

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

OPERATING PROCEDURE

Title: Field Temperature Measurement

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Authors

Name: Hunter Johnson
Title: Environmental Engineer

Signature:  **Date:** 2/4/11

Approvals

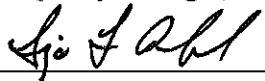
Name: Archie Lee
Title: Chief, Enforcement and Investigations Branch

Signature:  **Date:** 2/4/2011

Name: Bill Cosgrove
Title: Chief, Ecological Assessment Branch

Signature:  **Date:** 2/4/11

Name: Liza Montalvo
Title: Field Quality Manager, Science and Ecosystem Support Division

Signature:  **Date:** 2/4/11

Revision History

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-R3, <i>Field Temperature Measurement</i>, replaces SESDPROC-102-R2</p> <p>Cover Page: Author was changed from Ron Phelps to Hunter Johnson. The Enforcement and Investigations Branch Chief was changed from Antonio Quinones to Archie Lee. The FQM was changed from Laura Ackerman to Liza Montalvo.</p> <p>Section 1.2: Added the following statement: Mention of trade names or commercial products does not constitute endorsement or recommendation for use.</p> <p>Section 1.3: Omitted the reference to the H: drive of the LAN.</p> <p>Section 1.5: In Section 1.5.1, added “The field investigators will” to the first sentence. Deleted Section 1.5.2.</p> <p>Section 2: In the first paragraph, kept the first sentence but replaced the rest of the paragraph with the following language for clarification purposes: “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. Data Sonde thermistors will be verified on a monthly basis to ensure accuracy. These verification checks are documented in the instrument’s tracking logbook.”</p> <p>Deleted the second paragraph.</p> <p>Section 3.1: In the first paragraph, replaced the first sentence with: “Field temperature measurements may be made with a field thermometer, equipment thermistor, or NIST-traceable thermometer.” In the second sentence, replaced “thermometer” with “temperature measurement device.”</p> <p>Section 3.2: Created new sections 3.2.1 and 3.2.2 as follows: Converted the “Note” to new section 3.2.1. Replaced the first sentence with “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 $\pm 4.0^{\circ}\text{C}$.”</p> <p>Converted the first paragraph to section 3.2.2. Revised the original language to clarify the verification requirements of the NIST-traceable thermometers that are used to verify other temperature measuring devices, such as field thermometers and equipment thermistors.</p>	<p>February 4, 2011</p>

<p>Section 3.3: Replaced “thermometer” with “temperature measurement device.”</p> <p>Section 3.4: Added “if not in-situ” to number 4.</p>	
<p>SESDPROC-102-R2, <i>Field Temperature Measurement</i>, Replaces SESDPROC-102-R1</p> <p>Cover Page: Author was changed from Marty Allen to Ron Phelps.</p> <p>Revision History Changed Field Quality Manager to Document Control Coordinator.</p> <p>Section 1.3 Changed Field Quality Manager to Document Control Coordinator.</p> <p>Section 2 Deleted last sentence of paragraph 1. Deleted Fisher brand stem type in paragraph 2.</p> <p>Section 3.1 Deleted “Normally” on the first sentence. Deleted the last sentence.</p> <p>Section 3.2 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>General Updated referenced procedures due to changes in title names and/or to reflect most recent version.</p> <p>Title Page 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>Section 1.3 Updated information to reflect that procedure is located on the H: drive of the LAN.</p> <p>Section 1.4 Alphabetized and revised the referencing style for consistency.</p> <p>Section 2 Added last paragraph regarding stopping measurements due to environmental conditions.</p>	<p>November 1, 2007</p>
<p>SESDPROC-102-R0, <i>Field Temperature Measurement</i>, Original Issue</p>	<p>February 05, 2007</p>

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1 General Information

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. Mention of trade names or commercial products does not constitute endorsement or recommendation for 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 SESD local area network (LAN). The Document Control Coordinator is responsible for ensuring the most recent version of the procedure is placed on the LAN 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. The field investigators will address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

2 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. Data Sonde thermistors will be verified on a monthly basis to ensure accuracy. These verification checks are documented in the instrument's tracking logbook.

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

3.1 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.

3.2 Instrument Verification

3.2.1 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.

3.2.2 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.

3.3 Inspections

All temperature measurement devices 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, 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.

3.5 Units

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

Conversion Formulas:

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