

<b>Region 4</b> <b>U.S. Environmental Protection Agency</b> <b>Science and Ecosystem Support Division</b> <b>Athens, Georgia</b>	
<b>Operating Procedure</b>	
<b>Title: Field Temperature Measurement</b>	<b>ID: SESDPROC-102-R5</b>
Issuing Authority: Chief, Field Services Branch	
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**Purpose**

This document describes general and specific procedures, methods and considerations to be used and observed when measuring the temperature of aqueous phase environmental media, including groundwater, surface water and certain wastewaters.

**Scope/Application**

The procedures contained in this document are to be used by field personnel when measuring the temperature of aqueous phase environmental media in the field. On the occasion that SESD field personnel determine that any of the procedures described in this section cannot be used to obtain temperature measurements of the media being sampled, and that another method or measurement instrument must be used to obtain said measurements, the variant instrument and measurement procedure will be documented in the field log book and subsequent investigation report, along with a description of the circumstances requiring its use.

While this SOP may be informative, it is not intended for and may not be directly applicable to operations in other organizations. Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

## TABLE OF CONTENTS

<b>1.0</b>	<b>Field Temperature Measurement Procedures .....</b>	<b>3</b>
1.1	General .....	3
1.2	Instrument Verification .....	3
1.2.1	Field thermometers and thermistors.....	3
1.2.2	NIST-traceable thermometer.....	3
1.3	Inspections.....	4
1.4	Sample measurement procedures for thermometers/thermistors .....	4
1.5	Units.....	4
1.6	Quality Control.....	4
<b>2</b>	<b>Definitions.....</b>	<b>5</b>
<b>3</b>	<b>References.....</b>	<b>5</b>
<b>4</b>	<b>Revision History .....</b>	<b>5</b>

## **1.0 Field Temperature Measurement Procedures**

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### **1.1 General**

Field temperature measurements may be made with a field thermometer, equipment thermistor, or NIST-traceable thermometer. At a minimum, the temperature measurement device should be capable of measuring in 0.1°C increments.

### **1.2 Instrument Verification**

#### **1.2.1 Field thermometers and thermistors**

Temperature measurement devices such as field thermometers and equipment thermistors will be verified against a NIST-traceable thermometer prior to use and should agree within  $\pm 4.0^\circ\text{C}$ . Corrections may be applied for measurements up to  $\pm 4.0^\circ\text{C}$  depending on investigation objectives, but the instrument must be repaired or replaced beyond that range.

Due to the stable nature of thermistors on multi-parameter water quality instruments, thermistors will be checked at the beginning and end of a field study, but do not have to be checked for every calibration during the study. In order to track stability and reliability, the thermistors on these units will be checked against a NIST-traceable thermometer on an annual basis, with the electronic record of these checks maintained on the Ecology Section Sharepoint Site.

In order to provide the most stable readings, thermistor checks against the NIST-traceable thermometer should be conducted in a liquid calibration standard at stabilized room temperature as opposed to air during the saturated air calibration of dissolved oxygen.

Enforcement cases would still require temperature verification for every calibration and end check related to the case.

#### **1.2.2 NIST-traceable thermometer**

Verification of the NIST-traceable thermometers that are used to verify temperature measuring devices is accomplished by comparing temperature readings from the NIST-traceable thermometer to a thermometer that has an independent certification of accuracy traceable to the National Institute of Standards and Testing. Current certified thermometers are maintained by the SESD Analytical Support Branch and are called reference thermometers.

Each NIST-traceable thermometer is verified by comparing at least annually against a reference thermometer. If corrections need to be applied, they will be noted in the NIST-traceable thermometer. Depending on investigation objectives, project leaders may decide to apply the correction factor as necessary.

### 1.3 Inspections

All temperature measurement devices should be inspected for leaks, cracks, and/or function prior to each use.

### 1.4 Sample measurement procedures for thermometers/thermistors

(Make measurements in-situ when possible)

1. Clean the probe end with de-ionized water and immerse into sample.
2. If not measuring in-situ, swirl the instrument in the sample for mixing and equilibration.
3. Allow the instrument to equilibrate with the sample for at least one minute.
4. Suspend the instrument away from the sides and bottom, if not in-situ, to observe the temperature reading.
5. Record the reading in the log book. For most applications, report temperature readings to the nearest 0.5°C or to the nearest 0.1°C depending on need.

**Note:** Always clean the thermometer with de-ionized water or a detergent solution, if appropriate, prior to storage and/or use.

### 1.5 Units

Degrees Celsius (°C) or Degrees Fahrenheit (°F)

#### *Conversion Formulas:*

$$^{\circ}\text{F} = (9/5 ^{\circ}\text{C}) + 32 \quad \text{or} \quad ^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$$

### 1.6 Quality Control

All thermometers should be maintained and operated in accordance with the manufacturer's instructions and the SESD Operating Procedure for Equipment Inventory and Management (SESDPROC-108). Temperature measurement devices such as pH, conductivity and dissolved oxygen (DO) meter thermistors will be verified against a National Institute of Standards and Technology (NIST)-traceable thermometer before each use as described in Section 3.2.

If at any time during a field investigation, it appears that the environmental conditions could jeopardize the quality of the measurement results, the measurements will be stopped. This will be documented in the field logbook.

## 2 Definitions

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None

## 3 References

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SESD Operating Procedure for Equipment Inventory and Management, SESDPROC-108, Most Recent Version

SESD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

United States Environmental Protection Agency (US EPA). Most Recent Version. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Region 4 Science and Ecosystem Support Division (SESD), Athens, GA

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SEDS, Athens, GA, Most Recent Version

## 4 Revision History

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This table shows changes to this controlled document over time. The most recent version is presented in the top row of the table. Previous versions of the document are maintained by the SEDS Document Control Coordinator.

History	Effective Date
SESDPROC-102-R5, <i>Field Temperature Measurement</i> , replaces SESDPROC-102-R4 <b>General:</b> Corrected any typographical, grammatical, and/or editorial errors. Additionally, the document was edited to reflect new Document Control Processes.  <b>Section 1.2.1:</b> Verification requirements of thermistors on multi-parameter water quality instruments were modified.	March 14, 2018
SESDPROC-102-R4, <i>Field Temperature Measurement</i> , replaces SESDPROC-102-R3	October 23, 2014
SESDPROC-102-R3, <i>Field Temperature Measurement</i> , replaces SESDPROC-102-R2	February 4, 2011
SESDPROC-102-R2, <i>Field Temperature Measurement</i> , Replaces SESDPROC-102-R1	June 13, 2008
SESDPROC-102-R1, <i>Field Temperature Measurement</i> , Replaces SESDPROC-102-R0	November 1, 2007
SESDPROC-102-R0, <i>Field Temperature Measurement</i> , Original Issue	February 05, 2007