SeaMetrics

AO55 Blind Analog Transmitter Instructions

General Information

The SeaMetrics AO55 is a blind (non-indicating) 4-20 mA transmitter, designed for use with almost all SeaMetrics flow sensors. It accepts a pulse frequency input from the flow sensor, and converts this input into a continuous analog output signal. Power for the transmitter is taken from the current loop itself, so only two wires are required. The digital design makes it possible to span the unit in the field without tools. The frequency at which 20 mA is desired is entered on a set of rotary switches, and an internal microcontroller automatically scales all other values accordingly. An additional benefit of the microcontroller is its ability to average inputs, for smoothing of the output signal. The degree of averaging can be selected in the field, from 2 to 16 seconds.

For maximum environmental protection, the electronic components are encased in a special semi-flexible urethane potting material. The housing is cast from aluminum and fuse-coated. The clamshell housing is connected directly to the flow sensor or, in the wall mount version, provided with mounting feet.

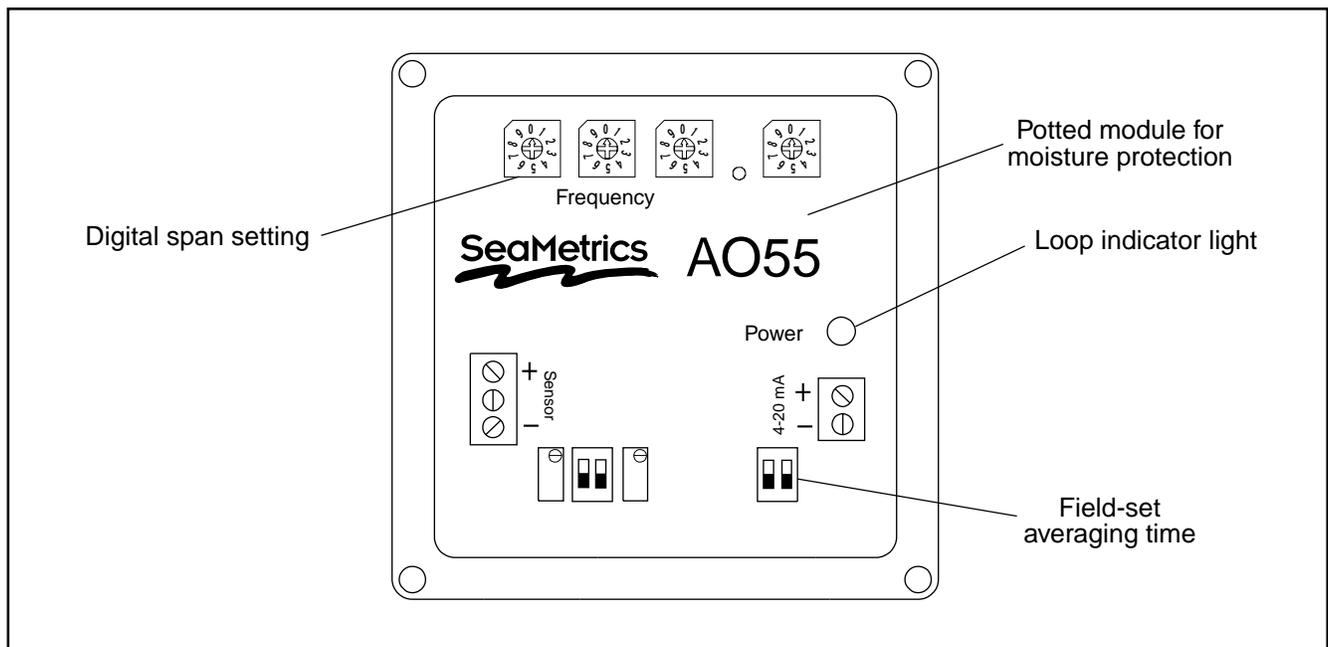The AO55 will operate on a relatively wide range of current loop voltages, 12 to 36 VDC. However, lower voltages limit the load that can be applied to the loop without distortion of the signal. (See chart on page 4 if there is a question regarding voltage vs. load.) A built-in power regulator supplies the appropriate power to the flow sensor.

Typical applications for this transmitter are telemetry (or SCADA), distributed control systems, programmable controllers, data logging, and chart recording.

Specifications

Power	12 - 36 VDC
Temperature	32° - 130°F (0° - 55°C)
Input	open-collector solid-state
Minimum Frequency	10 Hz (@20 mA)
Maximum Frequency	999.9 Hz
Output	proportional 4-20 mA
Frequency Setting	4 rotary DIP switches
Input Averaging	2 - 16 seconds (switch selectable)
Response Time	2-60 seconds 90% of full scale (dependent on input averaging)

Features

Digital span setting
Frequency
Potted module for moisture protection
Loop indicator light
Power
SeaMetrics AO55
Sensor
4-20 mA
Field-set averaging time

Installation

Mounting. The wall mount style (AO55W) is the only housing which needs to be mounted, since the meter mount (AO55M) is already physically connected to the flow sensor. The AO55W comes with mounting feet and requires four screws to attach it to any stable surface.

Connection. On either style of housing, the upper portion must be removed to make connections. Use a standard hex wrench (5/32" or 4 mm) to loosen the screws, then remove the upper half. The connections are made to terminal blocks in this upper half, which contains the potted electronics. Note that the terminal blocks are a removable style, and can be unplugged and plugged back in for convenience.

Look at the connections diagram before connecting to the current loop. The only connections required on an AO55M are the positive and negative loop connections. On an AO55W, the sensor must also be connected, since it is remote from the transmitter. Be careful to follow the color coding of the three flow sensor wires in order to establish the correct polarity. Incorrect polarity can damage the sensor.

Settings

Setting Frequency. The AO55 converts a train of off/on pulses from the flow sensor into a continuous milliamp signal. This signal ranges from 4 milliamps at zero flow to 20 milliamps at the desired maximum flow. This desired maximum is determined by the user, and then entered as a frequency.

To determine the frequency setting, follow these steps:

1) Decide what flow rate should represent the top of the scale. This is ordinarily the maximum expected flow or a value just above it, in gallons per minute.

2) Determine the k-factor of the flow sensor. This will be on the model/serial label of the fitting in the case of any TX or IP 80-series (81 or 82). For an IP or TX 100/200 series (101, 201, 115, 215) it will be on a chart in the instruction manual. For any S-series flow sensor (SPX, SPT, SEB) it will be on the model/serial label. The k-factor is simply the number of pulses the flow sensor produces per gallon of flow. It is determined by a flow test, except in the case of the 100/200 series, which are adjustable for a wide range of pipe sizes.

3) Calculate frequency, using this formula:

$$\frac{\text{K-FACTOR} \ \times \ \text{TOP FLOW (gpm)}}{60}$$

Enter this frequency, using the four rotary switches marked frequency. Note the decimal point between the third and fourth switches.

Frequency Setting Example

An IP 81 with AO55M is installed in a 2" PVC line. The maximum flow for this installation is estimated to be about 150 GPM. To be on the safe side, a flow rate of 170 GPM is selected as the full-scale maximum, the flow at which the current loop will register 20 mA.
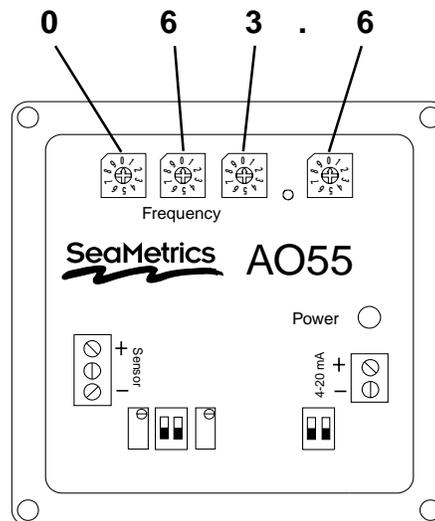
The model/serial label on the SeaMetrics fitting reads "k = 54.50"
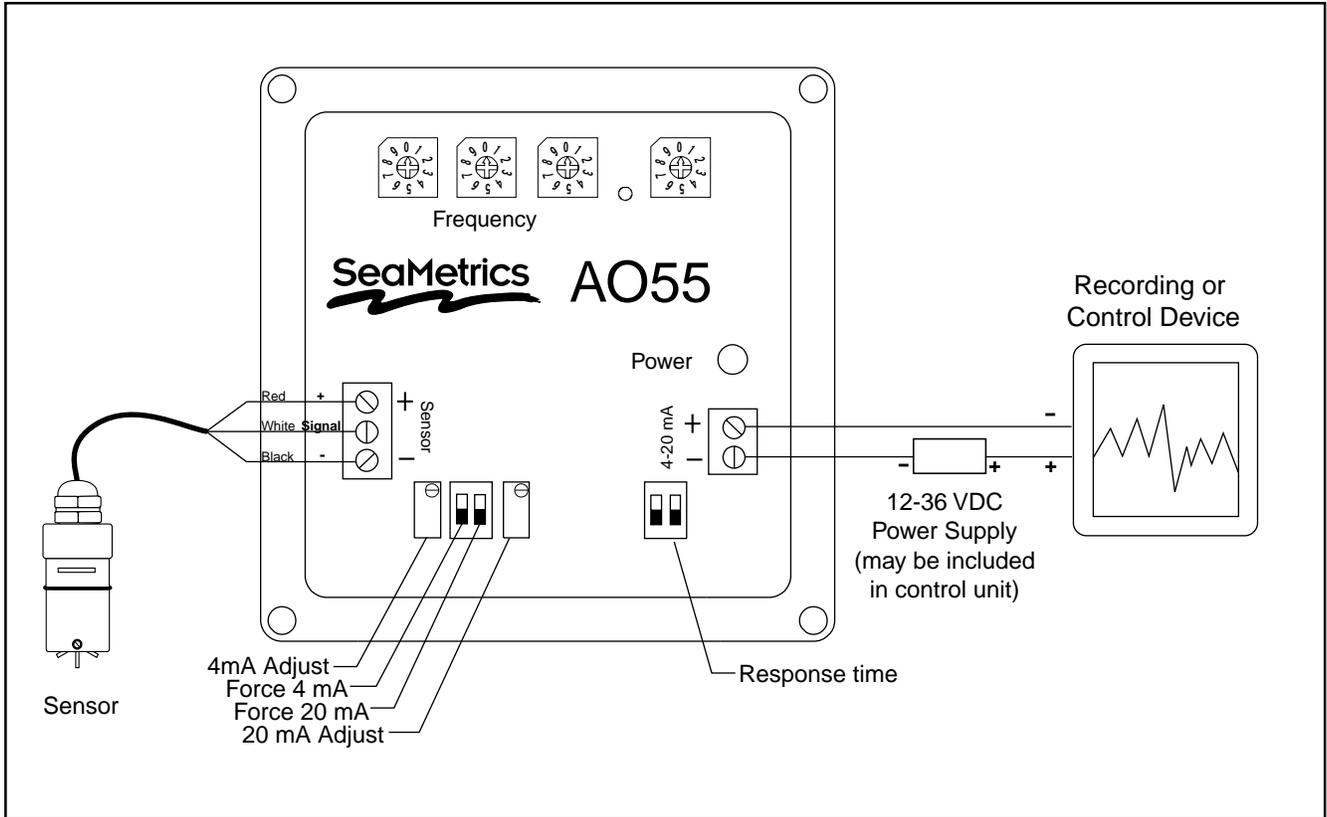
$$\frac{54.50 \times 170}{60} = 63.58$$

Rounding to one decimal point, 63.6 is entered on the rotary switches (063.6).

Example: 63.6

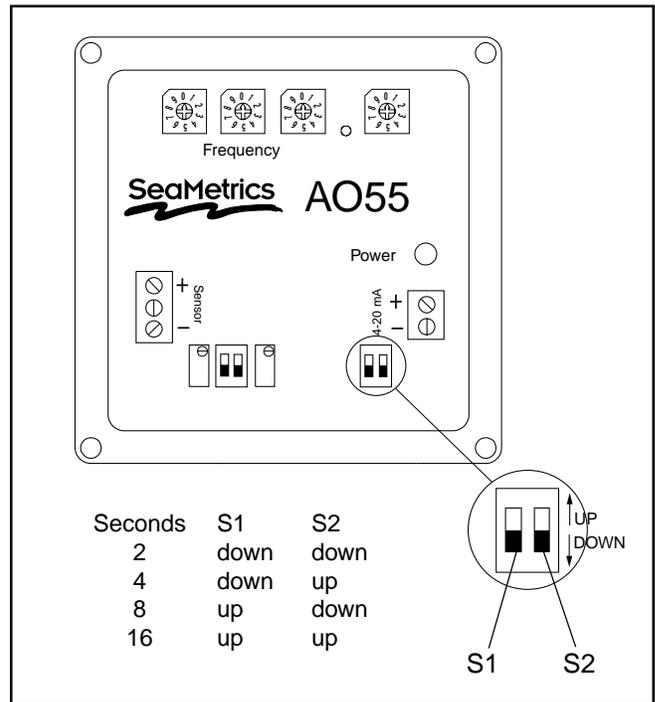Turn rotary switch pointer to the desired digit.

Connections

Setting Averaging Time. For most applications, this step can be ignored. The unit comes with a setting already in place which will work fine for most applications. However, for applications in which a particularly steady output signal is desired, or in large pipe, a larger averaging period may be desirable. Note however that the averaging period requires a tradeoff, since a longer averaging period implies a slower response time. If steady signal is more important than fast response, increase the averaging time as desired. See the diagram for the switch positions and their corresponding times.

Checking Calibration

Normally it should not be necessary to check calibration, since the digital design of this unit virtually eliminates drift. However, there are two types of calibration check which can be performed. Look at the "Connections" diagram to locate the 4 and 20 mA force switches. To force the 4 mA output, put its switch in the up position. Check the current output at the Power terminals, and if necessary trim to 4.00 mA using the appropriate trimpot. Return the switch to the down position, and repeat the process with the 20 mA switch.

Setting Averaging Time

Seconds	S1	S2
2	down	down
4	down	up
8	up	down
16	up	up

Troubleshooting Guide

Problem	Probable Cause	Check First	Further Test
No analog signal at reading device	Break in current loop Dead power supply Reversed polarity	Loop indicator light on?	Multimeter: check voltage on power supply Check polarity
Output stuck at 4 mA	No frequency input from flow sensor	Flow sensor rotor turn freely? Flow sensor connections good? Flow sensor polarity correct? Terminal blocks firmly plugged in?	With flow sensor disconnected, use short piece of wire to repeatedly short between sensor "sig" and "-" terminals. Output mA should rise.
mA signal doesn't match flow rate	Inadequate voltage Wrong frequency setting	Voltage vs. load chart Review setting procedure	Multimeter: check voltage

Load vs. Supply Voltage

Loop Power (VDC) — *Operating Region*

Y-axis: 36, 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 12

X-axis: 200, 400, 600, 800, 1000, 1200

Load Resistance

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