

**United States Department of Agriculture
Agricultural Marketing Service, Science & Technology
Microbiological Data Program**

SOP No: MDP-SAMP PROC 5		Page 1 of 8
Title: Infrared (IR) Thermometer Use		
Revision: 1	Replaces: : 09/01/01	Effective: 07/01/02

1. Purpose:

To provide standard procedures for the use of the infrared (IR) thermometer by all sample collectors participating in the USDA/AMS Microbiological Data Program (MDP).

2. Scope:

This standard operating procedure (SOP) shall be followed by all sample collectors during the sample collection process as required by MDP.

3. Principle:

The IR thermometer can be used to safely measure surface temperatures of hot, hazardous, or hard-to-reach objects without contact. The infrared thermometer measures the surface temperature of an object. The unit's optics sense emitted, reflected, and transmitted energy, which are collected and focused onto a detector. The unit's electronics translate the information into a temperature reading that is displayed on the unit. The laser is used for aiming purposes only.

4. Outline of Procedure:

- 6.1 Equipment and Materials
 - 6.2 Checking the Unit's Calibration/Calibration Test Procedure
 - a. Cold calibration check
 - b. Hot calibration check
 - c. Medium calibration check
 - 6.3 Measuring and Recording Temperature
 - a. Measuring Temperature
 - b. Recording Temperature
 - c. Field of view
 - 6.4 Reminders
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- 6.5 Maintenance
 - a. Lens cleaning
 - b. Cleaning the housing
- 6.6 Measuring Temperature

5. References:

- MDP LAB-OP-01; September 9, 2001.

6. Specific Procedures:

6.1 Equipment and Materials

MDP sample collectors will use a portable infrared thermometer to measure the external temperature of MDP commodities.

6.2 Checking the Unit's Calibration/Calibration Test Procedure

Sample collectors should check the unit's calibration on a quarterly basis to ensure the most accurate temperature measurement is obtained. The cold calibration method is more reliable because the cold water holds a more stable temperature. If the non-contact thermometer is not measuring surface temperature correctly, or if other difficulties are encountered, contact the company where the thermometer was purchased. The following procedures are merely used as guidelines for calibrating an infrared thermometer. Sample collectors should refer to instructions provided with their infrared thermometer to ensure accurate calibration.



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a. Cold calibration check

1. Fill a large polystyrene (e.g., Styrofoam) cup (10 oz or larger) halfway to the surface with crushed ice.
2. Add cold tap water to ½ to 1 inch below the rim of the cup. Tip: Two cups, one inside the other, will provide better insulation and more stable temperatures throughout the test.
3. Immerse the tip of an accurately calibrated contact probe thermometer, that has been calibrated to a National Institute of Standards (NIST) thermometer, into the water and vigorously stir the water's surface with the probe for one minute, or until contact probe temperature stabilizes.
4. When the probe temperature has stabilized, continue stirring the water, while taking simultaneous temperature measurements with the IR thermometer.
5. Hold the IR thermometer within 3 inches of the surface of the water for the most accurate measurement. Infrared temperature measurement should be within the manufacturers specifications (+/-) of the probe reading at 0°C (32°F).

b. Hot calibration check

Use the same procedure as cold calibration, substituting hot water.

1. Fill a large Styrofoam cup (10 oz or larger) up to ½ to 1 inch below the rim with hot water (>60°C/140°F). Hot tap water is adequate for the procedure.
 2. Repeat steps in 6.2.a.3-5. Important: The surface of the water must be agitated while taking the IR temperature measurement.
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3. Infrared measurement temperatures should be within the manufacturers specifications (+/-)of the probe reading.

4. Caution:

a. Hold the infrared thermometer outside the rim of the cup, away from the steam, at approximately 3 inches from the surface of the water.

b. Avoid steam condensation on the IR thermometer's lens. If this should happen, do not wipe the lens; let it dry at room temperature and resume measurement.

c. The hot verification should be used as a general check on the accuracy of the IR thermometer. Due to the varying emissivity of water and the evaporative cooling of the surface of the water, consider the IR thermometer to be accurately calibrated if the reading is within $\pm 2^{\circ}\text{C}$ ($\pm 3.5^{\circ}\text{F}$) of the probe reading.

c. Medium calibration check

Use the same procedure as cold calibration, substituting luke-warm water.

1. Fill a large Styrofoam cup (10 oz or larger) up to $\frac{1}{2}$ to 1 inch below the rim with lukewarm water ($15^{\circ}\text{C}/59^{\circ}\text{F}$). Tap water is adequate for the procedure.

2. Repeat steps in 6.2.a.3-5. Important: The surface of the water must be agitated while taking the IR temperature measurement.

3. Infrared temperature measurement should be within $\pm 2^{\circ}\text{C}$ ($\pm 3^{\circ}\text{F}$) of probe reading at @ -18 to $+23^{\circ}\text{C}$ (0 to 73°F)

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6.3 Temperature Measuring and Recording

a. Measuring Temperature

Sample collectors may measure the external temperature of the produce located in the same box or the container in which the sample was collected or by measuring the temperature of one of the sub-samples collected. Each individual sub-sample does not need to be measured for temperature. Sample collectors should carefully review the operating instructions provided with the infrared thermometer to determine the proper distance the thermometer should be held from the sample. If such instructions are not provided, the sample collector should contact vendor's customer service department for further instructions.

b. Recording Temperature

The external temperature must be recorded on the MDP SIF (MDP SAMP PROC 5) under the "Source Sample Identification" section. The external temperature may be recorded in either °C or °F.

c. Field of View

As the distance from the object increases, the spot size of the area measured by the unit becomes larger. The relationship between distance and spot size will depend on the model or brand that has been purchase. For example, the relationship between the distance the thermometer is held away from the sample and the spot size can range from 3:1 to 12:1 at the focus point. In general, most infrared thermometers may be held anywhere from 3" to 12" away from the sample.

1. Make sure that the target is larger than the unit's spot size. The smaller the target, the closer you should be to it.



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2. When accuracy is critical, make sure the target is at least twice as large as the spot size.

6.4 Reminders

- a. The unit cannot measure through transparent surfaces such as glass or plastic. It will measure the surface temperature of these materials instead. Therefore, if the sample is already bagged, open the bag and take the temperature through the opening.
- b. Steam, dust, smoke, or other particles can prevent accurate measurement by obstructing the unit's optics.

6.5 Maintenance

- a. Lens cleaning
 1. Blow off loose particles using clean compressed air.
 2. Gently brush remaining debris away with a camel's hair brush.
 3. Carefully wipe the surface with a moist cotton swab. The swab may be moistened with water. NOTE: DO NOT use solvents to clean the plastic lens.
- b. Cleaning the housing
 1. Use soap and water on a damp sponge or soft cloth. NOTE: DO NOT submerge the unit in water.

Note: > = Greater than

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- Spelling and grammatical changes.
- Update signature page position titles and office name and address
- Removed+/- 1° C (2°F) under section 6.6(a)(5) and replaced with manufacturers specifications.
- Removed+/- 2° C (3.5°F) under section 6.6(b)(3) and replaced with manufacturers specifications.

