NIST OFFICE OF WEIGHTS AND MEASURES

Examination Procedure Outlines (EPOs) for Retail Computing Scales

EPO 1

Retail Computing Scales

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NIST Examination Procedure Outline (EPO) for
Retail Computing Scales

1. Scope.

It is recommended this outline be followed as minimum criteria for examining electronic digital indicating and mechanical analog-indicating retail computing scales and prepackaging scales. Requirements that apply only to scales marked with an accuracy class are indicated with an asterisk (*). Nonretroactive requirements are followed by the applicable date in parentheses.

2. Safety Notes.

When excerpting this Examination Procedure Outline for duplication, the "Safety Considerations" section and the "Glossary of Safety Key Phrases" should be duplicated and included with the outline.

Safety policies and regulations vary among jurisdictions. It is essential that inspectors or servicepersons be aware of all safety regulations and policies in place at the inspection site and to practice their employer's safety policies. The safety reminders included in this EPO contain general guidelines useful in alerting inspectors and servicepersons to the importance of taking adequate precautions to avoid personal injury. These guidelines can only be effective in improving safety when coupled with training in hazard recognition and control.

Prior to beginning any inspection, the inspector should read and be familiar with the EPO Safety Annex - "Safety Considerations and Glossary of Safety Key Phrases." The terms and key phrases in each safety reminder of this outline are found in the glossary of the EPO Safety Annex. The inspector is reminded of the importance of evaluating potential safety hazards prior to an inspection and taking adequate precautions to avoid personal injury or damage to the device. As a minimum, the following safety precautions should be noted and followed during the inspection.

- **Electrical Hazards**
- **First Aid Kit**
- **Lifting**
- **Location**
- **Obstructions**
- **Personal Protection Equipment**
  - e.g., Safety Shoes
- **Safety Data Sheets (SDS)**
- **Support – for Scale and Test weights**
- **Transportation of Equipment**

Also:

- **Wet and Slick Conditions**
- **Chemicals**
- **Petroleum Products and**
- **Hazardous Materials**

SAFETY REMINDER!!!

- **Check the inspection site carefully for safety hazards and take appropriate precautions.**
- **Learn the nature of hazardous products used at or near the inspection site.**
- **Use personal protection equipment appropriate for the inspection site.**
- **Be sure a first aid kit is available and the kit is appropriate for the type of inspection activity.**

3. Inspection.

NOTE: Code references used throughout the document are drawn from NIST Handbook (HB) 44 General Code (Section 1.10) and Scales Code (Section 2.20). The relevant code section(s) is cited by its numerical designation and the applicable requirement(s) from that code section is identified by letter-number designation only. The code section and paragraph designation(s) are then shown immediately after the corresponding line item or task listed in the procedure. For example, NIST HB 44 General Code (Section 1.10) is designated as "1.10:" followed by the paragraph designation(s) relevant to the line item.

3.1. Accessibility and Assistance in Inspecting, Testing, and Sealing.

Device must be readily accessible for purposes of testing. Assistance shall be provided by the firm if needed.

Code Reference: 1.10: G-UR.2.3., G-UR.4.4.

3.2. Zero-Load Balance and Level Condition.

Check the zero-load balance and level conditions as found. If the device is not indicating a zero-balance and/or level condition, the user should be made aware of these requirements and a warning issued if necessary. For prepackaging scales, check to determine if tare is being taken.

Code Reference: 1.10: G-UR.3.1, 2.20: UR.4.1., UR.4.2.

3.2.1. Zero Indication.

3.2.1.1. Zero Indication – General.

- Indicate or record zero-balance condition. If indication is by other than a continuous digital zero, then an automatic means to inhibit weighing or to return to a continuous digital indication when in an out-of-balance condition.

  Code Reference: 2.20: S.1.1.(a), S.1.1.(c).

- Automatic-indicating scale or balance indicator shall indicate or record an out-of-balance condition on both sides of zero.

  Code Reference: 2.20: S.1.1.(b).

3.2.1.2. Zero Indication – Digital.

- Display of digital zero.

  Code Reference: 1.10: G-S.5.2.2.(d) (1/1/86).

- Digital zero representation of balance condition.

  Code Reference: 2.20: S.1.1.1.(a).

- Zero deviation after zero setting.
  Code Reference: 2.20: S.1.1.1.(b) (1/1/25).
- Digital center-of-zero indication.
  Code Reference: 2.20: S.1.1.1.(c) (1/1/93).

3.2.2. Zero-Load Adjustment.

3.2.2.1. General means.
Code Reference: 2.20: S.2.1.1.

3.2.2.2. Manual and semi-automatic zero-setting, direct sales.
Code Reference: 2.20: S.2.1.2.

3.2.2.3. Automatic zero-tracking (scales manufactured between 1/1/81 and 1/1/07).
Code Reference: 2.20: S.2.1.3.1.(a).

3.2.2.4. Automatic zero-tracking (scales manufactured on or after 1/1/07).
Code Reference: 2.20: S.2.1.3.2.(b).

3.2.2.5. Initial zero-setting mechanism (Class I, II, and III only).
Code Reference: 2.20: S.2.1.5.

- Complete scales.
  Code Reference: 2.20: S.2.1.5.(a).
- Scales with separable components.
  Code Reference: 2.20: S.2.1.5.(b) (1/1/09).

3.2.3. Combined zero-tare ("0/T") key for scales not used in direct sales.
Code Reference: 2.20: S.2.1.6.

3.2.4. Level-indicating means.
Code Reference: 2.20: S.2.4.

3.2.4.1. Level condition.
Code Reference: 2.20: UR.4.2.

3.3. Selection and Suitability.

3.3.1. Suitability, general.
Code Reference: 1.10: G-UR.1.1., G-UR.1.2., 2.20: UR.1.

3.3.2. Special designs.
Code Reference: 2.20: UR.3.6.

3.3.3. Adjustable components.
Code Reference: 2.20: S.1.10.

3.3.4. Electronic adjustable components.
Code Reference: 1.10: G-S.8. (1/1/90).

3.3.5. Design of weighing devices, Accuracy Class.
Code Reference: 2.20: S.5.*

3.3.5.1. Designation of Accuracy Class.
Code Reference: 2.20: S.5.1. (1/1/86), UR.1.1.

3.3.5.2. Parameters for Accuracy Class.
Code Reference: 2.20: S.5.2. (1/1/86).

3.3.6. Typical class for weighing applications.
Code Reference: 2.20: UR.1.1., Table 7a. & Table 7b.

3.3.7. Recommended minimum load.
Code Reference: 2.20: UR.3.1.

3.3.8. Maximum load.
Code Reference: 2.20: UR.3.2.

3.3.9. Drainage for weighing wet commodities not in watertight containers.
Code Reference: 2.20: UR.3.7.

3.3.10. Environment.

3.3.10.1. Suitable for the environment in which it is used.
Code Reference: 1.10: G-UR.1.2.

3.3.10.2. Protection from environmental factors.
Code Reference: 2.20: UR.2.3.

3.3.11. Permanence.
Code Reference: 1.10: G-S.3.

3.4. Installation.

3.4.1. In accordance with manufacturer's instructions.
Code Reference: 1.10: G-UR.2.1.

3.4.2. Indicating and recording elements.
Code Reference: 1.10: G-UR.2.2.

SAFETY REMINDER!!!

- **Check to be sure the scale supports are adequate to support the scale and test weights equal to the capacity of the scale!**

3.4.3. Foundation, supports, and clearance – Soundness of the scale's support structure and clearance of its parts from any impedance.

Code Reference: 2.20: UR.2.1., UR.2.2., UR.2.4.

3.4.4. Visibility of Identification – Installation to ensure ready visibility of markings.

Code Reference: 1.10: G-UR.2.1.1.

3.4.5. Position of equipment.

Code Reference: 1.10: G-UR.3.3.

3.4.5.1. Customer indications.

Code Reference: 2.20: S.1.8.4.

3.5. Use.

3.5.1. Facilitation of fraud.

Code Reference: 1.10: G-S.2.

3.5.2. Method of operation.

Code Reference: 1.10: G-UR.3.1.

3.5.3. Special designs.

Scales designed and marked for special applications shall not be used for other than the intended purpose.

Code Reference: 1.10: G-UR.3.1., 2.20: UR.3.6.

3.5.4. Operation with associated and nonassociated equipment.

Code Reference: 1.10: G-UR.3.2.

3.5.5. Recommended minimum load.

Code Reference: 2.20: UR.3.1.

3.5.6. Maximum load.

Code Reference: 2.20: UR.3.2.

3.6. Maintenance.

3.6.1. Maintenance of equipment, general.

Code Reference: 1.10: G-UR.4., G-UR.4.1.

3.6.2. Abnormal performance.

Code Reference: 1.10: G-UR.4.2.

3.6.3. Scale modification.

Code Reference: 2.20: UR.4.3.

3.6.4. Use of adjustments.

Code Reference: 1.10: G-UR.4.3.

3.6.5. Check for the presence security seals on any component designed to be sealed.
Code Reference: 1.10: G-UR.4.5.

3.7. Design of Weighing Device.

3.7.1. Designation of Accuracy Class.
Code Reference: 2.20: S.5.1. (1/1/86), UR.1.1.

3.7.2. Parameters for Accuracy Class.
Code Reference: 2.20: S.5.2. (1/1/86).

3.7.3. Multi-Interval and Multiple Range.
Code Reference: 2.20: S.5.3.

Relationship of the minimum load cell verification interval (v_{min}) to the value of the scale interval (e).
Code Reference: 2.20: S.5.4. (1/1/94).

Relationship of the verification scale interval (e) of a weighing/load-receiving element to the value of the scale division (d). Except for dynamic monorail scales and weight classifiers, the value of "e" must be equal to "d" on Class III, IIL, and IIII scales.
Code Reference: 2.20: S.1.2.2.2.

On a weight classifier such as a postal or shipping scale that rounds up and is marked for special use, the value of "e" shall be equal to or less than "d."
Code Reference: 2.20: S.1.2.2.2.2.

3.7.4. Extended display mode.
Code Reference: 2.20: S.1.2.2.3.

3.8. Markings.

3.8.1. Markings – Overview.

3.8.1.1. Identification.
Code Reference: 1.10: G-S.1., G-S.1.1. (1/1/04), G-S.1.2.

3.8.1.2. Size and character; designation and marking of subordinate values.
Code Reference: 1.10: G-S.5.2.3.

3.8.1.3. Values.
Code Reference: 1.10: G-S.5.2.4.

3.8.1.4. Permanence of markings.
Code Reference: 1.10: G-S.5.2.5.

3.8.1.5. Accuracy Class.
Code Reference: 2.20: S.5.

3.8.1.6. Location.

Code Reference: 2.20: S.6.2.

3.8.1.7. Specific Scales' Code markings.

Code Reference: 2.20: S.6.3., Table S.6.3.a. & Table S.6.3.b.

3.8.1.8. Special design.

Code Reference: 2.20: Table S.6.3.a. & Table S.6.3.b. (1/1/86), UR.3.6.

Scales designed for special application appropriately marked to restrict its use (e.g., postal scale, prepack scale, weight classifier).

Code Reference: Table S.6.3.b. Note 13 (Nonretroactive 1/1/86).

Except for Class I and II prescription scales which meet HB 44 requirements for counting features, scales with operational counting feature must be marked "counting feature not legal for trade" to show counting feature is not legal for trade.

Code Reference: Table S.6.3.b. Note 13 Retroactive.

3.8.2. Marking Requirements – All Devices.

3.8.2.1. General.

Code Reference: 2.20: S.6.

3.8.2.2. Identification.

Code Reference: 1.10: G-S.1.

3.8.2.2.1. Name, initials, or trademark of manufacturer or distributor.

Code Reference: 1.10: G-S.1.(a) Retroactive.

3.8.2.2.2. Model identifier.

Code Reference: 1.10: G-S.1.(b) Retroactive.

Model identifier prefix and acceptable abbreviation for "model" and "number."

Code Reference: 1.10: G-S.1.(b)(1) (1/1/03).

3.8.2.2.3. Nonrepetitive serial number.

Code Reference: 1.10: G-S.1.(c) (1/1/68).

Serial number prefix.

Code Reference: 1.10: G-S.1.(c)(1) (1/1/86).

Acceptable abbreviations for "serial" and "number."

Code Reference: 1.10: G-S.1.(c)(2) (1/1/01).

3.8.2.2.4. As of 2004 the current software version or revision identifier for not-built-for-purpose software-based devices and as of 2022 the current software version or revision identifier for all software-based devices.

Code Reference: 1.10: G-S.1.(d) (1/1/04), G-S.1.(d) (1/1/22).

Software version or identifier.

Code Reference: 1.10: G-S.1.(d).

(1) Preface identifying it as such.
Code Reference: 1.10: G-S.1.(d)(1)*i*. (1/1/07).

(2) Continuously displayed or accessible via display.
Code Reference: 1.10: G-S.1.(d)(1)*ii*. (1/1/22).

(3) Acceptable abbreviations for “version,” “number,” and “revision."
Code Reference: 1.10: G-S.1.(d)(2) (1/1/07).

3.8.2.2.5. NTEP CC number for devices with NTEP CC.

Code Reference: 1.10: G-S.1.(e) (1/1/03).

Preface by the terms “NTEP CC,” “CC,” or “Approval” followed by either the word or an acceptable abbreviation of “number.”
Code Reference: 1.10: G-S.1.(e) (1/1/03).

3.8.2.3. Location of marking information for not-built-for-purpose, software-based devices.
Code Reference: 1.10: G-S.1.1. (1/1/04).

3.8.2.4. Devices or main elements remanufactured as of January 1, 2002.
Code Reference: 1.10: G-S.1.2. (1/1/02).

Name, initials, or trademark of last remanufacturer or distributor.
Code Reference: 1.10: G-S.1.2.(a) (1/1/02).

Model designation if different from original model designation.
Code Reference: 1.10: G-S.1.2.(b) (1/1/02).

3.8.2.5. Operational controls, indications, and features.
Code Reference: 1.10: G-S.6. (1/1/77).

3.8.2.6. Lettering.
Code Reference: 1.10: G-S.7.

3.8.2.7. Visibility of identification – installation to ensure ready visibility of markings.
Code Reference: 1.10: G-UR.2.1.1.

3.8.2.8. Interchange or reversal of parts.
Code Reference: 1.10: G-S.4.

3.8.3. Marking Requirements – Weighing, load-receiving, and indicating element in same housing or covered on the same CC (in addition to marking requirements for all devices).
Code Reference: 2.20: S.6.3., Table S.6.3.a. and Table S.6.3.b.

3.8.3.1. Accuracy Class.
Code Reference: Table S.6.3.b. Note 17 (Nonretroactive 1/1/86).

3.8.3.2. Nominal capacity.
Code Reference: Table S.6.3.b. Note 3 Retroactive and Note 18 Retroactive.

Where the value of "e" is equal to the value of "d," the nominal capacity shall be shown together with the value of the scale division "d" or the verification scale interval "e."

Code Reference: 2.20: Table S.6.3.b. Note 3 (Nonretroactive 1/1/83).

For any scale that has no "d", the nominal capacity shall be shown together with the verification scale interval "e."

Code Reference: Table S.6.3.b. Note 4(a) (Nonretroactive 1/1/86).

For any scale where "e" does not equal "d," the nominal capacity shall be shown together with the value of the scale division "d" and the verification scale interval "e."

Code Reference: 2.20: Table S.6.3.b. Note 4(b) (Nonretroactive 1/1/86).

3.8.3.3. Temperature Limits.

Temperature limits if narrower than and within – 10 °C to 40 °C (14 °F to 104 °F).

Code Reference: 2.20: Table S.6.3.b. Note 5 (Nonretroactive 1/1/86).

3.8.4. Marking Requirements – Indicating element not permanently attached or covered on separate CC (in addition to marking for all devices).

Code Reference: 2.20: S.6.3., Table S.6.3.a. and Table S.6.3.b.

3.8.4.1. Accuracy Class.

Code Reference: 2.20: Table S.6.3.b. Note 8 (Nonretroactive 1/1/88).

3.8.4.2. Nominal Capacity.

Code Reference: 2.20: Table S.6.3.b. Note 3 Retroactive and Note 18 Retroactive.

Where the value of "e" is equal to the value of "d," the nominal capacity shall be shown together with the value of the scale division "d" or the verification scale interval "e."

Code Reference: 2.20: Table S.6.3.b. Note 3 (Nonretroactive 1/1/83).

For any scale that has no "d," the nominal capacity shall be shown together with the verification scale interval "e."

Code Reference: 2.20: Table S.6.3.b. Note 4(a) (Nonretroactive 1/1/86).

For any scale where "e" does not equal "d," the nominal capacity shall be shown together with the value of the scale division "d" and the verification scale interval "e."

Code Reference: 2.20: Table S.6.3.b. Note 4(b) (Nonretroactive 1/1/86).

3.8.4.3. Temperature limits if narrower than and within – 10 °C to 40 °C (14 °F to 104 °F).

Code Reference: 2.20: Table S.6.3.b. Note 5 (Nonretroactive 1/1/86).

3.8.4.4. Maximum number of verification scale intervals (n_{max}).

Code Reference: 2.20: Table S.6.3.b. Note 6 (Nonretroactive 1/1/88).

3.8.5. Marking Requirements – Weighing and load-receiving element not permanently attached or covered on separate CC (in addition to marking for all devices).

Code Reference: 2.20: S.6.3., Table S.6.3.a. and Table S.6.3.b.

3.8.5.1. Accuracy Class.

Code Reference: 2.20: Table S.6.3.b. Note 19 (Nonretroactive 1/1/88).

3.8.5.2. Nominal capacity.
Code Reference: 2.20: Table S.6.3.b. Note 3 Retroactive and Note 18 Retroactive.

3.8.5.3. Temperature limits if narrower than and within – 10 °C to 40 °C (14 °F to 104 °F).
Code Reference: 2.20: Table S.6.3.b. Note 5 (Nonretroactive 1/1/86).

3.8.5.4. Maximum number of verification scale intervals (n_{max}).
Code Reference: 2.20: Table S.6.3.b. Note 19 (Nonretroactive 1/1/88).

3.8.5.5. Minimum verification scale division for which device complies with the requirements (e_{min} or d).
Code Reference: 2.20: Table S.6.3.b. Note 19 (Nonretroactive 1/1/88).

3.8.6. Marking Requirements – Load cell with Certificate of Conformance (in addition to marking for all devices).
Code Reference: 2.20: S.6.3., S.5.4. (1/1/94).

Note: Requires information on a data plate attached to the load cell or in an accompanying document. If a document is provided, the serial number shall appear on the load cell and in the document.
Code Reference: 2.20: Table S.6.3.b. Note 11 (Nonretroactive 1/1/88).

3.8.6.1. G-S.1. information, including the following shall be marked on both the load cell and in accompanying documents.
Code Reference: 2.20: Table S.6.3.b. Note 11 (Nonretroactive 1/1/91).

- Manufacturer's name or trademark.
- Model designation.
- Model designation prefix.
  Code Reference: 1.10: G-S.1.(b) (Nonretroactive 1/1/03).
- Serial number.
  Code Reference: 1.10: G-S.1.(c) (Nonretroactive 1/1/68).
- Serial number prefix.
  Code Reference: 1.10: G-S.1.(c)(1) (Nonretroactive 1/1/86).
- Abbreviation for word "serial."
  Code Reference: 1.10: G-S.1.(c)(2) (Nonretroactive 1/1/01).

3.8.6.2. Accuracy Class.
Code Reference: 2.20: Table S.6.3.b. Note 17 (Nonretroactive 1/1/86).

3.8.6.3. Temperature limits if narrower than and within – 10 °C to 40 °C (14 °F to 104 °F).
Code Reference: 2.20: Table S.6.3.b. Note 5 (Nonretroactive 1/1/86).

3.8.6.4. Maximum number of verification scale intervals (n_{max}).
Code Reference: 2.20: Table S.6.3.b. Note 6 (Nonretroactive 1/1/88).

3.8.6.5. "S" or "M" for single or multiple cell applications.
Code Reference: 2.20: Table S.6.3.b. Note 7 (Nonretroactive 1/1/88).

3.8.6.6. Direction of loading, if not obvious.
Code Reference: 2.20: Table S.6.3.b. Note 15 (Nonretroactive 1/1/88).

3.8.6.7. Minimum dead load, maximum capacity, and safe load limit.
Code Reference: 2.20: Table S.6.3.a. and Table S.6.3.b. Note 11 (Nonretroactive 1/1/88).

3.8.6.8. Load cell verification interval (v_{min}) stated in mass units.
Code Reference: 2.20: Table S.6.3.b. Note 21 (Nonretroactive 1/1/01).

3.9. Indicating and Recording Elements.

3.9.1. Appropriateness of design.

3.9.1.1. Accuracy Class.
Code Reference: 2.20: S.5.

3.9.1.2. Computing capability (for price-computing scales).
Code Reference: 2.20: S.1.8.

3.9.1.3. Indicating and recording elements, general design.
Code Reference: 1.10: G-S.5.1

3.9.1.4. Capacity indication, weight ranges, and unit weights.
Code Reference: 2.20: S.1.7.

3.9.1.5. Maximum range of initial zero-setting mechanism.

- Complete scales.
  Code Reference: 2.20: S.2.1.5.(a).
- Scales with separable components.
  Code Reference: 2.20: S.2.1.5.(b) (1/1/09).

3.9.1.6. Recommended minimum load.
Code Reference: 2.20: UR.3.1.

3.9.1.7. Maximum load.
Code Reference: 2.20: UR.3.2.

3.9.2. Display Height. For electronic cash registers (ECRs) and point-of-sale systems (POS systems) the display of measurement units, including those part of video displays and other user-provided indicating elements shall be a minimum of 9.5 mm (3/8 inch) in height.
Code Reference: 2.20: S.1.1.1.(d) (1/1/21), UR.2.10 (1/1/21).

3.9.3. Value of scale division and/or interval.

3.9.3.1. Value – General.
Code Reference: 1.10: G-S.5.3., G-S.5.3.1., 2.20: UR.1.1.(b).

3.9.3.2. Value of scale units.
Code Reference: 2.20: S.1.2.* (1/1/86).

3.9.3.3. Digital indicating scales, units.
Code Reference: 2.20: S.1.2.1. (1/1/89).

3.9.3.4. Class I and II scales, auxiliary indications and the value of the verification scale interval (e), general.
Code Reference: 2.20: S.1.2.2.1.*

3.9.3.5. Except for dynamic monorail scales and weight classifiers, the value of "e" must be equal to "d" on Class III, III L, and IIII scales.
Code Reference: 2.20: S.1.2.2.2.*

3.9.3.6. On a weight classifier such as a postal or shipping scale that rounds up and is marked for special use, the value of "e" shall be equal to or less than "d."
Code Reference: 2.20: S.1.2.2.2.2.*

3.9.3.7. Extended display mode.
Code Reference: 2.20: S.1.2.2.3.*

3.9.3.8. Recorded scale division shall be the same as the value of indicated division, except for Class I scales.
Code Reference: 2.20: UR.1.3. (1/1/86), UR.1.3.1.(a).

3.9.3.9. Multi-interval and multiple-range scales.
Code Reference: 2.20: S.5.3.

3.9.3.10. Prepackaging scales only.
Code Reference: 2.20: S.1.9.

3.9.4. Graduations.
Code Reference: 2.20: S.1.3.

3.9.5. Indicators.
Code Reference: 2.20: S.1.4.

3.9.6. Price Computing.

3.9.6.1. Money value graduations.
Code Reference: 2.20: S.1.8.1., S.1.8.2.

3.9.6.2. Money value computations.
Code Reference: 2.20: S.1.8.3.

3.9.6.3. Recorded representations, point-of-sale systems.
Code Reference: 2.20: S.1.8.5.

3.9.6.4. Money values, mathematical agreement.
Verify that the sales information recorded by cash registers interfaced with a weighing element shall contain the following for items weighed in a checkout stand and that all descriptors are appropriate:

- Net weight;
- Unit price;
- Total price;
- Product class, name, or code number; and
- Tare weight (1/1/25).

Code Reference: 1.10: G-S.5.5.

3.9.6.5. Customer indications, computing scales.
Code Reference: 2.20: S.1.8.4., S.1.8.4.1. (1/1/01).

3.9.7. Prepackaging scales only.
Code Reference: 2.20: S.1.9.1.

3.9.8. Tare.

3.9.8.1. Value of tare division.
Code Reference: 2.20: S.2.3. (1/1/83).

3.9.8.2. Tare mechanism.
Code Reference: 2.20: S.2.3.

3.9.8.3. Combined zero-tare ("0/T") key.
Code Reference: 2.20: S.2.1.6.

3.9.9. Repeatability.
Code Reference: 1.10: G-S.5.4.

3.9.10. Recorded representations.

3.9.10.1. Recorded representations, general.
Code Reference: 1.10: G-S.5.6., 2.20: UR.1.3. (1/1/86).

3.9.10.2. Recorded representations, prepackaging scales.
Code Reference: 2.20: S.1.9.2.

3.9.10.3. Indicated and recorded representation, abbreviations of units.
Code Reference: 1.10: G-S.5.6.1.

- Equipment manufactured on or after January 1, 2008.
  Code Reference: 1.10: G-S.5.6.1.(a).

- Equipment manufactured prior to January 1, 2008.
  Code Reference: 1.10: G-S.5.6.1.(b).

3.9.11. Damping means.
Code Reference: 2.20: S.2.5.

3.9.11.1. Motion detection, digital indicating elements.
Code Reference: 2.20: S.2.5.1.(b).

3.9.12. Adjustable components.
Code Reference: 2.20: S.1.10.

3.9.13. Manual weight entries.
Code Reference: 2.20: S.1.12. (1/1/93 & 1/1/05), UR.3.10.

3.10. Weighing Elements.

3.10.1. Antifriction means.
Code Reference: 2.20: S.4.1.

3.10.2. Adjustable components.
Code Reference: 2.20: S.1.10., S.4.2.

3.10.3. Multiple load-receiving elements.
Code Reference: 2.20: S.4.3.

3.10.4. Drainage, if wet commodities are weighed.
Code Reference: 2.20: S.3.2., UR.3.7.

3.10.5. Scoop counterbalance.
Code Reference: 2.20: S.3.3.

3.11. Provision for Sealing.

3.11.1. Sealing, General.
A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.
Code Reference: 1.10: G-S.8. (1/1/90).

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.
Code Reference: 1.10: G-S.8., 2.20: S.1.11.2.

Except for devices and systems adjusted using a removable digital storage device and Class I scales, the following provisions for sealing apply:
Code Reference: 2.20: S.1.11.2.

Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of an electronic device.

Code Reference: 2.20: S.1.11.2.(a) (1/1/79).

A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.

Code Reference: 2.20: S.1.11.2.(b) (1/1/90).

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.

Code Reference: 2.20: S.1.11.2.

Audit trails shall use the format set forth in Table S.1.11. Categories of Device and Methods of Sealing.

Code Reference: 2.20: S.1.11.2 (c) (1/1/95), Table S.1.11. (1/1/95).

3.11.2. A metrologically-significant software change is a sealable event.

Code Reference: 1.10: G-S.9.

3.11.3. Weight Classifier Option. Scales with option to function as a weight classifier or a normal round off scale shall be provided with a sealable means for selecting the mode and a clear annunciator adjacent to the display indicating the weight classifier mode.

Code Reference: 2.20: S.1.8.4.1. (1/1/01).

3.11.4. Physical Means of Security.

3.11.4.1. Security Seals. Check for the presence of security seals on the device. A security seal shall be affixed to any adjustment mechanism designed to be sealed. Document missing seals on the official report and apply new ones as needed.

Code Reference: 1.10: G-UR.4.5.

3.11.4.2. Accessibility to Security Seals. When applicable, the adjusting mechanism shall be readily accessible for the purpose of affixing a security seal. The device shall be installed or located such that access is provided to permit inspecting and applying security seals.

Code Reference: 1.10: G-UR.2.3.

3.11.5. Parameters Accessed Via Removable Digital Storage.

For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device**, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided for those parameters using either:

(1) an event logger in the device; or

(2) a physical seal that must be broken in order to remove the digital storage device from the device (or system).

** This applies only to removable digital storage devices that must remain in the device or system for it to be operational.

Code Reference: 1.10: G-S.8.2., 2.20: S.1.11., Table S.1.11. (1/1/95).

3.11.6. Audit Trails, General.

3.11.6.1. Audit Trail Information. If the system is equipped with an audit trail, note the event counter settings on the report form for future reference. If equipped with an event logger, print a copy of the event log and attach it to the report form for future reference. Note that on some systems an electronic copy of the event log may also be available; however, the system must still be able to provide a hard copy. Examine these records for any signs of misuse of adjustments.

Code Reference: 1.10: G-S.8. (1/1/90), 2.20: S.1.11.1., S.1.11.2.(c) (1/1/95), Table S.1.11. (1/1/95).

3.11.6.2. Single Provision for Sealing Multiple Elements. For multiple measuring elements with a single provision for sealing, a change to the adjustment of any measuring element must be individually identified.

Code Reference: 1.10: G-S.8.1. (1/1/10).

3.11.7. Event Logger.

If security is provided using an event logger, the event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter.

The event logger information must be available on demand through the device or through another on-site device at the time of inspection.

In addition to providing a printed copy of the information, the information may be made available electronically.

The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

Code Reference: 1.10: G-S.8. (1/1/90), 2.20: S.1.11., Table S.1.11. (1/1/95).

4. Pretest Determinations.

NOTE: Code references used throughout the document are drawn from NIST HB 44 General Code (Section 1.10) and Scales Code (Section 2.20). The relevant code section(s) is cited by its numerical designation and the applicable requirement(s) from that code section is identified by letter-number designation only. The code section and paragraph designation(s) are then shown immediately after the corresponding line item or task listed in the procedure. For example, NIST HB 44 General Code (Section 1.10) is designated as "1.10:" followed by the paragraph designation(s) relevant to the line item.

4.1. Tolerances – General.

4.1.1. Acceptance/Maintenance Tolerances.

Code Reference: 1.10: G-T.1., G-T.2.

4.1.2. Application.

Code Reference: 1.10: G-T.3., 2.20: T.N.2.1., T.N.2.3., T.N.2.4.

4.1.3. Intermediate Values.

Code Reference: 1.10: G-T.4.

4.2. Tolerance Values

4.2.1. Determine the number of verification scale intervals (n) using the following formula:

$$n = \frac{Scale\ capacity}{Value\ of\ the\ verification\ Scale\ Interval\ (e)}$$

4.2.2. Tolerance Associated with the Standard.

4.2.2.1. Tolerance on Tests When Type 2 Transfer Standards Are Used.

Code Reference: 1.10: G-T.5.

When Type 2 transfer standards are used to conduct accuracy tests, adjust the tolerances as described in General Code paragraph G-T.5. Tolerances on Tests When Type 2 Transfer Standards Are Used.

4.2.3. Unmarked Scales – Tolerance Values.

4.2.3.1. Unmarked Scales – All.

Code Reference: 2.20: T.1.1., Table T.1.1., T.1.2., Table 5.

- Multiple indicating or recording elements.

  Code Reference: 2.20: T.N.4.1.
- Single indicating or recording elements.

  Code Reference: 2.20: T.N.4.2.
- Single indicating element, multiple indications.

  Code Reference: 2.20: T.N.4.3.
- Repeatability.

  Code Reference: 2.20: T.N.5.
- Discrimination.

  Code Reference: 2.20: T.N.7.2., N.1.5. (1/1/86), N.1.5.1.
- Operating temperature.

  Code Reference: 2.20: T.N.8.1.4. (Nonretroactive 1/1/81).
- Radio frequency interference and other interferences.

  Code Reference: 2.20: T.N.9.

4.2.3.2. Unmarked Scales With "n" Equal to 5000 or Less.

Code Reference: 2.20: T.1.1.

- Tolerance application.

  Code Reference: 2.20: T.N.2.
- General tolerances.

  Code Reference: 2.20: T.N.2.1.
- Subsequent verification examinations.

  Code Reference: 2.20: T.N.2.3.

- Multiple-range and multi-interval scales.

  Code Reference: 2.20: T.N.2.4.
- Ratio tests (scales equipped with commercial weights).

  Code Reference: 2.20: T.N.2.5.
- Tolerance values.

  Code Reference: 2.20: T.N.3., T.N.3.1. Table 6, T.N.3.2.

4.2.3.3. Unmarked Scales With "n" Greater Than 5000.

Code Reference: 2.20: Table T.1.1.

- Tolerances – general.

  Code Reference: 2.20: T.1., Table T.1.1.
- Ratio tests (scales equipped with commercial weights).

  Code Reference: 2.20: T.N.2.5.

4.2.3.4. Unmarked Postal & Parcel Post Scales – Tolerance Values.

Code Reference: 2.20: T.1.1., Table T.1.1., T.1.2., Table 5.

4.2.4. Marked Scales – Tolerance Values.

4.2.4.1. Scales marked with an accuracy class designation, design.

Code Reference: 2.20: T.N.1.1.

- Accuracy Classes.

  Code Reference: 2.20: T.N.1.2.
- Verification scale interval.

  Code Reference: 2.20: T.N.1.3.
- General tolerances.

  Code Reference: 2.20: T.N.2.1.
- Subsequent verification examinations.

  Code Reference: 2.20: T.N.2.3.
- Multiple-range and multi-interval scales.

  Code Reference: 2.20: T.N.2.4.
- Ratio tests (scales equipped with commercial weights).

  Code Reference: 2.20: T.N.2.5.
- Maintenance tolerance values.

  Code Reference: 2.20: T.N.3.1. [Table 6].
- Acceptance tolerance values.

  Code Reference: 2.20: T.N.3.2.
- Multiple indicating or recording elements.

  Code Reference: 2.20: T.N.4.1.

- Single indicating or recording elements.

  Code Reference: 2.20: T.N.4.2.
- Single indicating element, multiple indications.

  Code Reference: 2.20: T.N.4.3.
- Shift or section test (agreement of indications).

  Code Reference: 2.20: T.N.4.4.
- Repeatability.

  Code Reference: 2.20: T.N.5.
- Discrimination.

  Code Reference: 2.20: T.N.7.1., T.N.7.2., N.1.5. (1/1/86), N.1.5.1.
- Operating temperature.

  Code Reference: 2.20: T.N.8.1.4.
- Radio frequency interference and other interferences.

  Code Reference: 2.20: T.N.9.

4.3. Accuracy of Field Standards.
Code Reference: 2.20: N.2.

4.4. Minimum Test Weights and Test Loads.
Code Reference: 2.20: N.3., Table 4.

5. Test Notes.

NOTE: Code references used throughout the document are drawn from NIST Handbook 44 (HB 44) General Code (Section 1.10) and Scales Code (Section 2.20). The relevant code section(s) is cited by its numerical designation and the applicable requirement(s) from that code section is identified by letter-number designation only. The code section and paragraph designation(s) are then shown immediately after the corresponding line item or task listed in the procedure. For example, NIST Handbook 44 (HB 44) General Code (Section 1.10) is designated as "1.10:" followed by the paragraph designation(s) relevant to the line item.

5.1. Test Methods. Permissible test methods for verifying compliance of commercial weighing and measuring systems with the provisions of NIST Handbook 44 include, but are not limited to, test methods and apparatus that have been approved by the Director as outlined in HB 44 Appendix A – Fundamental Considerations.
Code Reference: 1.10: G-N.3., Appendix A – Fundamental Considerations.

5.2. Zero-Load Balance and Level Condition. Check for maintenance of the zero-load balance and level condition. Establish a correct zero-load balance and level condition prior to beginning the test.
Code Reference: 2.20: UR.4.1., UR.4.2.

5.3. Repeatability. Check repeatability of indications throughout the test.

5.3.1. Repeatability of indications.
Code Reference: 1.10: G-S.5.4., 2.20: T.N.5.

5.4. Agreement of Indications. Check for agreement of indications throughout the test.
Code Reference: 1.10: G-S.5.2.2., 2.20: T.N.4.

5.4.1. Multiple digital indications and representations.
Code Reference: 2.20: T.N.4.1.

5.4.2. Single indicating/recording element with component parts.
Code Reference: 2.20: T.N.4.2.

5.4.3. Single indicating element, multiple indications.
Code Reference: 2.20: T.N.4.3.

5.5. Return to Zero-Load Balance. Recheck the zero-load balance each time the test load is removed.

5.5.1. Zero-load balance change.
Code Reference: 2.20: N.1.9.

5.5.2. Abnormal performance.
Code Reference: 1.10: G-UR.4.2.

5.6. Recorded Representations.

5.6.1. Availability of Recorded Representation. Verify that any options available for obtaining a recorded representation are appropriate. For systems specifically required by a section of the Scales Code to issue a recorded representation, the recorded representation shall be made available to the customer in hard copy form unless otherwise specified by the customer. The customer may be given the option of not receiving the recorded representation. If the system is equipped with the capability of issuing an electronic receipt, the customer may also be given the option of receiving the recorded representation electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy.
Code Reference: 1.10: G-S.5.6.

5.7. Steps After Each Test Load – Recorded Representations. If the scale is equipped with a printer, print a ticket or label at each test load. Verify the following:

5.7.1. Digital Indication and Representations, Agreement and Display. Check that any recorded representations for weight, unit price, and total sale agree with their associated corresponding values that are displayed and are appropriately displayed.
Code Reference: 1.10: G-S.5.2.2., G-S.5.6., 2.20: S.1.8.3.

5.7.2. Motion Detection. Check the effectiveness of motion detection.
Code Reference: 2.20: S.2.5.1.(b).

5.7.3. Value of the Indicated and Recorded Scale Division. Verify that the value of the scale division as recorded on the recorded representation is the same as the division value indicated.
Code Reference: 2.20: UR.1.3. (1/1/86).

5.8. Steps After Each Test Load – Price Computations and Display.

5.8.1. Money-value, Mathematical Agreement. Verify price calculations based on weight are rounded to the nearest cent.

Code Reference: 1.10: G-S.5.5.

5.8.2. Price Computations. Check price computations on all indicators in the system and on any recorded representation.

Code Reference: 1.10: G-S.5.5., G-S.5.6.

5.9. Zone of Uncertainty and Width of Zero, Electronic Scales Only. If, during the conduct of the test, the performance of the device is questionable with respect to the zone of uncertainty or the width of zero (see test procedure below), adequate tests should be conducted to determine compliance

Code Reference: 2.20: N.1.5. (1/1/86), N.1.5.1., S.1.1.1.(a), S.1.1.1.(b) (1/1/25), S.1.1.1.(c) (1/1/93).

5.10. Other Operational Features, Electronic Scales Only. If the device is equipped with operational features such as programmable tare and/or unit prices, multiplier keys, sales accumulation, manual weight entries, price retention, two scales with one printer, etc., check proper operation and appropriateness.

Code Reference: 1.10: G-UR.4.1., G-UR.4.2., 2.20: S.4.3., S.1.12. (1/1/93 and 1/1/05), UR.3.10.

5.11. Class I and Class II Scales.

Class I and Class II scales shall be equipped with an appropriate means for arresting the oscillation of the mechanism.

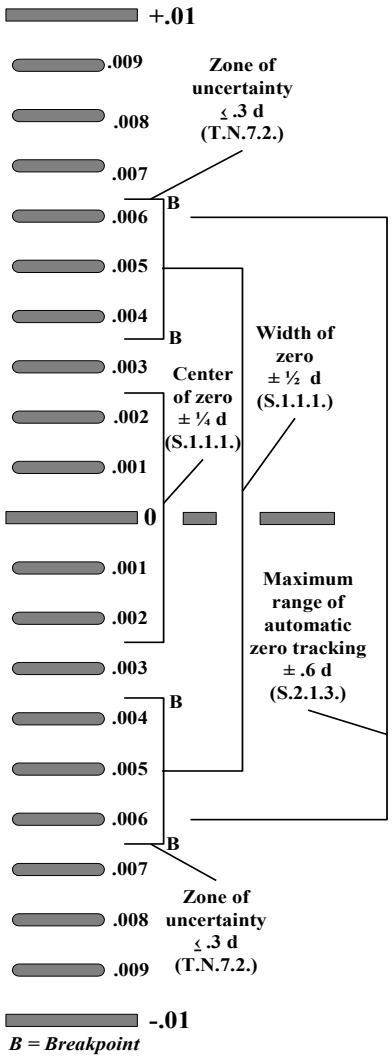
Code Reference: 2.20: S.2.5.2.

Class I and Class II scales with a counting feature shall indicate to the operator when the piece weight computation is complete by a stable display of the quantity placed on the load-receiving element.

Code Reference: 2.20: S.2.5.3.

6. Test.

NOTE: Code references used throughout the document are drawn from NIST HB 44 General Code (Section 1.10) and Scales Code (Section 2.20). The relevant code section(s) is cited by its numerical designation and the applicable requirement(s) from that code section is identified by letter-number designation only. The code section and paragraph designation(s) are then shown immediately after the corresponding line item or task listed in the procedure. For example, NIST HB 44 General Code (Section 1.10) is designated as "1.10:" followed by the paragraph designation(s) relevant to the line item.



This example of Automatic Zero-Tracking and the Width of Zero test is based on a scale division of 0.01 lb. The principles used in this example can also be used to test scales with other division sizes, including scales indicating in metric units.

Automatic Zero-Tracking Test:

Test action	Required Indication
a. Zero scale	0.00 lb
b. Apply 0.007 lb	+ 0.01 lb
(Repeat three times. Three failures will result in scale rejection.)	
c. Zero scale	0.00 lb
d. Apply 0.007 lb	+ 0.01 lb
e. Zero Scale	0.00 lb
f. Remove 0.007 lb	− 0.01 lb or a below zero indication

(Repeat three times. Three successive failures will result in scale rejection. If scale passes go to the next test.)

Width of Zero test:

Test action	Required Indication
a. Zero scale	0.00 lb
b. Apply 0.007 lb	+ 0.01 lb
c. Zero scale	0.00 lb
d. Remove 0.007 lb	− 0.01 lb or a below zero indication.
e. Apply 0.015 lb	+ 0.01 lb stable

(Three successive failures will result in rejection.)

Note: The Width of Zero test is predecessor to the test for discrimination and may be performed on scales manufactured prior to 1986. For scales manufactured on or after 1/1/86, the test for discrimination applies.

Important: Apply or remove the test weights all at once in both tests. Use forceps if necessary.

6.1. Test for Electronic Scales.

6.1.1. Discrimination Test, At or Near Zero. Except for Class I or II scales in which e = d and is less than 5 mg, if environmental conditions can be controlled, conduct a Discrimination Test at or near zero load.

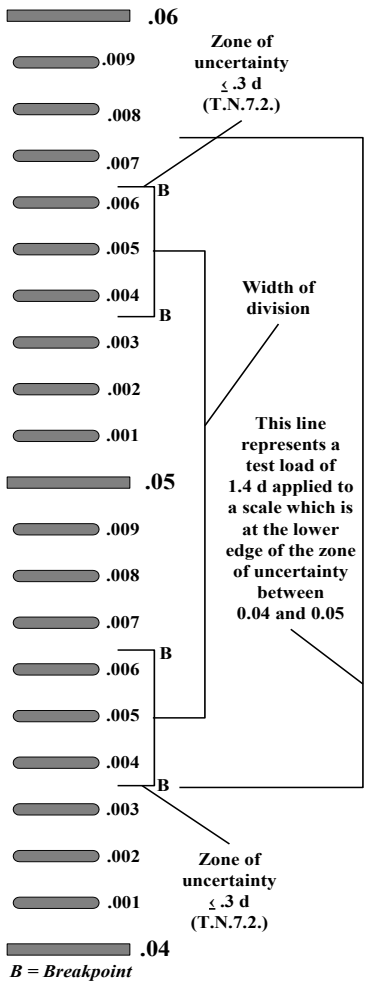
Code Reference: 2.20: N.1.5. (1/1/86), N.1.5.1.

A test load equivalent to 1.4 d shall cause a change in the indicated or recorded value of at least 2.0 d.

Code Reference: 2.20: T.N.7.2.

SAFETY REMINDER!!!

- **Wear Safety Shoes!**
- **Use Proper Lifting Techniques!**



This example of a Discrimination Test at or near zero load is based on a scale division (d) of 0.01 lb. The principles used in this example can also be used to test scales with other division sizes, including scales indicating in metric units.

a. With the device at zero, place decimal weights on scale equal to 1 d.

b. Zero the scale and place a test load equal to 5 d on the load receiving element.

c. Remove the decimal weights in 0.1 d increments until the indication flickers between 0.04 lb and 0.05 lb. If the indication does not flicker but indicates a steady 0.04 lb, add 0.1 d. If the scale indicates 0.05 lb, it is at the breakpoint in the zone of uncertainty. (Remove the 0.1 d if it was used to verify the breakpoint.)

d. Add a test load equal to 1.4 d to the scale (0.014 lb)

e. The indication should read a steady 0.06 lb.

f. If the scale passes this test at a load near zero, a Discrimination Test should be performed near the maximum test load.

6.1.2. Increasing-Load Test.[1] (with the test load approximately centered) place the following minimum test loads (20 d) on the load-receiving element of the scale:

For scales indicating in metric units:

- Place a load of 100 g; then add test loads in increments of 500 g to a total load of 2.5 kg; at 500 g to 2.5 kg intervals thereafter up to an amount equal to the shift-test load (i.e., a test-weight load equal to at least 30 % of scale capacity, but not to exceed 35 % of scale capacity).

[1] For scales that are not marked with an accuracy classification and have less than 1000 verification scale intervals (n), use the following procedure: begin test at 20 d; then test at 0.50 lb and at each pound thereafter to capacity, including test loads at ¼, ½, and ¾ capacity.

- Include test points equal to 500 d, 2000 d, and 4000 d.

  Code Reference: 2.20: N.1.1.

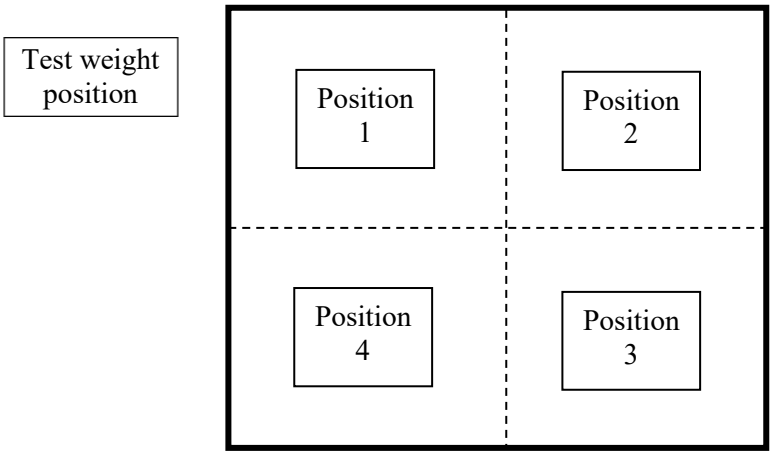
For other scales:

- Place a load of 0.50 lb; then add test loads in pound increments to a total load of 5 lb; at 1 lb, 2 lb, or 5 lb intervals thereafter to an amount equal to the shift test load (i.e., a test-weight load equal to at least 30 % of scale capacity, but to exceed 35 % of scale capacity).
- Include test points equal to 500 d, 2000 d, and 4000 d.

  Code Reference: 2.20: N.1.1.

6.1.3. Shift Test. Conduct a shift test using test weights equal to no less than 30 % of scale capacity, but not to exceed 35 % of scale capacity.

Code Reference: 2.20: N.1.3.7.(a).



Shift Test Positions – Electronic Scales

6.1.4. Increasing-Load Test. – Continue increasing-load test.

6.1.4.1. For scales indicating in metric units – at 2.5 kg intervals to capacity.

6.1.4.2. For other scales – at 5 lb intervals to capacity.

6.1.5. Radio Frequency Interference (RFI)/Electromagnetic Interference (EMI).

Conduct test at or near capacity when RFI/EMI transmission sources are present or if a problem is suspected.

Code Reference: 1.10: G-N.2., G-UR.1.2., G UR.3.2., G-UR.4.2., 2.20: N.1.6., T.N.9.

6.1.6. Over-Capacity Indication. Test for over-capacity indication.

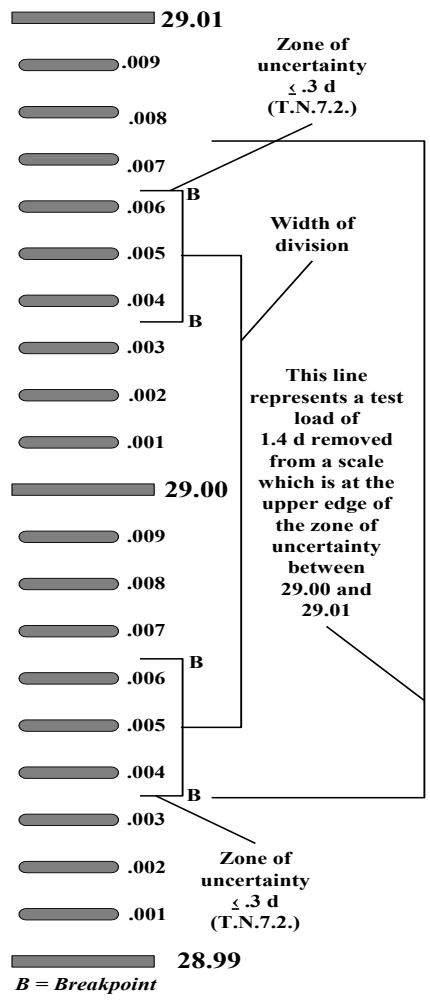
Code Reference: 2.20: S.1.7.(a), S.1.7.(b) (1/1/93)

6.1.7. Discrimination Test, Maximum Capacity. Except for Class I or II scales in which e = d and is less than 5 mg, if environmental conditions can be controlled, conduct a Discrimination Test at maximum capacity.

Code Reference: 2.20: N.1.5. (1/1/86), N.1.5.1.

A test load equivalent to 1.4 d shall cause a change in the indicated or recorded value of at least 2.0 d.

Code Reference: 2.20: T.N.7.2.



This example of a Discrimination Test near capacity is based on a scale division (d) of 0.01 lb at a test load of 29.00 lb. The principles used in this example can also be used to test scales with other division sizes and capacities, including scales indicating in metric units.

a. With the scale at zero, add decimal weights equal to 1.4 d and zero the device.

b. Add test weights to make the scale indicate a weight value near capacity (e.g., 29.00 lb).

c. With the scale stable, add decimal weights in 0.1 d increments until the indication flickers between 29.00 lb and 29.01 lb. If the indication shows a steady 29.01 lb, remove 0.1 d. If the scale indicates 29.00 lb it is at the breakpoint in the zone of uncertainty. (Replace the 0.1 d if it was used to verify the breakpoint.)

d. Remove the 1.4 d test load (0.014 lb).

e. The scale should indicate a steady 28.99 lb.

f. If the test passes this test at a load near the maximum capacity, a Discrimination Test should be performed near zero.

6.1.8. Decreasing-Load Test.

The decreasing-load test shall be conducted with the test load approximately centered on the load-receiving element.

Code Reference: 2.20: N.1.2.

6.1.8.1. Test Loads for Scales Marked with an Accuracy Class Designation and Having 1000 or More Verification Scale Intervals (n).

The decreasing-load test shall be conducted with test loads equal to the maximum test load at each tolerance value. For example, on a Class III scale, at test loads equal to 4000 d, 2000 d, and 500 d; for all other scales, the test load shall be equal to one-half of the maximum load applied in the increasing-load test.

Code Reference: 2.20: N.1.2.1.*

6.1.8.2. Test Load for All Other Scales.

The decreasing-load test shall be conducted with a test load equal to one-half of the maximum load applied in the increasing-load test.

Code Reference: 2.20: N.1.2.2.

6.1.9. Zero-Load Balance Change. Remove the test load and verify the zero-load balance does not change by more than the minimum applicable tolerance.

Code Reference: 2.20: N.1.9., G-UR.4.2.

6.1.10. Automatic Zero-Tracking Mechanism. Test for proper design of automatic zero-tracking mechanism, if the scale is so equipped.

Code Reference: 2.20: S.2.1.3.1.(a) or S.2.1.3.2.(b).

Under normal operating conditions the maximum load that can be "rezeroed" when placed on or removed from the platform all at once, shall be 0.6 scale division for scales manufactured between January 1, 1981 and January 1, 2007, and 0.5 scale division for scales manufactured after January 1, 2007.

6.1.11. Tare Clearing. Check proper design of tare auto-clear, if scale is so equipped.

Code Reference: 2.20: S.2.3. (1/1/83).

6.1.12. Semi-Automatic Zero-Tracking Mechanism. If scale is equipped with a semi-automatic zero-tracking mechanism, test effectiveness of motion detection.

Code Reference: 2.20: S.2.1.2.(b).

6.2. Test for Mechanical Scales.

SAFETY REMINDER!!!

- **Wear Safety Shoes!**
- **Use Proper Lifting Techniques!**

6.2.1. Zero-Load Balance and Level Condition. Check for maintenance of the zero-load balance and level condition. Establish correct zero-load balance and level conditions prior to beginning the test.

Code Reference: 2.20: N.1.9., UR.4.1., UR.4.2.

6.2.2. Discrimination Test, At or Near Zero Load (Automatic Indicating Scales). Except for Class I or II scales in which e = d and is less than 5 mg, if environmental conditions can be controlled, conduct a Discrimination Test at or near zero load.

Code Reference: 2.20: N.1.5. (1/1/86).

A test loads equivalent to 1.4 d shall cause a change in the indicated or recorded value of at least 1.0 d.

Code Reference: 2.20: T.N.7.1.*

6.2.3. Increasing-Load Test. Conduct an increasing-load test including test loads of 500 d, 2000 d, and 4000 d approximately centered on platform.

Code Reference: 2.20: N.1.1.

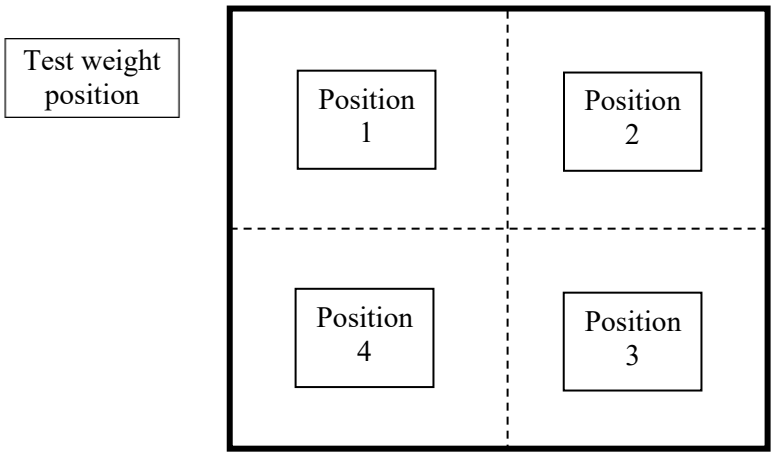
- For scales indicating in metric units: test loads of 30 g, 100 g, 200 g, and 500 g.
- For other scales: test loads of 1 oz, 3 oz, 7 oz, and 15 oz or 0.05 lb, 0.15 lb, 0.45 lb, and 0.95 lb.

Then check:

- For scales that indicate in metric units – at each 500 g to one quarter capacity.
- For other scales at each pound to one quarter capacity.

6.2.4. Shift Test. Conduct a shift test using test weights equal to no less than 30 % of scale capacity, but not to exceed 35 % of scale capacity.

Code Reference: 2.20: N.1.3.7.(a).



Shift Test Positions - Mechanical Scales

6.2.5. Increasing-Load Test. Continue increasing-load test at one-half, three-quarters, and nominal capacity.

Code Reference: 2.20: N.1.1.

6.2.6. Discrimination Test, Maximum Capacity (Automatic Indicating Scales). Except for Class I or II scales in which e = d and is less than 5 mg, if environmental conditions can be controlled, conduct a Discrimination Test at maximum capacity.

Code Reference: 2.20: N.1.5. (1/1/86).

A test load equivalent to 1.4 d shall cause a change in the indicated or recorded value of at least 1.0 d.

Code Reference: 2.20: T.N.7.1.*

6.2.7. Decreasing-Load Test. The decreasing-load test shall be conducted with the test load approximately centered on the load-receiving element.

Code Reference: 2.20: N.1.2.

6.2.7.1. Test Loads for Scales Marked with an Accuracy Class Designation and Having 1000 or More Verification Scale Intervals (n).

The decreasing-load test shall be conducted with test loads equal to the maximum test load at each tolerance value. For example, on a Class III scale, conduct the test at loads equal to 4000 d, 2000 d, and 500 d; for all other scales, the test load shall be equal to one-half of the maximum load applied in the increasing-load test.

Code Reference: 2.20: N.1.2.1.

6.2.7.2. Test Load for All Other Scales.

The decreasing-load test shall be conducted with a test load equal to one-half of the maximum load applied in the increasing-load test.

Code Reference: 2.20: N.1.2.2.

6.2.8. Zero-Load Balance Change. Remove the test load and verify the zero-load balance does not change by more than the minimum applicable tolerance.

Code Reference: 1.10: G-UR.4.2., 2.20: N.1.9.

6.2.9. Money-Value Test. Check cart or drum at several points.

Code Reference: 1.10: G-S.5.5.

6.2.10. Money-Value Computations, Analog Indications. Verify the money value computation (analog indications) does not exceed:

Code Reference: 2.20: S.1.8.1., S.1.8.2.

Maximum Money Value Interval	Price/Kilogram	Price/Pound
$0.01	$0.55 or less	$0.25 or less
$0.02	$0.56 to $2.75	$0.26 to $1.25
$0.05	$2.76 to $7.50	$1.26 to $3.40
$0.10	greater than $7.50	greater than $3.40

6.2.11. Money Value Computation. Verify analog quantity indications/digital money values.

Code Reference: 2.20: S.1.8.3.

7. Post-Test Tasks.

NOTE: Code references used throughout the document are drawn from NIST Handbook 44 (HB 44) General Code (Section 1.10) and Scales Code (Section 2.20). The relevant code section(s) is cited by its numerical designation and the applicable requirement(s) from that code section is identified by letter-number designation only. The code section and paragraph designation(s) are then shown immediately after the corresponding line item or task listed in the procedure. For example, NIST Handbook 44 (HB 44) General Code (Section 1.10) is designated as "1.10:" followed by the paragraph designation(s) relevant to the line item.

7.1. Security Means.

Adequate provision shall be made for applying a physical security seal and/or providing other approved means of security such as a data change audit trail.

Code Reference: 1.10: G-S.8. (1/1/90), G-S.8.1. (1/1/10), 2.20: S.1.11. (portions Nonretroactive), Table S.1.11. (1/1/95).

For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. Devices and Systems Adjusted Using Removable Digital Storage Devices.

Code Reference: 1.10: G-S.8.2., 2.20: S.1.11.1.

For multiple measuring elements with a single provision for sealing, a change to the adjustment of any measuring element must be individually identified.

Code Reference: 1.10: G-S.8.1. (1/1/10).

A metrologically-significant software change is a sealable event.

Code Reference: 1.10: G-S.9.

7.1.1. Audit Trail Information. If the system is equipped with an audit trail, note the event counter settings on the report form for future reference. If equipped with an event logger, print a copy of the event log and attach it to the report form for future reference. Note that on some systems an electronic copy of the event log may also be available; however, the system must still be able to provide a hard copy. Examine these records for any signs of misuse of adjustments.

Code Reference: 1.10: G-S.8. (1/1/90), 2.20: S.1.11.1., S.1.11.2.(c) (1/1/95), Table S.1.11. (1/1/95).

7.1.2. Security Seal. Check for the presence of security seals on the device. Document missing seals on the official report and apply new ones as needed.

Code Reference: 1.10: G-UR.4.5.

7.2. Review/Analyze Results. After all equipment at a location has been tested, review the results to determine compliance with requirements for equipment maintenance and use of adjustments.

Code Reference: 1.10: G-UR.4.1., G-UR.4.3.

7.3. Record Compliance Action and Explain Results. Record the compliance action and disposition of the device on the report and explain the results to the device owner.

SAFETY REMINDER!!!

- **Secure all test equipment when transporting it to next location.**

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