

## Connecting a Temperature Sensor (Thermistor Type)

### Introduction

A powerful feature of the Data Dolphin datalogger is its ability to read from a large variety of sensor devices. A resistive temperature sensor, commonly known as a thermistor, can easily be connected to any of the Data Dolphin inputs. This can be done without the assistance of any type of signal-conditioning device. This tech note answers some of the frequently asked questions regarding the connection of a thermistor to a standard or precision input of the Data Dolphin.

### Is the Thermistor Recognized By the Data Dolphin Software?

Before connecting a thermistor to the Data Dolphin input, there are a few things to consider. Firstly, is the thermistor recognized by the Data Dolphin software?

Thermistors are classified by their resistance at 25° Celsius. Thus, a 10k $\Omega$  thermistor will provide 10000 ohms of resistance at a temperature of 25° Celsius. The Data Dolphin software will accept 2252 $\Omega$ , 5 k $\Omega$ , 10 k $\Omega$  and 30 k $\Omega$  thermistors. Ensure that your thermistor matches one of these values.



### What Is the Proper Matching Termination Resistance for Your Thermistor?

Next, a termination resistance is required. Typically a precision resistor of 10k $\Omega$  or 33k $\Omega$  is used. The Data Dolphin software suggests a default termination resistance when a thermistor value is selected from the drop down combo box. This resistance is 10k $\Omega$  for the 2252 $\Omega$ , 5k $\Omega$ , and 30k $\Omega$  thermistors and 33k $\Omega$  for the 10k $\Omega$  thermistor. These termination resistances are recommended, but you may want to select a value that will provide the most accuracy and resolution for the temperature range that you will be measuring. For example, say you are interested in measuring the temperatures in the 0°C and 10°C range. Referring to your thermistor specification charts, you find that the resistance of your thermistor in the middle of this temperature range is approximately 10k $\Omega$ . You will then want a termination resistor with an equivalent value. Note that a resistor with a tolerance of 0.1% and a temperature coefficient of either 15 ppm or 50 ppm is typically used.



Termination resistance is restricted to certain values by the Data Dolphin software (see *How Do I Configure the Data Dolphin for a Thermistor?* on page 2).

## Are All Thermistors the Same?

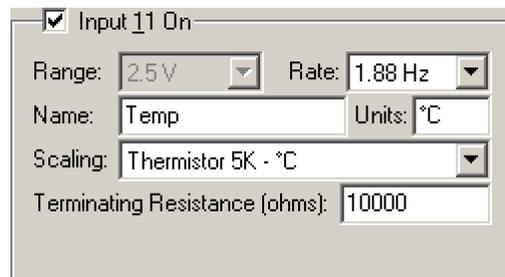
A wide variety of thermistors with varying degrees of accuracy are available for many different temperature ranges. As a general rule, the more linear the performance of the thermistor (temperature vs. resistance), the greater the relative cost involved. It is therefore important to select the appropriate thermistor for your application. The following table depicts this accuracy vs. cost relationship:

Rated Accuracy	General Linearity	Approximate Price*
$\pm 0.05$ °C	Best	Very Expensive
$\pm 0.1$ °C	Excellent	Expensive
$\pm 0.2$ °C	Good	Average
$\pm ?$ °C	Ungraded	Inexpensive

## How Do I Configure the Data Dolphin for a Thermistor?

The last thing to consider is whether or not you have correctly configured a Data Dolphin input to read the voltages from the thermistor. Open your Data Dolphin software and ensure that the input you will be connecting the thermistor to have been enabled. Next, choose the correct thermistor in the “scaling” combo box. If the value suggested to you by the Data Dolphin software is not the one you are using, enter the correct termination resistance in the textbox. In the figure at the bottom of the page, a 5k $\Omega$  thermistor has been installed for input 11.

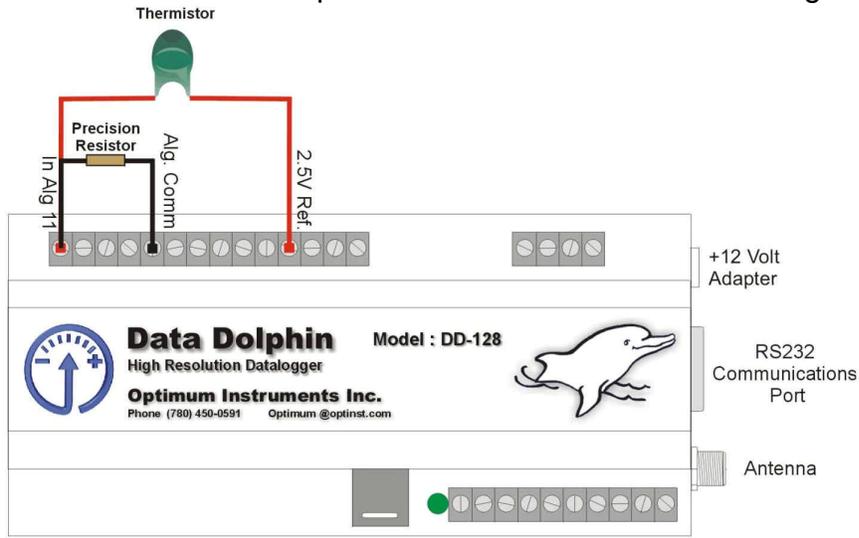
Termination resistance is restricted to certain values by the Data Dolphin software. The resistance must be in multiples of 1000, ending in 000, 100, 250 and 350. It also cannot exceed a value of 63350 ohms or be less than 0 ohms. For example, if you require a termination resistance of 26, 267 $\Omega$ , then the closest values allowed to you by the Data Dolphin software would be 26, 250 $\Omega$  and 26,350 $\Omega$ .



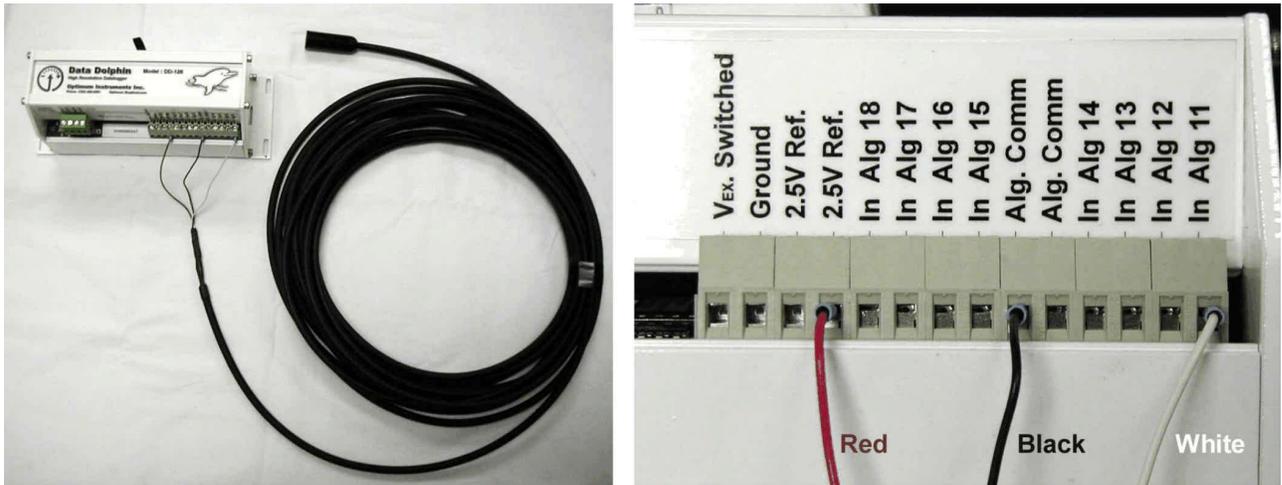
Input 11 On  
 Range: 2.5 V    Rate: 1.88 Hz  
 Name: Temp    Units: °C  
 Scaling: Thermistor 5K - °C  
 Terminating Resistance (ohms): 10000

## Where Does the Thermistor Connect To On A Data Dolphin?

Once you satisfied the above conditions, you are ready to connect the thermistor to the Data Dolphin. Refer to the wiring diagram below to connect the thermistor and resistor(s) into the screw type terminal block. In a typical configuration, one end of the thermistor is connected to the 2.5V reference terminal and the other to the enabled input. The termination resistor(s) are connected between the input and ground terminals. If you are using a pre-assembled temperature probe (shown in the bottom photo), connect the red lead to the 2.5V reference terminal, the white lead to the enabled input and the black lead to the analog common ground.



**Thermistor and Precision Resistor Wiring**



**Temperature probe wiring**