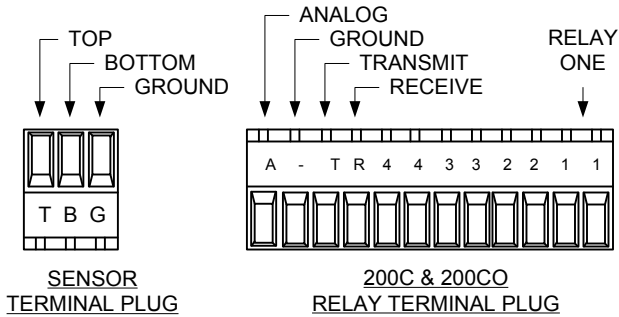
WHITE or GREEN + (TOP)
WHITE + (BOTTOM)
BLACK – (GROUND)

RED + (T)
WHITE + (B)
BLACK – (G)

CABLE BY CUSTOMER

TOP SENSOR (>8')

BOTTOM SENSOR

FIG 3.3.1

FIG 3.6.1

3.4 Test the gauge

Test the operation of the gauge by dipping the sensor into water. **NOTE**: for trouble shooting, wrapping your hand around the sensor may give an indication. The level is displayed in feet, the factory default setting.

Error code $\quad EPO \quad$ indicates the display is not correctly programmed for the sensor length. See 3.7.6.

3.5 Tether the sensor

The sensor stands on the bottom of the tank and is tethered at the top to keep it vertical. Lower the sensor into the water using the tether rope. **DO NOT SUSPEND THE SENSOR FROM THE POWER CABLE**. The sensor is internally weighted and will rest on the bottom of the tank. For dual sensor applications mount a support leg to the top sensor. TIP- To protect the sensor it is suggested to install a stillwell in the tank. One method is to install a 6" PVC pipe, slotted on the bottom and open on the top, in the tank. The sensor may then be lowered inside the stillwell and does not require tethering.

3.6 Install control wiring (Model 200C / 200CO)

Install the control wiring to the control relays. Conductor size is 16 gauge maximum. 18 gauge stranded conductors are recommended. The display relay screw terminal plug is labeled for relays 1 to 4. See Fig 3.6.1.

3.7 Program the display

Program the display for the required alarm points and control relay settings referring to the following instructions and the Programming Modes PDF.

3.7.1 Entering program mode

To enter the programming mode hold the ENTER and ESC buttons down for 5 seconds. The display will move through the diagnostic mode `d IA6` and will then display the first item of the menu, the HIGH LEVEL ALARM. `Stor` Scroll through the first level of menu items by using the UP and DOWN buttons. Select the next level of each menu item by pressing the ENTER button. Move back to the previous level of menu items by pressing the ESC button. Pressing ESC will not change any values. Press ENTER to store each change into memory.

3.7.2 Programming HIGH level alarm

Program a HIGH LEVEL ALARM by setting the trip point at the desired depth. As the water level rises up past that depth, the red LED and the audio alarm will activate. Set the release point depth below the trip point to turn the alarm off as the water level falls and returns to normal. Set the audio alarm `bEEP` on or off.

3.7.3 Programming LOW level alarm

Program a LOW LEVEL ALARM by setting the trip point at the desired depth. As the water level falls below that depth the red LED and the audio alarm will activate. Set the release point depth above the trip point to turn the alarm off as the water level rises and returns to normal. Set the audio alarm `bEEP` on or off.

3.7.4 Programming four control relays (Model 200C)

Program any of the four CONTROL RELAYs by setting the desired action, or polarity, for the relay – normally open or normally closed. Set the trip point at the desired depth to energize the relay. Set the release point which de-energizes the relay. Setting the release point above the trip point is a FILL configuration. Setting the release point below the trip is a PUMP DOWN configuration. The four relays can be set independently

for any span throughout the entire range of the sensor to operate pumps, aerators, low or high level cutouts, remote alarms, security systems, auto dialers or other control applications. Set the polarity of the relay to Normally Open or Normally Closed to suit the application. The energized / de-energized relay status is shown on the front bottom of the display by four green LEDs. The position of the LED corresponds to the positions of the relay wiring terminations on the screw terminal plug below.

3.7.5   Programming display brightness

Set the brightness of the LED display to 1, 2, 3 or 4 where 4 is the brightest.

3.7.6   Programming sensor lengths

Program the length of the bottom and top sensors. Lengths are entered in one foot increments up to 8 feet, the maximum length of an individual sensor. When two sensors are used, enter each of their lengths. In the case of partial foot sensors, program to the next foot. Example – a 5 ½ foot sensor would be entered as 6 feet.

3.7.7   Programming display units

The factory setting of the display is `FEEt` (feet and decimals of a foot). The display can be programmed to display `5 i` (meters) or `PErc` (percent) of the sensor length. (Volume will be available in the future for specific tank configurations.)

3.7.8   Reprogramming and return to display mode

Scroll to `9u it` and press ENTER to return to the level display.

3.8   200CO Analog and digital output

Model 200CO analog and digital outputs are available through the screw terminal relay terminal plug. See FIG 3.6.1.

3.8.1   Analog 1-5 VDC level output

Connect to the analog (A) and ground (-) terminals to transmit the analog 1-5 VDC level output.

3.8.2   RS232 serial level output

Serial communication is 9600 8N1 - 9600 baud, 8 data bits, no parity and one stop bit. Connect to the ground (-), receive (R) and transmit (T) terminals to an RS232 connector. The display transmits a serial string with each time a reading is updated.

3.8.3   Identification numbers.

The ID number identifies each gauge when multiple gauges read into a central program. ID1 And ID2 identify the serial string.

4.   OPERATION and TROUBLESHOOTING

4.1 Self calibration

This instrument "learns" the characteristics of the tank it is installed in while it is in use. Readings may be less accurate when the system is first tested. Once the tank is in use and has been filled at least ¼ full the system will be "taught' and give the best accuracy.

4.2 Diagnostic mode menu

To enter the diagnostic mode press ENTER and ESC at the same time for 1 second. The display will show `d IA6` , indicating it is entering diagnostic mode.

The power level is displayed first. This value is the power level that the sensor is operating at as a percentage of the maximum possible signal strength.

The second value is the length of the sensor in 1 ½" increments.

4.3 State table and troubleshooting

5. SPECIFICATIONS

LED DISPLAY	HIGH LEVEL	LOW LEVEL	AUDIO	CORRECTIVE ACTION
boot				Display is loading software upon power up.
OPEn				Display is not reading sensor; check all cable connections to sensor.
SHrt				Check all sensor cable connections for correct polarity. Check cable for pinches. Sensor damaged internally; replace sensor.
EPO				"Error Partially Open" Check that the display **LEn** is programmed to the length of the sensor. Check wiring connections. Sensor damaged; replace sensor.
Enb				"Error No Bits" Check wiring to the sensor for intermittent connections. Sensor damaged; replace sensor.
Unknown alphanumeric value				Unplug power supply and plug back in. Display will reboot and return to numeric level display mode. Check programmed values for correctness.
Dim				Check the brightness of the display. See 3.7.5 in this manual.
	LED on unexpected			Check programmed HIGH alarm trip and release points; see 3.6.2
		LED on unexpected		Check programmed LOW alarm trip and release points; see 3.6.2
			Audio on unexpected	Check programmed HIGH and LOW alarm **bEEP OFF** . Verify that release points are set correctly and the unit is not "hunting". See 3.7.2 & 3.7.3

5.1 Level display

Display	• rated for dry locations, -30 °F to 120 °F • four digit LED • self diagnostic software messages • programmable HIGH and LOW level visual and audible alarms. • Audio transducer 85 db min @ 10 cm • Model 200C / 200CO – four configurable control relays, dry contacts. Relays rated 5 Amps at 30 V. • Model 200CO – level output in analog 1-5VDC and RS232 formats
Power supply	• 120 VAC, 60 Hz, 5 W, adapting to 12 VDC, UL listed and CSA certified

5.2 Sensor

Sensor	• Sealed 1 ½" PVC pipe, 3m (9') SJOOW cable, NEMA 6P weatherproof junction box.

6. WARRANTY

Aquatic Sentry Controls Inc. warrants that this product is free from defects in materials and workmanship under normal use and service for a period of one year from the date of purchase by the initial owner. Aquatic Sentry shall be responsible only for actual loss or damage suffered and then only to the extent of Aquatic Sentry's invoiced price. Within the warranty period we shall repair, refurbish or replace, at our option, such products or components, which are returned to us with shipping charges prepaid, and which are determined by us to be defective. This warranty will not apply to any product or part thereof which has been subject to misuse, negligence, or accident; or misapplied; or modified; or repaired by unauthorized persons; or improperly installed. The provisions of the above warranty are our sole obligation and exclude all other remedies or warranties, expressed or implied, including warranties of merchantability and fitness for a particular purpose, whether or not purposes or specifications are described herein. We further disclaim any responsibility whatsoever to the customer, or to any person, for injury to person, damage to, or loss of property or value caused by any product, regardless of whether the defect is warrantable or whether the product has been subjected to misuse, negligence, accident; or modified or repaired by unauthorized persons; or improperly installed.

Under no circumstances shall the company be liable for any incidental, consequential or special damages, loss or expenses arising from the use of this product, or in connection with the use of, or inability to use, our product for any other purpose whatsoever.

Aquatic Sentry products or parts thereof assumed to be defective by the purchaser within the stipulated warranty period should be returned to the seller or local distributor for evaluation and service. If deemed necessary, the seller or distributor shall contact Aquatic Sentry Controls Inc. for a Returned Materials Authorization and then return the item for direct factory evaluation, service or replacement. No material may be returned to Aquatic Sentry Controls Inc. without proper factory authorization.