

**EPO No. 1****Examination Procedure Outline for  
Retail Computing Scales**

It is recommended that this outline be followed for 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. Non-retroactive requirements are followed by the applicable date in parentheses.

**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.*

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. The inspector should read and be familiar with the introductory section on safety "Safety Considerations" found at the beginning of this publication. As a minimum, the following safety precautions should be noted and followed during the inspection. Definitions of each reminder are found in the "Glossary of Safety Key Phrases" at the back of this publication.

*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.*

**Electrical Hazards****Personal Protection Equipment**

e.g., Safety Shoes

**First Aid Kit****Support – for Scale and Test Weights****Lifting****Transportation of Equipment****Location**also:   **Wet/Slick Conditions**         **Chemicals, Petroleum Products, and Hazardous Materials**         **Obstructions**

**EPO No. 1****Inspection:****Safety First!!!**

**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 that a first aid kit is available and that the kit is appropriate for the type of inspection activity.**

### **H-44 General Code and Scales Code References**

1. Zero-load balance as found. For pre-packaging scale, check to determine if tare is being taken.....S.1.1., UR.4.1., S.2.1.1., S.2.1.2., G-S.5.2.2.(d) (1/1/86)
  2. General Considerations
 

Selection .....	G-UR.1.1.
Installation.....	G-UR.2.1., G-UR.2.2., UR.2.2.
Supports and clearance.....	UR.2.1., UR.2.4.
- Check to be sure the scale supports are adequate to support the scale and test weights equal to the capacity of the scale !**
- Accessibility for inspection, testing, and sealing.....G-UR.2.3.
  - Testing devices at a central location.....G-UR.4.6.
  - Assistance.....G-UR.4.4.
  - Position, customer readability .....G-UR.3.3., S.1.8.3.
  - Level indicating means and condition .....S.2.4., UR.4.2.
  - Maintenance, use, and environmental factors  
(cleanliness, obstructions, modifications, etc.) .....G-S.2., G-UR.1.2., G-UR.3.1.,  
G-UR.3.2.,  
UR.3.5., G-UR.4., UR.2.3.,  
UR.4.3.
  3. Marking .....S.6.3., G-S.5.2.4, S.5.1., S.6.2
    - a. Marking requirements - all devices
 

Identification .....	G-S.1.
Name or ID of manufacturer.....	Retroactive
Model designation .....	Retroactive
Model prefix .....	(1/1/03)
Nonrepetitive serial number .....	(1/1/68)

**Inspection (cont.):**

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Marking requirements - all devices (cont.)	
Identification (cont.)	G-S.1.
Serial number prefix	(1/1/86)
NTEP CC prefix and number	(1/1/03)
(for devices that have an NTEP CC)	
Remanufacturer information, as appropriate	G-S.1.1.
name and ID of remanufacturer	(1/1/02)
model number if different from original model number	(1/1/02)
Lettering	G-S.7.
Operational controls, indications, and features	G-S.6. (1/1/77)
Visibility of identification	G-UR.2.1.1.
Interchange or reversal of parts	G-S.4.
b. Marking requirements - weighing and indicating elements in same housing or covered on the same CC (in addition to marking for all devices)	S.6.3.
Accuracy class	(1/1/86)
Nominal capacity	Retroactive
Value of scale division with nominal capacity, if not apparent	(1/1/83)
Value of "e" (if different from "d")	(1/1/86)
Temperature limits if other than -10 °C to 40 °C (14 °F to 104 °F)	(1/1/86)
Scales designed for special purposes	(1/1/86)
c. Marking requirements - indicating element not permanently attached or covered on separate CC (in addition to marking for all devices)	S.6.3.
Accuracy class	(1/1/86)
Nominal capacity	Retroactive
Value of scale division with nominal capacity, if not apparent	(1/1/83)
Value of "e" (if different from "d")	(1/1/86)
Temperature limits if other than -10 °C to 40 °C (14 °F to 104 °F)	(1/1/86)
Scales designed for special purposes	(1/1/86)
Maximum number of scale divisions ( $n_{max}$ )	(1/1/88)
d. Marking requirements - weighing and load receiving element not permanently attached or covered on separate CC (in addition to marking for all devices)	S.6.3.
Accuracy class	(1/1/86)
Nominal capacity	Retroactive
Temperature limits if other than -10 °C to 40 °C (14 °F to 104 °F)	(1/1/86)
Scales designed for special purposes	(1/1/86)
Maximum number of scale divisions ( $n_{max}$ )	(1/1/88)
Minimum verification scale division for which device complies with the requirements ( $e_{min}$ or d)	(1/1/88)
e. Marking requirements - load cell with Certificate of Conformance (in addition to marking for all devices)	S.6.3. S.5.4. (1/1/94)
<b>Note:</b> 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	(1/1/88)
Manufacturer's name or trademark, model designation, model prefix, and serial number and prefix shall also be marked on both the load cell and in any accompanying documents	(1/1/91)

**Inspection (cont.):**

**EPO No. 1**

Marking requirements - load cell with Certificate of Conformance (cont.).....	S.6.3. S.5.4. (1/1/94)
Accuracy class.....	(1/1/88)
Temperature limits if other than -10 °C to 40 °C (14 °F to 104 °F).....	(1/1/86)
Maximum number of divisions.....	(1/1/88)
“S” or “M” for single or multiple cell applications .....	(1/1/88)
Direction of loading, if not obvious.....	(1/1/88)
Minimum dead load, maximum capacity, safe load limit, and load cell verification interval, v <sub>min</sub> .....	(1/1/88)
 4. Indicating and recording elements.	
Value of scale division .....	S.1.2.* (1/1/86), S.1.2.1. (1/1/89), S.1.2.2., S.5.3., UR.1.1.(b), G-S.5.3., G- S.5.3.1., U.R.1.3. (1/1/86)
Prepackaging scales only.....	S.1.9.1.
Value of tare division .....	S.2.3. (1/1/83)
Tare mechanism .....	S.2.3.
Combined zero-tare (“0/T”) key .....	S.2.1.6.
Appropriateness of design .....	G-S.3., G-S.5., S.1.3., S.1.4., S.1.8.1., S.1.8.2., S.5.2.*(1/1/86), S.1.8.3.1 (1/10/01), S.5.4
Prepackaging scales only.....	S.1.9.2.
Suitability for use .....	UR.1., UR.1.1., UR.3.1.*, UR.3.2., G-UR.1.1.
Damping means .....	S.2.5.
Adjustable components .....	S.1.10.
Provisions for sealing .....	S.1.11.(a) (1/1/79), S.1.11.(b) (1/1/90), S.1.11(c) (1/1/95), G- UR.4.5., G-S.8. (1/1/90), S.1.8.3.1. (1/1/01)
 5. Weighing elements	
Antifriction means .....	S.4.1.
Adjustable components .....	S.4.2.
Multiple load-receiving elements .....	S.4.3.
Drainage, if wet commodities are weighed .....	S.3.2., UR.3.6.
Scoop counterbalances .....	S.3.3.

**Pretest Determinations:**

Tolerances.

1. Acceptance/maintenance .....
  2. Application .....
- G-T.1., G-T.2.  
G-T.3.

**EPO No. 1****Pretest Determinations (cont.):**

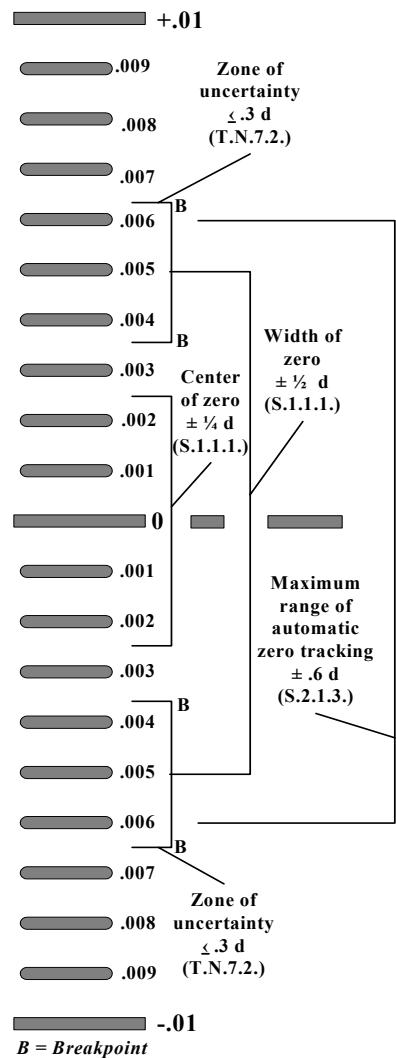
## 3. Tolerance values:

Determine number of scale divisions (n) <sup>1</sup> .....	n = <u>Scale capacity</u> Value of scale division
If scale is marked with an accuracy designation.....	T.N.2.1., T.N.2.3., T.N.2.4., T.N.3.1./ Table 6 (Class III), T.N.3.2., T.N.4.4., T.N.5.
If scale is unmarked but n equals 5000 or less .....	T.1.1., T.N.2.1., T.N.2.3., T.N.2.4., T.N.3.1./Table 6 (Class III), T.N.3.2., T.N.4.3., T.N.5.
Unmarked postal & parcel post scales.....	T.1.2.
Discrimination .....	T.N.7.1., T.N.7.2., N.1.5.(1/1/86), N.1.5.1

**Test Notes:**

1. Check repeatability of, and agreement between, indications throughout test. .... G-S.5.2.2.(a), T.N.5.,  
G-S.5.4.
2. Recheck zero-load balance each time test load is removed. .... N.1.9., G-UR.4.2.
3. If scale is equipped with a printer, print ticket  
or label at each test load. Check effectiveness  
of motion detection, and check labels and weight  
and money value agreement..... G-S.5.2.2., G-S.5.5.,  
G-S.5.6., S.2.5.1.(b),  
S.1.8.2., S.1.8.4., UR.1.3.  
(1/1/86)
4. **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..... N.1.5. (1/1/86), N.1.5.1.,  
S.1.1.1.(a), S.1.1.1.(b) (1/1/93)

<sup>1</sup> On a multiple range or multi-interval scale the number of divisions for each range independently shall not exceed the maximum specified for the accuracy class. The number of scale divisions, n, for each weighing range is determined by dividing the scale capacity for each range by the verification scale division, e, for each range (i.e., do not add "n" for the ranges together). On a scale system with multiple load receiving elements and multiple indications each element considered shall not independently exceed the maximum specified for the accuracy class if the system has a summing indicator, the  $n_{max}$  for the summed element shall not exceed the maximum specified for the accuracy class. (Table 3 footnote added 1998).

**EPO No. 1****Test Notes (cont.):**

This example of Auto Zero 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.

Auto zero:

<u>Test action</u>	<u>Indication</u>
a. Zero scale	.00
b. Appy 0.007	.+01
(Repeat three times. Three failures will result in scale rejection.)	
c. Zero scale	.00
d. Apply 0.007	.+01
e. Zero Scale	.00
f. Remove 0.007	-.01 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:

<u>Test action</u>	<u>Indication</u>
a. Zero scale	.00
b. Apply 0.007	.+01
c. Zero scale	.00
d. Remove 0.007	-.01 or a below zero indication.
e. Apply 0.015	.+01 Stable

(Note: The scale should pass this test with 0.013. The 0.002 is added to recognize field environments. Three successive failures will result in rejection.)

Apply or remove weights all at once in both tests. Use forceps if necessary.

5. **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, or two scales with one printer, check proper operation and appropriateness .....

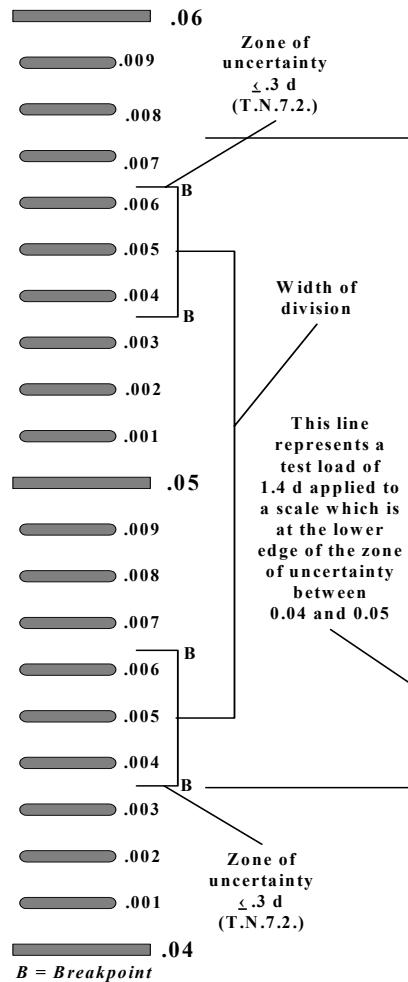
G-UR.4.1., G-UR.4.2.,  
S.4.3., S.1.12.(1/1/93), UR.3.9.

**Test for Electronic Scales:**

**WEAR SAFETY SHOES !**  
**USE PROPER LIFTING TECHNIQUES !**

**EPO No. 1****Test for Electronic Scales (cont.):**

1. Test for discrimination at zero load (if environmental conditions permit)..... N.1.5. (1/1/86), N.1.5.1.



This example of a discrimination test at zero load 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.

- With the devices at zero, place decimal weights on scale equal to 1 d.
- Zero the scale and place a test load equal to 5 d on the load receiver.
- 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.)
- Add a test load equal to 1.4 d. to the scale (0.014 lb)
- The indication should read a steady 0.06 lb.
- If the scale passes this test at a load near zero, the test should be performed near the maximum test load.

2. Increasing-load test<sup>2</sup> (with the load centered)

at the following minimum test loads (20d):

For scales indicating in metric units:

- 100 grams; then at each 500 grams to 2.5 kilograms; at 2.5-kilograms intervals thereafter to one-half scale capacity (include 500d, 2000d, and 4000d)..... N.1.1.

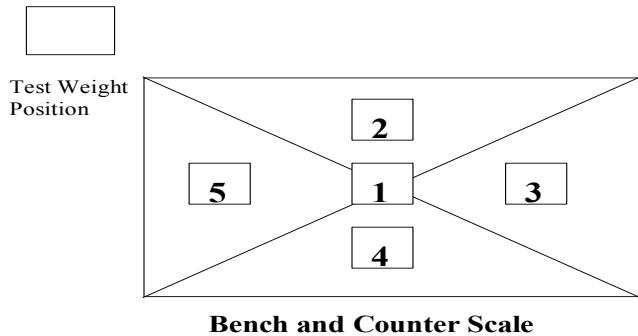
For other scales:

- 0.50 pound; then at each pound to 5 pounds; at 5 pound intervals thereafter to one-half scale capacity (include 500d, 2000d, and 4000d)..... N.1.1.

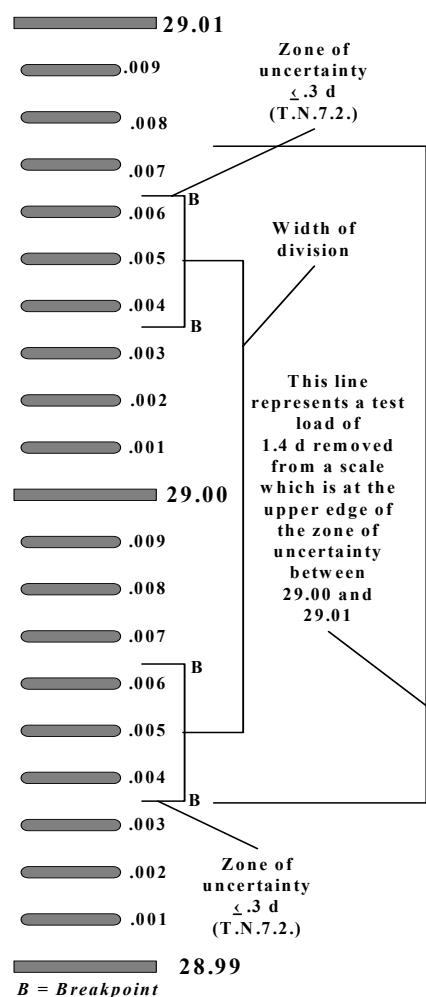
<sup>2</sup> For scales that are not marked with an accuracy classification and have less than 1000 scale divisions, use the following procedure: begin test at 20 d then test at 0.50 pound and at each pound to capacity, including 1/4, 1/2, and 3/4 capacity.

**EPO No. 1****Test for Electronic Scales (cont.):**

3. Shift test--one-half capacity load.....N.1.3.1.



4. Continue increasing-load test:  
 For scales indicating in metric units - at 2.5-kilograms to capacity  
 For other scales – at 5-pound intervals to capacity.
5. RFI/EMI tests (if a problem is suspected)  
 Radio Frequency Interference (RFI)  
 Electromagnetic Interference (EMI) at capacity.....G-UR.1.2., G-N.2., G-UR.3.2.,  
 G-UR.4.2.,  
 N.1.6., T.4., T.N.9.\*
6. Test for over-capacity indication.....S.1.7.
7. Test for discrimination at capacity (if environmental conditions permit). ....N.1.5. (1/1/86), N.1.5.1.  
 A test load equivalent to 1.4d shall cause a change in the indicated or recorded value of at least 2.0d. ....T.N.7.2.

**EPO No. 1****Test for Electronic Scales (cont.):**

This example of a discrimination test near capacity is based on a scale division 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 near the maximum capacity, the test should be performed near zero.

8. Decreasing-load test--for scales marked with an accuracy class and having 1000 or more scale divisions (d), test with loads equal to the maximum test load at each tolerance value. For example, on a Class III scale, at test loads equal to 4000d, 2000d, and 500d; for scales with n less than 1000d, the test load shall be equal to one-half of the maximum load applied in the increasing-load test. .... N.1.2., N.1.2.1., or N.1.2.2.
9. Recheck zero-load balance ..... N.1.9., G-UR.4.2.
10. Test for proper design of automatic zero-setting mechanism, if scale is so equipped. .... S.2.1.3.(a) (1/1/81)  
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.
11. Check proper design of tare auto-clear, if scale is so equipped. .... S.2.3. (1/1/83)

**Test for Electronic Scales (cont.):**

**EPO No. 1**

12. If scale is equipped with a semi-automatic zero-setting mechanism, test effectiveness of motion detection ..... S.2.1.2.(b)
13. Establish correct zero-load balance ..... N.1.9., G-UR.4.2.

**Test for Mechanical Scales:**

**WEAR SAFETY SHOES !  
USE PROPER LIFTING TECHNIQUES !**

1. Increasing-load test (include test loads of 500d, 2000d, and 4000d as part of this test)..... N.1.1

For scales that indicate in metric units: test loads of 30, 100, 200, and 500 grams

For other scales: test loads of 1, 3, 7, and 15 ounces or 0.05, 0.15, 0.45, and 0.95 pounds centered,

Then check:

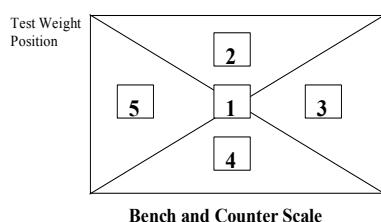
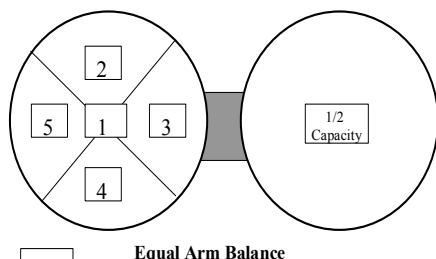
For scales that indicate in metric units - at each 500 grams to one quarter capacity

For other scales – at each pound to one-quarter capacity.

2. Shift test--one-half capacity load ..... N.1.3.1.

**Shift Test Pattern**

1/2 Capacity Test Load



Bench and Counter Scale

3. Continue increasing-load test at three-quarters and capacity..... N.1.1.

**Test for Mechanical Scales (cont.):**

4. Test for discrimination at capacity

**EPO No. 1**

(if environmental conditions permit).....N.1.5.(1/1/86), N.1.5.1.

A test load equivalent to 1.4d shall cause a change in the indicated or recorded value of at least 1.0d.....T.N.7.1.

5. Decreasing-load test .....N.1.2.  
 For scales marked with an accuracy class and having 1000 or more scale divisions, test with loads equal to the maximum test load at each tolerance value. For example, on a Class III scale, at test loads equal to 4000d, 2000d, and 500d; for scales with n less than 1000, the test load shall be equal to one-half of the maximum load applied in the increasing-load test.....N.1.2.1.

All other scales. One-half of the maximum load applied in the increasing-load test .....N.1.2.2

6. Recheck zero-load balance .....G-UR.4.2, N.1.9.  
 7. Money-value test. Check chart or drum at several points .....G-S.5.1.

The money value computation does not exceed: .....S.1.8.

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

8. Establish correct zero-load balance .....G-UR.4.2., N.1.9.

Secure all test equipment when transporting it to next location.