Audit Trail Criteria

- Weighing Devices

NIST Handbook 44

Introduction

- Audit trails accepted in 1989
- Audit trails provide more information than a lead-and wire seal
- Many benefits to users and weights and measures officials

Introduction (continued)

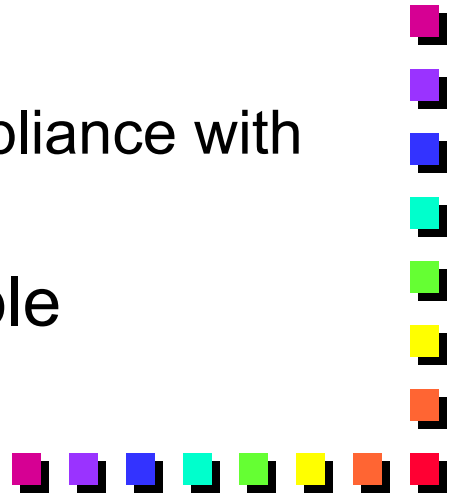
- Same notification requirements apply
- Weights and Measures officials and service personnel must understand
  - Audit trail format
  - Audit trail requirements
  - How to use the information from audit trails

Sealing and Security Seals History

- Before 1979
  - Only lead and wire seals permitted
  - Only adjustments for performance requirements were required to be sealed
- 1979 : Pressure sensitive security seals permitted
- 1985: G-S.8. Added; applied to all electronic adjustable components

Sealing and Security Seals History (continued)

- 1989: G-S.8. & Scales Code S.1.11. Amended
  - Approved means of electronic audit trail recognized
  - Seal features and parameters affecting metrological integrity
    - adjustments affecting accuracy
    - selection of operations that affect compliance with Handbook 44
  - Maintain record of changes to sealable parameters



G-S.8. Provision for Sealing

- G-S.8. Recognizes security means other than physical seals

- Alternative forms of security must be an “approved means”
  - Guidelines for “approved means” established for scales and liquid-measuring devices

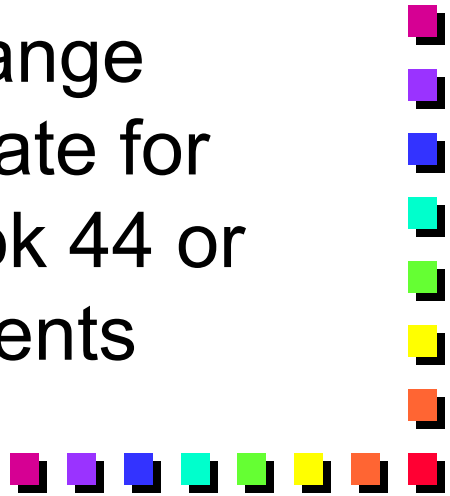
- Must seal any adjustment that affects the “metrological integrity” of the device

  That is…..

Metrological Parameters to be Sealed

- Parameters that can affect the measurement features that have a significant potential for fraud

- Features of parameters whose range extends beyond what is appropriate for device compliance with Handbook 44 or suitability of equipment requirements



Two Types of Parameters to be Sealed

- Adjustment Parameters:
  - Parameters whose values are expected to change as a result of accuracy adjustments
- Configuration Parameters:
  - Parameters whose values are expected to be entered once only and not generally changed after all initial installation settings are made

Five Philosophies/Principles for Sealing

1. Need to seal depends on:
   - Ease of facilitation of fraud
   - Likelihood that fraud will not be detected

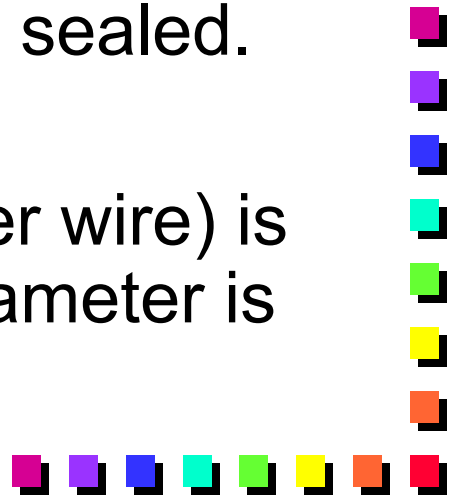
2. Features/Functions used in routine operation do not need to be sealed (e.g., setting unit prices).

Five Philosophies/Principles for Sealing

3. If selection of parameter would result in obvious error, parameter is not required to be sealed.

4. If menu of parameter options is available, access to menu of options must be sealed.

5. If a physical act (e.g., cutting jumper wire) is required to change parameter, parameter is not required to be sealed.



Typical Parameters and Features to be Sealed

- Defined in NCWM Publication 14
  - scale features and parameters
  - liquid-measuring device features and parameters
  - other device type features and parameters

Scale Features and Parameters	
Typical Scale Features to be Sealed	**Typical Scale Features and Parameters Not Required to be Sealed**
Coarse zero Span Linearity correction values Motion detection (on/off) Motion detection (number of divisions and speed of operation) Number of samples averaged for weight readings Averaging time for weight indications Selection of measurement units (if internally switched and not automatically displayed on the indicator) Division value, d Number of scale divisions, n Range of over capacity indications (if it can be set to extend beyond regulatory limits) Automatic zero-setting mechanism (on/off) for bulk-weighers hopper scales and all Class III L devices Automatic zero-setting mechanism (range of a single step) 1/4 and 1/2 lb pricing capability or multiplier keys Weight Classifier mode (enabled/disabled) Manual Gross Weight Entries (enabled/disabled) for applications where this feature is not permitted in Handbook 44	Automatic zero-setting mechanism (Selection of total range, e.g., 4 percent or 100 percent of capacity) Display update rate Weigh-in/weigh-out operation (on/off) Stored tare weight capability (e.g., computing scales and vehicle weight by information number) Selection of tare feature operation, e.g., keyboard or push-button tare (on/off) Product codes Commodity unit prices Discounts Baud rate for electronic data transfer Manual Gross Weight Entries for application where this feature is permitted in Handbook 44

Benefits of Audit Trails

- Provides industry with an alternative to physical security seals
- Provides more information than physical security seals
- Device owner can use to detect employee tampering

Benefits of Audit Trails (continued)

- Evidence to weights and measures of the number, frequency, and types of changes
- Alerts inspector when investigation is necessary
- Deterrent to fraudulent manipulation of parameters

Definition of “Remote” Device

- Not required for the measurement operation of the primary device or to compute the transaction information (in any mode)
- Not a permanent part of the primary device
- Able to adjust another device or change a device’s sealable configuration parameters

Criteria Defining a System

- The device, component, or main element is essential to the measurement operation of the device or the display of transaction information.

- The device, component, or main element is a permanent part of the device.

Categories of Devices - Overview

- Category 1
  - No remote configuration capability
- Category 2
  - Remote configuration capability
  - Hardware enabling access for remote communication
- Category 3
  - Remote configuration capability
  - Unrestricted access to configuration parameters or adjustments

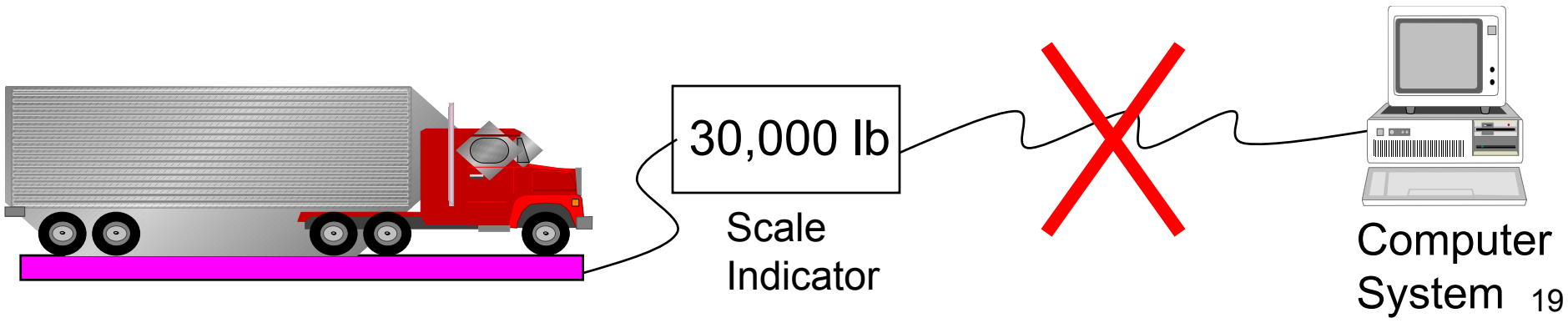
Table S.1.11. Categories of Device and Methods of Sealing	
Categories of Device	***Method of Sealing***
Category 1: No remote configuration capability.	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: Remote configuration capability, but access is controlled by physical hardware. *Device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to ten 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.)*
[Nonretroactive as of January 1, 1995] (Table added 1993)	

Table S.1.11.
Scales Code

Weighing Devices
Category 1

- No remote configuration capability
- Access to adjustments/configuration only at the device
- Sealing:
  - physical seal or
  - two event counters (minimum form of audit trail)

Example: Computer system may communicate with scale and print tickets/invoices but can NOT Remotely *Configure* scale



Weighing Devices
Category 2

- Remote configuration capability
- Access to remote configuration is controlled by physical hardware at the device
- Clear indication when in configuration mode
  - including indication on any recorded representation
- Sealing:
  - hardware enabling access for remote communication sealed using a physical seal

  OR
  - device receiving parameters sealed with two event counters (calibration and configuration)

Weighing Devices
Category 2 - Example

Required Sealing:

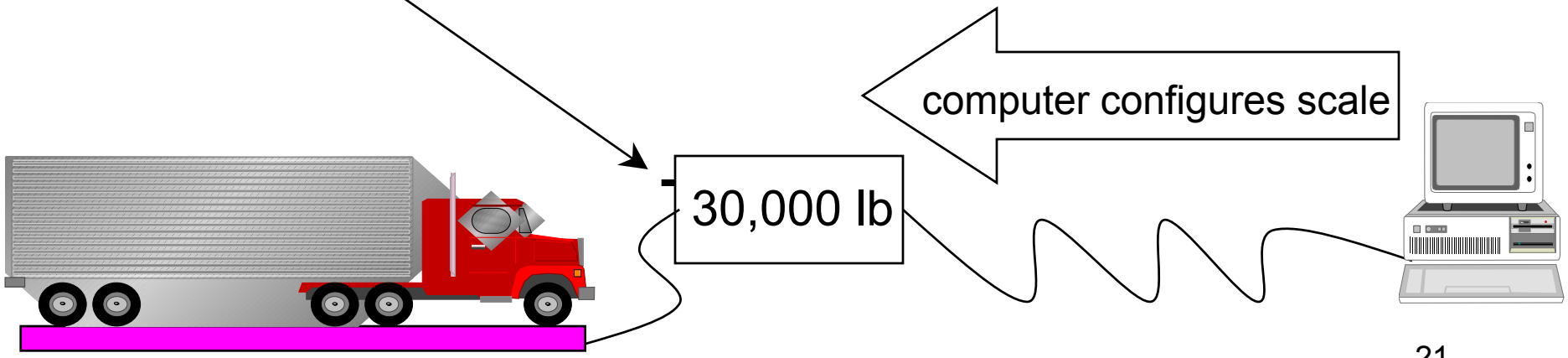
-Physical seal on hardware at scale

OR

-Two event counters:

- -one for configuration parameters
- -one for calibration parameters

Physical hardware at device enables access to remote configuration



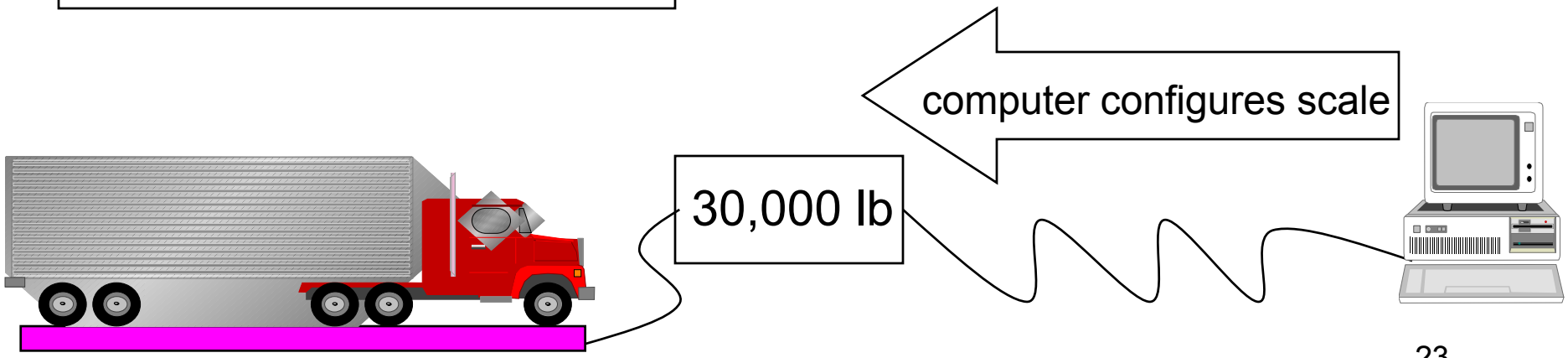
Weighing Devices
Category 3

- Remote configuration capability
- Access to configuration parameters or adjustments unrestricted or controlled through software switch (e.g. password)
- Sealing:
  - event logger (or centralized event logger)
    - includes event counter (000 to 999), parameter ID, date, time, new value
    - printed copy through device or through another on-site device

Weighing Devices
Category 3 - Example

Unrestricted Access
-i.e., scale can be configured through computer anytime

Required Sealing:
-Event logger is required
- -event counter (000 to 999)
- -parameter ID
- -date
- -time
- -new value of parameter



Categories of Devices
Other Device Types

- Audit trail requirements for other device types may vary
  - some device types may have more stringent requirements
- Examples:
  - belt-conveyor scales have only two categories
    - Category 1 and 3
  - grain moisture meters have five categories
    - Categories 1, 2, 3, 3a, and 3b

Access to Audit Trail Information General

- Described in the NTEP Certificate of Conformance
- Viewing or printing contents:
  - must be “convenient”
  - must be separate from calibration or set-up mode
  - must not affect normal operation before or after access
  - may be through a supervisor’s mode
  - may require a key to access

Access to Audit Trail Information General

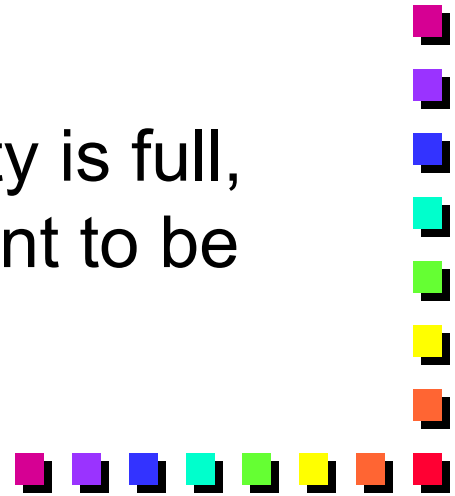
- Displayed or printed information shall be readily interpretable by the inspector
- Order of displayed or printed information is most recent to oldest event

General Requirements for Audit Trails

- Adjustment mode accesses only sealable parameters
- An event counter shall be able to count at least 1000 values (e.g., 000 to 999)
  - Increments only *once* while in the configuration mode regardless of the number of changes while in that mode
  - Counter increments *only* when parameter is changed

General Requirements for Audit Trails (continued)

- Audit trail data shall be:
  - Stored in non-volatile memory
  - Retained for at least 30 days if power is removed
  - Protected from unauthorized erasure, substitution, or modification
- When the event logger storage capacity is full, any new events shall cause oldest event to be deleted



Minimum Form of Audit Trail

- Two event counters:
  - One for adjustment parameters
  - One for configuration parameters
- Capacity of 0 to 999 for each counter
- Counter increments once each time access mode is entered and an adjustment is made

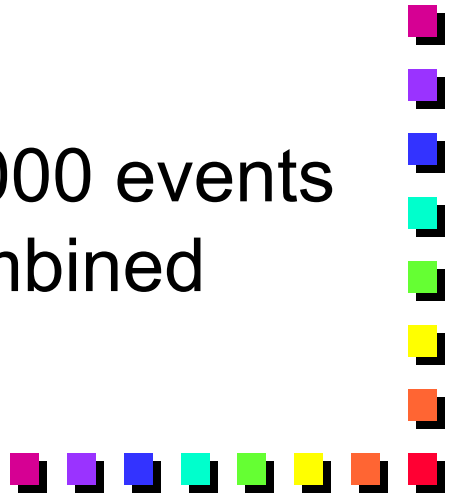
Event Logger

- Required on systems with remote configuration with unrestricted access

- Requires:
  - Event Counter
  - Time
  - Date
  - ID of parameter changed
  - New value for parameter

Event Logger (continued)

- Hard copy printout must be available at device or through another on-site device
- Needs to retain 10 entries per sealable parameter
- Not required to retain more than 1000 events in the logger for all parameters combined

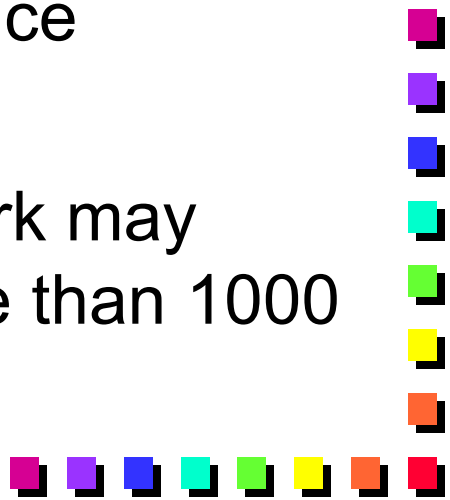


Centralized Event Logger

- Changes through the device sent to and retained in centralized event logger
- It shall not be possible to circumvent the event logger
  - Changes to sealable parameters made through the device (rather than the central device) shall also be recorded in the centralized logger

Centralized Event Logger (continued)

- Devices which have stand-alone operation must have the minimum form of audit trail for the stand-alone operation
- Hard copy of event logger contents must be available on demand from on-site device
- Large numbers of devices on a network may require a logger with capacity for more than 1000 events



Physical Seal Compared to Audit Trail

- Physical seal:
  - Broken seal indicates access to the sealed features or adjustments
  - Viewed as a deterrent

Physical Seal Compared to Audit Trail (continued)

- Audit Trail:
  - Indicates if changes were made to adjustments or to configuration parameters
  - Indicates number of times the changes were made
  - Record of changes serves as a deterrent
  - Retains the last values of electronic adjustments or on event logger