

# Archived: Using the Stevens SDX Submersible Depth Transmitter with NI Wireless Sensor Networks (WSN)

Updated Feb 4, 2020

## NI does not actively maintain this document.

This content provides support for older products and technology, so you may notice outdated links or obsolete information about operating systems or other relevant products.

## Overview

**Note:** NI WSN products are not supported beyond LabVIEW 2015. If you have questions on migrating products, contact technical support at [ni.com/support](https://ni.com/support).

This document describes the use of the Stevens Water Monitoring Systems SDX Submersible Depth Transmitter with the NI Wireless Sensor Networks (WSN) system for wireless depth measurements. This document is one in a series of documents describing how to use specific sensor products with the NI WSN system to wirelessly enable a variety of applications, such as environmental monitoring, climate studies, resource monitoring, etc. For more information on using other sensors with the NI WSN system, please refer to the [WSN Sensor Solutions](#) document

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## Stevens Water Monitoring Systems SDX Submersible Depth Transmitter

Stevens Water Monitoring Systems, Inc. is a manufacturer of sensor systems that help optimize management of water resources. As such, Stevens has a number of transmitters for water-level measurement applications that operate through monitoring water pressure on a submerged sensor. The Stevens SDX (Submersible Depth Transmitter), seen in Figure 1, is a sealed unit that is suitable for submersion in water and other liquid medias.



**Figure 1: The Stevens SDX Submersible Depth Transmitter**

With an EPDM rubber housing to protect the electronics, the SDX is an extremely durable sensor capable of level measurements at three depths, 0-10 ft, 0-35 ft, and 0-50 ft, specified by the user at time of purchase. Low depth units are ideal for open channel flow applications. Higher depth units are suitable for ground water, storage tank, or other similar applications. Some applications include well monitoring, ground water monitoring, surface water monitoring, soil & ground water remediation, and environmental impact studies.

A pressure transducer is the primary sensing element, and measures the water depth by sensing pressure above the SDX. Internal circuitry within the SDX housing converts the signal to a 4-20 milliamper (mA) output, with 4 mA corresponding to zero depth (atmospheric pressure) and 20 mA to the rated depth for the selected range. Power for the two-wire current loop is derived from an external power supply.

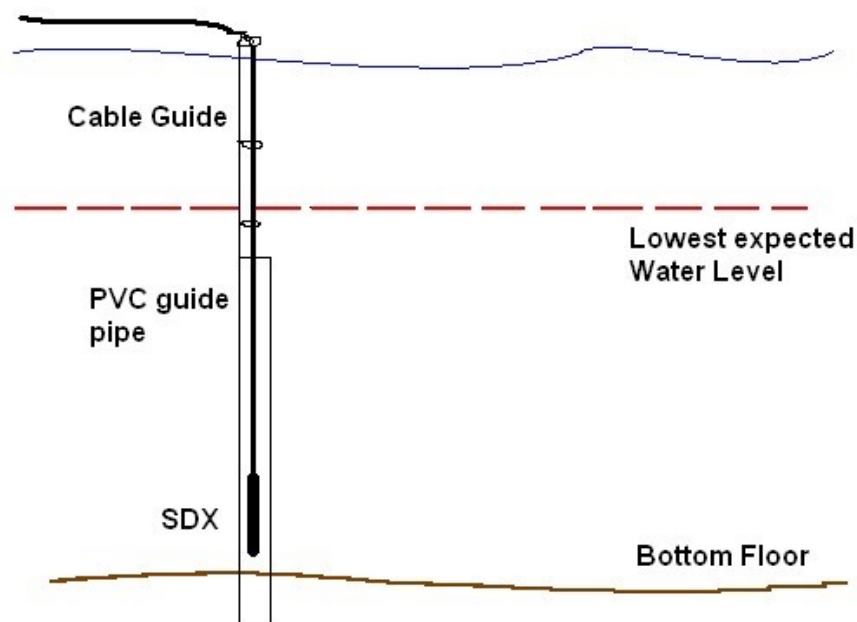
The SDX's cable contains a vented tube that should be left open to atmosphere and unobstructed at the end of the cable connected to the measurement device. This vent provides the sensor with an atmospheric reference, which is necessary for barometric pressure compensation and ensures the highest possible accuracy when making a level measurement.

However, leaving this vent tube open can result in condensation or moisture entering the SDX cable's vent tube. While this will not damage the pressure transducer or the SDX's internal electronics, it is possible for vapor to condense into water which could create an offset in the pressure transducer's output. In the interest of preventing this, an optional desiccant cartridge with vent tube adapter, seen below in Figure 2, can be attached to the vent tube's opening to prevent moisture from entering the tube.



**Figure 2. Stevens Water Desiccant Cartridge for the SDX Submersible Depth Transmitter**

The SDX Sensor can be placed in the media of interest in a number of ways. Sometimes it may be desirable to install an SDX downhole in a stilling well or groundwater monitoring well. Normally, the SDX can be supported simply by its attached cable. When monitoring a free medium, such as a lake or pond, Stevens Water recommends using a PVC pipe for protection and stability. The PVC pipe can be inserted into the bottom floor of the body of water of interest, as seen in Figure 3 below. The user will need to make sure that the top of the pipe will never be above the water level in order to ensure accuracy of measurement. The SDX can then be placed in the pipe and hung with a guide pole at the appropriate depth. The PVC pipe will serve to hold the SDX in place and also provide a level of protection.



**Figure 3: SDX Placement in PVC Pipe**

## Wireless Depth Measurement

By combining the SDX Submersible Depth Transmitter with the NI Wireless Sensor Network (WSN), you can easily build

and deploy a distributed water monitoring system. The NI WSN-3202 voltage node can remotely collect water level data and transmit it wirelessly back through the NI Wireless Sensor Network for observation and analysis.

The addition of multiple WSN-3202 voltage nodes on a system allows a user to monitor water level at multiple locations. This benefits applications where it is necessary to monitor multiple bodies of water spread over large distances, such as monitoring all the ponds in a park or checking the water level in all the tanks of a fishery. Adding WSN voltage nodes to the system also allows a user to incorporate a number of other environmental and water quality sensors for complete environmental applications.

## Connecting the SDX to the NI WSN-3202 Node

Because the SDX outputs a 4-20 mA signal, you will need to use a precision shunt resistor to convert the current signal to a voltage signal that is compatible with the WSN-3202 voltage input node. For example, you can use the 249  $\Omega$  resistors included in NI's [SCXI Precision Resistor Kit](#), which would convert the 4-20 mA current to a voltage drop of approximately 1-5 V across the resistor. The measured voltage will have a linear correspondence to the depth of the SDX sensor.

The SDX Water level sensor requires an external power supply of 14 - 35 VDC. Because this exceeds the 12 VDC power available on the SEN PWR line of the WSN-3202, you must provide an external power supply, such as a solar panel or external battery.

The cable connection on the SDX Submersible Depth Transmitter contains 3 wires which should be connected to the WSN-3202, and an appropriate DC power supply, as show in Figure 4. The black lead returns the SDX's current output. This should be connected to the precision shunt resistor. The system should be grounded at one point only, usually near the measurement device. Finally the silver drain wire should be connected to the ground of this system.

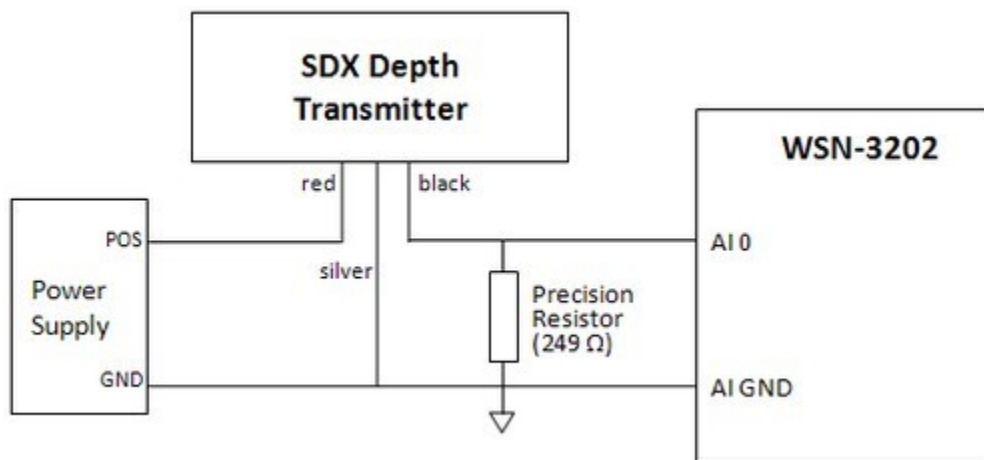


Figure 4. Connecting the SDX to the NI WSN-3202

SDX Cable Lead	Connection
Red	Power (positive lead)
Black	Current Output
Silver	Drain (ground connection)

Table 1. SDX Wire Labels

# Programming NI WSN for use with the SDX Submersible Depth Transducer

## Using LV on a host PC with the NI WSN-3202 with the SDX

The LabVIEW Project Explorer Window can be used on a host computer to configure the WSN-3202 node to measure the output of the SDX transmitter. Right click on the 3202 node in the Project Explorer to configure the node's properties. Under the channels tab, configure all channels for a range appropriate to the shunt resistor you selected. For example, if you have a 249 Ω resistor, across which you are shunting 4-20 mA, you can expect to see 0.996 – 4.98 V, and would therefore want to configure all your AI channels for Range: -5 to 5 Volts.

Under the node tab, set the node sample interval (seconds) hardware configuration setting to an interval appropriate for your application. The higher the sample interval value, the less often the WSN-3202 will take a reading from the SDX. A typical sample rate for measurement of pond water level might be one sample every hour, or 3600 seconds.

You can read the SDX's data into LabVIEW by reading the current value of the shared variables available from the NI WSN-3202. Simply read the analog input channels that the voltage drop across the resistor is physically wired to, AI 0 in Figure 4, and then scale the acquired analog signals.

The user will need to be aware of the depth that their SDX sensor was rated for at the time of purchase, Dmax in the equation below. If R is the resistance value in Ohms of the shunt resistor, you now know two points (Depth d, Measured Voltage V):

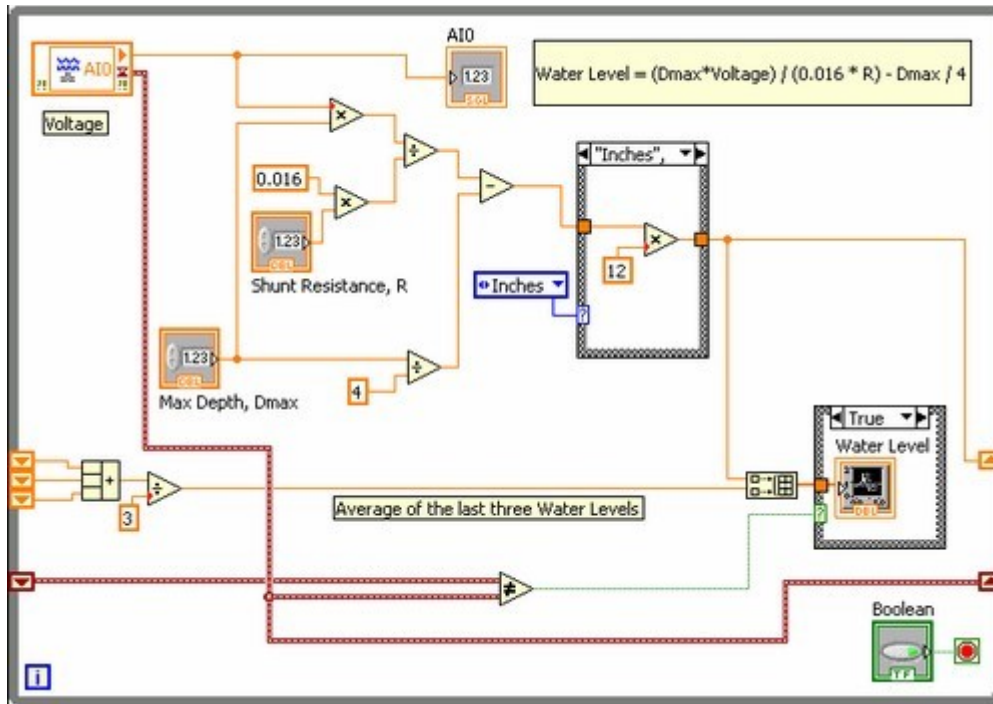
( 0 , 0.004 \* R) and ( Dmax , 0.020 \* R) where 0 is atmospheric pressure and Dmax corresponds to the maximum rated depth.

So:

$$\begin{aligned} y &= m * x + b \\ \text{Voltage} &= m * \text{Depth} + b \\ \text{Voltage} &= (0.016 * R) / Dmax * \text{Depth} + 0.004 * R \end{aligned}$$

$$\text{Depth} = (Dmax * \text{Voltage}) / (0.016 * R) - Dmax / 4$$

Implementation of this measurement and scaling can be seen in the block diagram below. You can also right click on the AI0 shared variable in the Project Explorer and enable Timestamps. This will let you right click on the variable itself on the block diagram, and select Show Timestamp. Now, you can perform a comparison



**Figure 5. LabVIEW Diagram to Acquire, Scale, and Display Water Level Reading**

## Using LabVIEW WSN Embedded Programs on the NI WSN-3202 with the SDX

With LabVIEW WSN, you can download and run LabVIEW VIs on the WSN node for local data processing and control. For example, you could perform the data scaling to engineering units, add custom filtering, or perform alarming locally on the node itself. Another possible use is to utilize a digital output of the WSN-3202 to connect and disconnect the external power supply to the SDX transmitter, under LabVIEW WSN control, in order to minimize power draw by the SDX transmitter.

## Related Links

[More information on NI Wireless Sensor Network and the WSN-3202](#)

[NI WSN Wireless Sensor Partners](#)

[More information on Stevens SDX Transmitter](#)

**WAS THIS INFORMATION HELPFUL?**

Helpful



Not Helpful

