

**Region 4  
U.S. Environmental Protection Agency  
Science and Ecosystem Support Division  
Athens, Georgia**

**OPERATING PROCEDURE**

**Title: Field Temperature Measurement**

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## 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 SESD Document Control Coordinator.

History	Effective Date
<p>SESDPROC-102-R2, <i>Field Temperature Measurement</i>, Replaces SESDPROC-102-R1</p> <p><b>Cover Page:</b> Author was changed from Marty Allen to Ron Phelps.</p> <p><b>Revision History</b> Changed Field Quality Manager to Document Control Coordinator.</p> <p><b>Section 1.3</b> Changed Field Quality Manager to Document Control Coordinator.</p> <p><b>Section 2</b> Deleted last sentence of paragraph 1. Deleted Fisher brand stem type in paragraph 2.</p> <p><b>Section 3.1</b> Deleted “Normally” on the first sentence. Deleted the last sentence.</p> <p><b>Section 3.2</b> Changed “Calibration” to “Verification”. Added recalibration requirements.</p>	<p>June 13, 2008</p>
<p>SESDPROC-102-R1, <i>Field Temperature Measurement</i>, Replaces SESDPROC-102-R0</p> <p><b>General</b> Updated referenced procedures due to changes in title names and/or to reflect most recent version.</p> <p><b>Title Page</b> Changed title for Antonio Quinones from Environmental Investigations Branch to Enforcement and Investigations Branch. Changed Bill Cosgrove’s title from Acting Chief to Chief.</p> <p><b>Section 1.3</b> Updated information to reflect that procedure is located on the H: drive of the LAN.</p>	<p>November 1, 2007</p>

<p><b>Section 1.4</b> Alphabetized and revised the referencing style for consistency.</p> <p><b>Section 2</b> Added last paragraph regarding stopping measurements due to environmental conditions.</p>	
<p>SESDPROC-102-R0, Field Temperature Measurement, Original Issue</p>	<p>February 05, 2007</p>

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# **1 General Information**

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## **1.1 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.

## **1.2 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.

## **1.3 Documentation/Verification**

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and has been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the H: drive of the SESD local area network. The Document Control Coordinator is responsible for ensuring the most recent version of the procedure is placed on the H: drive and for maintaining records of review conducted prior to its issuance.

## **1.4 References**

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). 2001. 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 SESD, Athens, GA, Most Recent Version

## **1.5 General Precautions**

### ***1.5.1 Safety***

Proper safety precautions must be observed when conducting temperature measurements in the field. Refer to the SESD Safety, Health and Environmental Management Program Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines, however, should only be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

### ***1.5.2 Procedural Precautions***

All temperature measurements pertinent to the sampling event should be recorded in the field log book for the event. All records should be entered according to the procedures outlined in the SESD Operating Procedure for Logbooks (SESDPROC-010).

## 2 Quality Control

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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). Regardless which type of thermometer is used, its accuracy should be verified prior to use. All stand-alone thermometers and instrument thermistors are verified against a National Institute of Standards and Technology (NIST)-traceable thermometer at least semi-annually. This includes, but is not limited to, the pH, conductivity and DO meters. These verification checks are documented in a logbook and maintained at the Federal Equipment Center (FEC).

The thermistors for all pH, conductivity, and DO meters should be verified in the field with one of the NIST-traceable digital thermometers. All data for the field verifications should be documented in the field investigator's logbooks according to the procedures found in the SESD Operating Procedure for Logbooks (SESDPROC-010).

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.

## 3 Field Temperature Measurement Procedures

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### 3.1 General

Temperature measurements may be made with an alcohol-filled thermometer, a NIST-traceable digital thermometer, or a thermistor. At a minimum, the thermometer should be capable of measuring in 0.1°C increments.

### 3.2 Instrument Verification

Verify any temperature measurement device by checking at least annually against a NIST-certified thermometer. Clearly indicate and document whatever correction must be applied to the thermometer. The NIST thermometer should be recalibrated at least every five years or whenever the thermometer has been exposed to temperature extremes.

**Note:** Thermistors should be checked 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  $\pm 4.0^\circ\text{C}$ , but the instrument must be repaired or replaced beyond that range.

### 3.3 Inspections

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

### 3.4 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 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.

### 3.5 Units

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

*Conversion Formulas:*

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